File Handling

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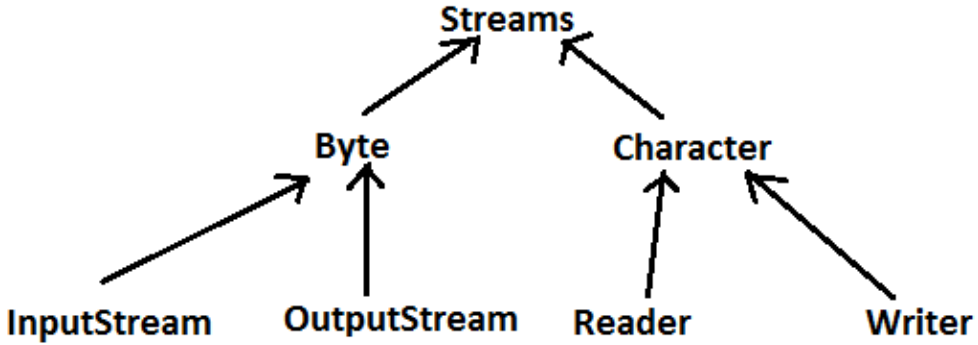
Introduction

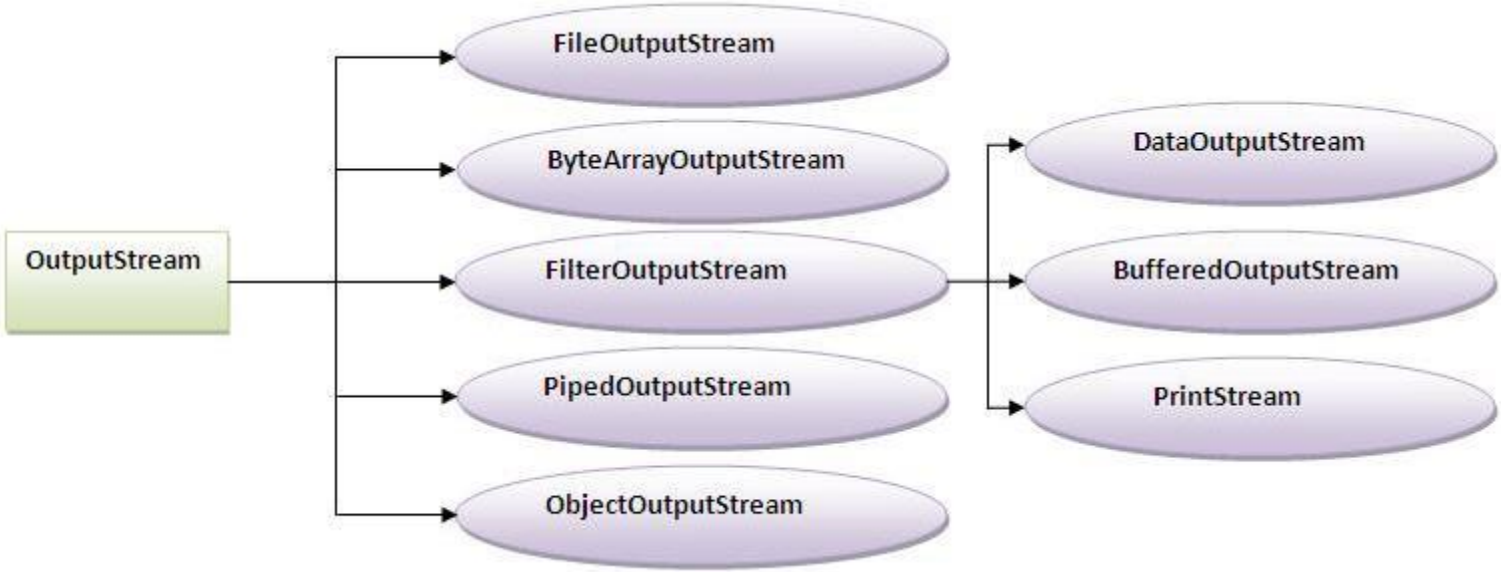
- File handling is used to read & manipulate different files on hard disk.
- Java introduces IO APIs for file handling & provides an important package called java.io.
- For IO operations, java uses concept called ‘Streams’. Stream is a sequence of data in byte format.
- Operation that reads the file stream is called as InputStream where as writing into file stream is called as OutputStream.

