Mobile Application Development Platforms and Mobio's Technology

Adam Blum
Vice President of Engineering
Mobio Networks

Agenda

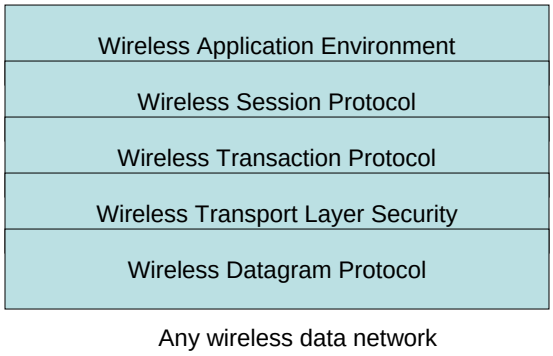
- Approaches to developing connected apps on mobile devices
  - Webwise
  - Local apps
- What's new and different now
- So… what Mobio built
- Demo

Approaches to Mobile Development of Third Party Apps

- “the mobile web”
  - WAP
  - WAP/WML 2.0/XHTML Mobile Profile
- Mobile optimized operating systems
  - Symbian
  - Palm
  - Windows Mobile
  - BREW
- J2ME

WAP

- Open standard for wireless applications
  - *Browse mobile-optimized websites with your cellphone*



The WAP
Wireless Application Environment

- The primary language is Wireless Markup Language (WML)
  - XML compliant
- A WML document is a “deck”
- Decks are composed of “cards” representing single interaction with the user
- Compressed into WBXML
- WML browsers
  - Operate
  - WinWAP
  - Klondike
  - OpenWave
  - NeoMar => Good Technology
- Almost all of these browsers are moved to either XHTML or HTML

Few seriously say that WAP per se has a future

Other Mobile Web “Standards”

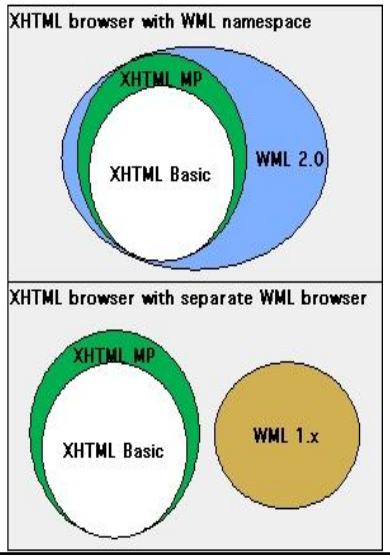
- Openwave,formerly phone.com, need Unwired Planet)
  - Handheld Device Markup Language
  - Influenced WAP/WML
- NTT DoCoMo
  - iMode (based on proprietary Compact HTML)

The Vision of WML2

- XHTML Basic
  - Basic Forms
  - Hypertext
  - Basic Tables
  - CSS – important for now graphical devices
- More features from XHTML
  - acronym, address, br, b, big, hr, I, small, dl, fieldset, optgroup
- Features of WML not in XHTML
  - Navigation aids, onenter events, elements, attributes
  - All prefixed with “wml:”

WML2: The Compromise

- WML2 compliance ended up being defined as either
  - supporting true WML2
  - OR supporting XHTML MP+ WML 1.x
- In this muddy state of affairs, vendors implemented what they wanted to
  - Not necessarily either of these scenarios



WML2 Current Status

- Implementations
  - Nokia – XHTML MP, no WML namespace
  - Openwave – uses WML namspace
  - Access Compact NetFront 3.0, Samsung - only XHTML basic
  - Opera supports most of the WML 2 (all of XHTML MP) with some exceptions of WML controls
- Usability on the XHTML basic implementations is possibly worse on these noncompliant implementations than even WAP

So How Do You Write an XHMTL MP App?

Create some XHTML content

```
• <html>
• <body>
• <h1>an example</h1>
• <p>item 1</p>
• <p>item 2</p>
• </body>
• </html>
```

Style it with CSS

```
• h1 {font-size:x-large;color:#4040ff;text-align:center; text-decoration:underline;}
• p {border:1px #6060ff solid;background:#f0f0ff; text-align:center;font-size:medium;padding:4px;}
• a {color:black}
• body {background:#c0c0ff;}
```

Set the mime type to application/xhtml+xml

But How Do You Handle When The Device Can Support WML Extensions?

