

# BROCADE BIGIRON RX SERIES



## DATA CENTER

## Modular Layer 2/3 Ethernet Switches

### HIGHLIGHTS

- Interchangeable half-height line modules reduce sparring costs and provide cost-effective modular growth
- Compact chassis design supports high density—up to 256 10 GbE, 768 wire-speed 1 GbE, and up to 512,000 IPv4 routes per module
- Near-8 Tbps switching capacity is available in Multi-Chassis Trunking (MCT)\* mode
- Scalable end-to-end QoS is supported with hardware-based honoring, marking, and congestion management
- High-availability design features redundant and hot-pluggable hardware, hitless Layer 2 upgrades and failover, MCT, and graceful BGP and OSPF restart
- Advanced non-blocking Clos fabric features adaptive self-routing with graceful system degradation in the event of module failures
- Embedded sFlow per port supports scalable hardware-based traffic monitoring
- Continuous System Monitoring (CSM) tool ensures optimal system uptime

The Brocade One™ strategy helps simplify networking infrastructures through innovative technologies and solutions. The Brocade BigIron RX Series supports this strategy by enabling high-performance networks, averting failure before it occurs, and providing seamless virtual machine mobility for mission-critical applications.

The role of data networks in our daily lives continues to expand and grow. Emerging needs such as application convergence, non-stop operation, scalability, and IPv6-readiness place new demands on the network. Modern network solutions must be assessed across a wider set of attributes than earlier generations of equipment. In particular, the network must be evaluated on merits that include performance, reliability, scalability, Quality of Service (QoS), security, and Total Cost of Ownership (TCO).

The Brocade® BigIron® RX Series of Layer 2/3 Ethernet switches excels in all of these areas, enabling network designers to deploy an Ethernet infrastructure that addresses today's requirements with a scalable architecture designed to support network growth and evolution. The BigIron RX Series incorporates the latest advances in switch architecture, system resilience, QoS, and switch security in a family of modular chassis, setting industry-leading benchmarks for price/performance, scalability, and TCO.

Available in three chassis models, the BigIron RX Series allows network designers to standardize on a single product family for aggregation and backbone switching. In addition to its enterprise role, the BigIron RX Series, with its high-density and compact design, is an ideal IP solution for high-performance computing environments and Internet Exchanges and Internet

Service Providers (IXPs and ISPs), where non-blocking, high-density Ethernet switches are needed.

All three BigIron RX systems are designed for non-stop operation, supporting 1:1 management module redundancy, N+1 switch module redundancy, M+N power module redundancy, and N+1 fan redundancy. Additionally, the BigIron RX Series supports hitless Layer 2 software upgrades and graceful restart routing for fast convergence in the event of a management module failure.

At the heart of the BigIron RX architecture is an adaptive self-routing Clos switch fabric with a Virtual Output Queue (VOQ) design. This non-blocking architecture is optimized



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\*Multi-Chassis Trunking (MCT) available for purchase the first half of 2012.

for maximum throughput and low latency for all size packets. Scalable to over one billion packets per second, the BigIron RX Series is the most powerful Ethernet switch in its class. This advanced and scalable design ensures the reliable delivery of all IP-based voice, video, and data applications.

The BigIron RX Series switches ship with field-proven Brocade IronWare networking software and Brocade IronShield security, embedded sFlow per port, advanced Ethernet switching, IPv4/IPv6 routing, and multilayer security services. The BigIron RX Series enables a user to deploy a reliable, secure, and scalable networking solution today that is ready to accommodate tomorrow's applications and technologies.

## PURPOSE-BUILT FEATURE SET FOR DEMANDING NETWORKS

### Industry-Leading Performance and Scalability

The BigIron RX Series delivers up to 1.6 Tbps data throughput per system.

### High-Availability Design

Redundant and resilient design ensures high-availability operation for demanding environments:

- **Redundant, Hot-Swappable Components:** Provide non-stop service delivery:
  - **Management Module:** Systems configured with dual management modules with sub-second detection and failover.
  - **Switch Fabric Element Redundancy:** Systems configured with a redundant switch fabric module support millisecond failover performance.

- **Hitless Management Failover (HMF):** Stateful failover ensures that the forwarding engines on the line modules are not impacted by a management failover. This capability enables non-stop packet forwarding in the event of a management module failover.
- **Redundant Power Supplies:** All three chassis support M+N power module redundancy for AC and DC power configurations.
- **Distributed Forwarding Architecture:** Advanced network processors, high-performance CPU, and high-speed memory on each interface module provide for a scalable, high-performance architecture.
- **IEEE 802.3ad Link Aggregation up to Eight Links:** Scalable, cross-module trunking provides for resilient high-capacity connections between switches.
- **Resilient Layer 2 and Layer 3 Protocols:** Provide fast service restoration in the event of link or equipment failures:
  - **Metro Ring Protocol (MRP):** Optimized for ring topologies, IEEE 802.1s and 802.1w for general Layer 2 topologies, VSRP for redundant switch configurations and VRRP/VRRP-E for redundant router configurations, ECMP for routed backbones.
  - **Multi-Chassis Trunking (MCT):** Allows two BigIron RX chassis to appear as one, so aggregated links can forward traffic to either chassis, resulting in higher network utilization and sub-second failover in case of a link or node failure.

