BROCADE ICX 6650 SWITCH

DATA CENTER

High-Density 10 GbE Fixed Switch for Campus Aggregation and Top-of-Rack Deployment

HIGHLIGHTS

- Provides a 10/40 Gigabit Ethernet (GbE) switch for the aggregation and small core in campus environments and for Top of Rack (ToR) deployments in high-performance data centers

- Delivers industry-leading 10 GbE density in a 1RU fixed switch form factor, saving valuable rack space

- Offers flexible Ports on Demand (PoD) licensing for seamless scalability

- Provides a low-latency, cut-through, non-blocking architecture—ideal for the campus aggregation and small core, as well as data center HPC, high-frequency trading, iSCSI storage, and real-time application environments

- Delivers superior value by incorporating enterprise-grade advanced features such as VRRPe, BGP, robust IPv6 support, and Multi-Chassis Trunking (MCT) at no cost

- Provides highly efficient AC or DC power and cooling with front-to-back or back-to-front airflow and automatic fan-speed adjustment

Today's campus environments are migrating to 10/40 Gigabit Ethernet (GbE) as enterprises rapidly adopt applications such as high definition video for collaboration, and BYOD (Bring Your Own Device) which drive the need for resilient, high bandwidth enterprise access networks. To meet these challenges, today's campus network solutions must provide a broad set of capabilities—including higher levels of performance, reliability, security, Quality of Service (QoS), and Total Cost of Ownership (TCO).The advanced Layer 3 functionality on the Brocade® ICX® 6650 Switch has a rich campus feature set making it the lead campus aggregation and small core switch offering in Brocade ICX family of Ethernet switches for campus LAN environments. In addition to a rich Layer 3 feature set, the Brocade ICX 6650 also supports Multi-Chassis Trunking (MCT) and is an integral part of the Brocade HyperEdge™ Architecture for Campus LAN.

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 6650 Switch is a 1RU high-performance, high-availability, and high-density 10/40 GbE solution that meets the needs of business-sensitive campus deployments and High-Performance Computing (HPC) environments. With industry-leading price/performance and a low-latency, cut-through, non-blocking architecture, the Brocade ICX 6650 provides a cost-effective, robust solution for the most demanding deployments.

BROCADE

LEADING-EDGE FLEXIBILITY AND RELIABILITY

The Brocade ICX 6650 provides a highly flexible 10/40 GbE aggregation solution that offers the highest levels of reliability. It features 1/10 GbE for access and server connectivity and 10/40 GbE for uplink connectivity, along with Ports on Demand (PoD) licensing that allows organizations to buy only the port density they need now and expand later through software enablement, without requiring an entire hardware replacement in the future. In addition, the Brocade ICX 6650 supports redundant, hot-swappable AC or DC power supplies and fans, reversible airflow, and advanced software.

Flexible Campus and Data Center Deployment with Future-Proofing

The Brocade ICX 6650 is a high-density 10 GbE solution for direct access or server connectivity in campus or data center environments. Each of the 56 front Small Form-Factor Pluggable (SFP+) ports can function as dual-speed 1/10 GbE ports.

The Brocade ICX 6650 also provides six Quad Small Form-Factor Pluggable (QSFP+) ports in the back, including two 4×10 GbE breakout ports and four high-speed 40 GbE ports for uplink network connectivity, making it a flexible solution for environments of any size.

By enabling 1/10 GbE and 40 GbE ports in a 1RU space, the Brocade ICX 6650 gives organizations the high density they need to design highly flexible networks while conserving valuable rack space. In addition, they can utilize multiple combinations of short-range and long-range transceivers for a variety of connectivity options.

Increased Reliability through Redundancy and Intelligence

The Brocade ICX 6650 supports 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 1).

The hot-swappable power supplies and fan assembly 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 6650 switches 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.

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 6650 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 (0.1 watts) cabling within and between the racks, the Brocade ICX 6650 supports SFP+ Direct Attach Copper (Twinax) cables at up to five meters. For switch-to-switch connectivity, the Brocade ICX 6650 supports low-power-consuming SFP+ and 40GBASE-SR4 QSFP+ optical transceivers. In high-port-density deployments, these features save significant operating costs.

