ANGULAR
ARCHITECTS
INSIDE KNOWLEDGE

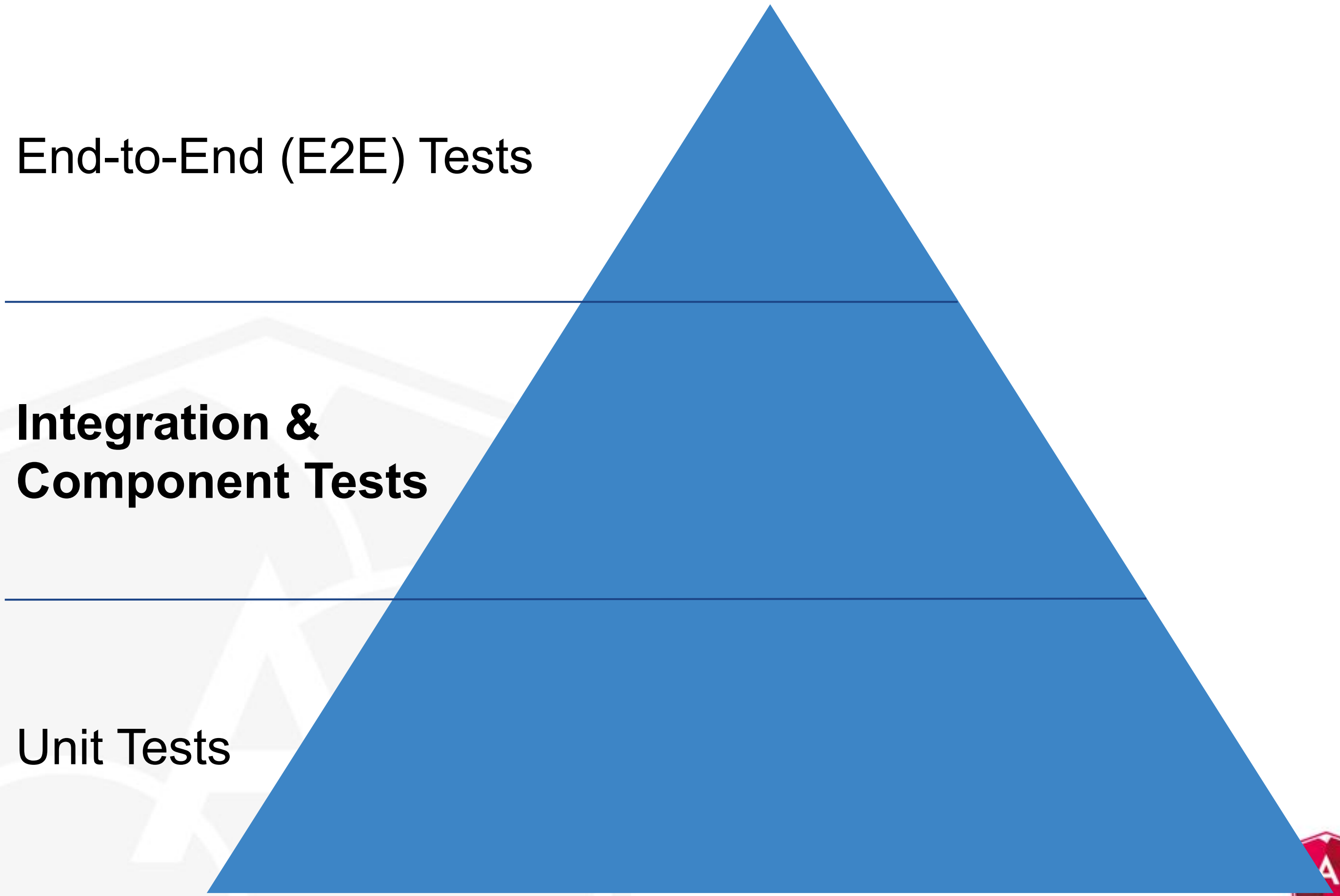
Angular Testing

5 - Component & Integration Tests

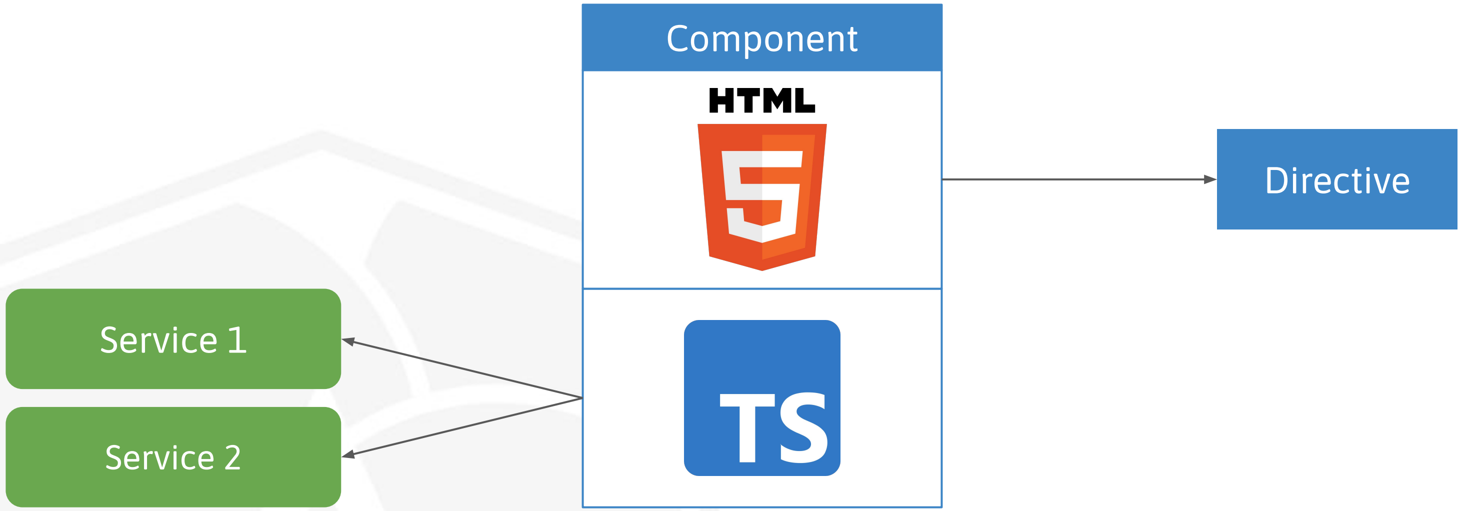
End-to-End (E2E) Tests

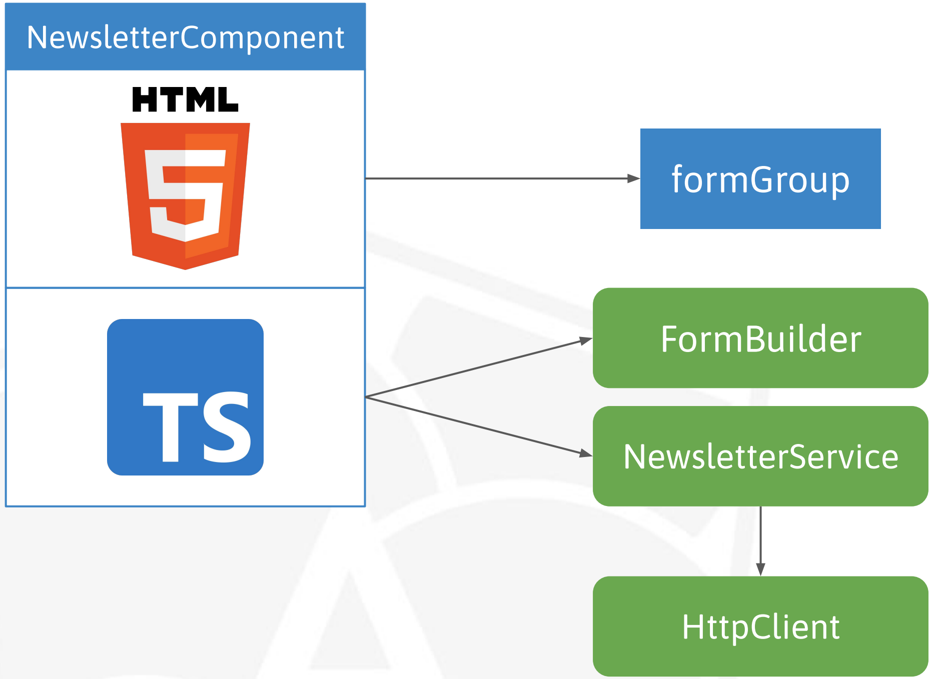
Integration &
Component Tests

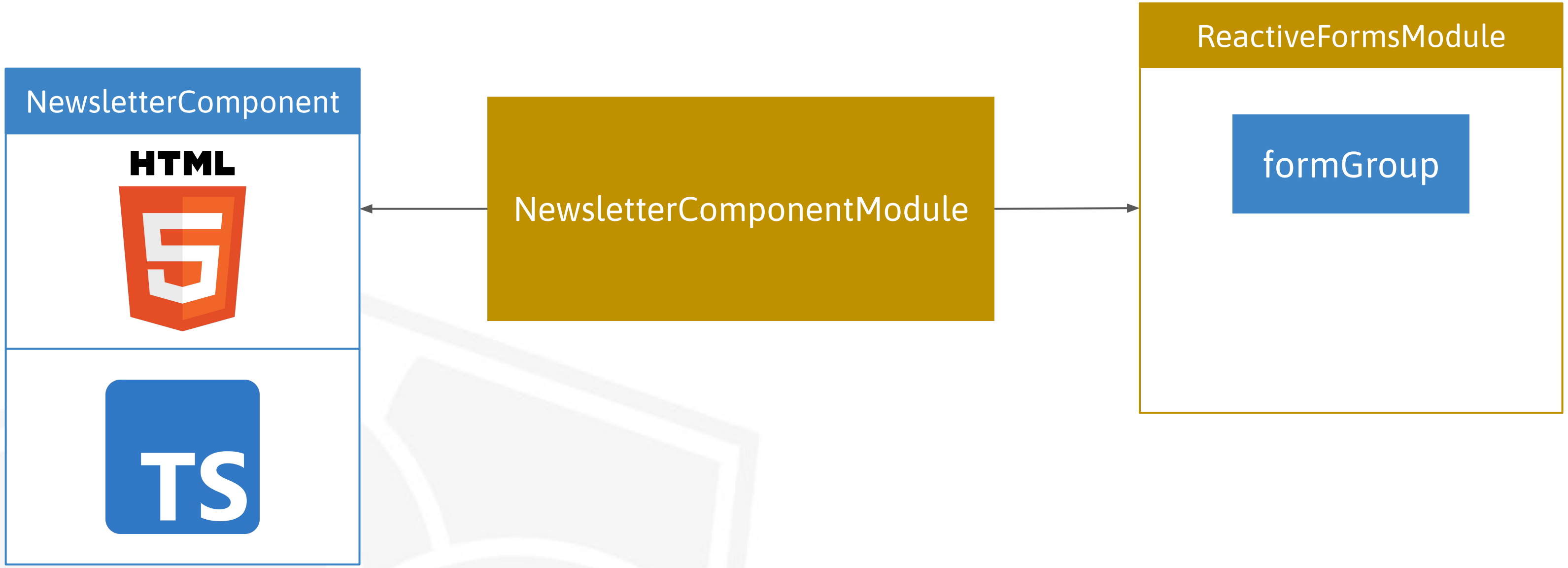
Unit Tests



