Fabric OS® v9.1.1b

Fabric OS v9.1.1b Release Notes Digest

Version 2.0

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Chapter 1: Preface

1.1 Contacting Technical Support for your Brocade® Product

If you purchased Brocade product support directly from Broadcom, use one of the following methods to contact the Technical Assistance Center 24x7. For product support information and the latest information on contacting the Technical Assistance Center, go to www.broadcom.com/support/fibre-channel-networking/contact-brocade-support.

Online	Telephone
For nonurgent issues, the preferred method is to log on to the Support portal at support.broadcom.com. (You must initially register to gain access to the Support portal.) Once registered, log on and then select **Brocade Products**. You can now navigate to the following sites: ▪ **Case Management** ▪ **Software Downloads** ▪ **Licensing** ▪ **SAN Reports** ▪ **Brocade Support Link** ▪ **Training & Education**	For Severity 1 (critical) issues, call Brocade Fibre Channel Networking Global Support at one of the phone numbers listed at www.broadcom.com/support/fibre-channel-networking/contact-brocade-support.

If you purchased Brocade product support from a Broadcom OEM/solution provider, contact your OEM/solution provider for all your product support needs.

- OEM/solution providers are trained and certified by Broadcom to support Brocade products.
- Broadcom provides backline support for issues that cannot be resolved by the OEM/solution provider.
- Brocade Supplemental Support augments your existing OEM support contract, providing direct access to Brocade expertise. For more information on this option, contact Broadcom or your OEM.

For questions regarding service levels and response times, contact your OEM/solution provider.

To expedite your call, have the following information immediately available:

General Information:

- Technical support contract number, if applicable.
- Switch model.
- Switch operating system version.
- Error numbers and messages received.
- **`supportSave`** command output and associated files.

  For dual-CP platforms the **`supportSave`** command gathers information from both CPs and any AP blades installed in the chassis.
- Detailed description of the problem, including the switch or fabric behavior immediately following the problem and any specific questions.
- Description of any troubleshooting steps already performed and the results.
- Serial console and telnet session logs.
- Syslog message logs.

Switch Serial Number.

The switch serial number is provided on the serial number label, examples of which follow:

The serial number label is located as follows:

- Brocade G630, G620, G610, G720, and G730 – On the switch ID pull-out tab located on the bottom of the port side of the switch.
- Brocade 7810 – On the pull-out tab on the front left side of the chassis underneath the serial console and Ethernet connection and on the bottom of the switch in a well on the left side underneath (looking from the front).
- Brocade X6-8, X6-4, X7-8, and X7-4 – Lower portion of the chassis on the non-port side beneath the fan assemblies.

World Wide Name (WWN).

When the Virtual Fabric feature is enabled on a switch, each logical switch has a unique switch WWN. Use the **`wwn`** command to display the switch WWN.

If you cannot use the **`wwn`** command because the switch is inoperable, you can get the primary WWN from the same place as the serial number.

License Identifier (License ID).

There is only one license ID associated with a physical switch or director/backbone chassis. This license ID is required as part of the ordering process for new FOS licenses.

Use the **`licenseIdShow`** command to display the license ID.

1.2 Related Documentation

White papers, data sheets are available at www.broadcom.com. Product documentation for all supported releases is available on the support portal to registered users. Registered users can also find release notes on the support portal.

Chapter 2: Locating Product Manuals and Release Notes

The following sections outline how to locate and download Brocade product manuals and release notes from Broadcom and the support portal. Although the illustrations show Fibre Channel and Fabric OS® (FOS), they work for all Brocade products and operating systems.

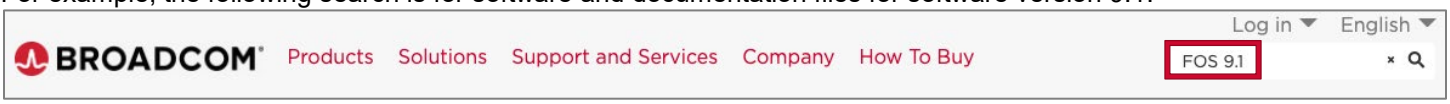
2.1 Locating Product Manuals and Release Notes

2.1.1 Locating Product Manuals on Broadcom

Complete the following steps to locate your product manuals on Broadcom.com.

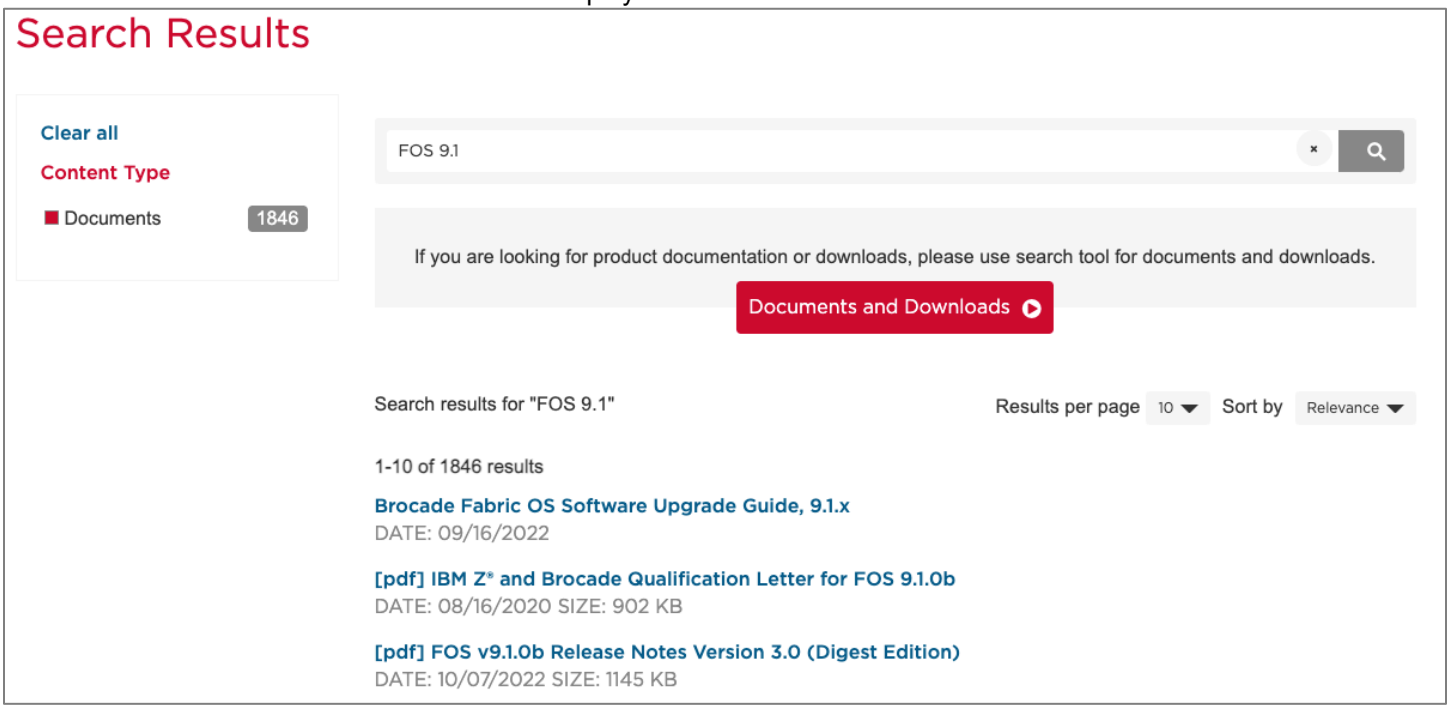
1. Go to https://www.broadcom.com.
2. Enter the product name or the software version number in the **Search** box.

   For example, the following search is for software and documentation files for software version 9.1.



3. Select the **Documents** check box to list only the documents.

   The list of documents available for the release displays.



2.1.2 Locating Product Manuals and Release Notes on the Support Portal

Complete the following steps to locate your product manuals on the support portal.

1. Go to https://support.broadcom.com/, click **Login**, and enter your username and password.

   If you do not have an account, click **Register** to set up your account.
2. Select **Brocade Storage Networking** in the support portal.

2.2 Document Feedback

Quality is our first concern and we have made every effort to ensure the accuracy and completeness of this document. If you find an error, omission or think that a topic needs further development, we want to hear from you. You can provide feedback by sending an email to documentation.PDL@broadcom.com. Provide the publication title, publication number, and as much detail as possible, including the topic heading and page number, as well as your suggestions for improvement.

Chapter 3: Overview

The Fabric OS v9.1.1b release is a patch release based on FOS v9.1.1a.

This release includes all fixes from Fabric OS v9.1.1 through Fabric OS v9.1.1b, including Fabric OS v9.1.1_01.

All hardware platforms and features supported in FOS v9.1.1 are supported in FOS v9.1.1b

Fabric OS v9.1.1b includes software enhancements and defect fixes.

Chapter 4: What's New in FOS 9.1.1b

4.1 Hardware

There is no new hardware supported with FOS v9.1.1b

4.2 Software

The following lists the software changes with this release.

4.2.1 Resolution of Important Defects

The following important defects are resolved in FOS 9.1.1b:

- FOS-844552 - Unexpected kernel panic/cold boot or HA out of sync
- FOS-846325 - On a MXG610 embedded switch, running FOS versions FOS9.0.x, FOS9.1.x, user may encounter IO service disruption after a reboot / hareboot, triggered by uboot tune DRAM failure leading to a Reset (power cycle) of the system
- FOS-843463 - The MAPS rule defCHASSISCERT_VALIDITY_15 is being triggered even though the certificate was recently replaced

4.2.2 Enhancements

FOS v9.1.1b includes the following enhancements, described in more detail below:

- The command `grep` is enhanced to allow all options to filter and sort FOS command output.

4.2.2.1 Allow all options to filter and sort FOS command output with grep

The command `grep` is enhanced to allow all options to filter and sort FOS command output. Command options -r/R designed for filesystem access are not allowed.

Full list of allowed options for `grep` is displayed below.

Pattern selection and interpretation:

-E, --extended-regexp	PATTERNS are extended regular expressions
-F, --fixed-strings	PATTERNS are strings
-G, --basic-regexp	PATTERNS are basic regular expressions
-e, --regexp=PATTERNS	use PATTERNS for matching
-f, --file=FILE	take PATTERNS from FILE
-i, --ignore-case	ignore case distinctions in patterns and data
--no-ignore-case	do not ignore case distinctions (default)
-w, --word-regexp	match only whole words
-x, --line-regexp	match only whole lines
-z, --null-data	a data line ends in 0 byte, not newline

Miscellaneous:

-s, --no-messages	suppress error messages
-v, --invert-match	select non-matching lines
-V, --version	display version information and exit
--help	display this help text and exit

Output control:

-m, --max-count=NUM	stop after NUM selected lines
-b, --byte-offset	print the byte offset with output lines
-n, --line-number	print line number with output lines
--line-buffered	flush output on every line
-H, --with-filename	print file name with output lines
-h, --no-filename	suppress the file name prefix on output
--label=LABEL	use LABEL as the standard input file name prefix
-o, --only-matching	show only nonempty parts of lines that match
-q, --quiet, --silent	suppress all normal output
--binary-files=TYPE	assume that binary files are TYPE; TYPE is 'binary', 'text', or 'without-match'
-a, --text	equivalent to --binary-files=text
-I	equivalent to --binary-files=without-match
-d, --directories=ACTION	how to handle directories; ACTION is 'read' or 'skip'
-D, --devices=ACTION	how to handle devices, FIFOs and sockets; ACTION is 'read' or 'skip'
-L, --files-without-match	print only names of FILEs with no selected lines
-l, --files-with-matches	print only names of FILEs with selected lines
-c, --count	print only a count of selected lines per FILE
-T, --initial-tab	make tabs line up (if needed)
-Z, --null	print 0 byte after FILE name

Context control:

-B, --before-context=NUM	print NUM lines of leading context
-A, --after-context=NUM	print NUM lines of trailing context
-C, --context=NUM	print NUM lines of output context
-NUM	same as --context=NUM
--color[=WHEN], --colour[=WHEN]	use markers to highlight the matching strings; WHEN is 'always', 'never', or 'auto'
-U, --binary	do not strip CR characters at EOL (MSDOS/Windows)

Chapter 5: What's New in FOS 9.1.1a

5.1 Certifications

FOS v9.1.1a is the first Fabric OS release at the 9.x level which is submitted for Common Criteria certification.

