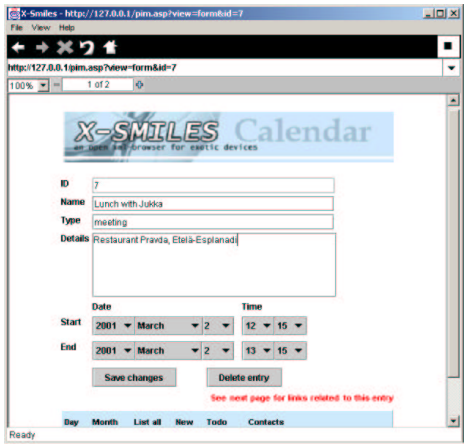
XForms in X-Smiles

Mikko Honkala

Helsinki University Of Technology, Finland



Mikko.Honkala@hut.fi

http://www.x-smiles.org/

Outline of the Presentation

- Introduction
  - HIIT XML Devices project
  - W3C's XForms
- XForms working draft
- XForms implementation in X-Smiles browser
  - Demos

HIIT XML Devices

- Researching the use of XML in small embedded devices
  - Handhelds, Digi-TV, NG mobile phones
- Porting X-Smiles XML browser into different devices
- Enhancing client-side interactivity through W3C's XForms

xsmiles

Introduction to XForms

- World Wide Web Consortium (W3C) creates Web standards.
  - HTML, XML, SVG, SMIL, etc...
  - over 500 member institutions.
  - co-steered by MIT (USA), KEIO (Japan) and INRIA (France). (vendor and market neutral).
- XForms.
  - W3C's future Web forms technology.
  - Ideas from proprietary form languages (FML, Formsheets, XFA,XFDL).
  - Builds upon tested, pre-existing XML technologies rather than re-inventing the wheel.
  - X-Smiles in XForms WG

Forms Example : purchaseOrder

Purchase Order

Units	Item	Price/unit	Total
3	X-Smiles desktop	50 mk	150 mk
1	X-Smiles PDA	500 mk	500 mk
1	Java debugger	1500 mk	1500 mk

Subtotal 2150

Taxes 473

Total 2623

Submit

What's missing in the current Web forms

- No separation between content and presentation
- Validation must be done at the server: more round-trips
- Constraints and calculations between fields have to be programmed with scripts
- Most web services live in the XML world. Therefore a component is needed to map HTML forms into XML and vice versa

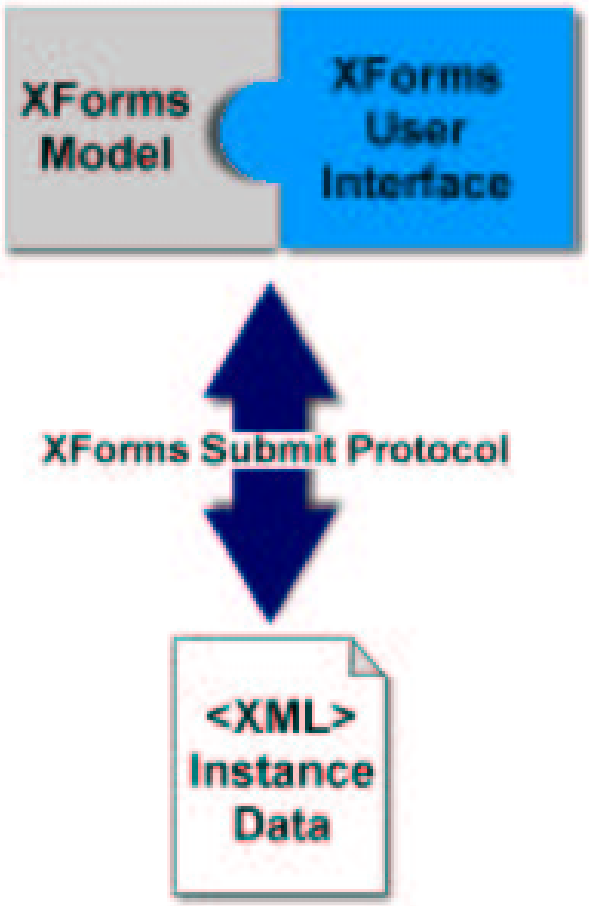
xsmiles

How does XForms solve these problems?

- Content is separated from the presentation
- Presentation is defined elsewhere in the document, it is only bound to the content
- Validation is done in the client using XML schema and inter-data constraints
- Constraints and calculations are defined declaratively in the markup. Let the XForms processor implement them rather than program them in JavaScript
- XForms capable client receives and sends XML directly

XForms document components

- **Instance** – content (XML instance)
- **Model** – validation, constraints, calculations
- **User Interface** – embedded in host language
- In addition:
  - **Binding** – binding between the instance,model and UI
- Can be seen as a MVC



xsmiles

XForms Use Cases

- Multipage Tax Input forms with calculations and validation
- Web shop order forms
- Interactive Vector Graphics
- Software configuration frontend

  -> ... everything that needs user interaction within Web document formats

XForms Example : purchaseOrder

Purchase Order

Units	Item	Price/unit	Total
3	X-Smiles desktop	50 mk	150 mk
1	X-Smiles PDA	500 mk	500 mk
1	Java debugger	1500 mk	1500 mk

