Implementing RCMD

This module describes how to implement RCMD.

Feature History for Implementing RCMD

Release	Modification
Release 4.2.0	This feature was introduced.

Route Convergence Monitoring and Diagnostics

Route Convergence Monitoring and Diagnostics (RCMD) is a mechanism to monitor OSPF and ISIS convergence events, gather details about the SPF runs and time taken to provision routes and LDP labels across all LCs on the router.

RCMD is a tool that collects and reports data related to routing convergence. Highlights of the RCMD mechanism are:

- Lightweight and always-on using route flow markers across routing components (all nodes & MC).
- Tracks most convergence events and all routes affected by them.
- Provides within-router view with statistics and time-lines on per convergence event basis.
- Measurements against time-line/SLA and triggers specified EEM actions on excess.
- 'On the router' reports via CLI/XML interface.

- Each RCMD enabled router provides a digest of convergence data.

The events that are monitored and reported by RCMD are:

- OSPF and IS-IS SPF events (default VRF only).
- Add/delete of specific external or inter-area/level prefixes.
- IGP flooding propagation delays for LSA/LSP changes.

RCMD runs in two modes:

- Monitoring—detecting events and measuring convergence.
- Diagnostics—additional (debug) information collection for 'abnormal' events.

Configuring Route Convergence Monitoring and Diagnostics

Perform these tasks to configure route convergence monitoring and diagnostics:

SUMMARY STEPS

1. **configure**
2. **router-convergence**
3. **collect-diagnostics** *location*
4. **event-buffer-size** *number*
5. **max-events-stored** *number*
6. **monitoring-interval** *minutes*
7. **node** *node-name*
8. **protocol**
9. **priority**
10. **disable**
11. **leaf-network** *number*
12. **threshold** *value*
13. **storage-location**
14. **diagnostics** *directory-path-name*
15. **diagnostics-size**
16. **reports** *directory-path-name*
17. **reports-size**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RP0/CPU0:router# configure`	Enters global configuration mode.

	Command or Action	Purpose
Step 2	**router-convergence** **Example:** `RP/0/RP0/CPU0:router(config)#router-convergence`	Enters configure Router Convergence Monitoring and Diagnostics (rcmd) configuration mode.
Step 3	**collect-diagnostics** *location* **Example:** `RP/0/RP0/CPU0:router(config-rcmd)#collect-diagnostics 0/3/CPU0`	Configures to collect diagnostics on specified node.
Step 4	**event-buffer-size** *number* **Example:** `RP/0/RP0/CPU0:router(config-rcmd)#event-buffer-size 100`	Sets event buffer size 9as number of events) for storing event traces .
Step 5	**max-events-stored** *number* **Example:** `RP/0/RP0/CPU0:router(config-rcmd)#max-events-stored 10`	Sets maximum number of events to be stored in the server.
Step 6	**monitoring-interval** *minutes* **Example:** `RP/0/RP0/CPU0:router(config-rcmd)#monitoring-interval 120`	Sets interval (in minutes) to collect logs.
Step 7	**node** *node-name*	Configures parameters for a specified node. `RP/0/RP0/CPU0:router(config-rcmd)#node`

Step 8	**protocol**
	Example:
	`RP/0/RP0/CPU0:router(config-rcmd)#protocol ISIS`
	`RP/0/RP0/CPU0:router(config-rcmd-proto)#`
		Specifies the protocol for which to configure RCMD parameters.
		• ISIS-Select ISIS to configure parameters related to ISIS protocol
		• OSPF-Select OSPF to configure parameters related OSPF protocol

Step 9	**priority**
	Example:
	`RP/0/RP0/CPU0:router(config-rcmd-proto)#priority critical`
	`RP/0/RP0/CPU0:router(config-rcmd-proto-prio)#`
		Sets priority for monitoring of route convergence for the specified protocol.
		• Critical-Set to monitor route convergence for critical priority routes
		• High-Set to monitor route convergence for high priority routes
		• Medium-Set to monitor route convergence for medium priority routes
		• Low-Set to monitor route convergence for low priority routes

	Command or Action	Purpose
Step 10	**disable** **Example:** `RP/0/RP0/CPU0:router(config-rcmd-proto-prio)#disable`	Disables the monitoring of route convergence for specified priority.
Step 11	**leaf-network** *number* **Example:** `RP/0/RP0/CPU0:router(config-rcmd-proto-prio)#leaf-network 100`	Enables leaf network monitoring. Specify a maximum number of leaf networks to be monitored. Range for maximum number is 10-100.
Step 12	**threshold** *value* **Example:** `RP/0/RP0/CPU0:router(config-rcmd-proto-prio)#threshold 1000`	Specifies threshold value for convergence in milliseconds. Select a threshold value from the range. Range is 0-4294967295 milliseconds

Step 13	**storage-location**
	Example:
	`RP/0/RP0/CPU0:router(config-rcmd)#storage-location`
	`RP/0/RP0/CPU0:router(config-rcmd-store)#`
		Sets the absolute directory path for storing diagnostic reports.

