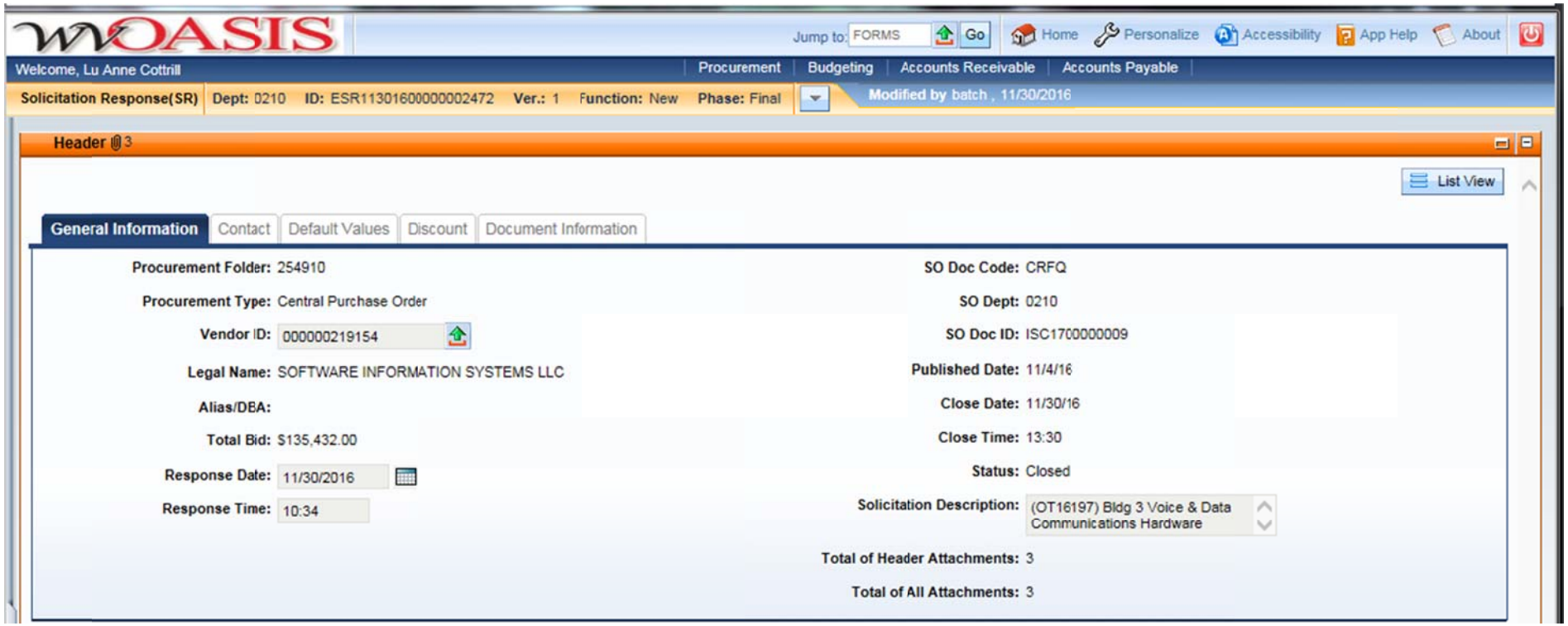
The following documentation is an electronically-submitted vendor response to an advertised solicitation from the *West Virginia Purchasing Bulletin* within the Vendor Self-Service portal at ***wvOASIS.gov***. As part of the State of West Virginia's procurement process, and to maintain the transparency of the bid-opening process, this documentation submitted online is publicly posted by the West Virginia Purchasing Division at ***WVPurchasing.gov*** with any other vendor responses to this solicitation submitted to the Purchasing Division in hard copy format.


WVOASIS
Jump to: FORMS Go
Home
Personalize
Accessibility
App Help
About
Welcome, Lu Anne Cottrill
Procurement
Budgeting
Accounts Receivable
Accounts Payable
Solicitation Response(SR) Dept: 0210 ID: ESR11301600000002472 Ver.: 1 Function: New Phase: Final
Modified by batch , 11/30/2016
Header 3
List View
General Information
Contact
Default Values
Discount
Document Information
Procurement Folder: 254910
Procurement Type: Central Purchase Order
Vendor ID: 000000219154
Legal Name: SOFTWARE INFORMATION SYSTEMS LLC
Alias/DBA:
Total Bid: $135,432.00
Response Date: 11/30/2016
Response Time: 10:34
SO Doc Code: CRFQ
SO Dept: 0210
SO Doc ID: ISC1700000009
Published Date: 11/4/16
Close Date: 11/30/16
Close Time: 13:30
Status: Closed
Solicitation Description: (OT16197) Bldg 3 Voice & Data Communications Hardware
Total of Header Attachments: 3
Total of All Attachments: 3

Purchasing Division
2019 Washington Street East
Post Office Box 50130
Charleston, WV 25305-0130

State of West Virginia
Solicitation Response

Proc Folder : 254910

Solicitation Description : (OT16197) Bldg 3 Voice & Data Communications Hardware

Proc Type : Central Purchase Order

Date issued	Solicitation Closes	Solicitation Response	Version
	2016-11-30 13:30:00	SR 0210 ESR11301600000002472	1

VENDOR

000000219154

SOFTWARE INFORMATION SYSTEMS LLC

Solicitation Number: CRFQ 0210 ISC1700000009

Total Bid : $135,432.00 **Response Date:** 2016-11-30 **Response Time:** 10:34:16

Comments:

FOR INFORMATION CONTACT THE BUYER

Stephanie L Gale

(304) 558-8801
stephanie.l.gale@wv.gov

Signature on File **FEIN #** **DATE**

All offers subject to all terms and conditions contained in this solicitation

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	3.1.1 Aggregation Switches	2.00000	EA	$67,716.000000	$135,432.00

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description : Aggregation Switches for Enterprise and Cloud Data Centers, Extreme Networks, Summit Switches, Part Number: 17310, Summit X670-G2-48x-4q-Base-Unit, or Equal

Comments: Brocade alternative. Pricing sheet is attached with bid response

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
2	3.1.2 Power Supply Units	2.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description : Power Supply Units, Extreme Networksÿ¿ÿ¢ÿ¿ÿ¿ÿ¿ÿ¿ Summit 550W AC PSU FB power supplies, Part Number: 10925, or Equal

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
3	3.1.3 Purpose Built Switches	6.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description : Purpose Built Switches to support Gigabit Ethernet-enabled servers in enterprise and cloud data centers, Extreme Networksÿ¿ÿ¢ÿ¿ÿ¿ÿ¿ÿ¿ Summit X670 fan module FB, Part Number: 17111, or Equal

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
4	3.1.4 QSFP+ Passive Direct Attach Copper Cable	30.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description : QSFP+ Passive Direct Attach Copper Cable, Extreme Networksÿ¿ÿ¢ÿ¿ÿ¿ÿ¿ÿ¿ 0.5 meter, compatible 40G, Part number 10311, or Equal

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
5	3.1.5 Power Cords	2.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description : Power Cords, Extreme Networks, 10A NEMA 5-15P IEC320-C13 AC Power Cords, Part Number 10061, or Equal

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
6	3.1.6 Base Switches	26.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description : Base Switches, Extreme Switches, Part Number 16179 - X450-G2-48p-10GE4-Base, or Equal

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
7	3.1.7 Fan Modules	26.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description : Fan Modules, Extreme Summit X460/X450-G2 fan module FB, Part Number 10945, or Equal

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
8	3.1.8 Power Supplies	26.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description : Power Supplies, Extreme Summit 1100W PoE AC PSU FB with Front to Back airflow, Part Number 10941, or Equal.

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
9	3.1.9 Power Cords	26.00000	EA	$0.000000	$0.00

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description : Power Cords, 13A, NEMA 5-15, C15, Part Number 10099, or Equal

	Purchasing Divison **2019 Washington Street East** **Post Office Box 50130** **Charleston, WV 25305-0130**	**State of West Virginia** **Request for Quotation** **21 — Info Technology**

Proc Folder: 254910

Doc Description: (OT16197) Bldg 3 Voice & Data Communications Hardware

Proc Type: Central Purchase Order

Date Issued	Solicitation Closes	Solicitation No	Version
2016-11-04	2016-11-30 13:30:00	CRFQ 0210 ISC1700000009	1

BID RECEIVING LOCATION

BID CLERK
DEPARTMENT OF ADMINISTRATION
PURCHASING DIVISION
2019 WASHINGTON ST E
CHARLESTON WV 25305
US

VENDOR

Vendor Name, Address and Telephone Number:

Software Information System, LLC
200 Association Drive, Suite 210
Charleston, WV 25311

Total $135,432

FOR INFORMATION CONTACT THE BUYER

Stephanie L Gale
(304) 558-8801
stephanie.l.gale@wv.gov

Signature X [signature] **FEIN #** 61-1371685 **DATE** 11-30-2016

All offers subject to all terms and conditions contained in this solicitation

ADDITIONAL INFORMAITON:

The West Virginia Purchasing Division is soliciting bids on behalf of the West Virginia Office of Technology to establish a contract for the one time purchase of voice and communications hardware for agencies relocating to Building 3.

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	RECEIVING DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 908 BULLITT ST CHARLESTON WV 25301-1002 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
1	3.1.1 Aggregation Switches	2.00000	EA		See Pricing page

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description :

Aggregation Switches for Enterprise and Cloud Data Centers, Extreme Networks, Summit Switches, Part Number: 17310, Summit X670-G2-48x-4q-Base-Unit, or Equal

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	RECEIVING DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 908 BULLITT ST CHARLESTON WV 25301-1002 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
2	3.1.2 Power Supply Units	2.00000	EA		See pricing page

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description :

Power Supply Units, Extreme Networksÿ¿ÿ¢ÿ¿ÿ¿ÿ¿ÿ¿ Summit 550W AC PSU FB power supplies, Part Number: 10925, or Equal

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	RECEIVING DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 908 BULLITT ST CHARLESTON WV 25301-1002 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
3	3.1.3 Purpose Built Switches	6.00000	EA		See pricing page

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description :

Purpose Built Switches to support Gigabit Ethernet-enabled servers in enterprise and cloud data centers, Extreme Networksÿ¿ÿ¢ÿ¿ÿ¿ÿ¿ÿ¿ Summit X670 fan module FB, Part Number: 17111, or Equal

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	RECEIVING DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 908 BULLITT ST CHARLESTON WV 25301-1002 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
4	3.1.4 QSFP+ Passive Direct Attach Copper Cable	30.00000	EA		See pricing page

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description :

QSFP+ Passive Direct Attach Copper Cable, Extreme Networksÿ¿ÿ¢ÿ¿ÿ¿ÿ¿ÿ¿ 0.5 meter, compatible 40G, Part number 10311, or Equal

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	RECEIVING DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 908 BULLITT ST CHARLESTON WV 25301-1002 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
5	3.1.5 Power Cords	2.00000	EA		See pricing page

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description :

Power Cords, Extreme Networks, 10A NEMA 5-15P IEC320-C13 AC Power Cords, Part Number 10061, or Equal

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	RECEIVING DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 908 BULLITT ST CHARLESTON WV 25301-1002 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
6	3.1.6 Base Switches	26.00000	EA		

5-a Price Post

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description :

Base Switches, Extreme Switches, Part Number 16179 - X450-G2-48p-10GE4-Base, or Equal

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	RECEIVING DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 908 BULLITT ST CHARLESTON WV 25301-1002 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
7	3.1.7 Fan Modules	26.00000	EA		

5-a Price, Post

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description :

Fan Modules, Extreme Summit X460/X450-G2 fan module FB, Part Number 10945, or Equal

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	RECEIVING DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 908 BULLITT ST CHARLESTON WV 25301-1002 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
8	3.1.8 Power Supplies	26.00000	EA		

30- Price, Post

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description :

Power Supplies, Extreme Summit 1100W PoE AC PSU FB with Front to Back airflow, Part Number 10941, or Equal.

INVOICE TO	SHIP TO
DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 1900 KANAWHA BLVD E, BLDG 5 10TH FLOOR CHARLESTON WV25305 US	RECEIVING DEPARTMENT OF ADMINISTRATION OFFICE OF TECHNOLOGY 908 BULLITT ST CHARLESTON WV 25301-1002 US

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Total Price
9	3.1.9 Power Cords	26.00000	EA		

See phone page

Comm Code	Manufacturer	Specification	Model #
43190000			

Extended Description :

Power Cords, 13A, NEMA 5-15, C15, Part Number 10099, or Equal

SCHEDULE OF EVENTS

Line	Event	Event Date
1	Technical Questions Due	2016-11-16

Exhibit A Pricing Page		
Contract Item	Quantity	Unit Price
3.1.1 Aggregation Switches for Enterprise and Cloud Data Centers, Extreme Networks' Summit Switches, Part Number 17310 - Summit X670-G2-48x-4q-Base-Unit, or Equal	2	
3.1.2 Power Supply Units, Extreme Networks' Summit 550W AC PSU FB power supplies, Part Number: 10925, or Equal	2	
3.1.3 Purpose Built Switches to support Gigabit Ethernet-enabled servers in enterprise and cloud data centers, Extreme Networks' Summit X670 fan module FB, Part Number: 17111, or Equal	6	
3.1.4 QSFP+ Passive Direct Attach Copper Cable, Extreme Networks' 0.5 meter, compatible 40G, Part number 10311, or Equal	30	
3.1.5 Power Cords, Extreme Networks, 10A NEMA 5-15P IEC320-C13 AC Power Cords, Part Number 10061, or Equal	2	
3.1.6 Base Switches, Extreme Switches, Part Number 16179 - X450-G2-48p-10GE4-Base, or Equal	26	
3.1.7 Fan Modules, Extreme Summit X460/X450-G2 fan module FB, Part Number 10945, or Equal	26	
3.1.8 Power Supplies, Extreme Summit 1100W PoE AC PSU FB with Front to Back airflow, Part Number 10941, or Equal	26	
3.1.9 Power Cords, 13A, NEMA 5-15, C15, Part Number 10099, or Equal	26	