Subtotal 2150

Taxes 473

Total 2623

Submit

XForms Example : Instance Data

```
<purchaseOrder>
    <items>
        <item>
            <name>X-Smiles desktop</name>
            <units>2</units>
            <price>50</price>
            <total>0</total>
        </item>
        <item>
            <name>X-Smiles PDA</name>
            <units>2</units>
            <price>100</price>
            <total>0</total>
        </item>
        <item>
            ...
        </item>
    </items>
    <totals>
        <subtotal>0</subtotal>
        <tax>0</tax>
        <total>0</total>
    </totals>
    <info>
        <tax>0.22</tax>
    </info>
</purchaseOrder>
```

XForms Example : Model

```
<head>
<xfm:xform>
   <xfm:model href="purchaseOrder.xsd" >
   <xfm:instance href="purchaseOrderData.xml" />
   <xfm:bindings>
        <xfm:bind ref="purchaseOrder/totals/subtotal"
   calculate="sum(../../items/item/total)"/>
        <xfm:bind ref="purchaseOrder/totals/tax"
   calculate="../subtotal * ../../info/tax"/>
        <xfm:bind ref="purchaseOrder/totals/total"
   calculate="../subtotal + ../tax"/>
        <xfm:bind ref="purchaseOrder/items/item/total"
   calculate="../units * ../price"/>
   </xfm:bindings>
</xfm:xform>
</head>
```

XForms Example : The user interface

```
<body><table>
     <th><td>Units</td><td>Item
name</td><td>Price</td><td>Total</td>
     </th>
     <xfm:repeat select="/purchaseOrder/items/item">
       <tr>
         <td>
           <xfm:textbox ref="units">
             <xfm:hint>Enter the quantity of this item.</xfm:hint>
           </xfm:textbox>
         </td>
         <td><xfm:output ref="name"/></td>
         <td><xfm:output ref="price"/></td>
         <td><xfm:output ref="total"/></td>
       </tr>
     </xfm:repeat>
   </table>
   <xfm:output ref="purchaseOrder/totals/total">
     <xfm:caption>Total price</xfm:caption>
   </xfm:output>
 </body>
```

Validation Using XML Schema

- XML Schema is a W3C recommendation from Summer 2001
  - Defines the structure of an XML document as well as datatypes
    - ’xsd:date’ (1999-05-31)
    - ’xsd:time’ (13:20:00.000)
    - ’xsd:decimal’ (-123.4)
  - Datatypes can be created by the user with restrictions and unions
    - e.g. An integer smaller than 1000
  - Datatypes are more important to Xforms
    - It is also possible to use a simpler ’schema for instance’ syntax

Constraints

- Constraints apply to instance data in the model
  - **calculate –** parts of data calculated from other parts
  - **relevant –** is the item shown to the user
  - **readOnly –** can the user edit the item
  - **isValid –** is the data valid
  - **required –** is the data required for submission

```
<bind ref="items/item/total"
  calculate="../units * ../price"
  relevant="../units>0" />
```

Binding & Constraints using XPath

- XPath is a W3C recommendation
  - Developed mainly for XSLT but very general
- is used to:
  - select a single node from an XML document
    `/purchaseOrder/items/item[1]`
  - select multiple nodes (nodeset) from an XML document
    `/purchaseOrder/items/item`
  - perform calculations with the data in XML
    `sum(/purchaseOrder/items/item/total)`

XForms User Interface

- Very general level of user interface controls
  - selectOne
  - selectMany

- Can be used also in non-graphical environments (e.g VoiceXML)
- Meant to be embedded in XML languages
- Additional presentation hints with CSS stylesheets and presentation parameters

```
<selectOne selectUI="listbox" style="width:
  200pt;height: 100pt;background-color: gray;"/>
```

X-Smiles Browser

- XML Browser
  - XSL FO, SVG, SMIL, Xforms.
  - XSLT Transformations
  - ECMAScript
- Java-based
  - portability, available components, JMF
- Open Source
- Virtual prototype
  - Desktop, digi-TV, PDA, mobile phone

XForms Implementation in X-Smiles

- The first browser implementation
- Supports most of the XForms features:
  - user inteface controls (textbox, selectOne, ...)
  - validation
  - calculations
  - mouse events
- We are co-specifying XForms

Embedding in different Markup languages

- It is possible to embed XForms in all XML languages supported by X-Smiles
  - SVG
    - inside ’foreignObject’ element
  - SMIL
    - As a content object
  - XSL FO
    - Embedding within ’fo:declarations’ and ’fo:instream-foreign-object’

Implementation details

- Schema validation is done using Xerces (Apache's XML parser)
- XPath calculations use Xalan's Xpath engine (Apache's XSLT transformer)
- User interface implemented using Swing widgets
- Calculation order and circularity checking algorithms implemented natively

XForms Features in X-Smiles

Feature	Now	Future
Form controls	4	5
Datatype aware controls	0	3
Schema validation	5	5
Inline/ext instance & schema	5	5
Host languages	3	5
Constraints: calculate	4	5
readOnly	0	5
relevant	0	3
required	0	5
validate	0	5
Switch	0	3
Repeat	0	4

Future work

- Implement XForms processor on top of DOM
- Constraints: readOnly, relevant, required,validate
- Using datatype information in form controls
  - This information not currently available from Xerces
- Repeat
- Switch
- uploadMedia – submitting binary within XML data
- Styling with CSS

Demos

- X-Smiles configuration file
- XForms in SMIL
- XForms in SVG / Scripting
- XForms calculations