Functional Testing of Web Services

Yury Makedonov, CGI

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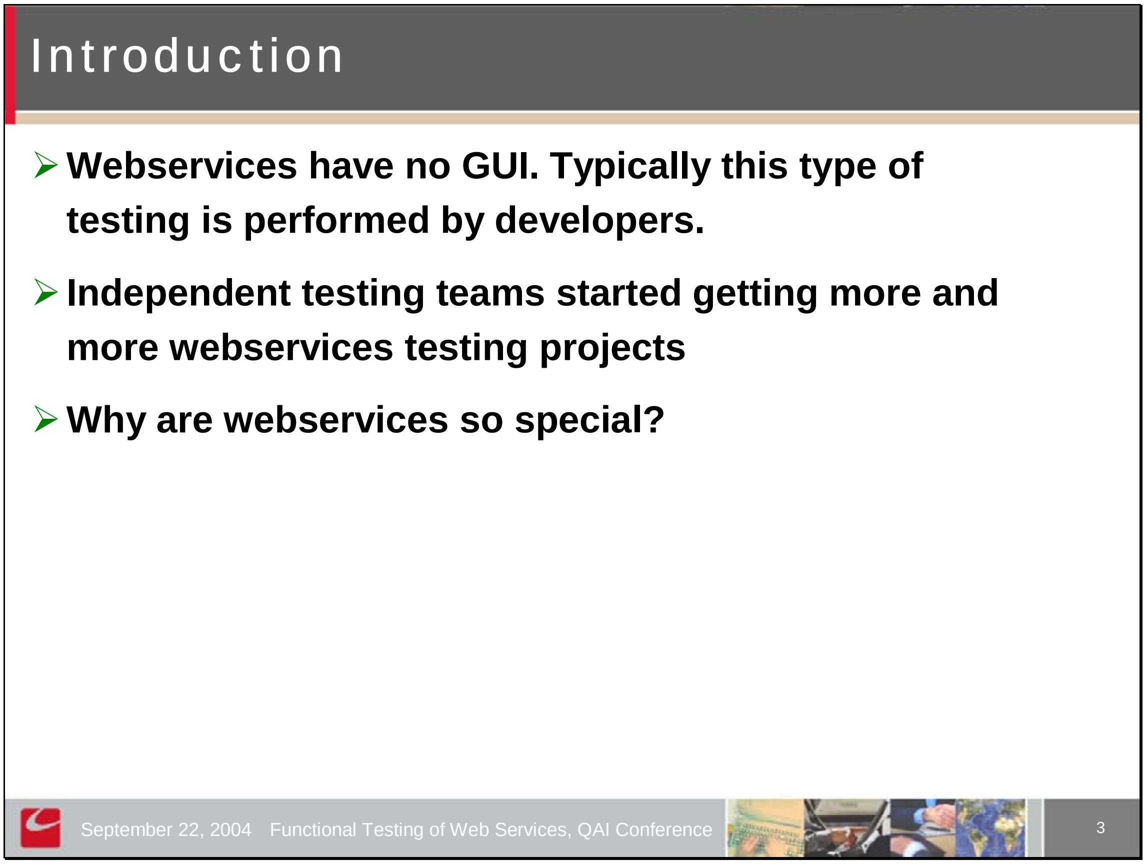
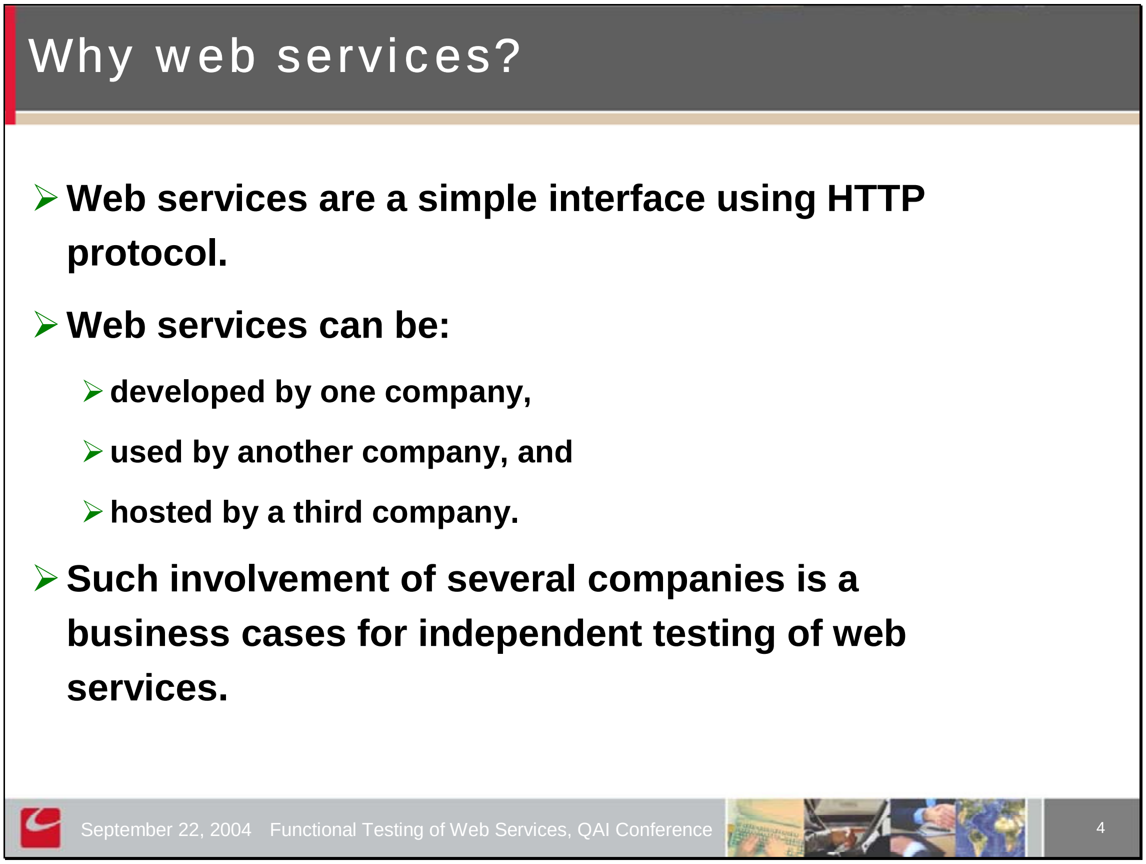
Agenda

- Why we are getting more and more web services testing
- What are web services
- What is XML
- How to test web services
  - Test Approach
  - Tools
- Summary
- Q&A
- **Intended audience:**
  Testers without development background



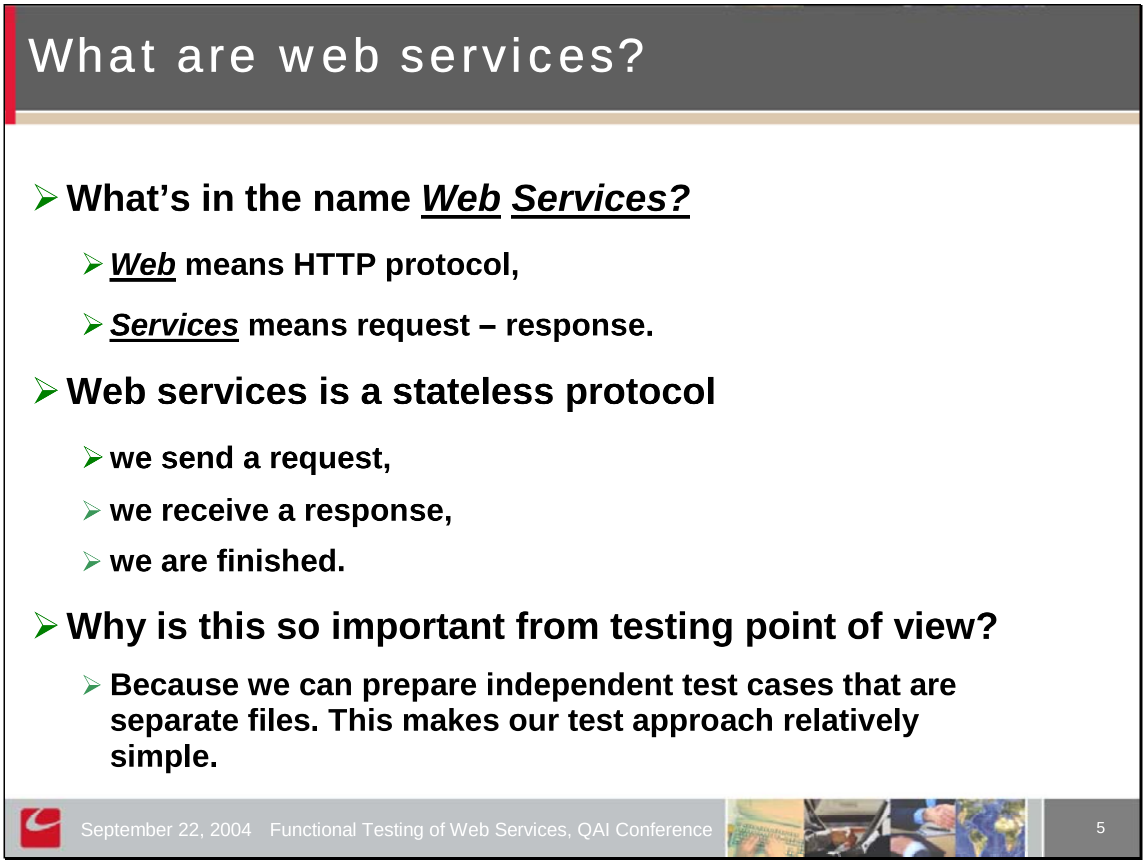
Introduction

- Webservices have no GUI. Typically this type of testing is performed by developers.
- Independent testing teams started getting more and more webservices testing projects
- Why are webservices so special?



