

Conference Notes:

NGN and Emerging Markets – Investment, Infrastructure and Innovation

Königswinter, Germany

December 5, 2005

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Bad Honnef, February 2006

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Overview

This is an exciting period for the electronic communications industry. The conventional telephone network and the newer Internet are merging and morphing in new and complicated ways. What does the future hold? What challenges and what opportunities await industry players? And what is the proper role for regulation in this evolving world?

The “NGN and Emerging Markets – Investment, Infrastructure and Innovation” conference took place in Königswinter, Germany, on December 5, 2005. It was organized by the WIK on behalf of the German Federal Network Agency, the Bundesnetzagentur (BNetzA). It brought together senior experts from industry, academia and government to explore their ideas on these themes and to seek to reach a common understanding.

This report seeks to summarize the presentations and the discussions that took place. This section provides a brief overview of the key themes that were discussed over the course of the workshop. The subsequent sections provide a comprehensive summary of each individual session. Readers may also wish to review the presentations, which are available to conference participants (with a userid of “ngn”) on the WIK web site at www.wik.org.

There were a number of major, recurring general themes throughout:

- The need to find the right balance between infrastructure competition and service competition;
- The corresponding challenge to the regulator of enabling competitive entry without impeding investment or innovation;
- The recognition that services and underlying transmission have become decoupled, probably implying large changes in industry structure;
- The still-unresolved question of whether innovation in the world of the future will be primarily driven by network operators at the core, or by innovators at the edge, or by both;
- The related question of the proper future balance of centralization or decentralization of functionality;
- The differences in approach between new Internet-based competitors and traditional telecoms operators; and
- A range of challenges to interconnection and interoperability among providers.

A number of additional issues emerged that were largely tied to the transitional period from today’s world to that of the future NGN:

- Should the migration be gradual and stepwise, or should it be a “Big Bang”?

- How should regulation operate in a period of transition?
- How should stakeholders be consulted as incumbents with SMP evolve their networks?
- As incumbents unilaterally evolve their networks, competitive investments may be stranded. What are the implications for the corresponding costs?

Enabling competition without impeding investment or innovation

Mr. Kurth's opening remarks lay out the timely question: How are policymakers to balance the need for innovation and investment on the one hand, against the need for competition on the other? The European regulatory framework explicitly recognizes both as goals, but provides little guidance as to how to balance the two. Closely related to these issues are the definition and the appropriate treatment of emerging markets.

Mme. Gauthey of the French ARCEP said that she and her colleagues do not want to hinder new investments; at the same time, they are not willing to tolerate remonopolization of the local loop. France has little near term prospect for infrastructure competition as regards broadband; consequently, they have placed heavy reliance on erecting all rungs of the Ladder of Investment. In the French context, this has been extremely effective, leading to surging adoption of broadband and to substantial investment both by the incumbent and by competitors.

Prof. Cave's remarks, by contrast, were focused on countries where infrastructure competition between cable and traditional telecoms incumbents is effective, with moderately effective competition from wireless as well. In such settings, it would be appropriate for the regulator to step back and allow competitive forces to take the lead. Policymakers would retain the ability to respond *ex post* with competition law to any competitive problems that might remain.

Infrastructure competition versus service competition

All speakers recognized the value of infrastructure competition. Prof. Vogelsang argued cogently that service competition plays as an important complementary role to infrastructure competition. On the one hand, it is a critical element of the Ladder of Investment, allowing competitive entrants to build up sufficient scale to make infrastructure competition economically feasible. On the other, service competition may be appropriate indefinitely where infrastructure cannot be cost-effectively replicated, or where scale economies are so strong as to make infrastructure competition inappropriate.

Incumbent strategies versus strategies of newer Internet-based firms

Mr. Thilo Salmon of Sipgate (an independent VoIP provider) argued that the success of the Internet largely reflected the ability of countless firms to innovate at the edge of the network, without requiring any changes at all to the underlying network. This is innovation from the outside in.

Mr. Bross of BT was instead focused on innovation initiated by the network provider. Certain kinds of application services can best be provided when integrated with presence, authentication, location, and other services, some of which are most appropriately provided by the network. This is innovation from the inside out.

There is, of course, merit in both positions. Ultimately, the market must decide.

Interconnection in the NGN world

Mr. Salmon (and also Dr. Blau of Bellsouth) felt that NGN interconnection should most appropriately follow the Internet peering model of commercially negotiated arrangements, with no regulatory intervention. Dr. Schmidt (T-Com) took issue with this. He acknowledged that there were many uncertainties about how most appropriately to account for interconnection in the NGN world, but contended that future arrangements must still ensure that the network provider is somehow compensated for the use of its network.

