BROCADE FCX 624 AND 648 SWITCHES

DATA CENTER

Powerful, Efficient, Easy-to-Manage Data Center Edge Switches

HIGHLIGHTS

- Gigabit Ethernet (GbE) top-of-rack switch purpose-built for the data center

- A choice of 24- and 48-port models in compact 1U form factors

- An optional 4-port 10 GbE module that enables wire-speed, end-to-end GbE performance across all ports

- Brocade IronStack technology that enables horizontal stacking of switches, unifying network management for an entire row of servers

- Reversible front-to-back airflow and redundant cooling fans to meet strict data center environmental requirements

- Hardware-based sFlow traffic monitoring capabilities, with Brocade IronShield 360 providing real-time protection from network attacks

- Protected by the Brocade Assurance Limited Lifetime Warranty for as long as the original purchaser continues to own and use the product

The Brocade® FCX 624 and 648 Switches provide new levels of performance, flexibility, and manageability required for today's growing enterprise data centers. Featuring advanced capabilities and a purpose-built design, these switches support modern data center architectures where wire-speed performance and cost reduction are both high priorities. In fact, the innovative design doubles the number of 10 Gigabit Ethernet (GbE) connections between network layers, making the switches ideal for highly utilized virtual data centers.

These 24- and 48-port data center switches feature four ports of 10 GbE capabilities and reversible front-to-back airflow. Utilizing Brocade IronStack technology, organizations can horizontally stack up to eight top-of-rack switches into a single logical switch, simplifying management in the network access layer.

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PURPOSE-BUILT FOR THE DATA CENTER

Modern enterprise data centers have strict requirements in regard to form factor, port density, power redundancy, and airflow for servers, storage, and networking equipment. To meet those requirements, the Brocade FCX 624 and 648 switches feature a purpose-built design to extend proven Brocade technology into the data center.

Optional High-Density 10 GbE Module

Both switches accept an optional 10 GbE module containing four SFP+ ports, enabling high-bandwidth connectivity to the aggregation or core layers, or creating a switch stack horizontally across a row of servers. Utilizing the SFP+ port form factor enables higher density, more flexible cabling options, and better energy efficiency. The ability to use short-range and long-range optics, along with copper Twinax cables, supports flexible and cost-effective network architectures.

Industry-leading 4-port 10 GbE density in a 1U switch provides up to 40 Gbps of uplink bandwidth to the aggregation or core layers of the network (see Figure 1). Even with the high-density 48-port model, this bandwidth enables a near 1:1 subscription ratio throughout the network. As a result, organizations can deploy highly utilized networks to avoid congestion during peak hours.

In a stack of Brocade FCX 624 or 648 switches, up to eight 10 GbE links can be aggregated, providing 80 Gbps of bandwidth between the horizontal stack and the aggregation or core layers.

Organizations can also use a 4-port GbE SFP module for optical 1 GbE uplink connections. In the future, as bandwidth demands increase, organizations can replace this module with the 4-port 10 GbE module. This modular design increases investment protection by supporting 10 GbE deployment when the time is right.

Flexible Power and Cooling Options

Brocade FCX switches for the data center optionally contain dual hot-swappable, load-sharing, redundant power supplies (see Figure 2). The modular design also has a removable fan assembly containing four redundant blowers. These features provide another level of availability for data center top-of-rack switches.

The Brocade FCX 624 and 648 are the first Brocade data center Ethernet switches with reversible front-to-back airflow options. This design improves mounting flexibility in a server rack, while adhering to the cooling guidelines of the data center. Organizations can specify airflow direction at the time of order and can reverse the direction after deployment by swapping the power supplies and the fan assembly.

Additional design features include intake and exhaust temperature sensors and fan spin detection to streamline identification of abnormal or failed operating conditions, helping to minimize mean time to repair.

