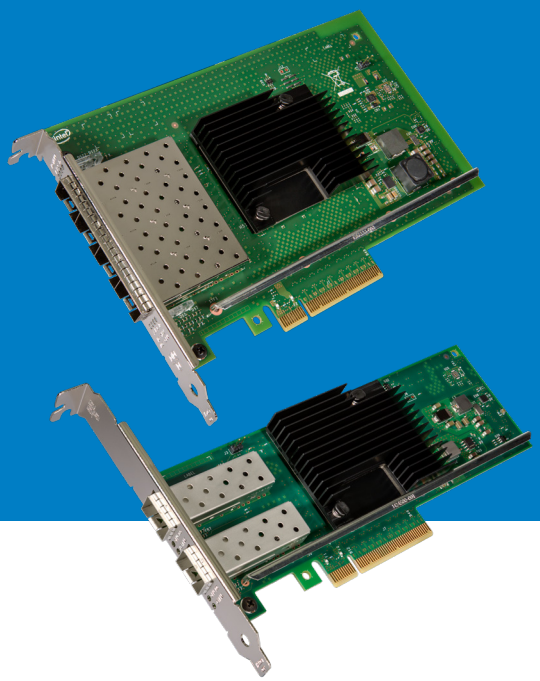
Product Brief

Intel® Ethernet 700 Series Network Adapters

Intel® Ethernet Converged Network Adapter X710-DA2/DA4



Dual and Quad-port 10GbE adapters with Hardware Optimization and Offloads for the Rapid Provisioning of Networks in an Agile Data Center

Key Features

- PCI Express (PCIe) 3.0, x8
- Network Virtualization offloads including VxLAN, GENEVE, NVGRE, MPLS, and VxLAN-GPE with Network Service Headers (NSH)
- Intel® Ethernet Flow Director for hardware based application traffic steering
- Dynamic Device Personalization (DDP) enables increased packet processing efficiency for NFV and Cloud deployments
- 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 on servers with Intel® Xeon® processors
- I/O virtualization innovations for maximum performance in a virtualized server

Overview

The Intel® Ethernet Converged Network Adapter X710 addresses the demanding needs of an agile data center by providing unmatched features for both server and network virtualization, flexibility for LAN and SAN networks, and proven, reliable performance.

The Intel® Ethernet 700 Series Network Adapters. These adapters are the foundation for server connectivity, providing broad interoperability, critical performance optimizations, and increased agility for Communications, Cloud, and Enterprise IT network solutions.

- **Interoperability** - Multiple speeds and media types for broad compatibility backed by extensive testing and validation.
- **Optimization** - Intelligent offloads and accelerators to unlock network performance in servers with Intel® Xeon® processors.
- **Agility** - Both Kernel and Data Plane Development Kit (DPDK) drivers for scalable packet processing.

Intel® Ethernet 700 Series delivers networking performance across a wide range of network port speeds through intelligent offloads, sophisticated packet processing, and quality open source drivers.

All Intel® Ethernet 700 Series Network Adapters include these feature-rich technologies:

Flexible and Scalable I/O for Virtualized Infrastructures

Intel® Virtualization Technology (Intel® VT), delivers outstanding I/O performance in virtualized server environments.

I/O bottlenecks are reduced through intelligent offloads, enabling near-native performance and VM scalability. These offloads include Virtual Machine Device Queues (VMDq) and Flexible Port Partitioning using SR-IOV with a common Virtual Function driver for networking traffic per Virtual Machine (VM). Host-based features supported include:

VMDQ for Emulated Path: VMDQ, enables a hypervisor to represent a single network port as multiple network ports that can be assigned to the individual VMs. Traffic handling is offloaded to the network controller, delivering the benefits of port partitioning with little to no administrative overhead by the IT staff.

SR-IOV for Direct Assignment: Adapter-based isolation and switching for various virtual station instances enables optimal CPU usage in virtualized environments.

- Up to 128 virtual functions (VFs), each VF can support a unique and separate data path for I/O related functions within the PCI Express hierarchy.
- Use of SR-IOV with a networking device, for example, allows the bandwidth of a single port (function) to be partitioned into smaller slices that can be allocated to specific VMs or guests, via a standard interface.

Intel® Ethernet Adaptive Virtual Function (Intel® Ethernet AVF): Customers deploying mass-scale VMs or containers for their network infrastructure now have a common VF driver. This driver eases SR-IOV hardware upgrades or changes, preserves base-mode functionality in hardware and software, and supports an advanced set of features in the Intel® Ethernet 700 Series.

Enhanced Network Virtualization Overlays (NVO)

Network virtualization has changed the way networking is done in the data center, delivering accelerations across a wide range of tunneling methods.

