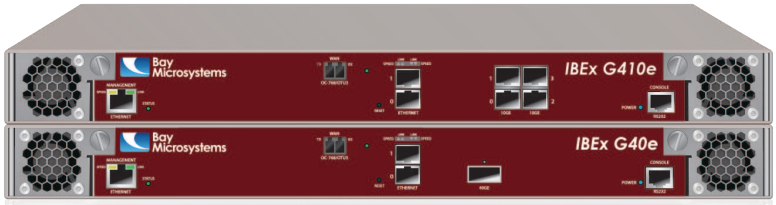
Bay Microsystems™

PRODUCT BRIEF

IBEx G410e/G40e

Global 10/40G Ethernet Data Center Bridging WAN Acceleration Platform



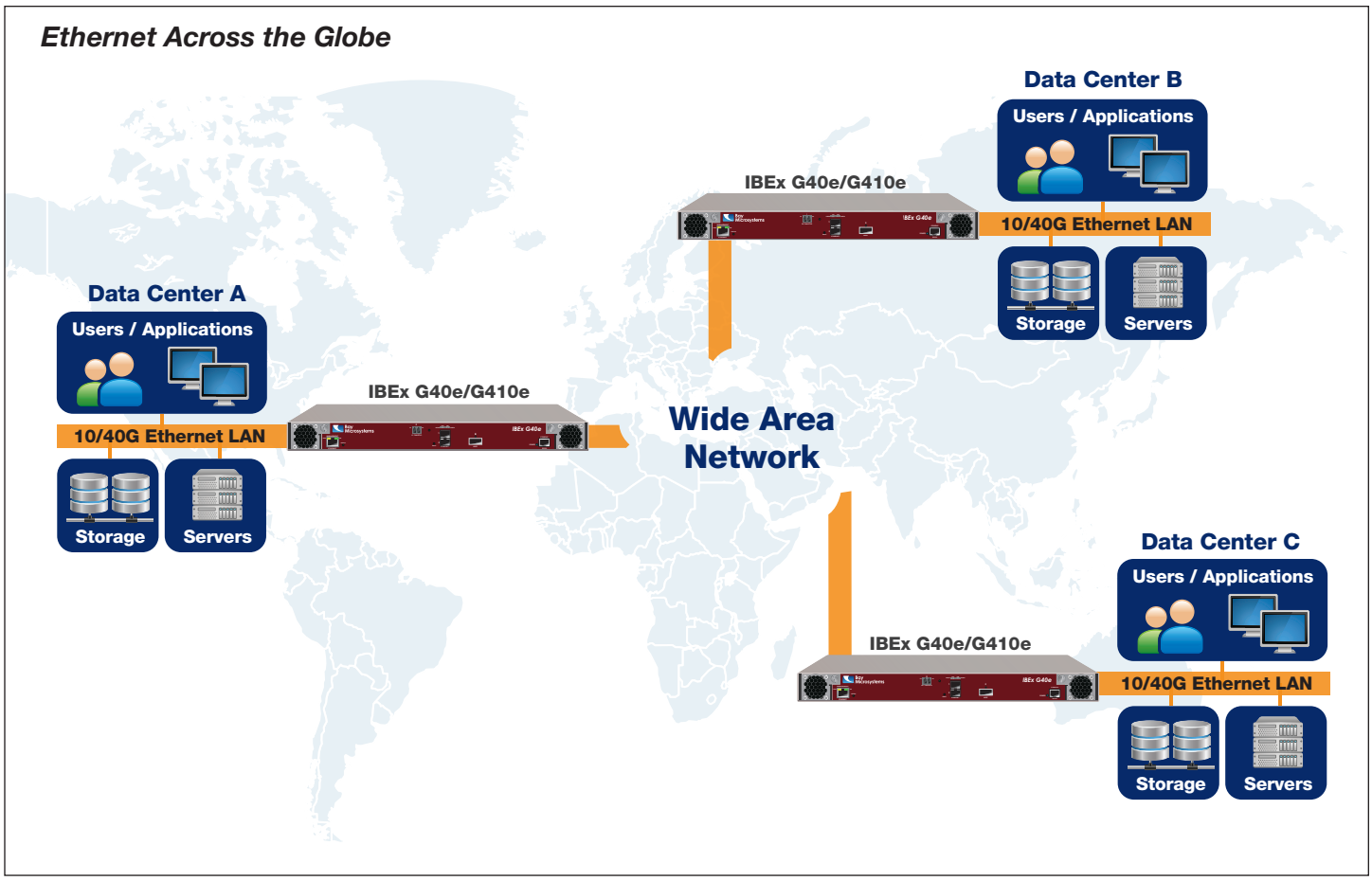
As commercial enterprises, government agencies, and service providers strive to reduce expenses, increase reliability, and expand services, they are realizing that using separate application-specific networks and dedicated isolated data centers requires more equipment, power, training, management personnel, and maintenance resources than using a common, converged network infrastructure with consolidated server and storage resources. Not only are cost reductions driving traditional storage and local area networks to be consolidated into a single network infrastructure, but also the need to extend compute and storage services globally between data centers over metro and wide area networks that are capable of handling these expanded service requirements.

