10 Gb Performance at the Low Cost of Copper

This 10 Gigabit X520-T2 Ethernet Server Adapter showcases Intel's third-generation standards-based 10GBASE-T adapter in a low-profile PCI Express* form factor. This new dual port adapter provides bandwidth-intensive applications highly affordable 10 Gigabit Ethernet (10GbE) network performance with cost-effective RJ-45 connections for distances up to 100 meters.

10GBASE-T is the most cost-effective deployment of 10GbE for connectivity and will be the primary media of choice for volume 10GbE deployments as datacenters continue to drive to reduce costs through network convergence and virtualization while still providing increased application performance and availability.

Next-Generation 10 Gigabit Performance

The drive to 10 Gigabit Ethernet comes from information technologies including virtualization, advances in storage architectures, network convergence, server clustering, new forms of information delivery using the Internet, and the next wave of digital and social media content.

At the heart of tomorrow's network infrastructure, 10 Gigabit Ethernet is the core of any next generation data center. Data centers are demanding flexible and scalable I/O solutions to meet the rigorous requirements of running mission-critical applications in virtualized and unified storage environments. With the latest server platform from Intel, customers can now realize the full potential of 10 Gigabit Ethernet networking and realize up to 2.5 times the bandwidth supported by earlier generation platforms.

Performance-Enhancing Features for Multi-Core Environments

When implemented within multi-core processor environments, the Intel® Ethernet Server Adapter X520-T2 offers advanced networking features, Intel® I/O Acceleration Technology (Intel® I/OAT), 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).

Best Choice for Virtualization

The Intel X520-T2 server adapter includes Intel® Virtualization Technology for Connectivity (Intel VT-c) to deliver outstanding performance in virtualized server environments. Intel VT-c includes hardware optimizations that help reduce I/O bottlenecks and improve the overall server performance. These technologies are Virtual Machine Device Queues2 (VMDq) and Virtual Machine Direct Connect (VMDc). VMDq improves data processing by offloading the sorting and queuing functionality to the I/O controller from the VMM. VMDc provides direct connectivity to the VMs to deliver near-native performance and VM scalability.
Features Benefits

Intel® 82599 10 Gigabit Ethernet Controller
• Industry-leading, energy-efficient design for next-generation 10 Gigabit performance and multi-core processors

Low-profile
• Enables higher bandwidth and throughput from standard and low-profile PCIe slots and servers

Load balancing on multiple CPUs
• 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*

iSCSI remote boot support
• Provides centralized Storage Area Network (SAN) management at a lower cost than competing iSCSI solutions

Support for most Network Operating Systems (NOS)
• Enables widespread deployment

RoHS compliant, lead-free, technology
• Compliant with the European Union directive (effective as of July 2006) to reduce the use of hazardous materials

Intel® ProSet Utility for Windows* Device Manager
• Provides point-and-click management of individual adapters, advanced adapter features, connection teaming, and virtual local area network (VLAN) configuration

Compatible with x8 and x16 standard and low-profile PCI Express* slots
• Allows each PCI Express* slot port to operate without interfering with the other

I/O Features for Multi-core Processor Servers

Intel® QuickData Technology
• DMA Engine: enhances data acceleration across the platform (network, chipset, processor), thereby lowering CPU utilization
• Direct Cache Access (DCA): allows the processor to pre-fetch the data from memory, thereby avoiding cache misses and improving service level agreements (SLA) of the applications

MSI-X support
• Minimizes the overhead of interrupts
• Allows load balancing of interrupt handling between different cores/CPUs

Low latency
• Based on the sensitivity of the incoming data, the adapter can bypass the automatic moderation of time intervals between the interrupts

Header Splits and Replication in Receive
• Helps the driver focus on the relevant part of the packet without the need to parse it

Multiple Queues: 16 queues per port
• Network packet handling without waiting or buffer overflow providing efficient packet prioritization

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

Tx TCP segmentation offload (IPv4, IPv6)
• Increased throughput and lower processor usage
• Compatible with large-send offload feature in Microsoft Windows* Server operating systems

Receive and Transmit Side Scaling for Windows environment and Scalable I/O for Linux* environments (IPv4, IPv6, TCP/UDP)
• Enables the direction of the interrupts to the processor cores in order to improve the CPU utilization rate

IPsec Offload
• Offloads IPsec capability onto the adapter instead of the software to significantly improve throughput and CPU usage (for Windows* 2008 Server and Vista*)

LinkSec
• IEEE spec: 802.1ae
• Layer 2 data protection with encryption/authentication ability between devices (e.g., routers, switches)
• LinkSec is designed into the network adapter hardware. These adapters are prepared to provide LinkSec functionality when the ecosystem is ready to support this new technology

Unified Networking
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, the Intel Ethernet Server Adapter X520-T2 supports iSCSI acceleration and provides advanced features for unified networking. 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. Intel’s unified networking solutions enable cost-effective connectivity to the SAN; customers can use NAS or iSCSI to carry storage traffic over Ethernet.

