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Next Generation Networks (NGN)
and
Next Generation Access (NGA)

A Research Report for INTUG
by Stratix Consulting

Executive Summary

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Next Generation Networks (NGNs) and Next Generation Access (NGA) Position Paper

Executive Summary

INTUG is pleased to present this Position Paper on Next Generation Networks (NGNs), which has been prepared on its behalf by Stratix Consulting BV.

NGNs are in some respects a reconstruction of "public" networks, with operators adopting technologies and standards developed first for the private networks of business users.

This technological change provides an opportunity for more standardised pan-European services and for removal of many costly interfaces between *public* and *private networks* which business currently require for wide-area access to their ICT systems.

It should also enable easier market entry for new network service providers, who can deploy commercial off-the-shelf equipment. However, parts of the business models of public network operators were based on clear dividing lines between technologies deployed for customers in *private* and *public networks.* NGNs therefore have an impact on their business models.

The original drivers for liberalisation of communications markets since the 1960s were:

1. Lack of incentive for innovation in user services by incumbent operators, and by their suppliers who formed part of a vertically integrated business model.

2. High prices, due to monopoly providers' focus on their voice services business, and a strategy of pricing leased lines on lost (voice) revenue rather than production costs.

Telecommunications reform has tried to break down unnecessary vertical integration in order to facilitate real competition at each layer. The close commercial links between incumbent operators and equipment suppliers have been largely broken, and a thriving networking and IT-industry now provides the business community with many innovative products and services for their private networks, but vertical integration remains in most public networking.

There has been a trend in recent years towards re-monopolisation in public networks, as the number of alternative operators installing cable has reduced with market consolidation, and given the high cost of installing infrastructure. This risks a return to slow innovation and high prices, particularly for mobile (data) networks and fixed networks based on fibre.

Many policy issues concerning NGNs and Next Generation Access (NGA) are not really about technology, but are about network topology and about attempts by incumbents to conserve their existing business models in wholesale markets, for example by evading regulatory models designed to facilitate competition.

There is a serious risk that dilution of ex-ante regulation, e.g. by limiting equivalent access to legacy technologies like copper, will foreclose competition as NGNs/NGA are implemented.

The regulatory framework must not be technology specific. NGN and NGA simply represent the next step in a continuum of investment phases in more advanced telecommunications technology. They must not be used as a lever to destroy competition, which sector regulation has strived to establish during the last 15 years.

Multinational Enterprises (MNEs) are now consolidating data centres and application servers regionally and even globally. Public applications and information services also have global scale and scope. National Regulatory Authorities (NRAs), however, operate as their name suggests, at national level, and in the EU only analyse markets at Member State level. This can lead to a false assumption that national regulation of vertically integrated businesses, using national cost modelling, is sufficient, when modern *core systems* serve the entire European continent, while being operated from a handful of physical sites.

This produces a patchwork of fragmented network services with inconsistent pricing and interconnection arrangements, which adds cost for business customers, whilst allowing operators to benefit from economies of scale in their core systems. MNEs suffer since they cannot gain uniform and seamless transnational services.

The absence of competitive pan-European bitstream service providers means there is little pressure on NRAs to even harmonise national bitstream service definitions.

Regulation has so far failed to ensure non-discriminatory availability of uniform wholesale inputs from incumbent operators, which are essential for multinational network coverage. The ONP-defined minimum set of leased lines has not been updated and is now outdated. Its natural successors, Bitstream and Ethernet services, differ in features and quality levels per country, and are often not directly available to MNEs, as operators limit provision to public network operators. As a result, supply of pan-European business services is unnecessarily slow and expensive and, in some cases, simply impossible.

This creates barriers to trade for businesses seeking to compete internationally, even within the EU, as this often requires piecing together wide area network services from different suppliers with different technologies, despite being able to implement local office networks in a uniform manner. Business users still cannot obtain the seamless services they need to support efficient ICT investment, either within all Member States, or across the EU.

The phrase 'The rise of the stupid network' was used to describe a shift of intelligence outward to end-user devices and inward to shared data centres. Telecommunications operators have responded by re-establishing vertical integration, arguing that this is a technological necessity.

Many incumbents and their NGN equipment suppliers see the transition to NGN as primarily technology replacement and reduction of cost and complexity in the core network. It also provides an opportunity to regain control, which has been eroded by the rise of the Internet. They seek to do this by adding control features, which re-establish *vertical integration* between services like voice telephony, and control over the network loops. Industries are therefore protecting themselves by defining different technical varieties for VoIP.

NGA by sub-loop unbundling is an inadequate solution for competition
NGA also poses a threat to competition. New network topologies with equipment nearer to the customer (eg Fibre to the Kerb/Street Cabinet) change the scale of local operations from several thousands of lines per local exchange building to a few hundred per street cabinet.

Competitive entrants with a relatively small market share can still compete with local loop unbundling in the first situation, with a few hundred customers per collocation site. The greater granularity in the second situation produces too few customers per cabinet for a viable business case, except perhaps in a few business parks with more than one operator installing equipment in a street cabinet.

As a consequence, competitors are withdrawing from the local loop unbundling market, and must buy bitstream services from incumbents. Even this option may be blocked by excessively priced access to backhaul fibre.

Long fibre loops and an effective competitive market for wholesale and retail inputs on an equivalent basis must be the aim, and where this does not emerge through natural market forces, functional separation must be available as a regulatory option.
A long-term view would recognise that the deployment of fibre loops enables not shorter, but far longer, local loops. Several incumbents have already publicly recognised that the erection of street cabinets with active VDSL-equipment in it, is only an intermediate step. When the copper sub-loops are converted to fibre, they will be removed and replaced by passive optical connections. Active optical equipment will then serve much larger areas.

Technology neutrality itself would equate fibre loops with copper loops, and thus unbundling should apply. Access to longer loop fibres of 15 to 20 km allows specialist service providers to enter the market by leasing those longer fibre loops wholesale to cater for the specific demands of businesses. Fibre-to-the-Cabinet (VDSL) drastically reduces competition to one or two operators per area. Fibre-to-the-Home/Office re-emerges as the scale alters.

This provides huge incentives for incumbents to stick to FTTC for as long as possible, and to delay expanding fibre to customer premises under the current regime. Where creation of competing infrastructures is not economically feasible, and competitive supply of retail and wholesale equivalent inputs does not occur, functional separation must be available to NRAs as a regulatory option to generate a viable technology-independent competitive market.

The topology of the network is not a market structure neutral issue as it alters the options for enabling competition.
Implementing street nodes first and then fibre to the home forecloses markets as competitors withdraw. Businesses will again be forced to deal with national markets for reaching their branch offices as the number of lines per street node is too low to allow for business oriented pan-European service providers investing in active equipment. Business users may actually end up with even more fragmentation than today. Functional separation in such cases may prove to be the only way of overcoming this, whilst ensuring domestic consumers needs can also be met effectively in terms of domestic service definitions, control over local loops and national transport services.

