

**ChatScript Server Manual**  
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While the system defaults to running as a stand-alone chatbot under Windows, when run under LINUX it defaults to being a server.

Nominally (meaning depending on hardware and what your bot does) ChatScript can process a volley on a single core in 10 milliseconds on a slow machine, thus handling 100 volleys every second from different users using one core. A human-human volley is often around 15 seconds, so handling 1000 simultaneous users with a single core slow server is not unreasonable.

The fastest server OS for ChatScript is Linux. The Mac tends to misfire in the OS itself with heavy client loads. Windows is a much slower server in general. And Linux version of CS has support for forking chatscript (no such support under Windows), so you can run a fork of the engine on every core, saturating cpu processing to the max while still serving a single port. Speedup is nearly linear per core added.

## **Running the Server**

When you run the Mac/LINUX program, it defaults to server mode, port 1024. To run the server under Windows you must give it a command line parameter specifying a port.

There are various command line parameters to affect behavior, described at the end.

## **Unique User Names**

ChatScript maintains an independent history with each user-bot combination in a single file in the USER's directory. It is nominally up to you to define some unique name for each user. There is no login validation service provided by ChatScript; that is your responsibility. Some simple things which ChatScript supports directly are:

1. If the login name is “.”, the system will assign a user name of the IP address it receives. This doesn't work from localhost nor will it work if you have a server of your own relaying between the client and the ChatScript server (since the IP address will always be of your relay server).
2. If the login name is “guest”, the system will assign a user name of guest concatenated with the IP address.

You could also use the user's email address as a login id. ChatScript will automatically convert periods and @ in a user's name to \_ , so a login like “[gowilcox@gmail.com](mailto:gowilcox@gmail.com)” will become gowilcox\_gmail\_com. Likewise logging in as guest will result in something like “guest\_123\_124\_155\_12”.

Of course, if the user eventually comes back some other day on a different IP address, they lose their history. Can't be helped. And you end up with dead files.

### **Communicating with the Server**

The client webpage/program connects on a socket to the IP and port of the server. If you are coming from a webpage, the webpage must establish the socket. The system does not use HTTP. HTTP is an agreement on what port to use (a standard http port) and what message protocols look like to the HTTP server. Similarly ChatScript uses an agreement on what port to use (but you get to specify the port) and what the message protocols look like.

And, each communication is a one-shot deal. The socket is made, the client sends a message to the server, the server sends data back, AND CLOSSES THE CONNECTION.

Given that potentially thousands of users may be using the server at the same time, it is undesirable for it to try to maintain that many open sockets. If for some reason you need to maintain a permanent connection to a client, you can write an intermediary server program that has a permanent socket to the client, and relays messages back and forth between the client and the ChatScript server.

This is also what you would do if you wanted ChatScript to “push” unsolicited messages to the client. Your intermediary server can use timeouts to decide to send a specific message to the ChatScript server, and then relay the result back to the client as an unsolicited output. Similarly, your intermediate server might receive various asynchronous events and signals, and can pass requests to ChatScript at that time and pass the result back to a permanently connected client.

Each chat volley (incoming and outgoing message) is an entirely different connection. This means the Chatbot server is not devoting resources waiting for a user to reply and doesn't care how long it takes the user to come back again.

### **ChatScript Protocol**

The message a client sends is a concatenation of three null-terminated text strings.

The first string is the user login name.

The second is the name of the chatbot to talk to. If this is a null string, the system will connect to the default bot.

The third string is the message. If the message is null, this is a start of new conversation. This **MUST** be the first thing you do with a new user. Ideally you do it whenever a new conversation is starting with that user which is how the system knows the old conversation ended. Usually script will detect that this is the start of a new conversation

and say something like “hello” or “welcome back” to indicate the two parties are starting up a new conversation, though through the history file the system may have a lot of information about what has gone on in prior conversations. As long as the user is connected to the webpage, for example, you wouldn’t send a startup message again.

Due to the requirement of a unique user name, you NORMALLY require the user to enter a login name once on the client, after which you pass that on each transmission to the server. You can bypass asking for a user name if you always just use the “guest” or “.” user names.

The message sent to the server during a conversation should never be null (since that looks like a conversation start). Either always prepend a blank on every line from the user, or add a blank if the user presses ENTER without anything else or pass along the newline/cr character.

The chatbot can wait forever for each input (the connection is terminated for each volley) and the only way to know that the human “left” is when the human “comes back” with a start of a new conversation.

### **Testing the Server**

You can test everything on your own machine in Windows using batch files in SERVER BATCH FILES. Launch the server by double clicking on server.bat and then launch the client by double clicking on localclient.bat. Since this is on your own machine, firewall opening a port is unnecessary. Remember that to be a remote server you need to make your port available for inbound TCP if you have a firewall- if you don’t have a firewall you must be insane.).

