

Intel® Ethernet Converged Network Adapter X550

10GBASE-T Converged Network Adapter (CNA)

Simplifies Migration to 10 Gigabit Ethernet (GbE), Provides iSCSI, FCoE, Virtualization and Flexible Port Partitioning (FPP)



Key Features

- Low cost, low power, 10 GbE performance for the entire datacenter.
- Intel's second generation, single- and dual-port 10GBASE-T controller with integrated MAC and PHY.
- Standard CAT 6a cabling with RJ45 connectors.
- Supports NBASE-T* technology (2.5 and 5.0 GbE over CAT 5e)¹.
- Backward compatibility with existing 1000BASE-T networks simplifies the transition to 10 GbE.
- PCI Express* (PCIe*) v 3.0 with up to 8.0 GT/s.
- Unified networking delivering LAN, iSCSI and FCoE in one low-cost CNA.
- Flexible I/O virtualization for port partitioning and Quality of Service (QoS) of up to 64 virtual ports.
- Reliable, proven 10 GbE technology from Intel Corporation.

10 GbE for the Broad Market

The Intel® Ethernet Converged Network Adapter X550 is the newest innovation in Intel's leadership to drive 10 GbE into the broad server market. This adapter hosts Intel's latest Ethernet silicon, the Intel® Ethernet Controller X550, a low cost single-chip 10GBASE-T solution for today's server platforms.

Simplify the Transition to 10 GbE

With 10GBASE-T, migration to 10 GbE is dramatically simplified with backward compatibility for your existing GbE network infrastructure. Install an X550 adapter into a server and the auto-negotiation between 1 GbE and 10 GbE provides the necessary backwards compatibility that most customers require for a smooth transition and easy migration to 10 GbE. When time and budget allows, 10GBASE-T switches can be added any time to experience the full benefits of 10 GbE.

10GBASE-T uses the copper twisted-pair cables that are very familiar to IT professionals today. It is all you know and love about 1000BASE-T. The knowledge, training, and investment in BASE-T are preserved. 10GBASE-T is the easiest and most versatile 10 GbE interface that can be deployed anywhere in your data center. Its

flexible reach from 1 meter to 100 meters supports the latest network architectures including Top of Rack (ToR), Middle of Row (MoR), and End of Row (EoR).

10 GbE Performance at Low Cost and Low Power

The new Intel® Ethernet Converged Network Adapter X550 is the lowest cost way to deploy 10 GbE in your data center today. The Intel X550 uses low cost CAT 6 and CAT 6a cabling. Chances are this cabling already exists in the data center.

A way for Intel to reduce cost and power is to integrate components into a single-chip solution. Why is integration important? First, integration translates to lower power. This means no active heat sink and reduces the per-port power consumption. Second, integration also means a lower cost per port, because two separate components are not needed. When cabling is accounted for, cost efficiencies realized from a single part mean 10GBASE-T is the lowest cost media to deploy.

With lower cost and power, 10GBASE-T is ideal for broad deployment. 10GBASE-T is an option for every rack and tower server in the data center. The new Intel® Ethernet Converged

Network Adapter X550 (CNA X550 family) provides bandwidth-intensive applications with highly affordable 10 GbE network performance and cost-effective RJ45 connectivity for distances up to 100 meters.

Exciting New Data Center Models

More than just a 10 times per-port increase in performance by using the CNA X550 family versus a standard 1 GbE adapter opens doors for exciting new usage models, including unified networking, I/O virtualization, and flexible port partitioning.

A Complete Unified Network Solution

Converging data and storage onto one fabric eliminates the need for multiple adapters and cables per server. Furthermore, 10 GbE provides the bandwidth to converge these multiple fabrics into a single wire. A key capability that makes all this possible is traffic class separation provided by Data Center Bridging (DCB). DCB provides a collection of standards for additional QoS functionality such as lossless delivery, congestion notification, priority-based flow control, and priority groups. This enables the CNA X550 family to provide a one-wire solution with virtual pipes for the different classes of traffic:

- Data: best effort delivery of standard LAN traffic.
- Storage: NAS or SAN including lossless FCoE and iSCSI.
- Management: Guaranteed connectivity of data center IP management.