SUPERIOR ROI AND INVESTMENT PROTECTION

The Brocade ICX 6650 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) eliminates the need for staff retraining. As a result, the Brocade ICX 6650 enables organizations to better leverage their current training, tools, devices, and processes.

Brocade enables organizations to further maximize their investments by not requiring additional licensing fees for advanced Layer 3 features, including IPv6 routing.

SIMPLIFIED, STANDARDS-BASED MANAGEMENT

Deploying more switches in campus and data center infrastructures can increase overall network performance, but it also can prevent organizations from gaining a complete view of network capacity,

Figure 1.
The Brocade ICX 6650 features dual hot-swappable power supplies and fans.

bandwidth consumption, utilization, and overall health.

To overcome this challenge, the Brocade ICX 6650 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 ServerIron® ADX® Series application delivery switches, and Brocade MLXe core routers.

The Brocade ICX 6650 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, identify hot spots, and quickly diagnose and troubleshoot issues before they develop into widespread problems. The Brocade ICX 6650 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 6650 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 6650 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 6650 in several environments.

Data Protection through Robust Security
Security is a critical requirement in today's data centers and branch offices, and the Brocade ICX 6650 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 6650 also leverages 802.11x security, MAC authentication, port MAC security, and MAC filter enhancements.

The Brocade ICX 6650 implements hardware-based ACL, so security does not adversely affect switching performance. In addition, the Brocade ICX 6650 provides hardware-based protection against Distributed Denial of 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 6650 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 6650 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 6650 supports IGMPv1/2/3, PIM-SM/SSM/DM, MSDP, Anycast RP, and PIM Snooping for optimized multicast forwarding. In addition, the Brocade ICX 6650 provides storm-control features to contain and intelligently switch rather than broadcast multicast traffic.

KEY SOLUTION AREAS
The Brocade ICX 6650 provides a high-performance, cost-effective solution for many types of campus and data center environments, including 10 GbE aggregation of campus access switches, Top-of-Rack (ToR) server connectivity, iSCSI storage, and HPC environments.

Figure 2.
The Brocade ICX 6650 is suitable for deployment as a cost-effective campus aggregation solution, thanks to its market-leading 10 GbE density, high availability, and Layer 2 and Layer 3 features.
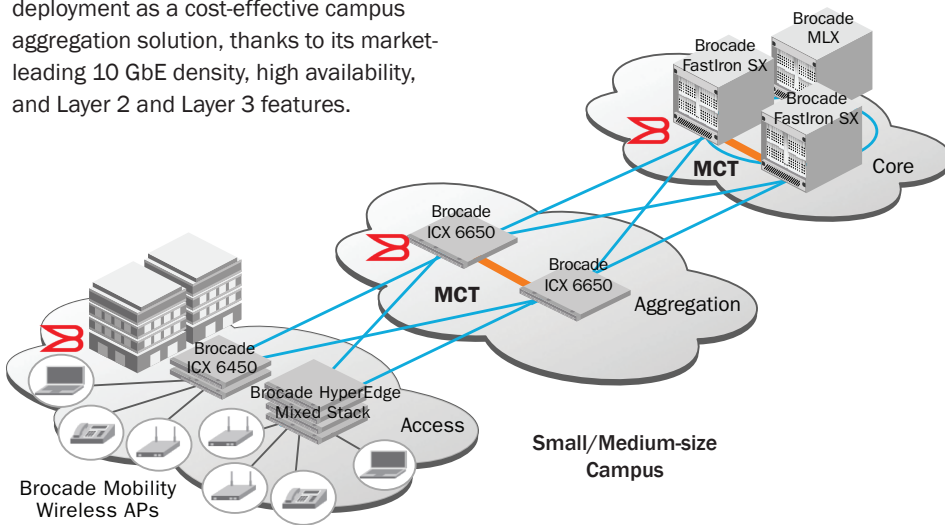

