9 ENABLING ENVIRONMENT FOR NGN

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9.1 Introduction

Today, the lines between traditional telecommunication services are blurred due to convergence in the Information Communication Technology (ICT) sector. The move to Next-Generation Networking (NGN) constitutes the latest step on the road to convergence of the ICT sector, as it will essentially enable consumers to receive a wide range of services all over a single, all Internet Protocol (IP)-based network.

For incumbent fixed-line providers, the transition to NGN, both at the access and core level, is being driven by various factors which include:[1]

- competitive pressure from traditional cable television providers offering "triple-play" bundles, as well as pressure from other new market players such as competitive providers, local governments and power companies;
- expected cost savings associated with the economies of scope deriving from the integration of existing networks;
- expected reductions in the ongoing operational costs of copper local access networks, as NGN allows local exchanges to be eliminated, thereby directly linking customer premises with the data-switching capabilities higher up in the network architecture; and
- ever-increasing consumer demand for more bandwidth, particularly in developed markets, which requires upgrades to existing networks. In Japan, for example, operators are providing commercial offerings of 100 Mbit/s and more in response to consumer demand for higher speeds.

Thus far, the debate regarding the appropriate regulatory framework for the NGN environment focused largely on developed countries such as Australia, Japan, Singapore, the United States and some European Union (EU) member states, notably the United Kingdom, Germany and the Netherlands. Increasingly, however, more developing countries have initiated NGN consultations and are promoting public awareness of NGN through various regulatory processes and initiatives.

For regulators, migration to the NGN world can be characterized by the following observations:

- Traditional market boundaries have become increasingly blurred in the presence of IP-enabled services and fixed-mobile convergence.
- Regulatory frameworks, which generally were designed for a traditional circuit-switched environment, may not be equipped to address an IP-based environment where multiple services can be offered over a single platform.
- Access providers and network operators must make intensive investments in upgrading and building new infrastructure and are looking for regulatory certainty.
- New bottlenecks and market dominance in the ICT industry can emerge.[2]

9.1.1 *Bridging the digital divide*

The creation of enabling environments for NGN deployment will be closely linked with efforts to address and bridge the digital divide. Despite dramatic increases in penetration in many developing countries, particularly via mobile network deployment, major disparities still remain in the area of Internet access, especially high-speed Internet access.[3] Indeed, Asia, Europe and the Americas account for no less than 99 per cent of all global broadband subscribers, the majority of which are in the wealthier countries of North America, Western Europe and Asia. According to the 2006 Millennium Goals Report, by the end of 2004 there was a large digital divide separating developed and developing regions regarding Internet use with over 50 per cent of the population in developed regions having access to the Internet as compared to only 7 per cent in developing regions and less than 1 per cent in the 50 least developed countries (LDCs).[4]

The shift towards NGN will not happen overnight and will be dependent on country-specific conditions. Nevertheless, NGN is increasingly becoming an important issue for both developed and developing countries.[5] Migration towards all IP-based environments, the deployment of the necessary access infrastructure and the ability to offer consumers higher speeds and newer applications is expected to become, as mobile telephony currently is, a major driver in bridging the digital divide between the information-rich and information-poor countries. However, the shift towards an NGN world will provoke some concern on the part of regulators as to the digital divide within their own jurisdictions. This divide may grow as a consequence of the economics of NGN deployment, which favour initial access network deployment in densely populated areas.

Box 9.1: Mechanisms to promote service-based competition

Unbundling of the local loop: This mechanism has two modalities: full unbundling or shared access. Full unbundling allows the service-based operator seeking access from the facilities-based operator to have management control over the copper pairs connecting a subscriber to the facilities-based operator's main distribution frame (MDF). The service-based operator seeking access can provide both voice and data services on the facilities-based operator's network. Shared access refers to an arrangement where the service-based operator has access to either voice or data transmission over the facilities-based operator's network. The service-based operator leases part of the copper pair spectrum while the facilities-based operator maintains control of the copper pair.

Bitstream access: This involves the facilities-based operator installing high-speed access links to its customers and opening these links to its competitors. In this case, the service-based operator seeking access has no management control over the physical line and is not permitted to add any equipment to the network.

Total Service Resale: This allows a service-based provider to purchase the facilities-based operator's service at a wholesale discount, rebrand the service, and resell it to the consumer. This allows the service-based provider to build a customer base and obtain a retail sales margin over the wholesale rate.

9.1.2 NGN deployment in developing countries

Service providers in developing countries are aware of cost-saving efficiencies associated with NGN. In countries such as Brazil, India and Vietnam, providers have already announced plans to migrate to core NGN. Similarly, in countries such as Argentina, Bangladesh, Brazil, Bulgaria, the Cayman Islands, Pakistan, Venezuela and Vietnam providers have initiated fibre-to-the-x (FTTx) projects. At this stage, however, such projects are mostly concentrated in highly populated, high-income areas.

Developing countries have certain advantages in the migration process towards NGN, which they should leverage to create the proper enabling environment for this transition.

- Compared to more developed ICT markets, service providers in developing countries generally have fewer legacy products in their core networks. This makes it easier for them to migrate to all IP-based systems, thus leapfrogging technologies and going to core NGN straightaway.
- In the case of access networks, the limited penetration of copper networks in developing countries can facilitate "greenfield" deployment of FTTx projects.[6] Thus, they will also be able to leapfrog access technologies, where economically viable, and go directly to NGN access infrastructure. Similarly, in certain countries the lack of complex *ex ante* access regulations can be viewed as an advantage, as operators there are confronted with fewer regulatory burdens and commitments to consider and maintain.

9.1.3 Way forward

Regulators must see NGN deployment in its proper context – as a continuation of their broadband and convergence policies. Robust policies that continue to promote both of these aims are a prerequisite when creating an enabling environment that will open the way for migration to NGN.

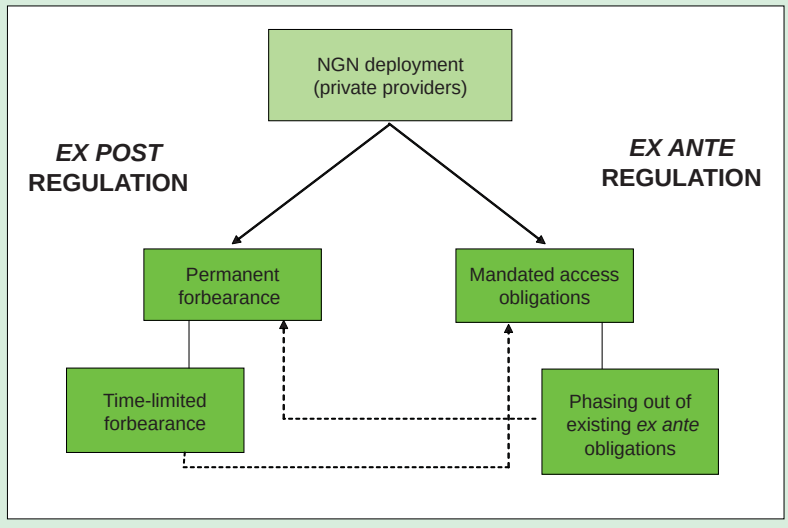
As noted in the World Summit on the Information Society (WSIS) Action Plan, "(g)overnments should foster a supportive, transparent, pro-competitive and predictable policy, legal and regulatory framework, which provides the appropriate incentives to investment and community development in the Information Society." This is of paramount importance for facilitating NGN deployment.[7] Regulators must provide operators with regulatory certainty that will permit them to incur the risks associated with NGN deployment, particularly the high upfront investments required. However, regulators should keep in mind that their role is not to provide incentives to make particular investments, but to ensure that incentives for efficient investment are not distorted, particularly by disproportionate regulation.[8] Thus, regulators must strive to strike the appropriate balance between these objectives as they advance to the new world of NGN.

9.2 Role of the regulator in transitioning to and facilitating an NGN environment

With the emergence of NGN, regulators are faced with the issue of deciding whether to implement an *ex post* regulatory model, or maintain *ex ante* regulation. *Ex ante* regulation refers to the process of establishing specific rules and requirements to prevent anti-competitive or otherwise undesirable market activity by operators before it occurs. *Ex post* regulation, which relies primarily on competition law, involves establishing few or no specific preventive rules in advance, but instead remedying and punishing market failure or anti-competitive behaviour after it has occurred.

In certain countries, regulators have required incumbent operators to provide their competitors with mandatory access to their networks through means such as local loop unbundling, wholesale access and resale (see Box 9.1). With the transition to NGN, the issue is whether these new IP-based networks, which will require significant investment by the incumbent operators, should be subject to the same access obligations currently being imposed on other parts of their network. In considering this issue, regulators are assessing the level of competition in their markets to determine if a shift towards an *ex post* model could sustain existing levels of competition and enhance consumer welfare. At the same time, regulators are also debating whether leaving such networks free from *ex ante* regulation will lead to greater investment in NGN, which in turn could lead to the emergence of new services and markets.

Figure 9.1: Regulator's decision tree



For example, in the EU, this debate has been particularly heated lately, where competition in retail electronic communications markets, specifically the broadband market, currently relies on mandatory wholesale access imposed on operators found to have significant market power (SMP). However, under the EU regulatory framework, *ex ante* regulations that impose mandatory access to existing networks can serve only as an interim measure to ensure competition between services until adequate infrastructure competition exists.[9] *Ex ante* regulation usually is imposed only after conducting a thorough market review under the EU Framework Directive. The process for market review involves defining the relevant economic market(s), assessing competition in each market(s), in particular assessing whether any firms in that market have SMP, and then applying the appropriate *ex ante* regulatory obligations on any firms found to have SMP. In addition, *ex ante* access and price regulation must be set up in such a way that it does not negatively influence investment incentives for market players and, if possible, promotes companies to "ascend the investment ladder".[10]

Regulators in developing countries are also keenly aware of regulatory concerns associated with the migration towards NGN. We have seen much discussion and input related to NGN from contributions submitted by developing countries to the 2006 World Telecommunication Development Conference (WTDC) and the Forum at ITU TELECOM WORLD 2006. The Telecom Regulatory Authority of India (TRAI), for example, has focused on raising awareness of the benefits of NGN, as well as creating the necessary enabling environment for their deployment, by addressing licensing reform and creating a level playing field for competition. More recently, during the Consultation to the 2007 ITU Global Symposium for Regulators (GSR), regulators from Costa Rica, Morocco and Poland indicated that they consider the imposition of access obligations to be a favourable mechanism for increasing broadband penetration and promoting future NGN take-up.[11]

9.2.1 Regulator's decision tree

With the transition to NGN, regulators generally are faced with two primary options: extending current access obligations to the NGN world or permanently forbearing from doing so. However, some regulators have also opted to pursue transitional options, involving either *ex ante* or *ex post* regulation, by imposing forbearance in a time-limited manner or by eliminating regulatory obligations in phases (see Figure 9.1). These are extremely complex decisions, and there are advantages and disadvantages to each approach (see Box 9.2).

In mature, access-intensive markets, where the regulatory environment has encouraged competitive providers over the past years to deploy their infrastructure to as many interconnection points as possible, and allowed them to use the incumbent's non-replicable assets from there to reach the end user, regulatory clarity is seen as vital. Without it, some argue that current and future investment by competitive providers may be disrupted, as their investment decisions are highly dependent on the incumbent's future plans. In the Netherlands, for example, the Dutch regulator OPTA has identified the lack of clarity and certainty regarding access alternatives in the wake of incumbent KPN's NGN migration as a factor leading to low levels of investment in Digital Subscriber Line (DSL) networks by competitive providers during the first semester of 2006.[12]

Rather than wait for regulatory intervention that may not suit their business interests, certain incumbent operators have taken a more proactive stance and voluntarily agreed to certain measures regarding access to their proposed next-generation networks. For example, under the possible threat of divestiture, BT in the United Kingdom voluntarily agreed to allow third parties to access its NGN core network. Similarly, France Telecom has announced plans to allow rival operators to access its new fibre-to-the-home (FTTH) systems in an effort to prevent regulatory intervention.