Unified Networking Principles

Intel's unified networking solutions are built on the principles that have made us successful in Ethernet:

- Open architecture integrates networking with the server, enabling IT managers to reduce complexity and overhead while enabling a flexible and scalable data center network.

- Intelligent offloads lower cost and power while delivering the application performance that customers expect.
- Proven unified networking is built on trusted Intel Ethernet technology, enabling customers to deploy FCoE or iSCSI with the same quality used in their traditional Ethernet network.

Intel's unified networking solutions are enabled through a combination of Intel Ethernet products along with network and storage protocols integrated in the operating systems. This combination provides proven reliability with the performance that data center administrators around the world have come to expect from Intel.

Best Choice for Server Virtualization

Virtualization changes server resource deployment and management by running multiple applications and operating systems on a single physical server.

With Intel® Virtualization Technology for connectivity (VT-c), the CNA X550 family delivers outstanding I/O performance and QoS in virtualized data centers and cloud environments. I/O virtualization advances network connectivity used in today's servers to more efficient models by providing FPP, multiple Tx/Rx queues, Tx queue rate-limiting, and on-controller QoS functionality that is useful for both virtual and non-virtual server deployments.

The CNA X550 family reduces I/O bottlenecks by providing intelligent offload of networking traffic per VM, enabling near-native performance and VM scalability. The host-based virtualization technologies include:

- VMDq for emulated path: NIC-based VM queue sorting enabling efficient hypervisor-based switching.
- SR-IOV for direct assignment: NIC-based isolation and switching for various virtual station instances enabling optimal CPU usage in virtualized environment.

Additionally, the CNA X550 family provides virtual bridging support that delivers both host-side and switch-side control and management of virtualized I/O as well as the following modes of virtualized operation:

- VEPA: IEEE 802.1Qbg support for Virtual Ethernet Port Aggregator.
- VEB: Virtual Ethernet Bridge support with Intel VT.

Networking Virtualization

Network virtualization is the next big trend in creating an agile data center. The X550 CNA family of adapters are ready to help take you to the next level.

- VXLAN and NVGRE offloads: These stateless offloads preserve application performance for overlay networks. With these offloads it is possible to distribute network traffic across a CPU core.
- Preserves application performance in network virtualized environment.

Flexible Port Partitioning (FPP)

By taking advantage of the PCI-SIG* SR-IOV specification, FPP enables virtual Ethernet controllers that can be used by a Linux* host directly and/or assigned directly to virtual machines for hypervisor virtual switch bypass. FPP enables the assignment of up to 64 Linux host processes or virtual machines per port to virtual functions. An administrator can use FPP to control the partitioning of the bandwidth across multiple virtual functions. FPP can also provide balanced QoS by giving each assigned virtual function equal access to 10 Gb/s of bandwidth.

The combination of 10 GbE and unified networking helps organizations overcome connectivity challenges and simplify the data center infrastructure. 10 GbE provides a simple, well-understood fabric for virtualized data centers, one that helps reduce cost and complexity as the number of Virtual Machines (VMs) continue to grow.

Intel® Ethernet Converged Network

Adapter X550

Network Connectivity

GENERAL

FEATURES	BENEFITS
Intel® Ethernet Converged Network Adapter X550	• Intel's second integrated 10GBASE-T MAC/PHY, low-cost solution
Enhanced Low-Profile Solution	• Enables higher bandwidth and throughput from standard and low-profile PCIe slots and servers
RJ45 Connections Over CAT 6A Cabling	• Ensures compatibility with cable length up to 100 meters
Remote Boot iSCSI and FCoE	• Provides centralized Storage Area network (SAN) management at a lower cost than competing solutions
Support For Most Network Operating Systems (NOS)	• Enables widespread deployment
RoHS-compliant, Lead-free Technology	• Complies with the European Union (EU) directives to reduce the use of hazardous materials
Intel Backing	• Backed by an Intel limited lifetime warranty, 90-day money-back guarantee (U.S. and Canada) and worldwide support

