Unit Testing ASP.NET Core API Controllers

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Coming Up

Code coverage and deciding what to unit test

Testing controllers

- Variety of techniques

Test the behavior you coded yourself

Code Coverage and Deciding What to Unit Test

Steer away from generalizations like “don’t test repositories”, “don’t test constructors”, …

- Architectures, pattern implementations, … often differ from project to project
- So-called best practices are sometimes diverted from, on purpose or accidentally

Code Coverage and Deciding What to Unit Test

Trying to achieve 100% code coverage can be counterproductive

- ROI from writing the last 10% might not be worth it

A high code coverage percentage is not an indicator of success, or of code quality.

A high code coverage percentage only truly represents the amount of code that is covered by unit tests.

```
[HttpGet]
public async Task<ActionResult<IEnumerable<InternalEmployeeDto>>> GetInternalEmployees()
{
     var internalEmployees = await _employeeService.FetchInternalEmployeesAsync();
     var internalEmployeeDtos = internalEmployees.Select(e => new InternalEmployeeDto() {
          Id = e.Id,
          FirstName = e.FirstName,
          LastName = e.LastName,
          Salary = e.Salary,
          SuggestedBonus = e.SuggestedBonus,
          YearsInService = e.YearsInService });

     return Ok(internalEmployeeDtos);
}
```

Controllers Types: Thick Controllers

Thick controllers contain logic that implements the expected behavior
This is code that should be unit tested

```
[HttpGet]
public async Task<ActionResult<IEnumerable<InternalEmployeeDto>>>
GetInternalEmployees()
{
    var internalEmployeeDtos = await _employeeService.FetchInternalEmployeesAsync();
    return Ok(internalEmployeeDtos);
}
```

Controllers Types: Thin Controllers

Thin or skinny controllers delegate the actual implementation of the behavior to other components
These typically don’t need to be unit tested

Introduction to Testing API Controllers

A variety of reasons can lead to choosing for thin or thick controllers...

- One isn't necessarily better than the other

Can lead to a different decision regarding whether controllers should be unit tested

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You don't always have the luxury to decide

- You may get thrown into an existing project halfway through
- You may need to improve the reliability of an existing, finished application by writing tests

Not every application is built with the same level of quality

Introduction to Testing API Controllers

Automated tests can improve an application's reliability (potentially on the way to refactoring)

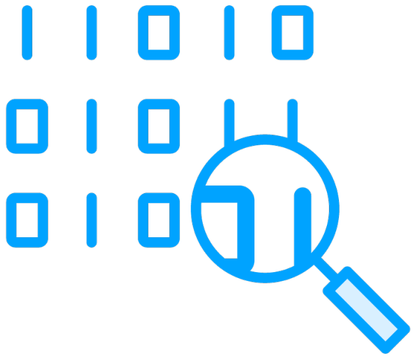
- Taking a pragmatic approach to unit testing can be valuable

Introduction to Testing API Controllers

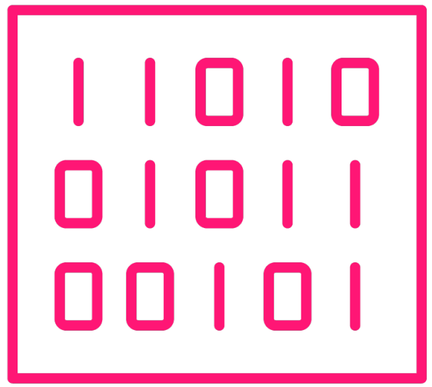
Test isolation is important

- Avoid model binding, filters, routing, ...

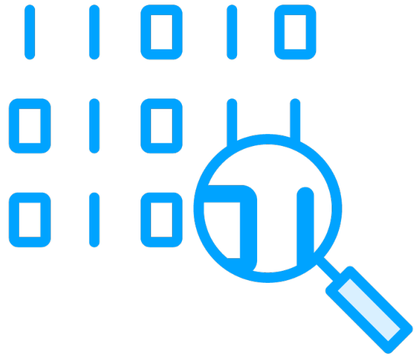
Introduction to Testing API Controllers



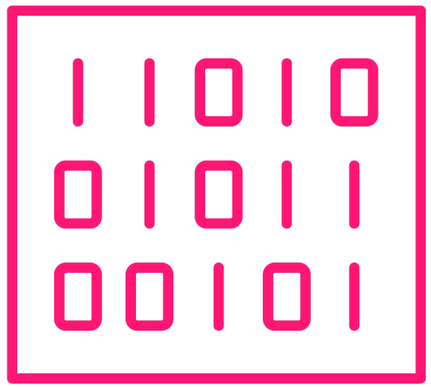
Expected return type



Expected type of the returned data



Expected values of the returned data



Other action logic that's not framework-related code

Introduction to Testing API Controllers

Concerns when unit testing controllers:

- Mocking controller dependencies
- Working with `ModelState` in tests
- Dealing with `HttpContext`
- Working with `HttpClient` calls in tests
- ...

Demo

Verifying `ActionResult` types when testing

Demo

Verifying model types when testing

Demo

Verifying model content when testing

Demo

Combining controller action asserts in one unit test and testing mapping code

Demo

Dealing with AutoMapper dependencies

Demo

Testing validation and `ModelState`

HttpContext

An object which encapsulates all HTTP-specific information about an individual HTTP request: a container for a single request

Common Information in HttpContext

Request

Response

Features (connection, server info, ...)

User

Testing with HttpContext

Use the built-in default implementation:
`DefaultHttpContext`

Use Moq for mocking:
`Mock<HttpContext>`

Demo

Testing with `HttpContext.Features`

Demo

Testing with `HttpContext.User`

Demo

Testing with `HttpClient` calls

Summary

Testing API controllers

- `ActionResult<T>`, DTO models, `ModelState`, `HttpContext`, ...

Use Moq or other test doubles

Up Next:

Unit Testing ASP.NET Core Middleware, Filters and Service Registrations