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Deploying Java Applications

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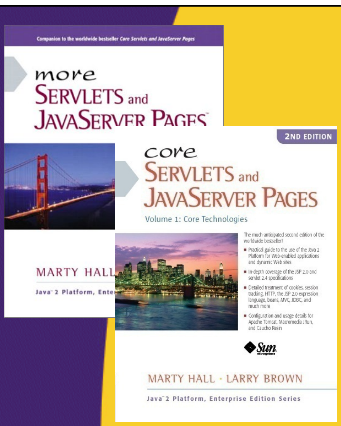
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2ND EDITION
Volume 1: Core Technologies
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JSF 2, PrimeFaces, Servlets, JSP, Ajax (with jQuery), GWT, Android development, Java 6 and 7 programming, SOAP-based and RESTful Web Services, Spring, Hibernate/JPA, XML, Hadoop, and customized combinations of topics.

Taught by the author of *Core Servlets and JSP*, *More Servlets and JSP*, and this tutorial. Available at public venues, or customized versions can be held on-site at your organization. Contact hall@coreservlets.com for details.

Agenda

- **Major Java Deployment Options**
  - Individual .class files
  - JAR files
  - OS wrapper around class files or JAR files
  - Applets
  - Java Web Start
  - Server-based Alternatives

Individual Class Files: Approach

- **Send all required .class files**
  - Packaged classes go in subdirectories matching package name
- **Identify a class with a `main` method**

```
public class SomeClass {
  public static void main(String[] args) {
    startTheWholeShebang();
  }
}
```

- **Invoke the class**
  - Packageless class

    `> java SomeClass` *`command-line-args`*
  - Packaged class

    `> java somePackage.SomeClass` *`command-line-args`*

Individual Class Files: Pros/Cons

- **Advantages**
  - Very simple to set up
  - Programmers can modify individual classes easily
- **Disadvantages**
  - Requires lots of separate files
    - Painful to install
  - Messy for non-Java-programmers
  - Requires the right Java version
  - No option for updates of class files
  - No option to assist in installing Java

Individual Class Files: Example

```
public class Launcher {
  public static void main(String[] args) {
    String[] names =
      {"Ebay", "Amazon.com", "Chase Bank", "PayPal"};
    int index = (int)(Math.random() * names.length);
    new Phisher(names[index]);
  }
}
```

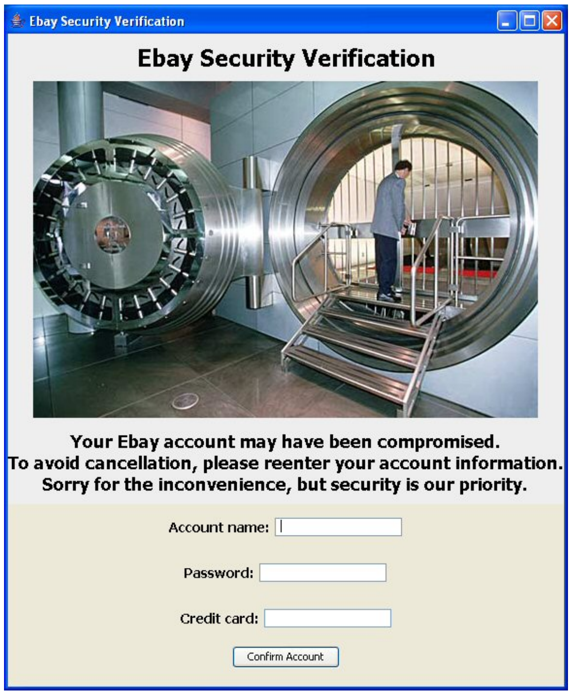
Individual Class Files: Example

```
public class Phisher extends JFrame {
  public Phisher(String company) {
    WindowUtilities.setNativeLookAndFeel();
    addWindowListener(new ExitListener());
    Container content = getContentPane();
    String title = company + " Security Verification";
    setTitle(title);
    String imageURL =
      "http://images.encarta.msn.com/xrefmedia/" +
      "sharemed/targets/images/pho/000a5/000a5038.jpg";
    String labelText =
      "<html><CENTER><H1>" + title + "</H1>" +
      "<IMG SRC=" + imageURL + "><BR>" +
      "<H2>Your " + company + " account may have been " +
      "compromised.<BR>To avoid cancellation, please " +
      "reenter your account information.<BR>Sorry for " +
      "the inconvenience, but security is our " +
      "priority.</H2>";
    JLabel label = new JLabel(labelText); ...
```

Individual Class Files: Example

```
DOS>dir/B
ExitListener.class
ExitListener.java
JFrameExample.java
LabeledTextField.class
LabeledTextField.java
Launcher.class
Launcher.java
Phisher.class
Phisher.java
WindowUtilities.class
WindowUtilities.java

DOS> java Launcher
```



Ebay Security Verification

Your Ebay account may have been compromised.
To avoid cancellation, please reenter your account information.
Sorry for the inconvenience, but security is our priority.

