IDIOMATIC SPOCK

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git.io/idiomatic-spock

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TESTS AS DOCUMENTATION

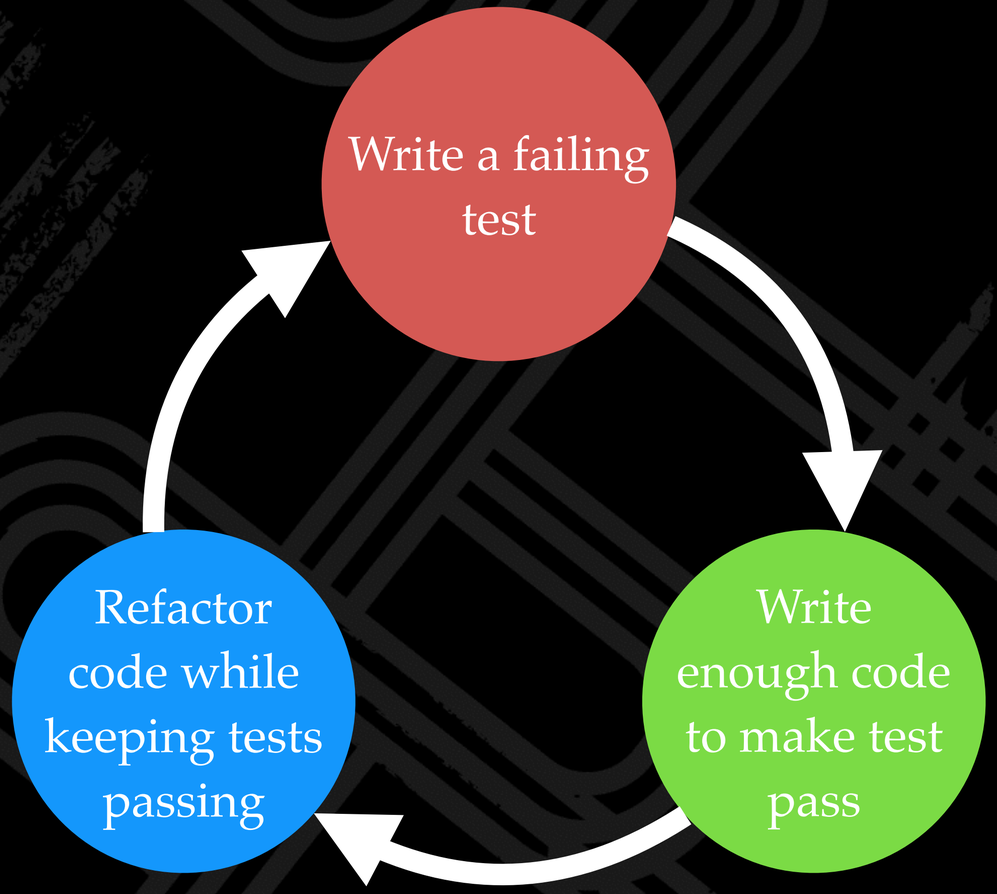
“Programs must be written for people to read, and only incidentally for machines to execute.”

