



# AToM Graceful Restart

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The AToM Graceful Restart feature assists neighboring routers that have nonstop forwarding (NSF), stateful switchover (SSO) and graceful restart (GR) for Any Transport over MPLS (AToM) to recover gracefully from an interruption in service. AToM GR functions strictly in helper mode, which means it helps other routers that are enabled with the NSF/SSO: Any Transport over MPLS and AToM Graceful Restart feature to recover. If the router with AToM GR fails, its peers cannot help it recover. AToM GR is based on the MPLS Label Distribution Protocol (LDP) Graceful Restart feature.

Keep the following points in mind when reading this document:

- The AToM GR feature described in this document refers to helper mode.
- For brevity, the NSF/SSO: Any Transport over MPLS and AToM Graceful Restart feature is called AToM SSO/NSF in this document.

## Finding Feature Information

For the latest feature information and caveats, see the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the [“Feature Information for AToM Graceful Restart” section on page 8](#).

Use Cisco Feature Navigator to find information about platform support and Cisco IOS XE software image support. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

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**Americas Headquarters:**  
**Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA**

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## Prerequisites for AToM Graceful Restart

AToM must be configured. For information about setting up or configuring AToM, see the [Any Transport over MPLS](#) document.

## Restrictions for AToM Graceful Restart

- AToM GR is supported in strict helper mode.
- MPLS LDP GR cannot be configured on label-controlled ATM (LC-ATM) interfaces.

## Information About AToM Graceful Restart

To configure AToM GR, you should understand the following concept:

- [How AToM Graceful Restart Works, page 2](#)

## How AToM Graceful Restart Works

AToM GR works in strict helper mode, which means it helps a neighboring Route Processor (RP) that has AToM NSF/SSO to recover from a disruption in service without losing its MPLS forwarding state. The disruption in service could result from a TCP or User Datagram Protocol (UDP) event or the stateful switchover of a route processor. AToM GR is based on the MPLS LDP Graceful Restart feature, which preserves forwarding information for AToM circuits during an LDP session interruption. When the neighboring router establishes a new session, the LDP bindings and MPLS forwarding state are recovered. For more information related to how the LDP Graceful Restart feature works, see the [MPLS LDP Graceful Restart](#) feature module.

## How to Configure AToM Graceful Restart

This section contains the following procedure:

- [Configuring AToM Graceful Restart, page 2](#) (required)

## Configuring AToM Graceful Restart

To configure AToM Graceful Restart, perform the following task.

There is no AToM-specific configuration for AToM GR. You enable LDP GR to assist a neighboring router configured with AToM NSF/SSO to maintain its forwarding state while the LDP session is disrupted. See the [LDP Graceful Restart](#) document for information about how LDP GR works and how you can customize it for your network.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip cef distributed**
4. **mpls ldp graceful-restart**
5. **exit**

## DETAILED STEPS

	Command or Action	Purpose
Step 1	<b>enable</b>  <b>Example:</b> Router> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
Step 2	<b>configure terminal</b>  <b>Example:</b> Router# configure terminal	Enters global configuration mode.
Step 3	<b>ip cef distributed</b>  <b>Example:</b> Router(config)# ip cef distributed	Enables distributed Cisco Express Forwarding.
Step 4	<b>mpls ldp graceful-restart</b>  <b>Example:</b> Router(config)# mpls ldp graceful-restart	Enables the router to protect the LDP bindings and MPLS forwarding state during a disruption in service. <ul style="list-style-type: none"> <li>• AToM GR is enabled globally. When you enable AToM GR, it has no effect on existing LDP sessions. New LDP sessions that are established can perform AToM GR.</li> </ul>
Step 5	<b>exit</b>  <b>Example:</b> Router(config)# exit	Exits to privileged EXEC mode.

# Configuration Examples for AToM Graceful Restart

This section provides the following configuration examples:

- [Configuring AToM Graceful Restart: Example, page 4](#)
- [AToM Graceful Restart—Recovering from an LDP Session Disruption: Examples, page 5](#)

## Configuring AToM Graceful Restart: Example

The following example shows a Fast Ethernet VLAN over MPLS configuration. PE1 is configured with AToM Graceful Restart. PE2 is configured with AToM NSF/SSO. The commands for configuring AToM GR and NSF/SSO are shown in bold.

PE1 with AToM GR	PE2 with AToM NSF/SSO
<pre> ip cef distributed ! mpls label protocol ldp <b>mpls ldp graceful-restart</b> mpls ldp router-id Loopback0 ! pseudowire-class atom encapsulation mpls ! interface Loopback0  ip address 10.1.1.2 255.255.255.255 ! interface FastEthernet2/1/1  no ip address ! interface FastEthernet2/1/1.2  description "xconnect to PE2"  encapsulation dot1Q 2 native  xconnect 10.2.2.2 1002 pw-class mpls ! ! IGP for MPLS router ospf 10 log-adjacency-changes auto-cost reference-bandwidth 1000 network 10.1.1.2 10.0.0.0 area 0 network 10.1.1.0 10.0.0.255 area 0 </pre>	<pre> <b>redundancy</b>   <b>mode sso</b> ip cef distributed ! mpls label protocol ldp <b>mpls ldp graceful-restart</b> mpls ldp router-id Loopback0 ! pseudowire-class atom encapsulation mpls ! interface Loopback0  ip address 10.2.2.2 255.255.255.255 ! interface FastEthernet0/3/2  no ip address ! interface FastEthernet0/3/2.2  description "xconnect to PE1"  encapsulation dot1Q 2  xconnect 10.1.1.2 1002 pw-class mpls ! ! IGP for MPLS router ospf 10 log-adjacency-changes <b>nsf cisco enforce global</b> auto-cost reference-bandwidth 1000 network 10.2.2.2 10.0.0.0 area 0 network 10.1.1.0 10.0.0.255 area 0 </pre>

## AToM Graceful Restart—Recovering from an LDP Session Disruption: Examples

The following examples show the output of the **show mpls l2transport vc** command during normal operation and when an LDP session is recovering from a disruption.