Figure 3.
The Brocade ICX 6650 provides data center ToR access while the Brocade MLXe routers provide an aggregation solution.
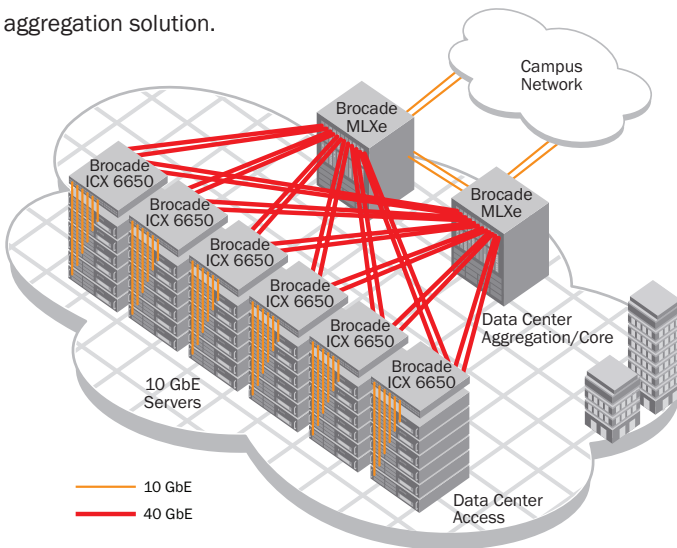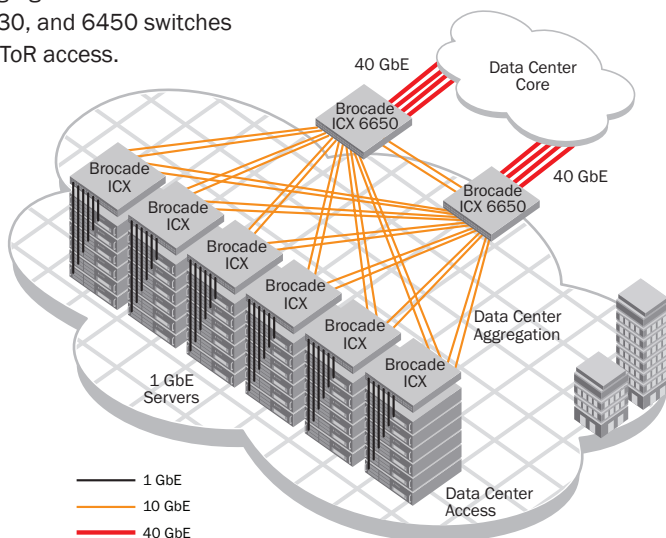

Figure 4.
The Brocade ICX 6650 provides data center aggregation with Brocade ICX 6610, 6430, and 6450 switches providing ToR access.

Campus Aggregation for Mid-size Enterprise Network

The Brocade ICX 6650 provides the necessary advanced Layer 2 and Layer 3 features and high-availability capabilities to be deployed as a campus aggregation solution. Small- to mid-sized campus environments typically do not require more than 128×10 GbE ports at the aggregation level. In such a case, a pair of Brocade ICX 6650 interconnected with 40 GbE links and running Multi-Chassis Trunking (MCT) make a cost-effective, highly available campus aggregation solution (see Figure 2).

Data Center ToR Server Connectivity

The Brocade ICX 6650 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 6650 10 GbE ports by using fiber and SFP+ optical transceivers or SFP+ Direct Attach Copper cable (see Figure 2).

If any servers in the rack have only 1 GbE-capable NICs, organizations can connect them to the same Brocade ICX 6650 switch by using a 10 GbE port as a 1 GbE port through an SFP. The Brocade ICX 6650 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.

Cost-Effective 10 GbE Data Center Aggregation

In data center environments where most servers are 1 GbE-capable, the Brocade ICX 6650 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 4).

High-Performance Cluster Computing Connectivity

HPC cluster connectivity has entered the mainstream marketplace with classic Ethernet switching as the technology of choice. Low-latency, high-density Ethernet switching is required for successful deployment, making the Brocade ICX 6650 ideal for this type of environment.

