Bootstrapping Groovy

Prashanth Babu / @P7h

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Navigate with space or → and ↓ or PgDown or swipe and hit Esc for a bird's-eye view of presentation.

Jeremy Kahn
@jeremyckahn

Protip: Nobody is really "qualified" to give tech talks. We're all exploring and figuring it out. Just share what you've learned.

1,034 RETWEETS **427** FAVORITES

9:45 AM - 11 Apr 13

What's on the menu?

- Plan
- Groovy installation and env setup
- Commands to execute Groovy
- Introduction to Groovy
- Groovy unique features [Java comparison]
- Closures
- Lists
- Ranges
- Maps
- Input Output
- Building and parsing XML or JSON
- Metaprogramming
- References

Plan

- Bird's eye view of Groovy
- Introduce few concepts
- Give sample code
- Do some exercises
- Explore this presentation yourself

Nothing is taught until something is learned.

About these slides

You can get to these slides at http://P7h.github.io/Groovy.
You can get the matching source code at
http://gist.github.com/P7h.

Plan

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Download Groovy

- *Prerequisite: JDK should be installed on your computer.*
- Download latest and greatest Groovy binary from: http://groovy.codehaus.org/Download.
- Latest version - as of this writing [08th December, 2013] - is: Groovy 2.2.1.

Groovy Installation and env setup

- Uncompress and move the folder to any location on your computer.
- Add GROOVY_HOME env variable pointing to the above location.
- Finally append $GROOVY_HOME/bin in PATH env variable for quick-access.

```
groovy -version
```

Hat tip: ~/.groovy/lib folder

IDE Plugins for Groovy

- Groovy plugins for various IDEs and Text Editors.
- Groovy / Grails Tool Suite aka GGTS.
- Spring Tool Suite aka STS.

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Commands to execute Groovy

- groovy
- groovyc
- groovysh
- groovyConsole
- java2groovy
- groovydoc

groovy

```
groovy -e "println 'Hello World'"
groovy HelloWorld.groovy
groovy HelloWorld
```

groovyc

```
groovyc HelloWorld.groovy
```

groovysh

```
groovysh
```

groovyConsole

```
groovyConsole
```

java2groovy

```
java2groovy HelloWorld.java
```

groovydoc

```
groovydoc HelloWorld.groovy
```

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Introduction

- What is Groovy?
- Type Systems
- Code snippet showdown: Groovy vs. Java
- How Groovy helps?
- Few demos
- Books on Groovy
- Recommended Book
- Groovy Twitterati

Tip

Any Java file can be renamed as a Groovy file. And it will compile and execute just as fine. Groovy runs on the JVM.

Groovy

Groovy is like a super version of Java. It can leverage Java's enterprise capabilities but also has cool productivity features like closures, DSL support, builders and dynamic typing.

```
Groovy = Java - boiler plate code
              + mostly dynamic typing
              + closures
              + domain specific languages
              + builders
              + metaprogramming
              + GDK library
```

Type Systems

- In programming languages, a **type system** is a collection of rules that assign a property called a ***type*** to the various constructs — such as variables, expressions, functions or modules, etc — a computer program is composed of.

Groovy is dynamically typed programming language; while Java is statically typed programming language.

Groovy

```
def groovyString = "Peter Higgs"
println groovyString.class
```

Java

```
String javaString = "Satyendra Nath Bose";
```

Obligatory "Hello World"

Java

```
public class HelloWorld {
    public static void main(String[] args) {
        System.out.println("Hello World");
    }
}
```

Groovy

```
println "Hello World"
```

System Properties

Java

```java
import java.util.Iterator;
import java.util.Properties;
import java.util.Set;
import java.util.SortedMap;
import java.util.TreeMap;

public class SystemProperties {
    public static void main(String[] args) {
        Properties properties = System.getProperties();
        SortedMap sortedSystemProperties = new TreeMap(properties);
        Set keySet = sortedSystemProperties.keySet();
        Iterator iterator = keySet.iterator();
        String key = null;
        while (iterator.hasNext()) {
            key = (String) iterator.next();
            System.out.println(key + " = " + properties.getProperty(key
        }
```

Groovy

```groovy
System.properties.sort().each { key, value ->
    println "$key = $value"
}
```