—Abelson and Sussman

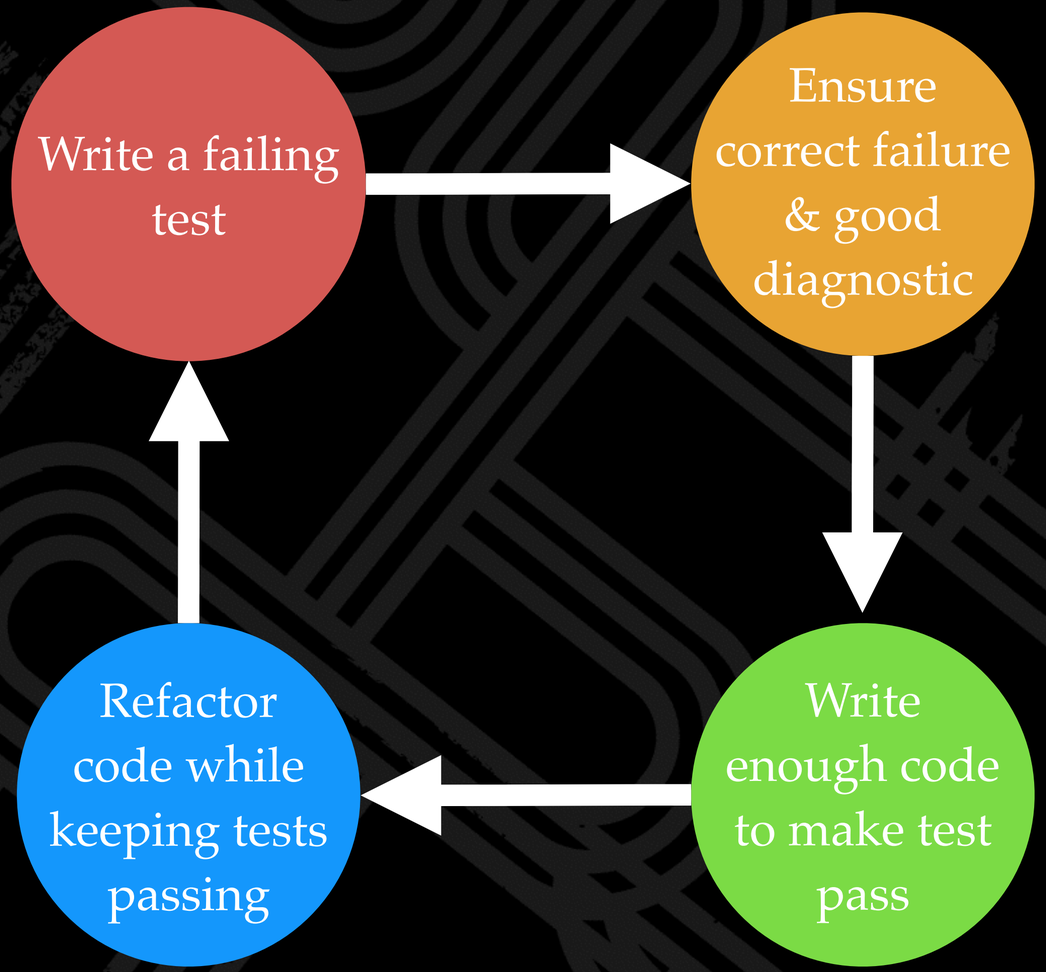
“Always code as if the guy who ends up maintaining your code will be a violent psychopath who knows where you live.”

—M. Golding

RED... GREEN... REFACTOR



RED... AMBER... GREEN... REFACTOR



THE PRIME DIRECTIVE

NEVER

TRUST A TEST YOU HAVEN'T SEEN FAIL

USE DOCUMENTATION ANNOTATIONS

```
@Subject ship = new Starship("Enterprise")

@Subject(Starship)

@Issue("https://github.com/robfletcher/betamax/issues/37")

@See("http://atompunkera.tumblr.com/")

@Title("a readable title")

@Narrative("""as a developer
              I want to die
              so I can end the pain""")
```

EFFECTIVE UNROLLING

```
@Unroll
def "rejects an input value of '#input'"()
```

```
@Unroll("#input converted to #format is '#output'")
def "translates strings to another format"()
```

```groovy
@Unroll
class ParameterizedSpec extends Specification
```

