

Invariant aspects in M-commerce environments

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MOTTO

- 3 billion people in the world have not made a phone call in their entire life



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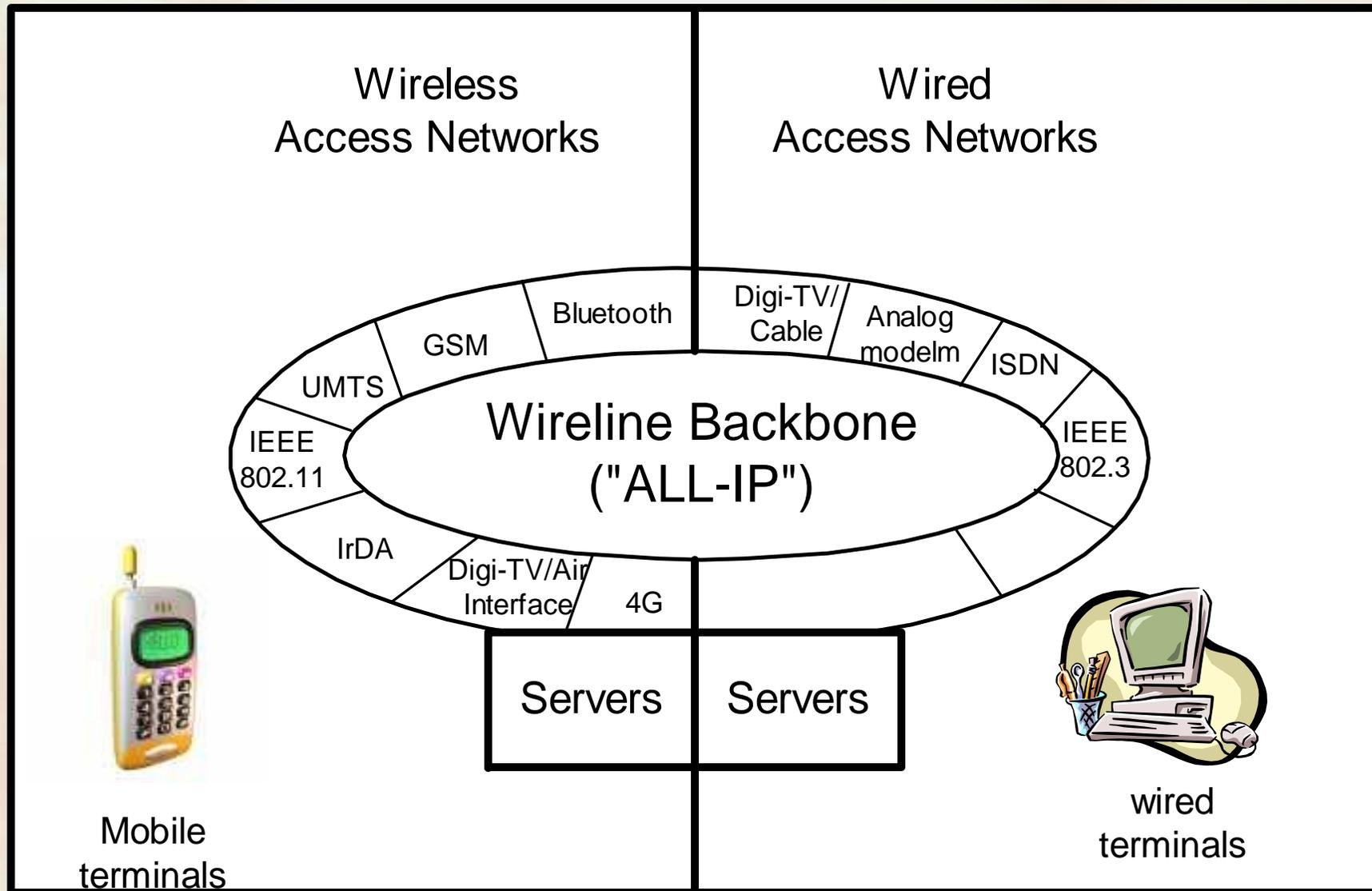


Acknowledgements

- The talk is partially based on the book chapter:
- Jari Veijalainen, Mathias Weske, Modeling Static Aspects of Mobile Electronic Commerce Environments. Chapter 7 in “Advances in Mobile Commerce Technologies”, Lim Ee Peng, Keng Siau (eds.). IDEA group publishing, 2003, pp.137-170.
- Jari Veijalainen and Mathias Weske: Surveying Mobile Commerce Environments. Mehdi Khosrow-Pour (ed.), Encyclopedia of Information Science and Technology, Volume I-III". ISBN: 1-59140-553-X; Idea Group Publishing, 2005.
- Several other papers of the author
- The M-business market analysis by Jeffrey Funk in Japan and some global sources

