Section Cheat Sheet (PPT)

Best Practices of Unit Tests

Isolated / Stand-alone

(separated from any other dependencies such as file system or database)

Test single method at-a-time

(should not test more than one method in a single test case)

Unordered

(can be executed in any order)

Fast

(Tests should take little time to run (about few milliseconds))

Repeatable

(Tests can run repeatedly but should give same result, if no changes in the actual source code)

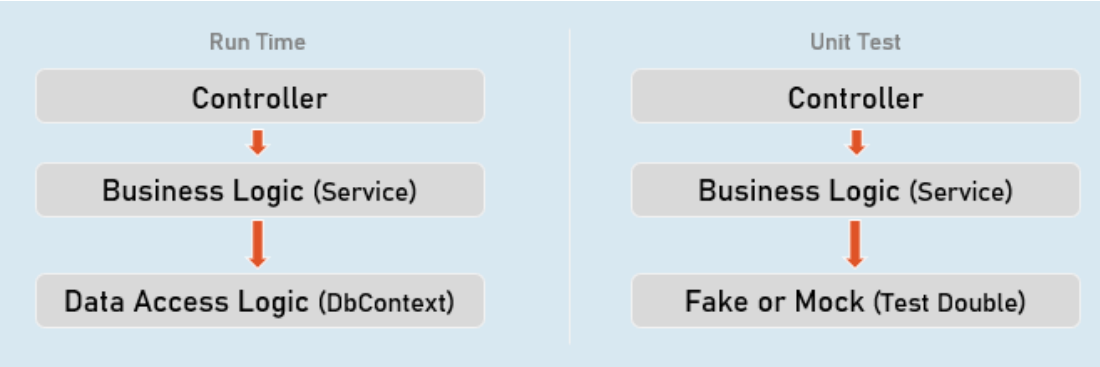
Timely

(Time taken for writing a test case should not take longer time, than then time taken for writing the code that is being tested)

Mocking the DbContext

Test Double

A "test double" is an object that look and behave like their production equivalent objects.



A "test double" is an object that look and behave like their production equivalent objects.

Fake

An object that providers an alternative (dummy) implementation of an interface

Mock

An object on which you fix specific return value for each individual method or property, without actual / full implementation of it.

Mocking the DbContext

```
Install-Package Moq
Install-Package EntityFrameworkCoreMock.Moq
```

Mocking the DbContext:

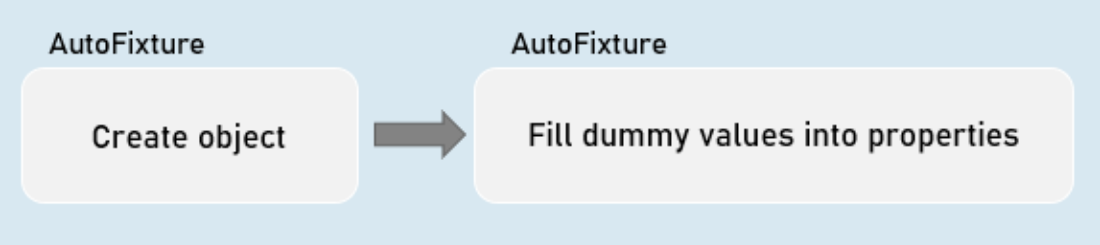
```
var dbContextOptions = new DbContextOptionsBuilder<DbContextClassName>
().Options;

//mock the DbContext
```

```
4   DbContextMock<DbContextClass> dbContextMock = new
DbContextMock<DbContextClass>(dbContextOptions);
5   var initialData = new List<ModelClass>() { … };
6
7   //mock the DbSet
8   var dbSetMock = dbContextMock.CreateDbSetMock(temp => temp.DbSetName,
initialData);
9
10  //create service instance with mocked DbContext
11  var service = newServiceClass(dbContextMock.Object);
```

AutoFixture

AutoFixture generates objects of the specified classes and their properties with some fake values based their data types.



Normal object creation

```
1   new ModelClass() {
2    Property1 = value,
3    Property2 = value
4   }
```

With AutoFixture

`Fixture.Create<ModelClass>(); //initializes all properties of the specified model class with dummy values`

AutoFixture

`Install-Package AutoFixture`

Working with AutoFixture:

```
1   var fixture = new Fixture();
```

```
2
3   //Simple AutoFixture
4   var obj1 = fixture.Create<ModelClass>();
5
6   //Customization with AutoFixture
7   var obj2 = fixture.Build<ModelClass>()
8    .With(temp => temp.Property1, value)
9    .With(temp => temp.Property2, value)
10   .Create();
```

Fluent Assertions

Fluent Assertions are a set of extension methods to make the assertions in unit testing more readable and human-friendly.

