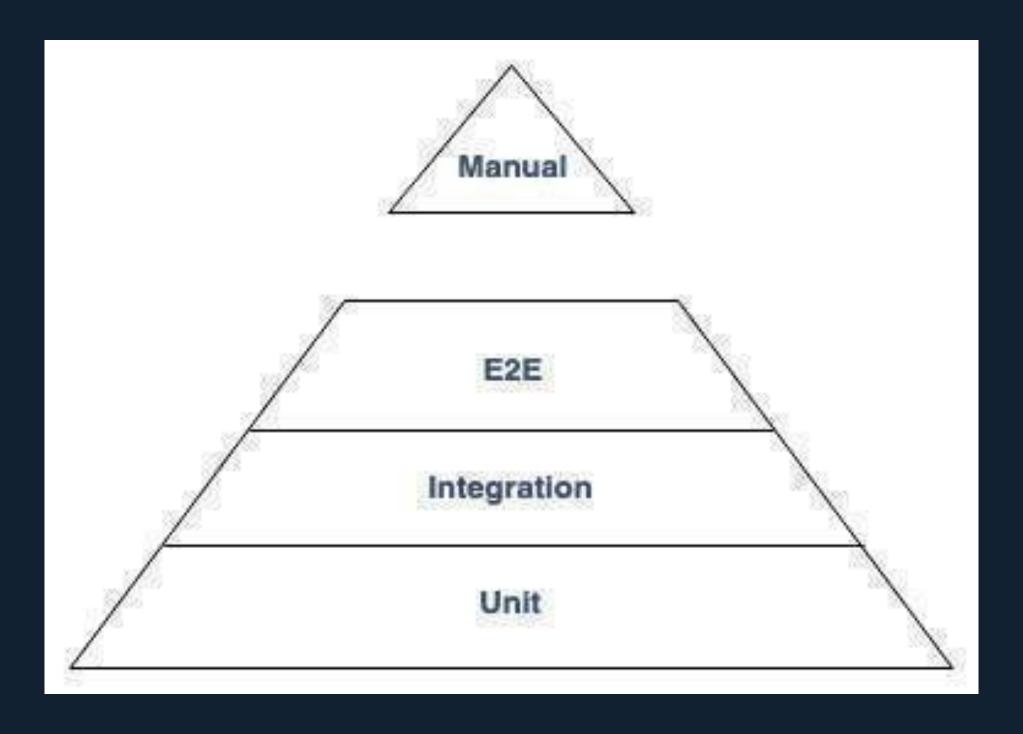
# CLIENT SIDE WEB ENGINEERING CLIENT SIDE TESTING

# WHY AUTOMATED TESTING

- » manual testing is expensive
  - » long feedback loop between developer/testers
- » helps to find and prevent defects
- » allow to change a systems behavior predictably
- » find/prevent defects
- » gain confidence about quality of the software

### **TESTING PYRAMID**



### **TESTING PYRAMID**

- » Unit tests
  - » lots of small and isolated tests which are fast to execute
- » Integration tests
  - » some integration tests which test external systems like databases
- >> E2E
  - » few tests which test the whole system

## **UNIT TESTING AND TDD**

- » Test driven development (also known as TDD)
- » Type of software development
- » Introduced by Kent Beck
  - » Author of Extreme Programming

### **WHY TDD**

- » early/fast feedback during development
- » Driving the design of our application
  - » Testing is a side-effect
- » Possibility to refactor
  - » Confidence that app is still working
- » Break down large problems into small problems
  - » Think about edge cases

### TDD TO ME

"Helps me to break down bigger tasks into small steps I can keep in my head"

### TDD

```
"TDD doesn't drive good design. TDD gives you immediate feedback about what is likely to be bad design. (Kent Beck)
I want to go home on Friday and don't think I broke something. (Kent Beck)"
```

### **WHAT IS TDD NOT**

- » Silver bullet for clean code
  - » it eventually leads to better code
- » Replacement for other testing strategies
  - » TDD doesn't catch all bugs
  - » Helps adding regression tests

