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Cisco Intelligent Gigabit Ethernet Switch

Objectives

BladeCenter™ Technical Training

- Present the system architecture, configuration and troubleshooting of the Cisco IGESM
- Demonstrate the interaction between the CIGESM and IBM BladeCenter Management Module
- Obtain hands-on experience of the switch setup and feature configuration

CIGESM Agenda Overview

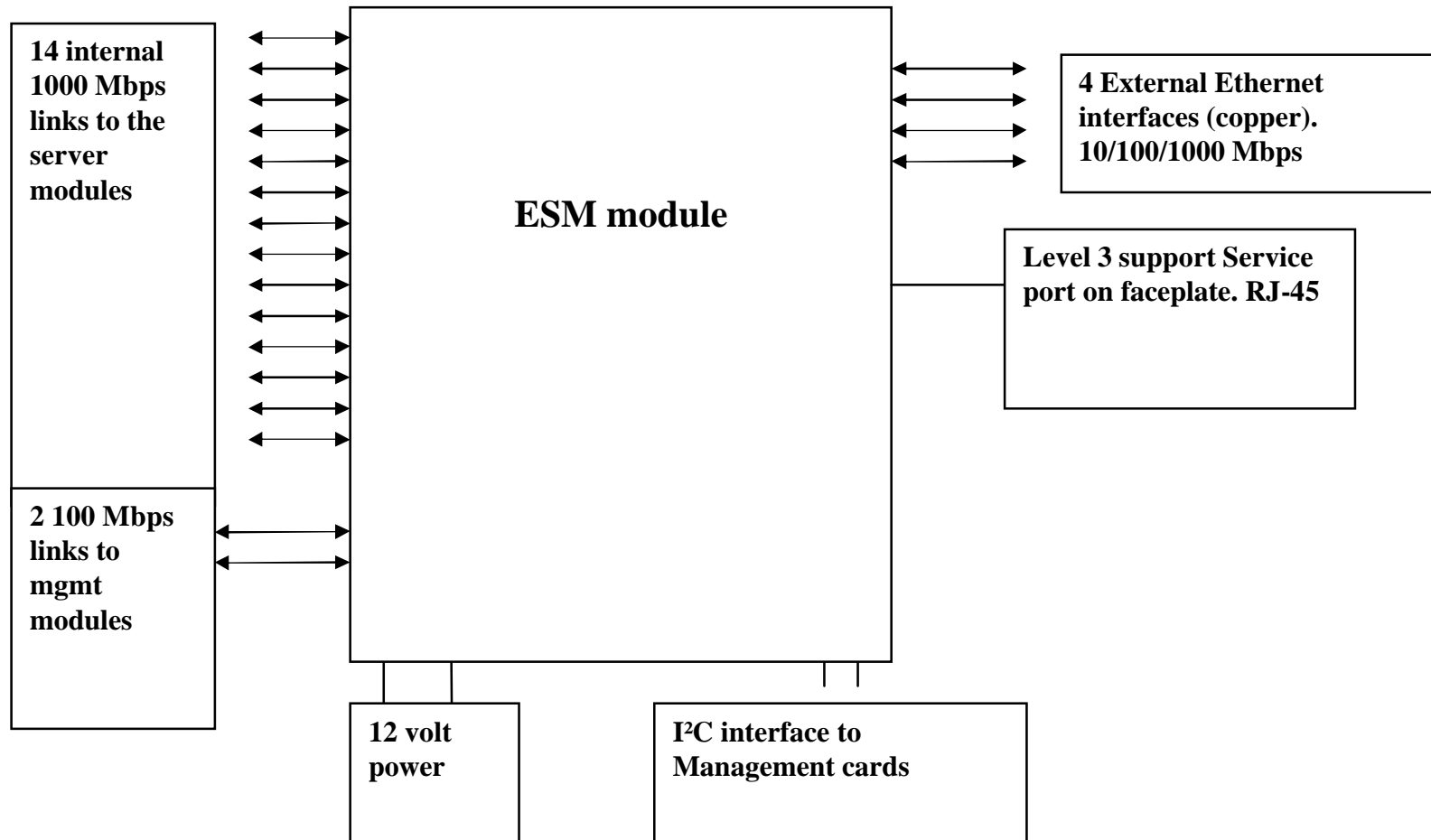
BladeCenter™ Technical Training

- Introduction
- System Overview
- Management Module/CMS Interaction
- Managing CIGESM
- Feature Configuration
- Serial Over LAN
- Troubleshooting
- Summary



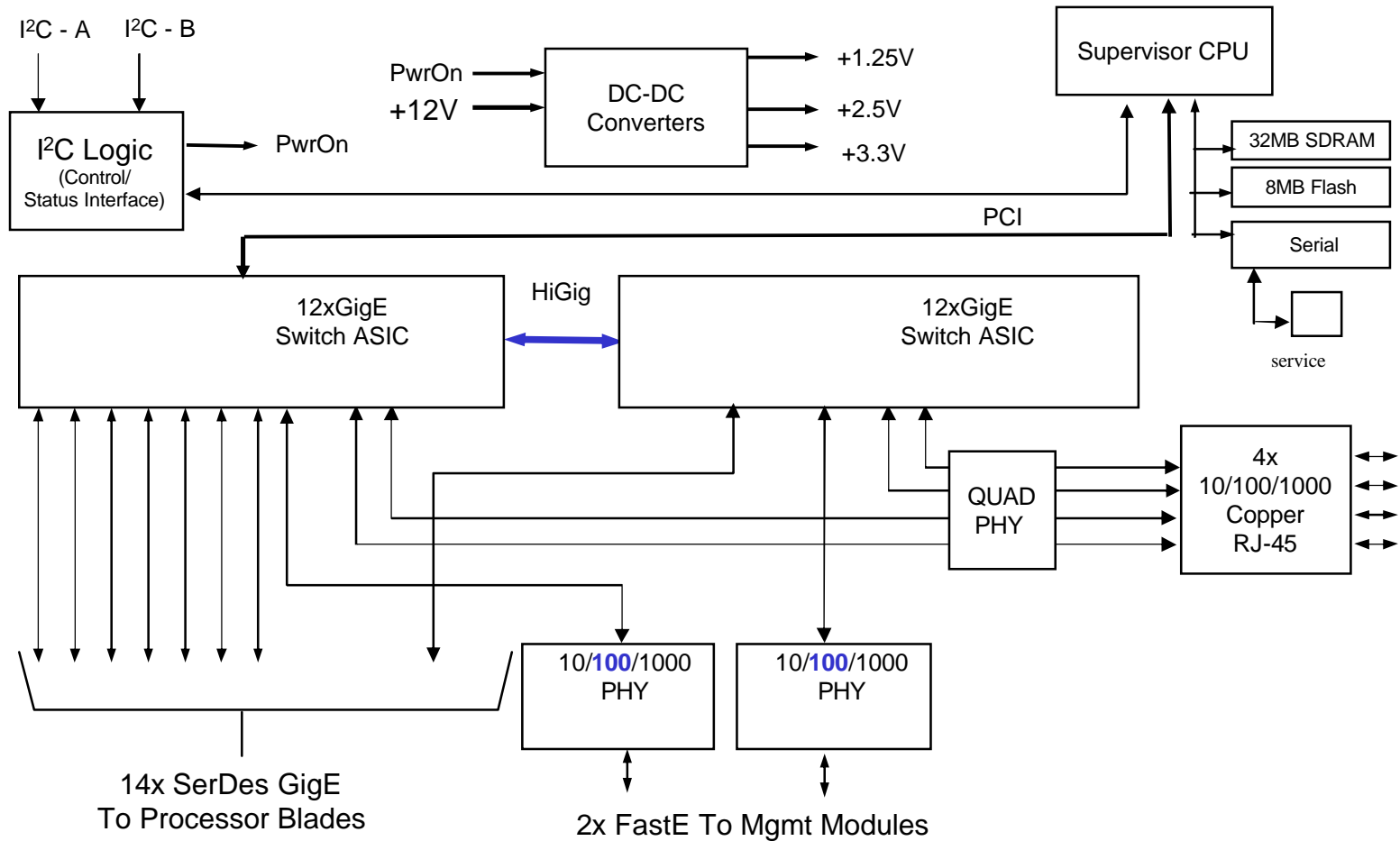
Cisco Intelligent Gigabit Ethernet Switch Module (CIGESM) Overview

