Ethernet Speeds, Feeds, & Facts

Did You Know?

Ethernet was named by Robert Metcalfe, one of its developers, for the passive substance called "luminiferous (light-transmitting) ether" that was once thought to pervade the universe, carrying light throughout. Ethernet was so- named to describe the way that cabling, also a passive medium, could similarly carry data everywhere throughout the network.

For more information - http://www.gstinc.com/store/Ethernet-C158.aspx

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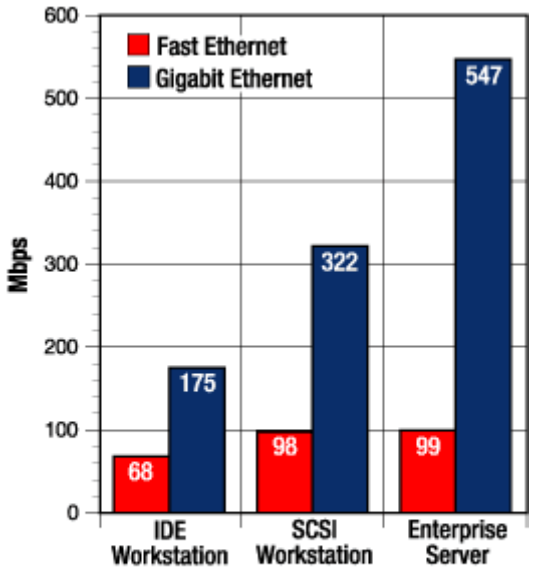
Executive Summary

Ethernet is the most widely-installed local area network (LAN) technology. Specified in a standard, IEEE 802.3, Ethernet was originally developed by Xerox from an earlier specification called *Alohanet* (for the Palo Alto Research Center Aloha network) and then developed further by Xerox, DEC, and Intel. An Ethernet LAN typically uses coaxial cable or special grades of twisted pair wires. Ethernet is also used in wireless LANs. The most commonly installed Ethernet systems are called 10BASE-T and provide transmission speeds up to 10 Mbps. Devices are connected to the cable and compete for access using a Carrier Sense Multiple Access with Collision Detection (CSMA/CD) protocol.

Fast Ethernet or 100BASE-T provides transmission speeds up to 100 megabits per second and is typically used for LAN backbone systems, supporting workstations with 10BASE-T cards. Gigabit Ethernet provides an even higher level of backbone support at 1000 megabits per second (1 gigabit or 1 billion bits per second). 10-Gigabit Ethernet provides up to 10 billion bits per second.



Fast Ethernet vs. Gigabit Ethernet Burst Throughput

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Ethernet Standards

10BASE-T

10BASE-T, one of several physical media specified in the IEEE 802.3 standard for Ethernet local area networks (LANs), is ordinary telephone twisted pair wire. 10BASE-T supports Ethernet's 10 Mbps transmission speed. In addition to 10BASE-T, 10 megabit Ethernet can be implemented with these media types:

- 10BASE-2 (Thinwire coaxial cable with a maximum segment length of 185 meters)
- 10BASE-5 (Thickwire coaxial cable with a maximum segment length of 500 meters)
- 10BASE-F (optical fiber cable)
- 10BASE-36 (broadband coaxial cable carrying multiple baseband channels for a maximum length of 3,600 meters)

This designation is an Institute of Electrical and Electronics Engineers (IEEE) shorthand identifier. The "10" in the media type designation refers to the transmission speed of 10 Mbps. The "BASE" refers to baseband signaling, which means that only Ethernet signals are carried on the medium. The "T" represents twisted-pair; the "F" represents fiber optic cable; and the "2", "5", and "36" refer to the coaxial cable segment length (the 185 meter length has been rounded up to "2" for 200).

100BASE-T

Fast Ethernet is a local area network (LAN) transmission standard that provides a data rate of 100 megabits per second (referred to as "100BASE-T"). Workstations with existing 10 megabit per second (10BASE-T) Ethernet card can be connected to a Fast Ethernet network. (The 100 megabits per second is a shared data rate; input to each workstation is constrained by the 10 Mbps card.)

Gigabit Ethernet

Gigabit Ethernet, a transmission technology based on the Ethernet frame format and protocol used in local area networks (LANs), provides a data rate of 1 billion bits per second (one gigabit). Gigabit Ethernet is defined in the IEEE 802.3 standard and is currently being used as the backbone in many enterprise networks.

Gigabit Ethernet is carried primarily on optical fiber (with very short distances possible on copper media). Existing Ethernet LANs with 10 and 100 Mbps cards can feed into a Gigabit Ethernet backbone. An alternative technology that competes with Gigabit Ethernet is ATM. A newer standard, 10-Gigabit Ethernet, is also becoming available.

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10-Gigabit Ethernet

10-Gigabit Ethernet (10GBASE-T), being standardized in IEEE 802.3a, is a telecommunication technology that offers data speeds up to 10 billion bits per second. Built on the Ethernet technology used in most of today's local area networks (LANs), 10-Gigabit Ethernet is described as a "disruptive" technology that offers a more efficient and less expensive approach to moving data on backbone connections between networks while also providing a consistent technology end-to-end. Using optical fiber, 10-Gigabit Ethernet can replace existing networks that use ATM switches and SONET multiplexers on an OC-48 SONET ring with a simpler network of 10-Gigabit Ethernet switches and at the same time improve the data rate from 2.5 Gbps to 10 Gbps.

10-Gigabit Ethernet is expected to be used to interconnect local area networks (LANs), wide area networks (WANs), and metropolitan area networks (MANs). 10-Gigabit Ethernet uses the familiar IEEE 802.3 Ethernet media access control (MAC) protocol and its frame format and size. Like Fast Ethernet and Gigabit Ethernet, 10-Gigabit Ethernet uses full-duplex transmission, which makes possible a considerable distance range. On multimode fiber, 10-Gigabit Ethernet will support distances up to 300 meters; on single mode fiber, it will support distances up to 40 kilometers. Smaller Gigabit Ethernet networks can feed into a 10-Gigabit Ethernet network

Ethernet Adapters

Item	Description
1954	10/100/1000 Base-TX Ethernet , 4-Port (Copper)
1959	10/100/1000 Base-TX Ethernet Low Profile PCI-X Adapter (Copper)
1978	Gigabit Ethernet-SX PCI-X Adapter
1979	10/100/1000 Base-TX Ethernet PCI-X Adapter
1981	10 Gigabit Ethernet-SR PCI-X Adapter
1982	10 Gigabit Ethernet-LR PCI-X Adapter
1983	2-Port 10/100/1000 Base-TX Ethernet PCI-X Adapter
1984	2-Port Gigabit Ethernet-SX PCI-X Adapter
1985	10/100MBps Ethernet PCI Adapter II
2964	10/100 Mbps Ethernet MC Adapter / UNI (Type 9-K & 9-Q)
2968	10/100 Mbps Ethernet PCI Adapter (Type 9-P)
2969	Gigabit Ethernet - SX PCI Adapter (Type 9-U)
2975	10/100/1000 Base-T Ethernet PCI Adapter (Type A-A)
2980	Ethernet High-Performance LAN Adapter (Type 2-1)
2981	Ethernet Adapter ISA Bus
2985	PCI Ethernet BNC/RJ-45 Adapter (Type 8-Y)
2987	PCI Ethernet AUI/RJ-45 Adapter (Type 8-Z)
2992	Ethernet/FDX 10 Mbps TP/AUI MC Adapter (Type 8-U)
2993	Ethernet 10 Mbps BNC Micro Channel Adapter (Type 8-V)
2994	10/100 Mbps Ethernet MC Adapter / SMP (Type 9-K & 9-Q)
4951	4-Port 10/100 Base-Tx Ethernet PCI Adapter (Type 9-Z)
4961	Universal 4-Port 10/100 Ethernet Adapter (Type A-E)
4962	10/100 Mbps Ethernet PCI Adapter II (Type A-F)
5700	Gigabit Ethernet - SX PCI-X Adapter (Type 5700)
5701	10/100/1000 Base-TX Ethernet PCI-X Adapter (Type 5701)
5706	2-Port 10/100/1000 Base-TX Ethernet PCI-X Adapter (Type 5706)
5707	2-Port Gigabit Ethernet-SX PCI-X Adapter (Type 5707)
5718	10-Gigabit Ethernet PCI-X Adapter
5719	10 Gigabit Ethernet-LR PCI-X Adapter
5740	10/100/1000 Base-TX Ethernet , 4-Port (Copper)

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Ethernet Details

1954	10/100/1000 Base-TX Ethernet , 4-Port (Copper)

The 4-Port 10/100/1000 Base -TX PCI-X adapter is a full height PCI-X 1.0a Ethernet adapter which supports four Gigabit ports on a single adapter, delivers increased bandwidth for slot-constrained servers, and is designed to provide high connectivity and reliability using two integrated, dual-port Gigabit Ethernet controllers.

