

ITR-4

4th Infocomm
Technology
Roadmap
Seminar

iDA

INFOCOMM
DEVELOPMENT
AUTHORITY OF
SINGAPORE

Mobile Wireless & Broadband Access

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collaborate

communicate

innovate

Scope of Presentation

- The vision of where Wireless and Wireline technologies are heading to...
- Key Highlights in Mobile Wireless
- Key Highlights in Broadband Access
- Singapore Landscape
- Conclusion

■ World converging to an User-Oriented Equation:

Seamless Mobility



Broadband



**Convergence of
tech + standards**

■ Mobility of Access to
Multimedia Services across
heterogeneous networks,
devices and service providers

■ Increased productivity &
consistent user experience

Emerging examples:

Virtual Home Environment (VHE):

UMTS concept of portable & network independent services.
Common VHE standard

WLAN/WWAN roaming:

inter-operator
AAA models

Ad-hoc Networking:
anywhere connectivity
for work and play

Machine Enhancements:

Common APIs & Protocols
simplify the movement of
services across different domains

Richer and multimode
networked terminals:
smartphone, tablet PC,
PDA-phone

■ **Emerging signs:**

- Broadband Everywhere facilitates the possibility to include varied types of multimedia, more sophisticated consumer and enterprise applications for a better future communication infrastructure

For instance:

- Optical Fibre (in long haul, metro, access)
- Broadband Access: Free Space Optics (FSO), Very High Speed Digital Subscriber Line (VDSL)
- Broadband Wireless WAN: Next Generation Wireless LAN (NGWLAN), CDMA2000 1xEV-DV, High Speed Downlink Packet Access (HSDPA) for WCDMA
- Longer Term Wireless Access: Ultra-Wideband (UWB), 4G mobile

How convergence is happening?

■ Emerging signs where tech and standards meet:

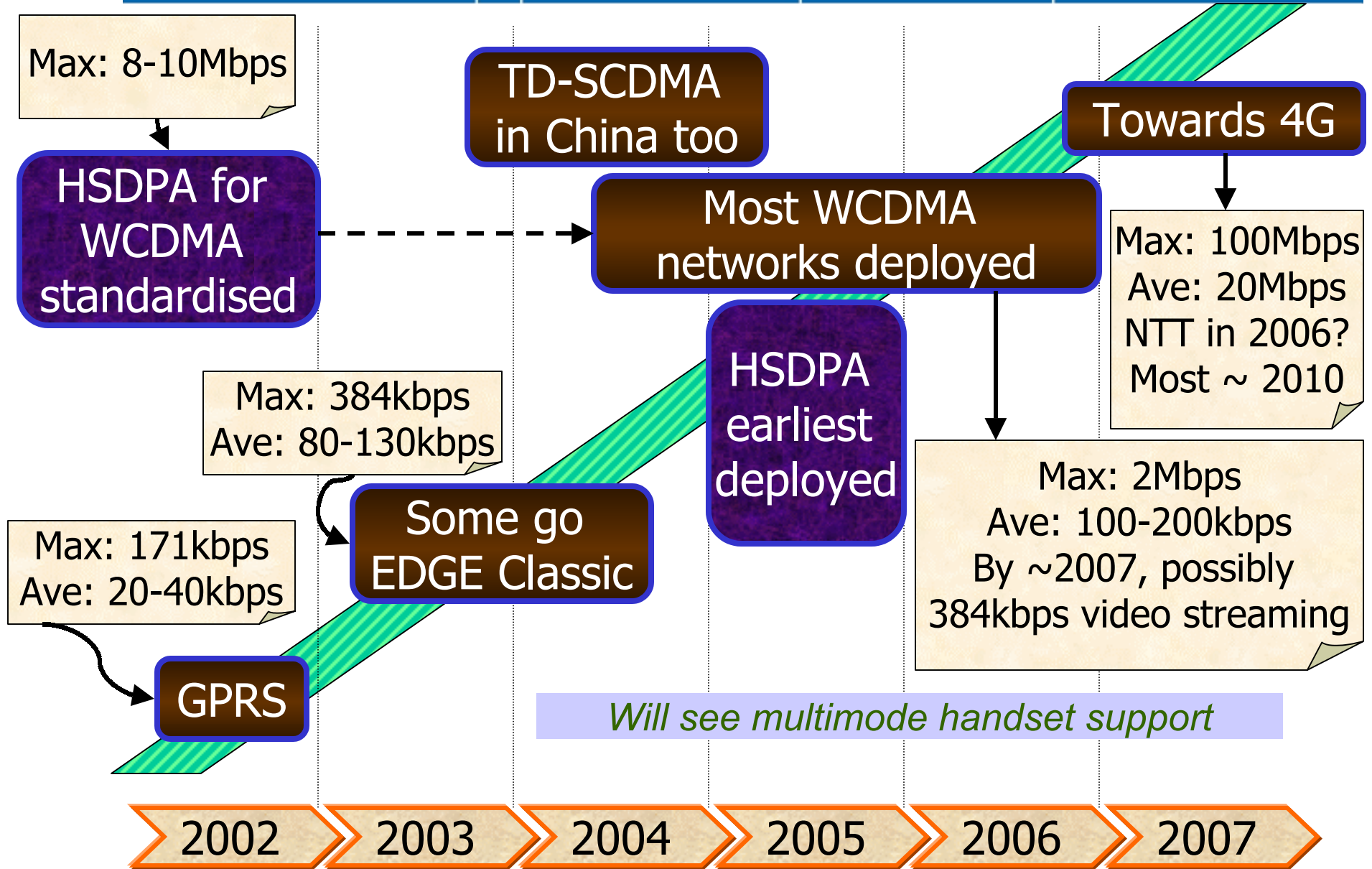
- End to End IP services: Both wireline and wireless networks shifting to ALL-IP, IPv6, roaming with Mobile IP. Progressing to the edge networks too.
- Broadcasting & Multicast with Mobile Wireless (3GPP Release 6 due in June 2003 *trends in full report*)
- Convergence to Open Standards and APIs, for instance:
 - Open Mobile Alliance (mid 2002), Open Service Access (early 1998)
 - IP Multimedia Subsystem specifications (includes GSM/CDMA IP service interoperability)