### Virtual Machine Mobility

Seamless vMotion support across server racks and port speeds ensures no disruption or downtime to application availability. ARP is immediately updated in the system upon receiving a gratuitous ARP request from vSwitch when the virtual machine moves.

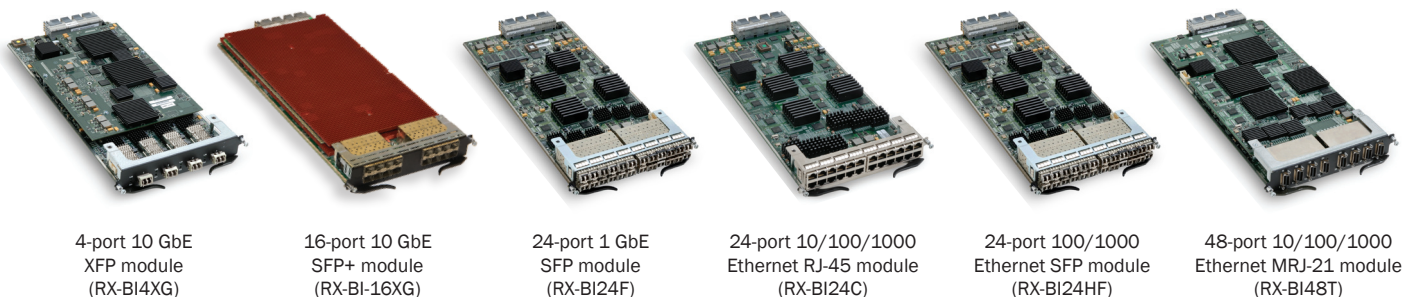
### Robust Layer 3 Feature Set

Brocade IronWare software suite includes scalable EGP and IGP routing protocols:

- **BGPv4:** Scalable to 2 million routes, 500 peers, and 14,000 attributes with MR2 management module.
- **OSPF:** Scalable to over 400,000 routes.
- **IS-IS:** Support for Level 1 and Level 2, includes 25,000 routes and 256 adjacencies.
- **Brocade Direct Routing (BDR):** The Forwarding Information Base (FIB) is downloaded to the hardware-based forwarding engine on each line module. This memory can be pre-populated with as many as 512,000 IPv4 and 64,000 IPv6 routes for wire-speed routing performance.
- **Policy-Based Routing (PBR):** Supports customizable routing policies using Access Control Lists (ACLs). This feature can be used to balance network usage by controlling the network paths for different traffic flows.
- **Comprehensive Multicast Feature Set:** Provides hardware-based support for a number of multicast protocols, including MSDP, PIM-SM (Sparse Mode), and PIM-DM (Dense Mode), allowing network managers to efficiently deploy next-generation multicast applications.
- **VRRP and VRRPE (Enhanced VRRP):** Enables the BigIron RX Series switch to operate as a backup router to other network routers. In the event of a router failure, the BigIron RX will automatically and seamlessly perform the tasks of the failed router.

Figure 1.

Brocade BigIron RX Series 1 GbE and 10 GbE modules.



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## Industry-Leading Layer 2 Features

To provide self-healing topologies in Layer 2 configurations, the BigIron RX Series supports industry-standard Ethernet protocols, including Spanning Tree Protocol (STP), Rapid Spanning Tree (RSTP), per VLAN STP (PVST), and per VLAN group STP (PVGST). The BigIron RX Series also supports Brocade Metro Ring Protocol (MRP) for sub-second service restoration in ring topologies. Additionally, the BigIron RX Series supports multi-instance spanning tree, VLAN topology grouping, and VLAN tunneling for advanced Layer 2 service configurations.

