

# MDS to MDS Elaborate Configuration with FCIP

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## Introduction

This document provides a sample configuration for elaborate Fibre Channel Over TCP/IP (FCIP) Multilayer Director Switch (MDS) to MDS.

FCIP describes mechanisms that allow the interconnection of islands of Fibre Channel (FC) storage area networks (SANs) over IP-based networks to form a unified SAN in a single FC fabric. FCIP relies on IP-based network services to provide the connectivity between the SAN islands over local area networks, metropolitan area networks, or wide area networks.

**Figure 1 Fibre Channel SANs Connected by FCIP**



FCIP uses Transmission Control Protocol (TCP) on port 3225 as a network layer transport.

## Prerequisites

### Requirements

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

- The IP backbone must be operational and deliver the required bandwidth to support the applications that run across the FCIP links this could be a Layer 2 (L2) or Layer 3 (L3) topology.
- If it is a L3 topology, the intermediate routers or multilayer switches must be set up and configured to appropriately forward IP traffic between source and destination IP addresses of the FCIP tunnels. If Quality of Service (QoS) or traffic shaping is enforced at any network device in the path between the FCIP peers, the network manager administrating the IP infrastructure should be consulted to get the necessary details before configuring any TCP-related parameters and features on the Multilayer Director Switch (MDS) FCIP profile(s).

- The Ethernet switches which are adjacent to the MDSes must support and be configured for 802.1Q trunking if subinterfaces are configured on the MDS IP Storage (IPS) services module.

## Components Used

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

- MDS 9509 with IPS service module (DS-X9308-SMIP) that runs version 1.2.(2a)
- MDS 9216 with IPS service module (DS-X9308-SMIP) that runs version 1.2.(2a)
- Catalyst 6509 that runs Catalyst OS (CatOS) 7.4(3)
- Win2003 Server (HPQ Pro-Liant-P4) with Emulex LP9K HBA
- IBM Storage Array (ESS-2105-F20)

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, make sure that you understand the potential impact of any command.

## Conventions

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

## Background Information

FCIP consists of these specifications:

### ANSI T11

1. FC-SW-2 describes the operation and interaction of FC switches including E\_Port and fabric operation.
2. FC-BB-2 is a mapping that pertains to the extension of FC switched networks across a TCP network backbone, and defines reference models that support E\_Port and B\_Port.

### IETF IPS Working Group

1. FC over TCP covers the TCP/IP requirements for transporting FC frames over an IP network.
2. FC frame encapsulation defines the common fibre encapsulation format.

An interconnection between two SAN switches or fabrics across FCIP is called an FCIP link and can contain one or more TCP connections. Each end of a FCIP link is associated with a Virtual E port (VE\_port) or a B\_port, depending on the implementation. FC-BB and FC-BB-2 are describing the differences between both approaches. The IPS services module (DS-X9308-SMIP) is supporting both modes but defaults to VE\_Port, which is also the recommended mode to run if all relevant peers are DS-X9308-SMIP modules. In this sample topology, FCIP over PortChannels, TCP parameters to configure, and FSF (special frame) configuration parameters are discussed.

## Configure

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

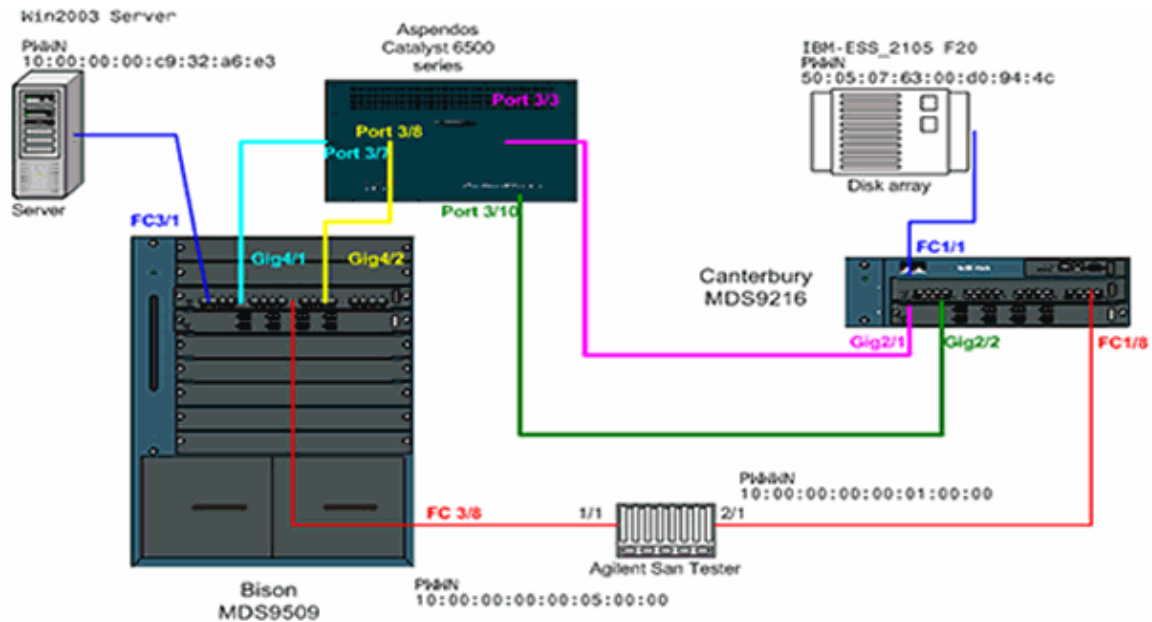
On the MDSes, you need to familiarize yourself with the IPS configuration guides for both platforms. You can find the most current version of the manuals at [Configuring IP Storage on Cisco.com](http://Configuring IP Storage on Cisco.com).

**Note:** Use the Command Lookup Tool (registered customers only) to find more information on the commands used in this document.

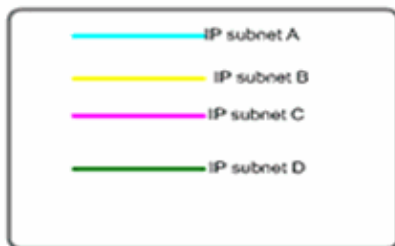
## Network Diagram

This document uses this network setup:

**Figure 2 Topology 3**



**Topology 3 - PortChannel of two FCIP interfaces**



Topology 3 depicts one FCIP Port Channel formed by two individual FCIP tunnels; the peer interfaces are across an IP cloud. The IP cloud is collapsed into one multilayer switch (Catalyst 6500) which routes traffic from subnet A to subnet C and from subnet C to subnet A (and from subnet B to subnet D and from subnet D to subnet A). Subnets are defined as follows:

- Subnet A : 100.100.100.0/30 – Bison int Gig4/1
- Subnet B: 100.100.100.4/30 – Bison int Gig4/2
- Subnet C: 200.200.200.0/30– Canterbury Gig2/1
- Subnet D: 200.200.200.4/30 – Canterbury Gig2/2

The topology provides a known **Maximum Bandwidth of 100 Mbps** and a **Minimum Bandwidth of 100 Mbps**, which is the profile running for our relevant IP traffic through this IP cloud . The initial configuration shows the aspects of FCIP–based Port Channeling and TCP traffic conditioning. In subsequent sections FSF, Passive TCP interfaces, and FCIP Timestamp will be explained further.