Compact Form Factor

Brocade FCX 624 and 648 switches provide up to 48 GbE ports and four 10 GbE ports in a compact 1U design. The shallow 17.2-inch depth of the switch enables deployment in next-generation high-density server designs while providing ample room for optimal cable management.
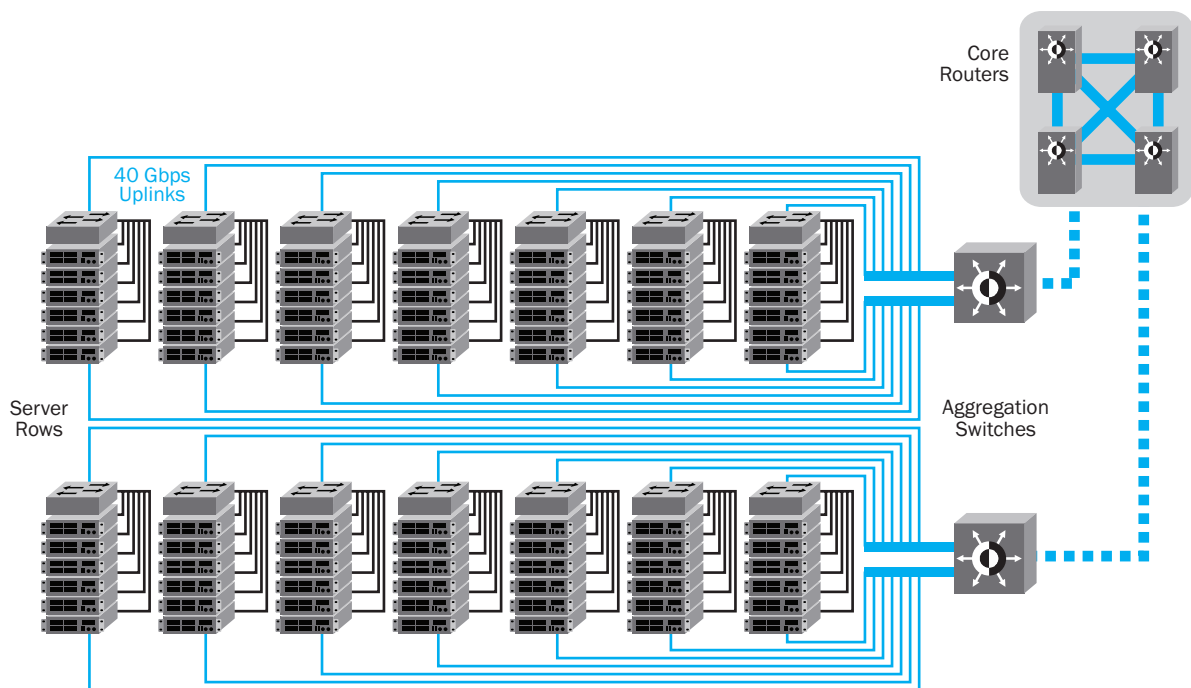
Figure 1.
The optional 4-port 10 GbE module enables end-to-end, near-non-oversubscribed GbE performance throughout the data center network.

Figure 2.
Brocade FCX 624 and 648 data center switches feature reversible front-to-back airflow, internal redundant power supplies, and a swappable fan assembly.

INCREASED SCALABILITY AND SIMPLIFIED MANAGEMENT

Brocade FCX 624 and 648 switches provide innovative ways to reduce management at the edge of the data center network by unifying management and simplifying scalability.

Simplified, High-Performance Stacking

The optional 10 GbE ports can unify a group of top-of-rack switches, providing a high-speed connection for server-to-server communication while significantly reducing network management. Leveraging Brocade IronStack technology, organizations can horizontally stack up to eight Brocade FCX 624 or 648 switches into a single logical switch.

This logically stacked switch has only a single IP address to manage. When new members join the stack, they automatically inherit the stack's configuration file, enabling true plug-and-play network expansion. Organizations can obtain console access to the stack through any of the stack members, eliminating the need to know which member is the primary controller.

Within the stack, there is 40 Gbps of bandwidth between stack members, providing efficient, high-speed server-to-server connectivity (see Figure 3). With four optional ports of 10 GbE capabilities, organizations can use two ports for connecting to the stack and two ports for high-speed connectivity to the aggregation or core layers—providing maximum flexibility in a compact data center access switch.

