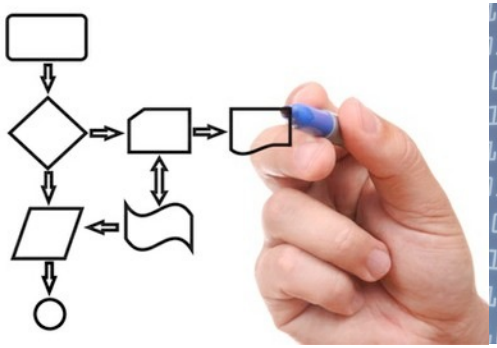
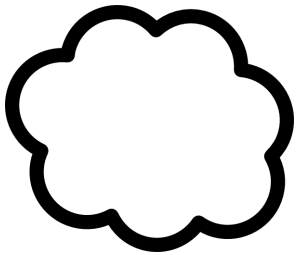
San Jose State University

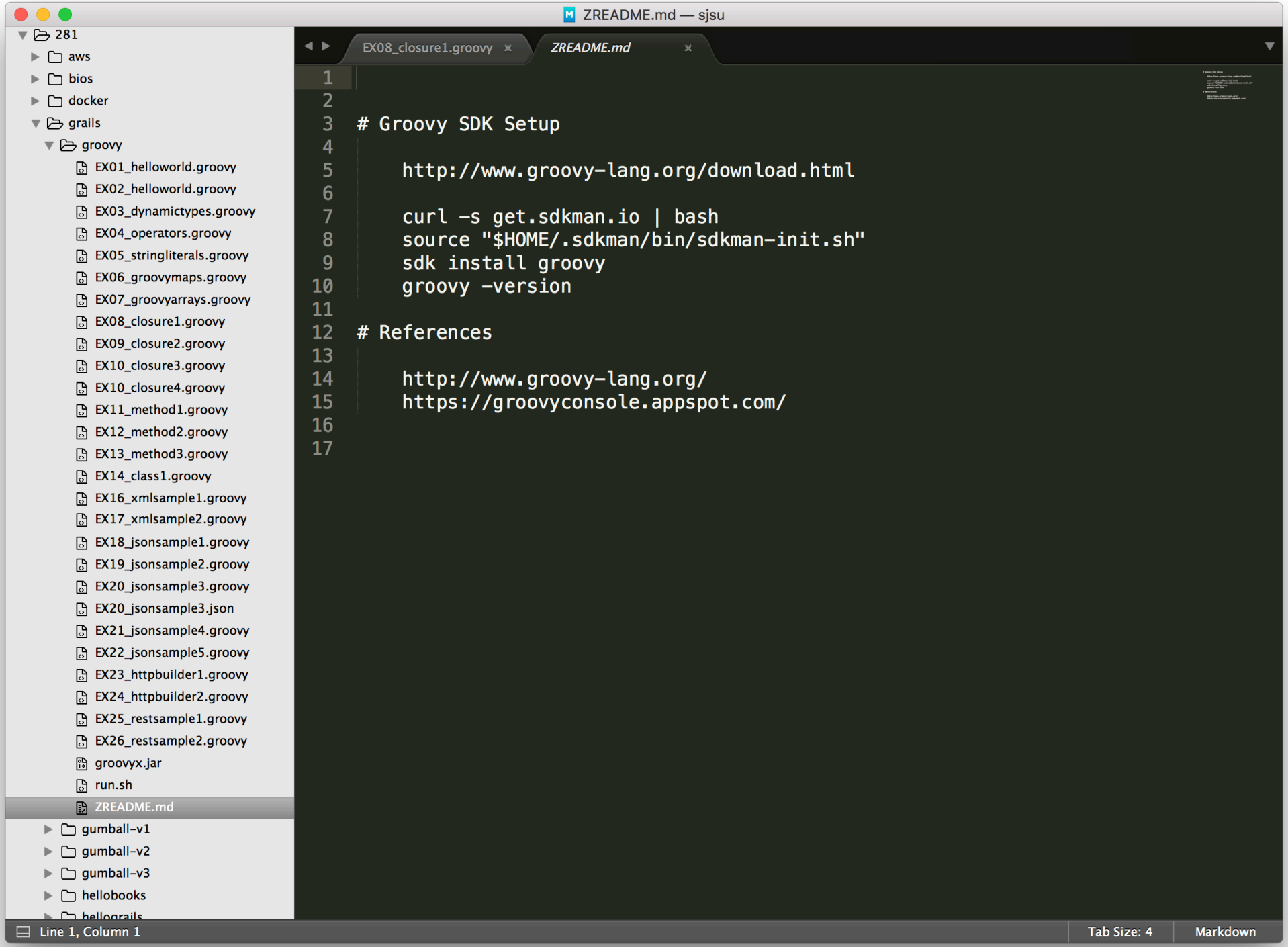
CMPE 281

Cloud Technologies

Quick Introduction to Groovy

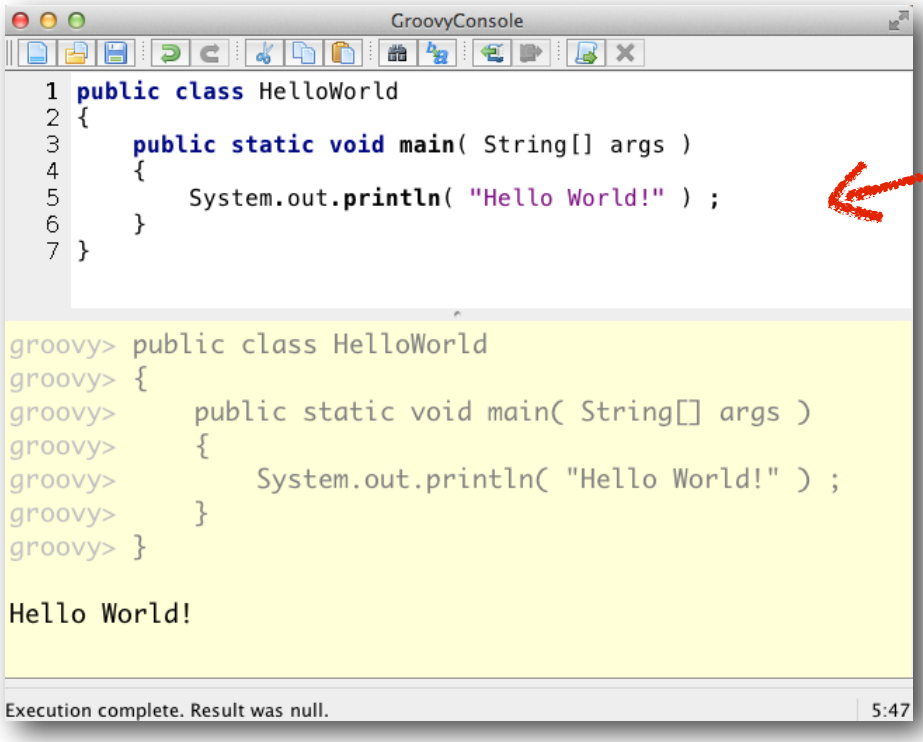




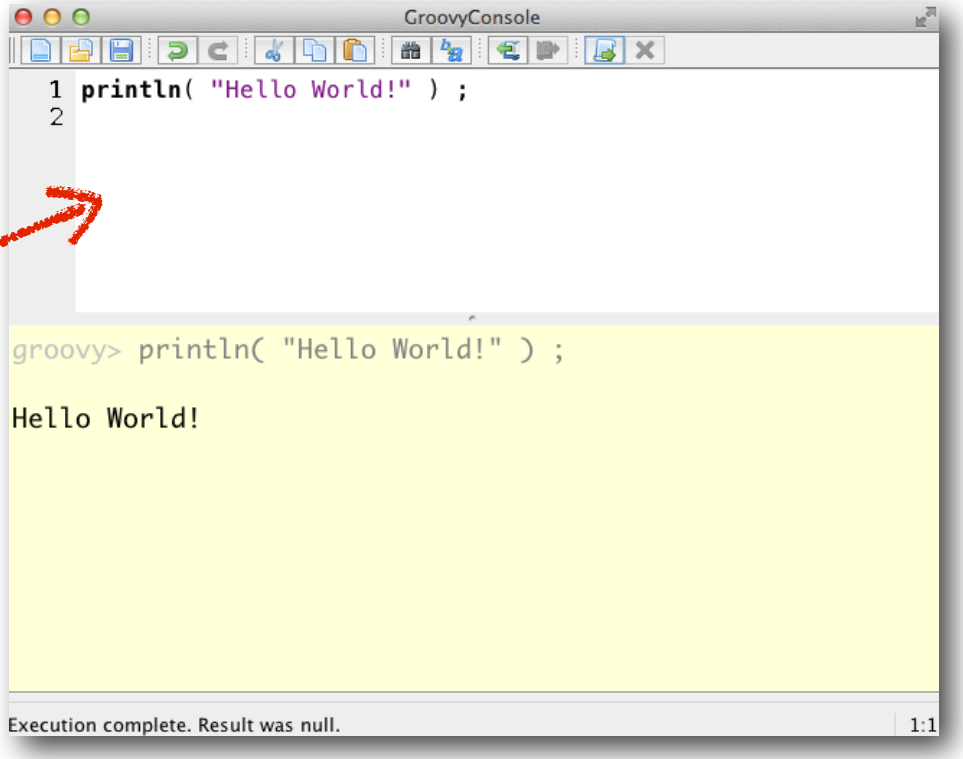

ZREADME.md — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
ZREADME.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
hellograils
EX08_closure1.groovy
ZREADME.md
Groovy SDK Setup
http://www.groovy-lang.org/download.html
curl -s get.sdkman.io | bash
source "$HOME/.sdkman/bin/sdkman-init.sh"
sdk install groovy
groovy -version
References
http://www.groovy-lang.org/
https://groovyconsole.appspot.com/
Line 1, Column 1
Tab Size: 4
Markdown

