

## SESSION : Mobility and Mobile Commerce

### •Mobility Overview

#### •Mobile commerce and its variants

- M-commerce
- V-Commerce
- P-commerce

#### •Wireless Networks

- Cellular networks: from 1 to 3G Networks
- Wireless LANs

#### •Middleware to support mobile commerce

- Wireless Application Protocol (WAP)
- I-Mode, Wireless Java, and others

Amjad Umar

## Mobility Overview

Different aspects of mobility:

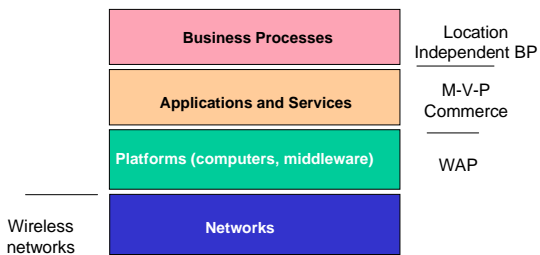
- People (customers, suppliers, employees)
- Devices (laptops, palm pilots, beepers, PDA, sensors)
- Networks: wireless

Mobile devices and wireless networks are not always same

Mobile Devices	Wireless Networks	Sample Applications
No	No	Stationary workstations in office
No	Yes	Wireless LANs to connect office workers in an unwired building
Yes	No	Using a portable computer in a hotel or conference room
Yes	Yes	Cellular phones, Palm Pilots, portable offices,

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## Mobility Issues at Various Levels



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## Mobile EB/EC Applications

- Mobility of:
  - Customers
  - Suppliers and Businesses
  - Employees
- Mobility applications in EB/EC
  - Mobile ebusiness applications (MEBAs), e.g., M-CRM, M-portal
  - Mobile ecommerce (M-Commerce)
  - Positional commerce (*p-commerce*)
  - Voice commerce (*v-commerce*)
  - Television commerce (T-Commerce)
- Issues in building mobile applications
  - Network speed (wireless networks slower and unreliable)
  - Display features (increased voice usage)
  - "Roaming support"
- Two views:
  - Mobile applications are fundamentally new applications.
  - Mobility is another dimension of the existing EB/EC applications

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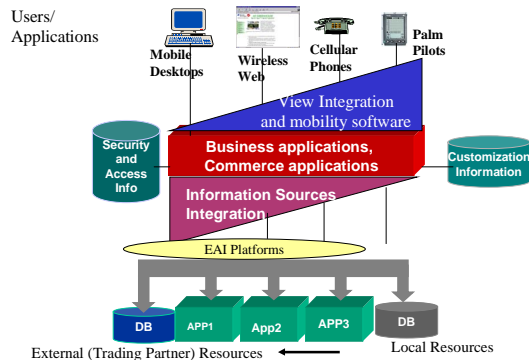
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## Mobile Architecture



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## Mobile Agents in Ecommerce

- Simply stated: Agent: something that works on your behalf
  - Typical agents are mobile, autonomous, intelligent
- Many applications of mobile agents in Ecommerce (eMarkets)
- Personal agents to collect and present information to you in the way you want it
  - shop bots: agents that go around and shop on your behalf
  - Brokers and traders can be agents that act on your behalf
  - Collaborative agents can perform collaborations
  - Mobile agents to support mobile ecommerce
    - wireless devices may not be always connected
    - mobile agents hop around finding their way over a wireless network
  - Multi-agent systems for large scale trading and brokering
    - Many local agents
    - Local agent managers handle local agents
    - multi-agent systems handle multiple local agent managers

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## P-Commerce

- E-Business using global positioning systems (GPS)
- Possible usage
  - find shops close to his/her current location
  - guide cars to less congested routes
  - link up with maps and GIS for computation or measurement
  - co-relate with data associated with entities that occupy a location (e.g. house)
  - auto select a carrier for a call with least costs or certain feature based on the calling location

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## V-Commerce

- E-Business using voice interfaces
- Why?
  - access for your customers who are not yet on-line
    - voice devices more popular than data devices
    - voice interface is easier to learn than web interface
    - mobile devices mostly voice
- Typical uses
  - transaction-based services
  - self-service
  - workforce productivity

