JavaFX and its Deployment

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Program Agenda

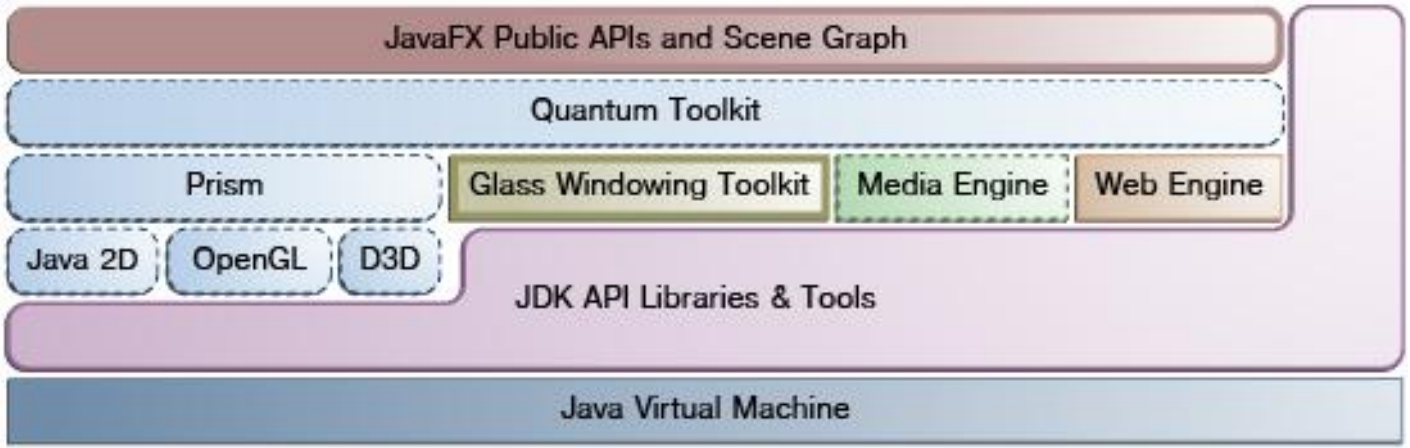
- JavaFX in general
- Deployment
- Execution Modes and Application Startup
- Packaging
- Browser Deployment
- NetBeans IDE
- Documentation

What You Will Learn

- JavaFX toolkit
- Deployment
  - Execution modes
  - Deployment tools
  - Effective documenting

JavaFX

- Graphics
- Media
- Rich Client/Internet Applications
- Architecture



JavaFX API features

- Full Java API access (generics, annotations, threads, 3rd party libraries)
- Binding support
  - Lazy binding, binding expressions
- Collections extension
  - Observable list and maps
- Animations
- Multitouch support
- UI controls
- Layouts, canvas support

Key ecosystem features

- FXML and SceneBuilder
  - XML-based declarative language to describe GUI
  - Can be generated by the SceneBuilder visual application
- Webview
  - based on Webkit, JavaScript call/be called from JavaFX
- Swing interoperability
- 2D & 3D, effects
- HW-accelerated graphics layer
- Media engine
- Possibility of self-contained applications that include the VM

