TCP/IP

UTILITIES

GUIDE

Arp

Displays and modifies entries in the Address Resolution Protocol (ARP) cache, which contains one or more tables that are used to store IP addresses and their resolved Ethernet or Token Ring physical addresses. There is a separate table for each Ethernet or Token Ring network adapter installed on your computer. Used without parameters, **arp** displays help.

Syntax

arp [**-a** [*InetAddr*] [**-N** *IfaceAddr*]] [**-g** [*InetAddr*] [**-N** *IfaceAddr*]] [**-d** *InetAddr* [*IfaceAddr*]] [**-s** *InetAddr EtherAddr* [*IfaceAddr*]]

Parameters

-a [*InetAddr*] [**-N** *IfaceAddr*]
: Displays current ARP cache tables for all interfaces. To display the ARP cache entry for a specific IP address, use **arp -a** with the *InetAddr* parameter, where *InetAddr* is an IP address. To display the ARP cache table for a specific interface, use the **-N** *IfaceAddr* parameter where *IfaceAddr* is the IP address assigned to the interface. The **-N** parameter is case-sensitive.

-g [*InetAddr*] [**-N** *IfaceAddr*]
: Identical to **-a**.

-d *InetAddr* [*IfaceAddr*]
: Deletes an entry with a specific IP address, where *InetAddr* is the IP address. To delete an entry in a table for a specific interface, use the *IfaceAddr* parameter where *IfaceAddr* is the IP address assigned to the interface. To delete all entries, use the asterisk (*) wildcard character in place of *InetAddr*.

-s *InetAddr EtherAddr* [*IfaceAddr*]
: Adds a static entry to the ARP cache that resolves the IP address *InetAddr* to the physical address *EtherAddr*. To add a static ARP cache entry to the table for a specific interface, use the *IfaceAddr* parameter where *IfaceAddr* is an IP address assigned to the interface.

/ ?
: Displays help at the command prompt.

Remarks

- The IP addresses for *InetAddr* and *IfaceAddr* are expressed in dotted decimal notation.
- The physical address for *EtherAddr* consists of six bytes expressed in hexadecimal notation and separated by hyphens (for example, 00-AA-00-4F-2A-9C).
- Entries added with the **-s** parameter are static and do not time out of the ARP cache. The entries are removed if the TCP/IP protocol is stopped and started. To create permanent static ARP cache entries, place the appropriate **arp** commands in a batch file and use **Scheduled Tasks** to run the batch file at startup.
- This command is available only if the **Internet Protocol (TCP/IP)** protocol is installed as a component in the properties of a network adapter in Network Connections

Examples

To display the ARP cache tables for all interfaces, type:

arp -a

To display the ARP cache table for the interface that is assigned the IP address 10.0.0.99, type:

arp -a -N 10.0.0.99

To add a static ARP cache entry that resolves the IP address 10.0.0.80 to the physical address 00-AA-00-4F-2A-9C, type:

arp -s 10.0.0.80 00-AA-00-4F-2A-9C

Formatting legend

Format	Meaning
Italic	Information that the user must supply
Bold	Elements that the user must type exactly as shown
Ellipsis (...)	Parameter that can be repeated several times in a command line
Between brackets ([])	Optional items
Between braces ({}); choices separated by pipe (|). Example: {even|odd}	Set of choices from which the user must choose only one
`Courier font`	Code or program output

Nslookup

Displays information that you can use to diagnose Domain Name System (DNS) infrastructure. Before using this tool, you should be familiar with how DNS works. The Nslookup command-line tool is available only if you have installed the TCP/IP protocol.

Syntax

nslookup [**-***SubCommand ...*] [{*ComputerToFind*| [**-***Server*]}]

Parameters

-*SubCommand ...*
Specifies one or more **nslookup** subcommands as a command-line option. For a list of subcommands, see Related Topics.

ComputerToFind
Looks up information for *ComputerToFind* using the current default DNS name server, if no other server is specified. To look up a computer not in the current DNS domain, append a period to the name.

-*Server*
Specifies to use this server as the DNS name server. If you omit *-Server*, the default DNS name server is used.

{**help**|**?**}
Displays a short summary of **nslookup** subcommands.

Remarks

- If *ComputerToFind* is an IP address and the query is for an A or PTR resource record type, the name of the computer is returned. If *ComputerToFind* is a name and does not have a trailing period, the default DNS domain name is appended to the name. This behavior depends on the state of the following **set** subcommands: **domain**, **srchlist**, **defname**, and **search**.
- If you type a hyphen (-) instead of *ComputerToFind*, the command prompt changes to **nslookup** interactive mode.
- The command-line length must be less than 256 characters.
- **Nslookup** has two modes: interactive and noninteractive.

If you need to look up only a single piece of data, use noninteractive mode. For the first parameter, type the name or IP address of the computer that you want to look up. For the second parameter, type the name or IP address of a DNS name server. If you omit the second argument, **nslookup** uses the default DNS name server.

If you need to look up more than one piece of data, you can use interactive mode. Type a hyphen (-) for the first parameter and the name or IP address of a DNS name server for the second parameter. Or, omit both parameters and **nslookup** uses the default DNS name server. Following are some tips about working in interactive mode:

- To interrupt interactive commands at any time, press CTRL+ B.
- To exit, type **exit**.
- To treat a built-in command as a computer name, precede it with the escape character (\).
- An unrecognized command is interpreted as a computer name.

- If the lookup request fails, **nslookup** prints an error message. The following table lists possible error messages.

Error message	Description
Timed out	The server did not respond to a request after a certain amount of time and a certain number of retries. You can set the time-out period with the **set timeout** subcommand. You can set the number of retries with the **set retry** subcommand.
No response from server	No DNS name server is running on the server computer.
No records	The DNS name server does not have resource records of the current query type for the computer, although the computer name is valid. The query type is specified with the **set querytype** command.
Nonexistent domain	The computer or DNS domain name does not exist.
Connection refused -or- Network is unreachable	The connection to the DNS name server or finger server could not be made. This error commonly occurs with **ls** and **finger** requests.
Server failure	The DNS name server found an internal inconsistency in its database and could not return a valid answer.
Refused	The DNS name server refused to service the request.
Format error	The DNS name server found that the request packet was not in the proper format. It may indicate an error in **nslookup**.

- For more information about the **nslookup** command and DNS, see the following resources:
  - Microsoft Windows Resource Kits Web site
  - Lee, T., Davies, J. 2000. *Microsoft Windows 2000 TCP/IP Protocols and Services Technical Reference*. Redmond, Washington: Microsoft Press.

- Albitz, P., Loukides, M. and C. Liu. 1998. *DNS and BIND, Third Edition*. Sebastopol, California: O'Reilly and Associates, Inc.

Examples

Each command-line option consists of a hyphen (-) followed immediately by the command name and, in some cases, an equal sign (=) and then a value. For example, to change the default query type to host (computer) information and the initial time-out to 10 seconds, type:

nslookup -querytype=hinfo -timeout=10

Formatting legend

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Between brackets ([])	Optional items
Between braces ({}); choices separated by pipe (|). Example: {even|odd}	Set of choices from which the user must choose only one
`Courier font`	Code or program output

Finger

Displays information about a user or users on a specified remote computer (typically a computer running UNIX) that is running the Finger service or daemon. The remote computer specifies the format and output of the user information display. Used without parameters, **finger** displays help.