BladeCenter™ Technical Training



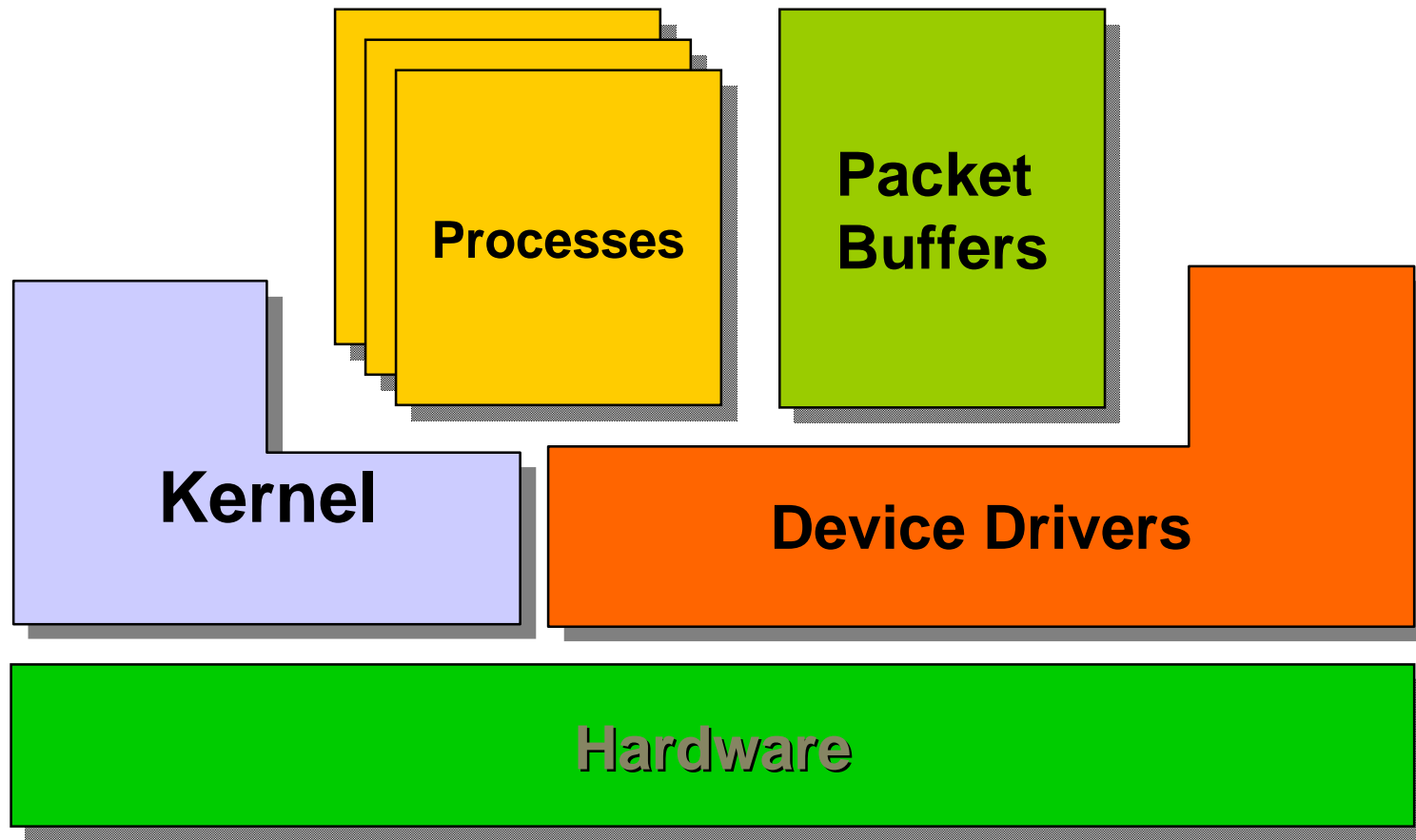
HW Block Diagram

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SW Block Diagram

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Partial Software Feature List

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- 4K VLAN ID range
- 250 active VLANs
- 8K MAC addresses
- Port monitoring
- Trunking
 - IEEE 802.1Q
 - VTP
 - DTP
 - VTP Pruning
- Security
 - Port security
 - IEEE 802.1x
 - RADIUS/TACACS+
 - Secure Shell
 - BPDU Guard
- QoS
 - 4 Priority Queues
 - IEEE 802.1p priority
 - Weighted Round Robin
 - Strict Priority Scheduling
 - Unicast/Multicast/Broadcast Storm Control
 - Voice VLAN
- IP Multicast
 - IGMP snooping
 - MVR
- Link Aggregation
 - LACP (802.3ad)
 - PAgP
- Spanning Tree
 - IEEE 802.1D
 - IEEE 802.1w (RSTP)
 - IEEE 802.1s (MSTP)
 - PVST/PVST+/PVRST+
 - Port fast
 - Uplink fast
 - Root guard
 - Backbone fast
- Manageability
 - CDP
 - NTP
 - SNMP v1, v2, v3

Bootup sequence

1. Management module validates the switch module. Instructs switch to bootup.
2. Switch executes bootloader out of reserved section in FLASH
3. Bootloader runs diagnostics/POST on CPU cache, DRAM (every time), and Flash
4. Bootloader loads IOS image from FLASH to DRAM and turns control over to IOS
5. IOS starts basic kernel and platform initialization
6. IOS performs POST tests on switching Hardware
7. IOS processes configuration file, updates information in VPD, and signals POST complete to Management Module
8. Management module reads VPD to get IP Address and POST status

CIGESM POST Failure Code

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Sub-Test Name	Diagnostic Indicator (in Hex)	Failing Functional Area	Failure Criticality
CPU Cache memory	0x01	Base Internal Functions	Critical
Non-Cache DRAM	0x02	Base Internal Functions	Critical
Internal ASIC packet memory	0x03-0x04	Base Internal Functions	Critical
ASIC PCI memory	0x05-0x06	Base Internal Functions	Critical
data path test: mgmt ports	0x07-0x08	Base Internal Functions	Critical
VPD region read test	0x09	Base Internal Functions	Critical
Flash Memory in Extended Post	0x0A	Base Internal Functions	Critical
Flash Memory in regular POST	0x0B	Base Internal Functions	Critical
Data path test: Internal GE ports	0x81-0x8E	Internal Interface Failure	Non-Critical
Data path test: External ports	0xA1- 0xA8	External Interface Failure	Non-Critical