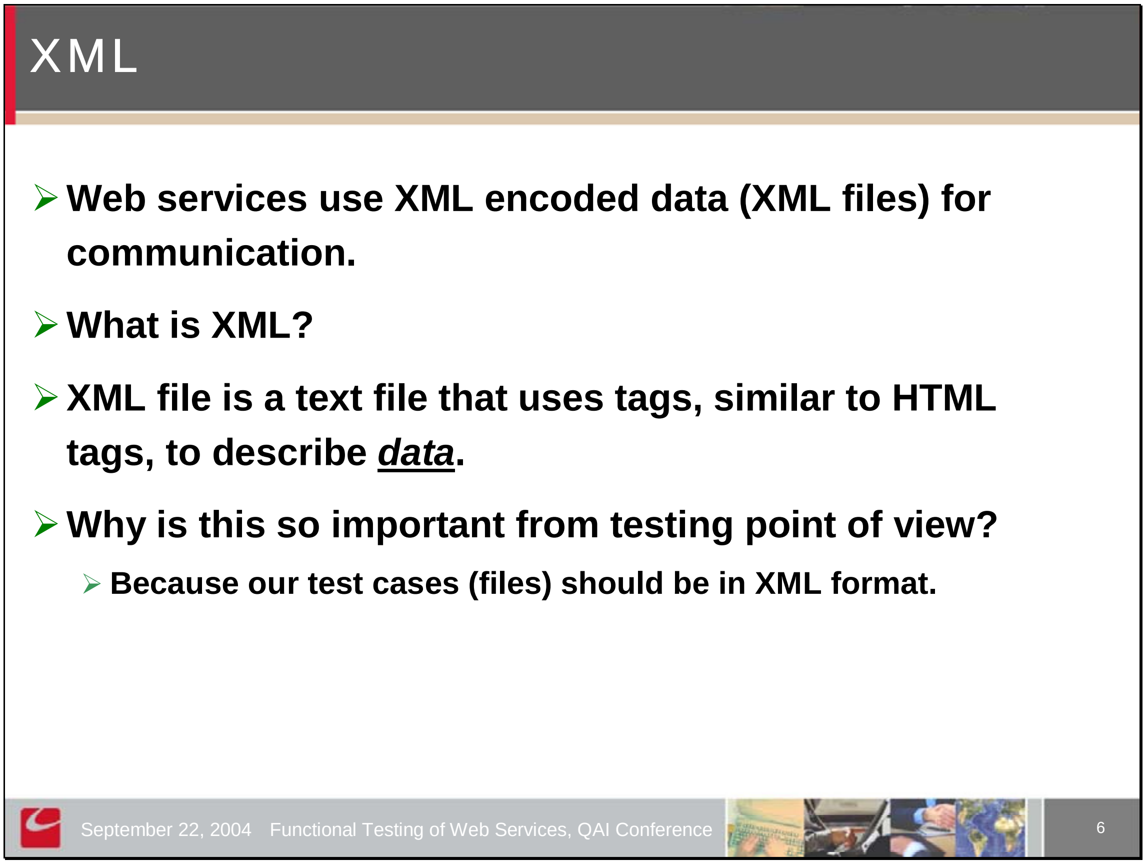
Why web services?

- Web services are a simple interface using HTTP protocol.
- Web services can be:
  - developed by one company,
  - used by another company, and
  - hosted by a third company.
- Such involvement of several companies is a business cases for independent testing of web services.



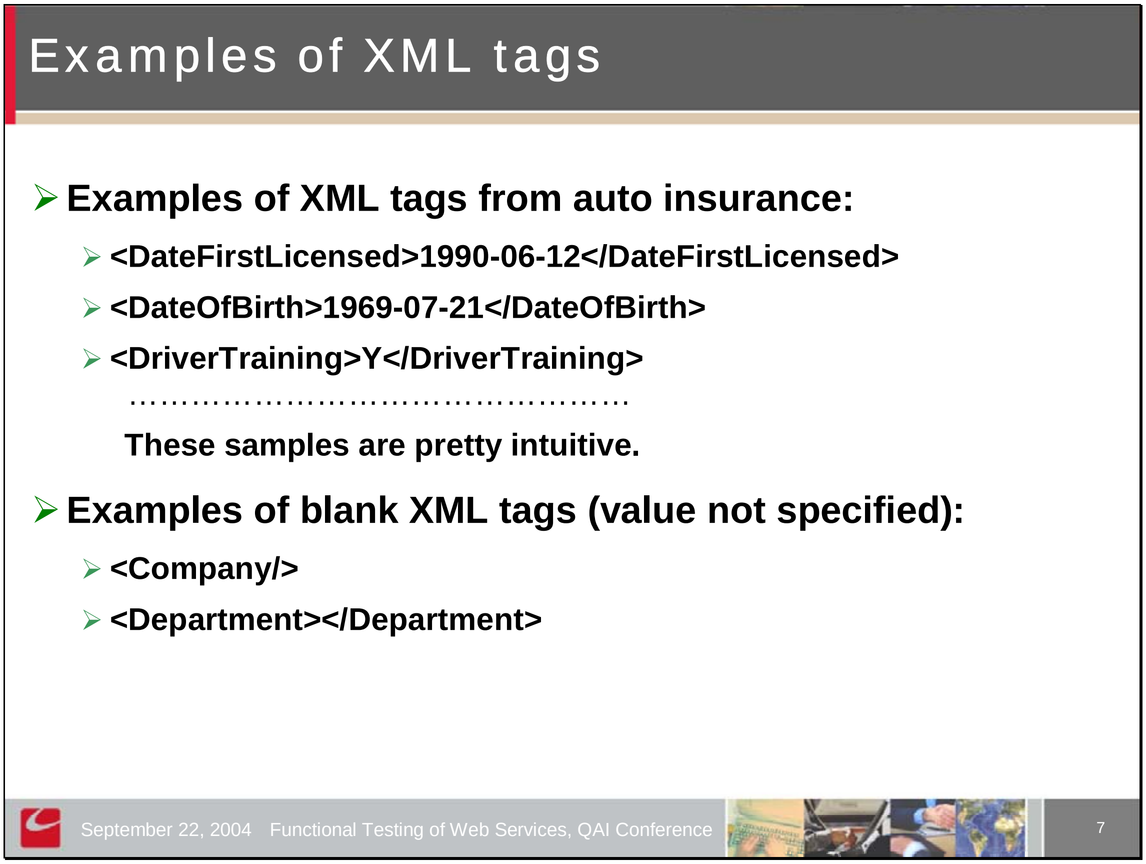
What are web services?

- **What's in the name *Web Services?***
  - ***Web* means HTTP protocol,**
  - ***Services* means request – response.**
- **Web services is a stateless protocol**
  - **we send a request,**
  - **we receive a response,**
  - **we are finished.**
- **Why is this so important from testing point of view?**
  - **Because we can prepare independent test cases that are separate files. This makes our test approach relatively simple.**



XML

- **Web services use XML encoded data (XML files) for communication.**
- **What is XML?**
- **XML file is a text file that uses tags, similar to HTML tags, to describe *data*.**
- **Why is this so important from testing point of view?**
  - **Because our test cases (files) should be in XML format.**

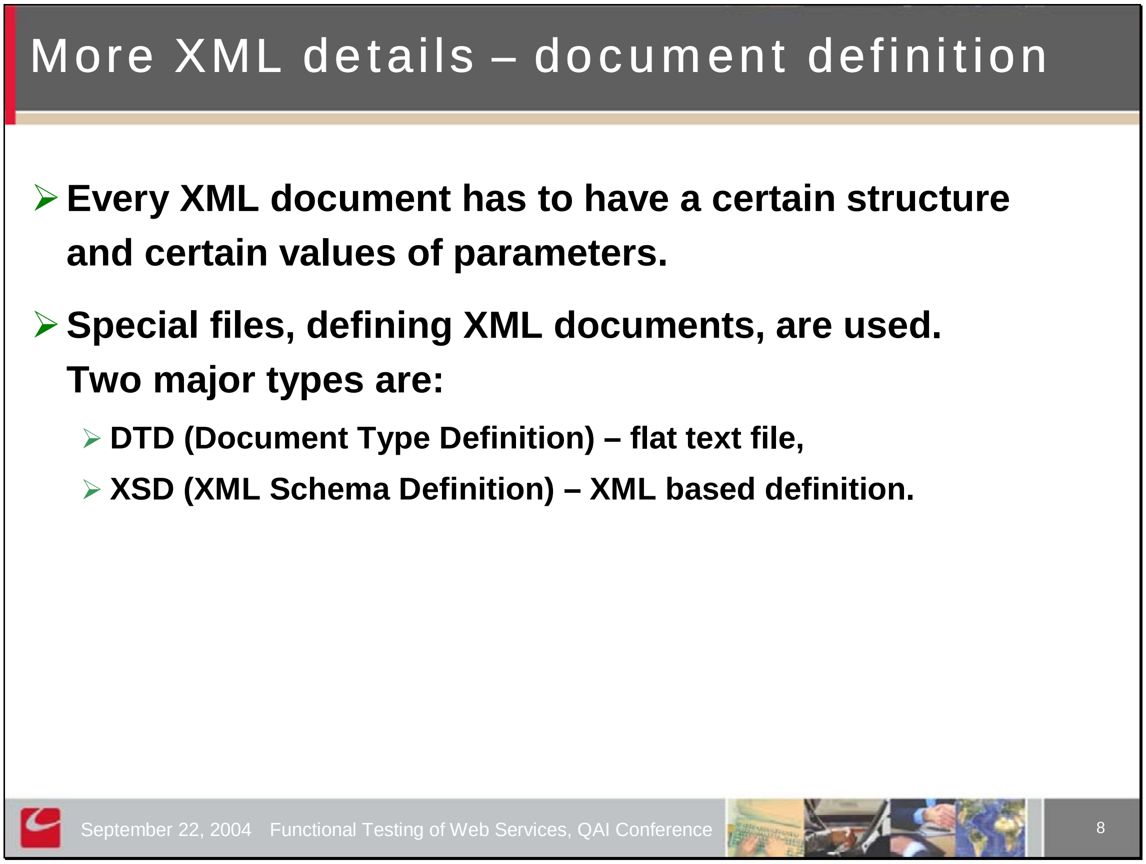


Examples of XML tags

- Examples of XML tags from auto insurance:
  - <DateFirstLicensed>1990-06-12</DateFirstLicensed>
  - <DateOfBirth>1969-07-21</DateOfBirth>
  - <DriverTraining>Y</DriverTraining>

