

Deployment of Small Cells in Hong Kong

Telecommunications Regulatory Affairs Advisory Committee
16 May 2014

Purpose

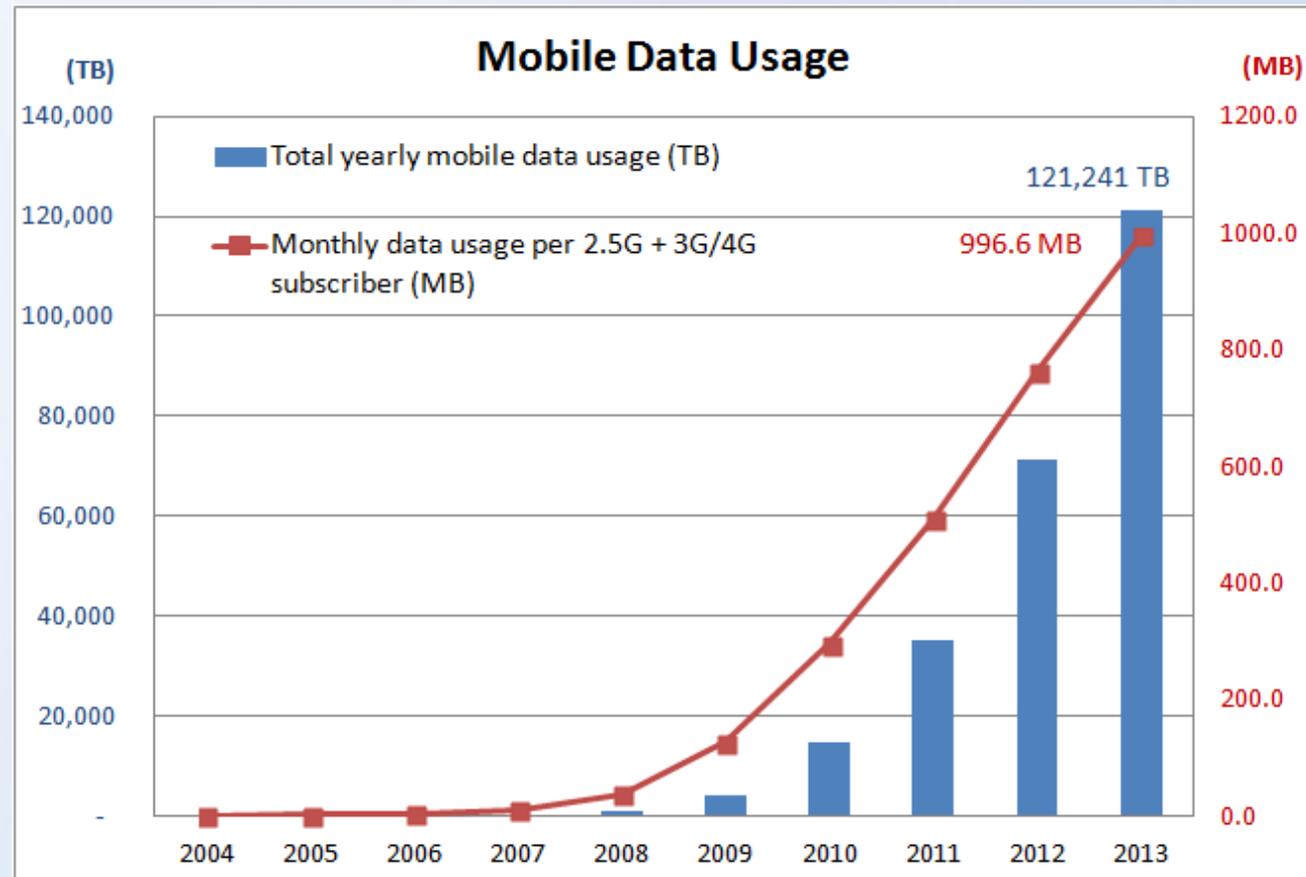
To brief Members about

- Global development of small cell deployment; and
- Facilitation of small cell deployment in Hong Kong

Background

Rapid Growth of Mobile Data Traffic in Hong Kong

- Yearly total mobile data usage in 2013: 121,241 TB, an increase of 70% as compared to 2012
- Monthly mobile data usage per 2.5G + 3G/4G subscriber in Dec 2013: 996.6 MB
- Representing a **rapid growth of mobile data traffic**



What is Small Cell?

