A common mistake…

```
public class PratoFiorito extends Application {      ...
        public PratoFiorito(Input input) {
         ...
        }
        @Override
        public void start(Stage stage) {
                Input input = new Input();
                PratoFiorito pf = new PratoFiorito(input);
        …
```

Non create MAI un costruttore non vuoto di una classe che estende Application

Non istanziate MAI una classe che estende Application

Java FX: il modello degli eventi

Gestire la pressione di tasti

```
Button b = new Button("PLUS");
EventHandler<KeyEvent> keyEventHandler = new
                                                    EventHandler<KeyEvent>() {
   @Override
   public void handle(KeyEvent e) {
      if (e. getCharacter().equals("+")) {
         System.out.println("Buttom + pressed");
      }
   }
};
b.addEventHandler(KeyEvent.KEY_TYPED,keyEventHandler);
```

Gestire la pressione di tasti

```
public void handle(KeyEvent e) {
   …
```

Il carattere frutto della pressione di una combinazione di tasti (inclusi shift, alt, control…)

```
if (e.getCharacter().equals("u")) …
if (e.getCode() == KeyCode.U) …
```

Il codice ottenuto da un singolo tasto (inclusi tutti I tasti speciali: frecce, control ecc.

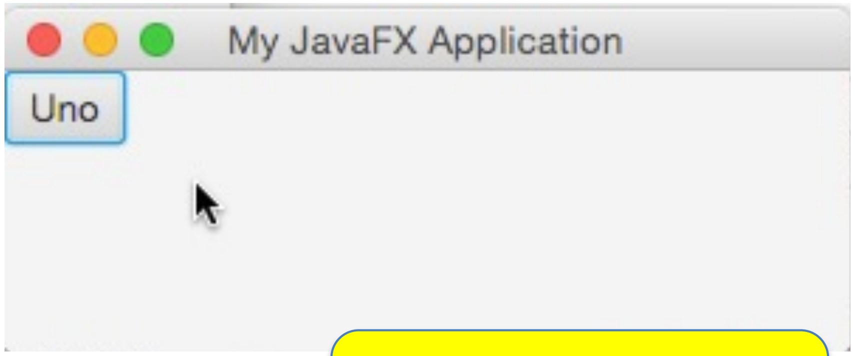
Use getCharacter with KEYTYPED and getCode with KEYPRESSED and KEYRELEASED

Gestire la pressione di tasti

"*"Key pressed" and "key released" events* are lower-level and depend on the platform and keyboard layout. They are generated whenever a key is pressed or released, and are the only way to find out about keys that don't generate character input (e.g., action keys (Fn), modifier keys, etc.). The key being pressed or released is indicated by the code variable, which contains a virtual key code."

Una app con un bottone…

```
public class Keyboard1 extends Application {
  int counter=0;
  public void start(Stage stage) {
    TilePane box = new TilePane();
    box.setHgap(50);
    Button b1 = new Button("Uno");
    box.getChildren().add(b1);
    EventHandler<ActionEvent> actionHandler =
      new EventHandler<ActionEvent>(){
      public void handle(ActionEvent t) {
        System.out.println((counter++) +
                          ((Button)(t.getTarget())).getText());
    }};
   b1.addEventHandler(ActionEvent.ACTION, actionHandler);
    Scene scene = new Scene(box, 400, 300);
    stage.setTitle("My JavaFX Application");
    stage.setScene(scene); stage.show();
  }
  public static void main(String[] args){Application.launch(args);}
}
```



sarebbe meglio
usare setId/getId

```
0Uno
1Uno
2Uno
3Uno
```

… che si può premere anche via tastiera

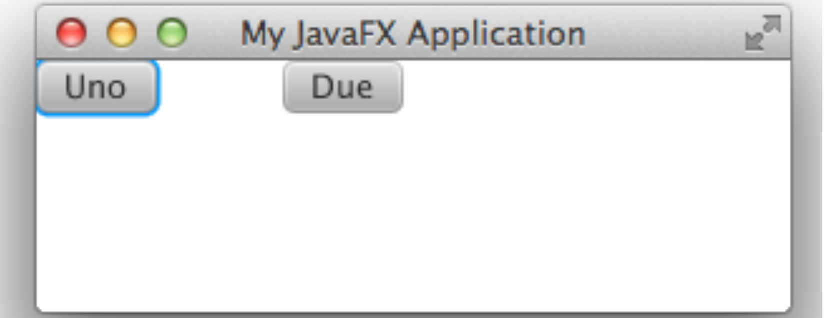
```
// dentro start()…
EventHandler<KeyEvent> keyEventHandler =
   new EventHandler<KeyEvent>(){
   public void handle(KeyEvent keyEvent) {
      if (keyEvent.getCharacter().equals("u”)) {
         b1.fireEvent(new ActionEvent());
         System out.println(keyEvent.getSource() +
                                    " =>"+keyEvent.getTarget());
      }
   }
};
b1.addEventHandler(KeyEvent.KEY_TYPED,keyEventHandler);
```

siamo noi a generare un `ActionEvent`!

```
Button@4e0cf854[styleClass=button]'Uno'=>
Button@4e0cf854[styleClass=button]'Uno'
```

