

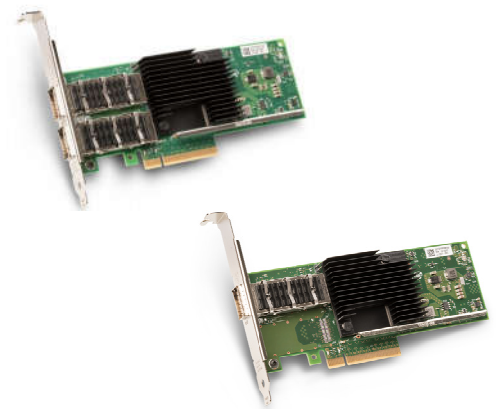
## Product Brief

Intel® Ethernet Converged Network Adapter XL710  
With Support for QSFP+ Connections  
Network Connectivity



# Intel® Ethernet Converged Network Adapter XL710

Extending Intel® Virtualization Technology (Intel® VT) beyond Server Virtualization to the Network with Hardware Optimizations and Offloads for the Rapid Provisioning of Networks in an Agile Data Center



## Key Features

- Single- and dual-port 40GbE adapters
- Supports 4x10GbE, 1x40GbE or 2x40GbE configurations
- PCI Express\* (PCIe\*) 3.0, x8
- Exceptional low power adapters
- Network Virtualization offloads including VXLAN, NVGRE, and Geneve<sup>1</sup>
- Intel® Ethernet Flow Director (Intel® Ethernet FD ) for hardware-based application traffic steering
- Data Plane Development Kit (DPDK) optimized for efficient packet processing
- Excellent small packet performance for network appliances and Network Functions Virtualization (NFV)
- Intelligent offloads to enable high performance with Intel® Xeon® processor-based servers
- I/O virtualization innovations for maximum performance in a virtualized server
- Unified networking providing a single wire support for LAN and storage: NAS (SMB, NFS) and SAN (iSCSI)

## Product Overview

Intel continues its legacy of Ethernet leadership by introducing a family of Intel® Ethernet Converged Network Adapter (Intel® Ethernet CNA) XL710s powered by the Intel® Ethernet XL710 Controller, codenamed Fortville.

The Intel® Ethernet CNA XL710 family addresses the demanding needs of the next-generation agile data center by providing unmatched features for both server and network virtualization, flexibility for LAN and SAN networks, and proven, reliable performance.

## Leading 10/40 GbE Performance

Optimized performance vectors (and key uses) include:

- **Small Packet Performance:** Maintains wire-rate throughput on smaller payload sizes (>128 bytes for 40GbE and 4x10GbE mode)
- **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)
- **Network Virtualization:** Network virtualization overlay offloads including VXLAN, NVGRE, and Geneve<sup>1</sup>
- **Storage Performance:** Enables competitive performance with native OS drivers and intelligent offload for NAS (NFS, SMB), and SAN (iSCSI)

## Agility

The Intel® Ethernet CNA XL710 delivers an innovative new architecture that has been designed to meet the needs of customers who require flexible 40GbE and 10GbE interfaces. With the unique ability to be configured for 4 x 10GbE, 1 x 40GbE, or 2 x 40GbE, this family of adapters offers the agility needed in today's data centers.

## Network Virtualization

Network virtualization is the next big trend in creating an agile data center. The family of Intel® Ethernet CNA XL710s are ready to help you take that next step.

- **VXLAN, NVGRE, and Geneve<sup>1</sup>:** These stateless offloads preserve application performance for overlay networks. With these offloads it is possible to distribute network traffic across CPU cores.

At the same time the Intel® Ethernet CNA XL710 offloads LSO, GSO, and checksum from the host software reducing CPU overhead.