Account name:

Password:

Credit card:

JAR Files: Approach

- **Create a text file that designates main class**
  - `Main-Class: classname`
    - Must have carriage return at the end of the line
- **Create a JAR file with extra entry in manifest**
  - `jar -cmf yourtextfile.txt yourjarfile.jar *.class`
    - Must have m and f in same order as text/JAR filenames
- **Execute class from JAR file**
  - `java –jar yourjarfile.jar`

JAR Files: Pros/Cons

- **Advantages**
  - Only one file to send to user
  - No subdirectories or other files
- **Disadvantages**
  - Not easy for programmer to modify
  - Requires the right Java version
  - No option for updates of class files
  - No option to assist in installing Java

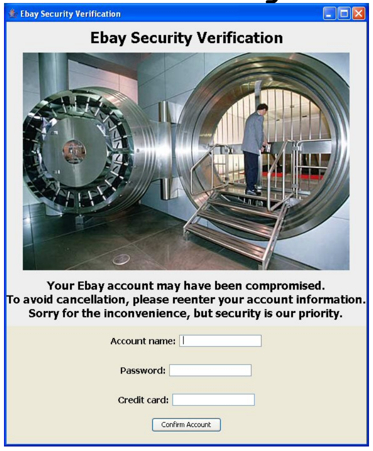
JAR Files: Example

- **ManifestEntry.txt**

```
Main-Class: Launcher
```

← Blank line here!

- `DOS> jar -cmf ManifestEntry.txt Phisher.jar *.class`
- `DOS> java -jar Phisher.jar`



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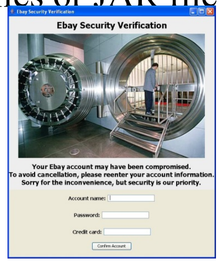
OS Wrapper

- **Wrap the call to Java inside a .bat file (Windows) or shell script (Unix/Linux)**
  - User can execute it in normal way (e.g., double click it)
  - Use javaw instead of java to avoid a popup console
- **Advantages**
  - User does not need to open DOS window or Unix shell
  - Double clicking icon is more natural to most users
- **Disadvantages**
  - File must be in same directory as .class files or JAR file
    - Or contain full path to class/JAR files
  - Requires the right Java version
  - No option for updates of class files
  - No option to assist in installing Java
- **Launcher.bat**

```
javaw -jar Launcher.jar
```



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Account name:

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Applets: Approach

- **Create a Web page that refers to an applet**

```
<APPLET CLASS="MyApplet.class" ...>
  Warning for users without Java
</APPLET>
```

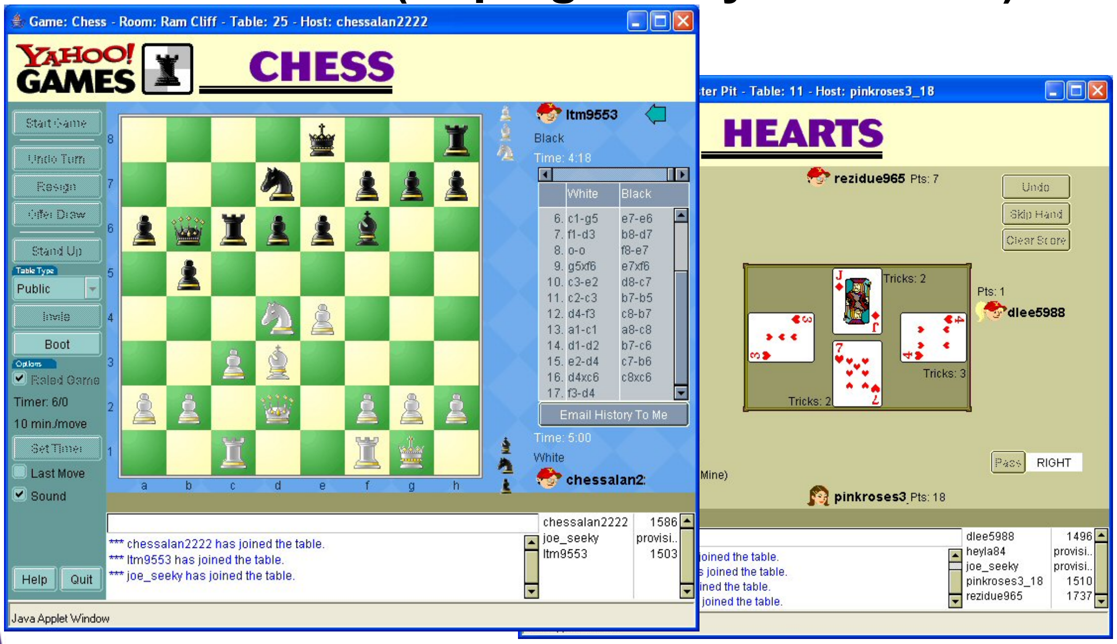
  - There is also Java plugin alternative with extra options
  - Applets covered in earlier lecture
- **User loads URL in browser**
  - http://host/path/filewithapplet.html
- **Applets can be embedded within browser or launch separate popup windows**

