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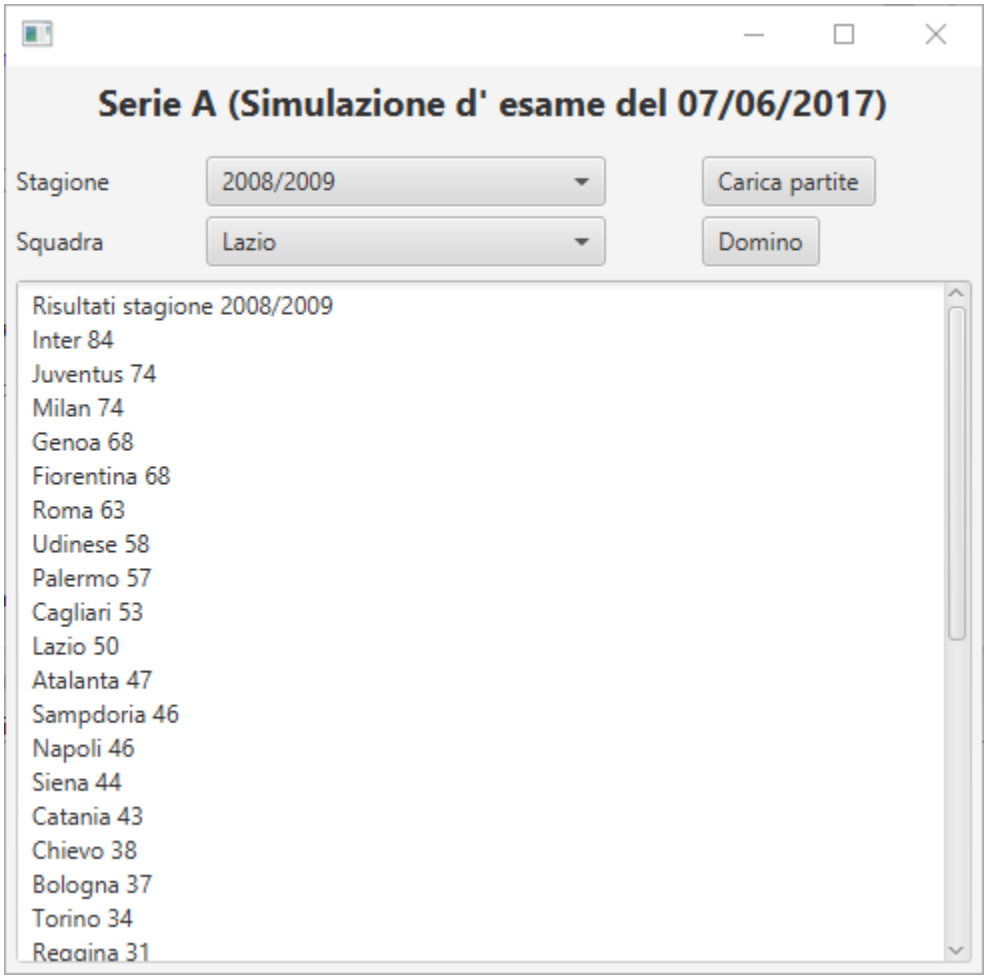
JavaFX – a Crash Course

