Data Communication and Network

Configuring and Troubleshooting TCP/IP

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Configuring and Troubleshooting TCP/IP

- On a TCP/IP network, each device (computer, router, or other device with a connection to the network) is referred to as a host. Each TCP/IP host is identified by a logical **IP address** that identifies a computer's location on the network in much the same way as a street address identifies a house on a street. Microsoft's implementation of TCP/IP enables a TCP/IP host to use a static Internet Protocol (IP) address or to obtain an IP address automatically from a **Dynamic Host Configuration Protocol** (DHCP) server.
- For simple network configurations based on local area networks (LANs), Windows XP also supports automatic assignment of IP addresses. Windows XP Professional includes many tools that you can use to troubleshoot TCP/IP and test connectivity.

After this lesson, you will be able to

- ■ Explain the use of IP addresses.
- ■ Configure TCP/IP to use a static IP address.
- ■ Configure TCP/IP to obtain an IP address automatically.
- ■ Explain the use of Automatic Private IP Addressing.
- ■ Specify an alternate TCP/IP configuration for a computer running Windows XP Professional.
- ■ Use TCP/IP tools to troubleshoot a connection.
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- Estimated lesson time: 60 minutes

What Is an IP Address?

	Decimal	Binary			
IP Address	135.109.15.42	10000111	01101101	00001111	00101010
Subnet Mask	255.255.0.0	11111111	11111111	00000000	00000000
Network ID	135.109.0.0	10000111	01101101	00000000	00000000
Host ID	0.0.15.42	00000000	00000000	00001111	00101010

Figure 13-1 The subnet mask separates the host ID and the network ID.

Table 13-1 IP Address Classes

Class	Network ID	Range of First Octet	Number of Available Network Segments	Number of Available Hosts	Subnet Mask
A	w.0.0.0	1–126	126	16,777,214	255.0.0.0
B	w.x.0.0	128–191	16,384	65,534	255.255.0.0
C	w.x.y.0	192–223	2,097,152	254	255.255.255.0
D	N/A	224–239	N/A	N/A	N/A
E	N/A	240–255	N/A	N/A	N/A

Private Addressing

Every network interface that is connected directly to the Internet must have an IP address registered with the Internet Assigned Numbers Authority (IANA), which prevents IP address conflicts between devices. If you are configuring a private network that is not connected to the Internet or one that exists behind a firewall or proxy server, you can configure devices on your network with private addresses and have only the public address configured on the interface that is visible to the Internet.

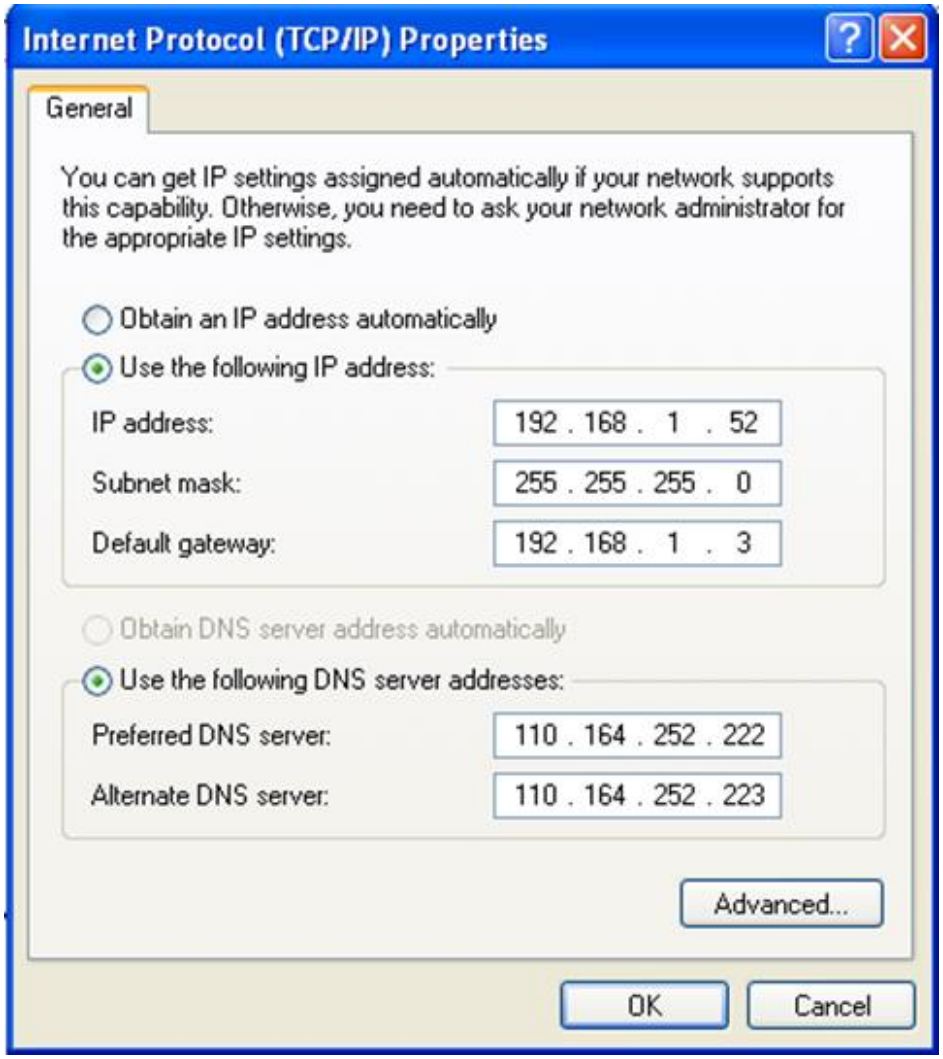
Each address class has a range of private addresses available for general use:

- Class A: 10.0.0.0 through 10.255.255.255
- Class B: 172.16.0.0 through 172.31.255.255
- Class C: 192.168.0.0 through 192.168.255.255

How to Configure TCP/IP to Use a Static IP Address

By default, client computers running Windows 95 and later are configured to obtain TCP/IP configuration information automatically. Automatic TCP/IP information is provided on a network using a DHCP server. When a client computer starts, it sends a broadcast message to the network looking for a DHCP server that can provide IP addressing information. Typically, most computers on a network should be configured to obtain IP addresses automatically because automatic addressing eliminates most of the errors and administrative overhead associated with assigning static IP addresses to clients. However, even in a DHCP-enabled environment, you should assign a static IP address to selected network computers. For example, the computer running the DHCP Service cannot be a DHCP client, so it must have a static IP address. If the DHCP Service is not available, you can also configure TCP/IP to use a static IP address. For each network adapter card that uses TCP/IP in a computer, you can configure an IP address, subnet mask, and default gateway, as shown in Figure 13-2.

Figure 13-2Configuring a static TCP/IP address in Windows XP Professional



	Decimal	Binary
IP Address	135.109.15.42	10000111 01101101 00001111 00101010
Subnet Mask	255.255.0.0	11111111 11111111 00000000 00000000
Network ID	135.109.0.0	10000111 01101101 00000000 00000000
Host ID	0.0.15.42	00000000 00000000 00001111 00101010

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135.109.015.042

255.255.0.0

135.109.015.042/16

135	109	015	042
10000111	01101101	00001111	00101010
255	255	0	0
11111111	11111111	00000000	00000000

AND

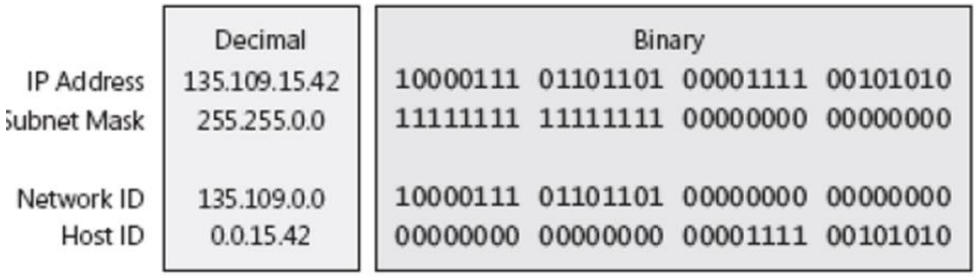
A	B	Y
0	0	0
0	1	0
1	0	0
1	1	1

ones' complement

A	Y
0	1
1	0

การหา **Network ID** และ **Host ID**

- Network ID = IP Address **AND** Subnet mask
- 1’Completement network ID=
- Host ID = IP **AND** 1’Completement network ID



	Decimal	Binary
IP Address	135.109.15.42	10000111 01101101 00001111 00101010
Subnet Mask	255.255.0.0	11111111 11111111 00000000 00000000
Network ID	135.109.0.0	10000111 01101101 00000000 00000000
Host ID	0.0.15.42	00000000 00000000 00001111 00101010

- 135.109.015.042=10000111.01101101.00001111.00101010
- 255.255.000.000=11111111.11111111.00000000.00000000
- Net ID= IP and Subnet mask
- ------IP-And SM --=10000111.01101101.00000000.00000000
- 1’Completement network ID=
- ----------=01111000.10010010.11111111.11111111
- Host ID = IP and 1’Completement network ID
- Host ID----------=00000000.00000000. 00001111.00101010

135.109.015.042/16 Network ID & Host ID

135	109	015	042
10000111	01101101	00001111	00101010
255	255	0	0
11111111	11111111	00000000	00000000

