BROCADE FASTIRON EDGE X SERIES

ENTERPRISE LAN SWITCHING

High Performance, Intelligent Switches Delivering 10 GbE Edge to Core

HIGHLIGHTS

- Increased ROI and decreased TCO through superior functionality, advanced technology, and security in a compact form factor at industry-leading prices

- Load-balanced, hot-swappable, and 1+1 power redundancy to ensure network reliability for enterprises and Metro Service Providers

- A rich suite of security features including IP source guard, dynamic Address Resolution Protocol (ARP) inspection, and DHCP snooping shields the enterprise from internal and external threats

- Combined SP/WRR queuing and cell-based switch fabric ensures low latency and jitter for voice and video traffic

- Embedded, hardware-based sFlow™—the industry standard for network traffic monitoring—enables network-wide accounting, utilization reporting, capacity planning, intrusion detection, and more

- Advanced IronWare™ Layer 2 Ethernet switching with a robust suite of security capabilities

- Flexibility option to upgrade the software to full Layer 3, including support for IP routing protocols such as RIPv1/v2, OSPF, BGP, and support for multicast routing

- IronShield™ 360 intrusion protection delivers dynamic and real-time protection from network and host-based attacks

- FastIron Edge X 624 and FastIron Edge X 648 IPv6-capable switches future proof the network for IPv6 application migration

Organizations continue to strive to be competitively superior and demand network infrastructures be resilient, secure, and do more with less. As requirements to protect, optimize, and grow the enterprise have extended from basic connectivity to a much high level of intelligent service-based infrastructures, the network has evolved to provide an even greater value to the organizations. The Brocade® FastIron® Edge Switch X Series provides greater flexibility, higher reliability, enhanced security, and extensive redundancy for better operational efficiency and faster response to business opportunities today and into the future.

The FastIron Edge X Series offers a diverse range of switches that meet Layer 2/Layer 3 edge, aggregation, or small-network backbone-connectivity requirements with intelligent network services, including superior quality of service (QoS), predictable performance, advanced security, comprehensive management, and integrated resiliency. It is the ideal networking platform to deliver 10 Gigabit Ethernet.

Additionally, the FastIron Edge X Series features the benefits of a "pay-as-you-grow" architecture and price-performance value for fixed Ethernet solutions with the addition of a removable, replaceable, load-sharing power supply and 10 GbE modules in a 1.5 Rack Unit (RU) form factor. The FastIron Edge X Series can be initially installed using "Small Form Pluggable" (SFP) Gigabit Ethernet modules, then field-upgraded with one or two "10 Gigabit Small Form Factor Pluggable" (XFP) modules, extending the usability of the product.

BROCADE

To meet existing and emerging network requirements, the FastIron Edge X Series supports advanced Layer 2 features, such as BPDU Guard, Root Guard, and Metro Ring Protocol; Base Layer 3 routing capabilities; complete quality of service (QoS) controls, including prioritization and rate limiting; and the Brocade IronShield™ for denial of service (DoS) protection. The FastIron Edge X Series is also software upgradeable to full Layer 3, supporting the advanced routing protocol BGP4. The extensive feature set supports network requirements ranging from basic connectivity to multicast-based streaming audio/video applications for converged services including Voice over IP (VoIP), with the full Layer 3 upgrade.

FUTURE-PROOFING THE NETWORK WITH IPV6

Migration to IPv6 is inevitable, but by starting with the deployment of IPv6-capable hardware the transition can be more controlled and less disruptive to the network. Japan and Europe are aggressively deploying IPv6, and deployment in North America is on the rise. In fact, some government agencies are mandating the purchase of IPv6-capable switches and routers. Therefore, it is important that enterprises and service providers plan to deploy IPv6-capable devices to capitalize on this inevitable change.

The IPv6-capable FastIron Edge X Series, combined with other Brocade products such as BigIron® and NetIron®, provides the industry's most complete end-to-end IPv6 solution. Customers can deploy the FastIron Edge X Series switches knowing they are IPv6-capable hardware today, and with future separately priced software upgrades they can support IPv6 routing and advanced IPv6 features tomorrow.

The new IPv6-capable FastIron Edge X Series switches enable network managers to future proof the network to support IPv6. The high performance of IPv6-ready platforms, security, convergence, and complete IPv4/IPv6 visibility using embedded sFlow provides a robust edge-to-core IPv6 solution.

CONFIGURATION ALTERNATIVES

This FastIron Edge X Series of switches is optimized for flexibility, reliability, enhanced security, and extensive redundancy. Available in six compact models, the FastIron Edge X Series helps enterprises and Metro Service Providers reduce costs and increase return on investment by offering superior features and advanced security at industry-leading prices.

The FastIron Edge X 424 and FastIron Edge X 624

- 24 x 10/100/1000 Mbps ports with 4 combo ports
- 1+1 system power redundancy

The FastIron Edge X 448 and FastIron Edge X 648

- 48 x 10/100/1000 Mbps ports with 4 combo ports
- 1+1 system power redundancy

The FastIron Edge X 424HF and FastIron Edge X 624HF

- 20 x 100/1000 Mbps SFP ports with 4 combo ports
- 1+1 system power redundancy

PRIMARY FEATURES AND BENEFITS

Advanced QoS to Ensure High Availability and Superior Data Traffic Integrity

The FastIron Edge X Series offers superior QoS features enabling network administrators to provide and ensure high-quality services throughout the network from end to end. The FastIron Edge X Series identifies, classifies, re-classifies, polices, and marks traffic prior to delivery based on specific criteria. The criteria types available are port, source/destination Media Access Control (MAC) address, 802.1p priority bit, source/destination IP address, Type of Service (ToS) or Differentiated Services Control Point (DSCP) fields, or the Transmission Control Protocol/User Datagram Protocol (TCP/UDP) port. VoIP handsets or bandwidth-critical application traffic can be classified by network administrators to discriminate among various traffic flows and enforce bandwidth policies on Layer 2 and Layer 3 QoS fields.

