

# Voltaire® Grid Director™ 4036E

Single system 40Gb/s InfiniBand (QDR) switch with integrated low latency Ethernet gateway



## Scaling-Out Data Centers with QDR

Faster servers combined with high performance storage and applications that use increasingly complex models are causing data bandwidth requirements to spiral upward. As servers are deployed with next generation processors and server busses, high-performance computing environments—in industries such as energy, bioscience, financial services, government and academic research—will need every last bit of bandwidth delivered with Voltaire's fourth generation Grid Director 4000 smart switches. As clusters grow in size and complexity, efficient routing and advanced management tools become mandatory for quick fabric bring-up and minimal fabric downtime.

The Voltaire Grid Director 4036E is a high performance, low latency and fully non-blocking InfiniBand switch, which includes a built-in low latency Ethernet gateway for bridging traffic to and from Ethernet-based networks or storage. With thirty-four 40 Gb/s InfiniBand ports (delivering 2.72 Tb/s), less than 100 nanoseconds of port-to-port latency, and two 1/10Gb Ethernet ports bridging traffic in less than two microseconds, I/O bottlenecks are removed making applications operate at maximum efficiency. The Voltaire Grid Director 4036E was designed as a self-contained full solution including an InfiniBand switch, an embedded subnet manager, and a built-in, hardware-based (cut-thru) low latency Ethernet gateway in a compact 1U device. The efficient Grid Director 4036E's smart design makes it easily useful for both small and large clusters.

## Accelerating Applications Across Different Networks

With its high bandwidth, low latency and reduced overhead, InfiniBand is the ideal choice for speeding application performance while simultaneously consolidating network and I/O infrastructure. Combining InfiniBand and Ethernet into a single solution provides the ideal rack backbone for next generation data centers. There are many applications, services and resources that reside on Ethernet LANs, or that cannot benefit from the capabilities of InfiniBand. By utilizing InfiniBand to connect application servers and Voltaire's multi-service switch solutions to seamlessly connect Ethernet, InfiniBand and Fibre Channel networks, IT organizations reduce complexity and cost and can concentrate on providing reliable, scalable, high performance solutions rather than on the specifics of the technology.

## Much More than Just Bridging

Accelerating applications across multiple network technologies requires much more than just fast bridging of data from one protocol to another. The Grid Director 4036E leverages Voltaire's experience in both InfiniBand and Ethernet technologies, including years of experience deploying InfiniBand-to-Ethernet gateways in commercial environments, in order to efficiently handle a variety of advanced networking protocols and ensure fast, seamless integration between the environments. These capabilities include:

- Transparent mapping between Ethernet VLANs and InfiniBand partitions to ensure continuity of security and service levels
- Accelerating IP multicast over InfiniBand using hardware-based multicast
- Flow control support over both InfiniBand and Ethernet links for efficient handling of congestion
- Layer 2/3/4-based packet filtering and classification
- Link aggregation (LAG) between Ethernet ports
- Aggregation of Ethernet ports from multiple gateways for scalability or redundancy purposes

## InfiniBand-to-Ethernet Gateway Use Cases

Some of the more popular use cases for InfiniBand-to-Ethernet gateways include the following:

- Financial service organizations, such as banks and hedge funds, often use InfiniBand for accelerating market data processing and algorithmic trading. The market data streams incoming from the stock exchange are typically received over 1 or 10 Gb Ethernet, and these need to enter the InfiniBand cluster with minimal additional cost or latency penalty. Market data feeds typically run mostly multicast traffic, which the 4036E significantly accelerates by seamlessly mapping it to hardware-based InfiniBand multicast.
- Database applications use InfiniBand to accelerate cluster-based data warehousing, as well as access to storage and decision support systems (DSS). These environments typically require seamless bridging to Ethernet in order to accelerate access to 10GbE NAS or for long distance connectivity to backup sites for disaster recovery.

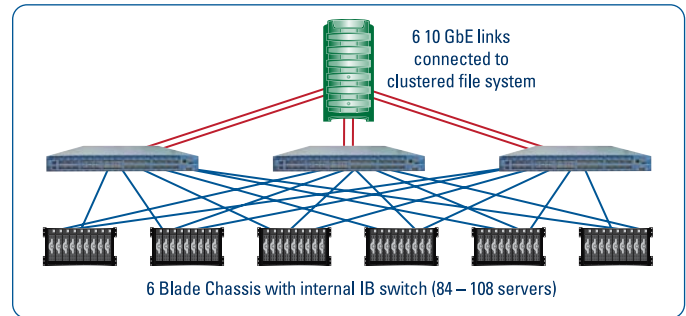


- Low latency, hardware-based (cut-thru) bridging between InfiniBand and Ethernet
- Provides high performance connectivity to Ethernet-based services and resources
- Reduce switching and adapter costs by consolidating network and I/O infrastructure
- 34 QDR (40 Gb/s) ports and two 1/10 GbE ports in a 1U switch
- Ultra-low latency:
  - ▶ less than 100 nanoseconds between InfiniBand ports
  - ▶ less than two microseconds between InfiniBand and Ethernet
- Plug & play, standards-based protocol bridging with zero configuration required on the 4036E itself or on the servers
- Embedded subnet manager



- More and more high-performance clustered file systems—such as NetApp, Panasas and BlueArc—are being used in academia, research, manufacturing, oil & gas, and other vertical markets, and are typically connected to the compute cluster over 10GbE. Using built-in gateways to bridge the InfiniBand cluster to the file system reduces the overall solution cost and guarantees maximum bandwidth for each node accessing the file system.

