

STACKABLE

- ▶ A COMPLETE LINE OF AWARD-WINNING STACKABLE LAYER 2/3 SWITCHES
- ▶ OFFERS WIRE-SPEED ETHERNET, FAST ETHERNET AND GIGABIT ETHERNET CONNECTIVITY
- ▶ INDUSTRY-LEADING PRICE/PERFORMANCE WITH COMPREHENSIVE LAYER 2/3 FUNCTIONALITY
- ▶ EXTENSIVE ADVANCED FEATURES, INCLUDING POLICY-BASED VLANs, SERVER LOAD BALANCING, L2/L3 QoS, SERVER AND INTER-SWITCH TRUNK GROUPS AND MULTICAST SUPPORT
- ▶ GIGABIT ETHERNET INTERFACES WITH SHORT (2 KM), MEDIUM (15 - 20 KM) AND LONG HAUL (20 - 150 KM) OPTICS
- ▶ FAST SPANNING TREE CONVERGENCE



LAYER 2 AND LAYER 3 LAN SWITCHES



Foundry Networks® offers a broad range of Layer 2/3 stackable LAN switches ideal for deployment in enterprise and service provider networks. These affordable, award-winning stackable solutions feature extensive Layer 2/3 functionality crucial for supporting next-generation, revenue-generating network services such as Ethernet MAN-based subscriber access, voice-over-IP, video-on-demand, video multicasts and application hosting. All Foundry stackables are packaged in slim form factors and priced competitively to allow customers to cost effectively add port density on an as-needed basis.

Foundry's Layer 2/3 stackable switches deliver the performance and advanced features required to support bandwidth-intensive applications. Foundry's extensive Quality-of-Service (QoS) capabilities enable enterprise and service provider customers to offer differentiated services based on application requirements or Service Level Agreements (SLAs). Foundry's

policy-based switching allows users to control packet forwarding based on a wide array of service policies. Foundry's wire-speed, multi-protocol routing support delivers crucial Layer 3 routing performance not available with traditional software-based routers. Dynamic virtual LANs (VLANs) give network managers the flexibility to assign VLANs on a per-port, protocol, subnet, or IEEE 802.1q tagged basis.

Based on a robust and flexible switching architecture, Foundry's Layer 2/3 stackable switches support large MAC address and routing tables. The FastIron® Workgroup and NetIron® Layer 2/3 switches are available with 8, 16 or 24 10/100 Ethernet and optional 1 or 2 Gigabit Ethernet ports. The TurboIron®/8 Layer 2/3 switch offers eight wire-speed Gigabit Ethernet ports. The TurboIron/8 Gigabit Ethernet switches can also be upgraded to deliver Layer 4 - 7 web switching. Only Foundry delivers a Gigabit Ethernet stackable switch that delivers a full range of Layer 2 - 7 switching functionality.



Foundry's Gigabit Ethernet options include multi-mode 1000BaseSX support for intra-building connectivity, single-mode 1000BaseLX for Gigabit Ethernet connectivity throughout the campus, and 1000BaseLH for Metropolitan Area Network (MAN) connectivity up to 150 kilometers.

Foundry Stackable L2/3 Switches

FASTIRON WORKGROUP L2/3 SWITCHES

The FastIron Workgroup switch offers high performance, Fast and Gigabit Ethernet switching at attractive prices. Enterprises that previously deployed hubs can now use the speed and dedicated bandwidth of switching to increase LAN performance and provide QoS to support mission-critical applications and future proof their networks.

The FastIron Workgroup switches cost-effectively accelerate network performance in workgroup and server farm environments. Features such as 16,000 MAC address support, Layer 2/3 QoS, optional redundant power and a complete set of network management applications enable the FastIron Workgroup switches to support mission-critical data and bandwidth-hungry multimedia applications.