Pension/Real Estate funds financing of open passive facilities are a new market reality
New institutional investors, like pension funds, prefer open local loop networks to spread their risks over multiple active equipment operators, and make this a prerequisite for their long-term investment. This must influence policy and regulation. The investment community treats a passive local loop network like a Real Estate asset only when it is not bound to a single active equipment operator. Its value rises when multiple firms are allowed to operate over it, as that reduces company-specific default risks. Open passive networks thus command a lower risk premium. Investing in a network with active electronics/optics is viewed as similar to investing in a company, with corporate level bankruptcy risks.

Incumbent operators used consultants and academics to challenge this market reality that open infrastructure commands lower risk-reward premiums. Existing funds which acquire and (co-) finance construction of passive antenna towers, fibre local-loops, duct networks, dark fibre backbones and data-centres for multiple service providers prove otherwise. Passive infrastructure investments have depreciation periods of multiple decades, whilst active equipment is often written down in 3 to 5 years, an investment horizon which aligns with the current market analysis review cycle. Regulatory and policy risks are very different and are currently biased more towards operators with active equipment and less towards investors in new passive networks with a Real Estate approach, as the passive infrastructure lifecycle is far longer than the policy cycle.

Policy makers must acknowledge that the financial community values incumbent telecom and cable operators today as ventures with a 3 to 5 year investment/renewal cycle. Any investment in new passive infrastructure leads to a sharp fall in their stock price. They lack access to so-called patient long-term capital, except when they can assure their investors that their investment in the passive part of NGNs and NGA will re-establish their monopoly position, or at least a very tight duopoly/oligopoly. This explains demands for Regulatory Holidays in Europe and requests in the USA to exempt new fibre networks from unbundling of local loops, both of which would restore their option of a vertical integration strategy.

Access to Number portability databases is needed to release a bottleneck facility. Internet based *server federations* are not a good alternative for IP Interconnection, since they show too limited a view of policy.

Discussion of VoIP implementation and interconnection obscures some key issues. Wholesale access for business users to naming and numbering resources is a standard practice among IP-addresses, Domain Names and other identifiers. It is, however, lacking in most countries for telephony services and numbering.

In most countries end-users are not eligible for direct assignment of telephone numbers. Few countries have introduced corporate number ranges directly assigned to end-users. If operators and service providers establish a *public infrastructure ENUM directory,* or an equivalent IT-solution as the NGN-successor of national number portability databases, these databases will become the new control points to leverage market power in the voice market.

The European Commission and NRAs should consider opening up numbering assignment to end users, and provide access to these systems for end users with the scale and capabilities to be able to list their own numbers in such an Infrastructure directory. This would allow such business users to route traffic to their own systems or chosen service providers, and to break today's voice termination monopolies. Having removed numbering control from incumbents, often by giving control to the NRA, this independence must be preserved with NGNs.

The newly created *VoIP Peering federations* on the public Internet provide a pan-European alternative to the still mainly national IP interconnection discussions. In the USA, some of these federations operate on quality-controlled networks capable of business grade services. The European Commission should foster transnational business grade developments in the EU, as it avoids the now visible technical fragmentation in VoIP technology.

The academic networks' Next Generation Internet is far closer to business needs.

New networks developed by Research and Education Networks called *The Next Generation Internet* show what happens with end users in the driving seat. These networks, a mixture of dark fibre, lighted paths and dedicated IP-based nets, with access to the public Internet, are far closer to the needs of business users and can provide a range of quality of service levels, while they can also be used to contract out operations and management tasks.

Academic networks have different legal, economic and administrative ownership, which can be split between different organisations. It is far closer to the way business users operate their own networks, with make or buy decisions based on the value added by contracting out or self-provision.

NRAs consider the make-buy decisions involved when they discuss relationships between wholesale operators and other service providers. They should recognise that business users have to make similar make-buy decisions to minimise fragmentation at pan-European level.

Conclusions

Effective interworking of ICT applications throughout the transnational extended supply chain of MNEs usually requires a dedicated "private" network (the public Internet does not provide adequate quality and reliability).

Fragmentation in the market for those services is currently increasing with the introduction of NGNs and NGA, mainly due to a return of vertical integration. It causes withdrawal from the market of specialist business providers and is aggravated by refusal to offer leased facilities such as dark fibre and local loops to business users or specialist service providers. There is a strong risk of market foreclosure in current developments as well as the (re-) appearance of 27 different national flavours in services in the EU.

This situation handicaps the ability of European firms to boost growth, productivity and jobs by re-engineering business processes and restructuring operations regionally or globally. Many of the benefits associated with the EU Single Market are therefore being sacrificed, and European competitiveness is being damaged by internal telecom taxes on trade.

NGNs and the supporting regulatory framework must provide a suitable environment for the supply of pan-EU communications services on a competitive basis, which delivers seamless high quality ubiquitous access for business customers. The aim must be to optimise efficient and effective investment in ICT by business users, in order to optimise the economy as a whole, rather than to optimise the contribution of incumbent telecom operators.

This requires proactive consultation at all points from design to implementation with public and private industry at an EU level, to achieve maximum consistency and eliminate avoidable duplication in testing, implementation and migration by business customers and their equipment and network service providers who support them across national borders.

INTUG urges the European Parliament, the European Commission and NRAs to focus on ensuring a framework of European sector regulation, which creates a single telecom market suitable for meeting the needs of both business users and residential domestic consumers. This should include:

- Equal access to all access services, whether copper, fibre or wireless, regardless of technology, based on risk-adjusted long run incremental cost
- Equal access to physical infrastructure, eg ducts, poles, buildings, street cabinets
- Equal access to administrative systems controlling key information databases including number portability repositories
- EU standard wholesale service definitions applied consistently
- Numbers issued to and owned by customers, not operators, under the administration of the national regulatory authorities

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INTUG

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1 Position Paper on Next Generation Networks (NGNs)

> "NGNs is the newest trick of big operators like DT and FT to keep us regulators busy and off the streets, so we could not go after them with real regulation"
> Prof. dr. Willy Jensen, Director-General Post & Telecom Norway, Delft University Conference, June 2006

There is a risk that government and industry are overlooking the business user perspective. This paper therefore goes beyond the operators' and regulators' view of NGNs to consider what business users require from them. It also discusses the IP Multimedia System (IMS), the proposed mobile variant of NGN, and the difficulties encountered in controlling IMS.

It is essential to recognise that business users requirements for telecommunications services across the EU differ from those of residential consumers in individual Member States.

Introduction

The International Telecommunications Users Group (INTUG) was established in 1974 to ensure that the voice of business telecommunications users was heard, wherever regulation was discussed. It is an independent association, consisting mainly of national and multinational user groups around the world, each representing many business users.

Stratix Consulting BV is an independent consultancy, based in Hilversum, the Netherlands. Founded in 1990 it has a practice advising on networking for corporate and not-for-profit clients, operators and service providers, investors and financiers, as well as governments and regulatory agencies. Stratix helped INTUG draft this NGN Position Paper.

