

# Towards a Taxonomy of Unit Tests

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# Navigating & Composing Unit Tests is difficult

Goal: Facilitate the

- navigation between tests and methods
- composition of complex test scenarios

Questions:

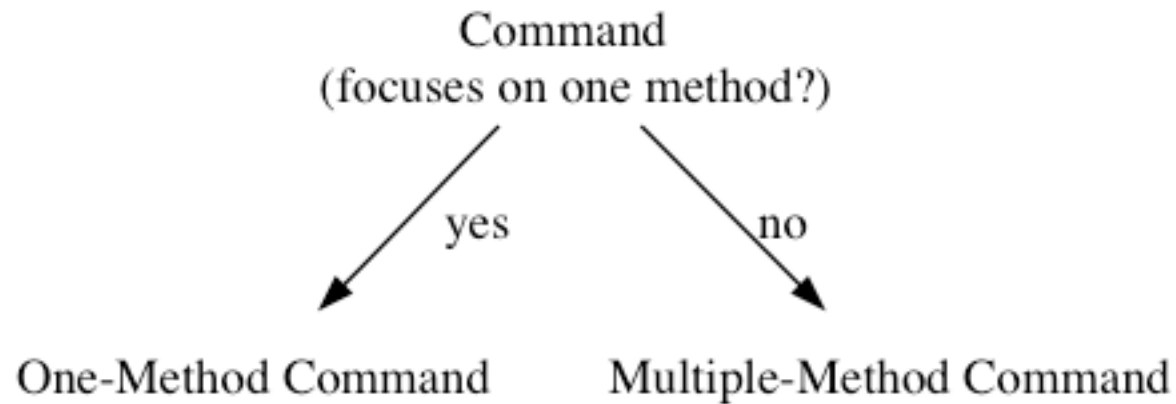
- What are the relationships between
  - tests and methods
  - tests and tests

One Metric:

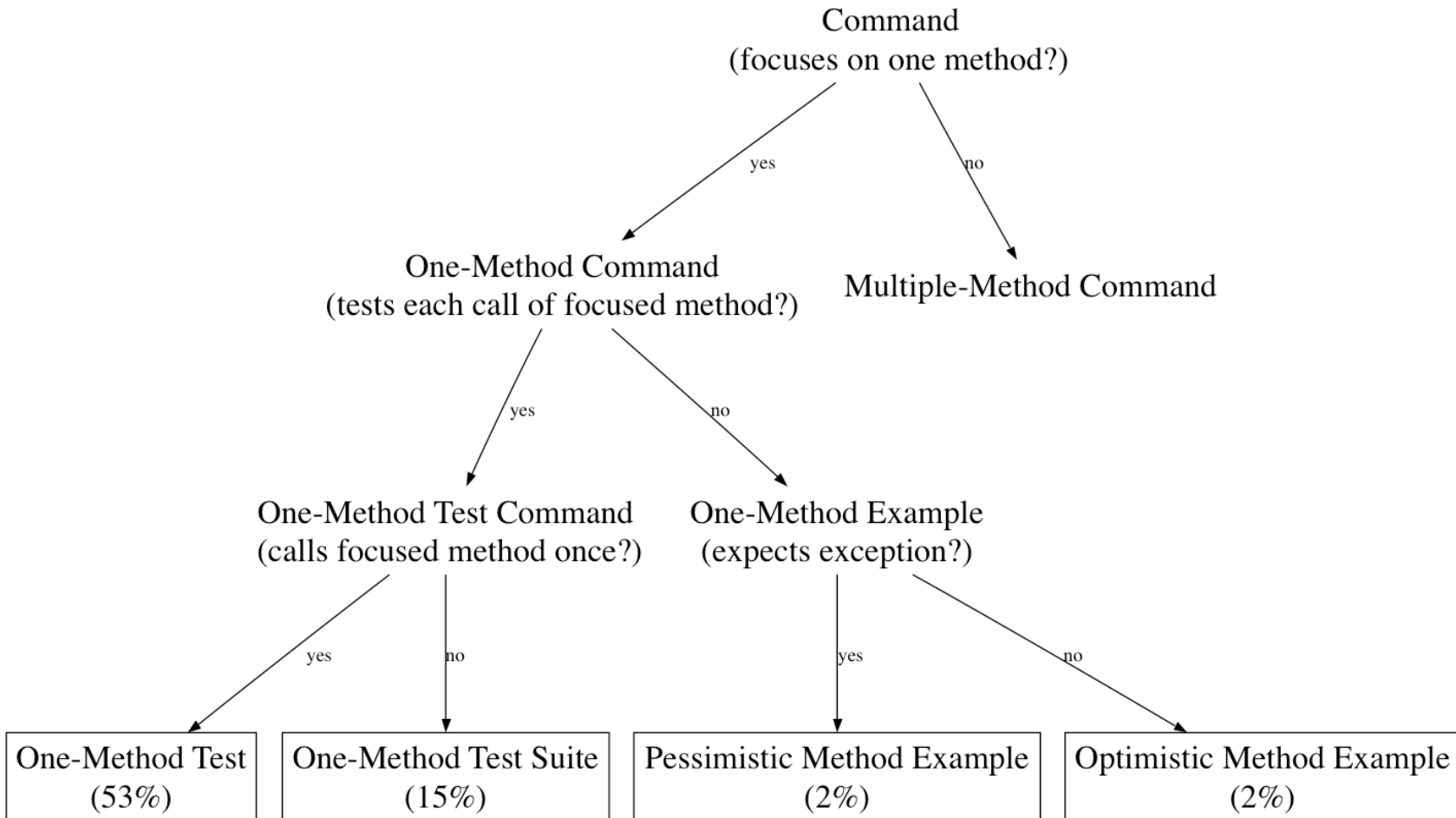
- What kind of unit tests with respect to these relations occur how often? -> Taxonomy