Organizations can trunk 10 GbE ports from different members of the stack to optimize performance and availability. To maximize the flexibility of which switches in the data center are members of a stack, organizations can use copper Twinax cables for short-distance connectivity and use fiber-optic cables to connect switches over longer distances.

HORIZONTAL STACKING

Stacking of Ethernet switches is most commonly found in wiring closets of enterprise campus networks. Stacking functionality enables small-form-factor switches to be linked using short copper cables—and then the stack of switches appears and behaves as a single logical switch to simplify management. When a new switch joins the stack, it automatically inherits the configuration of the stack without manual setup.

Stacking switches at the edge of data center networks provides the same value as it does in campus networks. The main difference is that the switches are not physically stacked on top of each other. Instead, longer cables logically unify the switches at the top of each server rack. For example, a row of top-of-rack switches can appear as a single logical switch, significantly reducing management overhead of the data center access layer.

40 Gbps

10 GbE for Stacking

1 GbE
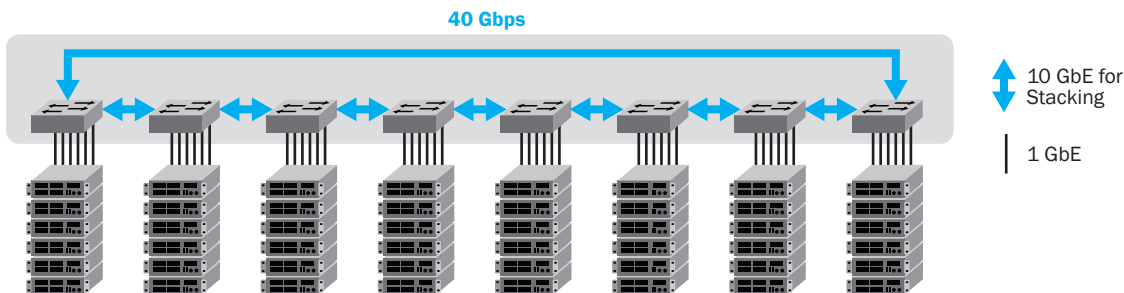
Figure 3.
Brocade FCX 624 and 648 switches at the top of server racks can be stacked into a single logical switch and then connected to the aggregation layer through the optional 4-port 10 GbE module.

REDUCED POWER CONSUMPTION

In today's rapidly growing business environments, organizations need to minimize power consumption throughout the entire IT infrastructure. Brocade FCX 624 and 648 switches are designed to reduce power usage, adhering to "green" initiatives in modern data centers.

Operating at power levels as low as 1.27 watts/Gbps, these switches consume minimal power for the performance and functionality they provide.

ADVANCED CAPABILITIES

To meet a wide range of requirements, Brocade FCX 624 and 648 switches provide full Layer 3 capabilities, along with metro features for connecting buildings and campuses.

Full Layer 3 Capabilities

Layer 3 functionality enhances the capability of the switches as a flexible data center solution. Organizations can use Layer 3 features such as IPv4 Open Shortest Path First (OSPF) and Routing Information Protocol (RIP) routing, policy-based routing, Virtual Router Redundancy Protocol (VRRP), and Dynamic Host Configuration Protocol (DHCP) Relay. In addition, organizations can remove complexity from end-to-end Layer 3 networks by utilizing Layer 3 capabilities built into every Brocade FCX switch.

For example, data-rich applications such as video distribution require scalable multicast services from end to end. The switches provide Internet Group Management Protocol (IGMP) and Protocol-Independent Multicast (PIM) snooping to improve bandwidth utilization in Layer 2 networks by restricting multicast flows to only the switch ports that have multicast receivers.

In Layer 3 networks, support for IGMP (v1, v2, and v3), IGMP Proxy, PIM-SM, PIM-SSM, and PIM-DM multicast routing optimizes network utilization and traffic routing for multicast applications. PIM

snooping and Passive Multicast Router Insertion (PMRI) can be combined, ensuring multicast distribution in Layer 2 networks. The switches use the PIM Snooping feature to acquire multicast routes, enabling them to intelligently switch multicast traffic rather than blindly broadcasting multicast traffic in the Layer 2 domain.

