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A Gentle Introduction

TDD IN GO

Practice, libraries and tools for
Test-Driven Development in the Go language

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Repo with examples and slides: https://tgo.li/tddgo

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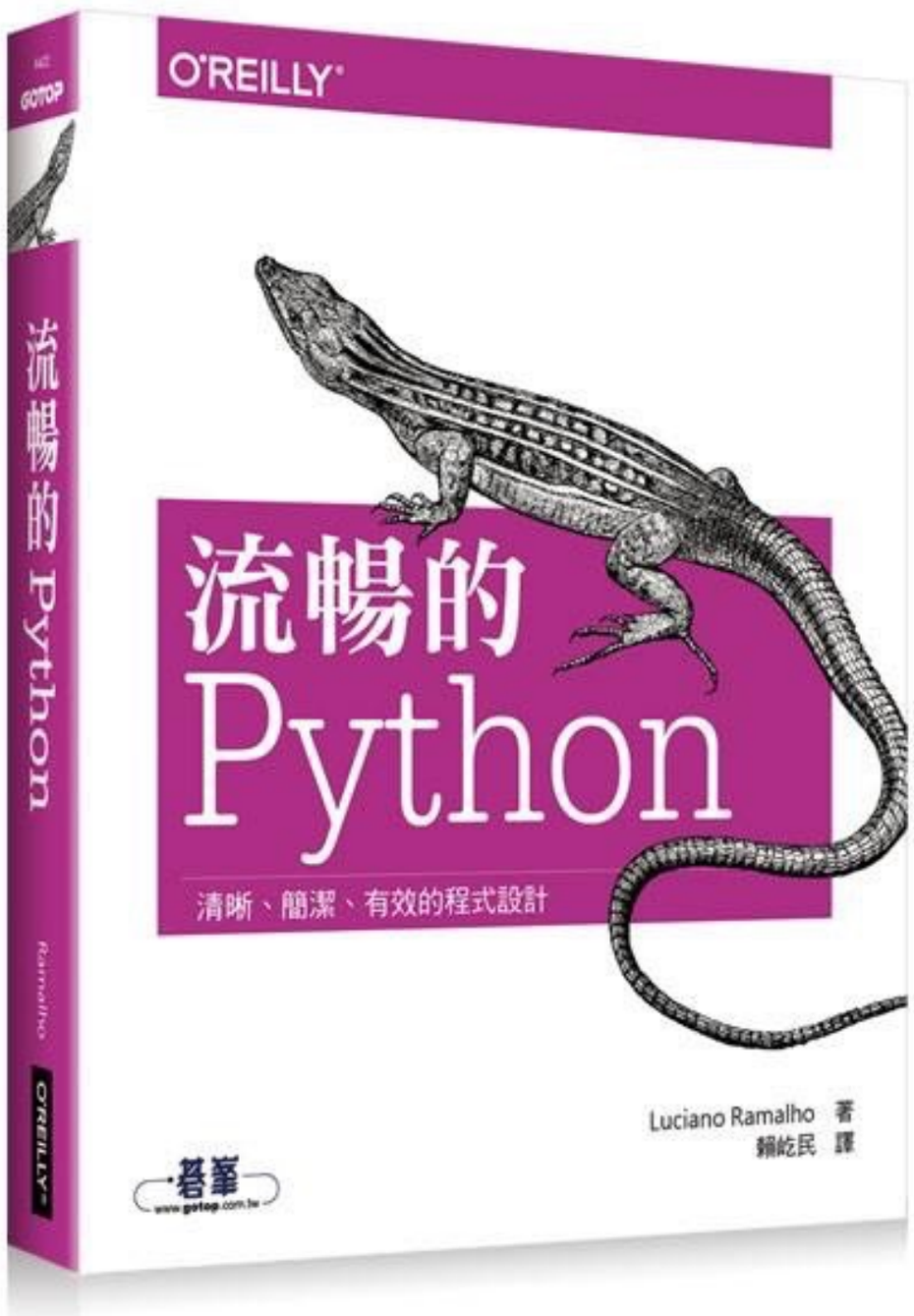
FLUENT PYTHON, MY FIRST BOOK



Fluent Python (O'Reilly, 2015)

Python Fluente (Novatec, 2015)

Python к вершинам мастерства (DMK, 2015)

流暢的 Python (Gotop, 2016)