- “Small cell” is an umbrella term for operator-controlled, low-powered radio access nodes, including those that operate in licensed spectrum and unlicensed carrier-grade Wi-Fi
- Small cells typically have a range from 10 metres to several hundred metres. This contrasts with a typical mobile macrocell that might have a range of up to several kilometres
- The term “small cell” may cover micro-, nano-, pico-cells, and femtocells installed at customer premises

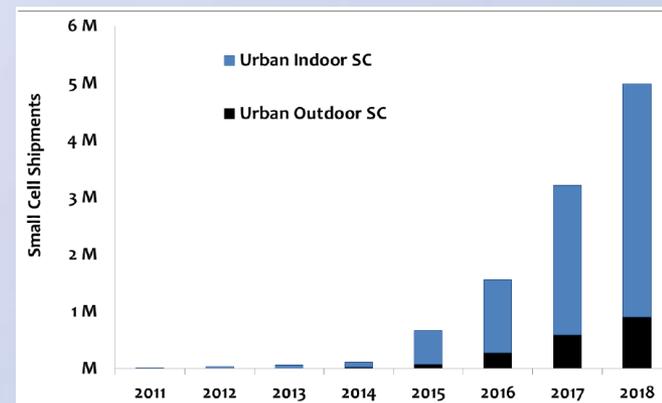
Global Development of Small Cell Deployment

Dense Deployment to meet Future Data Demand

- Mobile data demand continues to grow rapidly
- Dense deployment of small cells
 - providing indoor and outdoor coverage
 - increasing network capacity in a cost-effective manner
- Advantages of dense deployment of small cells:
 - Boosting capacity by providing cell-splitting gains due to increased spectrum re-use
 - Bringing users closer to base stations (improving SINR)
 - Being cost effective and easier to find suitable installation sites for small cells as compared to macro base stations

Global Small Cell Development

- By end of 2013, number of small cells shipment has grown to more than 7.9 million, with 7.7 million residential femtocells
- During 2013, shift from Residential application to Enterprise and Urban small cells
 - Growth rate of Residential femtocell shipments slowed to 7% annually
 - Growth rate of Enterprise grew by 86%; for Urban small cells grew by 84%
- At least 60 operators have completed trials and started commercial deployments of small cells
- More and more urban small cells will be deployed as operators need to handle high mobile traffic density



Traffic Offloading for Macro Cells

- Vodafone and Korea Telecom are rapidly increasing small cell deployment to offload traffic from macro networks in urban areas
- Vodafone plans to install more than 70,000 small cells by March 2016 to handle rising data traffic
 - Small cells enabled them to offload 25% - 30% of macro traffic in a dense outdoor area of Barcelona
- Korea Telecom has 10,000 femtocells in Seoul and 8,000 in other dense urban areas
 - Small cells enabled the operator to offload approx. 15% of traffic
- Obstacles in acquiring installation sites:
 - Accessing the municipal lamp posts and bus shelters for placing small cells

Additional Spectrum for Mobile Services

- Agenda item 1.1 of WRC-15
 - Will consider additional spectrum allocations to the mobile service on a primary basis and identification of additional frequency bands for IMT and related regulatory provisions
- The list of suitable frequency ranges as submitted by various parties (administrations, ITU Study Groups, regional organisations, etc.) ranges from 470 MHz to 6.5 GHz
- There are discussions that some higher frequency bands may be suitable for small cell deployment, e.g.
 - 3,400-4,200 MHz / 4,500-4,800 MHz / 5,850-6,425 MHz (compatibility problems with in-band fixed service / fixed satellite service given fixed satellite service installations are common in urban areas of HK)
 - 3,300-3,400 MHz / 4,400-4,500 MHz / 4,800-4,990 MHz (problems regarding adjacent band compatibility)
 - 5,925-6,425 MHz (deployed in dense urban areas and mainly indoor as pico and femto cells)

Small Cell Deployment in Hong Kong

Deployment of Non-Macro Cells in HK

- By end of March 2014, HK has over 33,000 base stations, including both macro and non-macro cells
- Non-macro cells are mainly deployed in indoor areas with lower ERP
- About 15% of the base stations with ERP ≤ 1 W
- About 35% of the base stations with ERP ≤ 10 W

Deployment of Femtocell

- Femtocell is a low power equipment designed for use in home or small business environment for improving the indoor coverage and reception of radio signals within buildings
- OFCA relaxed the regulatory requirements for femtocell deployment (indoor, emission power $< 0.1\text{W}$ and installed within any customer premises) in December 2011 after consultation with the industry
 - licence fee for femtocell base station is waived
 - no approval for femtocell installation is needed
 - 3 MNOs have included femtocell deployment in their licences