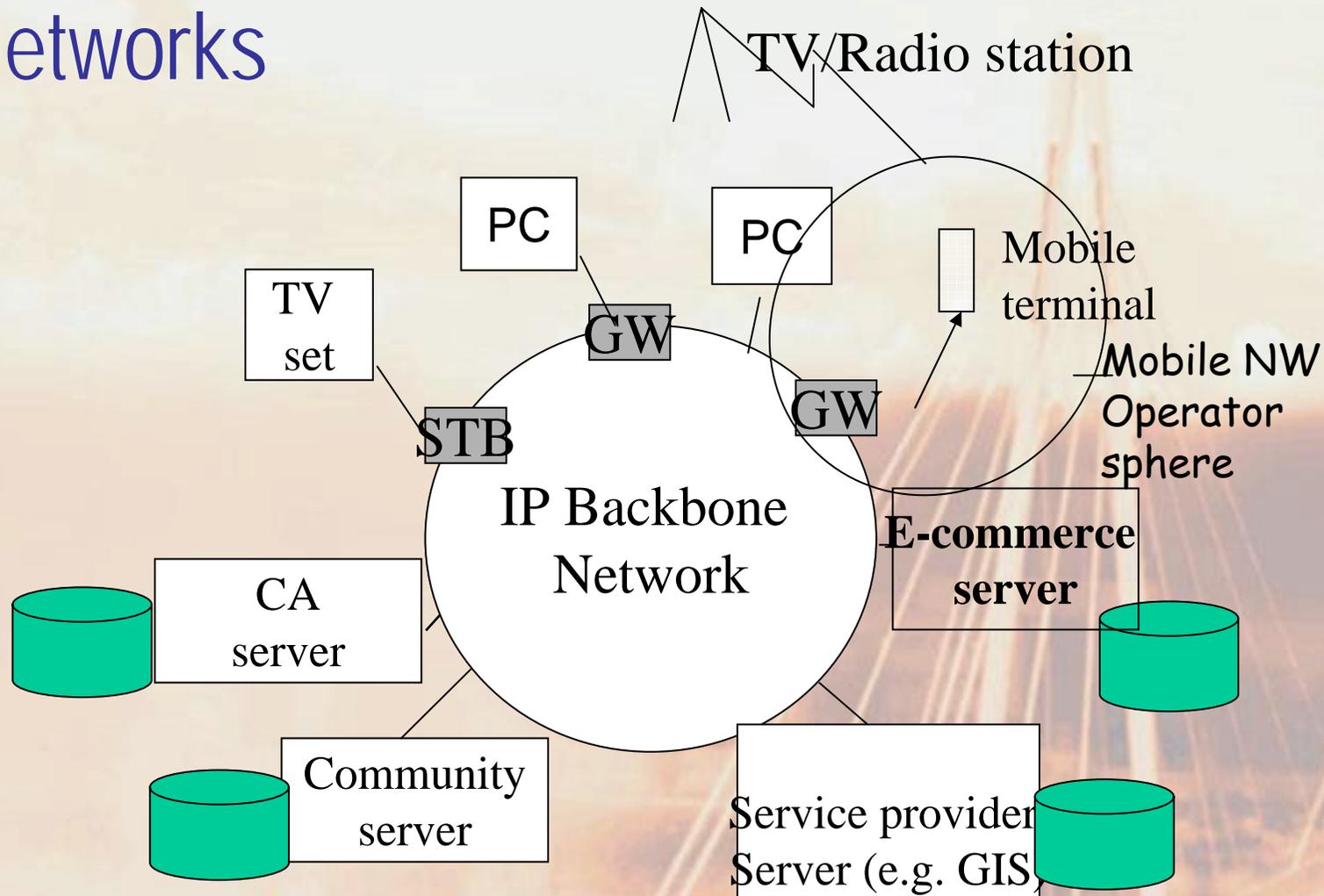


End of history: Current access networks

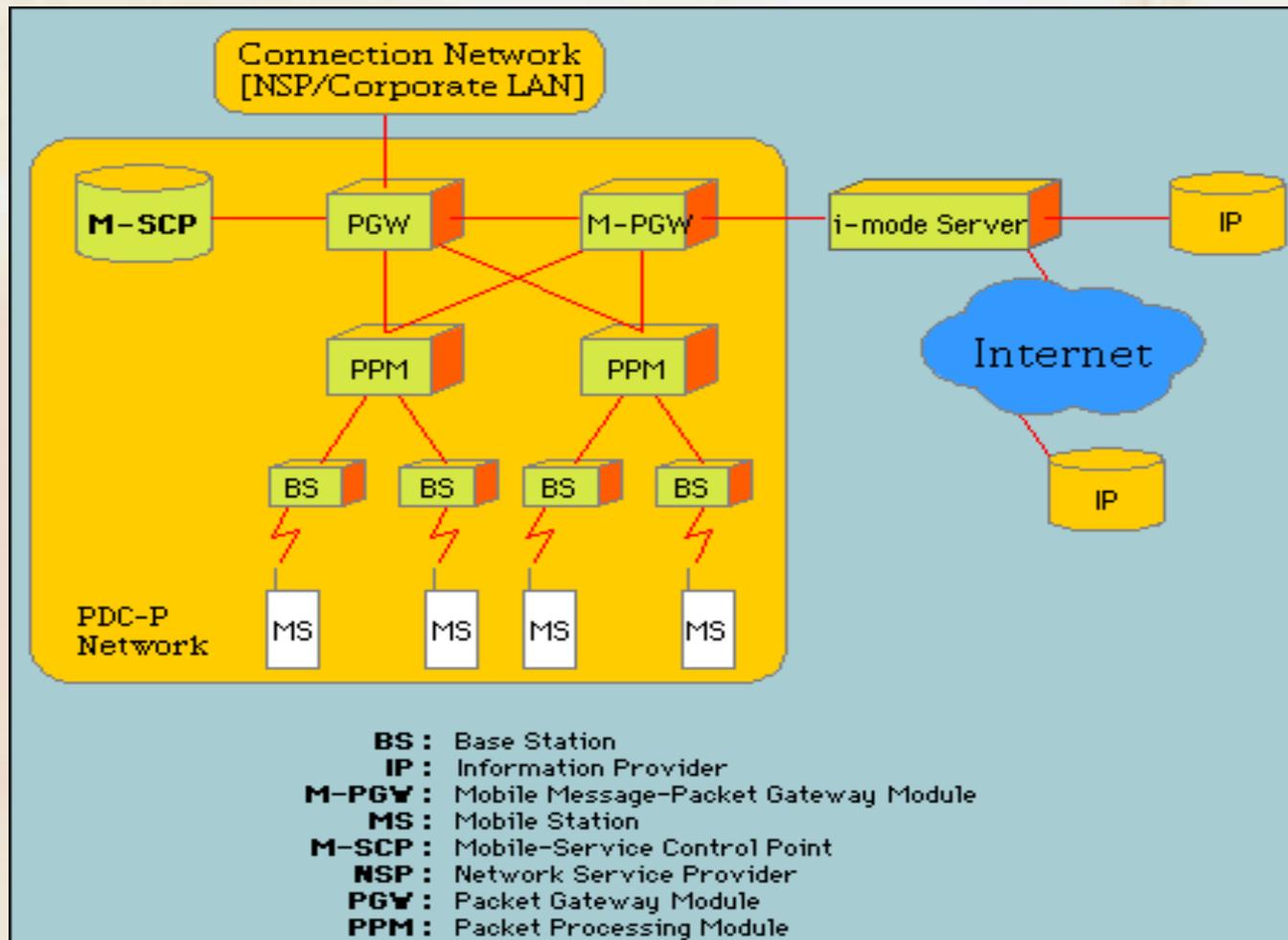


The current state of convergence of Internet and digital telecom, radio and TV networks

-



i-Mode horizontal architecture



Terminal market

- Terminal properties are crucial for the M-commerce
- in 2005 740 million terminals will be sold (estimate)
- Gartner group estimates that in 2010 there will be 3.1 billion users (I.e. 260 mio new users/year)
- Renewal interval Europe: 1.8 years, Hong Kong 1.2 y USA ca. 2 years
- If a terminal is renewed every 1-3 year, this means that in 2010 and onwards 1-3 billion terminals are sold each year
- Assuming 100 €/terminal, this makes 100-300 bn €/year for mere terminal market size



Some other figures

- ca. 1 billion Internet users (partially mobile internet users?) globally
- 1.7-2? bn mobile phone subscribers
- forecast for mobile subscribers: 3.1 bn around 2010
- over hundred of millions servers
- digital terrestrial TV introduced in many countries in Europe, Japan and USA
- many digital satellite channels



Historical remarks: Computer-mediated business; B2B transactions

- B2B applications especially in banking
 - Before computers and telephone/telegraph: paper documents as information carriers
 - The first teletype writer was introduced in 1914. Teletype writer became very popular because anything written and transmitted by a teletype writer is still legally valid.
See **The Worldwide History of Telecommunications** Wiley& Son, 2003
 - Telex era ended around 1990 and was superseded by teletex and telefax (standardized in 1968)
- computerization of banking business operations=> get rid of 10000 paper telex/day by sending the information from computer to computer and save manual work



Historical remarks: Computer-mediated business; B2B transactions

- Society for Worldwide Interbank Financial Telecommunication was established in 1973 to “automate the telex” by 239 banks from 15 countries
 - The first SWIFT network went into operation in 1977
 - The first global electronic data interchange (EDI) system
 - www.swift.com (now 7000+ participants in 200 countries)
 - Current message volume ca. 2 billion messages/year



Historical view: Computer-mediated business: B2B&EDIFACT

- A general EDIFACT standard 1986:
 - designed for big companies in any sector and for large transaction volumes, because specifications tedious to define and program in computers
- Around 1990 EDI systems were implemented on PCs
 - SMEs could reasonably purchase such a system and use it when doing business with large companies



Historical view: Computer-mediated business; B2C commerce over Internet

- mid 1990's came (PC) “Internet“, I.e. http and browsers into PC:s and as well as HTML as a markup language; www servers were installed in thousands
 - they run TCP/IP, i.e. were “Internet enabled”
- consumer market potential was huge and the B2C electronic commerce became possible



Historical overview: Computer-mediated business; B2C over Internet

- there was a lot of digital contents, among others music on CDs, that could be delivered through the network or sent to the customers on physical CDs; no wonder that these were among the first products to be sold over Internet by Amazon and others



Historical overview: Computer-mediated business; B2C commerce over Internet

- The internet channel could be used to **place designs and orders** for digital contents, and for tangible goods, like books –for cars or sauna interiors and **pay** for the goods by internet banking or credit card transactions – or paper bills
- information needed in these e-commerce transactions can be kept in computers and transactions performed *any time* without human intervention at the e-commerce site



Historical remarks; email

- email was introduced during 1980's to replace paper letters
- over time Internet email (SMTP, POP, IMAP) has gained ground although X.400 series of recommendations were developed and pushed in 1980's by CCITT



Historical remarks; E-commerce viewed as human to computer interactions

- The majority of e-commerce transactions are **human to computer** interactions; in contrast to EDI and many other B2B transactions that are M2M;
- The browser only needs to “understand” how to show the contents to the user, but not how to react to its meaning
- Thus, there is no need to standardize strictly the user interface contents or algorithms; natural language can be encoded into HTML (or other similar) format and the user can act appropriately;
- HTML contents can be designed irrespective of the other contents at other servers; the user will adapt to various page design



Historical remarks: B2C e-Commerce and the language communities

- The problem with natural language is that the target audience for e-Commerce services is the specific language group, in Europe from 2-3 million to 100 mio, USA 300-400 mill, Japan 126 mio, China over 1 bn, India over 1 bn (English)
- Large language communities, especially English-speaking, tend to dominate e-commerce, because people in many countries master enough English to use English e-commerce sites and thus these get larger customer base for free



2 Core concepts; formal definition of E-commerce

- **BROAD definition of E-commerce (OECD)**
- An **electronic transaction** is the sale or purchase of goods or services, whether between businesses, households, individuals, governments, and other public or private organisations, conducted over **computer-mediated networks**. The goods and services are ordered over those networks, but the payment and the ultimate delivery of the good or service may be conducted on or off -line.
- **Include:** orders received or placed on any online application used in automated transactions such as Internet applications, EDI, Minitel or interactive telephone systems.



Core concepts: convergence of Internet and mobile telecom networks

- around 1996 Nokia, Ericsson and some other companies came together and decided to develop technology to overcome the barriers between Internet and mobile telecom networks (Public Land Mobile Networks, PLMN)
- Wireless Application Protocol (WAP) Forum was established 1997 and the term **Mobile Internet** coined
- very soon the idea of **Mobile e-Commerce** was also in the air as an application of the emerging mobile internet, meaning roughly *e-commerce performed with mobile terminals using wireless (data) services*



M-commerce vs. m-business vs other mobile applications

Mobile Computing/Applications

Mobile Business

Mobile Commerce



Core concepts: M-commerce; special instance of E-commerce

- An M-commerce transaction is an E-commerce electronic transaction that is conducted using a *mobile terminal* and a *wireless access network*, such as Wireless Lan, 2G or 3G telecom network, Bluetooth connection, or an Infrared connection
- Notice, this definition excludes those E-commerce transactions from M-commerce sphere, where the terminal is not mobile, albeit wirelessly connected, and the case where a portable terminal is connected with a fixed line to the network; laptops and even fixed terminals in cars, as well as all small portable telecom terminals and PANs are included; voice-mediated commerce is excluded



Core concepts: Differences between M- and E-commerce

- A permanent factor that makes difference between M- and the rest of the E- commerce is the possibility of the user to engage **anywhere and anytime in** M-commerce transactions; for some this is the crucial difference
- The main functional distinction between the E-commerce in general and M-commerce are **dynamic Location Based Services (LBS)** that use the actual location of the terminal on earth in one way or the other to perform the transaction (cf. ordering taxi in a foreign city based on the positioning of the terminal and the taxi)



Core concepts: Differences between M- and E-commerce

- Further difference are the properties of the truly portable terminals: the simple UI facilities, slower processor, and smaller memory resources, as well as tiny energy reserves, as compared to PC:s or laptops
- A fourth main difference is the relatively small wireless link transmission capacity offered to the terminals; although the capacity is increasing with every network generation (10 kbps, 100 kbps, 1 Mbps..), so is the capacity of the fixed networks; thus the gap will exist also in the future;
- The gap becomes larger over time (top capacity –top capacity)



3 Invariant modeling: What could be invariant in M-commerce?

- The definition of M-commerce suggest already that a *terminal* and *computer-mediated network* are such; the transaction concept itself is a permanent entity as long as business exists; it refers to *business (model)*;
- the definition does not explicitly address the impact of regulative bodies, like OECD, EU, diverse governments or industry consortia, but their activity must be included in order to understand the phenomena
- further, technology development as such is persistent phenomenon that reshapes over and over again the concrete form in which the above ingredients take shape



3.1 Spheres of Concern

The above considerations lead to four relatively independently evolving *spheres*; this division itself is considered persistent

Regulatory Frameworks	Business Models
	Global Infrastructure
	Enabling Technologies