Tecniche di Programmazione – A.A. 2019/2020

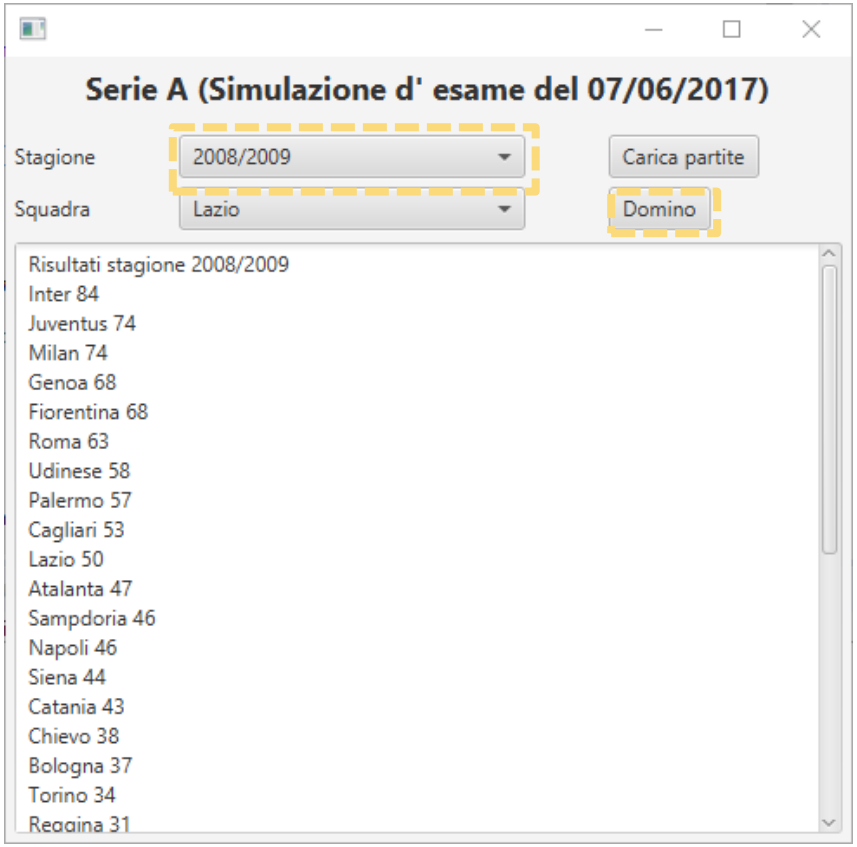
JavaFX applications

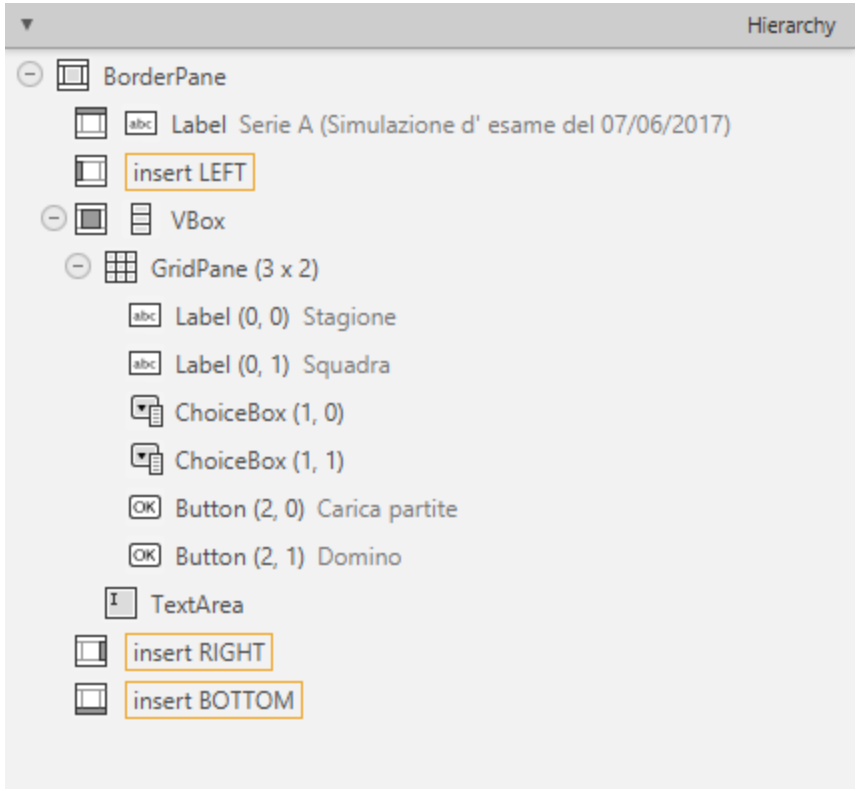


Application structure

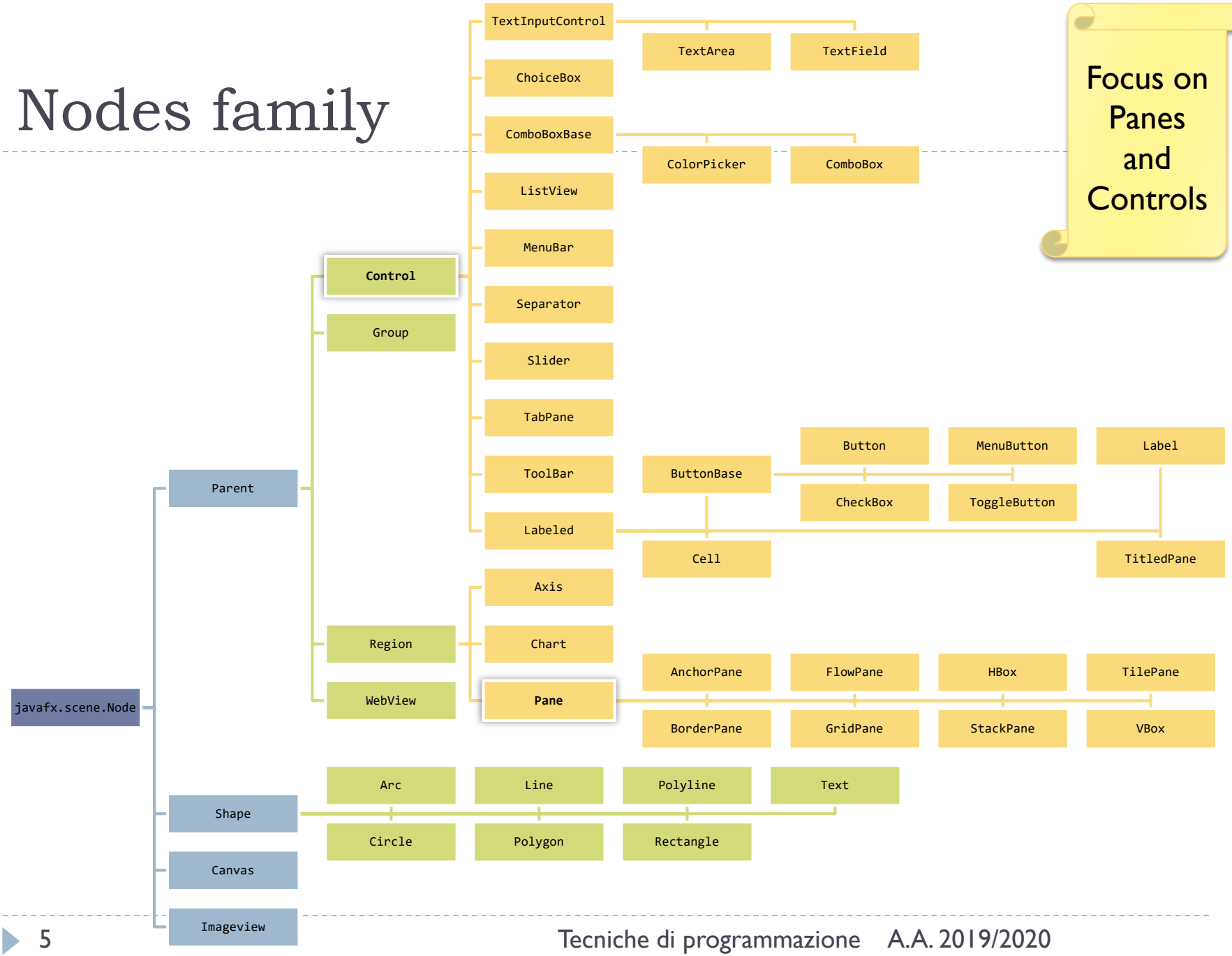
- **Stage**: where the application will be displayed (e.g., a Windows' window)
- **Scene**: one container of Nodes that compose one "page" of your application
- **Node**: an element in the Scene, with a visual appearance and an interactive behavior.
  - Nodes may be hierarchically nested

