CS 4244: Internet Programming

Network Programming in Java

Standard Java files

- source files: *.java
  Java source files contain the source code in readable form, as typed in by the programmer.

- class files: *.class
  Java class files contain byte code (a machine readable version of the class). They are generated by the compiler from the source file.

The edit-compile-execute cycle

- A file can be edited in any text editor
  - Notepad, emacs, PFE, ...
  - Careful with using Word: by default, Word does not save in text format
  - Make sure to save before compiling!

Command line invocation

- Compilation and execution of Java in JDK are done from a command line
- On Microsoft systems: DOS shell
- On Unix: Unix shell
- Must make sure that the commands for compiler and runtime are in the command path.

Compiling

- Name of the JDK compiler: javac
- To invoke:
  javac <source name>
- Compiles <source name> and all classes it depends on
- Example:
  cd C:\bluej\zuul
  javac Game.java
Error messages

```
C:\bluej\zuul> javac Game.java
Game.java:22: ';' expected.
   private Parser parser
^
1 error
C:\bluej\zuul>
```

The programmer has to open the file in the editor, find the line number, fix the error and recompile.

Execution

- `C:\bluej\zuul> java Game`
- “Java” starts the Java virtual machine.
- The named class is loaded and execution is started.
- Other classes are loaded as needed.
- Only possible if class has been compiled.

Problem: Execute what?

- If we try:
  ```
  C:\bluej\zuul> java Game.java
  Exception in thread "main"
  java.lang.NoSuchMethodError: main
  ```
- The problem: how does the system know which method to execute?

The main method

- The answer: The Java system always executes a method called `main` with a certain signature:
  ```java
  public static void main(String[] args)
  { ...
  }
  ```
- For this to work, such a method **must exist!**

The main method (2)

- “main” must exist
- “main” must be public
- “main” must be static (class method)
- “main” must have a String array parameter
- Only “main” can be invoked

Main method - example

```java
public static void main(String[] args)
{
    Game game = new Game();
    game.play();
}
```

- The main method should
  - create an object
  - call the first method
Java platform

- Comprises of various packages, each containing related classes
- Some key packages are
  - `java.util`
  - `java.io`
  - `java.lang`
  - `java.net`
  - ...

Java Network Programming

- Main package is `java.net`
- Contains various classes including
  - `Socket`
  - `DatagramPacket`
  - `URLConnection`
  - `HTTPURLConnection`
  - ...

Socket class

- `Socket s = new Socket(hostname, port);`
- Java abstraction of network socket
- Used to connect to machine/ip address with specified port number
- Depending on port number you connect on, you need to send more information

ServerSocket class

- `ServerSocket srv = new ServerSocket(port)`
- Used to create a Server socket
- Key method here is `accept()` of type `Socket`
  - Makes server wait for connection and opens socket on valid request