ACTF Visualization Engines and Alternative Interface Components

Kentarou Fukuda, IBM
### Background

#### New Technologies, New Standards, and Lack of Tools

<table>
<thead>
<tr>
<th>Evolution of runtime technologies</th>
<th>Current and coming accessibility standards and APIs</th>
<th>Existing accessibility check or repair tools</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traditional HTML</td>
<td>Section 508, WCAG 1.0 &amp; 2.0, ISO/IEC Guide 71, ISO/DIS 9241-151, etc.</td>
<td>Bobby, WebKing, etc.</td>
</tr>
<tr>
<td>Web 2.0 (DHTML / AJAX)</td>
<td>Section 508, WCAG 2.0, WAI-ARIA, ISO/IEC Guide 71, ISO/DIS 9241-151, MSAA (IAccessible2)</td>
<td></td>
</tr>
<tr>
<td>Flash</td>
<td>Section 508, ISO/IEC Guide 71, MSAA</td>
<td>LIFT, AccRepair for Flash</td>
</tr>
<tr>
<td>Eclipse RCP (SWT)</td>
<td>Section 508, ISO/IEC Guide 71, SWT Accessibility, MSAA (IAccessible2)</td>
<td>?</td>
</tr>
<tr>
<td>OpenDocument Format (ODF)</td>
<td>Section 508, ISO/IEC Guide 71, ODF 1.1 spec, ODF 1.2 spec.</td>
<td>?</td>
</tr>
</tbody>
</table>

### Runtime technology innovation goes on.

### Standards and APIs in blue bold face will be standardized or updated in 2008 to 2009.

### Lack of tools
Project Goal

Accelerate adoption of new accessibility standards, and accelerate research and development activities for next generation accessibility tools.

• Provide an extensible and comprehensive framework for accessibility tools.
• Allow developers to build various types of accessibility tools on top of ACTF.
  - Alternative interfaces for Persons with Disabilities (PwD)
  - Assistive technology simulation tools
  - Compliance validation and usability visualization tools
  - Accessibility check plugins for IDEs
  - …
• Contribute to other Eclipse projects
  - Cooperate with other Eclipse projects as closely as possible.
  - Help accessibility enhancement of other Eclipse projects.
  - Work towards making all development and authoring tools on Eclipse generate accessible artifacts.
**ACTF Organization and Timeline**

<table>
<thead>
<tr>
<th>Month</th>
<th>Event</th>
</tr>
</thead>
<tbody>
<tr>
<td>May, 2007</td>
<td>• ACTF project was proposed to Eclipse.org</td>
</tr>
<tr>
<td>Sep, 2007</td>
<td>• ACTF project proposal was accepted</td>
</tr>
<tr>
<td>Oct, 2007</td>
<td>• ACTF project was launched</td>
</tr>
<tr>
<td>Feb, 2008</td>
<td>• Most of initial contribution was completed</td>
</tr>
</tbody>
</table>
| Mar, 2008 | • Presentations and first F2F meeting at CSUN     
               • Presentations at EclipseCon                          |
| 2Q, 2008  | • Build 0.1 release (planned)                                     |
| 1H, 2009  | • Projected first release                                          |

### Project leads
- Chieko Asakawa, IBM
- Mike Paciello, The Paciello Group

### Mentors
- Naci Dai (WTP PMC, eiteration a.s.)
- Ed Merks (Modeling PMC, IBM)

### Community
- 7 Companies
- 6 Non-profit organizations
- 7 Academia
- 2 Open source communities
- 2 International consortiums

### Committers
- 21 committers from 9 organizations
Accessibility Tools Framework (ACTF)

**Validation**
- Validation Manager
- Validation Engine
- Validation Rules

**Presentation**
- Visualization Engine
- Report Generator
- View (UI)

**Alternative Interface**
- Alternative UI Transformer
- Audio Description & Caption Service
- Multimedia Controller
- TTS Service

**Infrastructure**
- Model Service
- Mediator
- Repository Service

**Eclipse Platform**
- Eclipse Platform

**Tools and Runtimes on top of ACTF**
- Accessibility Check and Visualization Tools
- Accessibility API Probe Tools
- Alternative Interface Runtimes
- Accessibility Plugins for Tools on Eclipse
- Other Tools, Runtimes, Plugins

**Existing Applications and Content**
- Web Content
- Office Document
- Multimedia Content
- Java UIs
- Other Applications