TURBOIRON/8 L2/3 GIGABIT ETHERNET SWITCHES

Foundry's TurboIron/8 switches provide immediate relief for congested networks. The TurboIron/8 comes with eight Gigabit Ethernet ports, supports 32,000 MAC addresses, and with a simple software upgrade, offers the flexibility of wire-speed Layer 2 and Layer 4 – 7 switching on a single platform. Enterprises that require full multi-protocol, wire-speed routing capabilities can upgrade a Foundry TurboIron/8 switch to deliver high-performance IP, IPX and AppleTalk protocol support.

Foundry Stackable Layer 3 Switches

NETIRON AND TURBOIRON/8 LAYER 3 SWITCHES

Foundry's NetIron and TurboIron Layer 3 switches boost Layer 3 routing performance and eliminate network bottlenecks with wire-speed, multi-protocol routing. Enterprises can use Foundry Layer 3 stackables to build high-performance backbones that provide efficient support for unpredictable Intranet traffic. NetIron delivers 10, 100 and 1000 Mbps connectivity, while TurboIron/8 offers all Gigabit Ethernet backbone routing.

NetIron and TurboIron Layer 3 switches support standard protocols such as IP, IPX, RIP, AppleTalk, IGMP, DVMRP, PIM-DM/SM, MSDP and MBGP. This broad range of routing support delivers seamless operation to any network. Built to provide consistently high

network performance, Foundry Layer 3 stackable switches accelerate Layer 2 and Layer 3 functions in hardware where forwarding, topology management and switching are all performed at wire speed.

Foundry Layer 3 switches support up to 230,000 routes. Support for up to 4000 Access Control Lists (ACLs) allows a NetIron or a TurboIron/8 to offload traditional routers of their ACL task, allowing for increased network performance and security.

Foundry Advanced Features

WIRE-SPEED L2/L3 SWITCHING PERFORMANCE

Foundry stackable switching solutions deliver top performance to support mission-critical applications. The FastIron Workgroup and NetIron stackable switches feature a 4.2 Gbps switching fabric, with maximum forwarding performance of 6.25 million packets per second (mpps). The TurboIron/8 features 32 Gbps total switching capacity with maximum forwarding performance of 11.6 mpps. This top performance can be used to boost Layer 2 and Layer 3 switching, either at the network edge, server farms, or for small-to-medium sized network backbones. NetIron stackables can deliver wire-speed Inter-VLAN routing and ACL performance, offloading traditional WAN routers and dramatically improving overall network performance.

COMPREHENSIVE, FLEXIBLE QOS FOR TODAY'S FRAME-BASED NETWORKS

Every Foundry stackable switch features eight QoS priorities, ensuring a robust set of classification categories for prioritizing network traffic. IronClad QoS, working in conjunction with Foundry's traffic classification algorithms and support for up to 4000 wire-speed ACLs, gives the network administrator full control over traffic flows within and through a network of Foundry devices. The result is the industry's broadest range of advanced QoS features available with a stackable switch. Network administrators can classify traffic based on the following attributes:

- ▶ *Incoming (ingress) port*
- ▶ *IP source/destination address*
- ▶ *TCP/UDP port or socket*
- ▶ *MAC address*
- ▶ *AppleTalk socket number*
- ▶ *VLAN membership*
- ▶ *802.1p tag*
- ▶ *Type of Service (ToS)*

All Foundry QoS settings can be easily configured and managed via the Command Line Interface (CLI), web-based GUI, or Foundry's IronView® network management application. The network manager can choose between strict priority (SP) or Weighted Fair Queuing (WFQ), configured on a per switch basis. With SP, all high priority traffic is serviced before the lower priority traffic. With WFQ, all queues service traffic according to the weighted value settings.

Assignable WFQ weightings ensure the allocation of minimum bandwidth (delivered under full load) for each of the eight QoS priorities. When the network administrator asks for or modifies the particular bandwidth for one of the QoS priorities, the management interface (via CLI, GUI, or IronView application) responds back with the "normalized" setting adjusted. In addition, the network administrator can reassign all 802.1p priorities.

