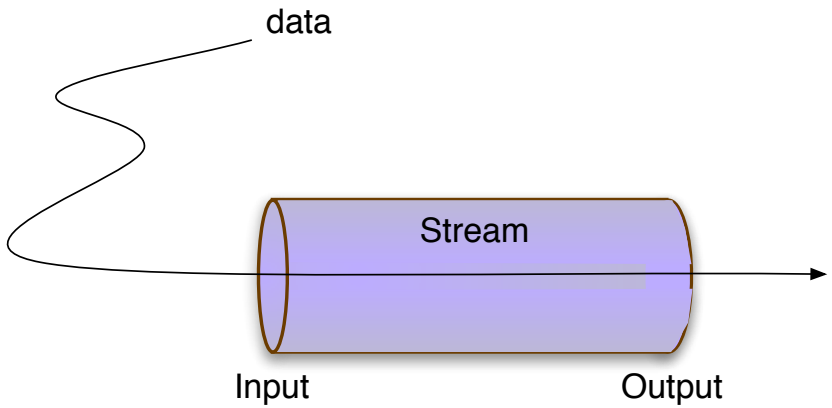
Java Basics
Part 4 - Streams

Manuel Oriol, April 27th, 2006

Chair of
Software Engineering

ETH
Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich



- Streams are useful to apply to different inputs and outputs a single treatment with different results
- Basically, receive and send bytes
- Streams are responsible for handling the outer part of the communication

Input Streams

- InputStream regroup all objects that can receive information
- Can build readers on top of them, to handle the inner part of the communication
- API

Output Stream

- regroup all objects that can send information
- can build filters around them
- API

Example: PrintStream

- System.out
- overloaded print/println/printf methods
- API

note: printf is a variable arguments method...

Variable Argument Methods

- Arguments are automatically boxed into an array (http://java.sun.com/developer/JDCTechTips/2005/tt1018.html):

```
import java.util.*;
public class MyArgs {
  public static void main(String args[]) {
    method1("Hello", "World");
    method1(args);
    method2(12, 'a', "Hello", Math.PI, 1/3.0);
    method2(18, 94.0);
  }
  private static void method1(String... args) {
    System.out.println(Arrays.asList(args) +
      " // " + args.length);
  }
  private static void method2(int arg, Object... args) {
    System.out.println(Arrays.asList(args) + " / " + arg);
  }
}
```

Example: FileInputStream

- Reads from an file
- See API

Reader

- For reading character streams...
- BufferedReader
- API

  String readline()

System.out

- is a PrintStream
- can be changed (e.g. output in a file, socket...)
- by default is set to

System.in

- By default reads on the terminal
- Can be changed
- easier to build a BufferReader on it

Using Streams for Keyboard Interactions

```
PrintStream out = new PrintStream(new FileOutputStream
("myfile.txt"));

out.println("My text");

out.close();

BufferedReader reader=new BufferedReader(new
FileInputStream("myfile2.txt"));

// this time we append

out=new PrintStream(new FileOutputStream("myfile.txt"),
true);

out.print("\t"+in.readLine());
```

Other Example: NoteTaker

```
public static void main(String[] args){
   String s;
   standard = new BufferedReader(new InputStreamReader(System.in));
   // checks arguments number
   if (args.length!=1) System.exit(0);
   // open the file name
   try {out = new FileOutputStream(args[0]);}
   catch (FileNotFoundException e){System.exit(0);}
   // users have to leave by using Control-C
   while(true){
      try {
         // read and write
         s=standard.readLine();
         out.write(s.getBytes());
         out.write("\n".getBytes());
      } catch (IOException e){
         System.out.println("I/O error");
         System.exit(0);
      }
   }
```

Basic Serialization

- ObjectOutputStream
- ObjectInputStream

Example OOS/OIS

```
ObjectOutputStream out = new ObjectOutputStream(new
FileOutputStream("myfile.txt"));

out.writeObject("test");

out.close();

...

ObjectInputStream ois=new ObjectInputStream(new
FileInputStream("myfile.txt"));

String s;

// this time we read the object

s=(String)ois.readObject();
```

Socket streams

- SocketInputStream
- SocketOutputStream

Example Socket Streams

```
Socket s;

...

PrintStream out = new PrinStream(s.getOutputStream
());

out.print("EOF");

...

BufferedReader reader=new BufferedReader
(s.getInputStream());

// this time we read a line

String s=reader.readLine();
```