- Four RJ-45 ports
- 3.3 volts, 64-bit 133 MHz with 64-bit Bus Mastering on the PCI-X bus
- IEEE 802.3ab 1000Base-T compliant
- IEEE 802.3u 100Base-T compliant
- IEEE 802.3 10Base-T compliant
- 802.1q VLAN tagging
- Interrupt Moderation
- TCP Segmentation offload and encapsulation in hardware
- Checksum offloading of IP, TCP, and UDP frame
- Increased connectivity while significantly reducing CPU utilization
- Two LED adapter status indicators per port for link activity and speed
- NIM is supported on all 4 ports
- RoHS compliant

Limit Full bandwidth performance may not be achieved with more than one adapter per PCI Host Bridge (PHB) or more than one CPU.

- Attributes provided: Four 10/100/1000 RJ-45 ports
- Attributes required: One available PCI-X card slot

1959	10/100/1000 Base-TX Ethernet Low Profile PCI-X Adapter (Copper)

The IBM Low Profile 10/100/1000 Base-TX Ethernet PCI-X Adapter is a Full Duplex Gigabit Ethernet adapter designed with highly integrated components. This adapter can be configured to run at 10/100/1000 MBps data rates.

The adapter interfaces to the system via the PCI-X bus and connects to the network using a 4-pair CAT-5 Unshielded Twisted Pair (UTP) cable for distances of up to 100m.

AIX Network Install Manager (NIM) boot capability is supported with this adapter. The adapter conforms to the IEEE 802.3ab 1000Base-T standard. The adapter also supports jumbo frames when running at the 1000 MBps speed.

Note: For optimum performance, adapter should be placed in a 64 bit PCI-X card Slot.

Limitations:
1000 MBps speed is not supported in Half Duplex (HDX) mode.

Requires: PCI or PCI-X card Slot

1978	Gigabit Ethernet-SX PCI-X Adapter

The IBM Gigabit Ethernet-SX PCI-X Adapter provides a 1GBps (1000 Base-SX) full-duplex Ethernet LAN connection with throughput on a standard shortwave multimode optical cable which conforms to the IEEE 802.3z standard.

The adapter supports distances of 260m for 62.5 micron Multi Mode Fiber (MMF) and 550m for 50.0 micron MMF.

For optimum performance, the adapter should be placed in a 64 bit PCI-X card slot.

This adapter utilizes LC type connectors. If attaching a device or switch with a SC type fiber connector, FC #2456 LC-SC 50 Micron Fiber Converter Cable or FC #2459 LC-SC 62.5 Micron Fiber Converter Cable is required.

Limitation: Half Duplex (HDX) mode is not supported.

1979	10/100/1000 Base-TX Ethernet PCI-X Adapter

Full Duplex Gigabit Ethernet adapter designed to run at 10, 100, or 1000MBps data rates, conforming to IEEE 802.3ab 1000Base-T standard.

The adapter interfaces to the system via the PCI-X Bus and connects to the network using a 4-pair CAT-5 Unshielded Twisted Pair (UTP) cable for distances of up to 100m.

The adapter also supports jumbo frames when running at the 1000MBps speed.

For optimum performance, the adapter should be placed in a 64 bit PCI-X card slot.

Limitations: The 1000MBps speed is not supported in Half Duplex (HDX) mode.

1981	10 Gigabit Ethernet-SR PCI-X Adapter

Provides 10 Gigabit Ethernet PCI-X based server connections.

Supports distances of up to 33m using 62.5 um multimode fiber or 300m using 50 um multimode fiber with 2000MHz km minimum model bandwidth at 850nm.

Adapter connector type is LC.

Supported on PCI-X slots only

1982	10 Gigabit Ethernet-LR PCI-X Adapter

Provides 10 Gigabit Ethernet PCI-X based server connections over a maximum of 10 kilometers of 1310nm single-mode fiber optic cable.

The adapter conforms to the IEEE 802.3ae standard.

The adapter requires 9um single-mode fiber optic cables and uses a SC connector.

1983	2-Port 10/100/1000 Base-TX Ethernet PCI-X Adapter

Full Duplex, dual ported, Gigabit Ethernet adapter designed to run each port at 10, 100, or 1000MBps data rates, conforming to IEEE 802.3ab 1000Base-T standard.

The adapter interfaces to the system via a PCI or PCI-X Bus and connects to a network using a 4-pair CAT-5 Unshielded Twisted Pair (UTP) cable for distances of up to 100m.

The adapter also supports jumbo frames when running at the 1000MBps speed.

A function called 'Large Send' or sometimes known as TCP Segmentation is also provided by this adapter. This function offloads the TCP segmentation operation from the IP layer to the adapter for outgoing (transmit side) TCP segments. Another function known as "Checksum Offload" which offloads the TCP/UDP Checksum Operation or workload from the CPU to the adapter is also provided.

For optimum performance, the adapter should be placed in a 64 bit PCI-X card slot whenever possible.

Limitations: 1000MBps speed is not supported in Half Duplex (HDX) mode.

1984	2-Port Gigabit Ethernet-SX PCI-X Adapter

The IBM 2-Port Gigabit Ethernet-SX PCI-X Adapter provides two 1GBps (1000 Base-SX) full-duplex Ethernet LAN connections with throughput on a standard shortwave multimode optical cable that conforms to the IEEE 802.3z standard.

The adapter supports distances of 260m for 62.5 micron Multi Mode Fiber (MMF) and 550m for 50.0 micron MMF.

A function called 'Large Send' or sometimes known as TCP Segmentation is also provided by this adapter. This function offloads the TCP segmentation operation from the IP layer to the adapter for outgoing (transmit side) TCP segments. Another function known as "Checksum Offload" which offloads the TCP/UDP Checksum Operation or workload from the CPU to the adapter is also provided.

This adapter utilizes LC type connectors. If attaching a device or switch with a SC type fiber connector, FC #2456 LC-SC 50 Micron Fiber Converter Cable or FC #2459 LC-SC 62.5 Micron Fiber Converter Cable is required.

Limitation: Half Duplex (HDX) mode is not supported.

Requires: One available PCI or PCI-X card slot

1985	10/100MBps Ethernet PCI Adapter II

The 10/100MBps Ethernet PCI Adapter II provides both 10Base-T and 100Base-TX full duplex ethernet LAN connectivity.

The adapter supports Category-5 unshielded twisted pair cabling for both 10/100MBps and Category-3 unshielded twisted pair cabling for 10MBps.

The 10/100MBps Ethernet PCI Adapter II supports:
Half / Full Duplex 10/100MBps Ethernet interface
10/100MBps data rates
Auto-negotiation for 10/100 speed and half/full duplex
Network boot capability and Network Install Manager (NIM)
IEEE 802.3 Ethernet Specification
IEEE 802.3u Fast Ethernet Specification

An additional function called 'Large Send' or sometimes known as TCP Segmentation is also available. This function offloads the TCP segmentation operation from the IP layer to the adapter for outgoing (transmit side) TCP segments.

Another function known as "Checksum Offload" which offloads the TCP/UDP Checksum Operation or workload from the CPU to the adapter is also available.