Scope of Presentation

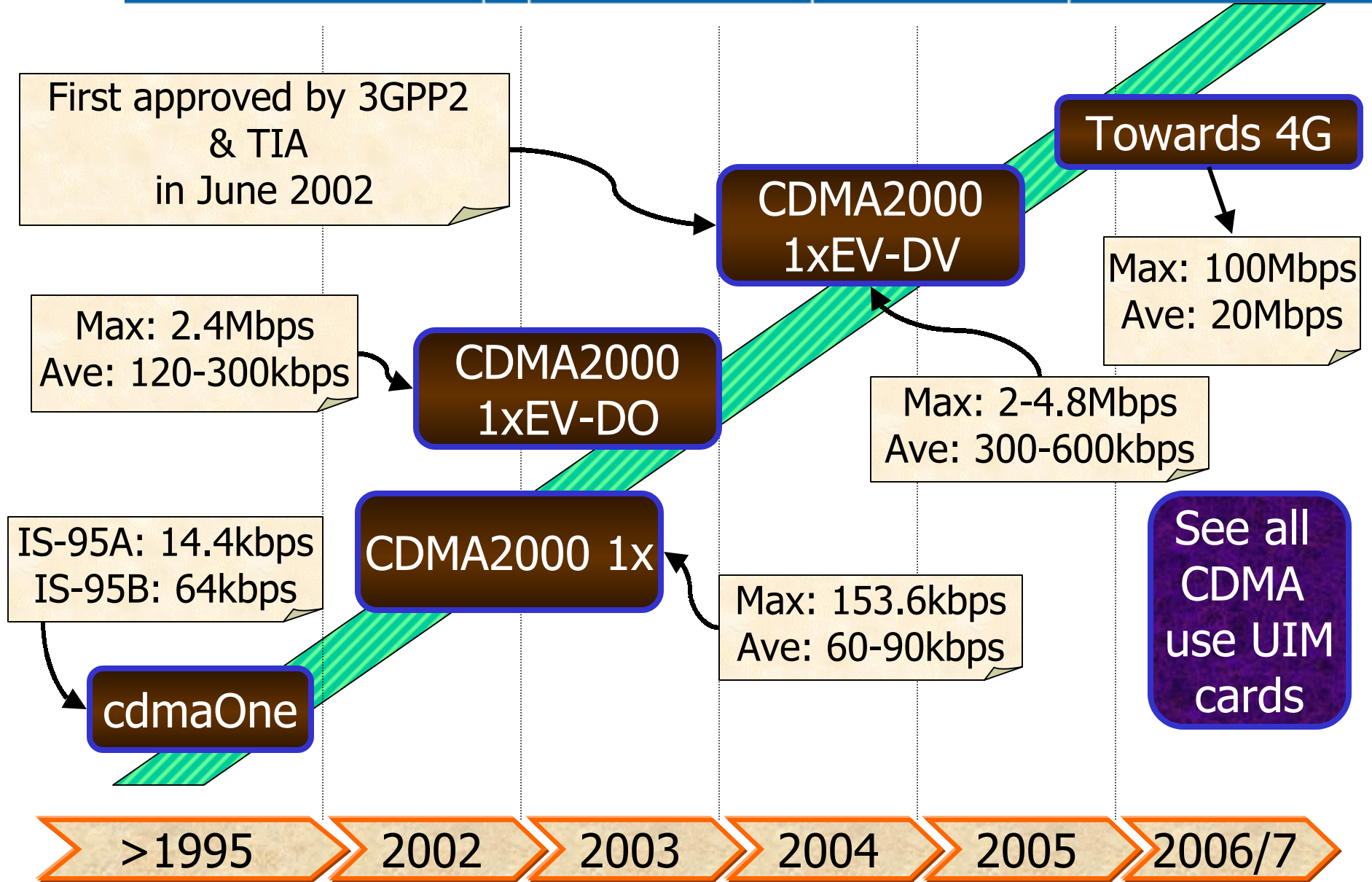
Mobile Wireless

- The Vision of Wireless and Wireline
- **Key Highlights in Mobile Wireless**
- Key Highlights in Broadband Access
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Next Leaps in GSM Migration



