

Hong Kong Ubiquitous City Wi-Fi and Beyond

John Chiu
 Chairman - HKWTIA

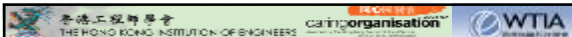
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Agenda

- Wi-Fi in Hong Kong
- U-city Project
- Development in wireless technologies

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Wi-Fi in Hong Kong

- According to OFTA, a total of 4,271 registered locations of Wi-Fi Access Points (as of 30 April 08)
- Commercial service providers
- Government Wi-Fi Programme
- Free Wi-Fi service in public housing estates

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Locations with Wi-Fi Service

- Apart from Wi-Fi at home and office for personal or private use, locations with Wi-Fi Service:
 - Shopping malls
 - Commercial buildings
 - Cyberport
 - Coffee shops
 - Hotels
 - Housing estates
 - Residential buildings
 - Hong Kong International Airport
 - MTR
 - Schools and universities in Hong Kong
 - Etc...

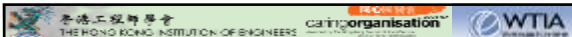
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Commercial service providers

- PCCW
 - more than 3000 hotspots
 - conveniences stores, coffee shops, restaurants, shopping mall, airport, MTR stations, Universities and tertiary institutes
- Y5Zone
 - over 800 access points
 - partner with Internet service providers, mobile operators, roaming consortiums, properties developers and management companies
- Hong Kong Broadband
 - Public housing estate
- FON
 - a Community of people making WiFi universal and free
- others

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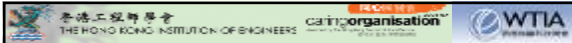


Government Wi-Fi Programme



- provide free wireless Internet access to the public in some 350 government premises with high public patronage, include
 - all public libraries,
 - public enquiry service centres,
 - key cultural and recreational centres,
 - job centres,
 - community halls,
 - large parks,
 - government offices that are frequented by the public

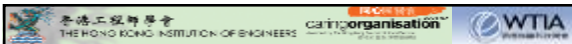
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Government Wi-Fi Programme

- progressively install Wi-Fi facilities at some 120 premises by mid 2008 and another 230 premises by mid 2009.
- Benefit
 - to enable the public to access the Internet more conveniently, with more locations available and better geographical coverage.
 - the public will be able to surf the web for business, study and leisure, or access government services with greater ease than ever before.

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Free Wi-Fi service in public housing estates

- For public rental housing (PRH) tenants
- free access of the Internet through Wi-Fi service
- free WiFi service currently provided at about 120 PRH estates of the Housing Authority (HA)
- additional 45 PRH estates, including 26 estates not covered by the service at present, will be introduced in phases with the first batch of 10 estates starting on 17 April 2008 and the rest by August this year.

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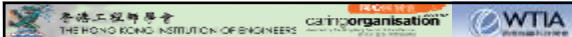




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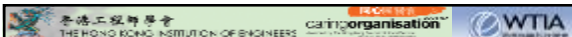
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U-city Project

- Issues
- Project Vision
- Project Objectives
- Key Benefits
- Project Deliverables
- Innovative Application Award

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Issues

- Lack of innovative wireless services
- Lack of momentum for general public to use wireless services
- Lack of cross wireless platform environment for services development

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Project Vision

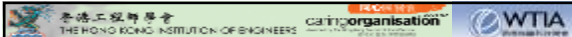
To facilitate the

*Cross Platform Wireless Application
Development & Usage in Hong Kong*

By

*WTIA/ HKWDC being the hub linking the Wireless
Industry in Hong Kong with the end users (Corporate &
General Public)*

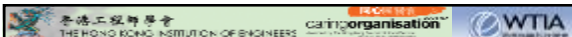
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Project Objectives

- To create and foster **innovative** hotspot applications
- To raise **public awareness** of the possibilities afforded by our regional Wi-Fi zone
- To **stimulate** the Wireless Application development on integrated wireless platform

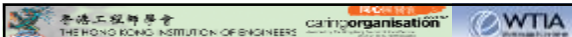
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Key Benefits

- Stimulate the **usage and development** of wireless services
- **Popularization** of wireless and information technology applications
- **Environment** for developing, testing and deploying WMC applications
- Better service to **businesses and the tourism industry**
- Enhancement of Hong Kong's image as a **Ubiquitous City**

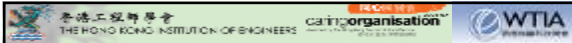
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Project Deliverables

