

ANGULAR TESTING

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Agenda

- What is Automated Testing?
- Types of Tests
- Fundamentals of Unit Testing
- Set Up and Tear Down
- Spies
- Code Coverage
- Angular Testing Utilities - TestBed
- Working with Components
- Testing Property & Event Bindings
- Handling Component Dependencies
- Testing Async Operations
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What is Automated Testing?

- Practice of writing code to test our code
- Run tests in an automated fashion
- Manual testing is time consuming
- Writing automated tests – is this not time consuming?
 - App code
 - Test code
- Automated testing
 - helps you catch defects before releasing your software
 - build software of better quality
 - help you become a better developer
 - enforces you to write better and more reliable code
- Be pragmatic, automated testing may not be good for
 - start ups – limited time, limited budget, not sure about product future
 - frequent change in requirements – will need change in test code

Types of Tests

- Unit tests
 - Test a component in isolation, without external resources like database, file, etc
 - Easy to write
 - Fast
 - Don't test functionality of app, low confidence
 - Angular – Testing Component code in isolation (without template)
- Integration tests
 - Test a component with external resources
 - Better confidence than unit tests
 - Angular – Testing Component code with External Template
- End-to-end tests
 - Test the entire app as a whole
 - Test the app functionality, more confidence
 - Slow and fragile
- Ideal scenario
 - Spend more time to write unit and integration tests
 - Write few end-to-end tests for only the key functionality

Fundamentals of Unit Testing

- Tests are first-class citizens
 - Clean coding practices
 - Apply same principles as the functional code
 - Small functions / methods – 10 lines or less
 - Proper naming
 - Single responsibility – test only one thing
- Angular Testing Tools
- Jasmine
 - A behavior-driven development framework for testing JavaScript code
 - Dependency free and doesn't require a DOM
- Karma
 - A test runner for writing and running unit tests while developing Angular apps
- Protractor
 - Write and run end-to-end (e2e) tests

Fundamentals of Unit Testing

- Test files should have .spec.ts extension
- Running tests using Angular CLI
 - ng test
- describe() – define a suite – group of related tests
 - describe('suite-name', function)
- it() – define a spec or test
 - it('spec-name', function)
- expect()
 - Jasmine API
 - Takes actual value as the parameter
 - Chained with a Matcher function
- Matcher function
 - Takes the expected value as parameter
 - Responsible for reporting to Jasmine if the expectation is true or false

```
expect(result).toBe('value')  
expect(result).toContain('value')  
expect(result).toEqual(12)  
expect(result).toBeNull()  
expect(result).toBeTruthy()
```

Set Up and Tear Down

- Arrange - initialize the system under test
- Act - calling a method / function
- Assert – assertion

- `beforeEach(function)`
 - Run some shared setup before each of the specs in the describe in which it is called
- `afterEach(function)`
 - Run some shared teardown after each of the specs in the describe in which it is called
- `beforeAll(function)`
 - Run some shared setup once before all of the specs in the describe are run
- `afterAll(function)`
 - Run some shared teardown once after all of the specs in the describe are run

Spies

- `spyOn()`
 - Install a spy onto an existing object
- `spyOn(object, 'methodName').and.callFake(function)`
 - function should match 'methodName' signature
- `spyOn(object, 'methodName').and.returnValue(observable)`
- `Observable.from([array])`
- `Observable.empty()`
- `Observable.throw(error)`
- `expect(spy).toHaveBeenCalled()`
- `expect(spy).toHaveBeenCalledWith(id)`

Code Coverage

- How much of our code is covered with tests?
- `ng test --code-coverage`
- Open 'index.html' within 'coverage' folder in the project

Angular Testing Utilities - TestBed

- Used to test interaction between a component and its template or with other components
- Include TestBed class and several other helper functions
- Module - '@angular/core/testing'
- TestBed
 - The first and most important Angular testing utility
- TestBed.configureTestingModule(metadataObject)
 - Used to create a dynamic Angular testing module
 - Takes an @NgModule-like metadata object
 - 'metadataObject' can have most of the properties of NgModule.

Working with Components

- `TestBed.createComponent(component)`
 - Used to create an instance of component-under-test
 - Returns ***component test fixture***
- `ComponentFixture`
 - Wrapper around a component
 - Gives access to component instance as well as its template (DOM representation)
- `ComponentFixture.componentInstance`
 - Returns instance of the component class
- `ComponentFixture.nativeElement`
 - Returns the native DOM element at the root of the component
- `ComponentFixture.debugElement`
 - Provides a wrapper object around component's root native element
 - Provides useful methods for querying the DOM

Testing Property & Event Bindings

- `DebugElement.query(predicate)`
 - Used to query the DOM
 - predicate is a function that returns true if a condition is met
 - Returns the first element that matches the predicate
- `By.css()`
 - Predicates for use with `DebugElement`'s query functions
 - Match elements by the given CSS selector
- `ComponentFixture.detectChanges()`
 - Trigger a change detection cycle for the component
- `DebugElement.triggerEventHandler('eventName', eventObj)`
 - Used to trigger an event on an element. For e.g., to invoke 'click' event on a button with id 'save', following code is used
 - `const button = fixture.debugElement.query(By.css('#save'));`
 - `button.triggerEventHandler('click', null);`

Handling Component Dependencies

- Providing Dependencies

- Register the service in the testing module by adding it to the 'providers' array
- Register any other Angular dependency in the testing module by adding it to 'imports' array
 - For e.g., if the service internally uses Http, add HttpClientModule to 'imports' array of testing module configuration

- Getting Dependencies

- TestBed.get(service)
 - Returns a reference to 'service' instance injected in a component

Handling Component Dependencies

- Providing Stubs

- Identify the dependencies and their methods that are used within the component
- Create a stub class for each of the dependencies
- Define method stubs
- Replace the actual dependency with their corresponding stub implementation within the 'providers' array

```
TestBed.configureTestingModule({
  declarations: [ UserDetailsComponent ],
  providers: [
    { provide: Router, useClass: RouterStub },
    { provide: ActivatedRoute, useClass: ActivatedRouteStub }
  ]
})
```

Handling Component Dependencies

- Testing the navigation
 - Get Router object from TestBed
 - Spy on 'navigate()' method
 - Invoke component's 'save()' method
 - Verify if 'router.navigate()' method is called with '/users' route
- Handling route parameters
 - Define a Subject observable object within ActivatedRoute stub class
 - Add public 'push()' method. Call 'next()' method on subject instance to propagate the parameter to the observer
 - Add public 'params' getter that returns subject instance as an observable
 - Within the test, call 'push()' and pass an object with 'id' property set to 0
 - Verify if 'router.navigate()' method is called with 'not-found' route
- Testing RouterOutlet components
 - Verify if the component template contains 'RouterOutlet' directive
 - Verify if the component template contains 'RouterLinkWithHref' directive
 - Add 'RouterTestingModule' to 'imports' array of testing module
- Misc Tests
 - Shallow Component Tests
 - NO_ERRORS_SCHEMA
 - Testing Custom Directives

Testing Async Operations

- `async()`
 - Runs the body of a test (it) or setup (beforeEach) function within a special async test zone
- `ComponentFixture.whenStable()`
 - Returns a promise that resolves when the fixture is stable
 - To resume testing after completion of asynchronous activity or asynchronous change detection, hook that promise
- `fakeAsync()`
 - Runs the body of a test (it) within a special fakeAsync test zone, enabling a linear control flow coding style
- `tick()`
 - Simulates the passage of time and the completion of pending asynchronous activities

Q & A

- Thank you!