Companion Products
Consider these Intel® products in your server and network planning:
• Intel® Ethernet Server Adapter X520 Series for 10GbE SFP+ PCIe v2.0 (5 GT/s) performance
• 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/1000 Desktop Adapters for PCI Express and PCI interfaces
• Other Intel® PRO Desktop and Server Adapters
• Intel® Xeon® Processors
• Intel® Server Boards

Order Code
Single unit: E10G42BT
## Virtualization Features

<table>
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<th>Feature</th>
<th>Benefits</th>
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| Virtual Machine Device queues (VMDq) | • Offloads the data-sorting functionality from the Hypervisor to the network silicon, improving data throughput and CPU usage  
• Provides QoS feature on the Tx data by providing round-robin servicing and preventing head-of-line blocking  
• Sorting based on MAC addresses and VLAN tags |
| Next-Generation VMDq (64 queues per port) | • Enhanced QoS feature by providing weighted round-robin servicing for the Tx data  
• 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  
• Supports replication of multicast and broadcast data |
| PC-SIG SR-IOV Implementation (64 virtual functions per port) | • Provides an implementation of the PC-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  
• Integrated with Intel® VTI 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 |
| IPv6 Offloading | • Checksum and segmentation capability extended to the new standard packet type |
| Advanced Packet Filtering | • 24 exact-matched packets (unicast or multicast)  
• 4096-bit hash filter for unicast and multicast frames  
• 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 |

## Manageability Features

<table>
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| Preboot eXecution Environment (PXE) Support | • Enables system boot up via the LAN (32-bit and 64-bit)  
• Flash interface for PXE image |
| Simple Network Management Protocol (SNMP) and Remote Network Monitoring (RMON) Statistic Counters | • Minimizes the overhead of interrupts  
• Allows load balancing of interrupt handling between different cores/CPUs |
| iSCSI Boot | • Enables system boot up via iSCSI  
• Provides additional network management capability |
| Watchdog Timer | • Gives an indication to the manageability firmware or external devices that the chip or the driver is not functioning |

## Specifications

### General

- **Product code**: E10G42BT
- **Connector**: RJ-45 Copper
- **Cabling**: Category-6A

### Adapter Product Features

- **Intel® PROSet Utility**: for easy configuration and management
- **Intel® lead-free® technology**
- **Plug and play specification support**: Standard
- **Intel® I/OAT including QuickData**
- **RohS®**
- **Cabling Distance**:
  - 10GBase-T 100 m on Cat-6A, 55 m on Cat-6
  - 1000Base-T 100 m on Cat-5e, Cat-6 or Cat-6A
- **Receive-side scaling**
- **VMDq®**
- **Advanced packet filtering (per port)**: 16 exact-matched packets (unicast or multicast)  
• 4096-bit hash filter for multicast frames  
• Promiscuous (unicast and multicast)  
• 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

- **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 Server 2003 *
- Microsoft Vista®
- Microsoft Windows Virtual Server 2005 *
- Red Hat Enterprise 4* or later
- SUSE SLES 10* or later, Professional 9.2 or later
- FreeBSD 5.x* or later
- VMware ESX 3.x* support
- Fedora®
- EFI 1.1

### Intel Backing

- **Limited Lifetime Warranty**
- **90-day, money-back guarantee** (U.S. and Canada)
- **Interrupt levels**: INTA, MSI, MSI-X
- **Hardware certifications**: FCC, B, UL, CE, VCCI, BSMI, CTICK, KCC
- **Controller-processor**: Intel® B2599EB
- **Maximum power consumption**: 250 W Maximum
**Advanced Software Features**

- 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/IP, User Datagram Protocol/UDP)
- Internet Protocol (IP)
- IEEE 802.1p
- TCP segmentation and large send offload
- MSI-X supports Multiple Independent Queues
- Interrupt moderation

**Technical Features**

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPv6 offloading</td>
<td>Checksum and segmentation capability extended to new standard packet type</td>
</tr>
<tr>
<td>Data rate(s) supported per port</td>
<td>1 Gigabit and 10 Gigabit</td>
</tr>
<tr>
<td>Bus type</td>
<td>PCIe Express 2.0 (5.0 Gbps)</td>
</tr>
<tr>
<td>Bus width</td>
<td>x8 lane PCIe Express, operable in x8 and x16 slots</td>
</tr>
<tr>
<td>Bus speed (x8 encoded rate)</td>
<td>20 Gbps uni-directional; 40 Gbps bi-directional</td>
</tr>
<tr>
<td>Interrupt levels</td>
<td>INTA, MSI, MSI-X</td>
</tr>
<tr>
<td>Hardware certifications</td>
<td>FCC B, UL, CE, VCCI BSMI, CTICK, KCC</td>
</tr>
<tr>
<td>Controller-processor</td>
<td>Intel® 82599EB</td>
</tr>
</tbody>
</table>

**For Product Information**

To speak to a customer service representative regarding Intel products, please call 1-800-538-3373 (U.S. and Canada) or visit support.intel.com/support/go/network/contact.htm for the telephone number in your area. For additional product information on Intel Networking Connectivity products, visit www.intel.com/network/connectivity.

**Network-Ready Servers**

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**Customer Support**

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To see the full line of Intel Network Adapters for PCI Express*, visit [www.intel.com/go/ethernet](http://www.intel.com/go/ethernet).

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1. Intel® Quick Data Technology requires operating system support.
2. 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.
3. Lead has not been intentionally added, but lead may still exist as an impurity below 1000 ppm, or an approved RoHS exemption applies.
4. Intel® VMDq requires operating system support.
5. Available only when used with a capable switch.

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