## Server Virtualization

With Intel® Virtualization Technology (Intel® VT), the Intel® Ethernet CNA XL710 family delivers outstanding I/O performance in virtualized server environments. They reduce I/O bottlenecks by providing intelligent offloads for networking traffic per Virtual Machine (VM), enabling near-native performance and VM scalability. The host-based virtualization technologies supported by Intel® VT include:

- **VMDq for Emulated Path:** Adapter-based VM Queue sorting enabling efficient hypervisor-based switching
  - **SR-IOV for Direct Assignment:** Adapter-based isolation and switching for various virtual station instances enabling optimal CPU usage in virtualized environments
- Additionally, the Intel® Ethernet CNA XL710 provides Virtual Bridging<sup>2</sup> (VB) 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<sup>2</sup>:** IEEE 802.1Qbg support for Virtual Ethernet Port Aggregator<sup>2</sup>
  - **VEB:** Virtual Ethernet Bridge support via Intel VT

## Intel® Ethernet Flow Director

Intel® Ethernet FD is an advanced traffic steering capability built into the Intel® Ethernet CNA XL710. It consists of a large number of flow affinity filters that direct received packets by their flows to queues for classification, load balancing, and matching between flows and CPU cores. It eliminates context switching required within the CPU.

As a result, Intel® Ethernet FD significantly increases the number of transactions per second and reduces latency for cloud applications like Memcached.

## Intelligent Offloads

The Intel® Xeon® processor family has demonstrated increased computing performance and increased integration of key server subsystems generation after generation. To offload is to leverage the ever-escalating computing power of the Intel® Xeon® processor where appropriate and implement complementary accelerations in the network controller—this is what Intel refers to as “intelligent offloads.” By employing a balanced hybrid of compute and offload, intelligent offloads are able to achieve the optimized point of performance and efficiency. This is most notably observed in the following usage models:

- **TCP Stateless Offloads:** Demonstrates leading performance vs. TOE solutions without restricting feature usage (TOE usage usually requires that key features be disabled). Supported stateless offloads include Checksum, TSO, VMDq, and RSS.
- **Host iSCSI Initiator:** Provides exceptional performance without the need for full-offload HBA methods.
- **Flow Classification:** Routing data flows across multiple consumers and connections.

## Power Savings

Power efficiency is critical to IT specialists as energy consumption is a real OpEx concern.

- **Lowest Power Consumption:** The new generation of Intel® Ethernet CNA XL710s are power misers. They deliver double the throughput with only half the power of the previous Intel® Ethernet Converged Network Adapter X520 generation.

## LAN/SAN for Today's Data Centers

Converging data and storage onto one fabric eliminates the need for multiple adapters, cables, and switches. Furthermore both 10GbE and 40GbE provides the bandwidth to converge these multiple fabrics. 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:** Lossless network for iSCSI
- **Management:** Guaranteed connectivity of data center IP management

## Manageability

The Intel® Ethernet CNA XL710 family also incorporates the manageability required by IT personnel for remote control and alerting. Communication to the Board Management Controller (BMC) is available through an on-board SMBus port, providing a variety of management protocols, including IPMI, BMC Pass-thru, OS2BMC, and MCTP/SMBus.

## World-Class Intel Support

Intel Customer Support Services offers a broad selection of technical and customer support programs. For more information, contact your local Intel representative. Service and availability may vary by country.

GENERAL	
FEATURES	BENEFITS
Intel® Ethernet Converged Network Adapter XL710	<ul style="list-style-type: none"> <li>Industry-leading, energy-efficient design for next-generation 10/40GbE performance and multi-core processors</li> </ul>
QSFP+ Connectivity	<ul style="list-style-type: none"> <li>Intel® Ethernet CNA XL710 with QSFP+ connections support 40GBASE-SR4, 40GBASE-LR4 and QSFP+ CR4 Copper Direct Attach physical media.</li> </ul>
Low-profile	<ul style="list-style-type: none"> <li>Enables higher bandwidth and throughput from standard and low-profile PCIe slots and servers</li> </ul>
Load balancing on multiple CPUs	<ul style="list-style-type: none"> <li>Increases performance on multi-processor systems by efficiently balancing network loads across CPU cores when used with Receive-Side Scaling (RSS) from Microsoft or Scalable I/O on Linux*</li> </ul>
iSCSI remote boot support	<ul style="list-style-type: none"> <li>Provides centralized Storage Area Network (SAN) management at a lower cost than other iSCSI solutions</li> <li>No additional cost for iSCSI support, included in the standard Intel® Ethernet CNA XL710</li> </ul>
Support for most network operating systems	<ul style="list-style-type: none"> <li>Enables widespread deployment</li> </ul>
RoHS-compliant	<ul style="list-style-type: none"> <li>Complies with the European Union directive 2011/65/EU to reduce the use of hazardous materials</li> </ul>
Intel® PROSet Utility for Windows* Device Manager	<ul style="list-style-type: none"> <li>Provides point-and-click management of individual adapters, advanced adapter features, connection teaming, and Virtual Local Area Network (VLAN) configuration</li> </ul>
Time Sync (IEEE 1588*, 802.1as)	<ul style="list-style-type: none"> <li>Enables networked Ethernet equipment to synchronize internal clocks according to a network master clock; endpoint can then acquire an accurate estimate of the master time by compensating for link latency</li> </ul>