# The root of our Taxonomy:

## Does a test focus on one method?



# One-Method Commands: One-Method Tests and Examples



# One-Method Test

- Definition  
“Tests the outcome of exactly one call of a method under test.”
- Example  

```
YearMonthWeekTest>>testIndexOfDay  
    self assert:(Week indexOfDay:  
    'Friday')=6.
```
- Occurrences  
53% of the Squeak Tests

# One-Method Test Suite

- Definition

Tests the outcome of the method under test in several situations:

- Example

```
YearMonthWeekTest>>testDaysInMonth
```

```
self assert:(Month daysInMonth:2 forYear: 2000)=29.
```

```
self assert:(Month daysInMonth:2 forYear: 2001)=28.
```

```
self assert:(Month daysInMonth:2 forYear: 2004)=29.
```

```
self assert:(Month daysInMonth:2 forYear: 2100)=28.
```

- Occurrences

15% of the Squeak Tests

# Pessimistic Method Example

- Definition
  - checks that an exception is thrown if a method is called in a way which violates a precondition.
- Example

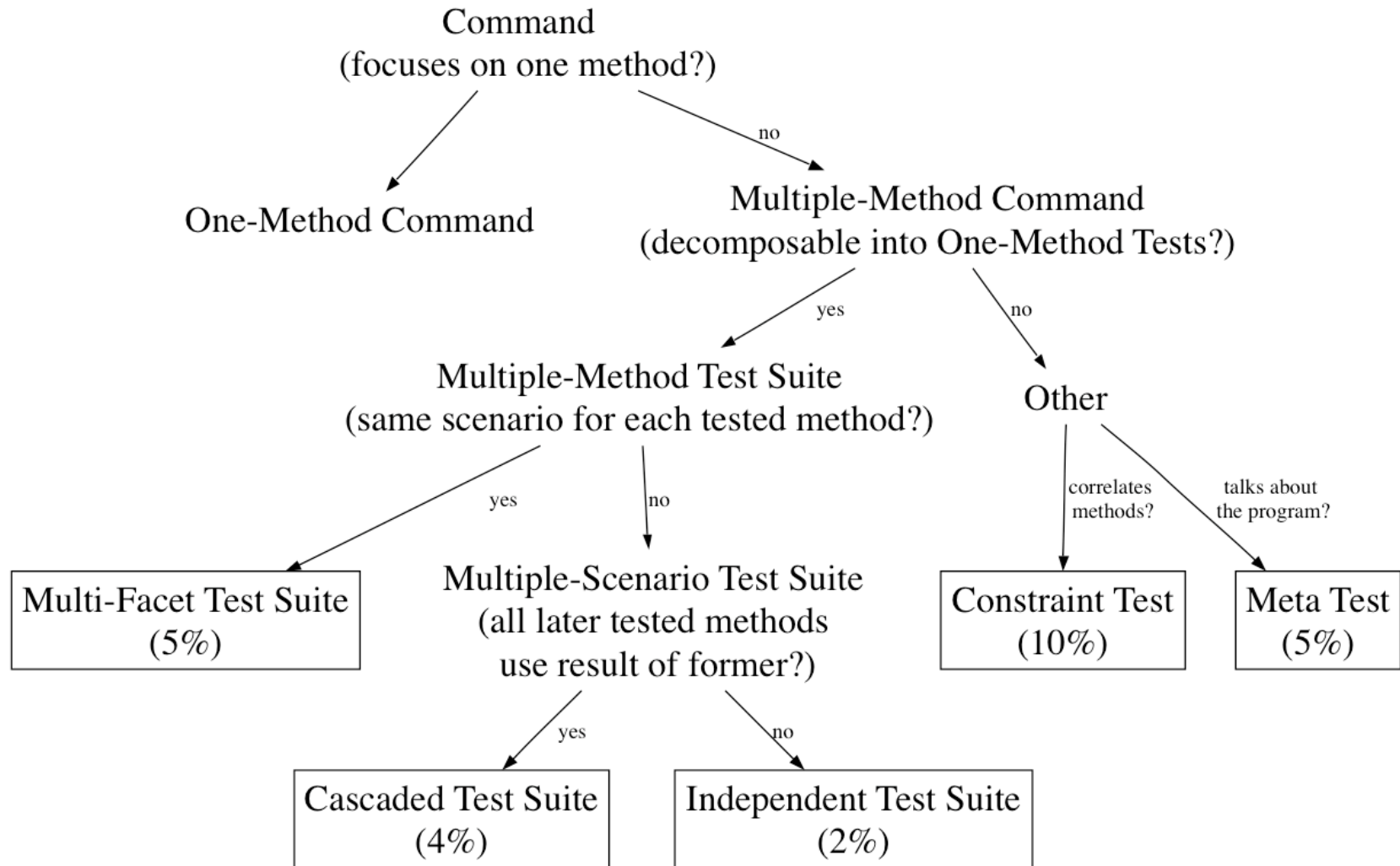
```
DosFileDirectoryTests>>testFileDirectoryNonExistence"  
Hoping that you have 'C:' of course..."  
FileDirectory activeDirectoryClass ==DosFileDirectory  
    ifFalse:[^self].  
self should: [  
    (FileDirectory basicNew fileOrDirectoryExists: 'C:')]  
    raise:InvalidDirectoryError.
```
- Occurrences
  - 2% of the Squeak Tests

# Optimistic Method Example

- Definition