`Install-Package FluentAssertions`

Assert

```
1   //Equal
2   Assert.Equal(expected, actual);
3
4   //Not Equal
5   Assert.NotEqual(expected, actual);
6
7   //Null
8   Assert.Null(actual);
9
10  //Not Null
11  Assert.NotNull(actual);
12
13  //True
14  Assert.True(actual);
15
16  //False
17  Assert.False(actual);
18
19  //Empty
20  Assert.Empty(actual);
21
22  //Not Empty
23  Assert.NotEmpty(actual);
24
```

```
//Null or empty
Assert.True(string.IsNullOrEmpty(actual)); //string
Assert.True(actual == null || actual.Length == 0); //collection

//Should not be null or empty
Assert.False (string.IsNullOrEmpty(actual)); //string
Assert.False(actual == null || actual.Length == 0); //collection

//number should be positive
Assert.True(actual > 0);

//number should be negative
Assert.True(actual < 0);

//number should be >= expected
Assert.True(actual >= expected);

//number should be <= expected
Assert.True(actual <= expected);

//number should be in given range
Assert.True(actual >= minimum && actual <= maximum);

//number should not be in given range
Assert.True(actual < minimum || actual > maximum);

//check data type
Assert.IsType<ExpectedType>(actual);

//Compare properties of two objects (Equals method SHOULD BE overridden)
Assert.Equal(expected, actual);

//Compare properties (should not be equal) of two objects (Equals method SHOULD BE overridden)
Assert.NotEqual(expected, actual);
```

Fluent Assertion

```
//Equal
actual.Should().Be(expected);

//Not Equal
actual.Should().NotBe(expected);

//Null
actual.Should().BeNull();

```

```
//Not Null
actual.Should().NotBeNull();

//True
actual.Should().BeTrue();

//False
actual.Should().BeFalse();

//Empty
actual.Should().BeEmpty();

//Not Empty
actual.Should().NotBeEmpty();

//Null or empty
actual.Should().BeNullOrEmpty();

//Should not be null or empty
actual.Should().NotBeNullOrEmpty();

//number should be positive
actual.Should().BePositive();

//number should be negative
actual.Should().BeNegative();

//number should be >= expected
actual.Should().BeGreaterThanOrEqualTo(expected);

//number should be <= expected
actual.Should().BeLessThanOrEqualTo(expected);

//number should be in given range
actual.Should().BeInRange(minimum, maximum);

//number should not be in given range
actual.Should().NotBeInRange(minimum, maximum);

//number should be in given range
actual.Should().BeInRange(minimum, maximum);

//number should not be in given range
actual.Should().NotBeInRange(minimum, maximum);

//check data type (same type)
actual.Should().BeOfType<ExpectedType>();

//check data type (same type or derived type)
actual.Should().BeAssignableTo<ExpectedType>();
```

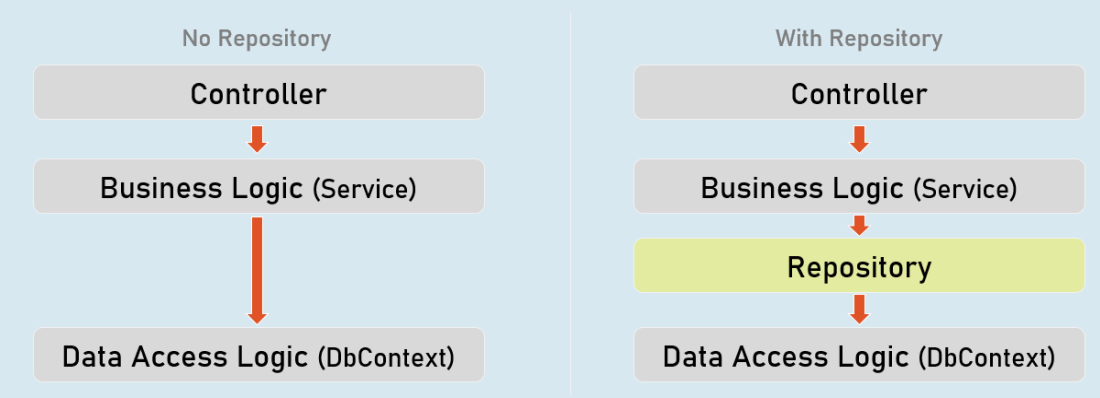
```
60
61    //Compare properties of two objects (Equals method NEED NOT be overridden)
62    actual.Should().BeEquivalentTo(expected);
63
64    //Compare properties (should not equal) of two objects (Equals method NEED NOT be overridden)
65    actual.Should().BeNotEquivalentTo(expected);
```

