APACHE SLING & FRIENDS TECH MEETUP
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Junit 5 and Sling/AEM Mocks

Stefan Seifert, pro!vision GmbH

About the Speaker

- AEM Developer
- Apache Sling PMC
- CTO of pro!vision GmbH

Stefan Seifert

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https://www.pro-vision.de

adaptTo()

JUnit 5 – Top 10 New Features

#1 Visibility – Less boilerplate code

No more need to make classes, methods public

```
class VisibilityTest {

  private MyClass underTest;

  @BeforeEach
  void setUp() {
    underTest = new MyClass();
  }

  @Test
  void testTheAnswer() {
    assertEquals(42, underTest.theAnswer(),
        "Answer to the Ultimate Question of Life, "
         + "the Universe, and Everything");
  }

}
```

#2 Display names

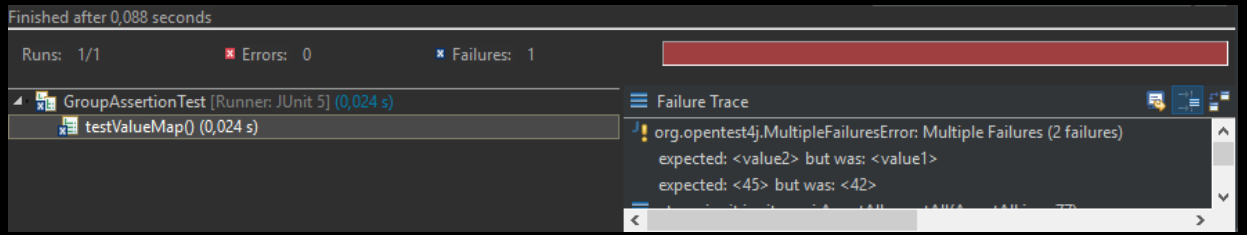
```java
@DisplayName("Display name demonstration")
class DisplayNameTest {

  @Test
  @DisplayName("This tests the correct answer")
  void testTheAnswer() {
    assertEquals(42, new MyClass().theAnswer());
  }

  @Test
  @DisplayName("This get's the answer wrong")
  void testTheWrongAnswer() {
    assertEquals(45, new MyClass().theAnswer());
  }

}
```

Give classes and tests nice names

#3 Group assertions

```
class GroupAssertionTest {

  @Test
  void testValueMap() {
    ValueMap props = new MyClass().getProps();
    assertAll(
        () -> assertEquals("value2", props.get("prop1", "")),
        () -> assertEquals(45, (int)props.get("prop2", 0))
    );
  }

}
```

Assert multiple conditions together



#4 Precise exception handling

```
@Test
void testException() {
  MyClass underTest = new MyClass();
  assertEquals(42, underTest.theAnswer());

  assertThrows(FileNotFoundException.class, () -> {
    underTest.readFile();
  });
}

@Test
void testTimeout() {
  MyClass underTest = new MyClass();

  assertTimeout(Duration.ofMillis(500), () -> {
    underTest.longRunningOperation();
  });
}
```

Instead of
@Test(expected= …)

Instead of
@Test(timeout= …)

#5 Tagging

Allows to filter tests by tags

```
class TaggingTest {

  @Test
  @Tag("fast")
  void testFastOperation() {
    assertEquals(42, new MyClass().theAnswer());
  }

  @Test
  @Tag("slow")
  void testSlowOperation() {
    new MyClass().longRunningOperation();
  }

}
```

#6 Dependency Injection

```
@ExtendWith(AemContextExtension.class)
class DependencyInjectionTest {

  @Test
  void testDependencies(AemContext context, TestInfo testInfo) {
    MyClass underTest = new MyClass();

    context.registerService(MyClass.class, underTest);

    assertEquals(42, new MyClass().theAnswer(),
        "The answer was wrong in: " + testInfo.getDisplayName());
  }

}
```

