НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ КОРАБЛЕБУДУВАННЯ ІМЕНІ АДМІРАЛА МАКАРОВА

Object-Oriented Programming in the Java language

Part 8. GUI: Java FX

Yevhen Berkunskyi, NUoS
eugeny.berkunsky@gmail.com
http://www.berkut.mk.ua

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What JavaFX is?

- JavaFX is a framework and (large) set of objects we can use to develop GUI-based applications
- The JavaFX API is a good example of how object-oriented principles can be applied in software development

JavaFX vs Swing vs AWT

- Java was first released with GUI support in something called the Abstract Windows Toolkit (**AWT**)
- **AWT** wasn't bad, but it had some limitations, and some particular problems with how it was implemented on some platforms
- Ultimately, **AWT** (which still exists, but isn't used much anymore) was replaced by a new library called **Swing**, which was more versatile, more robust, and more flexible.

JavaFX vs Swing vs AWT

- **Swing** was designed primarily for use in desktop applications (although you could do some web-based things with it, too).
- **Swing** has now been replaced by a completely new GUI library called **JavaFX**
- You can still use **Swing** (for the foreseeable future), but Oracle isn't going to develop it any further – it's essentially a dead-end technology
- Java has replaced **Swing** with **JavaFX**
- How long until **JavaFX** is replaced by something else? Nobody knows; probably many years

The Basic Structure of a JavaFX Program

- JavaFX programs all start not as some “regular” class like we’ve been doing, but as an extension of the abstract Application class in JavaFX, javafx.application.Application

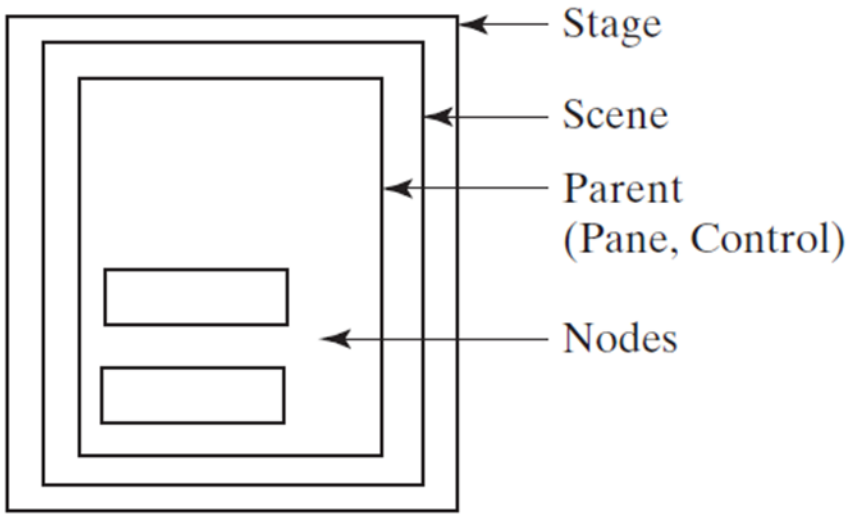
```
public class MyProgram {
    // Body of class
}
```

Becomes:

