JDevDay - Introduction to Scala

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Outline

1. Introduction to Scala
2. Setting up Scala
3. Absolute Scala basics
4. Functional Paradigm in Scala
5. Object Oriented Programming in Scala
6. Where to learn more Scala

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What is Scala?

What is Scala? The name Scala stands for "scalable language". The language is so named because it was designed to grow with the demands of its users.

- What makes Scala a Scalable Language ?
  - Statically typed language with OOP + FP both.
  - Fast and expressive, and peasant to use.
  - Excellent type inference.
  - Runs on JVM.
- Whats more?
  - Scala is compatible with Java
  - Scala is concise
  - Scala is high level
  - Scala is statically typed (vs dynamically typed)

What can you do with Scala today?

- Write web applications
  - Play Web Framework http://www.playframework.com/
  - Lift Web Framework http://liftweb.net/
- Write code that scales to huge amounts of data
  - Spark Project http://spark-project.org/
  - Scalding https://github.com/twitter/scalding
- Process huge number of concurrent tasks
  - Akka http://akka.io/
- Natural Language Processing and Machine Learning
  - ScalaNLP http://www.scalanlp.org/
- And anything could do in Java, now more concisely :-)

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Install the Scala Complier

- yum install scala

Install your faviourite Editor / IDE

- yum install emacs
- OR install Eclipse (ScalaIDE)

Scala compiler is

- scalac (just like javac command)
- scala (just like java command)
- fsc (fast scala compiler)

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Hello Scala World

helloworld.scala

```
object HelloWorld {
  def main(args: Array[String]) = {
    println("Hello Scala World!")
  }
}
```

Compile and run Hello Scala World

Output

```
$ scalac helloworld.scala
$ ls
helloworld.scala
HelloWorld.class
HelloWorld$.class
$ scala HelloWorld
Hello Scala World!
```

Values and Variables

- An example in Ruby (or maybe Python) a dynamically typed language
  - counter = Counter.new
  - counter = AtomicCounter.new
  - counter = File.new # this works here!
- Scala's static type system, avoids runtime overhead of dynamic types. The method dispatch is fast in a statically typed language.
  - var counter = new Counter()
  - counter = new AtomicCounter() // this has to be a Counter
  - counter = new File() // this doesn't work in Scala

Data Types

- Almost everything is same as Java
- Basic Data Types: (all integers are signed two's complement)
  - Integers: **Byte** (8bit), **Short** (16bit), **Int** (32bit), **Long** (64bit)
  - **Char** (16 bit unicode character), **String** (squence of Chars)
  - Reals: **Float** (32bit), **Double** (64bit)
  - **Boolean**: true / false
- Literal
  - basic data types i.e. 1, 0.123, 12L, 'a', "String"
  - symbol literal: 'identifier

More Concepts

- Data Containers
  - Array
  - List
  - Set
  - Map
  - Tuple
- Programming Abstraction Tools
  - Class
  - Object
  - Scala App
  - Package

Expressions

- Every thing is an expression
  - Basic expression: 1+2
  - An assignment is an expression
  - A function is an expression

Control Constructs

- if-else
- while
- do-while
- for
- match-case
- try-catch-finally

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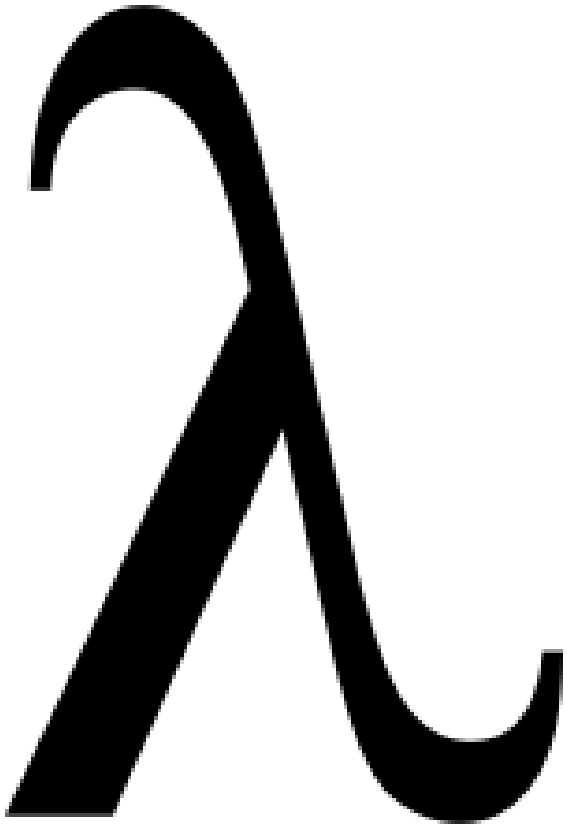
Matematical Logic

- Lambda Calculus (see Wikipedia)



Factorial Function

- Expressed as mathematical logic

$$n! = \begin{cases} 1 & \text{if } n = 0, \\ (n-1)! \times n & \text{if } n > 0. \end{cases}$$

FP is guided by two main ideas:

- Functions are **fist-class values**
- Functions have **no side effects** i.e. they can be replaced with their values

Hallmarks of Functional Programming

- mapping
- filtering
- folding
- reducing

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Object Oriented

- Decompose the problem into entities and interactions among entities
- Each entity and their interaction is represented using class/object
  - internal state is the member variables
  - interactions are the member functions

Functions

factorial.scala

```
def factorial(n:Int): Int =
  if(n<=0) 1 else n*factorial(n-1)
```

- Placeholder syntax
- Partially applied functions
- Closures

Traits

traits.scala

```
trait PartTime {
  // trait definition
}
```

Classes

classes.scala

```
class Employee(name: String, age: Int) {
  override def toString = name + ", " + age
}
class Supervisor(name: String, age: Int
  ) extends Employee(name, age) with PartTime
  {
  override def toString = name + ", " + age
}
```

Objects

objects.scala

```
object Employee {
  override def toString = name + ", " + age
}
```

Packages

package-example.scala

```
package in.tuxdna.scala
class Employee(name: String, age: Int) {
  override def toString = name + ", " + age
}

object Main extends App {
  val emp1 = new Employee("Tom", 21)
  println("Employee 1: "+emp1)
}
// $ scalac pacakge-example.scala
// Employee 1: Tom, 21
```

Features to be convered later

- XML Processing
- Actors
- Case Classes
- Properties
- Extistential Types
- Implicits
- Lazy Evaluation
- Parser Combinations
- Monads
- Annotations

Using Scala as a scripting language

- scala scriptname.scala

employee.scala

```
class Employee(name: String, age: Int) {
  override def toString = name + ", " + age
}

val emp1 = new Employee("Tom", 21)
println("Employee 1: "+emp1)

// $ scala employee.scala
// Employee 1: Tom, 21
```

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Books

- **Scala for the Impatient** (free) http://blog.typesafe.com/free-pdf-from-typesafe-scala-for-the-impatien-64715
- **Programming Scala** (free) http://ofps.oreilly.com/titles/9780596155957
- **Programming in Scala 2nd Ed.** http://www.amazon.com/Programming-Scala-Comprehensive-Step-Step/dp/0981531644
- **Functional Programming Principles in Scala** (free online course)
  - https://www.coursera.org/course/progfun
- Blogs
- Forums

Questions?

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Thank you!

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