Upcast - downcast

Conversioni forzate tra tipi riferimento: ***casting***

È possibile forzare la conversione da un tipo riferimento **`T`** ad un sottotipo **`T1`** purché …

- … il tipo **dinamico** dell'oggetto convertito sia un sottotipo di **`T1`**

Questa conversione implicita consentita dal polimorfismo (is-a) viene chiamata **upcast**

```
Object o = new AutomobileElettrica();
Automobile a = o; // errato, Object non è un
                  // sottotipo di Automobile
Automobile a = (Automobile) o; // corretto (casting)
```

Questa conversione esplicita viene chiamata **downcast**

```
public class Test {
   public static void main(String a[]) {
      new Test();
   }
```

cast

```
   Test() {
      A a;
      B b = new B();
      a=b;
      a.f1();
      a.f2();
   }
}
```

OK: upcast implicito

NO: "method f2 not found in class A" (compile time error)

```
class A            { void f1()
  {System.out.println("f1");} }
class B extends A { void f2()
  {System.out.println("f2");} }
class C extends B { void f3()
  {System.out.println("f3");} }
```

```
public class Test {
   public static void main(String a[]) {
      new Test();
   }
```

cast

```
   Test() {
      A a;
      B b = new B();
      a=b;
         a.f1();
         ((B)a).f2();
   }
}
```

OK: upcast implicito

OK: downcast corretto

```
class A            { void f1()
  {System.out.println("f1");} }
class B extends A { void f2()
  {System.out.println("f2");} }
class C extends B { void f3()
  {System.out.println("f3");} }
```

```
public class Test {
   public static void main(String a[]) {
      new Test();
   }
```

cast

```
   Test() {
      A a;
      B b = new B();
      a=b;
      a.f1();
      ((C)a).f3();
   }
}
```

OK: upcast implicito

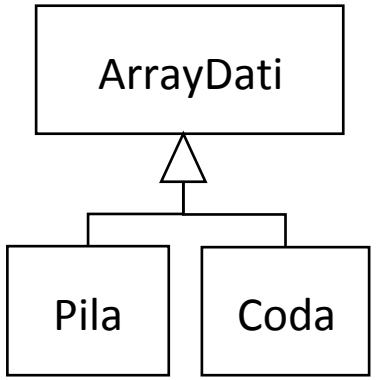
NO: downcast illecito (runtime error)
java.lang.ClassCastException

```
class A            { void f1()
  {System.out.println("f1");} }
class B extends A { void f2()
  {System.out.println("f2");} }
class C extends B { void f3()
  {System.out.println("f3");} }
```

Ricapitoliamo le vicende del binding…

Decisioni al volo…

```
public static void main(String
a[]){
    ArrayDati p;
    // leggi k
    if (k==1) p = new Pila();
    else p = new Coda();
    p.inserisci(1);
    p.inserisci(2);
    p.estrai();
}
```



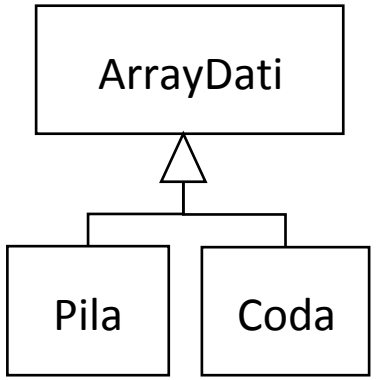
Il tipo di **p** viene deciso a **runtime**!

Il legame tra un oggetto e il suo tipo è **dinamico**

(*dynamic binding*, *late binding*, o *lazy evaluation*)

Domanda: perché non fare così?

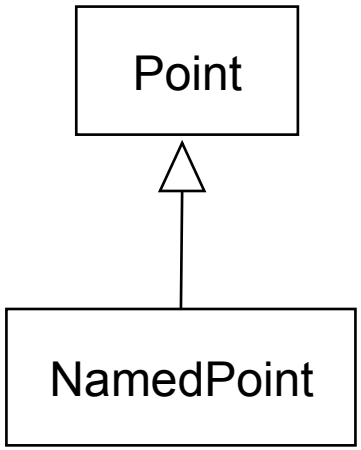
```
public static void main(String a[]){
    //ArrayDati p;
    // leggi k
    if (k==1) Pila p = new Pila();
    else Coda p = new Coda();
    p.inserisci(1);
    p.inserisci(2);
    p.estrai();
}
```



Determinazione del tipo: `instanceof`

- È possibile determinare il tipo dinamico di un oggetto con l'operatore **`instanceof`**
  - Utile per evitare errori di tipo a runtime dovuti a downcast

```
•public static void main(String a[]){
•   Point p;
•   // leggi k
•   if (k==1) p = new Point(2,2);
•   else p = new NamedPoint(3,3,"A");
•   p.getName();
•   if (p instanceof NamedPoint)
       ((NamedPoint) p).getName();
•}
```



Riassunto soluzione 1: casi semplicissimi.

```
class A {
    public void g(A x) {System.out.println("called on instance of A");}
}
class B extends A {
   public void g(A x) {System.out.println("called 1 on instance of B");}
   public void g(B x) {System.out.println("called 2 on instance of B");}
}
```

A a=new A();

A ab=new B();

B b=new B();

Risoluzione firma banale,
Tipo statico e tipo dinamico coincidono, nessun problema!

a.g(a); => A.g(A) => A.g(A)

b.g(a); => B.g(A) => B.g(A)

b.g(b); => B.g(B) => B.g(B)

called on instance of A
called 1 on instance of B
called 2 on instance of B

Riassunto soluzione 2: casi semplici.

```
class A {
    public void g(A x) {System.out.println("called on instance of A");}
}
class B extends A {
   public void g(A x) {System.out.println("called 1 on instance of B");}
   public void g(B x) {System.out.println("called 2 on instance of B");}
}
```

A a=new A();

A ab=new B();

B b=new B();

Risoluzione firma banale,
Nell'argomento tipo statico e runtime non coincidono ma il fatto non è rilevante,
Tipo statico e tipo dinamico coincidono, nessun problema!

a.g(ab); => A.g(A) => A.g(A) called on instance of A

b.g(ab); => B.g(A) => B.g(A) called 1 on instance of B

Riassunto soluzione 3: dynamic binding.

```
class A {
    public void g(A x) {System.out.println("called on instance of A");}
}
class B extends A {
   public void g(A x) {System.out.println("called 1 on instance of B");}
   public void g(B x) {System.out.println("called 2 on instance of B");}
}
```

A a=new A();

A ab=new B();

B b=new B();

Risoluzione firma banale,
Tipo statico e tipo dinamico NON coincidono, dynamic binding!

ab.g(ab); => A.g(A) => B.g(A) called 1 on instance of B

ab.g(b); => A.g(A) => B.g(A) called 1 on instance of B

Riassunto soluzione 4: Liskov

```
class A {
    public void g(A x) {System.out.println("called on instance of A");}
}
class B extends A {
   public void g(A x) {System.out.println("called 1 on instance of B");}
   public void g(B x) {System.out.println("called 2 on instance of B");}
}
```

A a=new A();

A ab=new B();

B b=new B();

Nella risoluzione statica non trovo il metodo cercato, e devo ricorrere a Liskov
Poi nel binding dinamico non ho complicazioni..

a.g(b); => A.g(B) => A.g(A) => A.g(A)

called on instance of A

Riassunto soluzione 5: Liskov + Dynamic Binding.

```
class A {
    public void g(A x) {System.out.println("called on instance of A");}
}
class B extends A {
   public void g(A x) {System.out.println("called 1 on instance of B");}
   public void g(B x) {System.out.println("called 2 on instance of B");}
}
```

