

Managing Catalyst Switch–Based and Workgroup Concentrator–Based FDDI Networks

Document ID: 9361

Introduction

Before You Begin

Conventions

Prerequisites

Components Used

Background Information

Workgroup Devices That Support FDDI

Modular FDDI Concentrators

10baseT Switch

Modular Switches

Common Topologies (What Connects To What?)

Connecting an Optical Bypass Switch

Common Types of FDDI and CDDI Interface Connectors

MIC – Duplex

RJ45 – Duplex

ST – Simplex

RJ45 – CDDI Pinouts

Common Types of FDDI and CDDI Cables

Fiber Cable Types

CDDI Catalyst 5000 UTP RJ45 Cables

Using a CDDI–FDDI Translator

Creating a Simple FDDI Ring by Using A & B Ports on Both a WS–C1201 and a WS–C1100

Background Information

WS–C1100

WS–C1201

Connecting a WS–C2820 SAS to a WS–C1100

Background Information

WS–C2820 Configuration

Creating a Dual Home Scenario with a Catalyst 5505, a WS–C1100, and a WS–C1400

Background Information

WS–C5000

Commands to Use for Verifying the Configuration is Working

Commands to Use for Troubleshooting the Configuration

Command Summary

Appendix A: Explanation of Fields from the show port Command on FDDI Interfaces

WS–C1100 / WS–C1201

WS–C1400

WS–C5500

Appendix B: Explanation of Fields From the show mac Command on FDDI Interfaces

Appendix C: FDDI and CDDI Module LEDs

WS–C1100/WS–C1400/WS–C1201/WS–C5500

Appendix D: Exercise on Reverse Engineering a FDDI Network Topology

Tasks

Related Information

Introduction

This document describes some of the common issues related to connecting Catalyst switches and Workgroup concentrators to Fiber Distributed Data Interface (FDDI) networks. It includes information on supported topologies (what connects to what) as well as common interface and cable types. It shows how to enable and disable FDDI ports and explains how to verify that the FDDI ring is operational.

Before You Begin

Conventions

For more information on document conventions, see the Cisco Technical Tips Conventions.

Prerequisites

There are no specific prerequisites for this document.

Components Used

To create the scenarios in this document, we used the following equipment in a lab environment:

- A terminal
- A console cable suitable for each of the devices presented
- One WS-C1100* FDDI concentrator
 - ◆ One WS-C1531 A/B MM card
 - ◆ One WS-C1143 8 M port MM MIC card
- One WS-C1201 Ethernet switch
 - ◆ One WS-C1511 A/B MM card
- One WS-C1400 FDDI concentrator
 - ◆ One WS-X5101 A/B MM MIC module
- One Catalyst WS-C5505
 - ◆ One WS-X1441 A/B & 6 M port MM MIC card
- One Catalyst WS-C2820
 - ◆ One WS-X2842 B MM MIC SAS module
- One Catalyst WS-C5505
 - ◆ One WS-X5101 A/B MM MIC module

* The WS-C1400 replaced the WS-C1100. The product catalog information on the WS-C1100 is no longer available.

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

Background Information

Most of the topology information in this document also applies to routers, servers, and other FDDI-capable devices.

Appendix D contains an exercise in reverse engineering a FDDI network topology by using only the commands available on the switches and concentrators. This exercise provides examples of the fundamental commands necessary for managing a FDDI network comprised of switches and concentrators.

This document is focused on the behavior of FDDI when topological changes occur within the network. It is not a tutorial on the FDDI networking specifications. Although having a solid understanding of the ANSI FDDI standards is helpful in managing a FDDI network, it is not a requirement for resolving many common issues.

This document does not include information on Layer 2 and above issues such as VLANs, FDDI to Ethernet frame translation, FDDI to Token Ring frame translation, or Transparent Bridging (802.1d STD).

The Related Information section at the end of this document has links to other sources of information on FDDI.

The following scenarios are presented in this document:

- Creating a simple dual attachment FDDI ring by using the A & B FDDI uplink ports on an Ethernet concentrator and the A & B ports on a FDDI concentrator.
- Connecting a single attachment station (SAS) link to a FDDI concentrator which is part of a dual attachment FDDI ring.
- Creating a dual home scenario with a Catalyst 5505, a WS-C1100, and a WS-C1400.
- Reverse engineering a FDDI network topology.

Workgroup Devices That Support FDDI

The following Cisco Catalyst products support FDDI/CDDI interfaces.

Modular FDDI Concentrators

Chassis

- *WS-C1100 eos
- *WS-C1400 eos

*These products are no longer available for sale. They are provided here for historical purposes only.

Note: The WS-C1400 replaced the WS-C1100.

10baseT Switch

Chassis

- *WS-C1201 eos

This product is no longer available for sale. It is provided here for historical purposes only.

Modular Switches

Chassis

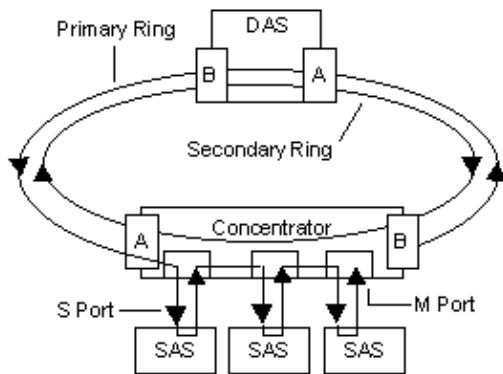
- WS-C2820
- WS-C5000

Common Topologies (What Connects To What?)

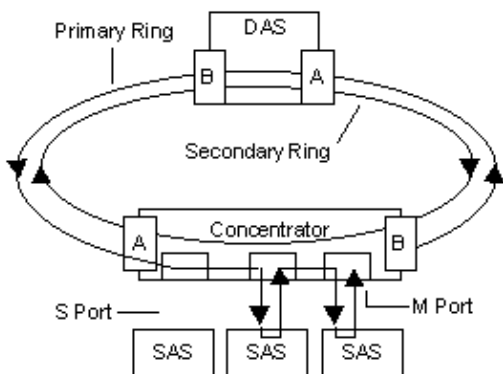
This section provides a brief introduction to FDDI terminology and technology as it relates to connecting FDDI devices together. It gives example of common FDDI topologies and equipment. It finishes with a table that shows the most common types of device-to-device connections.

FDDI specifies the use of dual rings. Traffic on these rings travels in opposite directions. Physically, the rings consist of two or more point-to-point connections between adjacent stations. One of the two FDDI rings is called the primary ring; the other is called the secondary ring. The primary ring is used for data transmission, and the secondary ring is generally used as a backup. Class B or SASs attach to one ring; Class A or dual attachment stations (DASs) attach to both rings. SASs are attached to the primary ring through a concentrator, which provides connections for multiple SASs. The ports on a concentrator that an SAS attaches to are known as Master (M) ports. The concentrator ensures that failure or power down of any given SAS does not interrupt the ring. This is particularly useful when PCs, or similar devices that frequently power on and off, connect to the ring. When a Class B station is connected to the network and operational the network is extended to run through a NIC on the SAS. The arrows in the next figure explain this concept.

A typical FDDI configuration with both DASs and SASs is shown in the figure below.

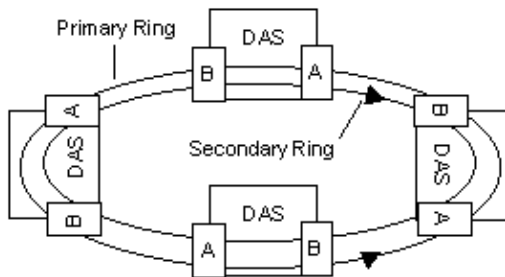


When a SAS is powered off, the M port on the concentrator wraps around the station's port and the ring continues operating. This is shown in the next figure.

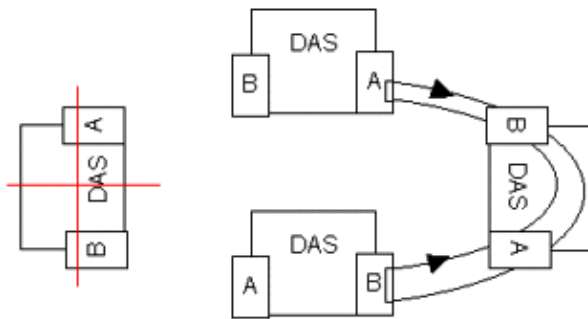


It is important to understand that there are two ways of connecting to a FDDI network. They are: connecting directly to the network and therefore becoming an integral part of the network (Class A Station, DAS) or connecting to a concentrator port (Class B Station, SAS). A Class A station must be on at all times (unless a bypass unit is installed) otherwise the network will wrap around the device. When a device is attached via a concentrator port (M port), as shown in the previous figure, it can join and leave the network without causing the network to wrap.

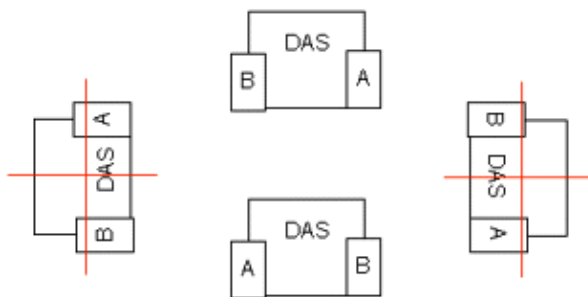
The following figure shows a FDDI network with four Class A DASs.



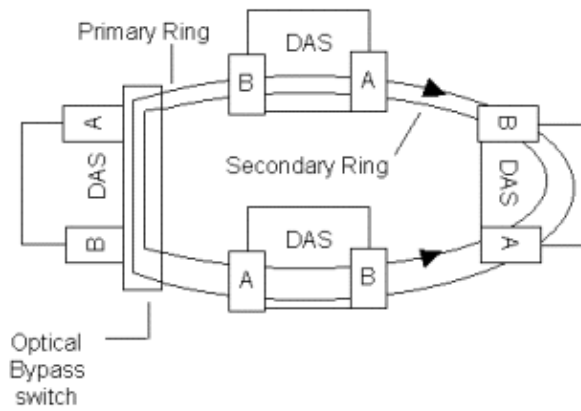
In the event that one of the station fails, the ring will wrap at the stations on either side of it. Instead of a dual counter rotating rings, there is now a single ring connecting the remaining devices. This is shown in the following figure.



The remaining three stations are still able to communicate. If the station on the right fails the remaining stations will not be able to communicate. This is shown in the next figure.

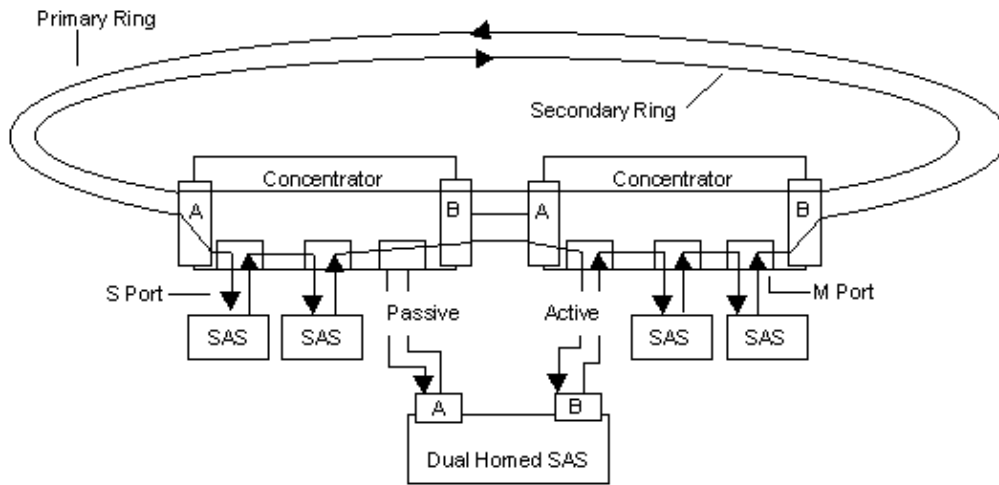


Optical bypass switches can be used to prevent ring segmentation by eliminating failed stations from the ring. This is shown in the next figure.



The optical bypass switch tracks the status of the DAS. When the DAS is not on-line, the ring is forwarded around the device instead of being wrapped at the adjacent DASs. Adding bypass switches for every DAS in the network greatly increases the cost and complexity of deploying and maintaining FDDI networks. This is why only highly reliable devices should be connected directly to the FDDI network.

Critical devices, such as routers or mainframe hosts, can use a fault-tolerant technique called dual homing to provide additional redundancy and to help guarantee operation. In dual homing situations, the critical device is attached to two concentrators. The next figure shows a dual homed configuration for devices such as file servers and routers. Note that the passive (standby) connection from the A port is not part of the primary ring. This is the scenario that is presented in the final section of this document.



In a dual homed scenario, one of the concentrator links (typically B to M) is declared the active link; the other one (A to M) is declared passive. The passive link stays in standby mode until the primary link (or the concentrator to which it is attached) is determined to have failed. When this occurs, the passive link automatically becomes the active link.

The previous paragraphs introduced the concept of assigning letters to the different types of ports an FDDI device can have. The four types of ports are: A, B, S and M. The following table shows the most common ways FDDI stations can be cabled together and which combinations result in an operational ring.

Port	A	B	S	M
A	Valid, undesired	Valid	Valid, undesired	Valid. Prevent THRU
B	Valid	Valid,	Valid,	Valid. Prevent

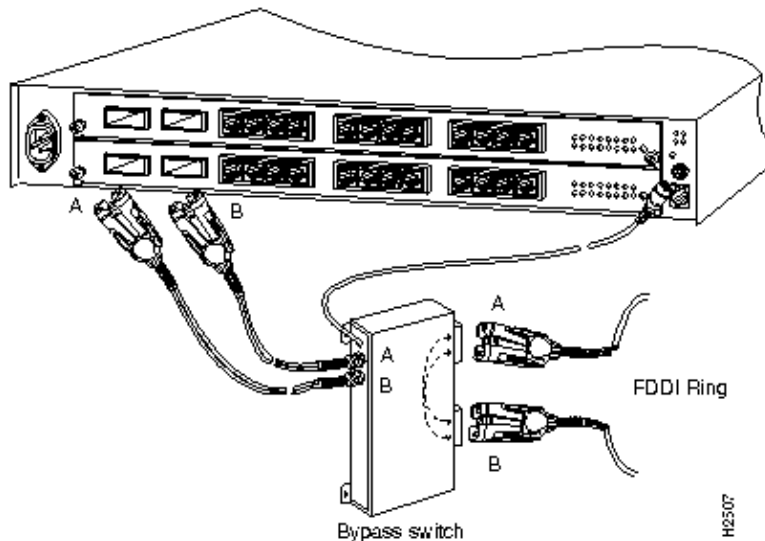
		undesired	undesired	THRU
S	Valid, undesired	Valid, undesired	Valid	Valid
M	Valid	Valid	Valid	Invalid, undesired

It is also possible to create more complex FDDI topologies such as trees. These topologies are beyond the scope of this document.