The appropriate course to pursue is dependent on country-specific conditions and the state of development of

Box 9.2: Pros and cons of *ex post* and *ex ante* regulatory options

	Pros	*Cons*
Permanent forbearance	Avoids distorting investment incentives by eliminating price regulation. Price regulation has the effect of capping positive returns from the NGN operator's investment, while leaving investors fully exposed should the investment be unsuccessful.	Without an obligation on the dominant provider to offer competitors wholesale products, they may not be available to competitors. As a result, competition in NGN services in the future may only exist between operators that own their own infrastructure to the end user's premises.
Time-limited forbearance or regulatory holiday	Delivers incentives to NGN operators that control bottlenecks by offering them monopoly rents for a period of time, after which regulation would apply or be enforced to protect competition.	Creates uncertainty as the payback periods for NGN investments are long. Time-limited forbearance of three to five years generally would not be sufficient for recuperation of the investment.
Mandated access	Ensures the continued progression of service-based competition models, allowing current competitors to use new NGN bottleneck facilities.	Incentives for efficient investment in NGN deployment may be distorted and incumbent operators may abstain from committing to such deployment. Depending on the level of mandated network access, it may dampen competitors' incentives to invest in their own infrastructure.
Phasing out of existing *ex ante* obligations	As in the case of permanent forbearance, it avoids distorting investment incentives; however, it allows the regulator more control over the process, as it is directed only at specific segments where facilities-based competition exists. If accompanied by the threat of reinstating *ex ante* regulation, it allows regulators to intervene where market forces cannot deliver effective facilities-based competition.	Eliminating the requirement that incumbent operators offer their competitors wholesale products runs the risk that such competition may not arise spontaneously. However, this may be remedied with the threat of *ex ante* regulation. As in the case of forbearance, the phasing out of existing *ex ante* regulations may lead to markets where the only competition in future NGN services will be between facilities-based operators that own their own infrastructure to the end user's premises.

Source: Authors, adapted from Ofcom, Regulatory challenges posed by next-generation access networks. Public discussion document, 23 November 2006, pp 22-24.

internal markets. However, regardless of what course a regulator pursues, it should keep in mind the need to create regulatory certainty for both incumbent and competing providers. Regulators must be mindful of the risks associated with NGN deployment so as not to stifle innovation. They must balance this goal with that of fostering robust, competitive markets. Although it is not necessarily the role of the regulator to protect investments made by competitive providers against market risks, it is still important to consider their interests in terms of ensuring the continued availability of current wholesale inputs to their products during the lifetime of the assets in which they have invested. Similarly, suitable migration paths for existing infrastructure investments following the deployment of new technologies must be ensured.[13]

9.2.2 *Regulatory checklist regarding* **ex post** *and* **ex ante** *regulation in an NGN environment*

To create enabling regulation for the transition towards an NGN environment, regulators need to consider a variety of issues based on the specific condition of their market. In particular, they need to consider how best to foster a competitive environment and what obstacles need to be addressed and remedied to sustain competition between incumbent operators and competitive providers.

Although there is no definitive list of issues and answers for regulators, particularly given the different market dynamics in each country, there are a number of issues regulators should consider when deciding between opting for *ex post* or *ex ante* regulation as a means to facilitate the transition to an NGN environment (see Box 9.3).

9.2.2.1 Is there sufficient facilities-based competition?

In determining whether to impose *ex ante* regulation on NGN deployments, regulators are looking at whether sufficient facilities-based competition exists in the market. The regulator has to consider if significant prospects exist for wide scale, competing end-to-end access infrastructure deployments that will provide competitive constraints to the incumbent operators' ability to leverage any position of market power. If sufficient competition is found to exist, some regulators have opted to forbear from regulating NGN. For example, regulators in the United States and Hong Kong, China, have abstained from imposing access obligations on FTTx deployments by incumbents. In Hong Kong, China, the Office of

Box 9.3: Checklist of issues regarding *ex post* and *ex ante* regulation

- Is there sufficient facilities-based competition?
- If so, is a phasing-out approach needed to transition from an *ex ante* to an *ex post* regulatory environment?
- Is time-limited forbearance or a regulatory holiday necessary?
- Does a bottleneck situation need to be addressed?

the Telecommunications Authority (OFTA) has eliminated unbundled access obligations to the incumbent's infrastructure altogether, albeit in phases. In both cases, regulators have relied on the large-scale deployment of competing networks, cable television in the United States and fibre-optic or hybrid fibre-coaxial (HFC) in Hong Kong, China, to keep incumbents in check, with *ex post* competition law remedies to address any future problems that may arise.

Deciding whether to rely on *ex ante* or *ex post* regulation largely depends on the market structure and the policy objectives of the country. For example, in the United States, the Federal Communications Commission (FCC) has acknowledged that unbundling can bring competition to markets faster than it might otherwise develop; however, it has decided that excessive network unbundling requirements tend to undermine the incentives of both incumbent providers and new entrants to invest in new facilities and deploy new technologies. As such, taking into account the levels of competition in the US broadband market, the FCC has not imposed unbundled access obligations on FTTH infrastructure deployed to serve the US mass market (see Box 9.4).

Nevertheless, no clear-cut rule exists to determine at what stage of deployment sufficient competition exists. In the United Kingdom, the Office of Communications (Ofcom) recently stated that the existence of cable television networks that cover 45 per cent of households is not evidence of sustainable, large scale end-to-end local access infrastructure competition in that country.[14] In Hong Kong, China, however, coverage of 53 per cent of households by at least two access infrastructure networks was deemed sufficient to trigger forbearance of access regulations by OFTA.[15]

9.2.2.2 If it is determined that sufficient facilities-based competition exists, is a phasing-out policy needed to transition from an *ex ante* to an *ex post* environment?

If regulators find that sufficient facilities-based competition exists, they may consider it necessary to eliminate certain regulatory obligations, but may opt to do so in a phased manner to avoid any major disruption in the marketplace. In Hong Kong, China, OFTA not only abstained from mandating access to fibre-based networks, but completely withdrew existing obligations from legacy, copper-based local loops.[16] This was implemented in a phased manner and on a building-to-building basis. Obligations were withdrawn only with respect to buildings served by at least two competing self-built access networks (see Box 9.5). Hong Kong, China's policy, however, should be viewed in the context of the territory's high urban density. There, the entire population lives and works in less than 100 000 buildings. Hence, the costs associated with deploying overlapping access facilities to customer premises is significantly lower than in Europe or the United States.

Similarly in France, as competitive conditions have evolved in the market and with several operators having been able to replicate SMP operator's resale services, the French regulator ARCEP is of the opinion that mandatory resale offerings are no longer needed and that *ex post* regulation is sufficient to maintain a competitive market with regard to wholesale broadband service resale.[17] As such, if competition conditions in the market continue improving, ARCEP could continue phasing out mandated wholesale broadband service obligations.

9.2.2.3 Is time-limited forbearance or a regulatory holiday necessary?

Prompted largely by requests from incumbent operators, certain regulators are considering whether to introduce time-limited forbearance policies, whereby the regulator makes a commitment not to mandate access to NGN infrastructure, particularly their access component, for a pre-established period of time. After such a period, regulation would either resume or be introduced in such markets if there was dominance, as determined by market analysis.

This policy may significantly alter the existing competitive landscape in the communications sector, particularly in markets where service-based providers have made significant inroads into the incumbents' market share by benefiting from mandated wholesale access, particularly unbundled local loop (ULL) and bitstream access. There is also a concern that regulatory holidays for NGN infrastructure, notably in instances where NGN services are a replacement for existing regulated broadband services, could hinder a competitors' ability to offer such services during the forbearance period. Moreover, this time lag might mean that it could take competitive providers several more years to recover, if at all, the market position they enjoyed before the regulatory holiday for incumbents was granted. From the incumbent's perspective, the length of the forbearance period might not be sufficient to recoup its investment. Uncertainty over the impact of regulation on revenue streams after the forbearance period may also impact a business case more than uncertainty in the early years following the investment.[18]

In 2005, TRAI proposed to the Government of India that, to promote quick growth and create immediate competition in broadband services, non-discriminatory ULL should be executed in a time-bound manner for both shared unbundling and bitstream access. In order to address the possible disincentives this would bring about for new greenfield network deployments, TRAI proposed that infrastructure less than five

Box 9.4: Regulation of unbundled access to fibre loops in the United States

The Telecommunications Act of 1996[1] was designed, in part, to introduce competition into the local exchange market in the United States. Among the various requirements imposed to achieve this goal, few, if any, have spurred so much regulatory attention, industry effort, or litigation, as the requirement under section 251(c)(3). This provision requires incumbent local exchange carriers (ILEC) to make elements of their networks available on an unbundled basis to new entrants at cost-based rates.

Litigation associated with shaping current unbundled network elements (UNE) regulation in the United States has resulted in the ILECs narrowing the initial scope and reach of the FCC's UNE regulations.[2] In this context, one of the main drivers influencing the UNE regulatory landscape in the United States was the creation of the right investment incentives to foster NGN roll-out, both by ILECs and new entrants. As a backdrop to this whole debate were the ILEC's arguments that initial FCC unbundling and sharing obligations, although innocuous to sunk investments such as legacy copper loops, dampened their incentives for new investment such as DSL upgrades and fibre deployments.

The centerpiece of the FCC's policy on the unbundling of specific next-generation access network elements for the provision of broadband services, particularly hybrid and FTTH networks, is its Triennial Review Order. There, the FCC imposed clear limitations on unbundled access to NGN loops serving the mass market in the United States, declining to require ILECs to provide unbundled access to their hybrid or FTTH loops for the provision of broadband services.[3] This decision was based on the FCC's recognition of robust broadband competition and increasing competition from inter-modal sources in the marketplace.

FCC rules provide for the following with regard to NGN access infrastructure unbundling:

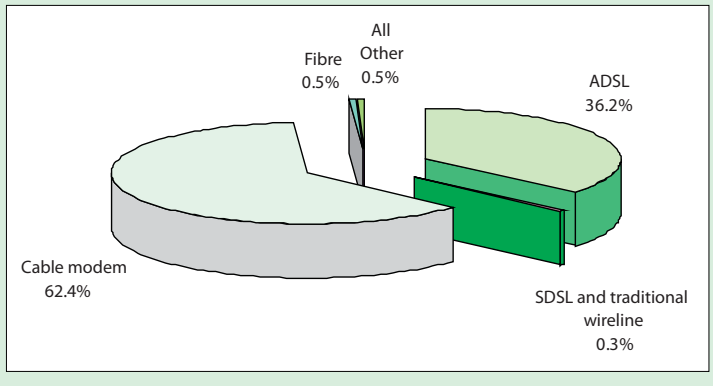
- For loops serving mass market customers, ILECs need not unbundle either dark or lit fibre loops that extend to the customer's premises (FTTH loops) deployed in new build, or "greenfield," situations.
- Where an FTTH loop is deployed in overbuild, or "brownfield," situations, ILECs either must provide unbundled access to a 64 kbit/s transmission path over the fibre loop or unbundled access to a spare copper loop.[4]

For hybrid copper/fibre loops, ILECs need not unbundle the packet-switched capabilities of those loops, but must provide unbundled access to any TDM features, functions and capabilities for requesting carriers seeking to provide broadband services.[5]

When a requesting carrier seeks access to a hybrid loop to provide narrowband service, the ILEC may provide either unbundled access to an entire hybrid loop capable of voice grade service using TDM technology or unbundled access to a spare copper loop.[6]

The FCC also has extended these rules to multiple dwelling units (MDUs) and concluded that FTTH rules apply to MDUs that are predominantly residential.[7]

Cable modem continues to be the prevalent technology for delivery of advanced services in the United States, accounting for 62.4 per cent of lines serving residential end users, with ADSL representing 36.2 per cent and fibre 0.5 per cent (see Figure 9.2). Nevertheless, the FCC's hands-off policy, along with other factors such as competitive pressure from cable television providers, has clearly had a positive impact on FTTH line growth in the United States. Indeed, after the D.C. Circuit Court upheld the FCC rules in *USTA II*, fibre take-up and deployment has seen a year-to-year increase of over 540 per cent from 2004 to 2005, compared to an increase of only 32 per cent and 74 per cent in the previous two years.[8]



Source: FCC, High-Speed Services for Internet Access: Status as of December 31, 2005.

