Energy-Efficient, Next-Generation 10 Gigabit Performance

10 Gigabit Ethernet has moved past the early adoption stage and is rapidly becoming mainstay for backbones within enterprise and service provider networks. The escalating deployments of servers with multi-core processors and demanding applications such as High Performance Computing (HPC), database clusters, and video-on-demand are driving the need for 10 Gigabit connections. Based on the Intel® 82598EB 10 Gigabit Ethernet controller, the next-generation Intel® 10 Gigabit XF Server Adapters are designed to meet the throughput and latency requirements of bandwidth-hungry applications, while offering a very low power envelope for energy efficiency. Ideal for slot-constrained environments, the Intel® 10 Gigabit XF Dual Port Server Adapter provides a simplified alternative to multiple 1 Gbps server adapters.

Performance-Enhancing Features for Multi-Core Environments

When implemented within multi-core processor environments, Intel 10 Gigabit XF Server Adapters offer advanced networking features for efficient distribution of Ethernet workloads across CPU cores. Load balancing of interrupts using MSI-X enables more efficient response times and application performance. CPU utilization can be lowered further through stateless offloads such as TCP segmentation offload, header replications/splitting, and Direct Cache Access (DCA).

Intel 10 Gigabit XF Server Adapters are optimized for virtualized environments, supporting multiple queues, alleviating I/O bottlenecks between virtual machines. Virtual Machine Device queue 1 (VMDq) technology offloads data sorting and data copying from the virtual machine monitor (VMM) software layer to the hardware, improving overall throughput and CPU utilization on virtualized servers. Additionally, Intel 10 Gigabit XF Server Adapters enable Intel® I/O Acceleration Technology® (Intel® I/OAT) with support for Intel® QuickData for faster I/O processing on the new Quad-Core and Dual-Core Intel® Xeon® processor-based servers.

Conserve valuable PCI Express® (PCIe®) server slots while adding 10 Gigabit Ethernet capability with Intel 10 Gigabit XF Server Adapters. The dedicated input/output (I/O) bandwidth of PCIe ensures priority performance on each port for 10 Gigabit Ethernet connectivity, as well as a low-profile design, which improves server throughput and rack density at the same time. In addition, eight-lane PCIe enables maximum bandwidth for fast and efficient data transfer. The low power, efficient design allows for two 10 Gigabit Ethernet ports in a single low-profile PCIe adapter.