Byte & character streams

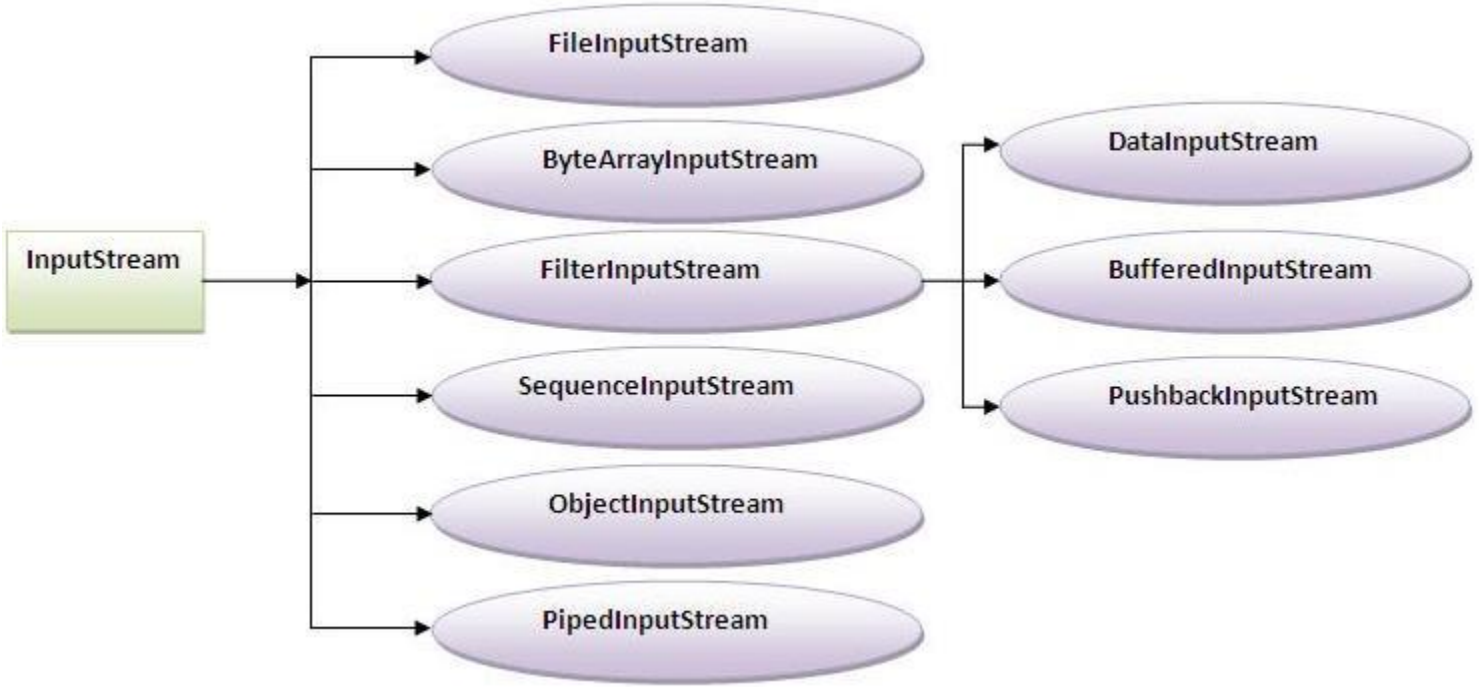


- Java offers us two types of stream classes. i.e. byte stream & character stream.
- Byte stream is a generic stream & useful for handling binary data where as character stream is used for handling text based data.
- Java IO APIs provide us four major classes i.e. two for byte stream (InputStream, OutputStream) & two for character stream (Reader, Writer).
- Note that all four classes are abstract class & hence we do not directly use them. Instead we use their sub classes.

