Test Automation & Advanced Selenium

Lesson 6: Web Driver Test with Xunit

Lesson Objectives

- Introduction to Xunit and Junit
- Junit Annotations
- Assertions/Verifications with Junit or TestNG
- Web Driver Test cases with Junit or TestNG
- Test Suite

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6.1: Selenium 2.0 – Web Driver Test with Xunit

Web Driver Test with Xunit

- Is something not missing? We do Testing, where are Test Cases , Test Suite, Verifications, Results , Reports….
- Because, Selenium web driver is automation API not testing API
- So, combine Selenium automation with testing frameworks, like Xunit

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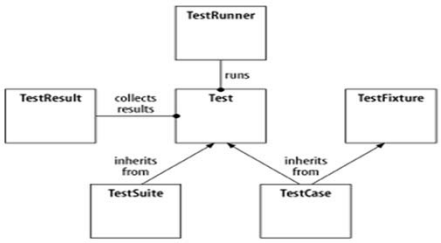
Introduction To XUNIT

- Xunit is the collective name for several unit testing frameworks that derive their structure and functionality from Smalltalk's SUnit.
- The names of many of these frameworks are a variation on "SUnit", usually substituting the "S" for the first letter (or letters) in the name of their intended language ("JUnit" for Java, "RUnit" for R etc.).
- These frameworks and their common architecture are collectively known as "Xunit".
- All Xunit frameworks share the following basic component architecture:



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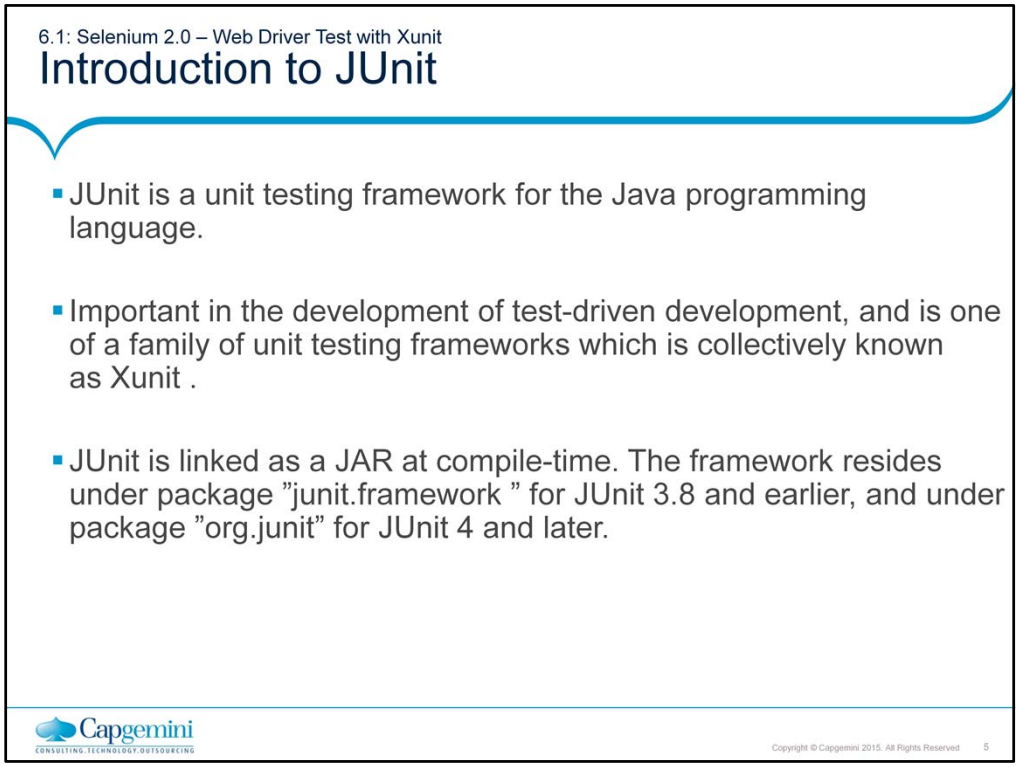

A research survey performed in 2013 across 10,000 Java projects hosted on GitHub found that JUnit, (in a tie with slf4j-api), was the most commonly included external library. Each library was used by 30.7% of projects.

