FastIron® XE Series

HIGH CAPACITY, INTELLIGENT, COMPACT ROUTING SWITCHES

HIGHLIGHTS

- FastIron Edge XE Series switches increase a network's return on investment (ROI) and decrease total cost of ownership (TCO) by offering high routing capacity, superior functionality, advanced security, and IPv6 future-proofing in a compact form factor at industry-leading prices.
- Expanded Layer 3 routing capacity for up to 512,000 IPv4 and 64,000 IPv6 unique unicast routes in hardware gives enterprises and service providers dense routing scalability in a compact form factor that saves rack space and power and reduces TCO.
- Up to 20 BGP peers and 1 million non-unique BGPv4 routes give large enterprises and service providers multiple views of the Internet routing table.
- Advanced IronWare™ Layer 2 Ethernet switching and full Layer 3 IPv4 and IPv6 service sets, including support for IPv4 protocols such as RIPv1/v2, OSPF, BGP, PIM, PBR, IGMP, VRRP(E), and IPv6 protocols such as RIPng, OSPFv3, IPv6 Static Routing, IPv6 ACL and IPv6-to-IPv4 static tunnels.
- Robust multicast performance with PIM routing, IGMPv1/v2/v3 Snooping, MLDv1/v2 Snooping, IGMP/MLD Fast Leave, Multicast Storm Control and up to 4,000 multicast forwarding entries in hardware.
- SP/WRR queuing, DiffServ QoS, and deep external buffers ensure low latency and jitter, and wire speed performance for aggregation and provisioning of quadruple play services.
- A rich suite of security features including 802.1x, MAC Authentication, Port Security, IP Source Guard, Dynamic ARP Inspection, and DHCP Snooping shield the enterprise from internal and external threats.
- Embedded, hardware-based sFlow™—the industry standard for network traffic monitoring—enables network-wide accounting, utilization reporting, capacity planning, intrusion detection, and more.
- IronShield™ 360 intrusion protection delivers dynamic and real-time protection from network-and host-based attacks.

Overview

The success of IP in the Internet and enterprise networks has spurred dramatic increases in the number of IP endpoints in both environments. With the Internet routing table approaching a quarter million routes, existing infrastructure is being pushed to its limits. FastIron Edge X Expanded Series (FESXE) switches provide a compact and cost-effective solution to address an organization's immediate need, as well as headroom for future growth. Additionally, the dual-stack IPv4/IPv6 feature set in paves the way for a graceful transition to IPv6. Designed for large scale growth and IPv6 migration, FESXE Series switches maximize ROI by helping organizations to scale their networks on a platform that can adapt to tomorrow's changing requirements.

FastIron Edge XE Series switches offer expanded Layer 3 routing capacity and scalability in a compact package. FastIron Edge XE Series switches deliver greater flexibility, higher reliability, enhanced security, and extensive redundancy for better operational efficiency and faster response to business opportunities today and into the future.

FOUNDRY® NETWORKS

By coupling greater capacity with wire-speed performance, superior functionality, embedded security, IPv6 capability, low power consumption and compact size, FastIron Edge XE Series switches can significantly increase a network's ROI and decrease TCO.

To meet existing and emerging network requirements, FastIron Edge XE Series switches support advanced Layer 2 features, such as BPDU Guard, Root Guard, and Metro Ring Protocol; full Layer 3 routing capabilities; complete Quality of Service (QoS) controls, including prioritization and rate limiting, advanced IPv4 protocols such as RIPv1/v2, OSPF, BGP, PIM, PBR, IGMP, and VRRP(E), and IPv6 protocols such as RIPng, OSPFv3, IPv6 Static Routing, IPv6 ACL and IPv6-to-IPv4 static tunnels; and Foundry's IronShield™ for Denial of Service (DoS) protection.

FastIron Edge XE Series switches also feature 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 10GbE modules in a 1.5 rack unit (RU) form factor. The FastIron Edge XE Series can be initially installed using "small form pluggable" (SFP) Gigabit Ethernet modules, then field-upgraded with a two "10 Gigabit small form factor pluggable" (XFP) module, extending the usability of the product.

CONFIGURATION ALTERNATIVES

FastIron Edge XE Series switches are optimized for flexibility, reliability, enhanced security, and extensive redundancy. Available in three configurations, these switches help enterprises and service providers reduce costs and increase ROI by offering superior features and advanced security at industry-leading prices.