$135 432.00

See Alternate Pricing Page

Brocade Alternate Bid for CRFQ 0210 ISC1700000009

Due 11-30-2016

Exhibit A Pricing Page

System 1					
Line No.	**Qty**	**Part Number**	**Description**	**Unit List**	**Ext List**
1	2	ICX7750-48F	BROCADE ICX 7750 WITH 48 10GBE SFP+ PORTS, 6 10/40GBE QSFP+ PORTS, ONE MODULAR SLOT. BASE LAYER 3 SOFTWARE FEATURE SET. REQUIRES ICX 7750-L3-COE TO USE ADVANCED L3 FEATURES. POWER SUPPLIES, FANS, OPTIONAL INTERFACE MODULES, OPTICS ORDERED SEPARATELY.	$11,000.00	$22,000.00
2	4	RPS9+E	500W AC POWER SUPPLY WITH EXHAUST AIRFLOW	$400.00	$1,600.00
3	2	ICX7750-FAN-E	KIT OF 4 ICX7750 FAN ASSEMBLIES PORT SIDE AIR INTAKE	$800.00	$1,600.00
4	2	ICX7750-L3-COE	ICX7750 PREMIUM LAYER3 FEATURES CERTIFICATE OF ENTITLEMENT	$3,500.00	$7,000.00
5	4	PCUSA	CALL FOR QUOTE - POWER CORD FOR RPS2/3/5/9, USA VERSION, 9'10" (~ 10')	$8.00	$32.00
6	26	ICX7450-48P-E	48-PORT 1 GBE SWITCH POE+ BUNDLE INCLUDES 4X10G SFP+ UPLINKS, 2X40G QSFP+ UPLINKS/STACKING, 1X1000W AC POWER SUPPLY AND ONE FAN, FRO NT TO BACK AIRFLOW	$3,200.00	$83,200.00
7	26	RPS16-E	ICX7450/6610 POE 1000W AC PSU, EXHAUST AIRFLOW, FRONT TO BACK AIRFLOW	$300.00	$7,800.00
8	26	ICX-FAN10-E	ICX 7450 EXHAUST AIRFLOW FAN, FRONT TO BACK AIRFLOW (TWO FANS REQUIRED WHEN USING TWO POWER SUPPLIES)	$100.00	$2,600.00
9	6	40G-QSFP-C-00501	40GE QSFP DIRECT ATTACHED COPPER CABLE, 0.5M, 1-PACK, PASSIVE	$50.00	$300.00
10	3	40G-QSFP-C-00508	40GE QSFP DIRECT ATTACHED COPPER CABLE, 0.5M, 8-PACK, PASSIVE	$400.00	$1,200.00
11	2	ICX7750-SVL-RMT-1	ESSENTIAL REMOTE SUPPORT, ICX 7750 48F, 48C, & 26Q	$800.00	$1,600.00
12	26	ICX7450-SVL-RMT-1	ESSENTIAL REMOTE SUPPORT, ICX 7450 24P & 48P CONFIGURATIONS	$250.00	$6,500.00
		Solution Total:			**$135,432.00**

DESIGNATED CONTACT: Vendor appoints the individual identified in this Section as the Contract Administrator and the initial point of contact for matters relating to this Contract.

Charles D. Arnett, Sr. Client Executive
(Name, Title)

(Printed Name and Title)

200 Association Drive Suite 210, Charleston, WV 25311
(Address)

304 768-1645 Fax 304 768-1671
(Phone Number) / (Fax Number)

carnett@thinksis.com
(email address)

CERTIFICATION AND SIGNATURE: By signing below, or submitting documentation through wvOASIS, I certify that I have reviewed this Solicitation in its entirety; that I understand the requirements, terms and conditions, and other information contained herein; that this bid, offer or proposal constitutes an offer to the State that cannot be unilaterally withdrawn; that the product or service proposed meets the mandatory requirements contained in the Solicitation for that product or service, unless otherwise stated herein; that the Vendor accepts the terms and conditions contained in the Solicitation, unless otherwise stated herein; that I am submitting this bid, offer or proposal for review and consideration; that I am authorized by the vendor to execute and submit this bid, offer, or proposal, or any documents related thereto on vendor's behalf; that I am authorized to bind the vendor in a contractual relationship; and that to the best of my knowledge, the vendor has properly registered with any State agency that may require registration.

Software Information Systems LLC
(Company)

Charles D Arnett, Sr. Client Executive
(Authorized Signature) (Representative Name, Title)

Charles D Arnett Sr. Client Executive
(Printed Name and Title of Authorized Representative)

11-30-2016
(Date)

304 768.1645 Fax 304 768.1671
(Phone Number) (Fax Number)

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

MANDATE: Under W. Va. Code §5A-3-10a, no contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and: (1) the debt owed is an amount greater than one thousand dollars in the aggregate; or (2) the debtor is in employer default.

EXCEPTION: The prohibition listed above does not apply where a vendor has contested any tax administered pursuant to chapter eleven of the W. Va. Code, workers' compensation premium, permit fee or environmental fee or assessment and the matter has not become final or where the vendor has entered into a payment plan or agreement and the vendor is not in default of any of the provisions of such plan or agreement.

DEFINITIONS:

"Debt" means any assessment, premium, penalty, fine, tax or other amount of money owed to the state or any of its political subdivisions because of a judgment, fine, permit violation, license assessment, defaulted workers' compensation premium, penalty or other assessment presently delinquent or due and required to be paid to the state or any of its political subdivisions, including any interest or additional penalties accrued thereon.

"Employer default" means having an outstanding balance or liability to the old fund or to the uninsured employers' fund or being in policy default, as defined in W. Va. Code § 23-2c-2, failure to maintain mandatory workers' compensation coverage, or failure to fully meet its obligations as a workers' compensation self-insured employer. An employer is not in employer default if it has entered into a repayment agreement with the Insurance Commissioner and remains in compliance with the obligations under the repayment agreement.

"Related party" means a party, whether an individual, corporation, partnership, association, limited liability company or any other form or business association or other entity whatsoever, related to any vendor by blood, marriage, ownership or contract through which the party has a relationship of ownership or other interest with the vendor so that the party will actually or by effect receive or control a portion of the benefit, profit or other consideration from performance of a vendor contract with the party receiving an amount that meets or exceed five percent of the total contract amount.

AFFIRMATION: By signing this form, the vendor's authorized signer affirms and acknowledges under penalty of law for false swearing (*W. Va. Code* §61-5-3) that neither vendor nor any related party owe a debt as defined above and that neither vendor nor any related party are in employer default as defined above, unless the debt or employer default is permitted under the exception above.

WITNESS THE FOLLOWING SIGNATURE:

Vendor's Name: Software Information Systems, LLC

Authorized Signature: _____ Date: 11-2-2016

State of West Virginia

County of Kanawha, to-wit:

Taken, subscribed, and sworn to before me this 2nd day of November, 2016.

My Commission expires 06/21, 2022.

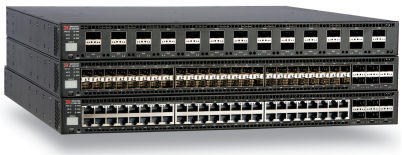
AFFIX SEAL HERE

Official Seal
Notary Public, State of West Virginia
Billy D Holcomb
South Charleston Public Library
312 Fourth Avenue
South Charleston WV 25303
My commission expires June 21, 2022

NOTARY PUBLIC Billy D. Holcomb

DATA SHEET

Brocade ICX 7750 Switch



HIGHLIGHTS

- Provides unprecedented stacking density and performance with up to 12 switches per stack and up to 5.76 Tbps of aggregated stacking bandwidth, limiting inter-switch bottlenecks and supporting large-scale distributed chassis deployments
- Enables single point of management across the campus through a distributed chassis architecture supporting long-distance stacking and new Brocade Campus Fabric technology
- Offers industry-leading 10/40 GbE port density and flexibility in a 1U form factor with up to 32×40 GbE or 96×10 GbE ports per unit, saving valuable rack space and power in wiring closets
- Provides chassis-class high availability with up to 12 full-duplex 40 Gbps stacking ports per switch, hitless stacking failover, and hot-swappable power supplies and fan assemblies
- Delivers superior value by incorporating enterprise-grade advanced features such as BGP, Multi-Chassis Trunking (MCT), and Virtual Routing and Forwarding (VRF)
- Provides OpenFlow support in true hybrid port mode, enabling Software-Defined Networking (SDN) for programmatic control of network data flows

10/40 GbE Distributed Chassis Switch for Campus Aggregation/Core

Today's enterprise network core and aggregation layers are quickly moving to 10 and 40 Gigabit Ethernet (GbE) switching as enterprises rapidly adopt applications such as High-Definition (HD) video, Bring Your Own Device (BYOD), and Virtual Desktop Infrastructure (VDI), which drive the need for resilient, high-bandwidth access networks. To meet these challenges, campus network solutions must provide better performance, port density, reliability, security, Quality of Service (QoS), and Total Cost of Ownership (TCO).

The Brocade® ICX® 7750 Switch delivers industry-leading 10/40 GbE port density, advanced high-availability capabilities, and flexible stacking architecture, making it the most robust Brocade aggregation and core distributed chassis switch offering for enterprise LANs. In addition to rich Layer 3 features, the Brocade ICX 7750 scales to 12-unit distributed-chassis stacking or Multi-Chassis Trunking (MCT) and is an integral part of Brocade Campus Fabric technology.

Today's data centers are also expanding as the demand for data and storage continues to grow exponentially. Moreover, requirements such as application convergence, non-stop operation, scalability, high availability, and power efficiency are placing even greater demands on the network infrastructure.

Part of the Brocade ICX family of Ethernet switches for campus LAN and classic Ethernet data center environments, the Brocade ICX 7750 Switch is a 1U high-performance, high-availability, and market-leading-density 10/40 GbE solution that meets the needs of business-sensitive campus deployments and classic Ethernet data center environments. With industry-leading price/performance and a low-latency, cut-through, non-blocking architecture, the Brocade ICX 7750 provides a cost-effective, robust solution for the most demanding deployments.

BROCADE CAMPUS FABRIC TECHNOLOGY

Brocade Campus Fabric technology brings campus networks into the modern era to better support seamless wireless mobility, security, and ease of application deployment. This innovative technology collapses multiple network layers into a single logical switch, flattening the network and eliminating deployment complexity while simplifying network management and reducing operating costs.

Brocade Campus Fabric technology enables organizations to build networks that deliver:

- **Consolidated management:** *Reduces unnecessary network layers to create large management domains that eliminate individual switch touch points, reducing maintenance time and costs.*
- **Shared network services:** *Allows premium and entry-level switches to mesh together into a single logical switch and share advanced Layer 2/3 services, delivering lower price-per-port functionality without compromising performance.*
- **Scale-out networking:** *Integrates high-performance, fixed form-factor switches to create a single distributed logical switch that is independent of physical location and allows organizations to add ports whenever and wherever needed across the campus without adding complexity.*

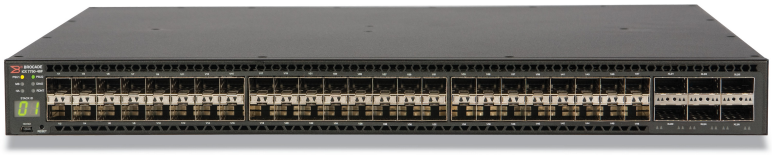


Figure 1. The Brocade ICX 7750-48F features 48 1/10 GbE SFP+ ports and 6 40 GbE QSFP+ ports that can each be split into 4×10 GbE SFP+ ports. The front panel also displays the unit stacking ID.

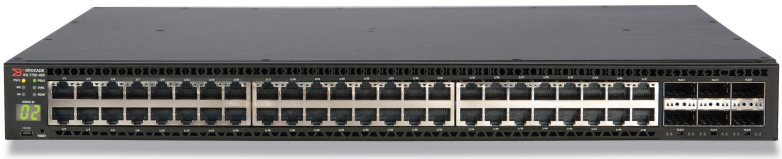


Figure 2. The Brocade ICX 7750-48C features 48 10GBASE-T ports and 6 40 GbE QSFP+ ports that can each be split into 4×10 GbE SFP+ ports.

Figure 3. The Brocade ICX 7750-26Q features 26 40 GbE QSFP+ ports that can be split into as many as 96 10 GbE SFP+ ports.

Brocade Campus Fabric Technology: Extending Options and Scalability

Brocade Campus Fabric technology, available on the Brocade ICX 7150[1], 7250, 7450, and 7750 Switches, extends network options and scalability. It integrates premium Brocade ICX 7750 with Brocade ICX 7450, Brocade ICX 7250, and Brocade ICX 7150 Switches, collapsing network access, aggregation, and core layers into a single logical switch. This logical device shares network services while reducing management touch points and network hops through a single-layer design spanning the entire campus network. These powerful deployments deliver equivalent or better functionality than large, rigid modular chassis systems, but with significantly lower costs and smaller carbon footprints.

Brocade ICX switches support a Distributed Chassis deployment model that uses standards-based optics and cabling interface connections to help ensure maximum distance between campus switches—up to 80 km—and minimum cabling costs—up to 50 percent less than incumbent solutions. This gives organizations the flexibility to deliver ports wherever they are needed on campus at a fraction of the cost. The Distributed Chassis design future-proofs campus networks by allowing networks to easily and cost-effectively expand in scale and capabilities.

[1] Support on the Brocade ICX 7150 to be available in a future release.

Leading-Edge Flexibility and Reliability

The Brocade ICX 7750 provides a highly flexible 10/40 GbE aggregation solution that offers the highest levels of reliability and port density available in a 1U form factor. The Brocade ICX 7750 is available in three models: the Brocade ICX 7750-48F, 7750-48C, and 7750-26Q. The Brocade ICX 7750-48F and 7750-48C both offer 48 10 GbE ports (SFP+ and 10GBASE-T, respectively) and up to 12 40 GbE ports (six optional) (see Figures 1 and 2). The Brocade ICX 7750-26Q offers up to 32 40 GbE QSFP+ ports (six optional) (see Figure 3).

All models support stacking, which allows organizations to buy only the ports they need now and expand later by adding switches to the stack where and when they are needed. This eliminates the need for a forklift upgrade and helps avoid provisioning an underutilized, centralized chassis. In addition, the Brocade ICX 7750 supports redundant, hot-swappable AC or DC power supplies and fans, reversible airflow, and advanced software.

