Data Access Layer (DAL)

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Object Oriented Programming

Agenda

1. Serialization

2. Writing and Reading Files

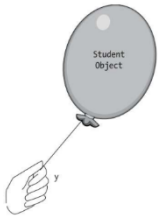
1. Serialization

Saving objects' state

Serialization and **plain Text** are two possible options to **save application states**.

Use serialization to write and read Java objects

If your data will be used by **only the Java program that generated it,** use **serialization**



Serialization save the **entire object state**

Objects must implement ***Serializable*** Interface

```java
import java.io.Serializable;

public class Carreer implements Serializable {

    private int id;
    private int startYear;
    private String name;

    // ...
```

```java
import java.io.Serializable;

public class Person implements Serializable {

    private Carreer carreer;
    private String name;
    private int age;

    // ...
```

```java
// ...
public class SerializationSaveExample {

    public static void main(String[] args) {

        FileOutputStream fileStrem = null;

        try {

            // If the file "MySaveFile.obj" does not exist, it will be created
            // FileOutputStrem knows how to connect (and create) a file
            fileStrem = new FileOutputStream("MySaveFile.obj");

            // Two test objects
            Person jack = new Person(new Carreer(5, 2005, "Soccer Player"), "Jack", 20);
            Person sunny = new Person(new Carreer(879, 1989, "Singer"), "Sunny", 40);

            // ObjectOutputStream let us write objects
            ObjectOutputStream os = new ObjectOutputStream(fileStrem);

            // Serialize and write the object to file
            os.writeObject(jack);
            os.writeObject(sunny);

            // Close the stream
            os.close();

            System.out.println(jack);
            System.out.println(sunny);

            // ...
```

Serializable objects can be written in a file

MySaveFile.obj

```
1  ¬íNULENOsrNULESCserializationexample.Person1'"zuDC4TÖSTXNULETXINULETXageLNUL
   BELcarreertNULRSLserializationexample/Carreer;LNULEOTnametNULDC2Ljava/lang/St
   ring;xpNULNULNULDC4srNULFSserializationexample.Carreer±¦B2ÚÜÆSTXNULETXINUL
   STXidINUL startYearLNULEOTnameqNUL~NULSTXxpNULNULNULENONULNULBELÕtNUL
2  Soccer
   PlayertNULEOTJacksqNUL~NULNULNULNULNUL(sqNUL~NULEOTNULNULETXoNULNULBELÅt
   NULACKSingertNULENOSunny
```

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MySaveFile.obj

The generated files do not make sense for **humans** if you try to read it as text

Output - SerializationExample (run)

```
run:

Person:
        Name: Jack
        Age:20
        Carreer:
                Id: 5
                Start Year: 2005
                Name: Soccer Player

Person:
        Name: Sunny
        Age:40
        Carreer:
                Id: 879
                Start Year: 1989
                Name: Singer
BUILD SUCCESSFUL (total time: 0 seconds)
```

Serializable objects can be loaded from a file previously created

```java
public class SerializationLoadExample {

    public static void main(String[] args) {

        FileInputStream fileStrem = null;

        try {
            // If the file "MySaveFile.obj" does not exist, an exception will be thrown
            fileStrem = new FileInputStream("MySaveFile.obj");

            // ObjectOutputStream let us load objects
            ObjectInputStream os = new ObjectInputStream(fileStrem);

            // Load first two object from the file
            Object firstPerson = os.readObject();
            Object secondPerson = os.readObject();

            // Cast from objects to Person
            Person oldJack = (Person) firstPerson;
            Person oldSuny = (Person) secondPerson;

            System.out.println(oldJack);
            System.out.println(oldSuny);

            // ..
```

Output - SerializationExample (run)

```
run:

Person:
        Name: Jack
        Age:20
        Carreer:
                Id: 5
                Start Year: 2005
                Name: Soccer Player

Person:
        Name: Sunny
        Age:40
        Carreer:
                Id: 879
                Start Year: 1989
                Name: Singer
BUILD SUCCESSFUL (total time: 0 seconds)
```

```java
import java.io.Serializable;

public class Person implements Serializable {

    private Carreer carreer;
    private String name;
    private int age;

    // ...
```

Output - SerializationExample (run)

```
run:

Person:
        Name: Jack
        Age:20
        Carreer:
                Id: 5
                Start Year: 2005
                Name: Soccer Player

Person:
        Name: Sunny
        Age:40
        Carreer:
                Id: 879
                Start Year: 1989
                Name: Singer
BUILD SUCCESSFUL (total time: 0 seconds)
```

Object references are stored within the object

2. Writing and Reading Files

Use text plain file to write and read text strings

If your data will be used by other program write a **text plain file**

```java
public class PlainTextSaveExample {

    public static void main(String[] args) {

        FileWriter writer = null;

        try {

            // Two test objects
            Person jack = new Person(new Carreer(5, 2005, "Soccer Player"), "Jack", 20);
            Person sunny = new Person(new Carreer(879, 1989, "Singer"), "Sunny", 40);

            // If the file "MyPlainText.csv" does not exist, it will be created
            // FileWriter knows how to connect (and create) a file
            writer = new FileWriter("MyPlainText.csv");

            // Write a string to the file
            writer.write(jack.toString());
            writer.write(sunny.toString());

            // Close the file
            writer.close();

            System.out.println(jack);
            System.out.println(sunny);

            // ...
```

Text String can be stored in plain text files

MyPlainText.csv

```
1
2   Person:
3       Name: Jack
4       Age:20
5       Carreer:
6           Id: 5
7           Start Year: 2005
8           Name: Soccer Player
9   Person:
10      Name: Sunny
11      Age:40
12      Carreer:
13          Id: 879
14          Start Year: 1989
15          Name: Singer
```

The generated files are human readable

Text String can be stored in plain text files

```
// Write a string to the file
writer.write(jack.getName() + ","
        + jack.getAge() + ","
        + jack.getCarreer().getId() + ","
        + jack.getCarreer().getName() + ","
        + jack.getCarreer().getStartYear() + "\n");
writer.write(sunny.getName() + ","
        + sunny.getAge() + ","
        + sunny.getCarreer().getId() + ","
        + sunny.getCarreer().getName() + ","
        + sunny.getCarreer().getStartYear() + "\n");
```

MyPlainText.csv

```
1  Jack,20,5,Soccer Player,2005
2  Sunny,40,879,Singer,1989
3
```

We can adjust the output string to satisfy the requirements

Text String can be read from plain text files previously created

```java
public class PlainTextLoadExample {

    public static void main(String[] args) {

        try {

            // If the file "MyPlainText.csv" does not exist, it will be created
            File myFile = new File("MyPlainText.csv");

            // FileReader knows how to connect to a file
            FileReader fileReader = new FileReader(myFile);
            BufferedReader reader = new BufferedReader(fileReader);

            String line = null;

            // Read the file line by line
            while ((line = reader.readLine()) != null) {
                System.out.println(line);
            }
            reader.close();

            // ...
```

Output - SerializationExample (run)

```
run:
Jack,20,5,Soccer Player,2005
Sunny,40,879,Singer,1989
BUILD SUCCESSFUL (total time: 0 seconds)
```

References

Trail: Internationalization http://download.oracle.com/javase/tutorial/i18n/index.html

[Sierra] K. Sierra and B. Bates, *Head First Java*, 2nd Edition, O'Reilly Media, 2005.