

## PRODUCT BRIEF

Intel® Ethernet X710 Dual or Quad Port  
10 GbE SFP+/DA Converged Network Adapters  
Network Connectivity



# Intel® Ethernet X710 Dual or Quad Port 10 GbE SFP+/DA Converged Network Adapters

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

## Key Features

- Dual port low profile 10 GbE adapter
- Quad port full height 10 GbE adapter
- PCI Express\* (PCIe) 3.0, x8 or higher
- Exceptional Low Power Adapters
- Network Virtualization offloads including Geneve, VXLAN, and NVGRE
- Intel® Ethernet Flow Director for hardware based application traffic steering
- Data Plane Developer Kit (DPDK) optimized for efficient packet processing
- Excellent small packet performance for network appliances and Network Function 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

## Overview

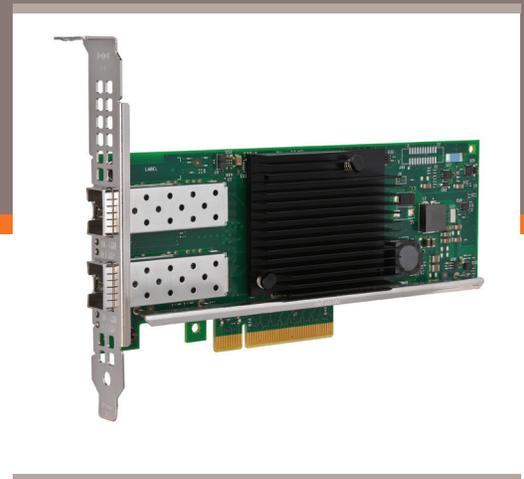
Intel continues its legacy of Ethernet leadership by introducing the latest 10 gigabit family of adapters powered by, the Intel® Ethernet Controller X710, codenamed Fortville.

The X710 adapter 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 networks, and proven, reliable performance.

## Leading 10 GbE Performance

The X710 adapter family delivers superior performance with a theoretical throughput of 80 Gb/s (40 Gb/s Tx; 40 Gb/s Rx) bi-directional throughput (quad-port adapter required), in a PCI Express v3.0 x8 slot. Optimized performance vectors (and key uses) include:

- **Small Packet Performance:** Achieves wire-rate throughput on smaller payload sizes (>128 Bytes at 40 GbE and >64 Bytes at 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).
- **Network Virtualization:** Network virtualization overlay offloads including Geneve, VXLAN, and NVGRE.



## Power Savings

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

- **Lowest Power Consumption**

The new generation of X710 adapters are power misers. They deliver double the throughput with only half the power of the previous X520 generation.

## Server Virtualization

With Intel® Virtualization Technology (VT), the X710 family of adapters deliver 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, X710 adapters provide Virtual Bridging<sup>1</sup> 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:

- **VEB:** Virtual Ethernet Bridge support via Intel VT.

- **Flexible Port Partitioning (FPP)**

FPP takes advantage of the PCI-SIG SR-IOV specification. With FPP, virtual controllers can be used by the Linux\*

host directly and/or assigned to virtual machines. It enables you to assign up to 63 Linux host processes or virtual machines per port to virtual. A network administrator can then control the partitioning of their 10 GbE bandwidth across multiple dedicated network resources, ensuring balanced QoS by giving each assigned virtual controller equal access to 10 Gbs of bandwidth. Network administrators may also rate limit each of these services to control how much of the 10 GbE pipe is available to each process.

## Network Partitioning

Network Partitioning allows for administrators to split up the 10 GbE pipes on the adapter into 8 to 16 separate partitions or physical functions and allocate bandwidth and resources as needed. Each of the four partitions is an actual PCI Express function that appears in the server's system ROM, O/S, or virtual O/S as a separate physical NIC.

## Network Virtualization

Network virtualization is the next big trend in creating an agile data center. The family of X710 adapters are ready to help you take that next step.

- **VXLAN, NVGRE, GENEVE Offload**

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 X710 offloads LSO, GSO, and checksum from the host software reducing CPU overhead.

## Intel® Ethernet Flow Director

Flow Director is an advanced traffic steering capability built into the X710 controller. It consists of a large number of flow affinity filters that direct receive 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, Flow Director significantly increasing 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 implementing 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.

- **Flow Classification:** Trafficking data flows across multiple consumers and connections.

## Software Tools and Management

Intel® Ethernet Converged Network Adapters (CNAs) support Dell's Lifecycle Controller. The Lifecycle Controller is coupled with the Dell DRAC service processor to provide embedded system management. The Lifecycle Controller enables both local and remote access to manage initial setup and configuration of the BIOS settings on the platform, setup, and configuration of Intel Ethernet adapters, update of all the platform firmware, and the deployment of the operating systems.