Distributed Chassis Architecture for Ultimate Flexibility

The Brocade ICX 7750 Switch redefines the economics of enterprise networking by delivering a unique 10/40 GbE campus aggregation solution in a fixed form factor and new levels of performance, availability, and flexibility. It provides the capabilities of a chassis with the flexibility and cost-effectiveness of a stackable switch.

Figure 4. Up to 12 Brocade ICX 7750 Switches can be stacked using up to 12 standard full-duplex 40 Gbps QSFP+ ports per switch, providing up to 5.76 Tbps of aggregated stacking bandwidth.

Figure 5. The Brocade ICX 7750 features hot-swappable redundant power supplies (1+1) and fans (3+1), and an optional 6 40 GbE ports module that can be used for stacking or as additional 40 GbE data ports.

The Brocade ICX 7750 delivers wire-speed, non-blocking performance across all ports to support latency-sensitive applications such as real-time voice/video streaming and Virtual Desktop Infrastructure (VDI). Up to 12 Brocade ICX 7750 Switches can be stacked together using up to 12 full-duplex 40 Gbps standard QSFP+ stacking ports that provide an unprecedented maximum of 5.76 Tbps of aggregated stacking bandwidth with full redundancy, eliminating inter-switch bottlenecks (see Figure 4).

High Availability with Hitless Failover

Organizations can count on Brocade ICX 7750 Switches to deliver continuous availability for an optimized user experience. Brocade stacking technology helps provide high availability, performing real-time state synchronization across the stack and enabling instantaneous hitless failover to a standby controller in the unlikely event of a failure of the master stack controller. Organizations also can use hot-insertion/removal of stack members to avoid interrupting service when adding a switch to increase the capacity of a stack or replacing a switch that needs servicing. These features provide another level of availability for the campus wiring closet in a compact form factor. In addition to stack-level high availability, Brocade ICX Switches also support stack-level In Service Software Upgrade (ISSU), a unique capability that enables a stack of Brocade ICX Switches to go through a software upgrade without service interruption. Additional design features include intake and exhaust temperature sensors and fan spin detection to quickly identify abnormal or failed operating conditions—helping to minimize mean time to repair.

FLEXIBLE, LONG-DISTANCE STACKING

Up to 12 Brocade ICX 7750 Switches can be stacked together to form a single logical switch, providing STP-free traffic forwarding, a single point of management, and Link Aggregation Groups (LAGs) across the stack.

Up to 12 full-duplex standard QSFP+ 40 Gbps stacking ports (front six and the optional rear six ports may be used) provide a class-leading 5.76 Tbps of aggregated stacking bandwidth with full redundancy, essentially eliminating the need to work around inter-switch bottlenecks.

A selection of standard QSFP+ copper cables or standard QSFP+ optics can be used to stack Brocade ICX 7750 Switches together, enabling stacking over distance and thereby eliminating the need for stacked switches to be co-located in the same wiring closet.

BROCADE ICX 7750 SWITCH AND CONTROLLER INTEROPERABILITY

The Brocade ICX 7750 Switch operates seamlessly under the Brocade SDN Controller. This controller is a quality-assured edition of the OpenDaylight controller code supported by an established networking provider and its leaders within the OpenDaylight community.

Increased Reliability through Redundancy and Intelligence

The Brocade ICX 7750 includes dual-internal redundant power supplies. These power supplies are hot-swappable and load-sharing with auto-sensing and auto-switching capabilities, which are critical for power redundancy and deployment flexibility (see Figure 5).

The hot-swappable power supplies (1+1) and fan assembly (3+1) allow organizations to replace components without service disruption. In addition, several high-availability and fault-detection features help in failover of critical data flows, enhancing overall system availability and reliability. Organizations can use Brocade Network Advisor and sFlow-based network monitoring and trending to proactively monitor risk areas and optimize network resources. Brocade Multi-Chassis Trunking (MCT) supports dual homing of wiring closet access switches, or servers in a rack, to two Brocade ICX 7750 stacks in an MCT peer group, eliminating the risk of a single point of failure. In conjunction with MCT, VRRP-E (the Brocade extension to VRRP for MCT) provides redundancy and sub-second failover for both Layer 2 and Layer 3. For metro or campus deployments in a ring topology, the Brocade Metro Ring Protocol (MRP-I and MRP-II) prevents Layer 2 loops and enables faster re-convergence than Spanning Tree Protocol (STP) with sub-second failover.

SDN-Enabled Programmatic Control of the Network

Software-Defined Networking (SDN) is a powerful new network paradigm designed for the world's most demanding networking environments and promises breakthrough levels of customization, scale, and efficiency. The Brocade ICX 7750 enables SDN by supporting the OpenFlow 1.0 and 1.3 protocols, which allow communication between an OpenFlow controller and an OpenFlow-enabled switch. Using this approach, organizations can control their networks programmatically, transforming the network into a platform for innovation through new network applications and services. The Brocade ICX 7750 delivers OpenFlow in true hybrid port mode. With Brocade hybrid port mode, organizations can simultaneously deploy traditional Layer 2/3 forwarding with OpenFlow on the same port. This unique capability provides a pragmatic path to SDN by enabling network administrators to progressively integrate OpenFlow into existing networks, giving them the programmatic control offered by SDN for specific flows while the remaining traffic is forwarded as before. Brocade ICX 7750 hardware support for OpenFlow enables organizations to apply these capabilities at line rate in 10 GbE and 40 GbE networks.

Greener Campus and Data Center Networks with Lower TCO

As application data and storage requirements continue to rise exponentially, demand for higher port density and bandwidth grows, along with the number of network devices and power consumption. Organizations seeking to reduce TCO need solutions that can provide higher scalability and density per rack unit, thereby reducing power consumption and heat dissipation.

The Brocade ICX 7750 addresses those needs with a state-of-the-art ASIC, reversible airflow, automatic fan-speed control, and power-efficient optics to ensure the most efficient use of power and cooling. For low-cost, low-latency, and low-energy-consuming cabling within and between the racks, the Brocade ICX 7750 supports SFP+ direct-attached copper cables at up to 5 meters. For switch-to-switch connectivity, the Brocade ICX 7750 supports low-power-consuming SFP+ and 40GBASE-SR4 QSFP+ optical transceivers at up to 100 meters. In high-port-density deployments, these features save significant operating costs.

Superior ROI and Investment Protection

The Brocade ICX 7750 combines strategic performance, availability, and scalability advantages with investment protection for existing LAN environments. It utilizes the same Brocade FastIron® operating system used by other Brocade Ethernet/IP products. This helps ensure full forward and backward compatibility among the product family while simplifying software maintenance and field upgrades.

Moreover, the use of the same industry-standard Command Line Interface (CLI), common to all Brocade ICX switches, eliminates the need for staff retraining. As a result, the Brocade ICX 7750 enables organizations to better leverage their current training, tools, devices, and processes.

Simplified, Standards-based Management

Deploying more switches in a data center infrastructure can increase overall network performance, but it can also prevent organizations from gaining a complete view of network capacity, bandwidth consumption, utilization, and overall health.

To overcome this challenge, the Brocade ICX 7750 utilizes sFlow, a unique solution that helps simplify network management and monitoring. By providing real-time visibility into the network, sFlow helps organizations effectively manage transactions flowing throughout the network. This open standards-based approach integrates with a wide range of management, monitoring, and trending utilities. For example, organizations can use Brocade Network Advisor to manage all Brocade data center Ethernet/IP switches and routers, including Brocade VDX® switches, Brocade ICX switches, Brocade FCX Series switches, Brocade ADX® Series application delivery switches, and Brocade MLXe core routers.

The Brocade ICX 7750 also supports the IEEE 802.1AB LLDP standard, enabling organizations to build open, converged, and advanced multivendor networks. LLDP greatly simplifies and enhances network management, asset management, and network troubleshooting.

With the resulting insight, organizations can quickly and accurately review overall data center operations, identifyhot spots, and quickly diagnose and troubleshoot issues before they develop into widespread problems. The Brocade ICX 7750 also provides accurate SNMP/RMON statistics to Brocade Network Advisor, reducing the administrative burden normally associated with proactive network management, design, and capacity planning.

Purpose-built Feature Set

The Brocade ICX 7750 combines a wide range of unique features to help organizations overcome the most challenging business requirements.

Industry-Leading Advanced Layer 2 and Layer 3 Features

To provide self-healing topologies in Layer 2 configurations, the Brocade ICX 7750 supports industry-standard Ethernet protocols, including multiple varieties of STP and link aggregation as well as optic-, link-, and switch-level fault detection and correction features. The advanced Layer 2 and Layer 3 feature set is leveraged from Brocade FastIron switches that have been field-proven in enterprise and data center networks for more than a decade. With rich Layer 3 features enabled, organizations can utilize the Brocade ICX 7750 in multiple applications.

Data Protection through Robust Security

Security is a critical requirement in today's data centers and branch offices, and the Brocade ICX 7750 provides robust security through a wide range of advanced features. Organizations can use both regular and extended Access Control Lists (ACLs) to control access to and through data center networks.

Organizations can use control policies that permit or deny traffic based on a wide variety of identification characteristics—such as source/destination MAC addresses, source/destination IP addresses, TCP/UDP ports/sockets, and well-known port numbers—further protecting and restricting network access. In addition, for maximum security the Brocade ICX 7750 also leverages 802.1x security, MAC authentication, port MAC security, and MAC filter enhancements.

The Brocade ICX 7750 implements hardware-based ACL, so security does not adversely affect switching performance. In addition, the Brocade ICX 7750 provides hardware-based protection against Distributed Denial of

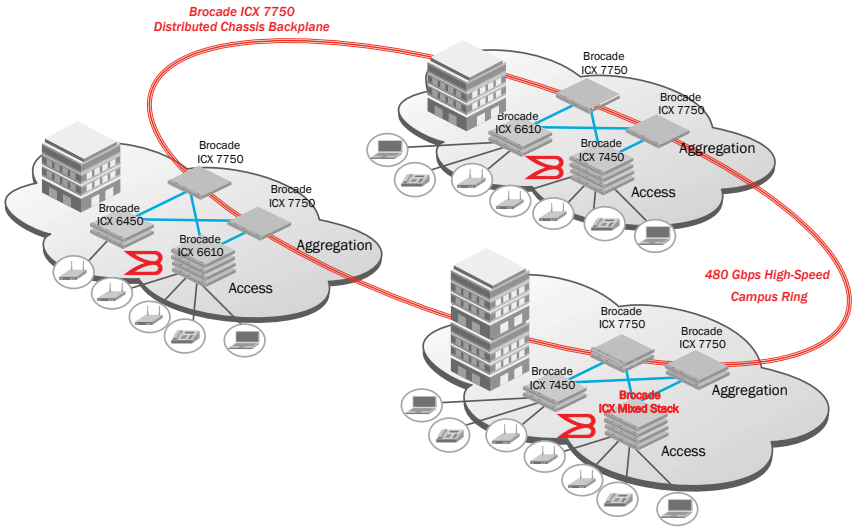


Figure 6. The stackable Brocade ICX 7750 is ideal for deployment as a cost-effective, high-performance solution, forming a single campus-wide ring and combining the aggregation and core layers in a single logical device.

Service (DDoS) attacks (ICMP flood and TCP SYN) as well as hardware-based private VLAN attacks—with no impact on CPU utilization. Also, BPDU Guard and Root Guard prevent rogue hijacking of the spanning tree root and maintain a contention-free—and loop-free—environment, especially during dynamic network deployments.

Advanced QoS to Improve Data Traffic Integrity

The Brocade ICX 7750 offers superior QoS features designed to ensure high-reliability services throughout the data center. It can identify, mark, classify, reclassify, and manage traffic based on specific criteria. This enables organizations to classify bandwidth-critical application traffic, discriminating among various traffic flows and enforcing bandwidth policies.

After the traffic is classified, organizations have complete control over the method the system uses to service the queues: Weighted Round Robin (WRR), Strict Priority (SP), or a mix of both. For granular control to regulate bandwidth utilization, the Brocade ICX 7750 can also perform ingress rate limiting and egress rate shaping.

Multicast-based Applications

The use of video, financial, and other one-to-many applications requires support for scalable multicast services. The Brocade ICX 7750 supports IGMPv1/2/3, PIM-SM/SSM/DM, MSDP, Anycast RP, and PIM and IGMP/MLD Snooping for optimized multicast forwarding. In addition, the Brocade ICX 7750 provides storm-control features to contain and intelligently switch rather than broadcast multicast traffic.

Key Solution Areas

The Brocade ICX 7750 provides a high-performance, cost-effective solution for many types of campus and data center environments, including 10/40 GbE core and aggregation of campus access switches, Top-of-Rack (ToR) server connectivity, and HPC environments.

Campus Aggregation for Enterprise Networks

The Brocade ICX 7750 provides the necessary advanced Layer 2 and Layer 3 features, high 10/40 GbE port density, and high-availability capabilities to be deployed as a campus aggregation solution. A stack of Brocade ICX 7750 Switches interconnected with 40 GbE links makes a cost-effective, highly available campus aggregation solution.

Collapsed Campus Aggregation/Core

Traditional three-tier network design, with "big-box" chassis at the aggregation and core layers, requires a significant up-front investment and offers limited deployment flexibility and future-proofing. In contrast, a distributed "multi-box" architecture at the aggregation and core layers can deliver much greater scalability and future-proofing with an easier "upgrade as you go" model. This type of architecture enables network architects to add capacity exactly where it is needed in the network, unlike a big-box chassis approach, with all ports located in the same closet.

Thanks to rapid technology evolution and innovative thinking, Brocade is able to offer the first stackable solution for campus aggregation and small core that delivers higher performance and port density than a traditional midsize chassis, while offering the same level of reliability and availability. Brocade long-distance stacking technology enables a ring of Brocade ICX 7750 Switches interconnected with 40 GbE stacking links and separated by up to 10 km each to be used as a combined aggregation and core layer for a midsize campus (see Figure 6).

Data Center ToR Server Connectivity

The Brocade ICX 7750 is designed to fit in server racks, and it consumes only one rack unit. To simplify cabling, the 10 GbE Network Interface Cards (NICs) in the servers connect to the Brocade ICX 7750 10 GbE ports by using fiber and SFP+ optical transceivers, SFP+ direct-attached copper cable, or standard copper Ethernet twisted pair cables with 10GBASE-T (see Figure 7).

