BlackDiamond® 8800 Series

BlackDiamond 8800 series switches simplify the Enterprise network.

Voice-Class Availability

- Redundant system design
- Modular ExtremeXOS® Operating System (OS) for non-stop operations
- Ethernet Automatic Protection Switching (EAPS) resiliency protocol

High-Performance Connectivity at Low Power

- Large switching capacity capable of supporting over 570 Mpps
- Convergence-ready connectivity with Voice-over-IP (VoIP) automatic provisioning
- Flexible connectivity options for multiple applications
- Low power consumption for reduced power and cooling costs

Comprehensive Security Providing Defense-In-Depth

- Directory-integrated link security
- Universal Port dynamic security profile to provide fine-grained security policies
- Threat detection and response instrumentation to react to network intrusion with CLEAR-Flow Security Rules Engine
- Hardened network infrastructure

A modular switching family of highly available switches delivers high-density gigabit, gigabit Power over Ethernet (PoE) and 10 Gigabit Ethernet.

Enterprise IT managers have limited time or resources to deal with overly complex, specialized network infrastructure solutions. BlackDiamond 8800 series switches from Extreme Networks® simplify the architecture. Purpose-built core, aggregation, edge and data center modules can meet your chassis needs across the network. Traditional three-tier architectures can be replaced with a streamlined two-tier network that reduces management overhead, operational complexity and capital expenditures.

BlackDiamond 8800 series switches deliver voice-class availability, high-density Power over Ethernet (PoE), Gigabit Ethernet, and 10 Gigabit Ethernet wherever it's needed. It serves well as a high-performance Enterprise core. The non-blocking ports interconnect thousands of servers for High Performance Cluster Computing (HPCC). A full range of Layers 2 - 4 features for IPv4 and IPv6 allow the aggregation of high-speed connections, eliminating bottlenecks between edge and core. BlackDiamond 8800 fits well at the edge of the most demanding enterprises switching Voice-over-IP, video, wireless and data traffic. The multifaceted BlackDiamond 8800 series switches support IPv6 today, preparing the Enterprise for the future.

Target Applications

- High-performance enterprise core for small- to medium-sized networks
- Interconnect switch providing low-latency connections at low power for data centers and High Performance Cluster (HPCC)
- Traditional gigabit or 10 Gigabit Ethernet aggregation switch
- High-density PoE edge switch for integrate wired, wireless and IP Telephony
- Single switch network solution for small to medium-sized networks

Voice-Class Availability

A high-performance network connection, whether used to connect PCs and IP telephones at the access layer or to interconnect servers in a cluster, is only useful if it is also highly available. BlackDiamond 8800 modular switching family incorporates extensive hardware redundancy and a modular OS—ExtremeXOS—that provides the network recovery required by converged applications.

Redundant System Design

Redundant Management Modules

BlackDiamond 8800 modular switch series are configured with an automatic failover mechanism so that if one Management Switch Module (MSM) fails, the second MSM will automatically take over management responsibility for the entire switch. This feature is critical for networks running voice and other mission-critical applications.

Advanced Chassis Design for Availability

BlackDiamond 8800 series switches include a passive backplane complemented by high availability design elements such as isolated control and data planes, redundant controller boards for power distribution, and fan control and environmental monitoring to identify anomalies before they affect network availability.

Redundant Load Sharing Power Supplies

BlackDiamond 8800 series switches support a set of redundant power configurations that can load share up to six internal power supplies simultaneously. Three power supplies in a 2 + 1 redundancy configuration can power a fully loaded chassis with gigabit or 10 Gigabit Ethernet ports. In addition, without the need of an external power tray, three power supplies are available to support large PoE implementations.

Redundant Cooling Fans in a Hot-Swappable Fan Tray

A tray of nine/six fans delivers redundant cooling in the BlackDiamond 8806/10 series chassis. The fan tray itself is hot swappable so the BlackDiamond 8800 series system keeps operating while the fan tray is replaced.

Modular Operating System for Non-stop Operations

True Preemptive Multitasking and Protected Memory

BlackDiamond 8800 series switches allow each of the many protocols such as Open Shortest Path First (OSPF) and Spanning Tree to run as separate OS processes that are protected from each other. This drives increased system integrity and inherently protects against Denial of Service (DoS) attacks.

Process Monitoring and Restart

ExtremeXOS dramatically increases network availability using process monitoring and restart. Each independent OS process is monitored in real time. If a process becomes unresponsive or stops running, it can be automatically restarted.

Loadable Software Modules

The modular design of ExtremeXOS allows the upgrading of individual software modules, should this be necessary, leading to higher availability in the network (see Figure 1).

High Availability Network Protocols

Ethernet Automatic Protection Switching (EAPS)

EAPS allows the IP network to provide the level of resiliency and uptime that users expect from their traditional voice networks. EAPS is superior to the Spanning Tree or Rapid Spanning Tree Protocols, offering sub-second (less than 50 milliseconds) recovery and delivers consistent failover regardless of number of VLANs, number of network nodes or network topology. In most situations, VoIP calls do not drop and digital video feeds do not freeze or pixelize because EAPS allows the network to recover almost transparently from link failure.

Spanning Tree/Rapid Spanning Tree Protocols

BlackDiamond 8800 series switches support Spanning Tree (802.1D), Per VLAN Spanning Tree (PVST+), Rapid Spanning Tree (802.1w) and Multiple Instances of Spanning Tree (802.1s) protocols for Layer 2 resiliency.

Software Enhanced Availability

Software enhanced availability allows users to remain connected to the network even if part of the network infrastructure is down. BlackDiamond 8800 series switches constantly checks for problems in the uplink connections using advanced Layer 3 protocols such as OSPF, VRRP and Extreme Standby Router Protocol™ (ESRP) (ESRP supported in Layer 2 or Layer 3), and dynamically routes around the problem.

Equal Cost Multipath

Equal Cost Multipath enables uplinks to be load balanced for performance and cost savings while also supporting redundant failover. If an uplink fails, traffic is automatically routed to the remaining uplinks and connectivity is maintained.

Link Aggregation (802.3ad)

Cross module link aggregation enables trunking of up to eight links on a single logical connection, for up to 80 Gbps of redundant bandwidth per logical connection.

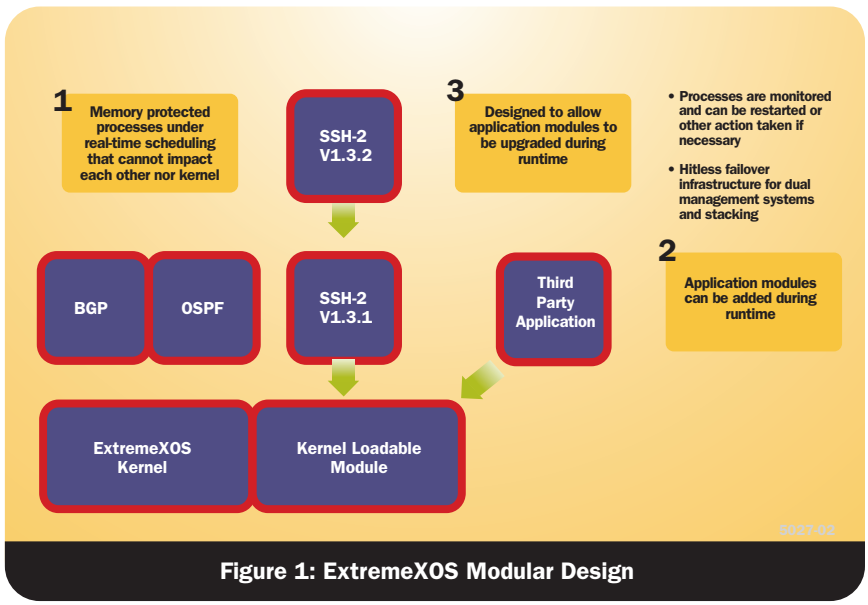


Figure 1: ExtremeXOS Modular Design

High-Performance Connectivity

BlackDiamond 8800 series switches deliver high-performance, cost-effective connectivity to address networking trends such as the increasing number of devices at the edge of the network: IP telephones, wireless Access Points (APs), and other devices. These networking trends drive the requirement for Gigabit Ethernet to the desktop and the use of 10 Gigabit Ethernet as an interconnect technology.

