UNIT TESTING

Ana Rita Silva, Manuel Zamith TVVS

Friday, October 7, 2016

What is this?

Unit Testing Techniques

Black Box Testing - Testing a system without having specific knowledge of the internal workings of the system, no access to the source code, and no knowledge of the architecture.

White/Clear Box Testing - Testing a system with full knowledge and access to all source code and architecture documents.

Grey Box Testing - Testing a system while having at least some knowledge of the internals of a system.

Why is this used?

- Tests one specific behavior
- Improves efficiency and reliability
- Can act as documentation of the system - the unit test itself is used to verify the design
- You can be more confident about your code
- Each test is autonomous

Benefits

Limitations

- Time consuming
- Does not show absence of errors
- Integration errors or system errors can be missed
- Test code can have more bugs than the code it is testing
- Value and accuracy of unit tests can be diminished if initial conditions are not set correctly. There are no tests for the tests, you don't know
- Does not help to define a product or a requirement - can lead to a unit test checking for the wrong thing, and writing code that passes the test

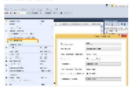
Unit Testing Tools

C/C++

PHP

Javascript

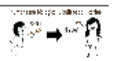
.NET & others

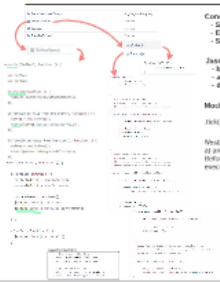


Code Coverage Tools for Javascript

- **JSCover** - free and coverage measured via a browser
- **BLANKET.JS** - deprecated for jasmine version
- **jasmine istanbul** - embedded in KARMA
- **KARMA** - spawns a web server that executes source code against test code for each of the browsers connected

Using Jasmine & KARMA





Concepts:
- **Specs** - function/test that contains 1 or + expectations
- **Expectation** - assertion that something is T/F
- **String** - title of the spec

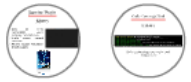
Jasmine Setup and Teardown:
- **beforeEach** - function called once before each spec
- **afterEach** - function called once after each spec
- **describe** - which function is called

Mocks & stubs

jasmine.clock()

tick(milliSecondsToTick); | install(); | uninstall() | mockDate();

Nesting - Calls to **describe** can be nested, with specs defined at any level - tree of functions corresponding.
Before a spec is executed, Jasmine walks down the tree executing each **beforeEach** function in order.



Exercise

Can you find the errors in source code?
Achieve 100% coverage and add new test case(s).

Follow the instructions provided in:
https://github.com/krampstudio/jasmine-test-users

References

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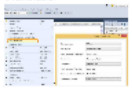

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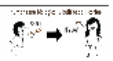

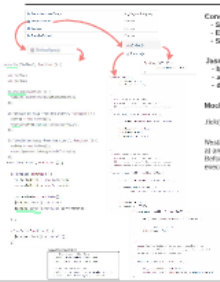

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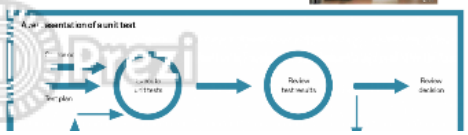

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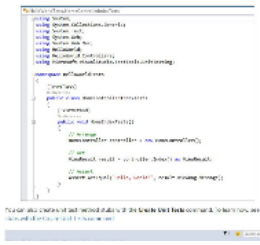

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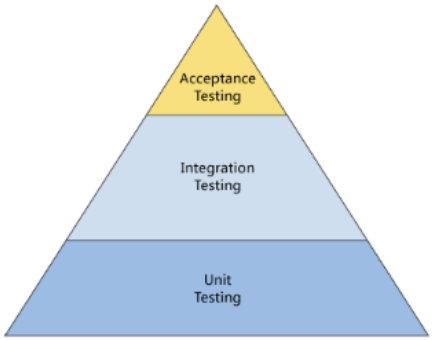