Connecting an Optical Bypass Switch

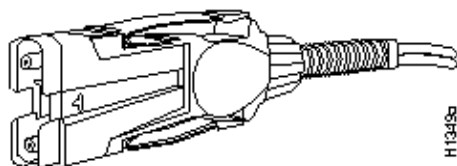
An optical bypass switch can be installed to maintain ring integrity in the event of a DAS device failure or removal from service for maintenance. If the concentrator enters a fault condition, is powered down, or rebooted, the ring will wrap at the optical bypass switch.

The figure below shows how the optical bypass switch connects to the ring and to a typical FDDI device. The dashed lines in the optical bypass switch show its function when it is in use. Make certain to maintain the A-to-B and B-to-A relationships.



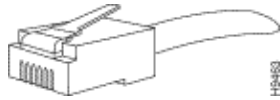
Common Types of FDDI and CDDI Interface Connectors

MIC – Duplex



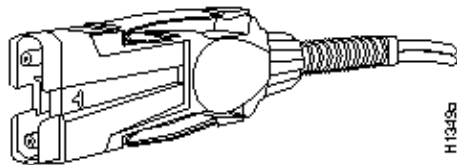
* Two fibers are terminated at the MIC connector. Only two patch cables with MIC terminators are required to create a ring. This is done by connecting A to B and B to A on the two DASs.

RJ45 – Duplex



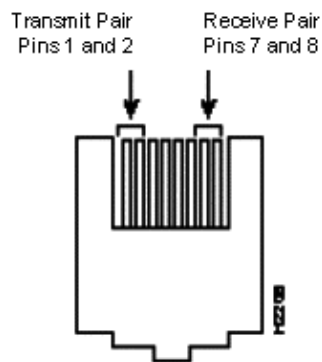
*Two fibers are terminated at the MIC connector. Only two patch cables with MIC terminators are required to create a ring. This is done by connecting A to B and B to A on the two DASs.

ST – Simplex



**Only one fiber is terminated with this connector on each patch cable. Two of these patch cables are required for each A to B connection. Four of these patch cables are required to create a full ring between DASs by connecting A to B and B to A.

RJ45 – CDDI Pinouts

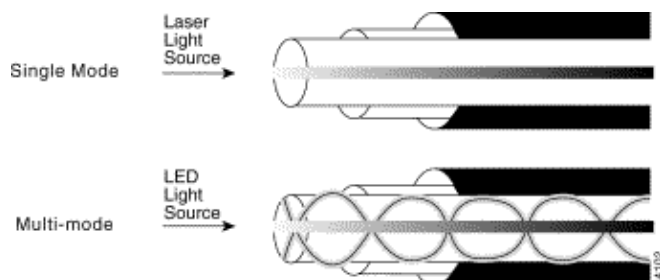


Common Types of FDDI and CDDI Cables

Multimode fiber is typically either 62.5/125-micron or 50/125-microns. Single-mode fiber is typically 8.7 to 10/125-microns. It is possible to use any type of connector on both types of fiber. It is also possible to have different types of connectors on the same cable. A common example is a multimode cable with a MIC on one end and two ST or SC connectors (one for each fiber) at the other end.

Fiber converters are available to connect multimode devices to single mode devices.

Fiber Cable Types



The following table provides the distance limitations for MM and SM fiber.

Transceiver Type	Maximum Distance Between Stations
Single-mode	8.6 miles (up to 30 km)
Multimode	1.2 miles (up to 2 km)

CDDI Catalyst 5000 UTP RJ45 Cables

The following table lists the pinout used for the CDDI/MLT-3 transmit and receive pairs.

CDDI/MLT-3 Pinout

PIN	Signal	Pin	Signal
1	TX+	5	-
2	TX-	6	-
3	-	7	RX+
4	-	8	RX-

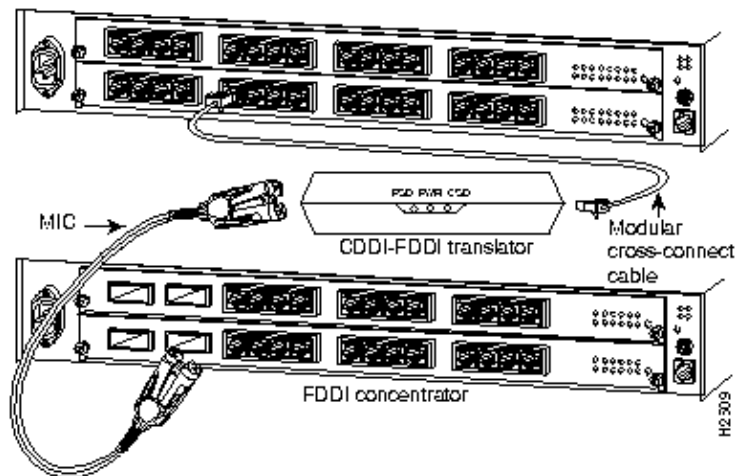
Check all existing cables for conformance with CDDI/MLT-3 distance requirements. The following table shows cable and distance specifications:

Data-grade unshielded twisted-pair (UTP)
Electronic Industries Association/Telecommunications Industries Association (EIA/TIA)-568 category 5, data-grade, modular cable is required for CDDI installations. The total length of data grade UTP cable from the switch to another switch, station, or CDDI concentrator must not exceed 330 feet (100.6 m), including patch cords and cross-connect jumpers.
Shielded twisted-pair (STP)
You must use IBM Type 1 STP wiring for your CDDI installation. The total length of STP cable measured from the adapter or media access unit (MAU) to the switch must not exceed 330 feet (100.6 m).

Using a CDDI-FDDI Translator

In a mixed configuration (CDDI/FDDI), use a CDDI-FDDI translator (Model Number WS-C703) to connect between the two media: modular UTP (category 5) or STP and optical fiber.

In the following figure a modular, cross-connect cable is used to connect a CDDI port on a switch to a CDDI-FDDI translator. A MIC is used to connect the other side of the translator to an FDDI port on a concentrator.



Creating a Simple FDDI Ring by Using A & B Ports on Both a WS-C1201 and a WS-C1100

Background Information

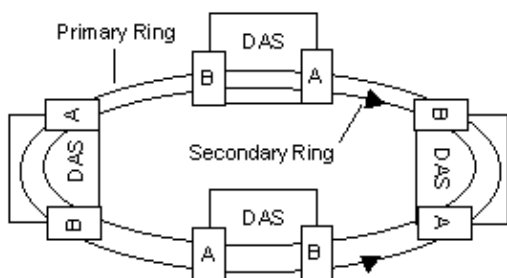
Introduction

This section shows how to create a simple FDDI ring using two devices. For the purposes of this document, almost any Catalyst device that support FDDI DAS connections could be used in this section. It includes information on enabling and disabling ports and checking the status of the FDDI ring by viewing the status of the ports on both concentrators.

In order to show the effect on a FDDI ring of ports being disabled on the concentrators in the ring, this section is broken down into two subsections. The first subsection shows what happens to the FDDI ring when the ports on the FDDI concentrator named "WS-C1100" are disabled. The status of the ring will be shown from the perspective of both concentrators. The second subsection shows what happens to the FDDI ring when the ports on the Ethernet concentrator named "WS-C1201" are disabled. Again, the status of the ring will be shown from the perspective of both concentrators.

Working with FDDI ports can be confusing because they are managed by their port number within the device while their role in the FDDI ring is determined by their port type (A, B, S, or M). The remainder of this document will use the port numbers when a port is being enabled, disabled or having its status displayed. The port's type will be used when discussing the role the port plays in the FDDI ring.

Reminder: By linking the A and B ports between two FDDI devices, a fully functional FDDI ring is created. New devices can be added to the ring by following the A to B rule: The A port of the first device connects to the B port of the next device. The A port on the last device is connected to the B port on the first device. This is shown in the following figure.



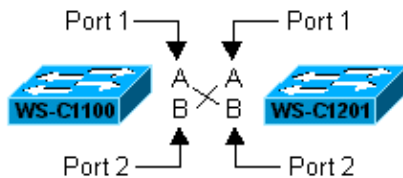
WS-C1100

This device is a FDDI concentrator. It has A and B ports and M ports. The A and B ports are connected using Multimode fiber cables with MICs to the A and B ports on the Catalyst WS-C1201 concentrator to form a FDDI ring.

- Product Catalog
- Product Documentation

In this subsection, the ports on WS-C1100 will be disabled one at a time. The effect this has on the status of the FDDI ring will be presented from the perspective of both WS-C1100 and WS-C1201.

The topology used in this section is shown in the figure below.



Tasks

Follow these steps to create a simple FDDI Ring by Using A & B Ports on a WS-C1100

1. Display the Version Information

```
WS-C1100> (enable) sh version
WS-C1100 Software, Version: 3.3
Copyright (c) 1995 by Cisco Systems
Compiled on Nov  1 1995, 18:42:43.
System Bootstrap Version: 2.1
Hardware Version: 2.0 Model: WS-C1100 Serial #: 061002510
18 FDDI interfaces
Uptime is 2 day, 13 hour, 58 minutes
WS-C1100> (enable)
```

2. Enable the A and B Ports (one at a time)

In order to make the ring fully operational, both the A and B ports must be enabled.

The following output shows enabling the A and B ports (ports 1 and 2) on WS-C1100.

```
WS-C1100> (enable) set port 1 enable
Port 1 enabled
WS-C1100> (enable) set port 2 enable
Port 2 enabled
WS-C1100> (enable)
```

Note: The ports on WS-C1201 are already enabled.

3. Display the Status of the A and B Ports

The following output from both switches shows that the FDDI ring is functioning normally. All ports have a status of *connected*. The Cur-Path is *thru*. The types are correct and the neighbors are correct (*A to B* and *B to A*).

```
WS-C1100> (enable) sh port
```

```

Port  Name                               Status   Req-Path  Cur-Path  Type  Neigh
-----
1
connected
  secondary thru           A      B
2
connected
  primary   thru           B      A

```

WS-C1201> (enable) **sh port**

```

Port  Name                               Status   Curr-Path  Type  Neigh  Media
-----
1A
connected
  thru           A      B      fiber
2B
connected
  thru           B      A      fiber

```

Note: The remaining information that this command usually presents has been omitted from this example and all other uses of this command within this document.

Appendix A shows the possible values of the fields displayed by this command.

4. Disable the A and B Ports (one at a time) and Show New Status

The following output shows disabling port 1 on WS-C1100 and the new port status. Disabling a port 1 causes its Cur-Path status to become *isolated*. The status is *disabled*. Port 2 has a status of *connected*. The status of Curr-Path on port 2 has become *concat*. The reason for this will be explained later in this section.

```

WS-C1100> (enable) set port 1 disable
Port 1 disabled

```

WS-C1100> (enable) **sh port**

```

Port  Name                               Status   Req-Path  Cur-Path  Type  Neigh
-----
1
disabled
  secondary isolated   A      U
2
connected
  primary   concat      B      A

```

Notice in the output below from WS-C1201 that the status of Curr-Path on port 1 is also *concat*. The switches now have a *concatenated* FDDI ring connecting them. Port 1 has a status of *connected*. Port 2 has a status of *notconnect* and the Curr-path is *isolated*.

WS-C1201> (enable) **sh port**

```

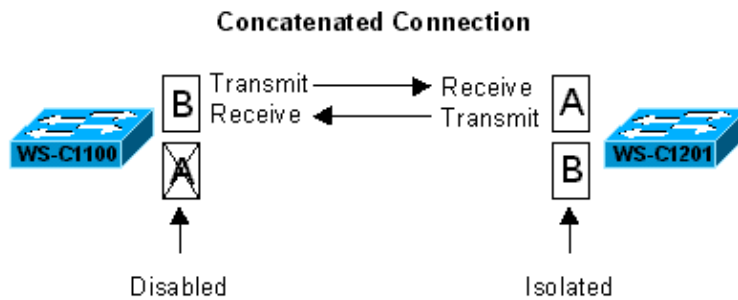
Port  Name                               Status   Curr-Path  Type  Neigh  Media
-----
1A
concat
  A      B      fiber
2B
notconnect

isolated
  B      A      fiber

```

Note: Each FDDI patch cable has two paths. In the case of fiber connections, each path is a single fiber. In the case of CDDI each path is two copper wires (2 paths * 2 wires = 4 wires per CDDI patch cable).

The following figure shows that by disabling port 1 on WS-C1100, a Transmit-Receive and a Receive-Transmit connection has been created over the two remaining fibers (paths) that connect port 2 (B) on WS-C1100 to Port 1 (A) on WS-C1201. Both ports are inserted in both the primary and secondary paths in a concatenated wrap configuration.



The following output shows disabling the port 2 on WS-C1100 and the new port status on both switches. Both ports on WS-C1100 are now disabled. In all cases the status of Curr-Path is isolated. The FDDI ring is now down.

```

WS-C1100> (enable) set port 2 disable
Port 2 disabled

WS-C1100> (enable) sh port
Port  Name          Status      Req-Path    Cur-Path    Type  Neigh
-----  -
1
disabled
  secondary
isolated
  A      U
2
disabled
  primary
isolated
  B      U

WS-C1201> (enable) sh port
Port  Name          Status      Curr-Path    Type  Neigh  Media
-----  -
1A
notconnect

isolated
  A      B      fiber
2B
notconnect

isolated
  B      A      fiber

```

WS-C1201

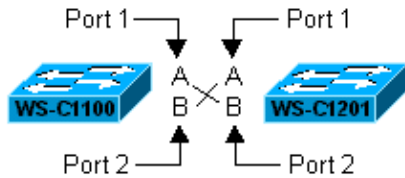
This device is an Ethernet concentrator. It has an optional FDDI interface with A and B ports. When the FDDI interface is installed, it becomes a translational bridge. The A and B ports are connected using Multimode fiber patch cables with MICs to the A and B ports of the WS-C1100 Catalyst switch to form a FDDI ring.