Inject dependencies from extensions or JUnit

#7 Conditional Test Execution

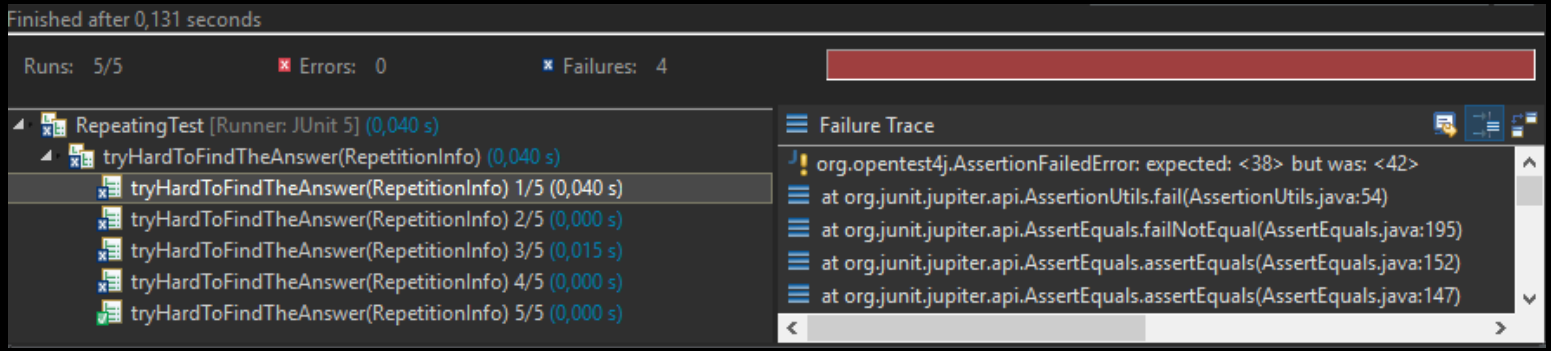
```
class ConditionalTest {

  @Test
  void runAlways() { /*...*/ }

  @Test
  @Disabled
  void runNever() { /*...*/ }

  @Test
  @EnabledOnOs({ OS.LINUX, OS.MAC })
  void runOnSpecificOS() { /*...*/ }

  @Test
  @DisabledOnJre(JRE.JAVA_10)
  void runOnSpecificJRE() { /*...*/ }

}
```

Environment-based conditions **@Disabled…** and **@Enabled…**

#8 Repeated Tess

Repeat 5 times

```
class RepeatingTest {

  @RepeatedTest(value = 5, name = "{displayName} {currentRepetition}/{totalRepetitions}")
  void tryHardToFindTheAnswer(RepetitionInfo info) {
    assertEquals(37 + info.getCurrentRepetition(), new MyClass().theAnswer());
  }

}
```

