



# STACKABLE

A Complete Line of Award-Winning Stackable Switches and Switching Routers

Offers Ethernet, Fast Ethernet and Gigabit Ethernet Connectivity

Delivers Wire-Speed Performance and Layer 2/3/4-7 Switching

Packed with advanced features, including VLANs, Server Load Balancing, QoS, Server and Inter-switch Trunk Groups and Multicast Support

# SWITCHES & SWITCHING ROUTERS



**Foundry Networks' award-winning switches and multi-protocol switching routers** deliver wire-speed performance and the flexibility of 10, 100 and 1000 megabits per second (Mbps) connectivity in a slim-line stackable form factor.

Foundry products include the industry's most advanced features and provide the performance needed to support today and tomorrow's applications. Virtual LANs (VLANs) give network managers the flexibility to assign VLANs on a port, protocol, sub-net or IEEE 802.1q tagged basis. Foundry's flexible switching allows users to maximize network performance

with Layer 2, Layer 3 or Layer 4-7 switching.

All Foundry products include quality of service (QoS) and multicast features that ensure availability of mission-critical data and bandwidth-hungry multimedia applications.

Based on a robust and flexible architecture, Foundry switches and routers support large MAC address and routing tables. Foundry backbone switches also can be field upgraded to provide multilayer switching, full multi-protocol routing capabilities and Layer 4-7 switching.

Transparently scaleable from 10 to 1000 Mbps, Foundry products leverage existing network infrastructures and provide investment protection.

Auto-sensing, auto-negotiating 10/100 Mbps ports simplify network administration by automatically learning the operating speed of directly attached devices.

Foundry's Gigabit Ethernet options include multi-mode 1000BaseSX support for intra-building connectivity and single-mode 1000BaseLX for Gigabit Ethernet connectivity throughout the campus, as well as 1000BaseT uplinks for desktops and servers. Corporations that want to extend the performance of Gigabit Ethernet across a metropolitan area network can use Foundry's enhanced single-mode option at distances up to 150 kilometers.

## Foundry Stackable Switches

### FastIron Workgroup Switch

Foundry's FastIron™ Workgroup Switch offers Fast and Gigabit Ethernet switching. Enterprises that previously deployed hubs can now use the speed and dedicated bandwidth of switching to increase LAN performance and provide QoS to their network.

The FastIron Workgroup Switch cost-effectively accelerates performance in workgroups and servers. Features such as 4,000 MAC addresses, QoS, Layer 4 TCP/UDP session switching, optional redundant power and a complete set of network management applications enable the FastIron Workgroup Switch to support mission-critical data and bandwidth-hungry multimedia applications.

### FastIron and TurboIron/8 Backbone Switches

Foundry's award-winning FastIron Backbone and TurboIron™/8 Switches provide immediate relief for congested networks. The FastIron Backbone Switch increases backbone performance and eliminates server congestion with 10, 100 and 1000 Mbps switching. The TurboIron/8 Switch delivers the power of an all Gigabit Ethernet solution to today's enterprise.

Designed for use in demanding networks, Foundry backbone switches learn and cache up to 32,000 MAC addresses in high-speed content addressable memory (CAM). Both switches offer the flexibility of wire-speed Layer 2, Layer 3 and Layer 4-7 switching on a single platform.

FastIron Backbone and TurboIron/8 Switches include Foundry's multilayer switching (MLS) feature. Multilayer switching enables Foundry backbone switches to transparently perform processing-intensive IP and IPX traffic forwarding, freeing existing routers to handle topology management and non-IP and IPX traffic. This capability off-loads traditional routers up to 80 percent, greatly improving performance and eliminating the need for costly upgrades.

Enterprises that require additional routing capabilities can field upgrade a Foundry FastIron Backbone or TurboIron/8 Switch to provide wire-speed, multi-protocol routing.