# Configurations

This document uses these configurations:

- MDS 9509 (Bison) with IPS-8 module
- MDS 9612 (Canterbury) with IPS-8 module

## MDS 9509 (Bison) with IPS-8 module

```
bison# sh ver
Cisco Storage Area Networking Operating System (SAN-OS) Software
TAC support: http://www.cisco.com/tac
Copyright (c) 2002-2003 by Cisco Systems, Inc. All rights reserved.
The copyright for certain works contained herein are owned by
Andiamo Systems, Inc. and/or other third parties and are used and
distributed under license.

Software
BIOS: version 1.0.8
loader: version 1.2(2)
kickstart: version 1.2(2a)
system: version 1.2(2a)

BIOS compile time: 08/07/03
kickstart image file is: bootflash:/k122a
kickstart compile time: 9/23/2003 11:00:00
system image file is: bootflash:/s122a
system compile time: 10/8/2003 18:00:00

Hardware
RAM 1024584 kB

bootflash: 500736 blocks (block size 512b)
slot0: 0 blocks (block size 512b)

bison uptime is 1 days 15 hours 45 minute(s) 44 second(s)

Last reset
Reason: Unknown
System version: 1.2(2a)
Service:

bison# sh run

Building Configuration ...
fcip profile 1
ip address 100.100.100.1
tcp max-bandwidth-mbps 100 min-available-bandwidth-mbps 100 round-trip-time-ms 10

!--- TCP bandwidth parameters defined specifically for this FCIP tunnel.
!--- Restricted to 100 Mbps max and min. See the Note on TCP Parameters
!--- comment section in this table below for more details.

fcip profile 2
ip address 100.100.100.5
tcp max-bandwidth-mbps 100 min-available-bandwidth-mbps 100 round-trip-time-ms 10

!--- TCP max and min bandwidth parameter are configured here exactly the
!--- same as for FCIP 1 because both tunnels are combined in one PortChannel
!--- interface and are subject to the same bandwidth restrictions in the IP core.

vsan database
vsan 600
vsan 601
```

```
fcdomain domain 1 preferred vsan 600
fcdomain domain 1 preferred vsan 601

interface port-channel 1

switchport trunk allowed vsan 600-601

interface fcipl
channel-group 1 force
no shutdown
use-profile 1
peer-info ipaddr 200.200.200.1

!--- Interface FCIP 1 is a member of channel-group 1. The force keyword makes it
!--- adopt the specific settings configured on interface port-channel 1.

interface fcip2
channel-group 1 force
no shutdown
use-profile 2
peer-info ipaddr 200.200.200.5

!--- Interface FCIP 2 is also member of channel-group 1.

boot system bootflash:/s122a sup-1
boot kickstart bootflash:/k122a sup-1
boot system bootflash:/s122a sup-2
boot kickstart bootflash:/k122a sup-2

ip domain-name cisco.com
ip name-server 144.254.10.123
ip route 200.200.200.0 255.255.255.252 100.100.100.2 distance 2
ip route 200.200.200.4 255.255.255.252 100.100.100.6 distance 2

!--- FCIP interfaces are on separate IP subnets, so in order to reach the FCIP
!--- peer IP address, you need adequate static routes to an L3 device that
!--- knows how to forward the packets to the final destination. Multiple routes
!--- to the same destination IP subnet are allowed, and the distance parameter
!--- can be used to specify a preferred next hop. Multiple next hops would
!--- require a subnet mask providing for a larger number of host; for example,
!--- a 28-bit subnet mask.

ssh key dsa 768 force
ssh server enable
switchname bison
zone default-zone permit vsan 600-601

interface GigabitEthernet4/1
ip address 100.100.100.1 255.255.255.252
switchport mtu 3000
no shutdown

!--- MTU size is defined as 3000 bytes. Make sure that all intermediate network
!--- devices between this interface and the peer IP address are capable of
!--- switching and routing Jumbo frames. In order to avoid FC Frame split,
!--- an MTU value of 2300 is required; 3000 is used in the configuration example
!--- for simplicity. FCIP TCP segments will normally never exceed 2264 bytes for
!--- TE ports or 2256 bytes for E ports, regardless of the configured MTU size.

interface GigabitEthernet4/2
ip address 100.100.100.5 255.255.255.252
switchport mtu 3000
no shutdown

interface fc3/1
```

```
interface fc3/2
interface fc3/3
interface fc3/4
interface fc3/5
interface fc3/6
interface fc3/7
interface fc3/8
interface fc3/9
interface fc3/10
interface fc3/11
interface fc3/12
interface fc3/13
interface fc3/14
interface fc3/15
interface fc3/16

interface mgmt0
ip address 10.48.69.151 255.255.255.128
```

*!--- Note on TCP Parameters*

*!--- The following TCP parameters can be individually configured per FCIP profile:*

```
bison(config-profile)# tcp ?
```

```
cwm Enable congestion window monitoring
keepalive-timeout Set keep alive timeout in sec
max-bandwidth-kbps Configure maximum available path bandwidth in Kbps
max-bandwidth-mbps Configure maximum available path bandwidth in Mbps
max-retransmissions Maximum number of retransmissions
min-retransmit-time Set minimum retransmit time in millisecond
pmtu-enable Enable PMTU Discovery
sack-enable Enable SACK option for TCP
send-buffer-size Send buffer size in KBytes
```

*!--- The **CWM** parameter default value is 10K and should be left untouched under normal conditions. Congestion window monitoring (CWM) is a way of controlling burstiness after long idle times or loss of Acks.*

*!--- The **keepalive-timeout** is the TCP keepalive timeout value and is set to 60 seconds by default, though it can range between 1 and 7200 seconds.*

*!--- The **max-** and **min-bandwidth** parameters program the TCP Maximum Window Size (scaling factor) and engages an internal shaper functionality. These values should be carefully chosen and requires understanding of the intermediate network s end-to-end topology. The default values are to be changed according to the aforementioned requirements. The Round-trip-time can be derived once you have your FCIP tunnel up and running by issuing the following command:*

```
bison# ips measure 200.200.200.1 interface gigabitethernet 4/1
```

```
Round trip time is 53 micro seconds (0.05 milliseconds )
```

```
!--- Always add an additional margin of at least a few microseconds to this value.  
!--- The max-retransmissions counter is set to 4 by default. In a healthy network  
!--- environment, this value should be left unchanged.
```

```
!--- The max-retransmission timer is set to 200 milliseconds. If you experience  
!--- extremely high retransmission counters, this value can be increased; but,  
!--- in general, changing this parameter is not required unless the RTT is  
!--- above 200 milliseconds.
```

```
!--- The PMTU (Path MTU discovery) is enabled by default. Best practice is to know  
!--- what is the maximum MTU size supported by all interfaces along the logical  
!--- path between both peers.
```

```
!--- The SACK feature (Selective Acknowledgment) is not enabled by default.  
!--- Consider enabling it when you have a lot of retransmissions occurring between  
!--- the two peers. SACK allows selective retransmissions of your window, which is  
!--- beneficial if larger maximum window sizes are configured and retransmissions  
!--- occur frequently. It is enabled in this sample configuration; when you do so,  
!--- make sure that it is enabled at both sides of the link.
```

```
!--- The send-buffer-size is the amount of buffers in addition to the TCP window  
!--- that are allowed to be transmitted out before starting to flow control the FC  
!--- sources. The default value is set to 0.
```

- For more details on PMTU, refer to RFC 1191 – Path MTU discovery [↗](#).
- For more details on SACK, refer to RFC 2018 – TCP Selective Acknowledgement Options [↗](#) and RFC 2883 – An Extension to the Selective Acknowledgement (SACK) Option for TCP [↗](#)