Groovy

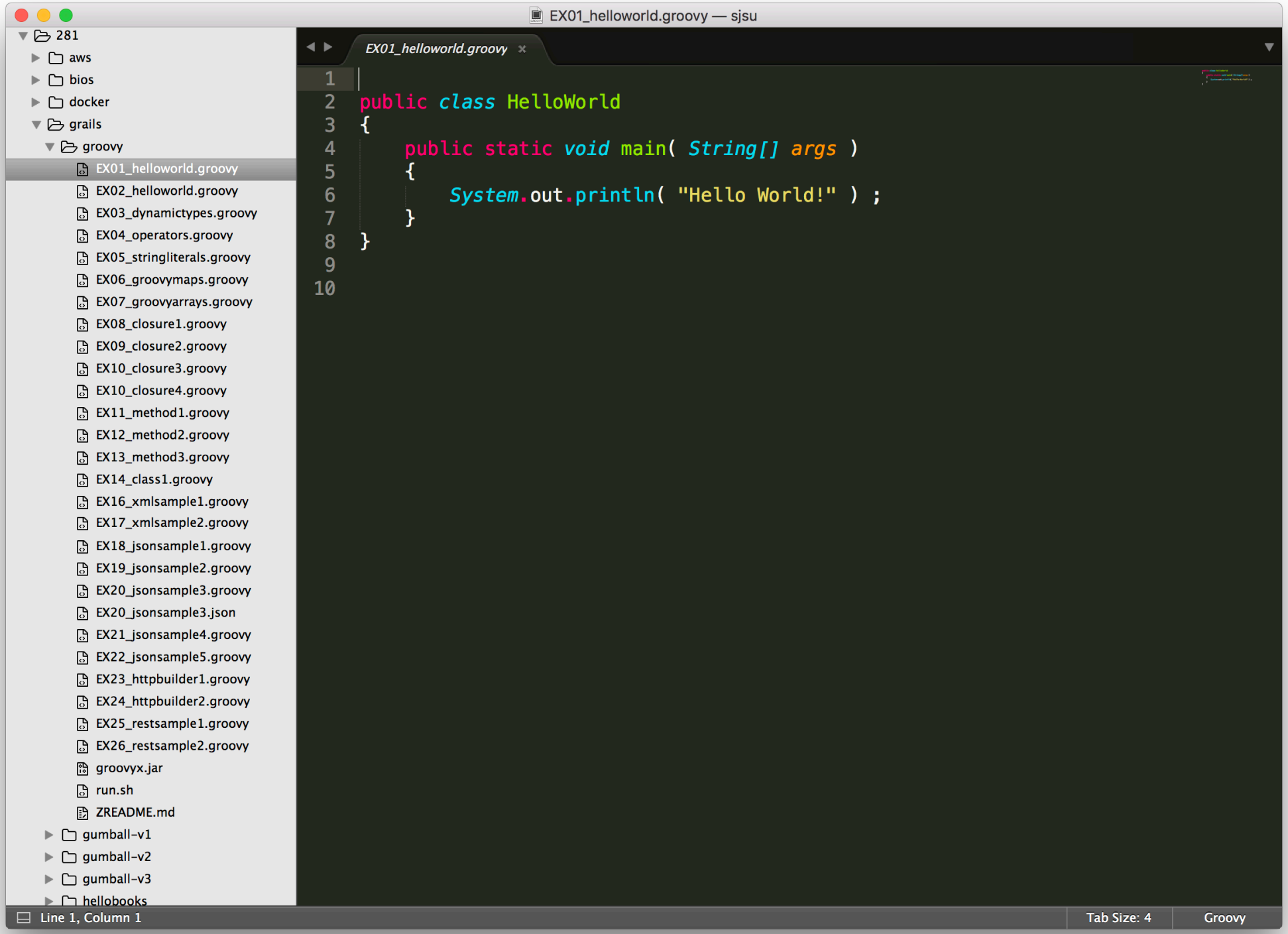
Hello World

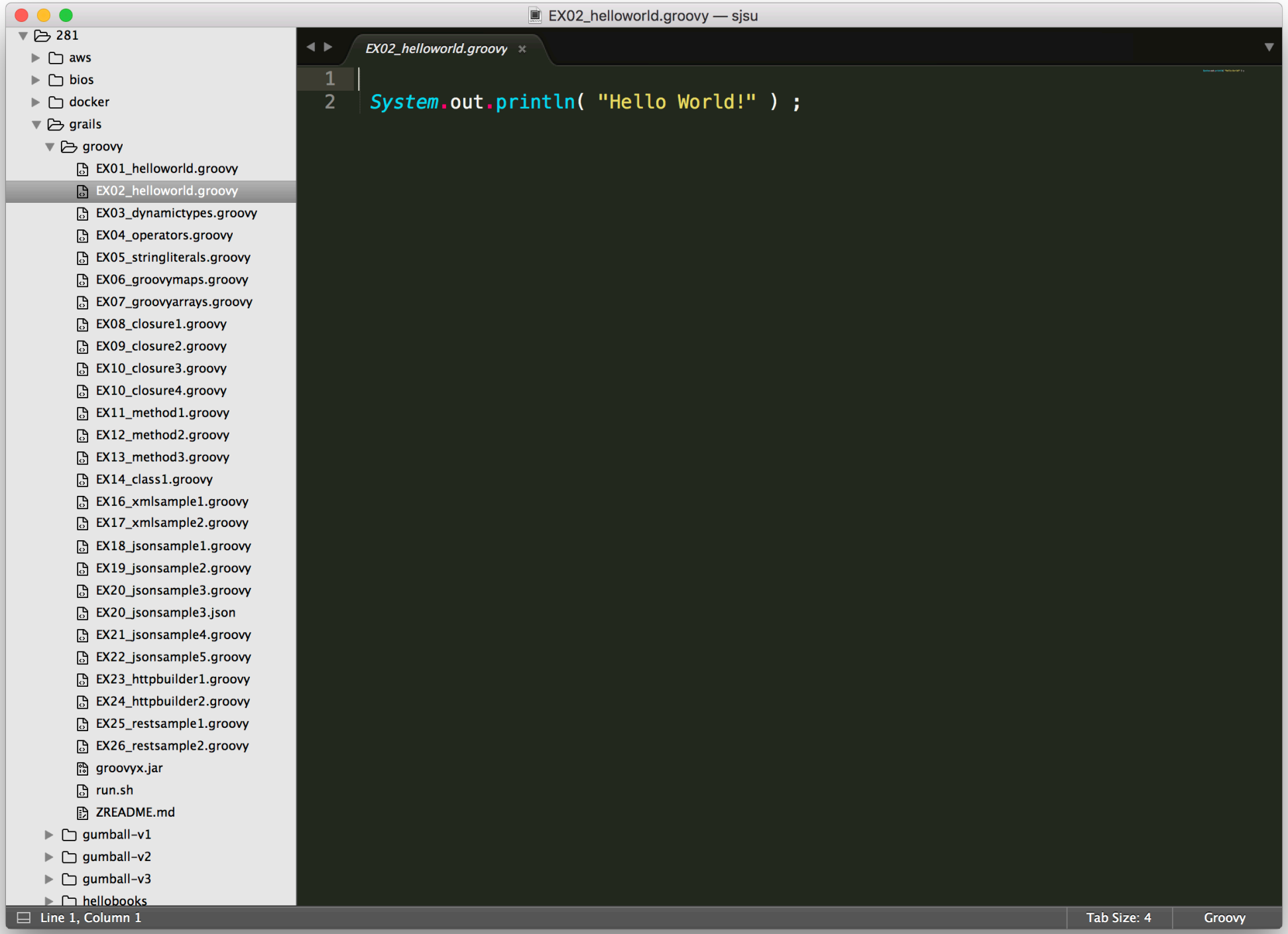


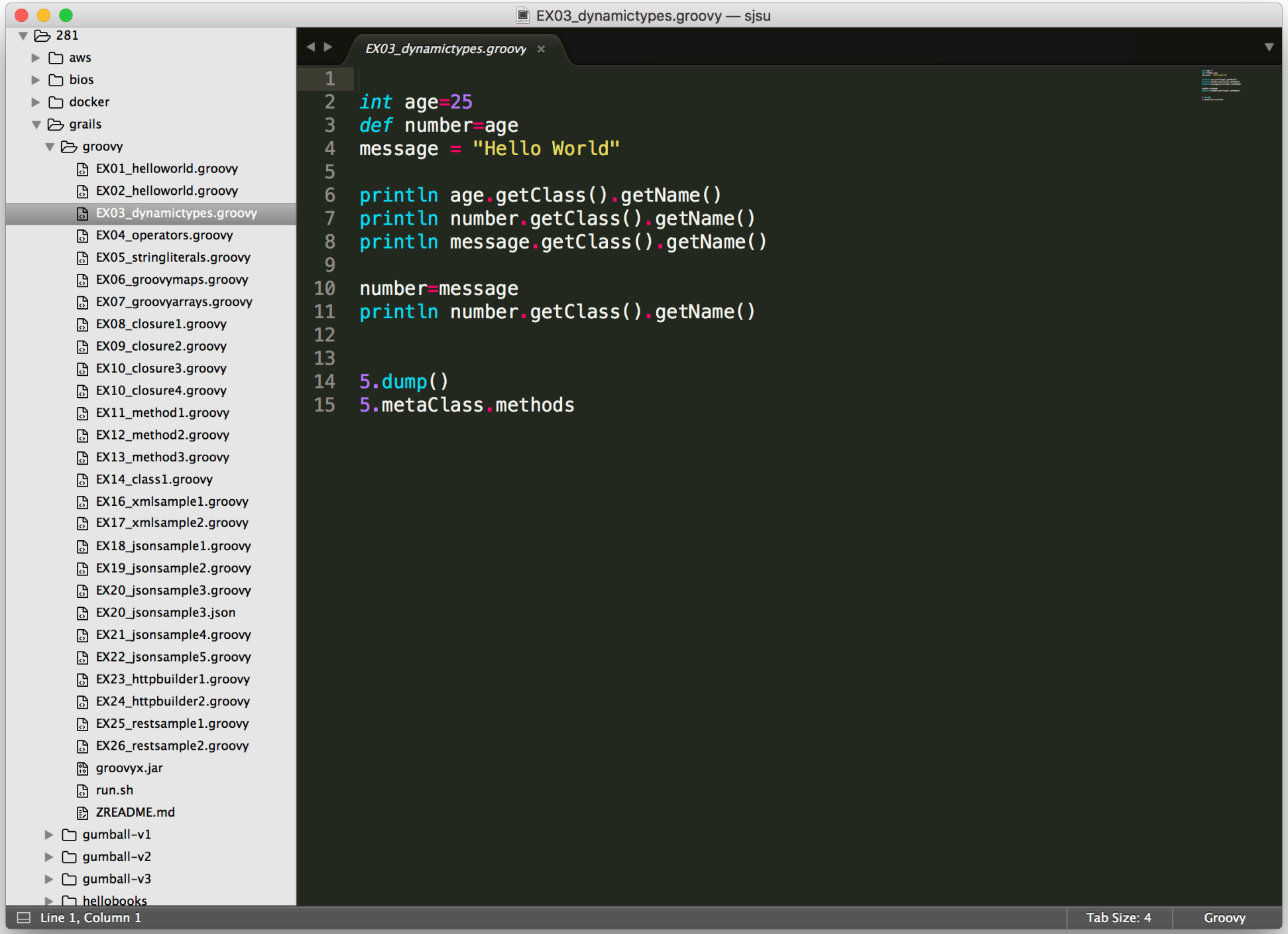
Groovy is "Java"

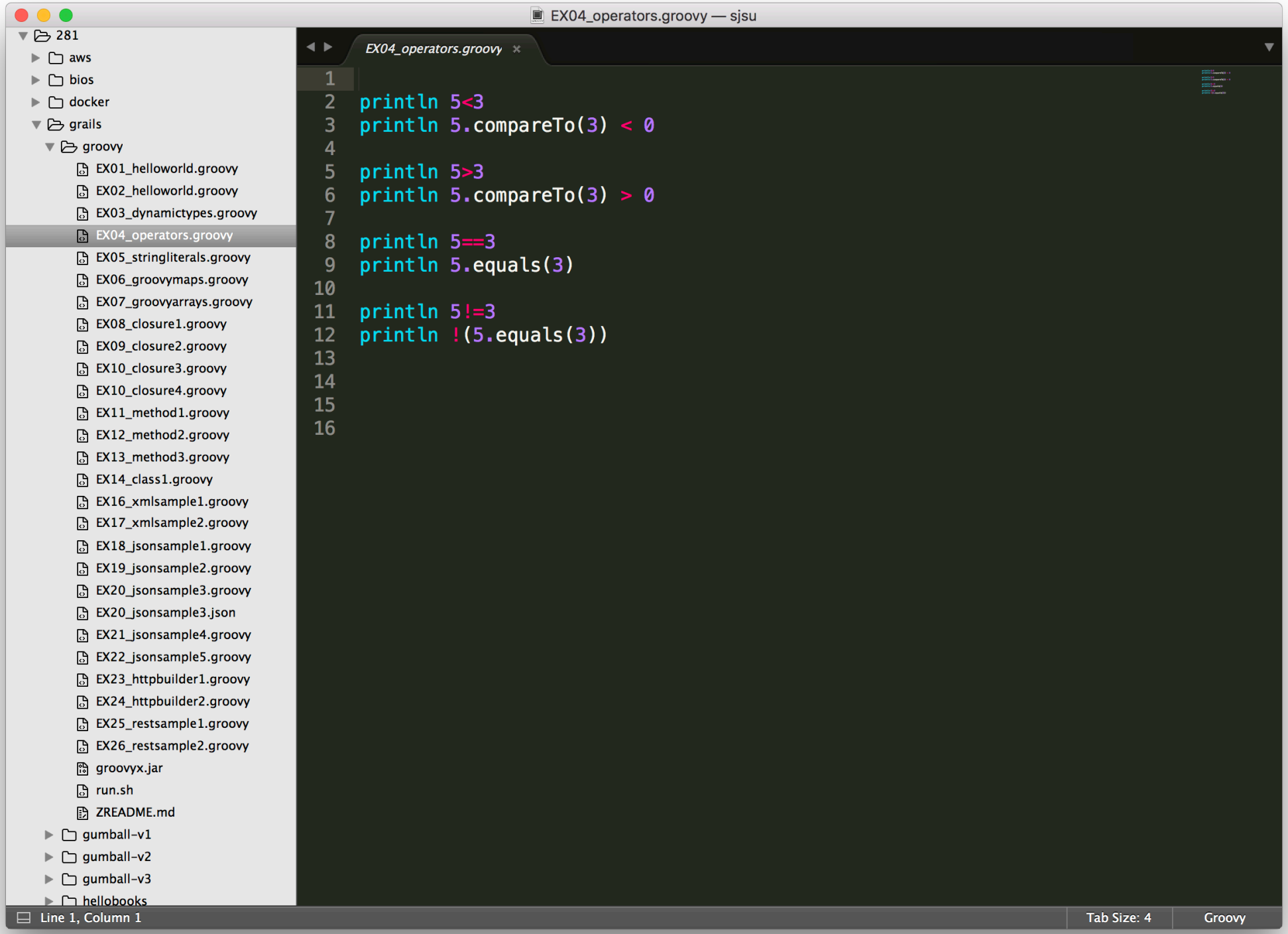


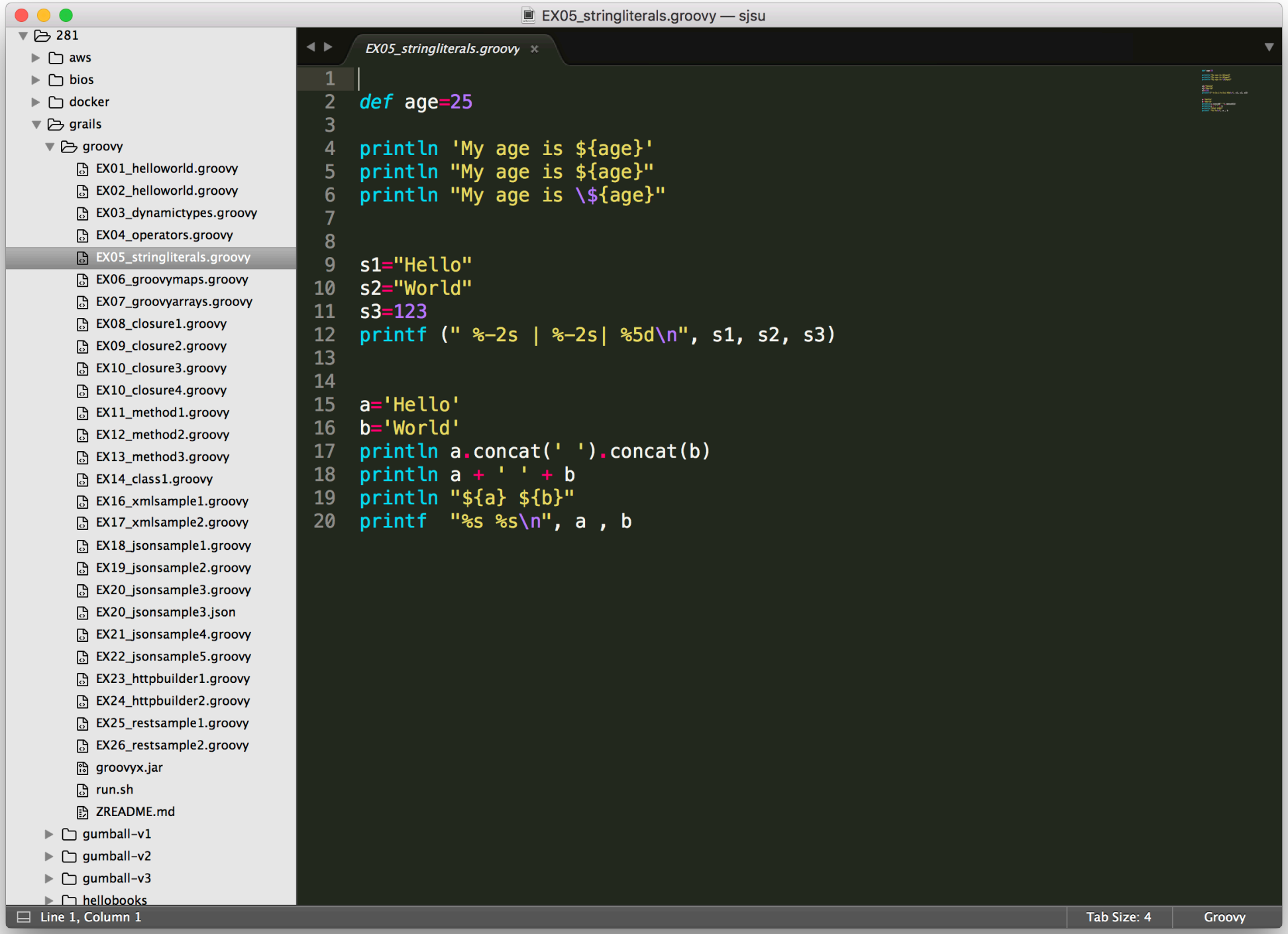
Yes, Groovy is "Java", but without the ceremony!