Requires: One PCI slot

2964	10/100 Mbps Ethernet MC Adapter / UNI (Type 9-K & 9-Q)

Provides:

1. Connectivity to 10/100BaseTX Ethernet LANs for RS/6000 Micro Channel Uni-processor systems.
2. 10Mb/sec or 100Mb/sec connectivity to 10 or 100BaseTX Ethernet LANs
   Auto sensing of the speed provided at the hub port.
3. Fully 802.3u Fast Ethernet standard-compatible.
   Allows migration from 10Mb/sec LANs to 100Mb/sec LANs using this same adapter.
4. Full duplex capability
5. Full frame buffering on both transmit and receive
6. 32-bit Micro Channel DMA bus master
7. Supports full 64-bit streaming with 80MB capability on MCA bus
8. Type 3 Micro Channel form factor
9. Supports network boot operations
10. MCA parity generation / detection

Connection requirements:

1. Connect to 10BaseT Ethernet LANs via 10BaseT hub using category 3, 4, or 5 unshielded twisted-pair cabling.
2. Connect to 100BaseT Ethernet LANs via 100BaseTX using category 5 UTP cabling

Announced for the following machines only:-

1. 7006-4xx, 7009-Cxx, 7012-39x, 7013-590/591/595, 7015-R20/R24, 7030-3BT/3CT

Slots required: One MCA slot

2968	10/100 Mbps Ethernet PCI Adapter (Type 9-P)

Provides a 10 Mbps (10BaseT) or 100 Mbps (100BaseTx) full-duplex Ethernet LAN connection.

Supports 32-bit bus master PCI connection to the host system for enhanced data throughput and lower bus utilization.

The adapter supports Category-5 Unshielded Twisted Pair.

Note: AIX drivers are shipped on CD with the hardware feature. Systems ordered with AIX preinstalled will have the device drivers installed on the hard disk drive.

Requires
1. AIX 4.1.5 & above

Max: 4

2969	Gigabit Ethernet - SX PCI Adapter (Type 9-U)

10Gbps (1000BaseT) full-duplex Ethernet LAN connection via SX fiber connection to a Gigabit Ethernet switch.

Requires
1. 64 bit PCI slot
2. AIX 4.3.2 or later required for Hardware Checksum and Jumbo Frame support.

Max: 2

2975	10/100/1000 Base-T Ethernet PCI Adapter (Type A-A)

The 10/100/1000 Base-T Ethernet PCI Adapter provides copper-cabling attachment using a RJ-45 connector.

Operating speeds of 10, 100, or 1000 Mbps to an Ethernet LAN with auto-negotiation to the highest available link speed.

At speeds of 10 or 100 Mbps, both full-duplex and half-duplex modes are supported. At the speed of 1000 Mbps, only full-duplex mode is supported.

Attributes
1. Designed to operate on systems with 32- or 64-bit PCI bus interface.
2. Conforms to the IEEE-802.3z standard for communications.
3. Uses a 4-pair CAT-5 unshielded twisted pair (UTP) cable for distances up to 100 m.
4. Four LED adapter status indicators for data and 10, 100, and 1000 Mbps indication.
5. 33 MHz through 66 MHz PCI bus speeds
6. 1 MB on-card FIFO for transmit and receive
7. The 10/100/1000 Base-T Ethernet PCI Adapter supports up to 9,000 byte jumbo frames for full-duplex Fast and Gigabit Ethernet.

Requires
1. AIX 4.3.3 with 4330-05 Recommended Maintenance Package, or later support.
2. RS/6000 SP nodes also require IBM Parallel System Support Programs (PSSP) for AIX Version 3.1.1 or PSSP Version 3.2.
3. The device driver for AIX 4.3.3 is shipped with the adapter and included in the AIX 4.3.3 Additional Device Software CD-ROM.

Limitations
1. AIX Network Install Manager (NIM) boot is not supported with this adapter.

Cable Orders: Customer supplied. Use CAT-5 twisted pair bulk cables (TIA/EIA 568A is recommended).

Supported systems at announcement
1. 701x-S7A, S80
2. 7025-F50, F80, H70
3. 7026-H50, H70, H80, M80
4. 7043-260, 270
5. 7044-170, 270

2980	Ethernet High-Performance LAN Adapter (Type 2-1)

For connecting Ssystem/6000s to Ethernet networks.

Allows connection to a 10 Megabit Carrier Sense Multiple Access/Collision Detection (CSMA/CD) Ethernet network.

Compatible with IEEE 802.3 and Ethernet external interfaces.

Requires standard 50-ohm or RG-58A/U coaxial cables.

Specifications:
1. Micro Channel Interface
2. 32-bit Bus Master
3. Compatible with IEEE 802.3 or Ethernet Version 2 Interfaces
4. Transmission speed of 10MBps
5. 16KB of high speed RAM for data buffering
6. Standard Micro Channel form factor card
7. Thick (DIX) or Thin (BNC) Cable support

Max: 2

2981	Ethernet Adapter ISA Bus

Connection to 10BaseT, 10Base2, and 10Base5 Ethernet

Adapter supports Remote Program Load.

AIX required: 4.1.3

Max: 2

2983	3COM Ethernet Adapter ISA BNC/AUI Interfaces 7020-40P

BNC/AUI 10/Mbps ISA Bus

2984	3COM Ethernet Adapter (RJ45 Twisted Pair Only) ISA - 7020-40P

10BaseT (RJ45) Twisted Pair Only. 10/Mbps ISA Bus

2985	PCI Ethernet BNC/RJ-45 Adapter (Type 8-Y)

10 Mbps Ethernet connectivity.

Adheres to the Peripheral Component Interconnect (PCI) Revision 2.0 and IEEE 802.3 standards.

Features high performance 32-bit card, 33MHz bus speed, yielding a PCI bus transfer rate of 132 MB/s.

Includes three LEDs to provide status of the card's operation and includes auto-sense of the media connection.

The controller chip on the card contains integrated DMA buffer management for low CPU and bus utilization and look-ahead packet processing which allows protocol analysis to begin before the end of the frame is received.

This card differs from feature 2987 because of the BNC/RJ-45 connector.

Characteristics:

1. 10 Mbps Ethernet compatible with IEEE 802.3 specifications
2. Peripheral Component Interconnect - PCI Bus - 132 MB/s
3. 32-bit Bus Master
4. Supports connections to 10Base2 via BNC connector and 10BaseT via RJ-45 connector
5. PCI Short - Form factor adapter

Requires:

1. PCI slot
2. AIX 4.1.5;
3. Windows NT 4.0

2986	3Com 10/100 Mbps PCI Fast Etherlink XL

3Com Corporation Fast Ethernet adapter for PCI-bus

Provides 10Mb/sec or 100Mb/sec connectivity to 10BaseT or 100BaseTX Ethernet LANs, including the ability to automatically sense the speed at the hub port. In addition, the adapter supports full duplex (FDX) operation in either 10Mb/sec or 100Mb/sec mode.

Allows migration from 10Mb/sec LANs to 100Mb/sec LANs using the same adapter supported under either AIX or Windows NT operating systems.

AIX Device Driver diskette is shipped with the adapter.

Features:

1. Fully 802.3u Fast Ethernet standard-compatible
2. Configurable transmit and receive buffering up to 8KB
3. Full duplex capability
4. Support under AIX SMIT and diagnostic routines
5. Remote boot capability is supported on all RS/6000 models that support the PowerPC Open Firmware standard
6. Connection requirements:
7. Connect to 10BaseT Ethernet LANs via 10BaseT hub using Category 3, 4, or 5 UTP cabling
8. Connect to 100BaseTX Ethernet LANs via 100BaseTX using Category 5 UTP cabling
9. Provides: One 10/100BaseTX Ethernet Port

Requires:

1. PCI slot
2. AIX 4.1.5;
3. Windows NT 4.0

2987	3COM 10/100MB Ethernet Adapter PCI 7020-140

Twisted Pair 10Base T Connection only. PCI Bus

2987	PCI Ethernet AUI/RJ-45 Adapter (Type 8-Z)

10 Mbps Ethernet connectivity.

Adheres to the Peripheral Component Interconnect (PCI) Revision 2.0 and IEEE 802.3 standards.