Large Switching Capacity

BlackDiamond 8800 series switches deliver industry leading 800 Gbps switch fabric bandwidth, and over 570 Mpps Layer 2 – Layer 3 hardware forwarding rate.

- 48 Gbps per slot capacity
- Local Switching on every I/O module

High-Density, Line-Rate Connectivity

BlackDiamond 8800 series switches support 1,200 non-blocking gigabit ports or over two hundred 10 Gigabit Ethernet ports in a single seven foot rack, allowing BlackDiamond 8800 series switches to deliver a very cost-effective connectivity option for clusters.

Jumbo Frame Support

Supporting jumbo frames allows cluster computing applications to optimize network performance.

IPv6 Packet Forwarding Support

IPv6 makes available trillions of new IP addresses and offers better address allocation, address aggregation, and features that provide significantly greater end-to-end connectivity and services. BlackDiamond 8800 series switches support IPv6 today, and enable the enterprises to get ready to handle IPv6 traffic as this traffic enters their networks.

Convergence-Ready Connectivity with VoIP Automatic Provisioning

Voice-Grade Connections

BlackDiamond 8800 series switches support 8 queues per port and a range of QoS technologies that can prioritize and predictably handle high priority traffic policing or rate-limiting on ingress, 802.1q tagging and DiffServ marking, and shaping on egress. The Extreme Networks tradition of building products with low latency and jitter continues with BlackDiamond 8800 series switches allowing network managers to build high-performance networks.

High-Density PoE

PoE allows BlackDiamond 8800 series switches to support large IP Telephony and wireless AP deployments. BlackDiamond 8810 can support up to 333 Class 3 ports in a single 14RU chassis or can power a maximum of 432 PoE ports in a single chassis with Class 1 or 2 power. No external power trays are needed in order to power up fully loaded BlackDiamond 8800 switches with Class 1, 2 or 3 devices.

Link Layer Discovery Protocol (LLDP) Support

BlackDiamond 8800 series switches incorporate LLDP to simplify troubleshooting of enterprise networks and enhance the ability of network management tools to discover and maintain accurate network topologies.

Universal Port—Voice-over-IP (VoIP) Auto Provisioning

BlackDiamond 8800 series sets the stage for convergence applications by allowing enterprises to add new access devices in a non-disruptive plug-and-play fashion. Voice and wireless services can be easily implemented without major network upgrades. BlackDiamond 8800 supports automatic provisioning of VoIP using LLDP and event based command scripting capability. It allows dynamic configuration of voice VLANs and QoS. This auto configuration capability allows you to configure VoIP phone settings such as voice VLAN settings, call server IP address configuration, etc. This level of simplicity in managing network changes will greatly reduce operating expenses.

Flexible Connectivity

BlackDiamond 8800 series switches offer highly flexible connectivity options. The "c" series products provide scale and density for the enterprise core and data center. The "a" series modules are designed to provide highly scalable connectivity for aggregation. The "e" series Gigabit Ethernet modules are designed to provide gigabit edge connectivity. Optional plug-in cards provide additional configuration options in edge deployments. In particular, the G48Te2 and G48Tc 10/100/1000 BASE-T modules can be PoE enabled later by adding a plug-in S-POE card. Similarly, on the MSM-48c module, customers can later add an 8-port 1 gigabit or 1-port 10 gigabit uplink cards, S-G8Xc or S-10G1Xc respectively. This is particularly useful for economical edge connectivity where customers only need a few uplink fiber ports. See Figures 2, 3 and 4 for a summary of multiple connectivity options using BlackDiamond 8800 series switches.

Low Power Consumption

BlackDiamond 8800 series with 400 Gigabit Ethernet ports consumes only 1.3 Kilowatts or 3.2 Watts per port. This is significantly lower than other switches in the industry, and can provide considerable savings in power and cooling costs.

Connectivity	Gigabit Edge			Gigabit Copper Aggregation		Gigabit Fiber Aggregation			10 Gigabit			
I/O Module Name	G48Te	G48Pe	G48Te2	G48Ta	G48Tc	G48Xa	G24Xc	G48Xc	10G4Xa	10G4Ca	10G4Xc	10G8Xc
ACL Hardware Resources	1K Centralized per 24-port block	1K Centralized per 24-port block	1K Centralized per 24-port block	2K Centralized per 24-port block	4K Centralized per 24-port block	2K Centralized per 24-port block	4K Centralized per 24-port block	4K Centralized per 24-port block	2K Centralized per 2-port block	2K Centralized per 2-port block	4K Centralized per 2-port block	4K Centralized per 2-port block
Policy Based Routing	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
sFlow Sampling	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware
CLEAR-Flow	No	No	No	No	Yes	No	Yes	Yes	No	No	Yes	Yes
10/100/1000 BASE-T Ports	48	48	48	48	48	/	/	/	/	/	/	/
POE	/	Yes	S-POE Card	/	S-POE Card	/	/	/	/	/	/	/
1000X Mini-GBIC Ports	/	/	/	/	/	48	24	48	/	/	/	/
10GBASE Ports	/	/	/	/	/	/	/	/	4 XFP	4 CX4	4 XFP	8 XFP
Backplane capacity (Gbps) 2 *MSM/1 *MSM	24/12	24/12	48/24	48/24	48/24	48/24	48/24	48/24	48/24	48/24	48/24	48/24
Load Sharing Groups	128	128	128	128	128	128	128	128	128	128	128	128
Jumbo Frame per Port	Per Port	Per Port	Per Port	Per Port	Per Port	Per Port	Per Port	Per Port	Per Port	Per Port	Per Port	Per Port
Layer 2 MAC FDB	8k	8k	8k	16k	32k	16k	32k	32k	16k	16k	32k	32k
IPv4 Longest Prefix Match (LPM) Entries	480	480	480	12K	12K	12K	12K	12K	12K	12K	12K	12K
IPv4 Host Table	500	500	500	2k	6k	2k	6k	6k	2k	2k	6k	6k
Extended IPv4 Host Cache	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
IP Multicast (S,G,V)	1k	1k	1k	1k	2k	1k	2k	2k	1k	1k	2k	2k
IPv6 Forwarding	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware	Hardware

Figure 2: Connectivity Options by I/O Module

Target Applications	Gigabit Edge			Gigabit Copper Aggregation		Gigabit Fiber Aggregation			10 Gigabit			
I/O Module Name	G48Te	G48Pe	G48Te2	G48Ta	G48Tc	G48Xa	G24Xc	G48Xc	10G4Xa	10G4Ca	10G4Xc	10G8Xc
High-Performance Enterprise Core					√		√	√			√	√
Enterprise Data Centers				√	√	√	√	√	√	√	√	√
Traditional Aggregation Layer				√	√	√	√	√	√		√	√
High-Density Gigabit Edge	√	√	√									
High Performance Cluster Computing				√	√				√	√	√	√
Single Switch Medium-Sized Network	√	√	√									

Figure 3: I/O Module by Application

MSM Module Name	MSM-G8X	MSM-48	MSM-48c
CPU	Single Core	Single Core	Dual Core
CLEAR-Flow	No	No	Yes
Gigabit Uplink	8-port SFP	No	Optional 8-port 1G SFP (S-G8Xc)
10G Uplink	No	No	Optional 1-port 10G XFP (S-10G1Xc)

Figure 4: MSM Module Options

Comprehensive Security Using Defense-in-Depth

Implementing a secure network means providing protection at the network perimeter as well as the core. Working together with Extreme Networks Sentriant® family of products, BlackDiamond 8800 switches use a defense-in-depth strategy in protecting your network from known or potential threats.

