Configuring Virtual Loopback and Null Interfaces on the Cisco ASR 9000 Series Router

This module describes the configuration of loopback and null interfaces on the Cisco ASR 9000 Series Aggregation Services Routers.

Loopback and null interfaces are considered virtual interfaces.

A virtual interface represents a logical packet switching entity within the router. Virtual interfaces have a global scope and do not have an associated location. Virtual interfaces have instead a globally unique numerical ID after their names. Examples are Loopback 0, Loopback 1Loopback1, and Loopback 99999. The ID is unique per virtual interface type to make the entire name string unique such that you can have both Loopback 0 and Null 0.

Loopback and null interfaces have their control plane presence on the active route switch processor (RSPRP). The configuration and control plane are mirrored onto the standby RSP RP and, in the event of a failoverswitchover, the virtual interfaces move to the ex-standby, which then becomes the newly active RSPRP.

Feature History for Configuring Loopback and Null Interfaces on Cisco IOS XR Software

<table>
<thead>
<tr>
<th>Release</th>
<th>Modification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Release 3.7.2</td>
<td>This feature was introduced on the Cisco ASR 9000 Series Router.</td>
</tr>
</tbody>
</table>

Contents

- Prerequisites for Configuring Virtual Interfaces, page 306
- Information About Configuring Virtual Interfaces, page 306
- How to Configure Virtual Interfaces, page 308
- Configuration Examples for Virtual Interfaces, page 312
- Additional References, page 313
Prerequisites for Configuring Virtual Interfaces

You must be in a user group associated with a task group that includes the proper task IDs. The command reference guides include the task IDs required for each command. If you suspect user group assignment is preventing you from using a command, contact your AAA administrator for assistance.

Information About Configuring Virtual Interfaces

To configure virtual interfaces, you must understand the following concepts:

- Virtual Loopback Interface Overview, page 306
- Null Interface Overview, page 306
- Virtual Management Interface Overview, page 307
- Active and Standby RPs and Virtual Interface Configuration, page 307

Virtual Loopback Interface Overview

A virtual loopback interface is a virtual interface with a single endpoint that is always up. Any packet transmitted over a virtual loopback interface is immediately received by the selfsame interface. Loopback interfaces emulate a physical interface.

In Cisco IOS XR software, virtual loopback interfaces perform the following functions:

- Loopback loopback interfaces can act as a termination address for routing protocol sessions. This allows routing protocol sessions to stay up even if the outbound interface is down.
- You can ping the loopback interface to verify that the router IP stack is working properly.

In applications where other routers or access servers attempt to reach a virtual loopback interface, you must configure a routing protocol to distribute the subnet assigned to the loopback address.

Packets routed to the loopback interface are rerouted back to the router or access server and processed locally. IP packets routed out the loopback interface but not destined to the loopback interface are dropped. Under these two conditions, the loopback interface can behave like a null interface.

Null Interface Overview

A null interface functions similarly to the null devices available on most operating systems. This interface is always up and can never forward or receive traffic; encapsulation always fails. The null interface provides an alternative method of filtering traffic. You can avoid the overhead involved with using access lists by directing undesired network traffic to the null interface.

The only interface configuration command that you can specify for the null interface is the `ipv4 unreachables` command. With the `ipv4 unreachables` command, if the software receives a nonbroadcast packet destined for itself that uses a protocol it does not recognize, it sends an Internet Control Message Protocol (ICMP) protocol unreachable message to the source. If the software receives a datagram that it cannot deliver to its ultimate destination because it knows of no route to the destination address, it replies to the originator of that datagram with an ICMP host unreachable message.

The Null 0 Null0 interface is created by default on the RSP RP during boot and cannot be removed. The `ipv4 unreachables` command can be configured for this interface, but most configuration is unnecessary because this interface just discards all the packets sent to it.
The Null 0 Null0 interface can be displayed with the `show interfaces null0` command.

**Virtual Management Interface Overview**

Configuring an IPv4 virtual address enables you to access the router from a single virtual address with a management network without prior knowledge of which RSP RP is active. An IPv4 virtual address persists across route switch processor (RSPRP) failover switchover situations. For this to happen, the virtual IPv4 address must share a common IPv4 subnet with a management Ethernet interface on both RPs.