also in **Simplified Chinese, Polish, Korean...**

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VISION FOR THIS TUTORIAL

Make the most of our time together

Lots of live coding, together

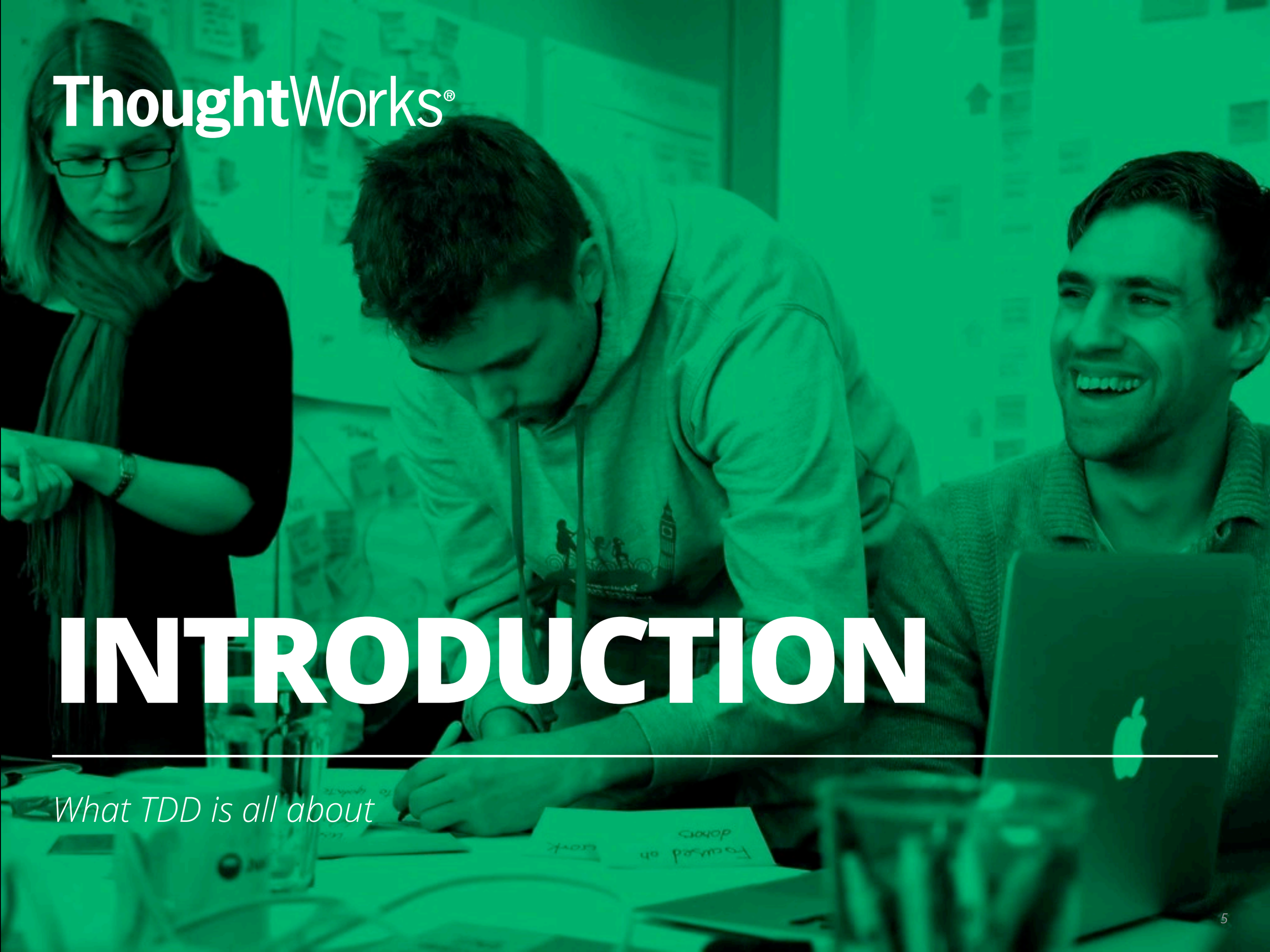
Simple yet complete app built from tests

Discussion of TDD styles and variations

Brief overview of tools and libraries

Lots of references for further study

Repo with examples and slides: https://tgo.li/tddgo



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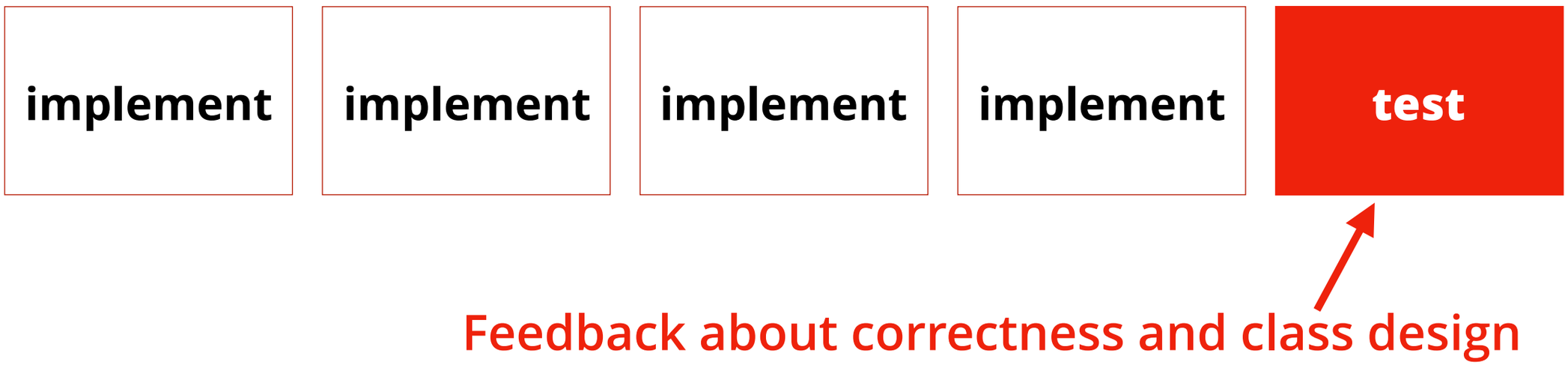
INTRODUCTION

