

**For Discussion
on 12 March 2012**

**Legislative Council
Panel on Information Technology and Broadcasting**

**Consultancy Study
in relation to the Implications of Next Generation Network on
the Regulation of Telecommunications Services in Hong Kong**

Introduction

The Office of the Telecommunications Authority (“OFTA”) has commissioned a consultancy study on the implications of the advent of Next Generation Network (“NGN”) on the telecommunications regulatory framework in Hong Kong. This paper briefs Members on the major recommendations put forward by the consultant.

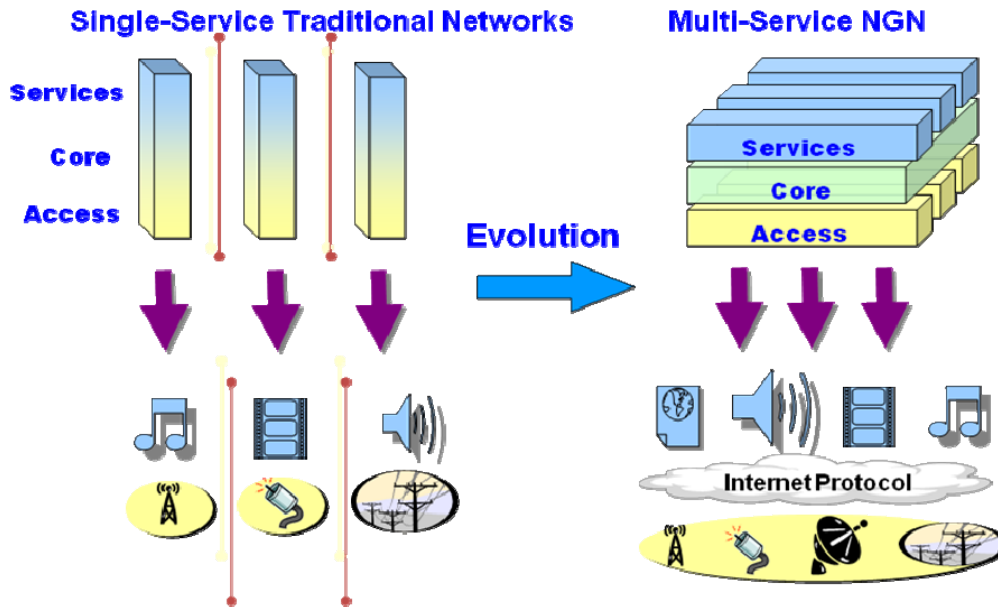
Background

2. As Figure 1 below illustrates, traditional telecommunications networks are built around circuit-switched technologies¹ and are primarily designed for the conveyance and provision of standalone services. Each network has its own core network and access network². In other words, a carrier who wishes to provide three types of services needs to establish and maintain three separate traditional networks. This limits the service scope of a telecommunications network and prolongs the time required for introduction of new services.

¹ Simply put, end-to-end connection in a circuit-switched network is established through dedicated circuits (which are physical paths) between endpoints. Once a circuit has been established, it will be used exclusively and fully occupied by the calling and called parties until it is released and not to be shared by other services or users. This contrasts with a packet-switched network which divides all messages to be transmitted, irrespective of content or type, into small data packets. The resource of the packet-switched network is shared by, and allocated to, the data packets as needed. Compared with circuit-switched networks, packet-switched networks have the advantage of making more efficient use of the network resources.

² A telecommunications network can broadly be divided into the core network and the access network. The access network runs from local telephone exchanges to end customers, while the core network comprises the rest of the network.

Figure 1
Difference between Single-Service Traditional Telecommunications Network and Multi-Service NGN



3. With the advent of new technologies, it is now possible to build a single network for conveyance and provision of a variety of services, like fixed voice telephony service, data service, mobile service and television service. Such new networks are commonly referred to as NGN. That is to say, with the migration to NGN, different types of services can now be provided over a common core network, and adopt the use of different wired and wireless access technologies.