I/O FEATURES FOR MULTI-CORE PROCESSOR SERVERS	
FEATURES	BENEFITS
Intel® Ethernet FD	<ul style="list-style-type: none"> <li>An advanced traffic steering capability increases the number of transactions per second and reduces latency for cloud applications like Memcached</li> </ul>
MSI-X support	<ul style="list-style-type: none"> <li>Minimizes the overhead of interrupts</li> <li>Load-balancing of interrupt handling between multiple cores/CPU's</li> </ul>
Multiple Queues: 1,536 Tx and Rx queues per device	<ul style="list-style-type: none"> <li>Network packet handling without waiting for buffer overflow providing efficient packet prioritization</li> <li>Actual number of queues will vary depending upon software implementation</li> </ul>
Tx/Rx IP, SCTP, TCP, and UDP checksum offloading (IPv4, IPv6) capabilities	<ul style="list-style-type: none"> <li>Lower processor usage</li> <li>Checksum and segmentation capability extended to new standard packet type</li> </ul>
VIRTUALIZATION FEATURES	
FEATURES	BENEFITS
Next-Generation VMDq	<ul style="list-style-type: none"> <li>Up to 256 maximum VMDq VMs supported</li> <li>Enhanced QoS feature by providing weighted round-robin servicing for the Tx data</li> <li>Offloads the data-sorting functionality from the Hypervisor to the network silicon, improving data throughput and CPU usage</li> <li>Provides QoS feature on the Tx data by providing round-robin servicing and preventing head-of-line blocking</li> <li>Sorting based on MAC addresses and VLAN tags</li> <li>Provides loopback functionality, where data transfer between the virtual machines within the same physical server need not go out to the wire and come back in, improving throughput and CPU usage</li> </ul>
PCI-SIG Single Root I/O Virtualization (SR-IOV) Implementation (128 per device)	<ul style="list-style-type: none"> <li>Provides an implementation of the PCI-SIG standard for I/O Virtualization. The physical configuration of each port is divided into multiple virtual ports. Each virtual port is assigned to an individual virtual machine directly by bypassing the virtual switch in the Hypervisor, resulting in near-native performance.</li> <li>Integrated with Intel® Virtualization Technology (Intel® VT) for Directed I/O (Intel® VT-d) to provide data protection between virtual machines by assigning separate physical addresses in the memory to each virtual machine</li> <li>128/port for single port</li> <li>64/port for dual port</li> <li>32/port for quad port</li> </ul>
Virtual Machine Load Balancing (VLMB)	<ul style="list-style-type: none"> <li>VMLB provides traffic load balancing (Tx and Rx) across VMs bound to the team interface, as well as fault tolerance in the event of switch, port, cable, or adapter failure</li> </ul>
Advanced Packet Filtering	<ul style="list-style-type: none"> <li>1536 exact matched packets (unicast or multicast)</li> <li>512 hash entries each for unicast and multicast</li> <li>Lower processor usage</li> <li>Promiscuous (unicast and multicast) transfer mode support</li> <li>Optional filtering of invalid frames</li> </ul>
VLAN support with VLAN tag insertion, stripping, and packet filtering for up to 4096 VLAN tags	<ul style="list-style-type: none"> <li>Ability to create multiple VLAN segments</li> </ul>
VXLAN, NVGRE and Geneve <sup>1</sup> Support	<ul style="list-style-type: none"> <li>Preserves application performance in network virtualized environments</li> </ul>
MANAGEABILITY FEATURES	
FEATURES	BENEFITS
Preboot eXecution Environment (PXE) Support	<ul style="list-style-type: none"> <li>Enables system boot up via the LAN (32-bit and 64-bit)</li> <li>Flash interface for PXE image</li> </ul>
Simple Network Management Protocol (SNMP) and Remote Network Monitoring (RMON) Statistic Counters	<ul style="list-style-type: none"> <li>Easy system monitoring with industry-standard consoles</li> </ul>
iSCSI Boot	<ul style="list-style-type: none"> <li>Enables system boot up via iSCSI</li> <li>Provides additional network management capability</li> </ul>
Watchdog Timer	<ul style="list-style-type: none"> <li>Gives an indication to the manageability firmware or external devices that the chip or the driver is not functioning</li> </ul>