USE UNROLL DESCRIPTIONS

```
def "can tell if the string '#string' is an integer or not"() {
  expect:
  string.isInteger() == shouldBeInteger

  where:
  string | shouldBeInteger
  "ABC"  | false
  "123"  | true
  "1.2"  | false
  "1 2"  | false
  "12a"  | false
}
```

```
StringParsingSpec > can tell if the string 'ABC' is an integer or not PASSED
StringParsingSpec > can tell if the string '123' is an integer or not PASSED
StringParsingSpec > can tell if the string '1.2' is an integer or not PASSED
StringParsingSpec > can tell if the string '1 2' is an integer or not PASSED
StringParsingSpec > can tell if the string '1a2' is an integer or not PASSED
```

```groovy
@Unroll
def "the string '#string' is #description"() {
  expect:
  string.isInteger() == expected

  where:
  string | expected
  "ABC"  | false
  "123"  | true
  "1.2"  | false
  "1 2"  | false
  "12a"  | false

  description = expected ? "an integer" : "not an integer"
}
```

```groovy
@Unroll("the string '#string' is #description")
def "identifies strings that are integers"() {
  expect:
  string.isInteger() == expected

  where:
  string | expected
  "ABC"  | false
  "123"  | true
  "1.2"  | false
  "1 2"  | false
  "12a"  | false

  description = expected ? "an integer" : "not an integer"
}
```

```
StringParsingSpec > the string 'ABC' is not an integer PASSED
StringParsingSpec > the string '123' is an integer PASSED
StringParsingSpec > the string '1.2' is not an integer PASSED
StringParsingSpec > the string '1 2' is not an integer PASSED
StringParsingSpec > the string '12a' is not an integer PASSED
```

SEPARATE TEST DATA FROM TEST LOGIC

```
def "passes data from stream to callback"() {
  given:
  def callback = Mock(Function)

  and:
  service.source = Stub(StreamSource) {
    connect() >> Observable.from("foo", "bar", "baz")
  }

  when:
  service.readStream(callback)

  then:
  1 * callback.apply("foo")
  1 * callback.apply("bar")
  1 * callback.apply("baz")
}
```

```groovy
def "passes data from stream to callback"() {
  given:
  def callback = Mock(Function)

  and:
  service.source = Stub(StreamSource) {
    connect() >> Observable.from(*data)
  }

  when:
  service.readStream(callback)

  then:
  data.each {
    1 * callback.apply(it)
  }

  where:
  data = ["foo", "bar", "baz"]
}
```

SPOCK WITH STYLE

REFACTOR WITH HELPER METHODS

```
def "user can purchase uniform"() {
  given:
  to LoginPage
  loginForm.with {
    email = "aaron.pyle@teleworm.us"
    password = "ahroh6tie4oCh"
    submit()
  }

  and:
  to ProductPage, "Starfleet uniform (TOS)"
  addToBasketButton.click()

  and:
  at BasketPage
  checkoutButton.click()

  expect:
  at CheckoutPage

  when:
  checkoutForm.with {
    street = "2415 Woodland Avenue"
    city = "Garyville"
    state = "LA"
    zip = "70051"
    cardType = "Mastercard"
    cardNo = "5555700540812370"
    expiry = "11/2017"
    cvc = "003"
    submit()
  }

  then:
  message == "Purchase successful"

  and:
  1 * paymentMock.charge("USD", 65)
}
```

```groovy
@Shared user = [
  email: "aaron.pyle@teleworm.us"
  password: "ahroh6tie4oCh"
  street: "2415 Woodland Avenue"
  city: "Garyville"
  state: "LA"
  zip: "70051"
  cardType: "Mastercard"
  cardNo: "5555700540812370"
  expiry: "11/2017"
  cvc: "003"
]

@Shared product = [
  name: "Starfleet uniform (TOS)"
  price: ["USD", 65]
]
```

```groovy
def "user can purchase uniform"() {
  given:
  loggedInAs user
  addedToBasket product

  when:
  completeCheckout user

  then:
  message == "Purchase successful"

  and:
  1 * paymentMock.charge(product.price)
}
```

```groovy
class StoreInteractions {
  static void loggedInAs(user) {}

  static void addedToBasket(String productName) {}

  static void completeCheckout(user) {}
}

import static StoreInteractions.*

class CheckoutSpec extends Specification {}
```

```groovy
class StoreInteractions {
  void loggedInAs(user) {}

  void addedToBasket(String productName) {}

  void completeCheckout(user) {}
}

class CheckoutSpec extends Specification {
  @Delegate storeInteractions = new StoreInteractions()
}
```

```groovy
@Category(Specification)
class StoreInteractions {
  void loggedInAs(user) {}

  void addedToBasket(String productName) {}

  void completeCheckout(user) {}
}

@Mixin(StoreInteractions)
class CheckoutSpec extends Specification {}
```

```groovy
trait StoreInteractions {
  void loggedInAs(user) {}

  void addedToBasket(String productName) {}

  void completeCheckout(user) {}
}

class CheckoutSpec extends Specification
                   implements StoreInteractions {}
```