Intel® Advanced Network Services (Intel® ANS) include new teaming technologies and techniques such as Virtual Machine Load-Balancing (VMLB) for Hyper-V environments. Intel ANS also provides

a variety of teaming configurations for up to eight ports, and support for teaming mixed vendors' server adapters. Intel ANS includes support for 802.1Q VLANs, making Intel ANS one of the most capable and comprehensive tools for supporting server adapter teaming.

Additionally, Intel® PROSet for Windows\* Device Manager (DMIX) and PROSetCL extend driver functionality to provide additional reliability and Quality of Service features and configuration.



FEATURES	BENEFITS
<b>GENERAL</b>	
10 Gigabit Intel® Ethernet Controller X710	<ul style="list-style-type: none"> <li>Industry-leading, energy-efficient design for next-generation 10 Gigabit performance and multi-core processors</li> </ul>
SFP+ Connectivity	<ul style="list-style-type: none"> <li>X710 adapters with SFP+ connections support 10GBASE-SR, and SFP+ Direct Attach Copper (DAC) 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>
Full-height	<ul style="list-style-type: none"> <li>Intel® Ethernet Converged Network Adapter X710-DA4 FH requires a full height slot for PCIe compliance</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>
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>
<b>I/O FEATURES FOR MULTI-CORE PROCESSOR SERVERS</b>	
Intel® Flow Director	<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 port	<ul style="list-style-type: none"> <li>Network packet handling without waiting or 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>

FEATURES	BENEFITS
<b>VIRTUALIZATION FEATURES</b>	
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> <li>Supports replication of multicast and broadcast data</li> </ul>
PCI-SIG 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® VT for Directed I/O (VT-d) to provide data protection between virtual machines by assigning separate physical addresses in the memory to each virtual machine</li> <li>64/port for dual port</li> <li>32/port for quad port</li> </ul>
Flexible Port Partitioning: 64 Virtual Functions per port	<ul style="list-style-type: none"> <li>Virtual Functions (VFs) appear as Ethernet Controllers in Linux OSes that can be assigned to VMs, Kernel processes or teamed using the Linux* Bonding Drivers</li> </ul>
Network Partitioning (NPAR)	<ul style="list-style-type: none"> <li>Network Partitioning allows for administrators to split up the 10GbE pipes on the NDC into 8 to 16 separate partitions or physical functions and allocate bandwidth and resources as needed</li> </ul>
Virtual Machine Load Balancing (VLMB)	<ul style="list-style-type: none"> <li>Virtual Machines Load Balancing (VMLB) provides traffic load balancing (Tx and Rx) across Virtual Machines 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>1,536 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 and NVGRE Support	<ul style="list-style-type: none"> <li>Preserves application performance in network virtualized environments</li> </ul>
<b>MANAGEABILITY FEATURES</b>	
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>
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>
Lifecycle Controller	<ul style="list-style-type: none"> <li>Local and remote access to BIOS setup and configuration on the platform and adapter</li> </ul>

INTEL® ETHERNET CONVERGED NETWORK ADAPTER X710 PRODUCT CODES		
CONFIGURATION	PRODUCT CODE	ADAPTER HEIGHT
X710-DA2	5N7Y5	Low Profile
X710-DA2	Y5M7N	Full Height
X710-DA4	DDJKY	Full Height

INTEL® ETHERNET SFP+ OPTIC PRODUCT CODES	
CABLE LENGTH (M)	PRODUCT CODE
SR Optic	R8H2F

**SPECIFICATIONS****GENERAL**

Connections	Dual or Quad SFP+ cages for: <ul style="list-style-type: none"> <li>SFP+ SR fiber-optic transceivers</li> <li>SFP+ Direct Attach cables (E10G42BTDA)</li> </ul>
Network Standards Physical Layer Interface	IEEE 802.3: 10GBASE-SR <ul style="list-style-type: none"> <li>(E10G41BFSR, 10G42BFSR)</li> </ul> SFF-8431: 10GSFP+ DAC (Direct Attach Copper) <ul style="list-style-type: none"> <li>(E10G42BTDA)</li> </ul>

**ADVANCED SOFTWARE FEATURES – ALL ADAPTERS**

Adapter fault tolerance (AFT)
Switch fault tolerance (SFT)
Adaptive load balancing (ALB)
Teaming Support
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

**TECHNICAL FEATURES**

Data rate supported per port	<ul style="list-style-type: none"> <li>Optical: 1 GbE/10 GbE</li> <li>Direct Attach: 10 GbE</li> </ul>
Bus type	<ul style="list-style-type: none"> <li>PCI Express 3.0* (8 GT/s)</li> </ul>
Bus width	<ul style="list-style-type: none"> <li>x8 or higher PCI Express</li> </ul>
Interrupt levels	<ul style="list-style-type: none"> <li>INTA, MSI, MSI-X</li> </ul>
Hardware certifications	<ul style="list-style-type: none"> <li>FCC B, UL, CE, VCCI, BSMI, CTICK, KCC</li> </ul>
Controller-processor	<ul style="list-style-type: none"> <li>Intel® Ethernet Controller X710-AM2</li> </ul>