On a Cisco ASR 9000 Series Router Cisco XR 12000 Series Router Cisco CRS-1 Router where each RSP RP has multiple management Ethernet interfaces, the virtual IPv4 address maps to the management Ethernet interface on the active RSP RP that shares the same IP subnet.

**Active and Standby RPs and Virtual Interface Configuration**

The standby RSP RP is available and in a state in which it can take over the work from the active RSP RP should that prove necessary. Conditions that necessitate the standby RSP RP to become the active RSP RP and assume the active RSPRP’s duties include:

- Failure detection by a watchdog
- Administrative command to take over
- Removal of the active RSP RP from the chassis

If a second RSP RP is not present in the chassis while the first is in operation, a second RSP RP may be inserted and automatically becomes the standby RSPRP. The standby RSP RP may also be removed from the chassis with no effect on the system other than loss of RSP RP redundancy.

After failoverswitchover, the virtual interfaces all are present on the standby (now active) RSPRP. Their state and configuration are unchanged and there has been no loss of forwarding (in the case of tunnels) over the interfaces during the failoverswitchover. The routers use nonstop forwarding (NSF) over bundles and tunnels through the failover switchover of the host RSPRP.

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**Note**

The user need not configure anything to guarantee that the standby interface configurations are maintained.

**Note**

Protocol configuration such as tacacs source-interface, snmp-server trap-source, ntp source, logging source-interface do not use the virtual management IP address as their source by default. Use the `ipv4 virtual address use-as-src-addr` command to ensure that the protocol uses the virtual IPv4 address as its source address. Alternatively, you can also configure a loopback address with the designated or desired IPv4 address and set that as the source for protocols such as TACACS+ using the `tacacs source-interface` command.
How to Configure Virtual Interfaces

This section contains the following procedures:

- Configuring Virtual Loopback Interfaces, page 308 (Required)
- Configuring Null Interfaces, page 309 (Required)
- Configuring Virtual IPv4 IPV4 Interfaces, page 311 (Required)

Configuring Virtual Loopback Interfaces

This task explains how to configure a basic loopback interface.

Restrictions

The IP address of a loopback interface must be unique across all routers on the network. It must not be used by another interface on the router, and it must not be used by an interface on any other router on the network.

SUMMARY STEPS

1. configure
2. interface loopback instance
3. interface loopback interface-path-id
4. ipv4 address ip-address
5. end
   or
   commit
6. show interfaces type instance
7. show interfaces type interface-path-id

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Step 1 configure</td>
<td>Enters global configuration mode.</td>
</tr>
</tbody>
</table>

Example:

```
RP/0/RSP0RP00/CPU0:router# configure
```
### Configuring Virtual Loopback and Null Interfaces on the Cisco ASR 9000 Series Router

#### How to Configure Virtual Interfaces

This task explains how to configure a basic null Null interface.

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 2</strong></td>
<td></td>
</tr>
<tr>
<td><code>interface loopback instance</code></td>
<td>Enters interface configuration mode and names the new loopback interface.</td>
</tr>
<tr>
<td><code>interface loopback interface-path-id</code></td>
<td></td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><code>RP/0/RSP0RP00/CPU0:router#(config)# interface Loopback 3</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong></td>
<td></td>
</tr>
<tr>
<td><code>ipv4 address ip-address</code></td>
<td>Assigns an IP address and subnet mask to the virtual loopback interface using the <code>ipv4 address</code> configuration command.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><code>RP/0/RSP0RP00/CPU0:router(config-if)# ipv4 address 172.18.189.38/32</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 4</strong></td>
<td></td>
</tr>
<tr>
<td><code>end</code> or <code>commit</code></td>
<td>Saves configuration changes.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><code>RP/0/RSP0RP00/CPU0:router(config-if)# end</code> or <code>RP/0/RSP0RP00/CPU0:router(config-if)# commit</code></td>
<td></td>
</tr>
<tr>
<td><strong>Step 5</strong></td>
<td></td>
</tr>
<tr>
<td><code>show interfaces type instance</code> or <code>show interfaces type interface-path-id</code></td>
<td>(Optional) Displays the configuration of the loopback interface.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td><code>RP/0/RSP0RP00/CPU0:router# show interfaces Loopback 3</code></td>
<td></td>
</tr>
</tbody>
</table>

### Configuring Null Interfaces

This task explains how to configure a basic null Null interface.

