

Upgrading MGX 8220 Firmware 2.1.18/16 to 4.0.03

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Introduction

This document describes a procedure that can be used by customers to upgrade MGX 8220 firmware from version 2.1.18/16 to 4.0.03.

Prerequisites

Requirements

Readers of this document should have knowledge of these topics:

- Cisco BPX ATM switch
- MGX 8220 firmware

Components Used

The information in this document is based on these firmware versions:

- MGX 8220 firmware versions 2.1.18/16 to 4.0.03

The upgrade procedure described in this document was tested in this environment:

- StrataView Plus (SV+) 8.4.06
- BPX 8.1.71 upgraded to 8.4.12
- MGX 8220 2.1.18/16 upgraded to 4.0.03
- One node hop, no switch or shelf traffic, inband management and upgrade.

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

Conventions

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

Background Information

The MGX 8220 is an adjunct shelf to the Cisco BPX ATM switch.

MGX 8220 Release 4.0 supports up to 80 channelized or non-channelized T1 and E1 interfaces on a single shelf. This provides support for:

- Frame Relay User–Network Interface (UNI) and network node interface (NNI)
- ATM UNI, NNI, and frame user network interface (FUNI)
- Frame–Relay–to–ATM network interworking
- Frame–Relay–to–ATM service interworking
- circuit emulation services

With the use of a new Service Resource Module (SRM), multiple T1 interfaces can be supported on physical T3 lines. MGX 8220 Release 4 also supports the use of Inverse Multiplexing for ATM (IMA), to provide ATM trunking below T3 or E3.

The system's modular, software–based architecture enables it to support these and other additional user services in the future, through downloadable software upgrades or new hardware modules.

This list defines the terms that are used in this document:

- 2cc Two core card sets (BNM/ASC/[SRM])
- MGX 8220 Shelf Controller (ASC) A pair of cards that provide overall control of the shelf and that provide line interfaces to maintenance and control ports that are used for user configuration and for management of the shelf.
- Broadband Network Module (BNM) A pair of cards which together provide the interface to the attached BPX over an ATM interface.
- Standard A standard upgrade technique is used to upgrade between MGX 8220 firmware and/or backup boot code releases. A standard technique trades traffic loss for configuration integrity and time to upgrade.

Upgrade Procedure

This section describes the required pre–upgrade steps and the inband upgrade procedure.

The standard upgrade technique is used for upgrades from MGX 8220 2.x and 3.x to 4.x. Several steps have been added to the standard technique to ensure a successful upgrade. These steps are designated with an asterisk (*). This MGX 8220 upgrade procedure follows the procedures described in MGX 8220 Upgrade and Downgrade Matrices, Concepts and Definitions.

Note: Several commands, which are needed to complete upgrade preparations and the upgrade, require Strata–level privilege access. You must be authorized to use this access level for this upgrade. The Account team will provide the password to you. All commands that require Strata–level privilege access for this upgrade will be moved to user–level, in a subsequent release.



Caution: Network configurations and modifications are not allowed during an upgrade or downgrade.

Database corruption will occur if any configuration change is made.

Pre-Upgrade Requirement Steps

You must complete these pre-upgrade steps before you upgrade your MGX 8220 firmware.



Caution: Each time that you issue the **resetcd** command, service is affected.

- * In some cases, ASCs are downgraded. The downgrade of MGX 8220 ASCs can produce invalid Battery-Backup RAM (BRAM) versions. Verify that the ASC BRAM signature and BRAM revision are appropriate for the current version of firmware, before all MGX 8220 upgrades. This needs to be performed on the active ASC card in each MGX 8220.

Identify the `cisCo` ASC BRAM Signature (this signature is for an MGX 8220 version 4 ASC).

```
shelf.1.[3|4].ASC.a > shellConn
shelf.1.[3|4].ASC.a > d 0xb6800490
b6800490: 1000 0063 1000 0069 2784 0073 1000 ae43 *.c.c.c.i.c.s.c.C*
b68004a0: 1000 006f *.c.o.....*
```

- Identify the ASC BRAM Revision (in this example it is 6 for MGX 8220 version 4).

```
shelf.1.[3|4].ASC.a > d 0xb680024c
b6800240: 1000 600 *.c..*
```

- MGX 8220 ASC cards that are executing release 2 firmware should not have the `cisCo` signature (it should show `c.c... ..`) and the BRAM revision should be 0 (`b6800240: 1000 0000`). For an MGX 8220 ASC card that is executing release 2 firmware with the `cisCo` signature, you must issue these commands:

```
shelf.1.[3|4].ASC.a > shellConn
shelf.1.[3|4].ASC.a > sysNvRamSet " ", 1, 292
shelf.1.[3|4].ASC.a > sysNvRamSetRmt " ", 1, 292, standby-ASC
```

!--- <standby-ASC> is the standby ASC card slot number (3 or 4).