Background

Operators have started to upgrade to NGNs using many corporate network technologies. But as they do, INTUG and Stratix observe a set of troubling developments:

1. Too much consumer-oriented designs, insufficiently fit for business usage
2. Re-monopolisation of transmission infrastructure in NGA
3. A regulatory cycle suitable for equipment renewal but not for physical infrastructure
4. Refusals to lease dark fibre, which NRAs do not recognise or analyse as a market
5. NRAs, not business users, defining national wholesale Bitstream and Ethernet services
6. Fragmentation of standards into national variants and implementations
7. Fragmentation of VoIP into fixed, mobile, cable and Internet sector variants
8. Operators leveraging control of E.164 numbers, instead of opening up numbers to users
9. Policy makers focusing on operator led innovation, not innovation for business use

As a consequence, application and network service providers and multinational enterprises (MNEs) cannot operate their ICT on a pan-European scale except based on best effort services. Network equipment will be country-specific and hence supply will dominated by the incumbent due to relatively greater economies of scale, compared with alternative operators. Implementing private network technologies in NGNs offers smoother and better integration with corporate networks, but current implementations look like a step back in time.
This generates a competitive disadvantage from economies of scale in high-grade ICT compared with the USA, China, India and Japan, where hundreds of millions of customers can be served with uniform services, with ICT consolidated in a few locations.

It is vital that the European Commission and the European Parliament take into account the views of all stakeholders, including business users, to ensure a regulatory framework, which enables seamless services and competition within Member States and across the EU. INTUG is acutely conscious of the powerful vested interests, which seek to protect national positions, and/or domination of certain markets. It is concerned that additional barriers of entry are appearing for smaller firms wanting to compete outside their home country, and the wider impact of ongoing fragmented markets work is a tax on doing pan-European business.

NGNs are a major architectural renewal of one of the largest infrastructure systems of the European Union, replacing old networks dedicated to voice telephony and in some countries video-distribution, with new "All-IP" investments adopting Internet technologies. Economic research suggests that architectural renewal disrupts industry structure with products, services and business models that break the old conventions.

The Internet and new computer networks, driven first by deployment at business users sites, are breaking the ties between ownership of cables, wires, telephone exchanges, antennae and networks, and the capability to operate a business supplying application services over it. This new *horizontal* industry structure disrupts the historic *vertically integrated* telephony and cable sector where voice and TV-services earned money for maintaining local infrastructure.

Businesses in some Member States have sometimes been able to connect offices and data centres over dark fibres, occasionally over hundreds of kilometres, and in a very few cases crossing borders. They do, however, encounter resistance to building such networks. Despite the existence of unused fibre and empty ducts in many areas where business users demand dark fibre, operators often refuse to lease them, or quote them far above cost.

Business users often outsource operation and maintenance of private networks, but public network operators, acting as service providers, seem very unwilling to provide a service over facilities they do not own. A few are now contemplating sale of local exchange buildings, antenna towers, ducts and dark fibre networks to financiers and third parties and leasing them back. This seems odd when they refuse to lease facilities to business users or other service providers as a service.

INTUG believes strongly that any party including, but not restricted to, all operators should have the right to obtain equal access to such facilities. A business user must be able to use these facilities without necessarily involving an operator.

NGN technologies have been developed for and by end users first and are already deployed in their facilities, providing vendors with steep economies of scale, as the volumes to supply businesses are huge. This strongly reduces barriers to entry for new operators as they can deploy standard off the shelf equipment. Operators, however, as well as their public network equipment suppliers, are attempting to redefine concepts of networking under the NGN umbrella in ways that restore vertical integration and foreclose the market. NRAs add to this by national interconnection standards and procedures.

The incumbents sense an opportunity to turn the clock back on recent regulatory progress, foreclosing competition via investment in their own NGNs and NGA, linked to a route to re-establishment of previous privileged regulatory status. This will suppress innovation and reduce, or even eliminate, service choice for business customers. In some Member States, there is an alarming tendency to a hands-off back seat approach to NGN/NGA regulation, which could easily lose the benefits of competition, which have been achieved through effective hands-on regulation of access of infrastructure, such as Local Loop Unbundling. This sometimes results in reduction to only one viable national operator, with competitors fragmented into small regional or local operators, recognised as “geographic segmentation”. This does nothing for national or international competition.

Extension of fibre to homes and businesses with NGN/NGA is the next step in a continuum of investment phases in advanced telecommunications technology. They must not be used as a lever to destroy the competition which regulation has created in the last 15 years.

This paper identifies a series of observable gaps in future regulatory and technical strategy. Many parties involved in NGNs continue to ignore these gaps. Those with a service provider centric view of regulation and NGN are often unaccustomed to the core principles of networking developed in the far more end-user driven Internet communities. Adoption of the Internet Protocol suite (TCP/IP), Ethernet as a generic transport network, and Session Initiation Protocol (SIP) for signalling (both technologies developed for, and by, end users) will provide an opportunity to eliminate artificial public/private network demarcations.

2 NGN is the telecom industry switching over to end user technologies

Most end users today deploy communications networks that adhere to standards set by what is loosely called the computer industry. Those standard bodies defined the now ubiquitous Ethernet, Internet Protocol and World-Wide-Web technologies[1]. Telecom operators used to deploy different *public network* technologies developed with their suppliers, mainly under the umbrella of the ITU, and regional bodies like ETSI and ANSI.

The 1980s and 1990s experienced repeated failure by the public telecom sector to sell their own technologies and solutions to business users, particularly for data communications. End users preferred other suppliers, who were more willing to implement technologies from standards bodies that end users could also join and influence, like IETF, IEEE and W3C.

NGNs are effectively an adoption by telecom operators in wide area public networks of many of those corporate network oriented technologies. This has shifted the focus of original technology innovation, from the laboratories of the public telecommunications industry and public operators, to suppliers of corporate network technologies and their main customers: business users. Most incumbent operators have shrunk their own R&D departments considerably, or in many cases have even shut their entire laboratories down.

The only area where the incumbent legacy telecoms industry still dominates the choice of technology and standards is the mobile sector. But even there, the IP Multimedia Subsystem technology uses IP as a transport protocol, and a joint IETF and ITU defined SIP-protocol for signalling, a visible shift towards standards and technologies developed for business users.

Deployment of those end user technologies in public NGNs offers an additional benefit for end users: better integration of the wide area networks with their home and office networks. It means that business users will be able to get rid of conversion boxes like broadband modems, edge or access multiplexers, wide area routers and WAN-optimisers. These are investments needed to handle incompatibility between *private networks* and *public networks*.

Parts of the business models of public network operators were based on a clear distinction between technologies deployed in *private* and *public networks.* NGNs therefore threaten to impact their business model. Many so-called technological issues tabled with NGNs are, on closer inspection, more about conserving existing operator business models, or in wholesale markets, about bypassing regulatory models designed to facilitate competition. Seeking to limit regulation to legacy technologies like copper, is one such example, which would result in the foreclosure of competition. Regulation should be technology-neutral.

[1] Many technologies originated by the IETF and the World-Wide-Web Consortium were developed by computer scientists and the IT-staff of large organisations, in particular universities and science labs. Since the second half of the 1990s many of these joined technology companies or (co-) founded one. This explains why these technologies have become so popular amongst corporate IT staff, as they were invented and designed by people far more knowledgeable about the demands in corporate networks than those working for public operators and public network suppliers.