- Product Catalog
- System Documentation
- Connecting to the Network

This section will repeat the steps from the previous section. This time the ports on WS-C1201 will be disabled. The effect disabling the ports on WS-C1201 has on WS-C1100's ports will be shown.

Note:

The topology used in this subsection is the same as the previous subsection. It is repeated in the figure below.



Tasks

Follow these steps to create a simple FDDI Ring by Using A & B Ports on a WS-C1201

1. Display the Version Information

```
WS-C1201> (enable) sh version
WS-C1201 Software, Version DmpSW: 4.29 NmpSW: 4.29
Copyright (c) 1994,1995 by Cisco Systems
DMP S/W compiled on Oct 14 1997 11:00:16
NMP S/W compiled on Oct 14 1997 10:41:55

System Bootstrap Version: 1.1

Hardware Version: 4.0 Model: WS-C1201 Serial #: 062020429
1 FDDI interface
8 10BaseT interfaces

4096K bytes of DRAM memory.
1024K bytes of NMP FLASH memory.
32K bytes of non-volatile configuration memory.

Uptime is 0 day, 1 hour, 22 minutes
WS-C1201> (enable)
```

2. Enable the A and B Ports

In order to make the ring fully operational, both the A and B ports must be enabled.

The following output shows enabling the A and B ports on WS-C1201.

```
WS-C1201> (enable) set port 1 enable
Bridge port 1 enabled.
WS-C1201> (enable)
```

Note: Enabling port 1 on WS-C1201 enabled port 2 as well. This is different from the behavior on WS-C1100 where each port could be enabled or disabled individually.

3. Display the Status of the A and B Ports

The following output from both switches shows that the FDDI ring is functioning normally. All ports have a status of *connected*. The Cur-Path is *thru*. The types are correct and the neighbors are correct (*A to B* and *B to A*).

```
WS-C1201> (enable) sh port
Port Name Status Curr-Path Type Neigh Media
-----
```

```

1A
connected

thru      A      B
      fiber

2B
connected

thru      B      A
      fiber

WS-C1100> (enable) sh port
Port Name                               Status      Req-Path    Cur-Path    Type    Neigh
----  -
1
connected

secondary thru      A      B

2
connected

primary thru      B      A

```

4. Disable the A and B Ports and Show New Status

The following output shows disabling the A and B ports on WS-C1201 and the new port status on both switches. In all cases the Curr-Path is *isolated*. The FDDI ring is now down.

```

WS-C1201> (enable) set port 1 disable

Bridge port 1 disabled.

WS-C1201> (enable) sh port
Port Name                               Status      Curr-Path    Type    Neigh    Media
----  -
1A
isolated
      A      B      fiber
2B
isolated
      B      A      fiber

WS-C1100> (enable) sh port
Port Name                               Status      Req-Path    Cur-Path    Type    Neigh
----  -
1
isolated
      A      U
2
isolated
      B      U

```

Connecting a WS-C2820 SAS to a WS-C1100

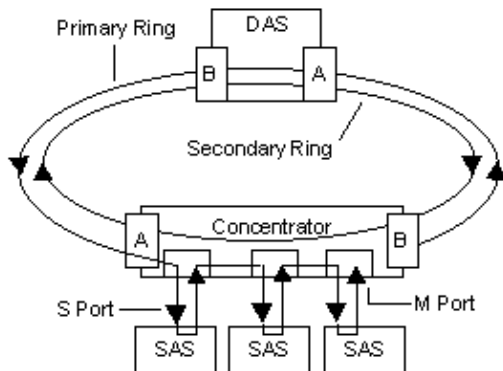
Background Information

Introduction

In this section, a SAS (WS-C2820) will be attached to WS-C1100. The resulting S to M connection will be shown from the perspective of both switches.

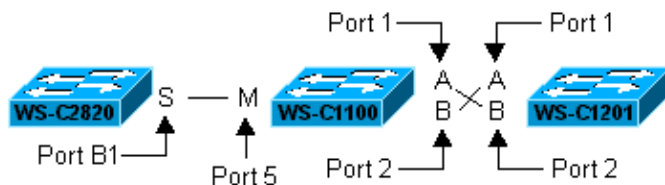
Note: The port on WS-C1100 is already enabled.

ReminderBy linking the S port from a SAS to an M port on a concentrator, the FDDI ring is extended through the SAS. The primary path now flows through each of the SASs as it passes through the concentrator. If the concentrator had to fall back to using the Secondary path to access the FDDI ring, the SAS would not be affected.



WS-C2820 Configuration

The topology used in this section is shown in the figure below.



The Catalyst 2820 is a modular Ethernet 10/100 switch. It supports Fast Ethernet, FDDI, or Asynchronous Transfer Mode (ATM) connectivity to servers and network backbones.

- Product Catalog
- System Documentation

Tasks

Follow these steps to connect a WS-C2820 SAS to a WS-C1100

1. Display the Version Information (from the command line interface)

Use the **show version** command on the command line interface to see version information:

```
WS-C2820> sh version
Cisco Catalyst 1900/2820 Enterprise Edition Software
Version V8.01.05      written from 204.103.106.008
Copyright (c) Cisco Systems, Inc. 1993-1998
WS-2820 uptime is 2day(s) 18hour(s) 09minute(s) 24second(s)
cisco Catalyst 2820 (486sxl) processor with 2048K/1024K bytes of memory
Hardware board revision is 1
Upgrade Status: No upgrade currently in progress.
Config File Status: No configuration upload/download is in progress
25 Fixed Ethernet/IEEE 802.3 interface(s)
SLOT A:
  100Base-FX(1 Port Fiber Model), Version 1
SLOT B:
```

```

FDDI (Fiber SAS Model), Version 00
v1.13 written from 192.168.022.050: valid
Base Ethernet Address: 00-50-F0-53-C8-C0
WS-C2820>

```

2. Enable the S Port (from the menu interface)

The following menu screen shows enabling the S port on WS-C2820.

```

The module status indicates whether the module as a whole is
participating in the frame forwarding process with the other switch
ports. If set to enabled, the module is forwarding frames to or from
the other switch ports. Any other status means the module is not
forwarding frames, even though the individual module ports may have
the status of enabled.

```

```

Module status may be [E]nabled or [D]isabled:

```

```

Current setting ==> Enabled

```

```

New setting ==> Enabled

```

Note: The ports on WS-C1201 are already enabled.

3. Display the Status of the S Port (from the menu interface) and the M Port

The following menu screen shows the status of (*BI*) S port on WS-C2820. The ring status is now operational. *operational*.

```

Catalyst 2820 - Port
B1
Configuration (Right Slot)
Module Name:  FDDI (Fiber SAS Model), Version 00
Description:  Single Attach Station   Ring Status:  Operational
802.1d STP State:  Forwarding         Forward Transitions:  1

----- Settings -----
[D] Description/name of port
----- Module Settings -----
[M] Module status                      Enabled
[I] Port priority (spanning tree)      128 (80 hex)
[C] Path cost (spanning tree)          10
[H] Port fast mode (spanning tree)     Disabled
[L] Novell SNAP frame translation      Automatic
[U] Unmatched SNAP frame destination  All

----- Actions -----
[R] Reset module                       [F] Reset module with factory defaults
----- Related Menus -----
[1] Basic FDDI settings                [2] Secondary FDDI settings
[A] Port addressing                    [V] View port statistics
[N] Next port                          [G] Goto port
[P] Previous port                      [X] Exit to Main Menu

Enter Selection:

```

The out below from WS-C1100 indicates that a SAS (WS-C2820 in this case) is attached to port 5. Note the S in the neighbor field. The port type is *M*. The status is *connected*. The Curr-Path is *primary*. The primary path is flowing through WS-C2820.

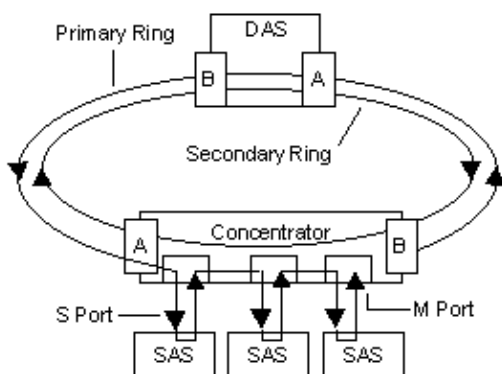
```

WS-C1100> (enable) sh port
Port Name                Status      Req-Path  Cur-Path  Type  Neigh

```

1	connected	secondary	thru	A	B
2	connected	primary	thru	B	A
3	notconnect	primary	isolated	M	U
4	notconnect	primary	isolated	M	U
5					
	<i>connected</i>	<i>primary</i>	<i>primary</i>	<i>M</i>	<i>S</i>

WS-C2820 is now part of the same FDDI ring that was created in the first section of this document. WS-C1100 still has the A to B and B to A connections to WS-C1400 that were created in the first section. The output above shows that ports 1 and 2 (A and B) are *connected*. In the figure below, the DAS would be WS-1201 and the concentrator would be WS-C1100. WS-C2820 would be one of the SASs.



4. Disable Forwarding on the S Port (from the menu interface)

The following menu screen shows disabling the S port (B1) on WS-C2820.

The module status indicates whether the module as a whole is participating in the frame forwarding process with the other switch ports. If set to enabled, the module is forwarding frames to or from the other switch ports. Any other status means the module is not forwarding frames, even though the individual module ports may have the status of enabled.

Module status may be [E]nabled or [D]isabled:

Current setting ==> Enabled

New setting ==> Disabled-management

```
WS-C1201> (enable) sh port
Port Name                Status      Curr-Path  Type  Neigh  Media
-----
1A                        connected
concat
  A      B      fiber
2B
notconnect
isolated
  B      A      fiber
```

5. Show New Status of the S Port (from the menu interface)

The following menu from WS-C2820 shows how using the **Disabled-management** option turns 802.1d Spanning Tree Forwarding off for the module it is applied to. It does not actually shut down the interface. Note in the following output that the ring status is still operational. The 802.1d STP

State is disabled. The physical state of this interface is up but the logical state in the Spanning Tree forwarding table is down.

```
Catalyst 2820 - Port
B1
  Configuration (Right Slot)
Module Name:  FDDI (Fiber SAS Model), Version 00
Description:  Single Attach Station   Ring Status:  Operational
802.1d STP State:
Disabled
  Forward Transitions:  10
----- Settings -----
[D] Description/name of port
----- Module Settings -----
[M] Module status                      Enabled
[I] Port priority (spanning tree)      128 (80 hex)
[C] Path cost (spanning tree)         10
[H] Port fast mode (spanning tree)    Disabled
[L] Novell SNAP frame translation     Automatic
[U] Unmatched SNAP frame destination  All
----- Actions -----
[R] Reset module                       [F] Reset module with factory defaults
----- Related Menus -----
[1] Basic FDDI settings                [2] Secondary FDDI settings
[A] Port addressing                    [V] View port statistics
[N] Next port                          [G] Goto port
[P] Previous port                      [X] Exit to Main Menu

Enter Selection:
```

The output below from WS-C1100 still indicates that a SAS (WS-C2820 in this case) is attached to port 5. Note the S in the neighbor field. The port type is M. The status is *connected*. The Curr-Path is primary. The *primary* path is still flowing through WS-C2820.

```
WS-C1100> (enable) sh port
Port  Name                Status      Req-Path  Cur-Path  Type  Neigh
----  -
1      primary                connected  secondary thru      A     B
2      primary                connected  primary   thru      B     A
3      primary                notconnect primary   isolated M     U
4      primary                notconnect primary   isolated M     U
5      primary                connected  primary   isolated M     U
connected
  primary  primary  M     S
```

6. Disable the M Port on WS-C1100 and View New Status on the S & M Ports

The output below shows port 5 on WS-C1100 being disabled and the resulting effect on both devices.

```
WS-C1100> (enable) set port 5 disable
Port 5 disabled.
```

The following output shows that the status of port 5 on WS-C1100 is now *disabled*. The Curr-Path is now *isolated*.

```
WS-C1100> (enable) show port
Port  Name                Status      Req-Path  Cur-Path  Type  Neigh
----  -
1      primary                connected  secondary thru      A     B
2      primary                connected  primary   thru      B     A
3      primary                notconnect primary   isolated M     U
```

```

4          notconnect primary isolated M U
5
disabled
      primary isolated M U

```

The following menu from WS-C2820 shows that the FDDI ring is now *Not Operational*. WS-C2820 has recognized that the M port on WS-C1100 has been disabled.

```

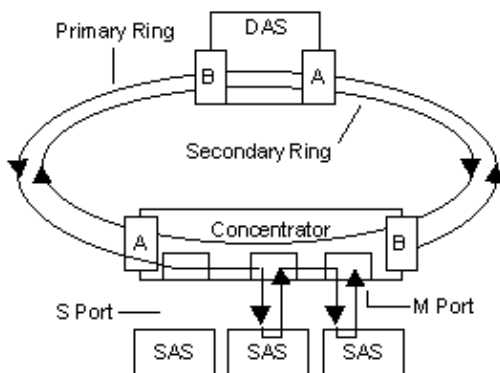
Catalyst 2820 - Port B1 Configuration (Right Slot)
Module Name:  FDDI (Fiber SAS Model), Version 00
Description:  Single Attach Station  Ring Status:  Not operational
802.1d STP State:  Blocking      Forward Transitions:  0
----- Settings -----
[D] Description/name of port
----- Module Settings -----
[M] Module status                               Suspended-ring-down
[I] Port priority (spanning tree)                128 (80 hex)
[C] Path cost (spanning tree)                   10
[H] Port fast mode (spanning tree)              Disabled
[L] Novell SNAP frame translation               Automatic
[U] Unmatched SNAP frame destination           All
----- Actions -----
[R] Reset module                               [F] Reset module with factory defaults
----- Related Menus -----
[1] Basic FDDI settings                       [2] Secondary FDDI settings
[A] Port addressing                           [V] View port statistics
[N] Next port                                 [G] Goto port
[P] Previous port                             [X] Exit to Main Menu

Enter Selection:

```

The previous example showed that disabling the S port on the WS-C2820 did not bring down the FDDI ring connection while disabling the M port on WS-C1100 did.

