Active Tags : an XML System for Native XML Programming

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Active Tags

an XML System for Native XML Programming

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What is the Active Tags suite ?

- A set of specifications (language/platform independant)
- A general-purpose framework
- Batch, Web applications, embedded in an application
- Looks like XSLT/XQuery/Jelly/ASP/PHP/JSP/JSTL/Ant...
- Use XML tags as actions to perform
- XPath-centric
- Can query various data sources (RDBMS, LDAP, XML native databases)
- Several libraries (modules) can be used

Specifications :
http://disc.inria.fr/perso/philippe.poulard/xml/active-tags/
Implementation :
http://reflex.gforge.inria.fr

The Active Tags engine, in Java

ReflеX

Why the Active Tags suite ?

Unix : everything is a file

OOP : everything is object

Active Tags : everything is XML

➔A powerful and complete system based upon XML technologies

Cohabitation of several tag libraries

Features are not overlapping each others

➔Chosen by INRIA

Used in production

➔Concise/powerful

Modular/extensible/maintenable

Easy to use (if you know XML/XPath ☺)

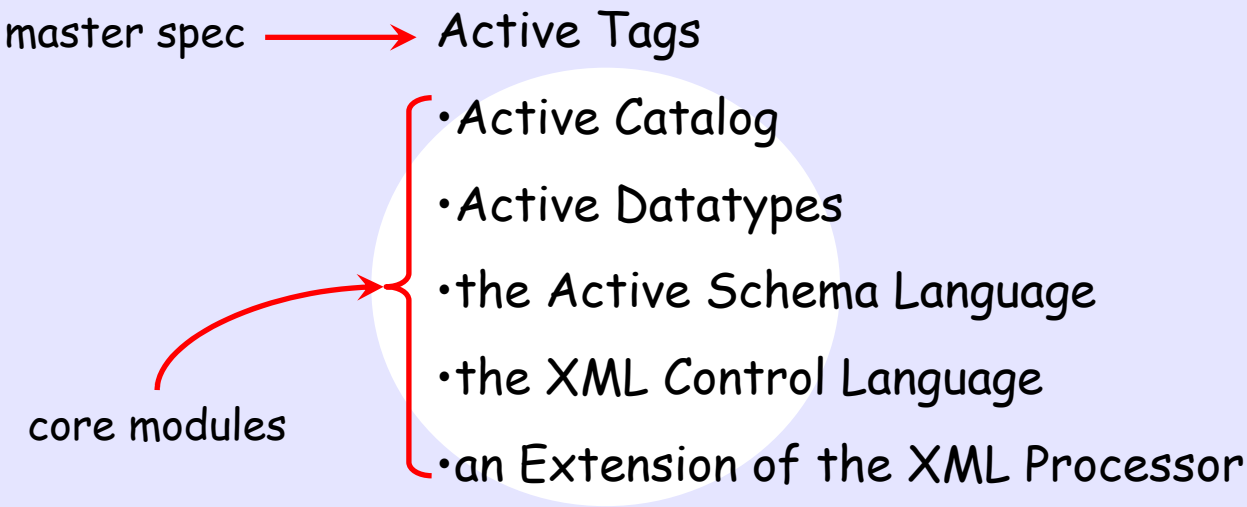
➔High-level API

General purpose

Mask details (DOM,SAX)

Connexions with the environment (SYSTEM, I/O, SQL, Web...)

Inside the Active Tags suite



- Active Sheet
- Active Document
- Active Material

Standard modules

- I/O module
- SYTEM module
- Web module
- RDBMS module

Application

- the XUnit framework

Some Active Tags features

Some examples...

- A simple example → the basics
- Handling XML documents → mask DOM and SAX differences
- Pipelines → filtering a SAX stream with XPath patterns
- Combining modules → module cohabitation
- A Web application → introduction of X-Operable Objects
- Modularization → macro creation
- XUnit → testing XML

A simple « Active Sheet »

a convenient root

with XCL : the XML Contol Language

```
<?xml version="1.0" encoding="iso-8859-1"?>
<xcl:active-sheet
    xmlns:xcl="http://www.inria.fr/xml/active-tags/xcl">
  <xcl:parse name="myDoc"
      source="file:///path/to/document.xml"/>
  <xcl:parse-stylesheet name="myXslt"
      source="file:///path/to/stylesheet.xsl"/>
  <xcl:transform source="{ $myDoc }"
      stylesheet="{ $myXslt }"
      output="file:///path/to/output.html"/>
</xcl:active-sheet>
```

instruction that creates the property named « myDoc »

