CCNA 1 v3.1 Module 1 Introduction to Networking

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Objectives

Upon completion of this module, the student will be able to perform tasks related to the following:	
1.1	Connecting to the Internet
1.2	Network Math

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Requirements for Internet Connection

The requirements for Internet connection include the following:

- Physical connection
- Logical connection
- Applications that interpret the data and display the information

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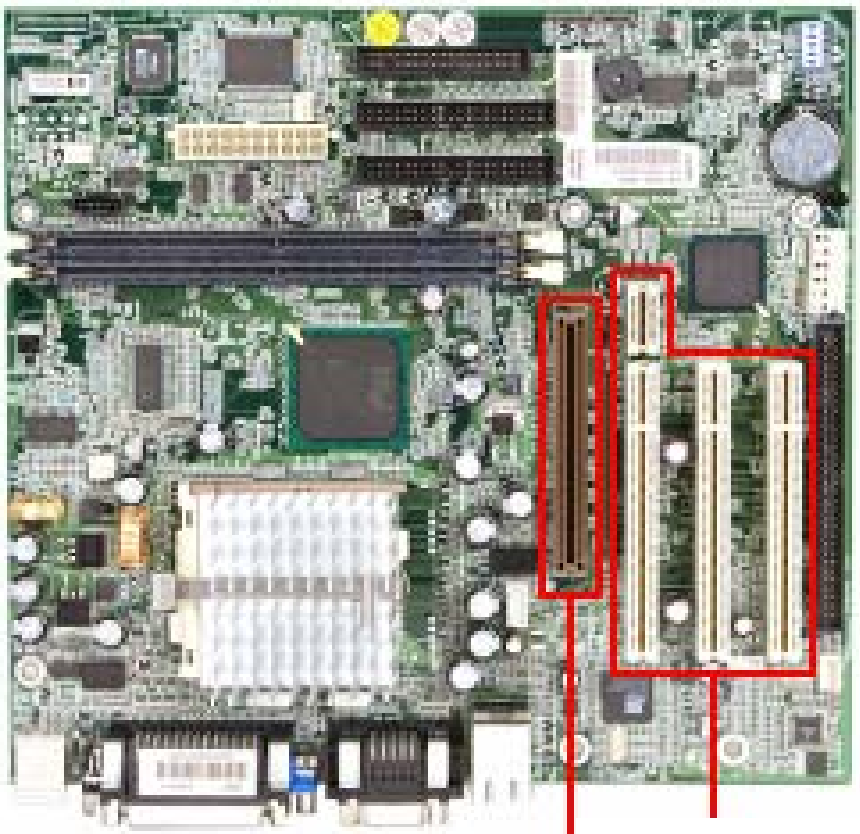
PC Basics



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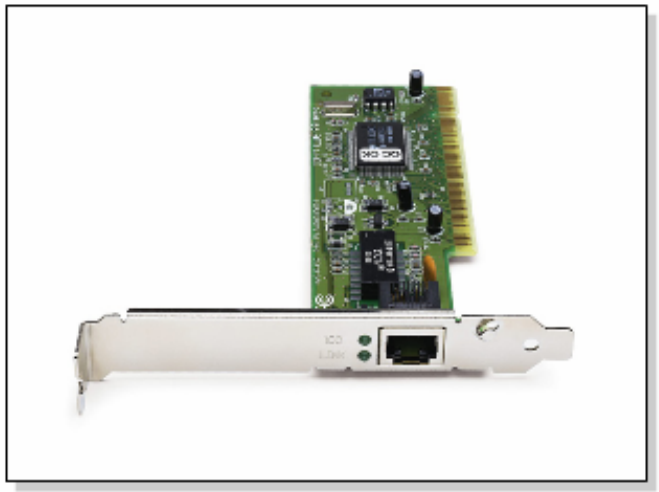
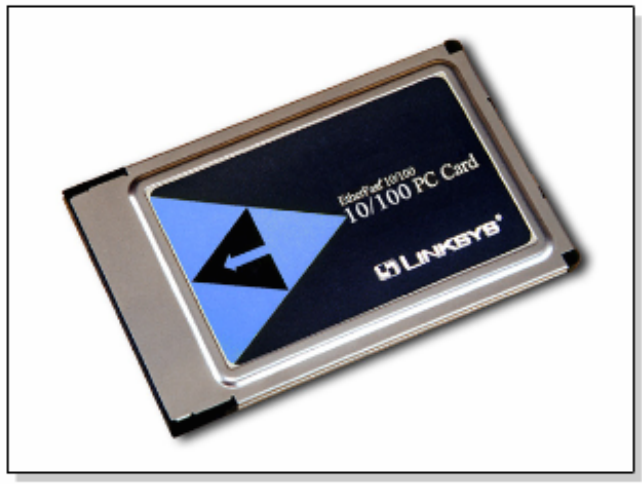
Network Interface Cards



