



COMMERCE COMMISSION

Next Generation Networks
Strategic Issues and Key Themes

6 May 2009

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Executive Summary

Next Generation Networks (all IP networks or NGN) have the potential to deliver significant social and economic benefits to New Zealanders. In a global economy, the provision of high quality, innovative and cost effective communication services are likely to have increasing importance for New Zealand's continued competitiveness and productivity.

A competitive marketplace is pivotal to the realisation of these benefits. If they are to be achieved and maximized, all stakeholders need to have a developed understanding of the issues and opportunities. Deployment of NGN is a significant investment which has the potential to fundamentally change the telecommunications market structure.

The implications for the competitive landscape will remain for many years. The more open and informed the debate at the early stages of the investment process, the greater the opportunity for competitive market outcomes to develop without subsequent need for regulatory intervention.

In March 2008 as NGN deployment strategies in New Zealand were just gaining interest from the public, media, industry and Government, the Commission initiated as a strategic initiative, this study of NGN issues. The Commission's intention was to facilitate robust discussions about the future competitive market to achieve the appropriate balance of investment incentives and competition that will enable a market-led transition to NGNs.

The study to date has generally raised the level of understanding of the NGN concepts as well as the opportunities and challenges they present. It has also shown where there is consensus of views and where there are gaps in understanding. Six key themes have emerged:

- **bottlenecks will continue to exist;**
- **there are several dimensions of open access networks; which are vital for enabling competition;**
- **NGN can be delivered over multiple technologies, not just fibre;**
- **interconnection and access remain essential features of a competitive market in the future;**
- **robust information on demand for next generation services is not publicly available; and**
- **it is important to ensure regulation reflects New Zealand market developments.**

These themes provide a strong indication of where the issues and opportunities around NGN deployment in New Zealand lie.

This report provides an overview of the views of stakeholders under each of the key themes and highlights where continuing information gaps exist.

Some of the areas where further assessment is required are not directly related to the Commission's role as telecommunications regulator. They are areas of work which the Commission believes need to be addressed if the potential benefits of next generation networks are to be fully utilised. The Commission encourages other parties to consider these as part of their future work programmes. Such areas may include technical interoperability standards, for example.

Next Steps

Consideration of the discussion of the key themes indicates that next generation networks can have a significant impact on competition. The Government's Broadband Investment Initiative (GBII) released in March 2009 also acknowledged this. The Government's broadband initiative will itself affect the likely competitive landscape in New Zealand.

Having considered this and all of the information from the study, submissions and conference, the Commission considers it can best add value to the ongoing debate by focussing its continuing work in the following areas:

- **open access;**
- **interconnection in an IP World;**
- **monitoring strategy; and**
- **regulatory principles.**

The Commission intends to consult on the work programme in due course.

Section 1 Introduction

In March 2008 the Commission launched a study into Next Generation Networks (NGN). The study is being undertaken pursuant to section 9A of the Telecommunications Act 2006, which empowers the Commission to conduct studies into any matter relating to the telecommunications industry or for the long-term benefit of end-users of telecommunications services within New Zealand.

In line with the Terms of Reference¹, the NGN study aims to:

- identify where there is consensus, and where and how views diverge;
- provide a strategic assessment of the likely impact of technological change on market structure and competition; and
- provide guidance as to where regulatory intervention is unlikely to be warranted and circumstances where regulation may be considered.

The Commission identified three workstreams², a questionnaire, discussion paper and conference, which would feed into a final report to help deliver these outputs. Information gathered from this process would be used to develop a set of scenarios³ to evaluate the potential market outcomes of NGN.

Following the *Broadband at a Crossroads* conference (NGN Conference) and analysis of the submissions on the discussion paper, the Commission recognised that absence of public data on demand-side drivers limited the feasibility of undertaking a robust study within the original proposed timetable.

Further, the release of the Government Broadband Investment Initiative (GBII) in March 2009 has the potential to shift how the market will develop and therefore the timing and priority of the issues that require debate. Accordingly, the Commission adapted the approach it is taking to deliver the outcomes of the study.

Instead of issuing a draft report and recommendations as originally proposed in the terms of reference, this report summarises the key themes that have emerged prior to the release of the GBII. It highlights where there is consensus, where there are gaps in information and additional work that is required to be undertaken for the competitive market outcomes to be fully achieved.

¹ See Appendix 1 for Terms of Reference for NGN Study.

² Fully described on page 7 of NGN Discussion Paper dated 24 December 2008.

³ Commission proposed to use this approach to capture potential market outcomes of NGN. See page 22 of NGN Discussion Paper dated 24 December 2008.

Key Themes

The key themes that have emerged are discussed below.

Bottlenecks will continue to exist

Competition at the retail and wholesale level is critical to the success of broadband in New Zealand. As technologies evolve, the competitive landscape changes. Bottlenecks are likely to continue to exist and new ones may emerge. Simply extending the current regulatory framework to NGNs would potentially risk diluting investments in NGNs altogether.

The challenge is to balance the need to provide incentives to enable efficient investment in new services with the need to ensure competition. The Commission will continue to monitor developments in NGNs and will undertake a review of the options available to achieve this balance.

There are several dimensions of open access networks

Open Access was widely acknowledged in the submissions as a term that has many contested meanings. The models for open access observed from deployments worldwide include both public and private investment.

To achieve the desired competitive outcomes in the broadband market, the terms and conditions of both private and public investment plans must be carefully aligned. The risks of not considering the implications of public investment on the overall competitive landscape can potentially lead to the emergence of enduring economic bottlenecks in private investment networks.

Interconnection and access remain essential parts of the market in the future

IP interconnection has received some attention throughout the consultation process. New Zealand has been recognised for progressing IP Interconnection issues ahead of other nations.

Some parties highlighted the role of the TCF IP Working Party in addressing this issue. Other parties have expressed the need for the Commission to maintain a watching brief over its progress, especially where there may be a manifestation of some form of market power.

NGN can be delivered over multiple technologies, not just fibre

The choice of technologies employed for broadband delivery will be essentially market driven. However, it will be important to identify the most likely technology options with implications for competition, i.e., network elements tending to be enduring economic bottlenecks. This is important because the options to promote competition are likely to vary depending on the technology deployed.

Information on demand for next generation services is not publicly available

Most of the information on NGN in New Zealand focuses on the supply-side, comparing various network architectures and the costs related to them. Public information on the demand for NGN services (such as applications and content), the willingness of users to pay for these and how the costs in delivering these services can be recovered is more limited.

Submissions have suggested that future demand for services would be useful in identifying the needs of consumers in New Zealand. This would form a key input in identifying initiatives to stimulate demand from both the private and public sector. This function falls outside of the Commission's role. However, from the Commission's perspective, demand-side surveys can potentially be used as a yardstick to gauge the effectiveness of the various regulatory tools used to deliver consumer benefits. The Commission will consider these issues as part of its ongoing monitoring strategy.

It is important to ensure regulation reflects New Zealand market developments

The appropriate regulatory paradigm for NGNs has attracted much attention in New Zealand as well as internationally following the deployment of broadband networks.

A number of regulatory approaches have been taken to enable the deployment of NGNs across the world, which have sought to strike a balance between incentivising efficient investment and ensuring effective competition. The available options must be carefully considered in the New Zealand context. In determining the appropriate regulatory approach for NGNs, it is important to take into account the risk of undoing the benefits delivered by existing regulation and reversing the effects of competition in the market today. The Commission is developing a set of overarching regulatory principles to guide its work on the approach to regulation.

Detailed discussion of these themes is outlined in the remainder of this report. This includes where the Commission considers additional work is warranted if New Zealand is to capitalise on the potential benefits of NGN.

