# Java Network (I)
# (Socket)

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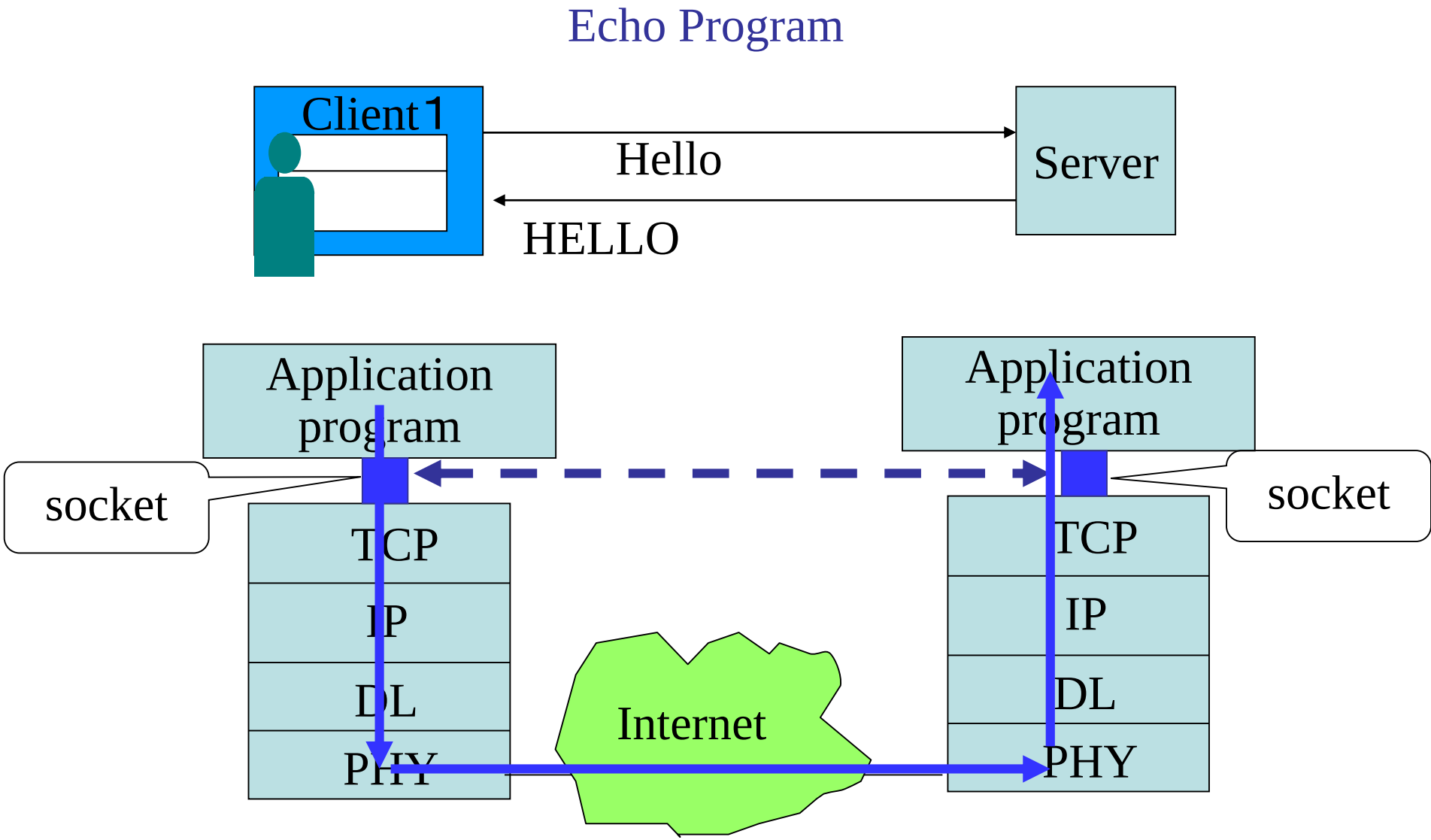
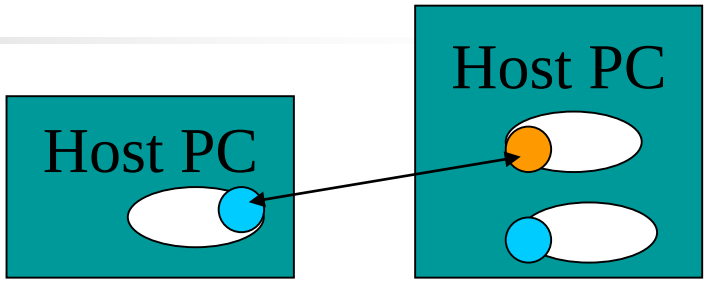
# Socket : Interface for Application Layer