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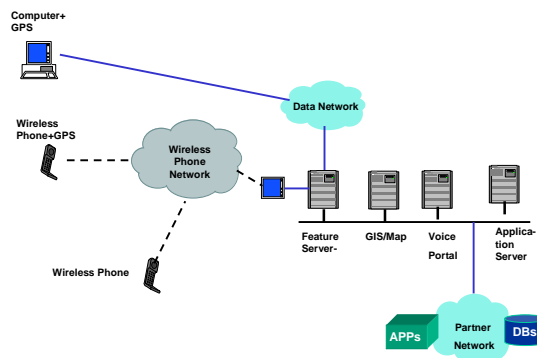
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## Positional and Voice Commerce



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## WIRELESS NETWORKS

- Cellular networks
  - Analog cellular and CDPD
  - Digital cellular and PCS
  - 3G: IMT-2000/UMTS
- Wireless LANs
- Bluetooth
- Other wireless networks
  - Paging
  - Public packet networks: Mobitex and Ricochet
  - Satellite systems
  - Fixed Wireless

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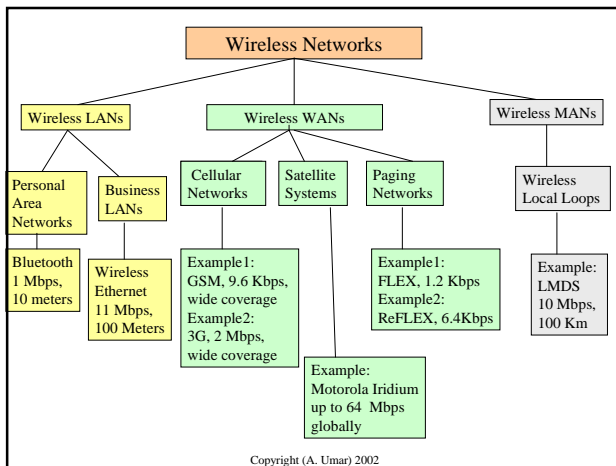
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	Local Area Networks (LANs)	Metropolitan Area Networks (MANs)	Wide Area Networks (WANs)
<b>Wired</b>	Wired LANs Ethernet (10-100 Mbps, 150 to 500 meters) Token Ring (4 -16 Mbps, 200 to 500 meters)	Wired MANs FDDI (100 Mbps, 50 Kilometers)	Wired WANs ATM (44 Mbps to 140 Mbps) Frame Relay (44 Mbps)
<b>Wireless</b>	Wireless LANs Bluetooth (1 Mbps, 10 meters) IEEE 802.11 LANs (2-11 Mbps, 100 meters)	Wireless MANs wireless local loops (10 Mbps, 100 Kilometers)	Wireless WANs Current GSM systems at 9.6Kbps, future 3G systems at 2 Mbps

Issues unique to wireless

- Frequency allocation
- Multiple Access
- Location

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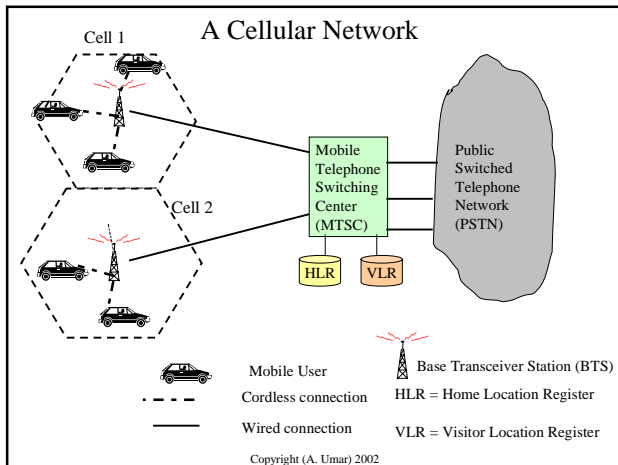
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## Cellular networks: What is 3G Anyway?

- 1G: First generation wireless cellular: Early 1980s
  - Analog transmission, primarily speech
- 2G: Second generation wireless cellular: Late 1980s
  - Digital transmission
  - Primarily speech and low bit-rate data
  - High-tier: GSM, IS-95 (CDMA), etc
  - Low-tier (PCS): Low-cost, low-power, low-mobility e.g. PACS
- 2.5G: 2G evolved to medium rate (< 100kbps) data
- 3G: future: Broadband multimedia
  - 144 kbps - 384 kbps for high-mobility, high coverage
  - 2 Mbps for low-mobility and low coverage