## Foundry Stackable Switching Routers

### NetIron and TurboIron/8 Switching Routers

Foundry's award-winning NetIron™ and TurboIron/8 switching routers boost Layer 3 performance and eliminate bottlenecks with wire-speed, multi-protocol routing. Enterprises can use Foundry routers to build a high performance backbone that provides efficient support for unpredictable Intranet traffic. NetIron provides 10, 100 and 1000 Mbps connectivity, while TurboIron/8 offers all Gigabit Ethernet backbone routing.

Standard IP, IPX, RIP, OSPF, AppleTalk and IP multicast routers, NetIron and TurboIron/8 interoperate seamlessly with installed networks. Built to provide consistently high network performance, Foundry routers accelerate Layer 2 and Layer 3 functions in hardware; forwarding, topology management and switching are performed at wire-speed.

Foundry switching routers provide up to 20 times the performance of traditional routers at less than 10 percent the cost. Able to handle mission critical networks with ease, Foundry routers support up to 200,000 routes. Unlike proprietary schemes that require new protocols, NetIron and TurboIron/8 simply accelerate existing protocols and all traffic flows. This eliminates the risk and cost associated with adopting new protocols and ensures interoperability with existing routers.

## Foundry Advanced Features

### Delivers QoS to Today's Frame-Based Networks

Foundry's selectable quality of service (QoS) is a simple yet effective technique that provides the benefits of quality of service in a frame-based network. With selectable QoS, even delay sensitive applications receive the bandwidth they need. Selectable QoS has three levels of functionality that can be enabled on FastIron, NetIron and TurboIron/8 switches and switching routers.

Level I minimizes the impact of queuing delays by providing normal or high traffic prioritization and IEEE 802.3x flow control for individual users, servers, ports or VLANs.

Level II transparently extends the benefits of quality of service across switch boundaries through a combination of 802.1p/q VLAN Tagging and normal or high traffic prioritization.

Level III enables network-wide QoS through Layer 4 switching. TurboIron/8 switches and switching routers include 4 levels of hardware priority for Layer 2, Layer 3 and Layer 4 prioritization.

### **Enables Multimedia Applications and Reduces Traffic**

Many emerging applications, such as video conferencing, are one-to-many or many-to-many transmissions in which one or many sources are sending to multiple recipients. Existing switches broadcast these transmissions to all ports, regardless of which port requires the information. This wastes valuable bandwidth and creates unnecessary traffic that slows down the network.

Foundry's hardware-based IGMP multicast traffic reduction feature, available on Foundry switches, forwards a single copy of a transmission only to those ports that request the message. This capability reduces overall network traffic, improving performance while conserving bandwidth.

Foundry switching routers include the industry's most complete suite of multicast protocols, including Internet Group Membership Protocol (IGMP), Distance Vector Multicast Routing Protocol (DVMRP) and Protocol Independent Multicast (PIM). These protocols enable network managers to efficiently support applications such as the distribution of stock quotes, video transmission of news services and distance learning.

### **VLANs Increase Flexibility and Performance**

All Foundry switches and routers support VLANs that give users the flexibility to assign VLANs on a port, protocol, sub-net or 802.1p/q tagged basis.

Foundry's VLANs simplify network address administration and increase available bandwidth. VLANs can be used to consolidate or isolate network traffic and enable managers to logically partition users and devices into virtual communities of interest. For example, a network manager can physically centralize servers, yet logically group servers and their client segments into the same VLAN.

Port-based VLANs allow managers to group specific port traffic into different broadcast domains, eliminating the risk of broadcast storms by maintaining distinct spanning tree domains. Up to 1,024 VLANs can be assigned to each Foundry FastIron switch or NetIron switching router. TurboIron/8 switches and switching routers support up to 4,096 policy-based VLANs.

Protocol and sub-net based VLANs increase network performance and provide managers with a high degree of network design flexibility. With sub-net VLANs, devices within a common sub-net can be resident across multiple ports of a Foundry switch or switching router. This increases performance by providing a greater pool of bandwidth for all devices.

Protocol VLANs enable managers to easily and transparently group like protocols into a defined VLAN. This reduces the number of nonessential broadcasts on other ports and allows a port to belong to multiple protocol VLANs without VLAN tagging, easing network design and administration.

