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Angular Testing

1 - Asynchronity and Mocking

Parameterisable Tests 1/2

```
for (let { sentence, words } of [
  { sentence: 'Veni vidi vici', words: 3 },
  { sentence: 'Lorem ipsum', words: 2 },
  { sentence: 'The brown 🦊 jumped over the lazy 🐶', words: 8 },
  { sentence: 'Some  space ', words: 2 }
]) {
  it(`"${sentence}" should have ${words} words`, () => {
    expect(sentence.split(' ').filter((word) => word)).toHaveLength(words);
  });
}
```

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Parameterisable Tests 2/2

```
it.each([
  { sentence: 'Veni vidi vici', words: 3 },
  { sentence: 'Lorem ipsum', words: 2 },
  { sentence: 'The brown 🦊 jumped over the lazy 🐶', words: 8 },
  { sentence: 'Some  space ', words: 2 }
])('"$sentence" should have $words words', ({ sentence, words }) => {
  expect(sentence.split(' ').filter((word) => word)).toHaveLength(words);
});
```

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Asynchronity

Potential Problems

- Expects not running
- Timeouts
- Cryptic error messages

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Native Approaches

- done callback
- return Promise
- return expect().resolves
- async/await

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done

```
it("should test with done", (done) => {
  let a = 1;
  Promise.resolve()
    .then(() => {
      a++;
      expect(a).toBe(1);
    })
    .then(done, done);
});
```

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return the Promise

```
it("should return the promise", () => {

  let a = 1;

  return Promise.resolve().then(() => {

    a++;

    expect(a).toBe(2);

  });

});
```

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return expect().resolves

```
it("should test with expect.resolves", () => {

  let a = 1;

  const promise = Promise.resolve().then(() => a + 1);

  return expect(promise).resolves.toBe(2);

});
```

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Use async/await

```
it("should test with done", async () => {

  let a = 1;

  await Promise.resolve().then(() => {

    a++;

  });

  expect(a).toBe(2);

});
```

Angular-based Approaches

- **waitForAsync**: automatic done callback
- **fakeAsync**: transforms async to sync task
  - flushMicrotasks: run all microtasks
  - tick: move forward in time
  - flush: run all asynchronous tasks

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waitForAsync: Automatic done callback

```
test('async', waitForAsync(() => {
    expect.hasAssertions();
    let a = 1;
    Promise.resolve().then(() => {
      a++;
      expect(a).toBe(2);
    });

    window.setTimeout(() => {
      a++;
      expect(a).toBe(3);
    }, 1000);
  })
);
```

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fakeAsync: Turn asynchronity into synchronity

```
test("microtasks", fakeAsync(() => {
  let a = 1;
  Promise.resolve().then(() => (a = 2));
  expect(a).toBe(1);

  flushMicrotasks();
  expect(a).toBe(2);
}));
```

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fakeAsync

```
test("immediate macrotasks", fakeAsync(() => {
  let a = 1;
  window.setTimeout(() => (a = 2));
  expect(a).toBe(1);

  tick();
  expect(a).toBe(2);
}));
```

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fakeAsync

```
test("delayed macrotasks", fakeAsync(() => {
  let a = 1;
  window.setTimeout(() => (a = 2), 2000);
  expect(a).toBe(1);

  tick(2000);
  expect(a).toBe(2);
}), 1000);
```

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fakeAsync

```
test("delayed macrotasks", fakeAsync(() => {
  let a = 1;
  window.setTimeout(() => (a = 2), 2000);
  expect(a).toBe(1);



  flush();
  expect(a).toBe(2);
}), 1000);
```

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Why fakeAsync over waitForAsync?

