B211 Internet Computing

Wireless Internet Services

Lecture Outline

- Wireless network technologies.
- Wireless application development.
- The future of wireless Internet applications.

What is the Wireless Internet?

- The *Wireless Internet* is a loose expression used to refer to a whole set of technologies developed to enable devices to connect to services available on the Internet and the WWW, without having to connect using physical cables.
- The wireless Internet is closely tied to the concept of having a *mobile* Internet.

Why Have Wireless Data Technologies?

- Conventional cable-based network cannot provide:
  - mobility for users wanting network services while on the move
  - flexibility for network nodes to change physical locations
  - ease in connecting and disconnecting devices to a network
- Wireless data network technologies are developed to accommodate these needs.

Example Benefits of a Wireless Data Technologies?

- With wireless data networks, for example:
  - Staff can connect to corporate networks from home or on the road.
  - Mobile phones and mobile devices can send and receive information to and from computers, fax machines, printers, and other office equipment.
  - Networks can be connected in any physical configuration, and the configuration can change easily.
  - Mobile computers can connect and disconnect to a local area network easily.
  - etc.

Mobile Network Services

- Wireless data networks depend on underlying mobile services for data exchange. All services use an allocated range in the electromagnetic spectrum.
  - 1G (first generation) services
    - Used by past analog cellular phones and paging systems
    - Mostly replaced by 2G services
    - Examples:
      - » AMPS (Advanced Mobile Phone Service) using 800Mhz

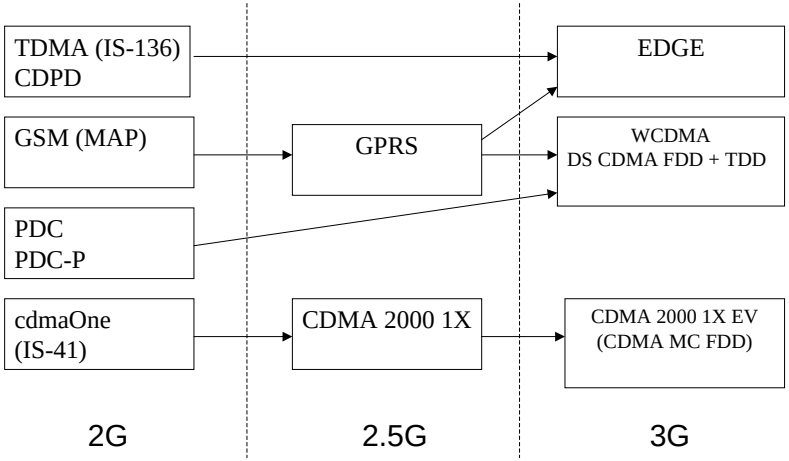
Mobile Network Services (cont'd)

- 2G (second generation) services
  - Operates at the rates of about 9.6Kbps, enough to transmit voice.
  - Examples:
    - » GSM (Global System for Mobile Communications) using frequencies 900MHz, 1.8GHz and 1.9GHz
    - » PCS (Personal Communications Systems) using 900MHz and 1.9GHz
- 2.5G services
  - Interim services currently being deployed while we wait for the 3G spectrum arrangements to be sorted out and technologies to be developed.
  - Examples:
    - » GPRS (General Packet Radio Service) using frequencies 900MHz, 1.8GHz and 1.9GHz

Mobile Network Services (cont'd)

- 3G services
  - ITU recently announced the spectrum to be used for 3G services, in the 800MHz and 2GHz band
    - » In most countries, the same parts of the 800Mhz band is already owned by corporations employing 2G services (eg. Telstra, Optus, Vodafone, etc in Australia). These corporation will maintain control over these parts for 3G development.
    - » Governments are currents auctioning the 2GHz parts.
  - 2 major competing standards
    - » Wideband Code Division Multiple Access (WCDMA)
    - » CDMA 2000
  - Digital rates of 2Mbps is expected
  - Roll-out delayed due to current economic conditions, and uncertainty about user demands.

Mobile Network Evolution



Source: Page 17 in Anderson, *GPRS and 3G Wireless Applications*, Wiley, 2001. Also in Unit Reader section 20.

Current 2G Service Subscribers

- As of August 2000, the number of 2G subscribers worldwide:
  - GSM: 362 million (68%)
  - cdmaOne: 72 million (13%)
  - TDMA (IS-136): 54.3 million (10%)
  - PDC: 48.8 million (9%)
  - Source: Page 15 & 16 in Anderson, *GPRS and 3G Wireless Applications*, Wiley, 2001. Also in Unit Reader section 20.
- This suggests the biggest migration path will be towards EDGE and then WCDMA for 3G services.