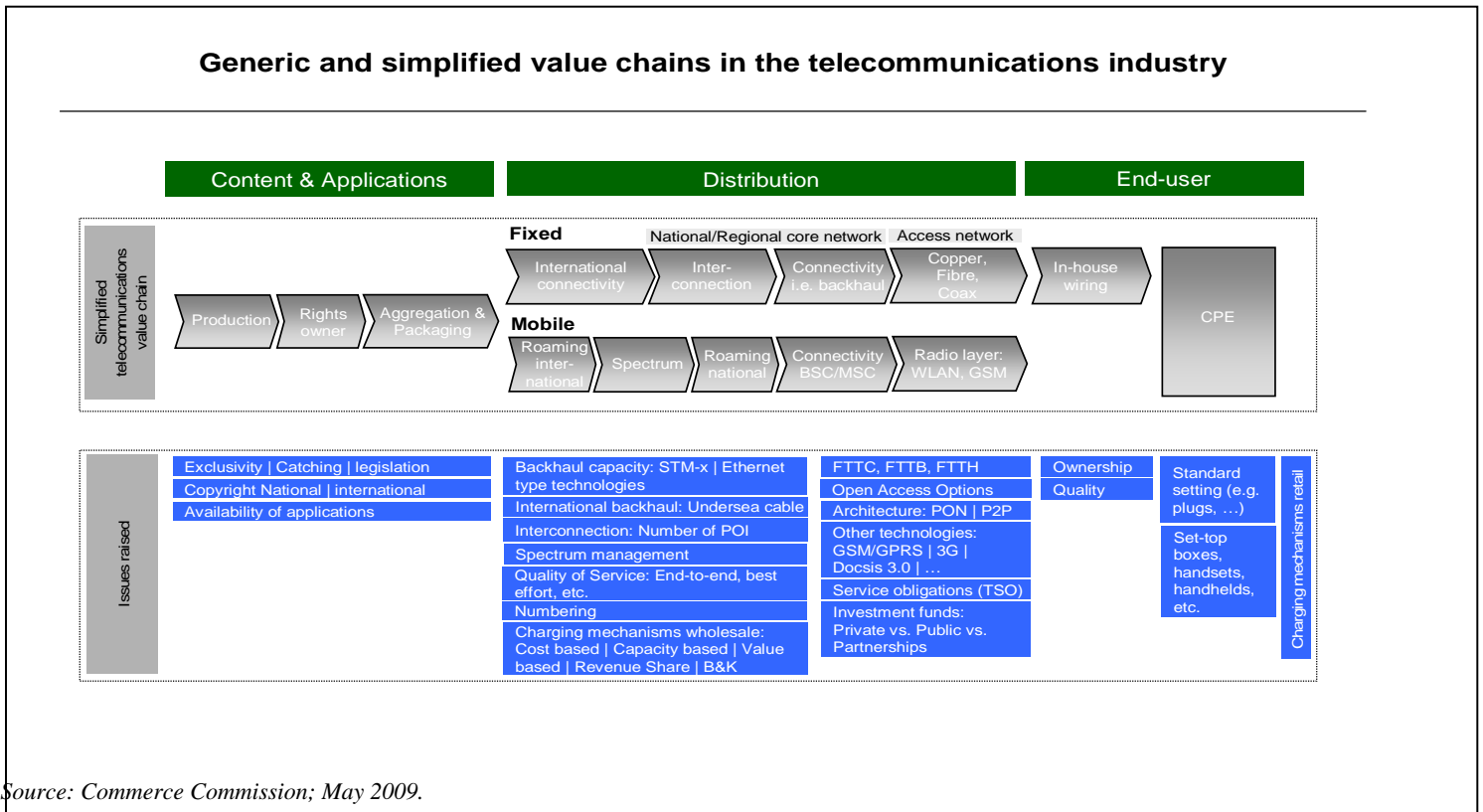
Section 2 The value chain

It is generally well understood that central to the concept of NGN is the ability of a unified IP based multi-service end-to-end network to deliver seamless services providing a specified quality of service. This concept enables full convergence of fixed and mobile networks, voice and data services as well as broadcasting services, driving the need for new investments in network infrastructure.

Convergence results in changes to the structure of markets along the value chain following the creation of new business models as operators and investors seek increased revenue and profitability, greater productivity and broader service offerings. This transition can potentially increase or limit competition (in which case, it may distort or undermine investments in infrastructure) in certain parts of the value chain.

The potential issues identified in the value chain based on the submissions received or issues that have been raised by a number of parties at the NGN Conference are shown in Diagram 1 below.

Diagram 1: Potential issues along the value chain

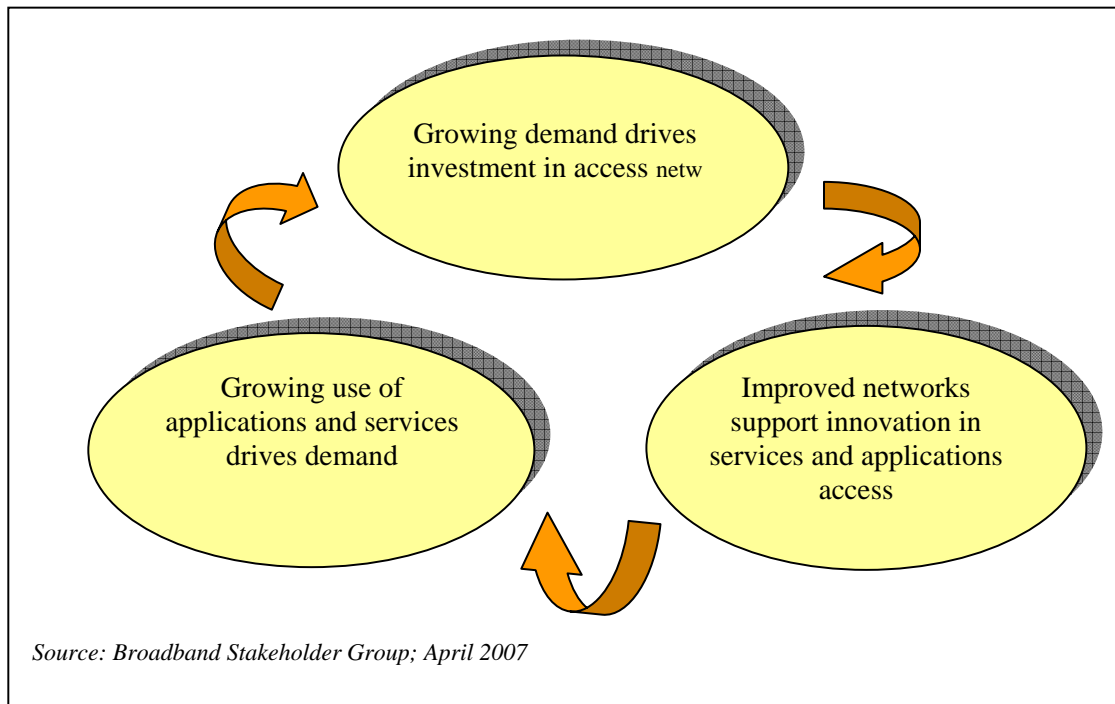


The responses to the Commission's consultations were received from a wide range of stakeholders. To some extent, this met the Commission's objective of keeping the NGN debate robust. However, some responses were particularly focussed on the network

infrastructure part of the value chain and the potential implications on the competitive environment at that level following the migration to NGN.

The opportunities and challenges of NGN are not just related to the need to secure efficient and timely investments and promote sustainable competition in the infrastructure layer. Network investment must be supported by having in place commercial business models that align the interests of operators with those of upstream content and service providers and end-users as demand for broadband increases. Diagram 2 below illustrates the broadband virtuous cycle.

Diagram 2: The broadband virtuous cycle



International developments have shown that countries with high broadband ranking and those that have progressed rapidly from lower rankings have had strategies that address competition issues in markets across the value chain. Such strategies consider both demand (uptake) and supply sides of the value chain, and are not solely focussed on “building the pipes”. Examples include:⁴

- United Kingdom
 - Digital Britain Report - outlined several strategies to reshape the communications, entertainment and knowledge industries.
- Japan

⁴Discussed at Commissions NGN Conference on 26 & 27 February 2009.

- adopted a comprehensive strategy for broadband deployment involving the private and public sector which includes a plan to stimulate demand at the national level.
- France
 - France Numerique 2012 Plan - designed to strengthen France's digital position and enhance its broader competitiveness.

A review of international developments so far has revealed that there is not a single best practice model for NGN deployment. This point was reiterated at the Conference where presenters highlighted that deployment strategies overseas vary significantly and are often attributable to economic, competition, social and political factors.

