https://github.com/shawnewallace/tdd-workshop

((CENTRIC))

Test Driven Design

Agenda

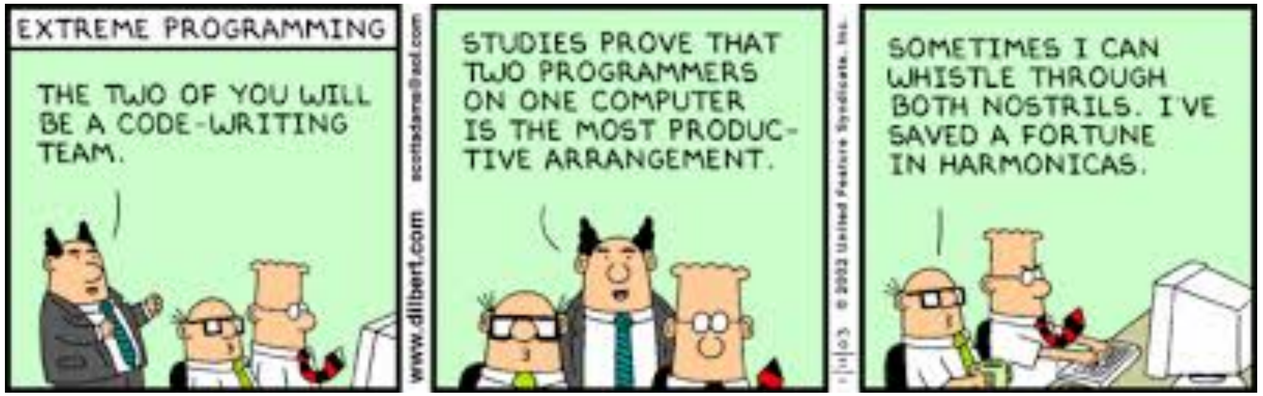
Morning

- Introduction
- The Case for TDD
- Types of Testing
- Live Coding Example
- **Lab 1 - TDD Kata**

LUNCH

Afternoon

- Design for Testability
- SOLID Principles
- **Lab 2 - Refactoring Exercise**
- Brownfield Development - adding TDD to existing project
- **Lab 3 - Legacy Refactor**



Introduction

TESTING

I FIND YOUR LACK OF TESTS DISTURBING.


I DON'T ALWAYS TEST MY CODE
BUT WHEN I DO I DO IT IN PRODUCTION
memegenerator.net

What it is

A Software Development Practice

What it is

Benefits

- Productivity
- Emergent Design
- Better Code
- Reduced Gold-Plating
- Regression Test Suite

What it’s not

A panacea

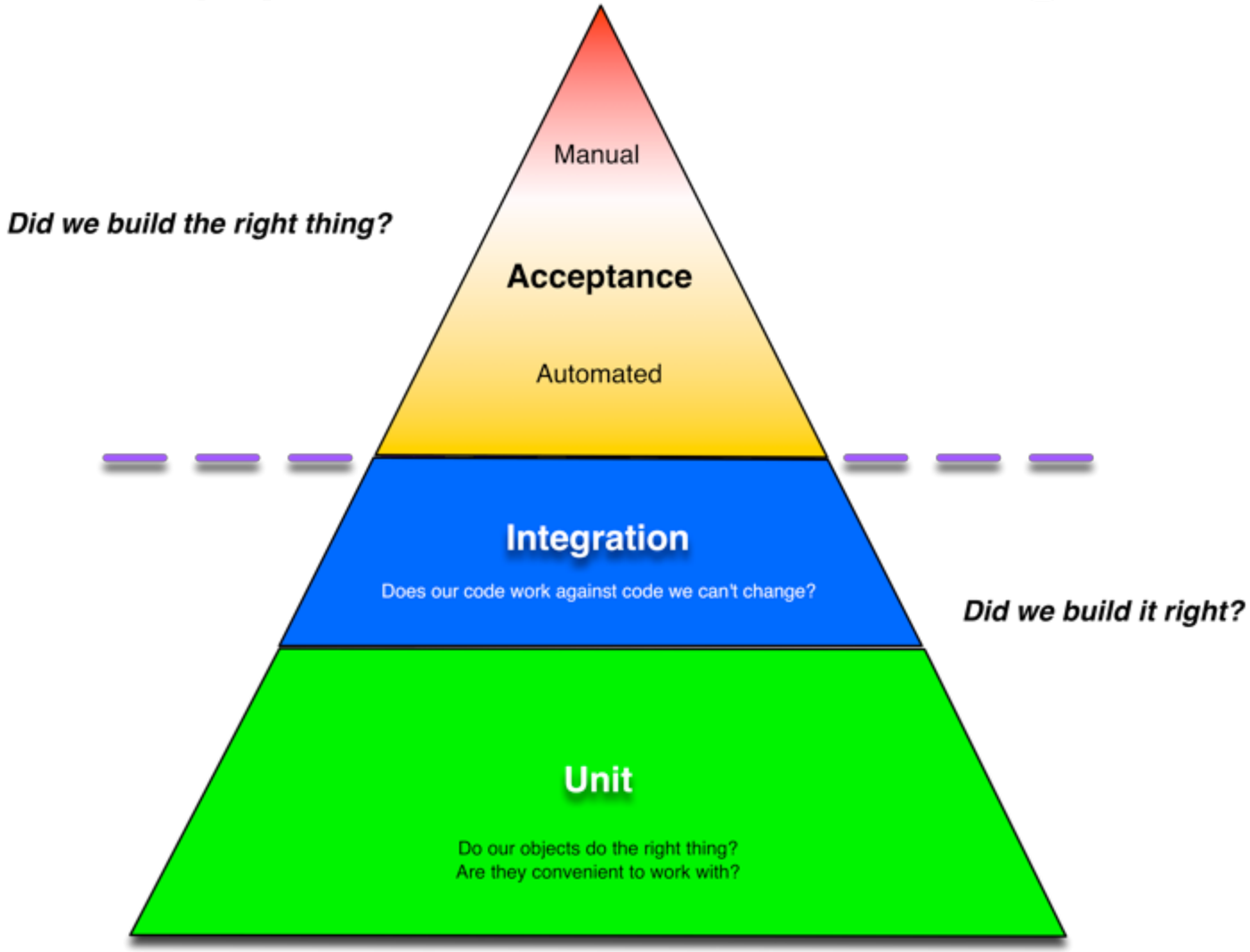
Done wrong, it’s still wrong

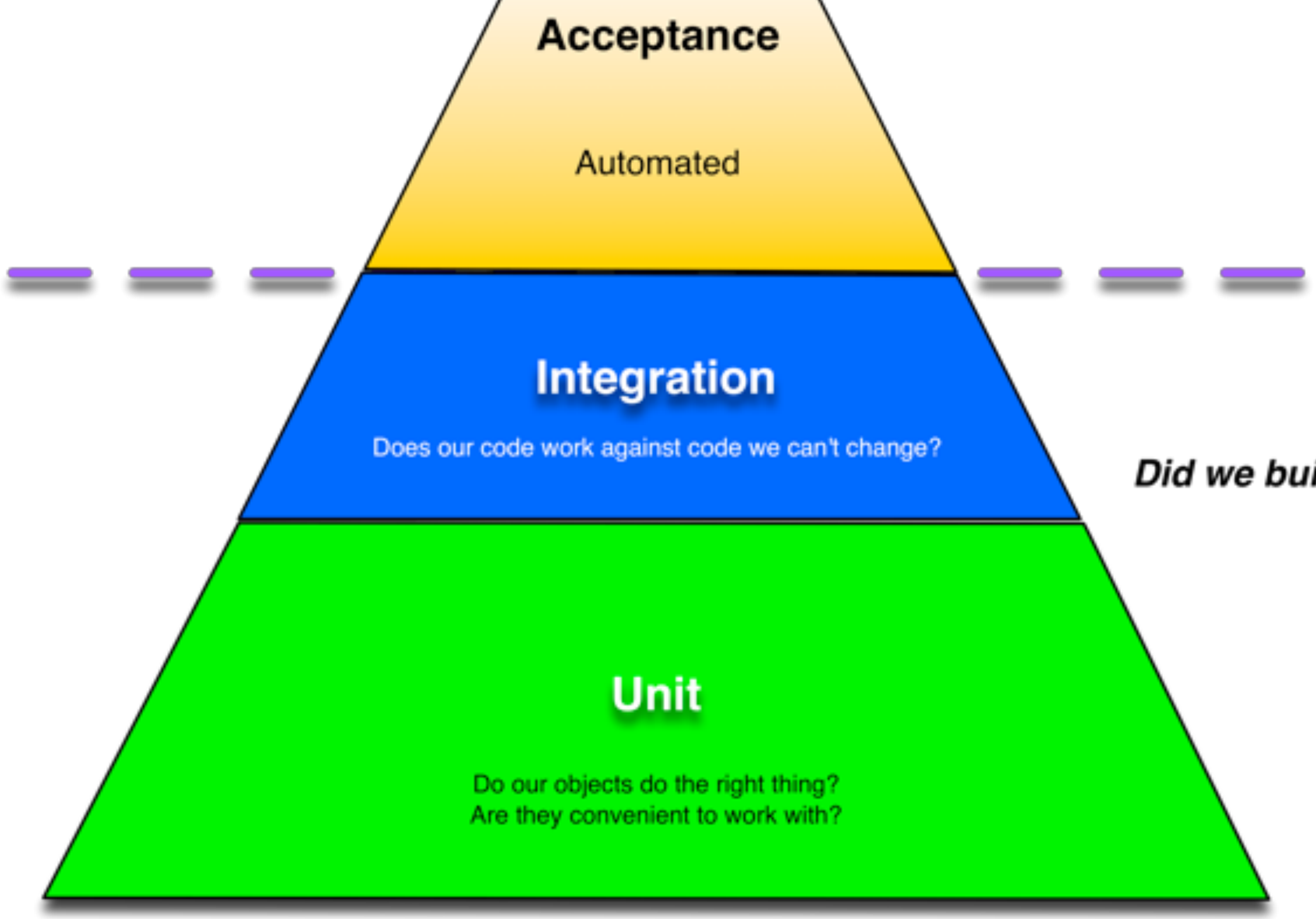
What it’s not

Shortcomings

- Can be difficult
- Management support is crucial
- Self-test paradigm
- Overhead
- Hard to get meaningful coverage in legacy systems

Types of Testing

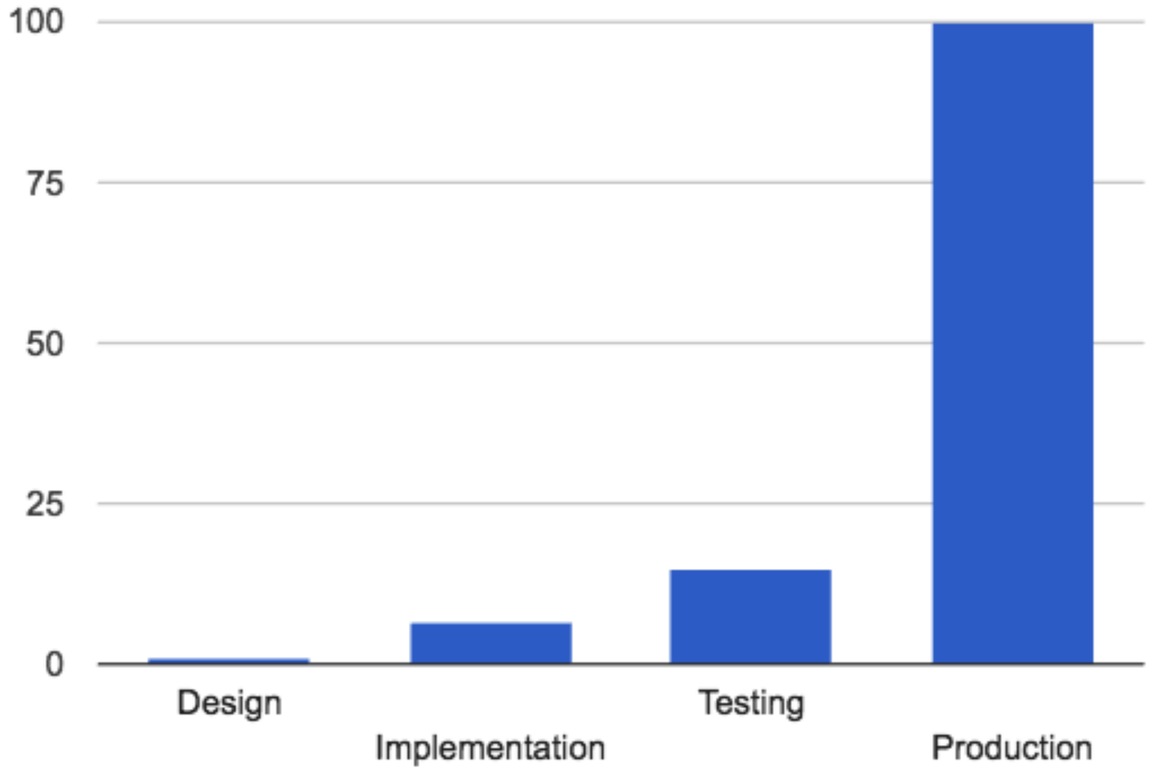




Did we build it right?

Studies

Relative cost of defect resolution



"fixing a production bug costs 100x more than fixing a bug at design time, and over 15x more than fixing a bug at implementation time."

https://www.researchgate.net/publication/255965523_Integrating_Software_Assurance_into_the_Software_Development_Life_Cycle_SDLC

The Effects of TDD

- It is common for initial project build-outs to take up to 30% longer with TDD
- TDD Reduces production bug density 40%-80%

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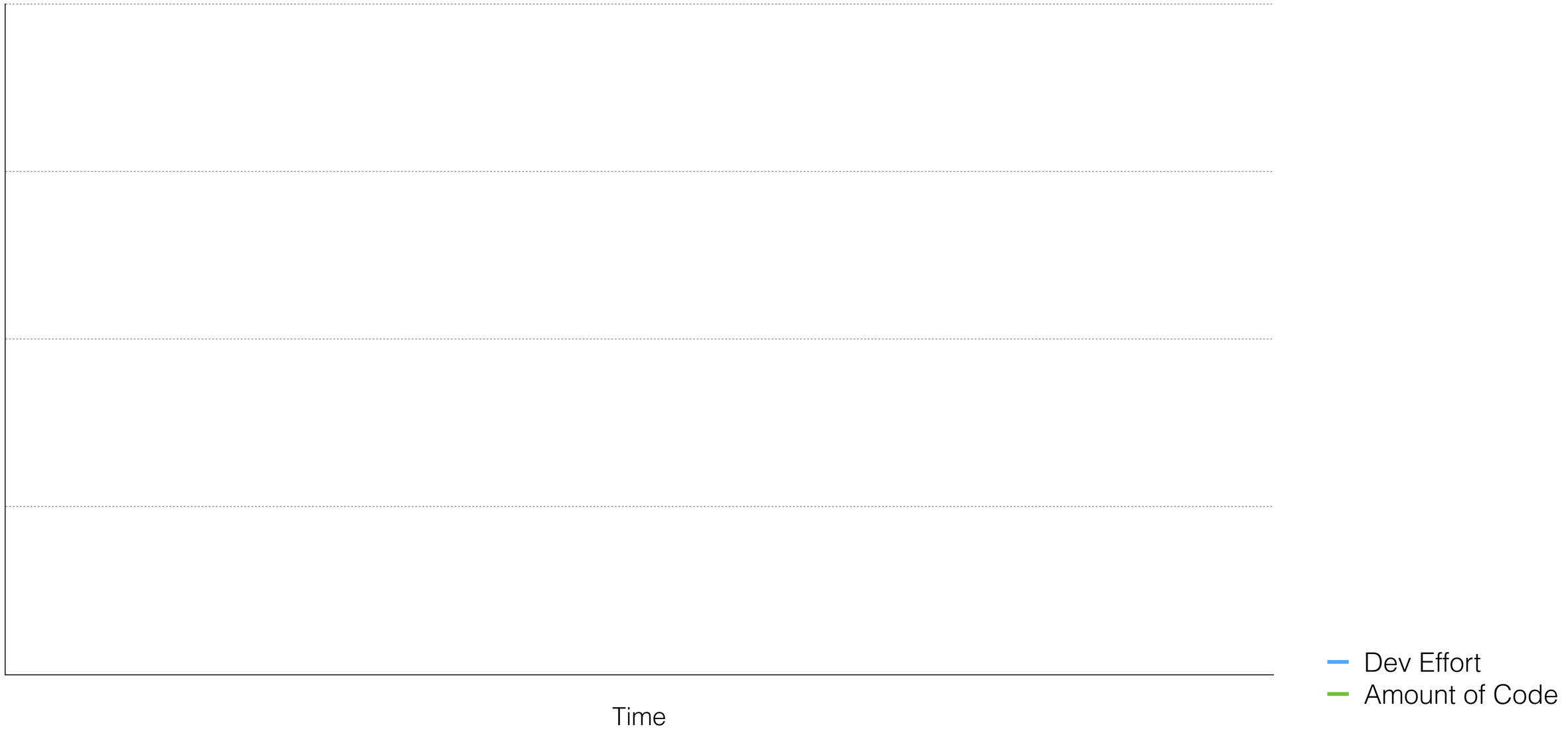
The ‘Agile’ Problem



