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)

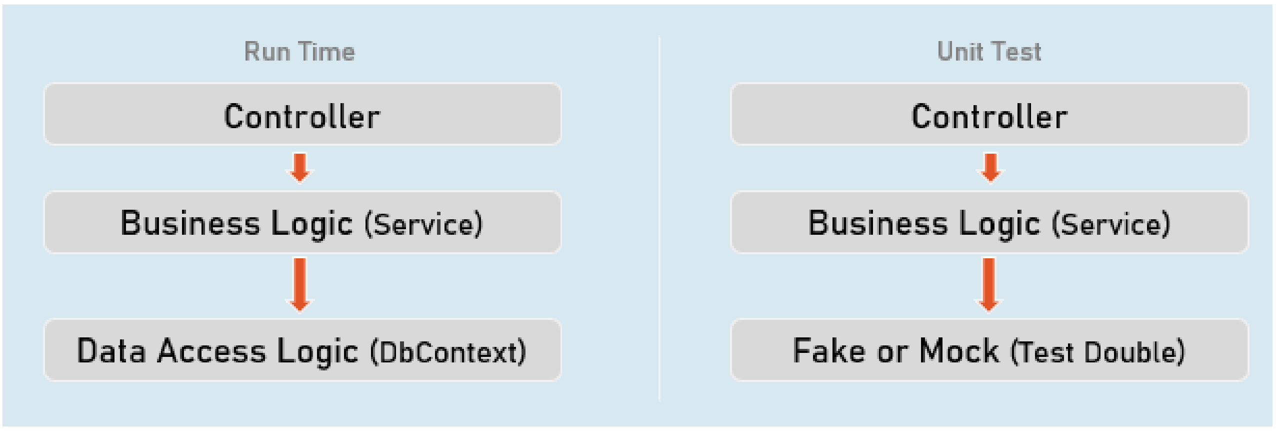
Timely

(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
```

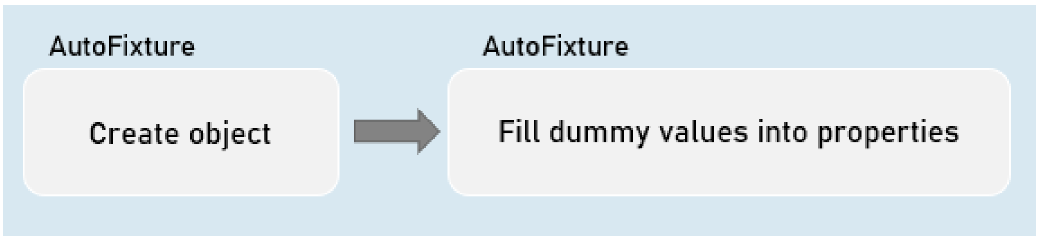
Mocking the DbContext:

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

//mock the DbContext
DbContextMock<DbContextClass> dbContextMock = new
       DbContextMock<DbContextClass>(dbContextOptions);
var initialData = new List<ModelClass>() { … };
```

```
//mock the DbSet
var dbSetMock = dbContextMock.CreateDbSetMock(temp =>
       temp.DbSetName, initialData);

//create service instance with mocked DbContext
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

```
new ModelClass() {
 Property1 = value,
 Property2 = value
}
```

With AutoFixture

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

AutoFixture

`Install-Package AutoFixture`

Working with AutoFixture:

```
var fixture = new Fixture();

//Simple AutoFixture
var obj1 = fixture.Create<ModelClass>();

//Customization with AutoFixture
var obj2 = fixture.Build<ModelClass>()
 .With(temp => temp.Property1, value)
 .With(temp => temp.Property2, value)
 .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

```
//Equal
```

```
    Assert.Equal(expected, actual);

    //Not Equal
    Assert.NotEqual(expected, actual);

    //Null
    Assert.Null(actual);

    //Not Null
    Assert.NotNull(actual);

    //True
    Assert.True(actual);

    //False
    Assert.False(actual);

    //Empty
    Assert.Empty(actual);

    //Not Empty
    Assert.NotEmpty(actual);

    //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
```