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Junit – Annotations

@Test:

- The Test annotation tells JUnit that the public void method to which it is attached can be run as a test case. To run the method, JUnit first constructs a fresh instance of the class then invokes the annotated method. Any exceptions thrown by the test will be reported by JUnit as a failure. If no exceptions are thrown, the test is assumed to have succeeded.

```
1  public class MyTestClass {
2      @Test
3      public void myTestMethod() {
4          /**
5           * Use Assert methods to call your methods to be tested.
6           * A simple test to check whether the given list is empty or not.
7           */
8          org.junit.Assert.assertTrue( new ArrayList().isEmpty() );
9      }
10 }
```

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Continued.

@Before:

- When writing tests, it is common to find that several tests need similar objects created before they can run. Annotating a public void method with @Before causes that method to be run before the Test method. The @Before methods of super classes will be run before those of the current class.

```
1  public class MyTestClass {
2      List<String> testList;
3      @Before
4      public void initialize() {
5          testList = new ArrayList<String>();
6      }
7      @Test
8      public void myTestMethod() {
9          /**
10          * Use Assert methods to call your methods to be tested.
11          * A simple test to check whether the given list is empty or not.
12          */
13         org.junit.Assert.assertTrue( testList.isEmpty() );
14     }
15 }
```

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Continued.

@After:

- If you allocate external resources in a Before method you need to release them after the test runs. Annotating a public void method with @After causes that method to be run after the Test method. All @After methods are guaranteed to run even if a Before or Test method throws an exception. The @After methods declared in super classes will be run after those of the current class.

```
1  public class MyTestClass {
2      OutputStream stream;
3      @Before
4      public void initialize() {
5          /**
6           * Open OutputStream, and use this stream for tests.
7           */
8          stream = new FileOutputStream(...);
9      }
10     @Test
11     public void myTestMethod() {
12         /**
13          * Now use OutputStream object to perform tests
14          */
15         ...
16         ...
17     }
18     @After
19     public void closeOutputStream() {
20         /**
21          * Close output stream here
22          */
23         try{
24           if(stream != null) stream.close();
25         } catch(Exception ex){
26         }
27     }
28 }
```

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Continued.

@BeforeClass:

- Annotating a public static void no-arg method with @BeforeClass causes it to be run once before any of the test methods in the class. The @BeforeClass methods of superclasses will be run before those the current class.
- The annotations @BeforeClass and @Before are same in functionality. The only difference is the method annotated with @BeforeClass will be called once per test class based, and the method annotated with @Before will be called once per test based.

```
1  public class MyTestClass {
2      @BeforeClass
3      public void initGlobalResources() {
4          /**
5           * This method will be called only once per test class.
6           */
7      }
8      @Before
9      public void initializeResources() {
10         /**
11          * This method will be called before calling every test.
12          */
13     }
14     @Test
15     public void myTestMethod1() {
16         /**
17          * initializeResources() method will be called before calling this method
18          */
19     }
20     @Test
21     public void myTestMethod2() {
22         /**
23          * initializeResources() method will be called before calling this method
24          */
25     }
26 }
```

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Continued.

@AfterClass:

- If you allocate expensive external resources in a BeforeClass method you need to release them after all the tests in the class have run. Annotating a public static void method with @AfterClass causes that method to be run after all the tests in the class have been run. All @AfterClass methods are guaranteed to run even if a BeforeClass method throws an exception. The @AfterClass methods declared in superclasses will be run after those of the current class.

```
public class MyTestClass {
    @BeforeClass
    public void initGlobalResources() {
        /**
         * This method will be called only once per test class. It will be called
         * before executing test.
         */
    }
    @Test
    public void myTestMethod1() {
        // write your test code here...
        ...
        ...
    }
    @AfterClass
    public void closeGlobalResources() {
        /**
         * This method will be called only once per test class. It will be called
         * after executing test.
         */
    }
}
```

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Continued.