5.2 Hardware

There is no new hardware supported with FOS v9.1.1.a

5.3 Software

The following lists the software changes with this release.

5.3.1 Resolution of Important Defects

The following important defects are resolved in FOS 9.1.1a:

- FOS-844849 - Credit loss observed on ISL link between two G730 switches
- FOS-841985 - Unable to capture supportsave via SANnav
- FOS-841961 - On a X7 director that had gone through CLI "firmwarecleaninstall" of FOS9.0.x, after an upgrade to FOS v9.1.x, the active CP will show FAULTY (53) and will essentially be unresponsive. No output on the serial console. The management and service ports are no longer accessible.
- FOS-841163 - User can't perform firmware download on the switch from the SANNav
- FOS-844483 - Following a power outage the switch may stay stuck in boot with the error message: "Can't get the kernel image".

5.3.2 Enhancements

FOS v9.1.1a includes the following enhancements, described in more detail below:

- Allow admin access via console with "enableadminlockout"
- SSL CA certificate bundle update

5.3.2.1 Allow admin access via console with "enableadminlockout"

The command `enableadminlockout` is enhanced to allow configuration of login via console access even when the admin account has been locked out. This configuration is optional and not enabled by default.

5.3.2.2 SSL CA certificate bundle update

The SSL CA certificate bundle in FOS is updated with FOS v9.1.1a. Expired CA certificates are removed, and new CA certificates are added.

For the list of changes in the SSL CA certificate bundle, see CA Certificate Bundle Updates.

Chapter 6: What's New in FOS 9.1.1

6.1 Certifications

FOS v9.1.1 is the first Fabric OS release at 9.x level which is submitted for FIPS 140-3 level 1 certification.

6.2 Hardware

The following section lists hardware introduced with this release.

6.2.1 Platforms

FOS v9.1.1 supports the same Brocade Gen 6 and Gen 7 Fibre Channel platforms supported in FOS v9.1.0x.

Gen 6 and Gen 7 platforms which ship from factory with FOS v9.1.1 are configured with Default Secure, only allowing secure protocols to access the switch management interface, consequently the following protocols are blocked:

- SNMPv1 and SNMPv2
- Telnet
- FTP
- HTTP

NOTE The end user can configure the switch to allow unsecure protocols.

6.2.2 New Optical Transceivers

FOS v9.1.1 adds support for the following optical transceivers:

Speed	Type	Manufacturing PN	Product PN
64G	LWL SFP+	57-1000496-01	XBR-000468
64G	ELWL SFP+	57-1000497-01	XBR-000466
32G	ELWL SFP+	57-1000498-01	XBR-000479

NOTE The 32G ELWL SFP+ XBR-000479 is not compatible with the previously released 32G ELWL SFP+ XBR-000478.

6.3 Software

The following section lists software changes with this release.

6.3.1 Resolution of Important Defects

The following important defects are resolved in FOS v9.1.1:

- FOS-826227–Devices in default allaccess zone cannot communicate to each other across LISLs in FICON environment on all platform
- FOS-832042–Brocade 7810 switch panics or hangs on boot up
- FOS-834530–Switch panics during adding aliases to zone configuration
- FOS-835586–SNMP consumes more CPU cycles, resulting in MAPS alerts
- FOS-837583–SNMP daemon leaks memory and causes switch to hafailover/hareboot/panic when switch runs out of memory
- FOS-839847–Switch subtype incorrectly displayed

In FOS v9.0.1b, 9.0.1c, 9.0.1d, 9.1.0, and 9.1.0b the following platforms incorrectly changed subtype.

In FOS v9.1.1 this is corrected as shown below:

Incorrect Subtype Shown in FOS v9.0.1b, 9.0.1c, 9.0.1d, 9.1.0, and 9.1.0b	Corrected Subtype Shown in FOS 9.1.1
162.1	162.0
162.6	162.5
184.1	184.0

In FOS v9.1.0b the following platforms incorrectly changed subtype.

In FOS v9.1.1 this is corrected as shown below:

Incorrect Subtype Shown in FOS v9.1.0b	Corrected Subtype Shown in FOS 9.1.1
165.x	165.0
166.x	166.0

6.3.2 Enhancements

FOS v9.1.1 includes the following enhancements, described in more detail below:

- Increase Trunking deskew for 8G, 16G or 32G speeds and LD/LS ports
- Switch decommission support
- FOS security hardening
- Support for XML license install with USB
- License export command for v4 (XML format) licenses
- REST Enhancements

6.3.2.1 Increase Trunking deskew for 8G, 16G, or 32G Speeds and LD/LS Ports

In FOS v9.0.x, the trunk deskew value on Gen 7 platforms is set to 300ns regardless of port speed. As a result, trunking would not form when a Gen 5/6 platform was replaced with a Gen 7 platform but retained existing cabling and DWDM at 8/16/32G speeds.

Change in FOS v9.1.1:

- When the E_Port speed is 8G, 16G or 32G, the legacy trunk deskew value (2550ns) is applied.
- When the E_Port speed is 64G, the trunk deskew value remains 300ns.
- When the E_Port is configured as LD/LS mode regardless of the speed (64G, 32G, 16G, or 8G), the legacy trunk deskew value (2550ns) is applied.

6.3.2.2 Switch Decommission Support

Switch decommissioning is provided for customers who want to erase all data on the switch prior to physically decommissioning the switch.

This is a destructive operation requiring a Decommission Authorization Code (DAC) from Brocade TAC.

Following the execution of this operation, the switch will be unusable and unrecoverable.

Example:

```
switch:admin> switchdecommission

This operation will erase the firmware on the switch, and it should be returned to the
service provider.
**********************************************************************

Please contact your service provider for a special authorization code.

License ID : (10:00:c4:f5:7c:16:9c:94)
**********************************************************************

Enter decommission authorization code(DAC):

Authorization successful. Switch decommission started......

/************************************************************/

Switch decommission has started. Please do not power off the switch.

Switch Decommission is completed.

Please return the switch to the service provider.

/************************************************************/
```

6.3.2.3 FOS Security Hardening

To provide additional security in FOS, the following commands have been removed:

- – awk
- – du
- – find
- – head
- – kill
- – pidof

- – rpm
- – sed

The following commands are hardened in FOS v9.1.1 by restricting and confining them to only execute specific functions and prohibiting the command from accessing the root shell:

- cat
- fosredirout
- grep
- less
- ls
- more
- rm
- scp
- touch

6.3.2.4 Support for an XML License Installation with a USB

Installation of licenses in XML format (version 4 licenses) are now supported with a USB.

The following is an example of the CLI syntax:

```
license --install {-key <lic_key>} |{-usb <lic_path>} | {-h <hostip> -t <protocol> [-m
<server_port_number>] -u <user>
[-p <password>] -f <filepath/xmlfile>}
```

NOTE Prior to executing the `license –install –usb` command, you must first enable the USB storage by executing the command `usbstorage -enable`.

6.3.2.5 License Export Command for v4 (XML Format) Licenses

Backup of switch licences in XML format (version 4 licenses) is now supported.

The following is an example of the CLI syntax:

```
license --export {-s <serial-number | all> -h <hostip> -t <protocol> [-m
<server_port_number>] -u <user> [-p <password>] {-f <path/file_name> | -d <directory>}}
```

6.3.2.6 REST Enhancements

The REST URIs covering the following commands have been updated to provide full parity with the CLI:

- devicelogin
- fabstatsshow
- mapsdb
- portshow (Extension not included)
- portstats64show
- sfpshow
- switchshow

Chapter 7: Software License Support

7.1 Optionally Licensed Software

Fabric OS v9.1.x includes all basic switch and fabric support software, as well as optionally licensed software that is enabled via license keys or license files.

Optionally licensed features include:

Brocade Ports on Demand – This license allows customers to instantly scale the fabric by provisioning additional SFP ports via license key upgrade. (Applies to select switch models.)

Brocade Double Density Ports on Demand – This license allows customers to instantly scale the fabric by provisioning additional SFP-DD ports via license key upgrade. (Applies to select switch models.)

Brocade Q-Flex Ports on Demand – This license allows customers to further scale the fabric and increase flexibility by provisioning additional 4x32G QSFP ports via license key upgrade. (Applies to the Brocade G620 and G630 only.)

Brocade Extended Fabrics – This license provides greater than 10 km of switched fabric connectivity at full bandwidth over long distances (depending on the platform, this can be up to 3000 km).

Brocade ISL Trunking – This license provides the ability to aggregate multiple physical links into one logical link for enhanced network performance and fault tolerance. It also includes Access Gateway ISL Trunking on those products that support Access Gateway deployment.

Brocade Fabric Vision® – This license enables support for MAPS (Monitoring and Alerting Policy Suite), Flow Vision, and ClearLink™ (D_Port) when connecting to non-Brocade devices. MAPS enables rules-based monitoring and alerting capabilities, and it provides comprehensive dashboards to quickly troubleshoot problems in Brocade SAN environments. Flow Vision enables host-to-LUN flow monitoring, application flow mirroring for nondisruptive capture and deeper analysis, and a test traffic flow generation function for SAN infrastructure validation. Support for D_Port to non-Brocade devices allows extensive diagnostic testing of links to devices other than Brocade switches and adapters.

NOTE On Brocade G620, G630, Brocade X6-8, and Brocade X6-4 platforms, this license enables the use of IO Insight capability. The license itself is identified as “Fabric Vision and IO Insight” on these platforms.

FICON Management Server – Also known as CUP (Control Unit Port), this license enables host control of switches in mainframe environments.

Integrated Routing – This license allows any Fibre Channel port in a Brocade X7-4, X7-8, G720, G730 and G620 to be configured as an EX_Port supporting Fibre Channel Routing (FCR).

Integrated Routing Ports on Demand – This license allows any Fibre Channel port in a Brocade 7810, G630, X6-8, or X6-4 to be configured as an EX_Port supporting Fibre Channel Routing. The maximum number of EX_Ports supported per platform is provided in the license.

ICL POD License – This license activates ICL ports on X6 or X7 platform core blades. An ICL license must be installed on the director platforms at both ends of the ICL connection.

On the Brocade X6-8:

The first ICL POD license enables 8 UltraScale ICL QSFP ports on each core blade of the X6-8 director, which are QSFP port numbers 0-3 and 8-11. The second ICL POD license enables all UltraScale ICL QSFP ports on each core blade of the director.

On the Brocade X6-4:

On the X6-4, the first ICL POD license enables 4 UltraScale ICL QSFP ports on each core blade of the director, which are QSFP port numbers 0, 1, 4, and 5. The second ICL POD license enables all UltraScale ICL QSFP ports on each core blade of the director.

On the Brocade X7-8:

On the X7-8, the first ICL POD license enables 4 UltraScale ICL QSFP ports on each core blade of the director, which are QSFP port numbers 0, 1, 8, and 9. The second ICL POD license on the X7-8 enables 8 UltraScale ICL QSFP ports on each core blade of the director, which are QSFP port numbers 0-3 and 8-11. The third ICL POD license on the X7-8 enables 12 UltraScale ICL QSFP ports on each core blade of the director, which are QSFP port numbers 0-5 and 8-13. The fourth ICL POD license on the X7-8 enables all UltraScale ICL QSFP ports on each core blade of the director.

On the Brocade X7-4:

On the X7-4, the first ICL POD license enables 4 UltraScale ICL QSFP ports on each core blade of the director, which are QSFP port numbers 0, 1, 4, and 5. The second ICL POD license on the X7-4 enables all UltraScale ICL QSFP ports on each core blade of the director.