WURFL and XSLT Invocation

```
• <? header("Content-type: text/vnd.wap.wml");
  require_once('wurfl_class.php');
  $device=new wurfl_class($HTTP_USER_AGENT);
  if($device->browser_is_wap){
        $xhtmlfile="file://D:/localhost/somecontent.html";
        $xslfile="file://D:/localhost/wmltransform.xsl";
        $xsltransform=xslt_create();
        $xslresult=xslt_process($xsltransform,$xhtmlfile,$xslfile);
        print($xslresult);
        xslt_free($xsltransform);
• }
  ?>
```

The XSLT Itself

```
• <wml>
  <card id="menu" title="{html/head/title}"> <p align="center"><b> <xsl:value-of
  select="html/body/h1"/> </b></p>
• <xsl:for-each select="html/body/p">
  <p align="center">
    – <a href="{a/@href}">
    – <xsl:value-of select="a"/></a> </p>
• </xsl:for-each>
```

J2ME MIDP

Relevant Specifications

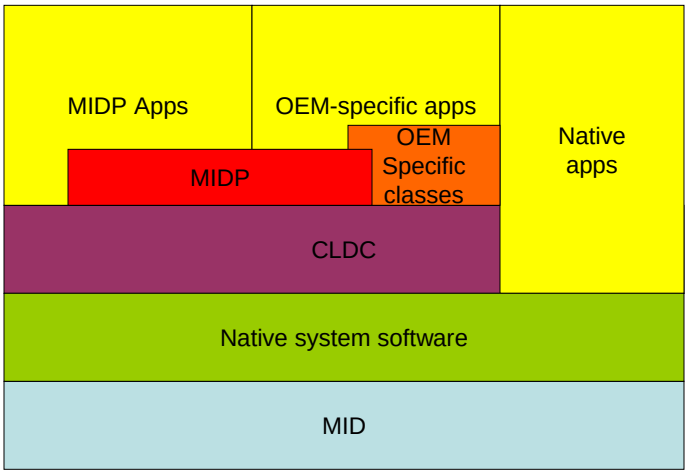
- JSR 37 – MIDP 1.0 – September 2000
  - Launched a wave of mostly failed wireless companies at the height of Bubble 1.0
- JSR 118 – MIDP 2.0 – June 2005
  - Enhanced UI, multimedia and game functionality, greater connectivity options, OTA provisioning, end-to-end security
- JSR 139: Connected Limited Device Configuration 1.1 – March 2003

MIDP 2.0

Covers
- Application delivery and billing
- Application signing model and privileged domains security model
- End-to-end transactional security (https)
- MIDlet push registration (server push)
- Networking
- Persistent storage
- Sound (from wav to MID)
- Timers
- User Interface (including requirements for games)

Does Not Cover
- Power management
- Low level security

High Level Architecture



Hardware Requirements

- Screen size: 96 x 54
- Display depth: 1 bit
- Pixel shape: 1:1
- Input: keyboard or touchscreen
- 256kb non-volatile memory for MIDP implementation
- 8 kb non-volatile memory for app-created persistent data
- 128 kb volatile for Java runtime (heap)
- Two way wireless
- Sound (including tones via MIDI)

Software Requirements

- Minimal kernel to manage underlying hardware, at least one schedulable entity to run the JVM
- Read and write from nonvolative memory
- Read and write access to device's wireless networking
- Time base for timestamping records written to permanent storage
- Write to bitmapped display
- Capture user input
- Application lifecycle management

Specification Requirements

- MIDP 1.0 and 2.0 MIDlets
- All classes, interface specified
- OTA provisioning
- Push
- Visual indication of network usage
- Serial ports
- http 1.1
- https
- PNGs
- MIDI and WAV
- X.509
- UTF-8 for character encoding

Package Summary

- User Interface
  - javax.microedition.lcdui
  - Javax.microedition.lcdui.game
- Application Lifecycle Package
  - javax.microedition.midlet
- Persistence Package
  - Javax.microedition.rms
- Networking Package
  - Javax.microedition.io
- Public Key Package
  - Javax.microedition.pki
- Sounds and tone media
  - Javax.microedition.media
  - Javax.microedition.media.control
- Core Packages
  - Java.lang
  - Java.util

Success of J2ME

Pros

- Over 1Bn devices predicted by end of next year
- Applications are relatively portable
- It's a successful gaming platform

