

BlackDiamond® 6808/6816 Switches

Today's Internet-driven economy requires information to always be available from multiple sources, even though network traffic is unpredictable and performance demands are great.

Web-content providers, e-commerce web-fronts and service providers need to deliver instantaneous bandwidth and highly available services to maintain customer satisfaction. That means infrastructures must be non-blocking and wire-speed to eliminate traffic choke points when customers request data or place orders. Additionally, it also means that the network must be self-healing so failures do not impede access to data or the placement of those orders.

BlackDiamond 6808 and 6816 Switch Architecture Overview**BlackDiamond 6808 and 6816**

The BlackDiamond 6808 and 6816 chassis are uniquely designed with carrier-class fault tolerance for IP data networks that require the highest level of availability as well as scalability. Both switches provide wire-speed Layer 2 and Layer 3 switching for consistent performance regardless of traffic patterns or network load.

BlackDiamond 6808

- The BlackDiamond 6808 can handle up to 64 Gigabit Ethernet ports when populated with the 8-port G8Xi or G8Ti modules, and 96 Gigabit Ethernet ports when populated with the G12SXi module.
- The BlackDiamond 6808 accommodates a maximum of 576 10/100 Mbps ports when fully populated with the F96Ti, or 224 100BASE-FX ports with fully populated with the F32F module.

BlackDiamond 6816

- The BlackDiamond 6816 leads the industry in density with up to 192 Gigabit Ethernet ports in a single chassis. In addition, the BlackDiamond 6816 offers 10/100 Ethernet port density of 1,152 ports.

Features

- Passive backplane supports dual-redundant, load-sharing and hot-swappable switch fabric modules
- Quad-redundant management CPUs
- Most advanced resiliency and fault tolerance:
 - Redundant load-sharing Management Switch Fabric Modules
 - Hot-swappable modules, power supplies and fan tray
 - Fully redundant, load-sharing power supplies
 - Dual switch configurations and ExtremeWare images
 - Extreme Standby Router Protocol (ESRP™)
 - OSPF Equal Cost Multipath Routing (ECMP)
- 10 Gigabit Ethernet
- WDM optical broadband networking
- MPLS edge routing (PoS) and BGP4
- Policy-Based QoS including prioritization, bandwidth management and congestion control
- Wire-speed IP/IPX routing and wire-speed switching
- Wire-speed server load balancing, web cache redirection, VLAN switching and routing, DiffServ and IEEE 802.1p and IETF DiffServ
- 4,096 IEEE 802.1Q VLANs
- IEEE 802.3ad link aggregation, and redundant PHY
- Access control lists access profiles, RADIUS, SSH2, and Network Login
- Extensive management via local and remote (telnet) CLI, SNMP, RMON and HTTP
- The BlackDiamond 6816 accommodates a maximum of 1,152 10/100BASE-TX ports when fully populated with the F96Ti. In addition, when fully populated with the F48Ti, the BlackDiamond chassis will accommodate a maximum of 576 10/100BASE-TX ports, or 448 100BASE-FX ports when fully populated with the F32F module
- The BlackDiamond 6816 switch supports a maximum of 128 Gigabit Ethernet ports when fully populated with the G8Xi and G8Ti modules, or 192 Gigabit Ethernet ports when fully populated with the G12SXi modules

- Industry-leading Layer 3 switching performance, availability and port density
 - 6808 Non-blocking 128 Gbps backplane yields over 96 million packet per second throughput
 - 6816 Non-blocking 256 Gbps backplane yields over 192 million packet per second throughput
- Reduction in network complexity and cost of ownership, plus scaling performance and increased resiliency
 - 6808 96 100BASE-X, 576 10/100BASE-TX or 224 100BASE-FX ports in a single 6808 chassis
 - 6816 192 100BASE-T or 192 100BASE-X ports, 1,152 10/100BASE-TX ports, or 448 100BASE-FX ports in a single 6816 chassis

The key to the architecture of the BlackDiamond 6808 and 6816 chassis switch is the passive backplane and redundant load-sharing Management Switch Fabric Modules (MSM64i). Passive backplanes offer the lowest possibility of failure in the network core and are key to a resilient, carrier-class core switch. The MSM64i performs two distinct and separate functions – switch management and backplane switching – for the BlackDiamond 6808 and 6816 chassis switch.

