Test Doubles and Mocking

Agenda

- Design to Interface and Testing
- Test Doubles
- Mocking Frameworks

Design to Interface and Testing

- **Designing to interface decouples code**
  - Allows the implementation to vary
  - Concrete implementation injected
- **Can inject concrete types purely designed for testing**
  - Designed to drive specific test conditions
  - Allow capture of “interesting” activity of SUT
- **Concrete types that look like real types are known as Test Doubles**

Different Kinds of Test Doubles

- **There are a range of types of Test Doubles**
  - Fakes
  - Stubs
  - Spies
  - Mocks
- **Distinction is often blurred in practice**
  - Spectrum of behavior

Fakes

- **Dummy or heavily simplified version of abstraction**
  - Useful when abstraction required but its behavior is not of interest

```
public class FakeLogger : ILogger
{
    public void Log(string message)
    {
        // no-op
    }
}
```

Stubs

- **Implementation is designed to return specific values**
  - Drive test conditions in various ways

```
public class StubAccountRepository : IAccountRepository
{
    public IEnumerable<Account> GetOverdrawnAccounts()
    {
        return new[]
            {
                new Account(-300m),
                new Account(-600m),
                new Account(-100m),
            };
    }
}
```

Spies

- **Give insight into behavior of SUT**
  - Can record data passed from SUT

```
public class SpyLogger : ILogger
{
    public string Message { get; private set; }

    public void Log(string message)
    {
        Message = message;
    }
}
```

Mocks

- **Set expectations and verify the result**
  - Similarities to Spies

```
public class MockLogger : ILogger{
    private int logCount, expected;

    public void Log(string message){
        logCount++;
    }
    public void ExpectedLogCount(int expected){
        this.expected = expected;
    }

    public bool Verify(){
        return logCount == expected;
    }
}
```

Where do Test Doubles Come From?

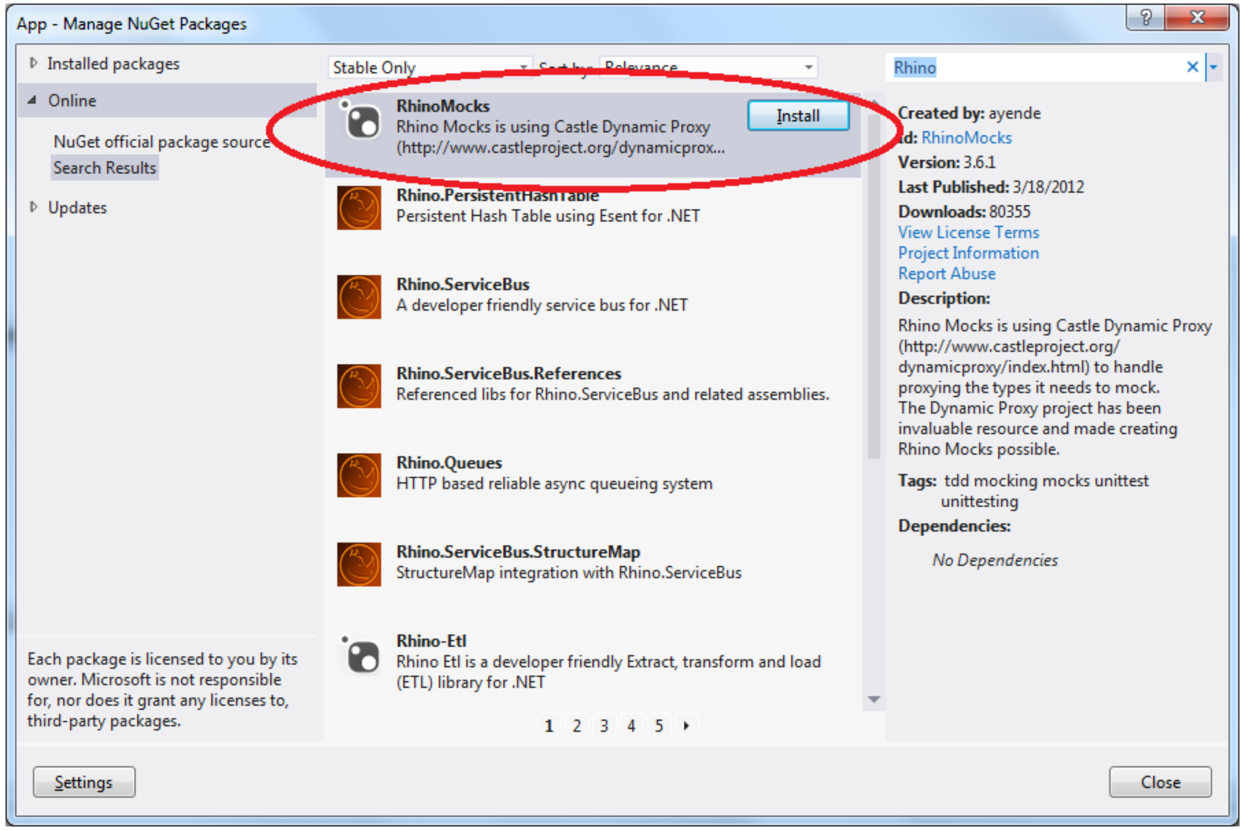
- **Can roll own test doubles**
  - Tuned to requirements
  - Have more code to maintain
- **Can use a Mocking Framework**
  - Generates necessary double on demand
  - Reduces your code base
  - Sometimes have to fight framework
- **Nothing wrong with combining approaches as required**

Mocking Frameworks

- **Many Mocking Frameworks for .NET**
  - Rhino Mocks
  - Moq
  - Nmock
  - TypeMock
  - EasyMock.NET
  - Microsoft Fakes (ships with VS Ultimate Edition)
- **All do a similar job**
  - Moq and Rhino most popular
  - TypeMock and Fakes provide extra functionality for legacy code

Rhino Mocks – an Example Mocking Framework

- **Rhino Mocks open source framework from Ayende Rahien**
  - Based on Castle Dynamic Proxy
  - Install as Nuget Package


App - Manage NuGet Packages

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Rhino

RhinoMocks — Install
Rhino Mocks is using Castle Dynamic Proxy (http://www.castleproject.org/dynamicprox...