VLAN tagging extends the benefits of VLANs throughout the network. Based on the 802.1p/q standard, VLAN tagging enables the creation of VLANs that cross switch boundaries. With tagging, multiple VLANs can be easily setup across a port or between switches, easing network management and ensuring interoperability between devices.

### **Integrated Switch Routing in a Single Device**

Integrated switch routing (ISR) enables Foundry switching routers to provide wire-speed routing and switching from a single device. With ISR, a single sub-net can span multiple ports. This allows managers to cost-effectively and seamlessly increase network bandwidth without changing the existing address and protocol architecture or installing additional equipment. ISR utilizes protocol VLANs to provide integrated routing between multi-port sub-nets, significantly easing network partitioning.

### **Increase Bandwidth and Network Resiliency**

Networks that need more bandwidth than a single, full-duplex link provides can use Foundry's trunk group

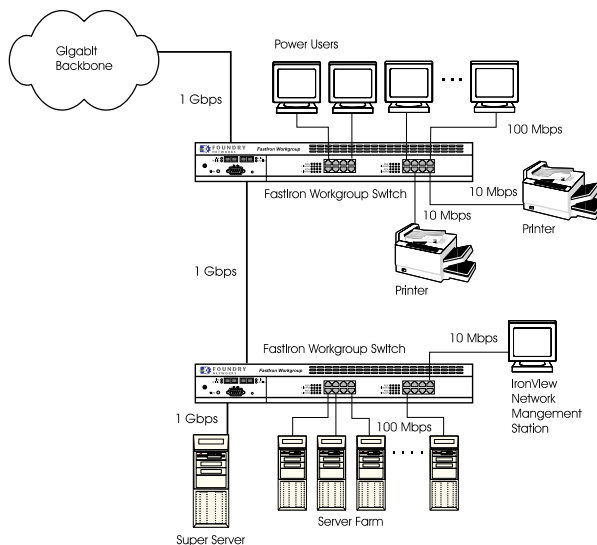
feature to build redundant, high-capacity links between switches or routers. Up to four 100 Mbps ports can be bundled together into one parallel, load-sharing link that delivers 800 Mbps of bandwidth. Gigabit Ethernet ports on FastIron switches and NetIron switching routers can be grouped together as well to provide up to 2 Gbps of bandwidth. TurboIron/8 switches and switching routers support up to 8 Gbps of redundant bandwidth. In the event of a failure, the remaining links are active, ensuring that traffic continues to flow.

Foundry switches and routers also include a server multi-homing capability that increases the performance of existing servers and provides network resiliency. With server multi-homing, managers can bundle up to four, full-duplex Fast Ethernet links into a single, load-sharing connection that delivers 800 Mbps. For even greater bandwidth, Foundry switches and routers can support up to four multi-homed connections per device.

### Layer 4-7 Switching with Internet IronWare

Foundry's FastIron Backbone and TurboIron/8 switches can be field upgraded to provide Layer 4-7 switching that improves the availability, performance and scalability of Internet services such as content publishing, web hosting and e-commerce. Foundry's Internet IronWare provides the FastIron Backbone and TurboIron/8 with an extensive suite of load balancing and transparent cache switching features that can be deployed concurrently for maximum flexibility and investment protection.

FIGURE 1



### Address Locking and Layer 3 Filtering for Network Security

Foundry switches include an address-locking feature which ensures that unauthorized users cannot access the network. With this capability, network managers can lock MAC addresses to a single port. In addition to providing network security on a per port basis, this feature can be used for fast and easy network provisioning.

Foundry's unique Layer 3 filtering capability allows network managers to easily and quickly build firewalls to prevent unauthorized network access. With Foundry routers, filters can be created based on IP source and destination addresses, as well as destination socket. This capability provides enterprises with an additional level of network security by ensuring that designated addresses cannot access corporate resources.