### MDS 9216 (Canterbury) with IPS-8 module

```
canterbury# sh run
```

```
Building Configuration ...
```

```
fcip profile 200
```

```
ip address 200.200.200.1
```

```
tcp max-bandwidth-mbps 100 min-available-bandwidth-mbps 100 round-trip-time-ms 10
```

```
fcip profile 201
```

```
ip address 200.200.200.5
```

```
tcp max-bandwidth-mbps 100 min-available-bandwidth-mbps 100 round-trip-time-ms 10
```

```
!--- The TCP parameters are identical to what is configured on the peering  
!--- FCIP interfaces. Only in very specific cases should different values be  
!--- considered, for example, if the return-path(s) are running across a different  
!--- part of the network or if the application dictates asymmetrical values.
```

```
vsan database
```

```
vsan 600
```

```
vsan 601
```

```
fcdomain domain 2 preferred vsan 600
```

```
fcdomain domain 2 preferred vsan 601
```

```
interface port-channel 2
```

```
switchport trunk mode auto
switchport trunk allowed vsan 600-601

interface fcip1
channel-group 2 force
no shutdown
use-profile 200
peer-info ipaddr 100.100.100.1

interface fcip2
channel-group 2 force
no shutdown
use-profile 201
peer-info ipaddr 100.100.100.5

!--- Both FCIP 1 and FCIP 2 are bound to the same channel-group 2. Also note that
!--- there is no strict relationship between profile-id and FCIP interface
!--- numbering here, as this is not a requirement. From a management and
!--- troubleshooting perspective, however, a strict relationship of both values
!--- is recommended.

vsan database
vsan 600 interface fcl/1
vsan 601 interface fcl/8

boot system bootflash:/s122a
boot kickstart bootflash:/k122a

ip domain-name cisco.com
ip name-server 144.254.10.123
ip default-gateway 10.48.69.129
ip route 100.100.100.0 255.255.255.252 200.200.200.2 distance 2
ip route 100.100.100.4 255.255.255.252 200.200.200.6 distance 2

!--- IP routes are defined for both FCIP peer IP addresses. The next hop must be
!--- aware of the best route to the peer s addresses or to the relevant IP subnets.

ssh key dsa 768 force
ssh server enable
switchname canterbury
system default switchport trunk mode auto
username admin password 5 $1$KcCrqxlu$mtU03/60PRUIfjl.aeEEc0 role network-admin
zone default-zone permit vsan 600-601
zoneset distribute full vsan 1-4093

interface GigabitEthernet2/1
ip address 200.200.200.1 255.255.255.252
switchport mtu 3000
no shutdown

interface GigabitEthernet2/2
ip address 200.200.200.5 255.255.255.252
switchport mtu 3000
no shutdown

interface GigabitEthernet2/3

interface GigabitEthernet2/4

interface GigabitEthernet2/5

interface GigabitEthernet2/6

interface GigabitEthernet2/7
```



```
interface GigabitEthernet2/8

interface fc1/1

interface fc1/2

interface fc1/3

interface fc1/4

interface fc1/5

interface fc1/6

interface fc1/7

interface fc1/8

interface fc1/9

interface fc1/10

interface fc1/11

interface fc1/12

interface fc1/13

interface fc1/14

interface fc1/15

interface fc1/16

interface mgmt0
ip address 10.48.69.156 255.255.255.128

interface iscsi2/1

interface iscsi2/2

interface iscsi2/3

interface iscsi2/4

interface iscsi2/5

interface iscsi2/6

interface iscsi2/7

interface iscsi2/8
```

## Verify

Use this section to confirm that your configuration works properly.

The Output Interpreter Tool (registered customers only) (OIT) supports certain **show** commands. Use the OIT to view an analysis of **show** command output.

- **show interface gig *x/y*** Displays status of the relevant Gigabit interface bound to the FCIP profile.
- **show ips stats tcp int gig *x/y*** Displays TCP statistics and active connections for the relevant Gigabit interface.

- **show ips arp int gig x/y** Displays all Address Resolution Protocol (ARP) entries for the relevant Gigabit interface; the next hop or peer should be present in this list.
- **show ips ip route int gig x/y** Displays the specific routes going across the relevant Gigabit interface.
- **show interface fcip x** Displays the FCIP interface status and all details related to this FCIP tunnel.
- **show profile fcip x** Displays the IP address to which the profile is bound and all configured TCP parameters.
- **show int fcip x counters** Used to check if there are any frames going through the FCIP tunnel.
- **show fcdomain vsan x** Lists all domain-related details; used to verify that the fabric is formed across the FCIP tunnel(s).
- **show fcns da vsan x** Displays all pwwn, FC4-Types, and FCIDs of the relevant VSAN; used to verify that all expected entries are distributed across the FCIP tunnel(s).

## Troubleshoot

Use this section to troubleshoot your configuration.

Be sure to issue the **show** commands multiple times to build a counter history. Counters that are not related to a point in time and just collected only once are mostly useless.

Use the configurations shown below for further troubleshooting.

- MDS 9509 (Bison)
- MDS 9216 (Canterbury)
- Special Frame Configuration (Bison)
- Special Frame Configuration (Canterbury)
- Display from Bison and Canterbury – Canterbury passive
- Display from Bison and Canterbury – Timestamp set

### MDS 9509 (Bison)

```
bison# sh int gig 4/1
GigabitEthernet4/1 is up
  Hardware is GigabitEthernet, address is 0005.3000.a85a
  Internet address is 100.100.100.1/30
  MTU 3000 bytes
  Port mode is IPS
  Speed is 1 Gbps
  Beacon is turned off
  Auto-Negotiation is turned on
  5 minutes input rate 312 bits/sec, 39 bytes/sec, 0 frames/sec
  5 minutes output rate 312 bits/sec, 39 bytes/sec, 0 frames/sec
  8685 packets input, 976566 bytes
    0 multicast frames, 0 compressed
    0 input errors, 0 frame, 0 overrun 0 fifo
  8679 packets output, 972382 bytes, 0 underruns
    0 output errors, 0 collisions, 0 fifo
    0 carrier errors

bison# sh int gig 4/2
GigabitEthernet4/2 is up
  Hardware is GigabitEthernet, address is 0005.3000.a85b
  Internet address is 100.100.100.5/30
  MTU 3000 bytes
  Port mode is IPS
  Speed is 1 Gbps
  Beacon is turned off
  Auto-Negotiation is turned on
```

```
5 minutes input rate 16 bits/sec, 2 bytes/sec, 0 frames/sec
5 minutes output rate 16 bits/sec, 2 bytes/sec, 0 frames/sec
590 packets input, 46496 bytes
  0 multicast frames, 0 compressed
  0 input errors, 0 frame, 0 overrun 0 fifo
547 packets output, 30898 bytes, 0 underruns
  0 output errors, 0 collisions, 0 fifo
  0 carrier errors
```

```
bison# sh ips stats tcp int gig 4/1
```

```
TCP Statistics for port GigabitEthernet4/1
```

```
Connection Stats
```

```
  14 active openings, 4 accepts
  4 failed attempts, 0 reset received, 14 established
```

```
Segment stats
```

```
  8897 received, 8505 sent, 0 retransmitted
  0 bad segments received, 0 reset sent
```

```
TCP Active Connections
```

Local Address	Remote Address	State	Send-Q	Recv-Q
100.100.100.1:65480	200.200.200.1:3225	ESTABLISH	0	0
100.100.100.1:65482	200.200.200.1:3225	ESTABLISH	0	0
100.100.100.1:3225	0.0.0.0:0	LISTEN	0	0

```
bison# sh ips stats tcp int gig 4/2
```

```
TCP Statistics for port GigabitEthernet4/2
```

```
Connection Stats
```

```
  2 active openings, 0 accepts
  0 failed attempts, 0 reset received, 2 established
```

```
Segment stats
```

```
  598 received, 43 sent, 0 retransmitted
  0 bad segments received, 0 reset sent
```

```
TCP Active Connections
```