4. More specifically, in an NGN which is basically a packet-switched network³, a message (be it a voice, data or video message) to be conveyed is divided into small data packets for delivery based on the Internet Protocol (or commonly known as IP). All sorts of messages can be accommodated within a standard data packet and delivered by a single transmission network. NGN provides an open platform such that service providers are able to freely develop innovative services and applications.

³ Please refer to footnote 1 for the difference between traditional circuit-switched networks and packet-switched networks.

5. Driven by commercial consideration of cost saving and the need to launch new services quickly in a competitive market, carriers in all advanced economies are in the process of rolling out NGN or migrating their existing networks to NGN. For example, an incumbent carrier in the UK announced in 2005 its plan to roll out an NGN across the UK which would replace up to 17 legacy networks. With a view to speeding up the rollout of NGN, governments in some economies provided public funds for the development of NGN. For example, the Australian government announced in 2009 that it would invest up to A\$43 billion over eight years to build and operate a national broadband network, while the Singaporean government provided a funding of up to S\$1 billion for building and operating a next generation nationwide broadband network the coverage of which is expected to reach 95% of all residential and non-residential buildings in this year.

6. In Hong Kong, a few carriers have already launched their NGNs while others are in the process of migrating their existing networks to NGN. The development of NGN in Hong Kong is driven by commercial consideration of carriers and does not involve government funding. This is consistent with the Government's telecommunications policy, which advocates a light-handed and market-driven approach for regulating telecommunications services. In face of the advent of NGN, the Government mainly takes the role of a facilitator and ensures that the benefits of consumers are safeguarded and effective market competition is sustained.

7. Traditionally, the regulation of telecommunications services has been developed based on circuit-switched single-service telecommunications networks. The advent of IP-based multiple-service NGN brings new challenges to the existing regulatory framework. For example, fixed carriers at this moment are still subject to the regulatory guidance that an interconnection charge needs to be paid by the originating operator to the terminating operator for fixed voice telephony traffic. The current methodologies and principles for calculating interconnection costs may no longer be applicable for multiple-service NGNs. Indeed, given that fixed and common costs account for a high proportion of the total network cost of an NGN, it will be extremely difficult for an NGN carrier to carry out an objective cost allocation

exercise in order to estimate the cost of voice interconnection. Another challenge ahead is to ensure seamless interconnection⁴ and interoperability⁵ between traditional networks and NGNs pending the full migration to NGNs. Last but not least, as the architecture of NGN is moving from a closed platform to an open platform⁶, an NGN will inevitably be exposed to more security threats and proper security measures and standards will become indispensable in the NGN era. The above are only some examples of the challenges that NGN may bring to our regulatory framework. As such, there is a need for a holistic review of the implications of development of NGN on the regulation of telecommunications services in Hong Kong.

Scope of the Consultancy Study

8. In May 2011, OFTA commissioned a consultancy study with a view to identifying the necessary changes to the telecommunications regulatory framework to ensure that it remains updated and appropriate in the NGN era. In the study, the consultant has reviewed the NGN development in a number of overseas economies (namely the UK, the US, Australia, Japan, South Korea and Singapore) and examined how the regulatory framework in these economies are being adjusted in response to NGN development, as well as the global technical developments in relation to NGN. In order to better understand the local situation in Hong Kong, the consultant has interviewed key stakeholders⁷ in June 2011 and presented the preliminary findings to the Regulatory Affairs Advisory Committee⁸, an advisory committee established under

⁴ In a multi-operator environment, the telecommunications networks operated by different operators will need to physically interconnect with each other in order to ensure that users subscribed to different operators can communicate with each other. To achieve this, there is a need to ensure that interconnected telecommunications networks of different operators are interoperable with each other, i.e. the interconnected networks are able to exchange information and to use the information that has been exchanged.

⁵ Interoperability is the ability of a system or a product to work with other systems or products without special effort on the part of the customer. Products achieve interoperability with products of other brands either (i) by adhering to published interface standards or (ii) by making use of some kind of converter that can convert one product's interface into another product's interface.

