

# 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:

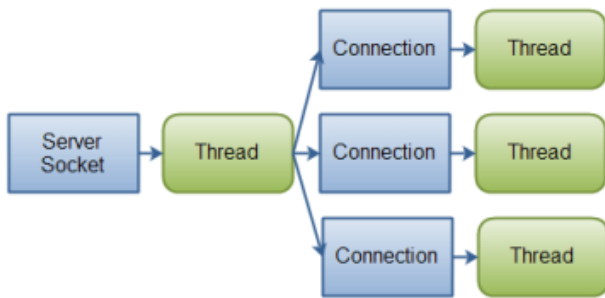
1. **Select a protocol:** TCP/IP is a common protocol for socket communication, but other protocols like UDP can also be used depending on the requirements.
2. **Determine the message format:** Decide on the format of the messages that will be exchanged between the client and server. This could be a 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:

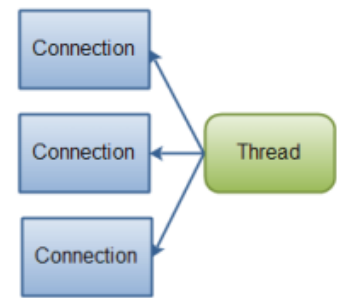
- Socket ::= IP address + (TCP/UDP) port number. A Socket is a combination of ip address and port number.
- TCP Sockets provides 'real-time' data transfer
  - binary data transfer but can be normal text or JSON, XML as well
  - no direct method sharing (can be implemented by hand)
  - TCP and UDP connections 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)

## Blocking and non-blocking TCP sockets in Java

Traditional Multi threaded socket

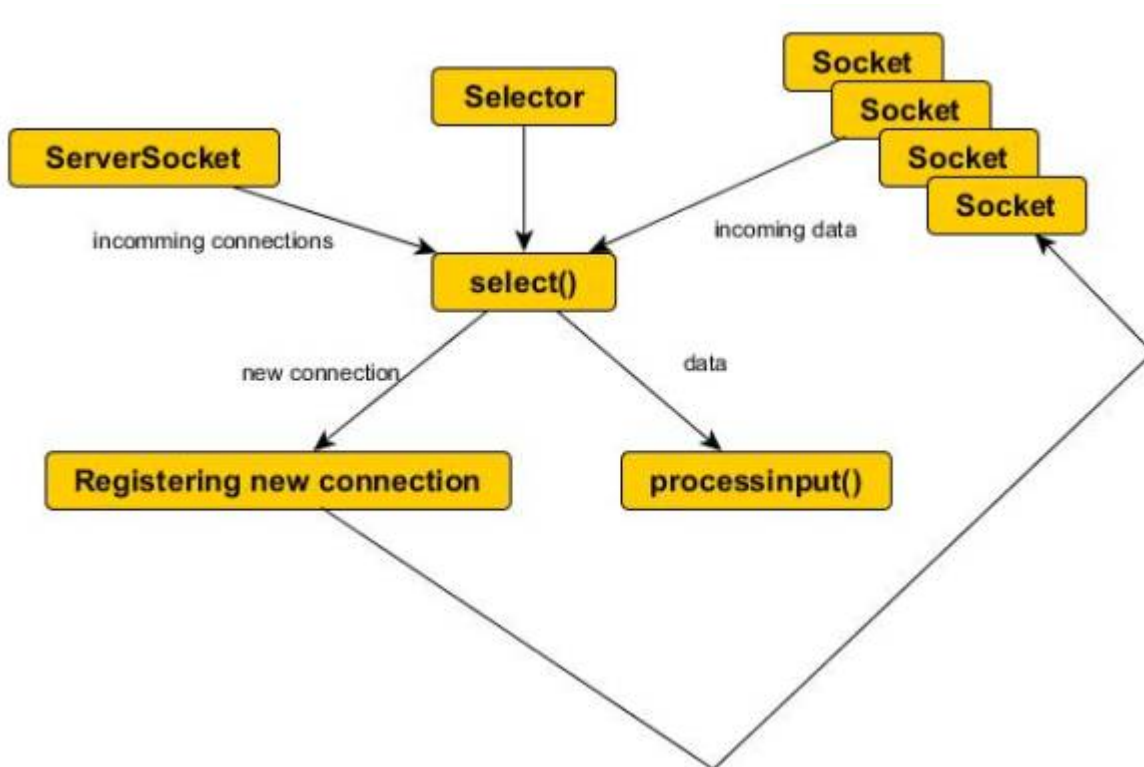


Non blocking 1 thread socket



Reading:

- <http://tutorials.jenkov.com/java-nio/nio-vs-io.html>
- <http://www.javaworld.com/article/2073344/core-java/use-select-for-high-speed-networking.html>



## Non-blocking loop

```
ServerSocketChannel serverSocketChannel = ServerSocketChannel.open();

serverSocketChannel.socket().bind(new InetSocketAddress(9999));
serverSocketChannel.configureBlocking(false); // ez a sor jelzi a
blokkolásmentes működést

while(true){
    SocketChannel socketChannel = serverSocketChannel.accept();
```

```
if(socketChannel != null){  
    // the connection is accepted  
}  
}
```

## Java examples

[Java example for Blocking and Non-Blocking Socket](#)

## Exercises

### Exercise 1.

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

#### 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 **blocking** UDP 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.

**Exercise 3.** Try out the non-blocking starter Java code and examine/debug the code.

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