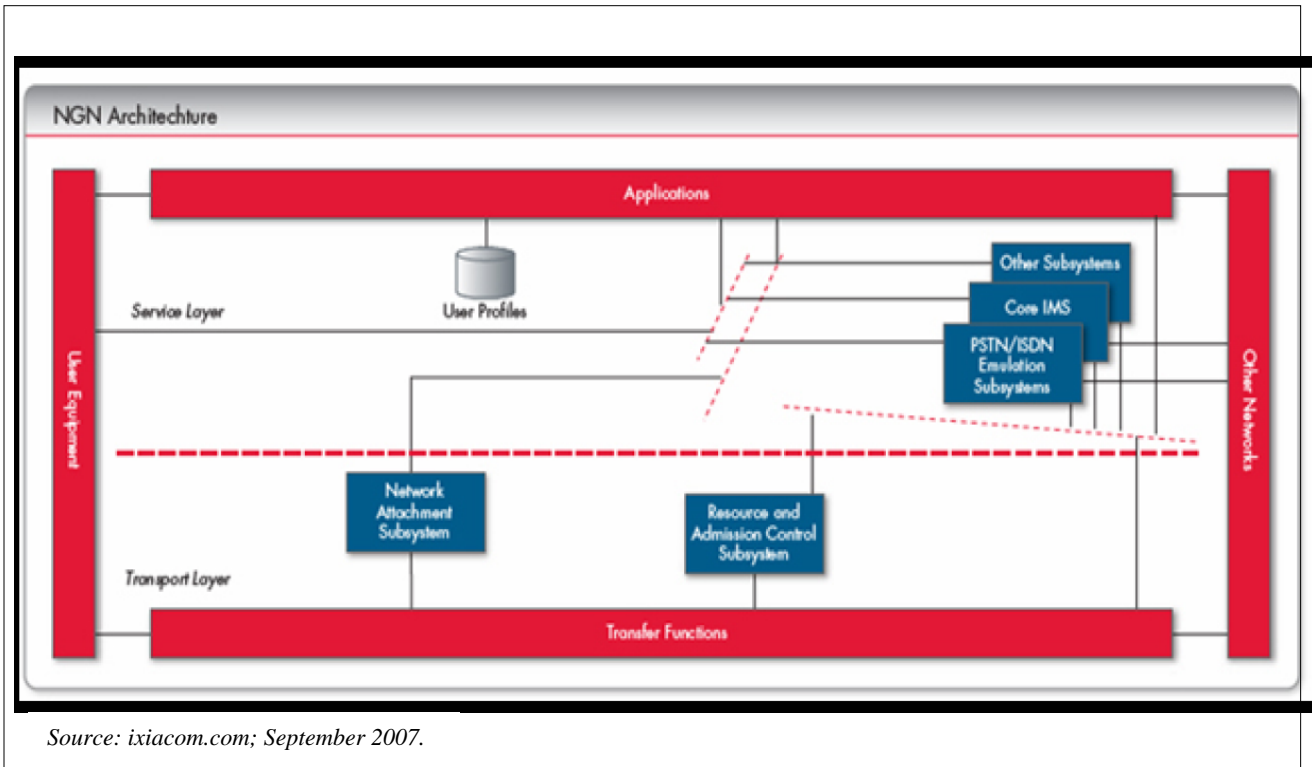
While there are lessons to learn from overseas, the most important is that there is no "one size fits all" approach. The experiences overseas must be considered in the context of the specific market and regulatory framework of each country. Similarly, there is no overseas jurisdiction that shares similar characteristics with New Zealand, so no single approach is likely to be suitable for wholesale adoption.

Overall, it is important to understand that to spur broadband performance it is crucial to address both the supply and demand sides of the equation.

Section 3 Bottlenecks

The key characteristic of NGNs is the de-coupling or separation of the transport (connectivity) portion of the network and the services that run on top of that transport layer. By separating transport and service layers, a provider can enable a new service by defining it directly at the service layer without considering the transport layers as illustrated in Diagram 3.

Diagram 3: NGN – Core, Access and Services



Source: ixiacom.com; September 2007.

The Commission raised in the Discussion Paper the question of whether bottlenecks will still exist in an NGN environment.

Submissions were generally made in the context of announced rollout plans and the open access model referred to in the previous *Broadband Investment Fund* initiative⁵. Varying views were expressed, indicating that bottlenecks can potentially be present in the access, core, international connectivity and other parts of the value chain.

As service and transport layers are increasingly independent, there are likely to be implications for future competition. Bottlenecks will still exist. They may be in different parts of the value chain and as one bottleneck is addressed, other bottlenecks may arise.

⁵http://www.med.govt.nz/templates/StandardSummary____38669.aspx

Access network (NGAN)

Wholesale access to both active and passive services is necessary to facilitate competition

There is a wide range of technology options that could be used to deliver NGAN. These include fibre, copper and coax based wired options, mobile, wireless and satellite. However, the debate has been mainly focussed on fibre-based deployments, i.e., fibre-to-the-cabinet (FTTC) and fibre-to-the-home (FTTH) architectures which will transform current access models.

With the exception of one view which said that fibre-based next generation access networks (NGAN) should ideally remove bottlenecks altogether⁶, parties stated that changes to bottleneck characteristics are likely to arise. This is because of the high cost of investment in FTTC and FTTH topologies, and it is therefore less likely that there will be broadband based infrastructure competition.

Against this background, wholesale access to both active and passive services (with regulated access where necessary) is regarded as necessary to facilitate both facilities-based and services-based competition (in varying degrees). No one solution is deemed sufficient to deliver competitive outcomes.

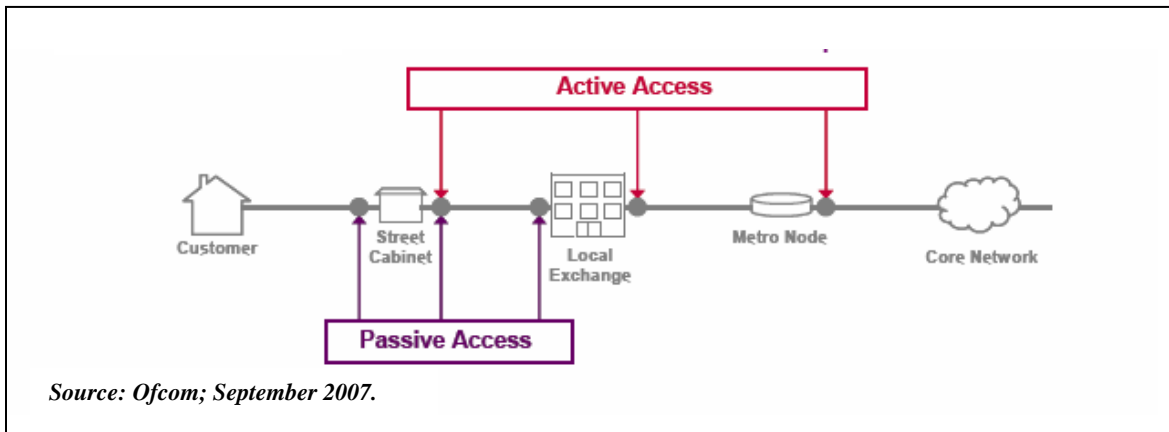
There is now a strong recognition of this in current international work, including:

- United Kingdom
 - policy framework for Delivering Super-Fast Broadband in the UK;
- the European Union
 - recommendation on regulated access to Next Generation Access Networks; and
- Australia
 - reflected in requirements for National Broadband Network.

Diagram 4 below provides an illustration of these competition options.

⁶However, they will remain if there is a monopoly infrastructure provider.

Diagram 4: Range of options for NGAN competition



Passive access refers to wholesale products based on direct access to physical elements of the access network, but does not include any form of electronics. Examples include access to ducts, unbundled copper loops or dark fibre. Active access refers to wholesale input products that are based on both active electronics and the physical elements of the access network. An example of this is bitstream access.

Submissions have placed considerable emphasis on the need to have access to active wholesale services. Reliance on what is described as “connectivity-based access services” is based on the assumption that local loop unbundling (LLU) and sub loop unbundling (SLU) options may not continue to be feasible in the long run. This is mainly due to the technological and economic constraints inherent in the network.

It was further indicated that the overall competitiveness of the market depends on the ability to access a product which is “raw”. This provides access seekers with the ability to control their own Quality of Service (QoS) leading to sufficient flexibility in product development and service delivery to drive innovation and deliver differentiated products.

Another point of view noted was that intramodal (service-based) competition⁷ is unable to deliver the full benefits of NGN. Other technology options such as mobile and satellite should be considered for the full benefits of NGN to be realised, hence placing heavier reliance on having competing networks.

Core network

An increase in the capability of the access network must be matched with the capability of the backhaul network

⁷ Intramodal competition in contrast to intermodal competition refers to a situation where competition arises between two or more services suppliers using the same underlying infrastructure.

The access component of NGNs described above is regarded as only one part of the connectivity equation of the overall business model and therefore cannot be viewed in isolation when considering the full potential of NGNs. Against this background, some parties considered backhaul capacity as having a significant economic impact on the end-user and the operator than last mile access.

Submissions stated that technical bottlenecks of future NGNs are likely to follow a similar pattern to the internet traffic bottleneck, notably in limitations of capacity in the core network. An increase in the capability of the access network must be matched with the capability of the backhaul network which is required for both fixed and wireless networks as it forms an important part of the technology mix. Without adequate capacity dimensioning to meet the commitments made by operators on speed capabilities, there will be little or no improvements to overall broadband performance.