Fluent Assertions - Collections:

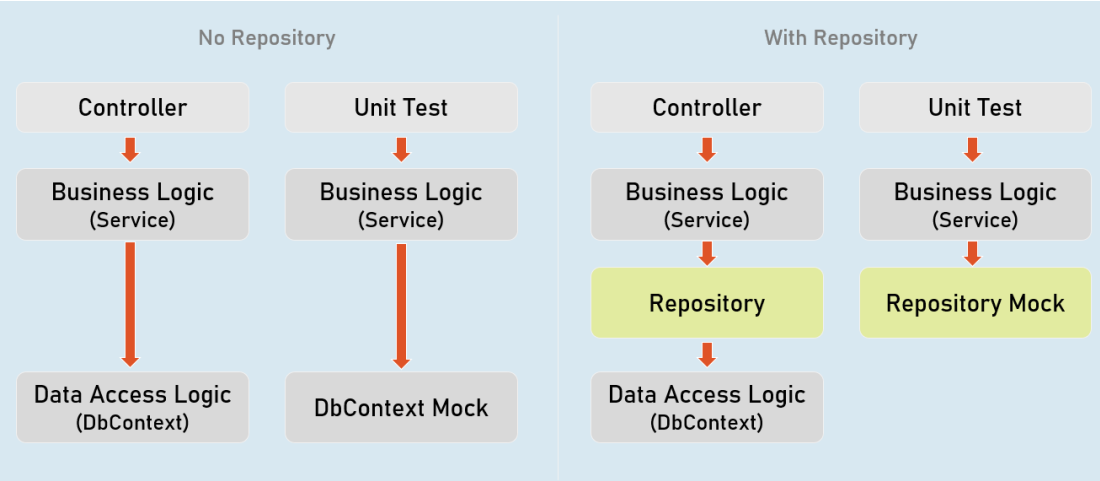
```
1     actualCollection.Should().BeEmpty();
2     actualCollection.Should().NotBeEmpty();
3
4     actualCollection.Should().HaveCount(expectedCount);
5     actualCollection.Should().NotHaveCount(expectedCount);
6
7     actualCollection.Should().HaveCountGreaterThanOrEqualTo(expectedCount);
8     actualCollection.Should().HaveCountLessThanOrEqualTo(expectedCount);
9
10    actualCollection.Should().HaveSameCount(expectedCollection);
11    actualCollection.Should().NotHaveSameCount(expectedCollection);
12
13    actualCollection.Should().BeEquivalentTo(expectedCollection);
14    actualCollection.Should().NotBeEquivalentTo(expectedCollection);
15
16    actualCollection.Should().ContainInOrder(expectedCollection);
17    actualCollection.Should().NotContainInOrder(expectedCollection);
18
19    actualCollection.Should().OnlyHaveUniqueItems(expectedCount);
20    actualCollection.Should().OnlyContain(temp => condition);
21
22    actualCollection.Should().BeInAscendingOrder(temp => temp.Property);
23    actualCollection.Should().BeInDescendingOrder(temp => temp.Property);
24
25    actualCollection.Should().NotBeInAscendingOrder(temp => temp.Property);
26    actualCollection.Should().NotBeInDescendingOrder(temp => temp.Property);
27
28    delegateObj.Should().Throw<ExceptionType>();
29    delegateObj.Should().NotThrow<ExceptionType>();
30
31    await delegateObj.Should().ThrowAsync<ExceptionType>();
32    await delegateObj.Should().NotThrowAsync<ExceptionType>();
```

Repository

Repository (or Repository Pattern) is an abstraction between Data Access Layer (EF DbContext) and business logic layer (Service) of the application.



Unit Testing



Benefits of Repository Pattern

Loosely-coupled business logic (service) & data access.

(You can independently develop them).

