XForms

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XForms in General

- Defined by World Wide Web Consortium (W3C)
- Splits traditional XHTML forms to three parts
  - model, instance data, and user interface
- Intended to be integrated into other markup languages such as XHMTL or SVG
  - adopted first in XHTML 2
- Mainstream browser support still quite limited

HTML Forms

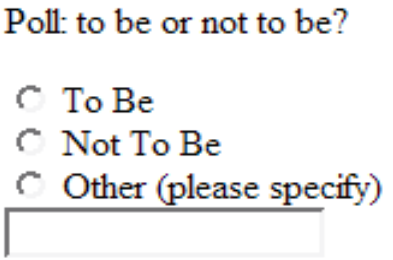
- In HTML forms the collected data is a set of name/value pairs determined by controls in the form.
- Form navigation can be guided through use of accesskey and tabindex attributes
- Textual controls can be set “readonly” or “disabled”

- HTML Form controls include:
  - single-line text input
  - multi-line text input
  - password text input
  - submit and reset
  - buttons (script enabled)
  - radio buttons
  - checkboxes
  - single select menu
  - multiple-select menu
  - file select
  - hidden controls
  - object controls

HTML Forms

- Initial values can be given to different controls
- Submission can be done in urlencoded or multipart/form-data (MIME) formats
  - GET or POST methods used to submit data

```
<form action="http://example.com/cgi-bin/submit-here"
name="shake-poll">
  <p>Poll: to be or not to be?</p>
  <input type="radio" name="thequestion" id="radio1" value="b"/>
  <label for="radio1">To Be<label><br/>
  <input type="radio" name="thequestion" id="radio2" value="n"/>
  <label for="radio2">Not To Be<label><br/>
  <input type="radio" name="thequestion" id="radio3"/>
  <label for="radio3">Other (please specify)<label><br/>
  <input type="text" name="othersel"/>
</form>
```



Issues With HTML Forms

- Dependent of scripting languages
  - marking required information
  - performing validations and calculations
  - error messages
  - managing dynamic layout
- Form data initialization based on existing information
- “Flat” data representation
  - name/value pairs
- Assumption of one step process from a client to a server
  - reinterpreting of data in later steps

Solutions provided by XForms

- Reduces need for scripting
  - XPath based calculations and validations
  - provides dynamic features like repeating tables and optional selections
  - XForms actions (e.g. set focus or change data value)
- Form data can be initialized directly from an XML file
- Use of XML provides a richer way of representing data
- XForms enables the gathered data to be circulated among necessary parties without need of reinterpretation

Benefits of XForms

- Strong typing
  - ready tools for type checking
- Existing schema re-use
- External schema augmentation
- Internationalization
  - use of XML 1.0
- Enhanced accessibility for underlying applications
  - content and presentation separation
- Multiple device support
  - high level user interface

XPath

- A W3C Recommendation
- Used by XForms to address elements in XML structures
  - Enables selection of a single node or a node-set
  - Syntax for location step: `axisname::nodetest[predicate]`
  - Example 1: `/html/head/title`
  - Example 2: `purchaseOrder/items/item[3]`
  - Example 3: `/html/head/*[@id][2]`
- Provides also support for basic calculations
  - mathematics, rounding, string manipulation etc.
  - Example 4: `string-length('hello world')`
  - Example 5: `purchaseOrder/subtotal * instance('taxtable')/tax`

XPath

- Axes are used as navigation instructions
  - define a node-set relative to the current node
  - default axis is 'child'
  - Example: abbreviation `..` equals `parent::node( )`
  - Axis names include:
    - ancestor
    - ancestor-or-self
    - decendant
    - attribute
    - following
    - preceding
    - etc. ...