Directory-Integrated Link Security

Network Login and Dynamic Security Profile

Network Login capability implemented in ExtremeXOS enforces user admission and usage policies. BlackDiamond 8800 series switches support a comprehensive range of Network Login options by providing an 802.1x agent-based approach, a web based (agentless) login capability for guests and a MAC-based authentication model for devices. With these modes of Network Login, only authorized users and devices can connect to the network and be assigned to the appropriate VLAN. The Universal Port scripting framework available in BlackDiamond 8800 switches lets you implement Dynamic Security Profiles which in sync with Network Login allows you to implement fine grained and robust security policies. Upon authentication, the switch can load dynamic ACL/QoS for a user or group of users, to deny/allow the access to the application servers or segments within the network.

Multiple Supplicant Support

Converged network designs often involve the use of shared ports for IP Telephony and wireless access. Multiple supplicant capability on a switch delivers secured access in such designs by uniquely authenticating and applying appropriate policies and VLANs for each user on a shared port.

Host Integrity Checking

Host integrity checking helps keep infected or non-compliant machines off the network. BlackDiamond 8800 series switches support a host integrity or endpoint integrity solution that is based on the model from the Trusted Computing Group.

BlackDiamond 8800 switches interface with Sentriant AG200, the endpoint security software from Extreme Networks, to verify that each endpoint meets the security policies that have been set and quarantines those that are not in compliance.

Threat Detection and Response

CLEAR-Flow Security Rules Engine

CLEAR-Flow Security Rules Engine provides first order threat detection and mitigation, and mirrors traffic to appliances such as Sentriant NG300 for further analysis of suspicious traffic in the network. Using CLEAR-Flow with Sentriant NG300 provides cost-effective scalability of the security solution. Sentriant NG300 can add/modify the BlackDiamond 8800 "c" series switch's CLEAR-Flow rules and ACLs to inspect additional traffic or change inspection thresholds thereby allowing an automated system to fine tune inspection rules in real-time.

sFlow®

sFlow is a sampling technology that provides the ability to sample application level traffic flows on all interfaces simultaneously.

Port Mirroring

BlackDiamond 8800 series switches support many-to-one and cross module port mirroring. This can be used to mirror traffic to an external network appliance such as an intrusion detection device for trend analysis or be utilized by a network administrator as a diagnostic tool when fending off a network attack.

Line-Rate Access Control Lists

BlackDiamond 8800 series switches support hardware-based ACLs based on Layer 2, 3 or 4 header information such as the MAC address or IP source/destination address or TCP/UDP port number.

Hardened Network Infrastructure

DoS Protection

BlackDiamond 8800 series switches handle DoS attacks gracefully. If the switch detects an unusually large number of packets in the CPU input queue, it will assemble ACLs that automatically stop these packets from reaching the CPU. After a period of time, the ACLs are removed. If the attack continues, they are reinstalled.

Policy-Based Routing

Policy-based routing provides a flexible mechanism for network administrators to customize the flow of traffic within their networks. ACLs configured on the switch can redirect packets away from their normal path to another physical switch port. Packets are selected according to their ACL match conditions such as QoS, VLAN, IP addresses, protocol, port number or other criteria.

ASIC-Based Longest Prefix Match

LPM routing eliminates the need for control plane software to learn new flows and allows the network to be resilient under a DoS attack.

Secure Management

The use of protocols like SSH2, SCP and SNMPv3 supported by a BlackDiamond 8800 series switch prevents the interception of management communications and man-in-the-middle attacks.

MD5 Authentication of Routing Protocols

MD5 authentication of routing protocols prevents attackers from tampering valid messages and attacking routing sessions.

Automated Attack Mitigation

1. An infected source enters the network.
2. BlackDiamond 8800 "c" series static ACLs and CLEAR-Flow rules filter out DoS attacks, determine traffic class as 'suspicious'.
3. Selectively port-mirror traffic to Sentriant NG300 for further analysis.
4. Sentriant NG300 continues to watch suspicious traffic and uses its internal rules to escalate traffic-class from suspicious to high level alert.
5. Sentriant NG300 initiates a dynamic ACL on BlackDiamond 8800 "c" series. BlackDiamond 8800 "c" series applies the dynamic ACL in real-time and continues to port mirror suspicious traffic. Sentriant NG300 also sends the mitigation action to Extreme Networks EPICenter network management software.
6. EPICenter works with core and edge switches to enforce the security policy (mitigation action).

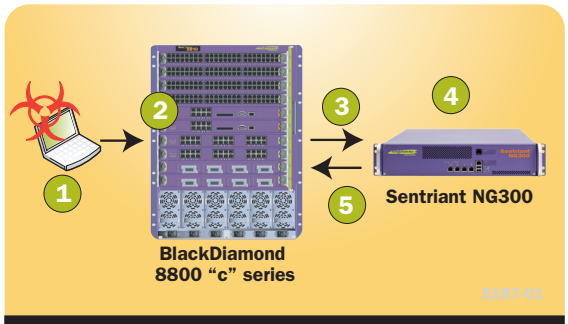
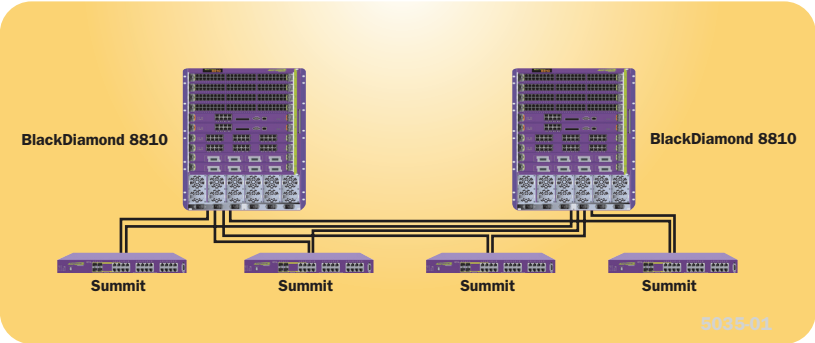


Figure 3: Automated Attack Mitigation

Target Applications

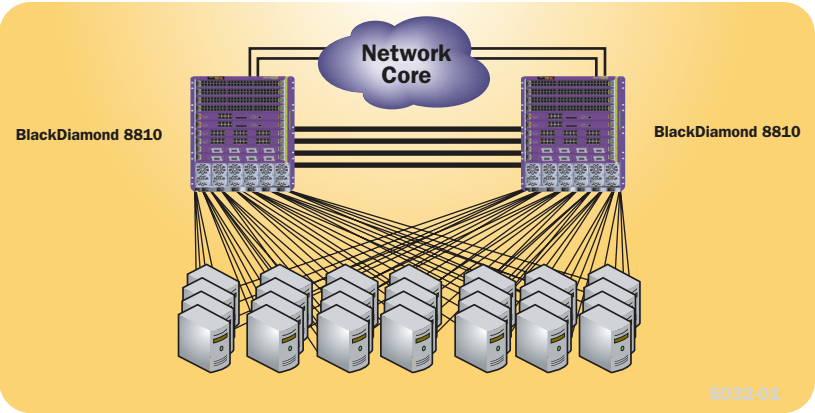
High-Performance Enterprise Core

BlackDiamond 8800 switches provide the ideal core network for a medium-sized network with high-performance and high density 10 Gigabit Ethernet and Gigabit Ethernet interfaces. Customers can connect up to 72 10 Ggigabit ports or 400 gigabit ports in a single 14RU BlackDiamond 8810 system.