Local Address	Remote Address	State	Send-Q	Recv-Q
100.100.100.5:65531	200.200.200.5:3225	ESTABLISH	0	0
100.100.100.5:65533	200.200.200.5:3225	ESTABLISH	0	0
100.100.100.5:3225	0.0.0.0:0	LISTEN	0	0

```
bison# sh int fcipl-2
```

```
fcipl is trunking
```

```
Hardware is GigabitEthernet
```

```
Port WWN is 20:c2:00:05:30:00:7a:de
```

```
Peer port WWN is 20:42:00:0c:30:6c:24:40
```

```
Admin port mode is auto, trunk mode is on
```

```
Port mode is TE
```

```
vsan is 1
```

```
Belongs to port-channel 1
```

```
Trunk vsans (allowed active) (600-601)
```

```
Trunk vsans (operational) (600-601)
```

```
Trunk vsans (up) (600-601)
```

```
Trunk vsans (isolated) ()
```

```
Trunk vsans (initializing) ()
```

```
Using Profile id 1 (interface GigabitEthernet4/1)
```

```
Peer Information
```

```
Peer Internet address is 200.200.200.1 and port is 3225
```

```
Special Frame is disabled
```

```
Maximum number of TCP connections is 2
```

```
Time Stamp is disabled
```

```
QOS control code point is 0
```

```
QOS data code point is 0
```

```
B-port mode disabled
```

```
TCP Connection Information
```

2 Active TCP connections  
Control connection: Local 100.100.100.1:65480, Remote 200.200.200.1:3225  
Data connection: Local 100.100.100.1:65482, Remote 200.200.200.1:3225  
28 Attempts for active connections, 7 close of connections

#### TCP Parameters

Path MTU 3000 bytes  
Current retransmission timeout is 200 ms  
Round trip time: Smoothed 5 ms, Variance: 6  
**Advertized window: Current: 118 KB, Maximum: 118 KB, Scale: 1**  
**Peer receive window: Current: 118 KB, Maximum: 118 KB, Scale: 1**  
**Congestion window: Current: 10 KB, Slow start threshold: 118 KB**  
5 minutes input rate 120 bits/sec, 15 bytes/sec, 0 frames/sec  
5 minutes output rate 120 bits/sec, 15 bytes/sec, 0 frames/sec  
4077 frames input, 379836 bytes  
    4071 Class F frames input, 379100 bytes  
    6 Class 2/3 frames input, 736 bytes  
    0 Error frames timestamp error 0  
4077 frames output, 381064 bytes  
    4071 Class F frames output, 380364 bytes  
    6 Class 2/3 frames output, 700 bytes  
    0 Error frames 0 reass frames

#### fcip2 is trunking

Hardware is GigabitEthernet  
Port WWN is 20:c6:00:05:30:00:7a:de  
Peer port WWN is 20:46:00:0c:30:6c:24:40  
Admin port mode is auto, trunk mode is on  
Port mode is TE  
vsan is 1  
**Belongs to port-channel 1**  
Trunk vsans (allowed active) (600-601)  
Trunk vsans (operational) (600-601)  
Trunk vsans (up) (600-601)  
Trunk vsans (isolated) ()  
Trunk vsans (initializing) ()  
Using Profile id 2 (interface GigabitEthernet4/2)  
Peer Information

Peer Internet address is 200.200.200.5 and port is 3225  
Special Frame is disabled  
Maximum number of TCP connections is 2  
Time Stamp is disabled  
QOS control code point is 0  
QOS data code point is 0  
B-port mode disabled

#### TCP Connection Information

2 Active TCP connections  
Control connection: Local 100.100.100.5:65531, Remote 200.200.200.5:3225  
Data connection: Local 100.100.100.5:65533, Remote 200.200.200.5:3225  
2 Attempts for active connections, 0 close of connections

#### TCP Parameters

Path MTU 3000 bytes  
Current retransmission timeout is 200 ms  
Round trip time: Smoothed 0 ms, Variance: 0  
**Advertized window: Current: 118 KB, Maximum: 118 KB, Scale: 1**  
**Peer receive window: Current: 118 KB, Maximum: 118 KB, Scale: 1**  
Congestion window: Current: 8 KB, Slow start threshold: 118 KB  
5 minutes input rate 32 bits/sec, 4 bytes/sec, 0 frames/sec  
5 minutes output rate 32 bits/sec, 4 bytes/sec, 0 frames/sec  
8 frames input, 1232 bytes  
    8 Class F frames input, 1232 bytes  
    0 Class 2/3 frames input, 0 bytes  
    0 Error frames timestamp error 0  
8 frames output, 1228 bytes  
    8 Class F frames output, 1228 bytes  
    0 Class 2/3 frames output, 0 bytes  
    0 Error frames 0 reass frames

```
bison# sh fcip pro 1
```

```
FCIP Profile 1
```

```
Internet Address is 100.100.100.1 (interface GigabitEthernet4/1)  
Listen Port is 3225
```

```
TCP parameters
```

```
SACK is enabled  
PMTU discovery is enabled, reset timeout is 3600 sec  
Keep alive is 60 sec  
Minimum retransmission timeout is 200 ms  
Maximum number of re-transmissions is 4  
Send buffer size is 0 KB  
Maximum allowed bandwidth is 100000 kbps  
Minimum available bandwidth is 100000 kbps  
Estimated round trip time is 10000 usec  
Congestion window monitoring is enabled, burst size is 10 KB
```

```
bison# sh fcip pro 2
```

```
FCIP Profile 2
```

```
Internet Address is 100.100.100.5 (interface GigabitEthernet4/2)  
Listen Port is 3225
```

```
TCP parameters
```

```
SACK is enabled  
PMTU discovery is enabled, reset timeout is 3600 sec  
Keep alive is 60 sec  
Minimum retransmission timeout is 200 ms  
Maximum number of re-transmissions is 4  
Send buffer size is 0 KB  
Maximum allowed bandwidth is 100000 kbps  
Minimum available bandwidth is 100000 kbps  
Estimated round trip time is 10000 usec  
Congestion window monitoring is enabled, burst size is 10 KB
```

```
bison# sh int port-channel 1
```

```
port-channel 1 is trunking
```

```
Hardware is Fibre Channel  
Port WWN is 24:01:00:05:30:00:7a:de  
Admin port mode is auto, trunk mode is on  
Port mode is TE  
Port vsan is 1  
Speed is 2 Gbps  
Trunk vsans (admin allowed and active) (600-601)  
Trunk vsans (up) (600-601)  
Trunk vsans (isolated) ()  
Trunk vsans (initializing) ()  
5 minutes input rate 120 bits/sec, 15 bytes/sec, 0 frames/sec  
5 minutes output rate 120 bits/sec, 15 bytes/sec, 0 frames/sec  
3969 frames input, 369812 bytes  
3963 Class F frames input, 369076 bytes  
6 Class 2/3 frames input, 736 bytes  
0 Error frames timestamp error 0  
3969 frames output, 371040 bytes  
3963 Class F frames output, 370340 bytes  
6 Class 2/3 frames output, 700 bytes  
0 Error frames 0 reass frames  
Member[1] : fcip1  
Member[2] : fcip2
```

```
bison# sh ips ip route interface gigabitethernet 4/1
```

```
Codes: C - connected, S - static  
No default gateway
```

```
S 200.200.200.0/30 via 100.100.100.2, GigabitEthernet4/1
C 100.100.100.0/30 is directly connected, GigabitEthernet4/1
```

```
bison# sh ips ip route interface gigabitethernet 4/2
```

```
Codes: C - connected, S - static
No default gateway
```

```
S 200.200.200.4/30 via 100.100.100.6, GigabitEthernet4/2
C 100.100.100.4/30 is directly connected, GigabitEthernet4/2
```

```
bison# sh ips arp int gig 4/1
```