Next Leaps in CDMA Migration



Trends in Mobile Devices

- 880million handsets in 2007: GSM based (80.5%), CDMA based (15%), Rest (TDMA/PDC 4.5%) [ARC Group]
- **Power Supply:** NiCd, NiMH, Li-ion, Li-poly to fuel cell technologies
- **Display:** rotating coloured LCD screens to organic LEDs
- **Storage:** digital media cards into Gbytes, USIM towards Mbytes
- **Imaging & Video:** integrated cameras (in 200m handsets by 2007 - [ARC]), MPEG-4 part 10 (= ITU term 'H.264') in 2003 (<50% savings)
- **Human-Machine Interface:** handwriting recognition (tablet PCs), intelligent text inputs, joysticks (integrated or clip-on's), scrollers, virtual keyboard and image sensing keyboards.
- **Machine-Machine Connectivity:** Bluetooth, USB, Firewire, integrated WLAN chips, UWB, hence enabling also ad-hoc networking
- **Digital Radio/Broadcast/Multicast:** VHF/UHF reception, Qualcomm's QTV™, 3GPP Release 6 (Multimedia Broadcast/Multicast MBM in June 2003)

- **Middleware:** Mainly J2ME (on most handsets by 2007), BREW (CDMA)
- **Operating Systems:** Symbian OS still leader in 2007, new entrants: SmartPhone 2002/Pocket PC 2002 Phone Edition, Linux eCOS.
- **Open Mobile Alliance (device centric):** umbrella organisation that pulls together work done by WAP Forum, Open Mobile Architecture Initiative, Location Interoperability Forum, Wireless Village, SyncML and MMS Interoperability Group.
- **Open Service Access (OSA/Parlay) (network centric):** Defines open APIs (Application Programming Interfaces) for multi-vendor interoperability and rapid service creation.
- **IP Multimedia Subsystem (IMS):** In May 2002, the Mobile Wireless Internet Forum (MWIF), Operator Harmonization Group (OHG), 3GPP and 3GPP2 began to co-operate on common IMS standard.
- **Markup languages:** i-mode (CHTML), WAP (WML), have converged to XHTML Basic, and this will progress to XHTML 2.0.

- **Billing via:** data volume, airtime, transaction, content, URL access...
- Large number of incompatible payment systems driven by payment institutions, telcos or equipment vendors (judging from their board memberships).
 - **3GPP defined contents-based APIs** for open standard billing;
 - **Mobile Payment Forum** (Nov 2001) for payment card account based billing (Visa, Mastercard, Amex, JCB, and telcos like NTT, Hutchison3G, Vodafone, etc);
 - **PayCircle** (Jan 2002) for open APIs in mobile payment (equipment vendors: HP, Oracle, Siemens, Sun etc)
- **Micropayment options:** via Bluetooth, Infrared, RFID (ISO 14443), Bar code scanning, etc.

- Enterprise Solutions / Corporate m-workforce
- Mobile Messaging
- Location Based Services
- Infotainment
- Personalised Services
- Mobile Commerce
- etc ...

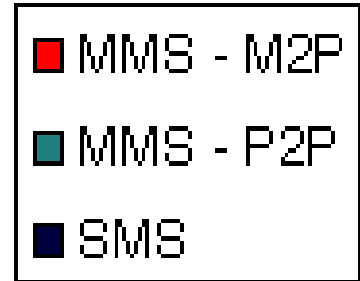
Trends in Mobile Services

By 2007: US\$22.1b global revenues in consumer & business sectors for MMS [Telecompetition Inc / UMTS]
[Ovum]: earliest 2007 for MMS revenue > SMS revenue