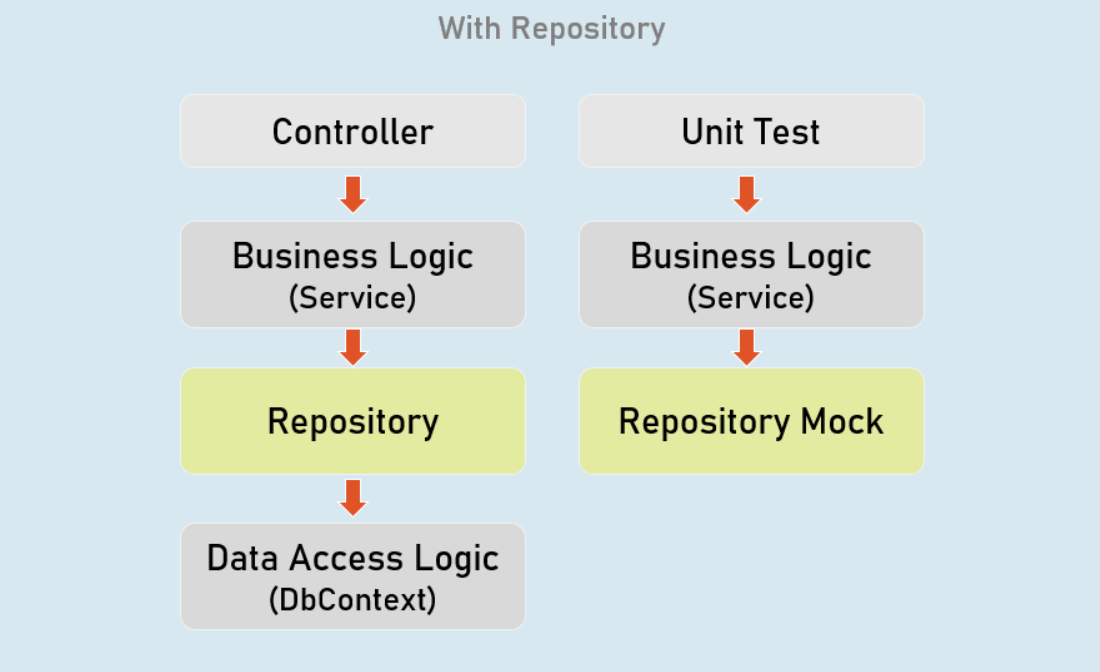
Changing data store

(You can create alternative repository implementation for another data store, when needed).

Unit Testing

(Mocking the repository is much easier (and preferred) than mocking DbContext).

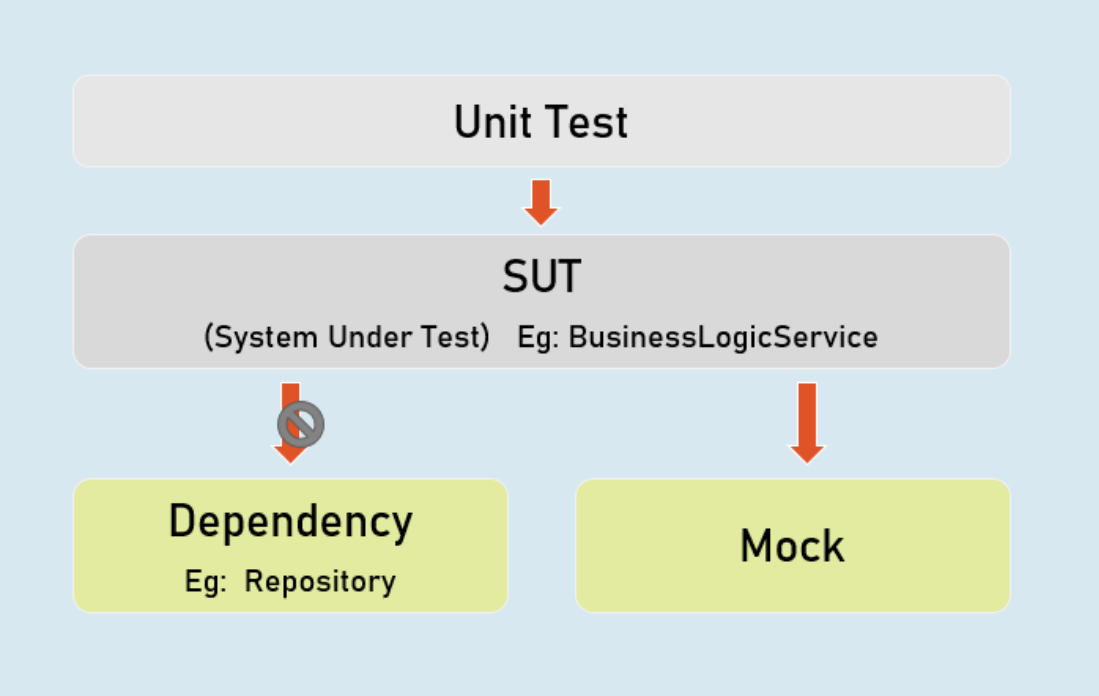
Mocking the Repository




```
Install-Package Moq
```

