XML Based Languages

Declarative programming language (only what has to be done, not how). Major contributor is W3C

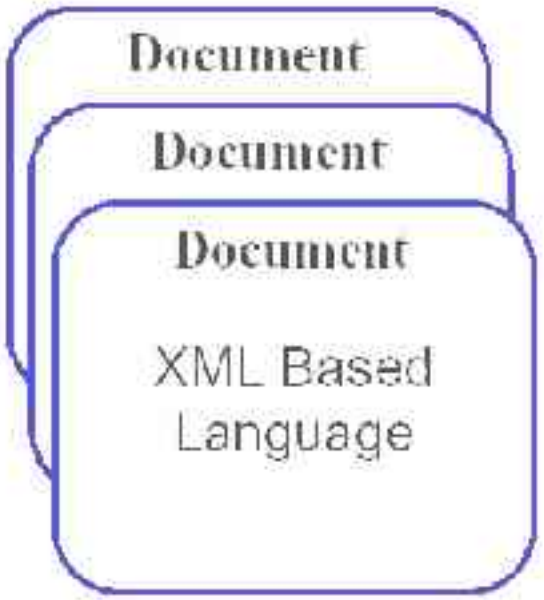
Pro

- Easiness of use (you can even use a text editor)
- Interoperability (only needs a compatible browser)
- Safest to distribute

Con

- Expressive power (quite limited, not a programming language!)
- Use of scripting for application logic (or not?)
- Needs of a service under it (browser)

XML Based Languages Overview



- HTML & XHTML
- Multimedia
  - SMIL, Timesheets
- User Interface
  - XForms, XIML
- Vector Graphics
  - SVG
- Voice
  - VoiceXML