Network ID = IP Address AND Subnet mask

10000111 01101101 00000000 00000000

1'Completement Network ID=

01111000 10010010 11111111 11111111

Host ID = IP and 1'Completement Network ID

00000000 00000000 00001111 00101010

135.109.015.042/16
255.255.000.000

- 135.109.015.042=10000111.01101101.00001111.00101010
- 255.255.000.000=11111111.11111111.00000000.00000000
- Net ID= IP and Subnet mask
- ------IP-And SM --=10000111.01101101.00000000.00000000
- 1’Completement network ID=
- ----------=01111000.10010010.11111111.11111111
- Host ID = IP and 1’Completement network ID
- Host ID----------=00000000.00000000. 00001111.00101010

192.168.010.050/24 Network ID & Host ID

192	168	010	050
10000111	01101101	00001010	00101010
255	255	255	0
11111111	11111111	11111111	00000000

Network ID = IP Address AND Subnet mask

10000111 01101101 00001010 00000000

1'Completement Network ID=

01111000 10010010 11110101 11111111

Host ID = IP and 1'Completement Network ID

00000000 00000000 00000000 00101010

192.168.010.050/24

- 192.168.010.050=11000000.10101000.00001010.00110010
- 255.255.255.000=11111111.11111111.11111111.00000000
- Net ID= IP and Subnet mask
- ------Net ID---------=11000000.10101000.00001010.00000000
- 1’Completement network ID=
- ----------=00111111.01010111.11110101.11111111
- Host ID = IP and 1’Completement network ID
- Host ID----------=00000000.00000000.00000000.00110010

10.0.0.5/24

- 1111 1111.1111 1111.1111 1111.0000 0000
- 255.255.255.0

Network Address:	10.0.0.0	Class A (Private)
Broadcast Address:	10.0.0.255	
Valid Host Range:	10.0.0.1 - 10.0.0.254	

172.16.1.254/16

- 1111 1111.1111 1111.0000 0000.0000 0000
- 255.255.0.0

Network Address:	172.168.0.0	Class B
Broadcast Address:	172.168.255.255	
Valid Host Range:	172.168.0.1 - 172.168.255.254	

192.168.1.100/25

Network Address:	192.168.1.0	Class C (Private)
Broadcast Address:	192.168.1.127	
Valid Host Range:	192.168.1.1 - 192.168.1.126	

Mask 128 = 10000000 Inverse Mask 01111111 = 127

Subnet	Mask	Inverse Mask	Subnet Size	Host Range	Broadcast
192.168.1.0	255.255.255.128	0.0.0.127	126	192.168.1.1 to 192.168.1.126	192.168.1.127
192.168.1.128	255.255.255.128	0.0.0.127	126	192.168.1.129 to 192.168.1.254	192.168.1.255

192.168.1.200/28

Mask 240 = 11110000 Inverse Mask 00001111 = 15

Subnet	Mask	Inverse Mask	Subnet Size	Host Range	Broadcast
192.168.1.0	255.255.255.240	0.0.0.15	14	192.168.1.1 to 192.168.1.14	192.168.1.15
192.168.1.16	255.255.255.240	0.0.0.15	14	192.168.1.17 to 192.168.1.30	192.168.1.31
192.168.1.32	255.255.255.240	0.0.0.15	14	192.168.1.33 to 192.168.1.46	192.168.1.47
192.168.1.48	255.255.255.240	0.0.0.15	14	192.168.1.49 to 192.168.1.62	192.168.1.63
192.168.1.64	255.255.255.240	0.0.0.15	14	192.168.1.65 to 192.168.1.78	192.168.1.79
192.168.1.80	255.255.255.240	0.0.0.15	14	192.168.1.81 to 192.168.1.94	192.168.1.95
192.168.1.96	255.255.255.240	0.0.0.15	14	192.168.1.97 to 192.168.1.110	192.168.1.111
192.168.1.112	255.255.255.240	0.0.0.15	14	192.168.1.113 to 192.168.1.126	192.168.1.127
192.168.1.128	255.255.255.240	0.0.0.15	14	192.168.1.129 to 192.168.1.142	192.168.1.143
192.168.1.144	255.255.255.240	0.0.0.15	14	192.168.1.145 to 192.168.1.158	192.168.1.159
192.168.1.160	255.255.255.240	0.0.0.15	14	192.168.1.161 to 192.168.1.174	192.168.1.175
192.168.1.176	255.255.255.240	0.0.0.15	14	192.168.1.177 to 192.168.1.190	192.168.1.191
192.168.1.192	255.255.255.240	0.0.0.15	14	192.168.1.193 to 192.168.1.206	192.168.1.207
192.168.1.208	255.255.255.240	0.0.0.15	14	192.168.1.209 to 192.168.1.222	192.168.1.223
192.168.1.224	255.255.255.240	0.0.0.15	14	192.168.1.225 to 192.168.1.238	192.168.1.239
192.168.1.240	255.255.255.240	0.0.0.15	14	192.168.1.241 to 192.168.1.254	192.168.1.255