Wireless Communications - Opportunities Ahead

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Wireless Opportunities Ahead

- This presentation will cover the following technologies
  - Short range radio
  - Wide area mobile networks
  - Fixed wireless access
  - Digital Terrestrial Television
- There are of course other wireless technologies
  - Radio-frequency identification (RFID), free-space optics, “wireless fibre”, etc.

Short Range Radio

- Wireless Local Area Network (LAN): up to 100 m, e.g. Wi-Fi
- Home Area Network (HAN): network within a home, e.g. Wi-Fi, HomeRF
- Personal Area Network (PAN): serving a single person or a small workgroup, e.g. Bluetooth
- Private LAN, HAN and PAN in designated bands - exempted from licensing
- Public LAN services - regulated under class licence (effective 21 February 2003)

Short Range Radio (2)

- 2400 - 2483.5 MHz
  - Shared with Industrial, Scientific and Medical (ISM) equipment
  - Suitable for IEEE 802.11b, 802.11g, HomeRF, Bluetooth, etc.
- 5150 - 5350 MHz
  - Suitable for IEEE 802.11a and HiperLAN I and II
- 5725 - 5850 MHz
  - Shared with ISM equipment
  - Suitable for IEEE 802.11a

Short Range Radio (3)

- Future development
  - IEEE 802.11e
    - enabling QoS on IEEE 802.11a/g/b
  - IEEE 802.11f
    - inter-network roaming
  - Ultra-Wideband (UWB) devices
    - high-speed transfer over short distances, e.g. 400 Mbps up to 10 m range
    - “overlay” on other spectrum (e.g. 3.1 - 10.6 GHz in US) without interference

3G Services

- Four licences issued in October 2001
- Spectrum per licensee in 1885 - 2025/2110 - 2200 MHz band
  - 2 x 15 MHz for FDD operation
  - 1 x 5 MHz for TDD operation
- Based on IMT-2000 family of technical standards adopted by ITU
- Four networks expected to be based on WCDMA
- First network operational since Jan 2004; other networks expected end-2004 or 2005

3G Services (2)

- Edge over 2.5G and 2.75G services
  - Higher peak data rate
    - WCDMA (384 kbps to 2 Mbps)
    - cdma2000 1x EV DO (2.4 Mbps) and 1x EV DV (3 Mbps)
  - Higher throughput
  - Lower cost for unit data volume
  - Relatively uncongested spectrum

3G Services (3)

- Product differentiation
  - Video streaming
  - Real-time video
  - More sophisticated content and applications
- “Open network access” requirement for non-affiliated content and application providers
  - to promote competition in content and applications

3G Services (4)

- Additional spectrum
  - 2.5 to 2.69 GHz allocated by ITU
- 3.5G or 4G?
  - 3.5G?
    - High Speed Data Packet Access (HSDPA) (10.7 or 14.4 Mbps) in WCDMA Release 5
    - cdma2000 3x
  - Generally 4G expected to provide data rate one or two orders higher than 3G (e.g. 20 to 200 Mbps range)
  - Expected not to materialize until end of decade

2G and 2.5G Mobile Services

Operator	*800/900 MHz*	*1.7 – 1.9 GHz*
Hutchison	GSM 900 CDMA (IS-95B)	GSM1800
CSL	GSM 900 TDMA (IS-136)	GSM1800
SmarTone	GSM 900	GSM1800
Sunday		GSM1800
Peoples		GSM1800
New World PCS		GSM1800

Renewal of 2G/2.5G Licences

- Existing licences expiring Jul 2005 to Sept 2006
- First right of refusal to be granted to operators of 9 GSM networks
- Spectrum vacated by CDMA network (825-835/870-880 MHz) to be offered through open bidding (spectrum auctioning)
- Spectrum vacated by TDMA network (880-890 MHz) to be reserved for guardband and expansion of 2G networks (paired with 925-935 MHz)

Renewal of 2G/2.5G Licences (2)

- Technology neutrality principles to be maintained
  - Choice of technical standard a commercial decision based on commercial availability of equipment, consumer demand, roaming requirements, etc.
  - All spectrum may be used for 3G (or higher generation) services
- Number of operators to be decided by market
  - Existing and new operators allowed to bid