FESX624E-PREM6

- 24 x 10/100/1000 Mbps copper ports with 4 combo ports
- 2-port 10GbE factory-orderable or field upgradable
- 1+1 system power redundancy-capable with AC/DC option
- Ships with advanced Layer 2 and full Layer 3 IPv4+IPv6 software

FESX648E-PREM6

- 48 x 10/100/1000 Mbps copper ports with 4 combo ports
- 2-port 10GbE factory-orderable or field upgradable
- 1+1 system power redundancy-capable with AC/DC option
- Ships with advanced Layer 2 and full Layer 3 IPv4+IPv6 software

FESX624HFE-PREM6

- 24 x 100/1000 Mbps SFP fiber ports with 4 combo ports
- 2-port 10GbE factory-orderable or field upgradable
- 1+1 system power redundancy-capable with AC/DC option
- Ships with advanced Layer 2 and full Layer 3 IPv4+IPv6 software

Target Applications

The feature-rich and scalable FastIron Edge XE IPv4/IPv6 switch is an ideal edge solution for large enterprises, government organizations and service providers, including content delivery network operators with dense edge and aggregation routing requirements.

INTERNET ROUTING FOR LARGE ENTERPRISES

FastIron Edge XE Series switches provide high BGP routing capacity in a compact form factor. These switches are capable of supporting multiple EBGP and IBGP peers to share up to 1 million BGP routing advertisements among peers. The separate 512,000 IPv4 and 64,000 IPv6 routing table entries easily store the current full Internet routing table as well as internal routes learned. FastIron Edge XE Series switches can also forward IPv4 and IPv6 packets at wire speed to learned routes.

CONTENT DELIVERY NETWORK

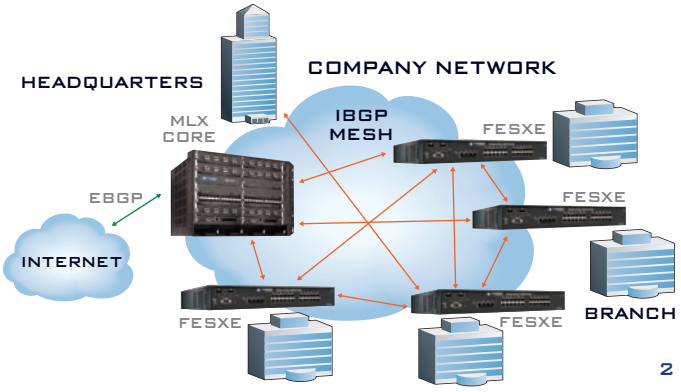
A Content Delivery Network (CDN) is a very efficient and scalable way to deliver content from the data center and storage network to end users over the Internet in the. FastIron Edge XE Series switches provide the required routing and IP next-hop space to route traffic to the Internet through the nearest site, while providing site-to-site connectivity through a high speed Metro Ring. The wire speed performance of FastIron Edge XE Series switches, combined with robust QoS and deep packet buffers, can easily handle burstiness and prioritize critical content.

ISP TRANSIT CONNECTIVITY

The Internet is a collection of large and small Internet Service Providers (ISPs) that share Internet routes with each other to make Internet destinations reachable by end users and enterprises. Most of these routes are shared through External BGP peering among the ISPs because of policy implementation and the route filtering capabilities of BGP. These policies dictate which packets can or cannot traverse an ISP's Autonomous System (AS).

The high BGP routing capacity and compact size make FastIron Edge XE Series switches an ideal top-of-the-rack BGP box. They support multiple EBGP and IBGP peers that can share up to 1 million BGP routing advertisements. The large routing table space easily stores all routes that may be required by the local AS. The FastIron Edge XE Series switches cans also forward IPv4 and IPv6 packets at wire speed to neighboring peers.