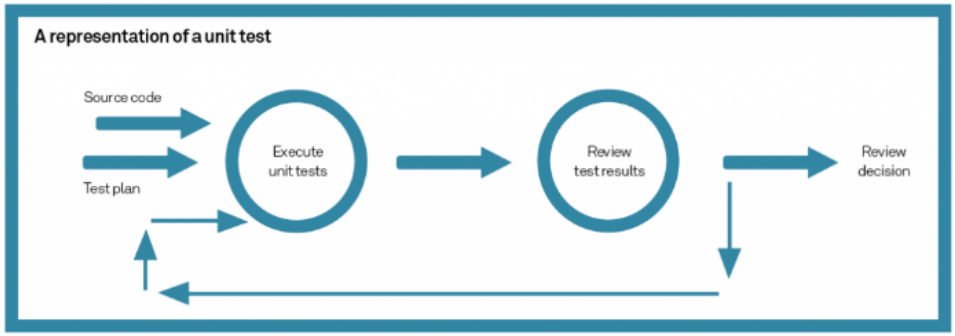

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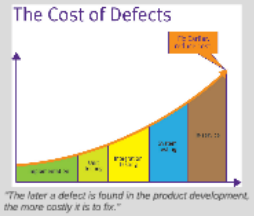

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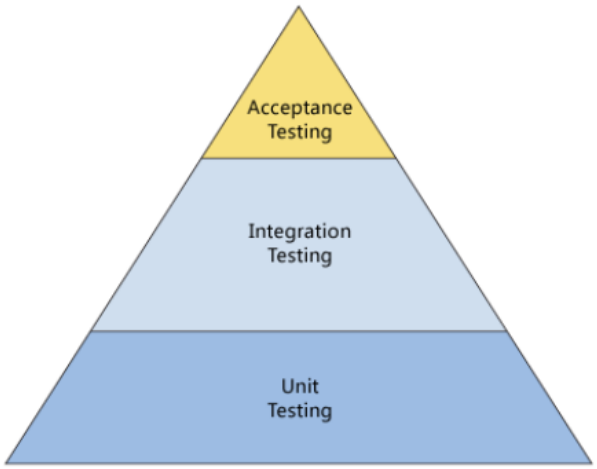

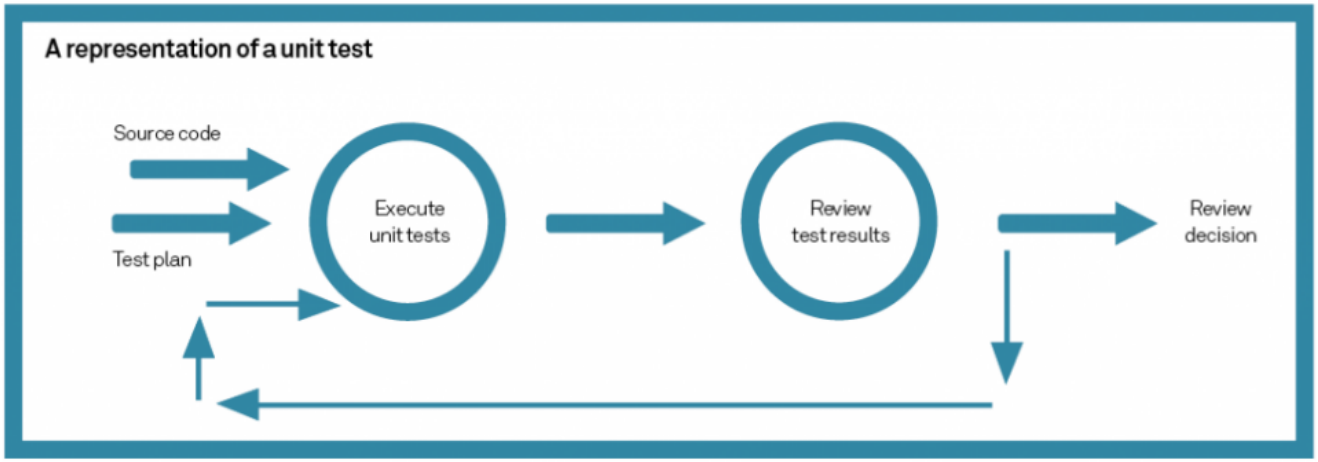

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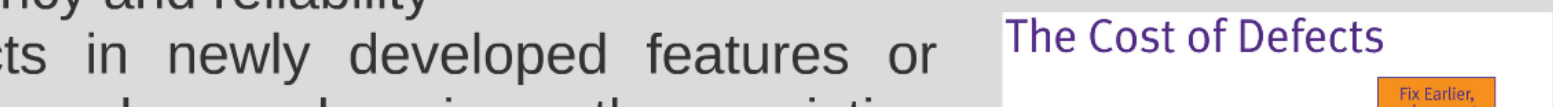

