STAX Service User's Guide

STAf eXecution engine
Version 3.5.17

June 27, 2016

Document Owner: Sharon Lucas

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Overview

STAX (STAf eXecution engine) is an XML-based execution engine implemented as an external STAF service. STAX was designed to make it significantly easier to automate the workflow of your tests and test environments.

STAX accepts job definitions, in the form of XML documents. Fundamentally, these job definitions allow you to specify the processes and STAF commands necessary to perform the job. STAX provides a wealth of expressive functionality on top of this, making it easy to implement, manage, track, and monitor your jobs.

STAX uses the Python scripting language for variable and expression evaluation. The Python code is executed by Jython, a version of Python written entirely in Java. This allows STAX to take advantage of the powerful and easy-to-use features of Python.

The sections that follow describe the basic concepts behind STAX, explain the STAX XML language used to define your jobs, and detail the commands externalized by the STAX service. Read on to find out more about the exciting new world of STAX.

Concepts

STAX Elements

A STAX Element is a node in a STAX XML document. Some of the items that STAX Elements can represent are: data to be used during the job, commands/processes to be executed, definitions of the logic and control flow within the job, exceptions and signals, and wrappers such as functions and blocks that encompass other STAX Elements.

Processes and Commands

A STAX job definition describes the execution flow for processes and STAF commands.

- A process element really defines the execution information for a STAF PROCESS START command. A process element specifies a command to be executed and the machine where it should run. For example, the command could specify to run a Java application or a Python file which is one of your testcases. A process element may contain many optional elements (which correspond to optional options that you can specify for a STAF PROCESS START command). For example, the parms, workdir, env, stdin, stdout, and stderr elements are some of the optional elements that can be specified within a process element. Note that you may specify an "if" attribute for each of these optional elements which provides a convenient shortcut to deal with many variations of optional process elements that, otherwise, would have to be specified using the if/elseif logic elements and multiple different process elements.

- A stafcmd element defines execution information for other STAF commands. A stafcmd element specifies the STAF service and request to be executed (e.g. RESPOOL REQUEST POOL, FS COPY FILE) and the machine where it should be run.

Processes and stafcmds may be put into sequential and/or parallel wrappers which can be nested.

Expression Evaluation via Python

STAX allows you to avoid hard-coding information in your job definition by using Python to assign values to variables and then using Python scripting language to evaluate expressions and to execute Python code. STAX also sets some variables in Python that provide runtime information about the job definition's execution.

For example, instead of hardcoding the name of the machines where processes and commands are executed during the job, a Python variable can be assigned the name of the machine and specified for the location element. Python variables also be provided at the time the job is requested to be executed. A Python variable may also be assigned a list of machine names.

After STAX processes some elements (e.g. process and stafcmd), the return code and result (if applicable) are accessible via STAX variables. These variables can be referenced by other STAX elements (e.g. via the if element's expression attribute) to determine logic flow within the job.

Groups

STAX can execute groups of STAX Elements sequentially or in parallel. When Elements are executed in parallel, STAX will run each of the Elements on a separate thread.

Loops

Loop Elements are available which allow a STAX Element to be executed repeatedly. Additionally, there are Iterate Elements which allow a STAX Element to be executed repeatedly while stepping through a list of data for each iteration (this could be used, for example, to execute a sequence of

commands for each machine in a list).

STAX-Threads

When the STAX Service executes elements in parallel, rather than using real system threads (and thereby potentially creating an overabundance of system threads), the STAX Service will simulate the threading capabilities via a thread pool which will utilize a manageable number of real system threads. These simulated threads are called STAX-Threads.

Whenever a new STAX-Thread is created, existing variables are cloned from the parent STAX-Thread. To create a global variable that can be accessed across STAX-Threads, use the STAXGlobal class described in "STAXGlobal Class" section. STAX elements that can create STAX-Threads include the following: <parallel>, <paralleliterate>, <process-action>, <job-action>, and <function> elements with a local scope.

Wrappers

STAX has several Wrapper Elements which simply provide additional functionality to another STAX Element. These Wrapper Elements can denote Testcases (with testcase status), Blocks (for which execution control can be manipulated), Timers (for time-based execution control), and Functions (which provide a unique name that can be called from other STAX Elements in the Job Definition.

Functions

Functions are a nearly universal program-structuring device. Functions serve two primary development roles: code reuse and procedural decomposition. Functions are the simplest way to package logic you may wish to use in more than one place and more than one time. Functions allow us to group and parameterize chunks of XML to be used arbitrarily many times later. Functions also provide a tool for splitting jobs into pieces that have a well-defined role. STAX allows functions to be imported from other XML files so that you can build up libraries of STAX functions that can be reused by many different STAX jobs.

Sub-Jobs

STAX provides a "job" element so that sub-jobs can be executed within a parent job with synchronized completion as well as providing access to the sub-job result.

Logic Flow

STAX provides an "if" element which can evaluate conditions using Python (for example, a return code) to determine logic flow within the STAX Job Definition, thus allowing job flow to branch dynamically.

Exceptions and Signals

The STAX Service provides exception and signal handling capabilities. STAX exception handlers, as well as finally blocks, alter the execution flow of the

job. STAX signal handlers provide asynchronous error handling of raised signals. The STAX execution engine may also raise signals or throw exceptions for errors which occur during job execution.

Monitoring STAX Jobs

A STAX Monitor application is available for the STAX Service. This application displays a graphical representation of the currently running elements of a given Job. The STAX Monitor makes it easy to see which processes and STAF commands are currently running as well as the blocks which contain them. You may select a process or STAF command to get more detailed information about it. You may also select a block and then control the execution of the job by choosing to hold, release, or terminate the block. The STAX Monitor also displays a list of testcases that have been run and the number of passes and fails for each. Also, a messages panel displays any messages that are sent by the job. This can help make debugging a job definition easy.

Logging

The STAX Service maintains a service log which records high level information about all jobs that have been submitted.

The STAX Service also maintains an individual job log for each submitted job. These job-specific logs record information such as testcase status and job execution tracing. If the "log" element is used within the STAX Job Definition, then a user log is also created for the submitted job.

Queues

The STAX Service uses the STAF QUEUE service for sending messages. Each STAF handle has a queue (see the STAF User's Guide for more information on STAF handles, queues, and the QUEUE service). Each STAX job has a handle associated with it (and, thus, a queue). A STAX job uses it's STAF Queue for lots of things, so you should not use the STAX job handle's queue (e.g. don't get try to get data off a STAX job handle's queue) as that can interfere with the use of the queue by the STAX service.

Alternatively, if you want your STAX job to use a queue on the STAX service side to send and receive messages, you can create your own STAF handle and use it's queue. Refer to Sample STAX Job 3 - Creating a STAF Handle and Using it's Queue for an example of how to create a STAF handle within a STAX job and use it's queue to get messages.

Using XML to Define STAX Jobs

STAX uses XML (Extensible Markup Language) to describe STAX job definitions. XML is a language defined by the World Wide Web Consortium (W3C), the body that sets the standards for the Web. It is called extensible because it is not a fixed format like HTML (a single, predefined markup language). Instead, XML is actually a 'metalanguage' -- a language for describing other languages -- which lets you design your own customized markup languages for limitless different types of documents. This section reviews some XML fundamentals. Refer to the "References" section for where to get more

information about XML.

Both markup and text in an XML document are case-sensitive. All XML processing instructions start with <? and end with ?>. XML comments start with <!-- and end with -->. In XML, tags always start with < and end with >. The names that can be used for a tag are defined by the DTD (Document Type Definition).

XML documents are made up of XML *elements*. Much like in HTML, you create XML elements with an opening tag, such as <stax>, followed by the element content (if any), such as text or other elements, and ending with the matching closing tag that starts with </, such as </stax>. It's necessary to enclose the entire document, except for processing instructions, in one element, called the *root element* -- that's the <stax> element here:

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax SYSTEM "stax.dtd">
<stax>
   .
   .
   .
</stax>
```

Empty Elements

Empty elements have only one tag, not a start and end tag. In XML, you close an empty element with />. For example, nop is an empty element:

```
<nop/>
```

Attributes

Attributes in XML are name-value pairs that let you specify additional data in start and empty tags. To assign a value to an attribute, you use an equal sign. Because markup is always text, attributes are also text. Even if you're assigning a number to an attribute, you treat that number as a text string and enclose it in quotes. In XML, you must enclose attribute values in quotation marks. Usually, you use double quotes, but if the attribute value itself contains double quotes, you can use single quotes to surround the text.

If the attribute value contains both single and double quotes, you can use the XML-defined entity ' for a single quote and " for double quotes.

An example of a defaultcall element with a function attribute is:

```
<defaultcall function="MainFunction"/>
```

Creating a STAX XML document

The root element can contain other elements, of course. Here, I added elements for three functions to the document and added one element that defines the function to call first by default. Note that the function element has an attribute called name and the defaultcall element is empty and has an attribute called function.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax SYSTEM "stax.dtd">
<stax>
  <defaultcall function="FunctionA"/>

  <function name="FunctionA">
      ...
  </function>

  <function name="FunctionB">
      ...
  </function>

  <function name="FunctionC">
      ...
  </function>
</stax>
```

The function element can contain a single task element as defined by the STAX DTD. Here, I added a process element to FunctionA, a stafcmd element to FunctionB, and a log element to functionC. A process element can contain other elements. In this case I added location, command, and parms. A stafcmd element can contain other elements. In this case I added location, service, and request.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax SYSTEM "stax.dtd">
<stax>
  <defaultcall function="FunctionA"/>

  <function name="FunctionA">
      <process>
        <location>'local'</location>
        <command>'java'</command>
        <parms>'com.ibm.staf.service.stax.TestProcess 2 4 0'</parms>
      </process>
  </function>

  <function name="FunctionB">
```

```
      <stafcmd>
        <location>'local'</location>
        <service>'misc'</service>
        <request>'version'</request>
      </stafcmd>
  </function>

  <function name="FunctionC">
      <log>'This function logs this message'</log>
  </function>
</stax>
```

Document Type Definition (DTD)

The STAX DTD specifies the correct syntax of the document. A STAX XML document is valid if it complies with the STAX DTD. A DTD is a formal description in XML Declaration Syntax of a particular type of document. It defines what names are to be used for the different types of elements, where they may occur, and how they all fit together. Refer to the "STAX Document Type Definition (DTD)" section to see the entire STAX DTD.

For example, the STAX DTD allows you to describe a STAF Command which has a name attribute and contains location, service, and request elements. The relevant part of the STAX DTD contains:

```
<!ELEMENT stafcmd   (location, service, request)>
<!ATTLIST stafcmd
          name      CDATA    #IMPLIED
>
<!ELEMENT location  (#PCDATA)>
<!ELEMENT service   (#PCDATA)>
<!ELEMENT request   (#PCDATA)>
```

This defines a stafcmd as an element type containing location, service, and request elements; and it defines location, service, and request as element types containing just plain text (Parsed Character Data or PCDATA) and defines name as an attribute type containing just plain text (Character Data or CDATA). Validating parsers read the DTD before they read your document so that they can identify where every element type ought to come and how each relates to the other, so that applications which need to know this in advance (such as the STAX service) can set themselves up correctly. The example above lets you create STAF commands like:

```
<stafcmd name="'Delay'">
  <location>'local'</location>
  <service>'delay'</service>
  <request>'delay 5000'</request>
</stafcmd>
```

A DTD provides applications with advance notice of what names and structures can be used in a particular document type. Using a DTD when editing files means you can be certain that all documents which belong to a particular type will be constructed and named in a consistent and conformant manner. The STAX service parses an XML document to break it down into its component parts and then handles the resulting data. STAX uses the XML Parser for Java which is a validating XML parser.

Refer to the References section for where to get more information about the XML Parser for Java.

You can use your favorite text editor to create a STAX XML document, or you can use an XML editor such as Cooktop. If you use an XML editor, you'll probably want to get the STAX DTD file so that the XML editor can use it to validate the XML syntax by updating the DOCTYPE statement in the xml file so that the SYSTEM value is the location of the stax.dtd file you created. The stax.dtd file is not provided with the STAX service because its contents can vary because you can extend it by registering STAX service extensions. You can get the stax.dtd file by running the following from a command prompt on your STAX service machine:

```
set STAF_QUIET_MODE=1                (or if on Unix:  export STAF_QUIET_MODE=1)
STAF local STAX GET DTD > stax.dtd
set STAF_QUIET_MODE=                 (or if on Unix:  unset STAF_QUIET_MODE)
```

This creates a stax.dtd file in the current directory. Or, see Appendix D: STAX Extensions Document Type Definition (DTD) for the contents of the STAX DTD (without any extensions).

Using Python for Expression Evaluation

STAX uses the Python for variable and expression evaluation. STAX uses Jython to execute the Python code. Jython is an implementation of the Python scripting language written in 100% pure Java that runs under any compliant Java Virtual Machine (JVM). Using Jython, you can write Python code that interacts with any Java code.

STAX variable names must follow the Python variable naming conventions. In Python, variable names come into existence when you assign values to them, but there are a few rules to follow when picking names for variables.

- *Syntax: (underscore or letter) + (any number of letters, digits or underscores)*
  Variable names must start with an underscore or letter, and be followed by any number of letters, digits, or underscores. _machine, machine, and Mach_1 are legal names, but 1_Mach, mach$, and @#! are not.

- *Case matters: MACHNAME is not the same as machname*

Python always pays attention to case, both in names you create and in reserved words. For instance, X and x refer to two different variable names.

- *Python reserved words are off limits*

  You cannot define variable names to be the same as words that mean special things in the Python language. Following are reserved words in Python: and, assert, break, class, continue, def, del, elif, else, except, exec, finally, for, from global, if, import, in, is, lambda, not, or, pass, print, raise, return, try, while.

  Note: Python lets you use the names of Python built-in functions as variable names. However, we recommend that you don't use the name of a Python built-in function as a variable name because you may want to use the Python built-in function at some point in your STAX job. Following are names of Python built-in functions: abs, basestring, bool, callable, chr, classmethod, cmp, compile, complex, delattr, dict, dir, divmod, enumerate, eval, execfile, file, filter, float, getattr, globals, hasattr, hash, help, hex, id, input, int, isinstance, issubclass, iter, len, locals, long, map, max, min, object, oct, open, ord, pow, property, range, raw_input, reduce, reload, repr, round, setattr, slice, staticmethod, str, sum, super, tuple, type, unichr, unicode, vars, xrange, zip.

- *STAX reserved words are off limits*

  You should not define variable names to be the same as words that mean special things to the STAX service. Following are reserved words in STAX:
  - RC
  - STAFResult
  - any word beginning with STAX (e.g. STAXJobName, STAXThreadID)
  - any word beginning with STAF (e.g. STAFResult, STAFRC)

Python string constants can be enclosed in single or double quotes, which allows embedded quotes of the opposite flavor.

For example, the following two lines do exactly the same thing in a STAX XML document. They assign a string constant (literal) "CoolTest" to the value of a variable named testName.

```
<script>testName = "CoolTest1"</script>
<script>testName = 'CoolTest1'</script>
```

However, the following line is not the same. It assigns the value of a variable named CoolTest1 to the value of a variable named testName. If this was not what you intended and a variable named CoolTest1 does not exist, a STAXPythonEvaluationError signal is raised.

```
<script>testName = CoolTest1</script>
```

For elements and attributes whose values are evaluated via Python, we need to distinguish between literals and variables.

For example, the following request element's value contains a string constant which is concatenated with the value of a variable named machName. So, if

the value of variable machName is 'testA.austin.ibm.com', after being evaluated by Python, the request element's value would be: 'RELEASE POOL ClientMachPool ENTRY testA.austin.ibm.com'.

```
<request>'RELEASE POOL ClientMachPool ENTRY ' + machName</request>
```

Another way to do this is:

```
<request>'RELEASE POOL ClientMachPool ENTRY %s' % (machName)</request>
```

where the %s indicates a String format (and can also be used for decimal format, etc.), and where the value of the machName variable would replace the %s marker.

Also, note that the following two lines do exactly the same thing in a STAX XML document. They assign a string constant (literal) "VerifyRC" to the function attribute's value.

```
<call function="'VerifyRC'"/>
<call function='"VerifyRC"'/>
```

However, the following line is not the same. It assigns the value of a variable named VerifyRC to the function attribute's value. If a variable named VerifyRC does not exist, a STAXPythonEvaluationError signal is raised.

```
<call function="VerifyRC"/>
```

Also, note that XML processors assume that < always starts a tag and that & always starts an entity reference, so you should avoid using those characters for anything else. You must use the entity reference < instead of < and entity reference & instead of & or else you'll get an XML parsing error. This can be difficult sometimes as the < character is used as the less-than operator in Python, as in this example, where RC < 0 is being assigned to the expression attribute.

```
<if expr="RC &lt; 0">
```

Here's another example that shows a <script> element that contains Python code using the regular expression (re) module to look for pattern '**<pass>**' anywhere in the STAFResult string variable and must use the entity reference < instead of <.

```
<script>
  import re
  matchstr = r'.*?&lt;pass>.*?'
  matchFlag = re.match(matchstr, STAFResult)
</script>
```

Refer to the "References" section for where to get more information about Jython and Python.

If you are already a CPython programmer, or are hoping to use CPython code under Jython, refer to the "Jython and CPython Differences" section for information about differences in the two implementations of Python.

Element Syntax and Usage

A job to be executed by the STAX Service is described by an XML document. The XML document must comply with the STAX document type definition (DTD) shown in "STAX Document Type Definition (DTD)". The function of the STAX XML document is to describe STAF command and process execution.

The first line in an XML document should start with an XML declaration. This indicates the document is written in XML and specifies the XML version, the language encoding for the document, and indicates that the document refers to an external DTD (standalone="no").

The second line in an XML document should be the document type declaration. This is used to indicate the DTD used for the document. It defines the name of the root element (stax), and the DTD to be used. STAX checks the syntax of XML documents using a validating XML parser to verify that the document complies with the DTD. Note that DTDs are all about specifying the structure and syntax of XML documents (not their content).

So, the first two lines in a STAX XML document should look like:

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax SYSTEM "stax.dtd">
```

The DOCTYPE statement's value for SYSTEM must end in `stax.dtd` (not case-sensitive) or a STAXXMLParseException error will be returned when executing the STAX XML document.

Note that references to external entities in a STAX XML document are not supported. If a STAX XML document references an external entity (other than the stax.dtd in the DOCTYPE statement), a STAXXMLParseException error will be returned when executing the STAX XML document.

This section describes the elements that can be used in a STAX XML document.

To ease the description of the elements, some elements will be grouped as follows so that they can be referenced as a group and will be shown in bold italics:

Reference	Elements

```
task              process | stafcmd | nop |
                  sequence | parallel | paralleliterate |
                  call | call-with-list | call-with-map | return | import |
                  if | loop | iterate | break | continue |
                  try | throw | rethrow |
                  signalhandler | raise |
                  hold | release | terminate |
                  testcase | tcstatus | script |
                  block | timer | log | message
```

Notes:

- Elements and attribute names in an XML document are case sensitive. That is, element <sequence> is different from <Sequence> and <SEQUENCE>.
- Only **sequence**, **parallel** and **stax** elements can contain multiple ***task*** elements.
- Names for elements (e.g. function names, block names, etc.) should not begin with STAX as these names are reserved for future extensions and enhancements.

Also, some examples of the usage of elements use "..." for brevity to represent that additional XML would be included in place of the "...".

Root Element

An XML document must contain a root element which contains all other elements in the document. The root element of a STAX XML document is **stax**.

stax

The **stax** element consists of any number of **function**, **script**, and/or **signalhandler** elements and an optional **defaultcall** element.

Usage:

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax SYSTEM "stax.dtd">

<stax>

  <defaultcall function="FunctionA"/>
  <script>machName = "test1.austin.ibm.com"</script>
```

```
  <function name="FunctionA">
    ...
  </function>

  <function name="FunctionB">
    ...
  </function>
  ...

</stax>
```

Python Code Execution

STAX uses Python, which is an object-oriented scripting language. To specify Python code to be executed, you can use the **script** element. The Python code can include any Python statements such as variable assignments, importing and running Python modules, accessing Java libraries, and running built-in Python tools.

All **script** elements contained in the root **stax** element are initialized at the beginning of the job, as each is encountered in sequential order, regardless of their placement within the **stax** element, and are accessible throughout the job (like global variables). All **script** elements contained in elements other than the **stax** element (e.g. such as the **sequence** element) are assigned as each is encountered and are accessible within their scope and are inherited from parent STAX-Threads.

Whenever a new STAX-Thread is created, existing variables are cloned from the parent STAX-Thread. To create a global variable that can be accessed across STAX-Threads, use the STAXGlobal class described in "STAXGlobal Class" section. STAX elements that can create STAX-Threads include the following: **parallel**, **paralleliterate**, **process-action**, **job-action**, and **function** elements with a local scope.

script: Run Python Code

The **script** element is used to specify Python code to be executed. For example, the **script** element can be used to define STAX variables which are utilized during the parsing of the XML document and the subsequent execution of the STAX job. Note that a STAX variable is used solely by the STAX job and is not associated with STAF variables. You can also use the **script** element to import and run Python modules and built-in Python tools.

Usage:

Goal: Create a variable named testName and assign it value "CoolTest1"

```
<script>testName = "CoolTest1"</script>
```

Goal: Create a variable named machName and assign it the value of the STAFResult variable.

```
<script>machName = STAFResult</script>
```

Goal: Create a list called machList containing 10 machine names by running the STAF Resource Pool Request command in a loop ten times, each time adding the STAF Result value from the RESPOOL REQUEST POOL command (which contains a machine name) to the list. Note that this example first creates an empty list and then adds a machine name to the list 10 times.

```
<script>machList = []</script>
<script>clientPool = 'ClientMachinePool'</script>
<loop var="i" from="1" to="10">
  <sequence>
    <stafcmd>
      <location>'server1.austin.ibm.com'</location>
      <service>'RESPOOL'</service>
      <request>'REQUEST POOL %s' % (clientPool)</request>
    </stafcmd>
    <script>machList.append(STAFResult)</script>
  </sequence>
</loop>
```

Goal: Create a list called allMachList by combining lists named unallocMachList and allocMachList. New list allMachList contains ['MachA','MachB','MachC','MachD','AllocMachA','AllocMachB'].

```
<script>unallocMachList = ['MachA','MachB','MachC','MachD']</script>
<script>allocMachList = ['AllocMachA','AllocMachB']</script>
<script>allMachList = unallocMachList + allocMachList</script>
```

Goal: Generate a random number (which could be used to randomly select which function to call) using the random module provided by Python. Note that in Python, you can use a semicolon to separate multiple statements on the same line.

```
<script>from random import random; r=random()*100</script>
```

Goal: Use a Java class, com.ibm.staf.STAFUtil (provided in JSTAF.jar), and it's wrapData() method to turn strings containing spaces into the colon-length-colon form needed for submitting a STAF Notify request. For more information on the STAFUtil Java class, see the STAF Java Classes (STAFUtil, STAFRC, STAFVersion, etc) section. This example also shows that for statements that are too long to fit on one line, Python lets you continue typing the statement on the next line, if you're coding something enclosed in (), {}, or [] pairs. Continuation lines can start at any indentation level.

```
<script>
```

```
  NotifyProfile = 'Jane Smith'
  Message = 'STAX Job ID %s failed.' % (STAXJobID)
  Request = ('NOTIFY PROFILE %s LEVEL NORMAL MESSAGE %s' %
             (STAFUtil.wrapData(NotifyProfile), STAFUtil.wrapData(Message)))
</script>

<message>NotifyRequest</message>
```

The message element would display something like:

```
NOTIFY PROFILE :10:Jane Smith LEVEL NORMAL MESSAGE :21:STAX Job ID 6 failed.
```

Goal: Create a Python class object, Server, and generate three instance objects from the class and create a list of these Server objects. Then iterate through the server list, logging information about each server object in the server list.

```
<script>
  # Define Server class
  class Server:
    def __init__(self, hostname, dir):
      self.hostname = hostname
      self.dir      = dir
    def __repr__(self):
      return "<Server: hostname=%s, directory=%s>" % (self.hostname, self.dir)
    def getHostname(self):
      return self.hostname
    def getDir(self):
      return self.dir

  # Create an array of 3 Server objects
  serverList = [
                Server('myServer.austin.ibm.com', 'C:/install'),
                Server('serverA.portland.ibm.com', 'D:/install'),
                Server('linuxServer.austin.ibm.com', '/usr/local/install')
               ]
</script>

<iterate var="server" in="serverList" indexvar="i">
  <log>
    'Server #%s: hostname=%s, directory=%s' % (i+1, server.getHostname(), server.getDir())
  </log>
```

```
</iterate>
```

Goal: Get the current date/time. Since STAX uses Jython to execute Python code, you can also import and use Python modules or Java classes to perform date/time functions such as getting the current date/time. Here are some ways to get the current date/time:

- Get the current date/time in the format you wanted using strftime from the Python time module.

```
<script>
  from time import strftime  # Only need to do once
  currTimestamp = strftime("%Y-%m-%d %H:%M:%S")
</script>
```

- Get the current date/time using the Python datetime module:

```
<script>
  from datetime import datetime  # Only need to do once
  currTimestamp = datetime.now()
</script>
```

- Get the current date/time using Java classes java.sql.Timestamp and java.lang.System:

```
<script>
  from java.sql import Timestamp   # Only need to do once
  from java.lang import System     # Only need to do once
  currTimestamp = Timestamp(System.currentTimeMillis())
</script>
```

Actions

The process, stafcmd, job, and nop elements perform actions.

process: Run a process

The **process** element represents a STAF process which will be executed on a specified machine. It submits a START request to the STAF PROCESS service to run the specified command on the specified machine and waits for the process to complete running before continuing to the next element in the STAX job. You should use the **process** element instead of a **stafcmd** element if you want to start a process and wait for it to complete.

After a process has completed (or if it could not be started) the following variables are set and can be referenced by the job:

- **RC** - the return code from the process. It is numeric. If it's the actual return code from the process, it is a Python Long numeric type (e.g. 0L, 25L). If an error occurred starting the process, it is a Python Integer numeric type.

- **STAFResult** - the STAF result from starting the process. If the process failed to start successfully, it contains any error messages from starting the process in a Python string type. If the process started successfully, it is set to special Python object None.

- **STAXResult** - contains any files specified by **returnstdout**, **returnstderr**, and/or **returnfile(s)**. If no files are returned, STAXResult is set to special Python object None. If one or more files are returned, the format of STAXResult is a list as follows:

  ```
  [ [<File 1 rc>, <File 1 data>], [<File 2 rc>, <File 2 data> ], ... ]
  ```

  Each entry in the list represents a returned file and consists of a 2-element list as follows:
  1. <File n rc> is a number containing the STAF return code indicating the success or failure of retrieving the file's contents
  2. <File n data> is a string containing the file's contents

  Files will be returned in the order of standard output, then standard error, then any files specified with the **returnfile(s)** element(s).

  For example, assume that the standard output of a process was simply "This is stdout data", and that the standard error of a process was "This is stderr data", and that you asked for both of these to be returned. STAXResult would look like the following.

  ```
  [ [0, 'This is stdout data'], [0, 'This is stderr data'] ]
  ```

The process element has one optional attribute:

- **name** - specifies the name that the STAX Monitor uses to refer to the <process> element. It defaults to `'Process<number>'`, where `<number>` is a unique number for each process executed in a job. The value is evaluated via Python to a string. This element is optional.

The process element contains two required elements (location and command) with many optional elements. The location element must be specified first, followed by the command element. The rest of the elements are optional.

Note that the process elements are equivalent to the options allowed for the STAF Process Service's START request (except where noted), so see the STAF User's Guide for more information.

Required process elements:

- **location** - specifies the machine where the process should be run. The value is evaluated via Python to a string. This element is required.

To run the process on the local STAX service machine, specify `'local'`. To run the process on a remote machine, specify the endpoint of the remote machine. The format for an endpoint is:

```
[<Interface>://]<System Identifier>[@<Port>]
```

where:

- `<Interface>` is the name of the network interface (e.g. ssl, tcp). If not specified, it defaults to thee default interface defined on the STAX service machine.
- `<System Identifier>` is a valid network identifier for the interface in question. You may specify logical or physical identifiers. For example, for a TCP/IP interface, the physical identifier for a system is the IP address, while the logical identifier is the hostname.
- `<Port>` is a valid port to use for a TCP/IP interface. If not specified, it defaults to the port for the network interface being used. One of the things this allows you to do is communicate with an instance of STAF that is using a different TCP/IP port. Note that the port specified does not have to be configured on the machine submitting the request.

Some examples of possible values for the location element are: `'local'`, `'server1.company.com'`, `'9.3.77.999'`, `'ssl://client.company.com'`, and `'tcp://client2.company.com@6500'`.

- **command** - specifies the command to be executed by the process element. The value is evaluated via Python to a string. This element is required.

  This element has the following optional attributes:

  - **mode** - specifies whether the command should be executed as though you were at a shell prompt. The value must evaluate via Python to one of the following:
    - 'default' - specifies that the command should not be started via a separate shell. This is the default.
    - 'shell' - specifies that the command should be started via a separate shell. This allows complex commands involving pipelines to be readily executed.
  - **shell** - specifies the shell to use when starting the process via a separate shell. This attribute is used only if the command's mode is set to 'shell'. The value overrides any shell defaults specified in the STAF configuration file. The value is evaluated via Python to a string.

Optional process elements:

Here are some important notes about optional process elements:

1. If specified, these optional process elements must be specified in the order listed below (with some variations). Refer to the "STAX Document Type Definition (DTD)" section to see the DTD for the process element and to see the variations in process element order that are allowed.

2. Each of these optional elements may specify an **if** attribute. The **if** attribute must evaluate via Python to a true or false value. If it does not evaluate to a true value, the element is ignored. The default value for the **if** attribute is 1, a true value. Note that in Python, true means any nonzero number or nonempty object; false means not true, such as a zero number, an empty object, or None. Comparisons and equality tests return 1 or 0 (true or false).

Using the **if** attribute provides a convenient shortcut to deal with many variations of optional process elements that, otherwise, would have to be specified using the **if**/**elseif** elements and multiple different process elements.

The process element may contain any of the following optional elements in the order listed (with some variations):

- **parms** - specifies any parameters that you wish to pass to the command. The value is evaluated via Python to a string. This element is optional.
- **workdir** - specifies the directory from which the command should be executed. If you do not specify this element, the command will be started from whatever directory STAFProc is currently in. The value is evaluated via Python to a string. This element is optional.
- **title** - specifies the program title of the process. Unless overridden by the process, the title will be the text that is displayed on the title bar of the application. The value is evaluated via Python to a string. This element is optional.
- **workload** - specifies the name of the workload for which this process is a member. This may be useful in conjunction with other process elements. The value is evaluated via Python to a string. This element is optional.
- **vars** (or **var**) - specifies STAF variables that go into the process specific STAF variable pool. The value must evaluate via Python to a string or a list of strings. Multiple vars elements may be specified for a process. The format for each variable is: 'varname=value' So, a list containing 3 variables could look like: ['var1=value1', 'var2=value2', 'var3=value3']. Specifying only one variable could look like either: ['var1=value1'] or 'var1=value1'. There can be 0 or more occurrences of this element.
- **envs** (or **env**) - specifies environment variables that will be set for the process. Environment variables may be mixed case, however most programs assume environment variable names will be uppercase, so, in most cases, ensure that your environment variable names are uppercase. The value must evaluate via Python to a string or a list of strings. Multiple envs elements may be specified for a process. The format for each variable is: 'varname=value' So, a list containing 3 variables could look like: ['ENV_VAR_1=value1', 'ENV_VAR_2=value2', 'ENV_VAR_3=value3']. Specifying only one variable could look like either: ['ENV_VAR_1=value1'] or 'ENV_VAR_1=value1'. There can be 0 or more occurrences of this element.
- **useprocessvars** - specifies that STAF variable references should try to be resolved from the STAF variable pool associated with the process being started first. If the STAF variable is not found in this pool, the STAF global variable pool should then be searched. This element is optional and is an empty element.
- **username** - specifies the username under which the process should be started. The value is evaluated via Python to a string. This element is optional.
- **password** - specifies the password with which to authenticate the user specified with the username element. The value is evaluated via Python to a string. This element is optional.
- **disabledauth** - allows you to specify the action to take if a username/password is specified but authentication has been disabled. This element is

optional and is an empty element.

This element has the following required attribute (in addition to the **if** attribute):

- **action** - Must evaluate via Python to a string containing either:
  - 'error' - specifies that an error should be returned.
  - 'ignore' - specifies that any username/password specified is ignored if authentication is disabled.

  This action overrides any default specified in the STAF configuration file.

- **stdin** - specifies the name of the file from which standard input will be read. The value is evaluated via Python to a string. This element is optional.

- **stdout** - specifies the name of the file to which standard output will be redirected. The value is evaluated via Python to a string. This element is optional.

  This element has the following required attribute (in addition to the **if** attribute):

  - **mode** - specifies what to do if the file already exists. The value must evaluate via Python to one of the following:
    - 'replace' - specifies that the file will be replaced. This is the default.
    - 'append' - specifies that the process' standard output will be appended to the file.

- **stderr** - specifies the file to which standard error will be redirected. The value is evaluated via Python to a string. This element is optional.

  This element has the following attribute (in addition to the **if** attribute):

  - **mode** - specifies what to do if the file already exists or to redirect standard error to the same file as standard output. The value must evaluate via Python to one of the following:
    - 'replace' - specifies that the file will be replaced. This is the default.
    - 'append' - specifies that the process' standard error will be appended to the file.
    - 'stdout' - specifies that standard error will be redirected to the same file to which standard output is being redirected. If a file name is specified, it is ignored.

- **returnstdout** - specifies to return in STAXResult the contents of the file where standard output was redirected when the process completes. This element is optional and is an empty element.

- **returnstderr** - specifies to return in STAXResult the contents of the file where standard error was redirected when the process completes. This element is optional and is an empty element.

- **returnfiles** (or **returnfile**) - specifies to return in STAXResult the contents of the specified file(s) when the process completes. The value must evaluate via Python to a string (containing a file name) or a list of strings (each containing a file name). There can be 0 or more occurrences of this

element.

- **stopusing** - allows you to specify the method by which this process will be STOPed, if not overridden on the STOP command. The value is evaluated via Python to a string. This element is optional.

- **console** - allows you to specify if the process should get a new console window or share the STAFProc console. This element is optional and is an empty element.

  This element has the following required attribute (in addition to the **if** attribute):

  - **use** - Must evaluate via Python to a string containing either:
    - 'new' - specifies that the process should get a new console window. This option only has effect on Windows systems. This is the default for Windows systems.
    - 'same' - specifies that the process should share the STAFProc console. This option only has effect on Windows systems. This is the default for Unix systems.

- **focus** - allows you to specify the focus that is to be given to any new windows opened when starting a process on a Windows system. The window(s) it effects depends on whether you are using the 'default' or the 'shell' command mode. If the process is started using the default command mode, then the specified focus specified is given to any new windows opened by the specified command. Otherwise, if the process is started using the shell command mode, then the specified focus is given only to the new shell command window opened, not to any windows opened by the specified command. This element only has effect on Windows systems and requires STAF V3.1.4 or later on the machine where the process is run. This element is optional and is an empty element.

  This element has the following required attribute (in addition to the optional **if** attribute):

  - **mode** - Must evaluate via Python to a string containing one of the following values:
    - 'background' - indicates to display a window in the background (not give it focus) in its most recent size and position. This is the default mode.
    - 'foreground' - indicates to display a window in the foreground (give it focus) in its most recent size and position.
    - 'minimized' - indicates to display a window as minimized.

  Note: This element was added in STAX V3.1.3.

- **statichandlename** - specifies that a static handle should be created for this process. The value is evaluated via Python to a string. It will be the registered name of the static handle. Using this option will also cause the environment variable STAF_STATIC_HANDLE to be set appropriately for the process. This element is optional.

- **other** - specifies any other STAF parameters that may arise in the future. It is used to pass additional data to the STAF PROCESS START request. The value is evaluated via Python to a string. This element is optional.

- **process-action** - specifies a task which will be executed after the process has started. This task will be executed in parallel with the process via a new STAX-Thread. If the **mode="'shell'"** attribute is not specified for the <command> element, the task will be able to use the variable STAXProcessHandle to obtain the process' handle in order to interact with the process. If the process completes before the task completes, the process will remain in a non-complete state until the task completes. If the process cannot be started, the process-action task is not executed. This element is optional, but if specified must be the last element in the <process> element.

  Note: To create a global variable that can be accessed across STAX-Threads, use the STAXGlobal class described in "STAXGlobal Class" section.

  Note: Currently, the STAXProcessHandle variable will only be valid if the **mode="'shell'"** attribute is not specified for the <command> element. If you need to specify the **mode="'shell'"** attribute, then you will need to use the handle's name. For more information on this problem, see Bug #1172800 - Using SHELL option causes incorrect handle # to be returned.

Options allowed for the STAF Process Service which are not allowed for the STAX process element are as follows.

- WAIT
- ASYNC
- NOTIFY ONEND

These options should not be put in the **other** element.

Notes:

1. See the timer element section for special considerations regarding accessing stdout/stderr data when using a <timer> element to terminate a process that runs continously. An example is also provided in the timer's "Usage" section.

2. You can use the <stdout> and/or <stderr> elements to stream a process's standard output and standard error, respectively, into a specified file. The contents of the file won't be returned to the user (e.g. via the STAXResult variable if using the <returnstdout> and/or <returnstderr> elements) until the process has completed. But, you could look at the contents of the stdout/stderr file while the process is still running by using a <parallel> or <process-action> element to do this in parallel with the process running.

3. After you obtain the content of a file created by the <stdout> or <stderr> element, if you no longer need the file, you can delete it using a <stafcmd> element to run the FS service's DELETE ENTRY command. Or, if you didn't need the file deleted immediately, you could create the stdout/stderr file in the {STAF/DataDir}/tmp directory. All contents of the {STAF/DataDir}/tmp directory are deleted when STAFProc is restarted.

Usage:

In the following example of a **process** element, a Java program is executed. When the process completes, the **if** element is run which checks the return code from the process.

```
<sequence>

  <process name="'TestProcess'">
    <location>'local'</location>
    <command>'java'</command>
    <parms>'com.ibm.staf.service.stax.TestProcess 5 1 0'</parms>
    <title>'Test Process'</title>
  </process>

  <if expr="RC != 0">
    <raise signal="'NonZeroRCError'"/>
  </if>

</sequence>
```

In the following example of a **process** element, a ping command is executed as though you were at a shell prompt. The ping is executed within a loop contained within a timer. If the ping command does not complete successfully (indicated by RC 0) within 30 seconds, a failure message is sent.

```
<sequence>

  <timer duration="'30s'">
    <loop until="RC == 0">
      <process name="'Ping'">
        <location>'local'</location>
        <command mode="'shell'">'ping -n 1 -w 1 %s' % machName</command>
      </process>
    </loop>
  </timer>

  <if expr="RC != 0">
    <message>'Ping of machine %s failed' % machName</message>
  </if>

</sequence>
```

The following example of a **process** element shows many of the optional elements that a process can contain and shows the use of the **if** element to specify whether an optional element should be used based on an expression evaluated while the job is running.

```
<script>
  machName = 'local'
```

```
    opSys = 'Win32'
    className = 'com.ibm.staf.service.stax.TestProcess'
    commonEnvVarList = ['COMMON_ENV_VAR_1=value1','COMMON_ENV_VAR_2=value2']
  </script>

  <process name="'aProcess'">
    <location>machName</location>
    <command>'java'</command>

    <parms if="opSys != 'Linux'">
      '%s 2 15 100' % className
    </parms>

    <title>'Title example for process with many elements'</title>

    <vars if="opSys == 'Win32'">
      ['tempPath=C:/temp', 'winRunPath=C:/temp/processa']
    </vars>

    <vars if="opSys == 'Linux'">
      ['tempPath=/test/temp']
    </vars>

    <var>
      'commonMachName=%s' % (machName)
    </var>

    <envs if="opSys == 'Win32'">
      ['TEMP_DIR=C:/temp']
    </envs>

    <envs>commonEnvVarList</envs>

    <useprocessvars if="opSys == 'Win32'"/>

    <disabledauth if="opSys == 'Win32'" action="'ignore'"/>

    <stdout mode="'replace'">
      'c:/temp/aProcess.out'
    </stdout>
```

```
    <stderr mode="'append'">
      'c:/temp/aProcess.err'
    </stderr>

    <console if="opSys == 'Win32'" use="'same'"/>

    <focus if="opSys == 'Win32'" mode="'minimized'"/>

  </process>
```

In the following example of a **process** element, a command which writes to stdout and stderr and produces a couple of files (C:\process1.inf and C:\process2.inf) is run. The contents of the stdout file and the two additional files are returned in STAXResult when the process completes. Note that the stdout file also contains stderr output because <stderr> specified mode 'stdout' instead of specifying a different file name. Then the contents all returned files are written to one central place, the STAX Job User Log.

```
<sequence>

  <process>
    <location>machName</location>
    <command>cmd</command>
    <stdout>'C:/temp.out'</stdout>
    <stderr mode="'stdout'"/>
    <returnstdout/>
    <returnfiles>['C:/process1.inf', 'C:/process2.inf']</returnfiles>
  </process>

  <if expr="RC != 0">
    <log level="'error'">
      'Process failed with RC=%s, Result=%s' % (RC, STAFResult)
    </log>

    <elseif expr="STAXResult != None">
      <iterate var="fileInfo" in="STAXResult" indexvar="i">
        <if expr="fileInfo[0] == 0">
          <sequence>
            <log level="'info'">fileInfo[1]</log>
          </sequence>
          <else>
            <log level="'error'">
              'Retrieval of file %s contents failed with RC=%s' % (i, fileInfo[0])
```

```
            </log>
          </else>
        </if>
      </iterate>
    </elseif>

    <else>
      <log level="'info'">'STAXResult is None'</log>
    </else>

  </if>

</sequence>
```

In the following example of a **process** element, the following shell-style command is executed, "grep 'Node Count = ' /tests/cli.out | awk '{print $8}'" redirecting its standard output and standard error to /tests/awk.out and returning the output. Note the use of the caret (^) as an escape character for "{" so that it doesn't try to resolve a variable named "print $8".

```
<process name="'Grep_and_awk_numClustNodes'">
  <location>machName</location>
  <command mode="'shell'">
    "/bin/grep 'Node Count = '  /tests/cli.out | awk '{print $8}'"
  </command>
  <stdout mode="'replace'" >'tests/awk.out'</stdout>
  <stderr mode="'stdout'"/>
  <returnstdout/>
</process>
```

In the following example of a **process** element, the command is started in a separate Cygwin shell on Windows, redirecting its standard output and standard error to D:/temp/copy.out and returning the output (if any).

```
<process name="'copyFiles'">
  <location>machName</location>
  <command mode="'shell'" shell="'D:/Cygwin/bin/bash -c %C'">
    'cp -fr D:/tests/test1/*.java D:/output/test1'
  </command>
  <stdout mode="'replace'" >'D:/temp/copy.out'</stdout>
  <stderr mode="'stdout'"/>
  <returnstdout/>
</process>
```

In the following examples of a **process** element, a **process-action** element is specified. The **process-action** task will be executed after the process starts and will send several messages via the QUEUE service to the process. Here is the Java application used in these examples:

```
import com.ibm.staf.*;
import java.util.*;

public class QueueListener implements Runnable
{
    private STAFHandle fHandle;
    private Thread fQueueThread;
    private static String delimiter = "";

    public static void main(String[] args)
    {
        QueueListener queueListener = new QueueListener();
        return;
    }

    public QueueListener()
    {
        try
        {
            fHandle = new STAFHandle("QueueListener");
            System.out.println("QueueListener's handle is: " +
                fHandle.getHandle() + ". Send a \"QueueListenerExit\" message" +
                " to terminate the program.");
        }
        catch (STAFException e)
        {
            System.out.println(e);
        }

        char[] delimiterArray = new char[80];
        Arrays.fill(delimiterArray, '=');
        delimiter = new String(delimiterArray);

        fQueueThread = new Thread(this);
        fQueueThread.start();
    }
```

```
    public void run()
    {
        STAFResult queueGetResult;

        while (true)
        {
            queueGetResult = fHandle.submit2("local", "QUEUE", "GET WAIT");

            STAFMarshallingContext mc =
                STAFMarshallingContext.unmarshall(queueGetResult.result);

            Map queueMap = (Map)mc.getRootObject();
            String message = (String)queueMap.get("message");

            System.out.println(delimiter);
            System.out.println(message);

            // is this a special exit message to tell the program to terminate?
            if (queueGetResult .result.indexOf("QueueListenerExit") >  -1)
            {
                System.out.println(delimiter);
                System.out.println("Exiting");
                System.exit(0);
             }
        }
    }
}
```

In the following example, since the mode="'shell'" attribute is not specified for the <command> element, the queued messages can be sent using the STAXProcessHandle variable.

```
<script>
  machName = 'local'
  messages = [
              STAFUtil.wrapData('First message'),
              STAFUtil.wrapData('Second message'),
              STAFUtil.wrapData('QueueListenerExit')
             ]
</script>
```

```
<process>
  <location>machName</location>
  <command>'java'</command>
  <parms>'QueueListener'</parms>
  <stderr mode="'stdout'"/>
  <returnstdout/>
  <process-action>
    <sequence>
      <iterate var="message" in="messages">
        <stafcmd>
          <location>'local'</location>
          <service>'QUEUE'</service>
          <request>'QUEUE HANDLE %s MESSAGE %s' % (STAXProcessHandle, message)</request>
        </stafcmd>
      </iterate>
    </sequence>
  </process-action>
</process>
```

In the following example, since the mode="'shell'" attribute is specified for the <command> element, the queued messages must be sent using the handle name.

```
<script>
  machName = 'local'
  messages = [
              STAFUtil.wrapData('First message'),
              STAFUtil.wrapData('Second message'),
              STAFUtil.wrapData('QueueListenerExit')
             ]
  processHandleName = 'QueueListener'
</script>

<process>
  <location>machName</location>
  <command mode="'shell'">'java QueueListener'</command>
  <stderr mode="'stdout'"/>
  <returnstdout/>
  <process-action>
    <sequence>
      <iterate var="message" in="messages">
```

```
        <stafcmd>
          <location>'local'</location>
          <service>'QUEUE'</service>
          <request>'QUEUE NAME %s MESSAGE %s' % (processHandleName, message)</request>
        </stafcmd>
      </iterate>
    </sequence>
  </process-action>
</process>
```

stafcmd: Run a STAF Command

The **stafcmd** element represents a STAF command which will be executed on a specified machine.

Note: If you want to start a process and wait for it to complete (e.g. if you want to submit a START request to the PROCESS service and wait for the process to complete), you should use the **process** element instead of the **stafcmd** element.

After the STAF command has completed, the following variables are set and can be referenced by the job:

- **RC** - the return code from the STAF command. It is an integer.
- **STAFResult** - the result from the STAF command. It can be a string, or, if the result is marshalled, it is the root object of the marshalled result which could be a Python List or a Python Dictionary (aka Map).
- **STAFResultContext** - the STAF marshalling context object for the result from the STAF command. It is an object of type org.python.core. PyInstance. The STAFMarshallingContext class provides a container for map class definitions and an object that uses (or is defined in terms of) them. Its string representation is equivalent to the "verbose format" (the hierarchical nested format) provided by the STAF executable.
- **STAFResultString** - The result string from the STAF command. It is a string. If the result is marshalled, it is the marshalled result string. Note: This variable would only be used if you needed the actual result string from a STAF command, such as if submitting a GET FILE request to the FS service when the specified file contains marshalled data and you want the actual contents of the file.

The **stafcmd** element has one optional attribute:

- **name** - specifies the name that the STAX Monitor uses to refer to the <stafcmd> element. It defaults to `'STAFCommand<number>'`, where `<number>` is a unique number for each STAF command executed in a job. The value is evaluated via Python to a string. This element is optional.

The **stafcmd** element contains the following required elements. These elements must be specified in the order listed here:

- **location** - specifies the machine where the STAF command should be run. The value is evaluated via Python to a string. This element is required.

  To run the STAF command on the local STAX service machine, specify `'local'`. To run the STAF command on a remote machine, specify the

endpoint of the remote machine. The format for an endpoint is:

```
[<Interface>://]<System Identifier>[@<Port>]
```

where:

- `<Interface>` is the name of the network interface (e.g. ssl, tcp). If not specified, it defaults to thee default interface defined on the STAX service machine.
- `<System Identifier>` is a valid network identifier for the interface in question. You may specify logical or physical identifiers. For example, for a TCP/IP interface, the physical identifier for a system is the IP address, while the logical identifier is the hostname.
- `<Port>` is a valid port to use for a TCP/IP interface. If not specified, it defaults to the port for the network interface being used. One of the things this allows you to do is communicate with an instance of STAF that is using a different TCP/IP port. Note that the port specified does not have to be configured on the machine submitting the request.

Some examples of possible values for the location element are: `'local'`, `'server1.company.com'`, `'9.3.77.999'`, `'ssl://client.company.com'`, and `'tcp://client2.company.com@6500'`.

- **service** - specifies the name of the STAF service to which you are submitting a request. The value is evaluated via Python to a string. This element is required.

  Some examples of possible values for the service element are: `'PING'`, `'FS'`, `'RESPOOL', and 'SEM'`.

- **request** - specifies the actual request string that you wish to submit to the STAF service. The value is evaluated via Python to a string. This element is required.

Usage:

This is an example of a **stafcmd** element that submits a PING request to the PING service on machine server1.company.com to see if STAFProc is running on that machine. When the STAF command completes, the **if** element checks the return code variable (RC) set by the STAF command. If the return code is not 0, the PING request failed and a message is logged.

```
<sequence>

  <stafcmd>
    <location>'server1.company.com'</location>
    <service>'PING'</service>
    <request>'PING'</request>
  </stafcmd>

  <if expr="RC != 0">
```

```
    <log>
      'STAF %s PING PING request failed with RC: %s, Result: %s' % (RC, STAFResult)
    </log>
  </if>

</sequence>
```

This is an example of a **stafcmd** element that submits a request to the RESPOOL (Resource Pool) service on a machine specified by a variable named resPoolServer. The STAF RESPOOL request is requesting a machine name from a pool specified by a variable named clientPool. When the STAF command completes, the **if** element checks the return code variable set by the STAF command. If the return code is 0 (aka STAFRC.Ok), the value of the STAFResult variable is stored to another variable named machName, otherwise, the RC and error message are logged. For more information on the STAFRC alias for the com.ibm.staf.STAFResult Java class, see the STAF Java Classes (STAFUtil, STAFRC, STAFVersion, etc) section.

```
<sequence>

  <script>resPoolServer = "server1.austin.ibm.com"</script>
  <script>clientPool = "clientMachinePool"</script>

  <stafcmd name="'Respool Request Pool'">
    <location>resPoolServer</location>
    <service>'RESPOOL'</service>
    <request>'REQUEST POOL %s' % (clientPool)</request>
  </stafcmd>

  <if expr="RC == STAFRC.Ok">
    <script>machName = STAFResult</script>
    <else>
      <log message="1">'RC=%s STAFResult=%s' % (RC, STAFResult)</log>
    </else>
  </if>

</sequence>
```

If you want to submit a START request to the PROCESS service and wait for the process to complete, you should use the **process** element, not the **stafcmd** element. However, if you want to submit a START request to the PROCESS service and not wait for it to complete (e.g. start the process asynchronously) before continuing to the next element in the STAX job, then you can use the **stafcmd** element. Here's an example of starting notepad on a Windows machine:

```
<sequence>
```

```
  <stafcmd name="'Start Notepad'">
    <location>'client1.company.com'</location>
    <service>'PROCESS'</service>
    <request>'START COMMAND notepad'</request>
  </stafcmd>

  <if expr="RC != STAFRC.Ok">
    <log message="1">
      'Starting Notepad failed with RC=%s STAFResult=%s' % (RC, STAFResult)
    </log>
  </if>

</sequence>
```

In the following example of a **stafcmd** element, a "SEND MESSAGE" request is submitted to the Email service on machine server1.company.com to send message "STAX Job ID 6 failed" to Jane Smith@company.com.

Note that STAFUtil's wrapData() method is used to turn strings containing spaces into the colon-length-colon form needed for submitting a SEND MESSAGE request to the Email service. For more information on the STAFUtil Java class, see the STAF Java Classes (STAFUtil, STAFRC, STAFVersion, etc) section.

```
<sequence>

  <script>
    emailServiceMachine = 'server1.company.com'
    message = 'STAX Job ID %s failed.' % (STAXJobID)
    subject = 'STAX Job Failed'
    address = 'JaneSmith@company.com'
    request = 'SEND MESSAGE %s' % (STAFUtil.wrapData(message))
    request += ' SUBJECT %s' % (STAFUtil.wrapData(subject))
    request += ' TO %s' % (address)
  </script>

  <stafcmd>
    <location>emailServiceMachine</location>
    <service>'Email'</service>
    <request>request</request>
  </stafcmd>

  <if expr="RC != 0">
```

```
    <log message="1">
      'Email request failed with RC=%s STAFResult=%s' % (RC, STAFResult)
    </log>
  </if>

</sequence>
```

In the following example of a **stafcmd** element which executes a FS QUERY ENTRY request on the local machine. A FS QUERY ENTRY request returns a PyDictionary (aka Map) if successful containing information about the file such as its name, type, size, and timestamp that it was last modified. Log the file information in a verbose format by specifying the STAFResultContext variable:

```
<sequence>

  <stafcmd>
    <location>'local'</location>
    <service>'FS'</service>
    <request>'QUERY ENTRY C:/tmp/testA.exe'</request>
  </stafcmd>

  <if expr="RC == STAFRC.Ok">
    <log message="1">STAFResultContext</log>
    <else>
      <log message="1">'FS QUERY failed with RC=%s STAFResult=%s' % (RC, STAFResult)</log>
    </else>
  </if>

</sequence>
```

The message logged in verbose mode could look like:

```
{
  Name              : C:/tmp/testA.exe
  Type              : F
  Upper 32-bit Size : 0
  Lower 32-bit Size : 12505
  Modified Date-Time: 20030506-19:14:40
}
```

In the following example of a **stafcmd** element which executes a FS LIST DIRECTORY LONG DETAILS request on the local machine. A FS LIST DIRECTORY LONG DETAILS request returns a PyList of PyDictionary (aka Map) if successful, where each PyDictionary represents an entry in the

specified directory and has keys such as 'name', 'lowerSize', 'type', and 'lastModifiedTimestamp'. It then checks for entries in the directory which are files with a size > 500000 bytes and logs a message containing the names of all the files meeting this criteria, along with their size and the timestamp that they were last modified.

```
<sequence>

  <stafcmd>
    <location>'local'</location>
    <service>'FS'</service>
    <request>'LIST DIRECTORY C:/tmp LONG DETAILS'</request>
  </stafcmd>

  <script>
    msg = ''

    if RC == STAFRC.Ok:
      for entryMap in STAFResult:
        # Check if the entry is a file whose size is greater than 500000 bytes
        if entryMap['type'] == 'F' and int(entryMap['lowerSize']) > 500000:
          # Print the name, size, and last Modified Timestamp for the entry:
          msg += 'Name: %s, Size: %s, Timestamp: %s\n' % \
               (entryMap['name'], entryMap['lowerSize'], entryMap['lastModifiedTimestamp'])
    else:
      msg = 'FS LIST ENTRY failed with RC=%s Result=%s' % (RC, STAFResult)
  </script>

  <log message="1">msg</log>

</sequence>
```

The message logged could look like:

```
Name: en_platformsdk_win2003.exe, Size: 340488704, Timestamp: 20040512-18:07:52
Name: project-docs.tar, Size: 1239040, Timestamp: 20040517-11:57:10
```

job: Execute a STAX Sub-Job

The **job** element represents a sub-job which will be executed within the parent job.

Notes:

- A sub-job will appear as a separate job.
- Terminating a parent job will terminate any sub-jobs as well.
- Holding/releasing a parent job will not hold/release its sub-jobs.

After a sub-job has completed (or if it could not be started) the following variables are set and can be referenced by the job:

- **RC** - the return code from submitting the request to execute the sub-job. It is an integer.
- **STAFResult** - the STAF result from submitting the request to execute the sub-job. If the sub-job failed to start successfully, it contains any error messages from trying the execute the sub-job. It is a string.
- **STAXSubJobID** - the job ID of the sub-job. If the sub-job was not successfully submitted for execution and a job ID was not yet assigned, it is set to 0. It is an integer.
- **STAXResult** - contains the result returned by the starting function of the sub-job. If nothing is returned (due to a problem submitting the request to execute the sub-job, or an error running the sub-job, or if an empty <return> element or if no <return> element is specified in the starting function), STAXResult is set to special Python object None.
- **STAXSubJobStatus** - contains the completion status of the sub-job. The sub-job completion status is a string that will be set to one of the following values:
  - `'Normal'` if the sub-job ended normally
  - `'Terminated'` if the sub-job was terminated (this means if the 'main' block was terminated) or if the sub-job was not successfully submitted for execution (e.g. due to an XML parsing error, etc)
  - `'Abnormal'` if the sub-job ended abnormally. A couple of examples of a sub-job ending abnormally are when at least one unhandled inherited condition remains on the condition stack when the sub-job completes. This can occur when a break or continue condition remains on the condition stack because there was no outer loop or iterate element, or when an exception is thrown but there's no catch element for it. This state takes precedence if the sub-job is also terminated.
  - `'Unknown'` if an unknown error occurred submitting the sub-job (should not occur).

The job element has the following optional attributes:

- **name** - specifies the name of the sub-job that is used to identify the sub-job. This attribute is equivalent to the JOBNAME option for a STAX EXECUTE command. The value is evaluated via Python to a string.
- **clearlogs** - specifies whether to delete the STAX Job and Job User logs before the sub-job is executed to ensure that only this sub-job's contents are in the log. This attribute is equivalent to the CLEARLOGS option for a STAX EXECUTE command. The value must evaluate via Python to one of the following (not case-sensitive):

- 'parent' - specifies to use the same value that was specified for the parent job. This is the default.
- 'default' - specifies to use the default STAX service setting for "Clear Logs".
- 'enabled' - specifies to clear its job logs
- 'disabled' - specifies to not clear its job logs
- otherwise, if it evaluates to a true value, the job logs are cleared; if it evaluates to a false value, the job logs are not cleared.

- **monitor** - specifies whether the job should be automatically monitored by the STAX Monitor (when the current job is already being monitored by the STAX Monitor). Note that "Automatically monitor recommended sub-jobs" must be selected in the STAX Job Monitor properties in order for it to be used. The value is evaluated via Python to a boolean value. The default value is 0, a false value.

- **logtcelapsedtime** - specifies whether to log the elapsed time for testcases in the summary records at the end of a STAX Job log and in the LIST TESTCASES output for the sub-job. This attribute is equivalent to the LOGTCELAPSEDTIME option for a STAX EXECUTE command. The value must evaluate via Python to one of the following (not case-sensitive):
  - 'parent' - specifies to use the same value that was specified for the parent job. This is the default.
  - 'default' - specifies to use the default STAX service setting for "Log TC Elapsed Time".
  - 'enabled' - specifies to log the elapsed time for testcases
  - 'disabled' - specifies to not log the elapsed time for testcases
  - otherwise, if it evaluates to a true value, the elapsed time for testcases is logged; if it evaluates to a false value, the elapsed time for testcases is not logged.

- **logtcnumstarts** - specifies whether to log the number of starts for testcases in the summary records at the end of a STAX Job log and in the LIST TESTCASES output for the sub-job. This attribute is equivalent to the LOGTCNUMSTARTS option for a STAX EXECUTE command. The value must evaluate via Python to one of the following (not case-sensitive):
  - 'parent' - specifies to use the same value that was specified for the parent job. This is the default.
  - 'default' - specifies to use the default STAX service setting for "Log TC Num Starts".
  - 'enabled' - specifies to log the number of starts for testcases
  - 'disabled' - specifies to not log the number of starts for testcases
  - otherwise, if it evaluates to a true value, the number of starts for testcases is logged; if it evaluates to a false value, the number of starts for testcases is not logged.

- **logtcstartstop** - specifies whether to log 'start' and 'stop' level records for testcases in the STAX Job log. This attribute is equivalent to the LOGTCSTARTSTOP option for a STAX EXECUTE command. The value must evaluate via Python to one of the following (not case-sensitive):
  - 'parent' - specifies to use the same value that was specified for the parent job. This is the default.
  - 'default' - specifies to use the default STAX service setting for "Log TC Start/Stop".
  - 'enabled' - specifies to log the 'start' and 'stop' records for testcases
  - 'disabled' - specifies to not log the 'start' and 'stop' records for testcases
  - otherwise, if it evaluates to a true value, the 'start' and 'stop' records for testcases are logged; if it evaluates to a false value, the 'start' and 'stop' records for testcases are not logged

- **pythonoutput** - specifies where Python stdout/stderr should be redirected (e.g. if you use the print statement in a <script> element in the sub-job).

This attribute is equivalent to the PYTHONOUTPUT option for a STAX EXECUTE command. The value must evaluate via Python to one of the following (not case-sensitive):

- 'parent' - specifies to use the same value that was specified for the parent job. This is the default.
- 'default' - specifies to use the default STAX service setting for "Python Output".
- 'jobuserlog' - specifies to redirect Python stdout/stderr to the STAX Job User Log
- 'message' - specifies to redirect Python stdout/stderr to the Messages panel in the STAX Monitor.
- 'jobuserlogandmsg' - specifies to redirect Python stdout/stderr to the STAX Job User Log and to the Messages panel in the STAX Monitor.
- 'jvmlog' - specifies to redirect Python stdout/stderr to the JVM Log for the STAX service.
- otherwise, if it evaluates to something else, an error will occur when the job is submitted for execution and the RC variable will be set to 47 (Invalid value) with additional information in the STAFResult variable.

- **pythonloglevel** - specifies the STAF log level to use when Python stdout is redirected to the STAX Job User Log (so it only has an effect if **pythonloglevel** is set to 'jobuserlog' or 'jobuserlogandmsg'). This attribute is equivalent to the PYTHONLOGLEVEL option for a STAX EXECUTE command. The value must evaluate via Python to one of the following (not case-sensitive):
  - 'parent' - specifies to use the same value that was specified for the parent job. This is the default.
  - 'default' - specifies to use the default STAX service setting for "Python Log Level".
  - One of the STAF logging levels: 'fatal', 'error', 'warning', 'info', 'trace', 'trace2', 'trace3', 'debug', 'debug2', 'debug3', 'start', 'stop', 'pass', 'fail', 'status', 'user1', 'user2', 'user3', 'user4', 'user5', 'user6', 'user7', or 'user8'.
  - otherwise, if it evaluates to something else, an error will occur when the job is submitted for execution and and the RC variable will be set to 47 (Invalid value) with additional information in the STAFResult variable.

- **invalidloglevelaction** - specifies the action to take when a log or message element uses an invalid log level. This attribute is equivalent to the INVALIDLOGLEVELACTION option for a STAX EXECUTE command. The value must evaluate via Python to one of the following (not case-sensitive):
  - 'parent' - specifies to use the same value that was specified for the parent job. This is the default.
  - 'default' - specifies to use the default STAX service setting for "Invalid Log Level Action".
  - 'raisesignal' - specifies to raise a STAXLogSignal signal.
  - 'loginfo' - specifies to use the "Info" logging level instead of the invalid log level.
  - otherwise, if it evaluates to something else, an error will occur when the job is submitted for execution and the RC variable will be set to 47 (Invalid value) with additional information in the STAFResult variable.

The job element contains the following elements in the order listed (with some variations). Refer to the "STAX Document Type Definition (DTD)" section to see the DTD for the job element.

Note that these elements are equivalent to the options allowed for the EXECUTE request (except where noted), so refer to the "EXECUTE" section for more information.

The job element must contain either a job-file or job-data element as follows:

- **job-file** - specifies the fully qualified name of a file containing the XML document for the sub-job to be executed. The job-file element is equivalent

to the FILE option for an EXECUTE request. The value is evaluated via Python to a string. This element has the following optional attribute:

- **machine** - specifies the name of the machine where the XML document is located. If not specified, it defaults to Python variable STAXJobXMLMachine. The machine attribute is equivalent to the MACHINE option for an EXECUTE request.

- **job-data** - specifies a string containing the XML document contents for the job to be executed. This element is equivalent to the DATA option for an EXECUTE request. Its value is evaluated via Python to a string only if its **eval** attribute evaluates to a true value via Python. This element has the following optional attribute:
  - **eval** - specifies whether the job-data is to be evaluated by Python in the parent job. This value must evaluate via Python to a true or false value. For example, if the job-data value is dynamically generated and assigned to a Python variable, rather then just containing the literal XML value, you would need to set the **eval** attribute to true (e.g. eval="1"). The default is false (eval="0").

The job element has the following optional elements. Each of these optional elements may specify an **if** attribute. The **if** attribute must evaluate via Python to a true or false value. If it does not evaluate to a true value, the element is ignored. The default value for the **if** attribute is 1, a true value. Note that in Python, true means any nonzero number or nonempty object; false means not true, such as a zero number, an empty object, or None. Comparisons and equality tests return 1 or 0 (true or false).

- **job-function** - specifies the name of the function element to call to start the job, overriding the defaultcall element, if specified, in the XML document. It must specify the name of a function element specified in the XML document. This element is equivalent to the FUNCTION option for an EXECUTE request. The value is evaluated via Python to a string. This element is optional.

- **job-function-args** - specifies arguments to pass to the function element called to start the job, overriding any arguments for the defaultcall element, if specified, in the XML document. This element is equivalent to the ARGS option for an EXECUTE request. Its value is evaluated via Python only if its **eval** attribute evaluates to a true value via Python. This element is optional and has the following optional attribute:
  - **eval** - specifies whether the job-function-args value is to be evaluated by Python in the parent job. The default is false (eval="0").

- **job-script** - specifies Python code to be executed. This element is equivalent to the SCRIPT option for an EXECUTE request. Multiple job-script elements may be specified for a job. Its value is evaluated via Python only if its **eval** attribute evaluates to a true value via Python. This element has the following optional attribute:
  - **eval** - specifies whether the job-script value is to be evaluated by Python in the parent job. The default is false (eval="0").

- **job-scriptfile** (or **job-scriptfiles**) - specifies the fully qualified name of a file containing Python code to be executed, or a list of file names containing Python code to be executed. The value must evaluate via Python to a string or a list of strings. This element is equivalent to the SCRIPTFILE option for a STAX EXECUTE command.

  Specifying only one script file could look like either:

  ```
  'C:/stax/scriptfiles/scriptfile1.py'   or    ['C:/stax/scriptfiles/scriptfile1.py']
  ```

  Specifying a list containing three script files could look like:

```
['C:/stax/scriptfiles/scriptfile1.py', 'C:/stax/scriptfiles/scriptfile2.py', 'C:/stax/scriptfiles/
scriptfile3.py']
```

The job-scriptfile element has the following optional attribute:

- **machine** - specifies the name of the machine where the script file(s) are located. If not specified, it defaults to Python variable STAXJobScriptFileMachine. This attribute is equivalent to the SCRIPTFILEMACHINE option for an EXECUTE request.

- **job-hold** - specifies to hold the sub-job after it has been successfully parsed before it starts running. When used in conjunction with the **monitor** attribute for the **job** element, this allows you to start the STAX Monitor application and monitor the sub-job from its beginning if desired. To do this, you must also specify a **monitor** attribute to specify that the sub-job should be automatically monitored by the STAX Monitor (when the current job is already being monitored by the STAX Monitor). Note that "Automatically monitor recommended sub-jobs" must be selected in the STAX Job Monitor properties in order for it to be used. Then the STAX Monitor will automatically monitor the sub-job and release the job so that the sub-job can be monitored from its beginning.

  The **job-hold** element is an empty element and has the following optional attributes:

  - **if** - is an expression that is evaluated via Python to a boolean value. If it evaluates to false, the job is not held. It defaults to true ('1').
  - **timeout** - specifies the maximum length of time to hold the sub-job. Its value must evaluate via Python to a string or a positive integer. It defaults to 0 which indicates to hold the sub-job indefinitely. The timeout can be expressed in milliseconds, seconds, minutes, hours, days, or weeks. Its format is `<Number>[s|m|h|d|w]`, where `<Number>` is an integer >= 0 and indicates milliseconds unless one of the following case-insensitive suffixes is specified:
    - s (for seconds)
    - m (for minutes)
    - h (for hours)
    - d (for days)
    - w (for weeks).

    Note that the calculated timeout cannot exceed 4294967294 milliseconds. For example:
    - timeout="'1000'" specifies 1000 milliseconds or 1 second
    - timeout="'5s'" specifies 5 seconds
    - timeout="'1m'" specifies 1 minute
    - timeout="'2h'" specifies 2 hours
    - timeout="'1w'" specifies 1 week
    - timeout="0" specifies to hold indefinitely

    A signal is raised if you specify an invalid timeout value.

- **job-action** - specifies a task which will be executed after the sub-job has started execution. This task will be executed in parallel with the sub-job via a new STAX-Thread. The task will be able to use the variable STAXSubJobID to obtain the sub-job's job ID in order to interact with the sub-job, if desired. If the sub-job completes before the task completes, the sub-job will remain in a non-complete state until the task completes. If the sub-job cannot start execution, the job-action task is not executed. This element is optional, but if specified, it must be the last element in the <job> element.

Note: To create a global variable that can be accessed across STAX-Threads, use the STAXGlobal class described in "STAXGlobal Class" section.

Options allowed for the EXECUTE command which are not allowed for the job element are as follows.

- WAIT
- TEST

Usage:

In the following example of a **job** element, a sub-job defined by an XML file named C:/stax/xml/myJob2.xml (located on the machine specified by STAXJobXMLMachine) is executed and given a job name of "MyJob". Since the monitor attribute is set to a true value, if the current job is being monitored by the STAX Monitor, and the "Automatically monitor recommended sub-jobs" option has been selected in the STAX Job Monitor Properties, a STAX Monitor window will be opened automatically for the sub-job. Also, since the <job-hold> element is specified, the sub-job will be held for up to 1 minute. If the current job is being monitored when the sub-job starts execution, the STAX Monitor will automatically start monitoring the sub-job and release it so that the sub-job is monitored from the beginning.

```
<job name="'Job 2'" monitor="1">
  <job-file>'C:/stax/xml/myJob2.xml'</job-file>
  <job-hold timeout="'1m'"/>
</job>
```

In the following example of a **job** element, a sub-job defined by an XML file named tests/testB/xml located on machine myMachine is executed and given a job name of 'Test B'. The job is started by calling function 'Main' and passing this function an argument list of [1, 'server']. In addition, two scriptfiles are specified as well as a couple of script elements. This sub-job is similar to the following STAX EXECUTE request:

```
EXECUTE FILE /tests/testB.xml MACHINE myMachine JOBNAME "Test B" CLEARLOGS
        FUNCTION Main ARGS "[1, 'server1']" SCRIPTFILEMACHINE myMachine
        SCRIPTFILE /tests/testB1.py SCRIPTFILE /tests/testB2.py
        SCRIPT "MachineList = ['machA', 'machB'] SCRIPT "maxTime = '1h'"
        WAIT RETURNRESULT
```

In addition, a **job-action** element is run in parallel with the sub-job after the sub-job has been started. In this example, it simply logs a message containing the job ID for the sub-job being executed. When the sub-job completes, the return code (RC) set when starting the sub-job is checked so that either a message is logged providing information about the sub-job that run (e.g. it's job ID, status, and result) or a message is logged providing information about why the sub-job could not be started. Checking the RC after a <job> element and logging an error message if the RC is not 0, is highly recommended.

```
<job name="'Test B'" clearlogs="'Enabled'">
  <job-file machine="'myMachine'">'/tests/testB.xml'</job-file>
  <job-function>'Main'</job-function>
```

```
  <job-function-args>[1, 'server1']</job-function-args>
  <job-scriptfiles machine="'myMachine'">['/tests/testB1.py', '/tests/testB2.py']</job-scriptfiles>
  <job-script>machineList = ['machA', 'machB']<job-script>
  <job-script>maxTime = '1h'</job-script>
  <job-action>
    <log>'Started sub-job %s' % (STAXSubJobID)</log>
  </job-action>
</job>

<if expr="RC == 0">
  <log message="1">
    'Sub-job %s completed.  Status: %s  Result: %s' % (STAXSubJobID, STAXSubJobStatus, STAXResult)
  </log>
  <else>
    <log message="1" level="'Error'">
      'Sub-job could not be started. RC: %s  Result: %s' % (RC, STAFResult)
    </log>
  </else>
</if>
```

In the following example of a **job** element, a sub-job defined by an XML file named C:/tests/Scenario01.xml located on machine myMachine is executed and given a job name of 'Scenario 01'. The option to clear the job logs is enabled, and all of the testcase logging options are enabled as well, and the python output is being redirected to both the STAX Job User Log and to the STAX Monitor's Messages panel and Python stdout is logged to the STAX Job User Log using logging level 'User1'.

```
  EXECUTE FILE C:/tests/Scenario01.xml MACHINE myMachine JOBNAME "Scenario 01"
          CLEARLOGS Enabled LOGTCELAPSEDTIME Enabled LOGTCNUMSTARTS Enabled
          LOGTCSTARTSTOP Enabled PYTHONOUTPUT JobUserLogAndMsg PYTHONLOGLEVEL User1

<job name="'Scenario 01'" clearlogs="'Enabled'"
     logtcelapsedtime="'Enabled'" logtcnumstarts="'Enabled'" logtcstartstop="'Enabled'"
     pythonoutput="'JobUserLogAndMsg'" pythonloglevel="'User'">
  <job-file machine="'myMachine'">'C:/tests/Scenario01.xml'</job-file>
</job>
```

This example of a **job** element uses the **job-data** sub-element instead of the **job-file** sub-element to define the STAX XML job to be run and evaluates it via Python to a string in the parent job.

```
  <script>
    machine = 'myMachine'
```

```
  xml = '&lt;?xml version="1.0" encoding="UTF-8" standalone="no"?>\n'
  xml = xml + '&lt;!DOCTYPE stax SYSTEM "stax.dtd">\n'
  xml = xml + '&lt;stax>\n'
  xml = xml + '  &lt;defaultcall function="Main"/>\n'
  xml = xml + '  &lt;function name="Main">\n'
  xml = xml + '    &lt;function-single-arg>\n'
  xml = xml + '      &lt;function-required-arg name="machList"/>\n'
  xml = xml + '    &lt;/function-single-arg>\n'
  xml = xml + '    &lt;sequence>\n'
  xml = xml + '      &lt;log message="1">\'machList=%s\' % (machList)&lt;/log>\n'
  xml = xml + '      &lt;return>machList&lt;/return>\n'
  xml = xml + '    &lt;/sequence>\n'
  xml = xml + '  &lt;/function>\n'
  xml = xml + '&lt;/stax>'
</script>

<job name="'My Sub Job'">
  <job-data eval="1">xml</job-data>
  <job-function-args eval="1">[ machine ]</job-function-args>
</job>

<if expr="RC == 0">
  <log message="1">
    'Sub-job %s completed.  Status: %s  Result: %s' % (STAXSubJobID, STAXSubJobStatus, STAXResult)
  </log>
  <else>
    <log message="1" level="'Error'">
      'Sub-job could not be started. RC: %s  Result: %s' % (RC, STAFResult)
    </log>
  </else>
</if>
```

This example of a **job** element uses the **job-data** sub-element instead of the **job-file** sub-element to define the STAX XML job to be run and does not evaluate the value in the **job-data** sub-element via Python.

```
<job name="'My Job'">
  <job-data eval="0">
    &lt;?xml version="1.0" encoding="UTF-8" standalone="no"?>
    &lt;!DOCTYPE stax SYSTEM "stax.dtd">
```

```
      &lt;stax>
        &lt;defaultcall function="Main"/>
        &lt;function name="Main">
          &lt;function-single-arg>
            &lt;function-required-arg name="machList"/>
          &lt;/function-single-arg>
          &lt;sequence>
            &lt;log message="1">'machList=%s' % (machList)&lt;/log>
            &lt;return>machList&lt;/return>
          &lt;/sequence>
        &lt;/function>
      &lt;/stax>
    </job-data>
    <job-function-args eval="0">[ 'myMachine' ]</job-function-args>
  </job>

  <if expr="RC == 0">
    <log message="1">
      'Sub-job %s completed.  Status: %s  Result: %s' % (STAXSubJobID, STAXSubJobStatus, STAXResult)
    </log>
    <else>
      <log message="1" level="'Error'">
        'Sub-job could not be started. RC: %s  Result: %s' % (RC, STAFResult)
      </log>
    </else>
  </if>
```

nop: Perform No Operation

The nop element indicates that no operation should be performed. This element is typically used in conjunction with the if, elseif, and else elements.

The **nop** element is an empty element and no attributes.

Usage:

In the following example of a **nop** element, if an expression is true, then use the **nop** element to do nothing; else perform function "ErrorRoutine".

```
<if expr="RC == 0">
  <nop/>
```

```
  <else>
    <call function="'ErrorRoutine'"/>
  </else>
</if>
```

Sequential Execution

The sequence element may contain any number of STAX elements and executes them serially.

sequence: Run Tasks In Sequence

The **sequence** element represents a container of STAX elements which will be executed serially, in the order in which the contained elements are listed in the sequence. A **sequence** element may contain any number of ***task*** elements. You may nest sequence elements.

Usage:

In the following example of a **sequence** element, a variable is created. Then the **stafcmd** element is executed. When the **stafcmd** element completes, the **process** element is executed. When the **process** element completes, the **call** element is executed. When the **call** element completes, the **sequence** element is complete.

<sequence>

```
  <script>server1 = "machine1.test.austin.ibm.com"</script>

  <stafcmd>
    ...
  </stafcmd>

  <process>
    ...
  </process>

  <call function="'VerifyRC'"/>
```

</sequence>

Parallel Execution

The parallel and paralleliterate elements execute tasks in parallel.

parallel: Run Tasks In Parallel

The **parallel** element represents a container of ***task*** elements which will be executed in parallel. Each ***task*** element it contains will be executed on a separate STAX-Thread and existing variables are cloned for each thread. The **parallel** element is considered to be complete when each of its contained ***task*** elements has completed. A **parallel** element may contain any number of ***task*** elements. You may nest **parallel** elements.

Note: To create a global variable that can be accessed across STAX-Threads, use the STAXGlobal class described in "STAXGlobal Class" section.

Usage:

In the following example of a **parallel** element, the **stafcmd**, **process**, and **call** elements are executed at the same time. When all three tasks are complete, the **parallel** element is complete and processing will continue on to the next element defined after the </**parallel**> element.

```
<parallel>

  <stafcmd>
    ...
  </stafcmd>

  <process>
    ...
  </process>

  <call function="'VerifyRC'"/>

</parallel>
```

paralleliterate: Run a Task for Each Entry in a List in Parallel

The **paralleliterate** element contains a single ***task*** element. The **paralleliterate** element performs the task for each value in a list. The iterations of the contained ***task*** element are executed in parallel (unlike the **iterate** element whose tasks are performed serially). Each iteration will be executed on a separate STAX-Thread and existing variables are cloned for each thread. The **paralleliterate** element is considered to be complete when all its iterations of the ***task*** element have completed.

Notes:

1. To create a global variable that can be accessed across STAX-Threads, use the STAXGlobal class described in "STAXGlobal Class" section.
2. If the list being iterated can contain a large number of items, you may want to specify the **maxthreads** attribute to perform the task in parallel for a subset of the list so that you don't exceed available memory if too many STAX-Threads are running concurrently.

The **paralleliterate** element has the following attributes:

- **var** - is the name of the variable which will contain the current item in the list/tuple being iterated. It is a literal and is required.
- **in** - is the list to be iterated. It is evaluated via Python and must evaluate to be a list or tuple. It is required. Note that the list may be assigned in many ways. Here are some examples of **in** attribute assignments:
  - the name of the variable that is a list or tuple: in="machList"
  - a literal list: in="['machA','machB','machC']"
  - a literal tuple: in="('testA','testB')"
  - a slice of a list/tuple: in="machList[1:]"
  - a concatenation of lists/tuples: in="machList1 + ['machD','machE']"
- **indexvar** - is the name of a variable which will contain the index of the current item in the list/tuple being iterated. It is a literal and is optional. Note that the index for the first element in the list/tuple is 0.
- **maxthreads** - specifies the maximum number of STAX-Threads that the paralleliterate element can run simultaneously at a time. It is optional and must evaluate to an integer value >= 0 via Python. The default value is 0 which means there is no maximum number of threads (and has the same effect as if the maxthreads attribute was not specified).

Usage:

The following example of a **paralleliterate** element runs ProcessA simultaneously on a group of machines whose names are contained in a list. The **paralleliterate** element is not complete until "ProcessA" has completed on all of the machines whose names are contained in the list.

```
<script>machList = ['machA','machB','machC','machD']</script>
<paralleliterate var="machName" in="machList">
  <process>
    <location>machName</location>
    <command>'ProcessA'</command>
  </process>
</paralleliterate>
```

The following example of a **paralleliterate** element submits a STAF request to the PING service to ping each machine in a list. If the ping fails, the name of the machine which could not be pinged is added to a list. The STAXGlobal class was used to store this list so that it can be accessed across STAX-Threads that are running in parallel.

```
<script>
  machineList = ['machA', 'machB', 'machC' ]
  gPingFailList = STAXGlobal([])
</script>

<paralleliterate var="machName" in="machineList">
  <sequence>

    <stafcmd>
      <location>machName</location>
      <service>'PING'</service>
      <request>'PING'</request>
    </stafcmd>

    <if expr="RC != 0">
      <script>gPingFailList.append(machName)</script>
    </if>

  </sequence>
</paralleliterate>

<if expr="len(gPingFailList) != 0">
  <message>
    'Could not ping the following machines: %s' % (gPingFailList.get())
  </message>
</if>
```

The following example of a **paralleliterate** element calls a function to run a test on each machine in an input list of machines. Since this machine list could contain hundreds of machines, the maxthreads attribute is being specified to run the test in parallel on a subset (20) of the machines at a time since running hundreds of STAX-Threads simultaneously could cause the STAX JVM to run out of memory.

```
<paralleliterate var="machine" indexvar="i" in="machineList" maxthreads="20">
  <block name="'#%s: %s' % (i + 1, machine)">
    <call function="'RunTest'">machine</call>
  </block>
</paralleliterate>
```

Functions

The function, call, call-with-list, call-with-map, defaultcall, return, and import elements deal with functions and how they are invoked.

function: Define a Named Task

To understand how to use the **function** element, you need to understand the following concepts:

- *<function> creates a function object and assigns it to a name*
  The **function** element creates a function object and assigns it to a name. The function name becomes a reference to the function object. There are really two sides to the function picture: a *definition* (the function element that creates a function) and a *call* (a call element that tells the STAX Job to run the function).

- *<return> sends a result object back to the caller*
  When a function is called, the caller stops until the function finishes its work and returns control to the caller. Functions that compute a value send it back to the caller with a **return** element. The **return** element can send back any sort of object, including multiple values.

- *Scope determines how variables are to be assigned*
  By default, all variables assigned in a function are global to the job's current STAX-Thread. However, you can assign a **local** scope to a function such that all names assigned in a function are local to that function and exist only while the function runs. Functions defined with a local scope provide a nested namespace, which contains a copy of variables in the caller's scope and which localizes any new variables created or changes to existing variables.

- *STAXGlobal class provides the ability to create truly global variables*
  An exception to the above scoping rules are variables that are instances of the STAXGlobal class. A STAXGlobal class is a Python class which STAX provides as a wrapper to provide for the creation of truly global variables, even across STAX-Threads and when used in functions declared with a local scope. See the STAXGlobal Class section for more information on how to create and use STAXGlobal variables.

The **function** element defines a named task and contains a single ***task*** element. A **function** element may only be defined within the root **stax** element.

The first function called when a job is started is determined by the **defaultcall** element or by the FUNCTION parameter of an EXECUTE request. Functions are called within a job definition file using the **call**, **call-with-list**, or **call-with-map** elements.

The **function** element has the following attributes:

- **name** - is the name of the function. It is required. No two function elements may have the same name. It is a literal. It cannot contain a variable as it is not evaluated via Python. It must be a proper XML name which means it must start with a letter, an underscore, or a colon. The next characters may be letters, digits, underscores, hyphens, periods, and colons (but no whitespace).

- **requires** - specifies other functions in the same job that must be imported along with the specified function. This allows the function's users to only

import the function itself, without having to worry about any other functions it may call. It is used by the <function-import> and <import> elements. The function names must be separated by a space (e.g. `requires="Function1 Function2 Function3"`). It is a literal. This attribute is optional.

- **scope** - specifies the scope of the function. It is a literal and, if specified, must be set to either global or local. It is optional and the default is global.
    - **global** - the function uses the same namespace so that the effects of variables defined/changed inside the function are global (within the same STAX-Thread).
    - **local** - the function provides a nested namespace which localizes the variables it uses. All variables assigned in a function are local to that function and exist only while the function runs. Variables previously defined in other functions with a global scope are still visible, however, any changes to these variables or new variables created are not visible to the caller after the function completes, unless the variable is an instance of the STAXGlobal class. Changes to STAXGlobal variables persist after a function completes.

The **function** element can also optionally contain the following elements, in the order listed, before the ***task*** element:

- **function-prolog** element - Contains a textual description of the function that can be used when transforming a STAX XML document to a Function Description document in HTML. This information will be placed before the function argument table in the Function Description document in HTML. This element replaces the deprecated **function-description** element.

  Note: This information is not used by STAX in any way and is completely ignored. In particular, this value is never passed to the Python interpreter, and thus, it should be a literal, not a quoted string. If you want to use standard HTML markup such as <p>, <b>, and <ol> in the description, then enclose the text in a CDATA section.

- **function-epilog** element - Contains a textual description of the function that can be used when transforming a STAX XML document to a Function Description document in HTML. This information will be placed after the function argument table in the Function Description document in HTML.

  Note: This information is not used by STAX in any way and is completely ignored. In particular, this value is never passed to the Python interpreter, and thus, it should be a literal, not a quoted string. If you want to use standard HTML markup such as <p>, <b>, and <ol> in the description, then enclose the text in a CDATA section.

- **function-import** element - Specifies to import functions from other STAX XML files. You can specify any number of **function-import** elements. The **function-import** element has the following attributes:
    - **file** - is the name of the STAX XML file from which the functions will be imported. It is a literal. Any STAF variables contained in the file name will be resolved on the STAX service machine. You must specify either the **file** attribute or the **directory** attribute, but not both.
        - If the **machine** attribute is specified, the **file** attribute should specify the fully-qualified path to the STAX XML file (an absolute file name).

- If the **machine** attribute is not specified, the **file** attribute can specify either the fully-qualified path to the STAX XML file (an absolute file name), or a relative path to the STAX XML file. It must be relative to the parent directory of the STAX XML file that contains the **function-import** element. A relative path can only be specified if the file being imported resides on the same machine as the STAX XML file that is importing the file. Using the relative path name allows a group of STAX XML files to be moved to different machines without modification to the **function-import** elements in your STAX XML files (assuming the same sub-directory structure that contains these files is maintained).

- **directory** - is the name of a directory that contains STAX XML files from which functions will be imported. It is a literal. Any STAF variables contained in the directory name will be resolved on the STAX service machine. You must specify either the **file** attribute or the **directory** attribute, but not both. All functions from the files contained within this directory that end in .xml (case-insensitive) will be imported. Subdirectories within the directory are ignored. You cannot specify a subset of functions to import when using the **directory** attribute.

  - If the **machine** attribute is specified, the **directory** attribute should specify the fully-qualified path (an absolute path) to the directory containing STAX XML files.

  - If the **machine** attribute is not specified, the **directory** attribute can specify either the fully-qualified path (an absolute path) to a directory containing STAX XML files, or a relative path to the directory. It must be relative to the parent directory of the STAX XML file that contains the **function-import** element. A relative path can only be specified if the directory being imported resides on the same machine as the STAX XML file that is importing the file. Using the relative path name allows a group of STAX XML files to be moved to different machines without modification to the **function-import** elements in your STAX XML files (assuming the same sub-directory structure that contains these files is maintained).

- **machine** - is the name of the machine where the STAX XML file or directory is located. It is optional. It is a literal. Any STAF variables contained in the machine name will be resolved on the STAX service machine. If the machine attribute is not specified, it will default to the machine where the STAX XML file that contains the **function-import** element resides.

The **function-import** element may optionally specify a subset of functions to import only if the **file** attribute is specified. The function names must be separated by whitespace (e.g. Function1 Function2 Function3). It is a literal. If you don't specify any functions to import, then all functions in the specified file will be imported.

If an error occurs while processing a **function-import** element:

- If the job hasn't started executing, RC 4001 (Error submitting execute request) will be returned with detailed information about the STAXFunctionImportException in the result.

- If the job is already running (e.g. because the **function-import** element is triggered by the **import** element), a STAXFunctionImportError signal is raised during run-time (which will log an error and terminate the job if using the default signal handler provided for this signal).

Using a **function-import** element instead of a **import** element within the function's task, provides the ability to import functions from xml files sooner, even before run-time if you only use **function-import** elements, not **import** elements. This allows any errors in the imported xml files to be discovered earlier. However, since **function-import** elements can be processed before run-time, you cannot specify Python variables in the attributes or contents of a **function-import** element, unlike a **import** element which dynamically imports an xml file during run-time.

Possible errors that could occur while processing a **function-import** element include:

- The machine specified could not be contacted
- An error occurred while getting the contents of an xml file (e.g. the file or directory does not exist, insufficient STAF trust, etc)
- An XML parse error occurred while parsing an imported XML file
- A Python Compile error occurred while compiling the Python code in an imported XML file,

After a **function-import** element has imported a function from a file, any function can then call the imported function during execution of the STAX job.

If file caching is enabled, the file cache will be checked for an up-to-date copy of the imported file before loading and parsing the XML from the target machine. For a file cache hit to occur, the imported file's name and machine must match a file cache entry. If the file is retrieved from cache, there can be an increase in the performance of the import operation. For more information on how caching works, refer to the "STAX File and Machine Caching" section.

- One of the following elements can be specified to define formal function arguments. Defining arguments can help prevent unintended namespace collisions and allows STAX to detect argument validation errors when calling functions at runtime.

  - **function-no-args** - is an empty element that specifies that the function does not allow any arguments to be passed to it.

  - **function-single-arg** - contains either a <function-required-arg>, <function-optional-arg>, or a <function-arg-def> element.

  - **function-list-args** - specifies a list of arguments. This element can contain zero or more <function-required-arg> elements, followed by zero or more <function-optional-arg elements (but must contain at least one of these arguments), followed by an optional <function-other-args> element, or it can contain one or more <function-arg-def> elements. Note, the order of the arguments is important. All <function-required-args> must precede all <function-optional-args>, and the <function-other-args> element must be last (if present).

  - **function-map-args** - specifies a map of arguments (recorded as name/value pairs). This element can contain any combination of one or more <function-required-arg> and <function-optional-arg> elements, followed by an optional <function-other-args> element, or it can contain one or more <function-arg-def> elements.. Note that the order of the <function-required-arg> and <function-optional-arg> elements is not relevant, unless an argument's default value specifies another argument's value. However, the <function-other-args> element must be specified last (if present).

If more arguments are passed to the function when called than are defined (assuming a <function-other-args> element, or a <function-arg def> with a

"type" attribute set to "other", is not specified) or if not all required arguments are passed to the function when called, a STAXFunctionArgValidate signal is raised to indicate the failure and the function is not executed.

The function argument elements are defined as follows:

- **function-required-arg** - defines an argument that must be passed when calling a function. It may optionally contain a description for the argument. This element has the following attribute:
  - **name** - is the name of the argument as it will appear inside the function. It is a literal and is required.

- **function-optional-arg** - defines an argument that may optionally be passed when calling a function. It may optionally contain a description for the argument. This element has the following attributes:
  - **name** - is the name of the argument as it will appear inside the function. It is a literal and is required.
  - **default** - is the default value for the argument. Its value is evaluated via Python. It is optional, and defaults to the special Python object None. If an optional argument is not provided when calling a function, its default value is used.

- **function-other-args** - defines the name of a list (if defined within a <function-list-args> element) or a map (if defined within a <function-map-args> element) which will contain any additional arguments passed when calling a function. If additional arguments are not provided when calling a function, its value is either an empty list or an empty map, depending on whether it was defined within a <function-list-args> element or a <function-map-args> element, respectively. It may optionally contain a description for the argument. The <function-other-args> element has the following attribute:
  - **name** - is the name of the argument list or map as it will appear inside the function. It is a literal and is required.

- **function-arg-def** - defines an argument which can contain private data, as well as other user-defined properties. This element has the following attributes:
  - **name** - is the name of the argument as it will appear inside the function. It is a literal and is required.
  - **type** - is the type of the argument. It is a literal and is optional. The allowed values are "required", "optional", and "other". The default value is "required".
  - **default** - is the default value for the argument. Its value is evaluated via Python. It is optional, and defaults to the special Python object None. If an optional argument is not provided when calling a function, its default value is used.

  Note: When using <function-arg-def> elements to define arguments within a <function-list-args> element, the order of the arguments is important. All arguments with type "required" must precede all arguments with type "optional", and the argument with type "other" must be specified last (if present).
  Note: When using <function-arg-def> elements to define arguments within a <function-maps-args> element, the order of the arguments with types "required" and "optional" is not relevant, unless an argument's default value specifies another argument's value. However, the argument with type "other" must be specified last (if present).

A function that does not define its arguments is implicitly defined as:

```
<function-single-arg>
  <function-optional-arg name="STAXArg" default="None"/>
```

```
</function-single-arg>
```

Note that the function argument elements (**function-required-arg**, **function-optional-arg**, and **function-other-args**) can contain a description of the argument. This information, along with the values of the **function-prolog** element (or the deprecated **function-description** element) and the **function-epilog** element, can be used in conjunction with an XSLT stylesheet to generate a nicely formatted HTML file documenting functions and their associated arguments specified in a STAX job. Refer to the "Generating STAX Function Documentation" section for more information on how to generate HTML documentation for your STAX functions.

The **function-arg-def** element can also optionally contain the following elements, in the order listed:

- **function-arg-description** element - Contains a description of the argument. This information, along with the values of the **function-prolog** element (or the deprecated **function-description** element) and the **function-epilog** element, can be used in conjunction with an XSLT stylesheet to generate a nicely formatted HTML file documenting functions and their associated arguments specified in a STAX job. Refer to the "Generating STAX Function Documentation" section for more information on how to generate HTML documentation for your STAX functions.

- **function-arg-private** element - Indicates that the argument contains private data. This element is optional and is an empty element.

- **function-arg-property** element - Allows you to specify properties for the argument. You may have multiple <function-arg-property> elements.

The **function-arg-property** element has the following required attributes:

- **name** - is the name of the property. It is a literal.
- **value** - is the value of the property. It is a literal.

The **function-arg-property** element can also optionally contain the following elements, in the order listed:

- **function-arg-property-description** element - Contains a description of the argument property. This information, along with the attributes of the **function-property-data** element can be used in conjunction with an XSLT stylesheet to generate a nicely formatted HTML file documenting function arguments and their associated properties specified in a STAX job. Refer to the "Generating STAX Function Documentation" section for more information on how to generate HTML documentation for your STAX functions.

- **function-arg-property-data** element - Contains data associated with the argument property. You may have multiple <function-arg-property-data> elements. A <function-arg-property> element can contain nested <function-arg-property-data> elements, which can be self-nested. This allows you to define an enumerated list of values for a function argument.

The **function-arg-property-data** element has the following required attributes:

- **type** - is the type of the property data. It is a literal.
- **value** - is the value of the property data. It is a literal.

Usage:

Goal: Define a simple function containing a sequence element (which can then contain any number of other elements).

```
<function name="FunctionA">
  <sequence>
    ...
  </sequence>
</function>
```

Goal: Define a function which you intend to import into other STAX XML job files. The requires attribute defines the two additional functions it requires so that they will be automatically imported as well when FunctionB is imported.

```
<function name="FunctionB" requires="FunctionC FunctionD">
  <sequence>
    ...
    <call function="'FunctionC'"/>
    ...
    <call function="'FunctionD'"/>
    ...
  </sequence>
</function>
```

Goal: Illustrate the use of local function scope and the STAXGlobal class. Note that only changes to globalVar (which is an instance of the STAXGlobal class) are visible after function Bar completes. Also, all existing variables are visible inside functions with "local" scope. Thus, variables localVar and globalVar are visible inside function Bar, even though function Bar has "local" scope and had not defined them. The following messages are displayed in the STAX Monitor when this example is run:

```
Before Bar: localVar=[1, 2], globalVar=[1, 2]
After  Bar: localVar=[1, 2], globalVar=[1, 2, 3]

<stax>

  <script>
    localVar = [1, 2]
    globalVar = STAXGlobal([1, 2])
  </script>

  <defaultcall function="Main"/>
```

```
  <function name="Main" scope="local">

    <sequence>

      <message>
        'Before Bar: localVar=%s, globalVar=%s' % (localVar, globalVar)
      </message>

      <call function="'Bar'"/>

      <message>
        'After  Bar: localVar=%s, globalVar=%s' % (localVar, globalVar)
      </message>

    </sequence>

  </function>

  <function name="Bar" scope="local">

    <script>
      localVar.append(3)
      globalVar.append(3)
    </script>

  </function>

</stax>
```

Goal: Illustrate the use of the **function-import** element using an absolute paths and specifying the machine attribute.

The following imports all functions from file C:/stax/baseFunctions.xml that resides on machine server1.company.com:

```
  <function-import file="C:/stax/commonFunctions.xml" machine="server1.company.com"/>
```

The following only imports functions FunctionA, FunctionB, and FunctionC from this file:

```
  <function-import file="C:/stax/commonFunctions.xml" machine="server1.company.com">
    FunctionA FunctionB FunctionC
```

```
</function-import>
```

The following imports all xml files from directory C:/stax/libraries that resides on machine server1.company.com:

```
<function-import directory="C:/stax/libraries" machine="server1.company.com"/>
```

Goal: Illustrate the use of the **function-import** element using relative file names. Assume the following STAX XML files reside on the same machine:

```
/stax/MyApp/job1.xml
/stax/MyApp/commonLib.xml
/stax/libraries/library1.xml
/stax/libraries/library2.xml
```

and you wanted function "Main" in the /stax/MyApp/job1.xml file to import all functions from files /stax/MyApp/commonLib.xml, /stax/libraries/library1.xml and /stax/libraries/library2.xml so that it could call functions from these imported files. You could do this as follows:

```
<function name="Main"/>
  <function-import file="commonLib.xml"/>
  <function-import file="../libraries/library1.xml"/>
  <function-import file="../libraries/library2.xml"/>

  <sequence>
    ...
  </sequence>

</function>
```

Instead of specifying two **function-import** elements to import the two xml files for /stax/libraries, you could use the **directory** attribute and do it as follows:

```
<function name="Main"/>
  <function-import file="commonLib.xml"/>
  <function-import directory="../libraries"/>

  <sequence>
    ...
  </sequence>

</function>
```

Goal: Illustrate the specification of a function which does not allow any arguments to be passed to it. If any arguments are passed to it when called, a STAXFunctionArgValidate signal is raised and the function is not run.

```
<function name="NoArgsFunction">
  <function-no-args/>

  <sequence>
    ...
  </sequence>

</function>
```

Goal: Illustrate the specification of a function which requires one argument, duration, to be passed to it. If zero or more than one argument is passed to it when called, a STAXFunctionArgValidate signal is raised and the function is not run.

```
<function name="OneRequiredArgFunction" scope="local">

  <function-single-arg>
    <function-required-arg name="duration"/>
  </function-single-arg>

  <timer duration="duration">
    <loop>
      ...
    </loop>
  </timer>

</function>

This function could be called in any of the following ways with the same result:

<call function="'OneRequiredArgFunction'">'24h'</call>

<call-with-list function="'OneRequiredArgFunction'">
  <call-list-arg>'24h'</call-list-arg>
</call-with-list>
```

Goal: Illustrate the specification of a function which requires two map arguments (returnCode and result) and has one optional argument (msg). If the two required arguments are not passed to it when called, a STAXFunctionArgValidate signal is raised and the function is not run. A function prolog element is provided to describe what this function does and descriptions of the arguments passed to the function are also provided.

