IBM Corporation
2455 South Road
Poughkeepsie, NY 12601

Broadcom Inc.
1320 Ridder Park Drive
San Jose, CA 95131

July 21, 2023

IBM Z® and Brocade Qualification support for FOS 9.0.1e

International Business Machines Corporation and Broadcom Inc. successfully completed qualification testing of zHPF® (High Performance FICON), FICON® and FCP protocols, using the switches and directors in **Table 1** running FOS 9.0.1e The testing also included the optics in **Table 2** and the configurations in **Table 3**. The IBM Z family hardware platforms tested are as follows: IBM z16™ Model A01 (z16 A01), IBM z16™ Model A02 (z16 A02), IBM z16™ Rack Mount (z16 Rack Mount), IBM z15™ models T01 (z15 T01) and T02 (z15 T02), IBM z14® (z14) and IBM z14 Model ZR1 (z14 ZR1), IBM z13® (z13) and IBM z13s® (z13s). The IBM LinuxONE™ hardware platforms tested are as follows: LinuxONE Emperor 4, LinuxONE Rockhopper 4, LinuxONE Rockhopper 4 Rack Mount, IBM LinuxONE III models LT1 and LT2, IBM LinuxONE Emperor™ II, IBM LinuxONE Rockhopper™ II, IBM LinuxONE Emperor™, and IBM LinuxONE Rockhopper™.

SANnav Management Portal and SANnav Global View were the management tools used during qualification testing.

Supported Directors and Switches

Table 1 *– Supported directors and switches*

Brocade Name	IBM Name	IBM Machine Type	Max. Logical Switches	Max. CUP Instances	FICON Base Switch Support (XISL)	Supported Blades
X7-8	SAN512B-7	8961-F78	16	8	Yes	FC64-48 FC32-X7-48 FC32-48 FC32-64[a] SX6
X7-4	SAN256B-7	8961-F74	16	8	Yes	
G720	SAN64B-7	8960-R64 8960-P64	4	2	Yes	N/A
X6-8	SAN512B-6	8961-F08	16	8	Yes	FC32-48 FC32-64[a] SX6
X6-4	SAN256B-6	8961-F04	16	8	Yes	
G620	SAN64B-6	8960-F64 8960-N64 8960-F65 8960-N65	4	2	Yes	N/A

a. The FC32-64 supports FCP use only (ex. replication applications), and cannot be in the same logical switch as FICON traffic.

The Brocade Product End of Life document lists additional details on support for Brocade directors and switches connected to FICON protocol-attached IBM Z released after z14 and z14 ZR1. Please contact your sales representative for additional details: https://www.broadcom.com/support/fibre-channel-networking/eol.

Supported Optics

***Table 2** – Supported Optics*

Supported SFP/SFP+ Optics	Products and Blades		Notes
	Gen7	Gen6	
64GFC SW SFP	G720 FC64-48		Links running at 64GFC tested over ISLs and ICLs between Brocade Gen7 Directors and switches. Direct connections between IBM Z FICON adapters and Brocade 64GFC optics tested only at 32GFC and 16GFC speeds.
32GFC SW/LWL SFP 32GFC ELWL SFP 32GFC SmartOptics DWDM SFP+	G720 FC64-48 FC32-X7-48 FC32-48 SX6	G620 FC32-48 SX6	The SmartOptics DWDM SFP+ can be used in conjunction with a SmartOptics multiplexer.[a]
16GFC SW/LWL SFP 16GFC ELWL SFP 16GFC SmartOptics DWDM SFP+	FC32-X7-48 FC32-48 SX6	G620 FC32-48 SX6	The SmartOptics DWDM SFP+ can be used in conjunction with a SmartOptics multiplexer.[a]
10GFC SW/LWL SFP	G720 FC64-48 FC32-X7-48 FC32-48 SX6	G620 FC32-48 SX6	
8GFC SmartOptics DWDM SFP+		G620 FC32-48 SX6	The SmartOptics DWDM SFP+ can be used in conjunction with a SmartOptics multiplexer.[a]
Supported QSFP Optics	**Products and Blades**		**Notes**
	Gen7	**Gen6**	
32GFC QSFP 16GFC QSFP		G620 FC32-64	Links running at 32GFC only tested over ISLs and ICLs between Brocade Gen6 and Gen7 Directors and switches. QSFPs support both of the 50m and 100m options. QSFPs in the G620 support ISL connections between G620 switches. QSFPs in the G620 do not support ICL connections to Gen6 or Gen7 chassis.
Supported ICL QSFP Optics	**Products and Blades**		**Notes**
	Gen7	**Gen6**	
Brocade Gen7 capable ICL QSFP	X7-8 X7-4		Brocade Gen7 capable ICL QSFPs only connect to other Brocade Gen7 capable ICL QSFPs.
32GFC ICL QSFP 32GFC 2km ICL QSFP	X7-8 X7-4	X6-8 X6-4	32GFC ICL QSFPs only connect to other 32GFC ICL QSFPs.