FOUNDRY RATE LIMITING DELIVERS TIERED NETWORK SERVICES

Foundry's Layer 3 stackable switches feature Fixed Rate Limiting that allows users to cap input or output bandwidth within a set of user defined parameters as small as 256 Kbps, augmented at 8 Kbps increments, all the way up to 1 Gbps. Foundry's Adaptive Rate Limiting allows multiple bandwidth provisioning policies to be applied in order, giving significant flexibility to service providers to provision their services. Packets exceeding defined rate limits can be dropped, transmitted as is, or transmitted with a different set of QoS characteristics. Adaptive Rate Limiting policies include a defined set of bandwidth provisioning parameters, including source or destination IP address range, source or destination TCP or UDP ports, IP precedence bits, DiffServ control points, MAC address, and standard and extended ACLs.

ENABLES MULTICAST APPLICATIONS, BOOSTS PERFORMANCE AND REDUCES TRAFFIC

Foundry offers industry leading hardware-based multicast support that allows network managers to efficiently deploy applications such as video-on-demand. Foundry's Internet Group Membership Protocol (IGMP) multicast traffic reduction feature forwards a single copy of a transmission only to requesting ports. This reduces overall network traffic and improves performance while conserving bandwidth. Foundry's ASICs are unique in their ability to recognize the multicast join and leave messages embedded in the multicast traffic flows at the port level, without needing to send the traffic to a management processor for handling.

Network managers can easily create a network that can sustain and intelligently forward multicast traffic throughout the network. With support for various multicast routing protocols, including DVMRP,

MSDP, MBGP, PIM-SM (Sparse Mode) and PIM-DM (Dense Mode), network managers can easily design a network that can provide video-on-demand services, or multicast-based voice and video applications without any detrimental effect to the network. These protocols enable network managers to efficiently support applications such as the distribution of stock quotes, video transmission of news services and distance learning.

DYNAMIC VLANs INCREASE FLEXIBILITY AND PERFORMANCE

Using dynamic VLANs, a powerful feature supported on all of Foundry's products, network administrators can simplify network address administration and increase available bandwidth by logically assigning users to virtual communities of interest based on a port, protocol, subnet, or 802.1q basis.

- ▶ *Port-based VLANs group users into different broadcast domains on a per port basis.*
- ▶ *Protocol-based VLANs define more granular VLAN communities based on AppleTalk, IP, IPX, DECnet, NetBIOS, or other protocol types. Membership can be determined automatically.*
- ▶ *Subnet, network, and AppleTalk cable-based VLANs create even finer community definitions within a protocol.*

IEEE 802.1q VLAN tagging enables the creation of standards-based, vendor-interoperable virtual LANs that span multiple devices.

INTEGRATED SWITCH ROUTING IN A SINGLE DEVICE

To reduce the dependency on external routers, Foundry's Integrated Switch Routing (ISR) feature enables NetIron and TurboIron/8 Layer 3 switches to route Layer 3 traffic from one protocol/VLAN, IP subnet, IPX network, or AppleTalk-cable VLAN to another VLAN using virtual interfaces (VEs). A virtual interface is a logical port on which you can configure Layer 3 routing parameters. This feature helps reduce the complexity of the network design when implementing VLANs by allowing network administrators to quickly respond to organizational changes without the added burden of additional equipment.

High Availability Features For Maximum Network Uptime

TRUNK GROUPING

Foundry stackable switches feature crucial high-availability features to ensure maximum network uptime and efficient bandwidth utilization. Networks that require more bandwidth than a single, full-duplex link provides can use Foundry's trunk group feature, based

on the IEEE 802.3ad standard, to build redundant, high-capacity links between switches and routers. On FastIron Workgroup and NetIron stackable switches, up to four 100 Mbps ports can be aggregated into one parallel, load-sharing link that delivers 400 Mbps of full-duplex bandwidth. Gigabit Ethernet ports can be aggregated to provide up to 2 Gbps of full-duplex bandwidth. In all cases, if one port goes down, the remaining aggregated ports will load balance traffic.

