

COMP 3410 / 6341 – I.T. in Electronic Commerce

E-Trading

2. Some Key Technologies

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...EC/ETIntro.html , OhdsET2.ppt

ANU July 2007

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QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

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are needed to see this picture.

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E-Trading Some Key Technologies

Agenda

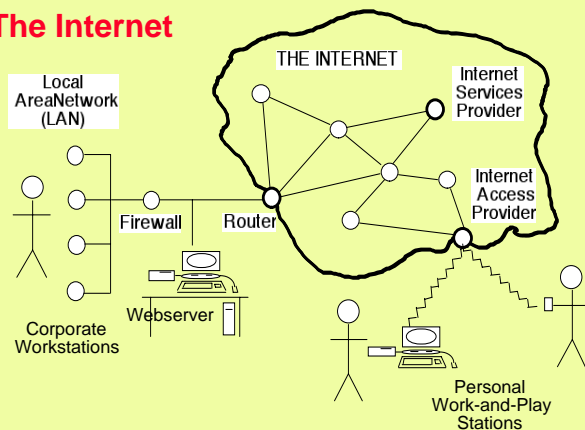
1. Internet Access:
 - Fixed-Point
 - Mobile / Wireless
 - Location and Tracking
 - Device-Independence
2. The Shopping Cart Model
3. Payment Schemes

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The Internet



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User Devices

- **Capacity** (now rivals Hosts)
- **Diversity** (vast, expanding)
desktops, laptops, handhelds, smartcards, ...
phones, PDAs, cameras, iPods, iPhones, ...
carburettors, fridges, ... RFID tags, ...
- **Wired Connectivity** (mostly Broadband)
This enables dispersion and replication
of devices capable of providing services
- **Wireless Connectivity** (now
mainstream)
This enables Mobility
which means Devices change networks
which means their IP-addresses change

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Public Access Points

- Workstations in the workplace
- 'Work, Study and Play'-stations in the home (PCs, perhaps TV sets, perhaps games-stations)
- Public Kiosks, e.g. tourism/Datatrax
- Private Kiosks e.g. ATMs
- PCs in libraries, communities, schools
- PCs in 'Internet Cafes', airport lounges, clubs
- Playstations in games-arcades

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Connection to the Internet

1 of 2

- **Permanent, Fixed-Location Connection**
 - leased-line or cable connection using own Router
 - provides a (semi-?)permanent IP-address
 - IP-address and line are registered
 - probably involves many 'nyms'
- **Temporary, Fixed-Location Connection**
 - dial-up connection via PSTN / PPP to an Internet Access Provider (IAP)
 - provides a temporary IP-address
 - IP-address and line are logged
 - may involve one or multiple 'nyms'

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Mobile Public Access Points

- Faxes (for printouts) and Phones (e.g. for spoken email)
- Private mini-workstations (e.g. in Boeing 777s)
- Portables, at docking stations
- Mobile access devices (integrated portable / handheld / PDA / mobile phone)
- Playstations in the hand
- Music playstations / iPods and imitators
- Digital cameras, still and video
- iPhone

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Connection to the Internet

2 of 2

- **Variable-Location Connection**
 - dial-up connection via cellular services (GSM, CDMA) to an Internet Access Provider (IAP)
 - Wifi / iBurst / WiMax wireless connection
 - provides a temporary IP-address, possibly MobileIP
 - locatable within cell
 - soon more accurately locatable (MOLI or GPS)?
 - may involve one or multiple 'nyms'
 - likely to be used by fixed-location devices as well e.g. in sparsely-populated regions, and to hide

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Wireless Comms Using Electromagnetic Radiation