Issues

- Very challenging to manage typical device memory footprints
- It still does require manual intervention and code analysis to port between devices
- Hasn't really taken off for enterprise or informational applications

Other Mobile OSes

- BREW
  - Qualcomm only
  - C++ is a high bar for app (not system) developers
- Symbian
  - Nokia only, not big in US
- Windows Mobile
  - Very small marketshare (though Q may change that)
- PalmOS
  - Palm not committed to it, PalmSource (now Access) is now more Linux focused

What's Different Now

- J2ME devices are ubiquitous
  - 50 million Razors
- Data plans are finally taking off in the US (20% penetration)
  - And being promoted aggressively by carriers
  - Still no widespread informational applications
- Web services (of one form or another) from consumer websites actually exist now

The Mobio Platform

Motivation and Vision

- Allow building of rich, thick client, device-optimized mobile consumer applications *very rapidly*
- Leverage existing technology *where possible*
- Use standards *where convenient*

Assumptions and Scope

- There is an existent WS-I compliant SOAP-based XML web service
  - Simplifies the problem enormously (witness Oracle Mobile XForms and Interactive Wireless Corp)
- Initial implementations of XForms on J2ME compliant devices
  - But will support Windows Mobile, BREW, Symbian, Linux eventually

What is an mApp

- XForms
- XFS
  - Server-side logic embedded into client-side script
- XSLT transformations
- (optional) BPEL scripts
- web services inventory

XFS

- JSP (server-side tags) but only
  - Root, element, attribute, if, choose, include
- Built-in objects
  - Preferences
    - ```
      <c:forEach var="prefEntry" items="${preferences}">
      <preference>
      <c:out value="${prefEntry.key}"/>:
      ${prefEntry.value.valuesAsString}
      </preference>

      </c:forEach>
      ```
  - Device
    - `${device.memory}`

Why Rich Client?

- Highly Interactive Dynamic Forms
- Code Execution and Data Processing on the Device (“the Ajax Effect”)
- “Three Clicks to Pick”

Counterexample:
Try wap.fandango.com
      ```

Why XForms

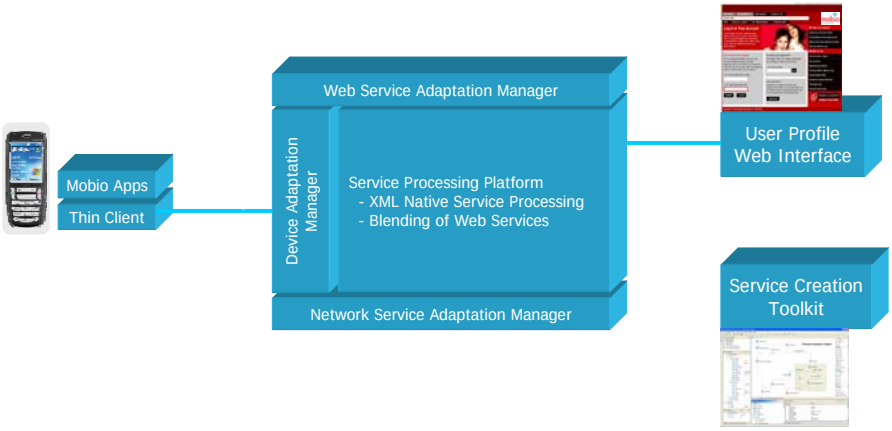
- **Separation of data and presentation**
- Leverage XForms tools
  - Orbeon
  - Visual XForms Designer
- Align with industry standards
- True chance for “write once-run anywhere”
- Allows multiple apps to fit on limited devices (the runner approach with highlevel app descriptions enables this)

Future:

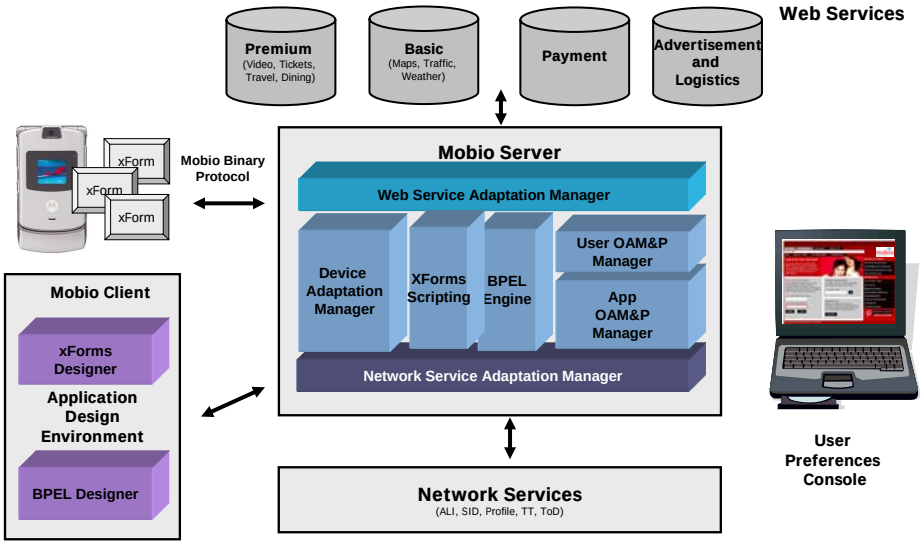
- Even assuming Ajax-capable mobile browsers, XForms can generate HTML+Ajax Javascript on server and is much easier authoring experience

But don’t stick with
“from the standard” widgets

Mobio Platform



Mobio Functional Architecture



Sample mApp: The Model

```
<xf:model>
•   <xf:instance id="search_data">
•        <BugQuery xmlns="">
         <assigned_to>${preferences['owner'].value}@mobio.net</assigned_to>
•        </BugQuery>
•   </xf:instance>

•   <xf:instance id="BugQueryResponse"><BugQueryResponse xmlns=""/></xf:instance>
•   <xf:instance id="admin">
         <data xmlns="">
•                <index>1</index>
•        </data>
•   </xf:instance>
•   <xf:instance id="search_output">
•        <data xmlns=""/>
•   </xf:instance>
•
•   <xf:submission action="/mobio/invoker/Bugs/BugService/BugQuery“ method="post"
    id="search_for_bugs"  replace="instance" instance="search_output"
    ref="instance('search_data')"/>
•
•   <xf:submission action="bugs.xfs" method="get" id="home"
    includenamespaceprefixes="" />
</xf:model>
```

Sample mApp: The Search Form

```
<body class="bg">
•       <xf:switch>
•       <xf:case id="search_form">
•               <div class="color1 dotted-underline">Search by Owner</div>
•               <xf:input ref="instance('search_data')/assigned_to">
•                       <xf:label>Owner:</xf:label>
•               </xf:input>
•
•               <xf:action ev:event="xforms-submit-done“
                        ev:observer="search_for_bugs">
                        <xf:toggle case="show_bugs"/>
•               </xf:action>
•
•               <!--softkey menu-->
•               <xf:send submission="search_for_bugs" ev:observer="root"
                        ev:event="menu-1-action"/>
•
•               <xf:select1 ref="instance('home_menu')/selected“
                        class="right_menu">
•               <xf:label>Options</xf:label>
•                       <xf:item>
•                               <xf:label>Get Bugs</xf:label>
•                               <xf:value>menu-1-action</xf:value>
•                       </xf:item>
•               </xf:select1>
•       </xf:case>
```

Sample App: The Results Form

```
<xf:case id="show_bugs">
•  <xf:group ref="instance('search_output')/BugQueryResult" class="inline">
    <xf:repeat nodeset="Bug" id="bug-repeat" number="4">
•       <!-- this is the description field inside the bug object-->
•       <div class="block">
•       <xf:trigger class="link">
•               <xf:label ref="bug_id"/>
•               <xf:action ev:event="DOMActivate">
•  <!-- set the index for the "clicked" bug so that the next page knows which bug t
   show -->
•               <xf:setvalue ref="instance('admin')/index" value="index('bug-
   repeat')>             <!--turn page-->
•               <xf:toggle case="bug_description"/>
                <xf:action>
        </xf:trigger>
•
•       <xf:output class="color2 inline" ref="short_desc"/>
•       </div>
•  </xf:repeat>
•  </xf:group>
•  <xf:trigger id="new_search" class="soft_button">
•       <xf:label>New Search</xf:label>
•       <xf:toggle case="search_form" ev:event="DOMActivate"/>
•  </xf:trigger>
</xf:case>
```