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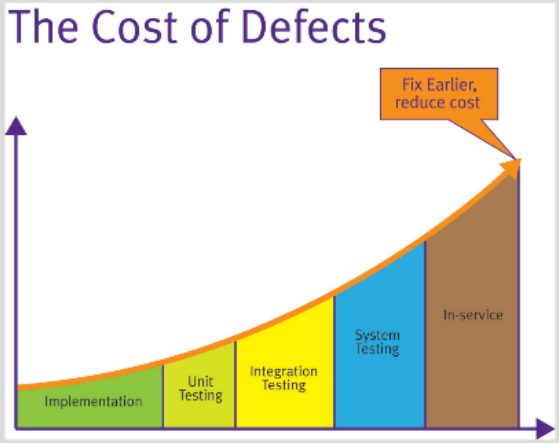

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Humans are biologically built to spill coffee

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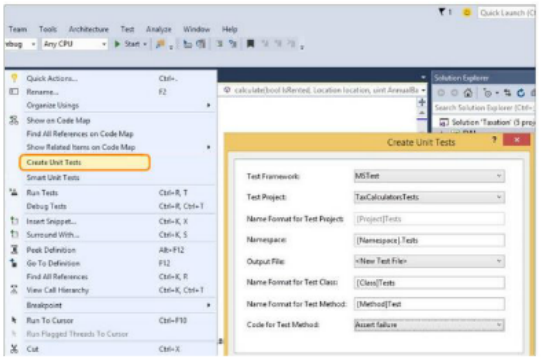
HelloWorldTests.HomeControllerIndexTests
using System;
using System.Collections.Generic;
using System.Text;
using System.Web;
using System.Web.Mvc;
using HelloWorld;
using HelloWorld.Controllers;
using Microsoft.VisualStudio.TestTools.UnitTesting;

namespace HelloWorldTests
{
    [TestClass]
    0 references
    public class HomeControllerIndexTests
    {
        [TestMethod]
        0 references
        public void HomeIndexTests()
        {
            // Arrange
            HomeController controller = new HomeController();

            // Act
            ViewResult result = controller.Index() as ViewResult;