1. Run unreachable asynchronous tasks
2. Have assertion at the end (AAA pattern)
3. No remaining macrotasks as "implicit" assertion

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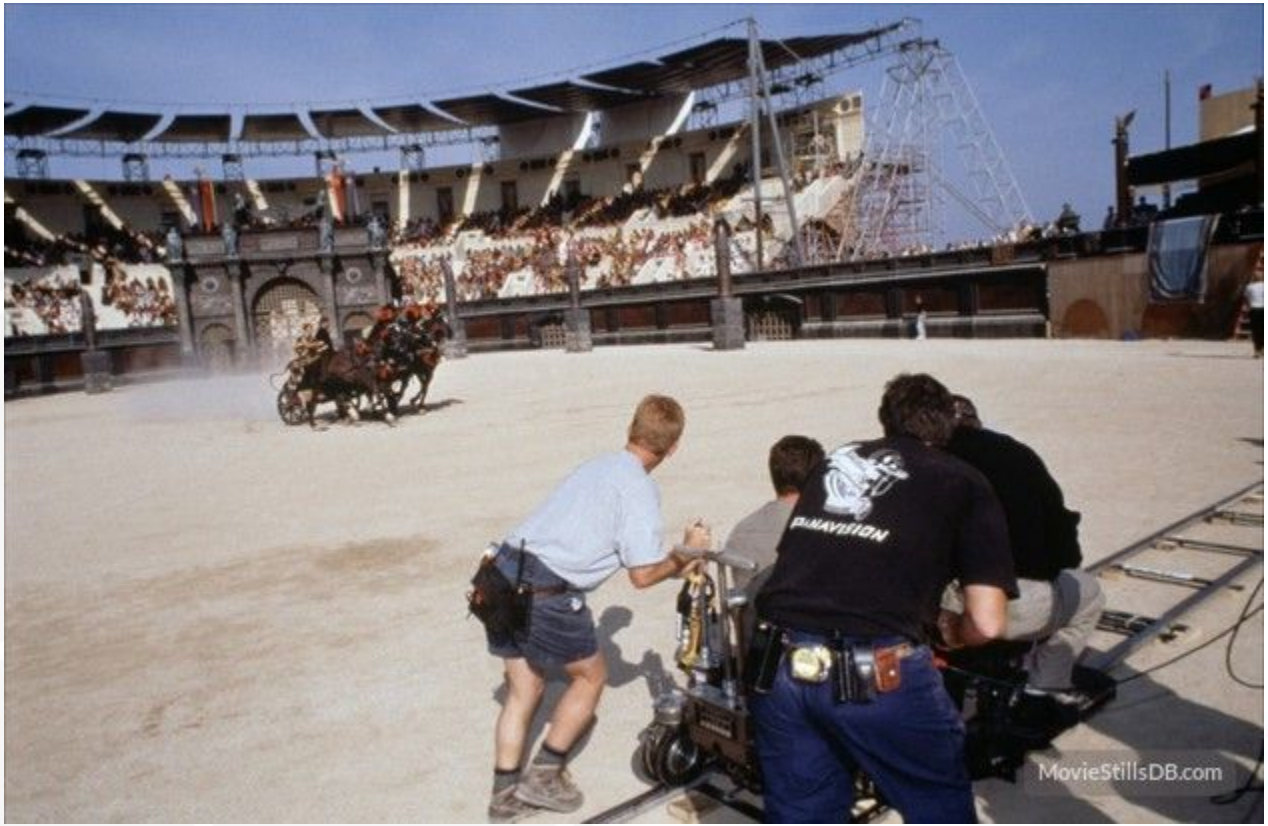
Mocking (Test Doubles)



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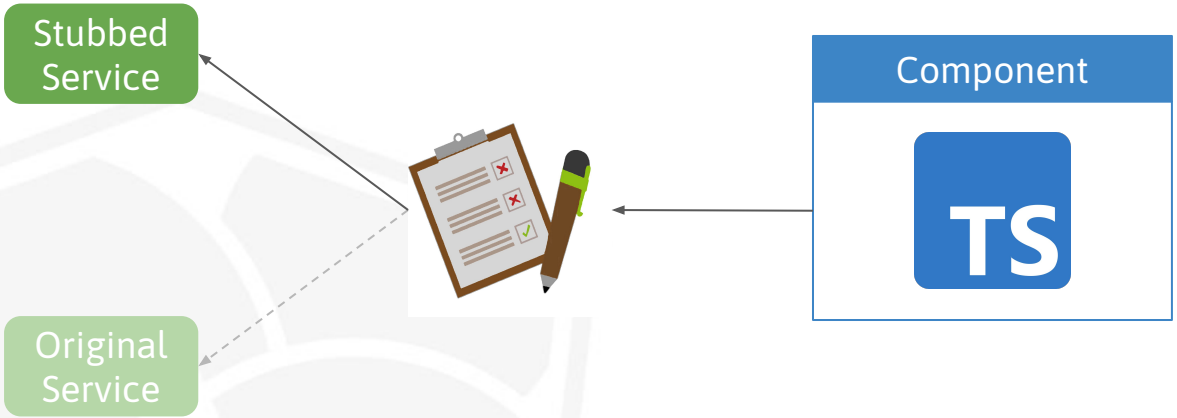
Stub