XML Schema

- A W3C recommendation
- XForms uses datatypes defined in XML Schema
- XML Schema is written in XML
- Defines
  - elements and attributes that can appear in a document
  - possible child elements, their order and number
  - whether element is empty or contains text
  - data types for elements and attributes
  - default and fixed values for elements and attributes

XML Schema

- Enables
  - definition of allowed document content
  - validation of data correctness
  - definition of restrictions on data
  - definition of data patterns

```
<?xml version="1.0"?>
<xs:schema
xmlns:xs="http://www.w3.org/2001/XMLSchema"
targetNamespace="http://www.w3schools.com"
xmlns="http://www.w3schools.com"
elementFormDefault="qualified">
<xs:element name=”to” type=”xs:string”>
...
...
</xs:schema>
```

```
<?xml version="1.0"?>
<note xmlns="http://www.w3schools.com"
xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
xsi:schemaLocation="http://www.w3schools.com note.xsd">
<to>Tove</to>
<from>Jani</from>
<heading>Reminder</heading>
<body>Don't forget me this weekend!</body>
</note>
```

```
<xs:element name="xxx" type="yyy"/>
```

XML Schema

- Common types:
  - xs:string
  - xs:decimal
  - xs:integer
  - xs:boolean
  - xs:date
  - xs:time

```
<xs:attribute name="lang"
type="xs:string" default="EN"
use=”required”/>
```

- Both elements and attributes may have default or fixed values
- Attributes can be defined to be either “required” or “optional”

XML Schema

- Possible data value restrictions:

enumeration	maxExclusive	minExclusive	pattern
fractionDigits	maxInclusive	minInclusive	totalDigits
length	maxLength	minLength	whiteSpace

- Complex types can be defined for complex elements
  - empty elements
  - contain other elements and/or attributes

```
<xs:element name="letter" type="lettertype"/>

<xs:complexType name="lettertype" mixed="true">
  <xs:sequence>
    <xs:element name="name" type="xs:string" maxOccurs="10" minOccurs="1"/>
    <xs:element name="orderid" type="xs:positiveInteger"/>
    <xs:element name="shipdate" type="xs:date"/>
  </xs:sequence>
</xs:complexType>
```

XML Schema

- Data value restriction examples:

```
<xs:element name="age">

<xs:simpleType>
  <xs:restriction base="xs:integer">
    <xs:minInclusive value="0"/>
    <xs:maxInclusive value="100"/>
  </xs:restriction>
</xs:simpleType>

</xs:element>
```

```
<xs:element name="car" type="carType"/>

<xs:simpleType name="carType">
  <xs:restriction base="xs:string">
    <xs:enumeration value="Audi"/>
    <xs:enumeration value="Golf"/>
    <xs:enumeration value="BMW"/>
  </xs:restriction>
</xs:simpleType>
```

```
<xs:element name="password">

<xs:simpleType>
  <xs:restriction base="xs:string">
    <xs:pattern value="[a-zA-Z0-9]{8}"/>
  </xs:restriction>
</xs:simpleType>

</xs:element>
```

```
<xs:element name="gender">

<xs:simpleType>
  <xs:restriction base="xs:string">
    <xs:pattern value="male|female"/>
  </xs:restriction>
</xs:simpleType>

</xs:element>
```

XForms Model

- The Model of MVC
- Is used to describe the data separately from the UI (control elements)
- Marked with `<model>` element
- Contains an `<instance>` element
  - contains a template for the data to be collected
- Contains a `<submission>` element
  - defines how the instance data is submitted
- May contain a `<bind>` element
  - used to bind elements inside the model to control elements

XForms Model

- An example of a model:

```
<model>
<instance>
  <person>
    <name>
      <fname/>
      <lname/>
    </name>
  </person>
</instance>
<bind nodeset="/person/name/fname" id="firstname"/>
<bind nodeset="/person/name/lname" id="lastname"/>
<submission id="form1" method="get" action="submit.asp"/>
</model>
```

XForms User Interface

- The View of MVC
- Uses XForms controls
  - device independent
- Each control element contains a `<label>` element
  - defines the visual guide (text) presented for the user
- `<select>` and `<select1>` elements contain multiple `<item>` elements that each contain their own `<label>` and `<value>` elements
- Control elements:

input	submit	upload
secret	trigger	select(1)
textarea	output	range

XForms User Interface

- Each control element is bound to some element(s) in the model
- With IDREFs

```
<!-- in the XForms Model -->
<xforms:bind nodeset="email" id="mybind" required="true()"/>
...
<!-- later in the document -->
<xforms:input bind="mybind"...>
```