Once classified, the traffic is queued and scheduled for delivery—the network administrator has complete control over how the system services the queues. Weighted, adjustable Round Robin (WRR) queuing ensures that all packets can be delivered and lower-priority packets are not starved for bandwidth. Strict Priority (SP) queuing ensures highest-priority traffic always gets serviced first, ahead of all other traffic, while SP combined with WRR guarantees highest-priority traffic delivery and equal servicing of the lower priority queues.

The FastIron Edge X Series is capable of performing rate-limiting, giving a network administrator the granular control needed to regulate bandwidth utilization. On ingress, extended ACLs, in combination with rate limiting traffic policies, can be used to fairly balance, fine-tune, and control bandwidth consumption. On egress, outbound rate limiting can be used to control bandwidth per port and per priority queue. Combined voice, video, and high-speed data services are delivered throughout a unified network without suffering from reduced performance through these enhanced bandwidth utilization features.

High-Performance, High-Availability, and Cost-Effective Metro Access

The FastIron Edge X Series is installed with IronWare, which includes metro features like Metro Ring Protocol, Virtual Switch Redundancy Protocol, Super Aggregated VLAN, and Protected-Link. The FastIron Edge X Series includes support for jumbo frames up to 9,216 bytes, required by metro providers that offer high-speed and high-value Ethernet services for storage and high-performance networking.

The FastIron Edge X Series is ideal for 1 GbE service delivery within a 10 GbE metro access infrastructure. The FastIron Edge X Series can be equipped with a 2-port 10 GbE module populated with one (1) or two (2) XFP optics capable of reaching distances of up to 40 km, allowing Metro Service Providers to connect various points-of-presence with 10 GbE. This solution optimizes the fiber infrastructure usage and allows the delivery of high-speed service offerings, such as remote backup or remote data-center facilities.

Ease of Use: Plug and Play

The FastIron Edge X Series supports the IEEE 802.1AB LLDP and ANSITIA 1057 LLDP-MED standards, enabling organizations to build open, converged, advanced multi-vendor networks. LLDP greatly simplifies and enhances network management, asset management, and network troubleshooting. For example, it enables discovery of accurate physical network topologies, including those that have multiple VLANs where all subnets may not be known. LLDP-MED addresses the unique needs that voice and video demand in a converged network by advertising media and IP telephony specific messages that can be exchanged between the network and the endpoint devices. LLDP-MED provides exceptional interoperability, IP telephony troubleshooting, and automatic deployment of policies, inventory management, and E911 location/emergency call service. These sophisticated features make converged network services easier to install, manage, and upgrade—and they significantly reduce operations costs.

Complete Solution for Multicast and Broadcast Video

The use of video applications in the workplace requires support for scalable multicast services from the edge to the core. IGMP and PIM snooping improves bandwidth utilization in Layer 2 networks by restricting multicast flows to only those 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.

Service and metro providers that have transit networks and want to offer high-end services such as IPTV or Video-On-Demand services will benefit from the multicast features. Service providers can combine

PIM Snooping and Passive Multicast Router Insertion (PMRI), ensuring multicast distribution in an Ethernet-based network or Layer 2 network. The FastIron Edge X Series 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.

IronShield™ Security for Network Protection

The FastIron Edge X Series supports configurable levels for user-selectable security such as MAC address lockdown. The network administrator can assign a single MAC address or a group of addresses to an individual port in order to prevent unauthorized users from accessing the network. Using Remote Authentication Dial-In User Service (RADIUS) authentication servers, the network manager can enable 802.1x port-based authentication—ensuring that the FastIron Edge X Series first authenticates the user before allowing the port to transmit data onto the network. This also grants users secure mobility, while maintaining the integrity and security of the network against unwarranted breaches.

To protect the network against DoS attacks, the network manager can disable the forwarding of ICMP messages and also enable the option to rate limit ICMP and TCP SYN packets. The FastIron Edge X Series monitors, throttles, and locks out ICMP and TCP SYN traffic both to the management address of the switch and traffic transiting the system. Enabling this feature will secure and protect the network from suffering a user-generated DoS attack or aiding one. To prevent "user identity theft" (spoofing), the FastIron Edge X Series switches support DHCP snooping, Dynamic ARP inspection, and IP source guard. These three features work together to deny spoofing attempts and to defeat man-in-the-middle attacks.

