WEB SERVICES TEST AUTOMATION

Notes for Facilitated Discussion

at

September 2013 Meeting of
Northern Virginia Test Automation Interest Group

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Roundtable Discussion Facilitated by:

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Discussion Outline

1. Overview of various types of web services.

2. Discussion of test automation strategies, tools, and experiences. Discussion topics may include:
   - Evolution of the term 'web services' in recent years
   - Overview of RESTful web services
   - Test automation patterns for SOAP/WSDL/XML web services; tools such as SOATest, SOAPUI, HPUFT, etc.
   - Test automation patterns for RESTful web services

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Evolution of the term 'web services'

The term as it was used then....

And how its used now....

Mashups
Web Services - General usage

Wikipedia:

• Software functions provided at a network address communicated via the web

• Always available
NEXT:

1. SOAP/WSDL/XML type web services – basics and test automation

2. RESTful Services – basics and test automation
SOAP/WSDL/XML context

SOAP – Simple Object Access Protocol specification for exchanging structured information in Web Services

WSDL - Web Services Description Language

XML – Extensible Markup Language

--W3C standards
Request/Response

Example SOAP Request:

```xml
<?xml version="1.0" encoding="UTF-8" standalone="no" ?>
<SOAP-ENV:Envelope
  SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
  xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/"
  xmlns:xsi="http://www.w3.org/1999/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/1999/XMLSchema">
  <SOAP-ENV:Body>
    <ns1:doubleAnInteger
      xmlns:ns1="urn:MySoapServices">
      <param1 xsi:type="xsd:int">123</param1>
    </ns1:doubleAnInteger>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>
```
WSDL

Contains objects:

<table>
<thead>
<tr>
<th>WSDL 1.1 Term</th>
<th>WSDL 2.0 Term</th>
</tr>
</thead>
<tbody>
<tr>
<td>Service</td>
<td>Service</td>
</tr>
<tr>
<td>Port</td>
<td>Endpoint</td>
</tr>
<tr>
<td>Binding</td>
<td>Binding</td>
</tr>
<tr>
<td>PortType</td>
<td>Interface</td>
</tr>
<tr>
<td>Operation</td>
<td>Operation</td>
</tr>
<tr>
<td>Message</td>
<td>n/a</td>
</tr>
<tr>
<td>Types</td>
<td>Types</td>
</tr>
</tbody>
</table>
Example: old Amazon Alexa WSDL

```xml
<?xml version="1.0" encoding="UTF-8"?>
<definitions
xmlns:soap="http://schemas.xmlsoap.org/wsdl/soap/
xmlns="http://schemas.xmlsoap.org/wsdl/
xmlns:xs="http://www.w3.org/2001/XMLSchema"
    <types>
        <xs:schema>
                        schemaLocation="AlexaTopSites.xsd"/>
        </xs:schema>
    </types>
    <message name="TopSitesRequestMsg">
        <part name="body" element="tns:TopSites"/>
    </message>
    <message name="TopSitesResponseMsg">
        <part name="body" element="tns:TopSitesResponse"/>
    </message>
....
    <service name="AlexaTopSites">
        <port name="AlexaTopSitesPort" binding="tns:AlexaTopSitesBinding">
            <soap:address location="http://ats.amazonaws.com"/>
        </port>
    </service>
</definitions>
```
XSD

