Chapter 1 - Groovy DSL

Objectives

Key objectives of this chapter

- Basic Groovy Syntax
- Defining Functions
- Defining Classes
- Classes vs Scripts
- Defining Shared Libraries
- Using Shared Libraries

1.1 What is Groovy

- Groovy is an object oriented language
- It is based on Java platform.
- First released in 2007.
- It is distributed via the Apache License.

1.2 Groovy in Jenkins

- Groovy can be executed in Jenkins in various ways
  - Script Console (http://localhost:8080/script)
  - Execute system groovy script (Build step)
    - Runs in Jenkins' JVM.
    - Jenkins' system is available to the scripts
  - Execute groovy script (Build step)
    - Runs outside Jenkins' JVM.
    - Jenkins' system isn't available to scripts
  - Groovy PostBuild Plugin
- Pipeline Job Command

1.3 Comments in Groovy

- Single-line comment
  - //
- Multi-line comment
  - /*
  - */

1.4 Data Types

- Built-in types
  - byte
  - short
  - int
  - long
  - float
  - double
  - char
  - Boolean
  - String
- Object types
  - java.lang.Byte
  - java.lang.Short
  - java.lang.Long

- java.lang.Float
- java.lang.Double
- java.math.BigInteger
- java.math.BigDecimal

1.5 Identifiers

- Identifiers are used to define variables, functions, or other user defined objects.
- Identifiers start with a letter, a dollar, or an underscore.
- They cannot start with a number.
- e.g.
  - customer123name, _customer123Name, customer_name123

1.6 Variables

- Case-sensitive
- Variable declarations
  - String message = "Hello World";
  - int a = 5;
- Printing variables
  - println message;
  - println(message);
  - print message;
  - print(message);

1.7 def

- def keyword can be used to define an identifier
- When using def, the actual type holder is **Object (**so you can assign any object to variables defined with def, and return any kind of object if a method is declared returning def)
- e.g.
  - def x = 5;

1.8 String Interpolation

- String interpolation requires double quotes.

```
String name = "Bob";
String message = "Hi, ${name}";
```

1.9 Operators

- Arithmetic
  - +, -, *, /, %, ++, --
- Relational
  - ==, !=, <, <=, >, >=
- Logical
  - &&, ||, !
- Bitwise
  - &, |, ^, ~
- Assignment

- +=, -=, *=, /=, %=
- Range
  - ..
  - e.g. def range = 5..10
  - println(range); //prints [5,6,7,8,9,10]
  - println(range.get(2); //prints 7

1.10 Ranges

- Range examples
  - 1..5 (inclusive range)
  - 1..<5 (exclusive range)
  - 5..1 (descending order)
  - 'a'..'f' (character range)
  - 'f'..'a' (descending order)
- Methods
  - contains(val)
  - get(pos)
  - size()
  - subList(fromIndex, toIndex)

1.11 Conditional Statements

- if

```
if (a < 5) {
   println("A is less than 5");
}
```

- if / else

```
if(a <  5) {
   println("A is less than 5");
}
else if(a == 5) {
   println("A is equal to 5");
}
else {
   println("A is greater than 5");
}
```

- switch

```
switch(a) {
   case 1:
      println("A is 1");
      break;
   case 2:
      println("A is 2");
      break;
   default:
      println("Unknown");
      break;
}
```

1.12 Loops

- for

```
for(int a = 0; a < 10; a++) {
   println(a);
}
```

- for-in

```
String[] teams = ["Flames", "Maples", "Oilers" ];
for(String team in teams) {
   println(team);
}
```

- while

```
while(a < 5) {
   println(a);
   a++;
}
```

- Additional keywords
  - break

```
while(a < 5) {
   println(a);
   a++;
   if(a == 3) {
      break;
   }
}
```

  - continue

```
while(a < 5) {
   println(a);
   a++;
   if(a == 3) {
```

```
        continue;
    }
}
```

1.13 Lists

- List examples
  - [] // an empty list
  - [1, 2, 3, 4, 5]
  - [1, 2, [3, 4], 5] // a nested list
  - ['apple', 'banana', 'cherry'] // a list of strings
  - [1, 'apple', 2, 'banana'] // heterogeneous list
- Methods
  - list.add(val);
  - list.remove(val);
  - list.contains(val);
  - list.get(3);
  - list.isEmpty();
  - list.minus(anotherList);
  - list.plus(anotherList);
  - list.pop();
  - list.reverse();
  - list.size();
  - list.sort();