Configuring the TestingModule

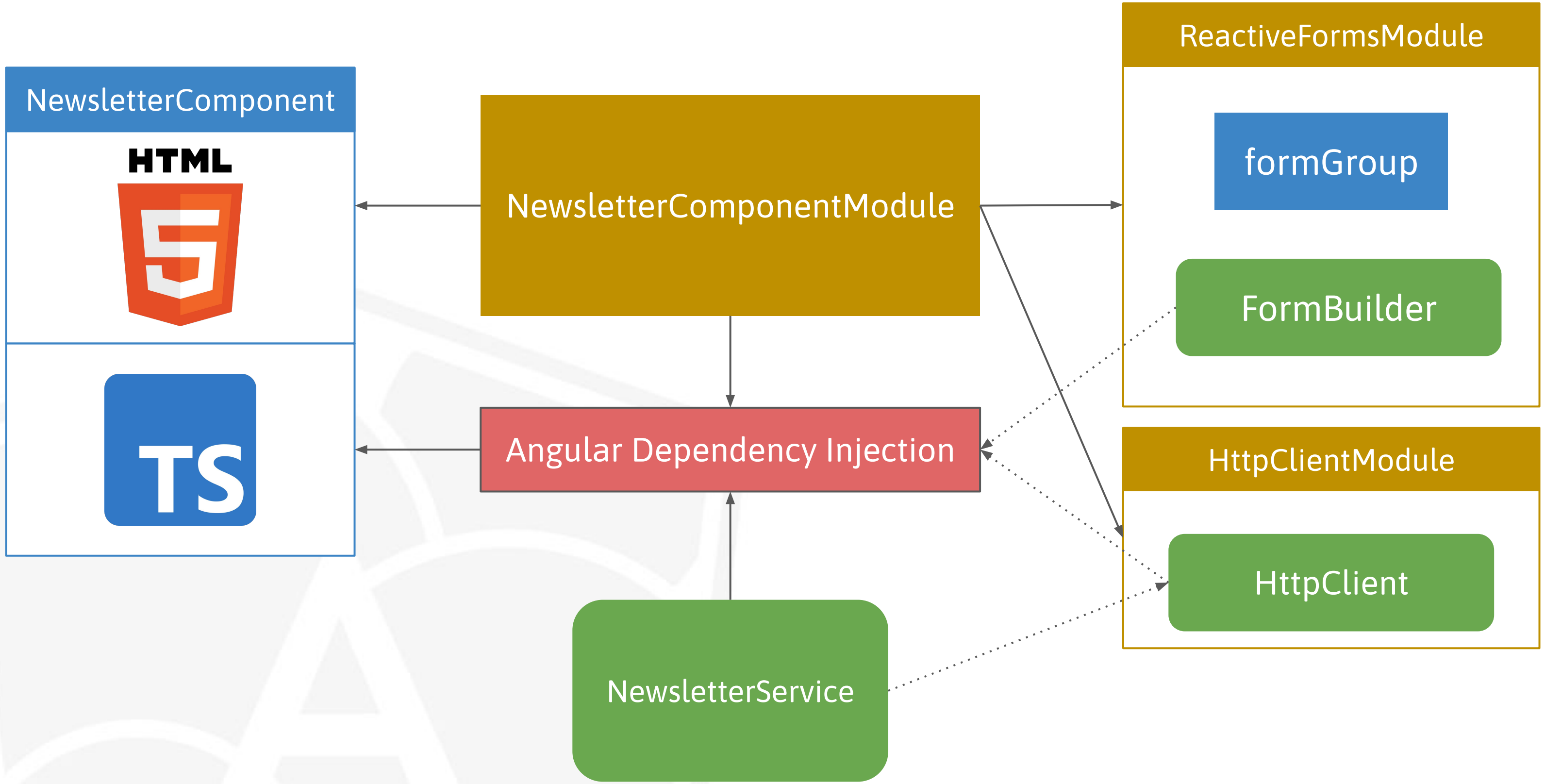

Component
HTML
TS
Directive
Service 1
Service 2


NewsletterComponent
HTML
TS
formGroup
FormBuilder
NewsletterService
HttpClient


NewsletterComponent
HTML
TS
NewsletterComponentModule
ReactiveFormsModule
formGroup

Different Ways of providing Services

