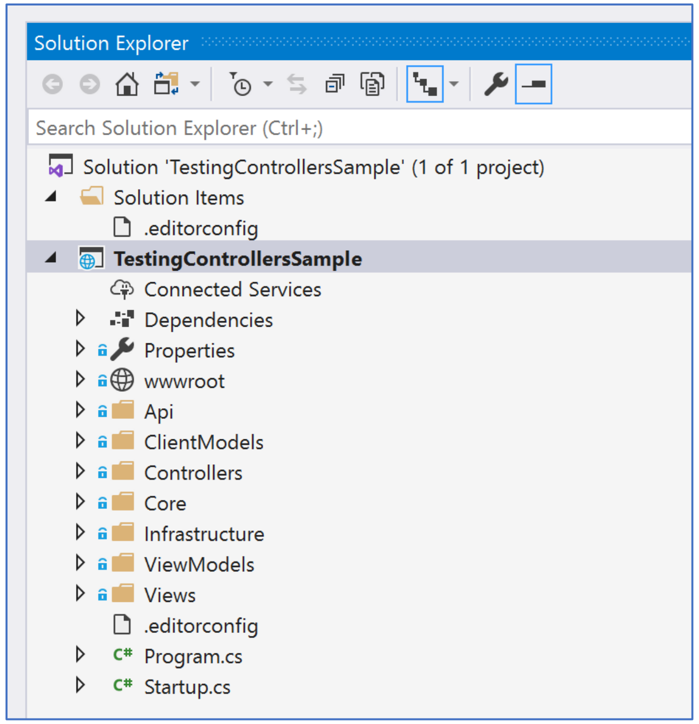
Lab: Unit Testing in Visual Studio with xUnit

May 2020

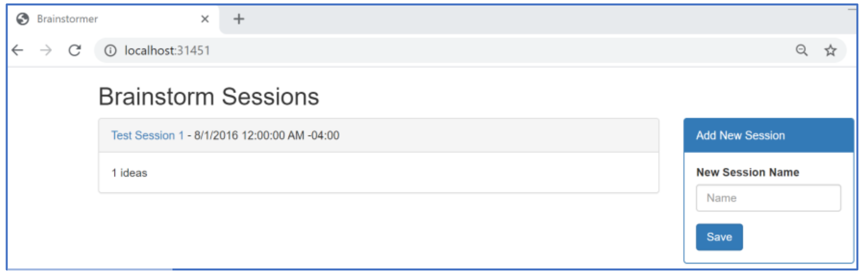
Let’s open the system under test (sut) Brainstorm

1. Clone repository to local folder from
   - https://github.com/jagojar/workshop-testing
2. Under folder **src** find solution file **TestingControllersSample.sln.**
3. Double click to open solution **TestingControllersSample.sln** in Visual Studio.
4. Run project **TestingControllersSample**
   - With F5 or
   - Top menu > Debug > Start Debugging
5. The browser loads the web application
   See **image 2**



```
Solution Explorer
Search Solution Explorer (Ctrl+;)
Solution 'TestingControllersSample' (1 of 1 project)
  Solution Items
    .editorconfig
  TestingControllersSample
    Connected Services
    Dependencies
    Properties
    wwwroot
    Api
    ClientModels
    Controllers
    Core
    Infrastructure
    ViewModels
    Views
    .editorconfig
    Program.cs
    Startup.cs
```