**Existing TTS Engines**
What is the Accessibility Tools Framework? | © 2008 by IBM Corporation; made available under the EPL v1.0

Large Difference between Sighted and the Blind

Sighted

- Eye-movement-based exploration with visual cues

Blind

- Keyboard-based exploration without visual cues
W3C Web Accessibility Initiative (WAI)
• Web Content Accessibility Guidelines - 1999

Canada
- Canadian Human Rights Act
- Ontarians with Disabilities Act – 2001

United States
- Section 508 of Rehabilitation Act - 2001

Europe
- European Union – Procurement of accessible IT, 2004
- UK – Web accessibility, 2004
- Germany – Barrier Free Decree, 2002
- Italy – ICT accessibility & government procurement, 2004
- Switzerland – Public sector Web accessibility, 2004
- Netherlands – Web accessibility, 2003

Japan
- JIS standards – 2004

Australia / New Zealand
- Australian Banker’s Association Industry endorsed eCommerce standards – 2000
- Australian Communications Industry Forum’s (ACIF) Guidelines – 2001
Web Accessibility and Usability

- Regulations and Guidelines
  - Contributing to a steady improvement of accessibility

- Usability issues
  - Hard to navigate through the Web
    - difficult to find main content
    - hard to understand the structure of a Web page
  - Hard to listen to the Web
    - inappropriate alternative text
    - space-separated characters
In the late 1990s, the Web became a new information resource for the blind. However, because of increasing reliance upon visual techniques, more information is becoming inaccessible.
Inappropriate Alternative Text

- Ambiguous ALT attributes
  - Images with role
    - “Image”, “Photo”, etc.
  - Image links, Form elements
    - “Click here”, “Button”, “”(null), etc.

```
foo.com
```

“click here” ➔ “jump to foo.com”

“photo”
“Photo of Mt. Fuji”
“Mt. Fuji”

etc.
Inappropriate alternative text

- Unnecessary ALT attributes
  - Images for visual effects
    - “spacer”, “shade”, etc.

- Redundant ALT attribute

```html
<a href="search.html">
  <img src="search.gif" alt="Search">
</a>
```

Usual browser

Voice browser
ACTF Visualization Engines

• Provide a visual representation of the PwD users’ usability of content or applications.
  ♦ Blind usability visualization engine
  ♦ Image simulation engine
    ▪ Low vision simulation
    ▪ Presentation simulation

• Objective
  ♦ Provide a tool to learn about real accessibility issues
    ▪ Encourage authors/designers to check accessibility whenever they are authoring content.
  ♦ Provide a tool to effectively demonstrate accessibility issues
    ▪ Encourage website owners to renovate their pages to be accessible.
Blind Usability Visualization

• Objective: “Visualize the non-visible blind usability”

• Approach
  • Reaching time visualization
    ▪ Simulate voice browser and users’ behavior to calculate reaching time to each element in a page
    ▪ Present the reaching times to each part of a page by using background colors.
  • Reading text presentation
    ▪ Presenting the text information extracted or generated by standard voice browsers, while retaining the fundamental visual layouts.

Insert “Skip-to-main” link

Reaching time color:

More than 45 seconds to get to the main content.

Only 3 seconds to get to the main content.
What is the Accessibility Tools Framework?

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**Blind Usability Visualization Example**

**Original**

**Inaccessible**

**With skip-link**

**With heading Tags**

- Easy to find main contents
- Headers can use as TOC
- Easy to navigate through the page
Blind Visualization Overview

- **Model Services**
  - IE
  - OOo
  - get Model (DOM)
- **Blind Visualization View**
  - aDesigner Help
    - About aDesigner
      - HTML Accessibility mode
        - Overview of the HTML Accessibility mode
        - Exploring the HTML Accessibility mode
        - Two types of visits
    - OpenDocument Accessibility
      - Overview of the OpenDocument Accessibility
      - Exploring the OpenDocument Accessibility mode
      - GUI Accessibility mode
  - New Visualization Engine
  - Voice Browser Engine
- **New Visualizer**
- **ODF Visualizer**
  - Blind Visualization Engine
- **HTML Visualizer**
• Users can customize
  - Mode
    - Blind usability visualization mode
    - Voice browser output mode (text mode)
  - Colors for visualization
  - Maximum reaching time that can be allowed
  - List of inappropriate ALT attributes
    - photo
    - image
    - space
    - 1234.jpg
    - etc.
Blind Visualization
Interface / Implementation