1 Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56. The 1996 Act amended the Communications Act of 1934, 47 U.S.C. § 151 *et seq.*

2 For a complete account see FCC, In the Matter of Unbundled Access to Network Elements; Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers, WC Docket No. 04-313 and CC Docket No. 01-338, *Order on Remand,* 20 FCC Rcd 2533, 2537-2545, para. 6-19 (2005) (*Triennial Remand Order*).

3 In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers; Implementation of the Local Competition Provisions of the Telecommunications Act of 1996; Deployment of Wireline Services Offering Advanced Telecommunications Capability, CC Docket Nos. 01-338, 96-98, 98-147, *Report and Order and Order on Remand and Further Notice of Proposed Rulemaking*, 18 FCC Rcd 16978, 17103-04, 17149, para. 200, 288 (2003) (*Triennial Review Order*). These rules were later upheld by the D.C. Circuit on March 2, 2004, in *USTA II* (359 F.3d at 564-76).

4 *Ibid* at 17144-46, para. 276-277. Overbuild or "brownfield" deployment refers to the situation in which "an incumbent local exchange carrier (LEC) constructs fibre transmission facilities parallel to or in replacement of its existing copper plant." *Ibid.* at 17144, para. 276.

5 *Ibid* at 17149-50, § 288-289.

6 *Ibid* at 17153-54, § 296.

7 In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers; Implementation of the Local Competition Provisions of the Telecommunications Act of 1996; Deployment of Wireline Services Offering Advanced Telecommunications Capability, CC Docket Nos. 01-338, 96-98, 98-147, *Order on Reconsideration*, 19 FCC Rcd 15856, 15857-58, § 4 (2004) (*Order on Reconsideration*).

8 See FCC, High-Speed Services for Internet Access: Status as of December 31, 2005. July 2006. Available at www.hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-266596A1.pdf

Box 9.5: Elimination of Type II interconnection in Hong Kong, China

Hong Kong, China introduced unbundled access obligations, so called Type II interconnection, in 1995 with the objective of encouraging investment in networks, facilitating effective competition in the telecommunication market and enhancing consumer choice.

In 2003, however, the government initiated a review of this policy, indicating that its continuation would only be justified "if the benefits from facilitating effective competition and enhancing consumer choice outweigh any potential detriment arising from dampening of incentives for investment in network infrastructure."[1]

In 2004, OFTA ordered the withdrawal of Type II interconnection obligations subject to a phasing-out period to be fully completed by 30 June 2008.[2] The withdrawal would be implemented on a building-by-building basis and apply to buildings already connected to at least two self-built customer access networks; however, the withdrawal would be subject to a two-year transitional period to ensure no disruption of choice and of service to consumers and a one-year "grandfather" period thereafter to protect the regulated interconnection terms and charges for lines connected before and during the transitional period. After the "grandfather" period, or 30 June 2008, whichever is earlier as the case may be, interconnection terms and charges would be subject to commercial negotiations between the carriers concerned.

OFTA indicated that liberalization had resulted in significant network roll-out by competitors. Upon review of market conditions it concluded, among other things, that:

- the absence of mandatory Type II interconnection was not necessarily found to be an impediment to market entry in areas with certain favourable conditions, nor was its availability necessarily a push towards reliance upon such a facility;[3] and
- the availability of mandatory Type II interconnection may discourage investment in additional fibre-based alternative customer access networks to buildings, even if it is technically feasible and economically viable to do so.

OFTA, however, recognized the need to maintain the threat of *ex ante* regulation in such cases where facilities were determined to be non-replicable. Thus, under the "essential facilities" doctrine, OFTA reserved the authority to impose Type II interconnection obligations if it determined: (i) that the dominant operators' customer access network cannot be duplicated; and (ii) that refusal to allow access to that operators' customer access network will foreclose competition.[4]

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1 OFTA, Review of Type II Interconnection Policy, July 2004, p. 5. Available at www.ofta.gov.hk/en/report-paper-guide/paper/information/info20040706.pdf

2 Ibid at p. 5.

3 In Hong Kong, China, Type II interconnection was only granted to the three new entrants in 1995, namely Hutchison Global Communications Limited (HGC), Wharf T&T Limited (Wharf T&T) and New World Telecommunications Limited (NWT), with the incumbent, PCCW-HKT Telephone Limited (PCCW-HKT), being forced to provide interconnection. Other competitors that entered the market starting from 2003, notably Hong Kong Broadband Network (HKBN), was not eligible for mandatory Type II interconnection and was required to build its network outright. In addition, OFTA observed that HGC was also building its fibre optic network steadily and was operating quite independently of the availability of mandatory Type II interconnection. Meanwhile, NWT and Wharf T&T relied more on Type II interconnection to roll out their own services.

4 OFTA, *supra* note 1, p. 5.

years old should not be unbundled. The Government of India, however, did not adopt TRAI's ULL recommendation.[19]

In Germany, incumbent provider Deutsche Telekom (DT) has actively sought relief from the extension of existing unbundling and wholesale obligations to its NGN infrastructure by strongly lobbying the German Government to award it regulatory holidays that it deems indispensable to recoup its investments. Although the German regulator, BNetzA, initially agreed with DT, the decision provoked a response from the European Commission (EC), who expressed "serious doubts" regarding the exclusion of VDSL connections from the relevant market as defined by the regulator. Ultimately, the EC prevailed and BNetzA imposed wholesale access obligations on DTs VDSL service (see Box 9.6). DT, however, continued its lobbying efforts and as a consequence amendments to the Telecommunications Act exempting "new and emerging markets" from regulation were introduced. These amendments would effectively exempt DT's NGN infrastructure from regulation. In response, the EC has initiated a fast-track infringement proceeding, threatening to refer the case to the European Court of Justice.[20]

Thus, at the European level, the EC has been vehement in including NGN access infrastructure within existing wholesale market definitions. The EC has reiterated this position in the context of the ongoing review of the electronic communications regulatory framework, indicating that the use of more efficient technologies to provide currently regulated services does not alter the justification for regulation. As such, if competitive conditions have not changed, the move to NGN should not be seen as an opportunity to roll back regulation on existing services.[21]

9.2.2.4 Is there a bottleneck situation that needs to be addressed?

In some countries, such as the United Kingdom, the Netherlands, the United States and Japan, regulators have been initially faced with determining if next-generation networks, particularly access networks, would become enduring bot-

Box 9.6: Bitstream access via VDSL infrastructure in Europe: the case of Germany

In August 2006, the regulator, BNetzA, imposed bitstream access obligations on all variants of incumbent DT's infrastructure, including ADSL2, ADSL2+, SDSL and VDSL.[1] This decision came after considerable controversy, as DT had vehemently opposed any *ex ante* regulation, instead seeking regulatory holidays and arguing that they were necessary to recoup investment costs incurred in updating its network to VDSL technology.[2] The EC strongly opposed this view from the outset, indicating in a recent letter to the German regulator that investment incurred by DT should be compensated, *"but cannot justify exclusion from the access obligation."*[3]

The original draft measures notified by BNetzA on 11 October 2005 generally excluded bitstream access via VDSL connections from review of wholesale broadband access in Germany.[4] At the time, the German regulator argued that no VDSL retail products were available, thus respective wholesale products could not be derived within the two-year period of the notified market analysis. The EC, however, expressed serious doubts with BNetzA's determination, noting that at such time there was no indication that, within the timeframe of the forward looking assessment, VDSL retail products would differ substantially from those delivered over ADSL(2+) technology.[5] The EC also argued that the costs incurred by DT in deploying the network could not justify excluding DT's VDSL services from the access obligations. Investment costs to upgrade broadband networks to VDSL technology were to be recouped by setting appropriate access prices that include the cost of capital.[6]

Soon thereafter, BNetzA amended the notified draft measures to include bitstream access via VDSL connections within the wholesale bitstream access market, and the EC withdrew its objections.[7]

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1 See EC, letter of 21 August 2006, Case DE/2006/0457: Remedies relating to the Market for IP bitstream access with handover at IP level at different places in the network hierarchy, including HFC broadband access with handover at IP level. Comments pursuant to Article 7(3) of Directive 2002/21/EC (Framework Directive).

2 VDSL access is generally offered over so-called "hybrid local loops" between the main distribution frame and the customer's premises. Hybrid local loops are lines partially consisting of fibre optic, either from the main distribution frame to the remote concentrator or to the street cabinet, whereas the part of the local loop leading into the premises of the end user consists of copper.

3 EC, *supra* note 1, p. 4.

4 See EC, letter of 11 November 2005, Case DE/2005/0262: Wholesale Broadband Access. Opening Phase II investigation pursuant to Article 7 (4) of Directive 2002/21/EC (Framework Directive).

5 Ibid. at p. 5.

6 Ibid. at p. 4.

7 See EC letter of 23 December 2005, Case DE/2005/0262: Wholesale Broadband Access in Germany. Withdrawal of serious doubts, p. 4.

tlenecks and, if so, what regulatory policy should be adopted in response. This has become a particularly pressing issue for countries where competition has been based on mandated access such as ULL, bitstream access and resale.

In the United Kingdom, Ofcom has acknowledged that the private sector is better suited to set the ground rules and standards to handle its own migration towards NGN. Nevertheless, Ofcom stepped in to usher BT's migration process to an all IP-based core network, dubbed the 21st Century Network (21 CN), by setting certain principles under which the transition would be conducted (see Box 9.7). Ofcom requires assurances that the deployment of BT's 21 CN does not foreclose competition, either by disrupting existing competitive businesses or preventing equality of access being provided in the future. In September 2005, BT agreed to undertakings to support these goals, including commitments to provide unbundled network access and other wholesale services on an "equivalence of inputs" basis, and not to make design decisions that would foreclose specific product options without adequate consultation.[22]

The concept of "equivalence of inputs" is at the heart of Ofcom's efforts. It basically means that BT is compelled to take structural measures at the wholesale level to ensure that wholesale components and products it sells to itself are identical to those it sells to its competitors. This policy is precisely aimed at providing competitive providers with unbundled access to those elements of BT's network that represent enduring economic bottlenecks. As part of these structural measures, BT effectively isolated elements including its local loop and backhaul in a separate business unit named Open Reach, which, although not structurally separated from BT, has been placed at arms length from the rest of the company.[23]

More recently, Ofcom has hinted at the need to establish mandatory access on future FTTx deployments in the United Kingdom, because they too might be enduring bottlenecks. In this sense, Ofcom has indicated that it does not foresee widespread facilities-based competition in end-to-end fixed-line next-generation access networks, and has invited comments on the best way forward.[24]

Similar issues are being addressed in the Netherlands, where the incumbent KPN is transitioning to NGN in the core and access levels. OPTA has proposed the need for KPN to provide a "fully fledged alternative" access offer that guarantees connectivity between KPN and the networks of other providers in a way that adequately compensates for the modifications made to current unbundled access offers.