Once the port is operational, the network administrator can use both regular and extended ACLs to control access to and through the network. Network managers can enable control policies that can permit or deny traffic based on a wide variety of identification characteristics, such as source/destination MAC addresses, source/destination IP addresses, and TCP/UDP ports/sockets or well known port numbers—further protecting and restricting network access from malicious users. The FastIron Edge X Series implements ACL lookups in hardware, therefore security and protection for the network does not adversely affect switching or routing performance. In addition, enhanced spanning tree features such as Root Guard and BPDU Guard prevent rouge hijacking of the spanning tree root and maintain a contention and loop-free environment especially during dynamic network deployments.

sFlow™—Always-On Wire-Speed Network Monitoring

All versions of the FastIron Edge X Series support sFlow, which is a unique solution to simplify network management. Deploying switches in a networking infrastructure increases overall network performance but eliminates the network administrator's ability to receive a total picture of network capacity, bandwidth consumption, utilization, and overall network health. However, sFlow delivers real-time, complete network visibility, enabling network managers to completely manage every network transaction flowing throughout the network. sFlow uses the built-in capability of the FastIron Edge X Series ASICs to collect and aggregate details on traffic flows from Layer 2 through Layer 4 and automatically delivers information to the IronView® Network Management station. IronView Network Management employs a Java-based network configuration and management tool that displays, in graphical detail network and application-level traffic information. With the resulting insight, the network manager can quickly and accurately review overall networking operations, zero in on hot spots, and quickly diagnose and troubleshoot difficulties before they develop into widespread problems. sFlow also automatically delivers accurate SNMP/RMON statistics, reducing the administrative burden normally associated with proactive network management, design, and capacity planning.

Increasing Network Reliability with Load-Balanced and Redundant Power

The FastIron Edge X Series includes internal power redundancy features, which are only available in a modular chassis. Every FastIron Edge X Series switch ships with a single AC power supply, but by adding an additional AC power supply 1+1 redundancy is achieved. The AC power supplies are hot-swappable and load-sharing, which are critical for delivering power redundancy and deployment flexibility.

Flexible Network Deployment with Extensive 100/1000 MBPS SFP and 10 GbE Uplink Options

The Brocade FastIron Edge X Series is ideal for delivering high-density 10/100/1000 Mbps and 10 GbE solutions for flexible networks. The FastIron Edge X Series can be ordered (or field-upgraded), with a 1-port or 2-port 10 GbE module supporting one (1) or two (2) XFP optics, allowing for a full breadth of networking interconnectivity. With two (2) ports of 10 GbE, network managers can easily build redundancy into their campus network and take advantage of low cost XFP optics.

The FastIron Edge X Series comes with 4-port Gigabit Ethernet SFP interfaces supporting a wide range of Gigabit Ethernet transceivers. In addition, the FESX424HF has 20 x 100/1000 Mbps SFP ports supporting Gigabit and Fast Ethernet transceivers. The high-density SFP ports enable network managers to design flexible, cost-effective networks that can grow with the application requirements. Network managers can mix and match various SFP combinations enabling an FESX424HF to offer both short range "fiber at the desktop", as well as "fiber-to-the-home" connectivity.

The FastIron Edge X Series can be deployed to deliver Gigabit over Copper (GoC) to the desktop, high-density aggregation within the distribution layer, and GoC connectivity for high-performance computing, grid-computing, and network-attached storage. Support for jumbo frames of up to 9,126 bytes ensures faster file transfer between high-end servers within the data center and assists in reducing the server CPU load.

The 10 GbE uplinks supported by the FastIron Edge X Series ensure that the data center can be easily connected to other switches, enabling concurrent support for low-latency applications, such as VoIP, mission-critical applications, and high-volume network traffic situations.

Figure 1. FastIron Edge X Switch rear view—redundant slot for second power supply

Future-Proofing the Network Through Deployment of IPv6-Capable Switches

Networks are in the early stages of large-scale IPv6 production deployment. However, few innovative IPv6 applications are on the market. Although the success of IPv6 will ultimately depend on the new applications that run over it, a key part of the IPv6 design is the ability to integrate into and coexist with existing IPv4 switches within the network and across networks during the steady migration from IPv4 to IPv6.

The FastIron Edge X Series of IPv6-capable switches, which support the 128-bit addressing format, are introduced with software release 04.0.01, offering an easy migration path by interworking between IPv4 and IPv6 switches with the existing network or across networks. The IPv6-capable FastIron Edge X Series delivers a full complement of standards-based, feature-rich switching and IPv4 multiprotocol routing capabilities. The network manager can pick and choose which sites are upgraded with IPv6-capable switches, preparing the network for future IPv6 applications.

The FastIron Edge X Series IPv6-capable switches are designed with high 10/100 port density and Gigabit Ethernet uplinks in a compact form factor. The switches provide enterprise network connectivity, delivering GoC to the desktop, within the enterprise distribution layer, and the data center for high-end servers, cluster computing, and network-attached storage devices.

KEY FEATURES AND BENEFITS

IronShield Advanced Security Features

- Multilevel access security for console access
- IronShield 360—sFlow-powered automated closed-loop threat detection and mitigation solution.
- Secure Web-based management interface prevents unauthorized users from accessing or changing the switch configuration
- Terminal Access Controller Access Control Systems (TACACS /TACACS+) and RADIUS operator authentication
- Secure Shell and SNMPv3 restrict and encrypt communications to the management interface and system
- IEEE 802.1x authentication including multiple device authentication and dynamic policy configuration for authenticated clients—VLAN, ACL, and MAC filter
- Private VLANs provide security and isolation between switch ports to help ensure that users cannot snoop on other users' traffic
- Denial of Service Protection—Monitoring, throttling, and locking out of ICMP and TCP SYN traffic both to the management address of the switch and for transit traffic
- IP Source Guard, DHCP Snooping, and ARP Inspection protect against snooping and man-in-the-middle attacks
- ACL log reports provide source detail for denied packets
- ACL-based Port Mirroring enables IP monitoring for CALEA and related law enforcement traffic monitoring
- Port Security and MAC Address Locking limits the number of MAC addresses learned on a port. Using Port Security, network managers can allow specific MAC addresses access to the network for specific time periods.
- MAC address authentication including multiple device authentication and dynamic policy configuration
- Byte-based and packet-based Broadcast, Multicast and unknown Unicast rate limiting
- Enhanced Port security for controlling access of authorized users

