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Junos<sup>®</sup> OS

# Operations Automation Developer Guide

Release  
13.2



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*Junos® OS Operations Automation Developer Guide*

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# About the Documentation

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## Supported Platforms

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For the features described in this document, the following platforms are supported:

- ACX Series
- EX Series
- J Series
- M Series
- MX Series
- QFX Series
- SRX Series
- T Series
- PTX Series

## Using the Examples in This Manual

---

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

If the example configuration does not start at the top level of the hierarchy, the example is a *snippet*. In this case, use the **load merge relative** command. These procedures are described in the following sections.

### Merging a Full Example

To merge a full example, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration example into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following configuration to a file and name the file **ex-script.conf**. Copy the **ex-script.conf** file to the **/var/tmp** directory on your routing platform.

```
system {
  scripts {
    commit {
      file ex-script.xml;
    }
  }
}
interfaces {
  fxp0 {
    disable;
    unit 0 {
      family inet {
        address 10.0.0.1/24;
      }
    }
  }
}
```

2. Merge the contents of the file into your routing platform configuration by issuing the **load merge** configuration mode command:

```
[edit]
user@host# load merge /var/tmp/ex-script.conf
load complete
```

## Merging a Snippet

To merge a snippet, follow these steps:

1. From the HTML or PDF version of the manual, copy a configuration snippet into a text file, save the file with a name, and copy the file to a directory on your routing platform.

For example, copy the following snippet to a file and name the file **ex-script-snippet.conf**. Copy the **ex-script-snippet.conf** file to the **/var/tmp** directory on your routing platform.

```
commit {
  file ex-script-snippet.xml; }
```

2. Move to the hierarchy level that is relevant for this snippet by issuing the following configuration mode command:

```
[edit]
user@host# edit system scripts
[edit system scripts]
```

3. Merge the contents of the file into your routing platform configuration by issuing the **load merge relative** configuration mode command:

```
[edit system scripts]
user@host# load merge relative /var/tmp/ex-script-snippet.conf
load complete
```

For more information about the **load** command, see the *CLI User Guide*.

## Documentation Conventions

Table 1 on page xiii defines notice icons used in this guide.

Table 1: Notice Icons

Icon	Meaning	Description
	Informational note	Indicates important features or instructions.
	Caution	Indicates a situation that might result in loss of data or hardware damage.
	Warning	Alerts you to the risk of personal injury or death.
	Laser warning	Alerts you to the risk of personal injury from a laser.

Table 2 on page xiv defines the text and syntax conventions used in this guide.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
<b>Bold text like this</b>	Represents text that you type.	To enter configuration mode, type the <b>configure</b> command:  user@host> <b>configure</b>
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> <b>show chassis alarms</b>  No alarms currently active
<i>Italic text like this</i>	<ul style="list-style-type: none"> <li>Introduces or emphasizes important new terms.</li> <li>Identifies book names.</li> <li>Identifies RFC and Internet draft titles.</li> </ul>	<ul style="list-style-type: none"> <li>A policy <i>term</i> is a named structure that defines match conditions and actions.</li> <li><i>Junos OS System Basics Configuration Guide</i></li> <li>RFC 1997, <i>BGP Communities Attribute</i></li> </ul>
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name:  [edit] root@# <b>set system domain-name</b> <i>domain-name</i>
<b>Text like this</b>	Represents names of configuration statements, commands, files, and directories; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> <li>To configure a stub area, include the <b>stub</b> statement at the [edit protocols <b>ospf area area-id</b>] hierarchy level.</li> <li>The console port is labeled <b>CONSOLE</b>.</li> </ul>
< > (angle brackets)	Enclose optional keywords or variables.	<b>stub</b> <default-metric <i>metric</i> >;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	<b>broadcast</b>   <b>multicast</b>  ( <i>string1</i>   <i>string2</i>   <i>string3</i> )
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	<b>rsvp { # Required for dynamic MPLS only</b>
[ ] (square brackets)	Enclose a variable for which you can substitute one or more values.	<b>community name members</b> [ <i>community-ids</i> ]
Indentation and braces ( { } )	Identify a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	

---

#### GUI Conventions

---

Table 2: Text and Syntax Conventions (*continued*)

Convention	Description	Examples
<b>Bold text like this</b>	Represents graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> <li>In the Logical Interfaces box, select <b>All Interfaces</b>.</li> <li>To cancel the configuration, click <b>Cancel</b>.</li> </ul>
> (bold right angle bracket)	Separates levels in a hierarchy of menu selections.	In the configuration editor hierarchy, select <b>Protocols&gt;Ospf</b> .

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- Software release version (if applicable)

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- Download the latest versions of software and review release notes:  
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- Search technical bulletins for relevant hardware and software notifications:  
<https://www.juniper.net/alerts/>
- Join and participate in the Juniper Networks Community Forum:  
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- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

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## PART 1

# Overview

- [Op Scripts Overview on page 3](#)



## CHAPTER 1

# Op Scripts Overview

- [Op Script Overview on page 3](#)
- [How Op Scripts Work on page 4](#)

## Op Script Overview

---

Junos OS operation (op) scripts automate network and device management and troubleshooting. Op scripts can perform any function available through the remote procedure calls (RPCs) supported by either the Junos XML management protocol or the Junos Extensible Markup Language (XML) API. Op scripts can be executed manually in the CLI or upon user login, or they can be called from another script. They are executed by the Junos OS management (mgd) process.

Op scripts enable you to do the following things:

- Create custom operational mode commands
- Execute a series of operational mode commands
- Customize the output of operational mode commands
- Shorten troubleshooting time by gathering operational information and iteratively narrowing down the cause of a network problem
- Perform controlled configuration changes
- Monitor the overall status of a device by creating a general operation script that periodically checks network warning parameters, such as high CPU usage.

Op scripts are based on the Junos XML management protocol, and the Junos XML API, which are discussed in *Junos XML API* and *Junos XML Management Protocol Overview*. Op scripts can be written in either the Extensible Stylesheet Language Transformations (XSLT) or Stylesheet Language Alternative Syntax (SLAX) scripting language. Op scripts use XPath to locate the operational objects to be inspected and XSLT constructs to specify the actions to perform on the located operational objects. The actions can change the output or execute additional commands based on the output.

### Related Documentation

- [SLAX Overview](#)
- [XPath Overview](#)
- [XSLT Overview](#)

## How Op Scripts Work

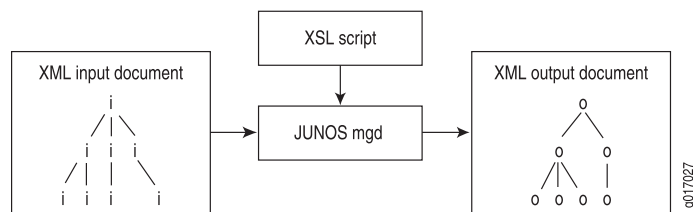
Op scripts execute Junos OS operational commands and inspect the resulting output. After inspection, op scripts can automatically correct errors within the device running Junos OS based on this output.

You add op scripts to device operations by listing the filenames of one or more op script files within the **[edit system scripts op]** hierarchy level. These files must be added to the appropriate op script file directory. For more information about op script file directories, see *Storing Scripts in Flash Memory*. Once added to the device, op scripts are invoked from the command line, using the **op filename** command.

You can use op scripts to generate changes to the device configuration by including the **<load-configuration>** tag element. Because the changes are loaded before the standard validation checks are performed, they are validated for correct syntax, just like statements already present in the configuration before the script is applied. If the syntax is correct, the configuration is activated and becomes the active, operational device configuration.

Figure 1 on page 4 shows a high-level view of the flow of op script input and output.

**Figure 1: Op Script Input and Output**



## PART 2

# Configuration

- [Creating and Executing Op Scripts on page 7](#)
- [Op Script Examples on page 25](#)
- [Summary of Operations Automation Configuration Statements on page 71](#)



## CHAPTER 2

# Creating and Executing Op Scripts

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- [Mapping Operational Mode Commands and Output Fields to Junos XML Notation on page 9](#)
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## Required Boilerplate for Op Scripts

---

When you write operation (op) scripts, you use Extensible Stylesheet Language Transformations (XSLT) or Stylesheet Language Alternative Syntax (SLAX) tools provided with Junos OS. These tools include basic boilerplate that you must include in all op scripts, optional extension functions that accomplish scripting tasks more easily, and named templates that make scripts easier to read and write, which you import from a file called **junos.xsl**. For more information about the extension functions and templates, see *Junos Script Automation: Understanding Extension Functions in the jcs and slax Namespaces* and *Junos Script Automation: Named Templates in the jcs Namespace Overview*.

Op scripts are based on Junos XML and Junos XML protocol tag elements. Like all XML elements, angle brackets enclose the name of a Junos XML or Junos XML protocol tag element in its opening and closing tags. This is an XML convention, and the brackets are a required part of the complete tag element name. They are not to be confused with the angle brackets used in the documentation to indicate optional parts of Junos OS CLI command strings.

You must include either XSLT or SLAX boilerplate as the starting point for all op scripts that you create. The XSLT boilerplate follows:

**XSLT Boilerplate for  
Op Scripts**

```
1 <?xml version="1.0" standalone="yes"?>
2 <xsl:stylesheet version="1.0"
3   xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
4   xmlns:junos="http://xml.juniper.net/junos/*/junos"
5   xmlns:xnm="http://xml.juniper.net/xnm/1.1/xnm"
6   xmlns:jcs="http://xml.juniper.net/junos/commit-scripts/1.0">
7   <xsl:import href="../import/junos.xsl"/>

8   <xsl:template match="/">
9     <op-script-results>
10      <!-- ... insert your code here ... -->
11    </op-script-results>
12  </xsl:template>

  <!-- ... insert additional template definitions here ... -->
</xsl:stylesheet>
```

Line 1 is the Extensible Markup Language (XML) processing instruction (PI), which marks this file as XML and specifies the version of XML as 1.0. The XML PI, if present, must be the first non-comment token in the script file.

```
1 <?xml version="1.0"?>
```

Line 2 opens the style sheet and specifies the XSLT version as 1.0.

```
2 <xsl:stylesheet version="1.0"
```

Lines 3 through 6 list all the namespace mappings commonly used in operation scripts. Not all of these prefixes are used in this example, but it is not an error to list namespace mappings that are not referenced. Listing all namespace mappings prevents errors if the mappings are used in later versions of the script.

```
3   xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
4   xmlns:junos="http://xml.juniper.net/junos/*/junos"
5   xmlns:xnm="http://xml.juniper.net/xnm/1.1/xnm"
6   xmlns:jcs="http://xml.juniper.net/junos/commit-scripts/1.0">
```

Line 7 is an XSLT import statement. It loads the templates and variables from the file referenced as `../import/junos.xsl`, which ships as part of Junos OS (in the file `/usr/libdata/cscript/import/junos.xsl`). The `junos.xsl` file contains a set of named templates you can call in your scripts. These named templates are discussed in *Junos Script Automation: Named Templates in the jcs Namespace Overview* and *Junos Named Templates in the jcs Namespace Summary*.

```
7   <xsl:import href="../import/junos.xsl"/>
```

Line 8 defines a template that matches the `</>` element. The `<xsl:template match="/">` element is the root element and represents the top level of the XML hierarchy. All XML Path Language (XPath) expressions in the script must start at the top level. This allows the script to access all possible Junos XML and Junos XML protocol remote procedure calls (RPCs). For more information, see *XPath Overview*.

```
8   <xsl:template match="/">
```

After the `<xsl:template match="/">` tag element, the `<op-script-results>` and `</op-script-results>` container tags must be the top-level child tags, as shown in Lines 9 and 10.

```
9     <op-script-results>
10      <!-- ... insert your code here ... -->
```



```
10      </op-script-results>
```

Line 11 closes the template.

```
11      </xsl:template>
```

Between Line 11 and Line 12, you can define additional XSLT templates that are called from within the `<xsl:template match="/">` template.

Line 12 closes the style sheet and the op script.

```
12 </xsl:stylesheet>
```

### SLAX Boilerplate for Op Scripts

The corresponding SLAX boilerplate is as follows:

```
version 1.0;

ns junos = "http://xml.juniper.net/junos/*/junos";
ns xnm = "http://xml.juniper.net/xnm/1.1/xnm";
ns jcs = "http://xml.juniper.net/junos/commit-scripts/1.0";
import "../import/junos.xsl";

match / {
  <op-script-results> {
    /*
     * Insert your code here
     */
  }
}
```

## Mapping Operational Mode Commands and Output Fields to Junos XML Notation

In op scripts, you use tag elements from the Junos XML API to represent operational mode commands and output fields. For the Junos XML equivalent of commands and output fields, consult the *Junos XML API Operational Reference*.

You can also display the Junos XML tag elements for operational mode command output by directing the output from the command to the `| display xml` command:

```
user@host> command-string | display xml
```

For example:

```
user@host> show interfaces terse | display xml
<rpc-reply xmlns:junos="http://xml.juniper.net/junos/10.0R1/junos">
  <interface-information
    xmlns="http://xml.juniper.net/junos/10.0R10/junos-interface" junos:style="terse">
    <physical-interface>
      <name>dsc</name>
      <admin-status>up</admin-status>
      <oper-status>up</oper-status>
    </physical-interface>
    <physical-interface>
      <name>fxp0</name>
      <admin-status>up</admin-status>
      <oper-status>up</oper-status>
      <logical-interface>
        <name>fxp0.0</name>
```

```
<admin-status>up</admin-status>
<oper-status>up</oper-status>
...
```

**Related Documentation**

- [Configuring Help Text for Op Scripts on page 15](#)
- [Declaring Arguments in Op Scripts on page 13](#)
- [Using RPCs and Operational Mode Commands in Op Scripts on page 10](#)

---

## Using RPCs and Operational Mode Commands in Op Scripts

Most Junos OS operational mode commands have XML equivalents. These XML commands can be executed remotely using the remote procedure call (RPC) protocol. All operational mode commands that have XML equivalents are listed in the *Junos XML API Operational Reference*.

Use of RPC and operational mode commands in op scripts is discussed in more detail in the following sections:

- [Using RPCs in Op Scripts on page 10](#)
- [Displaying the RPC Tags for a Command on page 11](#)
- [Using Operational Mode Commands in Op Scripts on page 12](#)

### Using RPCs in Op Scripts

To use an RPC in an op script, include the RPC in a variable declaration. You then invoke the RPC with the `jcs:invoke()` or `jcs:execute()` extension function and include the RPC variable as an argument. The `jcs:invoke()` function executes the RPC on the local device. You can use the `jcs:execute()` function with a connection handle to execute the RPC on a remote device.

The following snippet, which invokes an RPC on the local device, is expanded and fully described in “[Example: Customizing Output of the show interfaces terse Command Using an Op Script](#)” on page 31.

**XSLT Syntax**

```
<xsl:variable name="rpc">
  <get-interface-information/> # Junos RPC for the show interfaces command
</xsl:variable>
<xsl:variable name="out" select="jcs:invoke($rpc)"/>
...
```

**SLAX Syntax**

```
var $rpc = <get-interface-information>;
var $out = jcs:invoke($rpc);
```

To execute an RPC on a remote device, an SSH session must be established. In order for the script to establish the connection, you must either configure the SSH host key information for the remote device on the local device where the script will be executed, or the SSH host key information for the remote device must exist in the known hosts file of the user executing the script. For each remote device where an RPC is executed, configure the SSH host key information with one of the following methods:

- To configure SSH known hosts on the local device, include the **host** statement, and specify hostname and host key options for the remote device at the **[edit security ssh-known-hosts]** hierarchy level of the configuration.
- To manually retrieve SSH host key information, issue the **set security ssh-known-hosts fetch-from-server hostname** configuration mode command to instruct Junos OS to connect to the remote device and add the key.

```
user@host# set security ssh-known-hosts fetch-from-server router2
The authenticity of host 'router2 (10.10.10.1)' can't be established.
RSA key fingerprint is 30:18:99:7a:3c:ed:40:04:0f:fd:c1:57:7e:6b:f3:90.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'router2,10.10.10.1' (RSA) to the list of known
hosts.
```

- To manually import SSH host key information from a file, use the **set security ssh-known-hosts load-key-file filename** configuration mode command and specify the known-hosts file.

```
user@host# set security ssh-known-hosts load-key-file /var/tmp/known_hosts
Import SSH host keys from trusted source /var/tmp/known_hosts ? [yes,no] (no)
yes
```

- Alternatively, the user executing the script can log in to the local device, SSH to the remote device, and then manually accept the host key, which is added to that user's known hosts file. In the following example, root is logged in to router1. In order to execute a remote RPC on router2, root adds the host key of router2 by issuing the **ssh router2** operational mode command and manually accepting the key.

```
root@router1> ssh router2
The authenticity of host 'router2 (10.10.10.1)' can't be established.
RSA key fingerprint is 30:18:99:7a:3c:ed:40:04:0f:fd:c1:57:7e:6b:f3:90.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'router2,10.10.10.1' (RSA) to the list of known
hosts.
```

## Displaying the RPC Tags for a Command

To display the remote procedure call (RPC) XML tags for an operational mode command, enter **display xml rpc** after the pipe symbol (|).

The following example displays the RPC tags for the **show route** command:

```
user@host> show route | display xml rpc
<rpc-reply xmlns:junos="http://xml.juniper.net/junos/10.1I0/junos">
  <rpc>
    <get-route-information>
    </get-route-information>
  </rpc>
  <cli>
    <banner></banner>
  </cli>
</rpc-reply>
```

## Using Operational Mode Commands in Op Scripts

Some operational mode commands do not have XML equivalents. If a command is not listed in the *Junos XML API Operational Reference*, the command does not have an XML equivalent.

Another way to determine whether a command has an XML equivalent is to issue the command followed by the `| display xml` command:

```
user@host> operational-mode-command | display xml
```

If the output includes only tag elements like `<output>`, `<cli>`, and `<banner>`, the command might not have an XML equivalent. In the following example, the output indicates that the `show host` command has no XML equivalent:

```
user@host> show host hostname | display xml
<rpc-reply xmlns:junos="http://xml.juniper.net/junos/10.0R1/junos">
  <output>
    ...
  </output>
  <cli>
    <banner></banner>
  </cli>
</rpc-reply>
```



**NOTE:** For some commands that have an XML equivalent, the output of the piped `| display xml` command does not include tag elements other than `<output>`, `<cli>`, and `<banner>` only because the relevant feature is not configured. For example, the `show services cos statistics forwarding-class` command has an XML equivalent that returns output in the `<service-cos-forwarding-class-statistics>` response tag, but if the configuration does not include any statements at the `[edit class-of-service]` hierarchy level then there is no actual data for the `show services cos statistics forwarding-class` command to display. The output is something like this:

```
user@host> show services cos statistics forwarding-class | display xml
<rpc-reply xmlns:junos="http://xml.juniper.net/junos/8.3I0/junos">
  <cli>
    <banner></banner>
  </cli>
</rpc-reply>
```

For this reason, the information in the *Junos XML API Operational Reference* is normally more reliable.

An op script can include commands that have no XML equivalent. Use the `<command>`, `<xsl:value-of>`, and `<output>` elements in the script, as shown in the following code snippet. This snippet is expanded and fully described in [“Example: Displaying DNS Hostname Information Using an Op Script”](#) on page 41.

```
<xsl:variable name="query">
  <command>
    <xsl:value-of select="concat('show host ', $hostname)"/>
  </command>
</xsl:variable>
<xsl:variable name="result" select="jcs:invoke($query)"/>
<xsl:variable name="host" select="$result"/>
<output>
  <xsl:value-of select="concat('Name: ', $host)"/>
</output>
...
```

- Related Documentation**
- [Configuring Help Text for Op Scripts](#) on page 15
  - [Declaring Arguments in Op Scripts](#) on page 13
  - [Mapping Operational Mode Commands and Output Fields to Junos XML Notation](#) on page 9

## Declaring Arguments in Op Scripts

There are two ways to declare arguments to an op script: by including XSLT or SLAX instructions in the script or by including statements in the Junos configuration. *Script-generated* and *configuration-generated* arguments have the same operational impact.