If any servers in the rack have only 1 GbE-capable NICs, organizations can connect them to the same Brocade ICX 7750 Switch by using a 10 GbE port as a 1 GbE port through an SFP or copper port. The Brocade ICX 7750 ToR switch can connect to the data center middle-of-row/end-of-row aggregation chassis with either 10 GbE or 40 GbE, usually through link aggregation.

The Brocade ICX 7750 provides data center ToR access while Brocade MLXe routers provide an aggregation/core solution.

Cost-Effective 10 GbE Aggregation

In data center environments where most servers are 1 GbE-capable, the Brocade ICX 7750 provides a compact and cost-effective 10 GbE aggregation switch. It connects to the data center core through 10 GbE or 40 GbE ports, and it uses 10 GbE links to connect to Brocade ICX ToR switches at the edge of the network (see Figure 8).

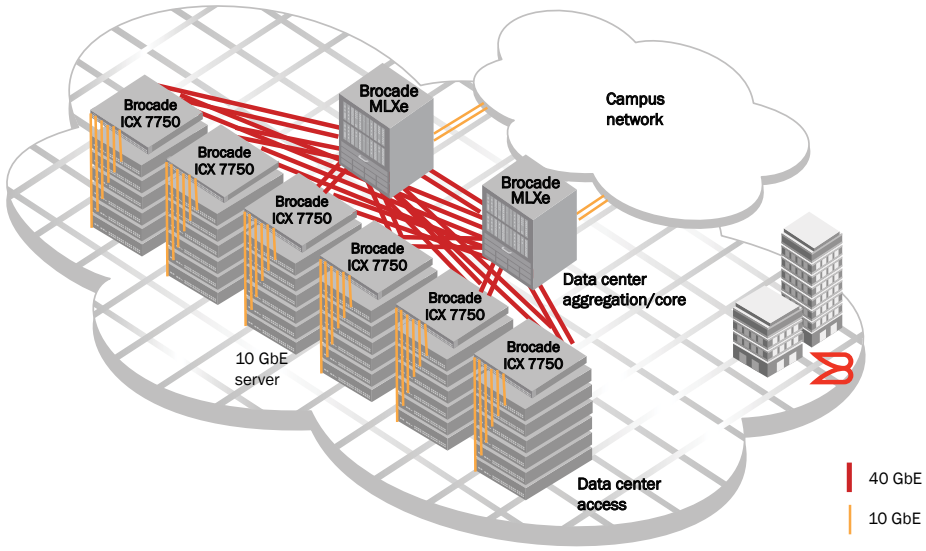


Figure 7. The Brocade ICX 7750 provides data center ToR access while Brocade MLXe routers provide an aggregation/core solution.

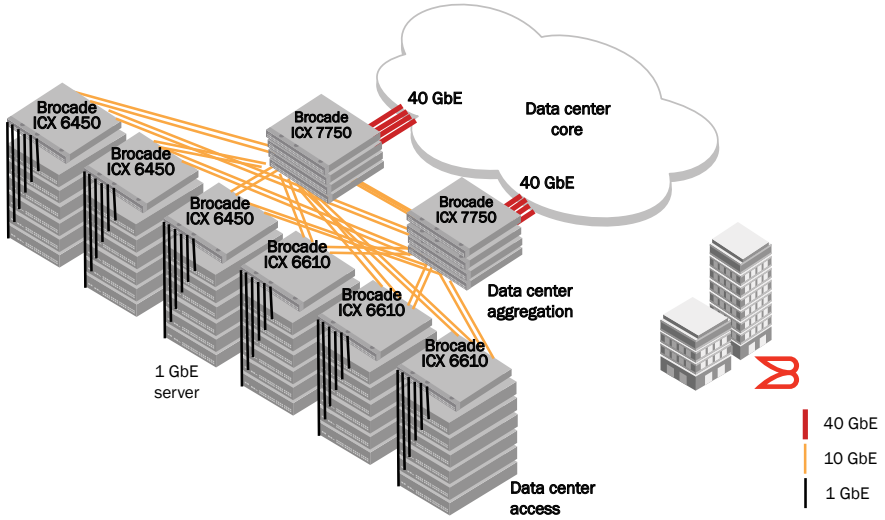


Figure 8. The Brocade ICX 7750 provides data center aggregation with Brocade ICX 6610 and 6450 Switches providing ToR access.

Brocade ICX 7750 Feature/Model Comparison

	26 QSFP+ Ports	48 SFP+ Ports	48 10GBASE-T Ports
	Brocade ICX 7750-26Q	Brocade ICX 7750-48F	Brocade ICX 7750-48C
Switching capacity (data rate, full duplex)	2.56 Tbps	1.92 Tbps	1.92 Tbps
Forwarding capacity (data rate, full duplex)	1.90 Bpps	1.44 Bpps	1.44 Bpps
Fixed ports: 1/10 Gbps SFP/SFP+		48	
Fixed ports: 100 Mbps, 1/10 Gbps 10GBASE-T RJ45			48
Fixed ports: 40 Gbps QSFP+	26	6	6
Modular slots	1	1	1
Modular ports: 40 Gbps QSFP+ (max.)	6	6	6
Latency	550 ns	550 ns	40 Gbps - 40 Gbps: 550 ns 10 Gbps -10 Gbps: 2.9 µs
Dynamic packet buffer size	12.2 MB	12.2 MB	12.2 MB
Base IPv4/IPv6 Layer 3 routing entitlement (Static Routing, RIP)	•	•	•
Advanced IPv4/IPv6 Layer 3 routing (OSPF, BGP, VRRP, PIM, PBR, VRF)	With Certificate of Entitlement	With Certificate of Entitlement	With Certificate of Entitlement
Aggregated stacking bandwidth (data rate, full duplex)	5.76 Tbps	5.76 Tbps	5.76 Tbps
Stacking density (maximum switches in a stack)	12	12	12
Stacking ports (Maximum ports usable for stacking)		Up to 12×40 GbE QSFP+ per switch	
Maximum stacking distance (distance between stacked switches)	10 km	10 km	10 km
Power			
Power inlet (AC)		C14	
Input voltage/frequency		AC: 100 to 240 VAC @ 50 to 60 Hz DC: 40 to 60 VDC	
Maximum power draw	586 W	586 W	586 W
Power supply rated maximum (AC)	2×500 W	2×500 W	2×500 W
Power supply rated maximum (DC)	2×500 W	2×500 W	2×500 W
Switch power utilization[2] (25°C) **Typical** **Maximum**	 274 W 350 W	 250 W 327 W	 511 W 586 W
Switch heat dissipation[2] (25°C) **Typical** **Maximum**	 935 BTU/hour 1,194 BTU/hour	 853 BTU/hour 1,116 BTU/hour	 1,744 BTU/hour 2,000 BTU/hour

[2] Traffic load is based on utilizing all ports.

Brocade ICX 7750 Feature/Model Comparison (Continued)

Environment			
Weight (with 2 power supplies, 4 fans, optional 6 ports module, no transceivers)	8.83 kg (19.43 lb)	9.08 kg (19.98 lb)	10.17 kg (22.38 lb)
Dimensions	440 mm (17.323 in.) W 406.4 mm (16 in.) D 43.6 mm (1.730 in.) H; (1U)	440 mm (17.323 in.) W 406.4 mm (16 in.) D 43.6 mm (1.730 in.) H; (1U)	440 mm (17.323 in.) W 431 mm (16.97 in.) D 43.6 mm (1.730 in.) H; (1U)
Acoustics (25°C, ISO 7779)	62 dBA	62 dBA	62 dBA
MTBF (25°C)	364,061 hours	353,967 hours	259,199 hours

Brocade ICX 7750 Specifications

Specifications	
Connector options	• 100[3]/1000 Mbps, 10 Gbps 10GBASE-T ports: RJ-45 • 1/10 Gbps SFP+ ports • 40 Gbps QSFP+ ports • Out-of-band Ethernet management: 10/100/1000 Mbps RJ-45 • Console management: mini-USB serial port (Mini-B plug) • File transfer: USB port, (standard-A plug) For the latest information about supported optics, please visit www.brocade.com/optics.
DRAM NVRAM (flash) Packet Buffer Size	8 GB 2 GB 12.2 MB
Maximum MAC addresses	96,000 (switch image), 32,000 (router image)
Maximum VLANs Maximum PVLANs	4,096 32
Maximum STP (spanning trees)	254
Maximum VE	512
Maximum routes (in hardware)	IPv4 routes: Up to 128,000 (shared resource) IPv6 routes: Up to 7,000 (shared resource) Next Hop Addresses: Up to 16,000 (shared resource)
Trunking	Maximum ports per trunk: 16 Maximum trunk groups: 256 × 8 or 128 × 16
Maximum jumbo frame size	9,216 bytes
QoS priority queues	8 per port
Multicast Group	8192 (Layer 2) 8192 (Layer 3)

[3] 100 Mbps will be supported in a future software release.

Brocade ICX 7750 Specifications (Continued)

Layer 2 switching	• 802.1s Multiple Spanning Tree • 802.1x Authentication with dynamic VLAN and ACLs • Auto MDI/MDIX • BPDU Guard, Root Guard • Dual-Mode VLANs • Dynamic VLAN Assignment • Dynamic Voice VLAN Assignment • Fast Port Span • GVRP: GARP VLAN Registration Protocol • IGMP Snooping (v1/v2/v3) • IGMP Proxy for Static Groups • IGMP v2/v3 Fast Leave • IGMP Tracking • Inter-Packet Gap (IPG) adjustment • Link Fault Signaling (LFS) • MAC Address Filtering • MAC Learning Disable • MLD Snooping (v1/v2)	• Multi-device Authentication • Per-VLAN Spanning Tree (PVST/PVST+/PVRST) • Mirroring—Port-based, ACL-based, MAC Filter-based, and VLAN-based • PIM-SM v2 Snooping • Port Loop Detection • Private VLAN • Protocol VLAN (802.1v), Subnet VLAN • Remote Fault Notification (RFN) • Single-instance Spanning Tree • Single-link LACP • Trunk Groups (static, LACP) • Uni-Directional Link Detection (UDLD) • Metro-Ring Protocol MRP (v1, v2) • Virtual Switch Redundancy Protocol (VSRP) • Topology Groups • VLAN Stacking (Q-in-Q) • MCT (Brocade Multi-Chassis Trunking)
Base Layer 3 IP routing	• IPv4 and IPv6 static routes • RIP v1/v2, RIPng (IPv6) • ECMP (up to 32 paths) • Port-based Access Control Lists • Layer 3/Layer 4 ACLs	• Host routes • Virtual Interfaces • Routed Interfaces • Route-only Support • Routing Between Directly Connected Subnets
Premium Layer 3 IP routing (with Certificate of Entitlement)	• IPv4 and IPv6 dynamic routes • OSPF v2, OSPF v3 (IPv6) • PIM-SM, PIM-SSM, PIM-DM, PIM passive (IPv4/IPv6 multicast routing functionality) • PBR • Virtual Route Redundancy Protocol (VRRP)	• VRRP-E (IPv4, IPv6) • VRRPv3 (IPv6) • BGP4, BGP4+ (IPv6) • GRE • IPv6 over IPv4 tunnels • VRF (IPv4 and IPv6)
Quality of Service (QoS)	• ACL Mapping and Marking of ToS/DSCP • ACL Mapping and Marking of 802.1p • ACL Mapping to Priority Queue • ACL Mapping to ToS/DSCP • Classifying and Limiting Flows Based on TCP Flags • DiffServ Support	• Honoring DSCP and 802.1p • MAC Address Mapping to Priority Queue • Priority Queue Management using Weighted Round Robin (WRR), Strict Priority (SP), and a combination of WRR and SP • Priority Flow Control
Traffic management	• ACL-based inbound rate limiting and traffic policies • Broadcast, multicast, and unknown unicast rate limiting • Inbound rate limiting per port • Outbound rate limiting per port and per queue	

Brocade ICX 7750 Specifications (Continued)

Security	• 802.1X Accounting • MAC Authentication • Flexible authentication • Web authentication • DHCP snooping • Dynamic ARP inspection • ND Inspection (Neighbor Discovery) • Bi-level Access Mode (Standard and EXEC Level) • EAP pass-through support • IEEE 802.1X username export in sFlow	• Protection against Denial of Service (DoS) attacks • Authentication, Authorization, and Accounting (AAA) • MAC Address Locking; MAC Port Security • Advanced Encryption Standard (AES) with SSHv2 • RADIUS/TACACS/TACACS+ • Secure Copy (SCP) • Secure Shell (SSHv2) • Username/Password • Change of Authorization (CoA) RFC 5176
SDN features	• Support for OpenFlow v1.0 and v1.3 • OpenFlow support with true hybrid port mode • Operates seamlessly under the Brocade SDN Controller and the applications running on the controller	
IEEE standards compliance	• 802.1AB LLDP/LLDP-MED • 802.1D-2004 MAC Bridging • 802.1p Mapping to Priority Queue • 802.1s Multiple Spanning Tree • 802.1w Rapid Reconfiguration of Spanning Tree (RSTP) • 802.1x Port-based Network Access Control (PNAC) • 802.3 Carrier Sense Multiple Access/Collision Detection (CSMA/CD) • 802.3ab 1000Base-T • 802.3 10Base-T	• 802.3ad Link Aggregation (Dynamic and Static) • 802.1 AX-2008 Link Aggregation • 802.3ae 10 Gigabit Ethernet • 802.3u 100Base-TX • 802.3x Flow Control • 802.3z 1000Base-SX/LX • 802.3 MAU MIB (RFC 2239) • 802.3ba 40 Gbps Ethernet • 802.3az-2010 EEE • 802.1Q VLAN Tagging • 802.1BR Bridge Port Extension
RFC standards compliance	For a complete list of RFCs supported by the Brocade FastIron® software platform, please visit www.brocade.com/fastironrfc.	
High availability	• Redundant hot-swappable power supplies • Hot-swappable fan trays • Layer 3 VRRP protocol redundancy • Multi-Chassis Trunking • Real-time state synchronization across the stack	• Hitless failover from master to standby stack controller • Hot insertion and removal of stacked units • Layer 2 VSRP switch redundancy • In Service Software Update (ISSU)