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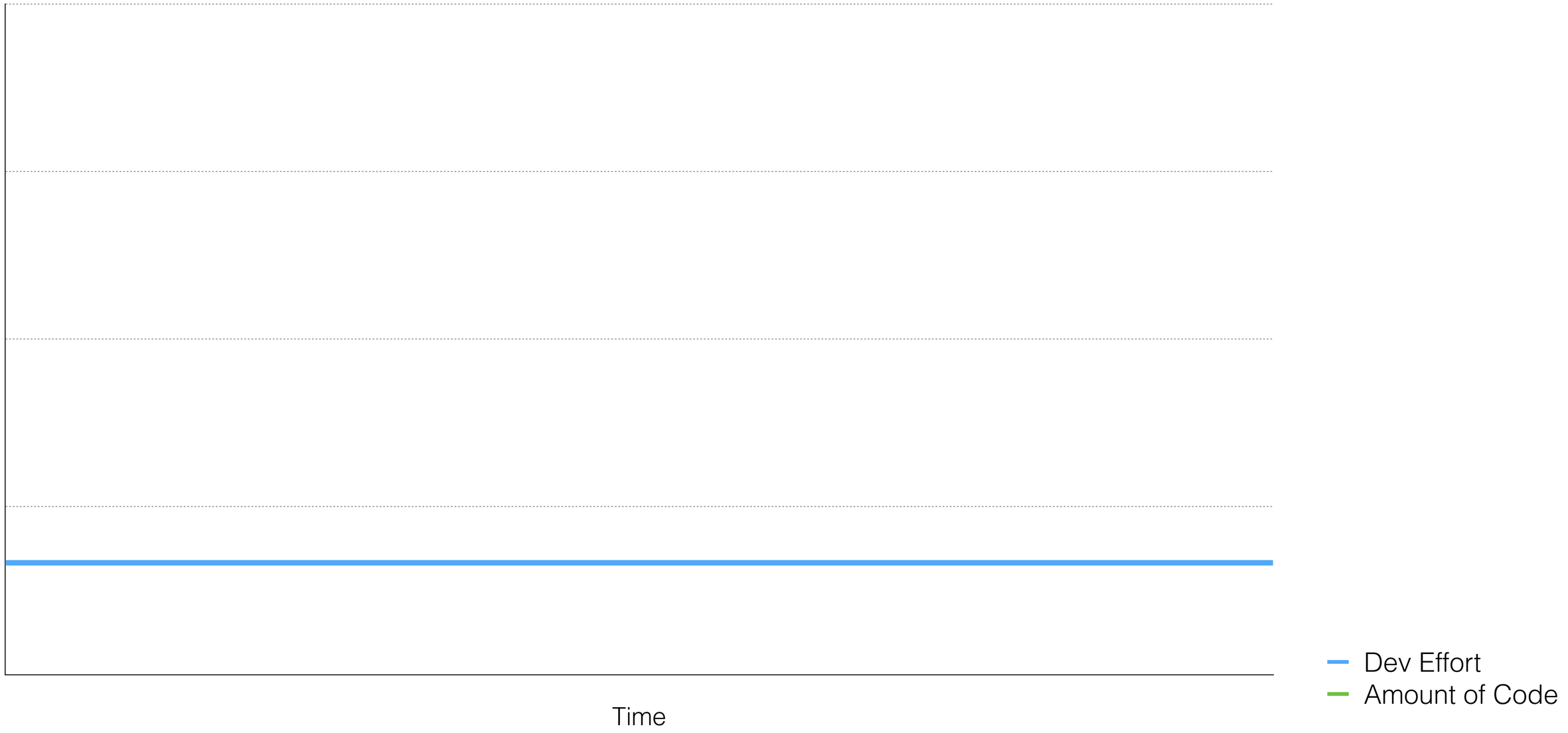

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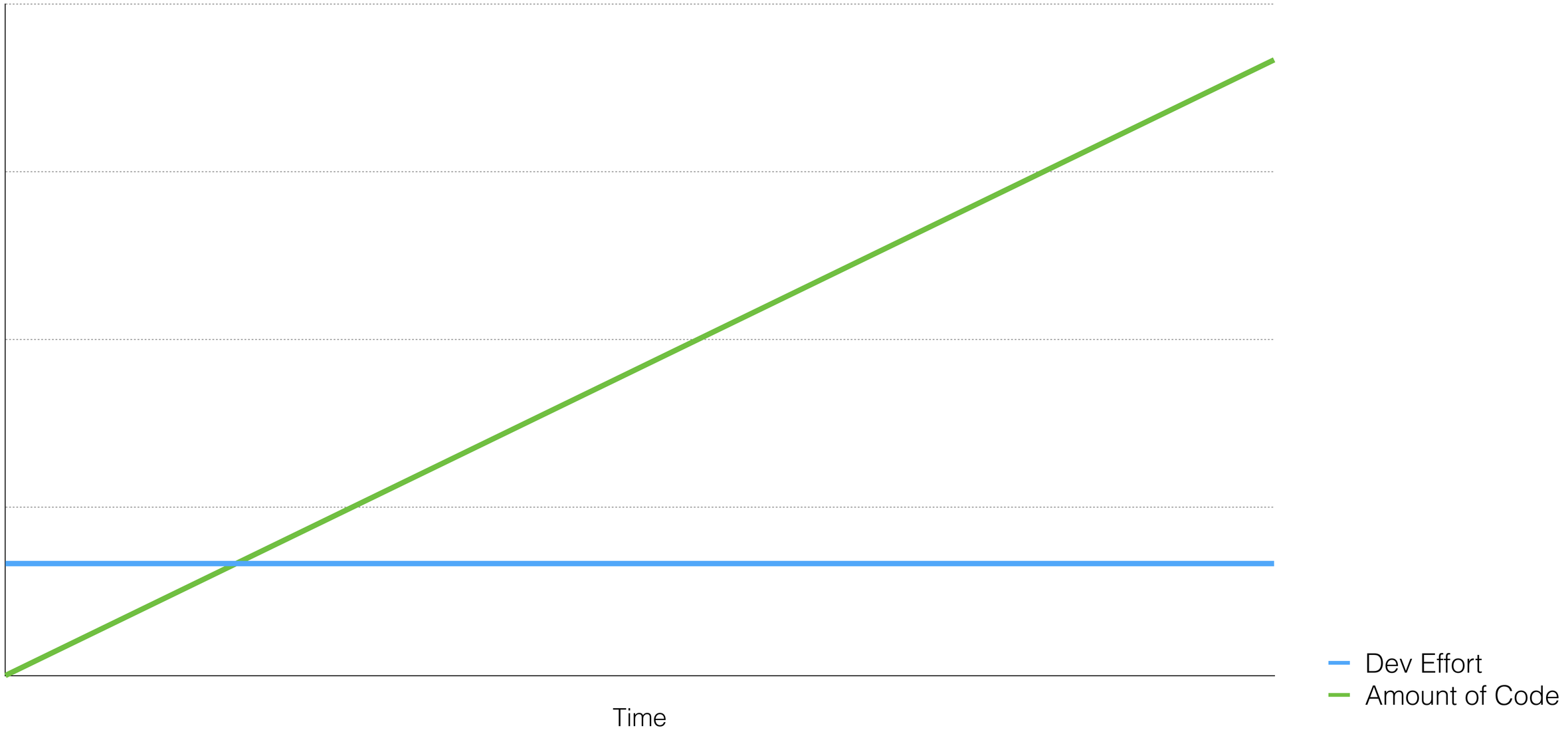

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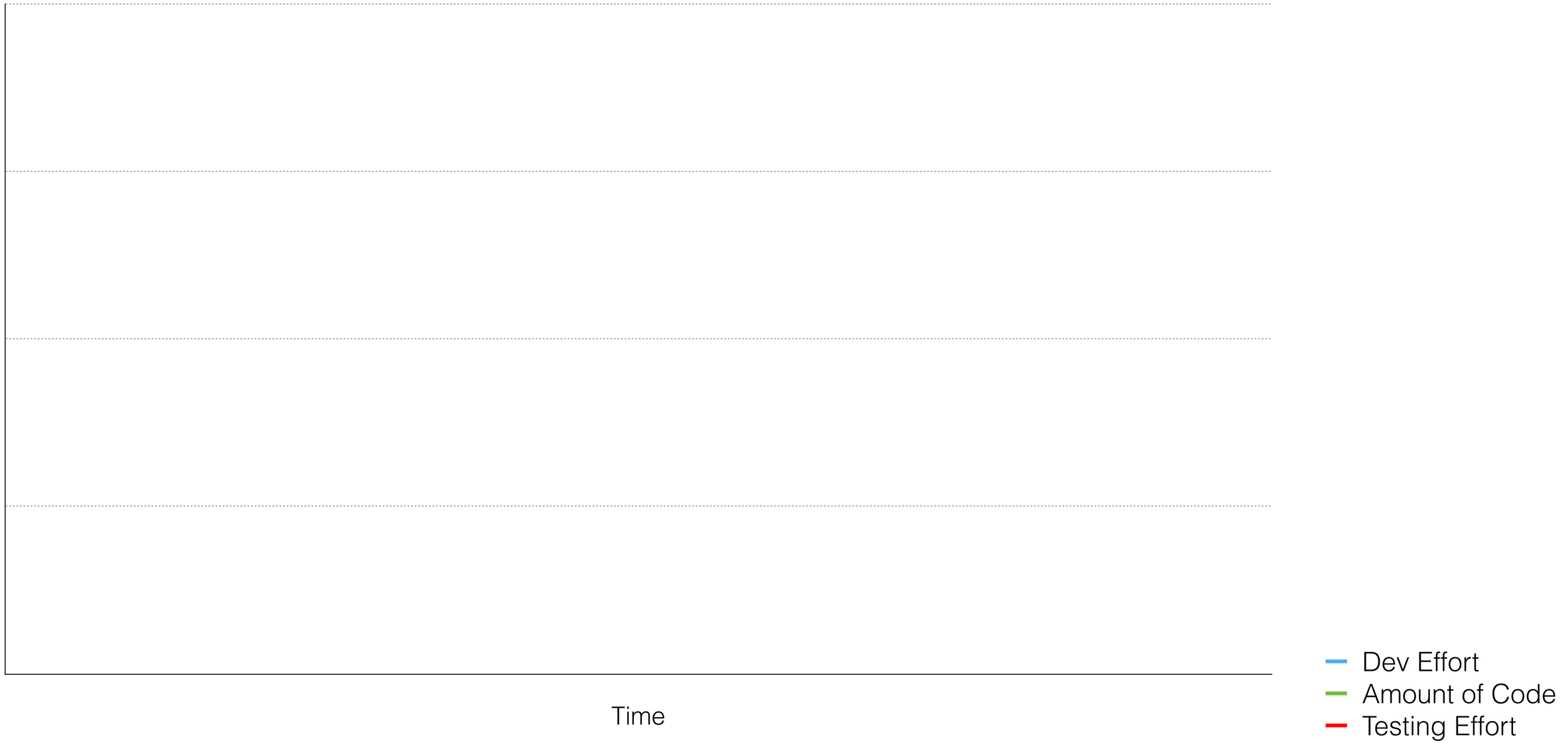

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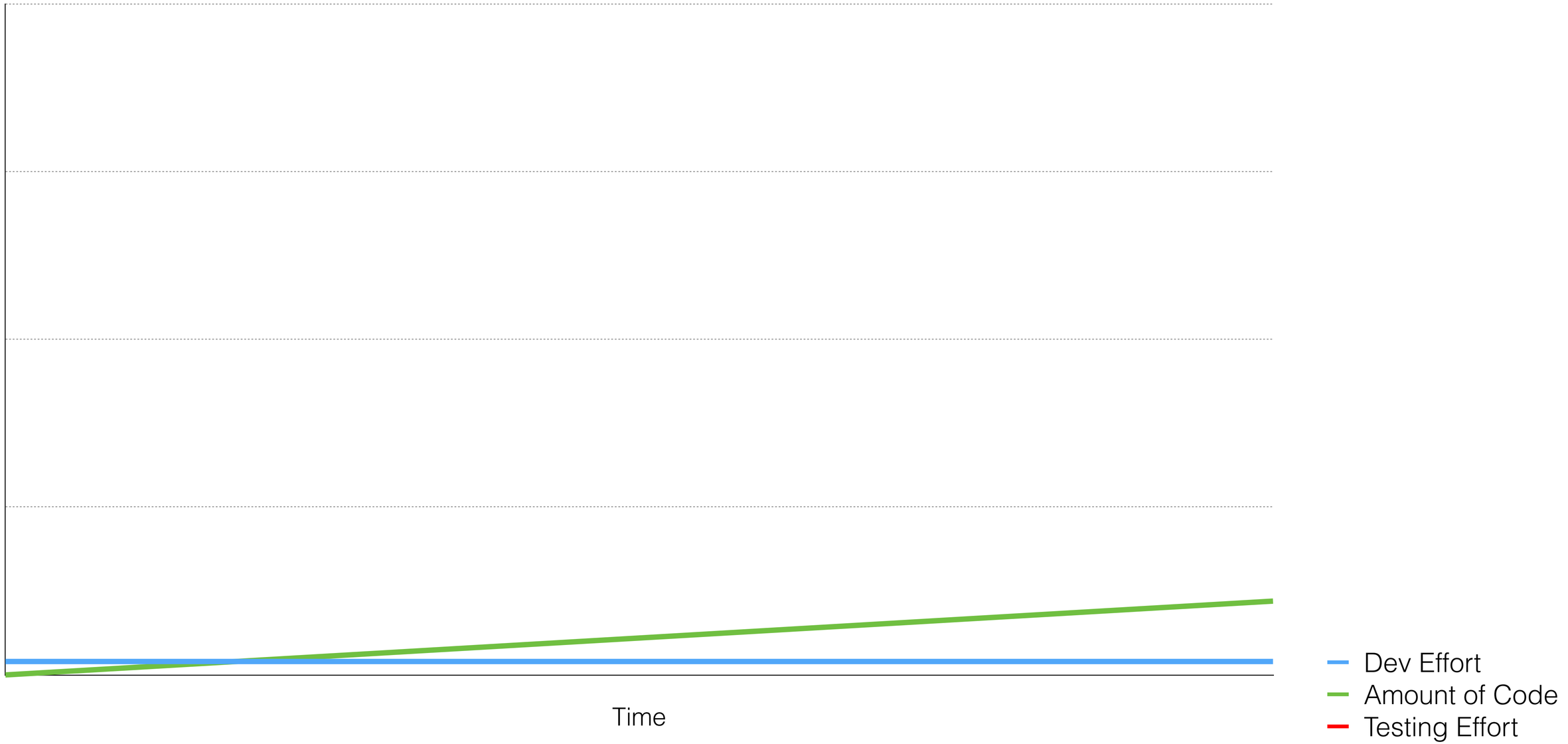