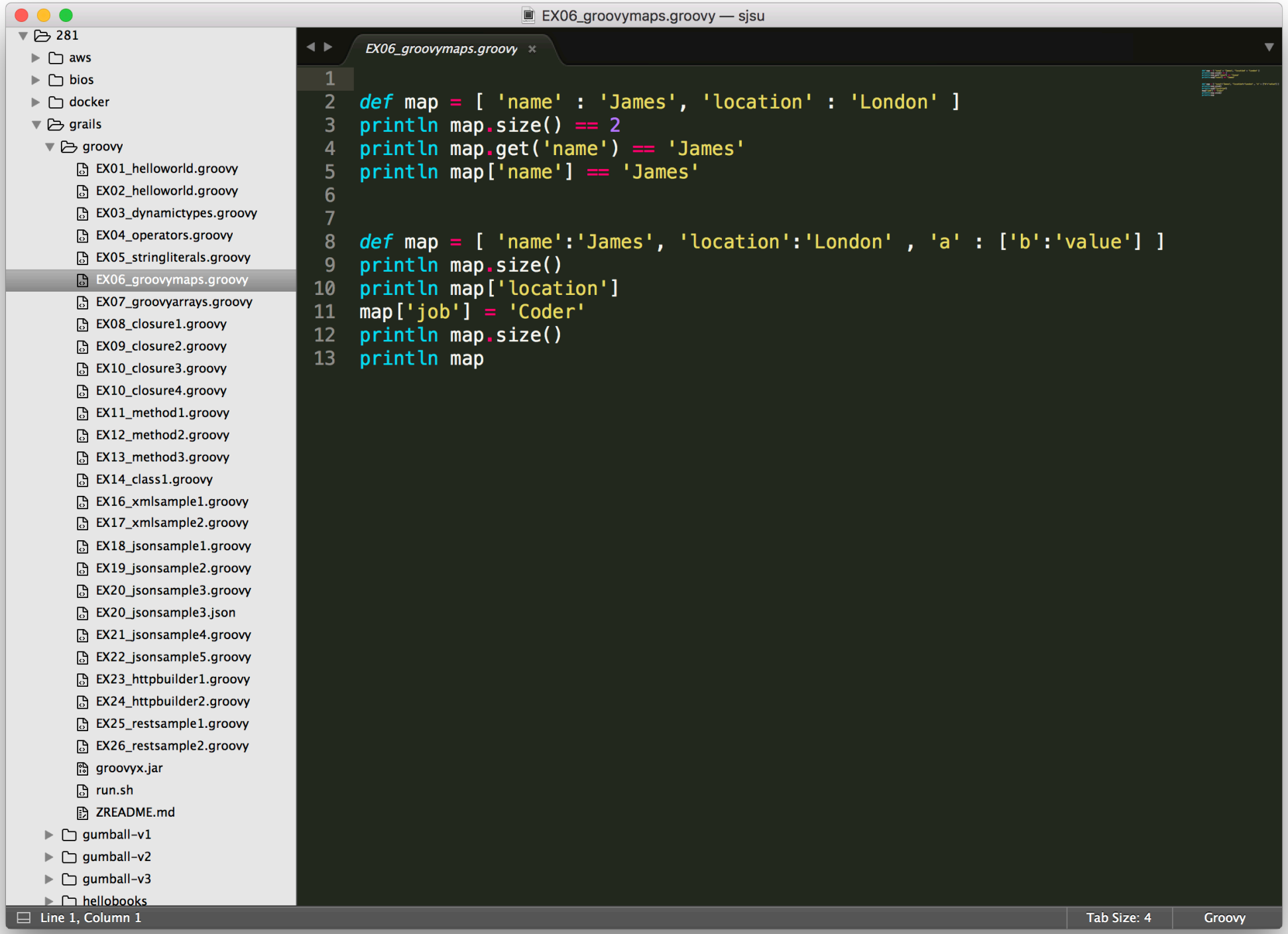

EX01_helloworld.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
ZREADME.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
EX01_helloworld.groovy
1 public class HelloWorld
2 {
3 public static void main(String[] args)
4 {
5 System.out.println("Hello World!") ;
6 }
7 }
8
9
10
Line 1, Column 1
Tab Size: 4
Groovy

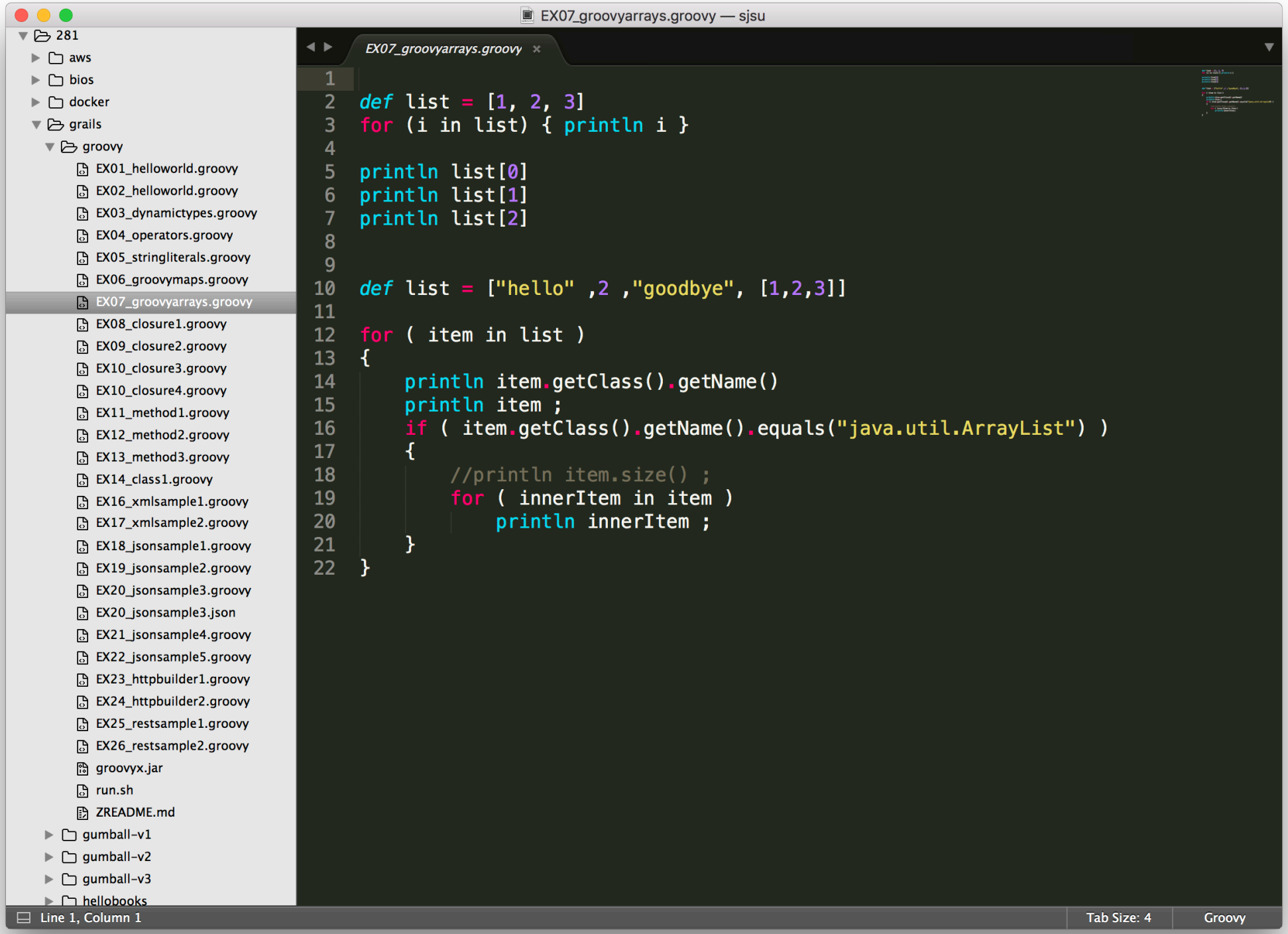

EX02_helloworld.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
ZREADME.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
EX02_helloworld.groovy
1
2
System.out.println("Hello World!") ;
Line 1, Column 1
Tab Size: 4
Groovy

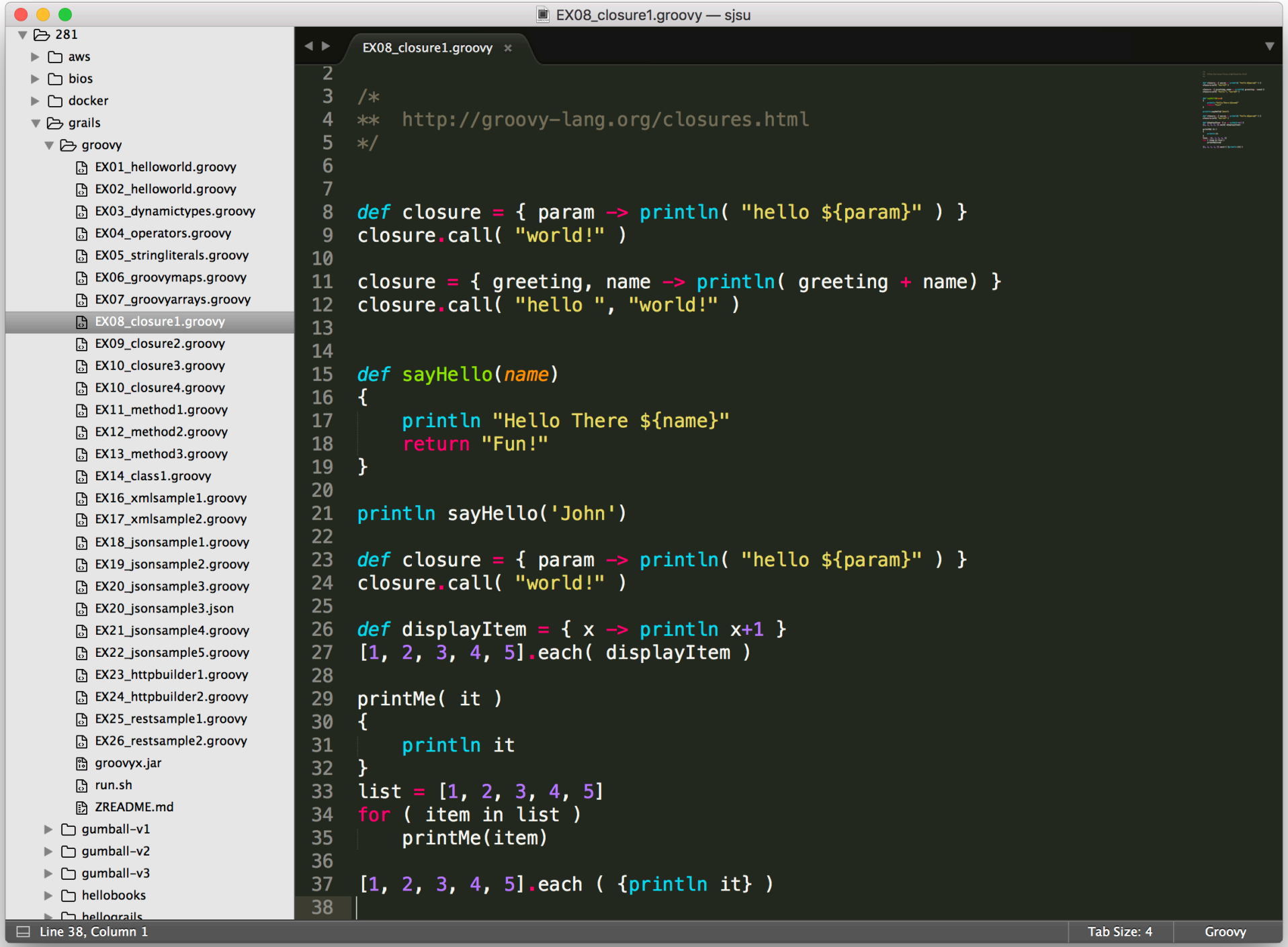

EX03_dynamictypes.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
ZREADME.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
EX03_dynamictypes.groovy
1
2 int age=25
3 def number=age
4 message = "Hello World"
5
6 println age.getClass().getName()
7 println number.getClass().getName()
8 println message.getClass().getName()
9
10 number=message
11 println number.getClass().getName()
12
13
14 5.dump()
15 5.metaClass.methods
Line 1, Column 1
Tab Size: 4
Groovy

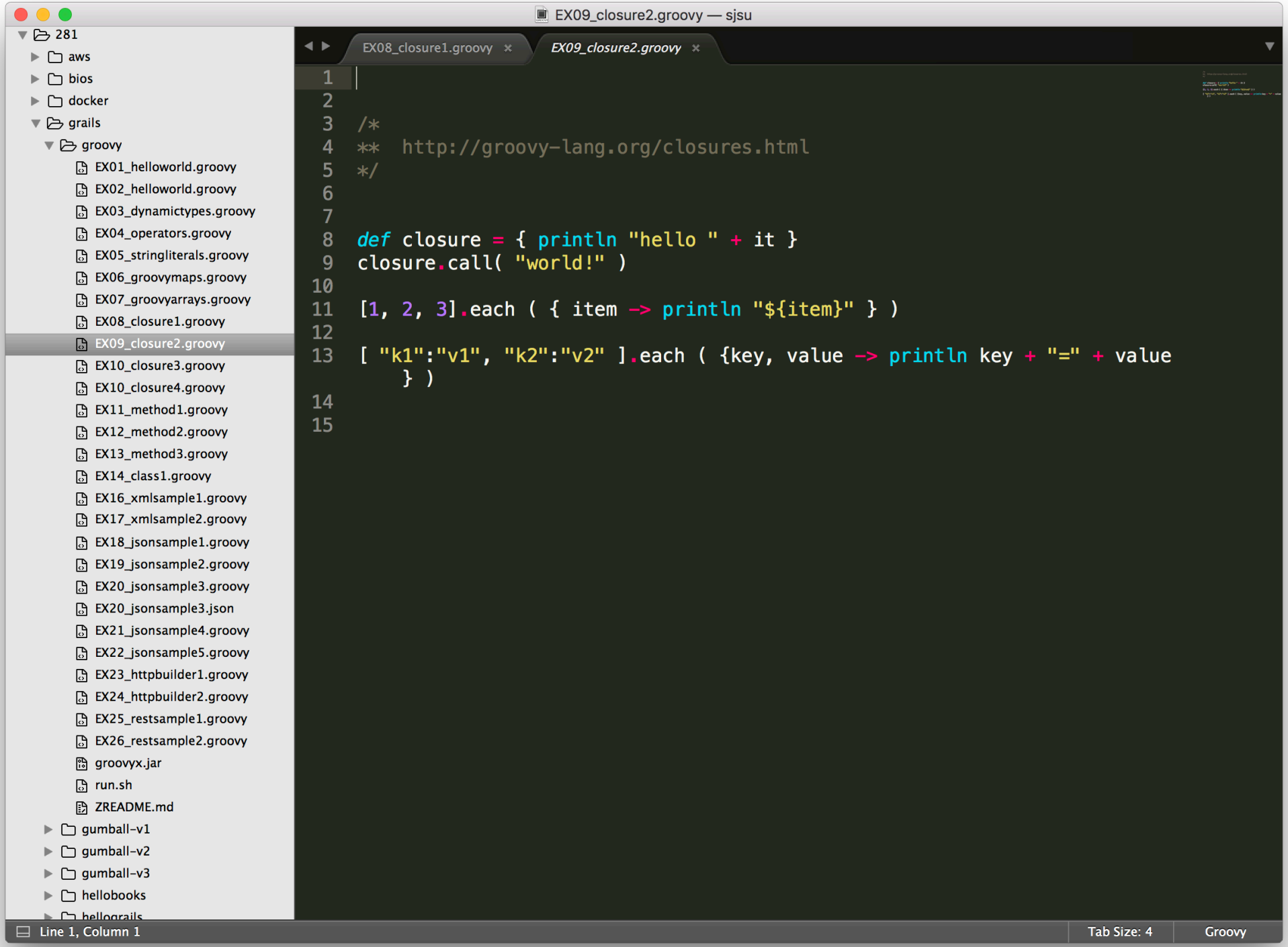

EX04_operators.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
ZREADME.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
EX04_operators.groovy
1
println 5<3
println 5.compareTo(3) < 0
println 5>3
println 5.compareTo(3) > 0
println 5==3
println 5.equals(3)
println 5!=3
println !(5.equals(3))
Line 1, Column 1
Tab Size: 4
Groovy