A a=new A();

A ab=new B();

B b=new B();

Nella risoluzione statica non trovo il metodo cercato, e devo ricorrere a Liskov
Poi nel binding dinamico devo adattare la soluzione trovata all'overriding.

ab.g(b); => A.g(B) => A.g(A) => B.g(A) called 1 on instance of B

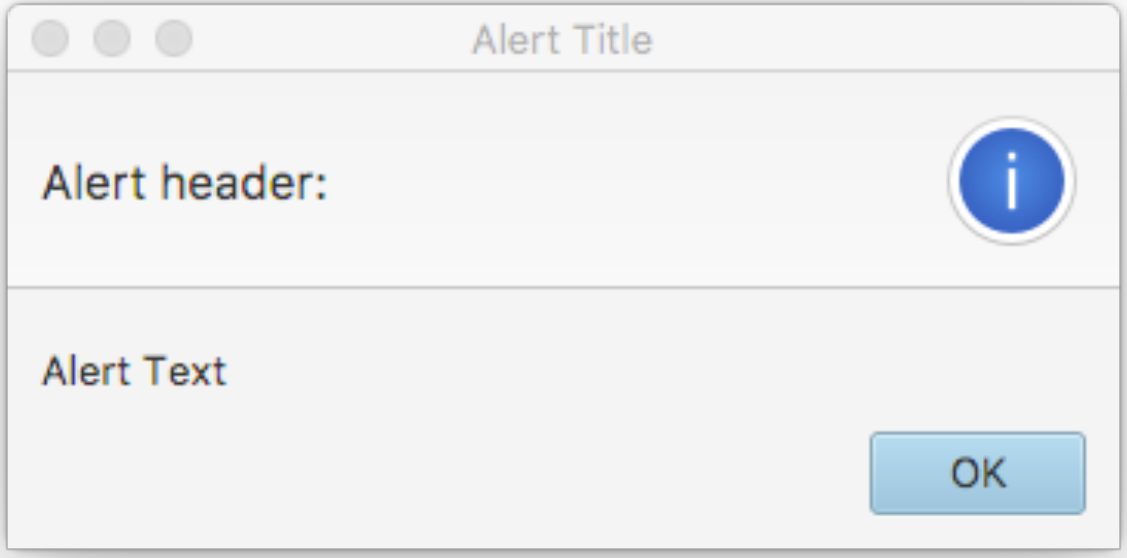
User Input

User input – senza grafica

```
import java.util.Scanner;
...
Scanner scanner = new Scanner(System.in);
System.out.println(”dimmi qualcosa");
String inputString = scanner.nextLine();
   ...
System.out.println(inputString);
```

User input – con grafica

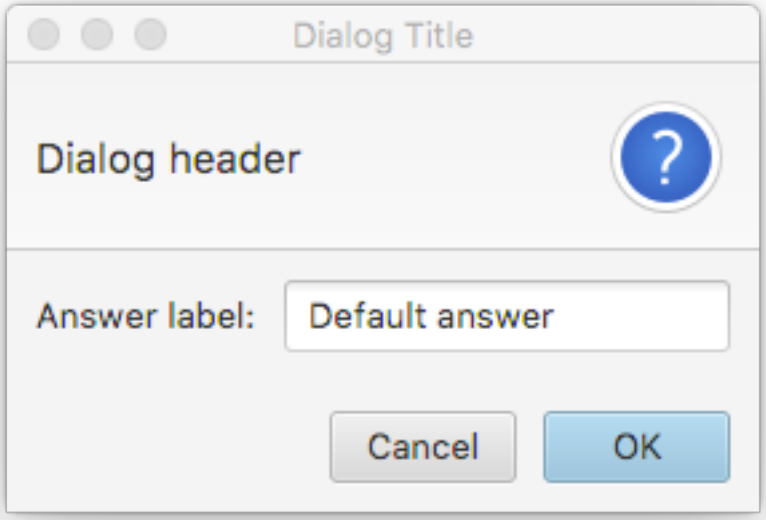
```
Alert alert = new Alert(AlertType.INFORMATION);
alert.setTitle("Alert Title");
alert.setHeaderText("Alert header:");
alert.setContentText("Alert Text");
alert.showAndWait();
```



User input – con grafica

```
TextInputDialog dialog = new TextInputDialog("Default
    answer");
dialog.setTitle("Dialog Title");
dialog.setHeaderText("Dialog header");
dialog.setContentText("Answer label:");
String s= dialog.showAndWait().get();
```

Non è proprio il modo giusto per farlo, ma per ora…



Conversione di stringhe in numeri

Conversione di stringhe in numeri

```
String s="10";
int i=Integer.parseInt(s);

String pi="3.1415026535";
float π=Float.parseFloat(pi);
```

Che succede se faccio

```
String s="pippo";
int i=Integer.parseInt(s);
```

?

Errore!

```
Exception in Application start method
java.lang.reflect.InvocationTargetException
	at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
	at sun.reflect.NativeMethodAccessorImpl.invoke(NativeMethodAccessorImpl.java:62)
	at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:43)
	at java.lang.reflect.Method.invoke(Method.java:498)
	at com.sun.javafx.application.LauncherImpl.launchApplicationWithArgs(LauncherImpl.java:389)
	at com.sun.javafx.application.LauncherImpl.launchApplication(LauncherImpl.java:328)
	at sun.reflect.NativeMethodAccessorImpl.invoke0(Native Method)
	at sun.reflect.NativeMethodAccessorImpl.invoke(NativeMethodAccessorImpl.java:62)
	at sun.reflect.DelegatingMethodAccessorImpl.invoke(DelegatingMethodAccessorImpl.java:43)
	at java.lang.reflect.Method.invoke(Method.java:498)
	at sun.launcher.LauncherHelper$FXHelper.main(LauncherHelper.java:767)
Caused by: java.lang.RuntimeException: Exception in Application start method
	at com.sun.javafx.application.LauncherImpl.launchApplication1(LauncherImpl.java:917)
	at com.sun.javafx.application.LauncherImpl.lambda$launchApplication$155(LauncherImpl.java:182)
	at java.lang.Thread.run(Thread.java:745)
Caused by: java.lang.NumberFormatException: For input string: "z"
	at sun.misc.FloatingDecimal.readJavaFormatString(FloatingDecimal.java:2043)
	at sun.misc.FloatingDecimal.parseFloat(FloatingDecimal.java:122)
	at java.lang.Float.parseFloat(Float.java:451)
	at javafxapplication27.JavaFXApplication27.start(JavaFXApplication27.java:36)
	at com.sun.javafx.application.LauncherImpl.lambda$launchApplication1$162(LauncherImpl.java:863)
	at com.sun.javafx.application.PlatformImpl.lambda$runAndWait$175(PlatformImpl.java:326)
	at com.sun.javafx.application.PlatformImpl.lambda$null$173(PlatformImpl.java:295)
	at java.security.AccessController.doPrivileged(Native Method)
	at com.sun.javafx.application.PlatformImpl.lambda$runLater$174(PlatformImpl.java:294)
	at com.sun.glass.ui.InvokeLaterDispatcher$Future.run(InvokeLaterDispatcher.java:95)
Exception running application javafxapplication27.JavaFXApplication27
```

Gestione degli errori

Proteggiamo questo codice

```
Scanner scanner = new Scanner(System.in);
String inputString;
int z;
System.out.println("dammi un numero");
inputString= scanner.nextLine();
z=Integer.parseInt(inputString);
System.out.println("input valido!");
```

Blocco try - catch

```
Scanner scanner = new Scanner(System.in);
String inputString;
int z;
 System.out.println("dammi un numero");
inputString= scanner.nextLine();
try {
     int z=Integer.parseInt(inputString);
     System.out.println("input valido!");
} catch (NumberFormatException ex) {
     System.out.println("input non valido!");
}
```

Possiamo fare di meglio

```
Scanner scanner = new Scanner(System.in);
String inputString;
int z;
boolean failure=true;
do {
  try {
      System.out.println("dammi un numero");
      inputString= scanner.nextLine();
      int z=Integer.parseInt(inputString);
      failure=false;
  } catch (NumberFormatException ex) {
      failure=true;
  }
} while (failure);
```

Clausola finally

Nota: c'è una ulteriore clausola!