  - expects that no exception is thrown if the method under test is called without violating some preconditions. .
- Example
  - BitBLTClipBugs>>testDrawingWayOutside2
  - f1 bb f2 l
  - f1 := Form extent: 100@100 depth: 1.
  - f2 := Form extent: 100@100 depth: 1.
  - bb := BitBlt toForm: f1.
  - bb combinationRule: 3.
  - bb sourceForm: f2.
  - bb destOrigin: 0@0.
  - bb width: SmallInteger maxVal squared; height: SmallInteger maxVal squared.
  - self shouldnt:[bb copyBits] raise: Error.
- Occurrences
  - 2% of the Squeak Tests



# Multiple-Method Commands are decomposable



# Multi-Facet Test Suite

(decomposable into One-Method Tests)

- Definition
  - reuses a scenario to test several candidate methods
- Example

```
TimeTest>>testPrinting
self
  assert: time printString = '4:02:47 am';
  assert: time intervalString =
    '4 hours 2 minutes 47 seconds';
  assert: time print24 = '04:02:47';
  assert: time printMinutes = '4:02 am';
  assert: time hhmm24 = '0402'.
```
- Occurrences
  - 2% of the Squeak Tests

# Cascaded Test Suite

(decomposable into One-Method Tests)

- Definition
  - results of one test are used to perform the next test
- Example

```
Base64MimeConverterTest>>testMimeEncodeDecode
lencodedl
encoded _Base64MimeConverter mimeEncode: message.
self should: [encoded contents = 'SGkgVGhlcmUh'].
self should:[(Base64MimeConverter mimeDecodeToChars:
encoded) contents = message contents].
```
- Occurrences
  - 4% of the Squeak Tests