Nested nodes





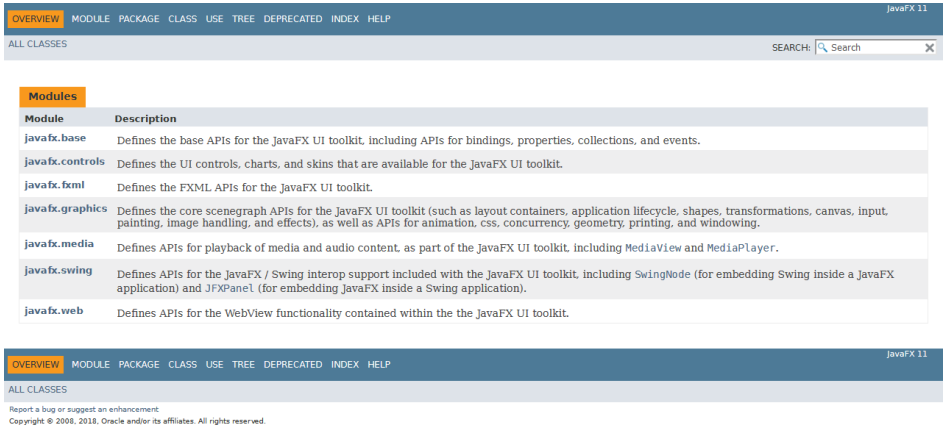
Nodes family

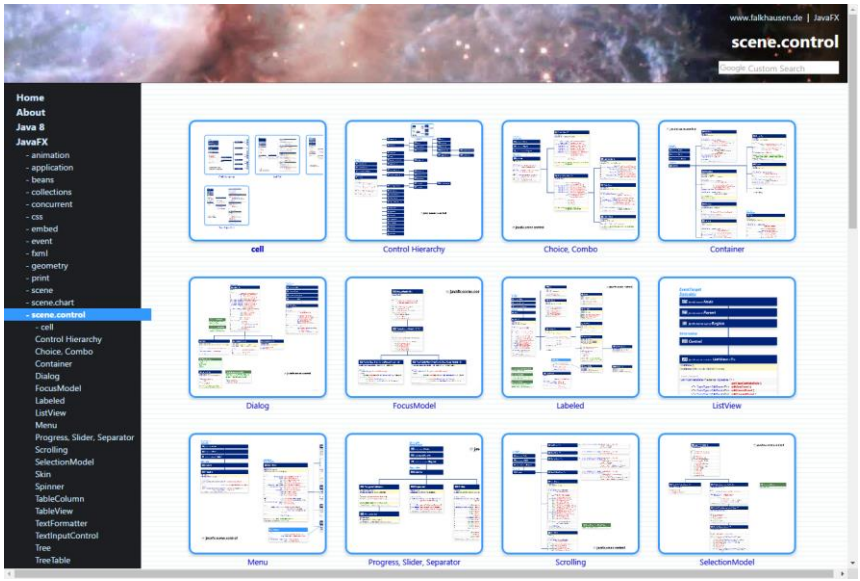


Focus on Panes and Controls

Essential Reference

- JavaFX JavaDoc API
  - https://openjfx.io/javadoc/11/
- JavaFX Class Diagrams
  - http://falkhausen.de/JavaFX-10/index.html





Example application structure

```
1  package it.polito.tdp.seriea;
2
3  import it.polito.tdp.seriea.model.Model;
4  import javafx.application.Application;
5  import javafx.stage.Stage;
6  import javafx.scene.Scene;
7  import javafx.scene.layout.BorderPane;
8  import javafx.fxml.FXMLLoader;
9
10
11 public class Main extends Application {
12     @Override
13     public void start(Stage primaryStage) {
14         try {
15             FXMLLoader loader = new FXMLLoader(getClass().getResource("SerieA.fxml")) ;
16             BorderPane root = (BorderPane)loader.load();
17             Scene scene = new Scene(root);
18
19             SerieAController controller = loader.getController() ;
20             Model model = new Model() ;
21             controller.setModel(model) ;
22
23             scene.getStylesheets().add(getClass().getResource("application.css").toExternalForm());
24             primaryStage.setScene(scene);
25             primaryStage.show();
26
27         } catch(Exception e) {
28             e.printStackTrace();
29         }
30     }
31
32     public static void main(String[] args) {
33         launch(args);
34     }
35 }
36
```

Extend javafx.application.Application

Load scene nodes from XML file

Define algorithms and data

Populate and show window

main()