Brocade ICX 7750 Specifications (Continued)

Network and Device Management		
Management	• DHCP Auto Configuration • Configuration Logging • Digital Optical Monitoring • Display Log Messages on Multiple Terminals • Embedded Web Management (HTTP/HTTPS) • Embedded DHCP Server • Industry-standard Command Line Interface (CLI) • Brocade Network Advisor (sold separately) • Key-based activation of optional software features • Integration with HP OpenView • Out-of-band Ethernet Management • ERSPAN support for remote troubleshooting and traffic monitoring • TFTP • TELNET Client and Server	• Bootp • 1157 SNMPv1/v2c • DHCP Server and DHCP Relay • SNMPv3 Intro to Framework • Architecture for Describing SNMP Framework • SNMP Message Processing and Dispatching • SNMPv3 Applications • SNMPv3 User-based Security Model • SNMP View-based Access Control Model SNMP • sFlow • NTP Network Time Protocol • Multiple Syslog Servers • Virtual Cable Tester (VCT) For management MIB, please visit www.brocade.com.
Environment	**Brocade ICX 7750-26Q and 7750-48F**	**Brocade ICX 7750-48C**
Operating temperature	-5°C to 45°C, 50°C at sea level (0°F to 113°F, 122°F at sea level)	40°C at sea level (0°F to 96°F, 96°F at sea level)
Non-operating temperature	-40°C to 60°C (-40°F to 140°F)	-40°C to 60°C (-40°F to 140°F)
Operating humidity	10% to 90% at 50°C (122°F)	10% to 90% at 40°C (104°F)
Non-operating humidity	10% to 90% at 60°C (140°F)	10% to 90% at 60°C (140°F)
Operating altitude	10,000 ft. (3,000 m) maximum	10,000 ft. (3,000 m) maximum
Non-operating altitude	39,000 ft. (12,000 m) maximum	39,000 ft. (12,000 m) maximum
Compliance/Certification		
Electromagnetic emissions	FCC Class A (Part 15); EN 55022/CISPR-22 Class A; VCCI Class A; ICES-003 Electromagnetic Emission; AS/NZS 55022; EN 61000-3-2 Power Line Harmonics; EN 61000-3-3 Voltage Fluctuation and Flicker; EN 61000-6-3 Emission Standard (supersedes: EN 50081-1)	
Safety	CAN/CSA-C22.2 NO. 60950-1-07; UL 60950-1 Second Edition; IEC 60950-1 Second Edition; EN 60950-1:2006 Safety of Information Technology Equipment; EN 60825-1 Safety of Laser Products—Part 1: Equipment Classification, Requirements and User's Guide; EN 60825-2 Safety of Laser Products—Part 2: Safety of Optical Fibre Communication Systems	
Immunity	EN 61000-6-1 Generic Immunity and Susceptibility (supersedes EN 50082-1); EN 55024 Immunity Characteristics (supersedes EN 61000-4-2 ESD); EN 61000-4-3 Radiated, Radio Frequency, Electromagnetic Field; EN 61000-4-4 Electrical Fast Transient; EN 61000-4-5 Surge; EN 61000-4-6 Conducted Disturbances Induced by Radio-Frequency Fields; EN 61000-4-8 Power Frequency Magnetic Field; EN 61000-4-11 Voltage Dips and Sags	
Environmental regulatory compliance	RoHS-compliant (6 of 6); WEEE-compliant	
Vibration	IEC 68-2-36, IEC 68-2-6	
Shock and drop	IEC 68-2-27, IEC 68-2-32	

Brocade ICX 7750 Ordering Information

Part Number	Description
Bare Switches and Port Modules	
ICX7750-48F	Brocade ICX 7750 with 48×1/10 GbE SFP+ ports, 6×40 GbE QSFP ports and modular interface slot. No power supplies or fan units (must be ordered separately). No optics. Requires ICX7750-L3-COE Certificate of Entitlement to use advanced Layer 3 features.
ICX7750-48F-RMT3	Brocade ICX 7750 with 48×1/10 GbE SFP+ ports, 6×40 GbE QSFP ports and modular interface slot, three years of remote service is included with this bundle. No power supplies or fan units (must be ordered separately). No optics. Requires ICX7750-L3-COE Certificate of Entitlement to use advanced Layer 3 features.
ICX7750-48C	Brocade ICX 7750 with 48×1/10 GbE RJ-45 10GBASE-T ports, 6×40 GbE QSFP ports and modular interface slot. No power supplies or fan units (must be ordered separately). No optics. Requires ICX7750-L3-COE Certificate of Entitlement to use advanced Layer 3 features.
ICX7750-26Q	Brocade ICX 7750 with 26×40 GbE QSFP ports and modular interface slot. No power supplies or fan units (must be ordered separately). No optics. Requires ICX7750-L3-COE Certificate of Entitlement to use advanced Layer 3 features.
ICX7750-6Q	Brocade ICX 7750 6×40 GbE QSFP module for use in Brocade ICX7750-48F, 7750-48C, or 7750-26Q
Power Supplies and Fans	
RPS9+I	500 W AC power supply; power-supply-side intake (port-side exhaust) airflow
RPS9+E	500 W AC power supply; power-supply-side exhaust (port-side intake) airflow
RPS9DC+I	500 W DC power supply; power-supply-side intake (port-side exhaust) airflow
RPS9DC+E	500 W DC power supply; power-supply-side exhaust (port-side intake) airflow
ICX7750-FAN-I	Fan kit of 4; fan-side intake (port-side exhaust) airflow
ICX7750-FAN-E	Fan kit of 4; fan-side exhaust (port-side intake) airflow
ICX7750-FAN-I-SINGLE	Fan single unit; fan-side intake (port-side exhaust) airflow
ICX7750-FAN-E-SINGLE	Fan single unit; fan-side exhaust (port-side intake) airflow
Feature Licenses and Accessories	
ICX7750-L3-COE	Certificate of Entitlement to use routing and advanced functionality. Without the Certificate of Entitlement, customers may use base Layer 3 features: VRRP, RIP, and static routes. Other Layer 3 features are considered advanced and require the ICX7750-L3-COE. The Certificate of Entitlement is serialized paper that is not tied to a particular switch; no activation is required.
BR-NTWADV-IP-BASE	Brocade Network Advisor IP management software license for up to 50 devices; required for initial purchase of IP-only management; minimum of one year of support is required.
Optics and Copper Cables	
10Ge-SFPP-AOC-0701	10 GbE SFP+ direct-attached active optical cable, 7 m, 1-pack
10Ge-SFPP-AOC-1001	10 GbE SFP+ direct-attached active optical cable, 10 m, 1-pack
10G-SFPP-USR	10GBASE USR SFP+ optical transceiver, 100 m over MMF LC, 1-pack
10G-SFPP-SR	10GBASE-SR SFP+ optical transceiver, SMF LC
10G-SFPP-LR	10GBASE-LR SFP+ optical transceiver, SMF LC
10G-SFPP-ER	10GBASE-ER SFP+ optic (LC), for up to 40 km over SMF
E1MG-TX	1000BASE-TX SFP copper, RJ-45 connector
E1MG-SX-OM	1000BASE-SX SFP optical transceiver, MMF LC, optical monitoring-capable
E1MG-LX-OM	1000BASE-LX SFP optical transceiver, MMF LC, optical monitoring-capable

Brocade ICX 7750 Ordering Information (Continued)

Part Number	Description
Optics and Copper Cables (Continued)	
40G-QSFP-LR4	40GBASE-LR4 QSFP+ optic (LC), for up to 10 km over SMF, 1-pack
40G-QSFP-SR4	40GBASE-SR4 QSFP+ optic (MTP 1×8 or 1×12), 100 m over MMF, 1-pack
40G-QSFP-QSFP-C-0101	40 GbE direct-attached QSFP+ to QSFP+ active copper cable, 1 m, 1-pack
40G-QSFP-QSFP-C-0301	40 GbE direct-attached QSFP+ to QSFP+ active copper cable, 3 m, 1-pack
40G-QSFP-QSFP-C-0501	40 GbE direct-attached QSFP+ to QSFP+ active copper cable, 5 m, 1-pack
40G-QSFP-SR4-INT	40GBASE-SR4 QSFP+ optic (MTP 1×8 or 1×12), 100 m over MMF, compatible with 10GBASE-SR, 10 GbE breakout cable, 1-pack
40G-QSFP-4SFP-C-0101	4×10 GbE direct-attached QSFP+ to 4 SFP+ copper breakout cable, 1 m, 1-pack
40G-QSFP-4SFP-C-0301	4×10 GbE direct-attached h QSFP+ to 4 SFP+ copper breakout cable, 3 m, 1-pack
40G-QSFP-4SFP-C-0501	4×10 GbE direct-attached QSFP+ to 4 SFP+ copper breakout cable, 5 m, 1-pack

Warranty

The Brocade ICX 7750 Switch is covered by the Brocade Assurance® Limited Lifetime Warranty. For details, visit www.brocade.com/warranty.

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Brocade Global Services

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Maximizing Investments

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BROCADE

DATA SHEET

Brocade ICX 7450 Switch

HIGHLIGHTS

- Offers ultimate flexibility and "pay as you grow" scalability in a modular design with three expansion slots for a choice of 1 GbE, 10 GbE, or 40 GbE uplinks, and a service module
- Supports next-generation 802.11ac Wave 2 wireless enterprise access points with 2.5 GbE ports
- Delivers market-leading stacking scalability of up to 12 switches per stack, 960 Gbps of aggregated stacking bandwidth, and
- long-distance stacking to enable single point management
- Provides OpenFlow support in true hybrid port mode, enabling a gradual transition to Software-Defined Networking (SDN) without disruption
- Offers Power over HDBaseT (PoH), to power video surveillance and video conferencing equipment, VDI terminals, and HD displays
- Meets compliance and data confidentiality requirements across corporate networks and cloud deployments by extending IPsec VPN to the wiring closet

Enterprise Stackable Switch Delivers Premium Capabilities and Ultimate Flexibility

The Brocade® ICX® 7450 Switch delivers the performance, flexibility, and scalability required for enterprise Gigabit Ethernet (GbE) access deployment. It offers market-leading stacking density with up to 12 switches (576 1 GbE and 48 1/10 GbE ports) per stack and combines chassis-level performance and reliability with the flexibility, cost-effectiveness, and "pay as you grow" scalability of a stackable solution. The mid-market stackable switch is one of the first in its class to offer 40 GbE uplinks, enabling enterprises to dramatically increase their network capacity while using their existing optical wire infrastructure. In addition, the Brocade ICX 7450 is the industry's first stackable switching solution to combine the performance and flexibility of network switching with the advantages of site-to-site IPsec VPN security to ensure end-to-end data integrity without the need for dedicated encryption appliances.

The unique design of the Brocade ICX 7450 provides three modular slots, offering up to 12 1/10 GbE SFP/SFP+ ports, 12 10GBASE-T ports, or up to three 40 GbE QSFP+ ports for uplink or stacking. As a result, the Brocade ICX 7450 can easily deliver sufficient bandwidth between the edge and aggregation layers to support expanding video traffic, VDI adoption, and high-speed wireless 802.11ac deployment. Additionally, the Brocade ICX 7450 delivers high performance across all ports for flawless support of latency-sensitive applications.

The Brocade ICX 7450 is an ideal network solution for campus network 1 GbE and 2.5 GbE access or small aggregation deployment with 10 GbE or 40 GbE uplinks to the core. The Brocade ICX 7450 also makes a very suitable data center Top-of-Rack (ToR) solution, delivering a mix of 1 GbE and 10 GbE server connectivity ports with 10 GbE or 40 GbE uplinks to the data center aggregation or core.

BROCADE CAMPUS FABRIC TECHNOLOGY

Brocade Campus Fabric technology brings campus networks into the modern era to better support seamless wireless mobility, security, and ease of application deployment. This innovative technology collapses multiple network layers into a single logical switch, flattening the network and eliminating deployment complexity while simplifying network management and reducing operating costs.

Brocade Campus Fabric technology enables organizations to build networks that deliver:

- **Consolidated management:** *Reduces unnecessary network layers to create large management domains that eliminate individual switch touch points, reducing maintenance time and costs.*
- **Shared network services:** *Allows premium and entry-level switches to mesh together into a single logical switch and share advanced Layer 2/3 services, delivering lower price-per-port functionality without compromising performance.*
- **Scale-out networking:** *Integrates high-performance, fixed form-factor switches to create a single distributed logical switch that is independent of physical location and allows organizations to add ports whenever and wherever needed across the campus without adding complexity.*

Figure 1. Up to 12 Brocade ICX 7450 switches can be stacked together using two full-duplex QSFP+ 40 Gbps ports that provide a fully redundant backplane with 960 Gbps of stacking bandwidth.

Scaling Out Ports as Demand Grows

The Brocade ICX 7450 is easy to deploy, manage, and integrate into both new and existing networks. Organizations can buy only what they need today, and easily scale out as demand grows and new technologies emerge.

With three modular slots, the Brocade ICX 7450 enables organizations to grow their networks when necessary. Organizations can initially deploy 1 GbE or 10 GbE uplink ports and upgrade to 40 GbE ports on-demand with a new, high-speed module.

The Brocade ICX 7450 also offers a low-cost entry point. By providing the flexibility of a stackable switch, the Brocade ICX 7450 saves organizations from having to invest in a costly chassis upfront and tie up valuable capital. Instead, they can buy a single Brocade ICX 7450 Switch to get started and add new Brocade ICX 7450 Switches to the stack as their business grows.

Integrating High-Performance IPsec Service

As organizations move to a hybrid cloud architecture with geographically dispersed business partners, concerns about security breaches are increasing. Many organizations seek to better meet compliance and protect their data in transit—whether across the Internet or the enterprise network. Brocade offers an industry-first stackable switching solution that delivers encryption from the wiring closet, providing a cost-effective way to ensure data security and integrity across the premises without needing to purchase dedicated encryption appliances.