SERVER MULTI-HOMING

Foundry stackable switches 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 400 Mbps full-duplex bandwidth. For even greater bandwidth, Foundry devices can support up to four multi-homed connections per device.

EXTENSIVE SPANNING TREE PROTOCOL CAPABILITIES

Spanning Tree Protocol (STP) running on switches delays message forwarding during the spanning tree recalculation period following a topology change. This slow convergence is undesirable and unnecessary in some circumstances. Foundry's STP enhancements include Fast Port Span, Fast Uplink Span, and single- or multiple-instance STP to help eliminate the delay and network complexity introduced by STP.

The Fast Port Span feature allows certain ports to enter the forwarding state in four seconds. Specifically, Fast Port Span allows faster convergence on ports that are attached to end stations and thus do not present the potential to cause Layer 2 forwarding loops. Because the end stations cannot cause forwarding loops, they can safely go through the STP state changes (blocking to listening to learning to forwarding) more quickly than is allowed by the standard STP convergence time. Fast Port Span performs the convergence on these ports in four seconds (two seconds for listening and two seconds for learning).

Fast Uplink Span running on a Foundry device deployed as a wiring closet switch decreases convergence time for the uplink ports to another device to just four seconds (two seconds for listening and two seconds for learning). The wiring closet switch must be a Foundry device but the device at the other end of the link can be a Foundry device or another vendor's switch. Configuration of the Fast Uplink Span feature takes place entirely on the Foundry device.

Single-instance STP enables network managers to configure a single instance of the spanning tree to run on all the port-based VLANs on a device. The single STP feature is especially useful for connecting a Foundry device to third-party devices that run a single spanning tree in accordance with the 802.1q specification. Multiple-instance STP permits a separate spanning tree instance to run in each port-based VLAN.

FAIL-SAFE OPERATIONS FOR MISSION CRITICAL 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.

In addition, Foundry supports an enhanced version of VRRP called VRRPE. This feature eliminates the guesswork in troubleshooting a failed default router by allowing network managers the convenience of a virtual interface. With the virtual interface, network managers can use ping to ensure that a default router is actually up and operational.

LAYER 4 – 7 SWITCHING AND INTERNET IRONWARE

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

ADDRESS LOCKING AND LAYER 3 FILTERING FOR NETWORK SECURITY

Foundry products offer hardware-based wire-speed ACLs, which enable network administrators to add granular bandwidth control by applying permit or deny filters to traffic based on source and destination IP address, IP protocol information, or TCP or UDP protocol information. Wire-speed ACL performance

can be crucial for service providers looking to provide effective port-to-port security in large-scale Ethernet MAN subscriber access applications. Foundry Layer 3 stackable switches support 4000 ACLs, and can be configured as follows:

- ▶ *Standard* – Permits or denies packets based on source IP address.
- ▶ *Extended* – Permits or denies packets based on source and destination IP address and based on other information, including:
 - Source/destination host names
 - IP subnet and range
 - Source/destination TCP or UDP port/socket
 - Well-known port numbers (0 – 1023)

In addition to wire-speed ACLs, there are security features that protect the network against Denial of Service (DoS) conditions such as TCP SYN or Smurf attacks. These features help by eliminating unnecessary network downtime caused by malicious hacker attacks.

COMPREHENSIVE SNMP 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 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. With a FastIron Workgroup switch, network managers can establish a 100 or