Advanced (-ADV) models include BGP routing capabilities, enabling remote offices to connect the Brocade FCX 624 and 648 switches to service provider networks.

Metro Features Connecting Buildings and Campuses

Because Brocade FCX 624 and 648 switches contain Metropolitan Area Network (MAN) features, organizations can use them to connect a distributed enterprise. In this type of environment, the switches provide rich services using MRP (v1 and v2) for building resilient ring-based topologies, Virtual LAN (VLAN) stacking, and advanced multicast capabilities—including IGMP v1/v2/v3 and Multicast Listener Discovery (MLD) v1/v2 snooping for controlling multicast traffic for high-bandwidth content delivery.

COMPREHENSIVE ENTERPRISE-CLASS SECURITY

Brocade FCX 624 and 648 switches utilize the Brocade IronWare® operating system, providing a rich security suite for a wide range of Layer 2 and Layer 3 services.

Threat Detection and Mitigation

The switches utilize embedded hardware-based sFlow traffic sampling to extend Brocade IronShield® 360 security to the network edge. This unique and powerful closed-loop threat mitigation solution uses best-in-class intrusion detection systems to inspect traffic samples for possible network attacks.

In response to a detected attack, Brocade IronView® Network Manager (INM) can automatically apply a security policy to the compromised port, stopping network attacks in real time without administrator intervention.

Advanced Multicast Features

The switches support a rich set of Layer 2 multicast snooping features that enable advanced multicast services delivery. IGMP snooping for IGMP version 1, 2, and 3 is supported. Support for IGMP v3 source-based multicast snooping improves bandwidth utilization and security for multicast services. To enable multicast service delivery in IPv6 networks, the switches support MLD v1/v2 snooping, the multicast protocols used in IPv6 environments.

Network Resiliency through Fault Detection

Software features such as Virtual Switch Redundancy Protocol (VSRP), Brocade Metro-Ring Protocol (MRP) v1 and v2, Rapid Spanning Tree Protocol (RSTP), protected link groups, 802.3ad Link Aggregation, and trunk groups provide alternate paths for traffic in the event of a link failure. Sub-second fault detection utilizing Link Fault Signaling (LFS) and Remote Fault Notification (RFN) helps ensure fast fault detection and recovery.

Enhanced spanning tree features such as Root Guard and Bridge Protocol Data Unit (BPDU) Guard prevent rogue hijacking of a spanning tree root and maintain a contention- and loop-free environment, especially during dynamic network deployments. In addition, the switches support port loop detection on edge ports that do not have spanning tree enabled. This capability protects the network from broadcast storms and other anomalies that can result from Layer 1 or Layer 2 loopbacks on Ethernet cables or endpoints.

Protected link groups minimize disruption to the network by protecting critical links from loss of data and power. In a protected link group, one port in the group acts as the primary or active link, and the other ports act as secondary or standby links. The active link carries the traffic and, if it goes down, one of the standby links takes over.

UniDirectional Link Detection (UDLD) monitors a link between two switches and brings down the ports on both ends of the link if the link fails at any point between the two devices.

The switches also support stability features such as port flap dampening, single-link Link Aggregation Control Protocol (LACP), and port loop detection.

SIMPLIFIED, SECURE MANAGEMENT BASED ON OPEN STANDARDS

Brocade FCX 624 and 648 switches provide simplified, standards-based management capabilities that help organizations reduce administrative time and effort while securing their networks.

Simplified Deployment with Auto-Configuration

The switches support auto-configuration, 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 complex manual configuration. When the switches power up, they automatically receive an IP address from DHCP and configuration information from an already configured Trivial File Transport Protocol (TFTP) server. At this time, the switches can also automatically receive a software update to be at the same code revision as already installed switches.