The Brocade ICX 7450 switch with the integrated IPsec VPN service module consolidates network switching and encryption to provide unprecedented VPN deployment flexibility and cost savings. By initiating an IPsec tunnel from the Brocade ICX 7450 for transporting selected traffic, organizations save the time and reduce the costs from having to install and manage encryption software on individual computers or deploy purpose-built encryption appliances.

The Brocade ICX 7450 Service Module provides hardware-based acceleration for IPsec VPNs using Advanced Encryption Standards (AES). It leverages programmable hardware technology to future-proof data protection, enabling more capabilities to be added as business needs evolve.

Brocade Campus Fabric Technology: Extending Options and Scalability

Brocade Campus Fabric technology, available on the Brocade ICX 7150[1], 7250, 7450, and 7750 Switches, extends network options and scalability. It integrates premium Brocade ICX 7750 with Brocade ICX 7450, Brocade ICX 7250, and Brocade ICX 7150 Switches, collapsing network access, aggregation, and core layers into a single logical switch. This logical device shares network services while reducing management touch points and network hops through a single-layer design spanning the entire campus network. These powerful deployments deliver equivalent or better functionality than large, rigid modular chassis systems, but with significantly lower costs and smaller carbon footprints.

Brocade ICX switches support a distributed chassis deployment model that uses standards-based optics and cabling interface connections to help ensure maximum distance between campus switches—up to 10 km—and minimum cabling costs. This gives organizations the flexibility to deliver ports wherever they are needed on campus at a fraction of the cost.

BROCADE ICX 7450 SWITCH AND CONTROLLER INTEROPERABILITY

The Brocade ICX 7450 Switch operates seamlessly with the Brocade SDN Controller and the applications running on the controller. This gives organizations the flexibility to move toward a dynamic infrastructure, benefiting from network application developments that help meet the operational or regulatory requirements of their industries.

Table 1: Brocade ICX 7450 models.

Brocade ICX 7450 Product Family	
All Brocade ICX 7450 models offer three modular slots for interchangeable uplink/stacking modules (one in the front, two in the back), dual power supply slots, dual fan trays, one RJ-45 network management port, one mini USB serial management port, and one USB storage port on the front panel.	
	**Brocade ICX 7450-24 Switch** 24×10/100/1000 Mbps RJ-45 ports
	**Brocade ICX 7450-24P Switch** 24×10/100/1000 Mbps RJ-45 PoE+ ports with eight pre-assigned ports supporting PoH (95 W)
	**Brocade ICX 7450-32ZP Switch** 24×10/100/1000 Mbps RJ-45 PoE+ ports with eight pre-assigned ports supporting PoH (95 W) and 8×100/1000 Mbps/ 2.5 GbE RJ-45 PoE+ ports
	**Brocade ICX 7450-48 Switch** 48×10/100/1000 Mbps RJ-45 ports
	**Brocade ICX 7450-48P Switch** 48×10/100/1000 Mbps RJ-45 PoE+ ports with eight pre-assigned ports supporting PoH (95 W)
	**Brocade ICX 7450-48F Switch** 48×100/1000 Mbps SFP ports

Figure 2: Brocade ICX 7450 rear view shown with two optional Brocade ICX7400-1X40GQ QSFP+ uplink/stacking modules, two AC power supplies, and two fan trays.

[1] Support on the Brocade ICX 7150 to be available in a future release.

The distributed chassis design future-proofs campus networks by allowing networks to easily and cost-effectively expand in scale and capabilities.

Flexible, Long-Distance Stacking for the Most Demanding Enterprise Environments

Brocade Ethernet switch stacking technology makes it possible to stack up to 12 Brocade ICX 7450 Switches together into a single logical switch using standard QSFP+ or SFP+ stacking ports. This allows the Brocade ICX 7450 to deliver a class-leading 960 Gbps of aggregated stacking bandwidth and offer simple and robust expandability for future growth at the network edge (see Figure 1).

A selection of standard QSFP+ or SFP+ copper cables or standard QSFP+ or SFP+ optics can be used to stack Brocade ICX 7450 Switches together, enabling stacking over distance and thereby eliminating the need for stacked switches to be colocated in the same wiring closet. This stacked logical switch also has only a single IP address to simplify management and offers transparent STP-free traffic forwarding and shared Link Aggregation Groups (LAG) across a pool of up to 576 1 GbE ports and 48 10 GbE ports. When new switches join the stack, they automatically inherit the stack's existing configuration file, enabling plug-and-play network expansion.

Brocade stacking technology also delivers high availability, enabling instantaneous hitless failover to a standby stack controller if the master stack controller fails. In addition, organizations can use hot-insertion and removal of stack members to avoid interrupting network services.

Simplified, Open-Standards-based Management and Monitoring

The Brocade ICX 7450 provides simplified, standards-based management capabilities that help organizations reduce administrative time and effort while securing their networks.

Table 2: Port and service module options for the Brocade ICX 7450.

Brocade ICX 7450 Port and Service Module Options	
Five different optional modules are offered for the Brocade ICX 7450. These modules are interchangeable and can be inserted in the three modular slots within the Brocade ICX 7450.[2]	
Brocade ICX7400-4X1GF Module	4-port 100 Mbps/1 GbE SFP
Brocade ICX7400-4X10GF Module	4-port 1/10 GbE SFP/SFP+ for uplink or stacking
Brocade ICX7400-4X10GC Module	4-port 1/10 GbE 10GBASE-T copper
Brocade ICX7400-1X40GQ Module	1-port 40 GbE QSFP+ for uplink or stacking
Brocade ICX7400-SERVICE-MOD Module	Service module for IPsec VPN encryption

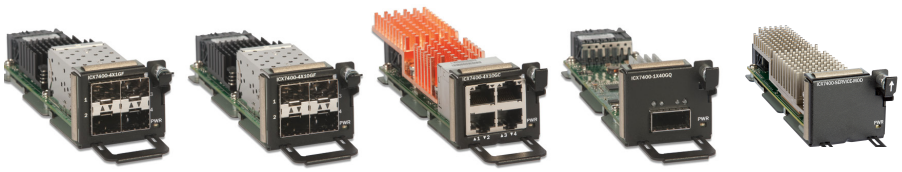

Figure 3: Five different optional port modules are offered for the Brocade ICX 7450 with a choice of 1 GbE SFP, 10 GbE SFP/SFP+, 10GBASE-T, and 40 GbE QSFP+ options and an IPsec VPN service module.

sFlow-based "Always-On" Network Monitoring

sFlow is a modern, standards-based network export protocol (RFC 3176) that addresses many of the challenges that network managers face today.
By embedding sFlow hardware support into the Brocade ICX 7450, Brocade delivers an "always-on" technology that operates with wire-speed performance. sFlow dramatically reduces implementation costs compared to traditional network monitoring solutions that rely on mirrored ports, probes, and line-tap technologies. Moreover, sFlow gives organizations full, enterprise-wide monitoring capability for every port in the network.

Simplified, Automated Deployment with Auto-Provisioning

The Brocade ICX 7450 supports Zero Touch Provisioning, simplifying deployment with a truly plug-and-play experience. Organizations can use this feature to automate IP address and feature configuration of the switches without requiring a highly trained network engineer onsite. When the switches power up, they automatically receive an IP address and configuration from DHCP and Trivial File Transport Protocol (TFTP) servers. At this time, the switches can also automatically receive a software update to be at the same code revision as currently installed switches.

Open-Standards Management

The Brocade ICX 7450 includes an industry-standard Command Line Interface (CLI) and supports Secure Shell (SSHv2), Secure Copy (SCP), and SNMPv3 to restrict and encrypt management communications to the system. In addition, support for Terminal Access Controller Access Control System (TACACS/TACACS+) and RADIUS authentication helps ensure secure operator access.

[2] The Brocade ICX7400-1X40GQ module cannot be installed in the front-facing slot of the 48-port Brocade ICX 7450 models (Brocade ICX 7450-48, 7450-48P, 7450-48F, 7450-32ZP). The Brocade ICX7400-4X1GF module cannot be installed in the rear slots of any model of the Brocade ICX 7450 Switch and is not supported by the Brocade ICX 7450-32ZP model.

Table 3: Power supply options for the Brocade ICX 7450.

Brocade ICX 7450 Power Supply Options	
The Brocade ICX 7450 offers a selection of PoE/non-PoE and AC/DC power supply options with front-to-back or back-to-front airflow cooling options. The DC power supply can be installed in either PoE or no-PoE switches.	
RPS15-E power supply	Non-PoE 250 W AC with front-to-back airflow
RPS15-I power supply	Non-PoE 250 W AC with back-to-front airflow
RPS16-E power supply	PoE 1,000 W AC with front-to-back airflow
RPS16-I power supply	PoE 1,000 W AC with back-to-front airflow
RPS16DC-E power supply	PoE 510 W DC with front-to-back airflow
RPS16DC-I power supply	PoE 510 W DC with back-to-front airflow

Figure 4: The Brocade ICX 7450 offers the choice of 250 W AC, 1,000 W AC, or 510 W DC power supply options. All power supplies are available with front-to-back or back-to-front airflow.

Out-of-Band Management

The Brocade ICX 7450 includes a 10/100/1000 Mbps RJ-45 Ethernet port dedicated to out-of-band management, providing a remote path to manage the switches, regardless of the status or configuration of the data ports.

SDN-Enabled Programmatic Control of the Network

Software-Defined Networking (SDN) is a powerful new network paradigm designed for the world's most demanding networking environments and promises breakthrough levels of customization, security, and efficiency. The Brocade ICX 7450 enables SDN by supporting the OpenFlow 1.3 protocol, which facilitates communication between the Brocade SDN Controller and the underlying network infrastructure.

In today's increasingly mobile world, organizations are looking to OpenFlow and SDN to achieve programmability in the campus LAN. The business needs driving SDN deployment are improved Quality of Service (QoS), enhanced security, and management simplification. With new policies such as BYOD significantly impacting campus networks, SDN is a powerful solution that better prioritizes and forwards traffic based on the context of a flow and to easily enforce granular policies for regulatory compliance or security reasons.

With hybrid-port mode on the Brocade ICX 7450 and all other Brocade ICX 7000 series switches, organizations can run traditional protocols and OpenFlow-directed flows at the same time. The Brocade ICX family supports the Brocade SDN Controller and other OpenDaylight-based controllers, enabling organizations to benefit from programmatic control through gradual transition of their network into the controller domain without disruption. Brocade ICX 7450 hardware support for OpenFlow ensures these traffic flows at line-rate speeds.

Unified Wired/Wireless Network Management with Brocade Network Advisor

Managing enterprise campus networks continues to become more complex due to the growth in services that rely on wired and wireless networks. Services such as Internet, e-mail, video conferencing, real-time collaboration, and distance learning all have specific configuration and management requirements. At the same time, organizations face increasing demand to provide uninterrupted services for high-quality voice and Unified Communications (UC), wireless mobility, and multimedia applications.

To reduce complexity and the time spent managing these environments, the easy-to-use Brocade Network Advisor discovers, manages, and deploys configurations to groups of IP devices. By using Brocade Network Advisor, organizations can configure Virtual LANs (VLANs) within the network, manage wireless access points, and execute commands on specific IP devices or groups of IP devices. sFlow-based proactive monitoring is ideal for performing network-wide troubleshooting, generating traffic reports, and gaining visibility into network activity from the edge to the core. Brocade Network Advisor also centralizes the management of the entire family of Brocade wired products and Ruckus wireless products.

Ready for Next-Generation Wireless Technology

Between the phenomenal expansion of wireless networks and the fast-paced evolution of enterprise wireless technology, wired networks are being pushed to their limits. At the same time, the current lifecycle for wireless network technologies is much shorter than it is for wired Ethernet networks, meaning that today's wireless networks will likely be upgraded two or three times over the life of the wired network. It is therefore critical that organizations choose a wired network solution capable of supporting next-generation wireless technology.

The Brocade ICX 7450 is designed to handle next-generation 802.11ac Wave 2 wireless access points. The Brocade ICX 7450-32ZP offers 8×2.5 GbE ports to connect multigigabit wireless access points. Moreover, the switch's non-blocking architecture offers up to 240 Gbps of uplink bandwidth with up to 3×40 GbE uplink ports, ensuring smooth end-to-end traffic flow from the wireless edge to the core.

EEE Power Savings

The Brocade ICX 7450 Switch supports the IEEE 802.3az standard for Energy Efficient Ethernet (EEE), reducing power consumption during periods of low utilization. Ports are placed into a low power mode when no data is being transmitted.

Enterprise-Class Availability

When every second matters, Brocade ICX 7450 switches help deliver continuous availability to optimize the user experience. Brocade stacking technology delivers high availability, performing real-time state synchronization across the stack and enabling instantaneous hitless failover to a standby controller in the unlikely event of a failure of the master stack controller. Organizations also can use hot-insertion/removal of stack members to avoid interrupting service when adding a switch to increase the capacity of a stack or replacing a switch that needs servicing.

In addition to stack-level high availability, Brocade ICX Switches also support stack-level In Service Software Upgrade (ISSU), a unique capability that enables a stack of Brocade ICX Switches to go through a software upgrade without service interruption.

Brocade ICX 7450 Switches include system-level high-availability features, such as dual hot-swappable, load-sharing, and redundant power supplies. The modular design also has dual hot-swappable fan trays. These features provide another level of availability for the campus wiring closet, all in a compact form factor.

Support for PoH to Power Next-Generation Edge Devices

The Brocade ICX 7450 can deliver both power and data across network connections, providing a single-cable solution for the latest edge devices. In addition to supporting the Power over Ethernet (PoE/PoE+) standards, the Brocade ICX 7450 also supports Power over HDBaseT (PoH). This new, high power standard delivers up to 95 watts per port through a standard Ethernet cable, simplifying the wiring of next-generation Ethernet-connected devices such as large HD displays, video surveillance equipment, and VDI thin terminals, enabling data and power to be carried by a single Ethernet wire. The PoE/PoE+ and PoH capabilities reduce the number of required power receptacles and power adapters while increasing reliability and wiring flexibility.

With a 1,500-watt power budget per switch (with two power supplies), the Brocade ICX 7450 24- and 48-port PoE models can supply up to Class 4 PoE+ power (30 watts) to every port and PoH power (95 watts) on eight dedicated ports.