If you run the Windows ChatScript engine with client=ip:port as an argument, it will act as a client to talk to and test a remote server. The ip address must be numeric and the :port is optional. The client will start a conversation and then loop with you conversing to it (assuming your server is running).

For LINUX, just perform the equivalent commands of the batch files (except that since you can’t readily run multiple apps, you’ll have to background the server presumably by doing a nohup command on it.

### **Command Authorization**

ChatScript has various :xxxx commands that can be given instead of normal chat input. These remain valid in server mode, and are a security liability if you have potentially hostile users. Therefore all :xxxx commands require authorization (even in stand-alone mode). This is the file “authorizedIP.txt” existing in the top level directory. It will be read to validate any :xxx command.

The authorization file ships with a default “all”, WHICH IS DANGEROUS TO A SERVER. Normally the file will exist but have its content erased. That will lock out commands. When you want to issue a command yourself to a running server, you go edit the file to insert on a line your own IP numeric address (since you have access to the file system itself, you are obviously an authorized person). Then you can log in to the ChatScript server and issue a :xxxx command. The file can have any number of lines of IP addresses to be considered legal.

### **Revising a Live Server**

When you want to change the contents of the server, obviously you could just stop and start it again. Of course that blocks people from using it in the interim and you might even cut off a user from getting his response. You don't have to do that.

You can restart a live server without interfering with people. In actuality, the server starts up by loading all of its data into memory (except for specific users). So the dictionary, topic data, livedata, etc are all memory resident. This means you can, while the server is running, revise those files on disk. You can, for example run a stand-alone copy and rebuilt topics from raw data. Or you can edit livedata files or dictionary files. None of this impacts a running server.

Then, as an authorized user, you can issue a :restart command. Because the chatbot server handles one user one volley at a time, when you are talking to the server no one else is (briefly). So you can tell the server to reload all of its data and that will complete your turn and it will then merrily handle the next user with the new data.

HOWEVER, each user's record tracks where they have been in a topic. If you have changed that topic, the record becomes invalid and any memory it has of where they have been in that topic, or if they are sitting at a rejoinder there waiting for the next user input, will be forgotten. It's now a fresh topic. All other unchanged topics will not affect the user in any way.

### **Preparing for compiling on the Server**

I develop the source on a Windows machine and transfer it to a LINUX box. To insure the source does not have carriage returns, I use :*clean* to read and write all src directory files without carriage returns.

### **Testing for server presence**

If you send the message: null 1 null (that's the null string user id, the string of the character “1” as bot id, and the null string message, the server will send back the string of the character “1”, with no logging done and minimal load on the server. This constitutes an echo-test to prove the server is running.

## Server Crashes

If the server crashes, it may automatically recover, generating the message “Sorry. I forgot what I was thinking about.” If your bot personality assigns a message to the user variable \$crashmsg, it will use that instead. One cannot guarantee the server doesn't go down completely, and I recommend it be on a cron job trying to start it maybe every minute or every 5. The system will detect if its port is already busy and not start a new copy if the old one is still running.

Be advised that ChatScript assumes the current directory is the one the executable is in and accesses its data relative to that. For cron this means you want an entry like:

```
0,5,10,15,20,25,30,35,40,45,50,55 * * * * cd /home/bruce/ChatScript;  
./ChatScript/LinuxChatscript32 2>/home/bruce/cronserver.log
```

## CPU vs IO bound

The ChatScript server consists of a main thread to handle computing a response, a thread to accept incoming connections, and threads for each connection spawned. The connection threads handle reading the message from the user, getting the attention of the main thread to get a response, and then passing that response back to the user. Any logging is normally done from the connection threads, so the main server is free to spend all its effort handling volleys.

Under a full load of users, the main thread will nominally be always busy and the system CPU bound as a consequence. However, the main thread must also read and write user data for each volley. That may slow things down and make the system IO bound if there are lots and lots of user files around and the system is using cloud-based files instead of local ones. This will lower thruput significantly. It can be compensated for by locally caching active user data. There is a parameter to tell the server to track some number of users in memory. It will write out those memory copies periodically, but obviously if the server crashes, some users may be 50 volleys out of date.

## Commands affecting the server

Various :xxxx commands primarily control/affect the server.

### **:show serverlog**

Toggles whether the server is logging data into the server logfile.

### **:show echoserver**

If server logging is enabled, this will print the entries sent to the log on the print console as well.

### **:shutdown**

This stops a running server, causing the program to exit. It will first flush any cached user files.