In Japan, the country with the highest FTTH penetration in the world, the Ministry of Internal Affairs and Communications (MIC) has mandated access to fibre deployed by incumbents NTT East and NTT West. There, competitive pressure

Box 9.7: NGN in the United Kingdom: Ofcom's measures to ensure access to BT's 21 CN

Since 2005, BT has been heavily investing in its 21 CN project to replace all of its existing network platforms with a single unified IP-based platform. Starting in late November 2006, BT began to transfer the first customer lines to its 21 CN, a process expected to take several years to complete. Ofcom views this major change as an opportunity to ensure that the network of an incumbent operator accommodates competition from the outset.

Accordingly, Ofcom sees its role as ensuring that clarity exists as to the regulatory policy requirements necessary to support effective competition. However, it has indicated that it does not wish to become involved in the detailed design of BT's network. Because of this, Ofcom has emphasized industry-led processes to guide the transition. Ofcom has proposed a number of key regulatory principles to guide its approach towards the transition to NGN. In this regard it intends:

- to promote competition at the deepest levels of infrastructure, where it will be effective and sustainable;
- to focus regulation to deliver equality of access beyond those levels;
- to withdraw from regulation at other levels as soon as competitive conditions allow;
- to promote a favourable climate for efficient and timely investment and to stimulate innovation, in particular by ensuring a consistent and transparent regulatory approach;
- to accommodate varying regulatory solutions for different products and where appropriate, different geographies;
- to create scope for market entry that could, over time, remove economic bottlenecks; and
- in the wider communications value chain, unless there are enduring bottlenecks, to adopt light-touch economic regulation based on competition law and the promotion of interoperability.

Ofcom views its challenge as establishing an appropriate balance between its role to provide regulatory certainty and the role of the market in determining the commercial outcome of NGN-based competition. To this end, it has recently undertaken two initiatives:

- First, in recognizing the need to provide greater certainty as to the nature of the *ex ante* competition regime associated with NGN, Ofcom has proposed an approach to address the impact of IP-based convergence on existing market definitions and on the associated SMP analysis and remedies.
- Second, Ofcom has also indicated the need to establish an industry body capable of providing a strong strategic vision for the access and interconnection arrangements required to support NGN-based competition.

In addition, Ofcom has recognized that a third line of work is required to consider consumer protection issues raised by the migration to NGN.

Sources: Ofcom, Next-Generation Networks. Future arrangements for access and interconnection, Consultation 13 January 2005, available at www.ofcom.org.uk/consult/condocs/ngn/ngn.pdf

Ofcom, Next-Generation Networks: Developing the regulatory framework, 7 March 2006, available at www.ofcom.org.uk/consult/condocs/nxgnfc/statement/ngnstatement.pdf

from electricity companies, who have rolled out their own infrastructure and aggressively engaged in price-based competition, has been a major driver of NGN migration, in particular FTTH deployment.

In determining the appropriate regulatory framework for the migration to NGN, regulators need to be aware of the delicate nature of their role in creating an enabling environment that balances both investment and competition incentives. If regulators opt for imposing access obligations, striking the right balance will be key. If competitive providers perceive access prices to be too high, they will be deterred from entry; while if such prices are perceived by the incumbent to be too low, they might be deterred from deploying NGN infrastructure.

In fact, some regulators have been left "perplexed" by the outcomes of their efforts to impose regulated access on future NGN access facilities.[25] Incumbents have reacted in different ways and not all have been willing to accept regulatory burdens placed on planned and yet to be deployed infrastructure. For example, disagreement with the Australian Competition and Consumer Protection Commission (ACCC), over what the incumbent operator, Telstra, could charge its rivals for access precipitated Telstra's unilateral decision, in August of 2006, to withdraw its plans to deploy an FTTN fixed-line network altogether.

9.3 Modifying the legal and regulatory framework in the transition to an NGN world

Migration towards NGN is a further step in the convergence of the ICT sector. As such, regulators will be faced with many of the same convergence-related issues they have been confronting to date. As such, there are a number of issues that regulators should consider when discussing possible changes to existing regulatory frameworks to facilitate NGN deployment (see Box 9.8).

Box 9.8: Checklist of issues regulators should consider for enabling NGN deployment

- Does the regulatory framework present any market entry barriers? Does it support full competition in the market, allowing service providers to offer multiple services? Are there any services, such as subscription television, that are restricted to only a number of service providers?
- Does the current licensing framework facilitate the provision of services over different platforms? Is it technology neutral?
- Are VoIP and other IP-based services allowed? If so, are they regulated in the same way as traditional services or does IP-specific regulation exist?
- What are the regulatory policies for new technologies and services with regard to numbering, spectrum, interconnection, universal service, rights of ways and shared deployment?
- Does the regulatory framework promote diversification of access networks?
- Are institutional and structural changes of the regulatory authority required to adapt to an NGN environment?
- Does the regulatory framework encourage and facilitate public and municipal initiatives?

9.3.1 Market barriers

In order to foster NGN deployment, regulators should look at their regulatory framework and eliminate market entry barriers that may prevent or hinder new entrants from participating in the market. These restrictions may relate to exclusivity rights granted to an incumbent operator, cross-ownership restrictions, excessively burdensome licensing requirements and foreign investment restrictions. For example, in the United States, telecommunication operators have been deploying FTTx due to competitive pressure from traditional cable television providers that are offering triple-play bundles. However, in some instances, they have encountered delays from local video market franchise authorities and been subject to unreasonable compensation requests to obtain the needed franchise to begin offering video services. Recently, the FCC adopted rules that prohibit local franchise authorities from unreasonably refusing to award competitive franchises for the provision of cable services.[26]

In other countries, governments have sought to eliminate restrictions that prevented operators from offering certain services. For example, in Mexico, the Secretariat of Communications and Transport (SCT) issued a Convergence Agreement on 3 October 2006 eliminating restrictions that prevented fixed telephony operators and subscription television operators from entering each other's market. In order to avoid cross-subsidization, however, operators are required to implement accounting separation for fixed telephony and subscription television services. With the issuance of the Convergence Agreement, the incumbent operator, Telmex, can now offer cable services with certain restrictions, while subscription television operators may use their network to provide local fixed telephony services. Previously, the SCT only permitted subscription television operators to indirectly provide local fixed telephony through a licensed fixed telephony operator.

9.3.2 Licensing

Licensing in the context of liberalized and convergent markets is increasingly seen as a means to control entry and as a tool for imposing regulatory obligations that ensure the implementation of policy objectives. Licensing regimes are thus required to evolve alongside markets and technologies to guarantee that they remain effective and beneficial for sector development. By remaining static in the context of convergence and NGN migration, licensing frameworks can become an obstacle to development in several ways:

- Preserving unnecessary, onerous and complicated licensing requirements can act as a barrier to market entry and hinder competition.
- Requiring operators seeking to introduce multiple-service offerings to obtain multiple licenses, often with different fees, requirements and geographic scope, can limit competition and impede the deployment of new services to consumers.
- Maintaining outdated and irrelevant licensing classifications can hinder technological advancement and service development.
- Licensing classifications based on specific types of technologies can act as artificial barriers to the introduction of alternative new technologies.[27]

To avoid these pitfalls, licensing frameworks should be flexible and technology neutral. The importance of such an approach to licensing has been recognized by numerous regulators. For example, in the Consultation to the 2007 GSR, regulators from Costa Rica, Jordan, Pakistan, Thailand and Tunisia noted that flexibility in licensing, which allows providers to offer multiple services, is an important step to attract investment in NGN.[28] In addition, regulators from Lithuania and Morocco emphasized the importance of a technology neutral approach to licensing in the transition towards NGN.[29] Such a licensing approach is vital in the transition towards an NGN world where service and application layers are decoupled from the underlying transport infrastructure. In the NGN world, all services and applications will be IP-based data packet transmissions and hence would not fit into traditional service categories and their corresponding service specific licensing regimes.

Because of this, regulators are reforming their licensing frameworks to allow for NGN service development that would permit operators to provide multiple services over the same

Box 9.9: Uganda's new licensing regime

Type of Licence	*Services Covered Under Licence*
Public Service Provider Licence	**Category 1**: **Public Voice and Data** – Cellular, Fixed Voice, Global Mobile Personal Communications by Satellite (GMPCS), Internet Access (including IP telephony and Virtual Private Networks), Internet Exchange Services and Virtual Private Networks (VPNs) that are not provided over the Internet **Category 2**: **Capacity Resale** – Local and international capacity resale, calling cards
Capacity Provider Licence	**Category 1**: Licensees that have already been permitted to install infrastructure of the type they have already invested in, for example Internet Access Providers with wireless networks **Category 2**: Persons whose core business is not in telecommunications but who possess private communication facilities with surplus capacity and wish to resale these to third parties **Category 3**: New entrants in the Internet Access market operating their networks using the Industrial, Scientific and Medical frequency (ISM) bands
Infrastructure Provider Licence	Public Infrastructure Provider Private Network Infrastructure
General Authorization	**Category 1**: Public Pay Communication Services such as Internet cafés, payphones, telephone bureaus, etc. **Category 2**: Private Networks

Source: UCC, Communications Licensing Application Guidelines, available at www.ucc.co.ug/licensing/default.php

network. For example, in Malaysia, the licensing framework was modified from a system of 31 different types of licences to four technology-neutral licences. Uganda also developed a new streamlined technology neutral licensing regime that was implemented in January 2007. Under the regime, there are three categories of licences: (i) a public service provider licence; (ii) a capacity provider licence; and (iii) an infrastructure provider licence; in addition to general authorizations (see Box 9.9).[30]

In addition, many regulators are shifting to a unified authorization system, including Nigeria, Peru, and Tanzania, as well as the EU member States. Under the new Converged Licensing Framework, for example, the Tanzania Communications Regulatory Authority recently issued a new type of licence that allows licensees to provide a host of services, including payphone, Internet access, videoconferencing, voice, data, VoIP, and calling card services. Similarly, in 2005, Morocco issued technology neutral, unified licences called "new generation licences" that allow licensees to offer all fixed telecommunication services, such as voice, video and data, and to deploy the necessary fixed-line and wireless infrastructure.[31]

Regulators also are reducing the administrative burdens involved in obtaining a licence by introducing registrations, notifications and, in certain instances, exemptions. For example, in the EU, operators seeking to offer services only need to file a notification with the national regulator listing the services they seek to provide. Similarly, in Japan, all authorizations are conducted through a registration or notification process. If the operations involve a network of a large size or scale, a registration must be filed that requires approval by the regulator; but in all other instances, only a notification is necessary. In certain countries, the regulator has opted not to impose any authorization requirements for particular services. For example, in the United States, VoIP providers are not subject to any licensing requirements; however, they may be subject to other regulatory obligations.

9.3.3 VoIP specific regulation in an NGN world

Regulators are assessing the need to issue VoIP specific regulations. In the last few years, voice services have contributed significantly to the uptake of IP-based applications and services and it is expected that this trend will continue at least for the foreseeable future. The erosion of traditional voice revenues as a consequence of the higher efficiency and lower costs of VoIP services has been one of the drivers of NGN deployment among incumbent providers. As a result, VoIP is no longer seen as a new disruptive technology in the marketplace. In countries where VoIP services were exempt from most, if not all, regulatory obligations imposed on traditional voice providers, such as access to emergency services and universal service contributions, regulators are beginning to issue specific rules tailored to address VoIP's distinct functionalities such as nomadicity of service.