Mr. Salmon and Dr. Schmidt seemed to make earnest efforts to find common ground, but it is not altogether clear whether they succeeded. Mr. Salmon acknowledged that it might be inappropriate for a next generation carrier Preselection service to be settled on a Bill and Keep basis. Dr. Schmidt said that he felt that the real question was the degree to which the current Calling Party Pays (CPP) call termination model should be carried over to the NGN world. Is there a difference between voice over the NGN, and voice over the public Internet? Dr. Schmidt noted that he was not necessarily arguing that traditional per-minute fees were appropriate in the NGN world, but he saw the need to take a cautious, reasoned, step by step approach going forward. Should there be differences based on distance, or point of interconnection? Should there be per minute charging, capacity charging, volume based charging, or what?

Slow or fast migration?

Mr. Bross spoke of BT's need for an accelerated transition to an NGN model (the 21CN) in order to compete effectively in the global market. Dr. Frank Schmidt of T-Com described his company's plans for a more cautious and phased migration.

How should the migration process be managed?

Mr. Bross of BT spoke of the Consult21 process, whereby BT is consulting with its wholesale customers (who are also its retail competitors) about the evolution of BT's network and the evolution of the wholesale offerings on which the competitors depend. He emphasized BT's commitment to making Openreach (the Access Services Division, which is responsible for implementing Equivalence of Input) effective, and of bringing its wholesale customers along in a cooperative fashion.

Significantly, Steve Hewson from MCI (which is a wholesale customer of BT) opined that BT's transparency and openness in these consultations had been extremely helpful. For a company like MCI that operates in many markets, this kind of open dialogue is key to sustained viability and investment. This is a useful message for regulators to hear as the migration to NGN progresses.

Session I

“NGN and emerging markets – what are we talking about?”

Matthias Kurth, President of Federal Network Agency, Germany

Mr. Kurth provided a thoughtful and comprehensive introductory address to the participants. It is available in full on the WIK website.

Mr. Kurth began by observing that competition has developed steadily since telecommunications markets were liberalised in 1998. Regulators have always confronted the question of the proper balance between service competition and infrastructure competition. Today, the migration to NGN raises the same question, but perhaps in a different form. How are we, as a regulator, to strike an appropriate balance between avoiding distortions of competition, while at the same time ensuring that there are sufficient incentives for investment in infrastructure?

He began by laying out a working definition of NGN – a term which tends to mean different things to different people. NGNs are generally felt to reflect the convergence of multiple networks into a single IP-based core network supporting multiple services. The converged network will be comprised of multiple layers (access, transport, control and services), and the interfaces between the layers will be open and standardised.

The move to NGNs potentially provides important advantages: lower unit costs, increased economies of scope and scale, and the opportunity for greater and faster innovation.

Different industry players may follow different paths to the NGN. PSTN operators may take a more centralised approach than ISPs. Some PSTN operators will prefer a fairly aggressive replacement of their core networks – as BT intends with its 21st Century Network (21CN) – while others may choose more of a step-by-step evolutionary path, with an extended period of parallel operation, as Deutsche Telekom intends. These are different paths to a largely common goal.

The National Regulatory Authorities (NRAs) have their work cut out for them. They must identify the non-replicable bottleneck facilities in the new NGN environment, and ensure that competitors have appropriate access over open interfaces in order to enable service competition further down the value chain. The NRAs must also anticipate new foreclosure strategies that might emerge, in order to ensure that incumbents do not improperly leverage new forms of dominance associated with their NGN-enhanced economies of scope into new markets.

Ofcom has sought to address these needs through the principle of equivalence of input, “requiring BT to make available the same SMP products and services to others as it makes available to itself, at the same price, and using the same systems and processes.”

At the same time, the NRA must seek to create the right climate for investment. Migration to NGN is likely to be associated with entrepreneurial risks that are different from those associated with current day-to-day operations. The operators that make these investments are entitled to an adequate return on investment, at least for some period of time. Any increased investment risk needs to be reflected in the risk premium that the regulator recognizes on the cost of capital.

Alternative network operators also need some predictability on the returns from their investments. To that end, the NRA needs to provide as much regulatory certainty as possible about the key facilities that the competitor needs from the incumbent, and especially for SMP access and interconnect products.

The migration to NGN is likely to involve rearrangement of the incumbent's core network, entailing changes in the number of levels of hierarchy in the network, the number of interconnect points, and the geographic arrangement of those points of interconnection. These changes could impact or strand certain sunk investments on the part of competitors. Sorting all of this out for the current network was a messy and contentious process; sorting it out again for the new NGN environment has the potential to be equally messy and contentious.

The Federal Network Agency (BNetzA) is trying to proactively anticipate these challenges. For that reason, they have established an advisory group on "Framework conditions for IP network interconnection".

Mr. Kurth went on to review the delicate balance that the European Regulatory Framework for electronic communications strikes as regards *emerging markets*. Recital 27 of the *Framework Directive* recognizes that the early market leader in an emerging market may hold a substantial share of an initially tiny market, and that premature imposition of remedies may be inappropriate. The *SMP Guidelines* go on to counsel against premature imposition of ex ante regulation that might distort the emerging market, yet at the same time they argue that the market leader should not be permitted to foreclose the emerging market. Beyond this, if an NRA were seeking to notify a market other than the standard 18 markets, the NRA would first need to apply the familiar three-criteria test.

