

Assignment 1

BUILDING A CHAT SERVER THAT WILL BE PART OF AN INTERCONNECTED NETWORK

For this assignment you will be responsible for developing a Chat Server. The chat server will perform the following functions

1. Maintain information about Users and the Forums that they are interested in.
2. Distribute messages sent on a Forum to only those Users that previously registered an interest in.
3. Incorporate support for both Registration and De-registration of a User from a forum
4. Relay messages forwarded to it by another Chat Server. To initiate a relay, a user has to specifically request that a message be relayed and can also specify a TTL that controls the maximum number of chat servers a message can go through.

You can make the following **assumptions** for this assignment

- The bytes are sent in network-order i.e. Big-Endian.
- All characters are ASCII (not Unicode).
- There is a one-to-one mapping between the connections and the users.
- All integers are SIGNED integers

Error Processing: If the message is not a CS670 message i.e. the first 4 bytes are not 314159265 do not process the message. The processing here could include an error notification being sent.

Sending Messages: Send messages once they have been fully constructed, and not as they are being constructed.

Constants

Protocol ID: 314159265 (4 bytes)
 REGISTER_USER : 1 (1 byte)
 Deregister_USER : 2 (1 byte)
 CHAT_MESSAGE: 20 (1 byte)
 RELAY_MESSAGE: 21 (1 byte)
 CHAT_SERVER_REGISTER_REQ: 31 (1 byte)
 CHAT_SERVER_REGISTER_RESP: 32 (1 byte)

The wire format for the messages in our chat example are listed below

1 Register/Deregister:

Size in bytes	Field Name	Notes
4	314159265	This set of 4 bytes identifies the packet as the CS670 chat protocol
1	REGISTER_USER/ DEREGISTER_USER	This byte identifies the packet as a registration or deregistration message
4	USER_NAME_LENGTH	This set of 4 bytes encapsulates the number of characters in the user name
USER_NAME_LENGTH	USER_NAME	The USER_NAME where each character is 8 bits (1 byte)
4	NUMBER_OF_FORUMS	The number of forums the user wants to register.
4	FORUM_1.LENGTH	The length of the first forum name
FORUM_1.LENGTH	FORUM_NAME_1	The name of the first forum

....
4	FORUM_N.LENGTH	The length of the Nth forum name
FORUM_N.LENGTH	FORUM_NAME_N	The name of the Nth forum

2 CHAT MESSAGE

Size in bytes	Field Name	Notes
4	314159265	This set of 4 bytes identifies the packet as the CS670 chat protocol
1	CHAT_MESSAGE	This byte identifies the packet as a chat message
1	RELAY_MESSAGE	Indicates whether this message should be relayed. If this value is 21 relay the message, otherwise don't.
1	TTL	This indicates the number of chat servers the message can pass through. Each chat server that gets this message must decrement it by 1, and if the value is 0 send only to connected clients and NOT send it to other Chat Servers
4	USER_NAME_LENGTH	This set of 4 bytes encapsulates the number of characters in the user name of the creator of the message
USER_NAME_LENGTH	USER_NAME	The USER_NAME where each character is 8 bits (1 byte)
4	FORUM.LENGTH	The length of the forum name
FORUM.LENGTH	FORUM_NAME	The name of the forum the message is sent to
4	MESSAGE_LENGTH	The length of the message
MESSAGE_LENGTH	MESSAGE	The text of the message sent to the forum
<p>The remainder of this message is used by chat servers to add their footprint to the message. This is used to</p> <ol style="list-style-type: none"> To keep a trace of how the message traversed the Chat Server network To make sure that the message is NOT resent to a Chat Server it already passed through 		
4	NUMBER_OF_CHATSERVERS	Traces the number of servers the message has passed through. This will be incremented every time a message is received at a chat server.
4	SERVER_1_INFO.LENGTH	The length of the 1 st Chat server name
SERVER_1_INFO.LENGTH	SERVER_1_INFO	The info about SERVER1.
....
4	SERVER_N_INFO.LENGTH	The length of the Nth Chat Server name
SERVER_N_INFO.LENGTH	SERVER_N_INFO	The info about SERVER1

3 Chat Server Registration Message

Chat Servers need a protocol for exchanging information about their names when they connect to each other. Listed below is a simple request response style communication between the servers. The server info could be something like "Bob's Server" or "Alice's Server". **Once a link is established between two chat servers, the link should be bi-directional irrespective of which server initiated the connection.**

Size in bytes	Field Name	Notes
4	314159265	This set of 4 bytes identifies the packet as the CS670 chat protocol
1	CHAT_SERVER_REGISTER_REQ	This byte identifies the packet as a chat server connecting to another chat server
4	SERVER_INFO.LENGTH	The length of the requesting Chat server's name
SERVER_INFO.LENGTH	SERVER_INFO	The info about the requesting SERVER.

Size in bytes	Field Name	Notes
4	314159265	This set of 4 bytes identifies the packet as the CS670 chat protocol
1	CHAT_SERVER_REGISTER_RESP	This byte identifies the packet as a chat server response to the requestor
4	SERVER_INFO.LENGTH	The length of the responding Chat server's name
SERVER_INFO.LENGTH	SERVER_INFO	The info about the responding SERVER