One network technology that is being considered to accomplish this infrastructure consolidation effort is Ethernet. Ethernet has become a ubiquitous technology throughout the world for providing network connectivity. It is available in nearly every computer and is widely accepted as the preferred physical layer of choice for networking systems for both enterprise and wide area networks. Over the past 30 years, Ethernet has demonstrated its capability as an efficient, cost effective, and easy to deploy layer two networking technology. Now with data center capabilities being forced to expand to handle the rapid growth in transaction processing volumes and "big data" cloud computing applications high-speed 10G and 40G Ethernet networks are being deployed to provide vital high performance data center connectivity.

In order to support this application diversity as well as the goal of network consolidation, Ethernet has undergone a number of significant enhancements to its original specification that have enabled it to be deployed as a cost effective universal fabric technology for both compute and storage services. These enhancements have enabled Ethernet to provide congestion control and maintain quality of service for compute and storage applications that require reliable end-to-end data delivery.

HIGHLIGHTS

- *Seamlessly extends 10/40G Ethernet over SONET OC-768/SDH STM-256, ITU-T G.709/G.975.1-I.4 OTU3, or dark fiber to any point on the globe*
- *Transparent Ethernet network extension over standard optical transport and packet switched networks all within a low-power, compact 1U form-factor platform*
- *Supports Data Center Bridging extensions for Fibre Channel over Ethernet (FCoE) and RDMA over Converged Ethernet (RoCE) applications*
- *Provides Carrier Ethernet functionality such as Ethernet Virtual Circuit (EVC) capabilities including E-Line and E-LAN services*



However, enabling transparent, cost-effective 10/40G Ethernet network services, while still maintaining data protection critical for global compute and storage services, can be challenging for IT administrations to deploy between geographically distributed sites. Not only must these global network services be delivered seamlessly between sites but also it's critical to provide wide area network service adaptation and tunneling capabilities to allow private Ethernet fabrics to be virtually extended between data centers without disruption or data loss.

The Solution

The Intelligent Bandwidth Exchange (IBEx™) G410e/G40e platforms utilize Bay Microsystems' proprietary packet and transport processing technology to provide seamless Ethernet Data Center Bridging (DCB) fabric extension functionality through wide area network adaptation and tunneling capabilities over a variety of protocols. The IBEx supports and interoperates with virtually any network topology and data rate, thereby enabling unencumbered, line-rate Ethernet extension over a diverse array of high-performance wide area network protocols and deployment scenarios.

The IBEx Ethernet product family provides flexible connectivity options for both 10G and 40G Ethernet networks all within a low power, compact 1U form-factor platform. This allows the IBEx product family to provide 1/10/40G Ethernet extension, aggregation, and adaptation over a variety of 40G wide area network infrastructures including SONET OC-768 / SDH STM-26, ITU-T G.709/ G975.1-I.4 OTU3, or dark fiber enabling IT managers to maintain protocol continuity beyond a single site to virtually anywhere around the globe without the need to modify existing applications.