Syntax

finger [**-l**] [*user*] [*@host*] [**...**]

Parameters

-l
Displays user information in long list format.

user
Specifies the user about which you want information. If you omit the *user* parameter, **finger** displays information about all users on the specified computer.

@host
Specifies the remote computer running the Finger service where you are looking for user information. You can specify a computer name or IP address.

/ ?
Displays help at the command prompt.

Remarks

- Multiple *user@host* parameters can be specified.

- You must prefix **finger** parameters with a hyphen (**-**) rather than a slash (**/**).
- This command is available only if the **Internet Protocol (TCP/IP)** protocol is installed as a component in the properties of a network adapter in Network Connections
- Windows 2000 and Windows XP do not provide a finger service.

Examples

To display information for user1 on the computer users.microsoft.com, type the following command:

finger user1@users.microsoft.com

To display information for all users on the computer users.microsoft.com, type the following command:

finger @users.microsoft.com

Formatting legend

Format	Meaning
Italic	Information that the user must supply
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Ping

Verifies IP-level connectivity to another TCP/IP computer by sending Internet Control Message Protocol (ICMP) Echo Request messages. The receipt of corresponding Echo Reply messages are displayed, along with round-trip times. Ping is the primary TCP/IP command used to troubleshoot connectivity, reachability, and name resolution. Used without parameters, **ping** displays help.

Syntax

ping [**-t**] [**-a**] [**-n** *Count*] [**-l** *Size*] [**-f**] [**-i** *TTL*] [**-v** *TOS*] [**-r** *Count*] [**-s** *Count*] [{**-j** *HostList* | **-k** *HostList*}] [**-w** *Timeout*] [*TargetName*]

Parameters

-t

Specifies that ping continue sending Echo Request messages to the destination until interrupted. To interrupt and display statistics, press CTRL-BREAK. To interrupt and quit ping, press CTRL-C.

-a

Specifies that reverse name resolution is performed on the destination IP address. If this is successful, ping displays the corresponding host name.

-n *Count*

Specifies the number of Echo Request messages sent. The default is 4.

-l *Size*

Specifies the length, in bytes, of the Data field in the Echo Request messages sent. The default is 32. The maximum *size* is 65,527.

-f

Specifies that Echo Request messages are sent with the Don't Fragment flag in the IP header set to 1. The Echo Request message cannot be fragmented by routers in the path to the destination. This parameter is useful for troubleshooting path Maximum Transmission Unit (PMTU) problems.

-i *TTL*

Specifies the value of the TTL field in the IP header for Echo Request messages sent. The default is the default TTL value for the host. For Windows XP hosts, this is typically 128. The maximum *TTL* is 255.

-v *TOS*

Specifies the value of the Type of Service (TOS) field in the IP header for Echo Request messages sent. The default is 0. *TOS* is specified as a decimal value from 0 to 255.

-r *Count*

Specifies that the Record Route option in the IP header is used to record the path taken by the Echo Request message and corresponding Echo Reply message. Each hop in the path uses an entry in the Record Route option. If possible, specify a *Count* that is equal to or greater than the number of hops between the source and destination. The *Count* must be a minimum of 1 and a maximum of 9.

-s *Count*

Specifies that the Internet Timestamp option in the IP header is used to record the time of arrival for the Echo Request message and corresponding Echo Reply message for each hop. The *Count* must be a minimum of 1 and a maximum of 4.

-j *HostList*

Specifies that the Echo Request messages use the Loose Source Route option in the IP header with the set of intermediate destinations specified in *HostList*. With loose source routing, successive intermediate destinations can be separated by one or multiple routers. The maximum number of addresses or names in the host list is 9. The host list is a series of IP addresses (in dotted decimal notation) separated by spaces.

-k *HostList*

Specifies that the Echo Request messages use the Strict Source Route option in the IP header with the set of intermediate destinations specified in *HostList*. With strict source routing, the next intermediate destination must be directly reachable (it must be a neighbor on an interface of the router). The maximum number of addresses or names in the host list is 9. The host list is a series of IP addresses (in dotted decimal notation) separated by spaces.

-w *Timeout*

Specifies the amount of time, in milliseconds, to wait for the Echo Reply message that corresponds to a given Echo Request message to be received. If the Echo Reply message is not received within the time-out, the "Request timed out" error message is displayed. The default time-out is 4000 (4 seconds).

TargetName

Specifies the destination, which is identified either by IP address or host name.

/ ?

Displays help at the command prompt.

Remarks

- You can use **ping** to test both the computer name and the IP address of the computer. If pinging the IP address is successful, but pinging the computer name is not, you might have a name resolution problem. In this case, ensure that the computer name you are specifying can be resolved through the local Hosts file, by using Domain Name System (DNS) queries, or through NetBIOS name resolution techniques.
- This command is available only if the **Internet Protocol (TCP/IP)** protocol is installed as a component in the properties of a network adapter in Network Connections

Examples

The following example shows **ping** command output:

```
C:\>ping example.microsoft.com
```

```
Pinging example.microsoft.com [192.168.239.132] with 32 bytes of data:

Reply from 192.168.239.132: bytes=32 time=101ms TTL=124

Reply from 192.168.239.132: bytes=32 time=100ms TTL=124

Reply from 192.168.239.132: bytes=32 time=120ms TTL=124

Reply from 192.168.239.132: bytes=32 time=120ms TTL=124
```

To ping the destination 10.0.99.221 and resolve 10.0.99.221 to its host name, type:

ping -a 10.0.99.221

To ping the destination 10.0.99.221 with 10 Echo Request messages, each of which has a Data field of 1000 bytes, type:

ping -n 10 -l 1000 10.0.99.221

To ping the destination 10.0.99.221 and record the route for 4 hops, type:

ping -r 4 10.0.99.221

To ping the destination 10.0.99.221 and specify the loose source route of 10.12.0.1-10.29.3.1-10.1.44.1, type:

ping -j 10.12.0.1 10.29.3.1 10.1.44.1 10.0.99.221

Formatting legend

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Between braces ({}); choices separated by pipe (|). Example: {even|odd}	Set of choices from which the user must choose only one
`Courier font`	Code or program output

Ftp

Transfers files to and from a computer running a File Transfer Protocol (FTP) server service such as Internet Information Services. **Ftp** can be used interactively or in batch mode by processing ASCII text files.

Syntax

ftp [**-v**] [**-d**] [**-i**] [**-n**] [**-g**] [**-s:***FileName*] [**-a**] [**-w:***WindowSize*] [**-A**] [*Host*]

Parameters

-v
Suppresses the display of FTP server responses.

-d
Enables debugging, displaying all commands passed between the FTP client and FTP server.

-i
Disables interactive prompting during multiple file transfers.

-n
Suppresses the ability to log on automatically when the initial connection is made.

