

NET TOOLS ABBREVIATED

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NSLOOKUP

nslookup [*-option ...*] [*host-to-find*] - [*server*]]

Description

nslookup is a program to query Internet domain name servers. **nslookup** has two modes: interactive and non-interactive. Interactive mode allows the user to query name servers for information about various hosts and domains or print a list of hosts in the domain. Non-interactive mode is used to print just the name and requested information for a host or domain.

Interactive mode is entered in the following cases:

0. when no arguments are given (the default name server will be used)
0. when the first argument is a hyphen (-) and the second argument is the host name or Internet address of a name server

Non-interactive mode is used when the name of or Internet address of the host to be looked up is given as the first argument. The optional second argument specifies the host name or Internet address of a name server.

Options listed under the **set** command can be specified on the command line if they precede the arguments and are prefixed with a hyphen. For example, to change the default query type to host information, and the initial timeout to 10 seconds, type:

nslookup -query=hinfo -timeout=10

Interactive Commands

Commands may be interrupted at any time by typing the system interrupt character (by default). To exit, type a <Ctrl>**d** (EOF) or type **exit**. The command line length must be less than 256 characters. To treat a built-in command as a host name, precede it with an escape character (\). Note that an unrecognized command will be interpreted as a host name.

host[server]

Look up information for **host** using the current default server or using **server** if it is specified. If **host** is an Internet address and the query type is ``A" or ``PTR", the name of the host is returned. If **host** is a name and does not have a trailing period, the default domain name is appended to the name. To look up a host not in the current domain, append a period to the name.

server (lserver) domain

Change the default server to **domain**. **lserver** uses the initial server to look up information about **domain** while **server** uses the current default server. If an authoritative

answer can not be found, the names of servers that might have the answer are returned.

root

Changes the default server to the server for the root of the domain name space. Currently, the host ``ns.internic.net" is used. (This command is a synonym for the **lserver ns.internic.net**.) The name of the root server can be changed with the **set root** command.

finger [name] [> filename] or [>> filename]

Connects with the finger server on the current host. The current host is defined when a previous lookup for a host was successful and returned address information (see the **set querytype=A** command). **name** is optional. ``>" and ``>>" can be used to redirect output in the usual manner.

ls [option] domain [> filename] or [>> filename]

List the information available for **domain**, optionally creating or appending to **filename**. The default output contains host names and their Internet addresses. **option** can be one of the following:

ls Options	
Option	Description
-t type	lists all records of the specified type (see querytype below)
-a	lists aliases of hosts in the domain (synonym for -t CNAME)
-d	lists all records for the domain (synonym for -t ANY)
-h	lists CPU and operating system information for the domain (synonym for -t HINFO)
-s	lists well-known services of hosts in the domain (synonym for -t WKS) When output is directed to a file, number signs are printed for every 50 records received from the server.

view filename

Sorts and lists the output of previous **ls** command(s) with **more**.

help or ?

Prints a brief summary of commands.

exit

Exits the program.

set keyword[=value]

This command changes state information that affects the lookups. Valid keywords are:

set Options	
Option	Description
all	Prints the current values of the frequently-used options to set . Information about the current default server and host is also printed.
class=name	Change the query class to one of:

	<p>IN - the Internet class CHAOS - the Chaos class HESIOD - the MIT Athena Hesiod class ANY - wildcard (any of the above)</p> <p>The class specifies the protocol group of the information. (Default = IN, abbreviation = cl)</p>
[no]debug	Turn debugging mode on. A lot more information is printed about the packet sent to the server and the resulting answer. (Default = nodebug , abbreviation = [no]deb)
[no]d2	Turn exhaustive debugging mode on. Essentially all fields of every packet are printed. (Default = nod2)
[no]defname	If set, append the default domain name to a single-component lookup request (i.e., one that does not contain a period). (Default = defname , abbreviation = [no]def)
[no]search	With defname , search for each name in parent domains of the current domain. (Default = search)
domain=name	Change the default domain name to name . The default domain name is appended to a lookup request depending on the state of the defname and search options. The domain search list contains the parents of the default domain if it has at least two components in its name. For example, if the default domain is CC.Berkeley.EDU, the search list is CC.Berkeley.EDU and Berkeley.EDU. Use the set srchlist command to specify a different list. Use the set all command to display the list. (Default = value based on hostname command, <i>/etc/resolv.conf</i> file or LOCALDOMAIN variable; abbreviation = do)
srchlist=name/name2/...	Change the default domain name to name1 and the domain search list to name1 , name2 , etc. A maximum of 6 names separated by slashes ("/") can be specified. For example: <pre>set srchlist=lcs.MIT.EDU/ai.MIT.EDU/MIT.EDU.</pre> sets the domain to "lcs.MIT.EDU" and the search list to the three names. This command overrides the default domain name and search list of the set domain command. Use the set all command to display the list. (Default = value based on hostname command, <i>/etc/resolv.conf</i> file or LOCALDOMAIN variable; abbreviation = srchl)
[no]ignore	Ignore truncate error.
port=port#	Connect to name server using port# . (Default = well known port number)
querytype=value type=value	Change the type of information returned from a query to one of: 1. A - the host's Internet address