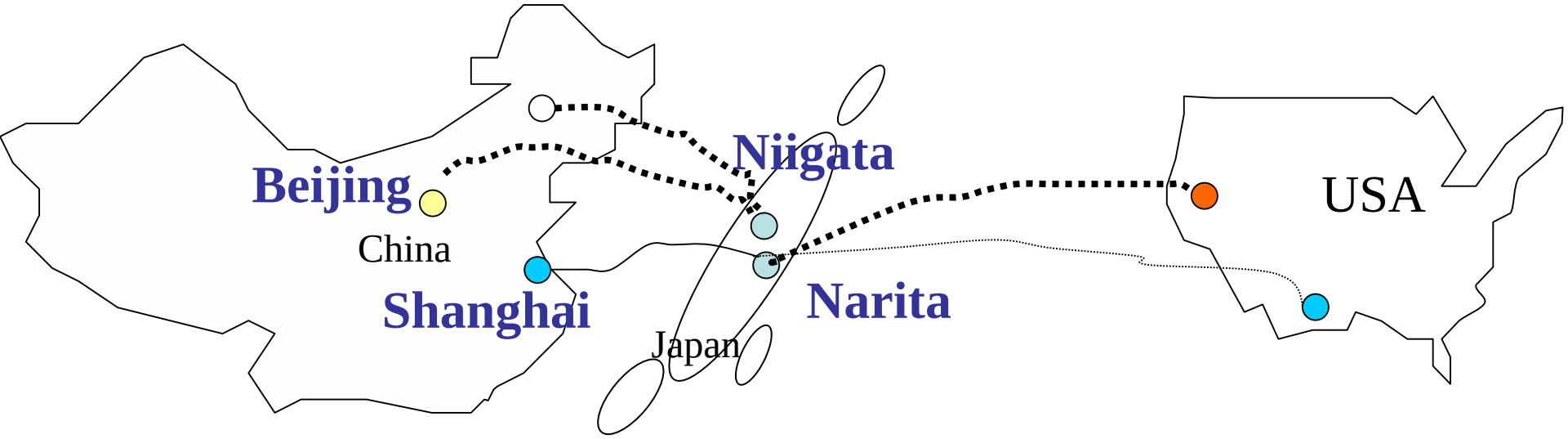


# Socket Address：IP and Port

**For example: Country and Airport**

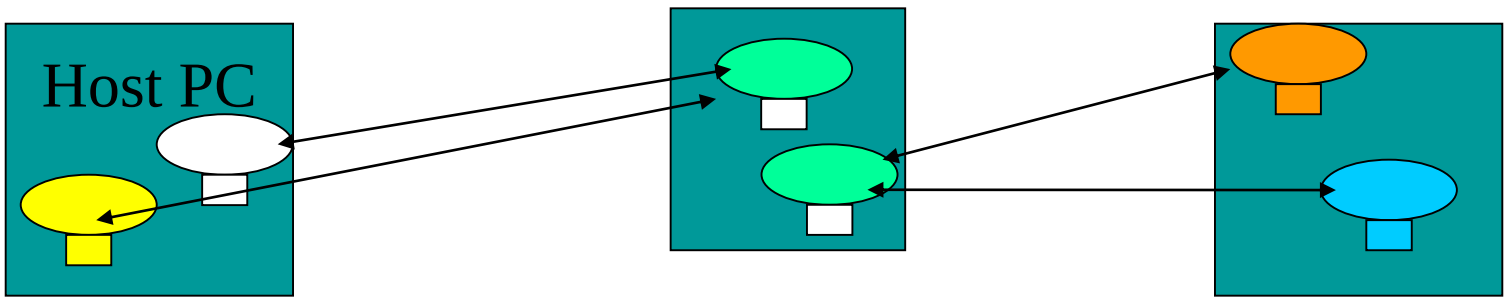
**Air lines：country A airport Q to country B airport R**