@Ignore:

- Sometimes you want to temporarily disable a test or a group of tests. Methods annotated with Test that are also annotated with @Ignore will not be executed as tests. Also, you can annotate a class containing test methods with @Ignore and none of the containing tests will be executed. Native JUnit 4 test runners should report the number of ignored tests along with the number of tests that ran and the number of tests that failed.

```
1  public class MyTestClass {
2      @Ignore
3      @Test
4      public void myTestMethod() {
5          /**
6           * This test will be ignored.
7           */
8          org.junit.Assert.assertTrue( new ArrayList().isEmpty() );
9      }
10 }
```

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Junit - Assertion

- JUnit provides overloaded assertion methods for all primitive types and Objects and arrays.
- The parameter order is expected value followed by actual value
- Some of the important methods of Assert class are:
  - void assertEquals(boolean expected, boolean actual)
    Check that two primitives/Objects are equal
  - void assertTrue(boolean expected, boolean actual)
    Check that a condition is true
  - void assertFalse(boolean condition)
    Check that a condition is false
  - void assertNotNull(Object object)
    Check that an object isn't null
  - void assertNull(Object object)
    Check that an object is null

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Continued.

- void assertSame(boolean condition)
  The assertSame() methods tests if two object references point to the same object

- void assertNotSame(boolean condition)
  The assertNotSame() methods tests if two object references not point to the same object

- void assertArrayEquals(expectedArray, resultArray);
  The assertArrayEquals() method will test whether two arrays are equal to each other

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Junit – Assertion Example

```
1  public class TestAssertions {
2      @Test
3      public void testAssertions() {
4          //test data
5          String str1 = new String ("abc");
6          String str2 = new String ("abc");
7          String str3 = null;
8          String str4 = "abc";
9          String str5 = "abc";
10         int val1 = 5;
11         int val2 = 6;
12         String[] expectedArray = {"one", "two", "three"};
13         String[] resultArray =  {"one", "two", "three"};
14         //Check that two objects are equal
15         assertEquals(str1, str2);
16         //Check that a condition is true
17         assertTrue (val1 < val2);
18         //Check that a condition is false
19         assertFalse(val1 > val2);
20         //Check that an object isn't null
21         assertNotNull(str1);
22         //Check that an object is null
23         assertNull(str3);
24         //Check if two object references point to the same object
25         assertSame(str4,str5);
26         //Check if two object references not point to the same object
27         assertNotSame(str1,str3);
28         //Check whether two arrays are equal to each other.
29         assertArrayEquals(expectedArray, resultArray);
30     }
31 }
```

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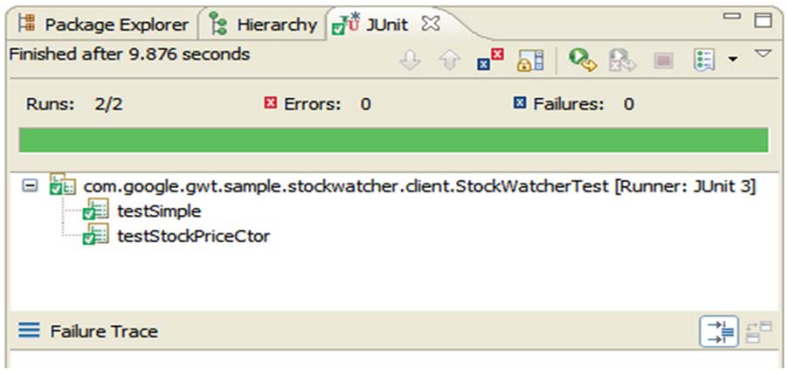
Junit – Reports

- Junit report collects individual XML files
- Merge the individual XML files generated by the JUnit task and eventually apply a stylesheet on the resulting merged document to provide a browsable report of the test cases results



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Web Driver Test cases with TestNG

- Open source Java testing framework, not limited to unit tests
- Designed to be better than JUnit, especially when testing integrated classes
- Supports parameterized tests out-of-the-box (in much more convenient way than JUnit does)
- Facilitates running multi-threaded tests
- Allows to express dependencies between test methods
- Integrates very well with the build tools: Ant, Maven and Gradle
- Supported by all major IDEs
- Can be used with different JVM languages (e.g. Java, Groovy, Scala) and cooperates with many quality and testing tools (e.g. code coverage tools, mocking libraries, matchers libraries)
- Some popular solutions - e.g. Spring Framework - provide means to facilitate testing with TestNG

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Continued.