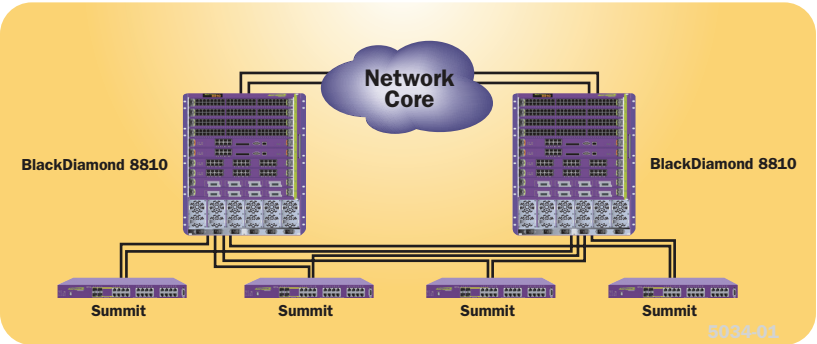
Enterprise Data Centers

High performance 1 gigabit and 10 gigabit connectivity at low latency and low power make BlackDiamond 8800 a winning switching platform for data centers. The high-density allows 400 wire-speed Gigabit Ethernet ports in a single 14RU chassis at less than 3.2 Watts per port, allowing customers to save on power and cooling costs while providing the superior switching performance required in the data center.



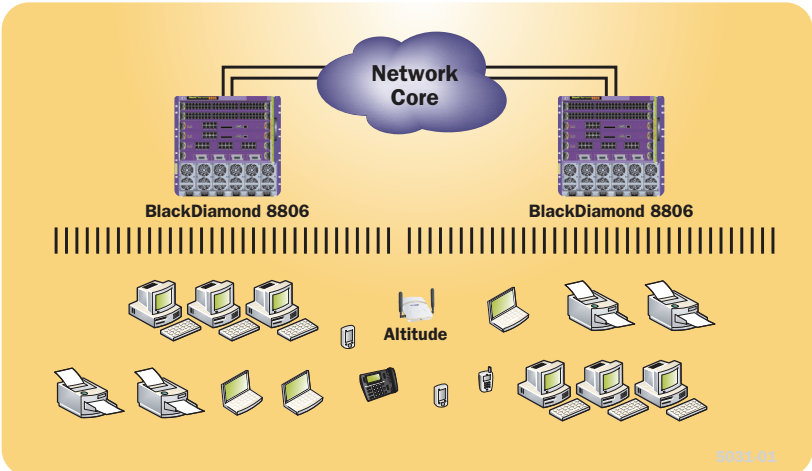
Traditional Aggregation Layer

While Extreme Networks believes that a two-tier network is a simpler approach, the layout of a building or campus or the wiring plant sometimes requires an aggregation layer. This layer typically aggregates gigabit or 10 gigabit uplinks from edge switches and connects up to the core through gigabit and/or 10 Gigabit Ethernet uplinks. BlackDiamond 8800 series switches provide high-density gigabit and 10 Gigabit Ethernet that is required for the aggregation layer.



High-Density PoE Edge Switch for Integrated Wired, Wireless and IP Telephony

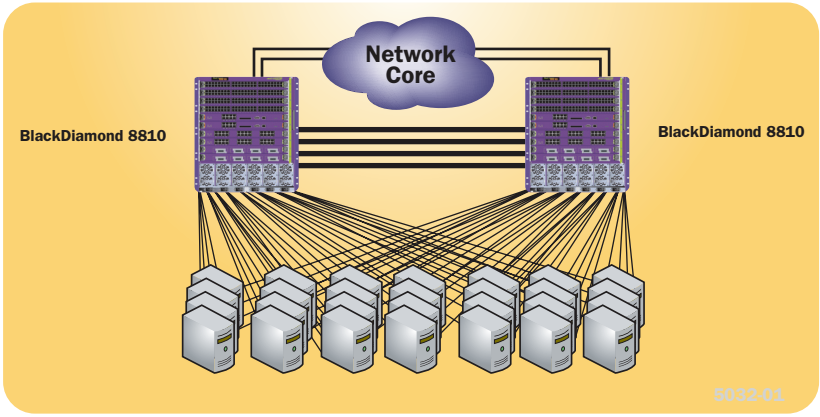
BlackDiamond 8800 series switches deliver high-performance and cost-effective connectivity driven by networking trends such as: the increasing number of IP telephones, wireless APs and other devices at the edge of the network, Gigabit Ethernet connections to the desktop and the use of gigabit and 10 Gigabit Ethernet as an interconnect technology. BlackDiamond 8800 series switches allow the traditional edge layer and aggregation layer of the network to be collapsed into a single unified access layer.



Target Applications

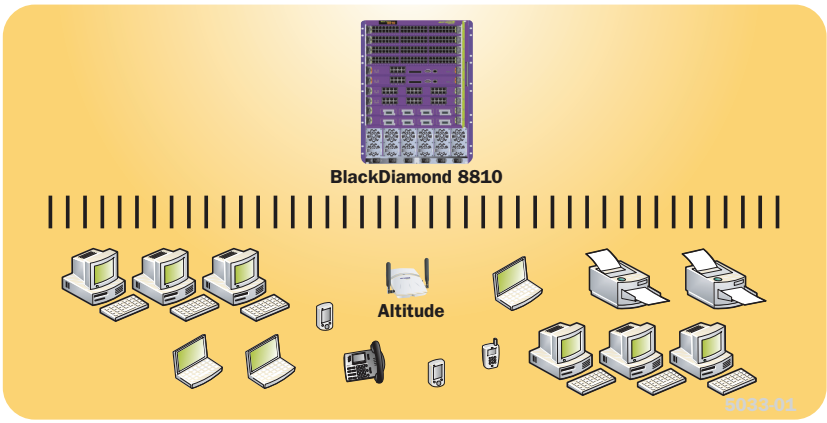
High Performance Cluster Computing

HPCC consists of hundreds or thousands of servers working co-operatively to solve large computational problems. With the use of relatively inexpensive and compact 1RU servers, a significant amount of processing power can be cost-effectively packed into a relatively small footprint. BlackDiamond 8800 series switches address the need for high-performance and cost-effective connectivity required for HPCC using gigabit and 10 Gigabit Ethernet as the interconnect technology.



Single Switch Medium-Sized Network

BlackDiamond 8800 series switches provide the small to medium enterprise with an ideal single switch solution that satisfies their complete networking needs. The typical multi-switch network can be combined to a single highly available switch that delivers high-density PoE for IP Telephony, high speed performance for services and comprehensive security.



