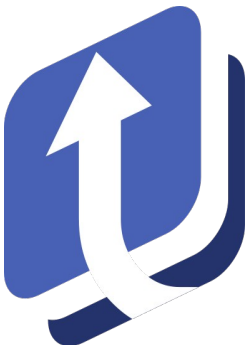
Buy a Feature Adventure in Immutability and Actors

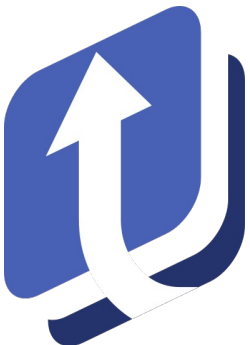
David Pollak

CUFP September 26th, 2008



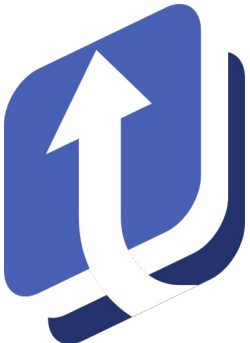
David Pollak

- Not strict, but pretty lazy
- Lead developer for *Lift* web framework
- Scala since November 2006, Ruby/Rails, Java/J2EE
- Spreadsheet junky (writing more than using)
- Paying work (all *Lift* based):
  - Enthiosys' Buy a Feature
  - SAP Community ESME project