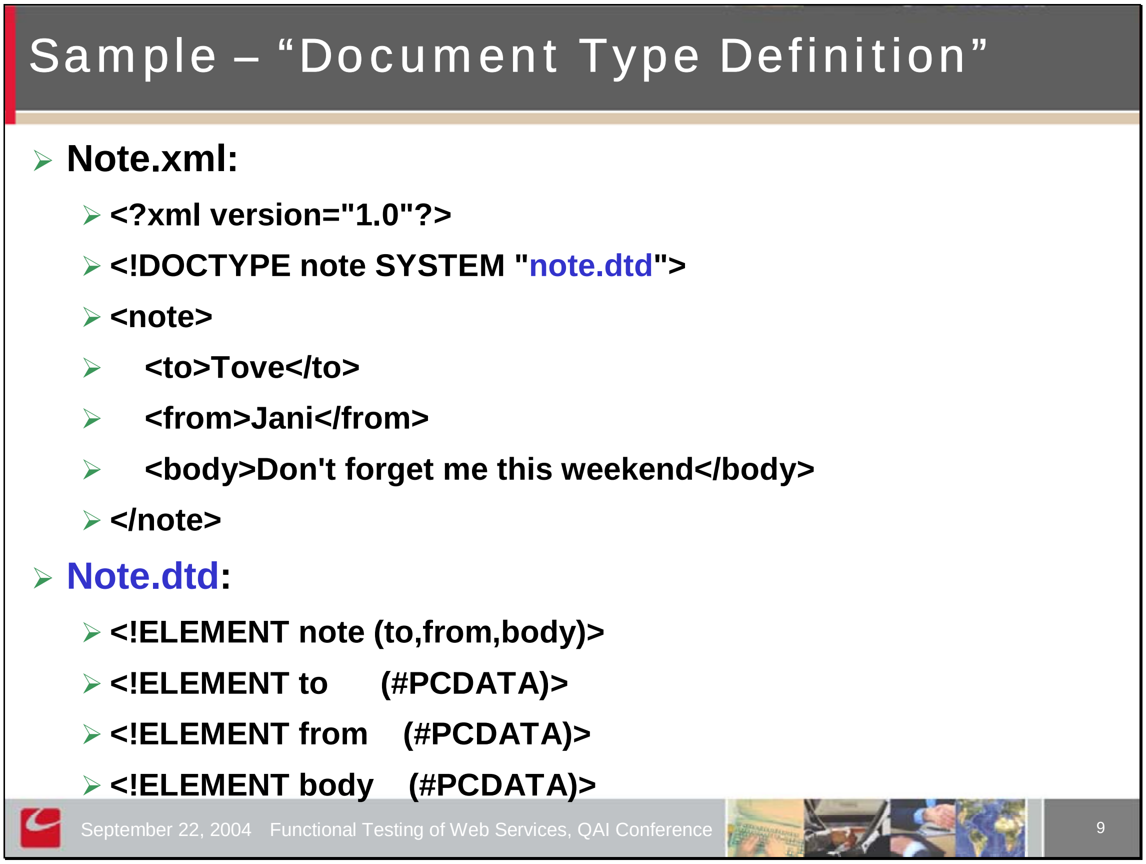
  ……………………………………………

  These samples are pretty intuitive.
- Examples of blank XML tags (value not specified):
  - <Company/>
  - <Department></Department>



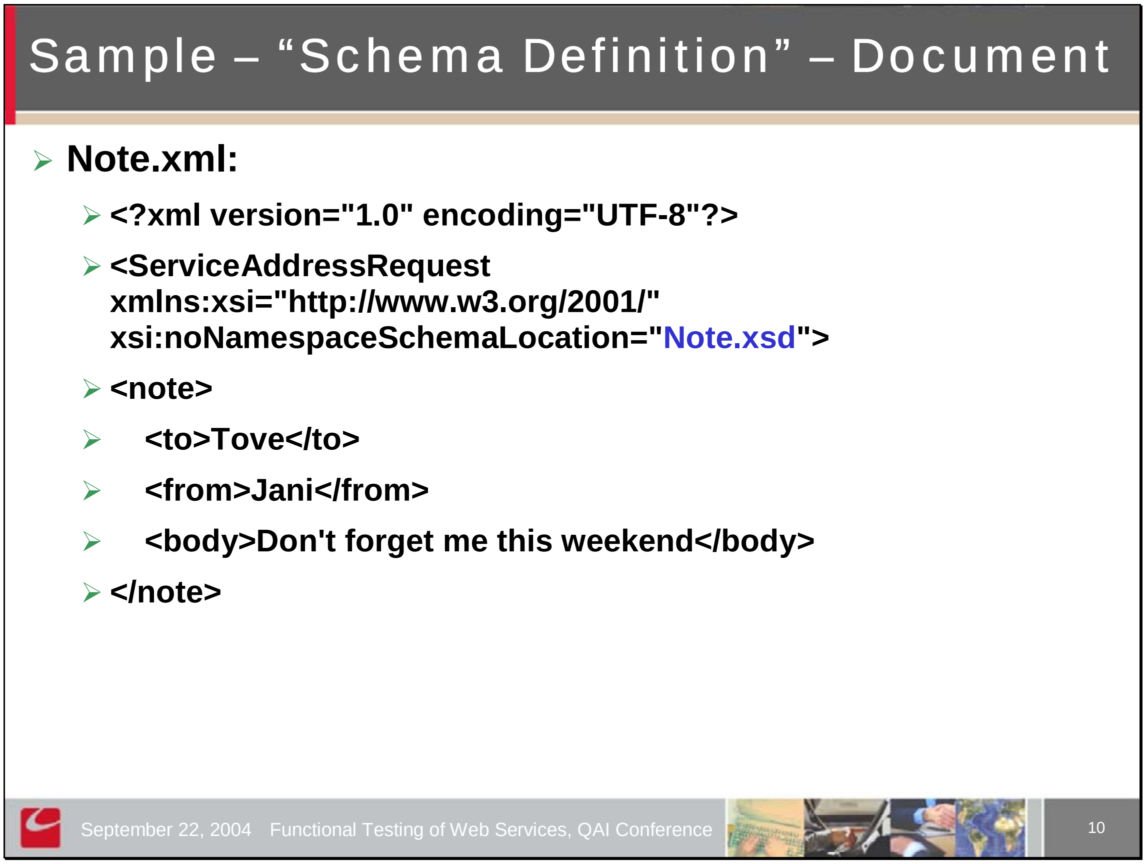
More XML details – document definition

- Every XML document has to have a certain structure and certain values of parameters.
- Special files, defining XML documents, are used. Two major types are:
  - DTD (Document Type Definition) – flat text file,
  - XSD (XML Schema Definition) – XML based definition.



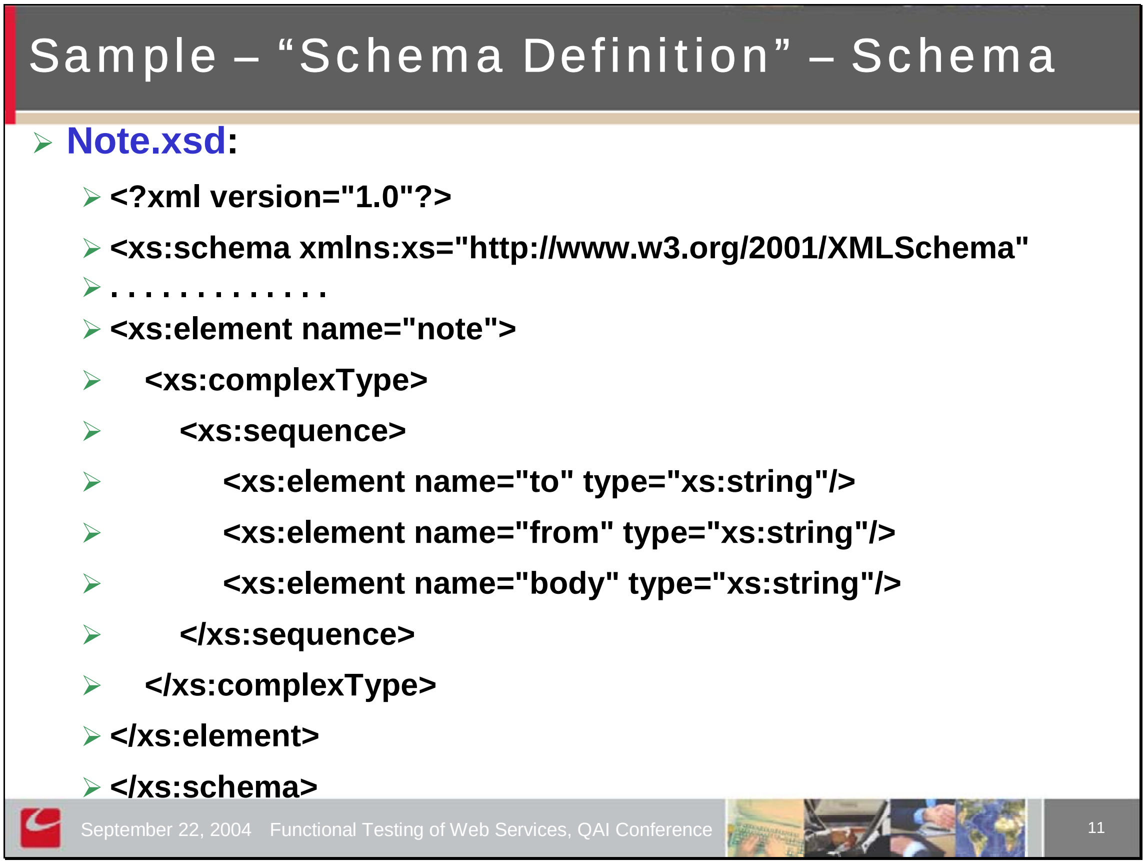
Sample – “Document Type Definition”