In practice, the NRA is confronted with many difficult determinations. First, it is by no means straightforward to determine whether a market should properly be viewed as *emerging*. Beyond that, application of the three-criteria test to an emerging market entails challenges of its own.

Under these conditions, the NRA will tend to focus initially on markets from which market power can be leveraged, in order to mitigate "the risk of market foreclosure and distortion of competition in downstream markets."

This implies the need to ensure that competitors can obtain necessary access products at the wholesale level in order to enable them to compete at the retail level. But this

leads to a further complexity: conditions are not necessarily uniform across geography, due to differences in economies of density. Assets that are replicable in metropolitan areas may not be replicable in rural areas.

Yet another concern relates to incumbent investments that simultaneously serve both to support existing services and to enable new services. Under these conditions, the existing obligations for existing services continue to apply as a general rule.

Again, regulatory obligations at the retail level should be avoided, except perhaps as a last resort. If needed, competition law should suffice.

Mr. Kurth emphasized the need for NRAs "... to achieve a fruitful balance between maintaining existing services competition on the one hand and providing incentives for investment and innovation on the other. And this must be done with regard to both the incumbent and new providers, if competition is to be intensified in the long run."

Session II

Models for service competition, access based competition and infrastructure competition

Chair: Dr. Karl-Heinz Neumann

Managing the “ladder of investment”

Prof. Martin Cave, Warwick Business School, Coventry, UK

The need for service competition

Prof. Ingo Vogelsang, Boston University, USA

In this session, two distinguished regulatory economists provided contrasting but complementary views of the role of telecommunications regulation in the world to come. Prof. Cave spoke largely of the importance of enabling facilities-based competition, and of the possibility of withdrawing *ex ante* obligations and instead relying on selective application of competition law remedies *ex post* once sufficient competition has been achieved. Prof. Vogelsang spoke of the sometimes overlooked importance of service competition: as a complement to infrastructure competition, as an enabler to competitive entry, and as a means of filling “gaps” in the competitive landscape indefinitely.

Dr. Neumann introduced the next panel by observing that we operate under three distinct theories of competition: service-based, access-based, and end-to-end infrastructure-based competition. How will the emergence of NGN alter the nature of competition? To the extent that NGN increases economies of scale and scope, might it impact the prospects for infrastructure-based competition? If so, Europe must view this as a concern, since we emphasize infrastructure-based competition. As an alternative view, might NGN greatly enhance prospects for service-based competition?

Dr. Cave, drawing on Dr. Neumann’s comments, characterized three alternative regulatory models:

1. Reliance on competition law, coupled with a willingness to allow operators to make substantial profits in order to spur deployment;
2. Identification of SMP at many points, with imposition of obligations that enable competitors to acquire necessary rights at cost-based prices and thereby to provide service-oriented competition; and
3. Recognition that many network elements can in fact be replicated over time, and establishment of a framework that encourages that replication. This approach rests on the (often unstated) belief that infrastructure competition, and especially inter-modal competition, confers unique benefits on consumers.

With the third of these options in mind, Dr. Cave then went on to describe his well-known “Ladder of Investment”. He spoke of three ladders for the network as it exists today (while recognizing that a different ladder might apply to the NGN world of the future): a ladder for voice, comprised of rungs for resale, national switching, local switching, and the local loop; a ladder for conventional broadband, comprised of rungs representing retail, the IP network, backhaul, the DSLAMs, and the local loop; and a ladder for corporate multi-site services, notably dependent on leased lines.

In evaluating policy directions for the Ladder of Investment, Prof. Cave turned to recent work by Prof. Eli Noam of Columbia University. Prof. Noam speaks of three kinds of countries as regards broadband competition: those that have 0.x competitors (where x is the fractional role played by wireless services such as 3G and WiMax); those that have 1.x competitors (generally just DSL and wireless); and those, such as the Netherlands, that have 2.x competitors (DSL, cable modem, and wireless). Cave argues that the presence of 2.x competitors demonstrates that there are no non-replicable infrastructure components. In the 2.x countries, a more deregulatory approach may be appropriate, with greater reliance on the *ex post* application of competition law to deal with market failure in preference to *ex ante* sector specific regulation.

Prof. Cave then proceeded to describe an innovative approach to the implementation of the Ladder of Investment for broadband under such circumstances. The regulator would start by identifying an appropriate competitive entrant to use as a thought model. How could that firm be incented to make infrastructure investments? In theory, one might imagine a regulatory approach based either on the quantity or the price of regulated inputs to the competitive firm. Controlling the quantity, i.e. eliminating regulated access, appears to be an unsatisfactory solution – it would necessarily subject the competitive firm to a market-based negotiation in which it would lack sufficient bargaining power.

Thus, the natural alternative is to consider price-based mechanisms. There would be a basis for doing so under the European Regulatory Framework for electronic communications. Article 13 of the Access and Interconnection Directive is based on cost-based interconnection, but Article 12 of the same Directive provides a more flexible view of pricing mechanisms, including the possibility of a “reasonable price” (such as RPI minus X). A national regulatory authority (NRA) could permissibly choose to impose a remedy under Article 12 rather than Article 13, thereby signalling its intent to permit a regulated price in excess of cost. Gradually ratcheting up the price in this way over time would serve to increase the competitive provider’s incentives to invest in infrastructure.

