Intel I350 Gigabit Ethernet Adapters
Product Guide

Based on the Intel I350 Gigabit Ethernet adapters from Lenovo build on Intel's history of delivering Ethernet products with flexible design and robust driver support. Available in either 1-port fiber configuration or a 2/4-port copper configuration, these adapters offer excellent price/performance, enhanced power-savings, and market-leading I/O virtualization technologies that includes SRIOV and VMDq.

The following figure shows the I350-T4 ML2 Quad Port GbE Adapter.

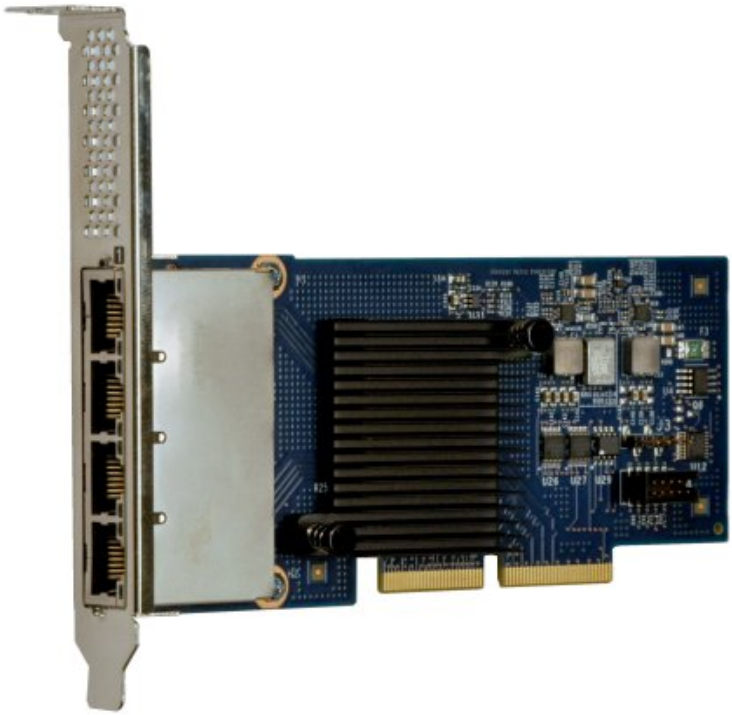

Figure 1. I350-T4 ML2 Quad Port GbE Adapter

Did you know?

Mezzanine LAN-on-Motherboard Generation 2 (ML2) is a new cost-effective adapter form factor for System x servers that offers the flexibility advantages of a PCIe adapter while supporting integrated networking features such as Wake-on-LAN and direct connectivity to the server's IMM2 service processor for out-of-band systems management.

Part number information

The following table shows the relevant part number and feature code for the adapter.

Table 1. Ordering part number and feature code

Part number	Feature code	Description
ThinkSystem options		
7ZT7A00533	AUZZ	Lenovo ThinkSystem I350-F1 PCIe 1Gb 1-Port SFP Ethernet Adapter By Intel
7ZT7A00534	AUZY	Lenovo ThinkSystem I350-T2 PCIe 1Gb 2-Port RJ45 Ethernet Adapter By Intel
7ZT7A00535	AUZW	Lenovo ThinkSystem I350-T4 PCIe 1Gb 4-Port RJ45 Ethernet Adapter By Intel
7ZT7A00536	AUKW	Lenovo ThinkSystem Intel I350-T4 ML2 1Gb 4-Port RJ45 Ethernet Adapter
System x options		
00D1998	A40R	I350-T4 ML2 Quad Port GbE Adapter
00AG500	A56K	Intel I350-F1 1xGbE Fiber Adapter
00AG510	A56L	Intel I350-T2 2xGbE BaseT Adapter
00AG520	A56M	Intel I350-T4 4xGbE BaseT Adapter

The part number for the adapter includes the following items:

- One Ethernet adapter with a full-height (3U, 4.75-in.) bracket
- One low-profile (2U) bracket
- Documentation

The following figure shows the Intel I350-F1 1xGbE Fiber Adapter.