- **Wide Area Networks – Satellite** (Geosynch; Low-Orbit)
GS is Large footprint, very high latency (c. 2 secs)
- **Wide Area Networks – Cellular** (up to 20km per cell, but relatively low capacity per user, even with 3G)
 - 1 – Analogue Cellular, e.g. AMPS, TACS
 - 2 – Digital Cellular, e.g. GSM, CDMA
 - 3 – '3G', e.g. GSM/GPRS, W-CDMA, UMTS
- **Wide Area Networks – IEEE 802.16 (WiMAX), 802.20 (MobileFi)** (3-10 km per cell, high-capacity per user, but a local monopoly?), and proprietary options such as **iBurst**
- **Local Area Networks – 'WiFi'** (10-100 m radius, monopoly?)
e.g. IEEE 802.11x esp. 11b,g / Apple Airport / Centrino
- **Personal Area Networks** (1-10 metres)
e.g. Bluetooth (or beamed infra-red)

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Wireless Services and the Internet (1) Device and Channel Capacity Issues

- **Mobile Devices** have limited capacity (processor, memory, storage, display, power)
- They may be unable to support conventional clients such as web-browsers
- **Bandwidth** may also be a significant constraint, because of web-site designers':
 - inadequate understanding
 - excessive enthusiasm
 - inadequate self-discipline

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The Generic Solution

- Either:
 - (1) a 'mini-browser'
 - Or:
 - (2) a complete alternative protocol stack (cf. HTTP, TCP, IP)
- and
- an alternative ML (cf. HTML, XHTML, XML)

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A Courageous Attempt at Solution (2)

Wireless Application Protocol

(WAP)

- WAP's '**lightweight protocols**':
 - replace the Application Layer – HTTP
 - avoid TCP (because of its overheads)
 - replace the Network Layer – IP
 - substitute a simple ML for HTML
- The WAP protocols can be readily mapped by a **web-to-WAP Gateway** (i.e. App Layer in an Intermediating Node)
- WAP is independent of the Link and Physical Layer standards (GSM, CDMA, etc.)

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HTTP/TCP/IP	WSP/WTP/UDP	<i>Bold packets contain payload Non-bold items are overhead</i>
1. → TCP SYN	1. → Data Request	
2. ← TCP SYN, ACK of SYN	2. ← ACK, Reply	
3. → ACK of SYN, Data Request	3. → ACK, Data Request	
4. ← ACK of Data	4. ← ACK, Reply	
5. → Reply	5. → ACK, Data Request	
6. ← ACK of Reply	6. ← ACK, Reply	
7. → Data Request	7. → ACK	
8. ← ACK of Data		
9. → Reply		
10. ← ACK of Reply		
11. → Data Request		
12. ← ACK of Data		
13. → Reply		
14. ← ACK of Reply		
15. → TCP FIN		
16. ← TCP FIN, ACK of FIN		
17. → ACK of FIN		

Typical Handset Session — 3 Requests, 3 Responses	
HTTP/TCP/IP	WSP/WTP/UDP
17 packets	7 packets
65% Overhead*	14% Overhead*

*does not account for DNS, SSL, Authentication or Cookies

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Wireless Services and the Internet

(2) Finding a Device's Network-Location

- Each device has a name (e.g. SIM-Card-Id)
- At any one time, each currently-active device is registered in a cell
- Where cellular technologies are used for the complete stack of protocols (e.g. for **telephony** rather than for Internet traffic), they include means for **'handoff'** of **moving devices from one cell to another**

Handoff works ... but unreliably

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Internet-Connected Mobile Devices

The Problem

- Each Internet-connected device is attached to a sub-net
- Its IP-Address is assigned from those of that sub-net
- A sub-net is a LAN, a cell, or a Wifi hotspot
- **When a device moves to a new sub-net, it loses its old IP-Address and has to get a new one from its new sub-net**
- So it will no longer be reachable at the old IP-Address
- Packets-in-transit will not arrive
- There is a delay before the new IP-address can be discovered by sending nodes
- **A quickly-moving node may change IP-address frequently**

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Internet-Connected Mobile Devices

The Solution – 'Mobile IP'

