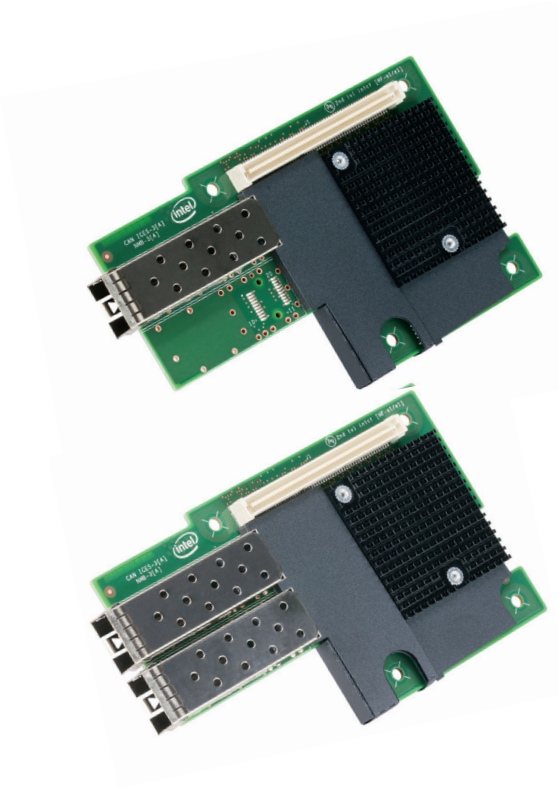
PRODUCT BRIEF
Intel® Ethernet Server Adapter X520-DA1/X520-DA2 for Open Compute Project (OCP)
Network Connectivity

Intel® Ethernet Server Adapter X520-DA1/X520-DA2 for Open Compute Project (OCP)

10 gigabit Ethernet server adapters provide ultimate flexibility and scalability for cloud deployments



Overview

The best-selling Intel® Ethernet Converged Network Adapter X520 Series is known for its high performance, low latency, reliability, and flexibility. The addition of the Intel® Ethernet Server Adapter X520 Series for Open Compute Project (OCP) to the family delivers the X520 capabilities in an Open Compute Project (OCP) form factor.

The Intel® Ethernet Server Adapter X520 Series for Open Compute Project (OCP) delivers a proven, reliable solution for deployments of Ethernet for high bandwidth, low cost, 10GbE network connections. Increased I/O performance with Intel® Data Direct I/O Technology (Intel® DDIO) and support for intelligent offloads make this adapter a perfect match for scaling performance on Intel® Xeon® processor E5/E7 based servers.

Powered by the Intel® 82599 10 Gigabit Ethernet Controller, the Intel® Ethernet Server Adapter X520 Series for OCP addresses the demanding needs of the next-generation data center by providing unmatched features for virtualization and proven, reliable performance. The Intel® 82599 10 Gigabit Ethernet Controller is the industry standard for 10 GbE, making it the most popular 10GbE controller on the market today.

The Open Compute Project (OCP) is a Facebook* initiative to openly share custom data center designs to improve both cost and energy efficiency across the industry. The OCP uses a minimalist approach to system design thereby reducing complexity and cost, allowing data centers to scale out more effectively. By publishing the designs and specifications of this low-power, low-cost hardware, it can reduce the cost of infrastructure for businesses large and small.

Optimized for Multi-core Processor Servers

Intel® Ethernet Flow Director

Today's data centers depend on the multiprocessing, 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 enabling 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 the 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.

The Intel® Ethernet Flow Director and the Application Target Routing (ATR) service found in Intel's 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 usage.

Intel Ethernet Flow Director enables 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.

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 includes 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 into 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.

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	Intel® Ethernet Server Adapter X520 Series for OCP with SFP+ connections support 10GBASE-SR, 10GBASE-LR and SFP+ Copper Direct Attach physical media.
OCP Form Factor	▪ Supports the OCP form factor for Server specifications revision 2
iSCSI Remote Boot v3.0	▪ Enables system boot-up via iSCSI ▪ Provides additional network management capability
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 Halogen	▪ Leadership in an environmentally friendly ecosystem
SMBus or NC-SI enabled	▪ Provides out of band (OOB) network access
I/O FEATURES FOR MULTI-CORE PROCESSOR SERVERS	
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
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 usage 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	
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

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
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 *(NOTE: Intel® Ethernet SFP+ Optics are required if optics will be used)* ▪ SFP+ Direct Attach cables
Network Standards	IEEE 802.3 SFF-8431

Technical Features

Data rate supported per port	▪ Optical: 1 GbE/10 Gb ▪ Direct Attach: 10 GbE
Bus type	PCI Express 2.0 (5.0 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 10 Gigabit Ethernet Controller