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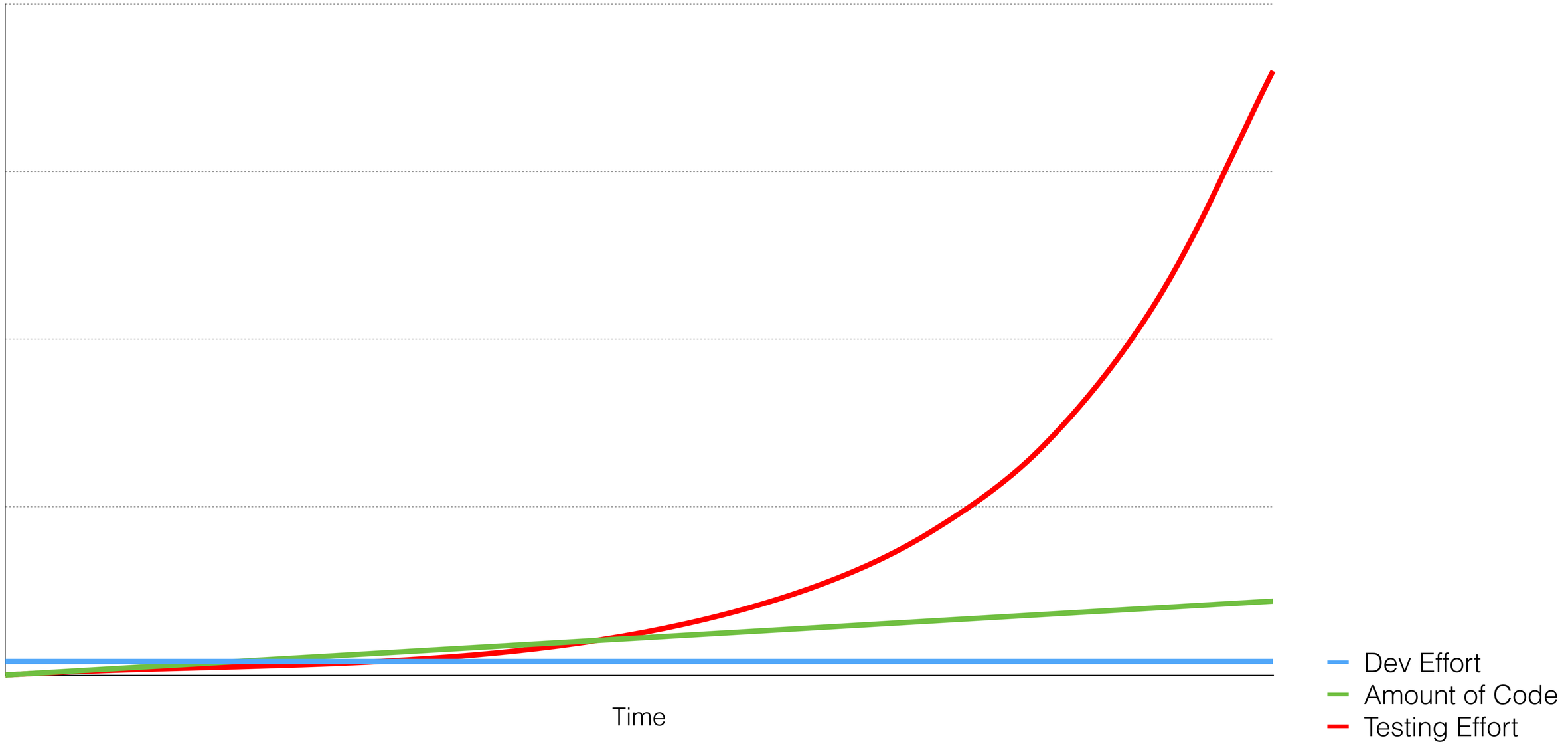
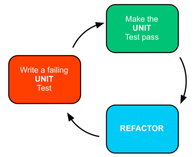
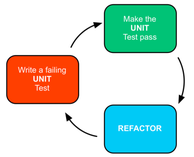