### DHCP Assist Streamlines Packet Flow

Dynamic Host Configuration Protocol (DHCP) eases network administration by eliminating the need to manually assign IP addresses. Foundry switches include a DHCP assist capability, which ensures that IP addresses are assigned to the proper sub-net by providing a pointer to the destination sub-net.

### Fail-safe Operations for Enterprise Networks

Foundry's Standby Router Protocol (FSRP) and Industry Standard Virtual Router Redundancy Protocol (VRRP) provide an additional level of redundancy to enterprise networks. FSRP and VRRP enable a Foundry router to act as a backup to other routers in the network. In the event of a router failure, the Foundry router will automatically and seamlessly perform the tasks of the failed router. This ensures that mission critical sessions are not lost and vital communication paths are not disrupted.

### Comprehensive Network Management with IronView

IronView network management provides a comprehensive and easy to use set of tools to simplify management of Foundry switches and routers. A command line interface (CLI) streamlines local and remote management and configuration. Simple Network Management Protocol (SNMP) device management and configuration applications are available on major platforms, including HP OpenView for Sun Solaris and

Windows NT, standalone Windows NT and web support, for quick and easy management. Foundry switches and routers also include Remote Monitoring (RMON) to simplify network monitoring and a mirror port for network tracing and troubleshooting.

## Application Scenarios

### FastIron WorkGroup Switch

The FastIron Workgroup Switch is a high-performance, low-cost solution for server farms and power workgroups. In shared 10 Mbps Ethernet environments, server links are quickly consumed, resulting in poor network performance. With a FastIron Workgroup Switch, network managers can establish a 100 or 1000 Mbps full-duplex connection to servers and dedicated 10 or 100 Mbps full-duplex connections to clients. This accelerates performance in server farms and provides workstations with sufficient bandwidth for power users and multimedia applications. [FIGURE 1]

Power workgroups contain high performance workstations that can easily oversubscribe shared 10 or 100 Mbps links. The FastIron Workgroup Switch provides dedicated 10 or 100 Mbps links to end-users. With support for 10, 100 and 1000 Mbps full-duplex Ethernet, the FastIron Workgroup Switch provides a scaleable and future-proof solution for enterprises that include bandwidth-hungry users. [FIGURE 2]

### FastIron Backbone Switch

When used as a collapsed Layer 2 backbone, the FastIron Backbone Switch enables network managers to collapse wiring closet segments into the network center and provide dedicated bandwidth to servers. Distributed segments or servers are connected to the FastIron Backbone Switch using 100 or 1000 Mbps links, providing each with a dedicated high-speed link to the network center. Existing 10 or 100 Mbps segments are connected to the backbone through a FastIron Workgroup Switch. [FIGURE 3]

### TurboIron/8 Backbone Switch

The TurboIron/8 Backbone Switch is a cost-effective, high-bandwidth solution that improves backbone and network center performance, and streamlines access to corporate resources that reside in server farms.

