2025/10/03 03:23 1/2 Socket communication

Socket communication

The client sends requests to the server over a TCP socket connection, and the server responds to these requests. Here are the basic steps involved in integrating software systems or components using TCP socket communication:

- 1. **Select a protocol**: TCP/IP is a common protocol for socket communication, but other protocols like UDP can also be used depending on the requirements.
- 2. **Determine the message format**: Decide on the format of the messages that will be exchanged between the client and server. This could be a simple text-based format or a more complex binary format.
- 3. **Define the communication interface**: Define the functions or APIs that will be used for communication between the client and server.
- 4. **Create the server**: Write the code for the server that listens for incoming client connections and handles incoming requests.
- 5. **Create the client**: Write the code for the client that connects to the server and sends requests.
- 6. **Handle errors**: Implement error handling mechanisms to ensure that communication errors are handled gracefully and do not cause the system to crash or become unstable.
- 7. **Test and iterate**: Test the system thoroughly and make any necessary changes or improvements to ensure that it is functioning correctly.

Features:

- Socket ::= IP address + (TCP/UPD) port number. A Socket is a combination of ip address and port number.
- TCP Sockets provides 'real-time' data transfer
 - binary data transfer but can be normal text or ISON, XML as well
 - no direct method sharing (can be implemented by hand)
 - TCP and UDP connections are possible. UDP is min 3 times quicker but one-way communication
- Persistent or On-Demand communication channel
 - because of connection time-loss usually persistent channels are better, but periodically 'ping' messages should be sent. (in order to avoid connection closing). In case of any problems reconnection is possible
 - in case of UDP channels an extra TCP channel is available for synchronizing in online games
- Results in the fastest possible transmission:
 - Where the number of transactions per second up to ~ 50 transactions, there should have been applied. (20ms / sec transfer)

Java example for Blocking and Non-Blocking Socket

Exercise 1.

Create a simplified FTP (file transport) client and **blocking** server where the client can send or download text files from the server:

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General use-cases

- 1.) Client connects to the server and sends a 'file listing' message
- 2.) Server sends back the list of the downloadable files
- 3.) Client lists the files and asks the user what action they want to take? Upload or download? ('u' or 'd')
- 4.) In both cases users must give the full file name with extension
- 5.) The client sends the selected file to the server (upload) or downloads the selected file from the server to a specific directory.

Server viewpoint

- 1.) After connecting, it reads the files from the /store subdirectory and sends the file names to the client after receiving the listing message.
- 2.) We are waiting for the client's 'u' or 'd' operation
- 3.) We get a filename from the client and if the action is 'd' (download), we read the file content and return its contents
- 4.) If the operation is 'u' (upload), we open a new file with the specified name and wait for the data to be written to the file.

Client viewpoint

- 1.) The client connects and waits for the list of files coming back and writes it to the console
- 2.) We ask for the "u" or "d" key
- 3.) Then we'll ask for the file-name as well.
- 4.) The client reads the files from the /files folder, or creates the downloaded file here
- 5.) If you press "d", it creates /files/ and writes data from the server
- 6.) If you press "u", /files/ is sent to the server

Exercise 2. Modify the **non-blocking** code so that you can transfer a burned-in name and existing text or image file larger than 2 kbytes and verify that it was successfully sent.

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