The Brocade ICX 6650 is designed to meet the high-performance, density, and reliability requirements of the most demanding HPC environments. In environments where high-speed cluster interconnectivity is required over distance, organizations can

use Brocade Metro Ring Protocol (MRP)-supporting devices (such as the Brocade FastIron, Brocade NetIron®, and Brocade BigIron® offerings) in conjunction with the Brocade ICX 6650 to provide dual-ring, fault-tolerant connectivity (see Figure 5).

Collapsed Aggregation and Core Deployment for Enterprise Networks

The aggregation and core layers may be collapsed in some environments due to a smaller number of connections from the access/edge layer. In this case, the need for a cost-effective, high-density 10 GbE platform becomes imperative. The Brocade ICX 6650 provides the necessary advanced Layer 2 and Layer 3 features to be deployed in such networks (see Figure 6).

Cost-Effective Co-Located Financial Services

Brokerage firms, trading partners, and financial service providers use co-located data centers as a way to connect and exchange data. The Brocade ICX 6650 acts as a border gateway for these data centers to efficiently and cost-effectively exchange BGP routes between virtual sites using 1/10 GbE connectivity (see Figure 7).

WARRANTY

The Brocade ICX 6650 Switch is covered by the Brocade Standard Limited Warranty. For details, visit www.brocade.com/warranty.

BROCADE GLOBAL SERVICES

Brocade Global Services has the expertise to help organizations build scalable, efficient cloud infrastructures. Leveraging 15 years of expertise in storage, networking, and virtualization, Brocade Global Services delivers world-class professional services, technical support, network monitoring services, and education, enabling organizations to maximize their Brocade investments, accelerate new technology deployments, and optimize the performance of networking infrastructures.

AFFORDABLE ACQUISITION OPTIONS

Brocade Capital Solutions helps organizations easily address their IT requirements by offering flexible network acquisition and support alternatives. Organizations can select from purchase, lease, Brocade Network Subscription, and Brocade Subscription Plus options to align network acquisition with their unique capital requirements and risk profiles. To learn more, visit www.Brocade.com/CapitalSolutions.
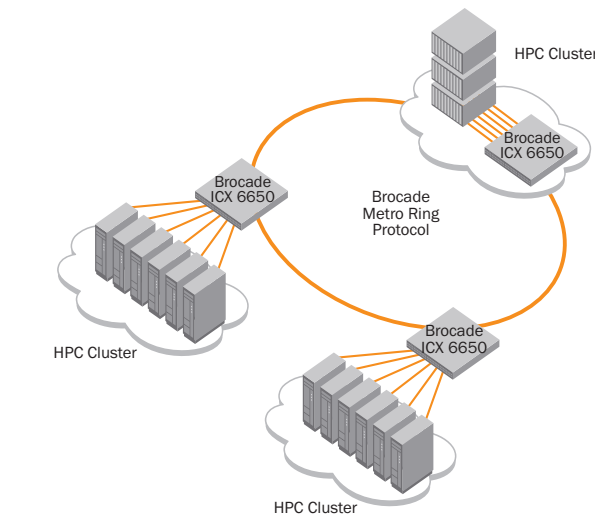

Figure 5.
The Brocade ICX 6650 provides HPC cluster interconnectivity based on Brocade MRP.
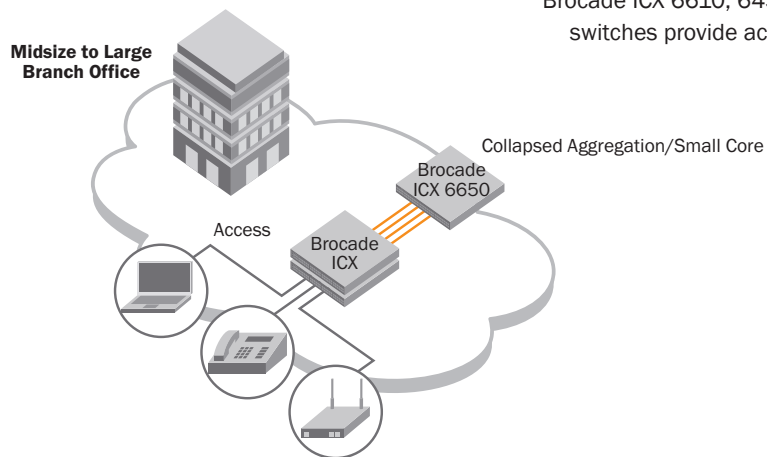