image 1



Brainstormer

localhost:31451

Brainstorm Sessions

Test Session 1 - 8/1/2016 12:00:00 AM -04:00

1 ideas

Add New Session

New Session Name

Name

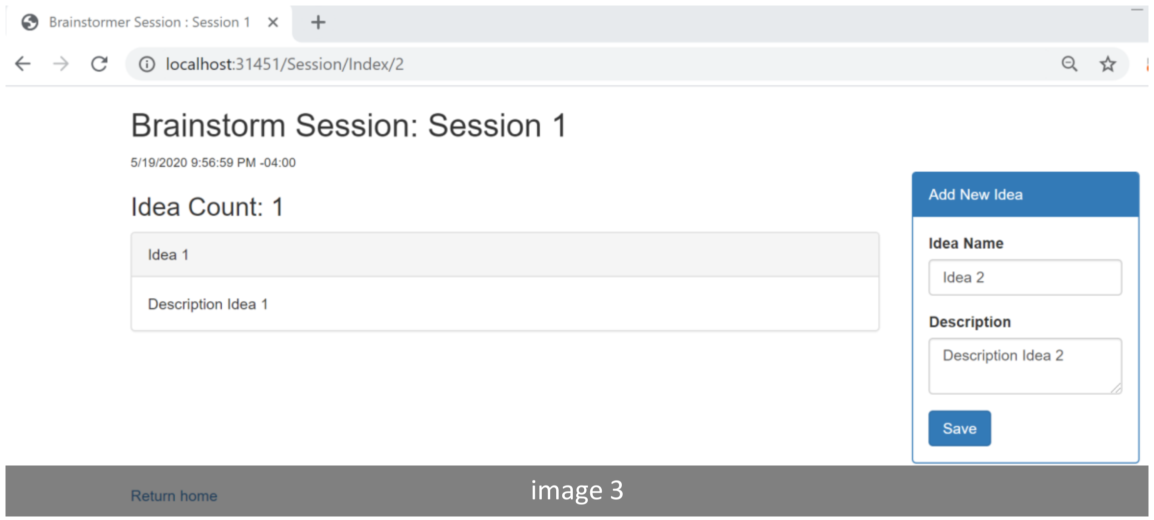
Save

image 2

Let’s play with Brainstorm

6. This web site helps to add Brainstorming sessions and add ideas to each session
7. The ideas for each session is displayed in the Session index. Example; http://localhost:31451/Session/Index/2

8. This project needs unit tests. We are adding a new project to accomplish that


Brainstormer Session : Session 1
localhost:31451/Session/Index/2
Add New Idea
Idea Name
Description
Save
Return home

Brainstorm Session: Session 1

5/19/2020 9:56:59 PM -04:00

Idea Count: 1

Idea 1

Description Idea 1

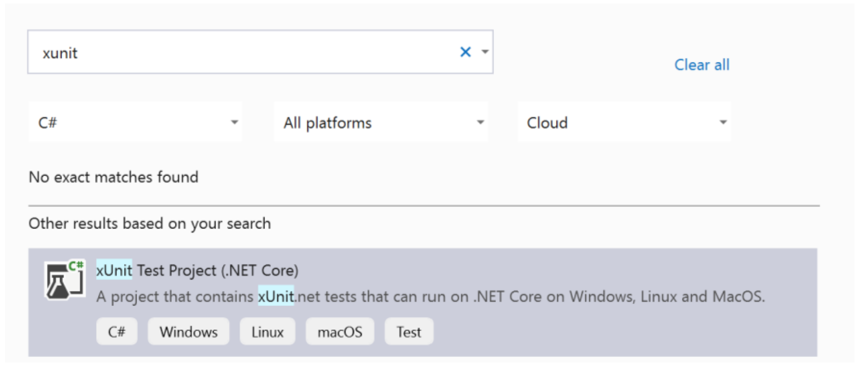
Idea 2

Description Idea 2

image 3

Let’s add a Unit Test Project

9. In solution explorer, right click on **TestingControllersSample** solution name. Select from the menu Add > New Project (see **image 4**)
10. Select **xUnit Test Project C#** (.Net Core) (see **image 5**). Click Next
11. Name the project **TestingControllersSample.UnitTests.** Click Create


xunit

C# All platforms Cloud

No exact matches found

Other results based on your search

xUnit Test Project (.NET Core)
A project that contains xUnit.net tests that can run on .NET Core on Windows, Linux and MacOS.