Internal network interface card



PCMCIA Network interface card

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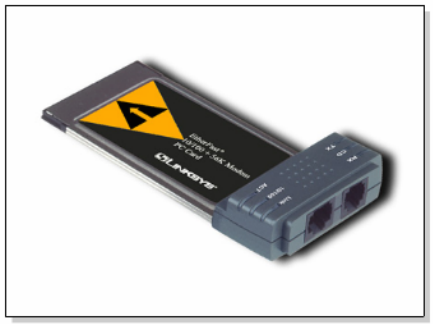
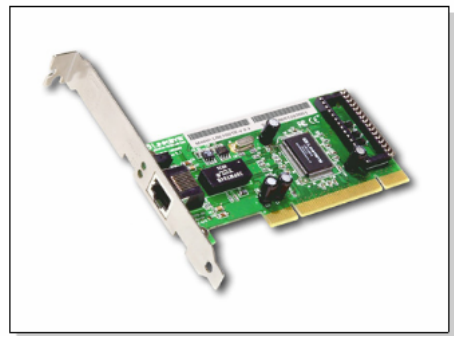
NIC and Modem Installation





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High-Speed and Dialup Connectivity

Connectivity Overview

- In early 1960s, modems were introduced to provide connectivity for dumb terminals to a centrally based computer
- In 1970s, BBS allowed users to connect and post or read messages on a discussion board
- In 1980s, the transfer of files and graphics became desirable
- In 1990s, modem speed increased up to 56 kbps
- In 2000, high-speed services became desirable

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TCP/IP Description and Configuration

- TCP/IP is a set of protocols developed to allow computers to share resources
- TCP/IP can be configured using the operating system tools

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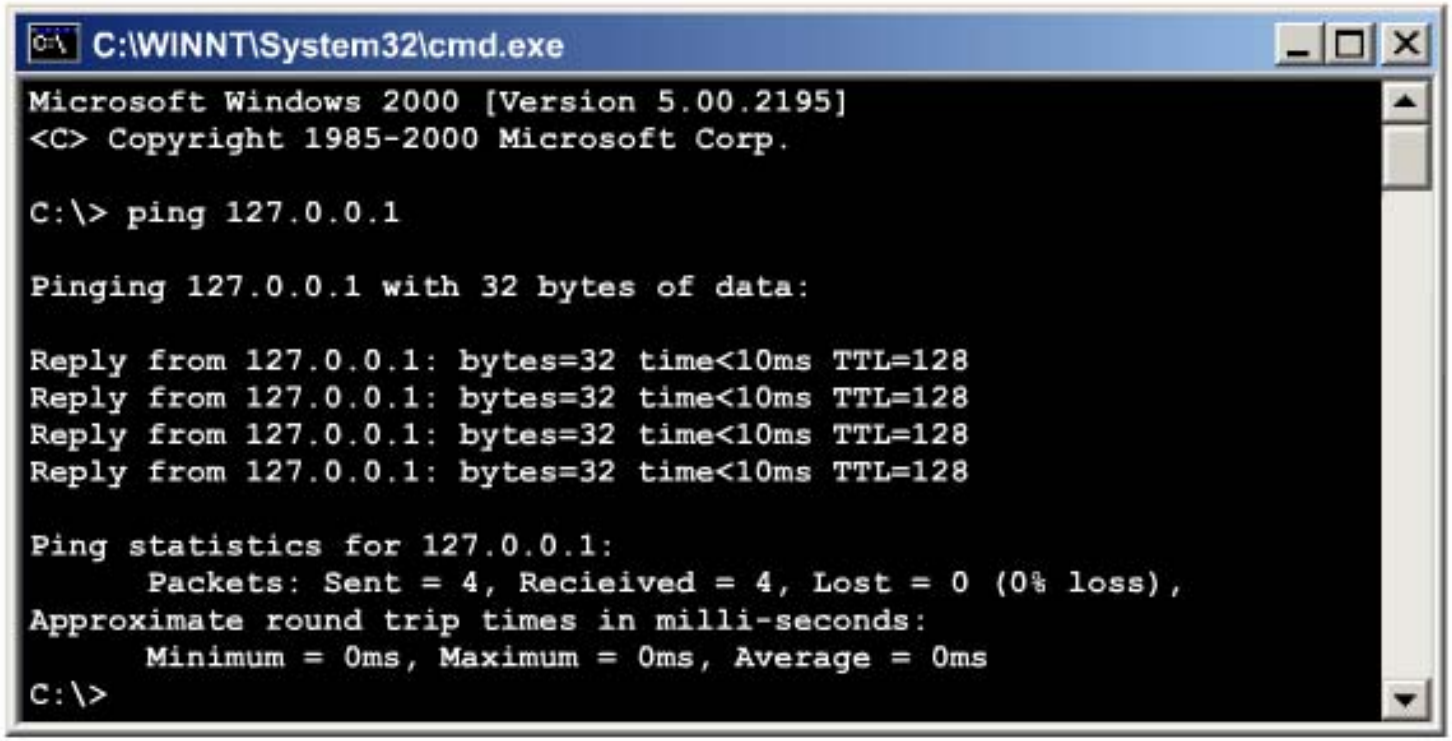
Testing Connectivity with Ping