a. Use of SmartOptics may require users to make changes to their MAPs policies. For details on the SmartOptics implementation, please refer to the SmartOptics solutions: https://smartoptics.com/products/brocade-collection/.

The Brocade Transceiver Modules (Documents→Compatibility Document) reference lists additional details on supported optics. Please contact your sales representative for additional details: https://www.broadcom.com/products/fibre-channel-networking/transceiver-modules.

Supported Topologies

Table 3 *- Supported cascaded configurations*

Switch(A) <ISL> Switch(A)
Extension(A) <IP> Extension (A)
Switch(A) <ISL> Extension (B) <IP> Extension (A)
Switch(A) <ISL> Extension (B) <IP> Extension (B) <ISL> Switch(A)
Switch(B) <ICL> Switch(B) <ISL> Extension (B) <IP> Extension (A)
Switch(B) <ICL> Switch(B) <ISL> Extension (B) <IP> Extension (B) <ISL> Switch(A)
Switch(B) <ICL> Switch(B) <ISL> Extension (B) <IP> Extension (B) <ISL> Switch(B) <ICL> Switch(B)
Switch(B) <ICL> Switch(B) <ISL> Switch(A)
Switch(B) <ICL> Switch(B) <ISL> Switch(B) <ICL> Switch(B)
Switch(B) <ICL> Switch(B) <ICL> Switch(B)[a]
FICON Multi-hop Configurations for Gen6 and Gen7 Switches and Directors (see Note below)
Restrictions and Switch Descriptions: Extension(A): • Extension switch 7840[b] or extension blade SX6. • Extension switch 7840[b] must connect to another 7840[b] or an SX6 extension blade for IP extension. Extension(B): • Extension switch 7840[b] or extension blade SX6. • Extension switch 7840[b] must connect to another 7840[b] or an SX6 extension blade for IP extension. • Switch & IP connections only. No device or channel connections. Switch(A): • May be any switch in **Table 1**. Switch(B): • May be X7-8 or X7-4 • May be X6-8 or X6-4

a. Also supported as a triangle configuration with Gen6/Gen7.
b. Extension switch 7840 is supported with FOS 8.2.2c or higher for connection to Gen6 and Gen7 switches and directors running FOS 9.0.1e.

Note: For more information regarding use of FICON multihop, requirements and supported configurations, please refer to "FICON Multihop: Requirements and Configurations (WP102704)" whitepaper: https://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP102704.

FICON Release Notes

Please refer to the Brocade Fabric OS v9.0.1e Release Notes v1.0 (or the latest available version) for additional requirements, restrictions, and recommendations. Please refer to the SANnav 2.1.1 Release Notes v1.0 (or the latest available version) for more information regarding the supported FOS releases.