[no]recurse	Tell the name server to query other servers if it does not have the information. (Default = recurse , abbreviation = [no]rec)
retry=number	Set the number of retries to number . When a reply to a request is not received within a certain amount of time (changed with set timeout), the request is resent. The retry value controls how many times a request is resent before giving up. (Default = 2, abbreviation = ret)
root=host	Change the name of the root server to host . This affects the root command. (Default = ns.internic.net , abbreviation = ro)
timeout=number	Change the time-out interval for waiting for a reply to number seconds. (Default = 10 seconds, abbreviation = t)
[no]vc	Always use a virtual circuit when sending requests to the server. (Default = novc , abbreviation = [no]v)
[no]ignoretc	Ignore packet truncation errors. (Default = noignoretc , abbreviation = [no]ig)

Diagnostics

If the lookup request was not successful, an error message is printed. Possible errors are:

Time-out - The server did not respond to a request after a certain amount of time (changed with **set timeout=value**) and a certain number of retries (changed with **set retry=value**).

No information - Depending on the query type set with the **set querytype** command, no information about the host was available, though the host name is valid.

Non-existent domain - The host or domain name does not exist.

Connection refused - Network is unreachable. The connection to the name or finger server could not be made at the current time. This error commonly occurs with **finger** requests.

Server failure - The name server found an internal inconsistency in its database and could not return a valid answer.

Refused - The name server refused to service the request.

Using nslookup Interactively

0. Enter nslookup at the command line. The nslookup prompt appears.
0. View the current options by entering set all.
0. Change any desired options by entering set *option*.
0. Issue nslookup commands.
0. Enter exit to leave nslookup.

DIG

`dig [@server] domain [query-type] [query-class] [+query_option] [-dig_option] [%comment]`

Description

The Domain Information Groper, **dig**, is a flexible command line tool which can be used to gather information from the Domain Name System (DNS) servers. **dig** has two modes:

0. simple interactive mode for a single query.
0. batch mode which executes a query for each in a list of several query lines.

All query options are accessible from the command line.

The typical use of **dig** is:

`dig @server domain query-type query-class`

dig Options	
Option	Description
server	The domain name or a dot-notation Internet address. If this optional field is omitted, dig attempts to use the default name server for your machine. If a domain name is specified, this will be resolved using the DNS resolver (BIND). If your system does not support DNS, you may have to specify a dot-notation address. Alternatively, if there is a server at your disposal somewhere, all that is required is that <code>/etc/resolv.conf</code> be present to indicate where the default name servers reside, so that server itself can be resolved. As an option, the user may set the environment variable LOCALRES to name a file which is to be used instead of