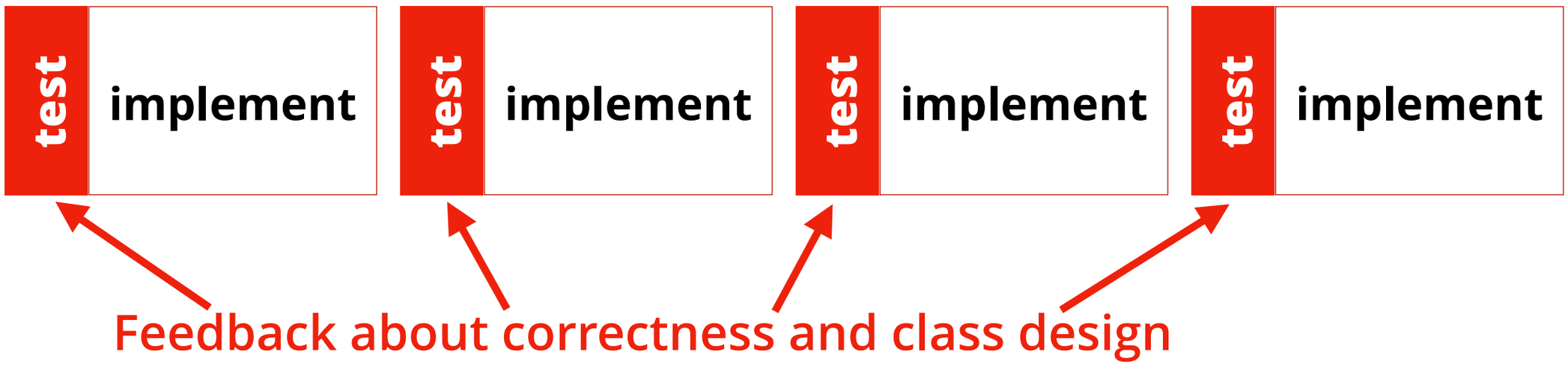
What TDD is all about

TRADITIONAL TESTING



Source: **Test-Driven Development**, by Hugo Corbucci and Mauricio Aniche

TEST-DRIVEN DEVELOPMENT

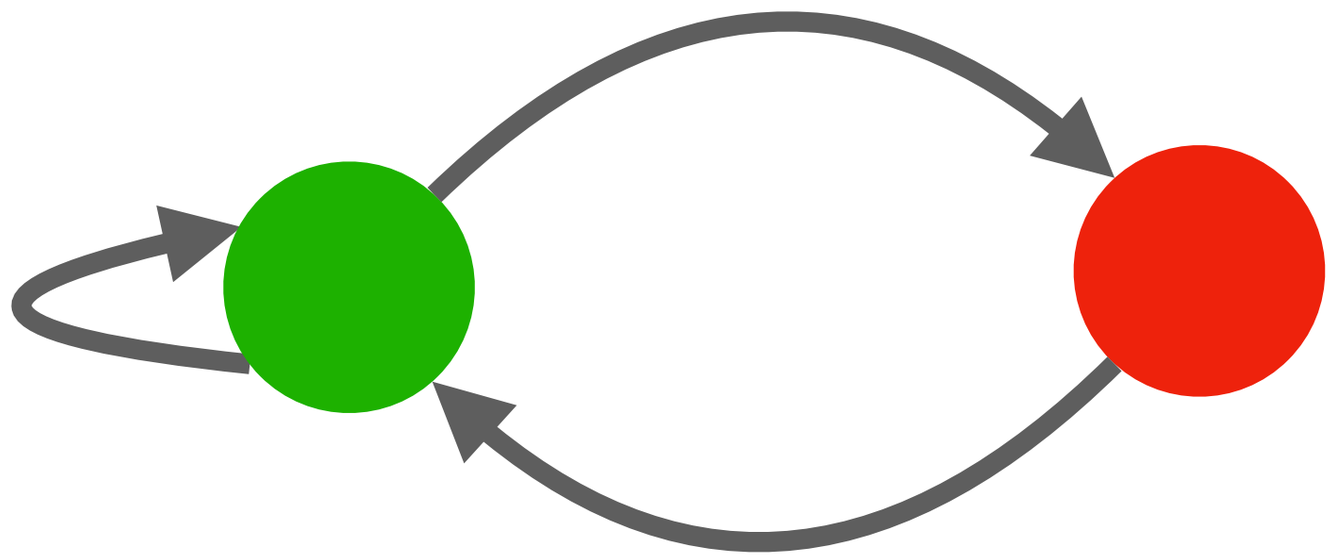


Source: **Test-Driven Development**, by Hugo Corbucci and Mauricio Aniche

TDD CYCLE

1. Write the simplest test for next functionality

4. Refactor to remove data and code duplication



2. Watch it fail

3. Implement the simplest solution to satisfy the test

Source: **Test-Driven Development**, by Hugo Corbucci and Mauricio Aniche

TDD BEST PRACTICE: BABY STEPS

Work on small increments.