% of spend on cellular

25%
20%
15%
10%
5%
0%

2002 2003 2004 2005 2006

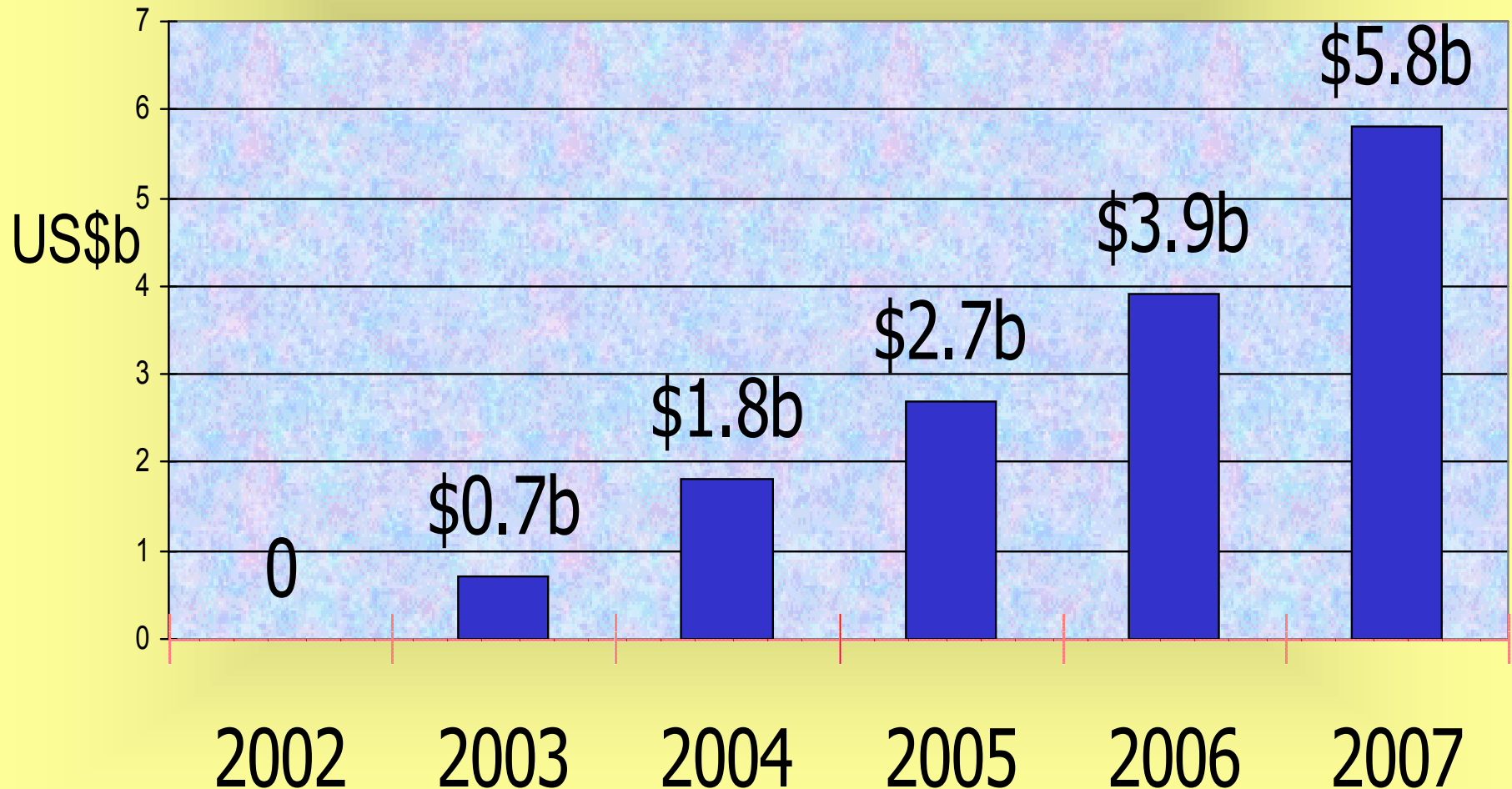


M2P: Machine to Person
P2P: Person to Person

source: Ovum

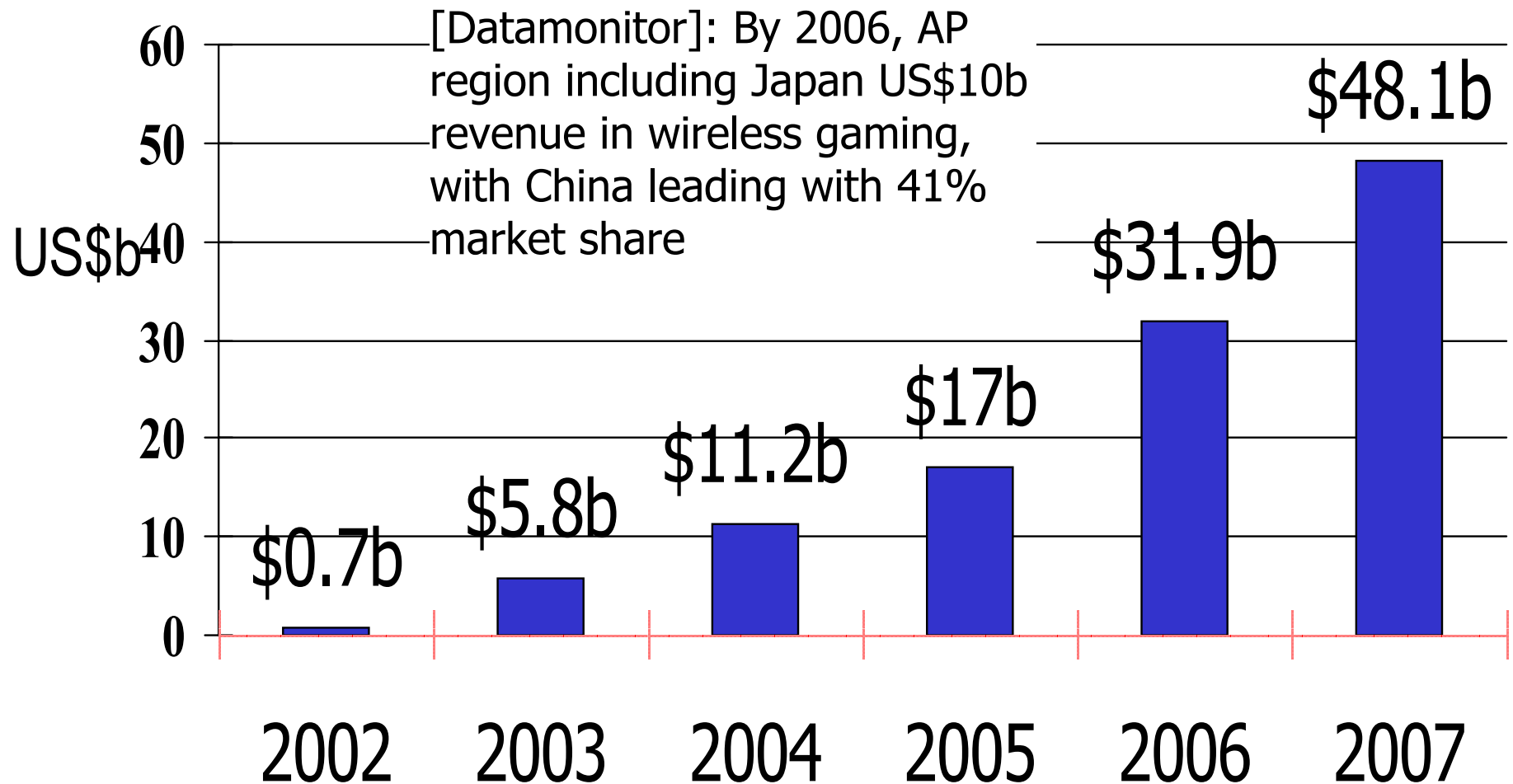
Trends in Mobile Services

Global Revenues in Location Based Services [Telecompetition Inc / UMTS]