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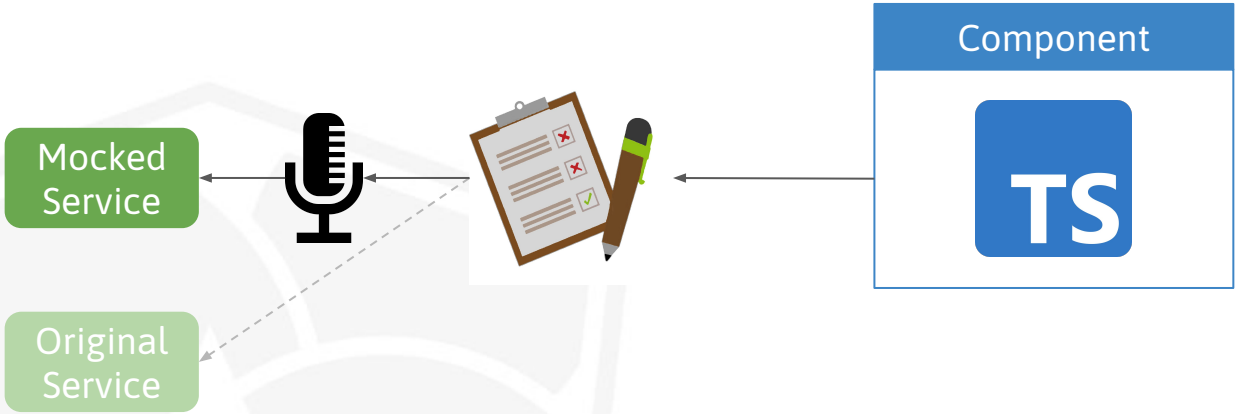
Mock



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Two Types

1. Stub: Replaces a dependency
    a. When dependency returns a value
    b. e.g. HTTP Request
    c. Is enough in most cases
    d. Test doesn't verify the stub is called
2. Mock: Verifies a call to a dependency
    a. A "side-effect only" dependency
    b. Usage has to be verified
    c. e.g. SnackBar, Router navigation
    d. Test verifies the mock is called

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```
export class ValidAddressLookuper {
  constructor(
    private addresses: () => AddressSource[],
    private addressValidator: AddressValidatorService
  ) {}

  lookup(query: string): boolean {
    return this.addresses()
      .filter((addressSource) => this.addressValidator.isValidAddress(addressSource))
      .some((address) => address.value.startsWith(query));
  }
}
```

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Stub

```
it('should stub validator', () => {
  const validator = { isValidAddress: () => true };
  const lookuper = new ValidAddressLookuper(
    () => [
      {
        value: 'Domgasse 5',
        expiryDate: new Date(2000, 0, 1)
      }
    ],
    validator as AddressValidatorService
  );