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Binary Number System

Keyboard	Binary Code
A	01000001
B	01000010
C	01000011
D	01000100
E	01000101
F	01000110
G	01000111
H	01001000

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Bits and Bytes

Units	Definition	Bytes*	Bits*	Examples
Bit (b)	Binary digit, a 1 or 0	1 bit	1 bit	On/Off; Open/Closed +5 Volts or 0 Volts
Byte (B)	Usually 8 bits	1 byte	8 bits	Represent the letter "X" as ASCII code
Kilobyte (KB)	1 kilobyte = 1024 bytes	1000 bytes	8,000 bits	Typical Email = 2 KB 10-page report = 10 KB Early PCs = 64 KB of RAM
Megabyte (MB)	1 megabyte = 1024 kilobytes = 1,048,576 bytes	1 million bytes	8 million bits	Floppy disks = 1.44 MB Typical RAM = 32 MB CDROM = 650 MB
Gigabyte (GB)	1 gigabyte = 1024 megabytes =1,073741,824 bytes	1 billion bytes	8 billion bits	Typical Hard Drive = 4 GB
Terabyte (TB)	1 terabyte = 1024 gigabytes = 1,099,511,627,778 bytes	1 trillion bytes	8 trillion bits	Amount of data theoretically transmittable in optical fiber in one second

* Common or approximate bytes or bits

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Base 10 Numbers

Place Value	1000's 100's 10's 1's
Base Exponent	$10^3 = 1000$ $10^2 = 100$ $10^1 = 10$ $10^0 = 1$
Number of Symbols	10
Symbols	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
Rationale	Typical number of fingers equals 10.

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Base 2 (Binary) Numbers

Place Value	1000 100 10 1
Base$^{\text{Exponent}}$	$10^3 = 1000$ $10^2 = 100$ $10^1 = 10$ $10^0 = 1$
Number of Symbols	10
Symbols	0, 1, 2, 3, 4, 5, 6, 7, 8, 9
Rationale	Typical number of fingers equals ten

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Converting Decimal numbers to 8-bit Binary Numbers

Conversion exercise

Use the example below to convert the decimal number 168 to a binary number:

- 128 fits into 168. So the left most bit in the binary number is a 1. 168 - 128 leaves 40.
- 64 does not fit into 40. So the second bit in from the left is a 0.
- 32 fits into 40. So the third bit in from the left is a 1. 40 - 32 leaves 8.
- 16 does not fit into 8 so the fourth bit in from the left is a 0.
- 8 fits into 8. So the fifth bit in from the left is a 1. 8 - 8 leaves 0. So, the remaining bits to the right are all 0.

Result: Decimal 168 = 10101000

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Converting 8-bit Binary Numbers to Decimal Numbers

Convert the binary number 01110000 to a decimal number.

Note: Work from right to left. Remember that anything raised to the 0 power is 1. Therefore $2^0 = 1$

$$
\begin{aligned}
0 \times 2^0 &= 0 \\
0 \times 2^1 &= 0 \\
0 \times 2^2 &= 0 \\
0 \times 2^3 &= 0 \\
1 \times 2^4 &= 16 \\
1 \times 2^5 &= 32 \\
1 \times 2^6 &= 64 \\
+\ 0 \times 2^7 &= 0 \\
\hline
&112
\end{aligned}
$$

Note: The sum of the powers of 2 that have a 1 in their position

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Four-Octet Dotted-decimal Representation of 32-Bit Binary Numbers