The FDDI ring now resembles the following figure where WS-C2820 is the SAS that is no longer participating in the FDDI ring. In this case, it is because the M port on the concentrator has been disabled. This effectively removes the SAS from the primary path.



Creating a Dual Home Scenario with a Catalyst 5505, a WS-C1100, and a WS-C1400

Background Information

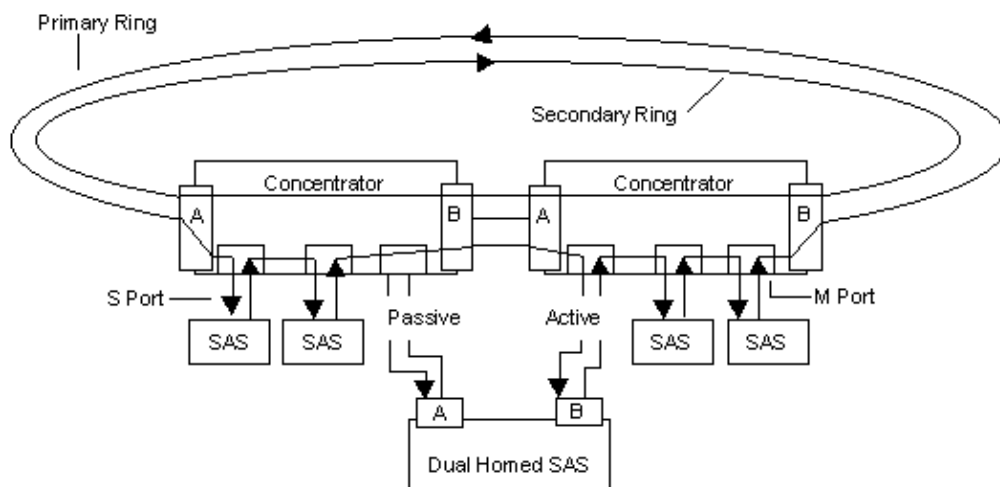
Introduction

In this section, a dual homed scenario will be created. A Catalyst 5505 will be dual homed to two Catalyst concentrators. The name of the Catalyst 5505 is WS-C5500. The name of the WS-C1400 is WS-C1400. The first part of this section will show how to enable the A and B ports on WS-C5500. It will also show the status of the ports on the two concentrators. The normal state of a dual homed connection will be presented.

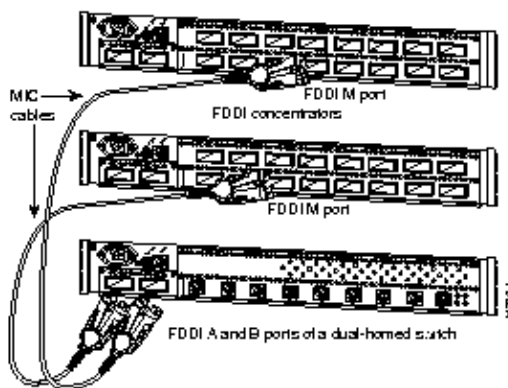
The next section will show how to disable the FDDI A and B ports on WS-C5500. It will also show the effect this has on the ports in the two concentrators.

Finally this section will show what happens when only the active link in a dual home connection is disabled. The result will be that the backup (standby) link will become the active link.

Reminder By linking the A and B ports between two FDDI devices, a fully functional FDDI ring is created. New devices can be added to the ring by following the A to B rule: The A port of the first device connects to the B port of the next device. The A port on the last device is connected to the B port on the first device.

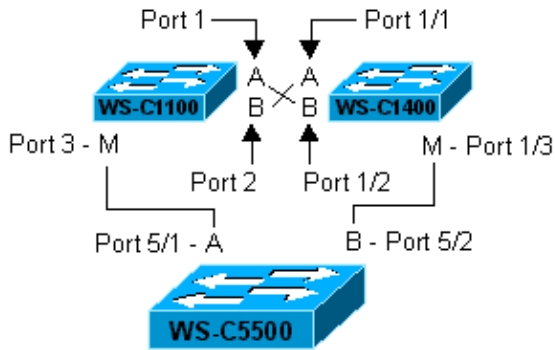


The following figure shows how to dual home a concentrator to two other concentrators.



WS-C5000

The topology used in this section is shown in the figure below.



The Catalyst 5000 family features five modular chassis: 2-, 5-, 9-, and 13-slot versions. It supports all common LAN media types including ATM (LANE only).

The Catalyst WS-C1400 is the replacement product for the WS-C1100.

Note: Direct links to the system documentation and product overview for the WS-5500 are not provided here because this product is still shipping. However, you can locate the current information at the CCO links below:

- Product Catalog
- System Documentation

Tasks

Follow these steps to create a Dual Home Scenario with a Catalyst 5505:

1. Display the Version Information and the Module Information

```

WS-C5500> (enable) sh version
WS-C5505 Software, Version McpSW: 4.2(1) NmpSW: 4.2(1)
Copyright (c) 1995-1998 by Cisco Systems
NMP S/W compiled on Sep  8 1998, 10:30:21
MCP S/W compiled on Sep 08 1998, 10:26:29

System Bootstrap Version: 5.1(2)

Hardware Version: 1.0  Model: WS-C5505  Serial #: 066509927

Mod Port Model          Serial #  Versions
-----
1   0   WS-X5530  008676033  Hw : 2.3
                               Fw : 5.1(2)
                               Fw1: 4.4(1)
                               Sw  : 4.2(1)

[ouput for modules 2-4 deleted]

5   2   WS-X5101  002723166  Hw : 1.0
                               Fw : 1.1
                               Fw1: 1.3
                               Sw  : 1.5

          DRAM          FLASH          NVRAM
Module Total  Used   Free   Total  Used   Free   Total Used   Free
-----
1          32640K 13545K 19095K  8192K  3951K  4241K  512K 114K  398K

Uptime is 7 days, 1 hour, 22 minutes

```

```

Console> (enable)

WS-C5500> (enable) show module 5
Mod Module-Name          Ports Module-Type          Model   Serial-Num Status
-----
5                          2      MM MIC FDDI             WS-X5101 002723166 ok

Mod MAC-Address(es)          Hw    Fw    Sw
-----
5  00-60-3e-8c-bf-31         1.0   1.1   1.5

Mod SMT User-Data          T-Notify CF-St   ECM-St   Bypass
-----
5  WorkGroup Stack          30     primary in        absent
WS-C5500> (enable)

```

In the output above, the last line displays the FDDI Station Management (SMT) information. Note that status of CF-St is *primary*. This is the same as the CE-State field in the **show port** command below. The remainder of the SMT information is discussed in this document. Also note the module status is *ok*. This indicates that the module itself has been recognized by the switch and that the module passed its power on diagnostics test.

2. Enable the A and B Ports

In this scenario, port 5/1 (the A port) is connected to port 4 (M port) on WS-C1100. Port 5/2 (the B port) is connected to port 1/3 (M port) on WS-C1400.

In order to make the ring fully operational, both the A and B ports must be enabled.

The following output shows enabling the A and B ports on WS-C5500.

```

WS-C5500> (enable) set port enable 5/1
Port 5/1 enabled

WS-C5500> (enable) set port enable 5/2
Port 5/2 enabled

```

```

WS-C5500> (enable)

```

3. Display the Status of the A and B Ports

The following output from WS-C5500 shows that this port is an A port. The neighbor is an M port. The status is *connecting*. The CE-State is *isolated* and the Com-State is *standby*. This is normal behavior for the backup port of a dual homed station.

```

WS-C5500> (enable) show port 5/1
Port Name          Status      Vlan    Level Duplex Speed Type
-----
5/1
connecting
1          normal    half    100 FDDI

Port  Trap      IfIndex
----  -
5/1  disabled  276

Port CE-State Conn-State Type Neig Con Est Alm Cut Lem-Ct    Lem-Rej-Ct Tl-Min
-----
5/1
isolated standby  A    M
no    9    8    7          0          0 40

Last-Time-Cleared

```

```

-----
Thu Dec 30 1999, 15:54:37
WS-C5500> (enable)

```

Port 5/1 on WS-C5500 is connected to port 4 on WS-C1100. The output below from WS-C1100 shows what its side of this link is doing. Note that port 4's state is *connecting*. This is the same state as port 5/1 on WS-C5500. Port 4 also knows that it is an M port and the neighbor is an A port.

```

WS-C1100> (enable) sh port

Port  Name                Status      Req-Path   Cur-Path   Type  Neigh
-----  -----
1      1                        connected  secondary  thru       A     B
2      2                        connected  primary    thru       B     A
3      3                        notconnect primary    isolated   M     U
4      4
connecting
      primary    isolated
M     A

```

Only one port on a dual homed station can be in a connected state at any time. In the event that the link between WS-C5500 and WS-C1400 goes down, WS-C5500 will make port 5/1 active.

The output below shows that this is a B port. The neighbor is an M port. The status is *connected*. The CE-State is *concat* and the Conn-State is active. This is normal behavior for the active port of a DAS. It looks very much like the first example in this document where one of the ports in a FDDI ring had been disabled leaving the connection in a *concatenated* state.

```

WS-C5500> (enable) show port 5/2
Port  Name                Status      Vlan      Level  Duplex  Speed  Type
-----  -----
5/2
connected
  1      normal    half     100    FDDI

Port  Trap      IfIndex
-----  -----
5/2  disabled  277

                                Ler
Port  CE-State Conn-State Type Neig Con Est Alm Cut Lem-Ct      Lem-Rej-Ct Tl-Min
-----  -----
5/2
concat active   B     M
      no    11  8  7      138          2  40

Last-Time-Cleared
-----
Thu Dec 30 1999, 15:54:37
WS-C5500> (enable)

```

Port 1/3 on WS-C1400 is connected to port 5/2 on WS-C5500. The output below from WS-C1400 shows that port 1/3's status is *ok*. It is the *primary* path. Its state is *active*. It is a M port and the neighbor is a B port.

```

WS-C1400> (enable) sh port

Port  Name                Status      Req-Path   Cur-Path   Conn-State  Type  Neigh
-----  -----
1/1      1/1                ok          secondary  thru        active      A     B
1/2      1/2                ok          primary    thru        active      B     A
1/3      1/3

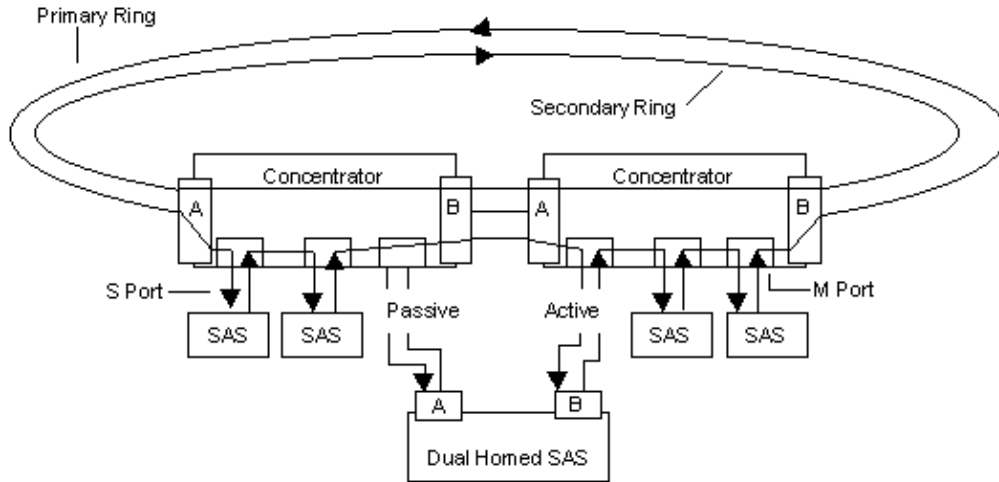
```

```

ok
    primary
primary
    active      M      B

```

This section showed the port level view from the three attached devices of a normal dual home configuration where each port is enabled and participating in maintaining the integrity of the ring. The dual home scenario is similar to the figure below. The B port of the DAS (WS-C5500) is *active* while the A port is *passive*.



4. Disable the A and B Ports and Show the New Status

The output below shows disabling the A and B ports on WS-C5500 and the new status for both ports.

```

WS-C5500> (enable) set port dis 5/1-2
Ports 5/1-2 disabled.
WS-C5500> (enable)

```

The status of port 5/1 is now *disabled*. The CE-State is *isolated* and the Conn-State is *disabled*.

```

WS-C5500> (enable) show port 5/1
Port Name                Status      Vlan      Level Duplex Speed Type
-----
5/1
disabled
  1          normal    half     100 FDDI

Port  Trap      IfIndex
----  -
5/1   disabled  276

                                Ler
Port  CE-State Conn-State Type Neig Con Est Alm Cut Lem-Ct  Lem-Rej-Ct Tl-Min
-----
5/1
isolated disabled
  A   M      no      9    8    7      0      0  40

Last-Time-Cleared
-----
Thu Dec 30 1999, 15:54:37
WS-C5500> (enable)

```

The status of port 5/2 is now *disabled*. The CE-State is *isolated* and the Conn-State is *disabled*.

```

WS-C5500> (enable) show port 5/2
Port Name Status Vlan Level Duplex Speed Type
-----
5/2
disabled
  1 normal half 100 FDDI

Port Trap IfIndex
-----
5/2 disabled 277

Ler
Port CE-State Conn-State Type Neig Con Est Alm Cut Lem-Ct Lem-Rej-Ct Tl-Min
-----
5/2
isolated disabled
  B M no 11 8 7 138 2 40

Last-Time-Cleared
-----
Thu Dec 30 1999, 15:54:37
WS-C5500> (enable)

```

The output below from WS-C1100 shows that its port 4 status is *notconnect* and its Cur-Path is *isolated*. The dual homed station is now completely down.

```

WS-C1100> (enable) sh port
Port Name Status Req-Path Cur-Path Type Neigh
-----
1 connected secondary thru A B
2 connected primary thru B A
3 notconnect primary isolated M U
4
notconnect
  primary isolated M U

```

The output below from WS-C1400 shows that its port 1/3 Conn-State is *connecting* and its Cur-Path is *isolated*.

```

WS-C1400> (enable) sh port
Port Name Status Req-Path Cur-Path Conn-State Type Neigh
-----
1/1 ok secondary thru active A B
1/2 ok primary thru active B A
1/3 other primary
isolated
  connecting M U

```

Note: WS-C1100 and WS-C1400 react differently to the disabled A and B ports on WS-C5500. WS-C1100's port status goes into *notconnect* while WS-C1400 goes into *connecting*. In both cases the devices are monitoring the state of the link waiting for the other device (WS-C5500) to re-enable the ports.