Overview of the Management Switch Fabric Module

The BlackDiamond 6808 chassis has ten slots. The two center slots support MSM64i modules, which perform packet switching between all modules across the 128 Gbps passive backplane and support boot and management operations. The BlackDiamond 6816 chassis has twenty slots – four center slots support MSM64i modules. The remaining 8 and 16 slots on the BlackDiamond 6808 and the 6816 respectively, accommodate a variety of switch modules with 10/100BASE-TX, 100BASE-FX, 100/1000BASE-T, 1000BASE-X Ethernet and WDM interfaces.

Each MSM64i module has two management processors to run the CLI, SNMP and RMON agents in the real-time operating system. These processors also run routing protocols, such as RIP, OSPF, BGP, DVMRP, and PIM, and the Spanning Tree Protocol. The BlackDiamond 6808 supports full management and redundant, non-blocking switch fabric with two MSM64i modules. Similarly, the BlackDiamond 6816 uses four MSM64i modules to achieve non-blocking performance as well as management and switch fabric redundancy.

Although only one MSM64i module is required in the BlackDiamond 6808 chassis, two MSM64i modules used in parallel can support load-shared switching, routing and switch management. BlackDiamond 6808 switches configured with two MSM64i modules deliver 128 Gbps of backplane capacity, supporting full non-blocking performance for 64 Gigabit Ethernet or 576 10/100BASE-TX ports.

By the same token, while only one MSM64i module is required in the BlackDiamond 6816 chassis, up to four MSM64i modules can be used in parallel to support load-shared switching, routing and switch management. BlackDiamond 6816 switches configured with four MSM64i modules deliver 256 Gbps of backplane capacity, fully supporting non-blocking performance for 128 Gigabit Ethernet or 768 10/100BASE-TX ports. Additionally, the BlackDiamond 6816 chassis supports a 96 port 10/100 module, making it possible for the 6816 to handle up to 1,152 10/100BASE-TX ports.

In summary, with two redundant MSM64i modules in the BlackDiamond 6808 chassis, all four processors are used – two processors per MSM – for protocol processing. The BlackDiamond 6816 has the capability to use all eight processors available for protocol processing – again, two per MSM. Each MSM64i module has 64 Gbps of switch fabric capacity for a total switching capacity in the 6808 of 128 Gbps, and 256 Gbps in the 6816.

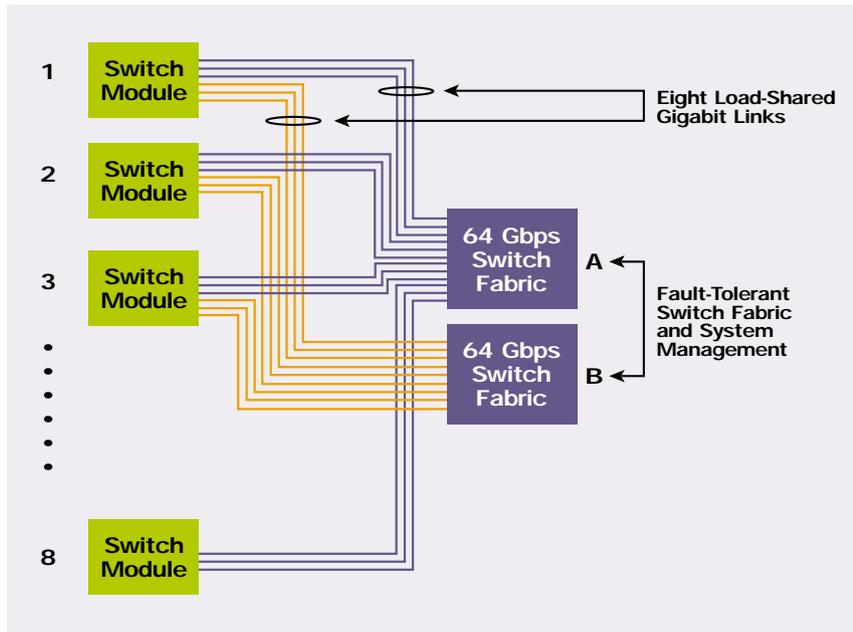
Non-Blocking Operation of the MSM64i Module

In the event that two MSM64i modules are used in the BlackDiamond 6808 chassis, or four MSM64i modules in the BlackDiamond 6816, they will load-share the responsibilities of switch management and backplane switching. Having multiple MSM64i modules in the chassis removes a critical single point of failure. If an MSM64i module fails, another one will continue to manage the chassis and switch traffic across the backplane.

