Object Serialization

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Outline

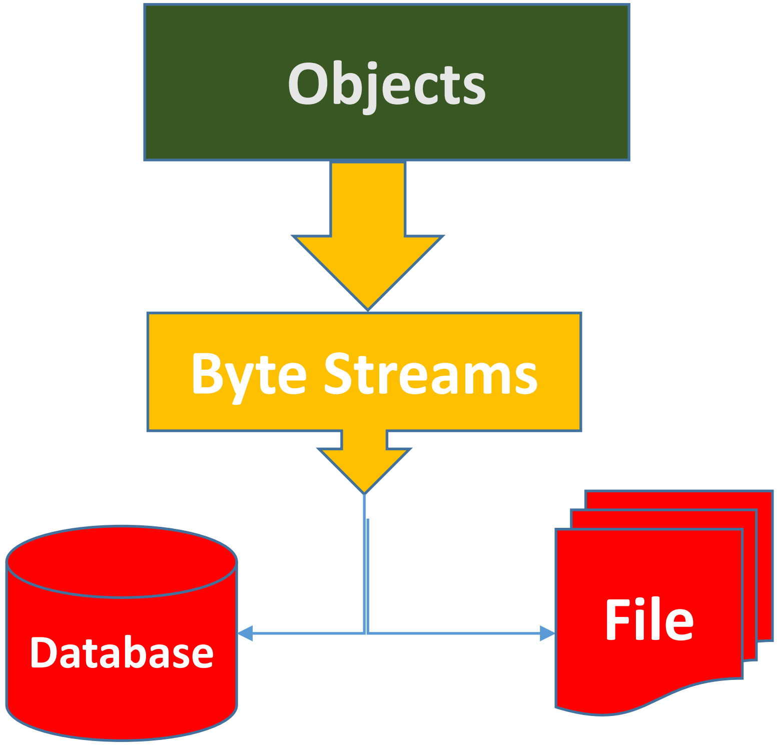
- What is Object Serialization?
- Why Object Serialization in Java?
- Package and class to support Serialization
- Package and class to support DeSerialization
- Serializable interface
- Example code

What is Object Serialization?

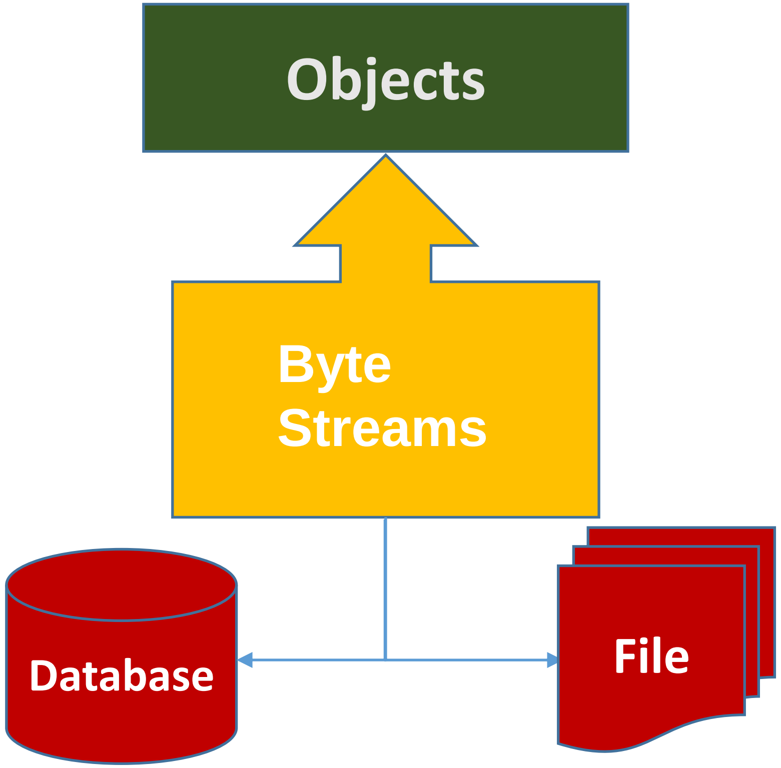
- Object serialization is the process of converting Object in to Byte Stream.
  - All primitive type fields
  - To exclude a field from serialization
    - static field, ***transient field***
- Object Deserialization is the process of reconstructing the Object from the Stream.

Serialization vs Deserialization

Serialization



Deserialization

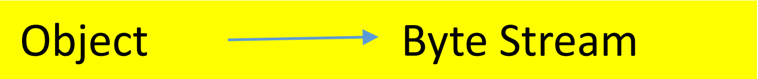


Why Object Serialization in Java?