**communication：A host Q port to B host R port**

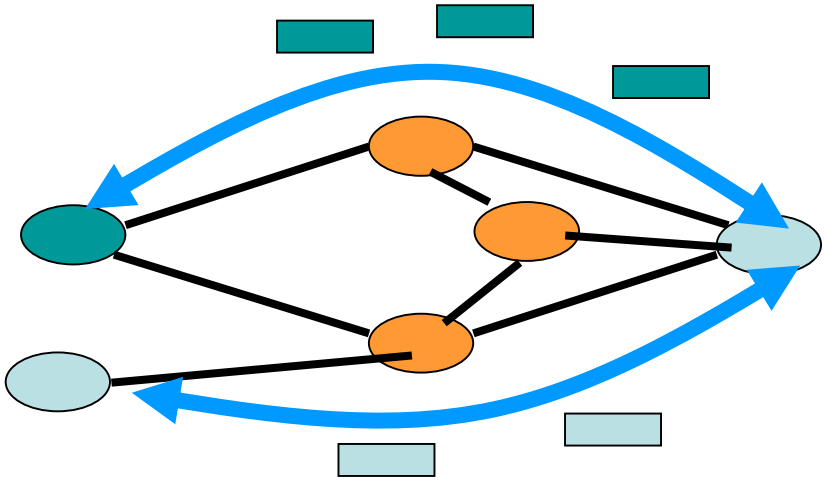
**1port：N ports**

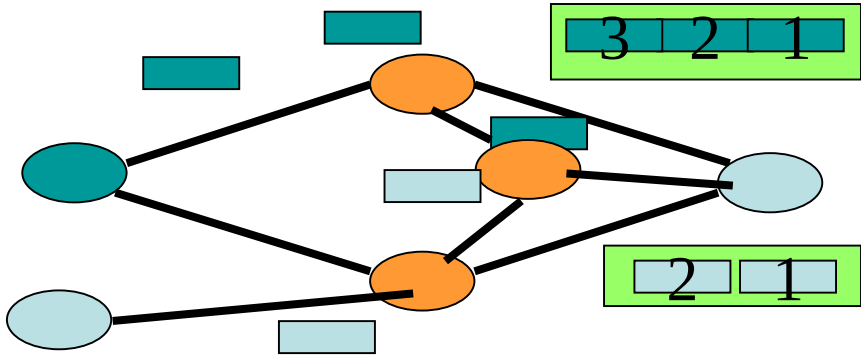


# Two types of Data Transportation Services

## 1. Connection oriented

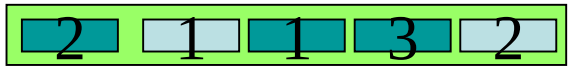
- Transmission Control Protocol (TCP) : To obtain reliable, sequenced data exchange.

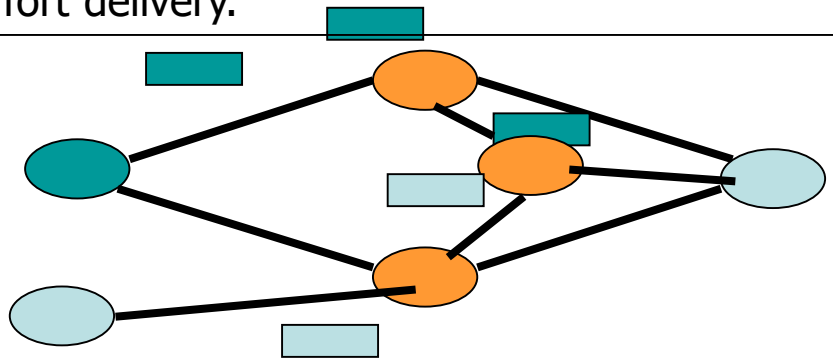


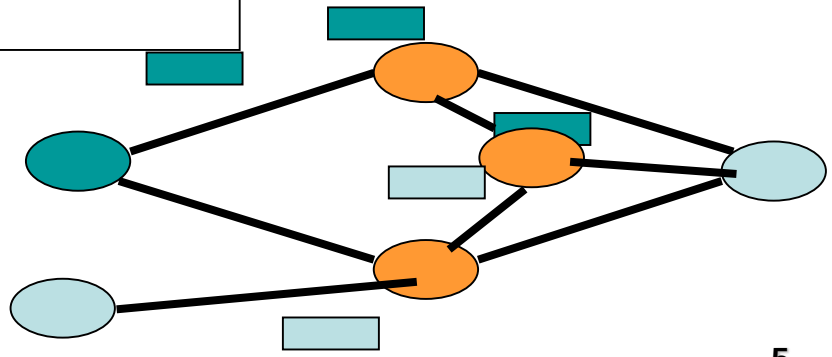



## 2. Connectionless

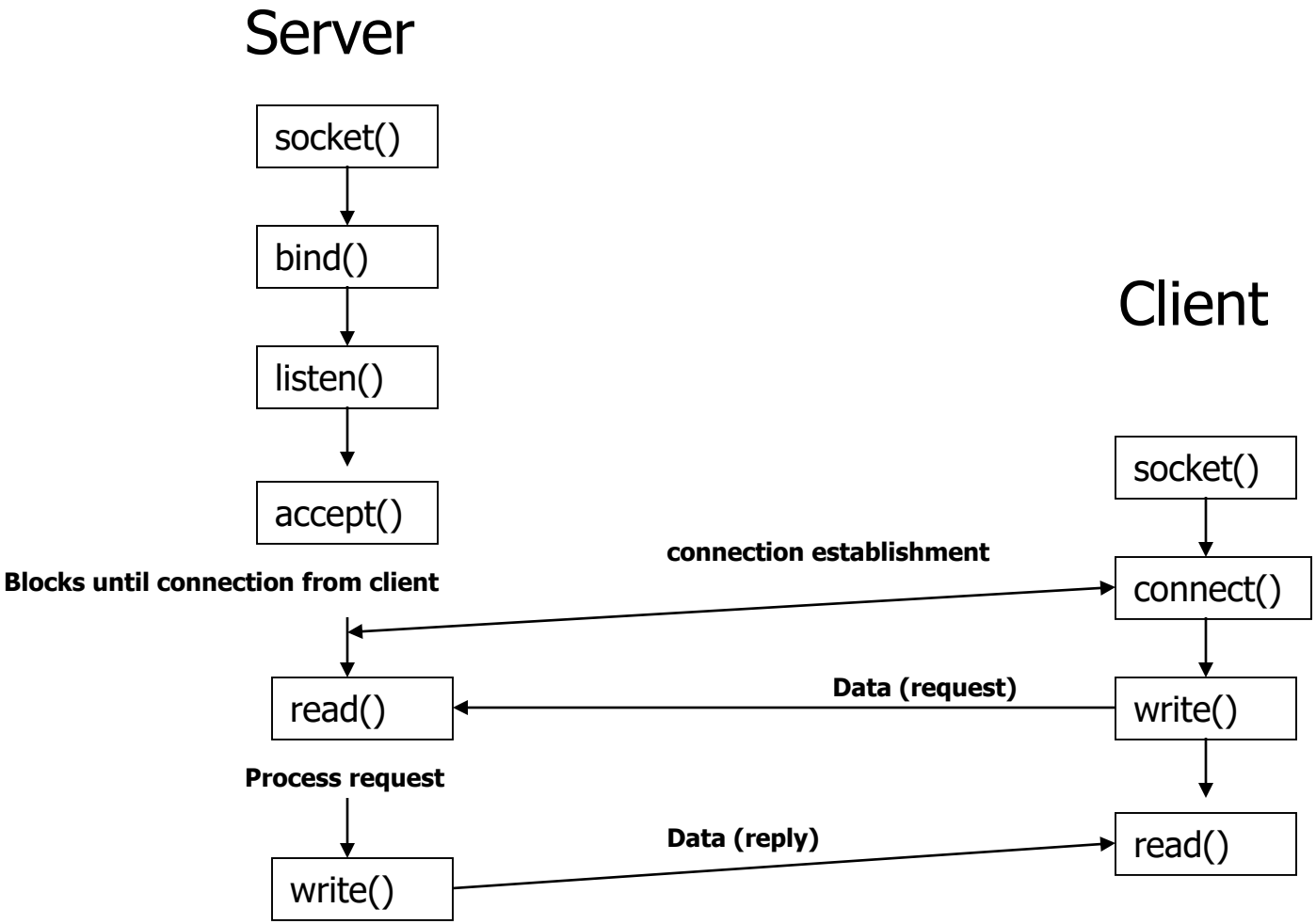
- User Datagram Protocol (UDP) : To obtain a more efficient, best-effort delivery.





