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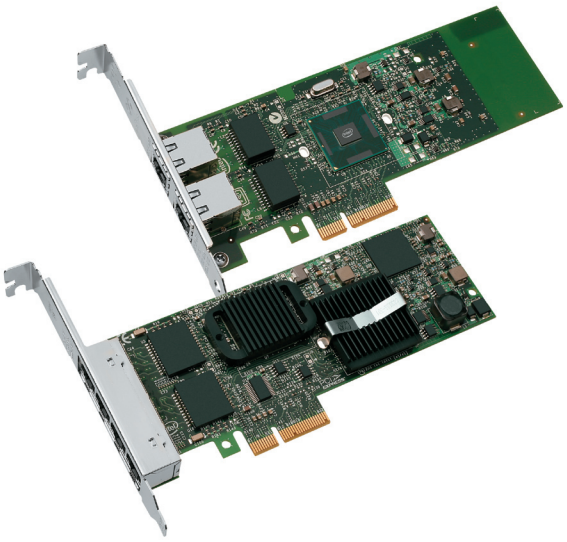
Product Brief

Intel® Gigabit ET Multi-Port Server Adapters
Network Connectivity

Intel® Gigabit ET Multi-Port Server Adapters

Dual- and quad-port Gigabit Ethernet server adapters designed for multi-core processors and optimized for virtualization.

- High-performing, 10/100/1000 Ethernet connection
- Reliable and proven Gigabit Ethernet technology from Intel Corporation
- Scalable PCI Express* interface provides dedicated I/O bandwidth for I/O-intensive networking applications
- Optimized for virtualized environments
- Flexibility with native iSCSI initiator and choice of dual- and quad-port copper adapters



The Intel® Gigabit ET Multi-Port Server Adapters are Intel's third generation of PCIe GbE network adapters. Built with the Intel® 82576 Gigabit Ethernet Controller, these new adapters showcase the next evolution in GbE networking features for the enterprise network and data center. These features include support for multi-core processors and optimization for server virtualization.

Designed for Multi-Core Processors

These new dual- and quad-port adapters provide high-performing, multi-port Gigabit connectivity in a multi-core platform as well as in a virtualized environment. In a multi-core platform, the adapters support different technologies such as Intel® QuickData Technology, MSI-X, and Low Latency Interrupts, that help in accelerating the data across the platform, thereby improving application response times.

The I/O technologies on a multi-core platform make use of the multiple queues and multiple interrupt vectors available on the network controller. These queues and interrupt vectors help in load balancing the data and interrupts amongst themselves in order to lower the load on the processors and improve overall system performance. For example, depending upon the latency sensitivity of the data, the low level latency interrupts feature can bypass the time interval for specific TCP ports or for flagged packets to give certain types of data streams the least amount of latency to the application.

Optimized for Virtualization

The Intel Gigabit ET Multi-Port Server Adapters showcase the latest virtualization technology called Intel® Virtualization Technology for Connectivity (Intel® VT for Connectivity). Intel VT for Connectivity is a suite of hardware assists that improve overall system performance by lowering the I/O overhead in a virtualized environment. This optimizes CPU usage, reduces system latency, and improves I/O throughput. Intel VT for Connectivity includes:

- Virtual Machine Device Queues (VMDq)
- Virtual Machine Direct Connect (VMDc)

Use of multi-port adapters in a virtualized environment is very important because of the need to provide redundancy and data connectivity for the applications/workloads in the virtual machines. Due to slot limitations and the need for redundancy and data connectivity, it is recommended that a virtualized physical server needs at least six GbE ports to satisfy the I/O requirement demands.

Virtual Machine Device queues (VMDq)

VMDq reduces I/O overhead on the hypervisor in a virtualized server by performing data sorting and coalescing in the network silicon.[1] VMDq technology makes use of multiple queues in the network controller. As data packets enter the network adapter, they are sorted, and packets traveling to the same destination (or virtual machine) get grouped together in a single queue. The packets are then sent to the hypervisor, which directs them to their respective virtual machines. Relieving the hypervisor of packet filtering and sorting improves overall CPU usage and throughput levels.

This new generation of PCIe Intel® Gigabit adapters provides improved performance with the next-generation VMDq technology, which includes features such as loop back functionality for inter-VM communication, priority-weighted bandwidth management, and doubling the number of data queues per port from 4 to 8. It now also supports multicast and broadcast data on a virtualized server.

Virtual Machine Direct Connect (VMDc)

VMDc is based on the single-root I/O virtualization standards (SR-IOV) developed by the PCI Special Interest Group (PCI-SIG). The VMDc implementation helps direct connectivity from the adapter to the virtual machines in order to provide near-native performance. It offers a standard mechanism for I/O devices such as network ports to advertise their ability to be simultaneously shared among multiple virtual machines. Each virtual machine is assigned its own virtual network port. By offloading this connectivity functionality to the adapter, you improve CPU usage and reduce latency.