Un app con due bottoni…

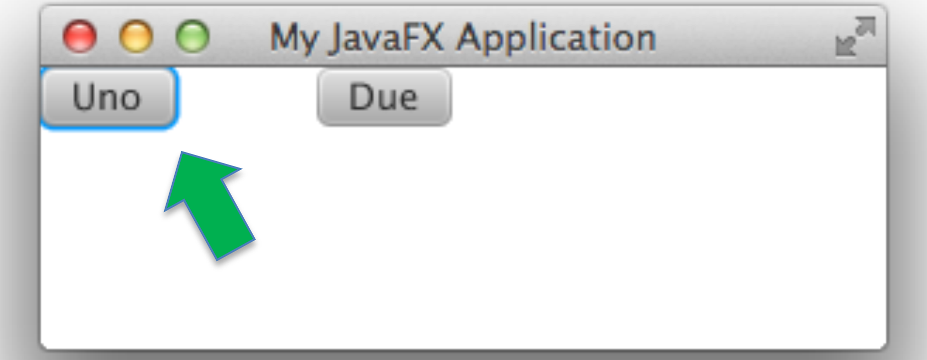
```
public class Keyboard1 extends Application {
  int counter=0;
  public void start(Stage stage) {
    TilePane box = new TilePane();
    box.setHgap(50);
    Button b1 = new Button("Uno");
    Button b2 = new Button("Due");
    box.getChildren().addAll(b1,b2);
    EventHandler<ActionEvent> actionHandler =
      new EventHandler<ActionEvent>(){
      public void handle(ActionEvent t) {
        System.out.println((counter++) +
                           ((Button)(t.getTarget())).getText());
    }};
    b1.addEventHandler(ActionEvent.ACTION, actionHandler);
    b2.addEventHandler(ActionEvent.ACTION, actionHandler);
    Scene scene = new Scene(box, 400, 300);
    stage.setTitle("My JavaFX Application");
    stage.setScene(scene); stage.show();
  }
…}
```



Riuso lo stesso listener!

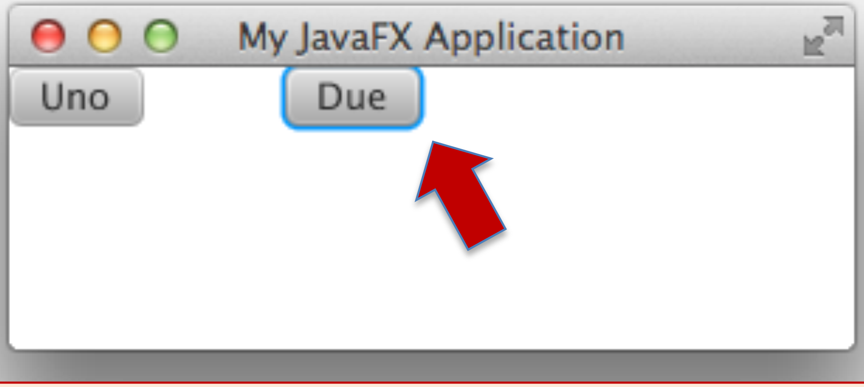
```
0Uno
1Uno
2Due
3Uno
4Due
5Due
```

La selezione da tastiera funziona?



SI!

```
Button@4e0cf854[styleClass=button]'Uno'=>
Button@4e0cf854[styleClass=button]'Uno'
```

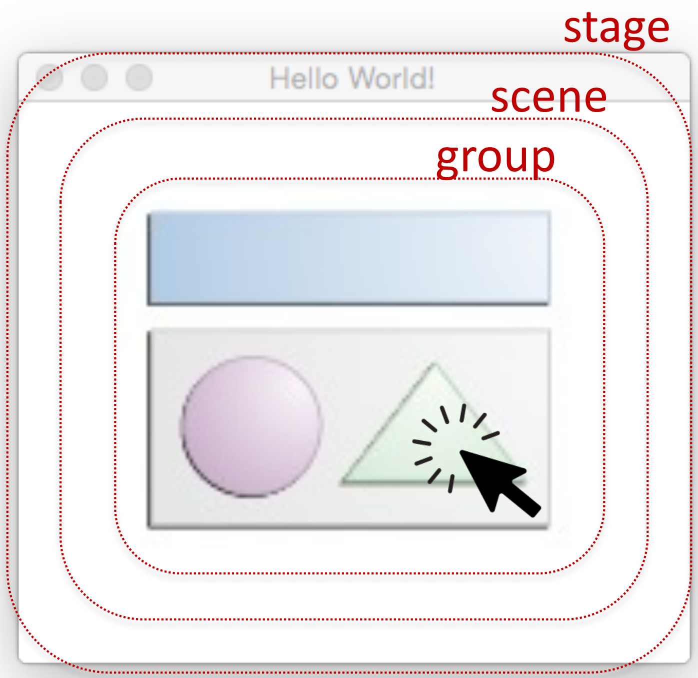


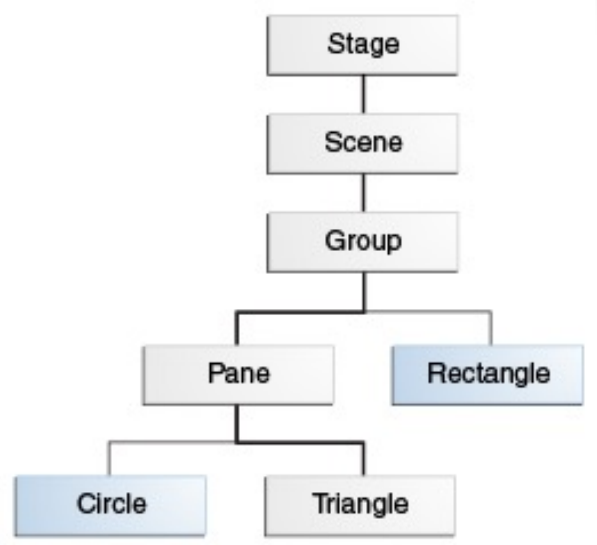
NO!