XML Based Languages
HTML & XHTML

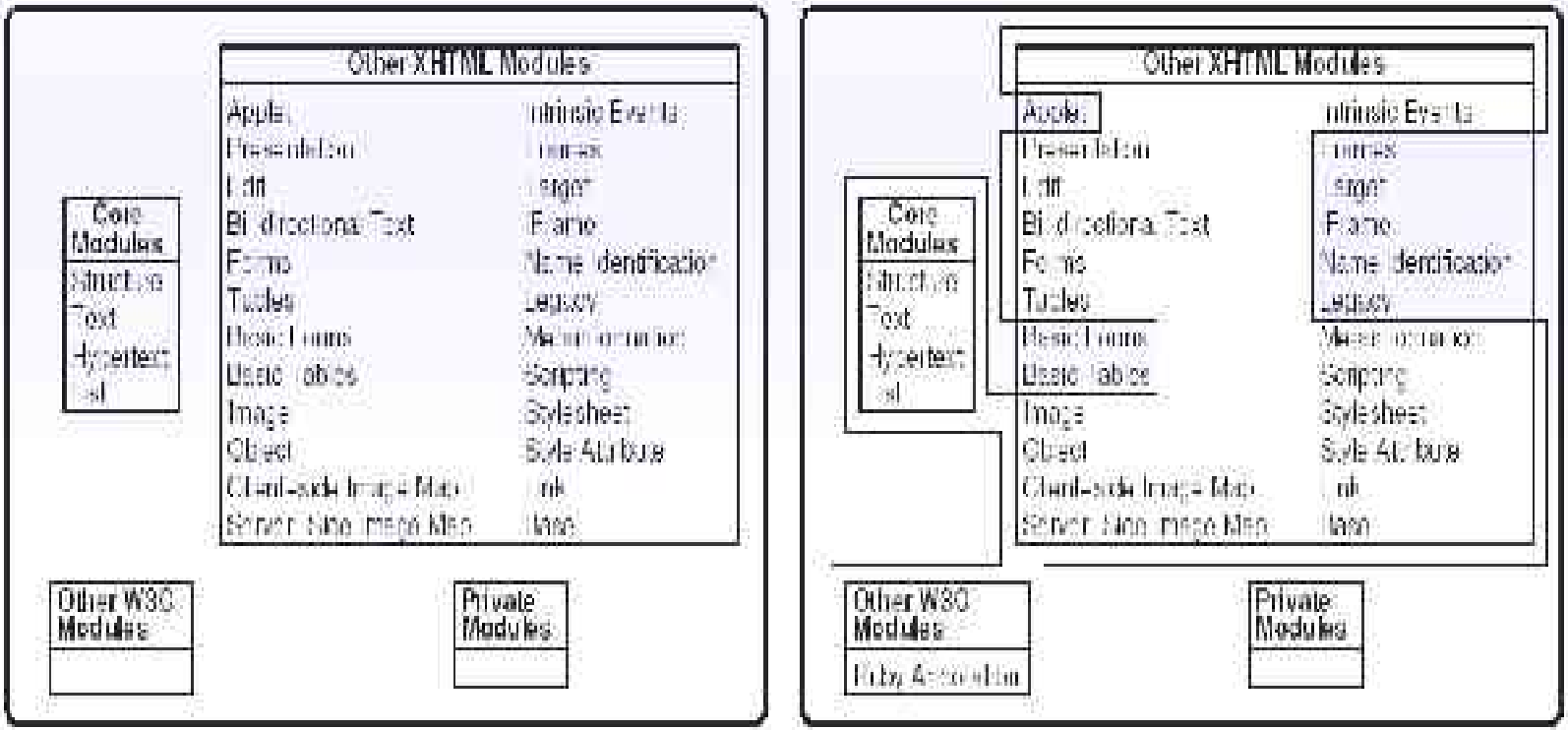
HTML

- HTML 4.01: (24 Dec. 1999) W3C Recommendation
- Lingua franca for publishing hypertext on the WWW.
- Non-proprietary
- Can be created by a wide range of tools:
  - Text editors
  - Authoring tools
- All kind of features (mixed together):
  - UI components
  - Fonts
  - Lists

XHTML

- XHTML 1.0 (26 Jan. 2000, revised 1 Aug. 2002) W3C Recommendation
- XHTML 2.0: (22 July 2004) W3C Working Draft
- Reformulation of HTML 4 in XML
- Intention
  - To only describe the structure of the document (CSS formatting)
- XHTML 1.0
  - Well formed documents
  - Proper nesting
  - ...
- XHTML 2.0
  - No backwards compatible
  - Reduces scripting
  - Includes XForms and XML Events

XML Based Languages
XHTML Modularization and XHTML 1.1



XML Based Languages
Multimedia

SMIL

- SMIL 2.0 (07 Aug. 2001) W3C Recommendation
- Easy to write, like HTML
- Doesn't define media formats, only integrates them
  - <img>, <video>, <audio>
- Defines the spatial and temporal dimensions of the document
- Limited Interaction
  - <a>, <area>: for links
- Absolute Layout

Timesheets

- Similar to CSS, but for temporal dimension
- Document composed of:
  - Content: XHTML
  - Formatting: CSS
  - Timing: Timesheets
- Similar syntax than SMIL

```
<time><par>
    <item select="#isect1"
    dur=10s>
    <item select="#isect2"
    dur=10s>
</par></time>
```

XML Based Languages
User Interface

XForms

- XForms 1.0 (14 Oct. 2003) W3C Recommendation
- Next generation of web forms
- Not intended as a self-standing document type
- Uses host language for the document layout (e.g., XHTML, SMIL)
- Advances user interface features:
  - text input, select one, select many, submit
- User input can be validated in the client-side
- Calculations are done, as well, in the client side

XUL

- XML User Interface Language
- Only supported in Mozilla and Netscape 6 (or later) browsers
- Only for window-based graphical UI (mobile phones?)
- Abstraction only at the platform level (not at the UI level, voice?)
- It separates:
  - Client application definition and programmatic logic
  - Presentation (using CSS)
  - Language-specific text labels
- Look & feel changed as wished
- Interaction achieved by scripting
- Interface elements: windows, menubar, scrollbar

XML Based Languages
Vector Graphics, Voice

SVG

- SVG 1.0 (04 Sept. 2001) W3C Recommendation
- SVG 1.1 (14 Jan. 2003) W3C Recommendation
- Describes vector-based graphics for the Web (no pixel based)
  - Shapes (e.g., lines & curves)
  - Images
  - Text
- Drawings can be
  - Interactive (e.g., Mouse clicked)
  - Animated (e.g., Change location)