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Cisco Intelligent Gigabit Ethernet Switch

Management Module/CMS Interaction

BladeCenter Management Module

Bay 1: WMN315804544

- ▼ Monitors
 - ⚠ System Status
 - Event Log**
 - LEDs
 - Hardware VPD
 - Firmware VPD
- ▼ Blade Tasks
 - Power/Restart
 - On Demand
 - Remote Control
 - Firmware Update
 - Configuration
 - Serial Over LAN
- ▼ I/O Module Tasks
 - Power/Restart
 - Management
 - Firmware Update
- ▼ MM Control
 - General Settings
 - Login Profiles
 - Alerts
 - Port Assignments
 - Network Interfaces
 - Network Protocols
 - Security
 - Configuration File
 - Firmware Update

Event Log ?

Monitor log state events

Severity	Source	Date	
E	Error	SERVPROC	03/22/04
W	Warning		
I	Info		

Note: Hold down Ctrl to select more than one option.
 Hold down Shift to select a range of options.

Filters: None

Index	Sev	Source	Date/Time	Text
1	I	SERVPROC	03/22/04, 16:56:45	User USERID attempting to restart switch module in bay 3.
2	I	SERVPROC	03/22/04, 16:56:45	I/O module 3 was powered on.
3	I	SERVPROC	03/22/04, 16:56:43	I/O module 3 was powered off.
4	I	SERVPROC	03/22/04, 16:56:31	System log cleared.
End of Log.				

Results of Power-on Self Test

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BladeCenter Management Module

Bay 1: WMN315804544

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 - Network Interfaces
 - Network Protocols
 - Security
 - Configuration File
 - Firmware Update

I/O Modules ?

Bay	Status	Type*	MAC Address	IP Address	Pwr	POST Status
1	●	Ethernet SM	00:05:5D:71:87:70	192.168.70.51	On	POST results available: FF: Module completed POST
2	●	Ethernet SM	00:09:97:ED:03:00	192.168.70.52	On	POST results available: FF: Module completed POST
3	●	Ethernet SM	00:0D:ED:46:B9:00	192.168.70.53	On	POST results available: FF: Module completed POST
4	●	Ethernet SM	00:0C:F8:2A:05:00	192.168.70.54	On	POST results available: FF: Module completed POST

* SM = Switch Module, CM = Concentrator Module, PM = Pass-thru Module



Management Modules ?

Click the icon in the Status column for details about the primary management module.

Bay	Status	IP Address (external n/w interface)	Primary
1	●	192.168.70.125	X
2		No MM present	

Power Modules ?

Bay	Status	Details
1	●	Power module status OK
2	●	Power module status OK
3	●	Power module status OK


BladeCenter Management Module


Bay 1: WMN315804544

- ▼ Monitors
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 - Firmware VPD
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- ▼ MM Control
 - General Settings
 - Login Profiles
 - Alerts
 - Port Assignments
 - Network Interfaces
 - Network Protocols
 - Security
 - Configuration File
 - Firmware Update

Event Log ?



Monitor log state events

Severity	Source	Date		
E	Error	BLADE_01	03/19/04	<input type="button" value="Filter"/> <input type="button" value="Disable Filter"/>
W	Warning	BLADE_02	03/18/04	
I	Info	BLADE_03	03/17/04	

Note: Hold down Ctrl to select more than one option.
Hold down Shift to select a range of options.

Filters: None

Index	Sev	Source	Date/Time	Text
1	I	SERVPROC	03/19/04, 11:28:16	I/O module 3 was powered on.
2	I	SERVPROC	03/19/04, 11:28:10	Recovery I/O module 3 Fault
3	E	SERVPROC	03/19/04, 11:28:09	I/O module 3 Fault
4	I	SERVPROC	03/19/04, 11:28:07	I/O module 3 was installed.
5	I	SERVPROC	03/19/04, 11:27:12	I/O module 3 was removed.
6	I	SERVPROC	03/19/04, 11:25:08	SM-3 POST has completed due to a unsolicited reset
7	I	SERVPROC	03/19/04, 11:17:01	SM-3 POST has completed due to a unsolicited reset
8	I	SERVPROC	03/19/04, 11:05:29	SM-3 POST has completed due to a unsolicited reset
9	I	SERVPROC	03/19/04, 10:43:32	Remote Login Successful. Login ID: 'USERID' from WEB browser at IP@=192.168.70.44'
10	I	SERVPROC	03/19/04, 10:42:01	I/O module 3 was powered on.


BladeCenter Management Module


Bay 1: WMN315804544

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System Status Summary ?

⚠ One or more monitored parameters are abnormal.

Warnings and System Events

- Chassis Running Nonredundant I/O Modules
- I/O module 3 POST Timeout.

The following links can be used to view the status of different components.

- [Blade Servers](#)
- [I/O Modules](#)
- [Management Modules](#)
- [Power Modules](#)
- [Blowers](#)
- [Front Panel](#)

Blade Servers ?

Click the icon in the Status column to view detailed information about each blade server.

Bay	Status	Name	Pwr	Owner**		Network		WOL*	Local Control			BSE†
				KVM	MT*	Onboard	Card		Pwr	KVM	MT*	
1	●	SN#ZJ1TS73CE17E	On			Eth	--- ---	On	X	X	X	
2	●	SN#ZJ1TS73CK1DW	On			Eth	--- ---	On	X	X	X	

The screenshot displays the BladeCenter Management Module interface. On the left is a navigation sidebar with categories like Monitors, Blade Tasks, I/O Module Tasks, and MM Control. The main content area is divided into three sections: I/O Modules, Management Modules, and Power Modules.

I/O Modules

Bay	Status	Type*	MAC Address	IP Address	Pwr	POST Status
1	●	Ethernet SM	00:05:5D:71:87:70	192.168.70.51	On	POST results available: FF: Module completed POST
2	●	Ethernet SM	00:09:97:ED:03:00	192.168.70.52	On	POST results available: FF: Module completed POST
3	▲	Ethernet SM	00:0D:ED:46:B9:00	192.168.70.53	On	POST results not complete: 0B
4	●	Ethernet SM	00:0C:F8:2A:05:00	192.168.70.54	On	POST results available: FF: Module completed POST

* SM = Switch Module, CM = Concentrator Module, PM = Pass-thru Module

Management Modules

Click the icon in the Status column for details about the primary management module.

