ECLIPSE 2020 CON

Easier integration testing in OSGi: The open source osgi-test project

BJ Hargrave (IBM)
Raymond Augé (Liferay Inc.)
Jeremy Krieg (Greek Orthodox Archdiocese of Australia - Greek Welfare Centre of SA)

Who are we?

- BJ Hargrave
- Raymond Augé
- Fr Jeremy Krieg

What is osgi-test?

- Part of the OSGi Alliance & initiative of some of the core Bnd/Bndtools developers
- Goal: make it easier to write automated tests that run *inside* an OSGi framework.
- Is itself a series of OSGi bundles containing useful test utilities:
  - Common utility library (also used internally by other osgi-test bundles)
  - OSGi-specific AssertJ custom assertions
  - JUnit 4 `TestRule`s and JUnit Jupiter test `Extension`s
- Uses Maven as the build environment using Bnd's maven plugins (somewhat of a reference implementation for integration testing in a bnd-maven project).
- Current early-adopter release 0.10.0 available in Maven Central.

AssertJ support

What is AssertJ?

- https://assertj.github.io/doc/, lead developer Joel Costigliola
- A series of open-source, domain-specific assertion libraries:
  - JDK (assertj-core)
  - Joda time
  - Guava
  - Neo4J
  - DB
  - Swing
- Core module (https://github.com/assertj/assertj-core - 1.8k stars, 432 forks) is a fork of the original *Fixtures for Easy Software Testing* (FEST) project by Alex Ruiz https://github.com/alexruiz/fest-assert-2.x/

Why AssertJ?

- Fluent API - easy to understand (even for non-developers).
- API design leverages the IDE's autocompletion to make writing tests easier.
- Object-specific assertions provide more informative feedback about test failures.
- "Soft" assertions allow multiple assertions per test method (useful for slow code).
- Assertions on a single object can be chained, making code more concise.
- Extensible - lends itself to creating your own domain-specific assertions.
- Test framework agnostic - works in JUnit 4, JUnit 5, TestNG, etc.
- OSGi-friendly - the osgi-test team has made some contributions to assertj-core to make sure it works well in an OSGi framework.

Example - Code

- Regular Jupiter assertions:

```
assertEquals(bundle.getState() & RESOLVED, RESOLVED, “mybundle.state”);
assertEquals(bundle.getSymbolicName(), “my.bundle.name”, “mybundle.bsn”);
```

- AssertJ Core:

```
assertThat(bundle.getState() & RESOLVED).as(“mybundle.state”).isEqualTo(RESOLVED);
assertThat(bundle.getSymbolicName()).as(“mybundle.bsn”).isEqualTo(“my.bundle.name”);
```

- AssertJ custom assertion from osgi-test:

```
assertThat(bundle).as(“mybundle”)
    .isInState(RESOLVED)
    .hasSymbolicName(“my.bundle.name”);
```

Example - IDE completion

```
@Test
void assertJOSGi() {
    Bundle bundle = FrameworkUtil.getBundle(PlayerTest.class);
    assertThat(bundle).as("mybundle.state").isIn
}
```

- **isIn**(Iterable<?> values) : BundleAssert - AbstractAs
- **isIn**(Object... values) : BundleAssert - AbstractAssert
- **isIn**stanceOf(Class<?> type) : BundleAssert - Abstra
- **isIn**stanceOfAny(Class<?>... types) : BundleAssert -
- **isIn**stanceOfSatisfying(Class<T> type, Consumer<T:
- **isIn**State(int expected) : BundleAssert - AbstractBun
- **isIn**StateMaskedBy(int mask) : BundleAssert - Abstra
- **is**Exactly**In**stanceOf(Class<?> type) : BundleAssert -
- **is**NotExactly**In**stanceOf(Class<?> type) : BundleAsse

Press 'Ctrl+Space' to show Template Proposals

AssertJ example - regular Jupiter output

```
assertEquals(bundle.getState() & RESOLVED, RESOLVED,
    “mybundle.state”);
```

yields:

```
org.opentest4j.AssertionFailedError: mybundle.state ==>
    expected: <0> but was: <4>
```

(oops, accidentally swapped expected and actual…)