1. @Injectable({providedIn: 'root'})
2. `providers` property of an NgModule
3. `providers` property of a Component/Pipe/Directive



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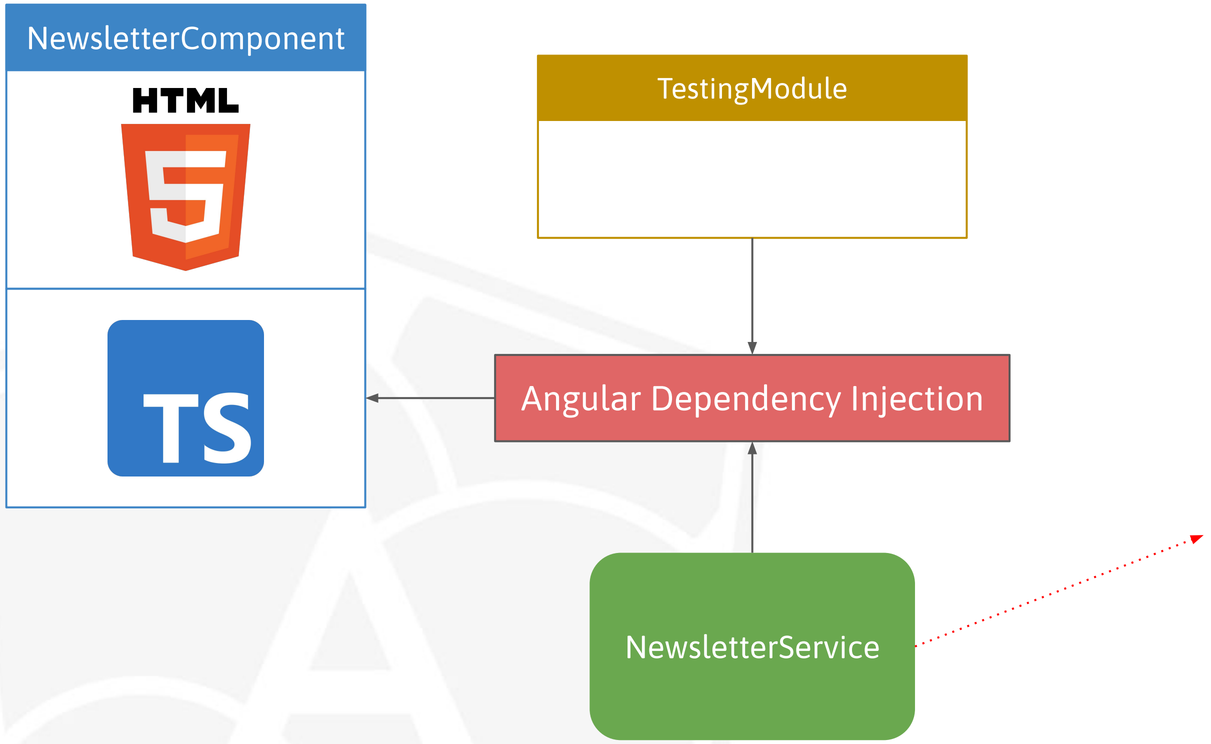
Testing Module

```
const fixture = TestBed.configureTestingModule({})
```