- Innovative Wi-Fi Application Services Award
- WiFi usage and adoption - Marketing Survey
- Wi-Fi Services Promotion

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Innovative Application Award

- Total 12 Innovative Wi-Fi proposals will be selected in three batches
- Developers response the RFP with an innovative application proposal
- Selection Panel selects a total of 12 innovative applications
- The Potential awardees required to launch their services in HKWDC & Gov WiFi areas within 3 months
- The award will cover 50% of development cost & capped at HK\$60,000
- The application IP is owned by the developer for commercialization


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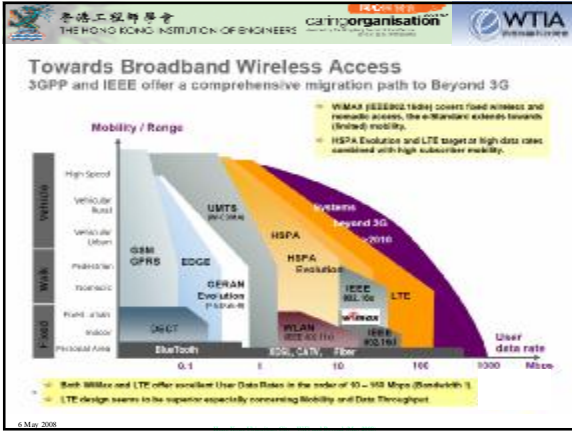
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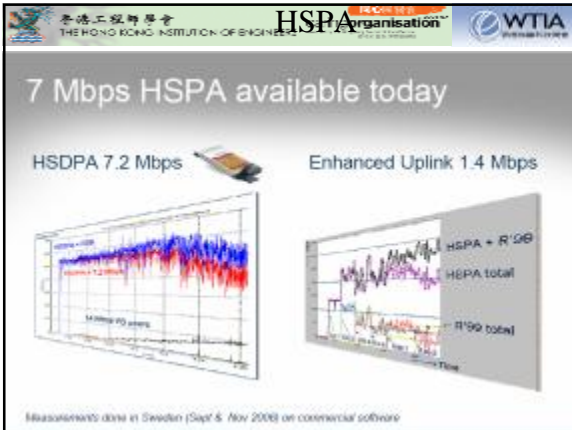
Development in Wireless Technologies

- 3GPP Technology Family
 - HSPA/ HSPA+
 - LTE
- IEEE Technology Family
 - WLAN (IEEE 802.11)
 - WiMAX Stationary (IEEE 802.16d)
 - WiMAX mobile (IEEE 802.16e)

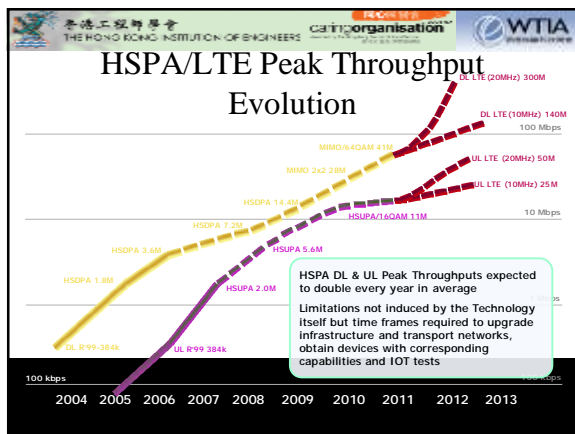
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- ### 3GPP Technology Family
- HSPA
 - **High speed data:** User experience comparable to DSL in terms of throughput and latency
 - High capacity, **full mobility**, high data security and QoS
 - Seamless 2G/3G handover
 - LTE
 - Broadband multimedia at low cost
 - Flat architecture, fully IP based
 - Flexible bandwidth and spectrum usage
 - Full mobility (target up to 350 km/h), security and QoS
 - Seamless 2G/3G/LTE handover