Test Driven Development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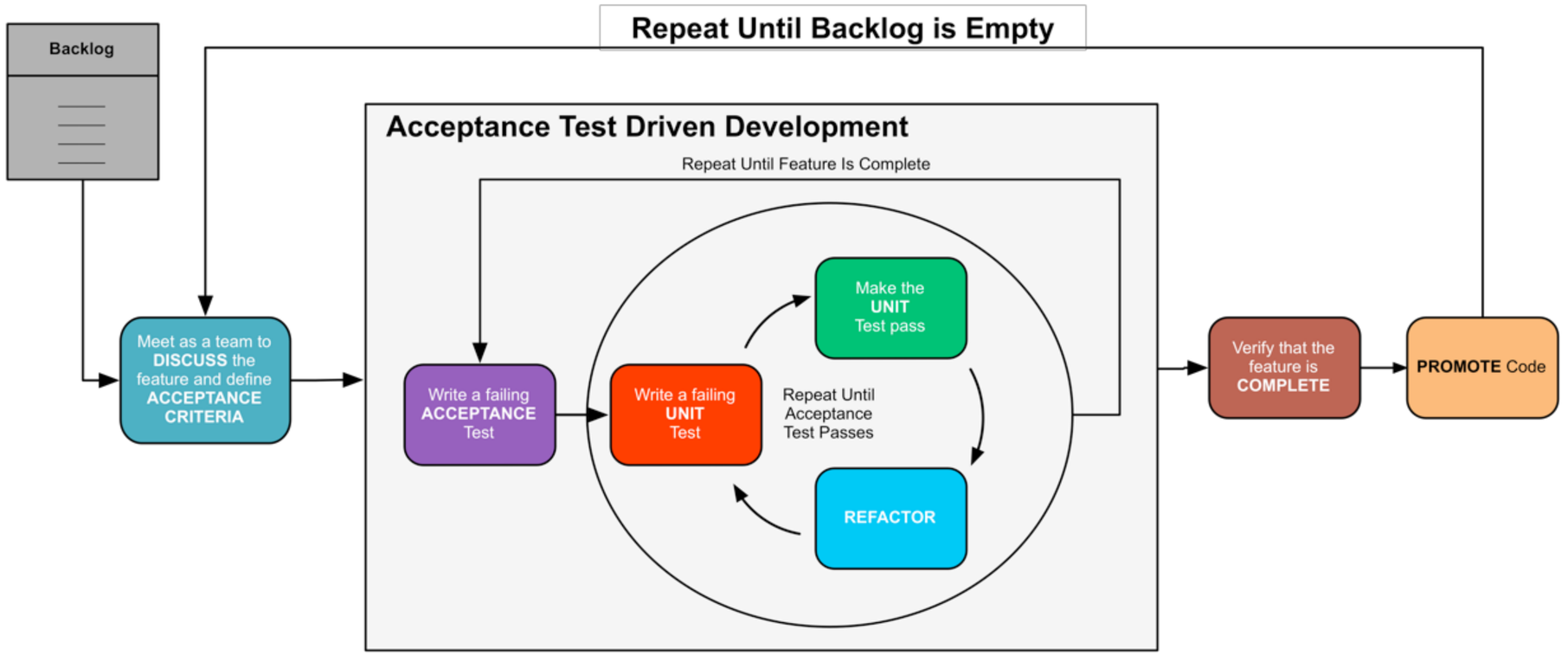
Workflow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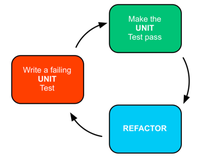
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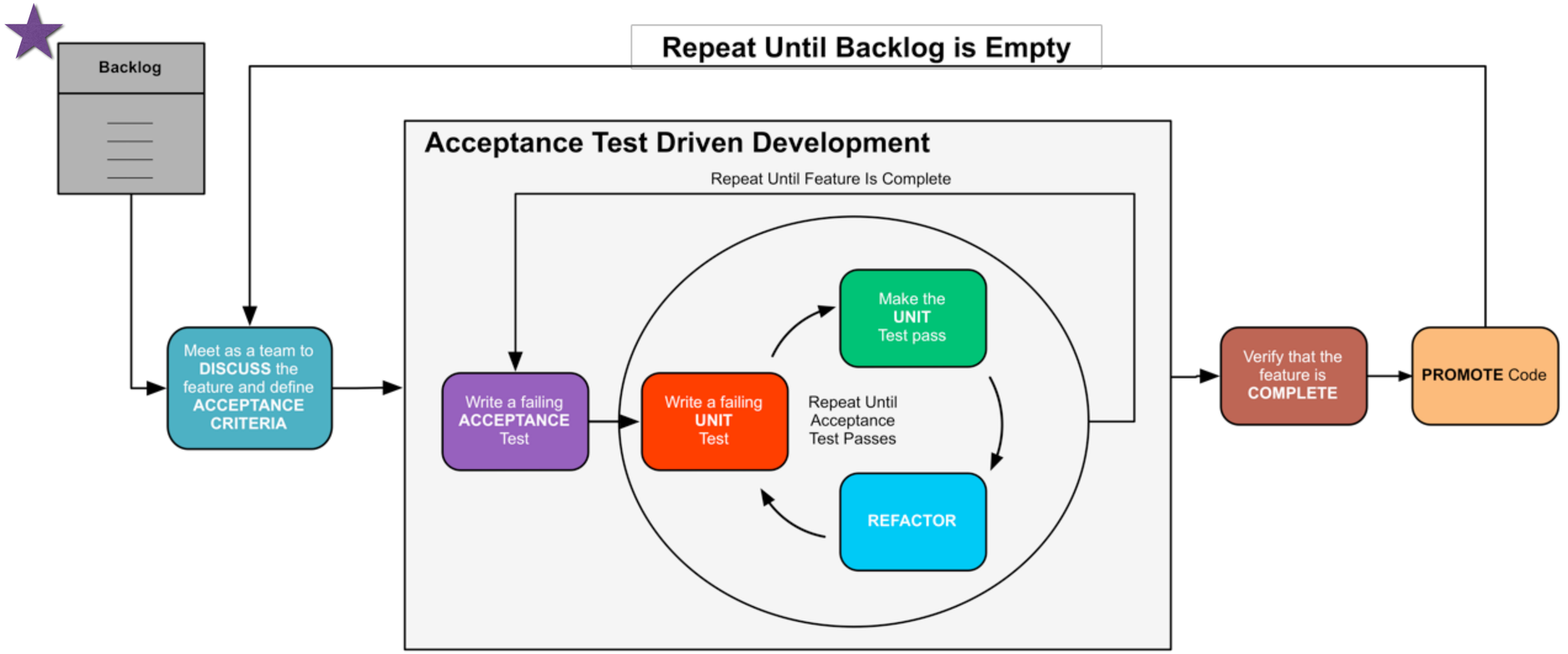
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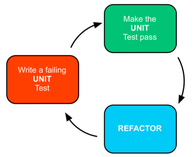
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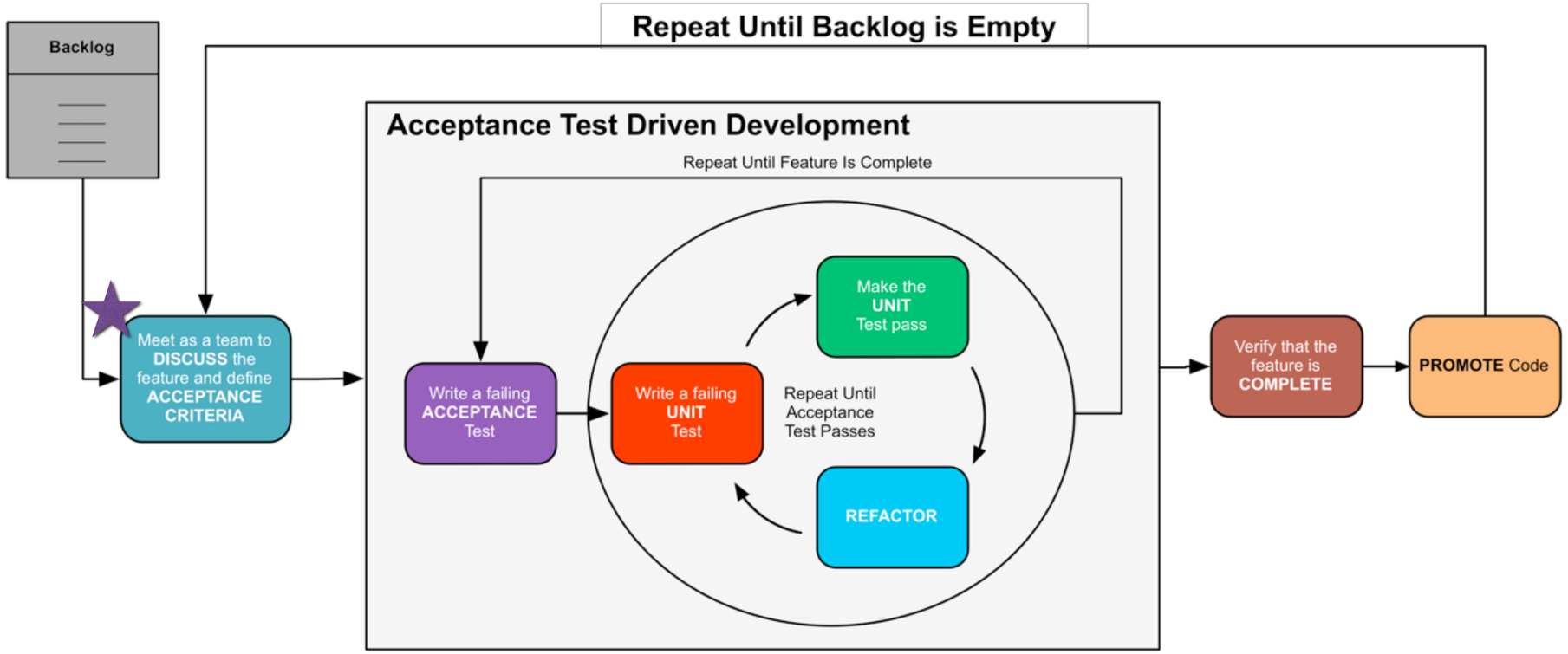
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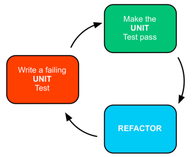
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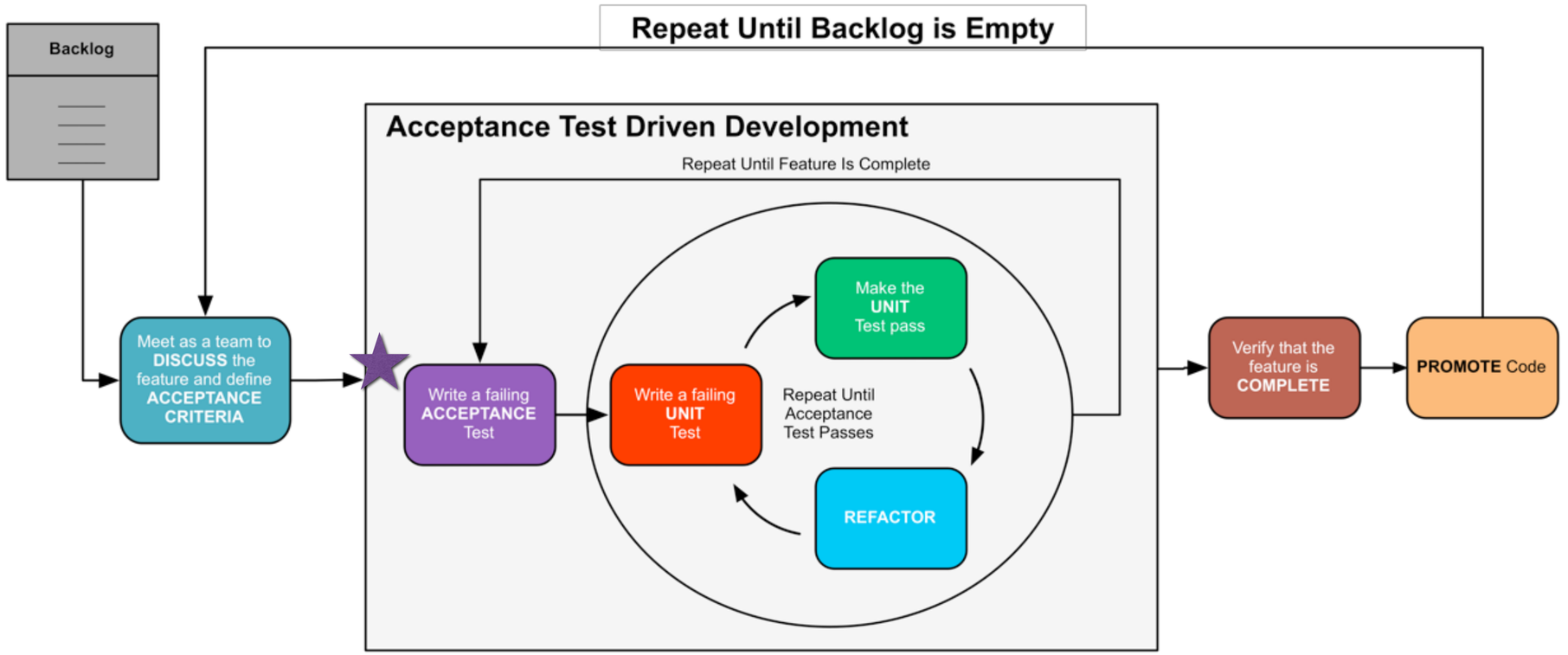
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Write a failing ACCEPTANCE Test
Write a failing UNIT Test
Make the UNIT Test pass
Repeat Until Acceptance Test Passes
REFACTOR
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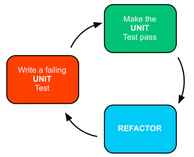
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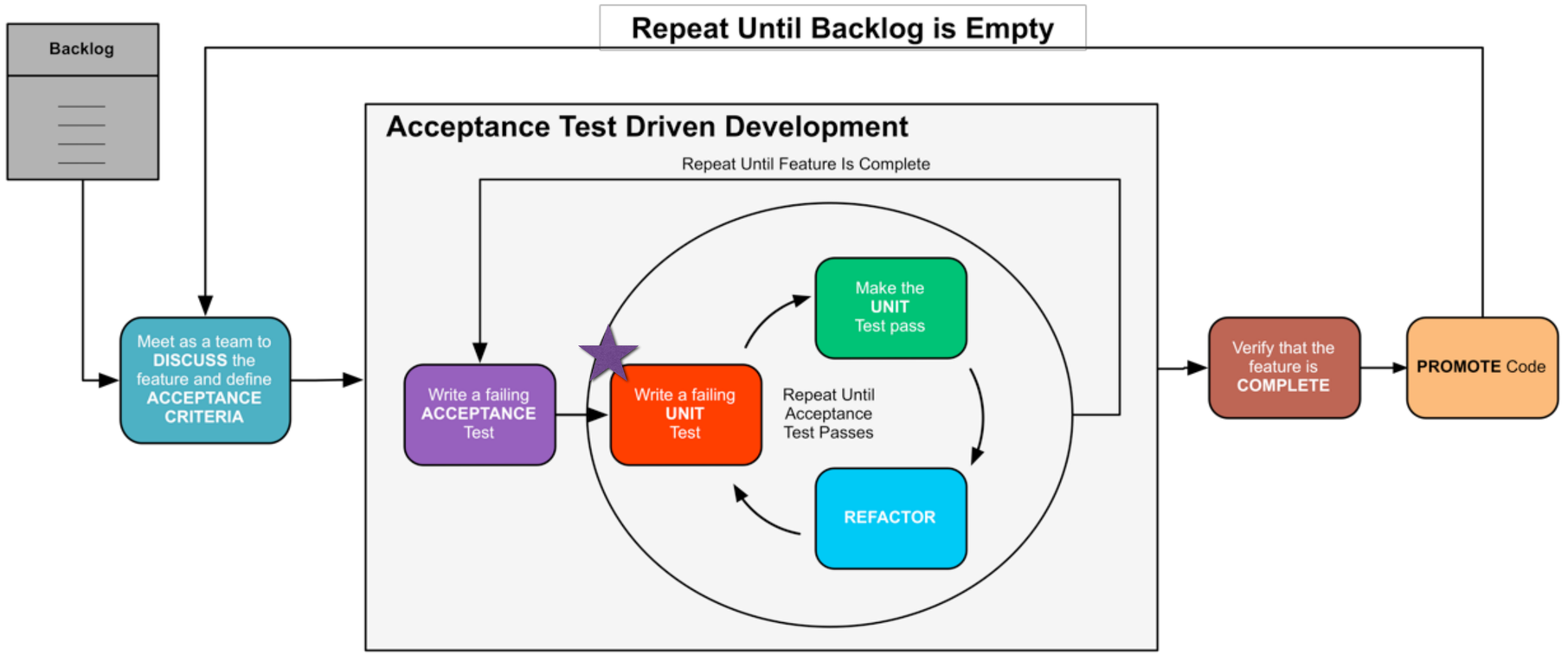
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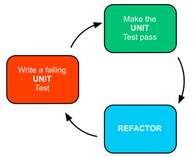
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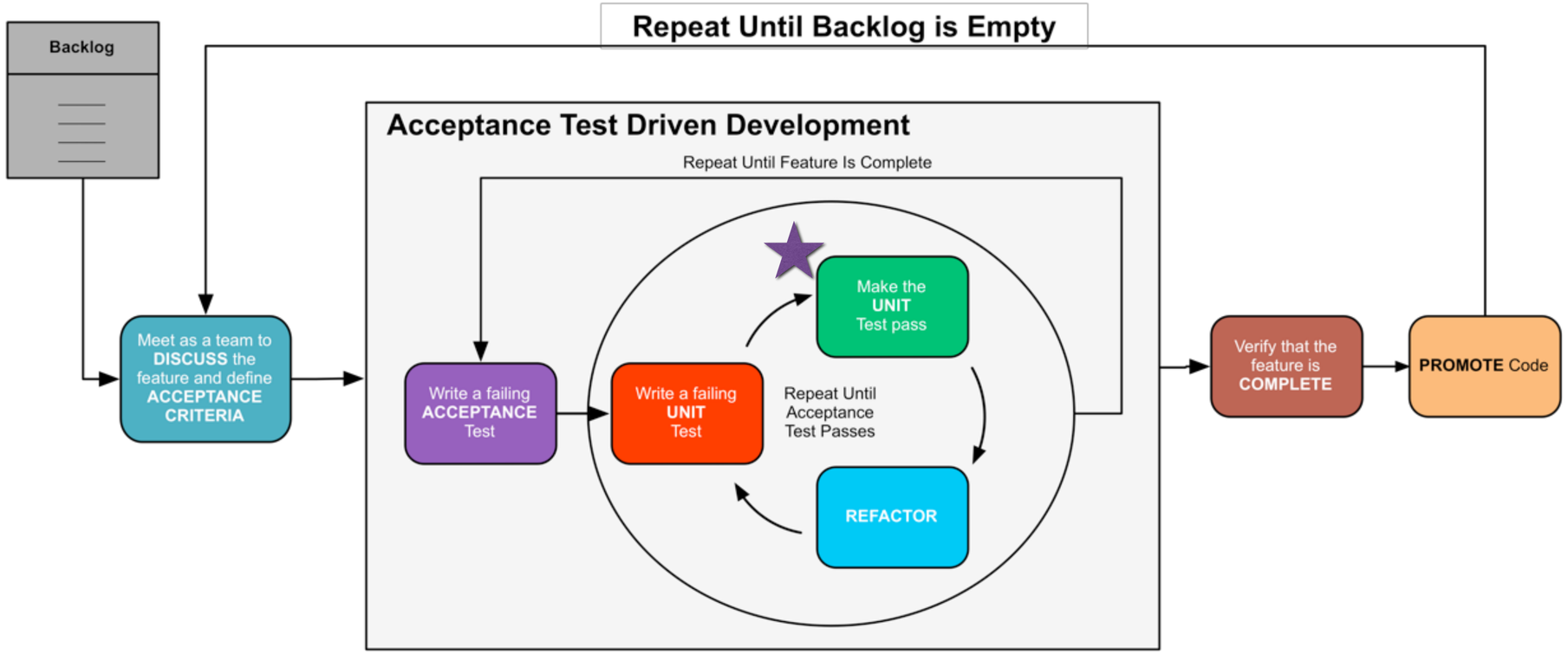
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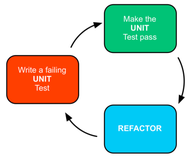