In addition, submissions stated that currently backhaul is sold as a managed service in units of capacity which makes the costs of acquiring this service prohibitive given the capability of FTTH delivery in the access layer. Therefore, backhaul will need to be provided in a more flexible way, for example, unconstrained capacity as demand increases.

International connectivity

A considerable number of submissions raised concerns about international connectivity and the high cost of capacity provided over the Southern Cross Cable between New Zealand and Australia. As demand for broadband services increases in the long term, there will likely be a need for additional high capacity connectivity. This issue is exacerbated by the flow of high traffic volumes as content is consumed from overseas. It was further stated that due to a lack of alternatives for the Southern Cross Cable this potential bottleneck issue should be immediately addressed by considering an alternative connection.

Other parts of the value chain

Another view expressed is that it should not be assumed that historical network bottlenecks will be repeated in the NGN environment. Changes in the value chain may result in bottlenecks emerging in different places, for example at the content level.

Need to provide sufficient incentive to enable efficient investment in the long run with the need to ensure competition

NGN is part of a continuum. As technology evolves it changes the competitive landscape and with this, bottlenecks will still continue to exist or likely shift elsewhere in the network. Simply extending the current regulatory framework to NGNs potentially risk

securing adequate and timely investments in NGNs altogether. At the same time, competition at the retail and wholesale level is critical to the success of broadband in New Zealand.

The challenge is to balance the need to provide sufficient incentive to enable efficient investment in new services with the need to ensure competition. The Commission will continue to monitor market-led developments in NGNs and will undertake a review of the options available to achieve this balance.

It is widely recognised that one way of facilitating competition in networks which are potentially enduring economic bottlenecks is through the establishment of open access networks (discussed in the following section). The Commission intends to explore the various options of open access and has accordingly identified this area as part of its ongoing work on NGN (see Section 9).

Against this background, several submissions have urged the Commission to assess the need for wholesale access bitstream services. In addition, concerns were raised in regard to having adequate and affordable backhaul capacity and increased international capacity.

The Commission will continue to monitor the progress made by industry in these areas prior to making a decision to intervene in order to respond to the needs of the market.

Section 4 Open access

The existence of competitive pressures in the market is an important determinant for investment in NGNs. In the most advanced markets such as the Netherlands, competition between telecommunications companies and cable operators to deliver TV-like entertainment services over these networks is driving investment.

In markets where there is no competing infrastructure, it is specifically necessary to balance the incentives to invest and desire to promote competition. Ideally, the choice of technology and design of the network will help facilitate that balance.

It is important to understand that solutions employed to introduce facilities-based competition will shape the competitive landscape of the market in a certain way for a very long period. Establishing an open access network is one way of achieving facilities-based competition and most often regarded as being the most cost efficient way of recouping investments given the high capital cost involved deploying NGNs. Hence, it seems likely that NGNs could become non-replicable assets in the long term.

No common definition of open access

Discussions around open access by stakeholders were mainly confined to the NGAN component. Open Access was widely acknowledged in the submissions as a term that has many contested meanings. The definitions provided as such were wide ranging and contained significantly conflicting views. A summary of the definitions provided in the submissions are reflected in Appendix 2.

The Commission identified three recurring elements present from the definitions provided, i.e., should open access:

- apply to private and/or public networks;
- be granted to all or selected network layers, i.e., network assets which are deemed difficult to replicate and where use of those assets provide operators flexibility to control their own services which in turn enables product differentiation; and
- be provided on non-discriminatory terms and conditions.

Open access platforms may accelerate wholesale revenue for incumbents

In overseas markets where copper local loop unbundling has been implemented in a competitive market, a subsequent paradigm shift by the incumbent to encourage anyone to use their network on the same terms (open access) has resulted in positive growth across these segments:

- an increase in end-user uptake of unbundled services;
- more competitive market structure with multiple players; and
- increase in profitability for the incumbent.

A significant factor to this is that wholesale revenues have been critical to the overall business case of incumbents. This is seen for example in:

- France - France Telecom has shown growth in wholesale revenue as a result of unbundling requirements imposed by the Government in 2002; and
- Netherlands - KPN stated that allowing competitors on their network translates to having all services run on their network. This results in lower cost per service and ultimately, an increase in the subscriber base. In the case of KPN, the decision to implement an open access network was driven by competitive pressures from competing cable network operators.

Because telecommunication networks have significant upfront investment as well as significant economies of scale and scope, network providers are starting to recognise that those who offer open access business models are likely to be more successful than network providers with a walled-garden business approach. This is because increasing volumes that result from an open network model are likely to off-set the lower per-unit price, maximising the overall returns as well as decreasing the payback period. This suggests that there may be commercial imperatives for operators of NGNs to provide wholesale services.

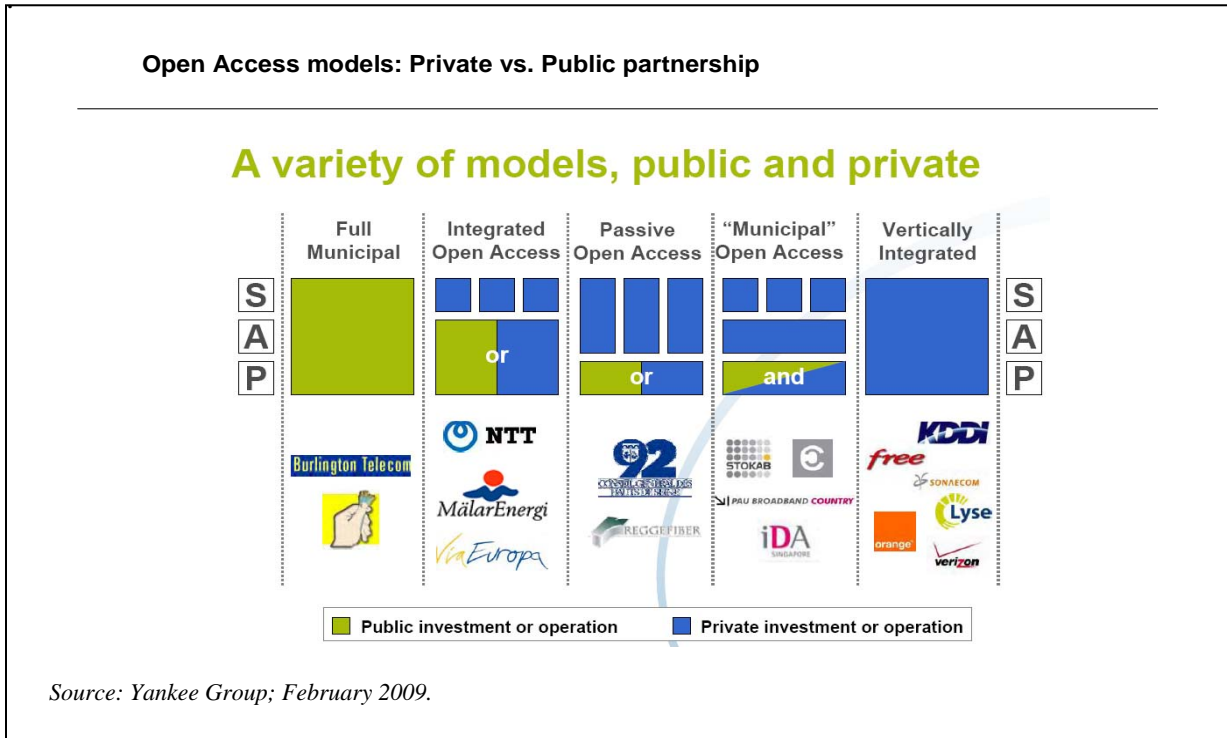
Facilities-based competition is therefore encouraged by introducing an open access regime which, in principle, is expected to deliver the similar outcomes for incumbents once market participants are able to work out what is the most viable option based on the local environment. Arguably, the question of having to balance investments and the promotion of competition in markets with no competing networks does not arise.

More than one open access model

The models for open access observed from deployments worldwide include both public and private investment networks although some parties are of the view that the open access regime should only form the basis of public sector intervention initiatives only.