## SPECIFICATIONS

### GENERAL

Connections	Single or Dual QSFP+ cages for: <ul style="list-style-type: none"> <li>• QSFP+ SR4 fiber-optic transceivers</li> <li>• QSFP+ LR4 fiber-optic transceivers</li> <li>• QSFP+ CR4 Direct Attach Cables</li> </ul>
Intel® Ethernet QSFP+ Optics required for a fiber configuration†	
Network Standards	IEEE 802.3:
Physical Layer Interface	<ul style="list-style-type: none"> <li>• 40GBASE-SR4</li> <li>• 40GBASE-LR4</li> <li>SFF-8431:</li> <li>• 40GSFP+ CR4 (Direct Attach Copper)</li> <li>• 40GSFP+ CR4 to 4xSFP+ (Breakout Cable)</li> </ul>

### ADVANCED SOFTWARE FEATURES – ALL ADAPTERS

Adapter fault tolerance (AFT) <sup>3</sup>
Switch fault tolerance (SFT) <sup>3</sup>
Adaptive load balancing (ALB) <sup>3</sup>
Teaming Support <sup>3</sup>
IEEE 802.3ad (link aggregation control protocol)
PCIe Hot Plug*/Active peripheral component interconnect (PCI)
IEEE 802.1Q* VLANs
IEEE 802.3 2005* flow control support
Tx/Rx IP, TCP, & UDP checksum offloading (IPv4, IPv6) capabilities [Transmission control protocol (TCP), user datagram protocol (UDP), Internet protocol (IP)]
IEEE 802.1p*
TCP segmentation/large send offload
MSI-X supports Multiple Independent Queues
Interrupt moderation
IPv6 offloading—Checksum and segmentation capability extended to new standard packet type

### NETWORK OPERATION SYSTEM (NOS) SUPPORT – ALL ADAPTERS

OPERATING SYSTEM	IA-32	X86-64	IA-64
Windows Server 2012 R2*	N/A	X	N/A
Windows Server 2012 R2 Core	N/A	X	N/A
Windows Server 2012	N/A	X	N/A
Windows Server 2012 Core	N/A	X	N/A
Windows Server 2008 R2*	N/A	X	N
Windows Server 2008 R2 Core	N/A	X	N
Linux* Stable Kernel version 2.6/4x	N/A	X	X
Linux RHEL 6.6, 6.7, and 6.8	N/A	X	X
Linux SLES 11 SP4 and SLES 12 SP1	N/A	X	X
FreeBSD* 10.2/10.3/11	N/A	X	X
UEFI* 2.1	N/A	X	X
UEFI* 2.3 and 2.4	N/A	X	X
VMware ESXi 5.1 (Limited Functionality)	N/A	X	N/A
VMware ESXi 5.5	N/A	X	N/A

## TECHNICAL FEATURES

Operating temperature	0 °C to 55 °C (32 °F to 131 °F)
Air flow	Minimum of 150 LFM required. Additionally for LR4, the following is required: <ul style="list-style-type: none"> <li>• 55 °C @ 400 LFM</li> <li>• 50 °C @ 250 LFM</li> <li>• 45 °C @ 150 LFM</li> </ul>
Storage temperature	-40 °C to 70 °C (-40 °F to 158 °F)
Storage humidity	Maximum: 90% non-condensing relative humidity at 35 °C
LED Indicators	LINK (solid) and ACTIVITY (blinking) LINK SPEED (green=40 Gbps; yellow=10 Gbps)