image 4

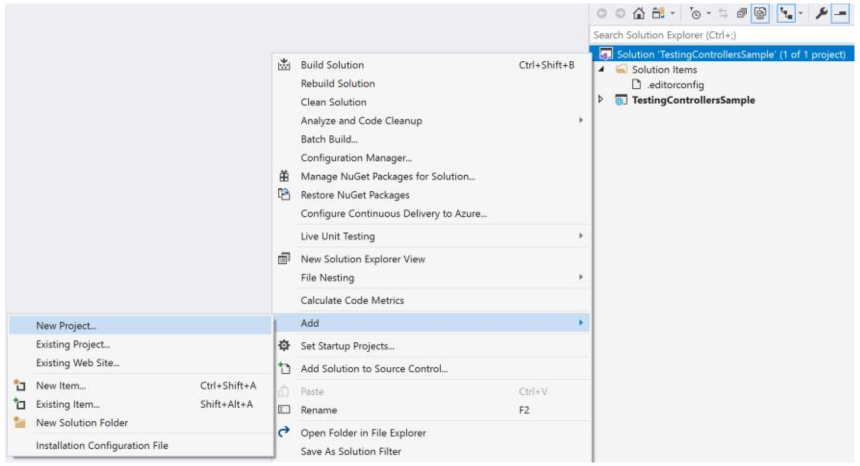
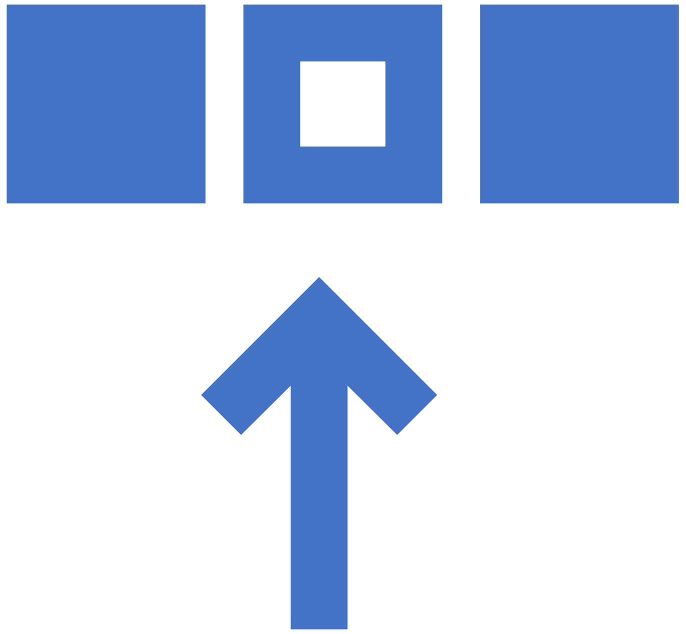


image 5

Let’s add some unit tests

12. To enable mocking. We need to add nuget package Moq to the unit test project.
13. In solution explorer, under **TestingControllersSample.UnitTests** right click on **Dependencies**. Select **Manage Nuget Packages…**
14. Click **Browse.** Search for **Moq.** Click on Moq item. Click **Install** button to add the package to the project.
15. It should be now listed in the **Installed** tab for nuget packages manager.
16. Now, we need to add the reference to the Brainstorm project.
17. Under **TestingControllersSample.UnitTests,** right click on **Dependencies**. Select **Add Reference.** Under Projects, check the box for **TestingControllerSample**. Click **Ok**.



Let’s add some unit tests

18. In solution explorer, under **TestingControllersSample.UnitTests** delete the default file UnitTest1.cs
19. Add a new class file to the project named **HomeControllerTests.cs**
20. In this file, we are going to add the first unit test method. Replace the content of the file with snippet 1. See note.
21. You can notice a few things:
    1. Name of the method describes the element to test and the goal of the test.
    2. The AAA pattern (Arrange, Act and Assert)
    3. We want to test only the Index method
22. Now, we need to add some code to the arrange part. See snippet 2

Note: find snippets in folder **workshop-testing/src/Snippets/unit tests**

```
using System;
using System.Collections.Generic;
using System.Linq;
using System.Threading.Tasks;
using Microsoft.AspNetCore.Mvc;
using Moq;
using TestingControllersSample.Controllers;
using TestingControllersSample.Core.Interfaces;
using TestingControllersSample.Core.Model;
using TestingControllersSample.ViewModels;
using Xunit;

namespace TestingControllersSample.UnitTests
{
    public class HomeControllerTests
    {
        [Fact]
        public async Task
Index_ReturnsAViewResult_WithAListOfBrainstormSessions()
        {
            //Arrange

            //Act

            //Assert

        }
    }
}
```