FIGURE 1: EXAMPLE APPLICATION OF FESXE SERIES SWITCHES IN A LARGE ENTERPRISE NETWORK



Primary Features and Benefits

ADVANCED QOS TO ENSURE HIGH AVAILABILITY AND SUPERIOR DATA TRAFFIC INTEGRITY

FastIron Edge XE Series switches are ideal for high-value environments that offer superior QoS features that enable network administrators to provide and ensure high-quality services throughout the network. The FastIron Edge XE Series switch identifies, classifies, re-classifies, polices, and marks traffic prior to delivery based on specific criteria. Available criteria types include 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, traffic is queued and scheduled for delivery—a network administrator has complete control over how the system services the queues. Weighted, adjustable Round Robin (WRR) queuing ensures that all packets are delivered and lower-priority packets are not starved for bandwidth. Strict Priority (SP) queuing ensures highest-priority traffic is always serviced first. SP combined with WRR guarantees highest-priority traffic delivery and equal servicing of lower priority queues.

FastIron Edge XE Series switches perform rate-limiting for granular control over bandwidth utilization. On ingress, extended ACLs combined with rate limiting traffic policies, can balance, fine-tune, and control bandwidth consumption. On egress, outbound rate limiting controls bandwidth per port and per priority queue. Combined voice, video, and high-speed data services are delivered throughout a unified network without experiencing reduced performance.

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 with 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 benefit from 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. FastIron Edge X Series switches use PIM Snooping to acquire multicast routes, and intelligently switch multicast traffic instead of blindly broadcasting multicast traffic in the Layer 2 domain.

IRONSHIELD™ SECURITY—COMPLETE NETWORK PROTECTION

FastIron Edge X Series switches support user-configurable levels of security, such as MAC address lockdown. A network administrator can assign a single MAC address or a group of addresses to an individual port to prevent unauthorized access. Using Remote Authentication Dial-In User Service (RADIUS) authentication servers, and 802.1x port-based authentication, the FastIron Edge X Series switch authenticates the user before allowing the port to transmit data to the network. This feature also provides secure mobility, and maintains the integrity and security of the network against breaches.

To protect the network against DoS attacks, a network manager can disable forwarding of ICMP messages and enable rate limiting of ICMP and TCP SYN packets. The FastIron Edge XE Series switch monitors, throttles, and locks out ICMP and TCP SYN traffic to the management address of the switch, and for traffic in the system. This feature secures and protects the network from user-generated DoS attacks, or inadvertently assisting one. FastIron Edge X Series switches also support DHCP snooping, Dynamic ARP inspection, and IP Source Guard, which work together to deny spoofing attempts and to defeat man-in-the-middle attacks.

Once a port is operational, a network administrator can use regular and extended ACLs to control access to and through the network, and enable control policies that permit or deny traffic based on a variety of identification characteristics, such as source/destination MAC addresses, source/destination IP addresses, and TCP/UDP ports/sockets or well-known port numbers. These control policies further protect network access from malicious users. FastIron Edge X Series switches implement ACL lookups in hardware, protecting switching and routing performance. Enhanced spanning tree features such as Root Guard and BPDU Guard prevent rogue hijack attempts on the spanning tree root, and help maintain a contention and loop-free environment, which is especially important during dynamic network deployments.

SFLOW—ALWAYS-ON WIRE-SPEED NETWORK MONITORING

All models of the FastIron Edge XE Series switches support sFlow,™ a unique solution for simplified network management. Switch deployment in a networking infrastructure increases overall network performance, but may interfere with the ability to view an overall picture of network capacity, bandwidth consumption, utilization, and network health. sFlow delivers real-time, complete network visibility, so that network managers can manage every transaction in the network. sFlow uses the built-in capability of the FastIron Edge X Series switch ASICs to collect and aggregate details on traffic from Layer 2 through Layer 4, and automatically delivers information to the IronView® Network Management station. IronView Network Management uses a Java-based network configuration and management tool

that displays network and application-level traffic in graphical detail, allowing the network manager to accurately review overall network operations, focus 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 AND AVAILABILITY

FastIron Edge XE Series switches are designed for maximum system availability, with redundant load-sharing power supplies, hot swappable components and failure protection features. High availability capabilities support extremely reliable network deployments that are resilient against, and tolerant of, network and equipment failures.

FastIron Edge XE Series switches include internal power redundancy features, which are only available in a modular chassis. Every FastIron Edge XE Series switch ships with a single AC (or DC) power supply, and adding an additional power supply provides 1+1 redundancy. AC/DC power supplies are hot-swappable and load-shared, critical for delivering power redundancy and deployment flexibility.

FastIron Edge XE Series switches supports hot swappable power supplies to ensure minimal downtime during replacement.