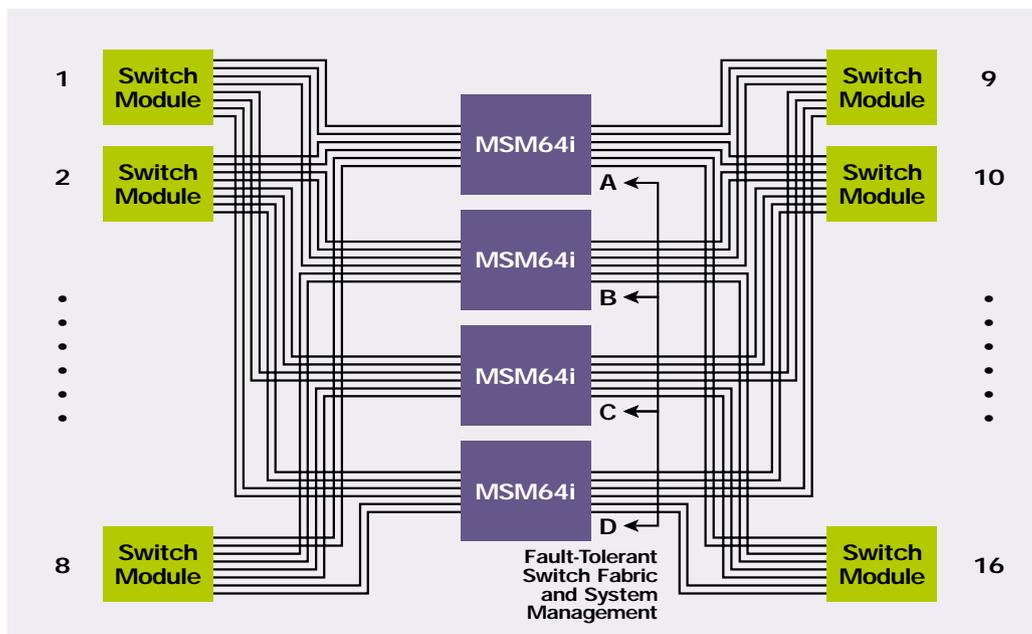
To meet the two objectives of wire-speed performance and carrier-class resiliency, the MSM64i module was designed so multiple modules in the BlackDiamond 6808 and 6816 chassis would deliver non-blocking performance as well as fault tolerance and redundancy.

BlackDiamond® 6808/6816 Switches

The diagrams below depict the backplane architecture of the BlackDiamond 6808 and 6816, and the communication channels between the switch modules and the MSM64i modules.



In a BlackDiamond 6808 chassis, a single MSM64i module provides four channels to each I/O slot and each channel is 1 Gbps, full duplex. The addition of a second switch fabric module doubles the number of channels to each slot from four to eight.



In a BlackDiamond 6816 chassis, a single MSM64i module provides two channels to each I/O slot and each channel is 1 Gbps, full duplex. The addition of three switch fabric modules quadruples the number of channels to each slot from two to eight.

With each MSM64i module delivering four channels to each of eight fast Ethernet or Gigabit Ethernet switch modules in the BlackDiamond 6808 chassis, it supports a total of 32 full-duplex, one Gbps channels. As a result, each MSM64i module delivers 64 Gbps of backplane switching. Two MSM64i modules in a chassis deliver a total of 128 Gbps of backplane switching.

In the BlackDiamond 6816 chassis each MSM64i module delivers two full duplex one Gbps channels to each of 16 modules, again supporting 32 full-duplex, one Gbps channels resulting in 64 Gbps of backplane switching. Up to four MSM64i modules can be installed to deliver 256 Gbps of backplane switching.

The load of backplane switching is evenly shared across the switch fabrics based on algorithms supported in the ExtremeWare software suite that comes with every BlackDiamond chassis switch. With this architecture, the load-sharing MSM64i modules guarantee that the backplane is never oversubscribed by any of the I/O modules. Additionally, because the MSM64i modules are fully load-sharing, it means that network operations can never be interrupted by the failure of a single module.