- * Confirm that Bad Service Module Checksum anomalies do not exist in the network.

MGX 8220 Service Modules (ASMs) may have been upgraded and downgraded with various MGX 8220 releases that support CRC check (for example, 2.1.23 and 3.0.03) and that do not support CRC check (for example, 2.1.25, 3.0.01, and 3.0.02).

Background

Configuration (PRI) file CRC checking was introduced in MGX 8220 versions 2.1.23 and 3.0.03. All versions of release 4 firmware include CRC checking. A signature (CHKS) is written into the file header, along with the CRC value, to indicate that the CRC value is valid. Any time that a configuration file is discovered without the CHKS signature, the CRC is calculated and stored in the file header, along with the signature. If a header contains the CHKS signature, the CRC value is assumed to be valid.

Scenario

If you upgrade a shelf from MGX 8220 release 2.1.18 version of firmware to MGX 8220 release 4.0.03 version of firmware, and the CRC check CHKS signature exists in a service module configuration file (PRI) on the ASC, then the CRC value in the PRI file header is no longer accurate.

When this shelf is upgraded to MGX 8220 release 4 version of firmware (which supports CRC checking), the active ASC card will discover the configuration file with the CHKS signature and an invalid CRC value. The service module will remain in a Mismatch state:

```
2.1.23 -> 2.1.18 -> 4.0.03 = Mismatch
3.0.01 -> 2.1.18 -> 4.0.03 = Mismatch
2.1.22 -> 3.0.02 -> 4.0.03 = OK
2.1.23 -> 3.0.02 -> 4.0.03 = Mismatch
2.1.23 -> 3.0.03 -> 4.0.03 = OK
```

Symptom(s)

The **dspecds** command identifies service modules in the Mismatch state after an upgrade.

```
shelf.1.1.<3|4>.ASC.a > dspecds
```

Slot	CardState	CardType	CardAlarm	Redundancy
1.1	Active	BNM-T3	Minor	
1.3	Active	ASC	Major	
1.5	Mismatch	FRSM-4T1		

The **dspecd** command yields a disk-related failure on the active ASC card:

```
shelf.1.1.<3|4>.ASC.a > dspecd
```

```
cardMajorAlarmBitMap: Disk related failure on slot <3|4>
```

The **dspllog** command suggests BAD checksum:

```
shelf.1.1.<3|4>.ASC.a > dspllog
```

```
FRSM going to standby : Config. Mismatch between ASC and FRSM
general error: acredSMstateMachine: checkPrimaryChkSum returned NOT OK, force Mismatch
informational: setAlarm: ALARM slot 3
general error: compSMchkSum_CRC : BAD checksum for slot No = 5
```

Confirmation

This Mismatch condition can be anticipated, if you identify the CHKS signature within a configuration (PRI) file on your MGX 8220 ASC cards that are executing 2.1.18 version of firmware (which does not support CRC checking). For ASC cards that are executing a firmware release prior to 2.1.23 or 3.0.03, you can issue the **get** TFTP command to get the service module configuration file(s).

```
server:% tftp AXIS-ATMip
```

```
tftp> bin
```

```
tftp> get AXIS_SM_1_SM-slot.PRI.service_password
```

```
tftp> quit
```

To confirm that the CHKS CRC check exists in the service module PRI file, issue the UNIX command **OD** (octal, decimal, hexadecimal, and ASCII dump) on your workstation:

```
server:% OD -x AXIS_SM_1_SM-slot.PRI.service_password | more

0000000 00ff ffff 0000 a860 0000 0006 0000 001e 0x43 = 'C'
0000020 ffff ffff ffff ffff ffff ffff ffff 4348 0x48 = 'H'
0000040 4b53                ^^^^ 0x4b = 'K'
                ^^^^                0x53 = 'S'
```