Bay	Status	IP Address (external n/w interface)	Primary
1	●	192.168.70.125	X
2		No MM present	

Power Modules

Bay	Status	Details
1	●	Power module status OK
2	●	Power module status OK
3	●	Power module status OK

CIGESM POST Failure Code

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Sub-Test Name	Diagnostic Indicator (in Hex)	Failing Functional Area	Failure Criticality
CPU Cache memory	0x01	Base Internal Functions	Critical
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data path test: mgmt ports	0x07-0x08	Base Internal Functions	Critical
VPD region read test	0x09	Base Internal Functions	Critical
Flash Memory in Extended Post	0x0A	Base Internal Functions	Critical
Flash Memory in regular POST	0x0B	Base Internal Functions	Critical
Data path test: Internal GE ports	0x81-0x8E	Internal Interface Failure	Non-Critical
Data path test: External ports	0xA1- 0xA8	External Interface Failure	Non-Critical

The screenshot displays the BladeCenter Management Module web interface. The top navigation bar includes the IBM logo, the title "BladeCenter Management Module", and the @server logo. A left-hand navigation menu is visible, listing various system management tasks such as Monitors, Blade Tasks, I/O Module Tasks, and MM Control. The main content area is divided into sections for "Bay 3 (Ethernet SM)" and "Bay 4 (Ethernet SM)".

Bay 3 (Ethernet SM) Configuration:

- Current IP Configuration:**
 - Configuration method: Static
 - IP address: 192.168.70.53
 - Subnet mask: 255.255.255.0
 - Gateway address: 192.168.70.126
- New Static IP Configuration:**
 - Status: Enabled
 - Instruction: *To change the IP configuration for this switch module, fill in the following fields and click "Save". This will save and enable the new IP configuration.*
 - IP address:
 - Subnet mask:
 - Gateway address:
- [Advanced Management](#)
-

Bay 4 (Ethernet SM) Configuration:

- Current IP Configuration:**
 - Configuration method: Static
 - IP address: 192.168.70.54

The screenshot displays the BladeCenter Management Module web interface. The left sidebar contains a navigation menu with categories like Monitors, Blade Tasks, I/O Module Tasks, and MM Control. The main content area is titled "Advanced Management for I/O Module 3" and includes links for POST Results, Advanced Setup, Restore Factory Defaults, Send Ping Requests, and Start Telnet/Web Session. Below these links, the "POST Results" section shows a successful message: "POST results available: FF: Module completed POST successfully." The "Advanced Setup" section contains four configuration items, each with a dropdown menu set to "Enabled":

Configuration Item	Value
Fast POST	Enabled
External ports	Enabled
External management over all ports	Enabled
Preserve new IP configuration on all resets	Enabled

At the bottom right of the configuration area, there are "Cancel" and "Save" buttons.

Different Restart Options

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Case	Reset Initiator	Preserve new IP Config	Restore Factory Default ^[1]		Resulting GbESM IP Configuration	IP Comm between MM and GbESM
			MM	Sw		
1	MM	Disabled	Yes	n/a	Factory setting ^[2] : 10.90.90.9x, etc. ^[3]	Possibly ⁴
2	MM	Enabled	Yes	n/a	New Static IP Configuration ^[5]	Available
3	MM	Disabled	No	n/a	New Static IP Configuration	Available
4	MM	Enabled	No	n/a	New Static IP Configuration	Available
5	GbESM	Disabled	n/a	Yes	Factory setting: 10.90.90.9x, etc.	Possibly
6	GbESM	Enabled	n/a	Yes	New Static IP Configuration	Available
7	GbESM	Disabled	n/a	No	Current IP Configuration ^[6]	Disabled ^[7]
8	GbESM	Enabled	n/a	No	New Static IP Configuration	Available

Management Module Firmware Update

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- A Management Module firmware update reloads the current IP address
- This means that if the customer has set his own IP address in his switch and is managing it externally, the customer loses connection with the switch
- The customer must reconfigure the IP address on each affected switch

Firmware Versions

The screenshot displays the BladeCenter Management Module interface. On the left is a navigation menu with categories like Monitors, Blade Tasks, I/O Module Tasks, and MM Control. The main area shows a table of system components and their firmware details. Below this, there are two sections: 'I/O Module Firmware VPD' and 'Management Module Firmware VPD'. A red oval highlights the first two rows of the I/O Module Firmware VPD table.

Bay	Type	Firmware Type	Build ID	Released	Revision
1	Ethernet SM	Boot ROM	BRCSMB12.1	03/08/2004	14AY
		Main Application 1	BRCSM112.1	03/08/2004	14AY
2	Ethernet SM	Boot ROM	WM01000	03/09/2004	2001
		Main Application 1	WM01000	03/09/2004	2001
		Main Application 2	WM00020	02/27/2004	2001

BladeCenter Management Module

Bay 1: WMN315804544

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 - Network Protocols
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 - Configuration File
 - Firmware Update

Advanced Management for I/O Module 3

Use the following links to jump down to different sections on this page.

- [POST Results](#)
- [Advanced Setup](#)
- [Restore Factory Defaults](#)
- [Send Ping Requests](#)
- [Start Telnet/Web Session](#)

POST Results

POST results available: FF: Module completed POST successfully.

Advanced Setup

Fast POST	Enabled
External ports	Enabled
External management over all ports	Enabled
Preserve new IP configuration on all resets	Enabled

Cancel Save

Starting a Web Session from the Management Module

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The screenshot displays the BladeCenter Management Module interface. On the left is a navigation tree with categories like Monitors, Blade Tasks, I/O Module Tasks, and MM Control. The 'Management' option under I/O Module Tasks is selected. The main content area shows three sections:

- Restore Factory Defaults**: A warning that all settings will be reset to factory defaults, with a note that configuration changes will be lost. A 'Restore Defaults' button is available.
- Send Ping Requests**: A section for testing the internal path between the management and switch modules. A 'Ping Switch Module' button is available.
- Start Telnet/Web Session**: A section for starting a telnet or web session. A note states that a Java 1.4 Plug-in is required for the telnet session. 'Start Telnet Session' and 'Start Web Session' buttons are available.