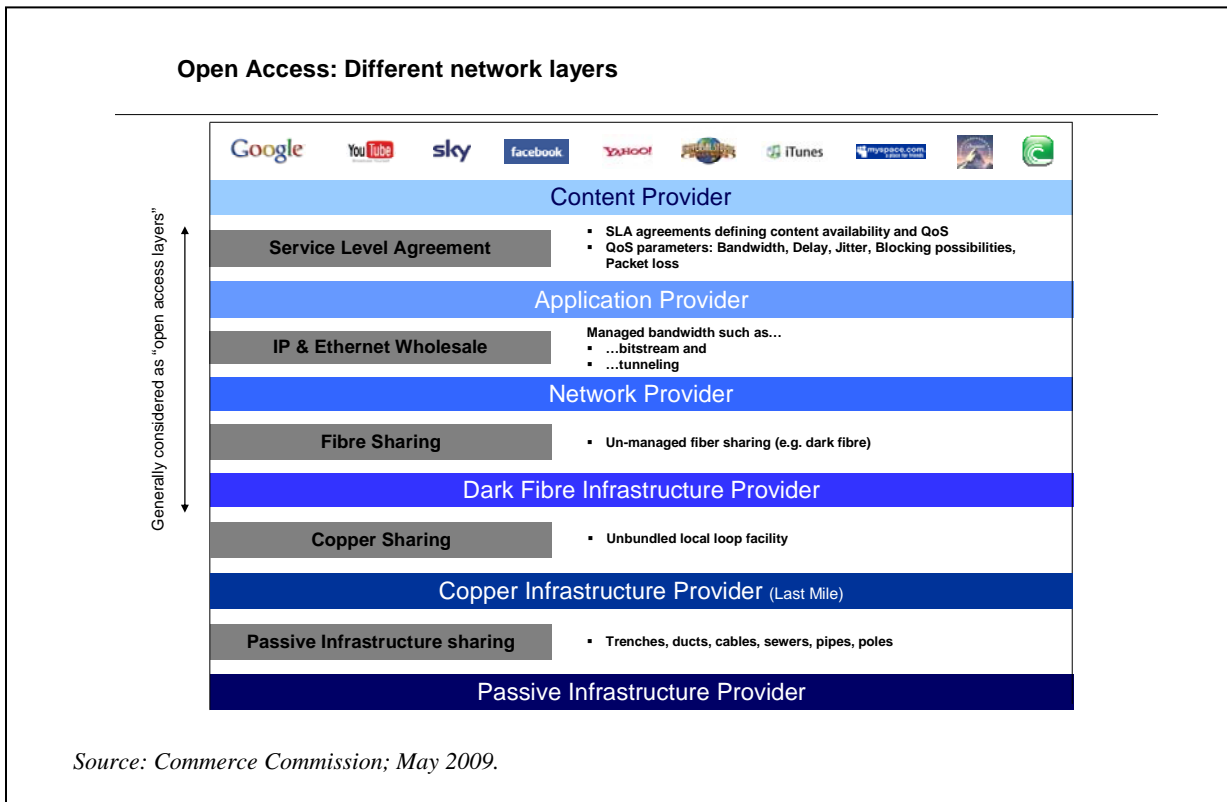
Facilities-based competition through open access can be introduced across all network layers regardless of the nature of network investment and structural design of the operating companies. Open access regimes overseas are made up of a variety of models and ownership structures as shown in Diagram 5. These models are based on fibre access networks which are believed to be the most likely deployment method for NGAN.

Diagram 5: Range of open access models



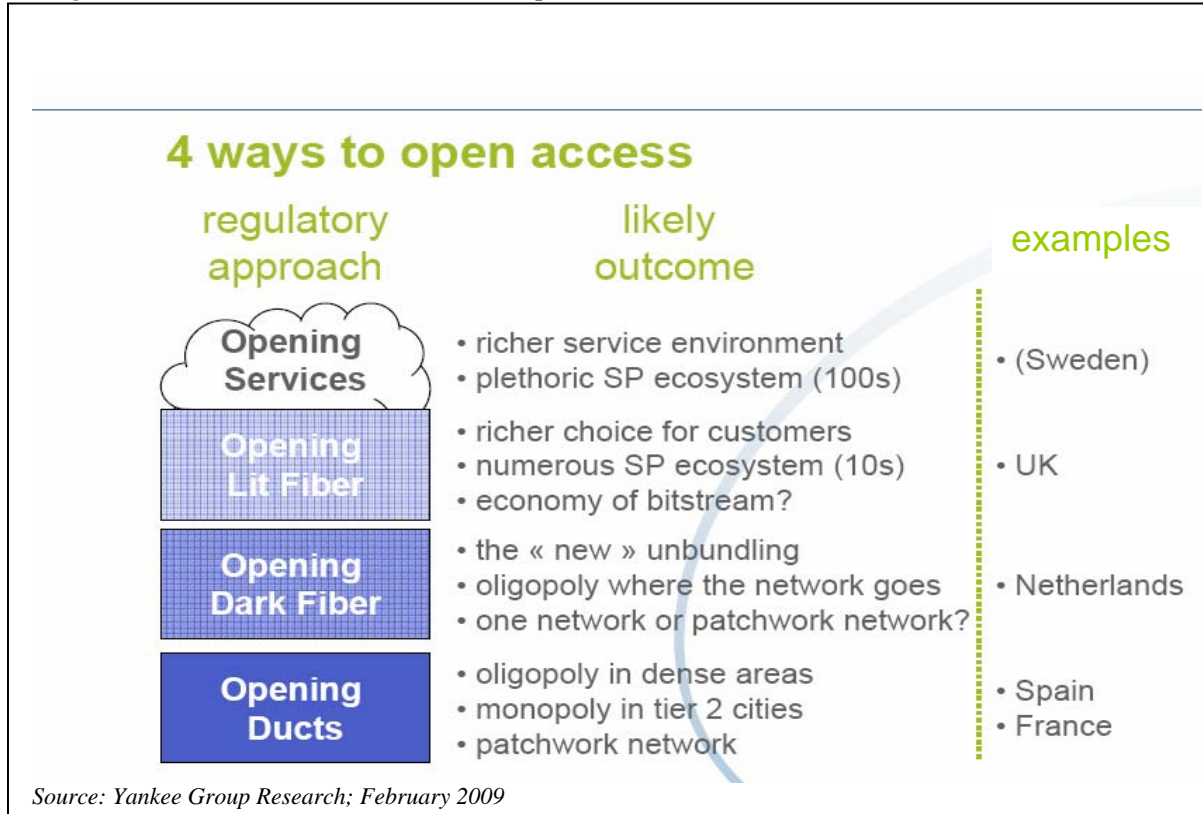
The possible options for open access discussed are shown in Diagram 6 below.

Diagram 6: Possible options for open access



Each of these options has been introduced in various European markets and are likely to deliver very different competitive market outcomes as seen in Diagram 7.

Diagram 7: Potential market outcomes with Open Access



The open access approach is about creating a set of core requirements

The network operator who builds and operates an open access network defines the entry conditions for potential service providers. The technological choices in the network and the commercial access conditions influence the way other service providers interconnect to the network, which facilities they have to provide for themselves and which facilities are shared.

To achieve the desired outcomes for competition in the broadband market, the terms and conditions of both private and public investment plans must be carefully aligned. The risks of not considering the implications of public investment on the overall competitive landscape can potentially lead to the emergence of enduring economic bottlenecks in private investment networks.

The key elements to build a framework for open access include:

- **competition** - at all layers in the IP network, i.e., infrastructure, transport and service layers for the core and access components (allowing a wide variety of physical networks and applications to interact in an open architecture);
- **transparency** - to ensure non discrimination within and between layers (that allows clear, comparative information on market prices and services); and
- **interoperability** – circumstances where everyone can connect to everyone else at the layer interface (so that any size organisation can enter the market and no one obtains a position of dominant market power).

These apply to both private and public networks, including those based on wired and wireless technologies. Accordingly, the Commission intends to develop a work programme to further study open access across the value chain. It will be targeted at formulating a minimum set of requirements.

