Blocking TCP sockets in Java

Blocking Socket server source code

```
    package org.ait;
    import java.io.IOException;
    import java.io.ObjectInputStream;
    import java.io.ObjectOutputStream;
    import java.net.ServerSocket;
    import java.net.Socket;
    public class Server {
        ServerSocket providerSocket;
        Socket connection = null;
        ObjectOutputStream out;
        ObjectInputStream in;
        String message;
        Server() {
        }
        void run() {
            try {
                // 1. create a socket server listening to port 8080
                providerSocket = new ServerSocket(8080);
                // 2. waiting for the connection (here we are waiting until
next connection)
                connection = providerSocket.accept();
                // 3. create Input and Output streams
                out = new ObjectOutputStream(connection.getOutputStream());
                in = new ObjectInputStream(connection.getInputStream());
                // 4. socket communication
                do {
                    try {
                        message = (String) in.readObject();
                        System.out.println("client>" + message);
                        if (message.equals("bye")) {
                            sendMessage("bye");
                        }
                    } catch (ClassNotFoundException classnot) {
                        System.err.println("Data received in unknown
format");
                    }
                } while (!message.equals("bye"));
            } catch (IOException ioException) {
                ioException.printStackTrace();
            } finally {
                // 4: close connection
                try {
                    in.close();
                    out.close();
```

```
                    providerSocket.close();
                } catch (IOException ioException) {
                    ioException.printStackTrace();
                }
            }
        }
        void sendMessage(String msg) {
            try {
                out.writeObject(msg);
                out.flush();
                System.out.println("server>" + msg);
            } catch (IOException ioException) {
                ioException.printStackTrace();
            }
        }
        public static void main(String args[]) {
            Server server = new Server();
            while (true) {
                server.run();
            }
        }
    }
```

Blocking Socket client source

```
    package org.ait;
    import java.io.IOException;
    import java.io.ObjectInputStream;
    import java.io.ObjectOutputStream;
    import java.net.Socket;
    import java.net.UnknownHostException;
    public class Client {
        Socket requestSocket;
        ObjectOutputStream out;
        ObjectInputStream in;
        String message;
        Client() {
        }
        void run() {
            try {
                // 1. try to connect to the socket: localhost:8080
                requestSocket = new Socket("localhost", 8080);
                // 2. Input and Output streams
                out = new
ObjectOutputStream(requestSocket.getOutputStream());
                in = new ObjectInputStream(requestSocket.getInputStream());
                // 3: communications
```

```
                do {
                    try {
                        sendMessage("Hello server");
                        sendMessage("bye");
                        message = (String) in.readObject();
                    } catch (Exception e) {
                        System.err.println("data received in unknown
format");
                    }
                } while (!message.equals("bye"));
            } catch (UnknownHostException unknownHost) {
                System.err.println("You are trying to connect to an unknown
host!");
            } catch (IOException ioException) {
                ioException.printStackTrace();
            } finally {
                // 4: close connection
                try {
                    in.close();
                    out.close();
                    requestSocket.close();
                } catch (IOException ioException) {
                    ioException.printStackTrace();
                }
            }
        }
        void sendMessage(String msg) {
            try {
                out.writeObject(msg);
                out.flush();
                System.out.println("client>" + msg);
            } catch (IOException ioException) {
                ioException.printStackTrace();
            }
        }
        public static void main(String args[]) {
            Client client = new Client();
            client.run();
        }
    }
```

Blocking UDP sockets in Java

The following Agent sends a message and waits for a response on port 8080, also with UDP. Older versions of the Eclipse IDE, the text you type on the console can be sent by pressing ctrl+z

```
package org.ait;
```

```
import java.io.BufferedReader;
import java.io.InputStreamReader;
import java.net.DatagramPacket;
import java.net.DatagramSocket;
import java.net.InetAddress;

public class UDPClient {
    public static void main(String args[]) throws Exception {
        BufferedReader inFromUser = new BufferedReader(new
InputStreamReader(System.in));
        DatagramSocket clientSocket = new DatagramSocket();
        InetAddress IPAddress = InetAddress.getByName("localhost");

        byte[] sendData = new byte[1024];
        byte[] receiveData = new byte[1024];

        String sentence = inFromUser.readLine();
        sendData = sentence.getBytes();

        DatagramPacket sendPacket = new DatagramPacket(sendData,
sendData.length, IPAddress, 8080);
        clientSocket.send(sendPacket);

        DatagramPacket receivePacket = new DatagramPacket(receiveData,
receiveData.length);
        clientSocket.receive(receivePacket);
        String modifiedSentence = new String(receivePacket.getData());

        System.out.println("converted:" + modifiedSentence);
        clientSocket.close();
    }
}
```