Resolution

The **compSetChkSum** shellConn command recalculates and updates the CRC value within the configuration file header on the active ASC card; it executes the version of firmware that supports CRC checking.

```
shelf.1.<3|4>.ASC.a > shellConn

shelf.1.<3|4>.ASC.a > compSetChkSum SM-slot, 1

!--- Where <SM-slot> is in the range from 5 to 14.
```

The **compSetChkSum** command writes the checksum only to the active ASC disk. To update the standby ASC card, the standby ASC should be reset (after you issue the **compSetChkSum** command on all of the affected service modules), in order to download the active ASC configuration files to the standby ASC card.

```
shelf.1.<3|4>.ASC.a > resetcd SM-slot
```

5. Save/Restore the ASC configuration.

The ASC card stores ASC configuration information in BRAM (Battery-Backed RAM). The BRAM contains a revision that identifies the format of the configuration information. The format can change from release to release. The newer versions of firmware will always provide conversion routines that automatically reformat the configuration information as part of an upgrade.

If the BRAM revision is different between the firmware revisions involved in an upgrade, the active ASC BRAM information should be saved before the upgrade; issue these commands from your workstation:

```
server:% tftp AXIS-ATMip

tftp> bin

tftp> get AXIS_ASC_ACTIVE.BR

tftp> quit
```

Note: The **get** command takes approximately 30 seconds to complete.

In the event ASC BRAM restore is required (normally only after a downgrade from a firmware revision with a different BRAM revision), issue these commands:

```
server:% tftp AXIS-ATMip

tftp> bin

tftp> put AXIS_ASC_ACTIVE.BR

tftp> quit
```

```
server:% tftp AXIS-ATMip

tftp> bin

tftp> put AXIS_ASC_ACTIVE.BR AXIS_ASC_STANDBY.BR

tftp> quit
```

The active and standby ASC cards must be reset, in order to execute the saved configuration. If the ASC BRAM revision is the same between the firmware revisions involved in a downgrade, the ASC configuration should be preserved. (There is no need to restore the configuration.)

6. Save/Restore the service module (SM) configuration.

The ASC card stores SM configuration information on the disk in a configuration (PRI) file. The file contains a revision that identifies the format of the configuration information. The format can change from release to release. The newer version of firmware will always provide conversion routines that automatically reformat the configuration information as part of an upgrade.

If the SM configuration file revision is different between the firmware revisions involved in an upgrade, the configuration file should be saved for each primary and standalone SM:

```
server:% tftp AXIS-ATMip

tftp> bin

tftp> get AXIS_SM_1_slot-num.PRI.Service-password

tftp> quit
```

Note: The **get** command takes approximately 9 seconds to complete.

In the event that SM configuration restore is required (normally only after a downgrade), issue these commands:

```
server:% tftp AXIS-ATMip

tftp> bin

tftp> put AXIS_SM_1_slot-num.PRI.Service-password

tftp> quit
```

The standby ASC card must be reset, in order to download the SM configuration files from the active ASC card. Each primary and standalone SM must be reset, in order to execute the saved configuration. If the SM configuration file revision is the same between the firmware revisions involved in a downgrade, the SM configuration should be preserved. (There is no need to restore the configuration.)

7. Open a StrataView Plus (SV+) MGX 8220 Node Administration window.

- a. On the SV+ topo screen, click the BPX node that contains the MGX 8220 to be upgraded.
- b. Choose **Node** from the menu bar.
- c. Choose **display shelves**.
- d. Select the MGX 8220 shelf to upgrade.

- e. Click **Admin**.
8. Issue the MGX 8220 ASC **dspadrxlat** command–line interface (CLI) command to display the connection s address translation table.


For all upgrades that involve a reset of the active ASC card, and for all downgrades in which the configuration is preserved, you must compare the number of shelf connections before and after the upgrade or downgrade.

```
shelf.1.<3|4>.ASC.a > dspadrxlat
```

This is the only information in which you are interested:

```
ConnNumOfValidEntries: value
```

Record this information.

 **Caution:** Do not make configuration changes to the MGX 8220 shelf while an upgrade or downgrade is in progress. There is a chance that all or part of the configuration changes could be lost.