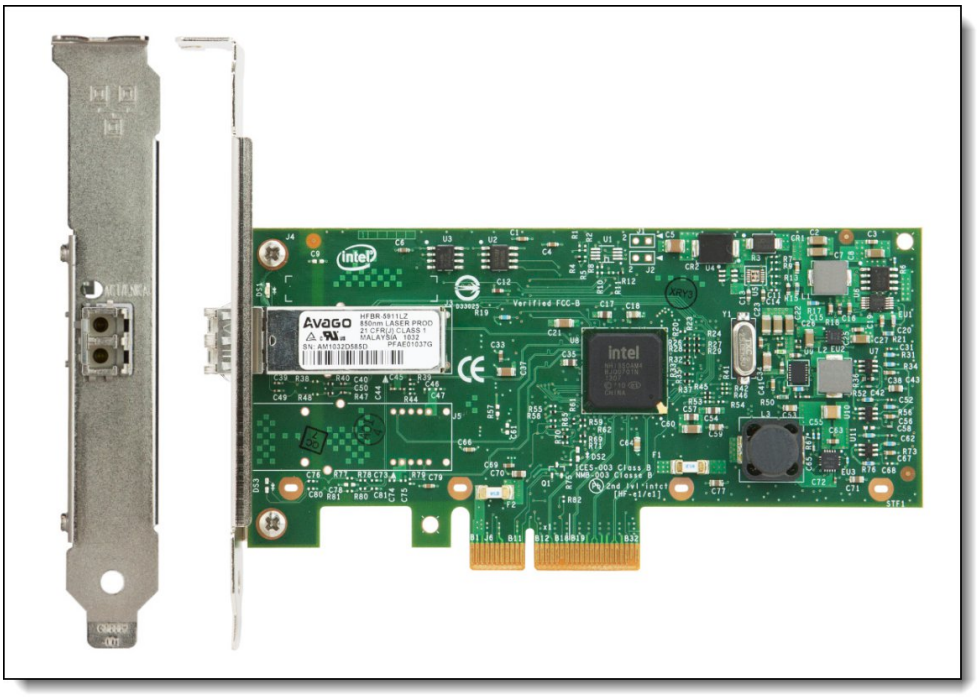

Figure 2. Intel I350-F1 1xGbE Fiber Adapter

Features and specifications

Adapter features:

- Connectors:
  - I350-T4 ML2, I350-T4 adapters: Four 10/100/1000 copper ports with RJ45 connectors
  - I350-T2 adapter: Two 10/100/1000 copper ports with RJ45 connectors
  - I350-F1 adapter: One fiber optic LC connector supporting MMF 62.5/50 µm cables, conforming to IEEE 802.3Z 1000BASE-SX. (Note: The LC connector is fixed and cannot be removed).
- Based on Intel I350 ASIC
- Line rate with IEEE 802.3 auto negotiation for 1000/100/10 Base-T Ethernet (T4 ML2, T2, and T4 adapters only)
- Host interface: PCIe 2.0 x4 host interface
- Form factor:
  - I350-T4 ML2 adapter: Mezzanine LOM Generation 2 (ML2) form factor
  - Other I350 adapters: Standard PCI-e low profile card form factor
- Power dissipation:
  - I350-T4 ML2 adapter: 12.5 W typical
  - I350-F1 adapter: 5.1 W typical
  - I350-T2 adapter: 4.6 W typical
  - I350-T4 adapter: 5.9 W typical

Performance features:

- TCP/UDP, IPv4 checksum offloads, and extended Tx descriptors
- IPv6 support for IP/TCP and IP/UDP receive checksum offloads
- Tx TCP segmentation offload (IPv4 and IPv6)
- Transmit segmentation offload
- Interrupt throttling control
- Message Signal Interrupt (MSI) support
- Message Signal Interrupt Extension (MSI-X) support
- Intelligent interrupt generation
- RSS for Windows
- Scalable I/O for Linux
- Low-latency interrupts
- Header/Packet Data Split in Receive
- PCIe v2.1 TLP processing hint requester
- Descriptor ring management hardware for transmit and receive

Ethernet and power features:

- IEEE 802.3, 802.3u, and 802.3ab (Base-T adapters only)
- Jumbo frame support (9500 bytes)
- IEEE 1588 and 802.1AS
- MDI/MDIX auto crossover detection
- IEEE 802.3x compliant flow control
- IEEE 802.3z (I350-F1 adapter only)
- Flow control (IEEE 802.3)
- VLAN support (IEEE 802.1q)
- Priority of service (IEEE 802.1p)
- PXE Preboot eXecution
- iSCSI support for native OS and VMM iSCSI software initiators
- Wake on LAN support (Base-T adapters only)
- IEEE 802.3az Energy Efficient Ethernet
- DMA coalescing

Virtualization features:

- SRIOV support
- Intel Virtual Technology (VT) with I/OAT and VMDq
- Eight TX and Rx Queue pairs per port
- Flexible Port Partitioning - 8 virtual functions (VFs) per port
- RX/TX Round-Robin Scheduling
- Traffic isolation
- Traffic steering
- VM to VM packet forwarding
- MAC and VLAN anti-spoofing
- Malicious driver detection
- Storm control
- Per-pool statistics, off loads, and jumbo support
- IEEE 802.1q VLAN support with VLAN tag insertion for up to 4096 VLANs
- Mirroring rules
- VEPA (VM switching)

Intel I/O Acceleration Technology (Intel I/OAT) is a suite of features that improves data acceleration across the platform, from networking devices to the chipset and processors, which helps to improve system performance and application response times. The suite of features includes the following items:

- Intel QuickData Technology: Provides the Direct Memory Access (DMA) engine, which moves data by using the chipset instead of the processor.
- MSI-X: Minimizes the impact of I/O interrupts by load-balancing interrupts across multiple processor cores.
- Low-Latency Interrupts: Allows the adapter to bypass the automatic moderation of time intervals between the interrupts (based on the sensitivity of the incoming data).
- Receive Side Scaling (RSS): Directs the interrupts to a specific processor core based on the application's address.

Virtual Machine Device Queues (VMDq) reduce the I/O impact on the Hypervisor in a virtualized server by performing data sorting and coalescing in the network silicon. VMDq technology uses 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) are grouped 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 processor usage and throughput levels.

Single Root I/O Virtualization (SR-IOV) is a method where the adapter and its resources are virtualized so that virtual machine guest can separately configure and access the virtualized resources without impacting the use of the same resources by other virtual machines.

The following figure shows the Intel I350-T2 2xGbE BaseT Adapter

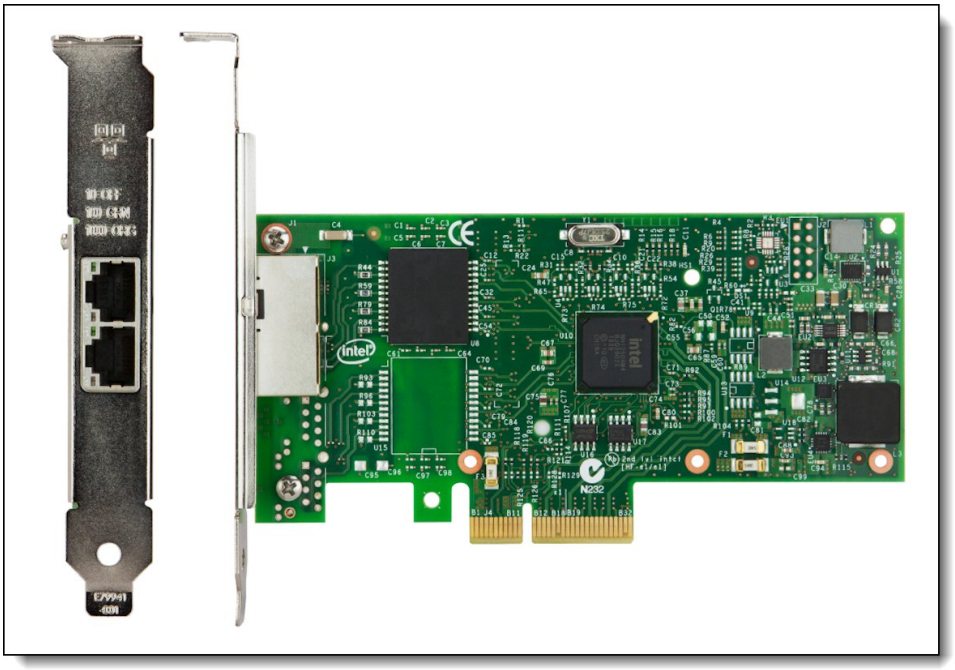

Figure 3. Intel I350-T2 2xGbE BaseT Adapter

Physical specifications

The ML2 adapter has the following physical specifications:

- Height: 69 mm (2.7 in.)
- Length: 168 mm (6.6 in.)
- Width: 17 mm (0.7 in.)

The PCIe low-profile adapters have the following physical specifications:

- Height: 69 mm (2.7 in.)
- Length: 135 mm (5.3 in.)
- Width: 17 mm (0.7 in.)

Shipping dimensions:

- Length: 290.3 mm (11.5 in)
- Width: 250.8 mm (8.2 in)
- Height: 50.8 mm (2.3 in)
- Weight: 0.4 kg (0.89 lb)

Operating environment

The adapter is supported in the following environment:

Temperature:

- 0 to 55 °C (32 to 131 °F) operating
- - 20 to 65 °C (-4 to 149 °F) storage

Relative humidity:

- Operating: 5% - 85%, noncondensing

Warranty

One-year limited warranty. When installed in a supported server, these cards assume the server's base warranty and any warranty upgrade.

