

Default TTL Values in TCP/IP

Internet's unbroken growth and recent fundamental topology changes within the international backbone occasionally cause some nasty connectivity problems. In most cases, the problem could be identified as hosts sending out IP packets with too small initial TTL (Time To Live) values. Worst case maximum hop counts of up to 40 can be observed nowadays. TCP and UDP initial TTL values should be set to a "safe" value of at least 60 today. Look here for more background information.

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A Look into the RFC's

Two RFC's give very clear guidelines for the implementation of the TTL field in the Internet Protocol:

Requirements for Internet Hosts -- Communication Layers (RFC 1122, R. Braden, Oct 89):

extracts from paragraph 3.2.1.7:

The IP layer **MUST** provide a means for the transport layer to set the TTL field of every datagram that is sent. When a fixed TTL value is used, it **MUST** be configurable. The current suggested value will be published in the "Assigned Numbers" RFC.

and

A fixed value must be at least big enough for the Internet "diameter," i.e., the longest possible path. A reasonable value is about twice the diameter, to allow for continued Internet growth.

Assigned Numbers (RFC 1700, J. Reynolds, J. Postel, October 1994):

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IP TIME TO LIVE PARAMETER

The current recommended default time to live (TTL) for the Internet Protocol (IP) [45,105] is 64.

The 'Assigned Numbers' RFC gets periodical updates going back as far as 1976. It is interesting to point out that the recommendation for a TTL default value of 64 is more

than three years old now. It has been first published in Assigned Numbers (RFC 1340, J. Reynolds, J. Postel, July 1992).

TTL Overview

Disclaimer:

The following list is a best effort overview of some widely used TCP/IP stacks. The information was provided by vendors and many helpful system administrators. We would like to thank all these contributors for their precious help ! SWITCH cannot, however, take any responsibility that the provided information is correct. Furthermore, SWITCH cannot be made liable for any damage that may arise by the use of this information.

OS Version	"safe"	tcp_ttl	udp_ttl
AIX	n	60	30
DEC Pathworks V5	n	30	30
FreeBSD 2.1R		y	64
HP/UX 9.0x		n	30
HP/UX 10.01		y	64
Irix 5.3	y	60	60
Irix 6.x	y	60	60
Linux	y	64	64
MacOS/MacTCP 2.0.x		y	60
OS/2 TCP/IP 3.0	y	64	64
OSF/1 V3.2A		n	60
Solaris 2.x	y	255	255
SunOS 4.1.3/4.1.4	y	60	60
Ultrix V4.1/V4.2A	n	60	30
VMS/Multinet		y	64
VMS/TCPware		y	60
VMS/Wollongong 1.1.1.1	n	128	30
VMS/UCX (latest rel.)		y	128
MS WfW	n	32	32
MS Windows 95		n	32
MS Windows NT 3.51	n	32	32
MS Windows NT 4.0	y	128	128

Detailed information about TCP/IP stacks

AIX

TCP TTL is 60 but UDP has a too low TTL of 30. The TTL initial values can be printed out and modified using the command "no". See the man page for more instructions. Further measures might be required to make the changes permanent.

DEC PATHWORKS V5 for DOS and Windows

TCP and UDP use too low TTLs of 30. These defaults can be modified in file

C:\PW\PWTCP.INI add line "IPTTL = 64"

FreeBSD 2.1R

TCP and UDP are set to a safe default of 64. The sysctl command can be used to show and modify (if required) the defaults:

```
% /usr/sbin/sysctl net.inet.ip.ttl      # show parameter
# /usr/sbin/sysctl -w net.inet.ip.ttl=64 # set parameter
```

Note that the change isn't permanent. One has to put this command into the /etc/rc or /etc/rc.local scripts to set this parameter after every reboot.

HP/UX 9.0x

TCP and UDP use too low TTLs of 30. HP Support Center provided the [set_ttl tool](#) to modify these defaults.

HP/UX 10.0x

TCP and UDP values are set to 64.

Irix 5.3, 6.2, 6.3, 6.4

TCP and UDP values are set to 60. The defaults can be modified by changing the file /var/sysgen/master.d/bsd and rebuilding the kernel.

Irix 6.5

TCP and UDP values are set to 60. The defaults can be modified using the 'systune' command.

Linux

At least after V1.1.59 (and most probably before) Linux uses "safe" values of 64 for both TCP and UDP default TTLs. As these values are "hardcoded", occasional modifications have to be done deep in the source - change the parameter sk->ip_ttl in file net/inet/af_inet.c to whatever you think is appropriate for you. Some pointers to find the position where sk->ip_ttl is set:

```
Linux V1.12.11:      net/inet/af_inet.c   line 695
Linux V1.3.45:      net/inet/af_inet.c   line 678
Linux V2.2.x:       net/ipv4/ipconfig.c   line 516
```

MacOS/MacTCP 2.0.x

TCP and UDP values are set to 60.