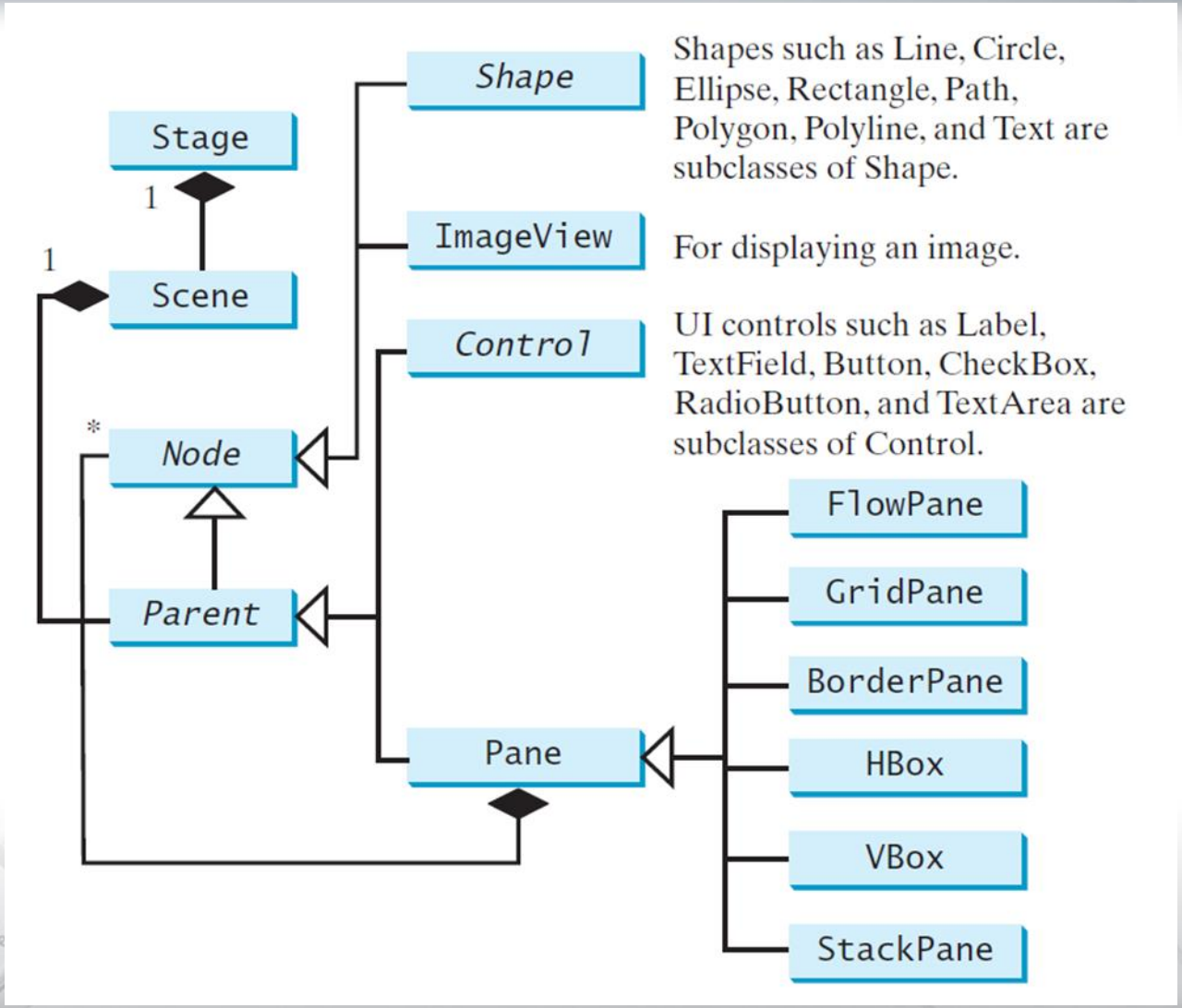
```
import javafx.application.Application;
…
public class MyProgram extends Application {
    // Body of class
}
```

Panes, UI Controls, and Shapes

- We can put the button directly on the scene, which centered the button and made it occupy the entire window.
- Rarely is this what we really want to do
- One approach is to specify the size and location of each UI element (like the buttons)
- A better solution is to put the UI elements (known as nodes) into containers called panes, and then add the panes to the scene



Panes, UI Controls, and Shapes



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Panes, UI Controls, and Shapes

- Beyond the obvious, typical “active” UI elements (things we can interact with, like buttons, etc.), are static shapes – lines, circles, etc.
- Before we can do much with shapes, we have to talk about coordinates within a pane.
- The top-left corner of a scene is *always* (0, 0), and the (positive) X-axis goes to the right, and the (positive) Y-axis goes down. Visually, we’re in Cartesian quadrant IV, but Y stays positive.
- All coordinates are in pixels

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Example

Common Properties and Methods for Nodes

- Nodes share many common properties
- JavaFX style properties are a lot like CSS (Cascading Style Sheets) use to specify styles in HTML (Web) pages.
- For more on HTML and CSS, see Liang supplements V.A and V.B (on the text's companion website)
- Thus, it's known as JavaFX CSS

The Color Class

- There are 3 sets of color constructors (“mixers”):
- The ones named Color (or color) require double values ϵ [0.0, 1.0] for the R/G/B/A components
- The ones named rgb require int values ϵ [0, 255]
- The hsb / hsba color models are also supported
- Just like String, Color is immutable.
- If we want a lighter version of this Color, we can use .lighter(), but we get a NEW color, rather than changing the value of the current color, just like .toUpperCase doesn’t change a String; it gives us a new one with upper case characters.

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Example

Layout Panes

- As we've said (and have been doing), we add our Nodes to a Pane, and then add the Pane to a Scene, and then the Scene to a Stage (probably the primary stage).
- How do we arrange (i.e., lay out) the Nodes on the pane?
- Java has several different kinds of Panes that do a lot of the layout work for us.