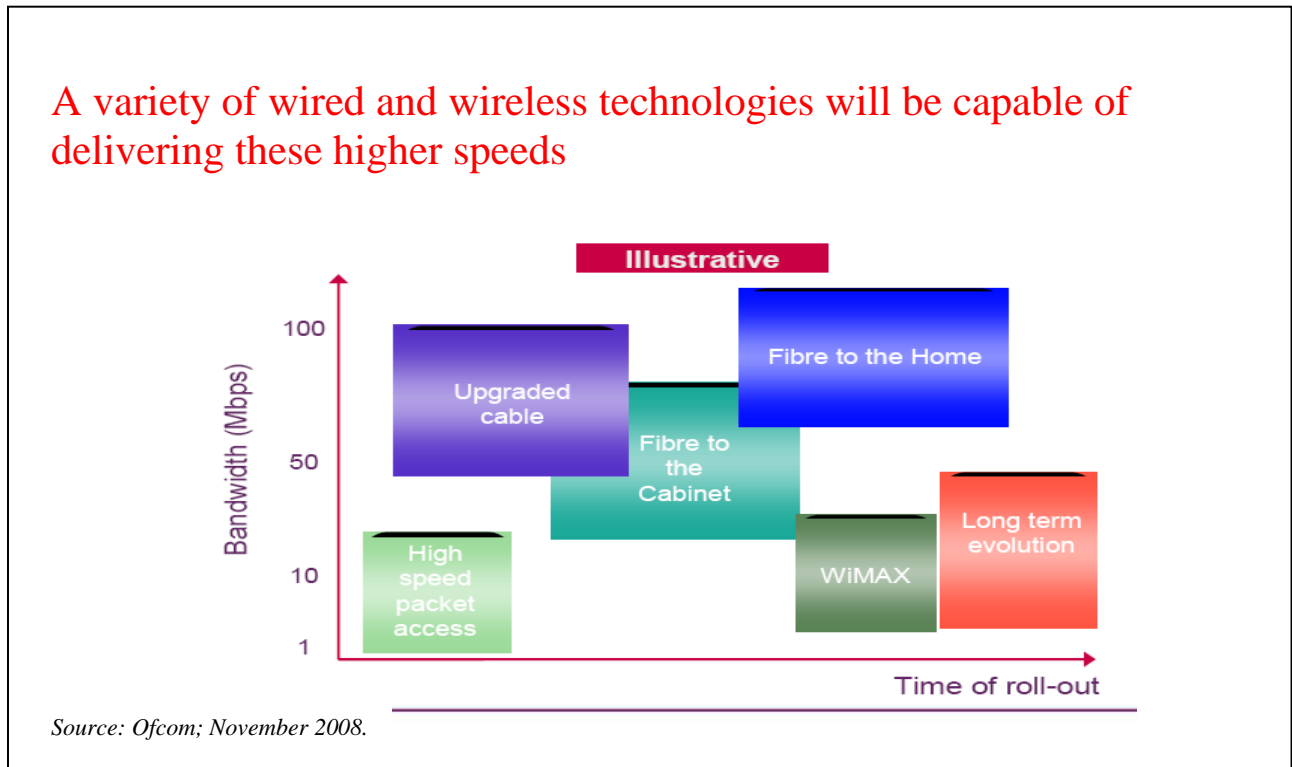
The GBII has outlined that local fibre companies will be required to provide access at the dark fibre layer. They will be required to adhere to common technical and commercial standards for open access for dark fibre and any wholesale dark fibre services. The Commission will take into account any policy developments in the GBII process, such as confirmation of open access arrangements, which will affect the Commission's work programme in this area.

As the development of open access requirements in one part of the network affect the competitive outcomes in other layers, ideally consensus on the minimum requirement should be set early in the process of developing the Government's initiative.

Section 5 Technologies

The generic definition of NGN is one that is technology neutral and focussed on the characteristics required to deliver innovative forms of content, services and applications. In practice, there is a wide range of technologies capable of delivering next generation broadband. Some are effectively evolutions of existing infrastructures that have already been deployed, while others involve the deployment of entirely new physical infrastructures. Diagram 8 provides an illustration of the various technologies and their respective capabilities.

Diagram 8: Wired and Wireless NGN Technologies



In this regard, submissions expressed the need to consider the importance of taking a technology neutral approach as different technologies can deliver different cost effective solutions for different circumstances. As demand for higher bandwidth increases, higher bandwidth technologies will be crucial and this includes LTE, WIMAX and fibre. Different technologies have different cost structures, different capabilities and different optimal demographic and geographic target.

Out of all these technologies (besides fibre), there is considerable emphasis on the potential for mobile (3G, LTE) and wireless (WiMax) networks to provide alternative solutions for broadband delivery. Parties have stated it is important to recognise that:

- NGN is already delivered through a combination of technologies including mobile (3G). Mobile and wireless technologies is said to provide the only feasible

method of supporting mobility and can be deployed rapidly and without the substantial cost of digging trenches and burying cables (it was noted that cost of deploying wireline technology has been prohibitive in various overseas jurisdictions);

- appropriately dimensioned wireless networks can come close to matching the characteristics of a wireline network particularly in areas where the wireline business case is not viable (for example, Telstra NextGen's national wireless network is said to offer high speed broadband at 14.4Mbps). Further, wireless standards are progressing rapidly and there is a widespread view that these networks could begin to deliver high-speed broadband connectivity using existing 3G and Long Term Evolution technologies; and
- satellite is an alternative for delivering broadband services in some rural areas, although with limitations with upstream bandwidth. Satellite has the potential to offer full geographic coverage.

At the international level, there is increasing interest in mobile networks deployment strategies. For example, the recently released Digital Britain report highlighted that mobility is now vital to consumers and businesses alike in the United Kingdom. This flexibility is said to apply equally to mobile broadband. Similarly, Japan is now shifting its focus to mobile rollout based on consumer demand for mobility, despite ranking highest in the world in FTTH deployment.

In consideration of this, international experts have cautioned against prematurely selecting a particular technology option before understanding the demands/needs and specific conditions of the market⁸. NGNs require capital intensive investments and it is therefore crucial to avoid getting locked into a single technology approach which may not prove to be commercially viable in the long run.

Options to promote competition are likely to vary depending on the technology employed

The choice of technology employed for broadband deployment will be market driven. At this stage, the Commission believes that it will be useful to identify technology options which are likely to result in enduring economic bottlenecks. This is important because the options to promote competition are likely to vary depending on the technology deployed. The Commission intends to address the issues associated with potential bottlenecks through the open access work programme.

⁸ NGN Conference; Kip Meek, Broadband Stakeholder Group.

Section 6 Interconnection

IP interconnection has received much attention throughout the consultation process. It is worthwhile noting that New Zealand has been recognised by a conference speaker to be progressing well ahead of other nations in tackling issues related to IP Interconnection. Submissions have highlighted that the TCF IP Working Party is currently addressing some of the issues but other parties have expressed the need for the Commission to maintain a watching brief over its progress, especially where this is a manifestation of some form of market power.

The discussions around IP Interconnection covered a range of different issues that are summarised in the following sections.

Definition of IP Interconnection

Neither the submissions nor the conference speakers agreed on a single definition of IP interconnection. Interconnection is seen as one essential service over the entire value chain, which enables operators to provide a QoS end-to-end service, beside other complementary services relating to access/connectivity. Speakers at the conference concluded that - in contrast to the PSTN world - IP-based interconnection is usually implemented by a mixture of interconnection and access, where IP-interconnection tends to be based on *peering arrangements* and the access services based on *transit arrangements*⁹. Some submitters pointed out that in practice interconnection and access services are overlapping, as interconnection always tends to include a share of access services (carriage of traffic).

The Commission will closely monitor the developments in this area and the corresponding work of the TCF IP Working Party as it is essential for a competitive future all-IP environment.

Points of Interconnection (POI)

The transition from the traditional PSTN networks to NGN will require a debate about the efficient number and the location of POIs. However, Conference speakers as well as submitters pointed out, that this discussion cannot be separated from the debate around the appropriate wholesale access service for transport/transit in an IP world. The TCF IP Working Party is currently addressing this issue and the Commission will closely monitor the developments in this area.

⁹ With peering, two Internet Service Providers (ISPs) agree to exchange traffic solely among their respective customers, sometimes without payment. On the other hand in the case of transit, one ISP agrees to carry the traffic of a customer (possibly also an ISP) to third parties, generally for a fee.

Pricing mechanisms and business models: Variety of different options

Speakers at the conference raised the issue whether different QoS requirements for different services (e.g., voice, data, IP traffic) would require different pricing mechanisms. Traditional providers of telecommunication voice services usually adhere to *wholesale* payment arrangements known as Calling Party's Network Pays (CPNP), where the network of the party that places (originates) a phone call makes a wholesale payment to the network of the party that receives (terminates) the call. CPNP arrangements are already problematic today due to the termination monopoly bottleneck. Carrying them forward at current fee levels into an IP-based NGN world could lead to a situation where the legacy bottlenecks of the past may be repeated in the future.

In the submissions Bill-and-Keep (B&K) arrangements have been considered to be an option under certain conditions.

Pricing mechanisms and business models are essential for competition in the long run, in particular where bottlenecks remain. Therefore, the Commission will closely monitor the developments and the corresponding work of the TCF IP Working Party.

Coordination of Standards and Interoperability are important

In most respects, technology and standards were seen by industry participants and submitters to be evolving satisfactorily in the market place, i.e., interoperability of networks. As such standards and interoperability issues are best addressed in the market place between different players. Areas addressed by submitters and conference participants where initiatives may be appropriate are how to deal with consequences of the exhaustion of IPv4 addresses¹⁰; the standard development in regard to classes of service for QoS, and for measurement of compliance to those classes; and initiatives for technologies that could over time ameliorate the termination monopoly, such as techniques to enable multiple operators to serve calls placed to a single telephone number.