Close Window

Toolkit: Roll over tools below

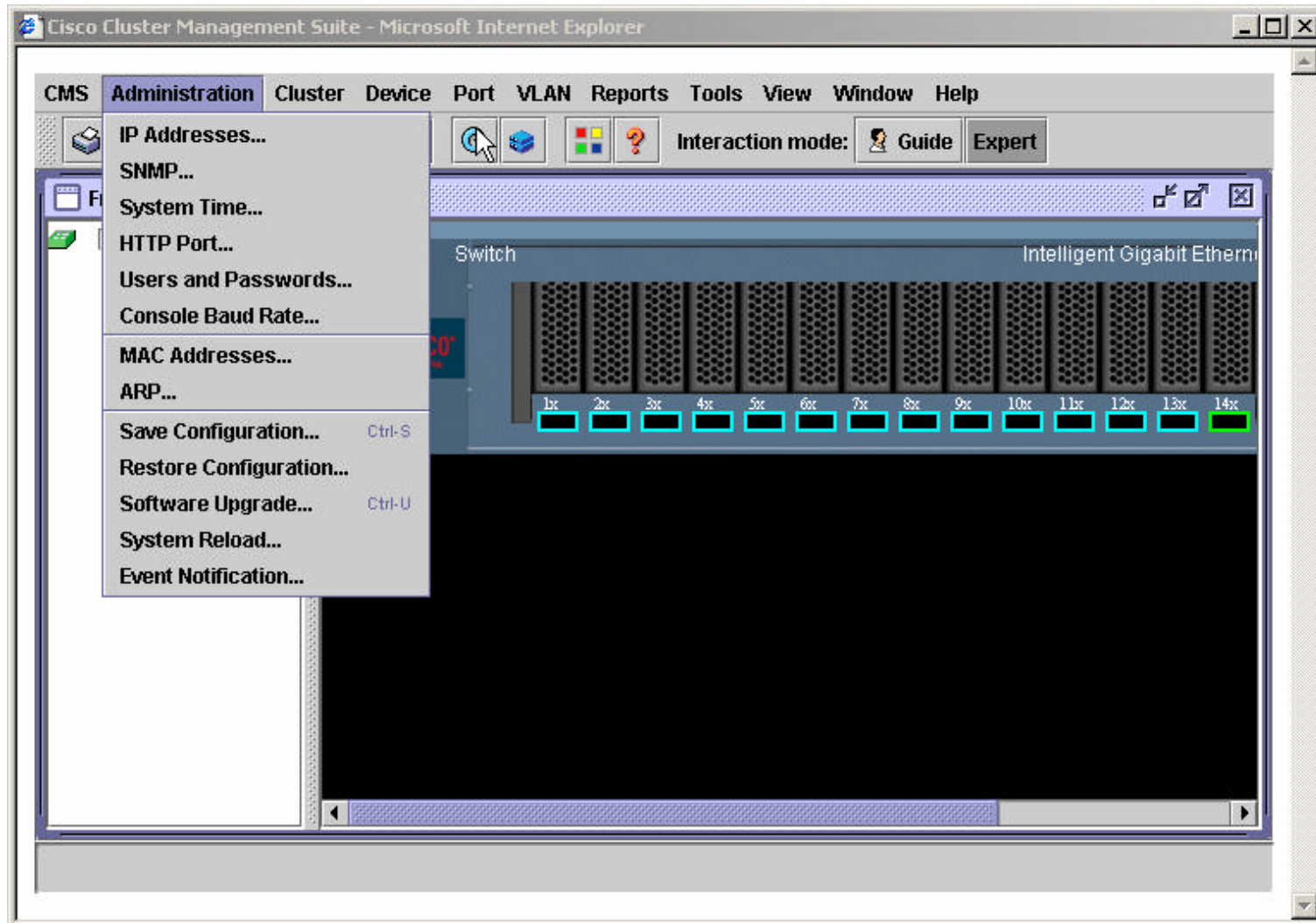
Cisco OS-CIGESM-18

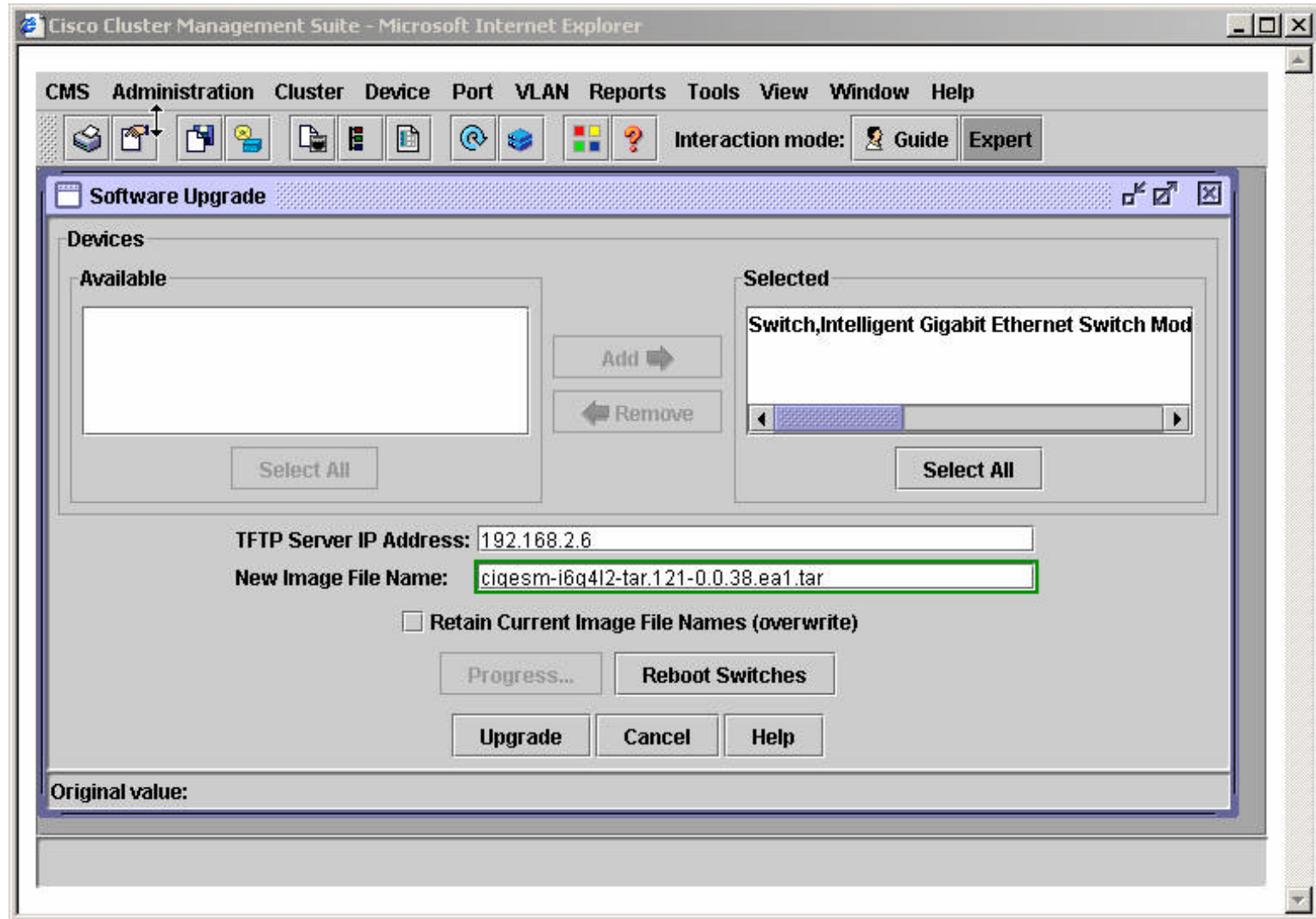
HOME	<div style="background-color: #f0f0f0; padding: 5px; margin-bottom: 5px;">Home: Summary Status</div> <div style="background-color: #f0f0f0; padding: 5px; margin-bottom: 5px;">Network Identity</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">IP Address</td> <td>192.168.2.51</td> </tr> <tr> <td>MAC Address</td> <td>00:0E:D7:ED:F5:80</td> </tr> </table> <div style="background-color: #f0f0f0; padding: 5px; margin-bottom: 5px;">System Details</div> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 30%;">Host Name</td> <td>Switch</td> </tr> <tr> <td>System Uptime</td> <td>20 minutes</td> </tr> <tr> <td>Serial Number</td> <td>FHH0805W00R</td> </tr> <tr> <td>Software Version</td> <td>12.1(0.0.42)AY</td> </tr> <tr> <td>System Contact</td> <td></td> </tr> <tr> <td>System Location</td> <td></td> </tr> </table>	IP Address	192.168.2.51	MAC Address	00:0E:D7:ED:F5:80	Host Name	Switch	System Uptime	20 minutes	Serial Number	FHH0805W00R	Software Version	12.1(0.0.42)AY	System Contact		System Location	
IP Address		192.168.2.51															
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| CLUSTER MANAGEMENT SUITE |
| TOOLS |
| HELP RESOURCES |
Close Window
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Software Upgrade – Web Interface