Decimal	11001000		01110010		00000110		00110011
Binary	200	.	114	.	6	.	51
	number	dot	number	dot	number	dot	number

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Hexadecimal

Decimal	Binary	Hexadecimal
0	00000000	00
1	00000001	01
2	00000010	02
3	00000011	03
4	00000100	04
5	00000101	05
6	00000110	06
7	00000111	07
8	00001000	08
9	00001001	09
10	00001010	0A
11	00001011	0B
12	00001100	0C
13	00001101	0D
14	00001110	0E
15	00001111	0F
16	00010000	10
32	00100000	20
64	01000000	40
128	10000000	80
255	11111111	FF

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Boolean or Binary Logic

	Inputs	Output
NOT	x	f
AND	x y	f
	Voltage In	Voltage Out

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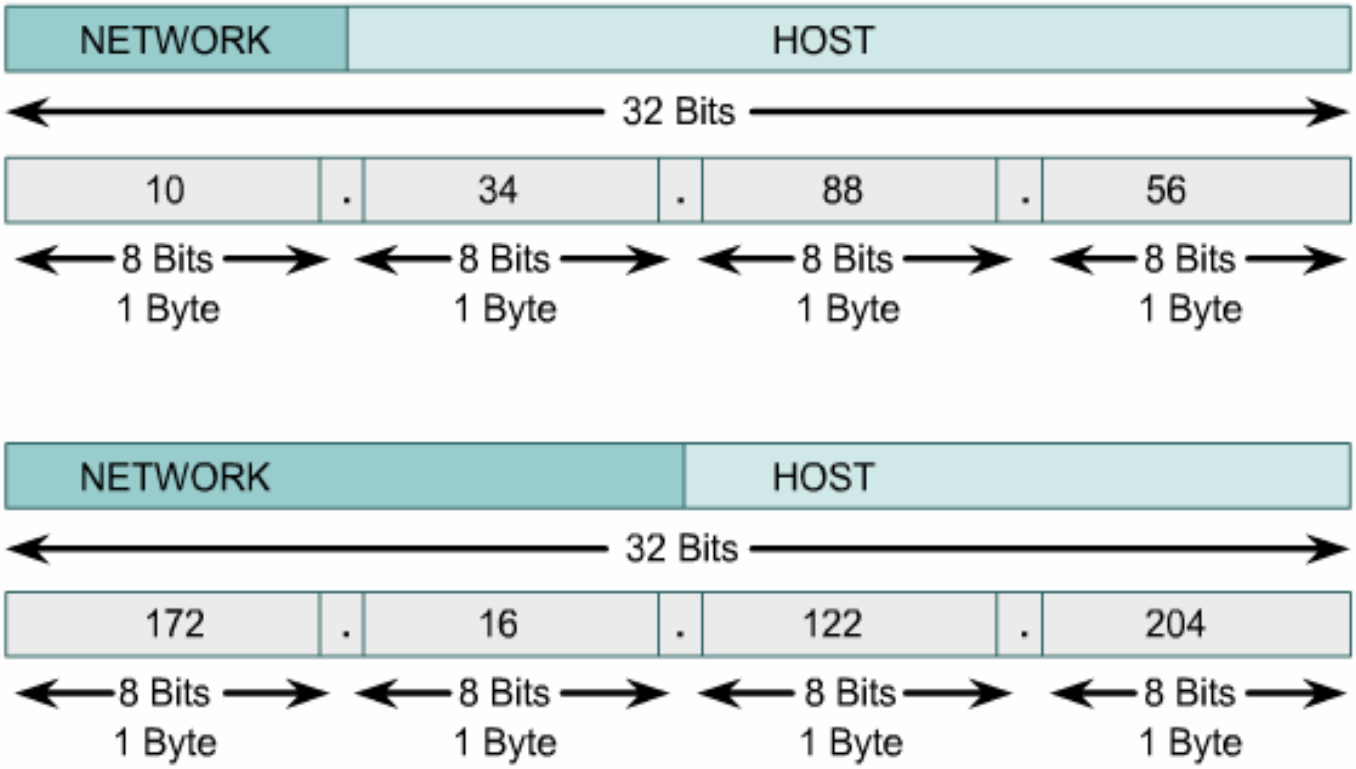
IP Addresses and Network Masks



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Summary

- Three requirements for an Internet connection are a physical connection, a logical connection, and a Web browser.
- Computers recognize and process data using a binary numbering system.
- The number system used most frequently is the decimal number system.
- The hexadecimal number system is used when working with computers because it can be used to represent binary numbers in a more readable form.

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