Impetus for telecom reform and innovation originated in user demands

The March 2004 Analysys Final Report for the European Commission on 'IP Voice and Associated Convergent Services' generated considerable debate about whether and how voice services self-provisioned by end users, and peer-to-peer VoIP applications like Skype, might fit into the new Regulatory Framework. The report and the workshop were very inconclusive, with little attention paid to the particular needs of multinational businesses. The near neglect of private end user networks and public VoIP regulation is regrettable.

There are, however, compelling reasons to expect that new developments adopted in the more competitive and far less regulated private environments of end users will inevitably influence requirements and technology for public networks. With the arrival in the IP-PBX market of Peer-to-Peer (P2P) solutions[2], and the IETF's P2PSIP standardisation work, this becomes more pressing. In P2P-based solutions, the only remaining key central elements will be user authentication devices or mechanisms, telephone number assignment, and its repository (ENUM).

Regulatory debate should not concentrate on the architectures developed by the NGN standardisation world of ITU, ETSI and 3GPP, with centralised SIP-servers and control by service providers. That is an incomplete view of electronic communications markets, neglecting the fact that NGN is mainly an adoption of end user technologies.

The historical split in regulation between *private* and *public networks* was an administrative decision. Public telephone operators claimed control up to the horn and handset until the landmark FCC decision in 1968 on the *Carterfone*. This first major liberalisation decision allowed end user devices, since they did not bring *"serious harm to the heart of the nation's communications network"*. It set the stage for many innovations that brought systems more suited to end user needs, fostered development of computer networks by business users, and generated regulations like Open Network Provisioning (ONP).

The far more competitive data communications industry, which was used to developing its technologies in closer co-operation with customers, and which in the case of the Internet was often created by end users, ultimately out competed the public telecommunications industry in scale and scope. The only area where the latter remained dominant and reached a large scale was in mobile technology, where the limited number of available spectrum licenses fostered a market of tight oligopolies, unsurprisingly with high prices.

[2] Proprietary market examples include Siemens BizIP, Avaya One-X

The original drivers for liberalisation of telecommunications markets since the 1960s were:

1. Lack of incentive for innovation in user services by incumbent operators, and by their suppliers, who collectively formed part of a vertically integrated business model

2. High prices, due to monopoly providers' focus on their voice services business, and a strategy of pricing leased lines on lost (voice) revenue rather than production costs.

The fact that successful end user solutions drive innovation is recognised today by the ITU in their decision to base the NGNs on technologies developed by the IETF, and their decision to enlist the IEEE's WiMax standard as an IMT 2000 technology. Unfortunately, whilst the telecommunications technology industries deserted national standards and industry champions in the 1990s, the regulatory framework is still implemented with national scale and scope. Despite using global standards, it permits national specific solutions, in particular in procedures and the detailed (wholesale) service specifications.

NRAs have moved their focus since 1998 from the pan-European goals of ONP towards national consumer markets and national wholesale competition concerns. This fragments the European market into *national services*, and loses the opportunity for creating a market for harmonised end-to-end services despite the use of global standard technologies.

NGNs (including VoIP) are a system wide renewal end-to-end, since end-user devices like (mobile) handsets are also becoming IP based and losing their 'dumb terminal' status. This drives innovation in the core. The best approach to discussing NGNs is to avoid distractions related to business models, and to look first at the evolution in corporate and home networks.

In modern IT-nets, applications servers are consolidated, often globally

David Isenberg wrote his 'The Rise of the Stupid Network ' article[3] more than a decade ago. This explained the shift of *'intelligence'* out of the core towards the edges of the network. This trend is not reflected in policy debates on *convergence* in general and NGN in particular.

For e-mail, the World Wide Web and many other IT applications, corporate end users have got used to determining whether those applications are run peer-to-peer or in a client-server architecture. In the latter case the application servers can have a different geographic scope, serving an office or a local (municipal), regional, national or even (inter-) continental area. When the application server is outsourced to a third party, an ASP or a (managed) hosting provider, one can speak of a *service* in the economic (contractual) sense.

[3] Computer Telephony, August 1997

In private networks, transport between peer applications or clients and servers is provided today via a "stupid" IP network, usually operated over owned local area networks (Ethernet for fixed networks, WiFi for wireless) and wide area networks rented from a telecom operator. For the wide area IP-network, one can choose either an IP-VPN (a network service), or rent an Ethernet or leased line service (data link transmission services), or even lease dark fibres (physical facilities) in some cases and complement them with one's own routers/switches.

More intelligent terminals in *private networks* (e.g. sophisticated handsets, PDAs and PCs) produce corporate networks where application clients communicate directly with application servers, which are often consolidated in shared service centres: corporate data centres serving entire countries, or even continents.

When business users want to establish pan-European or global networks, they need a uniform supply of high bit-rate pan-European data link transmission services to support application server consolidation, and scale economies in IT comparable with what US companies enjoy in their home market.

Without pan-European bitstream service providers there is inadequate competitive pressure for regulators to harmonise national *bitstream service definition*s. This produces barriers to national businesses attempting to expand and compete on a European scale, as expansion for them means an ICT redesign due to the lack of uniform European packet networking, despite being able to implement local office networks in a uniform manner.

This situation is aggravated by the decision of several incumbent operators to install more equipment in the local loop, one of the strategies to implement *NGA*. The very low number of potential business clients per equipment node creates a barrier to entry for the pan-European bitstream service providers who need access to unbundled local loops to built their networks. They are forced to purchase wholesale bitstream services, with all the national variations, except in a few big business parks, where these have competitive supply.

Public applications services also have a global scale and scope

Many application service and content providers on the public Internet (e.g. Google, Amazon, Microsoft, Yahoo) operate with significant geographic scope, where a few "server farms" per continent supply services like instant messaging to (hundreds of) millions of clients.

The trend to consolidate application platforms in a few geographical locations is also very common with outsourced ICT systems; call centres and corporate e-commerce platforms. Businesses with a more limited geographical scope can decide to self-provide their ICT and Internet applications on a national, regional, local (city) or even home/office scale, but many choose to outsource them (partially) to application service providers or hosting providers. In this way they can enjoy some of their provider's scale benefits.

Due to the capacity increases of NGN core platforms[4], the investment per user to provide voice services will be far lower than the old 2G/3G cores. Mobile Virtual Network Enablers (MVNEs) operating such NGN cores, offer a commodity business, which would lead one to expect declining service prices and strong competition between core platform owners.

The server platforms developed for IP-PBXs in corporate markets, and even those for public operator NGNs (IMS), allow for consolidation of core application servers and control systems per market player in a few national and/or continental centres. The arrival of specialist MVNEs, with their own NGN (=IMS) core to serve MVNOs, suggests that voice application services are becoming an independent market from mobile network ownership.

All these consolidating service providers, like the business users who have started to operate cross border, are developing towards an at least continent wide approach, and are effectively confronted with the same problem of the lack of harmonisation in the bitstream markets.

It forces them in the EU to make 27 market adaptations, or stick with best effort low grade offerings, while the costs of adhering to the national quirks (including regulations on data retention and wiretapping) are shifted onto users. Dominant *national access network* operators are not confronted with the cost of inconsistency, experience less competition, and can demand higher retail prices for services.