OutputStream hierarchy



InputStream hierarchy



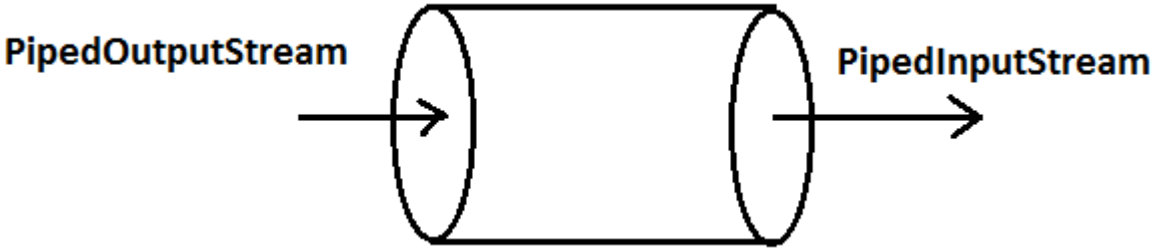
File writing operation

```
import java.io.*;

File file = new File(“c:/temp/abc.txt”);
FileOutputStream fos = new FileOutputStream(file);
String strData = “Hello Java”;
fos.write(strData.getBytes());
fos.flush();
fos.close();
```

File reading operation

```
File file = new File(“c:/temp/abc.txt”);
FileInputStream fis = new FileInputStream(file);
StringBuilder sb = new StringBuilder(“”);
int i = 0;
do {
        i = fis.read();
        if(i != -1)
                sb.append((char)i);
}
while(i != -1); // -1 represents end of file (EOF)
System.out.println(“File contents: “ + sb);
fis.close();
```

Piped streams



- Using piped streams, two threads can communicate with each other.

Piped streams continue…

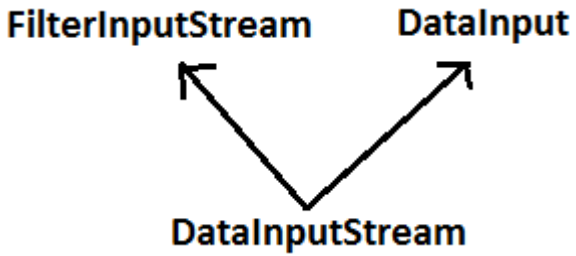
```
final PipedOutputStream output = new PipedOutputStream();
final PipedInputStream  input  = new PipedInputStream(output);

output.write("Hello Java".getBytes());

int i = 0;
do {
        i = input.read();
        if (i != -1)
                System.out.print((char)i);
}while(i != -1);
```

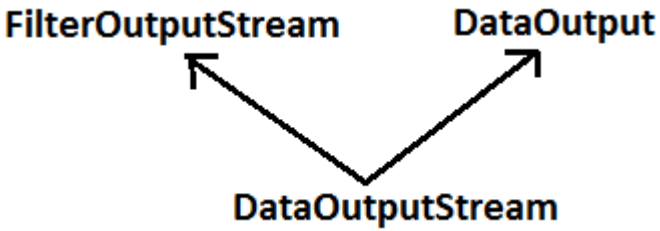
Sequence streams

- Sequence stream allows us to read data from multiple streams. Here is sample code:

```
FileInputStream fin1=new FileInputStream("abc.txt");
FileInputStream fin2=new FileInputStream("pqr.txt");
SequenceInputStream sis=new SequenceInputStream(fin1,fin2);
int i;
while((i=sis.read())!=-1){
   System.out.println((char)i);
}
sis.close();
fin1.close();
fin2.close();
```

Handling primitive data





- If you wish to read/write primitive data into a file then Java IO provides us two classes DataInputStream & DataOutputStream.
- DataInputStream & DataOutputStream extend filter stream classes & implement DataInput & DataOutput interfaces.
- These interfaces have required methods for handling primitive data types. For example readInt(), readDouble(), writeInt(), writeDouble() etc.