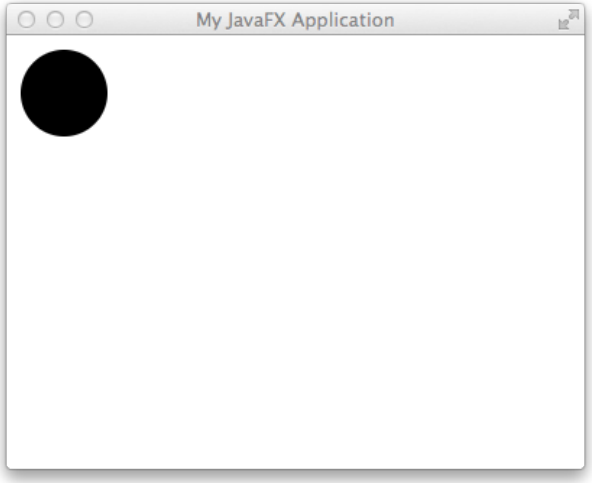
```
try {
    codice che potrebbe generare errore
} catch (NumberFormatException ex) {
    codice da eseguire se si verifica un errore
} finally {
    codice da eseguire sia che ci sia stato un errore,
    sia che non ci sia stato.
}
```

finally

The finally block always executes when the try block exits. This ensures that the finally block is executed even if an unexpected exception occurs. But finally is useful for more than just exception handling — it allows the programmer to avoid having cleanup code accidentally bypassed by a return, continue, or break. Putting cleanup code in a finally block is always a good practice, even when no exceptions are anticipated.

Esercizio

Esercizio per casa



Modificare il codice che disegna un disco, in modo che dopo aver disegnato la finestra con il cerchio (dopo la stage.show()), all'utente venga chiesto tramite un Dialog il valore del raggio, e si modifichi il cerchio usando il valore dato.

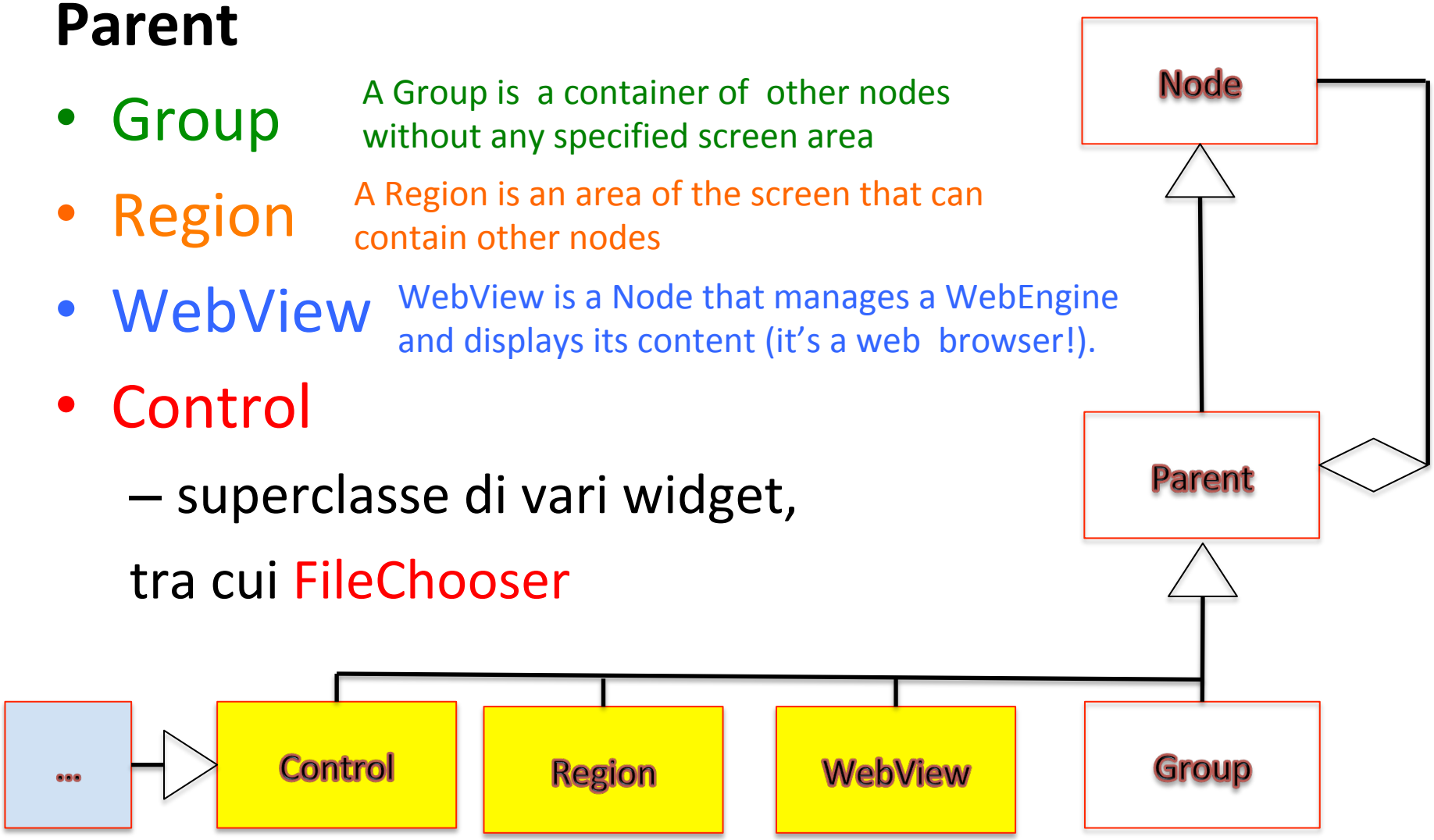
Si gestiscano errori, e si ponga un limite minimo e massimo ai valori accettati per il raggio.