Mocking the Repository:

```
1  //mock the repository
2  Mock<IRepository> repositoryMock = new Mock<IRepository>();
3
4  //mock a method repository method
5  repositoryMock.Setup(temp => temp.MethodName(It.Any<ParameterType>()))
6   .Returns(return_value);
7
8  //create service instance with mocked repository
9  var service = newServiceClass(repositoryMock.Object);
```



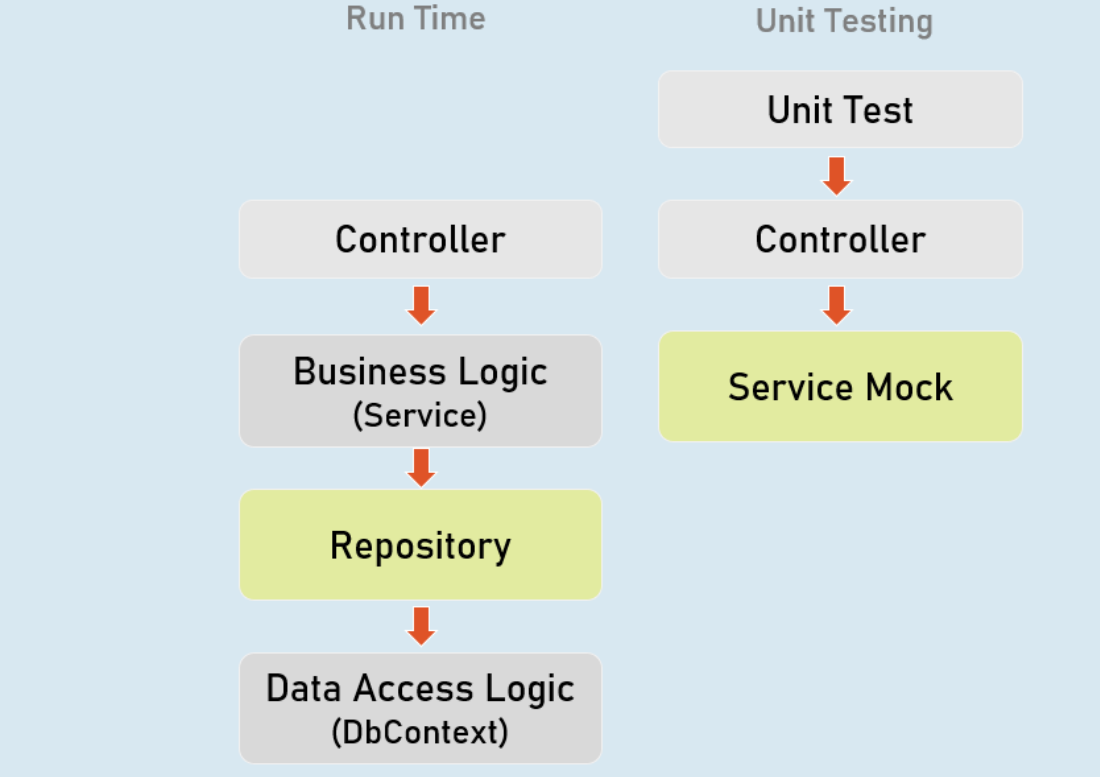
Mock<IPersonsRepository>

Used to mock the methods of IPersonsRepository.

IPersonsRepository

Represents the mocked object that was created by Mock<T>.