Server support - ThinkSystem

The following table lists the ThinkSystem servers that are compatible.

Table 2. ThinkSystem server support

Part number	Description	2S Rack & Tower							4S Rack			Dense/ Blade		
		ST550 (7X09/7X10)	SR530 (7X07/7X08)	SR550 (7X03/7X04)	SR570 (7Y03/7Y04)	SR590 (7X98/7X99)	SR630 (7X01/7X02)	SR650 (7X05/7X06)	SR850 (7X18/7X19)	SR860 (7X69/7X70)	SR950 (7X11/12/13)	SD530 (7X21)	SN550 (7X16)	SN850 (7X15)
7ZT7A00533	ThinkSystem I350-F1 PCIe 1Gb 1-Port SFP Ethernet Adapter	Y	Y	Y	Y	Y	Y	Y	Y	Y*	N	N	N	N
7ZT7A00534	ThinkSystem I350-T2 PCIe 1Gb 2-Port RJ45 Ethernet Adapter	Y	Y	Y	Y	Y	Y	Y	Y*	Y*	N	N	N	N
7ZT7A00535	ThinkSystem I350-T4 PCIe 1Gb 4-Port RJ45 Ethernet Adapter	Y	Y	Y	Y	Y	Y	Y	Y*	Y*	N	N	N	N
7ZT7A00536	ThinkSystem Intel I350-T4 ML2 1Gb 4-Port RJ45 Ethernet Adapter	N	N	N	N	N	N	N	Y	Y	Y	N	N	N

* Support is planned for 1Q/2018

Server support - System x

The adapter is supported in the servers that are identified in the following tables.

Support for System x and dense servers with Xeon E5/E7 v4 and E3 v5 processors

Table 3. Support for System x and dense servers with Xeon E5/E7 v4 and E3 v5 processors

Part number	Description	x3250 M6 (3943)	x3250 M6 (3633)	x3550 M5 (8869)	x3650 M5 (8871)	x3850 X6/x3950 X6 (6241, E7 v4)	nx360 M5 (5465, E5-2600 v4)	sd350 (5493)
00D1998	Intel I350-T4 ML2 Quad Port GbE Adapter	N	N	Y	Y	Y	N	N
00AG500	Intel I350-F1 1xGbE Fiber Adapter	N	N	Y	Y	Y	Y	N
00AG510	Intel I350-T2 2xGbE BaseT Adapter	Y	Y	Y	Y	Y	Y	Y
00AG520	Intel I350-T4 4xGbE BaseT Adapter	Y	Y	Y	Y	Y	Y	Y

Support for servers with Intel Xeon v3 processors

Table 4. Support for servers with Intel Xeon v3 processors

Part number	Description	x3100 M5 (5457)	x3250 M5 (5458)	x3500 M5 (5464)	x3550 M5 (5463)	x3650 M5 (5462)	x3850 X6/x3950 X6 (6241, E7 v3)	nx360 M5 (5465)
00D1998	Intel I350-T4 ML2 Quad Port GbE Adapter	N	N	N	Y	Y	Y	N
00AG500	Intel I350-F1 1xGbE Fiber Adapter	Y	Y	Y	Y	Y	Y	Y
00AG510	Intel I350-T2 2xGbE BaseT Adapter	Y	Y	Y	Y	Y	Y	Y
00AG520	Intel I350-T4 4xGbE BaseT Adapter	Y	Y	Y	Y	Y	Y	Y

Support for servers with Intel Xeon v2 processors

Table 5. Support for servers with Intel Xeon v2 processors

Part number	Description	x3500 M4 (7383, E5-2600 v2)	x3530 M4 (7160, E5-2400 v2)	x3550 M4 (7914, E5-2600 v2)	x3630 M4 (7158, E5-2400 v2)	x3650 M4 (7915, E5-2600 v2)	x3650 M4 BD (5466)	x3650 M4 HD (5460)	x3750 M4 (8752)	x3750 M4 (8753)	x3850 X6/x3950 X6 (3837)	x3850 X6/x3950 X6 (6241, E7 v2)	dx360 M4 (E5-2600 v2)	nx360 M4 (5455)
00D1998	Intel I350-T4 ML2 Quad Port GbE Adapter	N	N	N	N	N	N	N	Y	Y	Y	Y	N	N
00AG500	Intel I350-F1 1xGbE Fiber Adapter	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
00AG510	Intel I350-T2 2xGbE BaseT Adapter	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
00AG520	Intel I350-T4 4xGbE BaseT Adapter	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y

For the latest information about the adapters that are supported by each System x server type, see ServerProven:
http://www.lenovo.com/us/en/serverproven/xseries/lan/matrix.shtml

The following figure shows the Intel I350-T4 4xGbE BaseT Adapter.

