Mocking in Tests

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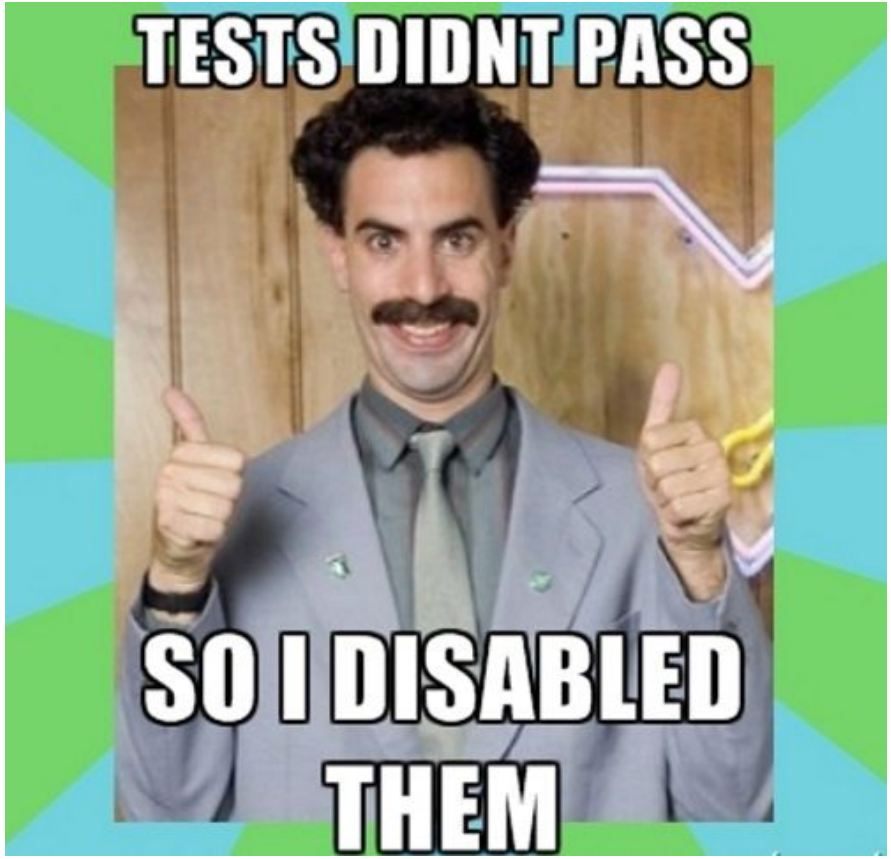
When do you say you are confident about the code you pushed on a Friday ?

What happens when your tests fail?


TESTS DIDNT PASS
SO I DISABLED THEM

😁 Tests are the reason developers sleep well at night

We write all kinds of tests around our software

Unit Tests | All other kind of tests

How are **unit tests** written?

 + soil + fertilisers = 

```
public class OrderStateTester extends TestCase {
  private static String TALISKER = "Talisker";
  private static String HIGHLAND_PARK = "Highland Park";
  private Warehouse warehouse = new WarehouseImpl();

  protected void setUp() throws Exception {
    warehouse.add(TALISKER, 50);
    warehouse.add(HIGHLAND_PARK, 25);
  }
  public void testOrderIsFilledIfEnoughInWarehouse() {
    Order order = new Order(TALISKER, 50);
    order.fill(warehouse);
    assertTrue(order.isFilled());
    assertEquals(0, warehouse.getInventory(TALISKER));
  }
  public void testOrderDoesNotRemoveIfNotEnough() {
    Order order = new Order(TALISKER, 51);
    order.fill(warehouse);
    assertFalse(order.isFilled());
    assertEquals(50, warehouse.getInventory(TALISKER));
  }
```

Classicist’s way of testing

```
public class OrderInteractionTester extends MockObjectTestCase {
  private static String TALISKER = "Talisker";

  public void testFillingRemovesInventoryIfInStock() {
    //setup - data
    Order order = new Order(TALISKER, 50);
    Mock warehouseMock = new Mock(Warehouse.class);

    //setup - expectations
    warehouseMock.expects(once()).method("hasInventory")
      .with(eq(TALISKER),eq(50))
      .will(returnValue(true));
    warehouseMock.expects(once()).method("remove")
      .with(eq(TALISKER), eq(50))
      .after("hasInventory");

    //exercise
    order.fill((Warehouse) warehouseMock.proxy());

    //verify
    warehouseMock.verify();
    assertTrue(order.isFilled());
  }
```

Mockist’s way of testing

What is a mock ?

