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**Article:** [Configure the max limit for TCP connections](http://heelpbook.altervista.org/wp-admin/post.php?post=2728&action=edit)

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# [**Microsoft Windows – Configure the max limit for concurrent TCP connections**](http://heelpbook.altervista.org/2012/microsoft-windows-configure-the-max-limit-for-concurrent-tcp-connections/)

To keep the **TCP/IP** stack from taking all resources on the computer, there are different parameters that control how many connections it can handle.

If running applications that are constantly opening and closing connections (**P2P**), or are providing a service which many tries to connect to at the same time (Web-server like IIS), then one can improve the performance of these applications by changing the restriction limits.

**TcpNumConnections**

There is a parameter that limits the maximum number of connections that **TCP** may have open simultaneously.

[HKEY\_LOCAL\_MACHINE \System \CurrentControlSet \Services \Tcpip \Parameters]

TcpNumConnections = 0x00fffffe (Default = 16,777,214)

**Note:** a 16 Million connection limit sounds very promising, but there are other parameters, which keeps us from ever reaching this limit.

When a client makes a **connect()** call to make a connection to a server, then the client invisible/implicit bind the socket to a local dynamic (anonymous, ephemeral, short-lived) port number. The default range for dynamic ports in **Windows** is 1024 to 5000, thus giving 3977 outbound concurrent connections for each IP Address.

It is possible to change the upper limit with this DWORD registry key:

[HKEY\_LOCAL\_MACHINE \System \CurrentControlSet \Services \Tcpip \Parameters]

MaxUserPort = 5000 (Default = 5000, Max = 65534)

**Note:** it is possible to reserve port numbers so they aren't used as dynamic ports in case one have a certain application that needs them. This is done by using the [ReservedPorts (Q812873)](http://support.microsoft.com/kb/Q812873) setting.

**Note:** Vista changes the default range from **1024-5000** to **49152-65535**, which can be controlled with the dynamicport setting using **netsh**. More Info [MS KB929851](http://support.microsoft.com/kb/929851).

More Info: [The Cable Guy - Ephemeral, Reserved, and Blocked Port Behavior](http://www.microsoft.com/technet/community/columns/cableguy/cg1205.mspx)

More Info: [MS KB Q196271](http://support.microsoft.com/kb/Q196271)

More Info: [MS KB Q319502](http://support.microsoft.com/kb/Q319502)

More Info: [MS KB Q319504](http://support.microsoft.com/kb/Q319504)

More Info: [MS KB Q328476](http://support.microsoft.com/kb/Q328476)

More Info: [MS KB Q836429](http://support.microsoft.com/kb/Q836429)

**MaxFreeTcbs**

For each connection a **TCP Control Block** (TCB - Data structure using 0.5 KB pagepool and 0.5 KB non-pagepool) is maintained. The **TCBs** are pre-allocated and stored in a table, to avoid spending time on allocating/deallocating the **TCBs** every time connections are created/closed.

The **TCB Table** enables reuse/caching of **TCBs** and improves memory management, but the static size limits how many connections **TCP** can support simultaneously (**Active + TIME\_WAIT**).

Configure the size of the **TCB Table** with this **DWORD** registry key:

[HKEY\_LOCAL\_MACHINE \System \CurrentControlSet \Services \Tcpip \Parameters]

MaxFreeTcbs = 2000 (Default = RAM dependent, but usual Pro = 1000, Srv=2000)

**MaxHashTableSize**

To make lookups in the **TCB** table faster a hash table has been made, which is optimized for finding a certain active connection. If the **hash table** is too small compared to the total amount of active connections, then extra **CPU** time is required to find a connection.

Configure the size of the hash table with this **DWORD** registry key (Is allocated from pagepool memory):

[HKEY\_LOCAL\_MACHINE \System \CurrentControlSet \services \Tcpip \Parameters]

MaxHashTableSize = 512 (Default = 512, Range = 64-65536)

**Note:** **Microsoft** recommends for a multiprocessor environment, that the value should not be higher than the maximum amount of concurrent connections (MaxFreeTcbs), also if multiprocessor then it might be interesting to look at the registry-key **NumTcbTablePartitions** (Recommended value CPU-count multiplied by 4).

More Info: [MS KB Q151418](http://support.microsoft.com/kb/Q151418)

More Info: [MS KB Q224585](http://support.microsoft.com/kb/Q224585)

**TcpTimedWaitDelay**

If having allocated a **1000 TCBs** then it doesn't mean that one will be able to have a 1000 active connections. Especially if the application is quickly opening and closing connections, because after a connection is "closed" it enters the state **TIME\_WAIT**, and will continue to occupy the port number for 4 minutes (**2\*Maximum Segment Live, MSL**) before it is actually removed.