⁶ NGN adopts IP technology which is an open standard and is not owned by any individual vendors.

⁷ Altogether 14 stakeholders have been interviewed by the consultant, including the major local and external fixed carriers, mobile carriers, the Society of Hong Kong External Telecommunications Services, the Hong Kong Internet Exchange, the Hong Kong Police Force and the Hong Kong Fire Services Department.

⁸ The Regulatory Affairs Advisory Committee is chaired by OFTA and its members include a number of industry associations, telecommunications users group, local fixed carriers, mobile carriers,

OFTA, in September 2011. The study was completed in January 2012 and the consultancy report is available on OFTA's website⁹.

9. The study has reviewed a range of issues in relation to the telecommunications regulatory framework, including interconnection, next generation access, network security and emergency call service. The consultant has put forward recommendations on these areas. Some of the recommendations could be taken forward by OFTA shortly while some are for longer term implementation. The major recommendations of the consultant that pertain to the telecommunications regulatory regime are set out in the following paragraphs.

Recommendations that could be taken forward by OFTA in the short term

(A) Interconnection

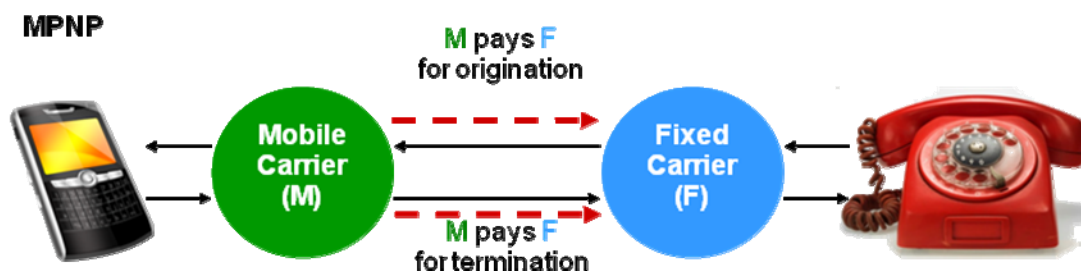
Regulatory guidance for fixed-fixed interconnection charge ("FFIC")

10. Generally speaking, there are three types of voice telephony traffic i.e. between two mobile phones, between a fixed line and a mobile phone as well as between two fixed lines. In Hong Kong, mobile-mobile interconnection charge ("MMIC") has never been subject to any regulatory guidance and is determined by the market through commercial negotiations. The fixed-mobile interconnection charge ("FMIC") was once subject to regulatory guidance in favour of the mobile party's network pays ("MPNP") model. Under the MPNP model, interconnection charge was paid by a mobile carrier to the interconnecting fixed carrier for voice telephony traffic both from a fixed line to a mobile phone, as well as from a mobile phone to a fixed line. Figure 2 below shows the direction of traffic and interconnection payment under the MPNP model.

representative of external fixed carriers, representative of external service providers, representatives of small and medium enterprises as well as members appointed on an ad personam basis.

⁹ The consultancy report can be downloaded from OFTA's website at <http://www.ofta.gov.hk/en/report-paper-guide/report/consultancy.html>.