Renewal of 2G/2.5G Licences (3)

- New 800 MHz network to stimulate growth mobile data services
  - Targets to be set on
    - Network coverage
    - Achievements in mobile data services in term of Average Revenue per User percentage, volume of data sent per user or capacity deployed for data traffic
- Proposals now subject to consultation
  - Consultation to end on 19 June 2004

Fixed Wireless Access

- Potential applications
  - Wireless local loops for narrowband/broadband
  - Backhaul for Wi-Fi wireless LAN hotspots
  - Potential for mobile services in future
- Frequency bands
  - IEEE 802.16a operates in 2 - 11 GHz
  - China, UK, Australia: 3.5 GHz
  - US, South Korea, Malaysia: 2.3/2.5 GHz
  - Singapore: under consultation 2.3/2.5 GHz, 1.9/2.1 GHz

Fixed Wireless Access (2)

- Capabilities
  - Range up to 50 km
  - Non line-of-sight operation
- Standards
  - IEEE 802.16a and HIPERMAN (Europe) (Wi-Max)
    - IEEE 802.16a approved 29 January 2003
    - Fixed access (Metropolitan Area Network)
    - 5 bps/Hz (or 70 Mbps/14 MHz channel)

Fixed Wireless Access (3)

- IEEE 802.16e (IEEE 802.16a enhanced)
  - Expected to be published end 04/early 05
  - Vehicular mobility (up to 100+ km/hr)
  - 5 bps/Hz (or 70 Mbps/14 MHz channel)
- IEEE 802.20 (Mobile-Fi)
  - Unlikely to be available before 2006
  - Mobility (up to 250 km/hr)
  - 3.2 bps/Hz (16 Mbps/5 MHz channel)

Fixed Wireless Access (4)

Preparatory work in Hong Kong

- Making spectrum available (probably in 3.5 GHz band) through discussions in Radio Spectrum Advisory Committee
- Examine potential interference with downlink of fixed satellite service in 3.4 - 3.7 GHz band (e.g. SMATV reception)

Digital Terrestrial Television (DTT)

- Advantages
  - Better picture (multipath immunity)
  - Better sound quality
  - Mobile reception feasible
  - Better spectral efficiency
    - Single frequency network possible
    - Multiple programmes per 8 MHz channel
  - High-definition TV possible

Digital Terrestrial Television (2)

- Each multiplex is 8 MHz channel in existing UHF band for analogue broadcasting
  - Four standard TV programme or one high-definition TV programme
  - Spare capacity for telecommunications (up to 25% of multiplex capacity) (one-way)
- Four multiplexes available in Hong Kong (after frequency coordination with Mainland)
  - Four single frequency networks
  - One multiple frequency network

Digital Terrestrial Television (3)

- Technical standards
  - Europe, Australia, Singapore, Taiwan (DVB-T)
  - USA, Canada, Korea (ATSC)
  - Japan (ISDB-T)
  - Mainland China (to be decided)
    - Tsinghua University (DMB-T)
    - Jiaotong University (ADTB-T)

Digital Terrestrial Television (4)

- Second consultation paper issued by Commerce, Industry and Technology Bureau in December 2003
  - Proposed DVB-T or determined by market forces
  - Proposed simulcast (together with analogue transmission) to commence in early 2006, territory wide coverage in 2008 and analogue broadcast to be continued until further review (5 years after simulcast or DTT take-up reaches 50%)
  - Broadcasters preferred adopting technical standard in Mainland China

Conclusions

- Users increasingly wish to be untethered
- Connections to users relying on wireless, even at home or in offices
- Radio spectrum availability constraints to be overcome by shorter-range wireless transmission
- Fixed services will continue to play a significant role - optical fibre cables to provide high-capacity backbone transmission

Conclusions (2)

- Wide area mobile networks still necessary for fast-moving users to avoid excessive requirements for hand-off
- Fixed wireless access to overcome bottleneck problem in “last mile”
- Digital video broadcast may be more efficient for point-to-multipoint or broadcast transmission
- Fixed/mobile convergence: networks will be used for both fixed and mobile services

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