            // Assert
            Assert.AreEqual("Hello, World!", result.ViewBag.Message);
        }
    }
}
```

You can also create unit test method stubs with the **Create Unit Tests** command. To learn how, see Create unit test method stubs with the Create Unit Tests command.



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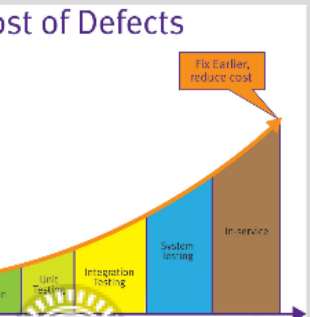

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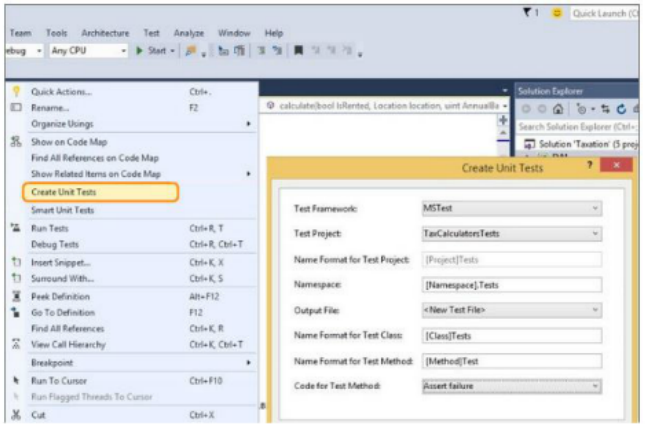

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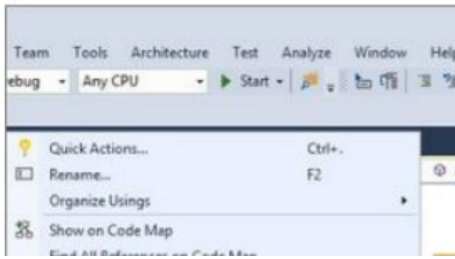

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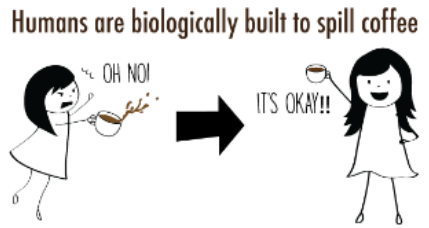

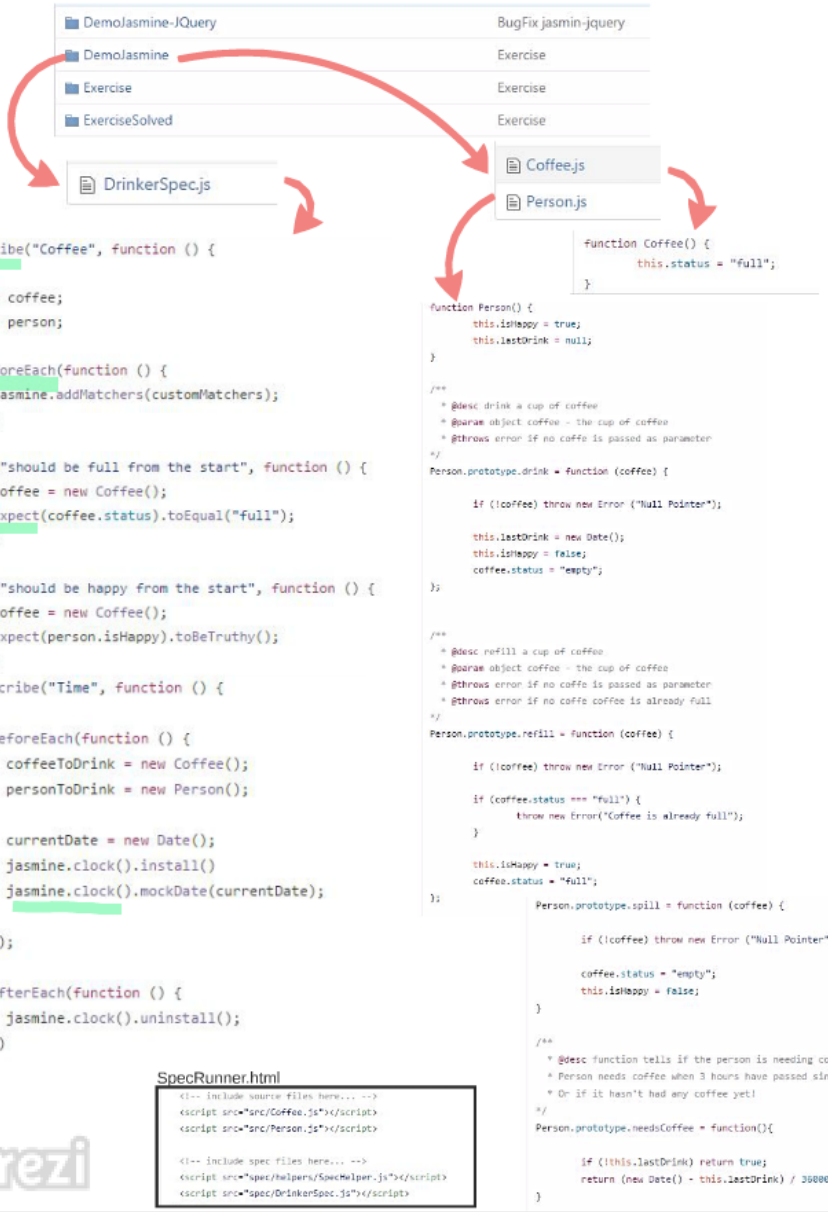

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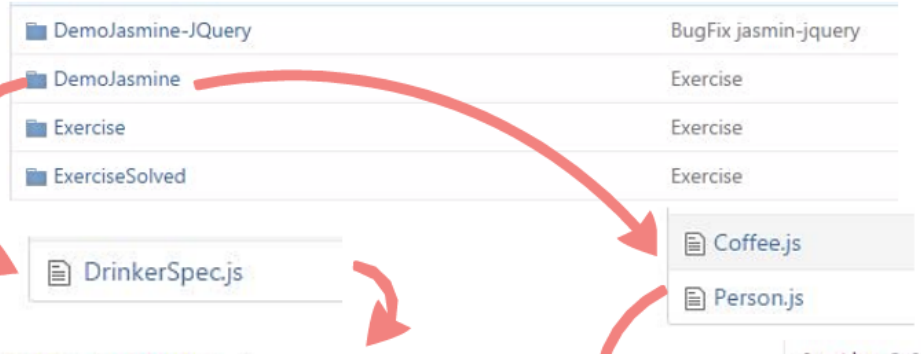