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Managing CIGESM

IOS mode

Mode	Functions	Prompt	How to get to
User	Limited privilege	Switch>	Telnet or service port
Privilege (Enable)	Super user power	Switch#	Enter Enable from User mode
Global configuration	Make global changes or the change has system-wide impact	Switch(config)#	Enter config terminal from privilege mode
Interface configuration	Set up interface specific config	Switch(config-if)#	Enter interface_name from global config mode
VLAN configuration	New way to configure VLAN	Switch(config-vlan)#	Enter vlan # from global config mode
VLAN database	Old way to configure VLAN	Switch(vlan)#	Enter vlan database from privilege mode
Bootloader	Set boot environment	Switch:	POST failure

- Inspect the CIGESM
 - check software version, system uptime

```
switch# show version
```

- check system health

```
switch# show process cpu
```

```
switch# show memory summary
```

- check system configuration

```
switch# show running-config
```

- Inspect the CIGESM
 - check port status

```
switch# show interface status
```

- check system history

```
switch# show log
```

- check platform specific information

```
switch# show platform summary
```

Managing CIGESM

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- change hostname

```
switch(config)# hostname NAME
```

- set up system time and date manually

```
switch# clock set HH:MM:SS Day Month Year
```

```
switch# show clock
```

- enable/disable message display to the screen

```
switch# terminal monitor
```

```
switch# terminal no monitor
```

- Default user login name and password

```
switch# show running-config
Building configuration...

Current configuration : 5545 bytes
!
version 12.1
no service password-encryption
!
username USERID privilege 15 secret 5 $1$wHcM$k2V7ULW2HsnsExS6JSd3a/
!
```

- login: **USERID** password: **PASSWORD** (note the zero)
- Same as the defaults used for management module
- Used to authenticate Telnet, CMS
- Used in case you need to recover a switch

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Software Upgrade

Software Upgrade

BladeCenter™ Technical Training

- Only **IOS** needs to be upgraded
- Regular IOS image vs. crypto image (no upgrade procedural difference)
 - Regular image: **cigesm-i6q4l2-mz.121-0.0.42.AY.bin**
 - Crypto image: **cigesm-i6k2l2q4-mz.121-0.0.42.AY.bin**
- Binary file vs. TAR file (copy vs. archive)
 - TAR file includes both IOS binary image and CMS files
 - **cigesm-i6q4l2-tar.121-0.0.42.AY.tar**
 - **cigesm-i6k2l2q4-tar.121-0.0.42.AY.tar**
- Where to get IOS images for CIGESM?
- Upgrade through TFTP

Upgrade IOS binary image only using Command Line Interface (CLI)

1. Download image to TFTP server
2. Ping from the switch to the TFTP server

```
switch# ping ip_address_of_tftp_server
```

3. Make sure you have enough space in FLASH

```
switch# dir flash:  
Directory of flash:/  
  
 3 -rwx      736  Mar 01 1993 00:00:27  vlan.dat  
 4 -rwx       16  Sep 10 2003 10:00:27  env_vars  
 5 -rwx     6631  Mar 01 1993 00:10:36  config.text  
10 drwx       192  Mar 04 1993 23:32:49  cigesm-i6q4l2-mz.121-0.0.42.AY  
  
7612416 bytes total (1999872 bytes free)
```

Upgrade IOS binary image only using CLI (cont.)

4. Copy image from TFTP to switch's FLASH

```
switch#copy tftp flash:
```

```
Address or name of remote host []? 192.168.10.1
```

```
Source filename []? cigesm-i6q4l2-mz.121-0.0.42.AY.bin
```

```
Destination filename [cigesm-i6q4l2-mz.121-0.0.42.AY.bin]?
```

```
Accessing tftp://192.168.10.1/cigesm-i6q4l2-mz.121-0.0.42.AY.bin...
```

Upgrade IOS binary image only using CLI (cont.)

5. Change switch boot path variable

```
switch(config)# boot system flash:new_image_name
```

6. Save the change and reload switch

```
switch# show boot  
switch# copy running-config startup-config  
switch# reload
```

7. Verify the change

Upgrade IOS and CMS with TAR file using CLI

1. Download TAR file to TFTP server
2. Ping from the switch to the TFTP server

```
switch# ping ip_address_of_tftp_server
```

3. Make sure you have enough space in FLASH

```
switch# dir flash:
Directory of flash:/

 3 -rwx      736  Mar 01 1993 00:00:27  vlan.dat
 4 -rwx       16  Sep 10 2003 10:00:27  env_vars
 5 -rwx     6631  Mar 01 1993 00:10:36  config.text
10 drwx      192  Mar 04 1993 23:32:49  cigesm-i6q4l2-mz.121-0.0.42.AY

7612416 bytes total (1999872 bytes free)
```

Upgrade IOS and CMS with TAR file using CLI (cont.)

4. Archive download TAR file from TFTP to switch's FLASH

```
switch# archive download-sw ?
```

```
/force-reload Unconditionally reload system after successful sw upgrade
```

```
/imageonly Load only the IOS image
```

```
/leave-old-sw Leave old sw installed after successful sw upgrade
```

```
/no-set-boot Don't set BOOT -- leave existing boot config alone
```

```
/overwrite OK to overwrite an existing image
```

```
/reload Reload system (if no unsaved config changes) after successful sw upgrade
```

```
/safe Always load before deleting old version
```

```
flash: Image file
```

```
ftp: Image file
```

```
rcp: Image file
```

```
tftp: Image file
```

Upgrade IOS and CMS with TAR file using CLI (cont.)

4. Archive download-sw

```
switch# arch down tftp://192.168.10.1/systemtest/cigesm-i6q4l2-tar.121-0.0.41.AY.tar
examining image...
Loading stiletto/cigesm-i6q4l2-tar.121-0.0.41.AY.tar from 192.168.10.1 (via Vlan1): !
extracting info (282
bytes)!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
[OK - 5357568 bytes]
```

Image info:

```
Version Suffix: i6q4l2-121-0.0.41.AY
Image Name: cigesm-i6q4l2-mz.121-0.0.41.AY.bin
Version Directory: cigesm-i6q4l2-mz.121-0.0.41.AY
los Image Size: 3042304
Total Image Size: 5355008
Image Feature: LAYER_2|MIN_DRAM_MEG=32
Image Family: CIGESM
Image Minimum DRAM required: 32
```


Upgrade IOS and CMS with TAR file using CLI (cont.)