In certain instances, regulation, or the lack thereof, has limited or hindered the development of VoIP. In Chile, for example, the lack of clarity on the regulatory treatment of VoIP services led the incumbent operator to block such services over broadband connections. Ultimately, this triggered the intervention of the Competition Tribunal, which ordered such practices to be ceased.[32] In addition, the Chilean regulator, SUBTEL, initiated a consultation on VoIP regulation which, among other things, expressly classified VoIP services as public

telecommunication services, requiring interested parties to secure the relevant concession. This move is intended to create legal certainty for the provision of VoIP services as a means to foster their deployment in the market place.[33]

In the United States, similar actions by an incumbent also prompted FCC intervention requiring it to cease blocking VoIP service over its network.[34] However, the FCC has yet to classify VoIP service as a telecommunication service or information service, or to adopt general regulations for VoIP. Nevertheless, the FCC has changed its deregulatory approach towards these services, imposing obligations to accommodate legal wiretaps, contribute to universal service funding and provide emergency calls on interconnected VoIP providers that allow calls to or from traditional telephone lines.[35] In addition, the FCC recognized that it was duty-bound to preserve and promote the vibrant and open character of the Internet; to foster the creation, adoption and use of Internet broadband content, applications and services; and to ensure that consumers benefit from the innovation that comes from competition. As such, the FCC issued a set of network neutrality principles to guide its ongoing policy-making activities. To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet, consumers are entitled to:

- access the lawful Internet content of their choice;
- run applications and use services of their choice, subject to the needs of law enforcement;
- connect their choice of legal devices that do not harm the network; and
- competition among network providers, application and service providers, and content providers.[36]

Regulators are realizing that traditional public switched telephone network (PSTN), oriented regulation does not always work for IP-based services and are increasingly finding the need to adopt specific VoIP regulations in light of the increasing role that the service is playing in the current telecommunications market. Clarity on the regulatory framework applicable to VoIP is generally seen by service providers as the first step towards a clear regulatory picture for NGN policy.

9.3.4 Numbering

Numbering policies and regulations were originally developed to address traditional voice telephony services. As a result, numbering plans assigned different ranges that distinguished mobile from fixed services and, in the case of fixed services, denoted different geographic areas. This differentiation had a two-fold function: informing end users of the charges of the calls and maintaining the interconnection cost structure based on the type of service and distance. However, with convergence and the migration towards IP-based NGN, regulators are finding that modifications to such policies and regulations are now necessary.

The increasing use of VoIP services has raised questions among regulators as to whether numbering resources should be assigned for VoIP services and whether traditional PSTN operator obligations should be imposed on VoIP providers. Regulators have adopted a variety of solutions, ranging from allowing VoIP providers to use geographic numbers – provided they offer service under the traditional PSTN regime with the relevant obligations – to creating specific numbering ranges for VoIP that take into account the special characteristics of the service, most notably its nomadic use. Some countries, such as Japan, Spain and the United Kingdom, have combined both measures, granting geographic numbers to VoIP providers if they operate under the traditional PSTN regime and specific number ranges if VoIP providers operate under the "information service" regime.

The ENUM initiative on electronic numbering is a further step in the process of numbering reform and seeks to address numbering issues associated with the migration from PSTN to all-IP networks. ENUM would allow for protocols that convert a telephone number from one world to the other.[37] This initiative would allow the possibility of introducing a fully neutral approach to numbering, in turn simplifying numbering regulations and addressing complexities resulting from all-IP environments. Essentially, by translating a PSTN number to an IP address, ENUM would make it easier to contact people through any electronic means, for example, by linking a user's e-mail address, telephone number and instant messenger ID to a single number.

ENUM developments may potentially define the future direction of numbering policies. In addition, it may address some of the transparency concerns with VoIP by mapping PSTN numbers to "uniform resource locators" (URLs). ITU-T Study Group 2 and the Internet Architecture Board are working together on the implementation of ENUM. An interim procedure to administer the delegation of ENUM resources has already been approved by ITU-T Study Group 2.[38] ENUM is currently in commercial operation in countries such as Austria, Finland, Germany, Netherlands, Poland and Romania. Other countries including Australia, China, Japan, the Republic of Korea, Sweden and the United States have started ENUM trials.[39] Nevertheless a few regulators, such as the ANRT of Morocco, question the maturity of such solutions that allow access to all NGN services by means of a unique identifier.[40]

As NGN will allow for ubiquitous communications both in fixed and mobile settings, issues such as fixed mobile convergence and inter-modal number portability will need to be addressed by regulators. Number portability can be inter-modal, allowing the porting of a number from a fixed to a mobile network, for example, or it can be restricted to portability within only one type of network. The United States, for example, allows geographically restricted inter-modal portability, allowing consumers to port between different types of networks within a limited geographical area. In Argentina, the telecommunication law allows inter-modal portability to be implemented by the regulator, although it has not yet been adopted. Hong Kong, China and Japan are currently discussing whether to introduce inter-modal number portability that could potentially include VoIP.

9.3.5 Spectrum

As currently envisaged, NGN is expected to deliver not only multiple services and applications over a single IP-based platform at higher data rates, but also to allow general mobil-

ity to accommodate the consistent and ubiquitous provision of such services and applications to end users. As such, the ITU Radiocommunication Sector (ITU-R) has been working toward defining the framework and overall objectives for radio access networks of the future, such as IMT-2000 and beyond.[41] The World Radiocommunication Conference 2007 is expected to address future spectrum requirements for such systems.[42]

Systems beyond IMT-2000 are of particular interest in the light of future NGN deployments that support mobile applications. These systems may require new wireless access technologies, some of which are expected to be developed around the year 2010. It is anticipated that these technologies will be capable of supporting high data transmission rates and high levels of mobility, with target peak data rates of up to 100 Mbit/s for mobile access and up to 1 Gbit/s for nomadic and local wireless access. In some countries, these technologies could be widely deployed around the year 2015.

In such an environment, regulators should monitor the roll-out of technologies that support systems beyond IMT-2000 and the development of their mobile and broadband markets in order to make any necessary policy decisions to enable the future deployment of systems that will accommodate the seamless transition between fixed and mobile access.

9.3.6 Interconnection

As discussed in Chapter 5 – Interconnection in an IP-based NGN environment, the introduction of NGN is challenging existing interconnection regulations that were designed primarily for PSTN networks and voice services. Traditionally, interconnection charges have been based on time and distance. However, NGN is IP-based, which makes time and distance largely irrelevant. As a result, charges tend to be flat and distance agnostic.

Currently, numerous regulators are evaluating how to migrate to an NGN environment with minimum distortions to the market, while at the same time preventing any disruption to competition. The issues of concern raised in some countries include: maintaining the any-to-any interconnection principle, which involves ensuring end-to-end connectivity; defining access level and service level interconnection; ensuring non-discrimination among operators using NGN technical capabilities, such as quality of service and traffic prioritization; managing the impact caused by a reduction in the number of interconnection points in the dominant operator's network; and defining charging principles under NGN cost structures such as bill and keep, capacity-based or service-based charges.

Some regulators have introduced reforms into their interconnection regulatory frameworks to address the new NGN environment. For instance, in the United Kingdom, Ofcom introduced the concept of "equivalence of inputs" for NGN. This concept mandates that, when the cost is proportionate, the SMP operator must make available to other operators at a wholesale level the same products and services it makes available to itself at the same price and using the same systems and processes. In other countries, such as Colombia and Spain, regulators have introduced capacity-based interconnection which, if not conceived initially for NGN, addresses the cost structures derived from the IP-architecture environment.

9.3.7 Universal service and access

As highlighted in Chapter 7 – Universal Access, the transition towards NGN will challenge universal service and access policies in various ways. As originally conceived, universal service was an obligation imposed on the monopoly telephony operator requiring it to expand coverage to provide voice services in remote and underserved areas. These operators typically cross-subsidized the cost of their universal service obligations with revenues derived from other services. With the introduction of competition and new technologies, many regulators substituted this implicit cross-subsidization with a requirement that all or some operators contribute a percentage of their revenues to a universal service fund.

The general objectives of universal service and access, which are expected to be maintained in the near future and into the NGN world, involve ensuring the availability, affordability, and accessibility of services.[43] The transition towards NGN will be uneven from a geographical standpoint, since operators will likely concentrate, at least initially, on a country's more profitable areas. This trend can be seen with fibre deployment both in developed and developing countries. As such, universal service and access policies may need to be modified to address these asymmetries.

Moreover, the move towards NGN implies that voice traffic will migrate to IP networks, hence threatening universal service and access funding models. Currently, many universal services funds are maintained by PSTN revenues from voice services. Regulators must determine whether IP-based services, notably VoIP, should be subject to universal service obligations. Most countries have not imposed universal service obligations on service operators using new technologies due to concerns that such obligations would inhibit the development of these players and their services. This trend, however, seems to be shifting, as more traffic moves from PSTN networks to IP-based networks. Some developing countries that allow VoIP, such as the Czech Republic, Mauritius, the Slovak Republic and Venezuela, are subjecting VoIP operators to universal service contribution regimes. In the United States, the FCC has extended universal service contributions to interconnected VoIP providers. In South Africa, VoIP providers that offer service by virtue of their value-added network licence must contribute to the universal service fund as a general telecommunications licence holder.

Similarly, as IP-based technologies proliferate, universal service and access policies in a growing number of countries have begun to include narrowband, and in rare cases broadband, Internet service within the scope of their universal service and access obligations. For example, the 2005 ITU Telecommunication Regulatory Survey indicated that 27 regulators included narrowband Internet service in their universal service definition and 11 included high-speed Internet service.[44] However, given the limited development of broadband markets in certain countries, some regulators have dismissed the expansion of universal service and access obligations to broadband connections because they are not yet considered an essential service of social importance.[45]

9.3.8 Rights of way and shared deployment

One of the most significant costs associated with NGN deployment relates to the excavation of conduits and the installation of fibre for the access part of the network. This entails actual construction and installation costs, as well as the cost of securing numerous permits such as digging and environmental permits. Thus, the simplification of requirements and the shared use of ducts and poles, as well as other possible solutions that reduce an operator's physical deployment costs, are relevant steps in creating an enabling environment for NGN.

Recognizing the constraints that some operators face in deploying networks, some regulators have sought to simplify the procedural requirements to secure rights of way in order to facilitate the roll-out of next-generation access networks. In Japan, for example, the MIC plans to revise the "Guidelines for the Use of Infrastructure such as Telegraph Poles and Conduits Owned by Public Utilities" to facilitate and promote competitive carrier initiatives to install their own FTTx network.[46] In France, competitive broadband provider Illiad has announced FTTH deployments in Paris using municipally-owned ducts and sewers. Similar initiatives have been taken in the United States, where the government has issued recommendations to streamline procedures for granting rights-of-way across federal lands, thereby removing another barrier to the deployment of broadband technology.[47]

In the Netherlands, OPTA has taken a different approach to reducing operator costs associated with deployment. It proposes the joint construction of fibre-optic infrastructure by the incumbent and interested competitors. Each party would lay their respective ducts into a gulley that has been jointly dug, hence reducing the digging costs. In addition, OPTA is considering imposing other possible arrangements, such as requiring operators to include an empty duct as standard procedure in any digging activities in order to sell it to third parties interested in deploying their own infrastructure.[48]

9.3.9 Promotion of diversification of access networks

Promoting diversification of access networks is a policy option being explored by regulators in developed and developing countries as a strategy to promote infrastructure deployment and increase broadband penetration and competition. In particular, the use of wireless technologies allow for significant cost reductions in network deployment, hence facilitating broadband service provision.

