PRODUCT BRIEF
Intel® Ethernet Converged Network Adapter X520-QDA1 with Support for QSFP+ Connections
Network Connectivity

Intel® Ethernet Converged Network Adapter X520-QDA1

Single-Port QSFP+ Converged Network (4x10GbE) Adapter Provides Ultimate Flexibility and Scalability in Virtual and Network Appliance Environments

Overview

The best-selling Intel X520 dual-port (2x10GbE) adapter is known for its high performance, low latency, reliability, and flexibility. The addition of a new low profile QSFP+ 4x10GbE adapter to the X520 family delivers all of the capabilities in a 4x10GbE adapter. The Intel® Ethernet Converged Network Adapter X520-QDA1 adapter delivers a proven, reliable solution for deployments of high density Ethernet for unified 10GbE network connections. The new single-port QSFP+ adapter delivers 4 channels of line-rate 10Gb Ethernet in a single PCIe slot using the latest PCI Express* (PCIe*) v3.0 bus technology for maximum bandwidth that addresses the increasing capability of the latest Intel® Xeon® processor E5/E7 based platforms.

This card allows customers to move to 40GbE today for high bandwidth application requirements such as content distribution, high-end virtualization using multiple CPUs, network appliances, and Applications Delivery Controllers (ACD) used for content caching, load balancing, and compression. The adapter uses a single PCI slot without the need to upgrade your switch infrastructure. Customers can deploy these adapters today using existing 10GbE switches giving IT managers an easy upgrade path to 40GbE.

Intel® Ethernet Converged Network Adapter X520-QDA1 (Single Port QSFP+ 4x10GbE)

The new QSFP+ single-port X520-QDA1 connects your server to the latest 40GbE switches with a single cable operating in 4x10GbE mode. This adapter can also utilize existing 10GbE SFP+ switches using the QSFP+ to 4xSFP+ breakout cable.

The QSFP+ adapter supports Direct Attach Copper Cables and Intel® Ethernet QSFP+ SR Optical Transceivers.

Powered by the latest network controller, the Intel® Ethernet 82599 Ethernet Controller, the X520-QDA1 adapter 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. The Intel® 82599 controller is the industry standard for 10GbE making it the most popular 10GbE controller on the market today.

Best Choice for Virtualization

Intel leads the industry in virtualization by being the first to provide virtualization for all the major operating systems and working with the OEMs to implement virtualization not only on the adapter but also on the platform.

Intel® Virtualization Technology for connectivity (Intel® VT-c)

Intel® Ethernet Controllers include Intel® Virtualization Technology for connectivity (Intel VT-c) to deliver virtualized I/O performance optimizations and Quality of Service (QoS) features designed directly in to the controller's silicon. Working in conjunction with virtualization optimized drivers, PCI-SIG* Single Root I/O Virtualization and Sharing (SR-IOV) can be used to help reduce I/O bottlenecks, and improve the overall server performance.

Hypervisor *BYPASS* using SR-IOV

Bypassing the hypervisor and allowing direct hardware access by virtual machines, reduces CPU overhead, reduces latency, and increases network throughput. Most of the current hypervisor releases have been enabled to partition a single physical Ethernet controller in to multiple virtual Ethernet controllers that can be used directly by VMs by taking advantage the PCI-SIG* SR-IOV standard. The use of these virtual controllers, known as Virtual Functions (VF), enables additional QoS features in the controller's silicon to manage and direct traffic such as traffic isolation, port partitioning with bandwidth allocation and on-chip VF-VF switching.

Unified Networking and Storage

The family of Intel® Ethernet CNA X520 adapters lowers your data center total cost of ownership (TCO) by providing the ability to route LAN and storage traffic over a single fabric. By enabling IT to unify LAN and storage traffic in a single network, Intel helps reduce costs and complexity, and enhance the efficiency of your virtual infrastructure.

Unified networking is ideal for cloud usage. Discrete data center networks for specific components such as storage and servers are no longer appropriate. As companies move to cloud computing, networks must be simpler to manage while supporting large volumes of traffic. Converged networks, with storage and server traffic running across a unified fabric, provide that capability. The benefits of such a unified network are simplification, lower TCO due to infrastructure consolidation, and greater flexibility.

In today's dynamic data center environment, you need to simplify as much as possible. Thanks to unified networking from Intel, you can combine all the traffic of multiple data center networks—such as iSCSI, FC, TCP/IP and NAS—using one efficient network fabric. You can also get world-class iSCSI and FCoE performance with native OS initiators and intelligent CPU and networking hardware offloads. Such innovations add up to a simpler, more efficient data center environment.

Intel has lead broad OS and software ecosystem engagements to enable effective protocol processing for storage and LAN traffic through native software storage initiators. Native initiators are:

- **Easy to use**—it has the same management interface that is integrated into the operating system
- **Reliable**—backed by the reliability and trust from operating system vendor
- **Cost Effective**—integrated into the Kernel means customers can implement over standard Ethernet connection and don't have to pay extra for the feature

With the use of intelligent offloads, Intel is able to target processing functions enabled with hardware assists or bypass offloads to optimize performance, scalability, and flexibility.