<http://www.itarchitect.com/article/NMG20020429S0013>

- This specification has been implemented slowly, but with wireless networking is increasingly important
- **Messages are directed to a specific, stable IP-Address**
(which could be thought of as a 'care-of' address)
- **A home agent on the home subnet of the mobile device performs re-direction of the traffic**
- Sending nodes only ever send to the home IP-Address
- There is a delay in the notification by the device of a new IP-Address, so messages in the interim need to be managed

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- **Location Detection**
the whereabouts of a device, or a person, in relation to known objects or reference points
- **Retrospective Tracking**
the trail within a particular space, that was followed by a device or person over a period of time
- **Real-Time Tracking**
the trail within a particular space, that is currently being followed by a device or person
- **Location Prediction**
the projection or inference of future locations

Wireless Services and the Internet (3) Device-Independent Web-Pages

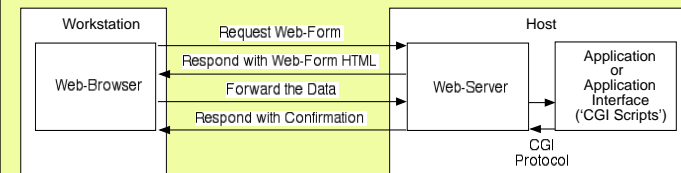
- Access is needed from many device-types, e.g.:
 - cellular phones
 - TV
 - digital cameras
 - in-car computers
- There is a risk that many device-types may only be able to access parts of the Web
- “W3C is dedicated to ensuring that the Web universe is not fragmented. Interoperable languages and protocols, and single-authored content should prevail”

2. The Shopping Cart Process

- Be offered a range of items available for sale
- Click on an item to select it
- Repeat until ready to pay
- ‘Proceed to the checkout’
- Provide payment and shipping details
- Click on a button to affirm the purchase
- Receive a confirmation

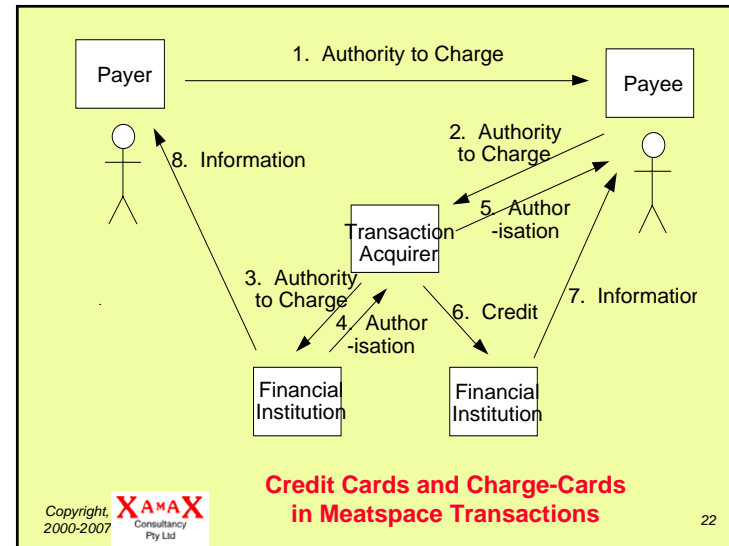
- Receive delivery
- Receive confirmation of payment

Web-Form Processing



3. Payment Schemes

- **Evolutionary approaches:**
 - credit-card details
 - debit-card details
- **Revolutionary approaches:**
 - electronic value-token creation and passing (cash-like), including micropayment schemes
 - electronic payment instructions (cheque-like)
- **Integrated approach:**
 - stored-value card



Processing for Internet Credit Cards

- card-holder states that he wishes to make a payment
- merchant acknowledges
- card-holder provides payment amount, digital certificate
- merchant requests an authorisation from the payment-processing organisation (via a payment gateway / acquirer)
- existing EFTS networks process the authorisation
- merchant receives authorisation
- merchant sends capture request (to commit the transaction)
- merchant receives confirmation the transaction is

