JavaOne™

# Introduction to JavaFX

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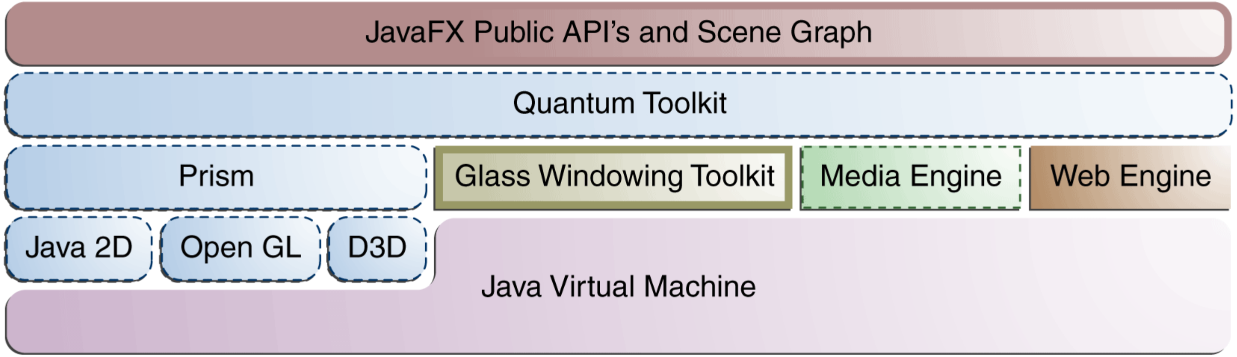
JavaFX is the Evolution of Java as a Rich Client Platform.

It is designed to provide a modern Java environment featuring a lightweight, hardware accelerated UI platform that meets tomorrow’s needs.

# JavaFX Runtime High Level Architecture



## JavaFX Glossary

- **Glass Windowing Toolkit**: Provides native operating services, such as managing the windows, timers, and surfaces
- **Prism**: Graphics pipeline that can run on hardware and software renderers
- **Quantum Toolkit**: Ties Prism and Glass together and makes them available to the JavaFX APIs

# Java APIs and FXML

## Java APIs for JavaFX

- End-to-end Java development
- Java language features - generics, annotations, multi-threading
- Fluent API for UI construction
- Alternative JVM supported languages (e.g. Groovy, Scala) with JavaFX
- Leverage sophisticated Java IDEs, debuggers and profilers
- Java APIs preserve convenient JavaFX Script features (e.g., bind)

## FXML

- Scriptable, XML-based markup language for defining UI
- Convenient alternative to developing UI programmatically in Java
- Easy to learn and intuitive for developers familiar with web technologies or other markup based UI technologies
- Powerful scripting feature allows embedding scripts within FXML. Any JVM scripting language can be used, including JavaScript, Groovy, and Scala

# New Graphics Pipeline

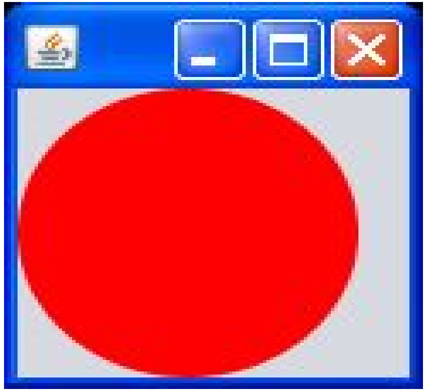
- New hardware accelerated graphics pipeline (Prism)
- New windowing toolkit (Glass) for Prism
- Java2D software pipeline under Prism
- High-level support for making rich graphics simple
  - Shadows, Blurs, Reflections, Effects, 2D transforms
  - 3D Transforms today; Full 3D objects in future

# Open Source and Standardization

- JavaFX source code being contributed as part of OpenJFX http://openjdk.java.net/projects/openjfx/
  - Source code being contributed in phases
  - Initial phase: UI Controls
- Oracle is committed to standardize JavaFX through JCP
  - One or more JSRs will be submitted
  - Expected to be become part of the Java SE specification