	<code>/etc/resolv.conf</code> . LOCALRES is specific to the dig resolver and is not referenced by the standard resolver. If the LOCALRES variable is not set or the specified file is not readable, then <code>/etc/resolv.conf</code> is used.
domain	The domain name for which you are requesting information. See the -x option for a convenient way to specify an inverse address query.
query-type	The type of information (DNS query type) that you are requesting. If omitted, the default is a (T_A = address). The following types are recognized: <ul style="list-style-type: none"> ▪ a - T_A - network address ▪ any - T_ANY - all/any information about specified domain ▪ mx - T_MX mail exchanger for the domain ▪ ns - T_NS - name servers ▪ soa - T_SOA - zone of authority record ▪ hinfo - T_HINFO - host information ▪ axfr - T_AXFR - zone transfer (must ask an authoritative server) ▪ txt - T_TXT - arbitrary number of strings
query-class	The network class requested in the query. If omitted, the default is in (C_IN = Internet). The following classes are recognized: <ul style="list-style-type: none"> ▪ in - C_IN - Internet class domain ▪ any - C_ANY - all/any class information
%ignored-comment	Use % to include an argument which is not parsed. This may be useful if running dig in batch mode. Instead of resolving every server domain name in a list of queries, you can avoid the overhead of doing so, but still have the domain name on the command line as a reference.
-f file	The file for dig batch mode. The file contains a list of query specifications (dig command lines) which are to be executed sequentially. Lines beginning with <code>`;"</code> , <code>`#</code> or a newline are ignored. Other options may still appear on command line, and will be in effect for each batch query.
-T time	Time in seconds between start of successive queries when running in batch mode. This can be used to keep two or more batch dig commands running roughly in synchronization. The default is zero.
-p port	Port number. Query a name server listening to a non-standard port number. The default is 53.
-P [ping-string]	After the query returns, execute a ping command for response time comparison via a call to the shell. The last three lines of statistics are printed for the command: <code>ping -s server_name 56 3</code>
-t query-type	Specify the type of query. This may be either an integer value to be included in the type field, or an abbreviation as discussed above (that is, mx = T_MX).
-c query-class	Specify the class of query. This may be either an integer value to be included in the class field, or an abbreviation as discussed above (that is, in = C_IN).

-envsav	This specifies that the dig environment (for example, defaults and print options) -- after all of the arguments are parsed -- should be saved to a file to become the default environment. This is useful if you do not like the standard set of defaults and do not desire to include a large number of options each time dig is used. The environment consists of resolver state variable flags, timeout values, and number of allowable retry attempts, as well as the flags detailing dig output (see below). If the shell environment variable LOCALDEF is set to the name of a file, this is where the default dig environment is saved. If not, the file <i>DiG.env</i> is created in the current working directory.
-envset	This flag only affects batch query runs. When this is specified on a line in a dig batch file, the dig environment -- after the arguments are parsed -- becomes the default environment for the duration of the batch file, or until the next line which specifies -envset is found.
-[no]stick	This flag only affects batch query runs. It specifies that the dig environment (as read initially or set by -envset is to be restored before each query (line) in a dig batch file. The default value of -nostick means that the dig environment does not stick, hence options specified on a single line in a dig batch file will remain in effect for subsequent lines: that is, they are not restored to the "sticky" default).
+query-option	Use + to specify an option to be changed in the query packet, or to change dig output specifics. Many of these are the same parameters accepted by nslookup. If an option requires a parameter, the syntax is: +keyword=value Most keywords can be abbreviated. Parsing of the + option is very simplistic -- a value must not be separated from its keyword by white space.

Keyword	Meaning
[no]debug	turn on/off debugging mode
[no]d2	turn on/off extra debugging mode
[no]recurse	use/do not use recursive lookup
retry=n	set number of retries to <i>n</i> (4)
time=n	set timeout length to <i>n</i> seconds
[no]ko	keep open option (implies vc)
[no]vc	use/do not use virtual circuit (novc)
[no]defname	use/do not use default domain name
[no]search	use/do not use domain search list (sea)
domain=name	set default domain name to <i>name</i>
[no]ignore	ignore/do not ignore truncation errors
[no]primary	use/do not use primary server (nopr)
nojaonly	authoritative query only flag (noaa)
[no]sort	sort resource records (nosor)
[no]cmd	echo parsed arguments (cmd)
[no]stats	print query statistics (st)

no]Header	print basic header (H)
[no]header	print header flags (he)
[no]ttlid	print TTLs (tt)
[no]cl	print class information (nocl)
[no]qr	print outgoing query (noqr)
[no]reply	print reply (rep)
[no]ques	print question section (qu)
[no]answer	print answer section (an)
[no]author	print authoritative section (au)
no]addit	print additional section (ad)
pfdef	set to default print flags
pfmin	set to minimal default print flags
pfset=n	set print flags to <i>n</i> , where <i>n</i> can be hex/octal/decimal
pfand=n	bitwise and print flags with <i>n</i>
pfor=n	bitwise or print flags with <i>n</i>

Examples of using the dig command

Obtain the latest list of root domain servers:

dig . ns

Find out the name servers for a zone:

dig @server domain ns

Request all records for a zone from an authoritative server:

dig @server domain axfr

NOTE: This command requires a zone transfer which the server may disallow.