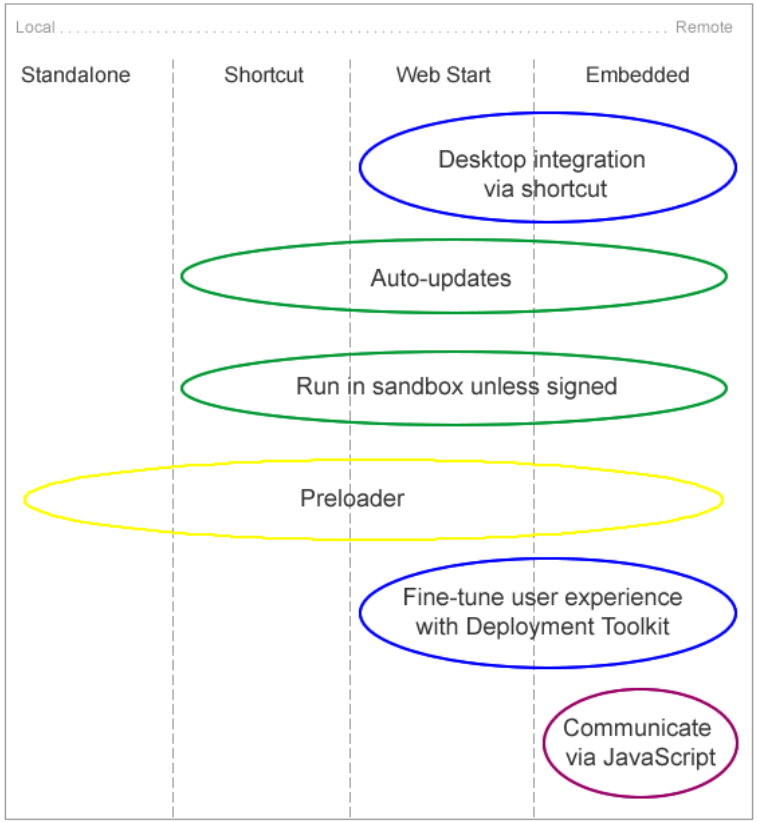
JavaFX Ensemble

JavaFX Deployment

Execution Modes

- Standalone program
  - Package available on a local drive including Java launcher (`java -jar MyApp.jar`, doubleclicking)
  - Native bundle
- Webstart
  - Link on a web page, package on remote server
- Applet
  - Embedded in a web page
- Desktop shortcut
  - For remote Webstart or embedded application

Execution Modes



- Web applications may ask the user to create a desktop shortcut (not applicable to a standalone app.)
- Auto-updates: every time the application starts
- Java Runtime protects the user (resources, connections, native libraries, ClassLoader creation, reading some System Properties)
- JavaScript: application can talk to the embedding web page