- **Note.xml:**
  - **<?xml version="1.0"?>**
  - **<!DOCTYPE note SYSTEM "note.dtd">**
  - **<note>**
  - **<to>Tove</to>**
  - **<from>Jani</from>**
  - **<body>Don't forget me this weekend</body>**
  - **</note>**
- **Note.dtd:**
  - **<!ELEMENT note (to,from,body)>**
  - **<!ELEMENT to   (#PCDATA)>**
  - **<!ELEMENT from   (#PCDATA)>**
  - **<!ELEMENT body   (#PCDATA)>**



Sample – “Schema Definition” – Document

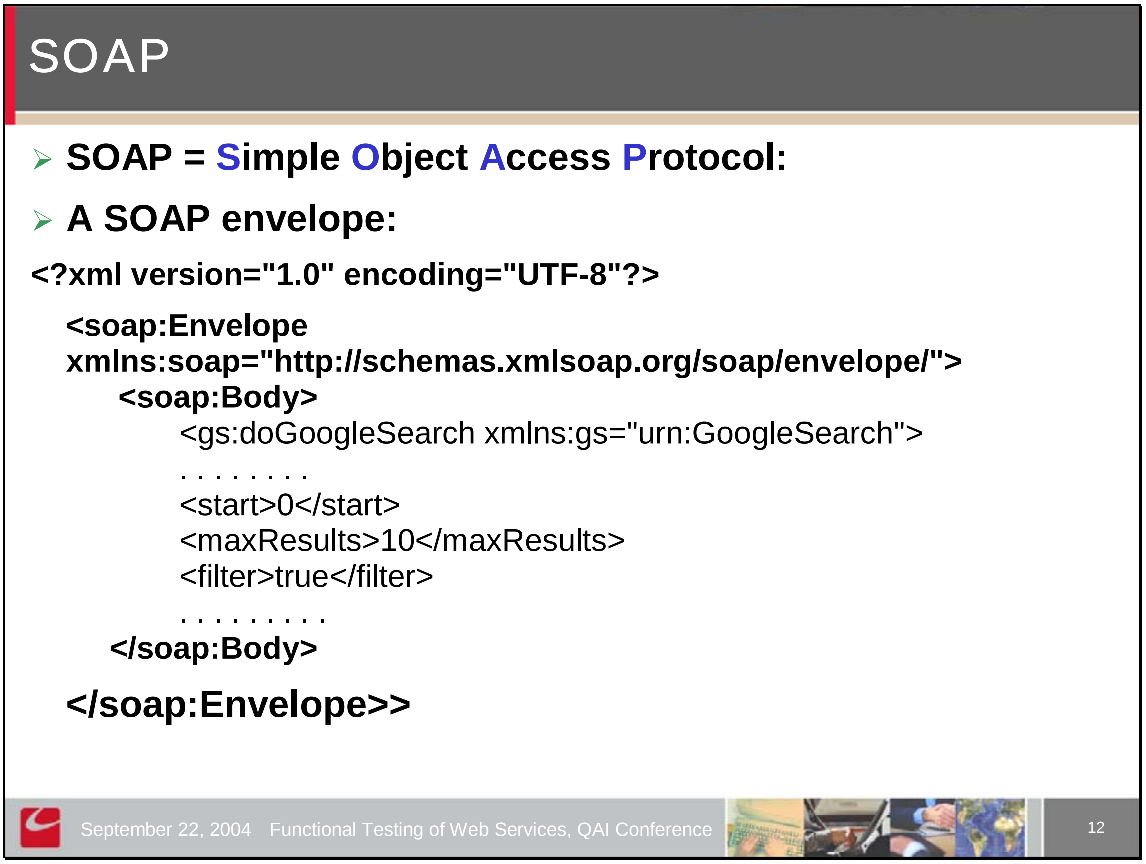
- **Note.xml:**
  - **<?xml version="1.0" encoding="UTF-8"?>**
  - **<ServiceAddressRequest xmlns:xsi="http://www.w3.org/2001/" xsi:noNamespaceSchemaLocation="Note.xsd">**
  - **<note>**
  - **<to>Tove</to>**
  - **<from>Jani</from>**
  - **<body>Don't forget me this weekend</body>**
  - **</note>**



Sample – “Schema Definition” – Schema

- Note.xsd:

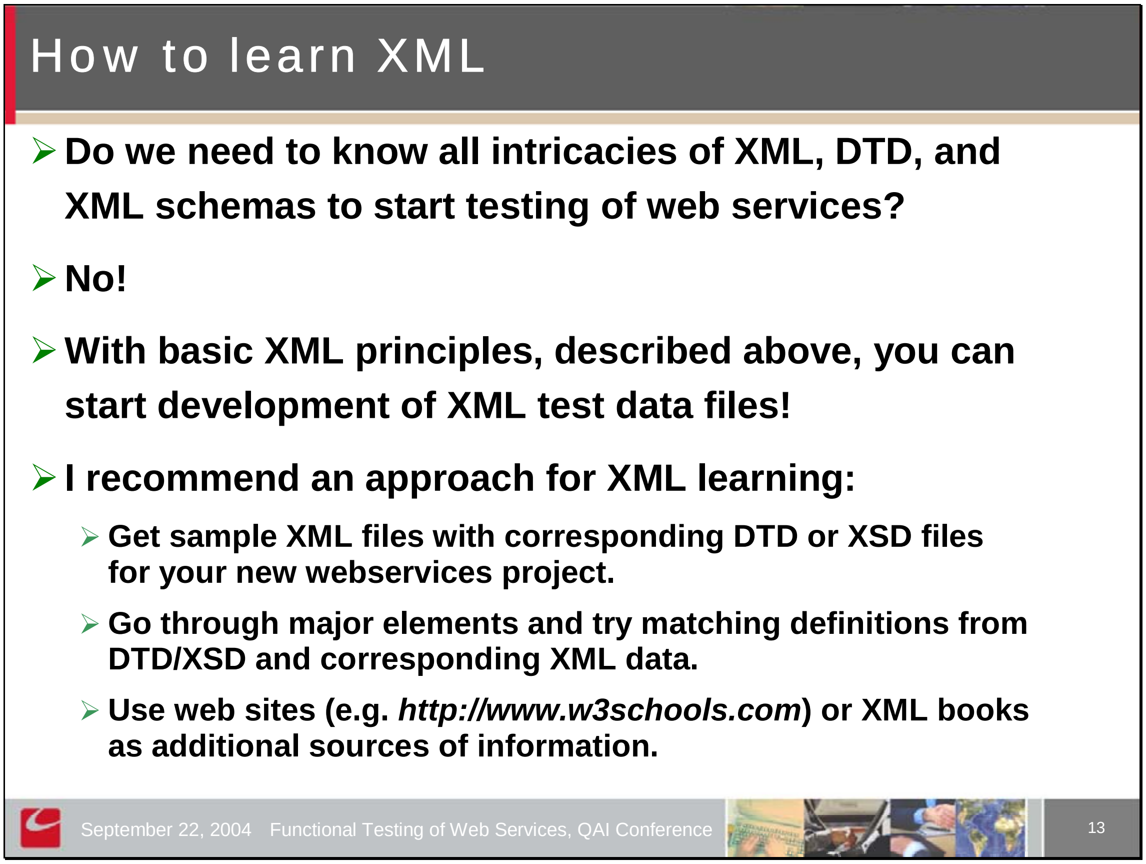
```
<?xml version="1.0"?>
<xs:schema xmlns:xs="http://www.w3.org/2001/XMLSchema"
. . . . . . . . . . . . .
<xs:element name="note">
   <xs:complexType>
      <xs:sequence>
          <xs:element name="to" type="xs:string"/>
          <xs:element name="from" type="xs:string"/>
          <xs:element name="body" type="xs:string"/>
      </xs:sequence>
   </xs:complexType>
</xs:element>
</xs:schema>
```



SOAP

- SOAP = Simple Object Access Protocol:
- A SOAP envelope:

```
<?xml version="1.0" encoding="UTF-8"?>
   <soap:Envelope
   xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/">
       <soap:Body>
            <gs:doGoogleSearch xmlns:gs="urn:GoogleSearch">
            . . . . . . . .
            <start>0</start>
            <maxResults>10</maxResults>
            <filter>true</filter>
            . . . . . . . . .
      </soap:Body>
   </soap:Envelope>>
```