Look up the domain name corresponding to the IP address 172.16.118.1:

dig -x 172.16.118.1

HOST

host [-l] [-v] [-w] [-r] [-d] [-t querytype] [-a] host [server]

Description

host looks for information about Internet hosts. It gets this information from a set of interconnected servers that are spread across the country. By default, it simply converts between hostnames and Internet addresses. However, with the **-t** or **-a** options, it can be used to find all of the information about a host that is maintained by the domain server.

The arguments can be either hostnames or host numbers. The program first attempts to interpret them as host numbers. If this fails, it will treat them as hostnames. A host number consists of integers separated by dots: for example, "128.6.4.194". A hostname consists of names separated by dots: for example, "topaz.rutgers.edu". Unless the name ends in a dot, the local domain is automatically tacked on the end. Thus, a Rutgers user can enter: **host topaz** and it will actually look up "topaz.rutgers.edu". If this fails, the name is tried unchanged (in this case, "topaz"). This same convention is used for mail and other network

utilities. The actual suffix to tack on the end is obtained from the results of a `gethostbyname` call, and using everything starting at the first dot.

The **first argument** is the hostname you want to look up. If this is a number, an *inverse query* is done: the domain system looks in a separate set of databases used to convert numbers to names. The **second argument** is optional. It allows you to specify a particular server to query. If you do not specify this argument, the default server (normally the local machine) is used. If a name is specified, you may see output of three different kinds.

host Options	
Option	Description
-w	This causes host to wait forever for a response. Normally it will time out after approximately one minute.
-v	Use ``verbose'' format for printout. This is the official domain master file format. Without this option, output still follows this format in general terms, but some attempt is made to make it more intelligible to normal users. Without -v , any , a , mx , and cname records are written out as has address, mail is handled by, and is a nickname for (respectively), and TTL and class fields are not shown.
-r	Turn off recursion in the request. This means that the name server will return only data it has in its own database. It will not ask other servers for more information.
-d	Turn on debugging. Network transactions are shown in detail.
-t querytype	Allows you to specify a particular querytype of information to be looked up. Currently-supported types include: a , ns , md , mf , cname , soa , mb , mg , mr , null , wks , ptr , hinfo , minfo , mx , uinfo , uid , gid and unspec . Additionally, the wildcard (which may be written as either any or *), can be used to specify any (all) of the above types. Types must be given in lower case. Note that the default is to look first for a , and then mx , except that if the verbose option is turned on, the default is only a . The -t option is particularly useful for filtering information returned by host . See the -l option below.
-a	this is equivalent to -v -t any (``all").
-l	List a complete domain. For example: host -l rutgers.edu gives a listing of all hosts in the <i>rutgers.edu</i> domain. The -t option is used to filter what information is presented. The default is address information, which also includes PTR and NS records. The command: host -l -v -t any rutgers.edu gives a complete download of the zone data for <i>rutgers.edu</i> , in the official master file format. (However the SOA record is listed twice, for arcane reasons.)

Examples:

Use **host** to find all the host records for a zone:

host -l domain

Use **host** to request all the records for a zone:

host -lv -t any domain

ARP

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

Description

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. With no flags, the program displays the current ARP entry for *hostname*. The host may be specified by name or by number, using Internet dot notation.

arp Parameters	
Parameter	Description
-a [<i>InetAddr</i>] [-N <i>IfaceAddr</i>]	Displays current ARP cache tables for all interfaces. To display the ARP cache entry for a specific IP address, use arp -a with the <i>InetAddr</i> parameter, where <i>InetAddr</i> is an IP address. To display the ARP cache table for a specific interface, use the -N <i>IfaceAddr</i> parameter where <i>IfaceAddr</i> is the IP address assigned to the interface. The -N parameter is case-sensitive.
-g [<i>InetAddr</i>] [-N <i>IfaceAddr</i>]	Identical to -a .
-d <i>InetAddr</i> [<i>IfaceAddr</i>]	Deletes an entry with a specific IP address, where <i>InetAddr</i> is the IP address. To delete an entry in a table for a specific interface, use the <i>IfaceAddr</i> parameter where <i>IfaceAddr</i> is the IP address assigned to the interface. To delete all entries, use the asterisk (*) wildcard character in place of <i>InetAddr</i> .
-s <i>InetAddr</i> <i>EtherAddr</i> [<i>IfaceAddr</i>]	Adds a static entry to the ARP cache that resolves the IP address <i>InetAddr</i> to the physical address <i>EtherAddr</i> . To add a static ARP cache entry to the table for a specific interface, use the <i>IfaceAddr</i> parameter where <i>IfaceAddr</i> is an IP address assigned to the interface.

