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Extensibility and Reusability of Web User Interface Components using XICL

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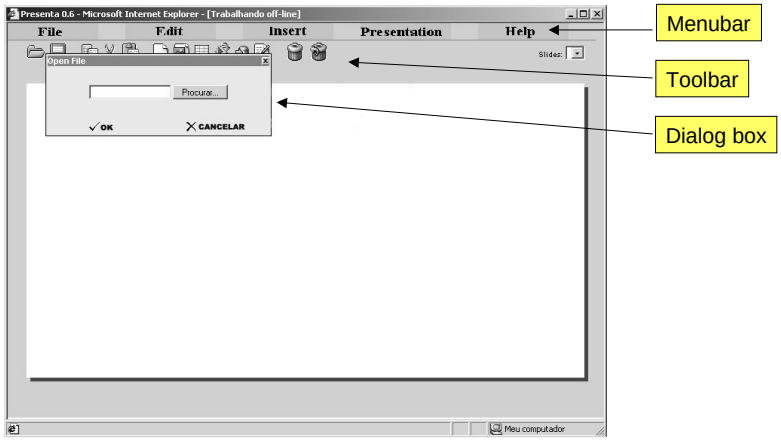
Motivations

- Web Systems and browser-based software:
  - Require many important interaction techniques such as pop-up menus, dialog boxes, toolbars, toolboxes, etc
- Their development using DHTML is a hard work:
  - Lack of ready-to-use powerful UI components.
  - No standardization, no portability, no extensibility
  - Development productivity needs to be improved
- Our goal
  - To provide an easy way to develop User Interface Components to Browser-based software

Browser-based UI components



Our requirements and constraints

- Requirements
  - Improve Web usability using common interaction techniques to browser-based software
  - Allow the development of new UI components to browser-based software by *reusing* and *extending* them
- Constraints
  - Open source and low cost software
  - Independence of the underlying platform
  - Easy to use for web developers
  - Use recommended W3C technologies

Component technologies to Browser-based User Interface

- Common technologies and their constraints
  - ActiveX and Web Controls (Microsoft)
    - Requires Windows and Internet Explorer
    - Proprietary, source code closed
  - Flash (Macromedia)
    - Requires a specific plug-in
    - Proprietary, source code closed
  - Java Applet (Sun)
    - Requires the Java Virtual Machine
    - Many web developers does not know how to programming in Java

XML-based languages to UI development

- UIML (User Interface Markup Language)
- XIML (eXtensible Interface Markup Language)
- AAIML (Alternate Abstract Interface Markup Language)
- AUIML (Abstract User Interface Markup Language)
- Many others

- No support to create new Web UI components
- ... generating a standard DHTML User Interface

XML-based languages to software components

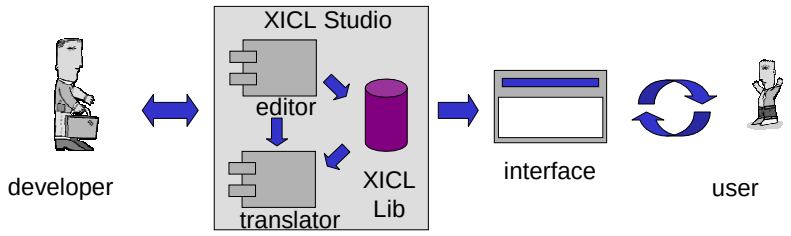
- CoML – Component Markup Language
  - A language to compose binary software components
- BML – Bean Markup Language
  - A language to configure Javabeans components
- WSUI – Web Services User Interfaces
  - Defines web services component on the server-side
  - The user interact with the service using HTML or WML user interface components.
- MXML – Macromedia XML
  - A language to lay out UI components: DataGrid, Tree, TabNavigator, Accordion and Menu
  - Requires Macromedia Flash Player

The XICL approach

- XICL – An XML-based language to develop Web User Interfaces and Components
- XICL stands for e**X**tensible user **I**nterface and **C**omponent markup **L**anguage
- New UI components are created from HTML components and others XICL components
- The XICL description is translated into DHTML code

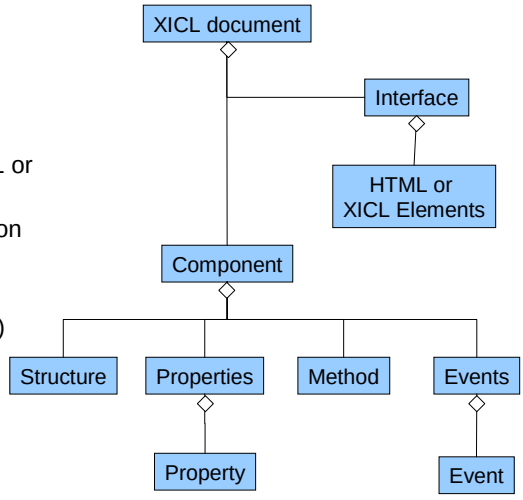
Developing UI using XICL

- The developer describes the user interface in XICL using a XML editor
- He/she could reuse and extend XICL components from the XICL library
- The translator generates a DHTML code that runs in standard browsers