5. Disable the Active Port on the Concentrator and Show the New Status

Ports 5/1 and 5/2 have been re-enabled to restore the links to their normal configuration. The active link should be between port 1/3 on WS-C1400 and port 5/2 on WS-C5500.

In this section, port 1/3 on WS-C1400 will be disabled. This will cause the link between 5/1 on WS-C5500 and port 4 on WS-C1100 to become the active link.

The following output shows port 1/3 on WS-C1400 being disabled.

Note: The WS-C1400 requires a mod_num/port_num designation to configure a port much like WS-C5500.

```
WS-C1400> (enable) set port 1/3 disable
Port 1/3 disabled.
WS-C1400> (enable)
```

The following output from WS-C1400 shows that its port 1/3 now a Conn-State of *disabled*. The Curr-path is *isolated*. This will cause WS-C5500 to bring the standby link to an active state.

```
WS-C1400> (enable) sh port
Port Name Status Req-Path Cur-Path Conn-State Type Neigh
-----
1/1 ok secondary thru active A B
1/2 ok primary thru active B A
1/3 other primary isolated
disabled
      M U
```

The following output from WS-C5500 shows that port 5/2 now has a status of *notconnect*. The CE-State is *isolated* and the Conn-State is *connecting*.

```
WS-C5500> (enable) show port 5/2
Port Name Status Vlan Level Duplex Speed Type
-----
5/2
notconnect
1 normal half 100 FDDI

Port Trap IfIndex
-----
5/2 disabled 277

Ler
Port CE-State Conn-State Type Neig Con Est Alm Cut Lem-Ct Lem-Rej-Ct Tl-Min
-----
5/2
isolated connecting
B M no 11 8 7 138 2 40

Last-Time-Cleared
-----
Thu Dec 30 1999, 15:54:37
WS-C5500> (enable)
```

The following output from WS-C5500 shows that port 5/1 now has a status of *connected*. The CE-State is *concat* and the Conn-State is *active*. The standby path has now become the active path.

```
WS-C5500> (enable) sh port 5/1
Port Name Status Vlan Level Duplex Speed Type
-----
5/1
connected
1 normal half 100 FDDI

Port Trap IfIndex
-----
5/1 disabled 276

Ler
Port CE-State Conn-State Type Neig Con Est Alm Cut Lem-Ct Lem-Rej-Ct Tl-Min
-----
```

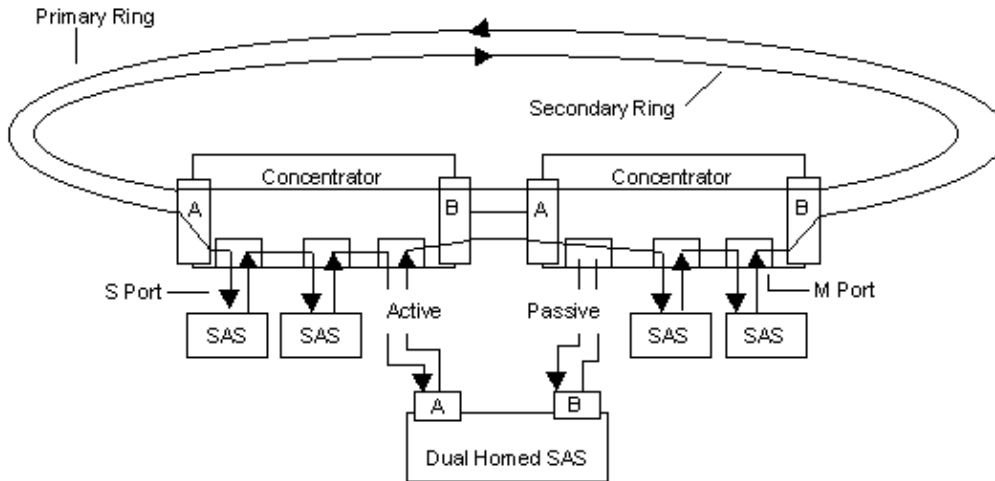
```

5/1
concat active A M
no 10 8 7 0 0 40

Last-Time-Cleared
-----
Thu Dec 30 1999, 15:54:37
WS-C5500> (enable)

```

The figure below shows the change that has occurred in this example. Previously the B port on the DAS was the active port. Now the A port is the active port.



The following output shows that port 4 on WS-C1100 now has a status of *connected*. The Curr-Path is *primary* This port had been the standby link. It is now the active link. It is a M port and the neighbor is now the A port on WS-C5500.

```

WS-C1100> (enable) sh port
Port Name Status Req-Path Cur-Path Type Neigh
-----
1 connected secondary thru A B
2 connected primary thru B A
3 notconnect primary isolated M U
4
connected primary primary M A

```

This section explained how a dual homed DAS will behave in the default configuration. It went on to explain what happens when the dual homed DAS has to make the standby port the active port due to a change in the status of an M port on a concentrator.

Commands to Use for Verifying the Configuration is Working

- **show port** – Displays the status of the ports on the switch. Shows the status of the ports participating in a FDDI ring.
- **show version** – Displays the version of software, microcode, and other system information such as module types and serial numbers.
- **show mac** – Displays the MAC addresses and other MAC related information. Also shows FDDI upstream and downstream neighbors.
- **show module** – Displays the modules in the system and their status. Also displays the FDDI SMT information.

Commands to Use for Troubleshooting the Configuration

- **show port** – Displays the status of the ports on the switch. Shows the status of the ports participating in a FDDI ring.
- **show mac** – Displays the MAC addresses and other MAC related information. Also shows FDDI upstream and downstream neighbors.
- **show module** – Displays the modules in the system and their status. Also displays the FDDI SMT information.
- **set port {{port_num} {enable | disable}}** – Sometimes a port will become stuck in an incorrect state. Resetting it by disabling and enabling it will occasionally resolve this situation.
- **set port {{enable | disable} {mod_num/port_num}}** – Sometimes a port will become stuck in an incorrect state. Resetting it by disabling and enabling it will occasionally resolve this situation.

Command Summary

Syntax:	show version
As used in this document:	<i>show version</i>

Syntax:	show module
As used in this document:	<i>show module</i>

Syntax:	show mac
As used in this document:	<i>show mac</i>

Syntax:	show mac [mod_num]*
As used in this document:	<i>showmac 5</i>

* Used in Appendix D

Syntax:	show port
As used in this document:	<i>show port</i>

Syntax:	show port [mod_num/port_num]
As used in this document:	<i>show port 5/1-2</i>

Syntax:	set port {{port_num} {enable disable}}
As used in this document:	<i>set port 1 enable</i>
	<i>set port 1 disable</i>

Syntax:	set port {{mod_num/port_num} {enable disable}}
As used in this document:	<i>set port enable 5/1 **</i>
	<i>set port disable 5/1 **</i>

```
set port 5/1 enable ***
```

```
set port 5/1disable ***
```

** WS-C5500

*** WS-C1400

Appendix A: Explanation of Fields from the show port Command on FDDI Interfaces

WS-C1100 / WS-C1201

Field	Value	Explanation
Status	connected	The port has made a connection to the port on its neighbor.
Status	connecting	The port is attempting to connect to the port on the neighboring device. This typically means that there is a physical connection to the neighbor's port but the link cannot change status to connected. This will happen when the neighbor is a dual homed DAS and the port is in standby mode. The DAS will ensure that only one of its links is active at any time. Any device attached to the port on the DAS which is in standby mode will remain in either a connecting or notconnect state.
Status	notconnect	The port is disconnected. Often happens when the port on the neighboring device has been disabled. This can also happen when the neighbor is a dual homed DAS and the port is in standby mode. The DAS will ensure that only one of its links is active at any time. Any device attached to the port on the DAS which is in standby mode will remain in either a connecting or notconnect state.
Status	disabled	The port has been disabled by the administrator.
Curr-Path	isolated	The port is not connected. This is normal when the local port is disabled or the neighbor's port is disabled. It may also happen when either port has suffered a hardware failure.

Curr-Path	primary	The port is inserted in the primary path. It means that the primary path of the FDDI ring is entering on one fiber (or copper pair for CDDI) of the port and exiting on the other fiber (or copper pair for CDDI) of the same port. This is normal for a M port when it is attached to either the active port on a dual homed DAS or an S port of a SAS.
Curr-Path	concatenated	The port is inserted in both the primary and secondary paths in a concatenated wrap configuration. This is normal on the active port (usually the B port) on a dual homed DAS. Note that the active port on the DAS will show concatenated while the M port it is attached to will show primary. It is also normal for either the A or the B port on a DAS when the other port has been disabled or suffered a hardware failure.
Curr-Path	thru	The port is inserted in both the primary and secondary paths (rings) in a thru configuration. The primary ring is entering on one fiber (or copper pair for CDDI) and the secondary ring is exiting on the other fiber (or copper pair for CDDI) of the same port. If the primary ring enters on port A it will exit on port B while the secondary ring will enter on port B and exit on port A.
Req-Path	primary	This is the requested path for this port. On a WS-C1531 A/B card the default is secondary for the A port and primary for the B port. It can be configured by the set path port_num {primary secondary} command.
Req-Path	secondary	See Req-Path above.
Type	A	This port on this switch is an A port.
Type	B	This port on this switch is an B port.
Type	M	This port on this switch is a M (Master) port.
Type	S	This port on this switch is a S (Slave) port.
Type	U	This port on this switch is undetermined. Switch cannot detect the port type.

Neighbor	A	The neighbor's port is an A port.
Neighbor	B	The neighbor's port is a B port.
Neighbor	M	The neighbor's port is a M (Master) port.
Neighbor	S	The neighbor's port is a S (Slave) port.
Neighbor	U	Neighbors port type is undetermined.

Note: The Cisco documentation linked to this document for the WS-C1201 and WS-C1100/WS-C1400 show a status field and a Conn-State field in the command reference section on the **show port** command. In this scenario, the WS-C1100 and WS-C1201 concentrators are running older software that only has the status field. For these two concentrators, the status field in this example is roughly equivalent to the Conn-State field as described in the documentation.

The WS-C1400 used in the last section of this document on creating a dual homed scenario has the software that displays both the status and the Conn-State fields. This is shown in the table below.

WS-C1400

Field	Value	Explanation
Status	ok	The port has connection. The link status LED is green.
Status	minor	A signal is detected, but the port is not connected. The link status LED is orange.
Status	other	The port has not connected.
Req-Path	primary	This is the requested path for this port. On a WS-C1531 A/B card the default is secondary for the A port and primary for the B port. It can be configured by the set path port_num {primary secondary} command.
Req-Path	secondary	See Req-Path above.
Curr-Path	isolated	The port is not connected. This is normal when the local port is disabled or the neighbor's port is disabled. It may also happen when either port has suffered a hardware failure.
Curr-Path	primary	The port is inserted in the primary path. It means that the primary path of the FDDI ring is entering on one fiber (or copper pair for CDDI) of the port and exiting on the other fiber (or copper pair for CDDI) of the same port. This is normal for a M port when it is attached to either the active port on a dual homed DAS

		or an S port of a SAS.
Curr-Path	concatenated	The port is inserted in both the primary and secondary paths in a concatenated wrap configuration. This is normal on the active port (usually the B port) on a dual homed DAS. Note that the active port on the DAS will show concatenated while the M port it is attached to will show primary. It is also normal for either the A or the B port on a DAS when the other port has been disabled or suffered a hardware failure.
Curr-Path	thru	The port is inserted in both the primary and secondary paths (rings) in a thru configuration. The primary ring is entering on one fiber (or copper pair for CDDI) and the secondary ring is exiting on the other fiber (or copper pair for CDDI) of the same port. If the primary ring enters on port A it will exit on port B while the secondary ring will enter on port B and exit on port A.
Conn-State	connected	The port has made a connection to the port on its neighbor.
Conn-State	connecting	The port is attempting to connect to the port on the neighboring device. This typically means that there is a physical connection to the neighbor's port but the link cannot change status to connected. This will happen when the neighbor is a dual homed DAS and the port is in standby mode. The DAS will ensure that only one of its links is active at any time. Any device attached to the port on the DAS which is in standby mode will remain in either a connecting or notconnect state.
Conn-State	active	The port is the active port of a dual homed DAS
Conn-State	standby	The port is the standby port of a dual homed DAS
Conn-State	notconnect	The port is disconnected. Often happens when the port on the neighboring device has been disabled. This can also happen when the neighbor is a dual homed DAS and the port is in standby mode. The

		DAS will ensure that only one of its links is active at any time. Any device attached to the port on the DAS which is in standby mode will remain in either a connecting or notconnect state.
Conn-State	disabled	The port has been disabled by the administrator.
Type	A	This port on this switch is an A port.
Type	B	This port on this switch is an B port.
Type	M	This port on this switch is a M (Master) port.
Type	S	This port on this switch is a S (Slave) port.
Type	U	This port on this switch is undetermined. Switch cannot detect the port type.
Neighbor	A	The neighbor's port is an A port.
Neighbor	B	The neighbor's port is a B port.
Neighbor	M	The neighbor's port is a M (Master) port.
Neighbor	S	The neighbor's port is a S (Slave) port.
Neighbor	U	Neighbors port type is undetermined.