[4] Where until recently Home Location Registers (in mobile network cores) served a typical million customers per server, due to Indian and Chinese scale requirements modern HLR-servers can handle up to 50 million customers. This allows operators to run a few redundant central cores serving a continental client base.

3 The telecom sector is still busy countering 'The rise of the stupid network'

One would expect NGNs, based on adapted Internet Protocol technologies and architectures as deployed by end users, would steer network operators, currently selling voice and audio-video services, into adhering to Internet design principles, where applications services are separated from network transport. This split between applications services and network transport is a commercial standard for the Internet business market, where users are offered separate prices for Internet connectivity and various application services like e-mail handling and website hosting. ISPs tend to bundle Internet access for the residential consumer and SOHO markets with e-mail and other application services, sometimes including Cable TV.

Adopting technologies initially developed for and by end users has not, however, stopped the ITU SG-13 from creating a *"Definition of Next Generation Network"*[5] that steers many of the architectural and design principles towards the operator mindset of service provision.

ITU SG-13: Definition of Next Generation Network (Y.2001)

"A Next Generation Network (NGN) is a packet-based network able to provide **services** including Telecommunication Services and able to make use of multiple broadband, QoS-enabled transport technologies and in which **service-related** functions are independent from underlying transport-related technologies. It offers unrestricted access by users to different **service providers**. It supports generalised mobility, which will allow consistent and ubiquitous **provision of services** to users."

At a joint ITU-T/IETF workshop on NGN in May 2005, the IETF presenter Jon Peterson said: *On the Internet, telephony is an application – not necessarily a service, no service must be provided.*

The point here is the use of the word *service* as an economic concept, a transaction with another party, and not a technical syllogism for an application service. Renting someone's plain IP transport capacity (e.g. Internet connectivity), or a dark fibre to an end user, is also a service in the economic sense. Richard Stastny, the well-known ENUM expert of Telekom Austria, criticised an elaboration of a block diagram presented by the ITU SG chairman in the workshop. He noted with concern the sudden appearance of User Network Interfaces and Network Node Interfaces in the transport layer. On IP networks developed by end users, there isn't a distinction between "user" and "network" interfaces, which would push large end users to a second-tier status; networks are each other's peers.

There is still a visible division between "Bellheads" and "Netheads" on how to architect NGNs and to handle voice with SIP technology, particularly in attempts to define an "operator only" technology domain. This forces large users to buy *services,* denying them the option of *making* them with their own ICT, and reducing choice in the area of operator added value.

[5] http://www.itu.int/ITU-T/studygroups/com13/ngn2004/working_definition.html

After the joint ITU-IETF workshop the words UNI and NNI disappeared from the graphs, but the concepts still linger on in many technical documents. In the complex architecture of an IMS NGN, there is a mindset to integrate many control functions into IMS between end users, border gateway routers (BG) and application gateways (GW).

While the service and application layer are equated, mere data transport is not seen as a service. This is an architecture designed by a working group that is trying to restore the functional ties between control of the voice application services and control of the data transport layer, and so make the network "intelligent" again.

In this design, a voice call across multiple service provider domains would trigger "Quality-of-Service" (QoS) negotiations between all domains in a path. On Internet backbones and access networks, Classes-of-Services in IP packet flow labels, suffice in most cases.
An over-engineered QoS call control architecture is a presumption by network operators of end user requirements. Tight integration of the transport layer, with application services and QoS control, increases prices, because across the board deployment forces all end users to pay for complex networks, when many only require basic transport services.

Technical varieties for VoIP reflect standards strategy games

NGN/VoIP implementation uses five different approaches, each by a 'cluster of firms':
1. **Fixed telcos**, relying on ITU/ETSI architectures with VoIP in a (logical) separated network
2. **Cable cos** building on implementation standards developed by PacketCable
3. **Internet cos** treating telephony as a public Internet application
4. **Mobile operators** moving gradually towards an IP Multimedia System
5. **IP-PBX + End users** deploying SIP and open source protocols

All have roadmaps for implementing SIP over different access network technologies over an IP layer, but they make specific, not always compatible, implementation decisions. These implementation differences, and lack of compatibility between clusters are increasing. This requires 'border application gateways' for interworking, effectively limiting interoperability support to the lowest common level: i.e. a 64 kbps PCM voice interconnection.

Interoperability issues will take some time to solve, before a functional IP Interconnection level is developed which will allow a video call from an IP video surveillance camera in a corporate network to deliver an alarm with live pictures on a security guard's mobile phone. This rather confusing state of affairs for end users reflects the high strategic stakes involved and the efforts of many vendors and operators, with very different technical backgrounds and market segments served, to carve out their niches and to add features.

NRAs who have mainly focused for a decade on price competition in highly mature services like voice telephony and leased lines, and engineering cost models, have not yet adjusted to NGNs, where technology, instead of tariffs, is the main competitive tool.

4 Next Generation Access (NGA) risks a return to re-monopolisation

NGN debates, although still at the beginning of the implementation stage in many operators' networks, are rapidly including NGA. All-IP, FTTH, FTTC and Metro Ethernet Services are frequently heard. Wavelength services or Lightpaths are far less frequently heard.

NGA by sub-loop unbundling is inadequate, with inadequate scale

Several incumbent operators have proposed NGA implementations with active electronic equipment in the local loop. Deploying equipment in street cabinets allows them to shorten the passive copper wires to a few hundred metres and so boost bandwidth. The side effect of this loop shortening in Very-high speed DSL based access networks is far fewer customer lines per active equipment node. Whereas collocation in local exchanges offer thousands or even tens of thousands of local loops, street cabinets offer just a few hundred lines per node.

Figure 1 shows, in the Netherlands, when Competitive carriers collocated at Main Distribution Frames with more than 10.000 lines, they were able to reach 75% of all local loops. This allowed sufficient scale for those who reached only a few percent of the homes in an area, to operate active equipment, as they still served several hundreds of lines.

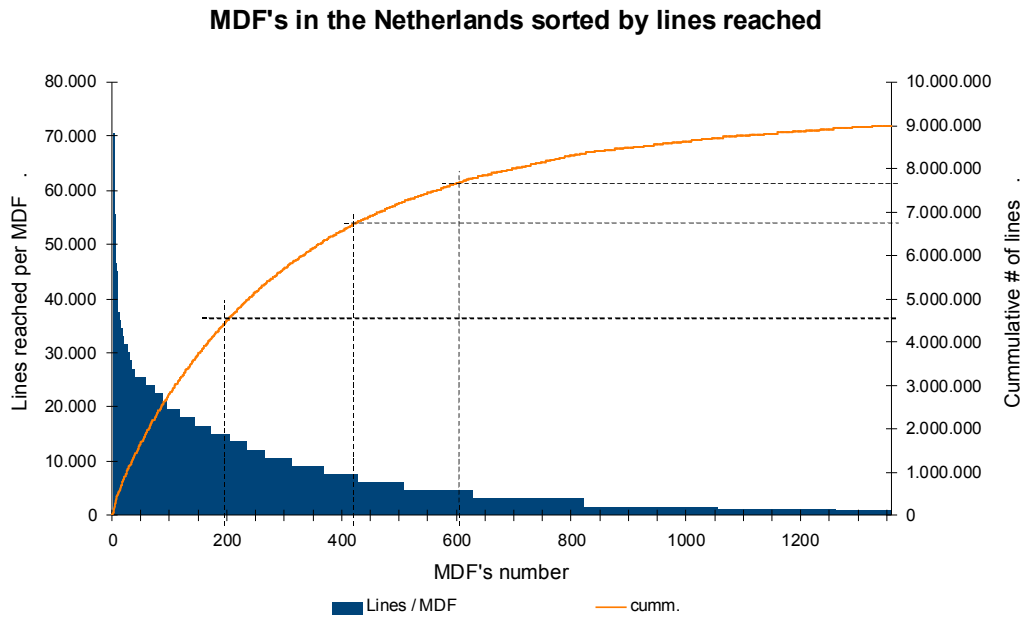

Figure 1 Competitive LEC's collocation on MDFs with more than 10.000 lines allowed them to reaching 75% of all lines