I/O FEATURES FOR MULTI-CORE PROCESSOR SERVERS

FEATURES	BENEFITS
MSI-X Support	• DMA engine – Enhances data acceleration across the platform (network, chipset, processor), lowering CPU usage
Low Latency	• Based on the sensitivity of the incoming data, the adapter can bypass the automatic moderation of time intervals between interrupts
Header Splits and Replication in Receive	• Helps the software device driver focus on the relevant part of the packet without the need to parse it
Multiple Queues – 64 Tx and Rx 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 a 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)
IPSec	• Offloads IPSec capability onto the adapter instead of software to significantly improve throughput and CPU usage
Compatible with x4, x8 and x16 Standard and Low-profile PCIe Slots	• Enables each PCIe slot port to operate without interfering or competing with other PCIe slot port
Receive and Transmit Side Scaling for Windows Environment and Scalable I/O for Linux* Environments (IPv4, IPv6 and TCP/UDP)	• Enables the direction of the interrupts to the processor cores in order to improve CPU use rate

SINGLE PORT POWER CONSUMPTION

LINK SPEED	AVERAGE POWER (W)	MAX POWER (W)
100 Mb/s	3.9	4.5
1 GbE	4.7	5.3
10 GbE	7.4	8.4

DUAL PORT POWER CONSUMPTION

LINK SPEED	AVERAGE POWER (W)	MAX POWER (W)
100 Mb/s	3.9	4.9
1 GbE	5.5	6.4
10 GbE	11.2	13.0

* LFM = minimum of 150 LFM under all operating conditions.

VIRTUALIZATION FEATURES

FEATURE	BENEFIT
Multi-mode I/O Virtualization Operations	<ul style="list-style-type: none"> • Supports two modes of operation of virtualized environments: <ul style="list-style-type: none"> – Direct assignment of part of the port resources to different guest operating systems using the PCI SIG SR-IOV standard (also known as native mode or pass-through mode) – Central management of the networking resources by hypervisor (also known as software switch acceleration mode) • A hybrid model, where some of the VMs are assigned a dedicated share of the port and the rest are serviced by a hypervisor is also supported
VXLAN Stateless Offloads	<ul style="list-style-type: none"> • A framework for overlaying virtualized layer 2 networks over layer 3 networks. VXLAN enables users to create a logical network for VMs across different networks
NVGRE Stateless Offloads	<ul style="list-style-type: none"> • Network Virtualization using Generic Routing Encapsulation. The encapsulation of an Ethernet Layer 2 Frame in IP that enables the creation of virtualized Layer 2 subnets that can span physical Layer 3 IP networks
Virtual Machine Device Queues (VMDq)	<ul style="list-style-type: none"> • Offloads data sorting from the hypervisor to silicon, improving data throughput and CPU usage • QoS feature for Tx data by providing round-robin servicing and preventing head-of-line blocking • Sorting based on MAC addresses and VLAN tags
64 Transmit (Tx) and Recive (Rx) Queue Pairs Per Port	<ul style="list-style-type: none"> • Supports VMware* NetQueue and Microsoft* VMQ • MAC/VLAN filtering for pool selection and either DCB or RSS for the queue in pool selection
FPP – 64 VFs Per Port	<ul style="list-style-type: none"> • VFs appear as Ethernet controllers in Linux operating systems that can be assigned to VMs, Kernel processes or teamed using the Linux bonding drivers
Support for PCI-SIG SR-IOV Specification	<ul style="list-style-type: none"> • Up to 64 VFs per port
IEEE 802.1Q VLAN Support with VLAN Tag Insertion, Stripping and Packet Filtering for up to 4096 VLAN tags	<ul style="list-style-type: none"> • Ability to create multiple VLAN segments • Filtering packets belonging to certain VLANs