- **Metro Ring Protocol (MRP):** An alternative to Spanning Tree Protocol, MRP provides sub-second fault detection and failover for Ethernet ring topologies. MRP works in conjunction with VSRP and 802.3ad-based link aggregation to provide bandwidth scalability and SONET-like resilience.
- **Virtual Switch Redundancy Protocol (VSRP):** Supports sub-second fault detection and failover for mesh topologies in which redundant switches provide backup operation for one another.
- **Single-Instance STP:** Provides a single instance of STP to run on all port-based VLANs within a single device, interoperable with others that are 802.1d compliant.
- **Rapid Spanning Tree Protocol Based on IEEE 802.1w:** Dramatically improves the spanning tree convergence time to sub-second by automatically renegotiating port roles in case of a link failure, without relying on timers.
- **Per VLAN Spanning Tree (PVST):** Allows for control of STP on an individual VLAN basis for traffic engineering VLAN traffic (such as load distribution).
- **Per VLAN Group Spanning Tree (PVGST):** Dramatically improves VLAN scalability by servicing up to 4096 VLANs with two to 16 STPs or Rapid STP group instances.
- **Topology Groups:** Dramatically improves Layer 2 control protocol scalability by allowing a few instances of STP, RSTP, MRP, or VSRP to control large groups of VLANs.
- **Super Aggregated VLANs (SAVs):** Allows transparent tunneling of multiple VLANs through a single backbone VLAN.
- **PIM and IGMP Snooping:** Offers efficient handling of multicast traffic in Layer 2 topologies by identifying ports that request a multicast stream and forwarding the

stream only on these ports. This dramatically improves the performance of multicast applications, allowing for many more streams to be transiting the network.

- **Multi-Chassis Trunking (MCT):** Provides fast link and node failover protection while simultaneously maximizing network utilization. Also, it eliminates the need for spanning tree while enabling efficient usage of network resources through active-active load balancing.

## Advanced Quality of Service

- **Advanced QoS:** Allows administrators to enforce QoS policies based on port, VLAN, source MAC, ACL rules, 802.1p priority, Type of Service (ToS), DiffServ settings, or Rate Limiting status.
- **Very Low Latency Across All Packet Sizes:** Consistently low latency for strict priority applications such as Voice over IP (VoIP), high-performance computing, and video over IP.
- **Configurable Combinations of Queuing Disciplines and Congestion Control Policies:** Combinations of Strict Priority (SP) and Weighted Fair Queuing (WFQ) provide flexibility for network administrators. In the event of egress port congestion, traffic policies can be configured for tail drop or Weighted Random Early Detection (WRED) operation.
- **Advanced Bandwidth Management:** Allows intelligent bandwidth management using hardware-based enforcement of Committed Information Rate (CIR) with Excess Burst control capabilities and seamless integration with other advanced QoS features, including priority marking and honoring.

## Cohesive, Unified, and Easy-to-Use Network Management

- **Centralized Network Management:** Brocade IronView Network Manager is a Web-based, graphical interface tool that empowers network operators to seamlessly control software and configuration updates.
- **Command Line Interface (CLI):** Industry-standard configuration interface, consistent and common throughout Brocade products.
- **Web Interface:** Provides easy-to-use Graphical User Interface (GUI) for system configuration from standard Web browsers.
- **sFlow (RFC 3176):** Provides scalable, wire-speed network monitoring and accounting with no impact on network performance.

## Brocade IronShield Security

- **Single Interface for Wire-Speed Extended IPv4 and IPv6 Layer 2, Layer 3, and Layer 4 Access Controls Lists (ACL):** Controls packet forwarding and restricts access to the system management interface, while providing wire-speed switching and routing:
  - **Extensible ACL Implementation for Layer 3 and 4 Information:** Identifies traffic based on source or destination IP address, IP protocol type, TCP or UDP port, IP precedence, or ToS values
  - **Flexible ACL Implementation for Layer 2 Information:** Identifies traffic based on source or destination MAC address, Ethernet type, VLAN-ID values, and 802.1p values
  - **ACL Scalability:** Support for up to 8000 ACLs
  - **Ease of Administration:** Identify an ACL by name or number, or add a comment line for ease of administration
  - **Secure Shell and Secure Copy:** Provides secure access to the administration and management interface over the network
- **Protection against Denial of Service (DoS) Attacks:** Prevents or minimizes network downtime from malicious users by limiting TCP SYN and ICMP traffic, and protects against broadcast storms.
- **User Authentication:** Authentication with AAA, 802.1x, MacAuth, RADIUS, TACACS, and TACACS+ prevents unauthorized network access.
- **MAC Port Security:** Controls the MAC addresses allowed per port.
- **sFlow (RFC 3176):** Provides cost-effective, scalable, wire-speed network monitoring to detect unusual network activity.
- **SNMPv3:** Secured SNMP management with authentication and privacy services.
- **BGP-Guard:** Complements MD5 security for BGP sessions to protect against session disruption by restricting the number of hops the BGP session can traverse.

## Continuous System Monitoring

Increasing system availability and averting failure before it occurs are key to ensuring maximum network uptime and application availability. Continuous System Monitoring (CSM) is a tool that runs in the background and monitors specific hardware components on all line cards, switch fabrics, and

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management modules. It uses both polling and interrupt methods to gather information about the system. If a failure is detected, an alarm entry is placed in the syslog, allowing IT administrators to take action. CSM will shut down, reset, or redirect traffic depending on the failure type.