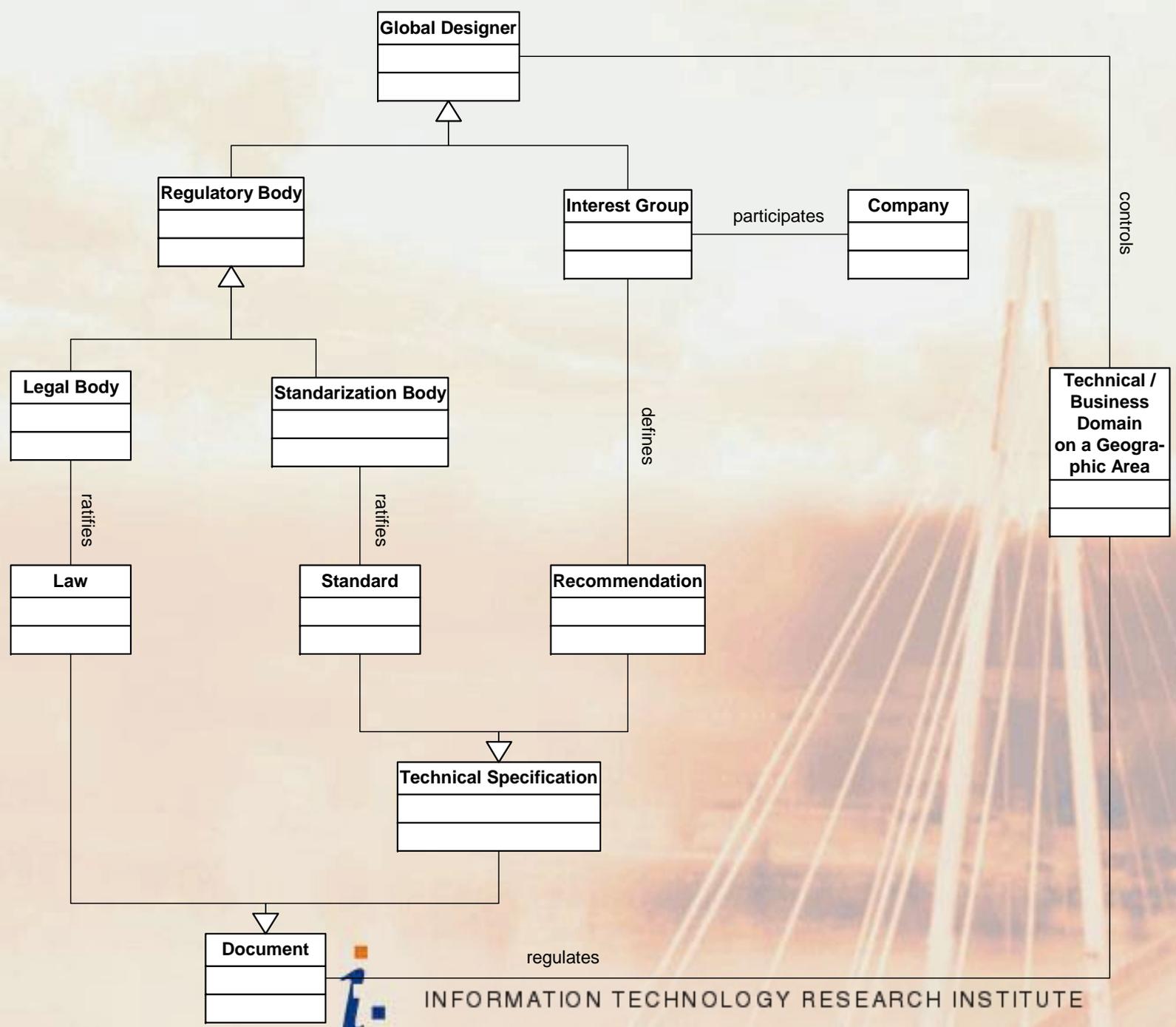


3.2 Spheres of Concern

- Regulatory Frameworks
 - The organizational and technical aspects of laws, standards and recommendation and the bodies involved in mobile commerce.
- Enabling Technologies
 - User terminal and network technologies, cryptography, including organizations developing these technologies that make E-commerce viable now and in the future
- Business Models
 - Business aspects, including business players, services, business protocols, revenue sharing, and code of conduct (Timmer's definition of BM)
- Global Infrastructure
 - The global network and concrete terminals that facilitate m-commerce at a certain point of time



Regulatory Frameworks Model



3.3 Regulatory Frameworks

- Organizational Entities (and Observations)
 - Legal bodies (ratify laws, or compile recommendations)
 - agencies of national and super-national (e.g. EU,OECD) governments
 - Standardization bodies (ratify standards)
 - Official std org (ISO, ANSI, DIN, etc) but also
 - ITU, ETSI, IEEE
 - Interest groups (define recommendations); tens of them, e.g.
 - UMTS Forum, Open Mobile Alliance
 - Location Interoperability Forum, LIF
 - Open Mobile Alliance
 - Companies (participate in Interest Groups)
 - Operators, device manufacturers, IT-companies, content providers, banks, other industries

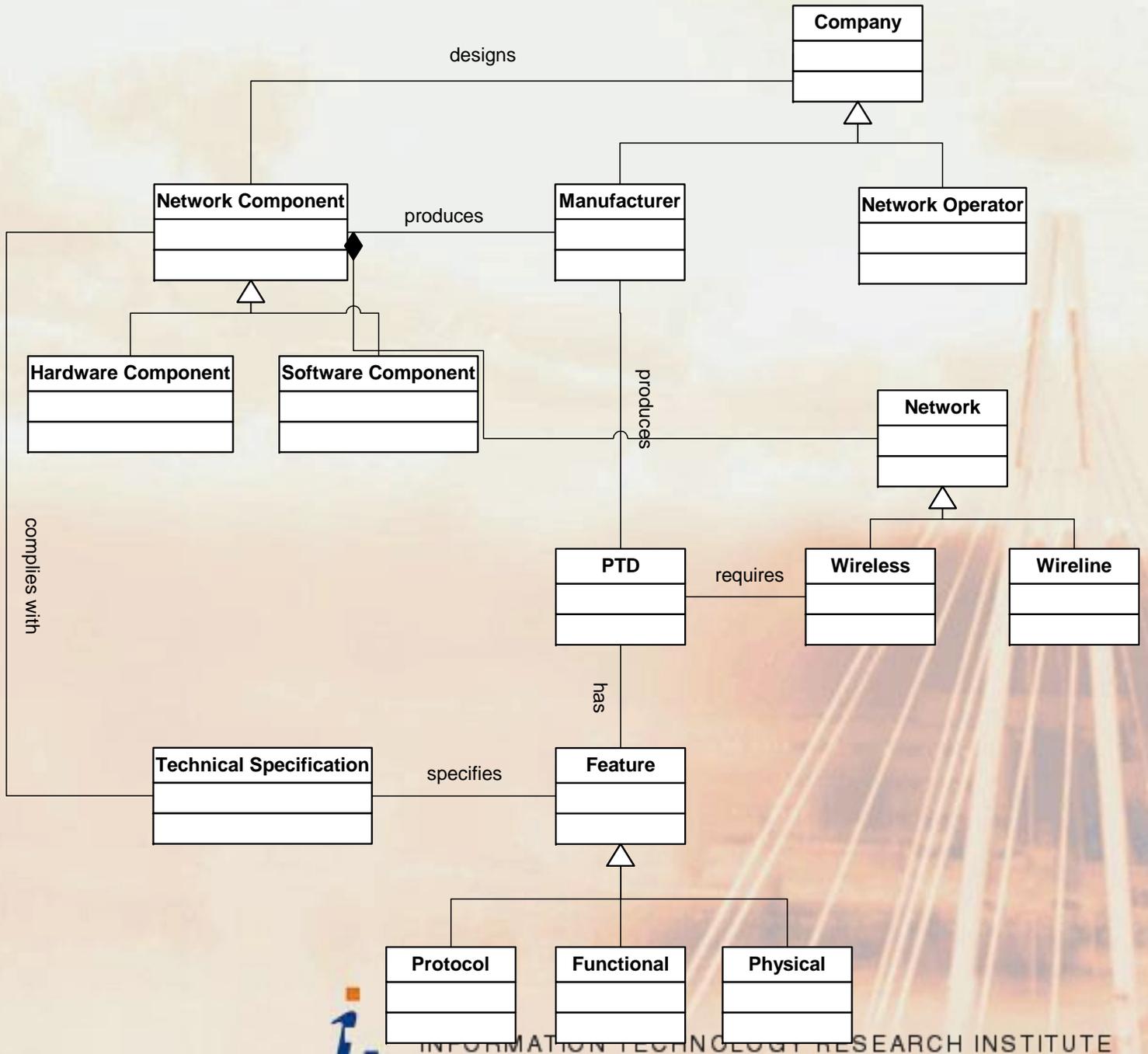


Spheres of Legal Regulation

- Radio Frequencies (World Radio Conference)
- Telecommunication business (Licensing, liabilities)
- TV and Radio broadcasting
- E-commerce (in EU there is a Directive about this)
- Protection of citizens (e.g. privacy)



Enabling Technologies Model



3.4 Enabling Technologies

- Personal Trusted Device, PTD, is a central component here
 - produced by a manufacturer
 - requires wireless network that
 - is operated by a network operator
 - is composed of a set of (hardware and software) network components
 - has features, specified in technical specifications
 - Protocol stacks: GSM, GPRS, UMTS, WLAN, BT, DVB-H, DAB,...
 - Functional: positioning, etc
 - Physical: display features, battery life, etc
 - While designed and manufactured, the terminal does not need to be supported by any network in GI



Enabling technologies (close to market)

<http://www.nokia.com/nokia/0,,62583,00.html>

- Bluetooth
- Data Synchronization
- EDGE
- GPRS
- HTML
- Instant Messaging
- Java™
- MMS
- Mobile Browsing
- Mobile Email
- Digital Rights Management



Enabling technologies (Nokia's site, close to market)

- Mobile Imaging
- Mobile Music
- Mobile Video
- Presence
- Push to Talk
- Series 60 Platform
- Service Activation
- Video Sharing
- WAP
- WCDMA
- WLAN
- XHTML