Extension Upgrade License – The Extension Upgrade license is available on the Brocade 7810, enabling additional ports, capacity, and features that provide the following: 12 32Gb/s FC ports, 4 tunnels, 6 circuits per tunnel, 2.5Gb/s WAN throughput, Fabric Vision, Extension Trunking, Brocade ISL Trunking, Integrated Routing Ports on Demand, and Brocade Extended Fabrics. This license is shown as a combination of existing FOS licenses that enable the above capabilities and features.

7.2 Temporary License Support

The following licenses are available in Fabric OS v9.1.x as either universal temporary or regular temporary licenses:

- Fabric (E_Port)
- Extended Fabric
- Trunking
- Integrated Routing
- Integrated Routing Ports on Demand
- FICON Management Server (CUP)
- Fabric Vision
- Extension Upgrade

NOTE Temporary licenses for features available on a per-slot basis enables the feature for all slots in the chassis.

Temporary and universal temporary licenses have durations and expiration dates established in the licenses themselves. FOS will accept up to two temporary licenses and a single universal license on a unit. Universal temporary license keys can be installed only once on a particular switch, but they can be applied to as many switches as desired. Temporary use duration (the length of time for which the feature will be enabled on a switch) is provided with the license key. All universal temporary license keys have an expiration date after which the license can no longer be installed on any unit.

Temporary or universal temporary licenses for Extension Upgrade do not enable additional ports on 7810.

Chapter 8: Hardware Support

8.1 Supported Devices

The following devices are supported in this release:

- Brocade X7-8 Director
- Brocade X7-4 Director
- Brocade X6-8 Director
- Brocade X6-4 Director
- Brocade G730 Switch
- Brocade G720 Switch
- Brocade G630 Switch
- Brocade G620 Switch
- Brocade G610 Switch
- Brocade G648 Blade Server SAN I/O Module
- Brocade MXG610 Blade Server SAN I/O Module
- Brocade 7810 Extension Switch

8.2 Supported Blades

8.2.1 X6-8 and X6-4 Blade Support

Fabric OS v9.1.x software is fully qualified and supports the blades for the X6-8 and X6-4 as noted in the following table.

Blades	FOS v9.1.x Support
FC32-48 32G FC blade	Supported.
SX6 Gen 6 Extension blade	Supported. Up to a maximum of four blades of this type.
FC32-64 32G FC/FCoE blade	Supported.

8.2.2 X7-8 and X7-4 Blade Support

Fabric OS v9.1.x software is fully qualified and supports the blades for the X7-8 and X7-4 as noted in the following table.

Blades	FOS v9.1.x Support
FC32-X7-48 32G X7 FC blade	Supported.
FC64-48 64G FC blade	Supported
FC32-48 32G FC blade	Supported.
SX6 Gen 6 Extension blade	Supported. Up to a maximum of four blades of this type.
FC32-64 32G FC/FCoE blade	Supported.

8.3 Supported Power Supplies

For the list of supported power supplies for Brocade X6 and power supply requirements, refer to the Brocade X6 Director Technical Specifications section of *Brocade X6-8 Director Hardware Installation Guide* and *Brocade X6-4 Director Hardware Installation Guide*.

For the list of supported power supplies for Brocade X7 and power supply requirements, refer to the *Brocade X7 Director Technical Specification*.

8.4 Supported Optics

For a list of supported fibre optic transceivers that are available from Brocade, refer to the latest version of the *Brocade Transceiver Support Matrix* available online at www.broadcom.com.

Chapter 9: Software Upgrades and Downgrades

9.1 Platform Specific Downloads

This release of FOS is available for entitled equipment download in **Platform Specific Download (PSD)** form. FOS PSD releases provide a smaller version of the FOS image that can only be loaded on a single hardware platform, consisting of a single switch model or group of switch models. These FOS PSD images enable much faster download and file transfer times since they are between 65-90% smaller in size than traditional full FOS images.

Unlike traditional FOS release images that can be installed on any supported Brocade switch and director, FOS PSD images must be downloaded separately for each platform that the FOS release will be used on. The full list of unique FOS PSD images available for this release and the models that each PSD image supports is noted in section FOS Image Filenames.

9.1.1 Using FOS PSDs

FOS PSD images are generally used in the same manner as traditional full FOS release images.

Once loaded onto a switch, the FOS image running is identical to what would be in use if a traditional full image was used for the installation. Issuing a `firmwareshow` command on a switch will display only the FOS version level, with no indication of whether the code was loaded from a FOS PSD image or a full FOS image.

9.1.1.1 Loading FOS PSDs via Web Tools or FOS Command Line

Installing a FOS PSD image on a switch is performed in the same manner as using a traditional full FOS image. If a FOS PSD image is loaded on an incorrect switch model (for example, attempting to load a FOS PSD image for a Gen 6 entry level switch on a Gen 6 Director), the following error message displays:

```
Cannot download the requested firmware because the firmware doesn't support this
platform. Please enter another firmware.
```

9.1.1.2 Loading FOS PSDs via Brocade SANnav™ Management Portal

Brocade SANnav™ Management Portal v2.1.1 or earlier does not support FOS PSD images. However, FOS PSD images are supported with SANnav v2.1.1.3 and later releases. SANnav v2.1.1.3 and later can both host and install FOS PSD images onto Brocade switches.

9.2 FOS Image Filenames

Fabric OS v9.1.1b

Image Filename	Description
v9.1.1b.md5	Fabric OS v9.1.1b MD5 Checksums
v9.1.1b_all_mibs.tar.gz	Fabric OS v9.1.1b SNMP MIBs
v9.1.1b_EXT.tar.gz	Fabric OS v9.1.1b for Linux to install on 7810 platform
v9.1.1b_EXT.zip	Fabric OS v9.1.1b for Windows to install on 7810 platform
v9.1.1b_EMB.tar.gz	Fabric OS v9.1.1b for Linux to install on G648 and MXG610 platforms
v9.1.1b_EMB.zip	Fabric OS v9.1.1b for Windows to install on G648 and MXG610 platforms

v9.1.1b_G6_ENTRY.zip	Fabric OS v9.1.1b for Windows to install on G610 platform
v9.1.1b_G6_ENTRY.tar.gz	Fabric OS v9.1.1b for Linux to install on G610 platform
v9.1.1b_G6_MID.tar.gz	Fabric OS v9.1.1b for Linux to install on G620 platform
v9.1.1b_G6_MID.zip	Fabric OS v9.1.1b for Windows to install on G620 platform
v9.1.1b_G6_ENTP.tar.gz	Fabric OS v9.1.1b for Linux to install on G630 platform
v9.1.1b_G6_ENTP.zip	Fabric OS v9.1.1b for Windows to install on G630 platform
v9.1.1b_G7_MID.tar.gz	Fabric OS v9.1.1b for Linux to install on G720 platform
v9.1.1b_G7_MID.zip	Fabric OS v9.1.1b for Windows to install on G720 platform
v9.1.1b_G7_ENTP.tar.gz	Fabric OS v9.1.1b for Linux to install on G730 platform
v9.1.1b_G7_ENTP.zip	Fabric OS v9.1.1b for Windows to install on G730 platform
v9.1.1b_G6G7_DIR.tar.gz	Fabric OS v9.1.1b for Linux to install on X6-8, X6-4, X7-8 and X7-4 platforms
v9.1.1b_G6G7_DIR.zip	Fabric OS v9.1.1b for Windows to install on X6-8, X6-4, X7-8 and X7-4 platforms
v9.1.1b.releasenotes_v2.0.pdf	Fabric OS v9.1.1b Release Notes

The image files for each respective platform can be downloaded from your switch vendor's website and https://support.broadcom.com/, except for YANG files which are available on https://www.broadcom.com/products/fibre-channel-networking/software/fabric-operating-system.

9.3 Migration Path

This section contains important details to consider before migrating to or from this FOS release. Refer to the *Brocade Fabric OS Software Upgrade User Guide* for detailed instructions on non-disruptive and disruptive upgrade procedures.

NOTE For Brocade X6, G630, X7, and G730 a valid Trusted FOS (TruFOS) Certificate is required to upgrade to FOS v9.1.x. For details on how to obtain a TruFOS Certificate, see Brocade Trusted FOS (TruFOS) Certificate.

9.3.1 Migrating to FOS 9.1.0

The supported upgrade paths to Fabric OS v9.1.x are as follows:

Current Version	Upgrade Path
FOS v9.0.x	Nondisruptive upgrade
FOS v8.2.x	Nondisruptive upgrade: First upgrade from FOS v8.2.x to FOS v9.0.x. Then if applicable (X6 and G630) install TruFOS Certificate and proceed with upgrade to FOS v9.1.x.

9.3.2 Migrating from FOS 9.1.x

The following table lists the currently supported Fabric OS downgrade versions and platforms.

Table 1 Gen 6 and Gen 7 Platforms and Supported Firmware Downgrade Versions from Fabric OS v9.1.x

Platforms	Fabric OS v9.1.x	Fabric OS v9.0.x	Fabric OS v8.2.x
Brocade Gen 7 (64G) Fixed-Port Switches			
Brocade G720 (Switch Type 181.0)	Supported	Supported	Not Supported
Brocade G720 (Switch Type 181.5)	Supported (Fabric OS v9.1.1 and later)	Not Supported	Not Supported
Brocade G730 (Switch Type 189.8)	Supported	Not Supported	Not Supported
Brocade Gen 7 (64G) Directors			
Brocade X7-4 Director	Supported	Supported	Not Supported
Brocade X7-8 Director	Supported	Supported	Not Supported
Brocade Gen 6 (32G) Fixed-Port Switches			
Brocade G610 (Switch Type 170.0 to 170.3)	Supported	Supported	Supported
Brocade G610 (Switch Type 170.4 or higher)	Supported	Supported (Fabric OS v9.0.1b and later)	Not Supported
Brocade G620 (Switch Type 162)	Supported	Supported	Supported
Brocade G620 (Switch Type 183.0)	Supported	Supported	Not Supported
Brocade G620 (Switch Type 183.5)	Supported (Fabric OS v9.1.1 and later)	Not Supported	Not Supported
Brocade G630 (Switch Type 173)	Supported	Supported	Supported
Brocade G630 (Switch Type 184)	Supported	Supported	Not Supported
Brocade 7810 Extension Switch	Supported	Supported	Supported (Fabric OS v8.2.1 and later)
Brocade G648 Blade Server SAN I/O Module	Supported	Supported	Supported
Brocade MXG610 Blade Server SAN I/O Module	Supported	Supported	Supported
Brocade Gen 6 (32G) Directors			
Brocade X6-4	Supported	Supported	Supported
Brocade X6-8	Supported	Supported	Supported
Brocade X6-4 (Switch Type 165.5)	Supported (Fabric OS v9.1.0b and later)	Not Supported	Not Supported
Brocade X6-8 (Switch Type 166.5)	Supported (Fabric OS v9.1.0b and later)	Not Supported	Not Supported

9.4 Brocade Trusted FOS (TruFOS) Certificate

Brocade TruFOS Certificates are factory installed on applicable platforms shipping with FOS v9.x.
For X6 Directors and G630, you may need to install a TruFOS Certificate prior to upgrading to FOS v9.1.x.

The installation can be performed using SANnav or using the CLI command license as shown in the example below:

```
Switch:admin> license –install -h 10.155.2.154 -t ftp -u UserName -p Password -f
/20211013171159568_10_00_c4_f5_7c_64_5b_60.xml
License Installed [FOS-87-0-04-11209683]
```

9.5 Upgrade/Downgrade Considerations

When upgrading a Gen 7 director or switch (X7-4, X7-8, G730, G720) to FOS v9.1.x, it is recommended to upgrade to FOS v9.1.1c. For additional information see TSB 2023-289-A.

During a firmware downgrade from v9.1.x to a pre-v9.1.0 firmware version, a transitory SEC-3089 error message may be displayed after `firmwaredownload` completes, but before a reboot is done.

The following platforms cannot be downgraded from FOS 9.1.1:

Brocade G620 (switchType 183.5)

Brocade G720 (switchType 181.5)

In FOS 9.1.x when performing firmwaredownload, the HA reboot triggers the broadcast message "`The system is going down for reboot NOW!`" -this is a standard Linux message when a system is doing a graceful shutdown.

This is non-disruptive to IO-traffic during this process.