**APPLICATIONS**

**Brocade for Data Center and Application Hosting Solutions**

Data centers are the core of business operations requiring high-density, high-performance, high-security, and low-latency switching to ensure connectivity to mission-critical applications. The increasing value of the data center to business operations necessitates that data and network integrity, confidentiality, and security must be maintained without impacting performance.

The BigIron RX Series addresses these needs by acting as the gateway and switch fabric of the data center (see Figure 2). The density of the BigIron RX Series allows for growth from the smallest to the largest data center. Port aggregation allows for

high-performance interconnects of up to 80 Gbps, increasing the availability of the server farm.

For small-scale networks, the BigIron RX Series can provide an ideal “data center-in-a box,” solution with its high-density 1 Gigabit Ethernet (GbE) and 10 GbE offerings. For midsize networks, the BigIron RX Series is ideally suited for access, aggregation, or core deployments. For large-scale networks, the BigIron RX Series is ideally suited for the access and aggregation layer.

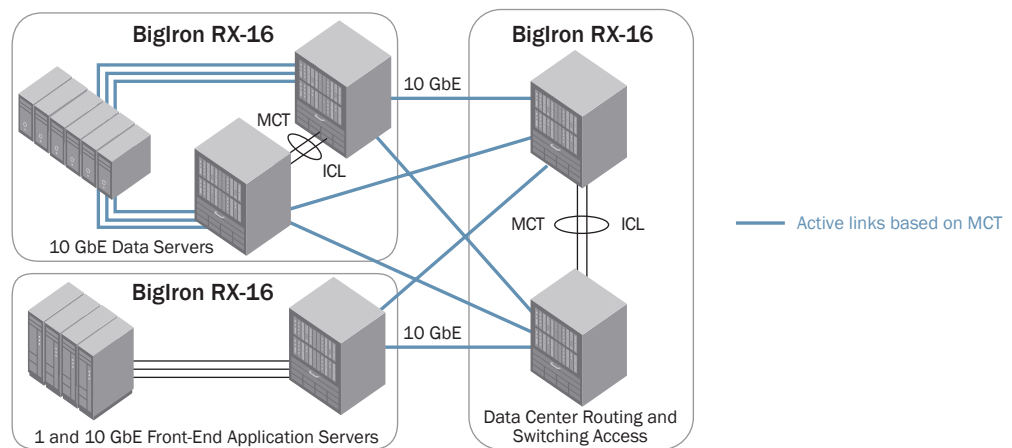
The hardware-based Brocade IronShield security features protect the server farm against Denial of Service (DoS) attacks and provide security for maintaining network integrity. The sFlow functionality supplies the network access information required to track who has accessed which server on the network, providing network usage audit trails. By utilizing Brocade wire-speed switching and filtering to screen and direct traffic to the appropriate server, and block undesired traffic with minimal latency, organizations can help ensure the optimal operation, security, and integrity of their networks and data centers.

**Brocade Enterprise Infrastructure Solutions**

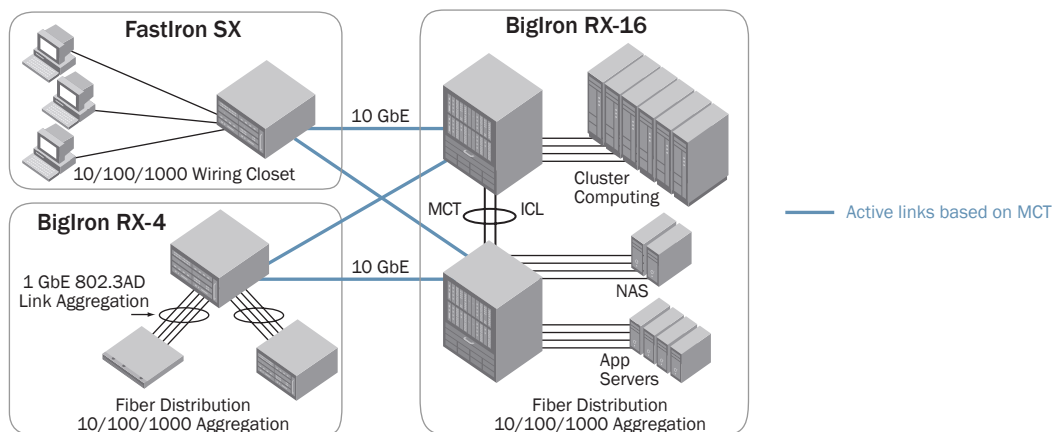
Today’s enterprise network is critical to the ongoing operations of the organization. Network administrators are concerned about zero downtime on the network, securing the network from DoS attacks, cyber-spying, and malicious users, and maintaining data integrity and confidentiality, without adding excessive cost or impacting performance. All this in a structure that allows for graceful growth as the enterprise grows.