-g
Disables file name globbing. **Glob** permits the use of the asterisk (*) and question mark (?) as wildcard characters in local file and path names. For more information, see Ftp: Glob

-s:*FileName*
Specifies a text file that contains **ftp** commands. These commands run automatically after **ftp** starts. This parameter allows no spaces. Use this parameter instead of redirection (**<**).

-a
Specifies that any local interface can be used when binding the FTP data connection.

-w:*WindowSize*
Specifies the size of the transfer buffer. The default window size is 4096 bytes.

-A
Logs onto the FTP server as anonymous.

Host
Specifies the computer name, IP address, or IPv6 address of the FTP server to which to connect. The host name or address, if specified, must be the last parameter on the line.

/ ?
Displays help at the command prompt.

Remarks

- You must prefix **ftp** parameters with a hyphen (**-**) rather than a slash (**/**).
- **Ftp** command-line parameters are case-sensitive.
- This command is available only if the **Internet Protocol (TCP/IP)** protocol is installed as a component in the properties of a network adapter in Network Connections
- **Ftp** can be used interactively. After it is started, **ftp** creates a subenvironment in which you can use **ftp** commands. You can return to the command prompt by typing the **quit** command. When the **ftp** subenvironment is running, it is indicated by the **ftp >** command prompt.
- For more information about **ftp** subcommands, see Related Topics.
- Ftp supports the use of IPv6 when the IPv6 protocol is installed. For more information, see IP version 6 and IPv6 applications

Examples

To log on to the FTP server named ftp.example.microsoft.com, type the following command:

ftp ftp.example.microsoft.com

To anonymously log on to the FTP server named ftp.example.microsoft.com, type the following command:

ftp -A ftp.example.microsoft.com

To log on to the FTP server named ftp.example.microsoft.com and run the **ftp** commands contained in a file named Resynch.txt, type the following command:

ftp -s:resynch.txt ftp.example.microsoft.com

Formatting legend

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`Courier font`	Code or program output

Rcp

Copies files between a Windows XP computer and a system running **rshd**, the remote shell service (daemon). Windows XP and Windows 2000 do not provide rshd service. Used without parameters, **rcp** displays help.

Syntax

rcp [{**-a** | **-b**}] [**-h**] [**-r**] [*Host*][**.***User***:**] [*Source*] [*Host*][**.***User***:**] [*Path**Destination*]

Parameters

-a
Specifies ASCII transfer mode. This mode converts the end-of-line (EOL) characters to a carriage return for UNIX and a carriage return/line feed for computers. This is the default transfer mode.

-b
Specifies binary image transfer mode. No carriage return/line feed conversion occurs.

-h
Transfers source files that are marked with the hidden attribute to the Windows XP computer. Otherwise, hidden files are not copied.

-r
Recursively copies to the destination the contents of all subdirectories of the source.

Host
Specifies the local or remote host. If *Host* is specified as an IP address or if the host name contains dots (.), you must specify the user.

User
Specifies the user name. If the user name is not specified, the name of the user who is currently logged on is used.

Source
Specifies the files to copy.

Path\Destination
Specifies the path relative to the logon directory on the remote host. Use the backslash (\), quotation mark ("), or apostrophe (‘) escape characters in remote paths to use wildcard characters on the remote host. If multiple source files are specified, the destination is a directory.

/ ?
Displays help at the command prompt.

Remarks

- Third-party transfers

The **rcp** command, a connectivity command, can also be used for third-party transfers. You can run the **rcp** command from a Windows XP computer to copy files between two other computers that are running **rshd**. The **rshd** daemon is available on UNIX computers, so the Windows XP computer can participate in a third-party transfer only as the system from which the commands are run.

- Using the **-r** parameter

Both the *Source* and *Path\Destination* must be directories. However, you can use **-r** without recursion if the source is not a directory.

- Using the *Source* and *Path\Destination* parameters

If the file name does not begin with a forward slash (/) for UNIX or a backslash (\) for Windows XP, it is assumed to be relative to the current working directory. On Windows XP, this is the directory from which the command is run. On the remote system, it is the logon directory for the remote user. A period (.) indicates the current directory. You can use the backslash (\), quotation mark ("), or apostrophe (‘) escape characters in remote paths as wildcard characters on the remote computer.

- Remote privileges

The **rcp** command does not prompt for passwords. The current or specified user name must exist on the remote computer and allow remote command execution with **rcp**.

- The .rhosts file

The .rhosts file specifies which remote systems or users can access a local account using **rsh** or **rcp**. This file (or a Hosts equivalent) is required for access to a remote system using these commands. Both the **rsh** and **rcp** commands transmit the local user name to the remote system. The remote system uses this name and the IP address (usually resolved to a computer name) of the requesting system to determine whether access is granted. There is no provision for specifying a password to access an account using these commands.

If the user is logged on to a domain, the primary domain controller must be available to resolve the logon name because it is not cached on the local computer. Because the user name is required as part of the **rsh** protocol, the command fails if it cannot be obtained.

The .rhosts file is a text file in which each line is an entry. An entry consists of the local computer name, the local user name, and any comments about the entry. Each entry is separated by a tab or space, and comments begin with a pound sign (#), for example:

```
computer5marie #This computer is in room 31A
```

The .rhosts file must be in the user's home directory on the remote computer. For more information about the specific implementation of the .rhosts file on a remote computer, see the remote system documentation.

Additionally, you can add your computer name to the /Etc/Hosts file on the remote computer. This allows the remote system to authenticate remote requests for your computer when you use the Windows XP TCP/IP utilities.

- Specifying computers (hosts)

Use the *Computer.User* parameters to use a user name other than the current one. If *Computer.User* is specified with *Source*, the .rhosts file on the remote computer must contain an entry for *User*, as follows:

```
rcp host99.user7:file1 corp7.admin:file2
```

The .rhosts file on corp7 should have an entry for user7 on host99.

If a computer name is supplied as a full domain name containing dots, a user name must be appended to the computer name, as previously described. This prevents the last part of the domain name from being interpreted as a user name, as follows:

```
rcp domain-name1.user:user92 domain-name2.user:user7
```

- Remote processing

Remote processing is performed by a command that is run from the user logon shell on most UNIX systems. The .profile or .cshrc of the user is executed before parsing file names, and exported shell variables can be used (using the escape character or quotation marks) in remote file names.

- Copying Files

If you attempt to copy a number of files to a file rather than a directory, only the last file is copied. The **rcp** command cannot copy a file onto itself (the Source and Path/Destination cannot be the same.)

If you have logged onto the Windows XP Professional computer using a domain other than the local one, and the primary domain controller is unavailable, the command fails because **rcp** cannot determine the local user name. The same restriction applies to **rsh**.

- This command is available only if the **Internet Protocol (TCP/IP)** protocol is installed as a component in the properties of a network adapter in Network Connections

Examples

To copy a local file to the logon directory of a remote computer, type:

rcp filename remotecomputer:

To copy a local file to an existing directory with a new file name on a remote computer, type:

rcp filename remotecomputer:/ directory/ newfilename

To copy multiple local files to the subdirectory of a remote logon directory, type:

rcp file1 file2 file3 remotecomputer:subdirectory/filesdirectory

To copy from a remote source to the current directory of the local computer, type:

rcp remotecomputer:filename

To copy multiple files from multiple remote sources to a remote destination with different user names, type:

rcp remote1.user1:file1 remote2.user2:file2 remotedest.destuser:directory

Formatting legend

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`Courier font`	Code or program output

Hostname

Displays the host name portion of the full computer name of the computer.