Trivia

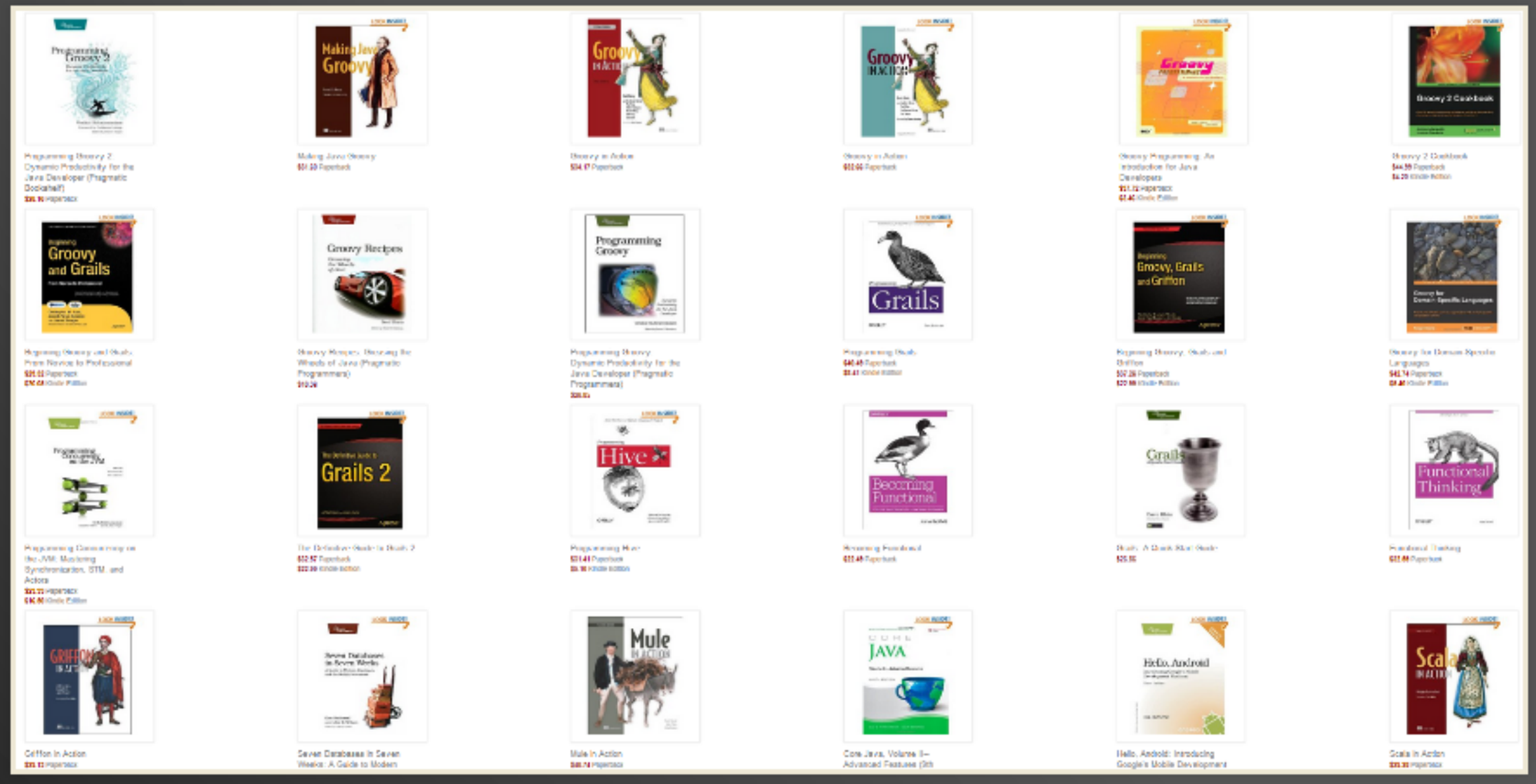
Guess what might be the output of this Groovy snippet?

```
String.methods.each {
    println it
}
```