Perché?!?

Generazione e propagazione degli eventi

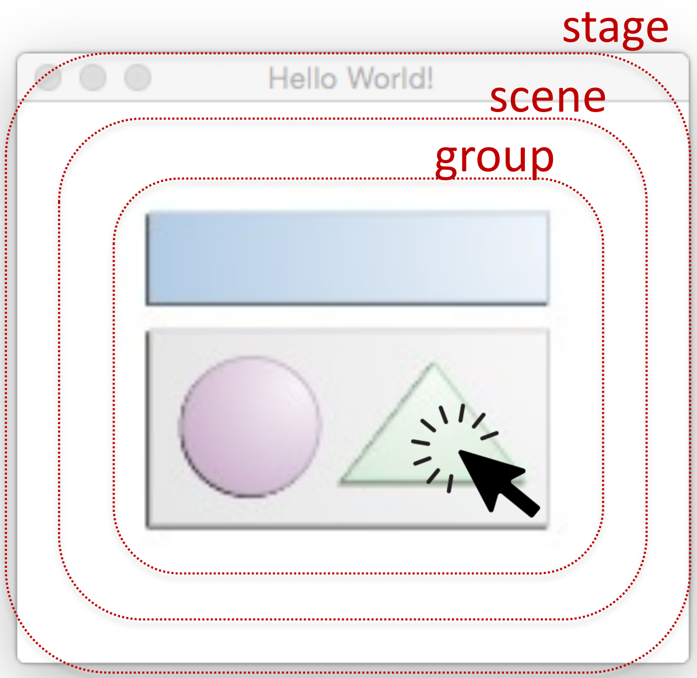
- Primo problema: un evento può essere generato in un'area di interesse per più di un oggetto… chi lo riceve?
- Regole per assegnare il «target»:
  - Key events: il nodo che ha il ***focus***
  - Mouse events: il nodo nella posizione del mouse. Se ce n'è più di uno, viene scelto quello «in superficie», ovvero quello alla fine della gerachia di contenimento
  - Sono definite regole per altri tipi di eventi per touch screen

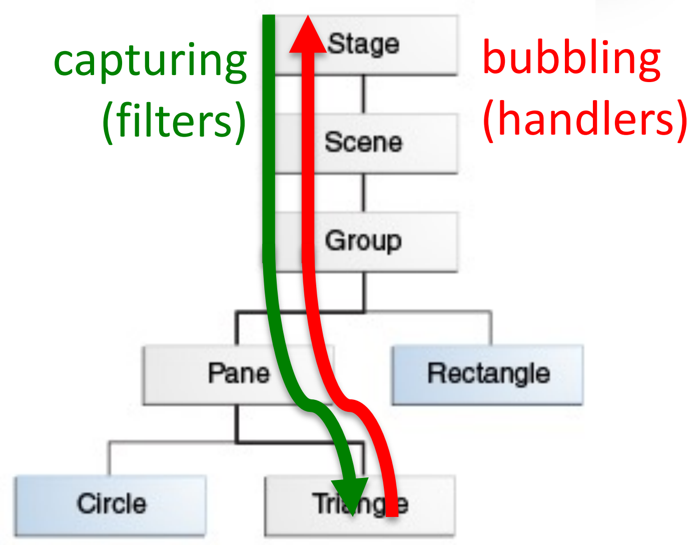




Generazione e propagazione degli eventi

- Secondo problema: a volte può essere utile far gestire un evento al contenitore e non al contenuto…
- Regola base: tutti gli eventi partono dallo stage, arrivano al target, e tornano allo stage
  - ***event capturing***: stage ➔ target
    - eventi intercettati mediante ***filter***
  - ***event bubbling***: target ➔ stage
    - eventi intercettati mediante ***handler***
- La sequenza di componenti stage ↔ target si chiama ***event dispatch chain***





Vediamo se è vero…

```
EventHandler handler = new EventHandler<ActionEvent>() {
  public void handle(ActionEvent t) {
    EventTarget target = t.getTarget();
    Object source = t.getSource();
    String id=null;
    if (source instanceof Node) {
      id = ((Node) source).getId();
    } else if (source instanceof Stage) {
      id="STAGE";
    } else if (source instanceof Scene) {
      id="SCENE";
    } else
      System.out.println("Unrecognized object: "+source);
    System.out.println("HANDLER: "+id+" "+source+" =>"+target);
  }
};
```

Vediamo se è vero…

```
EventHandler filter = new EventHandler<ActionEvent>() {
  public void handle(ActionEvent t) {
    EventTarget target = t.getTarget();
    Object source = t.getSource();
    String id=null;
    if (source instanceof Node) {
      id = ((Node) source).getId();
    } else if (source instanceof Stage) {
      id="STAGE";
    } else if (source instanceof Scene) {
      id="SCENE";
    } else
      System.out.println("Unrecognized object: "+source);
    System.out.println(”FILTER: "+id+" "+source+" =>"+target);
  }
};
```