Trends in Mobile Services

Global Revenues in Infotainment [Telecompetition Inc / UMTS]



Trends in Mobile Services

Personalised Services are increasingly popular

Personalisation engine:

- Profile Manager
- Content Manager
- Presentation Manager

Network authentication exists,
3GPP proposing ID framework
at application/service level

**unique
user ID:
e.g. SIM,
Biometrics**

T2R
(Trusted Transaction Roaming)
*Radicchio, Orange, Vodafone,
Liberty Alliance etc*

Applications for Personalisation

- **Hardware Accessories:** Smart Skin™ (Wildseed) game control keys
- **Software:** pre-configured web access, alerts, multi-application downloads
- **Instant Messaging:** buddy lists
- **Ringtones, logos, MP3 library, mobile webcasting to specific groups**
- **One-to-One Commerce & Customer Relationship Management**
- **3G Portals:** My Mobile Homepage (networked based storage)

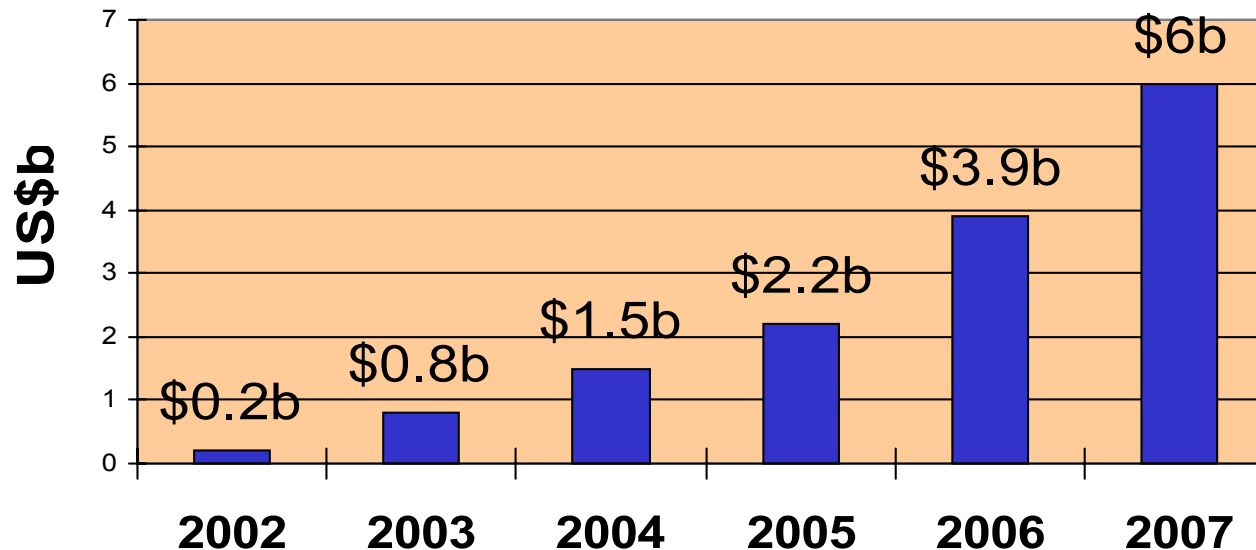
Trends in Mobile Services

Better Mobile Commerce with Multimedia Capabilities

Examples: stock trading, internet browsing & shopping, banking, ticketing, retail purchasing, micro-payment applications

Negative Influences: mobile gambling, adult entertainment (ARC Group: predicts this to be 3rd most popular application after MMS and character download).

Mobile Internet Global Revenues
[Telecompetition Inc / UMTS]