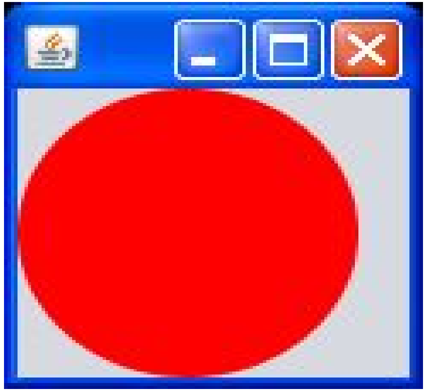
# Let’s Compare: JavaFX 1.x

```
import javafx.application.*;
import javafx.scene.shape.*;
import javafx.scene.paint.*;

Stage {
  scene:Scene{
    Content:[
      Circle {
        centerX: 50
        centerY: 50
        radius: 50
        fill: Color.RED
      }
    ]
  }
}
```



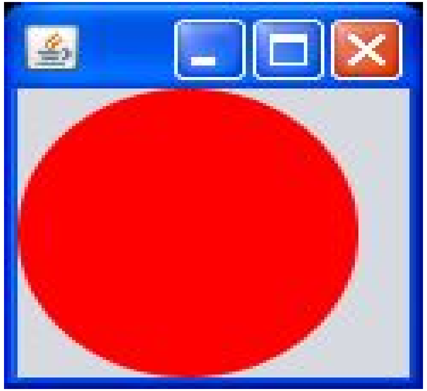
# Let’s Compare: JavaFX 2.0

```
public class JavaFXTest extends Application {
  @Override public void start(Stage stage) {
    Group root = new Group();
    Scene scene = new Scene(root,100,100);
    stage.setScene(scene);

    Circle c1 =
      new Circle(50.0f, 50.0f, 50.0f, Color.RED);

    root.getChildren().add(c1);
    stage.setVisible(true);
  }

  public static void main(String args[]) {
    launch(args);
  }
}
```



# Let’s Compare: FXML

```
<BorderPane>
  <center>
    <Circle radius=“50” centerX=“50”
       centerY=“50” color=“red”/>
  </center>
</BorderPane>
```



```
public class JavaFXTest extends Application {
  @Override public void start(Stage stage) {
    stage.setTitle(“FXML Example”);
    Parent root = FXMLLoader.load(getClass().getResource(“example.fxml"),
        ResourceBundle.getBundle(“r.fxml_example"));
    stage.setScene(new Scene(root));
    stage.show();

  }
}
```

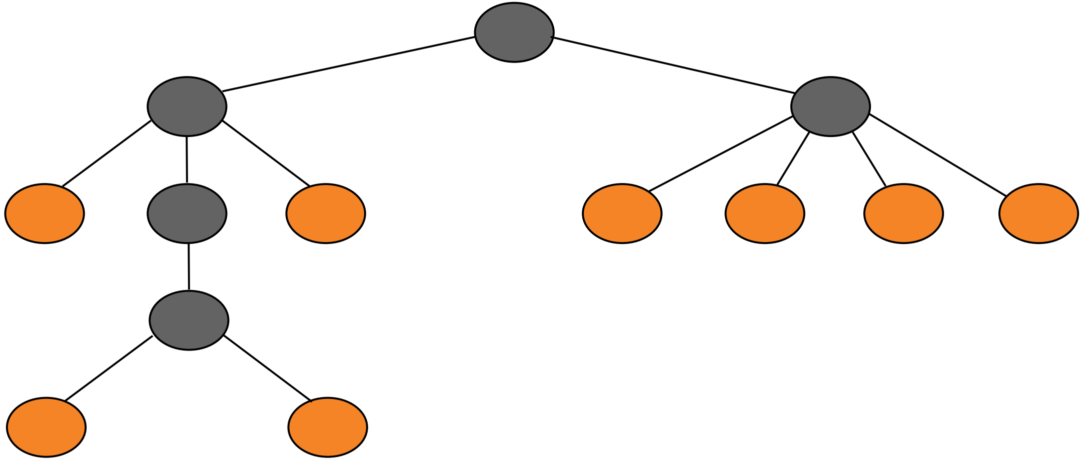
# Fluent API

- Controls have associated Builder class
  - e.g. `CircleBuilder<B extends CircleBuilder<B>>`

```
Circle c = CircleBuilder.
  create().
  centreX(50).
  centreY(50).
  radius(50).
  fill(Color.RED).
  build();
```

# Scene Graph

- Directed Acyclic Graph
- Parents and children
- Representation of the GUI components