High performance 32-bit card, 33MHz bus speed, yielding a PCI bus transfer rate of 132 MB/s.

Includes three LEDs to provide status of the card's operation and includes auto-sense of the media connection.

Differs from feature 2985 because of the AUI/RJ-45 connector.

Characteristics:

1. 10 Mbps Ethernet compatible with IEEE 802.3 specifications
2. Peripheral Component Interconnect - PCI Bus - 132MB/sec 32-bit Bus Master
3. Supports connections to 10BaseT networks via RJ-45 connectors and also contains a 15-pin AIX Ethernet connector
4. PCI Short - Form factor adapter

Requires:

1. PCI slot
2. AIX 4.1.5;
3. Windows NT 4.0

2992	Ethernet/FDX 10 Mbps TP/AUI MC Adapter (Type 8-U)

Attributes

1. Allows System/6000 to attach to 10Mbps Ethernet networks.
2. Parallel processing design reduces adapter latency and increases data throughput.
3. Ethernet Version 2 and IEEE 802.3 compatible.
4. The adapter has 2 ports (only one active): 10BaseT (Twisted Pair) and 10Base5 (AUI)

Characteristics:

1. 32-bit Busmaster Micro Channel Interface
2. Address and data parity support
3. Compatible with IEEE 802.3 or Ethernet Version 2 Interfaces
4. 10BaseT (Twisted Pair) and 10Base5 (AUI) Connectors

Requires

1. AIX V.4.1.4

Max: 4

2993	Ethernet 10 Mbps BNC Micro Channel Adapter (Type 8-V)

Ethernet/FDX 10Mbps BNC/AUI MC Adapter is designed to allow the RS/6000 attachment to 10Mbps Ethernet networks.

Parallel processing design reduces adapter latency and increases data throughput.

Ethernet Version 2 and IEEE 802.3 compatible.

Adapter has 1 port: 10Base2 (Coaxial).

Characteristics:

1. 32-bit Busmaster Micro Channel Interface
2. Address and data parity support
3. Compatible with IEEE 802.3 or Ethernet Version 2 Interfaces
4. 10Base2 (Coaxial) BNC Connector

Requires

1. AIX V.4.1.5 or later

2994	10/100 Mbps Ethernet MC Adapter / SMP (Type 9-K & 9-Q)

Attributes

1. Provides connectivity to 10/100BaseTX Ethernet LANs for RS/6000 Micro Channel SMP systems.
2. 10Mb/sec or 100Mb/sec connectivity to 10 or 100BaseTX Ethernet LANs
3. Auto sensing of the speed provided at the hub port.
4. Fully 802.3u Fast Ethernet standard-compatible.
5. Allows migration from 10Mb/sec LANs to 100Mb/sec LANs using this same adapter.
6. Full duplex capability
7. Full frame buffering on both transmit and receive
8. 32-bit Micro Channel DMA bus master
9. Supports full 64-bit streaming with 80MB capability on MCA bus
10. Type 3 Micro Channel form factor
11. Supports network boot operations
12. MCA parity generation / detection

Connection requirements:

1. Connect to 10BaseT Ethernet LANs via 10BaseT hub using category 3, 4, or 5 unshielded twisted-pair cabling.
2. Connect to 100BaseT Ethernet LANs via 100BaseTX using category 5 UTP cabling

AIX Version 4.1.5 device driver is shipped on diskette.

Systems ordered with AIX Version 4.1.5 preinstalled will have the device driver installed on the hard disk drive.

AIX Version 4.2.1 device driver is included on the Base Operating System.

Slots required: One MCA slot

Max: 2

4951	4-Port 10/100 Base-Tx Ethernet PCI Adapter (Type 9-Z)

The 4-Port 10/100 Base-Tx Ethernet PCI Adapter for RS/6000 is a single slot long, 32/64 bit PCI adapter supporting 4 industry standard Ethernet 10Base-T or 100 Base-T interfaces either half or full duplex.

The adapter makes available four Ethernet ports using a single PCI slot. This adapter provides the same function as purchasing four Ethernet adapters FC 2968.

Each port is provided with its own RJ-45 connector for attachment to standard CAT-3/5 Unshielded Twisted Pair, UTP (RJ45) cable.

The adapter is IEEE 802.3u compatible and provides full auto-negotiation for detecting speed and duplex capability across each port.

Network Boot Capability and Network Install Manager capability are available using this adapter if no specific limitation is stated.

Characteristics

1. Meets PCI 2.1 Specification
2. Operates at PCI bus speed of 33 MHz
3. Supports half and full duplex operation
4. Status LEDs for speed and data activity
5. FCC Class A and CISPR Class A certified for UTP-3/5 cabling
6. Supports NIM Install on selected machines
7. Provides network boot capability for selected RS/6000 machine types and models.

Requires:

1. AIX V.4.3.3 with the 2/2000 update CD or later
2. Standard CAT-3/5 Unshielded Twisted Pair (UTP) cable.

4961	Universal 4-Port 10/100 Ethernet Adapter (Type A-E)

IBM Universal 4-Port 10/100 Ethernet Adapter is a single slot, long, 64-bit, 33 MHz PCI adapter supporting 4 industry standard Ethernet 10 Base-T or 100Base-T interfaces either half or full duplex. Each port is provided with it's own RJ-45 connector for attachment to standard CAT-3/5 Unshielded Twisted Pair (UTP) cable. The adapter is IEEE 802.3u compatible and provides full auto-negotiation for detecting speed and duplex capability across each port.

Network boot capability and Network Install Manager (NIM) capability are available using this adapter if no specific limitation is stated.

The IBM Universal 4-Port 10/100 Ethernet Adapter (4961) should be considered where maximum port density is required per I/O card slot. But, for high end systems, where card slots are not the limiting factor and maximum throughput is required, the single port IBM 10/100 Mbps Ethernet PCI Adapter (2968) or 10/100 Mbps Ethernet PCI Adapter II (4962) are the preferred solutions.

Below are some performance factors to consider when choosing the right adapter for your needs. These performance comparisons are based on all four ports of the IBM Universal 4-Port 10/100 Ethernet Adapter (4961) being active.

A single IBM Universal 4-Port 10/100 Ethernet Adapter (4961) is expected to deliver up to 3 times the performance of a single IBM 10/100 Mbps Ethernet PCI Adapter (2968) or 10/100 Mbps Ethernet PCI Adapter II (4962).

Under most conditions, each port of the IBM Universal 4-Port 10/100 Ethernet Adapter (4961) is expected to perform at greater than 50% the throughput of the single port of the IBM 10/100 Mbps Ethernet PCI Adapter (2968) or 10/100 Mbps Ethernet PCI Adapter II (4962).

Note: The resulting performance in your environment compared to the above may vary and depends upon the RS/6000 model, the I/O configuration, and associated workload of your applications.

Requires:

1. PCI slot
2. AIX 4.3.3 with AIX Update CD LCD4-0995-14 or later
3. AIX 5.1 or later

4962	10/100 Mbps Ethernet PCI Adapter II (Type A-F)

Small form factor, single port PCI Ethernet adapter. This high performance, low power Ethernet 10/100Mbps LAN adapter can be used in both client and server PCI systems.

The 10/100 Mbps Ethernet PCI Adapter II provides both 10Base-T and 100Base-TX full duplex Ethernet LAN connectivity. The adapter supports Category-5 unshielded twisted pair cabling for both 10/100 Mbps and Category-3 unshielded twisted pair cabling for 10 Mbps.

Supports:

1. Half / Full Duplex 10/100 Mbps Ethernet interface
2. 10/100 Mbps data rates
3. Auto-negotiation for 10/100 speed and half/full duplex
4. Network boot capability and Network Install Manager (NIM)
5. IEEE 802.3 Ethernet Specification
6. IEEE 802.3u Fast Ethernet Specification

After 4/26/02, the 10/100 Mbps Ethernet PCI Adapter II supports the off-load of IP Security cryptographic algorithms by providing hardware assistance in performing data encryption and authentication. This support is provided with AIX 5.1 (with appropriate software updates) and later.