- To support persistence(permanent storage) of Java objects.
- To transmit objects over network.
- To create cloned copy/deep copy without clone class.

Package and class - Serialization

- Class ObjectOutputStream
  - java.lang.Object
    java.io.OutputStream
    java.io.ObjectOutputStream



Object → Byte Stream

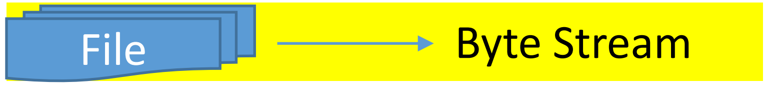
  - public class **ObjectOutputStream** extends OutputStream
    - Only objects that implements Serializable interface can be written to streams.
  - **Constructor**
    - public ObjectOutputStream(OutputStream out) throws IOException
    - Creates an ObjectOutputStream that writes to the specified OutputStream.
  - Parameters
    - out - output stream to write in to…
- Class FileOutputStream

Byte Stream → File

Package and class - DeSerialization

Byte Stream
Object

- **Class ObjectInputStream**
  - **Reconstruct Objects from Byte Stream**
  - java.lang.Object
    java.io.InputStream
    java.io.ObjectInputStream
  - public class **ObjectInputStream** extends InputStream
    - Only objects that implements Serializable interface can be read from streams.
- **Constructor**
  - public ObjectInputStream(InputStream out) throws IOException
    - Creates an ObjectInputStream that Read Object from the specified InputStream.
- Parameters
  - out - output stream to write in to…
- **Class FileInputStream**
  - Reads Byte Stream from a file



Serialization and DeSerialization methods

- Special Method required for Serialization
  - private void writeObject(ObjectOutputStream out) throws IOException
    - To write the state of the specified Object (individual fields) to the ObjectOutputStream.
- Special Method required for DeSerialization
  - private void readObject(ObjectInputStream in) throws IOException, ClassNotFoundException
    - To read the state of the Object (individual fields) from the Stream.

Serializable interface

public interface Serializable

  - No methods and no fields

- To enable Serializability of a class
  - class must implement the java.io.Serializable interface.
- Otherwise Classes state cannot be serialized or deserialized.
  - ***<NotSerializableException>*** *i*s thrown

Writing to an Object Stream

Serialize a Student object to a file

```
FileOutputStream f = new FileOutputStream(“File.txt");
ObjectOutputStream s = new ObjectOutputStream(f);
s.writeObject(“Student");
```

Reading from an Object Stream

Deserialize a Student object from a file.

- FileInputStream in = new FileInputStream(“File.txt");
- ObjectInputStream s = new ObjectInputStream(in);
- Student s = (Student)s.readObject();

```
import java.io.*;

class ProgramLanguage implements
Serializable{
        public String name;

        public int release;

        public String developer;

        public String designedBy;

}
```

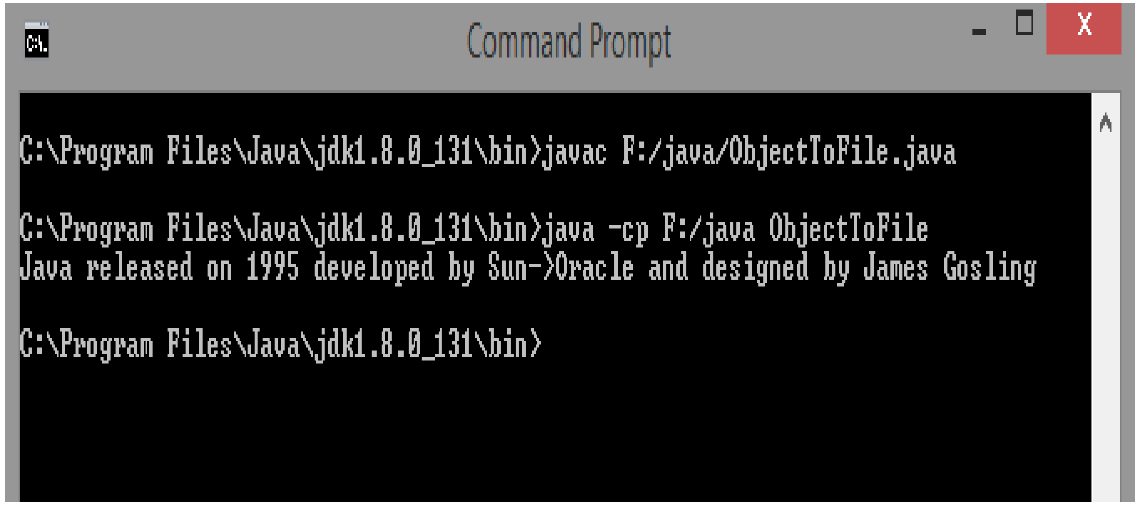
```
class ObjectToFile{
public static void main(String args[]) throws Exception{
        ProgramLanguage PL;
        PL=new ProgramLanguage();
        PL.name="Java";
        PL.release=1995;
        PL.developer="Sun->Oracle";
        PL.designedBy="James Gosling";
        //Serialization

        String Filename="F:/java/File.txt";
        FileOutputStream fo=new   FileOutputStream(Filename);
        ObjectOutputStream os=new ObjectOutputStream(fo);
        os.writeObject(PL);
        //DeSerialization

        FileInputStream fi=new FileInputStream(Filename);
        ObjectInputStream is=new ObjectInputStream(fi);
        ProgramLanguage PL1=(ProgramLanguage)is.readObject();

        System.out.println(PL1.name + " released on " + PL1.release +
        " developed by "  + PL1.developer + " and designed by
        " +PL1.designedBy);

        }
```



```
C:\Program Files\Java\jdk1.8.0_131\bin>javac F:/java/ObjectToFile.java

C:\Program Files\Java\jdk1.8.0_131\bin>java -cp F:/java ObjectToFile
Java released on 1995 developed by Sun->Oracle and designed by James Gosling

C:\Program Files\Java\jdk1.8.0_131\bin>
```