Brocade IronView Network Manager

Brocade INM provides unified management for Brocade FCX 624 and 648 switches along with the rest of the Brocade Ethernet network. It displays network- and application-level traffic information in graphical detail to greatly simplify network operations, provisioning, troubleshooting, and alarm reporting.

As a result, organizations can accurately monitor overall networking operation, identify hot spots, and quickly diagnose and troubleshoot issues before they develop into widespread network problems. In addition, Brocade INM provides multilevel access security on the console and a secure Web-based management interface that keeps out unauthorized users while providing simple and flexible administrative access.

Open Standards-Based Management

The switches include an industry-standard Command Line Interface (CLI) and support Secure Shell (SSHv2), Secure Copy (SCP), and SNMP v3 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.

Out-of-Band Management

The switches include an 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.

IDEAL FOR ETHERNET STORAGE TRAFFIC

Modern iSCSI Storage Area Network (SAN) environments require a high-performance network to reliably deliver block storage to servers. Brocade FCX 624 and 648 switches provide robust performance capabilities to handle servers that are saturating GbE links with storage traffic.

The combination of 10 GbE SFP+ ports and the IronStack technology enables organizations to expand their iSCSI storage environments with no additional management. The Brocade FCX switch stack can be connected to a full 10 GbE switch for SAN expansion with 10 Gigabit iSCSI storage. In addition, internal redundant power supplies and a swappable fan assembly provide the high-availability features required in shared storage environments.

BROCADE GLOBAL SERVICES

To help organizations get the most value from their technology investments, Brocade Global Services offers a variety of services with comprehensive hardware and 24×7 software support, including software fixes and new releases. Organizations can also utilize Brocade Professional Services to implement and validate the functionality of Brocade products. Leveraging the Brocade Network Monitoring Service (NMS), organizations can maximize the availability and performance of their critical application environments while reducing infrastructure cost and complexity.

WARRANTY

Brocade FCX switches are covered by the Brocade Assurance™ Limited Lifetime Warranty for as long as the original purchaser continues to own and use the product. The warranty covers the product hardware, including internal power supplies and internal fans, as well as software defect repairs. To streamline the product replacement process, qualified customers can directly access the Brocade Knowledge Portal to initiate advanced replacement on registered products.

MAXIMIZING INVESTMENTS

To help optimize technology investments, Brocade and its partners offer complete solutions that include education, support, and services. For more information, contact a Brocade sales partner or visit www.brocade.com.

BROCADE FCX SERIES FEATURE COMPARISON

	Data Center		Enterprise Campus Network				
	FCX 624	FCX 648	FCX 624S	FCX 648S	FCX 624S-F	FCX 624S-HPOE	FCX 648S-HPOE
Switching bandwidth (data rate, full duplex)	128 Gbps	176 Gbps	152 Gbps	200 Gbps	152 Gbps	152 Gbps	200 Gbps
Forwarding bandwidth (data rate, full duplex)	96 Mpps	132 Mpps	114 Mpps	150 Mpps	114 Mpps	114 Mpps	150 Mpps
Stacking bandwidth (data rate, full duplex)	40 Gbps	40 Gbps	64 Gbps	64 Gbps	64 Gbps	64 Gbps	64 Gbps
10/100/1000 Mbps RJ-45 ports	24	48	24	48	n/a	24	48
100/1000 Mbps SFP ports	n/a	n/a	n/a	n/a	20	n/a	n/a
1000 Mbps combo ports	4 (optional)	4 (optional)	4	4	4	4	4
10 Gigabit Ethernet XFP/CX4 ports	n/a	n/a	2 (optional)	2 (optional)	2 (optional)	2 (optional)	2 (optional)
10 Gigabit Ethernet SFP+ ports	4 (optional)	4 (optional)	n/a	n/a	n/a	n/a	n/a
16 Gbps CX4 stacking ports	n/a	n/a	2	2	2	2	2
Maximum PoE Class 3 ports	n/a	n/a	n/a	n/a	n/a	24	48
Maximum PoE+ ports	n/a	n/a	n/a	n/a	n/a	24	26
Power supplies	2 removable (second optional)	2 removable (second optional)	2 removable (second optional)	2 removable (second optional)	2 removable (second optional)	2 removable (second optional)	2 removable (second optional)
Optional FRUs							
1000 Mbps combo module	FCX-4G	FCX-4G	n/a	n/a	n/a	n/a	n/a
10 Gigabit Ethernet module	FCX-4XG	FCX-4XG	FCX-2XG	FCX-2XG	FCX-2XG	FCX-2XG	FCX-2XG
Second power supply	RPS13/RPS13-I	RPS13/RPS13-I	RPS13	RPS13	RPS13	RPS14	RPS14
Replacement fan unit	FCX-FAN-E/FCX-FAN-I	FCX-FAN-E/FCX-FAN-I	FCX-S-FAN	FCX-S-FAN	FCX-S--FAN	FCX-S-POE-FAN	FCX-S-POE-FAN