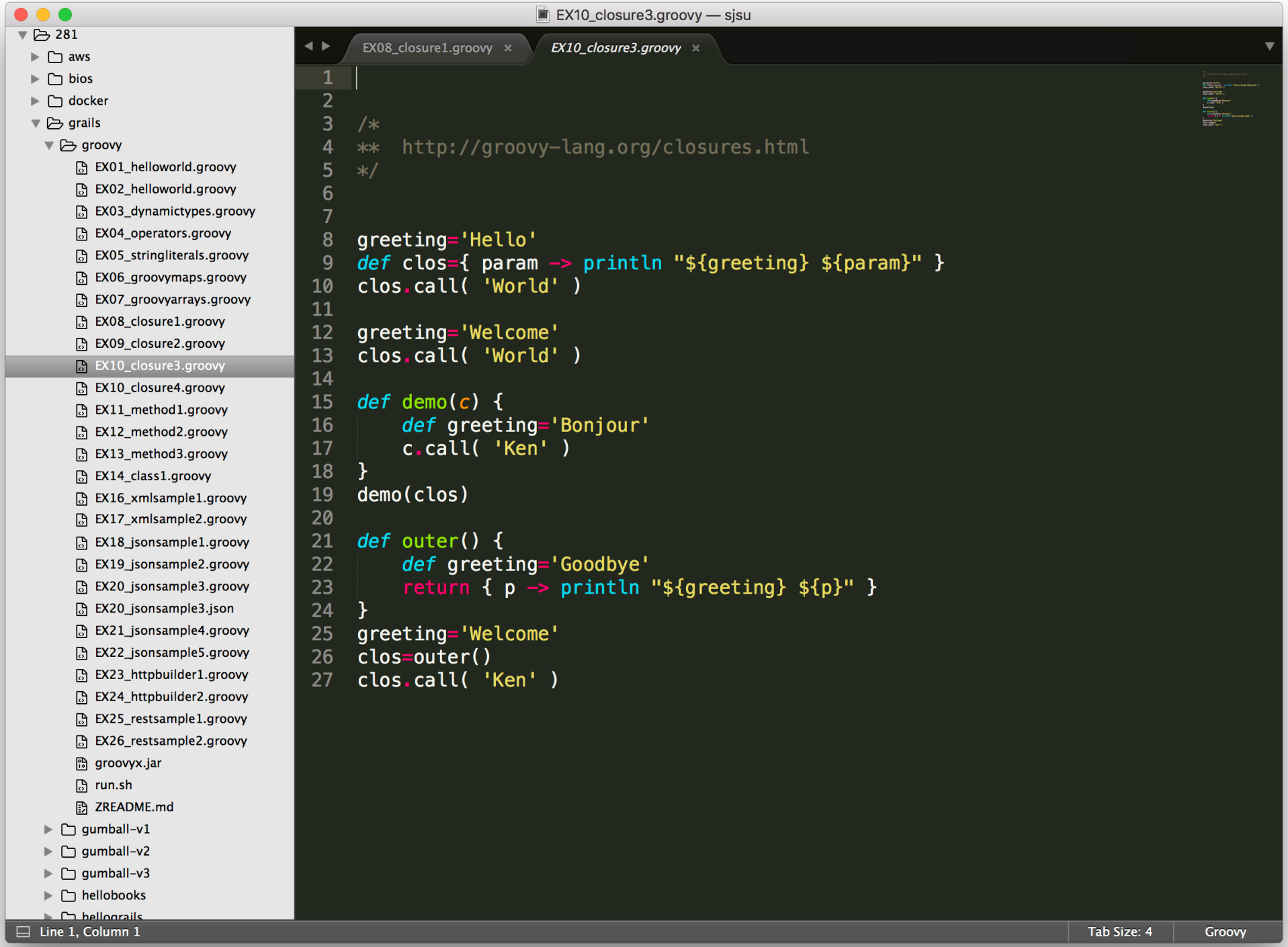

EX05_stringliterals.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
README.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
EX05_stringliterals.groovy
1 def age=25
2
3 println 'My age is ${age}'
4 println "My age is ${age}"
5 println "My age is \${age}"
6
7
8 s1="Hello"
9 s2="World"
10 s3=123
11 printf (" %-2s | %-2s| %5d\n", s1, s2, s3)
12
13
14 a='Hello'
15 b='World'
16 println a.concat(' ').concat(b)
17 println a + ' ' + b
18 println "${a} ${b}"
19 printf "%s %s\n", a , b
20
Line 1, Column 1
Tab Size: 4
Groovy

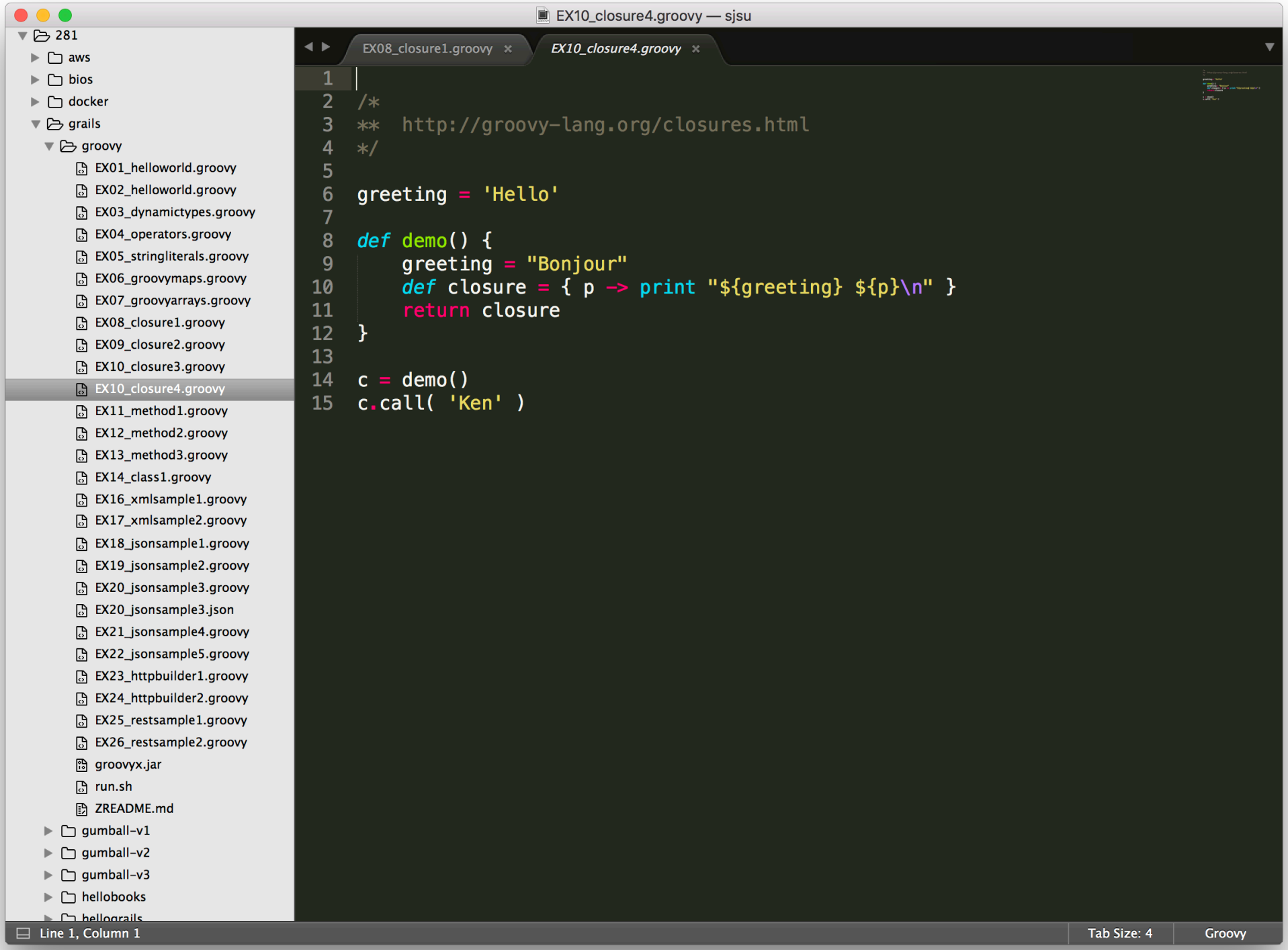

EX06_groovymaps.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
ZREADME.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
EX06_groovymaps.groovy
1 def map = ['name' : 'James', 'location' : 'London']
2 println map.size() == 2
3 println map.get('name') == 'James'
4 println map['name'] == 'James'
5
6
7 def map = ['name':'James', 'location':'London' , 'a' : ['b':'value']]
8 println map.size()
9 println map['location']
10 map['job'] = 'Coder'
11 println map.size()
12 println map
13
Line 1, Column 1
Tab Size: 4
Groovy

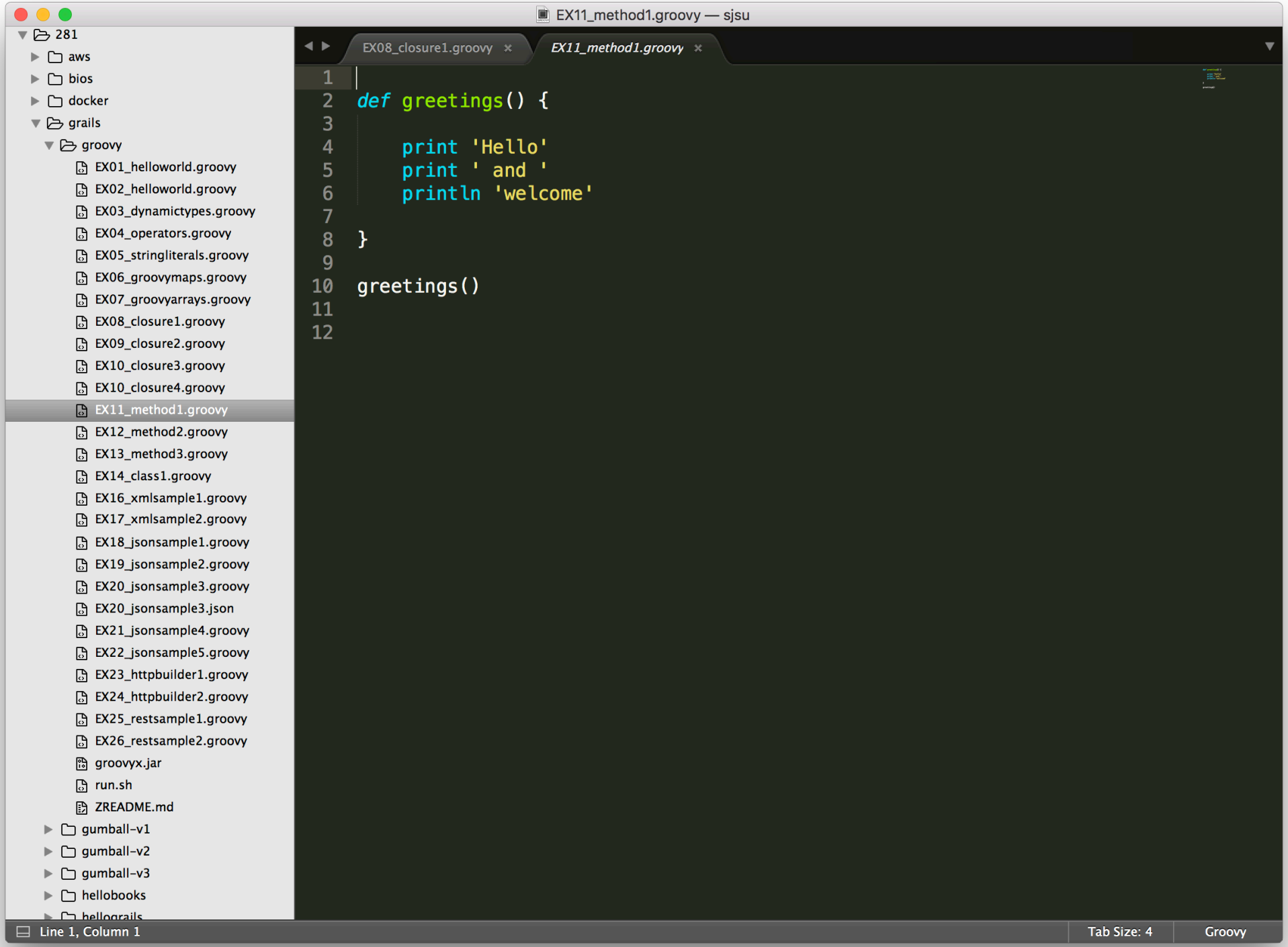

EX07_groovyarrays.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
ZREADME.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
EX07_groovyarrays.groovy
1
def list = [1, 2, 3]
for (i in list) { println i }
println list[0]
println list[1]
println list[2]
def list = ["hello" ,2 ,"goodbye", [1,2,3]]
for (item in list)
{
println item.getClass().getName()
println item ;
if (item.getClass().getName().equals("java.util.ArrayList"))
{
//println item.size() ;
for (innerItem in item)
println innerItem ;
}
}
Line 1, Column 1
Tab Size: 4
Groovy