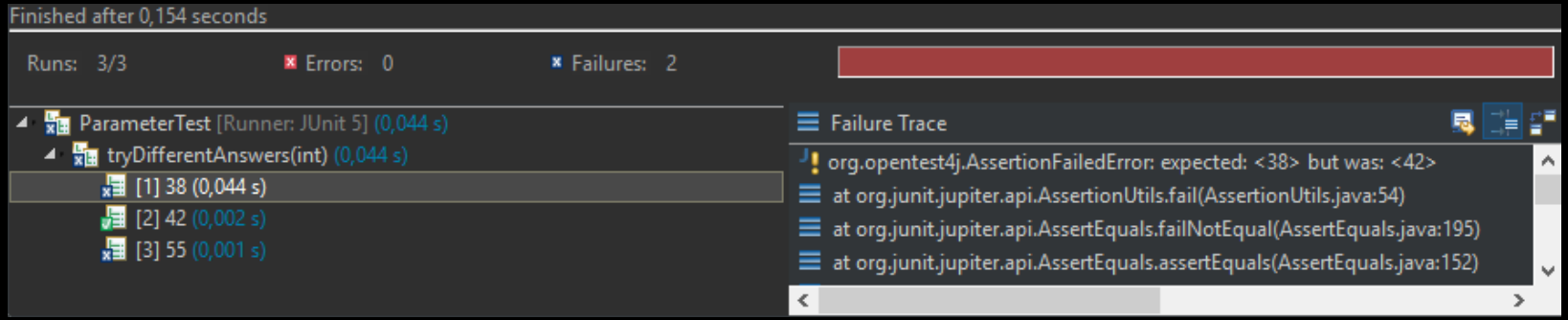


#9 Parameterized Tests

```
class ParameterTest {

  @ParameterizedTest
  @ValueSource(ints = { 38, 42, 55 })
  void tryDifferentAnswers(int anAnswer) {
    assertEquals(anAnswer, new MyClass().theAnswer());
  }

}
```

Run with parameters

- @ValueSource
- @EnumSource
- @MethodSource
- @CsvSource
- …



#10 Meta annotations

Your own "meta annotation"

```
@Target(ElementType.TYPE)
@Retention(RetentionPolicy.RUNTIME)
@ExtendWith(AemContextExtension.class)
@ExtendWith(MockitoExtension.class)
public @interface AemContextAndMockito {}
```

Assigning it applies all extensions

```
@AemContextAndMockito
class MetaAnnotationTest {
  @Mock
  private MyService service;
  @Test
  void testRegisterMockService(AemContext context) {
    context.registerService(MyService.class, service);
    assertSame(service, context.getService(MyService.class));
  }
}
```

#10 Meta annotations

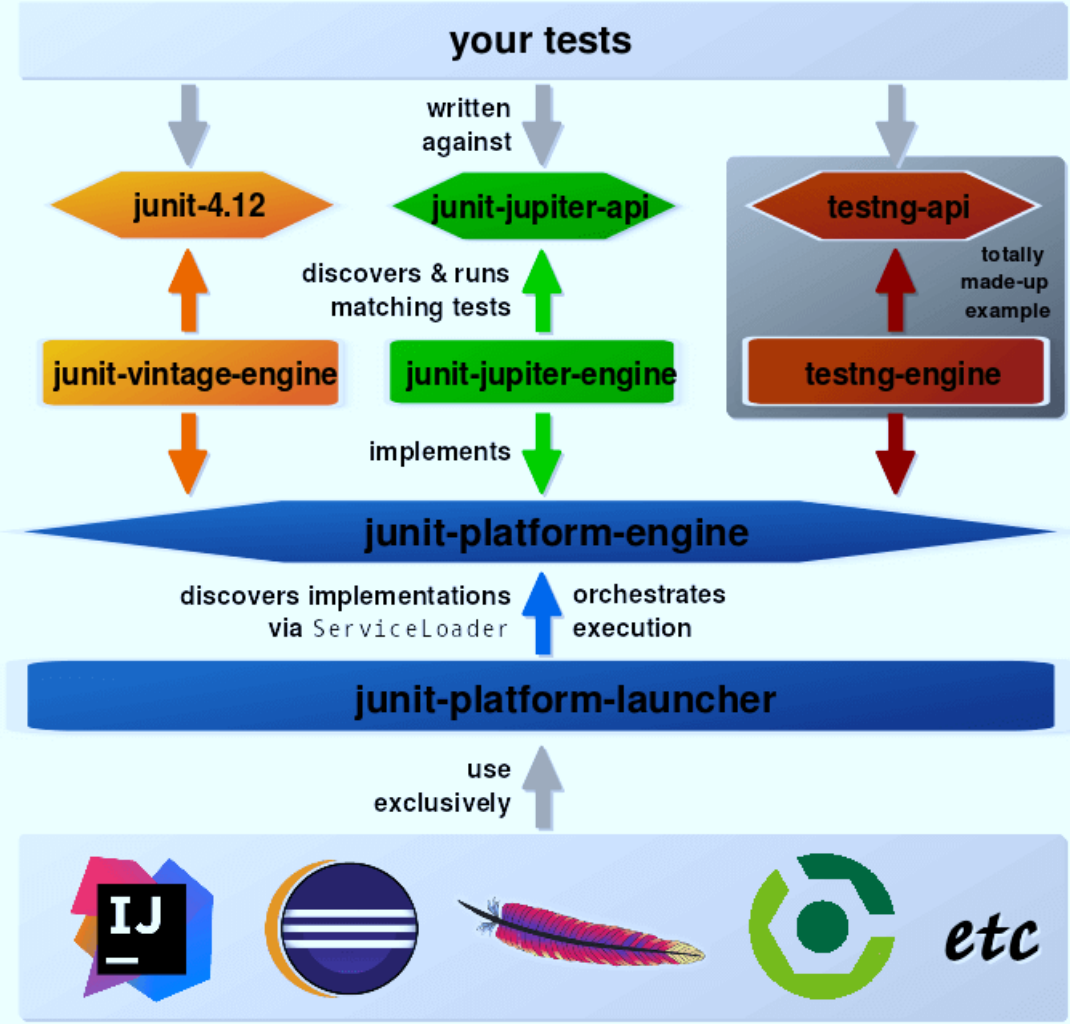
Tagging via meta annotations

```
@Target({ ElementType.TYPE, ElementType.METHOD })
@Retention(RetentionPolicy.RUNTIME)
@Tag("fast")
public @interface Fast {}

@Target({ ElementType.TYPE, ElementType.METHOD })
@Retention(RetentionPolicy.RUNTIME)
@Tag("slow")
public @interface Slow {}

class MetaAnnotationTagTest {
  @Test @Fast
  void testFastOperation() {
    assertEquals(42, new MyClass().theAnswer());
  }
  @Test @Slow
  void testSlowOperation() {
    new MyClass().longRunningOperation();
  }
}
```