**PHYSICAL DIMENSIONS**

X710-DA2 Low-profile PCIe*	<ul style="list-style-type: none"> <li>6.578 x 2.703 inches</li> </ul>
X710-DA4 Full-height PCIe	<ul style="list-style-type: none"> <li>6.578 x 4.372 inches</li> </ul>

**ADAPTER PRODUCT FEATURES**

Intel® PROSet Utility	<ul style="list-style-type: none"> <li>For easy configuration and management</li> </ul>
Plug and play specification support	<ul style="list-style-type: none"> <li>Standard</li> </ul>
Receive Side Scaling	<ul style="list-style-type: none"> <li>Multiple Rx queues enable the efficient distribution of network receive processing across multiple CPUs in multiprocessor systems</li> </ul>

**POWER CONSUMPTION**

SKU	Typical Power	Maximum Power
Dual-port 10GBASE-SR	4.3W	4.8W
Dual-port Direct Attach (Twinax)	3.3W	3.3W
Quad-port 10GBASE-SR	6.2 W	6.6 W
Quad-port Direct Attach (Twinax)	3.6 W	3.8 W
Air Flow	Minimum of 150 LFM required	
Operating temperature	0 °C to 55 °C (32 °F to 131 °F)	
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=10 Gbps; yellow=1 Gbps)

NETWORK OPERATION SYSTEM (NOS) SUPPORT – ALL ADAPTERS			
OPERATING SYSTEM	IA-32	X86-64	IA-64
Windows Server 2012 R2*	N/A	•	N/A
Windows Server 2012 R2 Core	N/A	•	N/A
Windows Server 2012*	N/A	•	N/A
Windows Server 2012 Core	N/A	•	N/A
Windows Server 2008 R2*	N/A	•	N
Windows Server 2008 R2 Core	N/A	•	N
Linux* Stable Kernel version 2.6.32/3x	•	•	•
Linux RHEL 6.5 and RHEL 7.0	•	•	•
Linux SLES 11 SP3 and SLES 12	•	•	•
UEFI* 2.1	N/A	•	•
UEFI* 2.3	N/A	•	•
VMware ESXi 5.1 <sup>1</sup> (Limited Functionality)	N/A	•	N/A
VMware ESXi 5.5 <sup>1</sup> and ESXi 6.0	N/A	•	N/A

**INTEL BACKING INFORMATION**

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

To see the full line of Intel Server Adapters visit [www.intel.com/go/ethernet](http://www.intel.com/go/ethernet), [www.IntelEthernet-Dell.com](http://www.IntelEthernet-Dell.com) or contact your Dell sales representative.

**INFORMATION PROVIDED BY:**



Third-party information brought to you courtesy of Dell.

1. Please contact your Dell sales representative for availability.

The information contained in this document, including all instructions, cautions, and regulatory approvals and certifications, is provided by Intel and has not been independently verified or tested by Dell. Dell cannot be responsible for damage caused as a result of either following or failing to follow these instructions. All statements or claims regarding the properties, capabilities, speeds or qualifications of the part referenced in this document are made by Intel and not by Dell. Dell specifically disclaims knowledge of the accuracy, completeness or substantiation for any such statements. All questions or comments relating to such statements or claims should be directed to Intel. Visit [www.dell.com](http://www.dell.com) for more information.

INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH INTEL® PRODUCTS. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. EXCEPT AS PROVIDED IN INTEL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, INTEL ASSUMES NO LIABILITY WHATSOEVER, AND INTEL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF INTEL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGEMENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT. UNLESS OTHERWISE AGREED IN WRITING BY INTEL, THE INTEL PRODUCTS ARE NOT DESIGNED NOR INTENDED FOR ANY APPLICATION IN WHICH THE FAILURE OF THE INTEL PRODUCT COULD CREATE A SITUATION WHERE PERSONAL INJURY OR DEATH MAY OCCUR.

Intel may make changes to specifications and product descriptions at any time, without notice. Designers must not rely on the absence or characteristics of any features or instructions marked "reserved" or "undefined." Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them. The information here is subject to change without notice. Do not finalize a design with this information. The products described in this document may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request. Contact your local Intel sales office or your distributor to obtain the latest specifications and before placing your product order. Copies of documents which have an order number and are referenced in this document, or other Intel literature, may be obtained by calling 1-800-548-4725, or by visiting Intel's Web Site at <http://www.intel.com>.

Copyright ©2015 Intel Corporation. All rights reserved. Intel, the Intel logo, and Xeon are trademarks of Intel Corporation in the U.S. and other countries. \*Other names and brands may be claimed as the property of others.