The UDP server waits for the agents messages on port 8080 and converts them to uppercase letters and sends them back to the client UDP socket.

```
package org.ait;

import java.net.DatagramPacket;
import java.net.DatagramSocket;
import java.net.InetAddress;

public class UDPServer {
    public static void main(String args[]) throws Exception {

        DatagramSocket serverSocket = new DatagramSocket(8080);
```

```
        byte[] bytesReceived = new byte[1024];
        byte[] bytesSent = new byte[1024];

        DatagramPacket receivePacket = new DatagramPacket(bytesReceived,
bytesReceived.length);
        // here we are waiting for the packets
        serverSocket.receive(receivePacket);

        String textMessage = new String(receivePacket.getData());

        System.out.println("I got: " + textMessage);

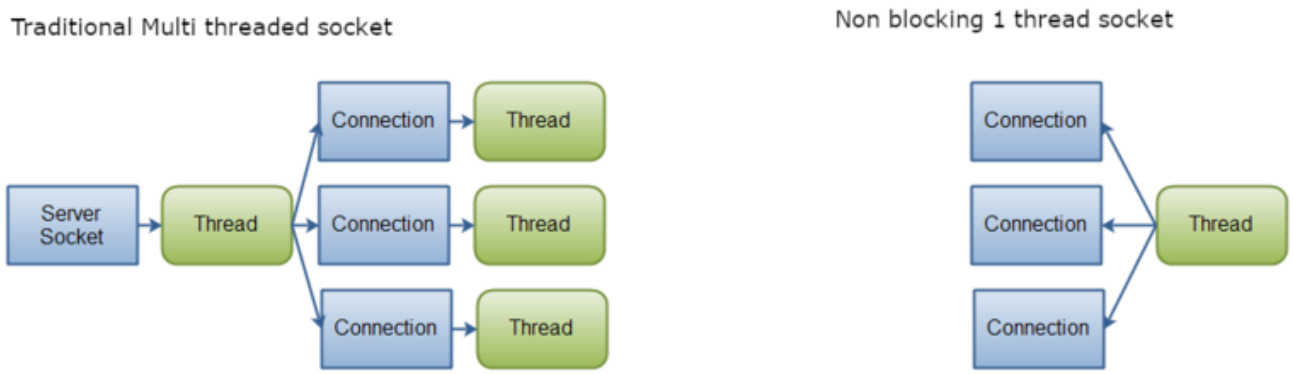
        InetAddress IPAddress = receivePacket.getAddress();
        int port = receivePacket.getPort();

        String upperCaseText = textMessage.toUpperCase();
        bytesSent = upperCaseText.getBytes();

        // send back
        DatagramPacket sendPacket = new DatagramPacket(bytesSent,
bytesSent.length, IPAddress, port);
        serverSocket.send(sendPacket);
        serverSocket.close();

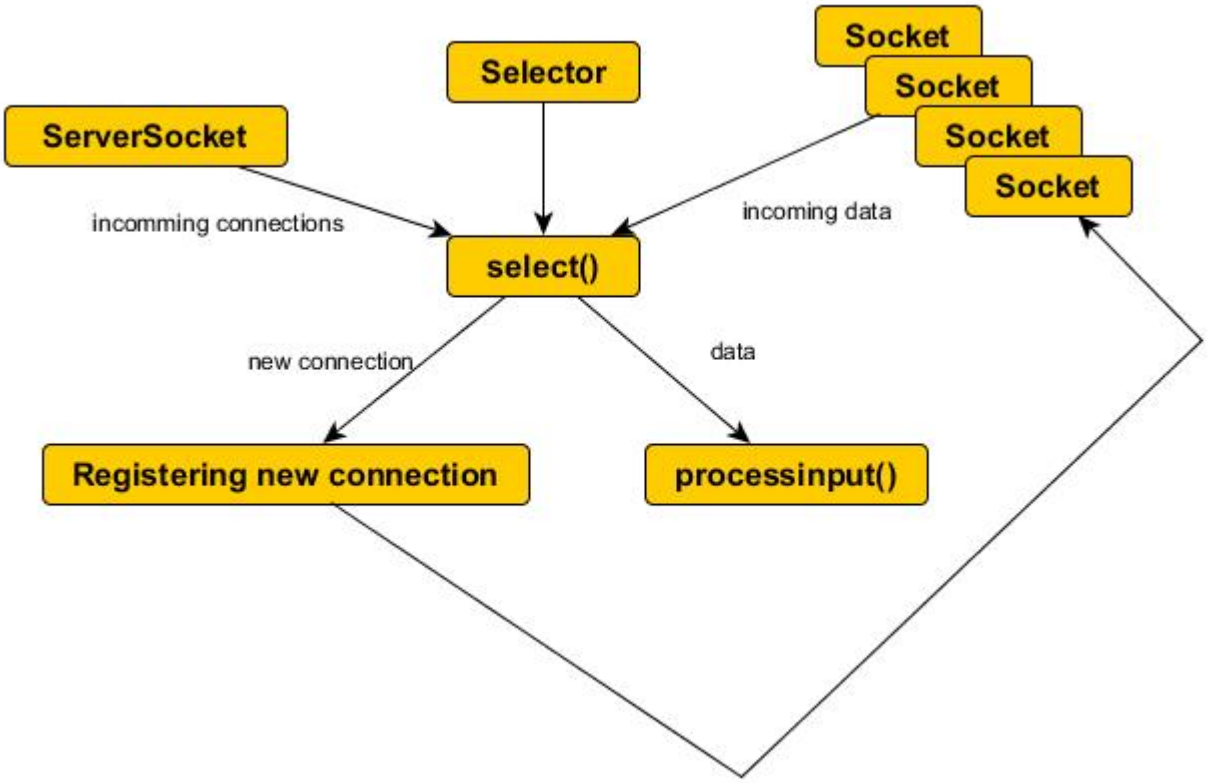
    }
}
```

