

# **Scala for GUI**

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# About me

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**Using Scala**  
**for personal project**



# Scala for GUI? Really?

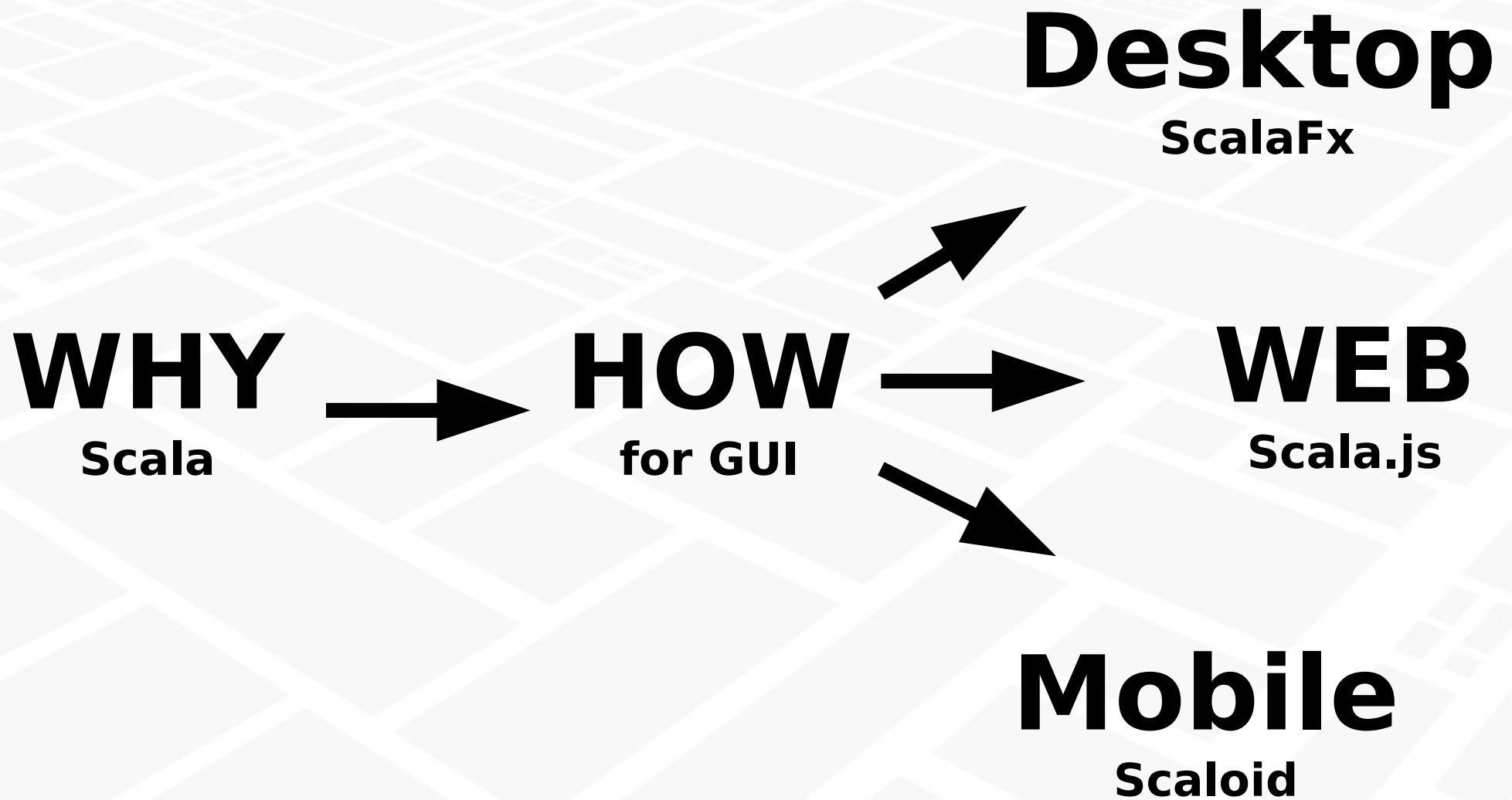
The screenshot shows a Typesafe blog page. At the top is a navigation bar with links for PRODUCTS, SUBSCRIPTION, RESOURCES, COMMUNITY, COMPANY, PARTNERS, and BLOG. Below the navigation bar, the page is dated 'BLOG / MARCH 5, 2015'. The main content area features a post by 'lwmasterson' from March 5, 2015, with tags for 'scala, apache, spark, kafka, samza, finagle'. The post title is 'Eight hot technologies that were built in Scala'. The post text discusses the Scala ecosystem and lists various technologies. On the right side of the post, there is a sidebar with a 'GET UPDATES' section containing 'All Blog Posts' and 'Blog RSS Feed', a 'Search Blog' input field, and a 'Filter By Tag' section with numerous tags such as 'bigdata', 'Training', 'activator', 'operations', 'BigData', 'MapReduce', 'ScalaIDE', 'ScalaDays', 'system', 'dbuild', 'methodologies', 'Partner', 'event-streaming', 'Scala', 'mapreduce', 'play', 'Spray', 'akka', 'takipi', 'Typesafe', 'IDE', 'tools', 'reactive', 'Scaladays', 'framework', 'samza', 'debug', 'finagle', and 'Slide'.