Dummy Objects

Fakes

Stubs

```
//setup - expectations
warehouseMock
  .with(eq(TALISKER),eq(50))
  .will(returnValue(true));
```

Spies

```
//setup - expectations
warehouseMock.expects(once()).method("hasInventory")
```

Another example

```
public interface MailService {
  public void send (Message msg);
}
public class MailServiceStub implements MailService {
  private List<Message> messages = new ArrayList<Message>();
  public void send (Message msg) {
    messages.add(msg);
  }
  public int numberSent() {
    return messages.size();
  }
}
```

class OrderStateTester...

```
  public void testOrderSendsMailIfUnfilled() {
    Order order = new Order(TALISKER, 51);
    MailServiceStub mailer = new MailServiceStub();
    order.setMailer(mailer);
    order.fill(warehouse);
    assertEquals(1, mailer.numberSent());
  }
```

Classicist

State Verification

class OrderInteractionTester...

```
  public void testOrderSendsMailIfUnfilled() {
    Order order = new Order(TALISKER, 51);
    Mock warehouse = mock(Warehouse.class);
    Mock mailer = mock(MailService.class);
    order.setMailer((MailService) mailer.proxy());

    mailer.expects(once()).method("send");
    warehouse.expects(once()).method("hasInventory")
      .withAnyArguments()
      .will(returnValue(false));

    order.fill((Warehouse) warehouse.proxy());
  }
}
```

Mockist

Behaviour & State Verification

Open Box Testing

Closed Box Testing

Classicist or Mockist way of testing

Mocks bring in a lot of power!


WITH
GREAT POWER COMES
GREAT RESPONSIBILITY

Classicist or Mockist way of testing

How does it impact your test/code design?

Test Setup Phase

Test Isolation

Test Isolation

993 out of 1293 tests failing

1 out of 1293 tests failing

Finding the root cause in test report

Lost opportunity to detect coupling

Behaviour verification

Behaviour verification

```
// ARRANGE
when(batchCalculationFileService.read(Mockito.any(String.class))).thenReturn(calculations);
ArgumentCaptor<CalculationModel> calculationModelCaptor = ArgumentCaptor.forClass(CalculationM
```

How does testing style impact your system’s design?

And eventually your development speed.

Example: Trust on Outside World Interface

```
import boto3

class AarogyaSetu(object):
    def __init__(self, name, value):
        self.name = name
        self.adhaar_number = adhaar_number

    def save(self, bucket_name):
        s3 = boto3.client('s3', region_name='us-east-1')
        s3.put_object(Bucket='mybucket', Key=self.name,
Body=self.adhaar_number)
```

```python
import boto3
from moto import mock_s3
from mymodule import MyModel


@mock_s3
def test_aarogya_setu_save():
    conn = boto3.resource('s3', region_name='us-east-1')
    # We need to create the bucket since this is all in Moto's
'virtual' AWS account
    conn.create_bucket(Bucket='mybucket')

    model_instance = AarogyaSetu('fsociety', 'xxxx-xxxxx-xxxxx-xxxx')
    model_instance.save()

    body = conn.Object('mybucket', 'fsociety').get()
['Body'].read().decode("utf-8")

    assert body == 'xxxx-xxxxx-xxxxx-xxxx'
```

Example: Logic coupled with side-effects

```
// users.js
import axios from 'axios';

class Users {
  static all() {
    return axios.get('/users.json').then(resp => {
      return resp.data.filter((user) => user.isActive)
     });
  }
}

export default Users;
```

```
// users.test.js
import axios from 'axios';
import Users from './users';

jest.mock('axios');

test('should fetch active users', () => {
  const users = [{name: 'Bob', isActive: true}, {name: 'Alice',
isActive: false}];
  const resp = {data: users};
  axios.get.mockResolvedValue(resp);

  // or you could use the following depending on your use case:
  // axios.get.mockImplementation(() => Promise.resolve(resp))

  return Users.all().then(data => expect(data).toEqual([{name: 'Bob',
isActive: true }]));
});
```

What if we resist the urge to mock here?

```
   // users.js
import axios from 'axios';

class Users {
  static all() {
    return axios.get('/users.json').then(resp => {
      return resp.data
     });
  }
  static filterActive(users) {
    return users.filter((user) => user.isActive)
  }
}
```