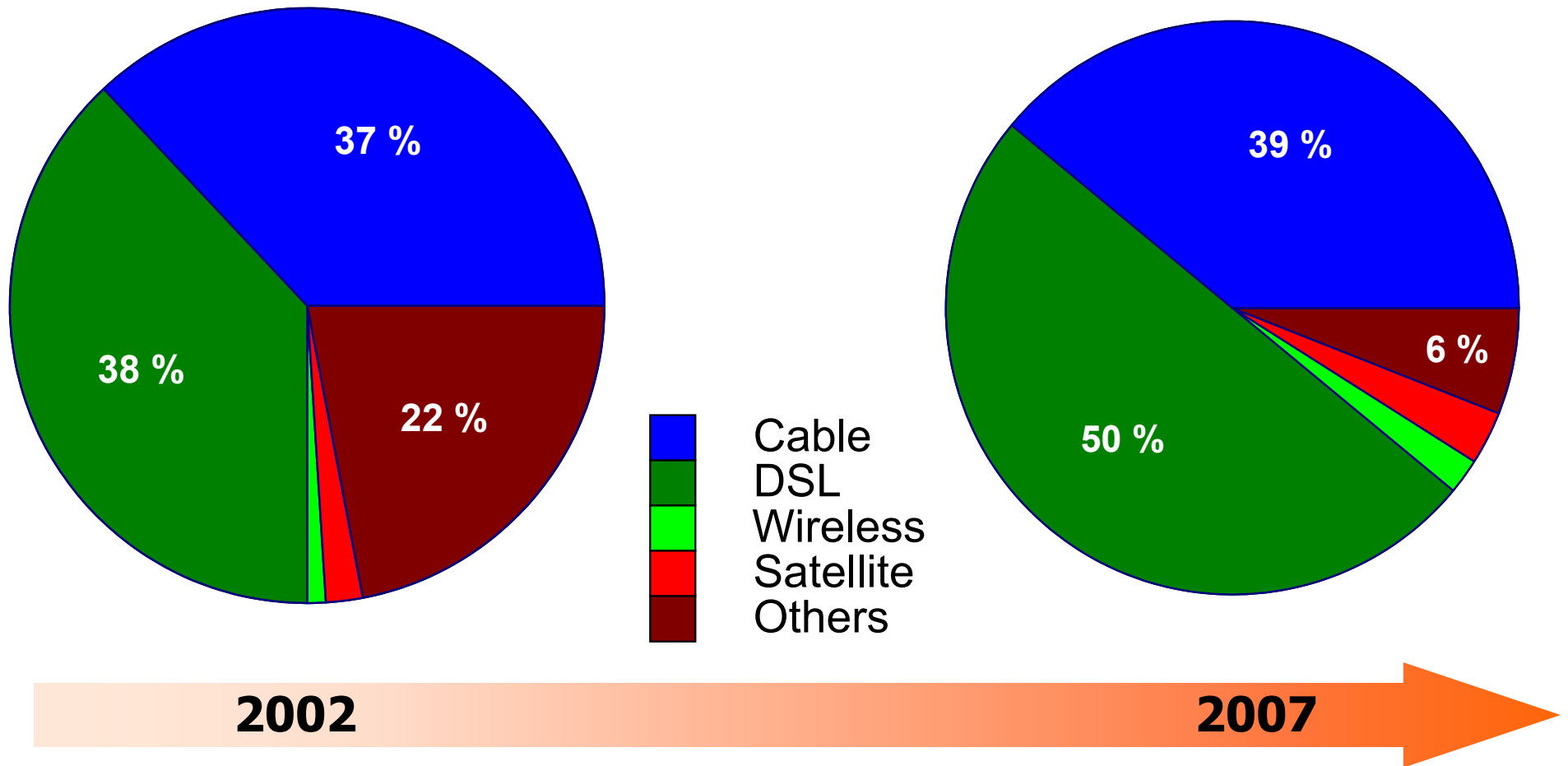


Scope of Presentation

Broadband Access

- The Vision of Wireless and Wireline
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Residential Market