FIGURE 2

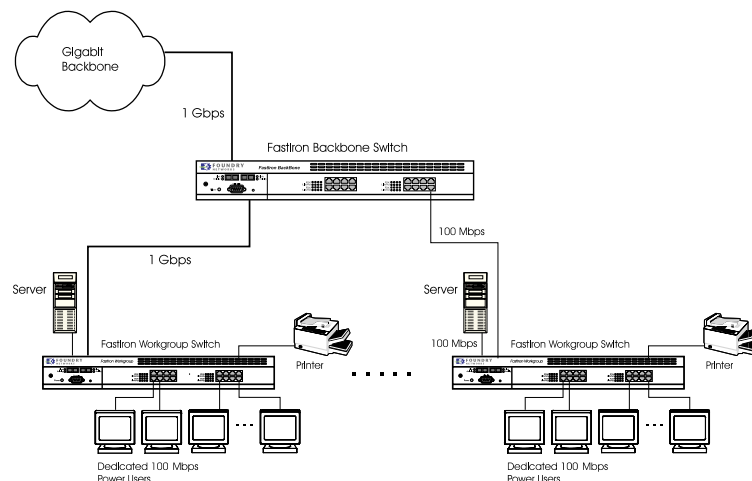


FIGURE 3

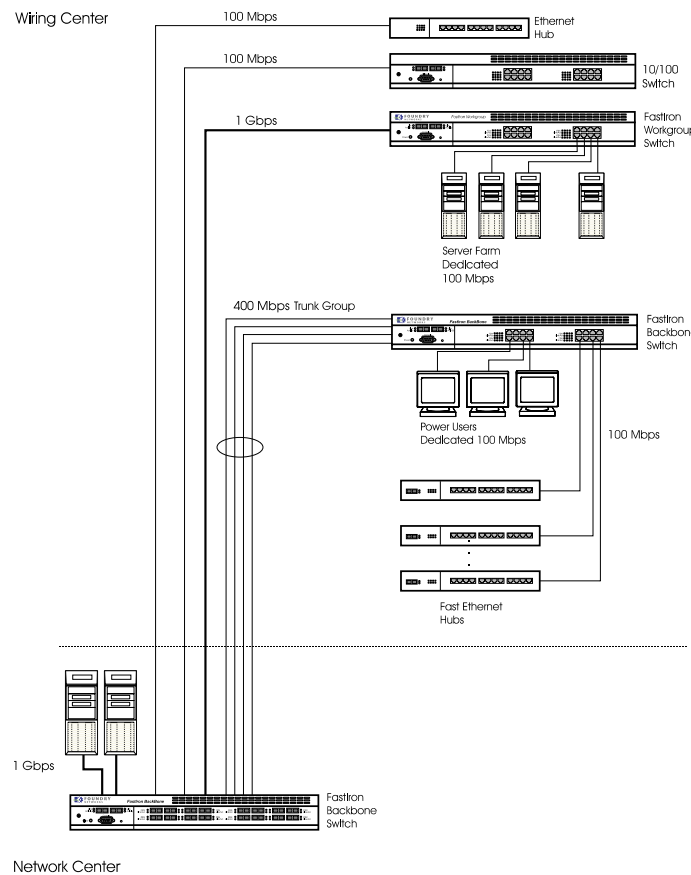
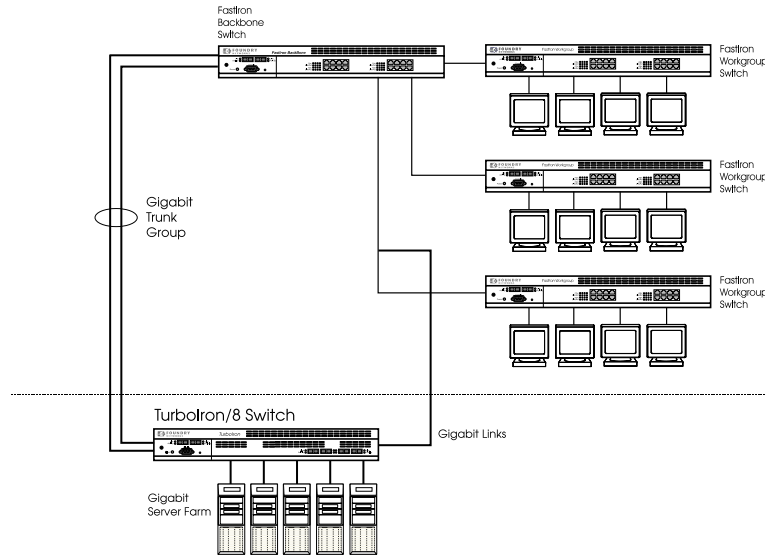


FIGURE 4

Wiring Closet



Network Center

With TurboIron/8 switches, enterprises can migrate to Gigabit Ethernet as their bandwidth needs increase.

