PRODUCT BRIEF
Intel® Ethernet Converged Network Adapter X520
with Support for SFP+ Connections
Network Connectivity

Intel® Ethernet Converged Network Adapter X520

Dual- and Single-Port 10 Gigabit SFP+ Ethernet Converged Network Adapters Provide Ultimate Flexibility and Scalability in Virtual and Unified Storage Environments

Overview

Intel's family of adapters, the Intel® Ethernet Converged Network Adapter X520 with SFP+ connectivity, are the most flexible and scalable Ethernet adapters for today's demanding data center environments. Data center networks are being pushed to their limits. 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 Gbps connections. Customers require flexible and scalable I/O solutions to meet the rigorous requirements of running mission-critical applications in virtualized and unified storage environments.

Powered by Intel's third-generation 10 GbE network controller, the Intel® Ethernet 82599 10 Gigabit Ethernet Controller, the X520 adapter family addresses the demanding needs of the next-generation data center by providing unmatched features for virtualization, flexibility for LAN and SAN networking, and proven, reliable performance.

Best Choice for Virtualization

The explosive growth in virtualization is leading to an increasing demand for network performance. With more Virtual Machines (VMs) running on each multi-core server, networking traffic is dramatically increased, with each VM competing for available I/O bandwidth. Intel's family of Intel Ethernet Converged Network Adapter X520 addresses networking bottlenecks in virtualized environments. These adapters enable network-intensive applications to achieve the performance expected in a virtualized environment.

The Intel Ethernet X520 family of adapters provides the best networking performance available in the industry, whether the physical port is configured in an emulation mode using the virtual switch in the Virtual Machine Monitor (VMM), or is directly assigned to a virtual machine. In the emulation mode, Intel's I/O technology, Virtual Machine Device queues[1] (VMDq) optimizes network performance by offloading data sorting and copying from the software Virtual Switch in the VMM to the Intel Ethernet 82599 10 Gigabit Controller. This configuration is best suited for a large number of VMs running standard applications that have limited bandwidth and latency requirements.

For mission-critical applications, where dedicated I/O is required for maximum network performance, users can assign a dedicated virtual adapter port to a VM. Using the PCI-SIG SR-IOV capability on an Intel Ethernet X520 adapter provides direct VM connectivity and data protection across VMs. SR-IOV technology enables the data to bypass the software virtual switch and provides near-native performance. It assigns either physical or virtual I/O ports to individual VMs directly. This technology is best suited for applications that demand the highest I/O throughput and lowest latency performance such as database, storage, financial and other applications.

PCI-SIG SR-IOV is a mechanism for devices to advertise their ability to be directly assigned to multiple virtual machines. SR-IOV enables the partitioning of a PCI Express* (PCIe) function into many virtual interfaces for the purpose of sharing the resources of a PCIe device in a virtual environment. These virtual interfaces are called Virtual Functions. Each virtual function can support a unique and separate data path for I/O-related functions within the PCIe hierarchy. Use of SR-IOV with a networking device, for example, enables 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.

The Intel Ethernet X520 family of adapters delivers the same functionality and throughput as ten dual-port, one gigabit adapters, saving cost, power, and complexity. For more information on virtualization please go to: www.intel.com/go/vtc.

Unified Networking and Storage

The family of Intel Ethernet X520 adapters lowers your data center total cost of ownership (TCO) by providing the ability to route LAN and SAN traffic over a single fabric.

Support for Fiber Channel over Ethernet (FCoE)

FCoE encapsulates Fiber Channel frames over standard Ethernet networks, enabling Fiber Channel to take advantage of 10 GbE networks while preserving its native protocol. The X520 adapters offer FCoE hardware acceleration to provide performance comparable to FC HBAs. The adapters support Data Center Bridging, also known as Converged Enhanced Ethernet (CEE), which enables customers to configure traffic classes and priorities to deliver a lossless Ethernet fabric. An Intel Ethernet Converged Network Adapter X520 reduces TCO by eliminating redundant fabrics and saves the cost of expensive FC HBAs and FC switch ports.