SPECIFICATIONS

GENERAL	DESCRIPTION
Intel® Ethernet Converged Network Adapter X550	<ul style="list-style-type: none"> • Single port: <ul style="list-style-type: none"> – X550T1 (single pack) – X550T1BLK (bulk 5 pack) • Dual port: <ul style="list-style-type: none"> – X550T2 (single pack) – X550T2BLK (bulk 5 pack)
Connector	<ul style="list-style-type: none"> • RJ45 copper
Cabling Distances	<ul style="list-style-type: none"> • 10GBASE-T: <ul style="list-style-type: none"> – 100 m using CAT 6A – 55 m using CAT 6 • 1000BASE-T: <ul style="list-style-type: none"> – 100 m using CAT 5e, CAT6 or CAT 6A

Intel® Ethernet Converged Network

Adapter X550

Network Connectivity

SPECIFICATIONS

NETWORK MANAGEMENT

Wired for Management (WfM) Baseline v2.0
Enabled for Servers

DMI 2.0 Support, Windows Management
Instrumentation (WMI) and SNMP

Remote Installation Services (RIS)

PXE 2.0 Enabled Through Boot Read-only
Memory (ROM)

SPECIFICATIONS

ADAPTER PRODUCT FEATURES

Intel® PROSet Utility for Easy Configuration and
Management

Intel® Lead-free Technology

Plug and Play Specification Support

Full-height Bracket Installed; Low-profile
Bracket Included in Package

RoHS Compliant

SPECIFICATIONS

HARDWARE FEATURES

DESCRIPTION

Data rate(s) Support Per Port	• 100 Mb/s, 1 GbE and 10 GbE
Bus Type	• PCI Express 3.0 (8.0 GT/s)
Bus Width	• x4 lane PCIe, operable in x8 and x16 slots
Interrupt Levels	• INTA, MSI, and MSI-X
Hardware Certifications	• Class A: USA-FCC; Canada – ICES-003/NMB-003, European Union – CE, Japan – VCCI, Taiwan – BSMI, Korea – MSIP, Australia/New Zealand – RCM, Safety EN/UL and CSA C22.2 60950-1
Controller/Processor	• Intel® Ethernet Controller X550

OPERATING SYSTEM/ARCHITECTURE SUPPORT

OPERATING SYSTEM	IA32	X64	IPF
Windows 7* SP1		x	
Windows 8		x	
Windows 8.1		x	
Windows 10		x	
Windows Server* 2008 R2		x	
Windows Server 2012		x	
Windows Server 2012 R2		x	
Windows PE 3.0 (2008 R2 PE)	x	x	
Windows PE 4.0 (2012 PE)	x	x	
Windows PE 5.0 (2012 R2 PE)	x	x	
Linux* Stable Kernel Version 2.6/3.x/4.x	x	x	x
Linux RHEL 6.7	x	x	
Linux RHEL 7.1	x	x	
Linux SLES 11 SP4	x	x	x
Linux SLES 12	x	x	
FreeBSD* 10.2	x	x	
UEFI* 2.1		x	x
UEFI 2.3		x	x
UEFI 2.4		x	
VMware* ESXi 5.5		x	
VMware ESXi 6.0		x	

For more information on the Intel® Ethernet Converged Network Adapter X550, visit www.intel.com/ethernet



*Feature to be enabled in a post-launch firmware release.

No license (express or implied, by estoppel or otherwise) to any intellectual property rights is granted by this document.

Intel disclaims all express and implied warranties, including without limitation, the implied warranties of merchantability, fitness for a particular purpose, and non-infringement, as well as any warranty arising from course of performance, course of dealing, or usage in trade.

This document contains information on products, services and/or processes in development. All information provided here is subject to change without notice. Contact your Intel representative to obtain the latest forecast, schedule, specifications and roadmaps.

The products and services described may contain defects or errors which may cause deviations from published specifications.

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

Intel and the Intel logo are trademarks of Intel Corporation in the U.S. and/or other countries.

* Other names and brands may be claimed as the property of others.