- **Protection through Virtualization**
  FastIron Edge XE Series switches support network virtualization features that hide unnecessary details from end devices and ensure an always-on network in the event of a component or complete node failure.

  Virtual Switch Redundancy Protocol (VSRP) and Enhanced Virtual Router Redundancy Protocols (VRRPE) provide redundancy and sub-second failover in networks. If the active switch becomes unavailable, a backup switch takes over and continues forwarding traffic.

  The Trunk Group feature allows load-sharing links between two Foundry switches or between a Foundry switch and a server. In addition to traffic load sharing, trunk groups provide redundant, alternate paths if any of the segments fail. Foundry software also supports the IEEE 802.3ad standard for link aggregation (LACP).

  The Protected Link Group feature minimizes disruption to the network by protecting critical links from loss of data and power. One port in the group acts as the primary or active link, and the other ports act as secondary or standby links. The active link carries the traffic. If the active link goes down, one of the standby links takes over.

  The Multiport Static MAC feature allows mapping of multiple ports or trunks to a cluster of devices, such as servers or firewalls, with a virtual MAC address for load balancing and fault tolerance.

- **Protection through Loop Avoidance**
  The Spanning Tree Protocols (STP, RSTP) and Port Loop Detection features in FastIron Edge XE Series switches detect and prevent loops in a Layer 2 network, preventing multicast broadcast storms that can bring an entire network down. Route filtering capabilities with route redistribution prevent Layer 3 loops.

- **Link Level Failure Protection**
  FastIron Edge XE Series switches support Unidirectional Link Detection (UDLD), Link Fault Signaling (LFS) and Remote Fault Notification (RFN) to detect and protect against link failures and fiber cuts.

ADVANCING THE INTELLIGENT EDGE FOR NEXT-GEN SERVICES

FastIron Edge XE Series switches provides scalable, secure, low-latency, and fault-tolerant infrastructure for cost-effective integration of VoIP, video, wireless, and data based service provisioning.

- **High Capacity Routing in Compact Size**
  FastIron Edge XE Series switches feature expansive routing capacities that scale to 512,000 IPv4 hardware routes, 64,000 IPv6 hardware routes, and 4,000 multicast hardware routes. For route distribution and calculation, FastIron Edge XE Series switches can support up to 1,000,000 BGPv4 routing advertisements. These capacities make FastIron Edge XE Series switches some of the leading capacity 1.5 RU compact routing switches in the market.

  The Foundry IronWare software in FastIron Edge XE Series switches includes optional support for IPv4 routing features such as IPv4 Static Routing, PBR, RIPv1/v2, OSPFv2, BGPv4, PIM-SM, PIM-DM, IGMP, ECMP or the IPv6+IPv4 routing feature set such as IPv6 Static Routing, RIPng and OSPFv3 and all the IPv4 protocols. (BGP+ will be added in the future). FastIron Edge XE Series switches present a future-ready solution that provides wire-speed IPv4 and IPv6 forwarding, including IPv6-to-IPv4 tunnels to facilitate smooth network migration.

- **Migration to IPv6 based Networks**
  Migration to IPv6 is inevitable. Deploying fully IPv6-capable switches now can make it easier to control the transition and less disruptive to the network. Today's networks are in the early stages of large-scale IPv6 production deployment as more innovative IPv6 applications become available. Although the success of IPv6 will ultimately depend on the new applications, 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 migration from IPv4 to IPv6.

  Foundry's completely IPv6-capable FastIron Edge XE Series switches, combined with other Foundry products such as BigIron® and NetIron®, provide the industry's most complete end-to-end IPv6 solution. IPv6-capable FastIron Edge XE

Series switches allow network managers to future-proof their enterprise and service provider networks to support IPv6 services. The high performance levels of the FastIron Edge XE Series switches, combined with security, convergence, and complete IPv4/IPv6 visibility using sFlow, provides an extremely robust and versatile edge-to-core IPv6 solution.

- **Cost Effective Metro Access Solution**
  Foundry IronWare software in FastIron Edge XE Series switches includes metro features such as Metro Ring Protocol, Virtual Switch Redundancy Protocol, Super Aggregated VLAN, and Protected-Link. FastIron Edge XE Series switches also include 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.