The IBEx G410e platform can even be used to provide network consolidation for up to four 10G networks services into a single 40G wide area network service thereby reducing infrastructure-operating costs. All this can be done utilizing IBEx's highly efficient system architecture with an unprecedented ultra-low port-to-port latency for most applications.

Data Center Bridging

Ethernet networks traditionally operate in a best-effort manner often resulting in dropped packets when network

congestion occurs, which can potentially hurt application performance and affect service reliability. The Data Center Bridging (DCB) architecture builds on Ethernet's strengths and adds several extensions for delivering reliability, maintaining flow control, and providing granular control of bandwidth allocation required for I/O convergence on unified fabrics and next-generation data center networks.

The IBEx Ethernet product family provides support for the DCB standards allowing seamless, reliable 10/40G Ethernet DCB fabric extension between data centers for protocols such as Fibre Channel over Ethernet (FCoE) and RDMA over Converged Ethernet (RoCE). This creates a global end-to-end framework between data centers for extending storage and compute services while ensuring optimal bandwidth and data protection for all applications.

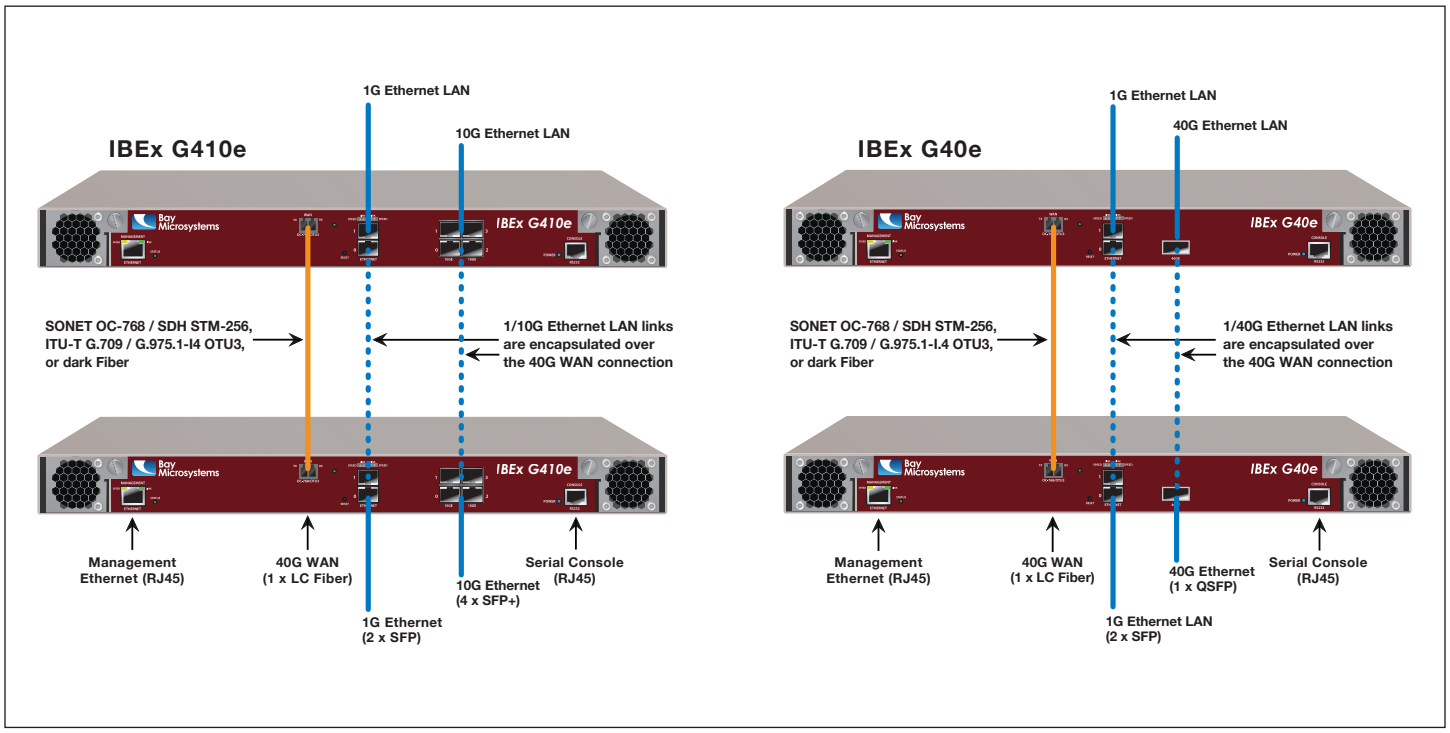
Carrier Ethernet

Carrier Ethernet extensions enable Ethernet to be extended from local area networks to wide area networks, empowering commercial enterprises and government agencies to transparently bridge LANs in separate locations together as if they were one seamless network. The IBEx G40e/G410e platforms makes use of Carrier Ethernet capabilities and allows network service providers to utilize the IBEx platform for deploying high-bandwidth 10/40G Ethernet connectivity and communication services between data centers over various wide area network services.