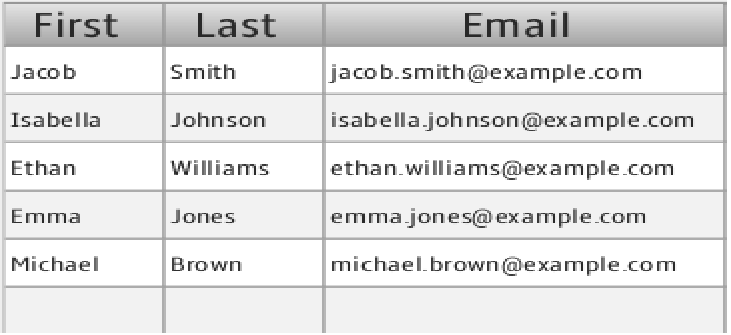
# Media

- Stable media framework based on GStreamer
- VP6, MP3 playback of Web multimedia content
  - Platform specific formats supported via native players/codecs
- Low latency audio
- Alpha channel support
- Performance improvements
- Full screen video

# Media

- JavaFX supports both visual and audio media
  - Including low latency audio/alpha channel support
- Cross-platform JavaFX media file format (fxm, mp3)
  - Platform specific formats supported via native players
- Media class represents a media file
- MediaPlayer provides control of the media rendering
- MediaView uses MediaPlayer to render media as Node
  - Many MediaViews can use the same MediaPlayer (cheaply)

# Table



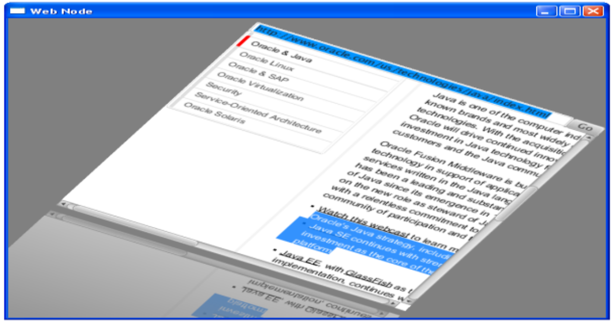
| First | Last | Email |
|---|---|---|
| Jacob | Smith | jacob.smith@example.com |
| Isabella | Johnson | isabella.johnson@example.com |
| Ethan | Williams | ethan.williams@example.com |
| Emma | Jones | emma.jones@example.com |
| Michael | Brown | michael.brown@example.com |

- Full featured table component
  - Resizeable columns
  - Columns can be moved
  - Groups of columns can be moved
- Uses standard MVC pattern
  - Create model for data
  - Attach to Table ‘view’ for display
- Efficient
  - Lazy loading of data – only displayed data is loaded

# Adding HTML Content

## The Embedded Browser (WebKit based)

- WebEngine
  - – Provides basic web page browsing functionality
  - – Supports user interaction: navigating links, submitting forms
  - – DOM/JavaScript access/injection
- WebView
  - – Web page as a Node in scenegraph
    - Effects can be applied
  - – Encapsulates WebEngine object
  - – No plugin support