Syntax

hostname

Parameters

/ ?

Displays help at the command prompt.

Remarks

- For more information about specifying the full computer name, see Related Topics.
- This command is available only if the **Internet Protocol (TCP/IP)** protocol is installed as a component in the properties of a network adapter in Network Connections

Examples

To display the name of the computer, type:

hostname

Formatting legend

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Italic	Information that the user must supply
Bold	Elements that the user must type exactly as shown
Ellipsis (...)	Parameter that can be repeated several times in a command line
Between brackets ([])	Optional items
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`Courier font`	Code or program output

Rexec

Runs commands on remote computers running the Rexec service (daemon). The **rexec** command authenticates the user name on the remote computer before executing the specified command. Windows XP and Windows 2000 do not provide the Rexec service. Used without parameters, **rexec** displays help.

Syntax

rexec [*Host*] [**-l** *UserName*] [**-n**] [*Command*]

Parameters

Host
Specifies the remote host (computer) on which to run *Command* by IP address or name.

-l *UserName*
Specifies the user name on the remote computer. If omitted, the user name of the user who is currently logged on is used.

-n
Redirects the input of **rexec** to the NUL device. This prevents the display of the command results on the local computer.

Command
Specifies the command to run on the remote computer.

/?
Displays help at the command prompt.

Remarks

- Standard operation

The **rexec** command prompts the user for a password and authenticates the given password on the remote computer. If the authentication succeeds, the command is run.

The **rexec** command copies standard input to the remote command, standard output of the remote *Command* to its standard output, and the standard error of the remote command to its standard error. The **rexec** normally quits when the remote command quits.

- Using Redirection symbols

for redirection to occur on the remote computer, enclose redirection symbols in quotation marks (for example, **">>"**). If you do not use quotation marks, redirection occurs on the local computer. For example, the following command appends the remote file *RemoteFile* to the local file *LocalFile*:

rexec othercomputer cat remotefile >> localfile

The following command appends the remote file *RemoteFile* to the remote file *OtherRemoteFile*:

rexec othercomputer cat remotefile ">>" otherremotefile

- Using interactive commands

You cannot run most interactive commands. For example, **vi** or **emacs** cannot be run by using **rexec**. You can, however, use **telnet** instead.

- This command is available only if the **Internet Protocol (TCP/IP)** protocol is installed as a component in the properties of a network adapter in Network Connections

Examples

To execute the **telcon** command on the remote computer vax1 using the name admin1, type the following command:

rexec vax1 -l admin1 telcon

Formatting legend

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Between braces ({}); choices separated by pipe (|). Example: {even|odd}	Set of choices from which the user must choose only one
`Courier font`	Code or program output

Ipconfig

Displays all current TCP/IP network configuration values and refreshes Dynamic Host Configuration Protocol (DHCP) and Domain Name

System (DNS) settings. Used without parameters, **ipconfig** displays the IP address, subnet mask, and default gateway for all adapters.

Syntax

ipconfig [**/ all**] [**/ renew** [*Adapter*]] [**/ release** [*Adapter*]] [**/ flushdns**] [**/ displaydns**] [**/ registerdns**] [**/ showclassid** *Adapter*]

[**/ setclassid** *Adapter* [*ClassID*]]

Parameters

/ all
Displays the full TCP/IP configuration for all adapters. Without this parameter, **ipconfig** displays only the IP address, subnet mask, and default gateway values for each adapter. Adapters can represent physical interfaces, such as installed network adapters, or logical interfaces, such as dial-up connections.

/ renew [*Adapter*]
Renews DHCP configuration for all adapters (if an adapter is not specified) or for a specific adapter if the *Adapter* parameter is included. This parameter is available only on computers with adapters that are configured to obtain an IP address automatically. To specify an adapter name, type the adapter name that appears when you use **ipconfig** without parameters.

/ release [*Adapter*]
Sends a DHCPRELEASE message to the DHCP server to release the current DHCP configuration and discard the IP address configuration for either all adapters (if an adapter is not specified) or for a specific adapter if the *Adapter* parameter is included. This parameter disables TCP/IP for adapters configured to obtain an IP address automatically. To specify an adapter name, type the adapter name that appears when you use **ipconfig** without parameters.

/ flushdns
Flushes and resets the contents of the DNS client resolver cache. During DNS troubleshooting, you can use this procedure to discard negative cache entries from the cache, as well as any other entries that have been added dynamically.

/ displaydns
Displays the contents of the DNS client resolver cache, which includes both entries preloaded from the local Hosts file and any recently obtained resource records for name queries resolved by the computer. The DNS Client service uses this information to resolve frequently queried names quickly, before querying its configured DNS servers.

/ registerdns
Initiates manual dynamic registration for the DNS names and IP addresses that are configured at a computer. You can use this parameter to troubleshoot a failed DNS name registration or resolve a dynamic update problem between a client and the DNS server without rebooting the client computer. The DNS settings in the advanced properties of the TCP/IP protocol determine which names are registered in DNS.

/ showclassid *Adapter*
Displays the DHCP class ID for a specified adapter. To see the DHCP class ID for all adapters, use the asterisk (*****) wildcard character in place of *Adapter*. This parameter is available only on computers with adapters that are configured to obtain an IP address automatically.

/ setclassid *Adapter* [*ClassID*]
Configures the DHCP class ID for a specified adapter. To set the DHCP class ID for all adapters, use the asterisk (*****) wildcard character in place of *Adapter*. This parameter is available only on computers with adapters that are configured to obtain an IP address automatically. If a DHCP class ID is not specified, the current class ID is removed.

/ ?
Displays help at the command prompt.

Remarks

- The **ipconfig** command is the command-line equivalent to the **winipcfg** command, which is available in Windows Millennium Edition, Windows 98, and Windows 95. Although Windows XP does not include a graphical equivalent to the **winipcfg** command, you can use Network Connections to view and renew an IP address. To do this, open Network Connections, right-click a network connection, click **Status**, and then click the **Support** tab.
- This command is most useful on computers that are configured to obtain an IP address automatically. This enables users to determine which TCP/IP configuration values have been configured by DHCP, Automatic Private IP Addressing (APIPA), or an alternate configuration.
- If the *Adapter* name contains any spaces, use quotation marks around the adapter name (that is, "*Adapter Name*").
- For adapter names, **ipconfig** supports the use of the asterisk (*) wildcard character to specify either adapters with names that begin with a specified string or adapters with names that contain a specified string. For example, **Local*** matches all adapters that start with the string Local and ***Con*** matches all adapters that contain the string Con.
- This command is available only if the **Internet Protocol (TCP/IP)** protocol is installed as a component in the properties of a network adapter in Network Connections
-

Examples

To display the basic TCP/IP configuration for all adapters, type:

ipconfig

To display the full TCP/IP configuration for all adapters, type:

ipconfig /all

To renew a DHCP-assigned IP address configuration for only the **Local Area Connection** adapter, type:

ipconfig /renew "Local Area Connection"

To flush the DNS resolver cache when troubleshooting DNS name resolution problems, type:

ipconfig /flushdns

To display the DHCP class ID for all adapters with names that start with *Local*, type:

ipconfig /showclassid Local*

To set the DHCP class ID for the **Local Area Connection** adapter to *TEST*, type:

ipconfig / setclassid "Local Area Connection" TEST

Formatting legend

Format	Meaning
Italic	Information that the user must supply
Bold	Elements that the user must type exactly as shown
Ellipsis (...)	Parameter that can be repeated several times in a command line
Between brackets ([])	Optional items
Between braces ({}); choices separated by pipe (|). Example: {even|odd}	Set of choices from which the user must choose only one
`Courier font`	Code or program output

Route

Displays and modifies the entries in the local IP routing table. Used without parameters, **route** displays help.

