CMER
Centre for Mobile Education and Research

Mobile Web Applications

Outline of the Course

- **Mobile Web and Mobile Web Applications**
- **Mobile Web Applications Markup Languages**
- **Developing Mobile Web Applications**
- **Form Handling, Validations, and Functions**
- **BlackBerry Application using Microsoft Visual Studio and Database Handling**
- **Database Handling, Session Control and AJAX**

What is the Mobile Web?

- **Mobile Web is medium to which Web sites are accessed using mobile devices**

- **Ubiquity → Mobile devices are capable of being connected to the Internet and exchange information**

  - **Connected anytime, all the time**

Mobile Devices

- **Mobile devices include**
  - **Mobile phones (or cellular phones)**
  - **Personal Digital Assistants (PDAs)**
  - **Mobile computers (or laptops/notebooks)**

- **Mobile devices are evolving rapidly**
  - **New mobile devices are produced almost weekly**
  - **New wireless access options continue to expand**

Mobile Device Diversification

- **Diversity: *good or bad?***
  - ❖**Advantage**
    - People have a large variety of mobile devices to choose from
    - Reduced cost
  - ❖**Disadvantage**
    - Content Adaptation: Inability to customize Web content to fit on each device
    - Compatibility: Inability build an application that can work on all mobile devices

Mobile Device Differentiation

- **Mobile devices mainly vary in**
  - ➤ **Connection speed**
  - ➤ **Screen size**
  - ➤ **Memory**
  - ➤ **Processing power**
  - ➤ **Browser support**
    - Old mobile devices support limited browsing (i.e. WAP)
    - New mobile devices support regular Web browsing (i.e. PDAs, BlackBerry, etc.)

Mobile Phones

- **Mobile phones make up the largest segment of mobile devices (CTIA, 2008)**

- **They have specially designed processor**

- **They also have specific operating systems**
  - ❖ **Symbian**
  - ❖ **Windows Mobile**

Mobile Phones (continued)

- **Mobile phones are capable of displaying Web content that is specially formatted**
  - **Use Wireless Access Protocol (WAP)**

- **WAP is an alternative to HTTP**
  - **Designed to deal with restrictions of low speed and high latency in the wireless arena**

  - **WAP-enabled phones uses Wireless Markup Language (WML) to understand mobile content**

Personal Digital Assistants (PDAs)

- PDA's come in different sizes and forms

- PDAs generally refer devices that are small enough to be held in the palm of the hand
  - They typically have larger screen size than mobile phones

- Operating Systems: Palm OS, Microsoft Windows CE, Symbian OS, and BlackBerry OS

Mobile Data Communication

- **Voice communication is no longer the primary usage of mobile phones**

  – **Data communication using mobile devices is growing rapidly**

  – **Mobile data communication include**
    - **Short Messaging Service (SMS)**
    - **Web Content Authoring**
    - **Video and TV**

Limitation of Mobile Devices

- ➢ **Limited screen sizes**
- ➢ **Numeric keypad or input**
- ➢ **Limited processors**
- ➢ **Limited set of image and multimedia support**
- ➢ **Limited Power**

Supporting Mobile Devices

- **How do we support existing mobile devices that differ in their capabilities?**

  – **Test your mobile content using**

    ➢ **As many browsers as possible**

    ➢ **Mobile device emulators,**

    ➢ **Actual mobile devices, and**

    ➢ **Customer feedback**

Applications for Mobile Devices

- **Ubiquitous access to information using mobile devices has:**

  - **Enabled users to accomplish tasks anywhere, anytime**

  - **opened the doors for developers to**
    - **create applications that can run on mobile devices**
    - **create Web applications that can interact with mobile devices**

Developing Mobile Applications

- **Development of mobile applications can be classified into two main categories**

Platform-specific

Browser-specific

Platform-specific

- **Platform-specific:** compiled applications where the device has a runtime environment to execute applications

    - **In this approach, subscribers may download these applications which may internally connect to the Internet and perform specific operations**

    - **Examples: Java 2 Platform Mobile Edition, Symbian, BREW, Adobe Flash Lite**

Browser-specific

- **Browser-specific:** applications are developed using a markup language and accessed via a browser (hence called *mobile Web applications*)