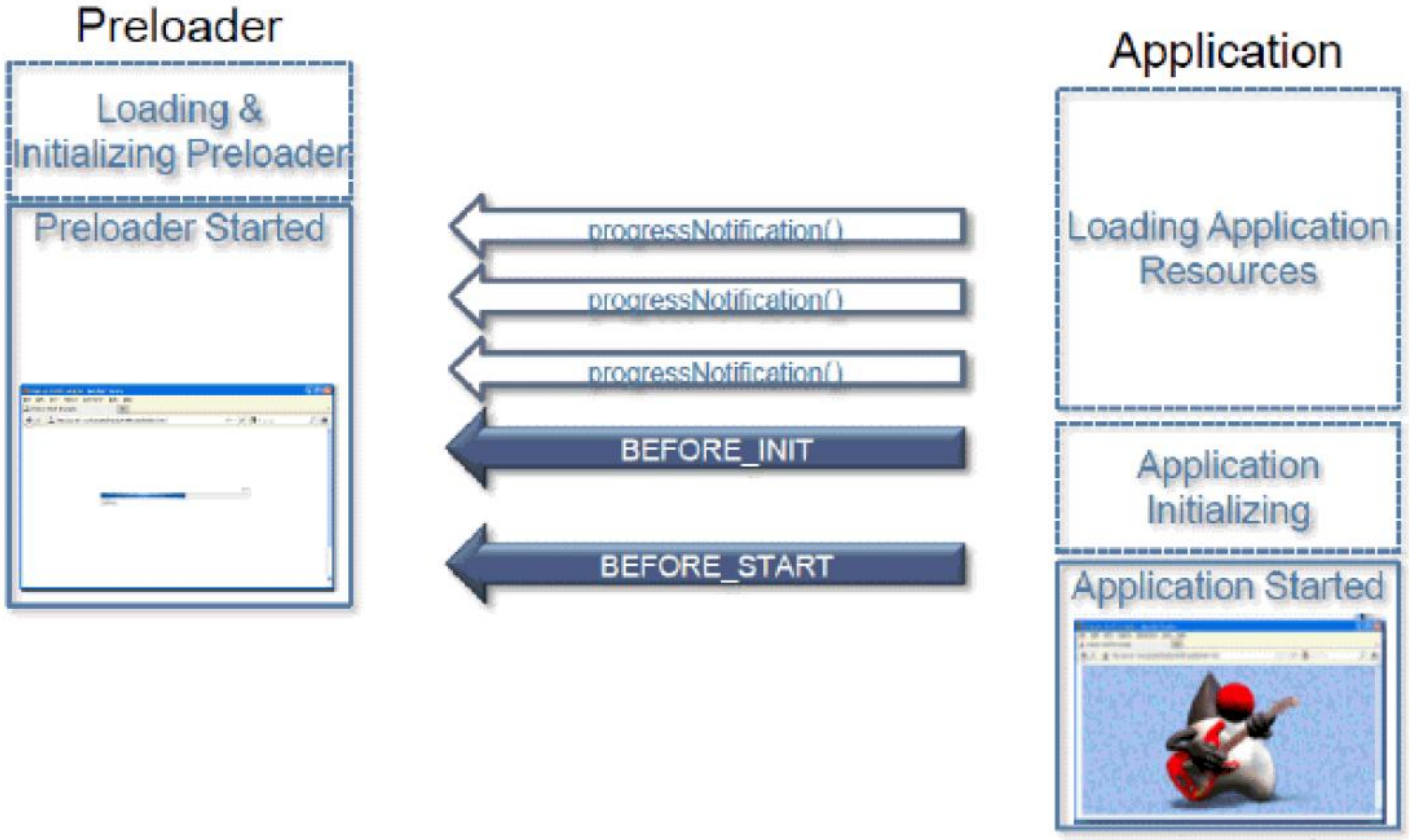
Application Startup

- User experience is very important for success of the applications
- Need to let the user know the status of loading and the progress toward running the application
- During initialization: JavaScript/HTML
- After initialization: customization of loading process possible (preloader)

Application Startup

- Startup sequence:
  - Splashscreen displayed
    - Check/Install/Update prerequisites
    - Init JVM and JavaFX
  - Preloader starts
    - Download Application JARs
    - Check permissions
  - Application Init
    - Application runs

Preloader



Initialization Customization

- Splashscreen: `onGetSplash` javascript callback
- Preloader: custom or default
  - Customizing default preloader via the CSS
    - `.default-preloader` class

```
.default-preloader {
  -fx-background-color: yellow;
  -fx-text-fill: red;
  -fx-preloader-graphic: url("http://host.domain/duke.gif");
  -fx-preloader-text: "Loading, loading, LOADING!";
 }
```

Initialization Customization

- Using Ant task

```
<fx:deploy ...>
  <fx:application ...>
  <fx:param name="javafx.default.preloader.stylesheet"
      value=".default-preloader { -fx-background-color:
 yellow; }"/>
  </fx:application>
</fx:deploy>
```

Preloader code

```
public class FirstPreloader extends Preloader {
  ProgressBar bar;
  Stage stage;
  private Scene createPreloaderScene() {
    bar = new ProgressBar();
    BorderPane p = new BorderPane();
    p.setCenter(bar);
    return new Scene(p, 300, 150);
  }
  public void start(Stage stage) throws Exception {
    this.stage = stage;
    stage.setScene(createPreloaderScene()); stage.show();
  }
  public void handleProgressNotification(ProgressNotification pn) {
    bar.setProgress(pn.getProgress());
  }
  public void handleStateChangeNotification(StateChangeNotification evt) {
    if (evt.getType() == StateChangeNotification.Type.BEFORE_START) {
      stage.hide();
    }
  }
}
```

Deployment tools
Packaging

Packaging

- Packaging ensures:
  - An easy-to-run instance of the program
    - Launching from the command line
    - Double-clickable jar
    - Desktop shortcut
    - Web page
  - All needed information/classes is available: required JRE and JavaFX Runtime, dependencies; autodownload/update
  - Visual feedback while loading

Packaging Tools

- Ant tasks
- NetBeans IDE
  - Most typical use cases, may be customized (`-post-jar` target)
- Command-line utility
  - Convenience tool

Packaging Steps

- CSS->BSS (optional)
  - Improves application runtime responsiveness
- Create jar file
  - Includes code and resources, including launcher for runtime detection, preloader, …
- Sign the jar file (optional)
  - Just when higher privileges needed
- Generate additional files for web deployment
  - Web page with javascript, JNLP file

Packaging Steps

	Ant task	CL tool	NetBeans
CSS->BSS	`<fx:csstobin>`	`javafxpackager -createbss`	"Binary Encode JavaFX CSS Files" checkbox
Create a jar	`<fx:jar>`	`javafxpackager -createjar`	Default build action, configurable
Sign a jar	`<fx:signjar>`	`javafxpackager -signjar`	"Request unrestricted access" checkbox, attach a certificate
Generate files for web deployment	`<fx:deploy>`	`javafxpackager -deploy`	Default build action, configurable

CSS Conversion

- Optional, improves performance, especially for large CSS files

- Loading a BSS file:

```
scene.getStylesheets().add(this.getClass()
                .getResource("mystyles.bss").toExternalForm());
```

CSS Conversion

- Ant task

```
<fx:csstobin outdir="build/classes">
     <fileset dir="build/classes" includes="**/*.css"/>
</fx:csstobin>
```