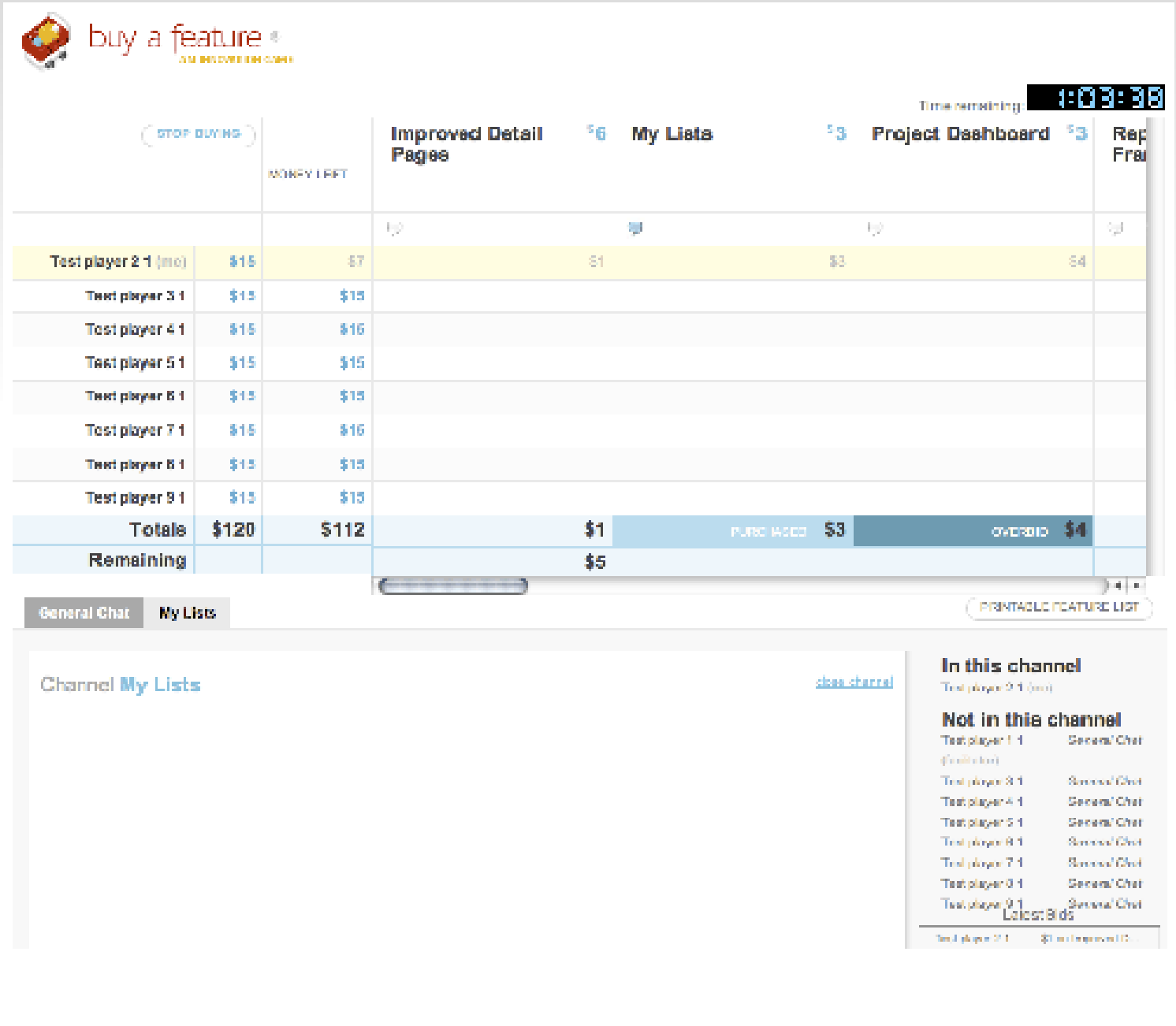


About Buy a Feature (online)

- The first of Enthiosys' online Innovation Games
- Serious Gaming for Agile Product Management
- Game Play:
  - Create a list of product features with estimated costs
  - 4-8 player buy features that they want
  - Motivate negotiations between players
  - Learn how players sell each other on features

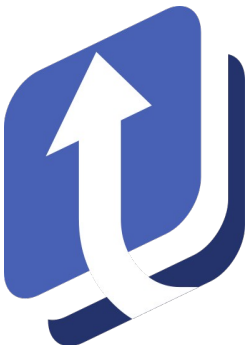


Buy a Feature



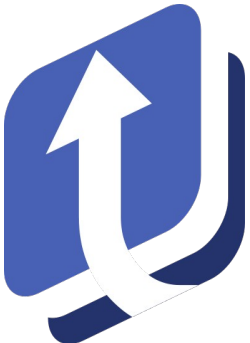
About Scala & *Lift*

- Scala
  - Hybrid OO & Functional Language
  - Compiles to Java Byte-Code and runs fast on JVM
  - Benefits similar to those of F#
  - FP concepts including Actors and Immutablity
- *Lift*
  - Concise, powerful web framework
  - Leverages Scala's functional features
  - Awesome Comet and AJAX support



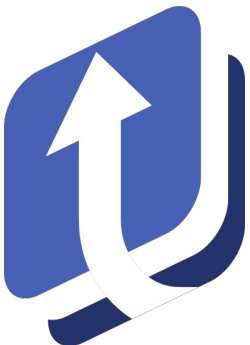
Buy a Feature Architecture

- *Lift* based Comet front-end
- UI state managed in *Lift* CometActors
- All user interaction via JSON messages/events
- Events sent to GameActor
- GameActor folds GameBoard and writes events
- GameActor sends GameBoard, etc. to CometActors



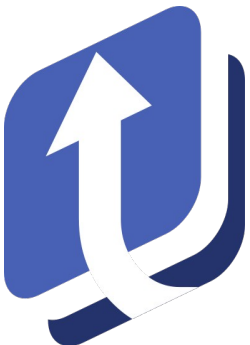
Actors – Why?

- Excellent concurrency management
- Event oriented
- Asynchronous
-
```
case EndGame =>
recordGameEnding()
this ! ChatMessage(Empty, timeNow,
                   "Game Ended", Empty, Empty)
eachListener(_ ! EndGame)
```



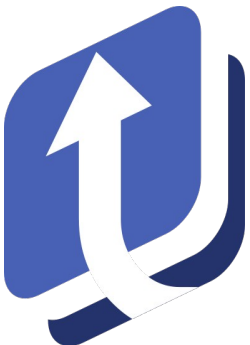
Actors – Where?

- UI
  - Pushes UI state changes out to browser
  - Listen for incoming events/messages
- Cross-session Game managers
  - Incoming events serialized
  - Incoming events → New State
  - New State → Listners (other Actors)



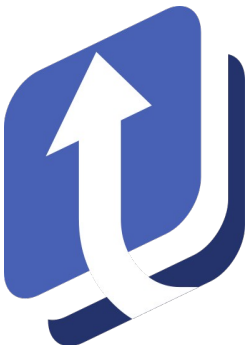
Events – Why?

- Anything that can change state is an Event
- Events are timestamped and persisted in RDBMS
- Events can be replayed through the system for TiVo style game replay and pausing
- Complementary to Actors



Events – Where?