Demos

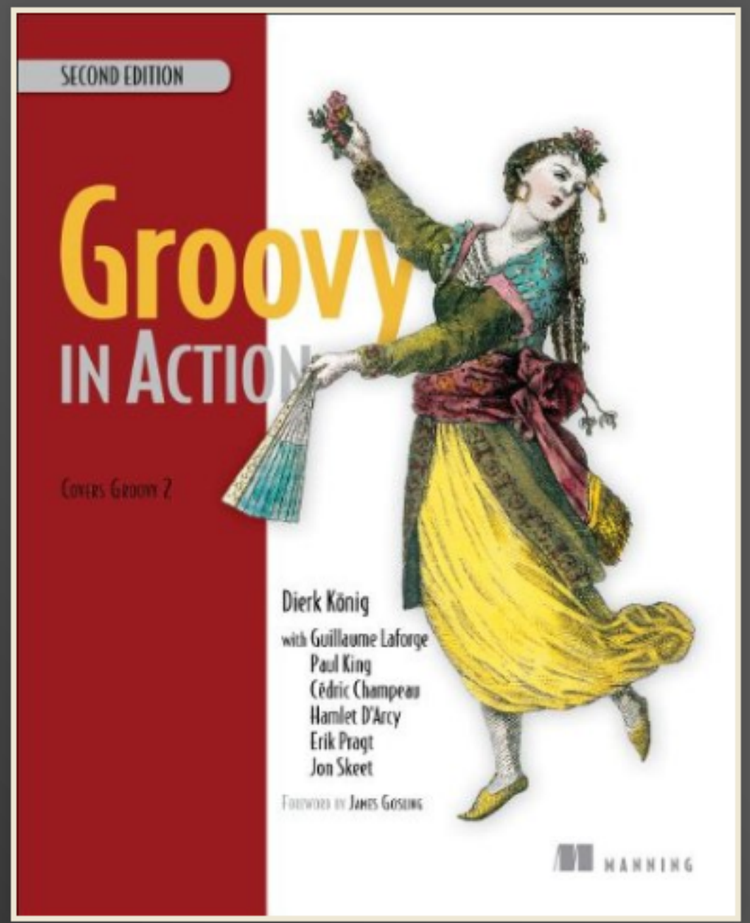
- Groovy script to fetch and display kitten pictures from Flickr.
- Java build script showdown: Maven vs. Gradle.
- Visualization app built using Groovy and Grails.
- Griffon sample app for loading dummy data to a database.

Books on Groovy



[Various Groovy Books on Amazon]

A thorough introduction to Groovy



Groovy in Action aka GinA

Groovy Twitterati

- Guillaume Laforge's public Groovy Ecosystem List

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Groovy Features

- Automatic imports
- Import aliasing
- Optional semicolons & parens
- Optional return statements
- Optional datatype declaration
- Operator overloading
- Safe dereferencing
- Autoboxing
- Groovy Truth
- Embedded Quotes & Heredocs
- GStrings
- POJO vs. POGO

- Automatic imports

```
import java.lang.*
import java.util.*
import java.net.*
import java.io.*
import java.math.BigInteger
import java.math.BigDecimal

import groovy.lang.*
import groovy.util.*
```

- Import aliasing

```
import java.text.SimpleDateFormat as SDF
SDF sdf = new SDF("MM/dd/yyyy")
println sdf.format(new Date())
```

- Optional semicolons and parentheses
- Optional return statements

```
firstName = "James"
lastName = "Strachan"

String getFullName() {
  "${firstName} ${lastName}"
}
println getFullName()
```

- Optional datatype declaration
- Operator overloading

```
def date = new Date()
date.next()
(1..3).each {
    println date++
}
```

- Safe dereferencing
Groovy

```
def str = "A String"
println str.size()

str = null
str.size() // Caught: java.lang.NullPointerException: Cannot invoke metho
           // on null object at ConsoleScript3.run(ConsoleScript3:5)
println str?.size()
```

- Safe dereferencing

Java

```
if (order != null) {
    if (order.getCustomer() != null) {
        if (order.getCustomer().getAddress() != null) {
            System.out.println(order.getCustomer().getAddress());
        }
    }
}
```

Groovy

```
println order?.customer?.address
```

- Autoboxing

```
def someNumber = 2
println someNumber.class

//Assign the same variable a different value or datatype.
someNumber = 2.0d
println someNumber.class
```

- Groovy Truth

```
//true
if(1) // any non-zero value is true
if(-1)
if(!null) // any non-null value is true
if( "John" ) // any non-empty string is true
Map family = [dad: "John" , mom: "Jane" ]
if(family) // true since the map is populated
String[] sa = new String[1]
if(sa) // true since the array length is greater than 0
StringBuilder sb = new StringBuilder()
sb.append( "Hi" )
if(sb) // true since the StringBuilder is populated

//false
if(0) // zero is false
if(null) // null is false
if( "" ) // empty strings are false
Map family = [:]
```

