

CORE JAVA

With

SCJP / OCJP

Study Material

Chapter 19: Development



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Development

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Introduction

Javac:

we can use Javac to compile a single or group of ".java files".

Syntax:

javac	<div style="border: 1px solid black; display: inline-block; padding: 2px 5px;">[options]</div> <div style="text-align: center;">↓</div>	Test.java (valid) Test.java Demo.java (valid) *.java (valid)
	-source -version -cp <path> -d <directory>	

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Java:

we can use java command to run a single ".class file".

Syntax:

```
java      [options]      classfile      arg[0]      arg[1].....  
          -version  
          -ea/-esa/-da/-dsa  
          -D   
          -cp/-classpath  
          .  
          .  
          .  
          .
```



Note :



We can compile any number of source files at a time but we can run only one .class file.

Classpath:

Class path describes the location where the required ".class files" are available.

Java compiler & JVM will use classpath to locate required class files.

 can set the class path in the following 3 ways.

-  1. Permanently by using environment variable "classpath". This class path will be preserved after system restart also. 
2. Temporary for a particular command prompt level by using "set" command.

Example:

```
set classpath=%classpath%;D:\durga_classes;.
```

Once if you close the command prompt automatically this class path will be lost.

3. We can set the class path for a particular command level by using "-cp" (or) "-class path". This class path is applicable only for that command execution. After executing the command this classpath will be lost.

Among the 3 ways of setting the class path the most common way is setting class path at command level by using "-cp". 

Note :

- By default java compiler & JVM will search in current working directory for the required .class files
- If we set the classpath explicitly then JVM will search only in our specified location for .class file and it won't search in current working directory.
- Once we set the classpath we can run our program from any location.



Example 1:

```
class Rain
{
public static void main(String args[]){
System.out.println("Raining of jobs these days");
}
}
```

Analysis:

D:\Java>javac Rain.java (valid)

D:\Java>java Rain (valid)

Raining of jobs these days.

D:\>java Rain (invalid)

Exception in thread "main" java.lang.NoClassDefFoundError: Rain

D:\>java -cp D:\java Rain (valid)

Raining of jobs these days.

D:\>java Rain (invalid)

C:\>java -cp d:\java Rain (valid)

Raining of jobs these days

Example 2:

C:

```
public class Fresher
{
public void methodOne(){
System.out.println("i want job
immediately");
}
}
```

D:

```
class ItCompany
{
public static void main(String args[]){
Fresher f=new Fresher();
f.methodOne();
System.out.println("don't worry you will
get soon....");
}
}
```

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Analysis:



C:\>javac Fresher.java (valid)

D:\>javac ItCompany.java (invalid)

compile time error: ItCompany.java:4: cannot find symbol
symbol : class Fresher
location: class ItCompany
Fresher f=new Freaher();



D:\>javac -cp c: ItCompany.java (valid)

D:\>java ItCompany

Runtime error:NoClassDefFoundError: Fresher



D:\>java -cp c: ItCompany

Runtime error:NoClassDefFoundError: ItCompany



D:\>java -cp .;c: ItCompany (valid)

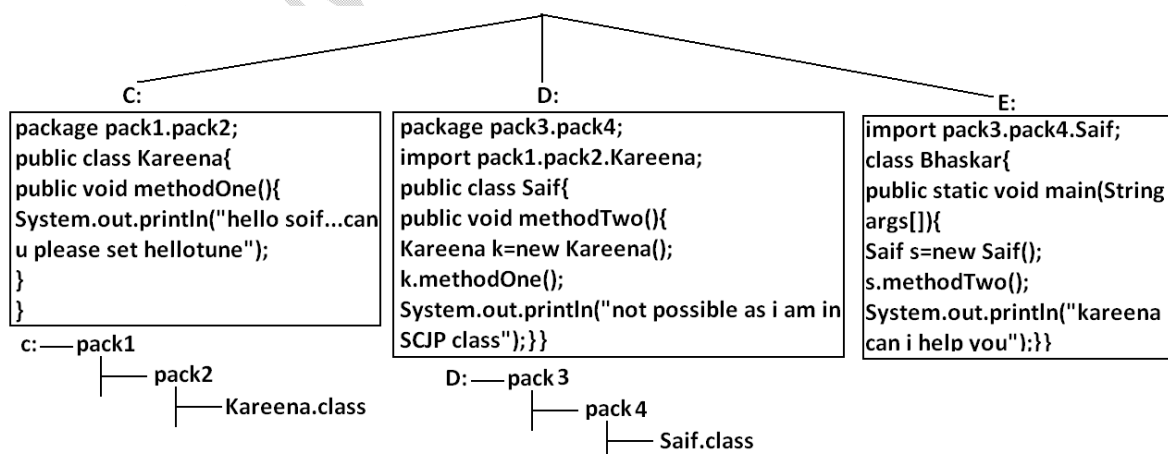
i want job immediately

don't worry you will get soon....