#### SUMMARY STEPS

1. `configure`
2. `interface null 0`
### How to Configure Virtual Interfaces

1. **Step 1**: `configure`  
   Example:  
   ```  
   RP/0/RSP0RP00/CPU0:router# configure  
   ```  
   Enters global configuration mode.

2. **Step 2**: `interface null 0`  
   Example:  
   ```  
   RP/0/RSP0RP00/CPU0:router(config)# interface null 0  
   ```  
   Enters the null 0 null0 interface configuration mode.

3. **Step 3**: `end` or `commit`  
   Example:  
   ```  
   RP/0/RSP0RP00/CPU0:router(config-null0)# end  
   ```  
   Saves configuration changes.  
   - When you issue the **end** command, the system prompts you to commit changes:  
     Uncommitted changes found, commit them before exiting(yes/no/cancel)?  
     ```  
     [cancel]:  
     ```  
   - Entering **yes** saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.  
   - Entering **no** exits the configuration session and returns the router to EXEC mode without committing the configuration changes.  
   - Entering **cancel** leaves the router in the current configuration session without exiting or committing the configuration changes.  
   - Use the `commit` command to save the configuration changes to the running configuration file and remain within the configuration session.

4. **Step 4**: `show interfaces null 0`  
   Example:  
   ```  
   RP/0/RSP0RP00/CPU0:router# show interfaces null 0null0  
   ```  
   Verifies the configuration of the null interface.

### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> configure</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Step 2</strong> interface null 0</td>
<td>Enters the null 0 null0 interface configuration mode.</td>
</tr>
</tbody>
</table>
| **Step 3** end or commit | Saves configuration changes.  
   - When you issue the **end** command, the system prompts you to commit changes:  
     Uncommitted changes found, commit them before exiting(yes/no/cancel)?  
     ```  
     [cancel]:  
     ```  
   - Entering **yes** saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.  
   - Entering **no** exits the configuration session and returns the router to EXEC mode without committing the configuration changes.  
   - Entering **cancel** leaves the router in the current configuration session without exiting or committing the configuration changes.  
   - Use the `commit` command to save the configuration changes to the running configuration file and remain within the configuration session. |
| **Step 4** show interfaces null 0 | Verifies the configuration of the null interface. |
Configuring Virtual IPv4 Interfaces

This task explains how to configure an IPv4 virtual interface.

SUMMARY STEPS

1. configure
2. ipv4 address virtual address ipv4ip-address subnet mask
3. end
   or
   commit
### DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> configure</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>RP/0/RSP0RP00/CPU0:router# configure</td>
<td></td>
</tr>
<tr>
<td><strong>Step 2</strong> ipv4 address virtual address ipv4-address subnet address/mask</td>
<td>Defines an IPv4 virtual address for the management Ethernet interface.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>RP/0/RSP0RP00/CPU0:router(config)# ipv4 virtual address 10.3.32.154/8</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> end or commit</td>
<td>Saves configuration changes.</td>
</tr>
<tr>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td>RP/0/RSP0RP00/CPU0:router(config-null0)# end</td>
<td></td>
</tr>
<tr>
<td>or</td>
<td></td>
</tr>
<tr>
<td>RP/0/RSP0RP00/CPU0:router(config-null0)# commit</td>
<td></td>
</tr>
</tbody>
</table>

- When you issue the **end** command, the system prompts you to commit changes:
  
  Uncommitted changes found, commit them before exiting (yes/no/cancel)?
  
  [cancel]:
  
  - Entering **yes** saves configuration changes to the running configuration file, exits the configuration session, and returns the router to EXEC mode.
  
  - Entering **no** exits the configuration session and returns the router to EXEC mode without committing the configuration changes.
  
  - Entering **cancel** leaves the router in the current configuration session without exiting or committing the configuration changes.
  
- Use the **commit** command to save the configuration changes to the running configuration file and remain within the configuration session.