Snippet 1

Let’s add some unit tests

23. This code mocks the repository object based on the interface IBrainstormSessionRepository. To control the behavior for the test operation, ListAsync method is mocked with the method GetTestSessions. See snippet 5 in next page.
24. The controller object is instantiated passing the mocked repository as a parameter. This adds a dependency with behavior expected for this test. Next step is **Act**. Add the code in snippet 4.
25. This code test the method Index from the controller.
26. The next step is to check for the expected result.

```
//Snippet 2:

// Arrange
var mockRepo = new Mock<IBrainstormSessionRepository>();
mockRepo.Setup(repo => repo.ListAsync())
             .ReturnsAsync(GetTestSessions());

var controller = new HomeController(mockRepo.Object);

//




// Snippet 3:

// Act
var result = await controller.Index();
//
```

Let’s add some unit tests

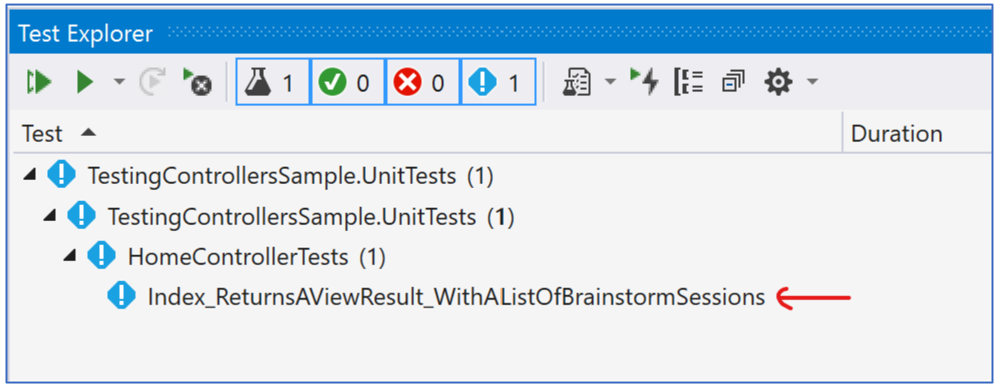
27. Add snippet 4.
28. In this code, we are asserting the type of the result and the expected number of items in the model.
29. To complete this unit test, we need to add code for the method GetTestSessions. Use snippet 5 to add method to class.

```
// Snippet 4

// Assert

var viewResult = Assert.IsType<ViewResult>(result);

var model = Assert.IsAssignableFrom<IEnumerable<StormSessionViewModel>>(
viewResult.ViewData.Model);

Assert.Equal(2, model.Count());
```

```
// Snippet 5

private List<BrainstormSession> GetTestSessions()
{
             var sessions = new List<BrainstormSession>();
             sessions.Add(new BrainstormSession()
             {
                DateCreated = new DateTime(2016, 7, 2),
                Id = 1,
                Name = "Test One“
            });
            sessions.Add(new BrainstormSession()
            {
                DateCreated = new DateTime(2016, 7, 1),
                Id = 2,
                Name = "Test Two“
            })
            return sessions;
}
```