XPath expression

Like « AVT » in XSLT but :

- can occur in text content
- is not cast to string
- can refer to objects

Shell-fashioned references

Comparison with Ant/Jelly/JSTL...

```
<document time="${now}">
    Welcome ${user.name} to Jelly!
</document>
```

Can't extend to path expressions ☹ ➔ **{$now/@year}**

Can't compute expressions ☹, can only refer to values

➔ **{$price * $discount}**

A self-descriptive system

the engine "knows" which tag is an action and which tag is a literal
→ an Active Catalog is plugged to the engine

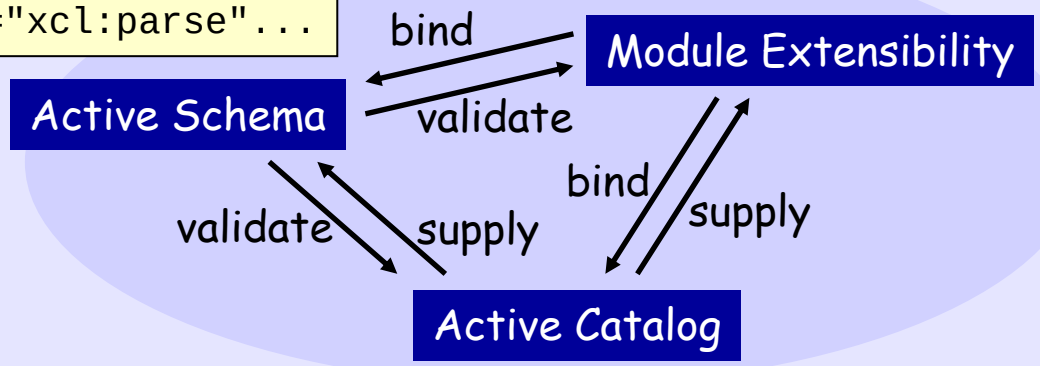
compatible

XML catalog : map URI → URIs
Active Catalog : map URI + selector → resources
(URI, module, schema, catalog, active-sheet...)
resource management facilities (caching policy)

How is it resolved ?
Active tag ⟶ `<xcl:parse>`

```
<exp:module target="xcl">
  <exp:element name="xcl:parse"...
```

```
<asl:schema target="xcl">
  <asl:element name="xcl:parse"...
```




```
<cat:catalog>
  <cat:uri name="http://www.inria.fr...
```

`<cat:catalog>`
`<exp:module>`
`<asl:schema>`
are resolved in
the same manner

Handling XML documents

`<xcl:parse>` parse an XML document or fragment
`<xcl:document>` create an XML document or fragment

} can be SAX or DOM

- deferred processing
- can be accessed with XPath
- can be **filtered** with XPath patterns

- SAX to DOM
- DOM to SAX

```
<xcl:parse name="myDom" type="DOM"/>
<xcl:document name="mySax" type="SAX">
   <wrapper>
      { $myDom }
   </wrapper>
</xcl:document>
```

```
<xcl:parse-stylesheet name="myXslt" source="file:///path/to/stylesheet.xsl"/>
<xcl:parse-filter name="xinclude" source="http://www.w3.org/2001/XInclude"/>

<xcl:parse name="myDoc" type="SAX" source="file:///path/to/document.xml"/>
<xcl:filter name="included" source="{ $myDoc }" filter="{ $xinclude }"/>
<xcl:transform source="{ $included }" stylesheet="{ $myXslt }"
      output="file:///path/to/output.html"/>
```

Built-in filters
- XInclude filter
- text to XML: Line reader, Tokenizer
  - regexp