Filter e handler sono definiti con le ***stesse*** modalità; ambedue devono implementare **`EventHandler`**

Cambia solo il modo con cui sono associati ai nodi

Vediamo se è vero…

```
box.setId("TILEPANE");
b1.setId("BUTTON1");
b2.setId("BUTTON2");
stage.addEventFilter(ActionEvent.ACTION, filter);
stage.addEventHandler(ActionEvent.ACTION, handler);
scene.addEventFilter(ActionEvent.ACTION, filter);
scene.addEventHandler(ActionEvent.ACTION, handler);
box.addEventFilter(ActionEvent.ACTION, filter);
box.addEventHandler(ActionEvent.ACTION, handler);
b1.addEventFilter(ActionEvent.ACTION, filter);
b1.addEventHandler(ActionEvent.ACTION, handler);
b2.addEventFilter(ActionEvent.ACTION, filter);
b2.addEventHandler(ActionEvent.ACTION, handler);
```

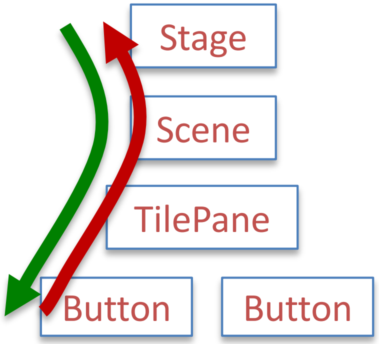
Vediamo se è vero…

OUTPUT

```
FILTER: STAGE javafx.stage.Stage@4a2e6207 =>Button[id=BUTTON1, styleClass=button]'Uno'
FILTER: SCENE javafx.scene.Scene@40410aad =>Button[id=BUTTON1, styleClass=button]'Uno'
FILTER: TILEPANE TilePane[id=TILEPANE, styleClass=root] =>Button[id=BUTTON1, styleClass=button]'Uno'
FILTER: BUTTON1 Button[id=BUTTON1, styleClass=button]'Uno' =>Button[id=BUTTON1, styleClass=button]'Uno'
HANDLER: BUTTON1 Button[id=BUTTON1, styleClass=button]'Uno' =>Button[id=BUTTON1, styleClass=button]'Uno'
HANDLER: TILEPANE TilePane[id=TILEPANE, styleClass=root] =>Button[id=BUTTON1, styleClass=button]'Uno'
HANDLER: SCENE javafx.scene.Scene@40410aad =>Button[id=BUTTON1, styleClass=button]'Uno'
HANDLER: STAGE javafx.stage.Stage@4a2e6207 =>Button[id=BUTTON1, styleClass=button]'Uno'
FILTER: STAGE javafx.stage.Stage@4a2e6207 =>Button[id=BUTTON2, styleClass=button]'Due'
FILTER: SCENE javafx.scene.Scene@40410aad =>Button[id=BUTTON2, styleClass=button]'Due'
FILTER: TILEPANE TilePane[id=TILEPANE, styleClass=root] =>Button[id=BUTTON2, styleClass=button]'Due'
FILTER: BUTTON2 Button[id=BUTTON2, styleClass=button]'Due' =>Button[id=BUTTON2, styleClass=button]'Due'
HANDLER: BUTTON2 Button[id=BUTTON2, styleClass=button]'Due' =>Button[id=BUTTON2, styleClass=button]'Due'
HANDLER: TILEPANE TilePane[id=TILEPANE, styleClass=root] =>Button[id=BUTTON2, styleClass=button]'Due'
HANDLER: SCENE javafx.scene.Scene@40410aad =>Button[id=BUTTON2, styleClass=button]'Due'
HANDLER: STAGE javafx.stage.Stage@4a2e6207 =>Button[id=BUTTON2, styleClass=button]'Due'
```

La sorgente dell'evento cambia a ogni passo!!!
(mentre il target rimane identico)

È possibile interrompere la catena?



«Consumare» eventi

```
class SuperHandler implements EventHandler<ActionEvent>{
  protected EventTarget target;
  protected Object source;
  protected String id;
  @Override
  public void handle(ActionEvent t) {
  target = t.getTarget();
  source = t.getSource();
  id = null;
  if (source instanceof Node {
    id = ((Node) source).getId();
  } else if (source instanceof Stage) {
    id="STAGE";
  } else if (source instanceof Scene) {
    id="SCENE";
  } else
    System.out.println("Unrecognized object: "+source);
}
```

Stesso codice di prima, ma ora possiamo specializzarlo

oppure

```
id = source.getClass().getSimpleName().toUpperCase();
```

«Consumare» eventi

```
SuperHandler filter = new SuperHandler () {
  public void handle(ActionEvent t) {
    super.handle(t);
    System.out.println("FILTER:"+id+" "+source+" ==> "+target);
  }
};
SuperHandler handler = new SuperHandler() {
  public void handle(ActionEvent t) {
    super.handle(t);
    System.out.println("HANDLER:"+id+" "+source+" ==> "+target);
  }
};
SuperHandler cutter = new SuperHandler() {
  public void handle(ActionEvent t) {
    super.handle(t);
    System.out.println("CUTTER:"+id+" "+source+" ==> "+target);
    t.consume();
  }
};
```