Schema – inline in WSDL or separate .xsd referenced from WSDL

Example: excerpt from old Amazon Alexa web services:

```xml
...<xs:complexType name="TopSitesRequest">
  <xs:sequence>
    <xs:element name="Security" minOccurs="0">
      <xs:complexType>
        <xs:sequence>
          <xs:element name="AWSAccessKeyId" type="xs:string" minOccurs="0"/>
          <xs:element name="Signature" type="xs:string" minOccurs="0"/>
          <xs:element name="Timestamp" type="xs:string" minOccurs="0"/>
        </xs:sequence>
      </xs:complexType>
    </xs:element>
    <xs:element type="xs:string" name="CountryCode" minOccurs="0"/>
    <xs:element type="xs:string" name="CityCode" minOccurs="0"/>
    <xs:element type="xs:string" name="Start" minOccurs="0"/>
    <xs:element type="xs:string" name="Count" minOccurs="0"/>
    <xs:element type="xs:string" name="ResponseGroup"/>
  </xs:sequence>
</xs:complexType>
...`
SOAP/WSDL/XML Test Automation Tools

SOAPUI - from SmartBear; free and pro$ versions; for inspecting, invoking, simulating/mocking & functional & load testing of web services over HTTP. Also handles RESTful services testing.

SOATest – from Parasoft; automatic test creation from WSDL, WSIL, UDDI and HTTP Traffic. Includes load & security testing; graphically model and test complex scenarios.

HPUFT – HP Unified Functional Testing - new version of HP Service Test and QuickTest Pro; also handles RESTful services testing.

XMLSpy – from Altova, for modeling, editing, transforming, debugging XML-related technologies. Text-based or graphical editing views. Useful for analyzing & validating WSDLs & XSDs.

OTHERS - ?
Road to RESTful Services

- Use of Javascript API to pull data from URL (AJAX)
- First: Dynamic webpage content (HTML & Text)
- Next: Javascript data (JSON)
- SOAP too complex for early Javascript
- AJAX/JSON provided simple web service interface
Key RESTful Services Concepts

• Not remote procedure calls

• Shaped by WWW hypermedia metaphor

• Can provide query suggestions, not just data

• Evolving and maturing platform

• SOAP frameworks incorporating features/design concepts
Useful Test Tool Features

- Make HTTP request to URL
- Select HTTP verb (e.g. GET, PUT, POST, DELETE, etc)
- Custom heading key/value pairs
- POST body text/data
- Review response metadata
- Review views of response data (e.g. raw, highlighted, display)
- Save and replay query
- Scripting (e.g. unit test capability)
- Proxy server capability
Sample Test Tools

RESTClient Firefox Addon – HTTP query tool available as Firefox addon. Good tool for manual testing of web service.  
(http://restclient.net/)

Fiddler2 - HTTP debugging proxy server application. It captures HTTP(S) traffic and logs it for the user to review. It can also be used to "fiddle" with HTTP traffic as it is being sent.  
(http://fiddler2.com/)

RESTClient – RESTClient is a Java application to test RESTful webservices. It can be used to test variety of HTTP communications. Provides unit test framework and Groovy support. (https://code.google.com/p/rest-client/)
RESTful Services Frameworks

**ServiceStack** – RESTful web service framework for .Net supports various data encoding formats and endpoints (e.g. RESTful and SOAP) ([http://www.servicestack.net/](http://www.servicestack.net/))

**Jersey RESTful Web Services** - an open source, production quality, framework for developing RESTful Web Services in Java. ([http://jersey.java.net/](http://jersey.java.net/))

RESTClient Firefox Addon

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public class TemplateClassTest
  extends org.wiztools.restclient.RESTTestCase {

  // Test method names must start with 'test':
  public void testStatus() {
    if(response.getStatusCode() != 200) {
      fail("This will fail the test!");
    }
  }
}
Fiddler
ServiceStack - Metadata

AEST Service HttpListener

The following operations are supported. For a formal definition, please review the Service XSD.

Operations:
- ClearJobsRequest
- QueryJobResultsRequest
- QueryJobsRequest
- RequestLogs
- ShutdownRequest
- SubmitAirportsRequest
- SubmitNoiseJobRequest
- SubmitPerformanceJobRequest

Clients Overview

XSDs:
- Service Types
- Wcf Data Types
- Wcf Collection Types

WSDLs:
- soap11
- soap12
ServiceStack – XML output
ServiceStack – JSON output
ServiceStack – SOAP 1.2 output
Comparison of Approaches to Web Services Test Automation

* SOAP/WSDL/XML web services test automation vs RESTful Services test automation

* Technology diffs affecting testing

* Web services test automation –dev/test/…?

* Considerations for agile contexts – unit/API/small/medium

* Future of web services and web services test automation

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A few other resources


**restito** - testing framework for rest clients in JAVA https://github.com/mkotsur/restito

**theRightAPI** - find/try/test API's online; $ ; more than 100 public API providers http://www.therightapi.com/discover

**Betamax** - Record & replay HTTP traffic for simple, reliable tests. - written in Groovy http://freeside.co/betamax/

**wiremock** http://wiremock.org/
WireMock is a flexible library for stubbing and mocking web services.

**Martin Fowler on improvements to RESTful services** – Discoverability and Hypermedia As The Engine Of Application State (HATEOAS) http://martinfowler.com/articles/richardsonMaturityModel.html

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