Ideally, *ex ante* regulatory support could ultimately be withdrawn once sufficient infrastructure had been replicated. Interventions along these lines would have to be carefully calibrated, of course, in terms of timing. Where an asset is imminently replicable, a credible pre-announcement two or three years in advance might be appropriate.

In Ofcom's recent agreement with BT, it has very much followed these principles. BT has agreed to reduce the price of the local loop; to reduce the price for a competitor to migrate from one BT broadband wholesale service to another; and to keep the price of bitstream services stable, all of which serve to encourage competitors to climb the ladder of investment and to selectively replicate infrastructure where feasible.

All of this seeks to implement the Ladder of Investment in such a way that regulation approximates the operations of competition law. It would need to be based on a better understanding of the potential replicability of infrastructure across the EU. Cave noted that, while he personally favours a limited number of access alternatives and considerable flexibility for the competitive provider to move from one to another, some other experts favour a larger number of access alternatives.

Implementation of a process along these lines has implications for all phases of the European Regulatory Framework: for market definition, for market analysis, and especially for the remedies phase.

Returning to Mr. Kurth's key theme, Prof. Vogelsang spoke of the need for service competition in contrast with infrastructure competition. He noted that the conventional view is that infrastructure competition is preferable, inasmuch as it provides true alternatives for consumers; leads to enduring competition, without requiring continuous regulatory intervention; and encourages efficiency and innovation. By contrast, service competition is often said to be more limited, undiversified, and dependent both on regulatory intervention and on infrastructure competition.

Prof. Vogelsang challenged this conventional view. He argued persuasively that the industry has by no means suffered from under-investment in infrastructure in the past few years. Beyond that, all indications are that service industries are just as innovative as infrastructure-based industries.

Based on this, he argues for a regulatory approach that strikes an appropriate balance between service competition and infrastructure competition.

He argued this based on two examples: resale of telecommunication service in the United States, and Voice over IP (VoIP).

In the mid-Eighties, AT&T was required to permit resale at its normal tariffed rates of any service that it offered. This did not create new offers, nor new prices – it simply prevented AT&T from refusing to sell to resellers. This was an effective procompetitive program. By contrast, the 1996 Telecommunications Act introduced resale mechanisms that were more intrusive. One was an obligation to offer at wholesale, at a price less than retail, any telecommunications service offered at retail. The second was a program called UNE-P, that Prof. Vogelsang views as an aberration – it was a resale obligation

under another name, and at a much lower price. The price of UNE-P was so low as to ensure that there would be no replication of facilities. There has been some resale in areas where excess facilities had been built out.

In Germany, there have been two noteworthy examples of resale. One is Deutsche Telekom's voluntary resale of DSL, which has been a successful program. The other is mobile resale, which has been extremely important as a means of promoting market entry. At the outset, as much as 50% of the German mobile market was resale. It helped to launch the market. It subsequently declined, and is now down to something like 15%.

In certain other sectors, resale is not unusual. Resale can be beneficial. It can improve allocative efficiency. It can also help the underlying facilities-based provider to expand its market, thereby achieving greater economies of scale.

The argument for service competition can be particularly compelling where there are non-replicable assets, or where economies of scale are so strong that it is not cost-effective to replicate assets. In such an environment, service competition may be more cost-effective and more appropriate than infrastructure competition.

Perhaps the most important argument for resale is that it facilitates market entry. Especially at the time of initial market entry, resale can enable the entrant to achieve sufficient scale and brand recognition. The entrant may be able to cost-effectively build infrastructure – to climb the Ladder of Investment – once sufficient scale has been achieved. In the U.S., resale of long distance service had exactly this effect.

Resale may also enable the new entrant to offset somewhat the incumbent's advantage in terms of economies of scope. It enables the competitive entrant to provide a broader palette of offerings.

Resale may also be appropriate to deal with selective gaps in the replicability of facilities. For example, the service offered by alternative operators by means of LLU could potentially reach up to 60% of the German population; however, viewed in terms of nodes, this corresponds to only 3,000 of DT's 8,000 nodes. Clearly, resale can play a useful role for nationwide service offerings.

Different pricing mechanisms are possible. If resale is priced on a resale minus basis, and if the retail price is unregulated, then the incumbent can charge a high price for both and can extract the surplus from the competitive entrant. This danger does not exist with cost-based pricing.

Returning to the Ladder of Investment, it is really not so much a ladder as a slide. At each step, unit costs are *lower* (although the scale economies needed to reach those levels may be higher).

Resale is the first rung on the Ladder. This suggests that Germany should have introduced it much earlier than was in fact the case. Even with its late introduction, it may still have an important role to play (1) for non-replicable assets, and (2) in rural areas.