9. Issue the MGX 8220 SM **dsptotals** CLI command to display the total number of lines, ports, and channels.

For all upgrades that involve a reset of a standalone or primary service module, you must compare the total number of lines, ports, and channels before and after the upgrade or downgrade.


```
shelf.1.<slot>.<type>.a > cc 5
```

```
shelf.1.<Slot>.<type>.a > dsptotals
```

This is the only information in which you are interested:

```
total active lines = value/maximum-lines  
total active ports = value/maximum-ports  
total active chans = value/maximum-channels
```

Record this information. This must be performed on each service module.

 **Caution:** Do not make configuration changes to the shelf while an upgrade or downgrade is in progress. There is a chance that all or part of the configuration changes could be lost.

Inband Upgrade Procedure

The estimated time to complete the inband upgrade of an MGX 8220 shelf is one hour. Complete these steps:

1. Download ASC BACKUP (boot) firmware via TFTP.

From an Xterm window on your workstation, issue these commands:

```
server:% tftp AXIS-ATMip
```

```
server:% bin
```

```
server:% tftp put ASC-BT-file AXIS_ASC_BACKUP.FW
```

Note: The **tftp put** command takes approximately 100 seconds to complete.

2. Issue the **chkflash** command from the MGX 8220 Node Administration window.

The MGX 8220 ASC and SM **chkflash** CLI command calculates and compares the flash checksum. In some releases, the **chkflash** command reports the firmware or backup boot code version as it resides in flash. In this case, the version that is reported by the **chkflash** command should be compared with the version of firmware or backup boot code that was written with the previous **tftp put** command.

```
shelf.1.<Slot>.<type>.<a|s>chkflash

Program length = 480179
Calculated checksum = c81e4997 stored checksum = c81e4997
Flash checksum passed
```

Note: If the **tftp put** command has completed and the MGX 8220 reports Failed Checksum, then you loaded the wrong firmware file.

3. Issue the MGX 8220 ASC and SM CLI **version** command from the MGX 8220 Node Administration window, to display the backup boot code version which is currently stored in flash (not necessarily the version of backup boot code that is being executed) and the firmware version that is being executed.

```
shelf.1.<Slot>.<type>.<a|> version

***** Stratacom Inc. AXIS ASC Card *****2
Firmware Version      = 4.0.03
Backup Boot version   = BT_4.0.03
ASCFRSM Xilinx file   = asc025.h
ASC2 Xilinx file      = asc025.h
ASCBNM Xilinx file    = bnm020
ASCBNM Altera file    = bnm155_2
SRM-T1E1 Xilinx file  = srm038.h
SRM-3T3 Xilinx file   = srm038.h
SRM-3T3 Encoder file  = encoder42_004.ttf
SRM-3T3 Encoder-2 file = encoder80_001.ttf
SRM-3T3 Decoder file  = decoder42_004.ttf
SRM-3T3 Clock file    = clkctrl_40.ttf
SRM-3T3 I-Cube file   = ic320.h
VxWorks (for STRATACOM) version 5.1.1-R3000.
Kernel: WIND version 2.4.
Made on Thu Sep 18 14:14:50 PDT 1997.
Boot line: ln(0,0)
```

4. Issue the **switchcc** command to activate the standby ASC.
5. Re-open a SV+ MGX 8220 Node Administration window.
 - a. On the SV+ topo screen, click the BPX node that contains the MGX 8220 to be upgraded.
 - b. Choose **Node** from the menu bar.
 - c. Choose **display shelves**.
 - d. Select the MGX 8220 shelf.
 - e. Click **Admin**.
6. Download the ASC BACKUP (boot) firmware via TFTP.

From an Xterm window on your workstation, issue these commands:

```
server:% tftp AXIS-ATMip

server:% bin

server:% tftp put ASC-BT-file AXIS_ASC_BACKUP.FW
```

Note: The **tftp put** command takes approximately 100 seconds to complete.

7. Issue the **chkflash** command from the MGX 8220 Node Administration window.

```
shelf.1.<Slot>.<type>.<a|s> chkflash

Program length = 480179
Calculated checksum = c81e4997 stored checksum = c81e4997
Flash checksum passed
```

Note: If the **tftp put** command has completed and the MGX 8220 reports Failed Checksum, then you loaded the wrong firmware file.