The following example shows the status of the VC on PE1 with AToM GR during normal operation:

```
Router# show mpls l2transport vc
```

Local intf	Local circuit	Dest address	VC ID	Status
Fa2/1/1.2	Eth VLAN 2	10.2.2.2	1002	UP

The following example shows the status of the VC on PE1 with AToM GR while the VC is recovering from an LDP session disruption. The forwarding state for the circuit remains as it was before the disruption.

```
Router# show mpls l2transport vc
```

Local intf	Local circuit	Dest address	VC ID	Status
Fa2/1/1.2	Eth VLAN 2	10.2.2.2	1002	RECOVERING

The following example shows the status of the VC on PE1 with AToM GR after the LDP session disruption was cleared. The AToM label bindings were advertised within the allotted time and the status returned to UP.

```
Router# show mpls l2transport vc
```

Local intf	Local circuit	Dest address	VC ID	Status
Fa2/1/1.2	Eth VLAN 2	10.2.2.2	1002	UP

The following example shows the detailed status of the VC on PE1 with AToM GR during normal operation:

```
Router# show mpls l2transport vc detail
```

```
Local interface: Fa2/1/1.2 up, line protocol up, Eth VLAN 2 up
Destination address: 10.2.2.2, VC ID: 1002, VC status: up
Preferred path: not configured
Default path: active
Tunnel label: imp-null, next hop point2point
Output interface: Se2/0/2, imposed label stack {16}
Create time: 1d00h, last status change time: 1d00h
Signaling protocol: LDP, peer 10.2.2.2:0 up
MPLS VC labels: local 21, remote 16
Group ID: local 0, remote 0
MTU: local 1500, remote 1500
Remote interface description: "xconnect to PE2"
Sequencing: receive disabled, send disabled
VC statistics:
packet totals: receive 3466, send 12286
byte totals: receive 4322368, send 5040220
packet drops: receive 0, send 0
```

The following example shows the detailed status of the VC on PE1 with AToM GR while the VC is recovering.

```
Router# show mpls l2transport vc detail

Local interface: Fa2/1/1.2 up, line protocol up, Eth VLAN 2 up
  Destination address: 10.2.2.2, VC ID: 1002, VC status: recovering
    Preferred path: not configured
    Default path: active
    Tunnel label: imp-null, next hop point2point
    Output interface: Se2/0/2, imposed label stack {16}
  Create time: 1d00h, last status change time: 00:00:03
  Signaling protocol: LDP, peer 10.2.2.2:0 down
  MPLS VC labels: local 21, remote 16
    Group ID: local 0, remote 0
    MTU: local 1500, remote 1500
    Remote interface description: "xconnect to PE2"
  Sequencing: receive disabled, send disabled
  VC statistics:
    packet totals: receive 20040, send 28879
    byte totals:   receive 25073016, send 25992388
    packet drops: receive 0, send 0
```

## Additional References

The following sections provide references related to the AToM GR feature.

## Related Documents

Related Topic	Document Title
MPLS LDP graceful restart	<a href="#">MPLS LDP Graceful Restart</a>
Configuring AToM	<a href="#">Any Transport over MPLS</a>
Nonstop forwarding and stateful switchover for AToM	<a href="#">NSF/SSO—Any Transport over MPLS and AToM Graceful Restart</a>
MPLS AToM and LDP commands	<a href="#">Cisco IOS Multiprotocol Label Switching Command Reference</a>
High availability commands	<a href="#">Cisco IOS High Availability Command Reference</a>

## 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
<i>MPLS Label Distribution Protocol MIB Version 8 Upgrade</i>	To locate and download MIBs for selected platforms, Cisco IOS XE software releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mib">http://www.cisco.com/go/mib</a>

## RFCs

RFCs	Title
RFC 3036	<i>LDP Specification</i>
RFC 3478	<i>Graceful Restart Mechanism for Label Distribution</i>

## Technical Assistance

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	<a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a>

# Feature Information for AToM Graceful Restart

Table 1 lists the features in this module and provides links to specific configuration information.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS XE software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.


**Note**

Table 1 lists only the Cisco IOS XE software release that introduced support for a given feature in a given Cisco IOS XE software release train. Unless noted otherwise, subsequent releases of that Cisco IOS XE software release train also support that feature.

**Table 1** Feature Information for AToM Graceful Restart

Feature Name	Releases	Feature Information
AToM Graceful Restart	Cisco IOS XE Release 2.3	<p>The AToM Graceful Restart feature assists neighboring routers that have nonstop forwarding (NSF), stateful switchover (SSO) and graceful restart (GR) for Any Transport over MPLS (AToM) to recover gracefully from an interruption in service. AToM GR functions strictly in helper mode, which means it helps other routers that are enabled with the NSF/SSO: Any Transport over MPLS and AToM Graceful Restart feature to recover. If the router with AToM GR fails, its peers cannot help it recover. AToM GR is based on the MPLS Label Distribution Protocol (LDP) Graceful Restart feature.</p> <p>In Cisco IOS Release XE 2.3, this feature was implemented on the Cisco ASR 1000 Series Aggregation Services Routers.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> <li>• <a href="#">How AToM Graceful Restart Works, page 2</a></li> <li>• <a href="#">Configuring AToM Graceful Restart, page 2</a></li> </ul> <p>This feature uses no new or modified commands</p>

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