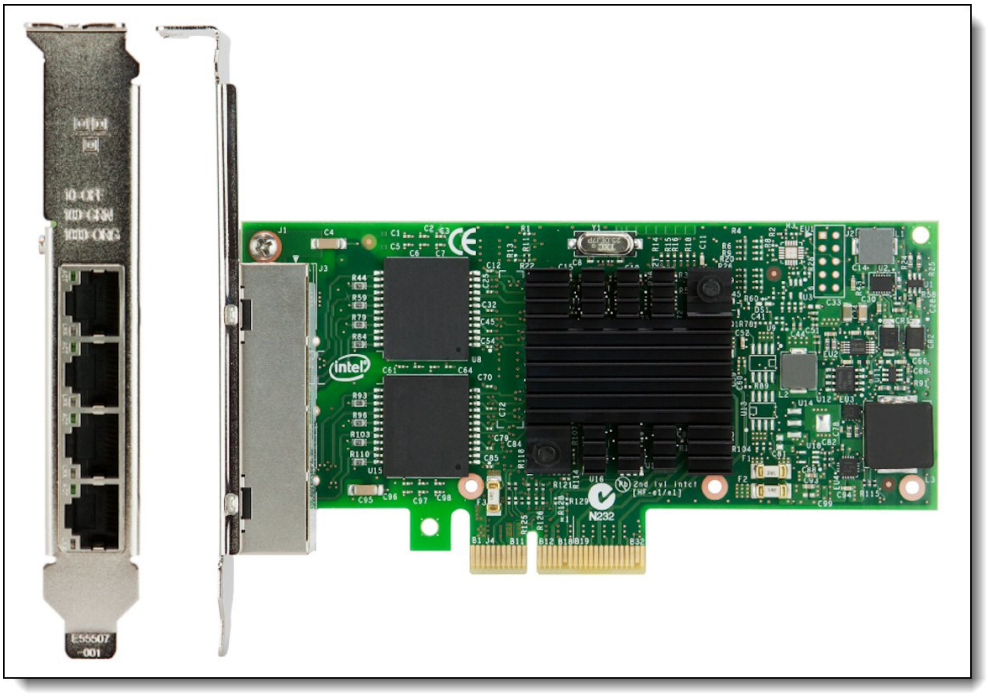

Figure 4. Intel I350-T4 4xGbE BaseT Adapter

Operating System support

The adapters support the following operating systems:

- Microsoft Windows Server 2008 R2
- Microsoft Windows Server 2012
- Microsoft Windows Server 2012 R2
- Microsoft Windows Server 2016
- Red Hat Enterprise Linux 5 Server Edition
- Red Hat Enterprise Linux 5 Server with Xen x64 Edition
- Red Hat Enterprise Linux 5 Server x64 Edition
- Red Hat Enterprise Linux 6 Server Edition
- Red Hat Enterprise Linux 6 Server x64 Edition
- SUSE LINUX Enterprise Server 11 for AMD64/EM64T
- SUSE LINUX Enterprise Server 11 for x86
- SUSE LINUX Enterprise Server 11 with Xen for AMD64/EM64T
- VMware ESXi 5.0
- VMware ESXi 5.1
- VMware ESXi 5.5
- VMware ESXi 6.0
- VMware ESXi 6.5

Note: Not all adapters described in this product guide support all the operating systems listed. Check ServerProven for the latest operating system compatibility for these adapters:
http://www.lenovo.com/us/en/serverproven/

Related publications

For more information, see the following resources:

- Networking adapters for System x product page
  http://shop.lenovo.com/us/en/systems/servers/options/systemx/networking/adapters/
- *Drivers and Installation and User's Guide for Intel Ethernet and 10 Gb Ethernet Adapters* (download and unpack the ISO image and open index.htm in a browser)
  http://ibm.com/support/entry/portal/docdisplay?lndocid=MIGR-5090295
- ServerProven compatibility page:
  http://www.lenovo.com/us/en/serverproven/xseries/lan/matrix.shtml

Related product families

Product families related to this document are the following:

- Ethernet Adapters

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