Non-blocking TCP sockets in Java



Reading:

- http://tutorials.jenkov.com/java-nio/nio-vs-io.html
- https://www.infoworld.com/article/2073344/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
    }
   }
```

Non-blocking Java client example

```
  import java.io.IOException;
  import java.io.InputStream;
  import java.io.OutputStream;
  import java.net.Socket;
  import java.util.Random;
```

```
  public class Client implements Runnable {
    private String host;
    private int port;
    // Bounds on how much we write per cycle
    private static final int minWriteSize = 1024;
    private static final int maxWriteSize = 65536;
    // Bounds on how long we wait between cycles
    private static final int minPause = (int) (0.05 * 1000);
    private static final int maxPause = (int) (0.5 * 1000);
    // Random number generator
    Random rand = new Random();
    public Client(String host, int port, int numThreads) {
        this.host = host;
        this.port = port;
        for (int i = 0; i < numThreads; ++i) {
            new Thread(this).start();
        }
    }
    public void run() {
        byte buffer[] = new byte[maxWriteSize];
        try {
            Socket s = new Socket(host, port);
            InputStream in = s.getInputStream();
            OutputStream out = s.getOutputStream();
            while (true) {
                int numToWrite = minWriteSize
                        + (int) (rand.nextDouble() * (maxWriteSize -
minWriteSize));
                for (int i = 0; i < numToWrite; ++i) {
                    buffer[i] = (byte) rand.nextInt(256);
                }
                out.write(buffer, 0, numToWrite);
                int sofar = 0;
                while (sofar < numToWrite) {
                    sofar += in.read(buffer, sofar, numToWrite - sofar);
                }
                System.out.println(Thread.currentThread() + " wrote " +
numToWrite);
                int pause = minPause + (int) (rand.nextDouble() * (maxPause
- minPause));
                try {
                    Thread.sleep(pause);
                } catch (InterruptedException ie) {
                }
            }
        } catch (IOException ie) {
            ie.printStackTrace();
        }
    }
    static public void main(String args[]) throws Exception {
        new Client("localhost", 4444, 3);
```