E:\>java -cp D;;C: ItCompany (valid)

Example 3:



Analysis:

```
C:\>javac -d . Kareena.java (valid)
D:\>javac -d . Saif.java (invalid) ———> compile time error
Saif.java:5: cannot find symbol
symbol : class Kareena
location: class pack3.pack4.Saif
Kareena k=new Kareena();

D:\>javac -cp c: -d . Saif.java (valid)
E:\>javac Bhaskar.java (invalid) ———> compile time error
Bhaskar.java:4: cannot find symbol
symbol : class Saif
location: class Bhaskar
Saif s=new Saif();

E:\>javac -cp d: Bhaskar.java (valid)
E:\>java Bhaskar (invalid) ———> Runtime error
NoClassDefFoundError: pack3/pack4/Saif

E:\>java -cp d: Bhaskar (invalid) ———> Runtime error
NoClassDefFoundError: Bhaskar

E:\>java -cp .;d: Bhaskar (invalid) ———> Runtime error
NoClassDefFoundError: pack1/pack2/Kareena

E:\>java -cp .;d;;c: Bhaskar (valid) ———> output:
hello soif...can u please set hellotune
not possible as i am in SCJP class
kareena can i help you

F:\>java -cp E;;D;;C: Bhaskar (valid) ———> output:
hello soif...can u please set hellotune
not possible as i am in SCJP class
kareena can i help you
```

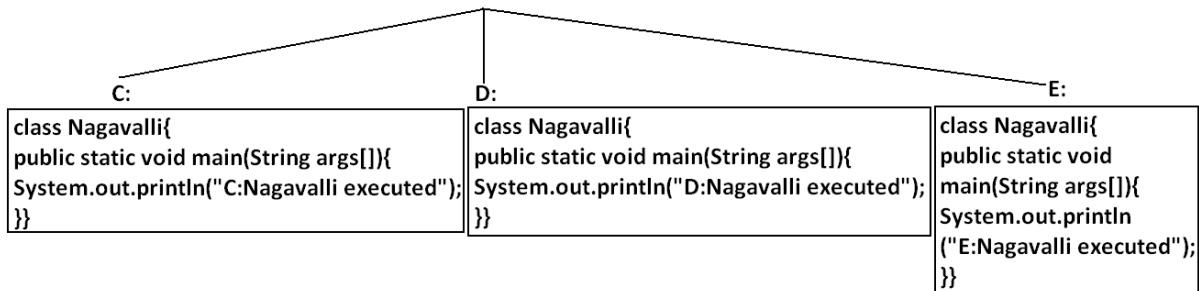


Note: If any folder structure created because of package statement. It should be resolved by import statement only and the location of base package should be make it available in class path.

Note: Compiler will always check one level of dependency, whereas the JVM will check all levels of dependency.

Note: In classpath the order of locations is very important and compiler & JVM will always search from left to right for the required .class file until a match is available.

Example 4:



Analysis:

C:\>javac Nagavalli.java (valid)

D:\>javac Nagavalli.java (valid)

E:\>javac Nagavalli.java (valid)

C:\>java Nagavalli

output:

C:Nagavalli executed

C:\>java -cp e;;d;c: Nagavalli

output:

E:Nagavalli executed

C:\>java -cp d;;e;c: Nagavalli

output:

D:Nagavalli executed

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Jar file:

If several dependent classes present then it is never recommended to set the classpath individual for every component. We have to group all these ".class files" into a single zip file and we have to make that zip file available to the classpath. This zip file is nothing but jar file.

Example 1 : To develop a Servlet class all dependent classes are available into a single jar file (Servlet-api.jar) hence we have to place this jar file available in the classpath to compile and run Servlet program.