Time between red/green states measured in minutes, not hours.

At first: practice with the smallest increments you can think.

Like 4L on 4WD: be willing and ready to engage reduced gear when the going gets tough.

TDD BEST PRACTICE: CALL SHOT

Before running test, call out expected outcome.

When pairing, co-pilot should call outcome.

— Test will error out because there's no method named `parseLine`.

— Test will fail because function returns **1**, but the expected result is **42**.

— Test will pass.

Source: **Test-Driven Development**, by Hugo Corbucci and Mauricio Aniche

TDD BEST PRACTICE: IMPROVE FAILING REPORTS

Figure 5.2 *Improving the diagnostics as part of the TDD cycle*

Source: **Growing Object-Oriented Software, Guided by Tests**
by Steve Freeman, Nat Pryce

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CODING DOJO

Let's practice

CODING DOJO: RULES FOR RANDORI SESSION

Rotating pairs of pilot and co-pilot.

After 7 minutes, call volunteer for co-pilot.

When tests are green, audience can make suggestions for refactoring or next test.

When a test is red, audience should only offer suggestions when requested by pair.

OUR GOAL

```
$ runes cat eyes
U+1F638 😸      GRINNING CAT FACE WITH SMILING EYES
U+1F63B 😻      SMILING CAT FACE WITH HEART-SHAPED EYES
U+1F63D 😽      KISSING CAT FACE WITH CLOSED EYES
$
```

SIMPLE EXAMPLE-TEST

An Example() function in a *_test file is a test.

```
func Example() {
        main()
        // Output:
        // Please provide one or more words to search.
}
```

Program output is compared to Output: comment.

TESTING PACKAGE: T TYPE API

testing - GoDoc

https://godoc.org/testing

type PB

- func (pb *PB) Next() bool

type T

- func (c *T) Error(args ...interface{})
- func (c *T) Errorf(format string, args ...interface{})
- func (c *T) Fail()
- func (c *T) FailNow()
- func (c *T) Failed() bool
- func (c *T) Fatal(args ...interface{})
- func (c *T) Fatalf(format string, args ...interface{})
- func (c *T) Helper()
- func (c *T) Log(args ...interface{})
- func (c *T) Logf(format string, args ...interface{})
- func (c *T) Name() string
- func (t *T) Parallel()
- func (t *T) Run(name string, f func(t *T)) bool
- func (c *T) Skip(args ...interface{})
- func (c *T) SkipNow()
- func (c *T) Skipf(format string, args ...interface{})
- func (c *T) Skipped() bool

type TB

TABLE TEST WITH SUB-TESTS

```go
func TestMake(t *testing.T) {
	testCases := []struct {
		elems   []string
		wantLen int
	}{
		{[]string{}, 0},
		{[]string{"a"}, 1},
		{[]string{"a", "b"}, 2},
		{[]string{"a", "b", "a"}, 2},
	}
	for _, tc := range testCases {
		t.Run(fmt.Sprintf("%v gets %d", tc.elems, tc.wantLen), func(t *testing.T) {
			s := Make(tc.elems...)
			assert.Equal(t, tc.wantLen, s.Len())
		})
	}
}
```

t.Run() is now the recommended way of running table tests as subtests.

PACKAGE TESTIFY: ASSERT SUB-PACKAGE API

assert - GoDoc

https://godoc.org/github.com/stretchrcom/testify/asse

Index

Variables
func CallerInfo() []string
func Condition(t TestingT, comp Comparison, msgAndArgs ...interface{}) bool
func Conditionf(t TestingT, comp Comparison, msg string, args ...interface{}) bool
func Contains(t TestingT, s, contains interface{}, msgAndArgs ...interface{}) bool
func Containsf(t TestingT, s interface{}, contains interface{}, msg string, args ...interface{}) bool
func DirExists(t TestingT, path string, msgAndArgs ...interface{}) bool
func DirExistsf(t TestingT, path string, msg string, args ...interface{}) bool
func ElementsMatch(t TestingT, listA, listB interface{}, msgAndArgs ...interface{}) (ok bool)
func ElementsMatchf(t TestingT, listA interface{}, listB interface{}, msg string, args ...interface{}) bool
func Empty(t TestingT, object interface{}, msgAndArgs ...interface{}) bool
func Emptyf(t TestingT, object interface{}, msg string, args ...interface{}) bool
func Equal(t TestingT, expected, actual interface{}, msgAndArgs ...interface{}) bool
func EqualError(t TestingT, theError error, errString string, msgAndArgs ...interface{}) bool
func EqualErrorf(t TestingT, theError error, errString string, msg string, args ...interface{}) bool
func EqualValues(t TestingT, expected, actual interface{}, msgAndArgs ...interface{}) bool
func EqualValuesf(t TestingT, expected interface{}, actual interface{}, msg string, args ...interface{}) bool
func Equalf(t TestingT, expected interface{}, actual interface{}, msg string, args ...interface{}) bool
func Error(t TestingT, err error, msgAndArgs ...interface{}) bool
func Errorf(t TestingT, err error, msg string, args ...interface{}) bool
func Exactly(t TestingT, expected, actual interface{}, msgAndArgs ...interface{}) bool

93 functions!