Syntax

route [**-f**] [**-p**] [*Command* [*Destination*] [**mask** *Netmask*] [*Gateway*] [**metric** *Metric*]] [**if** *Interface*]]

Parameters

-f

Clears the routing table of all entries that are not host routes (routes with a netmask of 255.255.255.255), the loopback network route (routes with a destination of 127.0.0.0 and a netmask of 255.0.0.0), or a multicast route (routes with a destination of 224.0.0.0 and a netmask of 240.0.0.0). If this is used in conjunction with one of the commands (such as **add**, **change**, or **delete**), the table is cleared prior to running the command.

-p

When used with the **add** command, the specified route is added to the registry and is used to initialize the IP routing table whenever the TCP/IP protocol is started. By default, added routes are not preserved when the TCP/IP protocol is started. When used with the **print** command, the list of persistent routes is displayed. This parameter is ignored for all other commands. Persistent routes are stored in the registry location **HKEY_LOCAL_MACHINE\ SYSTEM\ CurrentControlSet\ Services\ Tcpip\ Parameters\ PersistentRoutes**.

Command

Specifies the command you want to run. The following table lists valid commands.

Command	Purpose
add	Adds a route.
change	Modifies an existing route.
delete	Deletes a route or routes.
print	Prints a route or routes.

Destination

Specifies the network destination of the route. The destination can be an IP network address (where the host bits of the network address are set to 0), an IP address for a host route, or 0.0.0.0 for the default route.

mask *Netmask*

Specifies the netmask (also known as a subnet mask) associated with the network destination. The subnet mask can be the appropriate subnet mask for an IP network address, 255.255.255.255 for a host route, or 0.0.0.0 for the default route. If

omitted, the subnet mask 255.255.255.255 is used. Because of the relationship between the destination and the subnet mask in defining routes, the destination cannot be more specific than its corresponding subnet mask. In other words, there cannot be a bit set to 1 in the destination if the corresponding bit in the subnet mask is a 0.

Gateway

Specifies the forwarding or next hop IP address over which the set of addresses defined by the network destination and subnet mask are reachable. For locally attached subnet routes, the gateway address is the IP address assigned to the interface that is attached to the subnet. For remote routes, available across one or more routers, the gateway address is a directly reachable IP address that is assigned to a neighboring router.

metric *Metric*

Specifies an integer cost metric (ranging from 1 to 9999) for the route, which is used when choosing among multiple routes in the routing table that most closely match the destination address of a packet being forwarded. The route with the lowest metric is chosen. The metric can reflect the number of hops, the speed of the path, path reliability, path throughput, or administrative properties.

if *Interface*

Specifies the interface index for the interface over which the destination is reachable. For a list of interfaces and their corresponding interface indexes, use the display of the **route print** command. You can use either decimal or hexadecimal values for the interface index. For hexadecimal values, precede the hexadecimal number with **0x**. When the **if** parameter is omitted, the interface is determined from the gateway address.

/ ?

Displays help at the command prompt.

Remarks

- Large values in the **metric** column of the routing table are the result of allowing TCP/IP to automatically determine the metric for routes in the routing table based on the configuration of IP address, subnet mask, and default gateway for each LAN interface. Automatic determination of the interface metric, enabled by default, determines the speed of each interface and adjusts the metrics of routes for each interface so that the fastest interface creates the routes with the lowest metric. To remove the large metrics, disable the automatic determination of the interface metric from the advanced properties of the TCP/IP protocol for each LAN connection.

- Names can be used for *Destination* if an appropriate entry exists in the local Networks file stored in the *systemroot*\System32\Drivers\Etc folder. Names can be used for the *gateway* as long as they can be resolved to an IP address through standard host name resolution techniques such as Domain Name System (DNS) queries, use of the local Hosts file stored in the *systemroot*\system32\drivers\etc folder, and NetBIOS name resolution.

- If the command is **print** or **delete**, the *Gateway* parameter can be omitted and wildcards can be used for the destination and gateway. The *Destination* value can be a wildcard value specified by an asterisk (*). If the destination specified contains an asterisk (*) or a question mark (?), it is treated as a wildcard and only matching destination routes are printed or deleted. The asterisk matches any string, and the question mark matches any single character. For example, 10.*.1, 192.168.*, 127.*, and *224* are all valid uses of the asterisk wildcard.

- Using an invalid combination of a destination and subnet mask (netmask) value displays a "Route: bad gateway address netmask" error message. This error message appears when the destination contains one or more bits set to 1 in bit locations where the corresponding subnet mask bit is set to 0. To test this condition, express the destination and subnet mask using binary notation. The subnet mask in binary notation consists of a series of 1 bits, representing the network address portion of the destination, and a series of 0 bits, representing the host address portion of the destination. Check to determine whether there are bits in the destination that are set to 1 for the portion of the destination that is the host address (as defined by the subnet mask).

- The **-p** parameter is only supported on the route command for Windows NT 4.0, Windows 2000, Windows Millennium Edition, and Windows XP. This parameter is not supported by the **route** command for Windows 95 or Windows 98.
- This command is available only if the **Internet Protocol (TCP/IP)** protocol is installed as a component in the properties of a network adapter in Network Connections

Examples

To display the entire contents of the IP routing table, type:

route print

To display the routes in the IP routing table that begin with *10.*, type:

route print 10.*

To add a default route with the default gateway address of 192.168.12.1, type:

route add 0.0.0.0 mask 0.0.0.0 192.168.12.1

To add a route to the destination 10.41.0.0 with the subnet mask of 255.255.0.0 and the next hop address of 10.27.0.1, type:

route add 10.41.0.0 mask 255.255.0.0 10.27.0.1

To add a persistent route to the destination 10.41.0.0 with the subnet mask of 255.255.0.0 and the next hop address of 10.27.0.1, type:

route -p add 10.41.0.0 mask 255.255.0.0 10.27.0.1

To add a route to the destination 10.41.0.0 with the subnet mask of 255.255.0.0, the next hop address of 10.27.0.1, and the cost metric of 7, type:

route add 10.41.0.0 mask 255.255.0.0 10.27.0.1 metric 7

To add a route to the destination 10.41.0.0 with the subnet mask of 255.255.0.0, the next hop address of 10.27.0.1, and using the interface index 0x3, type:

route add 10.41.0.0 mask 255.255.0.0 10.27.0.1 if 0x3

To delete the route to the destination 10.41.0.0 with the subnet mask of 255.255.0.0, type:

route delete 10.41.0.0 mask 255.255.0.0

To delete all routes in the IP routing table that begin with *10.*, type:

route delete 10.*

To change the next hop address of the route with the destination of 10.41.0.0 and the subnet mask of 255.255.0.0 from 10.27.0.1 to 10.27.0.25, type:

route change 10.41.0.0 mask 255.255.0.0 10.27.0.25

Formatting legend

Format	Meaning
Italic	Information that the user must supply
Bold	Elements that the user must type exactly as shown
Ellipsis (...)	Parameter that can be repeated several times in a command line
Between brackets ([])	Optional items
Between braces ({}); choices separated by pipe (|). Example: {even|odd}	Set of choices from which the user must choose only one
`Courier font`	Code or program output