Example below:

```
Do you want to continue (Y/N) [Y]:
Firmware download in progress, please wait.

Broadcast message from root@Switch (Fri Aug 26 10:59:01 2022):

The system is going down for reboot NOW!
```

Refer to the *Brocade Fabric OS Software Upgrade User Guide* for detailed instructions on non-disruptive and disruptive upgrade procedures.

Prior to downgrading to a pre-v9.1.1 firmware version, any 64G LWL secure SFP must be removed. Firmware downgrade with 64G LWL secure SFP inserted fails since the SFP is not supported pre-v9.1.1. If attempted, remove the 64G LWL secure SFP and retry firmwaredownload.

Chapter 10: Limitations and Restrictions

This chapter contains information that you should consider before you use this Fabric OS release.

10.1 Scalability

All scalability limits are subject to change. Limits may be increased once further testing has been completed, even after the release of this version of the Fabric OS software. For current scalability limits for Fabric OS software, refer to the Brocade SAN Scalability Guidelines for Brocade Fabric OS 9.X document.

10.2 Compatibility/Interoperability

This section describes important compatibility and interoperability across Brocade products.

10.2.1 Brocade SANnav Management Portal Compatibility

When managing SAN switches with SANnav Management Portal it is recommended to first upgrade SANnav Management Portal to v2.2.1 (or later) prior to upgrading SAN switches to FOS v9.1.1.

While SANnav Management Portal v2.2.0 supports SAN switches running FOS v9.1.1, the use of IO Insight and Flow Vision features with SANnav requires SANnav Management Portal v2.2.1 (or later). For details, review the latest SANnav Management Portal v2.2 Release Notes.

10.2.2 Web Tools Compatibility

Web Tools supports firmware migration to v9.1.x from FOS v9.0.x.

Upgrading to FOS v9.0.x is supported from FOS v8.2.2a or later and FOS v8.2.1d or later.

To migrate from FOS v8.2.2 or from FOS v8.2.1c or earlier versions to FOS v9.0.0x using Web Tools, switches must first migrate to FOS v8.2.1d or later or to FOS v8.2.2a or later as a first step, then to FOS v9.0.x or later as the final step.

NOTE Web Tools will always show English language irrespective of Browser or Operating System language setting.

10.2.3 Fabric OS Compatibility

- The following table lists the earliest versions of Brocade software supported in this release, that is, the earliest supported software versions that interoperate. Use the latest software versions to get the greatest benefit from the SAN.
- To ensure that a configuration is fully supported, always check the appropriate SAN, storage, or blade server product support page to verify support of specific code levels on specific switch platforms before installing on your switch. Use only Fabric OS versions that are supported by the provider.
- For a list of the effective end-of-availability dates for all versions of Fabric OS software, refer to the *Brocade Software End of Availability Notice* published to the Brocade Product End-of-Life web page https://www.broadcom.com/support/fibre-channel-networking/eol.

- For the latest support and posting status of all release of Brocade Fabric OS, refer to the *Brocade Software: Software Release Support and Posting Matrices* published to the Brocade Product End-of-Life web page https://www.broadcom.com/support/fibre-channel-networking/eol.

Supported Products	Fabric OS Interoperability
Brocade 5424, 5431, 5432, 5480, NC-5480	FOS v7.4.2 or later (Not compatible in the same fabric. Must use FCR or connect as AG)
Brocade 300	FOS v7.4.2 or later (Not compatible in the same fabric. Must use FCR or connect as AG)
Brocade 7800	FOS v7.4.2 or later (Not compatible in the same fabric. Must use FCR) Note: There is no interoperability on VE interface(s) with another VE interface on a device running FOS v9.1.x (Brocade 7810 or Director with SX6 blade)
Brocade 7840	FOS v8.2.0 or later Note: When running FOS v8.2.1 or later there is interoperability on VE interface(s) with another VE interface on a device running FOS v9.1.x (Brocade 7810 or Director with SX6 blade)
Brocade DCX 8510-8/DCX 8510-4	FOS v8.2.x
Brocade DCX 8510-8/DCX 8510-4 with FC16-64 blade	FOS v8.2.x
Brocade 6505, 6510, 6520, 7840	FOS v8.2.x
Brocade 6542	FOS v8.2.x
Brocade 6543	FOS v8.2.x
Brocade 6547, 6548, M6505, 6545, 6546	FOS v8.2.x
Brocade 6558	FOS v8.2.x
Brocade G610 (switchType 170.0 to 170.3)	FOS v8.2.0 or later
Brocade G610 (switchType 170.4 or higher)	FOS v9.0.1b or later
Brocade G620 (switchType 162)	FOS v8.2.0 or later
Brocade G620 (switchType 183.0)	FOS 9.0.0 or later
Brocade G620 (switchType 183.5)	FOS 9.1.1 or later
Brocade G630 (switchType 173)	FOS 8.2.0 or later
Brocade G630 (switchType 184)	FOS 9.0.0 or later
Brocade 7810	FOS 8.2.1 or later
Brocade X6-8/X6-4	FOS v8.2.0 or later
Brocade X6-8/X6-4 with FC32-64 blade	FOS 8.2.0 or later
Brocade X6-8/X6-4 (switchType 166.5 and 165.5)	FOS 9.1.0b or later
Brocade G720 (switchType 181.0)	FOS 9.0.0 or later
Brocade G720 (switchType 181.5)	FOS 9.1.1 or later
Brocade G730 (switchType 189.8)	FOS 9.1.0 or later
Brocade X7-8/X7-4	FOS 9.0.0 or later

Brocade G648[1]	FOS 9.0.0 or later
Brocade MXG610[2]	FOS 9.0.1a or later

10.2.4 SNMP Support

Fabric OS v9.1.x documents the supported MIBs in the *Brocade Fabric OS MIB Reference Manual*. For information about SNMP support in Fabric OS software and how to use MIBs, refer to the *Brocade Fabric OS Administration Guide for Fabric OS v9.1.x*.

NOTE Fabric OS v9.1.x support SNMPv1 and SNMPv3, SNMPv2 deprecated in Fabric OS v9.0.1a, SNMP walk using SNMPv2 is blocked in Fabric OS v9.1.x.

10.2.5 Obtaining MIBs

You can download the MIB files required for this release from the Downloads area of the support portal site. To download the Brocade-specific MIBs, you must have a user name and password. Perform the following steps.

1. Go to https://support.broadcom.com/, click **Login**, and enter your username and password.

   If you do not have an account, click **Register** to set up your account.

2. Select **Brocade Storage Networking** in the support portal.

   Distribution of standard MIBs has been stopped. Download the required standard MIBs from the http://www.oidview.com/ or http://www.mibdepot.com/ or https://www.simpleweb.org/ietf/mibs/.

10.2.6 Flow Vision, IO Insight and VM Insight

- The VMID+ feature is mutually exclusive with extended ISL (XISL) usage on logical switches. Therefore, you should disable the VMID+ to allow the XISL-usage feature to work, and you should turn off the XISL usage feature for the VMID+ to work.
- The VMID+ feature is not supported with Fibre Channel Router (FCR).
- Configuring an EX_Port and F_Port with the application header on the same chassis is not supported in VF and non-VF mode. However, the configuration is not blocked.
- The VMID+ feature is not supported on FICON logical switch ports.
- Enabling the VMID+ configuration on F_Ports connected to encryption-supported third-party devices is not supported.

[1] Brocade G648 is also supported with FOS v8.2.0_gft release.

[2] Brocade MXG610 is also supported with FOS 8.1.0_lnx2, 9.0.1a, and 9.1.0b.

10.2.7 REST API Support

Fabric OS v9.1.x documents the supported REST API functions in the *Brocade Fabric OS REST API Reference Manual*.

10.2.7.1 Obtaining YANG Files

YANG is a standard data modelling language that defines the data sent over the FOS REST API. Each FOS REST API module is defined in a YANG module file with a .yang name extension. To download the Brocade FOS-specific YANG files from the Broadcom website, perform the following steps:

1. Go to https://www.broadcom.com/products/fibre-channel-networking/software/fabric-operating-system/.
2. Select **Downloads**.
3. The YANG files can be located under the Yang Modules.
4. Unzip or untar the Fabric OS package file; the `yang.tar.gz` file contains the collection of YANG module files that this FOS release version supports. Untar the `yang.tar.gz` file to obtain individual YANG module files.

   Alternatively, the YANG modules for a specific FOS version can be downloaded from https://github.com/brocade/yang.

10.3 Important Notes

Brocade recommends to always review Important Notes for each release.

10.3.1 4G Support on Gen 6 switches

The Brocade G620 with switchType 183, G630 with switchType 184, and FC32-X7-48 blades do not support 4G EX-Port.

Brocade G620 with switchType 183, G630 with switchType 184, and FC32-X7-48 blades support 4G E-Port connected between those three only (switchType 183, 184 and FC32-X7-48).

10.3.2 Access Gateway

- The 32G links with 4x32G QSFP ports (port 48 to port 63) do not have default mappings. These ports will be disabled by default when a Brocade G620 is enabled for Access Gateway mode or when the configuration is set to the default.
- Attempts to remove failover port mapping from N_Port number 0 on an Access Gateway fail. This problem does not exist on other N_Port numbers.
- Brocade G620 with switchType 183, G630 with switchType 184, and FC32-X7-48 blades do not support N-port connection from 4Gbps Access Gateway.

10.3.3 Brocade Analytics Monitoring Platform

FOS v9.1.x supports vTap on Brocade legacy Gen 6 platforms to be monitored by the Brocade Analytics Monitoring Platform. The supported Brocade platforms include: G610, G620, G630, X6-4, and X6-8.

10.3.4 ClearLink Diagnostics (D_Port)

Fabric OS v9.1.x supports D_Port tests between two Brocade switches and between Brocade switches and Gen 5 (16Gb/s), Gen 6 (32Gb/s), and Gen 7 (64Gb/s) Fibre Channel adapters from QLogic and Emulex®. The following are specific adapter models and driver versions supported by Brocade with Fabric OS v9.1.x for ClearLink Diagnostics.[2]

	Emulex 16G Adapter	Emulex 32G Adapter	Emulex Gen 7 Adapter	QLogic 16G Adapter	QLogic 32G Adapter
Adapter Model	LPe16002B-M6	LPe32002-M2	LPe35002 LPe35004 LPe36000	QLE2672	QLE2742
Adapter Firmware	12.8.542.25	12.8.542.26	12.8.542.xx	v8.08.231	V9.0.6.02
Adapter Driver	12.6.165.0	12.6.165.0	12.6.165.0 12.8.351.x	STOR Miniport 9.4.4.20	STOR Miniport 9.4.5.20

D_Port tests will fail between a port with a 64G optic on a switch or director operating with FOS v9.0.1b and a port on a G720, X7, G620 (switchType 183), or G630 (switchType 184) operating with FOS v9.0.0x. Any of these platforms operating with FOS v9.0.0x should be upgraded to FOS v9.0.1a or later prior to running D_Port tests to a 64G optic.

10.3.5 Diagnostic POST

- If Diagnostic POST is enabled, `supportSave` should not be started until the POST tests are completed after a switch or director boots up. Starting `supportSave` collection when POST tests are still running can result in unpredictable behaviour.

10.3.6 DWDM

- For best performance and resiliency when deploying native FC ISLs over DWDM, best practice is to deploy distinct ISLs over DWDM with in-order delivery (iodset) configured on the switches.
- Trunking over DWDM is not generally recommended due to the risk of out-of-order frame delivery. Trunking relies on deterministic deskew values across all trunked links to provide in-order delivery as well as FC primitives for trunk formation. These deskew values cannot be guaranteed with DWDM equipment in the path.
- Use of trunking over DWDM links should only be done when validated and supported by the DWDM vendor.
- With Gen 7 switches, the permitted deskew (variance in latency due to difference in cable length) is less at 64G compared to lower interface speeds.

[2] Adapter firmware or driver versions that are later than the ones listed in the table may not work.

