Configure Jumbo/Giant Frame Support on Catalyst Switches

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Related Information

Introduction

This document describes how to configure a jumbo/giant frame support on Cisco Catalyst Switches.

Prerequisites

Requirements

Ensure that you meet these requirements before you attempt this configuration:

- Understand MTU.
- Have knowledge of jumbo and baby giants.

Components Used

The information in this document is based on these software and hardware versions:

- Catalyst 6x00 / Cisco 7600 OSR Series
- Catalyst 4000/4500 Series
- Catalyst 3750/3560 Series
- Catalyst 3550 Series
- Catalyst 2970/2960 Series
- Catalyst 2950 Series
- Catalyst 2940 / Catalyst Express 500 Series
- Catalyst 2900XL/3500XL Series
- Catalyst 2948-L3/4908G-L3 Series
- Catalyst 1900/2800 Series

Note: In all the examples in this document, unless specifically mentioned, all values that quote MTU in bytes omit the 18 bytes for the Ethernet header and Frame Check Sequence (FCS).

The information in this document was created from the devices in a specific lab environment. All of the devices used in this document started with a cleared (default) configuration. If your network is live, ensure that you understand the potential impact of any command.

Conventions

Refer to the Cisco Technical Tips Conventions for more information on document conventions.

Background Information

This section describes the basic terminology that this document uses. This section also explains the background theory for the configurations in this document.

Term Definitions

- MTU: Maximum Transmission Unit (MTU) is the largest physical packet size, measured in bytes, that a network can transmit. Any messages larger than the MTU are divided into smaller packets before transmission.
- Jumbo: Jumbo frames are frames that are bigger than the standard Ethernet frame size, which is 1518 bytes (this includes Layer 2 (L2) header and FCS). The definition of frame size is vendor-dependent, as these are not part of the IEEE standard.
- Baby giants: The baby giants feature allows a switch to pass or forward packets that are slightly larger than the IEEE Ethernet MTU. Otherwise, the switch declares big frames as oversize and discards them.

Background Theory

In order to transport traffic across switched-networks, ensure that transmitted traffic MTU does not exceed the MTU that the switch platforms support. Here are the reasons why the MTU size of certain frames is truncated:

- Vendor-specific requirements: Applications and some Network Interface Cards (NICs) can specify an MTU size outside of the standard 1500 bytes. Much of this drive has been due to studies undertaken, which prove that an increase in the size of an Ethernet frame can increase average throughput.
- Trunking: In order to carry VLAN-ID information between switches or other network devices, trunking has been employed to augment the standard Ethernet frame. The current, most common forms of trunking are Cisco proprietary InterSwitch Link (ISL) encapsulation and IEEE 802.1q.

Refer to these documents for more information on trunking:

- InterSwitch Link Frame Format
- Basic Characteristics of 802.q Trunking
- MultiProtocol Label Switching (MPLS): When you enable MPLS on an interface, MPLS can also augment the frame size of a packet, based on the number of labels in the Label stack for an MPLS-tagged packet. The total size of a label is four bytes. The total size of a label stack is n x 4 bytes. If a label stack is formed, the frames can exceed the MTU.

Note: This article does not address interfaces such as Asynchronous Transfer Mode (ATM), Packet over SONET (POS), nor Token Ring.

Configure

In this section, you are presented with the information to configure the features described in this document.

Configurations

This document uses these configurations:

- Catalyst 6x00 / Cisco 7600 OSR Series
- Catalyst 4000/4500 Series
- Catalyst 3750/3560 Series
- Catalyst 3550 Series
- Catalyst 2970/2960 Series
- Catalyst 2950 Series
- Catalyst 2940 / Catalyst Express 500 Series
- Catalyst 2900XL/3500XL Series
- Catalyst 2948-L3/4908G-L3 Series
- Catalyst 1900/2800 Series

Catalyst Support for Maximum Frame Sizes

The ability of the various Catalyst switches to support various frame sizes depends on many factors that can include hardware and software. Notice that certain modules can support larger frame sizes than others, even within the same platform. Additionally, maximum frame size support can also change based on the software version you use.