**GUI  
not listed**



<https://typesafe.com/blog/eight-hot-technologies-that-were-built-in-scala>

# You will learn



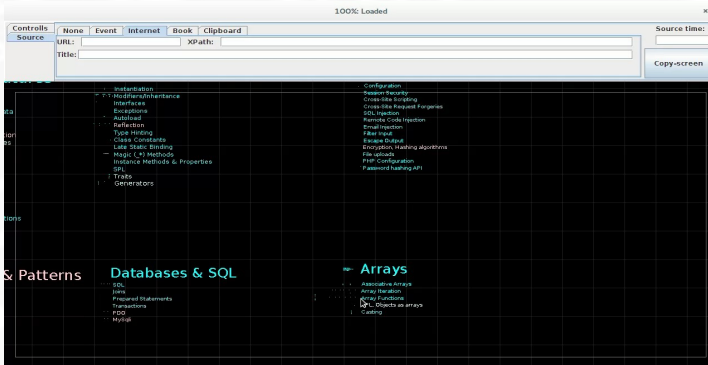
# Context: Knowledge management tool

The screenshot shows the Context knowledge management tool interface. At the top, a window title bar reads "100%: Loaded" with a close button. Below this is a control panel with tabs for "None", "Event", "Internet", "Book", and "Clipboard". The "Internet" tab is selected. The control panel includes input fields for "URL:" and "XPath:", a "Title:" field, and a "Source time:" field. A "Copy-screen" button is located on the right side of the control panel. The main content area is a dark grid with several knowledge nodes. On the left, there is a tree view of PHP-related topics including "Instantiation", "Modifiers/Inheritance", "Interfaces", "Exceptions", "Autoload", "Reflection", "Type Hinting", "Class Constants", "Late Static Binding", "Magic (\*) Methods", "Instance Methods & Properties", "SPL", "Traits", and "Generators". In the center, there are two large, light-colored nodes: "Databases & SQL" and "Arrays". The "Databases & SQL" node has sub-nodes for "SQL", "Joins", "Prepared Statements", "Transactions", "PDO", and "MySql". The "Arrays" node has sub-nodes for "Associative Arrays", "Array Iteration", "Array Functions", "SQL Objects as arrays", and "Casting".

# Context: When GUI matters

**GUI = Added value**

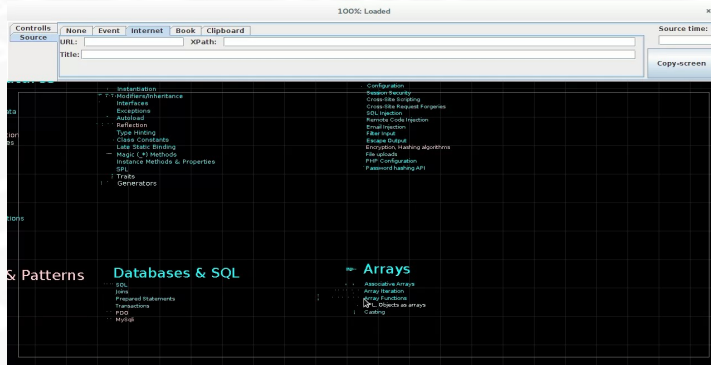
Prevent cognitive overhead  
Boost visual memory  
Faster perception