Technical Specifications

ExtremeXOS 12.1 Supported Protocols

Switching

- RFC 3619 Ethernet Automatic Protection Switching (EAPS) and EAPSv2
- IEEE 802.1D – 1998 Spanning Tree Protocol (STP)
- IEEE 802.1D – 2004 Spanning Tree Protocol (STP and RSTP)
- IEEE 802.1w – 2001 Rapid Reconfiguration for STP, RSTP
- IEEE 802.1Q – 2003 (formerly IEEE 802.1s) Multiple Instances of STP, MSTP
- EMISTP, Extreme Multiple Instances of Spanning Tree Protocol
- PVST+, Per VLAN STP (802.1Q interoperable)
- Draft-ietf-bridge-rstpmib-03.txt – Definitions of Managed Objects for Bridges with Rapid Spanning Tree Protocol
- Extreme Standby Router Protocol (ESRP)
- IEEE 802.1Q – 1998 Virtual Bridged Local Area Networks
- IEEE 802.3ad Static load sharing configuration and LACP based dynamic configuration
- Software Redundant Ports
- IEEE 802.1AB – LLDP Link Layer Discovery Protocol
- LLDP Media Endpoint Discovery (LLDP-MED), ANSI/TIA-1057, draft 08
- Extreme Discovery Protocol (EDP)
- Extreme Loop Recovery Protocol (ELRP)
- Extreme Link State Monitoring (ELSM)
- IEEE 802.1ag L2 Ping and traceroute, Connectivity Fault Management

Management and Traffic Analysis

- RFC 2030 SNTP, Simple Network Time Protocol v4
- RFC 854 Telnet client and server
- RFC 783 TFTP Protocol (revision 2)
- RFC 951, 1542 BootP
- RFC 2131 BOOTP/DHCP relay agent and DHCP server
- RFC 1591 DNS (client operation)
- RFC 1155 Structure of Mgmt Information (SMIv1)
- RFC 1157 SNMPv1
- RFC 1212, RFC 1213, RFC 1215 MIB-II, Ethernet-Like MIB & TRAPs
- RFC 1573 Evolution of Interface
- RFC 1650 Ethernet-Like MIB (update of RFC 1213 for SNMPv2)
- RFC 1901 – 1908 SNMP v2c, SMIv2 and Revised MIB-II
- RFC 2570 – 2575 SNMPv3, user based security, encryption and authentication
- RFC 2576 Coexistence between SNMP Version 1, Version 2 and Version 3
- RFC 1757 RMON 4 groups: Stats, History, Alarms and Events
- RFC 2021 RMON2 (probe configuration)
- RFC 2925 Ping/Traceroute MIB
- RFC 2668 802.3 MAU MIB
- draft-ietf-hubmib-mau-mib-v3-02.txt
- RFC 1643 Ethernet MIB
- RFC 1493 Bridge MIB
- RFC 1354 IPv4 Forwarding Table MIB
- RFC 2737 Entity MIB v2
- RFC 2233 Interface MIB
- RFC 3621 PoE-MIB (PoE switches only)
- Secure Shell (SSH-2) client and server
- Secure Copy (SCP-2) client and server
- Secure FTP (SFTP) server
- sFlow version 5
- Configuration logging
- Multiple Images, Multiple Configs
- RFC 3164 BSD Syslog Protocol with Multiple Syslog Servers
  - 999 Local Messages (criticals stored across reboots)
- Extreme Networks vendor MIBs (includes FDB, PoE, CPU, Memory MIBs)
- XML APIs over Telnet/SSH and HTTP/HTTPS
- Web-based device management interface – ExtremeXOS ScreenPlay

Security, Switch and Network Protection

- Secure Shell (SSH-2), Secure Copy (SCP-2) and SFTP client/server with encryption/authentication (requires export controlled encryption module)
- SNMPv3 user based security, with encryption/authentication (see above)
- RFC 1492 TACACS+
- RFC 2138 RADIUS Authentication
- RFC 2139 RADIUS Accounting
- RFC 3579 RADIUS EAP support for 802.1x
- RADIUS Per-command Authentication
- Access Profiles on All Routing Protocols
- Access Policies for Telnet/SSH-2/SCP-2
- Network Login – 802.1x, web and MAC-based mechanisms
- IEEE 802.1x – 2001 Port-Based Network Access Control for Network Login
- Multiple supplicants with multiple VLANs for Network Login (all modes)
- Fallback to local authentication database (MAC and Web-based methods)
- Guest VLAN for 802.1x
- RFC 1866 HTML – Used for web-based Network Login and ScreenPlay
- SSL/TLS transport – used for web-based Network Login and ExtremeXOS ScreenPlay, (requires export controlled encryption module)
- MAC Security – Lockdown and Limit
- IP Security – RFC 3046 DHCP Option 82 with port and VLAN ID
- IP Security – Trusted DHCP Server
- Layer 2/3/4 Access Control Lists (ACLs)
- RFC 2267 Network Ingress Filtering
- RPF (Unicast Reverse Path Forwarding) Control via ACLs
- Wire-speed ACLs
- Rate Limiting / Shaping by ACLs
- IP Broadcast Forwarding Control
- ICMP and IP-Option Response Control
- SYN attack protection
- CPU DoS Protection with traffic rate-limiting to management CPU
- Robust against common Network Attacks:
  - CERT (http://www.cert.org)
  - CA-2003-04: "SQL Slammer"
  - CA-2002-36: "SSHredder"
  - CA-2002-03: SNMP vulnerabilities
  - CA-98-13: tcp-denial-of-service
  - CA-98.01: smurf
  - CA-97.28:Teardrop_Land -Teardrop and "LAND" attack
  - CA-96.26: ping
  - CA-96.21: tcp_syn_flooding
  - CA-96.01: UDP_service_denial
  - CA-95.01: IP_Spoofing_Attacks_and_Hijacked_Terminal_Connections
  - IP Options Attack
- Host Attacks
  - Teardrop, boink, opentear, jolt2, newtear, nestea, syndrop, smurf, fraggle, papasmurf, synk4, raped, winfreeze, ping –f, ping of death, pepsi5, Latierra, Winnuke, Simping, Sping, Ascend, Stream, Land, Octopus

Security, Router Protection – Requires Edge License or above

- IP Security – DHCP enforcement via Disable ARP Learning
- IP Security – Gratuitous ARP Protection
- IP Security – DHCP Secured ARP/ARP Validation
- Routing protocol MD5 authentication (see above)

Security Detection and Protection in Core and Aggregation Products

- CLEAR-Flow, threshold based alerts and actions *(BlackDiamond 10808, BlackDiamond 12800, BlackDiamond 8800 "c" series, and Summit X450a series in non-SummitStack configuration only)*

IPv4 Host Requirements

- RFC 1122 Host Requirements
- RFC 768 UDP
- RFC 791 IP
- RFC 792 ICMP
- RFC 793 TCP
- RFC 826 ARP
- RFC 894 IP over Ethernet
- RFC 1027 Proxy ARP
- RFC 2068 HTTP server
- IGMP v1/v2/v3 Snooping with Configurable Router Registration Forwarding
- IGMP Filters
- Static IGMP Membership
- Multicast VLAN Registration (MVR)

IPv4 Router Requirements – Requires Edge License or above

- RFC 1812 Requirements for IP Version 4 Routers
- RFC 1519 CIDR
- RFC 1256 IPv4 ICMP Router Discovery (IRDP)
- Static Unicast Routes
- Static Multicast Routes
- RFC 1058 RIP v1
- RFC 2453 RIP v2
- Static ECMP
- RFC 1112 IGMP v1
- RFC 2236 IGMP v2
- RFC 3376 IGMP v3
- RFC 1354 IP Forwarding Table MIB
- RFC 1724 RIPv2 MIB