VxLAN, GENEVE, NVGRE, MPLS, and VxLAN-GPE with NSH Offloads: These stateless offloads preserve application performance for overlay networks, and the network traffic can be distributed across CPU cores, increasing network throughput.

Flexible Port Partitioning (FPP)

FPP leverages the PCI-SIG SR-IOV specification. Virtual controllers can be used by the Linux host directly and/or assigned to virtual machines.

- Assign up to 63 Linux host processes or virtual machines per port to virtual functions.
- Control the partitioning of per-port bandwidth across multiple dedicated network resources, ensuring balanced QoS by giving each assigned virtual controller equal access to the port's bandwidth.

Network administrators can also rate limit each of these services to control how much of the pipe is available to each process.

Greater Intelligence and Performance for NFV and Cloud deployments

Dynamic Device Personalization (DDP) customizable packet filtering, along with enhanced Data Plane Development Kit (DPDK), support advanced packet forwarding and highly-efficient packet processing for both Cloud and Network Functions Virtualization (NFV) workloads.

- DDP enables workload-specific optimizations, using the programmable packet-processing pipeline. Additional protocols can be added to the default set to improve packet processing efficiency that results in higher throughput and reduced latency. New protocols can be added or modified on-demand and applied at runtime using Software Defined Firmware or APIs, eliminating the need to reset or reboot the server. This not only keeps the server and VMs up, running, and computing, it also increases performance for Virtual Network Functions (VNFs) that process network traffic that is not included in the default firmware. Download DDP Profiles
- DPDK provides a programming framework for Intel® processors and enables faster development of high-speed data packet networking applications.

Advanced Traffic Steering

Intel® Ethernet Flow Director (Intel® Ethernet FD) is an advanced traffic steering capability. Large numbers of flow affinity filters direct receive packets by their flows to queues for classification, load balancing, and matching between flows and CPU cores.

Steering traffic into specific queues can eliminate 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.

FEATURES	DESCRIPTION
General	
SFP+ Connectivity	• X710 adapters with SFP+ connections support 10GBASE-SR, 10GBASE-LR and SFP+ Direct Attach Copper (DAC) physical media.
Low-Profile (non-compliance)	• Intel does offer a 4x10 SFP+, low profile, non-PCI compliant version of the Intel® Ethernet Converged Network Adapter X710-DA4 FH. Please contact your Intel representative for information about this adapter.
Full-Height	• Intel® Ethernet Converged Network Adapter X710-DA4 FH requires a full height slot for PCIe compliance.
Load balancing on multiple CPUs	• Increases performance on multi-processor systems by efficiently balancing network loads across CPU core when used with Receive-Side Scaling (RSS) from Microsoft or scalable I/O on Linux.
Protect, Detect and Recover	• The Intel Ethernet 700 Series implements a design philosophy of platform resiliency with 3 attributes supporting the NIST Cybersecurity Framework: Protect, Detect and Recover. These attributes verify the firmware and critical device settings with built-in corruption detection and automated device recovery to return the device to its originally programmed state.
Support for most network operating systems	• Enables broad deployment for different applications.
RoHS-compliant	• Complies with the European Union directive 2011/65/EU to reduce the use of hazardous materials.
Time Sync (IEEE 1588, 802.1as)	• 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.
I/O Features for Multi-Core Processor Servers	
Intel® Ethernet Flow Director (Intel® Ethernet FD)	• An advanced traffic steering capability increases the number of transactions per second and reduces latency for cloud applications like Memcached.
MSI-X support	• Minimizes the overhead of interrupts. • Load-balancing of interrupt handling between multiple cores/CPUs.
Multiple Queues: 1,536 Tx and Rx queues per device	• Network packet handling without waiting for buffer overflow providing efficient packet prioritization. • Actual number of queues will vary depending upon software implementation.
Tx/Rx IP, SCTP, TCP, and UDP checksum offloading (IPv4, IPv6) capabilities	• Lower processor usage. • Checksum and segmentation capability extended to new standard packet type.
Virtualization Features	
Next-generation VMDq	• Up to 256 maximum VMDq VMs supported. • Offloads the data-sorting based on MAC addresses and VLAN tags, functionality from the Hypervisor to the network silicon, improving data throughput and CPU usage.
PCI-SIG SR-IOV Implementation (128 per device)	• 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 VM directly by bypassing the virtual switch in the Hypervisor, resulting in near-native performance. • Integrated with Intel® VT for Directed I/O (Intel® VT-d) to provide data protection between VMs by assigning separate physical addresses in the memory to each VM. • 64/port for dual port.
Virtual Machine Load Balancing (VLMB)	• 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.
Advanced Packet Filtering	• 1536 exact matched packets (unicast or multicast). • 512 hash entries each for unicast and multicast. • Lower processor usage. • Promiscuous (unicast and multicast) transfer mode support. • Optional filtering of invalid frames.
VLAN support with VLAN tag insertion, stripping and packet filtering for up to 4096 VLAN tags	• Ability to create multiple VLAN segments.
VxLAN, NVGRE, GENEVE, VxLAN-GPE+NSH, MPLS	• Preserves application performance in network virtualized environments.
Manageability Features	
Preboot Execution Environment (PXE) Support	• Enables system boot via the LAN (32-bit and 64-bit). • Flash interface for PXE image.
Unified Extensible Firmware Interface (UEFI)	• Enables new technologies during the pre-OS boot process and addresses legacy BIOS limitations on hardware.
Simple Network Management Protocol (SNMP) and Remote Network Monitoring (RMON) Statistic Counters	• Easy system monitoring with industry-standard consoles.
Watchdog Timer	• Gives an indication to the manageability firmware or external devices that the controller or the software device driver is not functioning.