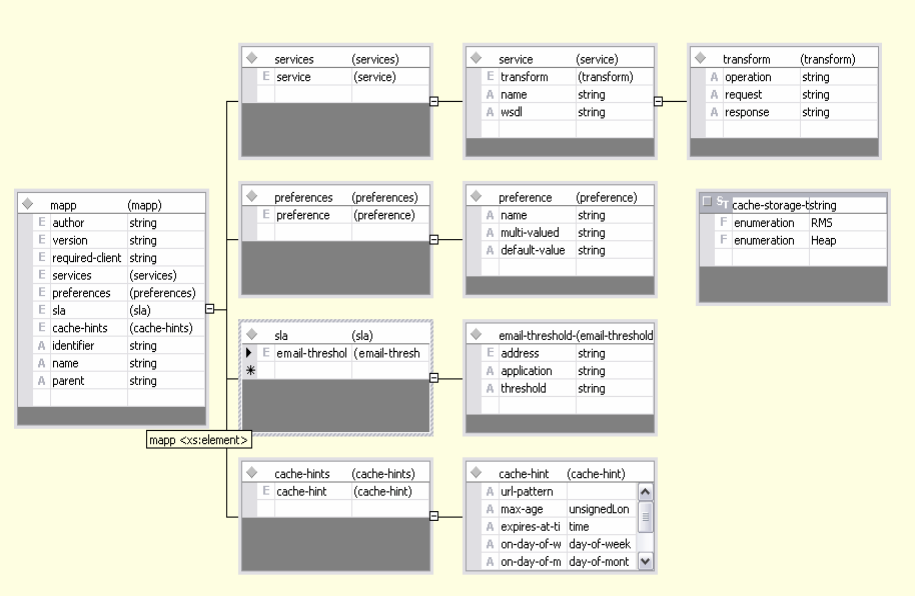
Sample mApp File

```
<?xml version="1.0" encoding="UTF-8"?>
<mapp name="Bugs" parent="Base Application"
xmlns="http://mobio.net/appsdev/mapp">
  <author>Adam Blum</author>
  <version>1.0</version>

  <services>
    <service name="BugService" wsdl=
     "http://clientdev1.mobio.net/Bugs/BugService.asmx?wsdl"/>
  </services>

  <preferences>
    <preference name="owner" multi-valued="false"/>
  </preferences>
</mapp>
```

mApp Schema



The MovieFinder App

- If you have Razor or other popular J2ME phone (Samsung i700, etc.), download from http://www.getmobio.com/customers/universal/

Challenges with the Platform

- Getting mobile XForms client running quickly and in limited memory on lowend devices
  - Such as Moto Razors
  - This is an ongoing issue
- Debugging applications with so many moving parts
- Teaching developers XForms
  - Easier in concept, but noone has knowledge out of the box
- Limitations of XForms as programmatic tool

Other Similar Proprietary Technology Platforms

- UI Evolution
  - UJML – procedural language wrapped in XML tags
  - J2EE app server with custom tag library
  - But
    - Not truly declarative
    - Not standards based
    - Not oriented to multiple apps running on client
    - Limited server services
- MFoundary
  - At a high level, *very* similar to what we do
  - MIL – declarative language for describing client apps that is even MVC
  - Server which provides provisioning, compression, data brokering, carrier integration, tracking/reporting
  - Eclipse-based IDE
  - But
    - No standards-based stuff (MIL vs. XForms)
    - No XFS (server-scripting
    - No preferences console or personalization
    - No transformation on server

Future Directions for the Mobio Platform

- More devices
  - All J2ME
  - Windows Mobile
  - BREW
  - All Ajax capable browser (Opera) devices with server-side generation of HTML+Javascript via Orbeon
- IDE
  - Drag and drop XForms
  - Point to web services
  - Command completion for preferences and capabilities in XFS
- Support for building backend service
  - First class use of Rails?
- REST-based web services on backend as well (or primarily?)
- Efficiencies between XForms MVC interfaces and MVC-based backend web services?

References

- "Developing Wireless Content using XHTML Mobile", Jean-Luc David , April 14, 2004, http://www.xml.com/pub/a/2004/04/14/mobile.html
- "Overview of Mobile Versions of XHTML", http://www.littlespringsdesign.com/design/xhtmlinfo/
- "Mobile Information Device Profile (MIDP): JSR 37, JSR 118, http://java.sun.com/products/midp/