DSL Roadmap

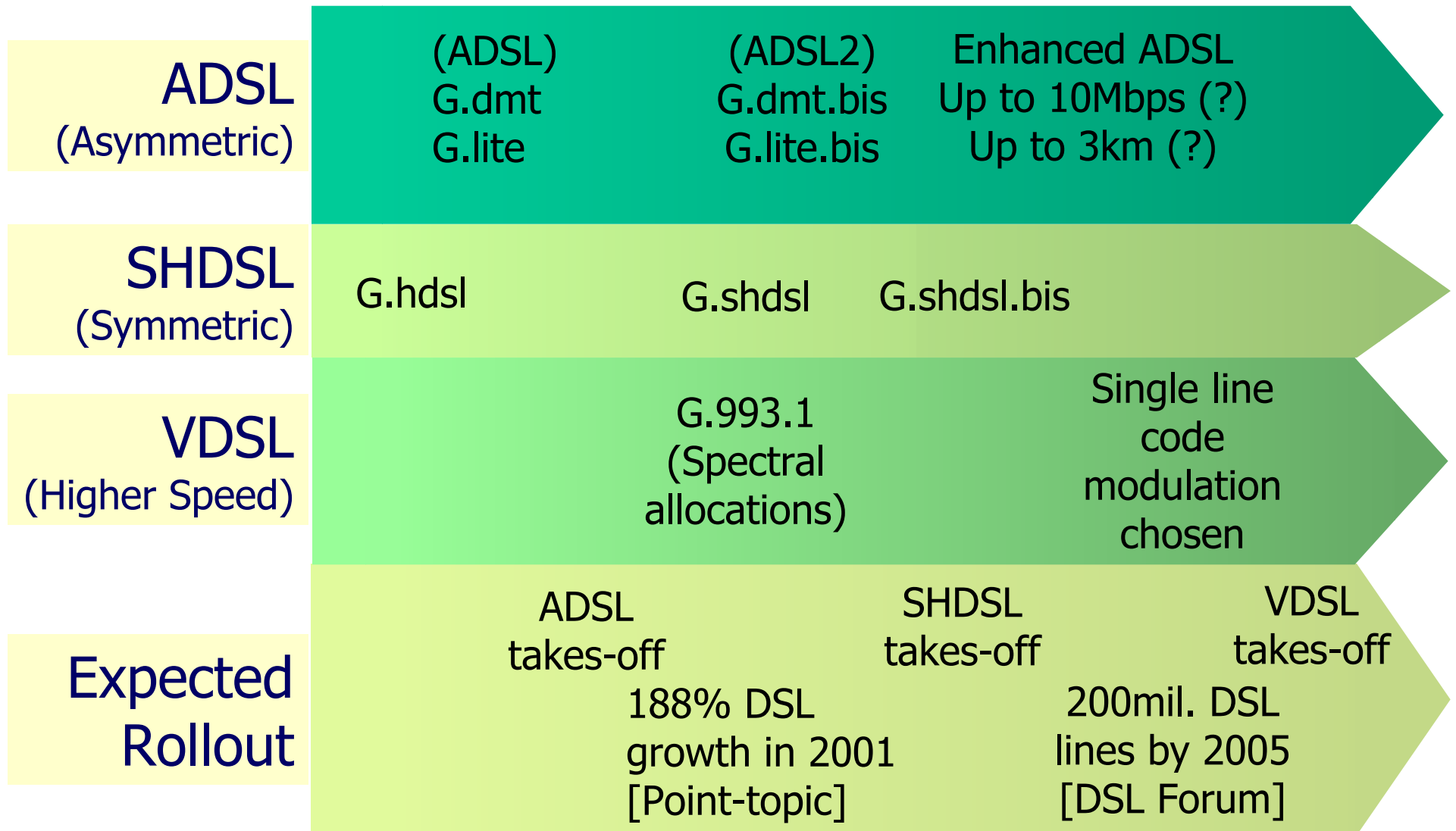
Broadband Access

1998

2001

2004

2007



Cable Roadmap

Broadband Access

Future Works (?)

- Utilize unused spectrum from 860MHz to 2GHz
- Provide switched Gigabit Ethernet

DOCSIS 1.1 (1999)

- 30Mbps/10Mbps downstream/upstream access speeds
- Tiered Services & QoS
- IP Multicast with IGMP
- Security
- Deployments appearing

DOCSIS 2.0 (2002)

- 30Mbps symmetric downstream/ upstream access speeds
- Adv PHY layer added making it backward compatible
- Deployment expected in around 2-3 years

DOCSIS 1.0 (1997)

- 30Mbps/5Mbps downstream/upstream access speeds
- Base Specification

- Standards
 - No widely accepted PLC standards
 - No widely accepted emission standards
 - National standards only (NB30, MPT1570, FCC Part 15)
- European Mandate 133
 - To harmonize PLC standards across Europe
- Key Issues
 - Emission control over short wave band (1 to 30MHz)
 - Co-existence control between last mile access and home networking

Optical Fibre (Access)

Broadband Access

IEEE 802.3ae
10GE std

ITU-T G.983
BPON std

IEEE 802.3ah
EPON stds

WDM-PON stds



■ Future Outlook [FTTH Council, USA]

- PON will be a major driver to FTTH proliferation
- Over 1 million homes passed by 2004
- Well-suited for high density greenfield deployments
- Preferred future-proof access medium
- Ethernet as transmission technology

- Multi-service delivery mechanism
 - Cellular backhaul, broadcast, wireless leased line
 - Rapid and Incremental rollout

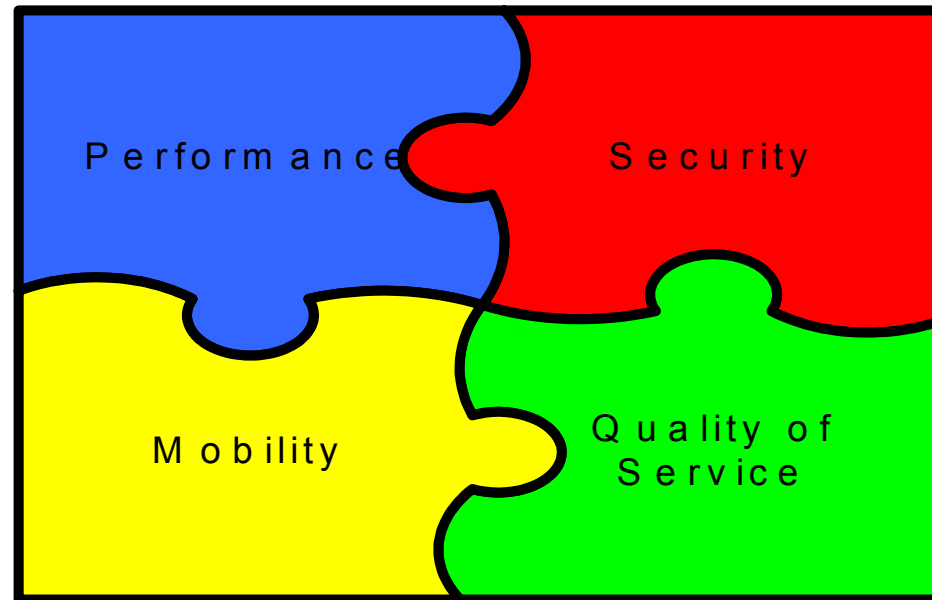
- Future Developments
 - Smart antenna and OFDM
 - Reduced demands on strict line of sight operation
 - Increased spectral efficiency and system capacity without compromising on the coverage area
 - Enhanced through wireless mesh architecture

- Fibre-like performance
 - High bandwidth connectivity (Up to 1.25 Gbps)
 - Fast, flexible and cheap way to extend reach of fibre
 - Some concerns about FSO performance in heavy rain, fog or haze
 - IDA has just completed FSO trials in Sengkang and results will be shared in the afternoon session

- Future Development
 - Higher Capacity: WDM-FSO (Up to 10 Gbps)
 - Enhanced transmission reliability: adaptive optics

Wireless Local Area Network

Broadband Access



- **Performance** - To provide high data rate
- **Mobility** - To provide seamless roaming across different WLAN networks or between wireless LAN networks and cellular networks
- **Security** - To provide good authentication and strong encryption
- **Quality of Service (QoS)** - To guarantee bandwidth for applications