- Extension point: `org.eclipse.actf.visualization.blind.blindVisualizer`
- Interface: `org.eclipse.actf.visualization.blind.IBlindVisualizer`
- Abstract Impl.: `org.eclipse.actf.visualization.blind.BlindVisualizerBase`

- Provided information for visualization:
  ```java
  IModelService modelService;
  IChecker[] checkers = CheckerExtension.getCheckers();
  String targetUrl;
  ```

- Returns:
  ```java
  Document resultDocument;
  File resultFile;
  PageData pageData;
  IEvaluationResult checkResult
  int maxReachingTime = 0;
  ```

- Example implementations:
  ```java
  - org.eclipse.actf.visualization.blind.html.BlindVisualizerHtml
  - org.eclipse.actf.visualization.blind.odfbyhtml.BlindVisualizerOdfByHtml
  ```
• Users can select
  • Guideline
    • WCAG1.0
    • Section 508
    • JIS
    • etc.
  • Evaluation Criteria
    • Compliance
    • Listenability
    • Navigability
  • Target DOM
    • Source
    • Live snapshot
ACTF Validation Engine

• Provide extensible accessibility validation features with initial support for:
  • Accessibility APIs such as Microsoft Active Accessibility (MSAA) and IAccessible2.
  • Eclipse SWT
  • Flash
  • HTML
  • Java Swing
  • OpenDocument Format (ODF)
• Developers can customize validation rules by using XML configuration files or through Java APIs.

The Accessibility Tools Framework Validation Engine
Today, 14:30, Room 207
Usability Evaluation

- **Navigability**
  - Reaching time
  - Existence of headings or skip-links for the main content
  - Ratio of accessible links in the page
  - Structure of FORM elements
  - Structure of TABLE elements

- **Listenability**
  - Appropriateness of ALT attributes
  - Redundant text
  - Space-separated characters
Configuration Files for Evaluation

- Guideline XML
  - Define guideline items
    - Guideline name
    - URL of help page
    - Etc.

- Check Item XML
  - Define mapping between validation items and guideline items
  - Define corresponding criteria for each check item
    - Compliance
    - Listenability
    - Navigability
    - (User original)

- Properties File
  - Define error descriptions in multiple languages

- Make validation rule/logic reusable and reduce code/rule clone
- Provide easy customization
• XML configuration file
  • enable/disable check item
  • modify corresponding guideline items
  • modify corresponding ratings and scores
  • create new guidelines/rating metrics

**guide.xml**

```xml
<?xml version="1.0" encoding="UTF-8" ?>
+ <!-- -->
- <guideline name="WCAG" order="1">
  <category>Accessibility</category>
  <description>W3C Web Content Accessibility Guidelines (WCAG) 1.0</description>
- <levels>
  - <level id="P1">
    <category>Accessibility</category>
    <description>W3C Web Content Accessibility Guidelines (WCAG) 1.0 (P1)</description>
  </level>
+ <level id="P2">
  + <level id="P3">
  </levels>
+ <mimetype>
  - <item id="1.1" level="P1">
    <helpUrl>http://www.w3.org/TR/WAI-WEBCONTENT/wai-pageauth.html#tech-text-equivalent</helpUrl>
  </item>
- <item id="2.1" level="P1">
  <helpUrl>http://www.w3.org/TR/WAI-WEBCONTENT/wai-pageauth.html#tech-color-convey</helpUrl>
</item>
```

**checkitem.xml**

```xml
<?xml version="1.0" encoding="UTF-8" ?>
+ <!-- -->
- <checker-config>
  - <checkitem id="C_0.0" type="error">
    - <guideline>
      <gItem name="WCAG" id="1.1" />
      <gItem name="Section508" id="a" />
      <gItem name="JIS" id="5.4(e)" />
      <gItem name="IBMGuideline" id="6" />
    </guideline>
  </checkitem>
- <checkitem id="C_0.1" type="info">
  - <guideline>
    <gItem name="WCAG" id="1.1" />
    <gItem name="Section508" id="a" />
    <gItem name="JIS" id="5.4(e)" />
    <gItem name="IBMGuideline" id="6" />
  </guideline>
```
public class OdfCheckerInfoProvider implements ICheckerInfoProvider {
    private static final String BUNDLE_NAME = "org.eclipse.actf.examples.adesigner.eval.odf.resources.description"; //$NON-NLS-1$