Only the largest one or two operators in an area can afford to install electronic equipment in a street cabinet. Sub-loop unbundling is far too costly for operators servicing a few percent of the lines in an area, as this means serving only a handful of customers per node.

Sub-loop unbundling and collocation in street cabinets is an inadequate regulatory solution, which produces inadequate scale for business users. The few competitive specialists with their own equipment, who serve their market outside large business parks and metropolitan centres, have market shares of only a few percent of the lines in most areas. Most DSL platform owners have decided to exploit existing equipment and withdraw from the market. Only incumbents, who enjoy high line penetration, are able to invest active equipment in the local loop on a sound economic base.

Incumbent operators can create substantial cash flow from selling local exchange buildings and even from excavation of feeder cables between local exchanges and street cabinets, due to the current high copper scrap-metal prices. Subsidising VDSL-deployment with a 'Regulatory Holiday' simply hastens re-monopolisation.

A long term view would foster long fibre loops as the preferred goal

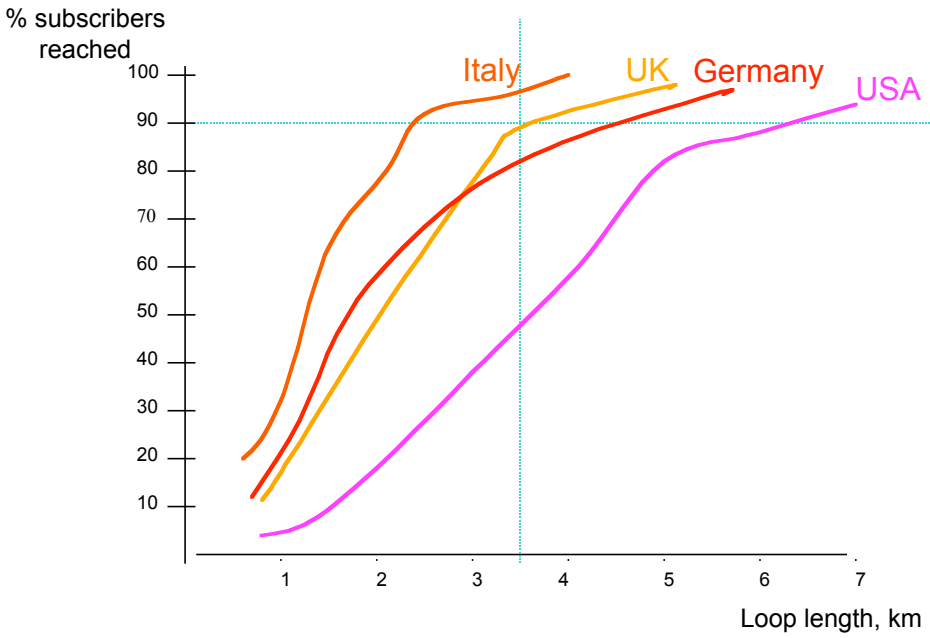

Figure 2 Current copper loop lengths in Italy, UK, Germany and the USA. Source: Ericsson.

An NGA infrastructure based on VDSL is effectively a last run exploitation of the old existing copper plant by shortening loop length. Local loop fibre infrastructure, on the other hand, allows for far longer passive loops, up to 15-20 km according to current design specifications, with many more extensions reachable from active equipment collocation sites.

Investors treat open passive networks[6] like Real Estate. Such architectures encourage long-term finance, as opening up to multiple operators is a hedge against operator bankruptcy and allows for a return and amortisation of decades. If investors consider passive loops like real estate, this applies even more strongly to the sharing of empty telecommunications ducts. On the other hand, investing in closed access networks and networks, with electronics in the outside plant, is treated like investing in an operator with a higher default risk and therefore far shorter return-on-investment standards are demanded by the investment community.

From the perspective of business users, an NGA network policy with a topology where multiple active equipment operators have sufficient scale to compete over (long) passive local loops, is far more attractive than other policies. It allows specialist business oriented network providers to enter the market, even in areas that are not currently served by competing DSL-operators, as the number of customers per MDF is too low. With their active equipment over passive loops, these specialists can deliver services far more tailored to business users' needs: symmetric bandwidths, low bandwidth oversubscription levels[7], low and predictable latency and easy bandwidth expansion, without the need to also retrofit the entire neighbourhood. It also enables high-availability network management that can guarantee the required service levels.

Some MNEs operate their own solutions over (leased) dark fibre networks in their local area networks and between major sites, and there is substantive knowledge of what is possible. Yet these are not used as examples for defining advanced wholesale bitstream services. Most bitstream services seem more designed to restrict or even degrade current equipment capabilities, than utilise and deliver what equipment makers have already invented.

An infrastructure of long fibre loops in less densely populated regions would bring markets where branch offices of business users are often situated, into heightened competition. It is unrealistic to expect the construction of multiple competing infrastructures in those areas. One passive network owned by a party whose long-term interest is openness for active equipment operators and penetration, and not how much data flows, is an inferior solution

NGA requires separate thinking on passive/active infrastructure services

Active equipment operators compete with shorter more dynamic product and service cycles. Inside businesses, active equipment upgrade decisions are typically made on a three-to-five year cycle. The current EU policy cycle of tri-annual market analysis by NRAs aligns with this cycle, and is therefore inclined toward active equipment operator competition.

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[6] A passive network consists of cables, wires, distribution frames and street cabinets and buildings housing them, but not active, power requiring electronics or optical equipment to send signals over it. Open means multiple service providers are allowed to connect their active equipment to the network.

[7] Bandwidth oversubscription is the habit of suppliers to reassign bandwidth multiple times, guaranteeing only a fraction.

Decisions on wiring and cabling inside business premises have, however, never been made with such a short-term view, and different treatment is required. Policy makers should acknowledge that the financial community values incumbent telecom and cable operators today mainly as ventures with a 3 to 5 year investment/renewal cycle, with renewal of active equipment and mere exploitation of the currently installed local loops. Investment in new passive infrastructure leads to a sharp fall in the stock price of operators. Operators lack access to so-called patient long-term capital, except when they can assure their investors that their investment in the passive part of NGA networks will effectively re-establish their monopolies or a very tight oligopoly. Hence the demands for Regulatory Holidays in Europe, and the request in some countries to exempt new fibre networks from unbundling of local loops, as that would restore their option of a vertical integration strategy.