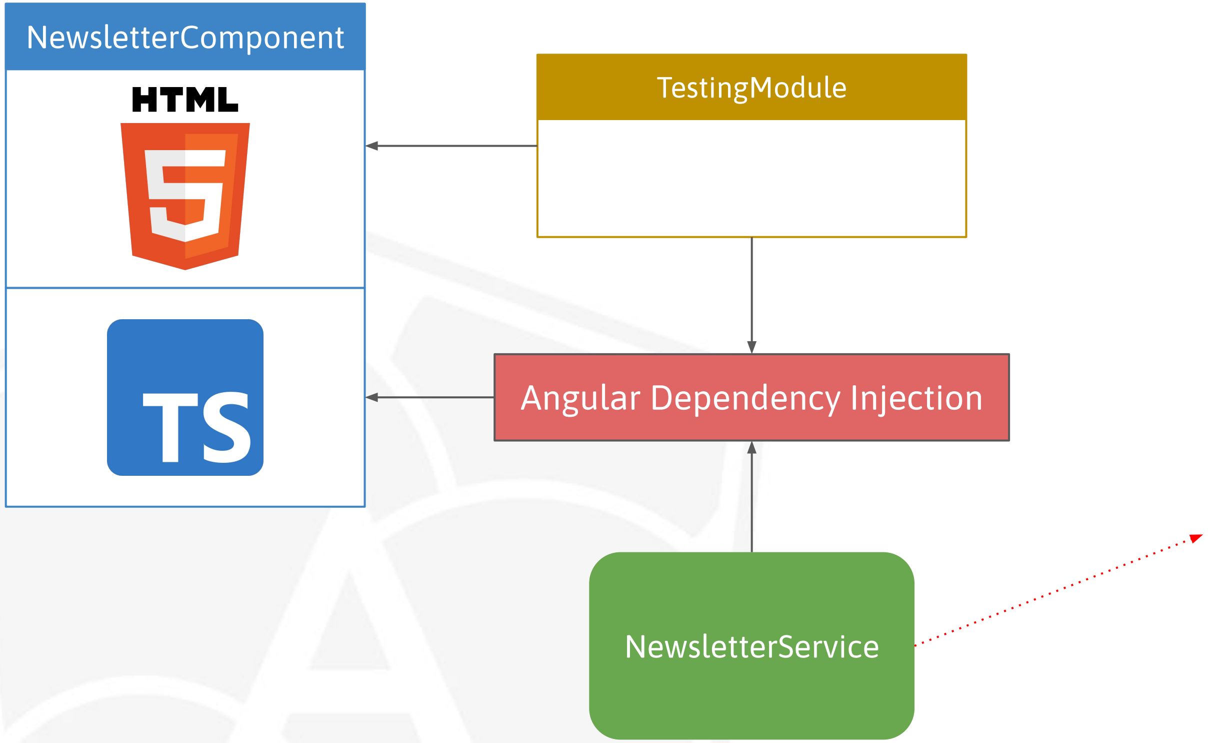

NewsletterComponent
HTML
TS
TestingModule
Angular Dependency Injection
NewsletterService

Testing Module

```
const fixture = TestBed.configureTestingModule({

  declarations: [NewsletterComponent]

})
```


NewsletterComponent
HTML
TS
TestingModule
Angular Dependency Injection
NewsletterService

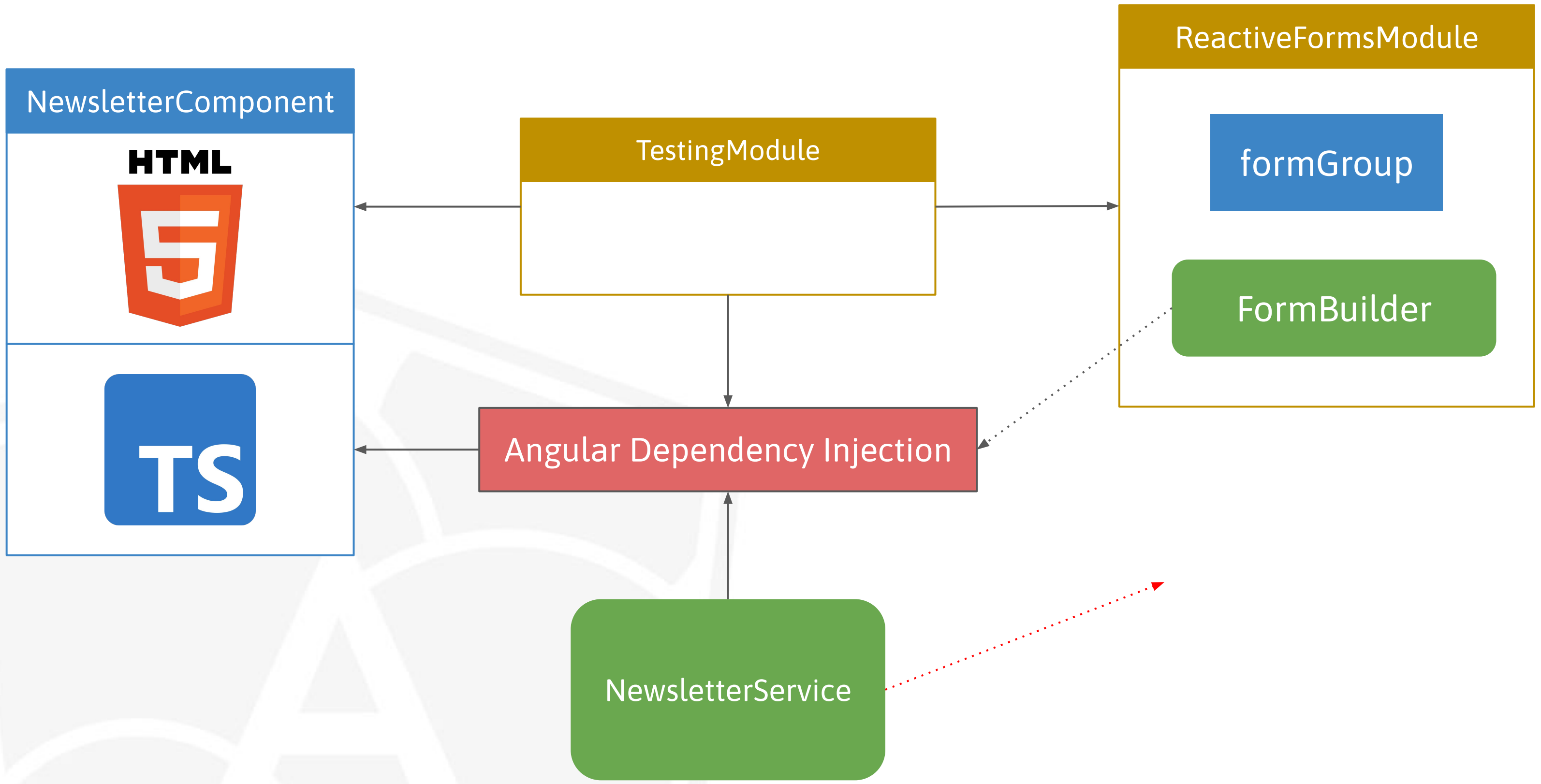
Testing Module

```
const fixture = TestBed.configureTestingModule({

  declarations: [NewsletterComponent],

  imports: [ReactiveFormsModule]

})
```