-v	Verbose output.
-n	Show network addresses as numbers.
-f	Causes the file <i>filename</i> to be read and multiple entries to be set in the ARP tables. Entries in the file should be of the form <i>hostname ether_addr [temp] [pub]</i> with argument meanings as given above.
/?	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

NETSTAT

```
netstat [-Aan] [-f address_family] [-M core] [-N system]
netstat [-dgiLmnrsv] [-f address_family] [-M core] [-N system]
netstat [-dn] [-i interface] [-M core] [-N system] [-w wait]
netstat [-p protocol] [-M core] [-N system]
netstat [-p protocol] [-M core] [-N system] -P pcbaddr
netstat [-p protocol] [-i] [-I Interface]
netstat [-s] [-f address_family] [-i] [-I Interface]
```

Description

The **netstat** command symbolically displays the contents of various network-related data structures. There are a number of output formats, depending on the options for the information presented. The **first form** of the command displays a list of active sockets for each

protocol. The **second form** presents the contents of one of the other network data structures according to the option selected. Using the **third form**, with a *wait* interval specified, **netstat** will continuously display the information regarding packet traffic on the configured network interfaces. The **fourth form** displays statistics about the named protocol. The **fifth and sixth forms** display per interface statistics for the specified protocol or address family.

netstat Options	
Option	Meaning
-A	With the default display, show the address of any protocol control blocks associated with sockets; used for debugging.
-a	With the default display, show the state of all sockets; normally sockets used by server processes are not shown.
-b	b With the interface display (option -i), show bytes in and out, in- stead of packets in and out.
-d	With either interface display (option -i or an interval, as de- scribed below), show the number of dropped packets.
-f add_fam	Limit statistics or address control block reports to those of the specified <i>address family</i> . The following address families are recognized: <ul style="list-style-type: none"> 0. <i>inet</i>, for AF_INET 0. <i>inet6</i>, for AF_INET6 0. <i>arp</i>, for AF_ARP 0. <i>ns</i>, for AF_NS 0. <i>iso</i>, for AF_ISO 0. <i>atalk</i>, for AF_APPLETALK 0. <i>local</i> or <i>unix</i>, for AF_LOCAL.
-g	Show information related to multicast (group address) routing. By default, show the IP Multicast virtual-interface and routing ta- bles. If the -s option is also present, show multicast routing statistics.
-i interface	Show information about the specified interface; used with a <i>wait</i> interval as described below. If the -f address_family option (with the -s option) or the -p protocol option is present, show per- interface statistics on the <i>interface</i> for the specified <i>address_family</i> or <i>protocol</i> , respectively.
-i	Show the state of interfaces which have been auto-configured (in- terfaces statically configured into a system, but not located at boot time are not shown). If the -a options is also present, mul- ticast addresses currently in use are shown for each Ethernet in- terface and for each IP interface address. Multicast addresses are shown on separate lines following the interface address with which they are associated. If the -f address_family option (with the -s option) or the -p protocol option is present, show per-interface statistics on all interfaces for the specified <i>address_family</i> or <i>protocol</i> , respectively.
-L	Don't show link-level routes (e.g., IPv4 ARP or IPv6 neighbour cache).
-M	Extract values associated with the name list from the specified core instead of the default <i>/dev/kmem</i> .

-m	Show statistics recorded by the memory management routines (the network manages a private pool of memory buffers).
-N	Extract the name list from the specified system instead of the default <i>/netbsd</i> .
-n	Show network addresses and ports as numbers (normally netstat interprets addresses and ports and attempts to display them symbolically). This option may be used with any of the display formats.
-S	Show network addresses as numbers (as with -n) but show ports symbolically).
-P <i>pcbaddr</i>	Dump the contents of the protocol control block (PCB) located at kernel virtual address <i>pcbaddr</i> . This address may be obtained using the -A flag. The default protocol is TCP, but may be overridden using the -p flag.
-p <i>protocol</i>	Show statistics about <i>protocol</i> , which is either a well-known name for a protocol or an alias for it. Some protocol names and aliases are listed in the file <i>/etc/protocols</i> . A null response typically means that there are no interesting numbers to report. The program will complain if <i>protocol</i> is unknown or if there is no statistics routine for it.
-s	Show per-protocol statistics. If this option is repeated, counters with a value of zero are suppressed.
-r	Show the routing tables. When -s is also present, show routing statistics instead.
-v	Show extra (verbose) detail for the routing tables (-r), or avoid truncation of long addresses.
-w <i>wait</i>	Show network interface statistics at intervals of <i>wait</i> seconds. The default display, for active sockets, shows the local and remote addresses, send and receive queue sizes (in bytes), protocol, and the internal state of the protocol. Address formats are of the form "host.port" or "network.port" if a socket's address specifies a network but no specific host address. When known the host and network addresses are displayed symbolically according to the databases <i>/etc/hosts</i> and <i>/etc/networks</i> , respectively. If a symbolic name for an address is unknown, or if the -n option is specified, the address is printed numerically, according to the address family.