Figure 2
Mobile Party's Network Pays (MPNP) Model

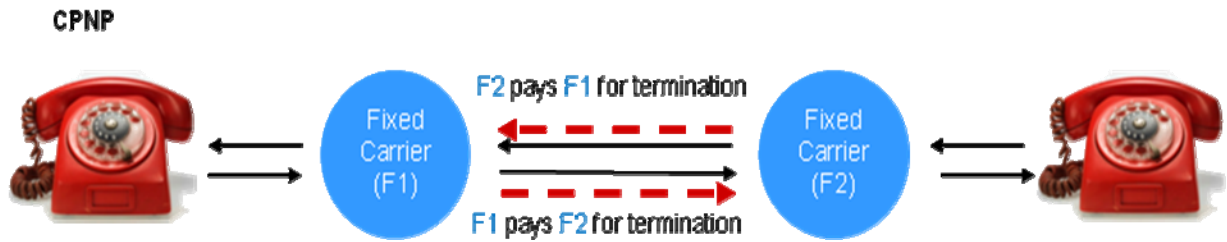


11. The regulatory guidance for FMIC was withdrawn in April 2009 in view of fixed-mobile convergence¹⁰. Since then, FMIC has been settled among fixed and mobile carriers through commercial negotiations, and the industry has in general adopted the Bill and Keep (“BAK”) arrangement for FMIC. Under the BAK arrangement, interconnecting parties agree to exchange traffic with each other without the levy or payment of interconnection charge. The consultant has quoted a number of benefits of the BAK arrangement, e.g. saving of resources which are otherwise needed for negotiating the level of interconnection charge among operators, saving of transaction costs of interconnection billing as well as costs for resolving billing disputes, and incentivizing carriers to improve network cost efficiency.

12. Currently, FFIC is still subject to regulatory guidance in favour of calling party's network pays (“CPNP”) model. Under the CPNP model, the originating fixed carrier pays a termination charge to the terminating fixed carrier. Figure 3 below shows the direction of traffic and interconnection payment under the CPNP model.

¹⁰ With the advent of new technologies, fixed and mobile services are converging. In the environment of fixed-mobile convergence, it may become difficult to classify clearly whether a service is a fixed or a mobile service as the service may be used by customers at fixed locations on some occasions and in motion on other occasions.

Figure 3
Calling Party's Network Pays (CPNP) Model



13. The consultant is of the view that there is a strong case for withdrawing the regulatory guidance for FFIC such that all types of voice interconnection charging in Hong Kong will be left to the market to decide through commercial negotiations. The consultant predicts that such a withdrawal is likely to lead to an outcome of BAK arrangement for FFIC, which will obviate the need for cost-allocation in estimating the cost of voice termination on a multi-service NGN. In view of these considerations, the consultant recommends that OFTA should consult the industry on the withdrawal of regulatory guidance for FFIC as soon as possible.

Interconnection architecture and standards for interoperability

14. Telecommunications networks may interconnect with each other through different architectures, and the choice is usually driven by commercial considerations of the interconnecting parties. While some networks may choose to interconnect directly on a bilateral basis, others may choose to interconnect through a common location so that they can have access to multiple networks without the need to establish multiple bilateral interconnections. Under Government's light-handed and market-driven approach, it will be more appropriate for the industry to discuss and reach consensus on the interconnection architecture. As such, the consultant recommends that the NGN Working Group¹¹ established under the Regulatory Affairs Advisory Committee should discuss the appropriate NGN interconnection architecture for Hong Kong.

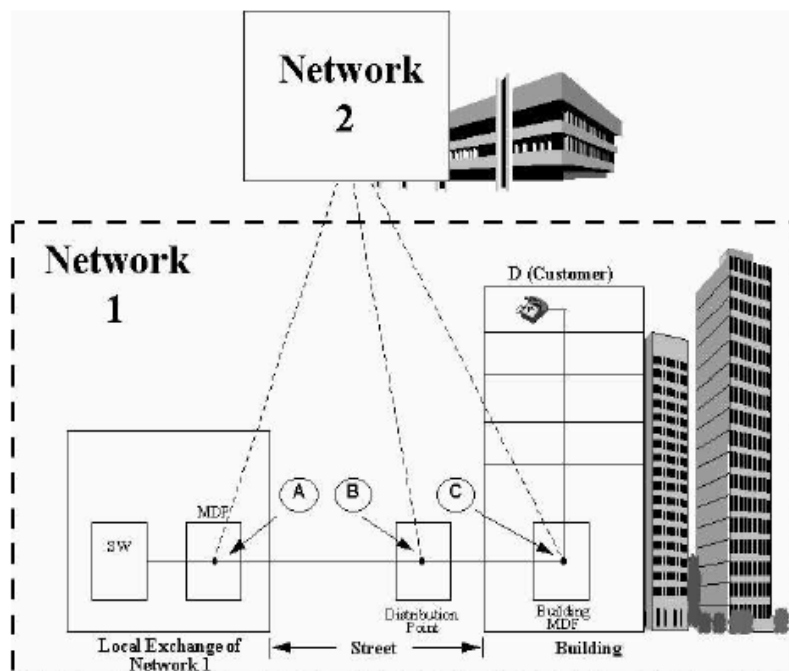
¹¹ The composition of the NGN Working Group is the same as that of the Regulatory Affairs Advisory Committee.