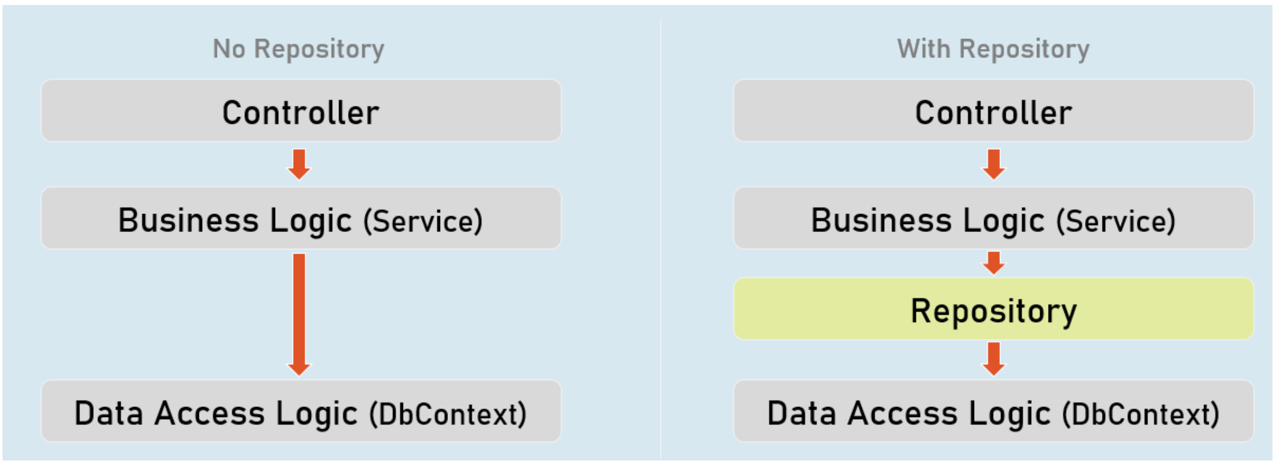
```
actual.Should().NotBeInRange(minimum, maximum);

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

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

//Compare properties of two objects (Equals method NEED NOT be
       overridden)
actual.Should().BeEquivalentTo(expected);

//Compare properties (should not equal) of two objects (Equals
       method NEED NOT be overridden)
actual.Should().BeNotEquivalentTo(expected);
```

Fluent Assertions - Collections:

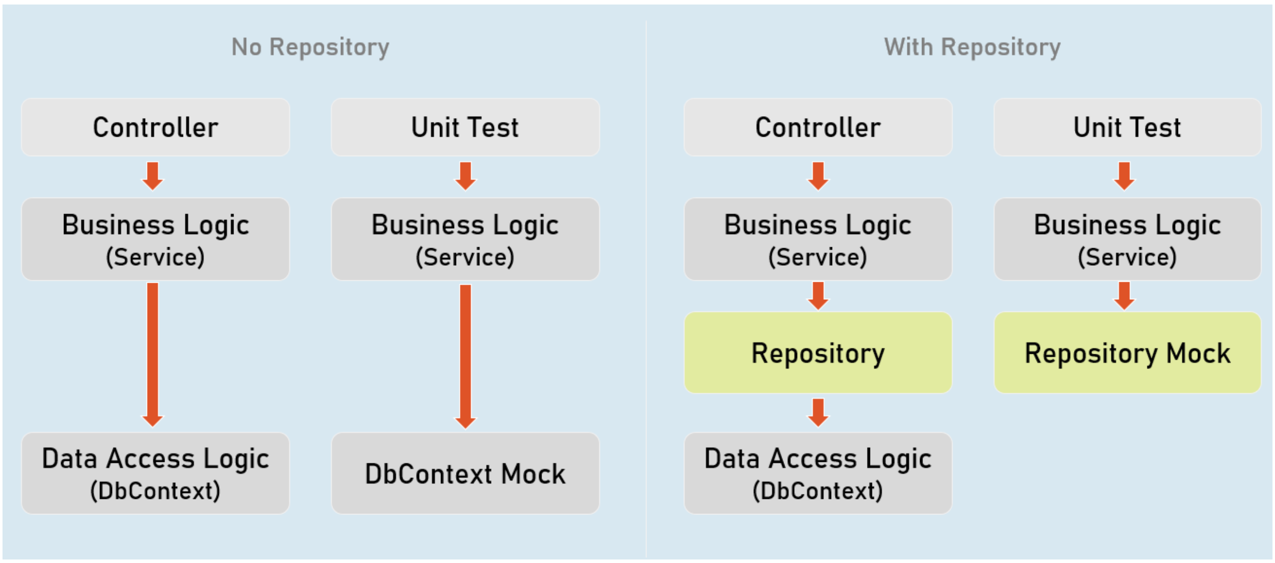
```
actualCollection.Should().BeEmpty();
actualCollection.Should().NotBeEmpty();

actualCollection.Should().HaveCount(expectedCount);
actualCollection.Should().NotHaveCount(expectedCount);

actualCollection.Should().HaveCountGreaterThanOrEqualTo(expectedCount);
actualCollection.Should().HaveCountLessThanOrEqualTo(expectedCount);

actualCollection.Should().HaveSameCount(expectedCollection);
actualCollection.Should().NotHaveSameCount(expectedCollection);

actualCollection.Should().BeEquivalentTo(expectedCollection);
