Integration Testing

.NET

Integration tests *ensure that an app's components function correctly at a level that includes the app's supporting infrastructure, such as the database, file system, and network.*

https://docs.microsoft.com/en-us/aspnet/core/test/integration-tests?view=aspnetcore-5.0

Integration Testing - Overview

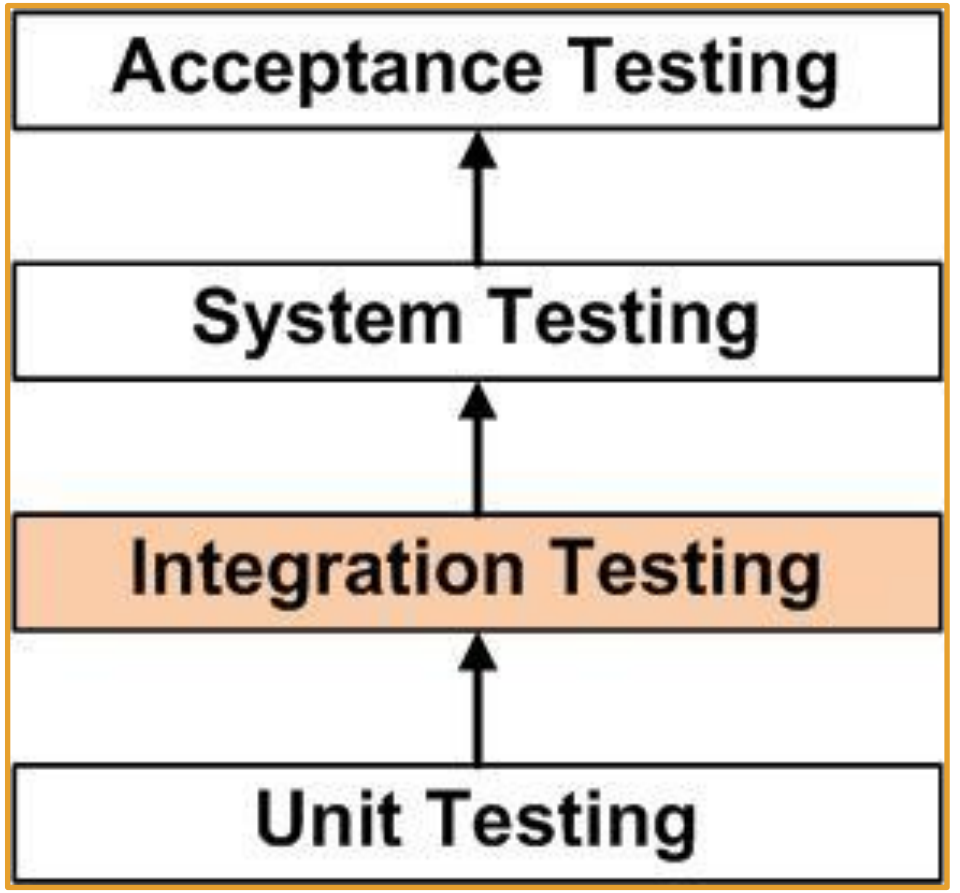
https://docs.microsoft.com/en-us/aspnet/core/test/integration-tests?view=aspnetcore-5.0#introduction-to-integration-tests

Integration tests are the second level of testing. They evaluate an app's components on a broader level than ***unit tests***.

Unit tests are used to test isolated software components, like methods.

Integration tests confirm that two or more app components work together to produce an expected result.

Broader tests of the app's infrastructure and framework can include everything from UI to DB. A different database or different app settings might be used for the tests.