Whilst competing infrastructures is a first choice solution, it is not economically feasible in some locations. Retail or wholesale supply of transmission wires (unbundled loops, both copper and fibre) offer a viable alternative solution to facilitate competition, provided these are delivered in a non-discriminatory manner. Where neither alternative creates the prospect of effective competition, functional separation offers a further solution. There is a risk that, if not properly designed, it could produce a wholesale market of bitstream products designed by committee (under regulatory supervision and prone to lobbying and capture), instead of producing the desired outcome of competition for the business of end users.

NGA network architecture and topology decisions, in particular location of active equipment nodes and openness of networks, are linked to the long-term financial arrangements which are available in capital markets, and the level of competition for data transport services over passive infrastructures. They are not business structure neutral, and they determine the level of entry and the structure of the supply side of the industry. Whilst NGA can be dealt with in a technology neutral fashion, it cannot be handled in a topology neutral fashion.

LLU, however, can be dealt with in a technology neutral approach, as it applies equally to copper wires and fibre optic loops (dark fibre), but operators have shown an unwillingness to rent transmission wires as an economic service to clients. Dark fibre links are a retail service which business users need and a wholesale product for competitive operators. Separate market analysis for this service seems justified. The reasons for repeated refusal to supply dark fibres, merit investigation, while empty ducts and unused high-wire cables exist.

The other vision: Next Generation Internet is far closer to business needs

It is particularly striking that, during the 2003-2008 period when operators and regulators were discussing NGNs, the Research and Education Networks, the original developers of the Internet, changed course. Instead of a shift toward a packet-based "All-IP" architecture, they developed their Next Generation Internet in the direction of Hybrid optical and IP networks.

Projects for their Next Generation Internet include National LightRail, GEANT2, GLIF and LambdaGrids, controlled by end users via Grid-applications, and developments like User Controlled Lightpath Provisioning (UCLP). New services from these academic projects are entering the corporate market, for example with (inter-) continental wavelength services.

The vision in this academic community is driven by their own needs as end users, and differs considerably from the NGN view developed by operators. The key difference is the GRID-applications requirement to control on demand resources that range from links to processing power and storage capacity to software code modules. The GRID applications that were developed in this decade for massive data processing of scientific data, are now launched into the business community, partially under more fancy names like "Cloud Computing", which is another name for distributed software, storage and processing.

Demands to access these types of services in the near future, or to construct some of them internally, are the driving forces for the far more specific network demands of business users. GRID-forum members have established a framework to look at (network) resources in ICT operations, which is centred on the following structure for ownership of the resource.

Legal Owner:
• Organisation that legally owns a resource
• A legal owner may sell the right to economically use the resource.
Economic Owner:
• Acquires economic resource usage right from a legal resource owner.
• A contract details terms by which a resource may be used.
• Economic owners may outsource resource management to an Administrative Owner by means of a service level agreement.
Administrative Owner:
• Technically implements the terms of a service level agreement
• Signals requests to other Administrative Owners and handles responses.
• Collects accounting information.
Relationship between owners:
• Legal, economic and administrative owners may or may not be independent organisations.
• Economic owners may acquire resources from different legal owners.
• Administrative owners may serve different economic owners.
• Economic owners may establish contracts with other economic owners to create more elaborate services. Technical details are delegated and implemented by Administrative Owners.

In this view of networks, legal, economic and administrative owners may be independent organisations. This is often hidden in policy discussions, as many operators prefer to discuss networking policy with a vertically integrated mindset. It is of utmost importance for business users to be able to operate with network resources in a manner that enables roles to be split or (re-) combined. Business processes need to have the flexibility to optimise by horizontal or vertical integration and for the choice to change over time. Hence business users must be able to tender for NGN and NGA services where they can form well-informed 'make or buy' decisions on real value add for specific tasks.

5 NGN and NGA policy issues

As NGN and NGA are across the board redesigns of network technologies, they effectively reopen some policy issues that were thought to be regulated "in a technology neutral way" but on closer inspection turn out to have been rather technology dependent. In these cases regulators and legislators must take action to revisit the issue.

Access to Number portability databases can undo a bottleneck facility

When the EU commissioned studies of NGNs in 2003 by Devoteam Siticom[8], and Naming and Numbering by Political Intelligence, a key issue was the 'control point'. Market parties could amass market power by control points that were difficult to circumvent by other players.

The table below shows the functional layers on the vertical axis and technologies/systems for VoIP, divided into the key network elements needed at each functional layer - Links, Nodes and Routing information.

	Link	Node	Routing information
Content	In-band signalling, Spoken commands	IVR, Speech recognition, Recorders, Voice Mail	Menu prompts, announcements
Application	SIP-signalling & speech codecs	VoIP-Softswitch, UMA controller, PSTN-Mediagateway	ENUM, DNS, location, presence, Number port dB
Network	IP Subnets	Edge & Core Routers	Route servers, BGPv4, BGPv6 AS-lists, IP address registries
Datalink transmission	XDSL, Cablemodem, xPON, Ethernet, C/DWDM, RF protocols	DSLAM, CMTS, OLT, Ethernet switch, OXC, Basestation	RADIUS/DHCP, Circuit-ID, VLAN-ID, λ-plan, RF-plan, HLR/VLR
Physical Facilities	Cables, Ducts, Spectrum	Distribution Frames, Collocation buildings, Towers & Rooftops	Maps, Geographic IS, Line ID codes, site registers

Control points can be very different at each functional layer. While access to the physical facilities in a local exchange or office (landlords sometimes only allow telecom operators to enter a building), could be a bottleneck in some countries, it could be access to cables, ducts or radio spectrum in another. Market players with control over most edge and core routers might also demonstrate market power, or organisations that control the number portability database (the routing information for call handling in a market).

Comparing the European Access Directives Article 6 (below) with this table, it is clear that the Article jumps from “access to links” to “access to routing information” at various functional layers, as they are presumed to constitute a bottleneck facility. However, at each layer, a link, node or the routing information, or the IT-systems implementing them, could develop into a control point. Due to technical developments, control points may change.

[8] Regulatory implications of the introduction of next generation networks and other new developments in electronic communications

Excerpt from European Access Directive:

(5) In an open and competitive market, there should be no restrictions that prevent undertakings from negotiating access and interconnection arrangements between themselves, in particular on cross-border agreements, subject to the competition rules of the Treaty. In the context of achieving a more efficient, truly pan-European market, with effective competition, more choice and competitive services to consumers, undertakings which receive requests for access or interconnection should in principle conclude such agreements on a commercial basis, and negotiate in good faith.