VoIP is a very interesting example of service competition, for two main reasons. First, it is a form of telephony that, like mobile, not only competes with conventional wired telephony but also offers some functional differentiation from it. Second, it is a form of service competition that opens the door to new infrastructure competition – it makes it possible for broadband media such as cable TV to compete with telecoms incumbents.

VoIP is a so-called *end to end* feature – it originates at the edge of the network, and not in the core. Anyone can provide VoIP – one does not need to be a network operator. This end to end characteristic is a hallmark of Internet-based innovation. The ability for a multiplicity of entrepreneurs to create new service innovations, without relying on the underlying network operators, is in most respects a very promising development; however, it also has a tendency to commoditize the network.

Returning to his key theme, Prof. Vogelsang argued that, in the case of the Internet, service competition has played a key role in enabling infrastructure-based competition, creating necessary preconditions and particularly providing competitors with sufficient scale economies. For sustainable competition, you need infrastructure competition; however, excessive reliance on infrastructure competition could be dangerous. At the same time, you also need a fair, effective, and insofar as possible self-policing interconnection regime. (This is, incidentally, one reason why Prof. Vogelsang tends to favour a Bill and Keep regime – it tends to require much less regulatory intervention.) What is needed is a balance between service competition and infrastructure competition.

In the subsequent question and answer period, Prof. Picot asked the speakers for their views on bitstream. Prof. Cave described it as a crucial intermediate step between pure unbundling of the local loop (with high capital demands on the competitive entrant), and resale of the complete bundled broadband service (with lower capital demands on the competitive entrant, but higher unit cost to the competitor). This is why the pricing and availability have been a key battleground for European regulation in recent years.

Prof. Vogelsang expressed full agreement, adding that bitstream, and LLU even more so, requires the competitor to build out to a point of interconnect. If only LLU were available, and not bitstream, then competitors would be obliged to build out to a great many points of interconnection, including many where the competitor lacked sufficient scale economies. As the network migrates to NGN, the competitor would effectively be duplicating the incumbent's network by interconnecting to numerous remote locations. This duplication may not be economically efficient or appropriate.

Dr. Ulrich Stumpf from the WIK asked whether the NRA should treat 1.x areas within a Member State differently from 2.x areas? Prof. Cave responded that he would indeed expect the NRA to explicitly respond to such a large difference in the competitive state of the market in different geographic areas. In practice, doing so might be difficult; nonetheless, it seemed to Prof. Cave that the difference between the 1.x and the 2.x areas was very substantial, and that it was important to avoid over-regulating half of a country.

Prof. Cave went on to acknowledge that his comments had glossed over an important distinction: If wireless broadband competition were ineffective, then a 2.x market would effectively be a 2.0 market, i.e. a duopoly. A duopoly may be only marginally preferable to a monopoly.

Session III

Technical convergence and long – term perspective of network development

Chair: Prof. Arnold Picot

Thorsten Heins, Member of the Board, Siemens Communications, Germany

Robert Pepper, Senior Managing Director, Global Advanced Technology Policy, Cisco Systems Inc., US

Dr. Reinhard Scholl, Deputy Director ITU

In this session, Mr. Heins and Dr. Pepper offered strikingly similar visions of the migration to NGN. Given that Mr. Heins represents Siemens, a European manufacturer with its roots in telephony, and that Dr. Pepper represents Cisco, a U.S.-based manufacturer grounded in the world of the Internet, the parallels are noteworthy.

Dr. Scholl closed out the session by describing ITU-T's role in fostering the NGN standardisation process.

Mr. Thorsten Heins began by showing the cover of a recent issue of *The Economist* with an article: "How the Internet killed the phone business". He emphasized, however, that the evolution that we are witnessing is not a threat – or rather, not just a threat – but that it is equally an opportunity.

To illustrate this point, he spoke of Skype, a new entrant VoIP provider that was recently purchased for a very substantial sum (some \$2.5B). Skype represents both disruptive technology and a disruptive business model, in many dimensions. The service is distance agnostic and duration agnostic – a huge challenge to the business models of established operators. Beyond this, it invested next to nothing in advertising, relying instead on word of mouth. They are signing up an average of 150,000 users per day, and they invest nothing in infrastructure. What this illustrates is that (to paraphrase the American author Mark Twain, who once remarked that rumors then circulating that he had died were premature) reports of the death of the telephone industry are premature; however, the industry will unquestionably be transformed.

What we are seeing instead is a plethora of new services: IPTV, online gaming, you name it. What we are seeing more broadly is the convergence of telecommunications with the entertainment industry. We are not just seeing convergence of many networks into one integrated network; we are seeing an incredible pace of innovation at all levels: network, access, and application.

In the case of wireless access, for example, what is emerging is not just one solution, but many solutions, distinguished primarily by bandwidth and mobility. This has enormous implications not only for the devices that are going to be needed, but also for the network infrastructure that will be needed. This is why Siemens feels very strongly that the service to the end user has to be network agnostic. The user should not have to know or care whether the underlying service is 3G, 2G, WiFi, WiMax, or anything else.