actualCollection.Should().NotBeEquivalentTo(expectedCollection);

actualCollection.Should().ContainInOrder(expectedCollection);
actualCollection.Should().NotContainInOrder(expectedCollection);
actualCollection.Should().OnlyHaveUniqueItems(expectedCount);
actualCollection.Should().OnlyContain(temp => condition);

actualCollection.Should().BeInAscendingOrder(temp =>
       temp.Property);
actualCollection.Should().BeInDescendingOrder(temp =>
       temp.Property);

actualCollection.Should().NotBeInAscendingOrder(temp =>
       temp.Property);
actualCollection.Should().NotBeInDescendingOrder(temp =>
       temp.Property);

delegateObj.Should().Throw<ExceptionType>();
delegateObj.Should().NotThrow<ExceptionType>();

await delegateObj.Should().ThrowAsync<ExceptionType>();
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).

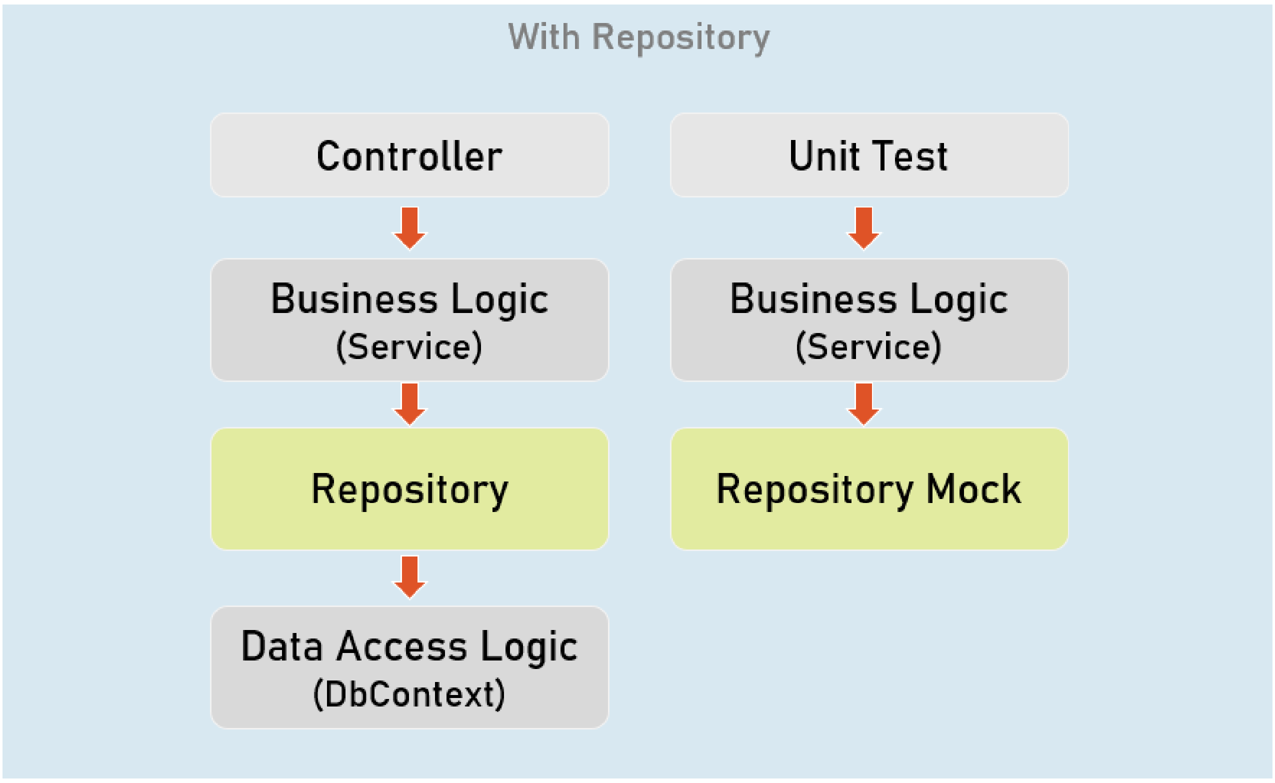
Changing data store

(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

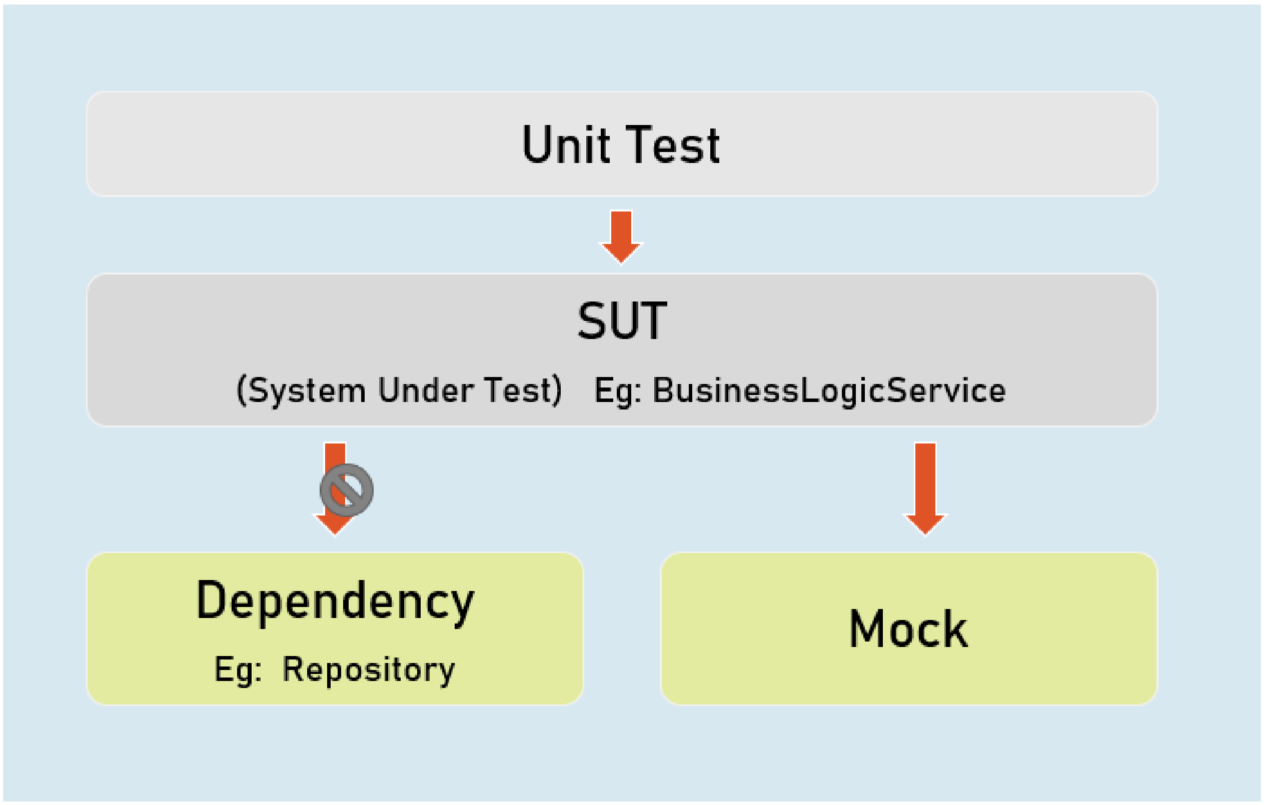


`Install-Package Moq`

Mocking the Repository:

```
//mock the repository
Mock<IRepository> repositoryMock = new Mock<IRepository>();
```

```
//mock a method repository method
repositoryMock.Setup(temp => temp.MethodName(It.Any<ParameterType>
       ()))
 .Returns(return_value);

//create service instance with mocked repository
var service = newServiceClass(repositoryMock.Object);
```



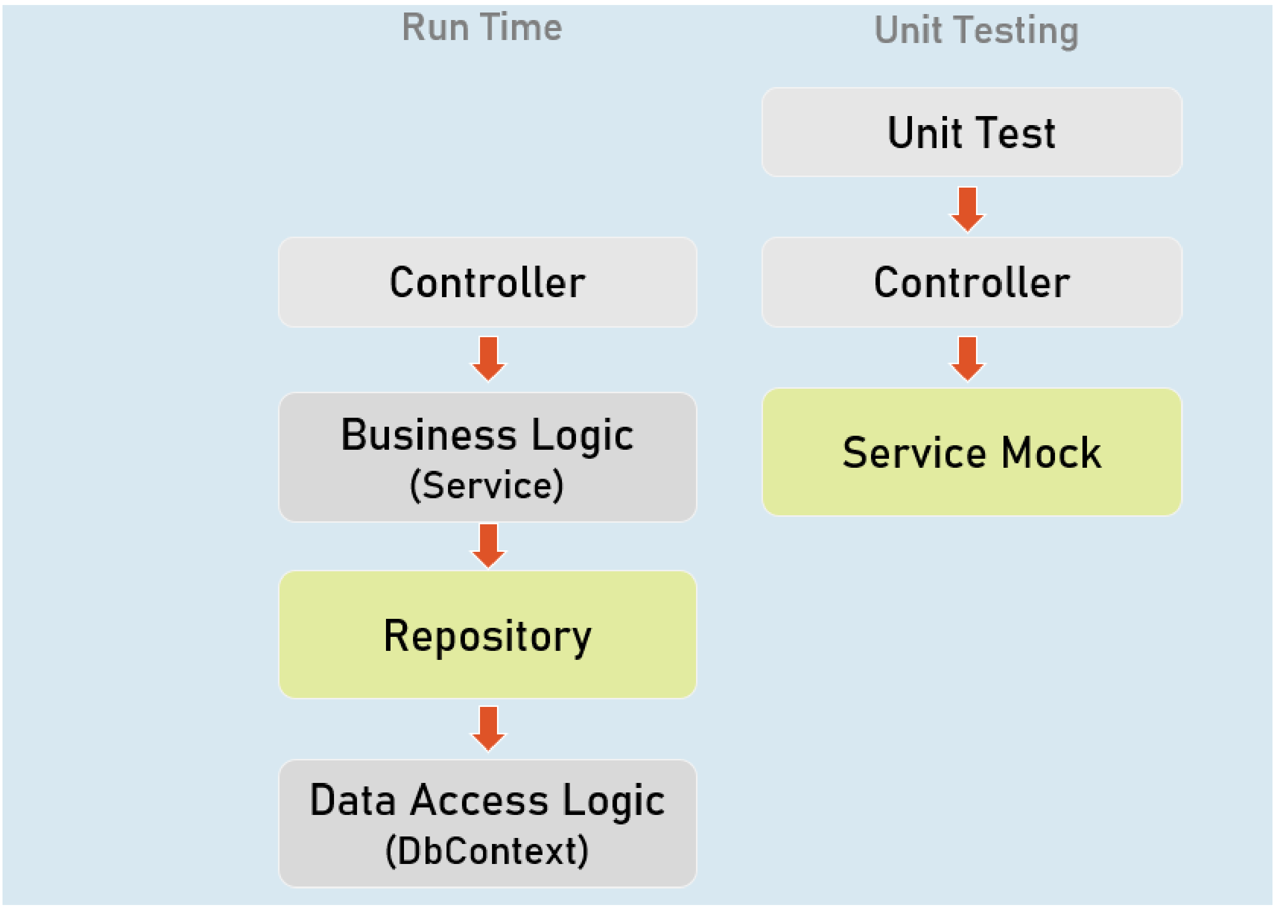
Mock<IPersonsRepository>

Used to mock the methods of IPersonsRepository.

IPersonsRepository

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

Unit Testing the Controller

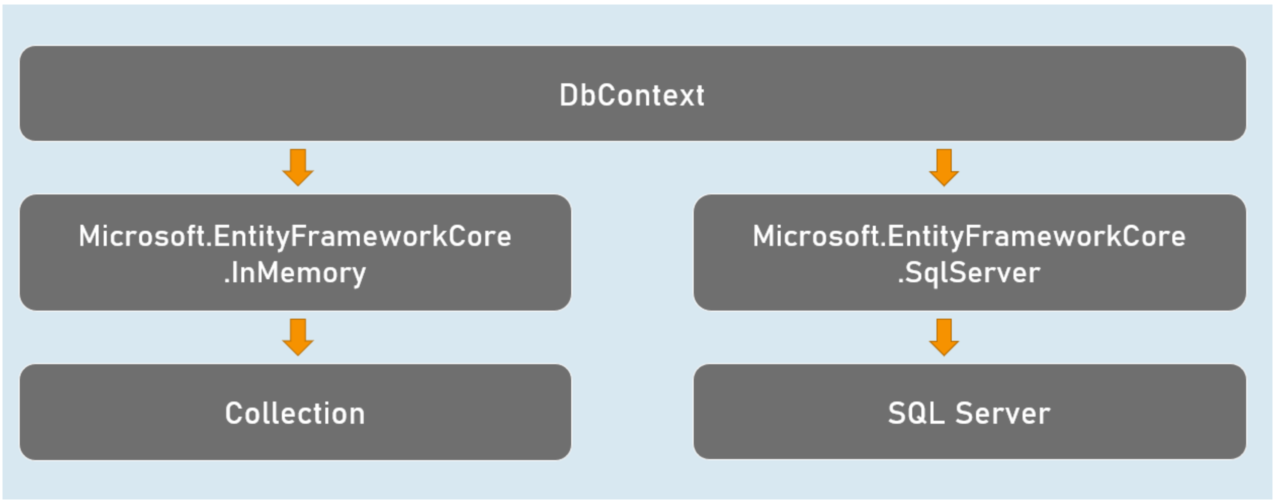


Unit Testing the Controller:

```
//Arrange
ControllerName controller = new ControllerName();

//Act
IActionResult result = controller.ActionMethod();
```

```
//Assert
result.Should().BeAssignableTo<ActionResultType>(); //checking
       type of action result
result.ViewData.Model.Should().BeAssignableTo<ExpectedType>();
       //checking type of model
result.ViewData.Model.Should().Be(expectedValue); //you can also
       use any other assertion
```

EFCore In-Memory Provider

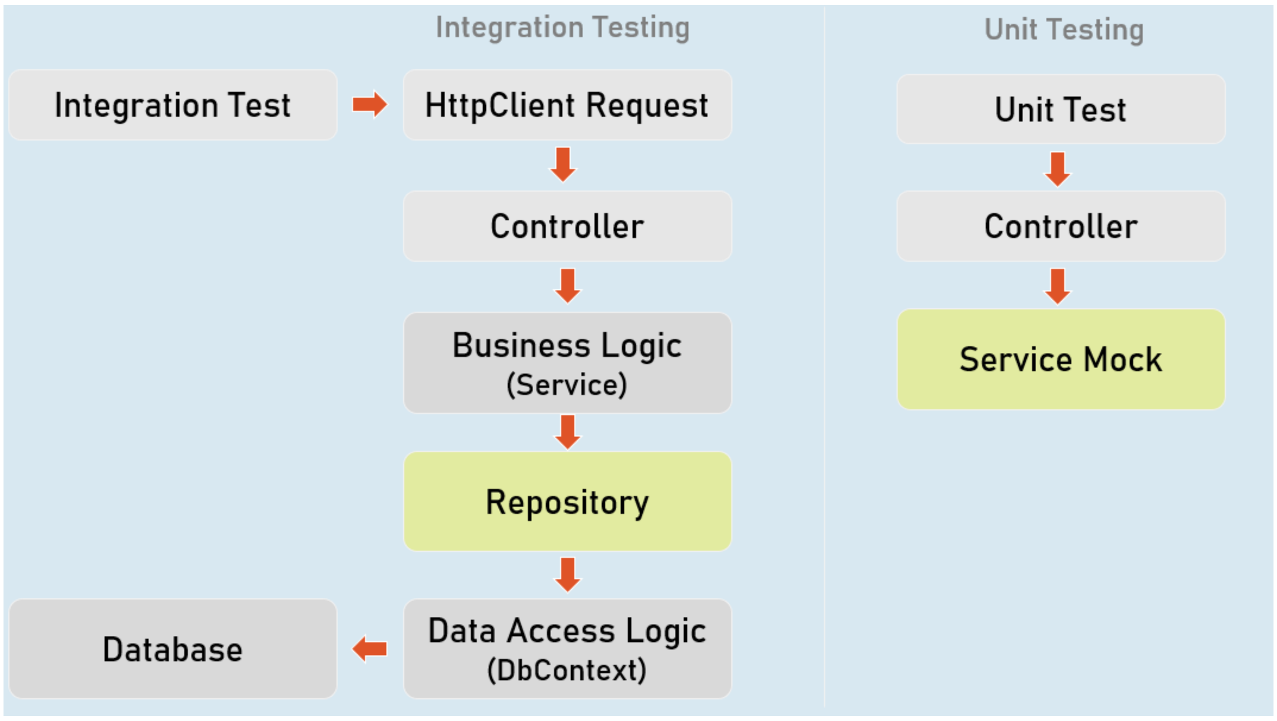

DbContext
Microsoft.EntityFrameworkCore .InMemory
Microsoft.EntityFrameworkCore .SqlServer
Collection
SQL Server

```
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();

//Create client
HttpClient client = factory.CreateClient();

//Send request client
HttpResponseMessage response = await client.GetAsync("url");

//Assert
result.Should().BeSuccessful(); //Response status code should be
        200 to 299
```