# Socket Call for Connection-Oriented Protocol



# Server Sockets and Sockets

## ServerSocket Constructor

This class implements server sockets. A server sock et waits for requests to come in over the network. It performs some operation based on that request, an d then possibly returns a result to the requester.

*ServerSocket(int port) throws IOException*

*- Creates a server socket, bound to the specified port.*

## accept() Method

*Socket accept() throws IOException*
*- Listens for a connection to be made to this socket and accepts it.*

## close() Method

*void close() throws IOException*
*- Closes this socket.*

## Socket Class

This class implements client sockets (also called j ust "sockets"). A socket is an endpoint for commu nication between two machines.

*Socket(String hostName, int port) throws UnknownHostException, IOException*
*- Creates a stream socket and connects it to the specified port number at the specified IP address.*

## getInputStream(), getOutputStream Method

*InputStream getInputStream() throws IOException*
*-Returns an input stream for this socket.*
*OutputStream getOutputStream() throws IOException*
*- Returns an output stream for this socket.*

## close()

*void close() throws IOException*
*- Closes this socket.*

http://docs.oracle.com/javase/8/docs/api/java/net/ServerSocket.html

http://docs.oracle.com/javase/8/docs/api/java/net/Socket.html

# Server Sockets and Sockets

```
import java.io.*;
import java.net.*;
import java.util.*;

class ServerSocketDemo {
  public static void main(String args[]) {
    try {

      // Get Port
      int port = Integer.parseInt(args[0]);
      Random random = new Random();
      //Create Server Socket
      ServerSocket ss = new ServerSocket(port);
      //Create Infinite Loop
      while(true) {
        //Accept Incoming Requests
        Socket s = ss.accept();

        //Write Result to Client
        OutputStream os = s.getOutputStream();
       DataOutputStream dos = new
DataOutputStream(os);
        dos.writeInt(random.nextInt());

        //Close socket
        s.close();
      }
    }
    catch (Exception e) {
      System.out.println("Exception: " + e);    }
  }
}
```

