intel.

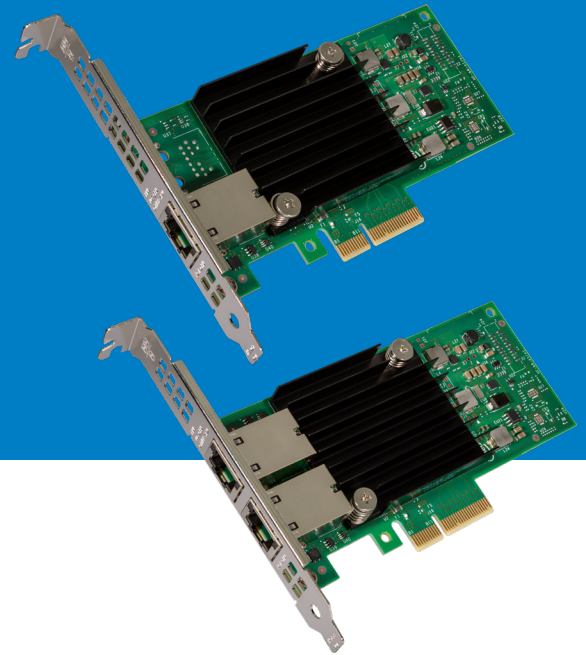# Intel® Ethernet Converged Network Adapter X550

Backward compatible 10GBASE-T network adapter simplifies migration to 10 Gigabit Ethernet (GbE)

Key Features

- Backward compatible with existing 1000BASE-T networks
- Supports NBASE-T technology (2.5 and 5GbE over CAT5e)
- Standard CAT6a cabling with RJ45 connectors
- Low cost, low power, 10GbE performance for the entire data center
- Flexible I/O virtualization for port partitioning and quality of service (QoS) of up to 64 virtual ports
- Single-chip solution with integrated MAC + PHY
- PCIe 3.0 with up to 8.0GT/s

Overview

Autonegotiation between 1GbE, 2.5GbE, 5GbE, and 10GbE provides the necessary backwards compatibility required for a smooth transition and easy migration to 10GbE.

The X550 is a low-cost option for deploying 10GbE in your data center because it uses CAT6 and CAT6A cabling - standard cabling for many data centers. Copper cabling's flexible reach from 1 meter to 100 meters also supports Top of Rack (ToR), Middle of Row (MoR), and End of Row (EoR) network architectures.

This adapter also reduces cost and power through its single-chip solution. The adapter uses the Intel® Ethernet Controller X550, with integrated MAC and PHY. Integration translates to lower power and means no more active heatsink reducing the per-port power consumption.

Integration also equals lower cost per port. When cabling is accounted for, cost efficiencies realized from a single 10GBASE-T adapter means that this is possibly the lowest-cost media to deploy. When time and budget allow, 10GBASE-T switches can be added to experience the full benefits of 10GbE.

Virtualization

Virtualization changes the way server resources are deployed and managed by running multiple applications and operating systems independently on a single server. The X550 includes Intel® Virtualization Technology for connectivity (Intel® VT-c) to deliver I/O virtualization and Quality of Service (QoS) features.

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, useful for both virtual and non-virtual server deployments.

The X550 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: Adapter-based VM queue sorting enabling efficient hypervisor-based switching.

- SR-IOV for direct assignment: Adapter-based isolation and switching for various virtual station instances enabling optimal CPU usage in virtualized environment.

Additionally, this adapter 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.

- 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, Intel® Ethernet Products enable FPP. With FPP, virtual controllers can be used by the Linux host directly and/or assigned to virtual machines. FPP allows you to use the functionality of SR-IOV to assign up to 64 processes per port to virtual functions in Linux. Administrators are able to partition their 10GbEbandwidth across multiple processes, ensuring QoS by giving each assigned process equal bandwidth. Network administrators may also rate-limit each of these services to control how much of the 10GbE pipe is available to each process.

Firmware Authentication

The X550 implements a signed firmware authenticated capability to verify the firmware and critical device settings with built-in corruption detection. This is done at the time of firmware updates.

Features	Description

General

RJ45 connections over CAT6A cabling	▪ Ensures compatibility with cable length up to 100 meters.
RoHS-compliant, lead-free technology	▪ Complies with the European Union (EU) directives to reduce the use of hazardous materials.

I/O Features for Multi-core Processor Servers

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	▪ 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 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.

Virtualization Features

Multi-mode I/O virtualization operations	▪Supports two modes of operation of virtualized environments:
	  -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	▪ 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	▪ 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)	▪ 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 receive (Rx) Queue pairs per port	▪ 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	▪ 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	▪ 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	▪ Ability to create multiple VLAN segments. ▪ Filtering packets belonging to certain VLANs.

Specifications

General

Connections	RJ45 copper
Cable Distance	10GBASE-T: 100 m using CAT6A, 55 m using CAT6 1000BASE-T: 100 m using CAT5e, CAT6 or CAT6A

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)

Adapter Product Features

- Plug and play specification support
- Full-height bracket installed; low-profile bracket included with package

Adapter Features

Data rate supported per port	100Mb/s, 1GbE and 10GbE
Bus type	PCIe 3.0 (8 GT/s)
Bus width	x4 lane PCIe, operable in x8 and x16 slots
Interrupt levels	INTA, MSI, MSI-X
Hardware certifications	FCC A, ICES-003/NMB-003, EN/UL, CE, VCCI, BSMI, MSIP, RCM, CSA
Controller	Intel® Ethernet Controller X550

Power Consumption

Link Speed / Traffic	Typical Power	Maximum Power
Single-port 100Mb/s	3.9 W	4.5 W
Single-port 1GbE	4.7 W	5.3 W
Single-port 10GbE	7.4 W	8.4 W
Dual-port 100Mb/s	3.9 W	4.9 W
Dual-port 1GbE	5.5 W	6.4 W
Dual-port 10GbE	11.2 W	13.0 W

Physical Dimensions

Dimensions	167 mm x 69 mm

Product Order Code

Configuration	Product Code
Single port	X550T1
Dual Port	X550T2, X550T2BLK

Supported Operating Systems

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

Warranty

Intel limited lifetime warranty for retail Ethernet Products, 90-day money-back guarantee (US and Canada).

Customer Support

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

Product Information

For information about Intel® Ethernet Products and technologies, visit: intel.com/ethernetproducts