### **TDD INTRO IN 7:26 MINUTES**

https://www.youtube.com/watch?v=WSes\_PexXcA

### **ESSENTIAL VS. ACCIDENTAL COMPLICATION**

- » Essential complication
  - » The problem is hard
  - » eg. Tax return Software
  - » nothing we can do about
- » Accidental complication
  - » We are not so good in our job
  - » eg. future proofing code

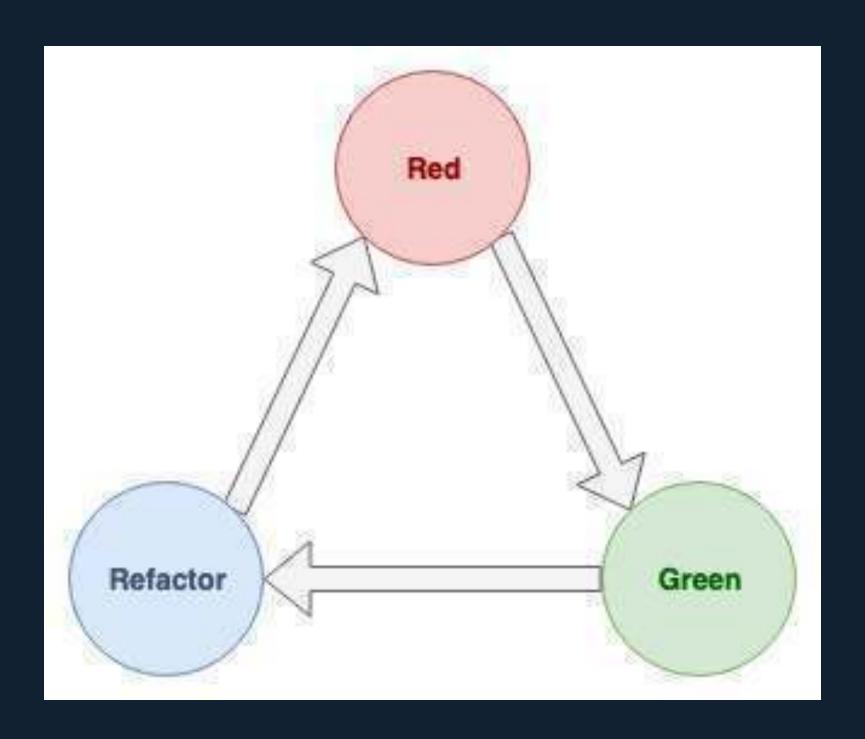
### **ACCIDENTAL COMPLICATION**

- » future proofing code
- » cutting corners
  - » to get stuff out of the door
  - » we're not going to change this anyways
- » drives up the cost/development time of a feature
  - » mostly the feature isn't complex
  - » the way the app is built drives the cost of a

### **AVOID ACCIDENTAL COMPLICATION**

- » Baby steps and TDD
- » Refactor a little after every feature/green test
  - » clean the kitchen
  - » prevents big bang refactoring
  - » which are hard to sell to business
- » Without refactoring features will take longer

# TDD CYCLE



### TDD CYCLE

- » Red: Write a test and watch it fail
- » Green: Write just as much code to make the test pass
- » Refactor: Clean up

### RED

- » Think about the test description
- » Descriptions should reflect the behaviour of the program

```
it('when product A given, price is 3$', () => {
   expect(calculatePrice('productA')).toEqual('3$')
})
```

### **GREEN**

```
» Write just enough code to make the test pass
  » if there is only 1 product just return 3$
function caluculatePrice () {
  return '3$'
};
it('when product A given, price is 3$', () => {
  expect(calculatePrice('productA')).toEqual('3$')
} ]
```

### REFACTOR

» Change the code without changing any of the behaviour

```
» "Clean the kitchen"
```

```
const caluculatePrice = () => '3$'
```

```
it('when product A given, price is 3$', () => {
  expect(calculatePrice('productA')).toEqual('3$')
})
```

### **RED (REPEAT)**

```
» start with the next test-case
const caluculatePrice = () => '3$'
it('when product A given, price is 3$', () => {
  expect(calculatePrice('productA')).toEqual('3$')
} ]
it('when product b given, price is 10$', () => {
  expect(calculatePrice('productB')).toEqual('10$')
}]
```

