Scala Clinic

Scala Standard Libary

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Intro to the Scala Library

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What's covered by the Scala Library?

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- Collections

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  - Immutable

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- Testing

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- Streams

Collections

Type	Immutable	Mutable	Parallel
Arrays		✓	✓
Buffers		✓	✓
Lists	✓	✓	✓
Stacks	✓	✓	✓
Vectors	✓	✓	✓
Sets	✓	✓	✓
BitSets	✓	✓	✓
Maps	✓	✓	✓
Queues	✓	✓	✓
Ranges	✓		✓
Streams	✓		✓

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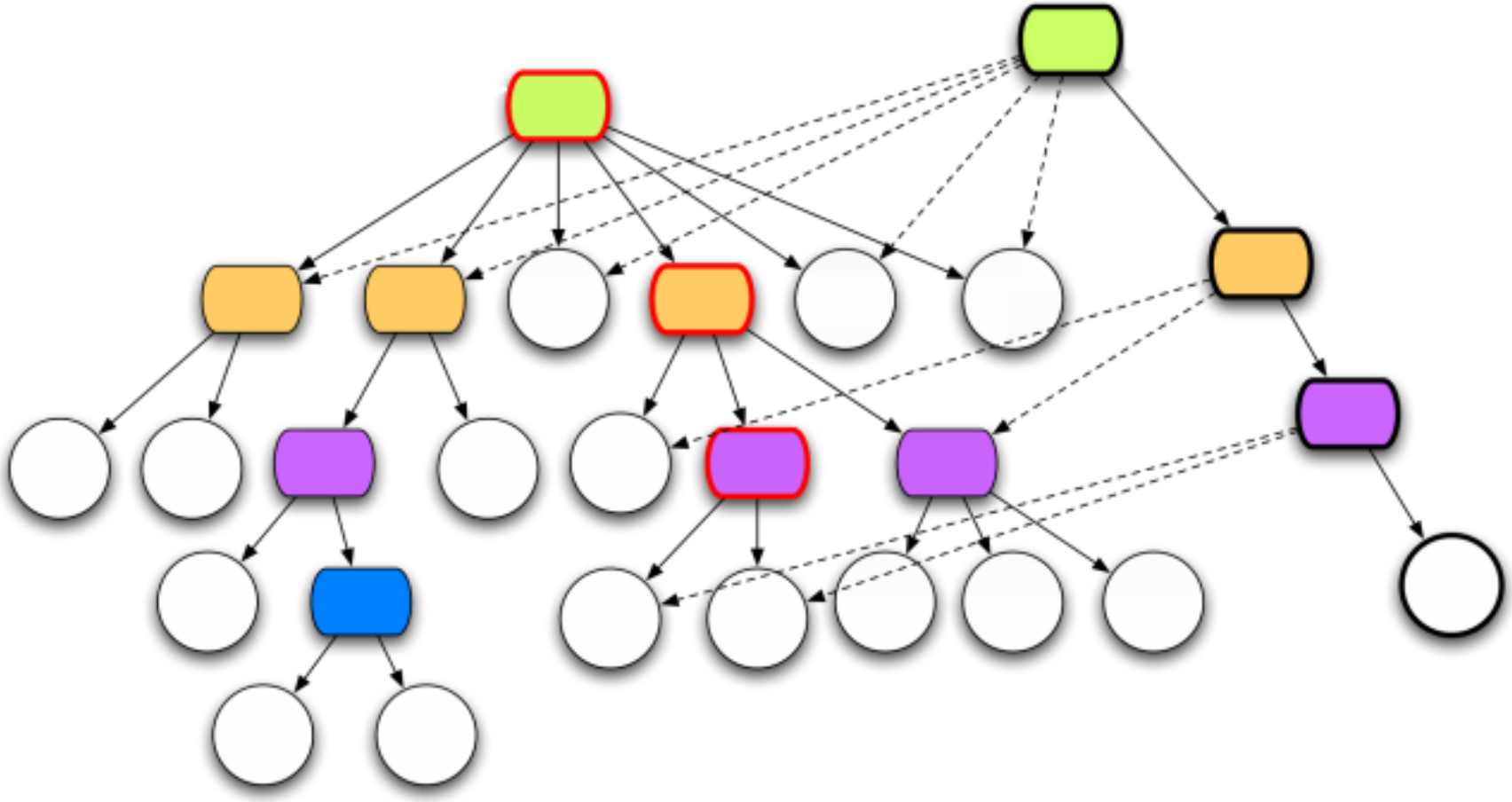
    - *No locks!*

Collections: Immutable

Structural Sharing



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  - `flatMap`
  - `foreach`
  - `filter`
  - `reduce`

Collections: Demo

Demo Collections

XML

XML Literals!

Example: *XML in your code*

```
val foo = <div>
            <span>This is some XML</span>
          </div>
// foo:scala.xml.Elem
```

XML

XML Literals!

Example: *XML producing functions*

```
def foo(x:String) = <div>
                      <span>{x}</span>
                    </div>
// foo:String => scala.xml.Elem
```

XML

XML Literals!

Example: *XML element splicing*

```
import scala.xml.Elem
def foo(x:Elem) = <div>
                    <span>{x}</span>
                  </div>
// foo:scala.xml.Elem => scala.xml.Elem
```

XML

XML Literals!

Example: *Generalized XML splicing*

```
import scala.xml.NodeSeq
def foo(x:NodeSeq) = <div>
                       <span>{x}</span>
                     </div>
// foo:scala.xml.NodeSeq => scala.xml.Elem
```

XML

XML Literals!