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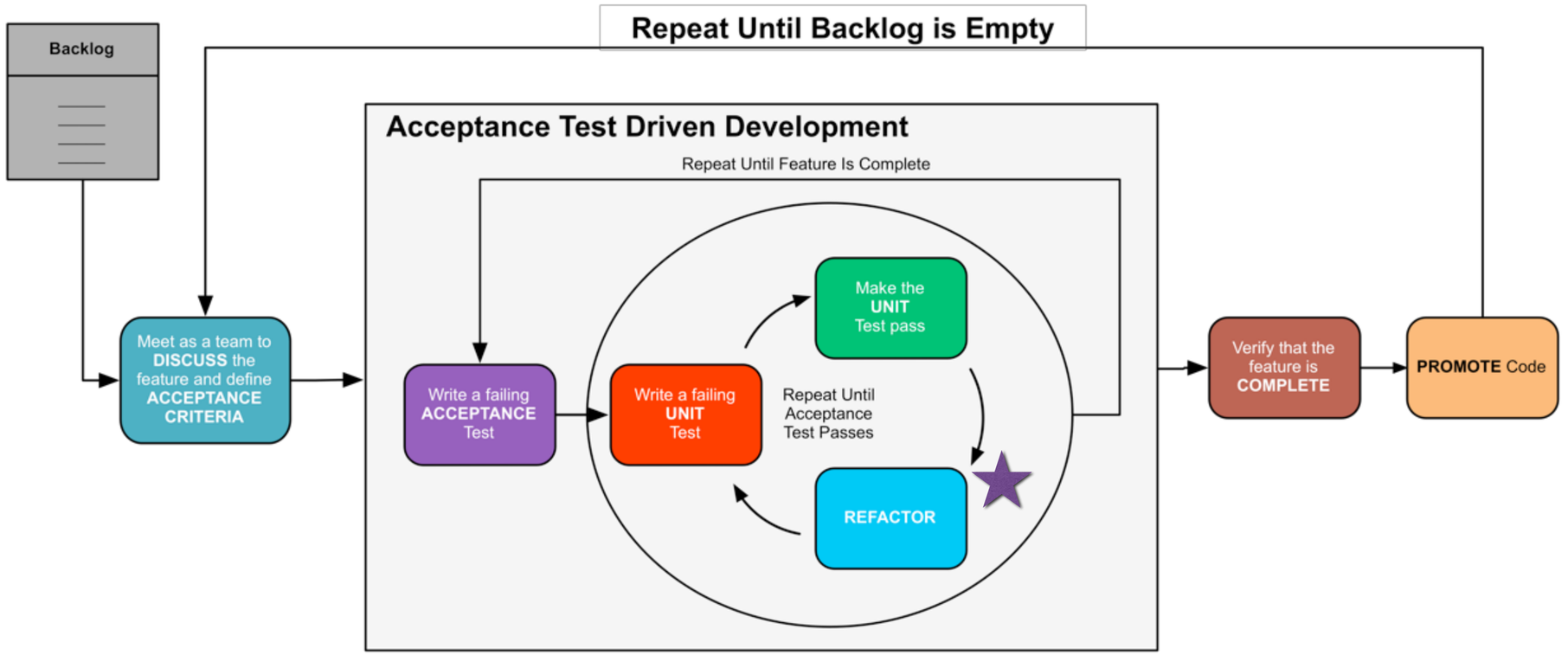
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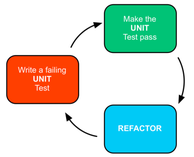
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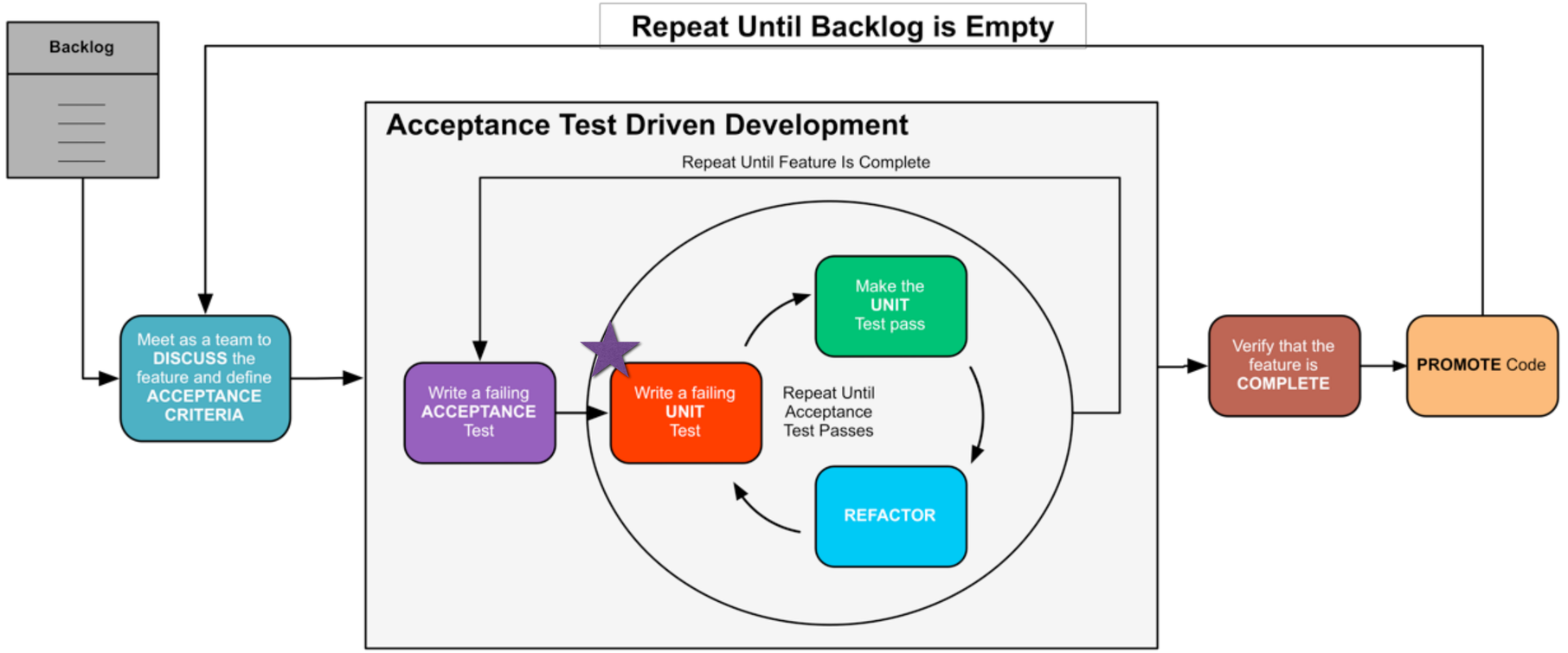
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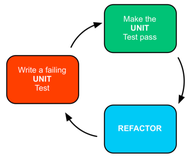
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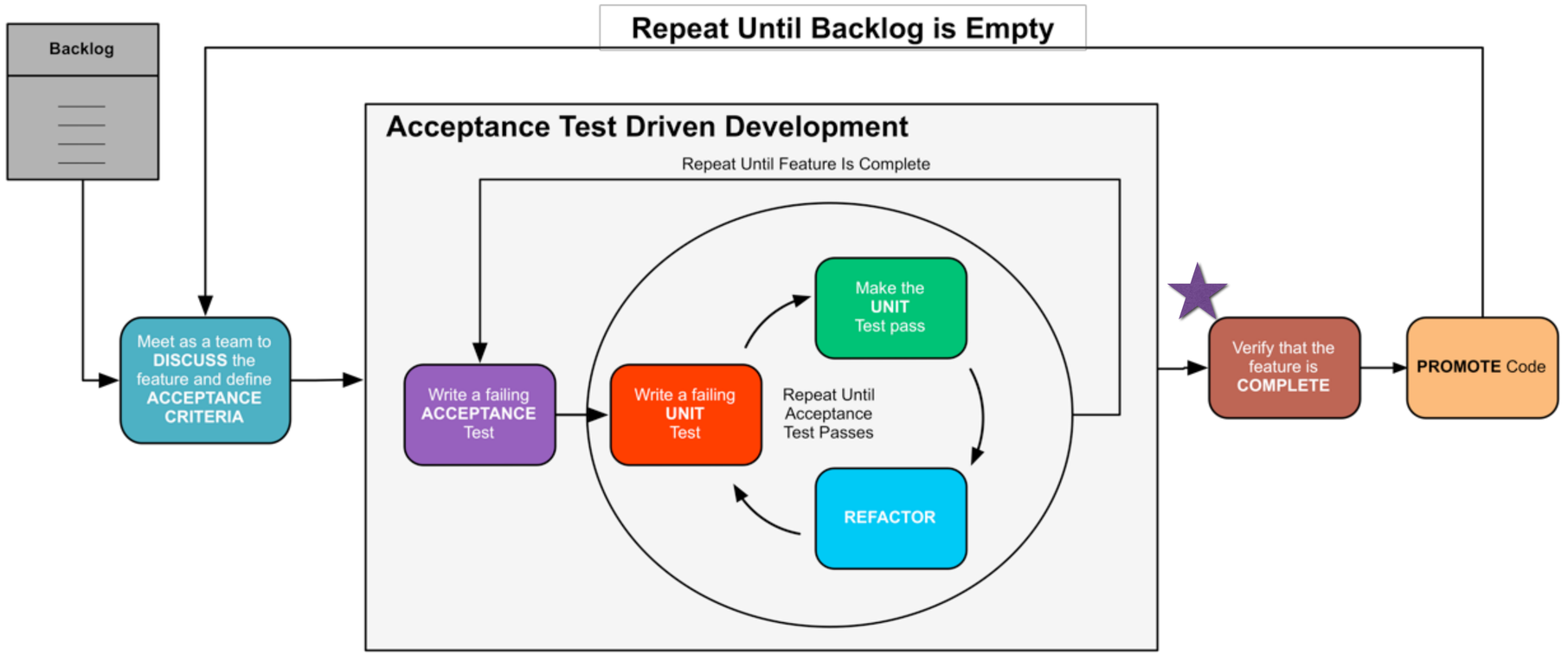
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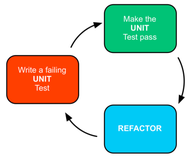
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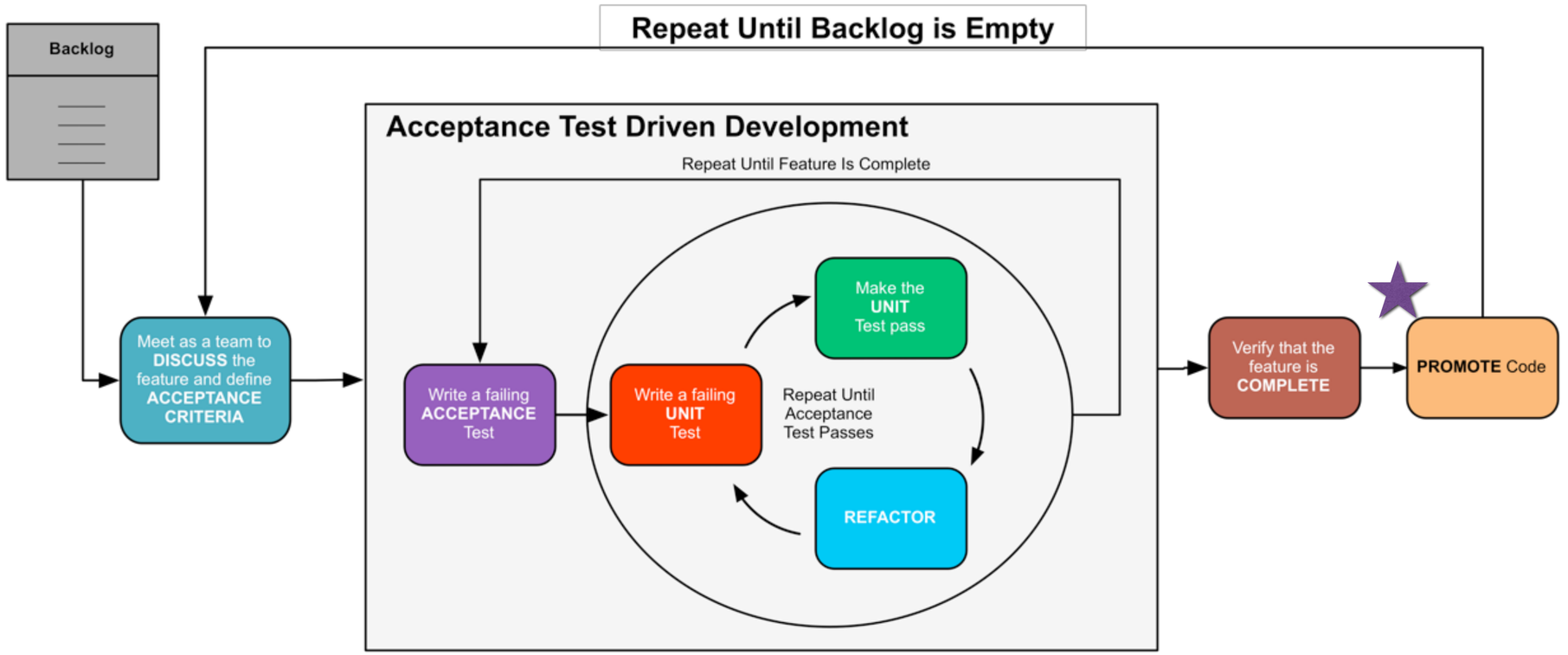
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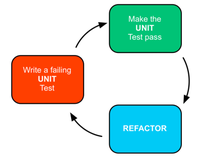
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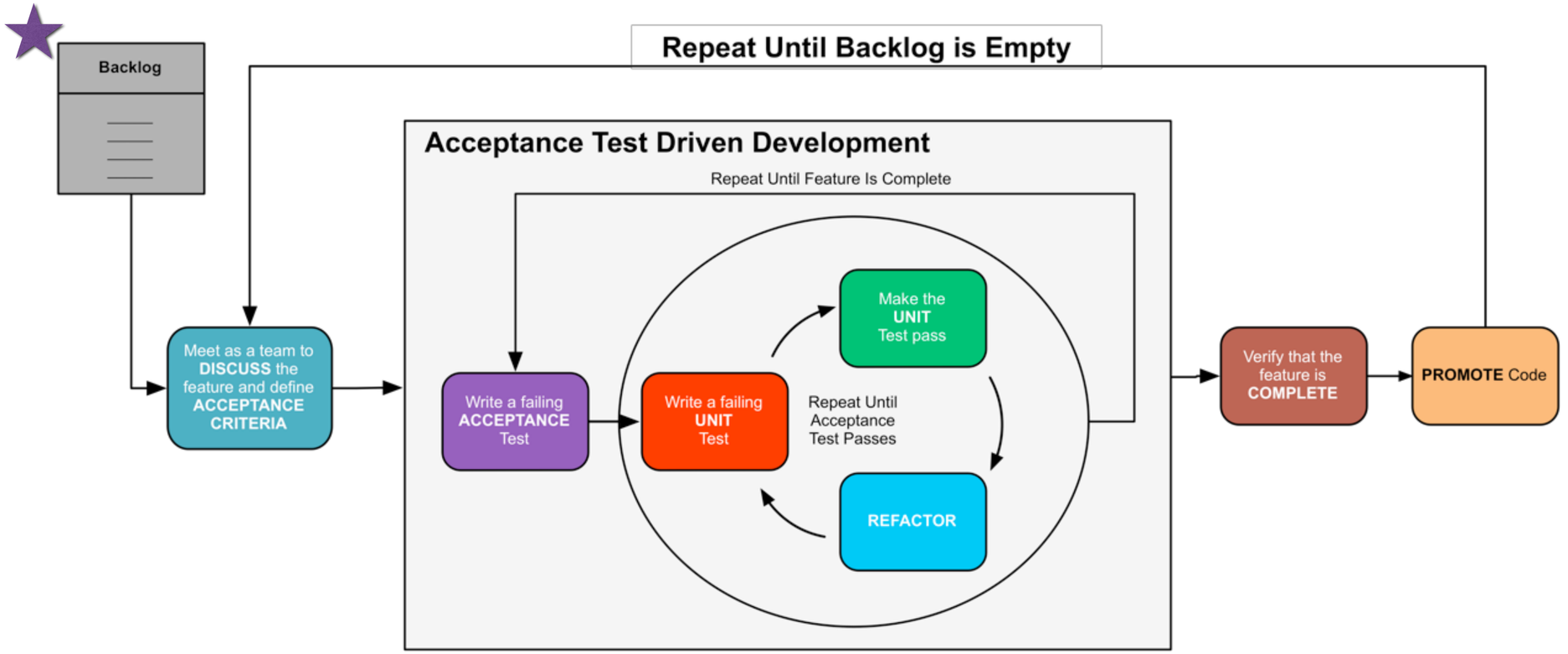
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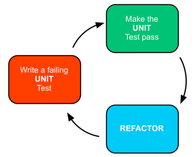
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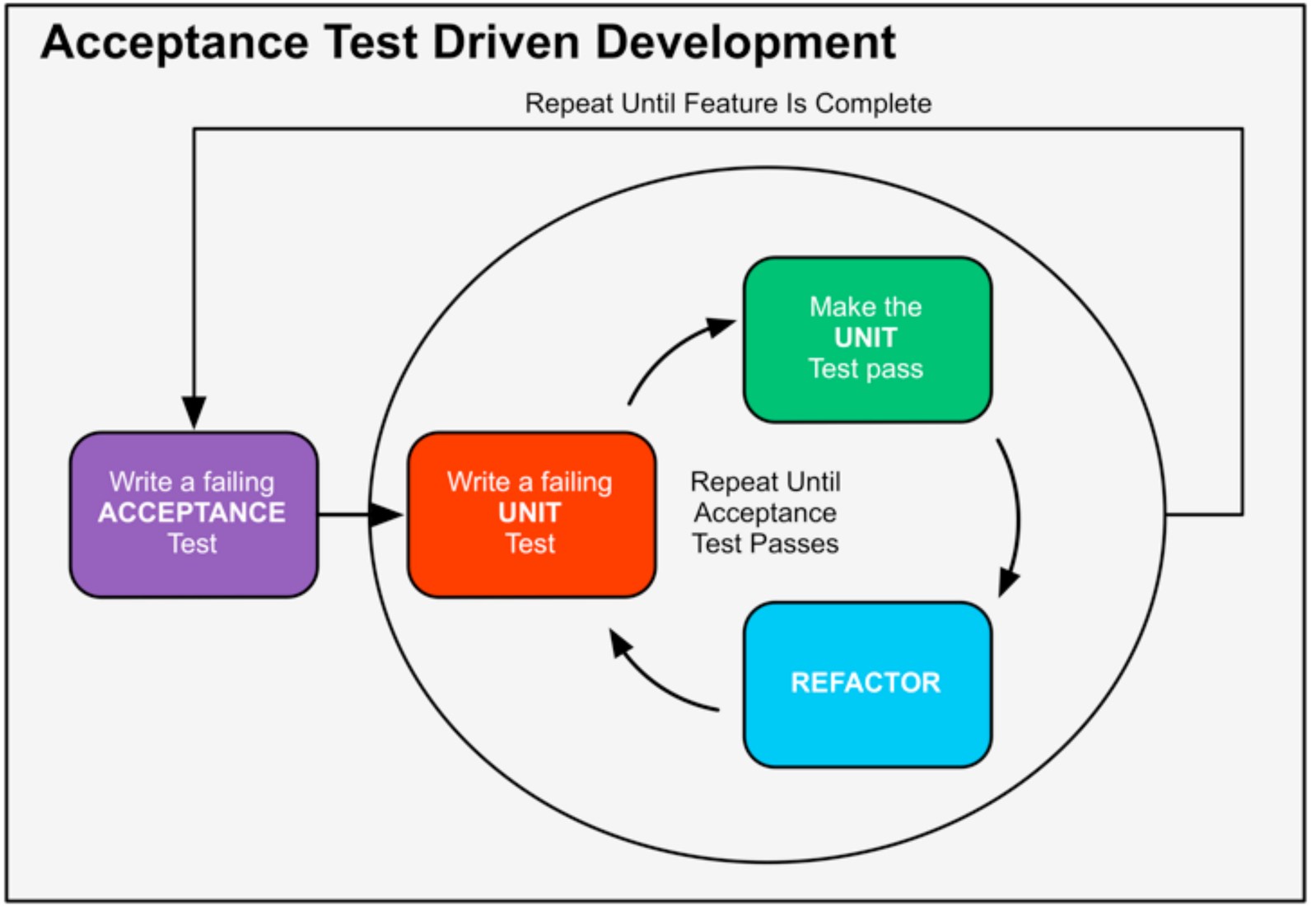
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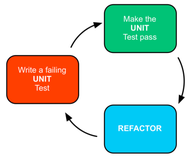
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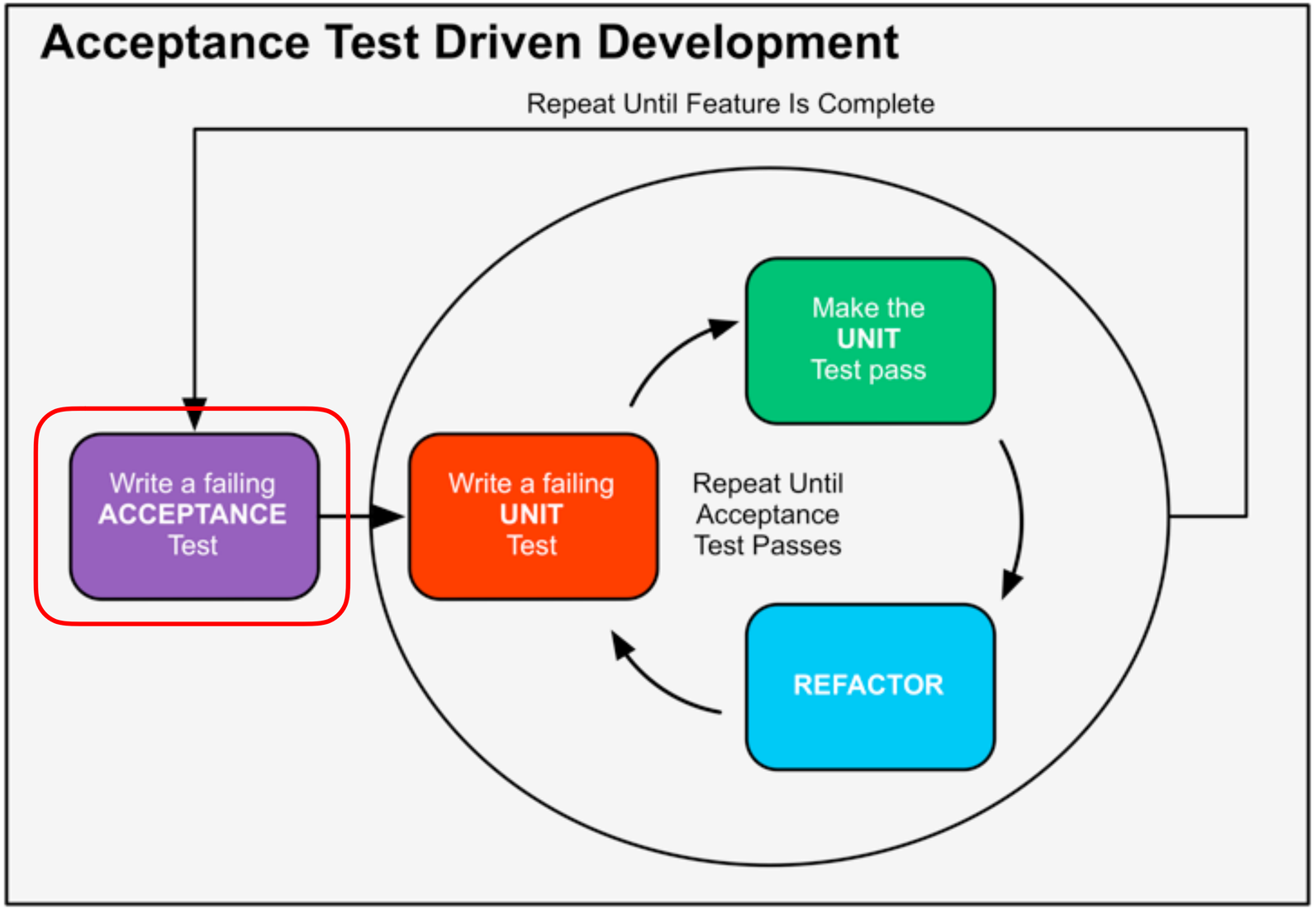
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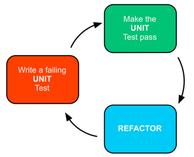
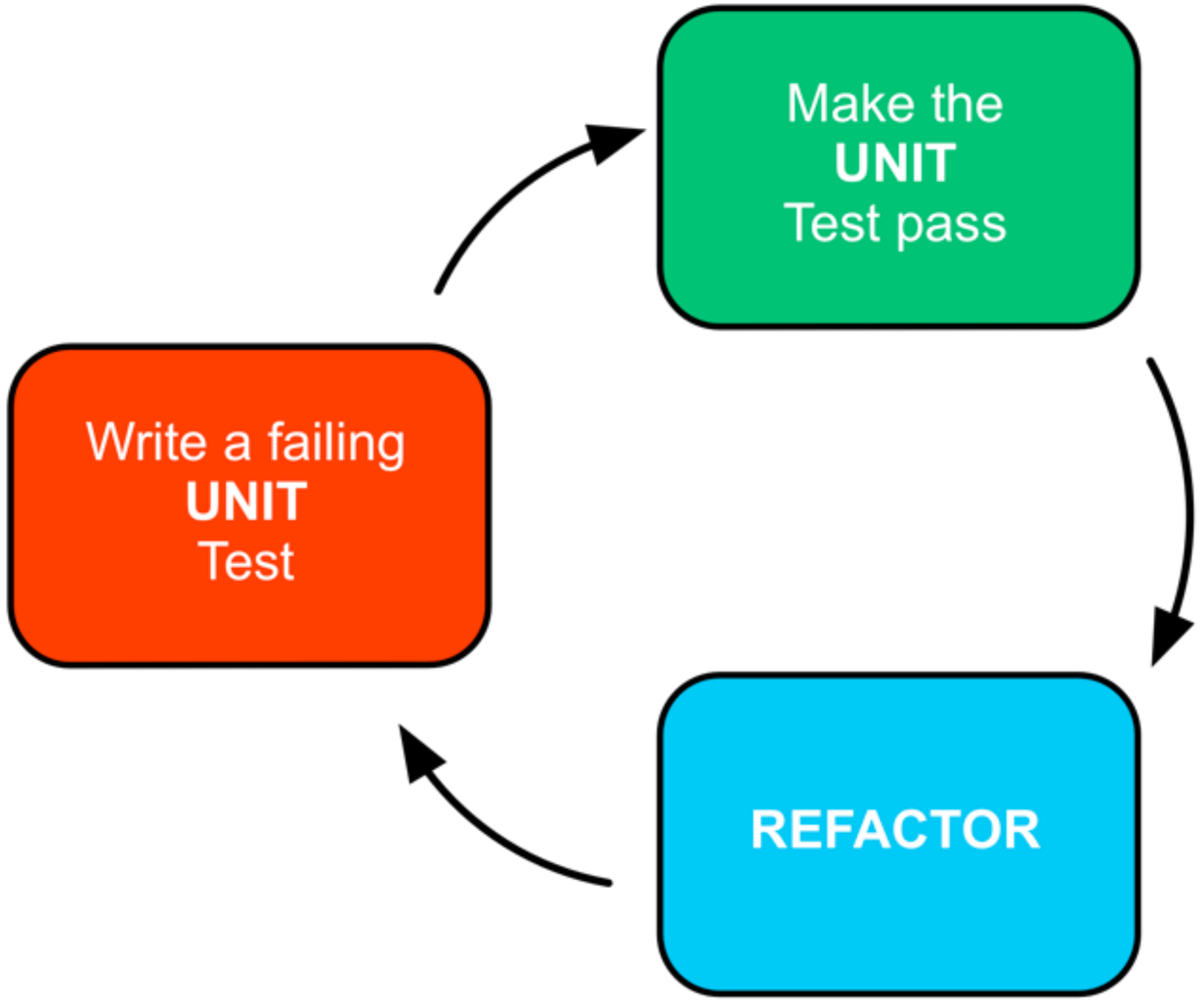