Palestra di Java con la grafica: Java FX - parte 2

Parent hierarchy

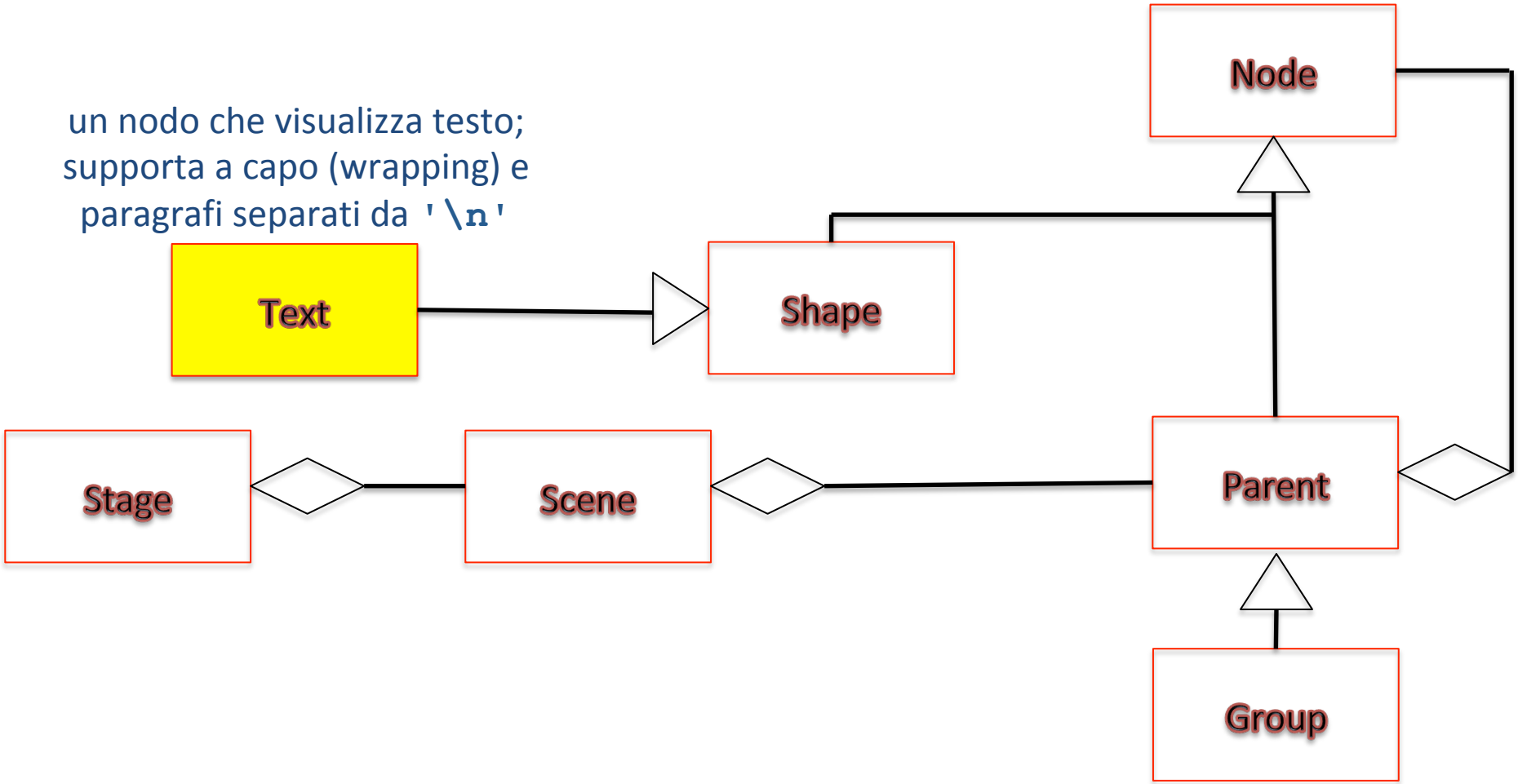
Parent

- Group — A Group is a container of other nodes without any specified screen area
- Region — A Region is an area of the screen that can contain other nodes
- WebView — WebView is a Node that manages a WebEngine and displays its content (it's a web browser!).
- Control
  - superclasse di vari widget, tra cui FileChooser



Shape & Text

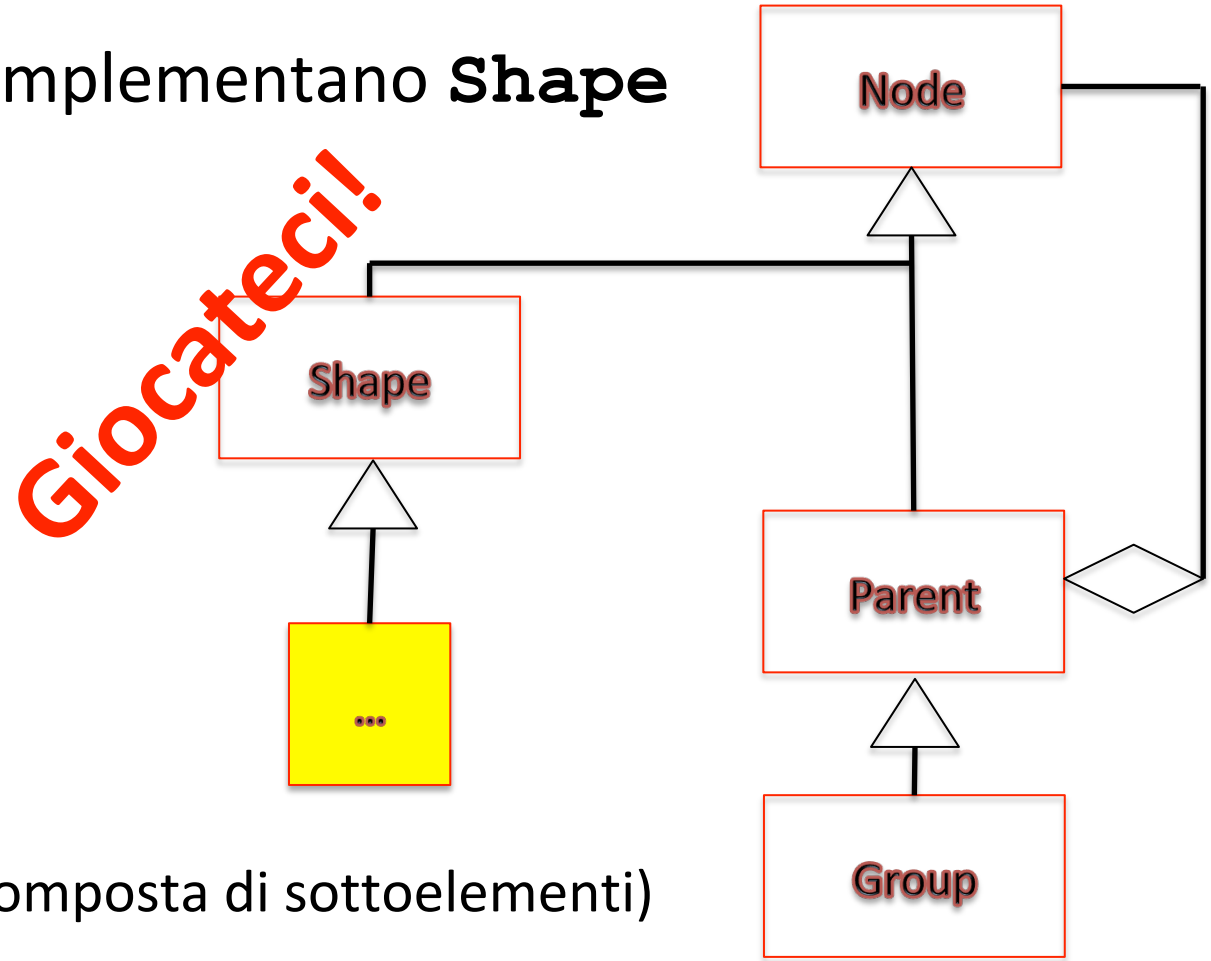
un nodo che visualizza testo;
supporta a capo (wrapping) e
paragrafi separati da `'\n'`