Fast Ethernet and Gigabit Ethernet Switch Modules

For switched 10/100 Mbps Ethernet, the F48Ti switch module supports 48 RJ-45 ports for 10/100BASE-TX auto-negotiating connectivity, while the F32F switch module has 32 MT-RJ ports for 100BASE-FX connectivity. The new F96Ti switch module supports 96 ports using standard category 5 telco (50-pin) connectors for 10/100BASE-TX auto-negotiating connectivity.

The BlackDiamond 6808 chassis accommodates a maximum of 384 10/100 Mbps ports when fully populated with the F48Ti, or 224 100BASE-FX ports when fully populated with the F32F. The F96Ti in the 6808 chassis will support 576 10/100BASE-TX ports.

The BlackDiamond 6816 chassis accommodates a maximum of 1,152 10/100BASE-TX ports when fully populated with the F96Ti. In addition, when fully populated with the F48Ti, the BlackDiamond 6816 will accommodate a maximum of 768 10/100BASE-TX ports, or 448 100BASE-FX ports when fully populated with the F32F.

For Gigabit Ethernet, the G8Ti switch module has eight auto-negotiating 100/1000BASE-TX ports for connections within 100 meters, using standard category 5 unshielded twisted pair (UTP). The G8Xi switch module features eight GBIC-based ports for 1000BASE-SX, 1000BASE-LX or 1000BASE-LX70 connections. The G8Xi is available only with the GBIC ports unpopulated so that the customer can select the appropriate GBIC transceivers – SX, LX, or LX-70 – needed for each configuration. The G12SXi has 12 ports and is based on a lower-cost MT-RJ transceiver. The WDMi module provides a 10 Gbps interconnect on a single-mode fiber pair for BlackDiamond switches in metropolitan area networks (MANs) and Internet exchange networks.

The BlackDiamond 6808 switch supports a maximum of 64 Gigabit Ethernet ports when fully populated with the G8Xi and G8Ti modules, or 96 Gigabit Ethernet ports when fully populated with the G12SXi modules. The BlackDiamond 6816 switch supports a maximum of 128 Gigabit Ethernet ports when fully populated with the G8Xi and G8Ti modules, or 192 Gigabit Ethernet ports when fully populated with the G12SXi modules.

Fault-Tolerance for Backplane Switching

The BlackDiamond 6808 and 6816 switches come with fault-tolerant and system-reliability features that network managers expect from a chassis-based switch. Every component is hot swappable, including MSM64i modules, switch interface modules, power supplies and fan trays. This high level of fault tolerance and system reliability ensures that network availability is fully optimized to support the toughest mission-critical requirements, such as e-commerce applications, enterprise resource planning, and core routing in metro service provider networks.

In the event of an MSM64i module failure, the ExtremeWare load-sharing algorithms will redistribute the load of backplane switching across the channels of the operational MSM64i module(s). To facilitate replacing a failed MSM64i module, the network administrator can hot swap the failed MSM64i module and replace it with a spare without causing any service interruptions.

When the replacement MSM is initially installed in the BlackDiamond 6808 and 6816 chassis, ExtremeWare will put it through Power-On Self-Test (POST) and diagnostics. Once ExtremeWare verifies that the new MSM64i module is operating properly, it will redistribute the load-sharing across all channels again. The functions of the load-sharing algorithm occur transparently to users attached to the switch, and requires no manual intervention from the network administrator.

Now that the new MSM64i module is operating, the network manager can load the proper switch configuration into NURAM and ExtremeWare images into FLASH by using the “synchronize” command in the command line interface (CLI). This greatly simplifies the hot swap of the MSM64i. Without this command the network administrator would have to load the ExtremeWare image and manually load the switch configuration. There would still be a risk that the image would not be identical since changes may have been made since the last load of ExtremeWare, or the last time that the switch configuration was archived. The synchronize command removes the guess work and possibility of human error.

Redundant Management Overview

The redundancy and load-sharing features inherent in BlackDiamond switches are designed to increase network uptime by ensuring quick recovery from failures. Although a fully loaded BlackDiamond 6808 switch can run from a single power supply, two load-sharing power supplies increase longevity and reduce operating temperature.