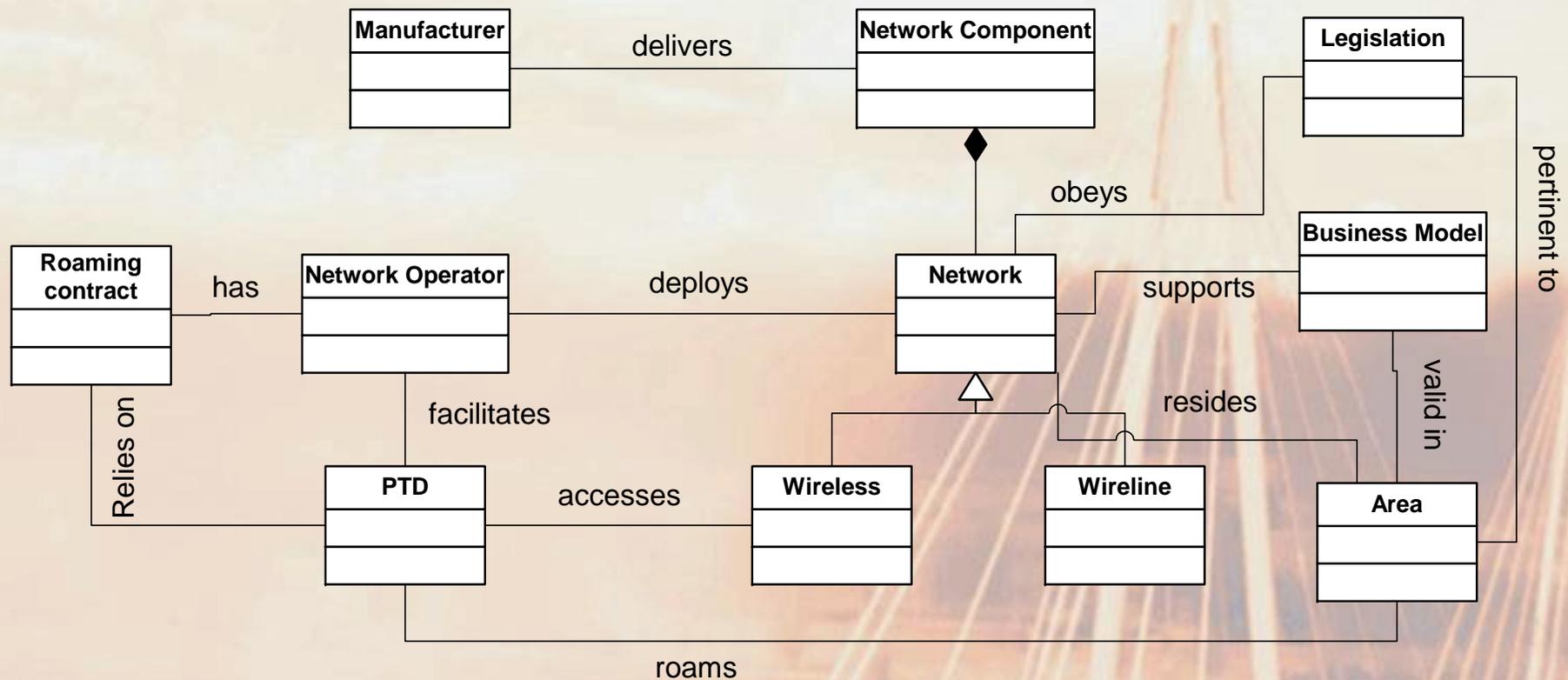


Enabling technologies

- all that needs to be developed in order to offer the next generation of systems (4G or B3G)
 - sensor network technologies
 - faster wireless transmission systems
 - security infrastructure for the future global infrastructure
 - etc.
- The interesting question is here, who control the development funding and formulate the agenda



Global Infrastructure Model



3.5 Global Infrastructure

- A set of Networks
 - deployed by network operator
 - that has roaming contract that a PTD relies on
 - is either wireless or wireline
 - resides in a geographical area
 - obeys legislation
 - that is pertinent to geographical area
 - supports business model
- Terminal (PTD)
 - Is compatible with certain access technologies and runs certain OS, applications, and is able to provide certain services to the customer

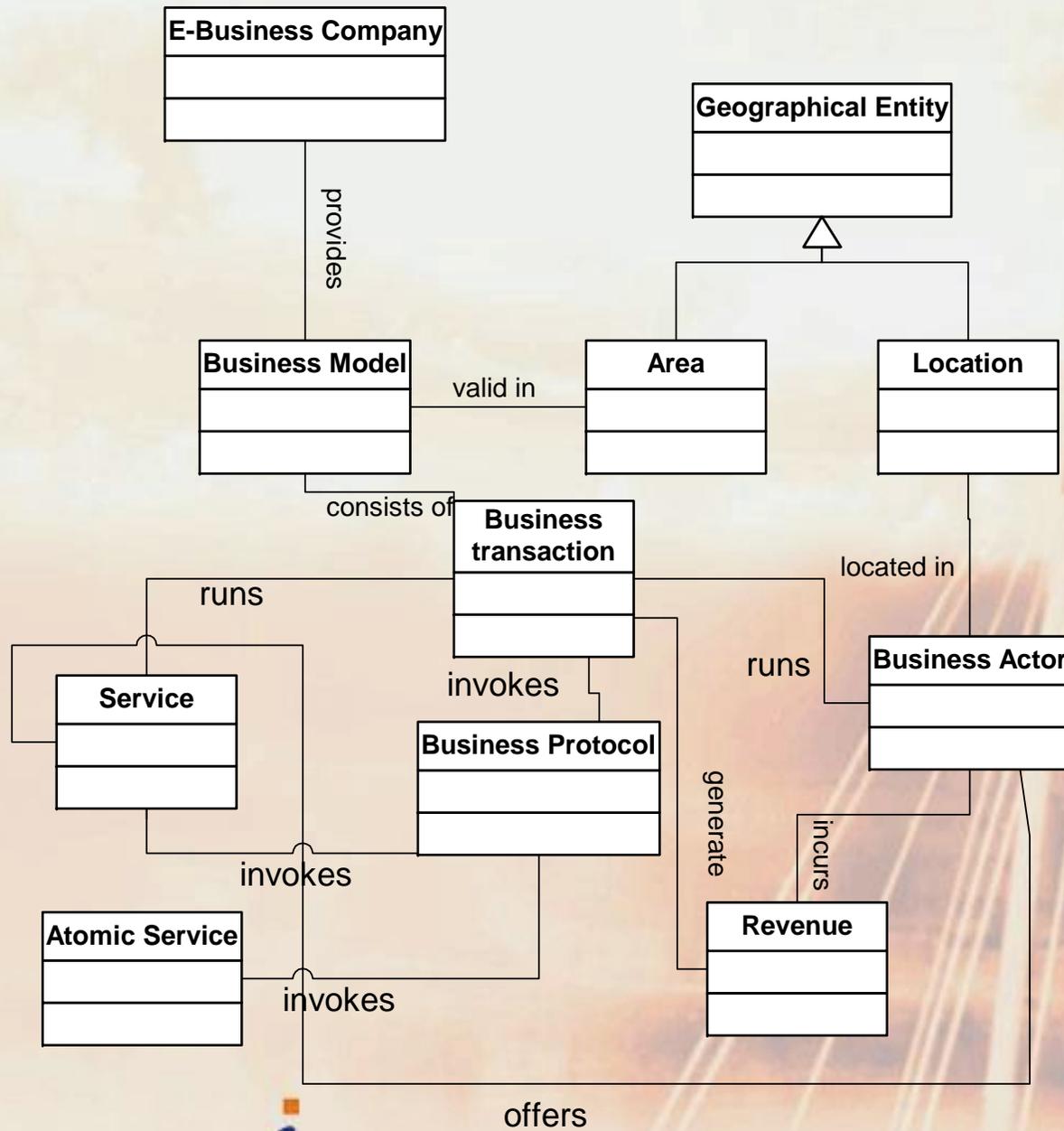


3.6 Global infrastructure: number of networks and their types

- Public Land Mobile Networks
 - GSM: over 700 networks in over 180 countries
 - 3G W-CDMA, CDMA-2000 in tens of countries
 - Chinese own 3G standard
- Satellite networks
- Wireless Radio/TV networks: convergence at terminals, at M-commerce infrastructure



Business Model²



3.7 Business Models

- Business Model
 - is provided by E-Business company
 - is valid in a geographical area
 - that is a geographical entity
 - consists of business transactions
 - that are invoked within a business protocol
 - that invokes services
 - » that are either atomic or composite
 - that are run by business actors
 - that are located in a geographical location
 - that incurs revenues by business transactions



4 Internet user numbers by eTForecasts

- The number of Internet users will top 1.07 billion in mid 2005
- There is little Internet user growth in the developed countries, but in the next five years many Internet users will be supplementing PC Internet usage with Smartphone and mobile device Internet usage.
- The growth of Internet users will continue in the developing countries for another decade.
- The US continues to lead with over 185 million Internet users predicted for year-end 2004. Internet usage is growing strongly in China, which surpassed Japan for second place in 2003.



Internet user numbers by eTForecasts

- Much of future Internet users growth will come from populous countries such as China, India, Brazil, Russia and Indonesia. These countries will also see strong growth of wireless web usage and for many new Internet users the cell phone will be their only Internet access device



Internet users (23rd March 2005) by Internet World Stat

1. US: 200,933,147
2. China: 94,000,000
3. Japan: 67,677,947
4. Germany: 46,312,662
5. India: 39,200,000
6. United Kingdom: 35,179,141
7. Korea (South): 31,600,000
8. Italy: 28,610,000
9. France: 24,848,009
10. Russia: 22,300,000
11. Canada: 20,450,000



Internet penetration level (20th April 2005) by Internet World Stat

1. Sweden: 73.6%
2. Hong Kong: 69.9%
3. Denmark: 68.7%
4. Norway: 68.3%
5. US: 67.8%
6. Australia: 66.4%
7. Netherlands: 66.2%
8. Iceland: 66.1 %
9. Canada: 63.8%
10. South Korea: 63.3%
11. Switzerland: 62.9%
12. Finland: 62.1%
13. Singapore: 60.2%
14. United Kingdom: 58.7%
15. Leichtenstein: 57.3%
16. New Zealand: 56.8%
17. Austria: 56.7%
18. Germany: 56.0%
19. Bermuda: 54.0%
20. Taiwan: 53.5%
21. Japan: 52.8%
22. Croatia: 52.0%
23. Ireland: 51.2%
24. Faroe Islands: 50.7%



Market overview current situation in Japan

- currently in entire Japan 100000+ content providers, 10000+ services and applications,
- 3 MNOs (NTT DoCoMo, Vodaphone, KDDI)
- Population 126 millions
- Homogeneous language and regulatory area



Market overview: i-Mode system as first incarnation of Mobile Internet

- In February 1999 NTT DoCoMo opened its i-Mode service for commercial use
- M-business was the central issue, geared towards consumers
- terminals run http and tcp-w/ip and have a mini-browser
- c-HTML (compact HTML), a subset of HTML, that is not compatible with WML proposed by WAPforum in 1998
- Text, pictures, later Java programs (games), video clips can be purchased and transferred to the terminals;
- (Internet) email was used instead of SMS (160 characters/message)



Market overview: i-Mode

- Billing for services offered for DoCoMo customers and official sites; thus the micro-payment problem was solved
- wireless packet data network as a transmission system
- access to Internet sites, including various content providers possible from terminals



Internet-enabled mobile phones (% of mobile phone users, 09/03) by MITI Japan in July 2004:

- Japan: 28.5%
- South Korea: 24.7%
- France: 10.5%
- Singapore: 8.2%
- Sweden: 7.2%
- Germany: 6.1%
- UK: 5.0%
- Finland: 4.2%
- Norway: 3.9%
- Spain: 3.4%
- US: 3.2%
- Netherlands: 3.1%



Mobile Internet users in Japan (by MITI)

(Reference : Internet Provider Services of Mobile Telephone)

Services	Groups	Mar. 2005		Feb. 2005 Total
		Increase	Total	
i-mode	NTT DoCoMo Group	509,500	44,020,900	43,511,400
EZweb	au Group (16,469,300)	407,100	18,258,800	17,851,700
	TU-KA Group (1,789,500) (Total as of Mar. 31)			
Vodafone Live	Vodafone Group	-26,500	12,874,100	12,907,300
TOTAL		890,100	75,153,800	74,270,400



Mobile subscribers in Japan by telecom standard (MITI)

System	Groups	Mar. 2005		Feb. 2005 Total
		Increase	Total	
PDC	NTT DoCoMo Group	-778,100	37,324,300	38,102,400
	TU-KA Group	-2,500	3,589,600	3,592,200
	Vodafone Group	-249,300	14,123,500	14,423,800
	PDC Subtotal	-1,029,900	55,037,400	56,118,400
cdmaOne	au Group	-105,600	1,607,500	1,713,100
W-CDMA	NTT DoCoMo Group	1,258,400	11,500,600	10,242,300
	Vodafone Group	241,900	917,200	675,300
CDMA2000 1x	au Group	541,600	17,934,900	17,393,300
Mobile Telephone Total		906,400	86,997,600	86,142,300

* NTT DoCoMo PDC subscribers include DoPa Single Service subscribers.