8. Issue the **version** command from the MGX 8220 Node Administration window.

```
shelf.1.<Slot>.<type>.<a|s> version

***** Stratacom Inc. AXIS ASC Card *****2
  Firmware Version      = 4.0.03
  Backup Boot version  = BT_4.0.03
  ASCFRSM Xilinx file  = asc025.h
  ASC2   Xilinx file   = asc025.h
  ASCBNM Xilinx file   = bnm020
  ASCBNM Altera file   = bnm155_2
  SRM-T1E1 Xilinx file = srm038.h
  SRM-3T3 Xilinx file  = srm038.h
  SRM-3T3 Encoder file = encoder42_004.ttf
  SRM-3T3 Encoder-2 file = encoder80_001.ttf
  SRM-3T3 Decoder file = decoder42_004.ttf
  SRM-3T3 Clock file   = clkctrl_40.ttf
  SRM-3T3 I-Cube file  = ic320.h
VxWorks (for STRATACOM) version 5.1.1-R3000.
Kernel: WIND version 2.4.
Made on Thu Sep 18 14:14:50 PDT 1997.
Boot line: ln(0,0)
```

9. Download ASC ACTIVE firmware via TFTP.

From an Xterm window on your workstation, issue these commands:

```
server:% tftp AXIS-ATMip

server:% bin

server:% tftp put ASC-ACTIVE-file AXIS_ASC_ACTIVE.FW
```

Note: The **tftp put** command takes approximately 340 seconds to complete.

10. Compare file size.

The firmware file size tends to be rather unique. The firmware file size can be used to verify that the firmware file was successfully **tftp put** to the ASC disk.

```
shelf.1.<3|4>.ASC.<a|s> shellConn

shelf.1.<3|4>.ASC.<a|s> cd "C:fw"

shelf.1.<3|4>.ASC.<a|s> ll

size      date      time      name
-----
512       date      time      .
512       date      time      ..
size      date      time      ASC.FW
```

11. Download ASC STANDBY firmware via TFTP.

From an Xterm window on your workstation, issue these commands:

```
server:% tftp AXIS-ATMip

server:% bin

server:% tftp put ASC-STANDBY-file AXIS_ASC_STANDBY.FW
```

Note: The **tftp put** command takes approximately 340 seconds to complete.

12. Compare file size.

The firmware file size tends to be rather unique. The firmware file size can be used to verify that the firmware file was successfully **tftp put** to the ASC disk.

```
shelf.1.1.<3|4>.ASC.<a|s> cc 4

shelf.1.1.<3|4>.ASC.<a|s> shellConn

shelf.1.1.<3|4>.ASC.<a|s> CD "C:fw"

shelf.1.1.<3|4>.ASC.<a|s> ll

!--- Where cc4 is the standby ASC.

size      date      time      name
-----
512      date      time      .
512      date      time      ..
size      date      time      ASC.FW
```

13. Load the boot code into all of the service modules.

From the MGX 8220 Node Administration window, issue these commands:

```
shelf.1.<Slot>.<type>.<a|s> cc 5

shelf.1.<Slot>.<type>.<a|s> shellConn

shelf.1.<Slot>.<type>.<a|s> flashStartAddr=0xbfc00000

flashStartAddr=0xbfc00000
value = 0 = 0x0

shelf.1.<Slot>.<type>.<a|s> flashEndAddr=0xbfc80000

flashEndAddr=0xbfc80000
flashEndAddr = 0x8014a014: value = -1077411840 = 0xbfc80000
```

From an Xterm window on your workstation, issue these commands:

```
server:% tftp AXIS-ATMip

server:% bin

server:% tftp put SM-BT-file AXIS_SM_1_<$slot>.FW

!--- Where <$slot> is the slot number of the service module.
```

Note: The **tftp put** command takes approximately 60 seconds to complete.