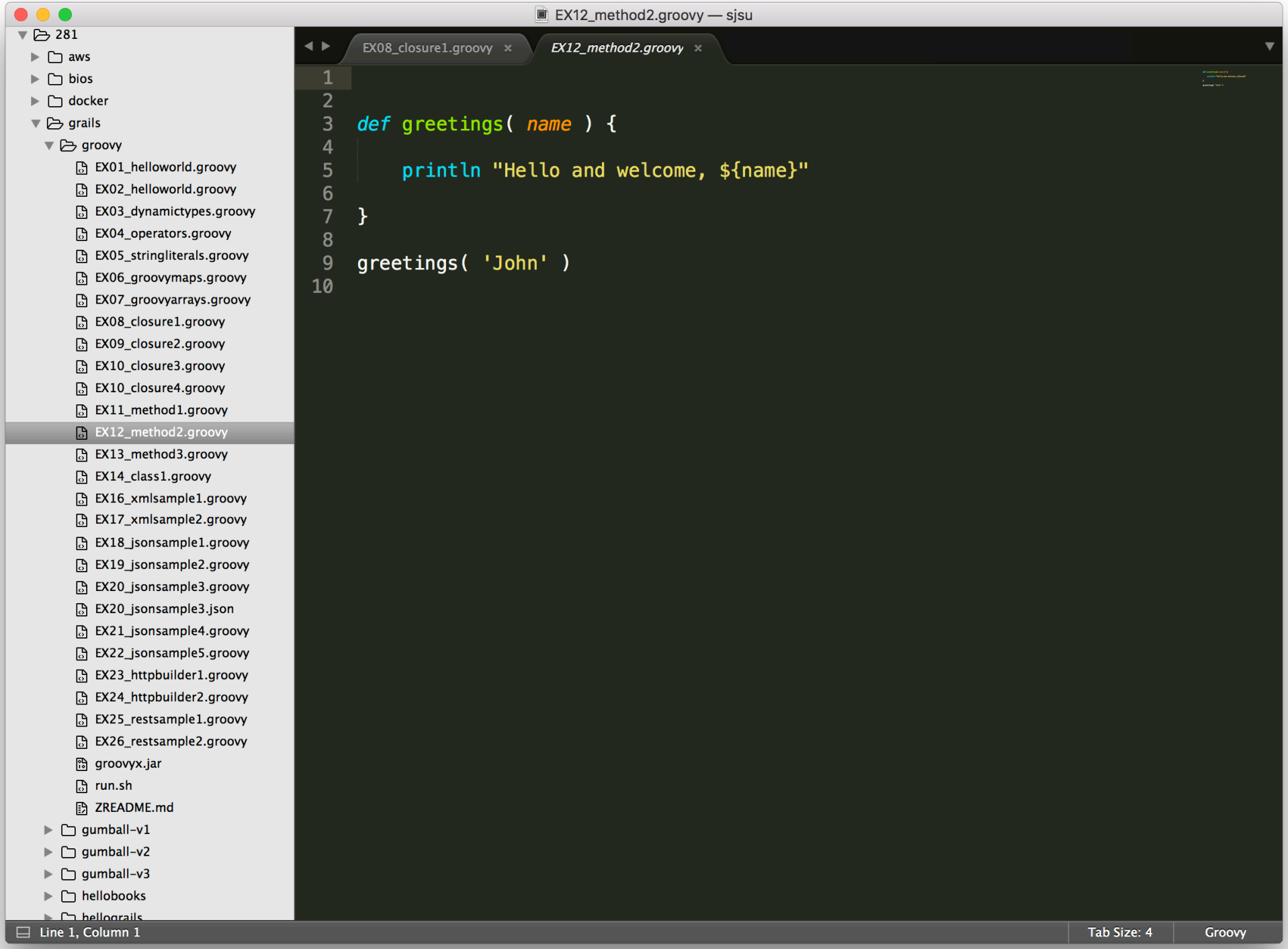

EX08_closure1.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
ZREADME.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
hellograils
EX08_closure1.groovy
2
3 /*
4 ** http://groovy-lang.org/closures.html
5 */
6
7
8 def closure = { param -> println("hello ${param}") }
9 closure.call("world!")
10
11 closure = { greeting, name -> println(greeting + name) }
12 closure.call("hello ", "world!")
13
14
15 def sayHello(name)
16 {
17 println "Hello There ${name}"
18 return "Fun!"
19 }
20
21 println sayHello('John')
22
23 def closure = { param -> println("hello ${param}") }
24 closure.call("world!")
25
26 def displayItem = { x -> println x+1 }
27 [1, 2, 3, 4, 5].each(displayItem)
28
29 printMe(it)
30 {
31 println it
32 }
33 list = [1, 2, 3, 4, 5]
34 for (item in list)
35 printMe(item)
36
37 [1, 2, 3, 4, 5].each ({println it})
38
Line 38, Column 1
Tab Size: 4
Groovy

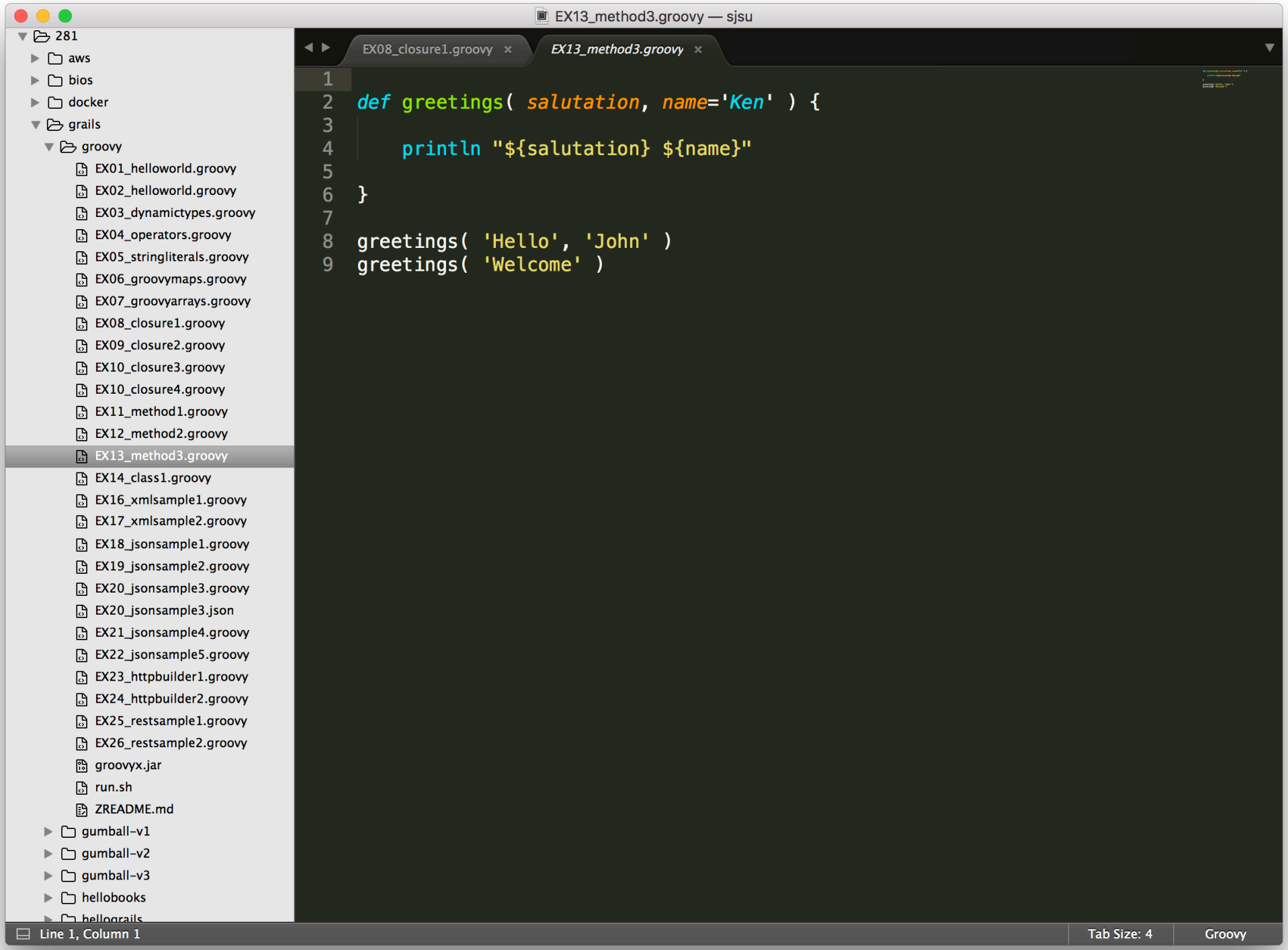

EX09_closure2.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
README.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
hellograils
EX08_closure1.groovy
EX09_closure2.groovy
1
2
3 /*
4 ** http://groovy-lang.org/closures.html
5 */
6
7
8 def closure = { println "hello " + it }
9 closure.call("world!")
10
11 [1, 2, 3].each ({ item -> println "${item}" })
12
13 ["k1":"v1", "k2":"v2"].each ({key, value -> println key + "=" + value
})
14
15
Line 1, Column 1
Tab Size: 4
Groovy

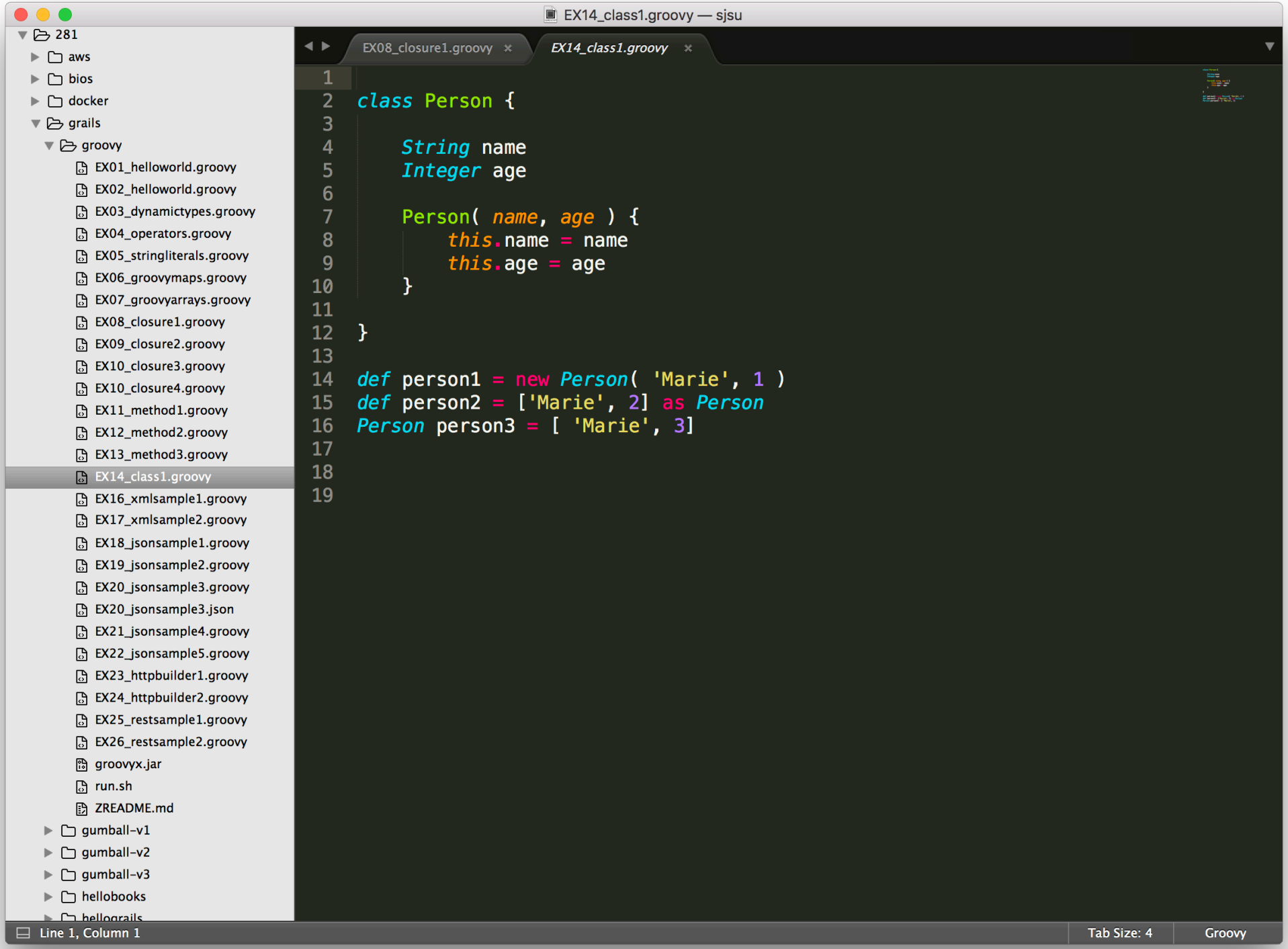

EX10_closure3.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
ZREADME.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
hellograils
EX08_closure1.groovy
EX10_closure3.groovy
1 /*
2 ** http://groovy-lang.org/closures.html
3 */
4
5 greeting='Hello'
6 def clos={ param -> println "${greeting} ${param}" }
7 clos.call('World')
8
9 greeting='Welcome'
10 clos.call('World')
11
12 def demo(c) {
13 def greeting='Bonjour'
14 c.call('Ken')
15 }
16 demo(clos)
17
18 def outer() {
19 def greeting='Goodbye'
20 return { p -> println "${greeting} ${p}" }
21 }
22 greeting='Welcome'
23 clos=outer()
24 clos.call('Ken')
Line 1, Column 1
Tab Size: 4
Groovy