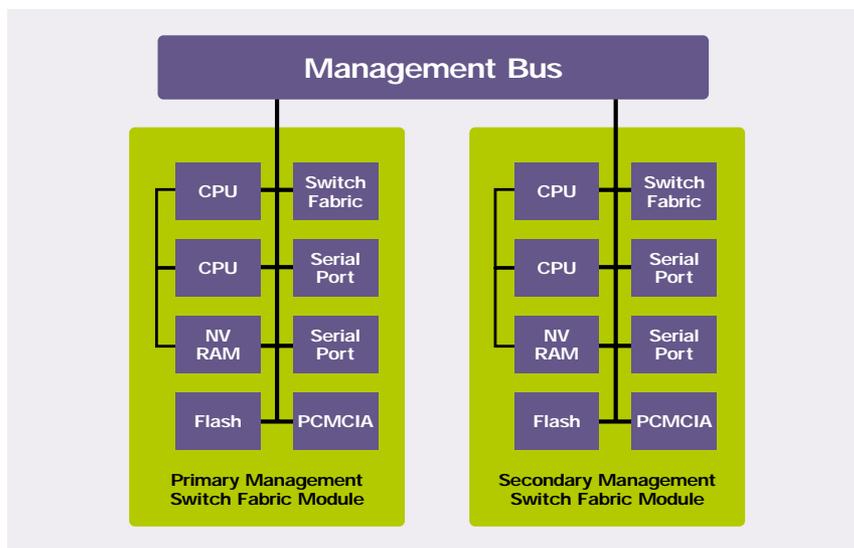
In addition to actively sharing the load of switching traffic across the backplane, redundant MSM64i modules manage chassis components and run applications like Spanning Tree, RIP v1/v2, OSPF, BGP4, DVMRP, PIM, and IPX RIP. One MSM64i module is the designated master that controls four management processors on both MSM64i modules and saves configurations in non-volatile memory, and ExtremeWare to FLASH memory on both MSM64i modules simultaneously. A synchronization function can allow you to quickly add a new MSM64i module to a chassis, and guarantee that all configurations will be identical to the master MSM64i module.

Guaranteed Synchronization through Redundant Management

The use of two MSM64i modules in the 6808 chassis, and multiple MSM64i modules in the 6816 chassis, provides carrier-class management redundancy. MSM64i modules support parallel management, with one acting as the master management entity and the other as the slave management entity. The master is responsible for all management tasks, and assigns some of those tasks to the slave MSM64i module.

This is very different from other schemes where a redundant management module is supported in a chassis. In other cases, a redundant management module sits idle and is not responsible for any management functions until the primary module fails. This presents several problems, including whether the configuration of the redundant management module is synchronized with the primary module and whether it is loaded with the proper software.

The diagram below depicts the high level architecture of two MSM64i modules in a single BlackDiamond 6808 chassis.



Because the MSM64i modules operate in parallel, one of them must have the role of the master and the others are slaves. The master MSM64i module is responsible for all tasks associated with switch management and protocol processing. This includes running the real time operating system, CLI, ExtremeWare Vista web server, and route processing.

The MSM64i modules communicate with each other and the I/O modules in the BlackDiamond 6808 and 6816 chassis via the management bus. A separate data path from the backplane channels, the management bus is used for the MSM64i modules to collect statistics from switch modules, communicate operational status between the master and slave, distribute management functions across the processors, perform configuration changes, and save new software images to FLASH memory. Each MSM64i module has two MIPS 5000-compliant 64-bit, 133 MHz processors. The master MSM64i module has access to all four processors - two are local on the primary MSM64i module and the other two are accessed via the management bus. The master MSM64i module can task processing to any one of these four processors.

Having a primary MSM64i module guarantees that the switch configuration, ExtremeWare software images and switch management are always synchronized. When the switch configuration is saved, the master MSM64i module writes configuration changes to NVRAM on the master and all slave MSM64i modules. Because two switch configurations can be saved to NVRAM, if the configuration is saved to location #1, then it is saved to location #1 on all MSM64i modules simultaneously. The same is true for installing ExtremeWare software. When loading a new ExtremeWare image, the master MSM64i writes it to FLASH memory on the master and all of the slave MSM64i modules simultaneously.