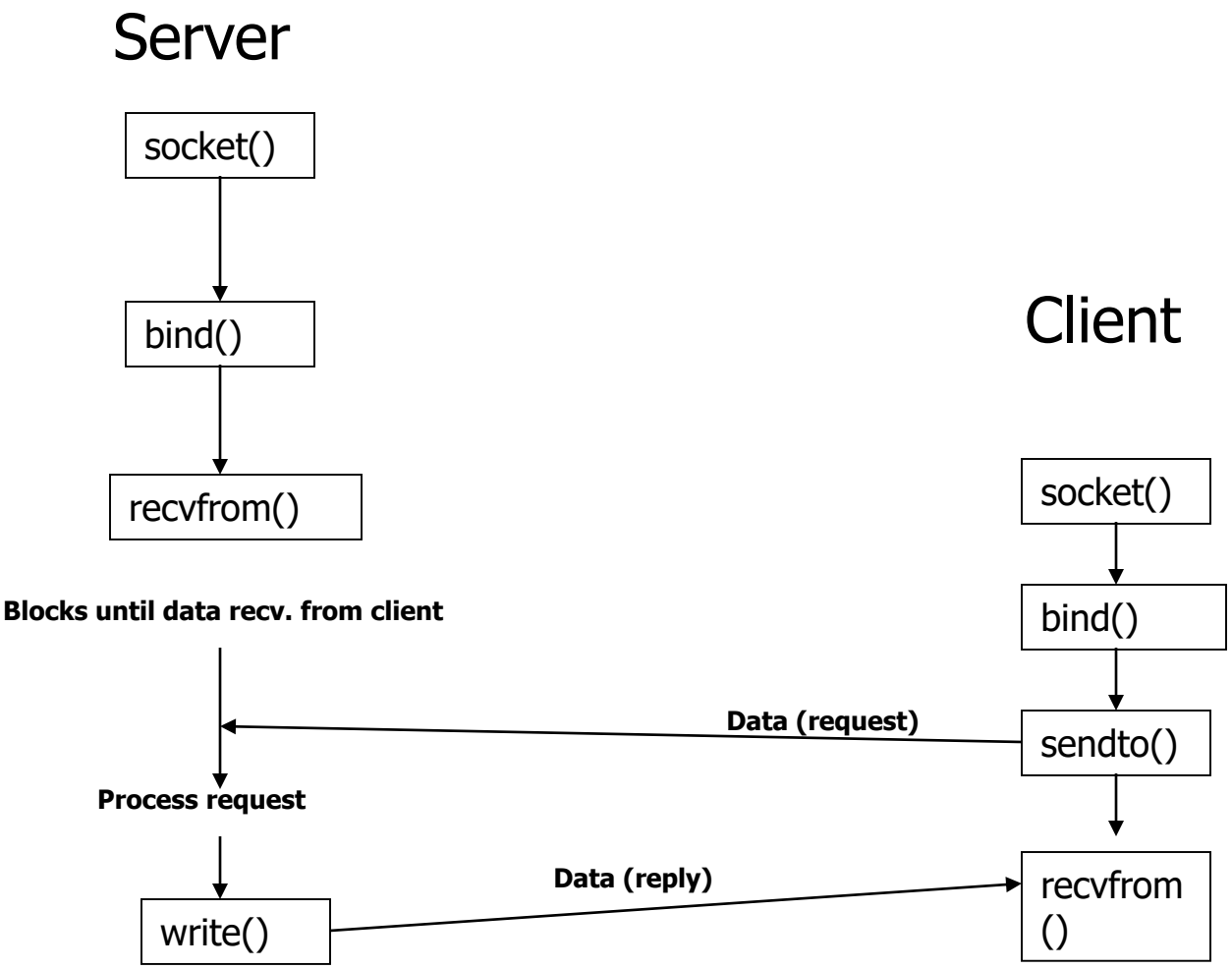
```
class SocketDemo {
  public static void main(String args[]) {
    try {
      //Get Server and Port
      String server = args[0];
      int port = Integer.parseInt(args[1]);
      //Create socket
      Socket s = new Socket(server, port);
      //Read random number from server
      InputStream is = s.getInputStream();
     DataInputStream dis = new
DataInputStream(is);
      int i = dis.readInt();
      //Display Result
      System.out.println(i);
      //Close Socket
      s.close();
    }
    catch (Exception e) {
      System.out.println("Exception: " + e);    }
  }
}
```

Running :

% java ServerSocketDemo 4321

% java SocketDemo 127.0.0.1 4321

# Socket Call for Connectionless Protocol



# Datagram Sockets and Packets

◆ **UDP does not guarantee reliable, sequenced data exchange, and therefore requires much less overhead**.

◆ **DatagramSocket() Method**

*DatagramSocket() throws SocketException*
*DatagramSocket(int port) throws SocketException*

◆ **DatagramPacket Constructor**

*DatagramPacket(byte buffer[], int size)*

*DatagramPacket(byte buffer[], int size, InetAddress ia, int port)*

◆ **receive() Method**

*void receive(DatagramPacket dp) throws IOException*

◆ **send() Method**

*void send(DatagramPacket dp) throws IOException*

◆ **close() Method**

*void close()*

http://docs.oracle.com/javase/8/docs/api/java/net/DatagramPacket.html

# Datagram Sockets and Packets

```
class DatagramReceiver {
  private final static int BUFSIZE = 20;
  public static void main(String args[]) {
    try {
      //Obtain port
      int port = Integer.parseInt(args[0]);

      //Create a DatagramSocket object for the port
      DatagramSocket ds = new DatagramSocket(port);

      //Create a buffer to hold incoming data
      byte buffer[] = new byte[BUFSIZE];

      //Create infinite loop
      while(true) {
        //Create a datagram packet
        DatagramPacket dp =
          new DatagramPacket(buffer, buffer.length);

        //Receive data
        ds.receive(dp);

        //Get data from the datagram packet
        String str = new String(dp.getData());

        // Display the data
        System.out.println(str);
      }
    }
    catch (Exception e) {
      e.printStackTrace();
    }
  }
}
```

```
class DatagramSender {
  public static void main(String args[]) {
    try  {
      // Create destination Internet address
      InetAddress ia =
        InetAddress.getByName(args[0]);
      // Obtain destination port
      int port = Integer.parseInt(args[1]);

      // Create a datagram socket
      DatagramSocket ds = new DatagramSocket();

      //Create a datagram packet
      byte buffer[] = args[2].getBytes();
      DatagramPacket dp =
        new DatagramPacket(buffer, buffer.length,
          ia, port);
      // Send the datagram packet
      ds.send(dp);
    }
    catch (Exception e) {
      e.printStackTrace();
    }
  }
}
```

Running :