EXAMPLE-TEST WITH FAKE COMMAND-LINE ARGUMENTS

Use defer with a lambda to restore arguments to initial value.

```
func Example_2WordQuery() { // ❶
        oldArgs := os.Args // ❷
        defer func() { os.Args = oldArgs }()
        os.Args = []string{"", "cat", "smiling"}
        main() // ❸
        // Output:
        // U+1F638      😸      GRINNING CAT FACE WITH SMILING EYES
        // U+1F63A      😺      SMILING CAT FACE WITH OPEN MOUTH
        // U+1F63B      😻      SMILING CAT FACE WITH HEART-SHAPED EYES
}
```

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TOOLS

Libraries and utilities for TDD in Go

LIBRARIES FOR TESTING

Go testing libraries with most Github stars*

5251 ★	stretchr/testify
3685 ★	smartystreets/goconvey
2166 ★	onsi/ginkgo
1452 ★	golang/mock
902 ★	DATA-DOG/go-sqlmock
884 ★	gavv/httpexpect
709 ★	onsi/gomega
575 ★	google/go-cmp
512 ★	franela/goblin
502 ★	h2non/baloo
496 ★	h2non/gock
404 ★	DATA-DOG/godog
387 ★	go-check/check

*Data collected 2018-07-05

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TECHNIQUES

Coding tips

SIMPLE EXAMPLE-TEST USING STRINGER INTERFACE

Implementing a String() method makes a type printable for testing and debugging

```
func ExampleMake() {
        w := []string{"beta", "alpha", "gamma", "beta"}
        s := Make(w...)
        fmt.Println(s)
        // Output: Set{alpha beta gamma}
}
```

EXAMPLE-TEST WITH UNORDERED OUTPUT

```go
func ExampleSet_Channel() {
        set := MakeFromText("beta alpha delta gamma")
        // iteration order over underlying map is undefined
        for elem := range set.Channel() {
                fmt.Println(elem)
        }
        // Unordered output:
        // alpha
        // beta
        // delta
        // gamma
}
```

Unordered output matches lines in any order

TEST WITH FAKE ENVIRONMENT VARIABLE

```go
func restore(nameVar, value string, existed bool) {
	if existed {
		os.Setenv(nameVar, value)
	} else {
		os.Unsetenv(nameVar)
	}
}

func TestGetUCDPath_isSet(t *testing.T) {
	pathBefore, existed := os.LookupEnv("UCD_PATH")
	defer restore("UCD_PATH", pathBefore, existed)
	ucdPath := fmt.Sprintf("./TEST%d-UnicodeData.txt", time.Now().UnixNano())
	os.Setenv("UCD_PATH", ucdPath)
	got := getUCDPath()
	if got != ucdPath {
		t.Errorf("getUCDPath() [set]\nwant: %q; got: %q", ucdPath, got)
	}
}
```

Use defer to restore environment to initial value

FAKING FILE INPUT (1/2)

```go
const dataStr = `003C;LESS-THAN SIGN;Sm;0;ON;;;;;Y;;;;;
003D;EQUALS SIGN;Sm;0;ON;;;;;N;;;;;
003E;GREATER-THAN SIGN;Sm;0;ON;;;;;Y;;;;;
003F;QUESTION MARK;Po;0;ON;;;;;N;;;;;
0040;COMMERCIAL AT;Po;0;ON;;;;;N;;;;;
0041;LATIN CAPITAL LETTER A;Lu;0;L;;;;;N;;;;0061;
0042;LATIN CAPITAL LETTER B;Lu;0;L;;;;;N;;;;0062;
`

func TestFilter(t *testing.T) {
	query := "sign"
	data := strings.NewReader(dataStr)
	got := Filter(data, query)
	want := []string{
		"U+003C\t<\tLESS-THAN SIGN",
		"U+003D\t=\tEQUALS SIGN",
		"U+003E\t>\tGREATER-THAN SIGN",
	}
	assert.Equal(t, want, got)
}
```

Use strings.NewReader to build a buffer from a string, implementing the Reader interface

FAKING FILE INPUT (2/2)

Instead of specific types, make your functions accept common, narrow interfaces like io.Reader

```
func Filter(data io.Reader, query string) []string {
        queryTerms := strset.MakeFromText(strings.ToUpper(query))
        scanner := bufio.NewScanner(data)
        result := []string{}
        for scanner.Scan() {
                name, code := parseLine(scanner.Text())
                if match(queryTerms, name) {
                        line := fmt.Sprintf("U+%04X\t%c\t%s", code, code, name)
                        result = append(result, line)
                }
        }
        return result
}
```

TEST WITH HTTP SERVER DOUBLE

The httptest package in the standard libraries provides doubles for testing HTTP clients and servers

```
func TestFetchUCD(t *testing.T) {
        srv := httptest.NewServer(http.HandlerFunc(
                func(w http.ResponseWriter, r *http.Request) {
                        w.Write([]byte(lines3Dto43))
                }))
        defer srv.Close()

        ucdPath := fmt.Sprintf("./TEST%d-UnicodeData.txt", time.Now().UnixNano())
        done := make(chan bool)                // ❶
        go fetchUCD(srv.URL, ucdPath, done) // ❷
        _ = <-done                             // ❸
        ucd, err := os.Open(ucdPath)
        if os.IsNotExist(err) {
                t.Errorf("fetchUCD did not save:%v\n%v", ucdPath, err)
        }
        ucd.Close()
        os.Remove(ucdPath)
}
```