How to learn XML

- **Do we need to know all intricacies of XML, DTD, and XML schemas to start testing of web services?**
- **No!**
- **With basic XML principles, described above, you can start development of XML test data files!**
- **I recommend an approach for XML learning:**
  - **Get sample XML files with corresponding DTD or XSD files for your new webservices project.**
  - **Go through major elements and try matching definitions from DTD/XSD and corresponding XML data.**
  - **Use web sites (e.g. *http://www.w3schools.com*) or XML books as additional sources of information.**

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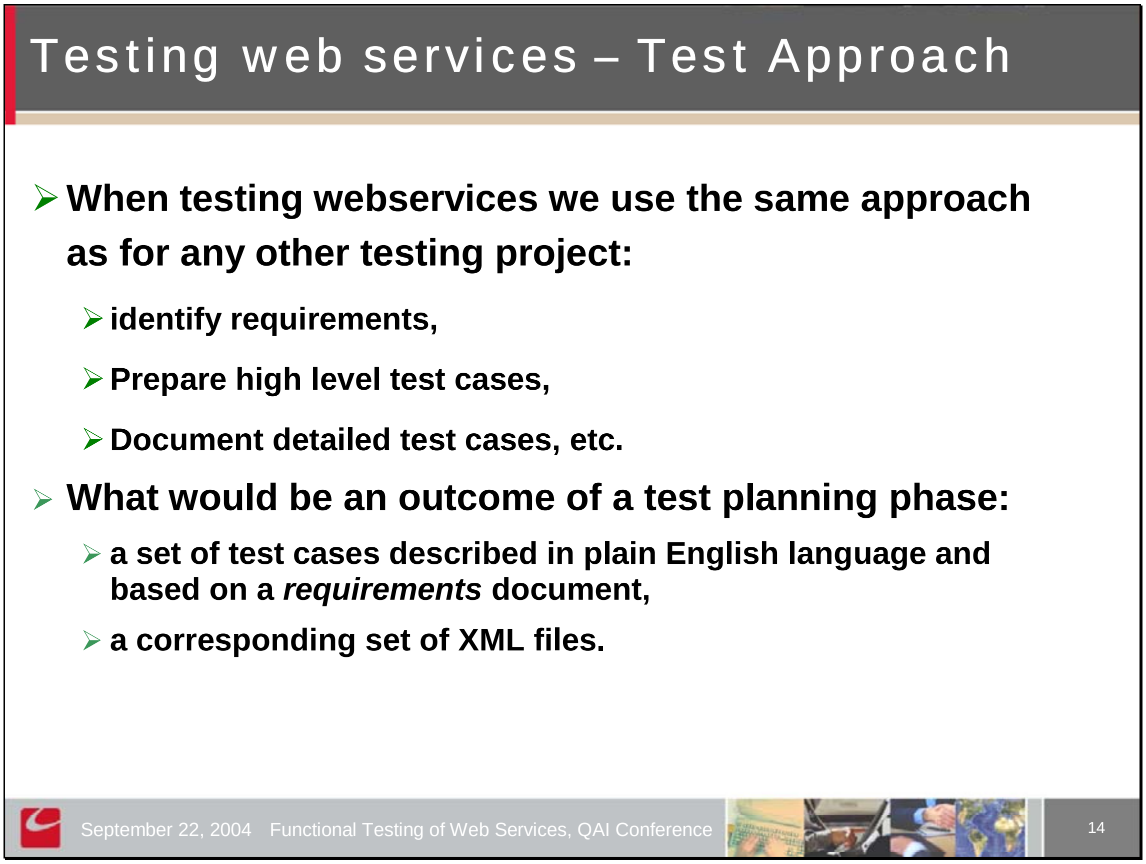

Testing web services – Test Approach

- **When testing webservices we use the same approach as for any other testing project:**
  - **identify requirements,**
  - **Prepare high level test cases,**
  - **Document detailed test cases, etc.**
- **What would be an outcome of a test planning phase:**
  - **a set of test cases described in plain English language and based on a *requirements* document,**
  - **a corresponding set of XML files.**

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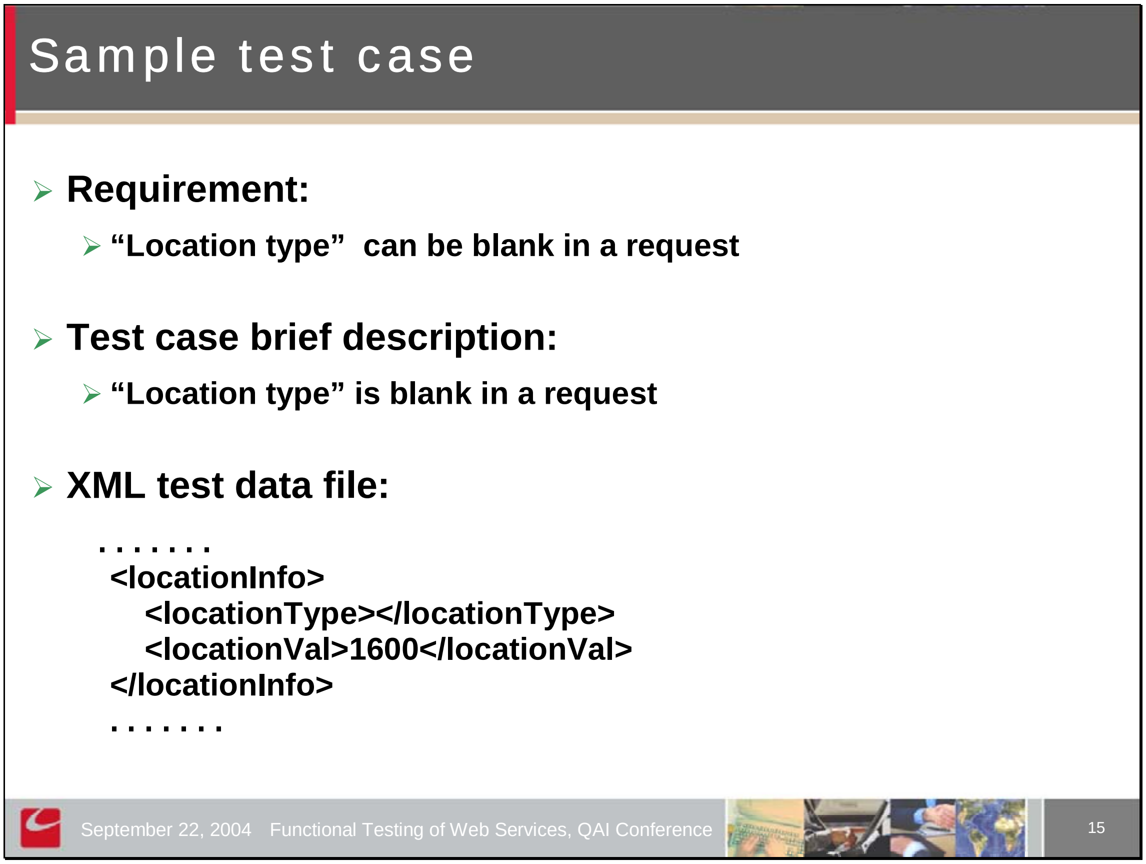
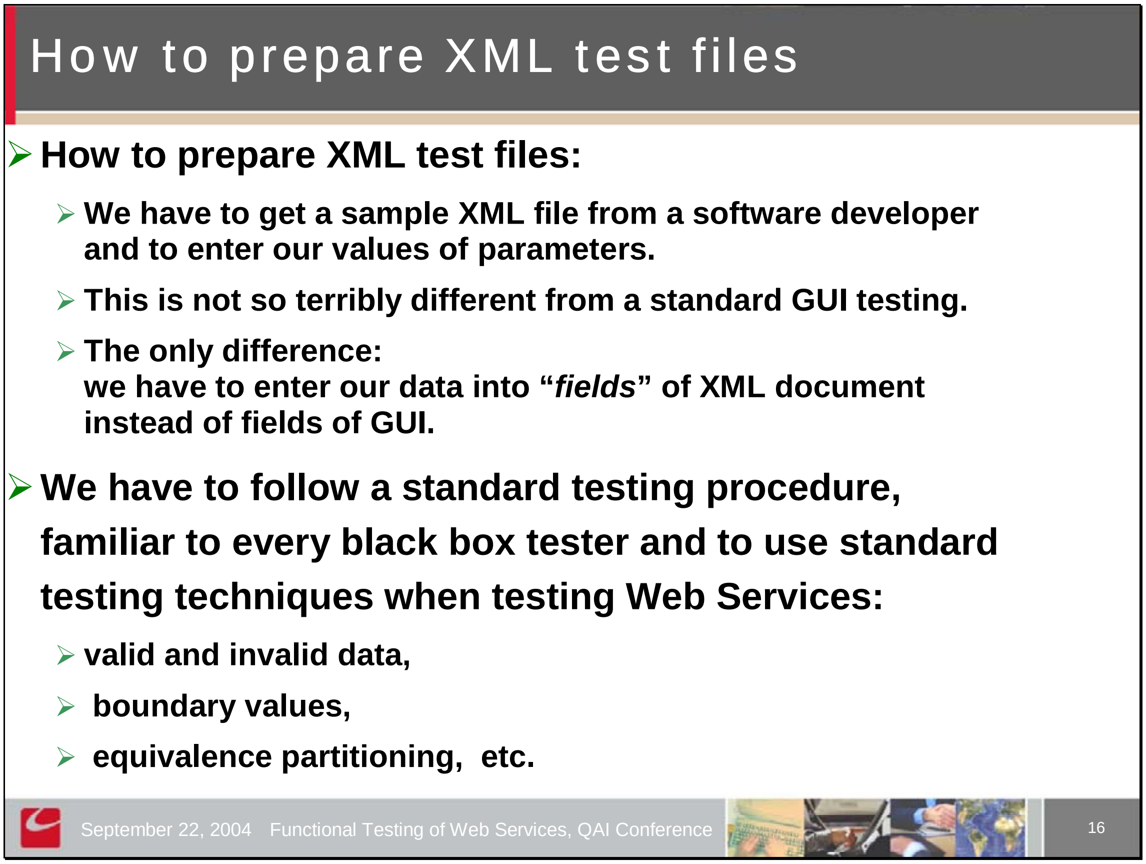