This is why Siemens views the IMS architecture as being vitally important. IMS is what's going to provide the ability to make applications entirely independent of the underlying data transport mechanisms and of the control plane. The network of the future will be a converged network, offering a huge array of services transparently over a great many different kinds of network technologies.

Mr. Heins closed by strongly endorsing Mr. Kurth's comments on the need to find the right balance between enabling competition on the one hand, and creating an environment conducive to innovation on the other.

Dr. Robert Pepper of Cisco began by describing Mr. Heins's remarks as evidencing a different kind of convergence – while Siemens and Cisco have very different corporate roots and origins, their corporate visions today are essentially identical.

Technological evolution is driving a migration from the silos of the past hundred years to a world of many multiple-purpose networks riding on multiple platforms. That is a fundamental change that needs to drive the way in which we look at industry structure, business models, investment, and regulation.

The new networks need to be viewed in terms of multiple layers – network core, access and services. Most, but not necessarily all, will be packetized and IP-based. The service is now de-coupled from the underlying network.

This is a continuous process, not an end state. It will happen in different phases, with different network operators migrating on different time scales and in different ways. It will continue.

It will potentially provide new services, and faster time to market. Innovation can now come at the edge of the network. A plethora of new services are now possible – not just VoIP, but everything over IP. In the home, we can have a rich mix of application services, including entertainment. Dr. Pepper spoke of watching his local California TV programs from his laptop in Germany, thanks to his Sling box. This is not just theoretical any more.

New forms of intelligence, however, may be moving back into the core. It's not just a matter of intelligence at the edge – it can be in both places. This core intelligence can

support user identification, user authentication, location, and presence, all of which serve to enable new capabilities and new services. The ability to identify a VoIP caller's location in order to enable access to emergency services may depend on this kind of capability.

Where we used to speak of Customer Premises Equipment (CPE), or of Consumer Electronics, today the lines are blurring. The consumer devices are converging as well.

This necessarily impacts regulatory policy. In the past, voice telephony was inextricably linked to the underlying transport. Today, VoIP voice is an application. This poses challenges to five key underlying concepts (with thanks to Mr. Heins for the fifth):

1. The product was voice.
2. The metric by which the service was measured, billed and regulated was the minute.
3. Location makes a difference.
4. Distance makes a difference.
5. Duration makes a difference – how long am I connected?

The move today is to broadband pipes, which enable a multitude of applications. The associated services are independent of location, distance and duration. This involves very significant investment, with uncertainty as to returns. Dr. Pepper opined that he expects the investments to ultimately pay off.

For the investments to succeed, a stable and predictable regulatory environment is essential. The key challenge, as Mr. Kurth and others have noted, is to promote competition, while at the same time promoting investment and enabling innovation. How do you align the incentives for both simultaneously? These are very difficult questions.

Dr. Reinhard Scholl provided an overview of the ITU's standardisation activities in regard to NGN.

Today, standards organisations compete with one another. This is largely a consequence of liberalisation, coupled with rapid technological advances. There are as many as 500 fora that are active in this space. This puts market-based pressure on ITU-T to continually improve its processes and effectiveness.

Our activities reflect a unique partnership between governments and private industry. Today, about 95% of the real work is done by the private sector, except perhaps where public policy is concerned.

ITU-T is a flexible and fast-moving environment, and every phase of the standards development process has been improved and accelerated over the past few years. You can start work on a new standardisation project almost instantly. About 95% of our work goes through a very fast approval process. What used to take years can now take place in days or months.

ITU-T also has a new mechanism: the *forum*. A forum (or focus group) operates under ITU sponsorship, but the forum has enormous flexibility to operate as it sees fit.

As regards the work going on at ITU-T with respect to NGN, Quality of Service (QoS) is noteworthy. Dr. Scholl claimed that in discussing QoS with the Internet community, and notably with the Internet Engineering Task Force (IETF), one might be told that the Internet was "... not reliably bad enough to justify the investments" that NGN envisions.

Convergence relates to all kinds of networks, not just traditional telecoms networks but also cable TV networks and mobile. It must be possible to access the same applications even as the user's location changes.

The key issue with NGN is the move from multiple vertical "silo" networks to a single converged network comprised of horizontal layers. For example, a BT spokesman recently observed that BT currently operates more than 22 networks, and more than 300 systems. (At this point, Matt Bross of BT chimed in: "He must be an optimist.") Converging these networks potentially offers huge savings.

ITU-T created the NGN Focus Group in June of 2004, and it immediately took off. It produced NGN Release 1 in November. It will be made public momentarily. The Focus Group is ending, but the work is being turned over to the conventional ITU Study Group system, which will begin work on it in January 2006.

The Focus Group produced a great deal of output. Key emphases for the work to date include Quality of Service, and Security.

Dr. Scholl regards BT as "a star in this work." He is impressed with BT's commitment to actually "turn off" the PSTN in 2010.

ITU-T has adopted the "marketing" name GSI (Global Standards Initiative) to refer collectively to our standards efforts in the NGN area in order to emphasize ITU-T's overall commitment to this initiative.