    – **In this approach, mobile devices can decide how to present content, and developers only provide content (browsers are used to connect to the Internet)**

    – **Examples: Wireless Markup Language (WML), XHTML**

Building Mobile Web Applications

- **Wireless Application Protocol (WAP)**

  - ➤ **Introduced between 1999 – 2000**
  - ➤ **WAP is a standardized technology for accessing the Internet using mobile devices**
  - ➤ **WAP is XML-based: uses the Wireless Markup Language (WML)**
  - ➤ **WML is used to develop mobile Web applications**

WAP Forum

- **In 1997, Motorola, Nokia, Ericsson Phone.com created the WAP Forum**
  - **It is a standards body the develops open standards for the mobile industry**
  - **Its mission is to bring the Internet to the wireless community**
  - **Prior to the emergence of PDAs, WAP was the primary source for accessing mobile content over the Web**
  - **WAP 2.0 is the most recent specification by the WAP Forum**

Main Goals of WAP

- **Create a global wireless protocol that is capable of working with different wireless network technologies**

- **Enable content and applications to adapt across various transport options**

- **Enable content and applications to adapt across various device types**

WAP Features

1. **Wireless Markup Language**
   - **Used for authoring services, serves the same purpose as HTML**
   - **Designed to fit small handheld devices**

2. **WMLScript**
   - **Enhance the functionality of services, similar to JavaScript,**
   - **Designed to add procedural logic and computational functions**

WAP Features (continued)

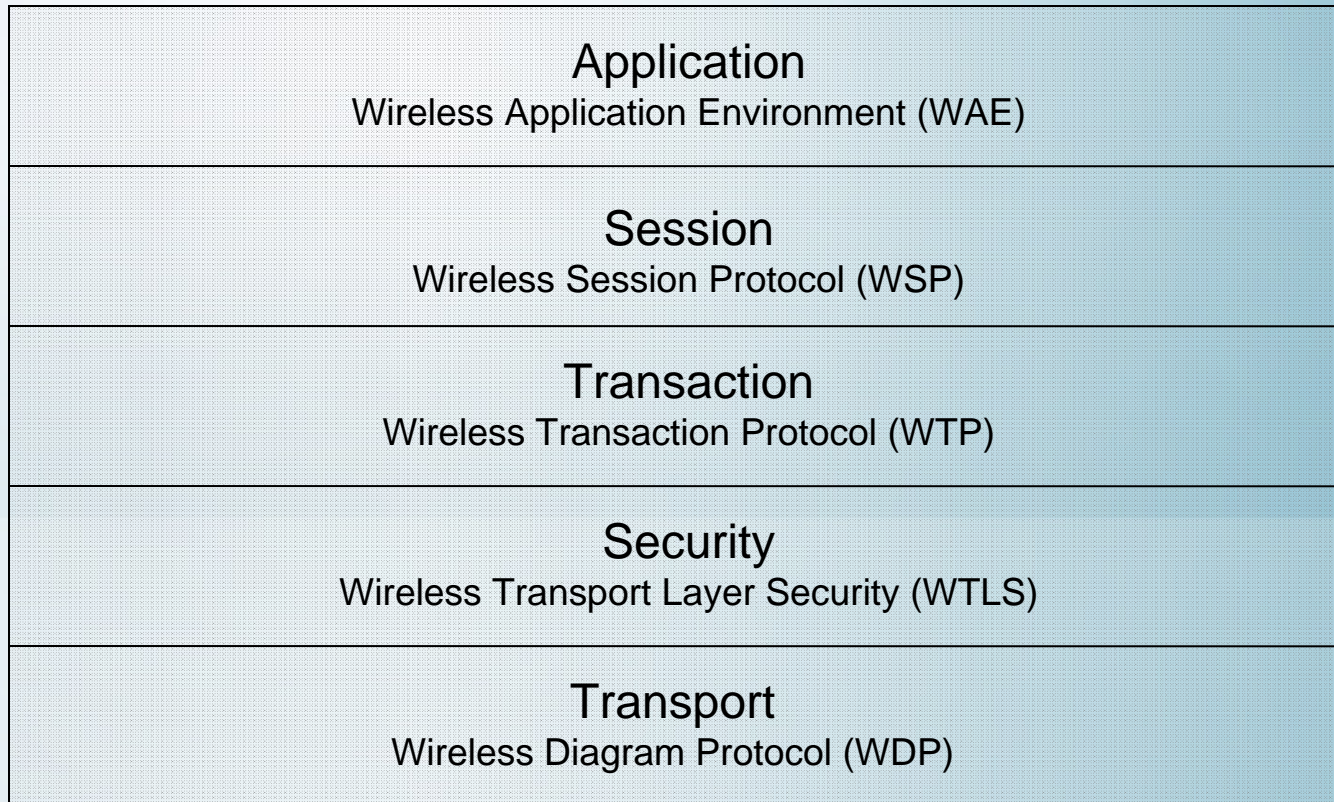3. **Wireless Telephony Application Interface (WTAI)**
    - **An application framework for performing telephony services**
    - **WTAI user agents can make calls, edit phone books, and more**