10.3.7 Ethernet Management Interface

- The recommended interface speed configuration for a Brocade Gen 6 or Gen 7 switch or director chassis is 1G auto-negotiate.
- If a Brocade switch management interface is running at 10 Mb/s, certain FOS operations such as `firmwaredownload` may fail.
- The 10Gb/s management interface on CPX6 blades is not supported.
- Half-duplex mode is not supported in FOS v9.x and is blocked.
- The `ethif --reseterror` command option is not supported in FOS v9.0.x.
- The `ethif --reseterror` command option is supported in FOS v9.1.x.

10.3.8 Extension

Extension between a Brocade 7810 or SX6 running FOS v9.x and a Brocade 7840 is supported only if the 7840 is running FOS 8.2.1 or later. The following table documents the combinations.

Site1 Switch/Blade	Site1 Firmware	Site2 Switch/Blade	Site2 Firmware
7840	8.2.1 or later	7840	8.2.1 or later
SX6	9.0.0 or later	7840	8.2.1 or later
7810	9.0.0 or later	7840	8.2.1 or later

10.3.9 FCoE

The following topologies for FCoE on the FC32-64 are not supported with FOS 9.1.x:

- Cisco UCS server directly connected to the FC32-64 without a Fabric Interconnect module.
- Cisco UCS server with a Fabric Interconnect module connected to the FC32-64 via a Nexus 5000 series switch in between. Neither running FCoE NPV mode nor L2 switching mode on the Nexus 5000 is supported.
- FCoE devices are supported in edge-to-edge fabric topology. They are not supported in edge-to-backbone fabric topology over FCR configurations.

10.3.10 FC-NVMe

- FC-NVMe is supported in edge-to-edge fabric topology with device type information (e.g. Initiator or Target) over FCR configurations.
- FC-NVMe is supported in edge-to-backbone fabric topology without device type information over FCR configurations.

10.3.11 Firmware Migration

When doing staged firmware download migration from FOS 9.0.x to FOS 9.1.x using `firmwaredownload -r` option if there is any explicit expected or unexpected switch reboot before the firmware is activated it can result in the switch or chassis being in an unrecoverable state. Consequently, the system will end up in an erroneous state and will not be able to boot up correctly.

10.3.12 Forward Error Correction

- FEC is mandatory with Gen 6 and Gen 7 Fibre Channel operating at 32Gb/s or higher bandwidth. This means that the `portcfgfec` command applies only to ports that are running at 16Gb/s or 10Gb/s.
- FEC capability is not supported with all DWDM links. This means that FEC may need to be disabled on 16Gb/s or 10Gb/s ports when using DWDM links with some vendors. This is done using the `portcfgfec` command. Failure to disable FEC on these DWDM links may result in link failure during port bring-up. Refer to the *Brocade Fabric OS 9.x Compatibility Matrix* for supported DWDM equipment and restrictions on FEC use.

10.3.13 FPGA Upgrade

When deploying the Gen 7 Fibre Channel 2KM QSFP (XBR-00476) for ICLs on Brocade X7, the Field Programmable Gate Array (FPGA) on each Core Routing blade (CR64) must be upgraded. If a Gen 7 Fibre Channel 2Km optic is plugged into CR64 blade with a down level FPGA version the RAS-LOG BL-1087 is displayed.

Example: `[BL-1087], 2973/525, SLOT 1 | CHASSIS, CRITICAL, X7-4, FPGA in slot 5 should be upgraded to support the Gen7 ICL QSFP for blade ID 214.`

In FOS 9.1.1, the FPGA upgrade can be performed non-disruptively by upgrading the CR64 blades one by one.

The upgrade process can take up to 20 minutes per CR64 blade.

10.3.13.1 FOS v9.1.1 FPGA Upgrade

To upgrade the FPGA on the CR64 blades perform the following steps:

1. Perform the following command to verify current FPGA code level `fpgaupgrade --latest`
2. Verify the *current* FPGA code level is lower than 0x01.0a for the CR64 blade slots
   - Slot 7 and 8 on X7-8
   - Slot 5 and 6 on X7-4

   After verification proceed to the next step.
3. Verify both CR64 blades are online with the command `slotshow.`
4. Prepare for upgrade of the FPGA on the first CR64 blade with the command `portdecom <ICL port> -qsfp` perform this for all connected E-ports (ICL ports) on the CR64 blade.
5. Disable the first CR64 blade on which the ICL ports were decommissioned in the previous step `portdisable -s <core blade slot #>.`
6. Upgrade the FPGA on the first CR64 blade with the command `fpgaupgrade -s <core blade slot #>`
   a. Respond `Yes` to automatically power-off and power-on the blade.
      i. `Do you want to power-off and power-on the slot # automatically, after FPGA and/or CPLD upgrade (y/[n])?:`
   b. In case you respond `No` to automatically power-off and power-on the blade perform these steps manually.
      i. `slotpoweroff <core blade slot #>`
      ii. `slotpoweron <core blade slot #>`
7. Verify the FPGA on the first CR64 blade is upgraded with the command `fpgaupgrade –latest.`
   a. Verify the FPGA code level is 0x01.0a
8. Enable the first CR64 blade with the command `portenable -s <core blade slot #>` (as needed).
9. Persistently enable all ICL ports on the CR64 blade (which were disabled in step 5 prior to the upgrade) `portcfgpersistentenable <ICL port>.`

   Repeat this step for all connected E-ports (ICL ports) on the CR64 blade.
10. Verify the ICL ports are online with the command `switchshow.`
11. Repeat steps 4 through 11 on the second CR64 blade.

    The FPGA upgrade is now complete.

10.3.14 Security

The security enhancements in this section all apply to both FOS v9.0.x and FOS v9.1.x

- FOS v9.0.x and v9.1.x require passwords for **admin** and **user** accounts to be changed from the default password string “password”. In the following scenarios, default password may still be present in FOS v9.0.x and v9.1.x. It is recommended to change the password in this scenario or at the next login prompt:
  - A default password is used in an earlier FOS version (prior to v9.0.0). FOS is upgraded from the earlier FOS version to FOS v9.x.
  - A default password is used in an earlier FOS version on active CP. The standby CP runs FOS v9.x and becomes active due to HA failover.
  - A default password is used in an earlier FOS version. Password is distributed from the earlier FOS version to FOS v9.x.
- It is recommended to reconfigure shared secrets for F_Port authentication between Access Gateway and switch before firmware upgrade to FOS v9.x. The shared secrets should be configured as given in the following table.

Access Gateway FOS Version	Edge Switch FOS Version	Shared Secret Configuration
Pre-9.0.0	9.0.0 or later	AG local secret = Switch local secret AG peer secret = Switch peer secret
9.0.0 or later	9.0.0 or later	AG local secret = Switch peer secret AG peer secret = Switch local secret

- It is recommended to reconfigure shared secrets for F_Port authentication between HBAs and a switch before the switch is upgraded to FOS v9.0.0 or later. Without reconfiguration, shared secrets configured in earlier FOS versions will fail F_Port authentication when a device port resets. The shared secrets should be configured as given in the following table.

FOS Version	Shared Secret Configuration
Pre-v9.0.0	Device local secret = Switch local secret Device peer secret = Switch peer secret
9.0.0 or later	Device local secret = Switch peer secret Device peer secret = Switch local secret

- FOS v9.x does not support F_Port authentication to Marvell QLogic BR series (Former Brocade Product Line) HBAs as these HBAs only support legacy Brocade F_Port authentication. For these devices to connect to FOS v9.x, F_Port authentication must be disabled.
- FOS v9.x does not support F_Port trunking when F_Port authentication is enabled
- Prior to upgrading to FOS v9.x:
  - First, ensure the secrets on both the switches (E-port authentication) are not the same. Otherwise, the E-port will segment after the upgrade to 9.x
  - Secondly, reconfigure shared secrets to be in compliance with FC-SP 2 standard

    If users configure any duplicated Virtual Fabric (VF) list with `ldapcfg –mapattr <ldaprole>` command, only the first mapping from the list will be used during LDAP authentication and authorization.
- FOS 9.x requires role mapping or VSA attributes to be configured for LDAP user authentication in a VF-enabled switch. In a non-VF switch, `ldapcfg --maprole` is mandatory. It should be configured before upgrading to FOS v9.x to avoid login failure for LDAP users.
- Users must specify the domain of an LDAP server when adding the LDAP server to the remote AAA configuration of a switch.

- Optional certificate extensions, such as BasicConstraints, KeyUsage, and ExtendedKeyUsage are ignored when a certificate containing these is imported in basic mode. During session establishment, the extensions are validated. Hence, invalid extensions will be rejected and result in session failure.
- Login of LDAP users using Distinguished Name (DN) will be supported only for the users created in container “Users” of the domain configured in the switch, even though the switch is configured with Global Catalog (GC) port of the server. Login using User Principal Name (UPN) and sAMAccountName will be supported irrespective of the domain and OU on which the user is created.

10.3.15 Zoning

- When performing configdownload with a file that contains unsorted zone membership, any unsorted members will be automatically sorted in the system when configdownload completes. As a result, when a switch is later re-enabled, port segmentation may occur due to adjacent switches having the same zones with unsorted membership lists. Users can recover from segmentation by executing cfgDisable, cfgClear, and cfgSave operations in order to clear the zoning database from the switch that just performed ‘configdownload’. After segmented ISL ports are re-enabled, zone merge can proceed.

NOTE These steps should ONLY be performed if the zone database is the same on the configdownload switch as it is on the rest of the fabric.

10.3.16 Brocade X6 Field Migration

- FOS v9.1.1x supports a field migration of a Brocade X6 switch Type 165.5 and 166.5 to an upgraded X6 with Gen 7 support.
- Field migration of a Brocade X6 (switch Type 165 and 166) to an upgraded X6 with Gen 7 support is available with FOS v9.0.0x, FOS v9.0.1x and FOS v9.1.0x.
  Refer to the *Brocade X6 Field Migration Guide* for step by step instructions.
- During field migration of Brocade X6 to a field upgraded X6 with Gen 7 support, the `portcfgupload` file will contain `portcfgtrunkport` commands for ICLs. A warning message is displayed to indicate that the command is not valid for ICL ports because trunking cannot be disabled on ICLs. This warning will not affect the ICLs and is harmless.

10.3.17 Miscellaneous

- After a power supply unit is removed from a Brocade G620, the `historyshow` command may miss the entries for this FRU removal or insertion event. In addition, the RASLog error message EM-1028 may be logged when the power supply is removed. This condition can be corrected by power-cycling the switch.
- After running offline diagnostics mode 1 on QSFP ports, a Brocade G620 must be rebooted before operational use.
- After running offline diagnostics with `portledtest`, `portloopbacktest`, or `turboramtest` commands on FOS v9.x, Brocade G630 with `swtichType` 184 must be rebooted before operational use.
- All links in an ICL QSFP connection on a Brocade X6 Director must be configured to the same speed using the `portcfgspeed` command from one of the following supported speeds: 16Gb/s, 32Gb/s, or ASN. To connect an ICL from an X6 with a 4x32GFC breakout optic (P/N 57-1000351-01) or a 4x16G FC optic to a 4x16G FC optic in a DCX® 8510, the X6 port’s speed must be set to 16Gb/s.
- Brocade G630 LEDs illuminate amber and green during power-up.
- The CLI command option `snmpconfig -set accesscontrol` is planned to be deprecated in the next major release.
- When replacing a FC32-64 blade with a FC32-48 blade, flexport and FCoE configurations should be removed before the FC32-64 blade is removed.