Figure 6.
The Brocade ICX 6650 provides a collapsed aggregation and core layer for enterprise networks, while the Brocade ICX 6610, 6430, and 6450 switches provide access to users.
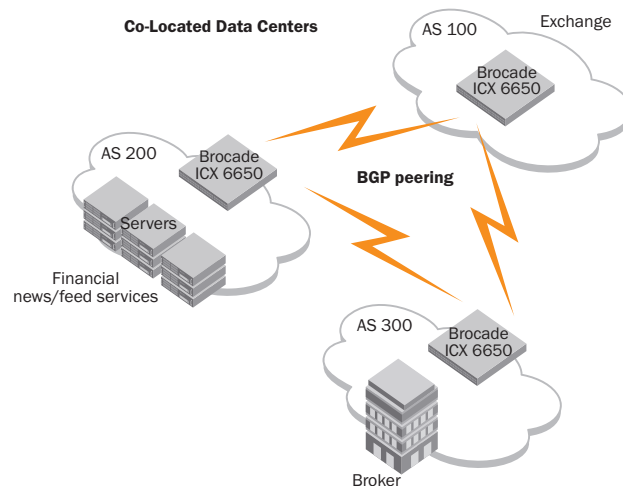

Figure 7.
The Brocade ICX 6650 acts as a border gateway to efficiently and cost-effectively exchange BGP routes between sites using 1/10 GbE connectivity.

MAXIMIZING INVESTMENTS

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

BROCADE ICX 6650 SPECIFICATIONS

System Architecture

Ports	56-port 10GBASE-X SFP+ (dual-speed 1/10 GbE) 2-port 4×10GBASE-X QSFP+ (10 GbE) 4-port 40GBASE-X QSFP+ (40 GbE)
Performance	8 MB packet buffer 1,600 Gbps line-speed full-duplex throughput 1,190 Mpps forwarding capacity 1,100 to 1800 nanosecond latency
Scalability	VLANs: 4,096 MAC addresses: 64,000 ACLs: 2000 (ingress/egress) QoS queues per port: 8 Link aggregation: 8 links per group, 127 groups per switch STP: 16 RSTP: 254 IPv4 routes: 8,000 IPv6 routes: 2,000 ARP entries: 64,000 Max ECMP: 8 IGMP groups: 4,000
Maximum frame size	10,220 byte Ethernet frame
Data traffic types	Unicast, multicast, and broadcast IP traffic
Media types	1000BASE-TX SFP, RJ45 (Cat5, 6, Cat6a/7) 1000BASE-SX SFP 1000BASE-LX SFP SFP+ Direct Attach Copper cable, 10 GbE (1/3/5 m Twinax) 10G SFPP-ER 10GBASE-ER SFP+ optic (LC), for up to 40km over SMF 10GBASE-USR SFP+ (MMF Ultra-Short Reach) 10GBASE-SR SFP+ (MMF Short Reach) 10GBASE-LR SFP+ (SMF 10 km reach) 40GBASE-SR4 QSFP+ (MTP 1×8 or 1×12), MMF 100 m 40GBASE-SR4 QSFP+ (MTP 1×8 or 1×12), MMF 100 m (10GBASE-SR compatible, breakout) QSFP+ to 4 SFP+ Direct Attach Copper breakout cable (1/3/5 m) 40G-QSFP-LR4 40GBase-LR4 QSFP+ optic (LC), for up to 10km over SMF, 1-pack 40G-QSFP-QSFP-C-0101 40GE Direct Attached QSFP+ to QSFP+ Active Copper cable, 1m, 1-pack 40G-QSFP-QSFP-C-0301 40GE Direct Attached QSFP+ to QSFP+ Active Copper cable, 3m, 1-pack 40G-QSFP-QSFP-C-0501 40GE Direct Attached QSFP+ to QSFP+ Active Copper cable, 5m, 1-pack
Licensing options	Ports on Demand (PoD) licenses for up to 24 additional SFP+ ports (1/10 GbE) in increments of 8, and up to 6 additional QSFP+ ports (4×10 GbE or 40 GbE) in increments of 2.