### Physical Dimensions

XL710 DA2 Low-profile PCIe	2.703 in. x 6.578 in.
Data rate supported per port	<ul style="list-style-type: none"> <li>• 40GbE mode: 40GbE</li> <li>• 4x10GbE mode: 10GbE</li> </ul>
Bus type	PCIe 3.0 (8 GT/s)
Bus width	8-lane PCIe
Interrupt levels	INTA, MSI, MSI-X
Hardware certifications	FCC B, UL, CE, VCCI, BSMI, CTICK, KCC
Controller-processor	Intel® Ethernet Controller XL710-BM2

### Power Consumption

SKU	TYPICAL POWER	MAX POWER
Single-port 40GBASE-SR4	4.2 W	4.6 W
Single-port 40GBASE-CR4	3.4 W	3.8 W
Single-port 40GBASE-LR4	6.6 W	7.5 W
Dual-port 40GBASE-CR4	3.6 W	4.0 W
Dual-port 40GBASE-SR4	4.9 W	5.6 W
Dual-port 40GBASE-LR4	8.5 W	9.5 W

## INTEL® BACKING INFORMATION

Backed by an Intel limited lifetime warranty, 90-day money-back guarantee (U.S. and Canada), and worldwide support.

INTEL® ETHERNET CNA XL710 PRODUCT CODES			
CONFIGURATION	PRODUCT CODE	ADAPTER HEIGHT	BULK SKU
Single Port	XL710QDA1	Low Profile	XL710QDA1BLK
Dual Port	XL710QDA2 <sup>4</sup>	Low Profile	XL710QDA2BLK

INTEL® ETHERNET QSFP+ TWINAXIAL CABLES	
CABLE LENGTH (M)	PRODUCT CODE
1	XLDACBL1
3	XLDACBL3
5	XLDACBL5

INTEL® ETHERNET QSFP+ BREAKOUT CABLES <sup>2</sup>	
CABLE LENGTH (M)	PRODUCT CODE
1	X4DACBL1
3	X4DACBL3
5	X4DACBL5

INTEL® ETHERNET QSFP+ OPTIC PRODUCT CODES	
OPTIC	PRODUCT CODE
SR4 Optic	E40GQSFP5R
LR4 Optic	E40GQSFP5LR

## For Product Information

To speak to a customer service representative, please call 1-800-538-3373 (U.S. and Canada) or visit [support.intel.com/support/go/network/contact.htm](http://support.intel.com/support/go/network/contact.htm) for the telephone number in your area. For additional product information on Intel Networking Connectivity products, visit [www.intel.com/ethernet](http://www.intel.com/ethernet)

## Customer Support

Intel® Customer Support Services offers a broad selection of programs including phone support and warranty service (service and availability may vary by country). For more information, contact us at [support.intel.com/support/go/network/adapter/home.htm](http://support.intel.com/support/go/network/adapter/home.htm)

### ‡ Optical Module Requirements for Intel® Ethernet Converged Network Adapters QSFP+ Open Optics Support

Intel® Ethernet Converged Network Adapters with QSFP+ Open Optics Support are designed to support either Power Class 1 modules or Power Class 4 modules as defined in the SFF-8679 specification. Consult the Intel documentation for the recommended Intel Ethernet Converged Network adapter for the supported Power Class. When Intel® QSFP+ Ethernet Optics modules are used, adapter use conditions for ambient temperature and airflow have been verified to meet the Standard Temperature Class of Operation as defined in the SFF-8679 specification. For use of other optics modules, it is the system integrator's responsibility to determine the necessary ambient temperature and airflow necessary for the third party optical modules to operate within the Temperature Class of Operation at all times. Operating optical modules outside the supplier specified Temperature Class of Operation range will permanently reduce the performance of the optical module over time.

<sup>1</sup> The Intel® Ethernet Converged Network Adapter is Geneve ready.

<sup>2</sup> Feature to be enabled in post-launch release.

<sup>3</sup> Windows Server 2008 support only.

<sup>4</sup> XL710-QDA2 will only support ONE QSFP+ breakout cable.

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