OS/2 TCP/IP 3.0

TCP and UDP values are set to 64.

OSF/1 V3.2A

TCP TTL is 60 but UDP has a too low TTL of 30. Modification of TCP/IP stack parameters can be made with netconfig2.3

Solaris 2.x

All versions use a default value of 255 for both TCP and UDP.

SunOS 4.1.3/4

Since version 4.1.3, both TCP and UDP default TTL is set to 60. I have no info about older releases, but these are obsolete anyhow. You can find (or modify) the TTL values in

```
udp_ttl: in /usr/kvm/sys/netinet/in_proto.c
tcp_ttl: in /usr/kvm/sys/netinet/tcp_timer.h by
        changing the parameter TCP_TTL
```

Ultrix

TCP TTL is 60 but UDP has a too low TTL of 30. Modification of TCP/IP stack parameters can be made with netconfig2.3

VMS/Multinet

All recent versions use a TTL of 64 for TCP and UDP. Should a modification of these parameters be required, it can be done as follows:

```
$ MULTINET SET/KERNEL TCP_TTL newvalue
$ MULTINET SET/KERNEL UDP_TTL newvalue
```

VMS/TCPware

TCPware for VMS (Alpha or VAX CPUs)

Default TTL = 60 for both TCP & UDP since at least TCPware 4.1-2A

If required for some reason, you can modify the values:

```
$ RUN TCPWARE:NETCU
NETCU> SET IPDEFAULTTTL default-time-to-live-hops
NETCU> EXIT
```

VMS/Wollongong Runtime Version 1.1.1.1

TCP TTL uses a safe value of 128, but UDP TTL is set to 32.

There is no way to change the defaults, but a new Runtime Version 2.5 is said to fix the problem (i.e. make the parameters configurable).

VMS/UCX

The latest version uses safe TTL values of 128 for TCP & UDP. No info on older version available yet. TTL values can be modified, if needed, by typing the command

```
$ UCX
UCX> set service/protocol=ip=time_to_live=64
```

MS Windows for Workgroups

Unsufficient TTL default values for both TCP and UDP. The defaults can be modified in file SYSTEM.INI, MSTCP section, by adding a line:

```
DefaultTTL=64
```

Windows 95

The default TTL is 32 for both TCP and UDP. Modification:

- Double click on program 'regedit.exe' in the Windows95 root directory.

- Go to 'Hkey_Local_Machine\System\CurrentControlSet\Services\VxD\MSTCP.
- Select 'Edit' and in drop-down menu 'new'. Choose a data format and enter parameter name and value in the appropriate format:

```
'binary value':   DefaultTTL      01 00 00 00
'string format':  DefaultTTL      64
```

Note that regedit adds quotes itself when using string format !

"Regedit-ophobe" people might alternatively have a look at the [ttlfix utility](#).

Windows NT 3.51

The default TTL is 32 for both TCP and UDP. Modification:

- Double click on program 'regedit32.exe' in the '\root\system32' directory.
- Go to 'HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\Tcpip\Parameters
- Change the "DefaultTTL" entry to

```
DefaultTTL  REG_DWORD  64
```

Windows NT 4.0

The default TTL has been raised to 128 for both TCP and UDP according to <http://msdn.microsoft.com/library/backgrnd/html/unicastrouting.htm>

Tools

netconfig2.3:

available from:

<ftp://cs.ucsd.edu/pub/csl/Netconfig/netconfig2.3.tar.gz>

With netconfig you can display and modify TCP/IP parameters in many Unix implementations. It does not work for Solaris 2.x however. Be careful when installing this tool, by default "make install" sets a "setuid root" permission, which is probably not exactly what you want.

set_ttl:

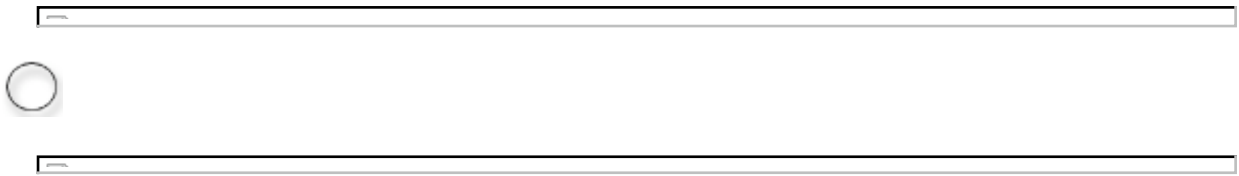
An unsupported utility, provided by the HP Support Center, which lets you change initial TTL values in HP/UX kernels. [HP's set_ttl script](#) is also available directly from this server.

ttlfix:

A small utility which automagically changes Windows95 TTL defaults to safe values. Available from

<ftp://ftp.active.ch/pub/internet/windows/ttlfix.zip>

ttlfix requires [vbrun300.zip](#) for startup. Install it in directory '\windows\system' if not yet there.



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