PING

```
/usr/sbin/ping host [ timeout ]  
/usr/sbin/ping -s [ -dILnrV ] [ -i interface_address ] [ -l interval ] [ -t ttl ] host [ packetsize ] [ count ]
```

Description

The ping utility utilizes the ICMP protocol's ECHO_REQUEST datagram to elicit an ICMP ECHO_RESPONSE from the specified host or network gateway. If host responds, ping will print host is alive on the standard output and exit. Otherwise, after timeout seconds, it will write no answer from host.

The default value of timeout is 20 seconds. When the **-s** flag is specified, ping sends one datagram per second (adjustable with **-l**) and prints one line of output for every

ECHO_RESPONSE that it receives. No output is produced if there is no response.

The default datagram packet size is 64 bytes, or you can specify a size with the **packetsize** argument. If an optional count is specified, ping sends ping requests until it either sends count requests or receives count replies.

ping Options	
Option	Description
-d	Set the SO_DEBUG
-I	Loose source routing
-L	Turn off loopback of multicast packets.
-n	Show network addresses as numbers.
-r	Bypass normal routing tables and send directly to a host on an attached network.
-R	Record route by storing it in IP header.
-v	Verbose output.
-i interface_address	Specify the outgoing interface address to use for multicast packets. The default interface address for multicast packets is determined from the (unicast) routing tables.
-l interval	Specify the interval between successive transmissions. The default is one second.
-t ttl	Specify the ttl hop value.

TRACEROUTE

```
traceroute [-d] [-F] [-I] [-n] [-v] [-x] [-f first_ttl] [-g gateway [-g gateway] | -r] [-i iface] [-m max_ttl] [-p port] [-q nqueries] [-s src_addr] [-t tos] [-w waittime] host [packetlen]
```

traceroute Options	
Option	Description
-d	Set the SO_DEBUG socket option.
-F	Set the "don't fragment" bit.
-I	Use ICMP ECHO instead of UDP datagrams.
-n	Print hop addresses numerically rather than symbolically and numerically. This saves a nameserver address-to-name lookup for each gateway found on the path.
-v	Verbose output. For each hop, the size and the destination of the response packets is displayed. Also ICMP packets received other than TIME_EXCEEDED and UNREACHABLE are listed as well.
-x	Prevent traceroute from calculating checksums. Note that checksums are usually required for the last hop when using ICMP ECHO probes. See the -l option.
-f first_ttl	Set the starting ttl value to <i>first_ttl</i> , to override the default value 1. traceroute skips processing for those intermediate gateways which are less than <i>first_ttl</i> hops away.
-g gateway	Specify a loose source route gateway. The

	user can specify more than one gateway by using -g for each gateway. The maximum that can be set is 8.
-r	Bypass the normal routing tables and send directly to a host on an attached network. If the host is not on a directly-attached network, an error is returned. This option can be used to send probes to a local host through an interface that has been dropped by the router daemon.
-i iface	Specify a network interface to obtain the source IP address for outgoing probe packets. This is normally only useful on a multi-homed host. The -s option is also another way to do this. Note that this option does not provide a way to specify the interface on which the probe packets are sent.
-m max_ttl	Set the maximum ttl used in outgoing probe packets. The default is 30 hops, which is the same default used for TCP connections.
-p port	Set the base UDP port number used in probes. The default is 33434. traceroute hopes that nothing is listening on UDP ports (base+(nhops-1)*nqueries) to (base+(nhops*nqueries)-1) at the destination host, so that an ICMP PORT_UNREACHABLE message will be returned to terminate the route tracing. If something is listening on a port in the default range, this option can be used to select an unused port range. nhops is defined as the number of hops between the source and the destination.
-q nqueries	Set the desired number of probe queries. The default is 3.
-s src_addr	Use the following address, which usually is given as an IP address, not a hostname, as the source address in outgoing probe packets. On multi-homed hosts, those with more than one IP address, this option can be used to force the source address to be something other than the IP address traceroute picks by default. If the IP address is not one of this machine's interface addresses, an error is returned and nothing is sent. When used together with the -i option, the given IP address should be configured on the specified interface. Otherwise, an error will be returned.
-t tos	Set the tos(type-of-service) in probe packets to the specified value. The default is zero. The value must be an integer in the range from 0 to 255. Gateways along the path may route the probe packet differently depending upon the tos value set in the probe packet.
-w waittime	Set the time, in seconds, to wait for a response to a probe. The default is five (5) seconds.
host	The network host.

