Module 16

Networking

Objectives

- Develop code to set up the network connection
- Understand the TCP/IP Protocol
- Use `ServerSocket` and `Socket` classes for implementation of TCP/IP clients and servers

Relevance

How can a communication link between a client machine and a server on the network be established?

Networking

This section describes networking concepts.

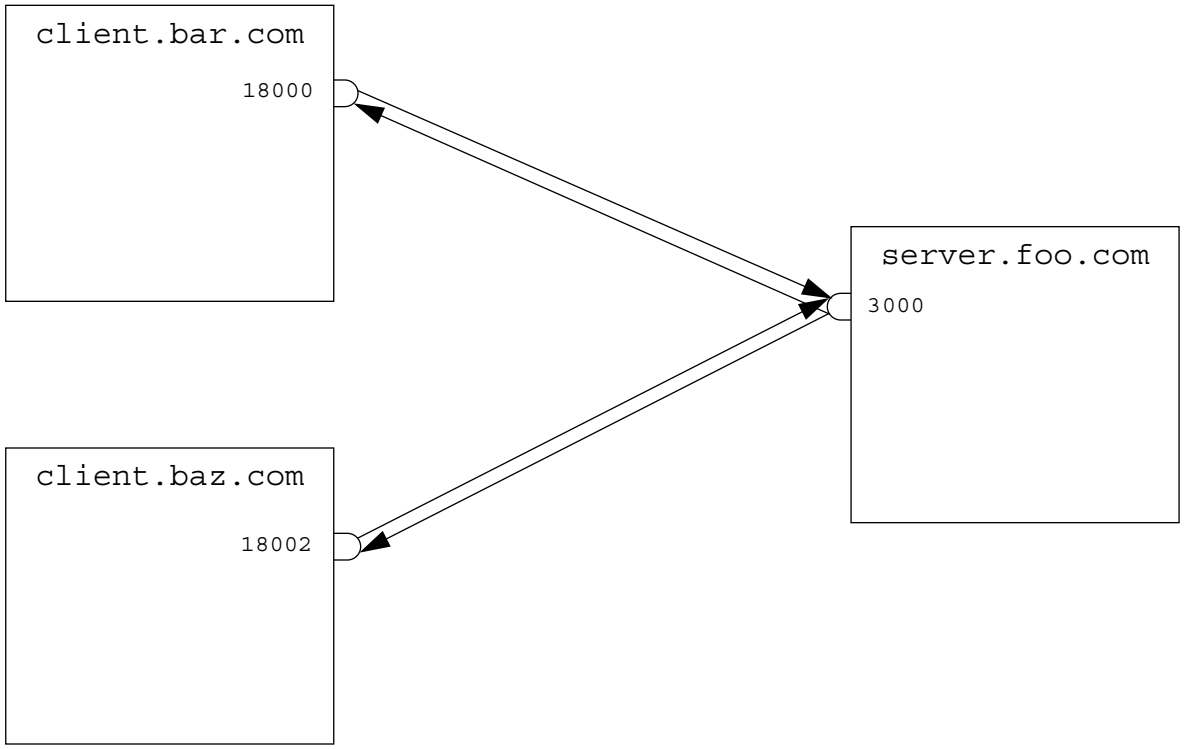
Sockets

- Sockets hold two streams: an input stream and an output stream.
- Each end of the socket has a pair of streams.

Setting Up the Connection

Set up of a network connection is similar to a telephone system: One end must *dial* the other end, which must be *listening*.

