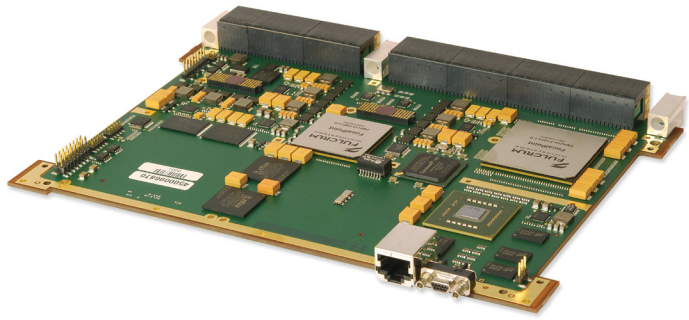
GE
Intelligent Platforms



NETernity™ GBX460

Rugged 6U OpenVPX™ Fully Managed Layer 2/3 10 GigE Switch Module

Features

- 6U OpenVPX™ Compliant: (VITA 65.0)
- VITA 48 (REDI)
- VITA 46.0-2007 (VPX Baseline Standard)
- Switch Profile: MOD6-SWH-16U20F-12.4.2-5
  Data Plane: 20 10GBase-KX4 ports
  Control Plane: 16 1000Base-KX ports
  (interoperates with 1000Base-BX)
- Optional Profile: MOD6-SWH-24F-12.4.3-5
  Data Plane: 24 x 10GE Ports
- Non-Blocking
- Front I/O: Up to two 10GigE Fiber Ports available for slot profile SLT6-SWH-16U20F-10.4.2
- Full wire-speed 10GE Performance
- Ruggedization Build Levels:
  - Level 1, 2 & 3 Air Cooled
  - Level 4 & 5 Conduction Cooled
  - Option to support VITA 48.5 Air Flow Through
- RoHS 2002/95/EC Compliant
- Based on high-performance Low Latency, Ethernet switch fabric from Intel Fulcrum
- Option for Unmanaged operation
- Hardware enabled IPv6 and IPv4 support
- OpenWare Switch Management environment
- Multi-cast Support: IGMP Snooping Querier and MLD Snooping Querier
- Allows up to 4096 VLANS
- L-3 Protocol support including OSPF and RIP

NETernity™ GBX460 is the world's first rugged 6U OpenVPX Fully Managed Layer 2/3 10 Gigabit Ethernet switch module supporting low latency, high throughput interprocessor communication (IPC) aimed at deployed defense and aerospace applications.

GBX460 delivers full wire-speed 10Gigabit Ethernet switching that can be fully managed via our OpenWare software. Proven, high performance architecture and a multilayer switching fabric provides a rich feature set, broad functionality, scalability, and product life longevity. Based on a PowerPC management processor and a leading high performance switch fabric, the GBX460 has integrated Layer-2/3 switching capabilities including support for IPv6 as well as the ability to support higher Layer 4-7 functionality when required.

IPv6 brings improved security, reliability and flexibility, enhanced support for mobile computing devices, and larger address space for global reach and scalability to applications. In the near future, support for IPv6 will be required for Military and Defense customers, and because this switch also supports IPv4 it offers a path forward which protects existing investments.

GBX460 delivers any node to any node connectivity between multiple computer nodes to support the very latest (HPC) Intel and NVIDIA GPGPU high performance computing cluster architectures. Typical applications include sensor and image processing for a range of intelligence, surveillance and reconnaissance (ISR) platforms including radar and communications processing.

Designed to support GE Intelligent Platforms market leading, rugged 6U OpenVPX single board computers (SBCs) and GPGPU processors,the GBX460 harnesses the speed and flexibility of the very latest 10GigE switch fabric from Intel Fulcrum. This innovative solution supports non-blocking, low latency data transfers across a multiprocessing cluster at up to full wire speed enabling new levels of performance for the most demanding ISR applications.

GE's latest 6U OpenVPX products are available in air and conduction cooled variants providing a clear choice for size, weight and power (SWaP) sensitive HPC applications. In addition, it has the flexibility to support high speed sensor I/O over 10GigE and system scaling from one to many compute nodes on airborne, ground vehicle and naval platforms to meet the most demanding mission profiles.