IFCONFIG

ifconfig *interface* *address_family* [*address* [*dest_address*]] [*parameters*] ifconfig [-mL] *interface* [*protocol_family*] ifconfig -a [-mL] [-b] [-d] [-u] [-s] [*protocol_family*] ifconfig -l [-b] [-d] [-u] [-s] ifconfig -s *interface* ifconfig -C

Description

ifconfig is used to assign an address to a network interface and/or configure network interface parameters. **ifconfig** must be used at boot time to define the network address of each interface present on a machine; it may also be used at a later time to redefine an interface's address or other operating parameters. Available operands for **ifconfig**: *address* For the DARPA-Internet family, the address is either a host name present in the host name data base, hosts, or a DARPA Internet address expressed in the Internet standard ``dot notation''.

Ifconfig Parameters	
Parameter	Description
alias	Establish an additional network address for this interface. This is sometimes useful when changing network numbers, and one wishes to accept packets addressed to the old interface.
-alias	Remove the specified network address alias.
arp	Enable the use of the Address Resolution Protocol in mapping between network level addresses and link level addresses (default). This is currently implemented for mapping between DARPA Internet addresses and Ethernet addresses.
-arp	Disable the use of the Address Resolution Protocol. anycast (inet6 only) Set the IPv6 anycast address bit.
-anycast (inet6 only)	Clear the IPv6 anycast address bit.
broadcast mask (Inet only)	Specify the address to use to represent broadcasts to the network. The default broadcast address is the address with a host part of all 1's.
debug	Enable driver dependent debugging code; usually, this turns on extra console error logging.
-debug	Disable driver dependent debugging code.
delete	Remove the network address specified. This would be used if you incorrectly specified an alias, or it was no longer needed. If you have incorrectly set an NS address having the side effect of specifying the host portion, removing all NS addresses will allow you to respecify the host portion. delete does not work for IPv6 addresses. Use -alias with explicit IPv6 address instead.
<i>dest_address</i>	Specify the address of the correspondent on the other end of a point to point link.
down	Mark an interface ``down''. When an interface is marked ``down'', the system will not attempt to transmit messages through that interface. If possible, the interface will be reset to disable reception as well. This action does not automatically disable routes using the interface.
ipdst	This is used to specify an Internet host who is willing to receive ip packets encapsulating NS packets bound for a remote network. An apparent point to point link is constructed, and the address specified will be taken as

	the NS address and network of the destination. IP encapsulation of CLNP packets is done differently.
media type	Set the media type of the interface to <i>type</i> . Some inter- faces support the mutually exclusive use of one of several different physical media connectors. For example, a 10Mb/s Ethernet interface might support the use of either AUI or twisted pair connectors. Setting the media type to ``10base5" or ``AUI" would change the currently ac- tive connector to the AUI port. Setting it to ``10baseT" or ``UTP" would activate twisted pair.
mediaopt opts	Set the specified media options on the interface. <i>opts</i> is a comma delimited list of options to apply to the in- terface.
-mediaopt opts	Disable the specified media options on the interface.
instance minst	Set the media instance to <i>minst</i> . This is useful for de- vices which have multiple physical layer interfaces (PHYs). Setting the instance on such devices may not be strictly required by the network interface driver as the driver may take care of this automatically.
metric n	Set the routing metric of the interface to <i>n</i> , default 0. The routing metric is used by the routing protocol routed. Higher metrics have the effect of making a route less favorable; metrics are counted as addition hops to the destination network or host.
mtu n	Set the maximum transmission unit of the interface to <i>n</i> . Most interfaces don't support this option.
netmask mask	Specify how much of the address to reserve for subdividing networks into sub-networks. The mask includes the network part of the local address and the subnet part, which is taken from the host field of the address. The mask can be specified as a single hex- adecimal number with a leading 0x, with a dot-notation Internet address, or with a pseudo-network name listed in the network table. The mask contains 1's for the bit positions in the 32-bit address which are to be used for the network and subnet parts, and 0's for the host part. The mask should contain at least the standard network portion, and the subnet field should be contiguous with the network portion. For INET and INET6 addresses, the netmask can also be given with slash-notation after the address (e.g 192.168.17.3/24).
nwkey persist	Enable WEP encryption for IEEE 802.11-based wireless network interfaces with the persistent key written in the network card.
nwkey persist:key	Write the <i>key</i> to the persistent memory of the network card, and enable WEP encryption for IEEE 802.11-based wireless network interfaces with the <i>key</i> .
-nwkey	Disable WEP encryption for IEEE 802.11-based wireless network interfaces.
powersave	Enable 802.11 power saving mode.
-powersave	Disable 802.11 power saving mode.
powersavesl	Set the receiver sleep dura- tion in