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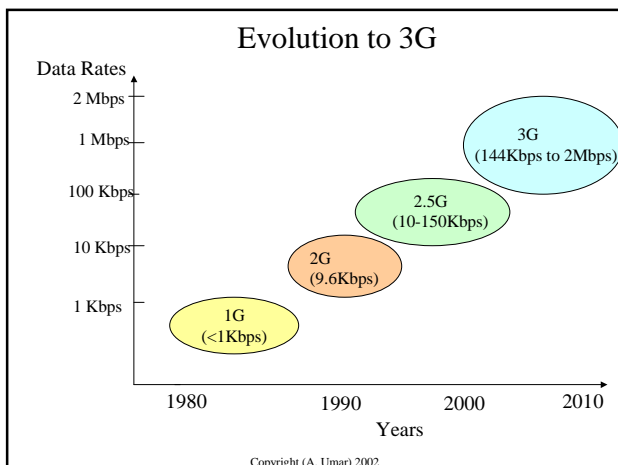
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## Wireless LANs

- First generation of products at about 1-2 Mbps
  - Lucent's WaveLAN, RadioLAN, etc.
  - factor of 10 less bandwidth than current Ethernet
- Next generation of products at 10-11 Mbps
  - factor of 10 less bandwidth than 100 Mbps Ethernet
- IEEE 802.11 standard
- Important niche and enterprise applications (e.g. hospitals)
- Increasing horizontal market interest (e.g. SOHO)
- Forecast: Total worldwide wireless LAN market revenues: \$305.4M (1998) to \$1.63B by 2005 -- Frost & Sullivan.

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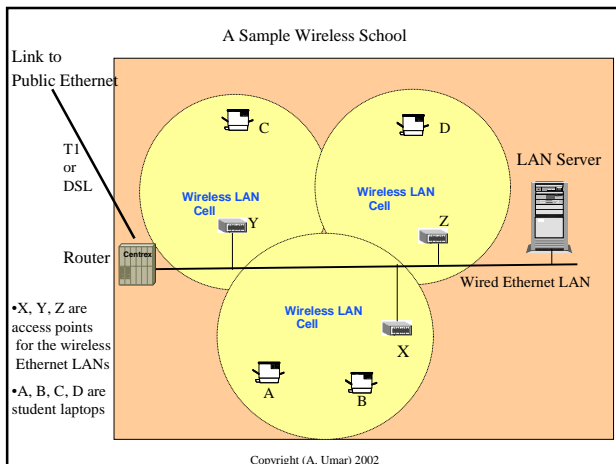
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## Bluetooth

- Founders: Ericsson, IBM, Intel, Nokia, Toshiba; May 98
- Currently: Over 850 companies, V1.0 spec issued 7/99
- Small form factor, low-cost, short range radio link between mobile PCs, phones and other portable devices
- Relatively fast, short packets
- Software for service and device discovery
- Typical application: cellular phone to PDA or earphone
- Forecast: 79% of digital handsets and > 200 million PCs will use Bluetooth by 2002 -- Dataquest

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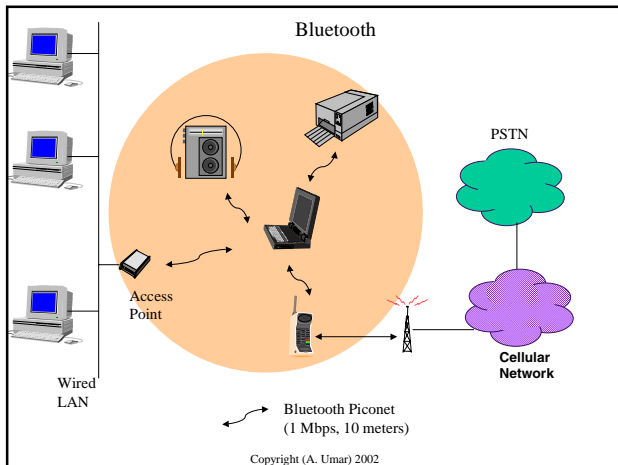
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### Web Links (use prefix www)

- pcsdata.com: PCS web site
- gsmdata.com: GSM web site
- wlana.com wireless LAN Association
- (pcca.org) portable computers and communications association
- www.palowireless.com
- bluetooth.com (the Bluetooth Web site)
- Bluetooth.ericsson.se.
- Online Magazines
  - Mobile Computing & Communications (mobilecomputing.com)
  - Wireless Design Online (wirelessdesignonline.com)
  - Wireless Design & Development (wirelessdesignmag.com)
  - Wireless & Mobility (wireless mag.com)
  - Wireless Review (wirelessreview.com)
  - Wireless Systems Design (wsdmag.com)
  - Wireless Week (wirelessweek.com)