Full Layer 3 Capabilities

Brocade ICX 7450 Switches offer powerful IPv4 and IPv6 Layer 3 switching capabilities. Organizations can use optional premium Layer 3 features (available as an option)—such as IPv4/IPv6 OSPF and RIP routing, Policy-Based Routing (PBR), VRRP, and Protocol-Independent Multicast (PIM)—to reduce complexity and enhance the reliability of large enterprise networks by bringing Layer 3 capabilities to the network edge and/or aggregation layer. Premium Layer 3 capabilities include BGP routing, enabling remote offices to connect Brocade ICX 7450 Switches to service provider networks. Premium routing capabilities can be added to any Brocade ICX 7450 Switch model through software licensing.

Data Center ToR Switch for 1 GbE and 10 GbE Server Connectivity

Thanks to its class-leading 10 GbE and 40 GbE port count, the Brocade ICX 7450 is a great solution as a Top-of-Rack (ToR) switch in a mixed 1 GbE/10 GbE server connectivity environment. It is designed to fit in server racks, consuming only one rack unit and offering dual integrated power supplies and fan assemblies with front-to-back or back-to-front airflow for flexible cooling options. In data center environments where most servers have 1 GbE and some 10 GbE network interfaces, the Brocade ICX 7450 provides a compact and cost-effective 1 GbE/10 GbE ToR switch. In this configuration some of the Brocade ICX 7450 10 GbE or 40 GbE ports can be used to connect to the data center aggregation switches.

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Brocade ICX 7450 Feature/Model Comparison

	24 or 48 RJ-45 Ports		24, 32, or 48 PoE+ Ports			48 SFP Ports
	Brocade ICX 7450-24	Brocade ICX 7450-48	Brocade ICX 7450-24P	Brocade ICX 7450-32ZP	Brocade ICX 7450-48P	Brocade ICX 7450-48F
Switching capacity (data rate, full duplex)	288 Gbps	336 Gbps	288 Gbps	328 Gbps	336 Gbps	336 Gbps
Forwarding capacity (data rate, full duplex)	214 Mpps	250 Mpps	214 Mpps	244 Mpps	250 Mpps	250 Mpps
Fixed ports: 10/100/1000 Mbps RJ45	24	48	24	24	48	
Fixed ports: 100/1000 Mbps SFP						48
Fixed ports: 100 Mbps/1000 Mbps/ 2.5 Gbps RJ45				8		
Modular slots	3	3	3	3	3	3
Modular ports: 1 Gbps SFP (max.)	4	4	4		4	4
Modular ports: 1/10 GbE SFP/SFP+ (max.)	12	12	12	12	12	12
Modular ports: 1/10GBASE-T RJ45 (max.)	12	12	12	12	12	12
Modular ports: 40 GbE QSFP+ (max.)	3	2	3	2	2	2
Modular service: IPsec VPN	With module	With module	With module		With module	With module
Maximum PoE class 3 ports (15.4 W per port)			24 (1 AC PSU)	32 (1 AC PSU)	48 (1 AC PSU)	
Maximum PoE+ ports (30 W per port)			24 (1 AC PSU)	32 (2 AC PSU)	48 (2 AC PSU)	
Maximum PoH ports (95 W per port)			8 (1 AC PSU)	8 (1 AC PSU)	8 (1 AC PSU)	
Base IPv4/v6 Layer 3 routing (Static, RIP)	•	•	•	•	•	•
Advanced IPv4/v6 Layer 3 routing (OSPF, BGP, VRRP, PIM, PBR, VRF)	With license	With license	With license	With license	With license	With license
Aggregated stacking bandwidth	960 Gbps	960 Gbps	960 Gbps	960 Gbps	960 Gbps	960 Gbps
Stacking density (maximum switches in a stack)	12	12	12	12	12	12
Stacking ports (Maximum ports[3] usable for stacking)	Up to 4×10 GbE SFP+ or 2×40 GbE QSFP+					
Maximum stacking distance (distance between stacked switches)	10 km	10 km	10 km	10 km	10 km	10 km
Power						
Power inlet (AC)	C14					
Input voltage/frequency	AC: 100 to 240 VAC @ 50 to 60 Hz | DC: 40 to 60 VDC					
Maximum current draw (at 100 VAC, one power supply)	13.3 Amp	13.3 Amp	12.5 Amp	12.5 Amp	12.5 Amp	13.3 Amp
Power supply rated maximum output (AC)	2×250 W	2×250 W	2×1,000 W	2×1,000 W	2×1,000 W	2×250 W
Power supply rated maximum output (DC)	2×510 W	2×510 W	2×510 W	2×510 W	2×510 W	2×510 W
PoE power budget (AC) (two AC power supplies)			1,500 W	1,500 W	1,500 W	
PoE power budget (DC) (two DC power supplies)			516 W	516 W	516 W	
Switch power consumption[4] (25°C) **Idle** (no PoE load) **10% traffic**[5] (full PoE load) **100% traffic**[5] (full PoE load)	63 W 64 W 69 W	93 W 95 W 100 W	75 W 911 W 916 W	90 W 922 W 930 W	106 W 930 W 935 W	119 W 120 W 123 W

Brocade ICX 7450 Feature/Model Comparison (Continued)

Switch heat dissipation[4, 6] (25°C) **Idle** (no PoE load) **10% traffic**[5] (full PoE load) **100% traffic**[5] (full PoE load)	215 BTU/hour 218 BTU/hour 235 BTU/hour	317 BTU/hour 324 BTU/hour 341 BTU/hour	256 BTU/hour 259 BTU/hour 276 BTU/hour	307 BTU/hour 314 BTU/hour 330 BTU/hour	362 BTU/hour 369 BTU/hour 386 BTU/hour	406 BTU/hour 409 BTU/hour 420 BTU/hour
Environment						
Weight[4]	6.4 kg (14.11 lb)	6.5 kg (14.33 lb)	6.9 kg (15.21 lb)	7.2 kg (15.87 lb)	7.2 kg (15.87 lb)	6.8 kg (14.99 lb)
Dimensions	440 mm (17.323 in.) W × 393.7 mm (15.5 in.) D × 43.7 mm (1.720 in.) H; 1U					
Acoustics[4] (25°C, ISO 7779)	46 dBA	47 dBA	49 dBA	49 dBA	49 dBA	46 dBA
MTBF[4] (25°C)	628,369 hours	571,520 hours	466,576 hours	448,376 hours	444,360 hours	576,586 hours

[3] 10 GbE SFP+ or 40 GbE QSFP+ modules are required for stacking.

[4] Switch includes one AC power supply, one fan, one 4×10 GbE SFP+ uplink module, two QSFP+ stacking modules.

[5] Traffic load on all ports connected with maximum possible PoE/PoE+ loads (if equipped).

[6] PoE power not included in switch heat dissipation figures since the heat is not dissipated at the switch.

Brocade ICX 7450 Specifications

Capabilities

Connector options	• 10/100/1000 Mbps, 2.5 Gbps, 10 Gbps 10GBASE-T ports: RJ-45 • 100 Mbps SFP ports • 1 Gbps SFP ports • 10 Gbps SFP+ ports • 40 Gbps QSFP+ ports • Out-of-band Ethernet management: 10/100/1000 Mbps RJ-45 • Console management: Mini-USB RS232 serial port (Mini-B plug) • File Transfer: USB port, standard-A plug For the latest information about supported optics, please visit www.brocade.com/optics.
Maximum MAC addresses	32,768
Maximum VLANs Maximum PVLANs	4,096 32
Maximum STP (spanning trees)	254
Maximum VEs	255
Maximum routes (in hardware)	15,168 (IPv4) 2,284 (IPv6) 16,000 (Next Hop Addresses)
Trunking	Maximum ports per trunk: 8 TBD Maximum trunk groups: 256 TBD
Maximum jumbo frame size	9,216 bytes
Average latency	1.3 µs
QoS priority queues	8 per port
IPsec performance	Maximum throughput: 10 Gbps, full-duplex Maximum tunnels: 20
Multicast Groups	8192 (Layer 2) 8192 (Layer 3)
VRF	16

Brocade ICX 7450 Specifications (Continued)

Features		
Layer 2 switching	• 802.1s Multiple Spanning Tree • 802.1x Authentication • Auto MDI/MDIX • BPDU Guard, Root Guard • Dual-Mode VLANs • MAC-based VLANs, Dynamic MAC-based VLAN activation • Dynamic Voice VLAN Assignment • Dynamic VLAN Assignment • Fast Port Span • GVRP: GARP VLAN Registration Protocol • IGMP Snooping (v1/v2/v3) • IGMP Proxy for Static Groups • IGMP v2/v3 Fast Leave • IGMP Tracking • Inter-Packet Gap (IPG) adjustment • Link Fault Signaling (LFS) • MAC Address Filtering	• MAC Learning Disable • MLD Snooping (v1/v2) • Multi-device Authentication • Per-VLAN Spanning Tree (PVST/PVST+/PVRST) • Mirroring - Port-based, ACL-based, MAC Filter-based, and VLAN-based • PIM-SM v2 Snooping • Port Loop Detection • Private VLAN • Protocol VLAN (802.1v), Subnet VLAN • Remote Fault Notification (RFN) • Single-instance Spanning Tree • Single-link LACP • Trunk Groups (static, LACP) • Uni-Directional Link Detection (UDLD) • Metro-Ring Protocol (MRP) (v1, v2) • Virtual Switch Redundancy Protocol (VSRP) • VLAN Stacking (Q-in-Q) • Topology Groups
Base Layer 3 IP routing	• IPv4 and IPv6 static routes • RIP v1/v2, RIPng (IPv6) • ECMP • Port-based Access Control Lists • Layer 3/Layer 4 ACLs • Host routes	• Virtual Interfaces • Routed Interfaces • Route-only Support • Routing Between Directly Connected Subnets • "MSDP" in Base Layer 3 IP routing
Premium Layer 3 IP routing (with software license)	• IPv4 and IPv6 dynamic routes • OSPF v2, OSPF v3 (IPv6) • PIM-SM, PIM-SSM, PIM-DM, PIM passive (IPv4/IPv6 multicast routing functionality) • PBR • Virtual Route Redundancy Protocol VRRP v3 (IPv6)	• VRRP-E (IPv4, IPv6) • BGP4, BGP4+ (IPv6) • GRE • IPv6 over IPv4 tunnels • VRF (IPv4 and IPv6)
Quality of Service (QoS)	• ACL Mapping and Marking of ToS/DSCP (CoS) • ACL Mapping and Marking of 802.1p • ACL Mapping to Priority Queue • Classifying and Limiting Flows Based on TCP Flags • DiffServ Support	• Honoring DSCP and 802.1p (CoS) • MAC Address Mapping to Priority Queue • Priority Queue Management using Weighted Round Robin (WRR), Strict Priority (SP), and a combination of WRR and SP • Priority Flow Control
Traffic management	• ACL-based inbound rate limiting and traffic policies • Broadcast, multicast, and unknown unicast rate limiting	• Inbound rate limiting per port • Outbound rate limiting per port and per queue

Brocade ICX 7450 Specifications (Continued)

Security	• IPsec 128/256 AES-GCM (with service module) • MACsec • 802.1X Authentication • MAC Authentication • Flexible authentication • Web authentication • DHCP snooping • Dynamic ARP inspection • Neighbor Discover (ND) Inspection • Bi-level Access Mode (Standard- and EXEC-level) • EAP pass-through support • IEEE 802.1X username export in sFlow • Protection against Denial of Service (DoS) attacks • Authentication, Authorization, and Accounting (AAA) • MAC Address Locking MAC Port Security • Advanced Encryption Standard (AES) with SSHv2 • RADIUS/TACACS/TACACS+ • Secure Copy (SCP) • Secure Shell (SSHv2) • Local Username/Password • Change of Authorization (CoA) RFC 5176	• RFC Conformance for Encryption: – RFC 5996 Internet Key Exchange Protocol Version 2 (IKEv2) – RFC 4303 IP Encapsulating Security Payload (ESP) – RFC 6379 Suite B Cryptographic Suites for IPsec (Suite-B-GCM-256 and Suite-B-GCM-128) – RFC 5903 Elliptic Curve Groups Modulo a Prime (ECP Groups) for IKEv2 – RFC 4868 Using HMAC-SHA-256, HMAC-SHA-384, and HMAC-SHA-512 with IPsec – RFC 4754 IKEv2 Authentication Using the Elliptic Curve Digital Signature Algorithm (ECDSA) – RFC 4106 The use of Galois/Counter Mode (GCM) in IPsec Encapsulating Security Payload (ESP) – SP800-56A Recommendation for Pair-Wise Key Establishment Schemes Using Discrete Logarithm Cryptography
SDN features	• OpenFlow v1.0 and v1.3 • OpenFlow with hybrid port mode	• Operates with the Brocade SDN Controller and the applications running on the controller
IEEE standards compliance	• 802.1AB LLDP • 802.1D MAC Bridging • 802.1p Mapping to Priority Queue • 802.1s Multiple Spanning Tree (MST) • 802.1w Rapid Reconfiguration of Spanning Tree • 802.1x Port-based Network Access Control (PNAC) • 802.3 Carrier Sense Multiple Access/Collision Detection (CSMA/CD) • 802.3ab 1000BASE-T • 802.1 AX-2008 Link Aggregation • 802.3ae 10 Gigabit Ethernet	• 802.3af Power over Ethernet (15.4 W) • 802.3at Power over Ethernet Plus • 802.3u 100Base-TX • 802.3x Full duplex and Flow Control • 802.3z 1000Base-SX/LX • 802.3 MAU MIB (RFC 2239) • 802.3ba 40 and 100 Gbps Ethernet • 802.1AE-MACsec (with license) • 802.3az Energy Efficient Ethernet • 802.1Q VLAN Tagging • 802.1BR Bridge Port Extension
IETF RFC standards compliance	• For a complete list of RFCs supported by the Brocade FastIron® software platform, please visit: www.brocade.com/fastironrfc.	
High availability	• Redundant hot-swappable power supplies • Hot-swappable fan trays • Layer 3 VRRP/VRRP-E protocol redundancy • Real-time state synchronization across the stack	• Hitless failover and switchover from master to standby stack controller • Hot insertion and removal of stacked units • Layer 2 VSRP switch redundancy • In Service Software Update (ISSU)

Brocade ICX 7450 Specifications (Continued)

Network and Device Management

Management	• DHCP Auto Configuration • Configuration Logging • Digital Optical Monitoring • Display Log Messages on Multiple Terminals • Embedded Web Management (HTTP/HTTPS) • Embedded DHCP Server • Industry-standard Command Line Interface (CLI) • Brocade Network Advisor (sold separately) • Key-based activation of optional software features • Integration with HP OpenView: • USB file management and storage • Macro for batch execution • Out-of-band Ethernet Management • ERSPAN support for remote traffic monitoring • TFTP	• TELNET Client and Server • Bootp • SNMPv1/v2c • DHCP Server and DHCP Relay • SNMPv3 Intro to Framework • Architecture for Describing SNMP Framework • SNMP Message Processing and Dispatching • SNMPv3 Applications • SNMPv3 User-based Security Model • SNMP View-based Access Control Model SNMP • sFlow • NTP Network Time Protocol • Multiple Syslog Servers • SCP • Virtual Cable Tester (VCT) For management MIB, please visit www.brocade.com.