SLOW TEST THAT CAN BE SKIPPED

Check testing.Short() then call t.Skip() to report it.

```
func TestOpenUCD_remote(t *testing.T) {
	if testing.Short() { // ❶
		t.Skip("skipped test [-test.short option]") // ❷
	}
	ucdPath := fmt.Sprintf("./TEST%d-UnicodeData.txt", time.Now().UnixNano())
	ucd, err := openUCD(ucdPath)
	if err != nil {
		t.Errorf("openUCD(%q):\n%v", ucdPath, err)
	}
	ucd.Close()
	os.Remove(ucdPath)
}
```

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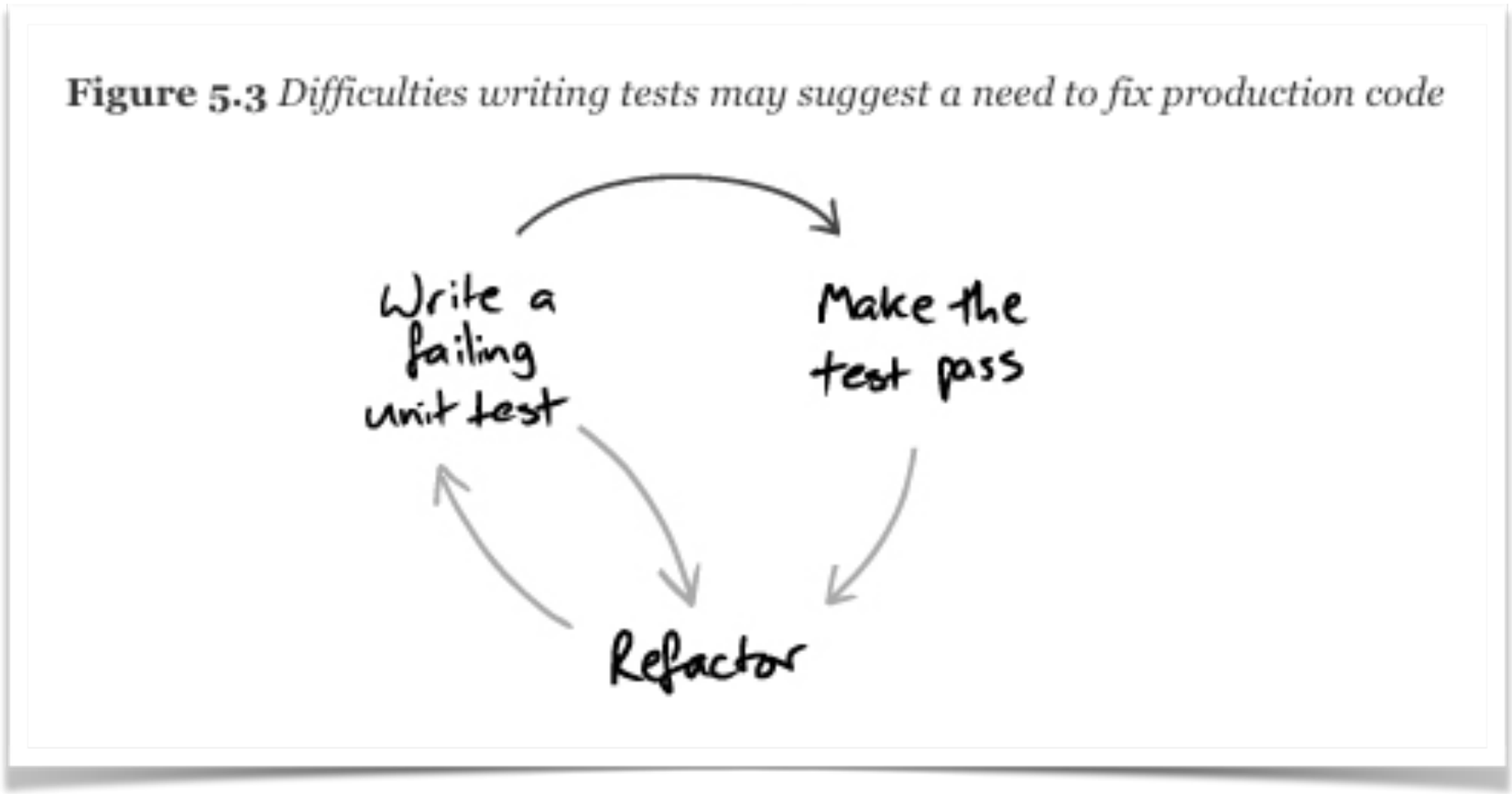
VARIATIONS