- Enhanced checks are performed on optics during firmware upgrade to FOS v9.0.0 or later. Firmware download is blocked if unsupported optics are discovered. The scanning of the optics takes a few minutes to complete. The amount of time it takes is dependent on the number of ports on a switch. On a fully loaded eight (8) slot director, it can take up to five (5) minutes to complete. In addition, ports with optics that fail the enhanced checks in FOS v9.x will not be able to come online due to the optics as invalid module.
- Brocade G620 with `switchType` 183 and G630 with `switchType` 184 do not support the following legacy optical modules:
  - 16G SWL (HAA1, HAA2 serial number)
  - 16G LWL (HDA1, HDA2, HDA3 serial number)
  - 32G QSFP SWL (ZTA serial number)

  The following examples show the `sfpShow` CLI outputs with the serial numbers of the legacy optical module

```
sfpshow <port> -f
...
Serial No: HAA11213107BTY2
...

sfpshow <port> -f
....
Serial No: HDA318014000DN1
....

sfpshow <port> -f
....
Serial No: ZTA11517000001K
```

- All user ports in a Gen 7 ICL QSFP port must be assigned to the same logical switch when Virtual Fabric is configured. Port 0 of the ICL QSFP must be enabled first before port 1, port 2, and port 3 within the same QSFP to be enabled. If port 0 of the Gen 7 ICL QSFP becomes offline, port 1, port 2, and port 3 of the QSFP will become offline as a result.
- All user ports in a Gen 7, 2KM ICL QSFP port must be assigned to the same logical switch when Virtual Fabric is configured. Port 3 of the ICL QSFP must be enabled first before port 0, port 1, and port 2 within the same QSFP to be enabled. If port 3 of the Gen 7, 2KM ICL QSFP becomes offline, port 0, port 1, and port 2 of the QSFP will become offline as a result.
- The output of CLI command `sfpShow` or any other interfaces to retrieve information from Gen 7 SWL QSFP (Part Number 57-1000490) and LWL QSFP (Part Number 57-1000491) does not match the Part Numbers on the media sticker labels. The output shows Gen 6 Part Number (57-1000351 for SWL or 57-1000480 for LWL). This does not affect operation of the optics.
- When a fabric with FOS v9.x is connected to a fabric with pre-FOS v9.0.0, RASLOG message FABR-1001 is generated as shown in the following example. This is an expected message. There is no impact on the ISL functionality.

```
[FABR-1001], 35, FID 128, WARNING,, port 62, incompatible VC count
```

- FOS v9.x has disabled directory listing in CLI shell. As a result, entering <tab><tab> key does not list all CLIs available. Users can enter help command to list the commands. The shell tab completion by entering the first letter followed by <tab> key is supported.
- The FCR support of “Long Distance Fabric” mode conflict cannot coexist with long distance port configuration. If long distance mode (LD, LS, or LE) is enabled on the EX_Port and the EX_Port detected Backbone Fabric's "Long distance fabric" configuration is different from the connected Edge Fabric's "Long distance fabric" configuration, then the EX_Port will be disabled.
- If “Long Distance Fabric” is enabled on a switch via the `configure` command, it is recommended to upgrade the switch from FOS v8.2.x directly to FOS v9.0.0a or later. If the “Long Distance Fabric” configuration is enabled on an E_Port or EX_Port, firmware upgrade or downgrade to FOS v9.0.0 will effectively cause the “Long Distance Fabric” configuration to be disabled.
- If an HTTPS certificate is installed on a switch in FOS v9.x, HTTP access is blocked by default as HTTPS access is supported.

- When `portloopbacktest` mode1 test runs on multiple Gen 7 ICL ports with multiple iterations, the test may fail. The workaround is to run the test on one ICL port at a time with a reduced number of iterations.
- Running long distance LE mode between any blades or switches among FC32-X7-48, FC64-48, or G720 with port QoS mode enabled and `vc_translation_link_init` mode enabled may result in frame timeouts. The workaround for this problem is to use LS or LD mode for long distance.
- If downloading firmware on an unsupported platform, a write post to /rest/operations/show-status/message-id/20000 occurs and will incorrectly concatenate firmware download error messages. No recovery is needed, and this behaviour will not cause any functional impact.
- Brocade G620 with switchType 183, G630 with switchType 184, and FC32-X7-48 blades do not support 4G EX-Port.
- Brocade G620 with switchType 183, G630 with switchType 184, and FC32-X7-48 blades support 4G E-Port connected between any of the three listed only
- When Connecting Brocade G730 with X7, G720, G620 switchType 183 or G630 switchType 184 these switches should run FOS v9.0.1c or later.
- When performing a configdownload operation this will not overwrite the existing MAPS "Custom RASLog mode" feature configuration on the switch. For example, if custom raslog mode is disabled in the switch but it is enabled in downloaded configuration, then the feature will remain disabled in switch and must be manually configured after the configdownload operation is complete.
- In case an NPIV flow is identified as SDDQ or Over Subscribed (and moved by Traffic Optimizer to an OS PG), the flow movement may cause some frames to be delivered Out of Order (OOO). In general, open systems devices have no issues when this happens.
- In FOS v9.1.1, CPX blades in X6 Switch Type 165.5 and 166.5 and X7 are displayed as CPX7 in `slotshow` command output.
- When upgrading from FOS v9.0.x to FOS v9.1.x, the AG ports will be moved from ALL_HOST_PORTS group to ALL_OTHER_F_PORTS group. Consequently, the MAPS thresholds for ALL_OTHER_F_PORTS will apply to these ports in FOS v9.1.x. The default thresholds for the groups ALL_HOST_PORTS and ALL_OTHER_F_PORTS are the same and if these are not changed there is no impact. In case custom thresholds are used and these are configured differently for the groups ALL_HOST_PORTS and ALL_OTHER_F_PORTS the thresholds (monitoring) for AG ports are impacted accordingly.
- When performing factory reset on an X6/X7, the cipher.syslog key is not reset to factory value.

  Consequently, TLS handshake failure messages are displayed ongoing on standby CP:

  Message: [SEC-3077], 123, SLOT 1 | CHASSIS, INFO, sw0, Event: TLS SESSION, TLS handshake failed, Info: certificate verify failed. Host=x.x.x.x

  To work around this perform factoryreset in the following way:

  1. Factoryreset
  2. When TLS handshake failure message is displayed -reboot the standby CP.

- When connecting a switch running FOS v9.1.x to a switch running pre FOS v9.1.x firmware, a FSPF-1006 RASLOG may be reported by the down-level neighbour switch.

  The FSPF-1006 RASLOG is reported by the down-level switch since the FSPF version identified by the FOS v9.1.x switch does not match what the pre FOS v9.1.x switch is expecting. The FSPF version is higher on the neighbour switch running 9.1.x. This log message is of informational character since the switch running 9.1.x automatically reverts to use the same code level as the switch running pre FOS 9.1.x firmware.
- In FOS 9.1.x, to conform to RFC3315 and RFC5942, the default value of prefix length for IPv6 DHCP address changed from 64 to 128. The prefix and gateway information are provided by the Router Advertisement (RA) and it is expected that RA is enabled in the network. If IPv6 RA is not enabled in the network, IPv6 connectivity issues will occur.

  The resolution is to enable RA to resolve IPv6 network connectivity issues.

- On G610 running FOS v9.1.1, in rare cases following a power outage the switch may be stuck in boot with the error message: “can’t get kernel message”. This may be seen on G610 switches with FOS v9.1.1 only following a power outage / power cycle. For this reason, it is recommended to run G610 switches on FOS v9.1.1a (or later) or v9.0.1x.
- When performing `supportSave` with `SCP` as the selected transfer protocol, the command defaults to using SFTP. In environments where SFTP ports are blocked the `supportSave` upload will fail.
- When upgrading a Gen 7 director or switch (X7-4, X7-8, G730, G720) to FOS v9.1.x, it is recommended to upgrade to FOS v9.1.1c. For additional information see TSB 2023-289-A.

Chapter 11: Security Vulnerability Fixes

This section lists the Common Vulnerabilities and Exposures (CVEs) that have been addressed. Each CVE is identified by the CVE ID number. For the latest security vulnerabilities disclosures, please visit Brocade Security Advisories web page at https://www.broadcom.com/support/fibre-channel-networking/security-advisories

Brocade Fabric OS version 9.1.1_01

CVE-2022-33186

A vulnerability in Brocade Fabric OS software v9.1.1, v9.0.1e, v8.2.3c, v7.4.2j and earlier versions could allow a remote unauthenticated attacker to execute on a Brocade Fabric OS switch commands capable of modifying zoning, disabling the switch, disabling ports and modifying the switch IP address.

Brocade Fabric OS version 9.1.1

CVE-2022-0778

In OpenSSL before OpenSSL 3.0.2, OpenSSL 1.1.1n, OpenSSL 1.0.2zd, it is possible to trigger an infinite loop by crafting a certificate that has invalid elliptic curve parameters.

CVE-2022-28169

A low privilege webtools user could gain elevated admin rights, or privileges, beyond what is intended or entitled for that user. By exploiting this vulnerability, a user whose role is not an admin, can create a new user with an admin role using the operator session id. The issue was replicated after intercepting the admin and operator authorization headers sent unencrypted and editing a user addition request to use the operator's authorization header.

CVE-2022-28170

Brocade Fabric OS Web Application services before Brocade Fabric v9.1.0, v9.0.1e, v8.2.3c, v7.4.2j stores server and user password in the debug statements.

CVE-2022-33179

A vulnerability in Brocade Fabric OS CLI before Brocade Fabric OS v9.1.0, 9.0.1e, 8.2.3c, 7.4.2j could allow an attacker to break out of restricted shells with “set context” and escalate privileges.

CVE-2022-33180

A vulnerability in Brocade Fabric OS CLI before Brocade Fabric OS v9.1.0, 9.0.1e, 8.2.3c, 8.2.0cbn5, could allow an attacker to export out sensitive files with “seccryptocfg”, “configupload”.

CVE-2022-33181

An *information disclosure* vulnerability in Brocade Fabric OS CLI before Brocade Fabric OS v9.1.0, 9.0.1e, 8.2.3c, 8.2.0cbn5, 7.4.2.j could allow an attacker to read sensitive files using switch commands “configshow” and “supportlink”.

CVE-2022-33182

A privilege escalation vulnerability in Brocade Fabric OS CLI before Brocade Fabric OS v9.1.0, 9.0.1e, 8.2.3c, 8.2.0cbn5, could allow a local user to escalate its privilege to root using switch commands “supportlink”, “firmwaredownload”, “portcfgupload, license, and “fosexec”.

CVE-2022-33183

A vulnerability in Brocade Fabric OS CLI before Brocade Fabric OS v9.1.0, 9.0.1e, 8.2.3c, 8.2.0cbn5, 7.4.2.j could allow an attacker to perform stack buffer overflow using in “firmwaredownload” and “diagshow” commands.

CVE-2022-33184

A vulnerability in Brocade Fabric OS fab_seg.c.h libraries could allow authenticated attackers to exploit stack-based buffer overflows, allowing the execution of arbitrary code as the root user account.

CVE-2022-33185

Several commands in Brocade Fabric OS before Brocade Fabric OS v.9.0.1e, v9.1.0 use unsafe string function to process user input. Authenticated attackers can abuse these vulnerabilities to exploit stack-based buffer overflows, allowing execution of arbitrary code as the root user account.

CVE-2021-39275

ap_escape_quotes() may write beyond the end of a buffer when given malicious input. No included modules pass untrusted data to these functions, but third-party/external modules may. This issue affects Apache HTTP Server 2.4.48 and earlier.

CVE-2021-34798

Malformed requests may cause the server to dereference a NULL pointer. This issue affects Apache HTTP Server 2.4.48 and earlier.

CVE-2021-23841

The OpenSSL public API function X509_issuer_and_serial_hash() attempts to create a unique hash value based on the issuer and serial number data contained within an X509 certificate. However it fails to correctly handle any errors that may occur while parsing the issuer field (which might occur if the issuer field is maliciously constructed). This may subsequently result in a NULL pointer deref and a crash leading to a potential denial of service attack. The function X509_issuer_and_serial_hash() is never directly called by OpenSSL itself so applications are only vulnerable if they use this function directly and they use it on certificates that may have been obtained from untrusted sources. OpenSSL versions 1.1.1i and below are affected by this issue. Users of these versions should upgrade to OpenSSL 1.1.1j. OpenSSL versions 1.0.2x and below are affected by this issue. However OpenSSL 1.0.2 is out of support and no longer receiving public updates. Premium support customers of OpenSSL 1.0.2 should upgrade to 1.0.2y. Other users should upgrade to 1.1.1j. Fixed in OpenSSL 1.1.1j (Affected 1.1.1-1.1.1i). Fixed in OpenSSL 1.0.2y (Affected 1.0.2-1.0.2x).

