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Product Brief

Intel® Ethernet Network Daughter Card X550-T4 4x10GBASE-T

Four ports of 10GBASE-T make this LAN on Motherboard option flexible and scalable within the Dell™ PowerEdge™ Select Network Adapter Family

Key Features

- Low cost, low power, 10GbE performance for the entire data center
- Standard CAT6A cabling with RJ45 connectors
- Backward compatibility with existing 1000BASE-T networks simplifies the transition to 10GbE
- PCI Express (PCIe) v3.0, x4
- Scalable iSCSI performance delivering cost-effective SAN connectivity
- Flexible I/O virtualization for port partitioning and Quality of Service (QoS) of up to 64 virtual ports
- Reliable, proven 10GbE technology from Intel Corporation
- Data Plane Development Kit (DPDK) optimized for efficient packet processing

Overview

The Intel® Ethernet Network Daughter Card X550-T4 brings 10 Gigabit Ethernet into the broader server market. This unique Network Daughter Card hosts two Intel® Ethernet Controller X550s, providing up to 40Gbs of 10GbE connectivity. This adapter can be used in multiple port configurations, giving the customer the ultimate flexibility of four ports of network connectivity with speeds of up to 10 Gigabit on a single adapter.

Network reconfiguration is minimal because it uses RJ45 connectors and CAT6 and CAT6A cabling – a standard 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.

The integrated MAC and PHY translates to lower power and means no more active heat sink – effectively reducing the per-port power consumption. Integration also means lower cost per port.

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

The Intel® Ethernet Network Adapter X550-T4 includes these featured technologies:

Simplify the Transition to 10GbE

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

10GBASE-T uses the copper twistedpair 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 10GbE interface that can be deployed anywhere in your data center. Its flexible reach from 1 meter to 100 meters supports Top of Rack (ToR), Middle of Row (MoR), and End of Row (EoR), network architectures.

10G Performance at Low Cost and Low Power

The Intel® Ethernet Network Adapter X550 uses low-cost CAT6 and CAT6A cabling. This cabling is prevalent in most data centers today.

Another way Intel reduces 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 one of least expensive media types to deploy.

Because of the low cost, low power inherent to 10GBASE-T, it is ideal for broad deployment. 10GBASE-T is an option for every rack and tower server in the data center. The X550 provides bandwidth-intensive applications with highly affordable 10GbE network performance, and cost-effective RJ45 connectivity for distances up to 100 meters.

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 (Intel® VT-C), the Intel® Ethernet Network Adapter X550 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 multiple Tx/Rx queues, Tx queue rate-limiting, and on-controller QoS functionality that is useful for both virtual and non-virtual server deployments.

I/O bottlenecks are reduced 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: NICbased isolation and switching for various virtual station instances enabling optimal CPU usage in virtualized environment.

Advanced Traffic Steering

Intel® Ethernet Flow Director (Intel® Ethernet FD) is an advanced traffic steering capability built into the adapter. It consists of a large number of flow affinity filters that direct receive packets by their flows to queues for classification, load balancing, and matching between flows and CPU cores.

Steering traffic into specific queues can eliminate context switching required within the CPU. As a result, Intel® Ethernet FD significantly increases the number of transactions per second and reduces latency for cloud applications like memcached.

Additionally, virtual bridging support 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 poet Aggregator.
- **VEB**: Virtual Ethernet Bridge support with Intel VT.

Scalable iSCSI Performance

iSCSI uses Ethernet to carry storage traffic, extending the familiarity and simplicity of Ethernet to storage networking, without the need for SAN-specific adapters or switches. Intel® Ethernet adapters, with native iSCSI initiators built into Microsoft Windows, Linux, and VMware ESXi platforms, provide a simple, dependable, cost-effective way to connect to LANs and iSCSI SANs.

Intel® Ethernet 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), direct cache access (DCA) and header splitting improve network data processing efficiency, and data center bridging (DCB) supports multiple traffic classes that can be prioritized for iSCSI traffic.

These native initiators are broadly tested using multiple generations of operating systems, storage systems, and OS tools to help ensure reliability and ease of use. Standardizing on Intel Ethernet for iSCSI allows administrators to use a single initiator, TCP/IP stack, and a common set of management tools and IT policies.