FUNCTIONAL GROOVY FOR ASSERTIONS

```
when:
def results = ships.findByAllegiance("Federation")

then:
results.size() == 3
results[0].allegiance == "Federation"
results[1].allegiance == "Federation"
results[2].allegiance == "Federation"
```

```
when:
def results = ships.findByAllegiance("Federation")

then:
results.every {
  it.allegiance == "Federation"
}
```

```
Condition not satisfied:

results.every { it.allegiance == "Federation" }
|       |
|       false
[Gr'oth, Enterprise, Constitution, Constellation, M'Char, Haakona]
```

```
when:
def results = ships.findByAllegiance("Federation")

then:
results.allegiance.every {
   it == "Federation"
}
```

```
Condition not satisfied:

results.allegiance.every { it == "Federation" }
|       |          |
|       |          false
|       [Klingon, Federation, Federation, Federation, Klingon, Romulan]
[Gr'oth, Enterprise, Constitution, Constellation, M'Char, Haakona]
```

GROUP ASSERTIONS BY TARGET

```
when:
def ship = ships.findByName("Enterprise")

then:
ship.registry == "NCC 1701"
ship.allegiance == "Federation"
ship.shipClass == "Constitution"
```

```
when:
def ship = ships.findByName("Enterprise")

then:
with(ship) {
  registry == "NCC 1701"
  allegiance == "Federation"
  shipClass == "Constitution"
}
```

```
expect:
with(ships.findByName("Enterprise")) {
  registry == "NCC 1701"
  allegiance == "Federation"
  shipClass == "Constitution"
}
```

```
when:
enterprise.with {
  accelerateTo(7)
  accelerateTo(9)
}

then:
with(engineeringOfficer) {
  1 * report("Dilithium chamber at maximum, Captain.")
  1 * warn("She cannae take any more, Captain!")
}
```

ONE [LOGICAL] ASSERTION

The *Single Responsibility Principle* for tests

```groovy
def "can list ships by allegiance"() {
  when:
  def results = ships.findByAllegiance("Federation")

  then:
  results.allegiance.every {
    it == "Federation"
  }

  and:
  results instanceof ImmutableList
}
```

BLOCK GRAMMAR

when / *then* or *given* / *expect*

```
when:
ship.crew << kirk << bones << scotty

then:
"Science officer" in ship.openPositions
```

```
given:
ship.crew << kirk << bones << scotty

expect:
"Science officer" in ship.openPositions
```

```
given:
crew << kirk

when:
crew << picard

then:
thrown TooManyCaptainsException
```

MOCKS & STUBS

The right tool for the job

```groovy
def paymentMock = Mock(PaymentService)

def "payment is taken at the end of checkout"() {
  given:
  loggedInAs user
  addedToBasket product

  when:
  completeCheckout user

  then:
  1 * paymentMock.charge(product.price)
}
```

```
def "presents ships as a bullet list"() {
  given:
  def shipList = ["Enterprise", "Constellation"]

  and:
  def shipStore = Mock(ShipStore)

  when:
  def output = ships.render()

  then:
  1 * shipStore.list() >> shipList

  and:
  $(output).find("ul > li")*.text() == shipList
}
```

```
def "presents ships as a bullet list"() {
  given:
  def shipList = ["Enterprise", "Constellation"]

  and:
  def shipStore = Stub(ShipStore) {
    list() >> shipList
  }

  when:
  def output = ships.render()

  then:
  $(output).find("ul > li")*.text() == shipList
}
```