The **show port** command on the WS-C5500 uses different names than the concentrators in the output for some of the fields. The table below provides explanations for these new fields. In addition the same values are occasionally used in different fields. For example the status field and the Conn-State field can both have a value of disabled.

WS-C5500

Field	Value	Explanation
Status	disabled	The port has been disabled by the administrator.
Status	connecting	The port is attempting to connect to the port on the neighboring device. This typically means that there is a physical connection to the neighbor's port but the link cannot change status to connected. This will happen when the neighbor is a dual homed DAS and the port is in standby mode. The DAS will ensure that only one of its links is active at any time. Any device attached to the port

		on the DAS which is in standby mode will remain in either a connecting or notconnect state.
Status	connected	The port has made a connection to the port on its neighbor.
Status	notconnect	The port is disconnected. Often happens when the port on the neighboring device has been disabled. This can also happen when the neighbor is a dual homed DAS and the port is in standby mode. The DAS will ensure that only one of its links is active at any time. An M port that is connected to the standby port of a dual homed DAS will remain in either a connecting or notconnect state.
CE-State	isolated	The port is not connected. This is normal when the local port is disabled or the neighbor's port is disabled. It may also happen when either port has suffered a hardware failure.
CE-State	primary	The port is inserted in the primary path. It means that the primary path of the FDDI ring is entering on one fiber (or copper pair for CDDI) of the port and exiting on the other fiber (or copper pair for CDDI) of the same port. This is normal for a M port when it is attached to either the active port on a dual homed DAS or an S port of a SAS.
CE-State	concatenated	The port is inserted in both the primary and secondary paths in a concatenated wrap configuration. This is normal on the active port (usually the B port) on a dual homed DAS. Note that the active port on the DAS will show concatenated while the M port it is attached to will show primary. It is also normal for either the A or the B port on a DAS when the other port has been disabled or suffered a hardware failure.
CE-State	thru	The port is inserted in both the primary and secondary paths (rings) in a thru configuration. The primary ring is entering on one fiber (or copper pair for CDDI) and the secondary ring is exiting on the other

		fiber (or copper pair for CDDI) of the same port. If the primary ring enters on port A it will exit on port B while the secondary ring will enter on port B and exit on port A.
Conn-State	connected	The port has made a connection to the port on its neighbor.
Conn-State	connecting	The port is attempting to connect to the port on the neighboring device. This typically means that there is a physical connection to the neighbor's port but the link cannot change status to connected. This will happen when the neighbor is a dual homed DAS and the port is in standby mode. The DAS will ensure that only one of its links is active at any time. Any device attached to the port on the DAS which is in standby mode will remain in either a connecting or notconnect state.
Conn-State	active	The port is the active port of a dual homed DAS
Conn-State	standby	The port is the standby port of a dual homed DAS
Conn-State	notconnect	The port is disconnected. Often happens when the port on the neighboring device has been disabled. This can also happen when the neighbor is a dual homed DAS and the port is in standby mode. The DAS will ensure that only one of its links is active at any time. Any device attached to the port on the DAS which is in standby mode will remain in either a connecting or notconnect state.
Conn-State	disabled	The port has been disabled by the administrator.
Type	A	This port on this switch is an A port.
Type	B	This port on this switch is an B port.
Type	M	This port on this switch is a M (Master) port.
Type	S	This port on this switch is a S (Slave) port.
Type	U	This port on this switch is undetermined. Switch cannot detect the port type.

Neighbor	A	The neighbor's port is an A port.
Neighbor	B	The neighbor's port is a B port.
Neighbor	M	The neighbor's port is a M (Master) port.
Neighbor	S	The neighbor's port is a S (Slave) port.
Neighbor	U	Neighbors port type is undetermined.

Appendix B: Explanation of Fields From the show mac Command on FDDI Interfaces

Field	Description	
SMT-Address	Displays the 48-bit MAC address in canonical format (for example 00:40:0b:a0:03:cf).	
Curr-Path	Indicates the current path handled by the MAC, and takes one of the following values:	
	Primary	The MAC is on the primary path.
	Isolated	The MAC is not on any path but is isolated.
	Unknown	The switch cannot determine the path.
TReq	Shows the time (in microseconds) that the MAC requests as the average token rotation time. You can configure this parameter with the admin. interface set treq command.	
TNeg	Contains the TReq value agreed on by all MACs in the ring.	
TMax	Holds the maximum time (in microseconds) that the MAC sends out as a TReq value.	
TVX	Contains the time (in microseconds) of the MAC valid transmission timer.	
Upstream-Nbr	Contains the address of the most recently known upstream neighbor to the MAC.	
Downstream-Nbr	Contains the address of the most recently known downstream neighbor to the MAC, the next MAC to receive frames from this MAC.	

Old-Upstream-Nbr	Contains the MAC address of the previous upstream neighbor.
Old-Downstream-Nbr	Contains the MAC address of the previous downstream neighbor.
Rcv-Smt	Shows the total number of SMT frames received by the MAC.
Xmit-llc	Shows the total number of LLC frames transmitted by the MAC.
Tvx-Exp-Ct	Displays the number of valid transmission timer (TVX) expirations counted by the MAC.
RingOp-Ct	Shows the number of times that the ring has encountered a break and has restarted.
Last-Time-Cleared	Displays the date and time that the MAC counters were last cleared.

Appendix C: FDDI and CDDI Module LEDs

WS-C1100/WS-C1400/WS-C1201/WS-C5500

LED	Color	Description
RING OP	Green or Off	Indicates whether or not the ring is operational. If the ring is operational, the LED is green. If the ring is not operational, the LED is off.
THRU	Green or Off	If ports A and B of the module are connected to the primary and secondary rings, the LED is green; otherwise, it is off.
WRAP A	Green or Off	If port A is connected to the ring and port B is isolated, the LED is green; otherwise, it is off.
WRAP B	Green or Off	If port B is connected to the ring and port A is isolated, the LED is green; otherwise, it is off.
Port A status	Green, Orange, or Off	If port A is connected to the ring, the LED is green. If port A receives a signal but fails to connect, or a dual homing condition exists, the LED is orange. The LED is turned off if no receive signal is detected.
Port B status	Green, Orange, or Off	If port B is connected to the ring, the LED is green. If port B receives a signal but fails to connect, or a dual homing condition exists, the LED is orange. The

		LED is turned off if no receive signal is detected.
Port M status	Green, Orange, or Off	If an M is connected to the S port of a SAS, the LED is green. If port B receives a signal but fails to connect, or a dual homing condition exists, the LED is orange. The LED is turned off if no receive signal is detected.
IN	On or Off	The optical bypass switch LED indicates the status of the device connected to the line module. When the LED is on, the bypass switch is activated and is in thru mode (the line module is attached to the dual ring).

Note: These devices will not check for twisted connections where A is cabled to A and B is cabled to B or other invalid cabling variations using their A and B ports. If the LEDs are green but traffic cannot pass on the ring, verify that a valid combination of ports have been connected.

The following output from WS-C1100, WS-C1400, and WS-C5500 shows how an incorrectly cabled FDDI ring will appear to be operational.

The following output shows that WS-C1100 has a B-B relationship on port 2. The ring still shows *cur-path* as *thru*.

```

WS-C1100> (enable) sh port

Port Name           Status   Req-Path
Cur-Path  Type  Neigh
-----
1          thru           connected secondary
           A      B
2          thru           connected primary
           B      B

```

The following output shows that WS-C1400 has a A-A relationship on port 1/1. The ring still shows *cur-path* as *thru*.

```

WS-C1400> sh port
Port Name           Status   Req-Path
Cur-Path  Conn-State  Type  Neigh
-----
1/1        thru           ok     secondary
           active
A      A
1/2        thru           ok     primary
           active      B      A

```

The following output shows that WS-C5500 has a A-A relationship on port 5/1. The ring still shows CE-State as thru.

```

WS-C5500> (enable) sh port 5

Port
CE-State
Conn-State
Type Neig
Con Est Alm Cut Lem-Ct Lem-Rej-Ct Tl-Min
-----
5/1
thru
active
A A
no 12 8 7 0 0 40
5/2
thru
active B B no 12 8 7 345 5 40

```

The LEDs on these ports indicate that the ring is operational. It is not. This is not a supported configuration.

Appendix D: Exercise on Reverse Engineering a FDDI Network Topology

This exercise in this appendix will walk you through reverse engineering a simple FDDI network topology. This will expose you to the fundamental commands available on switches and concentrators for managing FDDI networks.

The equipment in this exercise has already been introduced earlier in this document. It has however been re-cabled to form a new topology.

This exercise is not intended to replicate a real-world troubleshooting scenario. The network presented is intentionally kept very simple to avoid over complicating the explanations provided. The reader should be able to take the skills learned in this exercise and apply them to a real world network.

Tasks

Follow these steps to reverse engineer a FDDI network topology:

1. Identify the Type of Devices in the Network

Fill in the following table at the end of this step by accessing each of the devices and entering the **show version** command.

Device model (type)
WS-C1100
WS-C1400
WS-C5505
WS-C1201
WS-C2828-EN*

*Shown on first prompt

2. Identify the Types of FDDI Ports the Devices Have

The **show port** command works on the WS-C1100, WS-C1400, and WS-C1201. Use the **show port mod_num** command on the WS-C5505. Use the menus on the Port Configuration/Basic FDDI settings on the WS-C2828.

The following output from WS-C1100 shows that it has a combination of A/B and M ports.

```
WS-C1100> sh port
Port Name          Status      Req-Path  Cur-Path
Type
Neigh
-----
1                 connected  secondary thru
A
   B
2                 connected  primary   thru
B
   A
3                 connecting primary   isolated
M
   A
4                 notconnect primary   isolated
M
   U
5                 notconnect primary   isolated
M
   U
6                 notconnect primary   isolated
M
   U
7                 notconnect primary   isolated
M
   U
8                 notconnect primary   isolated
M
   U
9                 notconnect primary   isolated
M
   U
10                notconnect primary   isolated
M
   U
11                notconnect primary   isolated
M
   U
12                notconnect primary   isolated
M
   U
13                notconnect primary   isolated
M
   U
14                notconnect primary   isolated
M
   U
15                notconnect primary   isolated
M
   U
16                notconnect primary   isolated
M
   U
17                notconnect primary   isolated
M
```

```

      U
18          notconnect primary isolated
M
      U

```

The following output from WS-C1400 shows that it has a combination of A/B and M ports.

```

WS-C1400> sh port
Port Name                               Status Req-Path Cur-Path Conn-State
Type
  Neigh
-----
1/1                               ok     secondary thru     active
A
      B
1/2                               ok     primary  thru     active
M
      A
1/3                               ok     primary  primary  active
M
      B
1/4                               ok     primary  primary  active
M
      S
1/5                               other  primary  isolated  connecting
M
      U
1/6                               other  primary  isolated  connecting
M
      U
1/7                               other  primary  isolated  connecting
M
      U
1/8                               other  primary  isolated  connecting
M
      U

```

The following output from WS-C5500 shows that it has A/B ports.

```

WS-C5500> sh port 5/1

[output deleted]

Port CE-State Conn-State
Type
  Neig Con Est Alm Cut Lem-Ct Lem-Rej-Ct Tl-Min
-----
5/1 thru active
A
      B no 11 8 7 0 0 40

Last-Time-Cleared
-----
Thu Dec 30 1999, 15:54:37
WS-C5500>

```

```

WS-C5500> sh port 5/2

Port CE-State Conn-State
Type
  Neig Con Est Alm Cut Lem-Ct Lem-Rej-Ct Tl-Min
-----
5/2 thru active

```

```

B
A no 11 8 7 483 7 40

Last-Time-Cleared
-----
Thu Dec 30 1999, 15:54:37
WS-C5500>

```

The following output from WS-C1201 shows that it has A/B ports. (Ethernet ports not shown.)

```

WS-C1201> sh port
Port Name          Status      Curr-Path
Type
Neigh Media
-----
1A                 connecting isolated
A
M fiber
2B                 connected  concat
B
M fiber

```

The following output from WS-2822 shows that it has a S port. (Other non-FDDI ports not shown.)

```

Catalyst 2820 - Port B1 (Right Slot) Basic FDDI Settings

----- MAC and SMT Information -----
SMT version        2   Upstream neighbor    00-40-0B-3B-85-E8
MIB version        1   Station address      00-00-00-50-F0-53-C8-DF
Number of MACs     1   Downstream neighbor  00-40-0B-E0-5C-79
Non master ports   1   Optical bypass       Not present
ECM state          In   Attachment state
Wrap S

```

Based on the previous information it is now possible to populate the following table.

Device	Port Types
WS-C1100 (concentrator)	A, B and M
WS-C1400 (concentrator)	A, B and M
WS-C5505	A and B*
WS-C1201	A and B FDDI, Ethernet
WS-C2828-EN*	S port**
*Use the mod_num shown by the show port command for the show port command to get a detailed listing of the FDDI ports. show port 5	
**The C2828 only supports FDDI interfaces in slot A or slot B. Check both slots to see which has the FDDI module and what type it is.	

3. Identify the MAC Addresses in the Devices

In some cases, the MAC addresses will be the station management (SMT) addresses. In other cases, it will be the actual MAC addresses of the port. As we are not sure which type of addresses will be needed or which is which, all MAC addresses found will be recorded here.

Note: SMT is one of several parts of the FDDI standards. It is not necessary to understand what SMT is or its role in an FDDI network to finish this exercise.