AssertJ example - regular AssertJ

```
assertThat(bundle.getState() &
     RESOLVED).as("mybundle.state").isEqualTo(RESOLVED);
```

yields:

```
org.opentest4j.AssertionFailedError: [mybundle.state]
Expecting:
 <0>
to be equal to:
 <4>
but was not.
```

*(But what is state "4" again? And what state was it **actually** in?)*

AssertJ example - AssertJ OSGi

```
assertThat(bundle).as("mybundle").isInState(RESOLVED);
```

yields:

```
java.lang.AssertionError: [mybundle]
Expecting
  <my.test.project.test [7]>
to be in state:
  <4:RESOLVED>
 but was in state:
  <32:ACTIVE>
```

JUnit support (4 & 5)

What is JUnit?

- JUnit 4 has been the mainstay of Java unit testing for some time.
- JUnit 5 is its successor, comprised of:
  - JUnit Platform - a framework for discovering and running tests for custom `TestEngine` implementations (1.7 just released).
  - JUnit Jupiter (Jupiter = 5th planet from the Sun) - a new `TestEngine` implementation (5.7 just released).
  - JUnit Vintage - a `TestEngine` wrapper around JUnit 4.

JUnit in OSGi

- JUnit 4 has had OSGi bundled versions for some time (e.g., Apache servicemix)
- Eclipse (since Oxygen) also ships with OSGi bundles of JUnit 5, available in Orbit.
- More recently, Ray Augé added OSGi metadata to the JUnit 5 jars to make them bundles (shipped since JUnit Platform 1.6/Jupiter 5.6/Vintage 5.6) so they can be used directly out of Maven Central.
- PDE supports JUnit 4 & 5. osgi-test should work with PDE (*note: this has not been tested by us*).
- The osgi-test team prefers to work with Bnd/Bndtools, which since 5.0 supports JUnit 5 through the `biz.aQute.tester.junit-platform` tester bundle.

JUnit support in osgi-test

- `BundleContextExtension/BundleContextRule`
- `ServiceExtension/ServiceRule`
- `ConfigurationExtension`
- JUnit 4 rules have similar functionality to their counterpart Jupiter extensions, however...
- Most recent (and future) development has focused (and will focus) on Jupiter.
- This presentation focuses on the Jupiter extensions
- The osgi-test team recommends migrating to Jupiter where possible to fully leverage osgi-test.

JUnit support - `BundleContextExtension`

- Injects a `BundleContext` into the test as a field or test method parameter.
- Automatically rolls back changes to the `BundleContext` made within the test scope.
- Provides `InstallBundle` interface for installing *embedded* bundles into the running framework during the test
- Supports multiple levels of scope (ie, `@BeforeAll`, `@BeforeEach`, `@Nested`, etc).

JUnit support - `ServiceExtension`

- Injects services into the test as a field or parameter.
- Configuration via the `@InjectService` annotation (cardinality, filter, timeout, etc)
- Takes care of:
  - setting up the `ServiceTracker`;
  - waiting for the required number of services to arrive (often a source of bugs if you try to roll your own);
  - releasing service references at the end of the test scope.
- Provides a `ServiceAware` interface for introspection of the underlying `ServiceTracker` state.