BROCADE FCX 624 AND 648 SWITCH SPECIFICATIONS

System architecture	
Connector options	10/100/1000 ports: RJ-45 (fixed)
	1 Gbps SFP combo ports: SX, LX, LHA, LHB, 1000Base-BX, CWDM
	10 Gbps SFP+ ports: Direct-Attached Copper (Twinax), SR, LR
	Out-of-band Ethernet management: RJ-45 (fixed)
	Console management: DB9
Maximum MAC addresses	32,000
Maximum VLANs	4096
Maximum STP (spanning trees)	255
Maximum routes (in hardware)	16,000
Trunking	Maximum ports per trunk: 8
	Maximum trunk groups: 32

Maximum Jumbo Frame size	9000 bytes
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 Spanning Tree
	• 802.1x Port-based Network Access Control
	• 802.3 10 Base-T
	• 802.3ab 1000 Base-T
	• 802.3ad Link Aggregation (dynamic and static)
	• 802.3ae 10 Gigabit Ethernet
	• 802.3u 100 Base-TX
	• 802.3x Flow Control
	• 802.3z 1000Base-SX/LX
	• 802.3 MAU MIB (RFC 2239)

Layer 2 switching	• 802.1s Multiple Spanning Tree • 802.1x Authentication • Auto MDI/MDIX • BPDU Guard, Root Guard • Dual-Mode VLANs • Dynamic VLAN Assignment • Dynamic Voice VLAN Assignment • Fast Port Span • Flexible Static Multicast MAC Address Configuration • GARP VLAN Registration Protocol • IGMP Snooping (v1/v2/v3) • Link Fault Signaling (LFS) • MAC Address Locking • MAC-Layer Filtering • MAC Learning Disable; Port Security • MLD Snooping (v1/v2) • Multi-device Authentication • Per VLAN Spanning Tree (PVST/PVST+/PVRST) • PIM–SM Snooping • Policy-controlled MAC-based VLANs • Port-based Access Control Lists • Port-based, ACL-based, MAC Filter-based, and VLAN-based Mirroring • Port Loop Detection • Port Speed Downshift and Selective Auto-negotiation • Private VLAN • Private VLANs and Uplink Switch • Protected Link Groups • Protocol VLAN (802.1v), Subnet VLAN • Remote Fault Notification (RFN) • Single-instance Spanning Tree • Single-link LACP • Trunk Groups • Trunk Threshold • UniDirectional Link Detection (UDLD)
Layer 3 routing	• ECMP • Host routes • IPv4 static routes • Layer 3/Layer 4 ACLs RIP v1/v2 announce • OSPF v2 • PIM-SM, PIM-SSM, PIM-DM • RIP v1/v2 • Routed interfaces • Route-only support • Routing between directly connected subnets • Virtual interfaces • Virtual Route Redundancy Protocol (VRRP)
Advanced functionality (included with –ADV models)	• BGP
Metro features	• Metro-Ring Protocol (v1, v2) • Virtual Switch Redundancy Protocol (VSRP) • VLAN Stacking (Q-in-Q) • VRRP

| Quality of service | • ACL Mapping and Marking of ToS/DSCP
• ACL Mapping to Priority Queue
• ACL Mapping to ToS/DSCP
• Adaptive Rate Limiting
• Classifying and limiting flows based on TCP flags
• DHCP Option 82
• DHCP Relay
• DiffServ Support
• Honoring DSCP and 802.1p
• MAC Address Mapping to Priority Queue
• QoS Queue Management using Weighted Round Robin (WRR), Strict Priority (SP), and a combination of WRR and SP |
| 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 |