Environment

Temperature	Operating temperature: –5°C to 50°C/23°F to 122°F Storage temperature: –40°C to 70°C/–40°F to 158°F
Humidity	Operating relative humidity: 10% to 90% at 50°C, non-condensing Non-operating relative humidity: 5% to 95% at 70°C, non-condensing
Altitude	Operating altitude: 10,000 ft. (3,000 m) maximum Storage altitude: 39,000 ft. (12,000 m) maximum

Compliance/Certification

Electromagnetic emissions	FCC Class A (Part 15); EN 55022/CISPR-22 Class A; VCCI Class A; ICES-003 Electromagnetic Emission; AS/NZS 55022; EN 61000-3-2 Power Line Harmonics; EN 61000-3-3 Voltage Fluctuation and Flicker; EN 61000-6-3 Emission Standard
Safety	CAN/CSA-C22.2 NO. 60950-1-07; UL 60950-1; IEC60950-1; EN 60950-1:2006 Safety of Information Technology Equipment; EN 60825-1 Safety of Laser Products
Immunity	EN 61000-6-1 Generic Immunity and Susceptibility; EN 55024 Immunity Characteristics; EN 61000-4-3 Radiated, Radio Frequency, Electromagnetic Field; EN 61000-4-4 Electrical Fast Transient; EN 61000-4-5 Surge; EN 61000-4-6 Conducted Disturbances Induced by Radio-Frequency Fields; EN 61000-4-8 Power Frequency Magnetic Field; EN 61000-4-11 Voltage Dips and Sags
Environmental regulatory compliance	RoHS-compliant (6 of 6); WEEE-compliant
Vibration	IEC 68-2-36, IEC 68-2-6
Shock and drop	IEC 68-2-27, IEC 68-2-32

Brocade ICX 7450 Ordering Information

Part Number	Description
Switch Bundles	
ICX7450-24-E	24-port 1 GbE switch bundle includes 4×10 GbE SFP+ uplinks/stacking, 2×40 GbE QSFP+ uplinks/stacking, 1×250 W AC power supply and one fan, front-to-back airflow
ICX7450-24-40G-E	24-port 1 GbE switch bundle includes 3×40 GbE QSFP+ uplinks/stacking, 1×250 W AC power supply and one fan, front-to-back airflow
ICX7450-24P-E	24-port 1 GbE switch PoE+ bundle includes 4×10 GbE SFP+ uplinks/stacking, 2×40 GbE QSFP+ uplinks/stacking, 1×1,000 W AC power supply and one fan, front-to-back airflow
ICX7450-24P-40G-E	24-port 1 GbE switch PoE+ bundle includes 3×40 GbE QSFP+ uplinks/stacking, 1×1,000 W AC power supply and one fan, front-to-back airflow
ICX7450-24P-E-RMT3	24-port 1 GbE switch PoE+ bundle includes 4×10 GbE SFP+ uplinks/stacking, 2×40 GbE QSFP+ uplinks/stacking, 1×1,000 W AC power supply and one fan, front-to-back airflow, three years 24×7 remote support
ICX7450-32ZP-E	24-port 1 GbE and 8-port 2.5 GbE switch PoE+ bundle includes 4×10 GbE SFP+ uplinks/stacking, 2×40 GbE QSFP+ uplinks/stacking, 1×1,000 W AC power supply, and one front-to-back airflow fan
ICX7450-48-E	48-port 1 GbE switch bundle includes 4×10 GbE SFP+ uplinks/stacking, 2×40 GbE QSFP+ uplinks/stacking, 1×250 W AC power supply and one fan, front-to-back airflow
ICX7450-48P-E	48-port 1 GbE switch PoE+ bundle includes 4×10 GbE SFP+ uplinks/stacking, 2×40 GbE QSFP+ uplinks/stacking, 1×1,000 W AC power supply and one fan, front-to-back airflow
ICX7450-48P-E-RMT3	48-port 1 GbE switch PoE+ bundle includes 4×10 GbE SFP+ uplinks/stacking, 2×40 GbE QSFP+ uplinks/stacking, 1×1,000 W AC power supply and one fan, front-to-back airflow, three years 24×7 remote support
ICX7450-48P-STK-E	48-port 1 GbE switch PoE+ bundle includes 2×40 GbE QSFP+ uplinks/stacking, 1×1,000 W AC power supply and one fan, front-to-back airflow (stack member with no uplink module)
ICX7450-48P-STK-E-RMT3	48-port 1 GbE switch PoE+ bundle includes 2×40 GbE QSFP+ uplinks/stacking, 1×1,000 W AC power supply and one fan, front-to-back airflow, three years 24×7 remote support (stack member with no uplink module)
ICX7450-48F-E	48-port 1 GbE SFP fiber switch bundle includes 4×10 GbE SFP+ uplinks/stacking, 2×40 GbE QSFP+ uplinks/stacking, 1×250 W AC power supply and one fan, front-to-back airflow
ICX7450-48F-E-RMT3	48-port 1 GbE SFP fiber switch bundle includes 4×10 GbE SFP+ uplinks/stacking, 2×40 GbE QSFP+ uplinks/stacking, 1×250 W AC power supply and one fan, front-to-back airflow, three years 24×7 remote support
Bare Switches	
ICX7450-24	24-port 1 GbE switch with three modular slots for optional uplink/stacking ports. Power supplies, fans, and modules need to be ordered separately.
ICX7450-24P	24-port 1 GbE switch PoE+ with three modular slots for optional uplink/stacking ports. Power supplies, fans, and modules need to be ordered separately.
ICX7450-32ZP	24-port 1 GbE and 8-port 2.5 GbE switch PoE+ with three modular slots for optional uplink/stacking ports. Power supplies, fans, and modules need to be ordered separately.
ICX7450-48	48-port 1 GbE switch with three modular slots for optional uplink/stacking ports. Power supplies, fans, and modules need to be ordered separately.
ICX7450-48P	48-port 1 GbE switch PoE+ with three modular slots for optional uplink/stacking ports. Power supplies, fans, and modules need to be ordered separately.
ICX7450-48F	48-port 1 GbE switch SFP with three modular slots for optional uplink/stacking ports. Power supplies, fans, and modules need to be ordered separately.

Brocade ICX 7450 Ordering Information (Continued)

Part Number	Description
Modules	
ICX7400-4X1GF	Brocade ICX 7450 4-port 100 Mbps/1 GbE SFP module
ICX7400-4X10GF	Brocade ICX 7450 4-port 1/10 GbE SFP/SFP+ module (for stacking or uplinks)
ICX7400-4X10GC	Brocade ICX 7450 4-port 1/10 GbE 10GBASE-T copper module
ICX7400-1X40GQ	Brocade ICX 7450 1-port 40 GbE QSFP+ module (for stacking or uplink)
ICX7400-SERVICE-MOD	Brocade ICX 7450 Service Module for IPsec VPN encryption
Power Supplies and Fans	
RPS15-E	Brocade ICX 7450/6610 non-PoE 250 W AC power supply with front-to-back airflow
RPS15-I	Brocade ICX 7450/6610 non-PoE 250 W AC power supply with back-to-front airflow
RPS16-E	Brocade ICX 7450/6610 PoE 1,000 W AC power supply with front-to-back airflow
RPS16-I	Brocade ICX 7450/6610 PoE 1,000 W AC power supply with back-to-front airflow
RPS16DC-E	Brocade ICX 7450/6610 PoE 510 W DC power supply with front-to-back airflow
RPS16DC-I	Brocade ICX 7450/6610 PoE 510 W DC power supply with back-to-front airflow
ICX-FAN10-E	Brocade ICX 7450 front-to-back airflow fan
ICX-FAN10-I	Brocade ICX 7450 back-to-front airflow fan
Feature License and Accessories	
ICX7450-PREM-LIC	Brocade ICX 7450 Layer 3 Premium Software License
ICX-MACSEC-LIC	License to enable MACsec encryption
ICX7000-RMK	FRU, rack mount kit, two post, Brocade ICX 7750/7450
XBR-R000295	FRU, rack mount kit, four post, 24 in. to 32 in. depth rack
BR-NTWADV-IP-BASE	Brocade Network Advisor IP management software license for up to 50 devices; required for initial purchase of IP only management; minimum of one year of support required.
Optics	
E1MG-100FX-OM	100BASE-FX SFP optic MMF, LC connector, optical monitoring-capable
E1MG-100FX-IR-OM	100BASE-FX IR SFP optic for SMF with LC connector, optical monitoring-capable. For distances up to 15 km.
E1MG-100FX-LR-OM	100BASE-FX LR SFP optic for SMF with LC connector, optical monitoring-capable. For distances up to 40 km.
E1MG-TX	1000BASE-TX SFP copper, RJ-45 connector
E1MG-SX-OM	1000BASE-SX SFP optic, MMF, LC connector, optical monitoring-capable
E1MG-LX-OM	1000BASE-LX SFP optic, SMF, LC connector, optical monitoring-capable
E1MG-LHA-OM-T	1000BASE-LHA SFP optic, SMF, LC connector, optical monitoring-capable
E1MG-BXU	1000BASE-BXU SFP optic SMF, transmits at 1,310 nm and receives at 1,490 nm, LC connector, single-strand SMF fiber

Brocade ICX 7450 Ordering Information (Continued)

Part Number	Description
Optics	
E1MG-BXD	1000BASE-BXD SFP optic SMF, transmits at 1,490 nm and receives at 1,310 nm, LC connector, single-strand SMF fiber
10G-SFPP-USR	10GE USR SFP+ optic (LC), target range 100 m over MMF, 1-pack
10G-SFPP-SR	10GBASE-SR, SFP+ optic (LC), target range 300 m over MMF
10G-SFPP-LR	10GBASE-LR, SFP+ optic (LC), for up to 10 km over SMF
10G-SFPP-ER	10GBASE-ER SFP+ optic (LC), for up to 40 km over SMF
10G-SFPP-ZR	10GBASE-ZR SFP+ optic (LC), for up to 80 km over SMF
10G-SFPP-LRM	10GBASE-LRM, 1,310 nm SFP+ optic (LC), TAR
40G-QSFP-SR-BIDI	40GE SR QSFP+ optic (LC), Bidirectional, 100 m over OM3 MMF
40G-QSFP-SR4	40GBASE-SR4 QSFP+ optic (MTP 1×8 or 1×12), 100 m over MMF, 1-pack
40G-QSFP-ESR4	40GBASE-ESR4 QSFP+ optic 400 m over MMF, 1 pack
40G-QSFP-LM4	40GBASE-LM4 QSFP+ optic (LC), for up to 160 m over MMF and 2 km over SMF, 1-pack
40G-QSFP-LR4	40GBASE-LR4 QSFP+ optic (LC), for up to 10 km over SMF, 1-pack
Direct-Attached Cables	
10G-SFPP-TWX-0101	Direct-attached SFP+ active copper cable, 1 m, 1-pack
10G-SFPP-TWX-0301	Direct-attached SFP+ active copper cable, 3 m, 1-pack
10G-SFPP-TWX-0501	Direct-attached SFP+ active copper cable, 5 m, 1-pack
10GE-SFPP-AOC-0701	Direct-attached SFP+ active optic cable, 7 m, 1-pack
10GE-SFPP-AOC-1001	Direct-attached SFP+ active optic cable, 10 m, 1-pack
40G-QSFP-C-00501	40 GbE QSFP+ direct-attached passive copper cable, 0.5 m, 1-pack
40G-QSFP-C-00508	40 GbE QSFP+ direct-attached passive copper cable, 0.5 m, 8-pack
40G-QSFP-C-0101	40 GbE QSFP+ direct-attached passive copper cable, 1 m, 1-pack
40G-QSFP-QSFP-C-0101	40 GbE QSFP+ direct-attached QSFP+ to QSFP+ active copper cable, 1 m, 1-pack
40G-QSFP-QSFP-C-0301	40 GbE QSFP+ direct-attached QSFP+ to QSFP+ active copper cable, 3 m, 1-pack
40G-QSFP-QSFP-C-0501	40 GbE QSFP+ direct-attached QSFP+ to QSFP+ active copper cable, 5 m, 1-pack
40G-QSFP-QSFP-AOC-1001	40 GbE QSFP+ direct-attached QSFP+ to QSFP+ active optic cable, 10 m, 1-pack

For the latest information about supported optics and cables, please visit www.brocade.com/optics.

Ordering Instructions

Customers have two options when ordering a Brocade ICX 7450 Switch. They can select one of the six pre-built units from the "Switch Bundles" section, or they can build their own custom unit by selecting a "Bare Switch" and adding their choice of power supplies, fans, port modules, and the IPsec VPN service module.

Pre-built units ordered from the "Switch Bundles" section include a power cord, two-post rack mounting brackets, and a USB serial console cable. Units ordered from the "Bare Switches" section include two-post rack mounting brackets and a USB serial console cable. AC power supplies ordered separately include a power cord. Stacking cables must be ordered separately.

Legal Disclaimer

Product features, functionality and specifications may change or be discontinued without notice. Nothing in this document shall be deemed to create a warranty of any kind, either express or implied, statutory or otherwise, including but not limited to, any implied warranties of merchantability, fitness for a particular purpose, non-infringement of third-party rights or availability with respect to any products and services.

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