

Blocking TCP sockets in Java

Blocking Socket server source code

```
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

```
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();
    }
}
```

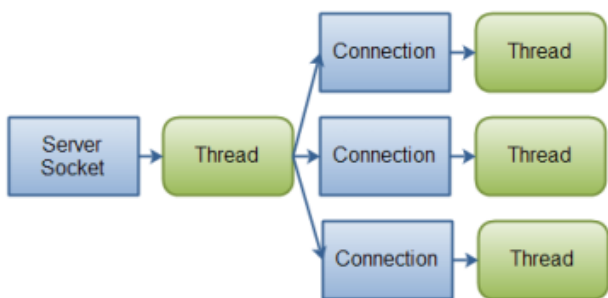
The UDP server waits for the agents messages on port 8080 and converts them to uppercase letters and sends them back to the client UDP socket.

```
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,
```

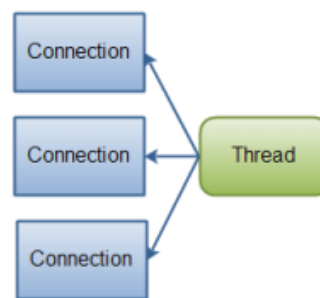
```
bytesSent.length, IPAddress, port);  
    serverSocket.send(sendPacket);  
    serverSocket.close();  
}  
}
```

Non-blocking TCP sockets in Java

Traditional Multi threaded socket

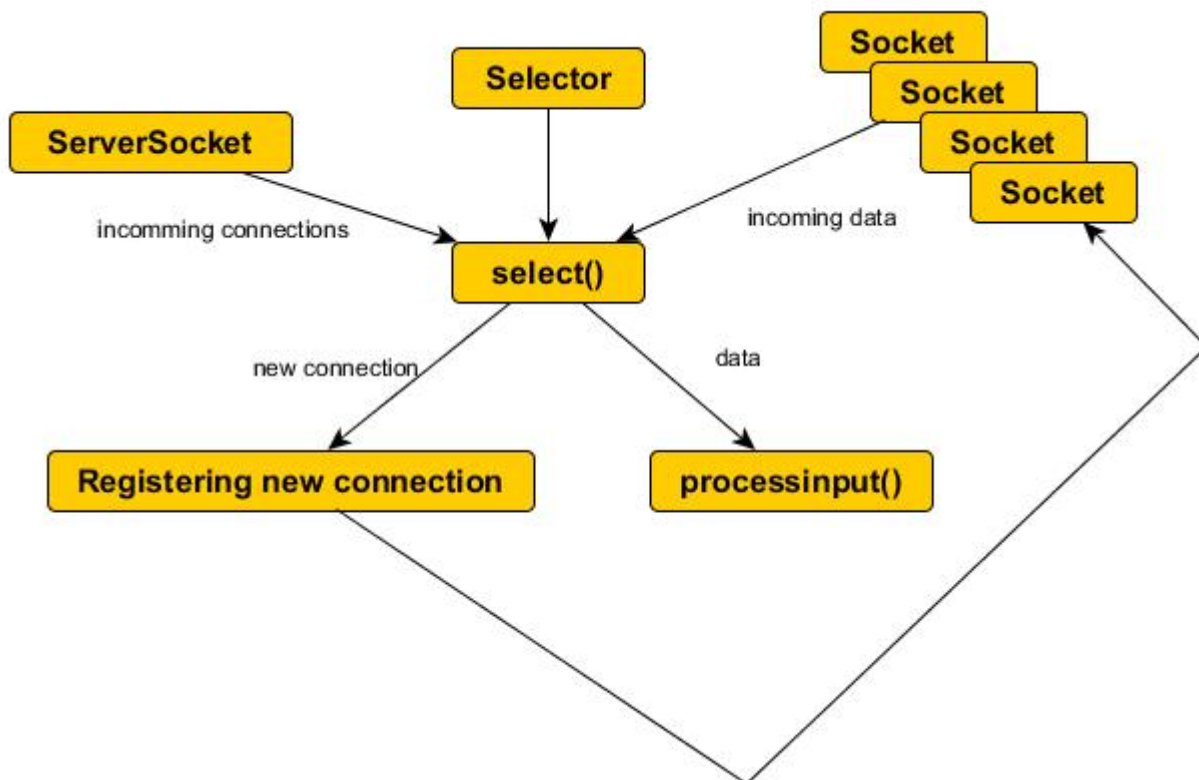


Non blocking 1 thread socket



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
    }
}
```

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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