Gerarchia di Shape

Le seguenti classi implementano **`Shape`**

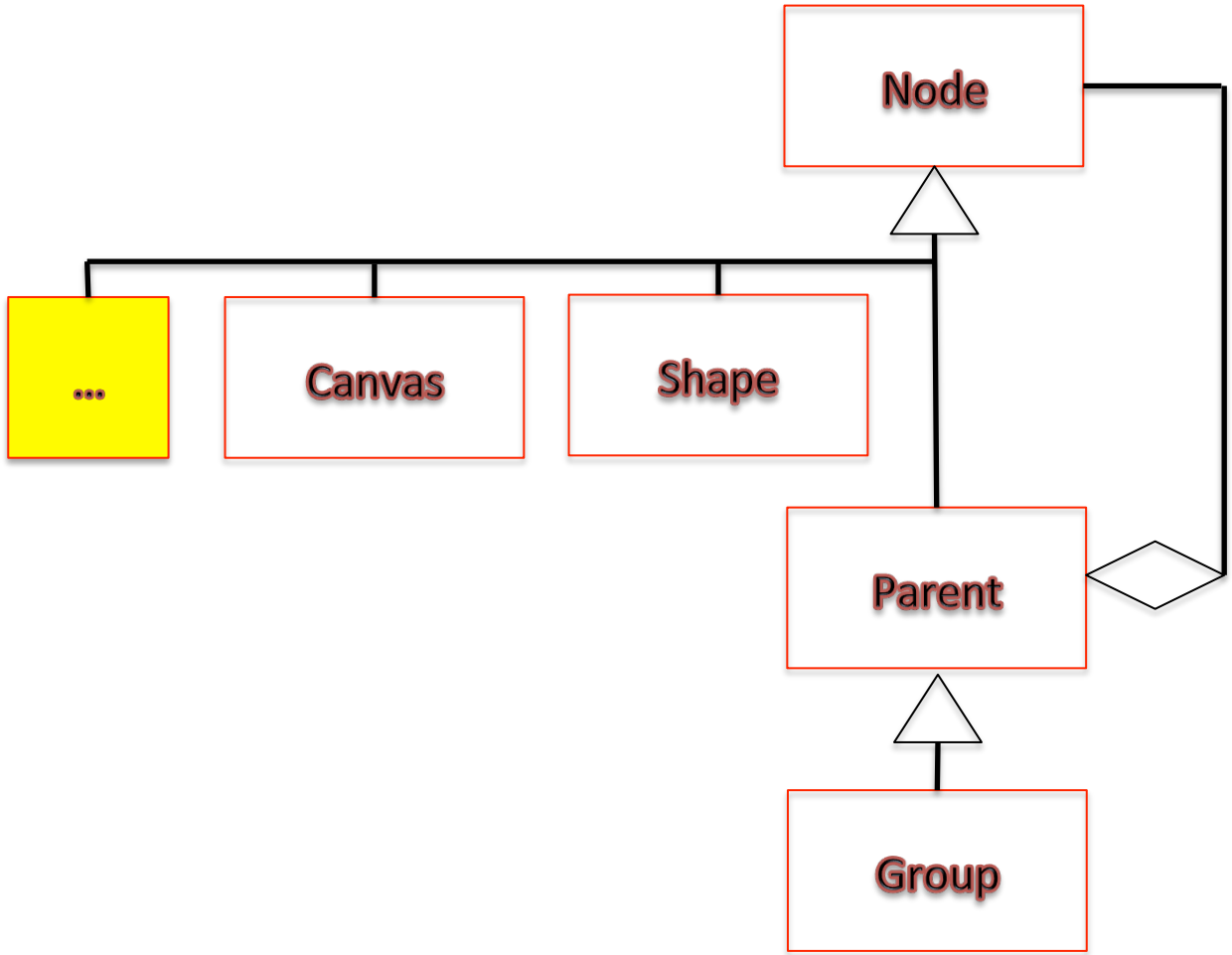
- `Line`
- `Polyline`
- `Polygon`
- `Rectangle`
- `Arc`
- `Circle`
- `Ellipse`
- `QuadCurve`
- `CubicCurve`
- `Text`
- `SVGPath` (linea composta di sottoelementi)



Node hierarchy

Node

- Parent
- Shape
- Canvas



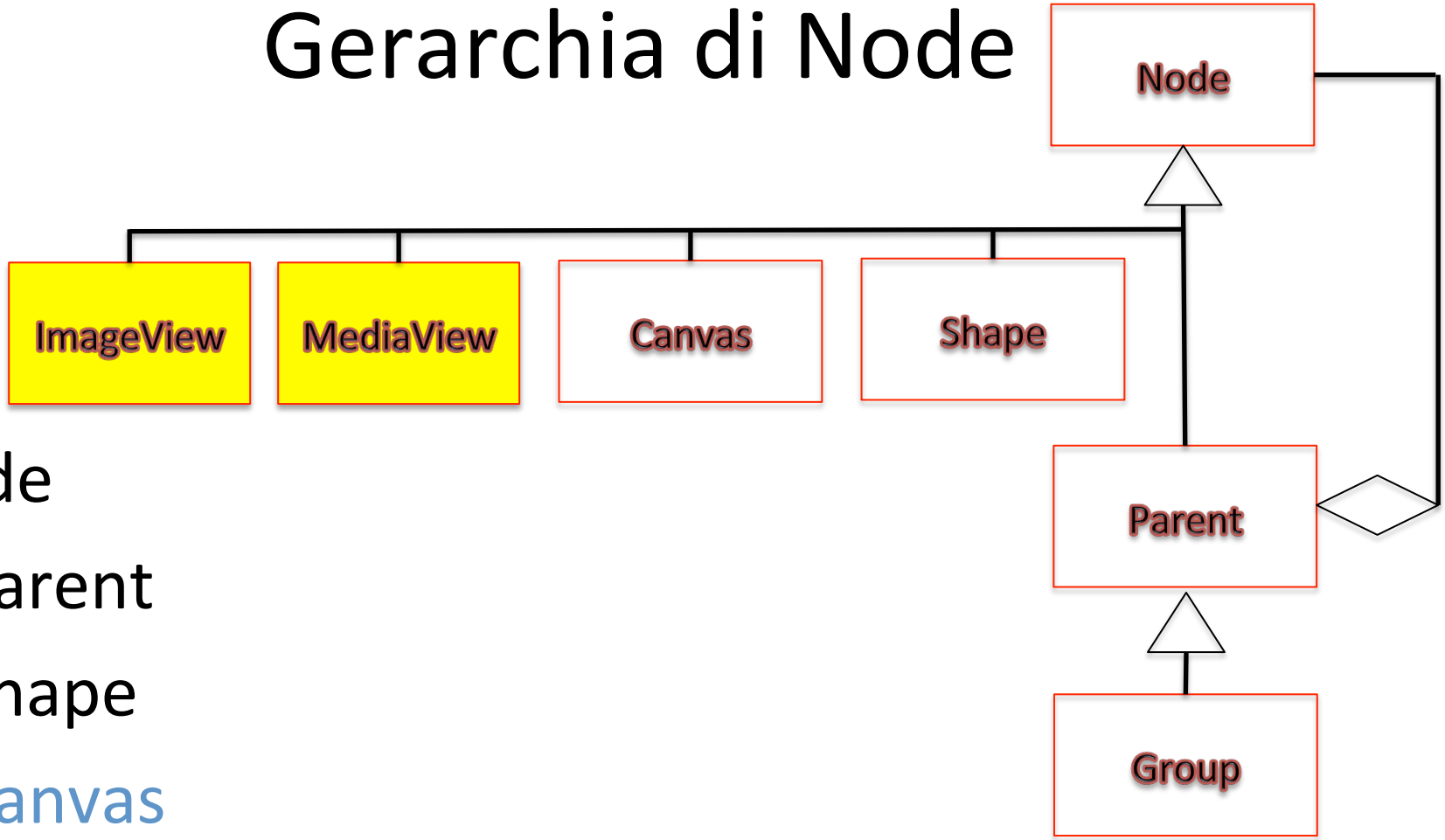
Canvas

Una "tela del pittore" con un metodo per ottenere il suo `GraphicContext` con varie primitive per disegnarci sopra:

- `fillArc()`
- `fillRect()`
- `drawImage()`
- …

http://docs.oracle.com/javafx/2/canvas/jfxpub-canvas.htm

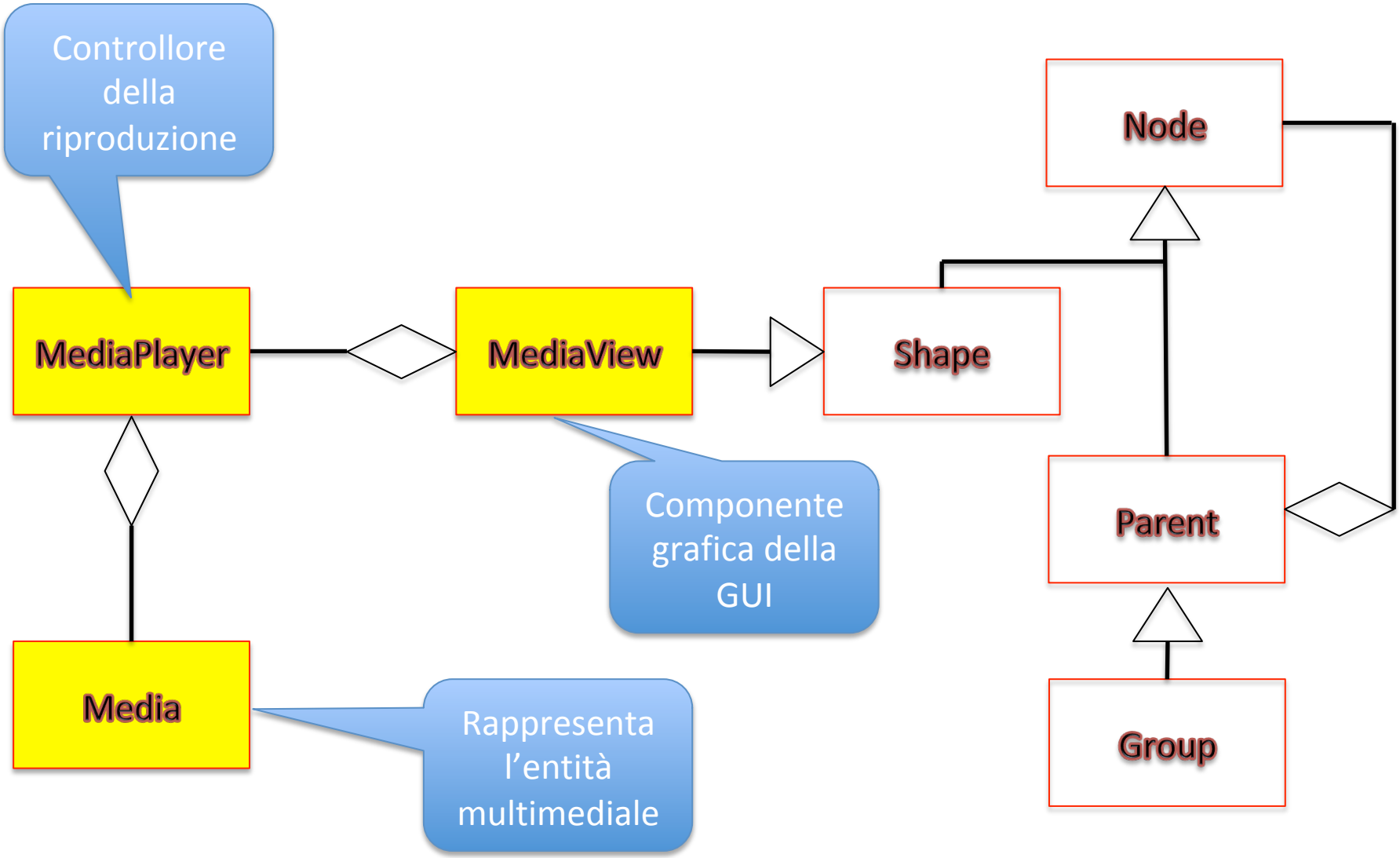
Gerarchia di Node



Node

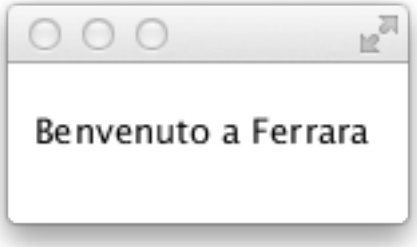
- Parent
- Shape
- Canvas
- ImageView
- MediaView

MediaView & Media



MediaView

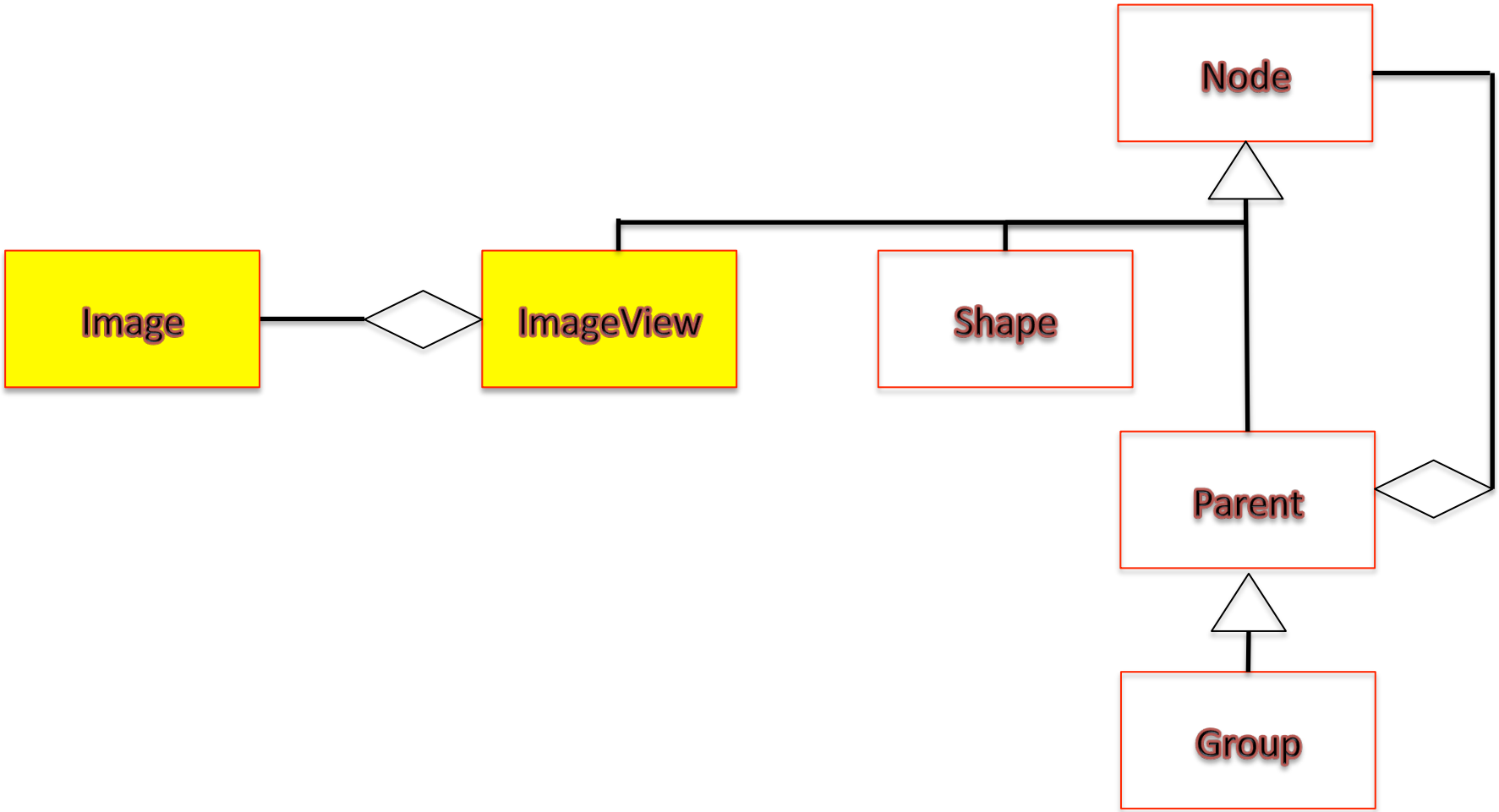
```
public class Sounds extends Application{
    public void start(Stage stage) {
        Media media = new Media("http://www.ferraraterraeacqua.it/
it/audioguide/audioguide-di-ferrara-citta-del-rinascimento/
01_benvenuto-a-ferrara.mp3");
        MediaPlayer mediaPlayer = new MediaPlayer(media);
        mediaPlayer.setAutoPlay(true);
        // create mediaView and add media player to the viewer
        MediaView mediaView = new MediaView(mediaPlayer);
        Group root = new Group(mediaView);
        root.getChildren().add(
               new Text(10, 30,"Benvenuto a Ferrara"));
        Scene scene = new Scene(root, 150, 60);
        stage.setScene(scene);
        stage.sizeToScene();
        stage.show();
    }
    public static void main(String[] args) {
        Application.launch(args);
    }
}
```