The Commission believes that technical standards and interoperability issues are best addressed by market participants, for example through the TCF. However, where technical standards create barriers to entry or prohibitively raise costs for market entrants, the Commission will reserve the right to intervene. Therefore, the Commission will closely follow the industry developments in the transition phase from traditional to NGN based networks.

¹⁰IPv4 is the current version of of the [Internet Protocol](#). Each computer or device connected to the Internet must use an [IP address](#) in order to communicate with other systems on the Internet.

Section 7 Demand

Most often, the underlying assumption made when discussing the need to progress from narrowband to broadband is the substantial economic and social benefits broadband is set to offer. Many predict that widespread deployment of high speed broadband would deliver significant productivity gains for New Zealand. Therefore, the mass adoption of broadband is critical to every sector of the economy.

Following the widespread and rapid adoption of broadband worldwide, there is an increasing body of evidence that supports these claims. The release of the Digital Britain Report (United Kingdom) and the Castalia report press coverage (New Zealand) prior to the Conference steered the conversation to the demand-side drivers for broadband and importantly, measures that can be adopted to create the pull factor for broadband uptake. This involves both public and private sector initiatives. The Commission notes that Government Broadband Investment Initiative (GBII) has recognised the importance of public sector involvement and, accordingly, has aimed to encourage the readiness of all public sector agencies to take advantage of NGN.

From a commercial perspective, submissions narrowed down the demand-side drivers to the availability of content. The two associated details are discussed below.

“Build the pipes and they will come”(supply drives demand)

First, the key driver for broadband is ultimately demand and content. Towards this end, there is already a wide array of global and local content competitors in the value chain capable of delivering content via high speed IP-based networks. These range from:

- new online video on demand aggregators (Apple, Amazon);
- user generated content aggregators (YouTube);
- commercial and state-owned free-to-air broadcasters moving into online delivery (TVNZ On Demand, BBCiPlayer); and
- consumer electronics and gaming console manufacturers.

Based on the above, parties have stated that content is already being delivered to some extent by various technologies and platforms, including mobile. However, the greatest hindrance to increased distribution and adoption is current broadband reliability and speed.

IPTV is the key driver to broadband up-take

Second, mixed reactions were noted on the issue of whether IPTV is regarded as the key driver for broadband services. Some contend that the business case for IPTV is not yet proven. Initially, the introduction of IPTV was prevalent in markets which faced competition from cable operators. However, there is currently a huge amount of investment taking place worldwide in broadband enabled value added services, including IPTV. Therefore, some are of the view that there is certainly a viable case for IPTV. Its success will depend on having adequate broadband infrastructure and access to premium content. In the absence of these factors, there may be no room for IPTV to develop in New Zealand.

Close attention should be paid to the actual growth and future demand

While there is generally a degree of demand following the availability of NGNs, it has been observed that there is limited availability on demand-side studies (e.g., applications and content) and consumer understanding of broadband services. Studies conducted are private and intended for commercial purposes. Towards this end, some operators felt that they are in the best position to gauge future demand based on a sound understanding of their subscribers needs.

This lack of readily available information on demand for broadband services has also prevented the Commission from identifying the potential market outcomes for NGN by using the suggested scenario-based analysis approach within the timeframes of the study.

A large number of submissions have suggested that a robust demand-side study will be useful in identifying the needs of consumers in New Zealand. This will form a key input in identifying initiatives which will stimulate demand from both the private and public sector. Therefore, availability of demand data is important to help inform decision making by stakeholders across the value chain. This function however, falls outside the Commission's role.

From the Commission's perspective, demand-side surveys can potentially be used as a yardstick to gauge the effectiveness of the various regulatory tools used to deliver consumer benefit. The Commission will consider this as part of its ongoing monitoring strategy.

Section 8 Regulation

The appropriate regulatory paradigm for NGNs has attracted much attention in New Zealand as well as internationally following the deployment of broadband networks.

A number of regulatory approaches have been taken to enable the deployment of NGNs across the world, which have sought to strike a balance between incentivising efficient investment and ensuring effective competition. The available options must be carefully considered in the New Zealand context. In determining the appropriate regulatory approach for NGNs, it is important to take into account the risk of undoing the benefits delivered by legacy regulation and reversing the effects of competition in the market today.

The need for consistency, certainty and predictability in the regulatory framework

The issue of an appropriate regulatory framework was raised by industry from the initial consultations on the Terms of Reference. In an endeavour to commence a discussion on facilitating a competitive environment with the transition to next generation networks the Commission proposed a set of possible regulatory principles in the NGN Discussion Paper which it considers will add value in facilitating the transition to an NGN world. The proposed regulatory principles were:

- the scope for competition for the long-term benefit of end-users should be preserved and enhanced where possible in a next generation environment;
- incentives to invest in next generation infrastructure, including access networks, as well as applications and services, should be preserved;
- industry self regulation should be encouraged, where this mechanism can deal effectively with next generation network issues, particularly in relation to technical issues;
- regulation should be considered only where necessary to constrain market power - where, for example, it is conferred by control over bottlenecks; and
- regulation should be scaled back as workable and effective competition develops.

Submissions generally stated that it is useful to develop a set of regulatory principles for NGNs to help industry to make informed investment decisions. However, only a limited number of parties agree with the set of principles suggested by the Commission.

There are fairly divergent views over the principles themselves. Some of the views were that:

- national objectives should be identified prior to development of principles;
- focus should be on facilities which are not easily replicable;
- end-user centric, allowing the freedom of choice in terms of services and service providers;
- regulatory intervention is necessary at an early point to facilitate competitive outcomes where there is presence of significant market power in the market; and
- regulatory intervention is necessary only when there is evidence of market failure.

More generally, views were expressed on the need to have consistency, certainty (transparency around regulatory processes) and predictability in the regulatory framework, as these factors were regarded as an important incentive to promote NGN development. This need is based on the uncertainty over the rate of return and demand and is well recognised among countries which are at the forefront of NGN deployment.

This view leaves open the question of how such factors should be applied specifically in the NGN environment in New Zealand. There are, however, overseas examples for the Commission to draw on, such as the United Kingdom. Several parties have regarded the Ofcom model as international best practice and suggestions have been made for the Commission to adopt a similar approach.

Ofcom has developed a set of high level regulatory principles to inform its day-to-day work. The overriding principle is the promotion of competition at the deepest level that is effective and sustainable, supported by equivalence of access. In addition, it has also outlined principles to guide its work on NGN, which are:

- contestability;
- maximising potential for innovation;
- equivalence;
- reflecting risk in returns; and
- regulatory certainty.

Regulation should be scaled back as workable and effective competition develops

There was widespread interest among stakeholders in the principle of scaling back regulation as workable and effective competition develops. On one hand, concerns were expressed over the absolute assumption of scaling back regulation and, to some extent, the adoption of this principle altogether. The Commission was asked to be mindful of

issues associated with migration of existing networks to NGN indicating that existing regulation is necessary until such time when there is sustainable competition in NGNs. Specific issues discussed relate to the viability of:

- LLU - concerns include risk of being faced with stranded assets following the migration from (LLU) to NGN-based competition; and
- SLU - questionable as additional backhaul cost and smaller number of lines addressed by a cabinet which may render the fibre-based FTTC model not economically viable.

Existing LLU operators need clarity about how the regulatory framework will evolve following NGA deployment and the implications for their businesses. The indication is that current regulation may be required to co-exist with NGA for some time.

On the other hand, strong support was also noted for the suggested principle of allowing regulation to be scaled back as workable and effective competition develops. This principle is regarded as necessary to incentivise players to invest in NGN. It was stated that if regulation is allowed to develop in a piecemeal way and not rationalised, it will be burdensome to operators. For example, it was argued that there is a need to remove resale regulation following the introduction of regulated bitstream and LLU services in 2006. In addition, regular reviews on the state of competition in the market were proposed to give effect to this principle.

Monitoring ongoing developments of industry-led efforts

The discussion above alludes to the question of what is the appropriate market framework for dealing with NGN issues. While some advocated the setting of a forum similar to the Broadband Stakeholders Group in the United Kingdom, others stated the industry is best placed to work out NGN issues and that efforts are ongoing through the Telecommunications Carriers Forum (TCF) to reach the necessary commercial solutions. However, concerns were also expressed over the composition of the TCF and the likelihood of smaller players being marginalised as a result of unequal bargaining power. Parties have also expressed concerns about the ability of the TCF to reach timely and efficient outcomes.