Advances for Storage Over Ethernet

The fast growth in storage capacity coupled with server virtualization has brought the need for Storage Area Network (SAN) to the forefront. To satisfy this growing demand, Intel 10 Gigabit XF Server Adapters support iSCSI acceleration and provide advanced features for unified storage connectivity. Fast and reliable networked storage can be achieved via native iSCSI support with Microsoft, Linux®, and VMware operating systems as well as support for iSCSI remote boot.
<table>
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<tr>
<th>Features</th>
<th>Benefits</th>
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<tr>
<td>Intel® 82598EB 10 Gigabit Ethernet Controller</td>
<td>• Industry-leading, energy-efficient design for next-generation 10 Gigabit performance and multi-core processors</td>
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<tr>
<td>Low-profile</td>
<td>• Enables higher bandwidth and throughput from standard and low-profile PCIe slots and servers</td>
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<tr>
<td>Load balancing on multiple CPUs</td>
<td>• Increases performance on multi-processor systems by efficiently balancing network loads across CPU cores when used with Receive-Side Scaling from Microsoft or Scalable I/O on Linux*</td>
</tr>
<tr>
<td>Intel® I/O Acceleration Technology™ (Intel® I/OAT)</td>
<td>• Accelerates I/O with higher throughput and lower CPU utilization by offloading processing overhead</td>
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<tr>
<td>iSCSI remote boot support</td>
<td>• Provides centralized storage area network (SAN) management at a lower cost than competing iSCSI solutions</td>
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<td>MSI-X support</td>
<td>• Minimizes the overhead of interrupts</td>
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<tr>
<td>Virtual Machine Device queues (VMDq)</td>
<td>• Allows the efficient routing of packets to the correct target machine in a virtualized environment using multiple hardware queues</td>
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<td>Low latency</td>
<td>• Ability to toggle between the interrupt aggregation and non-aggregation mode based on the type of data being transferred</td>
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<td>Optimized queues: 32 transmit (Tx) and 64 receive (Rx) per port</td>
<td>• Network packet handling without waiting or buffer overflow</td>
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<tr>
<td>Compatible with x4, x8, and x16 standard and low-profile PCI Express* slots</td>
<td>• Efficient packet prioritization</td>
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<td>Support for most network operating systems (NOS)</td>
<td>• Enables widespread deployment</td>
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<tr>
<td>Remote management support</td>
<td>• Reduces support costs with remote management based on industry-wide standards</td>
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<td>10GBASE-LR on single-mode fiber (LR version)</td>
<td>• Ensures compatibility with fiber-optic cable lengths up to 10 km</td>
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<tr>
<td>10GBASE-SR on multi-mode fiber (SR versions)</td>
<td>• Ensures compatibility with fiber-optic cable lengths up to 300 meters</td>
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<tr>
<td>RoHS compliant! lead-free* technology</td>
<td>• Compliant with the European Union directive (effective as of July 2006) to reduce the use of hazardous materials</td>
</tr>
<tr>
<td>Intel® PROSet Utility for Windows® Device Manager</td>
<td>• Provides point-and-click power over individual adapters, advanced adapter features, connection teaming, and virtual local area network (VLAN) configuration</td>
</tr>
<tr>
<td>Intel backing</td>
<td>• Backed by an Intel® limited lifetime warranty, 90-day money-back guarantee (U.S. and Canada), and worldwide support</td>
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</tbody>
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**Order Codes**

- EXPX9501AFXSR (Single-Port SR)
- EXPX9502AFXSR (Dual-Port SR)
- EXPX9501AFXLR (Single-Port LR)

**Companion Products**

Consider these Intel® products in your server and network planning:

- **Intel® PRO/1000 Server Adapters**
  - Copper or fiber-optic network connectivity, up to four ports per card
  - Solutions for PCI Express, PCI-X*, and PCI interfaces

- **Intel® PRO/10GbE Server Adapters**
  - CX4 offering for cost-effective 10 Gigabit-over-copper connections
  - Short-range and long-range connectivity solutions for fiber-optic cabling

- **Intel® PRO/1000 Desktop Adapters for PCI Express and PCI interfaces**
- **Other Intel® PRO Desktop and Server Adapters**
- **Intel® Xeon® processors**
- **Intel® Server Boards**
Specifications

General

Product codes
EXPX9502AFXSR (Dual-Port 10GBASE-SR);
EXPX9501AFXSR (Single-Port 10GBASE-SR);
EXPX9501AFXLR (Single-Port 10GBASE-LR)

Connectors
One or two LC fiber-optic connectors

Cabling
SR version: Multi-mode fiber (62.5 μm or 50 μm);
LR version: Single-mode fiber

Adapter Product Features

Intel PROSet Utility for easy configuration and management
Intel® lead-free® technology
Plug and play specification support
Intel® I/OATª including QuickData
Ships with full-height bracket installed, low-profile bracket added in package
RoHs¹

Cabling Distance
Fiber type
Minimum modal bandwidth@ 850 nm (MHz x km)
Operating range (meters)
SMF (LR version)
N/A
2 to 10,000
62.5 μm MMF (SR versions)
160
2 to 26
200
2 to 33
SO μm MMF (SR versions)
400
2 to 66
500
2 to 82
2000
2 to 300

Receive-side scaling
VMDq¹
In a virtualized environment, packets dedicated to different virtual machines can be routed to different queues, thus easing the routing of these packets to the target machine