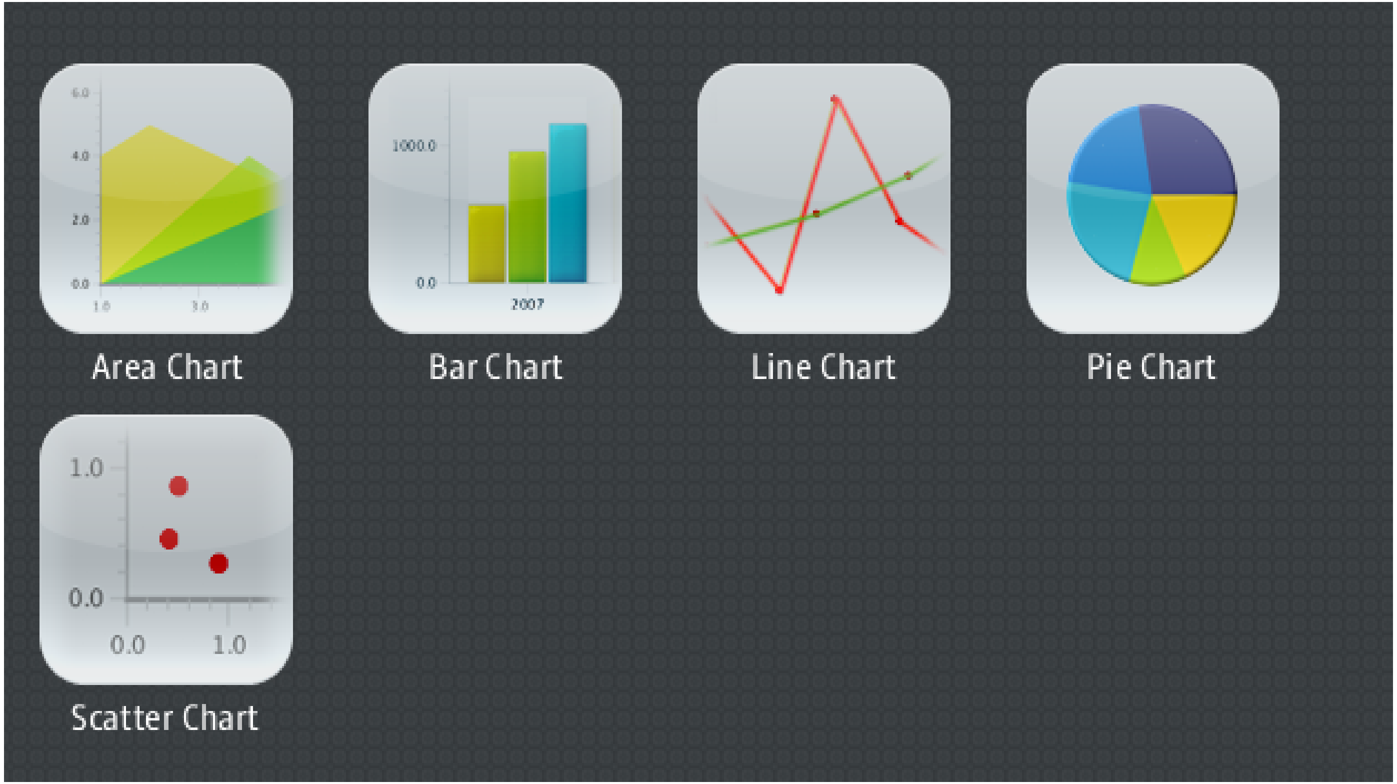


Java is one of the computer ind
known brands and most widely
technologies. With the acquisitio
Oracle will drive continued inno
investment in Java technology f
customers and the Java commu

Oracle Fusion Middleware is bu
technology in support of applica
services written in the Java lang
has been a leading and substan
of Java since its emergence in
on the new role as steward of J
with a relentless commitment to
community of participation and

- Watch this webcast to learn m
- Oracle's Java strategy, includi
- Java SE continues with stren investment as the core of the platform
- Java EE, with GlassFish as t implementation, continues w

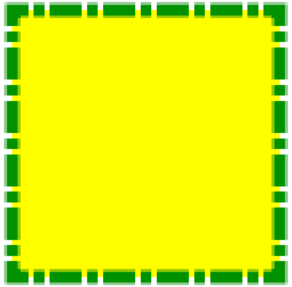
# Charts


6.0
4.0
2.0
0.0
1.0
3.0
Area Chart
1000.0
0.0
2007
Bar Chart
Line Chart
Pie Chart
1.0
0.0
0.0
1.0
Scatter Chart

# CSS Support

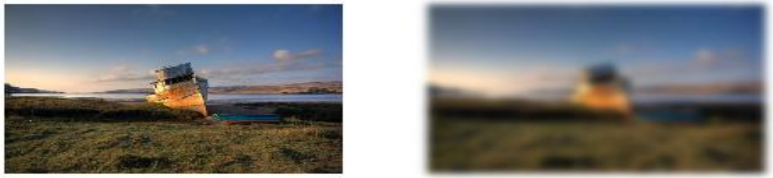
- All controls can be styled through CSS
  - Default, ‘Caspian’ stylesheet
- Change before starting application, or during runtime

```
.my-rect {
    -fx-fill: yellow;
    -fx-stroke: green;
    -fx-stroke-width: 5;
    -fx-stroke-dash-array: 12 2 4 2;
    -fx-stroke-dash-offset: 6;
    -fx-stroke-line-cap: butt;
}
```



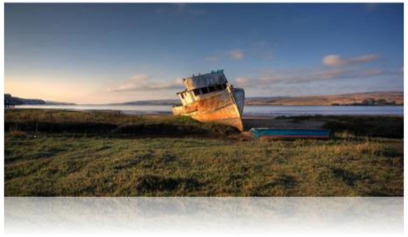
# Effects...