Lpq

Displays the status of a print queue on a computer running Line Printer Daemon (LPD). Used without parameters, **lpq** displays command-line help for the **lpq** command.

Syntax

lpq -S *ServerName* **-P** *PrinterName* [**-l**]

Parameters

-S *ServerName*
Required. Specifies, by name, the computer that hosts the print queue whose status you want to display.

-P *PrinterName*
Required. Specifies, by name, the printer for the print queue whose status you want to display.

-l
Specifies that you want to display details about the status of the print queue.

/ ?
Displays help at the command prompt.

Formatting legend

Format	Meaning
Italic	Information that the user must supply
Bold	Elements that the user must type exactly as shown
Ellipsis (...)	Parameter that can be repeated several times in a command line
Between brackets ([])	Optional items
Between braces ({}); choices separated by pipe (|). Example: {even|odd}	Set of choices from which the user must choose only one
`Courier font`	Code or program output

Rsh

Runs commands on remote computers running the RSH service or daemon. Windows XP and Windows 2000 do not provide an RSH service. An RSH service called Rshsvc.exe is provided with the Windows 2000 Server Resource Kit. Used without parameters, **rsh** displays help.

Syntax

rsh [*Host*] [**-l** *UserName*] [**-n**] [*Command*]

Parameters

Host
: Specifies the remote host (computer) on which to run *Command*.

-l *UserName*
: Specifies the user name to use on the remote computer. If omitted, the user name of the user who is currently logged on is used.

-n
: Redirects the input of **rsh** to the NUL device. This prevents the display of the command results on the local computer.

Command
: Specifies the command to run.

/ ?
: Displays help at the command prompt.

Remarks

- Standard operation

  The **rsh** command copies standard input to the remote *Command*, standard output of the remote *Command* to its standard output, and the standard error of the remote *Command* to its standard error. **Rsh** normally quits when the remote command quits.

- Using Redirection symbols

  Enclose redirection symbols in quotation marks for redirection to occur on the remote computer (for example, **">>"**). If you do not use quotation marks, redirection occurs on the local computer. For example, the following command appends the remote file *RemoteFile* to the local file *LocalFile*:

  ```
  rsh othercomputer cat remotefile >> localfile
  ```

  The following command appends the remote file *RemoteFile* to the remote file *OtherRemoteFile*:

  ```
  rsh othercomputer cat remotefile ">>" otherremotefile
  ```

- Using **rsh**

  When using a computer running Windows XP Professional that is logged on to a domain, the primary domain controller for the domain must be available to verify the user name or the **rsh** command fails.

- The .rhosts file

  The .rhosts file typically permits network access on UNIX systems. The .rhosts file lists computer names and associated logon names that have access to remote computers. When you run **rcp**, **rexec**, or **rsh** commands remotely with a correctly configured .rhosts file, you do not need to provide logon and password information for the remote computer.

  The .rhosts file is a text file in which each line is an entry. An entry consists of the local computer name, the local user name, and any comments about the entry. Each entry is separated by a tab or space, and comments begin with a pound sign (#). For example:

  ```
  host7 #This computer is in room 31A
  ```

  The .rhosts file must be in the user's home directory on the remote computer. For more information about the specific implementation of the .rhosts file on a remote computer, see the remote system documentation.

- This command is available only if the **Internet Protocol (TCP/IP)** protocol is installed as a component in the properties of a network adapter in Network Connections

Examples

To execute the telcon command on the remote computer vax1 using the name admin1, type:

rsh vax1 -l admin1 telcon

Formatting legend

Format	Meaning
Italic	Information that the user must supply
Bold	Elements that the user must type exactly as shown
Ellipsis (...)	Parameter that can be repeated several times in a command line
Between brackets ([])	Optional items
Between braces ({}); choices separated by pipe (|). Example: {even|odd}	Set of choices from which the user must choose only one
`Courier font`	Code or program output

Lpr

Sends a file to a computer running Line Printer Daemon (LPD) in preparation for printing. Used without parameters, **lpr** displays command-line help for the **lpr** command.

Syntax

lpr [**-S** *ServerID*] **-P** *PrinterName* [**-C** *BannerContent*] [**-J** *JobName*] [{ **-o** | **-o l**}] [**-d**] [**-x**] *FileName*

Parameters

-S *ServerID*
: Specifies, by name or IP address, the computer that hosts the printer on which you want to print the file. You do not need to provide this parameter if the printer is attached to the local computer.

-P *PrinterName*
: Required. Specifies, by name, the printer on which you want to print the file.

-C *BannerContent*
: Specifies the content to print on the banner page of the print job. If you do not include this parameter, the name of the computer from which the print job was sent appears on the banner page.

-J *JobName*
: Specifies the print job name that will be printed on the banner page. If you do not include this parameter, the name of the file being printed appears on the banner page.

{ **-o** | **-o l**}
: Specifies the type of file that you want to print. The parameter **-o** specifies that you want to print a text file. The parameter **-o l** specifies that you want to print a binary file (for example, a PostScript file).

-d
: Specifies that the data file must be sent before the control file. Use this parameter if your printer requires the data file to be sent first. For more information, see your printer documentation.

-x
: Specifies that the **lpr** command must be compatible with the Sun Microsystems operating system referred to as SunOS for releases up to and including 4.1.4_u1.

FileName
: Required. Specifies, by name, the file to be printed.

/ ?
: Displays help at the command prompt.

Remarks

- To find the name of the printer, open the Printers and Faxes folder. To open Printers and Faxes, click **Start**, click **Control Panel**, click **Printers and Other Hardware**, and then click **Printers and Faxes**.

Formatting legend

Format	Meaning
Italic	Information that the user must supply
Bold	Elements that the user must type exactly as shown
Ellipsis (...)	Parameter that can be repeated several times in a command line
Between brackets ([])	Optional items
Between braces ({}); choices separated by pipe (|). Example: {even|odd}	Set of choices from which the user must choose only one
`Courier font`	Code or program output

Tftp

Transfers files to and from a remote computer, typically a computer running UNIX, that is running the Trivial File Transfer Protocol (TFTP) service or daemon. Used without parameters, **tftp** displays help.