### **GREEN**

» start with the next test-case

```
const caluculatePrice = (product) => {
  if (product === 'productA') { return '3$' }
    (product === 'productB') { return '10$' }
it('when product A given, price is 3$', () => {
  expect(calculatePrice('productA')).toEqual('3$')
})
it('when product B given, price is 10$', () => {
  expect(calculatePrice('productB')).toEqual('10$')
})
```

### RED

```
const caluculatePrice = (product) => {
  if (product === 'productA') { return '3$' }
  if (product === 'productB') { return '10$' }
it('when product A given, price is 3$', () => {
  expect(calculatePrice('productA')).toEqual('3$')
})
it('when product B given, price is 10$', () => {
  expect(calculatePrice('productB')).toEqual('10$')
})
it('when unknown product is given, throws UnknownProductError', () => {
  expect(() => calculatePrice('productB')).toThrow(UnknownProductError)
})
```

### **GREEN**

```
class UnknownProductError extends Error {}
const caluculatePrice = (product) => {
  if (product === 'productA') { return '3$' }
  if (product === 'productB') { return '10$' }
  throw new UnknownProductError();
it('when product A given, price is 3$', () => {
  expect(calculatePrice('productA')).toEqual('3$')
})
it('when product B given, price is 10$', () => {
  expect(calculatePrice('productB')).toEqual('10$')
})
it('when unknown product is given, throws UnknownProductError', () => {
  expect([] => calculatePrice('productB')).toThrow(UnknownProductError)
})
```

# ANATOMY OF A TEST

- » Arrange => test setup
- » Aact => call the unit to test
- » Assert => verify the result

### **ANATOMY OF A TEST**

```
it('employeeReport: returns a list of employees ordered by their name', () => {
  // Arrange
  const employees = [
    { name: 'Sepp' },
    { name: 'Max' },
    { name: 'Anton' }
  // Act
  const result = employeeReport(employees)
  // Assert
  assertThat(result, orderedBy((a, b) => a.name < b.name))
})
```

# WHAT MAKES A GOOD UNIT TEST

- » Deterministic
  - » randomness hard to test
  - » current date or time is hard to test
- » Tests should not have any effect on the system
  - » changing global state (eg. database)
- » no external systems are called
- » little test setup

# CODE KATA

- » Small exercise
  - » to improve programming skills
  - » by challenging your abilities
  - » and encouraging you to find multiple approaches

# STEPS

- » Step 1: Think
- » Step 2: Write a test
- » Step 3: How much does this test suck?
- » Step 4: Run the test and watch it fail
- » Step 5: Write just enough code to make it pass
- » Step 6: Cleanup

### **FIZZ BUZZ (20 MINUTES)**

- » go to http://tddbin.com/
- » or git clone git@github.com:webpapaya/fhs-tddstarter.git
- » https://codingdojo.org/kata/FizzBuzz/

# ISOLATING UNITS UNDER TEST

# RECAP: WHAT MAKES A GOOD UNIT TEST

- » Deterministic
  - » randomness hard to test
  - » current date or time is hard to test
- » Tests should not have any effect on the system
  - » changing global state (eg. database)
- » no external systems are called

# DUMMY OBJECTS

- » Objects which aren't used
  - » so that the compiler doesn't complain
  - » used to fill parameter lists
  - » not relevant for JS but if you're using TS you might need these

# FAKE OBJECTS

- » Objects have a working implementation
  - » but take some shortcuts
  - » eg. inMemoryDatabases instead of persistent DB
- » example fake-local-storage

# STUB OBJECTS

- » Predefined return values for testing
- » Instead of calling the real API we return a value for testing
- » Examples:
  - » retrieving geolocation in tests
  - » testing edge cases (eg.: database throws
    OutOfMemory exception)

const retrieveGPSPosition = () =>
Promise.resolve({ lat: 12.12, lng: 14.15 })

# SPY OBJECTS

- » Are stubs that also record the way they were called
- » Used to verify side effects (eg. E-Mail sending)