The IBEx platform provides support for Ethernet Virtual Circuits (EVC) topology services including E-Line (Ethernet Private Lines (EPL), Ethernet Virtual Private Lines (EVPL)) and E-LAN. E-Line is a transparent point-to-point service providing Ethernet connectivity between two sites, while E-LAN supports multipoint connectivity for Ethernet networks. With IBEx, deploying these services requires no changes to the customer LAN equipment or networks and accommodates existing Ethernet network connectivity. This makes IBEx's Carrier Ethernet services ideally suited for a broad range of 10/40G Ethernet infrastructures and wide area network environments.

Pseudowire Services

The IBEx provides IETF-standard Layer 2 Tunneling Protocol version 3 (L2TPv3), Generic Routing Encapsulation (GRE), and Pseudowire Emulation Edge-to-Edge (PWE3) functionality enabling Ethernet networks to be tunneled over regular packet-oriented IP and MPLS networks. By using L2TPv3, GRE, or PWE3 Ethernet pseudowire technology, customer edge networks can be virtually extended between data centers over packet switched networks while still preserving local QoS policies. IBEx's robust feature set even allows for flexible tunneling options including IBEx to IBEx as well as IBEx to industry-standard networking equipment configurations.



SPECIFICATIONS

IBEx Models

G40e	1 x 40G Ethernet to 40G WAN (SONET/SDH or OTN)
G410e	4 x 10G Ethernet to 40G WAN (SONET/SDH or OTN)

Chassis

Form Factor	1U, 19-inch standard rack mount
Dimensions	17.26" Width x 19.40" Depth x 1.72" Height (43.85 cm x 49.27 cm x 4.36 cm)
Weight	Fully configured, 21.0 lbs. (9.53 kg)
Ventilation	Forced air system with front-to-back airflow (Reverse airflow option also available)
Acoustics	Intelligent, speed-controlled fans for low-noise operation
Indicators	AC power input, system status, and link/activity LEDs
High Availability	Redundant, hot-swappable AC power supplies and fan trays
Warranty	2 Years for Hardware and 1 Year for Software

Power and Environmental

Power Input	90-264 VAC (47-63Hz), auto-voltage sensing
Power Supplies	2 x 600 Watts, dual AC input
Power Consumption	140 Watts
Heat Dissapation	<511.8 BTU/Hour
Temperature	Operating: 32°F to 104°F (0°C to 40°C) Storage: -40°F to 158°F (-40°C to 70°C)
Humidity	10% to 95% RH, non-condensing