NTT DoCoMo's result FY 2004-2005 (estimates for 2006)

- overall revenues 4845 bn Y (4806, -0.8 %)
- voice ARPU 5330 Y (4990, -6.4 %)
- packet charges 1870 Y (1780, -4.8 %)
- overall ARPU 7200 Y (6770, -6 %)
- 2006 revenues 4806 bn Y (-0.8 %)
- wireless equipment value 4400 bn Y and 48 mio users
=>
92000 Y/user that is, 830 \$/user
- year 2006 50 million subs, 24 mio FOMA (3G) subs



The cost of terminal versus infrastructure

- a terminal costs roughly 100 \$; the value of the infrastructure is roughly 1000 \$/subscriber thus, the value of infrastructure to terminal base is 10:1 can this be reduced by other technology? organisational setting?
- notice that for any content-related service the above figure is too low, because service and content providers have to keep servers and communication equipment, too
- in the ultimate case there are no base stations, but the terminals are the only network component; for which applications is this realistic?



DoCoMo mobile business, FeliCa+i- Mode phones = Mobile wallet

3 mio handsets sold

- Transportation: airline E-ticket, train ticket (coming)
- Shopping, online shopping
- Tickets
- Memberships
- Key/ID
- Requires a special reader at service point, e-money can be loaded into the chip via i-Mode phone from bank
- [http://www.nttdocomo.com/presscenter/pressreleases/press/pressrelease.html?param\[no\]=549](http://www.nttdocomo.com/presscenter/pressreleases/press/pressrelease.html?param[no]=549)

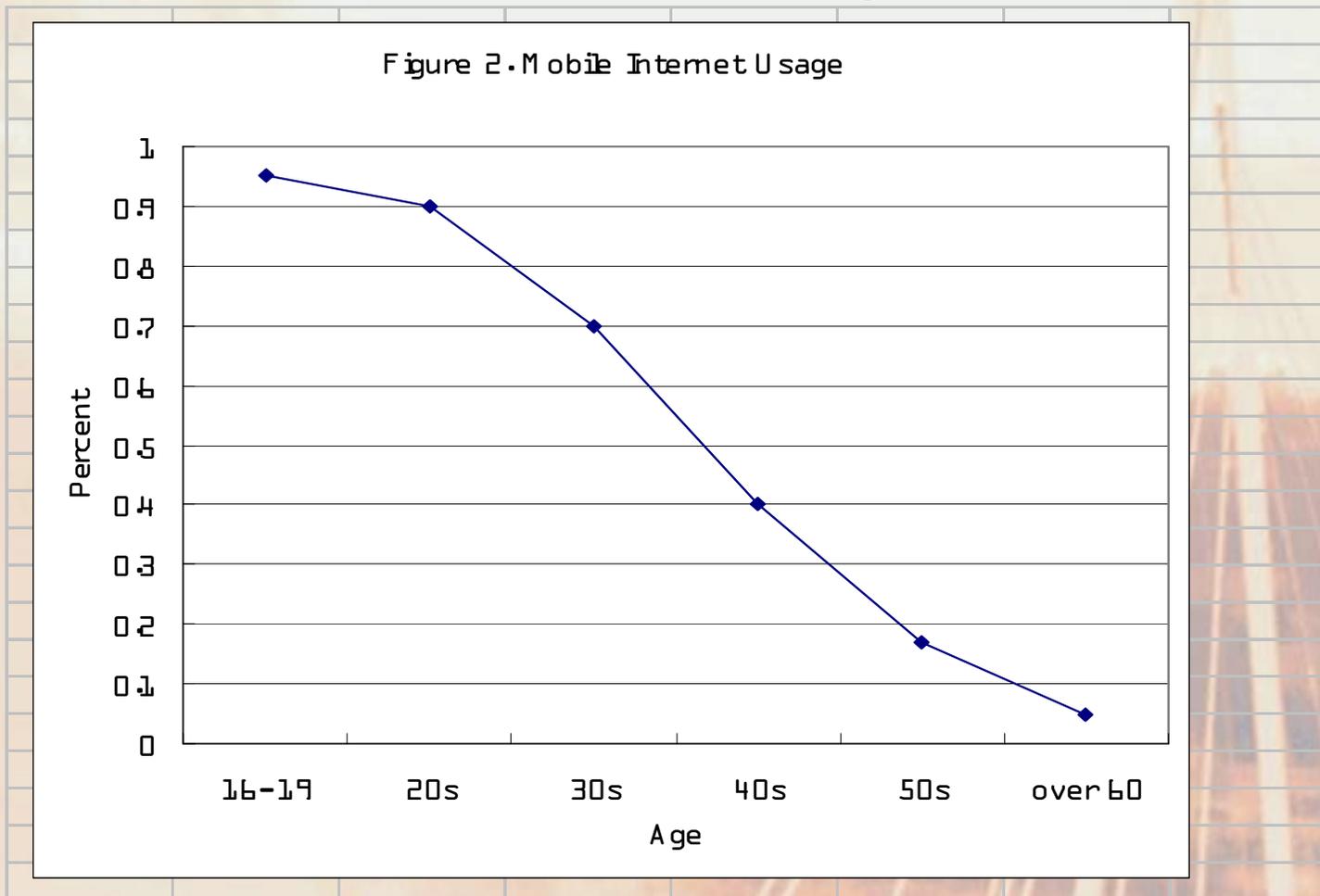


Japanese Mobile business (Jeffrey Funk: Mobile Disruption, 2004, and other papers)

- Different customers (e.g., younger) on mobile than on PC Internet
- Different Products/Selection Method from PC Internet
 - Not travel, computers, books; But: fashion, CDs, concert tickets,
 - Not from search engines. But from mail, followed by products at top of the page, in new release section, or product rankings



Mobile Internet usage by age group (Japan; Electronics Magazine & J.Funk)



Mobile market 2003 (Japan vs. Europe)

Category	Sub-Category	Japan		Europe	
		Total (millions)	Per Subscriber	Total (millions)	Per Subscriber
Messaging (Internet Mail or Peer-to Peer SMS) (includes packet charges)		US\$ 2,630	33.8	20,960	65.3
Contents	Entertainment content	1,740	22.4	2,000	6.23
	Other content	412	5.3		
	Total contents	2,152	27.7	2,000	6.23
Shopping	Sales of Products	2,001	25.7		
Transactions	Transaction Fees	474	6.09		
Gambling		2,370	30.5		
Sub-Total		7,000	90		
Other packet charges		17,355	223		
Total		24,355	313	22,960	71.5



Mobile shopping in Japan (by Jeff Funk)

- Early mobile shopping in Japan was driven by sales in music, videos, and fashion, where the latter includes clothing, jewelry, cosmetics, and health-related products
- Now also gambling (mainly horse-racing) is common



Japanese market (analysis by Jeff Funk)

- Business Model
 - Competing as much by convenience as price
 - Most official sites (of iMode) make money (>30) & many unofficial sites
- Fastest growing market is combination of phone with other media (magazines, television, and radio)



The mobile shopping market in Japan (2003) by Jeff Funk

Category	\$Millions
Books, CDs	255
Fashion	582
Food, Drinks	255
Travel	500
Other	409
Total	2,001

Source: Japanese Ministry of Economics and Industry, Company Documents, and Author's (Jeff Funk) Analysis, \$1=110Yen



Japanese market; Net Price (Fashion)

- Sales 7 M\$ in sales and 380 K\$ in profits a month from April to September 2003 (the same amount as Amazon.com in 1997 when it went public)
- Business Model
 - Offers unsold inventory at a discount to its 430,000 registered members
 - Level of discount (up to 30%) depends on number of buyers
 - Members have one week to convince friends to purchase products and obtain volume discounts
- Depends on:
 - Mobile mail culture (fast mail responses), Virtual communities of users
- Key role of other media: its best selling products are
 - Worn/used by actresses on TV programs; Appear in magazines



Japanese Market; Xavel's Girls Walker

- It has used mail magazine portal to become a leading seller of fashion-related products; Current sales of 4M\$ a month
- Mail magazine portal
 - Users write mail magazines
 - Xavel merely screens proposals and organizes the magazines
 - Used viral marketing to collect writers
 - 11.6 million PVs/day and 5 million unique users in mid-2003
- Strong interaction between fashion related mail magazines and mobile mail culture
 - Fashion mail magazines describe current fashion trends
 - Writers and readers constitute a virtual community
 - Magazines contain links to shopping pages
 - Role of celebrity endorsements: many consumers choose perfume based on perfume usage by popular actresses



Japanese Market: Magazines and Mobile Shopping

- Integrate Mobile Site with Magazines and Catalogues
 - Advantage of Mobile Over PC Internet
 - PC Internet requires big change in consumer behavior (must sit in front of the PC)
 - With phones, consumers can order products from couches, bathtubs, beds
- Magazines are Important Part of Consumer Information Searches
 - Consumers search for magazines in stores and for information in magazines
 - Bookstores and magazines are organized to support such searches
- >50 magazines Integrated with Mobile Internet Services
 - No need for sites to advertise services since the magazines do it for them
 - Internal cameras and bar code readers facilitate site access



Japanese Market; Radio Programs and Mobile Shopping

- Mobile Internet is main source of song and concert requests
 - Participative environment is important to radio stations all over the world
 - Japanese radio stations give points to members for requests and home page accesses
 - Purpose is to promote advertising on PC and mobile home pages for sponsors (many are music related)
- Music purchases may be big market
 - Now integrating on-air info about music with CD on-line site
 - Success of KDDI's Chaku Uta ringing tone service (as many downloads as i-Tunes) suggests integrated on-air downloading services will succeed
- Challenge for radio listener is finding site:
 - easy with internal radio but what about regular radio?

