Lec 15

Events
THE END IS NEAR
JavaFX - GUIs

- **Stage**: Top level Java FX Component
- **Scene**: A container for all the items in the scene
- **Border, Hbox, Vbox, FlowPane, GridPane**: Helper classes that govern where components appear in the Scene

A very rough guide to creating a simple GUI:

1. **Create a Layout Manager** → **Create and add components** → **Make a Scene** → **Set its properties**

You don’t always have to do this in this order. Some of the steps can have substeps (e.g., creating a Layout Manager to organize other components)
What happens if “deposit $20” is clicked

private int balance = 100;

public void start(Stage primaryStage) {
    Button deposit = new Button("Deposit $20");
    Button withdraw = new Button("Withdraw $20");
    Label label = new Label("Balance: ");
    TextField balanceField = new TextField ("$" + balance);
    balanceField.setPrefWidth(80);

    GridPane pane = new GridPane();
    pane.add(label,0, 0);
    pane.add(balanceField,1, 0);
    pane.add(deposit,0, 1);
    pane.add(withdraw,1, 1);

    Scene scene = new Scene(pane);
    primaryStage.setScene(scene);
    primaryStage.show();
}

A) Balance is increased to 120, but not shown
B) Program exits
C) Nothing
D) Java prints a message
public void start(Stage primaryStage) {
    Button a = new Button("Give me an A+ in CSE 8B");
    Scene scene = new Scene(a);
    primaryStage.setScene(scene);
    primaryStage.show();
}
Event Handlers

1. Tell the node (e.g. button, text field, etc) to listen
2. Add code to execute when event happens
Events

- [https://docs.oracle.com/javase/8/javafx/api/javafx.scene.control/Button.html](https://docs.oracle.com/javase/8/javafx/api/javafx.scene.control/Button.html)
  - Button click
  - Drag
  - Mouse enters/moves/exits
  - Key pressed/released/typed
  - Scroll
1) Tell node to listen

Button b = new Button(“ok”);
b.setOnAction(param);
b.setOnMouseEntered(param);
b.setOnKeyPressed(param);
b.setOnKeyTyped(param);

Where param is the code that will execute when the event happens.
2) Handle action event

```java
import javafx.event.ActionEvent;
import javafx.event.EventHandler;

public class Deposit implements EventHandler<ActionEvent>{

    public void handle(ActionEvent e) {
        // your code here
    }
}
```
Events

- <ActionEvent>
- <MouseEvent>
- <DragEvent>
- <TouchEvent>
What happens if “deposit $20” is clicked

```java
private int balance = 100;

public void start(Stage primaryStage) {
    Button deposit = new Button("Deposit $20");
    Button withdraw = new Button("Withdraw $20");
    Label label = new Label("Balance: ");
    TextField balanceField = new TextField("$" +
                                            balance);
    Deposit d = new Deposit();
    deposit.setOnAction(d);
    //same as before to set up GUI
}

public class Deposit implements EventHandler<ActionEvent>{
    public Deposit() {
        //constructor if needed
    }

    public void handle(ActionEvent e) {
        System.out.println("add $20");
    }
}
```

A) Balance is increased to 120,
B) Program exits
C) Nothing
D) Java prints “add $20”
What happens if user enters 200 into the balanceField

private int balance = 100;

public void start(Stage primaryStage) {
    Button deposit = new Button("Deposit $20");
    Button withdraw = new Button("Withdraw $20");
    Label label = new Label("Balance: ");
    TextField balanceField = new TextField("$" +
            balance);
    TField tf = new TField();
    balanceField.setOnKeyTyped(tf);
    //same as before to set up GUI
}

public class TField implements EventHandler<KeyEvent>{
    public void handle(KeyEvent e) {
        System.out.println("don’t change");
    }
}

A) Balance is increased to 200
B) Program exits
C) Nothing
D) Java prints “don’t change”
E) (D) 3 times
No connection between BankAcct object and Deposit object!
public class BankAcct extends Application {
    private int balance = 100;
    private Button deposit;
    private TextField balanceField;

    public void start(Stage primaryStage) {
        deposit = new Button("Deposit $20");
        Label label = new Label("Balance: ");
        balanceField = new TextField ("$" + balance);
        Button withdraw = new Button("Withdraw $20");

        Deposit d = new Deposit();
        deposit.setOnAction(d);

        // rest of code
    }

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

    public class Deposit implements EventHandler<ActionEvent>{
        public void handle(ActionEvent e) {
            balance += 20;
            balanceField.setText(balance + "");
        }
    }
}
Now the Deposit has access to the variables in BankAcct directly. Should make the class private.

Do not confuse this with subclasses!
public void start(Stage primaryStage) {
    Button deposit = new Button("Deposit $20");
    deposit.setOnAction(new EventHandler<ActionEvent>(){
        public void handle(ActionEvent e){
            balance += 20;
            balanceField.setText(balance + "");
        }
    });
    // rest of code
}

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

Other ways to write an Event Handler

Anonymous Inner Class
public void start(Stage primaryStage) {
    Button deposit = new Button("Deposit $20");
    deposit.setOnAction(e -> {
        // code to handle when deposit is clicked
        balance += 20;
        balanceField.setText(balance + "");
    });

    // rest of code
}

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

Anonymous
Inner Class via
Lambda Expression
public class BankAcct extends Application {
    private int balance = 100;

    public void start(Stage primaryStage) {
        Button deposit = new Button("Deposit $20");
        Button withdraw = new Button("Withdraw $20");
        Label label = new Label("Balance: ");
        TextField balanceField = new TextField("$" + balance);

        deposit.setOnAction(e -> {
            balance += 20;
            balanceField.setText("$" + balance);
            withdraw.setDisable(false);
        });

        withdraw.setOnAction(e -> {
            balance -= 20;
            balanceField.setText("$" + balance);
            if(balance <= 0) {
                withdraw.setDisable(true);
            }
        });

        // rest of code
    }
}

What happens if user hits:
withdraw X 5, then
deposit X 1

A) Balance = 20, withdraw is disabled
B) Balance = 0, withdraw is disabled
C) Balance = 20, withdraw is enabled
D) Balance = 0, withdraw is enabled
Ways to write an Event Handler

// Separate class or member inner class
class DepositHandlerClass implements EventHandler<ActionEvent> {
    @Override
    public void handle(ActionEvent e){
        System.out.println("Adding $20");
    }
}

// Anonymous Inner Class
btnDeposit.setOnAction(new EventHandler<ActionEvent>(){
    public void handle(ActionEvent e){
        System.out.println("Adding $20");
    }
});

// Lambda expressions, shorter Anonymous Inner Classes
btnDeposit.setOnAction( e-> { System.out.println("Adding $20"); });