ENFORCE PRECONDITIONS

```groovy
@Shared handle = DBI.open("jdbc:h2:mem:test")

def "writes to the database when data is added"() {
  given:
  def user = new User(name: "Spock")

  when:
  userStore.persist(user)

  then:
  selectInt("select count(*) from user") == 1
}
```

```groovy
@Shared handle = DBI.open("jdbc:h2:mem:test")

def "writes to the database when data is added"() {
  given:
  def user = new User(name: "Spock")

  expect:
  selectInt("select count(*) from user") == 0

  when:
  userStore.persist(user)

  then:
  selectInt("select count(*) from user") == 1
}
```

```groovy
def "a completed job cannot be restarted"() {
  given: "all tasks succeed"
  step1.execute(_) >> SUCCESS
  step2.execute(_) >> SUCCESS
  step3.execute(_) >> SUCCESS

  and: "the job has been run"
  def jobExecution = launchJob()

  expect: "the job to have completed successfully"
  jobExecution.exitStatus == ExitStatus.COMPLETED

  when: "the job is restarted"
  resumeJob jobExecution

  then: "an exception is thrown"
  thrown JobInstanceAlreadyCompleteException
}
```

ACCESS PREVIOUS VALUES

```
@Subject stack = new Stack()

def "size increases when we add items to a stack"() {
  when:
  stack.push "foo"

  then:
  stack.size() == 1
}
```

```groovy
@Subject stack = new Stack()

def "size increases when we add items to a stack"() {
  given:
  def oldSize = stack.size()

  when:
  stack.push "foo"

  then:
  stack.size() == oldSize + 1
}
```

```groovy
@Subject stack = new Stack()

def "size increases when we add items to a stack"() {
  when:
  stack.push "foo"

  then:
  stack.size() == old(stack.size()) + 1
}
```

SPOCK ANTI-PATTERNS

TEST ORGANIZATION

Think *behavior* not units of code

```groovy
@AutoCleanup
@Shared handle = DBI.open("jdbc:h2:mem:test")
@Subject ships = handle.attach(ShipStore)

def setup() {
  ships.createTable()

  insert("ship", "Enterprise", "Federation")
  insert("ship", "Constellation", "Federation")
  insert("ship", "M'Char", "Klingon")
}

def "can find by allegiance"() {
  when:
  def results = ships.findByAllegiance("Federation")

  then:
  results.allegiance.every {
    it == "Federation"
  }
}
```

```groovy
def "can find by name"() {
  when:
  def result = ships.findByName(name)

  then:
  result.name == name

  where:
  name = "M'Char"
}

def "inserting writes to the database"() {
  when:
  ships << new Ship(name, allegiance)

  then:
  count("ship", name: name) == 1

  where:
  name = "Haakona"
  allegiance = "Romulan"
}
```

WHEN BLOCK BLOAT

```
def "items can be viewed in the basket after selection"() {
  when:
  products.each {
    to ProductPage, it
    addToBasket()
  }
  to BasketPage

  then:
  basket.size() == 3
  basket.items.title == products

  where:
  products = ["Starfleet uniform", "Tricorder", "Phaser"]
}
```

```
def "items can be viewed in the basket after selection"() {
  given:
  products.each {
    to ProductPage, it
    addToBasket()
  }

  when:
  to BasketPage

  then:
  basket.size() == 3
  basket.items.title == products

  where:
  products = ["Starfleet uniform", "Tricorder", "Phaser"]
}
```

TAUTOLOGICAL TESTS

```
def "can find ships by allegiance"() {
  given:
  ships.insert new Ship("Enterprise", "Federation", Year.of(2245))
  ships.insert new Ship("Adventure", "Federation", Year.of(2376))
  ships.insert new Ship("Haakona", "Romulan", Year.of(2357))

  expect:
  ships.findByAllegiance("Federation") == handle.createQuery("""\
                                          select * from ship
                                          where allegiance = 'Federation'\
                                         """)
                                         .map(new ShipMapper())
                                         .list()
}
```

FALSE MONIKER TESTING

```groovy
@Subject def ships = new ShipStore()

def "can find ships by allegiance ordered by age"() {
  given:
  ships <<
    new Ship("Enterprise", "Federation", Year.of(2245)) <<
    new Ship("Adventure", "Federation", Year.of(2376)) <<
    new Ship("Haakona", "Romulan", Year.of(2357))

  expect:
  def matches = ships.findByAllegianceNewestFirst("Federation")
  matches.name == ["Enterprise", "Haakona", "Adventure"]
}
```

```groovy
def "can find ships by allegiance ordered by age"() {
  given:
  ships <<
    new Ship("Enterprise", "Federation", Year.of(2245)) <<
    new Ship("Adventure", "Federation", Year.of(2376)) <<
    new Ship("Haakona", "Romulan", Year.of(2357))

  expect:
  def matches = ships.findByAllegianceNewestFirst("Federation")
  matches.allegiance.every { it == "Federation" }
  matches.enteredService == matches.enteredService.sort().reverse()
}
```