IPv4 Router Requirements – Requires Advanced Edge License or above

- RFC 2338 VRRP
- RFC 2787 VRRP MIB
- RFC 2328 OSPF v2 (Edge-mode)
- OSPF ECMP
- OSPF MD5 Authentication
- RFC 1587 OSPF NSSA Option
- RFC 1765 OSPF Database Overflow
- RFC 2370 OSPF Opaque LSA Option
- RFC 3623 OSPF Graceful Restart
- RFC 1850 OSPFv2 MIB
- RFC 2362 PIM-SM (Edge-mode)
- RFC 3569, draft-ietf-ssm-arch-06.txt PIM-SSM PIM Source Specific Multicast
- draft-ietf-pim-mib-v2-o1.txt

IPv6 Host Requirements

- RFC 2460, Internet Protocol, Version 6 (IPv6) Specification
- RFC 2461, Neighbor Discovery for IP Version 6, (IPv6)
- RFC 2463, Internet Control Message Protocol (ICMPv6) for the IPv6 Specification
- RFC 2464, Transmission of IPv6 Packets over Ethernet Networks

Technical Specifications

- RFC 2465, IPv6 MIB, General Group and Textual Conventions
- RFC 2466, MIB for ICMPv6
- RFC 2462, IPv6 Stateless Address Auto configuration – Host Requirements
- RFC 1981, Path MTU Discovery for IPv6, August 1996 – Host requirements
- RFC 3513, Internet Protocol Version 6 (IPv6) Addressing Architecture
- RFC 3587, Global Unicast Address Format
- Telnet server over IPv6 transport
- SSH-2 server over IPv6 transport
- Ping over IPv6 transport
- Traceroute over IPv6 transport

IPv6 Interworking and Migration

- RFC 2893, Configured Tunnels
- RFC 3056, 6to4

IPv6 Router Requirements – Requires Edge License or above

- RFC 2462, IPv6 Stateless Address Auto configuration – Router Requirements
- RFC 1981, Path MTU Discovery for IPv6, August 1996 – Router requirements
- RFC 2710, IPv6 Multicast Listener Discovery v1 (MLDv1) Protocol
- RFC 3810, IPv6 Multicast Listener Discovery v2 (MLDv2) Protocol
- Static Unicast routes for IPv6
- RFC 2080, RIPng
- Static ECMP

Core Protocols for Layer 2, IPv4 and IPv6 – Requires Core License or above

- EAPSv2 Shared Ports – multiple interconnections between rings
- PIM-DM Draft IETF PIM Dense Mode draft-ietf-idmr-pim-dm-05.txt, draft-ietf-pim-dm-new-v2-04.txt
- RFC 3618 Multicast Source Discovery Protocol (MSDP)
- RFC 3446 Anycast RP using PIM and MSDP
- RFC 2740 OSPFv3, OSPF for IPv6
- RFC 1771 Border Gateway Protocol 4
- RFC 1965 Autonomous System Confederations for BGP
- RFC 2796 BGP Route Reflection (supersedes RFC 1966)
- RFC 1997 BGP Communities Attribute
- RFC 1745 BGP4/IDRP for IP-OSPF Interaction
- RFC 2385 TCP MD5 Authentication for BGPv4
- RFC 2439 BGP Route Flap Damping
- RFC 2918 Route Refresh Capability for BGP-4
- RFC 3392 Capabilities Advertisement with BGP-4
- RFC 4360 BGP Extended Communities Attribute
- RFC 4486 Subcodes for BGP Cease Notification message
- draft-ietf-idr-restart-10.txt Graceful Restart Mechanism for BGP
- RFC 4760 Multiprotocol extensions for BGP-4
- RFC 1657 BGP-4 MIB
- Draft-ietf-idr-bgp4-mibv2-02.txt – Enhanced BGP-4 MIB
- RFC 1195 Use of OSI IS-IS for Routing in TCP/IP and Dual Environments (TCP/IP transport only)
- RFC 2763 Dynamic Hostname Exchange Mechanism for IS-IS
- RFC 2966 Domain-wide Prefix Distribution with Two-Level IS-IS
- RFC 2973 IS-IS Mesh Groups
- Draft-ietf-isis-restart-02 Restart Signaling for IS-IS
- Draft-ietf-isis-ipv6-06 Routing IPv6 with IS-IS
- Draft-ietf-isis-wg-multi-topology-11 Multi Topology (MT) Routing in IS-IS

QoS, VLAN Services and MPLS

Quality of Service and Policies

- IEEE 802.1D – 1998 (802.1p) Packet Priority
- RFC 2474 DiffServ Precedence, including 8 queues/port
- RFC 2598 DiffServ Expedited Forwarding (EF)
- RFC 2597 DiffServ Assured Forwarding (AF)
- RFC 2475 DiffServ Core and Edge Router Functions

VLAN Services: VLANs, vMANs

- IEEE 802.1Q VLAN Tagging
- IEEE 802.1v: VLAN classification by Protocol and Port
- Port-based VLANs
- Protocol-based VLANs
- MAC-based VLANs
- Multiple STP domains per VLAN
- Upstream Forwarding Only / Disable Flooding
- draft-sanjib-private-vlan-08.txt Private VLANs
- Asymmetric VLANs
- VLAN Translation
- IEEE 802.1ad Provider Bridge Network, virtual MANs (vMANs)
- vMAN Ethertype Translation/Secondary VMAN Ethertype
- VLAN Aggregation (not applicable to Summit X150 and Summit X350)

General Specifications

Switching Capacity

BlackDiamond 8810

- 800 Gbps total switching capacity
- 4.016 Tbps total switching capacity (Including local switching)
- 570 Mpps Layer 2 HW forwarding rate
- 570 Mpps Layer 3 HW forwarding rate

BlackDiamond 8806

- 416 Gbps total switching capacity
- 288 Mpps Layer 2 HW forwarding rate
- 288 Mpps Layer 3 HW forwarding rate

Port Capacity

BlackDiamond 8810

- 72 ports 10GBASE-X (XENPAK) (64 ports if 2 MSMs)
- 432 ports 10/100/1000BASE-T (384 ports if 2 MSMs)
- 440 ports 1000BASE-X SFP (Mini-GBIC) (400 ports if 2 MSMs)

BlackDiamond 8806

- 40 ports 10GBASE-X (XENPAK) (32 ports if 2 MSMs)
- 240 ports 10/100/1000BASE-T (192 ports if 2 MSMs)
- 248 ports 1000BASE-X SFP (Mini-GBIC) (208 ports if 2 MSMs)

Management Switch Module

- The management and switching module contains the control path and the switch fabric for the BlackDiamond 8800

MSM-G8X Module BlackDiamond 8800 Management Switch Module, with 8 1000BASE-X mini-GBIC ports

MSM-48 BlackDiamond 8800 Management Switch Module, no I/O port

MSM-48c BlackDiamond 8800 Management Switch Module, optional I/O port

S-G8Xc 8-port 1G SFP card (add-on module for MSM-48c)

S-10G1Xc 1-port 10G XFP card (add-on module for MSM-48c)

I/O Module Options

G48Te 48-port 10/100/1000BASE-T Gigabit Ethernet module 2:1 oversubscription

G48Pe 48-port 10/100/1000BASE-T Gigabit Ethernet module with PoE 2:1 oversubscription

