Regex Engine Performance Enhancement

The Regex Engine Performance Enhancement feature introduces a new regular expression engine that is designed to process complex regular expressions. This new regular expression engine does not replace the existing engine. The existing engine is preferred for simple regular expressions and is the default engine and in Cisco IOS software. Either engine can be selected from the command-line interface (CLI).

Feature History for the Regex Engine Performance Enhancement Feature

Release	Modification
12.0(26)S	This feature was introduced.
12.3(4)T	This feature was integrated into Cisco IOS Release 12.3(4)T.
12.2(22)S	This feature was integrated into Cisco IOS Release 12.2(22)S.

Finding Support Information for Platforms and Cisco IOS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at http://www.cisco.com/go/fn. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.

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Prerequisites for Regex Engine Performance Enhancement

The regular expression engine can be selected only under a Border Gateway Protocol (BGP) routing process in router configuration mode. So, the engine can be changed only after BGP has been enabled.

Information About Regex Engine Performance Enhancement

To select a regular expression engine in Cisco IOS software, you must understand the following concepts:

Regular Expression Overview

A regular expression is a pattern to match against an input string. You specify the pattern that a string must match when you compose a regular expression. Matching a string to the specified pattern is called “pattern matching.” Pattern matching either succeeds or fails.

A regular expression can be a single-character pattern or a multiple-character pattern. That is, a regular expression can be a single character that matches the same single character in the input string or multiple characters that match the same multiple characters in the input string.

Default Regular Expression Engine

The default Cisco IOS regular expression engine uses a recursive algorithm. This engine is effective but uses more system resources as the complexity of regular expressions increase. The recursive algorithm works well for simple regular expressions, but is less efficient when processing very complex regular expressions because of the backtracking that is required by the default engine to process partial matches. In some cases, CPU watchdog timeouts and stack overflow traces have occurred because of the length of time that the default engine requires to process very complex regular expressions.

New Regular Expression Engine Selection

The Regex Engine Performance Enhancement feature introduces a deterministic processing time regular expression engine in Cisco IOS software. This new engine does not replace the default regular expression engine. The new engine employs an improved algorithm that eliminates excessive back tracking and greatly improves performance when processing complex regular expressions. When the new engine is enabled, complex regular expressions are evaluated more quickly, and CPU watchdog timeouts and stack overflow traces will not occur. However, the new regular expression engine takes longer to process simple regular expressions than the default engine.

We recommend that you use the new regular expression engine if you need to evaluate complex regular expressions or if you have observed problems related to evaluating regular expressions. We recommend that you use the default regular expression engine if you use only simple regular expressions. The new engine can be enabled by entering the **bgp regexp deterministic** command under a BGP routing process. The default regular expression engine can be reenabled by entering the **no** form of this command.

How to Change the Regular Expression Engine

Selecting the New Regular Expression Engine

We recommend that you use the new regular expression engine if you need to evaluate complex regular expressions or if you have observed problems related to evaluating regular expressions. We recommend that you use the default regular expression engine if you only use simple regular expressions.

Prerequisites

The regular expression engine can be selected only under a BGP routing process in router configuration mode. So, the engine can be changed only after BGP has been enabled.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *as-number*
4. **bgp regexp deterministic**
5. **exit**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**router bgp** as-*number* **Example:** `Router(config)# router bgp 1`	Enters router configuration mode, and creates a BGP routing process.

	Command or Action	Purpose
Step 4	**bgp regexp deterministic** **Example:** `Router(config-router)# no bgp regexp deterministic`	Configures Cisco IOS to use a deterministic regular expression engine. • The default regular expression engine in Cisco IOS software is nondeterministic. • The default engine can be restored by entering the **no** form of this command.
Step 5	**exit** **Example:** `Router(config-router)# exit`	Exits router configuration mode, and enters global configuration mode.

Examples

The following example configures Cisco IOS software to use the default regular expression engine:

```
router bgp 1
 no bgp regexp deterministic
```

The following example configures Cisco IOS software to use the deterministic processing time regular expression engine:

```
router bgp 1
 bgp regexp deterministic
```

Additional References

The following sections provide references related to the Regex Engine Performance Enhancement feature.

Related Documents

Related Topic	Document Title
Regular Expressions	"Regular Expressions" appendix of the *Cisco IOS Terminal Services Configuration Guide*

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL: http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing standards has not been modified by this feature.	—

Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, tools, and lots more. Registered Cisco.com users can log in from this page to access even more content.	TAC Home Page: http://www.cisco.com/public/support/tac/home.shtml BGP Support Page: http://www.cisco.com/cgi-bin/Support/browse/psp_view.pl?p=Internetworking:BGP

Command Reference

This section documents a new command. All other commands used with this feature are documented in the Cisco IOS command reference publications.

- **bgp regexp deterministic**

bgp regexp deterministic

To configure Cisco IOS software to use the deterministic processing time regular expression engine, use the **bgp regexp deterministic** command in router configuration mode. To configure Cisco IOS software to use the default regular expression engine, use the **no** form of this command.

bgp regexp deterministic

no bgp regexp deterministic

Syntax Description

This command has no keywords or arguments.

Defaults

The default regular expression engine is enabled.

Command Modes

Router configuration

Command History

Release	Modification
12.0(26)S	This command was introduced.
12.3(4)T	This command was integrated into Cisco IOS Release 12.3(4)T.
12.2(22)S	This command was integrated into Cisco IOS Release 12.2(22)S.

Usage Guidelines

The default Cisco IOS regular expression engine uses a recursive algorithm. This engine is effective but uses more system resources as the complexity of regular expressions increases. The recursive algorithm works well for simple regular expressions, but is less efficient when processing very complex regular expressions because of the backtracking that is required by the default engine to process partial matches. In some cases, CPU watchdog timeouts and stack overflow traces have occurred because of the length of time that the default engine requires to process very complex regular expressions.

The deterministic processing time regular expression engine does not replace the default regular expression engine. The new engine employs an improved algorithm that eliminates excessive backtracking and greatly improves performance when processing complex regular expressions. When the new engine is enabled, complex regular expressions are evaluated more quickly, and CPU watchdog timeouts and stack overflow traces will not occur. However, the new regular expression engine takes longer to process simple regular expressions than the default engine.

We recommend that you use the new regular expression engine if you need to evaluate complex regular expressions or if you have observed problems related to evaluating regular expressions. We recommend that you use the default regular expression engine if you use only simple regular expressions. The new engine can be enabled by entering the **bgp regexp deterministic** command under a Border Gateway Protocol (BGP) routing process. The default regular expression engine can be reenabled by entering the **no** form of this command.

Examples

The following example configures Cisco IOS software to use the deterministic processing time regular expression engine:

```
Router(config)# router bgp 1
Router(config-router)# bgp regexp deterministic
```

The following example configures Cisco IOS software to use the default regular expression engine:

```
Router(config)# router bgp 1
Router(config-router)# no bgp regexp deterministic
```