The BigIron RX Series incorporates exceptional resiliency, security, and scalability in an architecture designed to scale from the edge to the core to minimize TCO (see Figure 3). The resilient design includes redundant management modules, switch fabrics, fans, and power supplies. This hardware resiliency is enhanced with software resiliency, including hitless system failover and upgrade, graceful restart, MCT, MRP, VSRP, and VRRP for Layer 2 and Layer 3 resiliency. High-priority voice and data traffic fly through the chassis utilizing the high-performance

**Figure 2.** Data center and application hosting solutions.



**Figure 3.** Enterprise infrastructure solutions.



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hardware-based QoS features of the BigIron RX Series. Wire-speed security is maintained by locking out unauthorized users with port security, by filtering DoS and unauthorized traffic with ACLs, and by monitoring traffic flows with sFlow. The BigIron RX Series allows organizations to grow from just 24 ports of 10/100/1000 at the edge up to 768 ports of 10/100/1000 or 256 ports of 10 GbE in the core. The BigIron RX Series provides one common architecture that meets the demands of today's and tomorrow's enterprise network needs with high-performance, resiliency, security, and scalability with low TCO.

### Brocade for High-Performance Computing Solutions

High-performance computing has entered the mainstream marketplace with Ethernet switching as the technology of choice. Ultra-low latency and high-density Ethernet switching are required for successful deployment.

The BigIron RX Series chassis are ideal for this environment. They offer low latency

through the switch with unparalleled densities of 10/100/1000 Ethernet, fiber Gigabit Ethernet and 10 GbE in compact size chassis—up to 768 ports of 1 GbE or 256 ports of 10 GbE in a single chassis. The high-performance architecture offers up to 1.6 Tbps of data switching capacity to meet the needs of the most demanding HPC environment. The combination of performance, density, and reliability makes the BigIron RX Series an excellent choice for enterprise HPC environments (see Figure 4).

### 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.

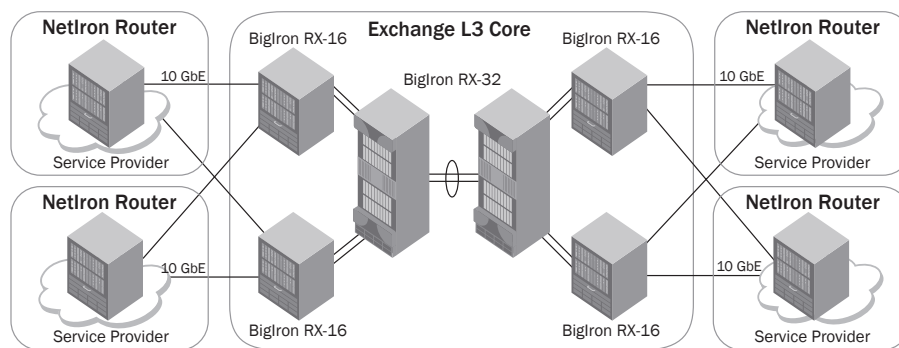
### CLOUD-OPTIMIZED NETWORK ACQUISITION

Brocade helps organizations easily address their information technology requirements by offering flexible network acquisition and support alternatives to meet their financial needs. Organizations can select from purchase, lease, and Brocade Network Subscription options to align network acquisition with their unique capital requirements and risk profiles.

### 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](http://www.brocade.com).

**Figure 4.** High-performance computing solutions.



### SYSTEM SUMMARY

Feature	BigIron RX-4	BigIron RX-8	BigIron RX-16
I/O Module Slots	4	8	16
Switching capacity per system			
Available data capacity	400 Gbps	800 Gbps	1.60 Tbps
Total switch capacity	960 Gbps	1.92 Tbps	3.84 Tbps
Packet forwarding capacity per system	286 Mpps	571 Mpps	1,142 Mpps
Max 10 GbE ports per system	64	128	256
Max 1 GbE ports per system	192	384	768
Height (inches/rack units)	7 in./4RU	12.25 in./7RU	24.5 in./14RU
Airflow	Side-to-Side	Side-to-Side	Front-to-Back
Power supply redundancy	M+N	M+N	M+N

(M = Number of supplies needed for fully loaded system and N = 1 to M supply redundancy)

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## BROCADE BIGIRON RX SERIES SPECIFICATIONS

### IEEE Compliance

- 802.3ae 10-Gigabit Ethernet
- 802.3ab Gigabit Ethernet over Copper
- 802.3x Flow Control
- 802.3ad Link Aggregation
- 802.1Q VLAN Tagging
- 802.1D Bridging
- 802.1w Rapid STP
- 802.1s Multiple Spanning Tree Protocol
- 802.1X User authentication
- 802.3 Ethernet Like MIB