At the same time, ITU-T is not alone in these efforts. Other standards groups in Asia, Europe and America are also doing work in this area. The ITU-T hopes to harmonize these activities.

In the subsequent question and answer period, Dr. Neuman returned to the speakers' claim that the migration to NGN will prove to be more of an opportunity than a threat. If this is so, Dr. Neuman asked, why is the market not ascribing a higher value to the stock of the traditional providers?

Mr. Heins said that he believed that the new services would be successful for a number of reasons, not least because of the value of having multiple services integrated or bundled; nonetheless, it was not yet clear which service providers would benefit. The universe of service providers would be transformed and broadened.

Dr. Pepper agreed, noting that financial markets like to be able to place reasoned "bets". The high degree of uncertainty is the problem. A lot of the investment today is *defensive* investment. In the US, the cable TV industry a decade ago invested some \$90B in order to respond to the satellite industry by offering lots of channels of programming. Only later were they able to capitalize on those *defensive* investments, turning them into *offensive* investments by offering cable modem service, and more recently VoIP. There is still enormous uncertainty as to who is going to benefit from these NGN investments at the end of the day, and that uncertainty is what is depressing share prices.

Session IV

Deployment models for FTTx

Chair: Dr. Iris Henseler-Unger

Experience in Japan

Keiichiro Seki, Director, International Economic Affairs, MIC (Communications Ministry), Japan

Experience in the U. S.

Dr. Robert Blau, Vice President, BellSouth, US

Future access to infrastructure and facilities in the UK against the backdrop of BT's "21st Century Network" and its organisational outsourcing of access services

Matt Bross, CTO, BT Group, UK

Dr. Henseler-Unger introduced the session by noting that there is a great deal that we can potentially learn from the experiences and perceptions of others.

This session was comprised of prominent experts from Japan, the U.S., and the UK.

Mr. Seki began with an overview of market developments in Japan. PSTN traffic is declining 15% annually. This results in corresponding annual increases in interconnection fees, and difficulties in funding the continued maintenance and improvement of the PSTN. Furthermore, the increase in interconnection fees makes it increasingly attractive to bypass the PSTN altogether, thus compounding the problem.

Meanwhile, mobile usage is surging. Mobile usage overtook fixed in November 2000, and continues to grow.

More than 8 million Japanese VoIP users have phone numbers. As of November 2005, the total number of VoIP users was 9.76 million. The MIC anticipates that VoIP will gradually replace the PSTN altogether, and will increasingly offer not only lower prices, but also advanced services.

But we cannot turn back the clock. Today, we cannot imagine a world without the Internet. The world of the future will be characterized by rich web services, massive storage capacity, ultra-fast transmission over FTTH, and sophisticated audio-visual applications. Continued innovation drives a virtuous cycle of supply and demand.

The number of broadband users in Japan recently exceeded 20 million. About 70% of these use ADSL. Significantly, the number of FTTH users – 3.4 million – exceeds that of cable modem users. Nonetheless, some areas will remain unserved, posing an ongoing

challenge for public policy. The net rate of increase of FTTH subscribers exceeds that of ADSL subscribers.

Japan has emphasized procompetitive regulation in terms of interconnection, collocation and unbundling. These programs have been effective – the broadband market share of NTT East and West is only 37%, one of the lowest rates in the world. The presence of effective competition in the Japanese market for broadband services has resulted in some of the fastest service in the world, at some of the lowest prices.

Regulation is easy to design, but difficult to implement because of inevitable delays introduced by incumbents, including non-price discrimination. Moreover, resale alone is not enough. With these considerations in mind, the Japanese MIC seeks to promote competition through a comprehensive palette of mutually complementary procompetitive regulatory obligations:

1. Pricing methodology
2. Collocation rules
3. Unbundling of dark fibre – not just for the last mile, but interoffice transport as well
4. Structural separation of NTT groups – NTT East and West can offer Internet service only through separate affiliates. Non-discrimination obligations apply vis-à-vis other ISPs.

NTT has been deploying fibre aggressively, despite the presence of unbundling obligations on fibre local loops since FY 2001. NTT East and West have been anxious to deploy FTTH to offset customer losses to competing broadband providers. A customer, once lost, is very hard to regain. Competition with mobile operators is also stimulating the incumbents to invest.

It is much easier to deploy FTTH to multiple dwelling units than to individual detached homes. For multiple dwellings, the incumbents control just 36% of the installed base, while for detached homes they retain 78% of the installed base. There must be invisible barriers to competitive entrants in this segment.

In setting interconnection prices, the MIC considers both expected supply and demand over the target period. Doing it in this way it is particularly suitable for new networks – it enables NTT East and West to achieve a proper return on the investments that they are making in new fibre networks, at the same time that consideration of anticipated future demand enables the MIC to avoid setting interconnection prices at levels that would be unreasonably or prohibitively high.