To declare arguments within a script, declare a global variable named **arguments**, containing `<argument>` tag elements. Within each `<argument>` tag element, include the required `<name>` tag element and the optional `<description>` tag element:

<b>XSLT Syntax</b>	<pre>&lt;xsl:variable name="arguments"&gt;   &lt;argument&gt;     &lt;name&gt;<i>name</i>&lt;/name&gt;     &lt;description&gt;<i>name</i>&lt;/description&gt;   &lt;/argument&gt; &lt;/xsl:variable&gt;</pre>
<b>SLAX Syntax</b>	<pre>var \$arguments = {   &lt;argument&gt; {     &lt;name&gt; "<i>name</i>";     &lt;description&gt; "<i>descriptive-text</i>";   } }</pre>

To declare arguments in the configuration, include the **arguments** statement in the `[edit system scripts op file filename]` hierarchy level.

```
[edit system scripts op file filename]
arguments {
```

```
argument-name {  
  description descriptive-text;  
}
```

If you include the optional `<description>` tag element or the `description` statement, the text of the description appears in the command-line interface (CLI) as a help-text string to describe the purpose of the argument, as discussed in “Configuring Help Text for Op Scripts” on page 15.

In the operation script, you must include a corresponding parameter declaration for each argument. The parameter name must match the name of the argument:

```
<xsl:param name="name"/>
```

The SLAX equivalent is:

```
param $name;
```

You can create a hidden argument by including the `<xsl:param name="name"/>` instruction without listing the argument in the `arguments` variable or in the configuration.

After you declare an argument, you can use command completion to list available arguments:

```
user@host> op filename ?  
Possible completions:  
argument-name      description  
argument-name      description
```

For each argument you include on the command-line, you must specify a corresponding value. To do this, include an *argument-name* and an *argument-value* when you execute the script with the `op filename` command:

```
user@host> op filename argument-name argument-value
```



**NOTE:** If you specify an argument that the script does not recognize, the script ignores the argument.

If you configure arguments by including the `arguments` statement in the configuration, any arguments that you declare directly in the script are still available, but are not listed among the Possible completions when you issue the `op filename ?` command.

If you declare all arguments in the script (and none in the configuration), then the arguments do appear in the Possible completions list. This is because the management (mgd) process populates the Possible completions list by first checking the configuration for arguments. The mgd process looks in the script for arguments only if no arguments are found in the configuration. Thus, if arguments are declared in the configuration, the arguments declared in the script become hidden in the CLI.

---

## Example: Declaring Arguments

Declare two arguments named **interface** and **protocol**. Execute the script, specifying the ge-0/2/0.0 interface and the **inet** protocol as values for the arguments. For either method, you must declare corresponding script parameters:

Declaring Arguments in the Op Script (script1)	<pre>&lt;xsl:param name="interface"/&gt; &lt;xsl:param name="protocol"/&gt;  &lt;xsl:variable name="arguments"&gt;   &lt;argument&gt;     &lt;name&gt;interface&lt;/name&gt;     &lt;description&gt;Name of interface to display&lt;/description&gt;   &lt;/argument&gt;   &lt;argument&gt;     &lt;name&gt;protocol&lt;/name&gt;     &lt;description&gt;Protocol to display (inet, inet6)&lt;/description&gt;   &lt;/argument&gt; &lt;/xsl:variable&gt;</pre>
Declaring Arguments in the Configuration	<pre>[edit system scripts op] file script1 {   arguments {     interface {       description "Name of interface to display";     }     protocol {       description "Protocol to display (inet, inet6)";     }   } }</pre>

## Executing the Script

```
user@host> op script1 interface ge-0/2/0.0 protocol inet
```

### Related Documentation

- [Example: Importing Files Using an Op Script on page 57](#)
- [Configuring Help Text for Op Scripts on page 15](#)
- [Mapping Operational Mode Commands and Output Fields to Junos XML Notation on page 9](#)
- [Using RPCs and Operational Mode Commands in Op Scripts on page 10](#)

## Configuring Help Text for Op Scripts

You can provide help text to describe an op script and its arguments when the **?** is used to list possible completions in the CLI. Include the **description** statement:

```
description descriptive-text;
```

You can include this statement at the following hierarchy levels:

- **[edit system scripts op file filename]**

- `[edit system scripts op file filename arguments argument-name]`

The following examples show the configuration and the resulting output.

### Examples: Configuring Help Text for Op Scripts

Configure help text for a script and display the resulting output:

```
[edit system scripts op]
user@host# set file interface.xml description "Test the interface"
user@host# commit

...
[edit system scripts op]
user@host# set file ?
Possible completions:
<name>          Local filename of the script file
interface.xml   Test the interface
```

Configure help text for a script's arguments and display the resulting output:

```
[edit system scripts op file interface.xml arguments]
user@host# set t1 description "Search for T1 interfaces"
user@host# set t3 description "Search for T3 interfaces"
user@host# commit

...
[edit system scripts op file interface.xml arguments]
user@host# set ?
Possible completions:
<name>          Name of the argument
t1              Search for T1 interfaces
t3              Search for T3 interfaces
```

#### Related Documentation

- [Declaring Arguments in Op Scripts on page 13](#)
- [Mapping Operational Mode Commands and Output Fields to Junos XML Notation on page 9](#)
- [Using RPCs and Operational Mode Commands in Op Scripts on page 10](#)

---

## Enabling an Op Script and Defining a Script Alias

Operation (op) scripts are stored on a device's hard drive in the `/var/db/scripts/op` directory or on the flash drive in the `/config/scripts/op` directory. Only users in the Junos OS **super-user** login class can access and edit files in these directories. For information about setting the storage location for scripts, see *Storing Scripts in Flash Memory*.



**NOTE:** If the device has dual Routing Engines and you want to enable an op script to execute on both Routing Engines, you must copy the script to the `/var/db/scripts/op` or `/config/scripts/op` directory on both Routing Engines. The `commit synchronize` command does not automatically copy scripts between Routing Engines.

---



You must enable an op script before it can be executed. Include the **file filename** statement at the **[edit system scripts op]** hierarchy level, specifying the name of an XSLT or SLAX file containing an op script. Only users who belong to the Junos **super-user** login class can enable op scripts.

```
[edit system scripts op]
file filename;
```

The filename of an op script written in SLAX must include the **.slax** extension for the script to be enabled and executed. No particular filename extension is required for op scripts written in XSLT, but we strongly recommend that you append the **.xsl** extension. Whether or not you choose to include the **.xsl** extension on the file, the filename that you add at the **[edit system scripts op]** hierarchy level must exactly match the filename of the script in the directory. For example, if the XSLT script filename is **script1.xsl**, then you must include **script1.xsl** in the configuration hierarchy to enable the script; likewise, if the XSLT script filename is **script1**, then you must include **script1** in the configuration hierarchy.

To determine which op scripts are currently enabled on the device, use the **show** command to display the files included at the **[edit system scripts op]** hierarchy level. To ensure that the enabled files are on the device, list the contents of the **/var/run/scripts/op/** directory using the **file list /var/run/scripts/op** operational mode command.

Optionally, you can define an alias for an op script and then specify either the filename or the alias when you execute the script. To define the alias, include the **command** statement at the **[edit system scripts op file filename]** hierarchy level:

```
[edit system scripts op]
file filename {
  command filename-alias;
}
```

---

## Executing an Op Script

Unlike commit scripts, operation (op) scripts do not execute during a commit operation. When you issue the **commit** command, op scripts configured at the **[edit system scripts op]** hierarchy level are placed into system memory and enabled for execution. After the commit operation completes, you can execute an op script from the CLI by issuing the **op** operational mode command. You also can configure the device to execute an op script automatically when a member of a specified Junos OS login class logs in to the CLI.

### Executing an Op Script by Issuing the op Command

To execute an op script from the CLI, issue the **op** operational mode command, specifying a URL, the script filename, or the alias defined by the **command** statement at the **[edit system scripts op file filename]** hierarchy level.

```
user@host> op (filename-or-alias | url url)
```

## Executing an Op Script at Login

You can configure an op script to execute automatically when any user belonging to a designated Junos OS login class logs in to the CLI. To associate an op script with a login class, include the `login-script script-filename` statement at the `[edit system login class class-name]` hierarchy level:

```
[edit system login]
class class-name {
  login-script script-filename;
}
```

The following example configures the `super-user-login.slax` op script to execute when any user who belongs to the `super-user` class logs in to the CLI (provided that the script has been enabled as discussed in [“Enabling an Op Script and Defining a Script Alias” on page 16](#)).

```
[edit system login]
class super-user {
  login-script super-user-login.slax;
}
```

**Related Documentation**

- [login-script \(Login\)](#)

---

## Configuring Checksum Hashes for an Op Script

You can configure one or more checksum hashes that can be used to verify the integrity of an op script before the script runs on the switch, router, or security device.

To configure a checksum hash:

1. Create the script.
2. Place the script in the `/var/db/scripts/op` directory on the device.
3. Run the script through one or more hash functions to calculate hash values.

Junos OS supports MD5, SHA-1, and SHA-256 hash functions.

```
user@host> file checksum md5 /var/db/scripts/commit/script1.slax
MD5 (/var/db/scripts/op/script1.slax) = 3af7884eb56e2d4489c2e49b26a39a97
user@host> file checksum sha1 /var/db/scripts/commit/script1.slax
SHA1 (/var/db/scripts/op/script1.slax) =
00dc690fb08fb049577d012486c9a6dad34212c0
user@host> file checksum sha-256 /var/db/scripts/commit/script1.slax
SHA256 (/var/db/scripts/op/script1.slax) =
150bf53383769f3bfedd41fe7332077f208d4fda81230cb27b8738
```

4. Configure the script with one or more hash values.

```
[edit system scripts op]
user@host# set file script1.slax checksum md5 3af7884eb56e2d4489c2e49b26a39a97
[edit system scripts op]
user@host# set file script1.slax checksum
sha-1 00dc690fb08fb049577d012486c9a6dad34212c0
[edit system scripts op]
```

```
user@host# set file script1.slax checksum
sha-256 150bf53383769f3bfedd41fe73320777f208d4fda81230cb27b8738
```

During the execution of the script, Junos OS recalculates the checksum value using the configured hash and verifies that the calculated value matches the configured value. If the values differ, the execution of the script fails. When you configure multiple checksum values with different hash algorithms, all the configured values must match the calculated values; otherwise, the script execution fails.



**NOTE:** If the op script is stored remotely, do not include the checksum statement in the configuration. You can verify the script's integrity before it runs by specifying the hash value on the command line when you run the op command with the <url> option and the <key> option.

#### Related Documentation

- *Configuring Checksum Hashes for a Commit Script*
- *Configuring Checksum Hashes for an Event Script*
- *file checksum md5* command in the *System Basics and Services Command Reference*
- *file checksum sha-256* command in the *System Basics and Services Command Reference*
- *file checksum sha1* command in the *System Basics and Services Command Reference*
- [op](#) on page 88 command in the *System Basics and Services Command Reference*

## Executing an Op Script from a Remote Site

As an alternative to storing operation (op) scripts locally on the device, you can store op scripts at a remote site. This allows you to execute the scripts by specifying a URL on the command line.

To execute an op script from a remote site:

1. Create the script.
2. (Optional) Store the script temporarily in the **/var/tmp** directory on the device, and run the script through one or more hash functions to calculate hash values.

Junos OS supports MD5, SHA-1, and SHA-256 hash functions.

```
user@host> file checksum md5 /var/tmp/script1.slax
MD5 (/var/tmp/script1.slax) = 3af7884eb56e2d4489c2e49b26a39a97
user@host> file checksum sha1 /var/tmp/script1.slax
SHA1 (/var/tmp/script1.slax) = 00dc690fb08fb049577d012486c9a6dad34212c0
user@host> file checksum sha-256 /var/tmp/script1.slax
SHA256 (/var/tmp/script1.slax) =
150bf53383769f3bfedd41fe73320777f208d4fda81230cb27b8738
```

3. Place the script on the remote server.
4. Provide the script URL and the optional hash values to the administrators who will execute the script.

5. Execute the script by running the **op** command and specifying the URL that points to the remote file.

```
user@host> op url https://www.juniper.net/scripts/2009-04-01.01.slax
key md5 3af7884eb56e2d4489c2e49b26a39a97
```

This example shows how to include the `<key>` option and the MD5 checksum information.



**NOTE:** If the **op** script is stored locally, do not include the hash key on the command line. Instead, configure the hash value by including the **checksum** statement at the **[edit system scripts op file *filename*]** hierarchy level. During the execution of the script, Junos OS recalculates the checksum value using the configured hash and verifies that the calculated value matches the configured value.

---

To prevent the execution of **op** scripts from remote sites, configure the **no-allow-url** statement at the **[edit system scripts op]** hierarchy level.

```
user@host# set system scripts op no-allow-url
```

When you configure the **no-allow-url** statement, issuing the **op url *url*** operational mode command generates an error.

#### Related Documentation

- [Configuring Checksum Hashes for an Op Script on page 18](#)
- `file checksum md5` command in the *System Basics and Services Command Reference*
- `file checksum sha-256` command in the *System Basics and Services Command Reference*
- `file checksum sha1` command in the *System Basics and Services Command Reference*
- [no-allow-url on page 78](#)
- [op on page 88](#) command in the *System Basics and Services Command Reference*

---

## Disabling an Op Script

You can disable an **op** script by deleting or deactivating the **file *filename*** statement at the **[edit system scripts op]** hierarchy in the configuration. To determine which **op** scripts are active on the device, issue the **show configuration system scripts op** operational mode command. The command output lists the enabled **op** scripts.

To delete an **op** script from the configuration, perform the following steps:

1. From configuration mode in the CLI, enter the following command:

```
[edit]
user@host# delete system scripts op file filename
```

2. Commit the configuration:

```
user@host# commit
```

The **file** statement is removed from the configuration for the specified op script, and the **op** operational mode command no longer lists the op script filename as a valid completion.

To deactivate an op script in the configuration, perform the following steps:

1. From configuration mode in the CLI, enter the following command:

```
[edit]
user@host# deactivate system scripts op file filename
```

2. Commit the configuration:

```
user@host# commit
```

The filename of the deactivated script remains in the configuration, but it is flagged with **inactive**. For example:

```
[edit system scripts op]
user@host# show

inactive: file script1.xsl;
file script2.xsl;
file script3.xsl;
```



**NOTE:** You can reactivate an op script using the **activate system scripts op file *filename*** command.

Alternatively, you can delete the script from the **/var/db/scripts/op** directory on a device's hard drive or from the **/config/scripts/op** directory on the flash drive. Only users in the Junos OS **super-user** login class can access and edit files in these directories. If you delete a script, you should also remove the **file** statement at the **[edit system scripts op]** hierarchy level in the configuration. If you delete an op script, but the **file** statement remains in the configuration, the CLI lists this script as a valid completion for the **op** command, but Junos OS issues an invalid filename error when the script is executed.

If you deactivate or delete the **file** statement for an op script in the configuration, you must enable the script again in order to execute it.

#### Related Documentation

- [Enabling an Op Script and Defining a Script Alias on page 16](#)

## Example: Configuring Limits on Executed Event Policies and Memory Allocation for Scripts

This example configures a maximum value for the number of event policies that the device can execute concurrently and a maximum memory limit for executed commit, event, and op scripts.

- [Requirements on page 22](#)
- [Overview on page 22](#)

- [Configuration on page 22](#)
- [Verification on page 23](#)

## Requirements

A device running Junos OS Release 12.3 or later.

## Overview

This example configures a device running Junos OS to limit the number of event policies that can run simultaneously on that device to a maximum of 12 policies. Additionally, the example configures each script type with a maximum amount of memory that the system can allocate to the data segment portion of a script of that type. The device is configured to allocate 192 MB for each executed commit script and event script and 100 MB for each executed op script.

## Configuration

### CLI Quick Configuration

To quickly configure this example, copy the following commands, paste them in a text file, remove any line breaks, change any details necessary to match your network configuration, and then copy and paste the commands into the CLI at the **[edit]** hierarchy level:

```
set system scripts commit max-datasize 192m
set system scripts op max-datasize 100m
set event-options max-policies 12
set event-options event-script max-datasize 192m
```

### Step-by-Step Procedure

1. Configure the maximum number of event policies that can execute concurrently.  
  
[edit]  
user@host# set event-options max-policies 12
2. Configure the maximum memory allocated for the data segment for each executed commit script.  
  
[edit]  
user@host# set system scripts commit max-datasize 192m
3. Configure the maximum memory allocated for the data segment for each executed op script.  
  
[edit]  
user@host# set system scripts op max-datasize 100m
4. Configure the maximum memory allocated for the data segment for each executed event script.  
  
[edit]  
user@host# set event-options event-script max-datasize 192m
5. Commit the configuration.  
  
[edit]  
user@host# commit

## Results

---

```
[edit]
event-options {
  event-script {
    max-datasize 192m;
  }
  max-policies 12;
}
system {
  scripts {
    commit {
      max-datasize 192m;
    }
    op {
      max-datasize 100m;
    }
  }
}
```

## Verification

Confirm that the configuration is working properly.

### Verifying the Limit on Concurrently Executing Event Policies

---

**Purpose** If the system is running the maximum number of event policies, the system ignores any triggered event policy until such time that another policy finishes. The system logs the `EVENTD_POLICY_LIMIT_EXCEEDED` message for any triggered event policies that were not executed. By default, system log messages are recorded in the **messages** log file.

**Action** Review the configured log file to verify whether any policies were barred from execution, because the maximum limit was reached. You can narrow the output to include only the relevant error messages by appending `| match EVENTD_POLICY_LIMIT_EXCEEDED`.

```
user@R1> show log messages | match EVENTD_POLICY_LIMIT_EXCEEDED
Jun 11 17:02:42 R1 eventd[1177]: EVENTD_POLICY_LIMIT_EXCEEDED: Unable to execute
policy 'raise-trap' because current number of policies (12) exceeds system limit
(12)
[output omitted]
```

**Related Documentation**

- [max-datasize on page 76](#)
- *max-policies*





## CHAPTER 3

# Op Script Examples

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- [Example: Customizing Output of the show interfaces terse Command Using an Op Script on page 31](#)
- [Example: Displaying DNS Hostname Information Using an Op Script on page 41](#)
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### Example: Changing the Configuration Using an Op Script

---

This example explains how to make structured changes to the Junos OS configuration using an op script.

- [Requirements on page 25](#)
- [Overview and Op Script on page 25](#)
- [Device Configuration on page 28](#)
- [Verification on page 29](#)

#### Requirements

This example uses a device running Junos OS.

#### Overview and Op Script

Op scripts can be used to make structured changes to the Junos OS configuration using the **jcs:load-configuration** template, which is included in the import file **junos.xsl**. Experienced users, who are familiar with Junos OS, can write scripts that prompt for the relevant configuration information and modify the configuration accordingly. This allows users who have less experience with Junos OS to safely modify the configuration using the script.

When called, the **jcs:load-configuration** template performs the following actions:

1. Locks the configuration database
2. Loads the configuration changes
3. Commits the configuration
4. Unlocks the configuration database

The **jcs:load-configuration** template makes changes to the configuration in **configure exclusive** mode. In this mode, Junos OS locks the candidate *global* configuration for as long as the script accesses the shared database and makes changes to the configuration without interference from other users.