# Context: When GUI matters

**GUI = Added value**

Prevent cognitive overhead  
Boost visual memory  
Faster perception

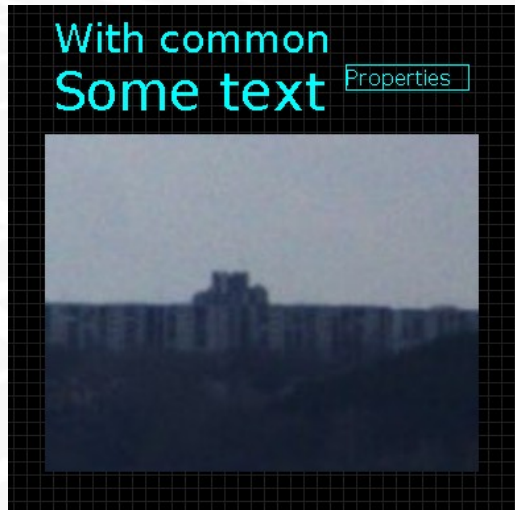


**Java 6 + Swing**  
Just get things done

**Personal use: more like prototype**



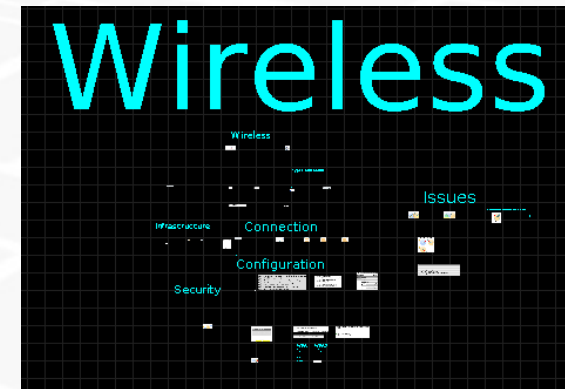
# WHY: Java → Scala



**Common**



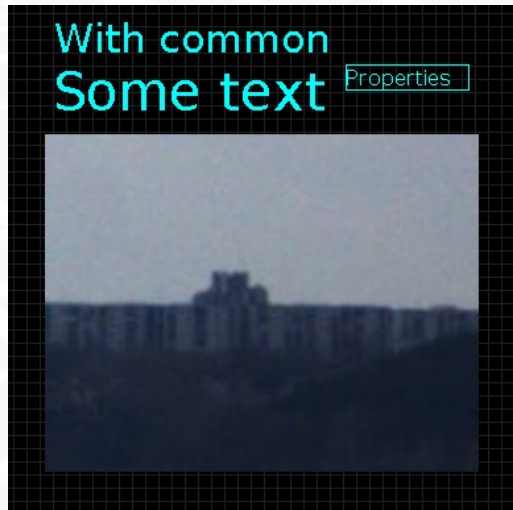
**Async**



**Zoom**



# WHY: Java → Scala



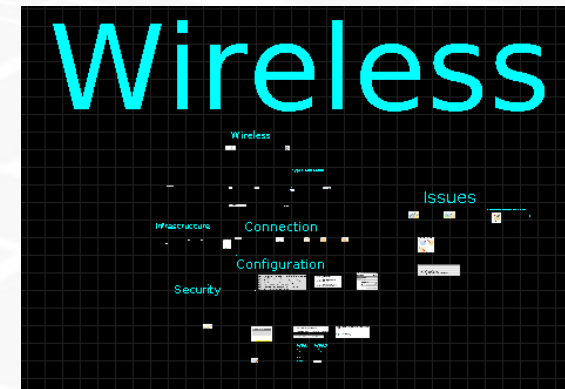
**Common**

**Traits**



**Async**

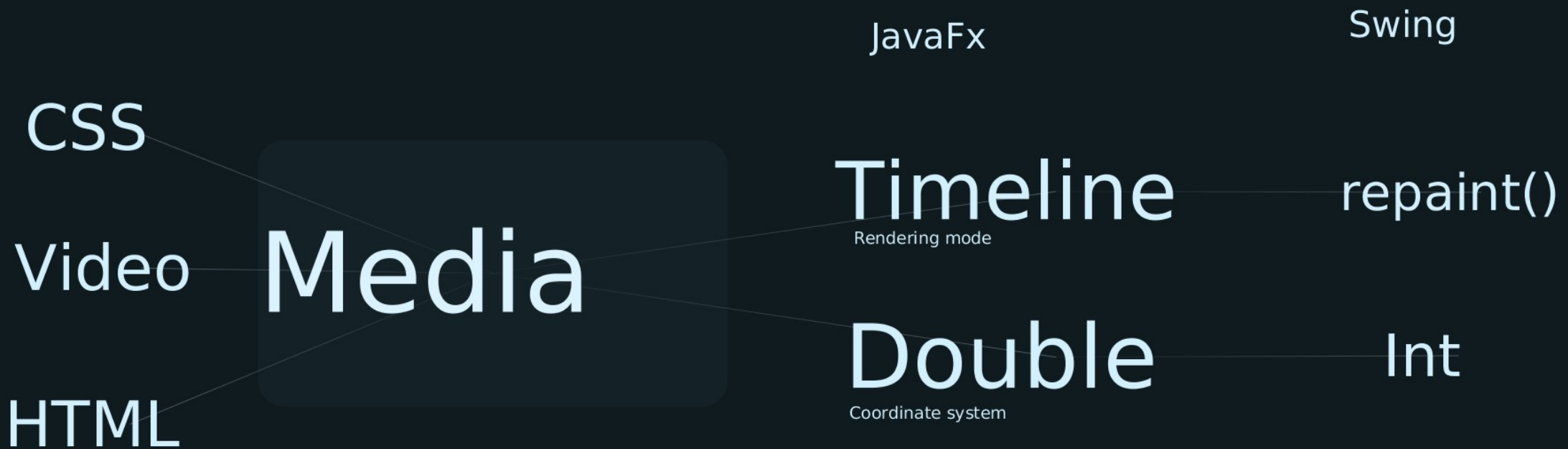