  expect(lookuper.lookup('Domgasse 5')).toBe(true);
});
```

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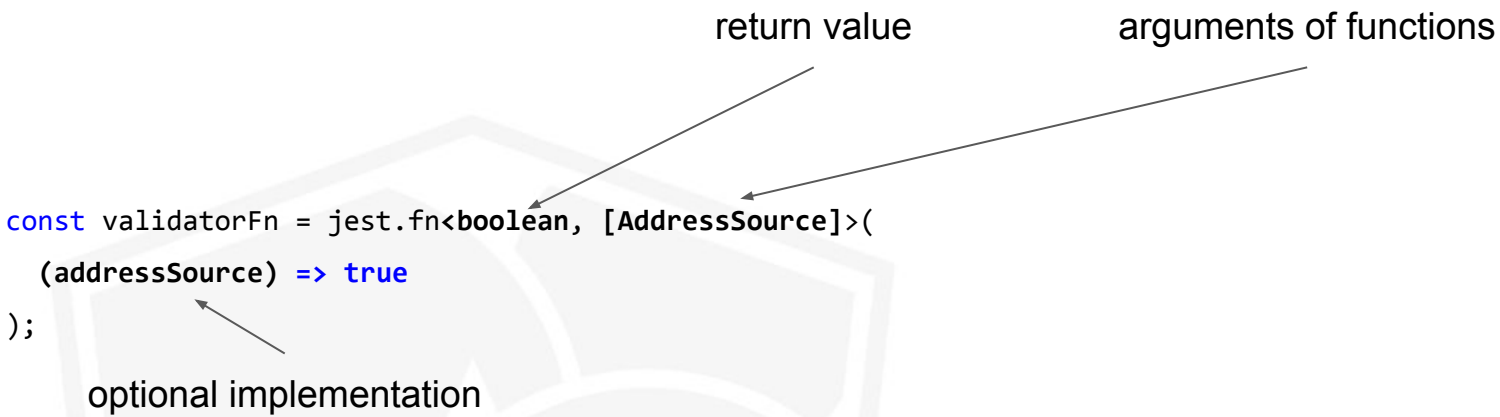
Mocking Functions



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Mock

```
it('should mock validator', () => {
  const validator = { isValidAddress: jest.fn<boolean, [AddressSource]>(() => true) };
  const lookuper = new ValidAddressLookuper(
    () => [
      {
        value: 'Domgasse 5',
        expiryDate: new Date(2000, 0, 1)
      }
    ],
    validator as AddressValidatorService
  );

  expect(lookuper.lookup('Domgasse 5')).toBe(true);
});
```

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Mock

```
it('should mock validator', () => {
  const validator = { isValidAddress: jest.fn<boolean, [AddressSource]>(() => true) };
  const lookuper = new ValidAddressLookuper(
    () => [
      {
        value: 'Domgasse 5',
        expiryDate: new Date(2000, 0, 1)
      }
    ],
    validator as AddressValidatorService
  );

  lookuper.lookup('Domgasse 5')

  expect(lookuper.lookup('Domgasse 5')).toBe(true);
});
```

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Mock

```
it('should mock validator', () => {
  const validator = { isValidAddress: jest.fn(() => true) };
  const lookuper = new ValidAddressLookuper(
    () => [
      {
        value: 'Domgasse 5',
        expiryDate: new Date(2000, 0, 1)
      }
    ],
    validator as AddressValidatorService
  );

  lookuper.lookup('Domgasse 5')

  expect(validator.isValidAddress).toBeCalled();
});
```

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Mock

```
it('should mock validator', () => {
  const validator = { isValidAddress: jest.fn(() => true) };
  const lookuper = new ValidAddressLookuper(
    () => [
      {
        value: 'Domgasse 5',
        expiryDate: new Date(2000, 0, 1)
      }
    ],
    validator as AddressValidatorService
  );

  lookuper.lookup('Domgasse 5')

  expect(validator.isValidAddress).toBeCalledWith({
    value: 'Domgasse 5',
    expiryDate: new Date(2000, 0, 1)
  });
});
```

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Mock

```
it('should mock validator', () => {
  const validator = { isValidAddress: jest.fn<boolean, [AddressSource]>(() => true) };
  const lookuper = new ValidAddressLookuper(
    () => [
      {
        value: 'Domgasse 5',
        expiryDate: new Date(2000, 0, 1)
      }
    ],
    validator as AddressValidatorService
  );

  lookuper.lookup('Domgasse 5')

  expect(validator.isValidAddress.mock.calls[0][0].value).toBe('Domgasse 5');
});
```

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Spying