In addition, on the issue of interconnection the TCP IP working party is seeking to address issues relating to virtual private networks and voice and Telecom's consultation through the TCF is only useful to the extent that it is able to address industry issues. This is a subset of the matters that will need to be considered to deliver end to end connectivity and interconnection in an all IP world.

The Commission monitors the TCF processes and is kept informed of developments on ongoing issues . Where it is unlikely that commercial solutions will be reached future consideration of a regulatory backstop mechanism may be necessary.

Overarching regulatory principles

The Commission is currently developing a set of regulatory principles to underpin the competition outcomes it wants to achieve over the next few years and the factors it will consider in making decisions to achieve such outcomes.

Section 9 Next Steps

The key themes have provided a good indication of the potential gaps across the value chain where the Commission, industry and Government will need to address for the potential long-term benefits to be realised. Some of these are more immediate than others and some fall outside of the Commission's role.

The areas listed below relate to potential competition issues arising from NGN deployment and as such are the key areas where the Commission intends to focus its continuing work as it considers this is where it can best add value to the ongoing debate.

Open Access

The Commission intends to address:

- what is open access and the requirement for open access at all layers; and
- what are the minimum requirements for the delivery of competitive market outcomes.

The Commission intends to talk informally with parties including Ministry of Economic Development over the next few weeks before outlining the proposed work programme and timetable.

Interconnection in an IP World

Both the price and non-price terms of interconnection in an IP world will be critical for competitive market outcomes to be achieved in an all IP world and the transition to it. The current TCF IP working party (IPWP) had progressed well to date, however, its agenda only addresses part of the issues and parties have recently raised concerns about the capacity of the TCP IPWP to deliver timely and efficient outcomes.

There are issues beyond those being addressed by the working party which can result in bottlenecks, for example, transit backhaul capacity. The Commission intends over the next month to discuss with the TCF and other parties where the Commission could play a role.

Monitoring Strategy

The Commission intends to consider the demand-side issues raised in the submissions as part of the ongoing development of the Commission's monitoring strategy.

Regulatory Principles

A statement of the Commission's regulatory principles is currently being developed as a separate workstream. The Commission intends to consult on its regulatory principles and the factors it considers in making decisions to achieve competitive market outcomes in the near future.

Appendix 1 Terms of Reference of NGN Study

Commerce Commission

Study into Next Generation Network issues

1. Commencement of study

The Telecommunications Act 2001 (“the Act”) as amended in December 2006 empowers the Commerce Commission (“the Commission”) to proactively conduct inquiries, reviews, and studies into any matter relating to the telecommunications industry or the long-term benefit of end-users of telecommunications services within New Zealand¹.

This power enables the Commission to take a strategic view of any matter which relates to the telecommunications industry.

The Commission has determined to commence a study under section 9A of the Telecommunication Act into Next Generation Network issues. The focus will be on raising the level of understanding of the Commission, industry and the wider community of key technological developments that will emerge during the next five years, and their impact on the commercial and competitive environment for telecommunications services.

All interested persons will have an opportunity to contribute to the study.

The Commission will publish a report at the conclusion of the study.

2. Next Generation Network study definition

The Commission proposes to use the International Telecommunications Union definition of Next Generation Networks:

A Next Generation Network (NGN) is a packet-based network able to provide Telecommunication Services to users and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent of the underlying transport-related technologies. It enables unfettered access for users to networks and to competing service providers and services of their choice. It supports generalised mobility which will allow consistent and ubiquitous provision of services to users. [ITU-T Recommendation Y.2001 (12/2004) - General overview of NGN]

The NGN is characterised by the following fundamental aspects:

- *Packet-based transfer*
- *Separation of control functions among bearer capabilities, call/session, and application/service*

¹ Section 9A(1)(b)

4. Aims of the study

The overall aim of the study is to develop a strategic view on NGN issues.

The Commission is entering into this process with no assumptions about the requirement for, or scope of likely regulation, and will be guided by information and submissions that arise during the process.

The Commission expects to the study will:

- Clearly identify the issues where there is consensus, and where and how views diverge
- Provide a strategic assessment of the likely impact of technological change on market structure and competition
- Provide guidance as to where regulatory intervention is unlikely to be warranted and circumstances where regulation may be considered.

5. Interaction with key stakeholders and other processes

In undertaking this study the Commission is mindful of the other processes in which industry is engaged. The Commission wishes to conduct its study in an efficient way to minimise workloads and avoid duplication.

There are three key NGN processes currently underway:

5.1 Telecom Operational Separation undertakings

The undertakings between the Minister and Telecom require Telecom to consult on, as a minimum:

- the transition of PSTN interconnection for voice services to IP interconnection for voice services
- the introduction of IP interconnection for virtual private networks

and requires Telecom Wholesale's establishment of a comprehensive industry-wide NGN consultation programme.

5.2 The Telecommunications Carriers' Forum (TCF)

The TCF has established a Working Group to consider NGN issues. As with all TCF Working Groups, the Commission has been invited to participate as an observer in this process.

5.3 InternetNZ

InternetNZ has set up the InternetNZ External Peering Group to work on issues relating to internet peering and interconnection in New Zealand.

5.4 The Commission's Study

The Commission will take account of the work done by each of the above groups, all of which involve public consultation in their own right.

The Commission's study will take a broader view of NGN developments than these three processes. In addition, there are other interested parties who are not involved in these existing processes. The Commission's study will ensure that the full range of views and issues are taken into account.

6. Proposed phases

The Commission proposes the following phases to its study and indicative timelines:

Proposed Phase	Activity	Timelines
Phase One	▪ Issue draft Commission Terms of Reference	6 March 2008
	▪ Industry written responses	29 March 2008
	▪ Release of Terms of Reference	May 2008
Phase Two	Set up	
	▪ Consultation, research and information gathering	May to Oct 2008
	▪ Workshops ▪ Conference	Sept, Oct 2008
Phase Three	Draft report, consultation	December 2008 to Feb 2009
Phase Four	Preparation of final Commission report	Mar 2009
Phase Five	Release of final Commission report	April 2009

Dated: 9 May 2008

Dr Ross Patterson
Telecommunications Commissioner

Appendix 2 Summary of Open Access Definitions

Telecom	<p>Commercial access on a non-discriminatory basis, to the service being offered to the service provider. If the access provider offers a vertically integrated wholesale/retail service offering that includes the access service- then the access service must be offered to all comers on the same terms and conditions that the access provider consumes to the service itself.</p> <p>Open access does not mean access to the underlying network elements (dark fibre, DSL ports, local fibre loop), nor does it mean unbundling of the service on offer.</p>
TelstraClear	Move from layer 1 raw network elements to layer -2 bitstream services.
Smartlinx	Connectivity to Layer 0 (duct sharing) and 2 (dark fibre).
CCNL	<p>The purest form of open access network is dark fibre, simply terminated at points the end user requires offering unlimited bandwidth, functionality and control to the end user. However, investment density demands some form of aggregation to improve underlying economics which suggest complimenting Dark Fibre with Raw Ethernet Bitstream Access.</p> <p>Network owners offering Open Access networks have the choice as to what level they open their network, this could be at Layer 2, Layer 1 or Layer 0. Offering 1,2, or all 3 of these options constitutes being Open Access, assuming access is unencumbered.</p>
Internet NZ	<p>Obligation of an access provider (any access provider that has SMP, regardless of funding source) to provide transmission capacity network to all access seekers, including their own wholesale or retail divisions, on equivalent price and non price terms and conditions.</p> <p>Provision of access to passive infrastructure should be an additional requirement where such networks are publicly funded, again on equivalent terms, to allow for any infrastructure investment that is possible.</p>
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Vector	<p>Connectivity to Layer 2, i.e., access to any network facility, view is supported internationally.</p> <p>In addition, there should be an “equivalence principle” which requires connectivity services to be offered to all interested parties on the same terms.</p>
Alcatel-Lucent	Provision of fibre for FTTH connectivity and supplying the home optical interconnect by a local access provider for a specific community.
	<p>Key parameters which define open access are:</p> <ul style="list-style-type: none"> • non discrimination in the delivery of services; and • transparency in service characteristics in order to encourage upstream innovation. <p>Open access in the future can include open ducts and tubes at layer 0, dark or grey fibre at Layer1 and must include bitstream services at layer 2.</p>
New Zealand Communications	Non discriminatory access.
Vodafone	Open access means access to bottleneck or subsidised infrastructure assets (usually layer 0 or layer 1) on a non discriminatory basis, in other words, all access seekers have access to the asset on equal terms (both price and non price). The asset owner does not enjoy an advantage relative to other access seekers.