Management

Supported management software	SSHv2, SNMPv1/v2/v3, Telnet; Brocade Network Advisor; RADIUS
Management access	One 10/100/1,000 Mbps (RJ-45) port and one mini-USB serial console port
Diagnostics	POST and embedded online/offline diagnostics

Mechanical

Enclosure	Reversible airflow; 1U; 16.88 in. EIA-compliant; power from non-port side
Size	Width: 429.0 mm (16.88 in.) Height: 44 mm (1.732 in.) Depth: 406.4 mm (16.00 in.)
System weight	8.41 kg (18.5 lb) with two power supplies, two fans, without transceivers

Environmental

Temperature	Operating: 0°C to 40°C (32°F to 104°F) Non-operating: −25°C to 70°C (−23°F to 158°F)
Humidity	Operating: 5% to 95% non-condensing Non-operating: 5% to 80% non-condensing
Operating noise	46.7 dB
Altitude	Operating: Up to 9,842 feet above sea level (3,000 m) Storage: Up to 39,370 feet above sea level (12,000 m)
Airflow	Maximum: 53 CFM Nominal (65% speed): 35 CFM
Heat dissipation	478 BTU/hour

Power

Power	Maximum power output (AC): 250 W per power supply Maximum power output (DC): 512 W per power supply Maximum power consumption: 230 W
Input voltage	AC: 100 to 240 VAC nominal DC: 40 to 60 VDC nominal
Input line frequency	50 to 60 Hz

Regulatory Compliance

Safety	CAN/CSA-C22.2 NO. 60950-1-07; UL 60950-1 2nd Edition; IEC 60950-1 2nd 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
Electromagnetic emission certification	CC 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)
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

RFC Compliance and Features

Layer 1	IEEE 802.3ad Link Aggregation IEEE 802.3x Flow Control IEEE 802.3 10BASE-T IEEE 802.3u 100BASE-TX IEEE 802.3z 1000BASE-SX/LX IEEE 802.3ab 1000BASE-T 802.3 CSMA/CD Access Method and Physical Layer Specifications 802.3ae 10 Gigabit Ethernet 802.3ba 40 Gigabit Ethernet Jumbo Frame