Writing a test is typically a three-step process:

- Write the business logic of your test and insert TestNG annotations in your code.
- Add the information about your test (e.g. the class name, the groups you wish to run, etc...) in a testng.xml file or in build.xml.
- Run TestNG

```
import org.testng.annotations.Test;
import static org.testng.Assert.assertEquals;

public class TestNGSimpleTest {
        @Test
        public void testAdd() {
                String str = "TestNG is working fine";
                assertEquals("TestNG is working fine", str);
        }
}
```

Test Case Example

```
<?xml version="1.0" encoding="UTF-8"?>
<!DOCTYPE suite SYSTEM "http://testng.org/testng-1.0.dtd" >
<suite name="Suite1">
  <test name="test1">
    <classes>
       <class name="TestNGSimpleTest"/>
    </classes>
  </test>
</suite>
```

testng.xml File

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TestNG Annotations

Annotation	Description
@Test	The annotation notifies the system that the method annotated as @Test is a test method
@BeforeSuite	The annotation notifies the system that the method annotated as @BeforeSuite must be executed before executing the tests in the entire suite
@AfterSuite	The annotation notifies the system that the method annotated as @AfterSuite must be executed after executing the tests in the entire suite
@BeforeTest	The annotation notifies the system that the method annotated as @BeforeTest must be executed before executing any test method within the same test class

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Continued.

@AfterTest	The annotation notifies the system that the method annotated as @AfterTest must be executed after executing any test method within the same test class
@BeforeClass	The annotation notifies the system that the method annotated as @BeforeClass must be executed before executing the first test method within the same test class
@AfterClass	The annotation notifies the system that the method annotated as @AfterClass must be executed after executing the last test method within the same test class
@BeforeMethod	The annotation notifies the system that the method annotated as @BeforeMethod must be executed before executing any and every test method within the same test class

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Continued.

@AfterMethod	The annotation notifies the system that the method annotated as @AfterMethod must be executed after executing any and every test method within the same test class
@BeforeGroups	The annotation notifies the system that the method annotated as @BeforeGroups is a configuration method that enlists a group and that must be executed before executing the first test method of the group
@AfterGroups	The annotation notifies the system that the method annotated as @AfterGroups is a configuration method that enlists a group and that must be executed after executing the last test method of the group

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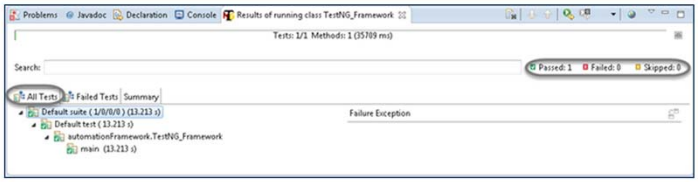
TestNG Result

- TestNG result is displayed into two windows as shown below:
  - Console Window
  - Testing Result Window

a

b



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TestNG Reports

- Generates a different type of report for test execution
- Whenever TestNG is run, HTML and XML reports are generated by default in the directory
- For implementing a reporting class, the class has to implement an org.testng.IReporter interface
- Has its own reporter objects which are called when whole suite run ends

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TestNG Reports

- Object containing the information of the whole test run is passed on to the report implementations
- Default implementations are:
  - Main
  - Failed Reporter
  - XML Reporter
  - EmailableReporter2
  - JUnitReport Reporter
  - SuiteHTML Reporter

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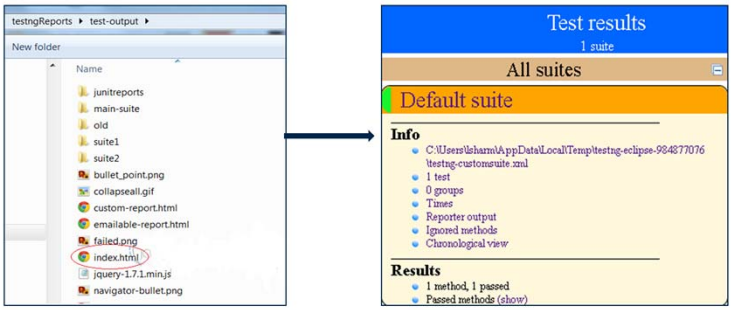
TestNG Reports

- In Main report layout ,test-output directory contains HTML reports like an index.html file, that is the entry point to the TestNG HTML report.
- The top-level report gives us a list of all the suites that were just run, along with an individual and compound total for each passed, failed, and skipped test.