Protocol	Address	Age (min)	Hardware Addr	Type	Interface
Internet	100.100.100.2	8	0008.e21e.c7bc	ARPA	GigabitEthernet4/1

```
!--- Verify that the hardware address listed belongs to the
!--- next hop networking device.
```

```
bison# sh ips arp int gig 4/2
```

Protocol	Address	Age (min)	Hardware Addr	Type	Interface
Internet	100.100.100.6	5	0008.e21e.c7bc	ARPA	GigabitEthernet4/2

```
bison# sh int port-channel 1 trunk vsan 600-601
```

```
port-channel 1 is trunking
  Vsan 600 is up, FCID is 0x010000
  Vsan 601 is up, FCID is 0x010000
```

```
bison# sh fcdomain vsan 600
```

```
The local switch is the Principal Switch.
```

```
Local switch run time information:
```

```
State: Stable
Local switch WWN: 22:58:00:05:30:00:7a:df
Running fabric name: 22:58:00:05:30:00:7a:df
Running priority: 2
Current domain ID: 0x01(1)
```

```
Local switch configuration information:
```

```
State: Enabled
FCID persistence: Disabled
Auto-reconfiguration: Disabled
Contiguous-allocation: Disabled
Configured fabric name: 20:01:00:05:30:00:28:df
Configured priority: 128
Configured domain ID: 0x01(1) (preferred)
```

```
Principal switch run time information:
```

```
Running priority: 2
```

Interface	Role	RCF-reject
port-channel 1	Downstream	Disabled

```
bison# sh fcdomain vsan 601
```

```
The local switch is the Principal Switch.
```

```
Local switch run time information:
```

```
State: Stable
Local switch WWN: 22:59:00:05:30:00:7a:df
```

```
Running fabric name: 22:59:00:05:30:00:7a:df
Running priority: 2
Current domain ID: 0x01(1)
```

Local switch configuration information:

```
State: Enabled
FCID persistence: Disabled
Auto-reconfiguration: Disabled
Contiguous-allocation: Disabled
Configured fabric name: 20:01:00:05:30:00:28:df
Configured priority: 128
Configured domain ID: 0x01(1) (preferred)
```

Principal switch run time information:

```
Running priority: 2
```

Interface	Role	RCF-reject
-----	-----	-----
<b>port-channel 1</b>	<b>Downstream</b>	<b>Disabled</b>
-----	-----	-----

### MDS 9216 (Canterbury)

```
canterbury# sh int gig 2/1-2
```

GigabitEthernet2/1 is up

```
Hardware is GigabitEthernet, address is 0005.3000.ade6
Internet address is 200.200.200.1/30
MTU 3000 bytes
Port mode is IPS
Speed is 1 Gbps
Beacon is turned off
Auto-Negotiation is turned on
5 minutes input rate 320 bits/sec, 40 bytes/sec, 0 frames/sec
5 minutes output rate 320 bits/sec, 40 bytes/sec, 0 frames/sec
8844 packets input, 993118 bytes
  0 multicast frames, 0 compressed
  0 input errors, 0 frame, 0 overrun 0 fifo
8855 packets output, 994686 bytes, 0 underruns
  0 output errors, 0 collisions, 0 fifo
  0 carrier errors
```

GigabitEthernet2/2 is up

```
Hardware is GigabitEthernet, address is 0005.3000.ade7
Internet address is 200.200.200.5/30
MTU 3000 bytes
Port mode is IPS
Speed is 1 Gbps
Beacon is turned off
Auto-Negotiation is turned on
5 minutes input rate 16 bits/sec, 2 bytes/sec, 0 frames/sec
5 minutes output rate 8 bits/sec, 1 bytes/sec, 0 frames/sec
634 packets input, 39538 bytes
  0 multicast frames, 0 compressed
  0 input errors, 0 frame, 0 overrun 0 fifo
610 packets output, 47264 bytes, 0 underruns
  0 output errors, 0 collisions, 0 fifo
  0 carrier errors
```

```
canterbury# sh ips stats tcp int gig 2/1
```

TCP Statistics for port GigabitEthernet2/1

```
Connection Stats
  18 active openings, 10 accepts
  14 failed attempts, 0 reset received, 8 established
```

Segment stats  
8919 received, 8923 sent, 0 retransmitted  
0 bad segments received, 0 reset sent

TCP Active Connections

Local Address	Remote Address	State	Send-Q	Recv-Q
200.200.200.1:3225	100.100.100.1:65480	ESTABLISH	0	0
200.200.200.1:3225	100.100.100.1:65482	ESTABLISH	0	0
200.200.200.1:3225	0.0.0.0:0	LISTEN	0	0

canterbury# **sh ips stats tcp int gig 2/2**

TCP Statistics for port GigabitEthernet2/2

Connection Stats  
498 active openings, 2 accepts  
498 failed attempts, 0 reset received, 2 established

Segment stats  
556 received, 579 sent, 0 retransmitted  
0 bad segments received, 0 reset sent

TCP Active Connections

Local Address	Remote Address	State	Send-Q	Recv-Q
200.200.200.5:3225	100.100.100.5:65531	ESTABLISH	0	0
200.200.200.5:3225	100.100.100.5:65533	ESTABLISH	0	0
200.200.200.5:3225	0.0.0.0:0	LISTEN	0	0

canterbury# **sh int fcip 1-2**

fcip1 is trunking

Hardware is GigabitEthernet  
Port WWN is 20:42:00:0c:30:6c:24:40  
Peer port WWN is 20:c2:00:05:30:00:7a:de  
Admin port mode is auto, trunk mode is auto  
Port mode is TE  
vsan is 1  
Belongs to port-channel 2  
Trunk vsans (allowed active) (600-601)  
Trunk vsans (operational) (600-601)  
Trunk vsans (up) (600-601)  
Trunk vsans (isolated) ()  
Trunk vsans (initializing) ()  
Using Profile id 200 (interface GigabitEthernet2/1)  
Peer Information  
Peer Internet address is 100.100.100.1 and port is 3225  
Special Frame is disabled  
Maximum number of TCP connections is 2  
Time Stamp is disabled  
QOS control code point is 0  
QOS data code point is 0  
B-port mode disabled

TCP Connection Information

2 Active TCP connections  
Control connection: Local 200.200.200.1:3225, Remote 100.100.100.1:65480  
Data connection: Local 200.200.200.1:3225, Remote 100.100.100.1:65482  
18 Attempts for active connections, 2 close of connections

TCP Parameters

Path MTU 3000 bytes  
Current retransmission timeout is 200 ms  
Round trip time: Smoothed 5 ms, Variance: 6  
**Advertized window: Current: 118 KB, Maximum: 118 KB, Scale: 1**  
**Peer receive window: Current: 118 KB, Maximum: 118 KB, Scale: 1**  
Congestion window: Current: 10 KB, Slow start threshold: 112 KB  
5 minutes input rate 136 bits/sec, 17 bytes/sec, 0 frames/sec  
5 minutes output rate 136 bits/sec, 17 bytes/sec, 0 frames/sec  
4189 frames input, 391368 bytes  
4183 Class F frames input, 390668 bytes



```
6 Class 2/3 frames input, 700 bytes
0 Error frames timestamp error 0
4189 frames output, 390140 bytes
4183 Class F frames output, 389404 bytes
6 Class 2/3 frames output, 736 bytes
0 Error frames 0 reass frames
```

fcip2 is trunking

```
Hardware is GigabitEthernet
Port WWN is 20:46:00:0c:30:6c:24:40
Peer port WWN is 20:c6:00:05:30:00:7a:de
Admin port mode is auto, trunk mode is auto
Port mode is TE
vsan is 1
Belongs to port-channel 2
Trunk vsans (allowed active) (600-601)
Trunk vsans (operational) (600-601)
Trunk vsans (up) (600-601)
Trunk vsans (isolated) ()
Trunk vsans (initializing) ()
Using Profile id 201 (interface GigabitEthernet2/2)
Peer Information
```

```
Peer Internet address is 100.100.100.5 and port is 3225
Special Frame is disabled
Maximum number of TCP connections is 2
Time Stamp is disabled
QOS control code point is 0
QOS data code point is 0
B-port mode disabled
```