- Broswer → Server (CometActor)
- CometActor → GameActor
- GameActor → RDBMS
- GameActor → Listners (mostly UI CometActor)
- CometActor → Browser

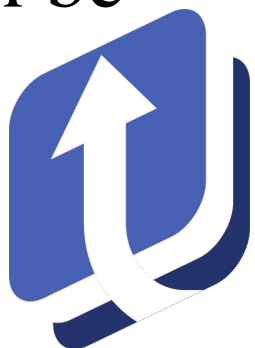


Post-Processing

- Game Events are recalled, in order from RDBMS
- Game Events are folded into GameBoard

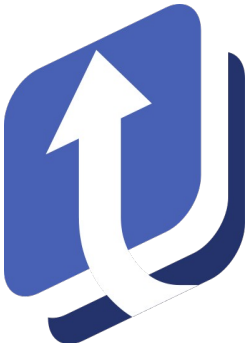
```
events.foldLeft(game.startingGameBoard){
  case (gb, (ev, (ft, bid))) =>
  gb.change(players(ev.theUser),
            gameInfo.features(ft),
            bid, ev.when)}
```

- GameBoard is queried for results
- GameBoard is immutable, so a separate copy can be associated with each Event
- Thus, there's a freeze-frame at each event



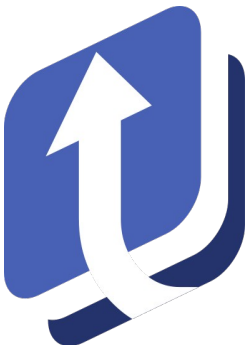
Defects

- *Lift* session bugs
  - Lots of stupid problems working around J2EE sessions
  - Why? I'm a moron
- Parsing
  - Users entering free text → lots of unexpected input
  - Most of our tests are here
- Post-processing
  - Didn't fold GameBoard, rolled my own, bad results
  - Too many GameBoards in memory



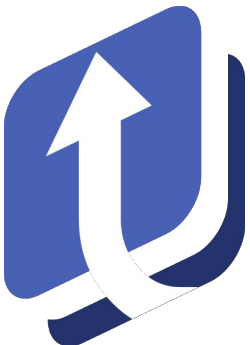
Initial Sell of Scala & Lift

- If you want me, you'll choose *Lift*
- 4 weeks of 'I could do this faster in Rails'
- Included client on SVN checkins and rants turned to questions (he's a Lisp and Smalltalk guy)
- Then the first code went live
- No questions since
- SAP's interest in Lift are validating this choice
- Allows for 'Exploration Driven Development'



Team Integration

- Disbelief over code size
- Attempts to dive below the abstractions
- Java-like coding on the road to functional
- Eventual adoption of map, fold, and filter
- NPE: Thing of the past
- Lack of tool support and examples in the wild are speed bumps, especially with existing code
- Need a team mentor to help with transition



Conclusion

- Amazing productivity for people once up FP curve
- Very low defect rate
- None of the defects were concurrency related!!
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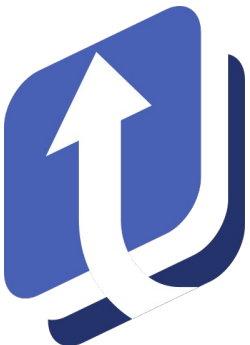
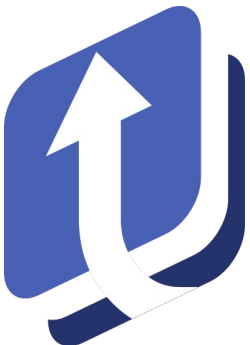
- Very flexible system (added Flash front end in a day)



End
http://buyafeature.com

- Questions?

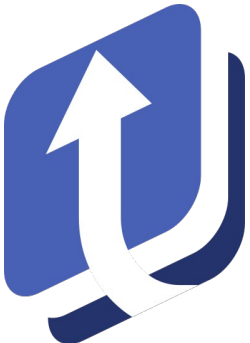


Scala: Functions are Objects

- Objects can be passed as parameters
- Functions are syntactically easy to create

```
var name = “”
SHtml.text(name, name = _)
```

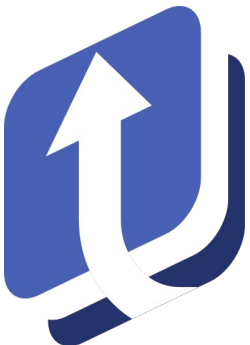
- They bind to variables/values (e.g. name)



Partial Functions

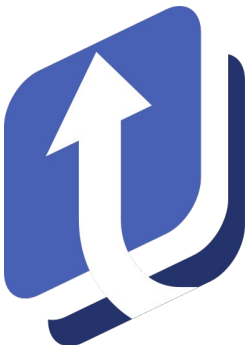
- `PartialFunction[A,B] extends Function1[A,B]`
- isDefinedAt(x: A)
- Better known as pattern matching:

```
{
  case Foo(bar) => bar
  case Baz(dog) => dog
}
```