Support for iSCSI

The adapters provide complete support for proven native OS and VMM iSCSI initiators as well as iSCSI boot. Historically, CRC32C computation has degraded system performance, but now with the CRC instruction set included in the latest Intel® Xeon® processors, CRC validation is possible with minimal impact to network throughput while delivering superior data integrity.

The Intel Ethernet family of X520 adapters do it all: 10 Gigabit LAN, FCoE, and iSCSI; truly delivering on the promise of unified networking.

Reliable Performance

The family of X520 adapters includes a number of advanced features that enable it to provide industry-leading performance and reliability.

Security Optimizations

The adapters support IPsec offload for Microsoft's* Network Access Protection (NAP), Active Directory,* and future security capabilities in Windows 7*. An X520 adapter enables customers to run a secure network environment without sacrificing performance.

PCIe v2.0 (5 GT/s)

PCIe v2.0 (5 GT/s) support enables customers to take full advantage of 10 GbE by providing a maximum of 20 Gbps bi-directional throughput per port on a single dual port card.

Designed For Multi-core Processors

Support for technologies such as multiple queues, receive-side scaling, multiple MSI-X vectors, and Low Latency Interrupts enable the X520 adapters to provide high-performance, 10 Gigabit connectivity in multi-core server blades. These technologies distribute network processing across multiple CPU cores, improving overall performance.

For today's demanding virtualized data center environments, the new family of X520 adapters deliver ultimate flexibility and scalability.

Features	Benefits
General	
Intel® 82599 10 Gigabit Ethernet Controller	▪ Industry-leading, energy-efficient design for next-generation 10 Gigabit performance and multi-core processors
SFP+ Connectivity	▪ X520 Adapters with SFP+ connections support 10GBASE-SR, 10GBASE-LR and SFP+ Copper Direct Attach physical media.
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 (RSS) from Microsoft or Scalable I/O on Linux*
iSCSI remote boot support	▪ Provides centralized storage area network (SAN) management at a lower cost than other iSCSI solutions
Fibre Channel over Ethernet (FCoE) Support	▪ Includes FCoE Boot and Data Center Bridging
Support for most network operating systems (NOS)	▪ Enables widespread deployment
RoHS-compliant[2]	▪ Complies with the European Union directive 2002/95/EC 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
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

Features	Benefits
I/O Features for Multi-core Processor Servers	
Intel® Direct Cache Access (DCA):	▪ Enables the adapter to pre-fetch the data from memory, avoiding cache misses and improving application response time
MSI-X support	▪ Minimizes the overhead of interrupts ▪ load-balancing of interrupt handling between multiple cores/CPUs
Low Latency Interrupts	▪ 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: 128 Tx and Rx 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)	▪ This technology enables the direction of the interrupts to the processor cores in order to improve the CPU usage rate
IPsec Offload	▪ Offloads IPsec capability onto the adapter instead of the software to significantly improve I/O throughput and CPU usage (for Windows* 2008 Server, Vista*, Windows* 2008 Server R2, and Windows* 7)
MacSec	▪ IEEE spec: 802.1ae ▪ Layer 2 data protection that provides encryption and authentication ability between two individual devices (routers, switches, etc.) ▪ MacSec is designed into the network adapter hardware. These adapters are prepared to provide MacSec functionality when the ecosystem is ready to support this new technology
Virtualization Features	
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[1] (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 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 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
Virtual Machine Load Balancing (VLMB)	▪ Virtual Machines Load Balancing (VMLB) provides traffic load balancing (Tx and Rx) across Virtual Machines bound to the team interface, as well as fault tolerance in the event of switch, port, cable, or adapter failure.
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	
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	▪ Easy system monitoring with industry-standard consoles
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