CVE-2022-0155

Follow-redirects is vulnerable to Exposure of Private Personal Information to an Unauthorized Actor.

CVE-2018-6485

An integer overflow in the implementation of the posix_memalign in memalign functions in the GNU C Library (aka glibc or libc6) 2.26 and earlier could cause these functions to return a pointer to a heap area that is too small, potentially leading to heap corruption.

CVE-2017-18018

In GNU Coreutils through 8.29, chown-core.c in chown and chgrp does not prevent replacement of a plain file with a symlink during use of the POSIX "-R -L" options, which allows local users to modify the ownership of arbitrary files by leveraging a race condition.

CVE-2014-9984

nscd in the GNU C Library (aka glibc or libc6) before version 2.20 does not correctly compute the size of an internal buffer when processing netgroup requests, possibly leading to an nscd daemon crash or code execution as the user running nscd.

CVE-2021-3712

ASN.1 strings are represented internally within OpenSSL as an ASN1_STRING structure which contains a buffer holding the string data and a field holding the buffer length. This contrasts with normal C strings which are represented as a buffer for the string data which is terminated with a NUL (0) byte. Although not a strict requirement, ASN.1 strings that are parsed using OpenSSL's own "d2i" functions (and other similar parsing functions) as well as any string whose value has been set with the ASN1_STRING_set() function will additionally NUL terminate the byte array in the ASN1_STRING structure. However, it is possible for applications to directly construct valid ASN1_STRING structures which do not NUL terminate the byte array by directly setting the "data" and "length" fields in the ASN1_STRING array. This can also happen by using the ASN1_STRING_set0() function. Numerous OpenSSL functions that print ASN.1 data have been found to assume that the ASN1_STRING byte array will be NUL terminated, even though this is not guaranteed for strings that have been directly constructed. Where an application requests an ASN.1 structure to be printed, and where that ASN.1 structure contains ASN1_STRINGs that have been directly constructed by the application without NUL terminating the "data" field, then a read buffer overrun can occur. The same thing can also occur during name constraints processing of certificates (for example if a certificate has been directly constructed by the application instead of loading it via the OpenSSL parsing functions, and the certificate contains non NUL terminated ASN1_STRING structures). It can also occur in the X509_get1_email(), X509_REQ_get1_email() and X509_get1_ocsp() functions. If a malicious actor can cause an application to directly construct an ASN1_STRING and then process it through one of the affected OpenSSL functions then this issue could be hit. This might result in a crash (causing a Denial of Service attack). It could also result in the disclosure of private memory contents (such as private keys, or sensitive plaintext). Fixed in OpenSSL 1.1.1l (Affected 1.1.1-1.1.1k). Fixed in OpenSSL 1.0.2za (Affected 1.0.2-1.0.2y).

CVE-2021-3711

In order to decrypt SM2 encrypted data an application is expected to call the API function EVP_PKEY_decrypt(). Typically an application will call this function twice. The first time, on entry, the "out" parameter can be NULL and, on exit, the "outlen" parameter is populated with the buffer size required to hold the decrypted plaintext. The application can then allocate a sufficiently sized buffer and call EVP_PKEY_decrypt() again, but this time passing a non-NULL value for the "out" parameter. A bug in the implementation of the SM2 decryption code means that the calculation of the buffer size required to hold the plaintext returned by the first call to EVP_PKEY_decrypt() can be smaller than the actual size required by the second call. This can lead to a buffer overflow when EVP_PKEY_decrypt() is called by the application a second time with a buffer that is too small. A malicious attacker who is able present SM2 content for decryption to an application could cause attacker chosen data to overflow the buffer by up to a maximum of 62 bytes altering the contents of other data held after the buffer, possibly changing application behaviour or causing the application to crash. The location of the buffer is application dependent but is typically heap allocated. Fixed in OpenSSL 1.1.1l (Affected 1.1.1-1.1.1k).

CVE-2020-29371

An issue was discovered in romfs_dev_read in fs/romfs/storage.c in the Linux kernel before 5.8.4. Uninitialized memory leaks to userspace, aka CID-bcf85fcedfdd.

CVE-2015-4042

Integer overflow in the keycompare_mb function in sort.c in sort in GNU Coreutils through 8.23 might allow attackers to cause a denial of service (application crash) or possibly have unspecified other impact via long strings.

CVE-2015-4041

The keycompare_mb function in sort.c in sort in GNU Coreutils through 8.23 on 64-bit platforms performs a size calculation without considering the number of bytes occupied by multibyte characters, which allows attackers to cause a denial of service (heap-based buffer overflow and application crash) or possibly have unspecified other impact via long UTF-8 strings.

CVE-2018-5764

The parse_arguments function in options.c in rsyncd in rsync before 3.1.3 does not prevent multiple --protect-args uses, which allows remote attackers to bypass an argument-sanitization protection mechanism.

CVE-2017-16548

The receive_xattr function in xattrs.c in rsync 3.1.2 and 3.1.3-development does not check for a trailing '\0' character in an xattr name, which allows remote attackers to cause a denial of service (heap-based buffer over-read and application crash) or possibly have unspecified other impact by sending crafted data to the daemon.

CVE-2017-17434

The daemon in rsync 3.1.2, and 3.1.3-development before 2017-12-03, does not check for fnamecmp filenames in the daemon_filter_list data structure (in the recv_files function in receiver.c) and also does not apply the sanitize_paths protection mechanism to pathnames found in "xname follows" strings (in the read_ndx_and_attrs function in rsync.c), which allows remote attackers to bypass intended access restrictions

Chapter 12: Defects

12.1 Closed With Code Changes in FOS v9.1.1b

Defect ID	Description
FOS-835031	REST POST on /rest/operations/security-certificate incorrectly returns 400 Bad Request.
FOS-838584	Weblinker termination due to segmentation fault.
FOS-843260	SNMP cannot get port address on FOS v9.1.0x.
FOS-844552	Unexpected kernel panic/cold boot or HA out of sync.
FOS-845216	User may encounter an unexpected sudden system reboot
FOS-845716	Ports Fenced upon Power Cycle of switch or blades.
FOS-846314	SfpShow indicating "Media not installed" and switchShow showing a port state of "Mod_Val"
FOS-846325	On a MXG610 embedded switch, running FOS versions FOS9.0.x, FOS9.1.x, user may encounter IO service disruption after a reboot / hareboot, triggered by uboot tune DRAM failure leading to a Reset (power cycle) of the system.
FOS-846838	Available ports section in Ports Widget shown in red color instead of green.

12.2 Closed With Code Changes in FOS v9.1.1a

Defect ID	Description
FOS-837451	DWDM is reporting a "loss of lock" error and the switch is showing no light on the port.
FOS-839186	Code upgrade turned into cold recovery when weblinker cannot restart in time, or on a normal operation switch, user may encounter failures in config change operations (e.g. portcfg or lscfg)
FOS-839936	User may encounter a CP Assert, upon initial failover to Fabric OS v9.x
FOS-840370	Firmwareupgrade via SANnav failed due to time-out from a busy standby CP.
FOS-840717	High CPU usage reported on SNMP daemon.
FOS-840909	FCPH-1003 Raslog reports duplicate port WWN with a port that does not have the same port WWN.
FOS-840971	If switch uptime is more than 99 days, then only the first two digits of the uptime days is displayed in Dashboard.
FOS-841163	User can't perform firmware download on the switch from the SANNav.
FOS-841478	Duplicate PWWN detection resulted in disruption to the existing FICON CHPID.
FOS-841961	On a X7 director that had gone through CLI "firmwarecleaninstall" of FOS9.0.x, after an upgrade to FOS v9.1.x, the active CP will show FAULTY (53) and will essentially be unresponsive. No output on the serial console. The management and service ports are no longer accessible.
FOS-841985	Unable to capture supportsave via Sannav.
FOS-842035	'Launch the Web Tools application' step is unnecessarily displayed in 'Support Data Collection' screen.
FOS-842160	Performing a firmwarecleaninstall to FOS v9.1.0b or FOS v9.1.1 from any other version prior to FOS v9.1.0b will fail. Firmware upgrades to these same versions will succeed.
FOS-842607	MXG610s embedded switch panics after Fabric Resource Director daemon (fredd) crashes or holds a large amount of memory.
FOS-843396	SNMP password has to be set twice.
FOS-843643	Web tools cannot save zone configurations when launched from the Dell Chassis UI
FOS-844393	Enabling DHCP from Static (v4) does not reflect the DHCP ipv4 address on embedded blade switches supported on HPE synergy chassis.
FOS-844483	Following a power outage the switch may stay stuck in boot with the error message: "Can't get the kernel image"

FOS-844625	Configdownload fails on embedded platforms.
FOS-844849	Credit loss observed on ISL link between two G730 switches

12.3 Closed With Code Changes in FOS v9.1.1

Defect ID	Description
FOS-825993	Failure status should be sent, if SS fails on any of the CP
FOS-826227	Devices in default allaccess zone cannot communicate to each other across LISLs in FICON environment on all platform.
FOS-832042	Brocade 7810 switch panics or hangs on boot up.
FOS-833824	The "Max UDP conn exceeded" counter in the output of "lan-stats –global" remains always at 0 even though the number of running UDP flows are more than the supported emulated UDP flows.
FOS-834530	Switch panics during adding aliases to zone configuration.
FOS-835586	SNMP consumes more CPU cycles, resulting in MAPS alerts.
FOS-835781	D-Port test is stuck in "In Progress" on 32G ADVA DWDM links.
FOS-835809	'Unmount USB Drive' option is displayed in WebEM after USB device is inserted. User would not be able to use the USB device connected to the switch as there is no option to mount the device.
FOS-835872	The output for the "ficonshow rnid" and "ficonshow rnid table" CLI does not include Node Descriptors for online E-Ports.
FOS-835998	tsclockserver Active server shows as NONE on non-principal switches however working fine on Principal switch with legacy mode disabled. Similarly, tsclockserver Active server shows as NONE when set to LOCL in legacy mode disabled.
FOS-836031	Switch panic after FDMI daemon terminated.
FOS-836043	Director-class switches returning chassis S/N when being queried for brocade-chassis info via REST, when WWN 1 S/N was previously returned and used for entitlement.
FOS-836077	On Standby CP, lines with '0's appear on console during hot code load.
FOS-836219	CLI "sfpshow -all" did not display complete output and the polling of smart SFP data stopped. It reported an very old "Last poll time:"
FOS-836265	During code upgrade from FOS v8.2.1x to FOS v8.2.3x, FOS cannot completely be brought up due to cald core dumps. User observes the switch hanging.
FOS-836313	The session which gets modified to HTTPS from HTTP based session, gets terminated when HTTP protocol is disabled after HTTPS certificate generation.
FOS-836339	REST GET operation on brocade-security/sshutil-public-key fails with error "Named account does not exist"
FOS-836369	D-Port test does not start on the secondary port links of a 53G BMF QSFP, when the test is initiated using "portdporttest –start" command option on all 4 ports.
FOS-836491	flow CLI does not report TIMEOUT count for an Initiator or Target device.
FOS-836506	Periodic XTUN-1997 triggers when running FICON and FCP/SCSI flows over an FCIP Tunnel Port Based or Device Based Routing configuration. The XTUN-1997 triggers are for Keepalive timeouts on the medium priority circuits.
FOS-836572	'snmpconfig' CLI returns error 'Failed to get snmp config info' due to SNMP service not restarting after getting disrupted.
FOS-836573	FICN_1062 and FICN_1063 RASLOGs every 1.5 seconds on FICON Emulation enabled FCIP Tunnel
FOS-837183	TX rules for ISL ports do not get triggered for MAPS custom policy that includes both RX and TX rules for the ISL ports.