  FastIron Edge XE Series switches are ideal for 1GbE service delivery within a 10GbE metro access infrastructure. These switches can be equipped with an expanded 2-Port 10GbE module populated with XFP optics capable of reaching distances of up to 40 km, allowing metro service providers to connect multiple points-of-presence with 10GbE. This solution optimizes the fiber infrastructure usage and delivers high-speed service offerings, such as remote backup or remote datacenter facilities.

GREEN NETWORK—LOWER TOTAL COST OF OWNERSHIP

- **Less Power Consumption and Rack Space**
  The compact 1.5RU size of FastIron Edge XE Series switches saves rack space and provides many of the features of a Layer 3 chassis-based system. Due to the compact size, FastIron Edge XE switches consume less power and dissipate less heat, requiring less cooling saving on operating expenses and lowering the TCO.

- **Future-Proofing with IPv6**
  Networks that rely on FastIron Edge XE Series switches have IPv6-capable hardware and software and are ready to deliver IPv6 based services. Preparing for IPv6 now requires a single upgrade cycle (instead of many possible cycles) and less down-time for the inevitable migration, which will reduce future capital expenses and TCO.

- **Open Standards**
  Foundry believes in supporting more standard-based features and protocols than proprietary ones. We want to help our customers avoid being locked to a single vendor or having to deal with expensive solutions and ongoing costs.

- **Flexible Network Deployment**
  Foundry's FastIron Edge XE Series switches deliver high-density 10/100/1000 Mbps and 10GbE solutions for flexible networks. FastIron Edge XE Series switches can be ordered (or field-upgraded), with a 2-Port 10GbE module supporting one or two low cost XFP optics, for interconnectivity and redundancy across an entire network campus.

Key Features and Benefits

FEATURES	BENEFITS
High Capacity IPv6 and IPv4 Routing	▶ IPv4 routing support including IPv4 Static Routing, PBR, RIPv1/v2, OSPFv2, BGPv4, PIM-SM, PIM-DM and ECMP ▶ IPv6 routing support including IPv6 Static Routing, RIPng and OSPFv3 (BGP+ roadmap) ▶ Smooth migration from IPv4- to IPv6-based network with IPv6-to-IPv4 static tunneling
IronShield Advanced Security	▶ 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, Secure Copy, 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 ▶ 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 ▶ Byte-based and packet-based broadcast, multicast, and unknown unicast rate limiting ▶ ACL log reports provide source detail for denied packets ▶ ACL-based Port Mirroring enables IP monitoring for CALEA and related law enforcement traffic monitoring ▶ Enhanced MAC filtering to include Denial of Service protection ▶ MAC address authentication including multiple device authentication and dynamic policy configuration ▶ Enhanced port security for controlling access of authorized users
Advanced Quality of Service	▶ Classification, reclassification, policing, and marking the traffic prior to delivery ▶ Identification, classification, and reclassification based on specific criteria (ACL-based) 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 using configurable Weighted Round Robin (WRR), Strict Priority (SP), or combined SP/WRR ▶ Eight hardware queues for flexible QoS management ▶ Ingress rate limiting—standard and extended ACL control, per VLAN, per port ▶ Egress rate shaping per port
System and Network Resilience	▶ Redundant, hot-swappable, load-sharing 1+1 power supplies ▶ Advanced protocols for topology resilience such as Foundry's Metro Ring Protocol (MRP), Virtual Switch Redundancy Protocol (VSRP) Virtual Router Redundancy Protocol (VRRP), Enhanced VRRP (VRRPE) and Enhanced Digital Optical Monitoring
Multicast for Real-Time Applications	▶ Advance multicast routing including IGMP, PIM Sparse and Dense mode for Financial, MSO/IPTV and Voice/Video delivery networks ▶ IGMP and MLD Snooping and Fast Leave features enable highly efficient multicast forwarding and reduce latency in time-sensitive voice and video multicast delivery ▶ Ability to learn same multicast MAC on different ports for applications like Microsoft NLB and NetScreen Firewall to announce load-balancing services. ▶ Ability to control selective control-protocol multicast group forwarding to CPU
IPv6 Management	▶ IPv6 ACL ▶ IPv6 addresses on the interfaces ▶ IPv6 debugs ▶ IPv6 Access Control Lists (ACL) to management ports ▶ IPv6 Web management using HTTP/HTTPS ▶ IPv6 logging ▶ Name-to-IPv6 address resolution using IPv6 DNS server ▶ IPv6 Ping ▶ IPv6 Traceroute ▶ IPv6 Telnet/SSH ▶ SNMPv3 over IPv6 ▶ IPv6 RADIUS ▶ IPv6 NTP