- Command line

```
javafxpackager -createbss -srcdir src\css -srcfiles stylesheet.css -
  outdir styles -outfile stylesheet
```

Create jar File

- The jar contains
  - Platform requirements (Java, JavaFX)
  - Java VM arguments
  - Application details (name of the main class, preloader class)
  - Application resources details
  - Class files and resources themselves
  - List of auxiliary jar files needed by the application

Create jar File

- Ant task

```
<fx:jar destfile="dist/application.jar">
  <fx:application name="Sample JavaFX application"
      mainClass="test.MyApplication"/> <!-- Details about application -->
  <fx:resources> <!-- Define what auxilary resources are needed -->
    <fx:fileset dir="dist" includes="lib/*.jar"/>
  </fx:resources>
  <fileset dir="build/classes"/>
  <manifest> <!-- Customize jar manifest (optional) -->
    <attribute name="Implementation-Vendor" value="Samples Team"/>
    <attribute name="Implementation-Version" value="1.0"/>
  </manifest>
</fx:jar>
```

Create jar File

- Command line

```
javafxpackager -createjar -appclass package.class -srcdir classes -outdir
  out -outfile outjar -v
```

Sign the jar File

- Optional, make sure it is really needed since it affects performance, pops out dialog boxes, etc.
- Similar to regular Java signing, with an option to sign the jar file as one object (saves about 10 percent of the jar size)
- See Java tutorial for signing details (keystores, signing keys)

Sign the jar File

- Ant task

```
<fx:signjar destdir="dist" keyStore="sampleKeystore.jks" storePass="****"
      alias="javafx" keyPass="****">
   <fileset dir='dist/*.jar'/>
</fx:signjar>
```

- Command line

```
javafxpackager -signjar --outdir dist -keyStore sampleKeystore.jks
      -storePass **** -alias javafx -keypass **** -srcdir dist
```

Generate Files for Web Deployment

- Deployment descriptor
- Basic or custom (to ease integration testing) html page
- Define details about the application, its parameters, preloader, stage size, platform requirements, needed permissions

Generate Files for Web Deployment

- Ant task

```
<fx:deploy width="600" height="400" outdir="web-dist" outfile="App">
   <fx:info title="Sample application"/>
   <fx:application name="SampleApp" mainClass="testapp.MainApp"
          preloaderClass="testpreloader.Preloader">
      <fx:param name="testVariable" value="10"/>
   </fx:application>
   <fx:resources>
      <fx:fileset requiredFor="preloader" dir="dist">
         <include name="preloader.jar"/>
      </fx:fileset>
      <fx:fileset dir="dist">
         <include name="helloworld.jar"/>
      </fx:fileset>
   </fx:resources>
</fx:deploy>
```

Generate Files for Web Deployment

- Command line

```
javafxpackager -deploy -outdir dist -outfile Sample -width 800 -
  height 600 -srcdir dist -srcfiles
  AnimatedCircles.jar;lib/somelibrary.jar;preloader.jar -
  appclass animatedcircles.AnimatedCircles -name "Animated
  Circles" -title "Animated Circles Demonstration" -vendor
  Oracle -embedjnlp -v
```

Web Page Templates

- Real web page testing

```
<html>
    <head>
        <title>Host page for JavaFX Application</title>
        #DT.SCRIPT.CODE#
        #DT.EMBED.CODE.ONLOAD#
    </head>
    <body>
        <h1>Embed JavaFX application into existing page</h1>
        <!-- application will be inserted here -->
        <div id="ZZZ"></div>
    </body>
</html>
```

Performance Tips

- Background (lazy) update check – default behavior
- Embedded JNLP in HTML (less connections)
- Embedded certificate into JNLP (no waiting for the security dialog)
- Sign jar as one binary object

JavaFX and JavaScript

- Calling JavaFX methods

```
var fxapp = document.getElementById("myApp")
var r = fxapp.doSomething()
```

- Calling JS functions, fields

```
public void resizeMyself(int w, int h) {
   JSObject jsWin = getHostServices().getWebContext();
   if (jsWin != null) {
      jsWin.eval("var m = document.getElementById('myApp');" +
      "m.width=" + w + "; m.height=" + h + ";");
   } else {
      // running as non embedded => use Stage's setWidth()/setHeight()
   }
}
```

Native Self-contained Bundles

- Includes all application resources
  - Including JRE runtime(!)
- JDK with bundled JavaFX SDK needed (i. e. > JDK7u6)
- Requested by parameters to `<fx:deploy>`, `javafxpackager` tool
- EXE, MSI, DMG, RPM, DEB
- Operating system requirements for system-dependent packages