NewsletterComponent
HTML
TS
TestingModule
ReactiveFormsModule
formGroup
FormBuilder
Angular Dependency Injection
NewsletterService

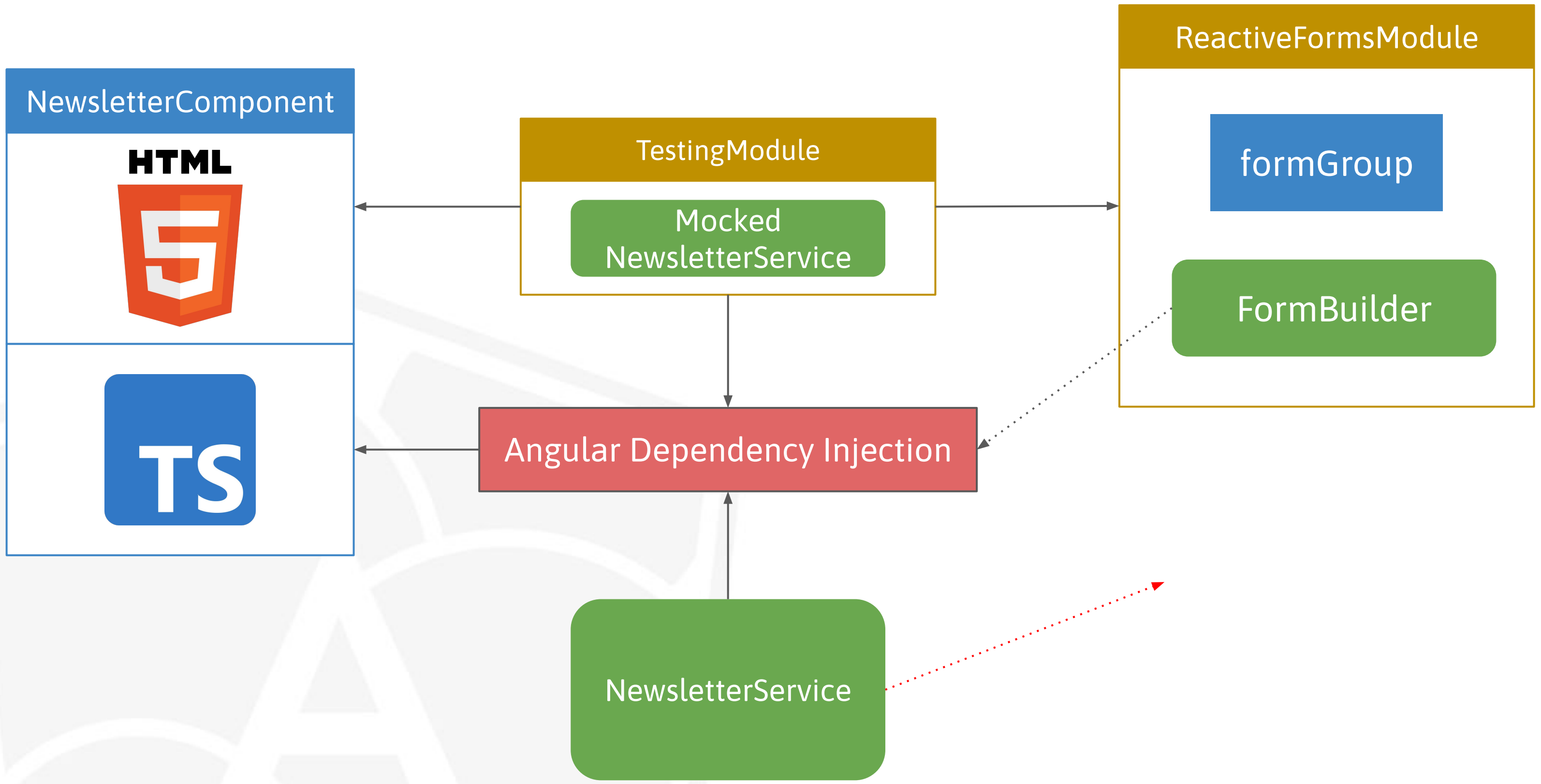
Adding Dependency Injection

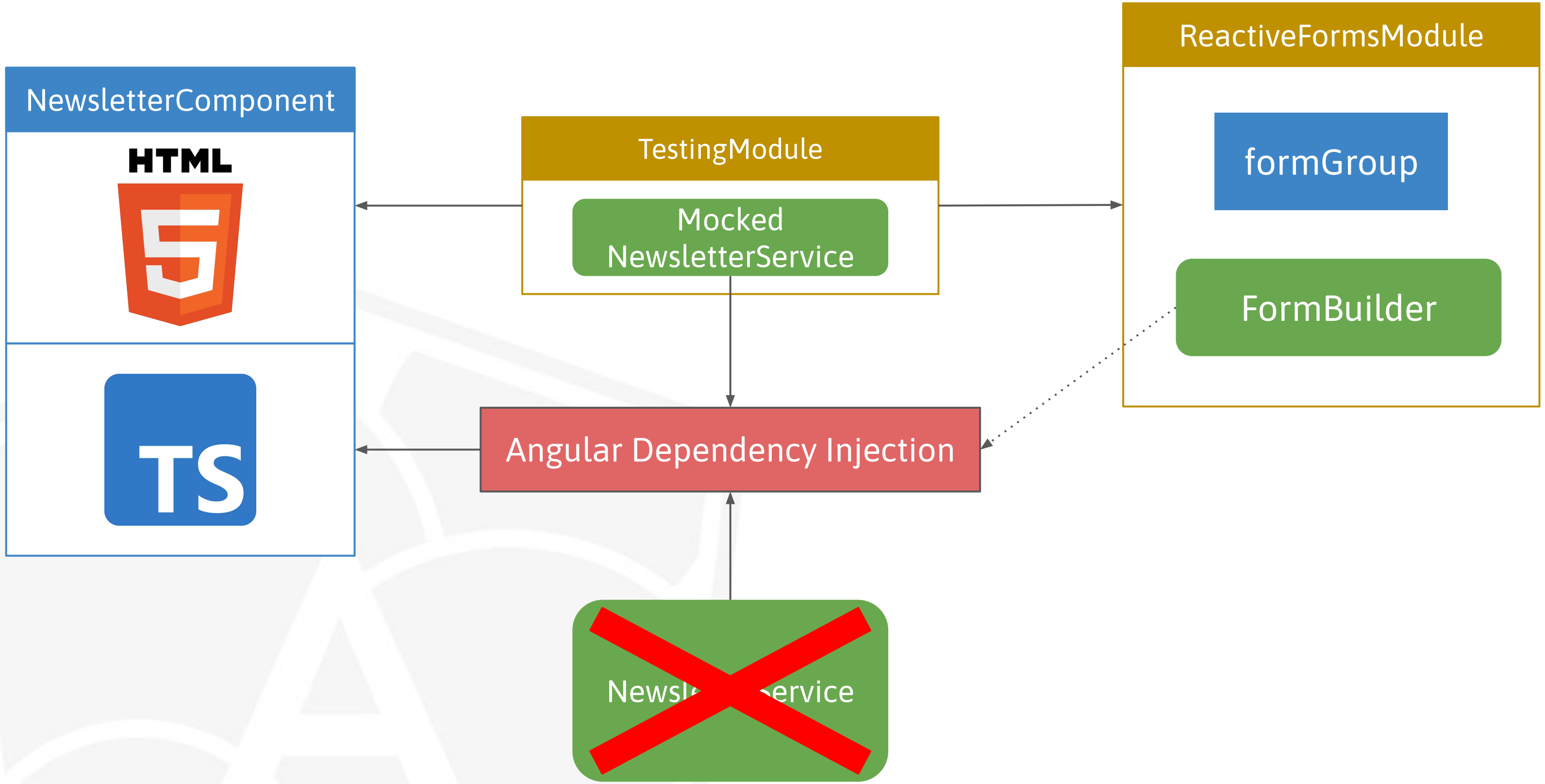
```
const fixture = TestBed.configureTestingModule({

  declarations: [NewsletterComponent],

  providers: [{ provide: NewsletterService, useValue: null }]

})
```


NewsletterComponent
HTML
TS
TestingModule
Mocked NewsletterService
ReactiveFormsModule
formGroup
FormBuilder
Angular Dependency Injection
NewsletterService


NewsletterComponent
HTML
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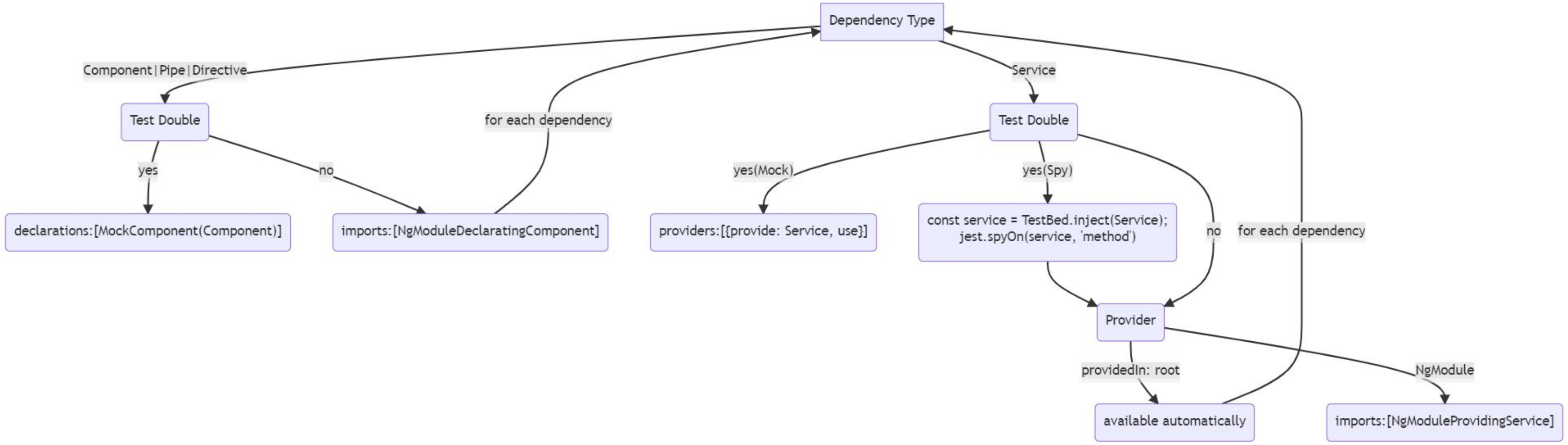
TestingModule
Mocked NewsletterService
ReactiveFormsModule
formGroup
FormBuilder
Angular Dependency Injection
NewsletterService

Decision Tree: TestingModule


Dependency Type
Component | Pipe | Directive
Test Double
yes
declarations:[MockComponent(Component)]
no
imports:[NgModuleDeclaratingComponent]
for each dependency
Service
Test Double
yes(Mock)
providers:[{provide: Service, use}]
yes(Spy)
const service = TestBed.inject(Service);
jest.spyOn(service, 'method')
no
for each dependency
Provider
providedIn: root
available automatically
NgModule
imports:[NgModuleProvidingService]

Mock Visual Elements

Mocking Components

1. "Three Monkeys"
2. Component Stubs
3. ng-mocks
4. Don't mock!