Step 14	**diagnostics** *directory-path-name* **Example:** `RP/0/RP0/CPU0:router(config-rcmd-store)#diagnostics /disk0:/rcmd`	Specifies the absolute directory path for storing diagnostic reports. Set a directory-path-name. Example: /disk0:/rcmd/ or <tftp-location>/rcmd/
Step 15	**diagnostics-size** **Example:** `RP/0/RP0/CPU0:router(config-rcmd-store)# diagnostics-size 8`	Specify a maximum size for the diagnostics directory. Set the size in %. Range is 5%-80%.
Step 16	**reports** *directory-path-name* **Example:** `RP/0/RP0/CPU0:router(config-rcmd-store)#reports /disck0:/rcmd`	Specifies the absolute directory path for storing reports. Set a directory-path-name. Example: /disk0:/rcmd/ or <tftp-location>/rcmd/
Step 17	**reports-size** **Example:** `RP/0/RP0/CPU0:router(config-rcmd-store)#reports-size 8`	Specify a maximum size for the reports directory. Set the size in %. Range is 5%-80%.

Route Convergence Monitoring and Diagnostics Prefix Monitoring

The Route Convergence Monitoring and Diagnostics (RCMD) prefix monitoring feature enables convergence monitoring for specific individual prefixes in Open Shortest Path First (OSPF) and Intermediate System-to-Intermediate System (IS-IS) Interior Gateway Protocols (IGP). In IGP, when the route information is created, the prefix is verified against the configured prefix-list. If the prefix is found to be monitored, it is marked for monitoring and information about each prefix change event is captured. The RCMD prefix monitoring individually monitors specific prefixes on each RCMD enabled router in the network. A maximum of 10 prefixes can be monitored. Individual prefix monitoring compliments the probes enabled at customer network edges to monitor connectivity and availability of specific service end-points.

The RCMD prefix monitoring for IS-IS prefixes is enabled by configuring the **prefix-list** command under Router IS-IS monitor-convergence configuration mode. The RCMD prefix monitoring for OSPF prefixes is enabled by configuring the **prefix-list** command under Router OSPF monitor-convergence configuration mode.

For individual prefix monitoring, the prefixes are marked before those appear for the route calculation so that the monitoring does not affect the convergence of OSPF or ISIS routes.

Route Convergence Monitoring and Diagnostics OSPF Type 3/5/7 Link-state Advertisements Monitoring

The Route Convergence Monitoring and Diagnostics (RCMD) OSPF type 3/5/7 link-state advertisements (LSA) monitoring feature flags and differentiates the LSAs during the monitoring of LSAs. A change in route for type 3/5/7 LSAs has to be monitored. During the route calculation, if the route source appears to be type 3/5/7 LSAs and the route change is an add or delete action, then those prefixes have to be monitored. RCMD monitors all deletion of available paths (a purge operation) and addition of the first path (a restoration operation) for all type 3/5/7 LSAs. The OSPF type 3/5/7 LSAs are monitored and reported on a individual prefix basis. However, a modify operation that involves a change in paths not affecting reachability as a whole, is not monitored. Although all prefixes are logged for reporting, the convergence tracking is rate-limited for the first 10 prefixes that are affected in an SPF run.

The RCMD OSPF type 3/5/7 LSA monitoring is enabled by configuring the **track-external-routes** and **track-summary-routes** under Router OSPF monitor-convergence configuration mode.

Enabling RCMD Monitoring for IS-IS Prefixes

Perform this task to enable individual prefix monitoring for IS-IS prefixes.

Before you begin

To enable monitoring of individual prefixes, first configure a prefix-list using the **{ipv4 | ipv6} prefix-list** command. Then, use this prefix list with the **prefix-list** command.

SUMMARY STEPS

1. **configure**
2. **router isis** *instance-id*
3. **address-family** {**ipv4 | ipv6**} [**unicast** | **multicast**]
4. **monitor-convergence**
5. **prefix-list** *prefix-list-name*
6. Use the **commit** or **end** command.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RP0/CPU0:router# configure`	Enters global configuration mode.
Step 2	**router isis** *instance-id* **Example:** `RP/0/RP0/CPU0:router(config)#router isis isp`	Enables IS-IS routing for the specified routing instance, and places the router in router configuration mode.
Step 3	**address-family** {**ipv4	ipv6**} [**unicast**	**multicast**] **Example:** `RP/0/RP0/CPU0:router(config-isis)#address-family ipv6 unicast`	Enter the IS-IS address-family configuration mode.
Step 4	**monitor-convergence** **Example:** `RP/0/RP0/CPU0:router(config-isis-af)#monitor-convergence`	Enables route convergence monitoring for IS-IS protocol.
Step 5	**prefix-list** *prefix-list-name* **Example:** `RP/0/RP0/CPU0:router(config-isis-af-rcmd)#prefix-list isis_monitor`	Enables individual prefix monitoring for IS-IS prefixes.
Step 6	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session. • **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration session, without committing the configuration changes.

