Intel® Ethernet Network Adapter X722

Dual and Quad-ports 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 Migrations 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.

Built on more than 35 years of continuous Ethernet innovations, the 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 such as 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), enabling near-native performance and VM scalability. 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 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):** A virtual function driver that eases SR-IOV hardware upgrades or changes, and preserves base mode functionality in hardware and software. Customers deploying mass-scale VMs or containers for their network infrastructure now have a common Virtual Function (VF) driver. This driver supports a Base Mode and advanced set of features on 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, and NVGRE: 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 ports bandwidth.

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

**Advanced Traffic Steering**
Intel® Ethernet Flow Director (Intel® Ethernet FD) is an advanced traffic steering capability built into the adapter. 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.

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 offers 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.

Multiple Queues: 1,536 Tx and Rx queues per device • Network packet handling without waiting for buffer overflow providing efficient packet prioritization.

Tx/Rx IP, SCTP, TCP, and UDP checksum offloading (IPv4 IPv6) capabilities • Lower processor usage.

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).

VLAN support with VLAN tag insertion, stripping and packet filtering for up to 4096 VLAN tags • Ability to create multiple VLAN segments.

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).

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.

iSCSI Boot • Enables system boot up via iSCSI.

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**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Operating Temperature</td>
<td>0 °C to 55 °C (32 °F to 131 °F)</td>
</tr>
<tr>
<td>Air Flow</td>
<td>Dual Port 275LFM @ 55 °C for Optics</td>
</tr>
<tr>
<td></td>
<td>Quad Port 325LFM @ 55 °C for Optics</td>
</tr>
<tr>
<td></td>
<td>250LFM @ 55 °C for DAC</td>
</tr>
<tr>
<td>Storage Temperature</td>
<td>-40 °C to 70 °C (-40 °F to 158 °F)</td>
</tr>
<tr>
<td>Storage Humidity</td>
<td>Maximum: 90% non-condensing relative humidity at 35 °C</td>
</tr>
<tr>
<td>LED Indicators</td>
<td>LINK (solid) and ACTIVITY (blinking)</td>
</tr>
<tr>
<td></td>
<td>LED color (green = 10Gbps)</td>
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**POWER CONSUMPTION**

<table>
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<tr>
<th>Media Type</th>
<th>Quad Port</th>
<th>Dual Port</th>
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<tbody>
<tr>
<td></td>
<td>Typical Power</td>
<td>Max Power</td>
</tr>
<tr>
<td>Direct Attach</td>
<td>7.9 W</td>
<td>11.2 W</td>
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<td>10GBASE-SR</td>
<td>9.9 W</td>
<td>13 W</td>
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<tr>
<td>10GBASE-LR</td>
<td>10.8 W</td>
<td>13.6 W</td>
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**ADAPTER FEATURES¹**

- Data Rate Supported Per Port: Optical: 10GbE
  Direct Attach: 10GbE
- Bus Type: PCI Express v3.0 (8 GT/s)
- Bus Width: PCI Express x8
- Interrupt Levels: INTA, MSI, MSI-X
- Hardware Certifications: FCC A, UL, CE, VCCI, BSMI, CTICK, KCC
- Controller: Intel® C628 Chipset

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

**PHYSICAL DIMENSIONS**

<table>
<thead>
<tr>
<th>Adapter Height</th>
<th>Size</th>
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<tbody>
<tr>
<td>Low profile</td>
<td>167mm x 69mm</td>
</tr>
<tr>
<td>Full height</td>
<td>167mm x 111mm</td>
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<tr>
<td>Low profile</td>
<td>167mm x 69mm</td>
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</table>

**PRODUCT ORDER CODES**

<table>
<thead>
<tr>
<th>Configuration</th>
<th>Product Code</th>
<th>Adapter Height</th>
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<tbody>
<tr>
<td>Dual Port</td>
<td>X722DA2</td>
<td>Low profile</td>
</tr>
<tr>
<td>Quad Port</td>
<td>X722DA4FH</td>
<td>Full height</td>
</tr>
<tr>
<td>Quad Port</td>
<td>X722DA4G1P5</td>
<td>Low profile</td>
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**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

<table>
<thead>
<tr>
<th>Product Order Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E10GSFPSRXX (Extended Temp)</td>
<td>Intel® Ethernet SFP+ SR Optic</td>
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**PRODUCT INFORMATION**

For information about Intel® Ethernet Products, visit: intel.com/ethernet

**Warranty**

Standard Intel limited warranty, one year. See Intel terms and conditions of sale for more details.

**Customer Support**

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

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