Power Consumption	Single-port	Dual Port	
10GBASE-SR/1000BASE-SX	Maximum: 8.71W* Typical: 3.9W**	10GBASE-SR	Maximum: 14.4W* Typical: 4.8W**
10GBASE-LR/1000BASE-LX	Maximum: 8.71W* Typical: 3.9W**	10GBASE-LR	Maximum: 14.4W* Typical: 4.8W**
Direct Attached Twinax	Maximum: 5.18W* Typical: 4.1W**	Direct Attached	Maximum: 7.4W* Typical: 4.1 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	Standard OCP Form Factor

Network Operating System (NOS) Support

Operating System	IA-32	x86-64
Windows Server 2008 R2 SP1	N/A	Y
Windows Server 2012	N/A	Y
Windows Server 2012 R2	N/A	Y
Linux* Stable Kernel version 2.6/3.x	Y	Y
Linux RHEL 5.9	Y	Y
Linux RHEL 6.4	Y	Y
Linux SLES 10 SP4	Y	Y
Linux SLES 11 SP2	Y	Y
Free BSD 9	Y	Y
UEFI 2.1/2.3	N/S	Y

*Calculated max assumes that either SR or LR optics consume 3.15W.

**Average of measurement data taken at nominal voltage and 25 °C temperature

Intel® Ethernet Server Adapter X520 Series for OCP Product Codes	
Configuration	**Product Code**
Single Port	X520DA1OCP[2] X520DA1OCPG2P20[3]
Dual Port	X520DA2OCP[2] X520DA2OCPG2P20[3]

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 on the Intel® Ethernet CNA X520-DA1OCP, visit **www.intel.com/go/ethernet**

[1] Requires a system supporting VMDq.

[2] SMBus enabled.

[3] NC-SI enabled.

INFORMATION IN THIS DOCUMENT IS PROVIDED IN CONNECTION WITH INTEL PRODUCTS. NO LICENSE, EXPRESS OR IMPLIED, BY ESTOPPEL OR OTHERWISE, TO ANY INTELLECTUAL PROPERTY RIGHTS IS GRANTED BY THIS DOCUMENT. EXCEPT AS PROVIDED IN INTEL'S TERMS AND CONDITIONS OF SALE FOR SUCH PRODUCTS, INTEL ASSUMES NO LIABILITY WHATSOEVER AND INTEL DISCLAIMS ANY EXPRESS OR IMPLIED WARRANTY, RELATING TO SALE AND/OR USE OF INTEL PRODUCTS INCLUDING LIABILITY OR WARRANTIES RELATING TO FITNESS FOR A PARTICULAR PURPOSE, MERCHANTABILITY, OR INFRINGE- MENT OF ANY PATENT, COPYRIGHT OR OTHER INTELLECTUAL PROPERTY RIGHT.

A "Mission Critical Application" is any application in which failure of the Intel Product could result, directly or indirectly, in personal injury or death. SHOULD YOU PURCHASE OR USE INTEL'S PRODUCTS FOR ANY SUCH MIS- SION CRITICAL APPLICATION, YOU SHALL INDEMNIFY AND HOLD INTEL AND ITS SUBSIDIARIES, SUBCONTRACTORS AND AFFILIATES, AND THE DIRECTORS, OFFICERS, AND EMPLOYEES OF EACH, HARMLESS AGAINST ALL CLAIMS COSTS, DAMAGES, AND EXPENSES AND REASONABLE ATTORNEYS' FEES ARISING OUT OF, DIRECTLY OR INDIRECTLY, ANY CLAIM OF PRODUCT LIABILITY, PERSONAL INJURY, OR DEATH ARISING IN ANY WAY OUT OF SUCH MISSION CRITICAL APPLICATION, WHETHER OR NOT INTEL OR ITS SUBCONTRACTOR WAS NEGLIGENT IN THE DESIGN, MANUFACTURE, OR WARNING OF THE INTEL PROD- UCT OR ANY OF ITS PARTS.

Intel may make changes to specifications and product descriptions at any time, without notice. Designers must not rely on the absence or characteristics of any features or instructions marked "reserved" or "undefined". Intel reserves these for future definition and shall have no responsibility whatsoever for conflicts or incompatibilities arising from future changes to them. The information here is subject to change without notice. Do not finalize a design with this information.

The products described in this document may contain design defects or errors known as errata which may cause the product to deviate from published specifications. Current characterized errata are available on request.

Contact your local Intel sales office or your distributor to obtain the latest specifications and before placing your product order.

Copies of documents which have an order number and are referenced in this document, or other Intel literature, may be obtained by calling 1-800-548-4725, or go to: http://www.intel.com/design/literature.htm.

*Intel, the Intel logo, and Xeon are trademarks of Intel Corporation in the U.S. and other countries. Other names and brands may be claimed as the property of others.

Copyright ©2014 Intel Corporation. All rights reserved.

Printed in USA LH/DVA ♻ Please Recycle 329599-002US