G48T 48-port 10/100/1000BASE-T Gigabit Ethernet module

G48P 48-port 10/100/1000BASE-T Gigabit Ethernet module with PoE

G48Te2 48-port 10/100/1000BASE-T RJ-45, edge, optional PoOE card

S-POE PoE Card (add-on module for G48Tc, G48Te2)

G48Ta 48-port 10/100/1000BASE-T Gigabit Ethernet module

G24X 24-port 1000BASE-X Gigabit Ethernet module, mini-GBIC modules required

G48Xa 48-port 1000BASE-X Gigabit Ethernet module, mini-GBIC modules required

G24Xc 24-port 1000BASE-X mini-GBIC

G48Xc 48-port 1000BASE-X mini-GBIC

10G4X 4-port 10GBASE-X 10 Gigabit Ethernet module, XENPAK modules required

10G4Xa 4-port 10GBASE-X 10 Gigabit Ethernet module, XFP modules required

10G4Ca 4-port 10GBASE-CX4 10 Gigabit Ethernet module

10G4Xc 4-port 10GBASE-XFP

10G8Xc 8-port 10GBASE-XFP

IEEE 802.3 Standard

G48Te, G48Te2, G48Pe, G48T, G48Tc, G48P and G48Ta Gigabit Ethernet modules comply with the following standards

- IEEE 802.3 10BASE-T
- IEEE 802.3u 100BASE-T
- IEEE 802.3ab 1000BASE-T

MSM-G8X, G24X, G48Xa, G24Xc and G48Xc Gigabit Ethernet modules comply with the following standard

- IEEE 802.3z 1000BASE-X

10GX4 and 10G4Xa 10 Gigabit Ethernet modules comply with the following standard

- IEEE 802.3ae 10GBASE-X

10G4Ca complies with the following standard

- IEEE 802.3ak 10GBASE-CX4

Power Supply Options

Both AC and DC power supplies are available

- AC power supplies can run from 90-264 VAC, and deliver
  - 700W at 90V to 100V, or
  - 1200W at 200V to 220V
- 48V DC power supplies deliver 1200W of power

Power over Ethernet (PoE) 802.3af

333 ports with 802.3af class 0 devices supported with 6 power supplies
432 ports with 802.3af class 1 devices supported with 6 power supplies
432 ports with 802.3af class 2 devices supported with 6 power supplies
333 ports with 802.3af class 3 devices supported with 6 power supplies

Technical Specifications

Physical Specifications

Dimensions

BlackDiamond 8810 Chassis:
24.47" high x 17.51" wide x 18.23" deep (62.2 cm x 44.5 cm x 46.3 cm)

BlackDiamond 8806 Chassis:
17.5" high x 17.51" wide x 18.23" deep (44.45 cm x 44.5 cm x 46.3 cm)

Power Supply:
4.75" high x 2.75" wide x 13.75" deep (12.1 cm x 6.99 cm x 34.9 cm)

MSM Module Dimensions:
1.63" high x 15.26" wide x 15.25" deep (4.1 cm x 38.8 cm x 38.7 cm)

I/O Module Dimensions:
1.63" high x 15.26" wide x 15.25" deep (4.1 cm x 38.8 cm x 38.7 cm)

S-G8Xc and S-10G1Xc Dimensions:
1.32" high x 6.94" wide x 11.19" deep (3.35 cm x 17.63 cm x 28.42cm)

S-POE Card Dimensions:
1.25" high x 14.31" wide x 4.81" deep (3.18 cm x 36.35 cm x 12.22 cm)

Weight

BlackDiamond 8810 Chassis: 79 lb (35.8 kg)
BlackDiamond 8810 Chassis fully loaded (max): 200.5 lb (90.9 kg)
BlackDiamond 8806 Chassis: 65 lb (29.5 kg)
BlackDiamond 8806 Chassis fully loaded (max): 151 lb (68.5 kg)
Power Supply: 7 lb (3.2 kg)
MSM-G8X Module: 7.5 lb (3.1 kg)
MSM-48 Module: 7.5 lb (3.1 kg)
MSM-48c Module: 6.45 lb (2.93 kg)
S-G8Xc Card: 2.20 lb (1.0 kg)
S-10G1Xc Card: 2.10 lb (0.95 kg)
G48Te Module: 6.75 lb (3.06 kg)
G48Pe Module: 6.75 lb (3.06 kg)
G48T Module: 7.75 lb (3.5 kg)
G48P Module: 8 lb (3.6 kg)
G48Te2 Module: 7.75 lb (3.52 kg)
S-POE Card: 0.80 lb (0.36 kg)
G48Ta Module: 6.75 lb (3.1 kg)
G48Tc Module: 7.75 lb (3.52 kg)
G48Xa Module: 8 lb (3.6 kg)
G24X Module: 7.75 lb (3.5 kg)
G24Xc Module: 6.95 lb (3.15 kg)
G48Xc Module: 7.55 lb (3.42 kg)
10G4X Module: 7.75 lb (3.5 kg)
10G4Xa Module: 6.5 lb (2.9 kg)
10G4Ca Module: 6.5 lb (2.9 kg)
10G4Xc Module: 6.50 lb (2.95 kg)
10G8Xc Module: 6.91 lb (3.13 kg)

Power

BlackDiamond 8810 Chassis with Fan Trays: 55W (Heat Dissipation: 188 BTU)
BlackDiamond 8806 Chassis with Fan Trays: 45W (Heat Dissipation: 154 BTU)
MSM-G8X Module: 150W (Heat Dissipation: 512 BTU)
MSM-48 Module: 150W (Heat Dissipation 512 BTU)
MSM-48c Module: 150W
G48Te Module: 120W (Heat Dissipation: 409 BTU)
G48Te2 Module: 110W
G48Pe Module: 120W (Heat Dissipation: 409 BTU)
G48T Module: 105W (Heat Dissipation: 358 BTU)
G48P Module: 110W (Heat Dissipation: 375 BTU)
G48Ta Module: 120W (Heat Dissipation: 409 BTU)
G48Tc Module: 110W
G48Tc Module with S-POE card: 110W
G24X Module: 105W (Heat Dissipation: 358 BTU)
G48Xa Module: 105W (Heat Dissipation: 358 BTU)
G24Xc Module: 100W
G48Xc Module: 125W
10G4X Module: 105W (Heat Dissipation: 358 BTU)
10G4Xa Module: 120W (Heat Dissipation: 409 BTU)
10G4Ca Module: 105W (Heat Dissipation: 358 BTU)
10G4Xc Module: 100W
10G8Xc Module: 135W

Operating Specifications

Operating Conditions

Operating Temperature Range: 0° C to 40° C (32° F to 104° F)
Operating Humidity: 10% to 93% relative humidity, non-condensing
Operational Shock: 30 m/s2 (3g), 11ms, 60 Shocks
Operational Sine Vibration: 5-100-5 HZ @ 0.2G, 0-Peak, 01 Oct./min.
Operational Random Vibration: 3-500MHz @ 1.5g rms

Regulatory/Safety Standards

North American Safety of ITE
- UL 60950-1:2003 1st Ed., Listed Device (U.S.)
- CSA 22.2#60950-1-03 1st Ed.(Canada)
- Complies with FCC 21CFR Chapter1, Subchapter J (U.S. Laser Safety)
- CDRH Letter of Approval (U.S. FDA Approval)
- IEEE 802.3af 6-2003 Environment A for PoE Applications