Scalable Routing Performance

Equal Cost Multipath Routing

Equal cost multipath (ECMP) routing greatly enhances network performance, throughput and reliability. When two or more connections are created between Layer 2 switches, the Spanning Tree Protocol must be running to prevent a loop. In a network with BlackDiamond and Summit™ Layer 3 switches, routed traffic will traverse multiple paths between any two hosts in the network – even if the Spanning Tree Protocol blocks a port that forms a loop. ECMP routing both increases throughput and ensures faster recovery in the event of a network failure.

Extreme Standby Router Protocol

The Extreme Standby Router Protocol™ (ESRP) enables host devices to continue communicating if a router is unavailable. With ESRP, network managers can configure a virtual router interface on two or more BlackDiamond switches on the same subnet. The connected hosts are then configured to use the virtual router interface as the default gateway.

Core and Server Network Applications

Core Network Applications

In all core networks, port density and Layer 3 scalability are critical whether you are an enterprise, service provider or web content provider. Here, the BlackDiamond 6808 and 6818 scale to 96 and 192 wire-speed Gigabit Ethernet ports, respectively, to handle the growing influx of enterprise and Internet traffic that travels between multiple networks. In addition to the added performance and reliability of ECMP with OSPF, the ESRP delivers unprecedented resilience for core switching and routing applications.

Server Farms

In any server environment, scaling port density and advanced availability features are needed to make services resistant to failures and independent of fluctuations in usage. In addition to advanced hardware fault tolerance, ExtremeWare combines server load balancing and web cache redirection to maximize server availability while speeding up response time. For increased bandwidth scalability, multiple 10, 100 and 1,000 Mbps switch ports on one or more modules can be aggregated into one logical link between switches in the data center and network core, and from switches to high-performance servers.

Enterprise Networks

In enterprise applications, the BlackDiamond 6808 and 6816 switches are ideal for core, segment and server switching applications. When used with Extreme's stackable Summit switches, network managers can build a seamless 10/100/1000 Mbps switched Ethernet network that delivers a common set of services throughout. The result is network simplicity, merged with scalable speed, performance, network size and Policy-Based Quality of Service (QoS).

Server Provider Networks

With the BlackDiamond 6808 and 6816 chassis switches, service providers and web content providers can build highly resilient and scalable networks with high 10/100BASE-TX port density, wire-speed routing performance, industry leading availability features, and Policy-Based QoS including IETF DiffServ.

Metro Service Providers

The metro service providers delivering high speed Ethernet/IP service and transparent LAN services (vMANs™) can leverage the carrier-class resilience, scalable bandwidth and high speed WDM interfaces of the BlackDiamond 6800 series switches to construct core metro and regional networks. The providers can then take advantage of the Alpine 3800 series to provision services from a BlackDiamond 6800 series switch in their point of presence (POP) to the customer premise.

Positive Impact on Today's Internet-Driven Economy

With the BlackDiamond 6808 and 6816 chassis switches, web-content providers, e-commerce web-fronts, and service providers can build non-blocking, wire-speed infrastructures with carrier-class resiliency. This is a huge step toward building Internet data networks that offer the same class of availability and reliability as public switched telephone networks.

Specifications

Performance

BlackDiamond 6808

128 Gbps non-blocking bandwidth
Route/filter/forward 96 million pps

BlackDiamond 6816

256 Gbps non-blocking bandwidth

Protocols and Standards

RIP

RFC 1058 RIP v1
RFC 1058 RIP v2
OSPF
RFC 2328 OSPF v2
RFC 1587 OSPF NSSA
RFC 2154 OSPF w/ Digital Signatures
(password, MD-5)

BGP4

RFC 1771 BGP4
RFC 1965 AS Confederations for BGP
RFC 1966 BGP Route Reflection
RFC 1997 BGP Communities Attribute
RFC 1745 BGP/OSPF Interaction

IP Multicast

RFC 2362 PIM-SM
PIM-DM Draft IETF PIM-DM v2-dm-03
RFC 1122 DVMRP Host Requirements
DVMRP v3 Draft IETF DVMRP v3-07
RFC 2236 IGMP v2
IGMP with Configurable Router
Registration Forwarding