Syntax

tftp [**-i**] [*Host*] [{ **get** | **put**}] [*Source*] [*Destination*]

Parameters

-i
Specifies binary image transfer mode (also called octet mode). In binary image mode, the file is transferred in one-byte units. Use this mode when transferring binary files. If **-i** is omitted, the file is transferred in ASCII mode. This is the default transfer mode. This mode converts the end-of-line (EOL) characters to an appropriate format for the specified computer. Use this mode when transferring text files. If a file transfer is successful, the data transfer rate is displayed.

Host
Specifies the local or remote computer.

put
Transfers the file *Destination* on the local computer to the file *Source* on the remote computer. Because the TFTP protocol does not support user authentication, the user must be logged onto the remote computer, and the files must be writable on the remote computer.

get
Transfers the file *Destination* on the remote computer to the file *Source* on the local computer.

Source
Specifies the file to transfer.

Destination
Specifies where to transfer the file. If *Destination* is omitted, it is assumed to have the same name as *Source*.

/ ?
Displays help at the command prompt.

Remarks

- Using the **get** parameter

  Specify **put** if transferring file *FileTwo* on the local computer to file *FileOne* on remote computer. Specify **get** if transferring file *FileTwo* on the remote computer to file *FileOne* on the remote computer.

- Windows XP or Windows 2000 does not provide a general purpose TFTP server. Windows 2000 provides a TFTP server service only to provide remote boot capabilities to Windows XP and Windows 2000 client computers.

- This command is available only if the **Internet Protocol (TCP/IP)** protocol is installed as a component in the properties of a network adapter in Network Connections

Examples

To transfer the file Users.txt from the local computer to the file Users19.txt on a remote computer named vax1, type:

tftp vax1 put users.txt users19.txt

Formatting legend

Format	Meaning
Italic	Information that the user must supply
Bold	Elements that the user must type exactly as shown
Ellipsis (...)	Parameter that can be repeated several times in a command line

Between brackets ([])	Optional items
Between braces ({}); choices separated by pipe (|). Example: {even|odd}	Set of choices from which the user must choose only one
`Courier font`	Code or program output

Nbtstat

Displays NetBIOS over TCP/IP (NetBT) protocol statistics, NetBIOS name tables for both the local computer and remote computers, and the NetBIOS name cache. **Nbtstat** allows a refresh of the NetBIOS name cache and the names registered with Windows Internet Name Service (WINS). Used without parameters, **nbtstat** displays help.

Syntax

nbtstat [**-a** *RemoteName*] [**-A** *IPAddress*] [**-c**] [**-n**] [**-r**] [**-R**] [**-RR**] [**-s**] [**-S**] [*Interval*]

Parameters

-a *RemoteName*
Displays the NetBIOS name table of a remote computer, where *RemoteName* is the NetBIOS computer name of the remote computer. The NetBIOS name table is the list of NetBIOS names that corresponds to NetBIOS applications running on that computer.

-A *IPAddress*
Displays the NetBIOS name table of a remote computer, specified by the IP address (in dotted decimal notation) of the remote computer.

-c
Displays the contents of the NetBIOS name cache, the table of NetBIOS names and their resolved IP addresses.

-n
Displays the NetBIOS name table of the local computer. The status of **Registered** indicates that the name is registered either by broadcast or with a WINS server.

-r
Displays NetBIOS name resolution statistics. On a Windows XP computer that is configured to use WINS, this parameter returns the number of names that have been resolved and registered using broadcast and WINS.

-R
Purges the contents of the NetBIOS name cache and then reloads the #PRE-tagged entries from the Lmhosts file.

-RR
Releases and then refreshes NetBIOS names for the local computer that is registered with WINS servers.

-s
Displays NetBIOS client and server sessions, attempting to convert the destination IP address to a name.

-S
Displays NetBIOS client and server sessions, listing the remote computers by destination IP address only.

Interval
Redisplays selected statistics, pausing the number of seconds specified in *Interval* between each display. Press CTRL+C to stop redisplaying statistics. If this parameter is omitted, **nbtstat** prints the current configuration information only once.

/?
Displays help at the command prompt.

Remarks

- **Nbtstat** command-line parameters are case-sensitive.
- The following table describes the column headings that are generated by **nbtstat**.

Heading	Description
Input	The number of bytes received.

Output	The number of bytes sent.
In/ Out	Whether the connection is from the computer (outbound) or from another computer to the local computer (inbound).
Life	The remaining time that a name table cache entry will live before it is purged.
Local Name	The local NetBIOS name associated with the connection.
Remote Host	The name or IP address associated with the remote computer.
<03>	The last byte of a NetBIOS name converted to hexadecimal. Each NetBIOS name is 16 characters long. This last byte often has special significance because the same name might be present several times on a computer, differing only in the last byte. For example, <20> is a space in ASCII text.
Type	The type of name. A name can either be a unique name or a group name.
Status	Whether the NetBIOS service on the remote computer is running (Registered) or a duplicate computer name has registered the same service (Conflict).
State	The state of NetBIOS connections.

- The following table describes the possible NetBIOS connection states.

State	Description
Connected	A session has been established.
Associated	A connection endpoint has been created and associated with an IP address.
Listening	This endpoint is available for an inbound connection.
Idle	This endpoint has been opened but cannot receive connections.
Connecting	A session is in the connecting phase and the name-to-IP address mapping of the destination is being resolved.
Accepting	An inbound session is currently being accepted and will be connected shortly.
Reconnecting	A session is trying to reconnect (it failed to connect on the first attempt).
Outbound	A session is in the connecting phase and the TCP connection is currently being created.
Inbound	An inbound session is in the connecting phase.
Disconnecting	A session is in the process of disconnecting.
Disconnected	The local computer has issued a disconnect and it is waiting for confirmation from the remote system.

- This command is available only if the **Internet Protocol (TCP/IP)** protocol is installed as a component in the properties of a network adapter in Network Connections

Examples

To display the NetBIOS name table of the remote computer with the NetBIOS computer name of CORP07, type:

nbtstat -a CORP07

To display the NetBIOS name table of the remote computer assigned the IP address of 10.0.0.99, type:

nbtstat -A 10.0.0.99

To display the NetBIOS name table of the local computer, type:

nbtstat -n

To display the contents of the local computer NetBIOS name cache, type:

nbtstat -c

To purge the NetBIOS name cache and reload the #PRE-tagged entries in the local Lmhosts file, type:

nbtstat -R

To release the NetBIOS names registered with the WINS server and re-register them, type:

nbtstat -RR

To display NetBIOS session statistics by IP address every five seconds, type:

nbtstat -S 5

Formatting legend

Format	Meaning
Italic	Information that the user must supply
Bold	Elements that the user must type exactly as shown
Ellipsis (...)	Parameter that can be repeated several times in a command line
Between brackets ([])	Optional items
Between braces ({}); choices separated by pipe (|). Example: {even|odd}	Set of choices from which the user must choose only one
`Courier font`	Code or program output

Tracert

Determines the path taken to a destination by sending Internet Control Message Protocol (ICMP) Echo Request messages to the destination with incrementally increasing Time to Live (TTL) field values. The path displayed is the list of near-side router interfaces of the routers in the path between a source host and a destination. The near-side interface is the interface of the router that is closest to the sending host in the path. Used without parameters, **tracert** displays help.