Management

| Management and control | • Auto-configuration
• Configuration logging
• Digital optical monitoring
• Display log messages on multiple terminals
• Embedded Web management
• Foundry Discovery Protocol (FDP)
• Industry-standard Command Line Interface (CLI)
• Integration with HP OpenView for Sun Solaris, HP-UX, IBM AIX, and Windows
• IronView Network Manager (INM) Version 3.3 or later
• MIB Support for MRP, Port Security, MAC Authentication, and MAC-based VLANs
• Out-of-band Ethernet management
• RFC 783 TFTP
• RFC 854 TELNET Client and Server
• RFC 1157 SNMPv1/v2c
• RFC 1213 MIB-II
• RFC 1493 Bridge MIB
• RFC 1516 Repeater MIB
• RFC 1573 SNMP MIB II
• RFC 1643 Ethernet Interface MIB
• RFC 1643 Ethernet MIB
• RFC 1724 RIP v1/v2 MIB
• RFC 1757 RMON MIB
• RFC 2068 Embedded HTTP
• RFC 2131 DHCP Relay
• RFC 2570 SNMPv3 Intro to Framework
• RFC 2571 Architecture for Describing SNMP Framework
• RFC 2572 SNMP Message Processing and Dispatching
• RFC 2573 SNMPv3 Applications
• RFC 2574 SNMPv3 User-based Security Model
• RFC 2575 SNMP View-based Access Control Model SNMP
• RFC 2818 Embedded HTTPS
• RFC 3176 sFlow
• SNTP Simple Network Time Protocol
• Support for multiple Syslog servers |
| Embedded security | • 802.1x accounting
• 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 |

Secure management	• Authentication, Authorization, and Accounting (AAA) • Advanced Encryption Standard (AES) with SSHv2, SNMPv3 • RADIUS/TACACS/TACACS+ • Secure Copy (SCP) • Secure Shell (SSHv2) • Username/password • Web authentication

Mechanical

Enclosure	Front-to-back airflow (reversible); 1U, 19-inch EIA-compliant, power from non-port side
Size	Width: 44.0 cm (17.3 in) Height: 4.4 cm (1.7 in) Depth: 43.5 cm (17.2 in)

Environmental

Temperature	Operating temperature: 32° to 104°F (0° to 40°C) Storage temperature: −23° to 158°F (−25° to 70°C)
Humidity	Relative humidity: 5% to 95%, non-condensing
Altitude	Storage altitude: 10,000 ft (3000 m) maximum
Acoustic	51 to 63 dB

Power

Power supplies	Up to two internal, redundant, field-replaceable, load-sharing AC power supplies
Power inlet	C13
Input voltage	Typical 100 to 240 VAC
Input line frequency	50 to 60 Hz

Certification

Electromagnetic emissions	FCC Class A (Part 15); EN 55022/CISPR-22 Class A; VCCI Class A
Environmental regulatory compliance	RoHS-compliant (6 of 6); WEEE-compliant

BROCADE FCX 624 AND 648 SWITCH POWER AND THERMAL SPECIFICATIONS

	Max Current at 100 VAC (Amps)	Max Current at 200 VAC (Amps)	Max System Power Draw (Watts)	Max Thermal Output (BTU/Hr)	Energy Efficiency (Watts/Gbps)[2]
FCX 624[1]	0.9	0.6	92.0	312.8	1.4
FCX 648[1]	1.2	0.7	112.0	421.6	1.3

[1] With 4-port 10 GbE module installed and one power supply

[2] Calculated using switch data rate

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