Enable RCMD Monitoring for OSPF Prefixes

Perform this task to enable individual prefix monitoring for OSPF prefixes.

Before you begin

To enable monitoring of individual prefixes, first configure a prefix-list using the **{ipv4 | ipv6} prefix-list** command. Then, use this prefix list with the **prefix-list** command.

SUMMARY STEPS

1. **configure**
2. **router ospf** *ospf-process-name*
3. **monitor-convergence**
4. **prefix-list** *prefix-list-name*
5. Use the **commit** or **end** command.

DETAILED STEPS

Step 1 **configure**

Example:

```
RP/0/RP0/CPU0:router# configure
```

Enters global configuration mode.

Step 2 **router ospf** *ospf-process-name*

Example:

```
RP/0/RP0/CPU0:router(config)#router ospf 1
```

Enables OSPF routing for the specified routing process and places the router in router configuration mode.

Step 3 **monitor-convergence**

Example:

```
RP/0/RP0/CPU0:router(config-ospf)#monitor-convergence
```

Enables OSPF route convergence monitoring.

Step 4 **prefix-list** *prefix-list-name*

Example:

```
RP/0/RP0/CPU0:router(config-ospf-af-rcmd)#prefix-list ospf_monitor
```

Enables individual prefix monitoring for OSPF prefixes.

Step 5 Use the **commit** or **end** command.

commit —Saves the configuration changes and remains within the configuration session.

end —Prompts user to take one of these actions:

- **Yes** — Saves configuration changes and exits the configuration session.
- **No** —Exits the configuration session without committing the configuration changes.
- **Cancel** —Remains in the configuration session, without committing the configuration changes.

Enabling RCMD Monitoring for OSPF Prefixes: Example

This example shows how to enable RCMD monitoring for individual OSPF prefixes:

```
ipv6 prefix-list ospf_monitor
 10 permit 2001:db8::/32
!
router ospf 100
 monitor-convergence
  prefix-list ospf_monitor
```

Enabling RCMD Monitoring for Type 3/5/7 OSPF LSAs

Perform this task to enable RCMD monitoring for type 3/5/7 OSPF LSAs.

SUMMARY STEPS

1. **configure**
2. **router ospf** *100*
3. **track-external-routes**
4. **track-summary-routes**
5. Use the **commit** or **end** command.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**configure** **Example:** `RP/0/RP0/CPU0:router# configure`	Enters global configuration mode.
Step 2	**router ospf** *100* **Example:** `RP/0/RP0/CPU0:router(config)#router ospf 100`	Enables OSPF routing for the specified routing process and places the router in router configuration mode.
Step 3	**track-external-routes** **Example:** `RP/0/RP0/CPU0:router(config-ospf-af-rcmd)#track-external-routes`	Enables tracking of external (Type-3/5/7) LSAs prefix monitoring.

	Command or Action	Purpose
Step 4	**track-summary-routes** **Example:** `RP/0/RP0/CPU0:router(config-ospf-af-rcmd)#track-summary-routes`	Enables tracking of summary (inter-area) routes monitoring
Step 5	Use the **commit** or **end** command.	**commit** —Saves the configuration changes and remains within the configuration session. **end** —Prompts user to take one of these actions: • **Yes** — Saves configuration changes and exits the configuration session. • **No** —Exits the configuration session without committing the configuration changes. • **Cancel** —Remains in the configuration session, without committing the configuration changes.

Enabling RCMD Monitoring for IS-IS Prefixes: Example

This example shows how to monitor RCMD prefix monitoring for individual IS-IS prefixes:

```
ipv6 prefix-list isis_monitor
 10 permit 2001:db8::/32
!
router isis isp
 address-family ipv6 unicast
  monitor-convergence
   prefix-list isis_monitor
```

Enabling RCMD Monitoring for OSPF Prefixes: Example

This example shows how to enable RCMD monitoring for individual OSPF prefixes:

```
ipv6 prefix-list ospf_monitor
 10 permit 2001:db8::/32
!
router ospf 100
 monitor-convergence
  prefix-list ospf_monitor
```

Enabling RCMD Monitoring for Type 3/5/7 OSPF LSAs: Example

This example shows how to enable tracking of prefix monitoring for OSPF external LSAs and summary routes:

```
router ospf 100
 monitor-convergence
  track-external-routes
  track-summary-routes
```