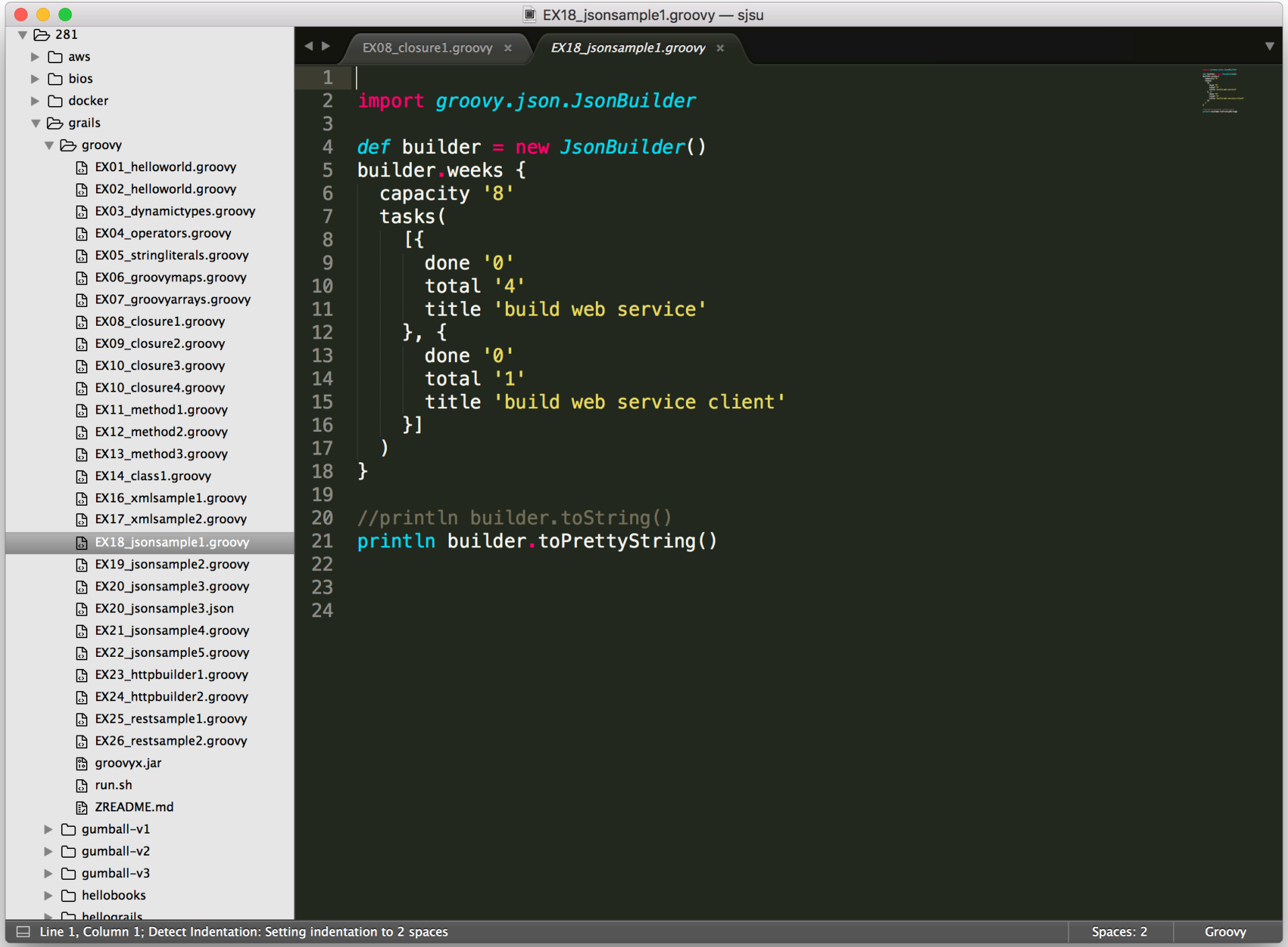

EX10_closure4.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
ZREADME.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
hellograils
EX08_closure1.groovy
EX10_closure4.groovy
1 /*
2 ** http://groovy-lang.org/closures.html
3 */
4
5 greeting = 'Hello'
6
7 def demo() {
8 greeting = "Bonjour"
9 def closure = { p -> print "${greeting} ${p}\n" }
10 return closure
11 }
12
13 c = demo()
14 c.call('Ken')
Line 1, Column 1
Tab Size: 4
Groovy

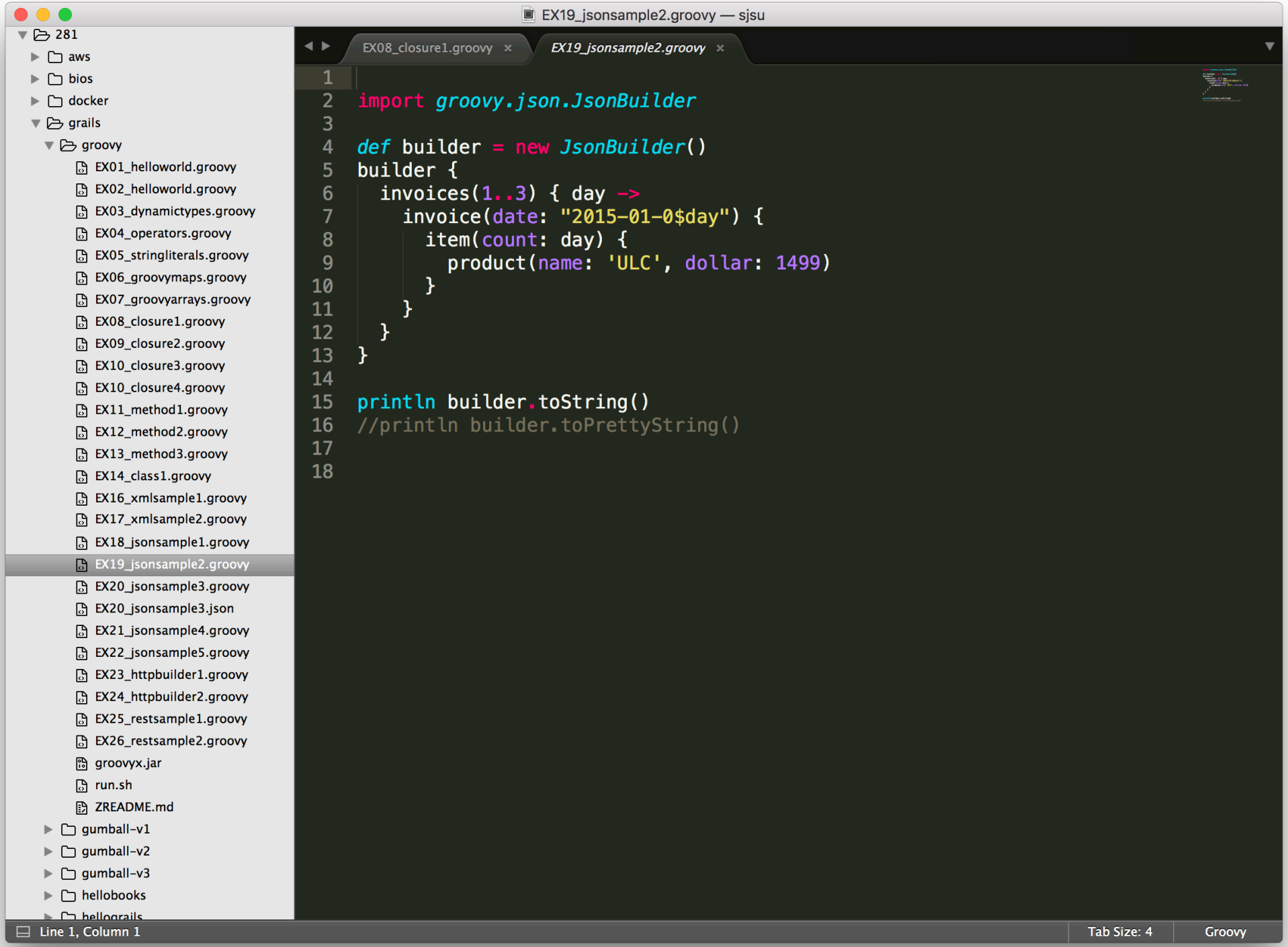

EX11_method1.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
ZREADME.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
hellograils
EX08_closure1.groovy
EX11_method1.groovy
1
def greetings() {
print 'Hello'
print ' and '
println 'welcome'
}
greetings()
Line 1, Column 1
Tab Size: 4
Groovy

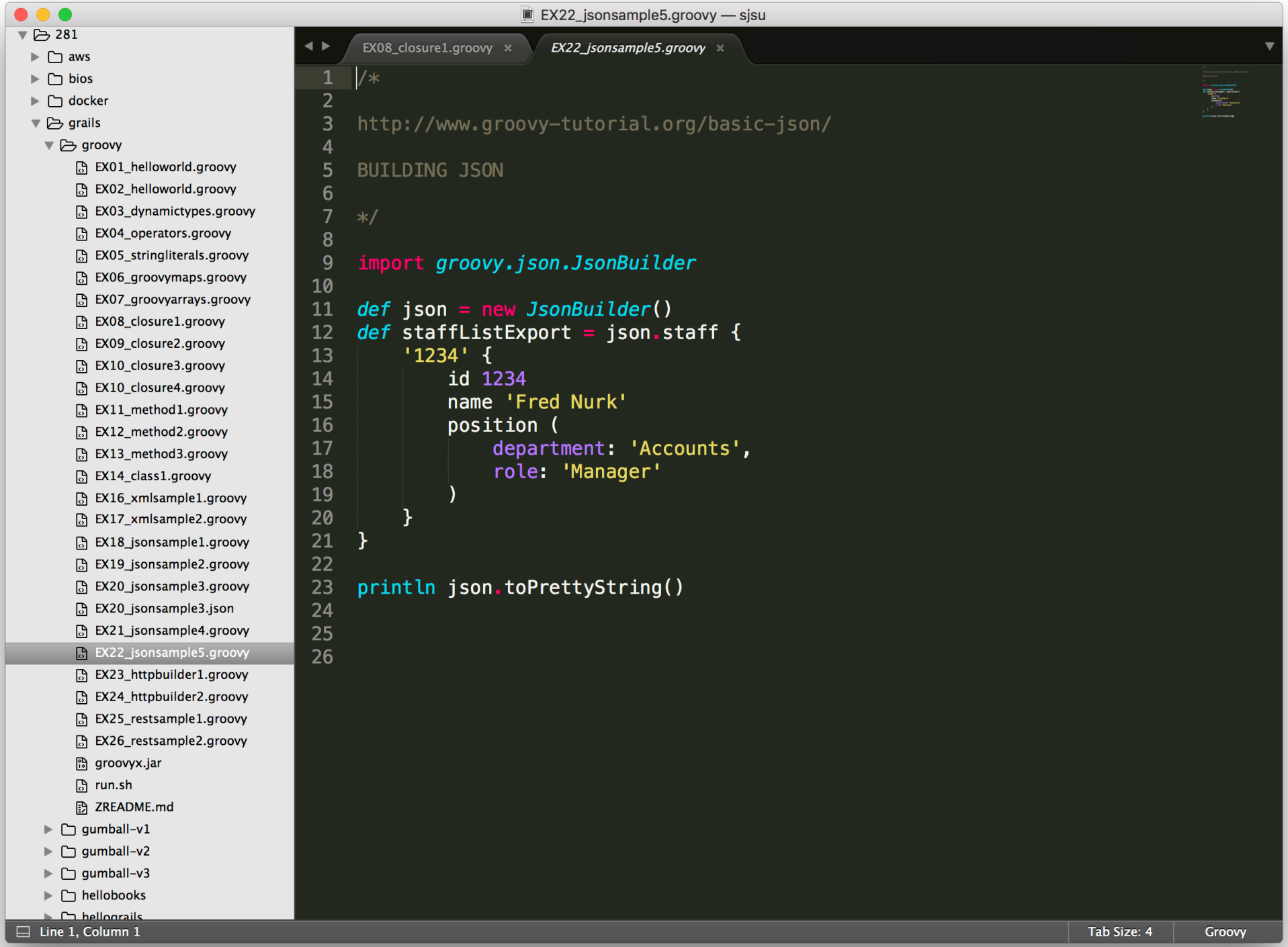

EX12_method2.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
README.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
hellograils
EX08_closure1.groovy
EX12_method2.groovy
def greetings(name) {
println "Hello and welcome, ${name}"
}
greetings('John')
Line 1, Column 1
Tab Size: 4
Groovy


EX13_method3.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
ZREADME.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
hellograils
EX08_closure1.groovy
EX13_method3.groovy
def greetings(salutation, name='Ken') {
println "${salutation} ${name}"
}
greetings('Hello', 'John')
greetings('Welcome')
Line 1, Column 1
Tab Size: 4
Groovy


EX14_class1.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
README.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
hellograils
EX08_closure1.groovy
EX14_class1.groovy
1 class Person {
2
3 String name
4 Integer age
5
6 Person(name, age) {
7 this.name = name
8 this.age = age
9 }
10
11 }
12
13 def person1 = new Person('Marie', 1)
14 def person2 = ['Marie', 2] as Person
15 Person person3 = ['Marie', 3]
16
17
18
19
Line 1, Column 1
Tab Size: 4
Groovy


EX18_jsonsample1.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
ZREADME.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
hellograils
EX08_closure1.groovy
EX18_jsonsample1.groovy
1 import groovy.json.JsonBuilder
2
3 def builder = new JsonBuilder()
4 builder.weeks {
5 capacity '8'
6 tasks(
7 [{
8 done '0'
9 total '4'
10 title 'build web service'
11 }, {
12 done '0'
13 total '1'
14 title 'build web service client'
15 }]
16)
17 }
18
19 //println builder.toString()
20 println builder.toPrettyString()
21
22
23
Line 1, Column 1; Detect Indentation: Setting indentation to 2 spaces
Spaces: 2
Groovy