Example 2 : To use Log4J in our application all dependent classes are available in log4j.jar hence to use Log4J in our application. We have to use this jar file in the classpath.

What is the difference between Jar, War and Ear ?

Jar (java archive): Represents a group of ".class files".

Var (web archive): Represents a web application which may contains Servlets, JSP, HTML pages, JavaScript files etc.

If we maintain web application in the form of war file, the project delivering, transportation and deployment will become easy.

Ear (Enterprise archive): it represents an enterprise application which may contain Servlets, JSP, EJB'S, JMS component etc.

In generally an ear file consists of a group of war files and jar files.

Ear=war+ jar

Various Commands:

To create a jar file:

```
D:\Enum>jar -cvf praveen.jar Beer.class Test.class X.class
D:\Enum>jar -cvf praveen.jar *.class
D:\Enum>jar -cvf praveen.jar *.*
```

To extract a jar file:

```
D:\Enum>jar -xvf bhaskar.jar
```

To display table of contents of a jar file:

```
D:\Enum>jar -tvf bhaskar.jar
```

Example 5:

```
public class BhaskarColorFulCalc{
```

```
public static int add(int x,int y){
return x*y;
}
public static int multiply(int x,int y){
return 2*x*y;
}}
```

Analysis:

```
C:\>javac BhaskarColorFulCalc.java
C:\>jar -cvf bhaskar.jar BhaskarColorFulCalc.class
```

Example 6:

```
class Client{
public static void main(String args[]){
System.out.println(BhaskarColorFulCalc.add(10,20));
System.out.println(BhaskarColorFulCalc.multiply(10,20));
}}
```

Analysis:

```
D:\Enum>javac Client.java (invalid)
D:\Enum>javac -cp c: Client.java (invalid)
D:\Enum>javac -cp c:\bhaskar.jar Client.java (valid)
D:\Enum>java -cp .;c:\bhaskar.jar Client (valid)
```

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Note: Whenever we are placing jar file in the classpath compulsory we have to specify the name of the jar file also and just location is not enough.

System properties:

- For every system some persistence information is available in the form of system properties. These may include name of the os, java version, vendor of jvm , userCountry etc.
- We can get system properties by using `getProperties()` method of system class.

The following program displays all the system properties.

Example 7:

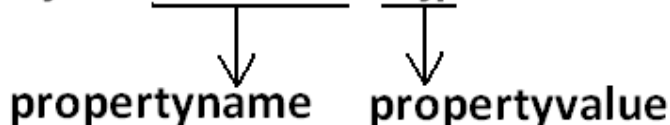
```
import java.util.*;
class Test{
public static void main(String args[]){
//Properties is a class in util package.
//here getProperties() method returns the Properties object.
Properties p=System.getProperties();
p.list(System.out);
}
}
```

How to set system property from the command prompt:

We can set a system property explicitly from the command prompt by using `-D` option.

Command:

D:\Enum>java -Dbhaskar=scjp Test



The main advantage of setting System Properties is we can customize the behaviour of java program.


```
class Test {
public static void main(String args[]) {
String course=System.getProperty("course");
if(course.equals("scjp")) {
    System.out.println("SCJP Information");
}
else
    System.out.println("other course information");
}
}
```

```
output:
c:> java -Dcourse=scjp Test
      SCJP Information
c:> java -Dcourse=scwcd Test
      other course information
```

What is the difference between path and classpath ?

Path: We can use "path variable" to specify the location where required binary executables are available.

If we are not setting path then "java" and "Javac" commands won't work.

Classpath: We can use "classpath variable" to describe location where required class files are available. 

If we are not setting classpath then our program won't compile and run.

What is the difference between JDK, JRE and JVM ?

JDK (java development kit): To develop and run java applications the required environment is JDK.