### Configuration Examples for Virtual Interfaces

This section provides the following configuration examples:

- Configuring a Loopback Interface: Example, page 312
- Configuring a Null Interface: Example, page 313

### Configuring a Loopback Interface: Example

The following example indicates how to configure a loopback interface:

```
RP/0/RSP0RP00/CPU0:router# configure
RP/0/RSP0RP00/CPU0:router(config)# interface Loopback 3
RP/0/RSP0RP00/CPU0:router(config-if)# ipv4 address 172.18.189.38/32
RP/0/RSP0RP00/CPU0:router(config-if)# end
```

Uncommitted changes found, commit them? [yes]: yes
Configuring Virtual Loopback and Null Interfaces on the Cisco ASR 9000 Series Router

RP/0/RSP0RP00/CPU0:router# show interfaces Loopback 3

Loopback3 is up, line protocol is up
Hardware is Loopback interface(s)
Internet address is 172.18.189.38/32
MTU 1514 bytes, BW Unknown
   reliability 0/255, txload Unknown, rxload Unknown
Encapsulation Loopback, loopback not set
Last clearing of *show interface* counters never
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
   0 packets input, 0 bytes, 0 total input drops
   0 drops for unrecognized upper-level protocol
Received 0 broadcast packets, 0 multicast packets
0 packets output, 0 bytes, 0 total output drops
Output 0 broadcast packets, 0 multicast packets

Configuring a Null Interface: Example

The following example indicates how to configure a null interface:

RP/0/RSP0RP00/CPU0:router# configure
RP/0/RSP0RP00/CPU0:router(config)# interface Null 0
RP/0/RSP0RP00/CPU0:router(config-null0)# ipv4 unreachables
RP/0/RSP0RP00/CPU0:router(config-null0)# end
Uncommitted changes found, commit them? [yes]: yes
RP/0/RSP0RP00/CPU0:router# show interfaces Null 0

Null0 is up, line protocol is up
Hardware is Null interface
Internet address is Unknown
MTU 1500 bytes, BW Unknown
   reliability 0/255, txload Unknown, rxload Unknown
Encapsulation Null, loopback not set
Last clearing of *show interface* counters never
5 minute input rate 0 bits/sec, 0 packets/sec
5 minute output rate 0 bits/sec, 0 packets/sec
   0 packets input, 0 bytes, 0 total input drops
   0 drops for unrecognized upper-level protocol
Received 0 broadcast packets, 0 multicast packets
0 packets output, 0 bytes, 0 total output drops
Output 0 broadcast packets, 0 multicast packets

Configuring a Virtual IPv4 Interface: Example

RP/0/RSP0RP00/CPU0:router# configure
RP/0/RSP0RP00/CPU0:router(config)# ipv4 virtual address 10.3.32.154/8
RP/0/RSP0RP00/CPU0:router(config-null0)# commit

Additional References

The following sections provide references related to loopback and null interface configuration.
## Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
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</thead>
<tbody>
<tr>
<td>Cisco ASR 9000 Series Router master command reference</td>
<td>Cisco ASR 9000 Series Router Master Commands List</td>
</tr>
<tr>
<td>Cisco ASR 9000 Series Router interface configuration commands</td>
<td>Cisco ASR 9000 Series Router Interface and Hardware Component Command Reference</td>
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<tr>
<td>Initial system bootup and configuration information for a Cisco ASR 9000 Series Router using the Cisco IOS XR Software.</td>
<td>Cisco ASR 9000 Series Router Getting Started Guide</td>
</tr>
<tr>
<td>Information about user groups and task IDs</td>
<td>Cisco ASR 9000 Series Router Interface and Hardware Component Command Reference</td>
</tr>
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</table>

## Standards

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<thead>
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<th>Standards</th>
<th>Title</th>
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</thead>
<tbody>
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<td>—</td>
</tr>
</tbody>
</table>

## MIBs

<table>
<thead>
<tr>
<th>MIBs</th>
<th>MIBs Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>There are no applicable MIBs for this module.</td>
<td>To locate and download MIBs for selected platforms using Cisco IOS XR Software, use the Cisco MIB Locator found at the following URL: <a href="http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml">http://cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml</a></td>
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</table>
RFCs

<table>
<thead>
<tr>
<th>RFCs</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.</td>
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</table>

Technical Assistance

<table>
<thead>
<tr>
<th>Description</th>
<th>Link</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.</td>
<td><a href="http://www.cisco.com/techsupport">http://www.cisco.com/techsupport</a></td>
</tr>
</tbody>
</table>