% java DatagramReceiver 4321

% java DatagramSender localhost 4321 Message

# Client and Server Application

```
import java.io.*;
import java.net.*;

public class Server
{
  public ServerSocket svrSocket = null;
  public Socket socket = null;
  public InputStream inputStream = null;
  public OutputStream outputStream = null;
  public DataInputStream dataStream = null;
  public PrintStream printStream = null;
  public DataOutputStream dataoutputStream = null;
  public String message;
  public BufferedReader charStream = new
BufferedReader(new InputStreamReader(System.in));

  public Server() {
    try {
      svrSocket = new ServerSocket(1056);
      System.out.println("\nInitializint Port...");
      System.out.println("\nListen...");
      socket = svrSocket.accept();
      System.out.println("\nConnect to Client!\n");
      inputStream = socket.getInputStream();
      dataStream = new DataInputStream(inputStream);
      outputStream = socket.getOutputStream();
      dataoutputStream = new
DataOutputStream(outputStream);

      message = dataStream.readUTF();
      System.out.println(message + "\n");
    }  catch( UnknownHostException e) {
       System.out.println("Error : Cannot find server." + e);
    }
    catch( IOException e ) {
      System.out.println("Error : I/O Error." + e);
    }
  }
```

```
public void readSocket(){
    try {
      message = dataStream.readUTF();
      System.out.println(message + "\n");
      if(message.equals("Exit")){
        System.exit(0);
                                                  }
    }
    catch( UnknownHostException e) {
      System.out.println("Error : Cannot find server." + e);
    }
    catch( IOException e ) {
      System.out.println("Error : I/O Error." + e);
    }
  }

  public void writeSocket(){
    try {
      String initmsg_r = new String("Enter your message: ");
      dataoutputStream.writeUTF(initmsg_r);
      System.out.print("Enter please for ready... ");
      message = charStream.readLine();
      if  (! Message.equals("Exit")) return;
      else {dataoutputStream.writeUTF("Exit");
              System.exit(0); }
    }
    catch( UnknownHostException e) {
      System.out.println("Error : Cannot find server." + e);
    }
    catch( IOException e ) {
      System.out.println("Error : I/O Error." + e);
    }
  }
```

# Client and Server Application

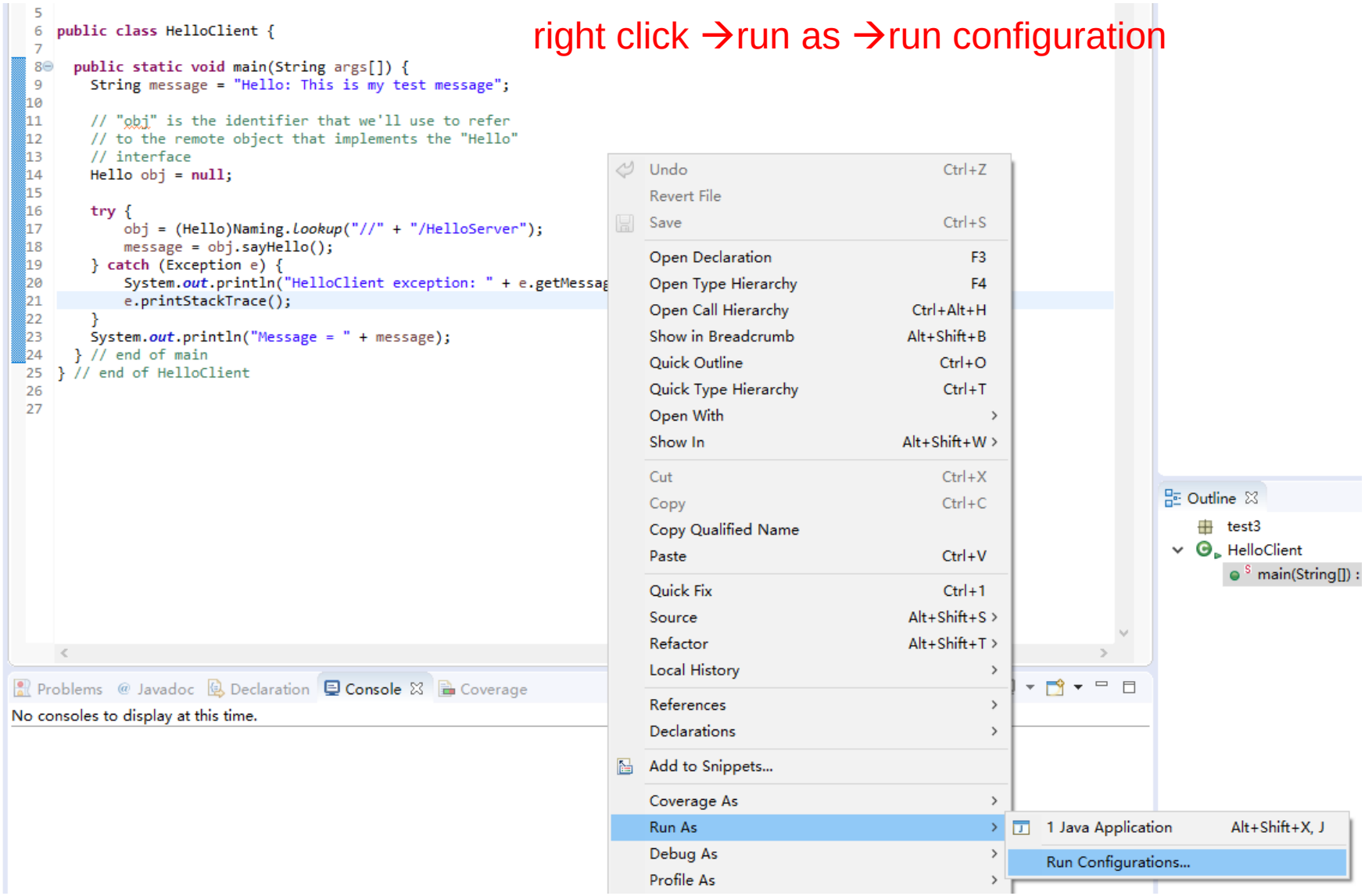
```
  public static void main(String args[]) {
    Server svr = new Server();
    for(;;){
      svr.writeSocket();
      svr.readSocket();
    }
  }
}
// End of Server
```