European Safety of ITE
- EN60950-1:2001+A11
- EN 60825-1+A2:2001 (Lasers Safety)
- TUV-R GS Mark by German Notified Body
- 73/23/EEC Low Voltage Directive

International Safety of ITE
- CB Report & Certificate per IEC 60950-1:2001+All Country Deviations
- AS/NZX 60950-1 (Australia/New Zealand)

EMI/EMC Standards

North America EMC for ITE
- FCC CFR 47 part 15 Class A (U.S.A.)
- ICES-003 Class A (Canada)

European EMC standards
- EN 55022:1998 Class A
- EN 55024:1998 Class A
  – includes IEC 61000-4-2, 3, 4, 5, 6, 8, 11
- EN 61000-3-2,3 (Harmonics & Flicker)
- ETSI EN 300 386:2001 (EMC Telecommunications)
- 89/336/EEC EMC Directive

International EMC Certifications
- CISPR 22:1997 Class A (International Emissions)
- CISPR 24:1997 Class A (International Immunity)
- IEC/EN 61000-4-2 Electrostatic Discharge, 8kV Contact, 15kV Air, Criteria A
- IEC/EN 61000-4-3 Radiated Immunity 10V/m, Criteria A
- IEC/EN 61000-4-4 Transient Burst, 1kV, Criteria A
- IEC/EN 61000-4-5 Surge, 2kV, 4kV, Criteria A
- IEC/EN 61000-4-6 Conducted Immunity, 0.15-80MHz, 10V/m unmod. RMS, Criteria A
- IEC/EN 61000-4-11 Power Dips & Interruptions, >30%, 25 periods, Criteria C

Country Specific
- VCCI Class A (Japan Emissions)
- AS/NZS 3548 ACA (Australia Emissions)
- CNS 13438:1997 Class A (BSMI-Taiwan)
- NOM/NYCE (Mexico)
- MIC Mark, EMC Approval (Korea)

Telecom Standards
- ETSI EN 300 386:2001 (EMC Telecommunications)
- ETSI EN 300 019 (Environmental for Telecommunications)

IEEE 802.3 Media Access Standards
- IEEE 802.3z 1000BASE-X
- IEEE 802.3ab 1000BASE-T
- IEEE 802.3ae 10GBASE-X
- IEEE 802.3ak 10GBASE-CX4
- IEEE 802.3af Power over Ethernet

Environmental

- EN/ETSI 300 019-2-1 v2.1.2 – Class 1.2 Storage
- EN/ETSI 300 019-2-2 v2.1.2 – Class 2.3 Transportation
- EN/ETSI 300 019-2-3 v2.1.2 – Class 3.1e Operational
- EN/ETSI 300 753 (1997-10) – Acoustic Noise
- NEBS GR-63 Issue 2 – Sound Pressure
- ASTM D3580 Random Vibration Unpackaged 1.5G

Warranty

- 1-year on Hardware
- 90-days on Software

Ordering Information

Part Number	Description
41011	BlackDiamond 8810 10-Slot Chassis including Fan Tray
41012	BlackDiamond 8806 6-Slot Chassis including Fan Tray
60020	BlackDiamond 10808/BlackDiamond 8800 700W/1200W 100-240V PSU
41050	BlackDiamond 8806 600W/900W 100-240V PSU
60021	BlackDiamond 10808/BlackDiamond 8800 1200W -48V DC PSU
41211	BlackDiamond 8800 Management Switch Module, w/8 1000BASE-X mini-GBIC I/O Ports
41212	BlackDiamond 8800 Management Switch Module, no I/O port
41213	BlackDiamond 8800 Management Switch Module, optional I/O port
41821	BlackDiamond 8800 8-port 1G SFP card (add-on module for MSM-48c)
41822	BlackDiamond 8800 1-port 10G XFP card (add-on module for MSM-48c)
41511	BlackDiamond 8800 48-port 10/100/1000BASE-T RJ-45
41512	BlackDiamond 8800 48-port 10/100/1000BASE-T PoE RJ-45
41513	BlackDiamond 8800 48-port 10/100/1000BASE-T RJ-45 2:1 Oversubscription, Edge
41514	BlackDiamond 8800 48-port 10/100/1000BASE-T PoE RJ-45 2:1 Oversubscription, Edge
41515	BlackDiamond 8800 48-port 10/100/1000BASE-T RJ-45, Advanced Aggregation
41516	BlackDiamond 8800 48-port 10/100/1000BASE-T RJ-45, edge, optional PoE card
41517	BlackDiamond 8800 48-port 10/100/1000BASE-T RJ-45, optional PoE card
41811	BlackDiamond 8800 POE Card (add-on module for G48Tc, G48Te2)
41541	BlackDiamond 8800 24-port 1000BASE-X mini-GBIC
41542	BlackDiamond 8800 48-port 1000BASE-X mini-GBIC, Advanced Aggregation
41543	BlackDiamond 8800 24-port 1000BASE-X mini-GBIC
41544	BlackDiamond 8800 48-port 1000BASE-X mini-GBIC
41611	BlackDiamond 8800 4-port 10GBASE-X XENPAK
41612	BlackDiamond 8800 4-port 10GBASE-X XFP, Advanced Aggregation
41613	BlackDiamond 8800 4-port 10GBASE-CX4
41614	BlackDiamond 8800 4-port 10GBASE-XFP
41615	BlackDiamond 8800 8-port 10GBASE-XFP
41111	BlackDiamond 8810 Spare Fan Tray
65043	BlackDiamond 8806 Spare Fan Tray
41112	BlackDiamond 8800 Spare PSU/Fan Controller Board
41121	BlackDiamond 8800 Spare Blank Panel
41141	BlackDiamond 8810 Mid Mount Kit
41151	BlackDiamond 8800 Cable Management Kit
41311	BlackDiamond 8800 ExtremeXOS Core Software Upgrade
86101	ExtremeXOS Universal Port Feature Pack
10110	10 Gigabit Ethernet XENPAK Transceiver, 850 nm, up to 300 m on Multimode Fiber, SC Connector
10111	10 Gigabit Ethernet XENPAK Transceiver, 1310 nm, up to 10 km on Single-mode Fiber, SC Connector
10112	10 Gigabit Ethernet XENPAK Transceiver, 1550 nm, up to 40 km on Single-mode Fiber, SC Connector
10113	10 Gigabit Ethernet XENPAK Transceiver, 1550 nm, up to 80 km on Single-mode Fiber, SC Connector
10114	10 Gigabit Ethernet WWDM XENPAK Transceiver, 1310 nm, up to 300 m on Multi-mode Fiber and up to 10 km on a Single-mode Fiber, SC Connector
10051	SFP, 1000BASE-SX, LC Connector

10052	SFP, 1000BASE-LX, LC Connector
10053	SFP, Extra Long Distance SMF 70 km/21 dB Budget, LC Connector
10056	SFP, 1000BASE-BX-U, SMF (1490 nm TX/1310 nm RX Wavelength)
10057	SFP, 1000BASE-BX-D, SMF (1310 nm TX/1490 nm RX Wavelength)
10060	SFP, Dual-speed 100 FX/1000LX, LC Connector
10063	SFP, 100BASE-FX MMF, LC Connector
10121	10GBASE-SR XFP Transceiver, 850nm up to 300m on Multimode Fiber, LC Connector
10122	10GBASE-LR XFP Transceiver, 1310nm, up to 10km on Single-mode Fiber, LC Connector
10124	10GBASE-ER XFP Transceiver, 1550nm up to 40km on Single-mode Fiber, LC Connector

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