Wireless LANs

- Though not strictly Internet technology (LANs operate on a lower level than TCP/IP), development of wireless LANs technologies is critically important to the wireless Internet since it is the end-points of Internet data in most cases.
- Most wireless LANs operate at a data rate of 2-20Mbps
  - compared to a standard Ethernet 100baseT with operates at 100Mbps.

Wireless LANs and PANs

- Some current specifications for wireless LANs:
  - IEEE 802.11
  - ITU's HomeRF
  - HiperLAN and HiperLAN2
- There are also specifications, like Bluetooth and IrDA, which communicates only within a few meters range, much smaller area than LANs.
  - These are commonly called wireless Personal Area Network (PANs) technologies.

Wireless Applications

- All previous pages deals with delivery and transport technologies. But what about the applications and content?
- One of the major barriers to past and current uptake of the wireless Internet is the fact that there isn't really much compelling applications or content that attracts users.

Special Considerations for Developing Wireless Applications

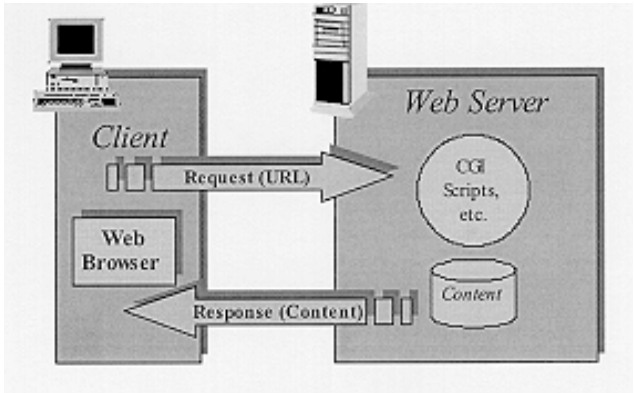
- Compared to normal computers, wireless devices have
  - less powerful CPUs
  - less memory
  - restricted power supply
  - smaller displays
  - different input methods (eg. phone keypad)
- Also, wireless data network generally have
  - less bandwidth
  - more delays
  - less connection reliability
  - less predictable availability
  - more potential security threats

The Wireless Application Protocol (WAP)

- One example application service specification if the Wireless Applications Protocol (WAP).
- The WAP Forum is an industry group consisting the major players in the development of wireless technologies.
- Though not very successful due to implementation problems and lack of compelling content, it does serve as a basis for learning about wireless application development.

The WWW Programming Model

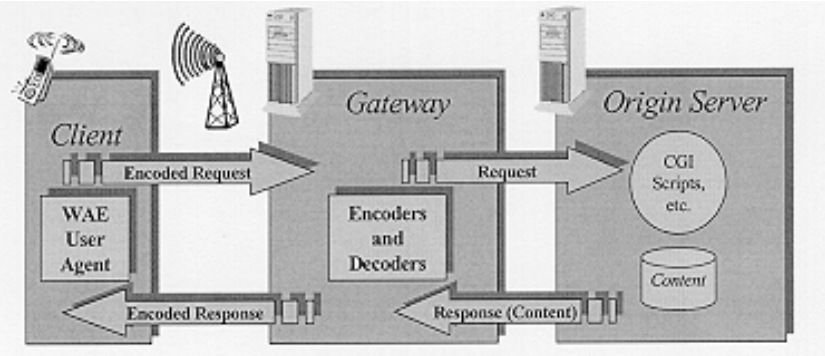
- Something we are already familiar with:



Source of diagram: WAP Architecture Specification (30/4/1998)
http://www1.wapforum.org/tech/documents/WAP-100-WAPArch-19980430-a.pdf

The WAP Programming Model

- Similar to the WWW model, except there is a WAP gateway between the client and server. The origin server is a normal web server.



Source of diagram: WAP Architecture Specification (30/4/1998)
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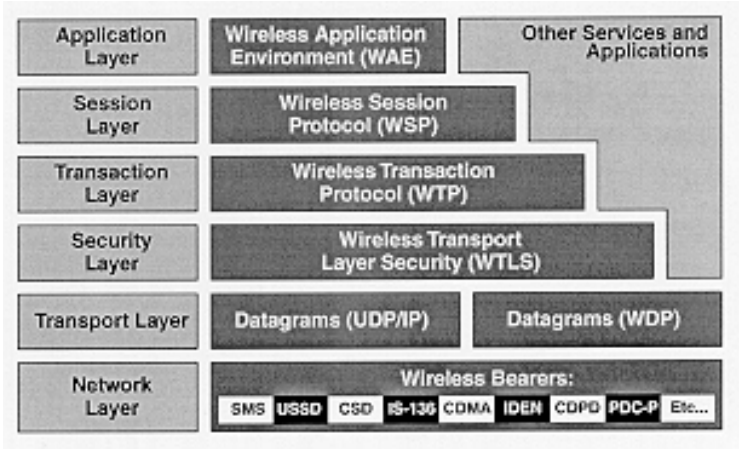
Components of the WAP Architecture