If another user is currently editing the configuration in **configure exclusive** mode or if the database is already locked when the template is called, the call fails. In addition, if there are existing, uncommitted changes to the configuration when the template is called, the commit fails. If the template call is successful but the commit fails, Junos OS discards the uncommitted changes and rolls back the configuration.

You provide arguments to the **jcs:load-configuration** template to specify how to integrate the changes into the existing configuration, how to customize the commit operation, what changes to make to the configuration, and which connection handle to use. Starting with Junos OS Release 12.2, you can include the rollback parameter to return the configuration to a previously committed configuration, or you can supply a null configuration for the configuration parameter. If you supply a null configuration to **jcs:load-configuration**, the template performs a simple commit of the candidate configuration. The XSLT and SLAX syntax for the template call is:

```
<xsl:call-template name="jcs:load-configuration">
  <xsl:with-param name="action" select="(merge | override | replace)"/>
  <xsl:with-param name="commit-options" select="node-set"/>
  <xsl:with-param name="configuration" select="configuration-data"/>
  <xsl:with-param name="connection" select="connection-handle"/>
  <xsl:with-param name="rollback" select="number"/>
</xsl:call-template>
```

```
call jcs:load-configuration($action="(merge | override | replace)",
  $commit-options=node-set, $configuration=configuration-data,
  $connection=connection-handle, $rollback=number);
```

The following sample SLAX script demonstrates how to use the **jcs:load-configuration** template to disable an interface on a device running Junos OS. All of the values required for the **jcs:load-configuration** template are defined as variables, which are then passed into the template as arguments.

In this example, the **usage** variable is initialized with a general description of the function of the script. When the script is run, the usage description is output to the CLI using a call to the **jcs:output()** function. This allows the user to verify that he is using the script for the correct purpose.

The script calls the **jcs:get-input()** function and prompts the user to enter the name of the interface that should be disabled. The interface name is stored in the **interface** variable.

The configuration data that includes the changes to the configuration are stored in the variable **config-changes**. This is the value used for the **configuration** parameter of the **jcs:load-configuration** template. This variable includes the Junos XML API tags for the configuration statements that are to be modified. The variable **interface**, which is supplied by the user, designates the name of the interface to disable.

The **load-action** variable is initialized to **merge**, which merges the configuration changes in the **disable** variable with the candidate configuration. This is the equivalent of the CLI configuration mode command **load merge**. Other load options include **replace** and **override**.

The **options** variable uses the **:=** operator to create a node-set, which is passed to the template as the value of the **commit-options** parameter. This example includes the **log** tag to add the description of the commit to the commit log file for future reference.

The call to the **jcs:open()** function opens a connection with the Junos OS management process (mgd) and returns a connection handle that is stored in the **conn\_handle** variable. All of the defined variables are passed as arguments to the **jcs:load-configuration** template at the time that it is called.

#### SLAX Syntax

```
version 1.0;

ns junos = "http://xml.juniper.net/junos/*/junos";
ns xnm = "http://xml.juniper.net/xnm/1.1/xnm";
ns jcs = "http://xml.juniper.net/junos/commit-scripts/1.0";
ns ext = "http://xmlsoft.org/XSLT/namespace";

import "../import/junos.xsl";

match / {
<op-script-results> {

    var $usage = "This script disables the interface specified by the user." _
                "The script modifies the candidate configuration to disable " _
                "the interface and commits the configuration to activate it.";
    var $temp = jcs:output($usage);

    var $interface = jcs:get-input("Enter interface to disable: ");

    var $config-changes = {
        <configuration> {
            <interfaces> {
                <interface> {
                    <name> $interface;
                    <disable>;
                }
            }
        }
    }

    var $load-action = "merge";

    var $options := {
        <commit-options> {
            <log> "disabling interface " _ $interface;
```

```
    }  
  }  
  
  var $conn_handle = jcs:open();  
  
  var $results := {  
    call jcs:load-configuration( $action=$load-action, $commit-options=$options,  
      $configuration=$config-changes, $connection=$conn_handle);  
  }  
  
  $close-results = jcs:close($conn_handle);  
}  
}
```

The `:=` operator copies the results of the **jcs:load-configuration** template call to a temporary variable and runs the **node-set** function on that variable. The resulting node-set is then stored in the **results** variable. The `:=` operator ensures that the **results** variable is a node-set rather than a result tree fragment so that the script can access the contents. The **jcs:close()** function closes the connection.

By default, the **jcs:load-configuration** template does not output messages to the CLI. To quickly view any issues with the commit, you should add code to the script to output any error or warning messages that are generated as a result of the **jcs:load-configuration** template call:

```
if ($results//xnm:error) {  
  for-each ($results//xnm:error) {  
    <output> message;  
  }  
}  
if ($results//xnm:warning) {  
  for-each ($results//xnm:warning) {  
    <output> message;  
  }  
}
```

## Device Configuration

To download, enable, and test the script:

1. Copy the script into a text file, name the file **config-change.slax**, and copy it to the **/var/db/scripts/op/** directory on the device.
2. In configuration mode, include the **file** statement at the **[edit system scripts op]** hierarchy level and **config-change.slax**.

```
[edit system scripts op]  
user@host# set file config-change.slax
```

3. Issue the **commit and-quit** command to commit the configuration and to return to operational mode.

```
[edit]  
user@host# commit and-quit
```

4. Before running the script, issue the **show interfaces *interface-name*** operational mode command and record the current state of the interface that will be disabled by the script.
5. Execute the op script by issuing the **op config-change** operational mode command.
 

```
user@host> op config-change
This script disables the interface specified by the user. The script modifies
the candidate configuration to disable the interface and commits the
configuration to activate it.
Enter interface to disable: so-0/0/0
```

## Verification

- [Verifying the Commit on page 29](#)
- [Verifying the Configuration Changes on page 29](#)

### Verifying the Commit

**Purpose** Verify that the commit succeeded.

**Action** You should include code in your script that parses the node-set returned by the **jcs:load-configuration** template for any errors or warnings. This allows you to more easily determine whether the commit succeeded. If there are no warning or error messages, you can verify the success of the commit in several ways.

- Check the commit log to verify that the commit was successful. If you included the **log** option in the **commit-options** parameter, the message should be visible in the commit log along with the commit information.

```
user@host> show system commit
0 2010-09-22 17:08:17 PDT by user via junoscript
disabling interface so-0/0/0
```

- Check the syslog message file to verify that the commit operation was logged. In this case, you also see an **SNMP\_TRAP\_LINK\_DOWN** message for the disabled interface so-0/0/0. Depending on your configuration settings for traceoptions, this message might or might not appear in your log file.

```
user@host> show log messages | last
Sep 22 17:08:13 host file[7319]: UI_COMMIT: User 'user' requested 'commit'
operation (comment: disabling interface so-0/0/0)
Sep 22 17:08:16 host xntpd[1386]: ntpd exiting on signal 1
Sep 22 17:08:16 host xntpd[1386]: ntpd 4.2.0-a Fri Jun 25 13:48:13 UTC 2010
(1)
Sep 22 17:08:16 host mib2d[1434]: SNMP_TRAP_LINK_DOWN: ifIndex 526,
ifAdminStatus down(2), ifOperStatus down(2), ifName so-0/0/0
```

### Verifying the Configuration Changes

**Purpose** Verify that the correct changes are integrated into the configuration.

**Action**

- Display the configuration and verify that the changes are visible for the specified interface:

```
user@host> show configuration interfaces so-0/0/0
disable;
```

- For this example, you also can issue the **show interfaces *interface-name*** operational mode command to check that the interface was disabled. In this case, the output captured *before* the interface was disabled shows that the interface is **Enabled**:

```
user@host> show interfaces so-0/0/0
Physical interface: so-0/0/0, Enabled, Physical link is Up
  Interface index: 128, SNMP ifIndex: 526
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3,
  Loopback: None, FCS: 16,
  Payload scrambler: Enabled
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps Internal: 0x4000
  Link flags     : Keepalives
  CoS queues     : 4 supported, 4 maximum usable queues
  Last flapped   : 2010-09-14 10:33:25 PDT (1w1d 06:27 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  SONET alarms   : None
  SONET defects  : None
```

The output captured *after* running the script to disable the interface shows that the interface is now **Administratively down**:

```
user@host> show interfaces so-0/0/0
Physical interface: so-0/0/0, Administratively down, Physical link is Up
  Interface index: 128, SNMP ifIndex: 526
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3,
  Loopback: None, FCS: 16,
  Payload scrambler: Enabled
  Device flags   : Present Running
  Interface flags: Down Point-To-Point SNMP-Traps Internal: 0x4000
  Link flags     : Keepalives
  CoS queues     : 4 supported, 4 maximum usable queues
  Last flapped   : 2010-09-14 10:33:25 PDT (1w1d 06:40 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  SONET alarms   : None
  SONET defects  : None
```

#### Related Documentation

- *Storing and Enabling Scripts*
- *close() Function (jcs Namespace)*
- *get-input() Function (jcs and slax Namespaces)*
- *jcs:load-configuration Template*
- *open() Function (jcs Namespace)*
- *output() Function (jcs and slax Namespaces)*

## Example: Customizing Output of the show interfaces terse Command Using an Op Script

This example uses an op script to customize the output of the **show interfaces terse** command. A line-by-line explanation of the XSLT script is provided.

- [Requirements on page 31](#)
- [Overview and Op Script on page 31](#)
- [Configuration on page 39](#)
- [Verification on page 40](#)

### Requirements

This example uses a device running Junos OS.

### Overview and Op Script

By default, the layout of the **show interfaces terse** command looks like this:

```
user@host> show interfaces terse
Interface           Admin Link Proto  Local                  Remote
dsc                  up    up
fxp0                 up    up
fxp0.0               up    up    inet   192.168.71.246/21
fxp1                 up    up
fxp1.0               up    up    inet   10.0.0.4/8
                                inet6   fe80::200:ff:fe00:4/64
                                tnp     fec0::10:0:0:4/64
                                4
gre                  up    up
ipip                 up    up
lo0                  up    up
lo0.0                up    up    inet   127.0.0.1              --> 0/0
lo0.16385            up    up    inet   fe80::2a0:a5ff:fe12:2f04
                                inet6
lsi                  up    up
mtun                 up    up
pimd                 up    up
pime                 up    up
tap                  up    up
```

In Junos XML, the output fields are represented as follows:

```
user@host> show interfaces terse | display xml
<rpc-reply xmlns:junos="http://xml.juniper.net/junos/10.0R1/junos">
  <interface-information xmlns="http://xml.juniper.net/junos/10.0R1/junos-interface"
    junos:style="terse">
    <physical-interface>
      <name>dsc</name>
      <admin-status>up</admin-status>
      <oper-status>up</oper-status>
    </physical-interface>
    <physical-interface>
      <name>fxp0</name>
      <admin-status>up</admin-status>
```

```
<oper-status>up</oper-status>
<logical-interface>
  <name>fxp0.0</name>
  <admin-status>up</admin-status>
  <oper-status>up</oper-status>
  ... Remainder of output omitted for brevity ...
```

**XSLT Syntax** The following script customizes the output of the **show interfaces terse** command. A line-by-line explanation of the script is provided.

```
1 <?xml version="1.0" standalone="yes"?>
2 <xsl:stylesheet version="1.0"
3   xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
4   xmlns:junos="http://xml.juniper.net/junos/*/junos"
5   xmlns:xnm="http://xml.juniper.net/xnm/1.1/xnm"
6   xmlns:jcs="http://xml.juniper.net/junos/commit-scripts/1.0">
7   <xsl:import href="../import/junos.xml"/>

8   <xsl:variable name="arguments">
9     <argument>
10       <name>interface</name>
11       <description>Name of interface to display</description>
12     </argument>
13     <argument>
14       <name>protocol</name>
15       <description>Protocol to display (inet, inet6)</description>
16     </argument>
17   </xsl:variable>
18   <xsl:param name="interface"/>
19   <xsl:param name="protocol"/>
20   <xsl:template match="/">
21     <op-script-results>
22       <xsl:variable name="rpc">
23         <get-interface-information>
24           <terse/>
25           <xsl:if test="$interface">
26             <interface-name>
27               <xsl:value-of select="$interface"/>
28             </interface-name>
29           </xsl:if>
30         </get-interface-information>
31       </xsl:variable>
32       <xsl:variable name="out" select="jcs:invoke($rpc)"/>
33       <interface-information junos:style="terse">
34         <xsl:choose>
35           <xsl:when test="$protocol='inet' or $protocol='inet6'
36             or $protocol='mpls' or $protocol='tnp'">
37             <xsl:for-each select="$out/physical-interface/
38               logical-interface[address-family/address-family-name = $protocol]">
39               <xsl:call-template name="intf"/>
40             </xsl:for-each>
41           </xsl:when>
42           <xsl:when test="$protocol">
43             <xnm:error>
44               <message>
45                 <xsl:text>invalid protocol: </xsl:text>
```



```

44         <xsl:value-of select="$protocol"/>
45     </message>
46 </xnm:error>
47 </xsl:when>
48 <xsl:otherwise>
49     <xsl:for-each select="$out/physical-interface/logical-interface">
50         <xsl:call-template name="intf"/>
51     </xsl:for-each>
52 </xsl:otherwise>
53 </xsl:choose>
54 </interface-information>
55 </op-script-results>
56 </xsl:template>
57 <xsl:template name="intf">
58     <xsl:variable name="status">
59         <xsl:choose>
60             <xsl:when test="admin-status='up' and oper-status='up'">
61                 <xsl:text> </xsl:text>
62             </xsl:when>
63             <xsl:when test="admin-status='down'">
64                 <xsl:text>offline</xsl:text>
65             </xsl:when>
66             <xsl:when test="oper-status='down' and ../admin-status='down'">
67                 <xsl:text>p-offline</xsl:text>
68             </xsl:when>
69             <xsl:when test="oper-status='down' and ../oper-status='down'">
70                 <xsl:text>p-down</xsl:text>
71             </xsl:when>
72             <xsl:when test="oper-status='down'">
73                 <xsl:text>down</xsl:text>
74             </xsl:when>
75             <xsl:otherwise>
76                 <xsl:value-of select="concat(oper-status, '/', admin-status)"/>
77             </xsl:otherwise>
78         </xsl:choose>
79     </xsl:variable>
80     <xsl:variable name="desc">
81         <xsl:choose>
82             <xsl:when test="description">
83                 <xsl:value-of select="description"/>
84             </xsl:when>
85             <xsl:when test="../description">
86                 <xsl:value-of select="../description"/>
87             </xsl:when>
88         </xsl:choose>
89     </xsl:variable>
90     <logical-interface>
91         <name><xsl:value-of select="name"/></name>
92         <xsl:if test="string-length($desc)">
93             <admin-status><xsl:value-of select="$desc"/></admin-status>
94         </xsl:if>
95         <admin-status><xsl:value-of select="$status"/></admin-status>
96         <xsl:choose>
97             <xsl:when test="$protocol">
98                 <xsl:copy-of

```

```
99      </xsl:when>
100      <xsl:otherwise>
101        <xsl:copy-of select="address-family"/>
102      </xsl:otherwise>
103    </xsl:choose>
104  </logical-interface>
105 </xsl:template>
106 </xsl:stylesheet>
```

**Line-by-Line Explanation** Lines 1 through 7, Line 20, and Lines 105 and 106 are the boilerplate that you include in every op script. For more information, see [“Required Boilerplate for Op Scripts” on page 7](#).

```
1  <?xml version="1.0" standalone="yes"?>
2  <xsl:stylesheet version="1.0"
3    xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
4    xmlns:junos="http://xml.juniper.net/junos/*/junos"
5    xmlns:xnm="http://xml.juniper.net/xnm/1.1/xnm"
6    xmlns:jcs="http://xml.juniper.net/junos/commit-scripts/1.0">
7    <xsl:import href="../import/junos.xml"/>
...
20  <xsl:template match="/">
...
105 </xsl:template>
106 </xsl:stylesheet>
```

Lines 8 through 17 declare a variable called **arguments**, containing two arguments to the script: **interface** and **protocol**. This variable declaration causes **interface** and **protocol** to appear in the command-line interface (CLI) as available arguments to the script.

```
8  <xsl:variable name="arguments">
9    <argument>
10      <name>interface</name>
11      <description>Name of interface to display</description>
12    </argument>
13    <argument>
14      <name>protocol</name>
15      <description>Protocol to display (inet, inet6)</description>
16    </argument>
17  </xsl:variable>
```

Lines 18 and 19 declare two parameters to the script, corresponding to the arguments created in Lines 8 through 17. The parameter names must exactly match the argument names.

```
18  <xsl:param name="interface"/>
19  <xsl:param name="protocol"/>
```

Lines 20 through 31 declare a variable named **rpc**. The **show interfaces terse** command is assigned to the **rpc** variable. If you include the **interface** argument when you execute the script, the value of the argument (the interface name) is passed into the script.

```
20  <xsl:template match="/">
21    <op-script-results>
22      <xsl:variable name="rpc">
23        <get-interface-information>
24          <terse/>
25        <xsl:if test="$interface">
```

```

26         <interface-name>
27         <xsl:value-of select="$interface"/>
28         </interface-name>
29     </xsl:if>
30 </get-interface-information>
31 </xsl:variable>

```

Line 32 declares a variable named **out** and applies to it the execution of the **rpc** variable (**show interfaces terse** command).

```

32     <xsl:variable name="out" select="jcs:invoke($rpc)"/>

```

Line 33 specifies that the output level of the **show interfaces** command being modified is **terse** (as opposed to **extensive**, **detail**, and so on).

```

33     <interface-information junos:style="terse">

```

Lines 34 through 39 specify that if you include the **protocol** argument when you execute the script and if the protocol value that you specify is **inet**, **inet6**, **mpls**, or **tnp**, the **intf** template is applied to each instance of that protocol type in the output.

```

34     <xsl:choose>
35     <xsl:when test="$protocol='inet' or $protocol='inet6'
36         or $protocol='mpls' or $protocol='tnp'">
37         <xsl:for-each select="$out/physical-interface/
38             logical-interface[address-family/address-family-name = $protocol]">
39             <xsl:call-template name="intf"/>
40         </xsl:for-each>
41     </xsl:when>

```

Lines 40 through 47 specify that if you include the **protocol** argument when you execute the script and if the protocol value that you specify is something other than **inet**, **inet6**, **mpls**, or **tnp**, an error message is generated.

```

40     <xsl:when test="$protocol">
41     <xnm:error>
42     <message>
43     <xsl:text>invalid protocol: </xsl:text>
44     <xsl:value-of select="$protocol"/>
45     </message>
46     </xnm:error>
47 </xsl:when>

```

Lines 48 through 52 specify that if you do not include the **protocol** argument when you execute the script, the **intf** template is applied to each logical interface in the output.

```

48     <xsl:otherwise>
49     <xsl:for-each select="$out/physical-interface/logical-interface">
50     <xsl:call-template name="intf"/>
51     </xsl:for-each>
52 </xsl:otherwise>

```

Lines 53 through 56 are closing tags.

```

53 </xsl:choose>
54 </interface-information>
55 </op-script-results>
56 </xsl:template>

```

Line 57 opens the **intf** template. This template customizes the output of the **show interfaces terse** command.

```
57    <xsl:template name="intf">
```

Line 58 declares a variable called **status**, the purpose of which is to specify how the interface status is reported. Lines 59 through 78 contain a **<xsl:choose>** instruction that populates the **status** variable by considering all the possible states. As always in XSLT, the first **<xsl:when>** instruction that evaluates as TRUE is executed, and the remainder are ignored. Each **<xsl:when>** instruction is explained separately.

```
58    <xsl:variable name="status">
59    <xsl:choose>
```

Lines 60 through 62 specify that if **admin-status** is up and **oper-status** is up, no output is generated. In this case, the **status** variable remains empty.

```
60    <xsl:when test="admin-status='up' and oper-status='up'">
61    <xsl:text> </xsl:text>
62    </xsl:when>
```

Lines 63 through 65 specify that if **admin-status** is down, the **status** variable contains the text **offline**.

```
63    <xsl:when test="admin-status='down'">
64    <xsl:text>offline</xsl:text>
65    </xsl:when>
```

Lines 66 through 68 specify that if **oper-status** is down and the physical interface **admin-status** is down, the **status** variable contains the text **p-offline**. (../ selects the physical interface.)

```
66    <xsl:when test="oper-status='down' and ../admin-status='down'">
67    <xsl:text>p-offline</xsl:text>
68    </xsl:when>
```

Lines 69 through 71 specify that if **oper-status** is down and the physical interface **oper-status** is down, the **status** variable contains the text **p-down**. (../ selects the physical interface.)

```
69    <xsl:when test="oper-status='down' and ../oper-status='down'">
70    <xsl:text>p-down</xsl:text>
71    </xsl:when>
```

Lines 72 through 74 specify that if **oper-status** is down, the **status** variable contains the text **down**.

```
72    <xsl:when test="oper-status='down'">
73    <xsl:text>down</xsl:text>
74    </xsl:when>
```

Lines 75 through 77 specify that if none of the test cases are true, the **status** variable contains **oper-status** and **admin-status** concatenated with a slash as a separator.

```
75    <xsl:otherwise>
76    <xsl:value-of select="concat(oper-status, '/', admin-status)"/>
77    </xsl:otherwise>
```

Lines 78 and 79 are closing tags.

```
78    </xsl:choose>
```

```
79      </xsl:variable>
```

Lines 80 through 89 define a variable called **desc**. An **<xsl:choose>** instruction populates the variable by selecting the most specific interface description available. If a logical interface description is included in the configuration, it is used to populate the **desc** variable. If not, the physical interface description is used. If no physical interface description is included in the configuration, the variable remains empty. As always in XSLT, the first **<xsl:when>** instruction that evaluates as TRUE is executed, and the remainder are ignored.

```
80      <xsl:variable name="desc">
81      <xsl:choose>
82          <xsl:when test="description">
83              <xsl:value-of select="description"/>
84          </xsl:when>
85          <xsl:when test="../description">
86              <xsl:value-of select="../description"/>
87          </xsl:when>
88      </xsl:choose>
89  </xsl:variable>
```

The remainder of the script specifies how the operational mode output is displayed.