Example: *Pattern Matching*

```
import scala.xml.Elem

def foo(x:Elem):String = (x match {
    case <div>{y}</div> => y
    case <span>{y}</span> => y
    case <script>{y}</script> => y
    case _ => "Unhandled case"
  }).toString
```

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- EPFL/TypeSafe actively looking to overhaul XML support in the language and standard libraries at some point.
  - Perhaps with the forthcoming quasi-quoting and macro systems.
- Of course there's other library stuff like functions for manipulating/querying XML documents.
- Of course you can use any other Java or Scala library to working with XML (Anti-XML is *very* good http://anti-xml.org/), but they will not *natively* work with the Scala XML types.

Parsing

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- Can define parsers directly in Scala without using external tools like *Antlr* http://www.antlr.org/

Parsing

Parsing Combinators

Example: *Simple parser*

```
import scala.util.parsing.combinator.syntactical._
import scala.util.parsing.combinator.{PackratParsers,RegexParsers}

class ExpressionParser extends RegexParsers with PackratParsers {
  val ws = "\\s*".r ^^ {_ => ()}
  val number = ws ~> "-?\\d+".r ^^ {x => x}
  val termOp = ws ~> "\\+|-".r ^^ {
    case "+" => "ADD"
    case "-" => "SUBTRACT"
  }
  val prodOp = ws ~> "\\*|/".r ^^ {
    case "*" => "MULT"
    case "/" => "DIVIDE"
  }
  def exp:Parser[String] = number ~ prodOp ~ exp <~ ws ^^ {case l ~ op
~ r => "%s(%s,%s)".format(op,l,r)} | number
  def term:Parser[String] = exp ~ termOp ~ term <~ ws ^^ {case l ~ op ~
r => "%s(%s,%s)".format(op,l,r)} | exp
  def test(s:String) {
    println(parseAll(term,s))
  }
}
```

Parsing: Demo

Demo Parsing Combinators

Actors

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  - Does support local and remote actors
  - Akka provides a much more robust actor implementation.
  - Scalaz also has a nice (local only) actor implementation that is also type-safe.

Actors

Ping-Pong

Example: *Messages*

```
case object Ping
case object Pong
case object Stop
```

Actors

Ping-Pong

Example: *Ponger*

```
class Ponger(count:Int,pinger:Actor) extends Actor {
  def act() {
    var c = count
    var continue = true
    while (continue) {
      receive {
        case Ping =>
          println("PING: %d".format(c))
          sleep(1000)
          c -= 1
          if (c > 0) pinger ! Pong
          else {
            pinger ! Stop
            continue = false
          }

      }
    }
  }
}
```

Actors

Ping-Pong

Example: *Pinger*

```
class Pinger extends Actor {
  def act() {
    var continue = true
    while (continue) {
      receive {
        case Pong =>
          println("PONG")
          sleep(1000)
          sender ! Ping
        case Stop =>
          println("Stopping")
          continue = false
      }
    }
  }
}
```

Actors

Ping-Pong

Example: *Runner*

```
object Runner {
  def run {
    val pinger:Actor = (new Pinger()).start()
    val ponger:Actor = (new Ponger(10,pinger)).start()
    ponger ! Ping
  }
}
```

Actors: Demo

Demo Actors

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  - Fair to say that many of them will be replaced by higher-performing versions coming from Akka
- The most ubiquitous concurrency mechanism in Scala is the *Future*

Concurrency: Futures

- A *Future* represents an asynchronous computation that will eventually yield a value

Concurrency: Futures

- A *Future* represents an asynchronous computation that will eventually yield a value
- *Futures* can have a variety of execution strategies

Futures

Delayed Execution

Example: *Bad way*

```
import scala.actors.Futures._
import java.lang.Thread._

object TehFutureWoooo {
  def testBad {
    val x = future {
      sleep(1000)
      5
    }
    println("Before")
    println(x())
    println("After")
  }
}
```

Futures

Monadic composition

Example: *Good way*

```
import scala.Responder
import scala.actors.{Future,Futures}, Futures._
import java.lang.Thread._

object TehFutureWoooo {
  def testGood:Responder[Int] = {
    val x = future {
      sleep(1000)
      5
    }
    println("Before")
    for (i <- x) yield {
      println("Inside: %d".format(i))
      i + 1
    }
  }
  def runner =
    for (i <- testGood) {
      println("After: %d".format(i))
    }

}
```

Futures: Demo

Demo Futures

Process Management

- Stole all the goodies from SBT

Process Management: Demo

Demo Process Management

Process Management

Shell interaction

Example:

```
import scala.sys.process.{Process,ProcessIO}
object Lister {
  val ls = Process("ls")
  val pio = new ProcessIO(_ => (),
                          stdout => scala.io.Source.fromInputStream(stdout)
                               .getLines.foreach(println),
                             _ => ())
  def runner {
    ls.run(pio)
  }
}
```

Swing

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- Provides nice wrappers for this library

Testing

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- Bare minimum benchmarking tool
- Several very robust Scala-oriented testing frameworks
- Can also use Java testing frameworks

Testing

Simple test

Example:

```
import scala.testing.Show

class Foo {
  def foo(i:Int):Int = i+1
}

object TestRunner extends Show {
  val f = new Foo
  def testFoo(i:Int):Int = f.foo(i)
  def tester {
    println(test('testFoo,5))
  }
}
```

Testing: Demo

Demo Testing