```
<function name="Check-STAFCmd-RC" scope="local">

  <function-prolog>
    Checks if a STAFCmd was successful and updates testcase status
  </function-prolog>

  <function-map-args>

    <function-required-arg name="returnCode">
      Return Code from a STAF Command
    </function-required-arg>

    <function-required-arg name="result">
      Result from a STAF Command
    </function-required-arg>

    <function-optional-arg name="msg" default="''">
      Message to display if an error occurs
    </function-optional-arg>

  </function-map-args>

  <if expr="RC == 0">
    <tcstatus result="'pass'"/>
    <else>
      <tcstatus result="'fail'">
        '%s; RC=%s, Result=%s' % (msg, returnCode, result)
      </tcstatus>
    </else>
  </if>

</function>

This function could be called in any of the following ways with the same result:

<call function="'Check-STAFCmd-RC'">
  { 'returnCode': RC, 'result': STAFResult, 'msg': 'This is the error message' }
</call>

<call-with-map function="'Check-STAFCmd-RC'">
```

```
    <call-map-arg name="'result'">STAFResult</call-map-arg>
    <call-map-arg name="'returnCode'">RC</call-map-arg>
    <call-map-arg name="'msg'">'This is the error message'<call-map-arg>
  </call-with-map>
```

Goal: Illustrate the specification of a function which requires a list argument (machName) and may have any number of additional arguments which will be stored in a list called testList. This example also shows the use of a STAXGlobal variable which is updated across STAX-Threads.

```
<function name="RunTests" scope="local">

    <function-list-args>
      <function-required-arg name="machName"/>
      <function-other-args name="testList"/>
    </function-list-args>

    <sequence>

      <script>
        testsRun = STAXGlobal([0])   # Number of tests run
      </script>

      <paralleliterate var="testName" in="testList">

        <sequence>

          <process>
            <location>machName</location>
            <command mode="'shell'">testName</command>
          </process>

          <script>testsRun[0] += 1</script>

        </sequence>

      </paralleliterate>

      <message>'Ran %s tests' % testsRun[0]</message>

    </sequence>
```

```
</function>

This function could be called in any of the following ways with the same result:

<call function="'RunTests'">
  'local', 'ping machineA', 'dir C:\ > C:\out'
</call>

<call function="'RunTests'">
  [ 'local', 'ping machineA', 'dir C:\ > C:\out' ]
</call>

<call-with-list function="'RunTests'">
  <call-list-arg>'local'</call-list-arg>
  <call-list-arg>'ping machineA'</call-list-arg>
  <call-list-arg>'dir C:\ > C:\out'<call-list-arg>
</call-with-list>
```

Goal: Illustrate the specification of a function that includes a complete desription of the function using the **function-prolog** and **function-epilog** elements. These elements utilize a CDATA section so that the text can include standard HTML markup so that when transformed via an XSLT processor (or by using the STAXDoc tool), the text is easily readable. Note this function is actually provided in the sample STAXUtil.xml file provides in the STAX zip/tar file.

```
<function name="STAXUtilLogAndMsg" scope="local">

  <function-prolog>
    <![CDATA[
    <p>
      Logs a message and sends the message to the STAX Monitor.
      It's a shortcut for specifying the <message> and <log> elements
      for the same message.
    </p>
    ]]>
  </function-prolog>

  <function-epilog>
    <![CDATA[
    <h4>Returns:</h4>
    <p>Nothing.  That is, STAXResult = None.</p>
    <h4>Example:</h4>
    <pre>
```

```
    <call function="'STAXUtilLogAndMsg'">'Here is my message'</call></pre>
        ]]>
      </function-epilog>

      <function-list-args>

        <function-required-arg name="message">
          The message you want to log in the STAX Job User log and to send to
          the STAX Monitor.
        </function-required-arg>

        <function-optional-arg name="level" default="'info'">
          The level of the message to be logged in the STAX Job User log.
        </function-optional-arg>

      </function-list-args>

      <sequence>

        <message>message</message>

        <log level="level">message</log>

      </sequence>

    </function>
```

Goal: Illustrate the specification of a function that accepts a map of <function-arg-def> elements. It also demonstrates how function arguments can be denoted as containing private data, as well as defining an enumerated list of values for a function argument. This example includes an argument named "color" that allows values of "red" (which would be the default selection in any form of graphical selection), "blue", and "green".

```
    <function name="RunCommand">

      <function-map-args>

        <function-arg-def name="command">
          <function-arg-description>
             A command to execute
          </function-arg-description>
        </function-arg-def>
```

```
      <function-arg-def name="user" type="optional" default="'anonymous'">
        <function-arg-description>
          The user id to run the command under
        </function-arg-description>
      </function-arg-def>

      <function-arg-def name="password" type="optional">
        <function-arg-description>
          The password for the user id
        </function-arg-description>
        <function-arg-private/>
      </function-arg-def>

      <function-arg-def name="numTimes" type="optional" default="1">
        <function-arg-description>
          The number of times to run the command
        </function-arg-description>
        <function-arg-property name="type" value="int"/>
      </function-arg-def>

      <function-arg-def name="color" type="required">
        <function-arg-description>
          This is the color of the entity
        </function-arg-description>
        <function-arg-property name="type" value="enum">
          <function-arg-property-description>
            This defines this argument as an enumeration
          </function-arg-property-description>
          <function-arg-property-data type="choice" value="'red'">
            <function-arg-property-data type="default"/>
          </function-arg-property-data>
          <function-arg-property-data type="choice" value="'blue'"/>
          <function-arg-property-data type="choice" value="'green'"/>
        </function-arg-property>
      </function-arg-def>

    </function-map-args>

  <function>
```

Here is an example of calling this function:

```
<call function="'RunCommand'">
  {
    'command' : 'TestA',
    'user'    : 'test',
    'password': 'secret',
    'numTimes': 5,
    'color'   : 'red'
  }
</call>
```

call: Call a Function

The **call** element specifies the name of a **function** element to be executed. When a **call** element is executed during the job execution, the function referred to is executed. The **call** element has the following required attribute:

- **function** - is the name of the function to call. Its value must evaluate via Python to a string. There must be a function element that exists whose name exactly matches, including case, the evaluated string.

Optionally, arguments may be passed when calling a function. The arguments are evaluated via Python in the caller's namespace. If no argument data is specified, then special Python object None is passed to the function. Any kind of argument data can be passed to functions using the <call> element and all of the types of function arguments (<function-no-args>, <function-single-arg>, <function-list-args>, or <function-map-args>) may be specified via this mechanism.

Usage:

Goal: Call a function named 'FunctionA', passing no arguments.

```
<call function="'FunctionA'"/>
```

Goal: Serially call each function (passing no arguments) whose name is in a list.

```
<iterate var="funcName" in="['FuncA','FuncB','FuncC','FuncD']">
  <call function="funcName"/>
</iterate>
```

Goal: Call a function which expects one argument.

```
  <call function="'FunctionWithOneArg'">'Hi'</call>
```

Goal: Call a function which expects a list of three arguments.

```
  <call function="'FunctionWithThreeArgs'">
    5, 'This is a message', ['test1', 'test2']
  </call>
or
  <call function="'FunctionWithThreeArgs'">
    [ 5, 'This is a message', ['test1', 'test2'] ]
  </call>
```

Goal: Call a function which expects a map of two required values named "testList" and "machineList":

```
  <call function="'Foo'">
    {
      'testList' : ['test1', 'test2'],
      'machineList' : ['machine1', 'machine2']
    }
  </call>
```

call-with-list: Call a Function with a Argument List

The **call-with-list** element specifies the name of a **function** element to be executed. When a **call-with-list** element is executed during the job execution, the function referred to is executed.The **call-with-list** element has the following required attribute:

- **function** - is the name of the function to call. Its value must evaluate via Python to a string. There must be a function element that exists whose name exactly matches, including case, the evaluated string.

The **call-with-list** element can contain any number of **call-list-arg** elements. Each **call-list-arg** element contains a value for an argument which is evaluated via Python in the caller's namespace and will be passed to the function in the form of a list.

Usage:

Goal: Call a function named 'FunctionWithArgs' passing it three arguments in the form of a list.

```
  <call-with-list function="'FunctionWithArgs'">
    <call-list-arg>5</call-list-arg>
```

```
    <call-list-arg>'This is a message'</call-list-arg>
    <call-list-arg>['test1', 'test2']</call-list-arg>
  </call-with-list>
```

Note that this is equivalent to the following examples which use the **call** element instead:

```
  <call function="'FunctionWithArgs'">
    5, 'This is a message', ['test1', 'test2']
  </call>

  <call function="'FunctionWithArgs'">
    [ 5, 'This is a message', ['test1', 'test2'] ]
  </call>
```

call-with-map: Call a Function with a Argument Map

The **call-with-map** element specifies the name of a **function** element to be executed. When a **call-with-map** element is executed during the job execution, the function referred to is executed. The **call-with-map** element has the following required attribute:

- **function** - is the name of the function to call. Its value must evaluate via Python to a string. There must be a function element that exists whose name exactly matches, including case, the evaluated string.

The **call-with-map** element can contain any number of **call-map-arg** elements. Each **call-map-arg** element has a required name attribute and contains an argument value. Both the name attribute and the argument value are evaluated via Python in the caller's namespace. The arguments are passed to the function in the form of a map of name/value pairs (also known as a dictionary in Python).

Usage:

Goal: Call a function named 'FunctionWithArgs' passing it three arguments in the form of a map (Python dictionary).

```
  <call-with-map function="'FunctionWithArgs'">
    <call-map-arg name="'size'">5</call-map-arg>
    <call-map-arg name="'msg'">'This is a message'</call-map-arg>
    <call-map-arg name="'testList'">['test1', 'test2']</call-map-arg>
  </call-with-map>
```

Note that this is equivalent to the following example which uses the **call** element instead:

```
  <call function="'FunctionWithArgs'">
```

```
    {'size' : 5, 'msg' : 'This is a message', 'testList' : ['test1', 'test2'] }
  </call>
```

defaultcall: Specify Default Starting Function To Call

The **defaultcall** element specifies the name of the function to call to start the job if no FUNCTION parameter is specified when the job is started using an EXECUTE request. The **defaultcall** element has the following required attribute:

- **function** - is the name of the function to call. It is a literal and so it cannot contain a variable as it is not evaluated via Python. There must be a function element that exists whose name exactly matches (including case).

Optionally, arguments may be passed via the **defaultcall** element. The arguments are evaluated via Python. If no argument data is specified, then special Python object None is passed to the function. Any kind of argument data can be passed to functions using the **defaultcall** element and all of the types of function arguments (**function-no-args**, **function-single-arg**, **function-list-args**, or **function-map-args**) may be specified via this mechanism.

A **defaultcall** element may only be defined within the root **stax** element, but it is not required. If a **defaultcall** element is not specified, a FUNCTION parameter on the STAX EXECUTE request must be specified.

Usage:

Goal: Call FunctionA by default to start the STAX job. No arguments are passed to FunctionA.

```
<stax>

  <defaultcall function="FunctionA"/>

  <function name="FunctionA">
    ...
  </function>
  ...

</stax>
```

Goal: Call FunctionA by default to start the STAX job. Pass a list of 2 arguments (duration and testList) to FunctionA.

```
<stax>

  <defaultcall function="FunctionA">[ '24h', ['machA', 'machB'] ]</defaultcall>
```

```
  <function name="FunctionA">
    <function-list-args>
      <function-required-arg name="duration"/>
      <function-optional-arg name="testList" default="['local']"/>
    </function-list-args>
    ...
  </function>
  ...

</stax>
```

return: Return from a Function

The **return** element ends the function call and sends a result back to the caller. The **return** element is optional; if it's not present, a function exits when control flow falls off the end of the function body.

After the call of a function has completed, the **STAXResult** variable contains the result sent back from the call. It can be set to any type of object. For example, an integer, a list, a string, etc. This can be especially useful when the function called is defined with a **local** scope.

If no **return** element is specified within a function, or if no value is specified for the result object, STAXResult is set to the special Python None object. If an error occurred calling the function (e.g. invalid arguments, Python Evaluation error), STAXResult is set to a result object called STAXFunctionError.

Note that because the return sends back any sort of object, it can return multiple values, by packaging them as a tuple. Thus, call by reference can be simulated by returning tuples and assigning back to the original argument names in the caller. See the last example in the Usage section.

If a value is specified for the return element, it is evaluated via Python.

The **return** element has no attributes.

Usage:

Goal: Return control to the caller with STAXResult set to RC (e.g. an integer value set by a process or STAF command).

```
  <return>RC</return>
```

Goal: Return control to the caller with STAXResult set to None.

```
  <return/>
```

Goal: Return control to the caller with STAXResult set to a list. The caller can access the RC by specifying STAXResult[0] and the message by specifying STAXResult[1].

```
  <return>[RC, 'A descriptive message']</return>
```

Goal: Simulate call by reference by returning new values in a tuple and assigning the results to the caller's names. After the call, A = 3 and B = ['test1', 'test2', 'test3']

```
<function name="FunctionPassByReference" scope="local">

  <function-list-args>
    <function-required-arg name="x"/>
    <function-required-arg name="y"/>
  </function-list-args>

  <sequence>
    <script>
      x = x + 2
      y.append('test3')
    </script>
    <return>x, y</return>
  </sequence>

</function>

The above function is called from another function as follows:

<script>
  A = 1
  B = ['test1', 'test2']
</script>

<call function="'FunctionPassByReference'">A, B</call>

<script>
  A, B = STAXResult
</script>
```

import: Import Functions From Other STAX XML Job Files

The **import** element specifies a set of functions to be imported from other STAX XML file(s). The **import** element has the following attributes:

- **file** - is the name of the STAX XML file from which the function(s) will be imported. Its value is evaluated via Python. Any STAF variables contained in the file name will be resolved on the STAX service machine. You must specify either the **file** attribute or the **directory** attribute, but not both.
    - If the **machine** attribute is specified, the **file** attribute should specify the fully-qualified path to the STAX XML file (an absolute file name).
    - If the **machine** attribute is not specified, the **file** attribute can specify either the fully-qualified path to the STAX XML file (an absolute file name), or a relative path to the STAX XML file. It must be relative to the parent directory of the current STAX XML file (STAXCurrentXMLFile). A relative path can only be specified if the file being imported resides on the same machine as the STAX XML file that is importing the file (STAXCurrentXMLMachine). Using the relative path name allows a group of STAX XML files to be moved to different machines without modification to the **import** elements in your STAX XML files (assuming the same sub-directory structure that contains these files is maintained).
- **directory** - is the name of a directory that contains STAX XML files from which functions will be imported. Its value is evaluated via Python. Any STAF variables contained in the directory name will be resolved on the STAX service machine. You must specify either the **file** attribute or the **directory** attribute, but not both. All functions from the files contained within this directory that end in .xml (case-insensitive) will be imported. Subdirectories within the directory are ignored. You cannot specify a subset of functions to import when using the **directory** attribute (that is, you cannot specify the **import-include** or the **import-exclude** element when the **directory** attribute is specified).
    - If the **machine** attribute is specified, the **directory** attribute should specify the fully-qualified path (an absolute path) to the directory containing STAX XML files.
    - If the **machine** attribute is not specified, the **directory** attribute can specify either the fully-qualified path (an absolute path) to a directory containing STAX XML files, or a relative path to the directory. It must be relative to the parent directory of the current STAX XML file (STAXCurrentXMLFile). A relative path can only be specified if the directory being imported resides on the same machine as the STAX XML file that is importing the file (STAXCurrentXMLMachine). Using the relative path name allows a group of STAX XML files to be moved to different machines without modification to the **import** elements in your STAX XML files (assuming the same sub-directory structure that contains these files is maintained).
- **machine** - is the name of the machine where the STAX XML file or directory is located. It is optional. Its value is evaluated via Python. Any STAF variables contained in the machine name will be resolved on the STAX service machine. If the machine attribute is not specified, it will default to STAXCurrentXMLMachine which specifies the machine where the STAX XML job file that contains the <import> element resides.
- **replace** - specifies what to do if a function already exists. It is optional. Its value is evaluated via Python. Its default value is 0, a false value.
    - If it evaluates to a "false" value (e.g. 0), then functions that already exist will not be replaced. This is the default.
    - If it evaluates to a "true" value (e.g. 1), then functions that already exist (e.g. have already been imported or were defined in the STAX xml

file being executed) will be replaced.

Note that in Python, true means any nonzero number or nonempty object; false means not true, such as a zero number, an empty object, or None.

- **mode** - specifies what happens when an error occurs when importing functions. It is optional. Its value must evaluate via Python to one of the following:
  - 'error' - specifies that a signal will be raised if an error occurs. This is the default.
  - 'ignore' - specifies that no signal will be raised if an error occurs. However, STAXResult will contain information about the error.

The **import** element contains the following optional elements:

- **import-include** - It specifies a list of the the functions to import from the xml file. Its value must evaluate via Python to a list. This element cannot be specified when the **directory** attribute is used.
- **import-exclude** - It specifies a list of functions which will not be imported from the xml file. Its value must evaluate via Python to a list. This element cannot be specified when the **directory** attribute is used.

If **<import-include>** is not present, then all functions will be imported (bound by any exclude list). If **<import-exclude>** is not present, then no functions will be excluded.

The **<import-include>** and **<import-exclude>** elements support grep matching.

After executing an **import** element, the STAXResult variable will be set as follows:

- If the **file** attribute was specified, STAXResult will be set to a list containing:
  - STAXResult[0]: Either None (if the xml file was imported successfully), or a list containing a STAXImportError object and a text string with details about the error.
  - STAXResult[1]: A list of the successfully imported functions that were requested to be imported.
  - STAXResult[2]: A list of the successfully imported functions that were required by other functions.
  - STAXResult[3]: A list of the functions that were requested to be imported but already existed and replace was not specified (so they were not imported).
  - STAXResult[4]: A list of the functions that were required by other functions but already existed and replace was not specified (so they were not imported).
  - STAXResult[5]: A list of the functions that were not requested to be imported and were not required by other functions.
  - STAXResult[6]: A list of functions requested to be imported that were not found.

- If the **machine** attribute was specified, STAXResult will be set to a list containing:
  - STAXResult[0]: Either None (if all the xml files in the directory were imported successfully), or a list containing a STAXImportDirectoryError object and a string containing an error message identifying the directory that could not be successfully imported.

- STAXResult[1]: A list containing information about the files in the directory that were successfully imported, and/or detailed information about any errors that occurred while importing files from the directory. Each entry in this list will contain:
  - STAXResult[0]: Either the name of the file in the directory that was successfully imported, or (if an error occurred), a list containing a STAXImportError object and a text string with details about the error.
  - STAXResult[1]: A list of the successfully imported functions that were requested to be imported.
  - STAXResult[2]: A list of the successfully imported functions that were required by other functions.
  - STAXResult[3]: A list of the functions that were requested to be imported but already existed and replace was not specified (so they were not imported).
  - STAXResult[4]: A list of the functions that were required by other functions but already existed and replace was not specified (so they were not imported).
  - STAXResult[5]: A list of the functions that were not requested to be imported and were not required by other functions.
  - STAXResult[6]: A list of functions requested to be imported that were not found.

If an error occurs while executing an **import** element, a STAXImportError signal will be raised if its mode is 'error' (or if it's mode is invalid, e.g. not 'error' or 'ignore'). When a STAXImportError signal is raised, the variable STAXSignalData will be set to a list containing an error type object and a string containingg the error description. The possible error types for STAXImportError are:

- STAXNoResponseFromMachine - the machine specified could not be contacted
- STAXFileCopyError - an error occurred while copying the xml file
- STAXXMLParseError - an XML parse error occurred while parsing the imported XML file
- STAXImportModeError - an import mode specified is not valid
- STAXImportDirectoryError - an error occurred while importing xml files from a directory

If you override the default Signal Handler for STAXImportError, you can access the error type in this manner:

```
<if expr="STAXSignalData[0] is STAXNoResponseFromMachine">
```

If file caching is enabled, the file cache will be checked for an up-to-date copy of the imported file before loading and parsing the XML from the target machine. For a file cache hit to occur, the imported file's name and machine must match a file cache entry. If the file is retrieved from cache, there can be an increase in the performance of the import operation. For more information on how caching works, refer to the "STAX File and Machine Caching" section.

Usage:

The **import** element may be specified anywhere except in the root <stax> element. This allows it to be executed at runtime, allowing Python expressions to be used in the element and enabling dynamic importing of functions. The **import** element acts like any other element and is not executed until runtime. This is unlike the **function-import** element which is handled before runtime (if not using any **import** elements), so you cannot use Python expressions in the **function-import** element.

Note that after an **import** element is executed, any other function can then call the imported function. So, for example, if functionA calls functionB and then functionC, and functionB imports functionX, functionC can call functionX without doing another import. If you have many functions to import, you can also create a function which does all of the imports and is the first function which is called in your job.

The following example of the **import** element specifies a relative path to the files to be imported. Using the relative path name allows a group of STAX XML files to be moved to different machines without modification to the <import> elements in your STAX XML files (assuming the same sub-directory structure that contains these files is maintained). So if the following STAX XML files resided on the same machine:

```
/stax/MyApp/job1.xml
/stax/MyApp/commonLib.xml
/stax/libraries/library1.xml
/stax/libraries/library2.xml
```

and you wanted file `/stax/MyApp/job1.xml` to import all functions from files `/stax/MyApp/commonLib.xml`, `/stax/common/library1.xml`, and `stax/common/library2.xml`, you could do this as follows:

```
<import file="'commonLib.xml'"/>
<import file="'../libraries/library1.xml'"/>
<import file="'../libraries/library2.xml'"/>
```

Or, instead of specifying two **import** elements to import the two xml files from /stax/libraries, you could use the directory attribute and do it as follows:

```
<import file="'commonLib.xml'"/>
<import directory="'../libraries'"/>
```

Note that this would be equivalent to specifying:

```
<import machine="STAXCurrentXMLMachine" file="'%s/../commonLib.xml' % (STAXCurrentXMLFile)"/>
<import machine="STAXCurrentXMLMachine" directory="'%s/../../libraries' % (STAXCurrentXMLFile)"/>
```

The following example of an **import** element imports all functions from file c:\util\library.xml, which is located on machine Server1A.

```
<import machine="'Server1A'" file="'c:/util/library.xml'"/>
```

The following example of an **import** element imports all functions from file c:\util\library.xml, which is located on machine Server1A and replaces any functions that already exist (e.g. that were already imported or defined in the xml file being executed).

```
<import machine="'Server1A'" file="'c:/util/library.xml'" replace="1"/>
```

The following example of an **import** element only imports functions FunctionA and FunctionB.

```
<import machine="'Server1A'" file="'c:/util/library.xml'">
    <import-include>['FunctionA', 'FunctionB']</import-include>
</import>
```

The following example of an **import** element imports all functions except those that start with "FunctionA".

```
<import machine="'Server1A'" file="'c:/util/library.xml'">
    <import-exclude>['FunctionA.*']</import-exclude>
</import>
```

The following example of an **import** element imports all functions that start with "MyFuncs" but do not start with "MyFuncsWin32".

```
<import machine="'Server1A'" file="'/usr/local/util/library.xml'">
    <import-include>['MyFuncs.*']</import-include>
    <import-exclude>['MyFuncsWin32.*']</import-exclude>
</import>
```

The following example of an **import** element imports all functions from all .xml files in directory /stax/common which is located on the STAXCurrentXMLMachine:

```
<import directory="'/stax/common'"/>
```

The following example of an **import** element imports all functions from file '{STAF/Config/STAFRoot}/services/stax/libraries/STAXUtil.xml' which is located on the STAXCurrentXMLMachine. Note that the STAF variable denoted by {STAF/Config/STAFRoot} will be resolved on the STAX service machine.

```
<import file="'{STAF/Config/STAFRoot}/services/stax/libraries/STAXUtil.xml'"/>
```

Here's is a more complete snippet of a STAX job that shows an **import** element that is called by the job's starting function so that the imported functions can then be called throughout the job, from any function. This **import** element imports all of the functions provided in STAXUtil.xml. Refer to the "STAX Utility Functions" section for more information about common functions like STAXUtilLogAndMsg that are provided in the STAXUtil.xml file.

```
<stax>

  <defaultcall function="main"/>
```

```
<script>
  # ImportMachine should be set to the machine where STAXUtil.xml resides
  # (e.g. 'local' if the file resides on the STAX service machine).
  # ImportDirectory should be set to the directory which contains file STAXUtil.xml.

  ImportMachine = 'local'
  ImportDirectory = 'C:/STAF/services/stax/libraries'
  ImportFile1 = '%s/STAXUtil.xml' % (ImportDirectory)
</script>

<function name="main">
  <sequence>

    <import machine="ImportMachine" file="ImportFile1"/>

    <call function="'STAXUtilLogAndMsg'">
      'This is the beginning of the job'
    </call>

    <call function="'FunctionA'"/>
    <call function="'FunctionB'"/>

  </sequence>
</function>

<function name="FunctionA">
  <sequence>

    <call function="'STAXUtilLogAndMsg'">
      'This is the beginning of FunctionA'
    </call>

    <!-- Add elements as needed -->

  </sequence>
</function>

<function name="FunctionB">
  <sequence>
```

```
      <call function="'STAXUtilLogAndMsg'">
        'This is the beginning of FunctionB'
      </call>

      <!-- Add elements as needed -->

    </sequence>
  </function>

</stax>
```

Loops

The loop, iterate, break, and continue elements deal with repeatedly executing a task.

loop: Run a Task Repeatedly

The **loop** element contains a single ***task*** element which may be executed a specified number of times, allowing specification of an upper and lower bound with an increment value and where the index counter is available to the contained ***task*** element. In addition, specification of a while and/or until expression is allowed. If no constraint attributes (e.g. to, until, or while) are specified for the **loop** element, then it loops "forever".

The **loop** element has the following optional attributes:

- **var** - is the name of the variable which will contain the loop index variable. It is a literal. It is optional.
- **from** - is the starting value of the loop index variable. It defaults to 1 if not specified. It must evaluate to an integer value via Python.
- **to** - is the maximum value of the loop index variable. It must evaluate to an integer value via Python. It is optional.
- **by** - is the increment value for the loop index variable. It defaults to 1 if not specified. It must evaluate to an integer value via Python.
- **while** - is an expression that must evaluate to a boolean value via Python and is performed at the top of each loop. If it evaluates to false, it breaks out of the loop. It is optional.
- **until** - is an expression that must evaluate to a boolean value via Python and is performed at the bottom of each loop. If it evaluates to true, it breaks out of the loop. It is optional.

Usage:

The following example of a **loop** element executes a process five times.

```
<loop from="1" to="5">
  <process>
```

```
    <location>'machA.austin.ibm.com'</location>
    <command>'P3.exe'</command>
  </process>
</loop>
```

The following example of a **loop** element serially calls each function in a list named funcList until the return code set in a called function is not 0.

```
<script>funcList = ['Func1','Func2','Func3','Func4']</script>
<loop var="funcIndex" from="0" to="3" until="RC != 0">
  <call function="funcList[funcIndex]"/>
</loop>
```

The following example of a **loop** element loops "forever". The job will not end until the block containing the continuous loop is terminated. Function 'LongFunction' runs in parallel with a block that runs function 'ShortFunction' in a forever loop. When function 'LongFunction' completes, the block containing the "forever" loop is terminated so that the job may complete.

```
<parallel>

  <sequence>
    <call function="'LongFunction'"/>
    <terminate block name="'main.LoopForever'"/>
  </sequence>

  <block name="'LoopForever'">
    <loop>
      <call function="'ShortFunction'"/>
    </loop>
  </block>

</parallel>
```

iterate: Iterate a List and Run Each Iteration In Sequence

The **iterate** element contains a single ***task*** element. The **iterate** element performs the task for each value in a list. The iterations of the contained ***task*** element are executed serially (unlike the **paralleliterate** element whose tasks are performed in parallel). The **iterate** element has the following attributes:

- **var** - is the name of the variable which will contain the current item in the list/tuple being iterated. It is a literal and is required.
- **in** - is the list to be iterated. It is evaluated via Python and must evaluate to be a list or tuple. It is required. Here are some examples of **in** attribute assignments:

        - the name of the variable that is a list or tuple: in="machList"
        - a literal list: in="['machA','machB','machC']"
        - a literal tuple: in="('testA','testB')"
        - a slice of a list/tuple: in="machList[1:]"
        - a concatenation of lists/tuples: in="machList1 + ['machD','machE']"
    - **indexvar** - is the name of the variable which will contain the index of the current item in the list/tuple being iterated. It is a literal and is optional. Note that the index for the first element in the list/tuple is 0.

Usage:

The following example of an **iterate** element runs a STAF RESPOOL RELEASE request to release each machine name in a list.

```
<script>allocMachList = ['machA','machB','machC']</script>
<iterate var="machName" in="allocMachList">
  <stafcmd>
    <location>'machine1.austin.ibm.com'</location>
    <service>'RESPOOL'</service>
    <request>'RELEASE POOL ClientMachPool ENTRY %s' % machName</request>
  </stafcmd>
</iterate>
```

The following example of an **iterate** element runs each process whose name is in a list on a machine. In addition, the **iterate** element is nested within a **paralleliterate** element such that this occurs simultaneously on all machines in the machine list.

```
<paralleliterate var="machName" in="['machA','machB','machC']">
  <iterate var="procName" in="['proc1','proc2','proc3','proc4']">
    <process>
      <location>machName</location>
      <command>procName</command>
    </process>
  </iterate>
</paralleliterate>
```

break: Jump out of the Closest Enclosing Loop or Iterate

The **break** element may be used to break out of a **loop** or **iterate** element.

The **break** element is an empty element and no attributes.

Usage:

The following example of a **break** element breaks out of an **iterate** element when a non-zero return code is encountered. So if the list contains "ProcessA", "ProcessB", and "ProcessC" and ProcessA returns 0 but then ProcessB returns a non-zero RC, ProcessC will not be executed.

```
<iterate var="processName" in="processList">
  <sequence>
    <process>
      <location>'machineA'</location>
      <command>processName</command>
    </process>
    <if expr="RC != 0">
      <break/>
    </if>
  </sequence>
</iterate>
```

The following example of a **break** element breaks out of a **loop** element when a non-zero return code is encountered after running ShortTestProcess. However, since the loop contains a **parallel** element, when the break occurs, the other task running in parallel, LongTestProcess, will be killed in order to exit the loop.

```
<script>className = 'com.ibm.staf.service.stax.TestProcess'</script>

<function name="LoopParallelBreakTest">

  <loop var="i" from="0" by="1" to="3">

    <sequence>

      <message>'Beginning loop #%s' % i</message>

      <parallel>

        <sequence>

          <process name="'ShortTestProcess'">
            <location>machName</location>
            <command>'java'</command>
            <parms>'%s 2 2 %s' % (className, i-1)</parms>
          </process>
```

```
            <if expr="RC != 0">
              <sequence>
                <message>'  ShortTestProcess failed with RC=%s' % RC</message>
                <message>'  Breaking out of loop #%s' % i</message>
                <break/>
              </sequence>
              <else>
                <message>'  ShortTestProcess completed'</message>
              </else>
            </if>

          </sequence>

          <sequence>
            <process name="'LongTestProcess'">
              <location>machName</location>
              <command>'java'</command>
              <parms>'%s 4 2 0' % className</parms>
            </process>
            <message>'  TestProcess2 completed'</message>
          </sequence>

        </parallel>

        <message>'Completed loop #%s' % i</message>

      </sequence>

    </loop>

  </function>
```

Note that the TestProcess class is provided as part of STAX. Its last input parameter is the return code that the process will return. The "Messages" output that you would see if you were monitoring a job running this function using the STAX Job Monitor would be:

```
Beginning loop #0
  ShortTestProcess completed
  LongTestProcess completed
```

```
Completed loop #0
Beginning loop #1
  ShortTestProcess completed
  LongTestProcess completed
Completed loop #1
Beginning loop #2
  ShortTestProcess failed with RC=1
  Breaking out of loop #2
```

continue: Jump to the Top of the Closest Enclosing Loop or Iterate

The **continue** element may be used to continue to the top of a **loop** or **iterate** element.

The **continue** element is an empty element and no attributes.

Usage:

The following example of a **continue** element continues to the top of the loop when a non-zero return code is encountered so that ProcessB is not executed if ProcessA fails on a loop iteration.

```
<loop var="i" from="1" to="10">
  <sequence>
    <process>
      <location>'machA.austin.ibm.com'</location>
      <command>'cmd.exe'</command>
      <parms>'ProcessA.exe'</parms>
    </process>
    <if expr="RC != 0">
      <continue/>
    </if>
    <process>
      <location>'machA.austin.ibm.com'</location>
      <command>'cmd.exe'</command>
      <parms>'ProcessB.exe'</parms>
    </process>
  </sequence>
</loop>
```

Conditional

The if element is a conditional that can control the logic and flow of the job.

if / elseif / else: Select a Task To Perform

The **if** element specifies a conditional. It allows you to specify a task to execute if an expression is evaluated to be true. It allows optional **elseif** elements and an optional **else** element to be performed if the expression is evaluated to be false. The **if**, **else**, and **elseif** elements may contain a single ***task*** element.

STAX uses Python as the expression evaluator engine.

Usage:

The following example of an **if** and **else** element checks the value of a variable named index to see if it has a zero remainder (even number), and if so, calls function Ogre1 and, otherwise, calls function Ogre2.

```
<if expr="(index % 2) == 0">
  <call function="'Ogre1'"/>
  <else>
    <call function="'Ogre2'"/>
  </else>
</if>
```

The following example uses a Python random number generator to determine which of four functions to randomly call:

```
<sequence>

  <script>from random import random</script>
  <script>r=random()*100</script>

  <if expr="r > 75">
    <call function="'Function1'"/>
    <elseif expr="r > 50">
      <call function="'Function2'"/>
    </elseif>
    <elseif expr="r > 25">
      <call function="'Function3'"/>
```

```
    </elseif>
    <else>
      <call function="'Function4'"/>
    </else>
  </if>

</sequence>
```

Wrappers

The block, testcase, and timer elements act as a wrapper around a single ***task*** element and provide additional functionality to the ***task*** element.

The tcstatus element records the status of a testcase and must be contained within a testcase wrapper.

block: Define a Task for which Execution Control is Provided

The **block** element is a wrapper which defines a task for which execution control is provided. The **block** element contains a single ***task*** element. It may be used in conjunction with the **hold**, **release**, and **terminate** elements and the STAX Service HOLD, RELEASE, and TERMINATE requests to define a task block that may be held, released, or terminated. Only blocks that are currently in use (e.g. running or held) can have actions (e.g. hold, release, or terminate) performed on them. Note that holding a block means that no additional elements within the block will be run while the block is held. However, any elements (e.g. processes, STAF commands, timers, etc.) within the block that have already started will continue to run.

Blocks may be nested. A block named 'main' exists that wraps everything in the job. For nested blocks, the block name will be in the hierarchical form of:

```
main.ParentBlockName[.ChildBlockName]...
```

when recorded in the STAX logs and queries, so don't use periods, ".", in your block names. The hierarchical block name must be unique with the parent block's scope.

The **block** element has the following attribute:

- **name** - specifies the name of the block. The value is evaluated via Python to a string. It is required. It should not contain periods (for the reason described above). The hierarchical block name must be unique with the parent block's scope, or a STAXInvalidBlockName signal will be raised and the <block> element will be bypassed.

The following variable is set by the STAX execution engine upon completion of a **block** element:

- **STAXBlockRC** - specifies the block's return code
  - Set to -1 if the block's task could not be started, possibly due to an invalid value for the block name.
  - Set to 0 if the block's task was started and the block was not terminated.
  - Set to 1 if the block's task was started and the block was terminated.

Usage:

This example shows a block which contains a process. The block's name is the value of a variable named machName. The **block** element provides execution control (the ability to hold, release, terminate) for the **process** element contained in the **block** element.

```
<block name="machName">
  <process>
    <location>machName</location>
    <command>'P4.exe'</command>
  </process>
</block>
```

Using the following example of the **block** element, here are some comments about holding and terminating the blocks:

- You can hold Block2, then hold Block1, and then release Block2, and then release Block1.
- If you hold Block1, you cannot hold Block2 since it's already blocked from holding Block1.
- If you terminate Block2, then process P4 would be terminated and process P5 would start running.
- If you terminate Block1, then all the processes currently running in it would be terminated and process P3 would start running.

```
<sequence>

  <process>
    <location>machName</location>
    <command>'P1.exe'</command>
  </process>


  <block name="'Block1'">

    <parallel>

      <process>
        <location>machName</location>
        <command>'P2.exe'</command>
      </process>
```

```
      <sequence>

        <block name="'Block2'">

          <process>
            <location>machName</location>
            <command>'P4.exe'</command>
          </process>

        </block>

        <process>
          <location>machName</location>
          <command>'P5.exe'</command>
        </process>

      </sequence>

    </parallel>

  </block>

  <process>
    <location>machName</location>
    <command>'P3.exe'</command>
  </process>

</sequence>
```

Here's another example of using the **block** element to control execution of tasks in a STAX job. This example runs two tasks in parallel. The first task run in parallel contains a block named "ServerTest" and runs a ServerTest process. The second task run in parallel contains a block named "ClientTest" and runs a ClientTest process. After the ClientTest process completes, it uses the **terminate** element to terminate the "main.ServerTest" block. It also logs the block return codes for these two blocks.

```
<parallel>

  <sequence>

    <block name="'ServerTest'">
```

```
        <process name="'Server Test'">
          <location>'server1.company.com'</location>
          <command>'/tests/ServerTest'</command>
        </process>
      </block>

      <log message="1">'ServerTest Block RC: %s' % (STAXBlockRC)</log>

    </sequence>

    <sequence>

      <block name="'ClientTest'">
        <sequence>

          <process name="'Client Test'">
            <location>'client1.company.com'</location>
            <command>'/tests/ClientTest'</command>
          </process>

          <!-- Terminate the Server Test Block after Client Test process runs -->
          <terminate block="'main.ServerTest'"/>

        </sequence>
      </block>

      <log message="1">'ClientTest Block RC: %s' % (STAXBlockRC)</log>

    </sequence>

  </parallel>
```

testcase and tcstatus: Define a Testcase and Record Status

The testcase element is a wrapper which defines a testcase and contains a single ***task*** element for which testcase status is recorded. The **testcase** element is used in conjunction with the **tcstatus** element to increment testcase pass/fail counters.

A **testcase** element has the following attributes:

- **name -** the name of the testcase. It is required and its value must evaluate via Python to a string.

- **mode -** the mode of the testcase. This attribute defines whether information about the testcase should be reported even if no tcstatus elements have been encountered. It is optional and its value must evaluate via Python to a string. The default value is "default", and indicates that information about the testcase should only be reported if a tcstatus element has been encountered. If the attribute's value is "strict", then information about the testcase will be reported even if no tcstatus elements have been encountered (in this case, pass and fail for the testcase will be 0).

A **tcstatus** element has the following attribute:

- **result -** indicates the status for the current testcase. It is required and it's value must evaluate via Python to one of the following values (not case-sensitive):
  - `'pass'` - This increments the number of passes for the testcase.
  - `'fail'` - This increments the number of fails for the testcase.
  - `'info'` - This is used to update the last status information for the testcase, so you should also specify additional information about the testcase status.

You may also specify additional information about the testcase status in the **tcstatus** element (e.g. an error message, percent complete, step number, etc). It is optional and its value must evaluate via Python to a string. For example:

```
<tcstatus result="'fail'">'Error in Step 5'</tcstatus>
<tcstatus result="'info'">'50% complete'</tcstatus>
```

You may nest **testcase** elements. For nested testcases, the testcase name will be recorded in the form of ParentTestcase.ChildTestcase in the STAX logs and queries (so don't use periods, ".", in your testcase names).

You can see the testcase status information using any of the following methods:

- While a STAX job is currently running, testcase status information for all testcases is displayed in the "Testcase Information" section of the STAX Monitor GUI.
- While a STAX job is currently running, you can submit a `LIST TESTCASES JOB <JobID>` request to the STAX service to list all testcases.
- When the STAX job completes, a summary of the number of passes and fails for each testcase is logged in the STAX Job log. Also, unless the testcase status is `'info'` , if you specified additional information about the status of a testcase, it is also logged in the STAX Job log. logged in the STAX Job log.

Usage:

In the following example of a **testcase** element, the testcase consists of a process that is run 10 times. Each time the process runs successfully, the test status pass counter is incremented, otherwise the test status fail counter is incremented and additional information about the error is recorded (and automatically sent to the STAX Monitor and logged in the STAX job log).

```
<testcase name="'TestA'">
  <loop var="i" from="1" to="10">
    <sequence>
```

```
      <process>
        ...
      </process>
      <if expr="RC == 0">
        <tcstatus result="'pass'"/>
        <else>
          <tcstatus result="'fail'">'RC=%s on loop %s' % (RC, i)</tcstatus>
        </else>
      </if>
    <sequence>
  </loop>
</testcase>
```

In the following example of a **testcase** element, the testcase consists of a process that is run 10 times. Each time the process runs successfully, the testcase's last status information is updated with a percent complete message. If a process fails, the test status fail counter is incremented and the testcase's last status information is updated with an error message and it breaks out of the loop. If the process ran successfully 10 times, the test status pass counter is incremented and the last status information is updated.

```
<testcase name="'MyTest'">
  <sequence>

    <loop var="i" from="1" to="10">
      <sequence>

        <process name="'My Test'">
          ...
        </process>

        <if expr="RC == 0">
          <tcstatus result="'info'">
            'Percent Complete: %s%%' % (i*10)
          </tcstatus>
          <else>
            <sequence>
              <tcstatus result="'fail'">
                'ERROR:  Percent Complete: %s%%' % (i*10)
              </tcstatus>
              <break/>
            </sequence>
          </else>
```

```
        </if>

      </sequence>
    </loop>

    <if expr="i == 11">
      <tcstatus result="'pass'">
        'Percent Complete: 100%'
      </tcstatus>
    </if>

  </sequence>
</testcase>
```

In the following example of a **testcase** element, mode 'strict' is used so that an entry for each testcase will be logged, even if no <tcstatus> elements were executed. For example, an entry for testcase 'Test1' is logged in the STAX job log and sent to the STAX Monitor with 0 passes and 0 fails even if no <tcstatus> elements were executed within it.

```
<function name="Main" scope="local">
  <testcase name="'Test1'" mode="'strict'">
    <paralleliterate var="machine" in="machList">
      <testcase name="machine" mode="'strict'">
        <sequence>
          <process>
            <location>machine</location>
            <command>'test1.exe'</command>
          </process>
          <if expr="RC == 0">
            <tcstatus result="'pass'"/>
            <else>
              <tcstatus result="'fail'">'Failed with RC=%s' % RC</tcstatus>
            </else>
          </if>
        </sequence>
      </testcase>
    </paralleliterate>
  </testcase>
</function>
```

timer: Define a Task for which Time Control is Provided

The **timer** element is a wrapper which defines a task for which time control is provided. The **timer** element contains a single ***task*** element and runs the task for a specified duration, stopping the task at the end of the specified duration (if the task is still running).

The **timer** element has the following attribute:

- **duration** - specifies the maximum length of time to run the task. The value is evaluated via Python to a string. It is required. The time may be expressed in milliseconds, seconds, minutes, hours, days, weeks, or years. For example:
  - duration="'50'" specifies 50 milliseconds.
  - duration="'90s'" specifies 90 seconds.
  - duration="'5m'" specifies 5 minutes.
  - duration="'36h'" specifies 36 hours.
  - duration="'3d'" specifies 3 days.
  - duration="'1w'" specifies 1 week.
  - duration="'1y'" specifies 1 year.

Also, the following variable is set by the STAX execution engine upon completion of a **timer** element:

- **RC** - specifies the timer's return code
  - Set to -1 if the task could not begin, possibly due to an invalid value for the duration attribute.
  - Set to 1 if the task is still running at the end of the specified duration.
  - Set to 0 if the task ended before the specified duration.

A common use of the <timer> element is to terminate a process that runs continuously. When a timer expires, it stops any processes contained within the timer element that are still running. Note that to obtain the stdout/stderr data for a process that is stopped by a <timer> element, you must use the <stdout>/<stderr> element within the <process> element to redirect the process's stdout/stderr to a specified file. After the timer has expired, you can obtain the contents of the process stdout/stderr file using the FS service GET FILE request. Note that a <timer> element could contain a <parallel> and/or <paralleliterate> element with multiple <process> elements running simultaneously. So, if a timer pops and terminates the processes, if a process's stdout/stderr was being redirected to a temporary file (e.g. by using a <returnstdout> element but no <stdout> element), there isn't a way to obtain the process stdout/stderr data because the data is only accessible via the STAXResult variable which no longer contains that data after the timer expires. An example of how to obtain the stdout/stderr data for a process that is terminated by a <timer> element is provided in the following "Usage" section.

Usage:

The following example of a **timer** element simultaneously calls function P3 in a continuous loop on a list of machines. A loop is not complete until function P3 has been run on all of the machines. After 24 hours, the test is stopped. The test is successful if it did not end before 24 hours.

```
<testcase name="'TestP3'">

  <sequence>
```

```
    <script>timerDuration = '24h'</script>

    <timer duration="timerDuration">
      <loop>
        <paralleliterate var="machName" in="MachList">
          <call function="'P3'"/>
        </paralleliterate>
      </loop>
    </timer>

    <if expr="RC == 1">
      <tcstatus result="'pass'">
        'Timer ran for %s' % timerDuration
      </tcstatus>
      <else>
        <tcstatus result="'fail'">
          'Timer did not run for %s. RC=%s' % (timerDuration, RC)
        </tcstatus>
      </else>
    </if>

  </sequence>

</testcase>
```

The following example of a **timer** element is like the previous example, but it also uses Python to calculate the elapsed time that the timer element ran so that it can record the elapsed time in the testcase status message.

```
<testcase name="'TimerTest'">

  <sequence>

    <script>
      timerDuration = '45m'
      import time
      starttime = time.time(); # record starting time
    </script>

    <timer duration="timerDuration">
      <loop>
```

```
          <paralleliterate var="machName" in="MachList">
            <call function="'aProcess'"/>
          </paralleliterate>
        </loop>
      </timer>

      <script>
        stoptime = time.time()             # record ending time
        elapsedSecs = stoptime - starttime # yields time elapsed in seconds
      </script>

      <if expr="RC == 1">
        <tcstatus result="'pass'">
          'Timer ran for %s seconds' % elapsedSecs
        </tcstatus>
        <else>
          <tcstatus result="'fail'">
            'Timer only ran for %s seconds. RC=%s' % (elapsedSecs, RC)
          </tcstatus>
        </else>
      </if>

    </sequence>

  </testcase>
```

The following example of a **timer** element uses the timer element to stop a process that runs continuously. After 1 hour, the process is stopped. This process's stdout and stderr are redirected to a file. The content of the process's stdout file is obtained by using the FS service's GET FILE request and it logs the stdout/stderr content to the STAX Job User log. Then, it deletes the stdout file using the FS service's DELETE ENTRY request. If the timer expired (e.g. if the process was still running after 4 hours), it logs a testcase pass result. Otherwise, it logs a testcase fail result.

```
<testcase name="'TestP4'">

  <sequence>

    <script>
      timerDuration = '1h'
      target = 'client1.company.com'
      command = 'java TestP4 50000 1 0'
      testDir = 'C:/tests/TestP4'
```

```
  stdoutFile = '%s/TestP4.out' % (testDir)
</script>

<timer duration="timerDuration">
  <sequence>

    <process name="'TestP4'">
      <location>target</location>
      <command mode="'shell'">command</command>
      <env>'CLASSPATH=%s{STAF/Config/Sep/Path}{STAF/Env/ClassPath}' % (testDir)
      <stdout>stdoutFile</stdout>
      <stderr mode="'stdout'"/>
      <stopusing>'WM_CLOSE'</stopusing>
    </process>

    <if expr="RC != 0">
      <log message="1">
        ('Process TestP4 failed to start or completed too soon.\n' +
         'RC=%s STAFResult=%s' % (RC, STAFResult))
      </log>
    </if>

  </sequence>
</timer>

<script>timerRC = RC</script>

<if expr="timerRC == 1 or timerRC == 0">
  <sequence>

    <stafcmd name="'Get TestP4 Stdout/Stderr'">
      <location>target</location>
      <service>'FS'</service>
      <request>'GET FILE %s' % (stdoutFile)</request>
    </stafcmd>

    <if expr="RC == 0">
      <sequence>

        <log message="1">'TestP4 Stdout/Stderr:\n%s' % (STAFResult)</log>
```

```
                <stafcmd name="'Delete file %s' % (stdoutFile)">
                  <location>target</location>
                  <service>'FS'</service>
                  <request>'DELETE ENTRY %s CONFIRM' % (stdoutFile)</request>
                </stafcmd>

              </sequence>

              <else>
                <log message="1">
                  'STAF %s FS GET FILE %s failed with RC=%s Result=%s' % \
                    (target, stdoutFile, RC, STAFResult)
                </log>
              </else>

            </if>

            <if expr="timerRC == 1">
              <tcstatus result="'pass'"/>
              <else>
                <tcstatus result="'fail'">
                  'Process TestP4 ended before timer duration: %s' % (timerDuration)
                </tcstatus>
              </else>
            </if>

          </sequence>

          <else>
            <tcstatus result="'fail'">'Timer failed to begin.'</tcstatus>
          </else>

        </if>

      </sequence>

    </testcase>
```

Directives

The hold, release, and terminate elements specify execution control of blocks during the execution of a job.

A block named 'main' exists that wraps everything in the job. Remember that blocks may be nested. For nested blocks, the block name is in the hierarchical form of:

```
main.ParentBlockName[.ChildBlockName]...
```

hold: Hold a Block

The **hold** element specifies to hold a block in the STAX job. A signal is raised if you try to hold a block that doesn't exist. If you try to hold a block that isn't RUNNING, the hold is silently ignored.

The **hold** element is an empty element.

The **hold** element has the following optional attributes:

- **block** - is the name of the block to hold. Its value must evaluate via Python to a string. It defaults to the current block (STAXCurrentBlock). To hold the entire job, specify 'main'.
- **if** - is an expression that is evaluated via Python to a boolean value. If it evaluates to false, the block is not held. It defaults to true ('1').
- **timeout** - specifies the maximum length of time to hold the block. Its value must evaluate via Python to a string or a positive integer. It defaults to 0 which indicates to hold the block indefinitely. The timeout can be expressed in milliseconds, seconds, minutes, hours, days, or weeks. Its format is `<Number>[s|m|h|d|w]`, where `<Number>` is an integer >= 0 and indicates milliseconds unless one of the following case-insensitive suffixes is specified:
  - s (for seconds)
  - m (for minutes)
  - h (for hours)
  - d (for days)
  - w (for weeks).

  Note that the calculated timeout cannot exceed 4294967294 milliseconds. For example:
  - timeout="'1000'" specifies 1000 milliseconds or 1 second
  - timeout="'5s'" specifies 5 seconds
  - timeout="'1m'" specifies 1 minute
  - timeout="'2h'" specifies 2 hours
  - timeout="'1w'" specifies 1 week
  - timeout="0" specifies to hold indefinitely

  A signal is raised if you specify an invalid timeout value.

release: Release a Block

The **release** element specifies to release a block in the STAX job. A signal is raised if you try to release a block that doesn't exist. If you try to release a block that isn't HELD, the release is silently ignored.

The **release** element is an empty element.

The **release** element has the following optional attributes:

- **block** - is the name of the block to release. Its value must evaluate via Python to a string. It defaults to the current block (STAXCurrentBlock).
- **if** - is an expression that is evaluated via Python to a boolean value. If it evaluates to false, the block is not released. It defaults to true ('1').

terminate: Terminate a Block

The **terminate** element specifies to terminate a block in the STAX job. A signal is raised if you try to terminate a block that doesn't exist.

The **terminate** element is an empty element.

The **terminate** element has the following optional attributes:

- **block** - is the name of the block to terminate. Its value must evaluate via Python to a string. It defaults to the current block (STAXCurrentBlock). To terminate the entire job, specify 'main'.
- **if** - is an expression that is evaluated via Python to a boolean value. If it evaluates to false, the block is not terminated. It defaults to true ('1').

Usage:

In the following example of the **hold** and **terminate** elements:

- If process P1 ended with a non-zero return code, then the job would be terminated.
- If process P2 ended with a non-zero return code, then Block1 would be held.
- If process P4 ended with a non-zero return code, then Block1 would be terminated and processing would continue at process P5.

```
<sequence>

  <process>
    <location>machName</location>
    <command>'P1.exe'</command>
  </process>

  <terminate block="'main'" if="RC != 0"/>
```

```
    <block name="'Block1'">

      <parallel>

        <sequence>

          <process>
            <location>machName</location>
            <command>'P2.exe'</command>
          </process>

          <hold if="RC != 0"/>

        </sequence>

        <sequence>

          <process>
            <location>machName</location>
            <command>'P4.exe'</command>
          </process>

          <terminate block="'main.Block1'" if expr="RC != 0"/>

        </sequence>

      </parallel>

    </block>

    <process>
      <location>machName</location>
      <command>'P5.exe'</command>
    </process>

  </sequence>
```

Exceptions

The try / catch / finally, throw, and rethrow elements deal with the processing of STAX exceptions. STAX exceptions alter the flow control of the job (unlike signals).

Note that the STAX execution engine does not currently throw any STAX exceptions. Currently, only STAX jobs you write in which you use the **throw** element throw exceptions.

try / catch / finally: Run a Task, Catch Exceptions and/or Run a Finalization Task

The **try** element allows you to perform a task. If an exception is thrown and the **try** element has one or more **catch** elements (aka exception handlers) that can catch it, then control will be transferred to the first such **catch** element. If the **try** element has a **finally** element, then the **finally** element's task is executed, no matter whether the try task completes normally or abruptly, and no matter whether a **catch** element is first given control.

A **try** element:

- Contains a single ***task***.
- Must contain at least one **catch** or **finally** element.
- Must contain one or more **catch** elements if no **finally** element is specified.
- Can contain one or more **catch** elements if a **finally** element is specified.
- Can contain at most one **finally** element.
- can be nested within other **try** elements.

A **catch** element performs a task when the specified exception is caught. A **catch** element contains a single ***task*** and has the following attributes:

- **exception** - is the name of the exception that the **catch** element handles. All exceptions that are a sub-type of this exception are caught as well. For example, a sub-type of an exception named 'STAXException' is 'STAXException.SubType1'. You may specify '...' to indicate that all exceptions are to be caught by this catch block. This attribute is required and its value must evaluate via Python to a string.
- **var** - is the name of a variable containing any additional information provided when the exception was thrown. It is a literal. This attribute is optional.
- **typevar** - is the name of a variable containing the specific type of exception thrown. It is a literal. This attribute is optional.
- **sourcevar** - is the name of a variable containing the source information for the exception. It is a literal. This attribute is optional. This variable will be a Python class containing the following functions:
  - **getSource** - a Python string containing the source information in the format: *throw: <exception-name> (Line: <number>, File: <xml-file>, Machine: <machine>)*
  - **getStackTrace** - a Python list containing the stack trace. Each item in the Python list represents a single stack frame (as a string). The frame at the bottom of the stack represents the execution point at which the stack trace was generated (i.e. the execution point where the exception was thrown)

  Accessing the sourcevar class directly will return a formatted representation

The first catch block that can handle the exception will be performed. For example, if a 'STAXException.SubType1' exception is thrown and there is

a <catch exception="'STAXException"'> element and a <catch exception="'STAXException.SubType1"'> element, the catch element which is listed first will handle the exception. However, note that if the <catch exception="'STAXException"'> element is listed first, the <catch exception="'STAXException.SubType1"'> block will never handle any exceptions since it is a sub-type of 'STAXException'.

A **finally** element ensures that the finally task is executed after the try task and any catch task that might be executed, no matter how control leaves the try task or catch task. A **finally** element contains a single ***task***. When a **finally** element is specified and a condition occurs that alters the flow synchronously or asynchronously, the finally task will always be executed no matter the condition (e.g block terminated, timer expired, a return, or an exception is thrown). Thus, the **finally** element provides a way to ensure that a finally task is performed for potential cleanup if a job ends due to being terminated for any reason.

Note that if you want to have a guaranteed way to stop a finally task, you should have the first element contained in your finally task be a block or timer element. For example, if you submit a request to terminate the job, it will not terminate the job until the finally task(s) complete. But if you submit a request to terminate a block that is currently running which is contained within a finally task, then the block will be terminated (it will not wait until that finally task completes).

Handling of the **finally** element is rather complex, so the two cases of a **try** element with and without a **finally** element are described as follows:

1. **Execution of try-catch**

   A try element without a finally element is executed by first executing the try task. Then there is a choice:

   - If execution of the try task completes normally, then no further action is taken and the try element completes normally.
   - If execution of the try task completes abruptly because of a throw of exception E, then there is a choice:
     - If exception E can be handled by any catch element of the try element, then the first such catch element is selected and the task of that catch element is executed. If that task completes normally, then the try element completes normally; if that task completes abruptly for any reason, then the try element completes abruptly for the same reason.
     - If exception E cannot be handled by any catch element of the try element, then the try element completes abruptly because of a throw of exception E.
   - If execution of the try task completes abruptly for any other reason, then the try element completes abruptly for the same reason.

2. **Execution of try-catch-finally**

   A try element with a finally element is executed by first executing the try task. Then there is a choice:

   - If execution of the try task completes normally, then the finally task is executed, and then there is a choice:
     - If the finally task completes normally, then the try element completes normally.
     - If the finally task completes abruptly for reason S, then the try element completes abruptly for reason S.

- If execution of the try task completes abruptly because of a throw of exception E, then there is a choice:
  - If exception E can be handled by any catch element of the try element, then the first such catch element is selected and the task of that catch element is executed. Then there is a choice:
    - If the catch task completes normally, then the finally task is executed. Then there is a choice:
      - If the finally task completes normally, then the try element completes normally.
      - If the finally task completes abruptly for any reason, then the try element completes abruptly for the same reason.
    - If the catch task completes abruptly for reason R, then the finally task is executed. Then there is a choice:
      - If the finally task completes normally, then the try element completes abruptly for reason R.
      - If the finally task completes abruptly for reason S, then the try element completes abruptly for reason S (and reason R is discarded).
  - If exception E cannot be handled by any catch element of the try element, then the finally task is executed. Then there is a choice:
    - If the finally task completes normally, then the try element completes abruptly because of a throw of exception E. Note that if the STAX job does not catch this exception in any try block it may be nested in, then an error is logged and the job is terminated.
    - If the finally task completes abruptly for reason S, then the try element completes abruptly for reason S (and the throw of exception R is discarded).

- If execution of the try task completes abruptly for any other reason R (e.g. return, timer expired, etc), then the finally task is executed. Then there is a choice:
  - If the finally task completes normally, then the try element completes abruptly for reason R.
  - If the finally task completes abruptly for reason S, then the try element completes abruptly for reason S (and reason R is discarded).

Usage:

The following example of the **try/catch** elements shows a **try** block containing a sequence of tasks to perform. If an exception is thrown, the **catch** block for the exception thrown is run and then processing will continue by executing the element following the end of the **try** block. If a 'Timeout. ServerStart' or 'Timeout.ClientStart' exception is thrown, the catch block for exception 'Timeout' can handle these exceptions because they are sub-types of exception 'Timeout'.

```
<try>

  <sequence>
    <call function="'CheckServerAvailability'"/>
    <if expr="STAXResult != 0">
      <throw exception="'ServerNotAvailable'"/>
    </if>
    <call function="'StartServers'"/>
    <if expr="STAXResult != 0">
```

```
      <throw exception="'Timeout.ServerStart'">'Server %s' % machine</throw>
    </if>
    <call function="'StartClients'"/>
    <if expr="STAXResult != 0">
      <throw exception="'Timeout.ClientStart'"/>'Client %s' % machine</throw>
    </if>
  </sequence>

  <catch exception="'ServerNotAvailable'">
    <log>'Handler: ServerNotAvailable'</log>
  </catch>

  <catch exception="'Timeout'" typevar="exceptionType" var="eInfo">
    <log>'Handler: Timeout, eType: %s, eInfo: %s' % (exceptionType, eInfo)</log>
  </catch>

</try>
```

The following example of the **try/finally** elements show a **try** block containing a sequence of tasks to perform and a **return** element. The **finally** block is executed after the try block, no matter now control leaves the try block. That is, even though the try block contains a **return** element, the finally block will be executed. Thus, the **finally** element provides a way to ensure that a clean-up task is performed no matter what condition may occur (e.g. terminate, timer expired, exception thrown, return, etc).

```
<function name="Main">

  <try>

    <block name="'RunTest'">
      <sequence>
        <call function="'InitJob'"/>
        <call function="'CheckServerAvailability'"/>
        <call function="'StartServers'"/>
        <call function="'StartClients'"/>
        <return>'Success'</return>
      </sequence>
    </block>

    <finally>
      <block name="'Cleanup'">
        <timer duration="'1h'">
```

```
            <sequence>
              <log message="1">'Perform Clean-up'</log>
              <call function="'Cleanup'"/>
            </sequence>
          </timer>
        </block>
      </finally>

    </try>

</function>
```

Note that in the above example, if `<return>'Clean-up complete'</return>` was added to the finally block, then if the try block returns 'Success', and the finally block returns 'Clean-up complete', then the try element completes by returning 'Clean-up complete' as per the rules discussed above in the **Execution of try-catch-finally** section.

The following example of the **try/catch/finally** elements show a try block containing a sequence of tasks to perform. If an exception is thrown, the catch block is run. The finally block is run, no matter how control leaves the try block or catch block.

```
<function name="Main">

  <try>

    <block name="'RunTest'">
      <sequence>
        <call function="'InitJob'"/>
        <call function="'CheckServerAvailability'"/>
        <call function="'StartServers'"/>
        <call function="'StartClients'"/>
      </sequence>
    </block>

    <catch exception="'...'" typevar="eType" var="eInfo">
      <sequence>
        <log message="1">
          "Handler: ..., eType: %s, eInfo: %s" % (eType, eInfo)
        </log>
        <call function="'HandleException'"/>
      </sequence>
    </catch>
```

```
    <finally>
      <block name="'Cleanup'">
        <sequence>
          <log message="1">'Perform Clean-up'</log>
          <call function="'Cleanup'"/>
        </sequence>
      </block>
    </finally>

  </try>

</function>
```

The following example of the **catch** element demonstrates how to use the **sourcevar** attribute:

```
<catch exception="'...'" typevar="exceptionType" var="eInfo" sourcevar="eSource">
  <sequence>
    <log>'Caught exception exceptionType=%s eInfo=%s' % (exceptionType, eInfo)</log>
    <log>eSource</log>
    <log>eSource.getSource()</log>
    <log>eSource.getStackTrace()</log>
    <log>STAFMarshalling.formatObject(eSource.getStackTrace())</log>
  </sequence>
</catch>
```

throw: Throw an Exception

The **throw** element specifies an exception to throw.

A **throw** element may be an empty element or you can optionally specify additional information when the exception is thrown. If additional information is specified in its value, it must evaluate via Python to a string value.

A **throw** element has the following attribute:

- **exception** - is the name of the exception being thrown. It must evaluate via Python to a string value. This attribute is required.

Usage:

The following example of the **throw** element shows a "NotAvailableException" exception being thrown.

```
<throw exception="'NotAvailableException'"/>
```

The following example shows a "TimerFailedException" exception being thrown with additional information provided about how long the timer ran.

```
<throw exception="'TimerFailedException'">
  'Only ran for %s seconds' % elapsedTime
</throw>
```

rethrow: Rethrow an Exception

The **rethrow** element specifies to rethrow the exception up the chain to a higher level try/catch block. The **rethrow** element should only be used in a **catch** block.

The **rethrow** element is an empty element and has no attributes.

Usage:

The following is an example of the **rethrow** element.

```
<rethrow/>
```

Example of Nested Try Blocks

The following STAX job contains three nested try blocks and shows how you can use the **try/catch**, **try/catch/finally**, **throw**, and **rethrow** elements.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax SYSTEM "stax.dtd">

<stax>

  <defaultcall function="Main"/>

  <script>
    serverMachine = 'server1.company.com'
    clientMachines = ['client1.company.com', 'client2.company.com']
```

```
</script>

<function name="Main">
  <sequence>


    <try>

      <try>

        <try>

          <sequence>

            <call function="'CheckServerAvailability'"/>
            <if expr="STAXResult != 0">
              <throw exception="'STAXException.ServerNotAvailable'">
                'Server: %s' % serverMachine
              </throw>
            </if>

            <log message="1">'Servers are available'</log>

            <call function="'StartServers'"/>
            <if expr="STAXResult != 0">
              <throw exception="'STAXException.Timeout.StartingServer'">
                'Server: %s' % serverMachine
              </throw>
            </if>

            <log message="1">'Servers are started'</log>

            <call function="'StartClients'"/>
            <if expr="STAXResult != 0">
              <throw exception="'STAXException.Timeout.StartingClient'">
                'Clients: %s' % clientMachines
              </throw>
            </if>

            <log message="1">'Clients are started'</log>
```

```
      <call function="'RunTest'"/>
      <log message="1">'Ran the test'</log>

    </sequence>

    <catch exception="'STAXException.Timeout.StartingClient'"
           typevar="eType" var="eInfo">
      <sequence>
        <log message="1">
          'Handler: STAXException.Timeout.StartingClient, ' + \
          'eType: %s, eInfo: %s' % (eType, eInfo)
        </log>
      </sequence>
    </catch>

    <catch exception="'STAXException.Timeout'" typevar="eType" var="eInfo">
       <sequence>
         <log message="1">
           'Handler: STAXException.Timeout, ' + \
           'eType: %s, eInfo: %s' % (eType, eInfo)
         </log>
         <rethrow/>
       </sequence>
    </catch>

  </try>

  <catch exception="'STAXException'" typevar="eType" var="eInfo">
    <sequence>
      <log message="1">
        "Handler: STAXException, eType: %s, eInfo: %s" % (eType, eInfo)
      </log>
      <throw exception="'OtherException'"/>
    </sequence>
  </catch>

</try>

<catch exception="'...'" typevar="eType" var="eInfo">
  <log message="1">
    "Handler: ..., eType: %s, eInfo: %s" % (eType, eInfo)
```

```
            </log>
          </catch>

          <finally>
            <block name="'Cleanup'">
              <sequence>
                <log message="1">'Perform Clean-up'</log>
                <call function="'Cleanup'"/>
              </sequence>
            </block>
          </finally>

        </try>

      </sequence>
    </function>

  </stax>
```

If function 'CheckServerAvailability' returns a non-zero value, exception 'STAXException.ServerNotAvailable' is thrown. There is no catch block for this exception in this try block so the exception is thrown up the chain to its parent try block which has a catch block for this exception since it is a sub-type of exception 'STAXException'. The catch block throws exception 'OtherException' which is handled by its parent try block which contains a catch handler for all exceptions. Then, the finally block is run. The following messages are logged:

```
  Handler: STAXException eType: STAXException.ServerNotAvailable, eInfo: Server: server1.
company.com
  Handler: ..., eType: OtherException, eInfo: None
  Perform Clean-up
```

If function 'StartServers' returns a non-zero value, exception 'STAXException.Timeout.StartingServer' is thrown. The exception is handled by the catch block that handles exception 'STAXException.Timeout' since it's a sub-type this exception. The catch block rethrows the exception up the chain to its parent try block. The exception is then handled by it's catch block since it is a sub-type of exception 'STAXException'. The catch block throws exception 'OtherException' which is handled by its parent try block which contains a catch handler for all exceptions. Then, the finally block is run. The following messages are logged:

```
  Servers are available
  Handler: STAXException.Timeout, eType: STAXException.Timeout.StartingServer, eInfo: Server:
server1.company.com
  Handler: STAXException, eType: STAXException.Timeout.StartingServer, eInfo: Server: server1.
company.com
```

```
  Handler: ..., eType: OtherException, eInfo: None
  Perform Clean-up
```

If function 'StartClients' returns a non-zero value, exception 'STAXException.Timeout.StartingClient' is thrown. The catch handler that handles this exception is run. Then the finally block is run. The following messages are logged:

```
  Servers are available
  Servers are started
  Handler: STAXException.Timeout.StartingClient, eType: STAXException.Timeout.StartingClient,
eInfo: Clients: ['client1.company.com', 'client2.company.com']
  Perform Clean-up
```

If no exceptions were thrown (all functions returned 0), the following messages are logged:

```
  Servers are available
  Servers are started
  Clients are started
  Ran the Test
  Perform Clean-up
```

Signals

The raise and signalhandler elements deal with the raising and handling of STAX signals. Unlike STAX exceptions, STAX signals, by themselves, do not alter execution flow. Signal handlers provide asynchronous error handling while executing a STAX job. The STAX execution engine may also raise signals for errors such as if a variable is referenced which does not exist or if a function is called that does not exist.

The following table contains the names of signals that may be raised by the STAX execution engine, the conditions in which STAX raises these signals, and a description of the default signal handlers provided by STAX.

Signal Name	Raised When:	Default Signal Handler
STAXProcessStartError	A specified process cannot be successfully started. The process is bypassed. Information about the process that could not be started is provided in a variable named STAXProcessStartErrorMsg.	Sends a message that includes the variable named STAXProcessStartErrorMsg to the STAX Monitor and logs a message in the STAX Job Log with level 'error'.

STAXProcessStartTimeout	A specified process was not started within the ProcessTimeout parameter value for the STAX service. Information about the process that could not be started within the timeout value is provided in a variable named STAXProcessStartTimeoutMsg.	Sends a message that includes the variable named STAXStartProcessTimeoutMsg to the STAX Monitor and logs a message in the STAX Job Log with level 'error'.
STAXCommandStartError	A specified STAF Command request cannot be successfully started. The <stafcmd> request is bypassed. Information about the command that could not be started is provided in a variable named STAXCommandStartErrorMsg.	Sends a message that includes the variable named STAXCommandStartErrorMsg to the STAX Monitor, logs a message in the STAX Job Log with level 'error', and terminates the job.
STAXPythonEvaluationError	Python cannot successfully evaluate a value, expression, or statement(s). The element is bypassed. Information about the element which could not be successfully evaluated by Python is provided in a variable named STAXPythonEvalMsg.	Sends a message that includes the variable named STAXPythonEvalMsg to the STAX Monitor, logs a message in the STAX Job Log with level 'error', and terminates the job.
STAXFunctionDoesNotExist	A function is called that does not exist. The call request is bypassed. Information about the call request is provided in a variable named STAXFunctionDoesNotExistMsg.	Sends a message that includes the variable named STAXFunctionDoesNotExistMsg to the STAX Monitor, logs a message in the STAX Job Log with level 'error', and terminates the job.
STAXFunctionArgValidate	A function is called with arguments that are not valid. The call request is bypassed. Information about the call request is provided in a variable named STAXFunctionArgValidateMsg.	Sends a message that includes the variable named STAXFunctionArgValidateMsg to the STAX Monitor, logs a message in the STAX Job Log with level 'error', and terminates the job.
STAXBlockDoesNotExist	A block name referenced by a <hold>, <release>, or <terminate> element does not exist. The hold/release/terminate block request is bypassed. Information about the hold/ release/terminate block request is provided in a variable named STAXBlockDoesNotExistMsg.	Sends a message that includes the variable named STAXBlockDoesNotExistMsg to the STAX Monitor and logs a message in the STAX Job Log with level 'error'.

STAXInvalidBlockName	A block with the name specified by the <block> element already exists. The <block> request is bypassed. Information about the invalid <block> request is provided in a variable named STAXInvalidBlockNameMsg. Note that this situation can easily occur if you have a block executing in parallel on multiple machines and you specify a literal block name, like name="'BlockA'", instead of one like name="'BlockA_%s' % machName" to uniquely identify each block.	Sends a message that includes the variable named STAXInvalidBlockNameMsg to the STAX Monitor, logs a message in the STAX Job Log with level 'error', and terminates the job.
STAXLogError	A <log> or <message> element that specifies to log a message is encountered but the LOG request to the STAF Log service failed (possibly due to an invalid log level, etc). The <log> element is bypassed. Information about the invalid <log> element is provided in a STAX variable named STAXLogMsg.	Sends a message that includes the variable named STAXLogMsg to the STAX Monitor and logs a message in the STAX Job Log with level 'error'.
STAXTestcaseMissingError	A <tcstatus> element is encountered but there is no <testcase> wrapper element containing it. The <tcstatus> element is bypassed. Information about the invalid <tcstatus> element is provided in a STAX variable named STAXMissingTestcaseMsg.	Sends a message that includes the variable named STAXTestcaseMissingMsg to the STAX Monitor, and logs a message in the STAX Job Log with level 'error'.
STAXInvalidTcStatusResult	A <tcstatus> element is encountered with an invalid result value (not 'pass' or 'fail'). The <tcstatus> element is bypassed. Information about the invalid <tcstatus> element is provided in a STAX variable named STAXInvalidTcStatusResultMsg.	Sends a message that includes the variable named STAXInvalidTcStatusResultMsg to the STAX Monitor, and logs a message in the STAX Job Log with level 'error'.
STAXNoSuchSignalHandler	A <raise> element specifies a signal for which there is no signal handler. The <raise> element is bypassed. Information about the invalid <raise> element is provided in a STAX variable named STAXNoSuchSignalHandlerMsg.	Sends a message that includes the variable named STAXNoSuchSignalHandlerMsg to the STAX Monitor, and logs a message in the STAX Job Log with level 'error'.

STAXInvalidTimerValue	A <timer> element specifies an invalid value for its duration attribute or a <hold> element specifies an invalid value for its timeout attribute. The element is bypassed. Information about the invalid <timer> or <hold> element is provided in a variable named STAXInvalidTimerValueMsg.	Sends a message that includes the variable named STAXInvalidTimerValueMsg to the STAX Monitor, logs a message in the STAX Job Log with level 'error', and terminates the job.
STAXEmptyList	An <iterate> or <paralleliterate> element specifies a list which is empty or set to None. Information about the element which specified the empty list is provided in a STAX variable named STAXEmptyListMsg.	Does nothing
STAXImportError	An error occurred while processing an <import> element. Information about the error is provided in a STAX variable named STAXImportErrorMsg. When a STAXImportError signal is raised, the variable STAXSignalData will be set to a list containing an error type and an error description.	Sends a message that includes the variable named STAXImportErrorMsg to the STAX Monitor, logs a message in the STAX Job Log with level 'error', and terminates the job.
STAXFunctionImportError	An error occurred while processing a <function-import> element during runtime. Information about the error is provided in a STAX variable named STAXFunctionImportErrorMsg. When a STAXFunctionImportError signal is raised, the variable STAXSignalData will be set to a list containing an error type and an error description.	Sends a message that includes the variable named STAXFunctionImportErrorMsg to the STAX Monitor, logs a message in the STAX Job Log with level 'error', and terminates the job.
STAXInvalidTestcaseMode	An invalid mode attribute was specified for a <testcase> element. The valid values for the attribute are 'default' and 'strict'.	Sends a message that includes the variable named STAXInvalidTestcaseModeMsg to the STAX Monitor and logs a message in the STAX Job Log with level 'error'.

STAXMaxThreadsExceeded	A <paralleliterate> or <parallel> element tries to start more than the maximum number of STAX Threads allowed by the STAX service's "Max STAX-Threads" setting (if it is set to a non-zero value) which specifies the maximum number of STAX Threads that can be running simultaneously in a job. Information about the error is provided in a STAX variable named STAXMaxThreadsExceededMsg.	Sends a message that includes the variable named STAXMaxThreadsExceededMsg to the STAX Monitor, logs a message in the STAX Job Log with level 'error', and terminates the job.
STAXInvalidMaxThreads	A <paralleliterate> element specifies an invalid negative value for its maxthreads attribute. The element is bypassed. Information about the invalid <paralleliterate> element is provided in a variable named STAXInvalidMaxThreadsMsg.	Sends a message that includes the variable named STAXInvalidMaxThreadsMsg to the STAX Monitor, logs a message in the STAX Job Log with level 'error', and terminates the job.

You may override a default signalhandler by providing your own signalhandler. See How to Perform Cleanup Before Job Termination for some examples.

raise: Raise a Signal

The **raise**element may be used to raise a specified signal. Signals may also be raised by the STAX execution engine. A signal interrupts the STAX job's normal flow of execution and allows a signal handler to take control. A signal handler is a function that is called when the corresponding signal occurs. When the signal handler returns, the STAX job continues to execute from the point in the job following where the signal was raised, assuming the signal handler did not terminate the job or block. If a signal handler is not provided for a generated signal, a STAXNoSuchSignalHandler signal is raised.

The **raise** element is an empty element.

The **raise** element has the following required attribute:

- **signal** - specifies the name of the signal being raised. It must evaluate via Python to a string value.

Usage:

The following example of the raise element raises a signal named 'NonZeroRCError' when a non-zero return code is encountered.

```
<function name="Valid-if-RC-0">
```

```
  <if expr="RC != 0">
    <raise signal="'NonZeroRCError'"/>
  </if>
</function>
```

signalhandler: Handle a Signal

The **signalhandler**element defines how to handle a specified signal. Signal handlers are inherited from parent threads. The **signalhandler**element contains a single ***task***element. A **signalhandler**element can be contained in the **stax**root element as well as anywhere where a ***task***element can be.

A **signalhandler** element has the following required attribute:

- **signal** - specifies the name of the signal that the signalhandler handles. It must evaluate via Python to a string value. This attribute is required.

Usage:

The following example of the **signalhandler**element handles signals named 'NonZeroRCError' by setting the testcase status to fail and terminating the job.

```
<signalhandler signal="'NonZeroRCError'">
  <sequence>
    <tcstatus result="'fail'">'RC=%s' % RC</tcstatus>
    <terminate block="'main'"/>
  </sequence>
</signalhandler>
```

How to Perform Cleanup Before Job Termination

The default signal handler for a STAXPythonEvaluationError signal logs a message (containing the value of the variable named STAXPythonEvalMsg) in the STAX Job Log with level 'Error' and sends the message to the STAX Monitor, and then it terminates the STAX job. But what if you wanted to do some "clean up" before the signal handler for a STAXPythonEvaluationError signal terminated the STAX job?

Here are three examples that show how you could make sure that cleanup gets performed whenever a STAXPythonEvaluationError signal is raised. The first two examples override the default signal handler for a STAXPythonEvaluationError. The last example (and perhaps the simplest) uses a **try / finally** element where the finally element calls a function to perform clean-up (no matter what -- e.g. if the job is terminated, etc).

1. This example overrides the default signal handler for a STAXPythonEvaluationError signal. The new signal handler logs a message in the STAX Job User Log with level 'Error' and sends the message to the STAX Monitor, calls the Cleanup function, and then terminates the STAX

job.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax SYSTEM "stax.dtd">

<stax>

  <defaultcall function="Main"/>

  <signalhandler signal="'STAXPythonEvaluationError'">
    <sequence>

      <log message="1" level="'Error'">
        'STAXPythonEvaluationError signal raised.  Clean up and terminate the job.%s' % \
        (STAXPythonEvalMsg)
      </log>
      <call function="'Cleanup'"/>
      <terminate block="'main'"/>

    </sequence>
  </signalhandler>

  <function name="Main">
    <sequence>

      <log message="1">'Starting the Main function...'</log>

      <log message="1">
        'Create a Python evaluation error here: %s' % (NonExistingVar)
      </log>

      <call function="'Cleanup'"/>

      <log message="1">'Ending the Main function...'</log>

    </sequence>
   </function>

  <function name="Cleanup">
    <sequence>
```

```
        <log message="1">'Starting clean-up...'</log>

      </sequence>
    </function>

</stax>
```

After running the above STAX job, the STAX Job User log contains 3 messages, including the STAXPythonEvaluationError message and the Starting clean-up... message. For example:

```
STAF local LOG QUERY MACHINE {STAF/Config/MachineNickname} LOGNAME STAX_Job_8_User
Response
--------
Date-Time         Level Message
----------------- ----- ------------------------------------------------------
20070419-18:19:45 Info  Starting the Main function...
20070419-18:19:45 Error STAXPythonEvaluationError signal raised.  Clean up and
                        terminate the job.  ===== Element Information =====  <l
                        og message="1">'Create a Python evaluation error here:
                        %s' % (NonExistingVar) </log>  ===== Python Error Infor
                        mation =====  com.ibm.staf.service.stax.STAXPythonEvalu
                        ationException:  Python string evaluation failed for: '
                        Create a Python evaluation error here: %s' % (NonExisti
                        ngVar)   Traceback (innermost last):    File "<pyEval s
                        tring>", line 1, in ?  NameError: NonExistingVar   ====
                        = Call Stack for STAX Thread 1 =====  [    Block: main
                           Sequence: 23/23    Function: Main    Sequence: 2/4
                        ]
20070419-18:19:45 Info  Starting clean-up...
```

Note that the STAX Job log contains a terminating job message, but does not contain the STAXPythonEvaluationError, as it is now being logged via a **log** element in the new signal handler, instead of being logged by the STAX service's default signal handler. For example:

```
STAF local LOG QUERY MACHINE {STAF/Config/MachineNickname} LOGNAME STAX_Job_8
Response
--------
Date-Time         Level  Message
----------------- ------ ------------------------------------------------------
20070419-18:19:45 Start  JobID: 8, File: C:/dev/src/stax/overridePythonError.xm
                         l, Machine: local://local, Function: Main, Args: null,
```

```
                              JobName: Test Overriding a SignalHandler
20070419-18:19:45 Info   Terminating block: main
20070419-18:19:45 Status Testcase Totals: Tests: 0, Pass: 0, Fail: 0
20070419-18:19:45 Status Job Result: None
20070419-18:19:45 Stop   JobID: 8
```

2. This example overrides the default signal handler for a STAXPythonEvaluationError signal. The new signal handler throws a STAX Exception of type 'MyPythonException' and with additional information about the Python error. The Main function has a try/catch block that catches STAX Exceptions with type 'MyPythonException' and any other STAX exception. If a STAX Exception is caught, the catch block logs a message with level 'Error' ands sends it to the STAX Monitor. Following the try/catch block is a call to the Cleanup function.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax SYSTEM "stax.dtd">

<stax>

  <defaultcall function="Main"/>

  <signalhandler signal="'STAXPythonEvaluationError'">
    <sequence>

      <throw exception="'MyPythonException'">
        'STAXPythonEvaluationError signal raised.%s' % (STAXPythonEvalMsg)
      </throw>

    </sequence>
  </signalhandler>

  <function name="Main">
    <sequence>

      <try>

        <sequence>
          <log message="1">'Starting the try block for the Main function...'</log>
          <log message="1">'Create a Python evaluation error here: %s' % (NonExistingVar)
</log>
          <log message="1">'Ending the try block for the Main function...'</log>
        </sequence>
```

```
      <catch exception="'MyPythonException'" typevar="eType" var="eInfo">
        <log message="1" level="'Error'">
          'Handler: MyPythonException, eType: %s, eInfo: %s' % (eType, eInfo)
        </log>
      </catch>

      <catch exception="'...'" typevar="eType" var="eInfo">
        <log message="1" level="'Error'">
          "Handler: ..., eType: %s, eInfo: %s" % (eType, eInfo)
        </log>
      </catch>

    </try>

    <call function="'Cleanup'"/>
    <log message="1">'Ending the Main function...'</log>

  </sequence>
 </function>

 <function name="Cleanup">
  <sequence>

    <log message="1">'Starting clean-up...'</log>

  </sequence>
 </function>

</stax>
```

After running the above job, the STAX Job User log contains 4 messages, including the STAXPythonEvaluationError message and the Starting clean-up... message. For example:

```
STAF local LOG QUERY MACHINE {STAF/Config/MachineNickname} LOGNAME STAX_Job_10_User
Response
--------
Date-Time        Level Message
---------------- ----- ------------------------------------------------------
20070419-18:24:40 Info  Starting the try block for the Main function...
20070419-18:24:40 Error Handler: MyPythonException, eType: MyPythonException, e
```

```
                                Info: STAXPythonEvaluationError signal raised.  ===== E
                                lement Information =====  <log message="1">'Create a Py
                                thon evaluation error here: %s' % (NonExistingVar) </lo
                                g>  ===== Python Error Information =====  com.ibm.staf.
                                service.stax.STAXPythonEvaluationException:  Python str
                                ing evaluation failed for: 'Create a Python evaluation
                                error here: %s' % (NonExistingVar)   Traceback (innermo
                                st last):    File "<pyEval string>", line 1, in ?  Name
                                Error: NonExistingVar   ===== Call Stack for STAX Threa
                                d 1 =====  [    Block: main    Sequence: 23/23    Funct
                                ion: Main    Sequence: 1/3    Try:     Sequence: 2/3  ]
        20070419-18:24:40 Info  Starting clean-up...
        20070419-18:24:40 Info  Ending the Main function...
```

Note that the STAX Job log does not contain the STAXPythonEvaluationError, as it is now being logged via a **log** element within the catch element, instead of being logged by the STAX service's default signal handler. For example:

```
STAF local LOG QUERY MACHINE {STAF/Config/MachineNickname} LOGNAME STAX_Job_10
Response
--------
Date-Time         Level  Message
----------------- ------ ------------------------------------------------------
20070419-18:24:40 Start  JobID: 10, File: C:/dev/src/stax/overridePythonError2.
                         xml, Machine: local://local, Function: Main, Args: nul
                         l, JobName: Test Overriding a SignalHandler
20070419-18:24:40 Status Testcase Totals: Tests: 0, Pass: 0, Fail: 0
20070419-18:24:40 Status Job Result: None
20070419-18:24:40 Stop   JobID: 10
```

3. You don't have to override the default signal handler for a STAXPythonEvaluationError signal in order to do some "clean up" before the signalhandler for a STAXPythonEvaluationError signal terminates the STAX job. Instead, you could use a **try / finally** element because the **finally** task is executed no matter what -- even when a STAXPythonEvaluationError signal is raised and the STAX job is terminated. For example:

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax SYSTEM "stax.dtd">

<stax>

  <defaultcall function="Main"/>
```

```
  <function name="Main">
    <sequence>

      <try>

        <sequence>
          <log message="1">'Starting the try block for the Main function...'</log>
          <log message="1">'Create a Python evaluation error here: %s' % (NonExistingVar)
</log>
          <log message="1">'Ending the try block for the Main function...'</log>
        </sequence>

        <finally>
          <call function="'Cleanup'"/>
        </finally>

      </try>

      <log message="1">'Ending the Main function...'</log>

    </sequence>
   </function>

  <function name="Cleanup">
    <sequence>

      <log message="1">'Starting clean-up...'</log>

    </sequence>
  </function>

</stax>
```

After running the above job, the STAX Job User log contains 2 messages, including the Starting clean-up... message. For example:

```
STAF local LOG QUERY MACHINE {STAF/Config/MachineNickname} LOGNAME STAX_Job_12_User
Response
--------
Date-Time         Level Message
```

```
----------------- ----- ----------------------------------------------
20070419-18:35:23 Info  Starting the try block for the Main function...
20070419-18:35:23 Info  Starting clean-up...
```

Note that the STAX Job log contains the STAXPythonEvaluationError as it is being logged by the STAX service's default signal handler and the terminating job message. For example:

```
STAF local LOG QUERY MACHINE {STAF/Config/MachineNickname} LOGNAME STAX_Job_12
Response
--------
Date-Time         Level  Message
----------------- ------ ------------------------------------------------------
20070419-18:35:22 Start  JobID: 12, File: C:/dev/src/stax/overridePythonError3.x
                         ml, Machine: local://local, Function: Main, Args: null,
                          JobName: Use Try/Finally to do Clean-up"
20070419-18:35:23 Error  STAXPythonEvaluationError signal raised. Terminating jo
                         b.   ===== Element Information =====  <log message="1">
                         'Create a Python evaluation error here: %s' % (NonExist
                         ingVar) </log>  ===== Python Error Information =====  c
                         om.ibm.staf.service.stax.STAXPythonEvaluationException:
                           Python string evaluation failed for: 'Create a Python
                          evaluation error here: %s' % (NonExistingVar)   Traceb
                         ack (innermost last):    File "<pyEval string>", line 1
                         , in ?  NameError: NonExistingVar   ===== Call Stack fo
                         r STAX Thread 1 =====  [    Block: main    Sequence: 22
                         /22    Function: Main    Sequence: 1/2    Finally:
                         Try:     Sequence: 2/3  ]
20070419-18:35:23 Info   Terminating block: main
20070419-18:35:23 Status Testcase Totals: Tests: 0, Pass: 0, Fail: 0
20070419-18:35:23 Status Job Result: None
20070419-18:35:23 Stop   JobID: 12
```

Logging / Messages

The log and message elements deal with logging a message to a STAX job user log and sending a message to the STAX Monitor.

log: Log a Message in the STAX Job User Log

The **log**element may be used to log a message in the STAX job user log. The log value and log level must evaluate via Python to a string value.

The **log** element has the following optional attributes:

- **level** - is the logging level of the message to be logged. It must evaluate via Python to be one of the STAF logging levels ('fatal', 'error', 'warning', 'info', 'trace', 'trace2', 'trace3', 'debug', 'debug2', 'debug3', 'start', 'stop', 'pass', 'fail', 'status', 'user1', 'user2', 'user3', 'user4', 'user5', 'user6', 'user7', or 'user8'). It defaults to 'info'.
- **if** - is an expression that is evaluated via Python to a boolean value. If it evaluates to false, the message is not logged. It defaults to true ('1').
- **message** - is an expression that is evaluated via Python to a boolean value. If it evaluates to true, the message is also sent to the STAX Monitor and displayed via its GUI in the message panel. It defaults to the STAXMessageLog variable whose value will default to 0 (false), but can be changed within the STAX job to turn on messaging (for the whole job or just within a function or block, etc.)

Refer to the "STAX Logging" section for more information on how to query a STAX job user log.

Usage:

The following example of the **log** element logs a message of level 'info' (the default log level) in the STAX job user log. If the STAXMessageLog variables evaluates via Python to true, the message will also be sent to the STAX Monitor:

```
<log>'The test is successful'</log>
```

The following example of the **log** element logs a message of level 'info' (the default log level) in the STAX job user log and sends the message to the STAX Monitor:

```
<log message="1">'The test is successful'</log>
```

The following example of the **log** element logs two messages in the STAX job user log and sends the messages to the STAX Monitor, since the STAXMessageLog variable has been set to 1 (true):

```
<script>STAXMessageLog = 1</script>
<log>'The test was successful'</log>
<log level="'warning'">'File xyz was not found'</log>
```

The following example of the **log** element logs a message of level 'info' (the default log level) in the STAX job user log after successfully running a STAF command If the STAF command fails, it logs a message of level 'warning' in the STAX job user log.

```
<sequence>

  <stafcmd>
```

```
    <location>machName</location>
    <service>"misc"</service>
    <request>"version"</request>
  </stafcmd>

  <if expr="RC == STAFRC.Ok">
    <log>'Machine %s is running STAF Version %s' % (machName,STAFResult)</log>
    <else>
      <log level="'warning'">'RC=%s on %s' % (RC, machName)</log>
    </else>
  </if>

</sequence>
```

Note that instead of using the "if" element, could use the "if" attribute of the log element as follows:

```
<log if="RC == STAFRC.Ok">'Machine %s is running STAF Version %s' % (machName, STAFResult)</log>
<log if="RC != STAFRC.Ok" level="'warning'">'RC=%s on %s' % (RC, machName)</log>
```

message: Send a Message to the STAX Monitor

The **message**element specifies a message which will be sent to the STAX Monitor and displayed via its GUI. The message value must evaluate via Python to a string value.

The **message** element has the following optional attribute:

- **if** - is an expression that is evaluated via Python to a boolean value. If it evaluates to false, the message element is ignored (meaning the message is not sent (or logged). It defaults to true ('1').
- **log** - is an expression that is evaluated via Python to a boolean value. If it evaluates to true, the message is also logged in the STAX Job User log. It defaults to the STAXLogMessage variable whose value will default to 0 (false), but can be changed within the STAX job to turn on logging (for the whole job or just within a function or block, etc).
- **level** - is the logging level of the message to be logged in the STAX Job User log. It must evaluate via Python to be one of the STAF logging levels ('fatal', 'error', 'warning', 'info', 'trace', 'trace2', 'trace3', 'debug', 'debug2', 'debug3', 'start', 'stop', 'pass', 'fail', 'status', 'user1', 'user2', 'user3', 'user4', 'user5', 'user6', 'user7', or 'user8'). It defaults to 'info'. If the log attribute evaluates to false, this attribute is ignored.

Note that any private data contained in a message will be masked (replaced with asterisks) before the message is sent.

Usage:

The following example of the **message**element sends a message to the STAX Monitor which displays it in the "Messages" panel. If the

STAXLogMessage variable evaluates via Python to true, the message will also be logged in the STAX Job User log with a logging level of 'info' (the default).

```
<message>'The test is successful'</message>
```

The following example of the **message** element sends a message to the STAX Monitor and logs the message with a logging level of 'info' (the default log level) in the STAX Job User log:

```
<message log="1">'The test is successful'</message>
```

The following example of the **message** element sends two messages to the STAX Monitor and logs the two messages in the STAX Job User log since the STAXLogMessage variable has been set to 1 (true):

```
<script>STAXLogMessage = 1</script>
<message>'The test was successful'</message>
<message level="'warning'">'File xyz was not found'</message>
```

The following example of the **message** element sendss a message to the STAX Monitor which displays it in the "Messages" panel:

```
<function name="Valid-if-RC-0">
  <if expr="RC != 0">
    <message>'RC=%s on machine %s' % (RC, machName)</message>
  </if>
</function>
```

Note that instead of using the "if" element, could use the "if" attribute of the message element as follows:

```
  <message if="RC != 0">'RC=%s on machine %s' % (RC, machName)</message>
```

Breakpoint

The breakpointelement allows you to denote a breakpoint in the STAX job. Breakpoints can be used to debug STAX jobs.

When a breakpoint is reached within the STAX job, the current STAX thread's execution will pause, and the user can perform the following tasks:

- retrieve all of the Python variables that are currently set in the thread
- execute Python code when a thread is at a breakpoint (to change the values of existing variables or define new variables)
- resume the breakpoint

- step into the breakpoint
- step over the breakpoint

Note that when you add a **breakpoint** element to your STAX job, the STAX job will always stop execution at the breakpoint. When you have finished debugging your STAX job, you must remove any **breakpoint** elements.

If you do not want to modify your STAX job to include **breakpoint** elements, you can set any number of breakpoints (for specific functions or line numbers) when submitting the job (via the STAX EXECUTE BREAKPOINT option), or dynamically after the STAX job has started (via the STAX ADD BREAKPOINT request).

For more information on using breakpoints, see **Using Breakpoints to Debug STAX Jobs**.

breakpoint: Setting Breakpoint in a STAX Job

The **breakpoint** element is an empty element and has no attributes.

Usage:

In the following example a **breakpoint**element has been added to a **sequence**. After the STAX job completes testcase "Java2D", the current STAX thread will be at a breakpoint. After the thread is resumed or stepped, testcase "Print" will be executed.