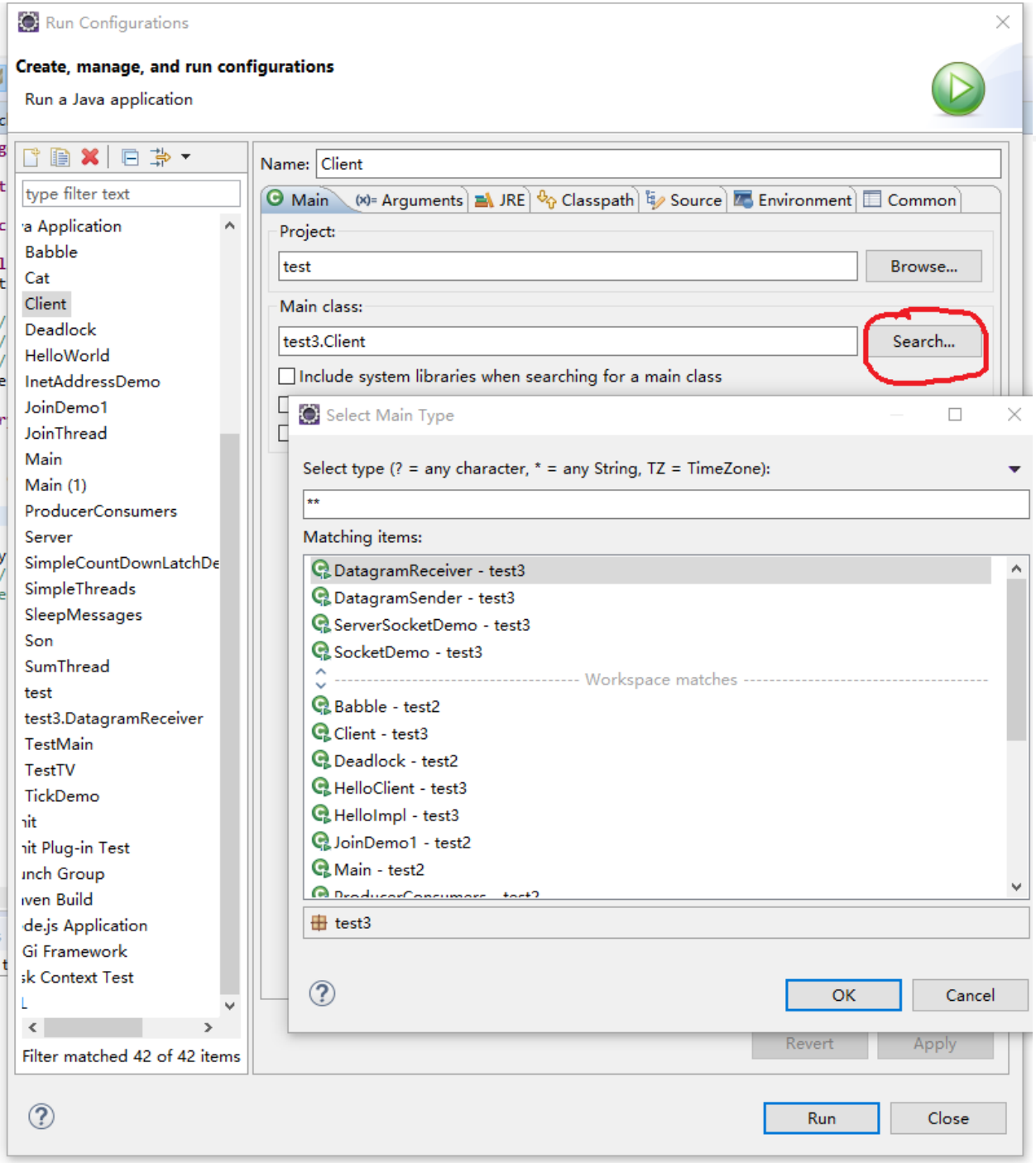
```
import java.net.*;
import java.io.*;

public class Client {

  public static void main(String args[]) {
  // Initialize the stream
  OutputStream outputStream = null;
  DataOutputStream dataoutputStream = null;
  InputStream inputStream = null;
  DataInputStream dataStream = null;
  BufferedReader charStream = null;

  // Initialize Socket
  Socket socket = null;
  String message;

  try {
      charStream = new BufferedReader(new
InputStreamReader(System.in));
 message = new String("Hi! I am a client");
      socket = new Socket("127.0.0.1", 1056);
```

```
dataStream = new DataInputStream(inputStream);
      outputStream = socket.getOutputStream();
      dataoutputStream = new
DataOutputStream(outputStream);
      dataoutputStream.writeUTF(message);
   } catch(UnknownHostException e) {
       System.out.println("Error : Cannot find server." + e);
     }
     catch(IOException e) {
       System.out.println("Error : I/O Error." + e);
     }

 while(true) {
   try {
      inputStream = socket.getInputStream();
      dataStream = new DataInputStream(inputStream);
      message = dataStream.readUTF();
      System.out.print(message);
      if(message.equals("Exit")){ System.exit(0); }
        message = charStream.readLine();
        dataoutputStream.writeUTF(message);
    } catch(UnknownHostException e) {
        System.out.println("Error : Cannot find server." + e);
      }
      catch(IOException e) {
        System.out.println("Error : I/O Error." + e);
      }
  } // end of while
 } // end of main method
} // end of Client Constructor
```