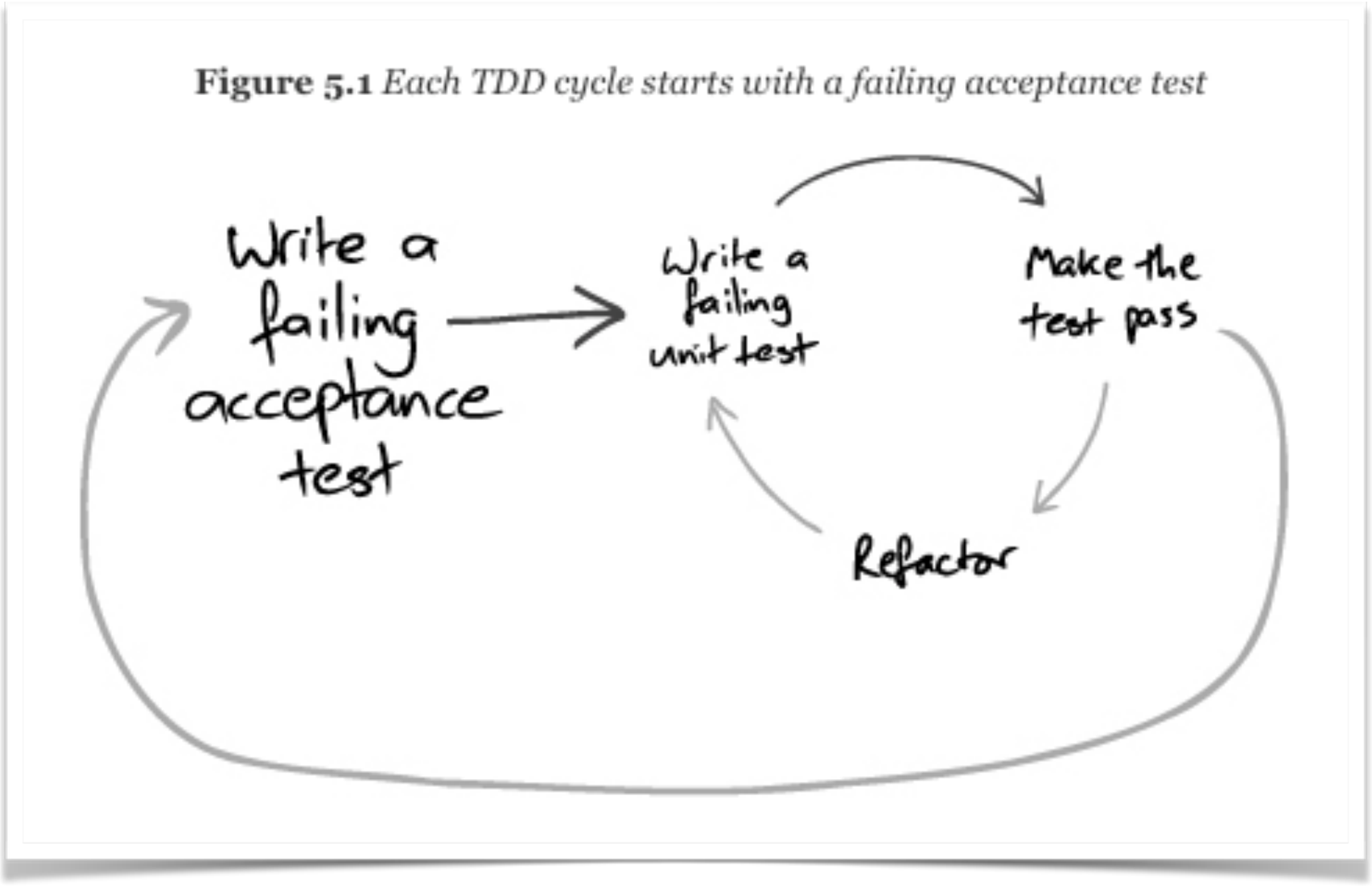
Beyond the classic TDD cycle

TDD CYCLE: REFACTOR AFTER TEST



Source: **Growing Object-Oriented Software, Guided by Tests**
by Steve Freeman, Nat Pryce

TDD CYCLES: MOCKIST STYLE



Source: **Growing Object-Oriented Software, Guided by Tests**
by Steve Freeman, Nat Pryce

TDD STYLES

Chicago style, a.k.a. “classic”

Mostly inside-out: from unit tests to acceptance tests

London style, a.k.a. “mockist”

Mostly outside-in: from acceptance tests to unit tests

ANDREW GERRAND ON FAKES

"Go eschews mocks and fakes in favour of writing code that takes broad interfaces."

"That's generally how we get around dependency injection frameworks and large mocking frameworks: just by writing code that uses small interfaces. Then we have small fakes like the ResponseRecorder — small fakes that allow us to inspect how they were used. There are frameworks that generate those kinds of fakes — one of them is called Go Mock [...]. They're fine, but I find that on balance the hand-written fakes tend to be easier to reason about, and clearer to see what is going on. That's my personal experience. But I am not an "enterprise" Go programmer so maybe people need that, I don't know. That's my advice."

— Andrew Gerrand in *Testing Techniques* (I/O 2014) https://tgo.li/2upCkek

MARTIN FOWLER ON TDD STYLES

Mocks Aren't Stubs

https://martinfowler.com/a

Search

MARTINFOWLER.COM

Mocks Aren't Stubs

The term 'Mock Objects' has become a popular one to describe special case objects that mimic real objects for testing. Most language environments now have frameworks that make it easy to create mock objects. What's often not realized, however, is that mock objects are but one form of special case test object, one that enables a different style of testing. In this article I'll explain how mock objects work, how they encourage testing based on behavior verification, and how the community around them uses them to develop a different style of testing.

