

A Unit-Test Framework

For an Oracle Fusion Middleware environment

Intended Audience:

Developers

Author:

Jang-Vijay Singh

jv@singhpora.com

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Objectives

- When an incremental change is made (such as a bug fix) – repeatable tests add some assurance that existing functionality works as is
- Unit tests as developed currently mainly contain “inputs” and matching “expected outputs” (*but can test more complex scenarios too as shown later*)

The “expected outputs” were initially obtained from the versions of code prior to the change (e.g. from the 11g server prior to 12c migration or from the older version of code without the change).

- Without access to a business requirements catalogue, it is impossible to create a full set of test cases but developers can keep adding to these as information becomes available or as new features/bug fixes are developed.

Objectives (contd)

- It is too time-consuming to run unit tests such as these **manually** every time a change is made (and these only relate to **one** field)
- It's better to automate and include such tests

A	B	C
UCN		Expected
999990001	PlugReq001_NoTemperaturesSet.xml	Keep original value in PLUGREQ
999990002	PlugReq002_MinTempSet_PlugReqBlank.xml	Set PLUGREQ to Y as it was blank but MinimumTemperature (or Max Temp) is set
999990003	PlugReq003_MinTempSet_PlugReqSetN.xml	Keep original value in PLUGREQ
999990004	PlugReq004_MinTempSet_PlugReqSetX.xml	Keep original value in PLUGREQ (because it is explicitly set and not blank)