This IP Security function, normally performed with encryption software by the host, is off-loaded to this adapter to enhance network traffic throughput and reduce CPU utilization. If you are running with AIX 5.1, to invoke the IP Security function on the adapter, you must obtain AIX 5.1 software updates IY27069 and IY26514 or the 5100-02 Recommended Maintenance package. These updates can be obtained by ordering APAR IY28102, or by ordering the AIX 5.1 Update CD (LCD4-1103-03) dated 4/2002 or later.

Note: This IP Security function is not supported with AIX 4.3 software.

An additional function called 'Large Send' or sometimes known as TCP Segmentation is also available. This function offloads the TCP segmentation operation from the AIX IP layer to the adapter for outgoing (transmit side) TCP segments.

Another function known as "Checksum Offload" which offloads the TCP/UDP Checksum Operation or workload from the CPU to the adapter is also available. Both these functions are available with AIX version 5.1 with APAR IY38248 or later software, or AIX version 5.2 with APAR IY38492 or later software.

Requires

1. AIX 5.2 or AIX 5.3, or later

Maximum

1. Max 6: 9111-520
2. Max 5: 9113-550, 9124-720
3. Max 24: 9117-570
4. Max 160: 9119-590/595

5700	Gigabit Ethernet - SX PCI-X Adapter (Type 5700)

PCI-X Adapter providing a 1 Gbps (1000 Base-SX) Full-Duplex Ethernet LAN connection via a standard Shortwave Multi Mode Fiber (MMF) Optical cable which conforms to the IEEE 802.3z standard. (Half Duplex (HDX) mode is not supported).

The adapter requires a Long or Short 3V PCI slot. However, for optimum performance, it should be placed in a 3V 64 bit PCI-X slot.

The adapter has a Duplex LC Fiber-Optic connector and supports distances of:

1. 260m for 62.5 micron MMF
2. 550m for 50.0 micron MMF.

#5700 only supports TCP/IP and requires an intervening switch/hub/router when connecting to 1000/100/10Mbps networks.

#5700 can also be used to connect to existing 100/10Mbps Ethernet LANs. If connecting to older SC type connector networks, a LC-SC Fiber Converter Cable is required.

AIX Network Install Manager (NIM) boot capability is supported with this adapter.

For pSeries, the Converter Cable FCs are:

1. #2456 50 Micron Fiber Converter Cable
2. #2459 62.5 Micron Fiber Converter Cable

Maximum

1. Max: 6 7038-6M2 model 650
2. Max 6: 9111-520
3. Max 5: 9113-550
4. Max 24: 9117-570
5. Max 160: 9119-590/595

pSeries Software Requirement

1. AIX 5.1 or later

p5 Software Requirement

1. AIX 5.2 or AIX 5.3 or later
2. SUSE LINUX Enterprise Server 9 for POWER, or later
3. Red Hat Enterprise Linux AS for POWER Version 3

5701	10/100/1000 Base-TX Ethernet PCI-X Adapter (Type 5701)

5701 is a Full Duplex 10/100/1000 Base-TX Ethernet PCI-X Adapter for attachment to IEEE standard 802.3Z Ethernet LANs.

This adapter can be configured to run at 10/100/1000 Mbps data rates. The adapter supports only TCP/IP and connects to the network using a 4-pair CAT-5 Unshielded Twisted Pair (UTP) cable for distances of up to 100m.

1000Mbps speed is not supported in Half Duplex (HDX) mode.

The adapter also supports jumbo frames when running at the 1000 Mbps speed.

For optimum performance, adapter should be placed in a 64 bit PCI-X card slot.

pSeries Attributes

1. Max: 6 7038-6M2 pSeries 650
2. pSeries: AIX Network Install Manager (NIM) boot capability is supported with this adapter.

pSeries OS Requirement

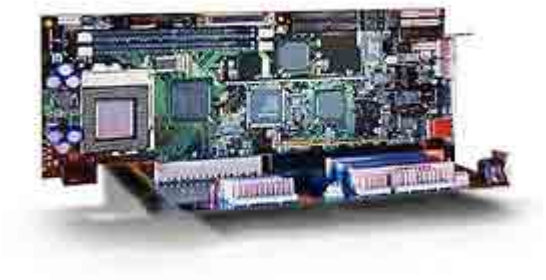
1. AIX 5.1 or later

p5 Maximums

1. Max 6: 9111-520
2. Max 5: 9113-550
3. Max 24: 9117-570
4. Max 160: 9119-590
5. Max 192: 9119-595

p5 OS levels Supported:

1. AIX 5.2 or AIX 5.3 or later
2. SUSE LINUX Enterprise Server 9 for POWER, or later
3. Red Hat Enterprise Linux AS for POWER Version 3



5706	2-Port 10/100/1000 Base-TX Ethernet PCI-X Adapter (Type 5706)

#5706 is a Full Duplex, dual ported, Gigabit Ethernet adapter that can be configured to run either port at 10, 100, or 1000Mbps data rates.

Attributes

1. Interfaces to the system via a PCI or PCI-X bus and connects to a network using a 4-pair CAT-5 Unshielded Twisted Pair (UTP) cable for distances of up to 100m.
2. Conforms to the IEEE 802.3ab 1000Base-T standard. The adapter also supports jumbo frames when running at the 1000 Mbps speed.
3. #5706 supports Large Send (TCP Segmentation). This function offloads the TCP segmentation operation from the AIX IP layer to the adapter for outgoing (transmit side) TCP segments.
4. #5706 also supports Checksum Offload function, which offloads the TCP/UDP Checksum Operation or workload from the CPU to the adapter.
5. AIX Network Install Manager (NIM) boot capability is supported with this adapter.
6. #5706 is supported in 3V PCI or PCI-X card slots (either long or short). However, for optimum performance, the adapter should be placed in a 64 bit PCI-X card slot.
7. #5706 does not support SNA
8. 1000Mbps speed is not supported in Half Duplex (HDX) mode.

Systems manufactured prior to October 25, 2002 may require a system firmware update. Check the following Web URL after October 25, 2002 to review and download latest firmware if needed. http://www.austin.ibm.com/support/micro/

pSeries Rules

1. AIX 5.1 or later, AIX 5.2 or later
2. Max: 5 per FC 6563 PCI Planar
3. Max: 10 per FC 6571 PCI-X planar

p5 Maximums

1. Max 6: 9111-520
2. Max 5: 9113-550
3. Max 24: 9117-570
4. Max 160: 9119-590
5. Max 192: 9119-590

Supported OS levels:

1. AIX 5.2 or AIX 5.3 or later
2. SUSE LINUX Enterprise Server 9 for POWER, or later
3. Red Hat Enterprise Linux AS for POWER Version 3

5707	2-Port Gigabit Ethernet-SX PCI-X Adapter (Type 5707)

2-Port Gigabit Ethernet-SX PCI-X Adapter provides 2x 1Gbps (1000 Base-SX) full-duplex Ethernet LAN connections with throughput on a standard shortwave multimode optical cable that conforms to the IEEE 802.3z standard.

Attributes

1. Supports distances of 260m for 62.5 micron Multi Mode Fiber (MMF) and 550m for 50.0 micron MMF.
2. #5707 supports Large Send (TCP Segmentation). This function offloads the TCP segmentation operation from the AIX IP layer to the adapter for outgoing (transmit side) TCP segments.
3. #5707 also supports Checksum Offload function, which offloads the TCP/UDP Checksum Operation or workload from the CPU to the adapter.
4. For pSeries, AIX Network Install Manager (NIM) boot capability is supported.
5. One 3V PCI or PCI-X card slot (short or long). For optimum performance, the adapter should be placed in a 64 bit PCI-X card slot whenever possible.
6. The #5707 does not support SNA.
7. Half Duplex (HDX) mode is not supported.
8. #5707 incorporates an LC type connector on the card. If connecting to older SC type connector networks a converter cable is required, as follows:
    - #2456 LC-SC 50 Micron Fiber Converter Cable
    - #2459 LC-SC 62.5 Micron Fiber Converter Cable

Systems manufactured prior to October 25, 2002 may require a system firmware update. Check the following Web URL: http://www.austin.ibm.com/support/micro/

pSeries Maximums

1. Max 5 per #6563 PCI Planar
2. Max 10 per #6571 PCI-X planar

p5 Maximums

1. Max 6: 9111-520
2. Max 5: 9113-550
3. Max 24: 9117-570
4. Max 160: 9119-590
5. Max 192: 9119-595

OS Requirements

1. pSeries: AIX 5.1 or later
2. p5: AIX 5.2 or AIX 5.3 or later
3. SUSE LINUX Enterprise Server 9 for POWER, or later
4. Red Hat Enterprise Linux AS for POWER Version 3

5718	10-Gigabit Ethernet PCI-X Adapter

Provides 10 Gigabit Ethernet PCI-X based server connections.