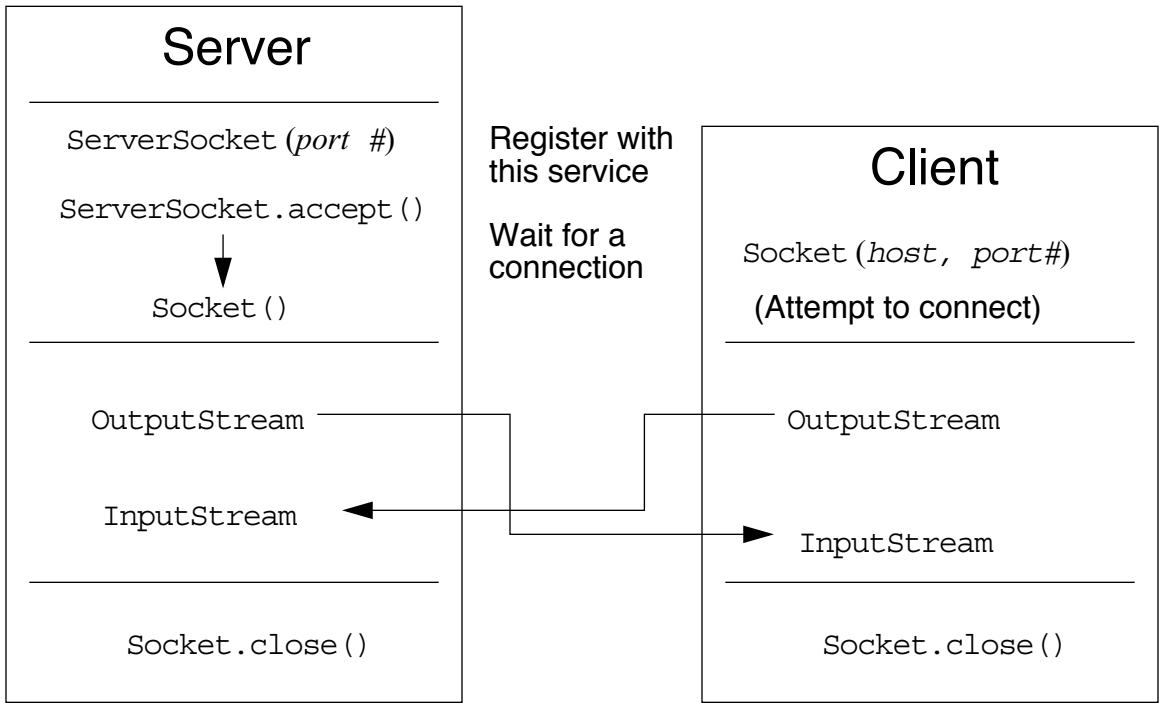
Networking



Networking With Java Technology

- To address the connection, include the following:
  - The address or name of remote machine
  - A port number to identify the purpose at the server
- Port numbers range from 0–65535.

Java Networking Model



Minimal TCP/IP Server

```
1   import java.net.*;
2   import java.io.*;
3
4   public class SimpleServer {
5     public static void main(String args[]) {
6       ServerSocket s = null;
7
8       // Register your service on port 5432
9       try {
10        s = new ServerSocket(5432);
11      } catch (IOException e) {
12        e.printStackTrace();
13      }
```

Minimal TCP/IP Server

```
14
15      // Run the listen/accept loop forever
16      while (true) {
17        try {
18          // Wait here and listen for a connection
19          Socket s1 = s.accept();
20
21          // Get output stream associated with the socket
22          OutputStream s1out = s1.getOutputStream();
23          BufferedWriter bw = new BufferedWriter(
24            new OutputStreamWriter(s1out));
25
26          // Send your string!
27          bw.write("Hello Net World!\n");
```

Minimal TCP/IP Server

```
28
29          // Close the connection, but not the server socket
30          bw.close();
31          s1.close();
32
33        } catch (IOException e) {
34          e.printStackTrace();
35        } // END of try-catch
36
37      } // END of while(true)
38
39    } // END of main method
40
41  } // END of SimpleServer program
```

Minimal TCP/IP Client

```
1   import java.net.*;
2   import java.io.*;
3
4   public class SimpleClient {
5
6     public static void main(String args[]) {
7
8       try {
9         // Open your connection to a server, at port 5432
10        // localhost used here
11        Socket s1 = new Socket("127.0.0.1", 5432);
12
13        // Get an input stream from the socket
14        InputStream is = s1.getInputStream();
15        // Decorate it with a "data" input stream
16        DataInputStream dis = new DataInputStream(is);
```

Minimal TCP/IP Client

```
17
18        // Read the input and print it to the screen
19        System.out.println(dis.readUTF());
20
21        // When done, just close the steam and connection
22        dis.close();
23        s1.close();
24
25      } catch (ConnectException connExc) {
26        System.err.println("Could not connect.");
27
28      } catch (IOException e) {
29        // ignore
30      } // END of try-catch
31
32    } // END of main method
33
34  } // END of SimpleClient program
```