General rules

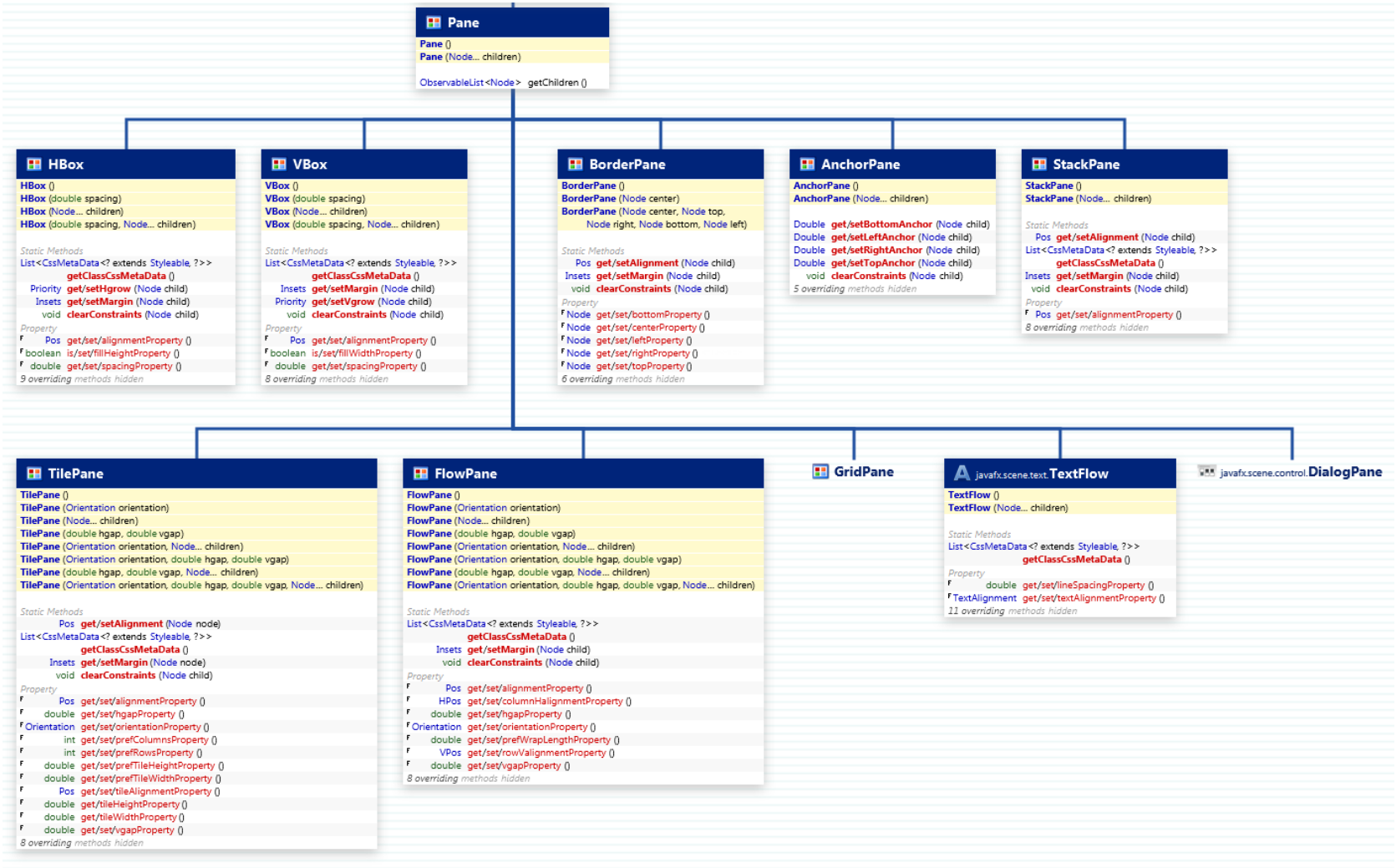
- A JavaFX application extends javafx.application.Application
- The main() method should call Application.launch()
- The start() method is the main entry point for all JavaFX applications
  - Called with a Stage connected to the Operating System's window
- The content of the scene is represented as a hierarchical scene graph of Nodes
  - Stage is the top-level JavaFX container
  - Scene is the container for all content

Nodes

- The Scene is populated with a tree of Nodes
  - Layout components (Panes)
  - UI Controls
  - Charts
  - Shapes
- Nodes have Properties
  - Visual (size, position, z-order, color, ...)
  - Contents (text, value, data sets, ...)
  - Programming (event handlers, controller)
- Nodes generate Events
  - UI events
- Nodes can be styled with CSS

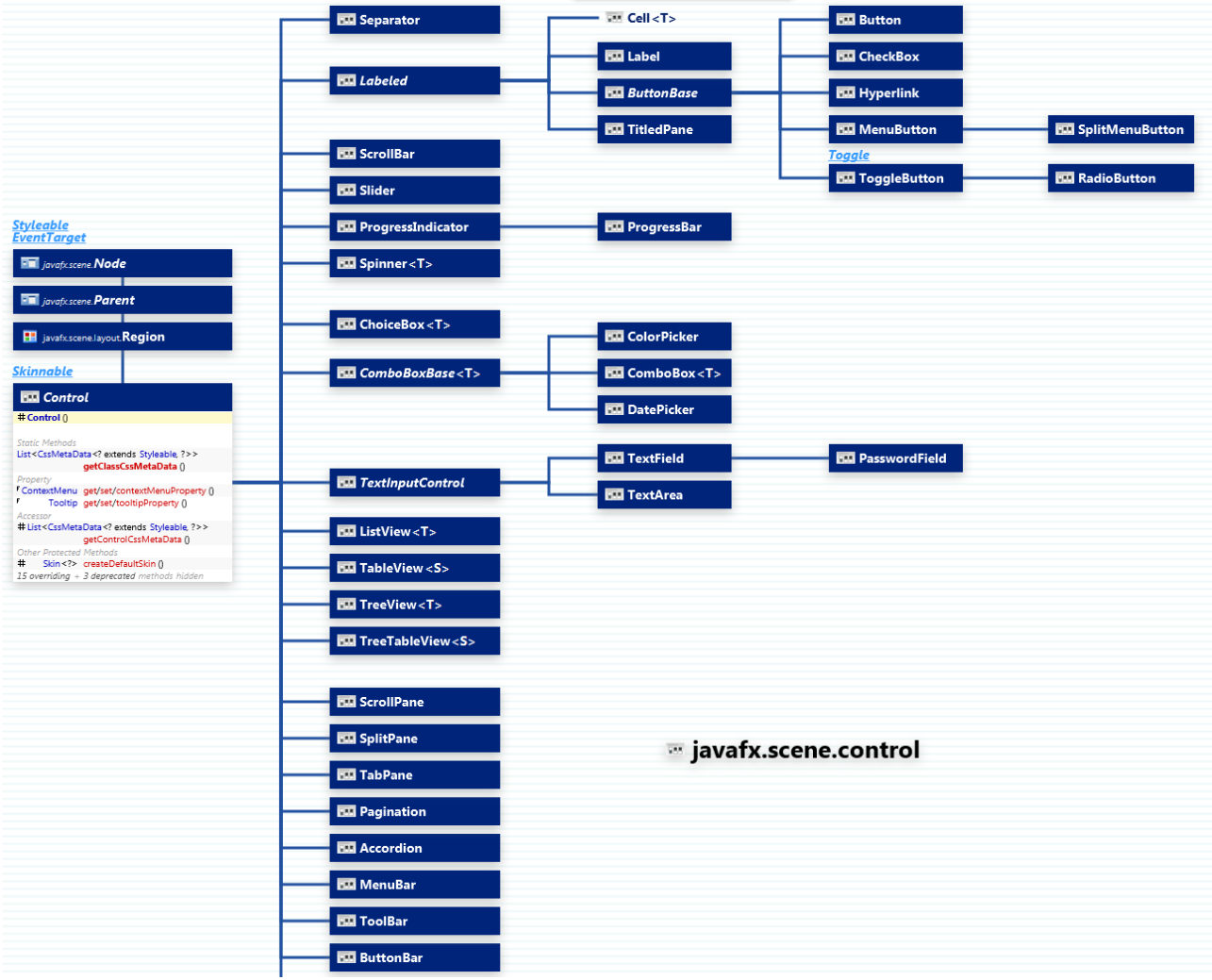
http://falkhausen.de/JavaFX-10/scene.layout/Pane.html

