Programming in Scala

TECH Talk

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Agenda

1. About Scala
2. Scala performance
3. Developer tools for Scala
4. Basic objects
5. Control structures
6. Functions and closures
7. Classes, continued
8. Collections
9. XML

About Scala

- Scala - Scalable language
- Designed in 2001 by Martin Odesrky, EPFL
- First release in late 2003

- Object-oriented language
- Functional language (currying, pattern matching, algebraic data types, lazy evaluation, immutability, etc.)
- Scripting language
- Statically typed

Why Scala

- Runs on JVM (.NET support dropped in 2012)
- Fully interoperable with Java & its libraries
- Offers lots of syntactic sugars
- Reactive programming: Event-driven, Scalable, Resilient, Responsive
- ...

Scala performance

Benchmark	wc -l	Factor
C++ Dbg/Opt	850	1.3x
Java	1068	1.6x
Java Pro	1240	1.9x
Scala	658	1.0x
Scala Pro	297	0.5x
Go	902	1.4x
Go Pro	786	1.2x

Figure : Number of lines of code.

Robert Hundt (2011), Loop Recognition in C++/Java/Go/Scala

Scala performance

Benchmark	Binary or Jar [Byte]	Factor
C++ Dbg	592892	45x
C++ Opt	41507	3.1x
Java	13215	1.0x
Java Pro	21047	1.6x
Scala	48183	3.6x
Scala Pro	36863	2.8x
Go	1249101	94x
Go Pro	1212100	92x

Figure : Size of compiled binaries.

Robert Hundt (2011), Loop Recognition in C++/Java/Go/Scala

Scala performance

Benchmark	Compile Time	Factor
C++ Dbg	3.9	6.5x
C++ Opt	3.0	5.0x
Java	3.1	5.2x
Java Pro	3.0	5.0x
Scala scalac	13.9	23.1x
Scala fsc	3.8	6.3x
Scala Pro scalac	11.3	18.8x
Scala Pro fsc	3.5	5.8x
Go	1.2	2.0x
Go Pro	0.6	1.0x

Figure : Time to compile the program.

Robert Hundt (2011), Loop Recognition in C++/Java/Go/Scala

Scala performance

Benchmark	Virt	Real	Factor Virt	Factor Real
C++ Opt	184m	163m	1.0	1.0
C++ Dbg	474m	452m	2.6-3.0	2.8
Java	1109m	617m	6.0	3.7
Scala	1111m	293m	6.0	1.8
Go	16.2g	501m	90	3.1

Figure : Memory footprint.

Robert Hundt (2011), Loop Recognition in C++/Java/Go/Scala

Scala performance

Benchmark	Time [sec]	Factor
C++ Opt	23	1.0x
C++ Dbg	197	8.6x
Java 64-bit	134	5.8x
Java 32-bit	290	12.6x
Java 32-bit GC*	106	4.6x
Java 32-bit SPEC GC	89	3.7x
Scala	82	3.6x
Scala low-level*	67	2.9x
Scala low-level GC*	58	2.5x
Go 6g	161	7.0x
Go Pro*	126	5.5x

Figure : Runtime benchmark.

Robert Hundt (2011), Loop Recognition in C++/Java/Go/Scala

IDEs & REPL

- Scaladoc
- IntelliJIDEA plugin
- Eclipse plugin
- REPL (Read-Eval-Print-Loop)
- SBT (Simple Build Tool)

Console Hands-on

Basic objects

1. *Rational* class
2. Override
3. String formatting
4. Preconditions
5. Try-catch block
6. Auxiliary constructors
7. Fields
8. Methods
9. Implicit conversions

Hands-on

Control structures

1. If
2. For (nested loops, filters)
3. While
4. Break, Continues

Hands-on

Functions and closures

1. Functions are first class
2. Functions are objects
3. Default parameter values
4. Partially applied functions
5. Higher order functions
6. Currying

Hands-on

Classes

1. Trait
2. Abstract class
3. Linearization, mix in, hierarchy
4. Case classes
5. Pattern matching

Hands-on

Collections

1. Mutable, Immutable
2. Array, List, Set, Map
3. Option class
4. Functions: sliding, foldLeft, foldRight, dropWhile, filter, mkString, etc.
5. JavaConversions

Hands-on

XML

Hands-on

References

- Coursera class: Functional programming in Scala
- Programming in Scala: A Comprehensive Step-by-Step Guide, 2nd Edition by Martin Odersky
- Scala in Action by Nilanjan Raychaudhuri (Apr 10, 2013)
- Scala for the Impatient by Cay S. Horstmann (Mar 16, 2012)


Questions
Answers