```
<sequence>

  <call function="'Setup'"/>

  <testcase name="'Java2D'">
    <sequence>
      <script>variationList = Java2DAPI[:]</script>
      <script>jarName = '%s/%s' % (TestCaseDir, TestCaseFiles[0])</script>
      <call function="'RunVariations'"/>
    </sequence>
  </testcase>

  <breakpoint/>

  <testcase name="'Print'">
    <sequence>
      <script>variationList = PrintAPI[:]</script>
      <script>jarName = '%s/%s' % (TestCaseDir, TestCaseFiles[1])</script>
```

```
      <call function="'RunVariations'"/>
    </sequence>
  </testcase>

</sequence>
```

System Requirements

A STAX Service machine is where the STAX Service is installed. The STAX Service machine has the following software and hardware requirements:

Software Requirements

- STAF Version 3.3.4 or higher must be installed on the STAX Service machine.
- The STAX Service code.
- The STAX Service is written in Java and requires Java 1.5 (aka 5.0) or higher.
- A file system that supports long file names.
- Any operating system that is supported by STAF. See the STAF User's Guide for a list of supported operating systems.

Hardware Requirements

- Pentium 300 Mhz CPU minimum
- 64M memory minimum

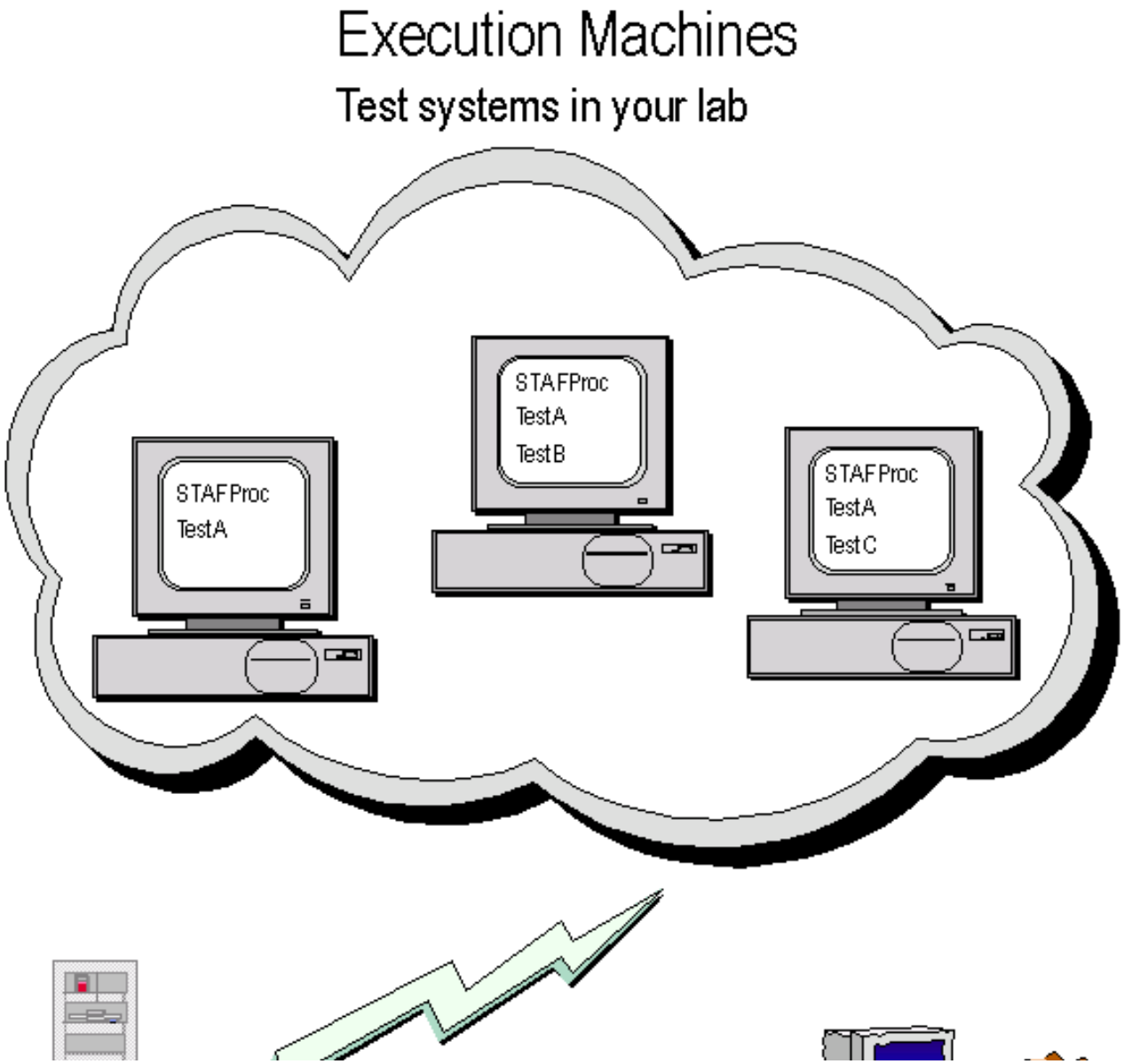
Installation and Configuration

Following is a diagram showing a typical configuration when using STAX. Usually, you install a single server-type system to be the STAX service machine. It has STAF installed with the STAX and Event services configured. This system must be up and running STAF while STAX jobs are running on it.

You can request STAX jobs to be executed and monitor them using the STAX Monitor (or via command-line requests). This can be done from any

machine, such as your office or home machine, as long as it is running STAF and has TCP/IP network capabilities such that it can communicate with the STAX service machine. Note that the same job can be monitored from multiple systems simultaneously.

The execution machines are the machines where you want tests to be run. Any number of execution machines can be involved in a single STAX job. A STAX job generally consists of processes and STAF commands that make up various testcases that run on any number of execution machines. The <location> element, which is part of each <process> and <stafcmd> element in a job, specifies the execution machine where the process or STAF command is run. You can pass additional information (e.g. a list of execution machines and/or tests) when submitting a STAX job for execution using SCRIPT/SCRIPTFILE parameters or by passing arguments to the starting function for the job.



STAX Service Machine

1. Install Java 1.5 (aka 5.0) or later from Oracle or IBM.

   The STAX Service is written in Java, so you need to install a JVM (e.g. Oracle or IBM) on the STAX Service machine. IBM employees must download the Oracle or IBM JVM from the internal JIM site. Non-IBM users can download from http://www.oracle.com/technetwork/java/index.html. We recommend that you install the most recent fixpack for the JVM you want to use, so that you will have all of the latest fixes. You cannot use the GNU libgcj compiler for Java on Linux.

   Verify that the PATH environment variable contains the Java bin directory (e.g. C:\j2sdk1.5.0\bin). You can type "java -version" to check the version of Java that's in the PATH. Or you can override the version of Java that you want the STAX service to use when registering the STAX service via the OPTION JVM=<Java Path> option when creating a new JVM (e.g. OPTION JVM=C:\j2sdk1.5.0\bin\java).

2. Install STAF Version 3.3.4 or later by following the installation instructions in the STAF documentation.

   Verify that the CLASSPATH environment variable contains the JSTAF.jar file (e.g. C:\STAF\bin\JSTAF.jar or /usr/local/staf/lib/JSTAF.jar). JSTAF.jar contains the STAF Java APIs to communicate with STAF from Java programs and is required to register STAF services written in Java.

3. Install the STAX service:

   a. Download the STAXV3517.zip/tar file from Get STAF Services and extract the STAX tar/zip file into a local directory.

- On Windows, unzip the STAXV3517.zip file into a local directory (e.g. C:\STAF\services).
- On Unix, untar the STAXV3517.tar file into a local directory (e.g. /usr/local/staf/services).

b. Verify that the local directory where you extracted the STAX zip/tar file now includes the following files:
   - STAX.jar
   - STAXMon.jar
   - STAFEvent.jar file.

4. Update the STAF configuration file as follows:

   - Register the STAX service.
   - Register the Event service if the Event Service is also installed on the STAX Service system and you plan to use the STAX Monitor.
   - Register the Log service if you want STAX log files to be created by the STAX service. Note that the default STAF configuration file includes a SERVICELOADER configuration line for STAF's default service loader which can dynamically load the Log Service.

   Following is the syntax for the lines which should be present in the STAF configuration file:

```
SERVICELOADER LIBRARY STAFDSLS

SERVICE <Name> LIBRARY JSTAF EXECUTE <STAX Jar File Name>
               [OPTION <Name[=Value]>]...
               [PARMS <"> [EVENTSERVICEMACHINE <EventMachine>]
                          [EVENTSERVICENAME <EventName>]
                          [EVENTGENERATION <Enabled | Disabled>]
                          [NUMTHREADS <NumThreads>]
                          [PROCESSTIMEOUT <ProcessTimeout>]
                          [FILECACHING <Enabled | Disabled>]
                          [MAXFILECACHESIZE <Max Files>]
                          [FILECACHEALGORITHM <LRU | LFU>]
                          [MAXFILECACHEAGE <Number>[s|m|h|d|w]]]
                          [MAXMACHINECACHESIZE <Max Machines>]
                          [MAXRETURNFILESIZE <Number>[k|m]]
                          [MAXGETQUEUEMESSAGES <Number>]
                          [MAXSTAXTHREADS <Number>]
                          [RESETJOBID <Enabled | Disabled>]
                          [CLEARLOGS <Enabled | Disabled>]
                          [LOGTCELAPSEDTIME <Enabled | Disabled>]
                          [LOGTCNUMSTARTS <Enabled | Disabled>]
                          [LOGTCSTARTSTOP <Enabled | Disabled>]
                          [PYTHONOUTPUT <PythonOutput>]
```

```
                                [PYTHONLOGLEVEL <Log Level>]
                                [INVALIDLOGLEVELACTION <RaiseSignal | LogInfo>]
                                [TIMEDEVENTQUEUE <Common | Job>]
                                [DEBUGTHREAD <Enabled | Disabled>]
                                [DEBUGCLONEFUNCTION <Enabled | Disabled>]
                                [DEBUGPROCESS <Enabled | Disabled>]
                                [DEBUGXMLPARSE <Enabled | Disabled>]
                                [EXTENSIONXMLFILE <Extension XML File> |
                                 EXTENSIONFILE <Extension Text File>]
                                [EXTENSION <Extension Jar File>...
                              <">]

SERVICE <Name> LIBRARY JSTAF EXECUTE <Event Jar File Name>
               [OPTION <Name[=Value]>]...
```

where:

- `<Name>` is the name by which the service will be known on this machine. The name of the STAX Service should generally be STAX and the name of the Event Service should generally be Event.

- `<STAX Jar File Name>` is the fully qualified name of the STAX.jar file. On Windows systems, this might be C:\STAF\services \STAX.jar. On Unix systems, this might be /usr/local/staf/services/STAX.jar.

- `<Event Jar File Name>` is the fully qualified name of the STAFEvent.jar file. On Windows systems, this might be C:\STAF \services\STAFEvent.jar. On Unix systems, this might be /usr/local/staf/services/STAFEvent.jar

- `OPTION` specifies a configuration option that will be passed on to the JSTAF Java service proxy library. This is typically used by service proxy libraries to further control the interface to the actual service implementation. You may specify multiple `OPTIONs` for a given service. See the STAF User's Guide for more information on options for the JSTAF Java service proxy library.

  Note that if you run long, resource-intensive STAX jobs, you may need to increase the minimum and maximum JVM heap sizes for the STAX Service to the maximum that the system can support based on its physical memory and the memory usage required by other applications running on the system. Also, you can override the version of Java that you want the STAX service to use when registering the STAX service via the OPTION JVM=<Java Path> option if you're creating a new JVM (e.g. OPTION JVM=C:\j2sdk1.5.0\bin \java).

- `EVENTSERVICEMACHINE` specifies the name of the Event service machine. It defaults to "local". This option will resolve STAF variables.
  Note: We recommend not to specify the `EVENTSERVICEMACHINE` parameter if the Event service is running in the same STAF instance as the STAX service for performance reasons.

- `EVENTSERVICENAME` specifies the name by which the Event service will be known to the STAX service. It defaults to "Event" (not case-sensitive) if not specified. This option will resolve STAF variables.

- `EVENTGENERATION` specifies whether the STAX service will generate job status events. If you plan to use the STAX Monitor to monitor jobs executed by this STAX service, you must enable event generation. If you are not using the STAX Monitor (or any other application that requires these job status events), then you may want to disable event generation to decrease memory usage and improve performance. Valid values are "Enabled" and "Disabled", not case-sensitive. If you specify "Enabled", job status events will be generated by the STAX service. If you specify "Disabled", job status events will not be generated. The default is "Enabled". This option will resolve STAF variables. For more information on the job status events generated by the STAX service, refer to the "Events Generated by STAX that Provide Job Status" section.

- `NUMTHREADS` specifies the number of physical threads that the STAX Service will use. It must be an integer value of 2 or greater. It defaults to 5 if not specified. This option will resolve STAF variables.

- `PROCESSTIMEOUT` specifies the number of milliseconds that the STAX service will wait for processes to start. It must be an integer value of 1000 (1 second) or greater. It's value should be at least the value of the CONNECTTIMEOUT operational parameter set for STAF on the STAX service machine. The default is 60000 milliseconds (1 minute). If a process does not start within the timeout value, a STAXProcessStartTimeout signal will be raised and the job will continue.

- `FILECACHING` specifies whether file caching will be performed. STAX file caching can improve performance when a STAX XML file is executed or imported more than once. Valid values are "Enabled" and "Disabled", not case-sensitive. If you specify "Enabled", file caching will be performed. If you specify "Disabled", file caching will not be performed. The default is "Enabled". This option will resolve STAF variables. For more information on how file caching works, refer to the "STAX File and Machine Caching" section. The maximum number of entries in the file cache can be changed using the MAXFILECACHESIZE parameter described below.

- `MAXFILECACHESIZE` specifies the maximum number of files that can be cached before files are removed. It must be an integer value >= -1. A value of 0 is equivalent to disabling file caching. A value of -1 means the cache size is unlimited. The default is 20. This option only has an effect if file caching is enabled. This option will resolve STAF variables.

- `FILECACHEALGORITHM` specifies the cache algorithm (aka replacement algorithm) for the file cache. When the cache is full (or when the size of the cache is changed to a smaller value), this algorithm chooses which files to discard to make room for the new files. Valid values are LRU or LFU.

    1. LRU specifies the "Least Recently Used" cache algorithm which removes the least recently used file first (e.g. the file with the oldest "Last Hit Date-Time"). This is the default.

    2. LFU specifies the "Least Frequently Used" cache algorithm which removes the file that is used least often (e.g. the file with the least number of "Hits"). If cached files have the same number of hits, the file with the oldest "Last Hit Date-Time" will be removed.

In addition, you can set a maximum age for a file in the file cache by specifying the `MAXFILECACHEAGE` parameter so that this algorithm will also take into account if a file hasn't been used for the specified maximum age which means it is considered to be stale. The maximum age is 0 by default, which means that there is no maximum age. If you set the maximum age to a non-zero value, this indicates that a file in the cache will be considered to be "stale" if it hasn't been used (last hit) for this maximum age. Stale files with the oldest "Last Hit Date-Time" will be removed before any non-stale files.

- `MAXFILECACHEAGE` specifies the maximum age for a file in the cache and is only used if the `FILECACHEALGORITHM` is set to LFU. The maximum age may be expressed in seconds, minutes, hours, days, or weeks. Its format is <Number>[s|m|h|d|w] where <Number> must be an integer from 0 to 2147483647 and indicates seconds unless one of the following case-insensitive suffixes is specified: s (for seconds), m (for minutes), h (for hours), d (for days), or w (for weeks). If <Number> is 0, this means that there is no maximum age. Examples:
  - 0 (no maximum age)
  - 30 (30 seconds)
  - 30s (30 seconds)
  - 5m (5 minutes)
  - 2h (2 hours)
  - 1d (1 day)
  - 1w (1 week)

- `MAXMACHINECACHESIZE` specifies the maximum number of machines that can be cached before machines are removed using a least recently used algorithm. It must be an integer value >= -1. A value of 0 means that machine caching is disabled. A value of -1 means the cache size is unlimited. The default is 20. This option will resolve STAF variables. STAX machine caching can improve performance when a STAX XML file being executed or imported resides on the same machine as another file that has already been executed or imported since information about that machine will be cached. For more information on how machine caching works, refer to the "STAX File and Machine Caching" section.

- `MAXRETURNFILESIZE` specifies the maximum size of a file that can be returned by either:

  - A process element that uses the returnstdout, returnstderr, and/or returnfile sub-element
  - A stafcmd element that submits a GET FILE request to the FS service

  The default is 0 which indicates not to limit the maximum size of returned files. Limiting the maximum returned file size can help prevent out of memory issues as these requests put the entire returned file contents in a result string which can consume a lot of memory for large files. This value may be expressed in bytes, kilobytes, or megabytes. Its format is `<Number>[k|m]` where `<Number>` is an integer >= 0 and indicates bytes unless one of the following case-insensitive suffixes is specified: `k` (for kilobytes) or `m` (for megabytes). The calculated value cannot exceed `4294967294` bytes. Examples of valid values include `100000`, `500k`, or `5m`.

  Note that the machine where the process or stafcmd is run must have STAF V3.3.4 or later installed for it to recognize the maximum return file size option.

- MAXGETQUEUEMESSAGES specifies the maximum number of messages that a STAX job's STAFQueueMonitor thread will get from the STAX job handle's queue at a time (via a local QUEUE GET WAIT FIRST <MaxGetQueueMessages> request). It must be an integer > 0 and < 101. The default is 25. This parameter was added in STAX V3.4.1.

- MAXSTAXTHREADS is the maximum number of STAX Threads that can be running simultaneously in a job. This maximum cannot be exceeded when <paralleliterate> and <parallel> elements start new STAX Threads. It must be an integer from 0 to 2147483647. The default is 0 which means there is no maximum. Its purpose is to help prevent "runaway" STAX jobs that use paralleliterate and/or parallel elements to run too many threads in parallel which can cause the STAX service to run out of memory and crash. If it is set to a non-zero number and this number is exceeded by a STAX job, the STAX service will raise a STAXMaxThreadsExceeded signal whose default action is to log a message and terminate the job.

- RESETJOBID specifies whether the STAX Job ID should be reset to 1 whenever the STAX service is registered (e.g. when STAFProc is restarted). Valid values are "Enabled" and "Disabled", not case-sensitive. If you specify "Enabled", the Job ID will be reset to 1 whenever the STAX service is registered. If you specify "Disabled", the Job ID will be persistent which means that the next Job ID to be used will be based on the last Job ID used and this will be determined by querying the last "Start" record in the STAX_Service log. The default is "Enabled". The maximum Job ID is Integer.MAX_VALUE (which on 32-bit machines is 2147483647). If the Job ID reaches its maximum value, it will be reset to 1. This option will resolve STAF variables. This parameter was added in STAX V3.5.1.

  Note that the RESETJOBID parameter determines whether STAX job numbers are reused. Since STAX Job Log names contain the Job ID, this parameter, along with the CLEARLOGS parameter, determines whether STAX job logs may contain the results for more than one job.

- CLEARLOGS specifies whether the STAX Job and Job User logs should be deleted before a job is executed. Since STAX job numbers are reused if you don't disable RESETJOBID when registering the STAX service, a specific job log may contain the results for more than one job. Valid values are "Enabled" and "Disabled", not case-sensitive. If you specify "Enabled", the log files will be deleted before a job is executed, in order to ensure that only one job's contents are in the logs. If you specify "Disabled", the job logs will not be deleted. The default is "Disabled". This option will resolve STAF variables.

- LOGTCELAPSEDTIME specifies whether to log the elapsed time in the summary "Status" record for each testcase written at the end of the STAX Job log and when you list testcases. Valid values are "Enabled" and "Disabled", not case-sensitive. If you specify "Enabled", the elapsed time will be logged. If you specify "Disabled", the elapsed time will not be logged. The default is "Enabled". This option will resolve STAF variables.

- LOGTCNUMSTARTS specifies whether to log the number of starts in the summary "Status" record for each testcase written at the end of the STAX Job log and when you list testcases. Valid values are "Enabled" and "Disabled", not case-sensitive. If you specify "Enabled", the number of starts will be logged. If you specify "Disabled", the number of starts will not be logged. The default is "Enabled". This option will resolve STAF variables.

- LOGTCSTARTSTOP specifies whether to log a "Start" record each time a testcase begins and to log a "Stop" record each time a

testcase ends in the STAX Job log. Valid values are "Enabled" and "Disabled", not case-sensitive. If you specify "Enabled", the start/stop testcase records will be logged. If you specify "Disabled", the start/stop testcase records will not be logged. The default is "Disabled". This option will resolve STAF variables.

- `PYTHONOUTPUT` specifies where Python stdout/stderr should be redirected (e.g. if you use the print statement in a <script> element in a STAX job). Valid values are the following (not case-sensitive):
  - "JobUserLog" indicates to log the Python output in the STAX Job User log. This is the default.
  - "Message" indicates to send the Python output to the STAX Monitor and display it in the Messages panel.
  - "JobUserLogAndMsg" indicates to log the Python output in the STAX Job User log and to send it to the STAX Monitor and display it in the Messages panel.
  - "JVMLog" indicates to write the Python output in the JVM Log for the STAX service using the following format so that you will know which STAX job originated the output and at what time:

    ```
    <Timestamp> <Python Log Level> Job <JobID> <Python Output>
    ```

  This option will resolve STAF variables.

- `PYTHONLOGLEVEL` specifies the STAF logging level to use when Python stdout is redirected to the STAX Job User Log, which means this option only has an effect if `PYTHONOUTPUT` is set to "JobUserLog" or "JobUserLogAndMsg". It must be one of the STAF logging levels (not case-sensitive): Fatal, Error, Warning, Info, Trace, Trace2, Trace3, Debug, Debug2, Debug3, Start, Stop, Pass, Fail, Status, User1, User2, User3, User4, User5, User6, User7, or User8. The default is "Info". This option will resolve STAF variables.

  Note: This log level is only used for Python stdout output, not for Python stderr output, as all Python stderr output uses log level "Error" if `PYTHONOUTPUT` is redirected to the STAX Job User log.

- `INVALIDLOGLEVELACTION` specifies the action to take when a <log> or <message> element uses an invalid STAF logging level. Valid values are the following (not case-sensitive):
  - "RaiseSignal" indicates to raise a STAXLogSignal. This is the default.
  - "LogInfo" indicates to use the "Info" log level instead of the invalid log level.

  This option will resolve STAF variables.

- `TIMEDEVENTQUEUE` specifies whether to use one common Timed Event Queue for all jobs (used by timer, process, and block elements) or to have each job use its own Timed Event Queue. It must be set to either "Common" or "Job". The default is "Common". This option will resolve STAF variables.

  Hint: If a STAX job's timer element "hangs" a job because it does not expire at the specified interval, configure the STAX service with the `TIMEDEVENTQUEUE` parameter set to "Job" to see if this resolves the problem.

- DEBUGTHREAD specifies whether to enable debugging for threads. The debug output will be logged to the STAX JVM Log file. This setting is intended for use only by STAX developers when debugging a problem. Enabling this option can generate a lot of data in the STAX JVM Log. Valid values are "Enabled" and "Disabled", not case-sensitive. The default is "Disabled". This option will resolve STAF variables. This parameter was added in STAX V3.5.11.

- DEBUGCLONEFUNCTION specifies whether to enable debugging for the STAX Python CloneGlobals function which is used when calling a function that was defined with a local scope or when creating a new child thread. The debug output will be logged to the location specified by the PYTHONOUTPUT setting. This setting is intended for use only by STAX developers when debugging a problem. Enabling this option can generate a lot of data in the STAX JVM Log. Valid values are "Enabled" and "Disabled", not case-sensitive. The default is "Disabled". This option will resolve STAF variables. This parameter was added in STAX V3.5.11.

- DEBUGPROCESS specifies whether to enable debugging for processes running in STAX jobs. The debug output will be logged to the STAX JVM Log file. This setting is intended for use only by STAX developers when debugging a problem. Enabling this option can generate a lot of data in the STAX JVM Log. Valid values are "Enabled" and "Disabled", not case-sensitive. The default is "Disabled". This option will resolve STAF variables. This parameter was added in STAX V3.5.12.

- DEBUGXMLPARSE specifies whether to enable debugging for xml parsing of STAX jobs. The debug output will be logged to the STAX JVM Log file. This setting is intended for use only by STAX developers when debugging a problem. Enabling this option can generate a lot of data in the STAX JVM Log. Valid values are "Enabled" and "Disabled", not case-sensitive. The default is "Disabled". This option will resolve STAF variables. This parameter was added in STAX V3.5.12.

- EXTENSIONXMLFILE specifies the fully-qualified name of an XML file that contains the names of the extension jar files to be registered. Refer to the "STAX Extensions" section for more information.

- EXTENSION specifies the fully-qualified name of an extension jar file. Refer to the "STAX Extensions" section for more information.

- EXTENSIONFILE specifies the fully-qualified name of a text file that contains the names of the extension jar files to be registered. Refer to the "STAX Extensions" section for more information.

Notes:

1. Each SERVICE configuration statement must be entered as one continuous line (or you can use a backslash (\) to specify line continuation.

2. If the Event Service machine is the same as the STAX service machine and "Event" is the name used when registering the Event Service, then you don't have to specify the EVENTSERVICEMACHINE or the EVENTSERVICENAME parameters. The <EventName> defaults to "Event" if it is not specified and the <EventMachine> defaults to "local" if it is not specified.

3. The STAX Service requires version 3.1.2 or later of the Event service.

4. The EVENTGENERATION, FILECACHING, MAXFILECACHESIZE, FILECACHEALGORITHM, MAXFILECACHEAGE, MAXMACHINECACHESIZE, MAXRETURNFILESIZE, MAXGETQUEUEMESSAGES, MAXSTAXTHREADS, CLEARLOGS, LOGTCELAPSEDTIME, LOGTCNUMSTARTS, LOGTCSTARTSTOP, PYTHONOUTPUT, PYTHONLOGLEVEL, INVALIDLOGLEVELACTION, DEBUGTHREAD, DEBUGCLONEFUNCTION, DEBUGPROCESS, and DEBUGXMLPARSE parameters may be changed using the SET command. Refer to the "SET" section for more information.

Examples of Service Configuration Lines for the STAX Service System:

- If the STAX and Event services are installed on the same system, the SERVICE configuration lines in the STAF configuration file might look like the following:

  Windows (assuming the STAX.jar and STAFEvent.jar files are in C:\STAF\services):

  ```
  SERVICE STAX LIBRARY JSTAF EXECUTE C:\STAF\services\stax\STAX.jar
  SERVICE EVENT LIBRARY JSTAF EXECUTE C:\STAF\services\stax\STAFEvent.jar
  ```

  Unix (assuming the STAX.jar and STAFEvent.jar files are in /usr/local/staf/services):

  ```
  SERVICE STAX LIBRARY JSTAF EXECUTE /usr/local/staf/services/stax/STAX.jar
  SERVICE EVENT LIBRARY JSTAF EXECUTE /usr/local/staf/services/stax/STAFEvent.jar
  ```

- If the Event service is installed on a different system (e.g. machA.austin.ibm.com) and is named "Event", the SERVICE configuration lines in the STAF configuration file might look like the following:

  ```
  SERVICE STAX LIBRARY JSTAF EXECUTE C:\STAF\services\stax\STAX.jar \
               PARMS "EVENTSERVICEMACHINE machA.austin.ibm.com"
  ```

  Note that since each SERVICE configuration statement must be entered as one continuous line, a backslash (\) can be used at the end of the prior line to indicate you're continuing on the next line.

- If you want the STAX service to use 8 physical threads, and you want to disable resetting the Job ID to 1, and you want to enable clearing the job logs, and the STAX and Event services are installed on the same system, the SERVICE configuration lines in the STAF configuration file might look like the following:

  ```
  SERVICE STAX LIBRARY JSTAF EXECUTE C:\STAF\services\stax\STAX.jar \
          PARMS "NUMTHREADS 8 RESETJOBID Disabled CLEARLOGS Enabled"
  SERVICE EVENT LIBRARY JSTAF EXECUTE C:\STAF\services\stax\STAFEvent.jar
  ```

- If you want the STAX service to run in a separate JVM named STAX and you want to increase the JVM's maximum heap size to 512M, and the STAX and Event services are installed on the same system, the SERVICE configuration lines in the STAF configuration file might look like the following:

```
SERVICE STAX LIBRARY JSTAF EXECUTE C:\STAF\services\stax\STAX.jar \
             OPTION JVMName=STAX OPTION J2=-Xmx512m
SERVICE EVENT LIBRARY JSTAF EXECUTE C:\STAF\services\stax\STAFEvent.jar
```

  Note that the -X Java options are non-standard and can vary by Java version. Use the "java -X" command to display the non-standard options available for the Java you are using.

- If you want the STAX service to run in a separate JVM named STAX, and you want to increase the JVM's maximum heap size to 1024M and increase the JVM's maximum permanent generation space to 256M, and the STAX and Event services are installed on the same system, the SERVICE configuration lines in the STAF configuration file might look like the following:

```
SERVICE STAX LIBRARY JSTAF EXECUTE C:\STAF\services\stax\STAX.jar \
             OPTION JVMName=STAX \
             OPTION "J2=-Xmx1024m -XX:MaxPermSize=256m -XX:PermSize=256m"
SERVICE EVENT LIBRARY JSTAF EXECUTE C:\STAF\services\stax\STAFEvent.jar
```

- If you want the STAX service to do file caching with a maximum file cache size of 40 and to use the Least Frequently Used (LFU) caching algorithm with a maximum age of 12h for cached files, and a maximum return file size of 25M, and the STAX and Event services are installed on the same machine, the SERVICE configuration lines in the STAF configuration file might look like the following:

```
SERVICE STAX LIBRARY JSTAF EXECUTE C:\STAF\services\stax\STAX.jar \
             PARMS "MAXFILECACHESIZE 40 FILECACHEALGORITHM LFU \
                    MAXFILECACHEAGE 12h MAXRETURNFILESIZE 25m"
SERVICE EVENT LIBRARY JSTAF EXECUTE C:\STAF\services\stax\STAFEvent.jar
```

- If you want the STAX and Event services to run in a separate JVM named STAX using the Java executable located in C:\j2sdk1.5.0\bin and you want the JVM to use 512M as the maximum memory allocation size, and the STAX and Event services are installed on the same system, the SERVICE configuration lines in the STAF configuration file might look like the following:

```
SERVICE STAX LIBRARY JSTAF EXECUTE C:\STAF\services\stax\STAX.jar \
             OPTION JVMName=STAX OPTION JVM=C:\j2sdk1.5.0\bin\java \
             OPTION J2=-Xmx512m
SERVICE EVENT LIBRARY JSTAF EXECUTE C:\STAF\services\stax\STAFEvent.jar \
              OPTION JVMName=STAX
```

Requesting Machine

Requesting machines are the ones that submit requests (e.g. EXECUTE, QUERY) to the STAX Service. Refer to the "Request Syntax"section for request details.

1. Install STAF by following the installation instructions in the STAF documentation.

2. A requesting machine must give a trust level of at least 4 to the STAX Service machine. The syntax for the `TRUST LEVEL` line that must be in the STAF configuration file on each requesting machine is:

```
TRUST LEVEL 4 MACHINE <STAX Service machine>
```

Execution Machine

Process execution machines have STAF processes and commands executed on them as defined by the STAX XML file.

1. Install STAF by following the installation instructions in the STAF documentation.

2. A process execution machine must give a trust level of 5 to the STAX Service machine. The syntax for the `TRUST LEVEL` line that must be in the STAF configuration file on each execution machine is:

```
TRUST LEVEL 5 MACHINE <STAX Service machine>
```

Monitoring Machine

STAX Monitoring machines can monitor the STAX jobs in progress.

1. Install Java 1.5 (aka 5.0) or later.

   The STAX Monitor is a Java application, so you need to install a JVM (e.g. Oracle or IBM) on the STAX Monitoring machine(s). IBM employees must download the Oracle or IBM JVM from the internal JIM site. Non-IBM users can download from http://www.oracle.com/technetwork/java/index.html. We recommend that you install the most recent fixpack for the JVM you want to use, so that you will have all of the latest fixes.

   Verify that the PATH environment variable contains the Java bin directory (e.g. C:\j2sdk1.5.0\bin). You can type "java -version" to check the version of Java that's in the PATH.

2. Install STAF 3.3.3 or later by following the installation instructions in the STAF documentation.

Verify that the CLASSPATH environment variable contains the JSTAF.jar file (e.g. C:\STAF\bin\JSTAF.jar or /usr/local/staf/lib/JSTAF.jar). JSTAF.jar contains the STAF Java APIs to communicate with STAF from Java programs and is required to register STAF services written in Java.

3. Install the STAX Monitor by copying the STAXMon.jar file onto the system. Note that the STAXMon.jar file is obtained by extracting the STAX zip/tar file as was already done on the STAX Service machine. We highly recommend copying it into a first or second level directory, such as services or services/stax, off of your STAF root directory (e.g. C:\STAF\services or C:\STAF\services\stax on Windows, /usr/local/staf/services or /usr/local/staf/services/stax on Unix) or to make starting the STAX Monitor easier.

4. The STAX Monitor (V3.5.17) must be configured to use a STAX service machine that is running STAX V3.5.9 or later.

5. A STAX Monitoring machine must give a trust level of at least 3 to the STAX Service machine. The syntax for the line that must be in the STAF configuration file on each STAX Monitoring machine is:

```
TRUST LEVEL 3 MACHINE <STAX Service machine>
```

Request Syntax

The STAX service provides the following requests:

- EXECUTE - Starts a job running based on a XML document which defines the workflow for a job.
- GET RESULT - Gets the results for a STAX job that has completed executing.
- GET DTD - Gets the STAX DTD (Document Type Definition).
- HELP - Displays a list of requests for the STAX service and how to use them.
- HOLD - Holds a job or a block in a job that is currently running.
- LIST - Lists all currently running jobs, or the number of jobs currently running, or specific information about a single job, or the settings for the STAX service, or the file cache.
- LOG MESSAGE - Logs a message to the STAX Job User Log for a job that is currently running and, optionally, sends the message to the STAX Monitor.
- QUERY - Queries information about a job that is currently running.
- RELEASE - Releases a job or a block in a job that is in the hold state.
- SEND MESSAGE - Sends a message to the STAX Monitor for a job that is currently running.
- STOP PROCESS - Stops a process in a job that is currently running.
- ADD BREAKPOINT - Adds a breakpoint for a job that is currently running.
- REMOVE BREAKPOINT - Removes a breakpoint for a job that is currently running.
- RESUME THREAD - Resumes a thread that is at a breakpoint
- STEP THREAD - Steps a thread that is at a breakpoint

- PYEXEC - Executes Python code in the specified thread
- SET - Sets STAX service options.
- START TESTCASE - Starts a new testcase in a job that is currently running.
- STOP TESTCASE - Stops a testcase or thread in a job that is currently running.
- TERMINATE - Terminates a job or a block in a job.
- UPDATE TESTCASE - Updates the status of a testcase in a job that is currently running.
- NOTIFY REGISTER/UNREGISTER - Registers or unregisters to receive a notification when a STAX job ends.
- NOTIFY LIST - Displays the job end notification list for a given job or all jobs.
- PURGE <FILECACHE | MACHINECACHE> - Clears the contents of the file cache or the machine cache.
- VERSION - Displays the version of the STAX service or the version of Jython packaged with the STAX service.

Here's the complete help syntax for the STAX service, with no STAX extensions registered. Note that STAX extensions can add additional options to the LIST and QUERY requests.

```
# STAF local STAX HELP
Response
--------
STAX Service Help:

EXECUTE   < <FILE <XML File Name> [MACHINE <Machine Name>]> | DATA <XML Data> >
          [JOBNAME <Job Name>] [FUNCTION <Function Name>] [ARGS <Arguments>]
          [SCRIPTFILE <File Name>... [SCRIPTFILEMACHINE <Machine Name>]]
          [SCRIPT <Python Code>]... [CLEARLOGS [<Enabled | Disabled>]]
          [ WAIT [<Number>[s|m|h|d|w]] [RETURNRESULT [DETAILS]] |
            HOLD [<Number>[s|m|h|d|w]] | TEST [RETURNDETAILS] ]
          [ NOTIFY ONEND [BYNAME] [PRIORITY <Priority>] [KEY <Key>] ]
          [LOGTCELAPSEDTIME <Enabled | Disabled>]
          [LOGTCNUMSTARTS <Enabled | Disabled>]
          [LOGTCSTARTSTOP <Enabled | Disabled>]
          [PYTHONOUTPUT <Python Output>] [PYTHONLOGLEVEL <Log Level>]
          [INVALIDLOGLEVELACTION <RaiseSignal | LogInfo>]
          [ BREAKPOINT <Function name> | <Line>[@@<File>[@@<Machine>]] ]...
          [BREAKPOINTFIRSTFUNCTION] [BREAKPOINTSUBJOBFIRSTFUNCTION]

GET       DTD
GET       RESULT JOB <Job ID> [DETAILS]

LIST      JOBS [TOTAL] | SETTINGS | MACHINECACHE |
          FILECACHE [SORTBYLRU | SORTBYLFU | SUMMARY] |
          TIMEDEVENTQUEUE [JOB <Job ID>] [TOTAL} |
```

```
            EXTENSIONS | EXTENSIONJARFILES |
            JOB <Job ID> <THREADS [LONG] | < THREAD <Thread ID> VARS [SHORT] > |
                         PROCESSES | STAFCMDS | SUBJOBS | BLOCKS | TESTCASES |
                         BREAKPOINTS | FUNCTIONS [| <List Type>]...>

QUERY       EXTENSIONJARFILE <Jar File Name> | EXTENSIONJARFILES |
            JOB <Job ID> [THREAD <Thread ID> [ VAR <VarName> [SHORT] ] |
                         PROCESS <Location:Handle> | STAFCMD <Request#> |
                         BLOCK <Block Name> | TESTCASE <Test Name> |
                         FUNCTION <Function Name>
                         [| <Query Type> <Type Value>]...]

STOP        JOB <Job ID> PROCESS <Location:Handle>

HOLD        JOB <Job ID> [BLOCK <Block Name>] [TIMEOUT [[s|m|h|d|w]]]

RELEASE     JOB <Job ID> [BLOCK <Block Name>]

TERMINATE   JOB <Job ID> [BLOCK <Block Name>]

START       JOB <Job ID> TESTCASE <Testcase name> [KEY <Key>]
            [PARENT <Testcase name>]

STOP        JOB <Job ID> TESTCASE <Testcase name> [KEY <Key>]

UPDATE      JOB <Job ID> TESTCASE <Testcase name> STATUS <Status>
            [MESSAGE <Message text>] [FORCE [PARENT <Testcase name>]]

LOG         JOB <Job ID> MESSAGE <Message> [LEVEL <Level>] [SEND]

SEND        JOB <Job ID> MESSAGE <Message>

ADD         JOB <Job ID> BREAKPOINT
             < FUNCTION <Function Name> |
               LINE <Line Number> [FILE <XML File>] [MACHINE <Machine Name>] >

REMOVE      JOB <Job ID> BREAKPOINT <Breakpoint ID>

RESUME      JOB <Job ID> THREAD <Thread ID>

STEP        JOB <Job ID> THREAD <Thread ID> [INTO | OVER]
```

```
STOP      JOB <Job ID> THREAD <Thread ID>

PYEXEC    JOB <Job ID> THREAD <Thread ID> CODE <Python Code>

SET       [CLEARLOGS <Enabled | Disabled>]
          [LOGTCELAPSEDTIME <Enabled | Disabled>]
          [LOGTCNUMSTARTS <Enabled | Disabled>]
          [LOGTCSTARTSTOP <Enabled | Disabled>]
          [PYTHONOUTPUT <Python Output>]
          [PYTHONLOGLEVEL <Log Level>]
          [INVALIDLOGLEVELACTION <RaiseSignal | LogInfo>]
          [EVENTGENERATION <Enabled | Disabled>]
          [FILECACHING <Enabled | Disabled>]
          [MAXFILECACHESIZE <Max Files>]
          [FILECACHEALGORITHM <LRU | LFU>]
          [MAXFILECACHEAGE <Number>[s|m|h|d|w]]
          [MAXMACHINECACHESIZE <Max Machines>]
          [MAXRETURNFILESIZE <Number>[k|m]]
          [MAXGETQUEUEMESSAGES <Number>]
          [MAXSTAXTHREADS <Number>]
          [DEBUGTHREAD <Enabled | Disabled>}
          [DEBUGCLONEFUNCTION <Enabled | Disabled>]
          [DEBUGPROCESS <Enabled | Disabled>}
          [DEBUGXMLPARSE <Enabled | Disabled>}

NOTIFY    REGISTER   ONENDOFJOB <Job ID> [BYNAME] [PRIORITY <Priority>]
NOTIFY    UNREGISTER ONENDOFJOB <Job ID>
NOTIFY    LIST       [JOB <Job ID>]

PURGE     <FILECACHE | MACHINECACHE> CONFIRM

VERSION   [JYTHON]

HELP
```

EXECUTE

EXECUTE starts the execution of a job based on an input XML document which defines the workflow for a job.

Syntax

```
EXECUTE   < <FILE <XML File Name> [MACHINE <Machine Name>]> | DATA <XML Data> >
          [JOBNAME <Job Name>] [FUNCTION <Function Name>] [ARGS <Arguments>]
          [SCRIPTFILE <File Name>... [SCRIPTFILEMACHINE <Machine Name>]]
          [SCRIPT <Python Code>]... [CLEARLOGS [<Enabled | Disabled>]]
          [ WAIT [<Number>[s|m|h|d|w]] [RETURNRESULT [DETAILS]] |
            HOLD [<Number>[s|m|h|d|w]] | TEST [RETURNDETAILS] ]
          [ NOTIFY ONEND [BYNAME] [PRIORITY <Priority>] [KEY <Key>] ]
          [LOGTCELAPSEDTIME <Enabled | Disabled>]
          [LOGTCNUMSTARTS <Enabled | Disabled>]
          [LOGTCSTARTSTOP <Enabled | Disabled>]
          [PYTHONOUTPUT <Python Output>] [PYTHONLOGLEVEL <Log Level>]
          [INVALIDLOGLEVELACTION <RaiseSignal | LogInfo>]
          [ BREAKPOINT <Function name> | <Line>[@@<File>[@@<Machine>]] ]...
          [BREAKPOINTFIRSTFUNCTION] [BREAKPOINTSUBJOBFIRSTFUNCTION]
```

`FILE` specifies the fully qualified name of a file containing the XML document for the job to be executed. This option will resolve STAF variables. If file caching is enabled, the file cache will be checked for an up-to-date copy of the file before loading it from the target machine. For a cache hit to occur, the **MACHINE** and **FILE** options must match those of a file cache entry. If the file is retrieved from cache, there is an increase in performance for the EXECUTE operation. For more information on how file caching works, refer to the "STAX File and Machine Caching" section.

`MACHINE` specifies the endpoint for the machine where the `FILE` is located. If not specified, it assumes the file is on the machine submitting the STAX EXECUTE request. This option will resolve STAF variables. If machine caching is enabled and the machine where the file resides is not the STAX service machine, the machine cache will be checked to see if information about this machine has been stored. If the machine already exists in the cache, then no additional information about the machine is required which can improve performance for the EXECUTE operation. For more information on how machine caching works, refer to the "STAX File and Machine Caching" section.

`DATA` specifies a string containing the XML document for the job to be executed.

`JOBNAME` specifies the name of the job. This can aid in the identification of a specific job. The job name defaults to the value of the function name called to start the job. This option will resolve STAF variables.

`FUNCTION` specifies the name of the function element to call to start the job, overriding the defaultcall element, if any, specified in the XML document. The <function name> must be an name of a function element specified in the XML document. This option will resolve STAF variables.

`ARGS` specifies arguments to pass to the function element called to start the job, overriding the arguments, if any, specified for the defaultcall element in the XML document. This option will not resolve STAF variables. This option will handle private data.

SCRIPTFILE specifies the fully qualified name of a file containing Python code to be executed. This is like a <script> element in root <stax> element in the XML document, but defined when submitting an execute request, rather than within the XML document. Note that a SCRIPTFILE parameter specified in an execute request will be executed by the STAX service after any "global" <script> elements (that is, those contained directly within the root <stax> element), but before any SCRIPT parameters are executed. Thus, you can override the value of a variable specified in a global <script> element by using a SCRIPTFILE parameter in the execute request. You may specify as many SCRIPTFILE parameters as needed. This option will resolve STAF variables.

SCRIPTFILEMACHINE specifies the endpoint for the machine where the SCRIPTFILE(s) are located. If not specified, it defaults to the value specified for MACHINE. If a MACHINE option was not specified, it assumes the script file(s) are on the machine submitting the STAX EXECUTE request. This option will resolve STAF variables.

SCRIPT defines Python code to be executed. This is like a <script> element in root <stax> element in the XML document, but defined when submitting an execute request, rather than within the XML document. Note that a script parameter specified in an execute request will be executed by the STAX service after any "global" <script> elements (that is, those contained directly within the root <stax> element) and after any SCRIPTFILE parameters are executes, but before the starting function is called. Thus, you can override the value of a variable specified in a global <script> element or in a SCRIPTFILE by using a script parameter in the execute request. You may specify as many SCRIPT parameters as needed. This option will handle private data.

CLEARLOGS is used to indicate that the STAX Job and Job User logs should be deleted before the job is executed. Since STAX job numbers are reused if you don't disable RESETJOBID when registering the STAX service, a specific job log may contain the results for more than one job. Valid values are "Enabled" and "Disabled", not case-sensitive. If you specify "Enabled" or no value, the log files will be deleted for the job that is about to execute, in order to ensure that only one job's contents are in the log. If you specify "Disabled", the job logs will not be deleted. This overrides the service setting for "Clear Logs". This option will resolve STAF variables.

WAIT is used to specify that the STAX EXECUTE request should not return until the STAX job has completed. You may specify an optional time duration, after which the request should timeout and return. If no time duration is specified, the request will wait indefinitely until the job has finished executing. This option will resolve STAF variables. The time duration may be expressed in milliseconds, seconds, minutes, hours, days, or weeks. Its format is <Number>[s|m|h|d|w], where <Number> is an integer >= 0 and indicates milliseconds unless one of the following case-insensitive suffixes is specified:

- s (for seconds)
- m (for minutes)
- h (for hours)
- d (for days)
- w (for weeks).

Note that the calculated timeout cannot exceed 4294967294 milliseconds. So, the maximum values in each time category that can be specified are:

- 4294967294 (4294967294 milliseconds)
- 4294967s (4294967 seconds)
- 71582m (71582 minutes)
- 1193h (1193 hours)

- 49d (49 days)
- 7w (7 weeks)

RETURNRESULT is used to specify that you want completion results for the job returned. This includes information like the job status, result, errors logged in the job log, testcase totals, etc. This option is only valid if the WAIT option is specified.

DETAILS is used to specify that you want detailed completion results for the job returned, including a list of the individual testcase results. This option is only valid if the WAIT and RETURNRESULT options are specified.

HOLD is used to hold the job after it has been successfully parsed and the job id has been returned. This allows you to start the STAX Monitor application and then release the job so that you can monitor the job from its beginning if desired. You may specify an optional time duration which indicates the maximum length of time the job will be held before being automatically released. If no time duration is specified, the default is to hold the job indefinitely. This option will resolve STAF variables. The time duration may be expressed in milliseconds, seconds, minutes, hours, days, or weeks. Its format is <Number>[s|m|h|d|w], where <Number> is an integer >= 0 and indicates milliseconds unless one of the following case-insensitive suffixes is specified:

- s (for seconds)
- m (for minutes)
- h (for hours)
- d (for days)
- w (for weeks).

Note that the calculated timeout cannot exceed 4294967294 milliseconds. So, the maximum values in each time category that can be specified are:

- 4294967294 (4294967294 milliseconds)
- 4294967s (4294967 seconds)
- 71582m (71582 minutes)
- 1193h (1193 hours)
- 49d (49 days)
- 7w (7 weeks)

TEST is used to test whether the execution options specified are valid, if an XML document is well-formed and valid, and if the Python code specified in the XML document compiles successfully. When this option is specified, execution of the job is not started.

RETURNDETAILS is used to specify that you want details about the functions defined for the specified XML document returned. This option is only valid if the TEST option is specified. You probably would not use this option unless you were writing your own application to submit a STAX job for execution. For example, the STAX Monitor application's Job Wizard submits a STAX EXECUTE request using this option to populate it's screens that allow you to select a function and enter argument values.

NOTIFY ONEND specifies that you wish to have a notification sent when this job ends. See "NOTIFY REGISTER/UNREGISTER" for the content of the notification message. The notification message will be sent to the machine that submitted the EXECUTE request.

BYNAME specifies that you wish to have the notification message sent when the job ends to the process(es) with the same machine and handle name of the process submitting the EXECUTE request. The default is to send the job end notification message to the queue of the machine/handle that submitted the EXECUTE request.

PRIORITY specifies the priority of the notification message. The default is 5. This option will resolve variables.

KEY specifies a key that will be included in the STAX Job End notification message. This option will resolve variables.

LOGTCELAPSEDTIME is used to specify whether to log the elapsed time in the summary "Status" record for each testcase written at the end of the STAX Job log and when you list testcases. Valid values are "Enabled" and "Disabled", not case-sensitive. This option overrides the service setting for "Log TC Elapsed Time". This option will resolve STAF variables.

LOGNUMSTARTS is used to specify whether to log the number of starts in the summary "Status" record for each testcase written at the end of the STAX Job log and when you list testcases. Valid values are "Enabled" and "Disabled", not case-sensitive. This option overrides the service setting for "Log TC Num Starts". This option will resolve STAF variables.

LOGTCSTARTSTOP is used to specify whether to log a "Start" record each time a testcase begins and to log a "Stop" record each time a testcase ends in the STAX Job log. Valid values are "Enabled" and "Disabled", not case-sensitive. This option overrides the service setting for "Log TC Start/ Stop". This option will resolve STAF variables.

PYTHONOUTPUT specifies where Python stdout/stderr should be redirected (e.g. if you use the print statement in a <script> element in a STAX job). This option overrides the service setting for "Python Output". This option will resolve STAF variables. Valid values are the following (not case-sensitive):

- "JobUserLog" indicates to log the Python output in the STAX Job User log.
- "Message" indicates to send the Python output to the STAX Monitor and display it in the Messages panel.
- "JobUserLogAndMsg" indicates to log the Python output in the STAX Job User log and to send it to the STAX Monitor and display it in the Messages panel.
- "JVMLog" indicates to write the Python output in the JVM Log for the STAX service using the following format so that you will know which STAX job originated the output and at what time:

```
<Timestamp> <Python Log Level> Job <JobID> <Python Output>
```

PYTHONLOGLEVEL specifies the STAF logging level to use when Python stdout is redirected to the STAX Job User Log, which means this option only has an effect if PYTHONOUTPUT is set to "JobUserLog" or "JobUserLogAndMsg". It must be one of the STAF logging levels (not case-sensitive): Fatal, Error, Warning, Info, Trace, Trace2, Trace3, Debug, Debug2, Debug3, Start, Stop, Pass, Fail, Status, User1, User2, User3, User4,

User5, User6, User7, or User8. This option overrides the service setting for "Python Log Level". This option will resolve STAF variables.

`INVALIDLOGLEVELACTION` specifies the action to take when a <log> or <message> element uses an invalid STAF logging level. This option overrides the service setting for "Invalid Log Level Action". This option will resolve STAF variables. Valid values are the following (not case-sensitive):

- "RaiseSignal" indicates to raise a STAXLogSignal. This is the default.
- "LogInfo" indicates to use the "Info" log level instead of the invalid log level.

`BREAKPOINT` specifies a function or line breakpoint to set for the job in the format `<Function name> | <Line>[@@<File> [@@<Machine>]]`. This option will resolve STAF variables. You can specify multiple `BREAKPOINT` options. For the `BREAKPOINT` value, you can specify a function name (case-sensitive), or a line number with an optional (fully-qualified path) XML file and an optional XML file machine.

- If a function name is specified, the STAX job will break whenever the function with that name is called (regardless of the XML file where the function is located). If you dynamically set a function name breakpoint, the STAX job will break the next time the function is called. Note that the function name is case-sensitive.
- If a line number is specified, and the XML file is not specified, the STAXJobXmlFile will be used. If the XML file machine is not specified, the STAX job will break immediately prior to executing the STAX task whose line number and XML file match (regardless of the task's XML file machine). The line number must be the line number of the beginning task element (i.e. to break on a <stafcmd>, the line number must be the line number for the <stafcmd>, not the <location>, <service>, <request>, or </stafcmd>).

`BREAKPOINTFIRSTFUNCTION` indicates to break at the first function that is called in the STAX job.

`BREAKPOINTSUBJOBFIRSTFUNCTION` indicates to break at the first function that is called in any subjobs started by the STAX job. This option propagates to any subjobs that the subjob starts.

For more information on using breakpoints, see **Using Breakpoints to Debug STAX Jobs**.

Security

This request requires at least trust level 4.

Results

- If an error occurs, the RC will be non-zero. Errors can result from invalid execution options, XML parsing errors, Python compile errors, etc. The result buffer will contain either:
  - a string containing an error message (if the error occurred before a Job ID was assigned), or

- a marshalled `<Map:STAF/Service/STAX/ExecuteErrorResult>` containing the Job ID in addition to an error message (if the error occurred after a Job ID was assigned). The map is defined as follows:

Definition of map class STAF/Service/STAX/ExecuteErrorResult			
Description: This map class represents the result when an error occurs submitting a job for execution if an error occurred after a Job ID was assigned.			
Key Name	**Display Name**	**Type**	**Format / Value**
jobID	Job ID	`<String>`	
errorMsg	Error Message	`<String>`	

- Upon successful return, the RC will zero. The result buffer will contain the following based on if the `TEST [RETURNDETAILS]` or `WAIT [<Number>[s|m|h|d|w]] [RETURNRESULT [DETAILS]]` option is specified on the `EXECUTE` request:

  - If neither the `TEST` nor `WAIT` option is specified, the result buffer will contain the Job ID. Note that when the `WAIT` option is not specified, the `EXECUTE` request returns as soon as it starts the STAX job and does not wait to return until the STAX job has completed.

  - If the `WAIT` option is specified:

    - If a timeout value is specified for the `WAIT` option and the request times out before the Job has completed, a RC 37 (Timeout) is returned and the result buffer will contain the Job ID.

    - If the `RETURNRESULT` option is not specified and the request does not timeout before the Job has completed, the result buffer will contain the Job ID.

    - If the `RETURNRESULT` option is specified and the `DETAILS` option is not specified and the request does not timeout before the Job has completed, the result will contain a marshalled `<Map:STAF/Service/STAX/JobResult>` representing the job result. The map is defined as follows:

Definition of map class STAF/Service/STAX/JobResult			
Description: This map class represents the result from a STAX job.			
Key Name	**Display Name**	**Type**	**Format / Value**
jobID	Job ID	`<String>`	
startTimestamp	Start Date-Time	`<String>`	`<YYYYMMDD-HH:MM:SS>`
endTimestamp	End Date-Time	`<String>`	`<YYYYMMDD-HH:MM:SS>`

status	Status	`<String>`	`'Normal' | 'Terminated' | 'Abnormal' | 'Unknown'`
result	Result	`<String> | <None>`	
jobLogErrors	Job Log Errors	`<List> of <Map:STAF/Service/Log/LogRecord>`	
testcaseTotals	Testcase Totals	`<Map:STAF/Service/STAX/TestcaseTotals>`	

Notes:

1. The "Status" value is the job completion status and it is set to one of the following:
   - `'Normal'` if the job ended normally
   - `'Terminated'` if the job was terminated (this means if the 'main' block was terminated)
   - `'Abnormal'` if the job ended abnormally. This can happen when at least one unhandled inherited condition remains on the condition stack when the job completes. For example, this can occur when a break or continue condition remains on the condition stack because there was no outer loop or iterate element, or when an exception is thrown but there's no catch element for it. This state takes precedence if the job is also terminated.
   - `'Unknown'` if the job has an unknown status. This should not occur.

2. The "Result" value is set to a "string" version of whatever the job specified to return, or <None> if the job did not specify anything to return.

   The job may not return anything if a <return> element is not executed in the starting function. This could be due to many reasons, such as an error occurring, the job being terminated, or if the starting function doesn't contain a <return> element.

3. The "Job Log Errors" value is a list of any errors logged in the STAX Job Log. If the DEFAULTMAXQUERYRECORDS setting for the LOG service on the STAX service machine is set to a non-zero number (the default is 100), then the maximum number of errors logged will be limited to this number (e.g. equivalent to specifying LAST <Number> on the LOG QUERY request).

- If the `RETURNRESULT DETAILS` options are specified and the request does not timeout before the Job has completed, the result will contain a marshalled `<Map:STAF/Service/STAX/JobDetailedResult>` representing the job result, including a list of the individual testcase results. The map is defined as follows:

Definition of map class STAF/Service/STAX/JobDetailedResult			
Description: This map class represents the detailed result from a STAX job.			
Key Name	**Display Name**	**Type**	**Format / Value**

jobID	Job ID	<String>	
startTimestamp	Start Date-Time	<String>	<YYYYMMDD-HH:MM:SS>
endTimestamp	End Date-Time	<String>	<YYYYMMDD-HH:MM:SS>
status	Status	<String>	'Normal' | 'Terminated' | 'Abnormal' | 'Unknown'
result	Result	<String> | <None>	
jobLogErrors	Job Log Errors	<List> of <Map:STAF/Service/Log/LogRecord>	
testcaseTotals	Testcase Totals	<Map:STAF/Service/STAX/TestcaseTotals>	
testcaseList	Testcases	<List> of <Map:STAF/Service/STAX/QueryTestcase>	

Notes:

1. The "Status" value is the job completion status and it is set to one of the following:
   - `'Normal'` if the job ended normally
   - `'Terminated'` if the job was terminated (this means if the 'main' block was terminated or if an error occurred before the 'main' block was started)
   - `'Abnormal'` if the job ended abnormally. This can happen when at least one unhandled inherited condition remains on the condition stack when the job completes. For example, this can occur when a break or continue condition remains on the condition stack because there was no outer loop or iterate element, or when an exception is thrown but there's no catch element for it. This state takes precedence if the job is also terminated.
   - `'Unknown'` if the job has an unknown status. This should not occur.

2. The "Result" value is set to a "string" version of whatever the job specified to return, or <None> if the job did not specify anything to return.

   The job may not return anything if a <return> element is not executed in the starting function. This could be due to many reasons, such as an error occurring, the job being terminated, or if the starting function doesn't contain a <return> element.

3. The "Job Log Errors" value is a list of any errors logged in the STAX Job Log. If the DEFAULTMAXQUERYRECORDS setting for the LOG service on the STAX service machine is set to a non-zero number (the default is 100), then the maximum number of errors logged will be limited to this number (e.g. equivalent to specifying LAST <Number> on the LOG QUERY request).

- If the `TEST` option is specified:

  - If the `RETURNDETAILS` option was not specified, the result buffer will contain the job ID. This indicates that no errors were found in the XML document.

  - If the `RETURNDETAILS` option is specified, the result buffer will contain a marshalled `<Map:STAF/Service/STAX/JobDetails` representing details about the functions defined in the XML document. The maps used to define the result are defined as follows:

Definition of map class STAF/Service/STAX/JobDetails			
Description: This map class represents details about the functions defined in the STAX XML document. This information is obtained by checking for <defaultcall> and <function> elements in the STAX XML document.			
Key Name	**Display Name**	**Type**	**Format / Value**
jobID	Job ID	`<String>`	
defaultCall	Default Call	`<String>`	
functionList	Functions	`<List> of <Map:STAF/Service/STAX/FunctionInfo>`	

Definition of map class STAF/Service/STAX/FunctionInfo			
Description: This map class represents a function defined in the STAX XML document. This information is from each <function> element (and it's sub-elements) defined in the STAX XML document.			
Key Name	**Display Name**	**Type**	**Format / Value**
functionName	Function Name	`<String>`	
prolog	Prolog	`<String>`	
epilog	Epilog	`<String>`	
argDefinition	Argument Definition	`<String>`	`'FUNCTION_DEFINES_NO_ARGS' | 'FUNCTION_ALLOWS_NO_ARGS' | 'FUNCTION_DEFINES_ONE_ARG' | 'FUNCTION_DEFINES_LIST_ARGS' | 'FUNCTION_DEFINES_MAP_ARGS' | 'FUNCTION_DEFINES_UNKNOWN_ARGS'`
argList	Arguments	`<List> of <Map:STAF/Service/STAX/ArgInfo>`	

Definition of map class STAF/Service/STAX/ArgInfo

Description: This map class represents a function argument. This information is obtained from each <function-required-arg>, <function-optional-arg> or <function-arg-def> element (and it's sub-elements) defined for a function in the STAX XML document.

Key Name	Display Name	Type	Format / Value
argName	Argument Name	`<String>`	
description	Description	`<String>`	
type	Type	`<String>`	`'ARG_REQUIRED' | 'ARG_OPTIONAL' | 'ARG_OTHER'`
defaultValue	Default Value	`<String> | <None>`	
private	Private	`<String>`	`'Yes' | 'No'`
properties	Properties	`<List> of <Map:STAF/Service/STAX/ArgPropertyInfo>`	

Notes:

1. The "Default Value" is `<None>` if the argument type is `'ARG_REQUIRED'` or `'ARG_OTHER'`.

Definition of map class STAF/Service/STAX/ArgPropertyInfo

Description: This map class represents a property for a function argument. This information is obtained from each <function-arg-property> element defined for a function argument in the STAX XML document.

Key Name	Display Name	Type	Format / Value
propertyName	Name	`<String>`	
propertyDescription	Description	`<String> or <None>`	
propertyValue	Value	`<String> or <None>`	
propertyData	Data	`<List> of <Map:STAF/Service/STAX/ArgPropertyDataInfo>`	

Definition of map class STAF/Service/STAX/ArgPropertyDataInfo

Description: This map class represents data for a property of a function argument. This information is obtained from each <function-arg-property-data> element defined for a property of a function argument in the STAX XML document.

Key Name	Display Name	Type	Format / Value
dataType	Type	<String>	
dataValue	Value	<String> or <None>	
dataData	Data	<List> of <Map:STAF/Service/STAX/ArgPropertyDataInfo>	

Examples

- **Goal:** Test if a XML job file named d:\stax\xml\JobA.xml is valid without actually starting the execution of the job.

  ```
  EXECUTE FILE D:\stax\xml\JobA.xml TEST
  ```

  Output:

  The job ID is returned if there are no errors (e.g. no XML parsing or Python compile errors in the XML document).

- **Goal:** Execute a job defined by an XML file named d:\stax\xml\JobA.xml and give it a job name of JobA.

  ```
  EXECUTE FILE D:\stax\xml\JobA.xml JOBNAME JobA
  ```

  Output: If the request is submitted from the command line and the job is started successfully with job ID 1, the result, in default format, could look like:

  ```
  1
  ```

- **Goal:** Execute a job defined by an XML file named C:\stax\xml\JobA.xml and have a notification sent when this job ends to the queue of the machine/handle that submitted the EXECUTE request.

  ```
  EXECUTE FILE C:\stax\xml\JobA.xml JOBNAME JobA NOTIFY ONEND
  ```

  Output: If the request is submitted from the command line and the job is started successfully with job ID 2, the result, in default format, could look like:

  ```
  2
  ```

- **Goal:** Execute a job defined by an XML file named d:\stax\xml\Ogre.xml which is located on machine client1.austin.ibm.com and assign a

literal string 'OgreSrv1' to a Python variable named S1.

```
EXECUTE FILE C:\stax\Ogre.xml MACHINE client1.austin.ibm.com SCRIPT "S1 = 'OgreSrv1'"
```

Output: If the request is submitted from the command line and the job is started successfully with job ID 3, the result, in default format, could look like:

```
3
```

- **Goal:** Execute a job defined by an XML file named /tests/test1.xml which is located on machine client1 and execute Python code contained in file /tests/init1.py located on machine client2.

```
EXECUTE FILE /tests/test1.xml MACHINE client1 SCRIPTFILE /tests/init1.py SCRIPTFILEMACHINE
client2
```

Output: If the request is submitted from the command line and the job is started successfully with job ID 4, the result, in default format, could look like:

```
4
```

- **Goal:** Execute a job defined by an XML file named d:\stax\xml\ProcessXYZ.xml, starting at ProcessY, and hold the job indefinitely so that it can be monitored from the beginning.

```
EXECUTE FILE D:\stax\xml\ProcessXYZ.xml JOBNAME JobXYZ FUNCTION ProcessY HOLD
```

Output: If the request is submitted from the command line and the job is started successfully with job ID 5, the result, in default format, could look like:

```
5
```

- **Goal:** Execute a job defined by an XML file named d:\stax\xml\ProcessXYZ.xml, starting at ProcessY, and hold the job for up to 1 minute so that it can be monitored from the beginning.

```
EXECUTE FILE D:\stax\xml\ProcessXYZ.xml JOBNAME JobXYZ FUNCTION ProcessY HOLD 1m
```

Output: If the request is submitted from the command line and the job is started successfully with job ID 5, the result, in default format, could look like:

```
5
```

- **Goal:** Execute a job defined by an XML file named /test/staxtest.xml located on the local machine, starting at function Main, and pass a list of tests as the arguments to the function.

  ```
  EXECUTE FILE /test/staxtest.xml FUNCTION Main ARGS "['test1', 'test2', 'test3']"
  ```

  Output: If the request is submitted from the command line and the job is started successfully with job ID 6, the result, in default format, could look like:

  ```
  6
  ```

- **Goal:** Execute a job defined by an XML file named /test/sample.xml located on the local machine, starting at function InitJob, and pass a map that contains a list of machines and a duration as the arguments to the function.

  ```
  EXECUTE FILE /test/sample.xml FUNCTION InitJob ARGS "{ 'MachList': ['machA', 'machB'],
  'duration': '5m' }"
  ```

  Output: If the request is submitted from the command line and the job is started successfully with job ID 7, the result, in default format, could look like:

  ```
  7
  ```

- **Goal:** Execute a job defined by an XML file named /test/serverTest.xml located on the local machine, starting at function Main, and pass a map that contains the name of a server and a password as the arguments to the function. Use privacy delimiters to protect the password.

  ```
  EXECUTE FILE /test/serverTest.xml FUNCTION Main ARGS "{ 'server': 'server1', 'password': '!!
  @secret@!!' }"
  ```

  Output: If the request is submitted from the command line and the job is started successfully with job ID 8, the result, in default format, could look like:

  ```
  8
  ```

- **Goal:** Execute a job defined by an XML file named d:\stax\xml\JobA.xml and wait indefinitely for the job to complete before returning the completion results for the job in the result buffer.

  ```
  EXECUTE FILE D:\stax\xml\JobA.xml WAIT RETURNRESULT
  ```

  Output: If the request is submitted from the command line and the job is started successfully with job ID 1 and the job completes normally,

returning 0, and runs 1 testcase with a total of 1 pass and 0 fails, then the result, in default format, could look like:

```
{
  Job ID         : 1
  Start Date-Time: 20101008-14:30:27
  Stop Date-Time : 20101008-14:32:29
  Status         : Normal
  Result         : 0
  Job Log Errors : []
  Testcase Totals: {
    Tests : 1
    Passes: 1
    Fails : 0
  }
}
```

Or, if the job was terminated due to a STAXPythonEvaluationError signal being raised because an undefined Python variable (e.g. myVar) was referenced, the result, in default format, could look like:

```
{
  Job ID         : 1
  Start Date-Time: 20101008-14:30:27
  Stop Date-Time : 20101008-14:30:29
  Status         : Terminated
  Result         : None
  Job Log Errors : [
    {
      Date-Time: 20101008-14:30:28
      Level    : Error
      Message  : STAXPythonEvaluationError signal raised. Terminating job.

===== XML Information =====

File: D:\stax\xml\JobA.xml, Machine: local://local
Line 32: Error in element type "script".

===== Python Error Information =====

com.ibm.staf.service.stax.STAXPythonEvaluationException:
Traceback (innermost last):
```

```
  File "", line 1, in ?
NameError: myVar

===== Call Stack for STAX Thread 1 =====

[
  function: main (Line: 8, File: D:\stax\xml\JobA.xml, Machine: local://local)
  sequence: 2/2 (Line: 13, File: D:\stax\xml\JobA.xml, Machine: local://local)
]
    }
  ]
  Testcase Totals: {
    Tests : 1
    Passes: 1
    Fails : 0
  }
}
```

- **Goal:** Execute a job defined by an XML file named /tests/myJob.xml and wait indefinitely for the job to complete before returning the detailed completion results for the job in the result buffer.

  ```
  EXECUTE FILE /tests/myJob.xml WAIT RETURNRESULT DETAILS
  ```

  Output: If the request is submitted from the command line and the job is started successfully with job ID 2 and the job completes normally, returning 'Success!', and runs 2 testcases with a total of 20 passes and 0 fails, then the result, in default format, could look like:

  ```
  {
    Job ID         : 2
    Start Date-Time: 20101028-14:39:49
    Stop Date-Time : 20101028-14:40:09
    Status         : Normal
    Result         : Success!
    Job Log Errors : []
    Testcase Totals: {
      Tests : 2
      Passes: 20
      Fails : 0
    }
    Testcases      : [
      {
  ```

```
      Testcase Name   : client1.Test1
      Passes          : 15
      Fails           : 0
      Start Date-Time : 20101028-14:39:49
      Elapsed Time    : 00:00:19
      Starts          : 1
      Status Date-Time: 20101028-14:40:08
      Last Status     : pass
      Information     :
      Testcase Stack  : [
        client1
        Test1
      ]
    }
    {
      Testcase Name   : client1.Test2
      Passes          : 5
      Fails           : 0
      Start Date-Time : 20101028-14:39:50
      Elapsed Time    : 00:00:17
      Starts          : 1
      Status Date-Time: 20101028-14:40:07
      Last Status     : pass
      Information     :
      Testcase Stack  : [
        client1
        Test2
      ]
    }
  ]
}
```

- **Goal:** Execute a job defined by an XML file named /tests/webTest.xml and wait indefinitely for the job to complete before returning and return the job result in addition to the job ID in the result buffer.

  ```
  EXECUTE FILE /tests/webTest.xml WAIT RETURNRESULT
  ```

  Output: If the request is submitted from the command line and the job is started successfully with job ID 3 and the job completes normally, returning nothing, then the result, in default format, could look like:

```
{
  Job ID         : 3
  Start Date-Time: 20101028-14:35:01
  Stop Date-Time : 20101028-14:39:19
  Status         : Normal
  Job Log Errors : []
  Result         : None
  Testcase Totals: {
    Tests : 1
    Passes: 1
    Fails : 0
  }
}
```

- **Goal:** Execute a job defined by an XML file named d:\stax\xml\JobA.xml and wait for up to 1 hour for the job to complete before returning.

  ```
  EXECUTE FILE D:\stax\xml\JobA.xml WAIT 1h
  ```

  Output: If the request is submitted from the command line and the job is started successfully with job ID 5, the result, in default format, could look like:

  ```
  5
  ```

- **Goal:** Execute a job defined by an XML file named /tests/Scenario1.xml and to clear its job logs before execution and to enable "Log TC Elapsed Time", "Log TC Num Starts", and "Log TC Start/Stops".

  ```
  EXECUTE FILE /tests/Scenario1.xml CLEARLOGS Enabled LOGTCELAPSEDTIME Enabled LOGTCNUMSTARTS
  Enabled LOGTCSTARTSTOP Enabled
  ```

  Output: If the request is submitted from the command line and the job is started successfully with job ID 6, the result, in default format, could look like:

  ```
  6
  ```

- **Goal:** Execute a job defined by an XML file named C:\stax\xml\JobA.xml and have a notification message with priority 3 and containing key "65:client1" sent when this job ends to the queue of the machine/handle name that submitted the `EXECUTE` request.

  ```
  EXECUTE FILE C:\stax\xml\JobA.xml JOBNAME JobA NOTIFY ONEND BYNAME PRIORITY 3 KEY "65:client1"
  ```

Output: If the request is submitted from the command line and the job is started successfully with job ID 7, the result, in default format, could look like:

```
7
```

- **Goal:** Execute a job defined by an XML file named c:/automation/runall.xml and have the STAX job reach a breakpoint every time the function named BeginRegressionTests is called

  ```
  EXECUTE FILE c:/automation/runall.xml BREAKPOINT BeginRegressionTests
  ```

  Output: If the request is submitted from the command line and the job is started successfully with job ID 8, the result, in default format, could look like:

  ```
  8
  ```

- **Goal:** Execute a job defined by an XML file named c:/automation/runall.xml and have the STAX job reach a breakpoint every time the STAX task at line 124 (in XML file c:/automation/runall.xml, since the file was not specified) executes, and every time the STAX task at line 38 in XML file c:/util/TestUtilityFunctions.xml executes (regardless of the machine where c:/util/TestUtilityFunctions.xml is located).

  ```
  EXECUTE FILE c:/automation/runall.xml BREAKPOINT 124 BREAKPOINT 38@@c:/util/
  TestUtilityFunctions.xml
  ```

  Output: If the request is submitted from the command line and the job is started successfully with job ID 9, the result, in default format, could look like:

  ```
  9
  ```

- **Goal:** Execute a job defined by an XML file named c:/automation/runall.xml and have the STAX job reach a breakpoint on the first function called.

  ```
  EXECUTE FILE c:/automation/runall.xml BREAKPOINTFIRSTFUNCTION
  ```

  Output: If the request is submitted from the command line and the job is started successfully with job ID 10, the result, in default format, could look like:

  ```
  10
  ```

- **Goal:** Execute a job defined by an XML file named c:/automation/runall.xml and have the STAX job break at the first function that is called in any subjobs started by the STAX job

```
EXECUTE FILE c:/automation/runall.xml BREAKPOINTSUBJOBFIRSTFUNCTION
```

Output: If the request is submitted from the command line and the job is started successfully with job ID 11, the result, in default format, could look like:

```
11
```

- **Goal:** Test if a XML job file named d:\stax\xml\JobA.xml is valid without actually starting the execution of the job and return information about the functions defined in this XML job file.

```
EXECUTE FILE D:\stax\xml\JobA.xml TEST RETURNDETAILS
```

Output:

```
{
  Job ID      : 1
  Default Call: RunCommand
  Functions   : [
    {
      Function Name      : RunCommand
      Prolog             :
      Epilog             :
      Argument Definition: FUNCTION_DEFINES_MAP_ARGS
      Arguments          : [
        {
          Argument Name: command
          Description  : A command to execute
          Type         : ARG_REQUIRED
          Default Value: <None>
          Private      : No
          Properties   : []
        }
        {
          Argument Name: user
          Description  : The user id to run the command under
          Type         : ARG_OPTIONAL
          Default Value: 'anonymous'
          Private      : No
          Properties   : []
```

```
}
{
  Argument Name: password
  Description  : The password for the user id
  Type         : ARG_OPTIONAL
  Default Value: None
  Private      : Yes
  Properties   : []
}
{
  Argument Name: numTimes
  Description  : The number of times to run the command
  Type         : ARG_OPTIONAL
  Default Value: 1
  Private      : No
  Properties   : [
    {
      Name       : type
      Description: <None>
      Value      : int
      Data       : []
    }
  ]
}
{
  Argument Name: color
  Description  : This is the color of the entity
  Type         : ARG_REQUIRED
  Default Value: <None>
  Private      : No
  Properties   : [
    {
      Name       : type
      Description: This defines this argument as an enumeration
      Value      : enum
      Data       : [
        {
          Type : choice
          Value: 'red'
          Data : [
            {
```

```
                    Type : default
                    Value: <None>
                    Data : []
                  }
                ]
              }
              {
                Type : choice
                Value: 'blue'
                Data : []
              }
              {
                Type : choice
                Value: 'green'
                Data : []
              }
            ]
          }
        ]
      }
    ]
  }
```

GET RESULT

GET RESULT gets the results for a completed STAX job.

You can only get the results for a STAX job that has completed, not for a STAX job that is currently running.

The STAX job results are also provided in the STAX Job Log which can be accessed using the STAF LOG service to query the log, but you have to parse the messages in the log to get individual data such as the total number of testcase passes and fails, etc. The `GET RESULT` request provides the testcase results as structured data in a marshalled string so you can use the STAF unmarshall API to get the result data without any parsing.

Note that the marshalled job results are stored in a file that exists until the STAX job ID is reused. Each time the STAX service is started and its RESETJOBID parameter is enabled (which is the default unless you set it to disabled), it resets to using job ID 1 for the first job executed. So the results for a job are available while the STAX service is running and after the STAX service has been unregistered and re-registered until the STAX job ID is reused.

Syntax

```
GET RESULT JOB <Job ID> [DETAILS]
```

`RESULT` specifies that you want results for the completed STAX job returned. This includes information like the job status, result, errors logged in the job log, testcase totals, etc.

`JOB` specifies the ID of a job that has completed and whose completion results you want returned.

`DETAILS` is used to specify that you want detailed results for the completed STAX job returned, including a list of the individual testcase results.

Security

This request requires at least trust level 2.

Results

Upon successful return, the result buffer will contain the completion results for the specified job ID. If the `DETAILS` option is not specified, you'll get the job results, including testcase totals, but not a detailed list of the individual testcase results. If the `DETAILS` option is specified, you'll also get the detailed list of the individual testcase results.

- The result buffer for a `GET RESULT JOB <Job ID>` request (without the `DETAILS` option will contain a marshalled `<Map:STAF/Service/STAX/GetResult>` which represents completion results for the specified STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/GetResult			
Description: This map class represents results for a completed STAX job.			
Key Name	**Display Name**	**Type**	**Format / Value**
jobName	Job Name	`<String> | <None>`	
startTimestamp	Start Date-Time	`<String>`	`<YYYYMMDD-HH:MM:SS>`
endTimestamp	End Date-Time	`<String>`	`<YYYYMMDD-HH:MM:SS>`
status	Status	`<String>`	`'Normal' | 'Terminated' | 'Abnormal' | 'Unknown'`
result	Result	`<String> | <None>`	
jobLogErrors	Job Log Errors	`<List> of <Map:STAF/Service/Log/LogRecord>`	

testcaseTotals	Testcase Totals	<Map:STAF/Service/STAX/TestcaseTotals>	
xmlFileName	XML File Name	<String>	
fileMachine	File Machine	<String>	
function	Function	<String>	
arguments	Arguments	<String> | <None>	Private data will be masked.
scriptList	Scripts	<List> of <String>	Private data will be masked.
scriptFileList	Script Files	<List> of <String>	
scriptMachine	Script Machine	<String> | <None>	

Notes:

1. The "Job Log Errors" value is a list of any errors logged in the STAX Job Log. If the DEFAULTMAXQUERYRECORDS setting for the LOG service on the STAX service machine is set to a non-zero number (the default is 100), then the maximum number of errors logged will be limited to this number (e.g. equivalent to specifying LAST <Number> on the LOG QUERY request).

The STAF/Service/Log/LogRecord map class is defined as follows:

Definition of map class STAF/Service/Log/LogRecord

Description: This map class represents information about a record logged in the STAX Job Log.

Key Name	Display Name	Type	Format / Value
timestamp	Date-Time	<YYYYMMDD-HH:MM:SS>	
level	Level	<String>	
message	Message	<String>	

The STAF/Service/STAX/TestcaseTotals map class is defined as follows:

Definition of map class STAF/Service/STAX/TestcaseTotals

Description: This map class represents testcase totals for a completed STAX job.

Key Name	Display Name	Type	Format / Value
numTests	Tests	<String>	
numPasses	Passes	<String>	
numFails	Fails	<String>	

- The result buffer for a `GET RESULT JOB <Job ID> DETAILS` request will contain a marshalled `<Map:STAF/Service/STAX/GetDetailedResult>` which represents detailed completion results the specified STAX job, including a list of the individual testcase results. The map class is defined as follows:

Definition of map class STAF/Service/STAX/GetDetailedResult			
Description: This map class represents detailed results for a completed STAX job.			
Key Name	**Display Name**	**Type**	**Format / Value**
jobName	Job Name	`<String> | <None>`	
startTimestamp	Start Date-Time	`<String>`	`<YYYYMMDD-HH:MM:SS>`
endTimestamp	End Date-Time	`<String>`	`<YYYYMMDD-HH:MM:SS>`
status	Status	`<String>`	`'Normal' | 'Terminated' | 'Abnormal' | 'Unknown'`
result	Result	`<String> | <None>`	
jobLogErrors	Job Log Errors	`<List> of <Map:STAF/Service/Log/LogRecord>`	
testcaseTotals	Testcase Totals	`<Map:STAF/Service/STAX/TestcaseTotals>`	
testcaseList	Testcases	`<List> of <Map:STAF/Service/STAX/QueryTestcase>`	
xmlFileName	XML File Name	`<String>`	
fileMachine	File Machine	`<String>`	
function	Function	`<String>`	
arguments	Arguments	`<String> | <None>`	Private data will be masked.
scriptList	Scripts	`<List> of <String>`	Private data will be masked.
scriptFileList	Script Files	`<List> of <String>`	
scriptMachine	Script Machine	`<String> | <None>`	

Notes:

1. The "Job Log Errors" value is a list of any errors logged in the STAX Job Log. If the DEFAULTMAXQUERYRECORDS setting for the LOG service on the STAX service machine is set to a non-zero number (the default is 100), then the maximum number of errors logged will be limited to this number (e.g. equivalent to specifying LAST <Number> on the LOG QUERY request).

Examples

- **Goal:** Get the results for completed STAX Job 1.

```
GET RESULT JOB 1
```

Output: If the request is submitted from the command line, the result, in verbose format, could look like:

```
{
  Job Name       : Test My Application
  Start Date-Time: 20101027-18:44:28
  End Date-Time  : 20101027-18:44:52
  Status         : Normal
  Result         : None
  Job Log Errors : []
  Testcase Totals: {
    Tests : 1
    Passes: 18
    Fails : 2
  }
  XML File Name  : c:\stax\myApp\testMyApp.xml
  File Machine   : local://local
  Function       : Main
  Arguments      : 'client1'
  Scripts        : []
  Script Files   : []
  Script Machine : <None>
}
```

Or, if the job had been terminated due to a STAXPythonEvaluationError signal being raised because the job referenced an undefined Python variable (e.g. myVar), the result, in verbose format, could look like:

```
{
  Job Name       : Test My Application
  Start Date-Time: 20101027-18:44:28
  End Date-Time  : 20101027-18:44:52
  Status         : Normal
  Result         : None
  Job Log Errors : [
    {
      Date-Time: 20101008-18:44:51
      Level    : Error
```

```
      Message  : STAXPythonEvaluationError signal raised. Terminating job.

===== XML Information =====

File: c:\stax\myApp\testMyApp.xml, Machine: local://local
Line 32: Error in element type "script".

===== Python Error Information =====

com.ibm.staf.service.stax.STAXPythonEvaluationException:
Traceback (innermost last):
  File "", line 1, in ?
NameError: myVar

===== Call Stack for STAX Thread 1 =====

[
  function: main (Line: 8, File: c:\stax\myApp\testMyApp.xml, Machine: local://local)
  sequence: 2/2 (Line: 13, File: c:\stax\myApp\testMyApp.xml, Machine: local://local)
]
    }
  ]
  Testcase Totals: {
    Tests : 1
    Passes: 0
    Fails : 0
  }
  XML File Name  : c:\stax\myApp\testMyApp.xml
  File Machine   : local://local
  Function       : Main
  Arguments      : 'client1'
  Scripts        : []
  Script Files   : []
  Script Machine : <None>
}
```

- **Goal:** Get the detailed results, including a testcase list, for completed STAX Job 1.

```
GET RESULT JOB 1 DETAILS
```

Output: If the request is submitted from the command line, the result, in verbose format, could look like:

```
{
  Job Name       : Test My Application
  Start Date-Time: 20101027-18:44:28
  End Date-Time  : 20101027-18:44:52
  Status         : Normal
  Result         : None
  Job Log Errors : []
  Testcase Totals: {
    Tests : 1
    Passes: 18
    Fails : 2
  }
  Testcases      : [
    {
      Testcase Name   : Test1.client1
      Passes          : 18
      Fails           : 2
      Start Date-Time : 20101027-18:44:29
      Elapsed Time    : 00:00:23
      Starts          : 1
      Status Date-Time: 20101027-18:44:52
      Last Status     : pass
      Information     :
      Testcase Stack  : [
        Test1
        Test1.client1
      ]
    }
  ]
  XML File Name  : c:\stax\myApp\testMyApp.xml
  File Machine   : local://local
  Function       : Main
  Arguments      : 'client1'
  Scripts        : []
  Script Files   : []
  Script Machine : <None>
}
```

GET DTD

GET DTD displays the DTD (Document Type Definition) for the STAX Service. An XML document executed by the STAX Service is considered valid if the document complies with this DTD. Note that DTDs are all about specifying the structure and syntax of XML documents (not their content).

If you use an XML editor to create and edit STAX XML documents, you'll probably want to create a stax.dtd file and reference this file in your DOCTYPE statement's SYSTEM value so that the XML editor can use it to validate the XML syntax. The stax.dtd file is not provided with the STAX service because its contents can vary because you can extend it by registering STAX service extensions.

Syntax

```
GET DTD
```

Security

This request requires at least trust level 2.

Results

The result buffer contains the DTD for the STAX service.

Examples

- **Goal:** Get the STAX DTD.

  ```
  GET DTD
  ```

- **Goal:** From a command prompt on Windows, get the STAX DTD and redirect it to a file.

  ```
  set STAF_QUIET_MODE=1
  STAF local STAX GET DTD > stax.dtd
  set STAF_QUIET_MODE=
  ```

  This creates a stax.dtd file in the current directory.

- **Goal:** From a command prompt on Unix, get the STAX DTD and redirect it to a file.

```
export STAF_QUIET_MODE=1
STAF local STAX GET DTD > stax.dtd
unset STAF_QUIET_MODE
```

This creates a stax.dtd file in the current directory.

HELP

Help displays the request options and how to use them.

Syntax

`HELP`

Results

The result buffer contains the Help messages for the request options for the STAX service.

HOLD

HOLD allows you to hold a job or a currently running block in a job.

Syntax

`HOLD JOB <JobID> [BLOCK <Block Name>] [TIMEOUT [<Number>[s|m|h|d|w]]]`

`JOB` specifies the ID of the job to hold. If no block is specified, then the "main" block in the job (which, by default, encompasses the entire job) is held which means that no additional elements (e.g. processes and STAF commands) in the job will be run until the job is released (e.g. by using a STAX RELEASE JOB <JobID> request).

`BLOCK` specifies a particular block in the job to hold. The block name must correspond to a block element name specified in the XML document. If a block in a job is held, no additional elements (e.g. processes and STAF commands) in that block will be run until that block is released (e.g. by using a STAX RELEASE JOB <JobID> BLOCK <Block Name> request).

A child block cannot be held if it is being held by a parent block.

`TIMEOUT` specifies the maximum length of time to hold the block before being automatically released. It defaults to 0 which indicates to hold the block indefinitely. The timeout can be expressed in milliseconds, seconds, minutes, hours, days, or weeks. Its format is `<Number>[s|m|h|d|w]`,

where `<Number>` is an integer >= 0 and indicates milliseconds unless one of the following case-insensitive suffixes is specified:

- s (for seconds)
- m (for minutes)
- h (for hours)
- d (for days)
- w (for weeks).

Note that the calculated timeout cannot exceed 4294967294 milliseconds. So, the maximum values in each time category that can be specified are:

- 4294967294 (4294967294 milliseconds)
- 4294967s (4294967 seconds)
- 71582m (71582 minutes)
- 1193h (1193 hours)
- 49d (49 days)
- 7w (7 weeks)

Security

This request requires at least trust level 4.

Results

Upon successful return, the result buffer does not contain anything.

Examples

- **Goal:** Hold all of job 5 indefinitely.

```
HOLD JOB 5
```

- **Goal:** Hold block main.MachineB in job 31 indefinitely.

```
HOLD JOB 31 BLOCK main.MachineB
```

- **Goal:** Hold all of job 1 for up to 1 minute.

```
HOLD JOB 1 TIMEOUT 1m
```

- **Goal:** Hold block main.Test1 in job 7 for up to 30 seconds.

```
HOLD JOB 7 BLOCK main.Test1 TIMEOUT 30s
```

LIST

LIST allows you to list all of the jobs currently running or to list information about a specified job's threads, blocks, testcases, processes, STAF commands, breakpoints, or functions. LIST also allows you to list the current operational settings for the service or to list extensions registered for the service, by element name or by extension jar file name. LIST also lets you list the contents of the machine cache or the file cache, or to get summary information about the file cache such as the hit ratio.

Syntax

```
LIST JOBS [TOTAL] | SETTINGS | MACHINECACHE |
     FILECACHE [SORTBYLRU | SORTBYLFU | SUMMARY] |
     TIMEDEVENTQUEUE [JOB <Job ID>] [TOTAL] |
     EXTENSIONS | EXTENSIONJARFILES |
     JOB <Job ID> <THREADS [LONG] | < THREAD <Thread ID> VARS [SHORT] > |
                   PROCESSES | STAFCMDS | SUBJOBS | BLOCKS | TESTCASES |
                   BREAKPOINTS | FUNCTIONS [| <List Type>]...>
```

`JOBS` lists the jobs that are currently running.

`JOBS TOTAL` returns the number of jobs that are currently running.

`SETTINGS` lists the current operational settings for the service.

`MACHINECACHE` lists the current contents of the machine cache.

`FILECACHE` lists the current contents of the file cache.

`SORTBYLRU` specifies to list the current contents of the file cache in the order determined by the LRU (Least Recently Used) algorithm. This means the files will be listed in descending order by last hit date.

`SORTBYLFU` specifies to list the current contents of the file cache in the order determined by the LFU (Least Frequently Used) algorithm. All non-stale files will be listed before any stale files. The non-stale files will be sorted by hit count in descending order, and then by last hit date in descending order (for those files with the same hit count). The stale files will be sorted by last hit date in descending order.

SUMMARY specifies to show summary information about the file cache, including its hit ratio.

TIMEDEVENTQUEUE specifies to list the current contents of the Timed Event Queue. If the STAX service is configured to use a common Timed Event Queue, do not specify the JOB option. If the STAX service is configured so that each job has its own Timed Event Queue, you must use the JOB option to specify the Job ID of the currently running job whose Timed Event Queue you want to list.

TIMEDEVENTQUEUE TOTAL returns the number of timed events in either the common Timed Event Queue (if the JOB option is not specified) or in the Timed Event Queue for the specified job (if the JOB option is specified).

EXTENSIONS lists the extension elements registered for the service in alphabetical order.

EXTENSIONJARFILES lists the names of the extension jar files registered for the service.

JOB specifies the Job ID for a currently running job.

THREADS [LONG] lists the threads that are currently running for the specified job; specifying the LONG option shows more detailed information about the threads. Note: The LONG option was added in STAX V3.4.3.

THREAD VARS [SHORT] lists the thread variables that are defined in the specified thread for the specified job. The default format expands all of the variables (recursively); specifying the SHORT option shows the variables in the original Python format.

BLOCKS lists the blocks that are currently running for the specified job.

TESTCASES lists the testcases that have had test status (number of passes and fails) recorded for the specified job.

PROCESSES lists the processes that are currently running for the specified job.

STAFCMDS lists the STAF commands that are currently running for the specified job.

SUBJOBS lists the sub-jobs that are currently running for the specified job (initiated via the <job> element).

BREAKPOINTS lists the breakpoints that are currently set for the specified job.

FUNCTIONS lists the functions that are currently available to be called for the specified job.

<List Type> lists the extensions of the specified type that are currently running for the specified job.

Security

This request requires at least trust level 2.

Results

Upon successful return, the result buffer will contain information about the request based on the options specified:

- **`LIST JOBS`**

  The result buffer for a `LIST JOBS` request (without the TOTAL option) will contain a marshalled `<List> of <Map:STAF/Service/STAX/JobInfo>` representing the jobs that are currently running. The map is defined as follows:

Definition of map class STAF/Service/STAX/JobInfo			
Description: This map class represents a STAX job.			
Key Name	**Display Name**	**Type**	**Format / Value**
jobID	Job ID	`<String>`	
jobName	Job Name	`<String> | <None>`	
startTimestamp	Start Date-Time	`<String>`	`<YYYYMMDD-HH:MM:SS>`
function	Function	`<String>`	
state	State	`<String>`	`'Pending' | 'Running'`

Notes:

1. The "Job Name" value is set to `<None>` if a job name was not specified for the job.
2. The "Function" value is set to the value of the function parameter specified on the EXECUTE request, or if one wasn't specified, it is set to the defaultcall element's function value.
3. The "State" value will be 'Pending' if the STAX EXECUTE request is in the process of submitting the job, or 'Running' if the job was submitted successfully and is running.

- **`LIST JOBS TOTAL`**

  The result buffer for a `LIST JOBS TOTAL` request will contain the number of jobs that are currently running.

- **`LIST SETTINGS`**

  The result buffer for a `LIST SETTINGS` request will contain a marshalled `<Map:STAF/Service/STAX/Settings>` representing the settings for the STAX service. The map is defined as follows:

Definition of map class STAF/Service/STAX/Settings

Description: This map class represents the settings for the STAX service.

Key Name	Display Name	Type	Format / Value
eventMachine	Event Machine	<String>	
eventService	Event Service Name	<String>	
eventGeneration	Event Generation	<String>	'Enabled' | 'Disabled'
numThreads	Number of Threads	<String>	
processTimeout	Process Timeout	<String>	
fileCaching	File Caching	<String>	'Enabled' | 'Disabled'
maxFileCacheSize	Max File Cache Size	<String>	
fileCacheAlgorithm	File Cache Algorithm	<String>	'LRU' | 'LFU'
maxFileCacheAge	Max File Cache Age	<String>	<Number>[s|m|h|d|w]
maxMachineCacheSize	Max Machine Cache Size	<String>	
maxReturnFileSize	Max Return File Size	<String>	
maxGetQueueMessages	Max Get Queue Messages	<String>	
maxSTAXThreads	Max STAX-Threads	<String>	
resetJobID	Reset Job ID	<String>	'Enabled' | 'Disabled'
clearLogs	Clear Logs	<String>	'Enabled' | 'Disabled'
logTCElapsedTime	Log TC Elapsed Time	<String>	'Enabled' | 'Disabled'
logTCNumStarts	Log TC Num Starts	<String>	'Enabled' | 'Disabled'
logTCStartStop	Log TC Start/Stop	<String>	'Enabled' | 'Disabled'
pythonOutput	Python Output	<String>	'JobUserLog' | 'Message' | 'JobUserLogAndMsg' | 'JVMLog'
pythonLogLevel	Python Log Level	<String>	
invalidLogLevelAction	Invalid Log Level Action	<String>	'RaiseSignal' | 'LogInfo'
extensions	Extensions	<List> of <String>	
extensionFile	Extension File	<String> | <None>	
timedEventQueue	Timed Event Queue	<String>	'Common' | 'Job'
debugThread	Debug Thread	<String>	'Enabled' | 'Disabled'
debugCloneFunction	Debug Clone Function	<String>	'Enabled' | 'Disabled'

debugProcess	Debug Process	<String>	'Enabled' | 'Disabled'
debugXmlParse	Debug Xml Parse	<String>	'Enabled' | 'Disabled'

Notes:

1. The "Event Machine" value is the name of the Event service machine used by the STAX service.
2. The "Event Service Name" value is the name by which the Event service is known to the STAX service.
3. The "Number of Threads" value is the number of physical threads used by the STAX service.
4. The "Process Timeout" value is the number of milliseconds that the STAX service waits for a process to start.
5. The "Max Return File Size" value is the maximum number of bytes that can be returned in a file by a process element and by a stafcmd element that submits a GET FILE request to the FS service. See the description of the MAXRETURNFILESIZE parameter in the "STAX Service Machine Installation and Configuration" section for more information.
6. The "Max Get Queue Messages" value is the maximum number of messages that a STAX job's STAFQueueMonitor thread will get from the STAX job handle's queue at a time. See the description of the MAXGETQUEUEMESSAGES parameter in the "STAX Service Machine Installation and Configuration" section for more information.
7. The "Max STAX-Threads" value is the maximum number of STAX Threads that can be running simultaneously in a job that paralleliterate and parallel elements cannot exceed when starting new STAX-Threads in parallel. See the description of the MAXSTAXTHREADS parameter in the "STAX Service Machine Installation and Configuration" section for more information.
8. The "Extensions" value is a list of the extension jar files specified by the EXTENSION parameter when registering the STAX service.
9. The "Extension File" value is the value of the EXTENSIONXMLFILE or the EXTENSIONFILE parameter when registering the STAX service (or <None> if these parameters were not specified).
10. The "Timed Event Queue" value is either set to "Common" if all jobs use a common Timed Event Queue or "Job" if each job uses its own Timed Event Queue. See the description of the TIMEDEVENTQUEUE parameter in the "STAX Service Machine Installation and Configuration" section for more information.

- **LIST FILECACHE [SORTBYLRU | SORTBYLFU]**

The result buffer for a LIST FILECACHE request (without the SUMMARY option specified) will contain a marshalled <Map:STAF/Service/STAX/FileCache> representing the file cache for the STAX service. The results will be sorted in the order determined by the cache algorithm by default. Or, if the SORTBYLRU option is specified, the results will be listed in descending order by last hit date. Or, if the SORTBYLFU option is specified, all non-stale files will be listed before any stale files and the non-stale files will be sorted by hit count in descending order, and then by last hit date in descending order (for those files with the same hit count). The stale files will be sorted by last hit date in descending order. The map is defined as follows:

Definition of map class STAF/Service/STAX/FileCache			
Description: This map class represents contents of the file cache.			
Key Name	**Display Name**	**Type**	**Format / Value**
machine	Machine	<String>	

file	File	<String>	
hits	Hits	<String>	
lastHit	Last Hit Date-Time (Last Hit)	<String>	<YYYYMMDD-HH:MM:SS>
addDate	Added Date-Time (Added)	<String>	<YYYYMMDD-HH:MM:SS>

Notes:

1. The "Machine" value is the name of the machine from where the STAX file was loaded.
2. The "File" value is the path to the file on the machine.
3. The "Hits" value is the number of cache hits for the entry.
4. The "Last Hit Date-Time" value is the date of the last cache hit.
5. The "Added Date-Time" value is the date the file was added to the cache.

- **LIST FILECACHE SUMMARY**

The result buffer for a `LIST FILECACHE SUMMARY` request will contain a marshalled `<Map:STAF/Service/STAX/FileCacheSummary>` representing summary information about the file cache for the STAX service. The map is defined as follows:

Definition of map class STAF/Service/STAX/FileCacheSummary			
Description: This map class represents summary information about the file cache.			
Key Name	**Display Name**	**Type**	**Format / Value**
hitRatio	Hit Ratio	<String>	<Number>%
hitCount	Hit Count	<String>	
missCount	Miss Count	<String>	
requestCount	Request Count	<String>	
lastPurgeDate	Last Purge Date-Time	<String>	<YYYYMMDD-HH:MM:SS>

Notes:

1. The "Hit Ratio" value shows how often a searched for file is actually found in the cache.
2. The "Hit Count" value is the total number of times that a file with the same Last Modification Date was found in the cache.
3. The "Miss Count" value is the total number of times that a file with the same Last Modification Date was not found in the cache.
4. The "Request Count" value is the total number of times that a file was searched for in the cache.
5. The "Last Purge Date-Time" value is the date that the cache was last purged (or the date the file cache was created if the cache has never been purged).

- **LIST MACHINECACHE**

The result buffer for a `LIST MACHINECACHE` request will contain a marshalled `<Map:STAF/Service/STAX/MachineCache>` representing the machine cache for the STAX service. The results will be sorted by the last hit date. The map is defined as follows:

Definition of map class STAF/Service/STAX/MachineCache			
Description: This map class represents contents of the machine cache.			
Key Name	**Display Name**	**Type**	**Format / Value**
machine	Machine	`<String>`	
fileSep	File Separator (File Sep)	`<String>`	
hits	Hits	`<String>`	
lastHit	Last Hit Date-Time (Last Hit)	`<String>`	`<YYYYMMDD-HH:MM:SS>`
addDate	Added Date-Time (Added)	`<String>`	`<YYYYMMDD-HH:MM:SS>`

Notes:

1. The "Machine" value is the name of the machine from where the STAX file was loaded.
2. The "File Separator" value is the file separator for the machine.
3. The "Hits" value is the number of cache hits for the entry.
4. The "Last Hit Date-Time" value is the date of the last cache hit.
5. The "Added Date-Time" value is the date the file was added to the cache.

- **`LIST TIMEDEVENTS`**

The result buffer for a `LIST TIMEDEVENTS` request (without the TOTAL option) will contain a marshalled `<List> of <Map:STAF/Service/STAX/TimedEvent>` representing the timed events in the Timed Event Queue for either all jobs (if the `JOB` option is not specified and if STAX is configured to use a common Timed Event Queue) or for a specified job (if the `JOB` option is specified and if STAX is configured to use a Timed Event Queue for each job via the TIMEDEVENTQUEUE configuration parameter). The map is defined as follows:

Definition of map class STAF/Service/STAX/TimedEvent			
Description: This map class represents a timed event in a STAX job.			
Key Name	**Display Name**	**Type**	**Format / Value**
notificationTime	Notification Time	`<String>`	`<YYYYMMDD-HH:MM:SS>`

Notes:

1. The "Notification Time" value is the date-time when the timed event expires.

- **LIST TIMEDEVENTQUEUE [JOB <JobID>] TOTAL**

  The result buffer for a `LIST TIMEDEVENTQUEUE [JOB <JobID>] TOTAL` request will contain the number of timed events in the Timed Event Queue for either all jobs (if the `JOB` option is not specified and if STAX is configured to use a common Timed Event Queue) or for a specified job (if the `JOB` option is specified and if STAX is configured to use a Timed Event Queue for each job via the TIMEDEVENTQUEUE configuration parameter).

- **LIST EXTENSIONS**

  The result buffer for a `LIST EXTENSIONS` request will contain a marshalled `<List> of <Map:STAF/Service/STAX/ExtensionElement>` where each entry in the list represents an extension element registered for the STAX service. The map is defined as follows:

Definition of map class STAF/Service/STAX/ExtensionElement			
Description: This map class represents a STAX extension element.			
Key Name	**Display Name**	**Type**	**Format / Value**
extensionElement	Extension Element	`<String>`	
extensionJarFile	Extension Jar File	`<String>`	

Notes:
1. The "Extension Element" value is the name of each extension element registered for the STAX service, enclosed in < and >.
2. The "Extension Jar File" value is the name of the extension jar file which contains the extension.

- **LIST EXTENSIONJARFILES**

  The result buffer for a `LIST EXTENSIONJARFILES` request will contain a marshalled `<List> of <Map:STAF/Service/STAX/ExtensionJarFile>` which represents the extension jar files registered for the STAX service. The map is defined as follows:

Definition of map class STAF/Service/STAX/ExtensionJarFile			
Description: This map class represents a STAX extension jar file.			
Key Name	**Display Name**	**Type**	**Format / Value**
extensionJarFile	Extension Jar File	`<String>`	
version	Version	`<String>`	
description	Description	`<String>`	

Notes:

1. The "Extension Jar File" value is the name of the extension jar file which contains the extension(s).
2. The "Version" value is the version of the extension(s) provided in the extension jar file. It is obtained from extension jar file's manifest via the "Extension-Version" attribute. If the version is not provided in the manifest, it is set to `'<Not Provided>'`.
3. The "Description" value is the description of the extension(s) provided in the extension jar file. It is obtained from the extension jar file's manifest via the "Extension-Description" attribute. If the description is not provided in the manifest, it is set to `'<Not Provided>'`.

- **`LIST JOB <Job ID> THREADS [LONG]`**

If the `LONG` option is not specified, the result buffer for a `LIST JOB <Job ID> THREADS` request will contain a marshalled `<List> of <Map:STAF/Service/STAX/ThreadInfo>` which represents a thread currently running in the specified STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/ThreadInfo			
Description: This map class represents a thread currently running in the specified job.			
Key Name	**Display Name**	**Type**	**Format / Value**
threadID	Thread ID	`<String>`	
parentTID	Parent TID	`<String> | <None>`	
state	State	`<String>`	

Notes:

1. The main thread (the one with "Thread ID" set to '1') will have it's "Parent TID" value set to `<None>`.

If the `LONG` option is specified, the result buffer for a `LIST JOB <Job ID> THREADS LONG` request will contain a marshalled `<List> of <Map:STAF/Service/STAX/ThreadLongInfo>` which represents detailed information about a thread currently running in the specified STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/ThreadLongInfo			
Description: This map class represents detailed information about a thread currently running in the specified job.			
Key Name	**Display Name**	**Type**	**Format / Value**
threadID	Thread ID	`<String>`	
parentTID	Parent TID	`<String> | <None>`	
parentHierarchy	Parent Hierarchy	`<String> | <None>`	
state	State	`<String>`	

startTimestamp	Start Date-Time	<String>	<YYYYMMDD-HH:MM:SS>
callStack	Call Stack	<List> of <String>	
conditionStack	Condition Stack	<List> of <String>	

Notes:

1. The main thread (the one with "Thread ID" set to '1') will have it's "Parent TID" and "Parent Hierarchy" values set to <None>.

2. "Parent Hierarchy" is the parent thread hierarchy in a parent.child format.

3. The "Call Stack" can be useful for tracing the progress of a job and for debugging. The format for each string in the call stack is: <Element Name>: <Action Info> (Line: <Line#>, Machine: <Machine>, File: <File>) . The content of the action information provided for each element is as follows:

```
  block: <Block Name>
  break:
  breakpoint:
  call: <Function Name>
  catch: <Exception Type>
  continue:
  script: <Value>
  finally:
  function: <Function Name>
  hold:
  if: <If Expression>
  iterate: <Current Iteration Index>/<List Size> [<Var Value>] <List (Not evaluated)>
  log: <Message Value>
  loop: #<Current Index> from <Value> to <Value> [by <Value>] [while <Value>] [until
<Value>]
  message: <Message Value>
  nop:
  process: <Process Name>
  parallel: <Number of Tasks>
  parallelIterate: <Number Threads Submitted>/<List Size> <State> <List (Not evaluated)>
  raise: <Signal Name>
  release:
  sequence: <Index of Current Task>/<Number of Tasks>
  signalhandler: <Signal Name>
  stafcmd: <STAF Command Name>
  terminate:
  testcase: <Testcase Name>
```

```
testcaseStatus: <Status Result>
try:
```

If the action information provided for an If, Iterate, Log, Loop, Message, ParallelIterate, Process, Script, or STAFCommand element has a length greater than 40 characters, only the first 40 characters are provided and "..." is appended to the action information.

Note that if a finally element is specified within a try element, the Finally appears before the Try and Catch (if any) in the call stack (even though the finally task will actually be executed after the Try and Catch). Also, note that the finally element is run in a separate thread using the same Python Interpreter so that it's using the same Python variables.

4. The "Condition Stack" can also be useful for debugging a STAX job. The format for each string in the call stack is: `<Condition Name>: <Condition Info>`. The content of the condition information provided for each condition is as follows:

```
<Condition Name>: Source=<Source>, Priority=<Priority>
```

- **`LIST JOB <Job ID> THREAD <Thread ID> VARS`**

The result buffer for a `LIST JOB <Job ID> THREAD <Thread ID> VARS` request will contain a marshalled `<List> of <Map: STAF/Service/STAX/ThreadVariable>` which represents a variable defined in the specified thread running in the specified STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/ThreadVariable			
Description: This map class rrepresents a variable defined in the specified thread running in the specified STAX job.			
Key Name	**Display Name**	**Type**	**Format / Value**
name	Name	`<String>`	
value	Value	`<String> | <List> of <Map: STAF/Service/STAX/ThreadVariable>`	
type	Type	`<String>`	

Notes:

1. The variable type is the Python variable type (i.e. org.python.core.PyList, org.python.core.PyDictionary, org.python.core.PyTuple, org.python.core.PyString, org.python.core.PyInteger, org.python.core.PyLong, etc.).
2. If the `SHORT` option is not specified, and the `Value` is a PyList, PyTuple, or PyDictionary, then the Value will be a List of map class STAF/Service/STAX/ThreadVariable representing the items in the List, Tuple, or Dictionary. This will occur recursively for each value in the output.

- **`LIST JOB <Job ID> BLOCKS`**

  The result buffer for a `LIST JOB <Job ID> BLOCKS` request will contain a marshalled `<List> of <Map:STAF/Service/STAX/BlockInfo>` which represents a block currently running in the specified STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/BlockInfo			
Description: This map class represents a block currently running in the specified job.			
Key Name	**Display Name**	**Type**	**Format / Value**
blockName	Block Name	`<String>`	
state	State	`<String>`	`'Running' | 'Held' | 'Unknown'`

Notes:
1. Each "Block Name" value is displayed in a ParentBlock.ChildBlock format.
2. Every job contains a default "main" block which includes the entire job.

- **`LIST JOB <Job ID> TESTCASES`**

  The result buffer for a `LIST JOB <Job ID> TESTCASES` request will contain a marshalled `<List> of <Map:STAF/Service/STAX/TestcaseInfo>` which represents a testcase that has had a testcase status recorded for the specified job. The map is defined as follows:

Definition of map class STAF/Service/STAX/TestcaseInfo			
Description: This map class represents a testcase in a STAX job.			
Key Name	**Display Name**	**Type**	**Format / Value**
testcaseName	Testcase Name	`<String>`	
numPasses	Passes	`<String>`	
numFails	Fails	`<String>`	
elapsedTime	Elapsed Time	`<String>`	`'<Pending>' | <HH[H]:MM:SS>`
numStarts	Starts	`<String>`	
information	Information (Info)	`<String>`	

Notes:

1. The value for "Testcase Name" is the testcase name in a ParentTestcase.ChildTestcase format.
2. The value for "Passes" is the total number of passes for a testcase
3. The value for "Fails" is the total number of fails for a testcase
4. The format for "Elapsed Time" is `HH:MM:SS` if the elapsed time is under 100 hours or `HHH:MM:SS` if 100 hours or more. Or, if the testcase has not yet been stopped in the job via a </testcase> or STOP request, so that there is no elapsed time, it's value is `'<Pending>'`.
5. The value for "Starts" is the number of times the testcase has been started in the job via a <testcase> element and/or a START request.
6. The value for "Information" is the last status information (aka message) recorded for the testcase, or blank if no status information has been provided.

- **`LIST JOB <Job ID> PROCESSES`**

The result buffer for a `LIST JOB <Job ID> PROCESSES` request will contain a marshalled `<List> of <Map:STAF/Service/STAX/ProcessInfo>` which represents a process currently running in the specified STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/ProcessInfo			
Description: This map class represents a process currently running in the specified job.			
Key Name	**Display Name**	**Type**	**Format / Value**
processName	Process Name	`<String>`	
location	Location	`<String>`	
handle	Handle	`<String>`	
command	Command	`<String>`	Private data will be masked.
parms	Parms	`<String> | <None>`	Private data will be masked.

- **`LIST JOB <Job ID> STAFCMDS`**

The result buffer for a `LIST JOB <Job ID> STAFCMDS` request will contain a marshalled `<List> of <Map:STAF/Service/STAX/StafcmdInfo>` which represents a STAF command currently running in the specified STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/StafcmdInfo			
Description: This map class represents a STAF command currently running in the specified job.			
Key Name	**Display Name**	**Type**	**Format / Value**

stafcmdName	Stafcmd Name	<String>	
location	Location	<String>	
requestNum	Request#	<String>	
service	Service	<String>	
request	Request	<String>	Private data will be masked.

- **LIST JOB <Job ID> SUBJOBS**

The result buffer for a LIST JOB <Job ID> SUBJOBS request will contain a marshalled <List> of <Map:STAF/Service/STAX/SubjobInfo> representing the sub-jobs that are currently running in the specified job. The map is defined as follows:

Definition of map class STAF/Service/STAX/SubjobInfo			
Description: This map class represents a STAX subjob.			
Key Name	**Display Name**	**Type**	**Format / Value**
jobID	Job ID	<String>	
jobName	Job Name	<String> | <None>	
startTimestamp	Start Date-Time	<String>	<YYYYMMDD-HH:MM:SS>
function	Function	<String>	
blockName	Block Name	<String>	

Notes:

1. The "Job Name" value is set to <None> if a job name was not specified for the job.
2. The "Function" value is set to the value of the function parameter specified on the EXECUTE request, or if one wasn't specified, it is set to the defaultcall element's function value.

- **LIST JOB <Job ID> BREAKPOINTS**

The result buffer for a LIST BREAKPOINTS request will contain a marshalled <List> of <Map:STAF/Service/STAX/BreakpointInfo> representing the breakpoints that are currently set in the specified job. The map is defined as follows:

Definition of map class STAF/Service/STAX/BreakpointInfo			
Description: This map class represents a breakpoint.			
Key Name	**Display Name**	**Type**	**Format / Value**
ID	Breakpoint ID	<String>	

function	Function Name	<String> | <None>
line	Line #	<String> | <None>
file	XML File	<String> | <None>
machine	Machine	<String> | <None>

- **LIST JOB <Job ID> FUNCTIONS**

  The result buffer for a LIST JOB <Job ID> FUNCTIONS request will contain a marshalled <List> of <Map:STAF/Service/STAX/FunctionListInfo> which represents a function currently available to be called in the specified STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/FunctionListInfo			
Description: This map class represents a function in the specified job.			
Key Name	**Display Name**	**Type**	**Format / Value**
function	Function	<String>	
file	File	<String>	
machine	Machine	<String>	

Examples

- **Goal:** List all of the jobs.