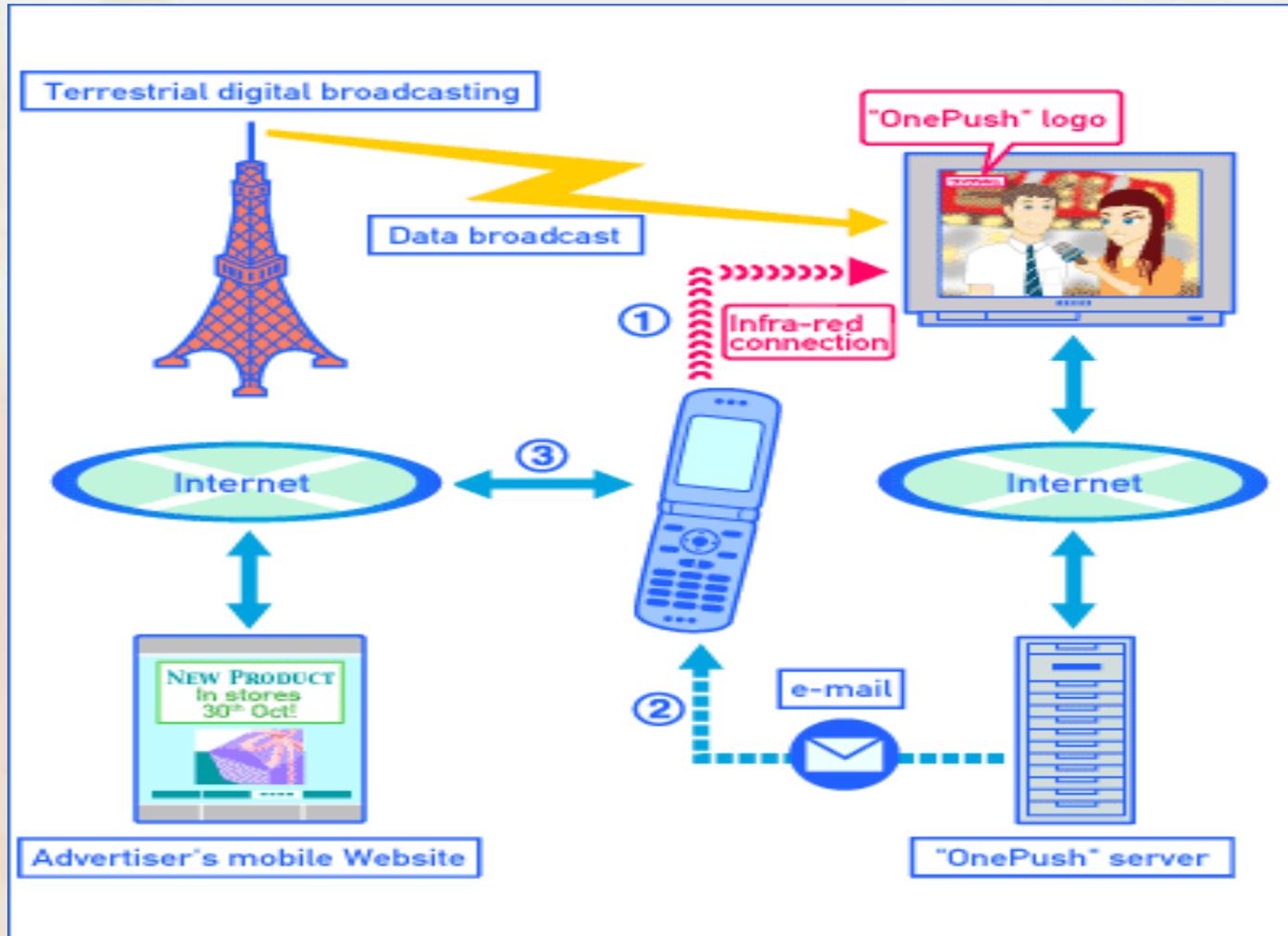


Japanese market: TV Stations and Mobile Shopping

- Initially TV stations opposed creation of virtual communities due to fear of losing commercial “viewing time.” Young people send mail during commercials, particularly following popular TV programs
- Now realize mobile mail is here to stay
 - Thus expanding content from ringing tones, screen savers, and games to voting, surveys, chat mail, and creation of virtual communities
 - Hope to sell products and information in programs
- Challenge for TV viewers is finding relevant site
 - Internal TV phone enables easy site access and greater program viewing
 - Infrared capable phones can be used as remote control devices
 - In combination with digital broadcasts to existing TVs, they can provide easy site access



One push logos (Cybird's home page)



Japanese market: Summary

- Mobile shopping market will likely pass entertainment contents in 2004 or 2005 in Japan
- The main customers are young people who
 - Would rather be outside than inside
 - When inside their homes, they would rather watch TV than look at a PC screen
 - Are heavy users of mobile mail
 - Quickly form virtual communities
 - Are heavily influenced by celebrity endorsements



Japanese market: Summary

- Technology and multi-channel integration
 - Internal cameras and bar code readers will facilitate integration of magazines and mobile sites
 - Facilitating the integration of mobile sites with radio and TV programming
- Internal radios and TVs
- Infrared for integration with existing TVs and their programs
 - Other technologies like Java, 3D rendering techniques
 - Similar trends will occur in the West as i-mode, Vodafone Live! and similar services diffuse in Europe and later the US, etc.



Mobile commerce volume estimates for 2009 (Jupiter Research Estimates)

- Mobile entertainment: \$48.0 billion
- Ticket purchases: \$39.0 billion
- POS: \$0.3 billion



Mobile Commerce volume estimates

- On average, **Western Europeans** will conduct around 28 transactions per year using their mobile phones by 2009, with each transaction valued at an average of approximately \$3.00. ([eMarketer](#), February 2005)
- Thus revenues are ca. 100 \$/customer in a year



Mobile phone market Q1/05

Mobile Phone Shipments Worldwide, by Vendor, Q1 2005 (in units and as % market share)

	Shipments	Market share
1. Nokia	53,800,000	30.9%
2. Motorola	28,700,000	16.5%
3. Samsung	24,500,000	14.1%
4. LG Electronics	11,100,000	6.4%
5. Sony Ericsson	9,400,000	5.4%
Others	46,800,000	26.9%
Total	174,300,000	100%

Note: vendor shipments are branded shipments and exclude OEM sales for all vendors

Source: International Data Corporation (IDC), April 2005

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www.eMarketer.com



INFORMATION TECHNOLOGY RESEARCH INSTITUTE

Smart mobile device market Q1_05

Smart Mobile Device Shipments Worldwide, by Vendor, Q1 2004 & Q1 2005 (in units, % market share and % growth)

	Q1 2004 shipments	% share	Q1 2005 shipments	% share	% growth
Nokia	1,670,160	28.2%	5,394,900	50.0%	223%
palmOne	995,960	16.8%	1,009,040	9.4%	1%
RIM	379,990	6.4%	758,300	7.0%	100%
Fujitsu	361,400	6.1%	654,320	6.1%	81%
HP	577,650	9.7%	607,010	5.6%	5%
Others	1,944,850	32.8%	2,358,810	21.9%	21%
Total	5,930,010	100.0%	10,782,380	100.0%	82%

Source: Canalys, April 2005

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www.eMarketer.com



INFORMATION TECHNOLOGY RESEARCH INSTITUTE

Mobile marketing volume estimates (US)

Mobile Advertising and Marketing Spending in the US, 2005-2009 (in millions)

	2005	2006	2007	2008	2009	CAGR
Conservative scenario	\$115.0	\$140.7	\$170.0	\$207.7	\$254.8	22.0%
Moderate scenario	\$172.5	\$218.7	\$269.9	\$341.4	\$434.3	26.0%
Aggressive scenario	\$253.0	\$333.0	\$428.4	\$568.5	\$760.4	31.7%

Note: Mobile advertising and marketing spending projections are derived from eMarketer online advertising spending data

Source: eMarketer, January 2005

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www.eMarketer.com



INFORMATION TECHNOLOGY RESEARCH INSTITUTE

Camera phones worldwide in 04/04 (eMarketer 01/05)

- Japan: 64% (of the mobile terminal base)
- Germany: 34%
- South Korea: 32%
- UK: 25%
- Spain: 19%
- China: 18%
- Australia: 16%
- Italy: 15%
- Sweden: 14%
- Mexico: 10%
- France: 9%
- US: 7%



Multimedia phones; example N91



Multimedia phones; example N91

- 2G/3G phone
- Camera with 2-megapixel resolution
 - Comparable with the cheap stand-alone cameras
- MP3 player, and other players
- 4 GB disk drive
 - Cf. some standalone digital music players (e.g iPod mini).



Multimedia phones; example N91

- snapping print-quality images,
- reading e-mail,
- browsing favorite Web sites,
- watching mobile TV,
- and much more.