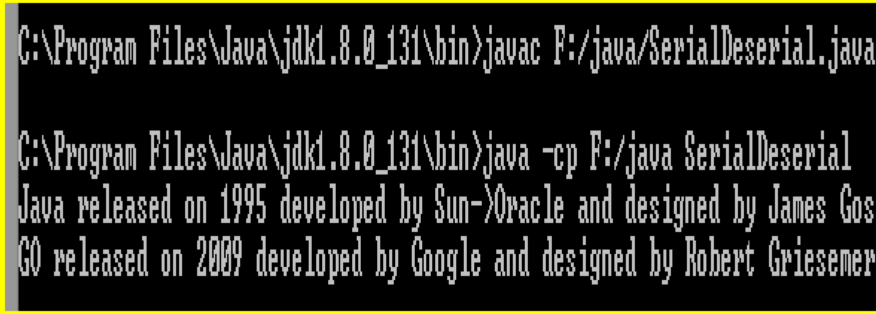
```
import java.io.*;

class ProgramLanguage
implements Serializable{
            public String name;
            public int release;
            public String developer;
            public String designedBy;
}
```

```
class SerialDeserial{
public static void main(String args[]) throws Exception{
            ProgramLanguage[] PL=new ProgramLanguage[2];
            PL[0]=new ProgramLanguage();
            PL[0].name="Java";
            PL[0].release=1995;
            PL[0].developer="Sun->Oracle";
            PL[0].designedBy="James Gosling";

            PL[1]=new ProgramLanguage();
            PL[1].name="GO";
            PL[1].release=2009;
            PL[1].developer="Google";
            PL[1].designedBy="Robert Griesemer";
ObjectOutputStream os=new ObjectOutputStream(new FileOutputStream("F:/java/object.txt“ )
            os.writeObject(PL);
ObjectInputStream is=new ObjectInputStream(new FileInputStream("F:/java/object.txt"));
            ProgramLanguage[] PL1=(ProgramLanguage[])is.readObject();

            System.out.println(PL1[0].name + " released on " + PL1[0].release + " developed
            by "  + PL1[0].developer + " and designed by " +PL1[0].designedBy);
            System.out.println(PL1[1].name + " released on " + PL1[1].release + " developed
            by "  + PL1[1].developer + " and designed by " +PL1[1].designedBy);
            }
```



```
C:\Program Files\Java\jdk1.8.0_131\bin>javac F:/java/SerialDeserial.java

C:\Program Files\Java\jdk1.8.0_131\bin>java -cp F:/java SerialDeserial
Java released on 1995 developed by Sun->Oracle and designed by James Gos
GO released on 2009 developed by Google and designed by Robert Griesemer
```

Other example code

```
//to read N objects from user
ObjectOutputStream os=new ObjectOutputStream(new FileOutputStream("F:/java/objects.txt“ ));
Scanner input=new Scanner(System.in);
ProgramLanguage PL;
while(input.hasNext())
{
name=input.next();
release=input.nextInt();
developer=input.nextLine();
designedBy=input.nextLine();
PL=new ProgramLanguage(name, release,developer, designedBy);
os.writeObject(PL);
}
```