FIGURE 1

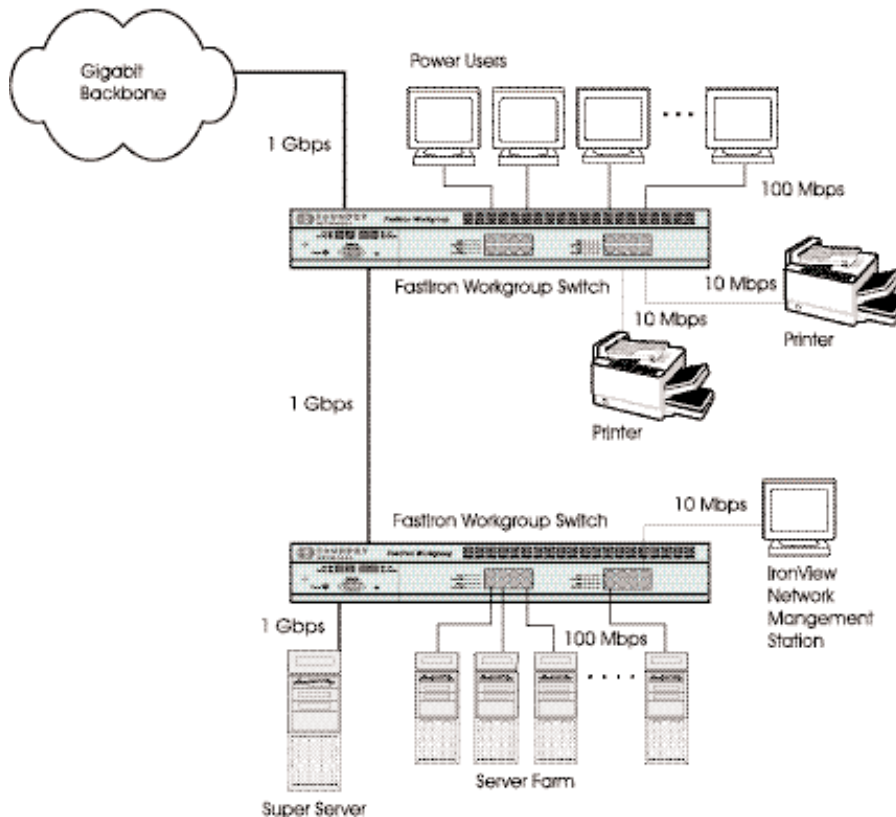
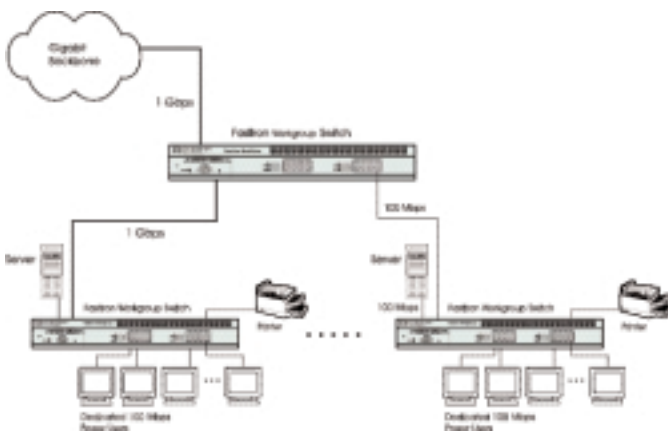


FIGURE 2



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. [See 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. [See Figure 2]