This behavior is specified in [RFC 793](http://www.faqs.org/rfcs/rfc793.html), and prevents attempts to reconnect to the same party, before the old socket is recognized as closed at both sides.

It is possible to change how long a socket should be in **TIME\_WAIT** state before it can be re-used freely:

[HKEY\_LOCAL\_MACHINE \System \CurrentControlSet \services \Tcpip \Parameters]

TcpTimedWaitDelay = 120 (Default = 240 secs, Range = 30-300)

More Info: [MS KB Q137984](http://support.microsoft.com/kb/Q137984)

More Info: [MS KB Q149532](http://support.microsoft.com/kb/Q149532)

More Info: [MS KB Q832954](http://support.microsoft.com/kb/Q832954)

**MaxFreeTWTcb**

**Note:** with Win2k the reuse of sockets have been changed, so when reaching the limit of more than 1000 connections in **TIME-WAIT** state, then it starts to mark sockets that have been in **TIME\_WAIT** state for more than 60 secs as free.

It is possible to configure this limit:

[HKEY\_LOCAL\_MACHINE \System \CurrentControlSet \services \Tcpip \Parameters]

MaxFreeTWTcbs = 1000 (Default = 1000 sockets)

**Note:** with **Win2k3 SP1** the reuse of sockets have been changed, so when it has to re-use sockets in **TIME\_WAIT** state, then it checks whether the other party is different from the old socket.

Eliminating the need to fiddle with (TcpTimedWaitDelay) and (MaxFreeTWTcbs) any more.

**KeepAliveTime**

If using an application protocol that doesn't implement timeout checking, but relies on the **TCP/IP** timeout checking without specifying how often it should be done, then it is possible to get connections that "**never**" closes, if the remote host disconnects without closing the connection properly.

The **TCP/IP** timeout checking is by default done every 2 hour, by sending a keep alive packet. It is possible to change how often **TCP/IP** should check the connections (Affects all TCPIP connections):

[HKEY\_LOCAL\_MACHINE \System \CurrentControlSet \services \Tcpip \Parameters]

KeepAliveTime = 1800000 (Default = 7,200,000 milisecs)

More Info: [MS KB Q140325](http://support.microsoft.com/kb/Q140325)

When data is sent/received the data is copied back and forth to **non-paged pool memory** for buffering. If there are many connections receiving/sending data, then it is possible to exhaust the non-paged pool memory.

The max size of the non-paged pool buffer allocated for each connection is controlled by **MaxBufferredReceiveBytes** or **TCP/IP Receive Window** depending on which is smallest.

More Info: [MS KB Q296265](http://support.microsoft.com/kb/Q296265)

**Note:** if using the **Professional/Home** edition of **Windows** then it is very likely that it is crippled (By **Microsoft**) not to handle many concurrent TCP connections.

Ex. **Microsoft** have officially stated that the backlog limit is **5** (**200 when Server**), so the **Professional** edition is not able to **accept()** more than 5 new connections concurrently.

More Info: [MS KB Q127144](http://support.microsoft.com/kb/Q127144)

**Note:** even if having optimized Windows to handle many concurrent connections, then connections might still be refused when reaching a certain limit, in case a **NAT-Router/Firewall** is placed infront of it, which is unable to handle so many concurrent connections.

**EnableConnectionRateLimiting**

**Note:** if having activated [SYN-Attack-Protection](http://support.microsoft.com/kb/Q324270) (Enabled by default in **Win2k3 SP1**) or installed **WinXP SP2**, a limit is introduced on how many connection attempts (half-open) one can make simultaneously (XP SP2 & Vista = 10; Vista SP2 = no limit).

This will keep worms like blaster and sasser from spreading too fast, but it will also limit other applications that creates many new connections simultaneously (Like **P2P**).

*EventID 4226: TCP/IP has reached the security limit imposed on the number of concurrent TCP connect attempts*

More Info: [www.LvlLord.de](http://www.LvlLord.de)

**Windows Vista SP2** removes the limit again, but it can be enabled with the following **DWORD** registry setting:

[HKEY\_LOCAL\_MACHINE \SYSTEM \CurrentControlSet \Services \Tcpip \Parameters]

EnableConnectionRateLimiting = 1

More Info: [MS KB 969710](http://support.microsoft.com/kb/969710)