Sample test case

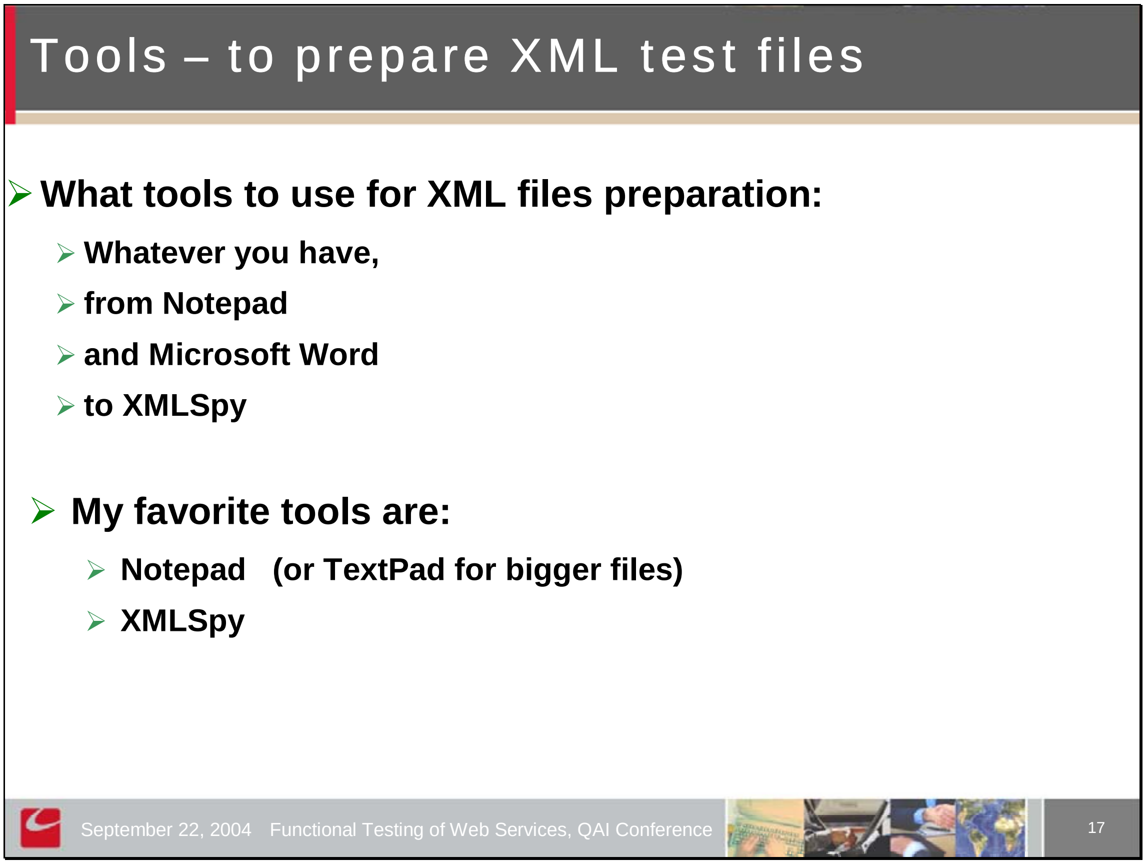
- **Requirement:**
  - **“Location type” can be blank in a request**
- **Test case brief description:**
  - **“Location type” is blank in a request**
- **XML test data file:**

```
. . . . . . .
 <locationInfo>
    <locationType></locationType>
    <locationVal>1600</locationVal>
 </locationInfo>
 . . . . . . .
```



How to prepare XML test files

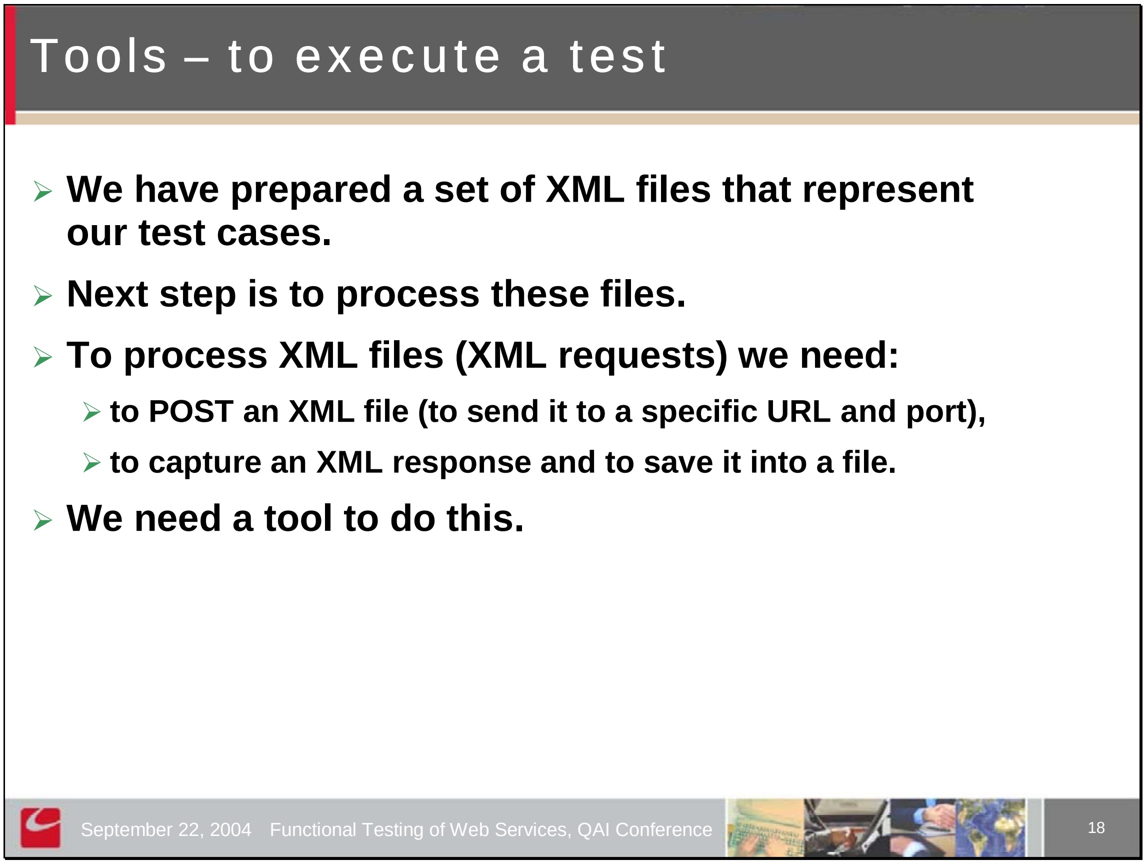
- **How to prepare XML test files:**
  - **We have to get a sample XML file from a software developer and to enter our values of parameters.**
  - **This is not so terribly different from a standard GUI testing.**
  - **The only difference:**
    we have to enter our data into “*fields*” of XML document instead of fields of GUI.
- **We have to follow a standard testing procedure, familiar to every black box tester and to use standard testing techniques when testing Web Services:**
  - **valid and invalid data,**
  - **boundary values,**
  - **equivalence partitioning, etc.**