Mocking Components - Three Monkeys

```
it('should mock components in 🙊🙉🙈 style, () => {
  const fixture = TestBed.configureTestingModule({
    declarations: [RequestInfoComponent],
    schemas: [NO_ERRORS_SCHEMA]
  }).createComponent(RequestInfoComponent);
  fixture.detectChanges();
  expect(true).toBe(true);
});
```

Mocking Components - Manually

```
it('should stub the components', () => {
  @Component({ selector: 'mat-form-field', template: '' })
  class MatFormField {}

  const fixture = TestBed.configureTestingModule({
    declarations: [RequestInfoComponent, MatFormField],
    imports: [ReactiveFormsModule]
  }).createComponent(RequestInfoComponent);

  fixture.detectChanges();
  expect(true).toBe(true);
});
```

Mocking Components - ng-mocks

```
it('should stub the components', () => {
  const fixture = TestBed.configureTestingModule({
    declarations: [RequestInfoComponent, MockComponent(MatFormField)],
    imports: [ReactiveFormsModule]
  }).createComponent(RequestInfoComponent);

  fixture.detectChanges();
  expect(true).toBe(true);
});
```

Mocking Components - Don't

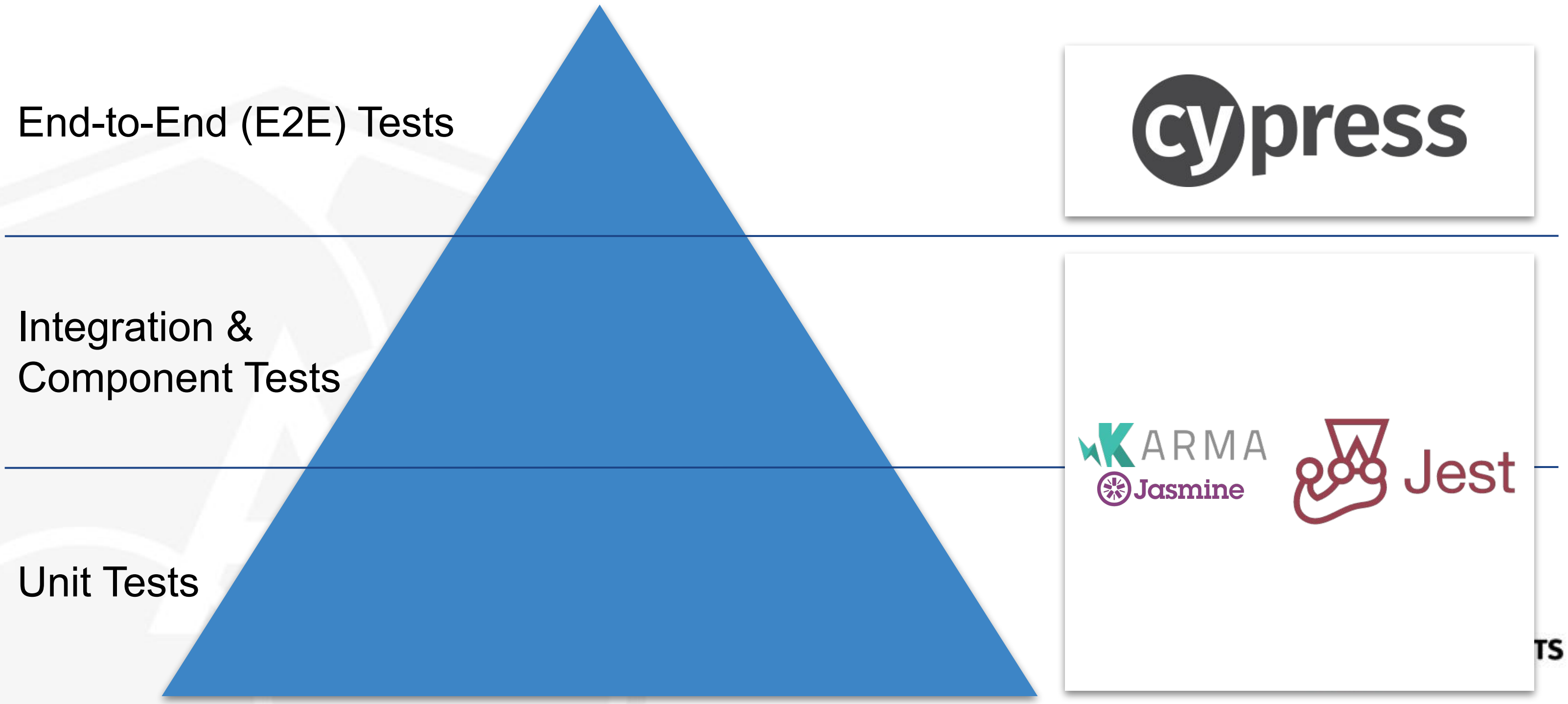
```
it('should import the modules', () => {
  const fixture = TestBed.configureTestingModule({
    declarations: [RequestInfoComponent],
    imports: [ReactiveFormsModule, MatFormFieldModule, MatHintModule, MatLabelModule]
}).createComponent(RequestInfoComponent);

  fixture.detectChanges();

  expect(true).toBe(true);
});
```