4. **Optimized Protocol Stack**
    - **Protocols used in WAP are optimized that address restrictions imposed by wireless environments**

WAP Architecture

Application
Wireless Application Environment (WAE)
Session
Wireless Session Protocol (WSP)
Transaction
Wireless Transaction Protocol (WTP)
Security
Wireless Transport Layer Security (WTLS)
Transport
Wireless Diagram Protocol (WDP)

WAP Model

1. Users enters a URL that understands WML

2. Phone sends URL request wirelessly via phone network to a WAP gateway

3. WAP gateway translates WAP request into conventional HTTP request

4. Appropriate Web server receives HTTP request, processes it, and prepares a response (contains HTTP header and WML content)

WAP Model (continued)

5. WAP gateway compiles WML into binary form
6. WAP gateway sends WML response back to phone
7. Phone retrieves WML via the WAP protocol
8. Phone micro-browser processes the WML and displays content on the screen

Shortcomings of WAP

- As mobile devices have provided capabilities such as higher resolution graphics, and moving images, WAP has become inefficient

    - Original WAP specification is incapable of supporting evolving mobile technology trends

    - Restrictions imposed by wireless carriers has made it progressively difficult for wireless clients to access more than simple Web portals

Standardizing Mobile Web Development by the W3C

- **The World Wide Web Consortium (W3C) established guidelines to help manage the development of mobile Web applications**

- **W3C Mobile Web Initiative**
  - **Guidelines and best practices for mobile Web development**
  - **mobileOK: specification that determines whether a Web content can work on various mobile devices or not**

  - **Mobile Web Best Practices 1.0: specifies best practices for delivering Web content to mobile devices**

Standardizing Mobile Web Development by the OMA

- **The Open Mobile Alliance (OMA), formerly the WAP Forum, defined the Extensible Hypertext Markup Language Mobile Profile (XHTML-MP)**

    - **XHTML-MP builds on and extends XHTML Basic 1.0**
        - **XHTML Basic was originally developed by the W3C**
        - **The OMA added enhancements to XHTML Basic 1.0 including support for WAP CSS (WCSS) and other usability improvements and defined it as the XHTML-MP**
        - **XHTML-MP has been adopted as a standard by device manufacturers and the majority of phones support it**

XHTML-MP

- **The main goal of XHTML-MP is associate technologies used for mobile Internet browsing with content of the World Wide Web**

- **Prior to XHTML-MP:**
  - **<u>WAP developers</u> use WML and WMLScript to create WAP sites,**
  - **<u>Web developers</u> use HTML/XHTML and Cascading Style Sheets (CSS) to build Web sites**

XHTML-MP (continued)

- **After XHTML-MP:**

  - XHTML and WAP CSS provides mobile Web application developers better presentation control

  - **Advantage:** The same technologies can now be used to develop Web and mobile Web applications

  - You can use any browser to view any WAP 2.0 application

    - WAP 2.0 is backward compatible
    - WAP 2.0 mobile devices support both WML/WMLScript, XHTML-MP / WCSS sites

Developing Mobile Web Applications Approaches

- **Developing Web-based mobile applications (or browser-specific) can be achieved using any of the following approaches:**

Adaptation

Lowest Common Denominator (LCD)

Adaptation Approach

- Adaptation approach (also known as adaptation or multi-serving):

  - Delivers content based on the capabilities of the mobile device
  - This approach is adaptive in the sense that developers adapt content to work within the constraints of the device
  - Developers may create <u>multiple versions</u> of the content to work on as many mobile devices as possible
  - Methods used for this technique include: detection, redirection, scaling images/graphics, etc.