```
describe("Coffee", function () {

  var coffee;
  var person;

  beforeEach(function () {
    jasmine.addMatchers(customMatchers);
  });

  it("should be full from the start", function () {
    coffee = new Coffee();
    expect(coffee.status).toEqual("full");
  });

  it("should be happy from the start", function () {
    coffee = new Coffee();
    expect(person.isHappy).toBeTruthy();
  });
describe("Time", function () {

    beforeEach(function () {
      coffeeToDrink = new Coffee();
      personToDrink = new Person();
```

```
function Coffee() {
        this.status = "full";
}
```

```
function Person() {
        this.isHappy = true;
        this.lastDrink = null;
}

/**
  * @desc drink a cup of coffee
  * @param object coffee - the cup of coffee
  * @throws error if no coffe is passed as parameter
*/
Person.prototype.drink = function (coffee) {

        if (!coffee) throw new Error ("Null Pointer");

        this.lastDrink = new Date();
        this.isHappy = false;
        coffee.status = "empty";
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it("should be full from the start", function () {
  coffee = new Coffee();
  expect(coffee.status).toEqual("full");
});

it("should be happy from the start", function () {
  coffee = new Coffee();
  expect(person.isHappy).toBeTruthy();
});
describe("Time", function () {

  beforeEach(function () {
    coffeeToDrink = new Coffee();
    personToDrink = new Person();

    currentDate = new Date();
    jasmine.clock().install()
    jasmine.clock().mockDate(currentDate);

  });

  afterEach(function () {
    jasmine.clock().uninstall();
  })
```

SpecRunner.html

```
<!-- include source files here... -->
<script src="src/Coffee.js"></script>
<script src="src/Person.js"></script>

<!-- include spec files here... -->
<script src="spec/helpers/SpecHelper.js"></script>
<script src="spec/DrinkerSpec.js"></script>
```

```
Person.prototype.drink = function (coffee) {

        if (!coffee) throw new Error ("Null Pointer");

        this.lastDrink = new Date();
        this.isHappy = false;
        coffee.status = "empty";
};


/**
  * @desc refill a cup of coffee
  * @param object coffee - the cup of coffee
  * @throws error if no coffe is passed as parameter
  * @throws error if no coffe coffee is already full
*/
Person.prototype.refill = function (coffee) {

        if (!coffee) throw new Error ("Null Pointer");

        if (coffee.status === "full") {
                throw new Error("Coffee is already full");
        }

        this.isHappy = true;
        coffee.status = "full";
};
```

```
Person.prototype.spill = function (coffee) {

        if (!coffee) throw new Error ("Null Pointer");

        coffee.status = "empty";
        this.isHappy = false;
}

/**
  * @desc function tells if the person is needing coffee
  * Person needs coffee when 3 hours have passed since last drink,
  * Or if it hasn't had any coffee yet!
*/
Person.prototype.needsCoffee = function(){

        if (!this.lastDrink) return true;
        return (new Date() - this.lastDrink) / 3600000.0 >= 3.0;
}
```

.tick(*nºmilliseconds*

Nesting - Calls to
at any level - tree
Before a spec is
executing each **be**

Jasm

- Used for
  manipulation,
  handling and animatio
- Works across s
  browsers.
- **Allows layout valid**
  of web pages.

Jasmine Plugin

jQuery

- Used for HTML manipulation, event handling and animation.
- Works across several browsers.
- **Allows layout validation of web pages.**

```
describe("JQuery", function () {

        var fixture;
        beforeEach(function () {
                loadFixtures('test.html');
        })