GaussianBlur

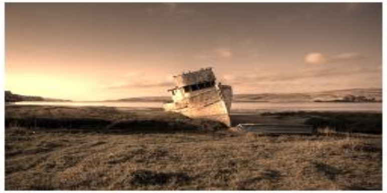


InnerShadow

Reflection

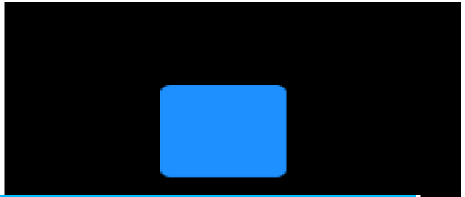


SepiaTone

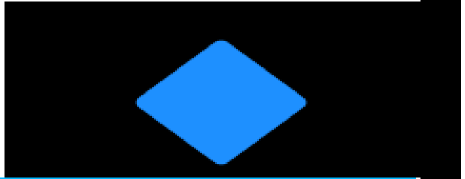


# Transforms

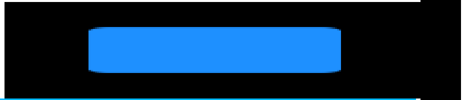
```
Rectangle rect=new Rectangle(0,0,60,60);
rect.setFill(Color.DODGERBLUE);
rect.setArcWidth(10);
rect.setArcHeight(10);
```



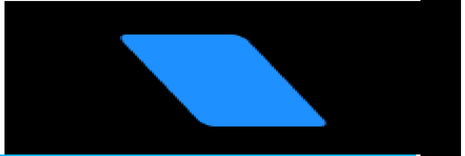
```
rect.setRotate(45);
```



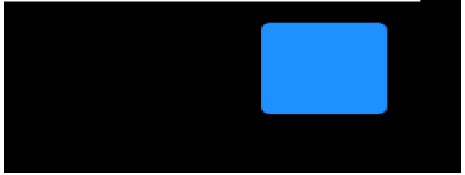
```
rect.setScaleX(2);
rect.setScaleY(0.5);
```



```
Shear shear = new Shear(0.7, 0);
rect.getTransforms().add(shear);
```



```
rect.setTranslateX(40);
rect.setTranslateY(10);
```



# Binding

- Creates a dependency between a property and a changeable value
- High level API
  - Easy to use
  - Covers most common situations
- Low level API
  - Allows for more complex interactions
  - Optimised for fast execution and small footprint

# Properties

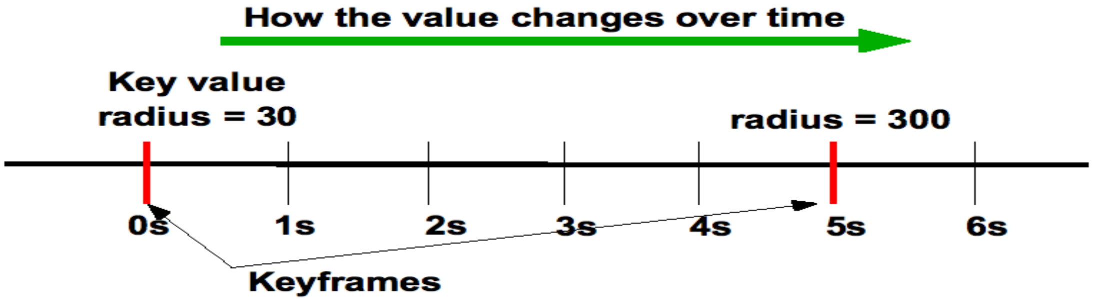
- Basis for high level binding API
- Concrete types for all primitives, String and Object
  - **`DoubleProperty`**, **`StringProperty`**, etc
- Simple API
  - **`bind`** / **`unbind`**
  - **`bindBidirectional`** / **`unbindBidirectional`**
  - **`isBound`**

# Simple Binding Example

```
private SimpleDoubleProperty topXProperty =
  new SimpleDoubleProperty();
private SimpleDoubleProperty topYProperty =
  new SimpleDoubleProperty();

Line foldLine = new Line();
foldLine.setEndX(200);
foldLine.setEndY(200);
foldLine.startXProperty().bind(topXProperty);
foldLine.startYProperty().bind(topYProperty);

...

topXProperty.set(tx);
topYProperty.set(ty);
```

# Timeline Based Animations

- `Timeline`
  - – Modifies values of variables specified in KeyFrames
- `KeyFrame`: specifies that a variable should have
  - – A particular value at a particular time
- `KeyValue`: Value to be interpolated for an interval



# Animated Transitions

- Pre-defined, single-purpose animations
  - Fade, Path, Pause, Rotate, Scale, Translate
  - Can specify to, from and by values
- Container transitions
  - Parallel, sequential
  - Can be nested arbitarily
- Transitions and Timelines share ancestary
  - A Timeline can be added to a Parallel / Sequential transition