### RFC Compliance

BGPv4	<ul style="list-style-type: none"><li>• RFC 4271 BGPv4</li><li>• RFC 1745 OSPF interactions</li><li>• RFC 1997 Communities &amp; Attributes</li><li>• RFC 2439 route flap dampening</li><li>• RFC 2796 route reflection</li><li>• RFC 3065 BGP4 confederations</li><li>• RFC 3392 Capability Advertisement</li><li>• RFC 2918 Route Refresh Capability</li><li>• RFC 1269 Managed Objects for BGP</li><li>• RFC 1657 Managed Objects for BGP-4 using SMIv2</li><li>• RFC 3682 Generalized TTL Security Mechanism for eBGP Session Protection</li><li>• RFC 2385 BGP Session Protection via TCP MD5</li><li>• draft-ietf-idr-restart Graceful Restart for BGP</li><li>• draft-ietf-idr-route-filter</li></ul>
OSPF	<ul style="list-style-type: none"><li>• RFC 2178 OSPF</li><li>• RFC 1583 OSPF v2</li><li>• RFC 3101 OSPF NSSA</li><li>• RFC 1745 OSPF Interactions</li><li>• RFC 1765 OSPF Database Overflow</li><li>• RFC 1850 OSPF v2 MIB and Traps</li><li>• RFC 2154 OSPF w/Digital Signatures (Password, MD-5)</li><li>• RFC 2328 OSPF v2</li><li>• RFC 2370 OSPF Opaque LSA Option</li><li>• RFC 3623 Graceful OSPF Restart</li></ul>
IS-IS	<ul style="list-style-type: none"><li>• RFC 1195 Routing in TCP/IP and Dual Environments</li><li>• RFC 2763 Dynamic Host Name Exchange</li><li>• RFC 2966 Domain-wide Prefix Distribution</li><li>• RFC 3567 IS-IS Cryptographic Authentication (MDS)</li></ul>
RIP	<ul style="list-style-type: none"><li>• RFC 1058 RIP v1</li><li>• RFC 1723 RIP v2</li><li>• RFC 1812 RIP Requirements</li></ul>
IP Multicast	<ul style="list-style-type: none"><li>• RFC 1122 Host Extensions</li><li>• RFC 1256 ICMP Router Discovery Protocol</li><li>• RFC 1112 IGMP</li><li>• RFC 2236 IGMP v2</li><li>• RFC 2362 PIM-SM</li><li>• RFC 3973 PIM-DM</li><li>• PIM-DM v1</li><li>• DVMRP v3-07</li><li>• RFC 1075 DVMRP v2</li><li>• RFC 2336 IGMP v2</li><li>• RFC 3618 MSDP</li><li>• RFC 2283 MBGP</li><li>• RFC 2858 BGP-MP</li><li>• RFC 3376 IGMP v3</li><li>• RFC 3446 Anycast RP</li><li>• RFC 4541 Considerations for IGMP and MLD Snooping</li></ul>

General Protocols	<ul style="list-style-type: none"><li>• RFC 791 IP</li><li>• RFC 792 ICMP</li><li>• RFC 793 TCP</li><li>• RFC 783 TFTP</li><li>• RFC 826 ARP</li><li>• RFC 768 UDP</li><li>• RFC 894 IP over Ethernet</li><li>• RFC 903 RARP</li><li>• RFC 906 TFTP Bootstrap</li><li>• RFC 1027 Proxy ARP</li><li>• RFC 950 Subnets</li><li>• RFC 951 BootP</li><li>• RFC 1122 Host Requirements</li><li>• RFC 1256 IRDP</li><li>• RFC 1519 CIDR</li><li>• RFC 1542 BootP Extensions</li><li>• RFC 1812 General Routing</li><li>• RFC 1541 and 1542 DHCP</li><li>• RFC 2131 BootP/DHCP Helper</li><li>• RFC 3768 VRRP</li><li>• RFC 854 TELNET</li><li>• RFC 1591 DNS (client)</li><li>• RFC 2784 GRE</li><li>• RFC 1191 Path MTU Discovery</li><li>• RFC 896 Congestion Control</li><li>• RFC 3635 Pause Control</li><li>• RFC 1858 IP Fragment Filtering</li><li>• RFC 1340 Assigned Numbers</li></ul>
Others	<ul style="list-style-type: none"><li>• RFC 2578 SMIv2</li><li>• RFC 2579 Textual Conventions for SMIv2</li><li>• RFC 2665 Ethernet Interface MIB</li><li>• RFC 1354 IP Forwarding MIB</li><li>• RFC 1757 RMON Groups Partial 1, full for 2, 3, 9</li><li>• RFC 2068 HTTP</li><li>• RFC 2030 SNMP</li><li>• RFC 2138 RADIUS</li><li>• RFC 3176 sFlow</li><li>• Draft-ietf-tcpm-tcpsecure-00</li></ul>
IPv6 Core	<ul style="list-style-type: none"><li>• RFC 2373 IPv6 Addressing architecture</li><li>• RFC 1886 DNS Extensions to support IPv6</li><li>• RFC 1887 IPv6 Unicast address allocation architecture</li><li>• RFC 2374 IPv6 aggregatable global Unicast address format</li><li>• RFC 2450 Proposed TLA and NLA Assignment Rules</li><li>• RFC 2471 IPv6 testing address allocation</li><li>• RFC 2526 Reserved IPv6 subnet anycast address</li><li>• RFC 2928 Initial IPv6 sub TLA ID assignments</li><li>• RFC 2460 IPv6 Specification</li><li>• RFC 2461 IPv6 Neighbor Discovery</li><li>• RFC 2462 IPv6 Stateless Address Auto-configuration</li><li>• RFC 4443 ICMPv6</li><li>• RFC 3513 IPv6 Addressing Architecture</li><li>• RFC 1981 IPv6 Path MTU Discovery</li><li>• RFC 3587 IPv6 Global Unicast Address Format</li><li>• RFC 2375 IPv6 Multicast Address Assignments</li><li>• RFC 2464 Transmission of IPv6 over Ethernet Networks</li><li>• RFC 2711 IPv6 Router Alert Option</li><li>• RFC 3363 DNS support</li></ul>