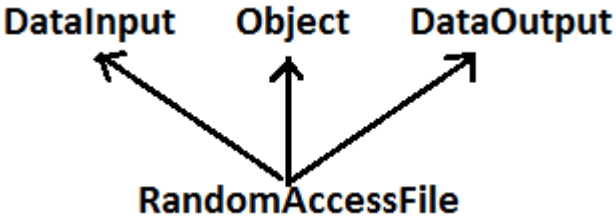
Writing primitive data

```
File file = new File("abc.txt");
FileOutputStream fos = new FileOutputStream(file);
DataOutputStream dos = new DataOutputStream(fos);
dos.writeInt(23);
dos.writeUTF("Tom");
dos.writeDouble(12000.85);
dos.flush();
fos.flush();
dos.close();
fos.close();
```

Reading primitive data

```
File file = new File("abc.txt");
FileInputStream fis = new FileInputStream(file);
DataInputStream dis = new DataInputStream(fis);
int id = dis.readInt();
String name = dis.readUTF();
double salary = dis.readDouble();
dis.close();
fis.close();
```

RandomAccessFile

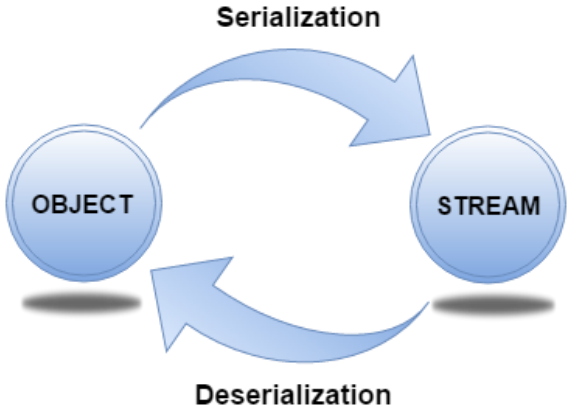


- In case of frequent read/write file operations, java developer needs a single stream class that can be used for both read/write purposes.
- Java IO APIs introduces an advanced class named 'RandomAccessFile' that is useful for both read & write operations.
- RandomAccessFile is also useful in case of handling primitive data.
- RandomAccessFile provides us file pointer that can be used for free navigation within a file.
- Note that RandomAccessFile does not extend InputStream or OutputStream classes.

RandomAccessFile continue…

```
File file = new File("abc.txt");
RandomAccessFile raf = new RandomAccessFile(file, "rw"); //rw means read & write both modes
raf.writeInt(23);
raf.writeUTF("Tom");
raf.writeDouble(12000.85);
long currentPosition = raf.getFilePointer(); //gives current file pointer position
raf.seek(0); //moves file pointer to required location within the file
int id = raf.readInt();
String name = raf.readUTF();
double salary = raf.readDouble();
raf.close();
```

Object Serialization



- Java supports object persistency in the form of ‘Object Serialization’. Serialization is a process in which current state of Object will be saved in stream of bytes.
- Java object is persistence into file system or to another java process is called as ‘Object Serialization’.
- Java object reading from file system or from another java process is called as ‘Object Deserialization’.
- In order to serialize any object, the object must implement Serializable interface.

Object Serialization code

```
File file = new File("abc.txt");
FileOutputStream fout = new FileOutputStream(file);
ObjectOutputStream out = new ObjectOutputStream(fout);
out.writeObject(new Order(1, "Chair purchase", 25000));
out.flush();
out.close();
```

Object Deserialization code

```
File file = new File("abc.txt");
FileInputStream fin = new FileInputStream(file);
ObjectInputStream in = new ObjectInputStream(fin);
Order order = (Order)in.readObject();
System.out.println("order = " + order);
```

Facts about Serialization

- If you do not wish to serialize a specific attribute of an object then declare it as ‘transient’. For example:

```
class Order {
   String title;
   transient double price;
}
```

- Static & transient part of an object is never serialized.
- If a serialized object maintains has a relationship with another object then contained object must also be serializable.
- If a base class implements Serializable interface then naturally all its sub classes become eligible to get serialized.
- If you wish to customize your serialization & deserialization process then implement Externalizable interface instead of Serializable.

SerialVersionUID

- *The serialVersionUID is a static final long number declared inside a class that gets serialized. For example:*

```
public class Employee implements Serializable
{
  public String firstName;
  private static final long serialVersionUID = 5462223600l;
}
```

- *Defining a serialVersionUID field in serializable class is not mandatory.*
- *If you do not declare serialVersionUID then coompiler will generate it automatically.*
- *If there is a difference between serialVersionUID of loaded reciever class and corresponding sender class then InvalidClassException will be thrown.*
- *You should use different serialVersionUID for different version of same class if you want to forbid serialization of new class with old version of same class.*

Thank You!

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