02 January 2007

Martin Fowler

Translations: French · Italian · Spanish · Portuguese · Korean

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Contents

Source: https://tgo.li/2lUqTXv

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REFERENCES

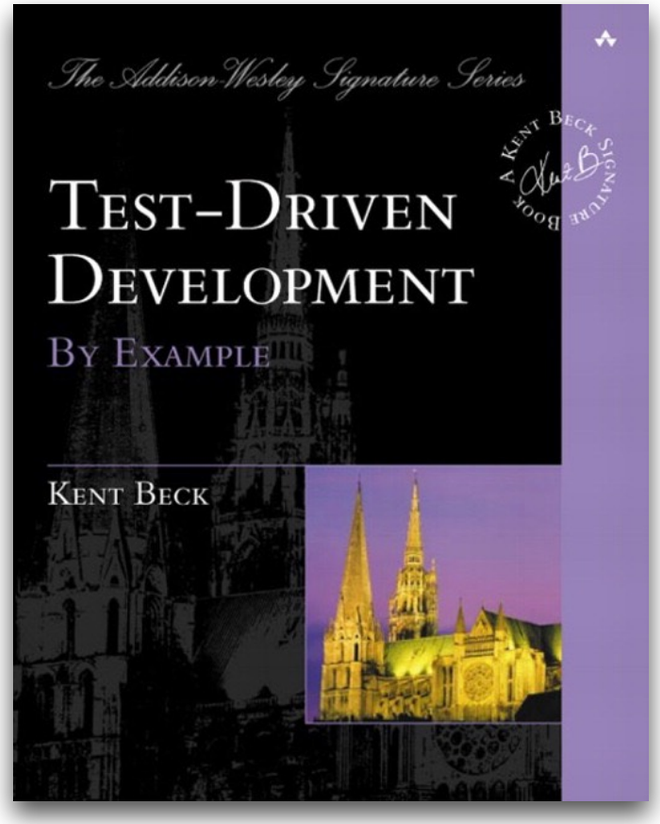
Where to learn more

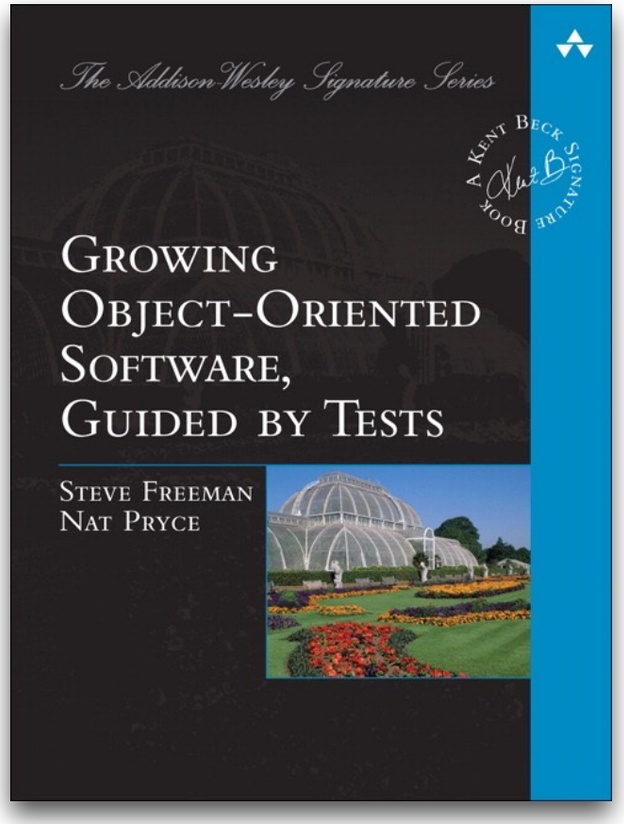
REFERENCES: BOOKS

Kent Beck: **Test Driven Development: By Example** https://tgo.li/2NvBfcX

Steve Freeman, Nat Pryce:
Growing Object-Oriented Software, Guided by Tests https://tgo.li/2tV8QoK

Hugo Corbucci and Mauricio Aniche (book in Portuguese):
Test-Driven Development: Teste e design no mundo real com Ruby
https://tgo.li/2zGSl4N





REFERENCES: POSTS, VIDEOS

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Go Testing Techniques (Google I/O 2014) https://tgo.li/2upCkek

Francesc Campoy [video]
Unit Testing HTTP Servers (justforfunc #16) https://tgo.li/2NSEGdZ

Martin Angers [post]
Lesser-known Features of Go-Test https://tgo.li/2m7ta1E

Martin Fowler [post]
Mocks Aren't Stubs https://tgo.li/2lUqTXv

Martin Fowler, Kent Beck, David Heinemeier Hansson [post + videos]
Is TDD Dead? https://tgo.li/2IWOAYn

Michael Feathers , Steve Freeman [video]
Test Driven Development: Ten Years Later https://tgo.li/2KD2Gnm

THANK YOU

Let's connect!

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