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IPv6 Routing	<ul style="list-style-type: none"> <li>• RFC 2080 RIPng for IPv6</li> <li>• RFC 2740 OSPFv3 for IPv6</li> <li>• IETF Draft_ietf_isis_IPv6 IS-IS for IPv6</li> <li>• RFC 2545 Use of MP-BGP-4 for IPv6</li> </ul>
IPv6 Multicast	<ul style="list-style-type: none"> <li>• RFC 2362 PIM-SM</li> <li>• RFC 2710 Multicast Listener Discovery (MLD) for IPv6</li> <li>• RFC 3306 Unicast-Prefix-based IPv6 Multicast Addresses</li> <li>• RFC 3810 MLDv2</li> <li>• RFC 4602 PIM-SM (Partial Address)</li> <li>• draft-holbrook-idmr-igmpv3-ssm—IGMPv3 &amp; MDLV2 for SSM</li> <li>• draft-ietf-ssm-arch SSM for IP</li> </ul>
IPv6 Transitioning	<ul style="list-style-type: none"> <li>• RFC 2893 Transition Mechanisms for IPv6 Hosts and Routers</li> <li>• RFC 3056 Connection of IPv6 Domains via IPv4 Clouds</li> </ul>

### Network Management

- IronView Network Manager (INM) Web-based graphical user interface
- Integrated Standard-based Command Line Interface (CLI)
- RFC 3176 sFlow
- RFC 854 Telnet
- RFC 2068 HTTP
- RFC 2578 and 3410 SNMPv2 and v3
- RFC 1757 RMON Group partial 1, full 2, 3, and 9
- HP OpenView for Sun Solaris, HP-UX, IBM's AIX, Linux and Windows NT
- SNMP MIB II

### Element Security Options

- MacAuth on tagged ports
- AAA
- RADIUS
- Secure Shell (SSH v2)
- Secure Copy (SCP)
- TACACS/TACACS+
- Username/Password (Challenge and Response)
- Bi-level Access Mode (Standard and EXEC Level)
- Protection for Denial of Service attacks, such as TCP SYN or Smurf Attacks

### Environmental

- Operating Temperature: 0°C to 40°C (32°F to 104°F)
- Relative Humidity: 5 to 90% at 40°C (104°F), non-condensing
- Operating Altitude: 10,000 ft (3000 m)
- Storage Temperature: -25°C to 70°C (-13°F to 158°F)
- Storage Humidity: 95% maximum relative humidity, non-condensing
- Storage Altitude: 15,000 ft (4500 m) maximum

### Safety Agency Approvals

- CAN/CSA-C22.2 No.60950-00/UL 60950—Third Edition, 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
- EN 60950 Safety of Information Technology Equipment

### Electromagnetic Emission Certification

- CSA 950 Electromagnetic Emission Certification
- FCC Class A
- EN 55022/CISPR-22 Class A/ VCCI Class A
- ICES-003 Electromagnetic Emission

