

Socket Programming

An Introduction using Java

Assumptions

- ❑ Familiar with network basics (i.e. TCP/IP)
- ❑ Familiar with basics of programming in Java

Objectives

- ❑ An introduction to writing and compiling a simple Java program
- ❑ Pointer on where to find tutorial on writing simple programs using IDEs
- ❑ Socket background (what is it)
- ❑ Communicating with Sockets using Java
- ❑ Scaling with threads

Using a text editor

- ❑ In a real project (school/ work) an IDE would be preferable
- ❑ No auto-complete, project management tools, syntax highlighting, contextual help etc, etc, etc...
- ❑ Manual build tools (in many cases IDE take care of the whole build cycle; including makefiles)
- ❑ Using a text editor, we need to compile using a command prompt

TRY: A hello world example

- Look at HelloWorld.java

```
/*  
 * Some comment goes here  
 */  
import java.io.*;  
  
public class HelloWorld  
{  
    public static void main(String[] args)  
    {  
        System.out.println("Hello World");  
    }  
}
```

- Make modifications to the code, re-compile

Compiling using Javac

- ❑ javac compiles java programs and produces executables which can run by the JVM (Java Virtual Machine)
- ❑ javac [options] [sourcefiles] [@argfiles]
- ❑ <http://java.sun.com/j2se/1.4.2/docs/tooldocs/windows/javac.html> for more details

TRY: Compiling HelloWorld

- We will compile our simple HelloWorld programs
- We will introduce errors and analyze the output
- In our case, we will simply compile using
`javac HelloWorld.java`

Some popular Java based IDEs

- Netbeans (opensource)
- Eclipse (opensource)
- BlueJ (designed for introductory teaching, opensource)
- IntelliJ (payware, but those who use it say it is worth it)

Hello World tutorial using IDE

- Netbeans
(<http://java.sun.com/docs/books/tutorial/getStarted/cupojava/netbeans.html>)
- Eclipse (<http://cs.millersville.edu/~liffick/cs161/labs/Lab1b.html>)
- BlueJ
(<http://www.cs.carleton.edu/faculty/dmusician/cs117w02/introlab/introlab.html>)

What are sockets

- TCP/IP protocol suite makes the internet possible
- Sockets are an abstraction
- Connection point to IP using either TCP or UDP
- Look at:

<http://java.sun.com/docs/books/tutorial/networking/sockets/index.html>

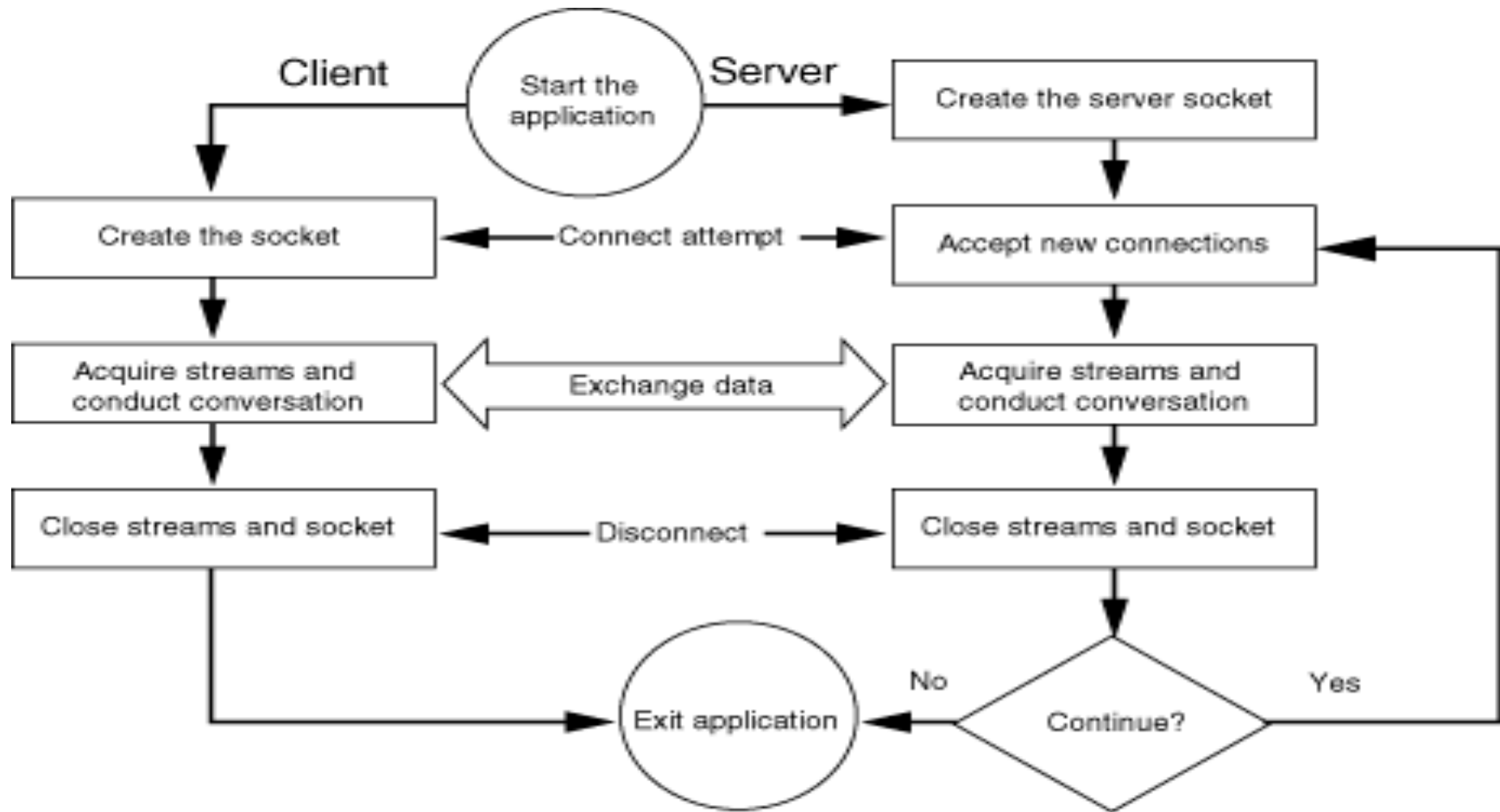
Connection vs. Connectionless

- ❑ Comes down to TCP vs. UDP
- ❑ Stream vs. Datagram
- ❑ A simplistic view: Guarantee vs. Performance

Common Client/Server pattern

- ❑ Server listens on known port
- ❑ Clients connect to that port
- ❑ The connection between the two is usually switched to another port, freeing up the initial port

Connection Initiation Diagram



Useful Classes

- Socket
- ServerSocket
- InputStream
- OutputStream
- BufferedReader/InputStreamReader
- DataOutputStream

...In more detail

- ❑ Create new server socket and start listening to a port
- ❑ Call the accept() method to get new connections
- ❑ Obtain input & output streams from the returned socket
- ❑ “Talk” using the application protocol specified
- ❑ Close the client streams and socket
- ❑ To accept another connection go back to step 2
- ❑ Close the server socket

API Docs

- <http://java.sun.com/j2se/1.4.2/docs/api/>
- Look for Socket related classes in java.net

TRY: Fetch URL Google.com

- Write a simple client that will get the text for the Google homepage.
- I will provide you with a sample client that does it for www.w3c.org
- Sample code located at:

http://ise.gmu.edu/~astavrou/courses/isa_656_F07/W3CClient.java