Applets: Pros/Cons

- **Advantages**
  - User can bookmark location
  - User gets updates automatically
- **Disadvantages**
  - Security restrictions
    - Applets cannot read/write local files, execute local programs, open arbitrary network connections, etc.
    - Digitally signed applets partially mitigate this
  - User must have right version of Java plugin
  - Accessed through browser
    - Does not seem like a "regular" program

Applets: Example

- **Yahoo Games (http://games.yahoo.com/)**



	White	Black
6.	c1-g5	e7-e6
7.	f1-d3	b8-d7
8.	o-o	f8-e7
9.	g5xf6	e7xf6
10.	c3-e2	d8-c7
11.	c2-c3	b7-b5
12.	d4-f3	c8-b7
13.	a1-c1	a8-c8
14.	d1-d2	b7-c6
15.	e2-d4	c7-b6
16.	d4xc6	c8xc6
17.	f3-d4	

```
*** chessalan2222 has joined the table.
*** ltm9553 has joined the table.
*** joe_seeky has joined the table.
```

chessalan2222	1586
joe_seeky	provisi..
ltm9553	1503

```
joined the table.
s joined the table.
ined the table.
joined the table.
```

dlee5988	1496
heyla84	provisi..
joe_seeky	provisi..
pinkroses3_18	1510
rezidue965	1737

Java WebStart: General Approach

- **Create XML file referring to JAR file and main class name**
  – XML file is called *mylauncher*.jnlp
- **Access the XML file in a browser**
  – http://host/path/mylauncher.jnlp
- **Code is cached locally**
  – Check for new version is automatic
  – Can also be run offline
  – Can create desktop icon automatically

Java WebStart: Pros/Cons

- **Advantages**
  - Ensures user has latest application updates
    - Downloads automatically
  - Ensures user has proper Java version
    - Downloads with minimal user intervention
  - JAR files cached locally
    - Faster download, offline execution
  - Can create desktop shortcut as launcher
- **Disadvantages**
  - Similar security restrictions to applets
    - Again, digital signatures can mitigate this
  - User must have *some* WebStart version installed
    - Fails for users that do not have Java installed at all
    - Autodetection of WebStart requires JavaScript code

Java WebStart: Example (Launcher)

```
public class Launcher2 {
  public static void main(String[] args) {
    String[] names =
      {"Ebay", "Amazon.com", "Chase Bank", "PayPal"};
    int index = (int)(Math.random() * names.length);
    new Phisher2(names[index]);
  }
}
```

Java WebStart: Example (GUI Code)

```
public class Phisher2 extends JFrame {
  public Phisher2(String company) {
    WindowUtilities.setNativeLookAndFeel();
    addWindowListener(new ExitListener());
    Container content = getContentPane();
    String title = company + " Security Verification";
    setTitle(title);
    String labelText =
      "<html><CENTER><H1>" + title + "</H1>" +
      "<H2>Your " + company + " account may have been " +
      "compromised.<BR>To avoid cancellation, please " +
      "reenter your account information.<BR>Sorry for " +
      "the inconvenience, but security is our " +
      "priority.</H2>";
    JLabel label = new JLabel(labelText);
    ClassLoader cl = getClass().getClassLoader();
    Icon bankVaultIcon =
      new ImageIcon(cl.getResource("images/bankvault.jpg"));
    label.setIcon(bankVaultIcon);
```

Java WebStart: Example (JAR File)

- JAR file must contain images and class files
- No extra manifest entry needed

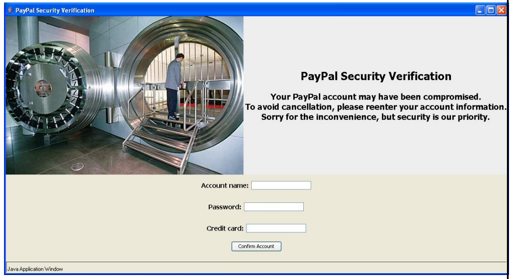
- `DOS> jar -cf Phisher2.jar images *.class`