### Immunity

- EN 61000-3-2 Power Line Harmonics
- EN 61000-4-2 ESD
- EN 61000-4-3 Radiated Immunity
- EN 61000-4-4 EFT
- EN 61000-4-5 Surge
- EN 61000-4-6 Low Frequency Common Immunity
- EN 61000-4-11 Voltage Dips and Sags Generic: EN50082-1
- ESD: IEC 61000-4-2; 4 kV CD, 8 kV AD
- Radiated: IEC 61000-4-3; 3 V/m
- EFT/Burst: IEC 61000-4-4; 1.0 kV (power line), 0.5 kV (signal line)
- Conducted: IEC 61000-4-6; 3 V

### Environmental Regulatory Compliance

- EU 2002/95/EC RoHS (with lead exemption)
- EU 2002/91/EC WEEE

### Warranty

- 1-year hardware
- 90-day software

### Mounting Options

- 19-inch Universal EIA 310 (Telco) Rack or Tabletop

## BROCADE BIGIRON RX SERIES SYSTEM SPECIFICATIONS

System Max	@ 100 VAC			@ 200 VAC			@ -48 VDC		
	Current Amps	Power Watts	Thermal Output BTU/Hr	Current Amps	Power Watts	Thermal Output BTU/Hr	Current Amps	Power Watts	Thermal Output BTU/Hr
BigIron RX-16	49	4905	16,741	24	4905	16,741	102	4905	16,741
BigIron RX-8	24	2417	8249	12	2417	8249	50	2417	8249
BigIron RX-4	12	1217	4155	6	1217	4155	25	1217	4155

\*Multi-Chassis Trunking (MCT) available for purchase the first half of 2012.

**BROCADE BIGIRON RX SERIES PHYSICAL SPECIFICATIONS**

	Dimensions		Weight	
BigIron RX-16	17.45w × 24.47h × 25.5d in.	44.32w × 62.15h × 64.77d cm	236 lb	107 kg
BigIron RX-8	17.45w × 12.21h × 22.5d in.	44.32w × 31.01h × 57.15d cm	131 lb	60 kg
BigIron RX-4	17.45w × 6.96h × 22.5d in.	44.32w × 17.68h × 57.15d cm	78 lb	35 kg

**ORDERING INFORMATION**

Part Number	Description		
BI-RX-16-AC	BigIron RX-16 AC system	RX-BI-SFM1	Switch Fabric Element for BigIron RX-4
BI-RX-8-AC	BigIron RX-8 AC system	RX-BI-SFM3	Switch Fabric Element for BigIron RX-8 and RX-16
BI-RX-4-AC	BigIron RX-4 AC system	RX-ACPWR-B-SYS	90–264 VAC power supply for BigIron RX-4 chassis
BI-RX-16-DC	BigIron RX-16 DC system	RX-ACPWR-F-SYS	90–264 VAC power supply for BigIron RX-8 and RX-16 chassis
BI-RX-8-DC	BigIron RX-8 DC system	RX-DCPWR-B-SYS	–48 VDC power supply for BigIron RX-4 chassis
BI-RX-4-DC	BigIron RX-4 DC system	RX-DCPWR-F-SYS	–48 VDC power supply for BigIron RX-8 and RX-16 chassis
RX-BI4XG	4-port 10 GbE XFP module for BigIron RX Series	10G-XFP-SR	850 nm serial pluggable XFP optic only (LC) over MMF
RX-BI-16XG	16-port 10 GbE SFP+ module for BigIron RX Series	10G-XFP-LR	1310 nm serial pluggable XFP optic only (LC) for up to 10 km over SMF
RX-BI24C	24-port 10/100/1000 Ethernet RJ-45 module for BigIron RX Series	10G-XFP-ER	1550 nm serial pluggable XFP optic only (LC) for up to 40 km over SMF
RX-BI24F	24-port 1 GbE SFP module for BigIron RX Series	10G-XFP-ZR	1550 nm serial pluggable XFP optic only (LC) for up to 80 km over SMF
RX-BI24HF	24-port 100/1000 Ethernet SFP module for BigIron RX Series	10G-SFPP-SR	10GBASE-SR, SFP+ optic (LC), target range 300 m over MMF
RX-BI48T	48-port 10/100/1000 Ethernet MRJ-21 module for BigIron RX Series	10G-SFPP-LR	10GBASE-LR, SFP+ optic (LC), for up to 10 km over SMF
RX-BI-MR	Management Module for BigIron RX Series chassis, 512 MB memory	10G-SFPP-ER	10GBASE-ER, SFP+ optic (LC), for up to 40 km over SMF
RX-BI-MR2	Management Module for BigIron RX Series, 2 GB memory		

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**Corporate Headquarters**

San Jose, CA USA  
T: +1-408-333-8000  
info@brocade.com

**European Headquarters**

Geneva, Switzerland  
T: +41-22-799-56-40  
emea-info@brocade.com

**Asia Pacific Headquarters**

Singapore  
T: +65-6538-4700  
apac-info@brocade.com

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