IEEE Technology Family

Standard	Year	Rate	Modulation	Frequency	Bandwidth	Power	Notes
IEEE 802.11a	2001	54 Mbps	OFDM	5 GHz	20 MHz	100 mW	802.11a
IEEE 802.11b	1999	11 Mbps	SS	2.4 GHz	20 MHz	100 mW	802.11b
IEEE 802.11g	2003	54 Mbps	OFDM	2.4 GHz	20 MHz	100 mW	802.11g
IEEE 802.11n	2009	600 Mbps	MIMO	2.4 GHz	40 MHz	100 mW	802.11n
IEEE 802.11ac	2013	1.3 Gbps	MIMO	5 GHz	80 MHz	100 mW	802.11ac
IEEE 802.11ad	2012	70 Gbps	OFDM	60 GHz	2.16 GHz	100 mW	802.11ad
IEEE 802.11ay	2013	400 Gbps	OFDM	60 GHz	8.16 GHz	100 mW	802.11ay
IEEE 802.15.4	2003	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4
IEEE 802.15.3	2003	480 Mbps	OFDM	2.4 GHz	10 MHz	100 mW	802.15.3
IEEE 802.15.1	2005	3.1 Mbps	SS	2.4 GHz	10 MHz	100 mW	802.15.1
IEEE 802.15.2	2005	2.4 Mbps	SS	2.4 GHz	10 MHz	100 mW	802.15.2
IEEE 802.15.4a	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4a
IEEE 802.15.4b	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4b
IEEE 802.15.4c	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4c
IEEE 802.15.4d	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4d
IEEE 802.15.4e	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4e
IEEE 802.15.4f	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4f
IEEE 802.15.4g	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4g
IEEE 802.15.4h	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4h
IEEE 802.15.4i	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4i
IEEE 802.15.4j	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4j
IEEE 802.15.4k	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4k
IEEE 802.15.4l	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4l
IEEE 802.15.4m	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4m
IEEE 802.15.4n	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4n
IEEE 802.15.4o	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4o
IEEE 802.15.4p	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4p
IEEE 802.15.4q	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4q
IEEE 802.15.4r	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4r
IEEE 802.15.4s	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4s
IEEE 802.15.4t	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4t
IEEE 802.15.4u	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4u
IEEE 802.15.4v	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4v
IEEE 802.15.4w	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4w
IEEE 802.15.4x	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4x
IEEE 802.15.4y	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4y
IEEE 802.15.4z	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4z
IEEE 802.15.4aa	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4aa
IEEE 802.15.4ab	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ab
IEEE 802.15.4ac	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ac
IEEE 802.15.4ad	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ad
IEEE 802.15.4ae	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ae
IEEE 802.15.4af	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4af
IEEE 802.15.4ag	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ag
IEEE 802.15.4ah	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ah
IEEE 802.15.4ai	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ai
IEEE 802.15.4aj	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4aj
IEEE 802.15.4ak	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ak
IEEE 802.15.4al	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4al
IEEE 802.15.4am	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4am
IEEE 802.15.4an	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4an
IEEE 802.15.4ao	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ao
IEEE 802.15.4ap	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ap
IEEE 802.15.4aq	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4aq
IEEE 802.15.4ar	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ar
IEEE 802.15.4as	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4as
IEEE 802.15.4at	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4at
IEEE 802.15.4au	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4au
IEEE 802.15.4av	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4av
IEEE 802.15.4aw	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4aw
IEEE 802.15.4ax	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ax
IEEE 802.15.4ay	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ay
IEEE 802.15.4az	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4az
IEEE 802.15.4ba	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ba
IEEE 802.15.4bb	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bb
IEEE 802.15.4bc	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bc
IEEE 802.15.4bd	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bd
IEEE 802.15.4be	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4be
IEEE 802.15.4bf	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bf
IEEE 802.15.4bg	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bg
IEEE 802.15.4bh	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bh
IEEE 802.15.4bi	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bi
IEEE 802.15.4bj	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bj
IEEE 802.15.4bk	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bk
IEEE 802.15.4bl	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bl
IEEE 802.15.4bm	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bm
IEEE 802.15.4bn	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bn
IEEE 802.15.4bo	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bo
IEEE 802.15.4bp	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bp
IEEE 802.15.4bq	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bq
IEEE 802.15.4br	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4br
IEEE 802.15.4bs	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bs
IEEE 802.15.4bt	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bt
IEEE 802.15.4bu	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bu
IEEE 802.15.4bv	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bv
IEEE 802.15.4bw	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bw
IEEE 802.15.4bx	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bx
IEEE 802.15.4by	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4by
IEEE 802.15.4bz	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4bz
IEEE 802.15.4ca	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ca
IEEE 802.15.4cb	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cb
IEEE 802.15.4cc	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cc
IEEE 802.15.4cd	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cd
IEEE 802.15.4ce	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ce
IEEE 802.15.4cf	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cf
IEEE 802.15.4cg	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cg
IEEE 802.15.4ch	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ch
IEEE 802.15.4ci	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ci
IEEE 802.15.4cj	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cj
IEEE 802.15.4ck	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ck
IEEE 802.15.4cl	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cl
IEEE 802.15.4cm	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cm
IEEE 802.15.4cn	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cn
IEEE 802.15.4co	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4co
IEEE 802.15.4cp	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cp
IEEE 802.15.4cq	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cq
IEEE 802.15.4cr	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cr
IEEE 802.15.4cs	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cs
IEEE 802.15.4ct	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4ct
IEEE 802.15.4cu	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cu
IEEE 802.15.4cv	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cv
IEEE 802.15.4cw	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cw
IEEE 802.15.4cx	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cx
IEEE 802.15.4cy	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cy
IEEE 802.15.4cz	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4cz
IEEE 802.15.4da	2007	250 kbps	SS	2.4 GHz	10 MHz	10 mW	802.15.4da
IEEE 802.15.4db	2007	250 kbps	SS				