Make the
UNIT
Test pass
Write a failing
UNIT
Test
REFACTOR

TDD Flow


Make the
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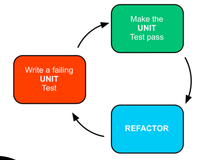
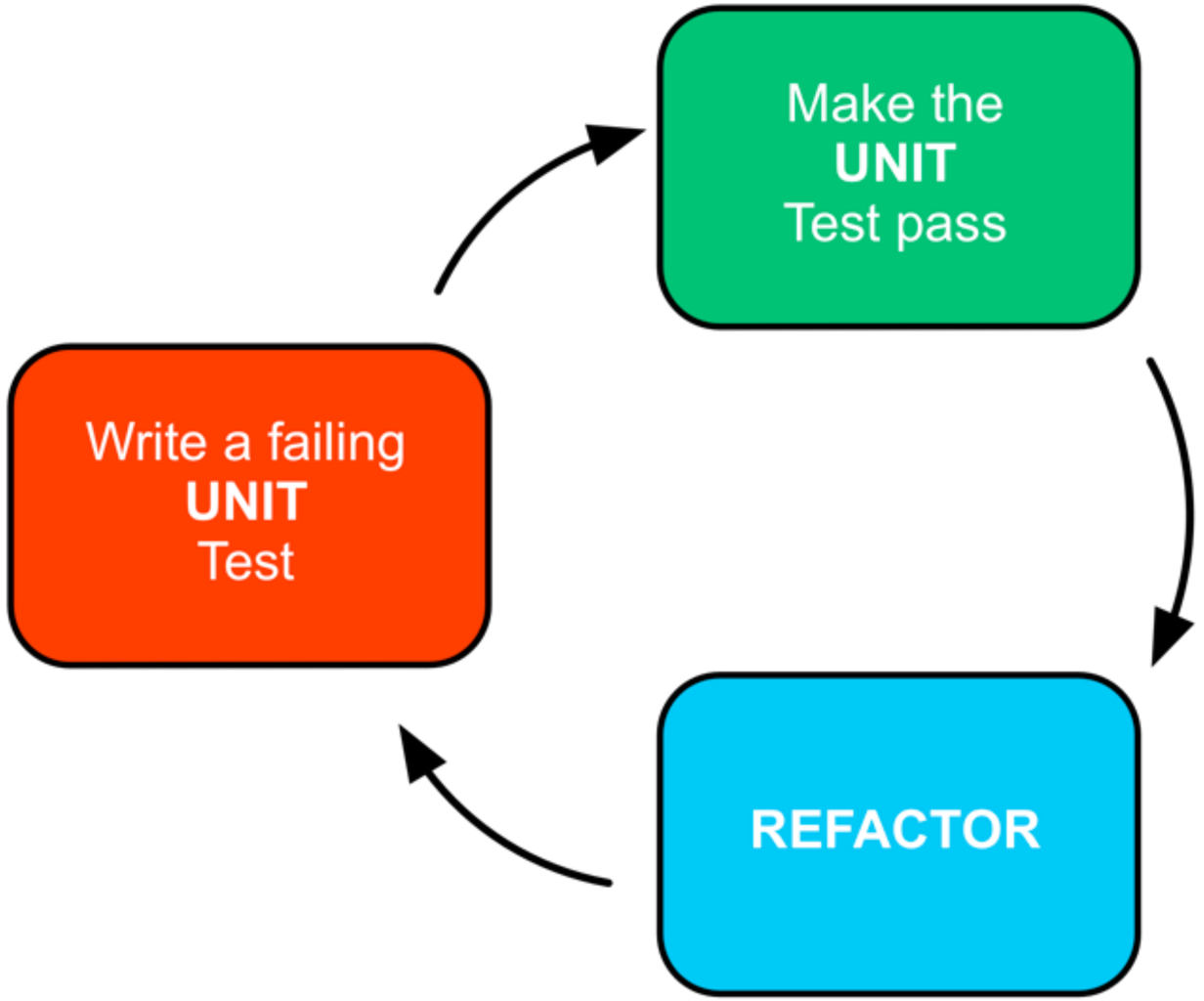
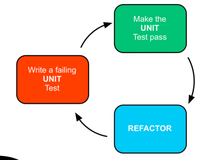
REFACTOR



The Three Rules of TDD



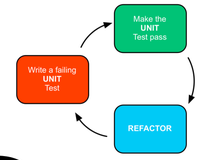
http://butunclebob.com/ArticleS.UncleBob.TheThreeRulesOfTdd



The Three Rules of TDD

1. **You are not allowed to write any production code unless it is to make a failing unit test pass.**

http://butunclebob.com/ArticleS.UncleBob.TheThreeRulesOfTdd

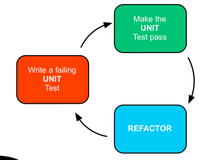


The Three Rules of TDD

1. **You are not allowed to write any production code unless it is to make a failing unit test pass.**

2. **You are not allowed to write any more of a unit test than is sufficient to fail; and compilation failures are failures.**

http://butunclebob.com/ArticleS.UncleBob.TheThreeRulesOfTdd



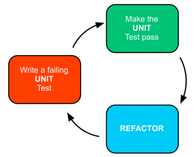
The Three Rules of TDD

1. **You are not allowed to write any production code unless it is to make a failing unit test pass.**

2. **You are not allowed to write any more of a unit test than is sufficient to fail; and compilation failures are failures.**

3. **You are not allowed to write any more production code than is sufficient to pass the one failing unit test.**

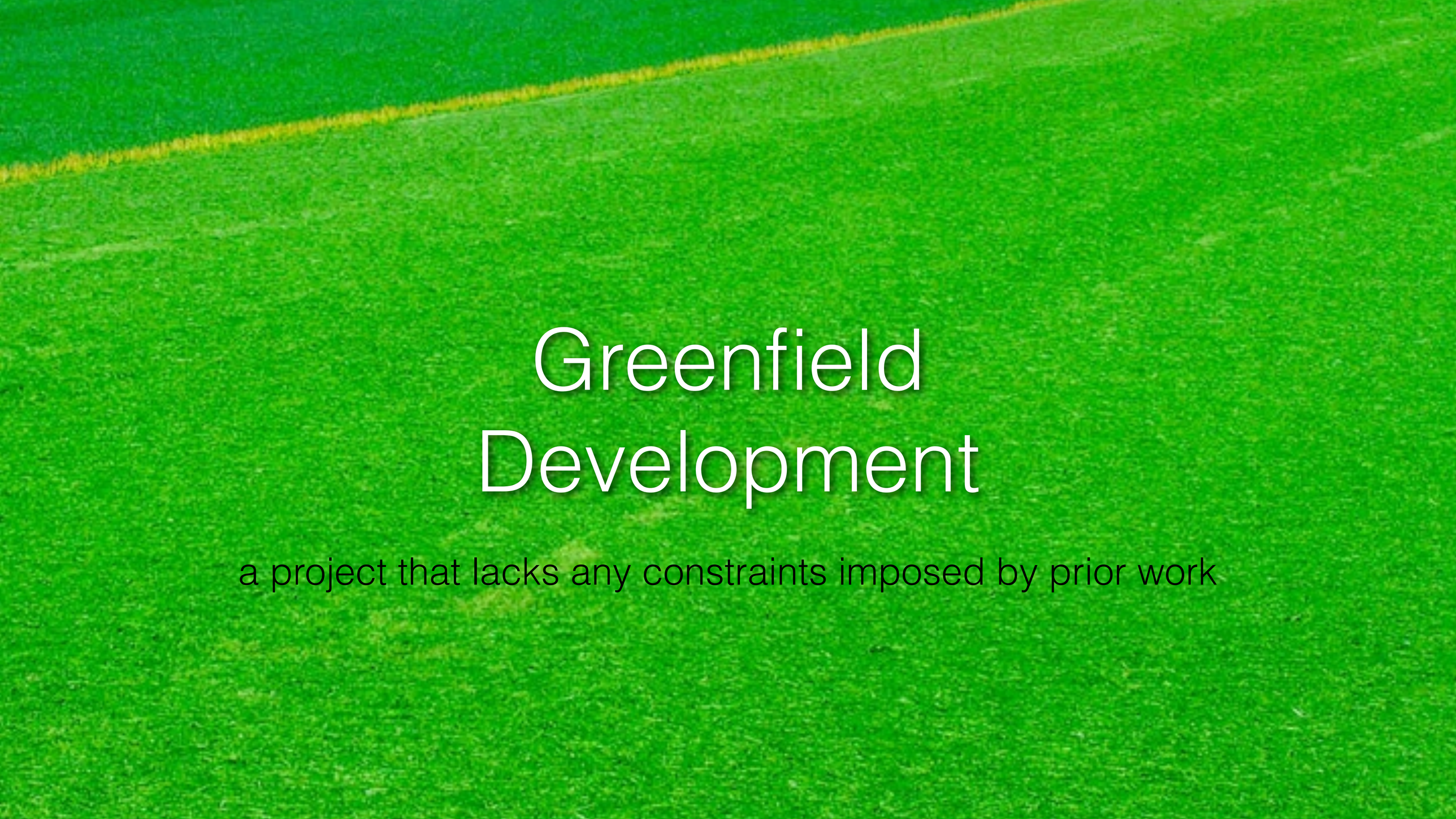
http://butunclebob.com/ArticleS.UncleBob.TheThreeRulesOfTdd



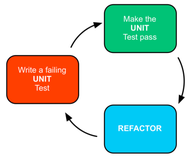
How to Decide

Not really qualified until you do it and are good at it.

It has to work for your project and your team, it might not.