Custom filters : XCL filters

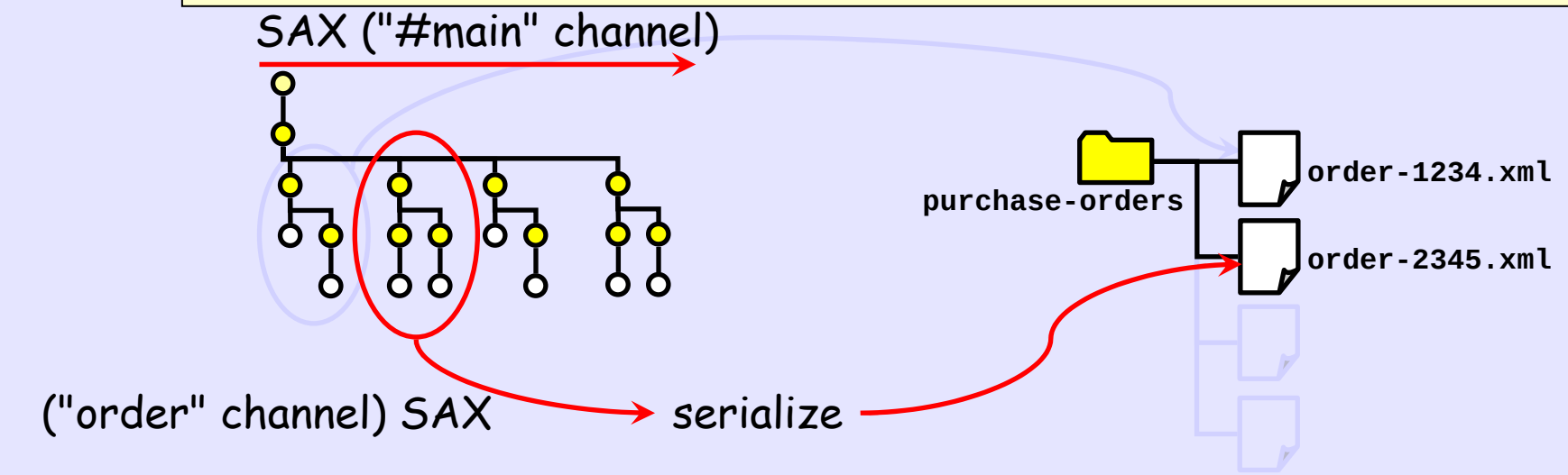
- a subset of tags for XPath-based filters
- can process extra-large documents with SAX

```
<xcl:parse-filter>
<xcl:filter>
<xcl:rule>      ← XPath pattern
<xcl:forward>   ← can specify several "channels"
<xcl:apply-rules>
```

```
<xcl:parse name="allPo"
    source="file:///path/to/purchase-orders.xml" type="SAX"/>
<xcl:filter name="poSplitter" source="{ $allPo }">
   <xcl:rule pattern="/purchase-orders/order">
       <xcl:document name="order" type="SAX">
           <xcl:forward channel="order">
               <xcl:apply-rules/>
           </xcl:forward>
       </xcl:document>
       <xcl:transform
          output="file:///path/to/purchase-orders/order-{ @id }.xml"
          source="{ $order }"/>
   </xcl:rule>
</xcl:filter>
<xcl:transform output="{ $sys:null }" source="{ $poSplitter }"/>
```

inline definition

could also be DOM



Try it ! download and test yourself the tutorial with an input of 15Mo

Combining several modules

modules URIs

literal

the engine "knows" which tag is active and which tag is a literal

AVT in content

```
<?xml version="1.0" encoding="iso-8859-1"?>
<xcl:active-sheet
    xmlns:sys="http://www.inria.fr/xml/active-tags/sys"
    xmlns:io="http://www.inria.fr/xml/active-tags/io"
    xmlns:xcl="http://www.inria.fr/xml/active-tags/xcl">
  <xcl:set name="dir"
      value="{ io:file('file:///path/to/dir/') }">
  <xcl:document name="mergeAll" type="SAX">
      <mergeAll>
          <xcl:for-each name="myFile"
                  select="{ $dir//*[@io:is-file] }">
              <xcl:parse name="myDoc" type="SAX"
                  source="{ $myFile }"/>
              { $myDoc }
          </xcl:for-each>
      </mergeAll>
  </xcl:document>
  <xcl:transform
      source="{ $mergeAll }"
      output="{ $sys:out }"/>
</xcl:active-sheet>
```

predefined property
the « SYSTEM » module

No stylesheet = copy

Active tags : `<xcl:parse>`

XPath functions : `io:file()`

Predefined properties : `$sys:out`

Foreign attributes : `@xcl:version` ← directives

Data types : `io:x-file` ← `x-` for « XML friendly » objects

- Can apply XPath expressions
- Can be X-updated

```
$dir//*[@io:is-file]
$dir/*[@io:is-file][@io:extension='xml']
```