15. Similarly, the consultant recommends that the Technical Standards Advisory Committee¹², an advisory committee established under OFTA, should develop the appropriate standards profiles for Hong Kong in order to enable interoperability with NGNs.

(B) Next Generation Access (“NGA”)

16. The access network for an NGN is also referred to as NGA which may be wired or wireless. For a wired access network, as illustrated in Figure 4 below, it runs from local telephone exchanges (i.e. Point A in Figure 4) to individual buildings (i.e. Point C) and then, via the in-building telecommunications system (“IBTS”) within the buildings, to individual residents or occupants of the buildings (i.e. Point D).

Figure 4
Wired Access Network



¹² The Technical Standards Advisory Committee is chaired by OFTA and its members include a number of industry associations, Consumer Council, Hong Kong Productivity Council, local fixed carriers, mobile carriers, representative of external fixed carriers, representative of external service providers, representative of mobile virtual network operators, representative of paging operators, representatives of free TV, pay TV and sound broadcasters, as well as members appointed on an ad personam basis.

17. If a fixed carrier does not have its own IBTS inside a building, it would need to share the existing IBTS in order to provide services to residents or occupants of that building. The effective sharing of IBTS within buildings is therefore a critical requirement for the comprehensive rollout of NGA and the provision of high-speed broadband services by fixed carriers to end customers who reside or do business in the building. To facilitate effective sharing of IBTS among fixed carriers, the consultant recommends that the Technical Standards Advisory Committee should consider whether standards are required at the relevant interfaces for sharing.

(C) Network security

18. As the architecture of NGN moves from a closed platform to an open platform that runs everything over IP technologies, the chance of network intrusion will inevitably increase. As such, an NGN without proper security measures in place would be highly vulnerable to malicious attacks and would pose security threats to its users. With a view to providing practical guidance to the industry on the necessary security measures for the proper operation of NGN, OFTA issued the security guidelines for NGN in April 2010. Apart from that, OFTA has also issued other guidelines for enhancing network security in Hong Kong, for example the guidelines on the security aspects for the design, implementation, management and operation of public Wi-Fi service issued in October 2007 (and revised in July 2008), as well as the guidelines for cable-based external carriers and Internet service providers to report network and service outage to OFTA issued in March 2007 (and revised in January 2008 and July 2011).

19. While recognising the effort of OFTA in enhancing network security in Hong Kong, the consultant notes that there are currently no minimum network security standards in Hong Kong and therefore recommends that the Technical Standards Advisory Committee should establish such as well as a mechanism for ensuring compliance with these standards.

(D) Emergency call service (“ECS”)

20. Based on public interest ground, the consultant recommends that NGN carriers, same as non-NGN carriers, should provide the public with free access to ECS such that the user can, without incurring any charge, communicate with the Hong Kong Police’s ECS centres. Furthermore, NGN carriers should ensure that emergency calls can be reliably and immediately delivered across their networks and network gateways to the ECS centres. To enable the prioritisation of delivery of emergency calls over NGN, the consultant recommends that the Technical Standards Advisory Committee and the NGN Working Group should develop NGN signalling standards as well as specifications for reservation of sufficient transport capacity in NGN for such prioritisation.