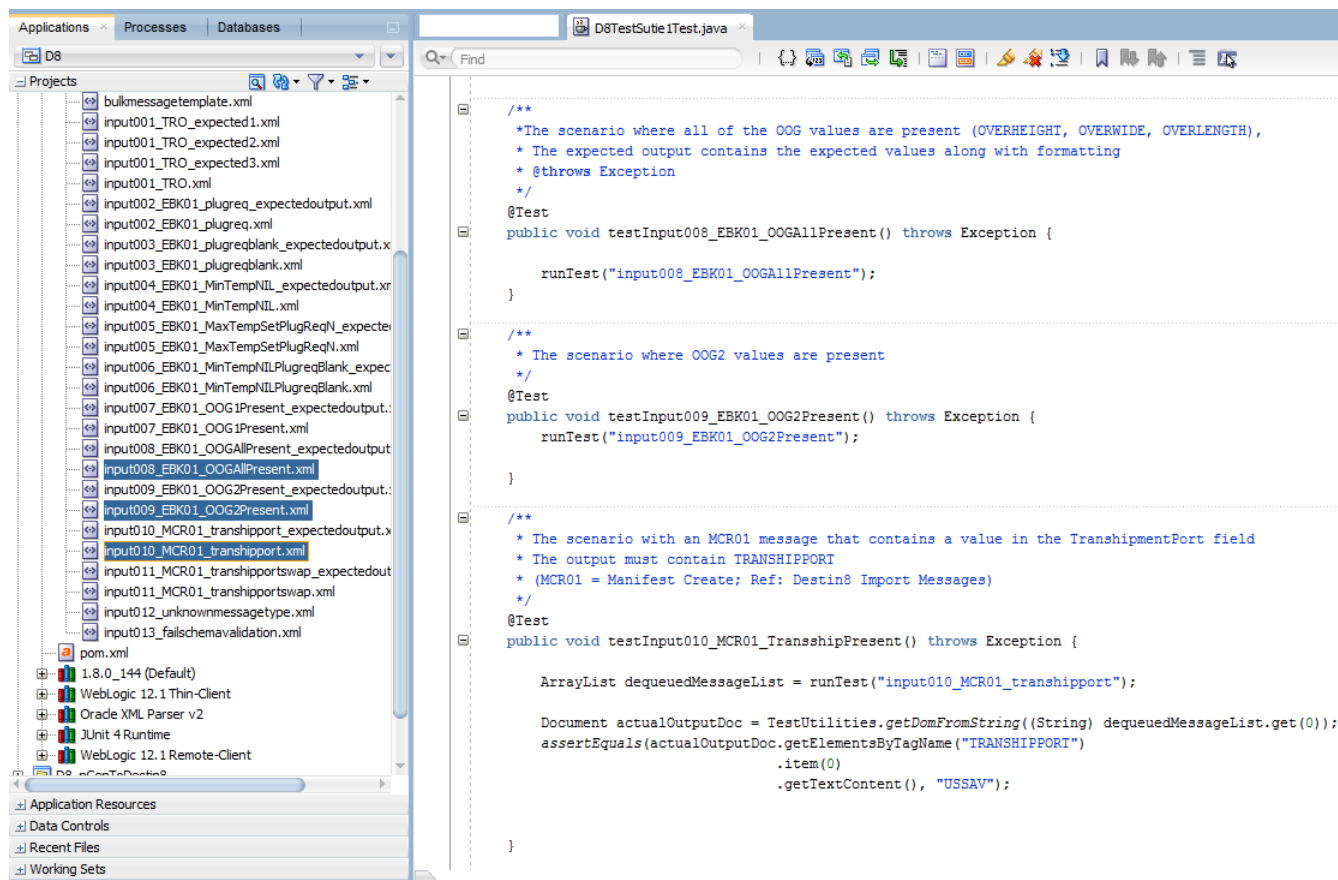
Principles

- Test a 'unit' – treating the system as a black box
- No point testing the platform features
- Test code is not shipped – it is only a local harness mainly used by developers to run tests repeatedly
- The goal is not to test network connectivity and environment configuration as such – it is to test code that is making changes to messages or applying some additional conditions/rules – this is why, it is better to mock external endpoints during **unit** testing
- It is **not a replacement** for systems integration testing (**SIT**) or user testing (UAT)
- As with every aspect of Software Engineering, one needs to apply pragmatism
- Test coverage can become a “**source of truth**” for *most* business requirements that were actually implemented (*this does not replace **formal business requirements specifications***)
- *Migration of existing flows to upgraded technologies becomes more reliable (e.g. 11g -> 12c -> PaaS/iPaaS/Integration Cloud)*
- Of course, good test coverage leads to higher maintainability i.e. reliable change control and enhancements

Walkthrough Samples

An example test suite with test inputs and outputs – shown in JDeveloper

The simplest test case consists of just one line – calling a function “runTest” accompanied with input and output files – all the repeated code (send input to JMS, receive output from JMS, compare XML documents) is hidden in that function. More complex scenarios can be explicitly covered as well (testInput010 shown below)



Walkthrough Samples2

- Scenario: JMS to http to JMS

It helps to mock the external endpoint to keep tests repeatable and under controlled conditions.

WireMock is a good tool for mocking http endpoints - it can be started up with each test to supply specific outputs in different scenarios

Test Framework

- A collection of reusable code that can be referred from individual projects.

Example:

The screenshot displays the Oracle JDeveloper IDE interface. The left-hand pane shows the 'TestUtilities' project structure, which includes 'Application Sources' (QueueReceive.java, QueueSend.java, QueueSetup.java, and TestUtilities.java) and 'Resources' (pom.xml and README). The 'TestUtilities.java' file is selected, and its 'Structure' view is shown at the bottom, listing methods: domToString, getDomFromString, verifyOutputXMLandXML, and verifyOutputXMLStringAndXMLString. The right-hand pane shows the source code of TestUtilities.java, which is a package-level utility class for testing XML files. The code includes imports, a class definition, and two static methods for verifying XML output. Green arrows highlight the relationship between the project structure and the code implementation.

Based on Oracle A-Team examples (but adapted and refactored) to send and receive messages from JMS queues.