Management and Monitoring

Ethernet	1 x RJ45 (Full Duplex 10/100/1000Base-T w/auto MDI-X)
Serial	1 x RJ45 (RS-232)
Protocols	HTTP/HTTPS, Secure Shell (SSH), Telnet, Network Time Protocol (NTP; RFC 1305)
User Interface	SSL-enabled Web-based Graphical User Interface (GUI), Secure Command-Line interface (CLI)
Remote Monitoring	SNMP (v2/3) managed object support, syslog

Security

User Authentication	Supports multiple user accounts, privilege levels, & access lists
Standards	Authentication, Authorization, and Accounting (AAA) Remote Authentication Dial In User Service (RADIUS)

1G Ethernet Interface

Node Type	Virtual wire
Interface	2 x 1G SFP pluggable transceiver
Port Type	RJ45 or LC fiber connector
Physical Layer	1000BASE-T/SX/LX
MTU Size	Up to 9600 bytes

10G Ethernet Interface (G410e only)

Node Type	Virtual wire
Interface	4 x 10G SFP+ pluggable transceiver
Port Type	LC fiber connector
Physical Layer	10GBASE-SR/LR/ER/ZR
MTU Size	Up to 9600 bytes

40G Ethernet Interface (G40e only)

Node Type	Virtual wire
Interface	1 x 40G Quad Small Form-factor Pluggable (QSFP)
Port Type	QSFP, MPO or LC fiber connector
Physical Layer	40GBASE-CR4/SR4/LR4
MTU Size	Up to 9600 bytes

40G WAN Interface

Node Type	Host
Interface	1 x 40G 300-pin MSA transponder (factory installed)
Port Type	LC fiber connector
Physical Layer	SONET OC-768/SDH STM-256 or ITU-T G.709/G.975.1-I.4 OTU3
Modulation	NRZ (VSR2000-3R2) or NRZ-DPSK (DWDM Tunable) (optional)
Payload	Packet over SONET (PoS), GFP-F
Timing	Integrated stratum reference or BITS line timing

Ethernet

Standards	IEEE 802.3: Ethernet IEEE 802.3i: 10BASE-T IEEE 802.3u: 100BASE-T IEEE 802.3x: Flow Control in Full-Duplex Ethernet LANs (Pause frame) IEEE 802.3z: 1000BASE-X IEEE 802.3ab: 1000BASE-T IEEE 802.3ad: Link Aggregation Control Protocol (LACP) IEEE 802.3ae: 10 Gigabit Ethernet IEEE 802.ba: 40/100 Gigabit Ethernet IEEE 802.1p: CoS Prioritization IEEE 802.1Q: VLAN tagging

Ethernet Pseudowire Services

Standards	Pseudowire Emulation Edge to Edge (PWE3) Generic Routing Encapsulation Protocol (GRE) Layer 2 Tunneling Protocol version 3 (L2TPv3)

Carrier Ethernet

EVC Services	E-Line (Ethernet Private Line (EPL), Ethernet Virtual Private Line (EVPL)) Ethernet Local Area Network (E-LAN)
Standards	IEEE 802.1ad: Provider Bridging (Stacked VLANs, Q-in-Q) IEEE 802.1ah: Provider Backbone Bridges (PBB) IEEE 802.1ag: Connectivity Fault Management (CFM) IEEE 802.3ah: Link OAM MEF 17 (Service OAM) Y.1731 Fault Management

Data Center Bridging (DCB)

Standards	IEEE 802.1Qbb: Priority-based Flow Control (PFC) IEEE 802.1Qaz: Enhanced Transmission Selection Data Center Bridging Exchange (DCBX) Protocol IEEE P802.1Qau: Congestion Notification

Traffic Management

Standards	Layer 2 and Layer 3 traffic classification Single rate Three Color Marking (srTCM) - RFC 2697 Two rate Three Color Marking (trTCM) - RFC 2698 Eight classes of service per port Flexible scheduling - strict priority and deficit-weighted round robin Port-level and class-level traffic shaping Color-aware policing

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Some features listed in the specifications may be under development.

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