Side Effect pushed to the boundary

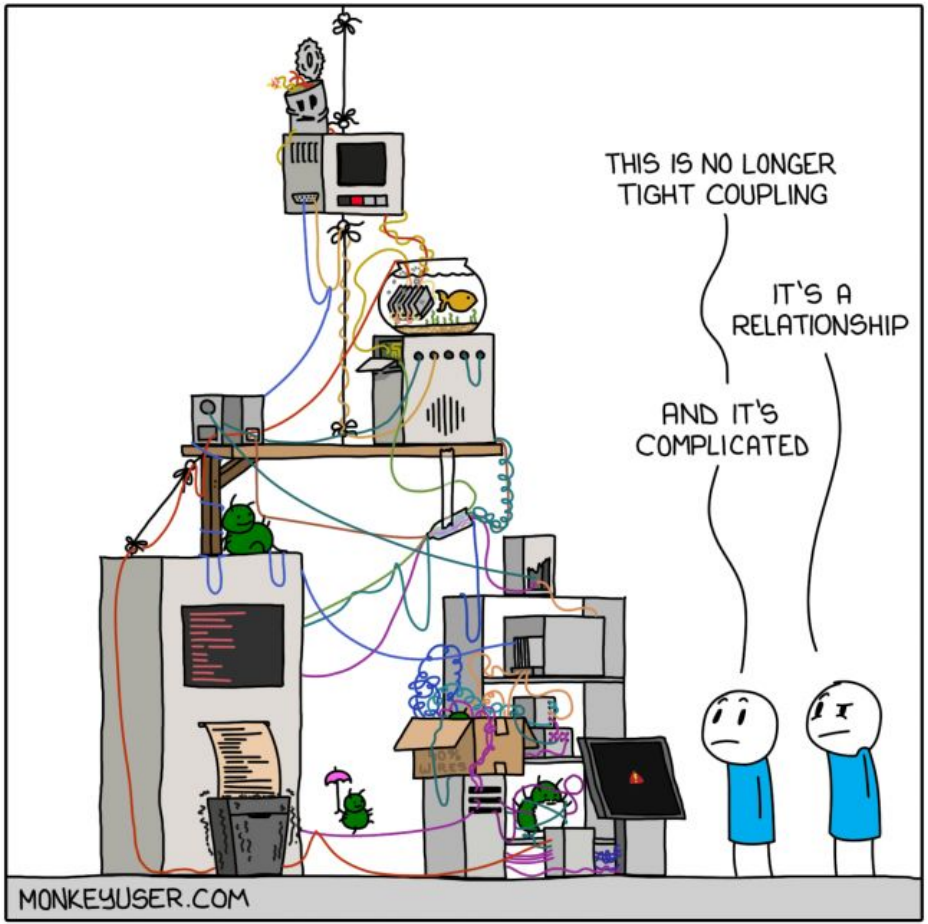
```
   // users.test.js
import axios from 'axios';
import Users from './users';

test('should filter active users', () => {
  // Given
  const users = [{name: 'Bob', isActive: true}, {name: 'Alice',
isActive: false}];
  // When
  const activeUsers = Users.filterActive(users)
  // Then
  expect(activeUsers).toEqual([{name: 'Bob', isActive: true}])
```

Coupling is bad.

Coupling is very bad!

NEXT LEVEL


THIS IS NO LONGER TIGHT COUPLING
IT'S A RELATIONSHIP
AND IT'S COMPLICATED
MONKEYUSER.COM

How to detect coupling ?

… and ofcourse don’t try to mock your way out.

Using composition

Example: Test an express app

```
const express = require('express');
const app = express();


app.get('/', function (req, res) {
  res.send('Hello World!')
});


app.listen(3000, function () {
  console.log('Example app listening on port 3000!')
});
```

```
const express = require('express');


const hello = require('./hello.js');
const handleListen = require('./handleListen');
const log = require('./log');


const port = 3000;
const app = express();


app.get('/', hello);


app.listen(port, handleListen(port, log));
```

Mocks ain’t evil

afterall

Balancing unit tests and integration tests is important

QAs and devs need to come together
to make the world a better(*aka tested*)
place to live in

Principles to use when mocking in your tests

Fight your urge to mock in unit tests

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Do not use off the shelf mocking tools

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Use test versions of external systems in integration tests.

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Test “state” not “behaviour”

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Push side effects to the boundaries of your system

Don’t take unit test coverage as the holy grail.

Test “state” not “behaviour”

Keep it simple !

“Simple ain’t easy”

Write tests to build confidence
And
NOT to make them run fast.