KEY FEATURES AND BENEFITS CONTINUED

Superior Quality of Service

- Classification, reclassification, policing, and marking the traffic prior to delivery

- Identification, classification, and reclassification based on specific criteria including port, source/destination MAC address, 802.1p priority bit, source/destination IP address, Type of Service (ToS), Differentiated Services Control Point (DSCP) fields, or the Transmission Control Protocol/User Datagram Protocol (TCP/UDP) port

- Flexible queue servicing utilizing configurable Weighted Round Robin (WRR), Strict Priority (SP), or combined SP/WRR

- 8 hardware queues for flexible QoS management

- Ingress rate limiting—standard and extended ACL control, per VLAN, per port

- Egress rate shaping—per port

- LLDP/LLDP-MED standards greatly simplify and enhance network management, QoS, asset management, and network troubleshooting

- 32M ingress and 32M egress external buffers with dynamic buffer allocation for voice/ video applications

High Availability Design

- Redundant, hot-swappable, load-sharing and distributed power supplies for system power

- Advanced protocols for topology resilience:
  - Metro Ring Protocol (MRP)
  - Virtual Switch Redundancy Protocol (VSRP)
  - Virtual Router Redundancy Protocol (VRRP)
  - Enhanced VRRP (VRRPE)
  - Rapid Spanning Tree Protocol (RSTP)
  - BPDU Guard and Root Guard
  - Per-VLAN Spanning Tree (PVST/PVRST) and Multiple Spanning Tree (802.1s)
  - IEEE 802.3ad trunking. Support for single instance LACP
  - Protected link
  - UDLD with link error dampening

SYSTEM SUMMARY

Feature	FESX424, FESX624 & FESX424-POE	FESX448 & FESX648	FESX424HF & FESX624HF
Switching Performance	88 Gbps	136 Gbps	88 Gbps
Forwarding Performance	65 Mpps	101 Mpps	65 Mpps
Layer 2 Entries in Hardware	16,000	16,000	16,000
Layer 3 IPv4 Entries in Hardware	128,000 for FESX424 256,000 for FESX624	128,000 for FESX448 256,000 for FESX648	128,000 for FESX424HF 256,000 for FESX624HF
Layer 3 IPv6 Entries in Hardware	32K for FESX624	32K for FESX648	32K for FESX624HF
10/100/1000 Port Density	24 with 4-port Combos	48 with 4-port Combo	4-port Combo
10/100/1000 Mbps PoE Density with 15.4W each	24 for FESX424-POE	0	0
100/1000 Mbps SFP Port Density	4-port Combo (1000 Only)	4-port Combo (1000 Only)	20 100/1000 SFP
100 Mbps Ethernet Optics	Not Applicable	Not Applicable	100FX-SR, 100FX-IR, 100FX-LR, and 100Base-BXD/BXU
Gigabit Ethernet Optics	SX, SX2, LX, LHA, LHB, 1000Base BXD/BXU, and CWDM		
10 Gigabit Ethernet	1 or 2-port XFP Module(s) (Optional) for FESX4xx; 2-port XFP Module (Optional) for FESX6xx; IPv4 and IPv6 versions of LR WAN PHY (Optional)		
10 Gigabit Ethernet Optics	SR, LR, ER, ZR, 1310-MM[1], and ZRD		
Support for AC and DC Power Supply	Yes	Yes	Yes
Power Supply Redundancy	1+1 for System/PoE	1+1 for System	1+1 for System

1-The Brocade 10G-XFP-1310-MM transceivers support 10-GbE operation on up to 200 meters of FDDI-grade MM fiber. This transceiver is compatible with 10GBase-LRM optics..

BROCADE FASTIRON EDGE X SERIES SPECIFICATIONS

IEEE Standards Compliance

- 802.3 10Base-T
- 802.3u 100Base-TX
- 802.3u 100Base-FX
- 802.3u 100Base-LX
- 802.3z 1000Base-SX/LX
- 802.3ab 1000Base-T
- 802.3ae 10-Gigabit Ethernet
- 802.3af Power over Ethernet
- 802.3x Flow Control
- 802.3ad Link Aggregation
- 802.1d Ethernet Bridging
- 802.1D MAC Bridges
- 802.1p/q VLAN Tagging
- 802.1w Rapid Spanning Tree
- 802.1s Multiple Spanning Tree
- 802.1X Port-based Network Access Control
- 802.1Q Generic VLAN Registration Protocol (GVRP)
- 802.3AB LLDP
- 802.1p Mapping to Priority Queue