Lines 90 and 91 specify that the logical interface name is displayed first in the output.

```
90      <logical-interface>
91      <name><xsl:value-of select="name"/></name>
```

Lines 92 through 94 test whether the **desc** variable has a nonzero number of characters. If the number of characters is more than zero, the interface description is displayed in the standard location of the **admin-status** field. (In standard output, the **admin-status** field is displayed on the second line.)

```
92      <xsl:if test="string-length($desc)">
93          <admin-status><xsl:value-of select="$desc"/></admin-status>
94      </xsl:if>
```

Line 95 specifies that the interface status as defined in the **status** variable is displayed next.

```
95      <admin-status><xsl:value-of select="$status"/></admin-status>
```

Lines 96 through 103 specify that if you include the **protocol** argument when you execute the script, only interfaces with that protocol configured are displayed. If you do not include the **protocol** argument, all interfaces are displayed.

```
96      <xsl:choose>
97      <xsl:when test="$protocol">
98          <xsl:copy-of
99              select="address-family[address-family-name = $protocol]"/>
100      </xsl:when>
101      <xsl:otherwise>
102          <xsl:copy-of select="address-family"/>
103      </xsl:otherwise>
103  </xsl:choose>
```

Lines 104 through 106 are closing tags.

```
104      </logical-interface>
105  </xsl:template>
```

106 </xsl:stylesheet>

**SLAX Syntax** The SLAX version of the script is as follows:

```
version 1.0;
ns junos = "http://xml.juniper.net/junos/*/junos";
ns xnm = "http://xml.juniper.net/xnm/1.1/xnm";
ns jcs = "http://xml.juniper.net/junos/commit-scripts/1.0";
import "../import/junos.xsl";

var $arguments = {
  <argument> {
    <name> "interface";
    <description> "Name of interface to display";
  }
  <argument> {
    <name> "protocol";
    <description> "Protocol to display (inet, inet6)";
  }
}
param $interface;
param $protocol;
match / {
  <op-script-results> {
    var $rpc = {
      <get-interface-information> {
        <terse>;
        if ($interface) {
          <interface-name> $interface;
        }
      }
    }
    var $out = jcs:invoke($rpc);
    <interface-information junos:style="terse"> {
      if ($protocol='inet' or $protocol='inet6' or $protocol='mpls' or
          $protocol='tnp') {
        for-each ($out/physical-interface/
            logical-interface[address-family/address-family-name = $protocol]) {
          call intf();
        }
      } else if ($protocol) {
        <xnm:error> {
          <message> {
            expr "invalid protocol: ";
            expr $protocol;
          }
        }
      } else {
        for-each ($out/physical-interface/logical-interface) {
          call intf();
        }
      }
    }
  }
}
intf () {
```

```

var $status = {
  if (admin-status='up' and oper-status='up') {
  } else if (admin-status='down') {
    expr "offline";
  } else if (oper-status='down' and ../admin-status='down') {
    expr "p-offline";
  } else if (oper-status='down' and ../oper-status='down') {
    expr "p-down";
  } else if (oper-status='down') {
    expr "down";
  } else {
    expr oper-status _ '/' _ admin-status;
  }
}
var $desc = {
  if (description) {
    expr description;
  } else if (../description) {
    expr ../description;
  }
}
<logical-interface> {
  <name> name;
  if (string-length($desc)) {
    <admin-status> $desc;
  }
  <admin-status> $status;
  if ($protocol) {
    copy-of address-family[address-family-name = $protocol];
  } else {
    copy-of address-family;
  }
}
}

```

## Configuration

### Step-by-Step Procedure

To download, enable, and test the script:

1. Copy the XSLT or SLAX script into a text file, name the file **interface.xml** or **interface.slax** as appropriate, and copy it to the **/var/db/scripts/op/** directory on the device.
2. In configuration mode, include the **file** statement at the **[edit system scripts op]** hierarchy level and **interface.xml** or **interface.slax** as appropriate.  
  

```

[edit system scripts op]
user@host# set file interface.(slax | xml)

```
3. Issue the **commit and-quit** command to commit the configuration and to return to operational mode.  
  

```

[edit]
user@host# commit and-quit

```
4. Execute the op script by issuing the **op interface** operational mode command.

## Verification

### Verifying the Commit Script Output

---

**Purpose** Verify that the script behaves as expected.



**Action** Issue the **show interfaces terse** and **op interface** operational commands and compare the output. The **show interfaces terse** command displays the standard output. The **op interface** command displays the customized output.

```
user@host> show interfaces terse
Interface      Admin Link Proto  Local                      Remote
dsc            up    up
fxp0           up    up
fxp0.0         up    up    inet   192.168.71.246/21
fxp1           up    up
fxp1.0         up    up    inet   10.0.0.4/8
                                   inet6  fe80::200:ff:fe00:4/64
                                   inet6  fec0::10:0:0:4/64
                                   tnp    4
gre            up    up
ipip           up    up
lo0            up    up
lo0.0          up    up    inet   127.0.0.1                  --> 0/0
lo0.16385      up    up    inet   127.0.0.1                  --> 0/0
                                   inet6  fe80::2a0:a5ff:fe12:2f04
lsi            up    up
mtun           up    up
pimd           up    up
pime           up    up
tap            up    up
```

```
user@host> op interface
Interface      Admin Link Proto  Local                      Remote
fxp0.0         This is the Ethernet Management interface.
                                   inet   192.168.71.246/21
fxp1.0         This is the Ethernet Management interface.
                                   inet   10.0.0.4/8
                                   inet6  fe80::200:ff:fe00:4/64
                                   inet6  fec0::10:0:0:4/64
                                   tnp    4
lo0.0          This is the Ethernet Management interface.
                                   inet   127.0.0.1                  --> 0/0
lo0.16385      This is the Ethernet Management interface.
                                   inet   127.0.0.1                  --> 0/0
                                   inet6  fe80::2a0:a5ff:fe12:2f04-->
```

Issue the **op interface** operational command for different hierarchy levels and review the output. For example:

```
user@host> op interface interface fxp0
Interface      Admin Link Proto  Local                      Remote
fxp0.0         This is the Ethernet Management interface.
                                   inet   192.168.71.246/21
```

```
user@host> op interface protocol inet
Interface      Admin Link Proto  Local                      Remote
fxp0.0         This is the Ethernet Management interface.
                                   inet   192.168.71.246/21
fxp1.0         This is the Ethernet Management interface.
                                   inet   10.0.0.4/8
lo0.0          This is the Ethernet Management interface.
                                   inet   127.0.0.1                  --> 0/0
lo0.16385      This is the Ethernet Management interface.
                                   inet   127.0.0.1                  --> 0/0
```

## Example: Displaying DNS Hostname Information Using an Op Script

This example uses an op script to display Domain Name System (DNS) information for a device in your network.

- [Requirements on page 42](#)
- [Overview and Op Script on page 42](#)
- [Configuration on page 44](#)
- [Verification on page 45](#)

## Requirements

This example uses a device running Junos OS.

## Overview and Op Script

This script displays DNS information for a device in your network. The script offers a slight improvement over the **show host *hostname*** command because you do not need to enter a hostname or IP address to view DNS information for the device you are currently using.

There is no Junos Extensible Markup Language (XML) equivalent for the **show host *hostname*** command. Therefore, this script uses the **show host *hostname*** command directly rather than using a remote procedure call (RPC).

The script is provided in two distinct versions, one using the `<xsl:choose>` element and the other using the `jcs:first-of()` function. Both versions accept the same argument and produce the same output. Each version is shown in both XSLT and SLAX syntax.

### XSLT Syntax Using the `<xsl:choose>` Element

```
<?xml version="1.0" standalone="yes"?>
<xsl:stylesheet version="1.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:junos="http://xml.juniper.net/junos/*/junos"
  xmlns:xnm="http://xml.juniper.net/xnm/1.1/xnm"
  xmlns:jcs="http://xml.juniper.net/junos/commit-scripts/1.0">
  <xsl:import href="../import/junos.xsl"/>

  <xsl:variable name="arguments">
    <argument>
      <name>dns</name>
      <description>Name or IP address of a host</description>
    </argument>
  </xsl:variable>
  <xsl:param name="dns"/>
  <xsl:template match="/">
    <op-script-results>
      <xsl:variable name="query">
        <xsl:choose>
          <xsl:when test="$dns">
            <command>
              <xsl:value-of select="concat('show host ', $dns)"/>
            </command>
          </xsl:when>
          <xsl:when test="$hostname">
            <command>
              <xsl:value-of select="concat('show host ', $hostname)"/>
            </command>
          </xsl:when>
        </xsl:choose>
      </xsl:variable>
    </op-script-results>
  </xsl:template>
</xsl:stylesheet>
```

```

        </xsl:when>
    </xsl:choose>
</xsl:variable>
<xsl:variable name="result" select="jcs:invoke($query)"/>
<xsl:variable name="host" select="$result"/>
<output>
    <xsl:value-of select="concat('Name: ', $host)"/>
</output>
</op-script-results>
</xsl:template>
</xsl:stylesheet>

```

### XSLT Syntax Using the jcs:first-of() Function

```

<?xml version="1.0" standalone="yes"?>
<xsl:stylesheet version="1.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:junos="http://xml.juniper.net/junos/*/junos"
  xmlns:xnm="http://xml.juniper.net/xnm/1.1/xnm"
  xmlns:jcs="http://xml.juniper.net/junos/commit-scripts/1.0">
  <xsl:import href="../import/junos.xsl"/>

  <xsl:variable name="arguments">
    <argument>
      <name>dns</name>
      <description>Name or IP address of a host</description>
    </argument>
  </xsl:variable>
  <xsl:param name="dns"/>
  <xsl:template match="/">
    <op-script-results>
      <xsl:variable name="target" select="jcs:first-of($dns, $hostname)"/>
      <xsl:variable name="query">
        <command>
          <xsl:value-of select="concat('show host ', $target)"/>
        </command>
      </xsl:variable>
      <xsl:variable name="result" select="jcs:invoke($query)"/>
      <xsl:variable name="host" select="$result"/>
      <output>
        <xsl:value-of select="concat('Name: ', $host)"/>
      </output>
    </op-script-results>
  </xsl:template>
</xsl:stylesheet>

```

### SLAX Syntax Using the <xsl:choose> Element

```

version 1.0;
ns junos = "http://xml.juniper.net/junos/*/junos";
ns xnm = "http://xml.juniper.net/xnm/1.1/xnm";
ns jcs = "http://xml.juniper.net/junos/commit-scripts/1.0";
import "../import/junos.xsl";

var $arguments = {
  <argument> {
    <name> "dns";
    <description> "Name or IP address of a host";
  }
}

```

```

}
param $dns;
match / {
  <op-script-results> {
    var $query = {
      if ($dns) {
        <command> 'show host ' _ $dns;
      } else if ($hostname) {
        <command> 'show host ' _ $hostname;
      }
    }
    var $result = jcs:invoke($query);
    var $host = $result;
    <output> 'Name: ' _ $host;
  }
}

```

### SLAX Syntax Using the jcs:first-of() Function

```

version 1.0;
ns junos = "http://xml.juniper.net/junos/*/junos";
ns xnm = "http://xml.juniper.net/xnm/1.1/xnm";
ns jcs = "http://xml.juniper.net/junos/commit-scripts/1.0";
import "../import/junos.xml";

var $arguments = {
  <argument> {
    <name> "dns";
    <description> "Name or IP address of a host";
  }
}
param $dns;
match / {
  <op-script-results> {
    var $target = jcs:first-of($dns, $hostname);
    var $query = {
      <command> 'show host ' _ $target;
    }
    var $result = jcs:invoke($query);
    var $host = $result;
    <output> 'Name: ' _ $host;
  }
}

```

## Configuration

### Step-by-Step Procedure

To download, enable, and test the script:

1. Copy the XSLT or SLAX script into a text file, name the file **hostname.xml** or **hostname.slax** as appropriate, and copy it to the **/var/db/scripts/op/** directory on the device.
2. In configuration mode, include the **file** statement at the **[edit system scripts op]** hierarchy level and **hostname.xml** or **hostname.slax** as appropriate.

```

[edit system scripts op]
user@host# set file hostname.(slax | xml)

```

3. Issue the **commit and-quit** command to commit the configuration and to return to operational mode.

```
[edit]
user@host# commit and-quit
```

4. Execute the op script by issuing the **op hostname <dns (hostname | address)>** operational mode command.

## Verification

### Verifying the Commit Script Execution

**Purpose** Verify that the script behaves as expected.

**Action** When you issue the **op hostname** operational mode command without the **dns** option, DNS information is displayed for the local device:

```
user@host1> op hostname
Name:
host1 has address 10.168.71.246
```

When you issue the **op hostname dns hostname** command, DNS information is displayed for the specified device:

```
user@host1> op hostname dns router1
Name:
router1 has address 10.168.71.249
```

When you issue the **op hostname dns address** command, DNS information is displayed for the specified address:

```
user@host1> op hostname dns 10.168.71.249
Name:
249.71.168.10.IN-ADDR.ARPA domain name pointer router1
```

## Example: Exporting Files Using an Op Script

The op script in this example uses the Junos XML protocol **file-put** operation to write to a file on a remote server and on the local device.

- [Requirements on page 45](#)
- [Overview and Op Script on page 46](#)
- [Configuration on page 50](#)
- [Verification on page 50](#)

## Requirements

This example uses a device running Junos OS.

## Overview and Op Script

The Junos XML protocol **file-put** operation creates a file and writes the specified contents to that file. The basic syntax for using the **file-put** command is as follows:

```
<rpc>
  <file-put>
    <delete-if-exist />
    <encoding>value</encoding>
    <filename>value</filename>
    <permission>value</permission>
    <file-contents>file</file-contents>
  </file-put>
</rpc>
```

The following tag elements are used with the **file-put** command. These tags can be placed in any order with the exception of **file-contents**. The **file-contents** tag element must be the last tag in list.

- **delete-if-exist**—(Optional) If included, any existing file is overwritten. If the tag is omitted, an error is returned if an existing file is encountered.
- **encoding**—(Mandatory) Specifies the type of encoding used. You can use **ASCII** or **base64** encoding.
- **filename**—(Mandatory) Within this tag, you include the full or relative path and filename of the file to create. When you use a relative path, the specified path is relative to the user's home directory. If the specified directory does not exist, the system returns a "directory does not exist" error.
- **permission**—(Optional) Sets the file's UNIX permission on the remote server. For example, to apply read/write access for the user, and read access to others, you would set the permission value to 0644. For a full explanation of UNIX permissions, see the **chmod** command.
- **file-contents**—(Mandatory) The **ASCII** or **base64** encoded file contents to export. This must be the last tag in the list.

**XSLT Syntax** The following sample script executes a Junos XML API request and exports the results to a file on a remote device and a file on the local device. The script takes three arguments: the IP address or hostname of the remote device, the filename, and the file encoding. The **arguments** variable is declared at the global level of the script so that the argument names and descriptions are visible in the command-line interface (CLI).

The script invokes the Junos XML API **<get-software-information>** request on the local device and stores the result in the **result** variable. The script declares the **fileput** variable, which contains the remote procedure call (RPC) for the **file-put** operation. The command-line arguments define the values for the **filename** and **encoding** tag elements. If the mandatory argument **myhost** is missing, the script issues an error and halts execution. Otherwise, the script prompts for the username and password that will be used to connect to the remote device.

If connection to the remote device is successful, the script executes the RPC within the context of the connection handle. The output of the **file-put** operation, which is the result of the **jcs:execute()** function, is stored in the **out** variable. If the operation encounters an error, the script prints the error to the CLI. If the **file-put** operation is successful, the contents specified by the **file-contents** tag element are exported to the specified file on the remote device. The connection to the remote host is then closed. The script also exports the contents to an identical file on the local device.