# Swing and SWT Interoperability

- Embed JavaFX content into existing Swing applications
- Extend existing Swing applications with new JavaFX features such as WebView and high-performance graphics
- Applies to SWT applications as well

# Standard Java Tools for Easy Development

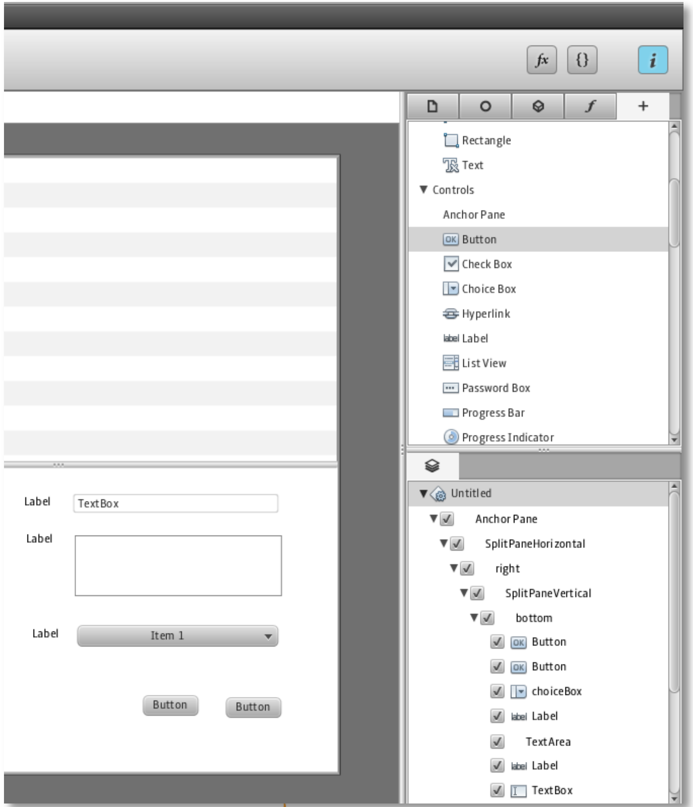
- Source editor with improved syntactic highlighting, code completion, refactoring etc.
- Full debugger and profiler support
- Project wizard for easy creation of JavaFX applications

Other Java IDEs

- Source editor with syntactic highlighting, code completion, refactoring etc.
- Full debugger and Profiler support

# JavaFX Scene Builder for Rapid UI Design

- WYSIWYG GUI design tool for the JavaFX platform
- Enables designing user interface screens by simply dragging and positioning GUI components from a palette onto a scene
- Generates files in FXML format  that can be used within a project in any IDE such as NetBeans or Eclipse
- Can be used to create GUI for desktop and Web applications
- Currently in Early Access (by invitation)



# Deployment

- Standard Java methods
  - Standalone application
  - Applet
  - Webstart
- From Java SE 7u6, JavaFX packager 2.2
  - Executable bundles: msi, exe, dmg, rpm
  - No admin permission (currently Windows only)
  - Auto-update facility being developed

# Distribution and Support

- JavaFX Distribution
  - JavaFX Runtime can now be distributed with third party applications
  - Applies to JavaFX 2.0.2 and higher
- JavaFX Platform Commercial Support
  - JavaFX is now part of the Java SE technologies covered through Oracle Premier Support
  - Applies to JavaFX 2.0.2 and higher

# JavaFX Future Directions

## Oracle’s Next Generation Java Client Solution

- Tighter Integration with Java SE
- Migration Path for Java Client UI Technologies
- Optimized Web Services Support
- Advanced Tooling
- Support for Modern Device Interactions
- Delivering on the Cross Platform Promise

# JavaFX is …

- Cross platform: Windows GA, Mac & Linux Dev. Preview
- Familiar: 100% Java APIs
- Powerful: leverages underlying Java platform
- Modern: CSS skinning, HW acceleration, Webkit
- Backwards ‘compatible’: Swing & SWT interoperability
- Flexible: applicable to embedded, tablets and mobile
- Open Source: http://openjdk.java.net/projects/openjfx

# Resources

- JavaFX website: http://javafx.com
- Open source project http://openjdk.java.net/projects/openjfx/
- Oracle Premier Support for Software http://www.oracle.com/us/support/software/premier/
- Blogs
  - http://fxexperience.com
  - http://blogs.oracle.com/javafx
- Twitter: @javafx4you

# Demos