Support for Fibre Channel over Ethernet (FCoE)

FCoE encapsulates Fibre Channel frames over standard Ethernet networks, enabling Fibre 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 (DCB), 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.

iSCSI Acceleration

The adapters provide complete support for proven native OS iSCSI initiators as well as iSCSI boot. Intel Ethernet server adapters include hardware-based iSCSI acceleration features that do not require offloading to a proprietary TCP/IP stack. iSCSI acceleration uses large send offload, Receive Side Coalescing and transmit send offloads to help reduce latency and lower CPU utilization. To improve efficiency, MSI-X, Receive-side Scaling and Intel Ethernet Flow Director scale I/O processing across multiple CPU cores. Direct memory access (DMA) and direct cache access (DCA) improve network data processing efficiency, and data center bridging (DCB) supports multiple traffic classes that can be prioritized for iSCSI traffic.

Flexible Port Partitioning Support

Intel Flexible Port Partitioning (FPP) is the ability to use SR-IOV Virtual Functions, (which have, up until now, been thought of as a strictly virtualization technology) in a bare-metal (or mixed) Open Source OS. This provides a way to very flexibly and efficiently configure your Ethernet ports.

The Intel® Ethernet CNA X520 family does it all: 4x10Gigabit LAN, FCoE, and iSCSI; truly delivering on the promise of unified networking.

Reliable Performance

The single port QSFP+ X520-QDA1 adapter includes a number of advanced features that enable industry-leading performance and reliability.

Intelligent Offloads

The adapter's stateless offloads accelerate TCP/IP traffic while preserving processor computing power for critical applications. By doing operations in hardware, rather than a local micro-processor, the X520-DA4 performance is able to scale with the processor generational gains.

Security Optimizations

The adapters support IPsec offload for Microsoft's* Network Access Protection (NAP), Active Directory,* and future security capabilities in Windows 7* and Windows 8*. An X520 adapter enables customers to run a secure network environment without sacrificing performance.

PCIe v3.0 (8 GT/s)

PCIe v3.0 (8 GT/s) support enables customers to take full advantage of four 10 GbE links by providing a maximum of 63 Gbps throughput on a single quad-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 family of adapters provide high-performance, 4x10 gigabit connectivity in multi-core server platforms. These technologies distribute network processing across multiple CPU cores, improving overall performance.

Intel® Ethernet Flow Director

Today's data centers depend on the multiprocessing of high performance capability of servers to increase system throughput, responsiveness, and reliability through the introduction of additional hardware threads, CPUs, or cores. But in a multiprocessing environment, it is essential to ensure a coordinated affinity of protocol processing and network applications on the same target cores. This affinity significantly reduces contention for shared resources, minimizes software synchronization overheads between cores, and enhances cache efficiency.

Receive Side Scaling (RSS) resolves the single-processor bottleneck by allowing the receive side network load from a network adapter to be shared across multiple cores. RSS enables packet receive-processing to scale with the number of available cores. However, RSS has a limitation, it cannot steer an incoming network flow to the same core where its application process resides. RSS does not maintain the Traffic Flow -> Core (Application) relationship. If an application is running on one core, while RSS has scheduled receive traffic to be on another core, poor cache efficiency and significant core-to-core synchronization overheads will result. The overall system performance can be significantly degraded.

Intel® Ethernet Flow Director and the Application Target Routing (ATR) service found in Intel Ethernet Controllers, is an advanced network offload technology that provides the benefits of parallel receive processing in multiprocessing environments that automatically steer incoming network data to the same core on which its application process resides. Intel Ethernet Flow Director and ATR preserve the Traffic Flow -> Core (Application) relationship. As a result, Intel

Ethernet Flow Director and ATR can significantly lower latency and improve CPU utilization.

Intel Ethernet Flow Director allows the administrators to define "signature filters" and the ATR service on the Intel Ethernet Controller uses these filters to ensure that all packets in a TCP flow are processed by a single core. This intelligent offload capability supports advanced filters that direct receive packets by their flows to different queues and enables tight control on routing a flow in the platform. It matches flows and CPU cores for flow affinity and supports multiple parameters for flexible flow classification and load balancing.

For today's demanding virtualized data center environments, the new X520-QDA1 adapter family delivers ultimate flexibility and scalability.