  ```
  LIST JOBS
  ```

  Output: If the request is submitted from the command line, the result, in table format, could look like:

  ```
  Job ID Job Name   Start Date-Time   Function    State
  ------ ---------- ----------------- ----------- -------
  4      Sample Job 20101119-20:40:16 MonitorTest Running
  5      TestA      20101119-20:52:31 main        Running
  7      WebTest    20101119-21:15:23 InitJob     Pending
  ```

- **Goal:** Get a count of the number of jobs currently running.

  <55> LIST JOBS TOTAL

Output: If 5 jobs are currently running, the result would look like:

```
5
```

- **Goal:** List the STAX service operational settings.

```
LIST SETTINGS
```

Output: If the request is submitted from the command line, the result could look like:

```
{
  Event Machine           : local
  Event Service Name      : Event
  Event Generation        : Enabled
  Number of Threads       : 5
  Process Timeout         : 60000
  File Caching            : Enabled
  Max File Cache Size     : 20
  File Cache Algorithm    : LRU
  Max File Cache Age      : 0
  Max Machine Cache Size  : 20
  Max Return File Size    : 0
  Max Get Queue Messages  : 25
  Max STAX-Threads        : 0
  Reset Job ID            : Enabled
  Clear Logs              : Disabled
  Log TC Elapsed Time     : Enabled
  Log TC Num Starts       : Enabled
  Log TC Start/Stop       : Disabled
  Python Output           : JobUserLog
  Python Log Level        : Info
  Invalid Log Level Action: RaiseSignal
  Extensions              : []
  Extension File          : C:/STAF/services/stax/extensions.xml
  Timed Event Queue       : Common
}
```

- **Goal:** List the contents of the file cache in the order determined by the cache algorithm. Let's assume the cache algorithm is LRU (Least Recently Used),

```
LIST FILECACHE
```

Output: If the request is submitted from the command line, the result could look like:

```
Machine File                 Hits Last Hit Date-Time Added Date-Time
------- -------------------- ---- ------------------ --------------------
client1 /stax/myfile.xml     6    20100603-14:15:34  20100603-14:01:21
client1 /stax/STAFTest.xml   3    20100603-14:15:33  20100603-13:49:27
client1 /stax/STAXUtil.xml   2    20100603-14:15:00  20100603-14:12:21
server1 /tmp/MainJob.xml     0    20100603-14:15:00  20100603-14:15:00
local   c:\stax\STAXUtil.xml 4    20100603-14:14:55  20100603-13:51:50
local   c:\stax\myJob.xml    3    20100603-14:14:52  20100603-13:51:42
```

- **Goal:** List the contents of the file cache in the order determined by the LFU (Least Frequently Used).

```
LIST FILECACHE SORTBYLFU
```

Output: If the request is submitted from the command line, the result could look like:

```
Machine File                 Hits Last Hit Date-Time Added Date-Time
------- -------------------- ---- ------------------ --------------------
client1 /stax/myfile.xml     6    20100603-14:15:34  20100603-14:01:21
local   c:\stax\STAXUtil.xml 4    20100603-14:14:55  20100603-13:51:50
local   c:\stax\myJob.xml    3    20100603-14:14:52  20100603-13:51:42
client1 /stax/STAFTest.xml   3    20100603-14:15:33  20100603-13:49:27
client1 /stax/STAXUtil.xml   2    20100603-14:15:00  20100603-14:12:21
server1 /tmp/MainJob.xml     0    20100603-14:15:00  20100603-14:15:00
```

- **Goal:** List summary information for the file cache.

```
LIST FILECACHE SUMMARY
```

Output: If the request is submitted from the command line, the result could look like:

```
Hit Ratio      : 75%
Hit Count      : 18
Miss Count     : 6
Request Count  : 24
Last Purge Date: 20100603-16:53:21
```

- **Goal:** List the contents of the machine cache.

  ```
  LIST MACHINECACHE
  ```

  Output: If the request is submitted from the command line, the result could look like:

  ```
  Machine File Separator Hits Last Hit Date-Time Added Date-Time
  ------- -------------- ---- ------------------ --------------------
  client1 /              6    20070922-14:15:34  20090322-14:14:47
  server1 /              1    20070922-14:15:00  20090322-14:15:00
  win1    \              2    20070922-14:14:55  20090322-14:14:55
  ```

- **Goal:** List the contents of the common Timed Event Queue used by all jobs (this is only valid if the STAX service is configured to use a common Timed Event Queue for all jobs).

  ```
  LIST TIMEDEVENTQUEUE
  ```

  Output: If the request is submitted from the command line, the result, in table format, could look like:

  ```
  Notification Time
  -----------------
  20140228-15:16:44
  20140228-15:16:45
  20140228-15:17:14
  20140228-15:25:01
  ```

- **Goal:** Get a count of the number of timed events in the Timed Event Queue used by all jobs (this is only valid if the STAX service is configured to use a common Timed Event Queue for all jobs).

  ```
  LIST TIMEDEVENTQUEUE TOTAL
  ```

  Output: If four timed events are in the Timed Event Queue, the result would look like:

  ```
  4
  ```

- **Goal:** List the contents of the Timed Event Queue for a job with Job ID 1 (this is only valid if the STAX service is configured to use a Timed Event Queue for each job via the TIMEDEVENTQUEUE configuration parameter).

```
LIST TIMEDEVENTQUEUE JOB 1
```

Output: If the request is submitted from the command line, the result, in table format, could look like:

```
Notification Time
-----------------
20140228-15:16:45
20140228-15:17:14
```

- **Goal:** Get a count of the number of timed events in the Timed Event Queue for a job with Job ID 1 (this is only valid if the STAX service is configured to use a Timed Event Queue for each job via the TIMEDEVENTQUEUE configuration parameter).

```
LIST TIMEDEVENTQUEUE JOB 1 TOTAL
```

Output: If two timed events are in the Timed Event Queue, the result would look like:

```
2
```

- **Goal:** List the STAX service extension elements:

```
LIST EXTENSIONS
```

Output: If the request is submitted from the command line, the result, in table format, could look like:

```
Extension Element Extension Jar File
----------------- --------------------------
<email>           C:\STAXExt\EmailExt.jar
<ext-delay>       C:\STAXExt\ExtDelay.jar
<ext-sleep>       C:\STAXExt\ExtDelay.jar
<ext-wait>        C:\STAXExt\ExtDelay.jar
```

- **Goal:** List the extension jar files registered for the STAX version:

```
LIST EXTENSIONJARFILES
```

Output: If the request is submitted from the command line, the result, in table format, could look like:

```
Extension Jar File            Version Description
----------------------------- ------- ---------------------------------
```

```
C:\STAXExt\ExtMessageText.jar 3.0.0   Message Text STAX Monitor Extension
C:\STAXExt\ExtDelay.jar       3.0.0   Delay STAX Extensions
C:\STAXExt\EmailExt.jar       1.0.0   eMail STAX Service Extension
```

- **Goal:** List all of the threads running for a job with Job ID 12.

```
LIST JOB 12 THREADS
```

Output: If the request is submitted from the command line, the result, in table format, could look like:

```
Thread ID Parent TID State
--------- ---------- -------
1         <None>     Blocked
2         1          Blocked
3         1          Blocked
4         2          Running
5         2          Blocked
```

- **Goal:** List detail information on all threads running for a job with Job ID 12.

```
LIST JOB 12 THREADS LONG
```

Output: If the request is submitted from the command line, the result could look like:

```
[
  {
    Thread ID       : 1
    Parent TID      : <None>
    Parent Hierarchy: <None>
    State           : Blocked
    Start Date-Time : 20100615-14:10:07
    Call Stack      : [
      function: test (Line: 13, File: C:\stax\test1.xml, Machine: local://local)
      sequence: 1/2 (Line: 14, File: C:\stax\test1.xml, Machine: local://local)
      parallel: 2  (Line: 16, File: C:\stax\test1.xml, Machine: local://local)
    ]
    Condition Stack : [
      HoldThread: Source=Parallel, Priority=1000
    ]
  }
```

```
    {
      Thread ID       : 2
      Parent TID      : 1
      Parent Hierarchy: 1
      State           : Blocked
      Start Date-Time : 20100615-14:10:08
      Call Stack      : [
        sequence: 1/1 (Line: 17, File: C:\stax\test1.xml, Machine: local://local)
        function: RunProcess (Line: 36, File: C:\stax\test1.xml, Machine: local://local)
        sequence: 1/1 (Line: 41, File: C:\stax\threadsList.xml, Machine: local://local)
        paralleliterate: 2/2 WAIT_THREADS range(1,maxRange) (Line: 42, File: C:\stax\test1.xml,
  Machine: local://local)
      ]
      Condition Stack : [
        HoldThread: Source=ParallelIterate, Priority=1000
      ]
    }
    {
      Thread ID       : 3
      Parent TID      : 1
      Parent Hierarchy: 1
      State           : Blocked
      Start Date-Time : 20100615-14:10:08
      Call Stack      : [
        sequence: 1/1 (Line: 21, File: C:\stax\test1.xml, Machine: local://local)
        stafcmd: STAFCommand1 (Line: 22, File: C:\stax\test1.xml, Machine: local://local)
      ]
      Condition Stack : [
        HoldThread: Source=STAFCommand, Priority=1000
      ]
    }
    {
      Thread ID       : 4
      Parent TID      : 2
      Parent Hierarchy: 1.2
      State           : Running
      Start Date-Time : 20100615-14:10:08
      Call Stack      : [
        sequence: 1/1 (Line: 43, File: C:\stax\test1.xml, Machine: local://local)
        if: counter == 1 (Line: 44, File: C:\stax\test1.xml, Machine: local://local)
        script: time.sleep(30) (Line: 45, File: C:\stax\test1.xml, Machine: local://local)
```

```
    ]
    Condition Stack : []
  }
  {
    Thread ID       : 5
    Parent TID      : 2
    Parent Hierarchy: 1.2
    State           : Blocked
    Start Date-Time : 20100615-14:10:09
    Call Stack      : [
      sequence: 1/1 (Line: 43, File: C:\stax\test1.xml, Machine: local://local)
      if: counter == 1 (Line: 44, File: C:\stax\test1.xml, Machine: local://local)
      sequence: 2/2 (Line: 47, File: C:\stax\test1.xml, Machine: local://local)
      process: Run process (Line: 49, File: C:\stax\test1.xml, Machine: local://local)
    ]
    Condition Stack : [
      HoldThread: Source=Process, Priority=1000
    ]
  }
]
```

- **Goal:** List all of the variables in thread 8 for Job ID 15 in SHORT format.

  ```
  LIST JOB 15 THREAD 8 VARS SHORT
  ```

  Output: If the request is submitted from the command line, the result, in table format, could look like:

```
Name               Value                                 Type
------------------ ------------------------------------- ----------------------
STAFMapClassDefini <class STAFMarshalling.STAFMapClass org.python.core.PyClass
tion               Definition at 1194318286>
STAFMarshalling    <module STAFMarshalling at 10690462 org.python.core.PyModule
                   22>
STAFMarshallingCon <class STAFMarshalling.STAFMarshall org.python.core.PyClass
text               ingContext at 1199397326>
STAFRC             <jclass com.ibm.staf.STAFResult at  org.python.core.PyJavaCl
                   229579212>                          ass
STAXArg            None                                org.python.core.PyNone
STAXBlockStack     ['main']                            org.python.core.PyList
STAXBuiltinFunctio <java function type at 2011716034>  org.python.core.PyReflec
```

```
n_type                                                  tedFunction
STAXCurrentBlock    'main'                              org.python.core.PyString
STAXCurrentFunctio  'test'                              org.python.core.PyString
n
STAXCurrentTestcas  None                                org.python.core.PyNone
e
STAXCurrentXMLFile  'c:\staxtest\debug.xml'             org.python.core.PyString
STAXCurrentXMLMach  'local://local'                     org.python.core.PyString
ine
STAXEventServiceMa  'local'                             org.python.core.PyString
chine
STAXEventServiceNa  'Event'                             org.python.core.PyString
me
STAXExceptionSourc  <class main.STAXExceptionSource at  org.python.core.PyClass
e                   1407064526>
STAXFileCopyError   org.python.core.PyInstance@1be059c1 org.python.core.PyInstan
                                                        ce
STAXFunctionError   org.python.core.PyInstance@67a299c2 org.python.core.PyInstan
                                                        ce
STAXGlobal          <class main.STAXGlobal at 149398164 org.python.core.PyClass
                    6>
STAXImportModeErro  org.python.core.PyInstance@347699c1 org.python.core.PyInstan
r                                                       ce
STAXIterateList     [0, 1, 2, 3]                        org.python.core.PyList
STAXJob             org.python.core.PyJavaInstance@1a85 org.python.core.PyJavaIn
                    99cd                                stance
STAXJobHandle       org.python.core.PyJavaInstance@56b9 org.python.core.PyJavaIn
                    59ce                                stance
STAXJobID           15                                  org.python.core.PyIntege
                                                        r
STAXJobLogName      'STAX_Job_15'                       org.python.core.PyString
STAXJobName         ''                                  org.python.core.PyString
STAXJobScriptFileM  'local://local'                     org.python.core.PyString
achine
STAXJobScriptFiles  org.python.core.PyArray@5d19d9ce    org.python.core.PyArray
STAXJobSourceHandl  117                                 org.python.core.PyIntege
e                                                       r
STAXJobSourceHandl  'STAX/JobMonitor/Execute'           org.python.core.PyString
eName
STAXJobSourceMachi  'local://local'                     org.python.core.PyString
ne
```

```
STAXJobStartDate    '20091217'                          org.python.core.PyString
STAXJobStartFuncti  None                                org.python.core.PyNone
onArgs
STAXJobStartFuncti  'test'                              org.python.core.PyString
onName
STAXJobStartTime    '15:20:06'                          org.python.core.PyString
STAXJobUserLog      org.python.core.PyJavaInstance@5d12 org.python.core.PyJavaIn
                    d9ce                                stance
STAXJobUserLogName  'STAX_Job_15_User'                  org.python.core.PyString
STAXJobWriteLocati  'c:\build\rel\win32\staf\retail\dat org.python.core.PyString
on                  a\STAF\service\stax\job\Job15'
STAXJobXMLFile      'c:\staxtest\debug.xml'             org.python.core.PyString
STAXJobXMLMachine   'local://local'                     org.python.core.PyString
STAXLogMessage      0                                   org.python.core.PyIntege
                                                        r
STAXLogTCElapsedTi  1                                   org.python.core.PyIntege
me                                                      r
STAXLogTCNumStarts  1                                   org.python.core.PyIntege
                                                        r
STAXLogTCStartStop  0                                   org.python.core.PyIntege
                                                        r
STAXMessageLog      0                                   org.python.core.PyIntege
                                                        r
STAXNoResponseFrom  org.python.core.PyInstance@255799c1 org.python.core.PyInstan
Machine                                                 ce
STAXPyEvalResult    'main'                              org.python.core.PyString
STAXPythonFunction  <function STAXPythonFunction_CloneG org.python.core.PyFuncti
_CloneGlobals       lobals at 1733990850>               on
STAXPythonFunction  <function STAXPythonFunction_Functi org.python.core.PyFuncti
_FunctionExists     onExists at 1741248962>             on
STAXPythonLogLevel  'Info'                              org.python.core.PyString
STAXPythonOutput    'JobUserLog'                        org.python.core.PyString
STAXResult          [None, ['STAXUtilExportSTAFVars', ' org.python.core.PyList
                    STAXUtilQueryTest', 'STAFProcessUsi
                    ng', 'STAXUtilQueryAllTests', 'STAF
                    ', 'STAXUtilListDirectory', 'STAXUt
                    ilCheckSuccess', 'STAFProcess', 'ST
                    AXUtilLogAndMsg', 'STAXUtilCopyFile
                    s', 'STAXUtilWaitForSTAF', 'STAXUti
                    lImportSTAFVars', 'STAXUtilImportST
                    AFConfigVars'], [], [], ['STAF', 'S
```

```
                    TAXUtilListDirectory', 'STAXUtilImp
                    ortSTAFVars'], [], []]
STAXServiceMachine  'davidbender.austin.ibm.com'        org.python.core.PyString
STAXServiceMachine  'testmachine1'                      org.python.core.PyString
Nickname
STAXServiceName     'stax'                              org.python.core.PyString
STAXTestcaseStack   []                                  org.python.core.PyList
STAXThreadID        8                                   org.python.core.PyIntege
                                                        r
STAXUnique          <class main.STAXUnique at 140447585 org.python.core.PyClass
                    4>
STAXXMLParseError   org.python.core.PyInstance@6ac119c2 org.python.core.PyInstan
                                                        ce
__doc__             None                                org.python.core.PyNone
__name__            'main'                              org.python.core.PyString
copy                <module copy at 1256790478>         org.python.core.PyModule
index               2                                   org.python.core.PyIntege
                                                        r
org                 <java package org at 1418549698>    org.python.core.PyJavaPa
                                                        ckage
re                  <module re at 1416862157>           org.python.core.PyModule
serverList          ['myServer.austin.ibm.com', 'C:/ins org.python.core.PyList
                    tall', 'serverA.portland.ibm.com',
                    'D:/install', 'linuxServer.austin.i
                    bm.com', '/usr/local/install']
testInfo            {'platform': 'win32', 'osarch': 'am org.python.core.PyDictio
                    d64', 'parms': {'ZIP': '78703', 'st nary
                    ate': 'TX', 'purchases': {'items':
                    ['printerABC', 'routerXYZ', 'usbMNO
                    '], 'tax': 4.2, 'total': 63.43, 'pr
                    ice': 59.23}, 'city': 'austin'}, 'l
                    anguage': ['english', 'french']}
types               <jclass org.python.modules.types at org.python.core.PyJavaCl
                     424630732>                         ass
```

- **Goal:** List all of the variables in thread 8 for Job ID 15 in the default format.

```
LIST JOB 15 THREAD 8 VARS
```

Output: If the request is submitted from the command line, the result, in table format, could look like (note that normally you would see a

longer list of variables, the example here is only a subset):

```
[
  {
    Name : STAXJobID
    Value: 15
    Type : org.python.core.PyInteger
  }
  {
    Name : STAXServiceMachineNickname
    Value: 'testmachine1'
    Type : org.python.core.PyString
  }
  {
    Name : STAXServiceName
    Value: 'stax'
    Type : org.python.core.PyString
  }
  {
    Name : serverList
    Value: [
      {
        Name :
        Value: 'myServer.austin.ibm.com'
        Type : org.python.core.PyString
      }
      {
        Name :
        Value: 'C:/install'
        Type : org.python.core.PyString
      }
      {
        Name :
        Value: 'serverA.portland.ibm.com'
        Type : org.python.core.PyString
      }
      {
        Name :
        Value: 'D:/install'
        Type : org.python.core.PyString
      }
```

```
      {
        Name :
        Value: 'linuxServer.austin.ibm.com'
        Type : org.python.core.PyString
      }
      {
        Name :
        Value: '/usr/local/install'
        Type : org.python.core.PyString
      }
    ]
    Type : org.python.core.PyList
  }
  {
    Name : testInfo
    Value: [
      {
        Name : platform
        Value: 'win32'
        Type : org.python.core.PyString
      }
      {
        Name : osarch
        Value: 'amd64'
        Type : org.python.core.PyString
      }
      {
        Name : parms
        Value: [
          {
            Name : ZIP
            Value: '78703'
            Type : org.python.core.PyString
          }
          {
            Name : state
            Value: 'TX'
            Type : org.python.core.PyString
          }
          {
```

```
                    Name : purchases
                    Value: [
                      {
                        Name : items
                        Value: [
                          {
                            Name :
                            Value: 'printerABC'
                            Type : org.python.core.PyString
                          }
                          {
                            Name :
                            Value: 'routerXYZ'
                            Type : org.python.core.PyString
                          }
                          {
                            Name :
                            Value: 'usbMNO'
                            Type : org.python.core.PyString
                          }
                        ]
                        Type : org.python.core.PyList
                      }
                      {
                        Name : tax
                        Value: 4.2
                        Type : org.python.core.PyFloat
                      }
                      {
                        Name : total
                        Value: 63.43
                        Type : org.python.core.PyFloat
                      }
                      {
                        Name : price
                        Value: 59.23
                        Type : org.python.core.PyFloat
                      }
                    ]
                    Type : org.python.core.PyDictionary
                  }
```

```
            {
              Name : city
              Value: 'austin'
              Type : org.python.core.PyString
            }
          ]
          Type : org.python.core.PyDictionary
        }
        {
          Name : language
          Value: [
            {
              Name :
              Value: 'english'
              Type : org.python.core.PyString
            }
            {
              Name :
              Value: 'french'
              Type : org.python.core.PyString
            }
          ]
          Type : org.python.core.PyList
        }
      ]
      Type : org.python.core.PyDictionary
    }
  ]
```

- **Goal:** List all of the blocks running for a job with Job ID 35.

  ```
  LIST JOB 35 BLOCKS
  ```

  Output: If the request is submitted from the command line, the result, in table format, could look like:

  ```
  Block Name          State
  ---------------     -------
  main                Running
  main.machineA       Running
  main.machineA.Test3 Held
  ```

```
main.machineB       Running
```

- **Goal:** List all of the testcases that have recorded testcase status for a job with Job ID 7.

  ```
  LIST JOB 7 TESTCASES
  ```

  Output: If the request is submitted from the command line, the result, in table format, could look like:

  ```
  Testcase Name      Passes Fails Elapsed Time Starts Information
  ------------------ ------ ----- ------------ ------ --------------------
  client2.TestB.init 5      1     01:32:05     3      Error in Step 39
  server1.TestA      1      0     00:20:13     1      100% complete
  TestC              0      1     <Pending>    1
  ```

- **Goal:** List all of the processes running for a job with Job ID 41.

  ```
  LIST JOB 41 PROCESSES
  ```

  Output: If the request is submitted from the command line, the result, in table format, could look like:

  ```
  Process Name Location Handle Command Parms
  ------------ -------- ------ ------- ----------------------------------------
  Process0     machineB 196    java    com.ibm.staf.service.stax.TestProcess 5 6 0
  Process2     machineB 213    java    ICC_ProfileRGB
  Process3     machineB 216    sol
  Process4     machineC 223    notepad
  ```

- **Goal:** List all of the STAF commands running for a job with Job ID 37.

  ```
  LIST JOB 37 STAFCMDS
  ```

  Output: If the request is submitted from the command line, the result, in table format, could look like:

  ```
  Stafcmd Name  Location Request# Service Request
  ------------ -------- -------- ------- ------------------------------------------------
  STAFCommand21 server1  343      DELAY   DELAY 30000
  STAFCommand23 server2  349      SERVICE LIST SERVICES
  STAFCommand24 machineC 351      DELAY   DELAY 60000
  STAFCommand25 machineB 355      FS      COPY FILE /tests/TestA.out TOFILE /results/TestA.out
  ```

- **Goal:** List all sub-jobs for a job with Job ID 3.

```
LIST JOB 3 SUBJOBS
```

Output: If the request is submitted from the command line, the result, in table format, could look like:

```
Job ID Job Name   Start Date-Time   Function    Block Name
------ ---------- ----------------- ----------- --------------------
4      Sample Job 20040919-20:40:16 MonitorTest main
5      Web Test   20040919-20:52:31 main        main.server1.WebTest
7      <None>     20040919-21:15:23 InitJob     main.WinNT_Block
```

- **Goal:** List all breapoints for a job with Job ID 5.

```
LIST JOB 5 BREAKPOINTS
```

Output: If the request is submitted from the command line, the result, in table format, could look like:

```
ID Function Name Line # XML File                    Machine
-- ------------- ------ --------------------------- -------
1  FunctionB     <None> <None>                      <None>
2  <None>        32     c:\staxtest\breakpoint4.xml <None>
3  FunctionF     <None> <None>                      <None>
```

Goal: List all of the functions for a job with Job ID 1.

```
LIST JOB 1 FUNCTIONS
```

Output: If the request is submitted from the command line, the result, in table format, could look like:

```
Function        File                                        Machine
--------------- ------------------------------------------- -------------
App1_Init       C:\stax\jobs\TestApp1.xml                   local://local
Base_CopyFile   C:\stax\libraries\baseFunctions.xml         local://local
Base_CreateDir  C:\stax\libraries\baseFunctions.xml         local://local
Base_DeleteDir  C:\stax\libraries\baseFunctions1.xml        local://local
Base_RenameFile C:\stax\libraries\baseFunctions.xml         local://local
Main            C:\stax\jobs\TestApp.xml                    local://local
```

```
Unix_ChangePerm C:\stax\libraries\unix\commonFunctions.xml local://local
Unix_DoIt       C:\stax\libraries\unix\commonFunctions.xml local://local
Win_DoIt        C:\stax\libraries\win\commonFunctions.xml  local://local
```

LOG MESSAGE

LOG allows you to log a message in the STAX Job User Log for a job that is currently running. It also allows you to optionally send a message to the STAX Monitor. It performs basically the same action as a <log> element (or <log message="1"> element) contained in a job's XML file.

This request is useful if you want a process defined by a <process> element in a job to log one or more messages in the STAX Job User Log and, optionally, to send the message(s) to the STAX Monitor to be displayed in the "Message" panel when monitoring the job. This can be done by passing the value of the STAXJobID Python variable to the process (e.g. via the <parms> element or <env> element) so it can be used for the value of the JOB option and then submitting a LOG request from within the process.

Note that this request was added in STAX V3.1.4.

Syntax

```
LOG JOB <Job ID> MESSAGE <Message> [LEVEL <Level>] [SEND]
```

JOB specifies the ID of the job.

MESSAGE specifies the message text to be logged in the STAX Job User Log and, optionally, sent to the STAX Monitor.

LEVEL specifies the is the logging level of the message to be logged. It must be one of the STAF logging levels (e.g. Fatal, Error, Warning, Info, Trace, Trace2, Trace3, Debug, Debug2, Debug3, Start, Stop, Pass, Fail, Status, User1, User2, User3, User4, User5, User6, User7, or User8). It is not case-sensitive. It is optional and defaults to Info.

SEND specifies to also send the message to the STAX Monitor. It is optional.

Note that a message logged in the STAX Job User Log is persistent, unlike a message sent to the STAX Monitor which is only displayed if the job is currently being monitored by the STAX Monitor running on any machine(s).

Security

This request requires at least trust level 3.

Results

Upon successful return, the result buffer does not contain anything.

Examples

- **Goal:** Log informational message "Running TestA on machine client1.company.com" for job 1 in the job's user log.

```
LOG JOB 1 MESSAGE "Running TestA on machine client1.company.com"
```

- **Goal:** Log error message "Error in Step 3 of TestA running on machine server2" for job 5 in the job's user log and send the message to the STAX Monitor.

```
LOG SEND JOB 3 LEVEL Error MESSAGE "Error in Step 5 of TestA running on machine server2"
```

- **Goal:** Log start message "Begin TestB on machine client1" for job 12 in the job's user log.

```
LOG JOB 12 LEVEL Start MESSAGE "Begin TestB on machine client1"
```

QUERY

QUERY allows you to query a job, an extension jar file, or all extension jar files. as well as a thread, a thread's Python variable, a process, a STAF command, a block, a testcase, or a function in a job.

Syntax

```
QUERY     EXTENSIONJARFILE <Jar File Name> | EXTENSIONJARFILES |
          JOB <Job ID> [THREAD <Thread ID> [ VAR <VarName> [SHORT] ] |
                        PROCESS <Location:Handle> | STAFCMD <Request#> |
                        BLOCK <Block Name> | TESTCASE <Test Name>
                        FUNCTION <Function Name>
                        [| <Query Type> <Type Value>]
```

`JOB` specifies the ID of a job to query that is currently running. Basic information about the job is returned if `BLOCK, THREAD, TESTCASE, PROCESS, STAFCMD, or FUNCTION` are not specified.

`BLOCK` specifies the name of a currently running block in the job to query. The request returns more detailed information about the specified block.

`THREAD` specifies a currently running Thread ID in the job to query. The request returns more detailed information about the specified thread.

VAR specifies a Python variable in the specified thread for the specified job to query. The request returns information (value and type) about the specified variable. The default format expands the variable value (recursively); specifying the SHORT option shows the variable value in the original Python format.

TESTCASE specifies a testcase name in the job to query. The request returns more detailed information about the specified testcase.

PROCESS specifies a location and handle number (separated by a colon) that uniquely identifies a currently running process in the job to query. The request returns more detailed information about the specified process.

STAFCMD specifies a request number that uniquely identifies a currently running STAF command in the job to query. The request returns more detailed information about the specified STAF command.

FUNCTION specifies a function name in the job to query. The request returns more detailed information about the specified function.

<Query Type> specifies a value for the extension type that uniquely identifies a currently running extension of the specified type in the job to query.

EXTENSIONJARFILE specifies the name of an extension jar file to query. The request returns more detailed information about the specified extension jar file, such as what elements it provides and what version of the STAX service is required. Note that the name of the extension jar file is case sensitive and must be specified exactly as it appears in the output from LIST EXTENSIONS or LIST EXTENSIONJARFILES.

EXTENSIONJARFILES specifies to query all of the extension jar files registered for the STAX service. The request returns more detailed information about all of the extension jar files, such as what elements each provides and what version of the STAX service is required.

Security

This request requires at least trust level 2.

Results

Upon successful return, the result buffer will contain information about the request based on the options specified:

- **QUERY JOB <Job ID>**

  The result buffer for a QUERY JOB <Job ID> request will contain a marshalled <Map:STAF/Service/STAX/QueryJob> which represents information about the specified STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/QueryJob
Description: This map class represents a STAX job that is currently running.

Key Name	Display Name	Type	Format / Value
jobID	job ID	<String>	
jobName	Job Name	<String> | <None>	
startTimestamp	Start Date-Time	<String>	<YYYYMMDD-HH:MM:SS>
xmlFileName	XML File Name	<String>	
fileMachine	File Machine	<String>	
function	Function	<String>	
arguments	Arguments	<String> | <None>	Private data will be masked.
scriptList	Scripts	<List> of <String>	Private data will be masked.
scriptFileList	Script Files	<List> of <String>	
scriptMachine	Script Machine	<String> | <None>	
sourceMachine	Source Machine	<String>	
notifyOnEnd	Notify OnEnd	<String>	'No' | 'By Handle' | 'By Name'
clearLogs	Clear Logs	<String>	'Enabled' | 'Disabled'
logTCElapsedTime	Log TC Elapsed Time	<String>	'Enabled' | 'Disabled'
logTCNumStarts	Log TC Num Starts	<String>	'Enabled' | 'Disabled'
logTCStartStop	Log TC Start/Stop	<String>	'Enabled' | 'Disabled'
pythonOutput	Python Output	<String>	'JobUserLog' | 'Message' | 'JobUserLogAndMsg' | 'JVMLog'
pythonLogLevel	Python Log Level	<String>	
invalidLogLevelAction	Invalid Log Level Action	<String>	'RaiseSignal' | 'LogInfo'
numThreadsRunning	Threads Running	<String>	
numBlocksRunning	Blocks Running	<String>	
numBlocksHeld	Blocks Held	<String>	
numBlocksUnknown	Blocks Unknown	<String>	
state	State	<String>	'Running' | 'Pending'

Notes:

1. The "Source Machine" value will be set to the endpoint of the machine that submitted the EXECUTE request
2. The "Blocks Running" value will be set to the number of blocks that are currently in a 'Running' state in the job.
3. The "Blocks Held" value will be set to the number of blocks that are currently in a 'Held' state in the job.
4. The "Blocks Unknown" value will be set to the number of blocks that are currently in an 'Unknown' state in the job.
5. The "State" value will be 'Pending' if the STAX EXECUTE request is in the process of submitting the job, or 'Running' if the job was submitted successfully and is running.

- **`QUERY JOB <Job ID> BLOCK <Block Name>`**

The result buffer for a `QUERY JOB <Job ID> BLOCK <Block Name>` request will contain a marshalled `<Map:STAF/Service/STAX/QueryBlock>` which represents a block currently running or held in the specified STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/QueryBlock			
Description: This map class represents a block currently running or held in the specified job.			
Key Name	**Display Name**	**Type**	**Format / Value**
blockName	Block Name	`<String>`	
state	State	`<String>`	`'Running' | 'Held' | 'Unknown'`
threadID	Thread ID	`<String>`	
startTimestamp	Start Date-Time	`<String>`	`<YYYYMMDD-HH:MM:SS>`

- **`QUERY JOB <Job ID> THREAD <Thread ID>`**

The result buffer for a `QUERY JOB <Job ID> THREAD <Thread ID>` request will contain a marshalled `<Map:STAF/Service/STAX/QueryThread>` which represents a thread currently running in the specified STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/QueryThread			
Description: This map class represents a thread currently running in the specified job.			
Key Name	**Display Name**	**Type**	**Format / Value**
threadID	Thread ID	`<String>`	
parentTID	Parent TID	`<String> | <None>`	
parentHierarchy	Parent Hierarchy	`<String> | <None>`	
startTimestamp	Start Date-Time	`<String>`	`<YYYYMMDD-HH:MM:SS>`

callStack	Call Stack	<List> of <String>
conditionStack	Condition Stack	<List> of <String>

Notes:

1. The main thread (the one with "Thread ID" set to '1') will have it's "Parent TID" and "Parent Hierarchy" values set to <None>.

2. "Parent Hierarchy" is the parent thread hierarchy in a parent.child format.

3. The "Call Stack" can be useful for tracing the progress of a job and for debugging. The format for each string in the call stack is: <Element Name>: <Action Info> (Line: <Line#>, Machine: <Machine>, File: <File>) . The content of the action information provided for each element is as follows:

```
  block: <Block Name>
  break:
  breakpoint:
  call: <Function Name>
  catch: <Exception Type>
  continue:
  script: <Value>
  finally:
  function: <Function Name>
  hold:
  if: <If Expression>
  iterate: <Current Iteration Index>/<List Size> [<Var Value>] <List (Not evaluated)>
  log: <Message Value>
  loop: #<Current Index> from <Value> to <Value> [by <Value>] [while <Value>] [until
<Value>]
  message: <Message Value>
  nop:
  process: <Process Name>
  parallel: <Number of Tasks>
  parallelIterate: <Number Threads Submitted>/<List Size> <State> <List (Not evaluated)>
  raise: <Signal Name>
  release:
  sequence: <Index of Current Task>/<Number of Tasks>
  signalhandler: <Signal Name>
  stafcmd: <STAF Command Name>
  terminate:
  testcase: <Testcase Name>
  testcaseStatus: <Status Result>
```

```
try:
```

If the action information provided for an If, Iterate, Log, Loop, Message, ParallelIterate, Process, Script, or STAFCommand element has a length greater than 40 characters, only the first 40 characters are provided and "..." is appended to the action information.

Note that if a finally element is specified within a try element, the Finally appears before the Try and Catch (if any) in the call stack (even though the finally task will actually be executed after the Try and Catch). Also, note that the finally element is run in a separate thread using the same Python Interpreter so that it's using the same Python variables.

4. The "Condition Stack" can also be useful for debugging a STAX job. The format for each string in the call stack is: `<Condition Name>: <Condition Info>`. The content of the condition information provided for each condition is as follows:

```
<Condition Name>: Source=<Source>, Priority=<Priority>
```

- **`QUERY JOB <Job ID> THREAD <Thread ID> VAR <VarName>`**

The result buffer for a `QUERY JOB <Job ID> THREAD <Thread ID> VAR <VarName>` request will contain a marshalled `<Map: STAF/Service/STAX/ThreadVariable>` which represents a variable defined in the specified thread running in the specified STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/ThreadVariable			
Description: This map class rrepresents a variable defined in the specified thread running in the specified STAX job.			
Key Name	**Display Name**	**Type**	**Format / Value**
name	Name	`<String>`	
value	Value	`<String> | <List> of <Map: STAF/Service/STAX/ ThreadVariable>`	
type	Type	`<String>`	

Notes:

1. The variable type is the Python variable type (i.e. org.python.core.PyList, org.python.core.PyDictionary, org.python.core.PyTuple, org.python.core.PyString, org.python.core.PyInteger, org.python.core.PyLong, etc.).
2. If the `SHORT` option is not specified, and the `Value` is a PyList, PyTuple, or PyDictionary, then the Value will be a List of map class STAF/Service/STAX/ThreadVariable representing the items in the List, Tuple, or Dictionary. This will occur recursively for each value in the output.

- **QUERY JOB <Job ID> TESTCASE <Test Name>**

The result buffer for a `QUERY JOB <Job ID> TESTCASE <Test Name>` request will contain a marshalled `<Map:STAF/Service/STAX/QueryTestcase>` which represents a testcase in a STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/QueryTestcase			
Description: This map class represents a testcase in a STAX job.			
Key Name	**Display Name**	**Type**	**Format / Value**
testcaseName	Testcase Name	`<String>`	
numPasses	Passes	`<String>`	
numFails	Fails	`<String>`	
startedTimestamp	Start Date-Time	`<String>`	`<YYYYMMDD-HH:MM:SS>`
elapsedTime	Elapsed Time	`<String>`	`'<Pending>' | <HH[H]:MM:SS>`
numStarts	Starts	`<String>`	
lastStatusTimestamp	Status Date-Time	`<String> | <None>`	`<YYYYMMDD-HH:MM:SS>`
lastStatus	Last Status	`<String> | <None>`	`'pass' | 'fail' | 'info'`
information	Information	`<String>`	
testcaseStack	Testcase Stack	`<List> of <String>`	

Notes:

1. The value for "Testcase Name" is the testcase name in a ParentTestcase.ChildTestcase format.
2. The value for "Passes" is the total number of passes for a testcase
3. The value for "Fails" is the total number of fails for a testcase
4. The value for "Start Date-Time" is the timestamp when the testcase started
5. The format for "Elapsed Time" is `HH:MM:SS` if the elapsed time is under 100 hours or `HHH:MM:SS` if 100 hours or more. Or, if the testcase has not yet been stopped in the job via a </testcase> or STOP request, so that there is no elapsed time, it's value is `'<Pending>'`.
6. The value for "Starts" is the number of times the testcase has been started in the job via a <testcase> element and/or a START request.
7. The value for "Status Date-Time" is the timestamp when the last status was recorded.
8. The value for "Information" is the last status information (aka message) recorded for the testcase, or blank if no status information has been provided.
9. The value for "Testcase Stack" is an ordered list containing the testcase hierarchy for the testcase. There will be 1 or more entries in the "Testcase Stack" list, depending on the number of testcases in the hierarchy. So, if a STAX job contained:

```
<testcase name="'Scenario1'" mode="'strict'">
```

```
    <testcase name="'client.company.com'" mode="'strict'">
      <testcase name="'TestA'" mode="'strict'">
         ...
      </testcase>
    </testcase>
  </testcase>
```

The "Testcase Stack" for testcase "Scenario1" would be a list containing "Scenario1". The "Testcase Stack" for testcase "Scenario1.client.company.com" would be a list containing "Scenario1" and "Scenario1.client.company.com", in that order. The "Testcase Stack" for testcase "Scenario1.client.company.com.TestA" would be a list containing "Scenario1", "Scenario1.client.company.com", and "Scenario1.client.company.com.TestA", in that order.

- **`QUERY JOB <Job ID> PROCESS <Location:Handle>`**

The result buffer for a `QUERY JOB <Job ID> PROCESS <Location:Handle>` request will contain a marshalled `<Map:STAF/Service/STAX/QueryProcess>` which represents a process that is currently running in a STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/QueryProcess			
Description: This map class represents a process that is currently running in a STAX job.			
Key Name	**Display Name**	**Type**	**Format / Value**
processName	Process Name	`<String>`	
location	Location	`<String>`	
handle	Handle	`<String>`	
blockName	Block Name	`<String>`	
threadID	Thread ID	`<String>`	
startTimestamp	Start Date-Time	`<String>`	`<YYYYMMDD-HH:MM:SS>`
command	Command	`<String>`	Private data will be masked.
commandMode	Command Mode	`<String>`	`'default' | 'shell'`
commandShell	Command Shell	`<String> | <None>`	
parms	Parms	`<String>`	Private data will be masked.
title	Title	`<String>`	
workdir	Workdir	`<String>`	
workload	Workload	`<String>`	

varList	Vars	<List> of <String>	
envList	Envs	<List> of <String>	
useProcessVars	Use Process Vars	<String> | <None>	
userName	User Name	<String> | <None>	
password	Password	<String> | <None>	This field will be masked.
disabledAuth	Disabled Auth	<String> | <None>	
stdin	Stdin	<String> | <None>	
stoutMode	Stdout Mode	<String> | <None>	
stdoutFile	Stdout File	<String> | <None>	
stderrMode	Stderr Mode	<String> | <None>	
stderrFile	Stderr File	<String> | <None>	
returnStdout	Return Stdout	<String> | <None>	
returnStderr	Return Stderr	<String> | <None>	
returnFileList	Returned Files	<List> of <String>	
stopUsing	Stop Using	<String> | <None>	
console	Console	<String> | <None>	
focus	Focus	<String> | <None>	'Background' | 'Foreground' | 'Minimized' | <None>
staticHandleName	Static Handle Name	<String> | <None>	
other	Other	<String> | <None>	

Notes:

1. The "Use Process Vars", "Return Stdout", and "Return Stderr" values will be set to 'true' if specified.
2. The "Vars" value will be set to a list of Name=Value strings, or an empty list if no <var> or <vars> elements are specified.
3. The "Envs" value will be set to a list of Name=Value strings, or an empty list if no <env> or <envs> elements are specified.
4. The "Password" value will be set to <None> if no password is specified or ******* if a password is specified.

- **QUERY JOB <Job ID> STAFCMD <Request#>**

The result buffer for a QUERY JOB <Job ID> STAFCMD <Request#> request will contain a marshalled <Map:STAF/Service/STAX/QueryStafcmd> which represents a STAF command that is currently running in a STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/QueryStafcmd			
Description: This map class represents a STAF command currently running in the specified job.			
Key Name	**Display Name**	**Type**	**Format / Value**
stafcmdName	Stafcmd Name	<String>	
location	Location	<String>	
requestNum	Request#	<String>	
service	Service	<String>	
request	Request	<String>	Private data will be masked.
blockName	Block Name	<String>	
threadID	Thread ID	<String>	
startTimestamp	Start Date-Time	<String>	<YYYYMMDD-HH:MM:SS>

- **QUERY JOB <Job ID> FUNCTION <Function Name>**

The result buffer for a QUERY JOB <Job ID> FUNCTION <Function Name> request will contain a marshalled <Map:STAF/Service/STAX/QueryFunction> which represents a function that is currently available to be called in a STAX job. The map is defined as follows:

Definition of map class STAF/Service/STAX/QueryFunction			
Description: This map class represents a function in the specified job.			
Key Name	**Display Name**	**Type**	**Format / Value**
function	Function	<String>	
file	File	<String>	
machine	Machine	<String>	
scope	Scope	<String>	'local' | 'global'
requires	Requires	<List> of <String>	
imports	Imports	<List> of <Map:STAF/Service/STAX/QueryFunctionImport>	

Definition of map class STAF/Service/STAX/QueryFunctionImport

Description: This map class represents a function-import element specified for a function.			
Key Name	**Display Name**	**Type**	**Format / Value**
file	File	`<String> | <None>`	
directory	Directory	`<String> | <None>`	
machine	Machine	`<String> | <None>`	
functions	Functions	`List of <String>`	

Notes:

1. If the **file** attribute was specified in the **function-import** element, the "File" value will contain the un-resolved, un-normalized file name specified and the "Directory" value will be <None>.
2. If the **directory** attribute was specified in the **function-import** element, the "Directory" value will contain the un-resolved, un-normalixed file name specified and the "File" value will be <None>.
3. If the **machine** attribute was not specified in the **function-import** element, the "Machine" value will be <None>

- **`QUERY EXTENSIONJARFILE <Jar File Name>`**

The result buffer for a `QUERY EXTENSIONJARFILE <Jar File Name>` request will contain a marshalled `<Map:STAF/Service/STAX/ExtensionInfo>` which represents information about STAX service and/or monitor extensions provided in an extension jar file. The maps are defined as follows:

Definition of map class STAF/Service/STAX/ExtensionInfo			
Description: This map class represents information about STAX service and/or monitor extensions provided in an extension jar file.			
Key Name	**Display Name**	**Type**	**Format / Value**
extensionJarFile	Extension Jar File	`<String>`	
version	Version	`<String>`	
description	Description	`<String>`	
parameterList	Parameters	`<List> of <String>`	
serviceExtensions	Service Extensions	`<List> of <Map:STAF/Service/STAX/ServiceExtension>`	
monitorExtensions	Monitor Extensions	`<List> of <Map:STAF/Service/STAX/MonitorExtension>`	

Notes:

1. The "Version" value is set to the version specified for the extension jar file in its manifext via the "Extension-Version" attribute. If not provided it is set to `<Not Provided>`. for the STAX service, enclosed in < and >.
2. The "Description" value is set to the description specified for the extension jar file in its manifest via the "Extension-Description" attribute. If not provided, it is set to `<Not Provided>`.
3. Each parameter in the "Parameters" list is set to a Name=Value pair for each <parameter> element specified for this extension via an extension xml file.
4. If this extension jar file does not contain any service extensions, the "Service Extensions" value will be an empty list.
5. If this extension jar file does not contain any monitor extensions, the "Monitor Extensiosns" value will be an empty list.

Definition of map class STAF/Service/STAX/ServiceExtension

Description: This map class represents information a STAX service extension.

Key Name	Display Name	Type	Format / Value
requiredServiceVersion	Service Version Prereq	`<String> | <None>`	
includedElementList	Included Elements	`<List> of <String>`	
excludedElementList	Excluded Elements	`<List> of <String>`	

Notes:

1. The "Service Version Prereq" value is set to the minimum version of the STAX service required for this extension. It is obtained from the "Required-Service-Version" attribute in the manifest of the extension jar file. It not provided, it is set to <None>.
2. The "Included Elements" value is set to a list of the elements provided for this extension that are supported.
3. The "Excluded Elements" value is set to a list of elements in this extension jar file that were specified to be excluded.

Definition of map class STAF/Service/STAX/MonitorExtension

Description: This map class represents information a STAX monitor extension.

Key Name	Display Name	Type	Format / Value
requiredMonitorVersion	Monitor Version Prereq	`<String> | <None>`	
extensionNameList	Extension Names	`<List> of <String>`	

Notes:

1. The "Monitor Version Prereq" value is set to the minimum version of the STAX Monitor required for this extension. It is obtained from the "Required-Monitor-Version" attribute in the manifest of the extension jar file. It not provided, it is set to <None>.
2. The "Extension Names" value is set to a list of the names of the monitor extensions provided in this extension jar file.

- **`QUERY EXTENSIONJARFILES`**

The result buffer for a `QUERY EXTENSIONJARFILES` request will contain a marshalled `<List> of <Map:STAF/Service/STAX/ExtensionInfo>` which represents all the STAX service and/or monitor extensions provided in the extension jar files. See section "QUERY EXTENSIONJARFILE <Jar File Name>" for a description of this map.

Examples

- **Goal:** Query a job with ID 5.

```
QUERY JOB 5
```

Output: If the request is submitted from the command line, the result, in verbose format, could look like

```
{
  Job ID                  : 5
  Job Name                : Sample Job
  Start Date-Time         : 20101120-14:41:40
  XML File Name           : C:/stax/xml/sample1.xml
  File Machine            : machineA.austin.ibm.com
  Function                : MonitorTest
  Arguments               : { 'TestList': ['Test1', 'Test2'] }
  Scripts                 : [
    server1 = 'db2Server.austin.ibm.com'
    server2 = 'webServer.austin.ibm.com'
  ]
  Script Files            : [
    'c:/stax/python/init.py'
  ]
  Script Machine          : machineA.austin.ibm.com
  Source Machine          : ssl://machineA.austin.ibm.com@6550
  Notify OnEnd            : No
  Source Machine          : machineB.austin.ibm.com
  Clear Logs              : Disabled
  Log TC Elapsed Time     : Enabled
  Log TC Num Starts       : Enabled
  Log TC Start/Stop       : Disabled
  Python Output           : JobUserLog
  Python Log Level        : Info
  Invalid Log Level Action: RaiseSignal
  Threads Running         : 11
  Blocks Running          : 3
```

```
  Blocks Held             : 0
  Blocks Unknown          : 0
  State                   : Running
}
```

- **Goal:** Query a job with ID 5 displaying more detailed information about a block named main.Ogre.OgreA.

```
QUERY JOB 5 BLOCK main.machineA.Test1
```

Output: If the request is submitted from the command line, the result, in verbose format, could look like

```
Block Name     : main.machineA.Test1
State          : Running
Thread ID      : 2
Start Date-Time: 20101120-14:41:48
```

- **Goal:** Query a job with ID 8 displaying more detailed information about a thread whose thread id is 7.

```
QUERY JOB 8 THREAD 7
```

Output: If the request is submitted from the command line, the result, in verbose format, could look like

```
{
  Thread ID       : 7
  Parent TID      : 4
  Parent Hierarchy: 1.4
  Start Date-Time : 20101002-14:07:57
  Call Stack      : [
    function: DoAll (Line: 12557, File: c:\tests\Test1.xml, Machine: client1)
    testcase: TestSTAF (Line: 12558, File: c:\test\Test1.xml, Machine: client1)
    sequence: 3/3 (Line: 12559, File: c:\tests\Test1.xml, Machine: client1)
    finally:  (Line: 12580, File: c:\tests\Test1.xml, Machine:client1)
    try:  (Line: 12568, File: c:\tests\Test1.xml, Machine: client1)
    paralleliterate: 1/1 WAIT_THREADS TestMachines (Line: 12569, File: c:\tests\Test
1.xml, Machine: client1)
  ]
  Condition Stack : [
    HoldThread: Source=ParallelIterate, Priority=1000
  ]
}
```

- **Goal:** Query a job with ID 16 displaying information (in SHORT format) about the variable named testInfo for a thread whose thread id is 2.

```
QUERY JOB 16 THREAD 2 VAR testInfo SHORT
```

Output: If the request is submitted from the command line, the result, in verbose format, could look like

```
Name     Value                                          Type
-------- ---------------------------------------------- ----------------------------
testInfo {'platform': 'win32', 'osarch': 'amd64',  org.python.core.PyDictionary
         'parms': {'ZIP': '78703', 'state': 'TX',
         'city': 'austin', 'purchases': {'items':
         ['printerABC', 'routerXYZ', 'usbMNO'], 't
         ax': 4.2, 'price': 59.23, 'total': 63.43}
         }, 'language': ['english', 'french']}
```

- **Goal:** Query a job with ID 16 displaying information (in the default format) about the variable named testInfo for a thread whose thread id is 2.

```
QUERY JOB 16 THREAD 2 VAR testInfo
```

Output: If the request is submitted from the command line, the result, in verbose format, could look like

```
[
  {
    Name : testInfo
    Value: [
      {
        Name : platform
        Value: 'win32'
        Type : org.python.core.PyString
      }
      {
        Name : osarch
        Value: 'amd64'
        Type : org.python.core.PyString
      }
      {
        Name : parms
```

```
Value: [
  {
    Name : ZIP
    Value: '78703'
    Type : org.python.core.PyString
  }
  {
    Name : state
    Value: 'TX'
    Type : org.python.core.PyString
  }
  {
    Name : city
    Value: 'austin'
    Type : org.python.core.PyString
  }
  {
    Name : purchases
    Value: [
      {
        Name : items
        Value: [
          {
            Name :
            Value: 'printerABC'
            Type : org.python.core.PyString
          }
          {
            Name :
            Value: 'routerXYZ'
            Type : org.python.core.PyString
          }
          {
            Name :
            Value: 'usbMNO'
            Type : org.python.core.PyString
          }
        ]
        Type : org.python.core.PyList
      }
      {
```

```
                    Name : tax
                    Value: 4.2
                    Type : org.python.core.PyFloat
                  }
                  {
                    Name : price
                    Value: 59.23
                    Type : org.python.core.PyFloat
                  }
                  {
                    Name : total
                    Value: 63.43
                    Type : org.python.core.PyFloat
                  }
                ]
                Type : org.python.core.PyDictionary
              }
            ]
            Type : org.python.core.PyDictionary
          }
          {
            Name : language
            Value: [
              {
                Name :
                Value: 'english'
                Type : org.python.core.PyString
              }
              {
                Name :
                Value: 'french'
                Type : org.python.core.PyString
              }
            ]
            Type : org.python.core.PyList
          }
        ]
        Type : org.python.core.PyDictionary
      }
    ]
```

- **Goal:** Query a job with ID 5 displaying more detailed information about a testcase named machineA.Test1.

```
QUERY JOB 5 TESTCASE machineA.Test1
```

Output: If the request is submitted from the command line, the result, in verbose format, could look like:

```
{
  Testcase Name   : machineA.Test1
  Passes          : 4
  Fails           : 1
  Start Date-Time : 20080827-18:25:51
  Elapsed Time    : 00:15:20
  Starts          : 1
  Status Date-Time: 20080827-18:49:54
  Last Status     : fail
  Information     :
  Testcase Stack  : [
    machineA
    machineA.Test1
  ]
}
```

- **Goal:** Query a job with ID 4 displaying more detailed information about a process running at location machine1 with handle 91.

```
QUERY JOB 4 PROCESS machine1.austin.ibm.com:91
```

Output: If the request is submitted from the command line, the result, in verbose format, could look like:

```
{
  Process Name      : TestProcess
  Location          : machine1.austin.ibm.com
  Handle            : 91
  Block Name        : main.machine1
  Thread ID         : 2
  Start Date-Time   : 20040919-21:32:57
  Command'          : java
  Command Mode      : default
  Command Shell     : <None>
  Parms             : com.ibm.staf.service.stax.TestProcess 5 6 0
  Title             : Test Process Title
```

```
  Workdir           : <None>
  Workload          : <None>
  Vars              : [
    STAFDemo/ResourcePoolMachine=machineA
    STAF/Service/Log/Mask=Error
  ]
  Envs              : [
    CLASSPATH=C:\STAF\services\stax\STAXMon.jar;{STAF/Env/ClassPath}
  ]
  Use Process Vars  : <None>
  User Name         : <None>
  Password          : <None>
  Disabled Auth     : <None>
  Stdin             : <None>
  Stdout Mode       : replace
  Stdout File       : C:\temp\aProcess.out
  Stderr Mode       : append
  Stderr File       : C:\temp\aProcess.err
  Return Stdout     : true
  Return Stderr     : true
  Returned Files    : [],
  Stop Using        : <None
  Console           : same
  Static Handle Name: <None>
  Other             : <None>
}
```

- **Goal:** Query a job with ID 8 displaying more detailed information about a STAF command with request number 2019.

  ```
  QUERY JOB 8 STAFCMD 2019
  ```

  Output: If the request is submitted from the command line, the result, in the default format, could look like:

  ```
  Stafcmd Name   : STAFCommand123
  Location       : local
  Request#       : 2019
  Service        : delay
  Request        : delay 30000
  Block Name     : main.Block A
  Thread ID      : 3
  ```

```
Start Date-Time: 20040922-11:29:56
```

- **Goal:** Query a job with ID 1 displaying more detailed information about a function named B3.

  ```
  QUERY JOB 1 FUNCTION Main
  ```

  Output: If the request is submitted from the command line, the result, in the default format, could look like:

  ```
  {
    Function: Main
    File    : C:\stax\jobs\TestApp.xml
    Machine : local://local
    Scope   : global
    Requires: [
      TestApp_Init
      TestApp_Cleanup
    ]
    Imports : [
      {
        File     : ../commonfunctions/baseFunctions.xml
        Directory: <None>
        Machine  : local://local
        Functions: [
          Base_CopyFile
          Base_CreateDirectory
          Base_DeleteEntry
        ]
      }
      {
        File     : <None>
        Directory: ../libraries
        Machine  : local://local
        Functions: []
      }
    ]
  }
  ```

- **Goal:** Query an extension jar file with name C:\STAF\services\stax\ExtDelay.jar displaying more detailed information about the Delay extension.

```
QUERY EXTENSIONJARFILE C:/STAF/services/stax/ExtDelay.jar
```

Output: If the request is submitted from the command line, the result, in verbose format, could look like:

```
{
  Extension Jar File: C:\STAF\services\stax\ExtDelay.jar
  Version           : 1.0.0
  Description       : Delay STAX Extensions
  Parameters        : [
    delay=5
  ]
  Service Extensions: {
    Service Version Prereq: 1.5.0
    Included Elements     : [
      ext-delay
      ext-sleep
      ext-wait
    ]
    Excluded Elements     : []
  }
  Monitor Extensions: {
    Monitor Version Prereq: 1.5.0
    Extension Names       : [
      ext-delay
    ]
  }
}
```

- **Goal:** Query all extension jar files displaying more detailed information about the STAX extensions.

```
QUERY EXTENSIONJARFILES
```

Output: If the request is submitted from the command line, the result, in verbose format, could look like:

```
[
  {
    Extension Jar File: C:\STAF\services\stax\ExtMessageText.jar
    Version           : 3.0.0
    Description       : Message Text STAX Monitor Extension
    Parameters        : []
```

```
      Service Extensions: <None>
      Monitor Extensions: {
        Monitor Version Prereq: 3.0.0
        Extension Names       : [
          ext-message
        ]
      }
    }
    {
      Extension Jar File: C:\STAF\services\stax\ExtDelay.jar
      Version           : 3.0.0
      Description       : Delay STAX Extensions
      Parameters        : [
        delay=5
      ]
      Service Extensions: {
        Service Version Prereq: 3.0.0
        Included Elements     : [
          ext-delay
          ext-sleep
          ext-wait
        ]
        Excluded Elements     : []
      }
      Monitor Extensions: {
        Monitor Version Prereq: 3.0.0
        Extension Names       : [
          ext-delay
        ]
      }
    }
  ]
```

RELEASE

RELEASE allows you to release a job or a block in a job. The job or job block to be released has to be in HELD state.

Syntax

```
RELEASE JOB <JobID> [BLOCK <Block Name>]
```

JOB specifies the ID of the job.

BLOCK specifies a particular block in the job to release. The block name must correspond to a block element name in the XML document.

If a BLOCK is not specified, then the "main" block in the job (which, by default, encompasses the entire job) is released.

A block will not resume execution until all holds affecting it have been released.

Security

This request requires at least trust level 4.

Results

Upon successful return, the result buffer does not contain anything.

Examples

- **Goal:** Release all of job 5.

```
RELEASE JOB 5
```

- **Goal:** Release job 23 in block MachineB.

```
RELEASE JOB 23 BLOCK MachineB
```

SEND MESSAGE

SEND allows you to send a message to the STAX Monitor for a job that is currently running. It performs basically the same action as a <message> element contained in a job's XML file.

This request is useful if you want a process defined by a <process> element in a job to send one or more messages to the STAX Monitor (to be displayed in the "Messages" panel when monitoring the job). This can be done by passing the value of the STAXJobID Python variable to the process (e.g. via the <parms> element or <env> element) so it can be used for the value of the JOB option and then submitting a SEND request from within the process.

Note that this request was added in STAX V3.1.4.

Syntax

```
SEND JOB <Job ID> MESSAGE <Message>
```

JOB specifies the ID of the job.

MESSAGE specifies the message text to be sent to the STAX Monitor.

An event will be generated that sends a message to the STAX Job Monitor. The message is displayed in the "Messages" panel of the STAX Monitor GUI for the job.

Note that a message sent to the STAX Monitor is not persistent, as the message is only displayed if the job is currently being monitored by the STAX Monitor running on any machine(s).

Security

This request requires at least trust level 3.

Results

Upon successful return, the result buffer does not contain anything.

Examples

- **Goal:** Send message "TestA completed Step 1 on machine client1.company.com" for job 1 (to be displayed in the STAX Job Monitor).

  ```
  SEND JOB 1 MESSAGE "TestA completed Step 1 on machine client1.company.com"
  ```

- **Goal:** Send message "Error in Step 5 of TestA running on machine server2" for job 12 (to be displayed in the STAX Job Monitor).

  ```
  SEND JOB 12 MESSAGE "Error in Step 5 of TestA running on machine server2"
  ```

STOP PROCESS

STOP PROCESS allows you to stop a process in a job that is currently running.

Note that this request was added in STAX V3.5.0.

Syntax

```
STOP JOB <Job ID> PROCESS <Location:Handle>
```

JOB specifies the ID of the job.

PROCESS specifies a location and handle number (separated by a colon) that uniquely identifies a currently running process in the job that you want to stop.

Security

This request requires at least trust level 4.

Results

Upon successful return, the result buffer does not contain anything.

Examples

- **Goal:** Stop a process with handle 69 on machine client1.company.com in job 1.

```
STOP JOB 1 PROCESS "client1.company.com:1"
```

ADD BREAKPOINT

ADD BREAKPOINT allows you to add a breakpiont dynamically after the job has started.

Note that this request was added in STAX V3.4.0.

Syntax

```
ADD JOB <Job ID> BREAKPOINT < FUNCTION <Function ID> | LINE <Line Number> [FILE <XML File>]
[MACHINE <Machine Name>] >
```

JOB specifies the ID of the job.

FUNCTION specifies the case-sensitive name of the function for the breakpoint. After submitting the ADD BREAKPOINT request, the STAX job

will break the next time the function is called.

LINE specifies the line number for the breakpoint. After submitting the ADD BREAKPOINT request, the STAX job will break the next time the STAX task on the line number specified is executed. The line number must be the line number of the beginning task element (i.e. to break on a <stafcmd>, the line number must be the line number for the <stafcmd>, not the <location>, <service>, <request>, or </stafcmd>).

FILE specifies the optional (fully-qualified path) XML file for LINE option. If the XML file is not specified, the STAXJobXmlFile will be used.

MACHINE specifies the optional XML file machine for the FILE option. If the XML file machine is not specified, the STAX job will break immediately prior to executing the STAX task whose line number and XML file match (regardless of the task's XML file machine).

For more information on using breakpoints, see **Using Breakpoints to Debug STAX Jobs**.

Security

This request requires at least trust level 4.

Results

Upon successful return, the result buffer will contain the breakpoint ID for the breakpoint just added.

Examples

- **Goal:** Add a breakpoint for job 5 at function updateDatabase.

  ```
  ADD JOB 5 BREAKPOINT FUNCTION updateDatabase
  ```

  Output: If the request is submitted from the command line, the result could look like:

  ```
  1
  ```

- **Goal:** Add a breakpoint for job 5 at line 890 (in the STAXJobXmlFile file).

  ```
  ADD JOB 5 BREAKPOINT LINE 890
  ```

  Output: If the request is submitted from the command line, the result could look like:

  ```
  2
  ```

- **Goal:** Add a breakpoint for job 5 at line 2091 in file C:/tests/stax/beginInstallation.xml.

```
ADD JOB 5 BREAKPOINT LINE 2091 FILE C:/tests/stax/beginInstallation.xml
```

Output: If the request is submitted from the command line, the result could look like:

```
2
```

REMOVE BREAKPOINT

REMOVE BREAKPOINT allows you to remove a breakpoint after the job has started.

Note that this request was added in STAX V3.4.0.

Syntax

```
REMOVE JOB <Job ID> BREAKPOINT <Breakpoint ID>
```

JOB specifies the ID of the job.

BREAKPOINT specifies the breakpoint ID to remove.

For more information on using breakpoints, see **Using Breakpoints to Debug STAX Jobs**.

Security

This request requires at least trust level 4.

Results

Upon successful return, the result buffer does not contain anything.

Examples

- **Goal:** Remove a breakpoint 2 for job 5.

```
REMOVE JOB 5 BREAKPOINT 2
```

RESUME THREAD

RESUME THREAD allows you to resume a thread that is currently at a breakpoint.

Note that this request was added in STAX V3.4.0.

Syntax

```
RESUME JOB <Job ID> THREAD <Thread ID>
```

JOB specifies the ID of the job.

THREAD specifies the thread ID to resume.

For more information on using breakpoints, see **Using Breakpoints to Debug STAX Jobs**.

Security

This request requires at least trust level 4.

Results

Upon successful return, the result buffer does not contain anything.

Examples

- **Goal:** Resume thread 7 in job 18.

  ```
  RESUME JOB 18 THREAD 7
  ```

STEP THREAD

STEP THREAD allows you to step execution of a thread that is currently at a breakpoint.

Note that this request was added in STAX V3.4.0.

Syntax

```
STEP JOB <Job ID> THREAD <Thread ID> [INTO | OVER]
```

JOB specifies the ID of the job.

THREAD specifies the thread ID to step.

INTO indicates to execute the next task in the STAX job, after which another breakpoint will be reached. This is the default.

OVER indicates to execute the next task in the STAX job, including any sub-tasks, after which another breakpoint will be reached.

As an example of the differences between STEP INTO and STEP OVER, if you had the following STAX job:

```
<sequence>

  <script>server1 = "machine1.test.austin.ibm.com"</script>

  <stafcmd>
    ...
  </stafcmd>

  <process>
    ...
  </process>

  <call function="'VerifyRC'"/>

  <message>
    ...
  </message>

</sequence>

<testcase name="'test1'">/
    ...
</testcase>
```

If the thread was at a breakpoint on the `sequence` line, and you submitted a STEP INTO request, the `sequence` task would start, and the thread would be at a breakpoint on the `script` line.

If the thread was at a breakpoint on the `sequence` line, and you submitted a STEP OVER request, the `sequence` task would execute, including all tasks that it contains. So the thread would execute the `script`, `stafcmd`, `process`, `call`, and `message` tasks. The thread will then reach a breakpoint on the `testcase` line.

If the thread was at a breakpoint on the `call` line, and you submitted a STEP INTO request, the `call` task would start, and the thread would be at a breakpoint on the `function` element (for function `VerifyRC`).

If the thread was at a breakpoint on the `call` line, and you submitted a STEP OVER request, the `call` task would start, and entire function will execute. When the function completes, the thread would be at a breakpoint on the `message` line.

For more information on using breakpoints, see **Using Breakpoints to Debug STAX Jobs**.

Security

This request requires at least trust level 4.

Results

Upon successful return, the result buffer does not contain anything.

Examples

- **Goal:** Step into the breakpoint at thread 7 in job 18.

```
STEP INTO JOB 18 THREAD 7
```

- **Goal:** Step over the breakpoint at thread 1 in job 24.

```
STEP JOB 24 THREAD 1 OVER
```

- **Goal:** Step into the breakpoint at thread 6 in job 5.

```
STEP JOB 5 THREAD 6
```

STOP THREAD

STOP THREAD allows you to stop a running thread. After the task currently being executed in the thread completes, the thread will reach a breakpoint.

Note that this request was added in STAX V3.4.0.

Syntax

```
STOP JOB <Job ID> THREAD <Thread ID>
```

JOB specifies the ID of the job.

THREAD specifies the thread ID to stop.

For more information on using breakpoints, see **Using Breakpoints to Debug STAX Jobs**.

Security

This request requires at least trust level 4.

Results

Upon successful return, the result buffer does not contain anything.

Examples

- **Goal:** Stop thread 3 in job 1.

  ```
  STOP JOB 1 THREAD 3
  ```

PYEXEC

PYEXEC will execute Python code in the specified thread's python interpreter.

Note that this request was added in STAX V3.4.0.

Syntax

```
PYEXEC JOB <Job ID> THREAD <Thread ID> CODE <Python Code>
```

JOB specifies the ID of the job.

THREAD specifies the thread ID..

CODE specifies the Python code to execute

For more information on using breakpoints, see **Using Breakpoints to Debug STAX Jobs**.

Security

This request requires at least trust level 4.

Results

Upon successful return, the result buffer does not contain anything.

Examples

- **Goal:** Execute Python code in thread 3 in job 1 to set a variable called `server` to the string `'systemABC.company.com'`.

```
PYEXEC JOB 1 THREAD 3 CODE "server='systemABC.company.com'"
```

- **Goal:** Execute Python code in thread 12 in job 9 to update fields in an existing Python variable.

```
PYEXEC JOB 9 THREAD 12 CODE "testInfo['language'].append('spanish'); testInfo['parms']
['purchases']['tax'] = 8.25"
```

SET

SET allows you to change the operational parameters of the STAX service. The same parameters for the SET request can be specified when registering the STAX service. Note that a setting change only effects any new STAX jobs, not STAX jobs that are already running.

Syntax

```
SET [CLEARLOGS <Enabled | Disabled>]
    [LOGTCELAPSEDTIME <Enabled | Disabled>]
    [LOGTCNUMSTARTS <Enabled | Disabled>]
    [LOGTCSTARTSTOP <Enabled | Disabled>]
    [PYTHONOUTPUT <Python Output>]
    [PYTHONLOGLEVEL <Log Level>]
    [INVALIDLOGLEVELACTION <RaiseSignal | LogInfo>]
```

```
[EVENTGENERATION <Enabled | Disabled>]
[FILECACHING <Enabled | Disabled>]
[MAXFILECACHESIZE <MaxFiles>]
[FILECACHEALGORITHM <LRU | LFU>]
[MAXFILECACHEAGE <Number>[s|m|h|d|w]]
[MAXMACHINECACHESIZE <MaxMachines>]
[MAXRETURNFILESIZE <Number>[k|m]]
[MAXGETQUEUEMESSAGES <Number>]
[MAXSTAXTHREADS <Number>]
[DEBUGTHREAD <Enabled | Disabled>]
[DEBUGCLONEFUNCTION <Enabled | Disabled>]
[DEBUGPROCESS <Enabled | Disabled>]
[DEBUGXMLPARSE <Enabled | Disabled>]
```

See section "Installation and Configuration, STAX Service Machine" for a description of these options.

Security

This request requires at least trust level 5.

Results

Upon successful completion, the result buffer does not contain anything.

Examples

- **Goal:** Enable clear logs.

  ```
  SET CLEARLOGS Enabled
  ```

- **Goal:** Enable all additional testcase logging.

  ```
  SET LOGTCELAPSEDTIME Enabled LOGTCNUMSTARTS Enabled LOGTCSTARTSTOP Enabled
  ```

- **Goal:** Disable logging "Start" and "Stop records each time a testcase begins and ends.

  ```
  SET LOGTCSTARTSTOP Disabled
  ```

- **Goal:** Set the maximum number of files to cache to 40 and set the caching algorithm to "Least Frequently Used", and set the maximum age for

cached documents to 12 hours.

```
SET MAXFILECACHESIZE 40 FILECACHEALGORITHM LFU MAXFILECACHEAGE 12h
```

- **Goal:** Set the maximum size for files returned by a process element or by a stafcmd element that submits a FS GET FILE request to 30M.

```
SET MAXRETURNFILESIZE 30m
```

- **Goal:** Set the maximum number of STAX Threads that can be running simultaneously in a job to help prevent "runaway" STAX jobs that use paralleliterate and/or parallel elements to run too many threads in parallel which can cause the STAX service to run out of memory and crash.

```
SET MAXSTAXTHREADS 2000
```

- **Goal:** Set Python output to be redirected to the STAX Job User Log and to the STAX Monitor via the "Messages" tab and set the logging level for Python stdout to "User1".

```
SET PYTHONOUTPUT JobUserLogAndMsg PYTHONLOGLEVEL User1
```

- **Goal:** When an invalid log level is used by a <log> or <message> element, have the job raise a STAXLogError signal.

```
SET INVALIDLOGLEVELACTION RaiseSignal
```

START TESTCASE

START TESTCASE allows you to start a new testcase in a STAX job that is currently running. It performs basically the same action as a <testcase> element with the 'strict' mode, including logging a "Start" level message in the STAX Job log if "Log TC Start/Stop" is enabled for the job. A START request sets the start time for the testcase from which its elapsed time will be calculated. For example, a START request can be submitted from a shell script or Java program, etc. that is run via a <process> element to start a testcase.

Syntax

```
START JOB <JobID> TESTCASE <Testcase Name> [KEY <Key>] [PARENT <Testcase Name>]
```

JOB specifies the ID of the job.

TESTCASE specifies the fully qualified name of the testcase to be started. If a testcase with the same name is currently active, you must specify a key to uniquely identify the active testcase. You may want to prefix the name of the testcase with the value provided in the STAXCurrentTestcase Python variable to maintain the testcase hierarchy.

KEY specifies a unique identifier for this testcase when combined with the Testcase name. A key must be specified if a testcase with the same name is already currently active (started and not yet stopped).

For example, if your STAX job contains a <paralleliterate> element that iterates over a list of machines and this element contains a <process> element and the process submits a START request for a testcase, a key must be specified in the START request to uniquely identify the testcase. For example, you may want to specify the machine name where the process is running and the process handle for the key, e.g. KEY machineA:48.

We strongly recommend that you always specify a KEY so that the testcase can be run in parallel.

PARENT specifies the fully qualified name of the parent testcase. This option is used only if the testcase name you specified for the TESTCASE option does not exist. The parent testcase name must be the name of a testcase that already exists and must be a valid parent testcase name. Specifying the PARENT option indicates that the testcase hierarchy will be generated using information about the testcase stack provided by its parent testcase. Note that the only reason you would use the PARENT option is if you use periods within a testcase name to mean something other than distinguishing the testcase hierarchy and if you want the "Testcase Stack" field (returned by a `STAX QUERY JOB <Job ID> TESTCASE <Testcase Name>` request to reflect the proper testcase hierarchy. For example, if the testcase name you want to start is `Scenario1.Test2.machine1.company.com` and this testcase doesn't exist and you want its testcase hierarchy to be:

```
Scenario1
  Test2
    machine1.company.com
```

then you would need to specify Scenario1.Test2 for the PARENT option. If you do not specify the PARENT option for this testcase, then the testcase hierarchy will be determined by the periods in the testcase name. For example:

```
Scenario1
  Test2
    machine1
      company
        com
```

Security

This request requires at least trust level 3.

Results

Upon successful return, the result buffer does not contain anything.

Examples

- **Goal:** Start a testcase named "Scenario01.Test2.MachineA" in job 3.

```
START JOB 3 TESTCASE "Scenario01.Test2.MachineA"
```

- **Goal:** Start a testcase named "Scenario01.Test3" in job 12 in parallel on machine clientA (process handle 48) and on machine clientB (process handle 86).

```
START JOB 12 TESTCASE Scenario01.Test3 KEY clientA:48
START JOB 12 TESTCASE Scenario01.Test3 KEY clientB:86
```

- **Goal:** Start a new testcase named "Scenario01.Test1.machine1.company.com" in job 4 and specify parent "Scenario01.Test1" to indicate that the testcase stack for this testcase should be ["Scenario01", "Scenario01.Test1", "Scenario01.Test1.machine1.company.com"].

```
START JOB 4 TESTCASE "Scenario01.Test1.machine1.company.com" PARENT "Scenario01.Test1"
```

STOP TESTCASE

STOP TESTCASE allows you to stop an active testcase (which was started via a START TESTCASE request) in a STAX job that is currently running. It performs basically the same action as a </testcase> element, including logging a "Stop" level message in the STAX Job log if "Log TC Start/Stop" is enabled. A STOP TESTCASE request sets the stop time for the testcase from which its elapsed time will be calculated.

For example, a STOP TESTCASE request can be submitted from a shell script or Java program, etc. that is run via a <process> element to stop a testcase.

Syntax

```
STOP JOB <JobID> TESTCASE <Testcase Name> [KEY <Key>]
```

JOB specifies the ID of the job.

TESTCASE specifies the fully qualified name of the active testcase to be stopped. The testcase name specified must already exist and must have been started via a START request.

KEY specifies a unique identifier for the testcase when combined with the Testcase name. If the testcase was started with a key specified, the same key must be specified in the testcase's corresponding STOP request.

Security

This request requires at least trust level 3.

Results

Upon successful return, the result buffer does not contain anything.

Examples

- **Goal:** Stop a testcase named "Scenario01.Test2.MachineA" in job 3.

```
STOP JOB 3 TESTCASE "Scenario01.Test2.MachineA"
```

- **Goal:** Stop a testcase named "Scenario01.Test3" in job 12 that is running in parallel on machines clientA (process handle 48) and clientB (process handle 86).

```
STOP JOB 12 TESTCASE Scenario01.Test3 KEY clientA:48
STOP JOB 12 TESTCASE Scenario01.Test3 KEY clientB:86
```

TERMINATE

TERMINATE allows you to terminate a job or a block in a job.

Syntax

```
TERMINATE JOB <JobID> [BLOCK <Block Name>]
```

JOB specifies the ID of the job to terminate. If a BLOCK is not specified, then the "main" block in the job (which, by default, encompasses the entire job) is terminated which means all processes and STAF commands currently running are terminated.

BLOCK specifies a particular block in the job to terminate. The block name must correspond to a block element name in the XML document. If a block in a job is terminated, the processes and STAF commands that are currently running in the block are terminated.

Security

This request requires at least trust level 4.

Results

Upon successful return, the result buffer does not contain anything.

Examples

- **Goal:** Terminate all of job 5.

```
TERMINATE JOB 5
```

- **Goal:** Terminate job 23 in block MachineB.

```
TERMINATE JOB 23 BLOCK MachineB
```

UPDATE TESTCASE

UPDATE TESTCASE allows you to update the status of a testcase in a job that is currently running. It performs basically the same action as a <tcstatus> element contained in a job's XML file. For example, an update request can be performed within a process running in a job to update the status for a testcase.

Syntax

```
UPDATE JOB <JobID> TESTCASE <Testcase name> STATUS <Status> [MESSAGE <Message text>] [FORCE [PARENT
<Testcase name>]]
```

JOB specifies the ID of the job.

TESTCASE specifies the fully qualified name of the testcase whose status is to be updated. The testcase specified must already exist, unless FORCE is also specified. If you wanted a process defined by a <process> element in a job to update the status of the current testcase, the value of the STAXCurrentTestcase Python variable could be passed to the process via the <parms> element or <env> element and an UPDATE request could be submitted from within the process, specifying the current testcase value passed in for the TESTCASE option.

STATUS specifies the status for the testcase. It is required and it's value must be one of the following values (not case-sensitive):

- `Pass` - This increments the number of passes for the testcase.
- `Fail` - This increments the number of fails for the testcase.
- `Info` - This is used to update the last status information for the testcase, so you should also use the MESSAGE option to specify additional information about the testcase status.

MESSAGE specifies additional information about the status for a testcase. It is optional.

FORCE specifies that if the testcase does not already exist, it should be added to the testcase map. Note that without a FORCE option, you cannot update the status of a testcase without the testcase already existing.

PARENT specifies the fully qualified name of the parent testcase. This option is used only if the testcase name you specified for the TESTCASE option does not exist and you specified the FORCE option. The parent testcase name must be the name of a testcase that already exists and must be a valid parent testcase name. Specifying the PARENT option indicates that the testcase hierarchy will be generated using information about the testcase stack provided by its parent testcase. Note that the only reason you would use the PARENT option is if you use periods within a testcase name to mean something other than distinguishing the testcase hierarchy and if you want the "Testcase Stack" field (returned by a `STAX QUERY JOB <Job ID> TESTCASE <Testcase Name>` request to reflect the proper testcase hierarchy. For example, if the testcase name you want to start and update is `Scenario1.Test2.machine1.company.com` and this testcase doesn't exist and you want its testcase hierarchy to be:

```
Scenario1
  Test2
    machine1.company.com
```

then you would need to specify Scenario1.Test2 for the PARENT option. If you do not specify the PARENT option for this testcase, then the testcase hierarchy will be determined by the periods in the testcase name. For example:

```
Scenario1
  Test2
    machine1
      company
        com
```

An event will be generated that sends a message to the STAX Job Monitor with the testcase status information.

Testcase status information is displayed in the "Testcase Information" section of the STAX Monitor GUI. A summary of the number of passes and fails for each testcase is logged in the STAX Job log. Also, unless the testcase status is Info, if additional information was specified about the status of a testcase, it is also logged in the STAX Job Log.

Security

This request requires at least trust level 3.

Results

Upon successful return, the result buffer does not contain anything.

Examples

- **Goal:** Increment the pass status for existing testcase "Scenario01.Test2.MachineA" in job 3.

```
UPDATE JOB 3 TESTCASE "Scenario01.Test2.MachineA" STATUS pass
```

- **Goal:** Increment the fail status for testcase "Memory Test" in job 21 and record a message about the cause of the failure. If the testcase does not exist, create it.

```
UPDATE JOB 21 TESTCASE "Memory Test" STATUS Fail MESSAGE "RC=1. Open a defect" FORCE
```

- **Goal:** Increment the pass status for testcase "Scenario01.Test1.machine1.company.com in job 4. If the testcase does not exist, first create it and generate its testcase stack using information about the testcase stack provided by its parent testcase "Scenario01.Test1" such that its testcase stack will be ["Scenario01", "Scenario01.Test1", "Scenario01.Test1.machine1.company.com"].

```
UPDATE JOB 4 TESTCASE "Scenario01.Test1.machine1.company.com STATUS Pass FORCE PARENT
"Scenario01.Test1"
```

NOTIFY REGISTER/UNREGISTER

NOTIFY REGISTER/UNREGISTER allow you to either register or unregister to receive a notification when a given STAX job ends.

Syntax

```
NOTIFY REGISTER   ONENDOFJOB <Job ID> [BYNAME] [PRIORITY <Priority>]
NOTIFY UNREGISTER ONENDOFJOB <Job ID>
```

`REGISTER` indicates you want to register for a notification when a STAX job ends. The queued message will have type "STAF/Service/STAX/Job/End" and its message will contain a marshalled `<Map>` which represents the completion information for the STAX job. See table Definition of map for "STAF/Service/STAX/Job/End" type message for the map definition of a job completion message.

`UNREGISTER` indicates you want to unregister a STAX job end notification.

`ONENDOFJOB` specifies the job ID of the job for which you wish to register or unregister for a job end notification. This option will resolve variables.

`BYNAME` indicates that you wish to have the notification message sent when the job ends to the process(es) with the same machine and handle name of the process that submitted the `NOTIFY REGISTER` request. The default is to send the job end notification message to the queue of the machine/

handle that submitted the `NOTIFY REGISTER` request.

`PRIORITY` specifies the priority of the job end notification message. The default is 5. This option will resolve variables.

Definition of map for "STAF/Service/STAX/Job/End" type message		
Description: This map represents STAX job completion information.		
Key Name	**Type**	**Format / Value**
endTimestamp	`<String>`	`<YYYYMMDD-HH:MM:SS>`
jobID	`<String>`	
key	`<String> | <None>`	
result	`<String> | 'None'`	
status	`<String>`	`'Normal' | 'Terminated' | 'Abnormal' | 'Unknown'`
staxServiceName	`<String>`	
startTimestamp	`<String>`	`<YYYYMMDD-HH:MM:SS>`
testcaseTotals	`<Map:STAF/Service/STAX/TestcaseTotals>`	

Notes:

1. The "result" value is set to a "string" version of whatever the job specified to return, or `'None'` if the job did not specify anything to return.

   The job may not return anything if a <return> element is not executed in the starting function. This could be due to many reasons, such as an error occurring, the job being terminated, or if the starting function doesn't contain a <return> element.

2. The "status" value is the job completion status and it is set to one of the following:
   - `'Normal'` if the job ended normally
   - `'Terminated'` if the job was terminated (this means if the 'main' block was terminated or if an error occurred before the 'main' block was started)
   - `'Abnormal'` if the job ended abnormally. This can happen when at least one unhandled inherited condition remains on the condition stack when the job completes. For example, this can occur when a break or continue condition remains on the condition stack because there was no outer loop or iterate element, or when an exception is thrown but there's no catch element for it. This state takes precedence if the job is also terminated.
   - `'Unknown'` if the job has an unknown status. This should not occur.

For example, suppose a `STAX EXECUTE` request was submitted which started job ID 1, completed normally, returned a job result of "0", and ran 1 testcase which had 18 passes and 2 fails. The queued message with type STAF/Service/STAX/Job/End message could look like the following:

```
{
  handle             : 24
  handleName         : STAX/Job/1
  machine            : local://local
  message            : {
    endTimestamp   : 20090328-13:57:22
    jobID          : 1
    key            : <None>
    result         : 0
    startTimestamp : 20090328-13:56:57
    status         : Normal
    staxServiceName: STAX
    testcaseTotals : {
      numFails : 2
      numPasses: 18
      numTests : 1
    }
  }
  priority           : 5
  staf-map-class-name: STAF/Service/Queue/Entry
  timestamp          : 20090328-13:57:22
  type               : STAF/Service/STAX/Job/End
  user               : none://anonymous
}
```

As another example, suppose a `STAX EXECUTE` request was submitted with options `NOTIFY ONEND KEY "65:client1"` which started job ID 2, completed normally and returned a job result of "Success", and ran 5 testcases which had a total of 28 passes and 2 fails. The queued message with type STAF/Service/STAX/Job/End could look like the following:

```
{
  handle             : 28
  handleName         : STAX/Job/2
  machine            : local://local
  message            : {
    endTimestamp   : 20090328-14:02:22
    jobID          : 2
    key            : <None>
    result         : Success
    startTimestamp : 20090328-13:57:09
    status         : Normal
```

```
    staxServiceName: STAX
    testcaseTotals : {
      numFails : 2
      numPasses: 28
      numTests : 5
    }
  }
  priority           : 5
  staf-map-class-name: STAF/Service/Queue/Entry
  timestamp          : 20090328-14:02:22
  type               : STAF/Service/STAX/Job/End
  user               : none://anonymous
}
```

As yet another example, suppose a `STAX EXECUTE` request was submitted which started job ID 3, and assume that the job was terminated. The queued message with type STAF/Service/STAX/Job/End could look like the following:

```
{
  handle             : 32
  handleName         : STAX/Job/3
  machine            : local://local
  message            : {
    endTimestamp   : 20090328-14:06:15
    jobID          : 3
    key            : <None>
    result         : None
    startTimestamp : 20090328-14:05:59
    status         : Terminated
    staxServiceName: STAX
    testcaseTotals : {
      numFails : 0
      numPasses: 0
      numTests : 1
    }
  }
  priority           : 5
  staf-map-class-name: STAF/Service/Queue/Entry
  timestamp          : 20090328-14:02:22
  type               : STAF/Service/STAX/Job/End
  user               : none://anonymous
```

```
}
```

Security

These requests require at least trust level 3.

Results

Upon successful return, the result buffer will contain no data.

Examples

- **Goal:** Register the current process to have a job end notification sent to it's handle number when job 5 ends.

  ```
  NOTIFY REGISTER ONENDOFJOB 5
  ```

- **Goal:** Register the current process to have a priority 3 job end notification sent to it's handle number when job 5 ends.

  ```
  NOTIFY REGISTER ONENDOFJOB 5 PRIORITY 3
  ```

- **Goal:** Register to have a job end notification sent to all processes with the registered handle name of the current process on the submitter's machine when job 6 ends.

  ```
  NOTIFY REGISTER ONENDOFJOB 6 BYNAME
  ```

- **Goal:** Unregister the current process to be notified when job 6 ends.

  ```
  NOTIFY UNREGISTER ONENDOFJOB 6
  ```

NOTIFY LIST

NOTIFY LIST allows you to display the job end notification list for a given job or all jobs.

Syntax

```
NOTIFY LIST [JOB <Job ID>]
```

`LIST` lists the notifiees to be notified when one or more STAX jobs ends.

`JOB` specifies the job ID of the STAX job for which you wish to list notifiees. This option will resolve variables.

Security

This request requires at least trust level 2.

Results

Upon successful return, the result buffer will contain information about the request based on the options specified:

- **`NOTIFY LIST`**

  The result buffer for a `NOTIFY LIST` request (without specifying the `JOB` option) will contain a marshalled `<List> of <Map:STAF/Service/STAX/Notifiee>` representing the registered notifiees for all STAX jobs. The map is defined as follows:

Definition of map class STAF/Service/STAX/Notifiee			
Description: This map class represents a notifiee for STAX job completion.			
Key Name	**Display Name**	**Type**	**Format / Value**
`jobID`	`Job ID (ID)`	`<String>`	
`machine`	`Machine`	`<String>`	
`handle`	`Handle (H)`	`<String>`	
`handleName`	`Handle Name`	`<String>`	
`notifyBy`	`Notify By (Notify)`	`<String>`	`'Handle' | 'Name'`
`priority`	`Priority (P)`	`<String>`	
Notes: 1. The "`Notify By`" value is set to `'Handle'` if the notifiee registered to be notified by handle number (the default). Or, if the notifiee registered to be notified by handle name, the "`Notify By`" value is set to `'Name'`.			

- **`NOTIFY LIST JOB <Job ID>`**

  The result buffer for a `NOTIFY LIST JOB <Job ID>` request will contain a marshalled `<List> of <Map:STAF/Service/STAX/`

JobNotifiee> representing the registered notifiees for the specified job. The map is defined as follows:

Definition of map class STAF/Service/STAX/JobNotifiee			
Description: This map class represents a notifiee for STAX job completion.			
Key Name	**Display Name**	**Type**	**Format / Value**
machine	Machine	<String>	
handle	Handle (H)	<String>	
handleName	Handle Name	<String>	
notifyBy	Notify By (Notify)	<String>	'Handle' | 'Name'
priority	Priority (P)	<String>	

Notes:

1. The "Notify By" value is set to 'Handle' if the notifiee registered to be notified by handle number (the default). Or, if the notifiee registered to be notified by handle name, the "Notify By" value is set to 'Name'.

Examples

- **Goal:** List all the job end notifiees for job 5. Assume there are three registered notifiees for job 5: two registered by handle and one registered by name.

```
NOTIFY LIST JOB 5
```

Output: If the request is submitted from the command line, the result, in table format, could look like:

```
Machine                        Handle Handle Name    Notify By Priority
------------------------------ ------ -------------- --------- --------
tcp://client1.company.com@6500 54     TestA/MyHandle Handle    5
tcp://client3.company.com@6500 31     TestC/MyHandle Name      1
tcp://client5.company.com@6500 96     TestD/MyHandle Handle    5
```

- **Goal:** List the job end notification list for all jobs. Assume three of the currently running jobs have one or more notifiees.

```
NOTIFY LIST
```

Output: If the request is submitted from the command line, the result, in table format, could look like:

```
Job ID Machine                          Handle Handle Name    Notify By Priority
------ ------------------------------- ------ -------------- --------- --------
3      tcp://client5.company.com@6500 96     TestD/MyHandle Handle    5
5      tcp://client1.company.com@6500 54     TestA/MyHandle Handle    5
5      tcp://client3.company.com@6500 31     TestC/MyHandle Name      1
5      tcp://client5.company.com@6500 96     TestD/MyHandle Handle    5
6      tcp://client3.company.com@6500 31     TestC/MyHandle Name      1
```

PURGE <FILECACHE | MACHINECACHE>

PURGE is used to clear the contents of the file cache or the machine cache.

Syntax

```
PURGE <FILECACHE | MACHINECACHE> CONFIRM
```

`FILECACHE` specifies that the file cache is to be cleared. This also clears the overall cache statistics provided via a `LIST FILECACHE SUMMARY` request like Hit Count, Miss Count, Total Requests, and the Hit Ratio.

`MACHINECACHE` specifies that the machine cache is to be cleared.

`CONFIRM` confirms the purge.

Security

This request requires at least trust level 5.

Results

If successful, the result buffer will contain a marshalled <Map:STAF/Service/STAX/PurgeStats>, representing the number of entries that were purged from the cache and the number of entries remaining in the cache. The map is defined as follows:

Definition of map class STAF/Service/STAX/PurgeStats			
Description: This map class represents the results of a cache purge.			
Key Name	**Display Name**	**Type**	**Format / Value**
numPurged	Number Purged	`<String>`	

numRemaining	Number Remaining	<String>

Examples

- **Goal:** Purge all entries in the file cache and clear the overall cache statistics.

  ```
  PURGE FILECACHE CONFIRM
  ```

  Result:
  ```
  Number Purged: 10
  Number Remaining: 0
  ```

- **Goal:** Purge all entries in the machine cache.

  ```
  PURGE MACHINECACHE CONFIRM
  ```

  Result:
  ```
  Number Purged: 10
  Number Remaining: 0
  ```

VERSION

VERSION displays the version level of the STAX service or the version level of Jython packaged with the STAX service.

Syntax

```
VERSION [JYTHON]
```

`VERSION` specifies to display the version level of the STAX service or the version level of Jython packaged with the STAX service.

`JYTHON` specifies to display the version level of Jython packaged with the STAX service.

Security

This request requires at least trust level 1.

Results

The result buffer contains the version level of the STAX service if option JYTHON is not specified. If option JYTHON is specified, the result buffer contains the version level of Jython packaged with the STAX service.

Examples

- **Goal:** Display the version level of the STAX service.

  ```
  VERSION
  ```

  Result: `3.5.17`

- **Goal:** Display the version level of Jython packaged with the STAX service.