    private static final ResourceBundle RESOURCE_BUNDLE = ResourceBundle.getBundle(BUNDLE_NAME);

    public InputStream[] getCheckItemInputStreams() {
        InputStream is = OdfChecker.class.getResourceAsStream("resources/ODFcheckitem.xml");
        return new InputStream[] { is }; 
    }

    public InputStream[] getGuidelineInputStreams() {
        InputStream is = OdfChecker.class.getResourceAsStream("resources/ODFGuide.xml");
        return new InputStream[] { is }; 
    }

    public ResourceBundle getDescriptionRB() {
        return RESOURCE_BUNDLE;
    }
}

see also: org.eclipse.actf.examples.adesigner.eval.html.HtmlCheckerInfoProvider.java
Simulating the experience of users who have low vision

Low vision simulation. In this example, Color Vision Deficiency (Deutan) and cataract are simulated.

Problem map that indicates the positions of problems.

The original Web page which people without low vision view.

Summary Report

Setting panel (Eyesight, color vision deficiencies, crystalline lens transparency)
Check visibility of presentation slides in large conference rooms
What is the Accessibility Tools Framework?

- Low Vision / Presentation Simulation

Model Services

- Low Vision
- Presentation

Requests

Other models (PDF, etc.)

- IE
- OOo

get Image (BMP)

Simulation configuration (LowVisionType)

Simulation Result

Other simulation

- Eyesight
- Color vision deficiencies
- Crystalline lens transparency

Image Simulation Engine

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ACTF aDesigner (Accessibility Designer)

• Functions
  • Visualization of blind usability
    ▪ Reaching time and reading text visualization
    ▪ Integration with a voice browser engine
  • Simulation of low vision
    ▪ Weak eyesight, color vision deficiencies, cataracts.
    ▪ Detect color combination problems.
  • Presentation simulation
    ▪ Check visibility of presentation slides in large conference rooms.
  • Checking compliance items from the usability point of view
    ▪ Appropriateness of ALT texts and skip-navigation links, etc.
    ▪ WCAG, Section 508, IBM CI162, JIS, etc.

http://www.eclipse.org/actf/downloads/
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**Eclipse Platform**

**Existing Applications and Content**
- Web Content
- Office Document
- Multimedia Content
- Java UIs
- Other Applications

**Tools and Runtimes on top of ACTF**
- Accessibility Check and Visualization Tools
- Accessibility API Probe Tools
- Alternative Interface Runtimes
- Accessibility Plugins for Tools on Eclipse
- Other Tools, Runtimes, Plugins

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ACTF Alternative Interface Part

• Provide middleware components for developing accessible alternative user interfaces.

  - **Multimedia controller**
    - Make multimedia content controllable with unified shortcut keys even if the content does not support keyboard operations.
    - Allow independent adjustment of each sound source.

  - **Audio description & caption service**
    - Provide audio descriptions and captions to multimedia content by using text metadata.

  - **Text-to-Speech service**
    - Provide interface to use TTS from the framework. (Currently, we support SAPI.)

  - **Alternative UI transformer**
    - Support improving the navigating and operating environments by using external metadata without changing the existing applications or content.
• The emergence of multimedia content
  • Entertainment, News, Education, E-government, …
  • Most of these content are inaccessible for the blind…

• Major issues
  1. Audio of a streaming video **interferes** with a synthesized assistive voice.
  2. Streaming videos do not provide **audio descriptions** for non-visual users.
  3. **Dynamically changing visual interfaces** can’t be perceived non-visually. (E.g. mouse only operation)
  4. The **work** to make multimedia content accessible for screen readers is too expensive.
1. Direct audio control
   - Allow users to increase or lower the volume, stop or play, and control audio speed by using simple keyboard commands.

2. User interface simplification
   - Structurally simplify interfaces by converting dynamic visual interfaces into static text-based interfaces.