Queue setup and initialisation (see usage examples in actual tests)

List of operations in TestUtilities

```
package fdrc.osb.testutilities;

import ...;

/**
 * General purpose utilities required during testing.
 */
public class TestUtilities {
    public TestUtilities() {
        super();
    }

    /**
     * @param expectedOutputFile - An XML file
     * @param actualOutputFile - An XML File
     * @return - boolean result of the match
     * @throws Exception
     */
    public synchronized static boolean verifyOutputXMLandXML(File expectedOutputFile,
        File actualOutputFile) throws Exception {

        String expectedOutputXML = Files.lines(Paths.get(expectedOutputFile.toURI())).collect(Collectors.joining());
        String actualOutputXML = Files.lines(Paths.get(actualOutputFile.toURI())).collect(Collectors.joining());

        return verifyOutputXMLStringAndXMLString(expectedOutputXML, actualOutputXML);
    }

    public static boolean verifyOutputXMLStringAndXMLString(String expectedOutputXML, String actualOutputXML) {
        Boolean result =
            (new XmlUtils())
                .equal(getDomFromString(expectedOutputXML), getDomFromString(actualOutputXML), new Options());
    }
}
```

Test Framework

- Example 2 – testing a publish-subscribe flow that includes JMS

The screenshot displays an IDE with the following components:

- Project Explorer (Left):** Shows the project structure. The `D8` project contains `src` and `testResources` folders. The `testResources` folder contains various XML files, including `input001_TRO_expected1.xml` through `input10_MAM01_transhipport.xml`. Annotations indicate that the actual OSB project is `D8_Destin8TonGen` and that the test resources are matched against expected outputs.
- Code Editor (Right):** Displays the `D8TestSuite1Test.java` file. The code includes setup for JMS queues and a test method `testInput001_TRO()`. Annotations explain the queue names and the purpose of the test.
- JUnit Test Runner (Bottom):** Shows the execution results of the tests. The tests are listed in a table, and the status bar indicates that all tests passed.

Annotations:

- The actual OSB project* (points to `D8_Destin8TonGen` in the Project Explorer).
- Actual output received is matched against these 'expected' outputs* (points to the `testResources` folder).
- the input file* (points to `input001_TRO.xml` in the `testResources` folder).
- The input and output queue JNDI names. For unit testing these are kept available on a LOCAL server (a LOCAL customisation plan can be used)* (points to the `RECEIVE_QUEUE` and `SEND_QUEUE` definitions).
- Explanatory note here explains what the test is meant to check for.* (points to the `testInput001_TRO()` method).
- The tests after execution* (points to the JUnit Test Runner results).

```
//SETUP Defines the queue to be read for this usecase.
public final static String RECEIVE_QUEUE = "ngen.queue.esb.saf.Outbound";
//SETUP
public final static String SEND_QUEUE = "ngen.queue.esb.InboundFromDestin8";

/**
 * This test case is meant to send a TRO xml message as input.
 * The output queue (which Ngen listens to) expects to receive 3 messages
 * The test listens for these three messages and compares them with the *expected*.xml messages
 * that we have as reference under testResources
 */
@Test
public void testInput001_TRO() throws Exception {
    synchronized (this) {
        File inputFile = new File("testResources/input001_TRO.xml");
        QueueSend queueSend = QueueSetup.getQueueSend(SEND_QUEUE);
        String xmlInputToSend = Files.lines(Paths.get(inputFile.toURI())).collect(Collectors.joining("\n"));

        QueueSend.readAndSend(queueSend, xmlInputToSend);

        QueueReceive queueReceive = QueueSetup.getQueueReceive(RECEIVE_QUEUE, 3);
        synchronized (queueReceive) {
            while (!queueReceive.isQuit()) {
                try {
                    queueReceive.wait();
                } catch (InterruptedException ie) {
                    ie.printStackTrace();
                }
            }
        }
    }
}
```

Test Name	Status
testInput001_TRO	✓
testInput002_EBK01_plugreq	✓
testInput003_EBK01_plugreqblank	✓
testInput004_EBK01_MinTempNil	✓
testInput005_EBK01_MaxTempSetPlugReqN	✓
testInput006_EBK01_MinTempNilPlugreqBlank	✓
testInput007_EBK01_OOGIPresent	✓
testInput008_EBK01_OOGAllPresent	✓
testInput009_EBK01_OOG2Present	✓
testInput010_EBK01_TransshipPresent	✓

Technologies

- Junit – plain and simple
- Oracle XMLDiff API's
- Oracle JMS samples from A-Team
- SOAPui – can be plugged in to automated tests