- Embedded Quotes

```
def s1 = 'You either die a "hero" or you live long enough to see yoursel
def s2 = "You either die a 'hero' or you live long enough to see yoursel
def s3 = "You either die a \"hero\" or you live long enough to see yours
```

- Heredocs

```
String groovyHereDocs1 = """Harvey said "You either die a hero or
you live long enough to see yourself become the villain."""
def groovyHereDocs2 = '''You either die a hero or
you live long enough to see yourself become the villain.'''
println groovyHereDocs2.class
```

- GStrings

```
def firstName = "James"
def lastName = "Strachan"
println "Ahoy ${firstName} ${lastName}, today is ${new Date()}"
```

- POJO

```
public class Person {

    private String firstName;
    private String lastName;

    public String getFirstName() {
        return firstName;
    }

    public void setFirstName(String firstName) {
        this.firstName = firstName;
    }

    public String getLastName() {
        return lastName;
    }

    public void setLastName(String lastName) {
```

- POGO

```
class Person {
    String firstName
    String lastName
    String toString() {
        firstName + " " + lastName
    }
}
//One way of instantiating an object in Groovy.
def person01 = new Person()
person01.firstName = "James"
person01.lastName = "Strachan"
println "Name: " + person01
```

```
//Another way of instantiating an object in Groovy.
person01.with {
    firstName = "Guillaume"
    lastName = "Laforge"
}
println "Name again: " + person01
```

```
//Yet another way of instantiating an object in Groovy.
def person02 = new Person(lastName: "Rocher", firstName: "Graeme")
println "Name yet again: " + person02
```

- Groovy coding guidelines

Groovy style and language feature guidelines for Java developers

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Closures

- Not to be confused with Clojure, another JVM based dynamic programming language.
- Closure is a free-standing, named block of code.
- It is a behavior that doesn't have a surrounding class.
- Helps in greater flexibility.
- Metaprogramming to enhance existing libraries.
- As of this writing, Java does not have this feature.
- Java 8 is scheduled to come with this most wanted feature coined as Lambdas in March, 2014.

- Closures without any parameters

```
def x = 5, y = 6;
def printNum {
    println x + " " + y
}
printNum()
```

- Closures with parameters

```
def printSum = { a, b ->
    print a + b
}
printSum 5, 7
```

- **Traditional mainstream languages**

Data can be stored in variables, passed around, combined in structured ways to form more complex data; code stays put where it is defined.

- **Languages supporting closures**

Data ***and code*** can be stored in variables, passed around, combined in structured ways to form more complex algorithms and data.

```
doubleNum = {
    num -> num * 2
}
assert doubleNum(3) == 6

def processThenPrint = { num, closure ->
    num = closure(num);
}
assert processThenPrint(3, doubleNum) == 6
assert processThenPrint(10) { it / 2 } == 5
```

Implicit variables

- A Closure that takes a single argument may omit the parameter definition of the Closure.

```
def printStr = {
    print it
}
printStr "Print but with a custom method"
```

```
String.methods.each {
    println it
}
```

- *More about Closures in List and Map Comprehensions later.*

Currying

- Transform function with particular number of parameters and returns a function with some of the parameter values fixed, creating a new function.
- Curry as many parameters as required.
- The first curry call fills in the leftmost parameter.
- Each subsequent call fills in the next parameter to the right.

```
/* Tax calculation example */

def calculateTax = { taxRate, amount ->
    amount + (taxRate * amount)
}

def tax = calculateTax.curry(0.1)

(10..15).each {
    println "Total cost: ${tax(it)}"
}
```

Loop variants

```
def result = ''
def compute = {
    if (!it) {
        result = '0'
    } else {
        result += it
    }
}

5.times compute
assert '01234' == result

0.upto 7, compute
assert '01234567' == result

0.step 10, 2, compute
assert '02468' == result
```

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Lists

```groovy
def list = [1, 2, 3, 4]
assert list.size == 4
assert list.size() == 4
assert list.class == ArrayList
```

```groovy
def list = []
assert list.size() == 0
list << 5
assert list.size() == 1
list << 'a' << 'e' << 'i'
assert list == [5,  'a', 'e', 'i']
```