http://docs.oracle.com/javafx/2/media/overview.htm

https://docs.oracle.com/javase/8/javafx/media-tutorial/overview.htm

ImageView & Image



Gerarchia di Parent (parziale)

Parent

- Control
  - superclasse di vari widget, tra cui FileChooser
- …

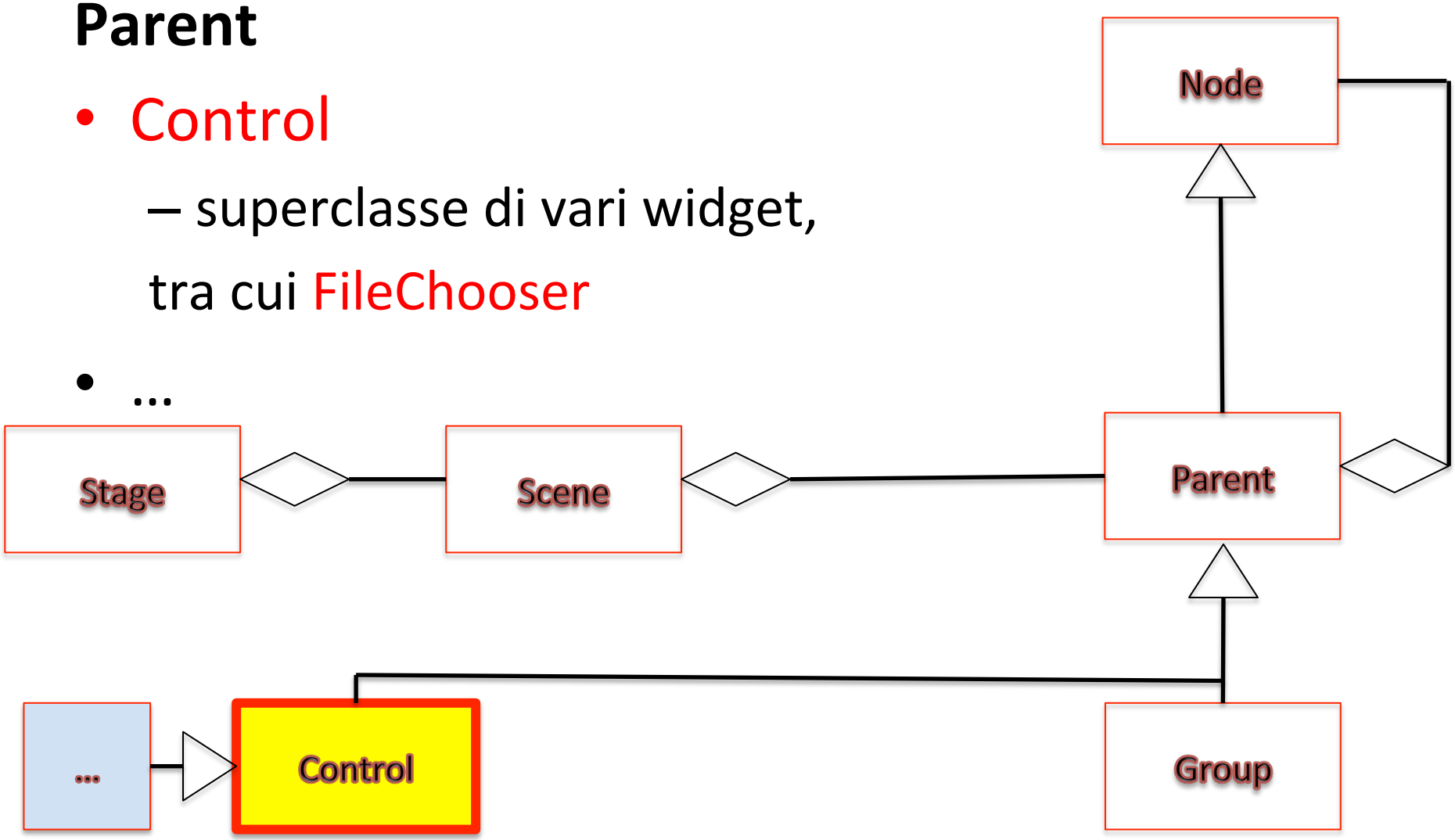
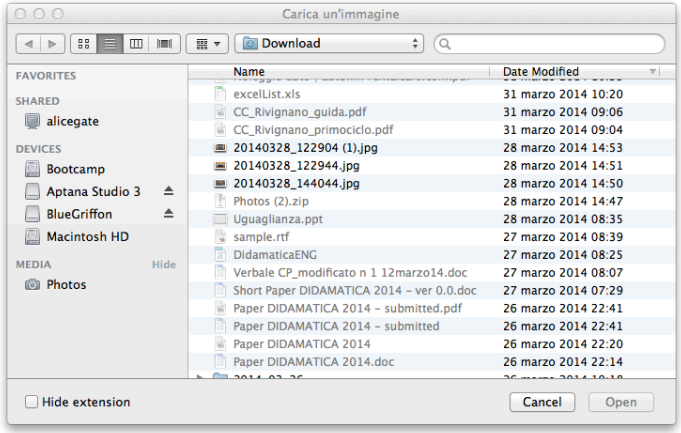