Advanced packet filtering (per port)
16 exact-matched packets (unicast or multicast)
4096-bit hash filter for multicast frames
Promiscuous (unicast and multicast) transfer mode support
Optional filtering of invalid frames

Direct Cache Access (DCA)
The I/O device activates a pre-fetch engine in the CPU that loads the data into the CPU cache ahead of time, before use, eliminating cache misses and reducing CPU load

Network Management

Wired for Management (WfM) baseline v2.0 enabled for servers
DMI 2.0 support, Windows® Management Instrumentation (WMI) and SNMP® Remote Installation Services (RIS)
PXE 2.0 enabled through boot read-only memory (ROM)

Network Operating Systems (NOS) Software Support

Microsoft Windows® 2003 Server
Microsoft Vista®
Windows® Virtual Server 2005
Red Hat® Enterprise Linux® 4 or later
SUSE SLES® 10 or later, Professional 9.2 or later
FreeBSD 5.x or later

Network Operating Systems Software Support (continued)

ESX 3.x support for VMware
Fedora
RHEL 1.1

Intel Backing

Limited lifetime warranty
90-day, money-back guarantee (U.S. and Canada)

Advanced Software Features

Adapter fault tolerance (AFT)
Switch fault tolerance (SFT)
Adaptive load balancing (ALB)
Teaming support
IEEE 802.3ad* Link aggregation control protocol
Test switch configuration

PCIe Hot Plug Active peripheral component interconnect (PCI)
IEEE 802.1Q* VLANs
IEEE 802.3 2005* flow control support IPv6, IPv4
Tx/RX IP, TCP and UDP checksum offloading IPv4, IPv6 capabilities control protocol (TCP), user datagram protocol (UDP)
Internet protocol (IP)
IEEE 802.1p* IPv6 offloading

Technical Features

Data rate(s) supported per port
10 Gigabit
Bus type
PCI Express 2.0 (2.5 GT/s)
Bus width
x8 lane PCI Express, operable in x4: x8 x16 slots
Bus speed (x8, encoded rate)
20 Gbps uni-directional, 40 Gbps bi-directional
Interrupt levels
INTA, MSI, MSI-X
Hardware certifications
FCC, B, UL, CE, VCC, BSMI, C-TICK, MIC
Controller-processor
Intel® B2599EB
Typical power consumption
Single-Port SR 10.4W (0.87A @ 12V);
Dual-Port SR 14W (1.17A @ 12V)
Single-Port LR 11.5W (0.96A @ 12V)
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
90% non-condensing relative humidity at 35°C

LEDs
2 (on dual port), 1 (on single port), LINK (solid), and ACTIVITY (blinking)

Physical Dimensions

Length
16.74 cm (6.59 in)
Width
6.89 cm (2.71 in)
Height of end bracket
PCI Express standard, 12 cm (4.725 in);
PCI Express low-profile, 7.92 cm (3.12 in)
Network-Ready Servers
Top PC and server manufacturers offer Intel adapters in their new products. Specify or ask for Intel Network Connections with your next PC, server, or mobile PC purchase. For a list of preferred suppliers, visit us at: http://www.intel.com/buy/networking/adapters.htm.

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

For Product Information
To see the full line of Intel Network Adapters for PCI Express, visit www.intel.com/network/connectivity

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6 Intel® I/O Acceleration Technology (Intel® I/OAT) requires an operating system that supports Intel I/OAT.
7 Intel® VMDq requires an operating system that supports VMDq.
2 Lead has not been intentionally added, but lead may still exist as an impurity below 1000 ppm, or an approved RoHS exemption applies.
3 Lead and other materials banned in RoHS Directive are either (1) below all applicable substance thresholds the EU or (2) an approved/pending exemption applies.
4 Available only when used with a capable switch.
5 Only x4 connections implemented with an x8 connector are supported.

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