**Immutability**



**Zoom**

**@tailrec**

# WHY: Swing → JavaFx



# Context: JavaFx example

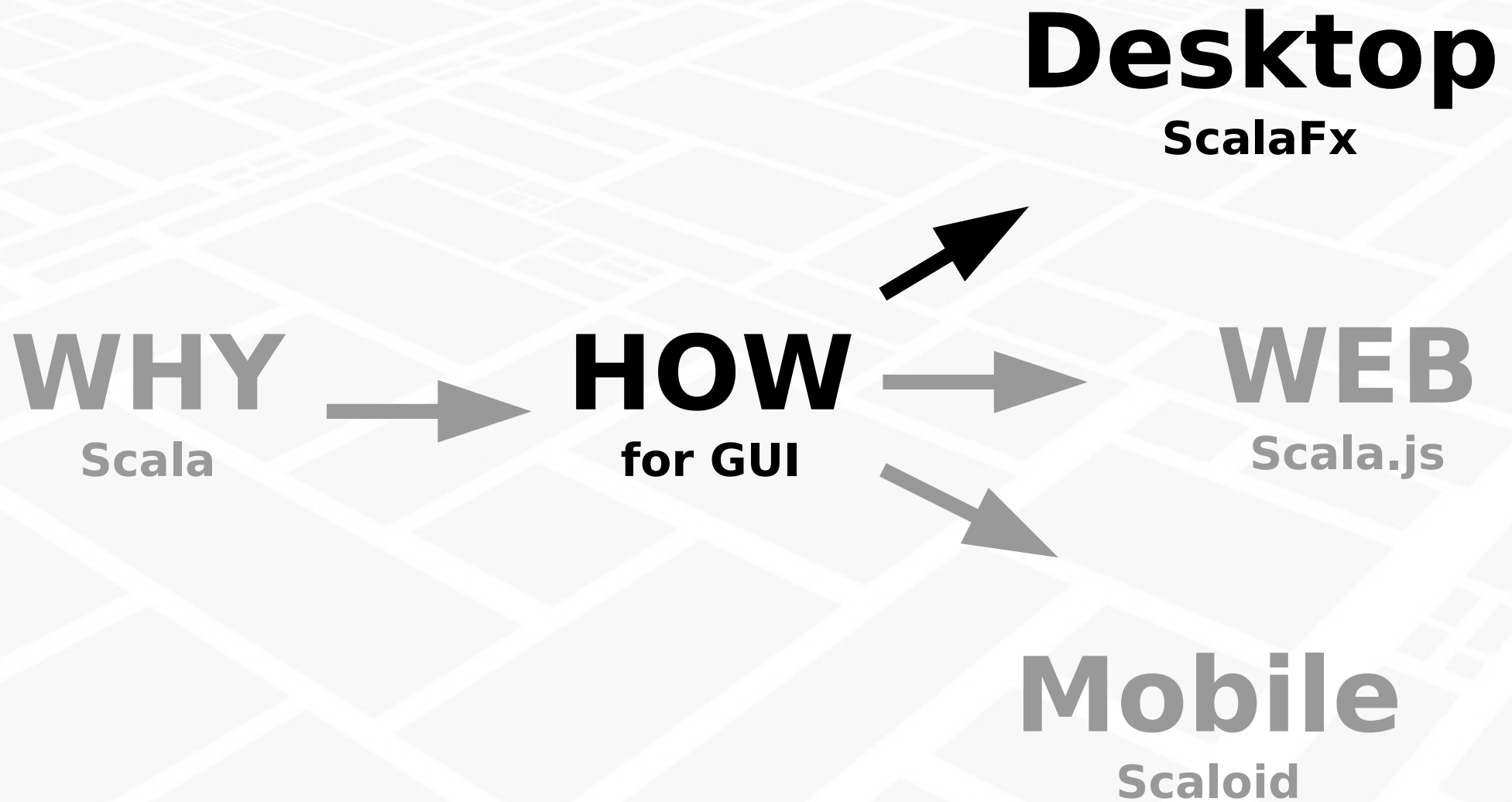


# HOW: JavaFx ↔ ScalaFx

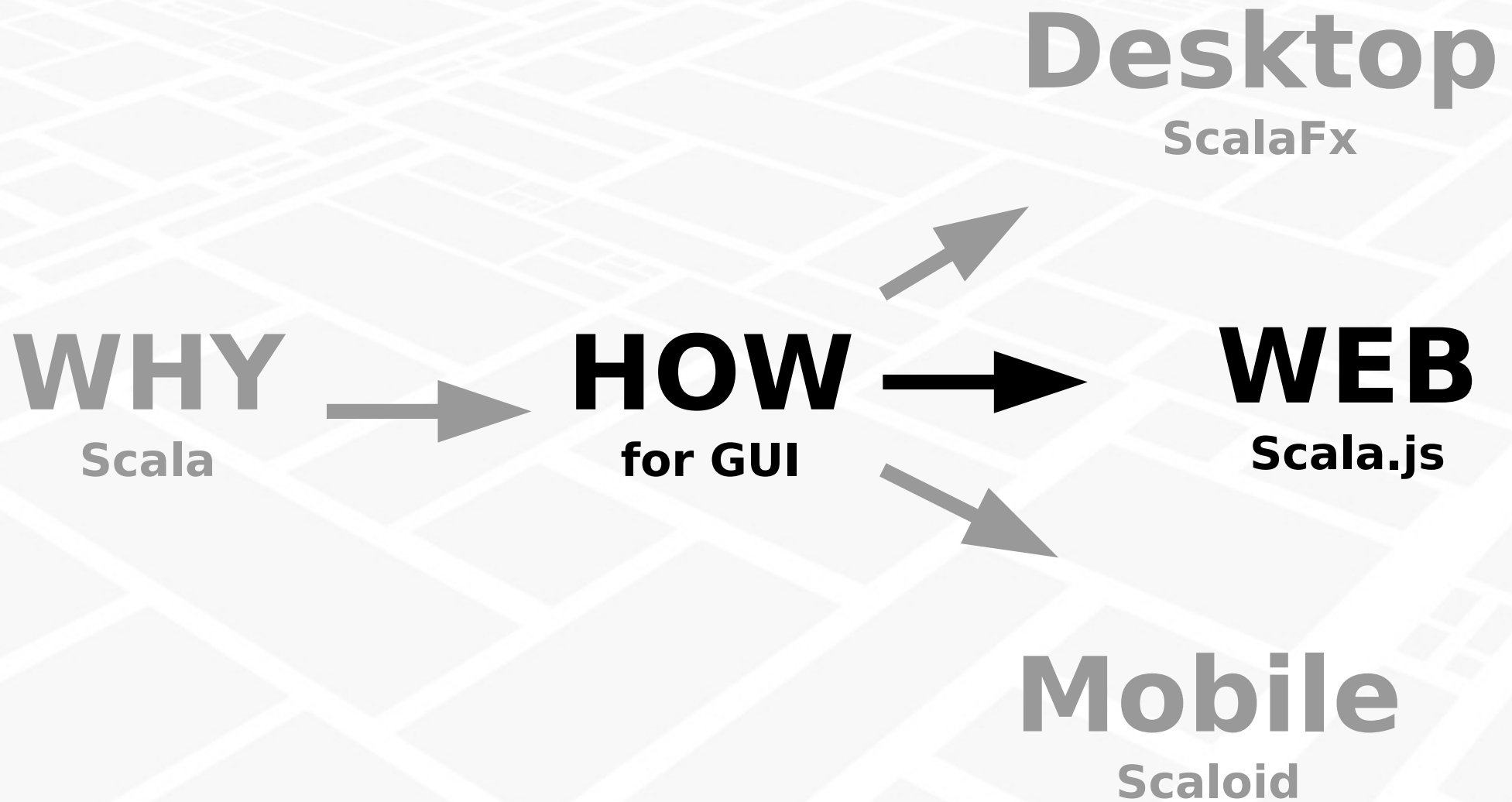
```
class Label(val _text: String)  
extends RichJPane  
with ViewableNode  
with Have0Operations  
with DragableNode[jp]  
with ZoomableNode[jp]  
with ScalableElement[jp]  
with Data  
with Transformable[Label]  
with EditableNode {  
  
class Image  
extends RichImageView  