Dichiarano una sottoclasse anonima di **`SuperHandler`**

Interrompe la propagazione dell’evento

Vediamo se è vero…

```
stage.addEventFilter(ActionEvent.ACTION, filter);
stage.addEventHandler(ActionEvent.ACTION, handler);
scene.addEventFilter(ActionEvent.ACTION, filter);
scene.addEventHandler(ActionEvent.ACTION, handler);
box.addEventFilter(ActionEvent.ACTION, cutter);
box.addEventHandler(ActionEvent.ACTION, handler);
b1.addEventFilter(ActionEvent.ACTION, cutter);
b1.addEventHandler(ActionEvent.ACTION, handler);
```

```
FILTER:STAGE javafx.stage.Stage@6418ebbb ==> Button@3b019254[styleClass=button]'Uno'
FILTER:SCENE javafx.scene.Scene@640f1a9d ==> Button@3b019254[styleClass=button]'Uno'
CUTTER:TILEPANE TilePane@69638f42[styleClass=root] ==> Button@3b019254[styleClass=button]'Uno'
```

```
stage.addEventFilter(ActionEvent.ACTION, filter);
stage.addEventHandler(ActionEvent.ACTION, handler);
scene.addEventFilter(ActionEvent.ACTION, filter);
scene.addEventHandler(ActionEvent.ACTION, handler);
box.addEventFilter(ActionEvent.ACTION, filter);
box.addEventHandler(ActionEvent.ACTION, cutter);
b1.addEventFilter(ActionEvent.ACTION, filter);
b1.addEventHandler(ActionEvent.ACTION, cutter);
```

```
FILTER:STAGE javafx.stage.Stage@45d7a782 ==> Button@327e1a10[styleClass=button]'Uno'
FILTER:SCENE javafx.scene.Scene@15be4106 ==> Button@327e1a10[styleClass=button]'Uno'
FILTER:TILEPANE TilePane@7818d4fc[styleClass=root] ==> Button@327e1a10[styleClass=button]'Uno'
FILTER:BUTTON Button@327e1a10[styleClass=button]'Uno' ==> Button@327e1a10[styleClass=button]'Uno'
CUTTER:BUTTON Button@327e1a10[styleClass=button]'Uno' ==> Button@327e1a10[styleClass=button]'Uno'
```

Come risolve il nostro problema?

```
// dentro start()…
EventHandler<KeyEvent> keyEventHandler =
  new EventHandler<KeyEvent>(){
  public void handle(KeyEvent keyEvent) {
    if (keyEvent.getCharacter().equals("u”)) {
      b1.fireEvent(new ActionEvent());
      System.out.println(keyEvent.getSource() +
                             " =>"+keyEvent.getTarget());
    }
  }
};
//b1.addEventHandler(KeyEvent.KEY_TYPED,keyEventHandler);
stage.addEventHandler(KeyEvent.KEY_TYPED,keyEventHandler);
```

```
javafx.stage.Stage@63e71ca8 =>
Button@4e0cf854[styleClass=button]'Uno'
```

```
javafx.stage.Stage@63e71ca8 =>
Button@73f19cb2[styleClass=button]'Due'
```