The extremely fast boot time for the GBX460 enables it to meet the needs of customer applications that require their network to be passing traffic in the shortest period of time after power-on.

NETernity™ GBX460

NETernity GBX460 is a High Performance Layer 2/3+ Ethernet embedded switch with extensive management capabilities and provides hardware speed switching of L-2 and L-3 frames including IPv6 switching and routing. Optionally, the twenty 10GigE and sixteen 1GigE version of the GBX460 can support up to two 10Gigabit Ethernet Fiber connections on the front panel. Per the OpenVPX standard, the 10 Gigabit Ethernet connections support the data plane and the sixteen 1Gigabit Ethernet connections support the control plane. The GBX460 is also available in a configuration supporting twenty four 10Gigabit Ethernet ports routed to the VPX Switch Fabric ports.

Designed to meet the needs of a wide range of challenging applications in military systems, the 6U VPX form factor GBX460 facilitates communications at high speed within the chassis or for external networks via its 10Gigabit Ethernet ports. The GBX460's high speed network capability is ideal for applications such as situational awareness, imaging, and sensor data.

Switch Fabric and OpenWare Protocol Features

- Supports both Layer-2 (L2) and Layer 3 (L3) packet switching. Packets are categorized by the MAC addresses for L2 switching and by IP addresses for L3 switching.
- Supports both IPv4 and IPv6 switching and routing.
- Virtual LANs (VLANs) (IEEE 802.1Q) defines a forwarding (switching) domain; supports up to 4096 VLANs.
- Packet filtering to prevent forwarding of certain packets; filtering capabilities are available in Layers 2 - 4.
- QoS prioritization (IEEE 802.1Q) permits classifying packet priorities which is beneficial in delay-sensitive applications.
- Link aggregation (IEEE 802.3ad) links a group of physical ports creating a single logical port to provide higher bandwidth and increase redundancy between switches. The fabric is capable of full wire speed switching, allowing a maximum aggregate throughput that is the sum of all aggregated ports.
- Multiple Spanning Tree Protocol (MSTP) (IEEE 802.1Q) enables automatic and rapid determination of an optimal loop-free topology from an arbitrary network of enabled switches with duplicate and redundant connections; supports rapid reconfiguration in the event of a link or switch failure; backward compatible with RSTP and STP.
- Broadcast storm control screens excessive traffic and controls the rate limit for each port and prevents flooding in the network.
- IPv4 and IPv6 multicast traffic forwarding is controlled by the configuration of multicast forwarding tables. The switch snoops IGMP and MLD messages which allow dynamic adjustment of the forwarding tables, ensuring more efficient bandwidth use.
- Port Mirroring eases debug and packet pattern analysis. This is a method which allows traffic generated on one or more ports to be mirrored to another port.

Refer to the OpenWare data sheet for more detailed information.

L-3 IP Routing Protocols

- OpenWare provides support for IPv4 and IPv6 routing protocols.
- OSPF (Open Shortest Path First), a flexible link state protocol, tests the state of links and transmits that information throughout the system to establish the shortest path to the destination. This protocol also load balances by distributing traffic equally among routes. Messages may also be routed based on the type of service so that critical messages can transverse the most reliable routes.
- RIP (Routing Information Protocol), an easy- to-implement, dynamic routing protocol, allows routers to exchange information for computing routes through networks. Routing tables are used to store destination and metric pairs.
- BGP (Border Gateway Protocol), a reliable and scaleable protocol used as an external gateway protocol, to create and maintain routes between different networks.