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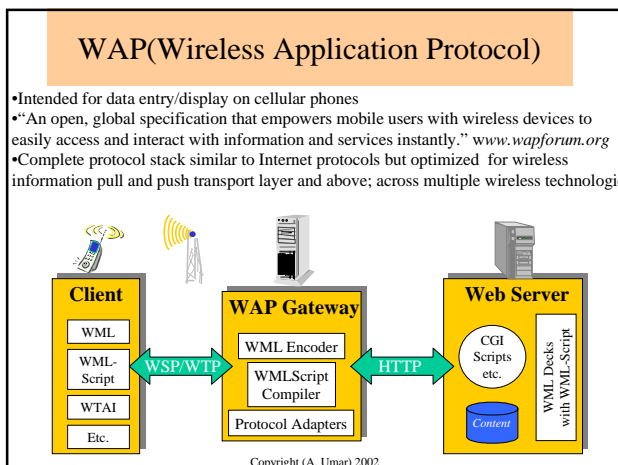
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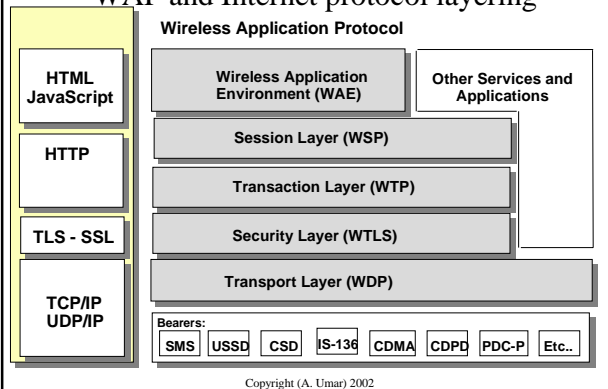
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Slide from WAP web site

## WAP and Internet protocol layering



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## WAP specifies ...

- Wireless Application Environment (WAE)
  - WML Microbrowser
  - WMLScript Virtual Machine
  - WMLScript Standard Library
  - Wireless Telephony Application Interface (WTAI)
  - WAP Content Types
- Wireless Protocols
  - Wireless Session Protocol (WSP)
  - Wireless Transport Layer Security (WTLS)
  - Wireless Transaction Protocol (WTP)
  - Wireless Datagram Protocol (WDP)
  - Wireless network interface definitions

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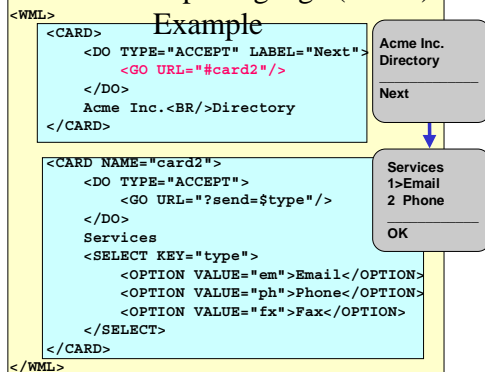
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## Wireless Markup Language (WML)



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## WAP Applications

- General Applications
  - Intelligent Information Inc.: Personalized info
  - MapQuest.com: Travel information (hotel, restaurants etc.)
  - MAZ (Germany): Location-based services
  - Peramon (UK): Email notification and access
  - Sonera (Finland): News, Account balances, Directory enquiries
  - Virtual Inc. (Taiwan): Mobile banking
- Niche Applications
  - Aspiro: Stock purchasing
  - Digital Bridges (UK): Multi-player wireless games
  - ServiceHub: Mobile field personnel dispatch

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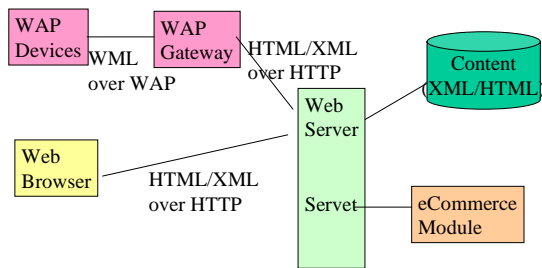
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Figure 2: WAP Prototype



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## WAP Summary

- WAP is becoming an important element of the wireless and mobile middleware space
- WAP penetration is greater in Europe and Far East than US and elsewhere -- but gaining ground rapidly
- Some questions:
  - How many content providers will generate WAP/WML content? How well will automatic HTML/WML translators work?
  - Will existing Internet technology mature fast enough to reduce impact of WAP?
  - Will sophisticated e-commerce services for mobile users (e.g. stock purchase, transactions etc.) really become a significant market?