General Features	
Features	Benefits
INTEL® 82599 Ethernet Controller	Industry-leading, energy-efficient design for next-generation 40 Gigabit performance and multi-core processors.
QSFP+ Connectivity (4X10GbE mode)	Support for QSFP+ SR4 and QSFP+ CR4 (Copper Direct Attach).
iSCSI and Fibre Channel over Ethernet (FCoE) Support	Includes iSCSI and FCoE Boot and Data Center Bridging (DCB).
RoHS-compliant	Complies with the European Union directive 2002/95/EC 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.
Low Profile Servers	Enables higher bandwidth and throughput from standard and low-profile PCIe slots.
I/O Features for Multi-core Processor Servers	
Features	Benefits
Intel® Data Direct I/O (Intel® DDIO)	Reduces memory accesses from I/O on local socket. Speeds up CPU data transfer. Accelerates inbound & outbound data flows.
Intel® Ethernet Flow Director	Intel Ethernet Flow Director and ATR can significantly lower latency and improve CPU utilization by preserving the affinity between the flow and the core where the application resides.
RSS - Receive Side Scaling	Uses multiple queues for receive traffic.
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 (LLI)	Based on the sensitivity of the incoming data, the adapter can bypass the automatic moderation of time intervals between the interrupts.
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.
TxTCP segmentation offload (IPv4, IPv6)	Increased throughput and lower processor usage.
Interrupt Throttle Rate (ITR)	ITR parameter controls how many interrupts each interrupt vector can generate per second.
Jumbo frames	Supports jumbo frames larger then default 1500.
Large Receive Offload (LRO)	Combines multiple Ethernet frames into a single receive in the stack, thereby potentially decreasing CPU utilization for receives.
MAC and VLAN anti-spoofing	If a malicious driver attempts to send a spoofed packet, it is dropped by the hardware and not transmitted. An interrupt is sent to the PF driver notifying it of the spoof attempt.
Flow Control	Ethernet Flow Control (IEEE 802.3x) support for capable link partner.
HW based receive side coalescing (RSC)	Merges multiple frames from the same IPv4 TCP/IP flow into a single structure that can span one or more descriptors.

Virtualization Features	
Features	Benefits
PC-SIG SR-IOV Implementation (up to 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® VT for Directed I/O (Intel® VT-d) to provide data protection between virtual machines by assigning separate physical addresses in the memory to each virtual machine.
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	
Features	Benefits
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 and FCoE Boot	Enables system boot up via iSCSI or FCoE. 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.

General Specifications	
Connectors	QSFP+ Cage supporting CR4 cables or QSFP+ SR4 optics.
Network Standards	IEEE 802.3 SFF-8436
Technical Features	
Data rate supported per port	Optical: 4x10GbE, Direct Attach: 4x10GbE
Bus type	PCI Express 3.0 (8.0 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	
X520-QDA1	Maximum: 20 W Typical: 16.7 W
Environmental	
Operating temperature	0 °C to 55 °C (32 °F to 131 °F)
Air Flow	Minimum of 200 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 QSFP+: Length = 6.664”, Width = 2.703”

Network Operating System (NOS) Support			
Operating System	IA-32	X86-64	IA-64
Windows 8.1	N	X	N/A
Windows Server 2012 R2	N/A	X	N/A
Windows Server 2012 R2 Core	N/A	X	N/A
Windows 8	N	X	N/A
Windows Server 2012	N/A	X	N/A
Windows Server 2012 Core	N/A	X	N/A
Windows 7	N	X	N/A
Windows Server 2008 R2	N/A	X	N
Windows Server 2008 R2 Core	N/A	X	N
Windows Server 2008 Sp2	N	N	N
Windows Server 2008 Sp2 Core	N	N	N/A
Linux* Stable Kernel version 2.6/3.x	X	X	X
Linux RHEL 5.9	X	X	N/A
Linux RHEL 6.5	X	X	X
Linux SLES 10 SP4	X	X	X
Linux SLES 11 SP3	X	X	X
FreeBSD* 10	X	X	X
UEFI* 2.1	N/A	X	X
UEFI* 2.3	N/A	X	X
VMware ESXi 5.0/5.1	N/A	X	N/A
VMware ESXi 5.5	N/A	X	N/A

Intel® Ethernet Converged Network Adapter X520 (4x10GbE) Product Codes		Intel® Ethernet Twinaxial Cable Product Codes		Intel® Ethernet Optic Product Codes	
Configuration	Product Codes	Cable Length (m)	Product Codes	Configuration	Product Codes
X520-QDA1 (LP)	X520QDA1	QSFP+, 1	XLDACBL1	QSFP+ SR OPTIC	E40GQSFPSR
		QSFP+, 3	XLDACBL3		
		QSFP+, 5	XLDACBL5		
		QSFP+ BREAK OUT, 1	X4DACBL1		
		QSFP+ BREAK OUT, 3	X4DACBL3		
		QSFP+ BREAK OUT, 5	X4DACBL5		

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

(Service and availability may vary by country.)

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 www.intel.com/support/feedback.htm for the telephone number in your area. For additional product information on Intel® Ethernet products, visit www.intel.com/go/ethernet.

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

[1] Requires a system that supports VMDq.

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