14. Issue the **chkflash** command from the MGX 8220 Node Administration window.

```
shelf.1.<Slot>.<type>.<a|s> chkflash
```

```
Program length = 264401  
Calculated checksum = 7cc222f2 stored checksum = 7cc222f2  
Flash checksum passed
```

15. Issue the **version** command from the MGX 8220 Node Administration window.

```
shelf.1.<Slot>.<type>>.<a|s> version
```

```
***** Stratacom Inc. AXIS FRSM Card *****  
Firmware Version      = 4.0.03  
Backup Boot version = BT_4.0.00  
ASCFRSM Xilinx file = frsm025.h  
VxWorks (for STRATACOM) version 5.1.1-R3000.  
Kernel: WIND version 2.4.  
Made on Thu Sep 18 14:25:13 PDT 1997.  
Boot line:
```

16. Complete Step 13, Step 14, and Step 15 for each service module.

17. From the MGX 8220 Node Administration window, issue these commands:

```
shelf.1.<Slot>.<type>.<a|s> cc 6
```

```
!--- Output suppressed.
```

```
shelf.1.<Slot>.<type>.<a|s> shellConn
```

```
shelf.1.<Slot>.<type>.<a|s> flashStartAddr=0xbfc00000
```

```
flashStartAddr=0xbfc00000  
value = 0 = 0x0
```

```
shelf.1.<Slot>.<type>.<a|s> flashEndAddr=0xbfc80000
```

```
flashEndAddr=0xbfc80000  
flashEndAddr = 0x8014a014: value = -1077411840 = 0xbfc80000
```

From an Xterm window on your workstation, issue these commands:

```
server:% tftp AXIS-ATMip
```

```
server:% bin
```

```
server:% tftp put SM-BT-file AXIS_SM_1_<slot>.FW
```

```
!--- Where <slot> is the slot number of the service module.
```

Note: The **tftp put** command takes approximately 60 seconds to complete.

18. From the MGX 8220 Node Administration window, issue this commands:

```
shelf.1. <Slot>. <type>.<a|s> chkflash
```

```
Program length = 264401  
Calculated checksum = 7cc222f2 stored checksum = 7cc222f2  
Flash checksum passed
```

19. From the MGX 8220 Node Administration window, issue this commands:

```
shelf.1.<Slot>.<type>.<a|s> version
```

```
***** Stratacom Inc. AXIS FRSM Card *****  
Firmware Version      = 4.0.03  
Backup Boot version = BT_4.0.00
```

```
ASCFRSM Xilinx file = frsm025.h
VxWorks (for STRATACOM) version 5.1.1-R3000.
Kernel: WIND version 2.4.
Made on Thu Sep 18 14:25:13 PDT 1997.
Boot line:
```

20. Issue the MGX 8220 active ASC **resetsys** CLI command, to reset all of the cards in the MGX 8220 shelf.

```
shelf.1.<3|4>.ASC.a > resetsys
```

The **resetsys** command terminates all Telnet sessions. You will have to restart a Telnet session after an ASC card returns to the active state.

Note: It will take about three minutes for the ASC to become active, and it will take an additional 30 seconds before the BNI-to-BNM MGX 8220 trunk recovers, for a total elapsed time around 3.5 minutes. The service modules will all be in boot; issue the **dspecs** command to verify that this is true. There is no service during this time. You can not issue the **cc** command to reach another service module during this time.

21. Re-open a SV+ MGX 8220 Node Administration window.
 - a. On the SV+ topo screen, click the BPX node that contains the MGX 8220 to be upgraded.
 - b. Choose **Node** from the menu bar.
 - c. Choose **display shelves**.
 - d. Select the MGX 8220 shelf to upgrade.
 - e. Click **Admin**.

22. Load the service module firmware.

Complete this step for the Frame Relay Service Modules (FRSMs), then complete it for the ATM UNI Service Module (AUSM).

Note: During tests of this procedure, it was discovered that you must wait five to eight minutes between each firmware TFTP file transfer. You will experience TFTP-timeouts, if you try to load the firmware too soon.

From an Xterm window on your workstation, issue these commands:

```
server:% tftp AXIS-ATMip

server:% bin

server:% tftp put SM-FW-file AXIS_SM_1_0.$slotFW

!--- Where <$slot> is the slot number of the service module.
```

Firmware will be written to the ASC PCMCIA. Upon completion of the TFTP file transfer, the firmware will automatically begin to load to the service modules.

Related Information

- [Cisco WAN Switching Solutions – Cisco Documentation](#)
 - [Guide to New Names and Colors for WAN Switching Products](#)
 - [Downloads – WAN Switching Software](#)
 - [Technical Support – Cisco Systems](#)
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