Tools – to prepare XML test files

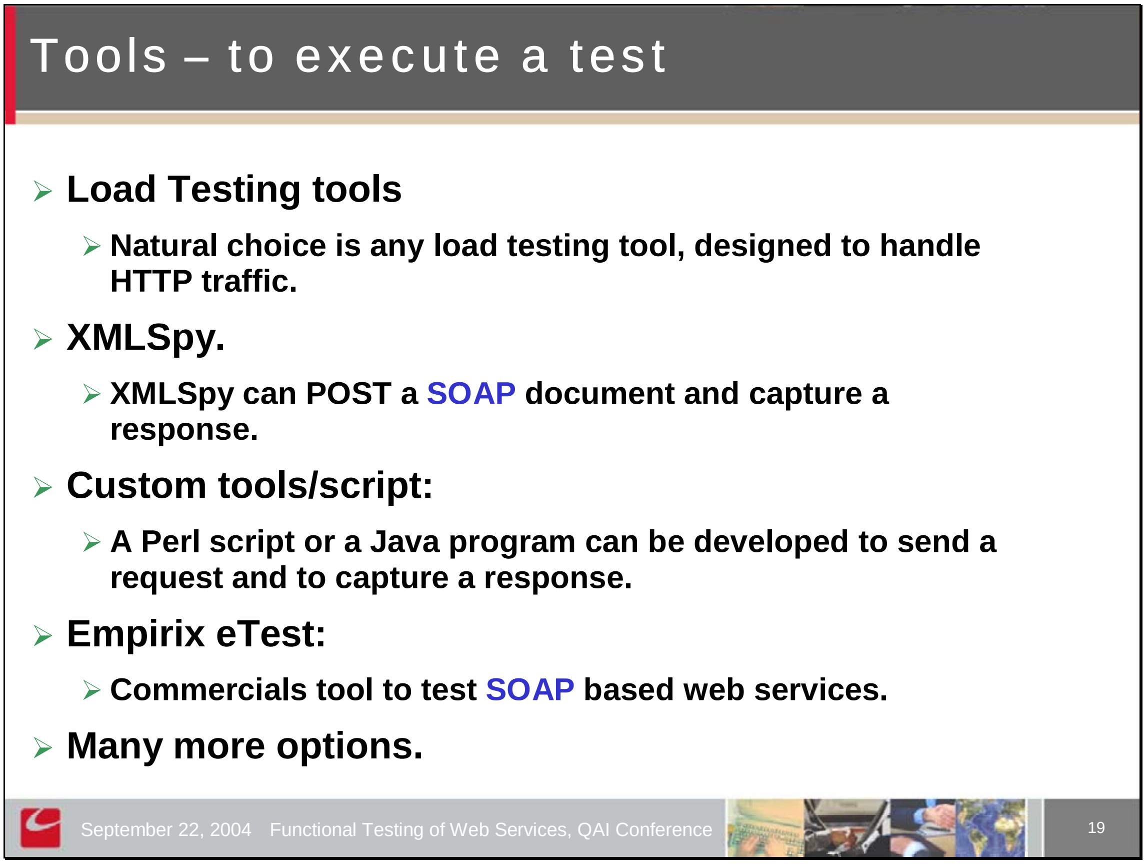
- What tools to use for XML files preparation:
  - Whatever you have,
  - from Notepad
  - and Microsoft Word
  - to XMLSpy

- My favorite tools are:
  - Notepad (or TextPad for bigger files)
  - XMLSpy



Tools – to execute a test

- We have prepared a set of XML files that represent our test cases.
- Next step is to process these files.
- To process XML files (XML requests) we need:
  - to POST an XML file (to send it to a specific URL and port),
  - to capture an XML response and to save it into a file.
- We need a tool to do this.



Tools – to execute a test

- Load Testing tools
  - Natural choice is any load testing tool, designed to handle HTTP traffic.
- XMLSpy.
  - XMLSpy can POST a SOAP document and capture a response.
- Custom tools/script:
  - A Perl script or a Java program can be developed to send a request and to capture a response.
- Empirix eTest:
  - Commercials tool to test SOAP based web services.
- Many more options.

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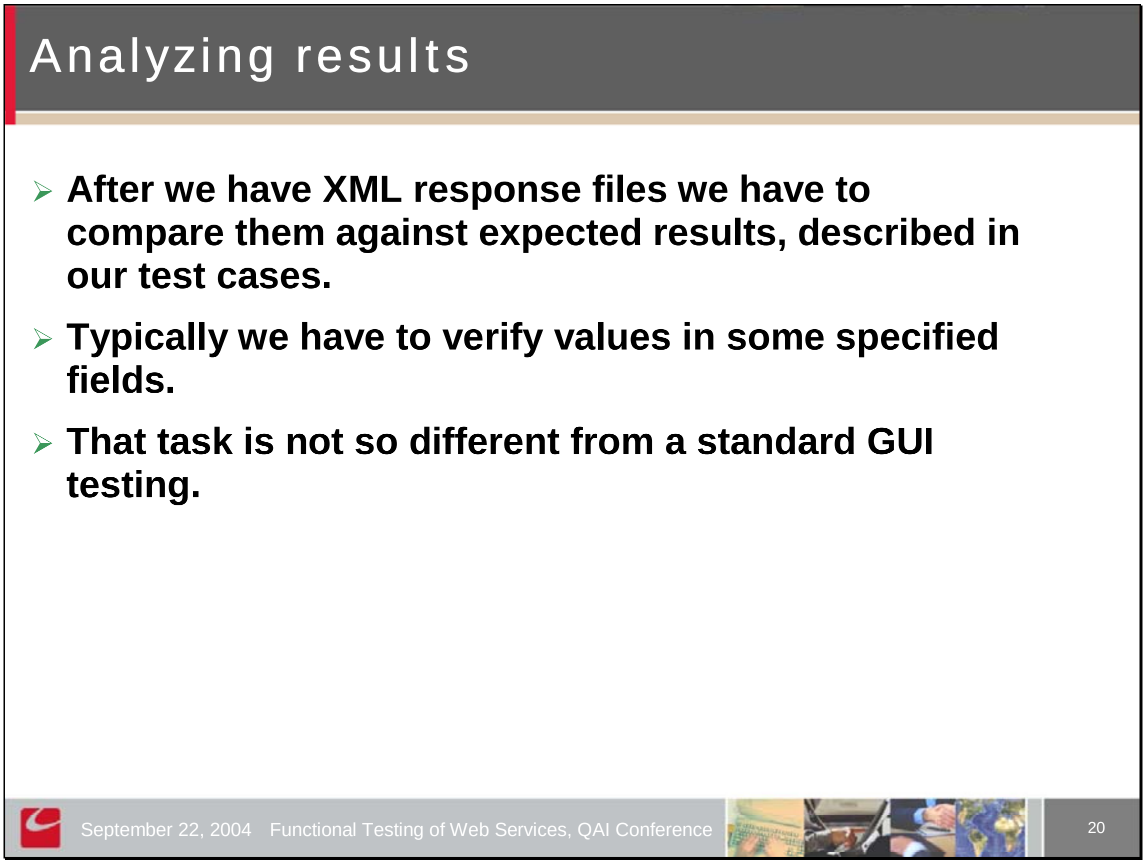

Analyzing results

- After we have XML response files we have to compare them against expected results, described in our test cases.
- Typically we have to verify values in some specified fields.
- That task is not so different from a standard GUI testing.

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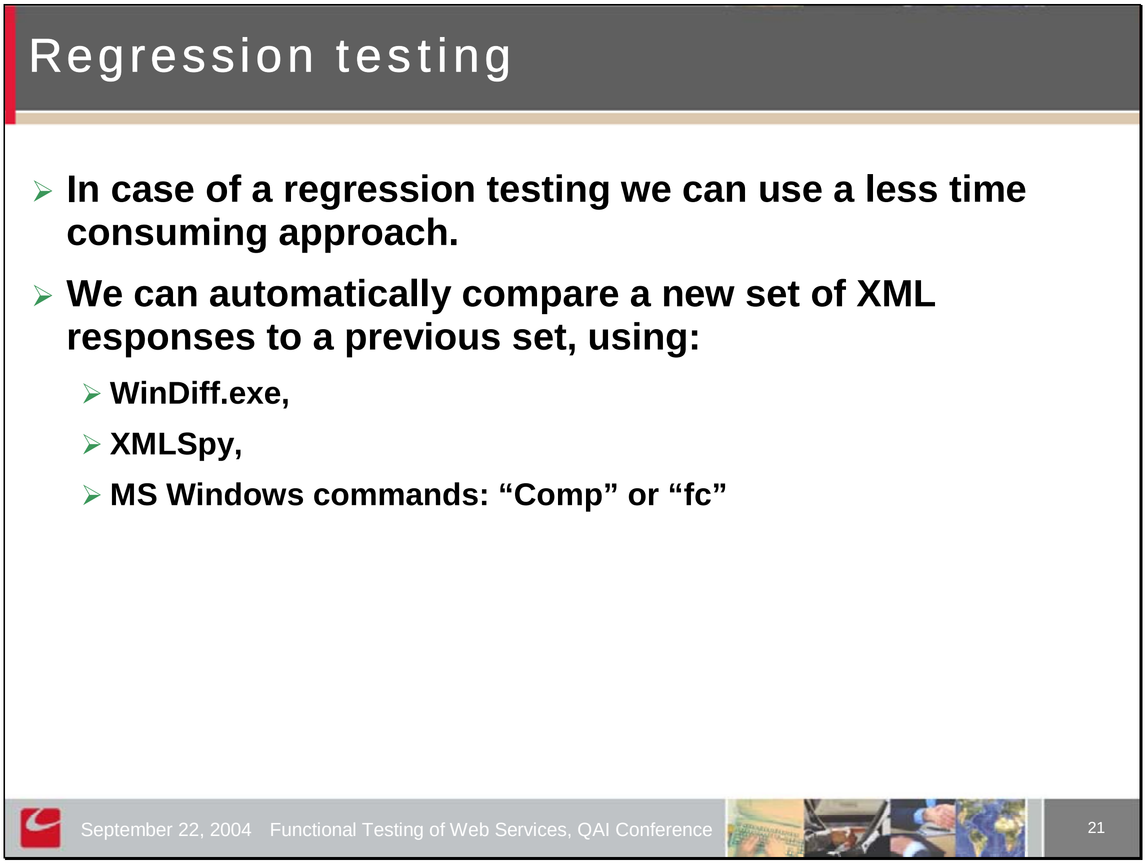

Regression testing

- In case of a regression testing we can use a less time consuming approach.
- We can automatically compare a new set of XML responses to a previous set, using:
  - WinDiff.exe,
  - XMLSpy,
  - MS Windows commands: “Comp” or “fc”