Syntax

tracert [**-d**] [**-h** *MaximumHops*] [**-j** *HostList*] [**-w** *Timeout*] [*TargetName*]

Parameters

-d
: Prevents **tracert** from attempting to resolve the IP addresses of intermediate routers to their names. This can speed up the display of **tracert** results.

-h *MaximumHops*
: Specifies the maximum number of hops in the path to search for the target (destination). The default is 30 hops.

-j *HostList*
: Specifies that Echo Request messages use the Loose Source Route option in the IP header with the set of intermediate destinations specified in *HostList*. With loose source routing, successive intermediate destinations can be separated by one or

multiple routers. The maximum number of addresses or names in the host list is 9. The *HostList* is a series of IP addresses (in dotted decimal notation) separated by spaces.

-w *Timeout*

Specifies the amount of time in milliseconds to wait for the ICMP Time Exceeded or Echo Reply message corresponding to a given Echo Request message to be received. If not received within the time-out, an asterisk (*) is displayed. The default time-out is 4000 (4 seconds).

TargetName

Specifies the destination, identified either by IP address or host name.

-?

Displays help at the command prompt.

Remarks

- This diagnostic tool determines the path taken to a destination by sending ICMP Echo Request messages with varying Time to Live (TTL) values to the destination. Each router along the path is required to decrement the TTL in an IP packet by at least 1 before forwarding it. Effectively, the TTL is a maximum link counter. When the TTL on a packet reaches 0, the router is expected to return an ICMP Time Exceeded message to the source computer. Tracert determines the path by sending the first Echo Request message with a TTL of 1 and incrementing the TTL by 1 on each subsequent transmission until the target responds or the maximum number of hops is reached. The maximum number of hops is 30 by default and can be specified using the **-h** parameter. The path is determined by examining the ICMP Time Exceeded messages returned by intermediate routers and the Echo Reply message returned by the destination. However, some routers do not return Time Exceeded messages for packets with expired TTL values and are invisible to the tracert command. In this case, a row of asterisks (*) is displayed for that hop.
- To trace a path and provide network latency and packet loss for each router and link in the path, use the **pathping** command.
- This command is available only if the **Internet Protocol (TCP/IP)** protocol is installed as a component in the properties of a network adapter in Network Connections

Examples

To trace the path to the host named corp7.microsoft.com, type:

tracert corp7.microsoft.com

To trace the path to the host named corp7.microsoft.com and prevent the resolution of each IP address to its name, type:

tracert -d corp7.microsoft.com

To trace the path to the host named corp7.microsoft.com and use the loose source route 10.12.0.1-10.29.3.1-10.1.44.1, type:

tracert -j 10.12.0.1 10.29.3.1 10.1.44.1 corp7.microsoft.com

Formatting legend

Format	Meaning
Italic	Information that the user must supply
Bold	Elements that the user must type exactly as shown
Ellipsis (...)	Parameter that can be repeated several times in a command line

Between brackets ([])	Optional items
Between braces ({}); choices separated by pipe (|). Example: {even|odd}	Set of choices from which the user must choose only one
`Courier font`	Code or program output

Netstat

Displays active TCP connections, ports on which the computer is listening, Ethernet statistics, the IP routing table, IPv4 statistics (for the IP, ICMP, TCP, and UDP protocols), and IPv6 statistics (for the IPv6, ICMPv6, TCP over IPv6, and UDP over IPv6 protocols). Used without parameters, **netstat** displays active TCP connections.

Syntax

netstat [**-a**] [**-e**] [**-n**] [**-o**] [**-p** *Protocol*] [**-r**] [**-s**] [*Interval*]

Parameters

-a
: Displays all active TCP connections and the TCP and UDP ports on which the computer is listening.

-e
: Displays Ethernet statistics, such as the number of bytes and packets sent and received. This parameter can be combined with **-s**.

-n
: Displays active TCP connections, however, addresses and port numbers are expressed numerically and no attempt is made to determine names.

-o
: Displays active TCP connections and includes the process ID (PID) for each connection. You can find the application based on the PID on the **Processes** tab in Windows Task Manager. This parameter can be combined with **-a**, **-n**, and **-p**.

-p *Protocol*
: Shows connections for the protocol specified by *Protocol*. In this case, the *Protocol* can be **tcp**, **udp**, **tcpv6**, or **udpv6**. If this parameter is used with **-s** to display statistics by protocol, *Protocol* can be **tcp**, **udp**, **icmp**, **ip**, **tcpv6**, **udpv6**, **icmpv6**, or **ipv6**.

-s
: Displays statistics by protocol. By default, statistics are shown for the TCP, UDP, ICMP, and IP protocols. If the IPv6 protocol is installed, statistics are shown for the TCP over IPv6, UDP over IPv6, ICMPv6, and IPv6 protocols. The **-p** parameter can be used to specify a set of protocols.

-r
: Displays the contents of the IP routing table. This is equivalent to the **route print** command.

Interval
: Redisplays the selected information every *Interval* seconds. Press CTRL+C to stop the redisplay. If this parameter is omitted, **netstat** prints the selected information only once.

/ ?
: Displays help at the command prompt.

Remarks

- Parameters used with this command must be prefixed with a hyphen (**-**) rather than a slash (**/**).

- **Netstat** provides statistics for the following:
  - Proto

    The name of the protocol (TCP or UDP).

  - Local Address

    The IP address of the local computer and the port number being used. The name of the local computer that corresponds to the IP address and the name of the port is shown unless the **-n** parameter is specified. If the port is not yet established, the port number is shown as an asterisk (*).

  - Foreign Address

    The IP address and port number of the remote computer to which the socket is connected. The names that corresponds to the IP address and the port are shown unless the **-n** parameter is specified. If the port is not yet established, the port number is shown as an asterisk (*).

  - (state)

    Indicates the state of a TCP connection. The possible states are as follows:

    CLOSE_WAIT

    CLOSED

    ESTABLISHED

    FIN_WAIT_1

    FIN_WAIT_2

    LAST_ACK

    LISTEN

    SYN_RECEIVED

    SYN_SEND

    TIMED_WAIT

    For more information about the states of a TCP connection, see RFC 793.

- This command is available only if the **Internet Protocol (TCP/IP)** protocol is installed as a component in the properties of a network adapter in Network Connections

Examples

To display both the Ethernet statistics and the statistics for all protocols, type the following command:

netstat -e -s

To display the statistics for only the TCP and UDP protocols, type the following command:

netstat -s -p tcp udp

To display active TCP connections and the process IDs every 5 seconds, type the following command:

nbtstat -o 5

To display active TCP connections and the process IDs using numerical form, type the following command:

nbtstat -n -o

Formatting legend

Format	Meaning
Italic	Information that the user must supply
Bold	Elements that the user must type exactly as shown
Ellipsis (...)	Parameter that can be repeated several times in a command line
Between brackets ([])	Optional items
Between braces ({}); choices separated by pipe (|). Example: {even|odd}	Set of choices from which the user must choose only one
`Courier font`	Code or program output