with ViewableNode  
with Have0Operations ...
```

```
mousePressed += beginDrag  
mouseReleased += endDrag  
mouseDragged += {  
  (e: MouseEvent) =>  
    if (beingDragged) {  
      endDrag(e)  
      beginDrag(e)  
    }  
}
```

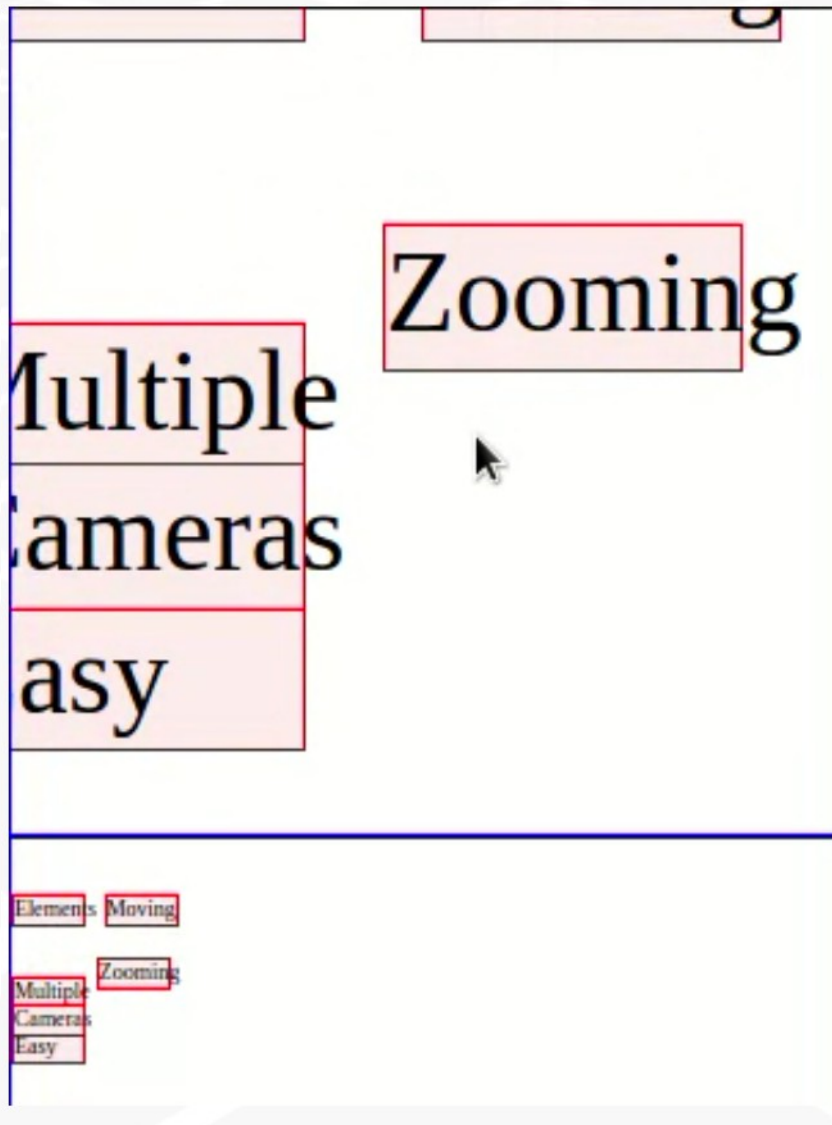
# HOW: Multi module project



# HOW: Multi module project



# HOW: Scala.js + React

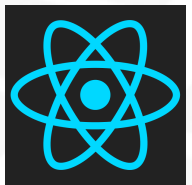


## Scala.js



Compile Scala → JavaScript  
Type safety for complex GUI  
Access to native JavaScript