`io:x-file` type definition

In the documentation of the I/O module

`name()`	`xs:QName`	The name of the file
`parent::`	`io:x-file`	The parent directory of this file
`child::`	`adt:list of io:x-file`	The files contained in this directory
`@io:length`	`xs:integer`	The length of this file
`@io:is-file`	`xs:boolean`	Indicates whether or not this is a file.
`@io:last-modified`	`xs:date`	The last date when this file was modified

```
<xcl:update referent="{ $dir/@io:last-modified }"
            operand="{ $newDate }"/>
```

`<xcl:update>`
`<xcl:rename>`
`<xcl:append>`
...etc

A Web application

incoming URL : `http://www.acme.com/index.xml`

```
<?xml version="1.0" encoding="iso-8859-1"?>
<web:service
    xmlns:web="http://www.inria.fr/xml/active-tags/web"
    xmlns:xcl="http://www.inria.fr/xml/active-tags/xcl">
  <web:mapping match="^/(.+)\.html$"
        mime-type="text/html">
      <xcl:parse name="myDoc" source="web:///{ $web:match/node()[1] }.xml"/>
      <xcl:transform
          source="{ $myDoc }"
          stylesheet="web:///WEB-INF/transform.xsl"
          output="{ value( $web:response/@web:output ) }"/>
  </web:mapping>
  <web:mapping match="...">
      <!--other web stuff-->
  </web:mapping>
</web:service>
```

regexp

captured group

type : `io:output`

XML view

```
<web:response
   web:output="[io:output@189c036]"
   web:mime-type="text/html"/>
```

bound to an object

type : `web:x-response`

X-Operable objects

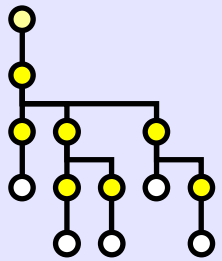
(cross-operable objects)

Objects type are identified by QNames like `web:x-response`, `io:x-file`, `io:output`, `io:input`, `xs:string`, `xs:integer`, `xml:document`, etc

```
<web:response
   web:output="[io:output@189c036]"
   web:mime-type="text/html">
      <Cache-Control>no-cache</Cache-Control>
      <Date>Tue, 15 Nov 1994 08:12:31 GMT</Date>
</web:response>
```

Not necessary represented with tags

Avoid round-trip



internal representation

Objects are not necessary representable in XML :

- what would be the XML representation of an instance of `io:input` or `io:output` ?

  (I'm not talking about the content, but about the container, as an object)

Big objects, binary object : high-cost for XML encoding/decoding

Incomplete objects : the content is computed only when it is accessed (late binding)

incoming URL : `http://www.acme.com/user.html?userName=Poulard`

```
<?xml version="1.0" encoding="iso-8859-1"?>
<web:service
  xmlns:web="http://www.inria.fr/xml/active-tags/web"
  xmlns:xcl="http://www.inria.fr/xml/active-tags/xcl">
  <web:mapping match="^/user\.html$">
    <xcl:set name="ldap"
      value="ldap://ldap.acme.org:9009/dc=acme,dc=org
              ??sub?(&(sn~={ $web:request/userName })"/>
    <xcl:parse name="dsml" source="{ $ldap }"/>
    <xcl:document name="userDoc"/>
      <user userName="{ $web:request/userName }">
        { $dsml }
      </user>
    </xcl:document>
    <xcl:transform
        source="{ $userDoc }"
        stylesheet="web:///WEB-INF/us
        output="{ value( $web:respons
  </web:mapping>
</web:service>
```

Web application

Batch script

```
<?xml version="1.0" encoding="iso-8859-1"?>
<xcl:active-sheet
  xmlns:sys="http://www.inria.fr/xml/active-tags/sys"
  xmlns:xcl="http://www.inria.fr/xml/active-tags/xcl">
  <xcl:set name="ldap"
    value="ldap://ldap.acme.org:9009/dc=acme,dc=org
            ??sub?(&(sn~={ $sys:env/userName })"/>
  <xcl:parse name="dsml" source="{ $ldap }"/>
  <xcl:document name="userDoc"/>
    <user userName="{ $sys:env/userName }">
      { $dsml }
    </user>
  </xcl:document>
  <xcl:transform source="{ $userDoc }"
     stylesheet="file:///path/to/userStylesheet.xsl"
     output="{ $sys:out }"/>
</xcl:active-sheet>
```

expose as a single tag
(externalization inside
a custom module)