Layout Panes

Name	Description
`Pane`	Base class for layout panes. Use its `getChildren()` method to return the list of nodes on the pane (or add to that list) Provides no particular layout capabilities – it's a "blank canvas" typically used to draw shapes on
`StackPane`	Places nodes on top of each other in the center of the pane
`FlowPane`	Places the notes row-by-row horizontally or column-by-column vertically (reading order)
`GridPane`	Provide a 2-D grid of cells, into which we can place nodes
`BorderPane`	Divides pane into top, bottom, left, right, and center regions
`HBox`	Places nodes in a single (horizontal) row
`VBox`	Places nodes in a single (vertical) column

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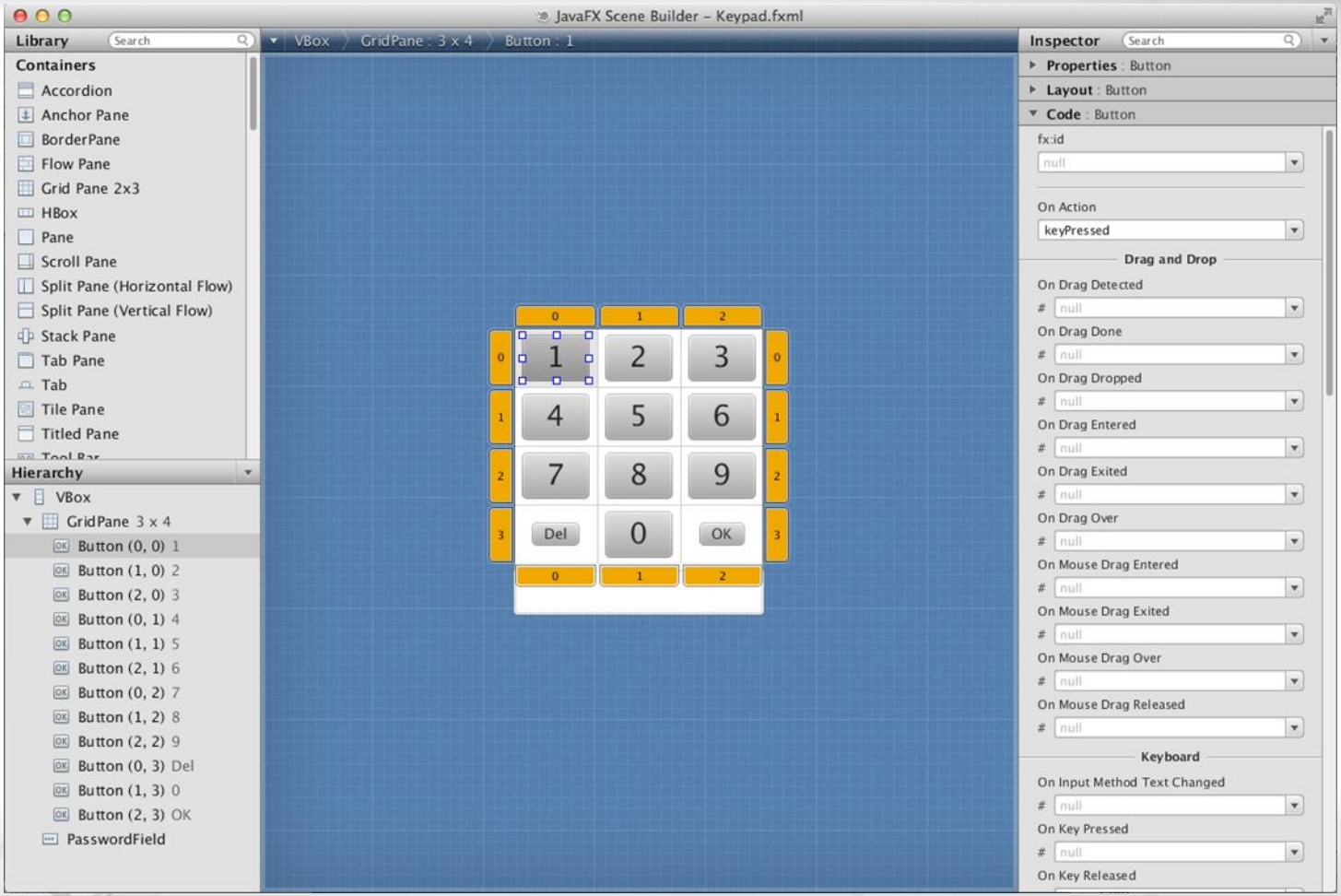
Scene Builder



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Scene Builder

- GUIs are created a lot faster than in Swing and AWT
- More sophisticated and aesthetically pleasing UIs
- Easy integration of sounds, images and videos and of web content
- Code is simplified in JavaFX by separating the UI from the logic of the application
- JavaFX can be integrated in Swing applications, allowing for a smoother transition

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Example

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Questions?

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