(6) In markets where there continue to be large differences in negotiating power between undertakings, and where some undertakings rely on infrastructure provided by others for delivery of their services, it is appropriate to establish a framework to ensure that the market functions effectively. National regulatory authorities should have the power to secure, where commercial negotiation fails, adequate access and interconnection and interoperability of services in the interest of end-users. In particular, they may ensure end-to-end connectivity by imposing proportionate obligations on undertakings that control access to end-users. Control of means of access may entail ownership or control of the physical link to the end-user (either fixed or mobile), and/or the ability to change or withdraw the national number or numbers needed to access an end-user's network termination point. This would be the case for example if network operators were to restrict unreasonably end-user choice for access to Internet portals and services.

(7) National legal or administrative measures that link the terms and conditions for access or interconnection to the activities of the party seeking interconnection, and specifically to the degree of its investment in network infrastructure, and not to the interconnection or access services provided, may cause market distortion and may therefore not be compatible with competition rules.

MNEs with large corporate networks and IP-PBXs may need access to Number portability databases/Infrastructure ENUM systems, to register the IP-addresses or the host names of their SIP-proxies and to link them to their telephone numbers. This would break the end-user control of service providers by removing their ability to change or withdraw national numbers needed to access an end-user's network termination point and assign it to the end-user itself.

Operators and service providers may well establish a *public Infrastructure ENUM directory* as the NGN-successor of current national Number portability databases. In most countries end-users are not eligible for direct assignment of telephone numbers, however a few countries have introduced corporate number ranges that are directly assigned to end-users. The European Commission and NRAs should consider opening up access to some systems for end users with the technical capabilities and scale to be able to list their numbers in such a directory, and allow parties to route traffic to their own systems or chosen service providers. For the World Wide Web, a few search engines, which provide routing information for content nodes and the hyperlinks to them, have become the power broker at that layer. One can construct such a split for every service, e.g. audio/video delivery and programme guides.

Today's Internet IP-address registries (RIPE NCC, ARIN, APNIC etc.) and routing have been 'economically neutralised' by creating broad associations. This 'neutralised' role is also taken up by many European DNS country code Top Level Domain registries. Governments have 'neutralised' the numbering plan for telephone numbers, but number portability has led to systems that are immediately involved in call completion.

Federated servers versus IP Interconnection limits policy discussion

Most of the Internet's co-ordination institutions, as created in the last two decades, allow end users to access meetings or become a member/participant etc. In some cases, end-users have become members of some of these bodies. The launch of NGNs is a good moment to rethink which bodies in voice and audio/video services have effectively been a "closed operator club" or "closed operator & regulator club", which now should be open to end users.

A 2007 Stratix Consulting study for the Dutch regulator OPTA found that the longer term policy questions are whether the service providers will change from wholesale 'per minute charges' to 'bill and keep', and what the rules will be for *multilateral arrangements.* VoIP service providers are operating in clusters. The key issue is how the telecommunications sector's classic approach of *bilateral interconnection contracts* between network operators or service providers interacts with the *multilateral arrangements* that are typical for many Internet co-ordination institutions like public Internet Exchanges.

The IETF's Working Group SPEERMINT has just finished an Internet Draft, describing the various models for VoIP peering between SIP Service Providers[9]. They found 4 main types: Static Direct, Static Indirect, On Demand (like e-mail) and Federations. On the Internet, VoIP peering between service providers has developed with clusters of service providers, nicknamed *Federations*, who peer traffic via a SIP-Exchange bartering among each other, while exchanging metered traffic. VoIP Peering federations, often organised around a private ENUM directory, also establish trust and authentication of traffic origin, filter Spam over IP Telephony (SPIT) and help block signalling of Caller ID to the called party between a public and private network, when Calling Line ID Restriction (CLIR) is active. Regulation of this needs service providers who can screen between end users, causing service providers to cluster around different implementations of the SIP-protocol which can suppress CLID.

These *Federations* give business users hope of a more uniform pan-European voice-service implementation, and a reduced need for different system integration tests per country. However, European *federations* still operate over the public Internet, which is of inadequate quality for business users. In the USA, some federations operate with a dedicated nation-wide network with QoS guarantees. Europe should at least foster VoIP Peering federations operating at business quality level, with access in all nations to counter fragmentation.

[9] A.Uzelac, Y.Lee, VoIP SIP Peering Use Cases, expires Aug 2008 http://www.ietf.org/internet-drafts/draft-ietf-speermint-voip-consolidated-usecases-05.txt

6 Conclusions

While Professor Willy Jensen joked about NGN and incumbents keeping his staff busy, it is clear that policy discussion on this subject tends to shift towards the operators' perspective. This Position Paper seeks to balance this with views from the business users' perspective. From that angle the adoption by public operators of end user technologies is promising.

INTUG looks forward to better integration with end user needs at application level and hopes that numbering and number portability will receive a higher position on the agenda.

In the business user market reliable international data transport networks between company sites, and linking suppliers and customers in the value chain, are far more important today than the demand for supply of fixed voice-services, as these are partially self-supplied and rapidly declining in cost. Mobile networks, however, are still far more voice-dominated, and represent a growing proportion of cost. NGN discussions and IP interconnection seem to be dominated by operators from that part of the industry attempting to leverage their current business models of per minute and per SMS charging in interconnection agreements in a regime where (mobile) operators charge each other for exchanging data-volumes too.

The impact of NGA architecture and topology on competition at international level for business ness users must be changed. Currently competition seems to be actually declining not increasing, as business oriented operators in some markets are reducing investment.

The interplay between the three to four year regulatory policy cycle and the roughly equal software, equipment and service innovation cycle is contrary to the renewal cycle observed for wiring, cabling and ducting, which is in the range of decades. This implies that regulatory and policy risks for the two types of investment are very different, and are currently biased more towards operators with active equipment, and less towards investors in new passive networks with financial cycles more akin to real estate.

Policy makers should acknowledge that the financial community values incumbent telecom and cable operators today mainly as ventures with a 3 to 5 year investment/renewal cycle, and not firms with Real Estate type long-term investment horizons. This explains operator demands for Regulatory Holidays and exemption of fibre networks from unbundling of local loops or functional separation, since it this would restore their option of vertical integration.

Real Estate style investors have access to long term capital and operate with a very different type of balance sheet for their open networks. It is investment in open, unbundled passive networks that provides the incentive for strong competition. The existing market for dark fibre rental in several Member States shows that business and wholesale users need them. Defining a market and analysing the supply and demand for bare transmission wires seems justified, due to distinct product and service features that are not easily substituted. The regular refusal of supply requires urgent regulatory attention.

The very different physical properties of fibre versus copper wiring allow for very different network topologies. Each of these topologies, however, influences the types and form of competition, as the decisions on where collocation is situated has a direct link to the economies of scale for incumbents and competitive operators with collocated active equipment. Topology decisions are not industry structure neutral.

It is essential that the introduction of NGNs and the supporting regulatory framework provide a suitable environment for pan-EU telecommunications services on a competitive basis, which delivers seamless high quality ubiquitous access for business customers.

The aim must be to optimise efficient and effective investment in ICT by business users, which enables them to generate productivity and growth for the whole EU economy, and not simply solutions which optimise the profitability of the incumbent telecom operators.

Optimisation must include proactive consultation at all points from design to implementation involving public and private industry at EU level. This will maximise consistency and limit duplication in testing, implementation and migration by business customers, and by their equipment and network service providers who support them across national borders.