RFC Compliance

Protocol Support	• DNS Client • RFC 1812 IP • RFC 2338 VRRP • VRRPE (Brocade VRRP Enhanced) • Generic VLAN Registration Protocol (GVRP) (conforms to IEEE 802.1Q) • PVST/PVST+/PVRST
BGP4	• 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 • 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
OSPF	• RFC 1583 and 2328 OSPF v2 • RFC 1587 OSPF NSSA Option • RFC 1745 OSPF Interactions • RFC 1765 OSPF Database Overflow • RFC 1850 OSPF Traps • RFC 1850 OSPF v2 MIB • RFC 2154 OSPF with Digital Signatures (Password, MD-5) • RFC 2178 OSPF v2 • RFC 2370 OSPF Opaque LSA Option
RIP	• RFC 1058 RIP v1 • RFC 1723 RIP v2
IP Multicast	• RFC 1112 IGMP • RFC 2236 IGMP v2 • RFC 3376 IGMP v3 • IGMP Proxy • DVMRP v3-07 • RFC 1075 DVMRP • RFC 1122 Host Extensions • RFC 1256 ICMP Router Discovery Protocol • PIM-DM v1 • RFC 2362 PIM-SM • PIM-SSM
General Routing Protocols	• RFC 768 UDP • RFC 783 TFTP • RFC 791 IP • RFC 792 ICMP • RFC 793 TCP • RFC 826 ARP • RFC 854 TELNET • RFC 894 IP over Ethernet • RFC 903 RARP • RFC 906 TFTP Bootstrap • RFC 1027 Proxy ARP • RFC 1519 CIDR • RFC 1541 and 2131 DHCP • RFC 1591 DNS (client) • RFC 1812 General Routing • RFC 2338 VRRP

Quality of Service

- MAC Address Mapping to Priority Queue
- ACL Mapping to Priority Queue
- ACL Mapping to ToS/DSCP
- ACL Mapping and Marking of ToS/DSCP
- DiffServ Support
- QoS Queue Management Using Weighted Round Robin (WRR), Strict Priority (SP), and a combination of WRR and SP

Management and Control

- Virtual Cable Tester
- IEEE 802.3 MAU MIB (RFC 2239)
- RFC 2571 Architecture for Describing SNMP Framework
- RFC 951 BootP
- RFC 1542 BootP Extensions
- RFC 2131 DHCP
- RFC 1493 Bridge MIB
- Configuration Logging
- RFC 1643 Ethernet-like Interface MIB
- RFC 2068 HTTP
- RFC 2818 HTTPS
- Industry Standard Command Line Interface (CLI)
- Integration with HP OpenView for Sun Solaris, HP-UX, IBM's AIX, and Windows NT Standalone Windows NT
- RFC 1354 IP Forwarding Table MIB
- IronView Network Manager (INM) Web-based Graphical User Interface
- Embedded Web Management
- RFC 3176 sFlow
- RFC 1213 MIB-II
- RFC 1516 Repeater MIB
- RFC 1724 RIPv2 MIB
- RFC 1757 RMON MIB
- RFC 2572 SNMP Message Processing and Dispatching
- RFC 1573 SNMP MIB II
- RFC 2575 SNMP View-based Access Control Model SNMP
- RFC 1157 SNMPv1/v2c
- RFC 3411 SNMPv3 Framework
- RFC 2570 SNMPv3 Intro to Framework
- RFC 3412 SNMPv3 Processing
- RFC 3414 SNMPv3 USM
- RFC 2574 SNMPv3 User-based Security Model (USM)
- RFC 2573 SNMPv3 Applications
- RFC 2575 SNMP View-based Access Control Model SNMP (VACM)
- RFC 3415 SNMPv3 VACM

Element Security Options

- Authentication, Authorization, and Accounting (AAA)
- Bi-level Access Mode (Standard and EXEC Level)
- Protection for Denial of Service attacks, Man-in-the-Middle attacks, TCP SYN attacks and Smurf attacks
- RADIUS
- Secure Copy (SCP)
- Secure Shell (SSHv2)
- TACACS/TACACS+
- Username/Password (Challenge and Response)

Performance

FESX424 and FESX624	• Switching Capacity 88 Gbps • Forwarding Rate 65 Mpps
FESX448 and FESX648	• Switching Capacity 136 Gbps • Forwarding Rate 101 Mpps
FESX424HF and FESX624HF	• Switching Capacity 88 Gbps • Forwarding Rate 65 Mpps

Dimensions

FESX424 and FESX624	2.63" (H) x 17.5" (W) x 19.6" (D) 6.68 cm (H) x 44.45 cm (W) x 49.78 cm (D)
FESX448 and FESX648	2.63" (H) x 17.5" (W) x 19.6" (D) 6.68 cm (H) x 44.45 cm (W) x 49.78 cm (D)
FESX424HF and FESX624HF	2.63" (H) x 17.5" (W) x 19.6" (D) 6.68 cm (H) x 44.45 cm (W) x 49.78 cm (D)

Weight

FESX424 and FESX624	25 lbs (11.36 kg) Fully Loaded including dual redundant power 17.5 lbs (7.95 kg) Empty
FESX448 and FESX648	29 lbs (13.2 kg) Fully Loaded including dual redundant power 17.5 lbs (7.95 kg) Empty
FESX424HF and FESX624HF	25 lbs (11.36 kg) Fully Loaded including dual redundant power 17.5 lbs (7.95 kg) Empty

Environmental Ranges

- Acoustic: 47dB
- Operating temperature: 32° to 104°F (0° to 40°C)
- Relative humidity: 5% to 90%, non-condensing
- Storage temperature: -23° to 158°F (-25° to 70°C)
- Maximum Watts:
  - 220W (750 BTU/Hr) per supply for the FESX424, FESX424HF, FESX624 and FESX624HF
  - 600W (2,047 BTU/Hr) per supply for the FESX448 and FESX648
- Storage altitude: 10,000ft (3,000m) maximum