- With XPath

```
<!-- in the XForms Model -->
<xforms:bind nodeset="email" id="mybind" required="true(  )"/>
...
<!-- later in the document -->
<xforms:input ref="email"...>
```

XForms User Interface

- Dynamic forms can be made without scripting
- With `<switch>` and `<case>` elements

```
<model>
  <toggle ev:event="xforms-ready" case="go">
  ...
</model>
<switch>
  <case id="default_message">You are using a browser that doesn't support XForms</case>
  <case id="go">...</case>
</switch>
```

- With `<repeat>` element

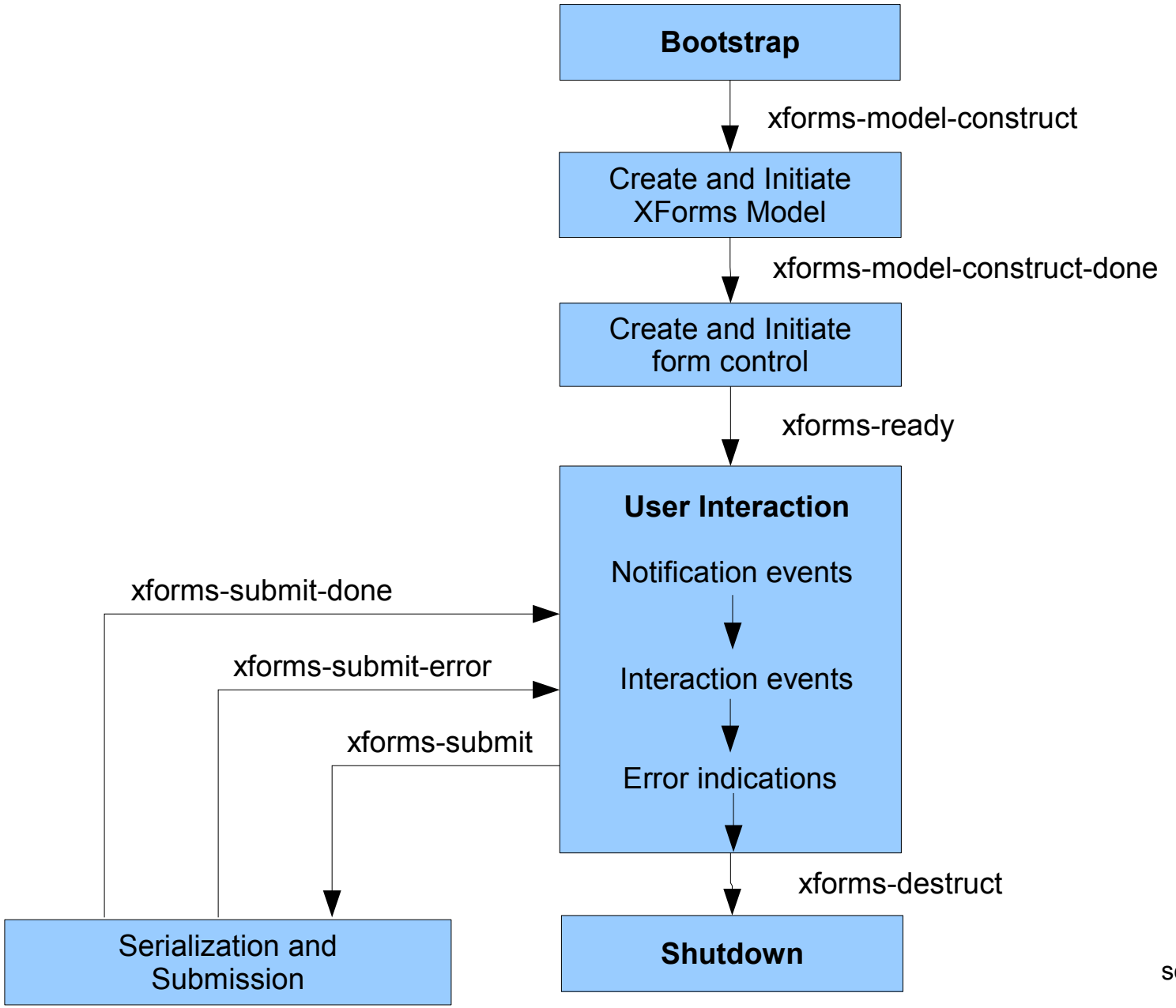
```
<model>
  <instance>
    <items xmlns="">
      <item quantity="1"/>
    </items>
  </instance>
</model>
```

```
<repeat nodeset="item">
  <input ref="@quantity" .../>
</repeat>
```

```
<!-- insert just after the index item -->
<trigger>
  <label>Insert</label>
  <insert nodeset="/items/item" at="index('r1')" position="after"/>
  <setvalue ref="/items/item[index('r1')]/@quantity">0</quantity>
</trigger>
```

```
<!-- delete the index item -->
<trigger>
  <label>Delete</label>
  <delete ev:event="DOMActivate" nodeset="/items/item"
at="index('r1')"/>
</trigger>
```