Layer 2	IEEE 802.1D MAC Bridging/STP IEEE 802.1p Mapping to Priority Queue IEEE 802.1Q VLAN Tagging IEEE 802.1w Rapid Spanning Tree Protocol (RSTP) IEEE 802.1s Multiple Spanning Tree Protocol (MSTP) IEEE 802.1x Port Based Network Access Control IEEE 802.1AB LLDP 802.1AX Link Aggregation Private VLAN STP Port Fast STP Root Guard 802.1ad Q-in-Q MCT (Brocade Multi-Chassis Trunking) MRP-I, MRP-II (Brocade Metro Ring Protocol) Topology and VLAN Groups	IP protocols (continued)	RFC 2385 TCP MD5 Authentication of BGP Session RFC 2439 Route Flap Dampening RFC 2796 Route Reflection RFC 2842 BGP4 Capabilities Advertisement RFC 2918 Route Refresh Capability **ECMP** IPv6 Host Support **IPv6** RFC 2080 RIPng RFC 2460 IPv6 RFC 2526 Reserved IPv6 Subnet Anycast Address RFC 2464/6085 IPv6 over Ethernet RFC 4291 IPv6 Addressing Architecture RFC 2710/3810 MLD v1/v2 for IPv6 RFC 5340 OSPF for IPv6 (OSPFv3) RFC 5798 VRRP v3 for IPv4 and IPv6
Security	Access Control Lists (ACLs) ACL for RP Candidate AES Encryption for SSHv2, SNMPv3 Port Mirroring sFlow Authentication, Authorization, and Accounting (AAA) Username/Password (Challenge and Response) Bi-Level Access Mode (Standard and EXEC Level) Secure Copy (SCP) Secure Shell (SSHv2) RFC 2865 RADIUS TACACS/TACACS+ MAC Filter and Authentication Port MAC Security 802.1X Accounting	Quality of Service (QoS)	Rate Limiting Traffic Shaping MAC Address Mapping to Priority Queue ACL Mapping to Priority Queue ACL Mapping to ToS/DSCP ACL Mapping and Marking of ToS/DSCP QoS Queue Management using Weighted Round Robin (WRR), Strict Priority (SP), and a combination of WRR and SP RFC 2475 An Architecture for Differentiated Services RFC 3246 An Expedited Forwarding PHB RFC 2597 Assured Forwarding PHB Group RFC 2698 A Two-Rate, Three-Color Marker
IP protocols	RFC 768 UDP RFC 783 TFTP RFC 791 IP RFC 792 ICMP RFC 793 TCP RFC 826 ARP RFC 894 IP over Ethernet RFC 903 RARP RFC 906 TFTP Bootstrap RFC 951 BootP RFC 1027 Proxy ARP RFC 1112 Host Extensions for IP Multicasting RFC 1519 CIDR RFC 1541 and 2131 DHCP RFC 1591 DNS (client) RFC 1812 Requirements for IPv4 Routers RFC 3768 VRRP VRRP-E (Enhanced VRRP) Brocade Virtual Switch Routing Protocol (VSRP) VRF (IPv4 and IPv6) **RIP** RFC 1058 RIP v1 RFC 1723 RIP v2 OSPF RFC 2328 OSPF v2 RFC 3101 OSPF NSSA RFC 1745 OSPF Interactions RFC 1765 OSPF Database Overflow RFC 1850 OSPF v2 MIB RFC 2154 MD5 – Support RFC 3137 Stub Router Advertisement RFC 4222 Pri Treatment and Congestion Avoidance **BGP** RFC 1269 BGP-3 MIB RFC 1657 BGP-4 MIB RFC 1745 OSPF Interactions RFC 1771 BGP-4 RFC 1965 BGP-4 Confederations RFC 1997 Communities Attribute	Multicast	RFC 1112 IGMP RFC 2236 IGMPv2 RFC 3376 IGMPv3 IGMP Proxy RFC 1112 Host Extensions RFC 3973 PIM-DM RFC 2362 PIM-SM/SSM RFC 3618 MSDP RFC 4610 Anycast-RP using PIM
		Management	Industry-standard Command Line Interface (CLI) Configuration logging LLDP Brocade Network Advisor Integration with HP OpenView for Sun Solaris, HP-UX, IBM AIX, and Windows NT IEEE 802.3 MAU MIB (RFC 2239) RFC 2571 Architecture for Describing SNMP Framework RFC 951 BootP RFC 1542 BootP Extensions PXE-boot over LAG/MCT RFC 2131 DHCP RFC 854 Telnet Client and Server RFC 2865 RADIUS RFC 1493 Bridge MIB RFC 1643 Ethernet-like Interface MIB RFC 3176 sFlow RFC 1213 MIB-II RFC 1516 Repeater MIB RFC 1354 IP Forwarding Table MIB RFC 1757 RMON MIB RFC 2572 SNMP Message Processing and Dispatching RFC 1573 SNMP MIB II RFC 1157 SNMPv1/v2c RFC 3411 SNMPv3 Framework RFC 3412 SNMPv3 Processing RFC 3414 SNMPv3 USM RFC 2030 SNTP