### **:restart**

This will force the system to reload all its data files from disk (dictionary, topic data, live data) and then ask for your login. It's like starting the system from scratch, but it never stops execution. Good for revising a live server.

### **:crash**

Force a crash to test system behavior during a crash.

### **:flush**

If the server is caching user topic data in memory, this flushes all the cache items to disk.

## **Command Line Parameters**

Either Mac/LINUX or Windows versions accept the following command line args:

### **Server or Not**

**port=xxx**

This tells the system to be a server and to use the given numeric port. You must do this to tell Windows to run as a server. The standard port is 1024 but you can use any port.

**local**

The opposite of the port command, this says run the program as a stand-alone system, not as a server.

### **Interface**

**interface=127.0.0.1**

By default the value is 0.0.0.0 and the system directly uses a port that may be open to the internet. You can set the interface to a different value and it will set the local port of the TCP connection to what you designate.

## User Facts

Scripts can direct the system to store individualized data for a user in the user's topic file in USERS. It can store user variables (\$xxx) or facts. Since variables hold only a single piece of information a script already controls how many of those there are. But facts can be arbitrarily created by a script and there is no natural limit. As these all take up room in the user's file, affecting how long it takes to process a volley (due to the time it takes to load and write back a topic file), you may want to limit how many facts each user can have written. This is unrelated to universal facts the system has at its permanent disposal as part of the base system.

**fact=xxxx**

This limits the user to only the xxxx most recent facts created by his interactions. The default is 800000 which is HUGE. It's also meaningless if you don't have scripts that write facts.

## User Caching

Each user is tracked via their topic file in USERS. The system must load it and write it back for each volley and in some cases will become I/O bound as a result (particularly if the filesystem is not local). You can direct the system to keep a cache in memory of recent users, to reduce the I/O volume. It will still write out data periodically, but not every volley. Of course if you do this and the server crashes, writebacks may not have happened and some system remembrance of user interaction will be lost. Of course if the system crashes, user's may not think it unusually that the chatbot forgot some of what happened. The system automatically writes to disk every 50 volleys, so a user file will never be more out of date than that.

**cache=nnn**  
**cache=nnnxmm**

This specifies how many users can be cached in memory and how big the cache block should be for a user. The default block size is 7000 bytes. User files typically are only around 4000 bytes. If a file is too big for the block, it will just have to write directly to and from the filesystem. The default cache count is 1. Nothing happens unless you also activate caching.

**save=n**

This specifies how many volleys should elapse before a cached user is saved to disk. Default is 50 in server mode and 1 in stand-alone mode. A value of 0 not only causes a user's data to be written out every volley, but also causes the user record to be dropped from the cache, so it is read back in every time it is needed (handy when running multi-core copies of chatscript off the same port).

### **userhold=xxx**

Just because a user is cached doesn't mean he's active. We don't know when he leaves. We only know he hasn't communicated in a while. If we need a cache block for a new user and we have run out, we will look to see if any old user has been silent for userhold seconds. If so, they can be flushed out, and replaced with a more active user. Default is 15 seconds, which is low. 45 seconds might be more reasonable.

### **Access to server machine itself**

#### **sandbox**

If the engine is not allowed to alter the server machine other than through the standard ChatScript directories, you can start it with the parameter "sandbox" which disables Export and System calls.

### **Logging or Not**

In stand-alone mode the system logs what a user says with a bot in the USERS folder. It can also do this in server mode. It can also log what the server itself does. But logging slows down the system. Particularly if you have an intervening server running and it is logging things, you may have no use whatsoever for ChatScript's logging.

#### **userlog**

Store a user-bot log in USERS directory. Stand-alone default if unspecified.

#### **nouserlog**

Don't store a user-bot log. Server default if unspecified.

#### **serverlog**

Write a server log. Server default if unspecified. The server log will be put into the LOGS directory under **serverlog**xxx.txt where xxx is the port.

#### **Noserverlog**

Don't write a server log.

### **Testing a server**

There are various configurations for having an instance be a client to test a server.

#### **client=xxxx:yyyy**



This says be a client to test a remote server at IP xxxx and port yyyy. You will be able to “login” to this client and then send and receive messages with a server.

**client=localhost:yyyy**

This says be a client to test a local server on port yyyy. Similar to above.

**load=1**

This creates a localhost client that constantly sends messages to a server. Works its way through REGRESS/bigregress.txt as its input (over 100K messages). Can assign different numbers to create different loading clients (e.g., load=10 creates 10 clients).

**dual**

Yet another client. But this one feeds the output of the server back as input for the next round.

There are also command line parameters for controlling memory usage which are not specific to being a server.