Multimedia phones; example N91

Physical Measures

160 g, 113 x 55 x 22 mm

Operating System:

SymbianOS 9.1

Video Support: 3GPP formats
(H.263), MPEG-4, RealVideo

Sound Formats: MIDI tones
(poly 64), AMR (NB-AMR)
True Tones (WB-AMR),
WAV, MP3, AAC, AAC+
eAAC+, RealAudio

Operating Frequency:

WCDMA 2100 MHz

GSM 900/ 1800/1900 MHz

- **Java Technology:** CLDC 1.1
MIDP 2.0
Nokia UI API
Wireless Messaging API
(JSR-120)
Mobile Media API (JSR-135)
Bluetooth API (JSR-82)
FileConnection and PIM API
(JSR-75)
Mobile 3D Graphics API
(JSR-184)
Java Technology Wireless
Industry rel. 1 (JSR-185)
Location API (JSR-179)



Multimedia phones; example N91

- Wireless Messaging API (JSR-205)
- SIP API (JSR-180)
- Web Services API (JSR-172)
- Security and Trust Services API (JSR-177)
- Scalable 2D Vector Graphics API (JSR-226)
- Advanced Multimedia Supplements (JSR-234)
- **Browser:** WAP 2.0 , XHTML/HTML over TCP/IP
- **Messaging:** SMS, MMS+SMIL
- **DRM:** OMA DRM v2.0
Delivery Method:
HTTP download
MMS



Multimedia phones; example N91

Screen Display:Color Depth:

262144 Colors (18 bit)

Resolution: 176 x 208

Memory:Heap size:Memory

allocated dynamically, Shared

Memory for Storage: 10 MB

Max JAR Size: Memory

allocated dynamically

4GB HDD, USB Mass Storage

Local Connectivity:Bluetooth,
USB, WLAN

Network Data Support:

CSD,HSCSD,GPRS,

EGPRS ,WCDMA

Extra Features:

2.0 megapixel camera with
digital zoom

Music player

Stereo FM Radio

RealOne Player

SMTP/POP3/IMAP4 email

PoC

Instant Messaging

Presence

SyncML

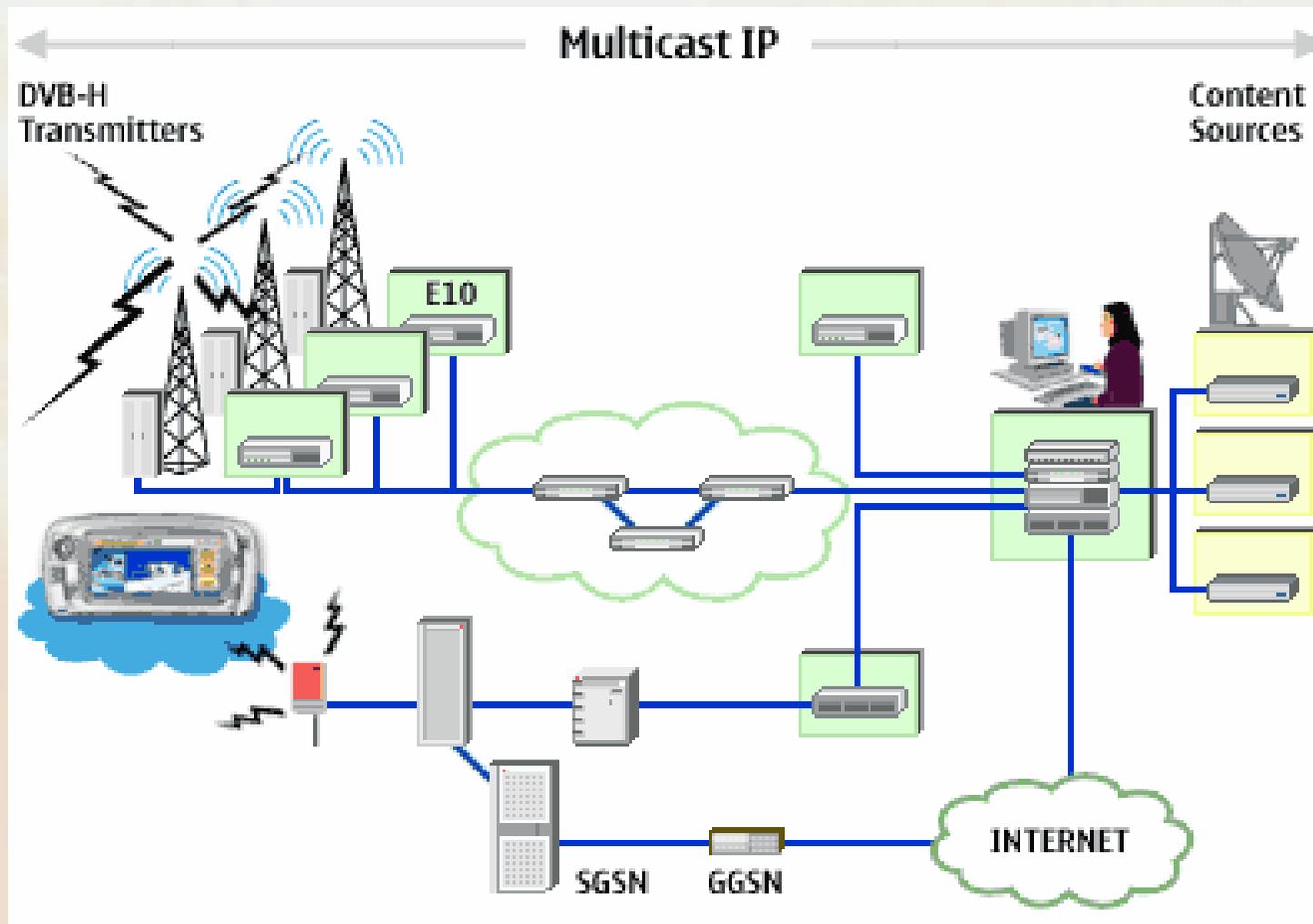
Themes



TV phones; N71



INFORMATION TECHNOLOGY RESEARCH INSTITUTE



5. Open Mobile Alliance as a global catalyst of M-commerce

- Established in June 2002 by over 200 players; Goals
 1. Deliver high quality, open technical specifications based upon market requirements that drive modularity, extensibility, and consistency amongst enablers to reduce industry implementation efforts.
 2. Ensure OMA service enabler specifications provide interoperability across different devices, geographies, service providers, operators, and networks; facilitate interoperability of the resulting product implementations.



OMA www.openmobilealliance.org

- 3 Be the catalyst for the consolidation of standards activity within the mobile data service industry; working in conjunction with other existing standards organizations and industry fora to improve interoperability and decrease operational costs for all involved.
- 4 Provide value and benefits to members in OMA from all parts of the value chain including content and service providers, information technology providers, mobile operators and wireless vendors such that they elect to actively participate in the organization.