In Japan, the MIC has committed to actively promoting the introduction of new wireless access technologies such as high-speed wireless LAN systems in the 5 GHz band and BWA systems using the 2.5 GHz band.[49] The ANRT in Morocco also encourages the diversification of access networks as an initial step on the road to FTTx deployments.[50] In addition, India's TRAI has recommended regulatory measures directed at allowing licence-exempt spectrum use in the 5.1 GHz and 5.3 GHz bands, as well as additional spectrum bands that are not in high usage, for the deployment of BWA networks.[51] Similarly, countries such as France, Germany, Norway, Portugal and the United States have granted BWA licences in the 3.5 GHz band, a trend which has also been adopted in developing countries such as Bulgaria, Colombia, Ecuador, Honduras and Jordan.

9.3.10 Institutional and organizational changes

There are three primary institutional designs for regulatory authorities with responsibility over the communications sector. The most prevalent model is the single-sector regulator whose sole function is to regulate the telecommunication sector, such as regulators in Botswana, Peru and Spain. In addition, numerous regulators such as those in Costa Rica, Germany, Jamaica, Latvia and Panama are multisector regulators with responsibility over various utility sectors that typically include telecommunications, water, electricity and transportation. In recent years, however, there has been an increase in regulators with responsibility over broadcasting, telecommunications and information technology. These regulators are commonly referred to as converged regulators. Today, such regulators are found in most EU countries, including Finland, Italy and the United Kingdom, as well as in Australia, Hong Kong, China, Malawi, Malaysia, South Africa and Tanzania. Governments in these countries believe that such structures are better equipped to address convergent environments, where different services are increasingly offered over the same platform. For the same reason, such a move may also facilitate the transition to NGN.

The origins of converged regulators vary from country to country. The FCC in the United States, for example, has had responsibility over telecommunications and broadcasting since its inception. In the Australia and United Kingdom, however, the creation of a converged regulator occurred as a result of institutional changes. For example, in 2002, the UK government established Ofcom by merging five regulatory bodies into one – the Independent Television Commission, the Broadcasting Standards Commission, the Office of Telecommunications, the Radio Authority and the Radiocommunications Agency. In 2005 in Australia, the Australian Communications Authority and the Australian Broadcasting Authority were merged to form the Australian Communications and Media Authority (ACMA), which has responsibility over telecommunications and broadcasting, including radio spectrum management and online content regulation. In Hong Kong, China, the government has proposed to merge the Broadcasting Authority and Telecommunications Authority into a unified regulator called the Communications Authority, through a comprehensive Communications Bill.[52]

Governments have identified various reasons for moving to a single regulator with responsibility over various industry sectors. By shifting regulatory responsibilities regarding the communications sector into one government agency, stakeholders have a one-stop-shop for resolving regulatory issues, resulting in greater consistency in regulatory approach and practice. In addition, certain operational efficiencies should result and greater resources should be available, since the single regulator now has a larger pool of experts. Furthermore, less overlap and turf battles between government agencies would be the natural result of a single regulator. Operators find it easier to have to comply with only one regulatory authority and to address their

Box 9.10: Singapore's Next-Generation National Infocomm Infrastructure (Next Gen NII)

Announced by Singapore's Prime Minister in February 2006, the Next Gen NII, which comprises fixed-line and wireless networks, is intended to be Singapore's new digital super-highway for super-connectivity. The wired broadband network or Next-Generation National Broadband Network (Next Gen NBN) will deliver broadband symmetric speeds of 1 Gbit/s and above to all homes, offices and schools, while the Wireless Broadband Network (WBN) will offer pervasive connectivity around Singapore.

Next Gen NBN

The Next Gen NBN is envisaged as a carrier-neutral, totally wired network. IDA has proposed this to be an open platform that supports multiple service providers in delivering multiple services to homes and offices. IDA expects the private sector to build, own and operate the NBN. However, IDA's proposal calls for structural separation of the Operating Company[1] and the retail service providers (RSPs) to ensure that all RSPs are treated on an equitable basis in terms of pricing and contractual arrangements for equivalent services and volumes. The government has indicated that it will provide some funding to kick-start the project and to ensure that this ultra high-speed broadband service will be viable, affordable and sustainable in the long term. The process of deploying the NBN was initiated with a Request-For-Concept (RFC) in March 2006. By year-end 2007, a private sector partner will be announced. The appointed operator is expected to complete at least 50 per cent of network rollout within three years of the award and to complete the project within five years.

WBN

To complement the Next Gen NBN, the government will first work with the private sector to accelerate the deployment of the WBN in key "catchment" areas, such as places of interests, the central business district and suburban town centres. On 10 October 2006, IDA selected three operators for the project. These operators launched initial commercial services in January 2007 and are expected to complete the project by year-end 2008.

Sources: IDA, Fact sheet: Next-Generation National Infocomm Infrastructure, available at www.itu.int/osg/spu/ngn/documents/NGNII-Factsheet-060303-Singapore.pdf; IDA, Summary of Responses of Request-For-Concept for Next-Generation National Broadband Network, August 15, 2006, available at www.ida.gov.sg/idaweb/doc/download/13757/Summary_of_RFC_Responses.pdf; IDA, Wireless Broadband Market Development Call for Collaboration (CFC) homepage, available at www.ida.gov.sg/idaweb/marketing/infopage.jsp?infopagecategory=factsheet:wireless&versionid=1&infopageid=I3764

[1] The Operating Company will be responsible for running the Network and providing bandwidth connectivity on a wholesale basis to RSPs that would compete with each other providing services to end users.

issues in one place. Another benefit of having a converged regulator is that it better reflects the marketplace, given that operators now offer triple- and quadruple-play offerings.

When considering whether to introduce institutional or organizational change to facilitate NGN development, governments should assess the objectives that they are trying to achieve and then think about what functions are best placed under the converged regulator. For example, in certain countries, such as Venezuela, the regulator has responsibility over broadcasting and telecommunications but may not have authority over consumer protection and competition issues, which are the responsibility of other authorities. Similarly, in Canada, spectrum matters are addressed by Industry Canada rather than by the regulator, the Canadian Radio-Television and Telecommunications Commission (CRTC). In other instances, responsibility over broadcasting content may reside with a separate regulatory authority. In Singapore, the Infocomm Development Authority (IDA) has responsibility over telecommunication and information technology matters, but the Media Development Authority (MDA) licenses over-the-air television and regulates content.

In addition, governments also need to consider the relationship between telecommunication, broadcasting and competition laws. Should the regulator have any responsibility over competition issues? Different countries take different approaches. In Australia, for example, the communications regulator has no authority over competition issues, whereas in the United Kingdom Ofcom has jurisdiction concurrently with the Office of Fair Trading. The issue of whether a sector regulator will generally be subordinate to a general competition authority with regard to telecommunication and broadcasting issues that include a competition element is important. For example, in Singapore, IDA has authority only to the extent that such responsibility has not been granted to the Competition Commission. If the jurisdiction and responsibilities of these two authorities are not appropriately balanced, inefficiencies and jurisdictional debates may ensue.

9.3.11 Public (municipal) initiatives

Another route taken by certain governments, particularly local governments, involves the direct deployment of next-generation access and core networks via public-private partnerships. Municipally sponsored FTTH projects are springing up across Europe and the United States with the goal of providing competing infrastructures that grant open access to competitive broadband service providers. Even some national regulators, such as Singapore's IDA with its Next-Generation National Infocomm Infrastructure (Next Gen NII) project, are also getting involved in similar initiatives (see Box 9.10). Such initiatives can be beneficial to competition. In Amsterdam, for example, expected competition from Citynet, a municipal project, has prompted the incumbent KPN's deployment of FTTH.[53]

Box 9.11: UTOPIA: Open access municipal FTTH in the United States

UTOPIA was originally formed in 2002 by fourteen cities in the State of Utah, in the United States. UTOPIA's mission is to build and maintain an FTTH open-infrastructure network. The project is funded by the sale of bonds that are guaranteed by 11 of the cities involved in the project. In 2004, USD 85 million in bonds were sold to fund the first phase of construction, which involved the laying down of fibre for six southern cities. The project is currently in its second phase, which involves rolling out fibre in the remaining five northern UTOPIA cities. To repay these bonds, UTOPIA will collect a wholesale fee from service providers. If such revenues prove to be insufficient, however, the 11 guarantor cities will be required to honour UTOPIA's bond commitments with monies levied from sales taxes. Currently, several small service providers such as MSTAR, Veracity Communications and X-Mission Internet, as well as large providers like AT&T, are offering voice, broadband and television services via UTOPIA'S network.

Source: www.utopianet.org; Steve Cherry, A Broadband Utopia Continued, IEEE Spectrum Online, May 2006, available at www.spectrum.ieee.org/may06/3434/3

Box 9.12: Enabling local governments to deploy next-generation access networks in France

In June 2004, France amended the Territorial Collectivities Code[1] to expand the authority of municipalities to promote and roll out telecommunication infrastructure within their jurisdictions. Local governments are now allowed to deploy networks that they may operate themselves as a carrier's carrier or outsource to private operators. In addition, municipalities are entitled to serve end users directly under very specific circumstances.[2]

Municipalities must publish their projects to roll out infrastructure in the official journal two months before starting operations and must also inform the regulator, ARCEP, of their projects. Local governments must adhere to principles of transparency, non-discrimination and proportionality in their telecommunication activities. In addition, they must establish account separation for activities involving the telecommunication network.

In early 2006, ARCEP reported that French municipalities had shown interest in 1 480 municipal telecommunications networks projects, 380 of which foresaw the deployment of fibre-optic networks.[3]

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1 *Code General de Collectivités Territoriales*. Article L 1425.1, introduced by the *Loi nº 2004-575 du 21 juin 2004 pour la confiance dans l'économie numérique*.

2 Municipalities can only serve end users directly if it is confirmed that private initiatives are insufficient to meet end-user demand in their jurisdictions. To this end, local governments must conduct public offerings to enlist private operators that meet this demand. Only if this process is unsuccessful (i.e., no private parties come forward to meet demand), and after duly notifying the French regulator, ARCEP, may local governments engage in the provision of end-user services.

3 *Equipement des zones d'activité en infrastructures de télécommunications à haut et très haut débit. Guide pour les aménageurs et pour les collectivités*. ARCEP, p. 14.

A key element of this trend involves the creation of an open-access network that will allow non-discriminatory access by multiple service providers to next-generation networks. However, not all municipal projects are open-access networks. In the United States, 32 municipality-led projects have been deployed, either directly or via municipally owned utility companies; however, the majority of these networks were not designed as open networks.[54] An interesting exception is that of the Utah Telecommunication Open Infrastructure Agency (UTOPIA), a planned FTTH open infrastructure network (see Box 9.11).

Poorly targeted public schemes, however, may potentially result in considerable harm, particularly if such public intervention distorts commercial incentives for efficient investment.[55] In many cases, governments must adopt suitable legislation or regulation that determines the scope of such projects. For example, in France, the Netherlands and the United States legislation was necessary for municipal projects to materialize (see Box 9.12).[56]

In addition, public projects may face legal challenges from incumbent providers. In the United States, for example, incumbent providers have consistently used the courts and state legislatures to block municipal broadband projects, particularly those related to Wi-Fi deployments.[57] At present, 14 states have enacted some sort of legislation restricting municipalities from offering telecommunication services, half of which apply to broadband.