10GbE

IEEE 802.3ae 10 Gigabit Ethernet
IEEE 802.3x Flow Control (pause frames)

ATM

RFC 1483/2584 multi-protocol encapsulation over
ATM AAL-5
ATM PVC to 802.1Q tag mapping

MPLS

RFC 3031 Multi-Protocol Label Switching
architecture
RFC 3032 MPLS label stack encoding
RFC 3036 LDP specification
draft-martini-12circuit-encap-mpls-08 transport of
Layer 2 frames over MPLS
draft-ietf-mpls-diff-ext-09 MPLS support of DiffServ
RFC 2961 RSVP refresh overhead reduction
extensions
draft-ietf-mpls-rsvp-lsp-tunnel-09 RSVP-TE:
extensions to RSVP for

LSP tunnels

RFC 2211 controlled load network element service
RFC 2702 requirements for traffic engineering
over MPLS

General Routing

RFC 1812 Router Requirements
RFC 1519 CIDR
RFC 1256 IRDP Router Discovery
RFC 783 TFTP
RFC 951 BootP
RFC 2131 BootP/DHCP Helper
RFC 1591 DNS (client operation)
RFC 1122 Host Requirements
RFC 768 UDP
RFC 791 IP

Specifications continued on page 8

Specifications

RFC 792 ICMP
 RFC 793 TCP
 RFC 826 ARP
 Extreme Standby Router Protocol (ESRP) Policy-Based Quality of Service
 IEEE802.1D-1998 (802.1p) Packet Priority
 RFC 2474 DiffServ Precedence
 RFC 2598 DiffServ Expedited Forwarding
 RFC 2597 DiffServ Assured Forwarding
 RFC 2475 DiffServ Core and Edge Router Functions
 Bidirectional Rate Shaping
 Layer 1-4, Layer 7 (user name)
 Policy-Based Mapping
 Policy-Based Mapping/Overwriting of DiffServ code

Management and Security

Management

RFC 1157 SNMP v1/v2c
 RFC 1757 RMON 4 groups: Statistics, History, Alarms, and Events
 RFC 2021 RMON2 (probe config)
 RFC 2668 MAU
 RFC 1493 Bridge MIB
 RFC 1213 MIB-II
 RFC 2037 Entity MIB
 RFC 2233 Interface MIB
 RFC 2096 IP Forwarding
 RFC 1724 RIP v2 MIB
 ExtremeWare Private MIB (include ACL, QoS and VLAN config)
 RFC 1866 HTML
 RFC 2068 HTTP
 RFC 854 Telnet
 HTML and Telnet Management
 Configuration logging
 Multiple ExtremeWare images and configurations
 Multiple syslog servers
 999 Local Messages (criticals stored across reboots)
 RFC 1769 v3 Simple Network Time Protocol

Security

FIPS-186 (Federal Information Processing Standards Publication 186) SSH2

RFC 1851 3DES-CBC cipher
 RFC 2792 DSA key exchange
 TACACS+
 RFC 2138 RADIUS
 RFC 2139 RADIUS Accounting
 Access Profiles on All Routing Protocols
 Access Profiles on All Management Methods
 Denial of Service Protection
 RFC 267 Network Ingress Filtering
 RPF (Unicast Reverse Path Forwarding) control
 Wire-speed ACLs
 Rate Limiting by ACLs
 IP Broadcast Forwarding Control
 ICMP and IP-Option Response Control
 Server Load Balancing with Layer 3, 4 Protection of Servers
 SYN attack protection
 Unidirectional Session Control

Physical Dimensions

BlackDiamond 6808

(H)26.25 in x (W)17.32 in x (D)18 in
 (H)66.68 cm x (W)43.99 cm x (D)45.72 cm
 Weight – Empty:60 lbs (27 kg)
 Weight – Fully loaded:170 lbs (76.5 kg)
 Weight – One AC power supply:30 lbs (13.5 kg)
 Weight – One module:5 lbs (2.25 kg)