Greenfield
Development
a project that lacks any constraints imposed by prior work

How do I start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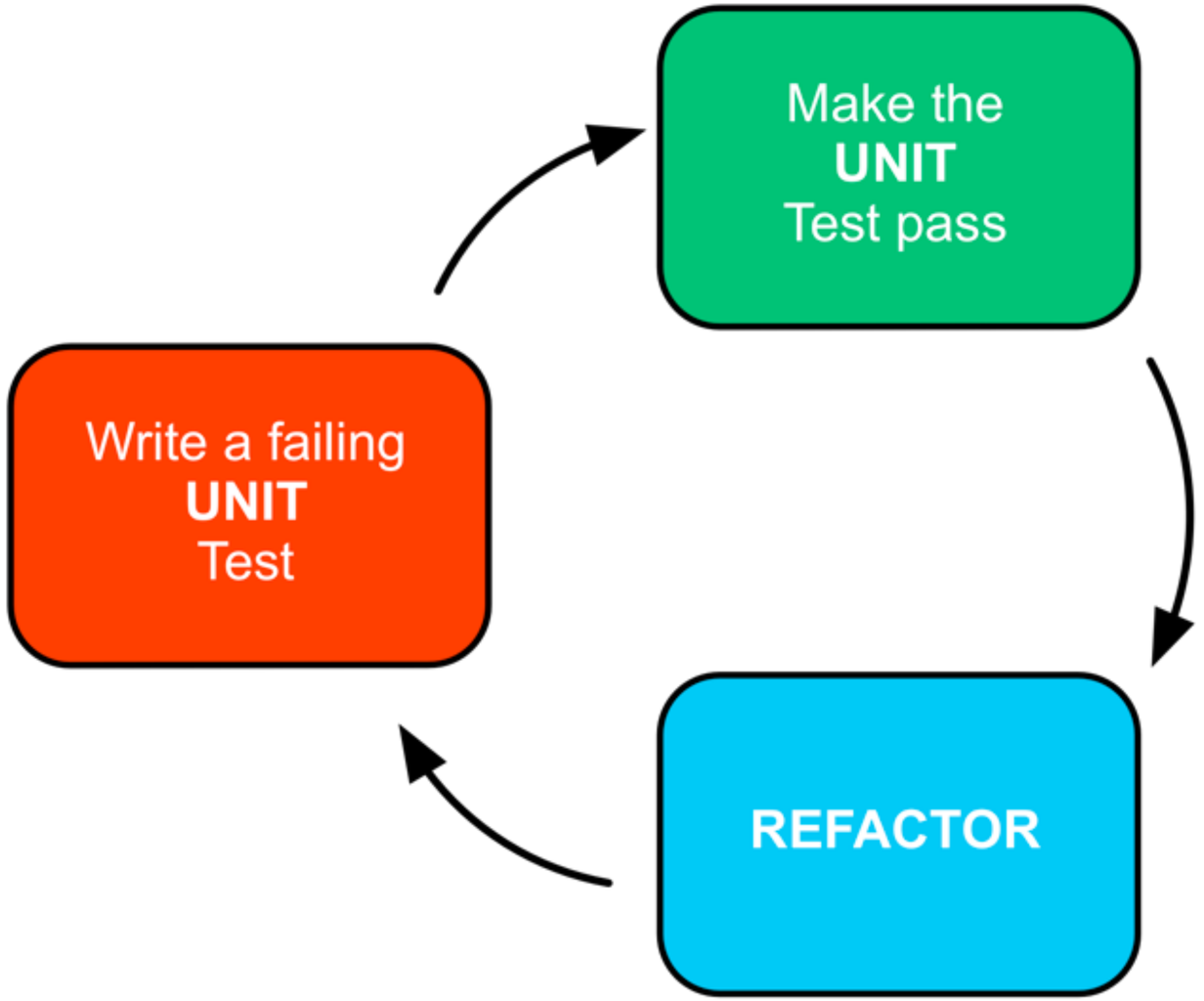
TDD Flow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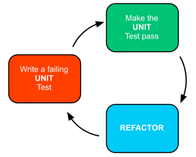


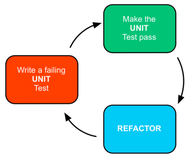
Workflow

Fibonacci Numbers

$$F_n = F_{n-1} + F_{n-2}$$

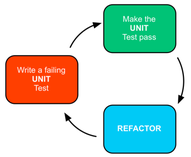
$$where$$

$$F_0 = 0, F_1 = 1$$



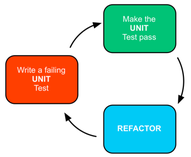
$$F_n = F_{n-1+} F_{n-2}$$
$$where$$
$$F_0 = 0, F_1 = 1$$

Red



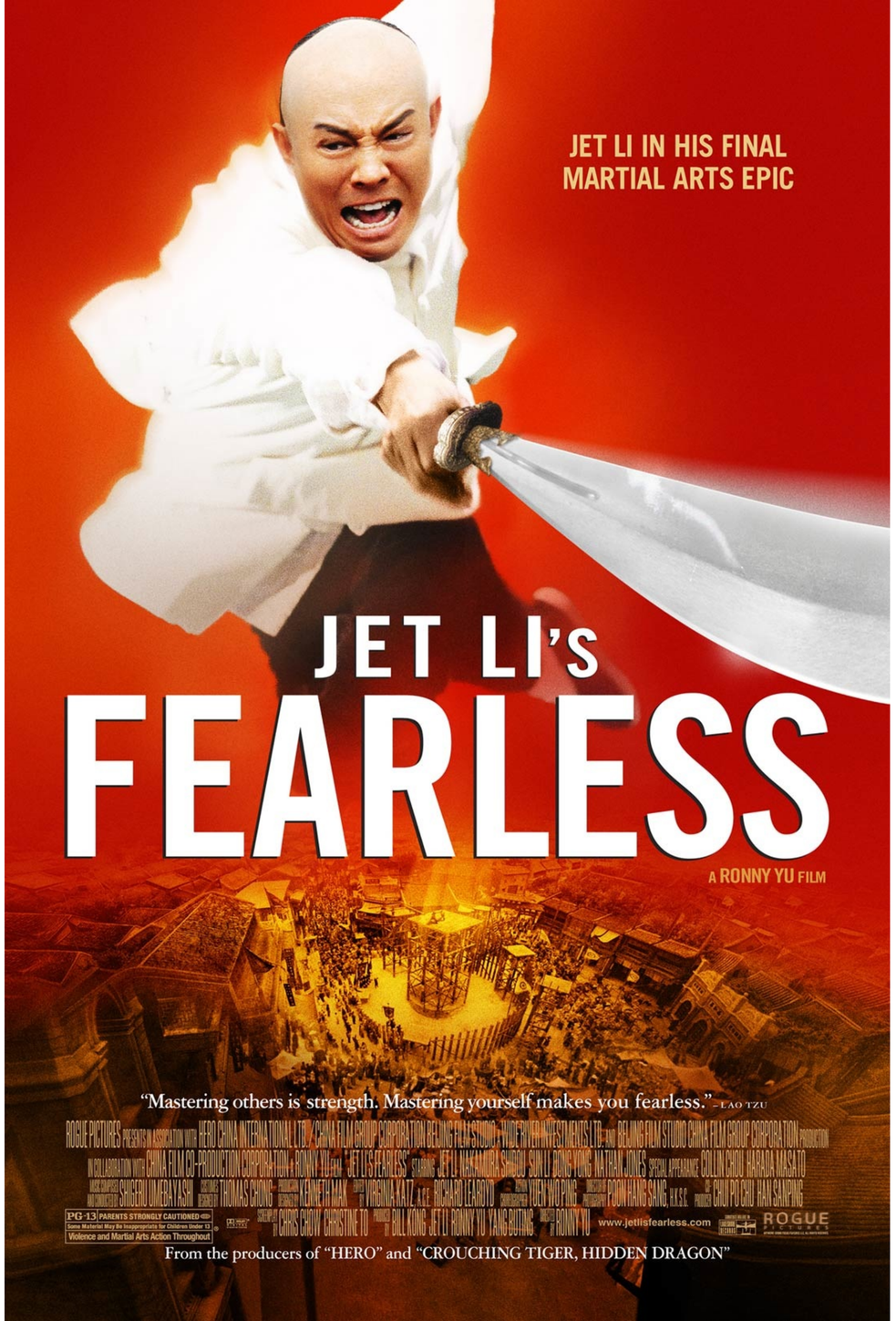
$$F_n = F_{n-1+} F_{n-2}$$
$$where$$
$$F_0=0, F_1=1$$

Green



$$F_n = F_{n-1+} F_{n-2}$$
$$where$$
$$F_0 = 0, F_1 = 1$$

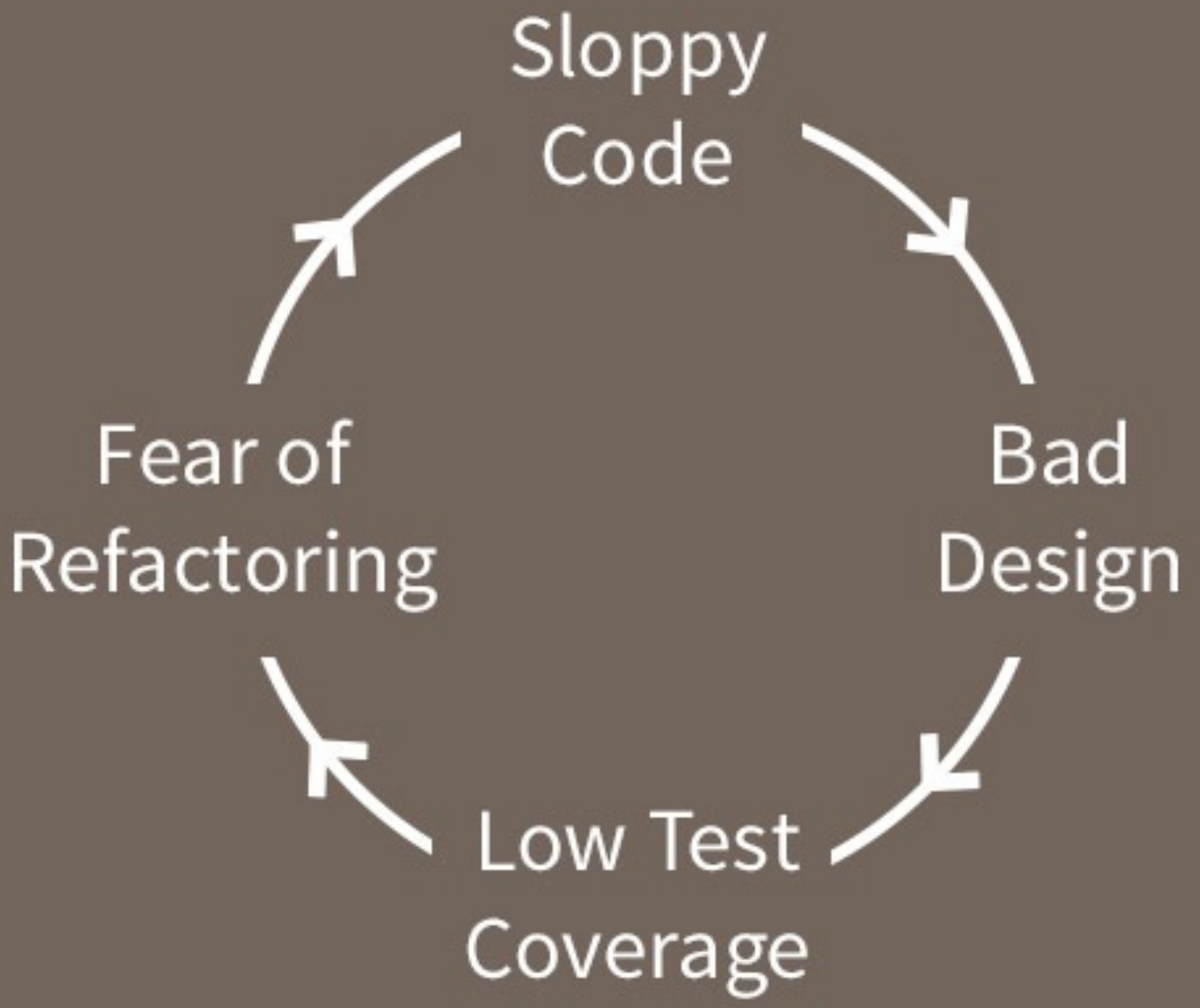
Refactor



$$F_n = F_{n-1} + F_{n-2}$$
$$where$$
$$F_0 = 0, F_1 = 1$$

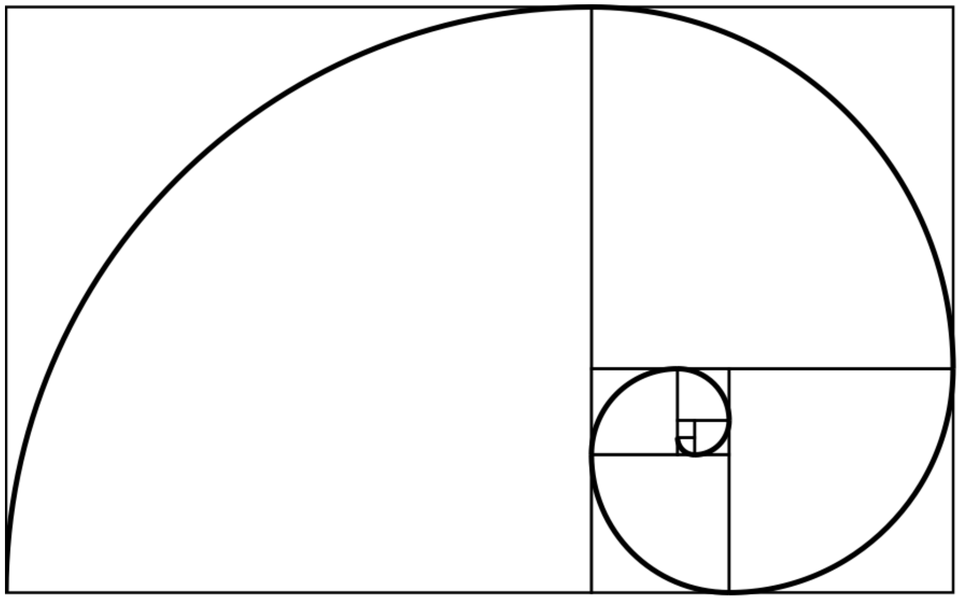
Refactor without Fear

((CENTRIC))


Sloppy Code
Bad Design
Low Test Coverage
Fear of Refactoring

$$Fibonacci(n) = \frac{\emptyset^n - (1 - \emptyset)^n}{\sqrt{5}}$$

$$\emptyset = \frac{1 + \sqrt{5}}{2}$$



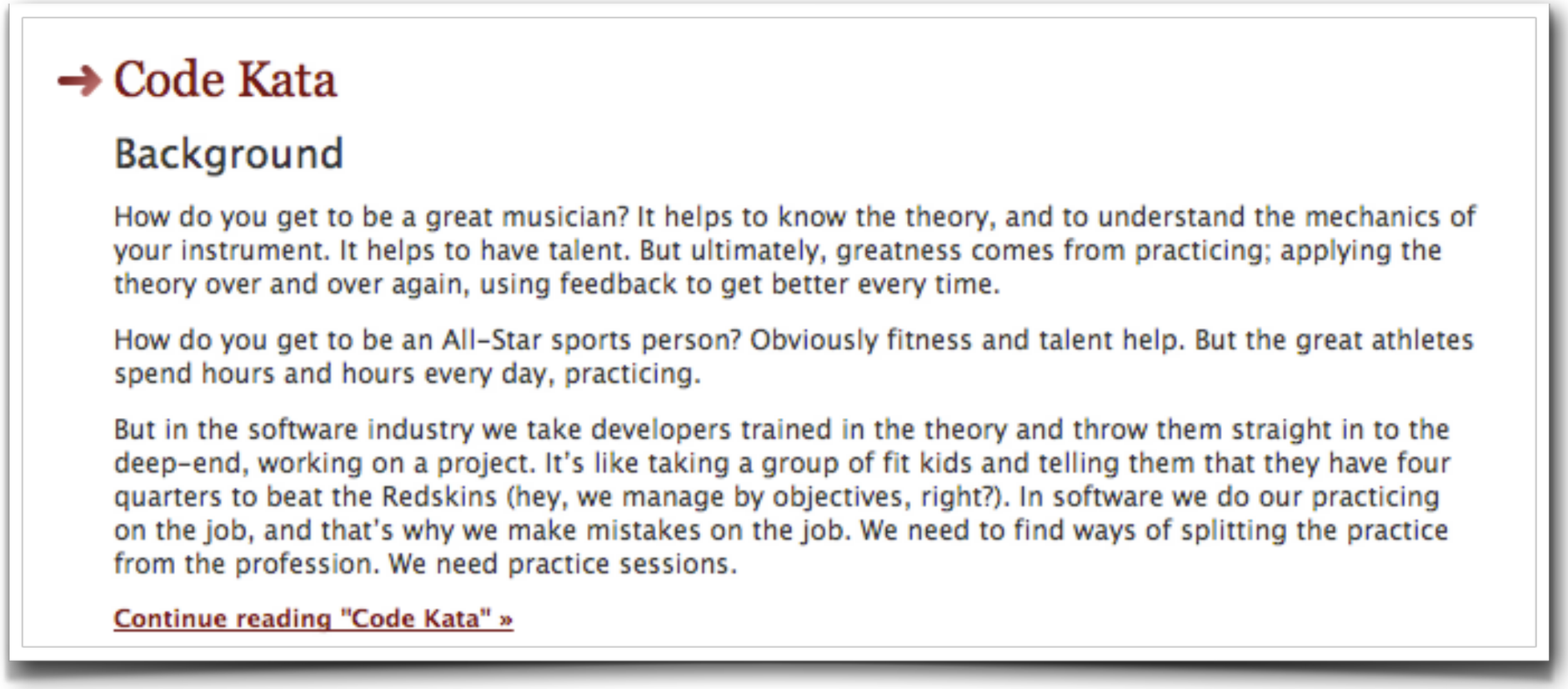
<lab 1>

<lab 1>

Work in Pairs

<lab 1>

The Code Kata



➜ Code Kata

Background

How do you get to be a great musician? It helps to know the theory, and to understand the mechanics of your instrument. It helps to have talent. But ultimately, greatness comes from practicing; applying the theory over and over again, using feedback to get better every time.