Catalyst 6000/6500 / Cisco 7600 OSR Series

The Catalyst 6000 series and 7600 Optical Services Router (OSR) platform can support jumbo frame sizes as of release 6.1(1) of CatOS, and 12.1(1)E for Native Cisco IOS®. However, this is dependent on the type of line cards that you use. There are generally no restrictions to enable the jumbo frame size feature. You can use this feature with trunking/non-trunking and channeling/non-channeling.

The default MTU size is 9216 bytes after you enable jumbo frame support on the individual port. However, an Application Specific Integrated Circuit (ASIC) limitation requires that you limit the MTU size to 8092 bytes on these 10/100-based line cards:

- WS-X6248-RJ-45
- WS-X6248A-RJ-45
- WS-X6248-TEL
- WS-X6248A-TEL
- WS-X6348-RJ-45
- WS-X6348-RJ-45V
- WS-X6348-RJ-21

The WS-X6516-GE-TX is also affected at 100 Mbps. At 10/1000 Mbps, up to 9216 bytes can be supported. However, the WS-X6548-RJ-45 line card is not affected, as this line card uses newer ASICs.

Note: Jumbo frame support is available on WS-X6101 ATM modules.

Configure Native Cisco IOS

```
<#root>

7609(config)#

interface gigabitEthernet 1/1


7609(config-if)#mtu ?
  <1500-9216>  MTU size in bytes

7609(config-if)#mtu 9216
```

Verify in Native Cisco IOS

```
<#root>

7609#

show interfaces gigabitEthernet 1/1


GigabitEthernet1/1 is up, line protocol is up (connected)
  Hardware is C6k 1000Mb 802.3, address is 0007.0d0e.640a (bia 0007.0d0e.640a)
  MTU 9216 bytes, BW 1000000 Kbit, DLY 10 usec,
  reliability 255/255, txload 1/255, rxload 1/255
```

The port ASICs on the Catalyst 6000 count as oversized, which are those frames greater than 1548 bytes but less than the configured jumbo MTU. It uses the rxOversizedPkts counter to track these frames in the output from the **show counter <mod/port>** command. In this case, the ifInErrors counter value increments and can equal the number of rxOversizedPkts packets value in the **show counter <mod/port>** command output. On a Catalyst 6000 that runs Cisco Integrated Cisco IOS (Native Mode), use the **show interface <interface-id>** command to check whether the input errors counter increments along with giant counters on the interface that receives these frames.

Note: There is no relationship between the MTU value that you can specify in the VLAN database and the **mtu** command in the interface configuration mode. With the VLAN database setting, the switch checks for an MTU value greater than 1500. If the switch detects a higher value, puts the VLAN in a non-operational state. Therefore, to support large frames, you only need to change the interface MTU value and not the VLAN database MTU value. If SVI is used, then in order to support large frames, you must increase the MTU on the SVI to route the traffic between VLANs. Refer to the Jumbo Frame Support section of Catalyst 6500 Release 12.2SX Software Configuration Guide for more information about Jumbo Frame support on the Catalyst 6500.

Catalyst 4000/4500 Series

You can classify the Catalyst 4000/4500 series switches into two groups in relation to jumbo or baby giant

support:

1. Devices that run CatOS system software.
2. Devices that run Cisco IOS system software.

Devices that Run the CatalystOS System Software

This group includes the Catalyst 4000/4500 devices with Supervisor I and Supervisor II, WS-C2948G, WS-C2980G, and the WS-C4912G fixed-configuration switches also. Due to an ASIC limitation, there is no support for baby giants.

Workaround

As a workaround, you can enable a port for trunking in order to support baby giants. When you enable a port for 802.1q trunking, the switch automatically assumes that an extra four bytes of data are appended on and increments the frame size of the L2 packet. Notice that ISL encapsulation is not supported on these platforms.