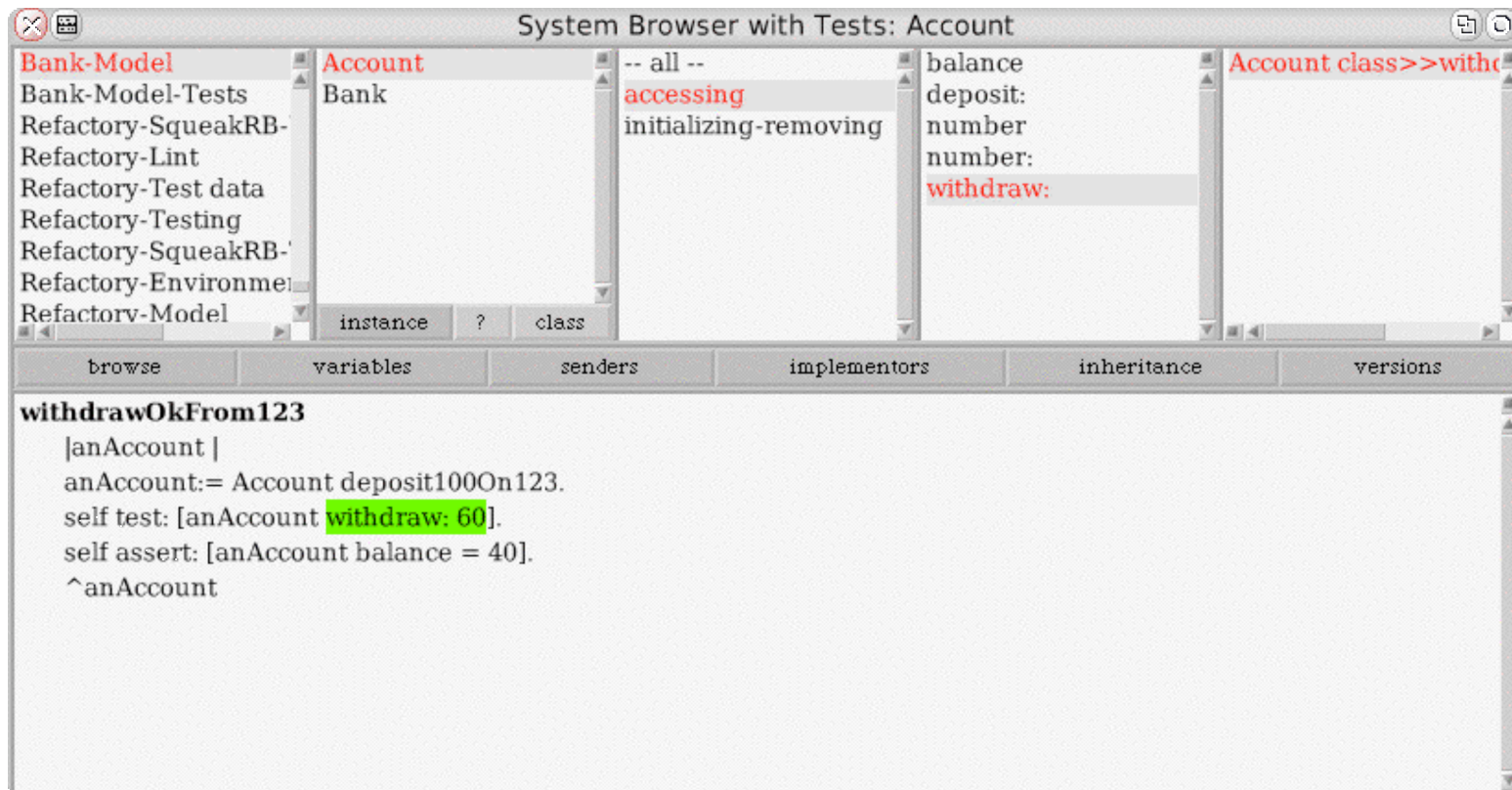
# Constraint Test

(decomposable into One-Method Commands)

- Definition
  - checks the interplay of several methods without focusing on one of them.
- Example

```
PNGReadWriterTest>>test16Bit
  self encodeAndDecodeForm:
    (self drawStuffOn:
      (Form extent: 33@33 depth: 16))
```
- Occurrences
  - 10% of the Squeak Tests

# A Five Pane Browser...



# Conclusion

- We built a terminology to denote existing unit tests with respect to composition
- Most unit tests of Squeak do focus on one method
- Tests are decomposable into one method commands
- One method commands can be linked and composed easily

# The Taxonomy