  ```
  VERSION JYTHON
  ```

  Result: `2.5.2-staf-v1`

STAX Monitoring

A Monitor application is available for the STAX Service. This application displays a real-time graphical representation of the currently running elements of a given STAX job.

The STAX Monitor application displays a list of all active jobs and an indication of which jobs are currently being monitored. The STAX Monitor application also provides a graphical user interface for the EXECUTE request which allows you to submit new jobs for execution and monitor the job from its beginning, if desired.

For each job that is monitored, the STAX Monitor application displays all currently executing <process>, <stafcmd>, <block>, and <job> elements for a STAX job. The graphical representation is a tree format, in order to show the hierarchy of the currently executing elements. The STAX Monitor application allows you to control the execution of the job by selecting a <block> element to hold, release, or terminate.

The STAX Monitor application also displays any testcases that have been executed and their status as well as any messages that have been sent via <message> elements or from the STAX service itself.

The STAX Monitor also displays all of the threads that are currently running in a STAX job, and allows you to interact with any breakpoints that are set for the STAX jobl

Multiple jobs can be monitored at the same time.

Starting the STAX Monitor

You can start the STAX Monitor using the -jar option, without adding the STAXMon.jar file to your CLASSPATH environment variable, if your STAXMon.jar file is in a first or second level directory off your STAF root directory (such as C:\STAF\services or C:\STAF\services\stax on Windows or /usr/local/staf/services or /usr/local/staf/services/stax on Unix systems). Note that when using the -jar option, Java does not use the CLASSPATH environment variable or the -cp option.

If your current directory contains STAXMon.jar, then to start the STAX Monitor, type:

```
java -jar STAXMon.jar
```

Or, if you are in another directory, fully qualify the STAXMon.jar file. So, if the STAXMon.jar file is in C:\STAF\services\stax, type:

```
java -jar C:\STAF\services\stax\STAXMon.jar
```

Or, you can start the STAX Monitor by specifying the main Java class name (which is case sensitive). When using this method, you must make sure that the STAXMon.jar and JSTAF.jar files are in your classpath and then type:

```
java com.ibm.staf.service.stax.STAXMonitor
```

The STAX Monitor accepts the following command line parameters:

```
-job <jobNumber> [-closeonend]
-jobparms <jobParmsFile> [-closeonend]
-extensions
-properties [-staxMachine <machineName>] [-staxServiceName <serviceName>]
            [-eventMachine <machineName>] [-eventServiceName <serviceName>]
            [-noStart]
-version
-help
```

`-job` specifies an existing job ID to monitor. This option will resolve variables.

`-closeonend` specifies that the STAX Monitor GUI should be closed when the monitored job ends. By default, the STAX Monitor GUI remains open when the monitored job ends.

`-jobparms` specifies a Job Parameters File for which a new STAX job should be submitted (and monitored, if specified in the Job Parameters File).

A Job Parameters File can be created by using the File Save or File Save As option on the STAX Monitor's "Start Job Parameters" window. This option will resolve variables.

`-extensions` displays the monitor extensions that are registered with the STAX Monitor.

`-properties` specifies to update one or more properties for the STAX Monitor.

`-staxMachine` specifies the name of the machine where the STAX service is running. This option will resolve variables.

`-staxServiceName` specifies the name used to register the STAX service. This option will resolve variables.

`-noStart` specifies to not start the STAX Monitor after updating its properties.

`-version` displays the version of the STAX Monitor.

`-help` displays help information for the STAX Monitor.

Examples Starting the STAX Monitor Using Parameters

Start the STAX Monitor specifying to monitor a current running STAX job with job ID 2:

```
java -jar STAXMon.jar -job 2
```

Start the STAX Monitor specifying to submit a new STAX job defined by Job Parameters File "C:\Documents and Settings\Administrator\Test6":

```
java -jar STAXMon.jar -jobParms "C:\Documents and Settings\Administrator\Test6"
```

Update properties for the STAX Monitor, such as setting the STAX service machine to server1.ibm.com and start the STAX Monitor:

```
java -jar STAXMon.jar -properties -staxMachine server1.ibm.com
```

Update properties for the STAX Monitor, such as setting the name of the STAX service to STAX2, but don't start the STAX Monitor:

```
java -jar STAXMon.jar -properties -staxServiceName STAX2 -noStart
```

On Windows with UAC Enabled and STAFProc Run as an Administrator

On Windows Vista and Windows Server 2008 and later (including Windows 7, Windows 8, Windows 8.1, Windows Server 2012, Windows Server

2012 R2, Windows 10, etc) that have User Account Controls (UAC) enabled, if STAFProc is being run as an Administrator on the machine where the STAX service that you are trying to monitor is registered, then you will also need to run the STAX Monitor as an Administrator or else you'll get "Error registering with STAF, RC: 21". This is also discussed in section 5.1.2 Running STAFProc on Windows with User Account Controls (UAC) Enabledin the STAF User's Guide.

One way to run the STAX Monitor as an Administrator is to find "Command Prompt" and right mouse on it and select "Run as administrator". Any command such as "java -jar STAXMon.jar" that is run from an "Administrator: Command Prompt", will be run as an Administrator. See Windows documentation for for information on how to run a command as an Administrator.

Setting STAX Monitor Properties

The first time you start the STAX Monitor, the "STAX Monitor Properties" window will be displayed (unless you specify the -properties option when starting the STAX Monitor).

The "STAX Monitor Properties" window contains five main tabs to allow properties for the STAX Monitor to be specified.

1. **"Machine Info" tab:**

   This tab allows you to specify the machine and service name of the STAX Service to which the STAX Monitor will be communicating.

   - Specify the machine and service name of the STAX Service machine:

     a. **STAX Machine** - Specify the name of the machine where the STAX service is running. It defaults to the local machine (the machine where you're running the STAX Monitor).

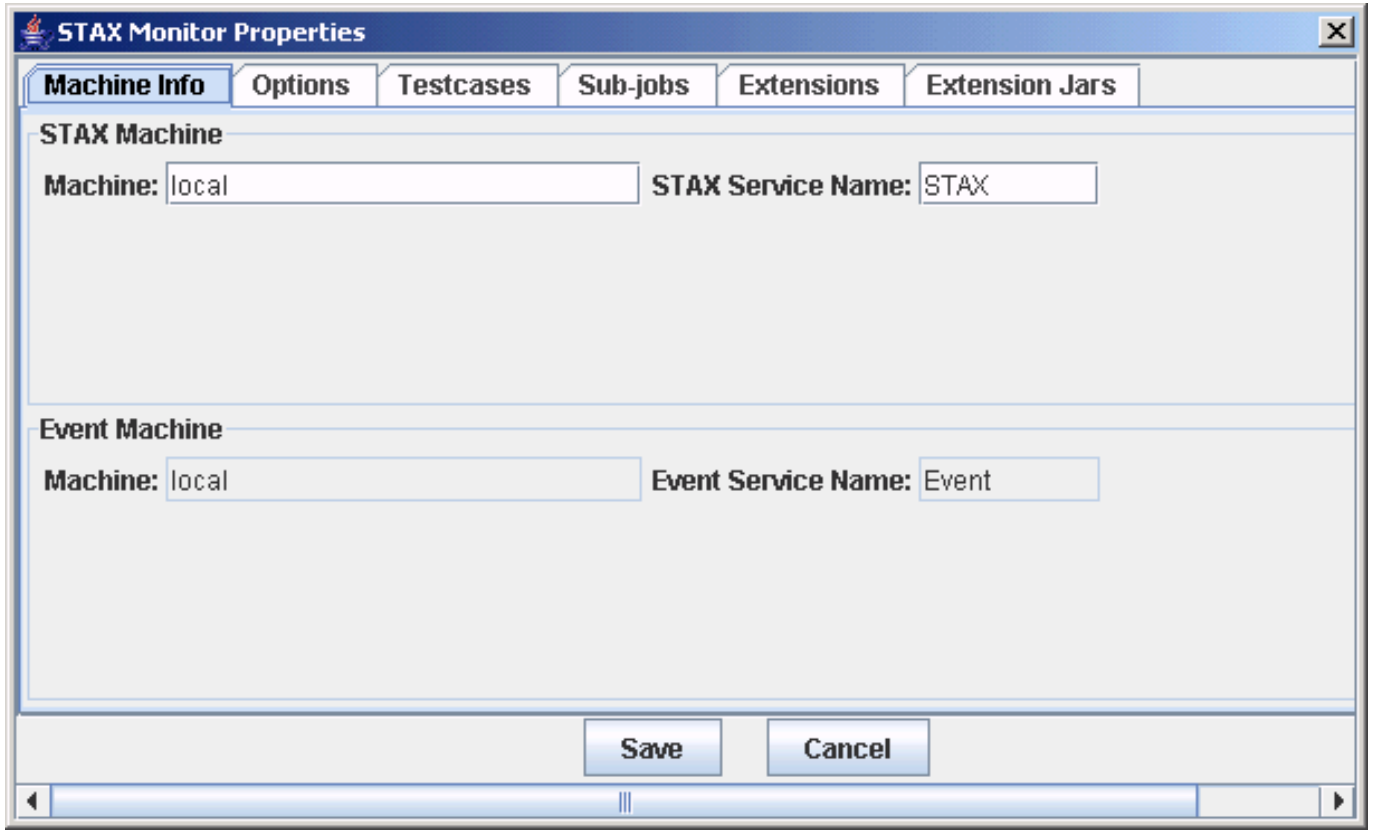
     b. **STAX Service Name** - Specify the name used to register the STAX service. It defaults to STAX. Typically, this value does not need to be changed.

   - Displays the machine name and service name of the Event Service used by the STAX Service:

     a. **Event Machine** - Displays the name of the Event Service machine used by the STAX service. It defaults to the specified STAX Machine if it cannot be obtained by submitting a "LIST SETTINGS" request to the specified STAX machine and STAX service. This field cannot be edited.

     b. **Event Service Name** - Displays the name of the Event Service used by the STAX service. It defaults to Event if it cannot be obtained by submitting a "LIST SETTINGS" request to the specified STAX machine and STAX service. This field cannot be edited.

Following is an example of the "Machine Info" tab:



2. **"Options" tab:**

   This tab allows you to specify options for the STAX Monitor:

   a. **Update Process Monitor information every x seconds** - Specify how frequently to refresh the Monitor information for processes. The default is 60 (every minute). The valid values are 0 or greater (0 indicates that the process monitor information should never be displayed). Saved updates to the seconds value will apply to all new STAX Monitor windows.

   b. **Update Elapsed Time every x seconds** - Specify how frequently to refresh the elapsed times with the STAX Monitor. The default is 1 (every second). The valid values are 0 or greater (0 indicates that the elapsed times should never be displayed). Saved updates to the seconds value will apply to all new STAX Monitor windows.

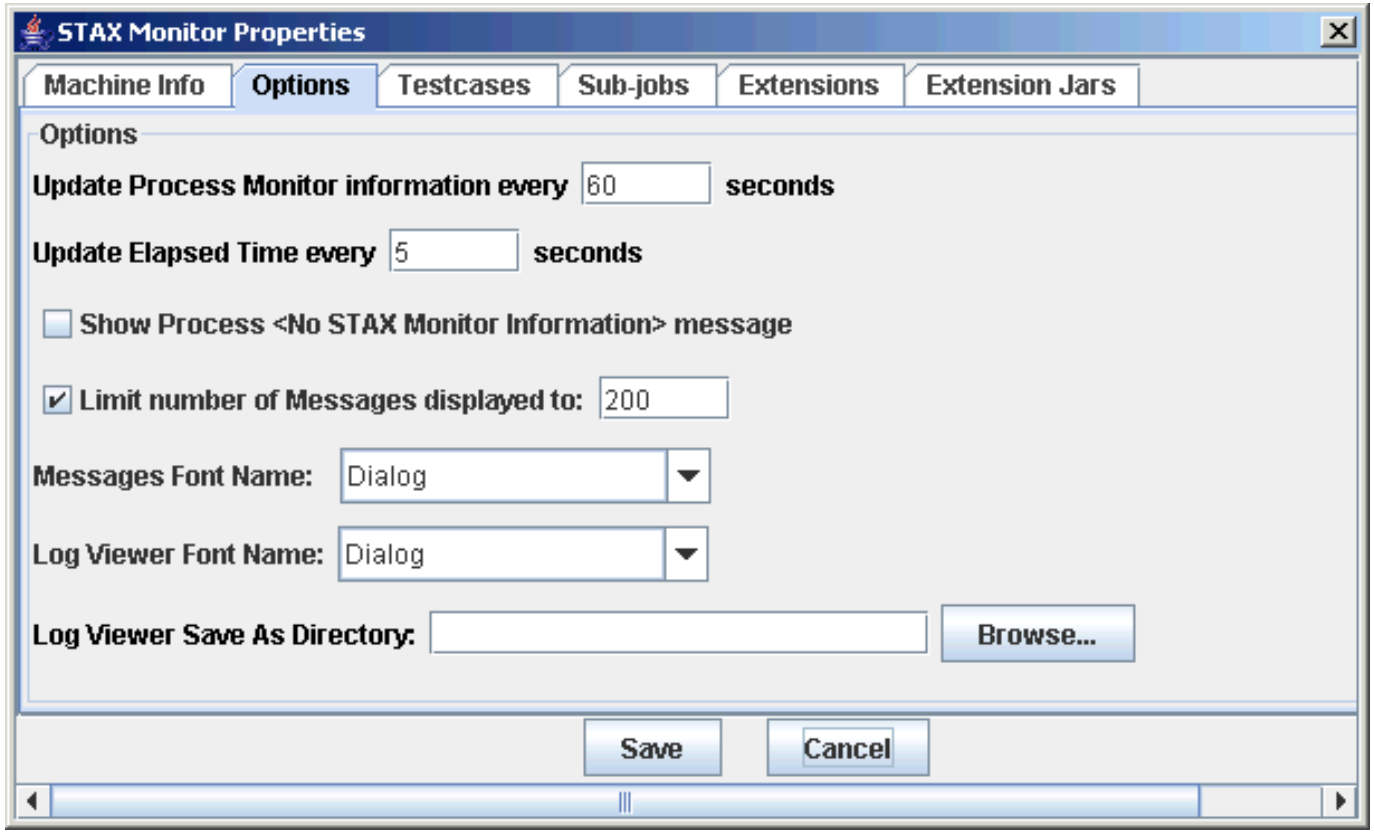
   c. **Show Process <No STAX Monitor Information> message** - Specify whether to show the "<No STAX Monitor Information>" message for processes that have no Monitor Information available. The default is to not display this message.

d. **Limit number of Messages displayed to** - Specify the limit of the number of messages that can be displayed in the Messages table. The default is to limit the number of messages to 200 (only the most recent 200 messages will be displayed in the Messages table).

e. **Messages Font Name** - Select the font name to use when displaying the Messages table. The default is the "Dialog" font name.

f. **Log Viewer Save As Directory** - Enter or browse to select the default directory to use when when displaying STAX log file and selecting the "File->Save As Text..." or "File->Save As Html..." menu item. If not specified, it will use the user's default directory which is typically the "My Documents" folder on Windows or the user's home directory on Unix.

Following is an example of the "Options" tab with its default values:



3. **"Testcases" tab:**

This tab allows you to specify testcase options for the STAX Monitor:

a. **Select the columns that will appear in the "Testcase Info" panel** - Specify which columns are displayed in the "Testcase Info" table.

The possible columns are: "Name", "PASS", "FAIL", "Start Date-Time", "Status Date-Time", "Duration", "Starts", and "Information".

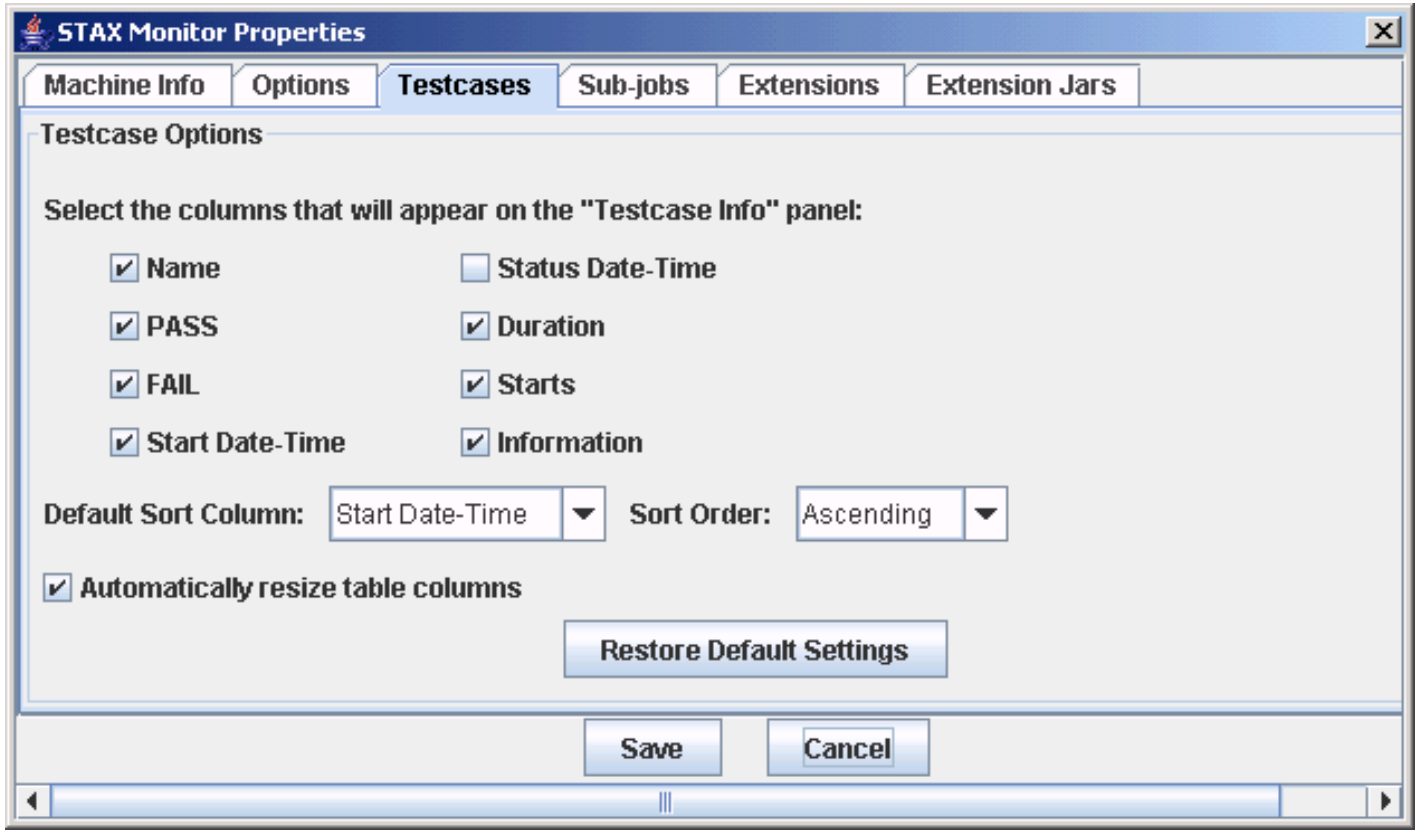
b. **Default Sort Column** - Specify the column by which the "Testcase Info" table will be sorted.

c. **Sort Order** - Specify whether to sort the "Testcase Info" table in ascending or descending order.

d. **Automatically resize table columns** - Specify whether to automatically resize the table columns in the "Testcase Info" table. If this option is selected, the column will automatically resize to show the complete text for that column. If the option is not selected, the column will not automatically resize to show the complete text for that column; this setting is useful if you want to resize any of the columns are retain the updated sizings when the table is updated.

e. **Restore Default Settings** - Click this button to restore the default settings for the Testcase options.

Following is an example of the "Testcases" tab with its default values:



4. **"Sub-jobs" tab:**

This tab allows you to specify whether to automatically monitor sub-jobs. Choose one of the following options:

a. **Automatically monitor sub-jobs** - A new STAX Monitor window will be opened for every sub-job that is started by the current job.

b. **Automatically monitor recommended sub-jobs** - A new STAX Monitor window will be opened only for sub-jobs whose <job> element attribute "monitor" is set to a true value. This is the default.

c. **Never automatically monitor sub-jobs** - Sub-jobs will never be automatically monitored.

Following is an example of the "Sub-jobs" tab:

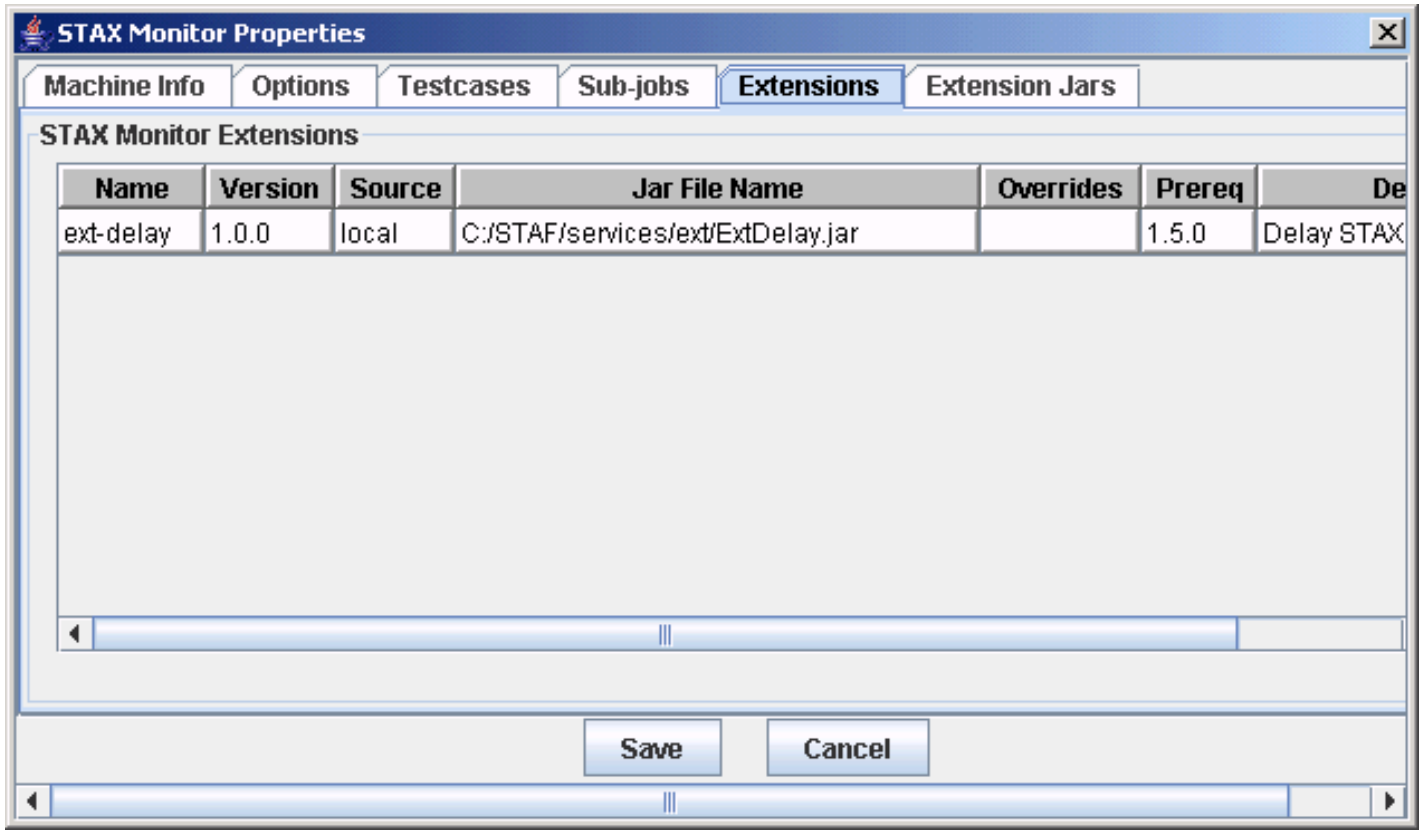
5. **"Extensions" tab:**

This tab allows you to display the monitor extensions that are registered with the STAX Monitor.

- **Name** - The name of the extension specified in the extension jar file's manifest.

- **Version** - The version of the extension, if provided in the extension jar file's manifest, or if not provided.
- **Source** - The source machine where the extension jar file containing this monitor extension resides. It will either be the name of the STAX service machine or local if the extension was specified via the "Extension Jars" tab.
- **Jar File Name** - The name of the extension jar file that contains this monitor extension.
- **Overrides** - If not blank, the name of the extension jar file that contains an overridden monitor extension.
- **Prereq** - The minimum required version of the STAX Monitor that this extension requires, if provided in the extension jar file's manifest, or if not provided.
- **Description** - A description of the extension jar file, if provided in the extension jar file's manifest, or if not provided

Following is an example of the "Extensions" tab with some monitor extensions registered:

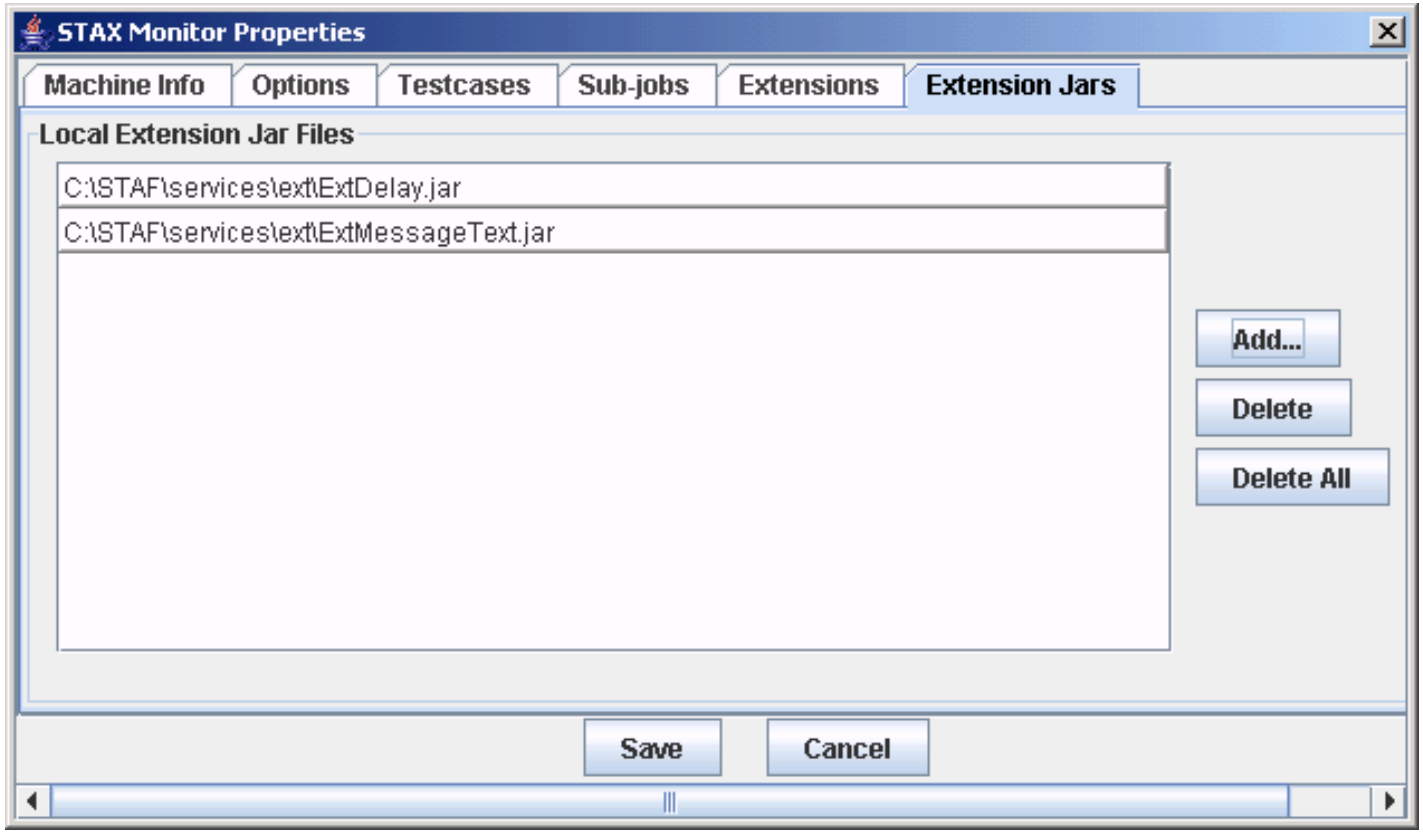


6. **"Extension Jars" tab:**

   This tab allows you to specify any local extension jar files containing STAX Monitor extensions that you want to register. Note that as of STAX V1.5.0, any STAX monitor extensions that are registered with the STAX service will be automatically made available to the STAX Monitor. You should only specify local extension jar files that are not already registered with the STAX service or that contain monitor extensions that you want to override (e.g. with a later version of the extension).

- **Local Extension Jar Files** - Specify the fully-qualified names of jar files on the local system that contain monitor extensions to be registered. You may specify as many extension jar files as needed. This is an optional field.
  - Click on the "Add" button to add a new extension jar file.
  - To delete an Extension Jar File that you already added, select it from the list and click on the "Delete" button.
  - Click on the "Delete All" button to delete all extension jar files in the list.

Following is an example of the "Extension Jars" tab with some extension jar files added:



Click on the "Save" button to save any changes (or the "Cancel" button to end without saving changes). The next window that will be displayed is the "STAX Job Monitor" window which contains a list of active jobs.

When you close and restart the STAX Monitor, the "STAX Properties" panel options last entered are restored.

Note that if this is is not the first time the STAX Monitor has been started, the "STAX Job Monitor" window is displayed first instead of the "STAX Monitor Properties" window. To update the properties from the "STAX Job Monitor" window, select "File" from the menu bar and then select "Properties..." in order to display the "STAX Monitor Properties" window. You must stop and restart the STAX Monitor before the properties update

will take place.

Displaying a List of Active Jobs

Following is an example of the "STAX Job Monitor" window with no jobs currently running or monitored:

The "STAX Job Monitor" displays STAX jobs that are currently running on the specified STAX machine (as well as completed jobs which are currently being monitored) in the "Active Jobs" table. Sub-jobs will appear as separate jobs and are also displayed in the "STAX Job Monitor" window.

The **File** menu bar contains the following menu items:

- **Properties...** - This option displays the STAX Job Monitor Properties dialog.
- **Submit New Job...** - This option displays the Start New Job dialog.
- **Resubmit Previous Job** - This option resubmits that last job that was submitted.
- **Exit** - Selecting this option closes the STAX Job Monitor window.

The **Display** menu bar contains the following menu items:

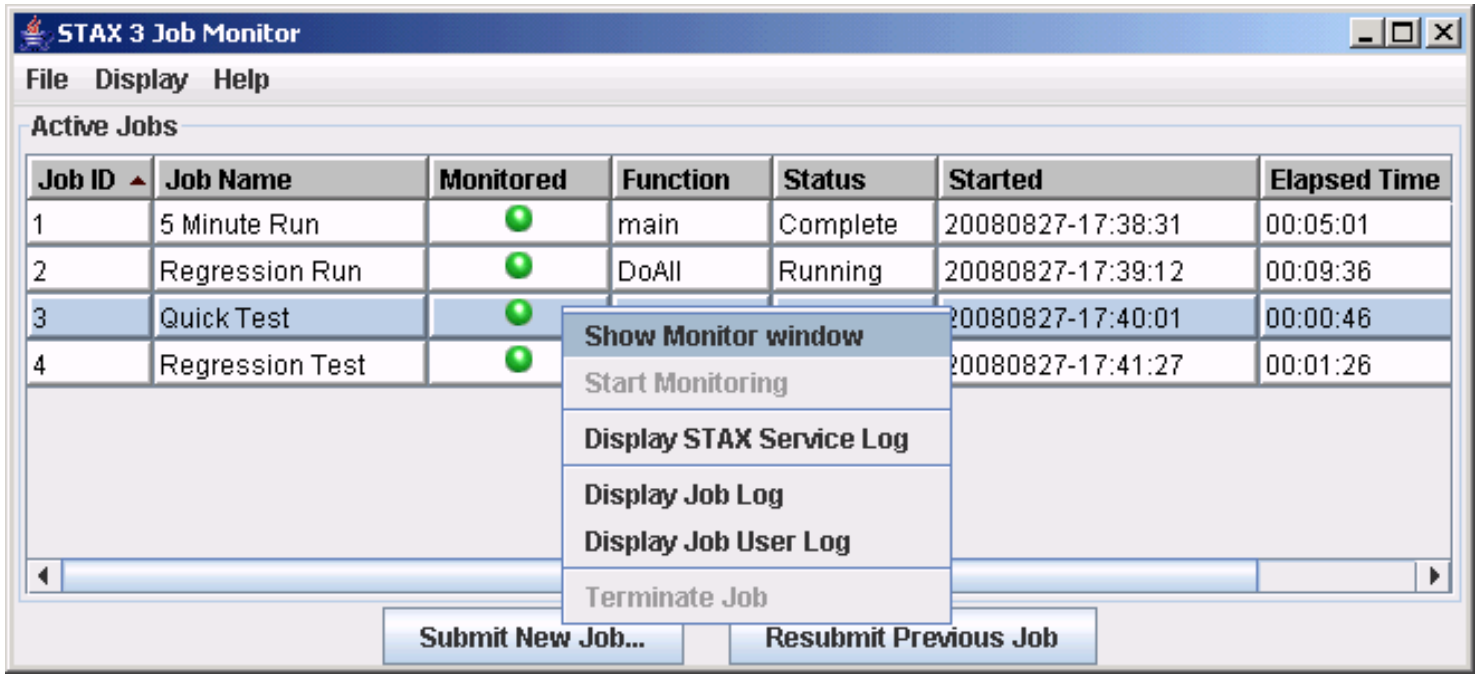
- **Display STAX Service Log** - Selecting this option causes the STAX Service Log to be displayed.

- **Display Selected Job's Log** - Selecting this option causes the Job Log for the currently selected Job to be displayed.
- **Display Selected Job's User Log** - Selecting this option causes the Job User Log for the currently selected Job to be displayed. If there are no entries in the Job User Log, then an informational message will be displayed to indicate that there are no entries in the log.
- **Display Recent Logs** - Moving the cursor over this option will display a sub-menu containing the last 20 STAX Job/User logs that have been displayed since the STAX Monitor was started. Selecting a STAX Job/User log from the sub-menu will result in the log being displayed again (with the current content of the log). If you move the cursor over an item in the sub-menu, the "Start" record from the job log will be displayed as a tool tip.
- **Display Job Log...** - Selecting this option allows you to display the Job Log for any Job ID.
- **Display Job User Log...** - Selecting this option allows you to display the Job User Log for any Job ID. If there are no entries in the Job User Log, then an informational message will be displayed to indicate that there are no entries in the log.
- **Display STAX JVM Log** - Selecting this option causes the JVM Log for the STAX service to be displayed. Only the entries in the current JVM Log from the last time the JVM was created are shown (though you can later use the "View->Show All" option to change it to display all entries in the JVM Log). This option is only enabled if STAF V3.2.1 or later is running on the STAX Monitor machine. Refer to the "Displaying a JVM Log" section for more information on this option.
- **Display Other JVM Log...** - Selecting this option allows you to display a JVM Log for any service currently registered on any machine. This option is only enabled if STAF V3.2.1 or later is running on the STAX Monitor machine. Refer to the "Displaying a JVM Log" section for more information on this option.

The "Active Jobs" table shows the following information for each active job:

- **Job ID** - Job number for an active job.
- **Job Name** - Name specified for the job, or <N/A> if no job name was specified when submitting the job for execution.
- **Monitored** - A green ball indicates that the job is currently being monitored. No green ball indicates that the job is currently running but is not being monitored.
- **Function** - Name of the function that was called to start the job.
- **Status** - "Pending" if the job is in the process of being submitted for execution, "Running" if the job is currently running, or "Complete" if the job has completed but is still being monitored.
- **Started** - Date and time that the job was started. The format is YYYYMMDD-HH:MM:SS.
- **Elapsed Time** - The elapsed time that the job has been running (or if the status is complete, the elapsed time that the job ran). The format is HH:MM:SS. If the elapsed time exceeds 99 hours, the format is HHH:MM:SS. Note that if you are monitoring a remote STAX service machine, then in order for the elapsed times to be accurate, the STAX service machine must be running STAF version 3.4.2 or later.
- **Result** - A "string" version of the Job Result. Private data will be masked.

Following is the "STAX Job Monitor" window which shows four active jobs:



If you right-mouse-click on a job in the "Active Jobs" table, a popup menu is displayed with the following options:

- **Show Monitor window** - This option is only enabled if you are currently monitoring the selected job. Selecting this option causes the "Job Monitor" window for this job to be brought to the foreground.
- **Start Monitoring** - This option is only enabled if you are not currently monitoring the selected job and the selected job has a "Running" status. Selecting this option causes a Job Monitor window to be created for this job.
- **Display STAX Service Log** - This option allows you to view the STAX Service Log.
- **Display Job Log** - This option is always enabled. Selecting this option causes the Job Log to be displayed.
- **Display Job User Log** - This option is always enabled. Selecting this option causes the Job User Log to be displayed. If there are no entries in the Job User Log, then an informational message will be displayed to indicate that there are no entries in the log.
- **Terminate Job** - This option is enabled for all jobs with a "Running" status. Selecting this option causes the job to be terminated. Terminating a parent job will terminate any sub-jobs as well.

Submitting a New Job for Execution

The STAX Monitor provides a graphical user interface for submitting an EXECUTE request (as an alternative to issuing an EXECUTE request via the command line). To submit a new job for execution from the "STAX Job Monitor" window, click on the "Submit New Job..." button or select "File" from the menu bar and then select "Submit New Job...". A "Start Job Parameters" window will be displayed.

Note that when you close and restart the STAX Monitor, the options on the "Start Job Parameters" panel last entered are restored.

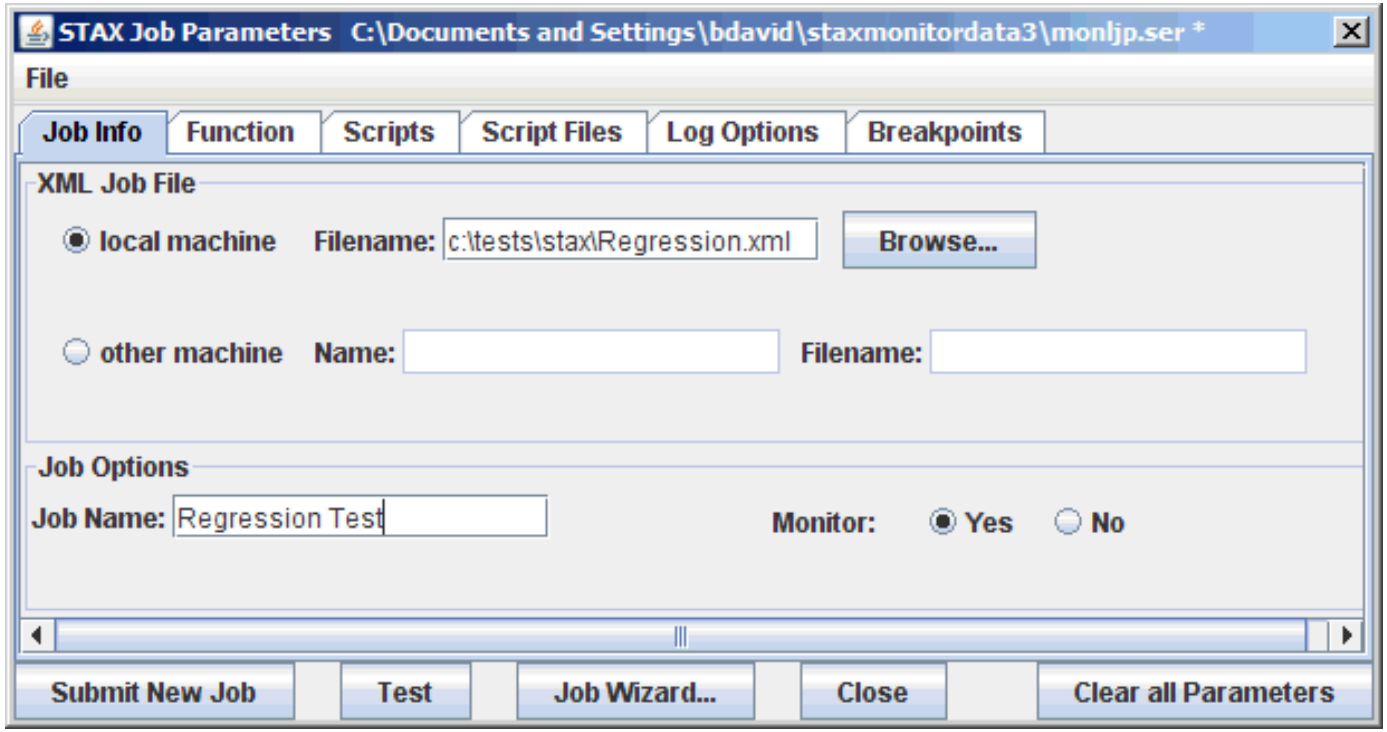
The "STAX Job Parameters" window contains five main tabs to allow job execution parameters to be specified.

1. **"Job Info" tab:**

   This tab allows you to specify the following job execution parameters:

   - **XML Job File** - Specify the fully-qualified name of the XML file to be executed. You may select "local machine" and enter the local file name, or select "other machine" and specify the machine and file names. For XML files on local machines, a "Browse..." button is provided which displays a "Select an XML Job Definition File" panel to allow you to select the file.
   - **Job Name** - Specify a name which identifies the job. This field is optional.
   - **Monitor** - Select "Yes" or "No" to indicate whether you want to monitor the job you are submitting.

   Following is an example of the "Start Job Parameters" panel with the "Job Info" tab selected and with some fields filled in:



2. **"Function" tab:**

   This tab allows you to specify the start function parameter for the job:

- **Start Function** - Select "default" to start executing the job at its default start function. Select "other" to specify the name of the function to be called to begin the job. If you select "default" and the XML document does not contain a <defaultcall> element, you will get a STAXInvalidStartFunctionException if you try to execute the job. You can pass parameters to the Start Function by specifying the parameters in the Arguments field.

Following is an example of the "Start Job Parameters" panel with the "Function" tab selected and with function arguments specified:

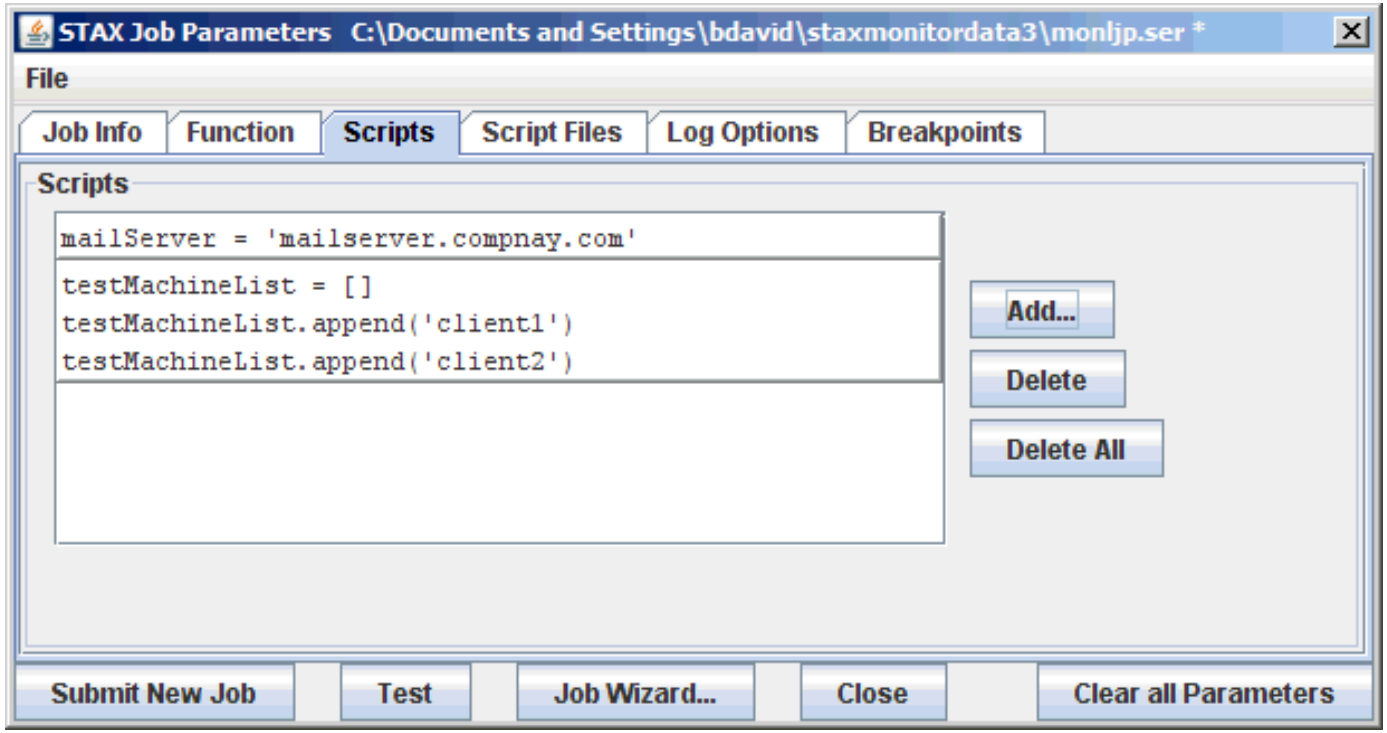
3. **"Scripts" tab:**

This tab allows you to specify Script parameters:

- **Scripts** - Specify any Python code to be executed. You may specify as many Script parameters as needed. This is an optional field. See the "EXECUTE" section for more information on a SCRIPT parameter.

  Click on the "Add" button to add a new Script parameter. To edit a script already in the list, double click on the script. To delete a Script parameter that you already added, select it from the list and click on the "Delete" button. Click on the "Delete All" button to delete all Scripts in the list.

Following is an example of the "Start Job Parameters" panel with the "Scripts" tab selected and with some fields filled in:



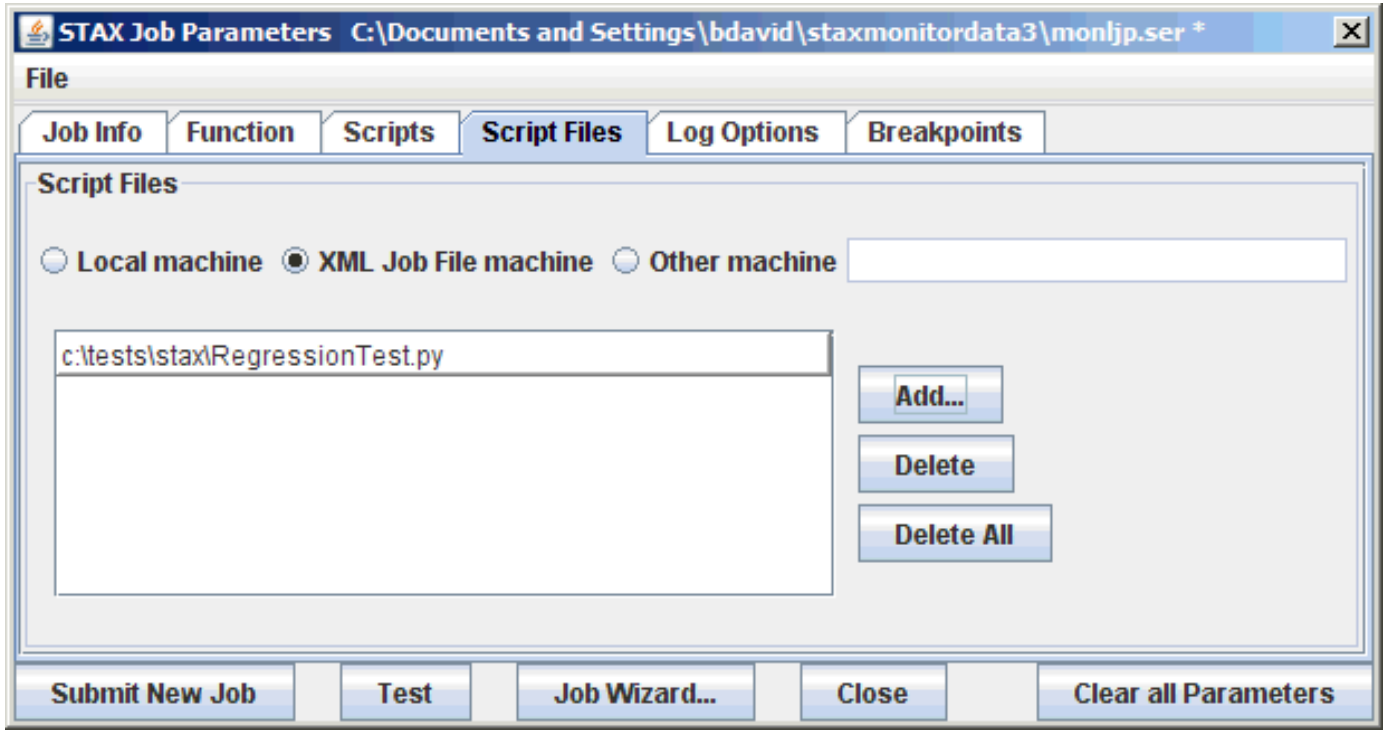
4. **"Script Files" tab:**

   This tab allows you to specify Script File parameters:

   - **Script File Machine** - Specify the machine where the script files are located. You may select one of the following:
     - **Local machine** - to indicate the script files are located on the local STAX Monitor machine.
     - **XML Job File machine** - to indicate the script files are located on the same machine specified for the XML Job File. This is the default.
     - **Other machine** - to specify the name of the machine where the script files are located

   - **Script Files** - Specify the fully-qualified names of script files that contain Python code to be executed. You may specify as many script files as needed. This is an optional field. See the "EXECUTE" section for more information on a SCRIPTFILE parameter.
     - Click on the "Add" button to add a new script file.
     - To edit the name of a script file already in the list, double click on the script file name.
     - To delete a script file that you already added, select it from the list and click on the "Delete" button.
     - Click on the "Delete All" button to delete all script files in the list.

Following is an example of the "Start Job Parameters" panel with the "Script Files" tab selected and with some fields filled in:



5. **"Log Options" tab:**

   This tab allows you to specify the log parameters:

   - **Clear Logs** - Select "Enabled", "Disabled", or "Default" to indicate whether the STAX Job and Job User logs should be deleted before the job is executed. Selecting "Enabled" specifies to delete the logs. Selecting "Disabled" specifies not to delete the logs. Selecting "Default" specifies to use the STAX service setting for "Clear Logs".

   - **Log TC Elapsed Time** - Select "Enabled", "Disabled", or "Default" to indicate whether to log the elapsed time in the testcase summary records at the end of the STAX Job log and in a LIST TESTCASES request. Selecting "Enabled" specifies to log the elapsed time for testcases. Selecting "Disabled" specifies not to log the elapsed time for testcases. Selecting "Default" specifies to use the STAX service setting for "Log TC Elapsed Time".

   - **Log TC Num Starts** - Select "Enabled", "Disabled", or "Default" to indicate whether to log the number of times a testcase is started in the testcase summary records at the end of the STAX Job log and in a LIST TESTCASES request. Selecting "Enabled" specifies to log the number of testcase starts. Selecting "Disabled" specifies not to log the number of testcase starst. Selecting "Default" specifies to use the STAX service setting for "Log TC Num Starts".

- **Log TC Start/Stop** - Select "Enabled", "Disabled", or "Default" to indicate whether to log "Start" and "Stop" level records each time a testcase begins or ends in the STAX Job log. Selecting "Enabled" specifies to log the testcase "Start" and "Stop" records. Selecting "Disabled" specifies not to log the testcase "Start" and "Stop" records. Selecting "Default" specifies to use the STAX service setting for "Log TC Start/Stop".

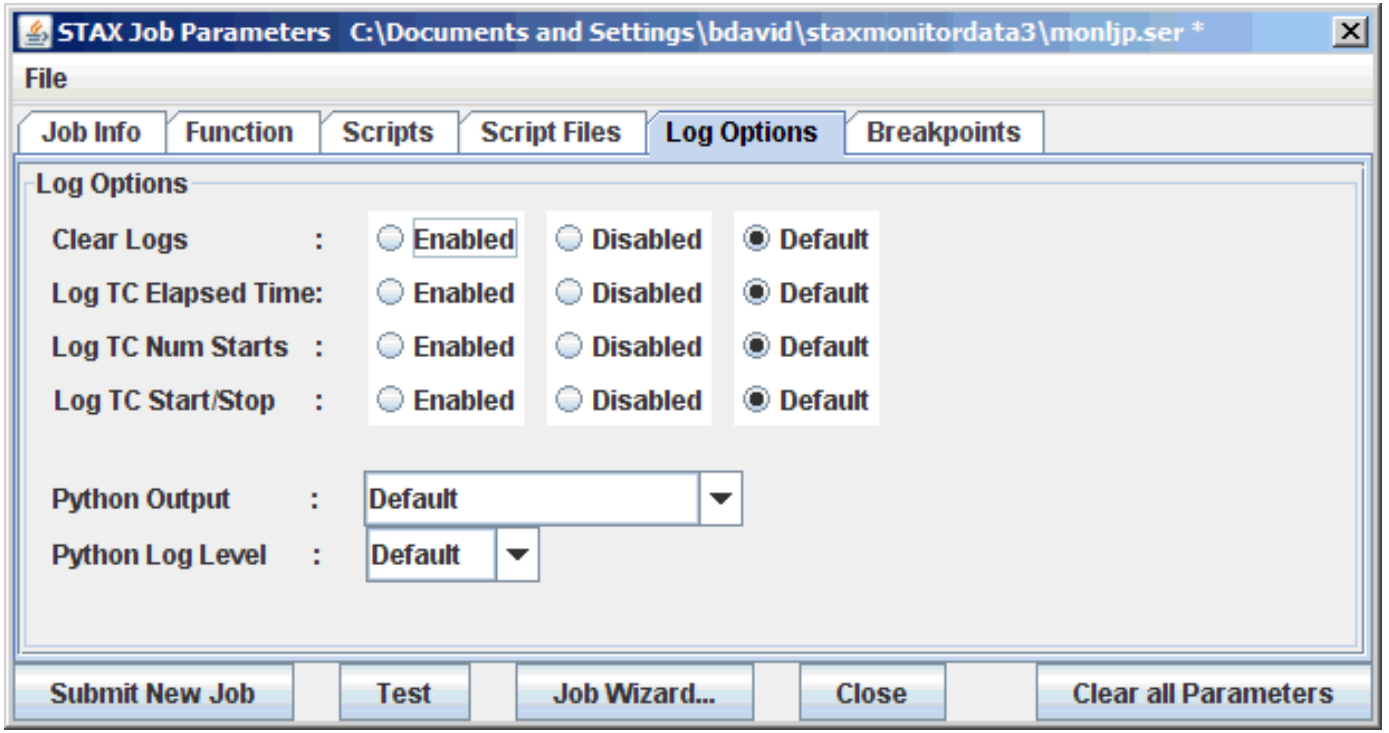
- **Python Output** - Select a value to indicate where Python output for the STAX job should be redirected. Selecting "Default" specifies to use the STAX service setting for "Python Output". Selecting "Job User Log" indicates to log the Python output in the STAX Job User log. Selecting "Message" indicates to send the Python output to the STAX Monitor and display it in the Messages panel. Selecting "Job User Log & Message" indicates to log the Python output in the STAX Job User log and to send it to the STAX Monitor and display it in the Messages panel. Selecting "JVM Log" indicates to write the Python output in the JVM Log for the STAX service using the following format so that you will know which STAX job originated the output and at what time:

  ```
  <Timestamp> <Python Log Level> Job <JobID> <Python Output>
  ```

- **Python Log Level** - Select a value to indicate the STAF logging level to use for Python stdout if Python output is redirected to the STAX Job User log. Selecting "Default" specifies to use the STAX service setting for "Python Log Level".

- **Invalid Log Level Action** - Select a value to indicate the action to take when an invalid STAF logging level is used by a <log> or <message> element. Selecting "Default" specifies to use the STAX service setting for "Invalid Log Level Action". Selecting "RaiseSignal" indicates to raise a STAXLogError signal. Selecting "LogInfo" indicates to use the "Info" log level instead of the invalid log level.

Following is an example of the "Start Job Parameters" panel with the "Log Options" tab selected:



6. **"Breakpoints" tab:**

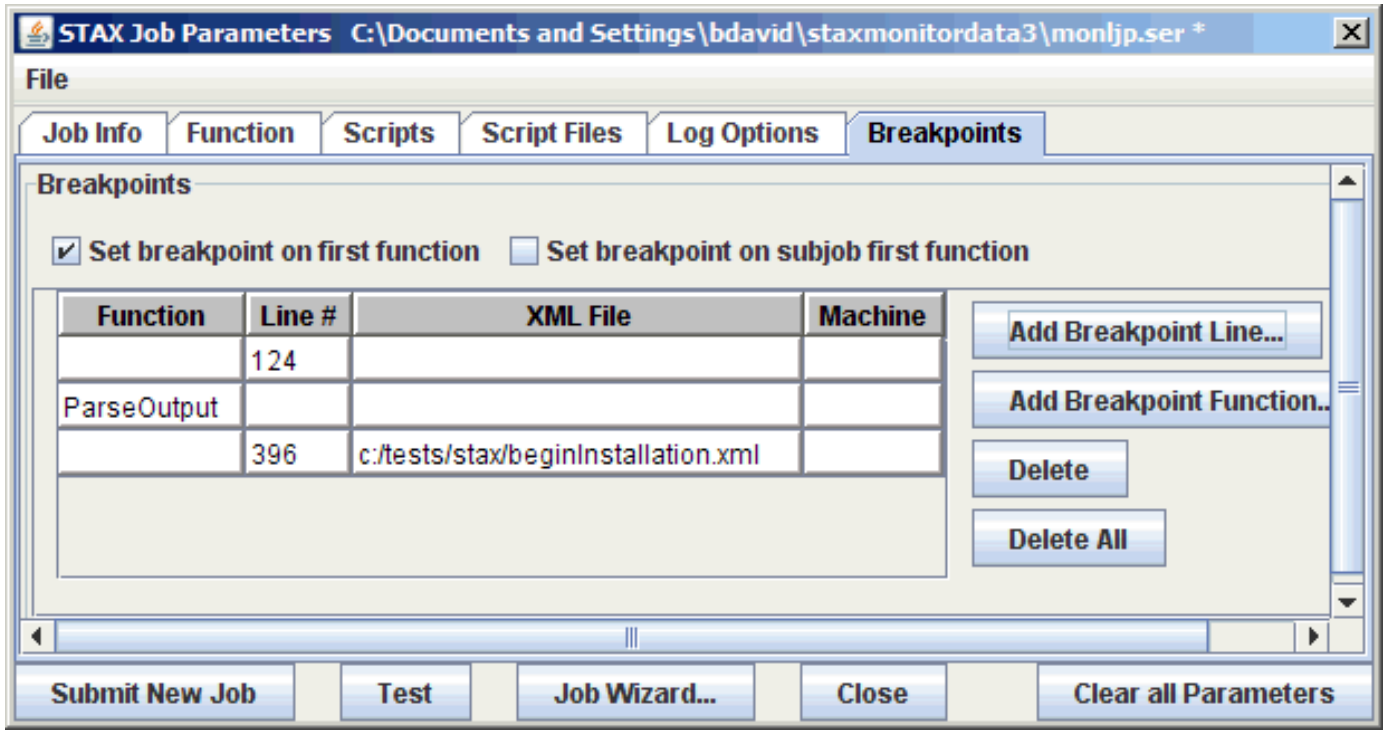
   This tab allows you to specify breakpoints for the STAX job:

   - The table shows all line/function breakpoints that will be specified via the BREAKPOINT option when the job is submitted.
   - If the **Set breakpoint on first function** checkbox is selected, the BREAKPOINTFIRSTFUNCTION option will be specified when the job is submitted.
   - If the **Set breakpoint on subjob first function** checkbox is selected, the BREAKPOINTSUBJOBFIRSTFUNCTION option will be specified when the job is submitted.
   - **Add Breakpoint Line...** allows you to add a line breakpoint. Clicking the button will display a panel where you can specify the line number (required), XML file (optional), and Machine (optional).
   - **Add Breakpoint Function...** allows you to add a function breakpoint. Clicking the button will display a panel where you can specify the case-sensitive function name (required).
   - **Delete** allows you to delete the currently selected breakpoint.

- **Delete All** allows you to delete all of the breakpoints.

- Double-clicking on a row in the table allows you to edit the selected breakpoint.

Following is an example of the "Start Job Parameters" panel with the "Breakpoints" tab selected:



Saving Execute Information in a Job Parameters File

You may save the information you specify to start a new job in a Job Parameters File. This is particularly useful when you plan on submitting the job with the parameters specified (or similar parameters) multiple times. To save the job parameters in a file, select "File" from the menu bar on the "Start Job Parameters" panel, and then select "Save As...". A "Save Current Job Parameters as" panel will be displayed which lets you specify the name and directory of the Job Parameters File to create.

Later, to display the "Start Job Parameters" panel with the information you previously stored in a Job Parameters File, select "File" from the menu bar on the "Start Job Parameters" panel, and then select "Open". An "Open Job Parameters File" window will be displayed which lets you specify or browse for the Job Parameters File you wish to use. Or, if the Job Parameters File you wish to use is one of the last ten Job Parameters Files specified, it can be selected directly when you select "File" from the menu bar on the "Start Job Parameters" panel.

If you want to save any changed information for an existing Job Parameters File that you have opened, select "File" from the menu bar on the "Start

Job Parameters" panel, and then select "Save".

Buttons on the "Start Job Parameters" Panel

The following buttons are available at the bottom of the "Start Job Parameters" panel:

- **Submit New Job** - click on this button to submit the job for execution. If the execution request is valid, the new job will appear in the "Active Jobs" table on the "STAX Job Monitor" window.

  If you selected "Yes" for the Monitor option, a "STAX Job Monitor" window for the job is then displayed.

- **Test** - click on this button to test whether the XML document is well-formed and valid and that the specified execution options are valid. The job will not be submitted for execution.

- **Job Wizard** - click on this button to use the Job Wizard to help you select the starting function and to specify function arguments for it. See the "Using the Job Wizard" section for more information on how to use the Job Wizard.

- **Close** - click on this button if you want to close the "STAX Job Parameters" window without submitting the job.

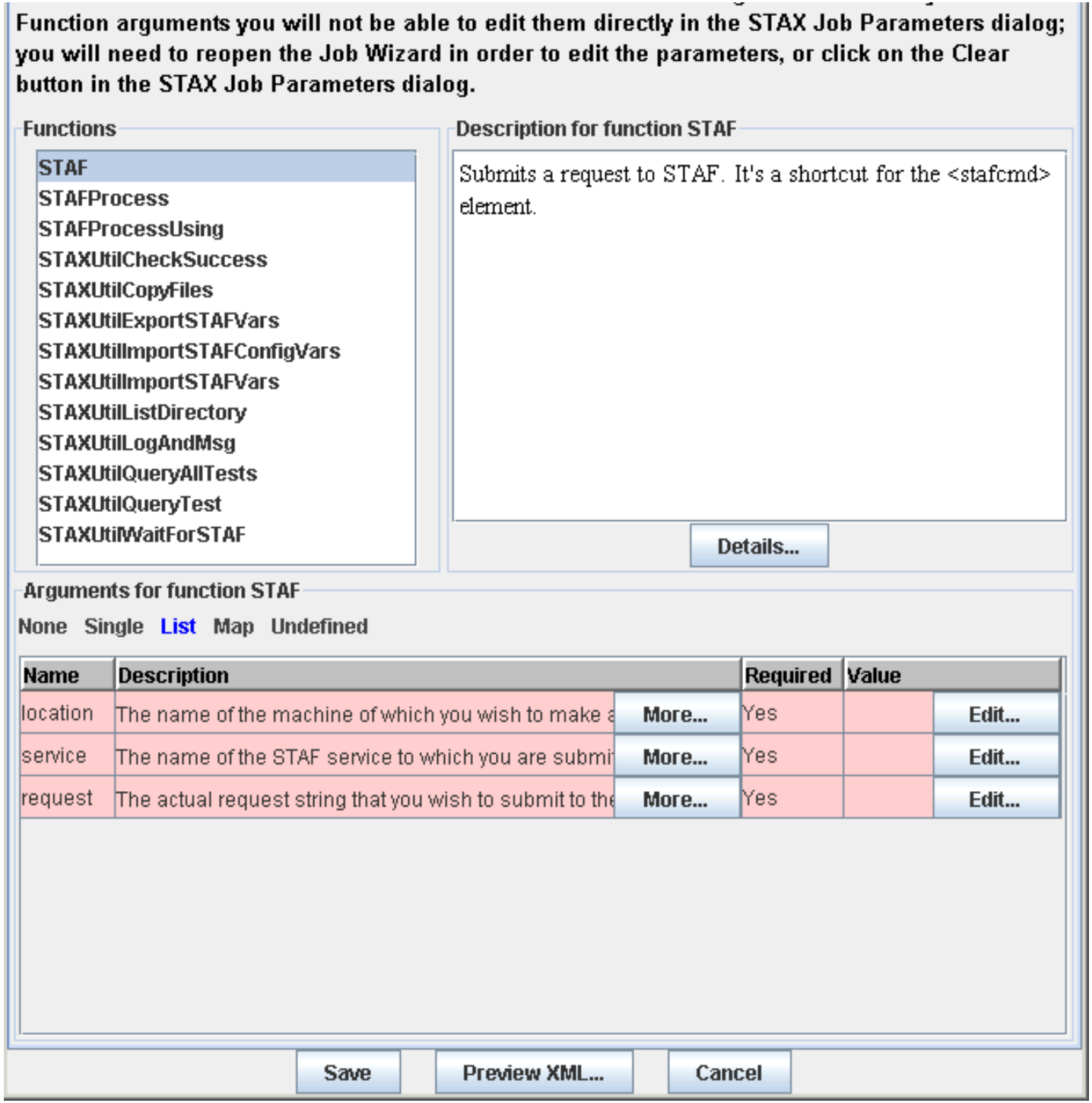
- **Clear all Parameters** - click on this button to clear all of the job execution parameters.

Using the Job Wizard

The STAX Monitor provides a Job Wizard to help you select the starting function for a job you want to execute and to help you specify function arguments for it, if needed. The Job Wizard lists all of the available functions in a given STAX XML file, as well as the arguments that can be specified for each function.

To use the Job Wizard, specify the fully-qualified name of the XML file to be executed in the "XML Job File" section of the "STAX Job Parameters" dialog (and the machine where it resides if not on the local machine), and then click on the "Job Wizard..." button.

Here is an example of the "STAX Job Wizard" dialog that will be displayed (when specifying C:\STAF\services\stax\libraries\STAXUtil.xml as the XML filename).



In the "Functions" list you will see an alphabetical list of all the functions that are available within the specified XML file. If the XML file designates

a default starting function via the <defaultcall> element, then the default function will be shown as "functionname (default)" in the list.

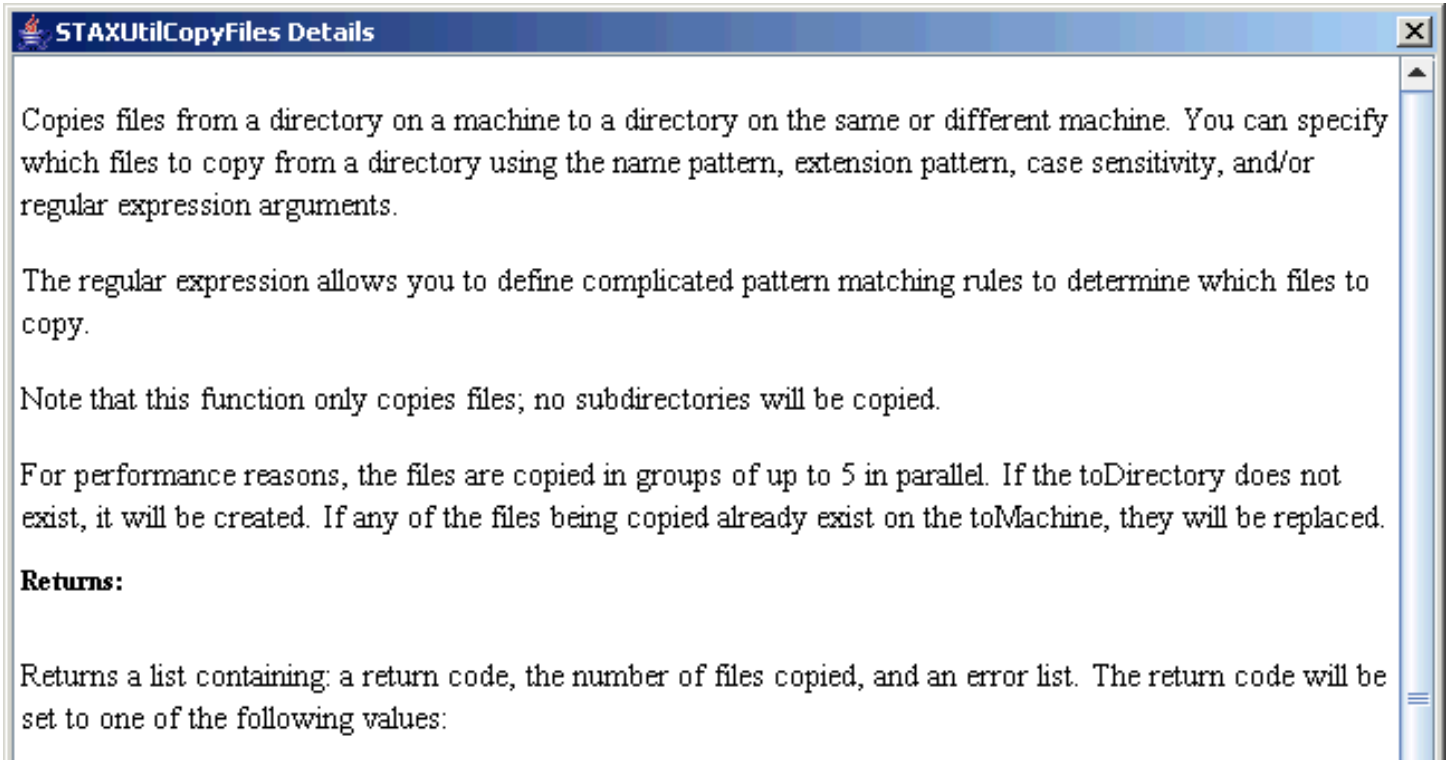
The function that is selected by default in the "Functions" list when the "STAX Job Wizard" dialog is first displayed is determined as follows:

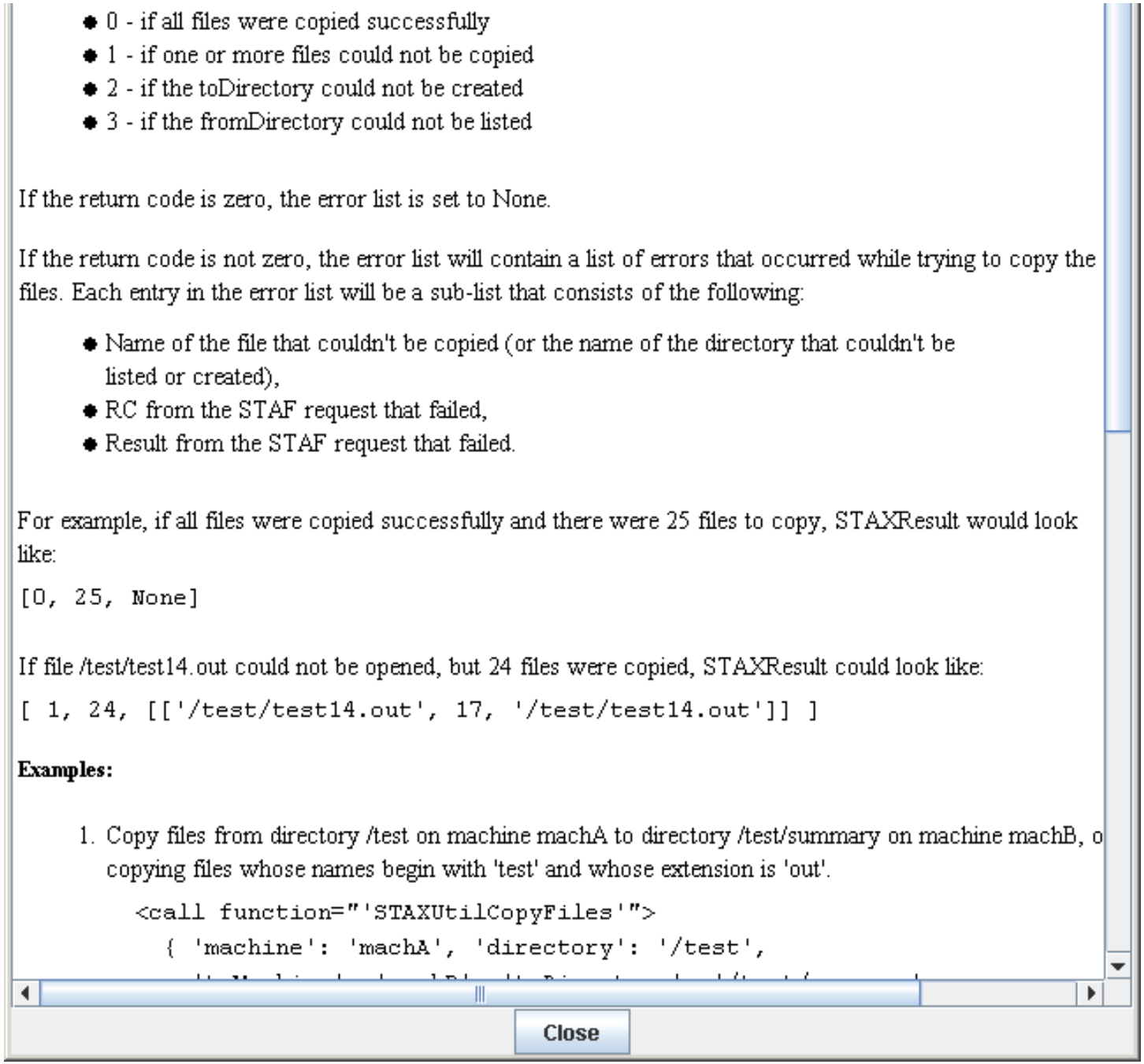
- If "default" was selected for the "Start Function" on the "Function" tab of the "STAX Job Parameters" dialog:
  - If the XML file designates a default starting function via the <defaultcall> element, the default function is selected.
  - Otherwise, if the XML file does not contain a <defaultcall> element, the first function in the list is selected.
- Otherwise, if "other" is selected for the "Start Function" with a valid function name, that function is selected.

Select the function you want to be the starting function for the job. When you select a function from the list of functions, the "Description for function <Function Name>" and "Arguments for function <Function Name>" sections of the "STAX Job Wizard" dialog will be updated within the description and arguments for the selected function.

The "Description for function <Function Name>" section to the right of the list of functions displays additional information for that function if a <function-prolog> or <function-description> element is provided for that function in the specified XML file.

If you click on the "Details..." button in the "Description for function <Function Name>" section, a new dialog will be shown which includes not only the information from the function's <function-prolog>/<function-description> element, but also the information from the function's <function-epilog> element, if provided in the specified XML file.





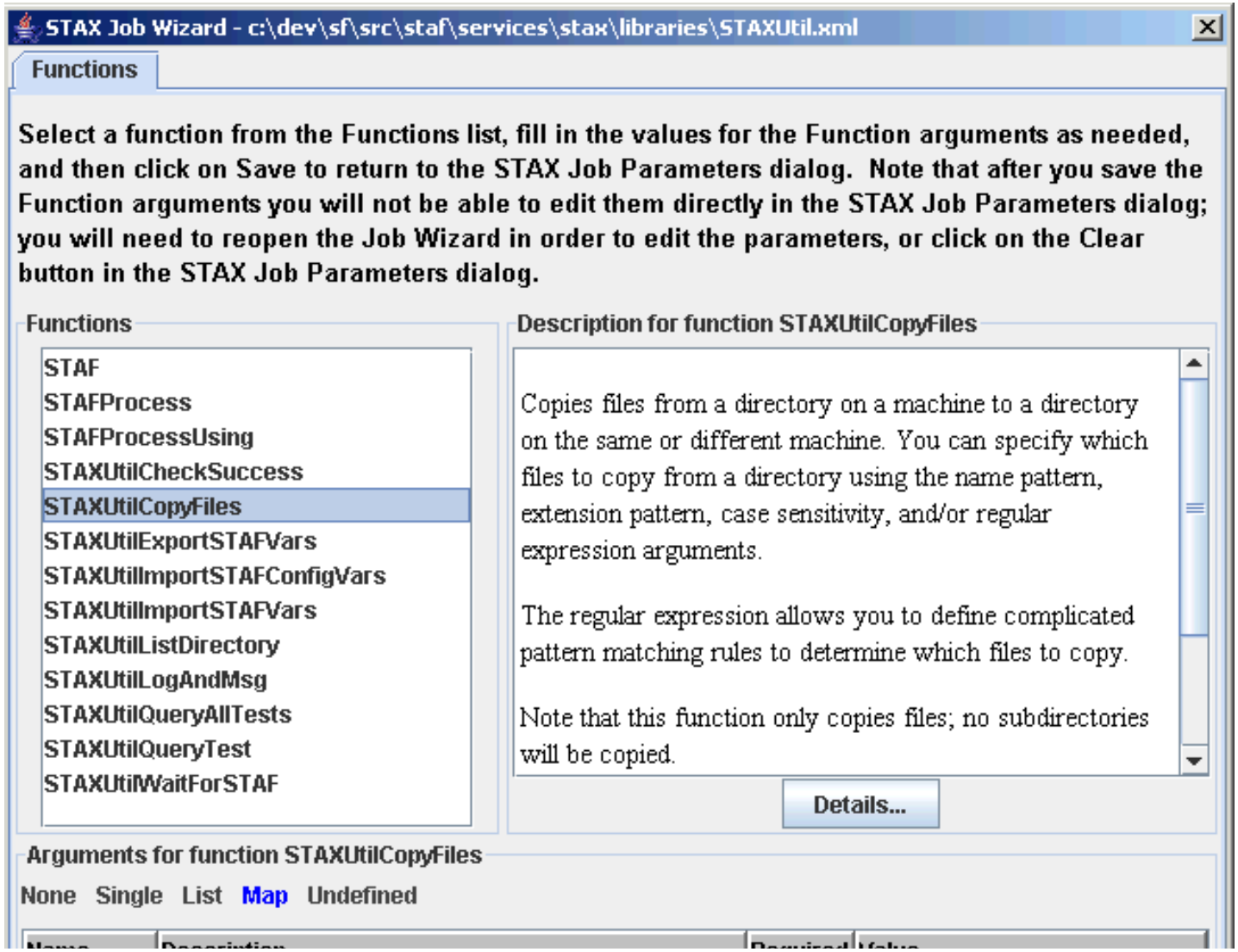
The lower part of the Job Wizard dialog shows the arguments that can be specified for the selected function.

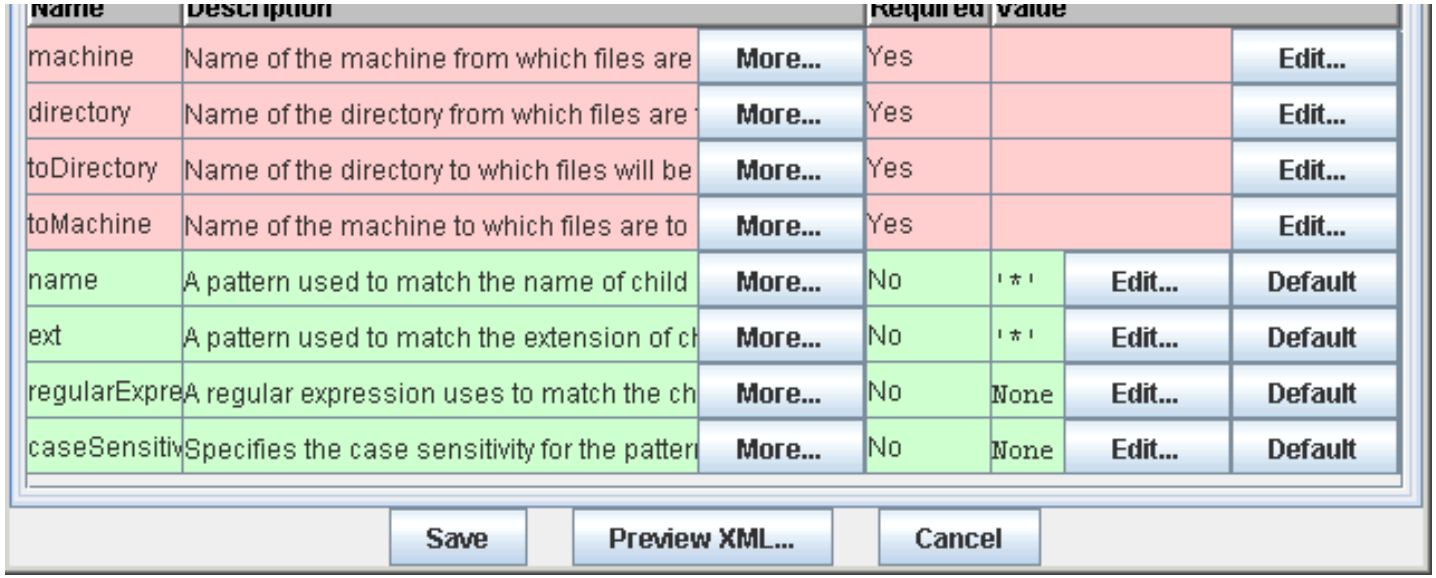
Arguments for the selected function will be one of the following types (the type will be highlighted in blue in the Job Wizard):

- None - No arguments may be specified
- Single - A single argument may be specified
- List - A list of arguments may be specified
- Map - A map of arguments may be specified
- Undefined - The function has defined no arguments (but the STAXArg argument may be specified)

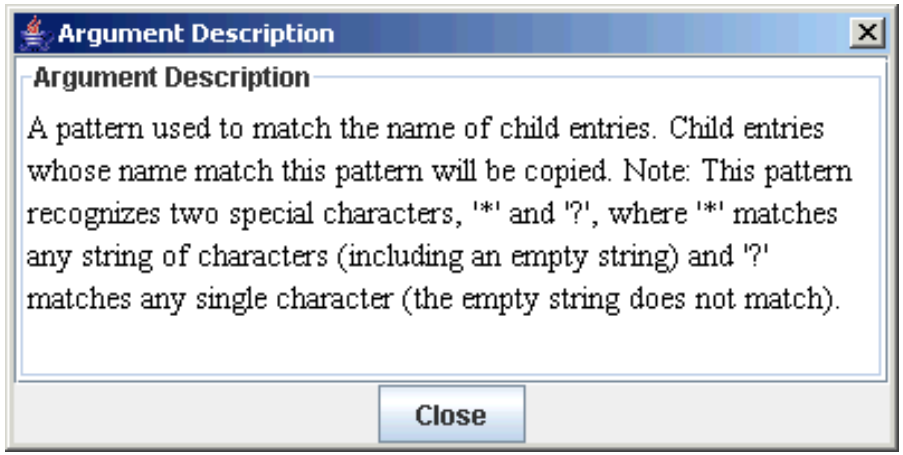
When the "STAF" function is selected (as shown in the previous "STAX Job Wizard" dialog), it shows that it accepts a "List" of three required arguments.

The following "STAX Job Wizard" panel would be shown if you selected the "STAXUtilCopyFiles" function from the "Functions" list. It's "Arguments for function <Function Name>" section shows that it accepts a "Map" of arguments, both required and optional arguments.



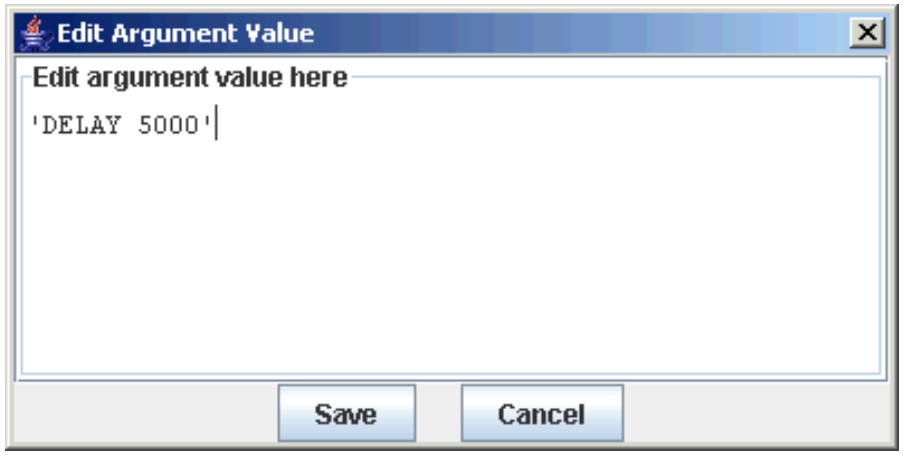


If the Description for an argument does not fit in the column, it will end with "..." and the full description can be viewed by clicking the "More..." button.



Required arguments will initially have a red background. After a value has been specified for the required argument, its background will change to green. Optional arguments will have a green background.

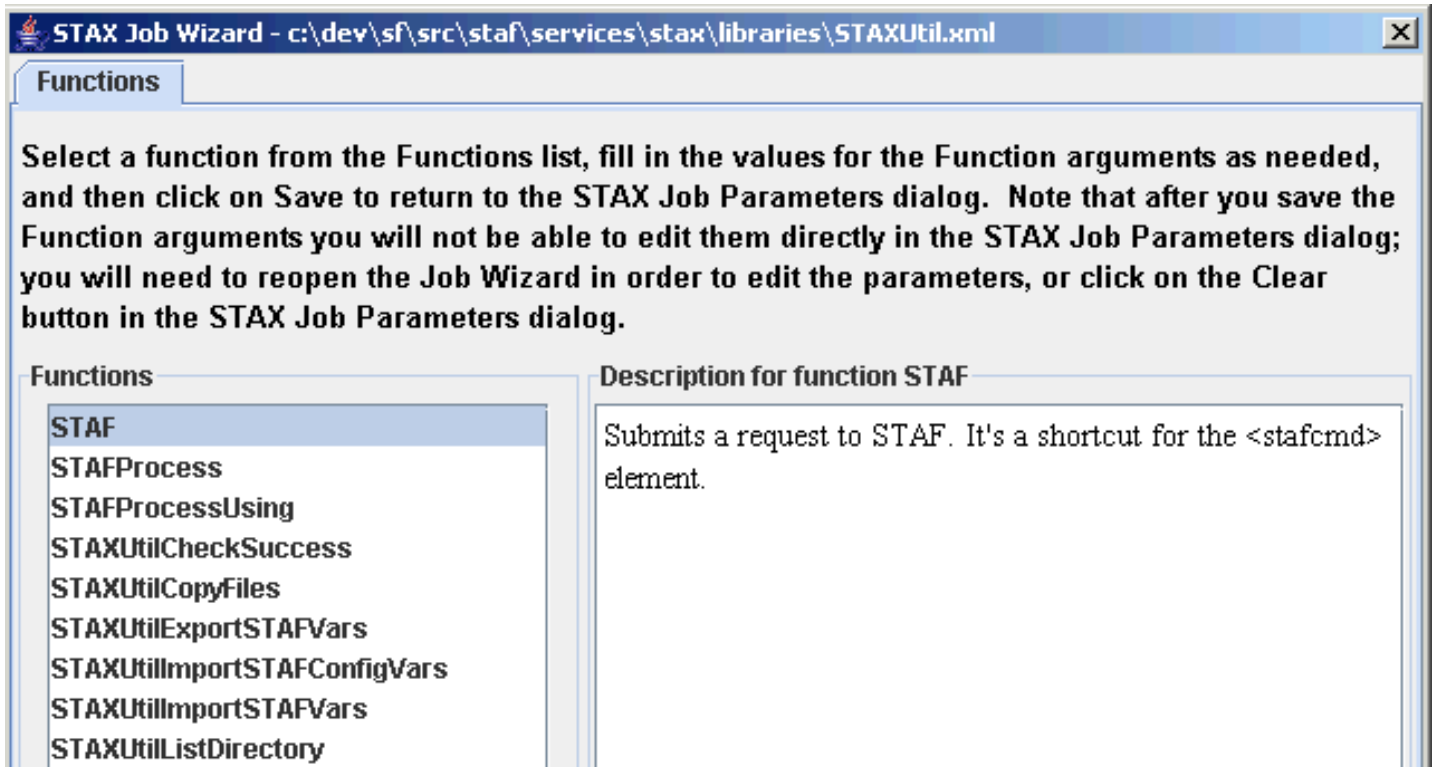
To specify a value for a parameter, you may either click on the Edit... button for the argument, which will display a multi-line input dialog, or click in the Value column for the argument and type in the single-line value (note that you must press Enter to save the changes).

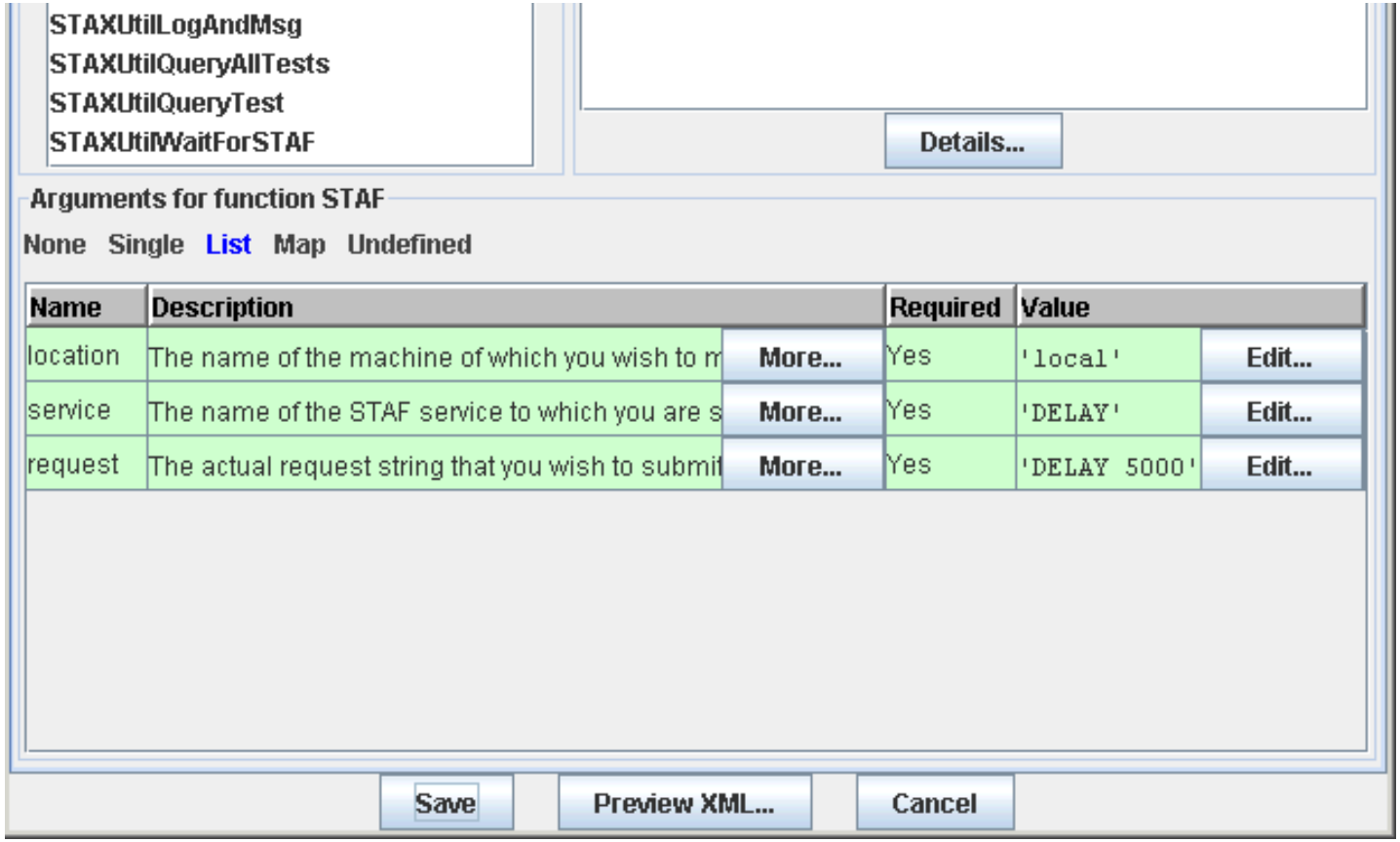


If the default value for an optional argument has been changed, and you wish to restore the default value, click on the "Default" button.

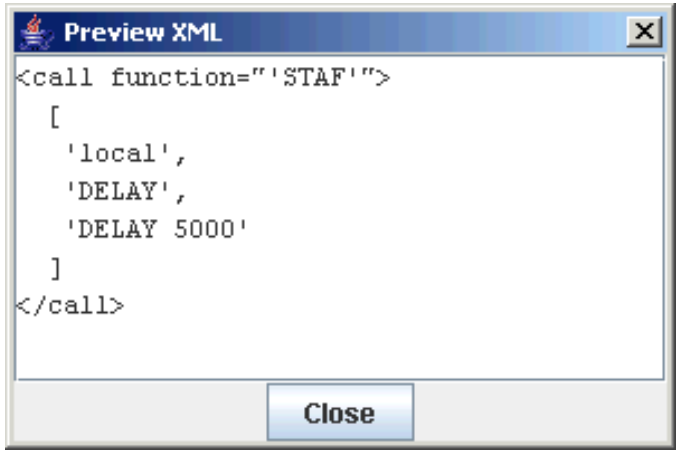
After you have filled in all of the required arguments (and modified the values of any optional arguments), all the arguments will have a green background.

Here's the "STAX Job Wizard" panel with function "STAF" selected after values have been entered for all of its required arguments:



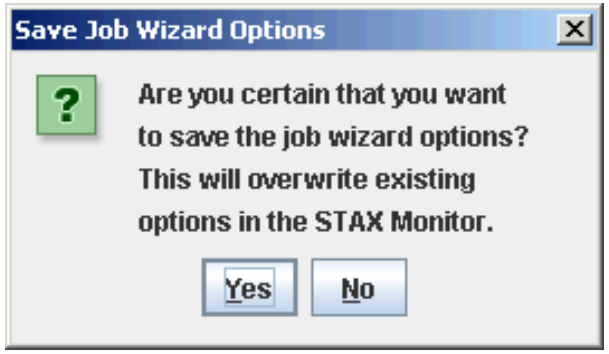


To see an example of the XML syntax for calling the selected function, click on the "Preview XML..." button.

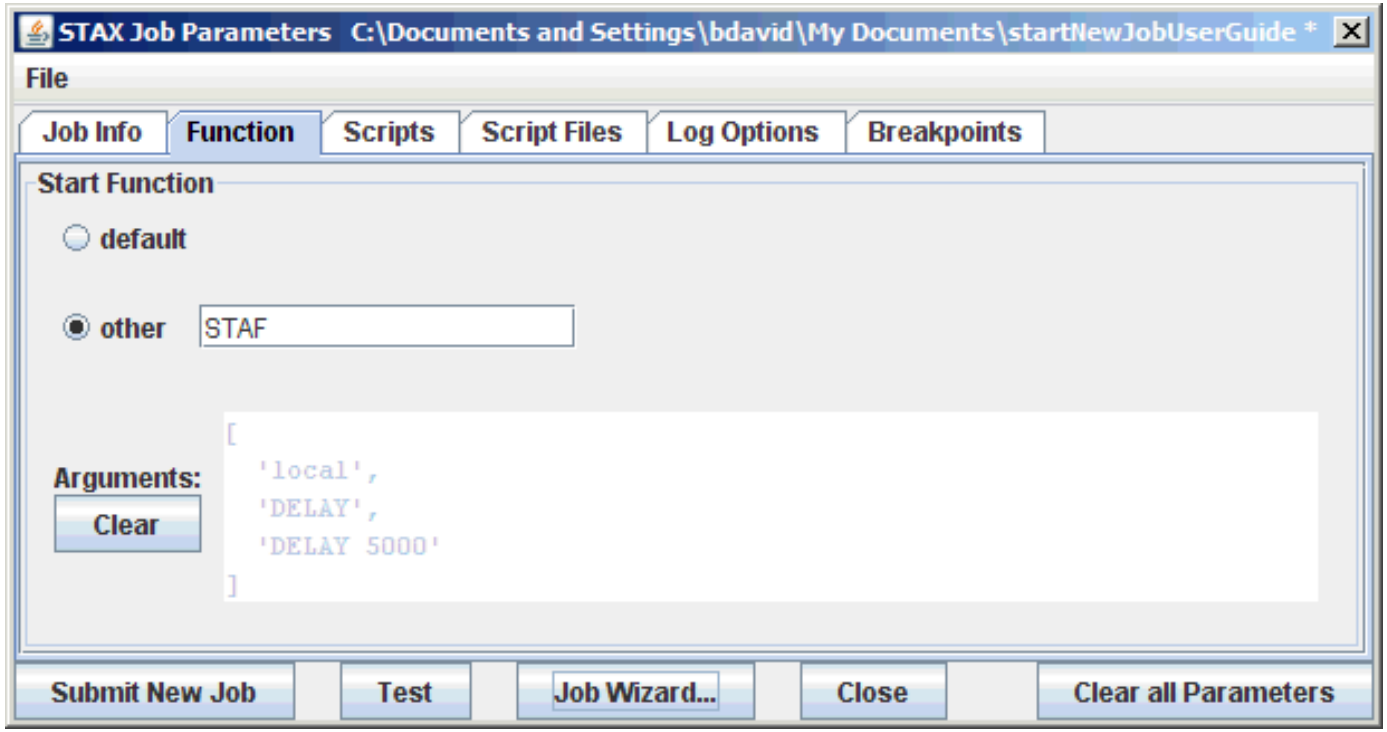


To save the function and argument values you have specified to the STAX Job Parameters dialog, click on the "Save" button. A confirmation dialog

will be displayed.



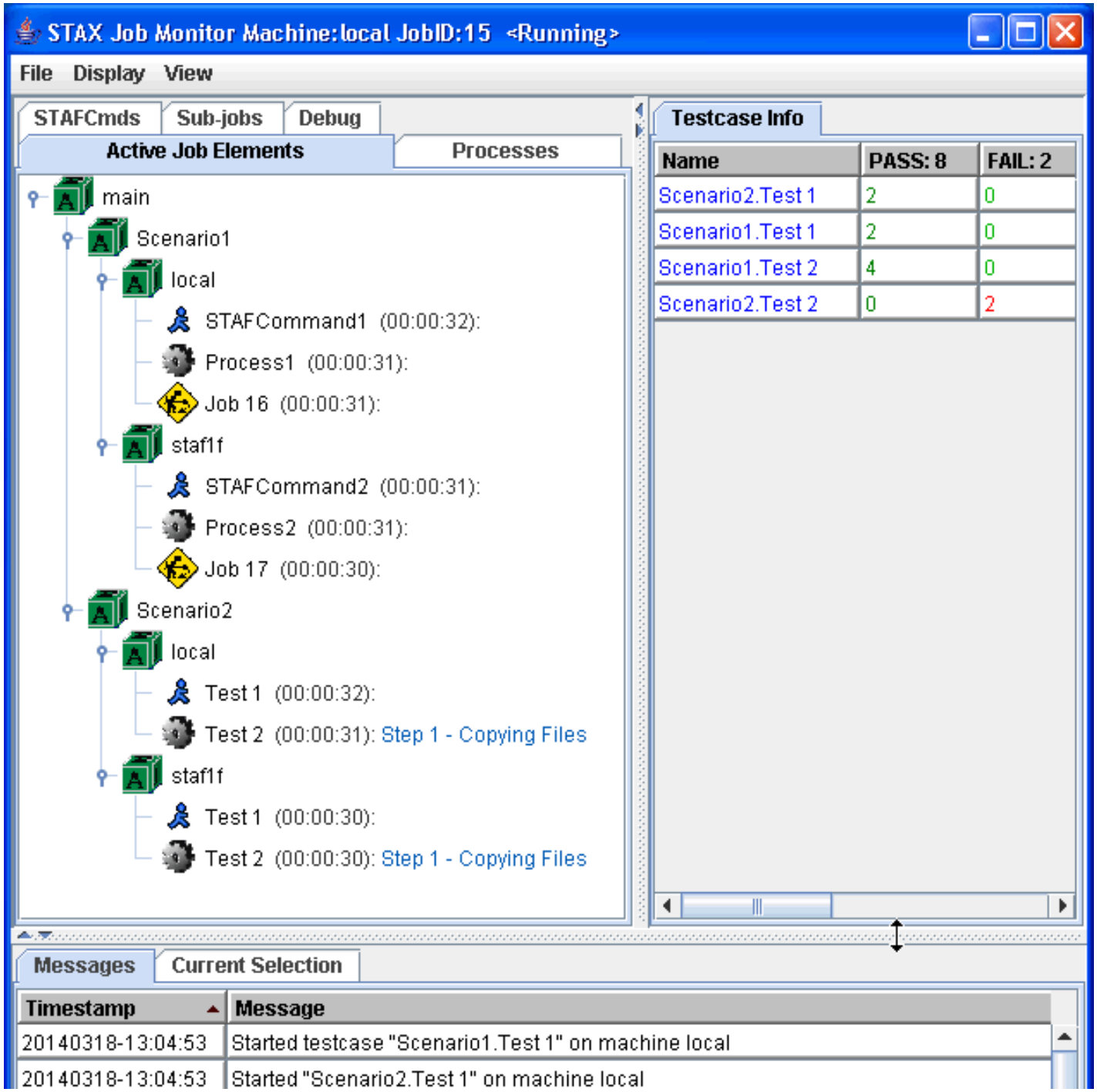
The values you specified will be saved in the STAX Job Parameters dialog.

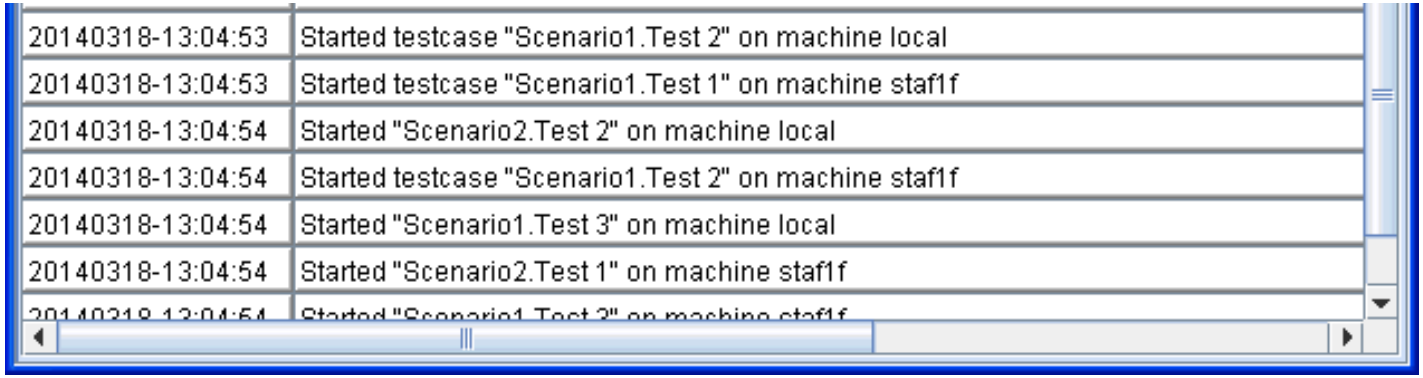


Note that after you save the arguments in the Job Wizard, you will no longer be able to directly edit the arguments in the STAX Job Parameters dialog. If you re-open the Job Wizard, all the arguments you specified will automatically be filled in, and you can modify them. If you wish to update the arguments in the STAX Job Parameters dialog, you must click on the "Clear" button and manually specify the arguments.

Monitoring a Job

The following is an example of the "STAX Job Monitor" window for a job:





The **File** menu bar contains the following menu items:

- **Exit** - This option is always enabled. Selecting this option closes the STAX Job Monitor window.

The **Display** menu bar contains the following menu items:

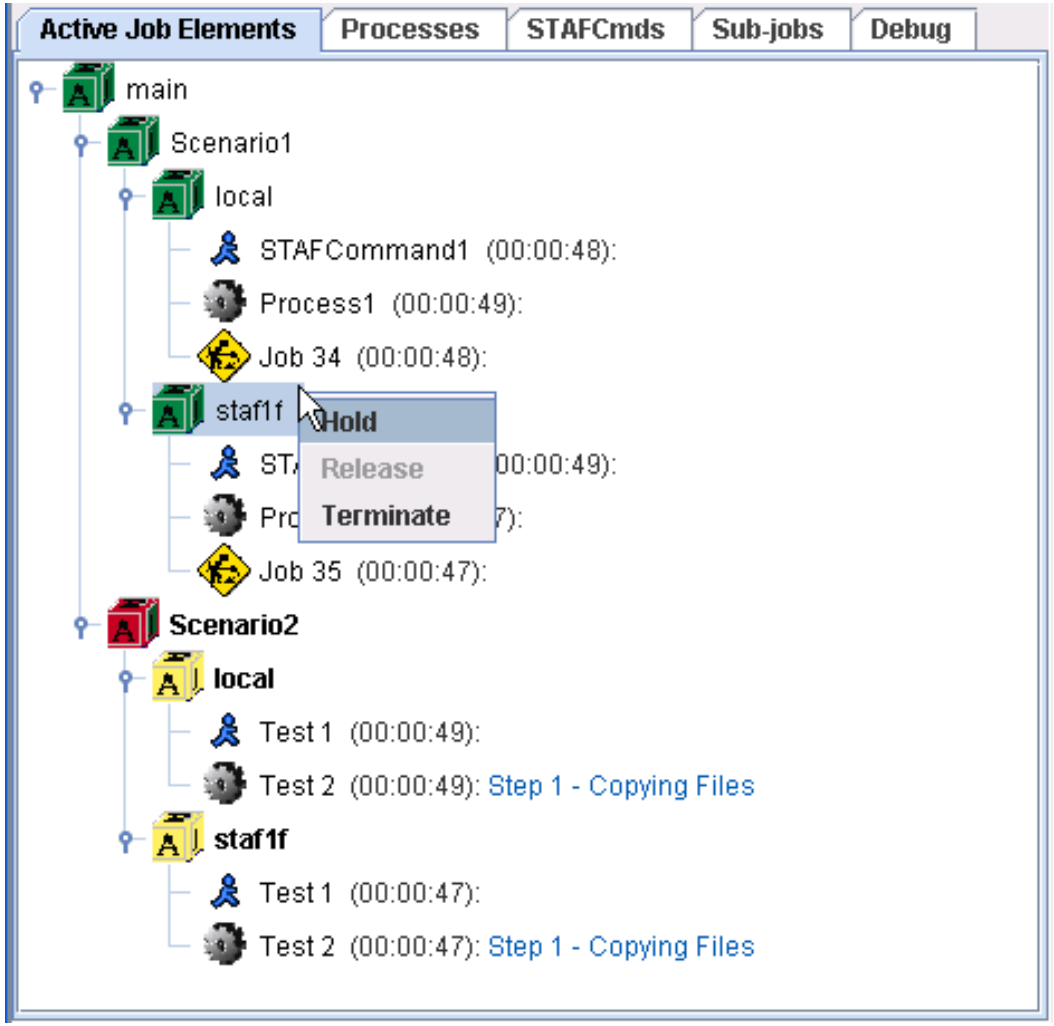
- **Display Job Log** - This option is always enabled. Selecting this option causes the Job Log to be displayed.
- **Display Job User Log** - This option is always enabled. Selecting this option causes the Job User Log to be displayed. If there are no entries in the Job User Log, then an informational message will be displayed to indicate that there are no entries in the log.

The **View** menu bar contains the following menu items, in three sections, where each section represents the panel where the item will be displayed. The first section corresponds to tabs that will show up in the top-left panel. The second section corresponds to tabs that will show up in the top-right panel. The third section corresponds to tabs that will show up in the bottom panel.

- **Active Job Elements**
- **Processes**
- **STAFCmds**
- **Sub-jobs**
- **Debug**
- **TestCase Info**
- **Messages**
- **Current Selection**

The "STAX Job Monitor" window contains seven main tabs:

1. **Active Job Elements**:



This tab displays the currently executing <block>, <process>, <stafcmd>, and <job> elements for a job in a tree format, in order to show the hierarchy of the currently executing elements.

For each <process>, <stafcmd>, and <job> element represented in the tree, the elapsed time that the process, stafcmd, or job element has been running is displayed to the right of the process, stafcmd, or job name in parenthesis. The format for displaying the elapsed time is HH:MM:SS. If the elapsed time exceeds 99 hours, the format is HHH:MM:SS. Note that if you are monitoring a remote STAX service machine, then in order for the elapsed times to be accurate, the STAX service machine must be running STAF version 3.4.2 or later.

For each <process> element represented in the tree, if the process generates STAF Monitor Service messages (see section 8.9 of the STAF User's Guide), the current monitor message is displayed to the right of the process name and elapsed time. The monitor information is periodically refreshed while the process is running. If the process has not written any STAF Monitor information, the text "No STAF Monitor information available" is displayed.

If you right-mouse-click on a block in the "Active Job Elements" panel, a popup menu is displayed with the options "Hold", "Release", and "Terminate" which allows you to control the execution of the block. Holding/Releasing a block which contains sub-jobs will not hold/release the sub-jobs. Terminating a block which contains sub-jobs will terminate the sub-jobs.

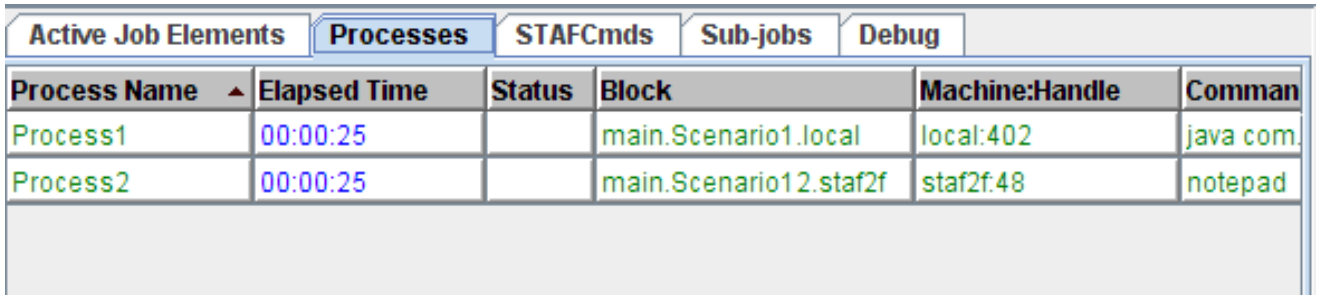
The color of the block icon for each block indicates the state of the block:

- A block that is currently running has a green block icon.
- A block that has been held has a red block icon.
- A block that is held by a parent block has a yellow block icon.

If you right-mouse-click on a process in the "Active Job Elements" panel, a popup menu is displayed with the "Stop" option which allows you to stop the process.

If you right-mouse-click on a Sub-job in the "Active Job Elements" panel, a popup menu is displayed with the options "Start Monitoring", "Display Job Log", "Display Job User Log", and "Terminate Job".

2. **Processes**:

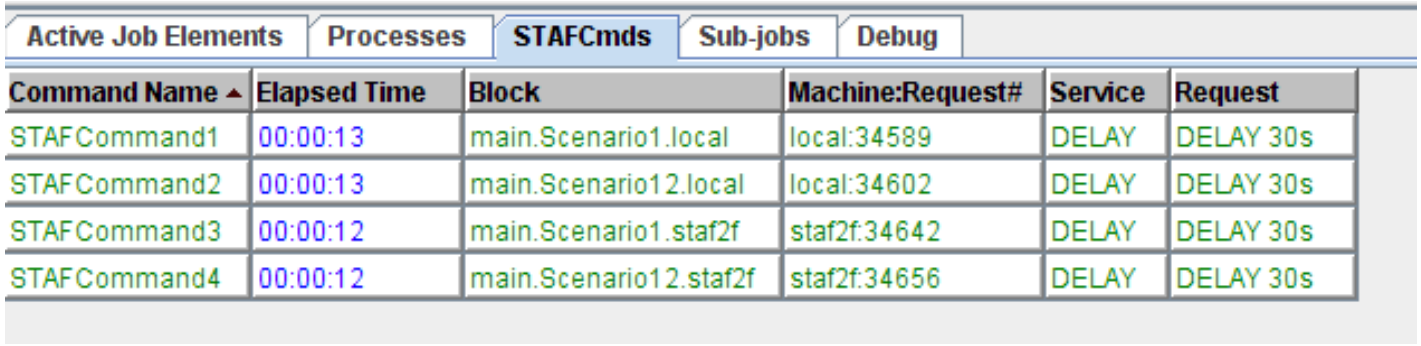


This tab displays the currently executing <process> elements for a job in a table.

For each <process> the elapsed time (HH:MM:SS) that the process element has been running is displayed in the table. The format for displaying the elapsed time is HH:MM:SS. If the elapsed time exceeds 99 hours, the format is HHH:MM:SS. Note that if you are monitoring a remote STAX service machine, then in order for the elapsed times to be accurate, the STAX service machine must be running STAF version 3.4.2 or later.

For each <process> element represented in the table, if the process generates STAF Monitor Service messages, the current monitor message is displayed in the "Status" column. The monitor information is periodically refreshed while the process is running.

3. **STAFCmds**:



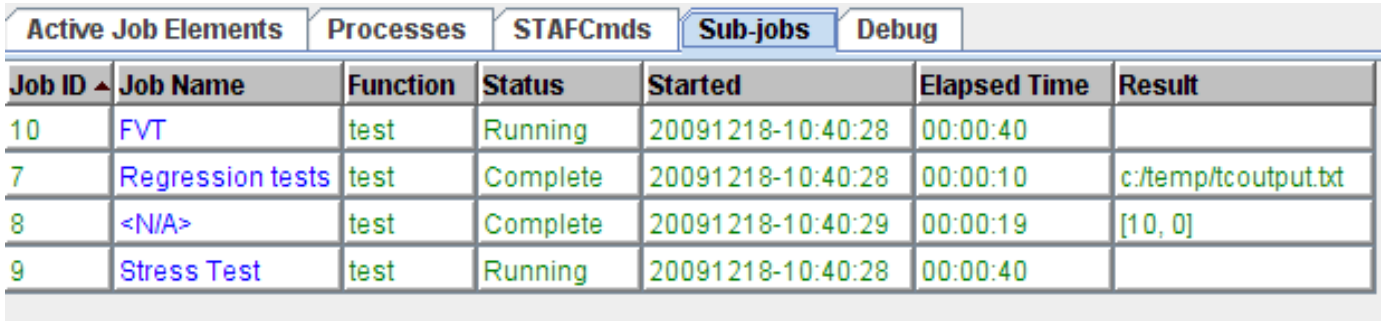
Command Name	Elapsed Time	Block	Machine:Request#	Service	Request
STAFCommand1	00:00:13	main.Scenario1.local	local:34589	DELAY	DELAY 30s
STAFCommand2	00:00:13	main.Scenario12.local	local:34602	DELAY	DELAY 30s
STAFCommand3	00:00:12	main.Scenario1.staf2f	staf2f:34642	DELAY	DELAY 30s
STAFCommand4	00:00:12	main.Scenario12.staf2f	staf2f:34656	DELAY	DELAY 30s

This tab displays the currently executing <stafcmd> elements for a job in a table.

For each <stafcmd> the elapsed time (HH:MM:SS) that the stafcmd element has been running is displayed in the table. The format for displaying the elapsed time is HH:MM:SS. If the elapsed time exceeds 99 hours, the format is HHH:MM:SS. Note that if you are monitoring a remote STAX service machine, then in order for the elapsed times to be accurate, the STAX service machine must be running STAF version 3.4.2 or later.

Note that this tab is not displayed by default. To view this tab, select the "View" menu bar and then select "Active STAFCmds".

4. **Sub-jobs**:

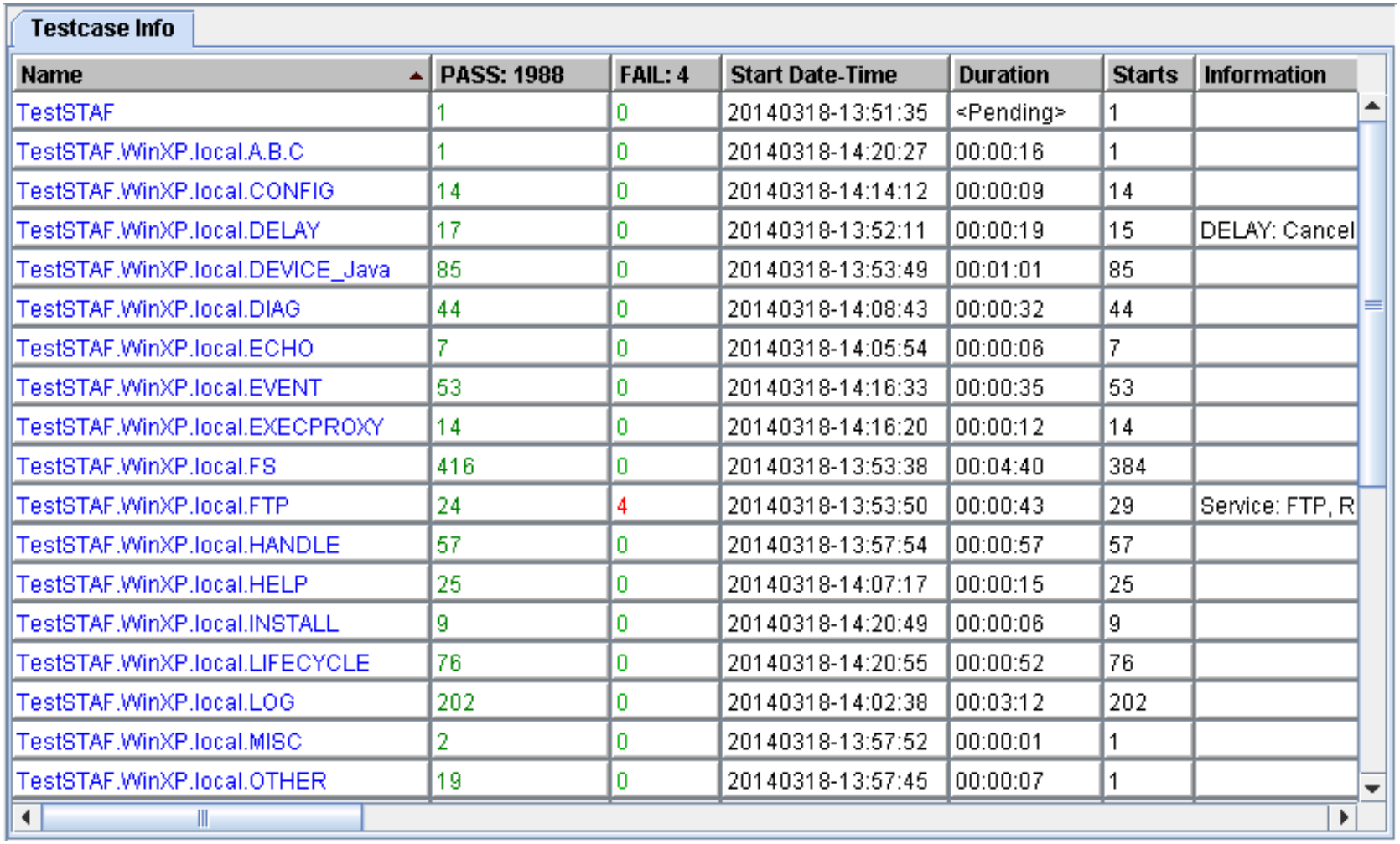


Job ID	Job Name	Function	Status	Started	Elapsed Time	Result
10	FVT	test	Running	20091218-10:40:28	00:00:40	
7	Regression tests	test	Complete	20091218-10:40:28	00:00:10	c:/temp/tcoutput.txt
8	<N/A>	test	Complete	20091218-10:40:29	00:00:19	[10, 0]
9	Stress Test	test	Running	20091218-10:40:28	00:00:40	

This tab displays information about both active and completed sub-jobs.

If you right-mouse-click on a Sub-job in the "Sub-jobs" tab, a popup menu is displayed with the options "Start Monitoring", "Display Job Log", "Display Job User Log", and "Terminate Job".

5. **TestCase Info**:



Testcase Info

Name	PASS: 1988	FAIL: 4	Start Date-Time	Duration	Starts	Information
TestSTAF	1	0	20140318-13:51:35	<Pending>	1	
TestSTAF.WinXP.local.A.B.C	1	0	20140318-14:20:27	00:00:16	1	
TestSTAF.WinXP.local.CONFIG	14	0	20140318-14:14:12	00:00:09	14	
TestSTAF.WinXP.local.DELAY	17	0	20140318-13:52:11	00:00:19	15	DELAY: Cancel
TestSTAF.WinXP.local.DEVICE_Java	85	0	20140318-13:53:49	00:01:01	85	
TestSTAF.WinXP.local.DIAG	44	0	20140318-14:08:43	00:00:32	44	
TestSTAF.WinXP.local.ECHO	7	0	20140318-14:05:54	00:00:06	7	
TestSTAF.WinXP.local.EVENT	53	0	20140318-14:16:33	00:00:35	53	
TestSTAF.WinXP.local.EXECPROXY	14	0	20140318-14:16:20	00:00:12	14	
TestSTAF.WinXP.local.FS	416	0	20140318-13:53:38	00:04:40	384	
TestSTAF.WinXP.local.FTP	24	4	20140318-13:53:50	00:00:43	29	Service: FTP, R
TestSTAF.WinXP.local.HANDLE	57	0	20140318-13:57:54	00:00:57	57	
TestSTAF.WinXP.local.HELP	25	0	20140318-14:07:17	00:00:15	25	
TestSTAF.WinXP.local.INSTALL	9	0	20140318-14:20:49	00:00:06	9	
TestSTAF.WinXP.local.LIFECYCLE	76	0	20140318-14:20:55	00:00:52	76	
TestSTAF.WinXP.local.LOG	202	0	20140318-14:02:38	00:03:12	202	
TestSTAF.WinXP.local.MISC	2	0	20140318-13:57:52	00:00:01	1	
TestSTAF.WinXP.local.OTHER	19	0	20140318-13:57:45	00:00:07	1	

This tab displays the following information for each testcase:

- Name of each <testcase> element that has been executed
- Cummulative number of its passes from when the job started executing
- Cummulative number of its fails from when the job started executing
- Timestamp when the testcase started.
- Timestamp when the testcase was last updated. Note that this column is not displayed by default. The column displayed in the "Testcase Info" table can be specified in the STAX Monitor Properties "Testcases" tab.

- Cummulative duration (e.g. committed elapsed time) for the testcase since the beginning of the job. The format is HH:MM:SS (or HHH:MM:SS if over 99 hours) or <Pending> if the testcase has not yet ended at least once yet via a </testcase> or STOP TESTCASE request.

  If a testcase is started more than once via a <testcase> element or a START TESTCASE request, the elapsed times for each testcase started are accumulated. So, it is possible that the elapsed time for a testcase is more than the elapsed time for a job if the same testcase is run in parallel multiple times.

  If you start monitoring an existing job and "Log TC Elapsed Time" was not enabled for the job, the duration for testcases which have already been started appears as ??:??:?? until a status for the testcase is recorded (or the testcase ends).

- Number of times the testcase has been started since the beginning of the job (via a <testcase> element or via a START TESTCASE request or via an UPDATE TESTCASE FORCE request)

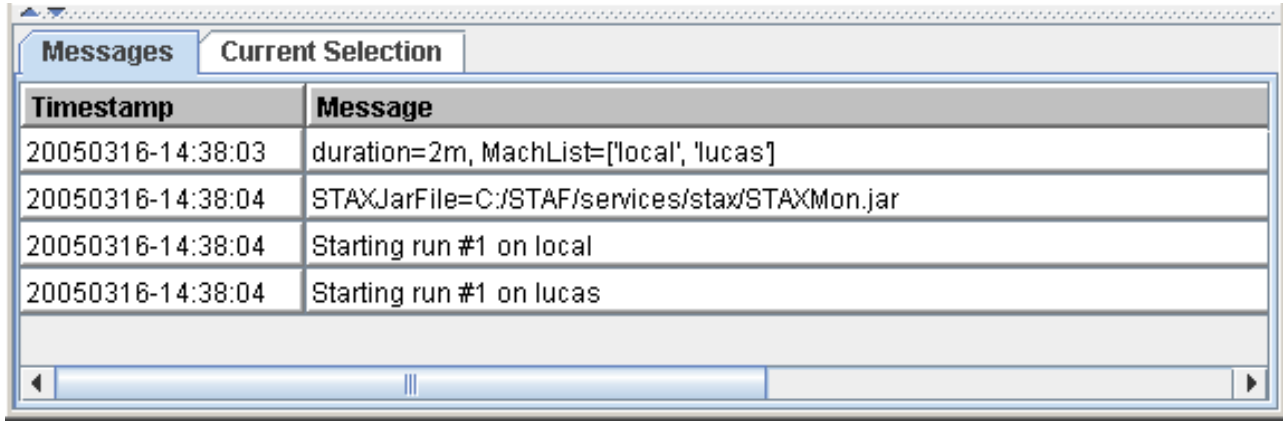
  If you start monitoring an existing job and "Log TC Num Starts" was not enabled for the job, the number of starts for testcases which have already been started appears as ? until a status for the testcase is recorded (or the testcase ends).

- Last status message if provided via a <tcstatus> element or via an UPDATE TESTCASE request.

Note that at least one testcase status (pass or fail) must be recorded via a <tcstatus> element in order for a testcase to appear in the "Testcase Information" panel (if the testcase's mode is not set to 'strict').

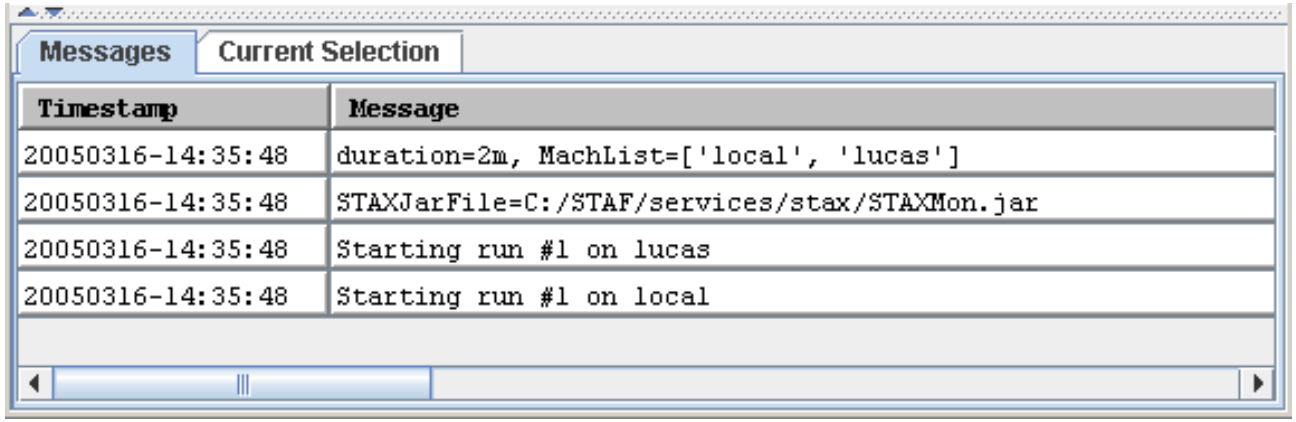
Note that the column by which the table is being sorted is indicated in the column header with an up-arrow icon (ascending) or a down-arrow icon (descending). You can click on a column header to sort the table by that column in ascending order. To sort the table by a column in descending order, press the "Shift" key on the keyboard and click on the column header. You can specify which columns are displayed, as well as the default sort column and order, in the STAX Monitor Properties "Testcases" tab.

6. **Messages**:

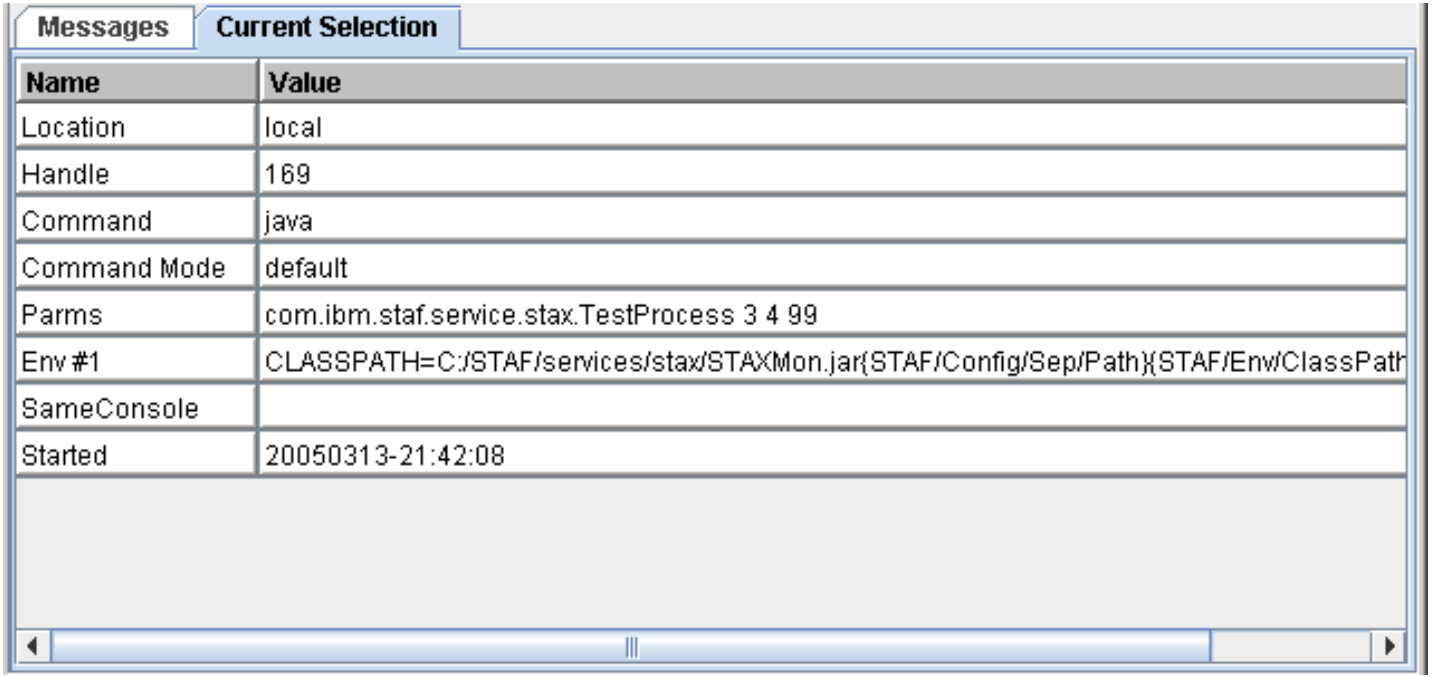


This tab displays the messages (and their timestamps) from each message sent by a <message> element or <log message="1"> element in the XML document or via a SEND MESSAGE request or via a LOG SEND MESSAGE request. The STAX service can also generate messages via its default signal handlers.

You can select the font name used when displaying the table in the Messages tab panel via the "Messages Font Name" on the "Options" tab of the STAX Monitor Properties panel. Here is an example of the dialog that is shown when the Messages tab panel is displayed if you selected "Monospaced" for the "Messages Font Name":



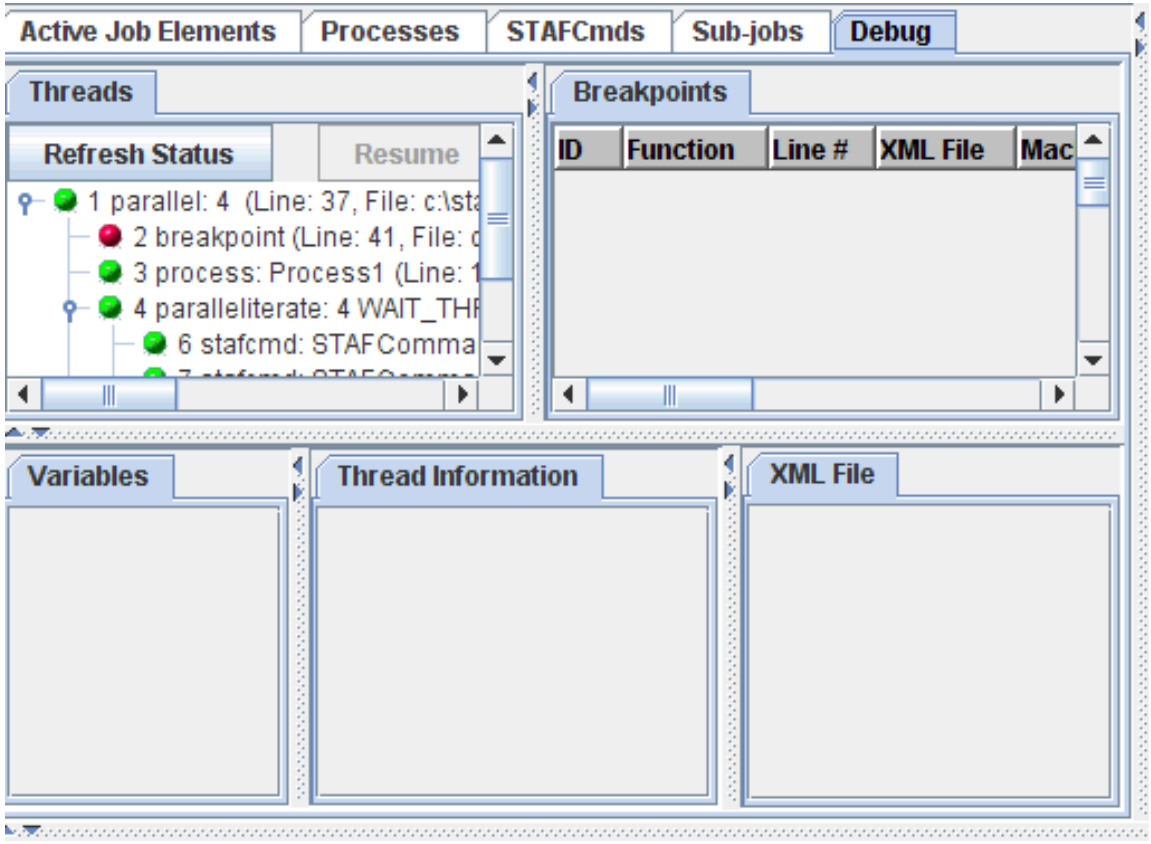
7. **Current Selection**:



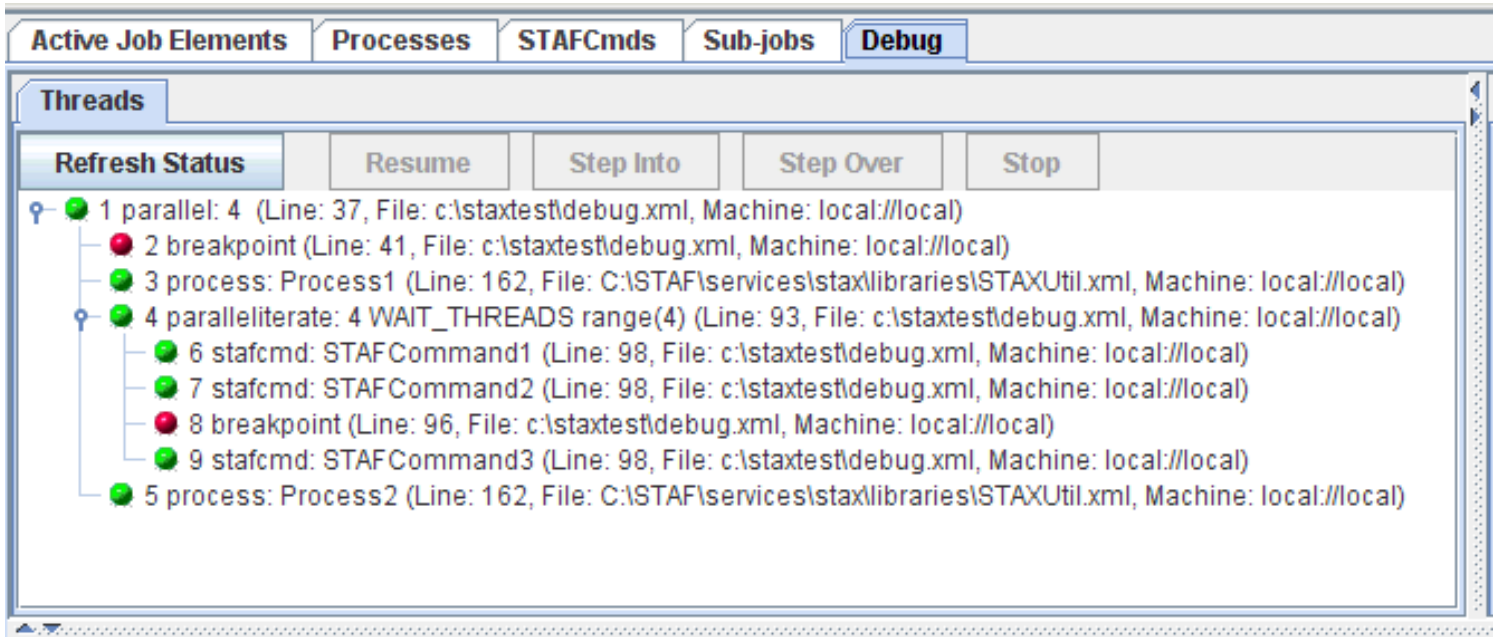
This tab shows more details about an element displayed in the "Active Job Elements", "Active Processes", "Active STAFCmds", or "Sub-jobs" panels when you click on that element in the panel.

8. **Debug**:

   This tab displays the thread/breakpoint information for the job.



The "Threads" tab shows a tree view of all of the currently running threads.

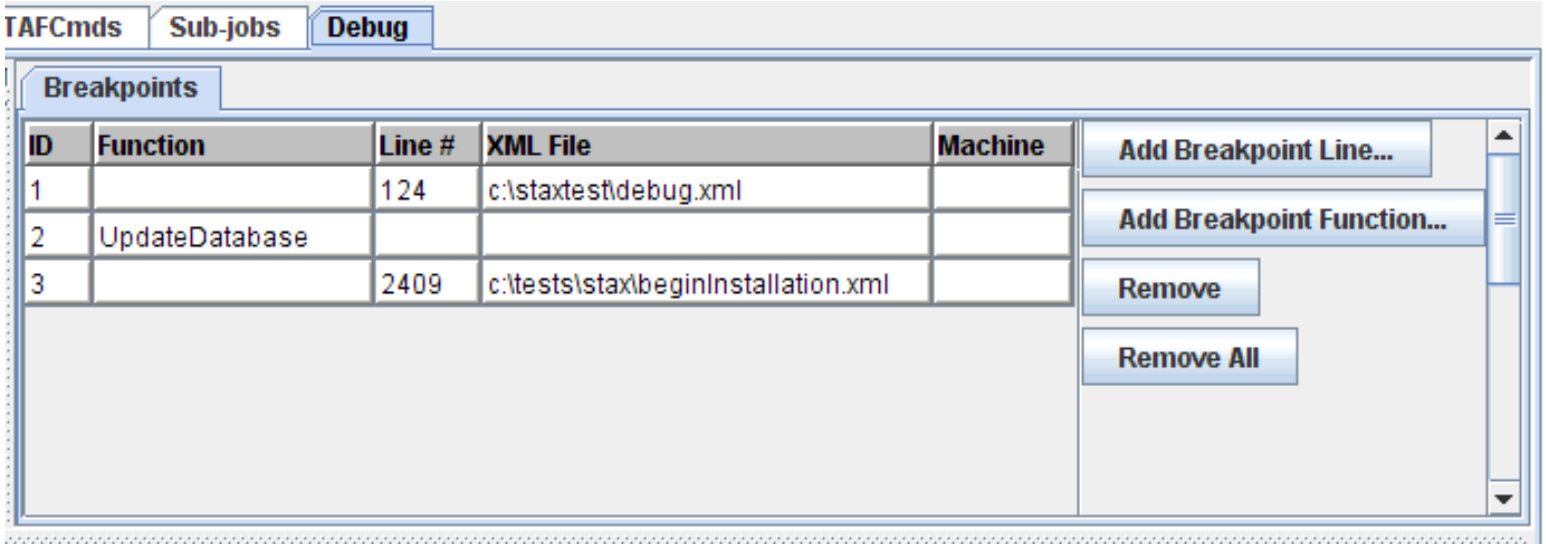


There will always be a thread 1. The green icon next to the thread number indicates the thread is running; the red icon next to the thread number indicates the thread is at a breakpoint. The text to the right of the thread number is the current action on the thread's stack. The "Threads" tab tree is updated whenever a thread starts or stops, a thread reaches a breakpoint or a thread breakpoint is resumed/stepped, the user changes the node selection in the tree, or the user clicks on the "Refresh Status" button. Note that all of the nodes in the tree are refreshed when any of these occur. Note that changes to a thread's action stack (i.e. executing eleemnts in a sequence) are not reflected in the "Threads" tab unless the user changes the selection or clicks on the "Refresh Status" button.

The "Threads" tab has the following buttons:

- `Refresh Status` This refreshes the thread tree view.
- `Resume` This resumes the currently selected thread. This button is only enabled if the selected thread is at a breakpoint.
- `Step Into` This steps into the currently selected thread. This button is only enabled if the selected thread is at a breakpoint.
- `Step Over` This steps over the currently selected thread. This button is only enabled if the selected thread is at a breakpoint.
- `Stop` This stops the currently selected thread. This button is disabled if the selected thread is at a breakpoint.

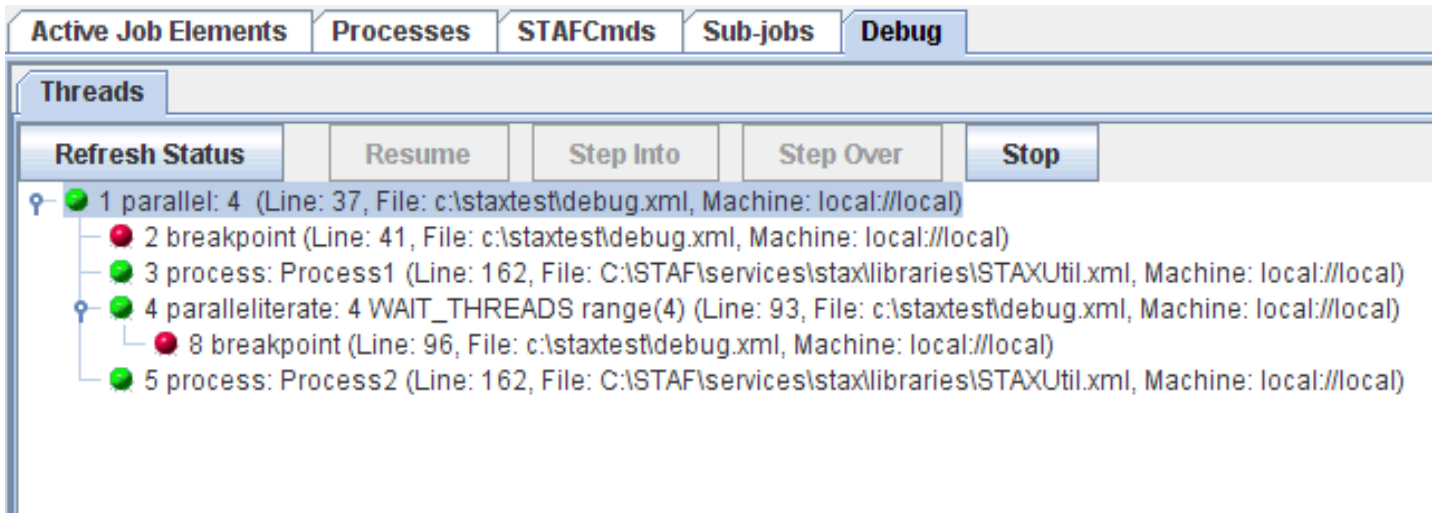
The "Breakpoints" tab shows the breakpoints (line and function) that are currently set for the STAX job.



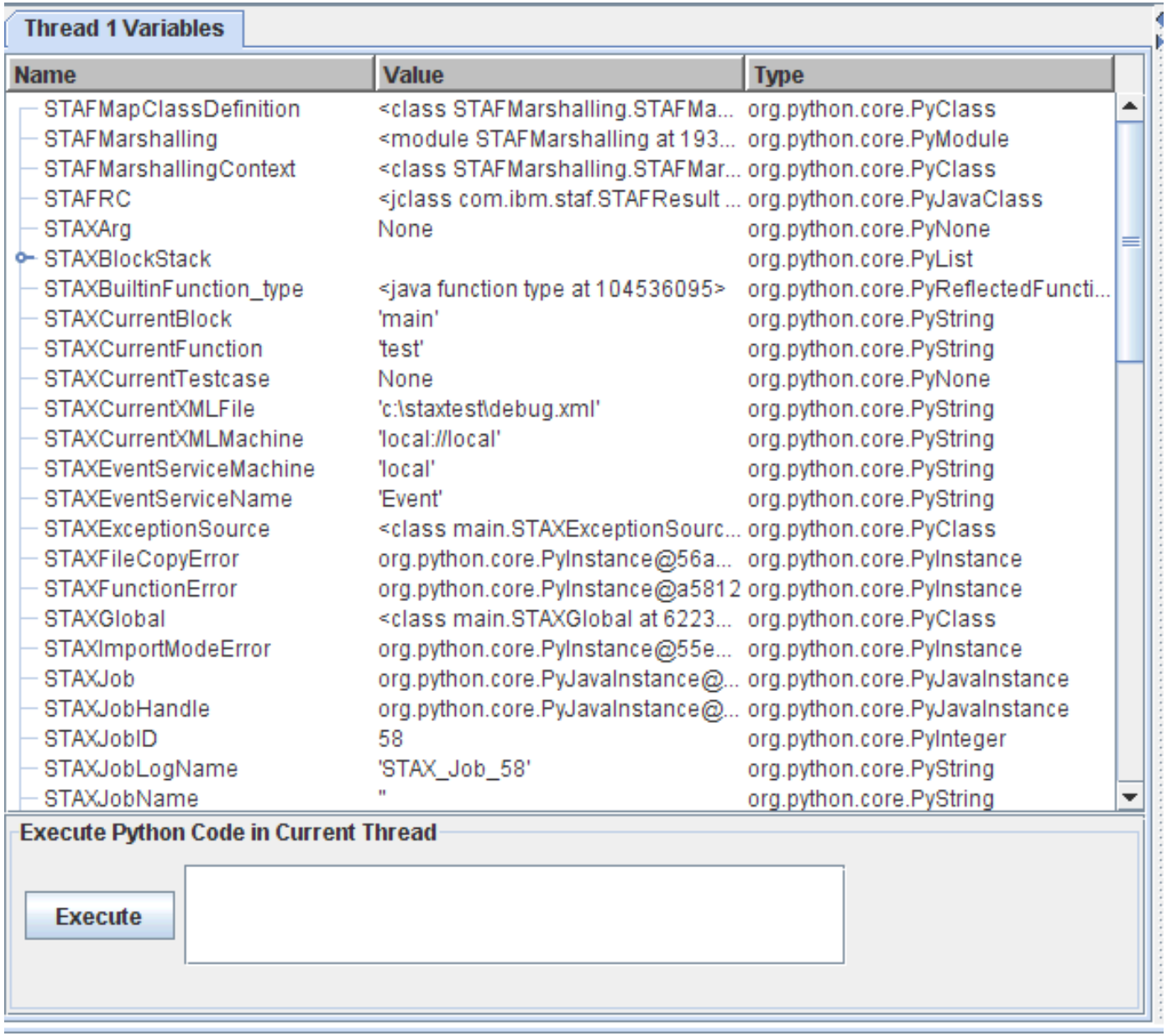
You can remove a specific breakpoint, or remove all breakpoints (both present a confirmation dialog). You can also add a line/function breakpoint.

The tabs in the bottom panel, "Variables", "Thread Information", and "XML File" are related to the currently selected thread in the "Threads" tab. If a thread is not selected, then these 3 tabs display nothing.

If we select thread 1:

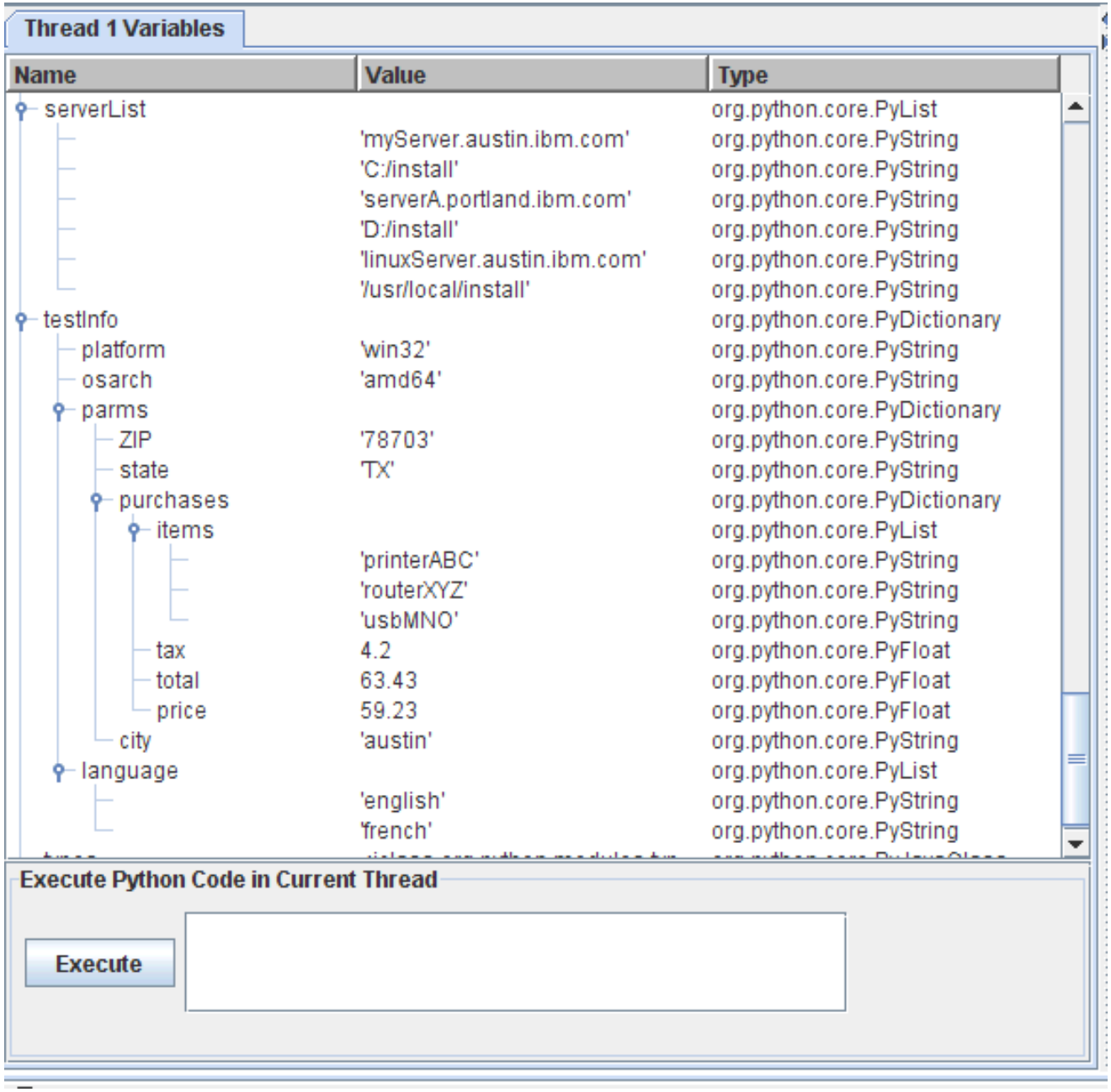


The "Thread 1 Variables" tab shows all of the Python variables that are defined in the thread's Python interpreter



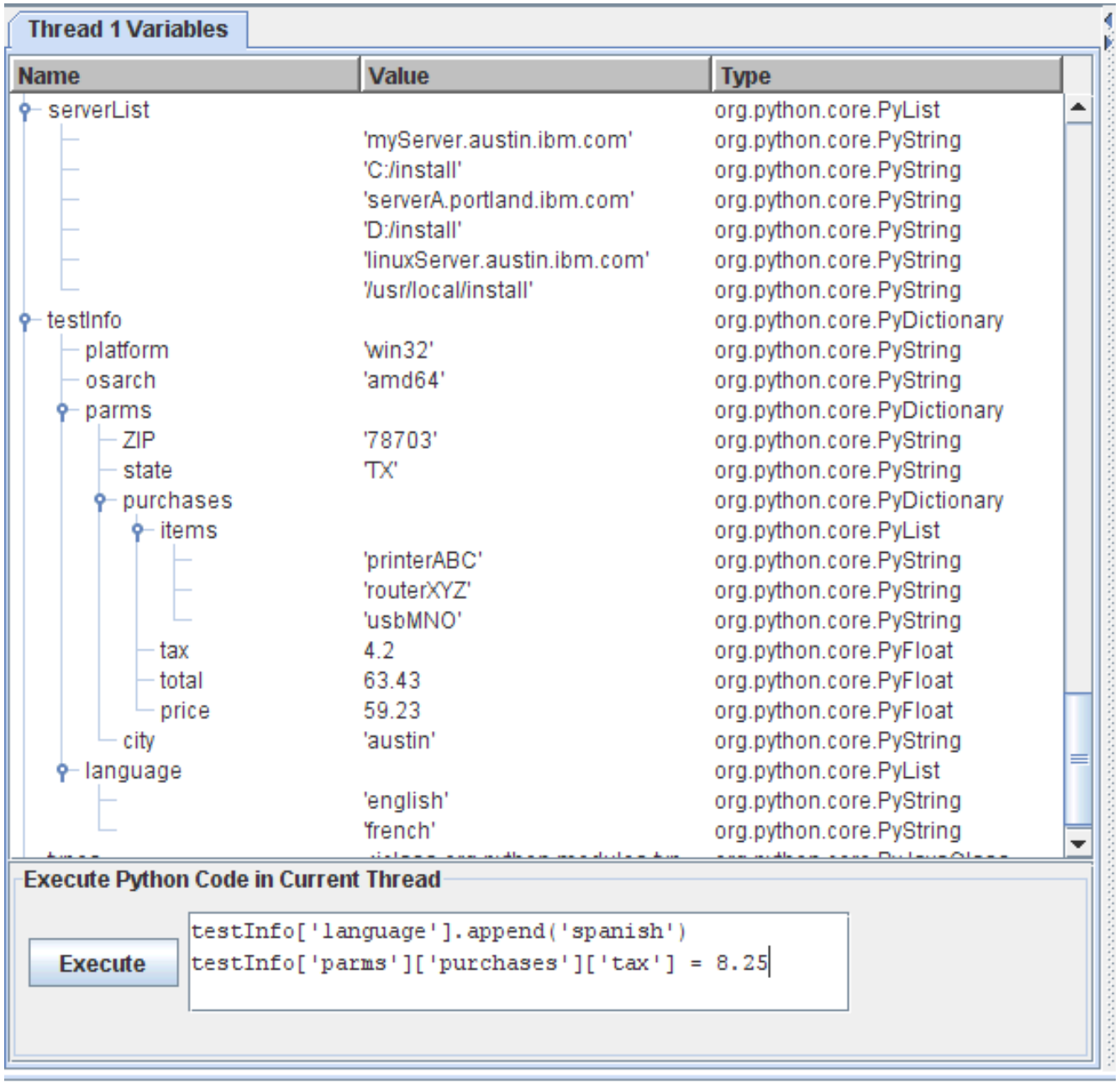
The variables are shown in a tree table format, which shows a hierarchical view of any list/dictionary objects. If the variable is a list/tuple/dictionary, you can expand its node to see the items the variable contains. If you right-click in the tree table, a popup-menu will be displayed with "Expand All" and "Collapse All" which allow you to expand/collapse all of the nodes in the tree table.

In the "Thread Variables" tab, if you expanded the nodes for testInfo, it would display as:

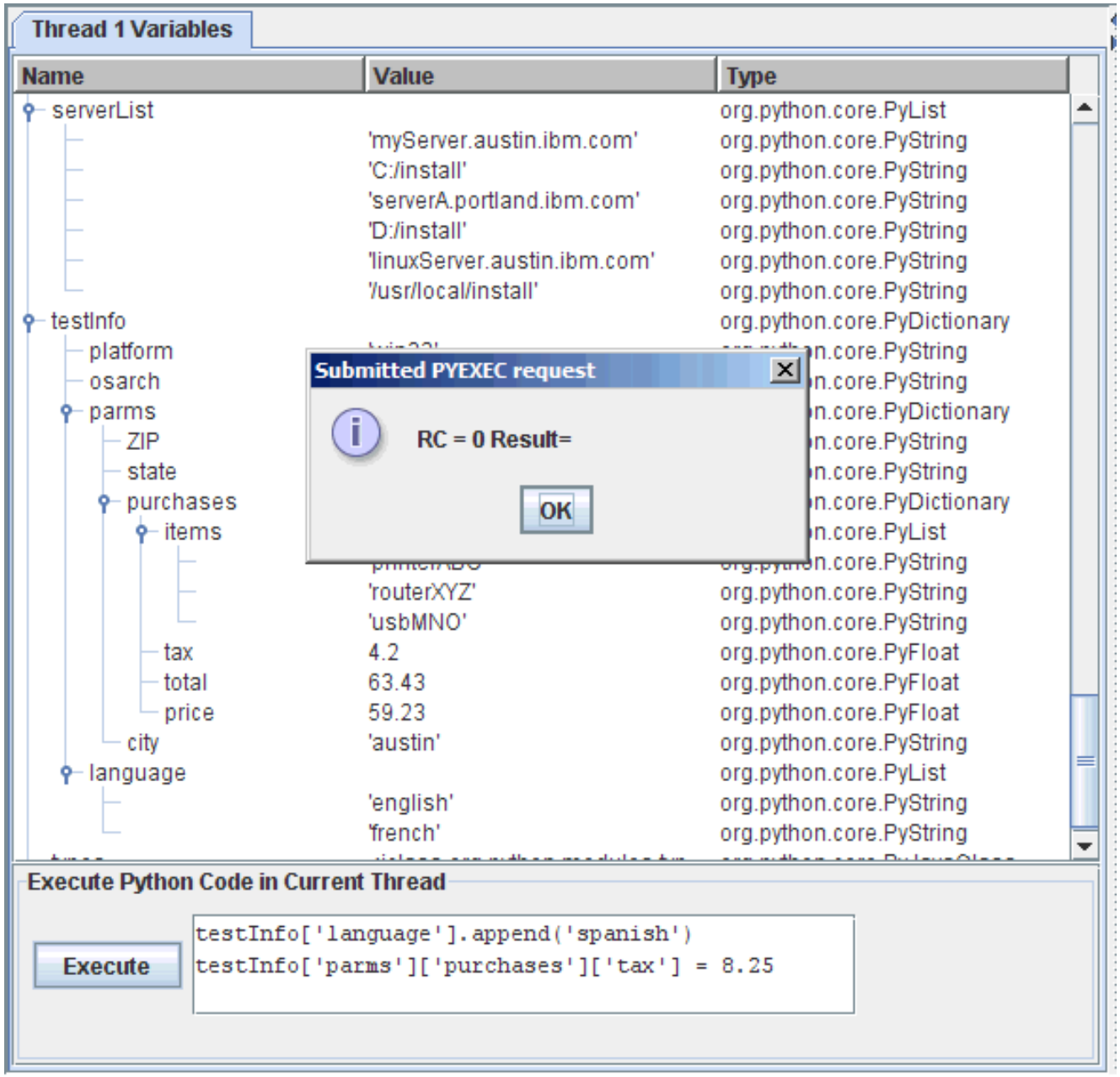


You can enter any Python code in the "Execute Python Code in Current Thread" field. Clicking on "Execute" will submit a PYEXEC request for the selected thread. If the PYEXEC request results in an error, a dialog will be displayed with the error deteails. If the PYEXEC request is successful, a success dialog will be displayed and then the table will be refreshed with the current variables defined in the thread's Python interpreter

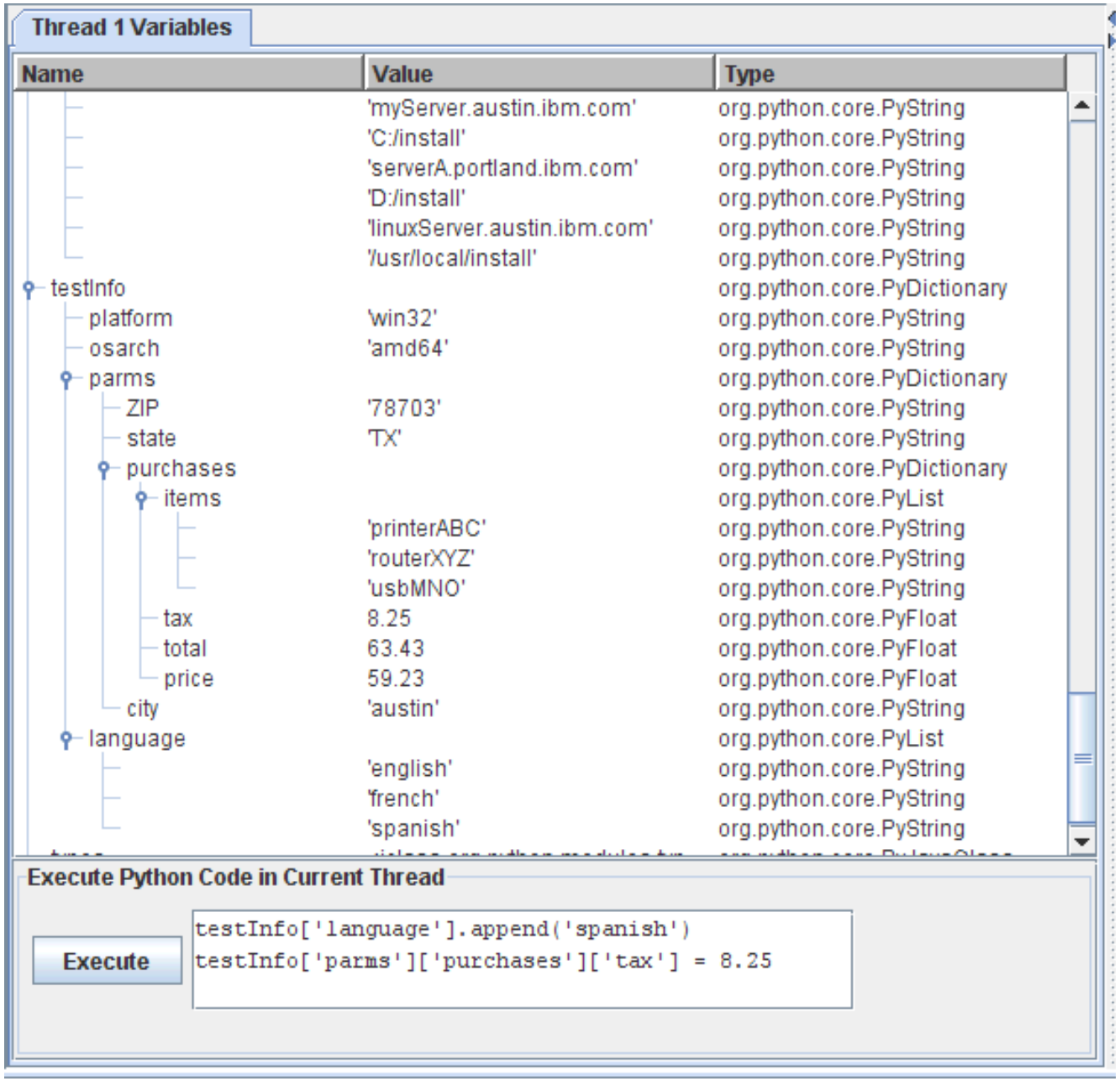
If you wanted to append another item to the "language" list in the "testInfo" dictionary, and change the "tax" float value in the "purchases" dictionary in the "parms" dictionary, you can add the following in "Execute Python Code in Current Thread":



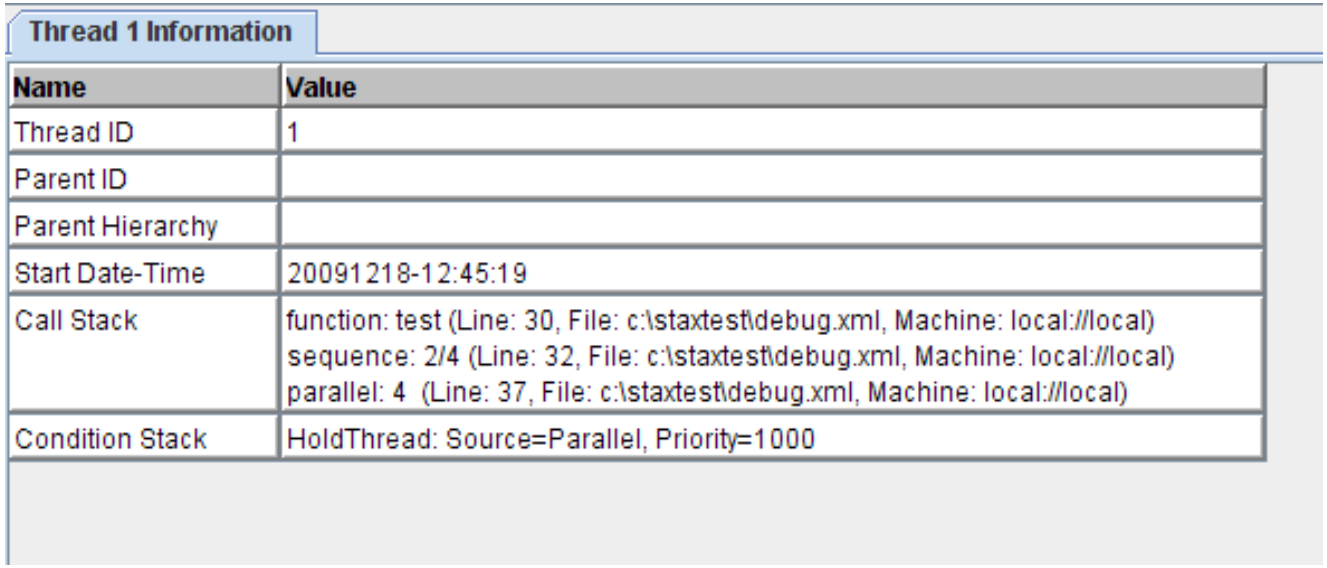
When you click on "Execute" you will get a popup indicating the request was successful:



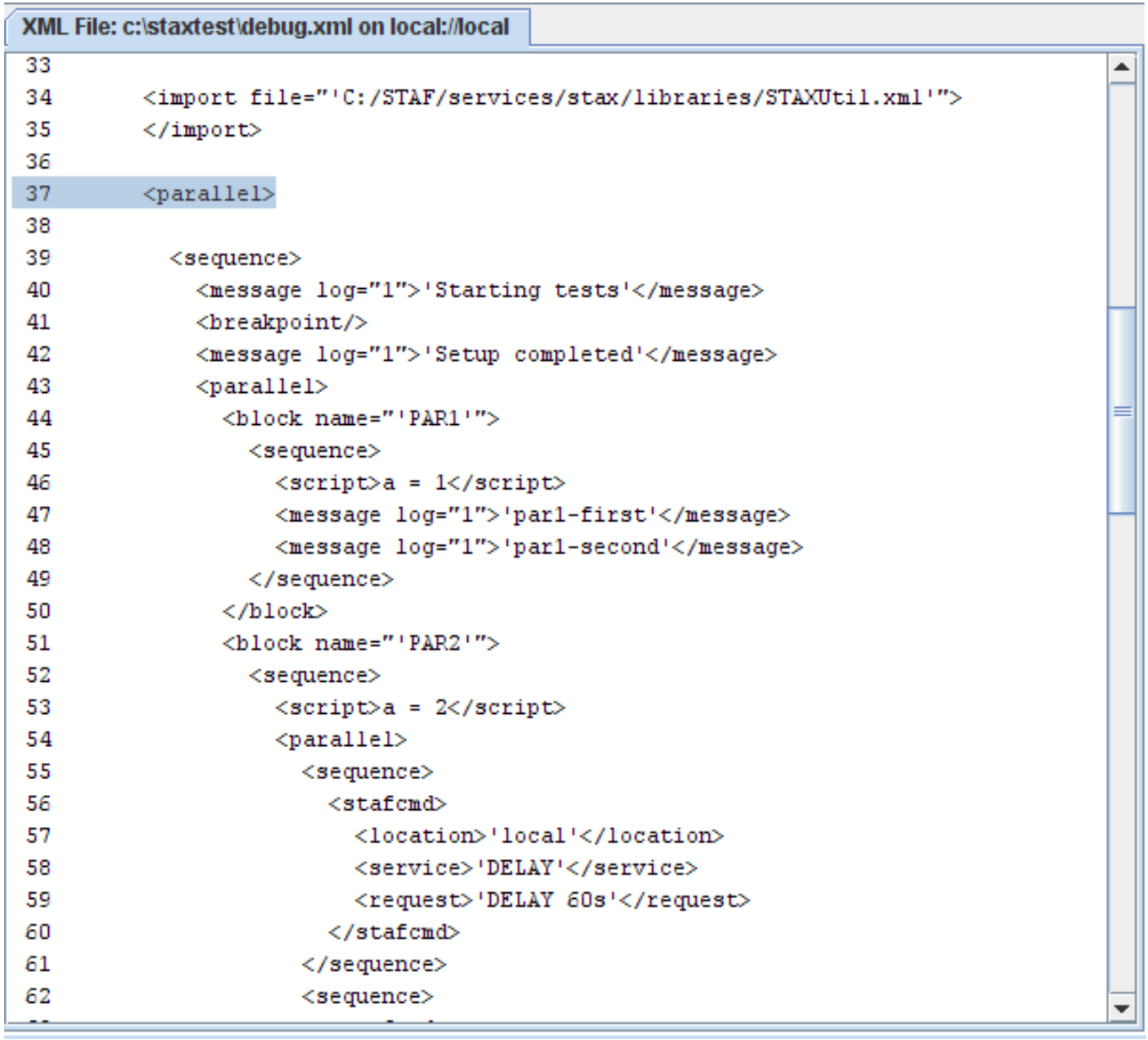
The "Thread Variables" view will automatically be refreshed. If you expand the variables again, you will see the expected updates for "language" and "tax":



The "Thread 1 Information" tab will show the "QUERY THREAD" output in a table format.



The "XML File" tab will diplay the XML file for the action the thread is currently executing



The tab name will include the XML file path/name and the XML file machine. The tab will show a text panel with the XML file contents, including the line numbers (note that the line numbers are displayed in a right-justified format, calculated based on the total number of lines in the XML file (i.e. if the XML file contained 15345 lines, the first line number would show as " 1"). The text panel will automatically be scrolled to the line corresponding to the action that the thread is currently executing; the line will also be highlighted. If you scroll to another location in the XML file, you can right-click in the text panel to get a popup menu item "Scroll to current line". Note that the STAX Monitor needs a trust level 4 for the XML file machine so that it can retrieve the file; if the STAX Monitor does not have a sufficient trust level, the RC 25 error will be displayed in the text panel.

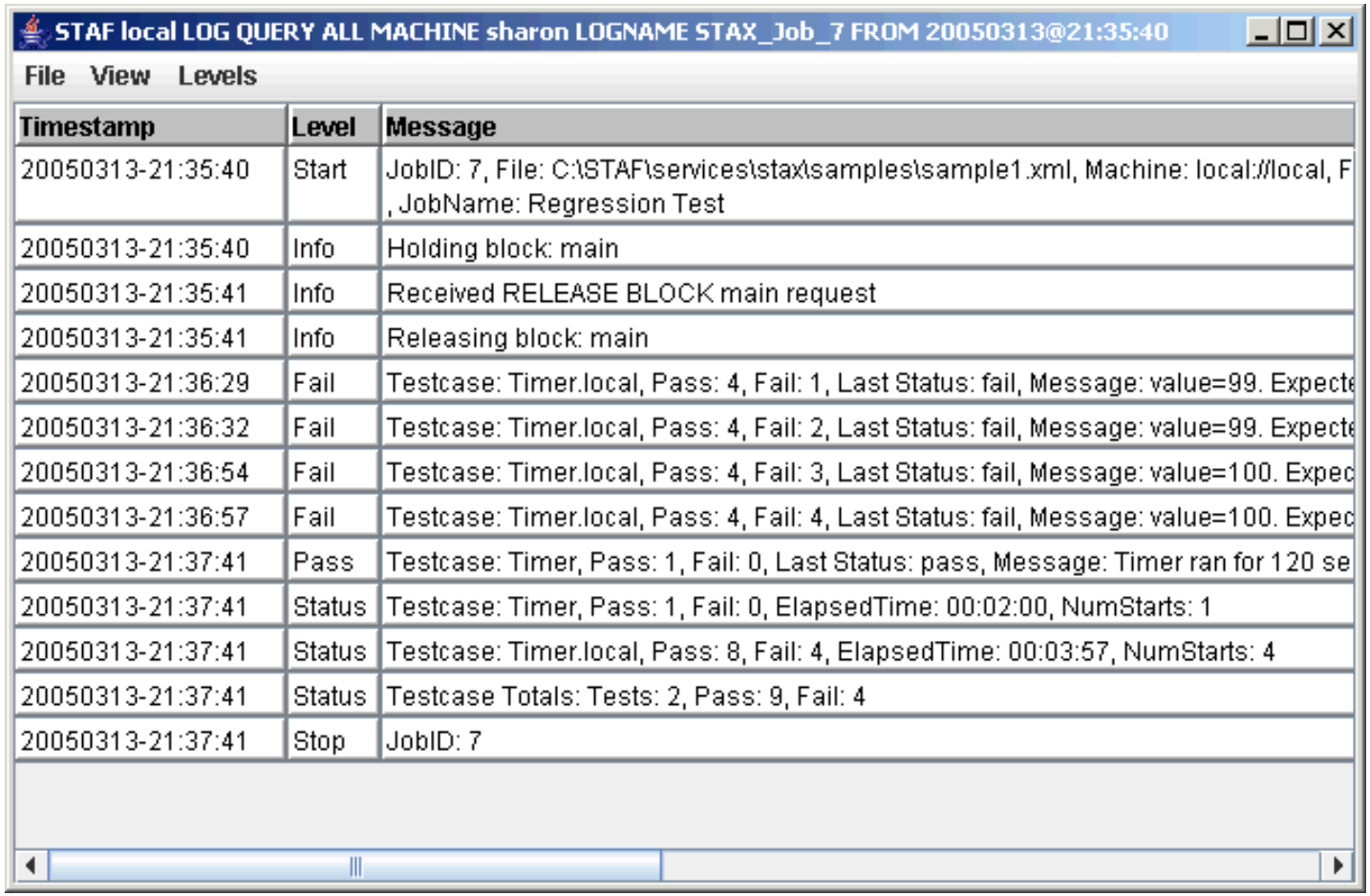
Notes:

- When you start monitoring a job that is already executing, the "Active Job Elements", "Processes", "STAFCmds", "Sub-jobs", "Debug", and "TestCase Info" tabs will show the same information as if you had been monitoring the job from its beginning. However, the "Messages" tab only displays messages that have occurred **after** you started monitoring the job.

- All of the tables in the Job Monitor are sortable:
  - To sort the table in ascending order by a column, click on the table's column header for that column.
  - To sort the table in descending order by a column, hold the Shift key while clicking on the table's column header for that column.

Displaying a Job Log

There are several menu options to display Job Logs. Here is an example of the dialog that is shown when a Log is displayed.



The **File** menu bar contains the following menu items:

- **Save As Text...** - Displays a dialog that allows you to select a file name where the formatted output will be saved and formats the log as text, where the timestamp, level, and message fields for each log record are printed in a single line with the fields separated by a space.
- **Save As Html...** - Displays a dialog that allows you to select a file name where the formatted output will be saved and formats the log as html. The html document will have a title containing the STAF LOG QUERY request that was submitted and will contain a table with three columns (timestamp, level, and message) where each row contains a log record. It will use the font specified for the Log Viewer.
- **Exit** - This option closes the Job Log.

Note: If you want to set the directory name that will be displayed as the default directory when the "Save As Text..." or "Save As Html..." menu item is selected, you need to set the "Log Viewer Save As Directory" field via the STAX Monitor Properties panel (on the "Options" tab) and save this property change.

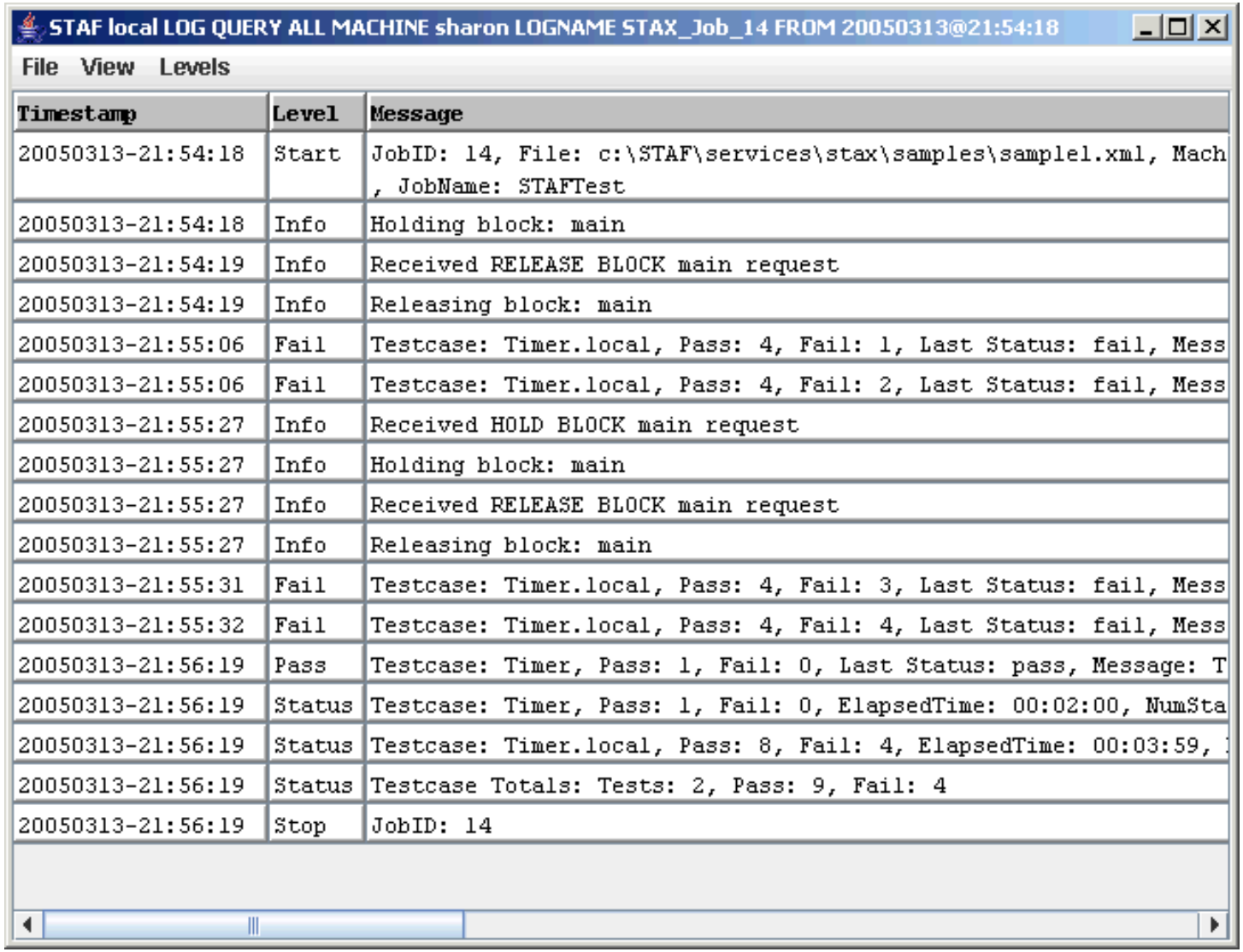
The **View** menu bar contains the following menu items:

- **Refresh** - This option refreshes the Job Log (the latest log information will be queried and the table will be updated).
- **Change Font...** - Displays a dialog that allows you to change the font for the log records. Note that this font change is only while you're viewing this log. To change the font to be used when displaying any STAX log, you need to select the "Log Viewer Font Name" via the STAX Monitor Properties panel (on the "Options" tab) and save this property change.

The **Levels** menu bar contains the following menu items (note that when any of the level options are changed, the information in the table will be refreshed with the latest information from the Log):

- **All** - Selecting this option controls whether all of the log levels will be displayed in the table.
- **Fatal** - Selecting this option controls whether Fatal log messages will be displayed in the table.
- **Error** - Selecting this option controls whether Error log messages will be displayed in the table.
- **Warning** - Selecting this option controls whether Warning log messages will be diplayed in the table.
- **Info** - Selecting this option controls whether Info log messages will be displayed in the table.
- **Trace** - Selecting this option controls whether Trace log messages will be displayed in the table.
- **Trace2** - Selecting this option controls whether Trace2 log messages will be displayed in the table.
- **Trace3** - Selecting this option controls whether Trace3 log messages will be displayed in the table.
- **Debug** - Selecting this option controls whether Debug log messages will be displayed in the table.
- **Debug2** - Selecting this option controls whether Debug2 log messages will be displayed in the table.
- **Debug3** - Selecting this option controls whether Debug3 log messages will be displayed in the table.
- **Start** - Selecting this option controls whether Start log messages will be displayed in the table.
- **Stop** - Selecting this option controls whether Stop log messages will be displayed in the table.
- **Pass** - Selecting this option controls whether Pass log messages will be displayed in the table.
- **Fail** - Selecting this option controls whether Fail log messages will be diplayed in the table.
- **Status** - Selecting this option controls whether Status log messages will be displayed in the table.
- **User1** - Selecting this option controls whether User1 log messages will be displayed in the table.
- **User2** - Selecting this option controls whether User2 log messages will be displayed in the table.
- **User3** - Selecting this option controls whether User3 log messages will be displayed in the table.
- **User4** - Selecting this option controls whether User4 log messages will be displayed in the table.
- **User5** - Selecting this option controls whether User5 log messages will be displayed in the table.
- **User6** - Selecting this option controls whether User6 log messages will be displayed in the table.
- **User7** - Selecting this option controls whether User7 log messages will be displayed in the table.
- **User8** - Selecting this option controls whether User8 log messages will be displayed in the table.

You can select the font name used when displaying log information via the "Log Viewer Font Name" on the "Options" tab of the STAX Monitor Properties panel. Here is an example of the dialog that is shown when a Log is displayed if you selected "Monospaced" for the "Log Viewer Font Name":



Timestamp	Level	Message
20050313-21:54:18	Start	JobID: 14, File: c:\STAF\services\stax\samples\sample1.xml, Mach , JobName: STAFTest
20050313-21:54:18	Info	Holding block: main
20050313-21:54:19	Info	Received RELEASE BLOCK main request
20050313-21:54:19	Info	Releasing block: main
20050313-21:55:06	Fail	Testcase: Timer.local, Pass: 4, Fail: 1, Last Status: fail, Mess
20050313-21:55:06	Fail	Testcase: Timer.local, Pass: 4, Fail: 2, Last Status: fail, Mess
20050313-21:55:27	Info	Received HOLD BLOCK main request
20050313-21:55:27	Info	Holding block: main
20050313-21:55:27	Info	Received RELEASE BLOCK main request
20050313-21:55:27	Info	Releasing block: main
20050313-21:55:31	Fail	Testcase: Timer.local, Pass: 4, Fail: 3, Last Status: fail, Mess
20050313-21:55:32	Fail	Testcase: Timer.local, Pass: 4, Fail: 4, Last Status: fail, Mess
20050313-21:56:19	Pass	Testcase: Timer, Pass: 1, Fail: 0, Last Status: pass, Message: T
20050313-21:56:19	Status	Testcase: Timer, Pass: 1, Fail: 0, ElapsedTime: 00:02:00, NumSta
20050313-21:56:19	Status	Testcase: Timer.local, Pass: 8, Fail: 4, ElapsedTime: 00:03:59,
20050313-21:56:19	Status	Testcase Totals: Tests: 2, Pass: 9, Fail: 4
20050313-21:56:19	Stop	JobID: 14

Displaying a JVM Log

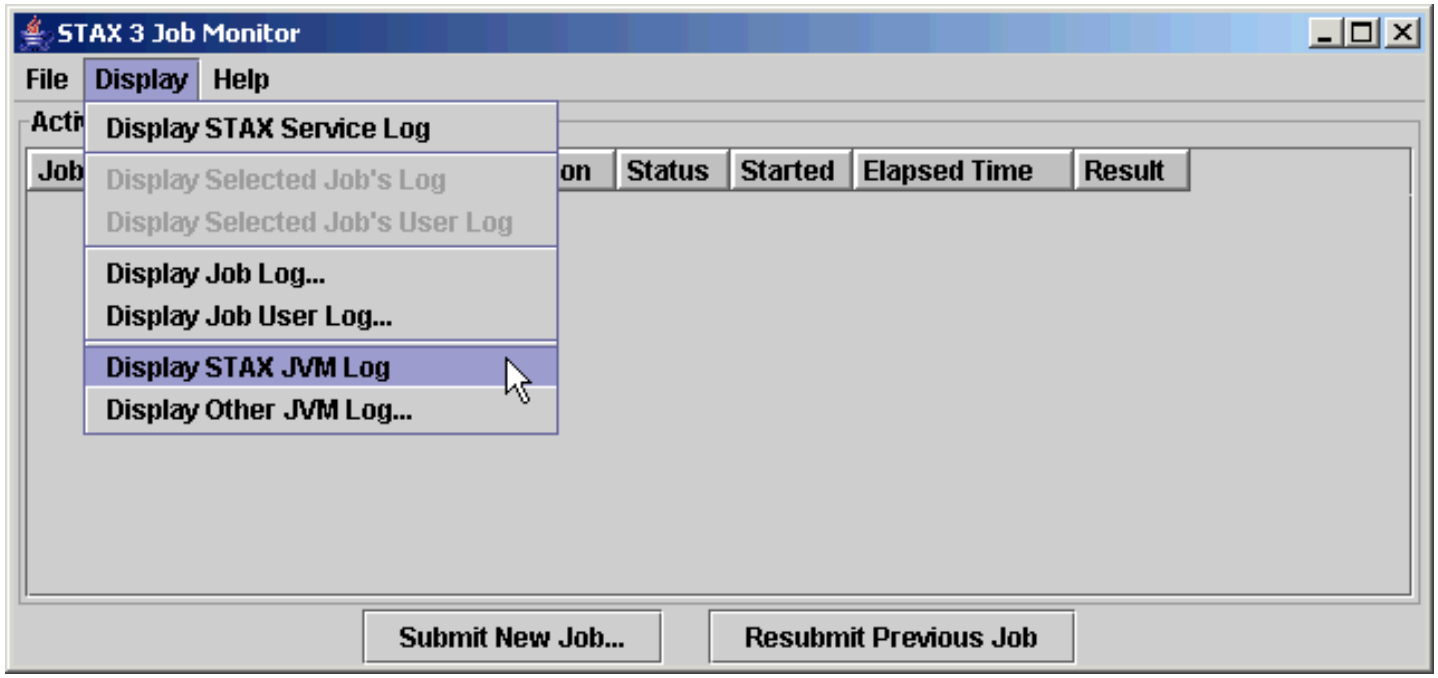
Each Java service that is registered with STAF runs in a JVM (Java Virtual Machine). Each JVM created by STAF has a JVM Log file associated with it. Note that more than one Java service may use the same JVM (and thus the same JVM Log file) depending on the options used when registering the service.

A JVM Log file contains JVM start information such as the date/time when the JVM was created, the JVM executable, and the J2 options used to start the JVM. It also contains any other information logged by the JVM. This includes any errors that may have occurred while the JVM was running. Also, the output from any print statements that you use within a <script> element in a STAX xml file can be be written to the STAX JVM

Log if the "Python Output" setting for the STAX job is set to "JVMLog". The default value for "Python Output" in the STAX Job User Log.

STAF stores JVM Log files in the {STAF/DataDir}/lang/java/jvm/<JVMName> directory. STAF retains a configurable number of JVM Logs (5 by default) for each JVM. The current JVM log file is named JVMLog.1 and older saved JVM log files, if any, are named JVMLog.2 to JVMLog.<MAXLOGS>. When a JVM is started, if the size of the JVMLog.1 file exceeds the maximum configurable size (1M by default), the JVMLog.1 file is copied to JVMLog.2 and so on for any older JVM Logs, and a new JVMLog.1 file will be created.

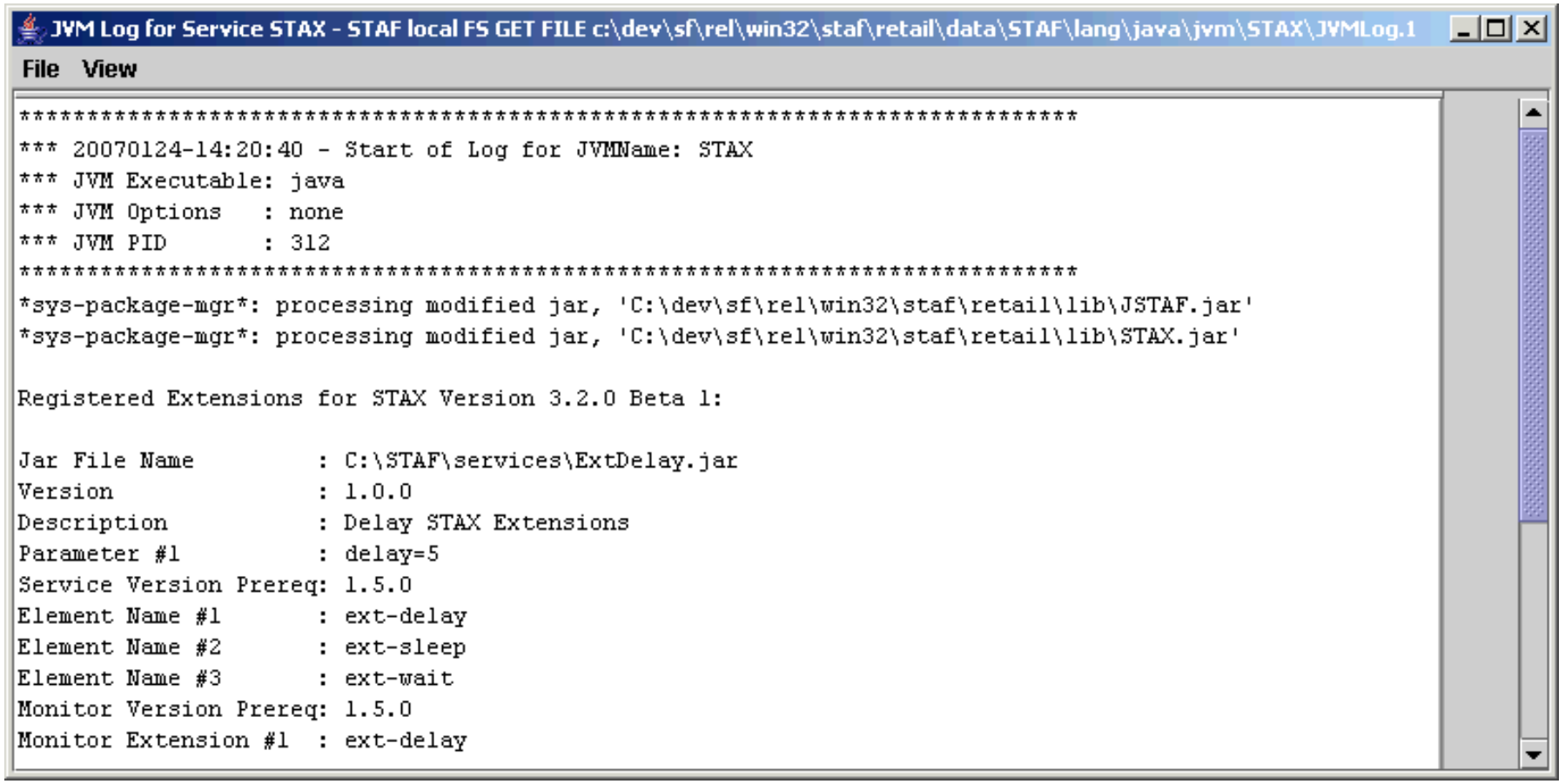
Following is the STAX Job Monitor window with the **Display** menu bar selected:



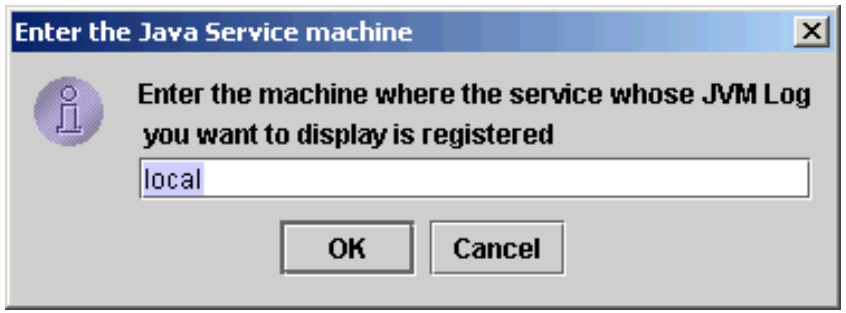
To display the JVM Log for the STAX service or for any Java service on any machine, from the main STAX Job Monitor window's **Display** menu bar, select one of the following menu items:

- **Display STAX JVM Log** - Selecting this option causes the current JVM Log for the STAX service to be displayed. Only the entries in the JVM Log from the last time the JVM was created are shown (though you can later use the "View->Show All" option to change it to display all entries in the JVM Log). This option is only enabled if STAF V3.2.1 or later is running on the STAX Monitor machine.
- **Display Other JVM Log...** - Selecting this option allows you to display the current JVM Log for any service currently registered on any machine. This option is only enabled if STAF V3.2.1 or later is running on the STAX Monitor machine.

Here is an example of the dialog that could be shown when you select the **Display STAX JVM Log** menu item:



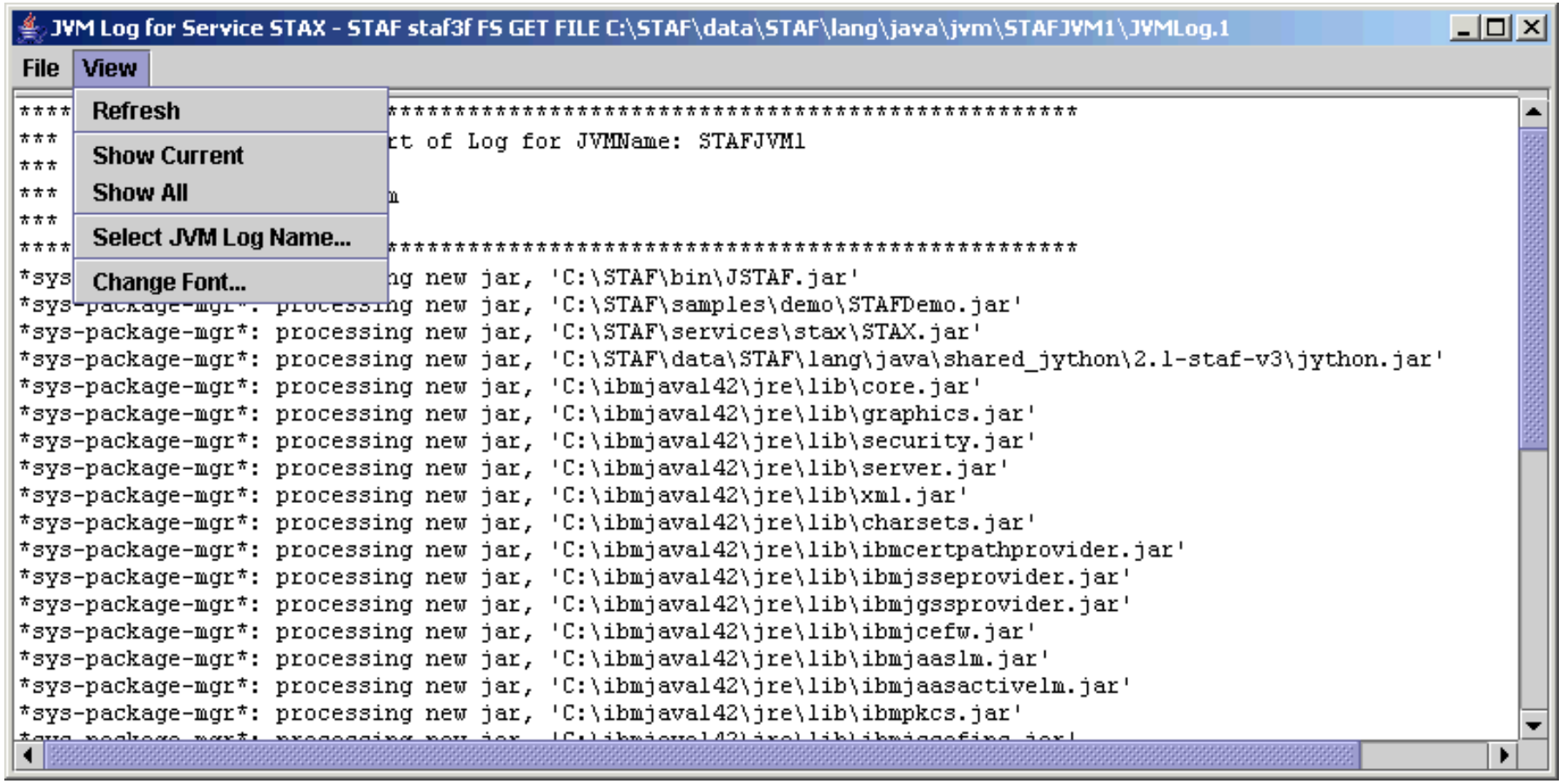
If you select the **Display Other JVM Log...** option, the following dialog is displayed so you can enter the machine endpoint where the STAF Java service whose JVM Log you want to display is currently registered. The default machine is the STAX Service machine that the STAX Monitor is configured to use.



Once you enter the machine name and select the OK button, the following dialog is displayed which shows a list of Java services currently registered on that machine.

Click on the drop-down list to see all of the Java services registered on this machine. Select a Java service, and then select the OK button to display the JVM Log for this Java service.

Here is an example of the dialog that is shown when the STAX JVM Log for machine staf3f is displayed along with the menu items on the **View** menu bar:



The **File** menu bar contains the following menu items:

- **Exit** - This option closes the JVM Log Viewer.

The **View** menu bar contains the following menu items:

- **Refresh** - This option refreshes the JVM Log (i.e. the latest JVM Log information will be displayed) and scrolls down to the end of the JVM Log.
- **Show Current** - This option displays only the entries in the JVM Log from the "current" JVM (the JVM that is currently running).
- **Show All** - This option displays all of the entries in the JVM Log This includes logs from any previous times the JVM was created, instead of just the entries from the current JVM.
- **Select JVM Log Name...** - This option displays a dialog which allows you to select a different JVM Log to display if older saved JVM Logs are available.
- **Change Font** - This option displays a dialog which allows you to change the font used when displaying the JVM Log file. The default font used is the Monospaced font. Changing the font also refreshes the JVM Log (i.e. the latest JVM Log information will be displayed) and scrolls down to the end of the JVM Log.

STAX Logging

STAX uses the STAF Log Service for logging, so the Log Service must be registered in order for STAX logs to be created.

There are three types of STAX logs:

- **STAX service log** - This log contains messages generated by the STAX Service for all jobs. This log contains a start and stop message for each STAX Job. The job start message includes additional information about the job such as job ID, XML file name, machine name, starting function, job name, and arguments passed to the starting function.

- **STAX job logs** - There is a STAX job log generated by the STAX Service for each STAX job ID. Each log contains messages for the job such as a start and stop message for the job. In addition, a message is logged if:

  - A job is held, released, or terminated.

  - A signal is raised by the STAX service during job execution and the default signal handler is invoked.

  - A <tcstatus> element or UPDATE request for a testcase is successfully executed, and a message (additional information about the testcase status) was specified with a Pass or Fail status. This logs a message with level "Pass" or "Fail" (based on the testcase status)

and the format of the message text is:

```
Testcase: <Testcase Name>, Pass: <NumPasses>, Fail: <NumFails>, Last Status: <Last
Status>, Message: <Message>
```

- If "Log TC Start/Stop" is enabled for the job and a <testcase> element is encountered or a START request for a testcase is successfully executed. This logs a message with level "Start" and the format of the message text is:

  ```
  Testcase: <Testcase Name>
  ```

- If "Log TC Start/Stop" is enabled for the job and a </testcase> element is encountered or a STOP request for a testcase is successfully executed. This logs a message with level "Stop" and the format of the message text is:

  ```
  Testcase: <Testcase Name>, ElapsedTime: <Elapsed Time>"
  ```

- A job terminates, a summary of the number of times each testcase passed or failed is logged with level "Status". If "Log TC Elapsed Time" is enabled for the job, the elapsed time for each testcase is also logged. If "Log TC Num Starts" is enabled for the job, the number of times each testcase was started is also logged. The format of the message text is:

  ```
  Testcase: <Testcase Name>, Pass: <NumPasses>, Fail: <NumFails>[, ElapsedTime:
  <ElapsedTime>][, NumStarts: <NumStarts>]
  ```

  Notes:

  1. If the default mode is specified for a testcase for which no passes or fails were recorded, no summary for that testcase is logged.

  2. If a testcase is started more than once via a <testcase> element or a START testcase request, the elapsed times for each testcase started are accumulated. So, it is possible that the elapsed time for a testcase is more than the elapsed time for a job if the same testcase is run in parallel multiple times.

  3. The format for elapsed time is HH:MM:SS or if the elapsed time exceeds 99 hours, the format is: HHH:MM:SS.

- A job terminates, a summary of the job's total number of testcases, passes, and fails is logged.

- **STAX job user logs** - If a STAX job uses the <log> element or the <message log="1"> element, or if a LOG MESSAGE request is submitted for the job, then a STAX job user log is generated for the job ID. The message is written to this log. STAF variables are allowed in the message. However, they will only be resolved if one of the STAF Log service options which specify to resolve variables is set.

Note: The maximum length of a message logged to all STAF logs, including STAX job and job user logs, is controlled by the STAF Log service's

MaxRecordSize setting. The default MaxRecordSize for the STAF Log service is 100K (100,000 characters). It is possible that a STAX job may try to log a message that is longer than 100K, so the STAX service automatically increases the Log service's MaxRecordSize to 1M (1,048,576 characters) if it is set to a smaller value. For example, if a STAX job contains a <script> element which consists of more than 100K of Python code, when a STAXPythonEvaluationError signal is raised, a message is written to the STAX job log which includes all the Python code contained in the <script> element where the error occurred, as well as the line number and a description of the problem. So, if the MaxRecordSize was not increased, the message logged would be truncated and important information for fixing the error could be missing. If desired, you can increase the maximum log record size even more. See the "Log Service" section in the STAF User's Guide for how to specify a MAXRECORDSIZE parameter when registering the Log service in the STAF.cfg file or to dynamically change it by submitting a SET MAXRECORDSIZE request to the Log service.

Listing/Querying STAX Service Logs

The STAX logs are machine logs. The names of the STAX logs begin with the STAX service name in uppercase (e.g. STAX). To get a list of all the logs on a STAX service machine named "stax1.company.com", use the following STAF log list request. The log files listed whose name begins with STAX are the STAX logs. For example:

```
STAF stax1.company.com LOG LIST MACHINE {STAF/Config/MachineNickname}
```

An example of output from listing STAX logs is:

```
Log Name         Date-Time         Size
---------------- ----------------- ------
STAX_Service     20130510-11:54:50 558601
STAX_Job_1       20130510-11:52:48 597216
STAX_Job_1_User  20130510-11:52:48 228688
STAX_Job_2       20130510-11:53:26 223540
STAX_Job_3       20130510-11:54:34 198001
STAX_Job_3_User  20130510-11:54:34 56788
STAX_Job_4       20130510-11:54:50 76624
STAX_Job_4_User  20130510-11:54:50 13111
```

To query a STAX service log, use the following STAF log query machine request (assuming STAX is the registered name for the service):

```
STAF -verbose stax1 LOG QUERY MACHINE {STAF/Config/MachineNickname} LOGNAME STAX_Service
```

An example of the output from a query of a STAX service log is:

```
Response
--------
[
```

```
  {
    Date-Time: 20151213-09:26:14
    Level    : Info
    Message  :
Registered Extensions for STAX Version 3.5.17:

Jar File Name         : C:\STAF\services\ExtDelay.jar
Version               : 1.0.0
Description           : Delay STAX Extensions
Parameter #1          : delay=5
Service Version Prereq: 1.5.0
Element Name #1       : ext-delay
Element Name #2       : ext-sleep
Element Name #3       : ext-wait
Monitor Version Prereq: 1.5.0
Monitor Extension #1  : ext-delay

Jar File Name         : C:\STAF\services\mts\ManualTestExt.jar
Version               : 3.0.0
Description           : Manual Test System (MTS) STAX Extensions
Parameter #1          : servicename=MTS
Parameter #2          : servicemachine=lucas
Service Version Prereq: 3.0.0
Element Name #1       : manual-test
Monitor Version Prereq: 3.0.0
Monitor Extension #1  : manual-test

  }
  {
    Date-Time: 20151213-16:36:51
    Level    : Start
    Message  : JobID: 1, File: c:\dev\src\stax\testSignalCallStack.xml, Machine:
 local://local, Function: Main, Args: null, JobName: Signal Call Stack
  }
  {
    Date-Time: 20151213-16:36:58
    Level    : Stop
    Message  : JobID: 1
  }
  {
    Date-Time: 20151213-16:43:43
```

```
    Level    : Start
    Message  : JobID: 2, File: c:\dev\src\stax\STAFTest.xml, Machine: tcp://clie
nt1.austin.ibm.com, Function: DoAll, Args: [1, 2], JobName: STAFTest
  }
  {
    Date-Time: 20151213-16:43:56
    Level    : Stop
    Message  : JobID: 2
  }
]
```

Querying STAX Job Logs

To query a STAX job log for Job ID 45, use the following STAF log query machine request (assuming stax1 is the STAX service machine and STAX is the registered name for the service):

```
STAF stax1 LOG QUERY MACHINE {STAF/Config/MachineNickname} LOGNAME STAX_Job_45
```

An example of the output from a query of a STAX job log is:

```
Response
--------
Date-Time Level  Message
--------- ------ ------------------------------------------------------------
20041201- Start  JobID: 45, File: c:\dev\src\stax\job1.xml, Machine: stax1.aust
13:43:14         in.ibm.com, Function: Main, Args: null, JobName: Job Test
20041201- Info   Holding block: main
13:43:14
20041201- Info   Received RELEASE BLOCK main request
13:43:15
20041201- Info   Releasing block: main
13:43:15
20041201- Fail   Testcase: Fail Tests, Pass: 0, Fail: 1, Last Status: fail, Mes
13:43:17         sage: Sub-job "Fail Test 1" could not be started.  RC: 4001 ST
                 AFResult: Caught com.ibm.staf.service.stax.STAXXMLParseExcepti
                 on:  Line 7: Element type "unknown" must be declared. STAXResu
                 lt: None STAXSubJobID: 0
20041201- Fail   Testcase: Fail Tests, Pass: 0, Fail: 2, Last Status: fail, Mes
13:43:18         sage: Sub-job "Fail Test 2" could not be started.  RC: 48 STAF
                 Result: C:/dev/src/stax/DoesNotExist.xml STAXResult: None STAX
```

```
                 SubJobID: 0
20041201- Fail   Testcase: Fail Tests, Pass: 0, Fail: 3, Last Status: fail, Mes
13:43:18         sage: Sub-job "Fail Test 3" could not be started.  RC: 13 STAF
                 Result: MySubJobFileName STAXResult: None STAXSubJobID: 0
20041201- Fail   Testcase: Fail Tests, Pass: 0, Fail: 4, Last Status: fail, Mes
13:43:20         sage: Sub-job "Fail Test 4" (Job ID 51) failed.  STAXResult: N
                 one
20041201- Fail   Testcase: Test A, Pass: 0, Fail: 1, Last Status: fail, Message
13:43:44         : Sub-job "Test A" (Job ID 46) failed.  STAXResult: None
20041201- Status Testcase: Fail Tests, Pass: 0, Fail: 4, ElapsedTime: 00:00:03,
13:43:45          NumStarts: 1
20041201- Status Testcase: Test A, Pass: 0, Fail: 1, ElapsedTime: 00:00:30, Num
13:43:45         Starts: 1
20041201- Status Testcase: Test B, Pass: 1, Fail: 0, ElapsedTime: 00:00:13, Num
13:43:45         Starts: 1
20041201- Status Testcase: Test C, Pass: 1, Fail: 0, ElapsedTime: 00:00:13, Num
13:43:45         Starts: 1
20041201- Status Testcase: Test D, Pass: 1, Fail: 0, ElapsedTime: 00:00:03, Num
13:43:45         Starts: 1
20041201- Status Testcase: Test E, Pass: 1, Fail: 0, ElapsedTime: 00:00:06, Num
13:43:45         Starts: 1
20041201- Status Testcase Totals: Tests: 6, Pass: 4, Fail: 5
13:43:45
20041201- Stop   JobID: 45
13:43:45
```

To query a STAX job log for Job ID 2, but just its last "Testcase Totals:" entry, use the following STAF log query machine request (assuming stax1 is the STAX service machine and STAX is the registered name for the service):

```
STAF stax1 LOG QUERY MACHINE {STAF/Config/MachineNickname} LOGNAME STAX_Job_2 CONTAINS "Testcase
Totals:" LAST 1
```

An example of the output from this query of a STAX job log is:

```
Response
--------
Date-Time         Level  Message
----------------- ------ ----------------------------------------
20041201-13:43:01 Status Testcase Totals: Tests: 3, Pass: 2, Fail: 7
```

Note that if you have not enabled the CLEARLOGS option and you have not disabled the RESETJOBID parameter when registering the STAX service, logs for from multiple STAX job runs can be contained in a single logfile, so you may want to use additional options in your LOG QUERY request to refine the query. For example, to display only the log information for the last STAX Job in the log, you can use the FROM option, specifying the date/time that the last STAX job began.