Rhino.PersistentHashTable
Persistent Hash Table using Esent for .NET

Rhino.ServiceBus
A developer friendly service bus for .NET

Rhino.ServiceBus.References
Referenced libs for Rhino.ServiceBus and related assemblies.

Rhino.Queues
HTTP based reliable async queueing system

Rhino.ServiceBus.StructureMap
StructureMap integration with Rhino.ServiceBus

Rhino-Etl
Rhino Etl is a developer friendly Extract, transform and load (ETL) library for .NET

1 2 3 4 5

Created by: ayende
Id: RhinoMocks
Version: 3.6.1
Last Published: 3/18/2012
Downloads: 80355
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Project Information
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Description:
Rhino Mocks is using Castle Dynamic Proxy (http://www.castleproject.org/dynamicproxy/index.html) to handle proxying the types it needs to mock. The Dynamic Proxy project has been invaluable resource and made creating Rhino Mocks possible.
Tags: tdd mocking mocks unittest unittesting
Dependencies:
No Dependencies

Each package is licensed to you by its owner. Microsoft is not responsible for, nor does it grant any licenses to, third-party packages.

Settings | Close

Generating a stub

- **Simple to generate a stub and decide method results on ad-hoc basis**

```
IAccountRepository repo = MockRepository.GenerateStub<IAccountRepository>();

repo.Stub(r => r.GetOverdrawnAccounts())
    .Return(new[]
             {
                 new Account(-300m),
                 new Account(-600m),
                 new Account(-100m),
              });
```

Stubbing Based on Inputs

- Can stub multiple times base on input parameters

```
IAccountRepository repo = MockRepository.GenerateStub<IAccountRepository>();

repo.Stub(r => r.GetRate(RateType.Current))
    .Return(0.02m);

repo.Stub(r => r.GetRate(RateType.HighInterest))
    .Return(0.1m);
```

Can Stub Ignoring Inputs

- **Can generate a stub method that returns the same irrespective of inputs**

```
IAccountRepository repo = MockRepository.GenerateStub<IAccountRepository>();

repo.Stub(r => r.GetRate(RateType.Current))
     .IgnoreArguments()
     .Return(0.02m);
```

Stubs Can Throw Exceptions

- **Need to test SUT if dependency throw exception**
  - Can specify stub throw exception on invocation
  - Common to use with IgnoreArguments though not required

```
IAccountRepository repo = MockRepository.GenerateStub<IAccountRepository>();

repo.Stub(r => r.GetRate(RateType.Current))
    .IgnoreArguments()
    .Throw(new ArgumentException());
```

Creating Mocks with Rhino Mocks

- **Must decide how to respond to invocation**
  - Whether to specify an implementation
- **Must specify expectations**
  - If a method is invoked
  - If how invoked is important
- **Need to track state**
  - Create an instance of MockRepository
- **Different kinds of mocks**
  - Dynamic Mock
  - Strict Mock
  - Partial Mock

Generating Mocks

- **Use method on MockRepository instance**
  - DynamicMock
  - StrictMock
  - PartialMock
- **DynamicMock**
  - Mock will do “default behavior” for non explicitly specified methods
- **StrictMock**
  - Mock will register failure for non explicitly specified methods
- **PartialMock**
  - Will allow mocking of abstract class, otherwise similar to DynamicMock

Setting Expections

- **Need to specify expected interaction**
  - States invocation expected and what result (if any) to generate

```
Expect.Call(repo.GetRate(RateType.Current))
      .Return(0.02m);
```

Exercising Mock

- **Need to demarcate set of operations that should create expectations**
  - What is the SUT going to do to satisfy expectations
- **Need to specify when expectations should be met**
  - When expectations should all have been satisfied
- **Rhino has evolved API – all work, your choice**
  - Original Syntax
  - Using Syntax
  - Fluent Syntax

Mock Usage Example (Original API)

```
var mocks = new MockRepository();

IAccountRepository repo = mocks.DynamicMock<IAccountRepository>();
var reporter = new Reporter(repo);

Expect.Call(repo.GetOverdrawnAccounts())
      .Return(new Account[]{});

mocks.ReplayAll();

reporter.Generate();

mocks.VerifyAll();
```

Interesting interaction must happen between these

Verifying APIs that Return Void

- **Call to Expect must return something**
  - Otherwise Return method doesn't know what to do
- **Overload which takes an Action delegate**
  - Use when API doesn't return anything

```
Expect.Call(() => traceLogger.Log(null))
      .IgnoreArguments();
```

Summary

- Coding to abstraction decouples your code and can provide test versions
- Can roll own test doubles
- Mocking frameworks take the strain