When placed in the network center [FIGURE 4], a TurboIron/8 leverages the power of Foundry's all Gigabit Ethernet switches. In this application, gigabit links provide very high-speed connections through the riser. The TurboIron/8 eliminates server congestion and improves response time by providing 1 Gbps links to a server farm. Foundry trunk groups are used to bundle 100 Mbps ports into parallel load-sharing links that deliver 2 Gbps of redundant bandwidth. The FastIron Backbone Switch provides 100 Mbps connections to desktop switches.

### Router Front-End Using a FastIron Backbone or TurboIron/8 Switch

When the multilayer switch feature is enabled on a FastIron Backbone or TurboIron/8 Switch, the switch can be used as a front-end processor for existing routers. The switch off-loads routers much in the same way as a front-end processor relieves an overburdened mainframe. By doing so, Foundry backbone switches enable network managers to leverage their investment in existing routers while cost-effectively eliminating inter-sub-net bottlenecks.

In this application, FastIron Backbone or TurboIron/8 Switches are placed in front of the router to perform IP and IPX forwarding. Distributed network segments are connected to the FastIron or TurboIron/8 Switch using 100 or 1000 Mbps links for dedicated high-speed connections. Existing 10 or 100 Mbps segments are cost-effectively attached to the backbone with Foundry Networks' FastIron Workgroup Switches. [FIGURE 5]

### NetIron and TurboIron/8 Switching Routers

NetIron routers can be used to build a low-cost, wire-speed collapsed router backbone, eliminating the need for expensive and slow routers in a campus LAN. In this application, NetIrons are placed in the network center and connected through the riser with fiber. Distributed network segments and servers are connected to the NetIron using 100 or 1000 Mbps links, providing a dedicated high-speed connection to the network center. Existing 10 or 100 Mbps segments are connected to the backbone through FastIron switches. For additional bandwidth and redundancy, multiple NetIron switching