OMA: protocol architecture

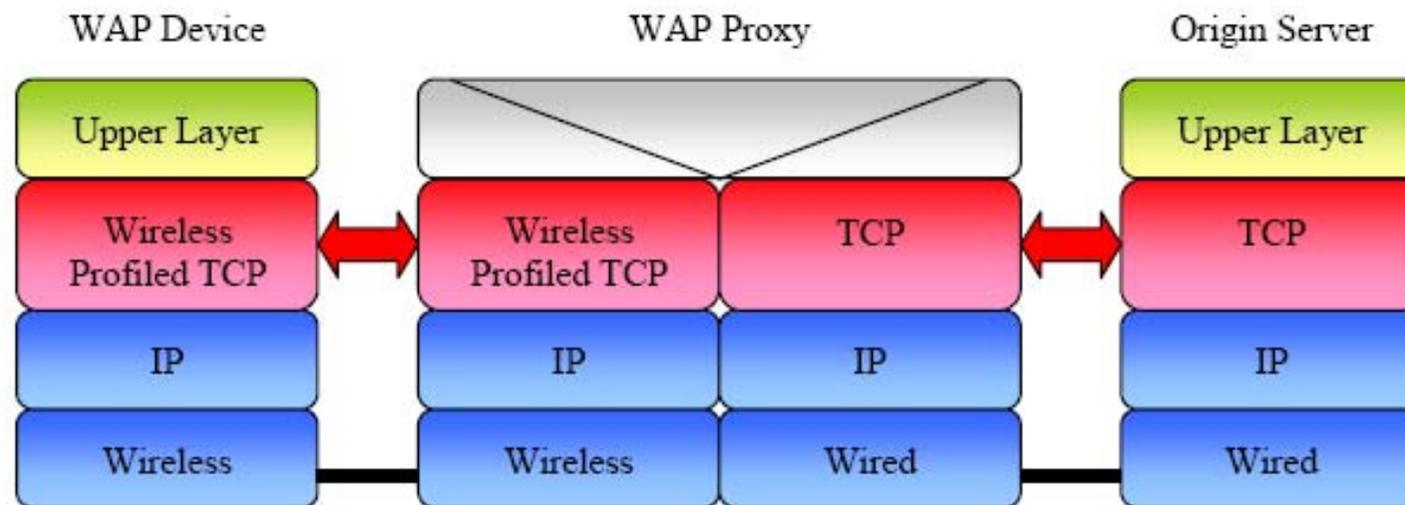


Figure 2: Wireless Profiled TCP with WAP Proxy



OMA: protocol architecture

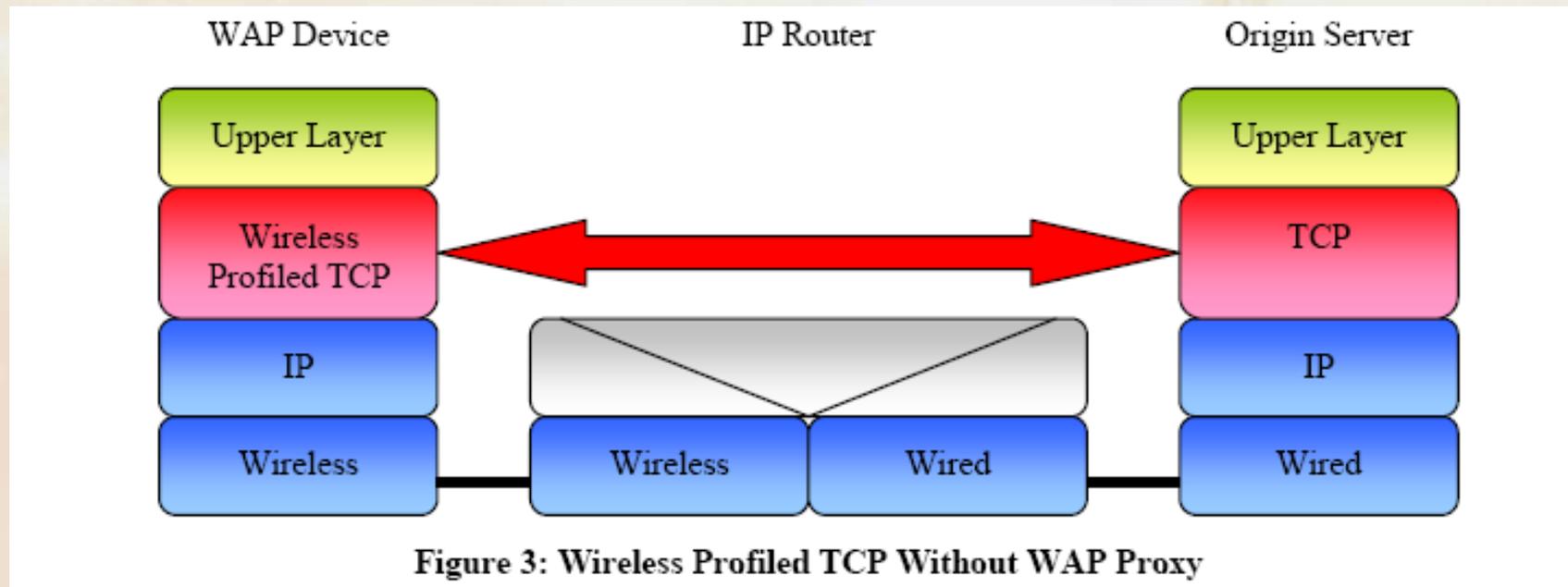
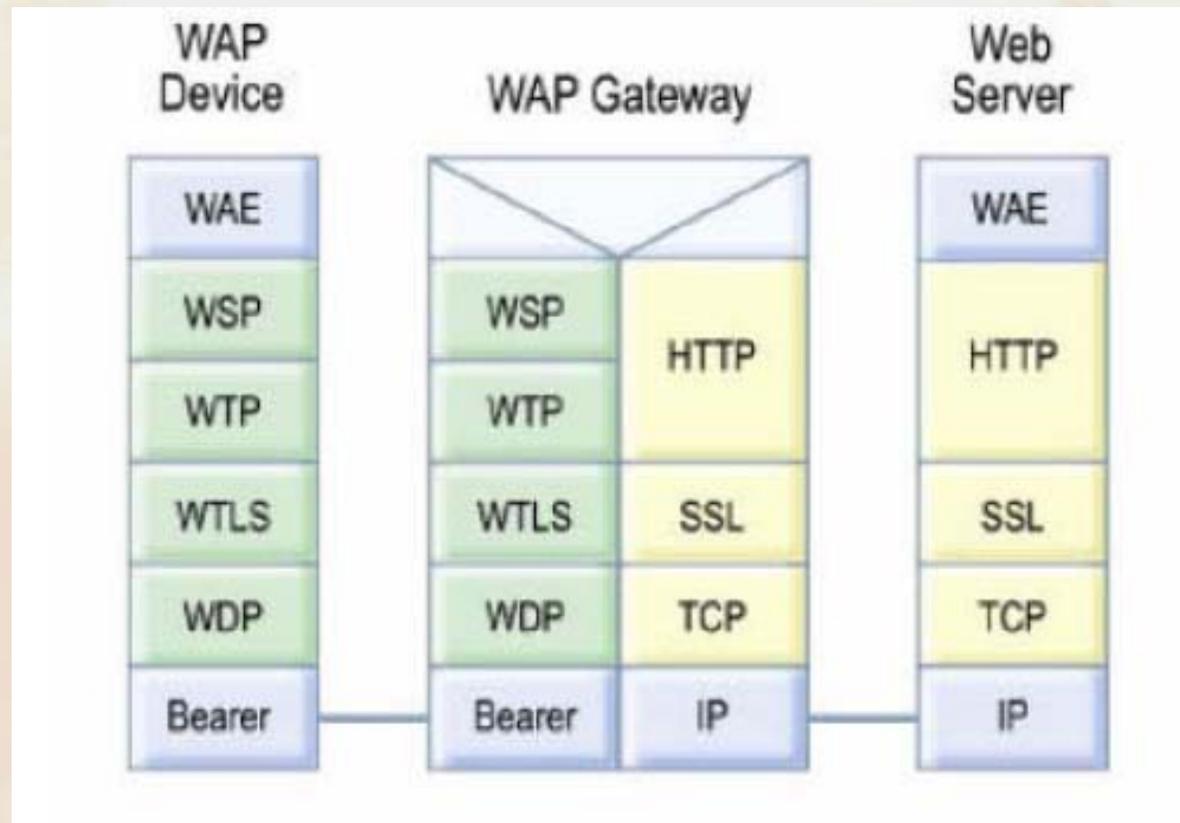


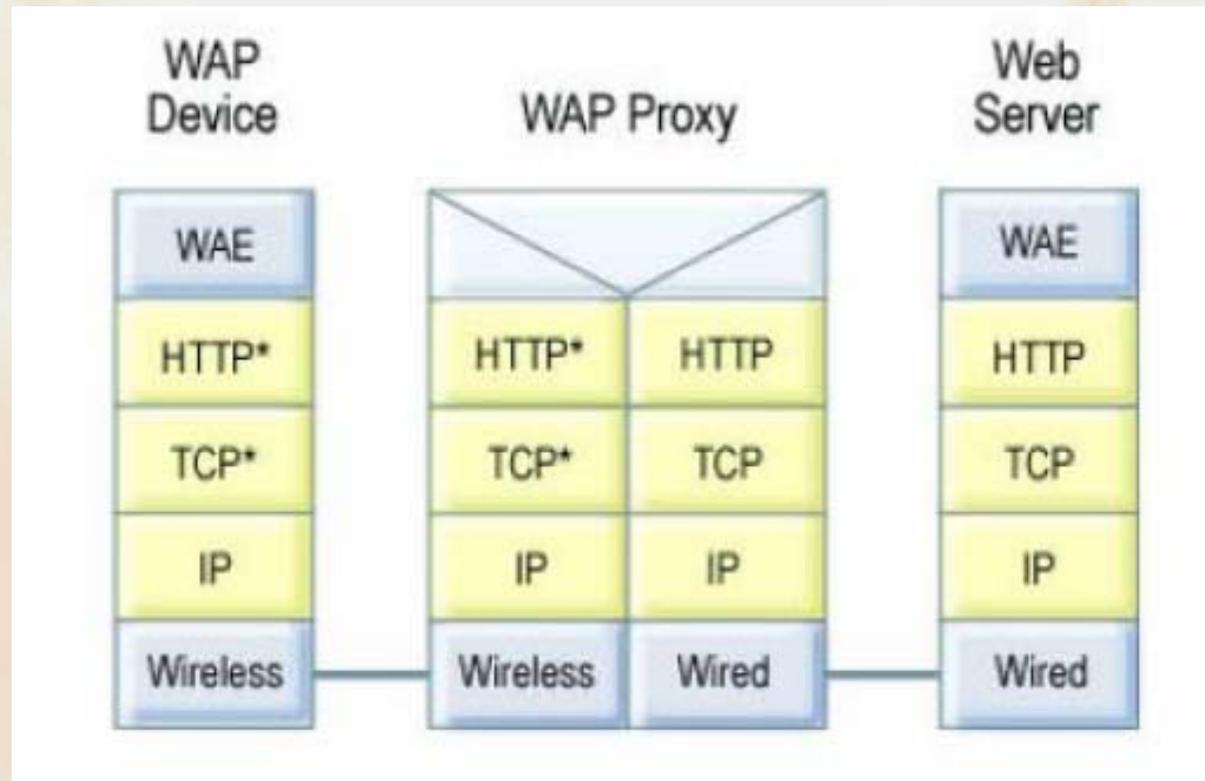
Figure 3: Wireless Profiled TCP Without WAP Proxy



OMA: protocol architecture



OMA: protocol architecture



Enabler approval process of OMA

- **Phase 1 (Candidate Enabler)** - An approved set of open technical specifications forming an enabler that can be implemented in products and solutions and which can be tested for interoperability.
- **Phase 2 (Approved Enabler)** - In addition to the open technical specification, in phase 2, the enabler has successfully passed interoperability tests.
- **Phase 3** - OMA Interoperability Release is approved interoperability end-to-end test reports, verifying end-to-end interoperability



The status of OMA Enablers

OMA Phase 1; OMA Phase 2:

OMA Web Services V1.0

OMA Wireless Public Key

Infrastructure V1.0

XDM - OMA XML Document

Management Version 1.0 V1.0



The status of OMA Enablers

	OMA Phase 1:	OMA Phase 2:
OMA Browsing	<u>V2.3</u> , <u>V2.2</u> , V2.1	
OMA Billing Framework	<u>V1.0</u>	
OMA Browser Protocol Stack	<u>V2.1</u>	
OMA Client Provisioning	<u>V1.1</u>	
OMA Data Synchronization	<u>V1.2</u>	<u>V1.1.2</u>
OMA Device Management		<u>V1.1.2</u>
OMA DRM	<u>V2.0</u>	<u>V1.0</u>
OMA DNS	<u>V1.0</u>	
OMA Download	<u>V1.0</u>	



The status of OMA Enablers

OMA Phase 1: OMA Phase 2:

OMA Email Notification	<u>V1.0</u>	
OMA External Functionality Interface	<u>V1.1</u>	
OMA Games Services	<u>V1.0</u>	
OMA Instant Messaging and Presence Service	<u>V1.2</u>	<u>V1.1</u>
IMS in OMA	<u>V1.0</u>	
OMA Mobile Location Protocol	<u>V3.1</u>	
OMA Multimedia Messaging Service	<u>V1.1</u> , <u>V1.2</u>	



The status of OMA Enablers

OMA Phase 1: OMA Phase 2:

On-Board Key Generation	<u>V1.0</u>	
OMA Online Certificate Status		
Protocol Mobile Profile	<u>V1.0</u>	
OMA Presence Simple	<u>V1.0</u>	
OMA Push to talk Over Cellular	<u>V1.0</u>	
OMA SyncML Common Specification	<u>V1.2</u>	<u>V1.1.2</u>
OMA User Agent Profile	<u>V2.0</u>	<u>V1.1</u>
OMA vObject Minimum Interoperability Profile	<u>V1.0</u>	



6 Conclusions and further work

- We to model in some sense invariant properties in M-commerce environments that will persist years of even tens of years into the future
- The model draws attention to four relatively independent spheres of concerns, regulatory frameworks, business models, global infrastructure, and enabling technologies;
- The model can be refined, as more experiences and empirical evidence are accumulated; especially the business level seems a bit too simple



6 Conclusions and further work

- The next step would be to look at dynamics within the spheres and the interplay between them;
- e.g., how self-organising interest groups influence the enabling technologies, why certain companies form them, how they influence governments and EU, etc;
- Why certain enabling technologies are adopted to certain parts of the global infrastructure, others to other parts;



6 Conclusions and further work

- operator policy as a regulative instrument
- privacy legislation as hindrance to LBS
- culture influencing business models
- community building using mobile channel
- competition of the user's time among channels: TV and radio
- can PTD really become personal shared device in P2P networks?