Environmental Regulatory Compliance

- IRoHS Compliant (5 of 6)
- WEEE Compliant

MTBF

- FESX424—302,114 hrs
- FESX424 with 2 XFP ports—127,795 hrs
- FESX424HF—274,776 hrs
- FESX424HF with 2 XFP ports—122,643 hrs
- FESX448—171,350 hrs
- FESX448 with 2 XFP ports—92,601 hrs
- FESX624—256,327 hrs
- FESX624 with 2 XFP ports—112,054 hrs
- FESX624HF—263,315 hrs
- FESX624HF with 2 XFP ports—119,292
- FESX648—177,648 hrs
- FESX648 with 2 XFP ports—86,242 hrs

Power Requirements

FESX424 and FESX624	AC input voltage: 100vAC @ 3.5A MAX, 240vAC @ 1.5A MAX, 50-60Hz per auto-sensing, auto-switching power supply
FESX448 and FESX648	AC input voltage: 100vAC @ 6A MAX, 240vAC @ 2.5A MAX, 50-60Hz per auto-sensing, auto-switching power supply
FESX424HF and FESX624HF	AC input voltage: 100vAC @ 3.5A MAX, 240vAC @ 1.5A MAX, 50-60Hz per auto-sensing, auto-switching power supply

Safety Certifications

- EN 60950
- CAN/CS-C22.2 No. 60950-00
- EN 60825-1 Safety of Laser Products—Part 1
- EN 60825-2 Safety of Laser Products—Part 2
- IEC 950
- UL 1950 Third Edition
- CSA 950

Electromagnetic Emission Certification

- FCC Class A (Part 15)
- EN 55022/CISPR-22 Class A
- VCCI Class A

Immunity

- Generic: EN 50082-1

Electromagnetic Emission Certifications

- FCC Class A (Part 15)
- EN 55022/CISPR-22 Class A
- VCCI Class A

Immunity

Generic: EN 50082-1

WARRANTY

- 5-year Limited Lifetime Hardware Warranty
- 90-days Limited Software Warranty

ORDERING INFORMATION

Part Number	Description
FESX424.	FastIron Edge X424 with Base L3 SW. Includes 20-port 10/100/1000 Mbps (RJ-45) and 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), and one AC power supply.
FESX424-PREM	FastIron Edge X424 with Full IPv4 L3 SW. Includes 20-port 10/100/1000 Mbps (RJ-45), 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), and one AC power supply.
FESX424-DC	FastIron Edge X424 with Base L3 SW. Includes 20-port 10/100/1000 Mbps (RJ-45) and 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), and one DC power supply.
FESX424-PREM-DC	FastIron Edge X424 with full IPv4 L3 SW. Includes 20-port 10/100/1000 Mbps (RJ-45), 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), and one DC power supply.
FESX424+1XG	FastIron Edge X424 with Base L3 SW. Includes 20-port 10/100/1000 Mbps (RJ-45) and 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 1-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX424+1XG-PREM	FastIron Edge X424 with Full IPv4 L3 SW. Includes 20-port 10/100/1000 Mbps (RJ-45) and 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 1-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX424+1XG-DC	FastIron Edge X424 with Base L3 SW. Includes 20-port 10/100/1000 Mbps (RJ-45) and 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 1-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX424+1XG-PREM-DC	FastIron Edge X424 with Full IPv4 L3 SW. Includes 20-port 10/100/1000 Mbps (RJ-45) and 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 1-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX424+2XG	FastIron Edge X424 with Base L3 SW. Includes 20-port 10/100/1000 Mbps (RJ-45) and 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 2-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX424+2XG-PREM	FastIron Edge X424 with Full IPv4 L3 SW. Includes 20-port 10/100/1000 Mbps (RJ-45) and 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 2-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX424+2XG-DC	FastIron Edge X424 with Base L3 SW. Includes 20-port 10/100/1000 Mbps (RJ-45) and 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 2-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX424+2XG-PREM-DC	FastIron Edge X424 with Full IPv4 L3 SW. Includes 20-port 10/100/1000 Mbps (RJ-45) and 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 2-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX424HF	FastIron Edge X424HF with Base L3 SW. Includes 20-port 100/1000 SFP, 4-port Combo to support 10/100/1000 Mbps (RJ45) or 100/1000 SFP, and one AC power supply.
FESX424HF-PREM	FastIron Edge X424 with Full IPv4 L3 SW. Includes 20-port 100/1000 SFP, 4-port Combo to support 10/100/1000 Mbps (RJ45) or 100/1000 SFP, and one AC power supply.
FESX424HF-DC	FastIron Edge X424HF with Base L3 SW. Includes 20-port 100/1000 SFP, 4-port Combo to support 10/100/1000 Mbps (RJ45) or 100/1000 SFP, and one DC power supply.
FESX424HF-PREM-DC	FastIron Edge X424 with Full IPv4 L3 SW. Includes 20-port 100/1000 SFP, 4-port Combo to support 10/100/1000 Mbps (RJ45) or 100/1000 SFP, and one DC power supply.
FESX424HF+1XG	FastIron Edge X424HF with Base L3 SW. Includes 20-port 100/1000 SFP, 4-port Combo to support 10/100/1000 Mbps (RJ45) or 100/1000 SFP, 1-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX424HF+1XG-PREM	FastIron Edge X424HF with Full IPv4 L3 SW. Includes 20-port 100/1000 SFP, 4-port Combo to support 10/100/1000 Mbps (RJ45) or 100/1000 SFP, 1-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX424HF+1XG-DC	FastIron Edge X424HF with Base L3 SW. Includes 20-port 100/1000 SFP, 4-port Combo to support 10/100/1000 Mbps (RJ45) or 100/1000 SFP, 1-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX424HF+1XG-PREM-DC	FastIron Edge X424HF with Full IPv4 L3 SW. Includes 20-port 100/1000 SFP, 4-port Combo to support 10/100/1000 Mbps (RJ45) or 100/1000 SFP, 1-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX424-POE	FastIron Edge X424-POE with Base L3 SW.includes 20-port 10/100/1000 802.3af and 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber(SFP) connectivity per port and one AC power supply.
FESX424-POE-PREM	FastIron Edge X424-POE with Full IPv4 L3 SW includes 20-port 10/100/1000 802.3af and 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port and one AC power supply.
FESX424-POE-DC	FastIron Edge X424-POE with Base L3 SW includes 20-port 10/100/1000 802.3af and 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber(SFP) connectivity per port and one DC power supply.
FESX424-POE-PREM-DC	FastIron Edge X424-POE with Full IPv4 L3 SW includes 20-port 10/100/1000 802.3af and 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port and one DC power supply.
FESX424-POE+1XG	FastIron Edge X424-POE with Base L3 SW includes 20-port 10/100/1000 802.3af and 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber(SFP) connectivity per port, 1-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX424-POE+1XG-PREM	FastIron Edge X424-POE with Full IPv4 L3 SW includes 20-port 10/100/1000802.3af and 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 1-port XFP 10 Gigabit Ethernet, and one AC power supply.
FESX424-POE+1XG-DC	FastIron Edge X424-POE+1XG with Base L3 SW includes 20-port 10/100/1000 802.3af and 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 1-port XFP 10 Gigabit Ethernet and one DC power supply.