Broadband Satellite

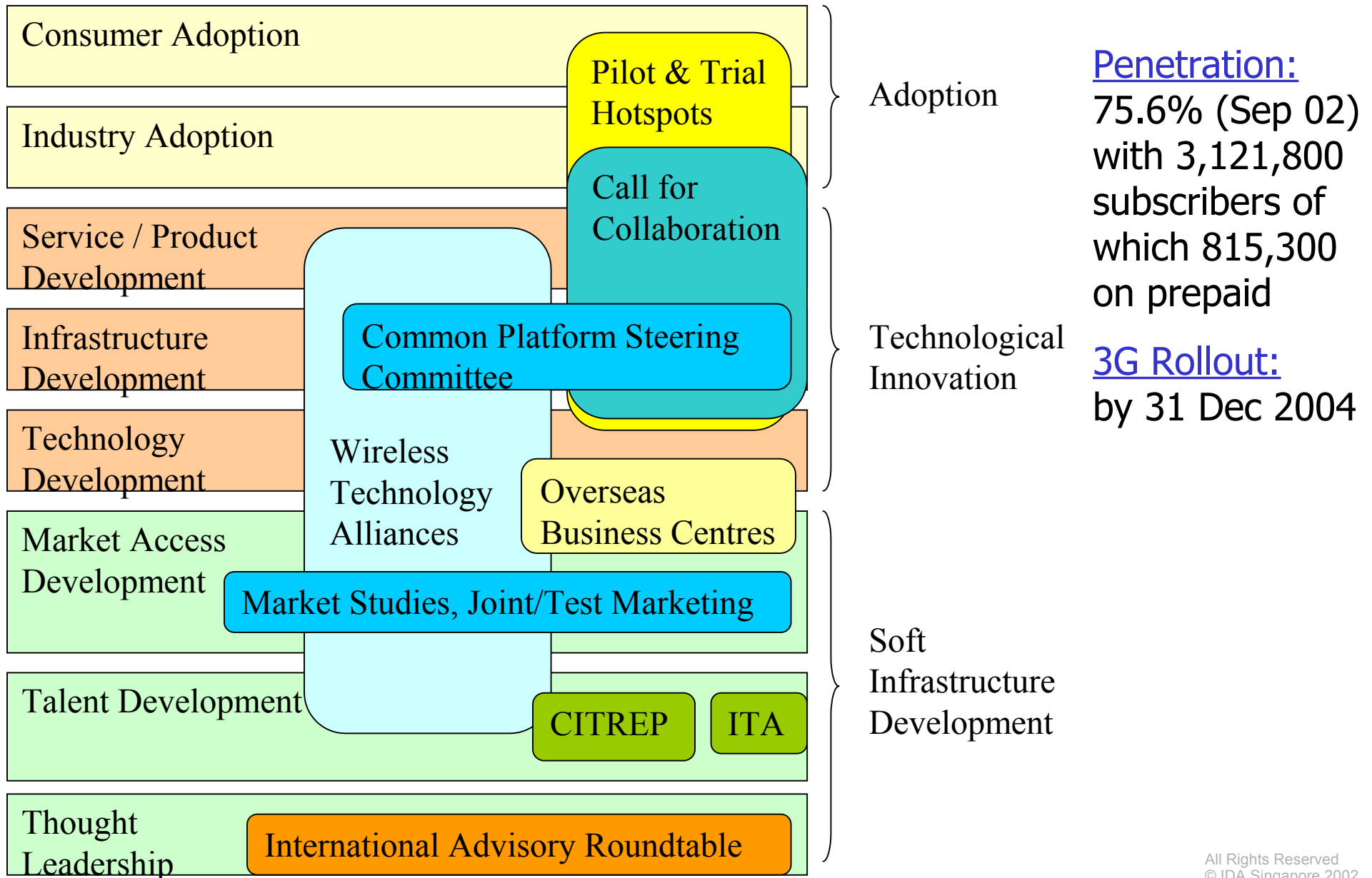
Broadband Access

- Key access technology in remote areas with poor or no wireline telecommunication infrastructure
- Technology will migrate from Ku band to Ka band systems, with the first systems expected in 2003
- Emerging market lies in offering Internet services to airplanes and ships

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Singapore Landscape



Singapore Landscape

■ Healthy Broadband Access Market

- Around 10 BASPs: SingNet, StarHub Online and PacNet
- Stimulate competition: Cable Open Access and Close Monitoring of alternative broadband access tech (PLC)

■ Local Statistics (2001)

- 950,000 broadband users (Survey of Broadband Users in Singapore)
- 17.7% households with broadband access (Survey on Infocomm Usage)

■ Government initiatives

- Singapore ONE
- Industry Development: FastTrack Programmes
- Tech Exploitation: FSO and Next Gen WLAN Trials

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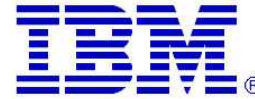
■ Mobile Wireless:

- Going towards application mobility across heterogeneous networks and devices.
- Quantum leap in 4G from 3G:
 - 4G rates average at 20Mbps compared to 3G which is likely to see initial rates below 384kbps.
 - Social paradigm: 3G is a technology push to users while 4G aims (would be designed) to be indispensable to individuals in performing their daily tasks - more user focused [MITF, Mobile IT Forum]
 - Increasing need for security as mobile world gets richer like the Internet - more focus on security by 4G

■ Broadband Access:

- Existing copper wires and coaxial cables infrastructure will remain the dominant means for delivering broadband access.
- Large scale migration to fibre, especially in residential market, is unlikely to happen over the next few years.
- Wireless broadband access technologies continues to complement the wireline broadband infrastructure to offer greater connectivity and mobility to end-users.

In Collaboration



Singapore Information Technology Federation