Recommendation to be considered in the longer term

(A) Interconnection

Conversion between Time Division Multiplexing (“TDM”) and IP

21. TDM is the technology adopted by the legacy circuit-switched telecommunications networks. On the other hand, NGN is based on IP technology. When a message is transmitted between a traditional network and an NGN, certain technical conversion between TDM and IP needs to take place and cost will be incurred. Currently, we have fewer NGN carriers in Hong Kong than non-NGN carriers. As a result, TDM-IP conversion cost is fully borne by NGN carriers. The consultant does not see any problems with this arrangement in the near term. However, as more traditional networks migrate to NGN in the future, such cost sharing arrangement may not be reasonable. The consultant therefore recommends that OFTA should consider issuing guidance in due course if the issue of sharing TDM-IP conversion cost cannot be resolved by the industry.

Basis for determining interconnection charges under the Telecommunications Ordinance (“the Ordinance”)

22. Under section 36A of the Ordinance, the Telecommunications Authority (“TA”) is empowered to determine the terms and conditions of interconnection, including but not limited to the level of interconnection charge. The charges in a determination shall be based on the relevant reasonable costs attributable to interconnection. The consultant considers that the TA, in determining interconnection charges under section 36A of the Ordinance, should be provided with the flexibility to adopt more economically efficient models, instead of simply cost-based models. Furthermore, the consultant is concerned that the requirement to set cost-based interconnection charges in a determination may create uncertainty for the industry as carriers may commercially agree not to impose any interconnection charge among themselves, in particular after the withdrawal of regulatory guidance on FFIC as recommended by the consultant (please see paragraph 13 above). As such, the consultant recommends that OFTA should consider a review of section 36A of the Ordinance in due course such that the basis for determining interconnection charges under the Ordinance can reflect economic efficiency, which includes but is not limited to cost-based considerations.

23. To enhance regulatory certainty, the consultant recommends that the TA may consider issuing guidelines to set out the relevant factors that may be taken into account when determining interconnection charges based on economic efficiency. Examples of the relevant factors quoted by the consultant include maximising economic welfare, encouraging efficient investment and promoting efficient market entry.

(B) NGA

Access to common parts of “single-owner” buildings for installing telecommunications facilities

24. Local fixed carriers may need to have access to the common parts of buildings in order to install telecommunications facilities for

provision of services to the residents or occupants of the buildings. The TA may grant authorisation under section 14(1) of the Ordinance to a local fixed carrier for accessing common parts of a building to install telecommunications facilities if the fixed carrier can demonstrate that the rollout of its self-built access network to the building requires such access for the purpose of serving only the residents or occupants of that building.

25. In the study, the consultant points out that fixed carriers encounter difficulty in gaining access to common parts of buildings which are owned by a single owner. In such “single-owner” buildings, although there may be multiple tenants, all areas within these buildings are owned by a single owner. Fixed carriers find it difficult to demonstrate that there are common parts in these buildings and hence cannot install facilities in such buildings. This creates obstacles for fixed carriers in rolling out their NGA to “single-owner” buildings and providing high-speed broadband services to the tenants in these buildings. As such, the consultant recommends that OFTA should consider a review of section 14 of the Ordinance in due course such that fixed carriers will have the same access right to common parts of “single-owner” buildings, which they currently enjoy for “multiple-owner” buildings.

Way forward

26. For those recommendations which have already received broad support from the industry, e.g. the withdrawal of the regulatory guidance for FFIC following industry consultation, OFTA will embark upon the exercise shortly. In addition, OFTA will task the relevant working groups and advisory committees to start discussion on the various issues as recommended by the consultant, including –

- interconnection architecture;
- standards for interoperability;
- standards for effective sharing of IBTS;
- minimum network security standards; and
- signalling standards as well as specifications for reservation of transport capacity for prioritisation of delivery of emergency calls over NGNs.

27. For those recommendations that are to be taken forward in the longer term, e.g. review of legislation, OFTA will closely monitor the development of NGN in Hong Kong and follow up on these issues in due course.

28. In sum, OFTA will consult the relevant stakeholders and the public before any final decision is to be made to the existing telecommunications regulatory framework in response to the NGN development.

**Commerce and Economic Development Bureau
(Communications and Technology Branch)
Office of the Telecommunications Authority
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