SPECIFICATIONS	
General	
Connections	Dual or Quad SFP+ cages supporting Direct Attach Copper (DAC) Twinaxial cable and optical transceivers
Network Standard Physical Layer Interfaces	10GBASE-SR and -LR optical transceivers 10GbE SFP+ DAC

Technical Features

Operating Temperature	0 °C to 55 °C (32 °F to 131 °F)
Airflow	150 LFM with 55 °C required for CR (DAC) 150 LFM with 55 °C or 500 LFM with 65 °C required with extended temp SR optics
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 = 10Gbps; yellow = 1Gbps)

Adapter Features

Data Rate Supported Per Port	• Optical: 1/10GbE • Direct Attach: 10GbE
Bus Type	PCIe 3.0 (8 GT/s)
Bus Width	PCIe x8
Interrupt Levels	INTA, MSI, MSI-X
Hardware Certifications	FCC A, UL, CE, VCCI, BSMI, CTICK, KCC
Controller	Intel® Ethernet Controller X710-BM2

Power Consumption

SKU	Typical Power	Maximum Power
Dual-port 10GBASE-SR	4.3 W	4.8 W
Dual-port 1000GBASE-SX	4.0 W	4.3 W
Dual-port 10GBASE-LR	4.5 W	5.1 W
Dual-port Direct Attach (Twinax)	3.3 W	3.7 W
Quad-port 10GBASE-SR	6.2 W	6.6 W
Quad-port 1000GBASE-SX	5.5 W	6.0 W
Quad-port 10GBASE-LR	6.9 W	7.4 W
Quad-port Direct Attach (Twinax)	3.6 W	3.8 W

Physical Dimensions

X710-DA2 Low profile	167 mm x 69 mm
X710-DA4 Full height	167 mm x 111 mm
X710-DA4 Low profile	167 mm x 69 mm

Product Order Code

Configuration	Product Code	Adapter Height
Dual Port	X710DA2	Low profile
Quad Port	X710DA4FH	Full height
Quad Port	X710DA4G2P5	Low profile

Supported Operating Systems

For a complete list of supported network operating systems for Intel® Ethernet 700 Series Adapters visit:
intel.com/support/EthernetOS

Intel® Ethernet Accessories

Intel® Ethernet Optics and Cables are proven, reliable solutions for high-density Ethernet connections. Combine these accessories with Intel® Ethernet 700 Series and 500 Series Network Adapters for dependable interoperability and consistent performance across the network. Learn more at intel.com/ethernetproducts

Warranty

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

Product Information

For information about Intel® Ethernet Products and technologies, visit: intel.com/ethernetproducts

Customer Support

For customer support options in North America visit:
intel.com/content/www/us/en/support/contact-support.html

No license (express or implied, by estoppel or otherwise) to any intellectual property rights is granted by this document. Intel disclaims all express and implied warranties, including without limitation, the implied warranties of merchantability, fitness for a particular purpose, and non-infringement, as well as any warranty arising from course of performance, course of dealing, or usage in trade.

This document contains information on products, services and/or processes in development. All information provided here is subject to change without notice. Contact your Intel representative to obtain the latest forecast, schedule, specifications and roadmaps.

The products and services described may contain defects or errors which may cause deviations from published specifications.

© Intel Corporation. Intel, the Intel logo, Xeon, and other Intel marks are trademarks of Intel Corporation or its subsidiaries.

Other names and brands may be claimed as the property of others.

Printed in USA 0121/ED/123E Please Recycle 331180-013US