INTERROGATING INTERNAL STATE

FAIL-FAST ASSERTIONS

```
def "can identify numeric strings"() {
  expect:
  ["1", "-1", "1.1", "0xf", "0E+7"].every {
    it.isNumber()
  }
}
```

```
["1", "-1", "1.1", "0xf", "0E+7"].every { it.isNumber() }
                                  |
                                false
```

```
given:
def stack = new Stack()

when:
stack.push "foo"

then:
stack.pop() == "foo"

expect:
stack.empty()

when:
stack.pop()

then:
thrown EmptyStackException
```

```groovy
@Stepwise
class StackSpec extends Specification {

  @Shared @Subject stack = new Stack()
  @Shared value = "foo"

  def "can push to the stack"() {
    expect:
    stack.push(value) == value
  }

  def "stack should have content"() {
    expect:
    stack.peek() == value
  }

  def "can pop from the stack"() {
    expect:
    stack.pop() == value
  }

  def "the stack should be empty"() {
    expect:
    stack.empty()
  }

  def "can't pop again"() {
    when:
    stack.pop()

    then:
    thrown EmptyStackException
  }
}
```

THINKING OUTSIDE THE BOX

TCK SPECIFICATIONS

One specification, multiple implementations

```groovy
abstract class ShipStoreSpec<T extends ShipStore> extends Specification {

  @Subject T ships

  def "can insert a new ship"() {
    when:
    ships.insert(new Ship("Enterprise", "Federation"))

    then:
    ships.list().size() == old(ships.list().size()) + 1
  }

  def "can find ships by allegiance"() {
    // ...
  }
}
```

```groovy
class MemoryShipStoreSpec extends ShipStoreSpec<MemoryShipStore> {
  def setup() {
    ships = new MemoryShipStore()
  }
}
```

```groovy
class PersistentShipStoreSpec extends ShipStoreSpec<PersistentShipStore> {

  @AutoCleanup Handle handle

  def setup() {
    handle = DBI.open("jdbc:h2:mem:test")
    ships = handle.attach(PersistentShipStore)
    ships.createTable()
  }

  def cleanup() {
    ships.dropTable()
  }
}
```

```
MemoryShipStoreSpec > can insert a new ship PASSED
MemoryShipStoreSpec > can find ships by allegiance PASSED
PersistentShipStoreSpec > can insert a new ship PASSED
PersistentShipStoreSpec > can find ships by allegiance PASSED
BUILD SUCCESSFUL
```

DATA-DRIVEN PARAMETERIZATION

Beyond data tables

```groovy
@Unroll
def "the #table table has a primary key"() {
  expect:
  with(handle.connection) { Connection connection ->
    connection.metaData.getPrimaryKeys(null, null, table).next()
  }

  where:
  table << tableNames
}
```

```groovy
@Shared @AutoCleanup Handle handle
@Shared Iterable<String> tableNames = []

def setupSpec() {
  handle.connection.with { connection ->
    def rs = connection.metaData.getTables(null, null, "%", ["TABLE"] as String[])
    while (rs.next()) {
      tableNames << rs.getString(3)
    }
  }
}
```

TEST JAVASCRIPT WITH NASHORN

```groovy
@Shared engine = new ScriptEngineManager().getEngineByName("nashorn")
@Shared @Subject moment

def setupSpec() {
  getClass().getResourceAsStream("/moment.js").withReader { reader ->
    engine.eval reader
  }

  moment = engine.invokeFunction("moment")
}
```

```
@Unroll
def "The date #date in friendly format is #expectedResult"() {
  expect:
  engine.invokeMethod(moment, "from", date.toString()) == expectedResult

  where:
  date                    | expectedResult
  now().plusDays(2)       | "2 days ago"
  now().plusMinutes(2)    | "2 minutes ago"
  now()                   | "a few seconds ago"
  now().minusDays(1)      | "in a day"
}
```