BlackDiamond 6816

(H)61.25 in x (W) 19 in x (D) 19 in
 (H) 155.57 cm x (W) 48.26 cm x (D) 48.26 cm
 Weight – Empty: 75.4 lbs
 Weight – Loaded: 360 lbs (160 kg)
 Weight – One AC power supply: 30 lbs (13.5 kg)
 Weight – One MSM blade: 5.8 lbs (2.61 kg)
 Weight – One F48Ti blade: 7.35 lbs (3.31 kg)
 Weight – One fan tray: 7.2 lbs (3.24 kg)
 Weight – One backplane: 70 lbs (31.5 kg)

Specifications continued on page 9

Specifications

Heat Dissipation

Power Supply 680 watt Maximum (2325 BTU/hr)
Input Voltage Operations: 100 - 120 VAC
and 200 - 240 VAC, autoranging
AC Line Frequency 47 Hz to 63 hz
DC Input: -48VDC, 30 Amp
Current Rating: 100 - 120 VAC: 13 A; 200 - 240
VAC: 6.5 A

Safety

UL 1950 3rd Edition, Listed (Safety of ITE)
EN60950:1992/A1-4:1997+ZB/ZC Deviations
(Safety of ITE)
IEC 950CB (Safety of ITE)
Low Voltage Directive (LVD)
CSA 22.2#950-95 (Safety of ITE)
AS/NZS 3260 (product safety standard)
EN60825-1 (Safety of Lasers Products)
FCC CFR 21 (Laser Products)

EMI/EMC

FCC CFR 47 part 15 Class A (USA EMC standard)
ICES-003A/C108.8-M1983 Class A
(Canada EMC standard)
VCCI Class A (Japan EMC standard)
AS/NZS 3548 (Australia EMC standard)
EN 55022 Class A (European EMC standard)
CISPR 22 Class A (European EMC standard)
EN 50082-1:1997 includes ENV 50204
(European EMC standards)
EN 55024:1998 includes IEC 61000-4-2, 3, 4, 5,
6, 8, 11 (European EMC standards)
EN 61000-3-2, 3 (European EMC standards)
CNS 13438 Class A (BSMI-Taiwan)
Low Voltage Directive (LVD)

Environmental Requirements

Operating Temperature 0° to 40° C
Storage Temperature: -40° to 70° C
Operating Humidity: 10% to 95% relative humidity,
non-condensing
EN60068 to Extreme IEC68 schedule

Reliability

Minimum 50000 hrs MTBF to Mil HDBK 217F
Notice 1, Parts Stress Method

Ordering Information

Part Number	Description
50011	BlackDiamond 6808 10-slot chassis
53011	BlackDiamond 6816 20-slot chassis
50015	Management Switch Fabric Module 64 (MSM64i). Minimum of one required; maximum of two.
50020	110 VAC Power Supply Unit (PSU). Minimum of [one 6808 two 6816]; maximum of [two 6808 four 6816].
50021	220 VAC Power Supply Unit (PSU). Minimum of [one 6808 two 6816]; maximum of [two 6808 four 6816].
50022	-48 VDC Power Supply Unit (PSU). Minimum of [one 6808 two 6816]; maximum of [two 6808 four 6816].
51032	8-port GBIC-based (G8Xi) switch module with 8 unpopulated 1000BASE-X GBIC ports
51033	8-port GbE module (G8Ti) with 8 auto-negotiating 100/1000BASE-T ports (RJ-45)
51034	Wavelength Division Multiplexing Module (WDMi)
51040	12-port MT-RJ-based (G12SXi) switch module with 12 1000BASE-SX ports
52011	48-port auto-negotiating 10/100BASE-TX (F48Ti) switch module (RJ-45)
52012	96-port auto-negotiating 10/100BASE-TX (F96Ti) switch module (Telco)
52020	32-port 100BASE-FX (F32F) switch module (MT-RJ)
52021	32-port 100BASE-FX (F32Fi) i series switch module (MT-RJ)
53010	4-port SONET/SDH OC-3c/STM-1 PoS SMF module.
53012	4-port SONET/SDH OC-3c/STM-1 PoS MMF module.
53020	2-port SONET/SDH OC-12c/STM-4 PoS MMF module.
53021	2-port SONET/SDH OC-12c/STM-4 PoS SMF module.
53040	Accounting & Routing Module (ARM).
53041	Multi-Protocol Label Switching (MPLS) module.
53111	4-port SONET/SDH OC-3c/STM-1 ATM SMF.
54002	1-port 10GBASE-LR 1310nm serial SC module.



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