The sample script includes the optional tag elements **permission** and **delete-if-exist** for the **file-put** operation. By including the **delete-if-exist** tag, the script overwrites any existing file of the same name on the remote and local hosts. In this example, the **permission** tag is set to **0644**.

```
<?xml version="1.0" standalone="yes"?>
<xsl:stylesheet
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:junos="http://xml.juniper.net/junos/*/junos"
  xmlns:xnm="http://xml.juniper.net/xnm/1.1/xnm"
  xmlns:jcs="http://xml.juniper.net/junos/commit-scripts/1.0" version="1.0">
  <xsl:import href="../../import/junos.xsl"/>

  <xsl:variable name="arguments">
    <argument>
      <name>myhost</name>
      <description>IP address or hostname of the remote host</description>
    </argument>
    <argument>
      <name>filename</name>
      <description>name of destination file</description>
    </argument>
    <argument>
      <name>encoding</name>
      <description>ascii or base64</description>
    </argument>
  </xsl:variable>

  <xsl:param name="myhost"/>
  <xsl:param name="filename"/>
  <xsl:param name="encoding"/>

  <xsl:template match="/">
    <op-script-results>
```

```
<xsl:variable name="rpc">
  <get-software-information/>
</xsl:variable>
<xsl:variable name="result" select="jcs:invoke($rpc)"/>

<xsl:variable name="fileput">
  <file-put>
    <filename>
      <xsl:value-of select="$filename"/>
    </filename>
    <encoding>
      <xsl:value-of select="$encoding"/>
    </encoding>
    <permission>0644</permission>
    <delete-if-exist/>
    <file-contents>
      <xsl:value-of select="$result"/>
    </file-contents>
  </file-put>
</xsl:variable>

<xsl:choose>
  <xsl:when test="$myhost = ''">
    <xnm:error>
      <message>missing mandatory argument 'myhost'</message>
    </xnm:error>
  </xsl:when>
  <xsl:otherwise>
    <xsl:variable name="username" select="jcs:get-input('Enter username: ')/>
    <xsl:variable name="pw" select="jcs:get-secret('Enter password: ')/>
    <xsl:variable name="connect" select="jcs:open($myhost, $username, $pw)"/>
    <xsl:choose>
      <xsl:when test="$connect">
        <output>Connected to host. Exporting file... </output>
        <xsl:variable name="out" select="jcs:execute($connect, $fileput)"/>
        <xsl:choose>
          <xsl:when test="$out//xnm:error">
            <xsl:copy-of select="($out//xnm:error)"/>
          </xsl:when>
          <xsl:otherwise>
            <output>
              <xsl:value-of select="$out"/>
            </output>
          </xsl:otherwise>
        </xsl:choose>
        <xsl:value-of select="jcs:close($connect)"/>
      </xsl:when>
      <xsl:otherwise>
        <output>No connection to host.</output>
      </xsl:otherwise>
    </xsl:choose>
  </xsl:otherwise>
</xsl:choose>

<xsl:variable name="local-out" select="jcs:invoke($fileput)"/>
```



```

    <output>
      <xsl:value-of select="concat('Saving file on local host\n', $local-out)"/>
    </output>
  </op-script-results>
</xsl:template>
</xsl:stylesheet>

```

**SLAX Syntax**

```

version 1.0;
ns junos = "http://xml.juniper.net/junos/*/junos";
ns xnm = "http://xml.juniper.net/xnm/1.1/xnm";
ns jcs = "http://xml.juniper.net/junos/commit-scripts/1.0";
import "../import/junos.xsl";

var $arguments = {
  <argument> {
    <name> "myhost";
    <description> "IP address or hostname of the remote host";
  }
  <argument> {
    <name> "filename";
    <description> "name of destination file";
  }
  <argument> {
    <name> "encoding";
    <description> "ascii or base64";
  }
}

param $myhost;
param $filename;
param $encoding;

match / {
  <op-script-results> {

    var $rpc = <get-software-information>;
    var $result = jcs:invoke($rpc);

    var $fileput = {
      <file-put> {
        <filename>$filename;
        <encoding>$encoding;
        <permission>'0644';
        <delete-if-exist>;
        <file-contents>$result;
      }
    }

    if ($myhost = "") {
      <xnm:error> {
        <message> "missing mandatory argument 'myhost'";
      }
    }
    else {
      var $username = jcs:get-input("Enter username: ");
      var $pw = jcs:get-secret("Enter password: ");
    }
  }
}

```

```
var $connect = jcs:open($myhost, $username, $pw);

if ($connect) {
    <output> "Connected to host. Exporting file... \n";
    var $out = jcs:execute($connect, $fileput);
    if ($out//xnm:error) {
        copy-of ($out//xnm:error);
    }
    else {
        <output> $out;
    }
    expr jcs:close($connect);
}
else {
    <output> "No connection to host.";
}

}
var $local-out = jcs:invoke($fileput);
<output> "Saving file on local host\n" _ $local-out;
}
}
```

## Configuration

### Step-by-Step Procedure

To download, enable, and test the script:

1. Copy the XSLT or SLAX script into a text file, name the file **export.xml** or **export.slax** as appropriate, and copy it to the **/var/db/scripts/op/** directory on the device.
2. In configuration mode, include the **file** statement at the **[edit system scripts op]** hierarchy level and **export.xml** or **export.slax** as appropriate.

```
[edit system scripts op]
user@host# set file export.(slax | xml)
```

3. Issue the **commit and-quit** command.

```
[edit]
user@host# commit and-quit
```

4. Execute the op script by issuing the **op export** operational mode command and include any necessary arguments.

## Verification

- [Verifying the Op Script Arguments on page 50](#)
- [Verifying Op Script Execution on page 51](#)

---

### Verifying the Op Script Arguments

**Purpose** Verify that the argument names and descriptions show up in the CLI.

**Action** Issue the **op export ?** operational mode command. The CLI lists the possible completions for the script arguments based on the definitions within the global **arguments** variable in the script.

```
user@host> op export ?
Possible completions:
<[Enter]>      Execute this command
<name>         Argument name
detail         Display detailed output
encoding       ascii or base64
filename       name of destination file
myhost         IP address or hostname of the remote host
|             Pipe through a command
```

---

### Verifying Op Script Execution

**Purpose** Verify that the script behaves as expected.

**Action** Issue the **op export myhost *host* encoding *encoding* filename *file*** operational mode command, and include the appropriate username and password when prompted. If script execution is successful, the result of the <**get-software-information**> RPC request is written to the file on the remote device and also on the local device. For example:

```
root@host> op export myhost router1 encoding ascii filename /var/log/host-version.txt
Enter username: root
Enter password:
Connected to host. Exporting file...
```

```
/var/log/host-version.txt
Saving file on local host
```

```
/var/log/host-version.txt
```

If you fail to supply the IP address or hostname of the remote device in the command-line arguments, the script issues an error and halts execution.

```
root@host> op export
error: missing mandatory argument 'myhost'
```

If you omit the **delete-if-exist** child tag of the **file-put** operation, and the specified file already exists, the script reports an error.

```
root@host> op export myhost router1 encoding ascii filename /var/log/host-version.txt
Enter username: root
Enter password:
Connected to host. Exporting file...
```

```
Destination file exists
Saving file on local host
```

```
Destination file exists
```

If you execute the script and include a directory path that does not exist on either the remote or the local host, the script reports an error.

```
root@host> op export myhost router1 encoding ascii filename /var/test/host-version.txt
Enter username: root
Enter password:
Connected to host. Exporting file...
```

```
Destination directory does not exist: /var/test
Saving file on local host
```

```
Destination directory does not exist: /var/test
```

- Related Documentation**
- [Declaring Arguments in Op Scripts on page 13](#)
  - [Example: Importing Files Using an Op Script on page 57](#)

## Example: Finding LSPs to Multiple Destinations Using an Op Script

This example uses an op script to check for label-switched paths (LSPs) to multiple destinations.

- [Requirements on page 53](#)
- [Overview and Op Script on page 53](#)
- [Configuration on page 56](#)
- [Verification on page 56](#)

### Requirements

This example uses a device running Junos OS.

### Overview and Op Script

The following example script, which is shown in both XSLT and SLAX, checks for LSPs to multiple destinations. The script takes one mandatory command-line argument, the address specifying the LSP endpoint. The address argument can include an optional prefix length. If no address is specified, the script generates an error message and halts execution.

The **get-configuration** variable stores the remote procedure call (RPC) to retrieve the **[edit protocols mpls]** hierarchy level of the device's committed configuration. This configuration is stored in the **config** variable. The **get-route-information** variable stores the RPC equivalent of the **show route address terse** operational mode command, where the value of the **destination** tag specifies *address*. The script sets this value to the address specified by the user on the command line. The script invokes the **get-route-information** RPC and stores the output in the **rpc-out** variable. If **rpc-out** does not contain any errors, the script examines all host route entries present at the **route-table/rt/rt-destination** node.

For each host route entry, if an LSP to the destination is configured in the active configuration, the script generates a "Found" message with the destination address and corresponding LSP name in the output. If an LSP to the destination is not configured, the output generates a "Missing" message containing the destination address and hostname.

#### XSLT Syntax

```
<?xml version="1.0" standalone="yes"?>
<xsl:stylesheet
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:junos="http://xml.juniper.net/junos/*/junos"
  xmlns:xnm="http://xml.juniper.net/xnm/1.1/xnm"
  xmlns:jcs="http://xml.juniper.net/junos/commit-scripts/1.0" version="1.0">
  <xsl:import href="../../import/junos.xml"/>

  <xsl:variable name="arguments">
    <argument>
      <name>address</name>
      <description>LSP endpoint</description>
    </argument>
  </xsl:variable>
```

```
<xsl:param name="address"/>
<xsl:template match="/">
  <op-script-output>
    <xsl:choose>
      <xsl:when test="$address = ''">
        <xnm:error>
          <message>missing mandatory argument 'address'</message>
        </xnm:error>
      </xsl:when>
      <xsl:otherwise>
        <xsl:variable name="get-configuration">
          <get-configuration database="committed">
            <configuration>
              <protocols>
                <mpls/>
              </protocols>
            </configuration>
          </get-configuration>
        </xsl:variable>
        <xsl:variable name="config"
          select="jcs:invoke($get-configuration)"/>
        <xsl:variable name="mpls" select="$config/protocols/mpls"/>
        <xsl:variable name="get-route-information">
          <get-route-information>
            <terse/>
            <destination>
              <xsl:value-of select="$address"/>
            </destination>
          </get-route-information>
        </xsl:variable>
        <xsl:variable name="rpc-out"
          select="jcs:invoke($get-route-information)"/>
        <xsl:choose>
          <xsl:when test="$rpc-out//xnm:error">
            <xsl:copy-of select="$rpc-out//xnm:error"/>
          </xsl:when>
          <xsl:otherwise>
            <xsl:for-each select="$rpc-out/route-table/rt/rt-destination">
              <xsl:choose>
                <xsl:when test="contains(.,'/32')">
                  <xsl:variable name="dest"
                    select="substring-before(.,'/')"/>
                  <xsl:variable name="lsp"
                    select="$mpls/label-switched-path[to = $dest]"/>
                  <xsl:choose>
                    <xsl:when test="$lsp">
                      <output>
                        <xsl:value-of select="concat('Found: ', $dest,
                          '(', $lsp/to, ') --> ', $lsp/name)"/>
                      </output>
                    </xsl:when>
                    <xsl:otherwise>
                      <xsl:variable name="name"
                        select="jcs:hostname($dest)"/>
                      <output>
                        <xsl:value-of select="concat('Name: ', $name)"/>
                      </output>
                    </xsl:otherwise>
                  </xsl:choose>
                </xsl:when>
              </xsl:choose>
            </xsl:for-each>
          </xsl:otherwise>
        </xsl:choose>
      </xsl:otherwise>
    </xsl:choose>
  </op-script-output>
</xsl:template>
```

```

        </output>
        <output>
          <xsl:value-of select="concat('Missing: ', $dest)"/>
        </output>
      </xsl:otherwise>
    </xsl:choose>
  </xsl:when>
  <xsl:otherwise>
    <output>
      <xsl:value-of select="concat('Not a host route: ', .)"/>
    </output>
  </xsl:otherwise>
</xsl:choose>
</xsl:for-each>
</xsl:otherwise>
</xsl:choose>
</xsl:otherwise>
</xsl:choose>
</op-script-output>
</xsl:template>
</xsl:stylesheet>

```

**SLAX Syntax**

```

version 1.0;
ns junos = "http://xml.juniper.net/junos/*/junos";
ns xnm = "http://xml.juniper.net/xnm/1.1/xnm";
ns jcs = "http://xml.juniper.net/junos/commit-scripts/1.0";

import "../import/junos.xml";

var $arguments = {
  <argument> {
    <name> "address";
    <description> "LSP endpoint";
  }
}
param $address;
match / {
  <op-script-output> {
    if ($address = "") {
      <xnm:error> {
        <message> "missing mandatory argument 'address'";
      }
    } else {
      var $get-configuration = {
        <get-configuration database="committed"> {
          <configuration> {
            <protocols> {
              <mpls>;
            }
          }
        }
      }
      var $config = jcs:invoke($get-configuration);
      var $mpls = $config/protocols/mpls;
      var $get-route-information = {
        <get-route-information> {

```

```

        <terse>;
        <destination> $address;
    }
}
var $rpc-out = jcs:invoke($get-route-information);
if ($rpc-out//xnm:error) {
    copy-of $rpc-out//xnm:error;
} else {
    for-each ($rpc-out/route-table/rt/rt-destination) {
        if (contains(.,'/32')) {
            var $dest = substring-before(.,'/');
            var $lsp = $mpls/label-switched-path[to = $dest];
            if ($lsp) {
                <output> 'Found: ' _ $dest _ '(' _ $lsp/to _ ') --> ' _
                    $lsp/name;
            } else {
                var $name = jcs:hostname($dest);
                <output> 'Name: ' _ $name;
                <output> 'Missing: ' _ $dest;
            }
        } else {
            <output> 'Not a host route: ' _ .;
        }
    }
}
}
}
}
}
}
}
}
}
}
}

```

## Configuration

### Step-by-Step Procedure

To download, enable, and test the script:

1. Copy the XSLT or SLAX script into a text file, name the file **lsp.xml** or **lsp.slax** as appropriate, and copy it to the **/var/db/scripts/op/** directory on the device.
2. In configuration mode, include the **file** statement at the **[edit system scripts op]** hierarchy level and **lsp.xml** or **lsp.slax** as appropriate.

```

[edit system scripts op]
user@host# set file lsp.(slax | xml)

```

3. Issue the **commit and-quit** command to commit the configuration and to return to operational mode.

```

[edit]
user@host# commit and-quit

```

4. Execute the op script by issuing the **op lsp address address** operational mode command.

## Verification

### Verifying Script Execution

**Purpose** Verify that the script behaves as expected.



**Action** Issue the `op lsp address address` operational mode command to execute the script. The output varies depending on the configuration.

```
user@R4> op lsp address 10.168.215.0/24
Found: 192.168.215.1 (192.168.215.1) --> R4>R1
Found: 192.168.215.2 (192.168.215.2) --> R4>R2
Name: R3
Missing: 10.168.215.3
Name: R5
Missing: 10.168.215.4
Name: R6
Missing: 10.168.215.5
```

## Example: Importing Files Using an Op Script

The op script in this example uses the Junos XML protocol **file-get** operation to read the contents of a file from a remote server.

- [Requirements on page 57](#)
- [Overview and Op Script on page 57](#)
- [Configuration on page 61](#)
- [Verification on page 61](#)

### Requirements

This example uses a device running Junos OS.

### Overview and Op Script

The Junos XML protocol **file-get** operation reads the contents of a file. The basic syntax for using the **file-get** command is as follows:

```
<rpc>
  <file-get>
    <filename>value</filename>
    <encoding>value</encoding>
  </file-get>
</rpc>
```

The following tag elements are used with the **file-get** command.

- **encoding**—(Mandatory) Specifies the type of encoding used. You can use **ASCII**, **base64**, or **raw** encoding.
- **filename**—(Mandatory) Within this tag, you include the full or relative path and filename of the file to import. When you use a relative path, the specified path is relative to the `/var/tmp/` directory if the **file-get** operation is executed locally. If the operation is executed remotely within the context of a connection handle, the path is relative to the user's home directory.



**NOTE:** When you use ASCII encoding, the **file-get** operation converts any control characters in the imported file to the Unicode character 'SECTION SIGN' (U+00A7).

**XSLT Syntax** The following sample script connects to a remote device and reads the contents of the specified file. The script takes three arguments: the IP address or hostname of the remote device, the filename, and the file encoding. The **arguments** variable is declared at the global level of the script so that the argument names and descriptions are visible in the command-line interface (CLI).

The script declares the **fileget** variable, which contains the remote procedure call (RPC) for the **file-get** operation. The command-line arguments define the values for the **filename** and **encoding** tag elements. If the mandatory argument **myhost** is missing, the script issues an error and halts execution. Otherwise, the script prompts for the username and password that will be used to connect to the remote device.

If connection to the remote device is successful, the script executes the RPC within the context of the connection handle. The output of the **file-get** operation, which is the result of the **jcs:execute()** function, is stored in the **out** variable. If the operation encounters an error, the script prints the error to the CLI. If the **file-get** operation is successful, the contents of the file are stored in the **out** variable, which is printed to the CLI. The connection to the remote host is then closed.

```
<?xml version="1.0" standalone="yes"?>
<xsl:stylesheet
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:junos="http://xml.juniper.net/junos/*/junos"
  xmlns:xnm="http://xml.juniper.net/xnm/1.1/xnm"
  xmlns:jcs="http://xml.juniper.net/junos/commit-scripts/1.0" version="1.0">
  <xsl:import href="../import/junos.xsl"/>

  <xsl:variable name="arguments">
    <argument>
      <name>myhost</name>
      <description>IP address or hostname of the remote host</description>
    </argument>
    <argument>
      <name>filename</name>
      <description>name of file</description>
    </argument>
    <argument>
      <name>encoding</name>
      <description>ascii, base64, or raw</description>
    </argument>
  </xsl:variable>

  <xsl:param name="myhost"/>
  <xsl:param name="filename"/>
  <xsl:param name="encoding"/>

  <xsl:template match="/">
    <op-script-results>
      <xsl:variable name="fileget">
        <file-get>
```

```

    <filename>
      <xsl:value-of select="$filename"/>
    </filename>
    <encoding>
      <xsl:value-of select="$encoding"/>
    </encoding>
  </file-get>
</xsl:variable>
<xsl:choose>
  <xsl:when test="$myhost = ''">
    <xnm:error>
      <message>missing mandatory argument 'myhost'</message>
    </xnm:error>
  </xsl:when>
  <xsl:otherwise>
    <xsl:variable name="username" select="jcs:get-input('Enter username: ')/">

    <xsl:variable name="pw" select="jcs:get-secret('Enter password: ')/">
    <xsl:variable name="connect" select="jcs:open($myhost, $username, $pw)/">

    <xsl:choose>
      <xsl:when test="$connect">
        <output>Connected to host. Reading file...
        </output>
        <xsl:variable name="out" select="jcs:execute($connect, $fileget)/">
        <xsl:choose>
          <xsl:when test="$out//xnm:error">
            <xsl:copy-of select="$out//xnm:error"/>
          </xsl:when>
          <xsl:otherwise>
            <output>
              <xsl:value-of select="concat('File contents: ', $out)"/>
            </output>
          </xsl:otherwise>
        </xsl:choose>
        <xsl:value-of select="jcs:close($connect)"/>
      </xsl:when>
      <xsl:otherwise>
        <output>No connection to host.</output>
      </xsl:otherwise>
    </xsl:choose>
  </xsl:otherwise>
</xsl:choose>
</op-script-results>
</xsl:template>
</xsl:stylesheet>

```

**SLAX Syntax**

```

version 1.0;
ns junos = "http://xml.juniper.net/junos/*/junos";
ns xnm = "http://xml.juniper.net/xnm/1.1/xnm";
ns jcs = "http://xml.juniper.net/junos/commit-scripts/1.0";
import "../import/junos.xml";

var $arguments = {
  <argument> {
    <name> "myhost";

```

```
        <description> "IP address or hostname of the remote host";
    }
    <argument> {
        <name> "filename";
        <description> "name of file";
    }
    <argument> {
        <name> "encoding";
        <description> "ascii, base64, or raw";
    }
}

param $myhost;
param $filename;
param $encoding;

match / {
    <op-script-results> {
        var $fileget = {
            <file-get> {
                <filename>$filename;
                <encoding>$encoding;
            }
        }
    }

    if ($myhost = "") {
        <xnm:error> {
            <message> "missing mandatory argument 'myhost'";
        }
    }
    else {
        var $username = jcs:get-input("Enter username: ");
        var $pw = jcs:get-secret("Enter password: ");
        var $connect = jcs:open($myhost, $username, $pw);

        if ($connect) {
            <output> "Connected to host. Reading file... \n";
            var $out = jcs:execute($connect, $fileget);
            if ($out//xnm:error) {
                copy-of $out//xnm:error;
            }
            else {
                <output> "File contents: " _ $out;
            }
            expr jcs:close($connect);
        }
        else {
            <output> "No connection to host.";
        }
    }
}
}
```

## Configuration

- Step-by-Step Procedure** To download, enable, and test the script:
1. Copy the XSLT or SLAX script into a text file, name the file **import.xml** or **import.slax** as appropriate, and copy it to the **/var/db/scripts/op/** directory on the device.
  2. In configuration mode, include the **file** statement at the **[edit system scripts op]** hierarchy level and **import.xml** or **import.slax** as appropriate.
 

```
[edit system scripts op]
user@host# set file import.(slax | xml)
```
  3. Issue the **commit and-quit** command to commit the configuration and to return to operational mode.
 

```
[edit]
user@host# commit and-quit
```
  4. Execute the op script by issuing the **op import** operational mode command and include any necessary arguments.