Past Discussion at the SSAC (1)

- There were requests from the industry:
 - Communications Authority (“CA”) to allocate 71-76 GHz/81-86 GHz bands (“E-band”) for backhaul applications
 - OFCA to coordinate with various government depts to formulate a more efficient application procedure for the use of government or non-government sites for setting up small cells with E-band backhaul
 - E.g. Formal submission to Buildings Dept may still be required for small cells with E-band backhaul equipment installation, as Minor Works Regime may not be applicable

Past Discussion at the SSAC (2)

- OFCA has implemented the One-stop Application Procedure since 2009 (for roof-top and indoor mobile base stations)
 - Installation of base stations can be exempted from the need for prior approval by the Buildings Dept if size, heights and floor loading of installation are within certain specified limits, no parts of installation would project beyond the external wall, etc.
- OFCA has been coordinating with other government depts for the use of government facilities

Options for implementation of the backhaul connection (1)

- Backhaul is needed to connect small cells to the core network, Internet and other services
- Mobile network operators (“MNO”) consider this more challenging than macrocell backhaul because:
 - Small cells are typically installed near street level
 - Carrier grade connectivity must be provided at much lower cost
- Backhaul solutions use a selection of physical transmission media, including:
 - Microwave, fibre, copper lines and wireless connectivity

Options for implementation of the backhaul connection (2)

- E-band is permitted worldwide for ultra high capacity point-to-point communications
- Allocation of E-band microwave links
 - Discussed at the 5th SSAC meeting in Sept 2013
 - Specified in the ITU-R recommendation. US, UK and Australia have allocated the E-band for backhaul applications
 - E-band link is typically for small cell deployment of the mobile network, and it is preliminarily estimated that the range of E-band link can attain 100 – 200 metres in practical HK environment
 - In HK, 6 parties (2 MNOs and 4 other parties) showed interests for E-band trials but the trial plan is yet to be submitted
 - To examine rain attenuation effect, the trial will be conducted in rainy season

Options for implementation of the backhaul connection (3)

- Availability of other microwave bands for the backhaul of outdoor small cells
 - 5.8 GHz (unlicensed band, not recommended for small cell backhaul due to its lower frequency range)
 - 6-42 GHz (only 38 GHz band may be used for fixed links)
 - 60 GHz (currently unplanned, pending the development of other competing applications, e.g. multi-gigabit wireless routing by WiGig, HD video links by WirelessHD consortium)

Potential Locations for the Installation of Small Cells (1)

- Payphone Kiosks
 - It is technically feasible to install small cells on top of the payphone kiosks
 - The small cells are of low emission power and the non-ionising radiation level shall be within the ICNIRP limits
 - OFCA will consider any concrete proposal from the relevant operators and as appropriate, discuss with Lands Dept



Potential Locations for the Installation of Small Cells (2)

- Lamp Posts
 - OFCA has been coordinating with other government depts (including Highways Dept and Lands Dept) to assist MNOs in application for installation of microcell base stations on lamp posts



Potential Locations for the Installation of Small Cells (3)

- Bus Stop Shelters
 - Bus stop shelters may be utilized for installing small cells
 - Negotiation with the concerned bus companies on the commercial terms and approvals from relevant government depts may be needed
 - MNOs may explore its feasibility with the bus companies and government depts
 - OFCA may consider any facilitating measures as appropriate



Radiation Safety

- As small cells may be installed at street level, there are concerns about radiation safety
- Similar to ordinary mobile base stations, MNOs are required to obtain the approval of the CA before bringing their small cells into operation
- The “Code of Practice for the Protection of Workers and Members of Public Against Non-Ionizing Radiation Hazards from Radio Transmitting Equipment” is applicable to all mobile base stations including small cells
- OFCA will continue to
 - strictly enforce approvals and random checks of the mobile base stations
 - strengthen the public education for the public to better understand the characteristics of electromagnetic radiation and the related safety standards, so as to enhance the public confidence

Conclusion

- To facilitate the small cell deployment in Hong Kong:
 - OFCA would propose to the CA to consider allocating spectrum for backhaul links
 - Coordinating with other govt depts (Lands Dept, Planning Dept, Transport Dept, Highways Dept, etc.) to facilitate the installation of small cells
- OFCA welcomes views and suggestions from the industry to facilitate the deployment of small cells for provision of higher-capacity services to meet the increasing mobile data demand

Thank you