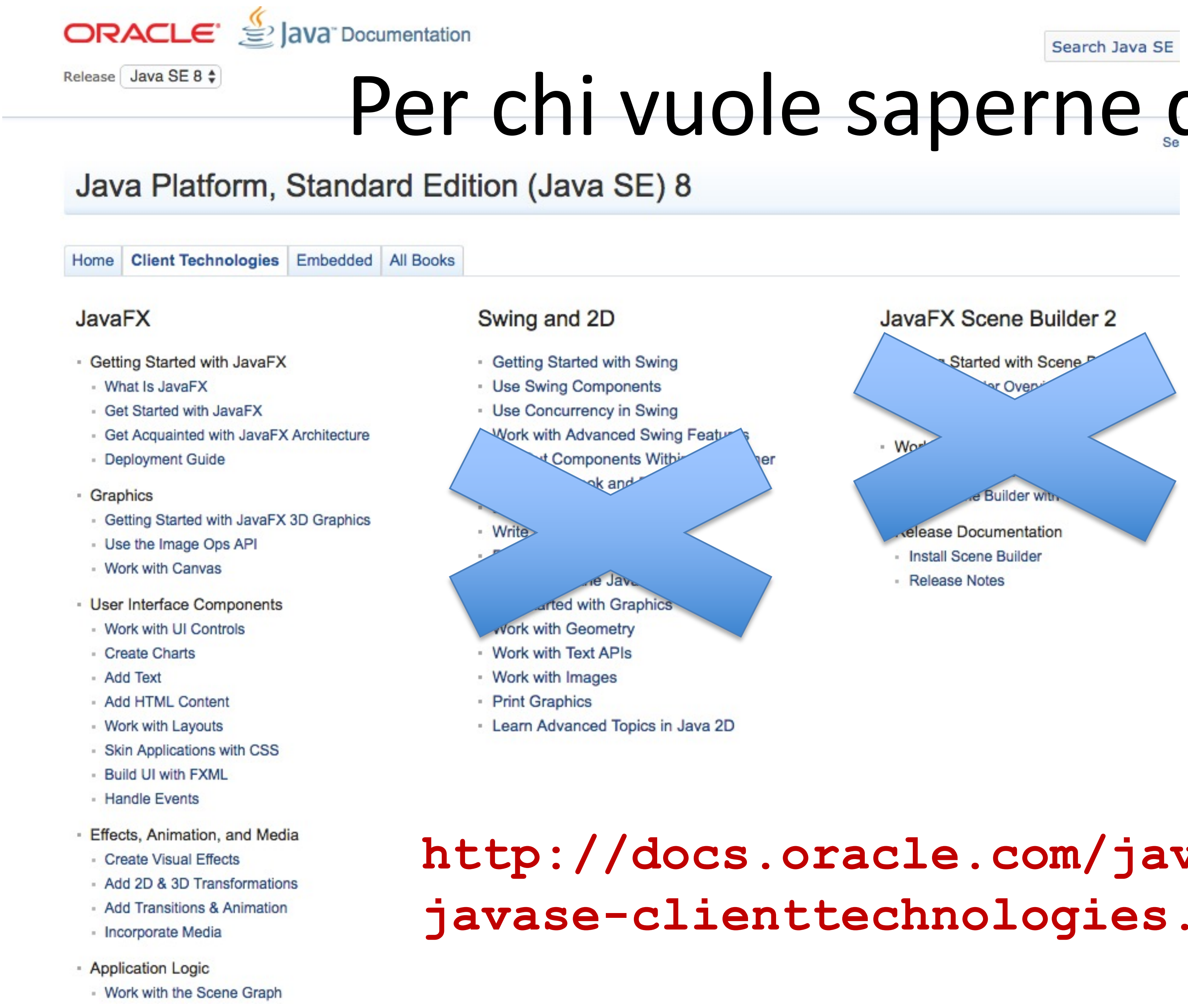
Gestire ambedue i bottoni…

```
// dentro start()…
EventHandler<KeyEvent> keyEventHandler =
  new EventHandler<KeyEvent>(){
  public void handle(KeyEvent keyEvent) {
     System.out.println(keyEvent.getSource() +
                              " =>"+keyEvent.getTarget());
    switch (keyEvent.getCharacter()){
       case "u":
       case "U":
         b1.fireEvent(new ActionEvent());
         break;
       case "d":
       case "D":
         b2.fireEvent(new ActionEvent());
         break;
  }
};
stage.addEventHandler(KeyEvent.KEY_PRESSED,keyEventHandler);
```

… spostando anche il focus

```
// dentro start()…
EventHandler<KeyEvent> keyEventHandler =
  new EventHandler<KeyEvent>(){
  public void handle(KeyEvent keyEvent) {
     System.out.println(keyEvent.getSource() +
                               " =>"+keyEvent.getTarget());
    switch (keyEvent.getCharacter()){
       case "u":
       case "U":
         b1.fireEvent(new ActionEvent()); b1.requestFocus();
         break;
       case "d":
       case "D":
         b2.fireEvent(new ActionEvent()); b2.requestFocus();
         break;
  }
};
stage.addEventHandler(KeyEvent.KEY_PRESSED,keyEventHandler);
```

Per chi vuole saperne di più…



Java Platform, Standard Edition (Java SE) 8

JavaFX

- Getting Started with JavaFX
  - What Is JavaFX
  - Get Started with JavaFX
  - Get Acquainted with JavaFX Architecture
  - Deployment Guide
- Graphics
  - Getting Started with JavaFX 3D Graphics
  - Use the Image Ops API
  - Work with Canvas
- User Interface Components
  - Work with UI Controls
  - Create Charts
  - Add Text
  - Add HTML Content
  - Work with Layouts
  - Skin Applications with CSS
  - Build UI with FXML
  - Handle Events
- Effects, Animation, and Media
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  - Incorporate Media
- Application Logic
  - Work with the Scene Graph