Use/define a custom module

```
<?xml version="1.0" encoding="iso-8
<web:service
  xmlns:acme="http://tags.acme.org/
  xmlns:web="http://www.inria.fr/xm
  xmlns:xcl="http://www.inria.fr/xm
  <web:mapping match="^/user\.html$
    <acme:user-info name="{ $web:request/userName }"/>
    <xcl:transform
      source="{ $acme:userInfo }"
      stylesheet="web:///WEB-INF
      output="{ value( $web:resp
  </web:mapping>
</web:service>
```

```
<?xml version="1.0" encoding="iso-8859-1"?>
<xcl:active-sheet
  xmlns:acme="http://tags.acme.org/usersInfo"
  xmlns:sys="http://www.inria.fr/xml/active-tags/sys"
  xmlns:xcl="http://www.inria.fr/xml/active-tags/xcl">
  <acme:user-info name="{ $sys:env/userName }"/>
  <xcl:transform source="{ $acme:userInfo }"
     stylesheet="file:///path/to/userStylesheet.xsl"
     output="{ $sys:out }"/>
</xcl:active-sheet>
```

EXP : Extensible XML Processor

```
<?xml version="1.0" encoding="iso-8859-1"?>
<exp:module target="acme"
  xmlns:acme="http://tags.acme.org/usersInfo"
  xmlns:exp="http://www.inria.fr/xml/active-tags/exp"
  xmlns:xcl="http://www.inria.fr/xml/active-tags/xcl">
  <exp:element name="acme:user-info">
    <xcl:set name="ldap"
      value="ldap://ldap.acme.org:9009/dc=acme,dc=org
              ??sub?(&(sn~={ $exp:params/@name })"/>
    <xcl:parse name="dsml" source="{ $ldap }"/>
    <xcl:document name="userDoc"/>
      <user userName="{ $exp:params/@name }">
        { $dsml }
      </user>
    </xcl:document>
    <exp:exports>
      <exp:export name="acme:userInfo" value="{userDoc}"/>
    </exp:exports>
  </exp:element>
</exp:module>
```

implementation of the tag (« macro tag »)

exported property

XPath functions and predefined properties can also be defined with macros

A module made of active tags

<xunit:test-case> ← set the boundaries of a test

<xunit:assert-boolean-equals>
<xunit:assert-number-equals>
<xunit:assert-node-equals>
} report assertions

<xunit:merge-reports> ← merge test-cases report

...etc

Test suites for :

- active sheets
- individual XSLT templates
- Java classes (that are dealing with XML datas)

→ harness for tests suites

```
<xunit:test-case name="acme-test" label="Acme test">
    <!--stuff to test-->
    <acme:foo bar="do-it-like-this"/>
    <!--check the result-->
    <xcl:parse name="result" source="result.xml"/>
    <xcl:parse name="output-expected"
        source="file:///path/to/output-expected.xml"/>
    <!--check if they are equals-->
    <xunit:assert-node-equals result="{ $result }"
       expected="{ $output-expected/some[1]/result[2] }"/>
</xunit:test-case>
```

HTML report :

Acme test	Tests : 82	Errors : 1	Failures : 0
Node expected :	/some[1]/result[2]/foo[3]		
Result node :	/foo[3]		
Attribute existence :	Unexpected attribute bar="BAR"		

Summary

- A systemic consideration of XML technologies
  - each component focus on a well-defined problematic
  - component cooperation
- Allow to handle with ease XML datas
  - text to XML
  - SQL to XML
  - LDAP to XML
  - SAX, DOM, XCL filters and pipelines
- Extensible better than ever
  - Custom modules (macro tags, macro XPath functions)
- Viability
  - Lots of runnable examples and tips in RefleX
  - Already used in production at INRIA
  - Could be closer to XPath2/XQuery data model
  - Some features still experimental or incomplete

And now ?

To go further :

- read carefully the slides !

  `http://disc.inria.fr/perso/philippe.poulard/xml/active-tags.pdf`

- email-me

  `Philippe.Poulard@sophia.inria.fr`

- discuss about Active Tags on the XML-dev list
- download the engine

  `http://reflex.gforge.inria.fr`

- try the tutorials
- send me some money ☺

Questions ?