Supports distances of up to 33m using 62.5 um multimode fiber or 300m using 50 um multimode fiber with 2000MHz km minimum model bandwidth at 850nm.

Attributes
1. Adapter connector type is LC.
2. Supported in PCI-X slots only

p5 OS Requirements
1. AIX V5.2.H and higher (No AIX V4 Support)
2. OS level required: AIX 5.2 or AIX 5.3 or later
3. Red Hat Enterprise Linux AS for POWER Version 3 or later
4. SUSE LINUX Enterprise Server 9 for POWER or later

p5 Maximums
1. Max 2: 9111-520
2. Max 1: 9113-550
3. Max 8: 9117-570
4. Max 16: 9119-590 (4 per I/O Drawer)
5. Max 24: 9119-595 (4 per I/O Drawer)

5719	10 Gigabit Ethernet-LR PCI-X Adapter

Provides 10 Gigabit Ethernet PCI-X based server connections over a maximum of 10 kilometers of 1310nm single-mode fiber optic cable.

The adapter conforms to the IEEE 802.3ae standard and requires 9um Single-Mode Fiber Optic Cables

The Adapter uses a SC type connector.

9110-510: Max: 1
9111-520: Max: 1
9113-550: Max: 2
9117-570: Max: 2
9118-575: Max: 4
9119-590: Max: 16 = 2 per I/O Drawer
9119-595: Max: 24 = 2 per I/O Drawer

AIX 5L for POWER V5.2 with 5200-04 Maint Pack (APAR IY56722) - plus APAR IY60347 or AIX 5L V5.3 with APAR IY60349

5740	10/100/1000 Base-TX Ethernet , 4-Port (Copper)

The 4-Port 10/100/1000 Base -TX PCI-X adapter is a full height PCI-X 1.0a Ethernet adapter which supports four Gigabit ports on a single adapter, delivers increased bandwidth for slot-constrained servers, and is designed to provide high connectivity and reliability using two integrated, dual-port Gigabit Ethernet controllers.

- Four RJ-45 ports
- 3.3 volts, 64-bit 133 MHz with 64-bit Bus Mastering on the PCI-X bus
- IEEE 802.3ab 1000Base-T compliant
- IEEE 802.3u 100Base-T compliant
- IEEE 802.3 10Base-T compliant
- 802.1q VLAN tagging
- Interrupt Moderation
- TCP Segmentation offload and encapsulation in hardware
- Checksum offloading of IP, TCP, and UDP frame
- Increased connectivity while significantly reducing CPU utilization
- Two LED adapter status indicators per port for link activity and speed
- NIM is supported on all 4 ports
- RoHS compliant

Limit Full bandwidth performance may not be achieved with more than one adapter per PCI Host Bridge (PHB) or more than one CPU.

- Attributes provided: Four 10/100/1000 RJ-45 ports
- Attributes required: One available PCI-X card slot
    - OS level required: AIX 5.2 or AIX 5.3, or later. SUSE Linux Enterprise Server 9 for POWER, or later. Red Hat Enterprise Linux AS 4 for POWER, or later. Refer to the following URL for systems and features that operate with Linux:

Network Definitions

10/100 Dual speed
Network components that support devices based on both Ethernet (10 Mbps) and Fast Ethernet (100 Mbps) technologies.

10 BaseT
A sub specification of IEEE 802.3 that requires the use of unshielded twisted pair telephone cabling with RJ-45 phone jacks to be used by Ethernet applications. The maximum length of a segment of twisted pair cable is 330 feet.

100BaseT
The IEEE specifications for Fast Ethernet networks.

10Base2 coaxial cable
The IEEE specifications for thin wire or thin net Ethernet network cable with a maximum segment length of 185 meters.

10Base5 coaxial cable
The IEEE specifications for thick wire Ethernet network cable with a maximum segment length of 500 meters.

802.11
An IEEE specification for wireless networking in the 2.4GHz frequency range with a maximum 2Mbps data transfer rate.

802.11a
An IEEE specification for wireless networking in the 5GHz frequency range with a maximum 54Mbps data transfer rate. The 802.11a specification also includes QoS (Quality of Service) technology to protect voice and multimedia data. At this time no 802.11a products are available on the market.

IEEE 802.11b
International standard networking technology for LAN wireless implementations that revised 802.11 to increase transmission speeds to 11Mbps.

802.11e
A proposed IEEE specification that will include QoS (Quality of Service) features, particularly the ability to recognize and prioritize different types of data, and security provisions. The specification draft has not yet been ratified by the IEEE.

IEEE 802.3
International standard networking technology for Ethernet implementations.

Access point
A wireless LAN transceiver that bridges a wired LAN to wireless devices.

Active Hub
Self-powered USB hubs that have their own power supply and are able to supply power to USB devices that require 100mA or more power. USB hubs without power supplies are referred to as passive hubs.

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Adapter
An electronic card or that installs in a PC's PCI or ISA slot or plugs into a PC Card slot or USB port to expand the PC's functionality.

AppleTalk
Apple Computer's networking application for Macintosh computers.

Asymmetric Digital Subscriber Line (ADSL)
A version of digital subscriber line technology with a range of 18,000 feet that transmits over a single copper twisted pair cable at upstream rates of 16 to 640 Kbps and downstream rates of 1.5 to 9 Mbps.

Attenuation
A decrease in a signal's strength (measured in decibels) as it transmits over wires or cables. The shorter the wire or cable the less attenuation occurs.

Backbone
The centralized part of a large network that links two or more subnetworks and is the primary path for data transmission.

Bandwidth
The amount of transmission capacity that is available on a network at any point in time. Available bandwidth is dependent on factors such as the rate of data transmission speed between networked devices and the type of device used to connect PCs to a network.

Baseband
A transmission method in which digital signals are carried over the entire bandwidth of a transmission medium.

Bidirectional
The ability to transmit signals in two directions.

Bits per second (bps)
A measure of data transmission speeds over communication lines based on the number of bits that can be sent or received per second.

Bluetooth wireless technology
A technology specification for linking portable computers, personal digital assistants (PDAs), and mobile phones for short-range transmission of voice and data across a global radio frequency band without the need for cables or wires. Bluetooth is a frequency hopping technology in the 2.4GHz frequency spectrum, with a range of 30 feet.

Bridge
A device that links two local networks using the same communications protocol and allows them to interface with other networks as a single network.

Broadband
A data transmission system that supports analog and digital transmission of multiple voice, data, and video signals simultaneously over the bandwidth of a single medium at relatively high speeds.

Bus
A path inside a computer consisting of wires and other components for transmitting signals within a computer and among a computer and its peripherals.

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Bytes per second (Bps)
A measure of data transmission speeds over communication lines based on the number of bytes that can be sent or received per second.

Cable modem
A modem that links a computer to a cable TV service for a 24/7 broadband Internet connection.

Cable networking
Linking computers and peripherals with bundled wires for the purpose of sharing resources.

CardBus
32-bit standard for PC Card expansion devices. Combines support for legacy 16-bit Release 2.0 PC Cards and 32-bit PCI bus. Maximum throughput in burst mode transferring double-words (dwords) is 132MB/sec, or 66MB/sec in word mode, and 33MB/sec in byte mode. Requires Windows 98 or later operating system with limited support by Windows 95.