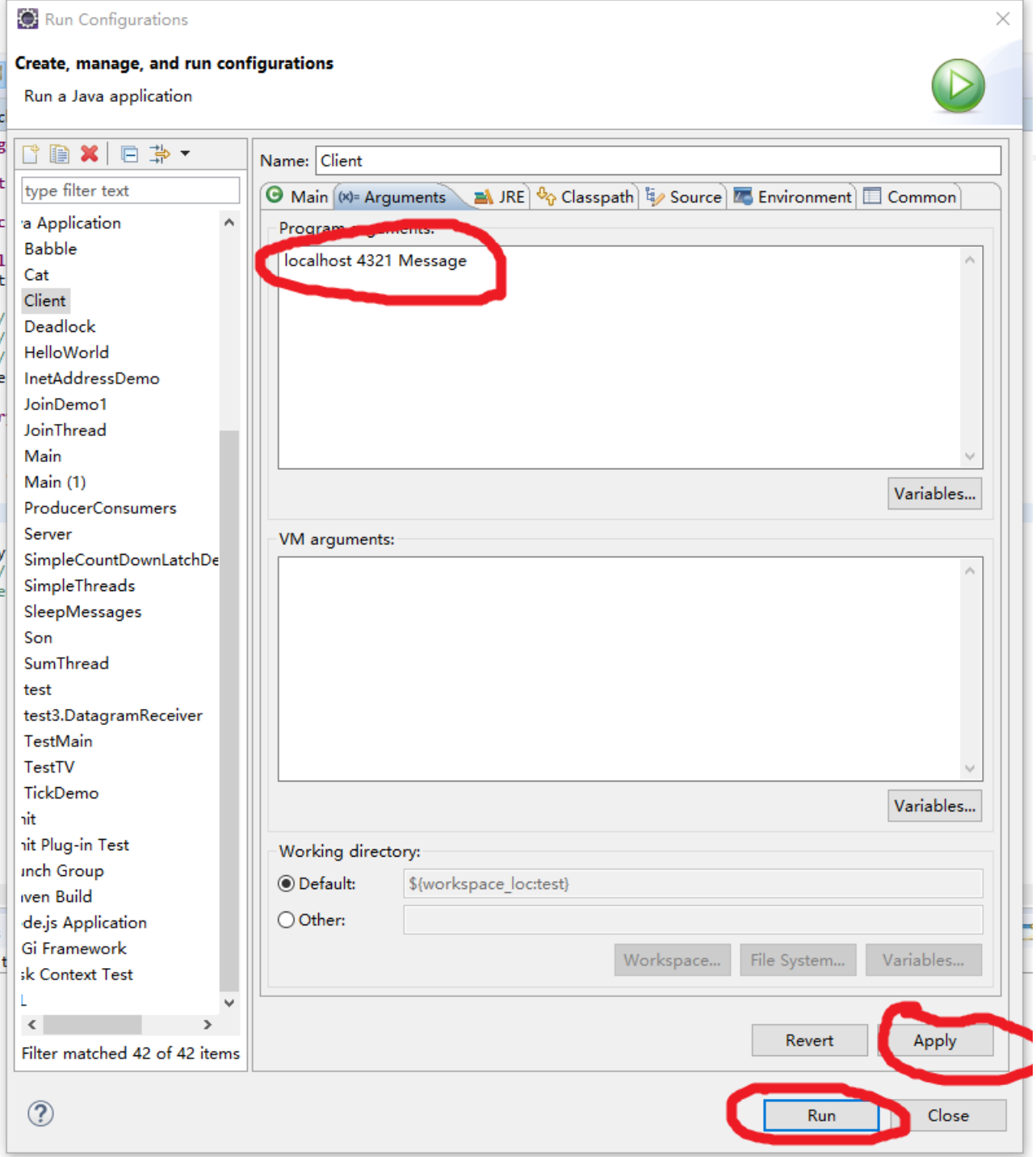
# Run Configuration in Eclipse

right click →run as →run configuration






Search the program you want to run




Input parameters (space between parameters) →Apply →run