Lists

```
assert [0, 1, 2] + 3 + [4, 5] + 6 == [0, 1, 2, 3, 4, 5, 6]
assert [0, 1, 2].plus(3).plus([4, 5]).plus(6) == [0, 1, 2, 3, 4, 5, 6]

def list = [0, 1, 2, 3]
list += 4
list += [5, 6]
assert list == [0, 1, 2, 3, 4, 5, 6]
assert list[3] == 3
assert list.getAt(5) == 5

list.putAt(5, -5)
assert list[5] == -5
assert list[-4] == 3
assert list[-4] * 2 == 6
assert list * 2 == [0, 1, 2, 3, 4, -5, 6, 0, 1, 2, 3, 4, -5, 6]

assert ('a'..'g')[3..5] == ['d', 'e', 'f']
```

Lists

```
assert [1,[2,3]].flatten() == [1,2,3]
assert [1,2,3].intersect([4,3,1])== [3,1]
assert [1,2,3].disjoint([4,5,6])

list = [1,2,3]
popped = list.pop()
assert popped == 3
assert list == [1,2]

assert [1,2].reverse() == [2,1]
assert [3,1,2].sort() == [1,2,3]
```

Lists

```
def list = [1, 2, 3, 4, 5]
def sublist = list.subList(2, 4)
sublist[0] = 9
assert list == [1, 2, 9, 4, 5]
list[3] = 11
assert sublist == [9, 11]
```

```
def range = ('a'..'f')
range.eachWithIndex{ it, i ->
    println "$i: $it"
}
assert range.join(', ') == 'a, b, c, d, e, f'
```

Lists

- Double each element in a List using a closure

```
def doubled = [1,2,3].collect { item ->
    item * 2
}
assert doubled == [2,4,6]
```

- Divide a list into 2 lists with one list containing only unique elements and another only duplicates.

```
list=[1, 2, 7, 2, 2, 4, 7, 11, 5, 2, 5]
def uniques = [] as Set, dups = [] as Set
list.each {
    uniques.add(it) || dups.add(it)
}
uniques.removeAll(dups)
assert uniques == [1, 4, 11] as Set && dups == [2, 5, 7] as Set
```

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Ranges

- Groovy offers a native datatype for Ranges.
- Ranges are specified using the double-dot range operator .. between the left and right bounds.

```
def range = 1..10
println range.class
println range instanceof List
range = 1..<10
def alphabets = 'a'..'z'
println alphabets.class
assert alphabets.contains('b')
alphabets.each {
    print it
}
```

```
IntRange.methods.each {
    println it
}
```

Few other methods of Range

```
def i = 1..5
println i.size()
println i.from
println i.to
println i.contains(1)
println i.contains(-9)
println i.reverse()
```

```
def today = new Date()
def nextWeek = today + 7
(today..nextWeek).each {
    println it
}
```

Ranges in switch cases

```
def stage = ""
def years = 58
switch (years) {
    case 1..3:
        stage = "toddler"
        break;
    case 3..15:
        stage = "school"
        break;
    case 16..22:
        stage = "college"
        break;
    case 22..58:
        stage = "job"
        break;
    default:
        stage = "retired"
}
```

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Maps

- Simple examples

```
def map = [name:"Sachin Tendulkar", likes:"Cricket", id:10]
assert map instanceof java.util.Map

assert map.get("name") == "Sachin Tendulkar"
assert map["name"] == "Sachin Tendulkar"
assert map.name == "Sachin Tendulkar"

assert map.get("id") == 10
assert map['id'] == 10
assert map.id == 10

map['status'] = "Retired"
assert map == [name:'Sachin Tendulkar', likes:'Cricket', id:10, status:'
```

Maps

- Iterating a Map

```
def map = ['Android': '4.4.2',
           'iPhone': 'iOS7',
           'Windows': 'Win8',
           'BlackBerry': 'BlackBerry10'
           ]
map.each { k, v ->
    println "${k} = ${v}"
}
```

Maps

- **+** and **<<** operators can be used to add elements to the Map.
- But **<<** produces a new map while **+** modifies the Map.

```
def map01 = [name:"Sachin Tendulkar", likes:"Cricket", id:10, country:"I
println map01

map01 << [name:"Roger Federer", likes:"Tennis", id:101]

def map02 = [name:"Sachin Tendulkar", likes:"Cricket", id:10, status: "R
println map02

map02 += map01
println map02
```