Carrier Sense Multiple Access with Collision Detection (CSMA/CD)
A method of managing traffic on an Ethernet network whereby a network device transmits data if it detects that a channel is available; if two devices transmit data simultaneously the sending devices detect a collision and retransmits after a random time delay.

Category 3 or Cat3 Cable
Twisted pair copper cables rated for low data rate networks such as 10Mbps Ethernet.

Category 5 or Cat5 Cable
Twisted pair copper cables rated for 10Mbps and 100Mbps date rates used for Fast Ethernet or 10/100 Ethernet.

Category 5e or Cat5e Cable
Twisted pair copper cables rated for 10Mbps, 100Mbps, and 1000Mbps (1Gbps) data rates.

Category 7 or Cat7 Cable
A proposed standard of twisted pair copper cables that with 600MHz frequency support (in contrast Cat5 and Cat5e each are 100MHz frequency standards).

Client
A networked PC that takes resources from a server and does not share its resources with other devices on the network.

Coax
See Coaxial cable.

Coaxial cable
Conductor used in Ethernet networks that is protected with shields of wire mesh and plastic insulation.

Collision
A CSMA/CD error condition that occurs when two computers transmit data simultaneously.

Collision avoidance
A network node characteristic for proactively detecting that it can transmit a signal without risking a collision.

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Communications protocol
Hardware and software specifications for a network communication method.

Convergence
The evolution in networking whereby digital voice, data, and video are transmitted across networks within a common communications system.

Cross-over cable
Conductor for networking two computers without the use of a hub.

Dial-up
A communication connection via the standard telephone network or Plain Old Telephone Service (POTS).

Digital Subscriber Line (DSL)
Various protocols for high-speed data, voice, and video transmission over twisted-pair copper POTS telephone wires.

Data-over-Cable Service Interface (DOCSIS) compliant
In accordance with technical specifications for cable equipment used by both users and service providers.

Domain Name System (DNS)
A program that translates URLs to IP addresses by accessing a database maintained on a collection of Internet servers. The program works behind the scenes to facilitate surfing the Web with alpha versus numeric addresses.

Downstream
Data flowing on a network traffic path from a service provider to an end user.

Dynamic Host Control Protocol (DHCP)
A utility that enables a server to dynamically assign IP addresses from a predefined list and limit their time of use so that they can be reassigned.

Ethernet
International standard networking technology for wired implementations with a speed of 10 Mbps.

EtherTalk
Apple Computer's support for Ethernet on its AppleTalk networking application

Fast Ethernet
International standard networking technology for wired implementations with a speed of 100 Mbps.

Firewall
A system that secures a network and prevents network access by unauthorized users.

FireWire
The IEEE 1394 standard for input/output technology for connecting high speed multimedia peripherals to a PC.

Forward Error Correction (FOE)
A class of technologies for improving communications bandwidth by correcting data bit parity errors on the receiving side of a communications transaction rather than requiring retransmission of data from the sending side of the transaction. Acronym "FEC" also used to be common.

Frame Relay
An efficient WAN technology that transmits data in packets or envelopes in bursts at standard speeds of 56Kbps.

Frequency
A measure of radio waves in cycles per second.

Gateway
Hardware and software for connecting networks using different technologies, such as Ethernet and powerline networks.

Gigabit
One billion bits.

1 Gigabit Ethernet -
There are two standards within the 1 Gigabit Ethernet specification: 802.3z standard 1000Base-X, which uses fiber optic media; and 802.3ab 1000Base-T, which uses twisted pair (copper) media. The maximum nominal data transfer rate is 1,000 megabits per second.

Gigahertz (GHz)
A measure of frequency in one billion cycles per second.

Hertz (Hz)
A measure of frequency in one cycle per second.

High-bit Rate Digital Subscriber Line (HDSL)
A version of digital subscriber line technology with a range of 12,000 feet that transmits over two twisted pair cables at a rate of 1.544 Mbps.

Home network
A home-based Local Area Network (LAN).

Home Phoneline Networking Alliance (HomePNA)
A networking industry group of companies working towards standardization of specifications for phoneline networking products and an expansion in market demand for such products.

Home Radio Frequency Working Group (HRFWG)
A networking industry group of companies working toward standardization of specifications for radio frequency networking products and an expansion in market demand for such products.

HomePlug Powerline Alliance (HomePlug)
A networking industry group of companies working toward standardization of specifications for powerline networking products and an expansion in market demand for such products.

Hops Count
A measure between two points on a network based on the number of adapter cards a transmission crosses.

Hub
A multi-port device used to connect PCs to a network. Each networked PC using Ethernet or Fast Ethernet is cabled to a hub, which can have 4,5,8,12,16, or 24 ports and can transmit data at either 10 Mbps or 100 Mbps or 10/100 dual speed. A hub transmits packets it receives to all ports. Hubs can be cabled together for network expansion. A hub's primary advantage is that its LEDs signal problems with any networked PC, while a network's operation is not impacted by problems on any one PC.

Industry Standard Architecture (ISA) card
An adapter that fits into an ISA slot of a PC motherboard.

Industry Standard Architecture (ISA) slot
An expansion bus for adapter cards used in PCs since the IBM AT model. ISA slots do not automatically assign IRQs to enable plug and play functionality.

Infrared Data Association (IrDA)
An international non-profit organization that develops and promotes technical standards for electronic data exchange between computing devices via wireless infrared light.

Institute of Electrical and Electronic Engineers (IEEE)
An international organization that sets electronic and electrical standards.

Integrated Services Digital Network (ISDN)
An ITU B64standard for bidirectional transmission of voice, data, and video signals over public or private telephone digital networks.

International Telecommunications Union (ITU)
A global organization whose mission is to adopt telecommunications treaties, regulations, and standards

Internet appliance
A computer that is intended primarily for Internet access via dial-up, cable, or network access. The devices are simple to set up and do not support installation of third-party software. They generally offer customized browsing, touch screen navigation, PIM applications and possibly PDA synchronization.

Internet Protocol (IP) address
A string of numbers assigned to each PC on a network. The IP address is used by the Internet Protocol to locate each device on the network.

Internet Service Provider (ISP)
A company that provides Internet access to individuals and businesses, either fee-based or for free.

Internet Sharing Software (ISS)
An application that allows all PCs on a network access the Internet simultaneously through a single modem and Internet Service Provider (ISP) account.

IP Telephony
Technology that supports voice, data, and video transmission via IP-based LANs, WANs, and the Internet. Voice Over IP is one technology protocol in the broader concept of IP Telephony. The promise and advantage of IP Telephony is that applications will be less media and location dependent as with Public Switched Telephone Network (PSTN) telephony.

Jitter
Signal distortion on an analog communication line.

Kilobits per second (kbps)
A measure of data transmission speed over communication lines in one thousand bits per second.

Kilobytes per second (Kbps)
A measure of data transmission speed over communication lines in one thousand bytes per second.

Latency
A measure of packet transmission time from the time a data transmission request is made by a device to the time the data is actually transmitted.

Local Area Network (LAN)
A system of connecting PCs and other devices within the same physical proximity for sharing resources, such as an Internet connections, printer, files, and drives.

Mapping
Assigning a PC to a shared drive or printer port on a network.

Megabits per second (Mbps)
A measure of data transmission speed over communication lines in one million bits per second.

Megahertz (MHz)
A measure of frequency in one million cycles per second.

Modem
A device that handles the modulation/demodulation process, i.e., from the sending device, digital computer signals are converted into analog signals that are transmitted over a phone line, and at the receiving point, analog signals are reconverted into digital signals.

Multimedia
Information that is simultaneously transmitted in multiple formats, including text, graphics, audio, and video

Network access point
Data exchange points for Internet Service Providers.

Network adapter
See Network Interface Card (NIC).

Network Address Translator (NAT)
A network capability that allows for the dynamic reuse of a single IP address for all PCs on a network.

Network architecture
The components and design of a network.