tunnel src_addr dest_addr	Configure the physical source and destination address for IP tunnel interfaces (gif). The arguments <i>src_addr</i> and <i>dest_addr</i> are interpreted as the outer source/destination for the encapsulating IPv4/IPv6 header.
deletetunnel	Unconfigure the physical source and destination address for IP tunnel interfaces previously configured with tunnel .
create	Create the specified network pseudo-device. destroy Destroy the specified network pseudo-device.
ptime n (inet6 only)	Set preferred lifetime for the address.
prefixlen n	Effect is similar to netmask . but you can specify by prefix length by digits.
deprecated (inet6 only)	Set the IPv6 deprecated address bit.
-deprecated (inet6 only)	Clear the IPv6 deprecated address bit.
tentative (inet6 only)	Set the IPv6 tentative address bit.
-tentative (inet6 only)	Clear the IPv6 tentative address bit.
vlan tag	If the interface is a vlan pseudo-interface, set the VLAN tag to <i>tag</i> . This is a 16-bit number which is used to create an 802.1Q VLAN header for packets sent from the vlan interface. Note that vlan and vlanif must be set at the same time.
vlanif iface	If the interface is a vlan pseudo-interface, associate the physical interface <i>iface</i> with it. Packets transmitted through the vlan interface will be diverted to the specified physical interface <i>iface</i> with 802.1Q VLAN en- capsulation. Packets with 802.1Q encapsulation received by the physical interface with the correct VLAN tag will be diverted to the associated vlan pseudo-interface. The VLAN interface is assigned a copy of the physical interface's flags and Ethernet address.
-a	May be used instead of an interface name. This flag instructs ifconfig to display information about all interfaces in the system
-s	Limits this to interfaces that are down, -u limits this to interfaces that are up, -b limits this to broadcast interfaces, and -s omits interfaces which appear not to be connected to a network.
-l	Used to list all available interfaces on the system, with no other additional information. Use of this flag is mutually ex- clusive with all other flags and commands, except for -d (only list in- terfaces that are down), -u (only list interfaces that are up), -s (only list interfaces that may be connected), -b (only list broadcast inter- faces).
-C	Used to list all of the interface cloners available on the system, with no additional information. Use of this flag is mutually exclusive with all other flags and commands.

ROUTE

`route [-n] [-q] [-v] Command [Family] [[-net| -host] Destination [-netmask Address]] Gateway] [Arguments]`

Description

The **route** command allows you to make manual entries into the network routing tables. The **route** command distinguishes between routes to hosts and routes to networks by interpreting the network address of the *Destination* variable, which can be specified either by symbolic name or numeric address. The **route** command resolves all symbolic names into addresses, using either the */etc/hosts* file or the network name server.

The **-netmask** argument must be followed by an address parameter (to be interpreted as a network mask). One can override the implicit network mask generated in the **-inet** case by making sure this option follows the *Destination* parameter.

If the **flush** or **-f** command is specified, route will "flush," or clear, the routing tables of all gateway entries. One can choose to flush only those routes whose destinations are of a given address family, by specifying an optional keyword describing which address family.

Examples

To establish a route so that a computer on one network can send a message to a computer on a different network, enter:

```
route add 192.100.201.7 192.100.13.7
```

The 192.100.201.7 address is that of the receiving computer (the *Destination* parameter). The 192.100.13.7 address is that of the routing computer (the *Gateway* parameter). To establish a route so you can send a message to any user on a specific network, enter:

```
route add -net 192.100.201.0 192.100.13.7
```

To clear the host gateway table, enter:

```
route -f
```