9.4 Facilitating the transition to an NGN world

It is important for governments to build in mechanisms for collaboration among regulators, policy-makers and industry as they grapple with the issue of how best to address the transition to an NGN environment. Regulators in Costa Rica, Lithuania and the United Kingdom, for example, have acknowledged that they should play a supervisory role rather than attempt to manage the migration to NGN, recognizing that industry stakeholders, who better understand the require-

ments and potential of NGN, are more likely to develop better solutions than regulators. The involvement of stakeholders in the regulatory process can take a number of forms, including a consultative process, hearings, seminars, forums, community meetings, as well as establishing technology expert groups and industry-led groups. The goal of such collaboration is to ensure that the regulatory framework does not become so restrictive that it thwarts investment in NGN and, at the same time, does not act too late to encourage competition.

Involving stakeholders in the regulatory process is an essential part of a regulator's decision-making process and provides abundant benefits. It enhances confidence in the regulator by providing stakeholders with an opportunity to voice their opinions on a regulatory issue. It also increases consensus and support for regulatory decisions, since the stakeholders have had an opportunity to participate in the process. Moreover, it provides an opportunity for stakeholders to provide input on the regulator's plan of action and allows for feedback from stakeholders with valuable insights into the sector, given their day-to-day operations in the industry. Finally, obtaining input from stakeholders reinforces regulatory autonomy and accountability, since it demonstrates to stakeholders that the regulator has decision-making power in the regulatory process.

9.4.1 Consultative processes

Many countries such as Australia, Germany, India, Japan, Mexico, Netherlands, Singapore and the United Kingdom have undertaken policy and regulatory initiatives related to NGN, IP and convergence.

For example, in January 2006, the Indian regulator TRAI issued a consultation paper seeking comments from stakeholders on NGN-related issues, such as the timing of the transition to NGN, regulatory and technical issues, and migration-related requirements. In addition, it conducted open house discussions in the cities of Bangalore and Delhi to seek the views of consumer organizations and other stakeholders. As a result, TRAI issued its recommendations in a document published in March 2006 that addressed, among other issues, the need to enhance industry-regulator collaboration in the transition towards NGN.[58]

During May and June 2006, OPTA of the Netherlands sought comments from stakeholders regarding regulatory issues surrounding the incumbent KPN's plans to migrate to NGN, a project called All-IP.[59] In particular, the consultation was focused on "the relationship between All-IP and KPN's existing obligation to offer unbundled access to its access network." In October 2006, OPTA issued an All-IP Position Paper to inform and consult stakeholders about the policies it was proposing to adopt and the follow-up activities it was planning to undertake.[60]

In addition, some countries have also initiated less formal consultation processes. Ofcom, for example, issued a public discussion document in November 2006 entitled "Regulatory challenges posed by next-generation access networks," in which it indicated its interest in obtaining stakeholder views and opinions. Although it did not initiate a formal consultation process, Ofcom indicated its interest in receiving written views from third parties to promote public discussion on the way forward regarding next-generation access network deployment and regulation. In addition, Ofcom noted its intention to organize several seminars in 2007 to meet with stakeholders to discuss the issues presented by next-generation access.

9.4.2 Public awareness campaigns

For some regulators, one of the first steps to addressing the transition to NGN has been to provide greater awareness about related issues and how they will impact industry and consumers. For example, after conducting its consultation process, the Indian regulator TRAI issued final recommendations that focused on the need to increase awareness about various aspects of NGN.[61] It recommended that: (i) the government organize interactive workshops and seminars; (ii) a cross-industry joint consultative group consisting of the Telecom Engineering Centre (TEC), which is the standards-setting organization in India, service providers, technical institutions and vendors be established to analyze NGN standards and their customization for national requirements; (iii) a detailed consultation be conducted with stakeholders on interconnection issues and QoS regulation for NGN; and (iv) an expert committee be established.

In Australia, the regulator has also been keen about the importance of public awareness. In its VoIP Report, ACMA included various recommendations regarding its obligations to promote consumer awareness regarding VoIP. In particular, ACMA decided to promote consumer awareness through toolkits and fact sheets about the differences between VoIP services and traditional circuit-switched telephony services and the ways consumers can influence the performance of their VoIP service. In addition, providers were required to disclose to consumers the characteristics and limitations of any VoIP service they purchase in comparison to traditional circuit-switched telephony services.

9.4.3 Industry and consultative bodies

Various countries are establishing industry groups or expert groups to address the transition to NGN. These groups may be ad hoc or an existing consultative body comprised of several government agencies, industry representatives and other interested parties. The role and functions of these consultative bodies vary, but they generally issue recommendations to the government addressing the need for changes in convergence legislation and regulation. The expectation is that such groups will benefit all stakeholders in the transition of the telecommunication industry to NGN and will help to ensure a smooth transition for both industry and end users. These consultative bodies are valuable tools that provide a way to constantly review and monitor the transition to NGN, as well as the effects of convergence. They can also provide first-hand contact between the government, industry and other parties that deal with these issues directly.

For example, in the United Kingdom, Ofcom established NGNuk, an independent NGN industry body, in order to create an improved framework for industry involvement (see Box 9.13). In Australia, several consultative forums for the

Box 9.13: NGNuk: Background, justification, goals and current developments

In June 2005, Ofcom published a consultation entitled "Next-Generation Networks: Further Consultation",[1] which proposed a series of policy principles and processes to support the development of NGN in the United Kingdom. Ofcom's position is that it is inappropriate for it to manage the migration to NGN and that this is best left to BT and competitive providers, which understand the requirements and possibilities of NGN and therefore are likely to develop better solutions than Ofcom. Because of this, Ofcom sought instead to ensure that suitable industry-led processes were established and empowered to successfully implement this change, in line with the policy principles proposed by Ofcom.

As a result, Ofcom proposed establishing an industry body to coordinate the UK telecommunication industry's transition to NGN core networks.[2] In its report entitled "Next-Generation Networks: Developing the regulatory framework",[3] Ofcom announced plans to establish NGNuk as an independent NGN industry body, with the purpose of creating an improved framework for industry engagement, focusing on three primary issues: IP interconnect architecture; IP interconnect commercial models; and network intelligence interoperability.[4]

The role of the proposed body is not to provide a substitute for Ofcom's regulatory functions, but to ensure that there is a clear commercial vision led by the industry for competition based on interconnected NGN. This, Ofcom has argued, would allow for regulation to follow the market rather than lead it.[5]

NGNuk began operations on 1 April 2006 and its Constitution was agreed upon and signed on 16 August 2006.[6] Its executive members consist of electronic communications network providers with a demonstrable and substantial network investment in NGN in the United Kingdom. Participating members reflect the wide range of NGN stakeholders with a *bona fide* and demonstrable intention to interconnect, use or invest in NGN in the United Kingdom.[7]

Ofcom's role in the move to NGN

What Ofcom does	*How Ofcom does it*
Help to identify and clarify potential regulatory issues early	Consultation and ongoing dialogue with stakeholders
Establish clear governing policy rules to support NGN-based competition	Consultation and subsequent statements
Establish a policy framework for consumer protection and information	Consultation and subsequent work on a communication plan
Ensure appropriate industry-led processes are established	Consultation and ongoing discussions with stakeholders
Ensure industry-led processes stay on track	Ongoing informal monitoring and dialogue with BT and other providers
Resolution of competition issues when industry processes fail	Formal market reviews and ex *post* competition powers as required
Updating *ex ante* regulatory framework to take account of NGN	Ongoing programme of market reviews such as updating market definitions, remedies and deregulating, as appropriate

Source: Ofcom, Next-Generation Networks: Further Consultation, p. 10.

1 Issued 30 June 2005.
2 Spectrum Strategy Consultants, Ofcom. Scoping an NGN industry body. 9 December 2005. Available at www.ofcom.org.uk/consult/condocs/nxgnfc/ngn/
3 Issued 7 March 2006. Available at: www.ofcom.org.uk/consult/condocs/nxgnfc/statement/ngnstatement.pdf
4 Ibid. at p. 8-9.
5 Ibid. at p. 9.
6 See NGNuk Constitution, available at: www.ngnuk.org.uk/docs/NGNuk_constitution_060816.pdf
7 Ibid. Sections 3.3.3 and 3.4.1.

communications sector were also established. For example, the Australian Communications Industry Forum (ACIF) implements and manages industry self-regulation. As part of its activities, it established the NGN Future Operations Group (NGN FOG) to discuss and analyze issues relating to NGN implementation. Similarly, Mexico recently established a Convergence Committee which comprised the regulator (COFETEL), service providers and industry experts. Recently, the regulator in India, TRAI, established the "NGN eCo" (NGN Expert Committee) to facilitate joint consultation between the regulator and consumers, industry players and policy-makers. The Committee will address issues such as interconnection, QoS, awareness building and the migration timetable for NGN.

Some consultative groups are much larger in scope, such as in Japan, where industry-academia-government collaboration was initiated through the establishment of the Next-Generation IP Network Promotion Forum in December 2005. The Forum consists of 211 members including universities, telecommunication operators, manufacturers and application production companies.

In certain countries, regulators have also established expert groups to assist them with the preparation of reports and studies that are used as part of the consultation process. For example, in October 2005, the MIC in Japan established a "Study Group on a Framework for Competition Rules to Address the Transition to IP-Based Networks" to address the migration towards NGN and its regulatory implications. This group issued a report with a set of recommendations and principles to guide competition policies in the NGN world. The MIC adopted these recommendations and formulated a road map for developing fair competition rules to further promote competition in telecommunication markets and secure user benefits.

Similarly, in Germany, the regulator created a Project Group, consisting of high-level telecommunication experts led by the head of the regulatory authority, to assist it in developing a report on the appropriate interconnection framework for IP-based networks. The Project Group's mandate was to act in an advisory capacity and not to make any legally binding decisions. In addition to assistance in preparing the report, the Project Group's experts have also given presentations that are accessible on the regulator's website.

9.4.4 International fora

International organizations such as ITU, *info*Dev, the International Telecommunication Users Group (INTUG) and the Organisation for Economic Co-operation and Development (OECD), as well as regional organizations and industry associations, such as the Asia-Pacific Economic Cooperation (APEC), the Asia-Pacific Telecommunity (APT), the Inter-American Telecommunication Commission (CITEL), the European Conference of Postal and Telecommunications Administrations (CEPT) and the EU are involved in NGN policy and regulatory initiatives through workshops, seminars, conferences, consultations, reports and study groups. For example, ITU has created the Next-Generation Networks Global Standards Initiative (NGN-GSI), which focuses on developing the detailed standards necessary for NGN deployment to give service providers the means to offer the wide range of services expected to be delivered by NGN. In collaboration with other bodies, NGN-GSI aims to harmonize different approaches to NGN architecture worldwide. At the same time, a number of ITU-T Study Groups are addressing questions related to NGN migration issues, particularly Study Group 1, but also Study Groups 11, 12, 13, 15, 16 and 19. Similarly, the ITU Development Sector (ITU-D) is also focusing on NGN through its programmes and study groups, in furtherance of recent decisions taken at the World Telecommunication Development Conference.

Regulators should monitor international developments on NGN-related issues, such as IP-interconnection, standardization and numbering. To the furthest extent possible, they should also participate actively by attending meetings and providing inputs into the process. Coordination and interaction with other regulators and entities that are confronting similar NGN transition issues are a useful resource that should be fully utilized.

[1] A next-generation network is composed of an access component and a core component. The access component (or next-generation access network), constitutes the evolution of existing access or distribution networks (local loops) with the deployment of new high-speed technologies, particularly fibre into the local loop. The core component constitutes the integration or convergence of existing backbone infrastructure (e.g. ATM, frame relay, X.25, ISDN, etc.) towards an integrated IP-based network, allowing for multiple service/application capabilities and differentiated quality of service.