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JavaFX Scene Builder 2

- Started with Scene B
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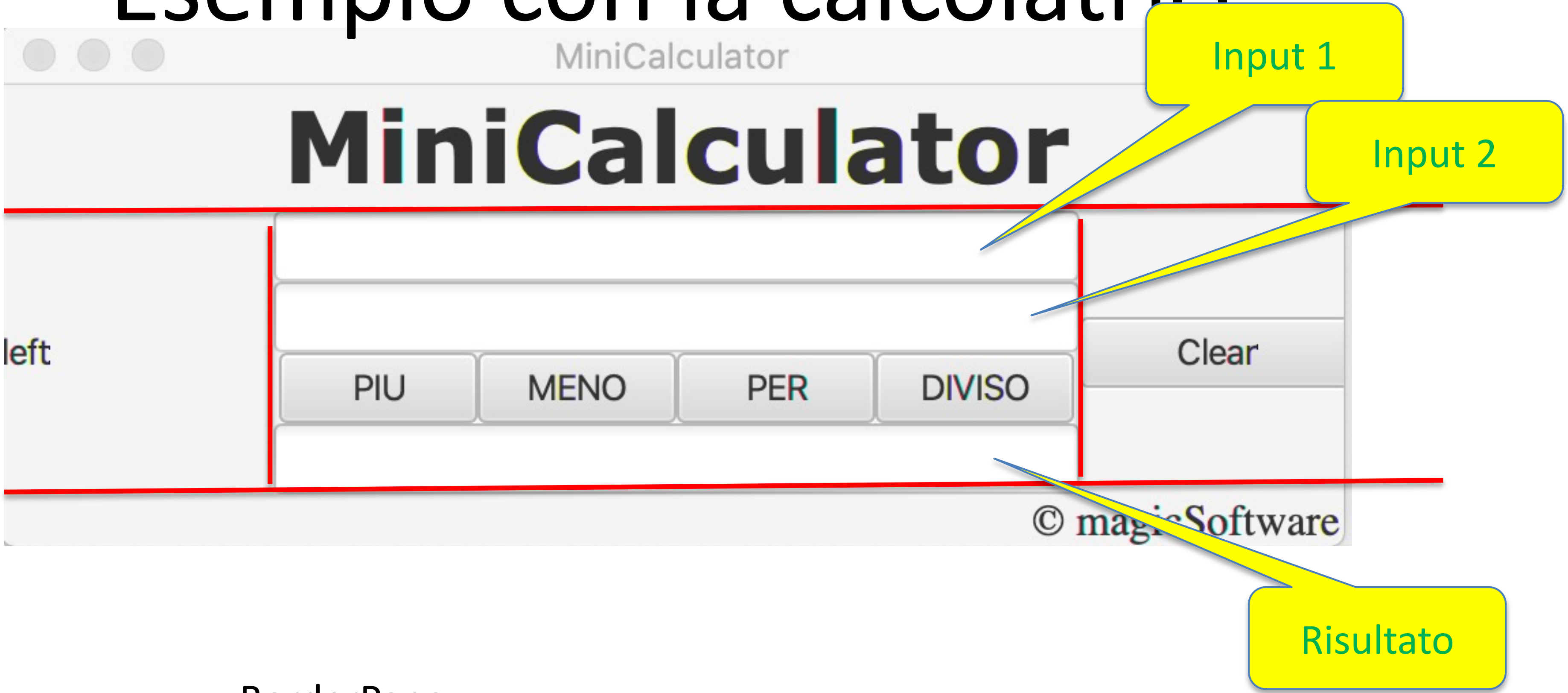
- elease Documentation
  - Install Scene Builder
  - Release Notes

http://docs.oracle.com/javase/8/javase-clienttechnologies.htm

Esempio con la calcolatrice



BorderPane,
al centro un TilePane di una colonna,
in terza riga un TilePane di quattro colonne

Bottone customizzato

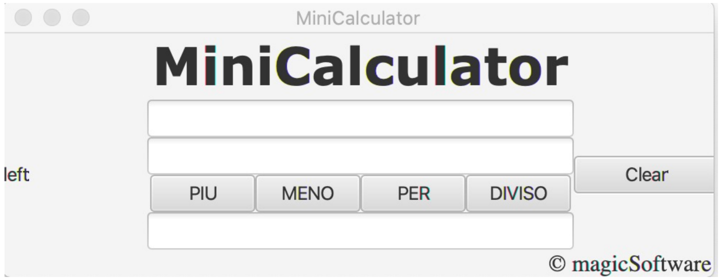
```
class OperationButton extends Button implements
    EventHandler<ActionEvent> {

        MiniCalculator2 mc = null;

        public OperationButton(MiniCalculator2 mc, String
               label, String id) {
            super(label);
            this.mc = mc;
            setId(id);
            addEventFilter(ActionEvent.ACTION, this);
        }
        void setOBwidth(double w) {
            this.setMaxWidth(w);
            this.setMinWidth(w);
        }
        @Override
        public void handle(ActionEvent t) {
            mc.compute(this.getId());
        }
    }
```

TextField customizzato

```
class NonEditableTextField extends TextField {
        NonEditableTextField(String s) {
            super(s);
            this.setEditable(false);
        }
    }
```

Application

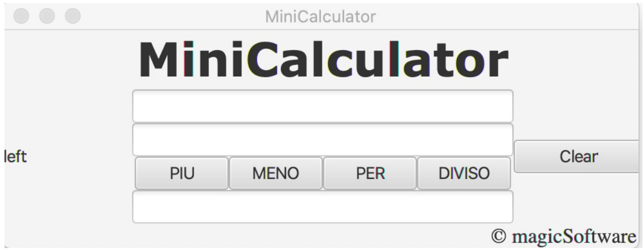
```
public class MiniCalculator2 extends Application {
    final TextField input1 = new TextField("");
    final TextField input2 = new TextField("");
    final NonEditableTextField output = new NonEditableTextField("");

    @Override
    public void start(Stage primaryStage) {
        primaryStage.setTitle("MiniCalculator");
        BorderPane borderP = new BorderPane();
        // ======== Top
        Label lt = new Label("MiniCalculator");
        lt.setFont(Font.font("Verdana", FontWeight.BOLD, 36));
        borderP.setTop(lt);
        BorderPane.setAlignment(lt, Pos.CENTER);
        // ======== Right
        Button clear = new Button("Clear");
        clear.setMinWidth(100.0);
        borderP.setRight(clear);
        BorderPane.setAlignment(clear, Pos.CENTER);
        clear.setOnAction(new EventHandler<ActionEvent>(){
            @Override
            public void handle(ActionEvent event) {
                input1.clear();
                input2.clear();
                output.clear();
            }
   });
```