Panes



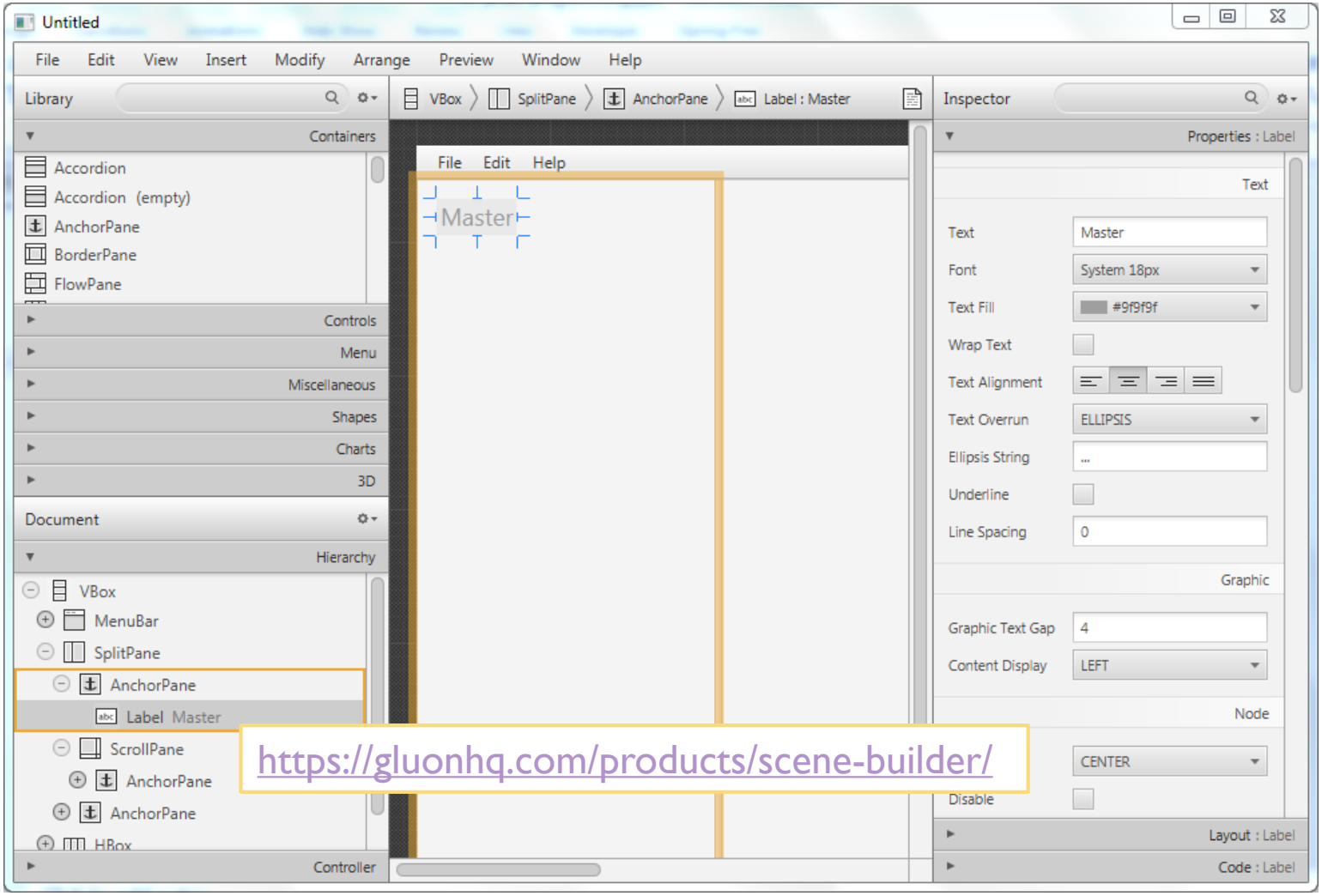
http://falkhausen.de/JavaFX-10/scene.control/Control-Hierarchy.html

Controls



GLUON Scene Builder

JavaFX Scene Builder 11



Building a scene from FXML

```
public void start(Stage stage) throws Exception {
        Parent root = FXMLLoader.load(
            getClass().getResource("/fxml/Scene.fxml"));

        stage.setTitle("Circle Demo");
        stage.setScene(new Scene(root));
        stage.show();
}
```