## React

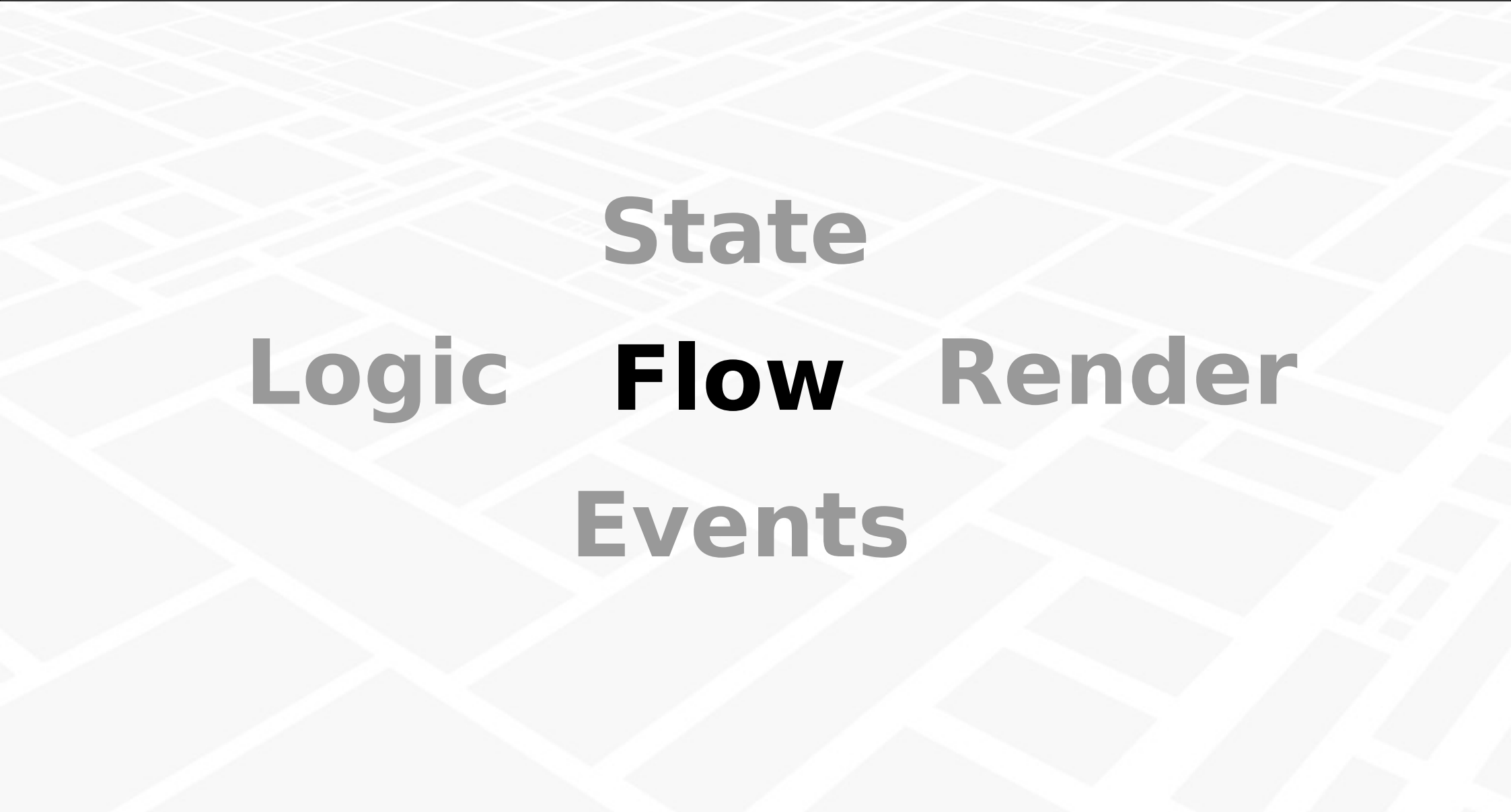


Forces immutability  
Direct data flow  
Virtual DOM

<https://github.com/japgolly/scalajs-react>



# HOW: Scala.js + React



**State**

**Logic**   **Flow**   **Render**

**Events**

# HOW: Scala.js + React

**State**

Logic Flow Render

Events

**Deeper  
structure**

```
case class State(camera: Camera) {  
  def inCamera(converter: Camera => Camera) =  
    copy(camera = converter(camera))  
}
```

**Immutable**

# HOW: Scala.js + React

State

Logic Flow Render

Events

```
.render { (P, S, B) =>
  <.span(
    P.element.text,
    ^.`class` := "draggable noselect",
    ^.`left` := (P.element.x - P.camera.x) / P.camera.scale,
    ^.`fontSize` := s"${1.0 / P.camera.scale}em",
    ^.`onMouseDown` ==> P.receive,
    ^.`onTouchStart` ==> P.receive,
  )
}
```