VoiceXML

- VoiceXML 2.0 (16 Mar. 2004) W3C Recommendation
- Creation of audio dialogs (user interfaces)
- Input
  - Speech Recognition and/or touch tone (keypad)
- Output
  - Pre-recorded audio and Text-to-Speech Synthesis (TTS)
- Describes:
  - Spoken prompts: synthetic speech
  - Recognition of spoken words and touch tone key presses (fields)
  - Control of dialog flow (menu, form that can be submitted to server)
  - Telephony control (call transfer)

XML Based Languages
Terminals & Browsers (Desktop)

http://www.xsmiles.org

http://www.opera.com/

http://www.mozilla.org

http://www.microsoft.com/windows/ie/

http://home.netscape.com/

XML Based Languages
Terminals & Browsers (Embedded)

Mobile Phone

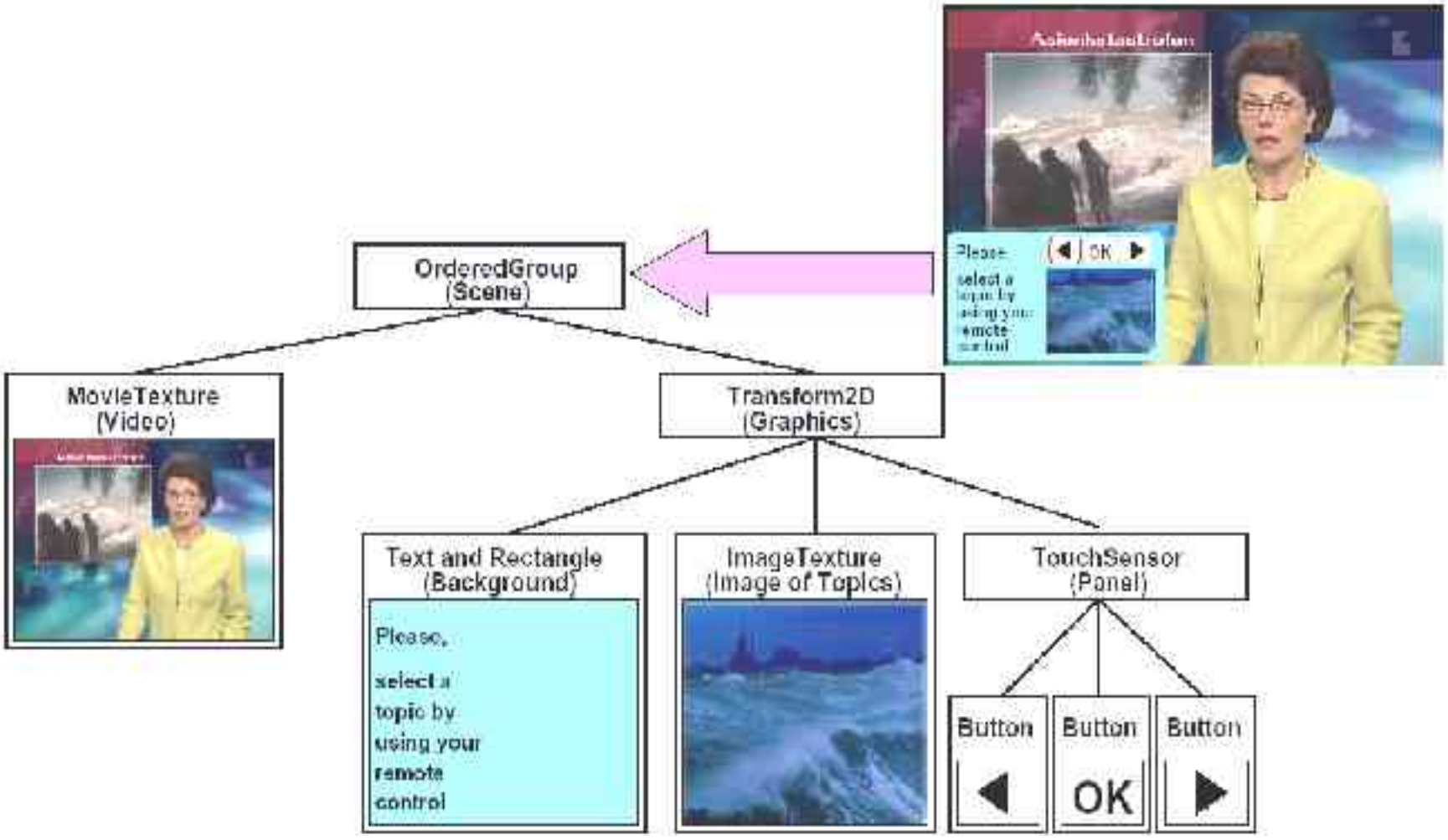
Espial Browser

Web TV

XML Based Languages
Summary

	XHTML	SVG	SMIL	XForms
Media Types				
Audio	No	Yes	Yes	--
Video	No	No	Yes	--
Text, Images	Yes	Yes	Yes	--
Arrangement of the signs				
Spatial	Flow & Absolute	Absolute		--
Temporal	No	No	Yes	--
Interaction	Links	Links	Links	Full

Multimedia Languages



Multimedia Languages
MPEG-4 Overview (1/2)

- Evolution:
  - MPEG traditionally targeted to audio/video codecs (MPEG-1, MPEG-2)
  - Complex toolkit capable of providing solutions for multimedia applications
- Scene:
  - Composition of different multimedia objects (2D, 3D, video) including their spatial and temporal relationships
- Entry points:
  - BInary Format for Scene (BIFS):
    - Hierarchical structure (scene graph)
    - Properties: color, size, position, and timing
    - Behavior: BIFS commands (conditional) and Animations
  - MPEG-Java: set of Java APIs
  - eXtensible MPEG-4 Texttual (XMT): XML language that describes scenes

Multimedia Languages
MPEG-4 Overview (2/2)

- Some of the Scene Nodes:
  - Top: root of the graph (e.g., Layer3D and Layer2D)
  - Grouping: containers of multimedia objects
  - Sensor: nodes capable of detecting events (e.g., Time and Touch)
  - Shape: Graphical Primitives that include two fields: Geometry (e.g., rectangle and circle) and Appearance (e.g., texture and material)
  - Face: integration of synthetic 3D human-like objects
- Interaction:
  - Sensors detect events and Route distribute them