IEEE 802.11n

- MIMO-multiple-input multiple-output
- 40 MHz operation to the physical (PHY) layer
- Jan 2008 - Draft 3.02 was approved.

IEEE Technology Family

- WiMAX Stationary (IEEE 802.16d)
 - Fixed or mobile network operators
 - Optimized wireless DSL services (Voice + data)
 - High capacity for stationary use
 - Selective QoS
- WiMAX mobile (IEEE 802.16e)
 - High capacity, limited mobility (<120 km/h)
 - Selective QoS

Summary

		LTE	WiMAX Mobile
Spectrum	40 MHz	✓	✓
Services	Cellular, Fixed/Wireless, Mobile, Broadband Data	✓✓✓✓	✓✓✓✓
Web/Its	Full Internet, Broadband	✓✓	✓✓
Backward Compatibility		All 3G ⁺ technologies	✓
Roaming		✓✓	✓✓✓✓
Performance	Throughput	✓✓✓✓	✓✓✓✓
	Power	✓✓✓	✓✓✓
	Latency	✓✓✓	✓✓✓
Availability		Available	Available

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WiMAX vs. LTE

- LTE or WiMax Market Success
 - Looking at typical operator use cases

2G/3G Network Upgrade	Evolution 3G/3.5G U.S. Revenue	Evolution 3G/3.5G U.S. Revenue
	Evolution 3G/3.5G U.S. Revenue	Evolution 3G/3.5G U.S. Revenue
	Evolution 3G/3.5G U.S. Revenue	Evolution 3G/3.5G U.S. Revenue
Evolution 2G mobile operators with 2G/3G/3.5G/4G	Evolution 2G mobile operators with 2G/3G/3.5G/4G	Evolution 2G mobile operators with 2G/3G/3.5G/4G
	Evolution 2G mobile operators with 2G/3G/3.5G/4G	Evolution 2G mobile operators with 2G/3G/3.5G/4G
	Evolution 2G mobile operators with 2G/3G/3.5G/4G	Evolution 2G mobile operators with 2G/3G/3.5G/4G
Evolution 2G mobile operators with 2G/3G/3.5G/4G	Evolution 2G mobile operators with 2G/3G/3.5G/4G	Evolution 2G mobile operators with 2G/3G/3.5G/4G
	Evolution 2G mobile operators with 2G/3G/3.5G/4G	Evolution 2G mobile operators with 2G/3G/3.5G/4G

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Technology Choice is Defined by Current Network, Spectrum Assets and Voice Strategy

```

    graph TD
      A{LTE vs WiMAX} --> B{Spectrum Assets}
      B --> C{Spectrum Assets}
      C --> D{Voice Strategy}
      D --> E{Voice Strategy}
      E --> F{WiMAX}
      E --> G{WiMAX}
  
```

LTE and WiMax are best suited for different customers in different spectrum: → no strong competition expected

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WiMAX in Hong Kong

- In Hong Kong, WiMAX will be covered in Broadband Wireless Access ("BWA") services.
- According to OFTA, BWA is
 - a radio access technology
 - support a variety of wide area high-speed wireless data services
 - deployment as wireless backhaul links for fixed or mobile networks
 - customer access networks
 - direct access networks for mobile customers
 - broadband wireless local loops for fixed customers
- OFTA announced in Dec 2007 that the spectrum in the 2.3 – 2.4 GHz (the "2.3 GHz band") and the 2.5 – 2.69 GHz (the "2.5 GHz band") will be released by auction in the fourth quarter of 2008
- 190 to 240 MHz of frequency spectrum can be made available for BWA services
- should be sufficient to accommodate at least six licences

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CAUTION ORGANISATION

WTIA
香港測量師學會

Questions ?

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