In addition, Intel Ethernet adapters include a number of hardware features designed to accelerate iSCSI traffic and enhance data processing. For example, TCP segmentation offload, Receive Side Coalescing (RSC), and checksum offload capabilities help reduce processor usage, increase throughput, and deliver exceptional iSCSI performance.

iSCSI uses your existing Ethernet infrastructure to connect to remote storage units using the SCSI protocol encapsulated in standard TCP/IP packets. Intel iSCSI Remote Boot enables PCI Express-based Intel® Ethernet Server Adapters to boot from a remote iSCSI disk volume on an iSCSI-based storage area network (SAN).

Finally, using native OS initiators, Intel Ethernet adapters enable support for the CRC-32 digest instruction set included with Intel® Xeon® processor products, which improves transmission reliability, delivering an enterprise-class iSCSI solution for the IT customer.

Network Virtualization

Network virtualization has changed the way networking is done in the data center, delivering accelerations across a wide range of tunneling methods.

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

Software Tools and Management

Intel® Ethernet Network Adapters support Dell's Lifecycle Controller. The Lifecycle Controller is coupled with the Dell Remote Access Card (DRAC) service processor to provide embedded system management. The Lifecycle Controller enables both local and remote access to manage initial setup and configuration of the BIOS settings on the platform, setup, and configuration of Intel Ethernet adapters, update of all the platform firmware, and the deployment of the operating systems.

Intel® Advanced Network Services (Intel® ANS) include new teaming technologies and techniques such as Virtual Machine Load-Balancing (VMLB) for Hyper-V environments. Intel ANS also provides a variety of teaming configurations for up to eight ports, and support for teaming mixed vendors' server adapters. Intel ANS includes support for 802.1Q VLANs, making Intel ANS one of the most capable and comprehensive tools for supporting server adapter teaming.

Features	Description
General	
DMA Coalescing	▪ Reduces platform power consumption by coalescing, aligning, and synchronizing DMA. ▪ Enables synchronizing port activity and power management of memory, CPU and RC internal circuitry.
Load balancing on multiple CPUs	▪ Increases performance on multi-processor systems by efficiently balancing network loads across CPU cores when used with Receive-Side Scaling from Microsoft or Scalable I/O on Linux.
Intelligent offload for iSCSI	▪ Hardware offload delivers application performance while the software initiator provides platform scalability and OS integration.
Support for most Network Operating Systems (NOS)	▪ Enables widespread deployment.
RoHS compliant, lead-free technology	▪ Compliant with the European Union directive (effective as of July 2006) to reduce the use of hazardous materials.
Lifecycle Controller	▪ Local and remote access to BIOS setup and configuration on the platform and adapter.
I/O Features for Multi-Core Processor Servers	
Intel® Ethernet Flow Director (Intel® Ethernet FD)	▪ An advanced traffic steering capability increases the number of transactions per second and reduces latency for cloud applications like Memcached.
MSI-X support	▪ Minimizes the overhead of interrupts. ▪ Load-balancing of interrupt handling between multiple cores/CPUs.
Multiple Queues: 128 Tx and Rx queues per port	▪ Network packet handling without waiting for buffer overflow providing efficient packet prioritization. ▪ Actual number of queues will vary depending upon software implementation.
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.
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 Offload	▪ Offloads IPsec capability onto the adapter instead of the software to significantly improve through-put and CPU usage (for Windows 7, Windows 2008 Server R2, Windows 2008 Server, and Vista).
MACSec	▪ IEEE spec: 802.1ae. ▪ Layer 2 data protection with encryption/authentication ability between devices (e.g, routers, switches). ▪ MACSec is designed into the network adapter hardware. These adapters are prepared to provide MACSec functionality when the ecosystem is ready to support this new technology.
Receive and Transmit Side Scaling for Windows environment and Scalable I/O for Linux environments (IPv4, IPv6, TCP/ UDP)	▪ Enables the direction of the interrupts to the processor cores in order to improve the CPU utilization rate.
RJ45 connections over CAT6A cabling	▪ Ensures compatibility with cable lengths up to 100 meters.
Virtualization Features	
Next-Generation VMDq	▪ Up to 64 maximum VMDq VMs supported per port. ▪ Offloads the data-sorting based on MAC addresses and VLAN tags, functionality from the Hypervisor to the network silicon, improving data throughput and CPU usage.
PCI-SIG SR-IOV Implementation (64 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 VM 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 VMs by assigning separate physical addresses in the memory to each VM.
Flexible Port Partitioning: 64 Virtual Functions per port	▪ Virtual Functions (VFs) appear as Ethernet Controllers in Linux OSes that can be assigned to VMs, Kernel processes or teamed using the Linux Bonding Drivers.
Advanced Packet Filtering	▪ 24 exact matched packets (unicast or multicast). ▪ 4096-bit hash entries each for unicast and multicast.
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 Layer3 IP networks.
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.
GENEVE Stateless Offloads	▪ A framework for overlaying virtualized layer 2 networks over layer 3 networks adding the option to include additional metadata. GENEVE enables users to create a logical network for VMs across different networks.
Manageability Features	
Preboot eXecution Environment (PXE) Support	▪ Enables system boot up via the LAN (32-bit and 64-bit). ▪ Flash interface for PXE image.
Unified Extensible Firmware Interface (UEFI)	▪ Enables new technologies during the pre-OS boot process and addresses legacy BIOS limitations on hard-ware.
Simple Network Management Protocol (SNMP) and Remote Network Monitoring (RMON) Statistic Counters	▪ Easy system monitoring with industry-standard consoles.
iSCSI Boot	▪ Enables system boot up via iSCSI. ▪ Provides additional network management capability.
Watchdog Timer	▪ Gives an indication to the manageability firmware or external devices that the controller or the software device driver is not functioning.