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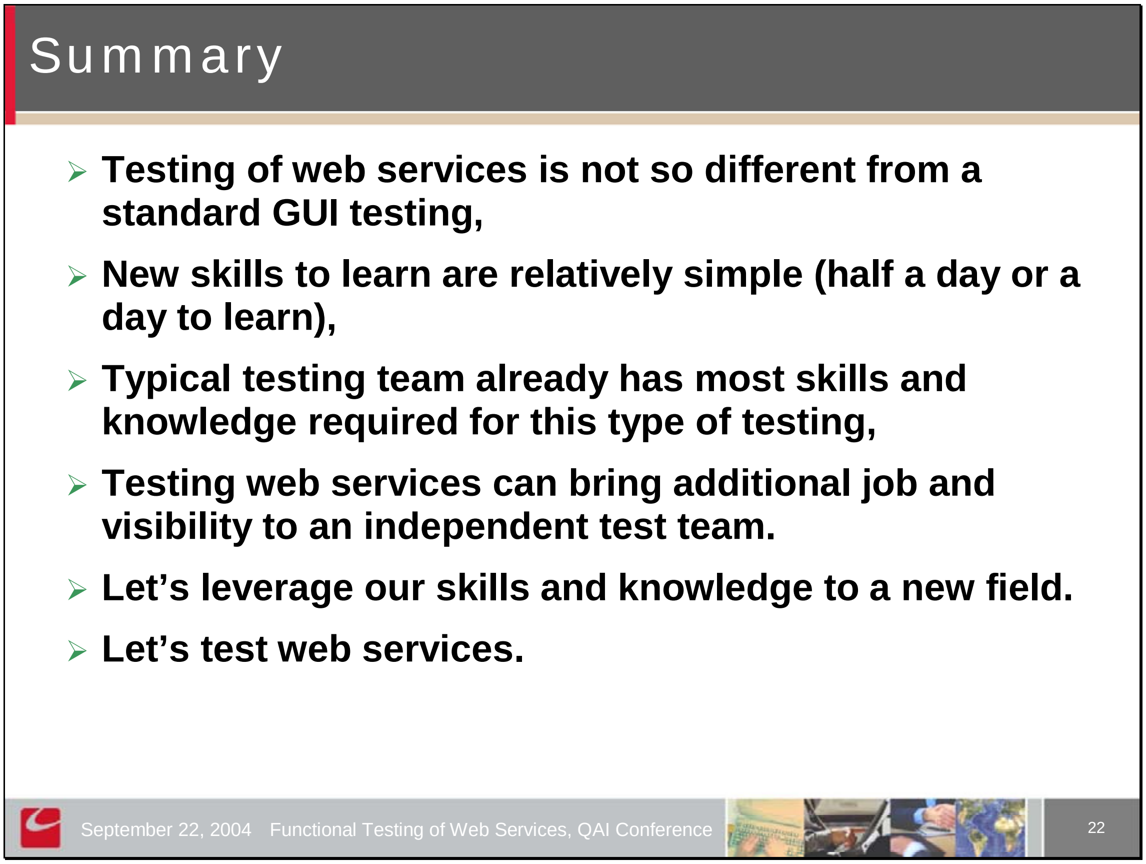

Summary

- Testing of web services is not so different from a standard GUI testing,
- New skills to learn are relatively simple (half a day or a day to learn),
- Typical testing team already has most skills and knowledge required for this type of testing,
- Testing web services can bring additional job and visibility to an independent test team.
- Let’s leverage our skills and knowledge to a new field.
- Let’s test web services.

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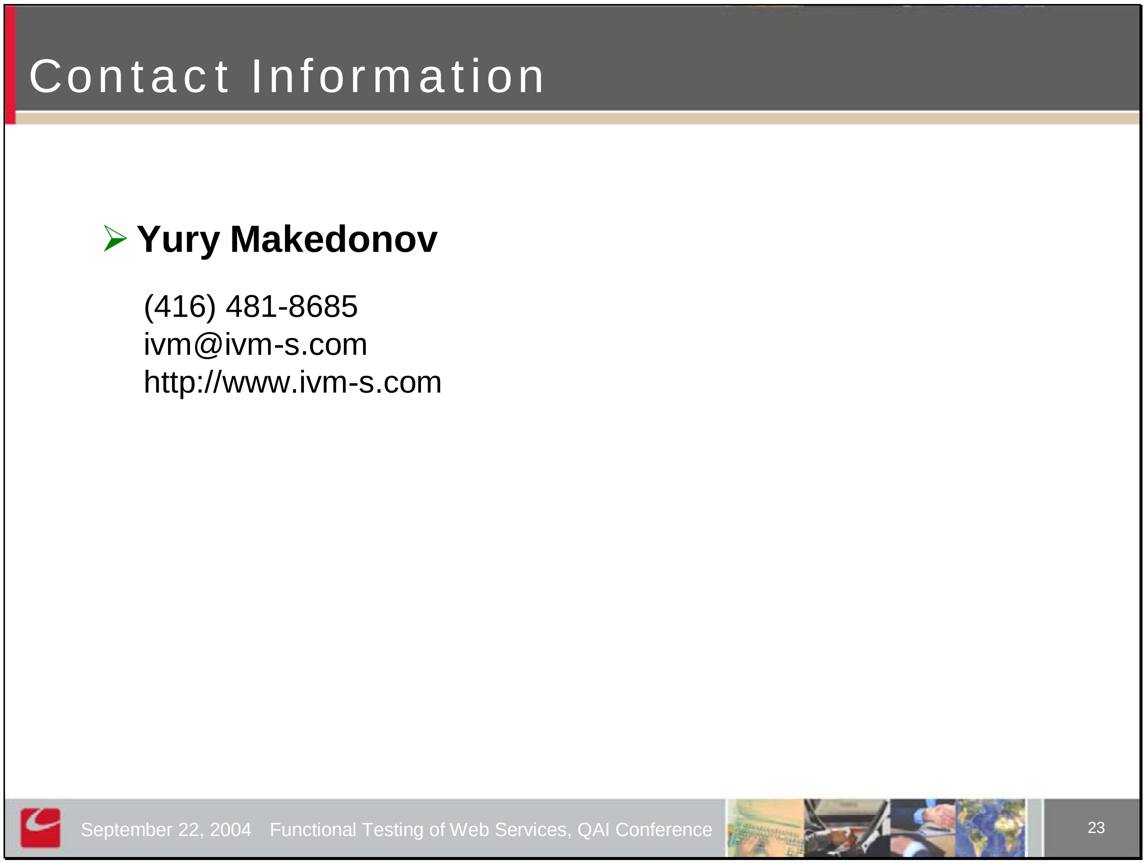
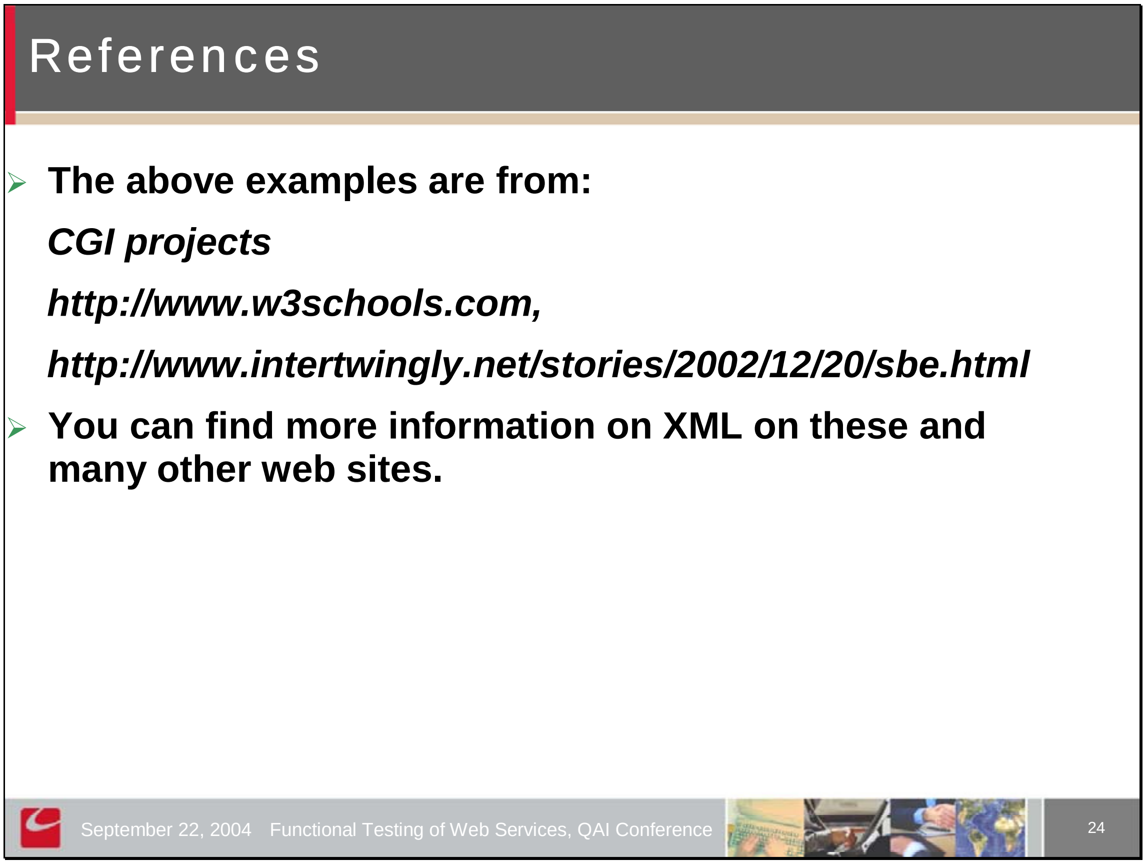


Contact Information

- **Yury Makedonov**

  (416) 481-8685
  ivm@ivm-s.com
  http://www.ivm-s.com



References

- **The above examples are from:**

  CGI projects

  http://www.w3schools.com,

  http://www.intertwingly.net/stories/2002/12/20/sbe.html
- **You can find more information on XML on these and many other web sites.**