4. Archive download-sw. The whole process can be interrupted by Ctrl-shift-6.

```
switch# arch down tftp://192.168.10.1/systemtest/cigesm-i6q4l2-tar.121-0.0.41.AY.tar  
examining image...
```

```
.....
```

```
Not enough free space to download w/o first deleting existing and/or current version(s)...  
Deleting flash:/cigesm-i6k2l2q4-mz.121-0.0.42.AY...done.
```

```
Extracting files...
```

```
Loading systemtest/cigesm-i6q4l2-tar.121-0.0.41.AY.tar from 192.168.10.1 (via Vlan1): !  
extracting info (282 bytes)
```

```
cigesm-i6q4l2-mz.121-0.0.41.AY/ (directory)
```

```
cigesm-i6q4l2-mz.121-0.0.41.AY/html/ (directory)
```

```
extracting cigesm-i6q4l2-mz.121-0.0.41.AY/html/CMS.sgz (1357883  
bytes)!!!!!!!!!!!!!!!!!!!!!!!!!!!!!! [Interrupted]
```

```
Premature end of tar file
```

```
ERROR: Problem extracting files from archive.
```

```
Switch#
```

Upgrade IOS and CMS with TAR file using CLI (cont.)

5. Check the boot path variable

```
switch# show boot
BOOT path-list:    flash:/cigesm-i6k2l2q4-mz.121-0.0.42.AY/cigesm-i6k2l2q4-mz.121-0.0.42.AY.bin
Config file:      flash:/config.text
Private Config file: flash:/private-config.text
Enable Break:     no
Manual Boot:      no
HELPER path-list:
NVRAM/Config file
  buffer size:    32768
```

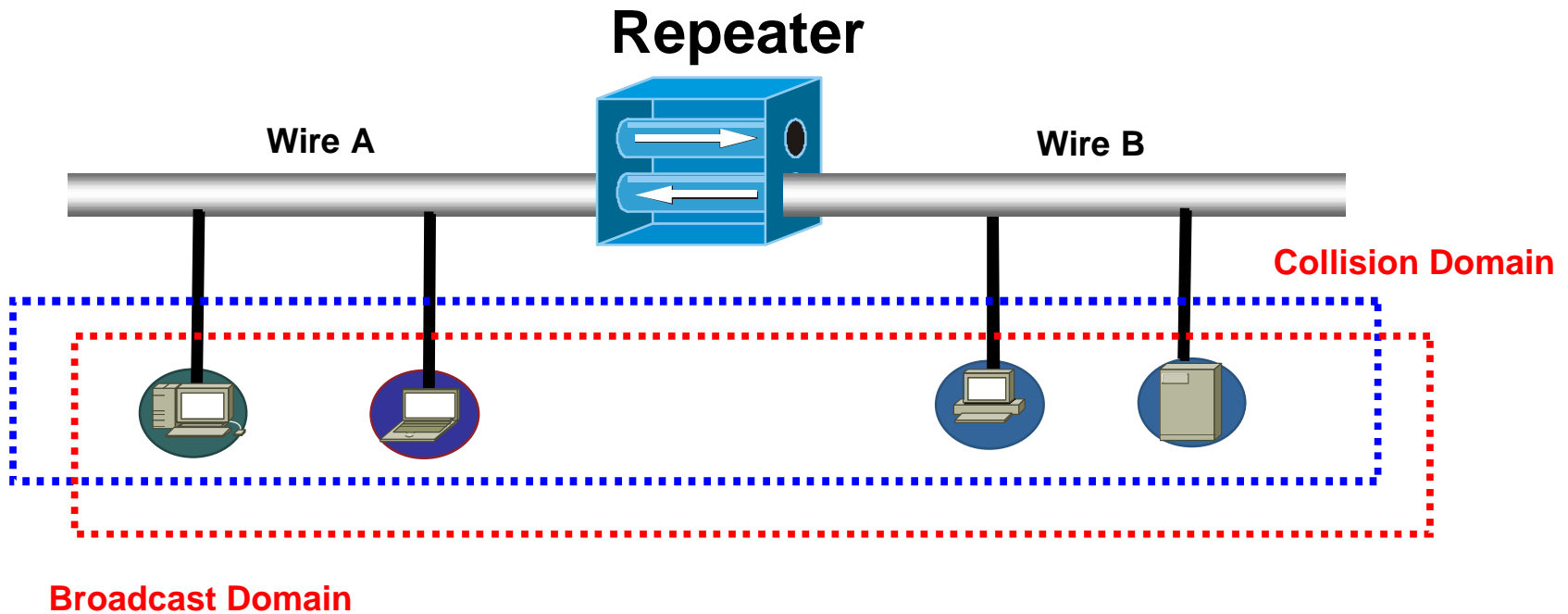
6. Reload the switch

7. Verify the upgrade

Upgrade IOS and CMS with TAR file using GUI

1. CMS GUI is based on IOS CLIs
2. Software upgrade is based on Archive CLI

Layer 2 Repeater Device:

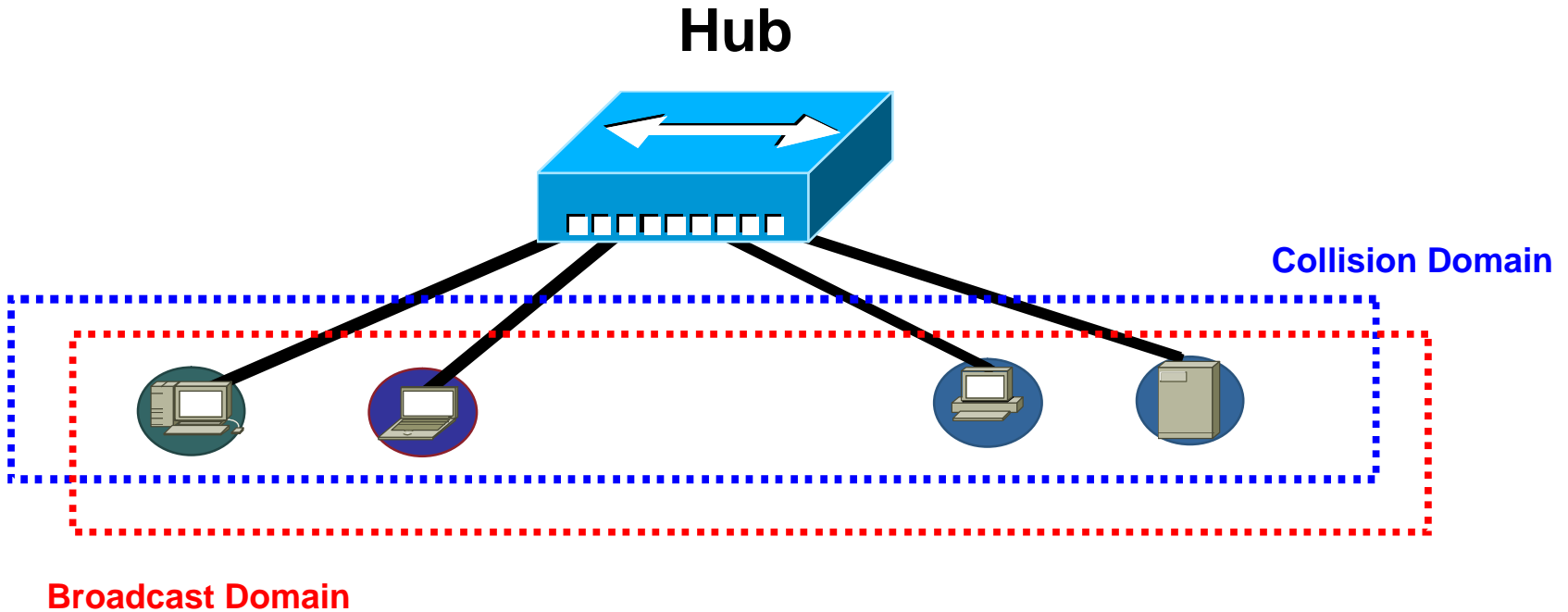


Repeater:

- ∅ operates at layer 1 of OSI model
- ∅ appears as an extension to the wire segment
- ∅ regenerates the signal from one wire to the other

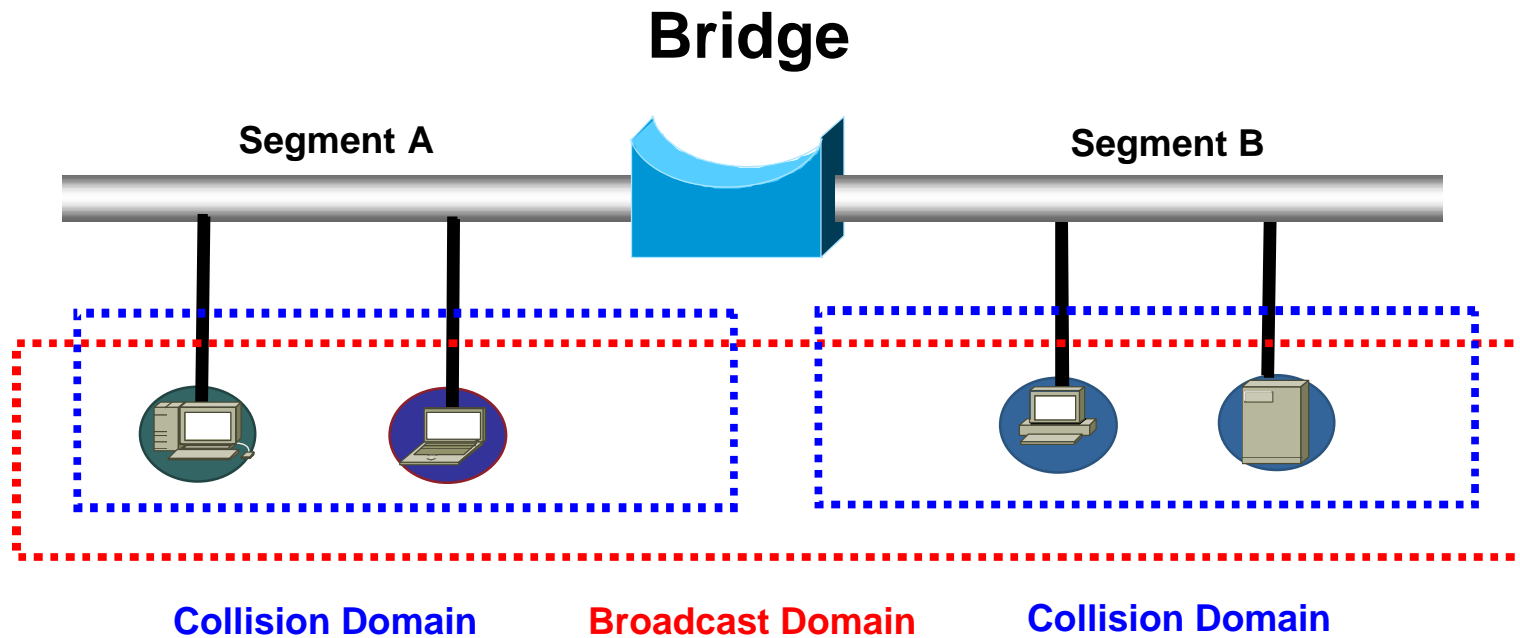
Layer 2 Hub Device:

BladeCenter™ Technical Training



Hub – multi-port repeater !

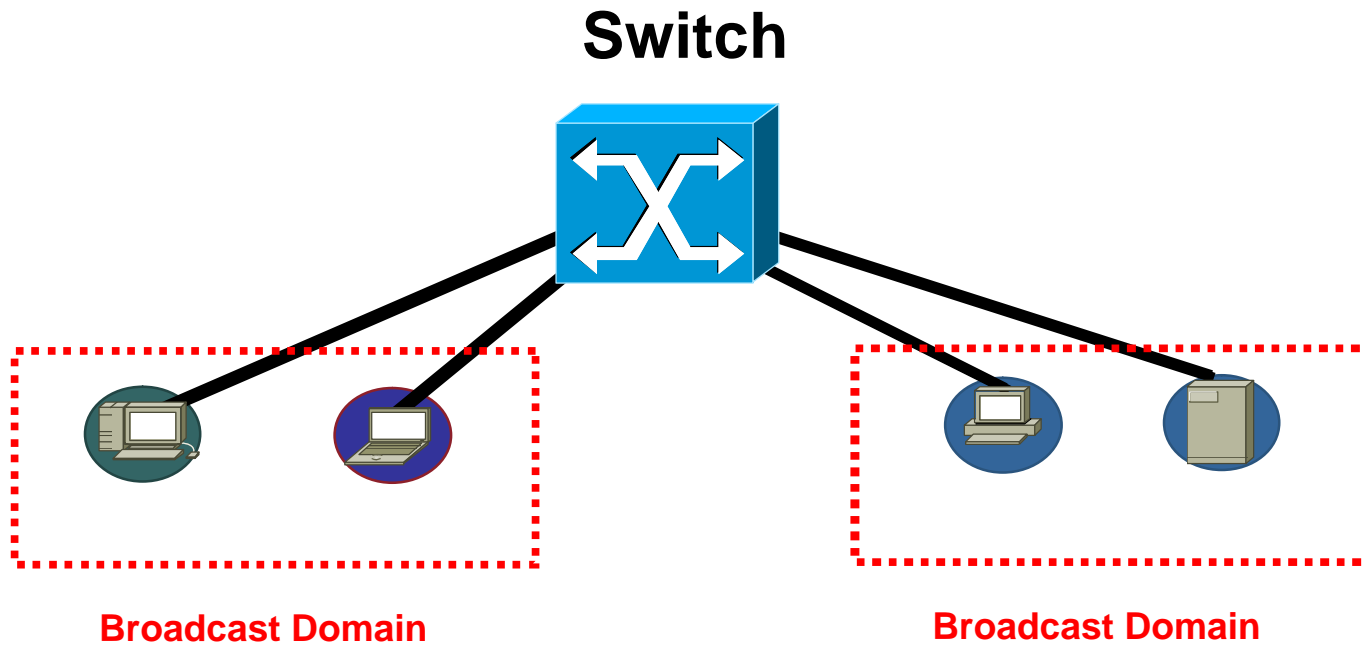
Layer 2 Bridge Device:



Bridge:

- ∅ operates at layer 2 of OSI model
- ∅ forwards frames based on header information such as MAC address

Layer 2 Switch Device:



Switch – multi-port bridge !

Ø broadcast domain based on the VLAN (virtual LAN)

Ø what happened to collision domain ?

Switch with VLAN – multi-port multi-bridges