TCP Connection Information

```
2 Active TCP connections
Control connection: Local 200.200.200.5:3225, Remote 100.100.100.5:65531
Data connection: Local 200.200.200.5:3225, Remote 100.100.100.5:65533
498 Attempts for active connections, 0 close of connections
```

TCP Parameters

```
Path MTU 3000 bytes
Current retransmission timeout is 200 ms
Round trip time: Smoothed 10 ms, Variance: 5
Advertized window: Current: 118 KB, Maximum: 118 KB, Scale: 1
Peer receive window: Current: 118 KB, Maximum: 118 KB, Scale: 1
Congestion window: Current: 8 KB, Slow start threshold: 112 KB
5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
8 frames input, 1228 bytes
8 Class F frames input, 1228 bytes
0 Class 2/3 frames input, 0 bytes
0 Error frames timestamp error 0
8 frames output, 1232 bytes
8 Class F frames output, 1232 bytes
0 Class 2/3 frames output, 0 bytes
0 Error frames 0 reass frames
```

canterbury# **sh int port 2**

port-channel 2 is trunking

```
Hardware is Fibre Channel
Port WWN is 24:02:00:0c:30:6c:24:40
Admin port mode is auto, trunk mode is auto
Port mode is TE
Port vsan is 1
Speed is 2 Gbps
Trunk vsans (admin allowed and active) (600-601)
Trunk vsans (up) (600-601)
Trunk vsans (isolated) ()
Trunk vsans (initializing) ()
5 minutes input rate 120 bits/sec, 15 bytes/sec, 0 frames/sec
```

```

5 minutes output rate 120 bits/sec, 15 bytes/sec, 0 frames/sec
4213 frames input, 394068 bytes
  4207 Class F frames input, 393368 bytes
  6 Class 2/3 frames input, 700 bytes
  0 Error frames timestamp error 0
4213 frames output, 392844 bytes
  4207 Class F frames output, 392108 bytes
  6 Class 2/3 frames output, 736 bytes
  0 Error frames 0 reass frames
Member[1] : fcip1
Member[2] : fcip2

```

```
canterbury# sh ips ip route interface gig 2/1
```

```
Codes: C - connected, S - static
No default gateway
```

```
S 100.100.100.0/30 via 200.200.200.2, GigabitEthernet2/1
C 200.200.200.0/30 is directly connected, GigabitEthernet2/1
```

```
canterbury# sh ips ip route interface gig 2/2
```

```
Codes: C - connected, S - static
No default gateway
```

```
S 100.100.100.4/30 via 200.200.200.6, GigabitEthernet2/2
C 200.200.200.4/30 is directly connected, GigabitEthernet2/2
```

```
canterbury# sh fcns da
```

```
VSAN 600:
```

```
-----
FCID      TYPE  PWWN                                (VENDOR)  FC4-TYPE:FEATURE
-----
0x010001  N     10:00:00:00:c9:32:a6:e3  (Emulex)  scsi-fcp:init
0x020001  N     50:05:07:63:00:d0:94:4c  (IBM)     scsi-fcp:target fc..
```

```
Total number of entries = 2
```

```
VSAN 601:
```

```
-----
FCID      TYPE  PWWN                                (VENDOR)  FC4-TYPE:FEATURE
-----
0x010100  N     10:00:00:00:00:05:00:00
0x020100  N     10:00:00:00:00:01:00:00
```

```
!--- Always verify that the fabric has formed with the expected neighbor(s)
!--- through FCIP E or TE port when the configuration is completed.
```

### Special Frame Configuration (Bison)

```
!--- Special frames are used to improve security.
!--- Before user-data is transmitted across an FCIP tunnel, FSF verifies that
!--- the peer is defined on the configured wwn.
```

```
interface fcip1
channel-group 1 force
no shutdown
use-profile 1
peer-info ipaddr 200.200.200.1
special-frame peer-wwn 20:00:00:0c:30:6c:24:40 profile-id 200
```

```
interface fcip2
channel-group 1 force
no shutdown
use-profile 2
peer-info ipaddr 200.200.200.5
special-frame peer-wwn 20:00:00:0c:30:6c:24:40 profile-id 201
```

*!--- The peer-wwn is derived from the peer MDS by issuing the following command:*

```
canterbury# sh wwn switch
```

```
Switch WWN is 20:00:00:0c:30:6c:24:40
```

*!--- This value is significant per peer switch, so it is used for all tunnels  
!--- towards this switch. This configuration shows the following:*

```
bison# sh int fcip 1-2
```

```
fcip1 is trunking
Hardware is GigabitEthernet
Port WWN is 20:c2:00:05:30:00:7a:de
Peer port WWN is 20:42:00:0c:30:6c:24:40
Admin port mode is auto, trunk mode is on
Port mode is TE
vsan is 1
Belongs to port-channel 1
Trunk vsans (allowed active) (600-601)
Trunk vsans (operational) (600-601)
Trunk vsans (up) (600-601)
Trunk vsans (isolated) ()
Trunk vsans (initializing) ()
Using Profile id 1 (interface GigabitEthernet4/1)
Peer Information
  Peer Internet address is 200.200.200.1 and port is 3225
  Special Frame is enabled
  Peer switch WWN is 20:00:00:0c:30:6c:24:40
  Peer profile id is 200
  Maximum number of TCP connections is 2
  Time Stamp is disabled
  QOS control code point is 0
  QOS data code point is 0
  B-port mode disabled
TCP Connection Information
  2 Active TCP connections
  Control connection: Local 100.100.100.1:65372, Remote 200.200.200.1:3225
  Data connection: Local 100.100.100.1:65374, Remote 200.200.200.1:3225
  82 Attempts for active connections, 9 close of connections
TCP Parameters
  Path MTU 3000 bytes
  Current retransmission timeout is 200 ms
  Round trip time: Smoothed 2 ms, Variance: 1
  Advertized window: Current: 118 KB, Maximum: 118 KB, Scale: 1
  Peer receive window: Current: 118 KB, Maximum: 118 KB, Scale: 1
  Congestion window: Current: 106 KB, Slow start threshold: 118 KB
  5 minutes input rate 46128 bits/sec, 5766 bytes/sec, 19 frames/sec
  5 minutes output rate 194867736 bits/sec, 24358467 bytes/sec, 20732 frames/sec
  5841 frames input, 1729836 bytes
    4575 Class F frames input, 429444 bytes
    1266 Class 2/3 frames input, 1300392 bytes
    0 Error frames timestamp error 0
  6339146 frames output, 7447938520 bytes
    4576 Class F frames output, 431800 bytes
    6334570 Class 2/3 frames output, 7447506720 bytes
    0 Error frames 0 rease frames
```

```

fcip2 is trunking
Hardware is GigabitEthernet
Port WWN is 20:c6:00:05:30:00:7a:de
Peer port WWN is 20:46:00:0c:30:6c:24:40
Admin port mode is auto, trunk mode is on
Port mode is TE
vsan is 1
Belongs to port-channel 1
Trunk vsans (allowed active) (600-601)
Trunk vsans (operational) (600-601)
Trunk vsans (up) (600-601)
Trunk vsans (isolated) ()
Trunk vsans (initializing) ()
Using Profile id 2 (interface GigabitEthernet4/2)
Peer Information
  Peer Internet address is 200.200.200.5 and port is 3225
  Special Frame is enabled
  Peer switch WWN is 20:00:00:0c:30:6c:24:40
  Peer profile id is 201
  Maximum number of TCP connections is 2
  Time Stamp is disabled
  QOS control code point is 0
  QOS data code point is 0
  B-port mode disabled
TCP Connection Information
  2 Active TCP connections
  Control connection: Local 100.100.100.5:3225, Remote 200.200.200.5:64535
  Data connection: Local 100.100.100.5:3225, Remote 200.200.200.5:64537
  58 Attempts for active connections, 1 close of connections
TCP Parameters
  Path MTU 3000 bytes
  Current retransmission timeout is 200 ms
  Round trip time: Smoothed 2 ms, Variance: 1
  Advertized window: Current: 118 KB, Maximum: 118 KB, Scale: 1
  Peer receive window: Current: 118 KB, Maximum: 118 KB, Scale: 1
  Congestion window: Current: 106 KB, Slow start threshold: 112 KB
  5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
  5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
  415 frames input, 398160 bytes
    16 Class F frames input, 2460 bytes
    399 Class 2/3 frames input, 395700 bytes
    0 Error frames timestamp error 0
  6078322 frames output, 7147327176 bytes
    16 Class F frames output, 2460 bytes
    6078306 Class 2/3 frames output, 7147324716 bytes
    0 Error frames 0 reass frames