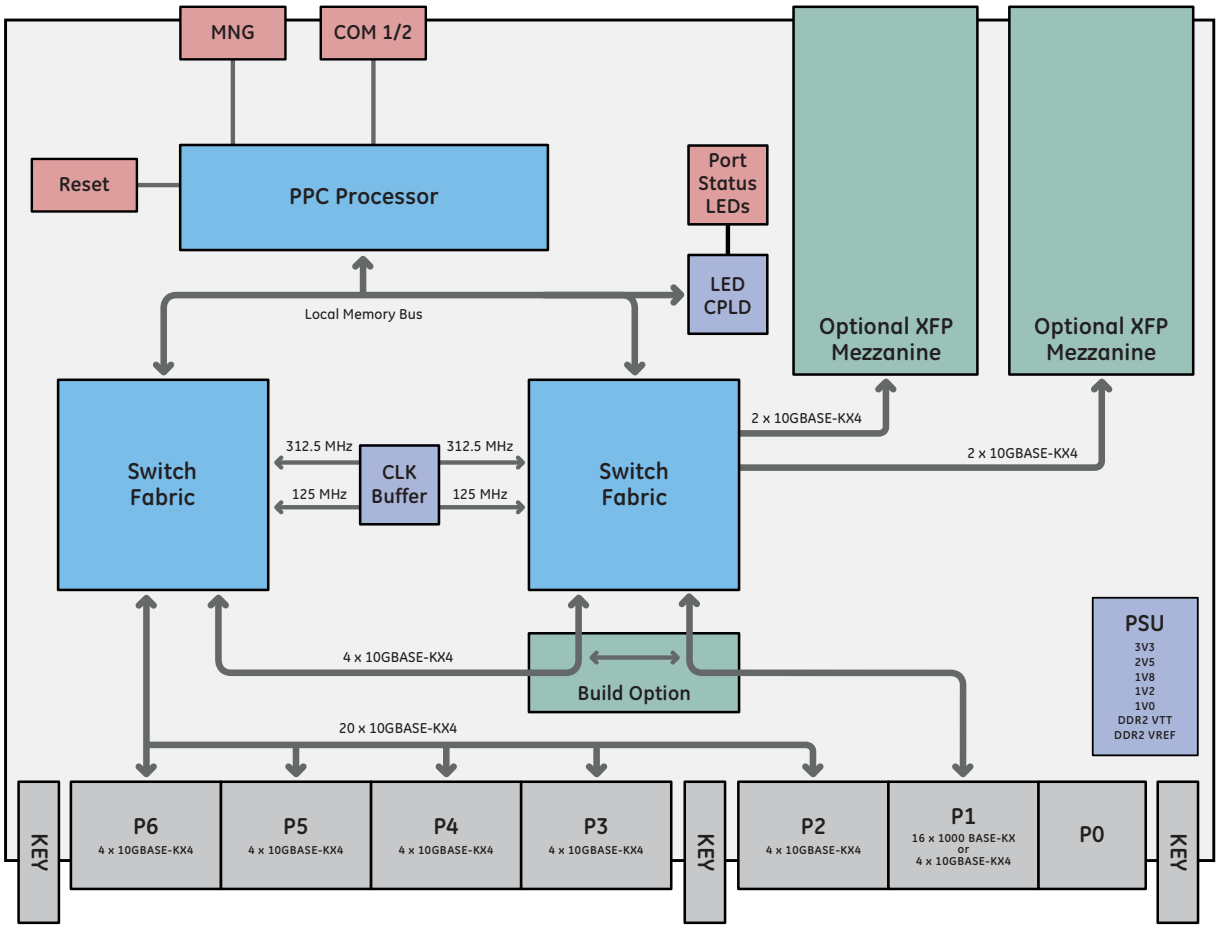
OpenWare Switch Management Environment

OpenWare™ is available exclusively on selected NETernity fully-managed Layer-2/3 Ethernet switches. Comprehensive and powerful, this switch management environment provides integrated management services including configuration, monitoring, switching control, addressing, routing and all supported protocols. Configuration and monitoring functions are accessible from a serial console or via a network. Supported access methods include Telnet, SSH and SNMP.

OpenWare features:

- IPv6 support for improved security, reliability and flexibility, enhanced support for mobile computing devices, and larger address space for global reach and scalability. IPv4 is also supported offering a path forward which protects existing investments.
- Easy deployment and management that results from the wide range of protocols supported. These protocols are defined by RFCs, and cover a range of operations: Switch, VLANs, Aggregation, Multicast, Filtering, Routing, QoS, and Management, NETernity switches with OpenWare offer broad functionality and support communications within the chassis as well as supporting the network outside of the chassis.
- MSTP, the latest version of the Spanning Tree protocol, allows use of the latest technology to create efficient, loop-free networks by combining multiple VLANs. In the event of link or switch failure, the network can be rapidly reconfigured minimizing down time. MSTP is backward compatible with RSTP and STP.
- Highly efficient bandwidth utilization. Multicast with IGMP Snooping Querier and MLD Snooping Querier for IPv6 operation ensures that frames are only forwarded on those ports having nodes that have joined the group.
- OpenWare makes use of Linux® based software to allow faster implementation and easy updates to firmware as part of standard releases or when customization is required. Customizations may be leveraged across all NETernity/OpenWare platforms. Standard Linux commands may be used as well as open source protocol and routing capabilities.
- OpenWare allows for a number of ways to manage the switch via serial console, Telnet, SSH, Web Interface or SNMP.
- Using a combination of open source protocol software and OpenWare allows us in certain instances to provide full software source to customers. Additionally, full control over the software environments permits customization for specific requirements such as customer-specific handling of failover conditions.

Block Diagram



Why choose GE Intelligent Platforms NETernity Ethernet Switches?

GE Intelligent Platforms has a wealth of expertise in Military, Commercial and Telecommunications markets. This makes us unique in the embedded computing industry – we understand application requirements and we know communication protocols.

Our line of NETernity Ethernet Switches is unmatched. Not only is our product selection extensive, but the switches themselves provide maximum flexibility, performance, and density. NETernity Ethernet Switches are available in a variety of form factors, interfaces, and levels of ruggedness, port configurations, media support, and types of management.

Fully Managed switches are Layer 2/3+ switches with control and monitoring capabilities via local or remote access. Layer 2 managed switches are switches with control and monitoring capabilities, but with the management limited to layer 2 capabilities. These are also accessed locally or remotely. Unmanaged switches are Layer-2 switches with no operator interfacing and are designed for quick deployment in simpler applications.

Call GE Intelligent Platforms knowledgeable sales team for help in selecting the switch that best meets your applications requirements.

NETernity™ GBX460

Specifications

Physical Interface

- All 10 Gigabit and 1 Gigabit Ethernet ports are routed to the VPX backplane along with the Ethernet management port and serial console.
- 10 Gigabit Ethernet ports support 10GBASE-KX4
- 1 Gigabit Ethernet ports support - 1000Base-KX (inter-operates with 1000Base-BX)

Form Factor

- 6U OpenVPX air, spray and conduction cooled builds
- 6U VITA48 REDI for 2LM
- Weight:
  - GBX460 Level 1, 2 and 3 = 850g excluding any SMC's that may be installed
  - GBX460 Level 4 & 5 = 875g excluding any SMC's that may be installed
  - SMC with two XFP's = 155g

OpenVPX

- MOD6-SWH-16U20F-12.4.2-5
- MOD6-SWH-24F-12.4.3-5

Power Requirements

- 12V power is 72W nominal, 84W maximum (excludes addition of 10GBase Fiber Ports which can draw an estimated max power of 3W each)

MTBF

- 362,485 hours per Ground Benign 30°C

Environmental

- Rugged Level 1 and Level 2
  - Operating Temperature LVL1: 0°C to +55°C
  - Operating Temperature LVL2: -20C to +65C
  - Storage Temperature: -50°C to +100°C
  - Vibration: 0.002g/Hz from 10 to 2000Hz random and 2g sinusoidal from 5 to 500Hz
  - Shock: 20g peak sawtooth, 11mS duration
  - Humidity: Up to 95% RH
- Rugged Level 3
  - Operating Temperature: -40°C to +75°C
  - Storage Temperature: -50°C to +100°C
  - Vibration: 0.004g/Hz 20 to 2000Hz with a flat response to 1000Hz. 6dB/octave roo-off from 1000 to 2000Hz
  - Shock: 20g peak sawtooth, 11mS duration
  - Humidity: Up to 95% RH
- Rugged Level 4 and Level 5
  - Operating Temperature LVL4: -40°C to +75°C at thermal Interface
  - Operating Temperature LVL5: -40°C to +85°C at thermal Interface
  - Storage Temperature: -50°C to +100°C
  - Vibration: Random 0.1g2/HZ from 15 to 2000HZ per MIL-STD-810E Fig 514.4 -8 for high performance aircraft - 12g RMS
  - Shock: 40g peak sawtooth, 11mS duration
  - Humidity: Up to 95% RH
- VITA 48.5 Air Flow Through
  - Operating Temperature: -40°C to +71°C at flow rate of 5 CFM (0.15in-water pressure drop across heat sink)
  - Storage Temperature: -50°C to +100°C
  - Vibration: Random 0.1g2/HZ from 15 to 2000HZ per MIL-STD-810E Fig 514.4 -8 for high performance aircraft - 12g RMS
  - Shock: 40g peak sawtooth, 11mS duration
  - Humidity: Up to 95% RH