COOL FEATURES

UNROLLED PARAMETERS

```
def "can convert case"() {
  expect:
  string.convert(style) == expected

  where:
  string          | style || expected
  "foo bar baz"   | CAMEL || "FooBarBaz"
  "foo bar baz"   | KEBAB || "foo-bar-baz"
  "foo bar baz"   | SNAKE || "foo_bar_baz"
}
```

```
def "can convert case"(long id, String name, Date enteredService) {
  expect:
  // ...

  where:
  [id, name, enteredService] << handle.executeQuery("""
                                  select id, name, entered_service
                                  from ships""")
}
```

CONDITIONAL TESTS

```
@IgnoreIf({ javaVersion <= 1.7 })

@IgnoreIf({ env.SKIP_INTEGRATION_TESTS == "yes" })

@Requires({ properties."os.name" ==~ /Windows.*/ })
```

```groovy
@Memoized
static boolean isReachable(String url) {
  try {
    def connection = url.toURL().openConnection()
    connection.connectTimeout = 1000
    connection.connect()
    true
  } catch (IOException ex) {
    false
  }
}

@IgnoreIf({ !isReachable("http://netflix.bv/") })
class NeedsRealNetworkConnectionSpec extends Specification {
```

JUNIT RULES

```groovy
@Rule TemporaryFolder temporaryFolder = new TemporaryFolder()

def "can copy a resource from classpath to a file"() {
  given:
  def resource = getClass().getResource("/test.txt")
  def file = temporaryFolder.newFile()

  when:
  resource.withReader { file << it }

  then:
  file.text == resource.text
}
```

HAMCREST MATCHERS

```groovy
import static spock.util.matcher.HamcrestSupport.expect
import static org.hamcrest.Matchers.containsInAnyOrder

// ...

when:
def starships = redis.smembers("starships:federation")

then:
expect starships.name, containsInAnyOrder(*expectedNames)

where:
expectedNames = ["Enterprise", "Adventure"]
```

```groovy
import static spock.util.matcher.HamcrestSupport.that
import static org.hamcrest.Matchers.isIn

// ...

given:
def die = new D6()

expect:
that die.roll(), isIn(1..6)
```

CLEANING UP RESOURCES

```groovy
def handle = DBI.open("jdbc:h2:mem:test")
@Subject ships = handle.attach(ShipStore)

def setup() {
  ships.createTable()
}

def cleanup() {
  ships.dropTable()
  handle.close()
}
```

```groovy
@AutoCleanup handle = DBI.open("jdbc:h2:mem:test")

@AutoCleanup("dropTable")
@Subject ships = handle.attach(ShipStore)

def setup() {
  ships.createTable()
}
```

```groovy
@Shared
@AutoCleanup handle = DBI.open("jdbc:h2:mem:test")

@Shared
@AutoCleanup("dropTable")
@Subject ships = handle.attach(ShipStore)

def setupSpec() {
  ships.createTable()
}
```

STUPID SPOCK TRICKS

IMPORT ALIASING

```
import java.lang.Void as Should

class MyBddSpec {

  Should "exhibit some behavior"() {
    // ...
  }

}
```

CREDITS

- Breaking down long tests is an application of Uncle Bob Martin's Clean Code principles.
- Luke Daley showed me how to use *expect:* blocks to enforce preconditions.
- The emphasis on diagnostic quality comes from Growing Object Oriented Software Guided by Tests by Steve Freeman and Nat Pryce.
- I think "*never trust a test you haven't seen fail*" was a quote from Colin Vipurs' talk on testing anti-patterns at Devoxx UK 2013.
- The section on separating test data from test logic is inspired by a blog post by J. B. Rainsberger.
- "*False moniker*" is an anti-pattern written about by Max Ashton.
- David Norton wrote about testing JavaScript using Spock and Nashorn.
- Spock is the creation of Peter Niederwieser.