The new Intel dual- and quad-port Gigabit adapters are hardware-ready for PCI-SIG SR-IOV functionality and provide functionality for future enablement of PCI-SIG SR-IOV in virtualization OS software.

On-Board Management Features

The Intel Gigabit ET Multi-Port Server Adapters enable network manageability implementations required by IT personnel for remote control and alerting (IPMI, KVM Redirection, Media Redirection) by sharing the LAN port and providing standard interfaces to a Board Management Controller (BMC). The communication to the BMC is available through an on-board System Management Bus (SMBus) port. The adapter provides filtering capabilities to determine which traffic is forwarded to the host.

Order Codes

Single Units:

430-0651	Intel® Gigabit ET Dual Port Server Adapter
430-0657	Intel® Gigabit ET Quad Port Server Adapter

Companion Products

Consider these Intel products in your server and network planning:

- Intel® 10 Gigabit Server Adapters
  - Copper or fiber-optic network connectivity, up to two ports per card
- Intel® Ethernet Server Adapters
  - Copper or fiber-optic network connectivity, up to four ports per card
  - Solutions for PCI Express, PCI-X,* and PCI interfaces
- Intel® Ethernet Desktop Adapters
- Intel® Xeon® processors

Features	Benefits
General	
Intel® 82576 Gigabit Ethernet Controller	• Industry-leading, energy-efficient design for next-generation Gigabit performance and multi-core processors
Low-profile	• Enables higher bandwidth and throughput from standard and low-profile PCIe slots and servers
Intel® Ethernet iSCSI	• iSCSI performance using native iSCSI initiators integrated into the operating system • Hardware-based iSCSI acceleration without offloading to a proprietary TCI/IP stack • Supported in virtualized environments
4Mbits Flash	• Supports PXE, iSCSI Boot, and uEFI drivers
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*
Compatible with x4, x8, and x16 standard and low-profile PCI Express* slots	• Allows each port to operate without interfering with the other
Multi-port design	• Enables dual- or quad-port operation in almost any PCI Express server slot, except x1 slots
Support for most network operating systems (NOS)	• Enables widespread deployment
RoHS-compliant[2]	• Compliant with the European Union directive 2002/95/EC to reduce the use of hazardous materials

Features	Benefits
I/O Features for Multi-Core Processor Servers	
Intel® QuickData Technology	▪ DMA Engine: enhances data acceleration across the platform (network, chipset, processor), thereby lowering CPU usage ▪ Direct Cache Access (DCA): enables the adapter to pre-fetch the data from memory, thereby avoiding cache misses and improving application response time
MSI-X support	▪ Minimizes the overhead of interrupts ▪ Allows load balancing of interrupt handling between multiple cores/CPUs
Low Latency Interrupts	▪ Based on the sensitivity of the incoming data it can bypass the automatic moderation of time intervals between the interrupts
Header splits and replication in receive	▪ Helps the driver to focus on the relevant part of the packet without the need to parse it
Multiple queues: 8 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
Tx TCP segmentation offload (IPv4, IPv6)	▪ Increased throughput and lower processor usage ▪ Compatible with large send offload feature (in Microsoft Windows* Server OSs)
Receive and Transmit Side Scaling for Windows* environment and Scalable I/O for Linux* environments (IPv4, IPv6, TCP/UDP)	▪ This technology enables the direction of the interrupts to the processor cores in order to improve the CPU utilization rate
Virtualization Features	
Virtual Machine Device queues[1] (VMDq)	▪ Offloads the data sorting functionality from the Hypervisor to the network silicon, thereby improving data throughput and CPU usage ▪ Provides QoS feature on the Tx data by providing round robin servicing and preventing head-of-line blocking ▪ Sorting based on MAC addresses and VLAN tags
Next-generation VMDq	▪ Enhanced QoS feature by providing weighted round robin servicing for the Tx data ▪ Provides loopback functionality, where data transfer between the virtual machines within the same physical server need not go out to the wire and come back in. This improves throughput and CPU usage. ▪ Supports replication of multicast and broadcast data
Virtual Machine Direct Connect (VMDc) (eight 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, thereby resulting in near-native performance. ▪ Integrated with Intel® VT for Directed I/O (VT-d) to provide data protection between virtual machines by assigning separate physical addresses in the memory to each virtual machine
IPv6 offloading	▪ Checksum and segmentation capability extended to the new standard packet type
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