NOTE: Please contact GE for alternate temperature and flow rates

Ordering Information

GBX460 - ABCDEF

- **A** designates the Rugged Level which can be 1, 2, 3, 4, 5 or 8 designates VITA 48.5
- **B** designates the Port Configuration: 1 = 24F model: 2 = 16U20F model
- **C** designates the number of 10GigE fiber front panel ports 0, 1 or 2 (front panel ports only available when B = 2)
- **D** designates the type of 10GigE transceiver if applicable:
  - 0 = no 10GBase fiber ports
  - 1 or 2 = 10GBase-SR ports, where 1 is for single port, 2 is for dual ports
  - 5 or 6 = 10GBase-LR ports, where 5 is for single port, 6 is for dual ports
  - A or B = 10GBase-ER ports, where A is for single port, B is for dual ports
- **E** designates the type of front panel and conduction cooled mechanicals:
  - 1 = VITA 46 0.8" pitch for rugged levels 4 and 5 without front panel ports
  - 3 = VITA 46 1" pitch for rugged Levels 1, 2 & 3 with or without front panel ports and Levels 4 & 5 with front panel ports
  - 5 = VITA 48.2 0.85" pitch for rugged Levels 4 and 5 without front panel ports
  - 6 = VITA 48.1 1" pitch for rugged Levels 1, 2 & 3 with or without front panel ports
  - B = VITA 48.2 L2M 0.85" pitch for rugged Levels 4 and 5 without front panel ports
  - C = VITA 48.2 L2M 1.0" pitch for rugged Levels 4 and 5 with front panel ports
  - E = VITA 48.5 1.2" pitch without front panel ports

GBX460RTM1-13	6U VPX Rear Transition Module with two 10GigE CX-4 connectors and eight 1GigE SFPs, VITA 46 1" pitch front panel - this part should only be used with the GBX460 20 10GigE+ 16 1GigE variant
GBX460RTM1-16	6U VPX Rear Transition Module with two 10GigE CX-4 connectors and eight 1GigE SFPs, VITA 48.1 1" pitch front panel - this part should only be used with the GBX460 20 10GigE+ 16 1GigE variant
GBX460RTM2-13	Rear Transition Module with support for up to eight (8) XFPs for the GBX460 model with 24 10GigE ports and up to 4 XFP's for the GBX460 model with 20 10GigE ports, VITA 46 1" pitch front panel – this part should only be used with the GBX460 24 10GigE variant
GBX460RTM2-16	Rear Transition Module with support for up to eight (8) XFPs for the GBX460 model with 24 10GigE ports and up to 4 XFP's for the GBX460 model with 20 10GigE plus 16 1GigE ports, VITA 48.1 1" front panel – this part should only be used with the GBX460 24 10GigE variant
SFMRTM1-13	6U VPX Rear Transition Module with support for up to twelve (12) SFPs, VITA 46 1" pitch front panel – this part should only be used with the GBX460 20 10GigE+ 16 1GigE variant
SFMRTM1-16	6U VPX Rear Transition Module with support for up to twelve (12) SFPs, VITA 48.1 1" pitch front panel – this part should only be used with the GBX460 20 10GigE+ 16 1GigE variant

NOTE: SFPs or XFPs are not included with the above rear transition module part numbers. A list of recommended SFPs and XFPs can be supplied upon request.

An option with three or four front panel 10GigE fiber ports may be supported in specific applications. Please contact GE for more information.

GE Intelligent Platforms Contact Information

Americas: **1 800 433 2682** or **1 434 978 5100**
Global regional phone numbers are listed by location on our web site at **www.gedefense.com/contact**

www.gedefense.com/ethernet-lan

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