Therefore, for implementations that require exactly one tag to be carried (either 802.1q or MPLS, but not both), you can configure the port as a trunk port to force the switchport to accept an extra four bytes of data. If the port were to carry multiple VLANs for VLAN-ID tagging or 802.1p prioritization, configure the port as a 802.1q trunk. However, even if VLAN tagging is not necessary, but you want the increased four-byte support, you can configure the port as a 802.1q trunk. Change the Native VLAN to be the one desired to carry the traffic. When you do so, you can accommodate an extra four bytes of data.

Devices that Run Cisco IOS System Software

The Cisco Catalyst 4000/4500 devices with Supervisors, which run only Cisco IOS, currently support baby giants up to 1600 byte-sized frames and jumbo frames. Refer to Troubleshooting Baby Giant/Jumbo Frames in Catalyst 4000/4500 with Supervisor III/IV for more information.

Catalyst 3750/3560 Series

Catalyst 3750/3560 Series switches support an MTU of 1998 bytes for all 10/100 interfaces. All Gigabit Ethernet interfaces support jumbo frames up to 9000 bytes. The default MTU and jumbo frame size is 1500 bytes. You cannot change the MTU on an individual interface. You must set the MTU globally. Reset the switch afterwards for the MTU change to take effect.

Configure

Use the **system mtu** command to change the MTU for all 10/100 interfaces. This command only effects 10/100 interfaces.

```
<#root>

3750(config)#

system mtu 1546

3750(config)#

exit
```

```
3750#
reload
```

Use the **system mtu jumbo** command to change the MTU for all Gigabit Ethernet interfaces. This command only effects Gigabit Ethernet Interfaces.

```
<#root>
3750(config)#
system mtu jumbo 9000
3750(config)#
exit
3750#
reload
```

Note: Gigabit Ethernet ports are not affected by the **system mtu** command; 10/100 ports are not affected by the **system mtu jumbo** command. If you do not configure the **system mtu jumbo** command, the set of the **system mtu** command applies to all Gigabit Ethernet interfaces.

Verify

Use the **show system mtu** command to view the mtu sizes after reload.

```
<#root>
Switch#
show system mtu

System MTU size is 1546 bytes
System Jumbo MTU size is 9000 bytes
```

Note: If Gigabit Ethernet interfaces are configured to accept frames greater than the 10/100 interfaces, jumbo frames that ingress on a Gigabit Ethernet interface and egress on a 10/100 interface are dropped.

Note: When you use dot1q on trunk interface on the Cat3750/3560, you can see runts in the **show interface** command output because Cat3750/3560 counts valid dot1q encapsulated packets that are 61-64 bytes and that includes the q-tag as undersized frames, even when these packets are forwarded correctly. In addition, these packets are not reported in the appropriate category (unicast, multicast, broadcast) in receive statistics.

Catalyst 3550 Series

You can classify the Catalyst 3550 series Layer 3 (L3) switches into two major groups, where the Gigabit Ethernet versions support up to 2000 bytes and the Fast Ethernet versions support up to 1546 bytes. These models support up to 2000 bytes:

1. WS-C3550-12G
2. WS-C3550-12T

Configure

```
<#root>

3550(config)#

system mtu ?

  <1500-2000>  MTU size in bytes

3550(config)#

system mtu 2000

Changes to the System MTU will not take effect until the next reload is done.
```

Verify

```
<#root>

3550#

show system mtu

System MTU size is

2000 bytes
```

In versions earlier than 12.1(9)EA1, an MTU of 2025 was configurable on these mentioned switches. Due to an ASIC limitation, the configurable MTU has been brought down to 2000 bytes.

These models support up to 1546 bytes:

- WS-C3550-24
- WS-C3550-24-DC-SMI
- WS-C3550-24-EMI
- WS-C3550-24-SMI
- WS-C3550-48-EMI

- WS-C3550-48-SMI

Configure

```
<#root>

3550(config)#

system mtu ?

  <1500-1546>  MTU size in bytes

3550(config)#

system mtu 1546

Changes to the System MTU will not take effect until the next reload is done.
```

Verify

```
<#root>

3550#

show system mtu

System MTU size is

1546 bytes
```

Note: The MTU size of 1546 does not include the 18 bytes of the standard Ethernet header and FCS. Therefore, these switches actually support Ethernet frames up to 1564 bytes.