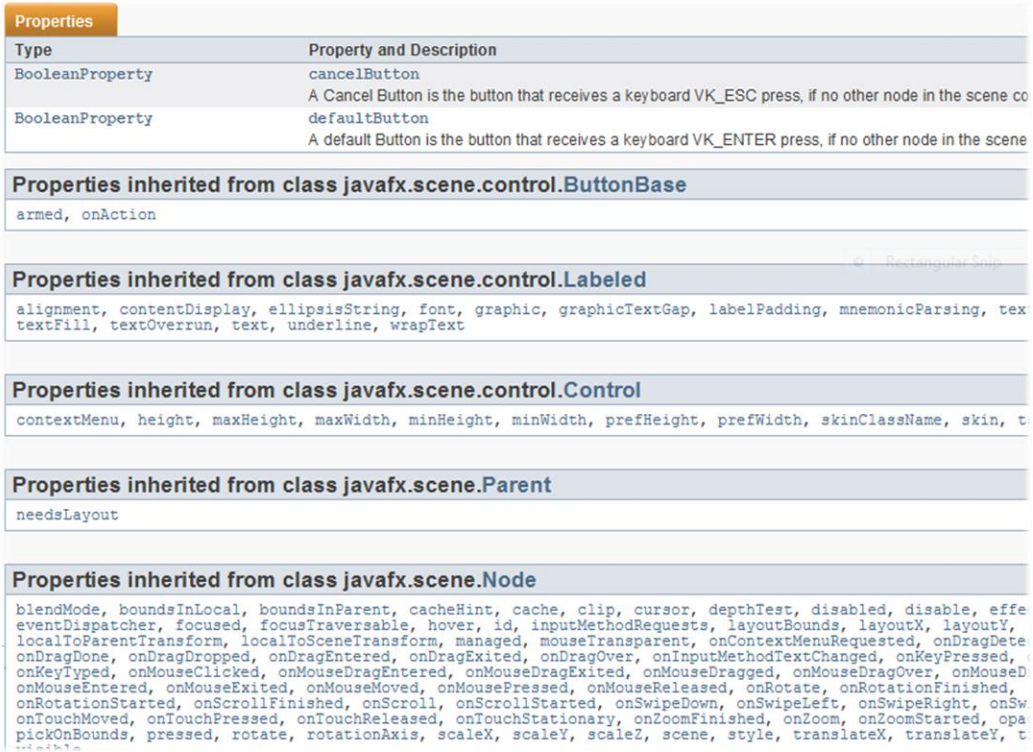
Key concepts in JavaFX

- **Property**: attributes of the Nodes, may specify content, size, color, … Can be read and written by the application
- **Event**: every user action on one element of the GUI generates a different *event*. Events can be captured and *handled* by our code

- **Controller**: the Java class that contains
  - References to interesting Nodes
  - Event Handlers

Properties

- Extension of the Java Beans convention
  - May be used also outside JavaFX
- Encapsulate properties of an object
  - Different types (string, number, object, collection, ...)
  - Set/Get
  - Observe changes
  - Support lazy evaluation
- Each Node has a large set of Properties
  - Can be manipulated
  - The scene updates



Properties

Type	Property and Description
BooleanProperty	cancelButton A Cancel Button is the button that receives a keyboard VK_ESC press, if no other node in the scene co
BooleanProperty	defaultButton A default Button is the button that receives a keyboard VK_ENTER press, if no other node in the scene

Properties inherited from class javafx.scene.control.ButtonBase

armed, onAction

Properties inherited from class javafx.scene.control.Labeled

alignment, contentDisplay, ellipsisString, font, graphic, graphicTextGap, labelPadding, mnemonicParsing, tex
textFill, textOverrun, text, underline, wrapText

Properties inherited from class javafx.scene.control.Control

contextMenu, height, maxHeight, maxWidth, minHeight, minWidth, prefHeight, prefWidth, skinClassName, skin, t

Properties inherited from class javafx.scene.Parent

needsLayout

Properties inherited from class javafx.scene.Node

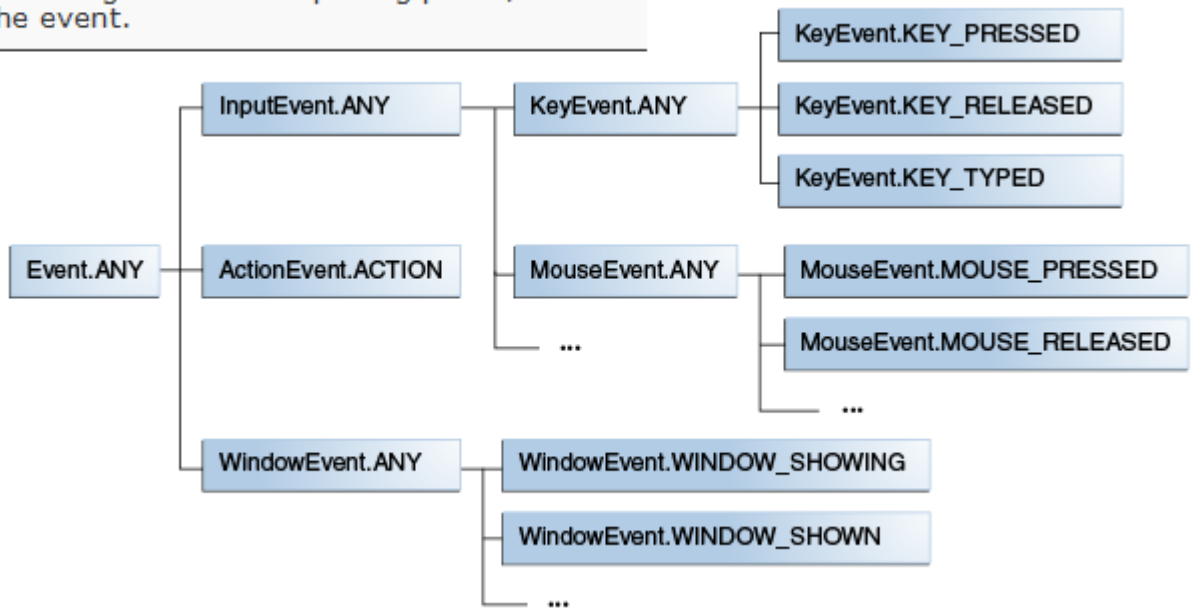
blendMode, boundsInLocal, boundsInParent, cacheHint, cache, clip, cursor, depthTest, disabled, disable, effe
eventDispatcher, focused, focusTraversable, hover, id, inputMethodRequests, layoutBounds, layoutX, layoutY,
localToParentTransform, localToSceneTransform, managed, mouseTransparent, onContextMenuRequested, onDragDete
onDragDone, onDragDropped, onDragEntered, onDragExited, onDragOver, onInputMethodTextChanged, onKeyPressed,
onKeyTyped, onMouseClicked, onMouseDragEntered, onMouseDragExited, onMouseDragged, onMouseDragOver, onMouseD
onMouseEntered, onMouseExited, onMouseMoved, onMousePressed, onMouseReleased, onRotate, onRotationFinished,
onRotationStarted, onScrollFinished, onScroll, onScrollStarted, onSwipeDown, onSwipeLeft, onSwipeRight, onSw
onTouchMoved, onTouchPressed, onTouchReleased, onTouchStationary, onZoomFinished, onZoom, onZoomStarted, opa
pickOnBounds, pressed, rotate, rotationAxis, scaleX, scaleY, scaleZ, scene, style, translateX, translateY, t