```

### Special Frame Configuration (Canterbury)

```

interface fcip1
channel-group 2 force
no shutdown
use-profile 200
peer-info ipaddr 100.100.100.1
special-frame peer-wwn 20:00:00:05:30:00:7a:de profile-id 1

interface fcip2
channel-group 2 force
no shutdown
use-profile 201
peer-info ipaddr 100.100.100.5
special-frame peer-wwn 20:00:00:05:30:00:7a:de profile-id 2

canterbury# sh int fcip 1

```

```
fcip1 is trunking
Hardware is GigabitEthernet
Port WWN is 20:42:00:0c:30:6c:24:40
Peer port WWN is 20:c2:00:05:30:00:7a:de
Admin port mode is auto, trunk mode is auto
Port mode is TE
vsan is 1
Belongs to port-channel 2
Trunk vsans (allowed active) (600-601)
Trunk vsans (operational) (600-601)
Trunk vsans (up) (600-601)
Trunk vsans (isolated) ()
Trunk vsans (initializing) ()
Using Profile id 200 (interface GigabitEthernet2/1)
Peer Information
  Peer Internet address is 100.100.100.1 and port is 3225
  Special Frame is enabled
  Peer switch WWN is 20:00:00:05:30:00:7a:de
  Peer profile id is 1
  Maximum number of TCP connections is 2
  Time Stamp is disabled
  QOS control code point is 0
  QOS data code point is 0
  B-port mode disabled
TCP Connection Information
  2 Active TCP connections
  Control connection: Local 200.200.200.1:3225, Remote 100.100.100.1:65372
  Data connection: Local 200.200.200.1:3225, Remote 100.100.100.1:65374
  2 Attempts for active connections, 0 close of connections
TCP Parameters
  Path MTU 3000 bytes
  Current retransmission timeout is 200 ms
  Round trip time: Smoothed 2 ms, Variance: 1
  Advertized window: Current: 118 KB, Maximum: 118 KB, Scale: 1
  Peer receive window: Current: 118 KB, Maximum: 118 KB, Scale: 1
  Congestion window: Current: 10 KB, Slow start threshold: 112 KB
  5 minutes input rate 94347400 bits/sec, 11793425 bytes/sec, 10031 frames/sec
  5 minutes output rate 144 bits/sec, 18 bytes/sec, 0 frames/sec
  3985861 frames input, 4685834196 bytes
    219 Class F frames input, 25228 bytes
    3985642 Class 2/3 frames input, 4685808968 bytes
    0 Error frames timestamp error 0
  1043 frames output, 866780 bytes
    218 Class F frames output, 23448 bytes
    825 Class 2/3 frames output, 843332 bytes
    0 Error frames 0 reass frames
```

```
canterbury# sh int fcip 2
```

```
fcip2 is trunking
Hardware is GigabitEthernet
Port WWN is 20:46:00:0c:30:6c:24:40
Peer port WWN is 20:c6:00:05:30:00:7a:de
Admin port mode is auto, trunk mode is auto
Port mode is TE
vsan is 1
Belongs to port-channel 2
Trunk vsans (allowed active) (600-601)
Trunk vsans (operational) (600-601)
Trunk vsans (up) (600-601)
Trunk vsans (isolated) ()
Trunk vsans (initializing) ()
Using Profile id 201 (interface GigabitEthernet2/2)
Peer Information
  Peer Internet address is 100.100.100.5 and port is 3225
  Special Frame is enabled
```

```

Peer switch WWN is 20:00:00:05:30:00:7a:de
Peer profile id is 2
Maximum number of TCP connections is 2
Time Stamp is disabled
QOS control code point is 0
QOS data code point is 0
B-port mode disabled
TCP Connection Information
  2 Active TCP connections
  Control connection: Local 200.200.200.5:64535, Remote 100.100.100.5:3225
  Data connection: Local 200.200.200.5:64537, Remote 100.100.100.5:3225
  500 Attempts for active connections, 0 close of connections
TCP Parameters
  Path MTU 3000 bytes
  Current retransmission timeout is 300 ms
  Round trip time: Smoothed 10 ms, Variance: 5
  Advertized window: Current: 118 KB, Maximum: 118 KB, Scale: 1
  Peer receive window: Current: 118 KB, Maximum: 118 KB, Scale: 1
  Congestion window: Current: 8 KB, Slow start threshold: 118 KB
  5 minutes input rate 94399712 bits/sec, 11799964 bytes/sec, 10034 frames/sec
  5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
  9769115 frames input, 11486944196 bytes
    16 Class F frames input, 2460 bytes
    9769099 Class 2/3 frames input, 11486941736 bytes
    0 Error frames timestamp error 0
  415 frames output, 398160 bytes
    16 Class F frames output, 2460 bytes
    399 Class 2/3 frames output, 395700 bytes
    0 Error frames 0 reass frames

```

### Display from Bison and Canterbury – Canterbury passive

```

interface fcip1
channel-group 2 force
no shutdown
use-profile 200
passive-mode
peer-info ipaddr 100.100.100.1
special-frame peer-wwn 20:00:00:05:30:00:7a:de profile-id 1

interface fcip2
channel-group 2 force
no shutdown
use-profile 201
passive-mode
peer-info ipaddr 100.100.100.5
special-frame peer-wwn 20:00:00:05:30:00:7a:de profile-id 2

canterbury# sh ips stats tcp int gig 2/1

TCP Statistics for port GigabitEthernet2/1
Connection Stats
  20 active openings, 14 accepts
  14 failed attempts, 0 reset received, 14 established
Segment stats
  12042719 received, 3181301 sent, 0 retransmitted
  0 bad segments received, 0 reset sent

TCP Active Connections
Local Address      Remote Address    State      Send-Q  Recv-Q
200.200.200.1:3225 100.100.100.1:65368 ESTABLISH  0       0
200.200.200.1:3225 100.100.100.1:65370 ESTABLISH  0       0
200.200.200.1:3225 100.100.100.1:65372 TIME_WAIT  0       0
200.200.200.1:3225 0.0.0.0:0        LISTEN    0       0