FOS-837405	Flow vision reports the wrong direction of flows for the SCSI devices that don't register FC4 features.
FOS-837518	ESMd panic seen when issuing a `portcfgge lan –set -lan` command.
FOS-837563	Brocade G630 switch (Switch type = 184) may experience sudden reboot – resets.
FOS-837583	SNMP daemon leaks memory and causes switch to hafailover/hareboot/panic when switch runs out of memory.
FOS-837755	Stale CAM entries are present on the ports, which were disabled.
FOS-837837	Performance stats for VE ports are not present in connunitportstat table
FOS-837911	Observed switch Panic from UCID termination resulting in UCID core file
FOS-838223	Devices in 64G switch with default allaccess zone cannot communicate to each other in FICON environment.
FOS-838514	7840, 7810 or SX6 blade encounters DP Linux out of Memory causing IO disruption
FOS-839056	Frame drops affecting entire fabric after creating smaller trunks from larger trunks.
FOS-839346	Path loss experienced after FOS upgrade on Access Gateway
FOS-839847	Switch subtype incorrectly displayed
FOS-840535	Link errors observed on port 47 of G620 (switch type 162) during HA upgrade

Appendix A: CA Certificate Bundle Updates

A.1 Added CA certificates from FOS v9.1.1a

Certificate Name:
GLOBALTRUST 2020
Data:
Version: 3 (0x2)
Serial Number:
5a:4b:bd:5a:fb:4f:8a:5b:fa:65:e5
Signature Algorithm: sha256WithRSAEncryption
Issuer: C=AT, O=e-commerce monitoring GmbH, CN=GLOBALTRUST 2020
Validity
Not Before: Feb 10 00:00:00 2020 GMT
Not After : Jun 10 00:00:00 2040 GMT

Certificate Name:
ANF Secure Server Root CA
Data:
Version: 3 (0x2)
Serial Number: 996390341000653745 (0xdd3e3bc6cf96bb1)
Signature Algorithm: sha256WithRSAEncryption
Issuer: serialNumber=G63287510, C=ES, O=ANF Autoridad de Certificacion, OU=ANF CA Raiz, CN=ANF Secure Server Root CA
Validity
Not Before: Sep 4 10:00:38 2019 GMT
Not After : Aug 30 10:00:38 2039 GMT

Certificate Name:
Certum EC-384 CA
Data:
Version: 3 (0x2)
Serial Number:
78:8f:27:5c:81:12:52:20:a5:04:d0:2d:dd:ba:73:f4
Signature Algorithm: ecdsa-with-SHA384
Issuer: C=PL, O=Asseco Data Systems S.A., OU=Certum Certification Authority, CN=Certum EC-384 CA
Validity
Not Before: Mar 26 07:24:54 2018 GMT
Not After : Mar 26 07:24:54 2043 GMT

Certificate Name:
Certum Trusted Root CA
Data:
Version: 3 (0x2)
Serial Number:
1e:bf:59:50:b8:c9:80:37:4c:06:f7:eb:55:4f:b5:ed
Signature Algorithm: sha512WithRSAEncryption
Issuer: C=PL, O=Asseco Data Systems S.A., OU=Certum Certification Authority, CN=Certum Trusted Root CA
Validity
Not Before: Mar 16 12:10:13 2018 GMT
Not After : Mar 16 12:10:13 2043 GMT

Certificate Name:
TunTrust Root CA
Data:
Version: 3 (0x2)
Serial Number:
13:02:d5:e2:40:4c:92:46:86:16:67:5d:b4:bb:bb:b2:6b:3e:fc:13
Signature Algorithm: sha256WithRSAEncryption
Issuer: C=TN, O=Agence Nationale de Certification Electronique, CN=TunTrust Root CA
Validity
Not Before: Apr 26 08:57:56 2019 GMT
Not After : Apr 26 08:57:56 2044 GM

Certificate Name:
HARICA TLS RSA Root CA 2021
Data:
Version: 3 (0x2)
Serial Number:
39:ca:93:1c:ef:43:f3:c6:8e:93:c7:f4:64:89:38:7e
Signature Algorithm: sha256WithRSAEncryption
Issuer: C=GR, O=Hellenic Academic and Research Institutions CA, CN=HARICA TLS RSA Root CA 2021
Validity
Not Before: Feb 19 10:55:38 2021 GMT
Not After : Feb 13 10:55:37 2045 GMT

Certificate Name:
HARICA TLS ECC Root CA 2021
Data:
Version: 3 (0x2)
Serial Number:
67:74:9d:8d:77:d8:3b:6a:db:22:f4:ff:59:e2:bf:ce
Signature Algorithm: ecdsa-with-SHA384
Issuer: C=GR, O=Hellenic Academic and Research Institutions CA, CN=HARICA TLS ECC Root CA 2021
Validity
Not Before: Feb 19 11:01:10 2021 GMT
Not After : Feb 13 11:01:09 2045 GMT

A.2 Removed CA certificates from FOS v9.1.1a

Certificate Name:
GlobalSign Root CA - R2
Data:
Version: 3 (0x2)
Serial Number:
04:00:00:00:00:01:0f:86:26:e6:0d
Signature Algorithm: sha1WithRSAEncryption
Issuer: OU=GlobalSign Root CA - R2, O=GlobalSign, CN=GlobalSign
Validity
Not Before: Dec 15 08:00:00 2006 GMT
Not After : Dec 15 08:00:00 2021 GMT

Certificate Name:
QuoVadis Root CA
Data:
Version: 3 (0x2)
Serial Number: 985026699 (0x3ab6508b)
Signature Algorithm: sha1WithRSAEncryption
Issuer: C=BM, O=QuoVadis Limited, OU=Root Certification Authority, CN=QuoVadis Root Certification Authority
Validity
Not Before: Mar 19 18:33:33 2001 GMT
Not After : Mar 17 18:33:33 2021 GMT

Certificate Name:
Sonera Class 2 Root
Data:
Version: 3 (0x2)
Serial Number: 29 (0x1d)
Signature Algorithm: sha1WithRSAEncryption
Issuer: C=FI, O=Sonera, CN=Sonera Class2 CA
Validity
Not Before: Apr 6 07:29:40 2001 GMT
Not After : Apr 6 07:29:40 2021 GMT

Certificate Name:
DST Root CA
Data:
Version: 3 (0x2)
Serial Number:
44:af:b0:80:d6:a3:27:ba:89:30:39:86:2e:f8:40:6b
Signature Algorithm: sha1WithRSAEncryption
Issuer: O=Digital Signature Trust Co., CN=DST Root CA X3
Validity
Not Before: Sep 30 21:12:19 2000 GMT
Not After : Sep 30 14:01:15 2021 GMT

Certificate Name:
Cybertrust Global Root

Data:
Version: 3 (0x2)
Serial Number:
04:00:00:00:00:01:0f:85:aa:2d:48
Signature Algorithm: sha1WithRSAEncryption
Issuer: O=Cybertrust, Inc, CN=Cybertrust Global Root
Validity
Not Before: Dec 15 08:00:00 2006 GMT
Not After : Dec 15 08:00:00 2021 GMT

Certificate Name:
Chambers of Commerce Root - 2008
Data:
Version: 3 (0x2)
Serial Number:
a3:da:42:7e:a4:b1:ae:da
Signature Algorithm: sha1WithRSAEncryption
Issuer: C=EU, L=Madrid (see current address at www.camerfirma.com/address)/serialNumber=A82743287, O=AC Camerfirma S.A., CN=Chambers of Commerce Root - 2008
Validity
Not Before: Aug 1 12:29:50 2008 GMT
Not After : Jul 31 12:29:50 2038 GMT

Certificate Name:
Global Chambersign Root - 2008
Data:
Version: 3 (0x2)
Serial Number:
c9:cd:d3:e9:d5:7d:23:ce
Signature Algorithm: sha1WithRSAEncryption
Issuer: C=EU, L=Madrid (see current address at www.camerfirma.com/address)/serialNumber=A82743287, O=AC Camerfirma S.A., CN=Global Chambersign Root - 2008
Validity
Not Before: Aug 1 12:31:40 2008 GMT
Not After : Jul 31 12:31:40 2038 GMT

Certificate name:
EC-ACC
Data:
Version: 3 (0x2)
Serial Number:
(Negative)11:d4:c2:14:2b:de:21:eb:57:9d:53:fb:0c:22:3b:ff
Signature Algorithm: sha1WithRSAEncryption
Issuer: C=ES, O=Agencia Catalana de Certificacio (NIF Q-0801176-I), OU=Serveis Publics de Certificacio, OU=Vegeu https://www.catcert.net/verarrel (c)03, OU=Jerarquia Entitats de Certificacio Catalanes, CN=EC-ACC
Validity
Not Before: Jan 7 23:00:00 2003 GMT
Not After : Jan 7 22:59:59 2031 GMT

Certificate Name:
Hellenic Academic and Research Institutions RootCA 2011
Data:
Version: 3 (0x2)
Serial Number: 0 (0x0)
Signature Algorithm: sha1WithRSAEncryption
Issuer: C=GR, O=Hellenic Academic and Research Institutions Cert. Authority, CN=Hellenic Academic and Research Institutions RootCA 2011
Validity
Not Before: Dec 6 13:49:52 2011 GMT
Not After : Dec 1 13:49:52 2031 GMT

Certificate Name:
Trustis FPS Root CA
Data:
Version: 3 (0x2)
Serial Number:
1b:1f:ad:b6:20:f9:24:d3:36:6b:f7:c7:f1:8c:a0:59
Signature Algorithm: sha1WithRSAEncryption
Issuer: C=GB, O=Trustis Limited, OU=Trustis FPS Root CA
Validity
Not Before: Dec 23 12:14:06 2003 GMT
Not After : Jan 21 11:36:54 2024 GMT

Certificate Name:
GlobalSign ECC Root CA - R4
Data:
Version: 3 (0x2)
Serial Number:
2a:38:a4:1c:96:0a:04:de:42:b2:28:a5:0b:e8:34:98:02
Signature Algorithm: ecdsa-with-SHA256
Issuer: OU=GlobalSign ECC Root CA - R4, O=GlobalSign, CN=GlobalSign
Validity
Not Before: Nov 13 00:00:00 2012 GMT
Not After : Jan 19 03:14:07 2038 GMT

Certificate Name:
GTS Root R1
Data:
Version: 3 (0x2)
Serial Number:
6e:47:a9:c5:4b:47:0c:0d:ec:33:d0:89:b9:1c:f4:e1
Signature Algorithm: sha384WithRSAEncryption
Issuer: C=US, O=Google Trust Services LLC, CN=GTS Root R1
Validity
Not Before: Jun 22 00:00:00 2016 GMT
Not After : Jun 22 00:00:00 2036 GMT

Certificate Name:
GTS Root R2
Data:
Version: 3 (0x2)
Serial Number:
6e:47:a9:c6:5a:b3:e7:20:c5:30:9a:3f:68:52:f2:6f
Signature Algorithm: sha384WithRSAEncryption
Issuer: C=US, O=Google Trust Services LLC, CN=GTS Root R2
Validity
Not Before: Jun 22 00:00:00 2016 GMT
Not After : Jun 22 00:00:00 2036 GMT

Certificate Name:
GTS Root R3
Data:
Version: 3 (0x2)
Serial Number:
6e:47:a9:c7:6c:a9:73:24:40:89:0f:03:55:dd:8d:1d
Signature Algorithm: ecdsa-with-SHA384
Issuer: C=US, O=Google Trust Services LLC, CN=GTS Root R3
Validity
Not Before: Jun 22 00:00:00 2016 GMT
Not After : Jun 22 00:00:00 2036 GMT

Certificate Name:
GTS Root R4
Data:
Version: 3 (0x2)
Serial Number:
6e:47:a9:c8:8b:94:b6:e8:bb:3b:2a:d8:a2:b2:c1:99
Signature Algorithm: ecdsa-with-SHA384
Issuer: C=US, O=Google Trust Services LLC, CN=GTS Root R4
Validity
Not Before: Jun 22 00:00:00 2016 GMT
Not After : Jun 22 00:00:00 2036 GMT

Revision History

Version	Summary of changes	Publication date
1.0	Initial version of document	01/19/2023
2.0	Updated Upgrade/Downgrade Considerations and Miscellaneous under Important Notes, to reflect TSB 2023-289-A. Corrected FPGA code level typo under FPGA Upgrade.	6/5/2023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