Specifications

General

Connections	4x RJ45 Copper Twisted-pair	
Network Standard Physical Layer Interfaces	10GBASE-T: 55 m on CAT6, 100 m on CAT6A 1000BASE-T: 100 m on CAT5e, CAT6 or CAT6A	100MBASE-T: 100 m on CAT5e, CAT6 or CAT6A

Advanced Software Features

Adapter fault tolerance (AFT)
Switch fault tolerance (SFT)
Adaptive load balancing (ALB)
Teaming Support
IEEE 802.3ad (link aggregation control protocol)
PCIe Hot Plug/Active peripheral component interconnect (PCI)
IEEE 802.1Q VLANs
IEEE 802.3 2005 flow control support
Tx/Rx IP, TCP, & UDP checksum offloading (IPv4, IPv6) capabilities (Transmission control protocol (TCP), user datagram protocol (UDP), Internet protocol (IP)
IEEE 802.1p
TCP segmentation/large send offload
MSI-X supports Multiple Independent Queues
Interrupt moderation
IPv6 offloading—Checksum and segmentation capability
Receive Side Scaling

Technical Features

Operating Temperature	0 °C to 55 °C (32 °F to 131 °F)
Air Flow	300 LFM 60 °C
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 = 10Gbps; yellow = 1Gbps)

Power Consumption

SKU	Typical Power	Max Power
4x10 Gbps	22.61 W	28.81 W
4x1 Gbps	12.29 W	
4x100 Mbps	9.47 W	

Physical Dimensions

Dimension	108mm x 93mm

Operating System/Architecture Support

OPERATING SYSTEM (X86-64)
Microsoft Windows Server 2016
Microsoft Windows Server 2016 Nano
Microsoft Windows Server 2012 R2
Microsoft Windows Server 2012
Red Hat Enterprise Linux 7.3
SUSE Linux Enterprise Server 11 SP4
SUSE Linux Enterprise Server 12 SP2
VMware ESXi 6.5
VMware ESXi 6.0 U3

Adapter Features

Data Rate Supported Per Port	100Mb/1GbE/10GbE
Bus Type	PCI Express 3.0 (8 GT/s)
Bus Width	PCI Express x8
Interrupt Levels	INTA, MSI, MSI-X
Hardware Certifications	FCC A, UL, CE, VCCI, BSMI, CTICK, KCC
Controller-processor	Intel® Ethernet Controller X550

Product Order Codes for PowerEdge

Description	SKU	Dell Tech	Intel MM#
X550-T4 RNDC	Factory installed: 540-BBUY Customer kit: 540-BBVC	64PJ8	951447

Dell Tech Backing Information

Standard one-year warranty.

To see the full line of Intel Ethernet Network Adapters visit www.dell.com or contact your Dell Technologies sales representative.

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