## Verification

### Verifying the Script Arguments

- Purpose** Verify that the argument names and descriptions show up in the CLI.
- Action** Issue the **op import ?** operational mode command. The CLI lists the possible completions for the script arguments based on the definitions within the global **arguments** variable in the script.
- ```
user@host> op import ?
Possible completions:
<[Enter]>          Execute this command
<name>            Argument name
detail            Display detailed output
encoding          ascii, base64, or raw
filename          name of file
myhost            IP address or hostname of the remote host
|                Pipe through a command
```

### Verifying Op Script Execution

- Purpose** Verify that the script behaves as expected.

**Action** Issue the `op import myhost host encoding encoding filename file` operational mode command, and include the appropriate username and password when prompted. If script execution is successful, the contents of the requested file are displayed. For example:

```
root@host> op import myhost router1 encoding ascii filename /var/db/scripts/op/test.slax
Enter username: root
Enter password:
Connected to host. Reading file...
File contents:

version 1.0;
ns junos = "http://xml.juniper.net/junos/*/junos";
ns xnm = "http://xml.juniper.net/xnm/1.1/xnm";
ns jcs = "http://xml.juniper.net/junos/commit-scripts/1.0";
import "../import/junos.xml";
...
```

If you fail to supply the IP address or hostname of the remote device in the command-line arguments, the script issues an error and halts execution.

```
root@host> op import
error: missing mandatory argument 'myhost'
```

Also, if the specified path or file does not exist, the script issues an error.

```
root@host> op import myhost router1 encoding ascii filename /var/db/scripts/op/test1.slax
Enter username: root
Enter password:
Connected to host. Reading file...
File contents:
```

```
Failed to open file (/var/db/scripts/op/test1.slax): No such file or directory
```

- Related Documentation**
- [Declaring Arguments in Op Scripts on page 13](#)
  - [Example: Exporting Files Using an Op Script on page 45](#)

---

## Example: Restarting an FPC Using an Op Script

This example uses an op script to restart a Flexible PIC Concentrator (FPC).

- [Requirements on page 62](#)
- [Overview and Op Script on page 63](#)
- [Configuration on page 64](#)
- [Verification on page 64](#)

### Requirements

This example uses a device running Junos OS that contains a Flexible PIC Concentrator (FPC) or equivalent component.

## Overview and Op Script

The following script, which is shown in both XSLT and SLAX formats, restarts an FPC given the slot number in which the FPC resides. The user provides the slot number in the command-line interface (CLI) when the script is invoked. The script stores the slot number as the value of the parameter **slot** and constructs the **request chassis fpc** command string to include the slot number of the FPC to restart. There is no Junos Extensible Markup Language (XML) equivalent for the **request chassis** commands. Therefore, this script invokes the **request chassis fpc** command directly rather than using a remote procedure call (RPC).

### XSLT Syntax

```
<?xml version="1.0" standalone="yes"?>
<xsl:stylesheet version="1.0"
  xmlns:xsl="http://www.w3.org/1999/XSL/Transform"
  xmlns:junos="http://xml.juniper.net/junos/*/junos"
  xmlns:xnm="http://xml.juniper.net/xnm/1.1/xnm"
  xmlns:jcs="http://xml.juniper.net/junos/commit-scripts/1.0">
  <xsl:import href="../../import/junos.xml"/>

  <xsl:variable name="arguments">
    <argument>
      <name>slot</name>
      <description>Slot number of the FPC</description>
    </argument>
  </xsl:variable>
  <xsl:param name="slot"/>
  <xsl:template match="/">
    <op-script-results>
      <xsl:variable name="restart">
        <command>
          <xsl:value-of select="concat('request chassis fpc slot ', $slot,
                                     'restart')"/>
        </command>
      </xsl:variable>
      <xsl:variable name="result" select="jcs:invoke($restart)"/>
      <output>
        <xsl:text>Restarting the FPC in slot </xsl:text>
        <xsl:value-of select="$slot"/>
        <xsl:text>. </xsl:text>
        <xsl:text>To verify, issue the "show chassis fpc" command.</xsl:text>
      </output>
    </op-script-results>
  </xsl:template>
</xsl:stylesheet>
```

### SLAX Syntax

```
version 1.0;
ns junos = "http://xml.juniper.net/junos/*/junos";
ns xnm = "http://xml.juniper.net/xnm/1.1/xnm";
ns jcs = "http://xml.juniper.net/junos/commit-scripts/1.0";
import "../../import/junos.xml";

var $arguments = {
  <argument> {
    <name> "slot";
```

```
        <description> "Slot number of the FPC";
    }
}
param $slot;
match / {
    <op-script-results> {
        var $restart = {
            <command> 'request chassis fpc slot ' _ $slot _ ' restart';
        }
        var $result = jcs:invoke($restart);
        <output> {
            expr "Restarting the FPC in slot ";
            expr $slot;
            expr ". ";
            expr "To verify, issue the \"show chassis fpc\" command.";
        }
    }
}
```

## Configuration

### Step-by-Step Procedure

To download, enable, and test the script:

1. Copy the XSLT or SLAX script into a text file, name the file **restart-fpc.xml** or **restart-fpc.slax** as appropriate, and download it to the **/var/db/scripts/op/** directory on the device.

Only users who belong to the Junos OS **super-user** login class can access and edit files in this directory.

2. In configuration mode, include the **file** statement at the **[edit system scripts op]** hierarchy level and **restart-fpc.xml** or **restart-fpc.slax** as appropriate.

```
[edit system scripts op]
user@host# set file restart-fpc.(slax | xml)
```

3. Issue the **commit and-quit** command to commit the configuration and to return to operational mode.

```
[edit]
user@host# commit and-quit
```

4. Execute the op script by issuing the **op restart-fpc slot slot-number** operational mode command.

## Verification

### Verifying Op Script Execution

---

**Purpose** Verify that the FPC has been restarted and is currently online.



**Action** Execute the op script by issuing the **op filename** operational mode command. Supply the **slot** number of the FPC as an argument.

```
user@host> op restart-fpc slot 0
```

When you execute the script, you should see output similar to the following:

Restarting the FPC in slot 0. To verify, issue the "show chassis fpc" command.

Issue the **show chassis fpc detail fpc-slot** operational mode command.

```
user@host> show chassis fpc detail 0
```

```
Slot 0 information:
  State                               Online
  Temperature                         36 degrees C / 96 degrees F
  Total CPU DRAM                      1024 MB
  Total RLDRAM                        256 MB
  Total DDR DRAM                      4096 MB
  Start time:                         2009-08-11 21:20:30 PDT
  Uptime:                             0 hours, 1 minutes, 50 seconds
  Max Power Consumption               335 Watts
```

**Meaning** The **show chassis fpc detail** command output displays the state, start time, uptime, and characteristics for the FPC. Verify that the FPC was restarted by checking the start time and uptime of the FPC. Verify the status of the restarted FPC by checking the state. If the status is **Present**, the FPC is coming up but is not yet online. If the status is **Online**, the FPC is online and running.

## Example: Searching Files Using an Op Script

This sample script searches a file on a device running Junos OS for lines matching a given regular expression. The example uses the **jcs:grep** template in an op script.

- [Requirements on page 65](#)
- [Overview and Op Script on page 65](#)
- [Configuration on page 68](#)
- [Verification on page 68](#)

### Requirements

This example uses a device running Junos OS.

### Overview and Op Script

The **jcs:grep** template searches an ASCII file for lines matching a regular expression. The template resides in the **junos.xsl** import file, which is included with the standard Junos OS installation available on all switches, routers, and security devices running Junos OS. To use the **jcs:grep** template in a script, you must import the **junos.xsl** file into the script and map the **jcs** prefix to the namespace identified by the URI <http://xml.juniper.net/junos/commit-scripts/1.0>.

In this example, all values required for the **jcs:grep** template are defined as global parameters. The values for the parameters are passed into the script as command-line arguments. The following script defines two parameters, **filename** and **pattern**, which store the values of the input file path and the regular expression. If you omit either argument when you execute the script, the script generates an error and halts execution. Otherwise, the script calls the **jcs:grep** template and passes in the supplied arguments.

If the regular expression contains a syntax error, the **jcs:grep** template generates an **error: regex error** message for each line in the file. If the regular expression syntax is valid, the template parses the input file. For each match, the template adds a **<match>** element, which contains **<input>** and **<output>** child tags, to the result tree. The template writes the matching string to the **<output>** child element and writes the corresponding matching line to the **<input>** child element:

```
<match> {  
  <input>  
  <output>  
}
```

In the SLAX script, the **:=** operator copies the results of the **jcs:grep** template call to a temporary variable and runs the **node-set** function on that variable. The **:=** operator ensures that the **results** variable is a node-set rather than a result tree fragment so that the script can access the contents. The XSLT script explicitly calls out the equivalent steps. The script then loops through all resulting input elements and prints each match.

#### XSLT Syntax

```
<?xml version="1.0" standalone="yes"?>  
<xsl:stylesheet xmlns:xsl="http://www.w3.org/1999/XSL/Transform"  
  xmlns:junos="http://xml.juniper.net/junos/*/junos"  
  xmlns:xnm="http://xml.juniper.net/xnm/1.1/xnm"  
  xmlns:jcs="http://xml.juniper.net/junos/commit-scripts/1.0" version="1.0">  
  <xsl:import href="../import/junos.xsl"/>  
  
  <xsl:variable name="arguments">  
    <argument>  
      <name>filename</name>  
      <description>name of file in which to search for the specified pattern  
    </description>  
    </argument>  
    <argument>  
      <name>pattern</name>  
      <description>regular expression</description>  
    </argument>  
  </xsl:variable>  
  
  <xsl:param name="filename"/>  
  <xsl:param name="pattern"/>  
  
  <xsl:template match="/">  
  
    <op-script-results>  
      <xsl:choose>  
        <xsl:when test="$filename = "">  
          <xnm:error>  
            <message>missing mandatory argument 'filename'</message>  
          </xnm:error>  
        </xsl:when>  
      </xsl:choose>  
    </op-script-results>  
  </xsl:template>  
</xsl:stylesheet>
```

```

</xsl:when>
<xsl:when test="$pattern = ''">
  <xnm:error>
    <message>missing mandatory argument 'pattern'</message>
  </xnm:error>
</xsl:when>
<xsl:otherwise>
  <xsl:variable name="results-temp">
    <xsl:call-template name="jcs:grep">
      <xsl:with-param name="filename" select="$filename"/>
      <xsl:with-param name="pattern" select="$pattern"/>
    </xsl:call-template>
  </xsl:variable>
  <xsl:variable xmlns:ext="http://xmlsoft.org/XSLT/namespace"
    name="results" select="ext:node-set($results-temp)"/>
  <output>
    <xsl:value-of select="concat('Search for ', $pattern, ' in ', $filename)"/>
  </output>
  <xsl:for-each select="$results//input">
    <output>
      <xsl:value-of select="."/>
    </output>
  </xsl:for-each>
</xsl:otherwise>
</xsl:choose>
</op-script-results>

</xsl:template>
</xsl:stylesheet>

```

**SLAX Syntax**

```

version 1.0;
ns junos = "http://xml.juniper.net/junos/*/junos";
ns xnm = "http://xml.juniper.net/xnm/1.1/xnm";
ns jcs = "http://xml.juniper.net/junos/commit-scripts/1.0";

import "../import/junos.xml";

var $arguments = {
  <argument> {
    <name> "filename";
    <description> "name of file in which to search for the specified pattern";
  }
  <argument> {
    <name> "pattern";
    <description> "regular expression";
  }
}

param $filename;
param $pattern;

match / {
  <op-script-results> {

    if ($filename = '') {
      <xnm:error> {

```

```
        <message> "missing mandatory argument 'filename'";
    }
}
else if ($pattern = '') {
    <xnm:error> {
        <message> "missing mandatory argument 'pattern'";
    }
}
else {
    var $results := { call jcs:grep($filename, $pattern); }

    <output> "Search for " _ $pattern _ " in " _ $filename;
    for-each ($results//input) {
        <output> .;
    }
}
}
```

## Configuration

### Step-by-Step Procedure

To download, enable, and run the script:

1. Copy the XSLT or SLAX script into a text file, name the file **grep.xml** or **grep.slax** as appropriate, and download it to the **/var/db/scripts/op/** directory on the device.
2. In configuration mode, include the **file** statement at the **[edit system scripts op]** hierarchy level and **grep.xml** or **grep.slax** as appropriate.

```
[edit system scripts op]
user@host# set file grep.(slax | xml)
```

3. Issue the **commit and-quit** command to commit the configuration and to return to operational mode.

```
[edit]
user@host# commit and-quit
```

4. Execute the op script by issuing the **op grep filename *filename* pattern *pattern*** operational mode command.

## Verification

### Verifying the Script Arguments

---

**Purpose** Verify that the argument names and descriptions appear in the command-line interface (CLI) help.

**Action** Issue the **op grep ?** operational mode command. The CLI lists the possible completions for the script arguments based on the definitions within the global variable **arguments** in the script.

```
user@host> op grep
Possible completions:
  <[Enter]>      Execute this command
  <name>         Argument name
  detail        Display detailed output
  filename      name of file in which to search for the specified pattern

  pattern       regular expression
  |             Pipe through a command
```

### Verifying Op Script Execution

**Purpose** Verify that the script behaves as expected.

**Action** If you issue the **op grep** command, but you fail to supply either the filename or the regex pattern, the script issues an error message and halts execution. For example:

```
user@host> op grep filename /var/log/messages
error: missing mandatory argument 'pattern'

user@host> op grep pattern SNMP_TRAP_LINK_DOWN
error: missing mandatory argument 'filename'
```

When you issue the **op grep filename *filename* pattern *pattern*** command, the script lists all lines from the input file that match the regular expression.

```
user@host> op grep filename /var/log/messages pattern SNMP_TRAP_LINK_DOWN
Search for SNMP_TRAP_LINK_DOWN in /var/log/messages
Feb 24 09:04:00 host mib2d[1325]: SNMP_TRAP_LINK_DOWN: ifIndex 543, ifAdminStatus
down(2), ifOperStatus down(2), ifName
1t-0/1/0.9
Feb 24 09:04:00 host mib2d[1325]: SNMP_TRAP_LINK_DOWN: ifIndex 542, ifAdminStatus
down(2), ifOperStatus down(2), ifName
1t-0/1/0.10
```

- Related Documentation**
- *SLAX Templates Overview*
  - *jcs:grep Template*
  - *regex() Function (jcs and slax Namespaces)*



## CHAPTER 4

# Summary of Operations Automation Configuration Statements

- [Any Hierarchy Level on page 71](#)
- [\[edit system scripts\] Hierarchy Level on page 71](#)

### Any Hierarchy Level

---

The following statement can be added at any level of the configuration:

```
apply-macro apply-macro-name {  
    parameter-name parameter-value;  
}
```

### [edit system scripts] Hierarchy Level

---

The following statements can be configured at the **[edit system]** hierarchy level. This is not a comprehensive list of statements available at the **[edit system]** hierarchy level. For more information about system configuration, see the *Junos OS Administration Library for Routing Devices*.

```
[edit system]  
scripts {  
    commit {  
        allow-transients;  
        direct-access;  
        file filename {  
            checksum (md5 | sha-256 | sha1) hash;  
            optional;  
            refresh;  
            refresh-from url;  
            source url;  
        }  
        max-datasize  
        refresh;  
        refresh-from url;  
        traceoptions {  
            file <filename> <files number> <size size> <world-readable | no-world-readable>;  
            flag flag;  
            no-remote-trace;  
        }  
    }  
}
```

```
}
load-scripts-from-flash;
op {
  file filename {
    arguments {
      argument-name {
        description descriptive-text;
      }
    }
    checksum (md5 | sha-256 | sha1) hash;
    command filename-alias;
    description descriptive-text;
    max-datasize
    refresh;
    refresh-from url;
    source url;
  }
  no-allow-url
  refresh;
  refresh-from url;
  traceoptions {
    file <filename> <files number> <size size> <world-readable | no-world-readable>;
    flag flag;
    no-remote-trace;
  }
}
synchronize;
}
```

---

## arguments (Op Scripts)

---

|                          |                                                                                                                                                                 |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax                   | <pre>arguments {   argument-name {     description descriptive-text;   } }</pre>                                                                                |
| Hierarchy Level          | [edit system <b>scripts op file filename</b> ]                                                                                                                  |
| Release Information      | Statement introduced in Junos OS Release 7.6.                                                                                                                   |
| Description              | For Junos OS op scripts, configure command-line arguments to the script.                                                                                        |
| Options                  | <b>argument-name</b> —The name of a command-line argument to an op script.<br><br>The remaining statement is explained separately.                              |
| Required Privilege Level | <b>maintenance</b> —To view this statement in the configuration.<br><b>maintenance-control</b> —To add this statement to the configuration.                     |
| Related Documentation    | <ul style="list-style-type: none"><li>• <a href="#">Declaring Arguments in Op Scripts on page 13</a></li><li>• <a href="#">description on page 74</a></li></ul> |



## checksum

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>checksum (md5   sha-256   sha1) hash;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit event-options event-script file <i>filename</i> ],<br>[edit system <a href="#">scripts</a> commit file <i>filename</i> ],<br>[edit system <a href="#">scripts op file</a> <i>filename</i> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 9.5.<br>Statement introduced in Junos OS Release 11.1 for the QFX Series.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Description</b>              | For Junos OS commit scripts and op scripts, specify the MD5, SHA-1, or SHA-256 checksum hash. When it executes a local event, commit, or op script, Junos OS verifies the authenticity of the script by using the configured checksum hash.                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Options</b>                  | <b>md5 hash</b> —MD5 checksum of this script.<br><br><b>sha-256 hash</b> —SHA-256 checksum of this script.<br><br><b>sha1 hash</b> —SHA-1 checksum of this script.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Required Privilege Level</b> | <b>maintenance</b> —To view this statement in the configuration.<br><b>maintenance-control</b> —To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <i>Configuring Checksum Hashes for a Commit Script</i></li> <li>• <i>Configuring Checksum Hashes for an Event Script</i></li> <li>• <a href="#">Configuring Checksum Hashes for an Op Script on page 18</a></li> <li>• <a href="#">Executing an Op Script from a Remote Site on page 19</a></li> <li>• <i>file checksum md5</i> command in the <i>System Basics and Services Command Reference</i></li> <li>• <i>file checksum sha-256</i> command in the <i>System Basics and Services Command Reference</i></li> <li>• <i>file checksum sha1</i> command in the <i>System Basics and Services Command Reference</i></li> </ul> |

## command

---

|                                 |                                                                                                                                                                             |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>command <i>filename-alias</i>;</code>                                                                                                                                 |
| <b>Hierarchy Level</b>          | [edit system <a href="#">scripts op file filename</a> ]                                                                                                                     |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 7.6.<br>Statement introduced in Junos OS Release 11.1 for the QFX Series.                                                          |
| <b>Description</b>              | For Junos OS op scripts, configure a filename alias for the script file. This allows you to run the script by referencing either the script filename or the filename alias. |
| <b>Options</b>                  | <i>filename-alias</i> —Alias for the script file.                                                                                                                           |
| <b>Required Privilege Level</b> | maintenance—To view this statement in the configuration.<br>maintenance-control—To add this statement to the configuration.                                                 |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">Enabling an Op Script and Defining a Script Alias on page 16</a></li></ul>                                              |