Catalyst 2970/2960 Series

The default maximum transmission unit (MTU) size for frames received and transmitted on all interfaces on the switch is 1500 bytes. You can increase the MTU size for all interfaces that operate at 10 or 100 Mbps with the **system mtu** global configuration command. You can increase the MTU size to support jumbo frames on all Gigabit Ethernet interfaces with the **system mtu jumbo** global configuration command.

Gigabit Ethernet ports are not affected by the **system mtu** command; 10/100 ports are not affected by the **system mtu jumbo** command. If you do not configure the **system mtu jumbo** command, the setting of the system mtu< /strong> command applies to all Gigabit Ethernet interfaces.

You cannot set the MTU size for an individual interface; you set it for all 10/100 or all Gigabit Ethernet interfaces on the switch. When you change the system or jumbo MTU size, you must reset the switch before the new configuration takes effect.

Frame sizes that can be received by the switch CPU are limited to 1998 bytes, no matter what value was

entered with the **system mtu** or **system mtu jumbo** commands. Although frames that are forwarded are typically not received by the CPU, in some cases, packets are sent to the CPU, such as traffic sent to control traffic, SNMP, or Telnet.

If Gigabit Ethernet interfaces are configured to accept frames greater than the 10/100 interfaces, jumbo frames received on a Gigabit Ethernet interface and sent on a 10/100 interface are dropped.

Configure

Use the **system mtu** command to change the MTU for all 10/100 interfaces. This command only affects 10/100 interfaces.

```
<#root>
2970(config)#
system mtu 1998
2970(config)#
exit
2970#
reload
```

Use the **system mtu jumbo** command to change the MTU for all Gigabit Ethernet interfaces. This command only affects Gigabit Ethernet Interfaces.

```
<#root>
2970(config)#
system mtu jumbo 9000
2970(config)#
exit
2970#
reload
```

Verify

Use the **show system mtu** command to view the MTU sizes after reload.

```
<#root>
2970#
show system mtu

System MTU size is 1998 bytes
System Jumbo MTU size is 9000 bytes
```

Catalyst 2950/2955 Series

You can classify the Catalyst 2950/2955 Series switches into two major groups, where one supports baby giants (up to 1530 bytes), but the other does not. However, this refers to traffic that flows through the switch. Packets destined to the management (VLAN) interface can support only 1500 bytes.

These models of 2950 switches support only 1500 bytes:

- WS-C2950-12
- WS-C2950-24
- WS-C2950-48
- WS-C2950C-24
- WS-C2950T-24

These models of 2950/2955 switches support up to 1530 bytes:

- WS-C2950G-12-EI
- WS-C2950G-24-EI
- WS-C2950G-24-EI-DC
- WS-C2950G-48
- WS-C2950G-48-EI
- All models of 2950 LRE Series switches
- All models of 2955 Series switches

For those switches that support up to 1530 bytes, the default MTU value is 1500. If you want to change this, use the global configuration command that is available for versions of software that are 12.1(6)EA2 or later. Here is sample configuration and verification:

Configure

```
<#root>

2950G(config)#

system mtu ?

  <1500-1530>  MTU size in bytes

2950G(config)#

system mtu 1530
```

Verify

```
<#root>

2950G#

show system mtu


System MTU size is 1530 bytes
```

Catalyst 2940 / Catalyst Express 500 Series

The System MTU can only be set to 1500 bytes, the default. You cannot set the MTU on a per-interface basis.

Catalyst 2900XL/3500XL Series

The Catalyst 2900XL/3500XL series switches are able to support up to the MTU size of 2018 bytes as of version 12.0(5.2)XU. There is no support for a full jumbo frame. You can configure the MTU size on a per-interface basis. You can perform this configuration on all 10/100/1000 interfaces.