```
STAF stax1 LOG QUERY MACHINE {STAF/Config/MachineNickname} LOGNAME STAX_Job_2 FROM 200412-
1@13:43:14 ALL
```

Querying STAX Job User Logs

To query a STAX job user log for Job ID 3, use the following STAF log query machine request (assuming stax1.austin.ibm.com is the STAX service machine and STAX is the registered name for the service):

```
STAF stax1.austin.ibm.com LOG QUERY MACHINE {STAF/Config/MachineNickname} LOGNAME STAX_Job_3_User
```

An example of the output from a query of a STAX job user log is:

```
Response
--------
Date-Time         Level  Message
----------------- ------ --------------------------------------------
20041208-11:16:46 Start  Starting the STAXMonitor test on machine machA
20041208-11:16:51 Info   TestProcess on machine machA RC = 0
20041208-11:16:51 Info   Delaying 1453 on machine machA
20041208-11:16:53 Info   Machine machA is running STAF Version 3.0.0
20041208-11:16:57 Info   TestProcess on machine machA RC = 1
20041208-11:17:04 Stop   Finished the STAXMonitor Test on machine machA
```

Note that if you have not enabled the CLEARLOGS option and you have not disabled the RESETJOBID parameter when registering the STAX service, logs from multiple STAX job runs can be contained in a single logfile, so you may want to use additional options in your LOG QUERY request to refine the query. For example, to display only the log information for the last STAX Job in the log, you can use the `FROM <Timestamp>`option, specifying the date/time that the last STAX job began, e.g. `FROM 20041208-11:16:46`.

Displaying STAX Logs via a GUI

You can use the STAX Monitor Java application to display STAX logs in a formatted, graphical representation. Refer to the "STAX Monitoring" section for more information on how to display a STAX log using the STAX Monitor. Note that only the log information for the last STAX Job in the log is displayed.

Or, you can use the STAX Log Viewer Java application, `com.ibm.staf.service.stax.STAXMonitorLogViewer`, provided in the STAXMon.jar file. You can run the STAX Log Viewer Java application independently from the STAX Monitor. When running this Java application, make sure that the STAXMon.jar and JSTAF.jar files are in your classpath and then type the following (the class name is case sensitive) to get help for running the STAX Log Viewer:

```
java com.ibm.staf.service.stax.STAXMonitorLogViewer -help
```

Or you can specify the fully-qualified names of the STAXMon.jar and JSTAF.jar files using the `-cp` (classpath) parameter when running the STAX Log Viewer. For example:

```
java -cp C:\STAF\services\stax\STAXMon.jar;C:\STAF\lib\JSTAF.jar com.ibm.staf.service.stax.
STAXMonitorLogViewer -help
```

The STAX Log Viewer accepts the following command line parameters:

```
-name <STAX Log Name>
-machine <STAX Service Machine Name>
-machineNickname <STAX Service Machine Nickname>
-fontName <Font Name>
-help
-version
```

You must specify either `-name <STAX Log Name>`or `-help`or `-version`.

`-name`specifies the name of an existing STAX Job log to display. This option will resolve variables. This parameter is required. You can specify the name of a STAX Job log (e.g. STAX_Job_1), a STAX Job User log (e.g. STAX_Job_1_User), or the STAX Service log (e.g. STAX_Service).

`-machine` specifies the name of the machine where the STAX logs are located. This option will resolve variables. This parameter is optional. The default is `local`.

`-machineNickname` specifies the machine nickname for the STAX service machine. This option will resolve variables. This parameter is optional. The default is `{STAF/Config/MachineNickname}`.

`-fontName` specifies the name of the font to use when displaying the STAX log. This parameter is optional. The default is `Dialog`.

`-help` displays help information for the STAX Log Viewer. This parameter is optional.

`-version` displays the version of the STAX Log Viewer. This parameter is optional.

Note that only the log information for the last STAX Job in the log is displayed.

Examples Starting the STAX Job Viewer

- Start the STAX Job Viewer specifying to display the STAX Job log on the local machine for STAX job 1:

```
java com.ibm.staf.service.stax.STAXMonitorLogViewer -name STAX_Job_1
```

- Start the STAX Job Viewer specifying to display the STAX Job User log for STAX job 2 on STAX service machine server1.company.com:

```
java com.ibm.staf.service.stax.STAXMonitorLogViewer -name STAX_Job_2_User -machine server1.
company.com
```

- Start the STAX Job Viewer specifying to display the STAX Service log on STAX service machine server1:

```
java com.ibm.staf.service.stax.STAXMonitorLogViewer -name STAX_Service -machine server1
```

- Start the STAX Job Viewer speicfying to display the STAX Job log for STAX job 3 on machine server1 using a Monospaced font:

```
java com.ibm.staf.service.stax.STAXMonitorLogViewer -name STAX_Job_3 -machine server1 -
fontName Monospaced
```

Formatting a STAX Log as Html or Text

The `STAFLogFormatter` class allows you to format a STAX log (which is a binary file that has been created by the STAF Log service) as html or text.

This Java class can be run as an application via the command line or can be run via another Java program. When run as an application, it submits the specified Log query request to query a STAF log on any machine currently running STAF and then formats the output as either html or text. Or, when run via a Java program that has already submitted a LOG QUERY request, you can use the `STAFLogFormatter` class to format the log query result as either html or text. You can specify various options including whether you want the formatted output written to a file.

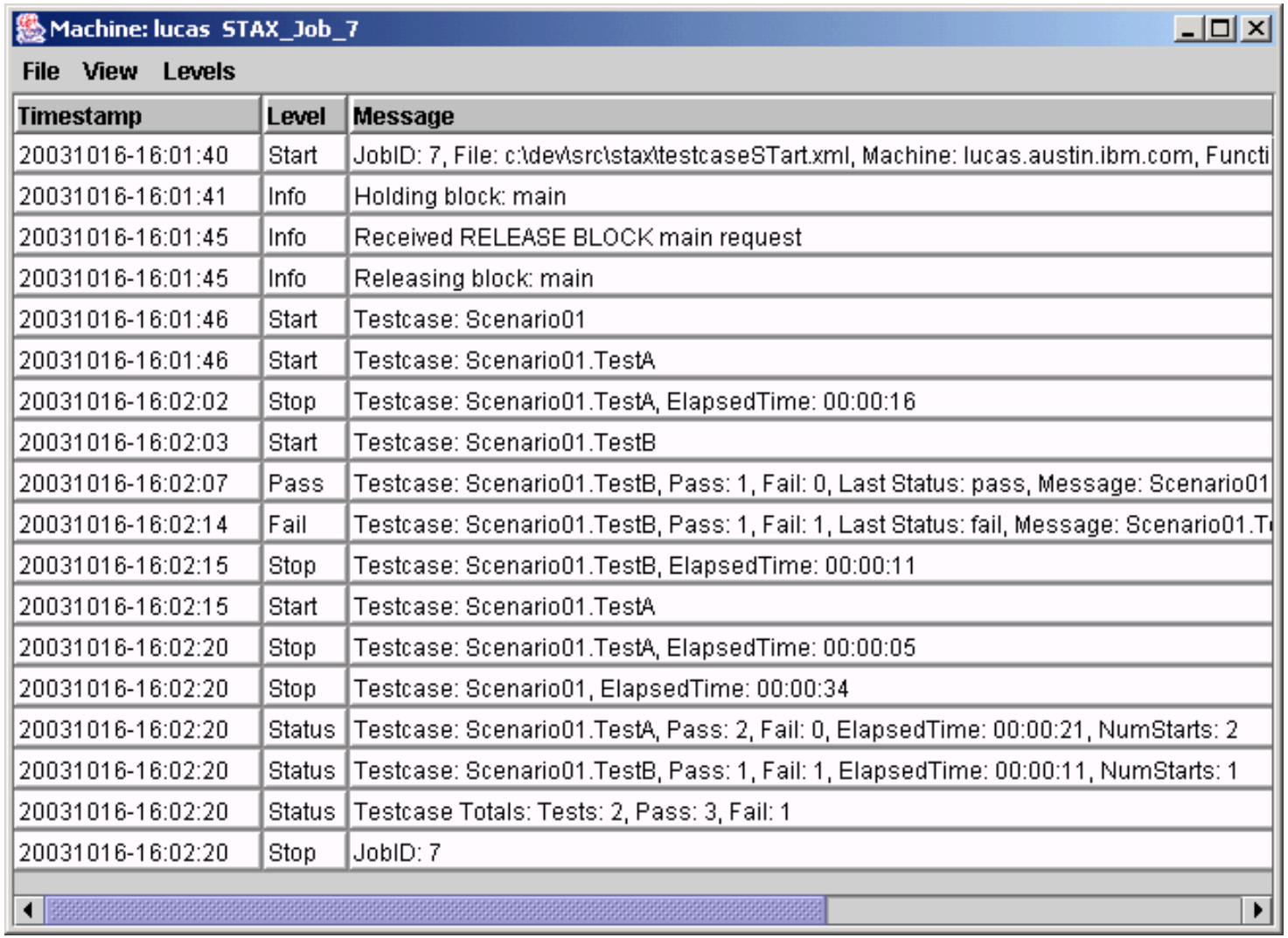
For more detailed information on using the `STAFLogFormatter` class, see section "3.6.3 Class STAFLogFormatter" in the STAF Java User's Guide.

Note that you can also format a STAX log as html or text in a file using the STAX Monitor. Refer to the "Displaying a Job Log" section for more information on how to display a STAX log using the STAX Monitor and then click on **File->Save As Html...** or **File->Save As Text...** to save the

STAX log formatted as html or as text in a file.

Enabling/Disabling Testcase Logging

Here's an example of the contents of the STAX Job Log for a job run with "Log TC Elapsed Time", "Log TC Num Starts", and "Log TC Start/Stop" enabled. Note that "Start" and "Stop" records are logged each time a testcase begins and ends and the elapsed time and number of starts for each testcase are provided in the "Status" records written at the end of the job. This also shows how the log is displayed via the STAX Monitor.



STAX Variables

The following variables are set in Python during Job Execution by the STAX service and can be referenced by your job definition. However, do not change their values.

- **RC**
  - Description: the return code from a <stafcmd>, <process>, <job>, or <timer> element
  - Assigned: each time a <stafcmd>, <process>, <job>, or <timer> element completes
  - Type: numeric. Note that the actual return code from a <process> element (if an error starting the process did not occur) is a PyLong numeric type (e.g 0L, 25L). In other cases, the return code will be a PyInteger type.

- **STAFResult**
  - Description: the result from a <stafcmd>, <process>, or <job> element
  - Assigned: each time a <stafcmd>, <process>, or <job> element completes
  - Type: string, PyList, or PyDictionary (aka Map)

- **STAFResultContext**
  - Description: the marshalling context object for the result from a <stafcmd> element. Its string representation is equivalent to the "verbose format" (the hierarchical nested format) provided by the STAF executable.
  - Assigned: each time a <stafcmd> element completes
  - Type: org.python.core.PyInstance

- **STAFResultString**
  - Description: the result string from a <stafcmd> element. If the result is marshalled, it is the marshalled result string.
  - Assigned: each time a <stafcmd> element completes
  - Type: string

- **STAFRC**
  - Description: the alias for the imported com.ibm.staf.STAFResult Java class. It contains constant definitions for STAF return codes (e.g. STAFRC.Ok, STAFRC.DoesNotExist). For more information on the STAFRC alias for the com.ibm.staf.STAFResult Java class, see the STAF Java Classes (STAFUtil, STAFRC, STAFVersion, etc) section.
  - Assigned: at the beginning of the execution of a STAX job
  - Type: Java class com.ibm.staf.STAFResult

- **STAXResult**
  - Description: the result from a function <call>, <call-with-list>, <call-with-map>, <process>, <job>, or <import> element
  - Assigned: each time a <call>, <call-with-list>, <call-with-map>, <process>, <job>, or <import> element completes
  - Type: anything (integer, string, variable, list, nothing, etc.)

- **STAXBlockRC**
  - Description: the return code from a <block> element
  - Assigned: each time a <block> element completes
  - Type: numeric.

- **STAXJobID**
  - Description: the Job ID of the STAX job
  - Assigned: at the beginning of the execution of a STAX job
  - Type: numeric

- **STAXSubJobID**
  - Description: the Job ID of the STAX sub-job (executed via a <job> element)
  - Assigned: each time a <job> element begins
  - Type: numeric

- **STAXSubJobStatus**
  - Description: the completion status of the STAX sub-job (executed via a <job> element)
  - Assigned: each time a <job> element completes
  - Type: string

- **STAXJobName**
  - Description: the name of the job specified on the EXECUTE request
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXJobWriteLocation**
  - Description: the name of a directory on the STAX service machine that the job can use to store data in
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXJobXMLFile**
  - Description: the fully qualified name of the file containing the XML document; this is the value of the FILE parameter, if specified, on the EXECUTE request; otherwise, if DATA <xml data> was specified on the EXECUTE request instead of FILE, it is set to "<inline data>"
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXJobXMLMachine**
  - Description: the machine where the file containing the XML document is located; this is the value of the MACHINE parameter, if specified, on the EXECUTE request; if not specified, then it is the endpoint of the machine submitting the EXECUTE request

- Assigned: at the beginning of the execution of a STAX job
- Type: string

- **STAXJobSourceMachine**
  - Description: the endpoint of the machine submitting the EXECUTE request
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXJobSourceHandle**
  - Description: the handle of the process submitting the EXECUTE request
  - Assigned: at the beginning of the execution of a STAX job
  - Type: numeric

- **STAXJobSourceHandleName**
  - Description: the name of the handle of the process submitting the EXECUTE request
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXJobScriptFileMachine**
  - Description: the endpoint for the machine where the script files are located. This is the value of the SCRIPTFILEMACHINE parameter, if specified, on the EXECUTE request. If the SCRIPTFILEMACHINE parameter was not specified on an EXECUTE request, it defaults to the value specified for the the MACHINE option on the EXECUTE request. If the MACHINE option was not specified, it assumes the script file(s) are on the machine submitting the STAX EXECUTE request.
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXJobScriptFiles**
  - Description: a list of names of script files; this is a list of the values of the SCRIPTFILE parameter(s), if specified, on the EXECUTE request; if no SCRIPTFILE parameters are specified, then it is an empty list
  - Assigned: at the beginning of the execution of a STAX job
  - Type: PyArray

- **STAXJobStartDate**
  - Description: the date the job started in format yyyymmdd
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXJobStartTime**
  - Description: the time the job started in format hh:mm:ss
  - Assigned: at the beginning of the execution of a STAX job

- Type: string

- **STAXJobStartFunctionName**
  - Description: the name of the starting function for the STAX job
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXJobStartFunctionArgs**
  - Description: the arguments passed to the starting function for the STAX job (in string format)
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXJobUserLog**
  - Description: a STAFLog wrapper object for the STAX Job User Log. You can use this object to log to the STAX Job User Log from Python code, instead of using the <log> element, which cannot be included in a <script> element. For example, within a <script> element, could do the following to log a message of level "info" in the STAX Job User Log:

    ```
    res = STAXJobUserLog.log('info', 'Here is an informational message')
    ```

    Note that the log method on this object requires two parameters: the log level string and the message. The log method returns a STAFResult object from which you can reference the return code and the result (e.g. res.rc and res.result).
  - Assigned: at the beginning of the execution of a STAX job
  - Type: STAFLog wrapper object

- **STAXThreadID**
  - Description: the Thread ID currently running
  - Assigned: at the creation of a new Thread. For example, a new thread is created when a job begins execution, when each task element contained in a <parallel> element is executed, and when each iteration of the task element contained in a <paralleliterate> element is executed.
  - Type: numeric

- **STAXCurrentFunction**
  - Description: the name of the current STAX function running in a thread
  - Assigned: when calling a STAX function (e.g. upon encountering a <call name="..."> element.
  - Type: string

- **STAXCurrentXMLFile**
  - Description: the name of the xml file that contains the STAX function that's currently running in a thread. If the current STAX function was not provided via a file by instead via the DATA option on an EXECUTE request, it is set to "<inline data>".
  - Assigned: at the beginning of the execution of a STAX job and each time a STAX function is called (e.g. upon encountering a <call

name="..."> element.
- Type: string

- **STAXCurrentXMLMachine**
  - Description: the machine where the xml file resides that contains the STAX function that's currently running in a thread.
  - Assigned: at the beginning of the execution of a STAX job and each time a STAX function is called (e.g. upon encountering a <call name="..."> element.
  - Type: string

- **STAXCurrentBlock**
  - Description: the name of the current block running in a thread
  - Assigned: when entering a block (e.g. upon encountering a <block name="..."> element and when entering the default 'main' block).
  - Type: string

- **STAXCurrentTestcase**
  - Description: the name of the current testcase running in a thread
  - Assigned: when entering a testcase (e.g. upon encountering a <testcase name="..."> element). If no testcase is currently running, then it is assigned None (a special object provided by Python which serves as an empty placeholder, much like null in Java).
  - Type: string

- **STAXProcessHandle**
  - Description: the process handle
  - Assigned: when the process has started executing. Only the <process-action> element can use this variable to access the handle for its process.
  - Type: string

- **STAXServiceName**
  - Description: the registered name of the STAX service executing the job
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXServiceMachine**
  - Description: the machine name (logical machine identifier) of the STAX service machine (the local machine)
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXServiceMachineNickname**
  - Description: the machine nickname of the STAX service machine (the local machine). It can be useful when querying STAX job logs, etc.
  - Assigned: at the beginning of the execution of a STAX job

- Type: string

- **STAXServicePath**
  - Description: the directory containing the STAX service jar file
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXEventServiceName**
  - Description: the registered name of the Event service (to which the STAX service submits requests)
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXEventServiceMachine**
  - Description: the machine name of the Event service machine
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXJobLogName**
  - Description: the name of the STAX job log for the current job (e.g. STAX_Job_1)
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXJobUserLogName**
  - Description: the name of the STAX job user log for the current job (e.g. STAX_Job_1_User)
  - Assigned: at the beginning of the execution of a STAX job
  - Type: string

- **STAXMessageLog**
  - Description: a flag indicating if the message being logged via a <log> element should also be sent to the STAX Monitor's message panel (if the message attribute is not specified for a <log> element. 1 indicates to send the message to the STAX Monitor; 0 indicates not to send the message to the STAX Monitor. Defaults ot 0.
  - Assigned: at the beginning of the execution of a STAX job
  - Type: numeric (0 or 1)

- **STAXLogMessage**
  - Description: a flag indicating if the message being sent to the STAX Monitor's message panel via a <message> element should also be logged to the STAX Job User log (if the log attribute is not specified for a <message> element. 1 indicates to log the message; 0 indicates not to log the messages. Defaults ot 0.
  - Assigned: at the beginning of the execution of a STAX job
  - Type: numeric (0 or 1)

- **STAXLogTCElapsedTime**
  - Description: a flag indicating if "Log TC Elapsed Time" is enabled or disabled for the STAX job. 1 means enabled; 0 means disabled.
  - Assigned: once at the beginning of the execution of a STAX job
  - Type: numeric (0 or 1)

- **STAXLogTCNumStarts**
  - Description: a flag indicating if "Log TC Num Starts" is enabled or disabled for the STAX job. 1 means enabled; 0 means disabled.
  - Assigned: once at the beginning of the execution of a STAX job
  - Type: numeric (0 or 1)

- **STAXLogTCStartStop**
  - Description: a flag indicating if "Log TC Start/Stop" is enabled or disabled for the STAX job. 1 means enabled; 0 means disabled.
  - Assigned: once at the beginning of the execution of a STAX job
  - Type: numeric (0 or 1)

- **STAXPythonOutput**
  - Description: the value specified for "Python Output" for the STAX job ('e.g. 'JobUserLog', 'Message', 'JobUserLogAndMsg', or 'JVMLog')
  - Assigned: once at the beginning of the execution of a STAX job
  - Type: string

- **STAXPythonLogLevel**
  - Description: the value specified for "Python Log Level" for the STAX job ('e.g. 'Info', 'Error', 'User1', etc.)
  - Assigned: once at the beginning of the execution of a STAX job
  - Type: string

- **STAXInvalidLogLevelAction**
  - Description: the value specified for "Invalid Log Level Action" for the STAX job (e.g. 'RaiseSignal' or 'LogInfo')
  - Assigned: once at the beginning of the execution of a STAX job
  - Type: string

- **STAXArg**
  - Description: the arguments passed when calling a function that did not define its arguments (via <function-list-args>, <function-map-args>, etc.)
  - Assigned: each time a <call>, <call-with-list>, <call-with-map> element begins if the function being called did not define its arguments
  - Type: anything (integer, string, variable, list, nothing, etc.)

STAXGlobal Class

The STAXGlobal class is a Python class which STAX provides as a wrapper to provide for the creation of truly global variables, even across STAX-Threads and when used in functions declared with a local scope.

Whenever a new STAX-Thread is created, existing variables are cloned from the parent STAX-Thread. STAX elements that can create STAX-Threads include the following:

- function elements with a local scope
- parallel
- paralleliterate
- process-action
- job-action

To create a global variable that can be accessed across STAX-Threads, create a variables that is an instance of the STAXGlobal class. A STAXGlobal variable allows you to modify it's value if it is passed into a local-scoped function or if it is shared across multiple threads. However, **creating** a STAXGlobal **inside** a local-scoped function will not cause it to appear once that function has returned. Any variable created within a local-scoped function will disappear when that function ends. Normally, any updates to variables disappear as well, but STAXGlobals allow updates to persist, so long as the STAXGlobal variable was created before the local-scoped function was called.

The STAXGlobal class provides the following constructor and methods:

- **STAXGlobal(***value = None***)** - Constructs a new instance of a STAXGlobal variable. If no value is specified, it's value defaults to None.
- **set(***value***)** - Sets a value for the STAXGlobal variable
- **get()** - Returns the value for the STAXGlobal variable

Note that you will generally want to use a list to define a STAXGlobal variable even if its value is just an integer or a string. For example, when function Main (see below) is called, the message it displays is (2, 3, 3, 3, 3), not (3, 3, 3, 3, 3) as you may have thought would be displayed.

```
<function name="Main" scope="local">
  <sequence>

    <script>
      ctr  = STAXGlobal(2)     # Be careful if you don't use a list
      gCtr = STAXGlobal([2])   # Instead, use a list to define
      gCtr2 = STAXGlobal(2)    # No list, but set method is used
      gCtr3 = STAXGlobal(2)    # No list, but set and get methods are used
      gCtr4 = STAXGlobal(2)    # Be careful if you don't use a list
    </script>
```

```
    <call function="'TestSTAXGlobal'"/>

    <message>ctr, gCtr[0], gCtr2, gCtr3, gCtr4</message>

  </sequence>
</function>

<function name="TestSTAXGlobal" scope="local">
  <script>
    ctr = ctr + 1              # Now ctr is bound to an integer
                               #   object, not a STAXGlobal
    gCtr[0] = gCtr[0] + 1      # Still a STAXGlobal
    gCtr2.set(gCtr2 + 1)       # Still a STAXGlobal
    gCtr3.set(gCtr3.get() + 1) # Still a STAXGlobal
    gCtr4 += 1                 # Still a STAXGlobal
  </script>
</function>
```

Note that STAXGlobal variables are not atomic across STAX-Threads. That is, if you created the following STAX variable:

```
<script>gTestIndex = STAXGlobal([0])</script>
```

And then in a **paralleliterate**or in a **parallel**element you incremented this variable as follows:

```
<script>gTestIndex[0] += 1</script>
```

If two STAX-Threads updated the counter at exactly the same time, you could end up with the wrong value.

There are several ways to protect against this:

1. If you had a STAF job that used paralleliterate element to run tests on multiple machines in parallel and you wanted to keep track of the total number of tests that ran successfully and the total number of tests that failed, you can use a couple of STAXGlobal variables to do this. However, to avoid problems if two STAX-Threads updated a STAXGlobal variable at exactly the same time, instead of just having one number that each STAX-Thread iteration updates, you could specify that the STAXGlobal variable is a list (or map) where each entry in the list keeps that keeps track of the number of testcases that ran successfully or failed on each machine and then after the paralleliterate completed, you could add those entries in the list to get the total number of tests that passed and failed on all machines. Since no two STAX-Threads are accessing the same entry in the list, there isn't a synchronization issue.

   ```
   <?xml version="1.0" encoding="UTF-8" standalone="no"?>
   ```

```
<!DOCTYPE stax SYSTEM "stax.dtd">

<stax>

  <defaultcall function="Main"/>

  <script>
    # Create a testList of lots of tests for demonstration purposes.
    # You would replace this list with your real tests.
    numTests = 10
    testList = []

    for i in range(1, numTests + 1):
      testList.append('Test%s' % (i))

    machineList = [ 'machine1', 'machine2', 'machine3' ]
    numMachines = len(machineList)

    # Create a global variable that can be accessed across STAX
    # Threads (as paralleliterate elements create a new STAX-thread).
    # Set it's value to a list, where each entry in the list will
    # contain the number of testcases that passes and failed.

    gTestsRanList = STAXGlobal( [] )  # Create an empty list

    for i in range(numMachines):
      # Initialize each entry in the list to be a list of 0 passes and 0 fails
      gTestsRanList.append([0, 0])
  </script>

  <function name="Main">

    <function-prolog>
      This function dispatches tests on machines. It runs a list of tests
      sequentially on each of the machines in machineList in parallel.
    </function-prolog>

    <sequence>

      <paralleliterate var="machine" in="machineList" indexvar="i">
        <iterate var="test" in="testList">
```

```
          <sequence>

            <call function="'setupAndRunTestCase'">
              { 'testcase': test, 'testMachineName': machine }
            </call>

            <if expr="STAXResult == 'Success'">
              <script>gTestsRanList[i][0] += 1</script>
              <else>
                <script>gTestsRanList[i][1] += 1</script>
              </else>
            </if>

          </sequence>
        </iterate>
      </paralleliterate>

      <script>
        totalPasses = 0
        totalFails = 0

        for i in range(numMachines):
          totalPasses += gTestsRanList[i][0]
          totalFails += gTestsRanList[i][1]
      </script>

      <log message="1">'Total Passes: %s' % (totalPasses)</log>
      <log message="1">'Total Fails : %s' % (totalFails)</log>

    </sequence>
  </function>

  <function name="setupAndRunTestCase" scope="local">

    <function-prolog>
      For demonstration purposes, this function is simply delaying
      for a random length of time to simulate running a testcase.
      Replace this function with one that actually runs a testcase
      via a process element.
    </function-prolog>
```

```
    <function-map-args>
      <function-required-arg name="testcase"/>
      <function-required-arg name="testMachineName"/>
    </function-map-args>

    <testcase name="testcase">
      <sequence>

        <log message="1">
          'Running %s on machine %s' % (testcase, testMachineName)
        </log>

        <script>
          maxDelay = 10000 # 10 seconds (in microseconds)
          import random
          randomDelay = random.choice(range(maxDelay))
        </script>

        <stafcmd name="'%s running on %s' % (testcase, testMachineName)">
          <location>'local'</location>
          <service>'DELAY'</service>
          <request>'DELAY %s' % (randomDelay)</request>
        </stafcmd>

        <tcstatus result="'pass'"/>

        <return>'Success'</return>

      </sequence>
    </testcase>
  </function>

</stax>
```

2. You may want to use the STAF SEM service to create a mutex semaphore and use it to synchronize access to a STAXGlobal variable. Here's a sample STAX job that dispatches tests on machines, keeping all the machines busy, so that in parallel, each machine is running one test, until there are no more tests to run. It uses a STAXGlobal variable named gTestIndex to keep track of the index of the test to be run next when a machine becomes available. This STAX job's synchronizes access to gTestIndex via it's getNextIndex function. This function requests a STAF mutex semaphore (with a unique name) before incrementing the gTestIndex variable and then releases the mutex semaphore.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax SYSTEM "stax.dtd">

<stax>

  <defaultcall function="Main"/>

  <script>
    machineList = [ 'machine1', 'machine2', 'machine3' ]

    # Create a testList of lots of tests for demonstration purposes.
    # You would replace this list with your real tests.
    numTests = 50
    testList = []
    for i in range(1, numTests + 1):
      testList.append('Test%s' % (i))
  </script>

  <function name="Main">

    <function-prolog>
      This function dispatches tests on machines. It keeps all the
      machines in machineList busy, so that in parallel, each machine
      is running one test at a time from the testList until there are
      no more tests to run.
    </function-prolog>

    <sequence>

      <log message="1">
        'Run %s tests on %s machines' % (len(testList), len(machineList))
      </log>
      <log message="1">'machineList: %s' % (machineList)</log>
      <log message="1">'testList: %s' % (testList)</log>

      <script>
        # Create a global variable that can be accessed across STAX
        # Threads (as paralleliterate elements create a new STAX-thread).
        # Note that you will generally want to use a list to define a
        # STAXGlobal variable even if its value is just an integer or
```

```
      # string.
      gTestIndex = STAXGlobal( [0] )
    </script>

    <paralleliterate var="machine" in="machineList">
      <sequence>

        <script>numTestsRun = 0</script>

        <loop>
          <sequence>

            <call function="'getNextTestIndex'"/>
            <script>testIndex = STAXResult</script>

            <if expr="testIndex >= len(testList)">
              <break/>
            </if>

            <call function="'setupAndRunTestCase'">
              {
                'testcase': testList[testIndex],
                'testMachineName': machine
              }
            </call>

            <script>numTestsRun += 1</script>

          </sequence>
        </loop>

        <log message="1">
          'Ran %s tests on machine %s' % (numTestsRun, machine)
        </log>

      </sequence>
    </paralleliterate>

  </sequence>
</function>
```

```
<function name="getNextIndex" scope="local">

  <function-prolog>
    This function returns the index of the next test to be run.
    It uses the STAF SEM service to create a mutex semaphore to
    synchronize access to gTestIndex (a STAXGlobal variable).
  </function-prolog>

  <sequence>

    <stafcmd>
      <location>'local'</location>
      <service>'SEM'</service>
      <request>'REQUEST MUTEX DispatchTest/TestIndexSem TIMEOUT 30000'</request>
    </stafcmd>

    <if expr="RC != 0">
      <sequence>
        <log message="1">
          'Request TestIndexSem mutex semaphore failed: RC=%s Result=%s' % \
          (RC, STAFResult)
        </log>
        <terminate block="'main'"/>
      </sequence>
    </if>

    <script>
      saveTestIndex = gTestIndex[0]
      gTestIndex[0] += 1
    </script>

    <stafcmd>
      <location>'local'</location>
      <service>'SEM'</service>
      <request>'RELEASE MUTEX DispatchTest/TestIndexSem'</request>
    </stafcmd>

    <if expr="RC != 0">
      <sequence>
        <log message="1">
          'Release TestIndexSem mutex semaphore failed: RC=%s Result=%s' % \
```

```
            (RC, STAFResult)
          </log>
          <terminate block="'main'"/>
        </sequence>
      </if>

      <return>saveTestIndex</return>

    </sequence>
  </function>

  <function name="setupAndRunTestCase" scope="local">

    <function-prolog>
      For demonstration purposes, this function is simply delaying
      for a random length of time to simulate running a testcase.
      Replace this function with one that actually runs a testcase
      via a process element.
    </function-prolog>

    <function-map-args>
      <function-required-arg name="testcase"/>
      <function-required-arg name="testMachineName"/>
    </function-map-args>

    <testcase name="testcase">
      <sequence>

        <log message="1">
          'Running %s on machine %s' % (testcase, testMachineName)
        </log>

        <script>
          maxDelay = 10000 # 10 seconds (in microseconds)
          import random
          randomDelay = random.choice(range(maxDelay))
        </script>

        <stafcmd name="'%s running on %s' % (testcase, testMachineName)">
          <location>'local'</location>
          <service>'DELAY'</service>
```

```
            <request>'DELAY %s' % (randomDelay)</request>
          </stafcmd>

          <tcstatus result="'pass'"/>

        </sequence>
      </testcase>
    </function>

</stax>
```

STAX Python Interfaces (STAFMarshalling)

The following Python classes, functions, and variables can be used by a STAX job when unmarshalling or formatting marshalled data, or to create marshalled data. These Python interfaces are provided in a Python module named STAFMarshalling.py, which is imported automatically by the STAX service.

Note: You cannot import module PySTAF (described in the Python User's Guide for STAF within a STAX job (e.g. within a <script> element) because it uses some C libraries which cannot be used by Jython (which is what STAX uses to execute code within a <script> element). PySTAF should only be imported by Python scripts that are executed via Python, not Jython. Instead, you can use the Python classes, functions, and variables defined in the STAFMarshalling module described in this section, as well as the STAF Java classes talked about in the STAF Java Classes (STAFUtil, STAFRC, STAFVersion, etc) section and defined in the Java User's Guide for STAF since Jython allows you to import Java classes in addition to Python modules.

Some useful top-level functions that are not part of a class that are provided in STAFMarshalling.py (and thus don't require an instance of the STAFMarshallingContext class to be invoked) include:

- Function `isMarshalledData`

  `isMarshalledData`(*someData*)
  A function used to test if the keyword argument *someData* is a string-based marshalled representation. Returns a true value if it is a marshalled string.

```
<script>
  if STAFMarshalling.isMarshalledData(aString):
      mc = STAFMarshalling.unmarshall(aString)
```

```
</script>
```

- Function `marshall`

  `marshall`(*object*[, *context*])

  A function used to create a string-based marshalled representation of the object specified by the keyword argument *object*. Returns a marshalled string.

  The default for optional keyword argument *context* is `None`.

  Note, normally you would use a `STAFMarshallingContext` object's marshall() method instead of this function.

```
<script>
  aString = STAFMarshalling.marshall(myList)
  aString = STAFMarshalling.marshall(myMap, myContext)
</script>
```

- Function `unmarshall`

  `unmarshall`(*data*[, *context*][, *flags*])

  A function used to convert a string-based marshalled representation specified by the keyword argument *data* back into a data structure. It returns a marshalling context (from which you can get the data structure via the STAFMarshallingContext class getRootObject() function).

  The required keyword argument *data* is a string to be unmarshalled.

  The optional keyword argument *context* specifies the `STAFMarshallingContext` object that should be used when generating when unmarshalling the string. The default is `None`.

  The optional keyword argument *flags* can be used to control how to unmarshall the string. When a string is unmarshalled into a data structure, it is possible that one of the string objects that is unmarshalled is itself the string form of another marshalled data structure. The default is `UNMARSHALLING_DEFAULTS` which will recursively unmarshall these nested objects. Use `IGNORE_INDIRECT_OBJECTS` to disable this additional processing.

```
<script>
  STAFMarshalling.unmarshall(myMarshalledData)
</script>
```

- Function `formatObject`

`formatObject`(*obj*[, *context*][),

A function used to convert a data structure into a verbose formatted hierarchical string that can be used when you want a "pretty print" representation of an object.

The required keyword argument *obj* specifies the object to be formatted in a verbose, more readable format.

The optional keyword argument *context* specifies the `STAFMarshallingContext` object that should be used when generating the "pretty print" output. The default is `None`.

For example, if you had a Python list of maps and wanted to log a verbose formatted string representation of the object, you could do the following:

```
<script>
  testList = [{'name': 'TestA', 'exec': '/tests/TestA.sh'}, {'name': 'TestB', 'exec': '/
tests/TestB.py'}]
</script>

<log message="1">STAFMarshalling.formatObject(testList)</log>
```

This would create a message that looked like:

```
[
  {
    exec: /tests/TestA.sh
    name: TestA
  }
  {
    exec: /tests/TestB.py
    name: TestB
  }
]
```

Or, if you used the <stafcmd> element to submit a STAF request that returns marshalled data (e.g. such as a QUERY, LIST, etc. request) and you wanted to log a verbose formatted representation for the result, you could use the STAFMarshalling.formatObject function and pass it the STAFResult and STAFResultContext variables. For example:

```
<log message="1">STAFMarshalling.formatObject(STAFResult, STAFResultContext)</log>
```

Note that you can simply log the string representation of the STAFResultContext variable to get the same result. For example, to log a verbose formatted representation for the following QUERY POOL request submitted to the RESPOOL service, you could do the following:

```
<stafcmd>
  <location>'local'
  <service>'RESPOOL'
  <request>'QUERY POOL Test'
</stafcmd>

<if expr="RC == 0">
  <log message="1">STAFResultContext</log>
</if>
```

This could create a message that looked like:

```
{
  Description     : Test Pool
  Pending Requests: []
  Resources       : [
    {
      Entry: Resource1
      Owner:
    }
  ]
}
```

If you compare this with logging the STAFResult variable instead, you can see that the verbose formatted representation is more human-readable, but more verbose. For example, if you specified to log STAFResult instead as follows:

```
<log message="1">STAFResult</log>
```

the following would be the message generated (on a single line):

```
{'requestList': [], 'staf-map-class-name': 'STAF/Service/ResPool/PoolInfo',
'description': 'Test Pool', 'resourceList': [{'owner': None, 'staf-map-class-name': 'STAF/
Service/ResPool/Resource', 'entry': 'Resource1'}]}
```

Class STAFMapClassDefinition

Definition

class `STAFMapClassDefinition`([*name*])

A class which provides the metadata associated with a map class. In particular, it defines the keys associated with the map class. This class is used to create and/or access a STAF map class definition which can be useful if you want to generate a STAF marshalling context with map classes. The map class definition is used to reduce the size of a marshalling map class in comparison to a map containing the same data. It also contains information about how to display instances of the map class, such as the order in which to display the keys and the display names to use for the keys. You get and set map class definitions using the `STAFMarshallingContext` class `setMapClassDefinition` and `getMapClassDefinition` functions.

The optional keyword argument *name* specifies the name of the STAF map class definition. The default is `None`.

`STAFMapClassDefinition` defines the following methods:

`createInstance`()

Returns a map containing one entry with a key name of `'staf-map-class-name'` with a value set to the name of the map class definition.

`addKey`(*keyName*[, *displayName*])

Adds a key to the map class definition.

The required keyword argument *keyName* specifies the name of a key.

The optional keyword argument *displayName* specifies a string to use when displaying the key. The default is `None` which indicates to use the actual key name when displaying the key.

`setKeyProperty`(*keyName*, *property*, *value*)

Sets a property such as a short display name ("display-short-name") for a key in the map class definition.

The required keyword argument *keyName* specifies the name of a key for which this property is being set.

The required keyword argument *property* specifies the name of the property being set. The only property name currently recognized isropery name currently recognized is `'display-short-name'`.

The required keyword argument *value* specifies the value for the property being set.

`keys`()

Returns a list of all of the keys. Each entry in the list is a map containing a key named `'key'`, and optionally, a key named

'display-name', and optionally, any key property names such as 'display-short-name'.

name()
Returns the name for the map class definition.

getMapClassDefinitionObject()
Returns the map class definition map which consists of a map containing two entries: 'name' and 'keys'.

Example

The following is an example of how to create a map class definition named 'Test/MyMap' containing four keys, each with a display name, and one with a short display name.

```
<script>
  myMapClassDef = STAFMapClassDefinition('Test/MyMap')
  myMapClassDef.addKey('name', 'Name')
  myMapClassDef.addKey('exec', 'Executable')
  myMapClassDef.addKey('testType', 'Test Type')
  myMapClassDef.setKeyProperty('testType', 'display-short-name', 'Test')
  myMapClassDef.addKey('outputList', 'Outputs')
</script>

<log message="1">
  "The keys for map class definition '%s' are:\n%s" % \
  (myMapClassDef.name(), STAFMarshalling.formatObject(myMapClassDef.keys()))
</log>
```

This example logs the following message:

```
The keys for map class definition 'Test/MyMap' are:
[
  {
    display-name: Name
    key         : name
  }
  {
    display-name: Executable
    key         : exec
  }
  {
```

```
    display-name      : Test Type
    key               : testType
    display-short-name: Test
  }
  {
    display-name: Outputs
    key         : outputList
  }
]
```

Class STAFMarshallingContext

Definition

class `STAFMarshallingContext`(`[`*obj*`]`)

A class is used to create and/or access a STAF marshalling context which is used by STAF to help in marshalling and unmarshalling data. A marshalling context is simply a container for map class definitions and a data structure that uses (or is defined in terms of) them.

In order to use a map class when marshalling data, you must add the map class definition to the marshalling context, set the root object of the marshalling context to the object you want to marshall, and then marshall the marshalling context itself. When you unmarshall a data structure, you will always receive a marshalling context. Any map class definitions referenced by map classes within the data structure will be present in the marshalling context.

The primary use of this class is to represent multi-valued results that consist of a data structure (e.g. results from a QUERY/LIST service request, etc.) as a string that can also be converted back into the data structure. This string can be assigned to the string result buffer returned from the service request.

The optional keyword argument *obj* specifies the root object to be marshalled. The default is `None`.

`STAFMarshallingContext` defines the following methods:

`isMarshalledData`(*someData*)

Tests if the keyword argument *someData* is a string-based marshalled representation. Returns a true value if is a marshalled string.

`setMapClassDefinition`(*mapClassDef*)

Called to add a map class definition to the marshalling context's mapClassMap.

`getMapClassDefinition`(*mapClassName*)

Returns the map class definition for the specified map class name from the mapClassMap.

hasMapClassDefinition(*mapClassName*)
Called to determine whether the marshalling context mapClassMap contains the specified map class definition.

getMapClassMap()
Returns the mapClassMap for the marshalling context.

mapClassDefinitionIterator()
Returns a map of the keys in mapClassMap.

setRootObject(*rootObject*)
Sets the root object for the marshalling context.

getRootObject()
Returns the root object for the marshalling context.

getPrimaryObject()
Returns the primary object for the marshalling context which is the marshalling context object itself if the mapClassMap contains one or more map class definitions. Otherwise, it returns the root object.

marshall()
This is the marshalling function that creates marshalled data for the marshalling context.

Examples

The following is an example of how to create a marshalling context containing one map class definition named 'Test/MyMap' and a root object which is a list of maps defined by the map class definition. Then it shows how to marshall and unmarshall the marshalling context.

```
<script>
  # Create a map class definition

  myMapClassDef = STAFMapClassDefinition('Test/MyMap')
  myMapClassDef.addKey('name', 'Name')
  myMapClassDef.addKey('exec', 'Executable')

  testList = [
              {'name': 'TestA', 'exec': '/tests/TestA.py'},
              {'name': 'TestB', 'exec': '/tests/TestB.sh'},
              {'name': 'TestC', 'exec': '/tests/TestC.cmd'}
             ]
```

```
  # Create a marshalling context with testList

  mc = STAFMarshallingContext()
  mc.setMapClassDefinition(myMapClassDef)

  myTestList = []

  for test in testList:
      testMap = myMapClassDef.createInstance()
      testMap['name'] = test['name']
      testMap['exec'] = test['exec']
      myTestList.append(testMap)

  mc.setRootObject(myTestList)
</script>

<log message="1">'Test List:\n%s' % (mc)</log>

<script>
  # Create a string from the marshalling context
  # This string could be a message that you log or send to a queue, etc.

  stringResult = mc.marshall()

  # Convert the marshalled string representation back into a list

  mc2 = STAFMarshalling.unmarshall(stringResult)
  theTestList = mc2.getRootObject()
</script>
```

This example logs the following message:

```
Test List:
[
  {
    Name      : TestA
    Executable: /tests/TestA.py
  }
  {
```

```
    Name      : TestB
    Executable: /tests/TestB.sh
  }
  {
    Name      : TestC
    Executable: /tests/TestC.cmd
  }
]
```

STAFMarshalling Constants

Constants defined in STAFMarshalling.py include:

UNMARSHALLING_DEFAULTS
Set to 0 to indicate that nested objects should be recursively unmarshalled.

IGNORE_INDIRECT_OBJECTS
Set to `1` to indicate that nested objects should not be recursively unmarshalled.

MARSHALLED_DATA_MARKER
Set to `'@SDT/'`.

NONE_MARKER
Set to `'@SDT/$0:0:'`.

SCALAR_MARKER
Set to `'@SDT/$'`.

SCALAR_STRING_MARKER
Set to `'@SDT/$S'`.

LIST_MARKER
Set to `'@SDT/['`.

MAP_MARKER
Set to `'@SDT/{'`.

MC_INSTANCE_MARKER
Set to `'@SDT/%'`.

CONTEXT_MARKER
Set to `'@SDT/*'`.

NONE_STRING
Set to `''`.

DISPLAY_NAME_KEY
Set to `'display-name'`.

MAP_CLASS_MAP_KEY
Set to `'map-class-map'`.

MAP_CLASS_NAME_KEY
Set to `'staf-map-class-name'`.

ENTRY_SEPARATOR
Set to `''`.

INDENT_DELTA
Set to 2.

SPACES
Set to a string containing 80 spaces.

STAF Java Classes (STAFUtil, STAFRC, STAFVersion, etc)

STAX uses Jython to execute Python code within a STAX job, which means that you can import Java classes, as well as Python modules, in a <script> element. This means that you can use the STAF Java classes that are provided in the JSTAF.jar file and that are described in the STAF Java User's Guide. This section shows you how to import these classes and how to use them within a STAX job.

STAF Java Class com.ibm.staf.STAFUtil

The Java class that is most commonly used in STAX jobs is the **`com.ibm.staf.STAFUtil`** class which provides some general utility APIs for STAF. This Java class is automatically imported by the STAX service (starting in STAX V3.5.3) so that you do not need to import this class in your STAX job. Static methods that are provided by the STAFUtil class include the **`wrapData()`** method which generates a length-delimited version of a string (the :length: format) and is useful when generating a request string for a STAF service request in a <stafcmd> element when you have option

values that can contain spaces. For example, when using the <stafcmd> element to submit a request to the FS service to copy a file whose name may contain spaces, you can call the `STAFUtil.wrapData()` method passing it the FILE and TOFILE option values as follows:

```
<script>
  fromMachine = 'client1.company.com'
  fromFile = 'C:\Program Files\MyApp\file1.txt'
  toMachine = 'client2.company.com'
  toFile = 'C:\My Documents\file1.txt'
  request = 'COPY FILE %s TOFILE %s TOMACHINE %s' % \
            (STAFUtil.wrapData(fromFile), STAFUtil.wrapData(toFile), toMachine)
</script>

<stafcmd>
  <location>fromMachine</location>
  <service>'FS'</service>
  <request>request</request>
</stafcmd>
```

Another static method provided by the STAFUtil class is the **`addPrivacyDelimiters()`** method which adds STAF privacy delimiters to a value that you want to keep private, like a password. For example, when using the <process> element, if you needed to provide a password in the <command> element that you wanted to keep private, you could call the **addPrivacyDelimiters()** method to add privacy delimiters around the password as follows:

```
<script>
  password = 'secret'
</script>

<process>
  <location></location>
  <command mode="'shell'">
    'C:/tests/admin -password %s' % (STAFUtil.addPrivacyDelimiters(password))
  </command>
  <stderr mode="'stdout'"/>
  <returnstdout/>
</process>
```

STAF Java Class com.ibm.staf.STAFResult (Imported as STAFRC)

Another Java class provided in the JSTAF.jar file is the **com.ibm.staf.STAFResult** class. This class contains the constant definitions for STAF return codes. This Java class is automatically imported as **STAFRC** (instead of **STAFResult** because STAFResult is the name of a variable set after

elements like <stafcmd> are run), so you should not import this class yourself within a STAX job. You may want to use the **STAFRC** constants in your STAX jobs when comparing the RC (return code) variable set by the <stafcmd> and <process> elements. For example, if you wanted to check if a particular file exists on a remote machine, you could use the <stafcmd> element to submit a QUERY ENTRY request to the FS service. If the file exists, the RC will be set to 0 (Ok). If the file does not exist, the RC will be set to 48 (DoesNotExist). If the remote machine is not running STAFProc, the RC will be set to 16 (NoPathToMachine). So, you could use STAFRC constants for these return codes, such as **STAFRC.Ok**, **STAFRC.DoesNotExist**, and **STAFRC.NoPathToMachine**, instead of using return codes 0, 48, and 16 to improve the readability of your code. For example:

```
<stafcmd>
  <location>machine</location>
  <service>'FS'</service>
  <request>'QUERY ENTRY %s' % (STAFUtil.wrapData(fileName))</request>
</stafcmd>

<if expr="RC == STAFRC.Ok">
  <log>'File %s exists on machine %s' % (fileName, machine)</log>
  <elseif expr="RC == STAFRC.DoesNotExist">
    <log>'File %s does not exist on machine %s' % (fileName, machine)</log>
  </elseif>
  <elseif expr="RC == STAFRC.NoPathToMachine">
    <log>'Error: Machine %s does not appear to be running STAFProc' % (machine)</log>
  </elseif>
  <else>
    <log>
      'Error: STAF %s FS QUERY ENTRY %s failed with RC=%s STAFResult=%s' % \
      (fileName, machine, RC, STAFResult)
    </log>
  </else>
</if>
```

STAF Java Class com.ibm.staf.STAFVersion

Another Java class provided in the JSTAF.jar file is the **com.ibm.staf.STAFVersion** class. This class, and its **compareTo()** method can be used to check if a machine is running at a minimum required STAF version. Here's an example of a STAX job that contains a function named compareStafVersion that compares the STAF version running on a specified machine with a specified version to verify if the machine is running this required STAF version or later. In this STAX job, the main function calls the compareStafVersion function to check if STAF Version 3.1.0 or later is running on machine client1.austin.ibm.com. This STAX job imports not only the **com.ibm.staf.STAFVersion** class, but also imports other Java classes such as **java.lang.NumberFormatException** and **java.lang.Error**. This STAX job also uses the STAFRC alias for the com.ibm.staf. STAFResult class talked about in the above section.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax SYSTEM "stax.dtd">
<stax>
  <defaultcall function="main" />

  <function name="main">
    <sequence>

      <call function="'compareStafVersion'">
        {'requiredVersion': '3.1', 'machine': 'client1.austin.ibm.com'}
      </call>

      <script>
        [rc, result] = STAXResult
      </script>

      <if expr="rc == 0">
        <log message="1">'Valid STAF version: %s' % (result)</log>
        <else>
          <log message="1">result</log>
        </else>
      </if>

    </sequence>
  </function>

  <function name="compareStafVersion">

    <function-prolog>
      <![CDATA[
      This function compares the STAF version of a machine with the specified
      minimum required STAF version.
      ]]>
    </function-prolog>

    <function-epilog>
      <![CDATA[
      <h4>Returns:</h4>
      This function returns a list containing the return code (an integer) and
      a string.  The string will either be the version of the specified machine
      if the return code is 0 indicating a success, or if the return code != 0,
```

```
  it the string will be an error message.

  <h4>Examples:</h4>
  <pre>
    <call function="'compareStafVersion'">
      {'requiredVersion': '3.3.3', 'machine': 'client1.company.com'}
    </call>

    <call function="'compareStafVersion'">
      {'requiredVersion': '3.1'}
    </call>
  </pre>
  </ol>
  ]]>
</function-epilog>

<function-map-args>
  <function-required-arg name="requiredVersion">
    This is the minimum required STAF version
  </function-required-arg>
  <function-optional-arg name="machine" default="'local'">
    This is the machine's host name or IP address whose STAF version is
    to be compared with the minimum required STAF version
  </function-optional-arg>
</function-map-args>

<sequence>

  <stafcmd>
    <location>machine</location>
    <service>'MISC'</service>
    <request>'VERSION'</request>
  </stafcmd>

  <if expr="RC != STAFRC.Ok">
    <sequence>
      <script>
        errMsg = 'STAF %s MISC VERSION failed with RC=%s STAFResult=%s' % \
                 (machine, RC, STAFResult)
      </script>
      <return>[RC, errMsg]</return>
```

```
      </sequence>
    </if>

    <script>
      versionStr = STAFResult

      # Verify that the required STAF version, or later, is running on
      # the specified machine

      rc = 0
      errMsg = versionStr

      from com.ibm.staf import STAFVersion
      from java.lang import NumberFormatException, Error

      try:
           version = STAFVersion(versionStr)
           reqVersion = STAFVersion(requiredVersion)

           if version.compareTo(reqVersion) < 0:
               # Version is lower than the minimum required version
               rc = STAFRC.InvalidSTAFVersion
               errMsg = 'Version is %s.  Version %s or later is required' % \
                        (versionStr, requiredVersion)
      except NumberFormatException, e:
          rc = STAFRC.InvalidValue
          errMsg = 'compareStafVersion:  Invalid STAF required version: ' + \
                   '%s, Exception info: %s' % (requiredVersion, str(e))
      except Error:
          # Class STAFVersion was added in STAF V3.1.0 so need to catch a
          # NoSuchMethod error
          rc = STAFRC.InvalidSTAFVersion
          errMsg = 'compareStafVersion:  Version is %s.  ' % (versionStr) + \
                   'Version %s or later is required.' % (requiredVersion)
    </script>

    <return>[rc, errMsg]</return>

  </sequence>

</function>
```

```
</stax>
```

For more information on the STAF Java classes that are provided in the JSTAF.jar file, see the STAF Java User's Guide.

STAX File and Machine Caching

STAX file and machine caching can improve performance when you re-run a STAX job using the same STAX xml file and/or when you import the same STAX xml file that has already been imported by another job because no re-parsing of the STAX xml file is required and no additional information about the machine where the STAX xml file resides is required.

The file cache stores parsed STAX XML files that have been loaded from a machine. When file caching is enabled, the cache will be checked during the following operations:

- When submitting an `EXECUTE` request using the `FILE` option.
- When a function imports file(s) using the `function-import` element.
- When a STAX job file imports a file using the `import` element.

The machine cache stores information (e.g. file separator) about the machines where the STAX XML files that have been loaded reside if the machine where the STAX XML file resides is remote (e.g. not the STAX service machine). The machine cache is checked during the same operations as above if the STAX XML file resides on a remote machine.

The file and machine cache stores entries based on the machine name and file path from which the STAX XML file was loaded. The cache cannot correlate different machine names that actually refer to the same physical machine (such as IP address vs host name). To maximize the benefits of the cache, the machine names supplied to an EXECUTE request and to <function-import> and <import> elements should be consistent for the same physical machines. The exception is with the local machine. The following machine names will all be treated as `local`:

- local
- 127.0.0.1
- localhost
- The resolved value of STAF variable {STAF/Config/Machine}
- The local ip address
- The local host name (if it can be resolved)

The file and machine cache will strip the interface and port from the machine (endpoint) name. The following machine names will all be interpreted as `myhost`:

- tcp://myhost
- tcp2://myhost@6501
- myhost@6500

The file cache normalizes file names and treats file names as case-sensitive on Unix machines and case-insensitive on Windows machines. But, there are still some cases where the STAX file cache cannot detect if a file name matches one that is in the file cache. For example, if the following Windows file names were specified, the STAX file cache would not detect a match:

- c:\test\myfile.xml
- \test\myfile.xml

So, it is best to specify consistent file names in EXECUTE requests and in <function-import> and <import> elements.

STAX File Cache Tuning

The STAX file cache first attempts to retrieve the modification time of the file from the target machine. If the modification time is different than that of the copy in the cache, the file will be reloaded and the cached copy will be updated. If the modification time cannot be retrieved, the cache will be bypassed.

You can set a maximum number of entries in the file cache. The default is 20, but you can change this by specifying the `MAXFILECACHESIZE` parameter when registering the STAX service, or you can change it dynamically by submitting a `SET MAXFILECACHESIZE` request to the STAX service.

You can set the cache replacement algorithm that you want the file cache to use. When the cache is full (or when the maximum size of the cache is changed to a smaller value), this algorithm chooses which files to discard to make room for the new files. The default is LRU (Least Recently Used), but you can change this by specifying the `FILECACHEALGORITHM` parameter when registering the STAX service, or you can change it dynamically by submitting a `SET FILECACHEALGORITHM` request to the STAX service. STAX file caching supports two cache replacement algorithms:

1. LRU specifies the "Least Recently Used" cache algorithm which removes the least recently used file first (e.g. the file with the oldest "Last Hit Date-Time"). This is the default.

2. LFU specifies the "Least Frequently Used" cache algorithm which removes the file that is used least often (e.g. the file with the least number of "Hits"). If cached files have the same number of hits, the file with the oldest "Last Hit Date-Time" will be removed.

   In addition, you can set a maximum age for a file in the file cache by specifying the `MAXFILECACHEAGE` so that this algorithm will also take into account if a file hasn't been used for the specified maximum age which means it is considered to be stale. The maximum age is 0 by default, which means that there is no maximum age. If you set the maximum age to a non-zero value, this indicates that a file in the cache will be considered to be "stale" if it hasn't been used (last hit) for this maximum age. Stale files with the oldest "Last Hit Date-Time" will be removed before any non-stale files. You can specify the `MAXFILECACHEAGE` parameter when registering the STAX service, or you can change it dynamically by submitting a `SET FILECACHEALGORITHM` request to the STAX service.

To help you choose which file cache replacement algorithm is best for your STAX service, you can submit a "LIST FILECACHE" request to the STAX service at any time to see the contents of the file cache. In addition, you can submit a "LIST FILECACHE SUMMARY" request to the STAX service to get a file cache summary information which includes a "Hit Ratio". In general, the better your hit ratio is, the better your selected file cache algorithm is performing for you. Note that you can change your file cache algorithm at any time. And if using the LFU file cache algorithm, you can tune its performance by changing the MAXFILECACHEAGE setting if desired.

You can clear the file cache by submitting a `PURGE FILECACHE` request to the STAX service. This also clears the overall cache statistics provided via a "LIST FILECACHE SUMMARY" request like Hit Count, Miss Count, Total Requests, and the Hit Ratio.

STAX Machine Cache Tuning

You can set a maximum number of entries in the machine cache. The default is 20, but you can change this by specifying the `MAXMACHINECACHESIZE` parameter when registering the STAX service, or you can change it dynamically by submitting a `SET MAXMACHINECACHESIZE` request to the STAX service. STAX machine caching uses a least recently used (LRU) algorithm for clearing the cache when it becomes full. The items with the oldest "Last Hit Date-Time" will be removed when the cache extends beyond its bounds, or when the size of the cache is changed to a smaller value. You can also clear the machine cache by submitting a `PURGE MACHINECACHE` request to the STAX service.

STAX Extensions

You can add extensions to the STAX service. For example, you can write a STAX service extension to define one or more new elements and you can write a STAX monitor extension to define a new plug-in view that can be displayed via the STAX Monitor. See the "STAX Extensions Developer's Guide" for more information on how to write extensions.

Registering STAX Service Extensions

This section discusses how to register STAX service extensions when configuring the STAX service. STAX service extensions allow you to extend the STAX DTD and define additional XML elements that can be used in STAX jobs.

STAX extensions are registered via the PARMS option when configuring the STAX service (either in the STAF.cfg file or dynamically using a SERVICE ADD request). Each STAX extension is provided in a jar file. You can specify the STAX extension jar files that you want to register using an EXTENSIONXMLFILE parameter or using EXTENSION parameters (or using an EXTENSIONFILE parameter, but this parameter has been deprecated).

Syntax

```
SERVICE <Name> LIBRARY JSTAF EXECUTE <STAX Jar File Name>
               [OPTION <Name[=Value]>]...
               [PARMS <"> [EVENTSERVICEMACHINE <EventMachine>]
                          [EVENTSERVICENAME <EventName>]
                          [EVENTGENERATION <Enabled | Disabled>]
                          [NUMTHREADS <NumThreads>]
                          [PROCESSTIMEOUT <ProcessTimeout>]
                          [FILECACHING <Enabled | Disabled>]
                          [MAXFILECACHESIZE <Max Files>]
                          [FILECACHEALGORITHM <LRU | LFU>]
                          [MAXFILECACHEAGE <Number>[s|m|h|d|w]]]
                          [MAXMACHINECACHESIZE <Max Machines>]
                          [RESETJOBID <Enabled | Disabled>]
                          [CLEARLOGS <Enabled | Disabled>]
                          [LOGTCELAPSEDTIME <Enabled | Disabled>]
                          [LOGTCNUMSTARTS <Enabled | Disabled>]
                          [LOGTCSTARTSTOP <Enabled | Disabled>]
                          [PYTHONOUTPUT <PythonOutput>]
                          [PYTHONLOGLEVEL <Log Level>]
                          [INVALIDLOGLEVLEACTION <RaiseSignal | LogInfo>]
                          [TIMEDEVENTQUEUE <Common | Job>]
                          [DEBUGTHREAD <Enabled | Disabled>]
                          [DEBUGCLONEFUNCTION <Enabled | Disabled>]
                          [DEBUGPROCESS <Enabled | Disabled>]
                          [DEBUGXMLPARSE <Enabled | Disabled>]
                          [EXTENSIONXMLFILE <Extension XML File> |
                           EXTENSIONFILE <Extension Text File>]
                          [EXTENSION <Extension Jar File>...
                      <">]
```

EXTENSIONXMLFILEspecifies the fully-qualified name of an extension XML file that defines all of the STAX extensions to be registered in an XML format. This XML file must conform to the stax-extensions DTD. Refer to the "Creating a STAX Extensions XML File"section for more information on how to create an extension xml file.We recommend using the EXTENSIONXMLFILE parameter to register STAX extensions as it provides the ability to specify parameters for extensions (if the extension supports parameters) and to include or exclude specific elements provided in the extension jar file. This option resolves STAF variables.

EXTENSION specifies the fully-qualified name of an extension jar file that defines a STAX extension to be registered. You may specify multiple EXTENSION parameters. You may optionally specify to only register some of the elements provided in the extension jar file by specifying one or more spaces after the jar file name, a #, one or spaces, and then a space separated list of the element names that to be registered. The format is:

```
<Jar File Name> [ # elementName1 elementName2 ...]
```

If no elements are specified when registering the extension, all of the elements with staf/stax/extension/<element> entries in the extension jar file's manifest file will be registered. This option resolves STAF variables.

EXTENSIONFILE specifies the fully-qualified name of a text file that contains entries where each line has the same format as described above for the EXTENSION parameter. This parameter has been deprecated as of STAX V1.5.0. Use the EXTENSIONXMLFILE parameter instead. This option resolves STAF variables.

Examples

Goal: Configure the STAX service and register all the STAX extensions specified in an extension xml file named extensions.xml in the services directory off the STAF root directory.

```
SERVICE STAX LIBRARY JSTAF EXECUTE {STAF/Config/STAFRoot}/services/stax/STAX.jar \
        OPTION J2=-Xmx512 \
        PARMS "EXTENSIONXMLFILE {STAF/Config/STAFRoot}/services/stax/extensions.xml"
```

Goal: Configure the STAX service using the EXTENSION option to specify extension jar files C:/STAXExt/ExtDelay.jar and C:/STAXExt/MyExt.jar.

```
SERVICE STAX LIBRARY JSTAF EXECUTE C:/STAF/services/stax/STAX.jar \
        OPTION J2=-Xm512 \
        PARMS "EXTENSION C:/STAXExt/ExtDelay.jar EXTENSION C:/STAXExt/MyExt.jar"
```

Goal: Configure the STAX service using the EXTENSION option to specify extension jar file C:/STAXExt/ExtDelay.jar and to only register the ext-delay and ext-wait elements). Note that double quotes are needed around the value specified for EXTENSION because the value contains spaces. Note also that because these double quotes are within the double quotes specified for the PARMS option, they need to be escaped (using \).

```
SERVICE STAX LIBRARY JSTAF EXECUTE {STAF/Config/STAFRoot}/services/stax/STAX.jar \
        PARMS "EXTENSION \"C:/STAXExt/ExtDelay.jar  # ext-delay ext-wait\""
```

Goal: Configure the STAX service using the EXTENSIONFILE option to specify the name of a text file, extensions.txt, located in the services/stax directory off the STAF root directory. This text file contains the names of extension jar files to be registered.

```
SERVICE STAX LIBRARY JSTAF EXECUTE {STAF/Config/STAFRoot}/services/stax/STAX.jar \
        PARMS "EXTENSIONFILE {STAF/Config/STAFRoot}/services/stax/extensions.txt"
```

Creating a STAX Extensions XML File

A STAX extensions XML file defines the STAX extensions to be registered when configuring the STAX service. This XML file must comply with the STAX Extensions document type definition (DTD) shown in appendix "STAX Extensions DTD". Note that the stax-extensions DTD is provided as part of the STAX zip/tar file (called ext/stax-extensions.dtd).

This section describes how to create a STAX Extensions XML file.

The first line in a STAX Extensions XML file should start with an XML declaration. This indicates the document is written in XML and specifies the XML version, the language encoding for the document, and indicates that the document refers to an external DTD (standalone="no").

The second line in a STAX Extensions XML file should be the document type declaration. This is used to indicate the DTD used for the document. It defines the name of the root element (stax-extensions), and the DTD to be used. STAX checks the syntax of XML documents using a validating XML parser to verify that the document complies with the DTD. Note that DTDs are all about specifying the structure and syntax of XML documents (not their content).

So, the first two lines in a STAX Extensions XML file should look like:

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax-extensions SYSTEM "stax-extensions.dtd">
```

stax-extensions

A STAX Extensions XML file must contain a root element which contains all other elements in the document. The root element of a STAX Extensions XML file is **stax-extensions**.

The **stax-extensions** element consists of one or more **extension** elements,

extension

The **extension**element is used to specify a STAX extension to register. All **extension**elements are contained within the root **stax-extensions**element.

The extension element has one attribute:

- **jarfile** - specifies the fully-qualified name of the STAX extension jar file to be registered. This attribute is required. This attribute will resolve STAF variables.

The extension element can optionally contain the following sub-elements:

- **parameter** - specifies the name and value for a parameter to this STAX extension. Any number of parameter elements may be specified for an extension. See the extension provider's documentation for each extension to see what parameters it supports, if any.

  The parameter element has two attributes:

  - **name** - specifies the name of the parameter. It is required.
  - **value** - specifies the value for the parameter. It is required.

- **include-element** - specifies the name of an element supported by the STAX extension jar file to be included. Any number of include-elements may be specified for an extension. However, if an include-element is specified, no exclude-elements can be specified. If one or more include-elements are specified, then only those elements named by each include-element are registered. Any other elements supported by the STAX extension jar file are excluded (not registered).

  The include-element has one attribute:

  - **name** - specifies the name of the element to include. It is required.

- **exclude-element** - specifies the name of an element supported by the STAX extension jar file to be excluded (not registered). Any number of exclude-elements may be specified for an extension. However, if an exclude-element is specified, no include-elements can be specified. If one or more exclude-elements are specified, then only those elements supported by the STAX extension jar file that are not named by an exclude-element are registered.

  The exclude-element has one attribute:

  - **name** - specifies the name of the element to exclude. It is required.

Note:

- If no **include-element** or **exclude-element** elements are specified, all of the elements supported by the STAX extension jar file will be registered.

Usage:

The following STAX Extensions XML file defines three STAX extensions. In this example, all three extension elements are empty elements.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax-extensions SYSTEM "stax-extensions.dtd">
<stax-extensions>
```

```
  <extension jarfile="C:/STAF/services/stax/ExtDelay.jar"/>

  <extension jarfile="C:/STAF/services/stax/ExtMessageText.jar"/>

  <extension jarfile="C:/STAF/services/stax/EmailExt.jar"/>

</stax-extensions>
```

The following STAX Extensions XML file defines four STAX extensions. All three extension files are located in the services/stax directory off the root of the STAF directory.

- The first extension jar file, named ExtMessageText.jar, has no parameters, no include-elements, and no exclude-elements.
- The second extension jar file, named ExtDelay.jar, has one parameter specified named delay and specifies to include all elements supported by this extension jar file except for the ext-wait and ext-sleep elements.
- The third extension jar file, named EmailExt.jar specifies to include just one element named email so that any other elements supported by this extension jar file are excluded (not registered).

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax-extensions SYSTEM "stax-extensions.dtd">

<stax-extensions>

   <extension jarfile="{STAF/Config/STAFRoot}/services/stax/ExtMessageText.jar"/>

   <extension jarfile="{STAF/Config/STAFRoot}/services/stax/ExtDelay.jar">
     <parameter name="delay" value="5"/>
     <exclude-element name="ext-wait"/>
     <exclude-element name="ext-sleep"/>
   </extension>

   <extension jarfile="{STAF/Config/STAFRoot}/services/stax/EmailExt.jar">
     <include-element name="email"/>
   </extension>

</stax-extensions>
```

Registering STAX Monitor Extensions

STAX monitor extensions define a new plug-in views that can be displayed via the STAX Monitor. For example, you may want to register a STAX monitor extension that displays a new extension element in the "Active Job Elements" panel. Or you may want to register a STAX monitor extension that displays a new tab in the "Active Job Elements" or "Info" panel.

As of STAX V1.5.0, any STAX monitor extensions that are registered with the STAX service will be automatically made available to the STAX Monitor. You should only specify local extension jar files that are not registered with the STAX service or that contain monitor extensions that you want to override (e.g. with a later version of the extension). See the "Registering STAX Service Extensions" section for more information on how to register STAX extensions with the STAX service.

To view monitor extensions that are registered with the STAX Monitor, from the main "STAX Job Monitor" panel, click on the **File->Properties->Extensions** tab. See the "Extensions" tab section for more information. You can also display the monitor extensions that are registered by specifying the -extensions option when starting the STAX Monitor.

To view, add, or delete a local extension jar file, from the main "STAX Job Monitor" panel, click on the **File->Properties->Extension Jars** tab. See the "Extension Jars" tab section for more information.

Note: The "View" menu for the "STAX Job Monitor" panel does not currently support the ability to de-select registered monitor extensions.

Generating STAX Function Documentation

As you grow your library of STAX functions, you will probably find it useful to document the STAX functions to make it easier to reuse them and share them with other test groups. We provide the following tools to generate documentation for your STAX xml files.

Using STAXDoc

STAXDoc is a tool used to generate documentation for your STAX xml files. STAXDoc is provided as a jar file, `STAXDoc.jar,` as part of the STAX service zip/tar file.

STAXDoc is a Java application that parses the documentation elements in a set of STAX xml files and generates an HTML document describing all of the functions defined in the STAX xml files. STAXDoc uses an XSLT stylesheet processor to transform function information provided in STAX xml files into HTML files which are nicely formatted.

You can run STAXDoc on a set of directories that contains STAX xml files. Each sub-directory is considered a source "package" and can be passed to the STAXDoc command line. STAXDoc also allows you to include other information, such as overview comments, in the HTML file it generates.

The documentation elements defined for a STAX xml file that STAXDoc parses include:

- `function-prolog` (or the deprecated `function-description` element)

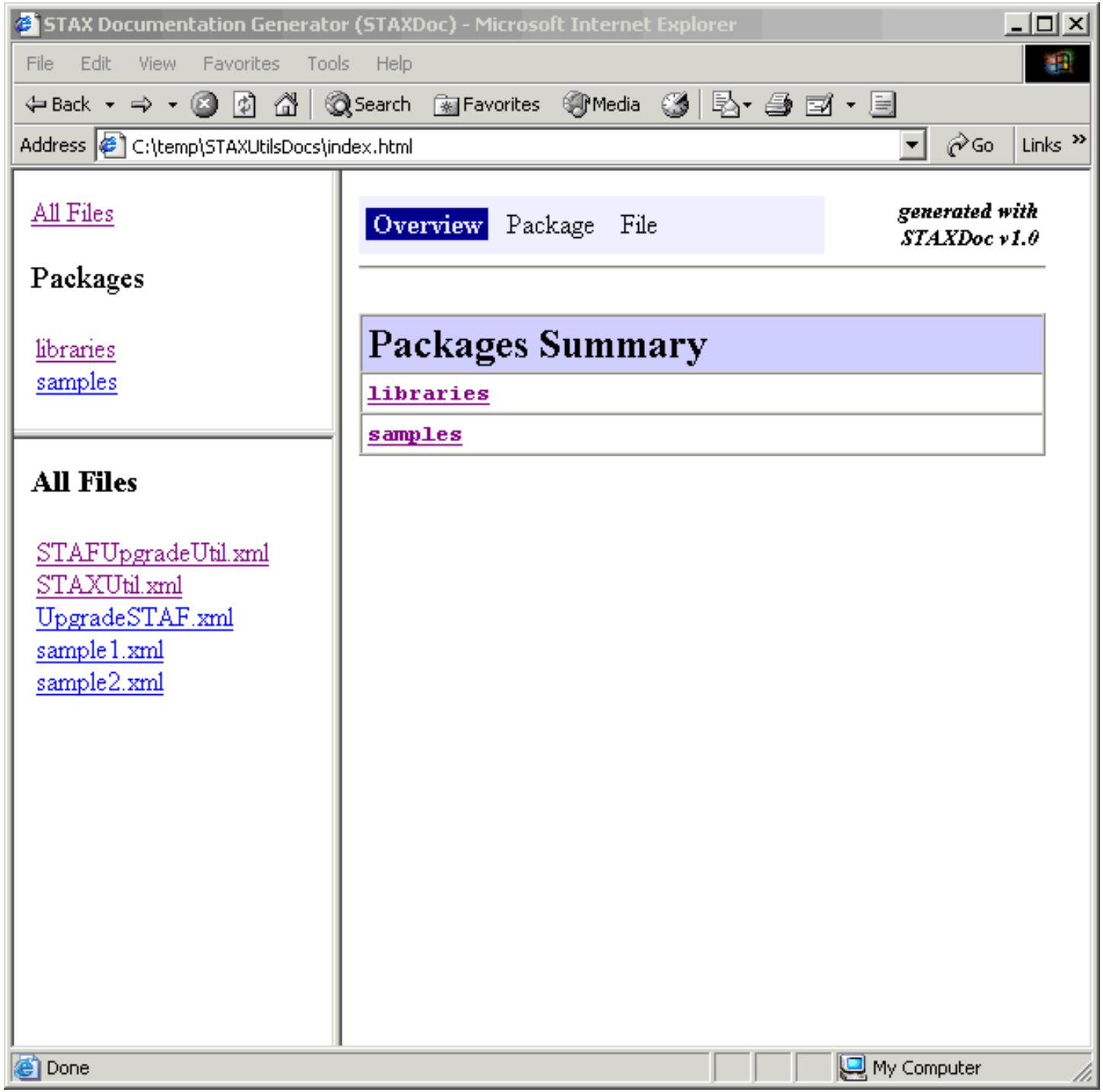
- `function-epilog`
- Description text for the following function argument elements:
  - `function-required-arg`
  - `function-optional-arg`
  - `function-other-arg`
  - `function-arg-def`

See the STAXDoc User's Guide for more information on how to use STAXDoc.

Here's an example of how to use STAXDoc to generate documentation for the "`samples`" and "`libraries`" directories in `C:\STAF\services\stax`.

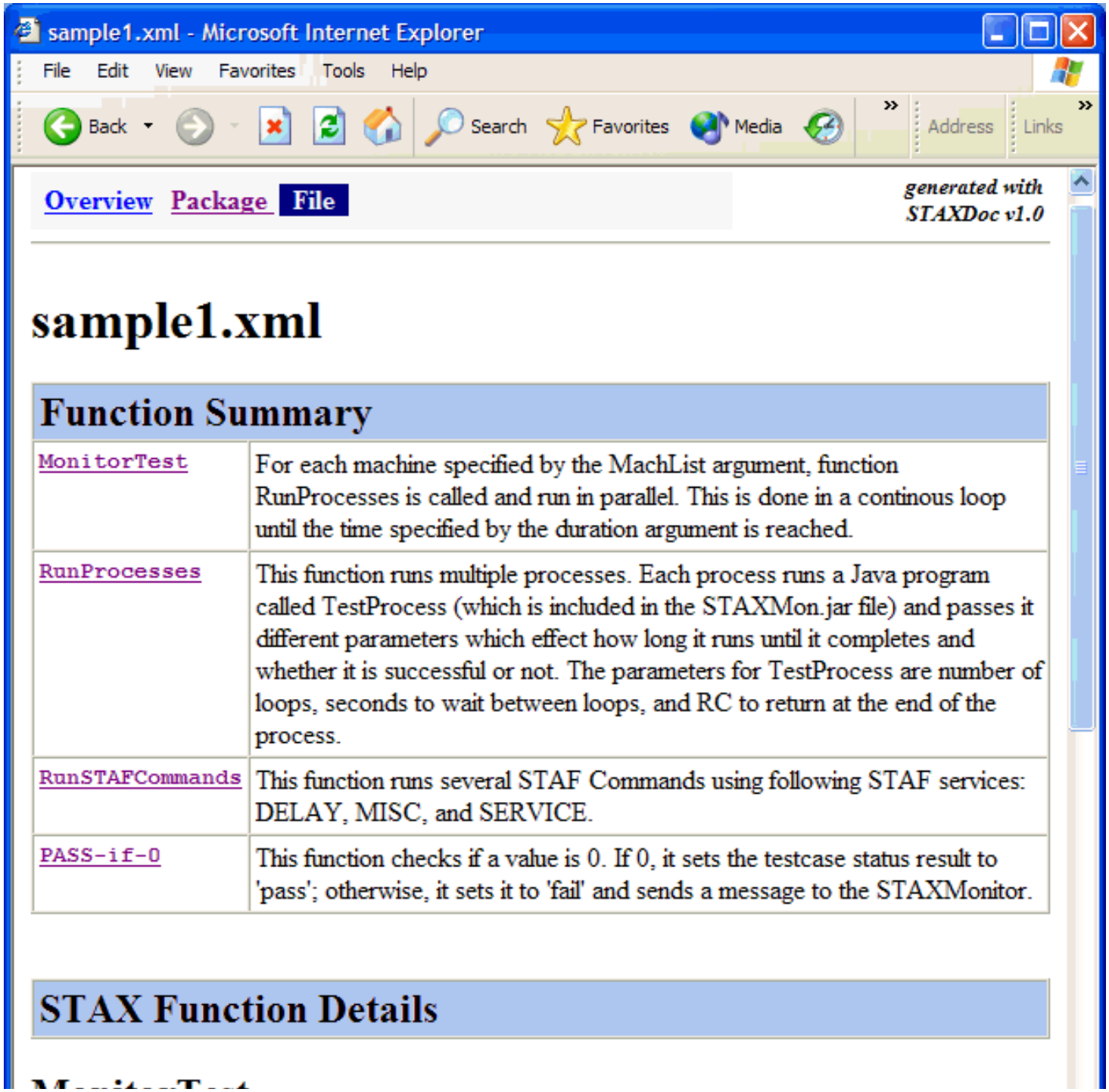
```
java -jar STAXDoc.jar -d c:\STAXDoc\samples -sourcepath C:\STAF\services\stax samples libraries
```

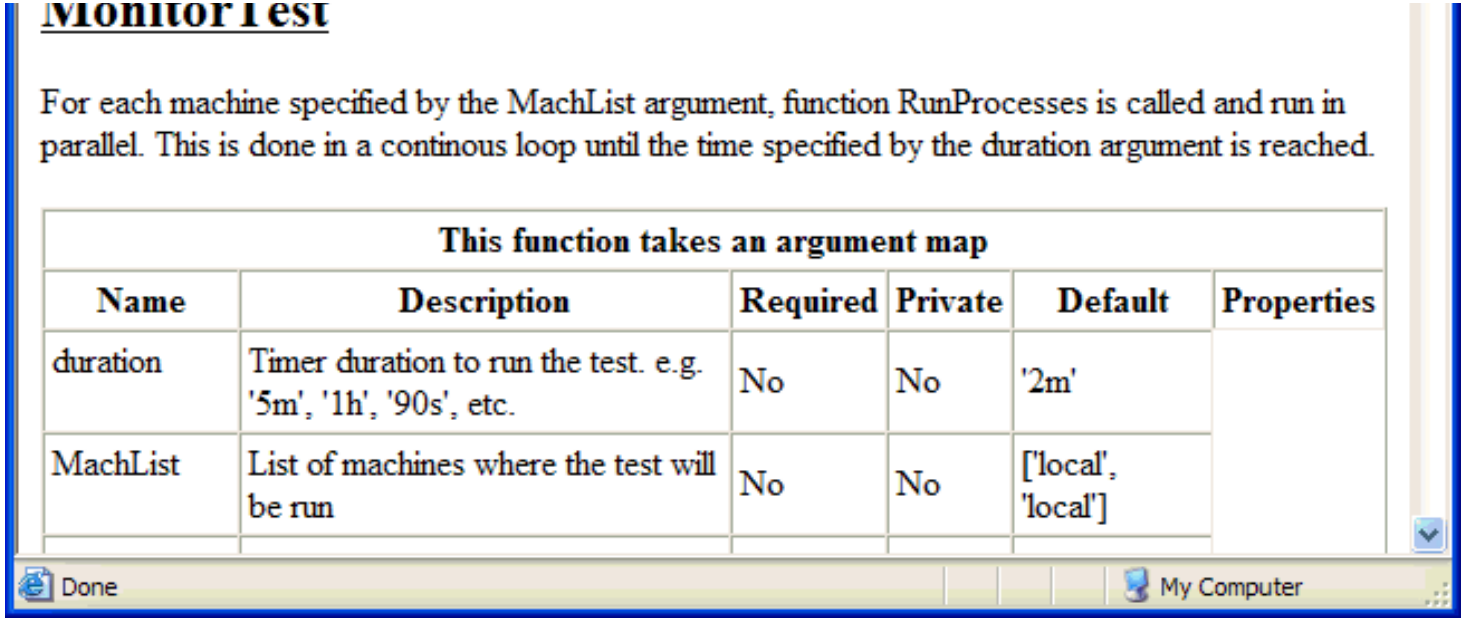
Here's a view of the HTML documentation generated by STAXDoc for the overall documentation obtained by specifying the `index.html` file in the destination directory:



Here's a view of part of the HTML documentation generated by STAXDoc for file `sample1.xml` obtained by clicking on **sample1.xml**.

Note that a summary of all of the functions defined in the xml file are shown first, followed by a detailed description of each function.





Monitor Test

For each machine specified by the MachList argument, function RunProcesses is called and run in parallel. This is done in a continous loop until the time specified by the duration argument is reached.

This function takes an argument map					
Name	**Description**	**Required**	**Private**	**Default**	**Properties**
duration	Timer duration to run the test. e.g. '5m', '1h', '90s', etc.	No	No	'2m'	
MachList	List of machines where the test will be run	No	No	['local', 'local']	

Done

My Computer

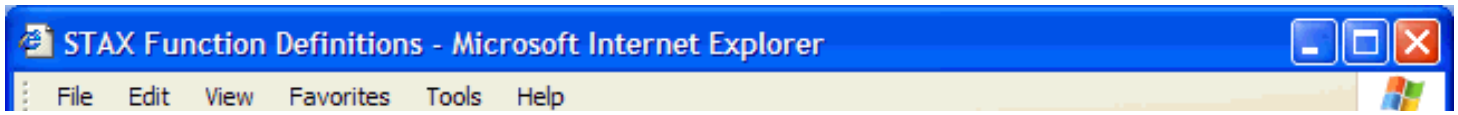
Using StyleSheet FunctionList.xsl

Instead of using STAXDoc, you can create your own XSL StyleSheet(s) to generate documentation about your STAX Functions. We provide a sample XSL Stylesheet, `FunctionList.xsl`. FunctionList.xsl describes how to transform information provided in the <function-prolog element (or the deprecated <function-description element), the <function-epilog> element and the function argument elements into readable documentation. It can be used in conjunction with an XSLT stylesheet processor, such as Xalan, to transform function information provided in a STAX XML document to an HTML document.

Many JREs (V1.3 oand later) provide an XSLT processor that you can use. Or, you can use an XSLT processor such as Xalan. The Xalan-Java XSLT processor is available for download from http://xml.apache.org/xalan-j/index.html. Other XSLT processors are also available.

The `FunctionList.xsl` file can be found in the `samples` directory from the extracted STAX zip/tar file you downloaded. You may want to customize this stylesheet to generate function documentation in the form that best suites your purposes.

Here is part of the HTML document generated from the `sample1.xml` file provided with STAX. This HTML documentation was generated using STAXDoc. Note that we had to comment out the DOCTYPE line in `sample1.xml` to avoid an error that STAX.DTD is not available (unless you create it using the STAX GET DTD request and redirect its output to a file). See section GET DTD for more information on how to create a stax.dtd file.



STAX Function Definitions - Microsoft Internet Explorer

File Edit View Favorites Tools Help

STAX Function Definitions

MonitorTest

For each machine specified by the MachList argument, function RunProcesses is called and run in parallel. This is done in a continous loop until the time specified by the duration argument is reached.

This function takes an argument map					
Name	**Description**	**Required**	**Private**	**Default**	**Properties**
duration	Timer duration to run the test. e.g. '5m', '1h', '90s', etc.	No	No	'2m'	
MachList	List of machines where the test will be run	No	No	['local', 'local']	
STAXJarFile	Fully-qualified name of STAX jar file on each machine where the test will be run	No	No	STAXJarFile	

RunProcesses

This function runs multiple processes. Each process runs a Java program called TestProcess (which is included in the STAXMon.jar file) and passes it different parameters which effect how long it runs until it completes and whether it is successful or not. The parameters for TestProcess are number of loops, seconds to wait between loops, and RC to return at the end of the process.

This function takes an argument map					
Name	**Description**	**Required**	**Private**	**Default**	**Properties**
machName	Location (machine name) to run the	Yes	No	N/A	

machName	process	Yes	No	N/A
blockNum	Number used in conjunction with the machine name to get a unique block name (in case running multiple times on the same machine)	Yes	No	N/A
loopNum	Current loop number	Yes	No	N/A

Debugging

If you have a question or are experiencing a problem, first check out the STAF/STAX FAQ at http://staf.sourceforge.net/current/STAFFAQ.htmto see if it provides an answer to your question or problem.

Note that since STAX is a Java service, errors that occur running the STAX service may be logged to its JVM log. If you're experiencing a problem configuring the STAX service, or an RC 6 submitting a request to the STAX service, or a problem running a STAX job, such as the job hanging, check its JVM log to see if any additional information about the problem is logged, such as a Java exception. The JVM logs are stored in the {STAF/DataDir}/lang/java/jvm/<JVMName> directory on the system where the STAX service is registered, where <JVMName> is either STAFJVM1 if you're using the default JVM name or it's the value specified for the JVMName option when the STAX service was registered. The current JVM log is named JVMLog.1. Or, to display the STAX JVM Log via the STAX Monitor, see the Displaying a JVM Log section.

If the JVM log contains an OutOfMemory error, any Java services using this JVM will have to be removed and added (registered) in order to start accepting requests. You may want to look at increasing the JVM's maximum heap size as the Java service(s) using this JVM may require more memory than can be allocated and also possibly increasing the JVM's maximum permanent generation space. See the answer to question Why is the STAX JVM crashing with a java.lang.OutOfMemoryError logged in the STAX JVM log? in the STAF/STAX FAQ for suggestions on how to tune the JVM to prevent OutOfMemory errors. Also, note that section 4.4.3 JSTAF service proxy library in the STAF User's Guide contains more information on how to set JVM options when registering a STAF Java service.

If the JVM crashed, any Java services using this JVM will have to be removed and added (registered) in order to start accepting requests.

If a STAX job appears to be hung or you just want to see what it's currently executing, submit the `LIST JOB <Job ID> THREADS` request to the STAX service to get a list of the threads currently running in the specified STAX job. Then, for each thread, submit a `QUERY JOB <Job ID> THREAD <Thread ID>` request to the STAX service to get more information on the curent state of a thread. Note that querying a thread provides

a "Call Stack" and a "Condition Stack" for the thread which can be useful for debugging a STAX job. See the QUERY JOB <Job ID> THREAD <Thread ID> section for more information on the "Call Stack" and "Condition Stack". Note that the "Call Stack" shows you which elements in a STAX job are currently being executed.

For example, if debugging job 10 that's currently running, you could submit the following requests:

```
C:\>STAF local STAX LIST JOB 10 THREADS
Response
--------
Thread ID Parent TID State
--------- ---------- -------
1         <None>     Blocked


C:\>STAF local STAX QUERY JOB 10 THREAD 1
Response
--------
{
  Thread ID      : 1
  Parent TID     : <None>
  Start Date-Time: 20071002-14:17:36
  Call Stack     : [
    function: Main (Line: 11, File: c:\tests\Test1.xml, Machine: client1)
    finally:  (Line: 31, File: c:\tests\Test1.xml, Machine: client1)
    try:  (Line: 13, File: c:\tests\Test1.xml, Machine: client1)
    iterate: 2/2 client1.company.com clientMachines (Line: 15, File: c:\tests\Te
st1.xml, Machine: client1)
    sequence: 2/3 (Line: 16, File: c:\tests\Test1.xml, Machine: client1)
    stafcmd: Delay 5 seconds (Line: 20, File: c:\tests\Test1.xml, Machine: clien
t1)
  ]
  Condition Stack: [
    HoldThread: Source=STAFCommand, Priority=1000
  ]
}
```

Note that this is the output when querying the following STAX job when while it is currently running the <stafcmd> element that delays for 5 seconds.

```
<!DOCTYPE stax SYSTEM "stax.dtd">

<stax>

  <defaultcall function="Main"/>

  <script>
    clientMachines = ['client1.company.com', 'client2.company.com']
  </script>

  <function name="Main">

    <try>

      <iterate var="machine" in="clientMachines">
        <sequence>

          <log message="1">'Starting Try Block for machine %s' % (machine)</log>

          <stafcmd name="'Delay 5 seconds'">
            <location>'local'</location>
            <service>'DELAY'</service>
            <request>'DELAY 5000'</request>
          </stafcmd>

          <log message="1">'Ending Try Block for machine %s' % (machine)</log>

        </sequence>
      </iterate>

      <finally>
        <block name="'FinallyBlock'">
          <log message="1">'Starting Finally Block...'</log>
        </block>
      </finally>

    </try>

  </function>

</stax>
```

Other LIST and QUERY requests for the STAX service can be submitted to get more information on the processes, staf commands, testcases, and blocks currently executing, well as functions that are available to be called, which can also be helpful when debugging a STAX job.

When debugging a STAX job, you may also find it useful to hold a STAX job and then query the job. You can submit a HOLD request to the STAX service via the command line or via the STAX Monitor. You can also add the **hold** element at various points in your STAX job and then you can query information about the STAX job.

When debugging a STAX job, you may find it useful to add **log** and/or **message** elements to your STAX job, or Python print statements in **script** elements. Note that output from a Python print statement will be written to the STAX Job User Log by default, but this can be changed via the PYTHONOUTPUT setting.

Also, when debugging a STAX job, check the STAX JVM Log to see if it contains any error information. To display the STAX JVM Log via the STAX Monitor, see the Displaying a JVM Log section.

Using Breakpoints to Debug STAX Jobs

When executing a STAX job, you can specify (either when submitting the job for execution, or dynamically after the job has started) any number of breakpoints for the following:

- A function name, or
- A line number, with an optional (fully-qualified path) XML file and an optional XML file machine.

If a function name is specified, the STAX job will break whenever the function with that name is called (regardless of the XML file where the function is located). If you dynamically set a function name breakpoint, the STAX job will break the next time the function is called.

If a line number is specified, and the XML file is not specified, the STAXJobXmlFile will be used. If the XML file machine is not specified, the STAX job will break immediately prior to executing the STAX task whose line number and XML file match (regardless of the task's XML file machine)

The line number must be the line number of the beginning task element (i.e. to break on a <stafcmd>, the line number must be the line number for the <stafcmd>, not the <location>, <service>, <request>, or </stafcmd>).

You can also include <breakpoint> elements within your STAX job to denote a breakpoint.

When a breakpoint is reached within the STAX job, the current STAX thread's execution will pause, and you will be able to retrieve all of the Python

variables that are currently set in the thread. You will also be able to execute Python code when a thread is at a breakpoint (to change the values of existing variables or define new variables).