1.14 Maps

- Dictionary / table / hash
- Unordered collection of object references
- key / value pair
- e.g.
  - [:] // an empty map
  - teams = ['Calgary': 'Flames', 'Toronto': 'Maples']
- Processing all items in a map

```
for(team in teams) {
   println(team);
}
```

- Methods
  - map.containsKey(key);
  - map.get(key);
  - map.put(key, value);
  - map.size();

1.15 Exception Handling

- try .. catch .. finally

```
try {
 def arr = [1,2,3];
 def item = arr[7];
 println(item);
```

```
}
catch(ArrayIndexOutOfBoundsException ex) {
 println(ex.getMessage());
}
catch(Exception ex) {
 println ("Some other exception");
}
finally {
 println("always executed");
}
```

1.16 Methods

- A method is defined with a return type or with the **def** keyword.
- e.g.

```
def sum(def a, def b) {
   return a + b;
}

def result = sum(5,6);
```

- Default parameters

```
def sum(def a = 5, def b = 6) {
   return a + b;
}

def result1 = sum(5);
def result2 = sum();
```

- Return keyword and semi-colon are optional, but recommended

```
def sum(def a, def b) {
 a + b
}
```

1.17 Closures

- e.g.

```
def closure = {println "Hello world"};
closure.call();
```

- Parameters in closure

```
def closure = {param -> println "Hello ${param}"};
closure.call("World");
```

- Multiple parameters in closure

```
def sumClosure = {num1, num2 -> return num1 + num2};
closure.call(5,6);
```

1.18 this Keyword

- Used for accessing instance-level variable.

```
class Customer {
String name;
public void SetName(String value) {
   this.name = value;
}
public String GetName() {
   return this.name;
}
```

1.19 Classes

- A Groovy class is a collection of data and the methods that operate on that data
- A class declares the state (data) and the behavior (methods) of objects defined by that class.

- Getter and setter methods are used to implement encapsulation
- e.g.

```
class Customer {
   String name;
   public void SetName(String value) {
      this.name = value;
   }
   public String GetName() {
      return this.name;
   }
}
```

- Instance creation

```
def cus1 = new Customer();
```

1.20 Static Methods

- Class level methods
- e.g.

```
class MyClass {
   static def MyMethod() {
      println("Static method");
   }
}
```

1.21 Inheritance

- **extends** keyword is used to inherit the properties of a class.

```
class Person {
   String name;
   public Person() {
```

```
        this.name = "";
    }
    public void SetName(String value) {
       this.name = value;
    }
    public String GetName() {
       return this.name;
    }
}

public class Student extends Person {
    public Student() {
       super();
    }
}
```

1.22 Abstract Classes

- Abstract classes represent generic concepts
- They cannot be instantiated
- They must be sub-classed
- e.g.

```
abstract class Person {
    public String name;
    abstract void DisplayDetails();
}

public class Customer extends Person {
    public Customer() {
       super();
    }
```

```
   void DisplayDetails() {
      println "Details…";
   }
}
```

1.23 Interfaces

- Defines a contract that a class needs to conform to.

```
interface Vehicle {
   void Start();
}

class Car implements Vehicle {
   void Start() {
      println("Car.Start()");
   }
}
```

1.24 Generics

- Generalized classes
- Generic for Collections

```
def list = new ArrayList<String();
list.add("A");
```

- Generalized Classes

```
public class MyClass<T> {
   private T localVariable;
   public T getVariable() {
      return this.localVariable;
   }
   public void set(T value) {
```

```
      this.localVariable = value;
   }
}
```

1.25 Jenkins Script Console

- Manage Jenkins > Script Console
- Allows execution of adhoc scripts.
- Sample script:

```
def printFile(location) {
   pub = new File(location)
   if (pub.exists()){
      println "Location ${location}"
      pub.eachLine{line-> println line}
   }
   else{
      println "${location} does not exist"
   }
}

printFile("C:/Windows/System32/drivers/etc/hosts")
```

1.26 Extending with Shared Libraries

- Parts of Pipelines can be shared between various projects to reduce redundancies and keep code DRY (Don't Repeat Yourself).
- A Shared Library is defined with a name, a source code retrieval method such as by SCM, and optionally a default version.
- Version can be anything understood by the SCM, e.g. branches, tags, and commit hashes.