FIGURE 5

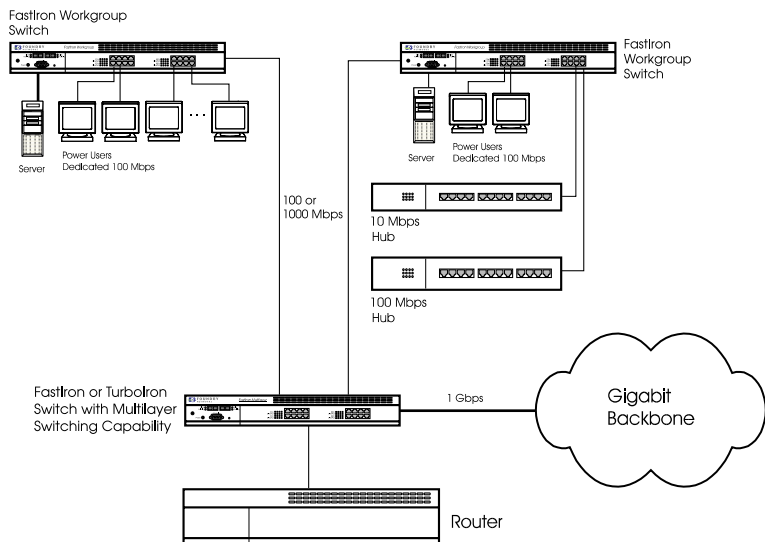
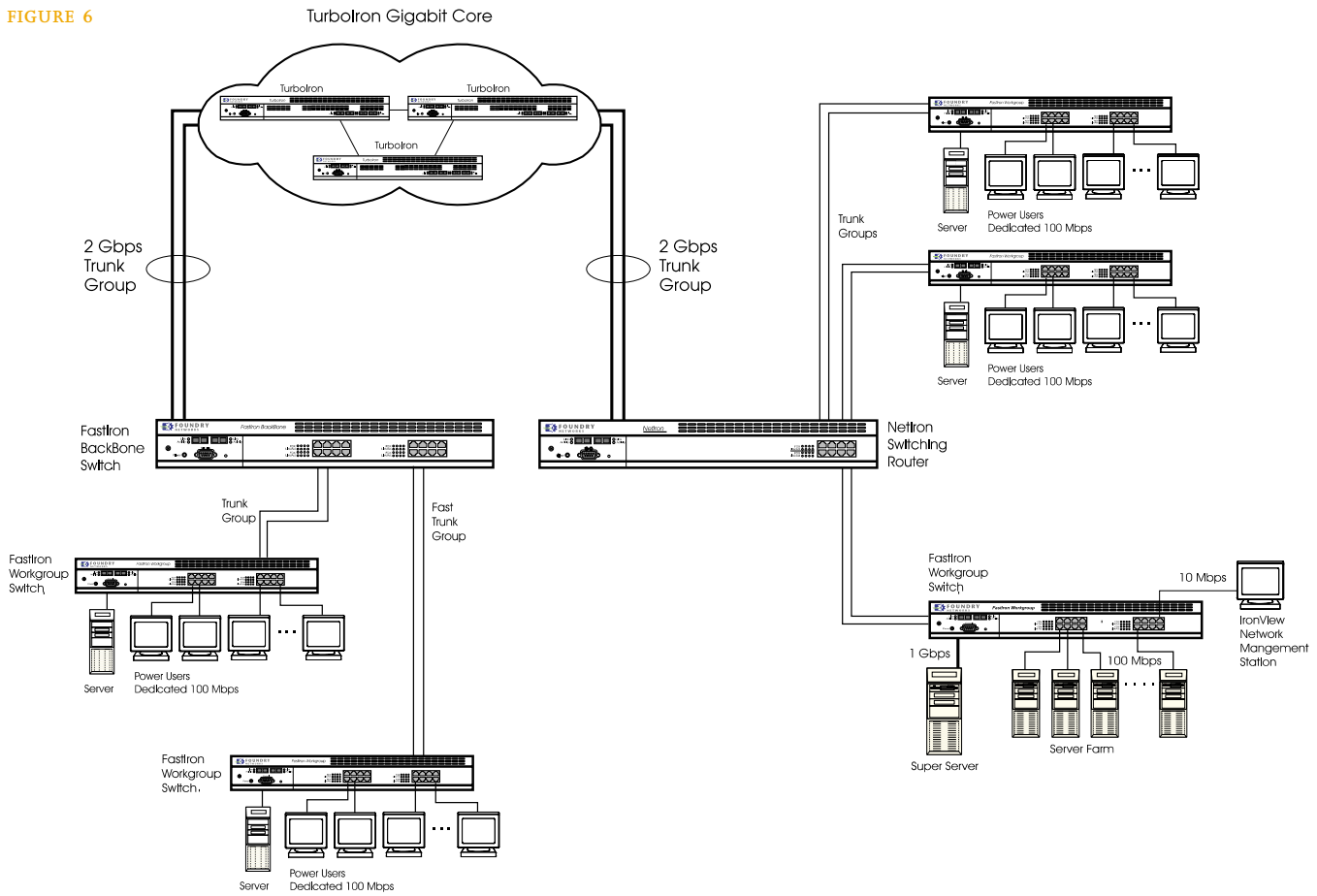


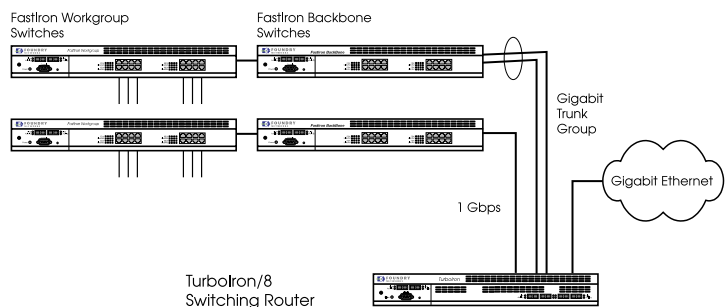
FIGURE 6



routers are interconnected with 100 or 1000 Mbps trunk group links providing up to 2 Gbps of capacity. [FIGURE 6]

In figure 7, a TurboIron/8 switching router enables very high performance centralized routing. In this application, 1 Gbps links and trunk groups provide high-speed connectivity through the riser. Backbone switches are attached with 1 Gbps links, while workgroup switches receive gigabit or dedicated 100 Mbps links. Buildings or floors are connected with 1 Gbps links for enterprise-wide performance.