FESX424-POE+1XG-PREM-DC	FastIron Edge X424-POE with Full IPv4 L3 SW includes 20-port 10/100/1000 802.3af and 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 1-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX424-POE+2XG	FastIron Edge X424-POE with Base L3 SW includes 20-port 10/100/1000 802.3af and 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber(SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX424-POE+2XG-PREM	FastIron Edge X424-POE with Full IPv4 L3 SW includes 20-port 10/100/1000 802.3af and 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX424-POE+2XG-DC	FastIron Edge X424-POEwith Base L3 SW includes 20-port 10/100/1000 802.3af and 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX424-POE+2XG-PREM-DC	FastIron Edge X424-POE with Full IPv4 L3 SW includes 24-port 10/100/1000 802.3af with 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX448	FastIron Edge X448 with Base L3 SW. Includes 44-port 10/100/1000 Mbps (RJ-45), 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), and one AC power supply.
FESX448-PREM	FastIron Edge X448 with Full IPv4 L3 SW. Includes 44-port 10/100/1000 Mbps (RJ-45), 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), and one AC power supply.
FESX448-DC	FastIron Edge X448 with Base L3 SW. Includes 44-port 10/100/1000 Mbps (RJ-45), 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), and one DC power supply.
FESX448-DC-PREM	FastIron Edge X448 with Full IPv4 L3 SW. Includes 44-port 10/100/1000 Mbps (RJ-45), 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), and one DC power supply.
FESX448+1XG	FastIron Edge X448 with Base L3 SW. Includes 44-port 10/100/1000 Mbps (RJ-45), 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 1-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX448+1XG-PREM	FastIron Edge X448 with Full IPv4 L3 SW. Includes 44-port 10/100/1000 Mbps (RJ-45), 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 1-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX448+1XG-DC	FastIron Edge X448 with Base L3 SW. Includes 44-port 10/100/1000 Mbps (RJ-45), 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 1-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX448+1XG-PREM-DC	FastIron Edge X448 with Full IPv4 L3 SW. Includes 44-port 10/100/1000 Mbps (RJ-45), 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 1-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX448+2XG	FastIron Edge X448 with Base L3 SW. Includes 44-port 10/100/1000 Mbps (RJ-45), 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 2-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX448+2XG-PREM	FastIron Edge X448 with Full IPv4 L3 SW. Includes 44-port 10/100/1000 Mbps (RJ-45), 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 2-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX448+2XG-DC	FastIron Edge X448 with Base L3 SW. Includes 44-port 10/100/1000 Mbps (RJ-45), 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 2-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX448+2XG-PREM-DC	FastIron Edge X448 with Full IPv4 L3 SW. Includes 44-port 10/100/1000 Mbps (RJ-45), 4-port Combo to support 10/100/1000 Mbps (RJ45) or Gigabit Ethernet fiber (SFP), 2-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX424-L3U	Full IPv4 Layer 3 software upgrade for FESX424, FESX424-POE and FESX424HF. This software upgrade adds support for IPv4 routing protocols such as RIPv1/v2, OSPF, BGP4, and multicast routing, including PIM-SM, PIM-DM, and DVMRP.
FESX448-L3U	Full IPv4 Layer 3 software upgrade for FESX448. This software upgrade adds support for IPv4 routing protocols such as RIPv1/v2, OSPF, BGP4, and multicast routing, including PIM-SM, PIM-DM, and DVMRP.
X4-1XG	Field upgradeable 1-port 10GbE XFP expansion module for FESX424, FESX424HF and FESX448
X4-2XG	Field upgradeable 2-port 10GbE XFP expansion module for FESX424, FESX424HF and FESX448
FESX624	FastIron Edge X624 with Base L3 SW includes 20-port 10/100/1000 plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, and one AC power supply.
FESX624-PREM	FastIron Edge X624 with Full IPv4 L3 SW, includes 20-port 10/100/1000 plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port and one AC power supply.
FESX624-DC	FastIron Edge X624 with Base L3 SW includes 20-port 10/100/1000 plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port and one DC power supply.
FESX624-PREM-DC	FastIron Edge X624 with Full IPv4 L3 SW, includes 20-port 10/100/1000 plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port and one DC power supply.
FESX624+2XG	FastIron Edge X624 with Base L3 SW includes 20-port 10/100/1000 plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet, and one AC power supply.
FESX624+2XG-PREM	FastIron Edge X624 with Full IPv4 SW includes 20-port 10/100/1000 plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet, and one AC power supply.

