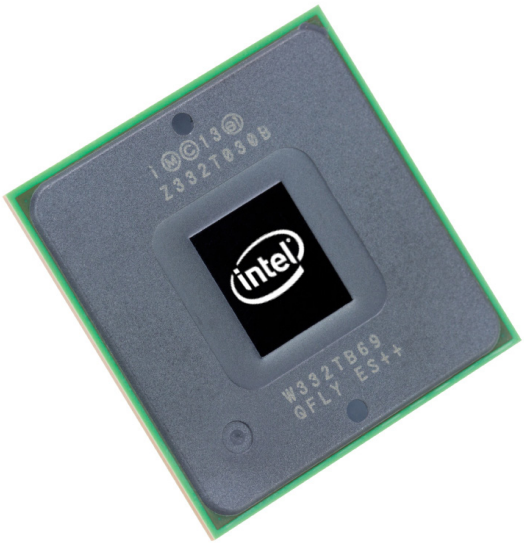
PRODUCT BRIEF
Intel® Ethernet Controller XL710 10/40 GbE
Network Connectivity

Intel® Ethernet Controller XL710 10/40 GbE

Extending Intel® Virtualization Technology beyond server virtualization to the network with hardware optimizations and off-loads for the rapid provisioning of networks in an agile data center



Key Features

- 10/40 Gigabit Ethernet (GbE) Controller: Dual and Single 40 GbE, Quad and Dual 10 GbE configurations
- PCI Express* (PCIe) 3.0, x8 including Direct I/O optimizations via TLP Processing Hints (TPH[1])
- Intelligent Off-load to enable high-performance with Intel® Xeon® servers
- Network Virtualization off-loads including VXLAN and NVGRE
- Industry-leading I/O virtualization innovations and performance with broad hypervisor and standards support
- Intel® Ethernet Flow Director: For hardware application traffic steering
- Excellent small packet performance for network appliances and NFV
- Intel® Data Plane Developer Kit Optimized
- Unified Networking providing a single wire for LAN and storage: NAS (SMB, NFS) and SAN (iSCSI, FCoE[1])

40 GbE Performance

The XL710 delivers 40 Gb/s performance with a theoretical maximum of 80 Gb/s bi-directional throughput (40 Gb/s in; 40 Gb/s out), a PCI Express v3.0 (8 GT/s) interface is required to deliver the expected performance. Optimized performance vectors (and key uses) include:

- **Small packet performance:** Maintains wire-rate throughput on smaller payload sizes (>128 Bytes for 40 GbE and >64 Bytes for 10 GbE
- **Bulk transfer performance:** Delivers line-rate performance with low CPU usage for large application buffers
- **Virtualized performance:** Alleviates hypervisor I/O bottlenecks by providing flow separation for Virtual Machines (VMs)
- **Standards-based Network Virtualization:** Network virtualization overlay off-loads including VXLAN and NVGRE
- **Storage performance:** Enables competitive performance with native OS drivers and intelligent off-load for NFS, SMB iSCSI, and FCoE

A Complete, Unified Networking Solution

Converging data and storage onto one fabric eliminates the need for multiple adapters and cables per server. Furthermore, 10/40 Gigabit Ethernet provides the bandwidth to converge these multiple fabrics into a single wire. A key capability that makes all this possible is traffic class separation provided by Data Center Bridging (DCB)—providing a one-wire solution with virtual pipes for the different classes of traffic:

- **Data:** Best effort delivery of standard LAN traffic
- **Storage:** NAS or SAN—including lossless FCoE and iSCSI
- **Management:** Guaranteed connectivity of data center IP management

Best Choice for Server Virtualization

With Intel® Virtualization Technology, the XL710 delivers outstanding I/O performance in virtualized data centers and cloud environments. The XL710 reduces I/O bottlenecks by providing intelligent off-load of networking traffic per VM, enabling near-native performance and VM scalability. The host-based virtualization technologies include:

- **VMDq for Emulated path:** NIC-based VM Queue sorting enabling efficient hypervisor-based switching
- **SR-IOV for Direct assignment:** NIC-based isolation and switching for various virtual station instances enabling optimal CPU usage in virtualized environments

Network Virtualization

- **Full VXLAN and NVGRE off-load:** Preserves application performance in network virtualized environments

Additionally, the XL710 provides Virtual Bridging support that delivers both host-side and switch-side control and management of virtualized I/O as well as the following modes of virtualized operation:

- **VEPA[1]:** IEEE 802.1Qbg support for Virtual Ethernet Port Aggregator
- **VEB:** Virtual Ethernet Bridge support via VT-c
- **Intel® Ethernet Flow Director:** An advanced traffic steering capability increases number of transactions per second and reduces latency for cloud applications like Memcached

Additional Intelligent Off-loads

The Xeon® family of processors has demonstrated increased computing performance and increased integration of key server subsystems generation after generation. From an I/O perspective, the "right answer" is to leverage the ever-escalating computing power of the Xeon processor where appropriate and implementing complementary accelerations in the network controller—this is what Intel refers to as "intelligent off-loads." By implementing a balanced hybrid of compute and off-load, the XL710 is able to achieve optimal performance and efficiency. This is most notably observed in the following usage models:

- **TCP Stateless Off-loads:** Demonstrates leading performance vs. TOE solutions without restricting feature usage (TOE usage usually requires that key features be disabled). Supported Stateless Off-loads include Checksum, TSO, VMDq, RSS
- **Host iSCSI/FCoE Initiators:** Provides exceptional performance without the need for full-off-load HBA[2] approaches
- **Flow Classification[1]:** Trafficking data flows across multiple consumers and connections

The other critical component of intelligent off-loads is efficiency. Power efficiency is critical to IT specialists as energy consumption is a real OpEx concern in data center operation.