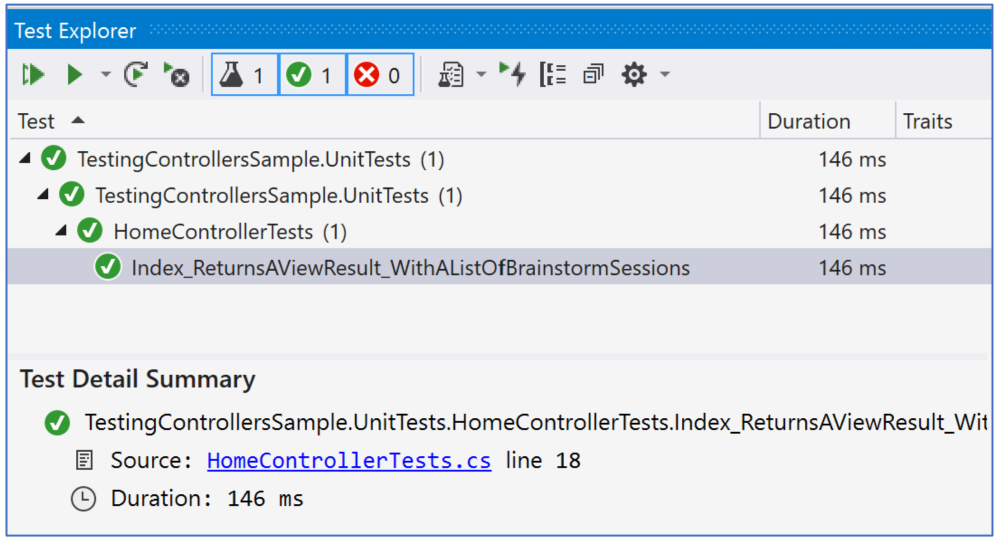
Let’s run unit tests

30. Build the solution from Solution Explorer. Right click on **TestingControllersSample** and select **Rebuild Solution.**
31. From menu **Test >** Select **Test Explorer** (see **image 6**).
32. Right click on **Index_ReturnsAViewResult_WithAListOfBrainstormSessions** and select **Run.**
33. After the test runs successfully, it should look like **image 7.**



Test | Duration
TestingControllersSample.UnitTests (1)
TestingControllersSample.UnitTests (1)
HomeControllerTests (1)
Index_ReturnsAViewResult_WithAListOfBrainstormSessions

Image 6



Test	Duration	Traits
TestingControllersSample.UnitTests (1)	146 ms	
TestingControllersSample.UnitTests (1)	146 ms	
HomeControllerTests (1)	146 ms	
Index_ReturnsAViewResult_WithAListOfBrainstormSessions	146 ms	

Test Detail Summary

TestingControllersSample.UnitTests.HomeControllerTests.Index_ReturnsAViewResult_Wit

Source: HomeControllerTests.cs line 18

Duration: 146 ms

Image 7

Let’s add more unit tests

34. Open file **HomeControllerTests.cs.**
35. Add another unit test method. Use **snippet 6.**
36. This method tests BadRequestResult is returned when the model is not valid.

```
 // Snippet 6

[Fact]

public async Task IndexPost_ReturnsBadRequestResult_WhenModelStateIsInvalid()
{
            // Arrange
            var mockRepo = new Mock<IBrainstormSessionRepository>();
            mockRepo.Setup(repo => repo.ListAsync())
                .ReturnsAsync(GetTestSessions());

            var controller = new HomeController(mockRepo.Object);

            controller.ModelState.AddModelError("SessionName", "Required");

            var newSession = new HomeController.NewSessionModel();


            // Act
            var result = await controller.Index(newSession);

            // Assert
            var badRequestResult =
             Assert.IsType<BadRequestObjectResult>(result);
             Assert.IsType<SerializableError>(badRequestResult.Value);

}
```

Let’s add more unit tests

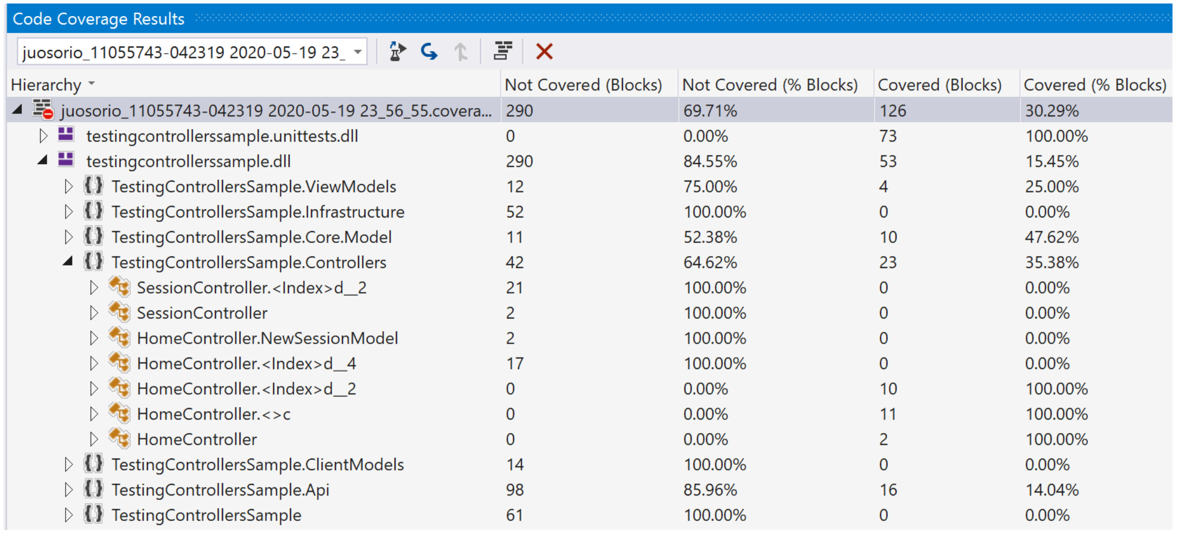
37. Add another file with name **ApiIdeasControllerTests.cs** to add some tests for the api. Use **snippet 7**.
38. Build solution **TestingControllersSample.**
39. In **Test Explorer**, the new unit tests are now available to run.
40. Click **TestingControllersSample.UnitTests** node and use the tool bar to run all the unit tests available.