Composing Partial Function

```
{ case Foo(bar) => bar
  case Baz(dog) => dog
} orElse { // compose
  case Moo(cow) => cow
  case Meow(cat) => cat
}
```



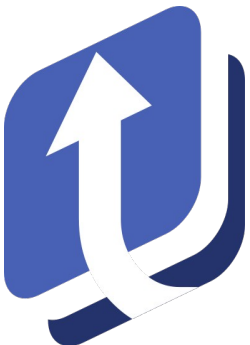
Extractors and Guards

- Extract data while matching other parts in a pattern:

```
{ case “Foo” :: id :: Nil => doIt(id) }
```

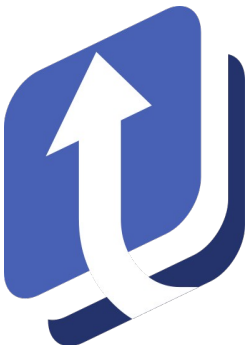
- Guards:

```
{ case “Foo” :: id :: Nil
  if isValid(id) && loggedIn_? =>
  doIt(id) }
```



Remembering Functions

- Functions are Objects
- `Map[String, String => XML]`
- `Map[String, PartialFunction[String, XML]]`
- `GET /ajax?OPAQUE_ID=someValue`
- `Map[OPAQUE_ID](someValue)`

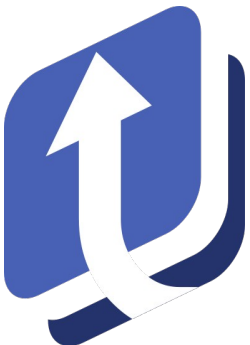


XML literals and manipulation

- In Scala, XML is like String: supported at the language level and immutable

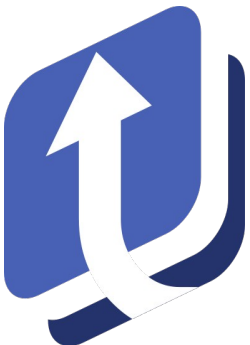
```
<foo>{(1 to 10).
      map(i => <val>{i}</val>)}</foo>
```

-
```
(xml \ “val”).map(_.text.toInt).
  .foldLeft(0)(_ + _) == 55
```



Actors and Partial Functions

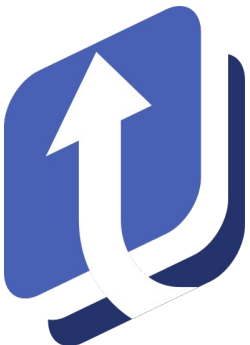
- Threadless, stackless units of execution
- React to events and otherwise consume nothing but memory
- ```
  react(PartialFunction[Any, Any]) →
  react {case Foo(bar) => doSomething(bar)
          case Baz(dog) =>
  doElse(dog) }
  ```
- ```
  react(primaryHndlr orElse
  secondaryHndler)
  ```



Lift REST APIs

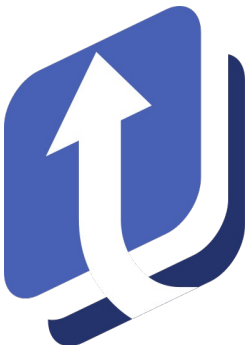
- ```
  LiftRules.addDispatchBefore {
  case RequestMatcher(
     RequestState(
        "showstates":: xs, _),_) =>

  XmlServer.showStates(xs) }
  ```
- ```
  def showStates(...) = XmlResponse(
  <states renderedAt={timeNow.toString}>
  ... </states>)
  ```



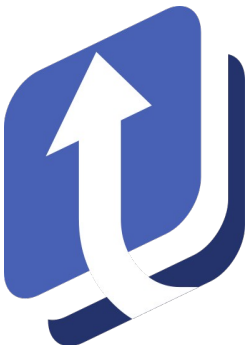
Lift and HTML forms

- `var name = “”`
- `text(name, name = _)`
- `def setLocale(loc: String) ...`
- `select(Locale.getAvailableLocales.toList`
  `.`
  `map(lo => (lo.toString,`
  `lo.getDisplayName)),`
  `setLocale)`



Lift & AJAX

- AJAX elements are bound to functions:
- ```
  a(() => {cnt = cnt + 1;
  SetHtml("cnt_id", Text( cnt.toString))},
  “click me”)
  ```
- ```
  ajaxSelect(opts,
      v => DisplayMessage("You selected "+v))
  ```



Lift CometActors

- *Lift* deals with all the plumbing:

```
def render = bind("time" -> timeSpan)
override def lowPriority = {
    case Tick => reRender(false)
}
```