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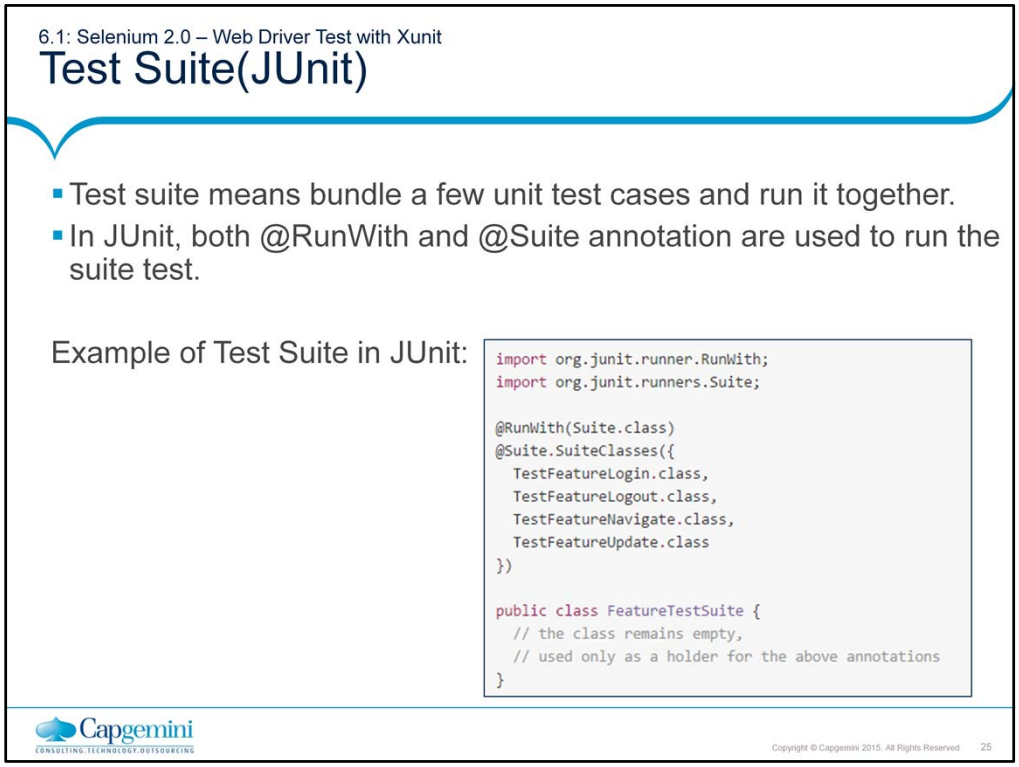
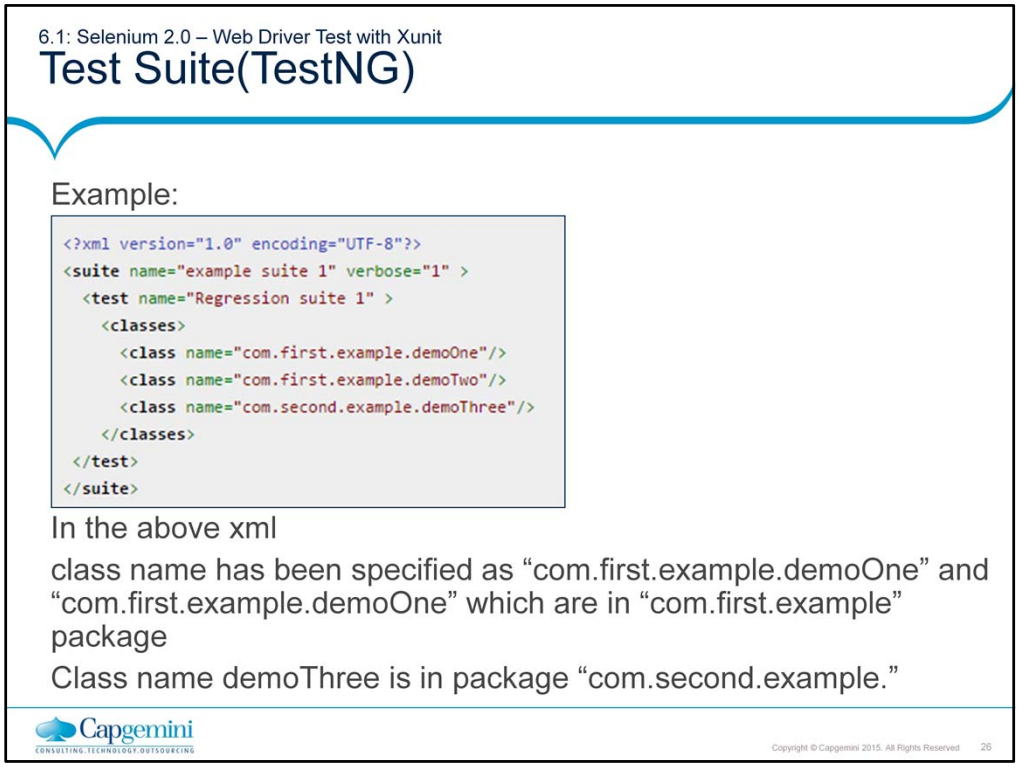
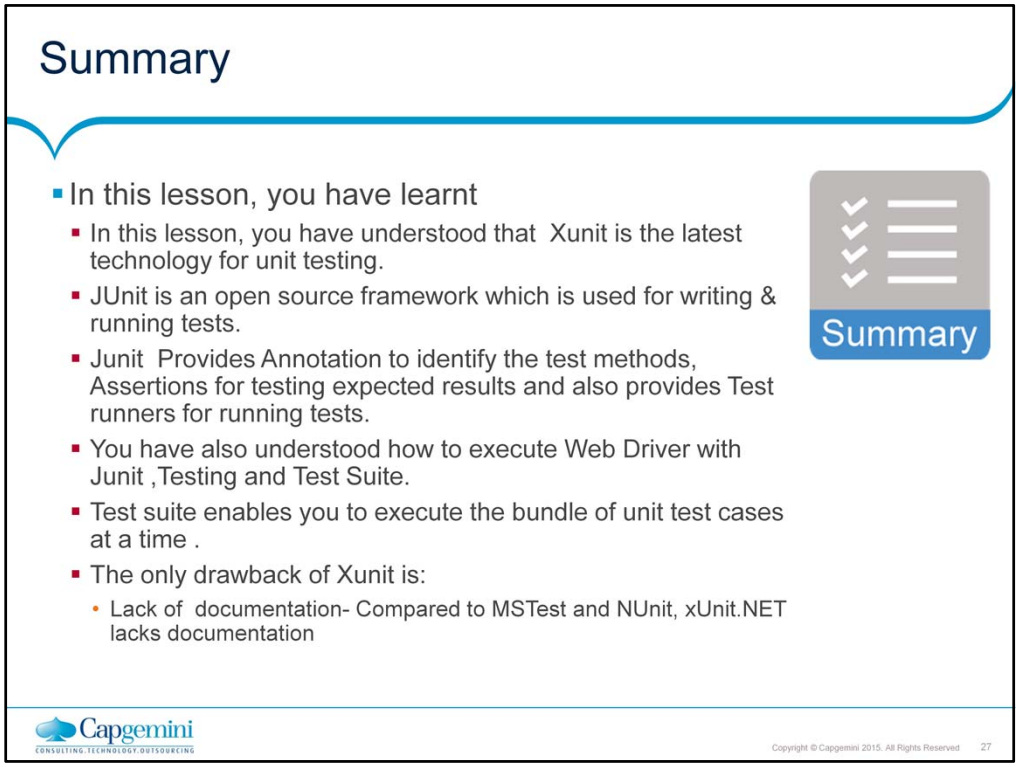


Aggregating tests in suites:
Using Suite as a runner allows you to manually build a suite containing tests from many classes. It is the JUnit 4 equivalent of the JUnit 3.8.x static Test suite() method. To use it, annotate a class with @RunWith(Suite.class) and @SuiteClasses(TestClass1.class, ...). When you run this class, it will run all the tests in all the suite classes.

Example:
The class above is a placeholder for the suite annotations, no other implementation is required.
Note : @RunWith annotation, which specifies that the JUnit 4 test runner to use is org.junit.runners.Suite for running this particular test class. This works in conjunction with the @Suite annotation, which tells the Suite runner which test classes to include in this suite and in which order.



We need to specify the class names along with packages in between the classes tags.
All the classes specified in the xml will get executes which have TestNG annotations.



Add the notes here.

Review Question

- Question 1
  - Select the Annotation which is NOT part of JUnit Annotations
  - @After
  - @After or Before
  - @Before
  - @AfterClass

- Question 2: True/False
  - The Selenium web driver is automation API not testing AP
- Question 3: Fill in the Blanks
  - The assertSame() methods tests if two object references point to the _____ .

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