Network Interface Card (NIC)
A type of PC adapter card that attaches to a network cable to provide two-way communication between the computer and network devices, such as a hub or switch. NICs can operate at 10 Mbps (Ethernet) or 100 Mbps (Fast Ethernet) or 10/100 Mbps dual speed.

Network operating system (NOS)
The software that runs on a network server to control network functions.

Noise
Unneeded network signals that degrade network performance.

Open Systems Interconnect Reference Model (OSI)
An International Standards Organization network model based on seven integrated layers of communication standards for computers in a network.

Packet
A segment of data sent over a network whose size and format is governed by the communications protocol used.

PC Card
A removable expansion card that fits into a PCMCIA standard slot – primarily used in portable devices, particularly notebook computers and PDAs. PC Card peripherals include memory cards, modems, NICs, hard drives, and interface adapters. All PC Cards are 85.6mm long and 54.0mm wide. Three types of PC Cards include Type I (3.3mm thick), Type II (5.0mm thick), and Type III (10.5mm thick). Release 1.0 cards supported memory devices only, release 2.0 supported memory and I/O. The original PCMCIA PC Cards were 16-bit devices with a maximum throughput of 20MBps for memory transfers and 7.84MBps for I/O transfers, both in word mode. 32-bit CardBus PC Cards have a 132MB/sec maximum burst transfer rate in double-word mode.

Personal Computer Memory Card International Association (PCMCIA)
Personal Computer Memory Card International Association. A standards organization that defines the specifications for and promotes PC Card technology. Expansion cards now referred to as "PC Cards" were originally called "PCMCIA Cards."

Passive Hub
USB hubs that do not have their own power supply and are not sufficient to power USB devices that require more than 100mA.

Peer-to-peer network
A computer network that has no server. All networked PCs are equally able to act as a network server or clients.

Peripheral Component Interconnect (PCI) card
An adapter that fits into a PCI slot in a PC motherboard.

Peripheral Component Interconnect (PCI) slot
A high speed expansion bus for adapter cards developed by Intel and incorporated in Pentium computers. One advantage of PCI slots is that they automatically assign IRQs to enable plug and play functionality.

Plug and Play(PnP)
A computer system feature that provides for automatic configuration of add-ons.

POTS
Plain old telephone service, I.e., standard analog telephone service.

Proxy server
A server that prevents direct communication between two or more networks but forwards alllowable data requests to remote servers and/or responds to data requests directly from stored remote server data.

Public Switched Telephone Network (PSTN)
The global public telephone network.

Redirection
A networking application function that intercepts and reroutes input and output requests for networked devices.

Residential
Home-based.

Residential Gateway
A device that enables Internet access sharing by multiple PCs and other devices on a home network.

RJ-11 connector
A phone line connector used to connect a phone to a phone jack, to connect computers to a home phone line, and a modem to a phone line.

RJ-45 connector
An eight-pin serial connector for Ethernet cables that is slightly wider than a RJ-11 connector.

Router
A type of bridge that can link networks using different protocols and can link local and remote networks.

Scalable
A network characteristic related to its ability to expand and contract based on revised requirements.

Server
A PC that provides its resources to other PCs on a network. A dedicated server only provides resources; if its resources are used directly then it also functions as a client.

Shared bandwidth
The division of network transmission capacity among multiple networked devices.

ShareWave
Home networking wireless technologies that are an extension of the 802.11b standard and are optimized for multimedia content.

Shielded twisted pair cable
A casing containing one or more pairs of copper wires that are wrapped around each other that is used as a network communications transmission medium.

Single-line Digital Subscriber Line (SDSL)
A version of digital subscriber line technology with a range of 10,000 feet that transmits over a single copper twisted pair cable at a rate of 1.544 Mbps.

Streaming digital audio
Sound that is transmitted in a fashion so that it is received in a format that retains the order in which it was sent and therefore it can be played from the time the transmission initializes.

Streaming digital video
Moving images that are transmitted in a fashion that they are received in a format that retains the order in which they were sent and therefore can be played from the time the transmission initializes.

Subnetwork
A network segment that is created to simplify addressing and is connected to the central network through a router, hub, or gateway.

Shared Wireless Access Protocol (SWAP) standard
HomeRF standard for voice and data transmissions in the 2.4 GHz band of the Public Switched Telephone Network and the Internet to provide a range to cover a typical home and yard.

Switch
A type of hub that efficiently controls the way multiple devices use the same bandwidth so that each can operate at full bandwidth resulting in faster performance than with a hub. Rather than transmitting packets it receives to all ports as with a hub, a switch transmits packets to only the receiving port.

TCP / IP
Transmission Control Protocol/Internet Protocol. The standard Internet communication protocol.

Telephony
The conversion of audio to electrical signals that are transmitted over copper wire or radio waves. With respect to the Interet, services that use computer networks to transmit voice with data.

Throughput
The speed at which data travels through a network.

Token Ring
A network architecture where one data packet at a time is passed around a loop in one direction until it connects with its receiving computer.

Transceiver
A component of a Network Interface Card (NIC) that connects the card to a network cable and enables the two-way transmission of network signals.

UNIX
The operating system developed by AT&T Bell Laboratories that is used for the Internet infrastructure and many server applications. Linux and BSD Unix are derivatives, as are many other versions.

Unshielded twisted pair (UTP) cable
A wire transmission medium used in 10BaseT networks that is protected with light plastic versus heavy metal and is therefore prone to interference.

Uplink port
A connector on a LAN hub to link a hub or a subnetwork to a port on a second hub. Some hubs have a separate port for uplinking; others have a single port that can be switched between a single device port or an uplink port.

Upstream
Data flowing on a network traffic path from an end user to a service provider.

V.90
Protocol for dial-up modems that supports nominal 56K transfer speeds. In reality the maximum transfer speed limits are 53K for downloading and 33.6K for uploading.

V.92
Protocol for dial-up modems that supports nominal 56K transfer speeds and manual adjustments for downloading and uploading speeds that exceed those of the v.90 dial-up modem protocol.

Very High Data Rate Digital Subscriber Line (VDSL)
A version of digital subscriber line technology with a range of 1,000 to 4,500 feet that transmits over a single copper twisted pair cable at upstream rates of 1.5 to 2.3 Mbps and downstream rates of 13 to 52 Mbps.

Virtual Private Network (VPN)
A data network created by companies using the Internet with secured protocols to preclude unauthorized access.

Voice over IP
Voice transmission in digital packets over the Internet, which is less expensive than voice transmission in analog packets using POTS.

WebCam
A Web page that displays still images or video that is captured by a digital camera connected to a PC.

Wide Area Network (WAN)
A communication system of connecting PCs and other devices across a large local, regional, national, or international geographic area.

Wi-Fi
Wireless-Fidelity. A designation by the Wireless Ethernet Compatibility Alliance (WECA) that an 802.11b wireless network component meets the compatibility standard set for interoperability with other 802.11b products.

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About the authorship of this paper

This GST Research Report was prepared by GST's Research & Engineering Group under the leadership of David Breisacher, CEO/Chairman at GST. David is the founder of several successful companies, including GST and BCC Technologies, a manufacturer of eServer disk, tape and memory storage devices. A visionary for the storage industry since the early 90's, David lends his market insight and predictions for the IBM midrange storage marketplace to the research conducted at GST. His experience in sensing shifts in technology and industry directions has made it possible for him to organize and structure successful companies to rapidly meet the evolving needs of storage users.

About GST, Inc.

GST, Inc. (http://www.gstinc.com) engineers, manufactures, markets and sells a line of innovative storage products to meet the need for high-performance, continuous reliability and cost-effective data storage. These products include tape solutions available today, and will include storage-related services, software and disk subsystems in the future. A comprehensive array of tape solutions range from single and dual tape subsystems, autoloaders, midrange tape libraries, to modular enterprise-wide tape libraries, with focus on improved backup and disaster recovery solutions. Modular design enables field upgrades, scalability, investment protection for existing GST tape solutions, and lower life-cycle costs. GST's product development is guided by several advisory boards to closely track market needs and fully utilize the latest engineering developments in product design. Complete information about products, support and company background can be found at the company's Website.

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