Lowest Common Denominator Approach

- Lowest Common Denominator (LCD) approach:

  - Defines a minimum set of features that a device have to support. In this case, content is developed based on these guidelines
  - In this approach, developers only create a <u>single version</u> of the content that can work fairly well on as many mobile devices as possible
  - The minimum set of features a device is expected to support is called the <u>Default Delivery Context (CDC)</u>
  - CDC is now part of the Mobile Web Best practices 1.0 recommendation by the W3C

Features Defined in the Default Delivery Context (CDC)

- ➢ **Usable Screen Width: 120 pixels, minimum**
- ➢ **Markup Language Support: XHTML Basic 1.1 delivered with content type application/xhtml+xml**
- ➢ **Character Encoding: UTF-8**
- ➢ **Image Format Support: JPEG, GIF 89a**
- ➢ **Maximum Total Page Weight: 20 kilobytes**
- ➢ **Colors: 256 Colors minimum**
- ➢ **Style Sheet Support: CSS Level 1. In addition, CSS Level 2 *@media* rule together with the *handheld* and *all* media types**
- ➢ **HTTP: HTTP/1.0 or more recent HTTP 1.1**
- ➢ **Script: No support for client-side scripting**

Adopted from W3C Mobile Web Best Practices 1.0

Adaptation versus LCD

- **Adaptation may be the ideal solution for delivering content to mobile devices**

- **However, it is more complex and involves more costs**

- **It also requires many changes to be applied on the server side for detecting and delivering content**

- **LCD is much easier and is less complex**

Steps for Building Mobile Web Applications

- **Define target audience**
  - How will use the application?
- **Determine user goals**
  - What users will achieve using the application?
- **Determine target devices**
  - What mobile devices will use the application?
  - Are you planning to limit your application to a particular set of mobile devices?

Steps for Building Mobile Web Applications (continued)

- **Prepare prototypes**
  - Draw sketches for accomplishing the user goals
- **Build prototypes**
  - Use mobile Web application development tool to build/create your application
- **Test your mobile Web application**
  - Run you mobile Web application on as many actual mobile devices as possible
  - Use mobile device emulators and get user feedback

Preparing the Development Environment

- **XHTML-MP can be developed using any text editor**
- **HTML editors can also be used to develop XHTML-MP**
- **For server-side scripting, a server-side setup is required**
  - **Server-side script should output XHTML-MP code instead of HTML**
  - **For testing, you can use desktop Web browser to test your mobile Web application**

Tools Needed for this Course

- **BlackBerry Specific**
  - **BlackBerry Plug-in for Microsoft Visual Studio**
  - **BlackBerry MDS Runtime**

- **Development**
  - **Microsoft Visual Studio (2005 or 2008)**
    - **ASP.NET experience is required**

- **Servers/Environments**
  - **.Net Framework (2.0)**
  - **Internet Information Services (IIS) 5.0 or 6.0**
    - **Requires some ASP.NET experience**
  - **Adobe ColdFusion MX or 8.0**
    - **Requires some ColdFusion experience**

Simulators Needed for this Course

- **BlackBerry Simulators**
  - **Any simulator**
  - **Preferred: BlackBerry® Pearl™ 8220 smartphone simulator**

- **Other Simulators:**
  - **Openwave Phone Simulator**

  - **Opera Mini Simulator**

  - **Motorola's tools**

  - **Sony Ericsson's tools**

Test Mobile Web Applications on Real Devices

- **DeviceAnyWhere**
  - **Online service that provides access to hundreds of real handsets, on line worldwide networks, remotely over the Internet for testing mobile Web applications**

DeviceAnywhere
by Mobile Complete