JUnit support - `ConfigurationExtension`

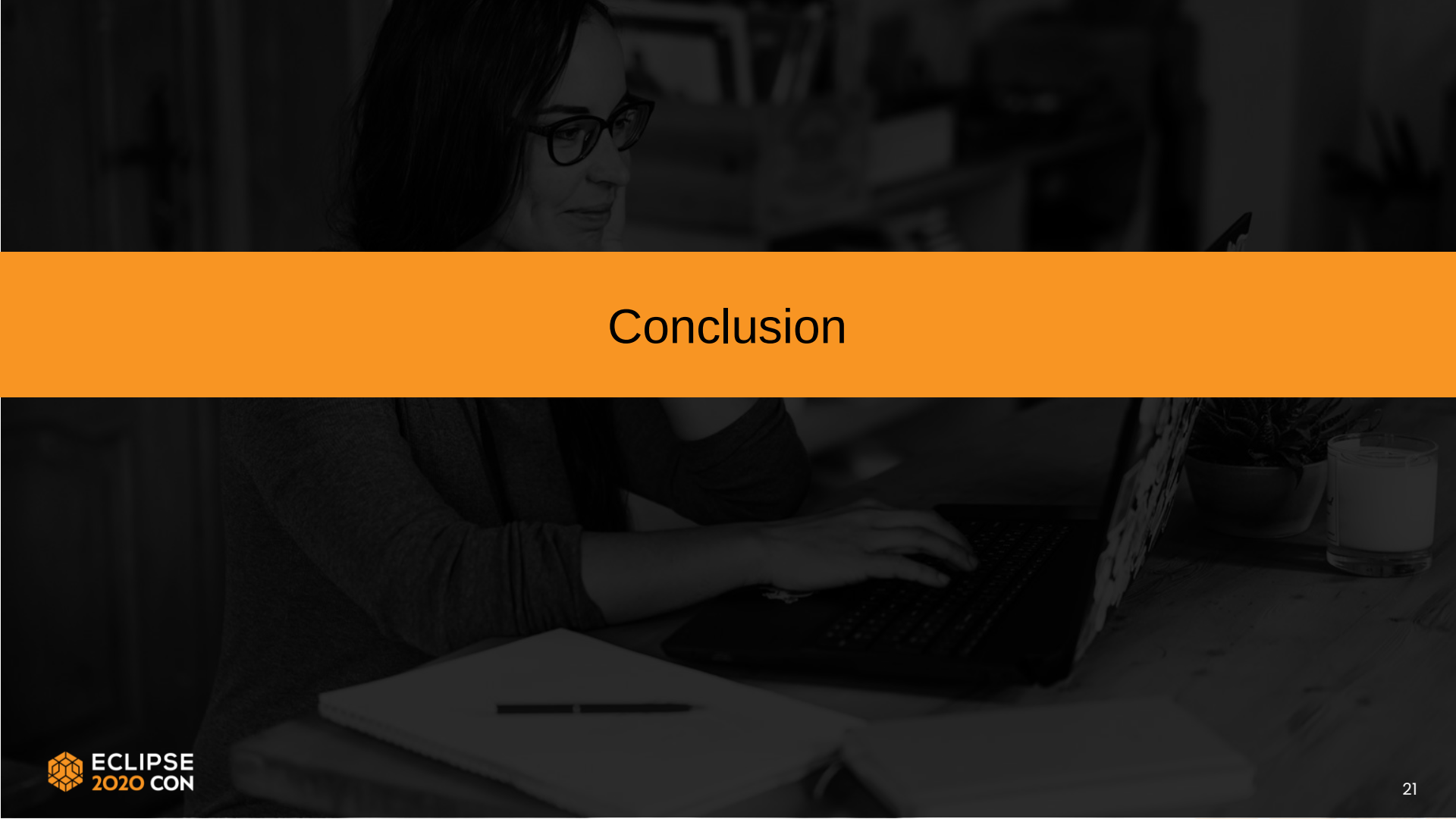
- Injects `Configuration` instances into the running test as a field or parameter.
- Allows you to declaratively create configurations with the OSGi `ConfigurationAdmin` service.
- Will automatically delete any configurations it has created once the test scope ends.
- No JUnit 4 `TestRule` counterpart implemented
- osgi-test team wishes to acknowledge Stefan Bischof (another Bnd contributor) for this contribution.

Live TDD demonstration

Demo code repository

https://github.com/rotty3000/osgi-test-example-mvn

Conclusion



Try it out and then feedback and contribute!

- Available from Maven Central
  - https://search.maven.org/search?q=g:org.osgi%20and%20a:org.osgi.test.*
  - OSGi is currently using osgi-test in some of its compliance tests for Release 8
  - Some projects like Apache Aries and idempiere-test are starting to use it
- GitHub repo
  - https://github.com/osgi/osgi-test/
- We would love any feedback
  - Open issues and PRs

Thank you!

Join the conversation:

@EclipseCon | #EclipseCon

ECLIPSE 2020 CON

Evaluate the Sessions

Sign in and vote at Eclipsecon.org:

-1 0 +1