FESX624+2XG-DC	FastIron Edge X624 with Base L3 SW includes 20-port 10/100/1000 plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet, and one DC power supply.
FESX624+2XG-PREM-DC	FastIron Edge X624 with Full IPv4 SW includes 20-port 10/100/1000 plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet, and one DC power supply.
FESX624HF	FastIron Edge X624HF with Base L3 SW includes 20-port 100/1000 SFP plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port and one AC power supply.
FESX624HF-PREM	FastIron Edge X624HF with Full IPv4 SW includes 20-port 100/1000 SFP plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port and one AC power supply.
FESX624HF-DC	FastIron Edge X624HF with Base l3 SW includes 20-port 100/1000 SFP plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port and one DC power supply.
FESX624HF-PREM-DC	FastIron Edge X624HF with Full IPv4 L3 SW includes 20-port 100/1000 SFP plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port and one DC power supply.
FESX624HF+2XG	FastIron Edge X624HF with Base L3 SW includes 20-port 100/1000 SFP plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX624HF+2XG-PREM	FastIron Edge X624HF with Full IPv4 L3 SW includes 20-port 100/1000 SFP plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX624HF+2XG-DC	FastIron Edge X624HF with Base L3 SW includes 20-port 100/1000 SFP plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX624HF+2XG-PREM-DC	FastIron Edge X624HF with Full IPv4 L3 SW includes 20-port 100/1000 SFP plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX648	FastIron Edge X648 with Base L3 SW includes 44-port 10/100/1000 plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port and one AC power supply.
FESX648-PREM	FastIron Edge X648 with Full IPv4 L3 SW includes 44-port 10/100/1000 SFP plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port and one AC power supply.
FESX648-DC	FastIron Edge X648 with Base L3 SW includes 44-port 10/100/1000 (RJ-45) plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port and one DC power supply.
FESX648-PREM-DC	FastIron Edge X648 with Full IPv4 L3 SW includes 44-port 10/100/1000 SFP plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port and one DC power supply.
FESX648+2XG	FastIron Edge X648 with Base L3 SW includes 44-port 10/100/1000 plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX648+2XG-PREM	FastIron Edge X648 with Full IPv4 L3 SW includes 44-port 10/100/1000 SFP plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet and one AC power supply.
FESX648+2XG-DC	FastIron Edge X648 with Base L3 SW includes 44-port 10/100/1000 (RJ-45) plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX648+2XG-PREM-DC	FastIron Edge X648 with Full IPv4 L3 SW includes 44-port 10/100/1000 (RJ-45) plus 4-port Combo copper/fiber Gigabit Ethernet ports 10/100/1000 Mbps (RJ45) or Gigabit Ethernet Fiber (SFP) connectivity per port, 2-port XFP 10 Gigabit Ethernet and one DC power supply.
FESX624-L3U-IPV4	Full IPv4 Layer 3 software upgrade for FESX624 and FESX624HF. This software upgrade adds support for IPv4 routing protocols such as RIPv1/v2, OSPF, BGP4, and multicast routing, including PIM-SM, PIM-DM, and DVMRP.
FESX648-L3U-IPv4	Full IPv4 Layer 3 software upgrade for FESX648. This software upgrade adds support for IPv4 routing protocols such as RIPv1/v2, OSPF, BGP4, and multicast routing, including PIM-SM, PIM-DM, and DVMRP.
X6-2XG	Field upgradeable 2-port 10GbE XFP expansion module for the FESX624, FESX624HF and FESX648.
RPS-X424	Redundant power supply (220W) for the FESX424, FWSX424 and FESX624.
RPSDC-X424	Redundant DC power supply (220W) for the FESX424, FESX624 and FWSX424.
RPS-X448	Redundant power supply (600W) for the FESX448, FESX648 and FWSX448.
RPSDC-X448	Redundant DC power supply (600W) for the FES X448 and FWS X448.
RPS8DC	Redundant -48V DC Power Supply for the FESX448, FWSX448 and FESX648 only.
RPS-X424-POE	Redundant power supply (600W) for the FESX424-POE.
RPSDC-X424-POE	Redundant DC (600W) for the FESX424-POE

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