  - Predefined behaviors: resize, relocate
  - Complex behavior: script or Java
- Widgets:
  - Can be implemented (e.g., sensor + Shape)
- Layout:
  - Local coordinates of the objects (more complex automatic layout is not permitted)

Multimedia Languages
MHEG Overview

- Content Classes
  - Multimedia objects (e.g., video or audio clips)
  - Contained in MHEG object (small data) or reference (e.g., filename, web server address)
  - Author can reference to smaller sections (e.g., track 5)
- Behavior Classes:
  - Synchronization of events and user interaction
  - User Interaction
- The action class:
  - Event triggers
  - Sequential and parallel
- The link class: establishes relationships between events and objects i.e. what actions to take on what objects in response to a particular event.
- Selection and modification classes:
  - E.g., Push button, checkbox, radio button, slider, text entry field and text lists
  - Selections, input information and trigger events.

Multimedia Languages
MHEG Example

```
(scene:InfoScene1
   <other scene attributes here>
   group-items:
    (bitmap: BgndInfo
       content-hook: #bitmapHook
       original-box-size: (320 240)
       original-position: (0 0)
       content-data: referenced-content: "InfoBngd"
    )
    (text:
       content-hook: #textHook
       original-box-size: (280 20)
       original-position: (40 50)
       content-data: included-content: "1. Lubricate..."
    )
    links:
       (link: Link1
          event-source: InfoScene1
          event-type: #UserInput
          event-data: #Left
          link-effect: action: transition-to: InfoScene2
       )
)
```

Conclusion

- Multimedia
  - Multimedia objects, visual style
  - Spatial layout, temporal dimension
  - Application logic, user interaction
- Four alternatives (from taxonomy)
  - Compiled languages (C): most efficient, less safer to distribute
  - VM languages (Java): programming language, interoperable
  - XML based languages: most interoperable, less expressive power
  - Multimedia Languages: intended for multimedia
- Number of APIs
  - C: OpenGL/Direct-X, DirectFB, SDL, linuxTV
  - Java: AWT, Swing, JMF, Java3D, Java OpenGL
  - XML: XHTML, SMIL, Timesheets, XForms, SVG, VoiceXML