- **Energy Efficient Ethernet[1] (EEE):** Provides the low-power interface logic for external PHYs to eliminate unnecessary wire energy

Integrated Solution for LAN on Motherboard (LOM)

The XL710 is a single-chip, 10/40 GbE implementation in a 25 x 25 mm package. It reduces total-solution cost and design complexity by integrating serial 10/40 GbE PHYs and providing multiple interface options including:

- 40 GbE:[3] KR4, CR4, XLPPI, XLAUI
- 10 GbE: KR, KX4,[4] SFI, XAUI[4]
- 1 GbE: KX, SGMII

With low power consumption, a small footprint and integrated serial PHYs, the con-troller is ideally suited for Server Blades, LOM, NIC, and Mezzanine card implementations. The XL710 also incorporates the manageability required by IT personnel for remote control and alerting. Communication to the Board Management Controller (BMC) is available either through an on-board SMBus port or the DMTF-defined NC-SI, providing a variety of management protocols, including IPMI, BMC Pass-thru, OS2BMC, and MTCP.

Specifications

Product Offerings	Host Interface Features	Network Interface Features		Performance	
Product Brand Name	PCI Express 3.0; x8, x4, x1	40 GbE Interfaces (dual port)	KR4, CR4, XLPPI, XLAUI Supports QSFP connector	40 Gb Throughput	Wire-rate down to 128 bytes
Intel® Ethernet Controller XL710-AM2	PCI Power Management/ ACPI Extensions	10 GbE Interfaces	KR, KX44, SFI, XAUI[4] Supports SFP+ connector	10 Gb Throughput	Wire-rate down to 64 bytes
Intel® Ethernet Controller XL710-AM1	TLP Processing Hint (TPH) Support	1 GbE Interfaces	KX, SGMII	Standard Linux Stack Latency	~8 µs
Intel® Ethernet Controller X710-AM2	MSI-X Support				

Please reference the Fortville Message of the Week for sampling details.

VIRTUALIZATION INTERFACE FEATURES	
Features	Implementation
Emulated Support	Driver Optimizations and VMDq enablement
Direct Assignment Support	PF and VF assignment with SR-IOV
Virtual Bridging Support	VEPA/802.1Qbg
Virtual Functions	Up to 128 per device
Network Virtualization	VXLAN, MACinUDP, NVGRE, IPinGRE

ADDITIONAL FEATURES
Enhanced Transmission Selection (draft IEEE 802.1az)
Priority Flow Control (draft IEEE 802.1Qbb)
Data Center Bridging (DCB/DCB-X) Support; Up to eight traffic classes
Jumbo Frame Support—Up to 9.5 KB (9728 Bytes)
VLAN Support
Flow Control
1588 Time Synchronization Support
GPIO (General Purpose I/O) Support
JTAG (IEEE 1149.1) Test Access Port

MECHANICAL AND ELECTRICAL	
Package	25 mm x 25 mm FC-BGA
Power	3.82 W typical power for 2x40
External Power Supply Voltages	3.30 Vdc, 0.85 Vdc
Safety and Regulatory	FCC B, UL, CE, VCCI, BSMI, CTICK, KCC, CSA

ENVIRONMENTAL	
Operating Temperature	0 °C to 50 °C (32 °F to 131 °F)

OPERATING SYSTEM (OS) SOFTWARE SUPPORT	
Windows Server* 2012 R2	FreeBSD*
Windows Server* 2008 R2 x64	Solaris*
Windows Server* 2012 / 2012 R2	VMware* ESXi 5.1 (10 GbE Only)
Linux*: RHEL and SuSE	VMware* ESXi 5.5
Linux* Kernel.org IB tree	

MANAGEMENT INTERFACE FEATURES
IPMI & BMC pass through
OS2BMC
MCTP (SMBus & PCIe)
DMTF NC-SI Pass-Through
SMBus Pass-Through
Advanced Filtering Capabilities (IPv4, IPv6)
PXE FLASH Interface Support
SNMP
RMON Statistic Counters

STORAGE INTERFACE FEATURES
iSCSI Acceleration
Unified Networking Features
Open-FCoE Support[1]
FCoE Transmit Segmentation
FCoE Tx/Rx CRC Off-load
FCoE Coalescing and Direct Data Placement
FCoE Boot
iSCSI boot

TCP/IP/L2 FEATURES
Receive Side Scaling (RSS) for TCP and UDP traffic
Large Send Off-load (LSO)) / Generic Send Off-load(GSO) including encapsulated traffic
TCP/UDP/IP/SCTP Checksum Off-load including encapsulated traffic
IPv4, IPv6

CERTIFICATIONS
RoHS Compliant
FCC Class A

To see the full line of Intel Ethernet Controllers, visit www.intel.com/network/connectivity.
For more information, contact your Intel sales representative.

For Product Information

To see the full line of Intel Network Adapters for PCI Express*, visit *www.intel.com/go/ethernet*.

To speak to a customer service representative regarding Intel products, please call 1-800-538-3373 (U.S. and Canada) or visit *support.intel.com/support/go/network/contact.htm* for the telephone number in your area.

Platform Validation

Architected and validated with Intel® Xeon® E5 v3 platform to deliver a balanced platform for data center and cloud infrastructures.

1. Feature to be enabled in Post-Launch Release.
2. SCSI Host Bus Adapter
3. Single 40 GbE port only configuration
4. The XAUI and KX4 interface options are limited to two 10 GbE ports . For four 10 GbE ports, KR or SFI must be used.

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