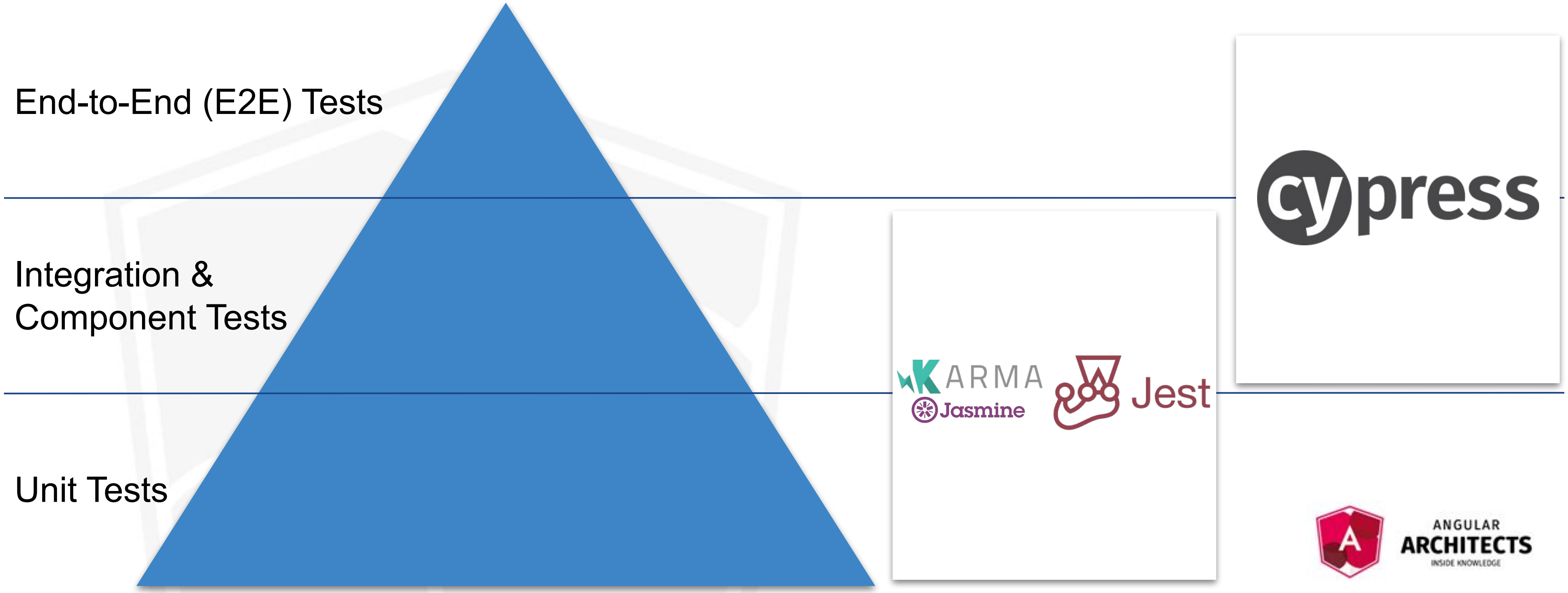
Cypress Component Test Runner

Classic testing pyramide



TS

Testing pyramide with Cypress Component Test Runner



Classic Way 1/2

```
it('should find an address', fakeAsync(() => {
  const fixture = TestBed.configureTestingModule({
    declarations: [RequestInfoComponent],
    imports: [
      NoopAnimationsModule,
      HttpClientTestingModule,
      CommonModule,
      ReactiveFormsModule,
      MatButtonModule,
      MatFormFieldModule,
      MatInputModule,
      MatIconModule
    ]
  }).createComponent(RequestInfoComponent);
  fixture.detectChanges();

  // ...
```

Classic Way 2/2

```
it('should find an address', fakeAsync(() => {
  // ...

  const input = fixture.debugElement.query(By.css('[data-testid=address]'))
    .nativeElement as HTMLInputElement;
  const button = fixture.debugElement.query(By.css('[data-testid=btn-search]'))
    .nativeElement as HTMLButtonElement;

  input.value = 'Domgasse 5';
  input.dispatchEvent(new CustomEvent('input'));
  button.click();

  TestBed.inject(HttpTestingController)
    .expectOne((req) => !!req.url.match(/nominatim/))
    .flush([true]);
  tick(1000);
  fixture.detectChanges();

  const message = fixture.debugElement.query(By.css('[data-testid=lookup-result]'))
    .nativeElement as HTMLParagraphElement;

  expect(message.textContent).toBe('Brochure sent');
}));
```

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E2E

```
it('should test the request info', () => {
  cy.visit('');
  cy.testid('btn-holidays').click();
  cy.get('app-holiday-card').first().find('a').click();
  cy.testid('address').type('Domgasse 5');
  cy.testid('btn-search').click();
  cy.testid('lookup-result').should('have.text', 'Brochure sent');
});
```

Current situation

- Component/Integration tests are too hard
  - Managing asynchrony
  - DOM interaction
  - Setup TestBed
- Mitigation via libraries like testing-library, etc. possible
- Developers favour E2E ➪ absence of Component tests

Integration/Component vs. E2E Tests

Integration/Component Tests

✅ Test components in isolation

✅ Precision & Control

✅ Fast

⛔ TestBed Setup

⛔ Manage asynchrony

⛔ Manage change detection

⛔ "DOM interaction"

E2E Tests

✅ No asynchrony management

✅ No change detection management

✅ Developer experience

- Browser feedback
- Screenshots
- Video recording
- Tasks, network stubbing,...

⛔ Infrastructure setup required

⛔ Slow

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Component/Integration in Cypress

✅ Test components in isolation

✅ Precision & Control

✅ No asynchrony management

✅ No change detection management

✅ Developer experience

⛔ TestBed Setup

⛔ Speed???

Setup

```
const setup = () => {
 const lookuper = {
   lookup(address: string) {
     return scheduled([address === "Domgasse 5"], asyncScheduler);
   },
 };
 mount(RequestInfoComponent, {
   imports: [NoopAnimationsModule],
   providers: [{ provide: AddressLookuper, useValue: lookuper }],
 });
};
```

Tests

```
it(`should show ${message} for ${address}`, () => {
  setup();
  cy.get("[data-testid=ri-address]").type(address);
  cy.get("[data-testid=ri-search]").click();
  cy.get("[data-testid=ri-message]").should("have.text", message);
});
```

Limitations

- ~~Only direct dependencies of a component can be mocked~~
- cy.clock/tick is not working
- ~~inject() & private~~
- Missing mocking libraries
  - sinon instead of jest
- ~~Technology in alpha stadium~~

Miscellaneous

HttpTest

```
it("should use Angular's http mock", () => {
  TestBed.configureTestingModule({
    declarations: [RequestInfoComponent],
    imports: [ReactiveFormsModule, HttpClientTestingModule],
  });
  const fixture = TestBed.createComponent(RequestInfoComponent);
  // queries for DOM Elements button and messageBox
  const httpController = TestBed.inject(HttpTestingController);

  button.click()

  const request = httpController.expectOne((req) => !!req.url.match(/nominatim/));
  request.flush([{ street: "Domgasse", streetNumber: 5 }]);
  expect(lookupResult.textContent).toBe("Address found");
});
```

Instead of HttpClientModule

Runs AFTER http request

Routing Tests 1/2

- RouterTestingModule provides routing functionality for tests
- Location can verify the expected url
- RoutingConfiguration is required
- Documentation not really great

Routing Tests 2/2

- @ngworker/spectacular
- Dedicated library for routing-based tests

Lab Time