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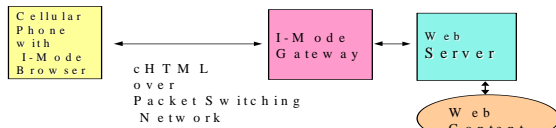
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## I-Mode

- Very popular in Japan (19 Million users)
- Competitor to WAP
- Very heavy graphics oriented
- WAP and I-mode may combine



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## Sun's Java Environments (wireless.java.sun.com)

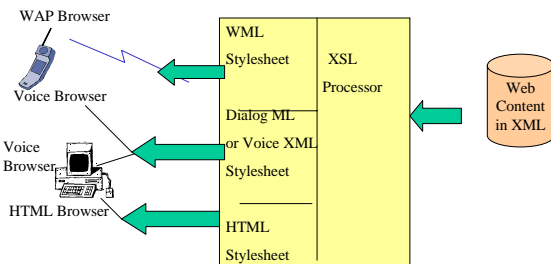
Wireless Java			
	J2SE, J2EE	J2ME	Other Java Technologies for Mobile Devices
Applications & Profiles	Applets, Servlets	Games, MIDP, MIDlets, others	Java Card Applets
Runtime Environments	Java Virtual Machine (JVM)	Compact and Kilo Virtual Machine (CVM/KVM)	JavaCard Virtual Machine, Others
Devices	PCs, Servers, Workstations	Consumer Electronics, Handhelds	Smart cards, Handhelds, other Mobile devices

### QualComm's Binary Runtime Environment for Wireless (BREW)

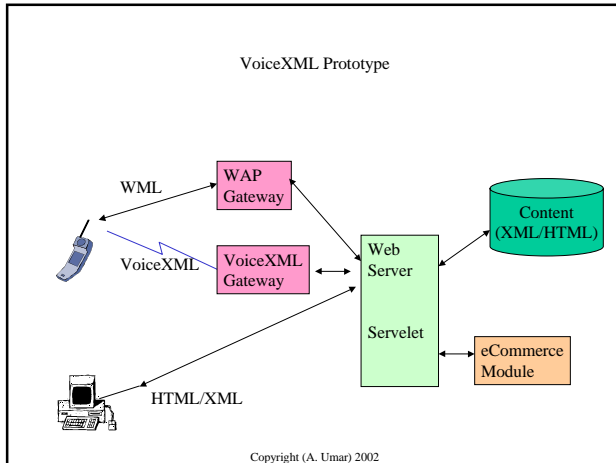
- simplifies application development on handsets from QualComm
- end users can download new applications as binary code
- can populate new cell phones quickly
- site ([www.qualcomm.com/brew](http://www.qualcomm.com/brew))

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## Voice Browsers



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### Voice XML for V-Commerce

- Voice XML Forum ([www.voicexml.org](http://www.voicexml.org))
- Extension of XML in cooperation with W3C
- Participation through IBM, AT&T, Lucent
- Goals
  - Enable internet access via voice and phone (e.g Voice activated web browsing).
  - Make setup of voice services, development of **interactive** speech-enabled applications easier and cheaper.

Example

```

<?xml version="1.0">
<vxml version="1.0">
  <form>
    <field name="drink">
      <prompt> would you like coffee, milk, or tea?</prompt>
      <grammar src="drink.gram" type="application/x-jsgf"/>
    </field>
    <block>
      <submit next = "http://www.drink.example/drink2.asp"/>
    </block>
  </form>

```

C: Please Choose Drink  
 U: Juice  
 C: Sorry, try Again  
 U: Tea

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### Mobile Computing Summary

- Mobile ecommerce is a potential area of growth
- Mobile computing middleware has to handle special cases:
  - Slow line speeds (19.2 Kbps)
  - Congestions are usual
  - More error prone
- Typically need special API
- Work on common middleware progressing
- Many vendor products emerging (e.g., Oracle In motion)
- Standards work is also progressing (e.g., Wireless Corba)

Some sites

- Wap forum ([www.wapforum.org](http://www.wapforum.org))
- [www.mobileinfo.com](http://www.mobileinfo.com)
- [www.ericsson.com](http://www.ericsson.com)
- [www.nokia.com](http://www.nokia.com)

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