How do you get to be an All-Star sports person? Obviously fitness and talent help. But the great athletes spend hours and hours every day, practicing.

But in the software industry we take developers trained in the theory and throw them straight in to the deep-end, working on a project. It's like taking a group of fit kids and telling them that they have four quarters to beat the Redskins (hey, we manage by objectives, right?). In software we do our practicing on the job, and that's why we make mistakes on the job. We need to find ways of splitting the practice from the profession. We need practice sessions.

Continue reading "Code Kata" »

http://codekata.pragprog.com/

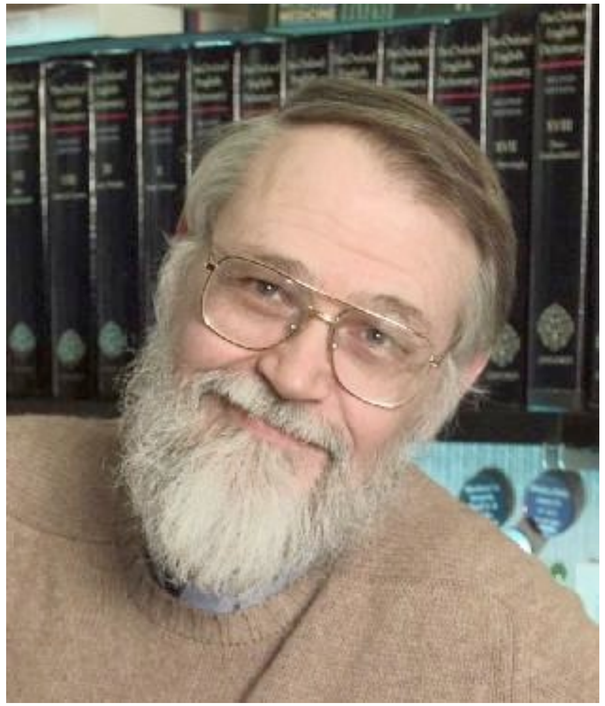
<lab 1>

The Code Kata

- FizzBuzz
- Bowling Game
- Leap Year Calculator
- Tennis Match
- Roman Numeral Converter
- Urinal Kata

https://github.com/shawnewallace/tdd-workshop

Design for Testability



"Debugging is twice as hard as writing the code in the first place. Therefore, if you write the code as cleverly as possible, you are, by definition, not smart enough to debug it."

--Brian Kernighan

Object Oriented Principles

Coupling and Cohesion

Tight vs. Loose Coupling

Interdependency

Coordination

Information Flow

High vs. Low Cohesion

Robustness

Reliability

Reusability

We want **LOOSE COUPLING**

and

HIGH COHESION

Object Oriented Principles

Object Oriented Principles

Single Responsibility Principle

Open/closed Principle

Liskov Substitution Principle

Interface Segregation Principle

Dependency Inversion Principle

Object Oriented Principles

★Single Responsibility Principle

Open/closed Principle

Liskov Substitution Principle

Interface Segregation Principle

Dependency Inversion Principle

Object Oriented Principles

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Interface Segregation Principle

Dependency Inversion Principle

Object Oriented Principles

Single Responsibility Principle

Open/closed Principle

Liskov Substitution Principle

★Interface Segregation Principle

Dependency Inversion Principle

Interface Segregation Principle

Code to interfaces, depending on your languages

Object Oriented Principles

Single Responsibility Principle

Open/closed Principle

Liskov Substitution Principle

Interface Segregation Principle

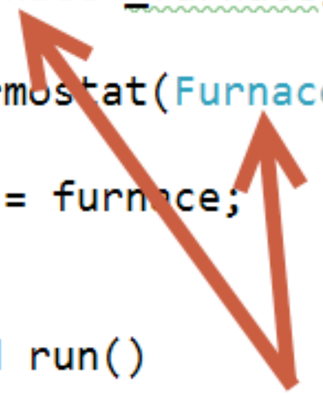
★Dependency Inversion Principle

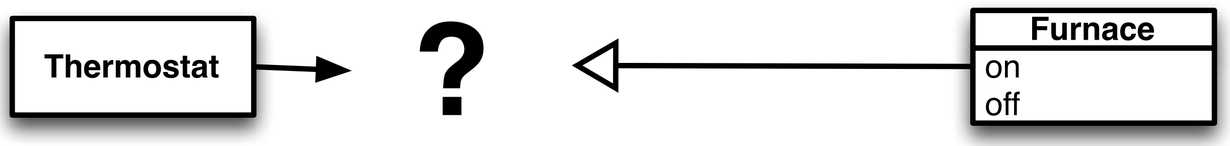
Dependency Inversion Principle

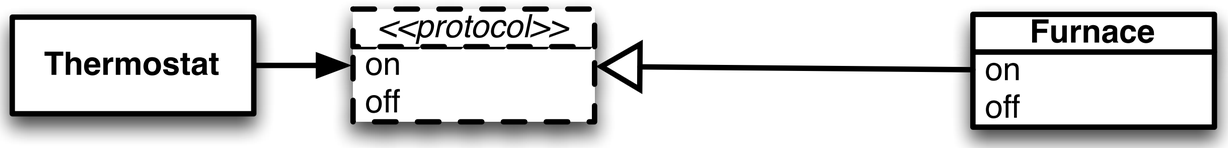
“Depend on abstractions, not ‘concretions’”

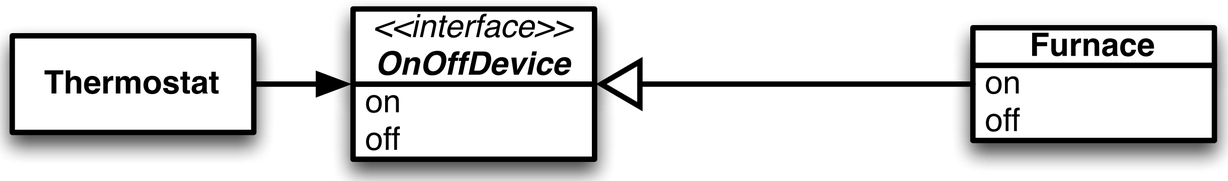

Thermostat
Furnace
on
off

```
public class Thermostat
{
  private Furnace _furnace;

  public Thermostat(Furnace furnace)
  {
    _furnace = furnace;
  }

  public void run()
  {
    if (shouldBeOn())
    {
      _furnace.on();
    }
    else
    {
      _furnace.off();
    }
  }

  private bool shouldBeOn()...
}
```



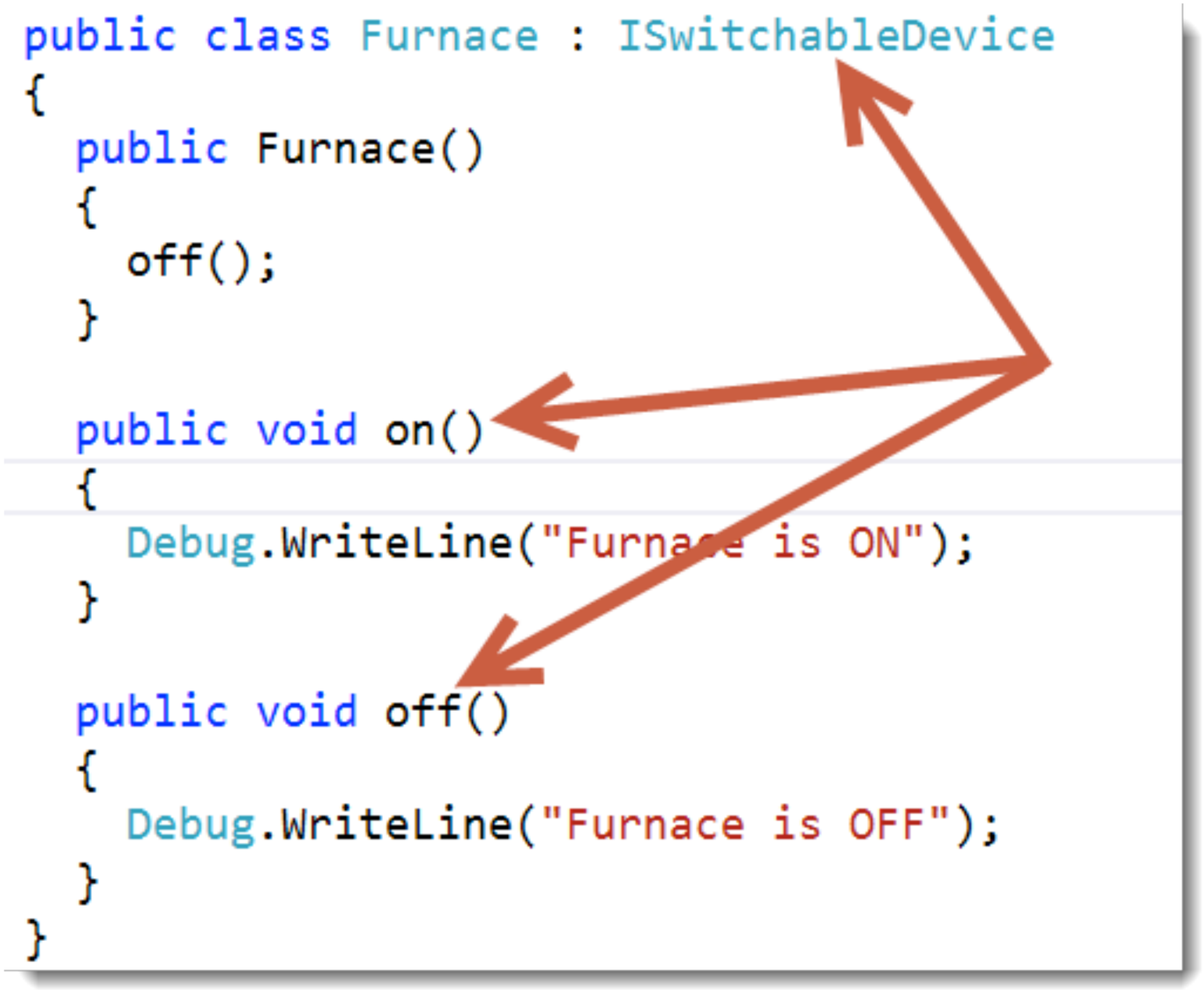

Thermostat
?
Furnace
on
off

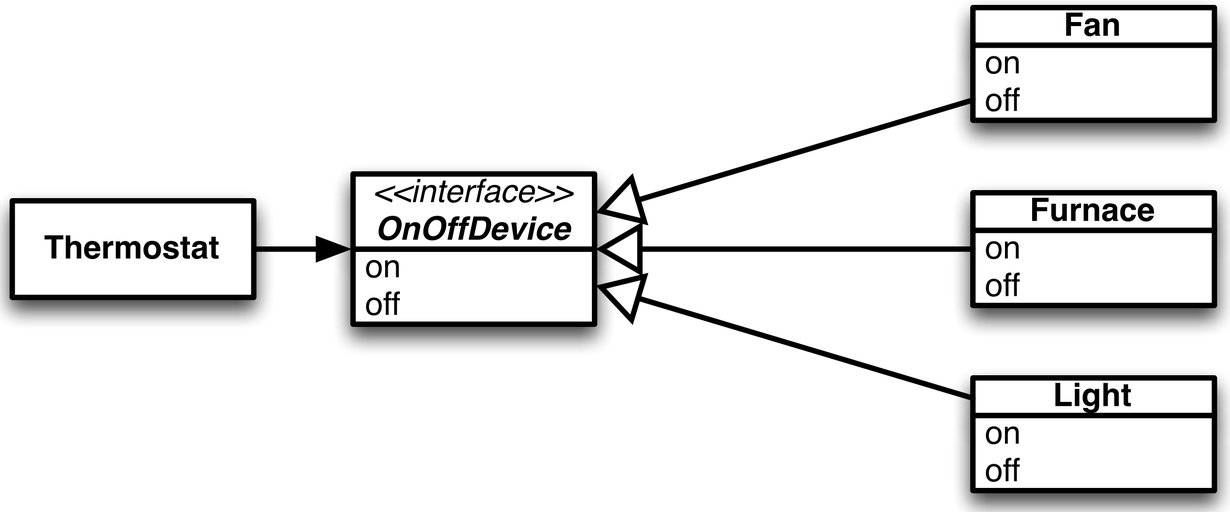

Thermostat
<<protocol>>
on
off
Furnace
on
off


Thermostat
<<interface>>
OnOffDevice
on
off
Furnace
on
off

```
public interface ISwitchableDevice
{
  void on();
  void off();
}
```

```
public class Thermostat
{
  private ISwitchableDevice _device;

  public Thermostat(ISwitchableDevice device)
  {
    _device = device;
  }
```


public class Furnace : ISwitchableDevice
{
public Furnace()
{
off();
}
public void on()
{
Debug.WriteLine("Furnace is ON");
}
public void off()
{
Debug.WriteLine("Furnace is OFF");
}
}


Thermostat
<<interface>>
OnOffDevice
on
off
Fan
on
off
Furnace
on
off
Light
on
off

<lab - refactor>

https://github.com/shawnewallace/tdd-workshop

Brownfield Development

Can we benefit?

Can we benefit?

We **can** improve design going forward

The goal is writing **working code**/providing **value**

How to start

- Test KEY use cases
- Test defects
- Test new features

Refactor

- Discover the intent
- Isolate Dependencies (Inversion of Control)
- Re-design for testability
- Introduce helpful abstractions
- Address anti-patterns

Refactor

Key anti-patterns

- Magic Numbers
- Long Methods
- Long Class
- Poor Naming
- Empty Catches
- Similar Code
- Unclear Tests
- Large Tests

<lab - >

https://github.com/shawnewallace/tdd-workshop

((CENTRIC))

Shawn Wallace

shawn.wallace@centricconsulting.com

http://about.me/shawnwallace

@ShawnWallace

614-270-1600