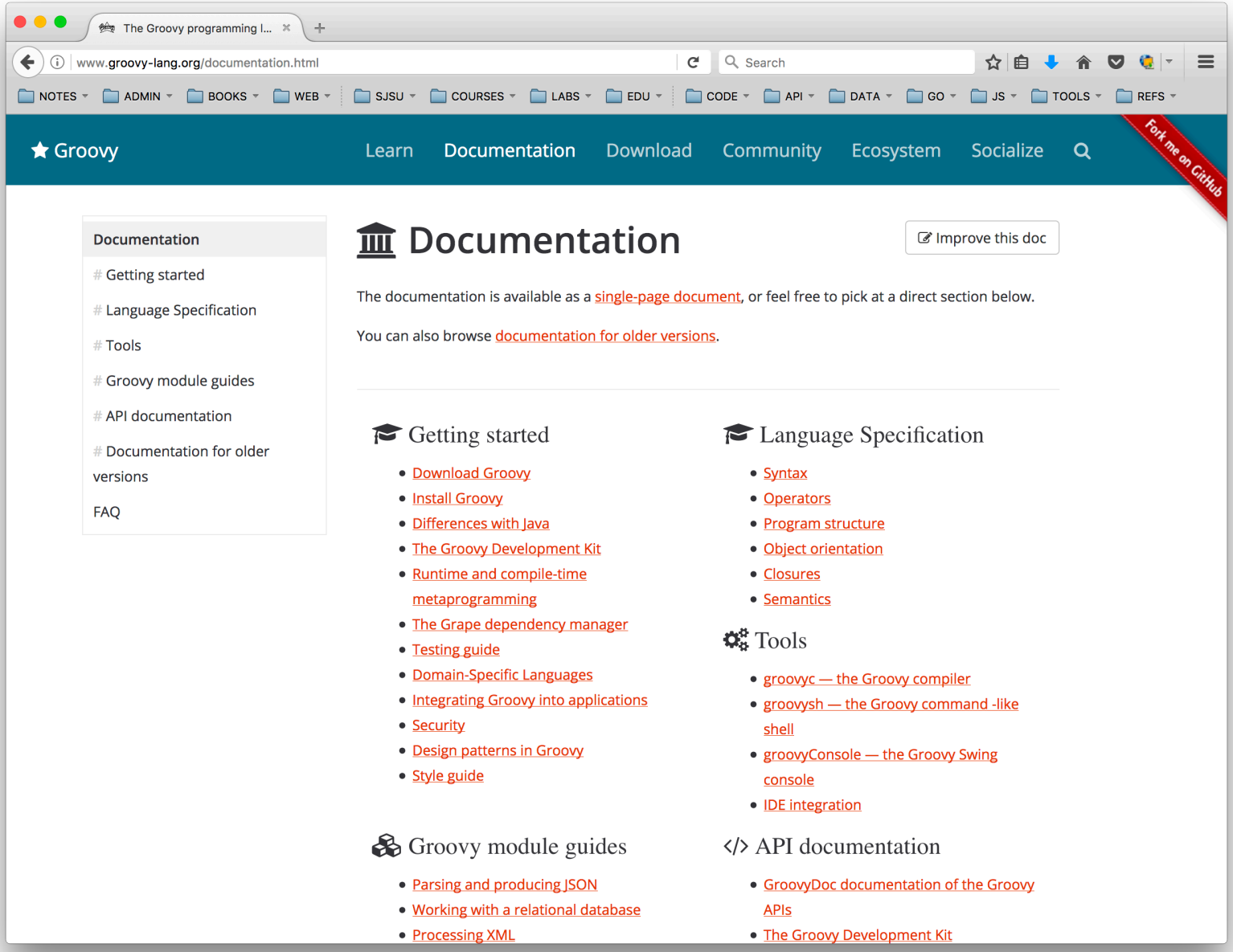

EX19_jsonsample2.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
ZREADME.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
hellograils
EX08_closure1.groovy
EX19_jsonsample2.groovy
1
2 import groovy.json.JsonBuilder
3
4 def builder = new JsonBuilder()
5 builder {
6 invoices(1..3) { day ->
7 invoice(date: "2015-01-0$day") {
8 item(count: day) {
9 product(name: 'ULC', dollar: 1499)
10 }
11 }
12 }
13 }
14
15 println builder.toString()
16 //println builder.toPrettyString()
17
18
Line 1, Column 1
Tab Size: 4
Groovy


EX22_jsonsample5.groovy — sjsu
281
aws
bios
docker
grails
groovy
EX01_helloworld.groovy
EX02_helloworld.groovy
EX03_dynamictypes.groovy
EX04_operators.groovy
EX05_stringliterals.groovy
EX06_groovymaps.groovy
EX07_groovyarrays.groovy
EX08_closure1.groovy
EX09_closure2.groovy
EX10_closure3.groovy
EX10_closure4.groovy
EX11_method1.groovy
EX12_method2.groovy
EX13_method3.groovy
EX14_class1.groovy
EX16_xmlsample1.groovy
EX17_xmlsample2.groovy
EX18_jsonsample1.groovy
EX19_jsonsample2.groovy
EX20_jsonsample3.groovy
EX20_jsonsample3.json
EX21_jsonsample4.groovy
EX22_jsonsample5.groovy
EX23_httpbuilder1.groovy
EX24_httpbuilder2.groovy
EX25_restsample1.groovy
EX26_restsample2.groovy
groovyx.jar
run.sh
ZREADME.md
gumball-v1
gumball-v2
gumball-v3
hellobooks
hellograils
EX08_closure1.groovy
EX22_jsonsample5.groovy
/*
http://www.groovy-tutorial.org/basic-json/
BUILDING JSON
*/
import groovy.json.JsonBuilder
def json = new JsonBuilder()
def staffListExport = json.staff {
'1234' {
id 1234
name 'Fred Nurk'
position (
department: 'Accounts',
role: 'Manager'
)
}
}
println json.toPrettyString()
Line 1, Column 1
Tab Size: 4
Groovy

Documentation

GDK

http://www.groovy-lang.org/documentation.html



Some Strings Examples

```
'Hello'.compareToIgnoreCase('hello')     // 0
'Hello'.concat('world')                  // Hello world
'Hello'.endsWith('lo')                   // true
'Hello'.equalsIgnoreCase('hello')        // true
'Hello'.indexOf('lo')                    // 3
'Hello world'.indexOf('o', 6)            // 7
'Hello'.matches('Hello')                 // true
'Hello'.matches('He')                    // false
'Hello'.replaceAll('l', 'L')             // HeLLo
'Hello world'.split('l')                 // 'He', 'o wor', 'd'
'Hello'.substring(1)                     // ello
'Hello'.substring(1, 4)                  // ell
'Hello'.toUpperCase()                    // HELLO
def message = 'Hello'
message.center(11)                       //□□□Hello□□□
message.center(3)                        // Hello
message.center(11, '#')                  // ###Hello###
message.eachMatch('.') { ch ->           // print H e l l o
  println ch }                             on separate lines
message.getAt(0)                         // H
message.getAt(0..<3)                     // Hel
message.getAt([0, 2, 4])                 // Hlo
message.leftShift('world')               // Hello world
message << 'world'                       // Hello world
message.minus('ell')                     // Ho
message-'ell'                            // Ho
message.padLeft(4)                       // Hello
message.padLeft(11)                      // □□□□□□Hello
message.padLeft(11, '#')                 // ######Hello
message.padRight(4)                      // Hello
message.padRight(11)                     // Hello□□□□□□
message.padRight(11, '#')                // Hello######
message.plus('world')                    // Hello world
message+'world'                          // Hello world
message.replaceAll('[a-z]') { ch ->      // HELLO
  ch.toUpperCase() }
message.reverse()                        // olleH
message.toList()                         // ['H', 'e', 'l', 'l', 'o
def message='Hello world'
message.tokenize()                       // ['Hello', 'world']
message.tokenize('l')                    // ['He', 'o wor', 'd']
```

```
def greeting='Hello world'
'Hello'+'world'              // Hello world       concatenate
'Hello'*3                    // HelloHelloHello   repeat
greeting-'o world'           // Hell              remove first occurrence
greeting.size()              // 11                synonymous with length
greeting.length()            // 11                synonymous with size
greeting.count('o')          // 2
greeting.contains('ell')     // true
```

In a regular expression, two special *positional characters* are used to denote the beginning and end of a line: caret (^) and dollar sign ($):

```
def rhyme='Humpty Dumpty sat on a wall'
rhyme=~'^Humpty'                          // true
rhyme=~'wall$'                            // true
```

Regular expressions can also include *quantifiers*. The plus sign (+) represents one or more times, applied to the preceding element of the expression. The asterisk (*) is used to represent zero or more occurrences. The question mark (?) denotes zero or once. The metacharacter { and } is used to match a specific number of instances of the preceding character. The following all yield `true`:

```
'aaaaab'=~'a*b'
'b'=~'a*b'
'aaacd'=~'a*c?d'
'aaad'=~'a*c?d'
'aaaaab'=~'a{5}b'
!('aab'=~'a{5}b')
```

Collections

Example	*Description*
`[11, 12, 13, 14]`	A list of integer values
`['Ken', 'John', 'Andrew']`	A list of `String`s
`[1, 2, [3, 4], 5]`	A nested list
`['Ken', 21, 1.69]`	A heterogeneous list of object references
`[ ]`	An empty list

```
def numbers = [11, 12, 13, 14]     // list with four items
numbers [0]                        // 11
numbers [3]                        // 14

numbers [-1]   // 14
numbers [-2]   // 13

[11, 12, 13, 14][2]   // 13

numbers [0..2]    // [11, 12, 13]
numbers [1..<3]   // [12, 13]

numbers [1] = 22          // [11, 22, 13, 14]
numbers [1] = [33, 44]    // [11, [33, 44], 13, 14]

numbers << 15     // [11, [33, 44], 13, 14, 15]

numbers = [11, 12, 13, 14]     // list with four items
numbers + [15, 16]             // [11, 12, 13, 14, 15, 16]

numbers = [11, 12, 13, 14]     // list with four items
numbers - [13]                 // [11, 12, 14]
```

TABLE 4.2 List methods

Name	*Signature/description*
`add`	`boolean add(Object value)` Append the new `value` to the end of this `List`.
`add`	`void add(int index, Object value)` Inserts a new `value` into this `List` at the given `index` position.
`addAll`	`boolean addAll(Collection values)` Append the new `values` on to the end of this `List`.
`contains`	`boolean contains(Object value)` Returns `true` if this `List` contains the specified `value`.
`flatten` *	`List flatten()` Flattens this `List` and returns a new `List`.
`get`	`Object get(int index)` Returns the element at the specified position in this `List`.

```
[11, 12, 13, 14].add(15)                  // [11, 12, 13, 14, 15]
[11, 12, 13, 14].add(2, 15)               // [11, 12, 15, 13, 14]
[11, 12, 13, 14].add([15, 16])            // [11, 12, 13, 14, 15, 16]
[11, 12, 13, 14].get(1)                   // 12
[11, 12, 13, 14].isEmpty()                // false
[14, 13, 12, 11].size()                   // 4
[11, 12, [13, 14]].flatten()              // [11, 12, 13, 14]
[11, 12, 13, 14].getAt(1)                 // 12
[11, 12, 13, 14].getAt(1..2)              // [12, 13]
[11, 12, 13, 14].getAt([2, 3])            // [13, 14]
[11, 12, 13, 14].intersect([13, 14, 15])  // [13, 14]
[11, 12, 13, 14].pop()                    // 14
[11, 12, 13, 14].reverse()                // [14, 13, 12, 11]
[14, 13, 12, 11].sort()                   // [11, 12, 13, 14]
```

Maps

Example	*Description*
`['Ken' : 'Barclay', 'John' : 'Savage']`	Forename/surname collection
`[4 : [2], 6 : [3, 2], 12 : [6, 4, 3, 2]]`	Integer keys and their list of divisors
`[ : ]`	Empty map


```
def names = ['Ken' : 'Barclay', 'John' : 'Savage']
def divisors = [4 : [2], 6 : [3, 2], 12 : [6, 4, 3, 2]]
names['Ken']                                          // 'Barclay'
names.Ken                                             // 'Barclay'
names['Jessie']                                       // null
divisors[6]                                           // [3, 2]
```

```
divisors[6] = [6, 3, 2, 1]              // [4 : [2], 6 : [6, 3, 2, 1],
                                        // 12 : [6, 4, 3, 2]]
```

```
def careful = [ 1 : 'Ken', '1' : 'Barclay']
careful[1]                                  // Ken
careful['1']                                // Barclay
```

TABLE 4.4 Map methods

Name	*Signature/description*
`containsKey`	`boolean containsKey(Object key)` Does this `Map` contain this `key`?
`get`	`Object get(Object key)` Look up the `key` in this `Map` and return the corresponding value. If there is no entry in this `Map` for the key, then return `null`.
`get` *	`Object get(Object key, Object defaultValue)` Look up the `key` in this `Map` and return the corresponding value. If there is no entry in this `Map` for the key, then return the `defaultValue`.
`getAt` *	`Object getAt(Object key)` Support method for the subscript operator.
`keySet`	`Set keySet()` Obtain a `Set` of the keys in this `Map`.
`put`	`Object put(Object key, Object value)` Associates the specified `value` with the specified `key` in this `Map`. If this `Map` previously contained a mapping for this `key`, the old value is replaced by the specified `value`.
`putAt` *	`Object putAt(Object key, Object value)` Support method to allow `Maps` to operate with subscript assignment.
`size`	`int size()` Returns the number of key-value mappings in this `Map`.
`values`	`Collection values()` Returns a collection view of the values contained in this `Map`.

```
def mp = ['Ken' : 2745, 'John' : 2746, 'Sally' : 2742]
mp.put('Bob', 2713)          // [Bob:2713, Ken:2745, Sally:2742, John:2746]
mp.containsKey('Ken')        // true
mp.get('David', 9999)        // 9999
mp.get('Sally')              // 2742
mp.get('Billy')              // null
mp.keySet()                  // [David, Bob, Ken, Sally, John]
mp.size()                    // 4
mp['Ken']                    // 2745
```

Methods

```
def methodName() {
   // Method code goes here
}
```

```
def methodName(para1, para2, para3) {
  // Method code goes here
}
```

```
def someMethod(para1, para2=0, para3=0) {
  // Method code goes here
}
```

```
def greetings() {
    print 'Hello'
    print ' and '
    println 'welcome'
}

greetings()
```

```
def greetings(name) {
  println "Hello and welcome, ${name}"
}

greetings('John')
```

```
def greetings(salutation, name='Ken') {
  println "${salutation} ${name}"
}
greetings('Hello', 'John')        // Hello John
greetings('Welcome')              // Welcome Ken
```

```
Hello and welcome
```

```
Hello and welcome, John
```

```
Hello John
Welcome Ken
```

Closures - Invocation & Parameters

9.1 CLOSURES

The syntax for defining a closure is:

```
{comma-separated-formal-parameter-list -> statement-list}
```

If no formal parameters are required, then the parameter `List` and the `->` separator are omitted. Here is a simple example of a closure with no parameters.

```
def clos={println 'Hello world'}
clos.call()
```

```
Hello world
```

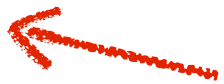
```
def clos={param -> println "Hello ${param}"}

clos.call('world')        // actual argument is 'world'
clos.call('again')        // actual argument is 'again'
clos('shortcut')          // abbreviated form
```

```
Hello world
Hello again
Hello shortcut
```

Observe the third invocation in which the `call` has been omitted.

The next illustration repeats the previous example and produces the same result, but shows that an implicit single parameter referred to as `it` can be used.