When a breakpoint is reached, you can resume the breakpoint, or step into or over the breakpoint. Stepping into the breakpoint means that the next task in the STAX job will execute, after which another breakpoint will be reached. Stepping over the breakpoint means that the next task, including any sub-tasks, in the STAX job will execute, after which another breakpoint will be reached. As an example, if you were at a breakpoint for a <call> element, stepping into the breakpoint would mean that the next breakpoint will be at the <function> element. Stepping over the breakpoint would mean that the entire function would execute, and another breakpoint would be reached after the function returns.

When stepping through elements, if the next task in the STAX job spawns multiple STAX threads (i.e. <parallel>, <paralleliterate>), then each of the spawned threads will reach a breakpoint. Note that the parent thread will still be in a "step" mode if all of its child threads are "resumed".

When stepping through elements, if a child STAX thread ends, then the parent thread will reach a breakpoint.

You can also arbitrarily "stop" a running thread, meaning that after the task currently running in the thread completes, the thread will reach a breakpoint. This is similar to using CTRL-C inside GDB to stop a thread's execution.

When a breakpoint is set for a STAX job (either when the job is submitted, or dynamically after the job has started), a unique breakpoint ID (starting at ID "1"). This breakpoint ID can be used to remove the breakpoint.

When a thread reaches a breakpoint, you use the Thread ID to access the information about the breakpoint.

If you are at a breakpoint for a <job> element, and step into the breakpoint, when the subjob starts, it will be at a breakpoint at the first <function> (regardless of whether the BREAKPOINTSUBJOBFIRSTFUNCTION option was specified).

Breakpoints (lines/functions) do not propagate to subjobs.

Here are some examples of using line number breakpoints:

```
21: <sequence>
22:
23:   <script>
24:     from random import random
25:     r1 = random()*100
26:     r2 = random()*100
27:   </script>
28:
29:   <stafcmd>
30:     <location>'local'</location>
```

```
31:     <service>'PING'</service>
32:     <request>'PING'</request>
33:   </stafcmd>
34:
35:   <log if="RC != STAFRC.Ok" level="'warning'">
36:     'RC=%s on %s' % (RC, machName)
37:   </log>
38:
39: </sequence>
```

To set a breakpoint for the `sequence`, you must specify line number 21.

To set a breakpoint for the `script`, you must specify line number 23.

To set a breakpoint for the `stafcmd`, you must specify line number 29.

To set a breakpoint for the `log`, you must specify line number 35.

Events Generated by STAX that Provide Job Status

When the STAX service is executing STAX jobs, it will generate events, via the Event service, about the elements that are being executed. These event notifications are used by the STAX Monitor to display the current execution status of a STAX job.

For example, when the STAX service encounters a <message> element in a STAX job, it will generate an event with TYPE "<STAX service name>/<STAX machine name>/<Job ID>" and SUBTYPE "Message". Details about the element will be contained in the event properties. The STAX Monitor registers to receive a notification about the job's Messages, and when it receives the notification, it will update the "Messages" tab with the information received in the event notifcation.

If you have a need to receive notifications about STAX jobs, you can register with the Event service to receive the notifications. The following table shows the TYPEs and SUBTYPEs for which the STAX service will generate events:

TYPE	SUBTYPE	DESCRIPTION
<STAX service name>/<STAX machine name>	Job	Event generated when any STAX job begins or ends
<STAX service name>/<STAX machine name>/<Job ID>	Job	Event generated for the specified Job ID when the job begins or ends

<STAX service name>/<STAX machine name>/<Job ID>	Block	Event generated for the specified Job ID when a block begins or ends, and when it is held, released, or terminated
<STAX service name>/<STAX machine name>/<Job ID>	Process	Event generated for the specified Job ID when a process starts or stops
<STAX service name>/<STAX machine name>/<Job ID>	STAFCommand	Event generated for the specified Job ID when a STAF command starts or stops
<STAX service name>/<STAX machine name>/<Job ID>	Message	Event generated for the specified Job ID when a message is executed
<STAX service name>/<STAX machine name>/<Job ID>	Testcase	Event generated for the specified Job ID when a testcase begins or ends
<STAX service name>/<STAX machine name>/<Job ID>	TestCaseStatus	Event generated for the specified Job ID when a testcase's pass/fail status is updated
<STAX service name>/<STAX machine name>/<Job ID>	subjob	Event generated for the specified Job ID when a subjob starts or stops
<STAX service name>/<STAX machine name>/<Job ID>	thread	Event generated for the specified Job ID when a thread starts or stops
<STAX service name>/<STAX machine name>/<Job ID>	breakpoint	Event generated for the specified Job ID when a breakpoint is added or removed, a thread reaches a breakpoint, or a thread at a breakpoint is resumed or stepped.

When you receive a queued notification for these events, details about the event will be contained in the message map for a "STAF/Service/Event" type queued message, and can be accessed via the "propertyMap" key. The following tables describe each property that will be included in the "propertyMap".

Definition of propertyMap for TYPE <STAX service name>/<STAX machine name> SUBTYPE Job		
Key Name	**Type**	**Format / Value**
type	<String>	'job'
block	<String>	'main'
status	<String>	'begin' | 'run' | 'end'
jobID	<String>	
startFunction	<String>	
jobName	<String>	
startTimestamp	<String>	<YYYYMMDD-HH:MM:SS>

result	<String>	
jobCompletionStatus	<String>	'Normal' | 'Terminated' | 'Abnormal' | 'Unknown'

Notes:

1. `startFunction` is only present when status='begin' or 'run'
2. `jobName` is only present when status='begin' or 'run'
3. `startTimestamp` is only present when status='begin' or 'run'
4. `result` is only present when status='end'
5. `jobCompletionStatus` is only present when status='end'

Definition of propertyMap for TYPE <STAX service name>/<STAX machine name>/<Job ID> SUBTYPE Job

Key Name	Type	Format / Value
type	<String>	'job'
block	<String>	'main'
status	<String>	'begin' | 'run' | 'end'
jobID	<String>	
startFunction	<String>	
jobName	<String>	
startTimestamp	<String>	<YYYYMMDD-HH:MM:SS>
result	<String>	
jobCompletionStatus	<String>	'Normal' | 'Terminated' | 'Abnormal' | 'Unknown'

Notes:

1. `startFunction` is only present when status='begin' or 'run'
2. `jobName` is only present when status='begin' or 'run'
3. `startTimestamp` is only present when status='begin' or 'run'
4. `result` is only present when status='end'
5. `jobCompletionStatus` is only present when status='end'

Definition of propertyMap for TYPE <STAX service name>/<STAX machine name>/<Job ID> SUBTYPE Block

Key Name	Type	Format / Value
type	<String>	'block'
block	<String>	

status	<String>	'begin' | 'end' | 'hold' | 'release' | 'terminate'
name	<String>	
Notes:		

Definition of propertyMap for TYPE <STAX service name>/<STAX machine name>/<Job ID> SUBTYPE Process		
Key Name	**Type**	**Format / Value**
type	<String>	'process'
block	<String>	
status	<String>	'start' | 'stop'
location	<String>	
command	<String>	
handle	<String>	
parms	<String>	
name	<String>	
mode	<String>	
workload	<String>	
title	<String>	
workdir	<String>	
shell	<String>	
varList	<List> of <String>	
envList	<List> of <String>	
useprocessvars	<None>	
stopusing	<String>	
newconsole	<String	
sameconsole	<String>	
focus	<String>	
username	<String>	
password	<String>	'*******'
disabledauthiserror	<String>	

ignoredisabledauth	<String>
stdin	<String>
stdout	<String>
stdoutappend	<String>
stderr	<String>
stderrappend	<String>
stderrtostdout	<String>
returnstdout	<None>
returnstderr	<None>
returnfilelist	<List> of <String>
statichandlename	<String>
other	<String>

Notes:

1. The following keys are only present if the corresponding option was specified: `shell` `varList` `envList` `useprocessvars` `newconsole` `sameconsole` `focus` `password` `disabledauthiserror` `ignoredisabledauth` `stdout` `stdoutappend` `stderr` `stderrappend` `stderrtostdout` `returnstdout` `returnstderr`
2. The following keys are only present when status='start': `mode workload title workdir shell varList envList useprocessvars stopusing newconsole sameconsole focus username password disabledauthiserror ignoredisabledauth stdin stdout stdoutappend stderr stderrappend stderrtostdout returnstdout returnstderr returnfilelist statichandlename other`

Definition of propertyMap for TYPE <STAX service name>/<STAX machine name>/<Job ID> SUBTYPE STAFCommand

Key Name	Type	Format / Value
type	<String>	'command'
block	<String>	
status	<String>	'start' | 'stop'
location	<String>	
requestNumber	<String>	
service	<String>	
request	<String>	

name	<String>	
Notes:		

Definition of propertyMap for TYPE <STAX service name>/<STAX machine name>/<Job ID> SUBTYPE Message		
Key Name	**Type**	**Format / Value**
messagetext	<String>	
Notes:		

Definition of propertyMap for TYPE <STAX service name>/<STAX machine name>/<Job ID> SUBTYPE Testcase		
Key Name	**Type**	**Format / Value**
name	<String>	
status	<String>	'begin' | 'end'
status-pass	<String>	<number of passes>
status-fail	<String>	<number of fails>
startedTimestamp	<String>	<start timestamp>
lastStatusTimestamp	<String>	<last status timestamp>
laststatus	<String>	'pass' | 'fail' | 'info'
elapsed-time	<String>	'<Pending>' | <HH[H]:MM:SS>
num-starts	<String>	
Notes:		

Definition of propertyMap for TYPE <STAX service name>/<STAX machine name>/<Job ID> SUBTYPE TestCaseStatus		
Key Name	**Type**	**Format / Value**
name	<String>	
status	<String>	'update'
status-pass	<String>	<number of passes>
status-fail	<String>	<number of fails>
startedTimestamp	<String>	<start timestamp>

lastStatusTimestamp	<String>	<last status timestamp>
laststatus	<String>	'pass' | 'fail' | 'info'
elapsed-time	<String>	'<Pending>' | <HH[H]:MM:SS>
num-starts	<String>	
message	<String>	
Notes:		

Definition of propertyMap for TYPE <STAX service name>/<STAX machine name>/<Job ID> SUBTYPE subjob		
Key Name	**Type**	**Format / Value**
type	<String>	'command'
block	<String>	
status	<String>	'start' | 'stop'
jobID	<String>	
jobName	<String>	
jobfile	<String> | '<include data>'	
jobfilemachine	<String>	
function	<String>	
functionargs	<String>	
clearlogs	<String>	'Enabled' | 'Disabled'
monitor	<String>	'true' | 'false'
logtcelapsedtime	<String>	'Enabled' | 'Disabled'
logtcnumstarts	<String>	'Enabled' | 'Disabled'
logtcstartstop	<String>	'Enabled' | 'Disabled'
pythonoutput	<String>	'JobUserLog' | 'Message' | 'JobUserLogAndMsg' | 'JVMLog'
pythonloglevel	<String>	
invalidloglevelaction	<String>	'RaiseSignal' | 'LogInfo'
scriptfilesmachine	<String>	
scriptFileList	<List> of <String>	
scriptList	<List> of <String>	

hold	<String>	Length of time to hold the sub-job
startdate	<String>	<YYYYMMDD>
starttime	<String>	<HH:MM:SS>
result	<String>	

Notes:

1. The following keys are only present when status='start':
   jobName, jobfile, jobfilemachine, function, functionargs, clearlogs, monitor, logtcelapsedtime, logtcnumstarts, logtcstartstop, pythonoutput, pythonloglevel, invalidloglevelaction, scriptfilesmachine, scriptFileList, scriptList, startdate, starttime
2. The "hold" key is only present when status='start' and a job-hold element was specified and its "if" attribute evaluated via Python to a true value. Then it will contain the maximum length of time in milliseconds to hold the sub-job or 0 to hold it indefinitely.
3. The following keys are only present when status='stop':
   result

Definition of propertyMap for TYPE <STAX service name>/<STAX machine name>/<Job ID> SUBTYPE thread

Key Name	Type	Format / Value
type	<String>	'thread'
id	<String>	
status	<String>	'start' | 'stop'
parent	<String>	
parentHierarchy	<String>	

Notes:

1.

Definition of propertyMap for TYPE <STAX service name>/<STAX machine name>/<Job ID> SUBTYPE breakpoint

Key Name	Type	Format / Value
type	<String>	'breakpoint'
id	<String>	
status	<String>	'add' | 'remove' | 'start' | 'stop'
function	<String>	
line	<String>	
file	<String>	

machine	<String>
block	<String>
threadID	<String>
lineNumber	<String>
xmlFile	<String>
xmlMachine	<String>
info	<String>

Notes:

1. The following keys are only present when status='add':
   function, line, file, machine
2. The following keys are only present when status='start' | 'stop':
   block, lineNumber, xmlFile, xmlMachine
3. The following keys are only present when status='start':
   threadID

Here is a sample Java program that executes a STAX job and registers to be notified about the events that the STAX service will generate for the job.

```
import com.ibm.staf.*;
import java.util.Map;

public class STAXExecuteListener extends Thread
{
    STAFHandle handle = null;
    String separator = "\n========================================" +
                       "========================================\n";

    public static void main(String[] args) throws STAFException
    {
        if (args.length < 3)
        {
            System.out.println();
            System.out.println("Usage: STAXExecuteListener " +
                               "<STAX-service-machine> <STAX-service-name> " +
                               "EXECUTE <execute-request-options>");
            System.out.println();
            System.out.println("Note: The HOLD option will be " +
                               "appended to the STAX EXECUTE REQUEST");
```

```
            System.out.println("Note: The EVENT service must be running on the "
                               + "STAX service machine and be named EVENT");
            System.exit(1);
        }

        String staxServiceMachine = args[0];
        String staxServiceName = args[1];
        String staxExecuteRequest = "";

        for (int i = 2; i < args.length; i++)
        {
            staxExecuteRequest += args[i] + " ";
        }

        staxExecuteRequest = staxExecuteRequest.trim();

        new STAXExecuteListener(staxServiceMachine,
                                staxServiceName,
                                staxExecuteRequest);
    }

    public STAXExecuteListener(String staxServiceMachine,
                               String staxServiceName,
                               String staxExecuteRequest)
    {

        try
        {
            handle = new STAFHandle("STAXExecuteListener");
        }
        catch(STAFException e)
        {
            e.printStackTrace();
            System.exit(1);
        }

        STAFResult result = handle.submit2(staxServiceMachine,
                                           staxServiceName,
                                           staxExecuteRequest + " HOLD");

        if (result.rc != STAFResult.Ok)
```

```
{
    System.out.println(staxServiceName + " EXECUTE rc=" + result.rc +
                       ", result=" + result.result);
    System.exit(result.rc);
}

String staxJobID = result.result;

System.out.println(separator);
System.out.println("STAX Job ID: " + staxJobID);
System.out.println(separator);

String eventType = staxServiceName.toUpperCase() + "/" +
                   staxServiceMachine + "/" +
                   staxJobID;
String eventSubtypes = " SUBTYPE Job SUBTYPE Block SUBTYPE Process" +
                       " SUBTYPE STAFCommand SUBTYPE Message" +
                       " SUBTYPE Testcase SUBTYPE TestCaseStatus" +
                       " SUBTYPE subjob";

result = handle.submit2(staxServiceMachine,
                        "EVENT",
                        "REGISTER TYPE " + eventType + eventSubtypes +
                        " BYHANDLE");

if (result.rc != STAFResult.Ok)
{
    System.out.println("EVENT REGISTER rc=" + result.rc +
                       ", result=" + result.result);
    System.exit(result.rc);
}

try
{
    Thread.sleep(2000);
}
catch(InterruptedException e)
{
    e.printStackTrace();
}
```

```
        start(); // start thread to listen for queued messages

        result = handle.submit2(staxServiceMachine,
                                staxServiceName,
                                "RELEASE JOB " + staxJobID);

        if (result.rc != STAFResult.Ok)
        {
            System.out.println(staxServiceName + " RELEASE rc=" + result.rc +
                               ", result=" + result.result);
            System.exit(result.rc);
        }
    }

    public void run()
    {
        while (true)
        {
            STAFResult result = handle.submit2("local", "QUEUE", "GET WAIT");

            if (result.rc != STAFResult.Ok)
            {
                System.out.println("QUEUE GET rc=" + result.rc +
                                   ", result=" + result.result);
                System.exit(result.rc);
            }

            STAFMarshallingContext outputContext =
                STAFMarshallingContext.unmarshall(result.result);

            Map queueMap = (Map)outputContext.getRootObject();

            String queueType = (String)queueMap.get("type");

            if (queueType.equalsIgnoreCase("STAF/Service/Event"))
            {
                 Map messageMap = (Map)queueMap.get("message");
                 String type = (String)messageMap.get("type");
                 String subtype = (String)messageMap.get("subtype");

                 System.out.println("TYPE   : " + type);
```

```
                    System.out.println("SUBTYPE: " + subtype);
                    System.out.println();

                    Map propertyMap = (Map)messageMap.get("propertyMap");
                    System.out.println(STAFMarshallingContext.formatObject(
                                       propertyMap));

                    System.out.println(separator);

                    // Exit if the job has completed
                    String staxType = (String)(propertyMap.get("type"));

                    if ((staxType != null) && staxType.equals("job"))
                    {
                        String jobStatus = (String)(propertyMap.get("status"));

                        if (jobStatus.equals("end"))
                        {
                            break;
                        }
                    }
                }
            }
        }
    }
```

Here are examples of running this sample Java program to submit some of the sample STAX jobs described in the Getting Started with STAXdocument:

CheckSTAFCmdRC.xml example:

```
$ java STAXExecuteListener staf3a.austin.ibm.com STAX EXECUTE FILE C:\STAF\services\stax
\CheckSTAFCmdRC.xml

================================================================================

STAX Job ID: 5

================================================================================
```

```
TYPE   : STAX/staf3a.austin.ibm.com/5
SUBTYPE: Block

{
  type  : block
  status: release
  name  : main
  block : main
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/5
SUBTYPE: STAFCommand

{
  service      : var
  type         : command
  requestNumber: 1560
  status       : start
  request      : resolve string {STAF/Config/OS/Name}
  location     : local
  name         : STAFCommand1
  block        : main
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/5
SUBTYPE: STAFCommand

{
  service      : var
  type         : command
  requestNumber: 1560
  status       : stop
  request      : resolve string {STAF/Config/OS/Name}
  location     : local
  name         : STAFCommand1
  block        : main
```

```
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/5
SUBTYPE: Message

{
  messagetext: 20070926-13:00:38 Great!  STAF/Config/OS/Name = WinXP
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/5
SUBTYPE: Block

{
  type  : block
  status: end
  name  : main
  block : main
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/5
SUBTYPE: Job

{
  type  : job
  result: None
  jobID : 5
  status: end
  block : main
}

================================================================================
```

FunctionParametersLogging.xml example:

```
$ java STAXExecuteListener staf3a.austin.ibm.com STAX EXECUTE FILE C:\STAF\services\stax
\FunctionParametersLogging.xml ARGS \"{ 'parms': '20 1 25' }\"

================================================================================

STAX Job ID: 8

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/8
SUBTYPE: Block

{
  type  : block
  status: release
  name  : main
  block : main
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/8
SUBTYPE: Process

{
  stderrtostdout  :
  handle          : 71
  other           :
  type            : process
  title           :
  mode            : default
  envList         : [
    CLASSPATH={STAF/Config/STAFRoot}/bin/JSTAF.jar;{STAF/Config/STAFRoot}/servic
es/stax/STAXMon.jar
  ]
  stdin           :
  status          : start
  block           : main
  parms           :
  command         : java com.ibm.staf.service.stax.TestProcess 20 1 25
```

```
  workdir         :
  statichandlename:
  username        :
  varList         : []
  returnstdout    :
  stopusing       :
  location        : local
  workload        :
  returnFileList  : []
  name            : My Test Process with parms 20 1 25
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/8
SUBTYPE: Process

{
  handle  : 71
  command : java com.ibm.staf.service.stax.TestProcess 20 1 25
  type    : process
  status  : stop
  location: local
  name    : My Test Process with parms 20 1 25
  parms   :
  block   : main
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/8
SUBTYPE: Message

{
  messagetext: 20070926-13:14:44 My Test Process with parms 20 1 25 Error: RC=25
, STAXResult=[[0, '']]
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/8
```

```
SUBTYPE: Block

{
  type  : block
  status: end
  name  : main
  block : main
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/8
SUBTYPE: Job

{
  type  : job
  result: 25L
  jobID : 8
  status: end
  block : main
}

================================================================================
```

Block.xml example:

```
$ java STAXExecuteListener staf3a.austin.ibm.com STAX EXECUTE FILE C:\STAF\services\stax\Block.xml

================================================================================

STAX Job ID: 11

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/11
SUBTYPE: Block

{
  type  : block
  status: release
```

```
  name  : main
  block : main
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/11
SUBTYPE: Block

{
  type  : block
  status: begin
  name  : main.SVT_Regression
  block : main.SVT_Regression
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/11
SUBTYPE: Process

{
  stderrtostdout  :
  handle          : 90
  other           :
  type            : process
  title           :
  mode            : default
  envList         : [
    CLASSPATH={STAF/Config/STAFRoot}/bin/JSTAF.jar;{STAF/Config/STAFRoot}/servic
es/stax/STAXMon.jar
  ]
  stdin           :
  status          : start
  block           : main.SVT_Regression
  parms           :
  command         : java com.ibm.staf.service.stax.TestProcess 30 1 0
  workdir         :
  statichandlename:
  username        :
```

```
  varList         : []
  returnstdout    :
  stopusing       :
  location        : local
  workload        :
  returnFileList  : []
  name            : My Test Process with parms 30 1 0
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/11
SUBTYPE: Process

{
  handle  : 90
  command : java com.ibm.staf.service.stax.TestProcess 30 1 0
  type    : process
  status  : stop
  location: local
  name    : My Test Process with parms 30 1 0
  parms   :
  block   : main.SVT_Regression
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/11
SUBTYPE: Message

{
  messagetext: 20070926-13:29:10 SUCCESS: My Test Process with parms 30 1 0
STAXResult=[[0, '']]
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/11
SUBTYPE: Process

{
```

```
  stderrtostdout  :
  handle          : 92
  other           :
  type            : process
  title           :
  mode            : default
  envList         : [
    CLASSPATH={STAF/Config/STAFRoot}/bin/JSTAF.jar;{STAF/Config/STAFRoot}/servic
es/stax/STAXMon.jar
  ]
  stdin           :
  status          : start
  block           : main.SVT_Regression
  parms           :
  command         : java com.ibm.staf.service.stax.TestProcess 15 2 0
  workdir         :
  statichandlename:
  username        :
  varList         : []
  returnstdout    :
  stopusing       :
  location        : local
  workload        :
  returnFileList  : []
  name            : My Test Process with parms 15 2 0
}

==========================================================================

TYPE   : STAX/staf3a.austin.ibm.com/11
SUBTYPE: Process

{
  handle  : 92
  command : java com.ibm.staf.service.stax.TestProcess 15 2 0
  type    : process
  status  : stop
  location: local
  name    : My Test Process with parms 15 2 0
  parms   :
  block   : main.SVT_Regression
```

```
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/11
SUBTYPE: Message

{
  messagetext: 20070926-13:29:40 SUCCESS: My Test Process with parms 15 2 0
STAXResult=[[0, '']]
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/11
SUBTYPE: Block

{
  type  : block
  status: end
  name  : main.SVT_Regression
  block : main.SVT_Regression
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/11
SUBTYPE: Block

{
  type  : block
  status: end
  name  : main
  block : main
}

================================================================================

TYPE   : STAX/staf3a.austin.ibm.com/11
SUBTYPE: Job
```

```
{
  type  : job
  result: None
  jobID : 11
  status: end
  block : main
}

================================================================================
```

Testcase.xml example (updated to only loop 3 times):

```
$ java STAXExecuteListener staf2c.austin.ibm.com STAX EXECUTE FILE C:/STAF/services/stax/Testcase.
xml

================================================================================

STAX Job ID: 17

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: Block

{
  type  : block
  status: release
  name  : main
  block : main
}

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: Process

{
  stderrtostdout  :
  handle          : 100
```

```
  other           :
  type            : process
  title           :
  mode            : default
  envList         : [
    CLASSPATH={STAF/Config/STAFRoot}/bin/JSTAF.jar;{STAF/Config/STAFRoot}/servic
es/stax/STAXMon.jar
  ]
  stdin           :
  status          : start
  block           : main
  parms           :
  command         : java com.ibm.staf.service.stax.TestProcess 1 1 97
  workdir         :
  statichandlename:
  username        :
  varList         : []
  returnstdout    :
  stopusing       :
  location        : local
  workload        :
  returnFileList  : []
  name            : My Test Process with parms 1 1 97
}

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: Process

{
  handle  : 100
  command : java com.ibm.staf.service.stax.TestProcess 1 1 97
  type    : process
  status  : stop
  location: local
  name    : My Test Process with parms 1 1 97
  parms   :
  block   : main
}
```

```
================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: Message

{
  messagetext: 20080827-20:18:44 My Test Process with parms 1 1 97 Error: RC=97,
 STAXResult=[[0, '']]
}

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: TestcaseStatus

{
  elapsed-time       : <Pending>
  num-starts         : 1
  laststatus         : fail
  lastStatusTimestamp: 20080827-20:18:45
  message            :
  startedTimestamp   : 20080827-20:18:42
  status-pass        : 0
  status-fail        : 1
  status             : update
  name               : Test Process
}

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: Testcase

{
  elapsed-time    : 00:00:04
  num-starts      : 1
  laststatus      : fail
  startedTimestamp: 20080827-20:18:42
  status-pass     : 0
  status-fail     : 1
  status          : end
```

```
  name            : Test Process
}

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: Process

{
  stderrtostdout  :
  handle          : 101
  other           :
  type            : process
  title           :
  mode            : default
  envList         : [
    CLASSPATH={STAF/Config/STAFRoot}/bin/JSTAF.jar;{STAF/Config/STAFRoot}/servic
es/stax/STAXMon.jar
  ]
  stdin           :
  status          : start
  block           : main
  parms           :
  command         : java com.ibm.staf.service.stax.TestProcess 1 1 78
  workdir         :
  statichandlename:
  username        :
  varList         : []
  returnstdout    :
  stopusing       :
  location        : local
  workload        :
  returnFileList  : []
  name            : My Test Process with parms 1 1 78
}

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: Process
```

```
{
  handle  : 101
  command : java com.ibm.staf.service.stax.TestProcess 1 1 78
  type    : process
  status  : stop
  location: local
  name    : My Test Process with parms 1 1 78
  parms   :
  block   : main
}

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: Message

{
  messagetext: 20080827-20:18:50 My Test Process with parms 1 1 78 Error: RC=78,
 STAXResult=[[0, '']]
}

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: TestcaseStatus

{
  elapsed-time       : 00:00:04
  num-starts         : 2
  laststatus         : fail
  lastStatusTimestamp: 20080827-20:18:51
  message            :
  startedTimestamp   : 20080827-20:18:42
  status-pass        : 0
  status-fail        : 2
  status             : update
  name               : Test Process
}

================================================================================
```

```
TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: Testcase

{
  elapsed-time    : 00:00:09
  num-starts      : 2
  laststatus      : fail
  startedTimestamp: 20080827-20:18:42
  status-pass     : 0
  status-fail     : 2
  status          : end
  name            : Test Process
}

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: Process

{
  stderrtostdout  :
  handle          : 102
  other           :
  type            : process
  title           :
  mode            : default
  envList         : [
    CLASSPATH={STAF/Config/STAFRoot}/bin/JSTAF.jar;{STAF/Config/STAFRoot}/servic
es/stax/STAXMon.jar
  ]
  stdin           :
  status          : start
  block           : main
  parms           :
  command         : java com.ibm.staf.service.stax.TestProcess 1 1 44
  workdir         :
  statichandlename:
  username        :
  varList         : []
  returnstdout    :
  stopusing       :
```

```
  location        : local
  workload        :
  returnFileList  : []
  name            : My Test Process with parms 1 1 44
}

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: Process

{
  handle  : 102
  command : java com.ibm.staf.service.stax.TestProcess 1 1 44
  type    : process
  status  : stop
  location: local
  name    : My Test Process with parms 1 1 44
  parms   :
  block   : main
}

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: Message

{
  messagetext: 20080827-20:18:56 My Test Process with parms 1 1 44 Error: RC=44,
 STAXResult=[[0, '']]
}

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: TestcaseStatus

{
  elapsed-time       : 00:00:09
  num-starts         : 3
```

```
  laststatus         : pass
  lastStatusTimestamp: 20080827-20:18:57
  message            :
  startedTimestamp   : 20080827-20:18:42
  status-pass        : 1
  status-fail        : 2
  status             : update
  name               : Test Process
}

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: Testcase

{
  elapsed-time    : 00:00:14
  num-starts      : 3
  laststatus      : pass
  startedTimestamp: 20080827-20:18:42
  status-pass     : 1
  status-fail     : 2
  status          : end
  name            : Test Process
}

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
SUBTYPE: Block

{
  type  : block
  status: end
  name  : main
  block : main
}

================================================================================

TYPE   : STAX/staf2c.austin.ibm.com/17
```

```
SUBTYPE: Job

{
  type  : job
  result: None
  jobID : 17
  status: end
  block : main
}

================================================================================
```

Support Information

If you have a question or are experiencing a problem, first check out the STAF/STAX FAQ at http://staf.sourceforge.net/current/STAFFAQ.htmto see if it provides an answer to your question or problem.

Please report bugs or request features via the STAF SourceForge website at:

http://staf.sourceforge.net

You may also post questions, problems, comments and suggestions via this website.

It is our goal to retain backward compatibility in future versions of STAX.

Known Problems

Here are some of the known problems and issues with this version of STAX. You may view a complete list of bugs and requested features via the STAF SourceForge website at:

http://staf.sourceforge.net

These problems will be resolved in a future version of STAX.

1. More detailed tracing of a job for debugging purposes will be provided in a future version of STAX.

2. More information about how to override and then restore the default signal handlers will be provided in a future version of STAX.

History of Changes

See the History file provided in the STAX zip/tar file you downloaded for a history of the changes that have been made to the STAX service.

Appendix A: STAX XML Document Examples

Some examples of STAX XML documents are provided in the samples and libraries directories as part of the STAX zip/tar file. The samples directory contains examples of STAX jobs. The libraries directory contain STAX XML documents that contain common functions that you may want to import and call from STAX XML documents that you write.

STAX Libraries Containing Common Utility Functions

The `libraries`directory provided in the STAX zip/tar file contains the following xml files that provide some common STAX utility functions:

- `STAFUpgradeUtil.xml` - contains a function called UpgradeSTAF that you can call to upgrade the version of STAF running on a remote machine. Note that a sample job is also provided, `samples/UpgradeSTAF.xml`, that imports the `STAFUpgradeUtil.xml` file and uses it's `UpgradeSTAF` function to upgrade the version of STAF running on one or more remote machines simultaneously.

- `STAXUtil.xml` - contains some common STAX utility functions

You may want to import functions from these files (using the <function-import> or <import> element) so that you can call these functions from STAX XMl documents that you write. This allows you to reuse common functions and makes integration of tests written by different parties easier. See `http://staf.sourceforge.net/current/STAXLibraries/index.html` for STAXDoc documentation on these functions, including a description of the arguments to pass in, what is returned, and usage examples.

Note: This HTML file was generated using STAXDoc which converts information in these library xml files into readable HTML documentation.

STAF Upgrade Functions

STAX library file `STAFUpgradeUtil.xml` contains the following functions:

- **UpgradeSTAF**

  Upgrades the version of STAF running on a remote target machine. The target machine where STAF will be upgraded to a new version must already have STAF running.

  Note that this version of `STAFUpgradeUtil.xml` only supports upgrading target machine(s} to STAF V3.3.0 or later.

  The minimum version of STAF that must be running on the target machine is:

  - 3.0.0 if the target machine is a Windows machine
  - 3.1.3 if the target machine is a Unix machine

  The STAX machine must be running STAF V3.1.0 or later.

  The target machine(s) must give the STAX machine trust level 5 and must give the installer machine trust level 4 or higher.

  The installer machine must give the STAX machine trust level 4 or higher.

  The STAF installer files must be downloaded to a single directory on the installer machine so that this function can copy the appropriate STAF installer file from the installer machine to the remote target machine. Note that only the InstallAnywhere Bundled JVM installer files (e.g. `STAFxxxx-setup-linux.bin`, `STAFxxxx-setup-win32.exe`) and GNU zipped tar installer files (e.g. `STAFxxxx-linux.tar.gz`) are supported by this function. The InstallAnywhere NoJVM installer files (e.g. `STAFxxxx-setup-linux-NoJVM.bin`) are not supported.

  A STAF upgrade does not automatically use the same settings that were selected by the previous STAF install. Also, this function doesn't support every STAF installation option, such as overriding the version of STAF Python, Perl, or Tcl support installed by default.

  Notes:

  1. This is the function you call to upgrade STAF. All of the other functions in this library file are just "helper" functions and are not intended to be called by other functions.
  2. You must import all of the functions in this library file to use this function.
  3. This function also requires that you import functions from the `STAXUtil.xml` library file.

STAX Utility Functions

STAX library file `STAXUtil.xml` contains the following functions:

- **STAF**

  Submits a request to STAF. It's a shortcut for the <stafcmd> element.

- **STAFProcess**

  Submits a STAF request to start a process in a separate shell (using the default shell command). It's a shortcut for the <process> element when you only need to specify the command to be started in a separate shell.

- **STAFProcessUsing**

  Submits a STAF request to start a process using a map to define values for the process element's sub-elements. It's a shortcut for the <process> element when additional options need to be specified.

- **STAXUtilLogAndMsg**

  Logs a message and sends the message to the STAX Monitor. It's a shortcut for specifying the <message> and <log> elements for the same message.

- **STAXUtilWaitForSTAF**

  Waits for STAF to become available (that is, for the STAFProc daemon to be running) on one or more machines. A maximum wait time can be specified, overriding the default maximum wait time of 5 minutes. If one or more machines are not available, and the maximum wait time has not been exceeded, delays 5 seconds and then retries. This function can be useful after rebooting one or more systems.

- **STAXUtilCopyFiles**

  Copies files from a directory on a machine to a directory on the same or different machine. You can specify which files to copy from a directory using the name pattern, extension pattern, case sensitivity, and/or regular expression arguments.

  The regular expression allows you to define complicated pattern matching rules to determine which files to copy.

  Note that this function only copies files; no subdirectories will be copied.

  For performance reasons, the files are copied in groups of up to 5 in parallel. If the toDirectory does not exist, it will be created. If any of the files being copied already exist on the toMachine, they will be replaced.

- **STAXUtilListDirectory**

  Lists files in a directory on a machine. You can specify which files to list using the name pattern, extension pattern, case sensitivity, and/or regular expression arguments.

  The regular expression allows you to define complicated pattern matching rules to determine which files to copy.

- **STAXUtilCheckSuccess**

  Checks if a result indicates success or failure. If the result evaluates to a true value:

  1. If a pass message is provided, it is logged in the STAX User Log and, optionally, sent to the STAX Monitor.
  2. A testcase status of pass is recorded if the recordStatus evaluates to a true expression.

  Otherwise, if the result evaluates to a false value:

  1. If a failure message is provided, it is logged in the STAX User Log and, optionally, sent to the STAX Monitor.
  2. A testcase status of fail is recorded if the recordStatus evaluates to a true expression.

- **STAXUtilImportSTAFVars**

  Imports STAF variables on the specified machines, creating STAX variables from them.

  If only one machine is specified, for each STAF variable name that is specified, a STAX variable with the specified name is created with the resolved contents of the STAF variable for the specified machine assigned to it.

  If a list of machines is specified, for each STAF variable name that is specified, a STAX map is created with the specified name which contains an entry for each machine (key) with a value of the resolved contents of the STAF variable for that machine assigned.

- **STAXUtilImportSTAFConfigVars**

  Imports STAF Configuration variables (such as STAF/Config/OS/Name and STAF/Config/Sep/File) on the specified machine, creating a STAX variable map containing their values and returning the map.

- **STAXUtilExportSTAFVars**

  Exports STAX variables, creating STAF variables from them on the specified machines.

For each STAX variable name that is specified, a STAF variable with the specified name is created for the specified machines.

- **STAXUtilQueryAllTests**

  For each STAX variable name that is specified, a STAF variable with the specified name is created for the specified machines. Query the results for all testcases in the currently running job, accumulating the total number of testcases, passes, and fails recorded so far as well as a map of all the testcases and their passes, fails, elapsed times, and number of starts.

- **STAXUtilQueryTest**

  Query the results for a single testcase in the currently running job.

Sample STAX Jobs

Here are some of examples of a STAX jobs.

Sample STAX Job 1 - Basic Example How to Run Processes and STAF Commands

This STAX job executes various STAF commands and processes and sends messages to the STAX Job Monitor. The following example is the sample1.xml file provided in the samples directory as part of the STAX zip/tar file.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax SYSTEM "stax.dtd">

<!--
    sample1.xml - Sample of a job definition file for STAX

    Job Description:

    This job executes various STAF commands and processes and
    sends messages to the STAX Job Monitor.
-->

<stax>

  <!--
    Change the values specified for MachList and/or duration
    and/or STAXJarFile as desired by changing the values passed to
    function MonitorTest via the <defaultcall> element in this file
```

```
    or override them by specifying the arguments parameter when
    submitting the job for execution.  Examples of values for the
    arguments parameter:
      { 'duration': '10m', 'MachList': ['machA', machB', 'machC'] }
      { 'MachList': ['myMachine'] }
      { 'duration': '1h' }
      { 'STAXJarFile': '/usr/local/staf/services/stax/STAXMon.jar' }
   -->

  <script>
    STAXServicesDir = '{STAF/Config/STAFRoot}{STAF/Config/Sep/File}services{STAF/Config/Sep/File}
stax'
    STAXJarFile = '%s{STAF/Config/Sep/File}STAXMon.jar' % STAXServicesDir
  </script>

  <defaultcall function="MonitorTest">
    { 'MachList': ['local', 'local'], 'duration': '2m', 'STAXJarFile': STAXJarFile }
  </defaultcall>

  <function name="MonitorTest" scope="local" requires="RunProcesses">

    <function-prolog>
      For each machine specified by the MachList argument, function
      RunProcesses is called and run in parallel.  This is done in a
      continous loop until the time specified by the duration argument
      is reached.
    </function-prolog>

    <function-map-args>

      <function-optional-arg name="duration" default="'2m'">
        Timer duration to run the test.  e.g. '5m', '1h', '90s', etc.
      </function-optional-arg>

      <function-optional-arg name="MachList" default="['local', 'local']">
        List of machines where the test will be run
      </function-optional-arg>

      <function-optional-arg name="STAXJarFile" default="STAFJarFile">
        Fully-qualified name of STAX jar file on each machine where the test will be run
      </function-optional-arg>
```

```
</function-map-args>

<testcase name = "'Timer'">

  <sequence>
    <script>
      import time
      starttime = time.time(); # record starting time
    </script>

    <message>
      'duration=%s, MachList=%s' % (duration, MachList)
    </message>

    <!-- Resolve the STAXJarFile which may contain STAF variables -->
    <stafcmd>
      <location>'local'</location>
      <service>'var'</service>
      <request>'resolve string %s' % STAXJarFile</request>
    </stafcmd>

    <if expr="RC == 0">
      <sequence>
        <script>STAXJarFile = STAFResult</script>
        <message>'STAXJarFile=%s' % (STAXJarFile)</message>
      </sequence>
      <else>
        <sequence>
          <message>
            'Error resolving STAXJarFile: RC=%s, STAFResult=%s, \
             STAXJarFile=%s' % (RC, STAFResult, STAXJarFile)
          </message>
          <message>'Terminating job'</message>
          <terminate block="'main'"/>
        </sequence>
      </else>
    </if>

    <!-- Loop continuously for the specified duration -->
    <timer duration="duration">
```

```
            <loop var="loopNum">
              <paralleliterate var="machName" in="MachList" indexvar="i">
                <block name="'%s_%d' % (machName, i)">
                  <testcase name="machName">
                    <call-with-map function="'RunProcesses'">
                      <call-map-arg name="'machName'">machName</call-map-arg>
                      <call-map-arg name="'loopNum'">loopNum</call-map-arg>
                      <call-map-arg name="'blockNum'">i</call-map-arg>
                    </call-with-map>
                  </testcase>
                </block>
              </paralleliterate>
            </loop>
          </timer>

          <script>
            stoptime = time.time()             # record ending time
            elapsedSecs = stoptime - starttime # difference yields time elapsed in seconds
          </script>

          <message>'Test complete - ran for %d seconds' % elapsedSecs</message>

          <if expr="RC == 1">
            <tcstatus result="'pass'">
              'Timer ran for %d seconds' % elapsedSecs
            </tcstatus>
            <else>
              <tcstatus result="'fail'">
               'Timer only ran for %d seconds. RC=%d' % (elapsedSecs, RC)
              </tcstatus>
            </else>
          </if>

        </sequence>

      </testcase>

    </function>

    <function name="RunProcesses" scope="local"
                                  requires="PASS-if-0 RunSTAFCommands">
```

```
<function-prolog>
  This function runs multiple processes.  Each process runs a Java
  program called TestProcess (which is included in the STAXMon.jar file)
  and passes it different parameters which effect how long it runs
  until it completes and whether it is successful or not.
  The parameters for TestProcess are number of loops, seconds to wait
  between loops, and RC to return at the end of the process.
</function-prolog>

<function-map-args>

  <function-required-arg name="machName">
    Location (machine name) to run the process
  </function-required-arg>

  <function-required-arg name="blockNum">
    Number used in conjunction with the machine name to get a unique
    block name (in case running multiple times on the same machine)
  </function-required-arg>

  <function-required-arg name="loopNum">
    Current loop number
  </function-required-arg>

</function-map-args>

<sequence>

  <message>
    'Starting run #%d on %s' % (loopNum, machName)
  </message>

  <script>
    className = 'com.ibm.staf.service.stax.TestProcess'
  </script>

  <process name="'TestProcess'">
    <location>machName</location>
    <command>'java'</command>
    <parms>'%s 5 6 0' % className</parms>
```

```
  <title>'First title example'</title>
  <env>'CLASSPATH=%s{STAF/Config/Sep/Path}{STAF/Env/ClassPath}' % STAXJarFile</env>
  <console use="'same'"/>
</process>

<call function="'PASS-if-0'">RC</call>

<message>
  'Process RC=%d on machine %s' % (RC, machName)
</message>

<call function="'RunSTAFCommands'">
  { 'machName': machName, 'blockNum': blockNum }
</call>

<call function="'PASS-if-0'">STAXResult</call>

<process name="'TestProcess'">
  <location>machName</location>
  <command>'java'</command>
  <parms>'%s 3 4 99' % className</parms>
  <env>'CLASSPATH=%s{STAF/Config/Sep/Path}{STAF/Env/ClassPath}' % STAXJarFile</env>
  <console use="'same'"/>
</process>

<call function="'PASS-if-0'">RC</call>

<message>
  'Process RC=%d on machine %s' % (RC, machName)
</message>

<process name="'TestProcess'">
  <location>machName</location>
  <command>'java'</command>
  <parms>'%s 5 5 100' % className</parms>
  <title>'Second title example with many Process elements'</title>
  <workload>'STAX Monitor Workload'</workload>
  <vars>['firstName=Dave','middleInitial=M.','lastName=Bender']</vars>
  <vars>['pet=cat','petName=Fluffy']</vars>
  <env>'CLASSPATH=%s{STAF/Config/Sep/Path}{STAF/Env/ClassPath}' % STAXJarFile</env>
  <env>'JAVA_APP=javaw.exe'</env>
```

```
        <useprocessvars/>
        <disabledauth action="'ignore'"/>
        <console use="'same'"/>
      </process>

      <call function="'PASS-if-0'">RC</call>

      <message>
        'Process RC=%d on machine %s' % (RC, machName)
      </message>

      <message>
        'Finished run #%d on machine %s' % (loopNum, machName)
      </message>

    </sequence>

  </function>


  <function name="RunSTAFCommands" scope="local">

    <function-prolog>
      This function runs several STAF Commands using following
      STAF services: DELAY, MISC, and SERVICE.
    </function-prolog>

    <function-map-args>

      <function-required-arg name="machName">
        Location (machine name) to run the process
      </function-required-arg>

      <function-required-arg name="blockNum">
        Number used in conjunction with the machine name to get a unique
        block name (in case running multiple times on the same machine)
      </function-required-arg>

    </function-map-args>
```

```
<block name="'STAFCommandBlock%d' % blockNum">

  <sequence>

    <script>from random import random;r=random();r=r*10000</script>

    <message>'Delaying %d ms on machine %s' % (r,machName)</message>

    <stafcmd name="'STAF Command: RANDOM DELAY'">
      <location>machName</location>
      <service>'delay'</service>
      <request>'delay %d' % r</request>
    </stafcmd>

    <if expr="RC != 0">
      <return>RC</return>
    </if>

    <stafcmd name="'STAF Command: MISC VERSION'">
      <location>machName</location>
      <service>'misc'</service>
      <request>'version'</request>
    </stafcmd>

    <if expr="RC != 0">
      <return>RC</return>
      <else>
        <message>
          'Machine %s has STAF Version %s' % (machName,STAFResult)
        </message>
      </else>
    </if>

    <stafcmd name="'STAF Command: SERVICE LIST'">
      <location>machName</location>
      <service>'service'</service>
      <request>'list'</request>
    </stafcmd>

    <if expr="RC != 0">
      <return>RC</return>
```

```
            <else>
              <message>
                'Machine %s has STAF services:\n%s' % (machName,STAFResult)
              </message>
            </else>
          </if>

          <return>0</return>

        </sequence>

      </block>

    </function>

    <function name="PASS-if-0" scope="local">

      <function-prolog>
        This function checks if a value is 0.  If 0, it sets the
        testcase status result to 'pass'; otherwise, it sets it
        to 'fail' and sends a message to the STAXMonitor.
      </function-prolog>

      <function-single-arg>
        <function-required-arg name="value">
          Value (usually RC or STAXResult variable) to compare with 0
        </function-required-arg>
      </function-single-arg>

      <if expr="value == 0">
        <tcstatus result="'pass'"/>
        <else>
          <tcstatus result="'fail'">
            'value=%d. Expected 0.' % value
          </tcstatus>
        </else>
      </if>
    </function>

  </stax>
```

Sample STAX Job 2 - Executing Tests in Parallel on Multiple Machines

This STAX job executes a set of automated tests on multiple machines in parallel.

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax SYSTEM "stax.dtd">
<!--
   j13auto.xml

   XML Sample for STAX (STAf eXecution)

   Job Description:

    This job executes a set of automated tests on each machine
    defined in the "TestMachines" List. Each machine executes
    in parallel.  The setup and tests run serially on each machine.
    On each machine, the "Setup" Function is executed, and then the
    "RunVariations" Function is executed first for the "Java2D API
    variations" list and then for the "Print API variations" List.

    This job imports functions from STAXUtil.xml.
-->

<stax>

  <defaultcall function="j13auto"/>

  <script>
    # Make sure the importDir is where you put STAXUtil.xml
    importDir = 'C:/staf/services/stax/libraries'
    TestCaseServer = 'AL1B4'
    TestCaseDir = 'D:/jdk13/tests/api'
    TestCaseFiles = ['Java2DAPI.jar','PrintAPI.jar']
    TestMachines = ['AL2C4','AM3D4','AA3B4','CE1A4','AH2D4']
    Java2DAPI = ['AlphaComposite001',     'AlphaComposite002',
                 'AlphaComposite003',     'GraphicsEnvironment001',
                 'GraphicsEnvironment002','ICC_ProfileRGB001',
                 'ICC_ProfileRGB002',     'ICC_ProfileRGB003',
```

```
                'ICC_ProfileRGB004',     'ICC_ProfileRGB005',
                'ICC_ProfileRGB006',     'GlyphMetrics001',
                'GlyphMetrics002',       'DirectColorModel001',
                'DirectColorModel002',   'DirectColorModel003',
                'DirectColorModel004',   'DirectColorModel005']
  PrintAPI =  ['PageFormat001',     'PageFormat002',
               'PrinterJob001',     'PrinterJob002',
               'PrinterJob003',     'PrinterJob004',
               'PageAttributes001', 'PageAttributes002',
               'PageAttributes003']
</script>

<function name="j13auto">

  <sequence>

    <import machine="'local'" file="'%s/STAXUtil.xml' % importDir"/>

    <paralleliterate var="machName" in="TestMachines">

      <sequence>

        <call function="'Setup'"/>

        <testcase name="'Java2D'">
          <sequence>
            <script>variationList = Java2DAPI[:]</script>
            <script>jarName = '%s/%s' % (TestCaseDir, TestCaseFiles[0])</script>
            <call function="'RunVariations'"/>
          </sequence>
        </testcase>

        <testcase name="'Print'">
          <sequence>
            <script>variationList = PrintAPI[:]</script>
            <script>jarName = '%s/%s' % (TestCaseDir, TestCaseFiles[1])</script>
            <call function="'RunVariations'"/>
          </sequence>
        </testcase>

      </sequence>
```

```
    </paralleliterate>

  </sequence>

</function>

<function name="Setup">

  <iterate var="file" in="TestCaseFiles">

    <stafcmd>
      <location>TestCaseServer</location>
      <service>'FS'</service>
      <request>
        'COPY FILE %s/%s TOMACHINE %s' % (TestCaseDir, file, machName)
      </request>
    </stafcmd>

  </iterate>

</function>

<function name="RunVariations">

  <testcase name="machName">

    <iterate var="variationName" in="variationList">

      <sequence>

        <process>
          <location>machName</location>
          <command>'java'</command>
          <parms>'-jar ' + jarName + ' ' + variationName</parms>
        </process>

        <call function="'STAXUtilCheckSuccess'">
          { 'result': RC == 0,
            'failMsg': 'Process failed. RC=%s Result=%s' % (RC, STAFResult),
            'sendToMonitor': 1, 'recordStatus': 1 }
```

```
            </call>

          </sequence>

        </iterate>

      </testcase>

    </function>

</stax>
```

If you performed a STAX EXECUTE request specifying a file containing the above sample XML file and then ran the following STAX request to query the job's testcase information right before the job completed:

```
  LIST JOB 15 TESTCASES
```

you would see output similar to the following (depending on how many testcase variations passed or failed on each machine) if "Log TC Elapsed Time" and "Log TC Num Starts" are disabled:

```
Java2D.AL2C4;18;0
Java2D.AM3D4;16;2
Java2D.AA3B4;5;13
Java2D.CE1C4;18;0
Java2D.AH2D4;18;0
Print.AL2C4;9;0
Print.AM3D4;9;0
Print.AA3B4;7;2
Print.CE1C4;8;1
Print.AH2D4;9;0
```

Sample STAX Job 3 - Creating a STAF Handle and Using it's Queue

This STAX job demonstrates how to create your own STAF handle within a STAX job and use it's queue to get messages.
Note that you should not use the STAX job handle's queue as that can interfere with the use of the queue by the STAX service as described in the Conceptssection, sub-section "Queues".

A new STAF handle can be created within a STAX job using the Java constructor for STAFHandle. The com.ibm.staf.STAFHandle class must be imported before using it. See the STAF Java User's Guide for more information. Note that Jython allows you to access Java classes, so that's why this works.

```
<script>
  from com.ibm.staf import STAFHandle

  # Create a STAF handle
  myHandle = STAFHandle("MySTAXJobHandle")
</script>
```

Then you can use this newly created handle to submit a `GET WAIT 60000`request to the QUEUE service (which waits for a message to be placed on the queue for up to 60 seconds) using the Java STAFHandle's submit2 method. You can customize this QUEUE GET request to meet your needs. Again, see the STAF Java User's Guidefor more information on the submit2 method and it's result.

```
<script>
  # Submit a STAF request using this handle

  request = 'GET WAIT 60000'
  result = myHandle.submit2('local', 'QUEUE', request)
</script>
```

If the `QUEUE GET WAIT 60000`request is successful, it's result is a marshalled string. The result must be unmarshalled to get the marshalling context and it's root object which is a map containing the queued message information. See the "STAX Python Interfaces"section for a description of the Python marshalling functions available like STAFMarshalling.unmarshall() and STAFMarshalling.formatObject().

```
<script>
  mc = STAFMarshalling.unmarshall(result.result)
  queueMsgMap = mc.getRootObject();
</script>
```

Then you can do whatever you want with the message you get from the queue. This job simply logs the message map info (using the STAFMarshalling.formatObject() method to "pretty print" it). It also shows how to access the "message" element in the message map. You can access other elements in the message map similarly (e.g. 'type', 'handle', etc). The keys for this map are documented in the STAF User's Guideunder the result from a QUEUE service's GET request.

```
<log message="1">
  STAFMarshalling.formatObject(mc)
</log>
```

```
  <log message="1">
    'Queued message: %s' % (queueMsgMap['message'])
  </log>
```

This job uses a <loop> element to continually check the queue for a message. Note that anytime the job is waiting on the STAFHandle to get data off the queue, a STAX Thread is being used. If you have too many jobs/threads waiting on STAF queues, the STAX service can run out of STAX Threads. You can largely get around this by not doing an infinite wait using the QUEUE GET command. Instead, provide a timeout, like `QUEUE GET WAIT 60000`(which waits for a message for 60 seconds). This causes a polling loop, which is generally not a good thing, but it will prevent any deadlocking in STAX.

To show how this STAX job works, you can execute this STAX job via the STAX Monitor and while it's running, from the command line submit a QUEUE request to the STAX machine specifying the handle that you created (which is logged by the STAX job to the STAX Job User log and is sent to the STAX Monitor). For example, if the handle you created in the STAX job is 133 (and you're submitting this request from the STAX machine):

```
  STAF local QUEUE QUEUE HANDLE 133 MESSAGE "Hello"
  STAF local QUEUE QUEUE HANDLE 133 MESSAGE "Hello again"
```

You'll see that the STAX job then gets these messages and logs them.

To stop the loop that the job is in waiting for more messages on it's queue (and to terminate the job), you could send a message to the queue that tells it to stop waiting for more messages. For example, this job checks for a message of type "MyJob/StopGettingMsgs" and breaks out of the loop when it receives any message with this type.

```
  STAF local QUEUE QUEUE HANDLE 133 TYPE MyJob/StopGettingMsgs MESSAGE Goodbye
```

Here's the sample STAX job that demonstrates how to create your own STAF handle within a STAX job and use it's queue to get messages:

```
<?xml version="1.0" encoding="UTF-8" standalone="no"?>
<!DOCTYPE stax SYSTEM "stax.dtd">

<stax>

  <defaultcall function="QueueGetMessage"/>

  <function name="QueueGetMessage">
    <sequence>

      <script>
```

```
  from com.ibm.staf import STAFHandle

  # Create a STAF handle
  myHandle = STAFHandle("MySTAXJobHandle")
</script>

<log message="1">
  'MySTAXJobHandle handle #: %s' % (myHandle.getHandle())
</log>

<loop>
  <sequence>

    <script>
      # Submit a STAF request using this handle

      request = 'GET WAIT 60000'
      result = myHandle.submit2('local', 'QUEUE', request)
    </script>

    <if expr="result.rc == STAFRC.Ok">
      <sequence>

        <script>
          # The result is a marshalled string so need to unmarshall
          # it to get the marshalling context and it's root object
          # which is a map containing the queued message information
          # with keys documented in the STAF User's Guide for the
          # QUEUE service's GET request.

          mc = STAFMarshalling.unmarshall(result.result)
          queueMsgMap = mc.getRootObject();
        </script>

        <if expr="queueMsgMap['type'] == 'MyJob/StopGettingMsgs'">
          <break/>
        </if>

        <log message="1">
          STAFMarshalling.formatObject(mc)
        </log>
```

```
              <log message="1">
                'Queued message: %s' % (queueMsgMap['message'])
              </log>

            </sequence>
          </if>

        </sequence>
      </loop>

      <script>
        # Unregister the STAF handle
        myHandle.unRegister()
      </script>

    </sequence>
  </function>

</stax>
```

Appendix B: STAX Service Error Code Reference

In addition to the common STAF return codes, the following STAX service return codes are defined:

Error Code	Meaning	Comment
4001	Error submitting execute request	Additional information about the error is put into the STAF Result. An example of additional information that may be provided is: Caught com.ibm.staf.service.stax.STAXXMLParseException: Line 78: The element type "sequence" must be terminated by the matching end-tag "</sequence>". In this case, it indicates an error in your XML file that you must correct.
4002	Block not held	Requested to release a block that is not held.

4003	Block already held	Requested to hold a block that is already held.
4004	Job not complete	Requested to get results for a job that is still running.
4005	Unable to step/resume breakpoint - block held	Requested to step/resume a breakpoint whose block is currently held.
4006	Parent block already held	Requested to hold a block that is already held by a parent block.

Appendix C: STAX Document Type Definition (DTD)

This section contains the DTD for the STAX service (without any extensions). You can display the DTD that the STAX service is using (including any extensions) by issuing the GET DTD request and you can redirect the output to a file to create a stax.dtd file as described in section GET DTD.

```
<!--
   STAf eXecution (STAX) Document Type Definition (DTD)

   STAX Version: 3.5.17

   STAX Extension Elements: []

   Generated Date: 20160627-19:58:01

   This DTD module is identified by the SYSTEM identifier:

     SYSTEM 'stax.dtd'

-->

<!-- Parameter entities referenced in Element declarations -->

<!ENTITY % stax-elems 'function | script | signalhandler'>

<!ENTITY % task       'try | release | continue |
                       sequence | call-with-map | signalhandler |
                       message | process | testcase |
                       log | stafcmd | nop |
                       call-with-list | script | job |
                       return | hold | parallel |
                       rethrow | tcstatus | import |
```

```
                        loop | timer | if |
                        paralleliterate | throw | break |
                        iterate | block | breakpoint |
                        raise | terminate | call'>

<!--================= STAX Job Definition ========================== -->
<!--
     The root element STAX contains all other elements.  It consists
     of an optional defaultcall element and any number of function,
     script, and/or signalhandler elements.
-->
<!ELEMENT stax         ((%stax-elems;)*, defaultcall?, (%stax-elems;)*)>

<!--================= The Default Call Function Element ============ -->
<!--
     The defaultcall element defines the function to call by default
     to start the job.  This can be overridden by the 'FUNCTION'
     parameter when submitting the job to be executed.
     The function attribute's value is a literal.
-->
<!ELEMENT defaultcall  (#PCDATA)>
<!ATTLIST defaultcall
          function     IDREF    #REQUIRED
>

<!--=============== The Try / Catch / Finally Elements ============= -->
<!--
     The try element allows you to perform a task and to catch
     exceptions that are thrown.  Also, if a finally element is
     specified, then the finally task is executed, no matter whether
     the try task completes normally or abruptly, and no matter whether
     a catch element is first given control.
-->
<!ELEMENT try        ((%task;), ((catch+) | ((catch*), finally)))>
<!--
     The catch element performs a task when the specified exception is
     caught.  The var attribute specifies the name of the variable to
     receive the data specified within the throw element.  The typevar
     attribute specifies the name of the variable to receive the type
     of the exception.  The sourcevar attribute specifies the name
     of the variable to receive the source information for the exception.
```

```
-->
<!ELEMENT catch      (%task;)>
<!ATTLIST catch
          exception  CDATA        #REQUIRED
          var        CDATA        #IMPLIED
          typevar    CDATA        #IMPLIED
          sourcevar  CDATA        #IMPLIED
>
<!ELEMENT finally    (%task;)>

<!--================= The Release Element ========================== -->
<!--
     The release element specifies to release a block in the job.
     If an if attribute is specified and it evaluates via Python to
     false, the release element is ignored.
-->
<!ELEMENT release    EMPTY>
<!ATTLIST release
          block      CDATA    #IMPLIED
          if         CDATA    "1"
>

<!--================= Continue Element ============================== -->
<!--
     The continue element can be used to continue to the top of a loop
     or iterate element.
-->
<!ELEMENT continue   EMPTY>

<!--================= The Sequence Element ========================== -->
<!--
     The sequence element performs one or more tasks in sequence.
-->
<!ELEMENT sequence   (%task;)+>

<!--================= The Call-With-Map Element ===================== -->
<!--
     Perform a function with the referenced name with any number of
     arguments in the form of a map of named arguments.  The function
     and name attribute values as well as the argument value are
```

```
     evaluated via Python.
-->
<!ELEMENT call-with-map       (call-map-arg*)>
<!ATTLIST call-with-map
          function   CDATA    #REQUIRED
>

<!ELEMENT call-map-arg        (#PCDATA)>
<!ATTLIST call-map-arg
          name       CDATA    #REQUIRED
>

<!--================= The Signal Handler Element ================== -->
<!--
     The signalhandler element defines how to handle a specified signal.
     The signal attribute value is evaluated via Python.
-->
<!ELEMENT signalhandler (%task;)>
<!ATTLIST signalhandler
          signal     CDATA        #REQUIRED
>

<!--================= The Message Element ========================== -->
<!--
     Generates an event and makes the message value available to the
     STAX Job Monitor.  The message must evaluate via Python to a string.

     The log attribute is evaluated via Python to a boolean.  If it
     evaluates to true, the message text will also be logged in the STAX
     Job User log.  The log attribute defaults to the STAXLogMessage
     variable whose value defaults to 0 (false) but can by changed within
     the STAX job to turn on logging.

     The log level is ignored if the log attribute does not evaluate to
     true.  It defaults to 'info'.  If specified, it must evaluate via
     Python to a string containing one of the following STAF Log Service
     logging levels:
       fatal, warning, info, trace, trace2, trace3, debug, debug2,
       debug3, start, stop, pass, fail, status, user1, user2, user3,
       user4, user5, user6, user7, user8
```

```
     If an if attribute is specified and it evaluates via Python to
     false, the message element is ignored.
-->
<!ELEMENT message     (#PCDATA)>
<!ATTLIST message
          log         CDATA       "STAXLogMessage"
          level       CDATA       "'info'"
          if          CDATA       "1"
>

<!--================= The STAF Process Element ==================== -->
<!--
     Specifies a STAF process to be started.
     All of its non-empty element values are evaluated via Python.
-->
<!ENTITY % procgroup1 '((parms?, workdir?) | (workdir?, parms?))'>
<!ENTITY % procgroup2 '((title?, workload?) | (workload?, title?))'>
<!ENTITY % procgroup1a '((parms?, workload?) | (workload?, parms?))'>
<!ENTITY % procgroup2a '((title?, workdir?) | (workdir?, title?))'>
<!ENTITY % procgroup3 '(((vars | var | envs | env)*, useprocessvars?) |
                        (useprocessvars?, (vars | var | envs | env)*))'>
<!ENTITY % procgroup4 '(((username, password?)?, disabledauth?) |
                        ((disabledauth?, (username, password?)?)))'>
<!ENTITY % procgroup5 '((stdin?, stdout?, stderr?) |
                        (stdout?, stderr?, stdin?) |
                        (stderr?, stdin?, stdout?) |
                        (stdin?, stderr?, stdout?) |
                        (stdout?, stdin?, stderr?) |
                        (stderr?, stdout?, stdin?))'>
<!ENTITY % returnfileinfo '(returnfiles | returnfile)*'>
<!ENTITY % procgroup5a '((%returnfileinfo;, returnstdout?, returnstderr?) |
                        (returnstdout?, returnstderr?, %returnfileinfo;) |
                        (returnstderr?, %returnfileinfo;, returnstdout?) |
                        (%returnfileinfo;, returnstderr?, returnstdout?) |
                        (returnstdout?, %returnfileinfo;, returnstderr?) |
                        (returnstderr?, returnstdout?, %returnfileinfo;))'>
<!ENTITY % procgroup6 '((stopusing?, console?, focus?, statichandlename?) |
                        (stopusing?, console?, statichandlename?, focus?) |
                        (stopusing?, focus?, console?, statichandlename?) |
                        (stopusing?, focus?, statichandlename?, console?) |
                        (stopusing?, statichandlename?, console?, focus?) |
```

```
                          (stopusing?, statichandlename?, focus?, console?) |
                          (console?, focus?, stopusing?, statichandlename?) |
                          (console?, focus?, statichandlename?, stopusing?) |
                          (console?, stopusing?, focus?, statichandlename?) |
                          (console?, stopusing?, statichandlename?, focus?) |
                          (console?, statichandlename?, focus?, stopusing?) |
                          (console?, statichandlename?, stopusing?, focus?) |
                          (focus?, console?, stopusing?, statichandlename?) |
                          (focus?, console?, statichandlename?, stopusing?) |
                          (focus?, stopusing?, console?, statichandlename?) |
                          (focus?, stopusing?, statichandlename?, console?) |
                          (focus?, statichandlename?, console?, stopusing?) |
                          (focus?, statichandlename?, stopusing?, console?) |
                          (statichandlename?, stopusing?, console?, focus?) |
                          (statichandlename?, stopusing?, focus?, console?) |
                          (statichandlename?, console?, focus?, stopusing?) |
                          (statichandlename?, console?, stopusing?, focus?) |
                          (statichandlename?, focus?, console?, stopusing?) |
                          (statichandlename?, focus?, stopusing?, console?))'>
<!ELEMENT process    (location, command,
                      ((%procgroup1;, %procgroup2;) |
                       (%procgroup2;, %procgroup1;) |
                       (%procgroup1a;, %procgroup2a;) |
                       (%procgroup2a;, %procgroup1a;)),
                      %procgroup3;,
                      ((%procgroup4;, %procgroup5;, %procgroup5a;, %procgroup6;) |
                       (%procgroup4;, %procgroup6;, %procgroup5;, %procgroup5a;) |
                       (%procgroup5;, %procgroup5a;, %procgroup4;, %procgroup6;) |
                       (%procgroup5;, %procgroup5a;, %procgroup6;, %procgroup4;) |
                       (%procgroup6;, %procgroup4;, %procgroup5;, %procgroup5a;) |
                       (%procgroup6;, %procgroup5;, %procgroup5a;, %procgroup4;)),
                      other?, process-action?)>
<!ATTLIST process
          name        CDATA   #IMPLIED
>

<!--
     The process element must contain a location element and a
     command element.
-->
```

```
<!ELEMENT location            (#PCDATA)>
<!ELEMENT command             (#PCDATA)>
<!ATTLIST command
          mode        CDATA   "'default'"
          shell       CDATA   #IMPLIED
>

<!--
     The parms element specifies any parameters that you wish to
     pass to the command.
     The value is evaluated via Python to a string.
-->
<!ELEMENT parms               (#PCDATA)>
<!ATTLIST parms
          if        CDATA     "1"
>

<!--
     The workload element specifies the name of the workload for
     which this process is a member.  This may be useful in
     conjunction with other process elements.
     The value is evaluated via Python to a string.
-->
<!ELEMENT workload            (#PCDATA)>
<!ATTLIST workload
          if        CDATA     "1"
>

<!--
     The title element specifies the program title of the process.
     Unless overridden by the process, the title will be the text
     that is displayed on the title bar of the application.
     The value is evaluated via Python to a string.
-->
<!ELEMENT title               (#PCDATA)>
<!ATTLIST title
          if        CDATA     "1"
>

<!--
     The workdir element specifies the directory from which the
```

```
     command should be executed.  If you do not specify this
     element, the command will be started from whatever directory
     STAFProc is currently in.
     The value is evaluated via Python to a string.
-->
<!ELEMENT workdir             (#PCDATA)>
<!ATTLIST workdir
          if        CDATA     "1"
>

<!--
     The vars (and var) elements specify STAF variables that go into the
     process specific STAF variable pool.
     The value must evaluate via Python to a string or a list of
     strings. Multiple vars elements may be specified for a process.
     The format for each variable is:
       'varname=value'
     So, a list containing 3 variables could look like:
       ['var1=value1', 'var2=value2', 'var3=value3']
     Specifying only one variable could look like either:
       ['var1=value1']      or
       'var1=value1'
-->
<!ELEMENT vars                (#PCDATA)>
<!ATTLIST vars
          if        CDATA     "1"
>

<!ELEMENT var                 (#PCDATA)>
<!ATTLIST var
          if        CDATA     "1"
>

<!--
     The envs (and env) elements specify environment variables that will
     be set for the process.  Environment variables may be mixed case,
     however most programs assume environment variable names will
     be uppercase, so, in most cases, ensure that your environment
     variable names are uppercase.
     The value must evaluate via Python to a string or a list of
     strings. Multiple envs elements may be specified for a process.
```

```
        The format for each variable is:
          'varname=value'
        So, a list containing 3 variables could look like:
          ['ENV_VAR_1=value1', 'ENV_VAR_2=value2', 'ENV_VAR_3=value3']
        Specifying only one variable could look like either:
          ['ENV_VAR_1=value1']      or
          'ENV_VAR_1=value1'
    -->
    <!ELEMENT envs                (#PCDATA)>
    <!ATTLIST envs
              if        CDATA     "1"
    >

    <!ELEMENT env                 (#PCDATA)>
    <!ATTLIST env
              if        CDATA     "1"
    >
    <!--
        The useprocessvars element specifies that STAF variable
        references should try to be resolved from the STAF variable
        pool associated with the process being started first.
        If the STAF variable is not found in this pool, the STAF
        global variable pool should then be searched.
    -->
    <!ELEMENT useprocessvars      EMPTY>
    <!ATTLIST useprocessvars
              if        CDATA     "1"
    >

    <!--
        The stopusing element allows you to specify the method by
        which this process will be STOPed, if not overridden on the
        STOP command.
        The value is evaluated via Python to a string.
    -->
    <!ELEMENT stopusing           (#PCDATA)>
    <!ATTLIST stopusing
              if        CDATA     "1"
    >

    <!--
```

```
      The console element allows you to specify if the process should
      get a new console window or share the STAFProc console.

      use    Must evaluate via Python to a string containing either:
             - 'new' specifies that the process should get a new console
               window.  This option only has effect on Windows systems.
               This is the default for Windows systems.
             - 'same' specifies that the process should share the
               STAFProc console.  This option only has effect on Windows
               systems.  This is the default for Unix systems.
-->
<!ELEMENT console             EMPTY>
<!ATTLIST console
          if        CDATA     "1"
          use       CDATA     #REQUIRED
>

<!--
      The focus element allows you to specify the focus that is to be
      given to any new windows opened when starting a process on a Windows
      system.  The window(s) it effects depends on whether you are using
      the 'default' or the 'shell' command mode:
        - Default command mode (no SHELL option):  The focus specified is
          given to any new windows opened by the command specified.
        - Shell command mode:  The focus specified is given only to the
          new shell command window opened, not to any windows opened by
          the specified command.

      The focus element only has effect on Windows systems and requires
      STAF V3.1.4 or later on the machine where the process is run.

      mode   Must evaluate via Python to a string containing one of the
             following values:
             - 'background' specifies to display a window in the background
               (e.g. not give it focus) in its most recent size and position.
               This is the default.
             - 'foreground' specifies to display a window in the foreground
               (e.g. give it focus) in its most recent size and position.
             - 'minimized' specifies to display a window as minimized.
-->
<!ELEMENT focus               EMPTY>
```

```
<!ATTLIST focus
          if        CDATA     "1"
          mode      CDATA     #REQUIRED
>

<!--
     The username element specifies the username under which
     the process should be started.
     The value is evaluated via Python to a string.
-->
<!ELEMENT username            (#PCDATA)>
<!ATTLIST username
          if        CDATA     "1"
>

<!--
     The password element specifies the password with which to
     authenticate the user specified with the username element.
     The value is evaluated via Python to a string.
-->
<!ELEMENT password            (#PCDATA)>
<!ATTLIST password
          if        CDATA     "1"
>

<!-- The disabledauth element specifies the action to take if a
     username/password is specified but authentication has been disabled.

     action  Must evaluate via Python to a string containing either:
             - 'error' specifies that an error should be returned.
             - 'ignore'  specifies that any username/password specified
               is ignored if authentication is disabled.
             This action overrides any default specified in the STAF
             configuration file.
-->
<!ELEMENT disabledauth        EMPTY>
<!ATTLIST disabledauth
          if        CDATA     "1"
          action    CDATA     #REQUIRED
>
```

```
<!--
     Specifies that a static handle should be created for this process.
     The value is evaluated via Python to a string.  It will be the
     registered name of the static handle.  Using this option will also
     cause the environment variable STAF_STATIC_HANDLE to be set
     appropriately for the process.
-->
<!ELEMENT statichandlename    (#PCDATA)>
<!ATTLIST statichandlename
          if        CDATA     "1"
>

<!--
     The stdin element specifies the name of the file from which
     standard input will be read.  The value is evaluated via
     Python to a string.
-->
<!ELEMENT stdin               (#PCDATA)>
<!ATTLIST stdin
          if        CDATA     "1"
>

<!--
     The stdout element specifies the name of the file to which
     standard output will be redirected.
     The mode and filename are evaluated via Python to a string.
-->
<!ELEMENT stdout              (#PCDATA)>
<!--  mode  specifies what to do if the file already exists.
            The value must evaluate via Python to one of the
            following:
            'replace' - specifies that the file will be replaced.
            'append'  - specifies that the process' standard
                        output will be appended to the file.
-->
<!ATTLIST stdout
          if        CDATA     "1"
          mode      CDATA     "'replace'"
>
```

```
<!--
     The stderr element specifies the file to which standard error will
     be redirected. The mode and filename are evaluated via Python to a
     string.
-->
<!ELEMENT stderr              (#PCDATA)>
<!-- mode   specifies what to do if the file already exists or to
            redirect standard error to the same file as standard output.
            The value must evaluate via Python to one of the following:
            'replace' - specifies that the file will be replaced.
            'append'  - specifies that the process's standard error will
                        be appended to the file.
            'stdout'  - specifies to redirect standard error to the
                        same file to which standard output is redirected.
                        If a file name is specified, it is ignored.
-->
<!ATTLIST stderr
          if        CDATA     "1"
          mode      CDATA     "'replace'"
>

<!--
     The returnstdout element specifies to return in STAXResult
     the contents of the file where standard output was redirected
     when the process completes.
-->
<!ELEMENT returnstdout        EMPTY>
<!ATTLIST returnstdout
          if        CDATA     "1"
>

<!--
     The returnstderr element specifies to return in STAXResult
     the contents of the file where standard error was redirected
     when the process completes.
-->
<!ELEMENT returnstderr        EMPTY>
<!ATTLIST returnstderr
          if        CDATA     "1"
>
```

```
<!--
     The returnfiles (and returnfile) elements specify that the
     contents of the specified file(s) should be returned in
     STAXResult when the process completes.  The value must evaluate
     via Python to a string or a list of strings.  Multiple returnfile(s)
     elements may be specified for a process.
-->
<!ELEMENT returnfiles         (#PCDATA)>
<!ATTLIST returnfiles
          if        CDATA     "1"
>

<!ELEMENT returnfile          (#PCDATA)>
<!ATTLIST returnfile
          if        CDATA     "1"
>

<!--
     The process-action element specifies a task to be executed
     when a process has started.
-->
<!ELEMENT process-action      (%task;)>
<!ATTLIST process-action
          if        CDATA     "1"
>
<!--
     The other element specifies any other STAF parameters that
     may arise in the future.  It is used to pass additional data
     to the STAF PROCESS START request.
     The value is evaluated via Python to a string.
-->
<!ELEMENT other               (#PCDATA)>
<!ATTLIST other
          if        CDATA     "1"
>

<!--================= The Testcase Element ========================== -->
<!--
     Defines a testcase.  Used in conjunction with the tcstatus
     element to mark the status for a testcase.
     The name attribute value is evaluated via Python.
```

```
-->
<!ELEMENT testcase   (%task;)>
<!ATTLIST testcase
          name       CDATA    #REQUIRED
          mode       CDATA    "'default'"
>

<!--================= The Log Element ============================== -->
<!--
     Writes a message and its log level to a STAX Job User Log file.
     The message must evaluate via Python to a string.

     The log level specified defaults to 'info'.  If specified, it
     must evaluate via Python to a string containing one of the
     following STAF Log Service Log levels:
       fatal, warning, info, trace, trace2, trace3, debug, debug2,
       debug3, start, stop, pass, fail, status, user1, user2, user3,
       user4, user5, user6, user7, user8
     The message attribute is evaluated via Python.  If it evaluates
     to true, the message text will also be sent to the STAX Job Monitor.
     The message attribute defaults to the STAXMessageLog variable whose
     value defaults to 0 (false) but can by changed within the STAX job
     to turn on messaging.

     If an if attribute is specified and it evaluates via Python to
     false, then the log element is ignored.
-->
<!ELEMENT log         (#PCDATA)>
<!ATTLIST log
          level      CDATA       "'info'"
          message    CDATA       "STAXMessageLog"
          if         CDATA       "1"
>

<!--================= The STAF Command Element ===================== -->
<!--
     Specifies a STAF command to be executed.
     Its name and all of its element values are evaluated via Python.
-->
<!ELEMENT stafcmd    (location, service, request)>
<!ATTLIST stafcmd
```

```
          name       CDATA   #IMPLIED
>
<!ELEMENT service    (#PCDATA)>
<!ELEMENT request    (#PCDATA)>

<!--================= The No Operation Element ====================== -->
<!--
     No operation action.
-->
<!ELEMENT nop        EMPTY>

<!--================= The Call-With-List Element ==================== -->
<!--
     Perform a function with the referenced name with any number of
     arguments in the form of a list.  The function attribute value
     and argument values are evaluated via Python.
-->
<!ELEMENT call-with-list      (call-list-arg*)>
<!ATTLIST call-with-list
          function   CDATA    #REQUIRED
>

<!ELEMENT call-list-arg       (#PCDATA)>


<!--================= The Script Element ============================ -->
<!--
     Specifies Python code to be executed.
-->
<!ELEMENT script     (#PCDATA)>

<!--================= The STAX Job Element ====================== -->
<!--
     Specifies a STAX sub-job to be executed.  This element is equivalent
     to a STAX EXECUTE request.

     The name attribute specifies the name of the job. The job name
     defaults to the value of the function name called to start the job.
     Its name and all of its element values are evaluated via Python.
     The job element must contain a location element and either a
     file or data element.  This attribute is equivalent to the
```

JOBNAME option for a STAX EXECUTE command.

The clearlogs attribute specifies to delete the STAX Job and Job User logs before the job is executed to ensure that only one job's contents are in the log. This attribute is equivalent to the CLEARLOGS option for a STAX EXECUTE command. The default is the same option that was specified for the parent job. Valid values include 'parent', 'default', 'enabled', and 'disabled'.

The monitor attribute specifies whether to automatically monitor the subjob. Note that 'Automatically monitor recommended sub-jobs' must be selected in the STAX Job Monitor properties in order for it to be used. The default value for the monitor attribute is 0, a false value.

The logtcelapsedtime attribute specifies to log the elapsed time for a testcase in the summary record in the STAX Job log and on a LIST TESTCASES request. This attribute is equivalent to the LOGTCELAPSEDTIME option for a STAX EXECUTE command. The default is the same option that was specified for the parent job. Valid values include 'parent', 'default', 'enabled', and 'disabled'.

The logtcnumstarts attribute specifies to log the number of starts for a testcase in the summary record in the STAX Job log and on a LIST TESTCASES request. This attribute is equivalent to the LOGNUMSTARTS option for a STAX EXECUTE command. The default is the same option that was specified for the parent job. Valid values include 'parent', 'default', 'enabled', and 'disabled'.

The logtcstartstop attribute specifies to log start/stop records for testcases in the STAX Job log. This attribute is equivalent to the LOGTCSTARTSTOP option for a STAX EXECUTE command. The default is the same option that was specified for the parent job. Valid values include 'parent', 'default', 'enabled', and 'disabled'.

The pythonoutput attribute specifies where to write Python stdout/stderr (e.g. from a print statement in a script element). This attribute is equivalent to the PYTHONOUTPUT option for a STAX EXECUTE command. The default is the same option that was specified for the parent job. Valid values include 'parent', 'default', 'jobuserlog', 'message', 'jobuserlogandmsg', and 'jvmlog'.

```
      The pythonloglevel attribute specifies the log level to use when writing
      Python stdout (e.g. from a print statement in a script element) if the
      python output is written to the STAX Job User Log.  This attribute is
      equivalent to the PYTHONLOGLEVEL option for a STAX EXECUTE command.
      The default is the same option that was specified for the parent job.
      Valid values include 'parent', 'default', or a valid STAF log level
      such as 'Info', 'Trace', 'User1', etc.

      The invalidloglevelaction attribute specifies the action to take when a
      log or message element uses an invalid STAF logging level.  This attribute
      is equivalent to the INVALIDLOGLEVELACTION option for a STAX EXECUTE
      command.  The default is the same option that was specified for the parent
      job.  Valid values include 'parent', 'default', 'raisesignal', and
      'loginfo'.

      The job element must contain either a job-file or job-data element.

      The job element has the following optional elements:
        job-function, job-function-args, job-scriptfile(s), job-script,
        job-hold, and job-action

      Each of these optional elements may specify an if attribute.
      The if attribute must evaluate via Python to a true or false value.
      If it does not evaluate to a true value, the element is ignored.
      The default value for the if attribute is 1, a true value.
      Note that in Python, true means any nonzero number or nonempty
      object; false means not true, such as a zero number, an empty
      object, or None. Comparisons and equality tests return 1 or 0
      (true or false).
  -->
  <!ELEMENT job        ((job-file | job-data),
                        job-function?, job-function-args?,
                        (job-scriptfile | job-scriptfiles)?,
                        job-script*, job-hold?, job-action?)>
  <!ATTLIST job
            name                CDATA   #IMPLIED
            clearlogs           CDATA   "'parent'"
            monitor             CDATA   #IMPLIED
            logtcelapsedtime    CDATA   "'parent'"
```

```
          logtcnumstarts        CDATA   "'parent'"
          logtcstartstop        CDATA   "'parent'"
          pythonoutput          CDATA   "'parent'"
          pythonloglevel        CDATA   "'parent'"
          invalidloglevelaction CDATA   "'parent'"
>

<!--
     The job-file element specifies the fully qualified name of a file
     containing the XML document for the STAX job to be executed.
     The job-file element is equivalent to the FILE option for a STAX
     EXECUTE command.

     The machine attribute specifies the name of the machine where the
     xml file is located.  If not specified, it defaults to Python
     variable STAXJobXMLMachine.  The machine attribute is equivalent
     to the MACHINE option for a STAX EXECUTE command.
  -->
<!ELEMENT job-file          (#PCDATA)>
<!ATTLIST job-file
          machine    CDATA   "STAXJobXMLMachine"
>

<!--
     The job-data element specifies a string containing the XML document
     for the job to be executed.  This element is equivalent to the
     DATA option for a STAX EXECUTE command.

     The eval attribute specifies whether the data is be evaluated by
     Python in the parent job.  For example, if the job-data information
     is dynamically generated and assigned to a Python variable, rather
     than just containing the literal XML information, then you would
     need to set the eval attribute to true (e.g. eval="1").
     The default for the eval attribute is false ("0").
  -->
<!ELEMENT job-data          (#PCDATA)>
<!ATTLIST job-data
          eval       CDATA   "0"
>

<!--
```

```
     The job-function element specifies the name of the function element
     to call to start the job, overriding the defaultcall element, if any,
     specified in the XML document. The <function name> must be the name
     of a function element specified in the XML document. This element is
     equivalent to the FUNCTION option for a STAX EXECUTE command.
-->
<!ELEMENT job-function       (#PCDATA)>
<!ATTLIST job-function
          if         CDATA   "1"
>

<!--
     The job-function-args element specifies arguments to pass to the
     function element called to start the job, overriding the arguments,
     if any, specified for the defaultcall element in the XML document.
     This element is equivalent to the ARGS option for a STAX EXECUTE
     command.

     The eval attribute specifies whether the data is to be evaluated
     by Python in the parent job.  The default for the eval attribute
     is false ("0").
-->
<!ELEMENT job-function-args  (#PCDATA)>
<!ATTLIST job-function-args
          if         CDATA   "1"
          eval       CDATA   "0"
>

<!--
     The job-script element specifies Python code to be executed.
     This element is equivalent to the SCRIPT option for a STAX
     EXECUTE command.  Multiple job-script elements may be specified.

     The eval attribute specifies whether the data is to be evaluated
     by Python in the parent job.  The default for the eval attribute
     is false ("0").
-->
<!ELEMENT job-script         (#PCDATA)>
<!ATTLIST job-script
          if         CDATA   "1"
          eval       CDATA   "0"
```

```
>

<!--
     The job-scriptfile element (equivalent to the job-scriptfiles
     element) specifies the fully qualified name of a file containing
     Python code to be executed, or a list of file names containing
     Python code to be executed. The value must evaluate via Python to
     a string or a list of strings. This element is equivalent to the
     SCRIPTFILE option for a STAX EXECUTE command.

     Specifying only one scriptfile could look like either:
       ['C:/stax/scriptfiles/scriptfile1.py']      or
       'C:/stax/scriptfiles/scriptfiel1.py'
     Specifying a list containing 3 scriptfiles could look like:
       ['C:/stax/scriptfiles/scriptfile1.py',
        'C:/stax/scriptfiles/scriptfile2.py',
         C:/stax/scriptfiles/scriptfile2.py' ]

     The machine attribute specifies the name of the machine where the
     SCRIPTFILE(s) are located. If not specified, it defaults to Python
     variable STAXJobScriptFileMachine.  This attribute is equivalent
     to the SCRIPTFILEMACHINE option for a STAX EXECUTE command.
-->
<!ELEMENT job-scriptfile     (#PCDATA)>
<!ATTLIST job-scriptfile
          if         CDATA   "1"
          machine    CDATA   "STAXJobScriptFileMachine"
>

<!ELEMENT job-scriptfiles    (#PCDATA)>
<!ATTLIST job-scriptfiles
          if         CDATA   "1"
          machine    CDATA   "STAXJobScriptFileMachine"
>

<!--
     The job-hold element specifies to hold the job.  This element is
     equivalent to the HOLD option for a STAX EXECUTE command,

     The default timeout is 0 which specifies to hold the job indefinitely.
     A non-zero timeout value specifies the maximum time that the job
```

```
     will be held,  The timeout can be expressed in milliseconds, seconds,
     minutes, hours, days, weeks, or years.  It is evaluated via Python.
       Examples:  timeout="'1000'"   (1000 milliseconds or 1 second)
                  timeout="'5s'"     (5 seconds)
                  timeout="'1m'"     (1 minute)
                  timeout="'2h'"     (2 hours)
                  timeout="'0'"      (hold indefinitely)
-->
<!ELEMENT job-hold           (#PCDATA)>
<!ATTLIST job-hold
          if         CDATA   "1"
          timeout    CDATA   "0"
>

<!--
     The job-action element specifies a task to be executed after the
     sub-job has started. This task will be executed in parallel with
     the sub-job via a new STAX-Thread. The task will be able to use the
     STAXSubJobID variable to obtain the sub-job ID in order to interact
     with the job. If the job completes before the task completes, the
     job will remain in a non-complete state until the task completes.
     If the job cannot be started, the job-action task is not executed.
-->
<!ELEMENT job-action         (%task;)>
<!ATTLIST job-action
          if        CDATA    "1"
>

<!--================= The Return Element ============================ -->
<!--
     Specifies a value to return from a function.
-->
<!ELEMENT return     (#PCDATA)>

<!--================= The Hold Element ============================== -->
<!--
     The hold element specifies to hold a block in the job.
     If an if attribute is specified and it evaluates via Python to
     false, the hold element is ignored.

     The default timeout is 0 which specifies to hold the block
```

```
     indefinitely.  A non-zero timeout value specifies the maximum time
     that the block will be held,  The timeout can be expressed in
     milliseconds, seconds, minutes, hours, days, or weeks.
     It is evaluated via Python.
       Examples:  timeout="'1000'"   (1000 milliseconds or 1 second)
                  timeout="'5s'"     (5 seconds)
                  timeout="'1m'"     (1 minute)
                  timeout="'2h'"     (2 hours)
                  timeout="0"        (hold indefinitely)
-->
<!ELEMENT hold       EMPTY>
<!ATTLIST hold
          block      CDATA    #IMPLIED
          if         CDATA    "1"
          timeout    CDATA    "0"
>

<!--================= The Parallel Element ========================== -->
<!--
     The parallel element performs one or more tasks in parallel.
-->
<!ELEMENT parallel   (%task;)+>

<!--================= The Rethrow Element ========================== -->
<!--
     The rethrow element specifies to rethrow the current exception.
-->
<!ELEMENT rethrow      EMPTY>

<!--================= The Testcase Status Element ================== -->
<!--
     Marks status result ('pass' or 'fail' or 'info') for a testcase
     and allows additional information to be specified.  The status
     result and the additional info is evaluated via Python.
-->
<!ELEMENT tcstatus   (#PCDATA)>
<!ATTLIST tcstatus
          result     CDATA  #REQUIRED
>

<!--================= The Import Element ============================ -->
```

```
<!--
     Allows importing of functions from other STAX XML job file(s).
     Either the file or directory attribute must be specified.
     All attributes and sub-elements are evaluated via Python.
-->
<!ELEMENT import         (import-include?, import-exclude?)?>
<!ATTLIST import
          file           CDATA       #IMPLIED
          directory      CDATA       #IMPLIED
          machine        CDATA       #IMPLIED
          replace        CDATA       "0"
          mode           CDATA       "'error'"
>
<!ELEMENT import-include (#PCDATA)>
<!ELEMENT import-exclude (#PCDATA)>


<!--================= The Loop Element ============================== -->
<!--
     The loop element performs a task a specified number of times,
     allowing specification of an upper and lower bound with an
     increment value and where the index counter is available to
     sub-tasks.  Also, while and/or until expressions can be
     specified.
-->
<!ELEMENT loop       (%task;)>
<!-- var      is the name of a variable which will contain the loop
               index variable.  It is a literal.
     from     is the starting value of the loop index variable.
               It must evaluate to an integer value via Python.
     to       is the maximum value of the loop index variable
               It must evaluate to an integer value via Python.
     by       is the increment value for the loop index variable
               It must evaluate to an integer value via Python.
     while    is an expression that must evaluate to a boolean value
               and is performed at the top of each loop.  If it
               evaluates to false, it breaks out of the loop.
     until    is an expression that must evaluate to a boolean value
               and is performed at the bottom of each loop.  If it
               evaluates to false, it breaks out of the loop.
```

```
-->
<!ATTLIST loop
          var         CDATA    #IMPLIED
          from        CDATA    '1'
          to          CDATA    #IMPLIED
          by          CDATA    '1'
          while       CDATA    #IMPLIED
          until       CDATA    #IMPLIED
>

<!--================= The Timer Element ============================ -->
<!--
     The timer element runs a task for a specified duration.
     If the task is still running at the end of the specified duration,
     then the RC variable is set to 1, else if the task ended before
     the specified duration, the RC variable is set to 0, else if the
     timer could not start due to an invalid duration, the RC variable
     is set to -1.
-->
<!ELEMENT timer     (%task;)>
<!-- duration is the maximum length of time to run the task.
       Time can be expressed in milliseconds, seconds, minutes,
       hours, days, weeks, or years.  It is evaluated via Python.
         Examples:  duration='50'    (50 milliseconds)
                    duration='90s'   (90 seconds)
                    duration='5m'    ( 5 minutes)
                    duration='36h'   (36 hours)
                    duration='3d'    ( 3 days)
                    duration='1w'    ( 1 week)
                    duration='1y'    ( 1 year)
-->
<!ATTLIST timer
          duration   CDATA        #REQUIRED
>

<!--================= The Conditional Element (if-then-else) ======= -->
<!--
     Allows you to write an if or a case construct with zero or more
     elseifs and one or no else statements.

     The expr attribute value is evaluated via Python and must evaluate
```

```
     to a boolean value.
-->
<!ELEMENT if         ((%task;), elseif*, else?)>
<!ATTLIST if
          expr       CDATA   #REQUIRED
>
<!ELEMENT elseif     (%task;)>
<!ATTLIST elseif
          expr       CDATA   #REQUIRED
>
<!ELEMENT else       (%task;)>

<!--================= The Parallel Iterate Element ================ -->
<!--
     The parallel iterate element iterates through a list of items,
     performing its contained task while substituting each item in
     the list.  The iterated tasks are performed in parallel.
-->
<!ELEMENT paralleliterate  (%task;)>
<!-- var      is the name of a variable which will contain the current
              item in the list or tuple being iterated.
              It is a literal.
     in       is the list or tuple to be iterated.  It is evaluated
              via Python and must evaluate to be a list or tuple.
     indexvar is the name of a variable which will contain the index of
              the current item in the list or tuple being iterated.
              It is a literal.  The value of the first index is 0.
     maxthreads is the maximum number of STAX-Threads that can be running
              simultaneously at a time.  It must evaluate to an integer
              value >= 0 via Python.  The default is 0 which means
              there is no maximum.
-->
<!ATTLIST paralleliterate
          var        CDATA    #REQUIRED
          in         CDATA    #REQUIRED
          indexvar   CDATA    #IMPLIED
          maxthreads CDATA    "0"
>

<!--================= The Throw Element ============================ -->
<!--
```

```
     The throw element specifies an exception to throw.
     The exception attribute value and any additional information
     is evaluated via Python.
-->
<!ELEMENT throw      (#PCDATA)>
<!ATTLIST throw
          exception  CDATA        #REQUIRED
>

<!--================= Break Element ================================ -->
<!--
     The break element can be used to break out of a loop or iterate
     element.
-->
<!ELEMENT break      EMPTY>

<!--================= The Function Element ========================== -->
<!--
     The function element defines a named task which can be called.
     The name, requires, and scope attribute values are literals.
     If desired, the function can be described using a function-prolog
     element (or the deprecated function-description element) and/or a
     function-epilog element.  Also, if desired, the function element
     can define the arguments that can be passed to the function.
     The function element can also define any number of function-import
     elements if it requires functions from other xml files.  The
     function-import element must specify either the file or directory
     attribute.
-->
<!ELEMENT function    ((function-prolog | function-description)?,
                       (function-epilog)?,
                       (function-import)*,
                       (function-no-args | function-single-arg |
                        function-list-args | function-map-args)?,
                       (%task;))>
<!ATTLIST function
          name         ID       #REQUIRED
          requires     IDREFS   #IMPLIED
          scope        (local | global) "global"
>
```

```
<!ELEMENT function-prolog       (#PCDATA)>

<!ELEMENT function-epilog       (#PCDATA)>

<!ELEMENT function-description  (#PCDATA)>

<!ELEMENT function-import       (#PCDATA)>
<!ATTLIST function-import
          file         CDATA    #IMPLIED
          directory    CDATA    #IMPLIED
          machine      CDATA    #IMPLIED
>
<!ELEMENT function-no-args      EMPTY>

<!ELEMENT function-single-arg   (function-required-arg |
                                 function-optional-arg |
                                 function-arg-def)>

<!ELEMENT function-list-args    ((((function-required-arg+,
                                    function-optional-arg*) |
                                   (function-required-arg*,
                                    function-optional-arg+)),
                                  (function-other-args)?) |
                                  function-arg-def+)>

<!ELEMENT function-map-args     (((function-required-arg |
                                   function-optional-arg)+,
                                  (function-other-args+)?) |
                                  function-arg-def+)>

<!ELEMENT function-required-arg (#PCDATA)>
<!ATTLIST function-required-arg
          name         CDATA    #REQUIRED
>

<!ELEMENT function-optional-arg (#PCDATA)>
<!ATTLIST function-optional-arg
          name         CDATA    #REQUIRED
          default      CDATA    "None"
>
```

```
<!ELEMENT function-other-args   (#PCDATA)>
<!ATTLIST function-other-args
          name         CDATA    #REQUIRED
>

<!ELEMENT function-arg-def      (function-arg-description?,
                                 function-arg-private?,
                                 function-arg-property*)>
<!ATTLIST function-arg-def
          name         CDATA    #REQUIRED
          type         (required | optional | other) "required"
          default      CDATA    "None"
>

<!ELEMENT function-arg-description  (#PCDATA)>

<!ELEMENT function-arg-private   EMPTY>

<!ELEMENT function-arg-property  (function-arg-property-description?,
                                  function-arg-property-data*)>
<!ATTLIST function-arg-property
          name         CDATA    #REQUIRED
          value        CDATA    #IMPLIED
>

<!ELEMENT function-arg-property-description  (#PCDATA)>

<!ELEMENT function-arg-property-data (function-arg-property-data)*>
<!ATTLIST function-arg-property-data
          type         CDATA    #REQUIRED
          value        CDATA    #IMPLIED
>

<!--================= The Iterate Element ========================== -->
<!--
     The iterate element iterates through a list of items, performing
     its contained task while substituting each item in the list.
     The iterated tasks are performed in sequence.
-->
<!ELEMENT iterate  (%task;)>
<!-- var      is the name of the variable which will contain the
```

```
                current item in the list or tuple being iterated.
                It is a literal.
     in         is the list or tuple to be iterated.  It is evaluated
                via Python and must evaluate to be a list or tuple.
     indexvar   is the name of a variable which will contain the index of
                the current item in the list or tuple being iterated.
                It is a literal.  The value for the first index is 0.
-->
<!ATTLIST iterate
          var         CDATA    #REQUIRED
          in          CDATA    #REQUIRED
          indexvar    CDATA    #IMPLIED
>

<!--================= The Block Element ============================ -->
<!--
     Defines a task block that can be held, released, or terminated.
     Used in conjunction with the hold/terminate/release elements to
     define a task block that can be held, terminated, or released.
     The name attribute value is evaluated via Python.
-->
<!ELEMENT block      (%task;)>
<!ATTLIST block
          name        CDATA    #REQUIRED
>

<!--================= The Breakpoint Element ============================ -->
<!--
     The breakpoint element allows you to denote a breakpoint.
-->
<!ELEMENT breakpoint     EMPTY>

<!--================= The Raise Element ============================ -->
<!--
     A raise signal element raises a specified signal.
     Signals can also be raised by the STAX execution engine.
     The signal attribute value is evaluated via Python.
-->
<!ELEMENT raise      EMPTY>
<!ATTLIST raise
```

```
          signal     CDATA        #REQUIRED
>

<!--================= The Terminate Element ======================== -->
<!--
     The terminate element specifies to terminate a block in the job.
     If an if attribute is specified and it evaluates via Python to
     false, the terminate element is ignored.
-->
<!ELEMENT terminate  EMPTY>
<!ATTLIST terminate
          block      CDATA    #IMPLIED
          if         CDATA    "1"
>

<!--================= The Call Element ============================== -->
<!--
     Perform a function with the referenced name.
     The function attribute value is evaluated via Python.
     Arguments can be specified as data to the call element.
     Arguments are evaluated via Python.
-->
<!ELEMENT call       (#PCDATA)>
<!ATTLIST call
          function   CDATA    #REQUIRED
>
```

Appendix E: References

- See the http://www.jython.org website for more information about Jython.
- See the http://www.python.org website for more information about Python.
- See the http://www.w3c.org website for more information about XML. See the http://www.xml.org/xml/resources_focus_beginnerguide.shtml website for an XML Beginner's Guide.
- For more information about the XML Parser for Java used by STAX to validate and parse XML documents:
  - See the http://w3.xml.ibm.com/xml4j website.
  - Otherwise, see the http://xml.apache.org/xerces2-j website.

Appendix F: Jython and CPython Differences

Although in most cases Jython behavior is identical to the C-language implementation of Python (CPython), there are still cases where the two implementations differ. If you are already a CPython programmer, or are hoping to use CPython code under Jython, you need to be aware of these differences. Also, there is a time lag between a new CPython release and the corresponding Jython release. STAX uses Jython 2.5.2 which implements the same set of language features as CPython 2.5. Jython 2.5.2 cannot execute Python code that uses functions that were provided in later versions of Python, such as Python 2.6.

Most Python modules that are written in Python work fine in Jython. A few types of modules will not run under Jython such as:

- Modules that contain functionality not included in a JVM

  Some standard CPython modules depend on operating system calls that are not available under Java. The most notable of these is *os*, which actually does run in Jython, but is missing much of its functionality.

- Modules that are implemented in C

  A number of common CPython modules are implemented in C rather than Python, either for a speed boost or because the module is a C wrapper around an external C library. The C modules, or any modules that depend on them, will not run in Jython.

See the "Jython Essentials" book, written by Samuele Pedroni and Noel Rappin, for more information about the differences between Jython and CPython.

Appendix G: Licenses and Acknowledgements

Jython

Jython is an implementation of the high-level, dynamic, object-oriented language Python written in 100% Pure Java, and seamlessly integrated with the Java platform. It thus allows you to run Python on any Java platform.

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