```
it('should check with spied validator', () => {
 const addressValidator = new AddressValidator();
 const spy = jest.spyOn(addressValidator, 'isValidAddress');
 const addresses = ['Domgasse 15, 1010 Wien'];
 const lookuper = new AddressLookuper(() => addresses, addressValidator);

 lookuper.lookup('Domgasse 15');

 expect(spy).toHaveBeenCalledWith('Domgasse 15, 1010 Wien');
});
```

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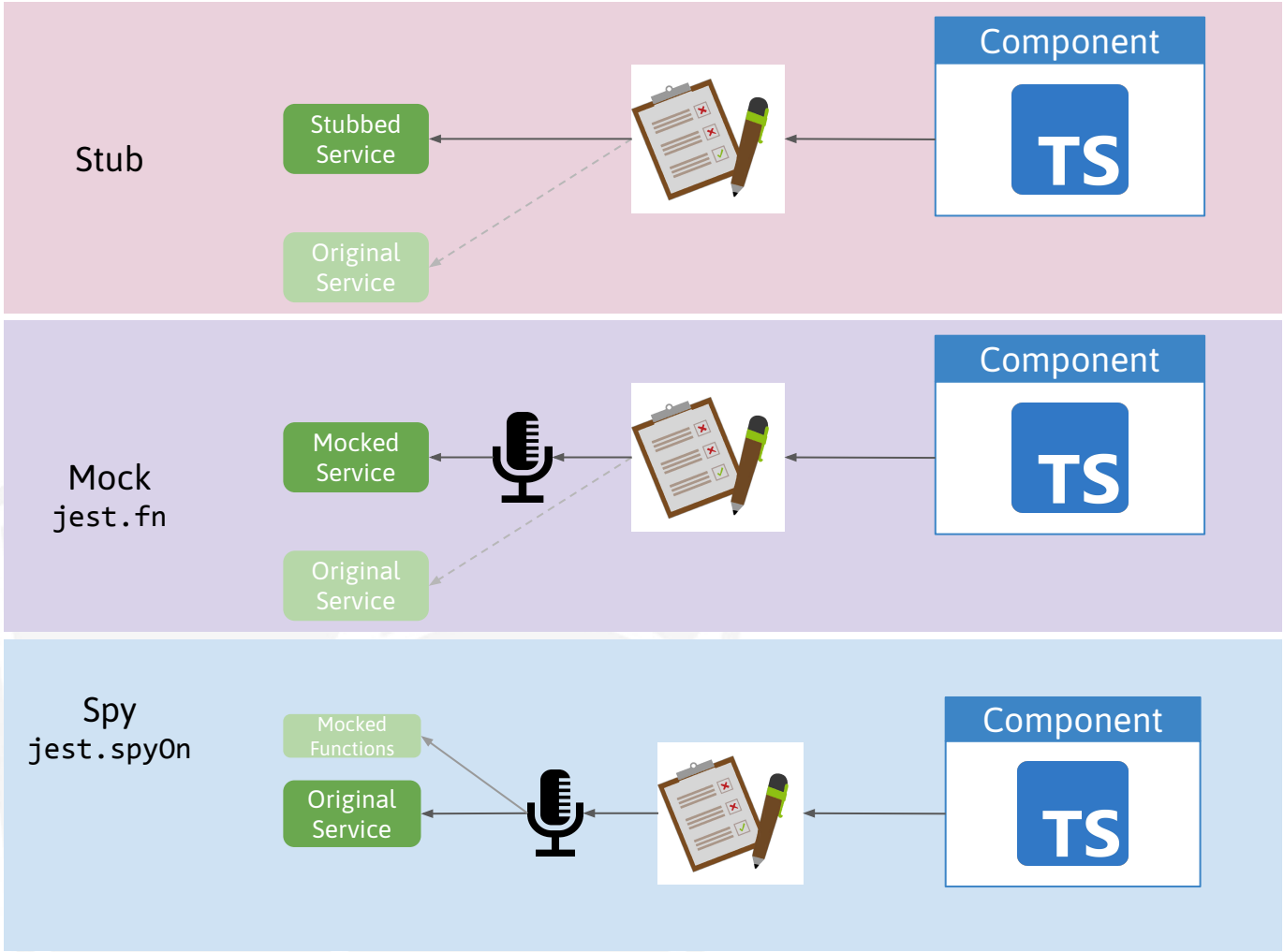

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Lab Time