Features

Benefits

Manageability Features	
On-board microcontroller	▪ Implements pass through manageability via a sideband interface to a Board Management Controller (BMC) via SMBus
Advanced filtering capabilities	▪ Supports extended L2, L3, and L4 filtering for traffic routing to BMC ▪ Supports MAC address, VLAN, ARP, IPv4, IPv6, RMCP UDP ports, and UDP/TCP ports filtering ▪ Supports flexible header filtering ▪ Enables the BMC to share the MAC address with the host OS
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
Wake-on-LAN support	▪ Packet recognition and wake-up for LAN on motherboard applications without software configuration
iSCSI boot	▪ Enables system boot up via iSCSI ▪ Provides additional network management capability
Watchdog timer	▪ Used to give an indication to the manageability firmware or external devices that the chip or the driver is not functioning
IEEE 1588 precision time control protocol	▪ Time synch capability—synchronizes internal clocks according to a network master clock
Intel Backing	
Intel® limited lifetime warranty	▪ Backed by an Intel® limited lifetime warranty, 90-day money-back guarantee (U.S. and Canada), and worldwide support

Specifications

General		
Product codes	430-0651	Intel® Gigabit ET Dual Port Server Adapter
	430-0657	Intel® Gigabit ET Quad Port Server Adapter
Connectors		RJ45
IEEE standards/network topology		10BASE-T, 100BASE-T, 1000BASE-T
Cabling		Category-5, unshielded twisted pair (UTP) Shielded Cable is required for EMI compliance

Adapter Product Features	
Intel® PROSet Utility	For easy configuration and management
Plug and play specification support	Standard
Ships with full-height bracket installed, low-profile bracket added in package	▪
Cable distance	100 m in Category-5 for 100/1000 Mbps; Category-3 for 10 Mbps
Receive Side Scaling	▪
Direct Cache Access (DCA)	The I/O device activates a pre-fetch engine in the CPU that loads the data into the CPU cache ahead of time, before use, eliminating cache misses and reducing CPU load

Specifications continued

Network Operating Systems (NOS) Software Support			
Operating System	IA32	x64	IPF
Windows* Vista* SP1	▪	▪	N/A
Windows Server* 2003 SP2	▪	▪	▪
Windows* Unified Storage Solution 2003	▪	▪	▪
Windows Server* 2008	▪	▪	▪
Linux* Stable Kernel version 2.6	▪	▪	▪
Linux* RHEL 4	▪	▪	
Linux* RHEL 5	▪	▪	▪
Linux* SLES 9	▪	▪	
Linux* SLES 10	▪	▪	▪
FreeBSD* 7.0	▪	▪	▪
UEFI* 1.1	▪	▪	▪
VMware ESX* 3.x	▪	▪	▪

Intel Backing	
Limited lifetime warranty	▪
90-day, money-back guarantee (U.S. and Canada)	▪

Advanced Software Features	
Adapter fault tolerance (AFT)	▪
Switch fault tolerance (SFT)	▪
Adaptive load balancing (ALB)	▪
Teaming support	▪
IEEE 802.3ad (link aggregation control protocol)	▪
Test switch configuration	Tested with major switch original equipment manufacturers (OEMs)
PCIe Hot Plug*/Active peripheral component interconnect (PCI)	▪
IEEE 802.1Q* VLANs	▪
IEEE 1588 Precision Time Control Protocol	Time synch capability – synchronizes internal clocks according to a network master clock
IEEE 802.3 2005* flow control support	▪
Tx/Rx IP, TCP, and 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 extended to new standard packet type

Technical Features	
Data rate supported per port	10/100/1000
Bus type PCI Express	2.0 (2.5 GT/s)
Bus width	4-lane PCI Express, operable in x4, x8 and x16 slots
Interrupt levels	INTA, MSI, MSI-X
Hardware certifications	FCC B, UL, CE, VCCI, BSMI, CTICK, MIC
Controller-processor	Intel® 82576
Typical power consumption	E1642ET 2.9W E1G44ET 8.4W
Operating temperature	0° C to 55° C (32° F to 131° F)
Storage temperature	-40° C to 70° C (-40° F to 158° F)
Storage humidity	90% non-condensing relative humidity at 35° C
LED indicators	LINK (solid) and ACTIVITY (blinking)

Physical Dimensions	
430-0651	
Length	16.74 cm (6.59 in)
Width	6.81 cm (2.681 in)
430-0657	
Length	16.74 cm (6.59 in)
Width	6.94 cm (2.733 in)
Full-height end bracket	12.00 cm (4.725 in)
Low-profile end bracket	7.92 cm (3.12 in)

To see the full line of Intel Network Adapters for PCI Express,
visit www.intel.com/go/ethernet or contact your Dell Sales Representative.

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[1] VMDq requires a virtualization operating system that supports VMDq.

[2] Lead and other materials banned in EU RoHS Directive are either (1) below all applicable substance thresholds or (2) an approved exemption applies.

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