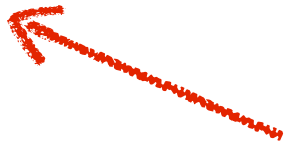
```
def clos={println "Hello ${it}"}

clos.call('world')
clos.call('again')

clos('shortcut')
```



Default Single Parameter "it"

Closures - Enclosing Scope

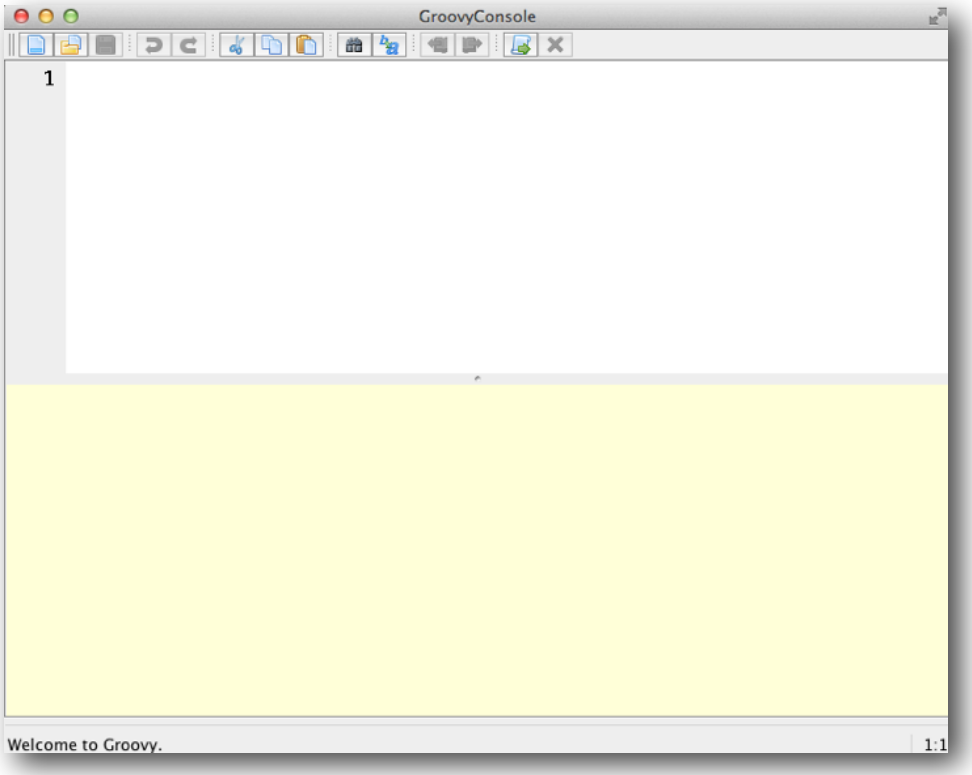

```
def greeting = 'Hello'
def clos = {param -> println "${greeting} ${param}"}
clos.call('world')

// Now show that changes to this variable change the closure.
greeting = 'Welcome'
clos.call('world')

def demo(clo) {
    def greeting = 'Bonjour'                    // does not affect closure
    clo.call('Ken')
}

demo(clos)
```

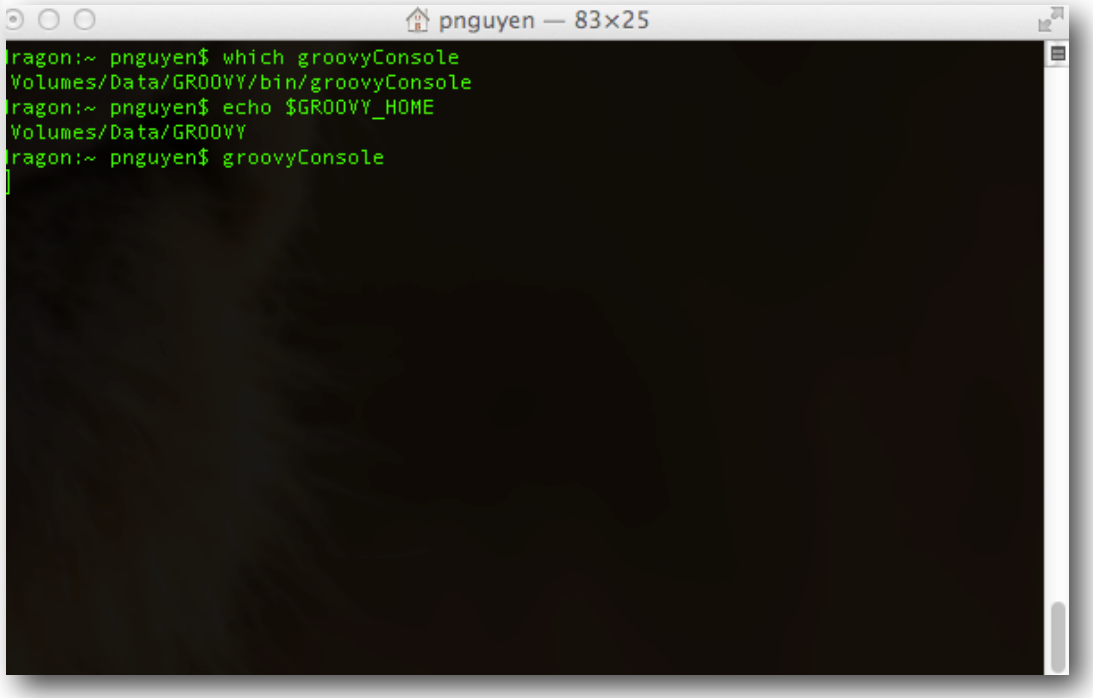


The resulting output is:

```
Hello world
Welcome world
Welcome Ken
```

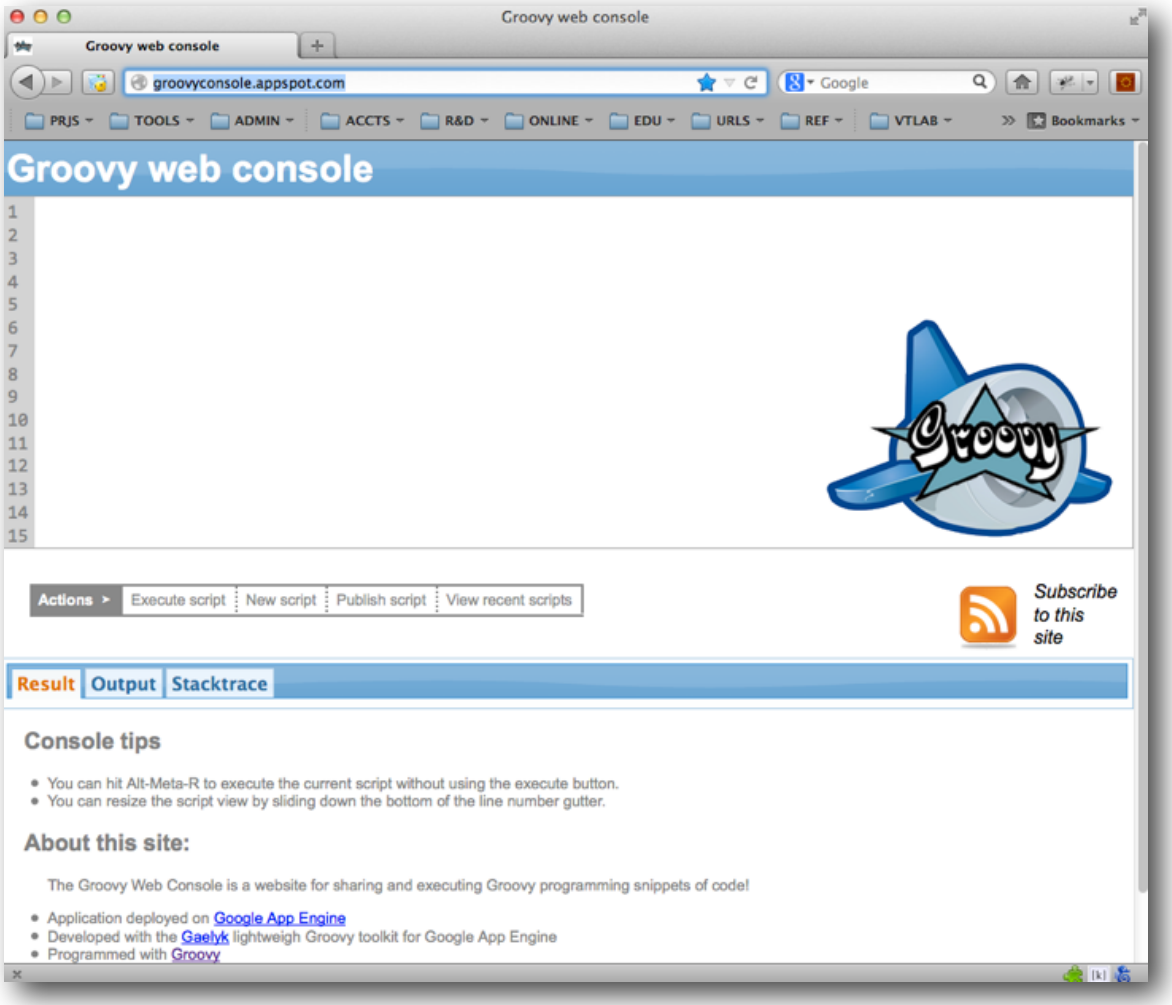
Groovy Console





Groovy Web Console

http://groovyconsole.appspot.com/



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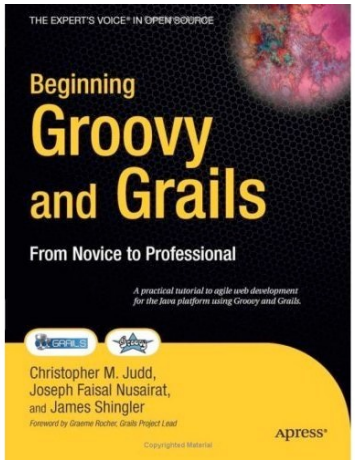
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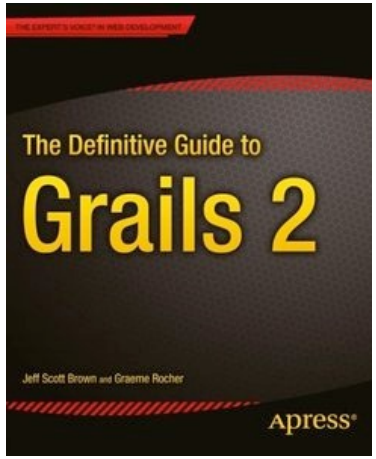
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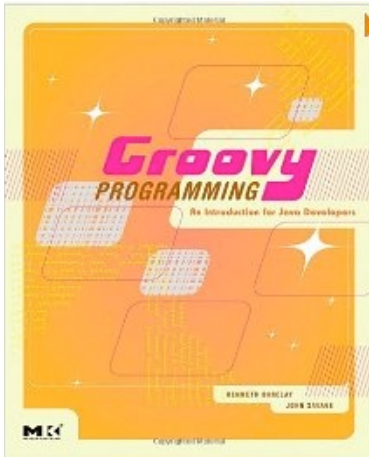
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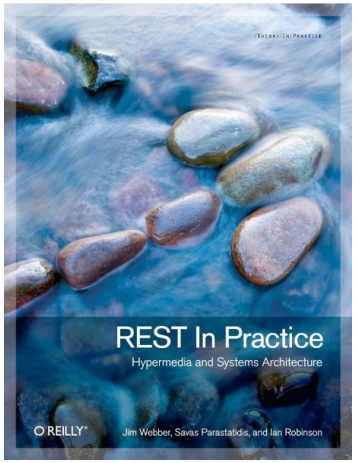
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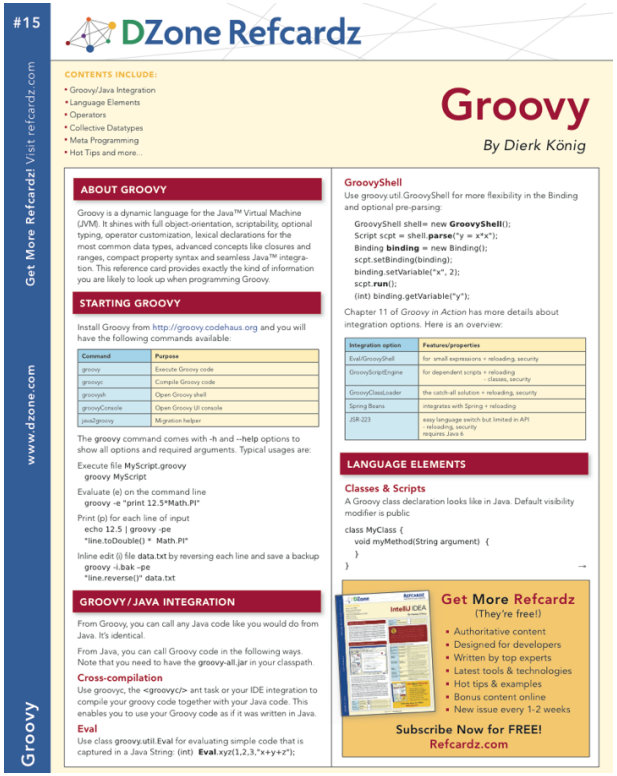
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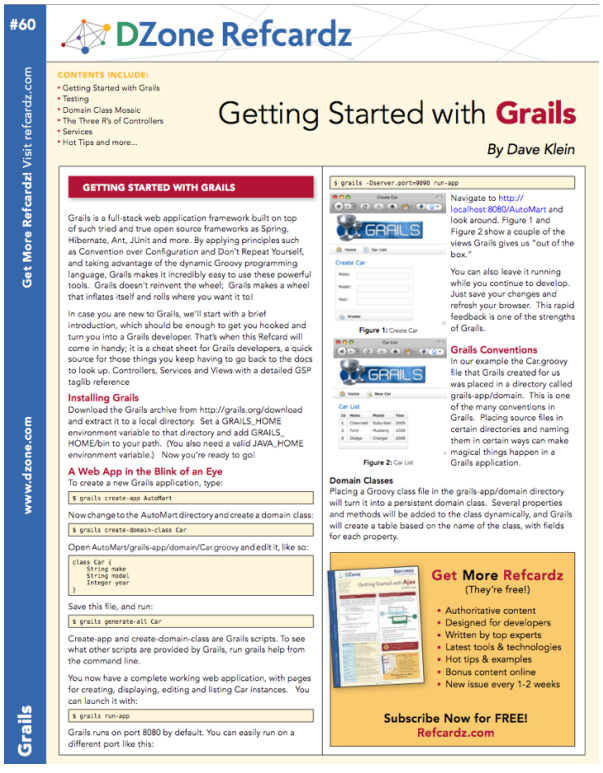
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