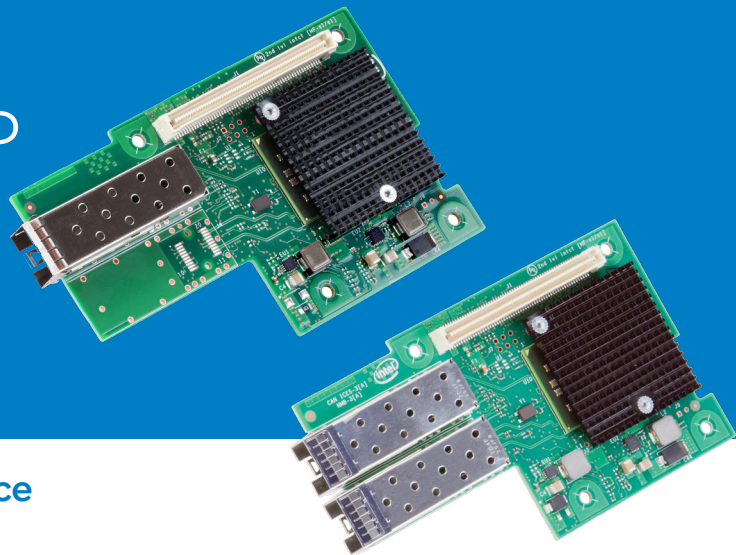


# Intel® Ethernet Server Adapter X520 for OCP



**Delivers proven reliable 10GbE performance  
and ultimate flexibility and scalability for  
Cloud deployments**

## Key Features

- OCP Mezzanine Card v2.0, Type 1
- Dual and Single Port 10GbE SFP+
- PCI Express (PCIe) 2.0 x8
- Receive Side Scaling (RSS) for UDP for VxLAN
- Intel® Data Direct I/O (Intel® DDIO) for intelligent offloads
- Intel® Ethernet Flow Director for hardware based application traffic steering
- Intel® Virtualization Technology for connectivity (Intel VT-c)

## Overview

The Open Compute Project (OCP) is a Facebook initiative to openly share custom data center designs to improve cost and energy efficiency across the industry. OCP uses a minimalist approach to system design thereby reducing complexity and cost, allowing data centers to scale out more effectively.

This OCP adapter delivers the capabilities of the Intel Ethernet Converged Network Adapter X520 (performance, low-latency and flexibility) in an Open Compute Project Mezzanine Card v2.0 form factor.

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 servers with Intel® Xeon® processors E5 and E7.

## Optimized for Multi-core Processor Servers

### Intel® Ethernet Flow Director

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.

Intel® Ethernet Flow Director (Intel® Ethernet FD) and the Application Target Routing (ATR) service 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. These technologies preserve the traffic flow > Core (application) relationship. As a result, Intel Ethernet FD and ATR can significantly lower latency and improve CPU usage.

Intel Ethernet FD enables administrators to define signature filters. The ATR service 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 for working with the OEMs to implement virtualization on the adapter, and on the platform.

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

Intel® VT-c delivers virtualized I/O performance optimizations and Quality of Service (QoS) features designed directly in the controller 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 and latency, and increases network throughput. Most hypervisor releases are enabled to partition a single physical controller into multiple virtual controllers. Virtual controllers, known as Virtual Functions (VF), use the PCI-SIG SR-IOV standard to enable additional QoS features in the controller silicon to manage and direct traffic isolation, port partitioning with bandwidth allocation, and on-chip VF-VF switching.

Features	Description
<b>General</b>	
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.
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)	<ul style="list-style-type: none"> <li>• Reduces memory accesses from I/O on local socket.</li> <li>• Speeds up CPU data transfer.</li> <li>• Accelerates inbound &amp; outbound data flows.</li> </ul>
Intel Ethernet FD	• Intel Ethernet FD 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	<ul style="list-style-type: none"> <li>• Minimizes the overhead of interrupts.</li> <li>• Load-balancing of interrupt handling between multiple cores/CPU's.</li> </ul>
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	<ul style="list-style-type: none"> <li>• Lower processor usage.</li> <li>• Checksum and segmentation capability extended to new standard packet type.</li> </ul>
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 than 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.
Hardware-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)	<ul style="list-style-type: none"> <li>• 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.</li> <li>• 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.</li> </ul>
Advanced Packet Filtering	<ul style="list-style-type: none"> <li>• 24 exact-matched packets (unicast or multicast).</li> <li>• 4096-bit hash filter for unicast and multicast frames.</li> <li>• Lower processor usage.</li> <li>• Promiscuous (unicast and multicast) transfer mode support.</li> <li>• Optional filtering of invalid frames</li> </ul>
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	<ul style="list-style-type: none"> <li>• Enables system boot via the LAN (32-bit and 64-bit).</li> <li>• Flash interface for PXE image.</li> </ul>
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

Connections	<ul style="list-style-type: none"><li>• One or two LC fiber-optic connectors (NOTE: Intel® Ethernet SFP+ Optics are required if optics will be used).</li><li>• SFP+ Direct Attach cables.</li></ul>
Network Standards	<ul style="list-style-type: none"><li>• IEEE 802.3</li><li>• SFF-8431</li></ul>

### Adapter Features

Data Rate Supported Per Port	Optical: 1 GbE/10 GbE Direct Attach: 10 GbE
Bus Type	PCIe 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	Intel® 82599 10 Gigabit Ethernet Controller

### Technical Features

Operating temperature	0 °C to 55 °C (32 °F to 131 °F)
Airflow	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)

### Power Consumption

Link Speed / Traffic	Typical Power	Maximum Power
Single-port 10GBASE-SR/1000BASE-SX	3.9 W**	8.71 W*
Single-port 10GBASE-LR/1000BASE-LX	3.9 W**	8.71 W*
Single-port direct attached twinax	4.1 W**	5.18 W*
Dual-port 10GBASE-SR	4.8 W**	14.4 W*
Dual-port 10GBASE-LR	4.8 W**	14.4 W*
Dual-port direct attached	4.1 W**	7.4 W*

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

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

### Physical Dimensions

Standard OCP Mezzanine Card v2.0 form factor

### Warranty

Intel limited lifetime hardware warranty, 90-day money-back guarantee (US and Canada) and worldwide support.

### Customer Support

For customer support options in North America visit:  
[intel.com/content/www/us/en/support/contact-support.html](http://intel.com/content/www/us/en/support/contact-support.html)

<sup>1</sup>SMBus enabled

<sup>2</sup>NC-SI enabled

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### Intel® Ethernet Server Adapter X520 Series for OCP Product Codes

Configuration	Product Code
Single Port	X520DA1OCP <sup>1</sup> X520DA1OCPG2P20 <sup>2</sup>
Dual Port	X520DA2OCP <sup>1</sup> X520DA2OCPG2P20 <sup>2</sup>

### 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	E10GSFP SR
LR Optic	E10GSFPLR

### Supported Operating Systems

For a complete list of supported network operating systems for Intel® Ethernet 500 Series Adapters visit:  
[intel.com/support/EthernetOS](http://intel.com/support/EthernetOS)

### Intel® Ethernet Accessories

Intel® Ethernet Optics and Cables are proven, reliable solutions for high-density Ethernet connections. Combine these accessories with Intel® Ethernet 700 Series and 500 Series Network Adapters for dependable interoperability and consistent performance across the network. Learn more at [intel.com/ethernet](http://intel.com/ethernet)

### Product Information

For information about Intel® Ethernet Products and technologies, visit: [intel.com/ethernet](http://intel.com/ethernet)

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