Events

- FX Event (javafx.event.Event):
  - Event Source => a Node
  - Event Target
  - Event Type
- Usually generated after some user action
- Event Types
- You can define **event handlers** in your application

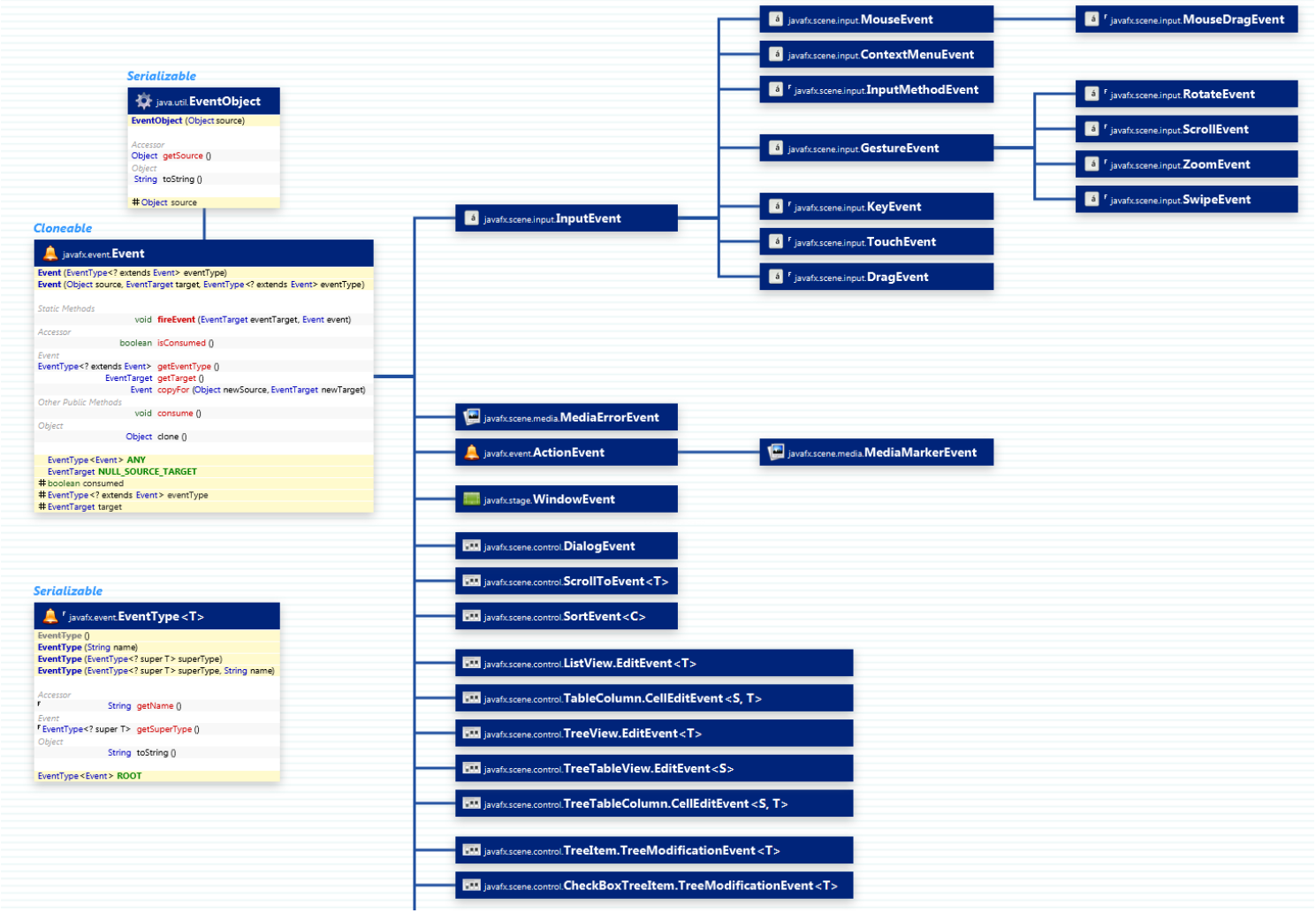
What is an event?

Property	Description
Event type	Type of event that occurred.
Source	Origin of the event, with respect to the location of the event in the event dispatch chain. The source changes as the event is passed along the chain.
Target	Node on which the action occurred and the end node in the event dispatch chain. The target does not change, however if an event filter consumes the event during the event capturing phase, the target will not receive the event.



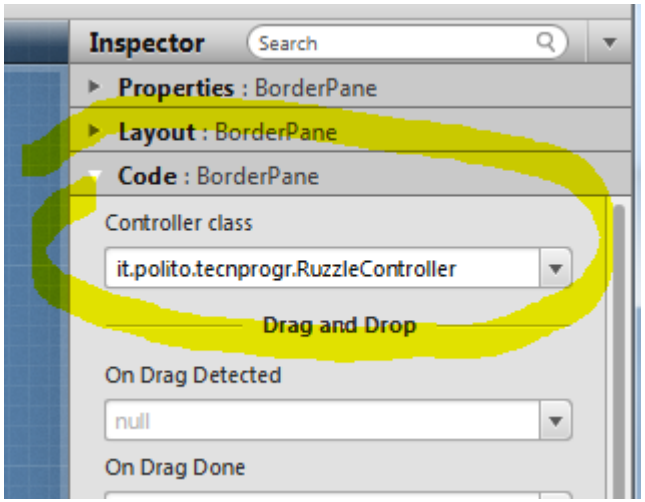
http://falkhausen.de/JavaFX-8/event/Event-Hierarchy.html

Event types



Defining a Controller class

- The Root element of the scene graph may specify a **`fx:controller`** attribute
  - `<BorderPane id="BorderPane" xmlns:fx="http://javafx.com/fxml" fx:controller="it.polito.tdp.RuzzleController">`