The **show mac** command works on the WS-C1100, WS-C1400, and WS-C1201. Use the **show mac mod_num** command on the WS-C5505. Use the menus on the Port Configuration/Basic FDDI settings on the WS-C2820.

```
WS-C1100> sh mac
MAC SMT-Address          Curr-Path TReq      TNeg      TMax      TVX
-----
1    cisco:03:31:34      primary   15000     15000     165004    2509
    (00:40:0b:c0:8c:2c)
2    cisco:03:31:35      secondary 15000     15000     165004    2509
    (00:40:0b:c0:8c:ac)
```

WS-C1100>

```
WS-C1400> sh mac
MAC SMT-Address          Curr-Path TReq      TNeg      TMax      TVX
-----
1    cisco:07:3a:9e      primary   15000     15000     165004    2509
    (00:40:0b:e0:5c:79)
2    cisco:07:3a:9f      secondary 165000    15000     165004    2509
    (00:40:0b:e0:5c:f9)
```

WS-C1400>

WS-C5500> sh mac 5

[output deleted]

```
MAC      SMT-Address          Curr-Path TReq      TNeg      TMax      TVX
-----
5/1-2    00:06:7c:31:fd:8c primary   165000    15000     165004    2509
          00-60-3e-8c-bf-31
```

WS-C5500>

```
WS-C1201> sh mac
MAC SMT-Address          Curr-Path TReq      TNeg      TMax      TVX
-----
1    00-40-0b-3b-85-e8 primary   165000    15000     165004    2509
```

WS-C1201>

Catalyst 2820 - Port B1 (Right Slot) Basic FDDI Settings

```
----- MAC and SMT Information -----
SMT version      2    Upstream neighbor    00-40-0B-3B-85-E8
MIB version      1    Station address      00-50-F0-53-C8-DF
```

Device	Port Types	MAC Addresses
WS-C1100	A, B and M	cisco:03:31:34
		00:40:0b:c0:8c:2c
		cisco:03:31:35
		00:40:0b:c0:8c:ac
WS-C1400	A, B and M	cisco:07:3a:9e
		00:40:0b:e0:5c:79

		cisco:07:3a:9f
		00:40:0b:e0:5c:f9
WS-C5505	A and B	00:06:7c:31:fd:8c
		00-60-3e-8c-bf-31
WS-C1201	A and B FDDI, Ethernet	00-40-0b-3b-85-e8
WS-C2828-EN	S port	00-50-F0-53-C8-DF

We now have a complete list of the addresses that the devices will use to identify themselves on the FDDI ring.

4. Determine the Port-to-Port Relationships (A-B, S-M)

The **show port** command works on the WS-C1100, WS-C1400, and WS-C1201. Use the **show port mod_num** command on the WS-C5505. Use the menus on the Port Configuration/Basic FDDI settings on the WS-C2828.

The following output from WS-C1100 shows that port 1 is connected A-B, port 2 is connected B-A, and port 3 is connected M-A. The remaining ports are unused and have been omitted from this section.

```
WS-C1100> sh port
Port  Name                               Status   Req-Path  Cur-Path  Type  Neigh
----  -
1      secondary thru      A        B
2      primary  thru      B        A
3      primary  isolated M        A
```

The following output from WS-C1100 shows that port 1 is connected A-B, port 2 is connected B-A, port 3 is connected M-B, and port 4 is connected M-S. The remaining ports are unused and have been omitted from this section.

```
WS-C1400> sh port
Port  Name                               Status   Req-Path  Cur-Path  Conn-State  Type  Neigh
----  -
1/1    secondary thru      active      A        B
1/2    primary  thru      active      B        A
1/3    primary  primary  active      M        B
1/4    primary  primary  active      M        S
```

The following output from WS-C5500 shows that port 5/1 is connected A-B and port 5/2 is connected B-A.

```
WS-C5500> sh port 5/1

[output deleted]

Port  CE-State  Conn-State  Type  Neig  Con  Est  Alm  Cut  Lem-Ct  Lem-Rej-Ct  Tl-Min
----  -
5/1  thru      active      A    B    no   11  8   7    0        0  40

Last-Time-Cleared
-----
Thu Dec 30 1999, 15:54:37
WS-C5500>
```

```
WS-C5500> sh port 5/2
```

```

Port   CE-State Conn-State  Type Neig Con Est Alm Cut Lem-Ct      Lem-Rej-Ct Tl-Min
-----
5/2   thru    active     B   A   no  11  8  7          483          7 40

Last-Time-Cleared
-----
Thu Dec 30 1999, 15:54:37
WS-C5500>
```

The following output from WS-C1201 that port 1 is connected A-M and port 2 is connected B-M.

```
WS-C1201> sh port
```

```

Port   Name           Status      Curr-Path  Type  Neigh  Media
-----
1A          connecting  isolated   A      M     fiber
2B          connected   concat    B      M     fiber
```

The following output from WS-2822 shows that it has a S port connection. It doesn't show that the neighbor port is an M port. S-M is assumed in this scenario.

```
Catalyst 2820 - Port B1 (Right Slot) Basic FDDI Settings
```

```

----- MAC and SMT Information -----
SMT version          2   Upstream neighbor   00-40-0B-3B-85-E8
MIB version          1   Station address     00-00-00-50-F0-53-C8-DF
Number of MACs       1   Downstream neighbor 00-40-0B-E0-5C-79
Non master ports     1   Optical bypass      Not present
ECM state            In   Attachment state    Wrap S
```

Based on the previous information it is now possible to populate the following table.

Note: Some devices use ":" as MAC addresses while others use "-". The "-" has been used for all addresses below to enhance the readability of the table.

Device	Port Types	MAC Addresses	Ports Connected As
WS-C1100	A, B and M	cisco:03:31:34	1- A-B (thru)
		00:40:0b:c0:8c:2c	2- B-A (thru)
		cisco:03:31:35	3- M-A (isolated)
		00:40:0b:c0:8c:ac	
WS-C1400	A, B and M	cisco:07:3a:9e	1- A-B (thru)
		00:40:0b:e0:5c:79	2- B-A (thru)
		cisco:07:3a:9f	3- M-B (primary)

		00:40:0b:e0:5c:f9	4- M-S (primary)
WS-C5505	A and B	00:06:7c:31:fd:8c	1- A-B (thru)
		00-60-3e-8c-bf-31	2- B-A (thru)
WS-C1201	A and B FDDI, Ethernet	00-40-0b-3b-85-e8	1- A-M (isolated)
			2- B-M (concat)
WS-C2828	S port	00-50-F0-53-C8-DF	B1- Wrap S

Based on the previous table, we can now make some guesses as to how these devices are connected. Three devices (WS-C1100, WS-C1400, and WS-C5500) have A-B, B-A thru connections. This appears to indicate that the three devices are connected to each other in a full DAS ring. We still need to figure the order that they are connected in. This will be done in section D5 below.

WS-C1201 has A-M and B-M connections that are isolated and concatenated, respectively. This indicates a dual homed DAS in normal operation (based on the findings in section 9 above). The devices it is connected to should have M-A isolated and M-B primary connections. Given that a dual homed DAS attaches to two separate devices, we need to look in the table for two devices that have these types of connections. WS-C1100 has an isolated M-A connection on port 3 and WS-C1400 has a primary M-B connection on port 1/3. We can assume that WS-C1201 is dual homed into both WS-C1100 and WS-C1400. We learned in Section 9 on dual homed DASs that the active connection is B (port 2) and the standby connection is A (port 1). We can assume that the following is true:

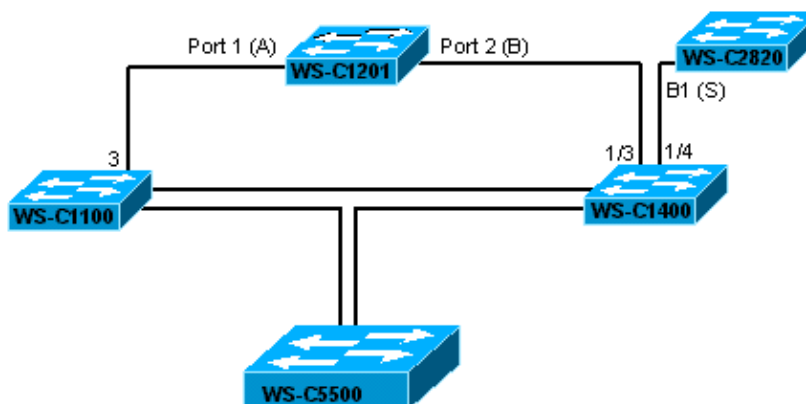
- ◆ WS-C1201 port 1:A is connected to WS-C1100 port 3:M.
- ◆ WS-C1201 port 2:B is connected to WS-C1400 port 1/3:M.

WS-C2820 is connected to a device that has an M-S connection. WS-C1400 shows a port relationship of M-S on port 1/4. We can assume that the following is true:

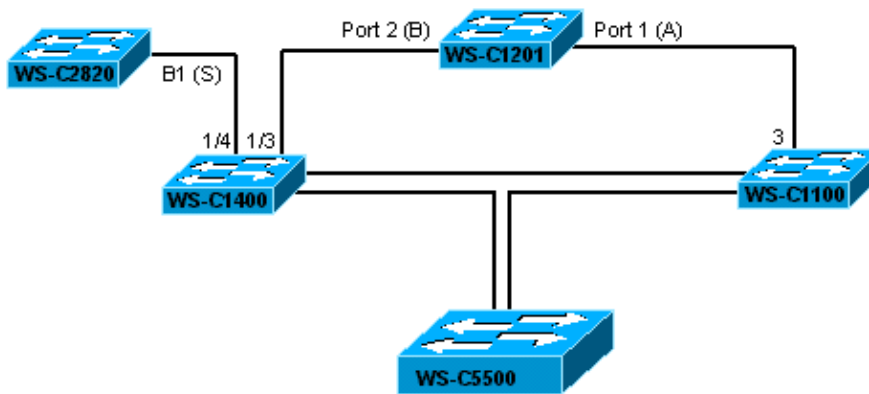
- ◆ WS-C2820 B1:S is connected to port 1/4:M of WS-C1400.

The following two figures represent the two possibilities for how this network could be connected.

Option A



Option B



There are two aspects of the topology that need to be resolved.

- The order of A–B and B–A connectivity between WS–C1100, WS–C1400, and WS–C5500. This is resolved in section D5 below.
- The actual port numbers used to connect the devices together. This is resolved in section D6 below.

5. Determine the Topology of the Network

FDDI has a concept of upstream neighbors and downstream neighbors. The neighbors are listed by either their MAC addresses and/or their SMT addresses. It is not necessary to make a distinction to fulfill this part of this exercise. By combining the information contained in the displays of the upstream and downstream neighbor information given in this section with the table completed in the previous section, all of the information necessary to determine the topology will be available.

The **show port** command works on the WS–C1100, WS–C1400, and WS–C1201. Use the **show port mod_num** command on the WS–C5505. Use the menus on the Port Configuration/Basic FDDI settings on the WS–C2828.

The following output from WS–C1100 shows the neighbors. This device reports information on both rings (primary [1] and secondary [2]) because it is active on both rings).

Note: The FDDI standard allows for devices to be active on both rings simultaneously. Devices that have this capability are able to transmit at 200MBs (100MB on each ring). WS–C1100 and WS–C1400 are active on both rings; however, they transmit only on one ring. The remaining devices in this scenario are active only on one ring at any time. This will be explained in more detail at the end of this section.

```
WS-C1100> sh mac
```

```
[output deleted]
```

	MAC	Upstream-Nbr	Downstream-Nbr	Old-Upstream-Nbr	Old-Downstream-Nbr
1	00:06:7c:31:fd:8c (00:60:3e:8c:bf:31)		cisco:dc:a1:17 (00:40:0b:3b:85:e8)	cisco:dc:a1:17 (00:40:0b:3b:85:e8)	cisco:07:3a:9e (00:40:0b:e0:5c:79)
2		cisco:07:3a:9f (00:40:0b:e0:5c:f9)	cisco:07:3a:9f (00:40:0b:e0:5c:f9)	cisco:03:31:34 (00:40:0b:c0:8c:2c)	00:06:7c:31:fd:8c (00:60:3e:8c:bf:31)

The previous output from WS–C1100 shows that there are different upstream and downstream neighbors on the primary ring (1) while the secondary ring (2) has the same device for both neighbors.

The following output from WS–C1400 shows the neighbors. This device reports information on both rings (primary [1] and secondary [2]).

```
WS-C1400> sh mac
```

```
[output deleted]
```

MAC	Upstream-Nbr	Downstream-Nbr	Old-Upstream-Nbr	Old-Downstream-Nbr
1	00:0a:0f:ca:13:fb (00:50:f0:53:c8:df)	00:06:7c:31:fd:8c (00:60:3e:8c:bf:31)	cisco:dc:a1:17 (00:40:0b:3b:85:e8)	00:06:7c:31:fd:8c (00:60:3e:8c:bf:31)
2	cisco:03:31:35 (00:40:0b:c0:8c:ac)	cisco:03:31:35 (00:40:0b:c0:8c:ac)	cisco:03:31:35 (00:40:0b:c0:8c:ac)	cisco:07:3a:9e (00:40:0b:e0:5c:79)

The previous output from WS-C1400 shows that there are different upstream and downstream neighbors on the primary ring (1) while the secondary ring (2) has the same device for both neighbors. This is explained later in this section.

The following output from WS-C5500 shows the neighbors. This device reports information on the primary ring.

```
WS-C5500> sh mac 5
```

```
[output deleted]
```

MAC	Upstream-Nbr	Downstream-Nbr	Old-Upstrm-Nbr	Old-Downstrm-Nbr
5/1-2	00:02:d0:07:3a:9e 00-40-0b-e0-5c-79	00:02:d0:03:31:34 00-40-0b-c0-8c-2c	00:02:d0:03:31:35 00-40-0b-c0-8c-ac	00:02:d0:dc:a1:17 00-40-0b-3b-85-e8

The following output from WS-C1201 shows the neighbors. This device reports information on the primary ring.

```
WS-C1201> sh mac
```

```
[output deleted]
```

MAC	SMT-Address	Curr-Path	TReq	TNeg	TMax	TVX
1	00-40-0b-3b-85-e8	primary	165000	15000	165004	2509

MAC	Upstream-Nbr	Downstream-Nbr	Old-Upstream-Nbr	Old-Downstream-Nbr
1	00-40-0b-c0-8c-2c	00-50-f0-53-c8-df	00-60-3e-8c-bf-31	00-40-0b-e0-5c-79

The following output from WS-C2820 shows the neighbors. This device reports information on the primary ring.

```
Catalyst 2820 - Port B1 (Right Slot) Basic FDDI Settings
```

```
----- MAC and SMT Information -----  
SMT version          2   Upstream neighbor    00-40-0B-3B-85-E8  
MIB version          1   Station address      00-00-00-50-F0-53-C8-DF  
Number of MACs       1   Downstream neighbor  00-40-0B-E0-5C-79  
Non master ports     1   Optical bypass       Not present  
ECM state             In   Attachment state     Wrap S
```

Based on the previous information, it is now possible to populate the following table. At this point in the exercise, it doesn't matter what order the devices in the table are in. A random ordering will suffice.