Parameters



Callbacks



# HOW: Scala.js + React

State

Logic Flow Render

Events

**Event  
propagation**

```
def beginDrag(e: PointerEvent): Unit =  
  preventDefault(e) {  
    selectedElement(e) match {  
      case Some(element) =>  
        elements.Dragging.begin(element, e)  
      case None =>  
        view.Dragging.begin(e)  
    }  
  }
```

```
def touch(reactEvent: ReactMouseEvent): Unit =  
  event(reactEvent) match {  
    case e: TouchStart if e.touchEvent.touches.length == 1 =>  
      preventDefault(reactEvent) {  
        elements.Dragging.begin(element, e.touchEvent.touches(0))  
      }  
  }
```

... **Different parameters**

# HOW: Scala.js + React

State

Logic Flow Render

Events

**All of same type**



```
def drag(event: ScreenPosition): T =  
  moveElement(event) andThen savePosition(event)
```

**Easy combine**

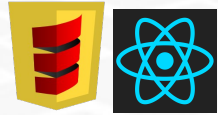


```
private def savePosition(position: ScreenPosition): T = {  
  State:State =>  
    state inSelected (_ inElements (  
      _ withPosition inCamera(state, position)  
    ))  
}
```

**Returns function**



# Rendering techniques



**State**

**Logic** **Flow** **Render**

**Events**

## Functional style

**Transformation based**

JavaFx

**Thread  
updates**

## Observers

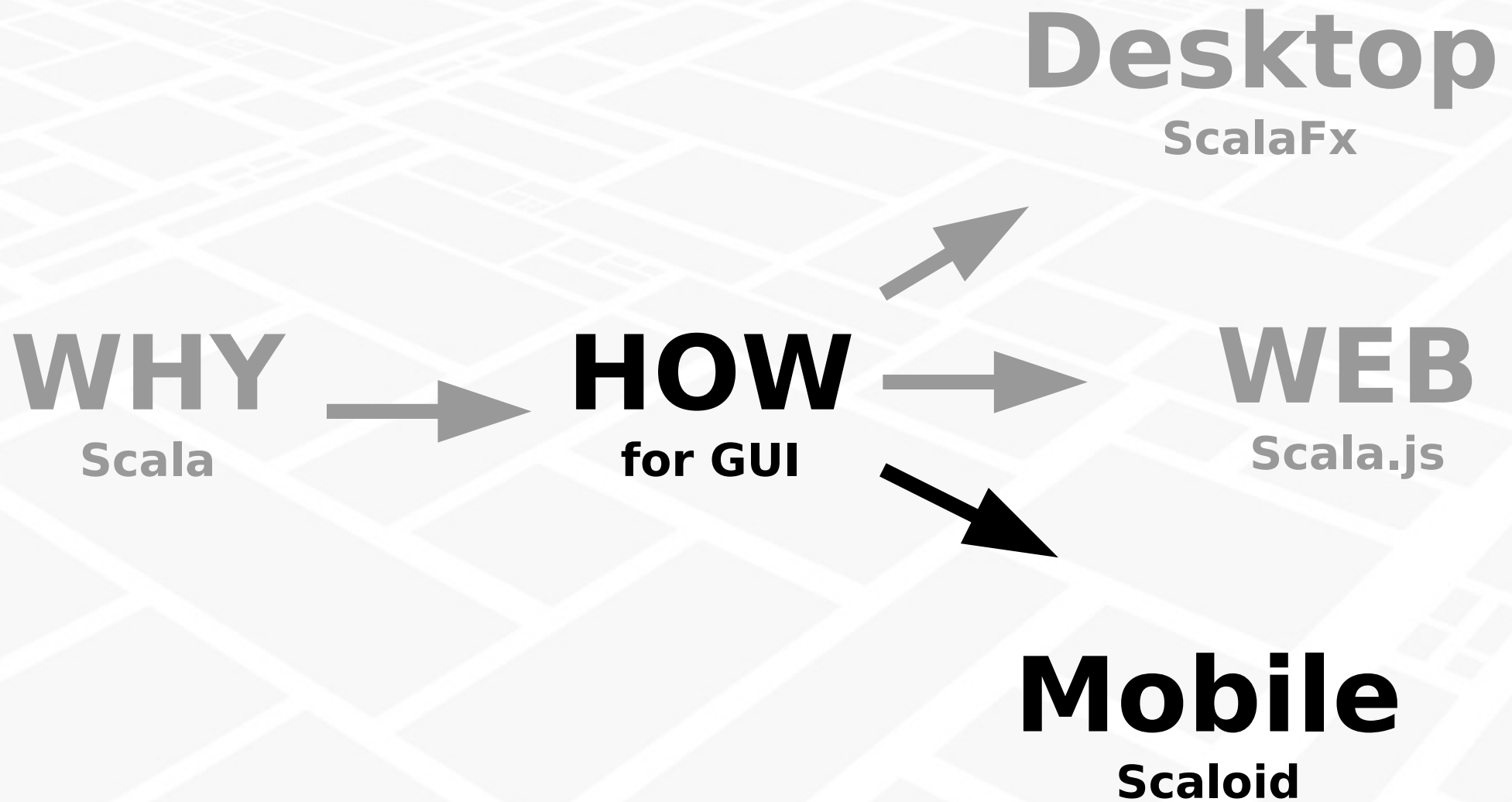
Swing

**Event  
dispatch**

## Force update

**From OS/callback**

# HOW: Multi module project



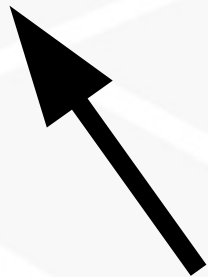


# Reuse in Multi module project

## Use tools

Scala.js

**crossProject**



Android

**scaloid**



**Not user-friendly**

**SBT vs IDEA**

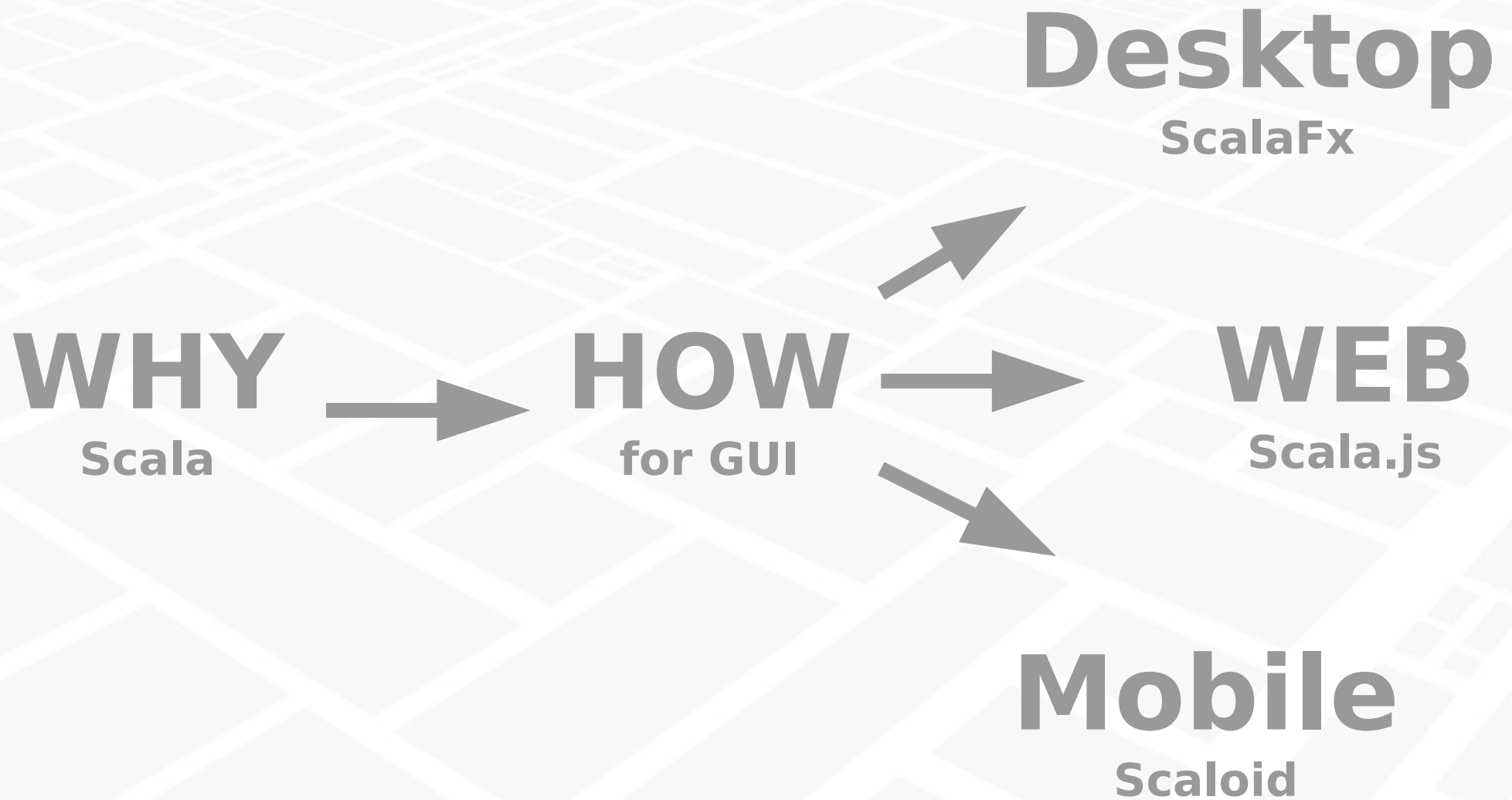
## Copy with symlinks



**Dirty, but works**

Code completion

# Questions?



# References and useful links

- <http://auginte.com/>
- <http://www.scala-lang.org/>
- <http://www.oracle.com/technetwork/java/javase/overview/javafx-overview-2158620.html>
- <https://github.com/scalafx/scalafx>
- <http://www.scala-js.org/>
- <https://github.com/japgolly/scalajs-react>
- <https://www.youtube.com/watch?v=KVZ-P-ZI6W4>
- <http://www.scala-js.org/doc/sbt/cross-building.html>