Snippet 7

```
using System.Threading.Tasks;
using Microsoft.AspNetCore.Mvc;
using Moq;
using TestingControllersSample.Api;
using TestingControllersSample.ClientModels;
using TestingControllersSample.Core.Interfaces;
using TestingControllersSample.Core.Model;
using Xunit;

namespace TestingControllersSample.Tests.UnitTests
{
    public class ApiIdeasControllerTests
    {
        [Fact]
        public async Task Create_ReturnsBadRequest_GivenInvalidModel()
        {
            // Arrange & Act
            var mockRepo = new Mock<IBrainstormSessionRepository>();
            var controller = new IdeasController(mockRepo.Object);
            controller.ModelState.AddModelError("error", "some error");

            // Act
            var result = await controller.Create(model: null);

            // Assert
            Assert.IsType<BadRequestObjectResult>(result);
        }

        [Fact]
        public async Task ForSession_ReturnsHttpNotFound_ForInvalidSession()
        {
            // Arrange
            int testSessionId = 123;
            var mockRepo = new Mock<IBrainstormSessionRepository>();
            mockRepo.Setup(repo => repo.GetByIdAsync(testSessionId))
                .ReturnsAsync((BrainstormSession)null);

            var controller = new IdeasController(mockRepo.Object);

            // Act
            var result = await controller.ForSession(testSessionId);

            // Assert
            var notFoundObjectResult = Assert.IsType<NotFoundObjectResult>(result);
            Assert.Equal(testSessionId, notFoundObjectResult.Value);
        }
}
```

Let’s run Code Coverage

41. From **Test Explorer**, right click on **TestingControllersSample.UnitTests.** Select **Analyze Code Coverage.**
42. This action will start a build in the solution. After some seconds, the report is available in **Code Coverage Results** window. See image
43. ***Optional***. Add your own unit test to increase the code coverage percentage.


Code Coverage Results

juosorio_11055743-042319 2020-05-19 23_

Hierarchy	Not Covered (Blocks)	Not Covered (% Blocks)	Covered (Blocks)	Covered (% Blocks)
juosorio_11055743-042319 2020-05-19 23_56_55.covera...	290	69.71%	126	30.29%
testingcontrollerssample.unittests.dll	0	0.00%	73	100.00%
testingcontrollerssample.dll	290	84.55%	53	15.45%
TestingControllersSample.ViewModels	12	75.00%	4	25.00%
TestingControllersSample.Infrastructure	52	100.00%	0	0.00%
TestingControllersSample.Core.Model	11	52.38%	10	47.62%
TestingControllersSample.Controllers	42	64.62%	23	35.38%
SessionController.<Index>d__2	21	100.00%	0	0.00%
SessionController	2	100.00%	0	0.00%
HomeController.NewSessionModel	2	100.00%	0	0.00%
HomeController.<Index>d__4	17	100.00%	0	0.00%
HomeController.<Index>d__2	0	0.00%	10	100.00%
HomeController.<>c	0	0.00%	11	100.00%
HomeController	0	0.00%	2	100.00%
TestingControllersSample.ClientModels	14	100.00%	0	0.00%
TestingControllersSample.Api	98	85.96%	16	14.04%
TestingControllersSample	61	100.00%	0	0.00%

Image 8