Native Self-contained Bundles

Pros and Cons

- Pros
  - Resemble native applications
  - No JVM compatibility issues
  - No java runtime has to be installed beforehand
- Cons
  - Need to download, install and run instead of just run from webpage
  - Larger download size
  - Package per target platform
  - No autoupdate as known from JNLP mechanism

Native Self-contained Bundles

Examples

- Ant task

```
<fx:deploy width="${javafx.run.width}" height="${javafx.run.height}"
   nativeBundles="all" outdir="${basedir}/${dist.dir}"
  outfile="${application.title}">
```

  - Possible values are `all, deb, dmg, exe, image, msi, none, rpm`

- Command line tool

```
javafxpackager -deploy -native -outdir packages -outfile BrickBreaker
   -srcdir dist -srcfiles BrickBreaker.jar -appclass brickbreaker.Main
   -name "BrickBreaker" -title "BrickBreaker demo"
```

- Possible more precise specification after `-native`: image, installer, msi, exe, dmg, etc.

Bundle options

	Installation location	License support	Prerequisities
EXE	**Per user:** %LOCALAPPDATA% System: %ProgramFiles%	Yes (optional)	Windows Inno Setup 5 or later[1]
MSI	Per user: %LOCALAPPDATA% **System:** %ProgramFiles%	N/A	Windows WiX 3.0 or later[2]
DMG	Per user: home dir **System:** /Applications	Yes (optional)	Mac OS X
RPM	Per user: N/A System: /opt	N/A	Linux RPMBuild
DEB	Per user: N/A System: /opt	N/A	Linux Debian packaging tools

1 http://www.jrsoftware.org/isinfo.php
2 http://wixtoolset.org/

The Simple Way

- Packager's makeAll command
- Presumes sources in `src`, destination is `dist`

```
javafxpackager -makeall -appclass colorfulcircles.ColorfulCircles -name
  "Colorful Circles" -width 800 -height 600
```

- Compiles, packages and deploys
- Searches for Java and JavaFX
- NetBeans IDE

Documenting JavaFX

Documenting JavaFX Properties

- JavaFX SDK contains Javadoc doclet with additional JavaFX-related feature
- It copies documentation from property definition to its getters and setters, adds links.
- Doclet available in JavaFX SDK in `lib/javafx-doclet.jar`
- Will be available as standard JDK doclet in JDK8 – see the latest development builds
- To enable JavaFX features, pass `-javafx` command line argument (set `javafx.javadoc` environment variable for older releases)

JavaFX Properties

```
private DoubleProperty rate;
/**
  * Setter for the rate property.
  * Property description: Defines the direction/speed at which the {@code Timeline} is
  * expected to be played.
  * @defaultValue 1.0
  * @see #rateProperty
  */
 public final void setRate(double value) {}

/**
  * Almost(!) Copied documentation
  */
 public final double getRate() {}

/**
  * Almost(!) Copied documentation
  */
 public final DoubleProperty rateProperty() {}
```

JavaFX Properties

```
/**
 * Defines the direction/speed at which the {@code Timeline} is
 * expected to be played.
 * @defaultValue 1.0
 */
private DoubleProperty rate;

public final void setRate(double value) {}

public final double getRate() {}

public final DoubleProperty rateProperty() {}
```

Using the Doclet

- Command line

```
javadoc -docletpath <path-to-the sdk>/lib/javafx-doclet.jar -doclet
  com.javafx.lib.doclets.formats.html.HtmlDoclet -sourcepath src -d docs
  -J-Djavafx.javadoc=true packageName
```

- Ant task

```
<javadoc  destdir="docs" sourcepath="src" packagenames="packageName"
  access="private" additionalparam="-J-Djavafx.javadoc=true">
      <doclet name="com.javafx.lib.doclets.formats.html.HtmlDoclet"
  path="<path the the sdk>/lib/javafx-doclet.jar">
      </doclet>
</javadoc>
```

What You Have Learned

- JavaFX
- Execution modes
- Deployment tools
- Effective Documenting

References

- JavaFX
  - http://www.oracle.com/technetwork/java/javafx/overview/index.html
- Deploying JavaFX Applications
  - http://docs.oracle.com/javafx/2/deployment/jfxpub-deployment.htm
- Doclet guide
  - http://docs.oracle.com/javafx/2/doclet/jfxpub-doclet.htm

Q & A