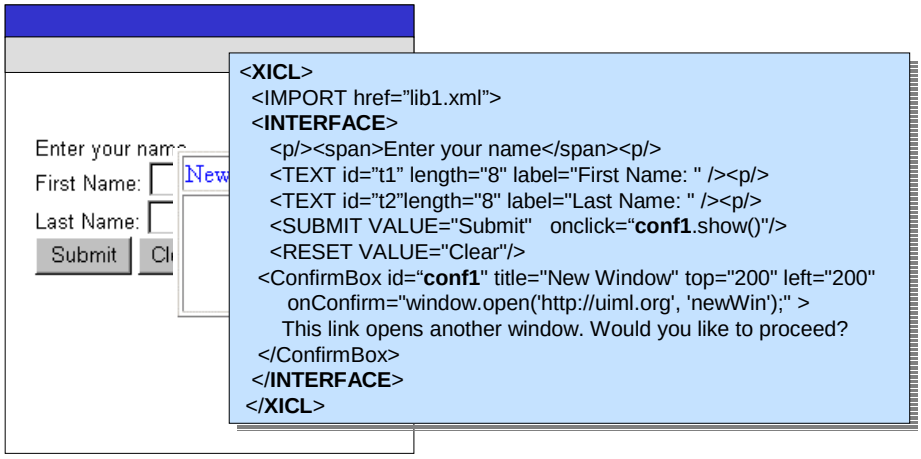


XICL conceptual model

- **XICL document**
  - **User INTERFACE** description (0 or 1)
    - Composed by HTML or XICL elements
  - **COMPONENT** description (0 or N)
    - Structure
    - Properties (property)
    - Events (event)
    - Methods (script functions)



A User Interface described using XICL



Defining new XICL components – 1/2

- Defining the Text component:

```
<COMPONENT name="TEXT">
   <STRUCTURE >
     <span>$label</span><input type="submit" maxlength="$length" >
   </STRUCTURE>
</COMPONENT>
```

Defining new XICL components – 2/2

- Extending a window to define the ConfirmBox component

```
<COMPONENT name="ConfirmBox" extends="Window">
  <STRUCTURE>
    <table width="100 %" border="0" >
      <form>
        <tr><COMPONENT ref="ANY"/></tr>
        <tr><td align="right"><input type="button" name="bOk" value=" Yes " /></td>
            <td align="left" ><input type="button" name="bCanc" value=" No "
                onclick=" $id.close();" /></td>    </tr>
      </form>
    </table>
  </STRUCTURE>
  <EVENTS>
     <EVENT  name="onConfirm" trigger="bOk.onclick;" function="$onConfirm; $id.close();"/>
     <EVENT  name="onCancel" trigger="bCanc.onclick;" function="$onCancel;$id.close();"/>
  </EVENTS>
</COMPONENT>
```


The UIML version of the example

```
<structure>
  <Html>
    <Body>
      <Form>
      <P/><Span co
      <Span conten
      <Text maxlen
      <Span conten
      <Text maxlen
      <Submit id="S
      <Reset value=
      </Form>
    </Body>
  </Html>
</structure>
```

```
<behavior>
  <rule>
    <condition>
      <event clas
    </condition>

    <action>
      <call name
    </action>
  </rule>
</behavior>
```

```
<peers>
   <presentation ... />
   <logic>
     <d-component id="form"... >
       <d-method  id="submit" ... >
        <script type="text/Javascript">
              function checkBeforeProceeding ()
                { if (confirm("This link opens another window.
                        Would you like to proceed?"))
                    window.open('http://uiml.org', 'newWin'); }
        </script>
       </d-method>
     </d-component>
</peers>
```

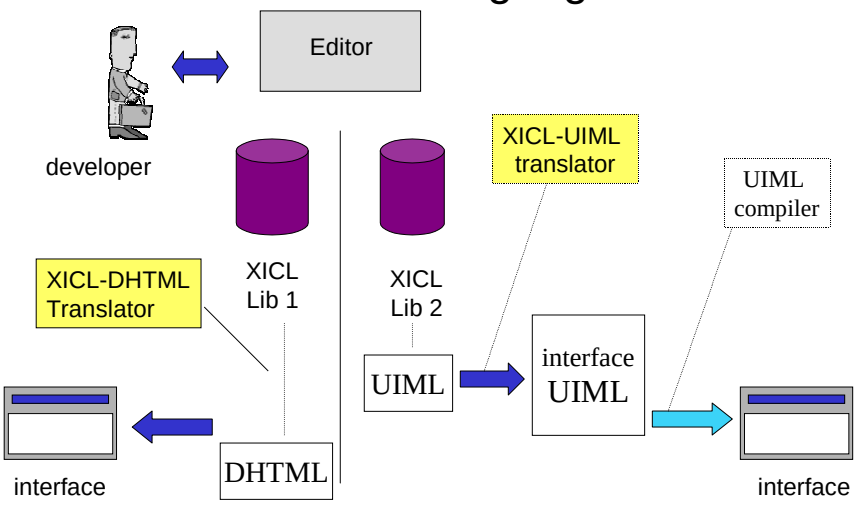
Main Contributions of XICL

- Reusability
  - easy to reuse UI components
- Extensibility
  - creating new components extending existing ones
- Abstraction
  - more powerful components
- Portability
  - run in the most of browsers
- Standardization
  - a common language to reuse and to extend components
- Productivity
  - It should enhance development productivity

Conclusions

- XICL promotes reusability and extensibility of UI components.
- XICL has an underlying conceptual model that standardize the development of UI components
- It is possible to develop the UI in an more abstract level than using only DHTML.
- The XICL code smoothly integrates with DHTML technologies promoting also system interoperability.
- The final user interface is implemented using DHTML technologies and can run in common Web browsers.

Integrating XICL with other XML-based language



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