JUnit 5 – Architecture

JUnit 5

Modular Architecture



Source: https://blog.codefx.org/design/architecture/junit-5-architecture-jupiter/

Core Principle

- “Prefer extension points over features”
- Very good extensibility
- Example:
  - JUnit 5 provides only “classic” assertions
  - Use libs like AssertJ, Hamcrest, Thruth for complex assertions

JUnit 5 – Tooling

JUnit 5 Tooling support

- Maven Surefire Plugin ✓
- Mockito ✓
- IDEs like Eclipse, IntelliJ ✓
- Plugins for Eclipse Infinitest ✓ MoreUnit ✗
- Sling Mocks, AEM Mocks ✓

Maven Dependencies

"Bill of Material"
Defines all versions

```
<dependencyManagement>
  <dependencies>

    <dependency>
      <groupId>org.junit</groupId>
      <artifactId>junit-bom</artifactId>
      <version>5.3.0</version>
      <type>pom</type>
      <scope>import</scope>
    </dependency>

  </dependencies>
</dependencyManagement>
```

JUnit 4 and 5
side-by-side

```
<dependencies>
  <dependency>
    <groupId>org.junit.jupiter</groupId>
    <artifactId>junit-jupiter-api</artifactId>
    <scope>test</scope>
  </dependency>
  <dependency>
    <groupId>org.junit.jupiter</groupId>
    <artifactId>junit-jupiter-params</artifactId>
    <scope>test</scope>
  </dependency>
  <dependency>
    <groupId>org.junit.jupiter</groupId>
    <artifactId>junit-jupiter-engine</artifactId>
    <scope>test</scope>
  </dependency>

  <!-- Only required for JUnit 4 compatibility -->
  <dependency>
    <groupId>org.junit.vintage</groupId>
    <artifactId>junit-vintage-engine</artifactId>
    <scope>test</scope>
  </dependency>
</dependencies>
```