TURBOIRON/8 LAYER 2/3 SWITCH

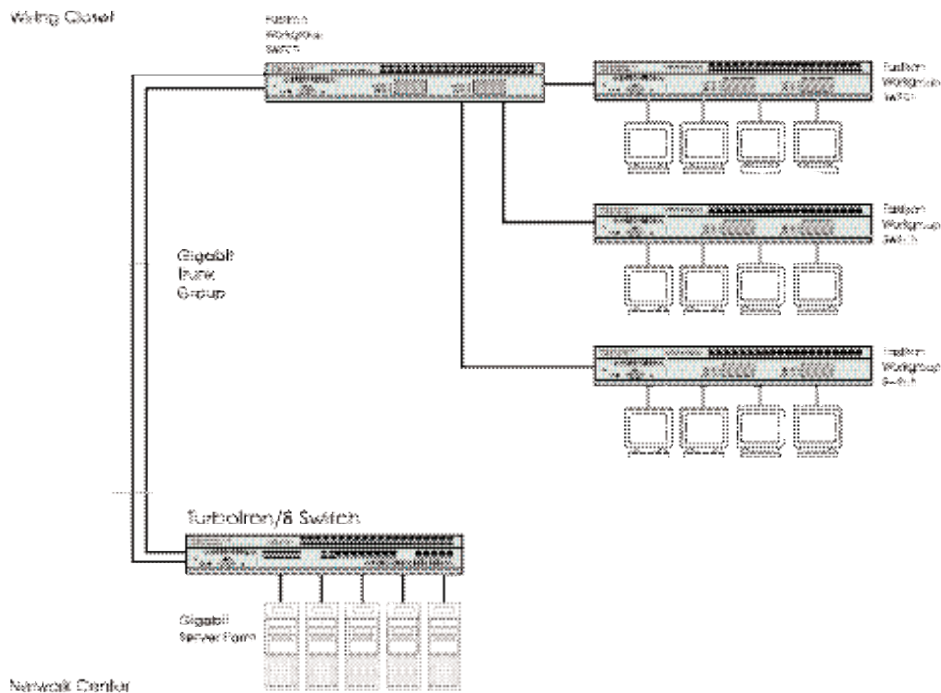
The TurboIron/8 Layer 2/3 switch is a cost-effective, high-bandwidth solution that improves backbone and network center performance, and streamlines access to corporate resources that reside in server farms. With TurboIron/8 switches, enterprises can migrate to Gigabit Ethernet as their bandwidth needs increase.

When placed in the network center (See Figure 3), a TurboIron/8 is deployed as a Gigabit Ethernet backbone in the data center. In this application, a Gigabit trunk provides very high-speed connections (2 Gbps) through the riser. The TurboIron/8 eliminates server congestion and improves response time by providing 1 Gbps links to a server farm. The FastIron Backbone switch provides 100 Mbps connections to desktop switches.

NETIRON AND TURBOIRON/8 LAYER 3 SWITCHES

NetIron Layer 3 switches 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 Layer 3 switches are interconnected with 100 or 1000 Mbps trunk group links providing up to 2 Gbps of capacity. [See Figure 4]

FIGURE 3



Technical Specifications

INTERNAL SWITCHING CAPACITY

4.2 Gbps FastIron and NetIron
32 Gbps: TurboIron/8

FRAME PROCESSING

Store and Forward

LATENCY

Less than 10 microseconds: FastIron and NetIron
Less than 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
802.3ad Link Aggregation Protocol
Repeater MIB
Ethernet Interface MIB
SNMP V1
SNMP MIB II

PROTOCOL SUPPORT

IP (RFC 1812)
RIP (RFC 1058)
RIP V2 (RFC 1723)
IPX/RIP/SAP AppleTalk
IGMP (RFC 1112 and RFC 2236)
DVMRP V3
VRRP (RFC 2338)
VRRPE (Foundry VRRP Enhanced)
Foundry Standby Router Protocol (FSRP)
DNS Client
PIM Dense and Sparse Mode (RFC 2362)
MSDP (draft-ietf-msdp-spec-06.txt and draft-ietf-msdp-mib-04.txt)
MBGP (RFC 2283)
ICMP Router Discovery Protocol (RFC 1256)
IP forwarding table MIB (RFC 1354)
PPP over SONET (RFC 1619)
PPP in HDLC-like framing (RFC 1662)
TFTP (RFC 783)
BootP (RFC 1542)
BootP (RFC 951)
Telnet (RFC 854)
RMON Groups 1,2,3,9 (RFC 1757)
HTTP (RFC 2068)
BootP/DHCP Relay (RFC 2131)

NETWORK MANAGEMENT

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

ELEMENT SECURITY OPTIONS

AAA
RADIUS
Secure Shell (SSH V1)
Secure Copy (SCP)
TACACS/TACACS+
Username/Password (Challenge and Response)
Bi-level Access Mode (Standard and EXEC Level) Repellant for Denial of Service attacks, such as TCP SYN or Smurf Attacks, directed at the equipment or to the attached network.

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° – 104° F (0° - 40° C)
Relative Humidity: 5% – 90%, non-condensing

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

Specifications subject to change without notice.



FOUNDRY NETWORKS

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