        it('should have a cool title', function () {

                title = $('h1')
                expect(title).toHaveText("MESW Login");
        });
```

MESW Login

Username

Password

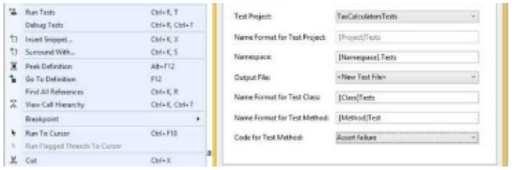
Submit

Code Coverage Tool

KARMA

Only requires type one line in cmd:
"karma start"

- **JSCover -** free and coverage measured via a browser
- **BLANKET.JS** - deprecated for jasmine version
- **jasmine istanbul** - embedded in KARMA
- **KARMA** - spawns a web server that executes source code against test code for each of the browsers connected



Exercise

Can you find the errors in source code?
Achieve 100% coverage and add new test case(s).

all files src/

70% Statements 21/30 **42.86%** Branches 6/14 **77.78%** Functions 7/9 **74.07%** Lines 20/27

File	Statements		Branches		Functions		Lines	
Movie.js	100%	6/6	100%	0/0	100%	3/3	100%	6/6
Television.js	62.5%	15/24	42.86%	6/14	66.67%	4/6	66.67%	14/21

Follow the instructions provided in:
https://github.com/mzamith/jasmine-test-cases

References

- iTGROW Software and Systems Training
- ISTQB Foundation Level (materials provided during the course)
- Software testing & QA blog by TestFort, 2016
- "Microsoft Developer Network", available at: https://msdn.microsoft.com/en-us
- Stage1 Magazine
- "Tutorialspoint", available at: https://www.tutorialspoint.com
- "Embedded Insights", available at: http://www.embeddedinsights.com/

> Fools ignore complexity. Pragmatists suffer it.
> Some can avoid it. Geniuses remove it.
> Alan J. Perlis

References

- iTGROW Software and Systems Training
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- Gadget Magazine
- "Tutorialspoint", available at: https://www.tutorialspoint.com
- "Embedded Insights", available at: http://www.embeddedinsights.com/channels/topics/unit-test/
- "Jasmine" GitHub, available at: http://jasmine.github.io/2.0/introduction.html
- "KARMA", available at: https://karma-runner.github.io/0.8/intro/configuration.html

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UNIT TESTING

Ana Rita Silva, Manuel Zamith TVVS

Friday, October 7, 2016

What is this?

Unit Testing Techniques

Black Box Testing - Testing a system without having specific knowledge of the internal workings of the system, no access to the source code, and no knowledge of the architecture.

White/Clear Box Testing - Testing a system with full knowledge and access to all source code and architecture documents.

Grey Box Testing - Testing a system while having at least some knowledge of the internals of a system.

Why is this used?

- Tests one specific behavior
- Improves efficiency and reliability
- Can act as documentation of the system - the unit test itself is used to verify the design
- You can be more confident about your code
- Each test is autonomous

Benefits

Limitations

- Time consuming
- Does not show absence of errors
- Integration errors or system errors can be missed
- Test code can have more bugs than the code it is testing
- Value and accuracy of unit tests can be diminished if initial conditions are not set correctly. There are no tests for the tests, you don't know
- Does not help to define a product or a requirement - can lead to a unit test checking for the wrong thing, and writing code that passes the test

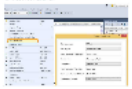
Unit Testing Tools

C/C++

PHP

Javascript

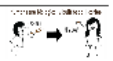
.NET & others

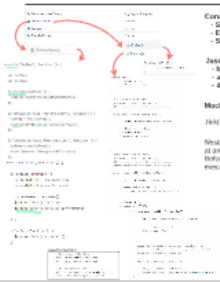


Code Coverage Tools for Javascript

- **JSCover** - free and coverage measured via a browser
- **BLANKET.JS** - deprecated for jasmine version
- **jasmine istanbul** - embedded in KARMA
- **KARMA** - spawns a web server that executes source code against test code for each of the browsers connected

Using Jasmine & KARMA





Concepts:
- **Specs** - function/test that contains 1 or + expectations
- **Expectation** - assertion that something is T/F
- **String** - title of the spec

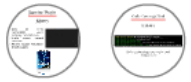
Jasmine Setup and Teardown:
- **beforeEach** - function called once before each spec
- **afterEach** - function called once after each spec
- **describe** - which function is called

Mocks & stubs

jasmine.clock()

tick(milliSecondsToTick); | install(); | uninstall() | mockDate();

Nesting - Calls to **describe** can be nested, with specs defined at any level - tree of functions corresponding.
Before a spec is executed, Jasmine walks down the tree executing each **beforeEach** function in order.



Exercise

Can you find the errors in source code?
Achieve 100% coverage and add new test case(s).

Follow the instructions provided in:
https://github.com/krampstudio/jasmine-test-users

References

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