3. Video descriptions with text
   - Infrastructure to provide video descriptions at low cost.

4. Workload reduction
   - Drastically reduce costs to make existing Flash and AJAX content accessible based on new metadata mechanisms.

http://www.eclipse.org/actf/downloads/
What is the Accessibility Tools Framework?

aiBrowser Overview

- Web Browser
- Multimedia Controller
- Data Model (HTML DOM, Flash)
- Alternative UI Transformer (Fennec Engine)
- Meta Data (Fennec)
- Alternative accessible interface
  - with ALT text
  - with heading
  - with shortcut-keys
  - with simplification
- Additional audio descriptions
- Audio Description Service
- TTS Service
- IBM what makes you...
- Audio description (XML)
- IBM
- © 2008 by IBM Corporation; made available under the EPL v1.0
• Exemplary tools are downloadable now!
  - AccProbe (Accessibility testing and debugging tool for applications.)
  - aDesigner (Accessibility check and usability visualization tool.)
  - aiBrowser (Alternative accessible interface for multimedia browsing.)

• Release 0.1 will be downloadable in 2Q 2008

Check it out and get involved!!
http://www.eclipse.org/actf
Thank you!

Join the long talk!
The Accessibility Tools Framework Validation Engine
Today, 14:30, Room 207
Backup
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**ACTF Community**

**Committers**

- **Company (7)**
  - Actuate Corporation, US
  - Adobe Systems Incorporated, US
  - IBM Corporation, US
  - SAP AG, Germany
  - SAS Institute Inc., US
  - Technosite (ONCE Foundation), Spain
  - The Paciello Group, US

- **Non-profit Organization (6)**
  - BrailleNet, France
  - Japan Braille Library, Japan
  - National Center for Accessible Media (NCAM), Media Access Group at WGBH, US
  - Royal National Institute of Blind People (RNIB), UK
  - The Carroll Center for the Blind, US
  - Vision Australia, Australia

- **Academia (7)**
  - Center for Mathematics and Computer Science, Netherlands
  - SIG-Universal Access to the Internet (UAI), Internet Technology Research Committee (ITRC), Japan
  - State University of New York at Stony Brook, US
  - Tokyo Institute of Technology, Japan
  - University of Manchester, UK
  - University of Toronto, Canada
  - University of Washington, US

- **Open Source Community (2)**
  - BIRT Project, Eclipse Foundation
  - Mozilla foundation, US

- **International Consortium (2)**
  - International Webmasters Association/HTML Writers Guild (IWA/HWG)
  - Web Accessibility Tools Consortium (WAT-C)
Schedule

• Release plan
  - 2Q, 2008: Build 0.1 release
  - 3Q, 2008: Milestone build 0.1 M1 release
  - 4Q, 2008: Build 0.2 release
  - 1H, 2009: Projected first release

• Enhancements currently under consideration include:
  - Refinement of APIs
  - Documentation
  - Support new accessibility guidelines
    (e.g., WCAG 2.0, WAI-ARIA, etc.)
What is the Accessibility Tools Framework?

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Visualize the experience of blind users

The original Web page which sighted people view.

Summary Report

Detailed Report

Text content that will be read out by a voice browser is visualized in this area.

Lighter background color indicates that it takes less time to reach there by using voice browsers.

The balloon message shows the exact time to reach the element on which the mouse cursor is placed.

Darker background color indicates that it takes more time to reach there by using voice browsers.

The overall page rating is calculated from:
1: Compliance to accessibility guidelines
2: Navigability (ease of navigation within the page)
3: Listenability (ease of listening)

The problems of the selected category are listed.
When a user selects an error in the problem list, the corresponding error position is highlighted.
aiBrowser
- A tool that enables multimedia content to be enjoyed by people with visual impairments -

1. Enable users to adjust volume of an individual source - to identify assistive voice - to listen to different sound sources

IBM TV
IT Solutions...

Synthesized assistive voice of screen reader

2. Provide audio caption by using text metadata & TTS

Behind the speaker, a picture of Jazz ...

3. Enables users to control multimedia by using pre-defined shortcut keys.

<table>
<thead>
<tr>
<th>Action</th>
<th>Key</th>
</tr>
</thead>
<tbody>
<tr>
<td>Play</td>
<td>Ctrl+P</td>
</tr>
<tr>
<td>Stop</td>
<td>Ctrl+S</td>
</tr>
<tr>
<td>Volume up</td>
<td>Ctrl+J</td>
</tr>
<tr>
<td>Volume down</td>
<td>Ctrl+K</td>
</tr>
</tbody>
</table>

4. Provide alternative text information by using external metadata.

Go to next chapter
Play previous movie
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