[2] See also Christian Wey, Pio Baake and Sven Heitzler, Ruling the New and Emerging Markets in the Telecommunication Sector. Challenges: The Emergence of Next-Generation Networks, ITU, 15 April 2006, available at www.itu.int/osg/spu/ngn/documents/Papers/Wey-060323-Prem-v1.1.pdf

[3] According to the 2006 Millennium Goals Report, in 2004, Africa added some 15 million new mobile phone subscribers. This figure is equivalent to the total number of fixed and mobile telephone subscribers on the continent in 1996. See UN, Millennium Development Goals Report 2006, p. 25. Available at www.unstats.un.org/unsd/mdg/Resources/Static/Products/Progress2006/MDGReport2006.pdf

[4] Ibid.

[5] See Keynote Speech by Mr M. H. Au, Director-General, Office of the Telecommunications Authority, Hong Kong , People's Republic of China in the Session on "Next-Generation Networks for Development: The Enabling Environment" on 7 December 2006, in the Telecommunications Development Symposium, ITU TELECOM WORLD 2006. Available at www.ofta.gov.hk/en/speech-presentation/2006/20061207.pdf

[6] "Greenfield" markets are those "which require entirely new construction of local loops (in addition to the deployment of the necessary switching and other network equipment) to serve new residential communities".

[7] See WSIS, Plan of Action. Document WSIS-03/GENEVA/DOC/5-E, 12 December 2003, Action Line C6. Available at www.itu.int/wsis/docs/geneva/official/poa.html#c6

[8] Ofcom, Regulatory challenges posed by next-generation access networks. Public discussion document. 23 November 2006, p. 16.

[9] Explanation to the recommendation of the European Commission of 11 February 2003 regarding relevant product and service market, Official Journal of the EC 203, L114/45, p. 29.

[10] The investment ladder, or "ladder of investment", is a theoretical concept based on the notion that competitors will roll out their networks gradually, first by simply reselling, then by purchasing wholesale broadband access, then acquiring unbundled access to the local loop, and finally deploying end-user connections.

[11] See regulator's contributions to the 2007 Global Symposium for Regulators, available at www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR07/consultation.html

[12] OPTA, KPN's Next-Generation Network: All-IP. Position Paper, 3 October 2006 (OPTA/BO/2006/202771), p. 8.

[13] Ofcom, *supra* note 8, p. 3.

[14] Ibid, p. 22.

[15] OFTA, Review of Type II Interconnection Policy, July 2004, p. 4. Available at www.ofta.gov.hk/en/report-paper-guide/paper/information/info20040706.pdf

[16] OFTA indicated that Type II Interconnection was only applicable to copper-based, not fibre-optic, customer access networks, as "unlike the copper network which pre-existed before market liberalization in respect of which PCCW-HKT has first mover advantage, all carriers should have had equal opportunities to lay optical fibre cables." OFTA, *supra* note 15, p. 12.

[17] ARCEP, *Notification à la Commission européenne du projet de décision proposant la levée de la régulation du marché des offres de gros d'accès large bande livrées au niveau national* (December 2006), available at www.arcep.fr/uploads/tx_gspublication/proj-dec-12bis-comue-dec2006.pdf

[18] Ofcom, *supra* note 8, p. 23.

[19] See TRAI, Recommendations pertaining to Local Loop Unbundling at para 3.4.2.13 to 3.4.2.22. See also Ministry of Communications and Information Technology, Broadband Policy 2004. Available at www.dotindia.com/ntp/broadbandpolicy2004.htm. See also TRAI, Letter to the Secretary of the Department of Telecommunications, Ministry of Communication and Information Technology, in re Broadband Policy 2004 – targets and achievement, F.No.2-2/2004-CN, 3 November 2005, Annex "A". Available at www.trai.gov.in/trai/upload/Recommendations/5/letter3nov05.pdf

[20] EC, Commission launches "fast track" infringement proceedings against Germany for "regulatory holidays" for Deutsche Telekom, Press Release, Brussels, 26 February 2007 (IP/07/237).

[21] See EC, Commission Staff Working Document. Public Consultation on a Draft Commission Recommendation on Relevant Product and Service Markets within the electronic communications sector susceptible to *ex ante* regulation in accordance with Directive 2002/21/EC of the European Parliament and of the Council on a common regulatory framework for electronic communication networks and services (second edition), 28 June 2006, SEC(2006) 837, p. 16. (Draft Recommendation).

[22] See Ofcom, Final statements on the Strategic Review of Telecommunications, and undertakings in lieu of a reference under the Enterprise Act 2002, 22 September 2005, available at www.ofcom.org.uk/consult/condocs/statement_tsr/statement.pdf

[23] See www.openreach.co.uk/orpg/home/home.do

[24] Ofcom, *supra* note 8.

[25] See ACCC "perplexed" by Telstra decision on fibre-to-the-node investment, Press release, 7 August 2006. Available at www.accc.gov.au/content/index.phtml/itemId/757949

[26] FCC Adopts Rules to Ensure Reasonable Franchising Process for New Video Market Entrants. 20 December 2006. Available at www.hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-269111A1.pdf

[27] See also Dale N. Hatfield and Eric Lie, Why Licence?, in Trends in Telecommunication Reform 2004/2005: Licensing in an Era of Convergence, ITU, p. 28.

[28] See regulator's contribution to the 2007 Global Symposium for Regulators, available at www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR07/consultation.html

[29] See RRT, Contribution of the Communications Regulatory Authority of the Republic of Lithuania to the 7th Annual Global Symposium for Regulators, available at www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR07/contributions/ltu.pdf. See also ANRT, Response to the consultation in preparation for the 2007 Global Symposium for Regulators, available at www.itu.int/ITU-D/treg/Events/Seminars/GSR/GSR07/contributions/mrc.pdf

[30] UCC, Communications Licensing Application Guidelines, available at www.ucc.co.ug/licensing/default.php

[31] See *Cahier des Charges de la licence nouvelle génération attribuée à Médi Telecom S.A. pour l'établissement et l'exploitation de réseaux publics de télécommunications au Royaume du Maroc*, available at www.anrt.net.ma/fr/

[32] See Competition Tribunal, Decision Nº 45/2006 of 26 October 2006, available at www.tdlc.cl/db_images/sentencias/45411f978d854_Sentencia-45-2006.pdf

[33] See SUBTEL, *Consulta Pública, Reglamento de Servicio Público de Voz sobre Internet*, available at www.subtel.cl/servlet/page?_pageid=58&_dad=portal30&_schema=PORTAL30

[34] See In the Matter of Madison River Communications, LLC and affiliated companies, File No. EB-05-IH-0110, Order, 20 FCC Rcd 4295 (2005).

[35] There is currently an ongoing proceeding regarding IP-enabled services in order to determine what rules will apply to these services. See In the Matter of IP-Enabled Services, WC Docket No. 04-36.

[36] See In the Matter of Appropriate Framework for Broadband Access to the Internet over Wireline Facilities; Review of Regulatory Requirements for Incumbent LEC Broadband Telecommunications Services; Computer III Further Remand Proceedings: Bell Operating Company Provision of Enhanced Services; 1998 Biennial Regulatory Review – Review of Computer III and ONA Safeguards and Requirements; Inquiry Concerning High-Speed Access to the Internet Over Cable and Other Facilities; Internet Over Cable Declaratory Ruling; Appropriate Regulatory Treatment for Broadband Access to the Internet Over Cable Facilities, CC Docket Nos. 02-33, 01-337, 95-20, 98-10, GN Docket No. 00-185, CS Docket No. 02-52, Policy Statement, 20 FCC Rcd 14986, 14987-88, para. 4 (2005). Available at www.cdt.org/speech/net-neutrality/20050923fcc-appropriate-framework-nprm.pdf

[37] ENUM resulted from the work of ITU's Internet Engineering Task Force (IETF)'s Telephone Number Mapping working group. The working group was assigned the task of defining a Domain Name System (DNS)-based architecture and protocols to map a PSTN telephone number to a Uniform Resource Locator (URL) through which a recipient could be contacted. For further details, see ITU-T Resolution 49, available at www.itu.int/dms_pub/itu-t/opb/res/T-RES-T.49-2004-PDF-E.pdf

[38] See www.itu.int/ITU-T/inr/enum/procedures.html and www.itu.int/ITU-T/inr/enum/procedures-02.html

[39] See www.itu.int/osg/spu/presentations/2004/enum-country-experiences-ftra-uganda-rs.pdf. For an example of an ENUM trial, see *also* www.enum.org/

[40] See ANRT, *supra* note 29.

[41] See Recommendation ITU-R M.1645.

[42] See Resolution 802 (WRC-03), resolves 1.4 (also referred to as Agenda item 1.4).

[43] Availability implies that the level and quality of service (including reliability) is the same wherever a person lives or works, so that residing in a high-cost rural or remote area does not affect a person's ability to access communication services. Affordability is referred to the fact that maintaining and using the service does not place an unreasonable burden on consumers, particularly on vulnerable disadvantaged consumers. Accessibility means that people with disability can use the service. See Patrick Xavier, What rules for universal service in an IP-enabled NGN environment? ITU, 15 April 2006, p. 5. Available at www.itu.int/osg/spu/ngn/documents/Papers/Xavier-060323-Fin-v1.pdf

[44] World Telecommunication Regulatory Database 2005.

[45] See Xavier, *supra* note 43, p. 8; Ofcom, Review of the Universal Service Obligation, 10 January 2005. Available at www.ofcom.gov.org.uk

[46] See MIC, New Competition Promotion Program 2010, 19 September 2006, p. 2, available at www.soumu.go.jp/joho_tsusin/eng/pdf/060928_1.pdf

[47] DOC, Federal Rights-of-Way Working Group, Improving Rights-of-Way Management Across Federal Lands: A Roadmap for Greater Broadband Deployment, April 2004.

[48] OPTA, *supra* note 12, p. 37.

[49] MIC, *supra* note 46, p. 3.

[50] See ANRT, *supra* note 29.

[51] TRAI, Recommendations on Issues Pertaining to Next-Generation Networks (NGN), 20 March 2006, p. 14. Available at www.trai.gov.in/trai/upload/Recommendations/47/recom20mar06.pdf

[52] Consultation on the Establishment of a Communications Authority, Communications and Technology Branch, Commerce, Industry and Technology Bureau, March 2006.

[53] See www.citynet.nl

[54] See Telecommunications Industry Association (TIA) and FTTH Council, U.S. Optical Fibre Communities – 2006, available at www.ftthcouncil.org/documents/959055.pdf. It is worth noting that there has been considerable increase in the number of communities served with FTTH in the United States during the past years. Data from 2005-2006 shows an increase of more than 135 per cent on a year-to-year comparison, as the number of communities served in May of 2005 was 398. See Telecommunications Industry Association (TIA) and FTTH Council, U.S. Optical Fibre Communities – 2005, available at www.ftthcouncil.org/documents/213284.pdf

[55] Ofcom, *supra* note 8, p. 19.

[56] See Randal C. Picker, Who Should Regulate Entry into IPTV and Municipal Wireless?, John M. Olin Law & Economics Working Paper No. 308, University of Chicago Law School, September 2006. Available at www.papers.ssrn.com/sol3/papers.cfm?abstract_id=931495.

[57] For a recent reference to the legal landscape of municipal Wi-Fi in the United States, see Federal Trade Commission, Municipal Provision of Wireless Internet, Staff Report, September 2006. Available at www.ftc.gov/os/2006/10/V060021municipalprovwirelessinternet.pdf

[58] See TRAI, *supra* note 51.

[59] OPTA, Issue Paper KPN's Next-Generation Network: All-IP, 22 May 2006, reference: OPTA/BO/2006/201599.

[60] OPTA, *supra* note 12.

[61] TRAI, *supra* note 51.