Maps

- Variants of iterating a Map

```
def p = new StringBuilder()
[1:'a', 2:'b', 3:'c'].each {
    p << it.key + ': ' + it.value + '; '
}
assert p.toString() == '1: a; 2: b; 3: c; '

def q = new StringBuilder()
[1:'a', 2:'b', 3:'c'].each { k, v ->
    q << k + ': ' + v  + '; '
}
assert q.toString() == '1: a; 2: b; 3: c; '

def r = new StringBuilder()
[1:'a', 2:'b', 3:'c'].eachWithIndex { it, i ->
  r << it.key + ' : ' + it.value + '; '
}
assert r.toString() == '1 : a; 2 : b; 3 : c; '
```

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Input Output

Read a file line-by-line

```
new File("ReadTheFile.txt").eachLine { line ->
    println(line)
}
```

Read a file with a Reader

```
def count=0, MAXSIZE=100
new File("ReadTheFile.txt").withReader { reader ->
  while (reader.readLine() != null) {
    if (++count > MAXSIZE) {
        println "Read 100 lines already!"
        break
    }
  }
}
```

Write a file with a Writer

```
def fields = ["a":"1", "b":"2", "c":"3"]
new File("WriteTheFile.ini").withWriter { out ->
    fields.each() { key, value ->
        out.writeLine("${key}=${value}")
    }
}
```

Loading a properties file in Groovy

```
java:oracle
```

```
def properties = new Properties()
new File("config.properties").withInputStream {
  stream -> properties.load(stream)
}

println "java = " + properties["java"]

properties.each { k, v ->
    println "${k} = ${v}"
}
```

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Builders and Parsers

- Extensive support building and parsing HTML, XML and JSON.

Building a XML file

```
def stringWriter = new StringWriter()
def builder = new groovy.xml.MarkupBuilder(stringWriter)
builder.numbers {
    description 'Squares and factors of 10..15'
    for (i in 10..15) {
        number (value: i, square: i*i) {
            for (j in 2..<i) {
                if (i % j == 0) {
                    factor (value: j)
                }
            }
        }
    }
}
println stringWriter
```

Building a JSON file

```
import groovy.json.*

class Player {
    String name
    List faveGrounds = []
}

class FaveGround {
    String ground
    String city
}

Player playr = new Player(name:"Sachin Tendulkar")
playr.faveGrounds << new FaveGround(ground: "Wankede", city:"Mumbai")
playr.faveGrounds << new FaveGround(ground: "SCG", city:"Sydney")

def builder = new JsonBuilder()
```

Reading an XML file

```
<langs type="languages">
    <language>Python</language>
    <language>Groovy</language>
    <language>Java</language>
</langs>
```

```
def langs = new XmlParser().parse("langs.xml")
println "type = ${langs.attribute("type")}"
langs.language.each{
    println it.text()
}
```

Reading an XML file using XMLSlurper

```
def CAR_RECORDS = '''
    <records>
      <car name='HSV Maloo' make='Holden' year='2006'>
        <country>Australia</country>
        <record type='speed'>Production Pickup Truck with speed of 271k
      </car>
      <car name='P50' make='Peel' year='1962'>
        <country>Isle of Man</country>
        <record type='size'>Smallest Street-Legal Car at 99cm wide and
      </car>
      <car name='Royale' make='Bugatti' year='1931'>
        <country>France</country>
        <record type='price'>Most Valuable Car at $15 million</record>
      </car>
    </records>
'''
```

Reading a JSON file JSONSlurper

```
import groovy.json.*

def jsonText = '''
{
  "limit":{
    "track":1234
  }
}
'''

def json = new JsonSlurper().parseText(jsonText)

def limit = json.limit
assert limit.track == 1234
```

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Metaprogramming

- Metaprogramming refers to writing code that can dynamically change its behavior at runtime.
- A Meta-Object Protocol [MOP] refers to the capabilities in a dynamic language that enable metaprogramming.
- In Groovy, the MOP consists of four distinct capabilities within the language: reflection, metaclasses, categories, and expandos.

```
println "Hello".toUpperCase()

String.metaClass.toUpperCase = {
        delegate.toLowerCase()
}

println "Hello".toUpperCase()
```

- Metaprogramming examples

```
Integer.metaClass.isEven = {  ->
    delegate % 2 == 0
}
println 7.isEven()
println 10.isEven()
```

```
Integer.metaClass.static.isEven = { number ->
    number % 2 == 0
}
Integer.isEven(1)
Integer.isEven(2)
```

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Groovy references

Web

Groovy Website
MrHAKI's Groovy Goodness Snippets

Mailing list for users

user@groovy.codehaus.org

Books

Bootstrapping Groovy

Prashanth Babu / @P7h

Thanks

Q n A