The new supported hardware features in this release are:

- 64GFC SW SFPs
- X7-8 and X7-4 chassis
- G720 Switch
- FC64-48 blade
- FC32-X7-48 blade
- FC32-48 blade in Gen7 chassis
- FC32-64 blade in Gen7 chassis
- SX6 blade in Gen7 chassis
- 32G SFPs
- 32G QSFP for ICLs
- 32G 2km QSFP for ICLs
- 32G 25KM Extended Long Wavelength (ELWL) optic
- Brocade Gen7 capable QSFP for ICLs
- SmartOptics support for Gen6 and Gen7 Directors

- SmartOptics 8G 80km DWDM SFP+ optic

The new supported features and functions in this release are:

- Fibre Channel Endpoint Security
- FICON Logical Switch
- Remote FICON CUP access from a CUP disabled switch

The supported routing modes for FICON are:

- Port Based Routing (PBR)
- Device Base Routing (DBR)
- Exchanged Base Routing (EBR) with FICON Dynamic Routing
    - For more information regarding host and control unit requirements for use of FICON Dynamic Routing, please refer to "FICON Dynamic Routing (FIDR): Technology and Performance Implications (WP102651)" whitepaper: http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/WP102651.

Notes and Recommendations:

1. **Upgrade Path**: The IBM Z and IBM LinuxONE supported FOS upgrade path to 9.0.1e for Gen7 is from 9.0.1d, 9.0.1b, 9.0.1a, 9.0.0b and for Gen6 is from 9.0.1d, 9.0.1b, 9.0.1a, 9.0.0b, 8.2.3c, 8.2.3a, 8.2.3, 8.2.2c, 8.2.2a, or 8.2.0a.
2. **FICON Operation**: The High Integrity Fabric (HIF) feature is required for proper operation with FICON channels attached to FICON switches and directors running pre-FOS 9.0.0b. The FICON Logical Switch (FICON LS) feature is required for proper operation with FICON channels attached to FICON switches and directors running FOS 9.0.0b and higher. Therefore, customers should verify the HIF state for pre-FOS 9.0.0b (i.e., set to enabled) and verify that FICON LS is enabled for FOS 9.0.0b or higher. If the HIF state is disabled or the channels are not in a FICON LS, then the FICON channels will enter the Invalid Attach state after a channel or port event occurs that requires the channels to log in.
3. **Extended Distance RPQ**: The tested distance for these switches and supported protocols is 300km (FICON, FCP, FCIP, and ISLs); however, IBM requires an Extended Distance RPQ for IBM Z and for LinuxONE to assure applications greater than 100km adhere to the bounds of the qualification.
4. **I/O Insight and Analytics Monitoring Platform**: Linux on IBM Z environments support Brocade I/O Insight and Analytics Monitoring Platform (AMP). These analytics capabilities are limited to FCP solutions only. FCP solutions such as Linux for IBM Z or IBM Metro Mirror support Brocade AMP connectivity to an IBM Z FICON SAN Fabric.
5. **Cabling Best Practices**: For more information, regarding cabling and other best practices please visit IBM's "Cabling Considerations in Storage Area Networks" support document: http://www-01.ibm.com/support/docview.wss?uid=ssg1S1004299.

The qualification testing performed ensures connectivity and interoperability of Fibre Connection (FICON) and Fibre Channel Protocol (FCP) switches and directors with IBM Z, as well as adherence to the FICON architecture and FCP architecture. The testing performed ensures the products support High Performance FICON for IBM Z (zHPF), intermix of FICON and FCP in the same switch/director, and cascading of switches/directors. All qualification testing is in accordance with Brocade and IBM guidelines, and both organizations reviewed and audited the methodologies and results. This procedure integrates a variety of fabric switches, storage devices, and processor channels to accomplish the comprehensive qualification process for FICON directors and switches.

Results achieved were in a test environment under laboratory conditions. IBM does not make any representations or warranties regarding Broadcom Inc. products. Broadcom retains sole responsibility for its products, the performance of such products and all claims relating to such products, including without limitation its products' compliance with product specifications, industry standards and safety and other regulatory requirements.

If a device supports attachment to the IBM Z platform, then IBM anticipates it will operate properly with the qualified products in this letter. For a list of IBM supported devices, please visit IBM System Storage Interoperation Center (SSIC): http://www-03.ibm.com/systems/support/storage/ssic/interoperability.wss. For third party devices please check with the OEM device vendor for support statements regarding attachment to IBM Z.

Qualification Letter Version History

- 10/07/2022: Initial version.
- 01/19/2023: Updated 64GFC and 32GFC optics support notes.
- 07/28/2023: Added new IBM Z processors and updated optics references.