- Library can be loaded implicitly or explicitly

1.27 Directory Structure

```
(root)
+- src                     # Groovy source files
|   +- org
|       +- foo
|           +- Bar.groovy  # for org.foo.Bar class
+- vars
|   +- foo.groovy          # for global 'foo' variable
|   +- foo.txt             # help for 'foo' variable
+- resources               # resource files (external libraries only)
|   +- org
|       +- foo
|           +- bar.json    # static helper data for org.foo.Bar
```

- Can be defined at various levels
- src directory should look like standard Java source directory structure. This directory is added to the classpath when executing Pipelines.
- The vars directory hosts scripts that define global variables accessible from Pipeline. The basename of each *.groovy file should be a Groovy identifier, conventionally camelCased. The matching *.txt can contain documentation.
- The resources directory allows usage from an external library to load associated non-Groovy files.

1.28 Sample Groovy Code

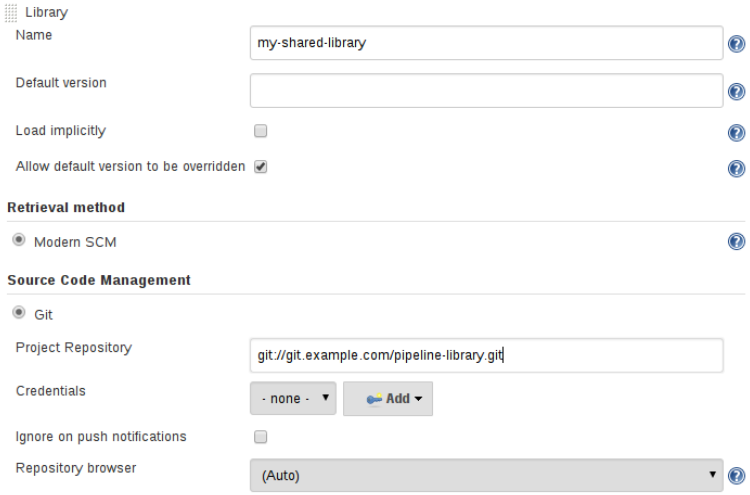
```
package com.abcinc;

def checkout() {
   node {
```

```
 stage 'Checkout'
 git url: 'C:\\Software\\repos\\SimpleGreeting.git'
   }
}
```

1.29 Defining Shared Libraries

- Shared libraries can be defined at various levels:
  - Global Shared Libraries
    - Manage Jenkins > Configure System > Global Pipeline Libraries
    - Folder-level Shared Libraries
    - Automatic Shared Libraries
      - e.g. GitHub Organization Folder



1.30 Using Shared Libraries

- Shared libraries can be utilized in various places
  - Pipeline
  - Execute system Groovy script
  - Execute Groovy script
  - Execute PostBuild script
- Loading libraries explicitly

```
@Library('my-shared-lib') _
@Library('my-shared-lib@master') _
@Library(['my-shared-lib', 'another-shared-lib']) _
```

- Conventionally the annotation goes on an **import** statement

```
@Library('my-shared-lib')
import com.abcinc.utils;
```

1.31 Same Shared Library Usage Code

```
@Library('my-shared-lib')
import com.abcinc.utils;

def u = new utils();
u.checkout();
```

1.32 Defining Global Variables

```
// vars/acme.groovy
def setName(value) {
name = value;
}
def getName() {
return name;
}

// src/com/abcinc/sample.groovy
def myFunction() {
name = "Bob";
}
```

1.33 Summary

- Groovy's syntax is similar to Java
- Semi-colon is optional in end of statement
- **return** keyword is optional in a method
- **def** keyword can be used to declare variables, as method return type, and for method input parameters.
- Groovy is used to define shared libraries
- In Jenkins shared libraries can be defined at various levels
- Shared libraries can be loaded implicitly or explicitly using @Library annotation.