Note: Some devices use ":" as MAC addresses while others use "-". The "-" has been used for all addresses below to enhance the readability of the table.

Note: Not all devices are active on both rings at the same time. In this scenario, only WS-C1100 and WS-C1400 participate actively on both rings.

Ring	Port	Downstream	WS-C1100 Addresses	Upstream
P	1	cisco-dc-a1-17 00-40-0b-3b-85-e8	cisco-03-31-34 00-40-0b-c0-8c-2c	00-06-7c-31-fd-8c 00-60-3e-8c-bf-31
S	2	cisco-07-3a-9f 00-40-0b-e0-5c-f9	cisco-03-31-35 00-40-0b-c0-8c-ac	cisco-07-3a-9f 00-40-0b-e0-5c-f9

Ring	Port	Downstream	WS-C1100 Addresses	Upstream
P	1	00-06-7c-31-fd-8c 00-60-3e-8c-bf-31	cisco-07-3a-9e 00-40-0b-e0-5c-79	00-0a-0f-ca-13-fb 00-50-f0-53-c8-df
S	2	cisco-03-31-35 00-40-0b-c0-8c-ac	cisco-07-3a-9f 00-40-0b-e0-5c-f9	cisco-03-31-35 00-40-0b-c0-8c-ac

Ring	Port	Downstream	WS-C1100 Addresses	Upstream
P	1	00-02-d0-03-31-34 00-40-0b-c0-8c-2c	00-06-7c-31-fd-8c 00-60-3e-8c-bf-31	00-02-d0-07-3a-9e 00-40-0b-e0-5c-79

Ring	Port	Downstream	WS-C1100 Addresses	Upstream
P	1	00-50-f0-53-c8-df	00-40-0b-3b-85-e8	00-40-0b-c0-8c-2c

Ring	Port	Downstream	WS-C1100 Addresses	Upstream
P	B1	00-40-0b-e0-5c-79	00-50-f0-53-c8-df	00-40-0b-3b-85-e8

Based on the previous table, it is now possible to populate the following table by substituting the MAC addresses for system names. The two rings have been placed in separate tables.

Downstream	This device	Upstream
WS-C1201	WS-C1100	WS-C5500

Downstream	This device	Upstream
WS-C5500	WS-C1400	WS-C2820

Downstream	This device	Upstream
WS-C1100	WS-C5500	WS-C1400

Downstream	This device	Upstream

WS-C2820	WS-C1201	WS-C1100
----------	----------	----------

Downstream	This device	Upstream
WS-C1400	WS-C2820	WS-C1201

Note: The primary ring flows in a counterclockwise direction.

In order to get the devices in the table in the correct order, you can start with any device. In this case, we start with WS-C1100. By placing the up and downstream neighbors in order within the table, we achieve the following result.

The primary ring appears to flow in the following manner:

Downstream	This device	Upstream
WS-C1201	WS-C1100	WS-C5500

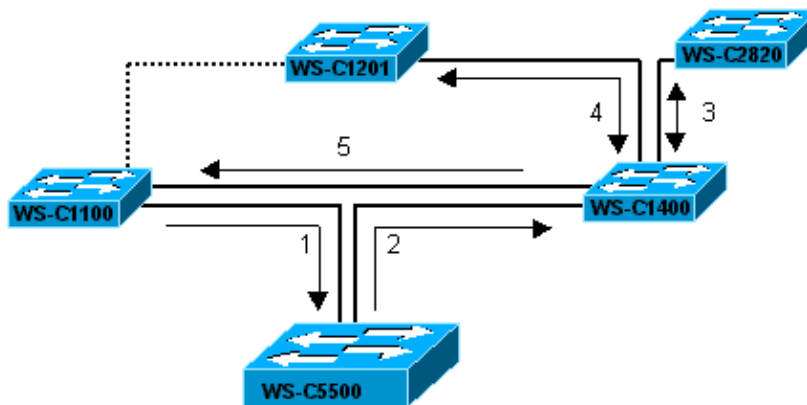
Downstream	This device	Upstream
WS-C1100	WS-C5500	WS-C1400

Downstream	This device	Upstream
WS-C5500	WS-C1400	WS-C2820

Downstream	This device	Upstream
WS-C1400	WS-C2820	WS-C1201

Downstream	This device	Upstream
WS-C2820	WS-C1201	WS-C1100

This results in the following picture.



Each device is only counted once in the path. Even though the primary path flows into WS-C1400 to WS-C2820 and back to WS-C1400 before proceeding to WS-C1201, the second hop through WS-C1400 is ignored.

The same is true for the path to WS-C1201. The fact that two M ports on WS-C1400 exist between

WS-C1201 and WS-C2820 is ignored. WS-C2820 sees WS-C1201 as its upstream neighbor and WS-C1201 sees WS-C2820 as its downstream neighbor.

The same logic applies to WS-C1201's indicating that its upstream neighbor is WS-C1100 and not WS-C1400.

The secondary ring flows in the following manner:

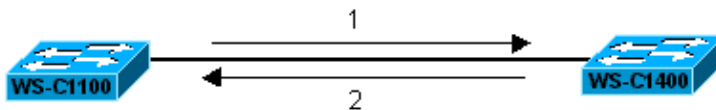
Note: The secondary ring flows in a clockwise direction.

Note: The two steps of substituting the MAC addresses for device names and the reordering of the table have been combined in this section.

Downstream	This device	Upstream
WS-C1400	WS-C1100	WS-C1400

Downstream	This device	Upstream
WS-C1100	WS-C1400	WS-C1100

This results in the following picture. The secondary ring only flows between WS-C1100 and WS-C1400.



6. Determine Which Ports are Physically Connected Between the Devices

The final step in determining the topology of the network is to establish which ports are connected between the devices.

We established the following in section D4:

- ◆ WS-C1201 port 1:A is connected to WS-C1100 port 3:M.
- ◆ WS-C1201 port 2:B is connected to WS-C1400 port 1/3:M.
- ◆ WS-C2820 B1:S is connected to port 1/4:M of WS-C1400.

These relationships are assumed to be correct based on the information available. We were able to make these assumptions because this is a simple network with only one dual homed DAS and one SAS. If there had been more of either of these devices, a visual inspection would have been required.

If performing a visual inspection is not possible, the network administrator is left with having to disable a port on one device and then searching for the other end of the connection by determining what port on another device changed state.

We established in section D5 that the order of devices on the primary path is:

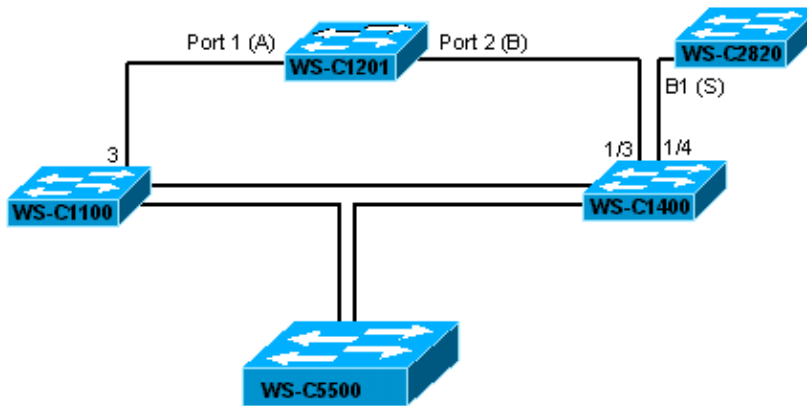
- a. WS-C1100
- b. WS-C5500
- c. WS-C1400
- d. WS-C2820
- e. WS-C1201

We established in section D5 that the order of devices on the secondary path is:

a. WS-C1100

b. WS-C1400

The following figure summarizes what has been learned in sections D4 and D5 above.



We now need to establish the A–B and B–A relationships between WS–C1100, WS–C1400, and WS–C5500 so that we can put the appropriate port numbers into the figure. Ideally this would be done by visual inspection. We will assume that a physical inspection is not possible and resort to disabling a port on WS–C1100 and the checking to see whether a port changed state on WS–C5500 or WS–C1400.

First we need to note the current state of the A and B ports .

```
WS-C1100> sh port
Port  Name                Status      Req-Path  Cur-Path  Type  Neigh
-----
1      1                        connected  secondary thru      A    B
2      2                        connected  primary  thru      B    A

WS-C1400> sh port
Port  Name                Status      Req-Path  Cur-Path  Conn-State  Type  Neigh
-----
1/1   1/1                  ok          secondary thru      active      A    B
1/2   1/2                  ok          primary  thru      active      B    A

WS-C5500> sh port 5/1

Port  CE-State  Conn-State  Type  Neig  Con  Est  Alm  Cut  Lem-Ct  Lem-Rej-Ct  Tl-Min
-----
5/1   thru     active     A    B    no   11   8   7    0        0  40

WS-C5500> sh port 5/2

Port  CE-State  Conn-State  Type  Neig  Con  Est  Alm  Cut  Lem-Ct  Lem-Rej-Ct  Tl-Min
-----
5/2   thru     active     B    A    no   11   8   7    483      7  40
```

Now we will disable port 1 on WS–C1100.

```
WS-C1100> (enable) set port 1 disable
Port 1 disabled.
WS-C1100> (enable)
```

Now we will see if a port on WS–C1400 changed state.

```
WS-C1400> sh port
```

Port	Name	Status	Req-Path	Cur-Path	Conn-State	Type	Neigh
1/1		ok	secondary	thru	active	A	B
1/2		ok	primary	thru	active	B	A

These ports have not changed state. If our previous drawing of the network is correct, one of the ports on WS-C5500 should have changed state.

```
WS-C5500> sh port 5/1
```

Port	CE-State	Conn-State	Type	Neig	Con	Est	Alm	Cut	Lem-Ct	Lem-Rej-Ct	Tl-Min
5/1	concat	active	A	B	no	12	8	7	0	0	40

Port 5/1 has changed state from **thru** to **concat**. We know from our previous exercise on dual homed DASs that this port has wrapped the ring. We now know that port 1 (A) on WS-C1100 is connected to port 5/2 (B) of WS-C5500. The following output from WS-C5500 confirms this.

```
WS-C5500> sh port 5/2
```

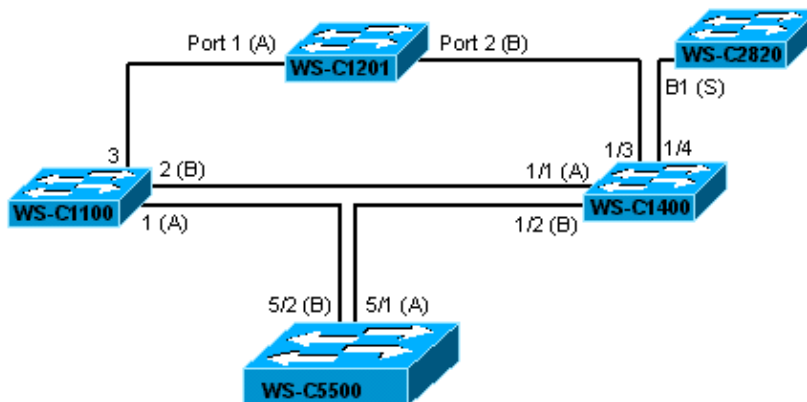
Port	CE-State	Conn-State	Type	Neig	Con	Est	Alm	Cut	Lem-Ct	Lem-Rej-Ct	Tl-Min
5/2	isolated	connecting	B	A	no	12	8	7	483	7	40

We can now establish the remaining relationships because every connection has to be either A-B or B-A.

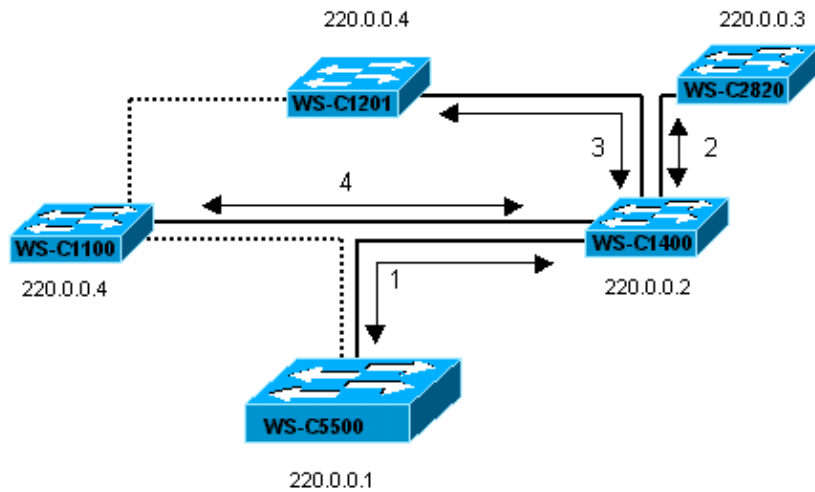
If P1 (A) of WS-C1100 goes to P5/2 (B) on WS-C5500 and the remainder of our network diagram is correct then:

- ◆ P5/1 (A) of WS-C5500 must go to P 1/2 (B) of WS-C1400
- ◆ P 1/1 (A) of WS-C1400 must go to P 2 (B) of WS-C1100

This is shown in the following figure.



As a final test that the ring is still operational, even though port 1 on WS-C1100 is disabled, we will ping all five devices from WS-C5500. The IP addresses are shown in the figure below. The primary path is shown by the arrows. The secondary path no longer exists as it has been merged with the primary path.



```

WS-C5500> (enable) ping 220.0.0.1 220.0.0.1 is alive
WS-C5500> (enable) ping 220.0.0.2 220.0.0.2 is alive
WS-C5500> (enable) ping 220.0.0.3 220.0.0.3 is alive
WS-C5500> (enable) ping 220.0.0.4 220.0.0.4 is alive
WS-C5500> (enable) ping 220.0.0.5 220.0.0.5 is alive
WS-C5500> (enable)

```

This completes the exercise of reverse engineering a FDDI network topology.

Related Information

- [Internetworking Technology Overview: FDDI](#)
- [Troubleshooting Fiber Distributed Data Interface](#)
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