Integration Tests – Cons

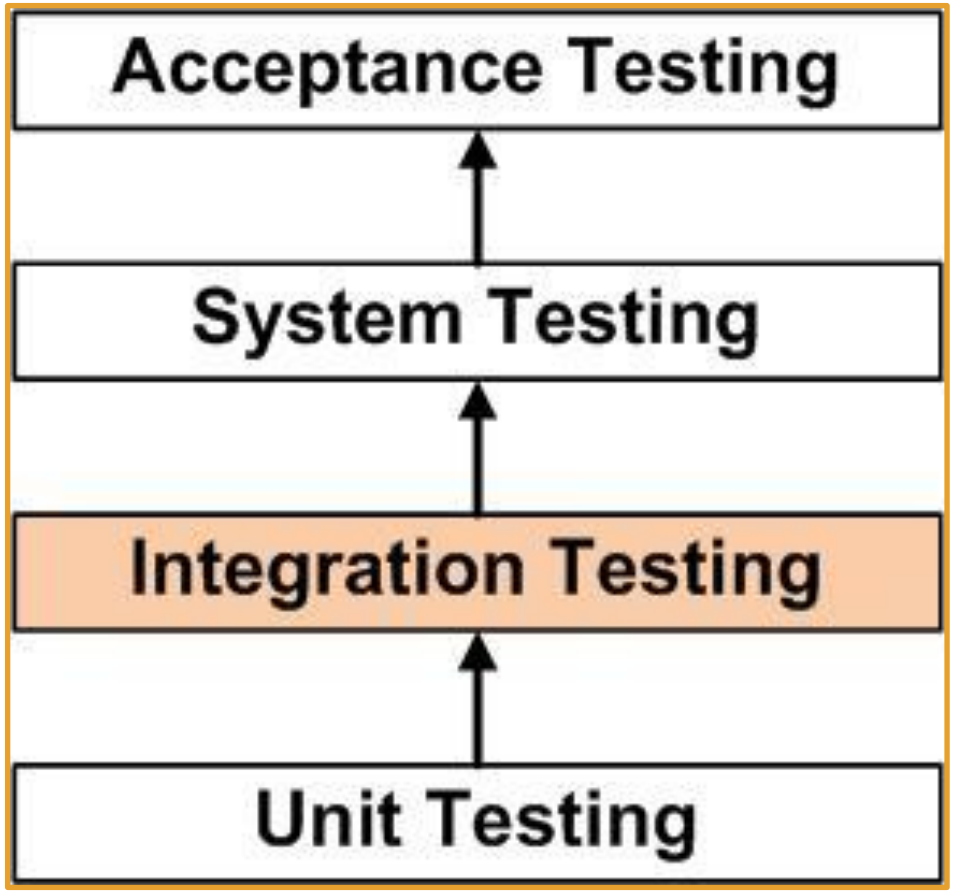
https://docs.microsoft.com/en-us/aspnet/core/test/integration-tests?view=aspnetcore-5.0#aspnet-core-integration-tests

Integration tests:

- use production components,
- require more code and data processing,
- take longer to run.

Limit the use of ***integration tests*** to the most important infrastructure scenarios.

If a behavior can be tested using both a unit test and an integration test, choose the unit test.



Integration Testing – Requirements/Setup

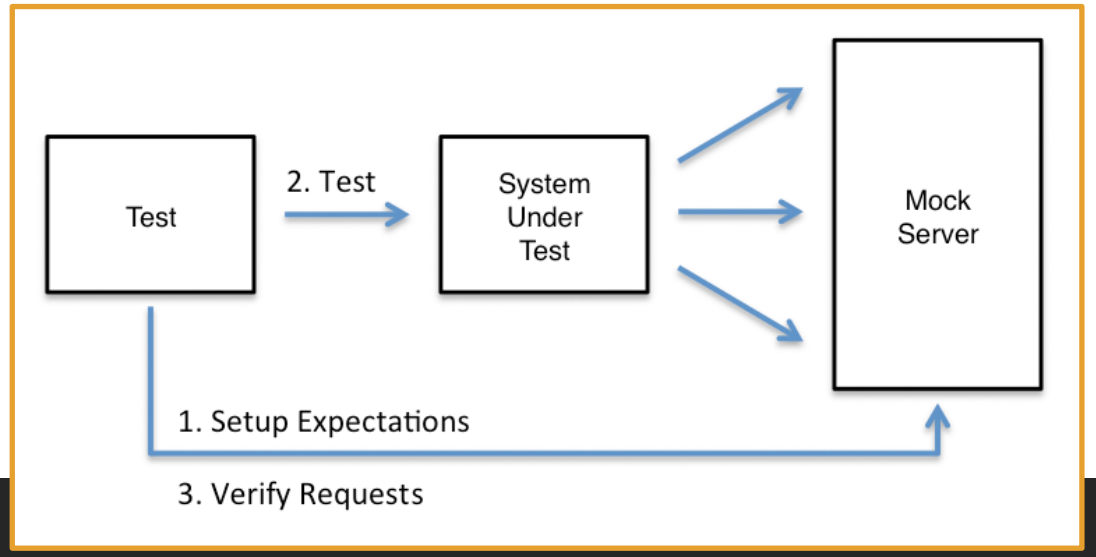
https://docs.microsoft.com/en-us/aspnet/core/test/integration-tests?view=aspnetcore-5.0#aspnet-core-integration-tests

To complete Integration tests in ASP.NET Core, you need:

- a test project containing the tests and having a reference to the ***SUT (System Under Test)***.
- a test web host (created by the test project) for the ***SUT*** that uses a test server client to handle requests and responses with the ***SUT***.
- a test runner is used to execute the tests and report the test results.
- the test app to specify the ***Web SDK*** in its project file (<Project Sdk="Microsoft.NET.Sdk.Web">).
- the test app to reference the ***Microsoft.AspNetCore.Mvc.Testing*** package