XForms Processing



source: XForms Essentials

Actions and Events

- XForms actions are handling response to events
- Actions:

message	reset	delete	refresh
setvalue	load	setindex	rebuild
setfocus	toggle	revalidate	dispatch
send	insert	recalculate	action

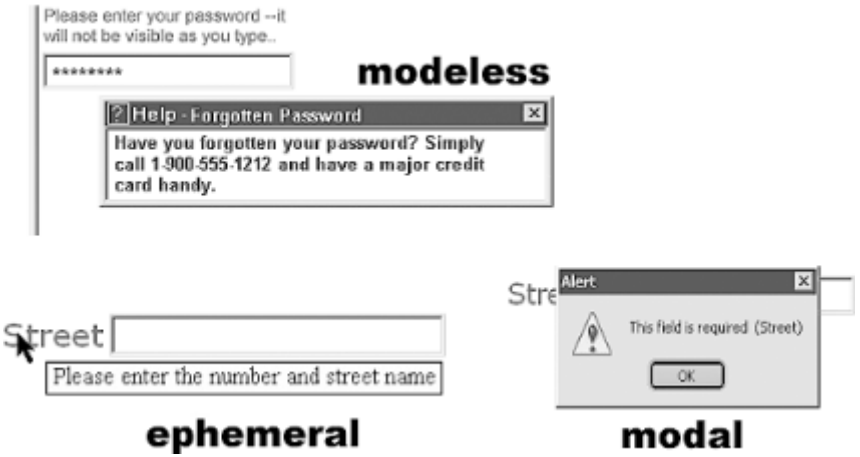
- Some useful events:

DOMActivate	xforms-model-destruct	xforms-submit
DOMFocusIn/Out	xforms-help	xforms-value-changed
xforms-ready	xforms-hint	xforms-select
xforms-model-construct-done	xforms-reset	xforms-deselect
xforms-valid	xforms-invalid	xforms-readonly
xforms-readwrite	xforms-required	xforms-optional
xforms-enabled	xforms-disabled	xforms-out-of-range
xforms-in-range	xforms-submit-done	

Actions and Events

- Example: Message action

```
<input ref="fname">
<label>First Name</label>
<message level="ephemeral" event="DOMFocusIn">
Input Your First Name
</message>
</input>
```



source: XForms Essentials

Used Sources

- XForms Essentials, Micah Dubinko, O'Reilly 2003
  - Available at: `http://xformsinstitute.com/essentials/`
- W3C tutorials (XML, XPath, XML Schema, XForms) 2006
  - Available at: `http://www.w3schools.com/`
- W3C XForms Recommendation 2006
  - Available at: `http://www.w3.org/TR/xforms/`
- X-Smiles Browser
  - Available at: `http://www.x-smiles.org/`