Configuration Example: Mid-size two-tier CLOS InfiniBand cluster connected to Ethernet-based high-performance storage



## Voltaire Server and Storage Switching Solutions

Voltaire's family of server and storage fabric switches and advanced management software improve performance of mission-critical applications, increase efficiency and reduce costs through infrastructure consolidation and lower power consumption. Leveraging the InfiniBand standard, Voltaire solutions offer improved performance, utilization and scalability across compute clusters, storage and IP networks. The Voltaire Grid Director 4036E is part of a complete family of solutions from Voltaire that offers enterprise data centers and HPC clusters the highest performance and a reduced total cost of ownership.

## Technical Specifications

### Voltaire Grid Director 4036E

- 19" rack mountable chassis, 1U height, configurable with redundant power supplies and fan units
- Aggregate data throughput: 2.72 Tb/s (QDR), 1360 Gb/s (DDR) or 680Gb/s (SDR)
- Port-to-port Latency
  - ▶ less than 100 nanoseconds InfiniBand to InfiniBand
  - ▶ less than 2 microseconds InfiniBand to Ethernet
- 9 Virtual lanes: 8 data + 1 management
- MTU: 4096 Bytes (max.)

### InfiniBand Ports

- 34 4X Quad Data Rate ports (QDR - 40 or 20 or 10 Gb/s auto-negotiate)
- IBTA 1.2.1 compliant
- Interconnect options: QSFP passive and/or active copper/fiber optic cables
- All ports are located on the rear panel
- Indicators: physical and logical status

### Ethernet Ports

- Two 1/10 GbE interconnect ports, SFP+ interfaces
- IEEE 802.3ab, and 802ad (link aggregation) compliant
- IEEE P802.3ak and IEEE P802.3ae 10GBASE-SR, 10GBASE-LR
- Support for Jumbo frames

### IETF Protocols

- TCP/IP: IETF RFC-793, IETF RFC-791, IETF RFC-768, RFC-926, RFC-1812, RFC-1027
- IPoIB: IETF RFC 4391, 4392
- VLAN support according IEEE 802.1q (up to 64 VLANS)
- IP multicast (IETF RFC 3171) and IGMPv2 (up to 3000 multicast groups)
- SNMP v2c: IETF - RFC190x

### Management

- Physical Ports:
  - ▶ DB-9 for serial management (RS232)
  - ▶ RJ45 jack connector for 10/100/1000 Ethernet port
  - ▶ Chassis Reset Button on the front and rear panels
  - ▶ USB port for file transfer
- Device Management:
  - ▶ CLI (Local/Telnet/SSH)
  - ▶ Management over IPv4 or IPv6
  - ▶ SNMP v1/v2c/v3
  - ▶ RADIUS, TACACS+ Authentication
- Fabric Management
  - ▶ On-board SM for fabrics up to 648 nodes
  - ▶ Voltaire Unified Fabric Manager™ (UFM™) software

### Indicators

- Fan unit LED indicator on the fan unit
- PSU LED indicator on the power supply
- Power supply/fan LED indicator on the front and rear panels
- Info LED indicator on the front and rear panels
- SM LED indicator on the front and rear panels
- System Power LED indicator on the front and rear panels
- System Temp LED indicator on the rear panel
- I/O LED indicator on the rear panel

### Power Requirements

- Dual redundant power supply slots and two hot-swappable power supplies
- Power entries: 100 to 240 VAC, 50/60 Hz, auto-sensing
- Power consumption
  - ▶ Maximum: 240W
  - ▶ Numbers relate to copper cables. For optic cables add 1.5W per port.
- Power supply with built-in power inlet

### Cooling

- Front-to-rear cooling
- Hot-swappable fan unit containing three fans for high availability
- Auto-heat sensing for silent fan operation

### Physical Characteristics

- 19-inch front or rear rack-mountable chassis
- Dimensions (H x W x D): 1.69 in. (43 mm) x 16.93 in. (430 mm) x 20.9 in. (530 mm) [including handles]
- Fixed rack-mount bracket kit included
- Optional cabling guide brackets kit designed for cable management
- Weight: 20 Lbs (9 Kgs)

### Environmental

- Operating
  - ▶ Ambient temperature: 32° to 113° F (0° to 45° C)
  - ▶ Humidity: 15 to 80%, non-condensing
  - ▶ Altitude: 0 to 9843 ft (3000m)
- Storage
  - ▶ Temperature: -13° to 158° F (-25° to 70° C)
  - ▶ Humidity: 5 to 90 non-condensing
  - ▶ Altitude: 0 to 15,000 ft (4570m)
- Certifications
  - ▶ Safety (Voltaire Typical)
    - UL60950
    - CB IEC60950
    - CSA-C22.2 No.60950-00
  - ▶ EMC (Voltaire Typical)
    - 47CFR FCC part 15
    - EN55022:98/EN55024:98/EN61000-3-2:00/EN61000-3-3:95
    - VCCI



Contact Voltaire to Learn More

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