© magicSoftware

Application

```
    // ======== Left
    Label lableft = new Label("left");
    lableft.setMinWidth(100.0);
    borderP.setLeft(lableft);
    BorderPane.setAlignment(lableft, Pos.CENTER_LEFT);
    // ======== Bottom
    Label lb = new Label("© magicSoftware ");
    lb.setFont(Font.font("Times", FontPosture.ITALIC, 16));
    borderP.setBottom(lb);
    BorderPane.setAlignment(lb, Pos.BOTTOM_RIGHT);
    // ======== Center
    final TilePane box = new TilePane();
    box.setPrefColumns(1);
    final TilePane hb = new TilePane();
    hb.setAlignment(Pos.CENTER);
    final OperationButton sum = new OperationButton(this,"PIU", "+");
    final OperationButton divide = new OperationButton(this,"DIVISO",
"/");
    final OperationButton multiply = new OperationButton(this,"PER",
"*");
    final OperationButton subtract = new OperationButton(this,"MENO",
"-");
    // ----
    hb.getChildren().addAll(sum, subtract, multiply, divide);
    box.getChildren().addAll(input1, input2, hb, output);
```

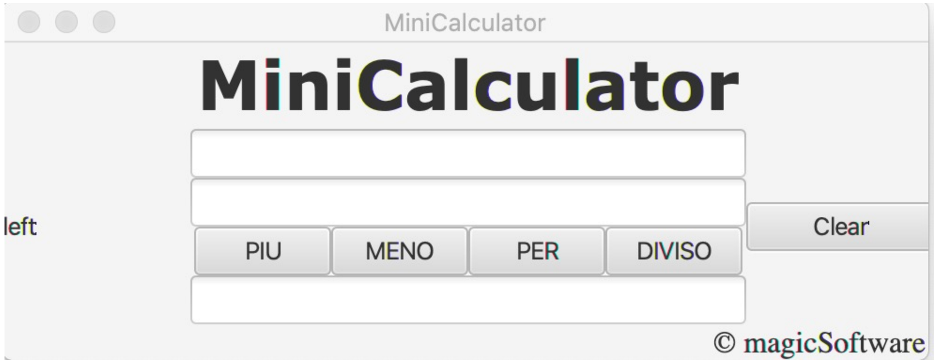


Application

```
    // ======== Behaviour
    borderP.setCenter(box);
    Scene scene = new Scene(borderP);
    scene.addEventFilter(KeyEvent.KEY_TYPED, new KBFilter(this));
    primaryStage.setScene(scene);
    primaryStage.sizeToScene();
    primaryStage.widthProperty().addListener(new
                                      ChangeListener<Number>() {
        @Override
        public void changed(ObservableValue<? extends Number> ov,
                   Number oldValue, Number newValue) {
           double w = newValue.doubleValue() * 3 / 5;
           box.setMaxWidth(w);
           box.setMinWidth(w);
           hb.setMaxWidth(w);
           hb.setMinWidth(w);
           double iw = Math.floor(w/4);
           sum.setOBwidth(iw);
           subtract.setOBwidth(iw);
           divide.setOBwidth(iw);
           multiply.setOBwidth(iw);
        }
    });
    primaryStage.show();
}
```

Gestione della tastiera:
La vediamo dopo.

Solo per I più curiosi e temerari: questa sezione(righe rosse) effettua un resizing dei TilePane e del loro Contenuto quando la finestra viene ridimensionata



Application

```
public void compute(String operator) {
    double o1, o2;
    try {
        o1 = Double.parseDouble(input1.getText());
        o2 = Double.parseDouble(input2.getText());
    } catch (NumberFormatException e) {
        Label msg = new Label("Errore - Not A Number!");
        StackPane g = new StackPane();
        g.getChildren().add(msg);
        Scene stageScene = new Scene(g, 300, 200);
        Stage errorStage = new Stage();
        errorStage.setScene(stageScene);
        errorStage.show();
        return;
    }
    switch (operator) {
        case "+":
            output.setText("" + (o1 + o2)); break;
        case "*":
            output.setText("" + (o1 * o2)); break;
        case "-":
            output.setText("" + (o1 - o2)); break;
        case "/":
            output.setText("" + (o1 / o2)); break;
    }
}
public static void main(String[] args) {Application.launch(args);}
```

Application

```
public class KBFilter implements EventHandler<KeyEvent> {
        MiniCalculator2 mc = null;
        KBFilter(MiniCalculator2 mc) {
            this.mc = mc;
        }
        @Override
        public void handle(KeyEvent e) {
            String t = e.getCharacter();
            if ("1234567890".contains(t)) {
               return;
            } else if (t.equals(".")) {
                if (e.getTarget() instanceof TextField) {
                    TextField tf = (TextField) (e.getTarget());
                    System.out.println(tf.getText());
                    if (tf.getText().contains(".")) {
                        e.consume();
                    }
                    return;
                }
            } else if ("+-/*".contains(t)) {
                mc.compute(t);
            }
            e.consume();
            return;
        }
    }
```

Gestione della tastiera:

Filtriamo gli eventi a livello di Scene

- Lasciamo arrivare al TextField
  numeri e punto,
- Interpretiamo I tasti operazione,
- Buttiamo tutto il resto