```

```
!--- Both FCIP interfaces for Canterbury are configured to be passive; this  
!--- results in the above TCP statistics where Canterbury, despite being  
!--- configured with the highest IP addresses for both tunnels, did not  
!--- initiate the TCP connections. Its peer, Bison, initiates.
```

```
canterbury# sh ips stats tcp int gig 2/2
```

```
TCP Statistics for port GigabitEthernet2/2
```

```
Connection Stats
```

```
500 active openings, 4 accepts  
498 failed attempts, 0 reset received, 6 established
```

```
Segment stats
```

```
11933351 received, 3144627 sent, 0 retransmitted  
0 bad segments received, 0 reset sent
```

```
TCP Active Connections
```

Local Address	Remote Address	State	Send-Q	Recv-Q
200.200.200.5:3225	100.100.100.5:65415	ESTABLISH	0	0
200.200.200.5:3225	100.100.100.5:65417	ESTABLISH	0	0
200.200.200.5:64535	100.100.100.5:3225	TIME_WAIT	0	0
200.200.200.5:3225	0.0.0.0:0	LISTEN	0	0

### Display from Bison and Canterbury – Timestamp set

```
!--- FCIP Time Stamp is enabled to allow the peer to drop FCIP userdata if it  
!--- exceeds the specified time-difference. The time difference is the maximum  
!--- value in transit of user data frames between two peer FCIP entities.
```

```
bison(config-if)# time-stamp acceptable-diff 1000
```

```
Please enable NTP with a common time source on both MDS Switches that are on  
either side of the FCIP link
```

```
!--- Note that the value specified is in milliseconds and, because a  
!--- time difference is specified, both ends of the FCIP tunnel must have access  
!--- to the same clock source through NTP.
```

```
interface fcip1  
channel-group 1 force  
no shutdown  
use-profile 1  
peer-info ipaddr 200.200.200.1  
time-stamp acceptable-diff 1000  
special-frame peer-wwn 20:00:00:0c:30:6c:24:40 profile-id 200
```

```
interface fcip2  
channel-group 1 force  
no shutdown  
use-profile 2  
peer-info ipaddr 200.200.200.5  
time-stamp acceptable-diff 1000  
special-frame peer-wwn 20:00:00:0c:30:6c:24:40 profile-id 201
```

```
bison# sh int fcip 1
```

```
fcip1 is trunking  
Hardware is GigabitEthernet  
Port WWN is 20:c2:00:05:30:00:7a:de  
Peer port WWN is 20:42:00:0c:30:6c:24:40  
Admin port mode is auto, trunk mode is on  
Port mode is TE  
vsan is 1
```

```
Belongs to port-channel 1
Trunk vsans (allowed active) (600-601)
Trunk vsans (operational) (600-601)
Trunk vsans (up) (600-601)
Trunk vsans (isolated) ()
Trunk vsans (initializing) ()
Using Profile id 1 (interface GigabitEthernet4/1)
Peer Information
  Peer Internet address is 200.200.200.1 and port is 3225
  Special Frame is enabled
  Peer switch WWN is 20:00:00:0c:30:6c:24:40
  Peer profile id is 200
  Maximum number of TCP connections is 2
  Time Stamp is enabled, acceptable time difference 1000 ms
  QOS control code point is 0
  QOS data code point is 0
  B-port mode disabled
TCP Connection Information
  2 Active TCP connections
  Control connection: Local 100.100.100.1:65368, Remote 200.200.200.1:3225
  Data connection: Local 100.100.100.1:65370, Remote 200.200.200.1:3225
  84 Attempts for active connections, 10 close of connections
TCP Parameters
  Path MTU 3000 bytes
  Current retransmission timeout is 200 ms
  Round trip time: Smoothed 2 ms, Variance: 3
  Advertized window: Current: 118 KB, Maximum: 118 KB, Scale: 1
  Peer receive window: Current: 118 KB, Maximum: 118 KB, Scale: 1
  Congestion window: Current: 10 KB, Slow start threshold: 118 KB
  5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
  5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
  5988 frames input, 1743840 bytes
    4719 Class F frames input, 443184 bytes
    1269 Class 2/3 frames input, 1300656 bytes
    0 Error frames timestamp error 0
  15337275 frames output, 18028320932 bytes
    4720 Class F frames output, 445544 bytes
    15332555 Class 2/3 frames output, 18027875388 bytes
    0 Error frames 0 reass frames
```

```
canterbury(config-if)# time-stamp acceptable-diff 1000
```

Please enable NTP with a common time source on both MDS Switches that are on either side of the FCIP link

```
interface fcip1
channel-group 2 force
no shutdown
use-profile 200
passive-mode
peer-info ipaddr 100.100.100.1
time-stamp acceptable-diff 1000
special-frame peer-wnn 20:00:00:05:30:00:7a:de profile-id 1
```

```
interface fcip2
channel-group 2 force
no shutdown
use-profile 201
passive-mode
peer-info ipaddr 100.100.100.5
time-stamp acceptable-diff 1000
special-frame peer-wnn 20:00:00:05:30:00:7a:de profile-id 2
```

```
canterbury# sh int fcip 1
```

```
fcip1 is trunking
```



```
Hardware is GigabitEthernet
Port WWN is 20:42:00:0c:30:6c:24:40
Peer port WWN is 20:c2:00:05:30:00:7a:de
Admin port mode is auto, trunk mode is auto
Port mode is TE
vsan is 1
Belongs to port-channel 2
Trunk vsans (allowed active) (600-601)
Trunk vsans (operational) (600-601)
Trunk vsans (up) (600-601)
Trunk vsans (isolated) ()
Trunk vsans (initializing) ()
Using Profile id 200 (interface GigabitEthernet2/1)
Peer Information
  Peer Internet address is 100.100.100.1 and port is 3225
  Passive mode is enabled
  Special Frame is enabled
  Peer switch WWN is 20:00:00:05:30:00:7a:de
  Peer profile id is 1
  Maximum number of TCP connections is 2
  Time Stamp is enabled, acceptable time difference 1000 ms
  QOS control code point is 0
  QOS data code point is 0
  B-port mode disabled
TCP Connection Information
  2 Active TCP connections
  Control connection: Local 200.200.200.1:3225, Remote 100.100.100.1:65368
  Data connection: Local 200.200.200.1:3225, Remote 100.100.100.1:65370
  2 Attempts for active connections, 0 close of connections
TCP Parameters
  Path MTU 3000 bytes
  Current retransmission timeout is 200 ms
  Round trip time: Smoothed 6 ms, Variance: 6
  Advertized window: Current: 118 KB, Maximum: 118 KB, Scale: 1
  Peer receive window: Current: 118 KB, Maximum: 118 KB, Scale: 1
  Congestion window: Current: 10 KB, Slow start threshold: 112 KB
  5 minutes input rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
  5 minutes output rate 0 bits/sec, 0 bytes/sec, 0 frames/sec
  9427366 frames input, 11084654892 bytes
    295 Class F frames input, 32716 bytes
    9427071 Class 2/3 frames input, 11084622176 bytes
    145359 Error frames timestamp error 145359
  1122 frames output, 874528 bytes
    294 Class F frames output, 30932 bytes
    828 Class 2/3 frames output, 843596 bytes
  0 Error frames 0 reass frames
```

## Related Information

- [T11 Home Page](#)
- [Issues in TCP Slow-Start Restart After Idle](#)
- [RFC 1191 – Path MTU discovery](#)
- [RFC 1323 – TCP Extensions for High Performance](#)
- [RFC 2018 – TCP Selective Acknowledgement Options](#)
- [RFC 2883 – An Extension to the Selective Acknowledgement \(SACK\) Option for TCP](#)
- [RFC 3821 – Fibre Channel Over TCP/IP \(FCIP\)](#)
- [Technical Support & Documentation – Cisco Systems](#)