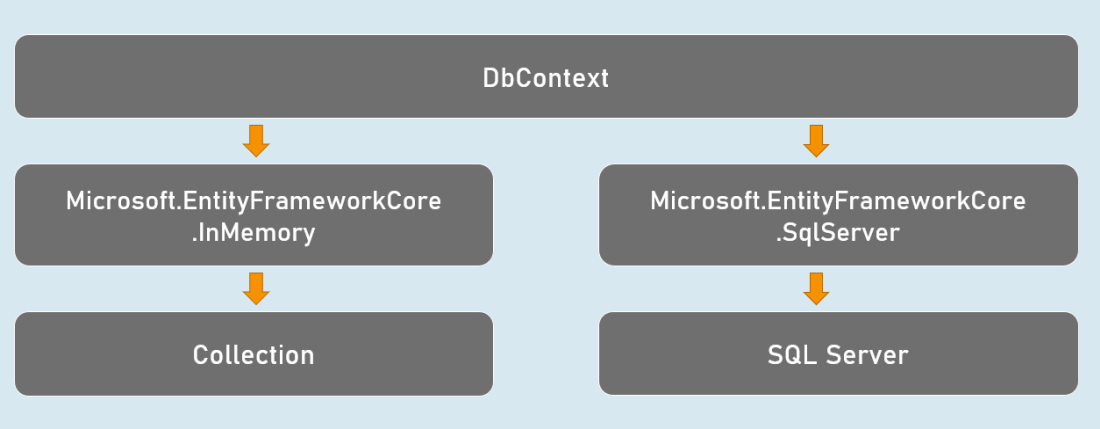
Unit Testing the Controller



Unit Testing the Controller:

```
1  //Arrange
2  ControllerName controller = new ControllerName();
3
4  //Act
5  IActionResult result = controller.ActionMethod();
6
7  //Assert
8  result.Should().BeAssignableTo<ActionResultType>(); //checking type of
action result
9  result.ViewData.Model.Should().BeAssignableTo<ExpectedType>();
//checking type of model
10 result.ViewData.Model.Should().Be(expectedValue); //you can also use any
other assertion
```

EFCore In-Memory Provider



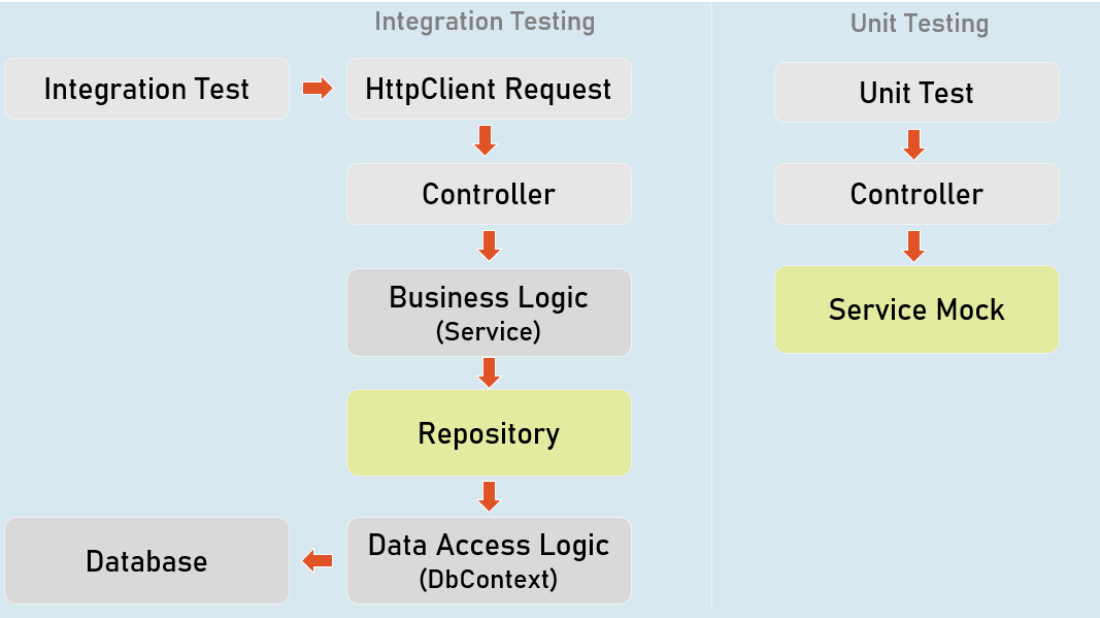

```
Install-Package Microsoft.EntityFrameworkCore.InMemory
```

Using In-memory provider:

```
var dbContextOptions =
 new DbContextOptionsBuilder<DbContextClassName>()
 .UseInMemoryDatabase("database_name");
 .Options;

var dbContext = newDbContextClassName(dbContextOptions);
```

Integration Test




```
//Create factory
WebApplicationFactory factory = new WebApplicationFactory();
```

```
3
4   //Create client
5   HttpClient client = factory.CreateClient();
6
7   //Send request client
8   HttpResponseMessage response = await client.GetAsync("url");
9
10  //Assert
11  result.Should().BeSuccessful(); //Response status code should be 200 to
299
```