Image & File

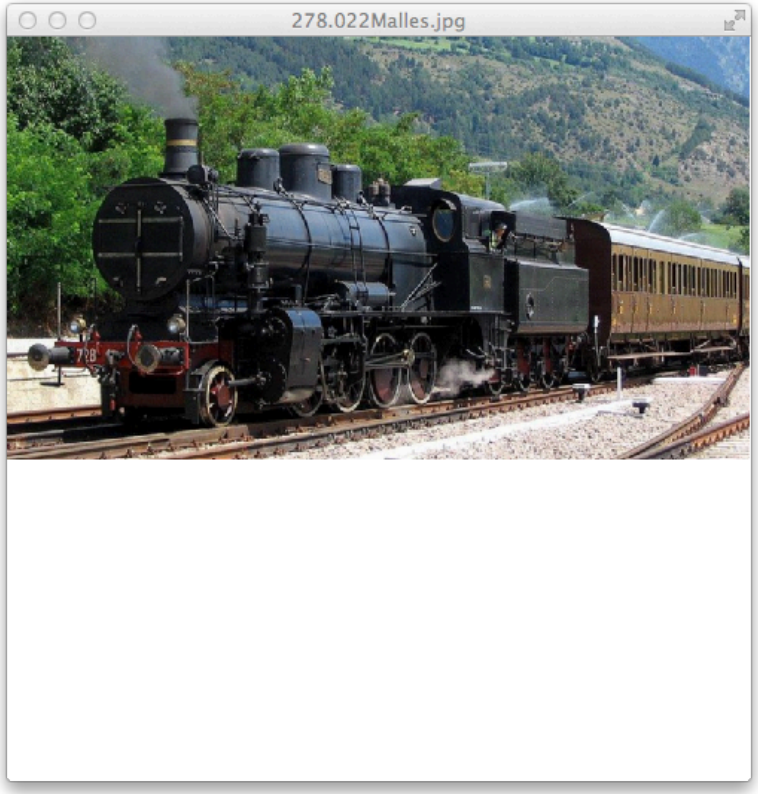



```
public class FilesAndImages extends Application {
    public void start(Stage stage) {
        FileChooser fileChooser = new FileChooser();
         fileChooser.setTitle("Carica un'immagine");
        fileChooser.getExtensionFilters().addAll(
                new FileChooser.ExtensionFilter("JPG", "*.jpg"),
                new FileChooser.ExtensionFilter("PNG", "*.png")
         );
        String url = System.getProperty("user.home");
         File f=new File(url);
        fileChooser.setInitialDirectory(f); // bugged on MacOsX
        File file = fileChooser.showOpenDialog(stage);
         if (file == null) {
             System.out.println("No file chosen");
             System.exit(1);
         }
```

Image & File

```
        Image image = new Image("file://" +
                    file.getAbsolutePath(), 500, 500, true, true);
        ImageView iw = new ImageView(image);
        Group root = new Group(iw);
        Scene scene = new Scene(root, 500,500);
        stage.setTitle(file.getName());
        stage.setScene(scene);
        stage.sizeToScene();
        stage.show();
    }

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



HOMEWORK

Esempio: Finestre multiple

```
package javafxapplication;

import javafx.application.Application;
import javafx.scene.Group;
import javafx.scene.Scene;
import javafx.scene.paint.Color;
import javafx.scene.text.Font;
import javafx.scene.text.Text;
import javafx.scene.text.TextAlignment;
import javafx.stage.Stage;
public class Finestre extends Application {
  @Override
  public void start(Stage stage) {
        Text t=new Text(50, 100, "The quick brown fox jumps over the lazy dog");
        t.setTextAlignment(TextAlignment.RIGHT);
        t.setWrappingWidth(50);
        t.setFill(Color.GREEN);
        Group g=new Group(t);
        Scene scene = new Scene(g);
        stage.setTitle("Titolo della finestra 1");
        stage.setScene(scene);
        // set stage dimension
        stage.setWidth(399);
        stage.setHeight(399);
        //stage.sizeToScene();
        // set stage position
        stage.setX(1000);
        stage.setY(800);
        // make stage visible
        stage.show();
        // ==================
        Text t2=new Text(0, 20, "Ping !\nPongPing !");
        t2.setTextAlignment(TextAlignment.LEFT);
        t2.setFill(Color.RED);
```

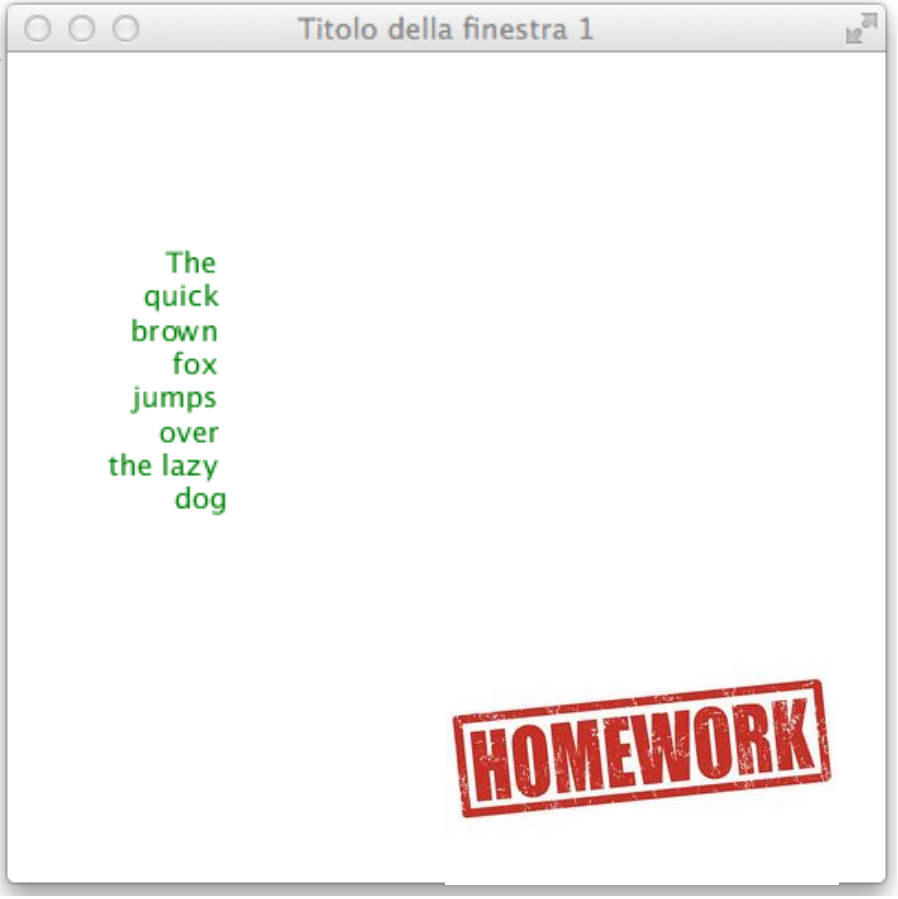
Ping !
PongPing !

Titolo della finestra 1

The quick brown fox jumps over the lazy dog

Finestre multiple: prima finestra

```
public class Finestre extends Application {
public void start(Stage stage) {
    Text t=new Text(50, 100, "The quick brown fox jumps over
       the lazy dog");
    t.setTextAlignment(TextAlignment.RIGHT);
    t.setWrappingWidth(50);
    t.setFill(Paint.valueOf("GREEN"));
    Group g = new Group(t);
    Scene scene = new Scene(g);
    stage.setTitle("Titolo
                 della finestra 1");
    stage.setScene(scene);
    // set stage dimension
    stage.setWidth(399);
    stage.setHeight(399);
   // set stage position
    stage.setX(1000);
    stage.setY(800);
    // make stage visible
    stage.show();
```



Finestre multiple: seconda finestra

```
        Text t2=new Text(0, 20, "Ping !\nPongPing !");
        t2.setTextAlignment(TextAlignment.LEFT);
        t2.setFill(Paint.valueOf("RED"));
        t2.setFont(new Font(20));
        Group g2 = new Group(t2);
        Scene scene2 = new Scene(g2);
        scene2.setFill(Paint.valueOf("YELLOW"));
        Stage stage2 = new Stage();
        stage2.setTitle("Titolo della finestra 2");
        stage2.setScene(scene2);
        stage2.sizeToScene();
        stage2.setX(100);
        stage2.setY(80);
        stage2.show();
  }
  public static void main(String[] args) {
        launch(args);
  }
}
```