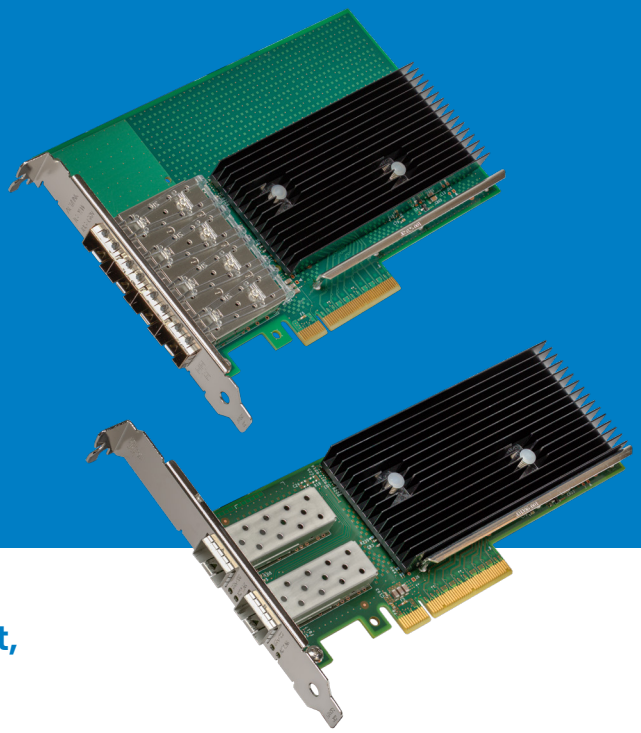
Product Brief

Intel® Ethernet 700 Series Network Adapters

Intel® Ethernet Network Adapter X722



Dual and quad–port 10GbE adapters supporting highly scalable iWARP RDMA for high-throughput, low-latency, and low-CPU data communication.

Key Features

- iWARP RDMA
- PCI Express (PCIe) v3.0, x8
- Network Virtualization offloads: VxLAN, GENEVE, and NVGRE
- Intel® Ethernet Flow Director 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 on servers with Intel® Xeon® Processors
- I/O virtualization innovations for maximum performance in a virtualized server

Overview

The Intel® Ethernet Network Adapter X722 features iWARP RDMA for high data throughput, low-latency workloads and low CPU utilization. The X722 is ideal for Software Defined Storage solutions, NVMe-over-Fabric solutions and Virtual Machine migration acceleration.

RDMA is a host-offload, host-bypass technology that enables a low-latency, high-throughput direct memory-to-memory data communication between applications over a network.

iWARP extensions to TCP/IP, standardized by the Internet Engineering Task Force (IETF), eliminate three major sources of networking overhead: TCP/IP stack process, memory copies, and application context switches. Based on TCP/IP, iWARP is highly scalable and ideal for Hyper-converged storage solutions.

The X722 is one of 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 Telecommunications, Cloud, and Enterprise IT network solutions.

- **Interoperability** - Multiple 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	• The X722 adapters with SFP+ connections support 10GBASE-SR, 10GBASE-LR and SFP+ Direct Attach Copper (DAC) physical media. **NOTE**: only 10GbE single-rate optics are supported. Do not use dual-rate 1GbE/10GbE optics with this adapter.
Low-Profile (non-compliance)	• Intel does offer a 4x10 SFP+, low profile, non-PCI compliant version of the Intel® Ethernet Network Adapter X722-DA4 FH. Please contact your Intel representative for information about this adapter.
Full-Height	• Intel® Ethernet Network Adapter X722-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.
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.
Remote Direct Memory Access (RDMA)	
iWARP	• Based on TCP/IP, routable and scalable, ideal for Software Defined Storage solutions.
Manageability Features	
Preboot eXecution Environment (PXE) Support	• Enables system boot up 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	• Reports service latency requirements for memory reads and writes to the Root Complex.
Network Standard Physical Layer Interfaces	• 10GBASE-SR and -LR optical transceivers and 10GbE SFP+ DAC. NOTE: Dual-rate 10GbE SFP+ transceivers are not supported for this adapter. Use only single-rate 10GbE SFP+ transceivers.

Technical Features

Operating Temperature	0 °C to 55 °C (32 °F to 131 °F)
Airflow	Dual Port 275LFM @ 55 °C for Optics 250LFM @ 55 °C for DAC Quad Port 325LFM @ 55 °C for Optics 300LFM @ 55 °C for DAC
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) LED color (green = 10Gbps)

Adapter Features[1]

Data Rate Supported Per Port	Optical: 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® C628 Chipset

[1]The Intel® Ethernet Network Adapter X722 does not support disabling connectivity to SMBus

Power Consumption

	Quad Port		Dual Port	
Media Type	Typical Power	Max Power	Typical Power	Max Power
Direct Attach	7.9 W	11.2 W	6 W	9 W
10GBASE-SR	9.9 W	13 W	7 W	11 W
10GBASE-LR	10.8 W	13.6 W	7.6 W	12.2 W

Physical Dimensions

X722-DA2 Low profile	167 mm x 69 mm
X722-DA4 Full height	167 mm x 111 mm
X722-DA4 Low profile	167 mm x 69 mm

Product Order Code

Configuration	Product Code	Adapter Height
Dual Port	X722DA2	Low profile
Quad Port	X722DA4FH	Full height
Quad Port	X722DA4G1P5	Low profile

Supported Operating Systems

For a complete list of supported network operating systems for Intel® Ethernet 700 Series Adapters visit:
intel.com/content/www/us/en/support/contact-support.html

Intel® Ethernet Accessories

Compatible Intel® Ethernet Optics, for Intel® Ethernet X722 Network Adapters, provide dependable interoperability and consistent performance across the network. Learn more at intel.com/ethernet

Product Order Code	Description
E10GSFPSRX (Extended Temp)	Intel® Ethernet SFP+ SR Optic

Warranty

Intel limited lifetime warranty for retail Ethernet Products, 90-day money-back guarantee (US and Canada).

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

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