Connectors	One or two LC fiber-optic connectors SFP+ Direct Attach cables (E10G42BTDA)
Network Standards Physical Layer Interface	IEEE 802.3: 10GBASE-SR (E10G41BFSR, E10G42BFSR) 10GBASE-LR (E10G41BFLR) SFF-8431: 10GSFP+Cu (a.k.a. Direct Attach) (E10G42BTDA)

Adapter Product Features

Intel® PROSet Utility	For easy configuration and management
Plug and play specification support	Standard
Receive Side Scaling	Multiple Rx queues enable the efficient distribution of network receive processing across multiple CPUs in multiprocessor systems
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

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 (TCP), user datagram protocol (UDP), Internet protocol (IP)
IEEE 802.1p*
TCP segmentation/large send offload
MSI-X supports Multiple Independent Queues
Interrupt moderation
IPv6 offloading – Checksum and segmentation capability extended to new standard packet type

Technical Features

Data rate supported per port:	▪ Optical: 1 GbE/10 GbE ▪ Direct Attach: 10 GbE
Bus type	PCI Express 2.0 (5 GT/s)
Bus width	4-lane PCI Express and 8-lane PCI Express
Interrupt levels	INTA, MSI, MSI-X
Hardware certifications	FCC B, UL, CE, VCCI, BSMI, CTICK, KCC
Controller-processor	Intel® 82599 Ethernet Controller

Power Consumption

SKU	Maximum Power	Typical Power
Dual-port 10GBASE-SR/1000BASE-SX	6.8 W	6.5 W
Dual-port 10GBASE-LR/1000BASE-LX	7.0 W	6.6 W
Dual-port direct attached twinax	6.2 W	5.8 W
Single-port 10GBASE-SR/1000BASE-SX	4.8 W	4.5 W
Single-port 10GBASE-LR/1000BASE-LX	4.8 W	4.5 W
Single-port direct attached twinax	4.6 W	4.3 W

Operating temperature	0 °C to 55 °C (32 °F to 131 °F)
Air Flow	Minimum of 100 LFM required
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=10 Gbps; yellow=1 Gbps)

Physical Dimensions

Low-profile PCIe	5.73 in. long, measured without PCIe bracket

Network Operating Systems (NOS) Software Support

Operating System	IA32	X64	IPF
Windows 7	▪	▪	N/A
Windows Server 2008 R2	N/A	▪	▪
Windows Server 2008 R2 Core	N/A	▪	▪
Linux SLES 11 SP1	▪	▪	▪
Windows Vista* SP2	▪	▪	N/A
Windows Server* 2003 SP2	▪	▪	▪
Windows Server 2008 SP2	▪	▪	▪
Windows Server 2008 SP2 Core	▪	▪	N/A
Linux* Stable Kernel version 2.6	▪	▪	▪
Linux RHEL 4.8	▪	▪	N/A
Linux RHEL 5.5	▪	▪	▪
Linux SLES 10 SP3	▪	▪	▪
Linux SLES 11	▪	▪	▪
FreeBSD* 8.0	▪	▪	▪
EFI* 1.1	N/A	N/A	▪
UEFI* 2.1	N/A	▪	▪

Intel® Backing Information

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

Intel® Ethernet Converged Network Adapter X520 Product Codes

Configuration	Product Code
X520-SR1†	E10G41BFSR
X520-SR2†	E10G42BFSR
X520-LR1†	E10G41BFLR
X520-DA2	E10G42BTDA

† Ships with pluggable optic installed.

Intel® Ethernet SFP+ Twinaxial Cable Product Codes

Cable Length (m)	Product Code
1	XDACBL1M
3	XDACBL3M
5	XDACBL5M

Intel® Ethernet SFP+ Optic Product Codes

Configuration	Product Code
SR Optic	E10GSFPSR
LR Optic	E10GSFPLR

For Product Information

To speak to a customer service representative, 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/go/ethernet.

Customer Support

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

(Service and availability may vary by country.)

For more information, visit **www.intel.com/go/ethernet**

1 Requires a system that supports VMDq.

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