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JUnit 5 – Sling & AEM Mocks

OSGi, Sling & AEM Mocks

- JUnit 5 support since August 2018
- We got “modular”, too:
  - Core
  - JUnit 4
  - JUnit 5

```
<dependency>
  <groupId>io.wcm</groupId>
  <artifactId>io.wcm.testing.aem-mock.junit5</artifactId>
  <version>2.3.2</version>
</dependency>

<dependency>
  <groupId>io.wcm</groupId>
  <artifactId>io.wcm.testing.aem-mock.junit4</artifactId>
  <version>2.3.2</version>
</dependency>
```

Using AemContext in JUnit 5

Use “junit5” package

Define **@ExtendWith**

No @Rule required

```
import io.wcm.testing.mock.aem.junit5.AemContext;
import io.wcm.testing.mock.aem.junit5.AemContextExtension;

@ExtendWith(AemContextExtension.class)
class MyUnitTest {

  private AemContext context = new AemContext();

  @BeforeEach
  void setUp() { /*...*/ }

  @Test
  void testMyCode() { /*...*/ }

}
```

Optional:
`RESOURCERESOLVER_MOCK`
`JCR_MOCK`
`JCR_OAK`

Using AemContext as method parameter

```
import io.wcm.testing.mock.aem.junit5.AemContext;
import io.wcm.testing.mock.aem.junit5.AemContextExtension;

@ExtendWith(AemContextExtension.class)
class MyUnitTest {

  @BeforeEach
  void setUp(AemContext context) {
    // ...
  }

  @Test
  void testMyCode(AemContext context) {
    // ...
  }

}
```

Alternative:
Pass in `AemContext`
as method parameter

You can also use:
`JcrMockAemContext`
`JcrOakAemContext`
to switch resource resolver type *

Contributed by **Karol Lewandowski**

* Switching resource resolver type via method parameters currently only supported in AEM Mocks

Using AemContextBuilder

```
@ExtendWith(AemContextExtension.class)
class MyUnitTest {

  private AemContext context = new AemContextBuilder()
      // register plugins
      .plugin(CACONFIG)
      .plugin(WCMIO_CACONFIG)
      // shared context setup code for all tests
      .<AemContext>afterSetUp(context -> {
        // register sling models
        context.addModelsForPackage("to.adapt.junit5demo");
      })
      .build();

  @BeforeEach
  void setUp() { /*...*/ }
  @Test
  void testMyCode() { /*...*/ }
}
```

Using `AemContextBuilder` not possible when passing in as method parameters

Recommendation: make this code reusable in a separate class

Migrating AEM/Sling Mocks Unit Tests

- It's easy to migrate JUnit 4 tests to JUnit 5
- See wiki page https://wcm-io.atlassian.net/wiki/x/AYAmJ

Demo

- Migrate AEM Mock Unit Test to JUnit 5

Same for OSGi Mock, Sling Mock

- In slides an demo we used only AEM Mocks
- But same applies also when using
  - OSGi Mocks
  - Sling Mocks

Future plans

- What JUnit 5 features do **you** want to use with AEM/Sling Mocks?
- Get in touch with us (mailing lists)

References

Related adaptTo() talks

- adaptTo() 2016:
  Unit Testing with Sling & AEM Mocks
- adaptTo() 2015:
  So how do I test my Sling application?
- adaptTo() 2014:
  Lightning Talk: Mock AEM & Co for Unit Tests

References

- wcm.io AEM Mocks
  http://wcm.io/testing/aem-mock/
- Apache Sling Mocks
  http://sling.apache.org/documentation/development/sling-mock.html
  http://sling.apache.org/documentation/development/osgi-mock.html
  http://sling.apache.org/documentation/development/jcr-mock.html
- JUnit 5
  https://junit.org/junit5/
- Need Help? Use the Apache Sling or wcm.io Mailing Lists
  https://sling.apache.org/project-information.html#mailing-lists
  http://wcm.io/mailing-lists.html

- Demo code for this talk
  https://github.com/adaptto/2018-junit5-and-sling-aem-mocks