## description

---

|                                 |                                                                                                                                                                                                                                                 |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>description <i>descriptive-text</i>;</code>                                                                                                                                                                                               |
| <b>Hierarchy Level</b>          | [edit system <a href="#">scripts op file filename</a> ]<br>[edit system <a href="#">scripts op file filename arguments argument-name</a> ]                                                                                                      |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 7.6.<br>Statement introduced in Junos OS Release 11.1 for the QFX Series.                                                                                                                              |
| <b>Description</b>              | For Junos OS op scripts, provide a help-text string that appears in the command-line interface (CLI).                                                                                                                                           |
| <b>Required Privilege Level</b> | maintenance—To view this statement in the configuration.<br>maintenance-control—To add this statement to the configuration.                                                                                                                     |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">Configuring Help Text for Op Scripts on page 15</a></li><li>• <a href="#">Declaring Arguments in Op Scripts on page 13</a></li><li>• <a href="#">file (Op Scripts) on page 75</a></li></ul> |

## file (Op Scripts)

|                                 |                                                                                                                                                                                                                                                                                                                       |
|---------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <pre> file <i>filename</i> {   arguments {     <i>argument-name</i> {       description <i>descriptive-text</i>;     }   }   checksum (md5   sha-256   sha1) <i>hash</i>;   command <i>filename-alias</i>;   description <i>descriptive-text</i>;   refresh;   refresh-from <i>url</i>;   source <i>url</i>; } </pre> |
| <b>Hierarchy Level</b>          | [edit system <a href="#">scripts op</a> ]                                                                                                                                                                                                                                                                             |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 7.6.<br>Statement introduced in Junos OS Release 11.1 for the QFX Series.                                                                                                                                                                                                    |
| <b>Description</b>              | For Junos OS op scripts, enable an op script that is located in the <code>/var/db/scripts/op</code> directory.                                                                                                                                                                                                        |
| <b>Options</b>                  | <p><b><i>filename</i></b>—The name of an Extensible Stylesheet Language Transformations (XSLT) or Stylesheet Language Alternative Syntax (SLAX) file containing an op script.</p> <p>The statements are explained separately.</p>                                                                                     |
| <b>Required Privilege Level</b> | <p><b>maintenance</b>—To view this statement in the configuration.</p> <p><b>maintenance-control</b>—To add this statement to the configuration.</p>                                                                                                                                                                  |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <a href="#">Enabling an Op Script and Defining a Script Alias on page 16</a></li> </ul>                                                                                                                                                                                      |

## max-datasize

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>max-datasize size;</code>                                                                                                                                                                                                                                                                                                                                                                  |
| <b>Hierarchy Level</b>          | [edit event-options event-script],<br>[edit system <b>scripts</b> commit],<br>[edit system <b>scripts</b> op]                                                                                                                                                                                                                                                                                    |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 12.3.                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b>              | Maximum amount of memory allocated for the data segment during execution of a script of the given type. Junos OS sets the maximum memory limit for the executing script to the configured value irrespective of the total memory available on the system at the time of execution. If the executing script exceeds the specified maximum memory limit for that script type, it exits gracefully. |
| <b>Default</b>                  | If you do not include the <b>max-datasize</b> statement, the system allocates half of the total available memory of the system up to a maximum value of 128 MB for the data segment portion of the executed script.                                                                                                                                                                              |
| <b>Options</b>                  | <b>size</b> —Maximum amount of memory allocated for the data segment during execution of a script of the given type. If you do not specify a unit of measure, the default is bytes.<br><b>Syntax:</b> <b>size</b> to specify bytes, <b>sizek</b> to specify KB, <b>sizem</b> to specify MB, or <b>sizeg</b> to specify GB<br><b>Range:</b> 2,3068,672 (22 MB) through 1,073,741,824 (1 GB)       |
| <b>Required Privilege Level</b> | <b>maintenance</b> —To view this statement in the configuration.<br><b>maintenance-control</b> —To add this statement to the configuration.                                                                                                                                                                                                                                                      |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li><i>max-policies</i></li><li><i>Example: Configuring Limits on Executed Event Policies and Memory Allocation for Scripts</i></li></ul>                                                                                                                                                                                                                      |

## op

```
Syntax  op {
        file filename {
            arguments {
                argument-name {
                    description descriptive-text;
                }
            }
            checksum (md5 | sha-256 | sha1) hash;
            command filename-alias;
            description descriptive-text;
            max-datasize
            refresh;
            refresh-from url;
            source url;
        }
        no-allow-url
        refresh;
        refresh-from url;
        traceoptions {
            file <filename> <files number> <size size> <world-readable | no-world-readable>;
            flag flag;
            no-remote-trace;
        }
    }
```

**Hierarchy Level** [edit system [scripts](#)]

**Release Information** Statement introduced in Junos OS Release 7.6.  
Statement introduced in Junos OS Release 11.1 for the QFX Series.

**Description** For Junos OS op scripts, configure an operation scripting mechanism.

**Options** The statements are explained separately.

**Required Privilege Level** maintenance—To view this statement in the configuration.  
maintenance-control—To add this statement to the configuration.

**Related Documentation**


- *Storing and Enabling Scripts*

## no-allow-url

---


|                                 |                                                                                                                                                                                                                                                      |
|---------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | no-allow-url;                                                                                                                                                                                                                                        |
| <b>Hierarchy Level</b>          | [edit system <a href="#">scripts op</a> ]                                                                                                                                                                                                            |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 10.0.<br>Statement introduced in Junos OS Release 11.1 for the QFX Series.                                                                                                                                  |
| <b>Description</b>              | For Junos OS op scripts, prohibit the remote execution of scripts. When you include this configuration statement, the <b>op url</b> operational mode command generates an error and does not permit you to execute the op script from a remote site. |
| <b>Required Privilege Level</b> | maintenance—To view this statement in the configuration.<br>maintenance-control—To add this statement to the configuration.                                                                                                                          |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">file (Op Scripts) on page 75</a></li><li>• <a href="#">Executing an Op Script from a Remote Site on page 19</a></li></ul>                                                                        |

## refresh (Op Scripts)

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | refresh;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Hierarchy Level</b>          | [edit system <a href="#">scripts op</a> ],<br>[edit system <a href="#">scripts op file filename</a> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 7.6.<br>Statement introduced in Junos OS Release 11.1 on the QFX Series.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>              | <p>For Junos OS op scripts, overwrite the local copy of all enabled op scripts or a single enabled script located in the <code>/var/db/scripts/op</code> directory with the copy located at the source URL, specified in the <b>source</b> statement at the same hierarchy level.</p> <p>The update operation occurs as soon as you issue the <b>set refresh</b> configuration mode command. Issuing the <b>set refresh</b> command does not add the <b>refresh</b> statement to the configuration. Thus the command behaves like an operational mode command by executing an operation, instead of adding a statement to the configuration.</p> |
|                                 | <div>  <p><b>NOTE:</b> On the QFabric system, op scripts are stored in the <code>/pbdata/mgd_shared/partition-ip/var/db/scripts/op/</code> directory on the Director device.</p> </div>                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | maintenance—To view this statement in the configuration.<br>maintenance-control—To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"> <li>• <i>Using a Master Source Location for a Script</i></li> <li>• <a href="#">refresh-from (Op Scripts) on page 80</a></li> <li>• <a href="#">source (Op Scripts) on page 82</a></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                 |

## refresh-from (Op Scripts)

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>refresh-from url;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Hierarchy Level</b>          | [edit system <a href="#">scripts op</a> ],<br>[edit system <a href="#">scripts op file filename</a> ]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Release Information</b>      | Statement introduced in Junos OS Release 7.6.<br>Statement introduced in Junos OS Release 11.1 on the QFX Series.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| <b>Description</b>              | <p>For Junos OS op scripts, overwrite the local copy of all enabled op scripts or a single enabled script located in the <code>/var/db/scripts/op</code> directory with the copy located at a URL other than the URL specified in the <b>source</b> statement.</p> <p>The update operation occurs as soon as you issue the <b>set refresh-from url</b> configuration mode command. Issuing the <b>set refresh-from</b> command does not add the <b>refresh-from</b> statement to the configuration. Thus the command behaves like an operational mode command by executing an operation, instead of adding a statement to the configuration.</p> |
|                                 | <div> <b>NOTE:</b> This statement is not supported on the QFabric system.</div>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Options</b>                  | <b>url</b> —Source specified as a Hypertext Transfer Protocol (HTTP) URL, FTP URL, or secure copy (scp)-style remote file specification.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Required Privilege Level</b> | <b>maintenance</b> —To view this statement in the configuration.<br><b>maintenance-control</b> —To add this statement to the configuration.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <i>Using an Alternate Source Location for a Script</i></li><li>• <a href="#">refresh (Op Scripts) on page 79</a></li><li>• <a href="#">source (Op Scripts) on page 82</a></li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                      |



## scripts

```

Syntax  scripts {
        commit {
            allow-transients;
            direct-access;
            file filename {
                checksum (md5 | sha-256 | sha1) hash;
                optional;
                refresh;
                refresh-from url;
                source url;
            }
            max-datasize
            refresh;
            refresh-from url;
            traceoptions {
                file <filename> <files number> <size size> <world-readable | no-world-readable>;
                flag flag;
                no-remote-trace;
            }
        }
        load-scripts-from-flash;
        op {
            file filename {
                arguments {
                    argument-name {
                        description descriptive-text;
                    }
                }
                checksum (md5 | sha-256 | sha1) hash;
                command filename-alias;
                description descriptive-text;
                max-datasize
                refresh;
                refresh-from url;
                source url;
            }
            no-allow-url
            refresh;
            refresh-from url;
            traceoptions {
                file <filename> <files number> <size size> <world-readable | no-world-readable>;
                flag flag;
                no-remote-trace;
            }
        }
        synchronize;
    }

```

Hierarchy Level [edit system]

**Release Information** Statement introduced in Junos OS Release 7.4.  
Statement introduced in Junos OS Release 11.1 for the QFX Series.

**Description** For Junos OS commit or op scripts, configure scripting mechanisms.



**NOTE:** The `traceoptions` statement is not supported on QFabric systems.

**Options** The statements are explained separately.

**Required Privilege Level** maintenance—To view this statement in the configuration.  
maintenance-control—To add this statement to the configuration.

**Related Documentation**

- *Storing and Enabling Scripts*

---

## source (Op Scripts)

---

**Syntax** `source url;`

**Hierarchy Level** [edit system [scripts op file filename](#)]

**Release Information** Statement introduced in Junos OS Release 7.6.  
Statement introduced in Junos OS Release 11.1 for the QFX Series.

**Description** For Junos OS op scripts, specify the location of the source file for an enabled script located in the `/var/db/scripts/op` directory. When you include the `refresh` statement at the same hierarchy level, the local copy is overwritten by the version stored at the specified URL.



**NOTE:** On the QFabric system, commit scripts are stored in the `/pbdata/mgd_shared/partition-ip/var/db/scripts/op/` directory on the Director device.

**Options** `url`—Master source file for an op script specified as an HTTP URL, FTP URL, or scp-style remote file specification.

**Required Privilege Level** maintenance—To view this statement in the configuration.  
maintenance-control—To add this statement to the configuration.

**Related Documentation**

- *Using a Master Source Location for a Script*
- [refresh \(Op Scripts\) on page 79](#)
- [refresh-from \(Op Scripts\) on page 80](#)

## traceoptions (Commit and Op Scripts)

|                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>              | <pre> traceoptions {     file &lt;filename&gt; &lt;files number&gt; &lt;size size&gt; &lt;world-readable   no-world-readable&gt;;     flag flag;     no-remote-trace; } </pre>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Hierarchy Level</b>     | [edit system <a href="#">scripts</a> commit],<br>[edit system <a href="#">scripts</a> op]                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Release Information</b> | Statement introduced in Junos OS Release 7.4.<br>Statement introduced in Junos OS Release 9.0 for EX Series switches.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Description</b>         | Define tracing operations for commit or op scripts.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Default</b>             | If you do not include this statement, no script-specific tracing operations are performed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Options</b>             | <p><b>file filename</b>—Name of the file to receive the output of the tracing operation. All files are placed in the directory <code>/var/log</code>. By default, commit script process tracing output is placed in the file <code>cscript.log</code> and op script process tracing is placed in the file <code>op-script.log</code>. If you include the <b>file</b> statement, you must specify a filename. To retain the default, you can specify <code>cscript.log</code> or <code>op-script.log</code> as the filename.</p> <p><b>Default:</b> Commit scripts: <code>/var/log/cscript.log</code>, Op scripts: <code>/var/log/op-script.log</code></p> <p><b>files number</b>—(Optional) Maximum number of trace files. When a trace file named <i>trace-file</i> reaches its maximum size, it is renamed and compressed to <i>trace-file.0.gz</i>. When <i>trace-file</i> again reaches its maximum size, <i>trace-file.0.gz</i> is renamed <i>trace-file.1.gz</i> and <i>trace-file</i> is renamed and compressed to <i>trace-file.0.gz</i>. This renaming scheme continues until the maximum number of trace files is reached. Then the oldest trace file is overwritten.</p> <p>If you specify a maximum number of files, you also must specify a maximum file size with the <b>size</b> option and a filename.</p> <p><b>Range:</b> 2 through 1000</p> <p><b>Default:</b> 10 files</p> <p><b>flag flag</b>—Tracing operation to perform. To specify more than one tracing operation, include multiple <b>flag</b> statements. You can include the following flags:</p> <ul style="list-style-type: none"> <li>• <b>all</b>—Log all operations</li> <li>• <b>events</b>—Log important events</li> <li>• <b>input</b>—Log script input data</li> <li>• <b>offline</b>—Generate data for offline development</li> <li>• <b>output</b>—Log script output data</li> <li>• <b>rpc</b>—Log script RPCs</li> <li>• <b>xslt</b>—Log the XSLT library</li> </ul> |

**no-world-readable**—Restrict file access to owner. This is the default.

**size** *size*—(Optional) Maximum size of each trace file, in kilobytes (KB), megabytes (MB), or gigabytes (GB). When a trace file named **trace-file** reaches this size, it is renamed and compressed to **trace-file.0.gz**. When **trace-file** again reaches its maximum size, **trace-file.0.gz** is renamed **trace-file.1.gz** and **trace-file** is renamed and compressed to **trace-file.0.gz**. This renaming scheme continues until the maximum number of trace files is reached. Then the oldest trace file is overwritten.

If you specify a maximum file size, you also must specify a maximum number of trace files with the **files** option and a filename.

**Syntax:** *size* to specify bytes, *sizek* to specify KB, *sizem* to specify MB, or *sizeg* to specify GB

**Range:** 10 KB through 1 GB

**Default:** 128 KB

**world-readable**—Enable unrestricted file access.

|                                 |                                                                 |
|---------------------------------|-----------------------------------------------------------------|
| <b>Required Privilege Level</b> | maintenance—To view this statement in the configuration.        |
|                                 | maintenance-control—To add this statement to the configuration. |

|                              |                                                            |
|------------------------------|------------------------------------------------------------|
| <b>Related Documentation</b> | • <i>Tracing Commit Script Processing</i>                  |
|                              | • <a href="#">Tracing Op Script Processing on page 101</a> |

## PART 3

# Administration

- [Operational Commands on page 87](#)



## CHAPTER 5

# Operational Commands

## op

---

|                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Syntax</b>                   | <code>op filename</code><br><code>&lt;detail&gt;</code><br><code>&lt;argument-name argument-value&gt;</code><br><code>&lt;key (md5   sha-256   sha1) key-value</code><br><code>&lt;url url&gt;</code>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Release Information</b>      | Command introduced in Junos OS Release 7.6.<br>Command introduced in Junos OS Release 9.0 for EX Series switches.<br><b>key</b> option introduced in Junos OS Release 10.0.<br><b>url</b> option introduced in Junos OS Release 10.0.                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Description</b>              | Execute an op script stored in one of the following locations: <ul style="list-style-type: none"><li>• On the router or switch in the <code>/var/db/scripts/op</code> directory</li><li>• At a remote URL</li></ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Options</b>                  | <b>detail</b> —(Optional) Display detailed output.<br><br><b>argument-name argument-value</b> —(Optional) Specify one or more arguments to the script.<br>For each argument you include on the command line, you must specify a corresponding value for the argument.<br><br><b>key (md5   sha-256   sha1) key-value</b> —(Optional) With the <code>&lt;url&gt;</code> option, specify a checksum hash to verify the integrity of the script. You can include the <code>&lt;key&gt;</code> option if the <b>checksum</b> statement is included at the <code>[edit system scripts op file filename]</code> hierarchy level.<br><br><b>url url</b> —(Optional) Specify a URL where the script is located. |
| <b>Additional Information</b>   | For more information about Junos op scripts, see the <i>Junos OS Automation Library</i> .                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Required Privilege Level</b> | maintenance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| <b>Related Documentation</b>    | <ul style="list-style-type: none"><li>• <a href="#">Executing an Op Script on page 17</a> in the <i>Junos OS Automation Library</i></li><li>• <a href="#">Executing an Op Script from a Remote Site on page 19</a> in the <i>Junos OS Automation Library</i></li><li>• <a href="#">checksum on page 73</a></li><li>• <code>file checksum md5</code></li><li>• <code>file checksum sha-256</code></li><li>• <code>file checksum sha1</code></li></ul>                                                                                                                                                                                                                                                    |
| <b>List of Sample Output</b>    | <a href="#">op on page 89</a><br><a href="#">op url on page 89</a>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |



**Output Fields** When you enter this command, you are provided feedback on the status of your request.

## Sample Output

**op**

```
user@host> op script1 interface ge-0/2/0.0 protocol inet
```

**op url**

```
user@host> op url https://www.juniper.net/fa/2009-04-01.01.slax key md5  
8de24d09e1d90b2581bb937d2a5ad590 interface ge-0/2/0.0 protocol inet
```

## op invoke-debugger cli

---

|                          |                                                                                                                                                                                                                                                                                                                 |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Syntax                   | <b>op invoke-debugger cli</b> <i>filename</i><br><detail><br>< <i>argument-name argument-value</i> >                                                                                                                                                                                                            |
| Release Information      | Command introduced in Junos OS Release 13.1.                                                                                                                                                                                                                                                                    |
| Description              | Invoke the SLAX debugger to trace the execution of an op script that is enabled in the configuration.                                                                                                                                                                                                           |
| Options                  | <b>detail</b> — Display detailed output.<br><br><b><i>argument-name argument-value</i></b> —(Optional) Specify one or more arguments for the script. For each argument you include on the command line, you must specify a corresponding value for the argument.<br><br><b><i>filename</i></b> —Script filename |
| Additional Information   | For more information about Junos op scripts, see the <i>Junos OS Configuration and Operations Automation Guide</i> .                                                                                                                                                                                            |
| Required Privilege Level | maintenance                                                                                                                                                                                                                                                                                                     |
| Related Documentation    | <ul style="list-style-type: none"><li>• <a href="#">SLAX Debugger, Profiler, and callflow on page 93</a></li></ul>                                                                                                                                                                                              |
| List of Sample Output    | <a href="#">op invoke-debugger cli on page 90</a><br><a href="#">op invoke-debugger cli script argument1 value1 on page 90</a>                                                                                                                                                                                  |
| Output Fields            | When you enter the <b>op invoke-debugger cli</b> command, the CLI displays the (sdb) prompt where you can enter SLAX debugger commands.                                                                                                                                                                         |

### Sample Output

#### op invoke-debugger cli

```
user@host> op invoke-debugger cli script1
sdb: The SLAX Debugger (version )
Type 'help' for help
(sdb)
```

#### op invoke-debugger cli script argument1 value1

```
user@host> op invoke-debugger cli script2 interface ge-0/2/0.0
sdb: The SLAX Debugger (version )
Type 'help' for help
(sdb)
```

## PART 4

# Troubleshooting

- [SLAX Debugger on page 93](#)
- [Troubleshooting Op Scripts on page 101](#)



## CHAPTER 6

# SLAX Debugger

- [SLAX Debugger, Profiler, and callflow on page 93](#)

### SLAX Debugger, Profiler, and callflow

---

- [SLAX Debugger, Profiler, and callflow Overview on page 93](#)
- [Using the SLAX Debugger, Profiler, and callflow on page 94](#)

### SLAX Debugger, Profiler, and callflow Overview

The Junos OS command-line interface (CLI) and the libslax distribution include the SLAX debugger (sdb), which is used to trace the execution of SLAX scripts. The SLAX debugger enables you to step through script execution, pause script execution at defined breakpoints, and review the value of script variables at any point.