FIGURE 7



## Technical Specifications

### Internal Switching Capacity

4.2 Gbps: FastIron and NetIron  
32 Gbps: TurboIron/8

### Frame Processing

Store and Forward

### Latency

<10 microseconds: FastIron and NetIron  
<5 microseconds: TurboIron/8

### Standards Compliance

802.3, 10BaseT  
802.3u 100BaseTX, 100BaseFx  
802.3z 1000BaseSX, LX  
802.3x Flow Control  
802.1p/q VLAN Tagging  
802.1d Bridging  
802.3 Ethernet Like MIB  
Repeater MIB  
Ethernet Interface MIB  
SNMPV1  
SNMP MIB II

### Protocol Support

IP  
IPX/RIP/SAP  
RIPV1  
RIPV2  
OSPF  
AppleTalk  
IGMP  
DVMRP  
PIM  
FSRP  
RFC 1256 Router Discovery Protocol  
RFC 783 TFTP  
RFC 1542 BootP  
RFC 951 BootP  
RFC 854 Telnet  
RMON  
RFC 2338 VRRP

### Network Management

Integrated Command Line Interface  
Telnet  
SNMP  
RMON  
HP OpenView for Sun Solaris, Windows NT  
Standalone Windows NT  
Web

### Warranty

1 year hardware  
90 days software

### Physical Dimensions

2.75"h x 17.5"w x 16.75"d  
(66.7mm x 444.5mm x 421.6 mm)  
18-22 lbs (8-10 kg)

### Power Requirements

110v/220v auto-sensing, 5/2.5 amp

### Environmental

Operating Temperature: 32 to 104° F (0-40° C)  
Relative Humidity: 5 to 90%, non-condensing  
Maximum BTUs for fully populated TurboIron/8: 3000  
Storage Temperature: -25° to 70° C  
Storage Humidity: 95% maximum relative humidity,  
non-condensing  
Storage Altitude: 10,000 ft (3,000 m) maximum

### Safety Agency Approvals

UL 1950  
CSA-C22.2 No. 950  
CISPR Safety, Paragraph 9  
TUV EN 60950, EN 60825-1, EN60825-2

### Electromagnetic Emissions Certifications

EN55022 Class A  
FCC Part 15 Class A  
VCCI Class A  
EN50082-1

### Mounting Options

19" Universal EIA (telco) Rack  
Tabletop

## Configuration Options

### FastIron Workgroup Switch Base Configuration

24 10BaseT/100BaseTX ports with RJ-45 Connectors

### FastIron Backbone Switch Base Configuration

16 10BaseT/100BaseTX ports with RJ-45 connectors

### NetIron Switching Router Base Configuration

16 10BaseT/100BaseTX ports with RJ-45 connectors  
24 10BaseT/100BaseTX ports with RJ-45 connectors

### TurboIron/8 Switch and Switching Router

#### Configuration Options

8 1000BaseSX multi-mode ports with SC connectors  
8 1000BaseLX multi-mode ports with SC connectors  
2 1000BaseLX/6 1000 BaseSX multi-mode ports  
with SC connectors  
4 1000 BaseLX/4 1000 Base SX multi-mode ports  
with SC connectors

#### Expansion Options for FastIron and NetIron

2 100BaseFX multi-mode ports with SC connectors  
1 1000BaseSX multi-mode ports with SC connectors  
2 1000BaseSX multi-mode ports with SC connectors  
1 1000BaseLX single-mode or multi-mode port  
with SC connectors\*  
2 1000BaseLX single-mode or multi-mode ports  
with SC connectors\*  
1 1000BaseT port  
1 or 2 port 1000 Mbps single-mode fiber support  
for distances up to 150 km

\* LX expansion modules are not available on the  
FastIron Workgroup Switch.



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