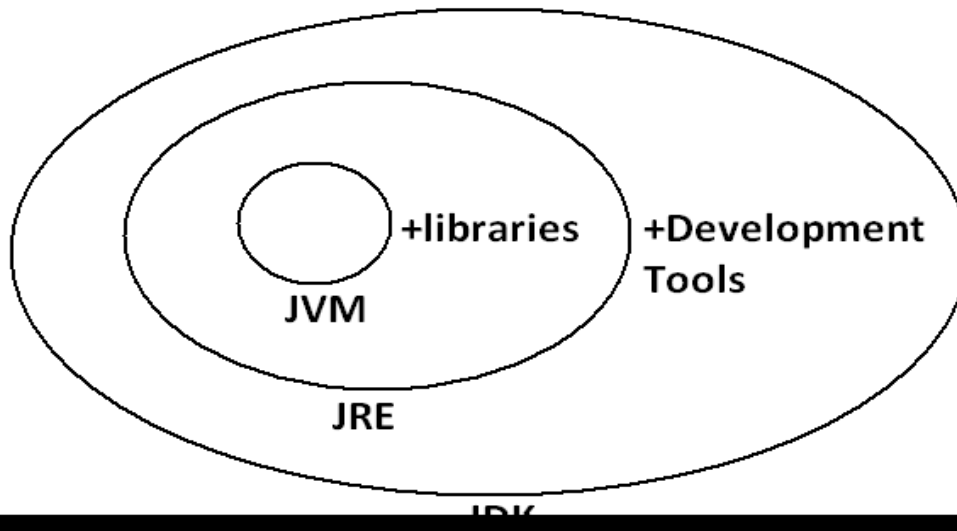
JRE (java runtime environment): To run java application the required environment is JRE. 

JVM (java virtual machine): To execute java application the required virtual machine is JVM.

JVM is an interpreter which is responsible to run our program line by line.



Diagram:



- JDK=JRE+Development Tools.
- JRE=JVM+Libraries.
- JRE is the part of JDK.
- Jvm is the part of JRE.

Note: At client side JRE is required and at developers side JDK is required.

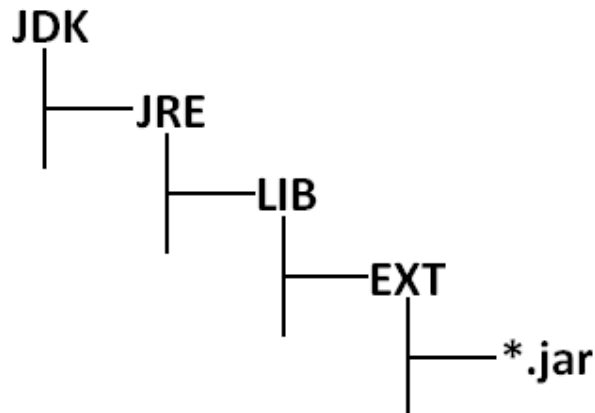
On the developers machine we have to install JDK , where as on the client machine we have to install JRE.

Shortcut way to place a jar files available in the classpath:

If we are placing jar file in the following location then it is not required to set classpath explicitly.

By default it's available for Java compiler and JVM.

Diagram:



Web Applications Vs Enterprise Applications:

A web application contains only web related technologies Servlets, Jsps, HTML etc., where as an enterprise applications can be developed by any technology from Java J2EE like Servlets, Jsps, EJB, JMS components etc.,

J2EE compatible application is Enterprise Application.

Web Server Vs Application Server :

Web Server provides environment to run web applications, webserver provides support only for web related technologies like Servlets, jsp.

Ex: Tomcat server

An Application Server provides environment to run enterprise applications. Application server provides support for any technology from J2EE like Servlet, Jsp, EJB, JMS components etc.,

Ex: weblogic, web sphere , J Boss etc.,

J2EE compatible server is Application Server.

Every application server contains in built web server.

Creation of executable jar file :

```

import java.awt.*;
import java.awt.event.*;

public class JarDemo {
    public static void main(String args[]) {
        Frame f=new Frame();
        f.addWindowListener(new WindowAdaptor {

```

```

public void windowClosing(WindowEvent e) {
    System.exit(0);
}
});

f.add(new Label("I can create Executable Jar File"));
f.setSize(500,500);
f.setVisible(true);
}

```



Main_Class : JarDemo

manifest.mf



javac JarDemo.java

1. java JarDemo

jar -cvfm demo.jar manifest.mf JarDemo.class
JarDemo\$1.class

2. java -jar demo.jar



3. By clicking jar file we can execute

Creation of Batch file :


```
java -cp c:\charan_classes JarDemo
```

abc.bat



By clicking this batch file , the java program will be executed.

In how many ways we can run a java program :

1. by executing class file.
Ex: java Test
2. by executing a jar file from the command prompt.
Ex: java -jar demo.jar
3. By double clicking jar file
4. By double clicking batch file

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