System Summary

FEATURE	FASTIRON EDGE X624E	FASTIRON EDGE X624HFE	FASTIRON EDGE X648E
Switching Capacity	88 Gbps	88 Gbps	136 Gbps
Packet Forwarding Capacity	65 Mpps	65 Mpps	101 Mpps
Processor	466 MHz	466 MHz	420 MHz
Memory Options	512 M	512 M	512 M
IPv4 Routes	512,000	512,000	512,000
IPv6 Routes	64,000	64,000	64,000
BGP Non-Unique Routes	1,000,000	1,000,000	1,000,000

Port Density

PORT TYPE	FASTIRON EDGE X624E		FASTIRON EDGE X624HFE		FASTIRON EDGE X648E	
	PER SWITCH	PER RACK	PER SWITCH	PER RACK	PER SWITCH	PER RACK
100 Base FX (SFP)	0	0	24	672	0	0
1000 Base X (SFP)	4	112	24	672	4	112
1000 Base T (RJ45)	24	672	4	112	48	1344
10/100/1000 Total (SFP+RJ45)	24	672	24	672	48	1344
10G Bases X (XFP)	2	56	2	56	2	56

System Power Draw

	SYSTEM MAX DRAW (MAX DRAW FROM CIRCUIT)				SYSTEM MAX OUTPUT (OUTPUT PER POWER SUPPLY)	MAX THERMAL OUTPUT	POWER/GIG
	Current @ 100 VAC (Amps)	Current @ 200 VAC (Amps)	Current @ 40 VDC (Amps)	Power (watts)	Power (watts)	Thermal (BTU/Hr)	(Watts/GbE)
FastIron Edge X624E	3.5	1.5	9.0	300-360	220	1024-1229	12.5-15.0
FastIron Edge X624HFE	3.5	1.5	9.0	300-360	220	1024-1229	12.5-15.0
FastIron Edge X648E	8.0	3.2	18.0	640-800	600	2185-2731	45.5-56.8

Technical Specifications

STANDARDS COMPLIANCE

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

RFC COMPLIANCE

Protocol Support

- DNS Client
- RFC 1812 IP
- RFC 2338 VRRP
- VRRPE (Foundry 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 w/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
- RFC 1112 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

IPv6 Core:

- RFC 4291 IPv6 Addressing architecture
- RFC 1886 DNS Extensions to support IPv6
- RFC 1887 IPV6 Unicast address allocation architecture
- RFC 3587 IPv6 Global Unicast address format
- RFC 2450 Proposed TLA and NLA Assignment Rules
- RFC 2471 IPv6 testing address allocation
- RFC 2526 Reserved IPv6 subnet anycast address
- RFC 2928 Initial IPv6 sub TLA ID assignments
- RFC 2460 IPv6 Specification
- RFC 4861 IPv6 Neighbor Discovery
- RFC 4862 IPv6 Stateless Address Auto-configuration
- RFC 4443 ICMPv6
- RFC 3513 IPv6 Addressing Architecture
- RFC 1981 IPv6 Path MTU Discovery
- RFC 3587 IPv6 Global Unicast Address Format
- RFC 2375 IPv6 Multicast Address Assignments
- RFC 2464 Transmission of IPv6 over Ethernet Networks
- RFC 2711 IPv6 Router Alert Option
- RFC 3363 DNS support

IPv6 Routing

- RFC 2080 RIPng for IPv6
- RFC 2740 OSPFv3 for IPv6

IPv6 Multicast

- RFC 2710 Multicast Listener Discovery (MLD) for IPv6
- RFC 3306 Unicast-Prefix-based IPv6 Multicast Addresses
- RFC 3810 MLDv2

IPv6 Transitioning

- RFC 4213 Transition Mechanisms for IPv6 Hosts and Routers

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

SYSTEM MANAGEMENT

- Foundry IronView Network Manager (INM)
- Web-based Graphical User Interface
- Embedded Web Management
- Industry Standard Command Line Interface (CLI)
- RMON HP OpenView for Sun Solaris
- HP-UX, IBM's AIX, and Windows NT
- Virtual Cable Tester
- Repeater MIB