BROCADE ICX 6650 ORDERING INFORMATION

Part Number	Description
ICX6650-32-ADV	Brocade ICX 6650 with 32 10 GbE SFP+ ports enabled. No power supplies or fan units (need to be ordered separately). Advanced S/W. Optional POD licenses to enable up to 56 10 GbE ports and 6 QSFP+ ports can be ordered separately. No optics.
ICX6650-32-E-ADV	Brocade ICX 6650 with 32 10 GbE SFP+ ports enabled. Includes two 250 W AC power supplies and two fan units, power-supply-side exhaust (port-side intake) airflow. Advanced software. No optics.
ICX6650-48-E-ADV	Brocade ICX 6650 with 48 10 GbE SFP+ ports enabled. Includes two 250 W AC power supplies and two fan units, power-supply-side exhaust (port-side intake) airflow. Advanced S/W. No optics.
ICX6650-56-E-ADV	Brocade ICX 6650 with 56 10 GbE SFP+ ports enabled. Includes two 250 W AC power supplies and two fan units, power-supply-side exhaust (port-side intake) airflow. Advanced S/W. No optics.
ICX6650-8P10G-LIC-POD	Ports-on-Demand license for all Brocade ICX 6650 models, for 8×10 GbE SFP+ ports
ICX6650-2P40G-LIC-POD	Ports-on-Demand license for all Brocade ICX 6650 models, for two QSFP+ (40 GbE or 4×10 GbE) ports
RPS15-E	250 W AC Power supply; power-supply-side exhaust (port-side intake) airflow
RPS15-I	250 W AC Power supply; power-supply-side intake (port-side exhaust) airflow
RPS16DC-E	510W DC Power supply; power-supply-side exhaust (port-side intake) airflow
RPS16DC-I	510W DC Power supply; power-supply-side intake (port-side exhaust) airflow
XICX6650-FAN-E	Fan unit; power-supply-side exhaust (port-side intake) airflow
XICX6650-FAN-I	Fan unit; power-supply-side intake (port-side exhaust) airflow
10G-SFPP-TWX-0101	SFP+ Direct Attach Copper cable, 1 m
10G-SFPP-TWX-0301	SFP+ Direct Attach Copper cable, 3 m
10G-SFPP-TWX-0501	SFP+ Direct Attach Copper cable, 5 m
10G-SFPP-USR	10GBASE USR SFP+ optical transceiver, 100 m over MMF LC, 1-pack
10G-SFPP-SR	10GBASE-SR SFP+ optical transceiver, MMF LC
10G-SFPP-LR	10GBASE-LR SFP+ optical transceiver, SMF LC
10G SFPP-ER	10GBASE-ER SFP+ optic (LC), for up to 40km over SMF
E1MG-TX	1000BASE-T SFP copper transceiver, 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
40G-QSFP-LR4	40GBase-LR4 QSFP+ optic (LC), for up to 10km 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-SR4-INT	40GBase-SR4 QSFP+ optic (MTP 1×8 or 1×12), 100 m over MMF (10GBASE-SR compatible, 4×10 GbE breakout), 1-pack
40G-QSFP-4SFP-C-0101	QSFP+ to 4 SFP+ (4×10 GbE) Direct Attach Copper breakout cable, 1 m, 1-pack
40G-QSFP-4SFP-C-0301	QSFP+ to 4 SFP+ (4×10 GbE) Direct Attach Copper breakout cable, 3 m, 1-pack
40G-QSFP-4SFP-C-0501	QSFP+ to 4 SFP+ (4×10 GbE) Direct Attach Copper breakout cable, 5 m, 1-pack
40G-QSFP-QSFP-C-0101	40GE Direct Attached QSFP+ to QSFP+ Active Copper cable, 1m, 1-pack
40G-QSFP-QSFP-C-0301	40GE Direct Attached QSFP+ to QSFP+ Active Copper cable, 3m, 1-pack
40G-QSFP-QSFP-C-0501	40GE Direct Attached QSFP+ to QSFP+ Active Copper cable, 5m, 1-pack

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