```
    }
  }
```

Non-blocking Java server example

```
public class Server implements Runnable {
  // The port we will listen on
  private int port;
  // A pre-allocated buffer for encrypting data
  private final ByteBuffer buffer = ByteBuffer.allocate(16384);
  public Server(int port) {
      this.port = port;
      new Thread(this).start();
  }
  public void run() {
      try {
          // Instead of creating a ServerSocket,
          // create a ServerSocketChannel
          ServerSocketChannel ssc = ServerSocketChannel.open();
          // Set it to non-blocking, so we can use select
          ssc.configureBlocking(false);
          // Get the Socket connected to this channel, and bind it
          // to the listening port
          ServerSocket ss = ssc.socket();
          InetSocketAddress isa = new InetSocketAddress(port);
          ss.bind(isa);
          // Create a new Selector for selecting
          Selector selector = Selector.open();
          // Register the ServerSocketChannel, so we can
          // listen for incoming connections
          ssc.register(selector, SelectionKey.OP_ACCEPT);
          System.out.println("Listening on port " + port);
          while (true) {
              // See if we've had any activity -- either
              // an incoming connection, or incoming data on an
              // existing connection
              int num = selector.select();
              // If we don't have any activity, loop around and wait
              // again
              if (num == 0) {
                  continue;
              }
              // Get the keys corresponding to the activity
              // that has been detected, and process them
              // one by one
```

```
                Set keys = selector.selectedKeys();
                Iterator it = keys.iterator();
                while (it.hasNext()) {
                    // Get a key representing one of bits of I/O
                    // activity
                    SelectionKey key = (SelectionKey) it.next();
                    // What kind of activity is it?
                    if ((key.readyOps() & SelectionKey.OP_ACCEPT) ==
SelectionKey.OP_ACCEPT) {
                        System.out.println("acc");
                        // It's an incoming connection.
                        // Register this socket with the Selector
                        // so we can listen for input on it
                        Socket s = ss.accept();
                        System.out.println("Got connection from " + s);
                        // Make sure to make it non-blocking, so we can
                        // use a selector on it.
                        SocketChannel sc = s.getChannel();
                        sc.configureBlocking(false);
                        // Register it with the selector, for reading
                        sc.register(selector, SelectionKey.OP_READ);
                    } else if ((key.readyOps() & SelectionKey.OP_READ) ==
SelectionKey.OP_READ) {
                        SocketChannel sc = null;
                        try {
                            // It's incoming data on a connection, so
                            // process it
                            sc = (SocketChannel) key.channel();
                            boolean ok = processInput(sc);
                            // If the connection is dead, then remove it
                            // from the selector and close it
                            if (!ok) {
                                key.cancel();
                                Socket s = null;
                                try {
                                    s = sc.socket();
                                    s.close();
                                } catch (IOException ie) {
                                    System.err.println("Error closing socket
"
                                            + s + ": " + ie);
                                }
                            }
                        } catch (IOException ie) {
                            // On exception, remove this channel from the
                            // selector
                            key.cancel();
                            try {
                                sc.close();
                            } catch (IOException ie2) {
                                System.out.println(ie2);
```

```
                            }
                            System.out.println("Closed " + sc);
                        }
                    }
                }
                // We remove the selected keys, because we've dealt
                // with them.
                keys.clear();
            }
        } catch (IOException ie) {
            System.err.println(ie);
        }
    }
    // Do some cheesy encryption on the incoming data,
    // and send it back out
    private boolean processInput(SocketChannel sc) throws IOException {
        buffer.clear();
        sc.read(buffer);
        buffer.flip();
        // If no data, close the connection
        if (buffer.limit() == 0) {
            return false;
        }
        // Simple rot-13 encryption
        for (int i = 0; i < buffer.limit(); ++i) {
            byte b = buffer.get(i);
            if ((b >= 'a' && b <= 'm') || (b >= 'A' && b <= 'M')) {
                b += 13;
            } else if ((b >= 'n' && b <= 'z') || (b >= 'N' && b <= 'Z')) {
                b -= 13;
            }
            buffer.put(i, b);
        }
        sc.write(buffer);
        System.out.println("Processed " + buffer.limit() + " from " + sc);
        return true;
    }
    static public void main(String args[]) throws Exception {
        new Server(4444);
    }
}
```

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Last update: **2026/03/09 08:08**