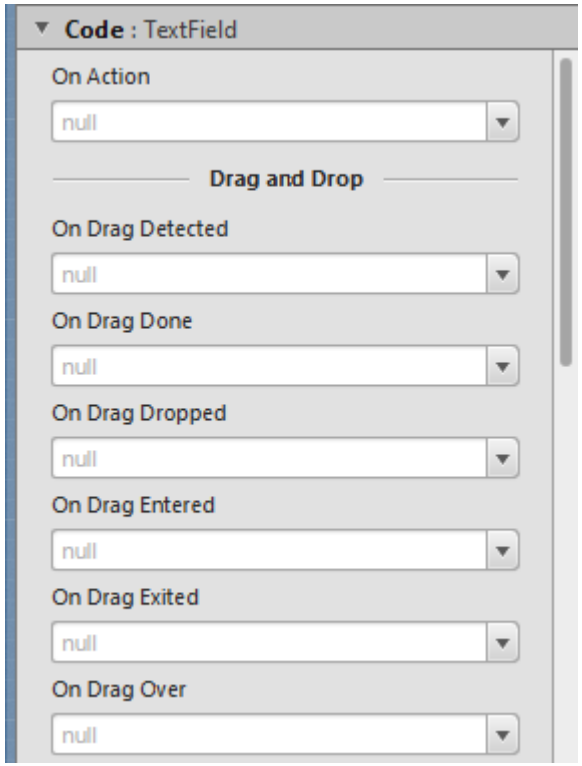
Injection of Node references

- The controller code may directly access various Nodes in the associated scene graph
- The attribute @FXML associates a Node variable with the corresponding node, with the same fx:id value as the variable name
- Try: View | Show Sample Controller Skeleton on the Scene Builder!

```
@FXML // fx:id="theTitle"
    private Label theTitle;
```

Registration of Event Handlers

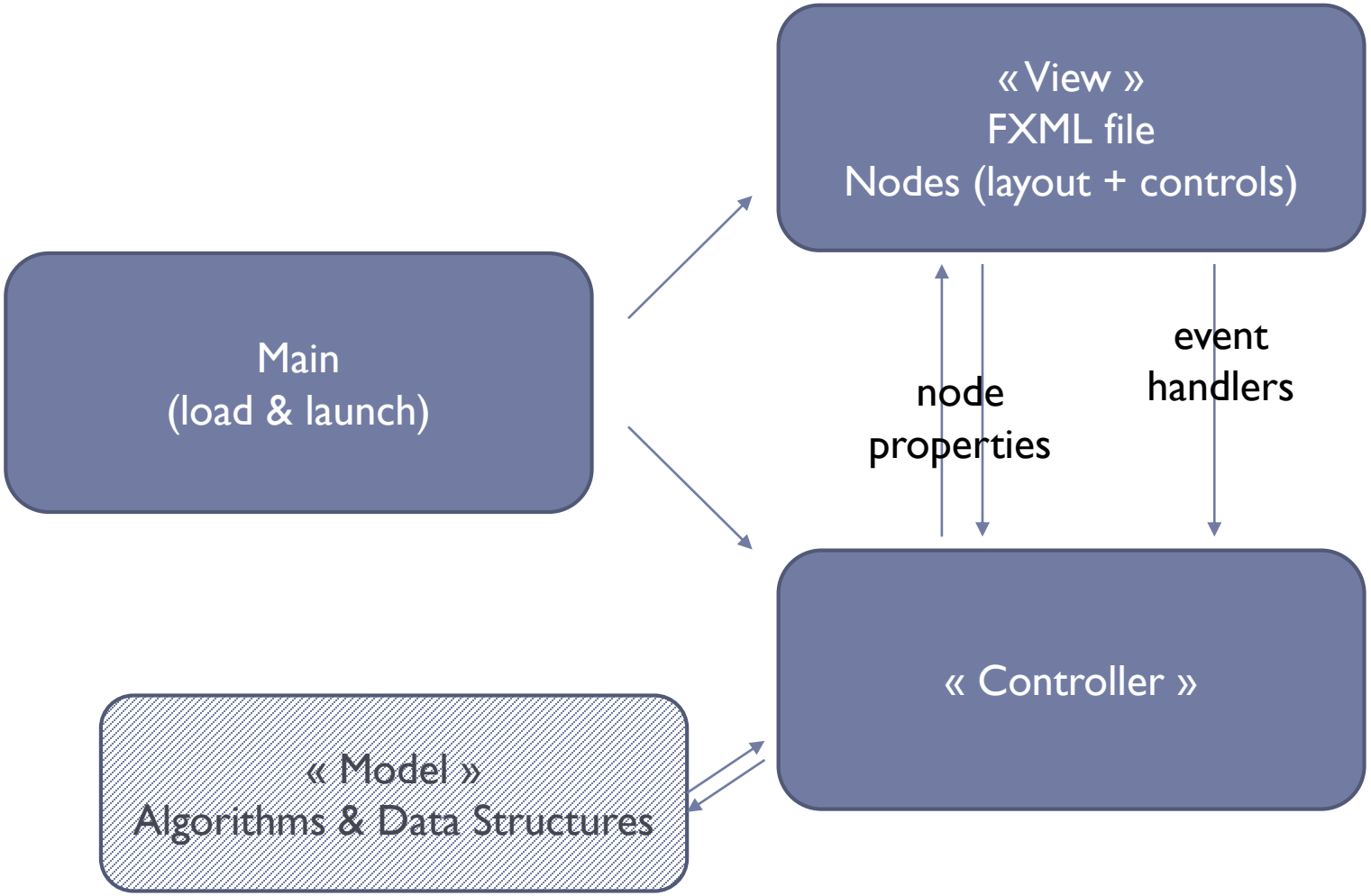
- In FXML, you may set a event handler through attributes
  - onAction, onKeyTyped, onMouseClicked, ... hundreds more ...
- The value should be the #name of a method in the controller class
  - With the right signature for the event type




```
<Button fx:id="cercaBtn"
onAction="#doCercaParola"
text="Cerca" />
```

```
@FXML
void doCercaParola (
ActionEvent event ) {
```

Minimal program structure



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