Source of diagram: WAP White Paper (http://www.wapforum.org/what/WAP_white_pages.pdf)

The Wireless Application Environment (WAE)

- Most of the developers of WAP applications and content would be developing at the top level, the WAE.
- The WAE consists of specifications for:
  - Wireless Mark-up Language (WML) - a mark-up language optimised for hand-held mobile terminals.
    - » Based on HTML
  - WMLScript - a scripting language for client-side processing
    - » Based on JavaScript
  - Wireless Telephony Application (WTA) - interfaces for voice telephony services and programming
  - Content formats - definitions for formats like images, phone records, calendar, etc.

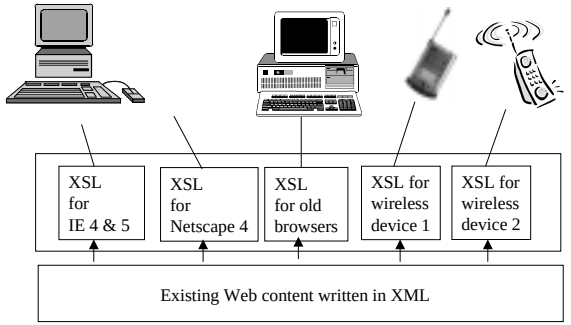
Competing Wireless Application Standards

- NTT DoCoMo's iMode
- Short Messaging Service (SMS)

i-Mode

- There are 27.8 million i-Mode subscribers worldwide (as of Oct 4 2001), increasing by about 40,000 per day.
- i-Mode is based on a version of HTML called compact HTML, or cHTML.
- Success of i-Mode in Japan based on
  - Pricing model - charges by data retrieved, not time connected.
  - Cooperation between handset manufacturers, content developers, and NTT DoCoMo.
  - Content and applications geared towards Japanese teenagers
    - » personal text messaging
    - » music
    - » etc.

XML for Wireless Devices



Web Server transforms XML for different clients

- The move towards XML means the content development platform becomes less of an issue.

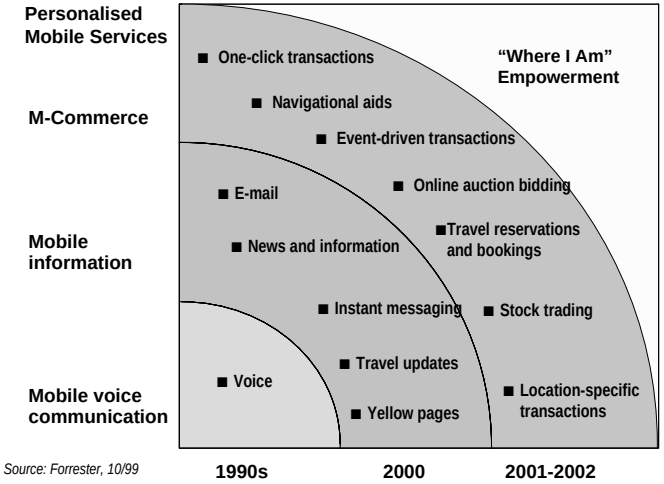
Wireless Internet Users

- As of November 2000, of the world's 25 million wireless internet users:
  - 81% (20 million) are in Japan - 16 million iMode, 4 million WAP.
  - 12.5% (2-3 million) are in Korea - WAP
  - 5% (1-2 million) are in Europe - WAP
  - 1% (<0.5 million) are in the USA - WAP and Palm.
- Source: www.eurotechnology.com/imode/faq-wap.html

What Application and Content?

- Is there a killer application that will spur the uptake of the wireless Internet?
  - Location-based services
  - Personalised news, mail, audio-visual entertainment
  - Library of e-books
  - Passport, tickets, itinerary
  - Mobile videophone
  - Personal assistant software

New Kinds of Services



Source: Forrester, 10/99

Leveraging Unique Opportunities

- The killer application(s) should take advantage of the unique opportunities offered by being in the wireless environment:
  - Mobility
  - Always online
  - Personalization of the the mobile device

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