The SLAX debugger operation and command syntax resemble that of the GNU Project Debugger (GDB). Many of the sdb commands follow their GDB counterparts, to the extent possible. [Table 3 on page 93](#) lists the SLAX debugger commands and a brief description of each command.

The SLAX debugger includes a profiler that can report information about the activity and performance of a script. The profiler, which is automatically enabled when you start the debugger, tracks script execution until the script terminates. At any point, profiling information can be displayed or cleared, and the profiler can be temporarily disabled or enabled. The SLAX debugger **callflow** command enables printing of informational data when you enter or exit levels of the script.

**Table 3: SLAX Debugger Commands**

| Command                          | Description                                                                                                                                                              |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>break [loc]</code>         | Add a breakpoint to the script at the current line of execution. Optionally specify <code>[file:]line</code> or a template name to create a breakpoint at that position. |
| <code>callflow [on   off]</code> | Enable or disable callflow tracing. You can explicitly specify the <b>on</b> or <b>off</b> value. Omitting the value toggles callflow on and off.                        |

Table 3: SLAX Debugger Commands (*continued*)

| Command                                                         | Description                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <code>continue [loc]</code>                                     | Continue running the script until it reaches the next breakpoint. If there are no defined breakpoints, the script runs in its entirety. Optionally, specify <code>[file:]line</code> or a template name. When you include the optional argument, script execution continues until it reaches either a breakpoint or the specified line number or template name, whichever comes first. |
| <code>delete [num]</code>                                       | Delete one or all breakpoints. Breakpoints are numbered sequentially as they are created. Omit the optional argument to delete all breakpoints. Include the breakpoint number as an argument to delete only the specified breakpoint. View currently active breakpoints with the <b>info</b> command.                                                                                  |
| <code>finish</code>                                             | Finish executing the current template.                                                                                                                                                                                                                                                                                                                                                 |
| <code>help</code>                                               | Display the help message.                                                                                                                                                                                                                                                                                                                                                              |
| <code>info [breakpoints   profile   profile brief]</code>       | Display information about the current script. The default command lists all breakpoints in the script. Optionally specify the <b>profile</b> or <b>profile brief</b> arguments to display profiling information.                                                                                                                                                                       |
| <code>list [loc]</code>                                         | List the contents of the current script. Optionally specify <code>[file:]line</code> or a template name from which point the debugger lists partial script contents. The output includes the filename, line number, and code.                                                                                                                                                          |
| <code>next</code>                                               | Execute the next instruction, stepping over any function or template calls.                                                                                                                                                                                                                                                                                                            |
| <code>over</code>                                               | Execute the next instruction, stepping over any function or template calls or instruction hierarchies.                                                                                                                                                                                                                                                                                 |
| <code>print &lt;xpath&gt;</code>                                | Print the value of the XPath expression.                                                                                                                                                                                                                                                                                                                                               |
| <code>profile [clear   on   off   report   report brief]</code> | Enable or disable the profiler. The profiler is enabled by default. Include the <b>clear</b> option to clear profiling information. Include the <b>report</b> or <b>report brief</b> option to display profiling information for the current script.                                                                                                                                   |
| <code>quit</code>                                               | Exit debugging mode.                                                                                                                                                                                                                                                                                                                                                                   |
| <code>reload</code>                                             | Reload the script.                                                                                                                                                                                                                                                                                                                                                                     |
| <code>run</code>                                                | Restart script execution from the beginning of the script.                                                                                                                                                                                                                                                                                                                             |
| <code>step</code>                                               | Execute the next instruction, stepping into any function or template calls or instruction hierarchies.                                                                                                                                                                                                                                                                                 |
| <code>where</code>                                              | Show the backtrace of template calls.                                                                                                                                                                                                                                                                                                                                                  |

## Using the SLAX Debugger, Profiler, and callflow

- [Invoking the SLAX Debugger on page 95](#)
- [Using the SLAX Debugger \(sdb\) on page 95](#)

- [Using the SLAX Profiler on page 97](#)
- [Using callflow on page 98](#)

### Invoking the SLAX Debugger

Both the Junos OS CLI and the SLAX processor in the libslax distribution include the SLAX debugger (sdb), which is used to trace the execution of SLAX scripts.

When you invoke the SLAX debugger, the command-line prompt changes to (sdb) to indicate that you are in debugging mode. For example:

```
sdb: The SLAX Debugger (version )
Type 'help' for help
(sdb)
```

When using the SLAX debugger from the Junos OS CLI, you can only use the debugger with op scripts that are enabled in the configuration. To invoke the SLAX debugger from the CLI on a device running Junos OS, issue the **op invoke-debugger cli** operational mode command, include the op script name, and optionally include any necessary script arguments.

```
user@host>op invoke-debugger cli script <argument-name argument-value>
```

The following example invokes the SLAX debugger for the op script **ge-interfaces.slax**, which has two parameters, **interface** and **protocol**. Values are supplied for both arguments.

```
user@host> op invoke-debugger cli ge-interfaces interface ge-0/2/0.0 protocol inet
sdb: The SLAX Debugger (version )
Type 'help' for help
(sdb)
```

To invoke the SLAX debugger when using the SLAX processor, issue the **slaxproc** command with the **--debug** or **-d** option. Specify the script file and any input or output files. If no input file is required, use the **-E** option to indicate an empty input document. If the **-i** or **--input** argument has the value "-", or if you do not include the input option or an input file, standard input is used. When using standard input, press Ctrl+d to signal the end-of-file. The general syntax is:

```
$ slaxproc --debug [options] [script] [files]
```

The following example invokes the SLAX debugger for the script **script1.slax** with an empty input document and an output file **script1-output.xml**

```
$ slaxproc --debug -n script1.slax -o script1-output.xml -E
sdb: The SLAX Debugger (version )
Type 'help' for help
(sdb)
```

### Using the SLAX Debugger (sdb)

To view the SLAX debugger help message, issue the **help** command at the (sdb) prompt. To display the help message for a single command, issue **help command**, where *command* is the sdb command for which you want more information. For example:

```
(sdb) help break
break [loc]  Add a breakpoint at [file:]line or template
```

The process for debugging a script varies depending on the script. A generic outline is presented here:

1. Enter debugging mode.
2. Insert breakpoints in the script using the **break** command.

During execution, the debugger pauses at defined breakpoints.

The breakpoint location can be the name of a template or a line number in the current script, or the filename and a line number separated by a colon. If you do not include an argument, a breakpoint is created at the current line of execution. Breakpoints are numbered sequentially as you create them. To view a list of breakpoints, issue the **info breakpoints** command. To delete a breakpoint, issue the **delete num** command, and specify the breakpoint number. To delete all breakpoints, issue the **delete** command with no argument.

The following example creates three breakpoints, the first at line 7, the second at line 25, and the third at the template named "three":

```
(sdb) break 7
Breakpoint 1 at file script1.slax, line 7
(sdb) break 25
Breakpoint 2 at file script1.slax, line 25
(sdb) break three
Breakpoint 3 at file script1.slax, line 51
(sdb) info breakpoints
List of breakpoints:
#1 [global] at script1.slax:7
#2 template two at script1.slax:25
#3 template three at script1.slax:51
```

3. Increment script execution by issuing the **continue**, **finish**, **next**, **over**, and **step** commands at the debugger prompt.

For example:

```
(sdb) next
Reached breakpoint 1, at script1.slax:7
script1.slax:3: var $byte = "10011001";
```

4. Review the value of variables as the program executes to ensure that they have the expected value.

```
print xpath-expression
```

5. To reload the script contents at any point and restart script execution from the beginning, issue the **reload** command.

```
(sdb) reload
The script being debugged has been started already.
Reload and restart it from the beginning? (y or n) y
Reloading script...
Reloading complete.
```



## Using the SLAX Profiler

The SLAX debugger includes a profiler that can report information about the activity and performance of a script. The profiler, which is automatically enabled when you start the debugger, tracks script execution until the script terminates. At any point, profiling information can be displayed or cleared, and the profiler can be temporarily disabled or enabled.

To access the profiler, issue the **profile** command at the SLAX debugger prompt, (sdb), and include any options. The profile command syntax is:

```
(sdb) profile [options]
```

[Table 4 on page 97](#) lists the profile command options. Issuing the **profile** command with no additional options toggles the profiler on and off.

```
(sdb) profile
Disabling profiler
(sdb)
```

You can access the profiler help by issuing the **help profile** command at the (sdb) prompt.

**Table 4: Profile command options**

| Option         | Description                  |
|----------------|------------------------------|
| clear          | Clear profiling information  |
| off            | Disable profiling            |
| on             | Enable profiling             |
| report [brief] | Report profiling information |

To enable the profiler and print a report:

1. Enter debugging mode. The profiler is enabled by default.
2. Step through script execution, or execute a script in its entirety.

```
(sdb) run
<?xml version="1.0"?>
<message>Down rev PIC in Fruvenator, Fru-Master 3000</message>
Script exited normally.
```

3. At any point during script execution, display profiling information.

The **brief** option instructs sdb to avoid showing lines that were not hit, since there is no valid information. If you omit the **brief** option, dashes are displayed.

```
(sdb) profile report brief
```

The following sample output shows a profile report with and without the **brief** option. The source code data in the example is truncated for display purposes.

```
(sdb) profile report
```

| Line  | Hits | User | U/Hit | System | S/Hit | Source       |
|-------|------|------|-------|--------|-------|--------------|
| 1     | -    | -    | -     | -      | -     | version 1.0; |
| 2     | -    | -    | -     | -      | -     |              |
| 3     | 2    | 4    | 2.00  | 8      | 4.00  | match / {    |
| 4     | 1    | 25   | 25.00 | 13     | 13.00 | var ....     |
| 5     | -    | -    | -     | -      | -     |              |
| 6     | -    | -    | -     | -      | -     | for-each.... |
| 7     | 1    | 45   | 45.00 | 10     | 10.00 | ..           |
| 8     | 1    | 12   | 12.00 | 5      | 5.00  | <message>    |
| 9     | 1    | 45   | 45.00 | 15     | 15.00 | ....         |
| 10    | -    | -    | -     | -      | -     | }            |
| 11    | -    | -    | -     | -      | -     | }            |
| Total | 6    | 131  |       | 51     | Total |              |

| (sdb) pro rep b |      |      |       |        |       |           |
|-----------------|------|------|-------|--------|-------|-----------|
| Line            | Hits | User | U/Hit | System | S/Hit | Source    |
| 3               | 2    | 4    | 2.00  | 8      | 4.00  | match / { |
| 4               | 1    | 25   | 25.00 | 13     | 13.00 | var ....  |
| 7               | 1    | 45   | 45.00 | 10     | 10.00 | ....      |
| 8               | 1    | 12   | 12.00 | 5      | 5.00  | <message> |
| 9               | 1    | 45   | 45.00 | 15     | 15.00 | ....      |
| Total           | 6    | 131  |       | 51     | Total |           |

The profile report includes the following information:

- **Line**—Line number in the source file.
- **Hits**—Number of times this line was executed.
- **User**—Number of microseconds of "user" time spent processing this line.
- **U/Hit**—Average number of microseconds of "user" time per hit.
- **System**—Number of microseconds of "system" time spent processing this line.
- **S/Hit**—Average number of microseconds of "system" time per hit.
- **Source**—Source code line.

This information not only shows how much time is spent during code execution, but can also show which lines are being executed, which can help debug scripts where the execution does not match expectations.

### Using callflow

The SLAX debugger **callflow** command enables printing of informational data when you enter or exit levels of the script.

To enable callflow and view callflow data for a script:

1. Enter debugging mode.
2. Issue the **callflow** command at the SLAX debugger prompt, (sdb).

```
(sdb) callflow
Enabling callflow
```

3. Step through script execution, or execute a script in its entirety.

Callflow prints information as it enters and exits different levels of the script. Each output line references the instruction, filename, and line number of the frame.

```
(sdb) run
callflow: 0: enter <xsl:template> in match / at script3.slax:5
callflow: 1: enter <xsl:template> in template one at script3.slax:14
callflow: 2: enter <xsl:template> in template two at script3.slax:20
callflow: 3: enter <xsl:call-template> at script3.slax:22
...
<?xml version="1.0"?>
<message>Down rev PIC in Fruvenator, Fru-Master 3000</message>
Script exited normally.
```

- Related Documentation**
- [op invoke-debugger cli on page 90](#)
  - *Understanding the SLAX Processor (slaxproc)*
  - *Using the SLAX Processor (slaxproc)*
  - *libslax Distribution Overview*



## CHAPTER 7

# Troubleshooting Op Scripts

- [Tracing Op Script Processing on page 101](#)

## Tracing Op Script Processing

---

Op script tracing operations track all op script operations and record them in a log file. The logged error descriptions provide detailed information to help you solve problems faster.

The default operation of op script tracing is to log important events in a file called **op-script.log** located in the **/var/log** directory. When the file **op-script.log** reaches 128 kilobytes (KB), it is renamed with a number 0 through 9 (in ascending order) appended to the end of the file and then compressed. The resulting files are **op-script.log.0.gz**, then **op-script.log.1.gz**, until there are 10 trace files. Then the oldest trace file (**op-script.log.9.gz**) is overwritten. (For more information about how log files are created, see the *Junos OS System Log Messages Reference*.)

This section discusses the following topics:

- [Minimum Configuration for Enabling Traceoptions for Op Scripts on page 101](#)
- [Configuring Tracing of Op Scripts on page 102](#)

## Minimum Configuration for Enabling Traceoptions for Op Scripts

If no op script trace options are configured, the simplest way to view the trace output of an op script is to configure the **output** trace flag and issue the **show log op-script.log | last** command. To do this, perform the following steps:

1. If you have not done so already, enable an op script by including the **file** statement at the **[edit system scripts op]** hierarchy level:

```
[edit system scripts op]
user@host# set file filename
```

2. Enable trace options by including the **traceoptions flag output** statement at the **[edit system scripts op]** hierarchy level:

```
[edit system scripts op]
user@host# set traceoptions flag output
```

3. Issue the **commit** command:

```
[edit]
user@host# commit
```

4. Display the resulting trace messages recorded in the file `/var/log/op-script.log` file. At the end of the log is the output generated by the op script you enabled in Step 1. To display the end of the log, issue the **show log op-script.log | last** operational mode command:

```
[edit]
user@host# run show log op-script.log | last
```

[Table 5 on page 102](#) summarizes useful filtering commands that display selected portions of the **op-script.log** file.

**Table 5: Op Script Tracing Operational Mode Commands**

| Task                                                           | Command                                               |
|----------------------------------------------------------------|-------------------------------------------------------|
| Display logging data associated with all op script processing. | <b>show log op-script.log</b>                         |
| Display processing for only the most recent operation.         | <b>show log op-script.log   last</b>                  |
| Display processing for script errors.                          | <b>show log op-script.log   match error</b>           |
| Display processing for a particular script.                    | <b>show log op-script.log   match <i>filename</i></b> |

#### Example: Minimum Configuration for Enabling Traceoptions for Op Scripts

Display the trace output of the op script file **source-route.xml**:

```
[edit]
system {
  scripts {
    op {
      file source-route.xml;
      traceoptions flag output;
    }
  }
}

[edit]
user@host# commit
[edit]
user@host# run show log op-script.log | last
```

## Configuring Tracing of Op Scripts

You cannot change the directory (`/var/log`) to which trace files are written. However, you can customize other trace file settings by including the following statements at the **[edit system scripts op traceoptions]** hierarchy level:

```
[edit system scripts op traceoptions]
```

```

file <filename> <files number> <size size> <world-readable | no-world-readable>;
flag all;
flag events;
flag input;
flag offline;
flag output;
flag rpc;
flag xslt;
no-remote-trace;

```

These statements are described in the following sections:

- [Configuring the Op Script Log Filename on page 103](#)
- [Configuring the Number and Size of Op Script Log Files on page 103](#)
- [Configuring Access to Op Script Log Files on page 104](#)
- [Configuring the Op Script Trace Operations on page 104](#)

### Configuring the Op Script Log Filename

By default, the name of the file that records trace output is **op-script.log**. You can specify a different name by including the **file** statement at the **[edit system scripts op traceoptions]** hierarchy level:

```

[edit system scripts op traceoptions]
file filename;

```

### Configuring the Number and Size of Op Script Log Files

By default, when the trace file reaches 128 KB in size, it is renamed and compressed to **filename.0.gz**, then **filename.1.gz**, and so on, until there are 10 trace files. Then the oldest trace file (**filename.9.gz**) is overwritten.

You can configure the limits on the number and size of trace files by including the following statements at the **[edit system scripts op traceoptions file <filename>]** hierarchy level:

```

[edit system scripts op traceoptions file <filename>]
files number size size;

```

For example, set the maximum file size to 640 KB and the maximum number of files to 20. When the file that receives the output of the tracing operation (**filename**) reaches 640 KB, it is renamed and compressed to **filename.0.gz**, and a new file called **filename** is created. When **filename** reaches 640 KB, **filename.0.gz** is renamed **filename.1.gz** and **filename** is renamed and compressed to **filename.0.gz**. This process repeats until there are 20 trace files. Then the oldest file (**filename.19.gz**) is overwritten.

The number of files can range from 2 through 1000 files. The file size can range from 10 KB through 1 gigabyte (GB).



#### NOTE:

If you set either a maximum file size or a maximum number of trace files, you also must specify the other parameter and a filename.

### Configuring Access to Op Script Log Files

By default, access to the op script log file is restricted to the owner. You can manually configure access by including the **world-readable** or **no-world-readable** statement at the **[edit system scripts op traceoptions file <filename>]** hierarchy level.

```
[edit system scripts op traceoptions file <filename>]
(world-readable | no-world-readable);
```

The **no-world-readable** statement restricts op script log access to the owner. The **world-readable** statement enables unrestricted access to the op script log file.

### Configuring the Op Script Trace Operations

By default, only important events are logged. You can configure the trace operations to be logged by including the following statements at the **[edit system scripts op traceoptions]** hierarchy level:

```
[edit system scripts op traceoptions]
flag all;
flag events;
flag input;
flag offline;
flag output;
flag rpc;
flag xslt;
```

Table 6 on page 104 describes the meaning of the op script tracing flags.

Table 6: Op Script Tracing Flags

| Flag           | Description                                                              | Default Setting |
|----------------|--------------------------------------------------------------------------|-----------------|
| <b>all</b>     | Trace all operations.                                                    | Off             |
| <b>events</b>  | Trace important events.                                                  | On              |
| <b>input</b>   | Trace op script input data.                                              | Off             |
| <b>offline</b> | Generate data for offline development.                                   | Off             |
| <b>output</b>  | Trace op script output data.                                             | Off             |
| <b>rpc</b>     | Trace op script RPCs.                                                    | Off             |
| <b>xslt</b>    | Trace the Extensible Stylesheet Language Transformations (XSLT) library. | Off             |



## PART 5

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