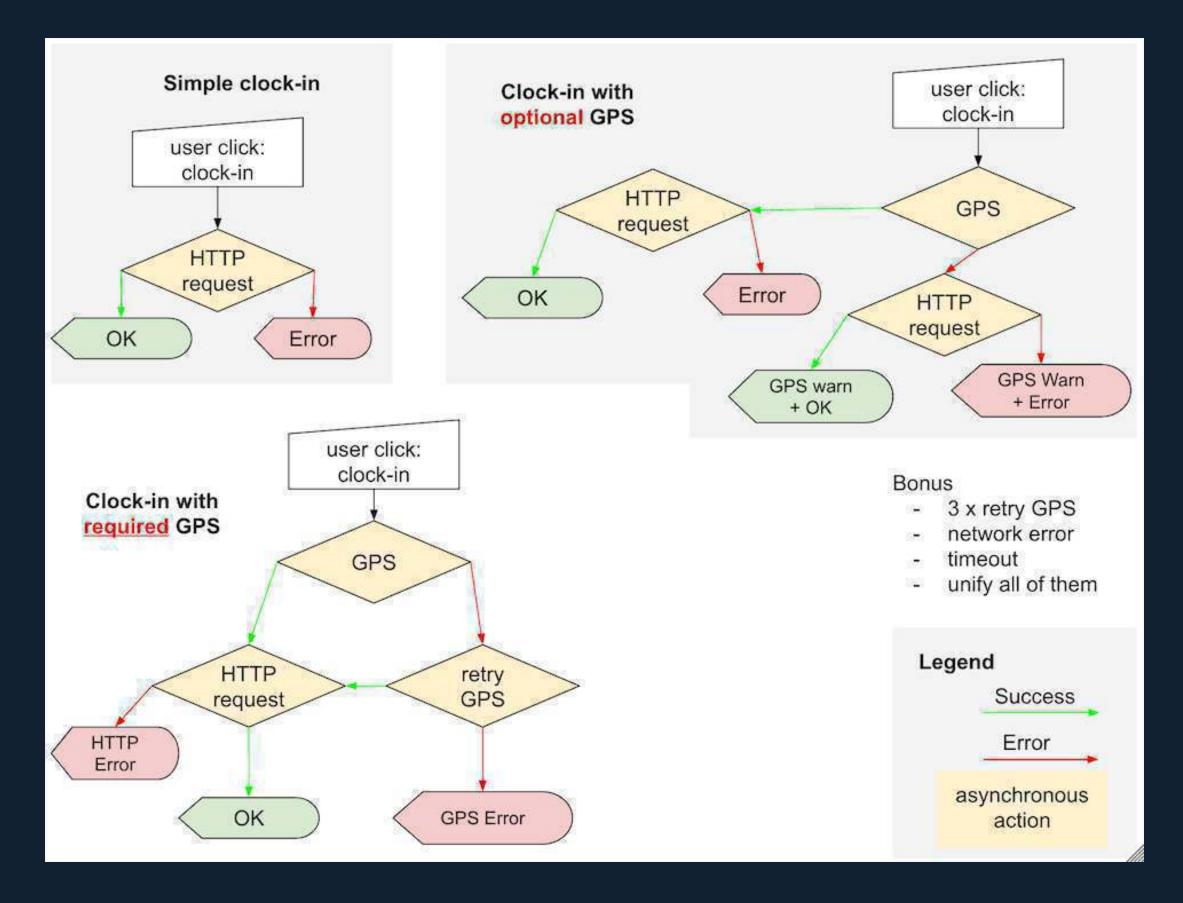
### **CLOCK IN KATA (REST OF THE LECTURE)**

```
» go to http://tddbin.com/
```

» http://kata-log.rocks/clock-in-kata

# REMEMBER STEPS

- » Step 1: Think
- » Step 2: Write a test
- » Step 3: How much does this test suck?
- » Step 4: Run the test and watch it fail
- » Step 5: Write just enough code to make it pass
- » Step 6: Cleanup



### **HOMEWORK**

- » Homework:
  - » can be done in pairs
  - » implement https://codingdojo.org/kata/Bowling/
  - » Work in a strict TDD loop
  - » commit before every new test
  - » write descriptive commit messages
  - » try to implement as little as possible in one

# RESOURCES

- » Integrated Tests are a Scam
- » Is TDD Dead
- » Mocks, Stubs, Spys
- » Extreme Programming
- >> TDD