ELEMENT SECURITY

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

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 both

PHYSICAL DIMENSIONS

FESX624E
- 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)

FESX624HFE
- 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)

FESX648E
- 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

FESX624E
- 25 lbs (11.36 kg) Fully Loaded including dual redundant power
- 17.5 lbs (7.95 kg) Empty

FESX624HFE
- 25 lbs (11.36 kg) Fully Loaded including dual redundant power
- 17.5 lbs (7.95 kg) Empty

FESX648E
- 29 lbs (13.2 kg) Fully Loaded including dual redundant power
- 17.5 lbs (7.95 kg) Empty

POWER SUPPLIES

RPS-X424 (FESX624E, FESX624HFE)
- 100–120 VAC Consumption (Amps): 3.5A MAX
- 200–240 VAC Consumption (Amps): 1.5A MAX
- AC Frequency: 50–60Hz
- Max Watts (Output): 220W (750 BTU/Hr)

RPSDC-X424 (FESX624E, FESX624HFE)
- -40– -60 VDC Consumption (Amps): 9A MAX
- Max Watts (Output): 220W (750 BTU/Hr)

RPS-X448 (FESX648E)
- 100–120 VAC Consumption (Amps): 8A MAX
- 200–240 VAC Consumption (Amps): 3.2A MAX
- AC Frequency: 50–60Hz
- Max Watts (Output): 600W (2,047 BTU/Hr)

RPSDC-X488 (FESX648E)
- -40– -60 VDC Consumption (Amps): 18A MAX
- Max Watts (Output): 600W (2,047 BTU/Hr)

OPTICS

100M Optics
- 100FX-SR, 100FX-IR, 00FX-LR, 100Base-BXD/BXU

1000M Optics
- SX, SX2, LX, LHA, LHB, 1000Base BXD/BXU, CWDM

10G Optics
- SR, LR, ER, ZR, 1310-MM, ZRD Foundry's 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

ENVIRONMENTAL

- 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)
- Storage altitude: 10,000ft (3,000 m) maximum

ENVIRONMENTAL REGULATORY COMPLIANCE

- RoHS Compliant (5 of 6)
- WEEE Compliant

ELECTRONIC EMISSION CERTIFICATION

- FCC Class A (Part 15)
- EN 55022/CISPR-22 Class A
- VCCI Class A
- ICES-003
- AS/NZS CISPR 22 Class A
- KN22
- EN 61000-3-2, Power Line Harmonics
- EN 61000-3-3, Voltage Fluctuation a Flicker
- EN 61000-6-3, Generic Emissions Standard

SAFETY COMPLIANCE

- EN 60950-1 Information Technology Equipment—Safety—Part 1: General Requirements
- EN 60825-1 Safety of Laser Products—Part 1
- EN 60825-2 Safety of Laser Products—Part 2
- IEC 60950-1 Information Technology Equipment—Safety—Part 1: General Requirements
- UL 60950-1 Information Technology Equipment —Safety—Part 1: General Requirements
- CSA 60950-1-03 Information Technology Equipment—Safety—Part 1: General Requirements

IMMUNITY

- Generic: EN 55024
- Generic: EN 61000-6-1

WARRANTY

- 5-Year Limited Lifetime Hardware Warranty Foundry warrants that, excluding the power supply, fan, removable optics and LED, the product hardware will be free from defects in material and workmanship that result in a material deviation from the applicable published Foundry technical specifications.
- 90-Days Limited Software Warranty Foundry warrants that software, when used in accordance with the terms of the Foundry license, will operate substantially as set forth in the applicable Foundry Documentation following delivery of the software to licensee.

FOUNDRY NETWORKS

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Foundry Networks, Inc. (NASDAQ: FDRY) is a leading provider of high-performance enterprise and service provider switching, routing, security and Web traffic management solutions, including Layer 2/3 LAN switches, Layer 3 Backbone switches, Layer 4-7 application switches, wireless LAN and access points, metro and core routers. Foundry's customers include the world's premier ISPs, metro service providers, and enterprises, including e-commerce sites, universities, entertainment, health and wellness, government, financial and manufacturing companies. For more information about the company and its products, call 1.888.TURBOLAN or visit www.foundrynet.com.

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