Configure

```
<#root>

3500XL(config)#

interface fastEthernet 0/3


3500XL(config-if)#

mtu ?


  <1500-2018>  MTU size in bytes

3500XL(config-if)#

mtu 2018
```

Verify

```
<#root>

3500XL#

show interfaces fastEthernet 0/3
```

```
FastEthernet0/3 is up, line protocol is up
  Hardware is Fast Ethernet, address is 0007.85b8.6983 (bia 0007.85b8.6983)
  MTU 2018 bytes, BW 0 Kbit, DLY 100 usec, reliability 255/255,
  txload 1/255, rxload 1/255
```

Note: Currently, the Catalyst 2900LRE-XL switches do no support frame sizes larger than 1536 bytes signaling connection due to limitations on the CPE device.

A Catalyst 2900XL reports oversized frames when Catalyst 2900XL receives a legal max-size Ethernet frame encapsulated or tagged for ISL/802.1Q but cannot forward the frame to any other ports. There are many valid reasons why a port receives a packet but does not forward the packet to any other ports. For example, packets that a port blocked by Spanning Tree Protocol (STP) receives are not forwarded. This issue is a cosmetic bug with Cisco bug ID CSCdm34557.

Note: Only registered Cisco Clients can access tools and bug information.

Catalyst 2948G-L3/4908G-L3 Series

The Catalyst 2948G-L3 and 4908G-L3 series switches do not support a configurable MTU on either 10/100 or 1000. The MTU is therefore the default, which is 1500 bytes.

Configure

```
<#root>

2948G-L3(config)#

interface gig 49


2948G-L3(config-if)#

mtu 2000


% Interface GigabitEthernet49 does not support user settable mtu.
```

Verify

```
<#root>

2948G-L3#

show interfaces gigabitEthernet 49


GigabitEthernet49 is up, line protocol is up
  Hardware is xpif_port, address is 0004.6e3b.b507 (bia 0004.6e3b.b507)
  MTU 1500 bytes, BW 1000000 Kbit, DLY 10 usec, rely 255/255, load 1/255
  Encapsulation ARPA, loopback not set, keepalive set (10 sec)
  Full-duplex, 1000Mb/s, 1000Base-SX, Auto-negotiation
```

Catalyst 1900/2820 Series

The ability of Catalyst 1900/2820 series switches to support baby jumbo frames depends on the revision of the switch in question. The older models of the 1900/2820 series switches that were manufactured with a metal casing can support a larger MTU of 1508 bytes to pass through. These frames are also be logged as giant frames in the statistics report, as shown here:

```
Catalyst 1900 - Port B Statistics Report
    Receive Statistics                    Transmit Statistics
-------------------------------------  -------------------------------------
Total good frames                 120  Total frames                   262767
Total octets                    10041  Total octets                 16840696
Broadcast/multicast frames         49  Broadcast/multicast frames      262664
Broadcast/multicast octets       5000  Broadcast/multicast octets    16825351
Good frames forwarded             107  Deferrals                            0
Frames filtered                    13  Single collisions                    3
Runt frames                         0  Multiple collisions                  0
No buffer discards                  0  Excessive collisions                 0
                                       Queue full discards                  0
Errors:                                Errors:
  FCS errors                        0    Late collisions                    0
  Alignment errors                  0    Excessive deferrals                0
  Giant frames                      5    Jabber errors                      0
  Address violations                0    Other transmit errors              0
```

The newer models of the 1900/2820 series switches that were manufactured with a plastic casing can support only a maximum MTU of 1500 bytes. Larger frames are dropped.

Related Information

- How to Configure Jumbo or Giant Frame Support on a Cisco Catalyst Switch
- 802.1Q Trunking Between Catalyst Switches Running CatOS
- ISL Trunking on Catalyst 5500/5000 and 6500/6000 Family Switches
- Technical Support & Documentation - Cisco Systems