Java WebStart: Example (JNLP File)

```
<jnlp spec="1.0"
      codebase="http://www.coreservlets.com/webstartdemo"
      href="Phisher2.jnlp">
  <information>
    <title>Phisher2</title>
    <vendor>freesecuritywarnings.com</vendor>
    <offline-allowed/>
  </information>
  <resources>
    <j2se version="1.5+"
          href="http://java.sun.com/products/autodl/j2se"/>
    <jar href="Phisher2.jar"/>
  </resources>
  <application-desc main-class="Launcher2"/>
</jnlp>
```

Java WebStart: Example (Execution)

- **After entering URL**
  - http://www.coreservlets.com/webstartdemo/Phisher2.jnlp



PayPal Security Verification

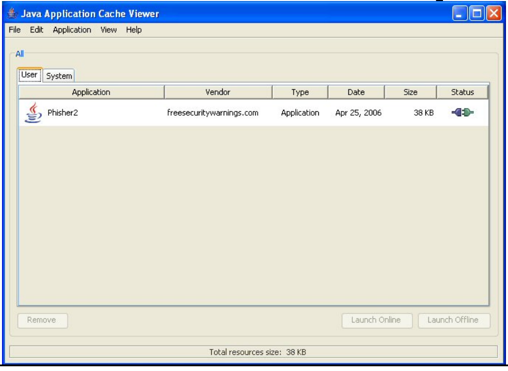
Your PayPal account may have been compromised.
To avoid cancellation, please reenter your account information.
Sorry for the inconvenience, but security is our priority.

Account name:

Password:

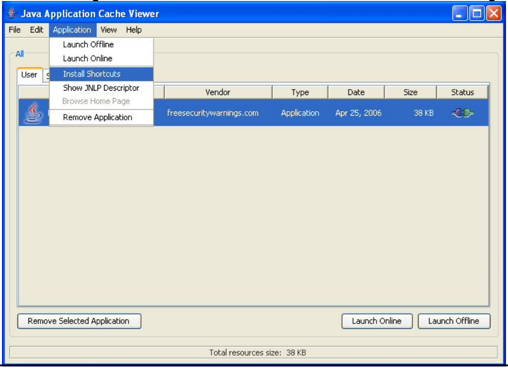
Credit card:

- **Later WebStart options (from Start Menu)**



Application	Vendor	Type	Date	Size	Status
Phisher2	freesecuritywarnings.com	Application	Apr 25, 2006	38 KB	

Total resources size: 38 KB



	Vendor	Type	Date	Size	Status
	freesecuritywarnings.com	Application	Apr 25, 2006	38 KB	

Total resources size: 38 KB

Java WebStart: Other JNLP File Capabilities

- **Bypassing security**
  - <**security**><**all-permissions**/></**security**>
  - Asks user for permission to run in unrestricted mode
    - Requires your JAR file(s) to be digitally signed
- **Auto-Shortcut**
  - <**shortcut online**="false">
        <**desktop**/>
        <**menu submenu**="My Corporation Apps"/>
    </**shortcut**>
- **java-vm-args (attribute of j2se element)**
  - Lets you pass args to java
- **More JNLP syntax info**
  - http://java.sun.com/j2se/1.5.0/docs/guide/javaws/developersguide/syntax.html

Java WebStart: More Info

- **Top-Level Documentation Page**
  - http://java.sun.com/j2se/1.5.0/docs/guide/javaws/
- **FAQ**
  - http://java.sun.com/j2se/1.5.0/docs/guide/javaws/developersguide/faq.html
- **Developer's Guide**
  - http://java.sun.com/j2se/1.5.0/docs/guide/javaws/developersguide/contents.html
    - Includes downloadable JavaScript and VBScript code for detecting users that do not have *any* version of WebStart, and for letting them download it in such a case
    - Shows how to digitally sign JAR files so that application can request unrestricted privileges

Server-Based Alternatives

- **Regular Sockets**
  - Request data from a normal server. Parse response explicitly.
- **Object Streams**
  - Request Java objects from a server running same major version of Java. No parsing required.
- **RMI**
  - Convenient wrapper to automate exchange of Java objects via object streams.
- **Servlets and Web Services**
  - Use HTTP to get HTML (regular Web applications), XML (Web services), or Java object streams (HTTP tunneling).

Summary

- **Individual class files**
  - Pros: simple to set up, easy Java programmer to edit
  - Cons: no auto-updates of code or Java version, nonintuitive to non-programmer
- **JAR files**
  - Pros: single file
  - Cons: same as class files
- **OS wrapper**
  - Pros: more intuitive (clickable)
  - Cons: same as class files
- **Applets**
  - Pros: Web access, auto-updates of code, security
  - Cons: Web only, no auto-update of Java version, security
- **Java WebStart**
  - Pros: Web/desktop access, auto-updates of code and Java, security
  - Cons: more complicated, security

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Questions?

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