The workflow of Integration Testing follows the familiar Arrange/Act/Assert process. Each test:

1. configures a web host
2. Creates a test server client
3. Arrange…
4. Act…
5. Assert…



Integration Testing – Requirements/Setup

https://docs.microsoft.com/en-us/aspnet/core/test/integration-tests?view=aspnetcore-5.0#aspnet-core-integration-tests

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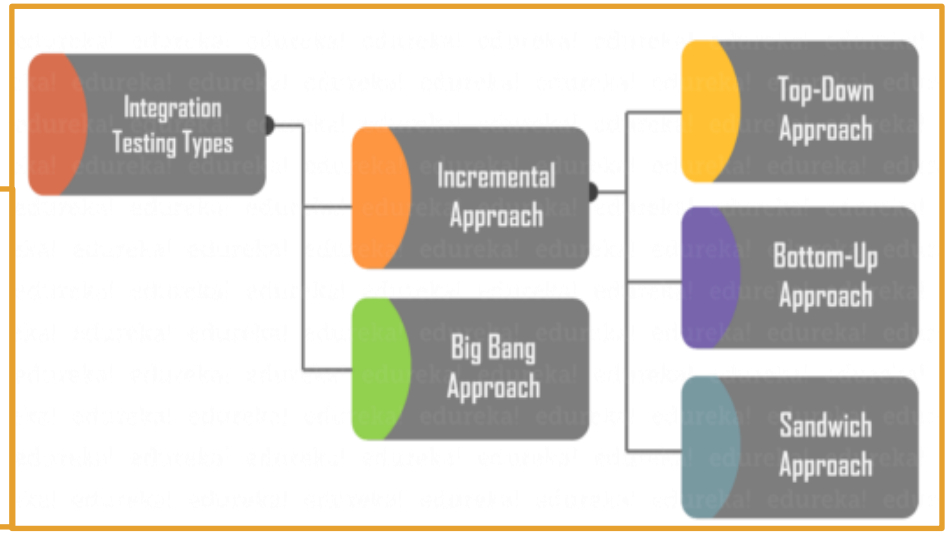
The ***Microsoft.AspNetCore.Mvc.Testing*** package handles the following tasks:

- Copies the dependencies file (.deps) from the SUT into the test project's bin directory.
- Sets the ***content root*** to the SUT's project root so that static files and pages/views are found when the tests are executed.
- Provides the ***WebApplicationFactory*** class to streamline bootstrapping the SUT with TestServer.

You can use a mock database for testing.
In an ***MVC*** app, tests are usually organized by ***Controller*** classes and named after the ***Controllers*** they test.



Integration Testing Setup – Step By Step

https://docs.microsoft.com/en-us/aspnet/core/test/integration-tests?view=aspnetcore-5.0#aspnet-core-integration-tests
https://docs.microsoft.com/en-us/aspnet/core/test/integration-tests?view=aspnetcore-5.0#basic-tests-with-the-default-webapplicationfactory

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1) The test project inherits
- IClassFixture<WebApplicationFactory<TEntryPoint>>.
- "TEntryPoint" is your app entry file, usually Startup.cs.

2) create a property:

private readonly WebApplicationFactory<TEntryPoint> _factory;

3) Inject the WebApplicationFactory<TEntryPoint> into the test project constructor.

4)In each test,
- var client = _factory.CreateClient(); //Arrange
- var response = await client.MethodToTest(url); //Act
- response.EnsureSuccessStatusCode(); //200-299 Assert
- Assert.Equal(verify the response was as expected) //Assert

```
public class BasicTests
    : IClassFixture<WebApplicationFactory<RazorPagesProject.Startup>>
{
    private readonly WebApplicationFactory<RazorPagesProject.Startup> _factory;

    public BasicTests(WebApplicationFactory<RazorPagesProject.Startup> factory)
    {
        _factory = factory;
    }

    [Theory]
    [InlineData("/")]
    [InlineData("/Index")]
    [InlineData("/About")]
    [InlineData("/Privacy")]
    [InlineData("/Contact")]
    public async Task Get_EndpointsReturnSuccessAndCorrectContentType(string url)
    {
        // Arrange
        var client = _factory.CreateClient();

        // Act
        var response = await client.GetAsync(url);

        // Assert
        response.EnsureSuccessStatusCode(); // Status Code 200-299
        Assert.Equal("text/html; charset=utf-8",
            response.Content.Headers.ContentType.ToString());
    }
}
```

Moq

https://docs.microsoft.com/en-us/aspnet/core/mvc/controllers/testing?view=aspnetcore-3.1

Stub

The Moq library used in this sample makes it possible to mix verifiable, or "strict", mocks with non-verifiable mocks (also called "loose" mocks or stubs). Learn more about customizing Mock behavior with Moq.