The Japanese market is thus characterized by a high take-up of ADSL, and by rapid deployment and adoption of FTTH. The Japanese broadband market differs from that of the U.S., 60% of which is based on cable modem service, denoting facilities-based competition in the last mile between ILECs and cable operators. It has some parallels with conditions in Italy and Sweden, both of which have substantial FTTH roll-outs – based in the former case on triple-play services, and in the latter case on STOKAB's¹ fiber infrastructure leased to third parties.

Different incumbents will attempt to use bundled services, migration to NGN, and other strategies in an effort to retain the customers that they serve on their local loops.

The migration to NGN implies serious economic challenges that the regulator must be aware of. In the fixed industry, fixed costs are huge, and marginal costs are very low. The objective must be to reach an equilibrium where marginal price is equal to marginal cost. Demand is a function of price. Today, the world of the PSTN implies relatively high price and correspondingly low demand. The new world of the NGN should be characterized by lower prices and increased consumption. This is also a good point for service providers – given that the market is characterized by high capital costs and low marginal costs, it is clear that from this equilibrium point, the more customers, the more profit. It is also desirable to shorten the period of wasteful parallel operation of both the PSTN and the NGN network. A role for public policy, then, is to shorten the time of transition to the new NGN-based equilibrium.

Dr. Robert Blau spoke of the three models of deep fibre deployment: fibre-to-the-node (to within 1,500 meters of the user), fibre-to-the-curb (150 meters), and fibre-to-the-premise. All of these are being applied by the former Bell companies in the U.S. in varying degrees.

All of these are variants of broadband *passive* optical networks – PON means that there are no active electronics in the path. Eliminating the electronics has the potential to greatly reduce operating costs. Some analysts predict that total replacement of the last mile in the U.S. could eliminate as much as 30% of operating expense.

The choice among the three forms of fibre deployment usually reflect a trade-off between capital costs and long term savings (or the creation of new revenue streams).

Copper DSL generally has to be within 12,000 feet of the home, and provides speeds of just a few Mbps, similar to cable modem service. FTTN provides perhaps 25-40 Mbps, but at a cost generally about \$250 per home passed, plus another \$500 or so per home

¹ STOKAB is a Swedish municipal corporation operating in the Stockholm metropolitan area that provides high speed fiber access from third party service providers to Swedish businesses and consumers on a nondiscriminatory basis. This is a common model in Sweden.

connected. The cost of FTTC depends greatly on the amount of fibre already deployed in the distribution network. Verizon has found that the cost of FTTH is about \$1,400 per home.

The huge difference is that copper DSL cannot carry high quality video. By contrast, FTTN is sufficient to offer a couple of high definition video channels, plus a couple of normal definition video channels, plus a 10 Mbps data service. This can support very different business plans, including head-to-head competition with cable operators.

At the same time, traditional service providers are likely to be under considerable pressure from non-facilities-based providers of VoIP, IPTV and other services. The U.S. RBOCs needed to make a competitive response, and this is it.

Verizon is deploying FTTH because they are looking to use a broadcast Radio Frequency (RF) video system, very much like a cable TV operator. Bellsouth and SBC will not be able to do that with the FTTN and FTTC solutions that both companies are emphasizing; they will instead have to use some variant of IPTV.

The providers will all deploy fibre selectively – none of them will respond to individual customer requests for service where fibre has not yet been deployed. Verizon has, however, been very aggressive in deploying FTTH, wiring whole neighbourhoods. They have already connected about 1.5 million homes. They intend to connect half of their customer base by 2010, at a cost of about \$3 billion per year. At the other end of the spectrum, SBC is planning to serve about half of their customer base with FTTN services (i.e. about 20-40 Mbps) by the end of the decade, which will cost them about \$2 billion per year. Bellsouth is planning to use a mix of FTTN and FTTC, using FTTH only for new housing developments. The cost of running trenches to individual homes is substantial – the corresponding increase in speed does not seem to Bellsouth to be essential for meeting customer demand for some years to come.

The combined U.S. markets for communications service and for entertainment is considerable – some \$350B per year. These markets are converging, and Bellsouth believes that customer demand for bundled and integrated services will be substantial. Dr. Blau feels that subscribers are willing to pay a significant premium – perhaps \$150 to \$200 per month – as long as they get a highly functional bundled service for a combined price not much more than what they are paying today.

Bundling also has the potential to reduce rates of customer churn.

The emergence of IP applications like VoIP and IPTV will cause Bellsouth's revenues to flatten if they do not respond. The U.S. RBOCs are betting on growth. The hope is the widespread availability of a new platform will enable new applications that will ultimately drive revenue growth.

In the Seventies and Eighties, the FCC spent a decade debating how to implement mobile telephony. Most studies suggest that the cost of that delay was somewhere in the neighbourhood of \$100-\$150B dollars. The cost of delay can be huge. It is very important that regulatory policy permit the fibre deployment to go forward.

The investment community is uncertain about these investments. They recall all too well the roughly \$500 billion that was lost in 2001 as a result of the telcoms melt-down.

Dr. Blau went on to argue that both PSTN operators and cable operators will need new business models, because new services such as VoIP and IPTV will disintermediate the existing service providers and undermine their traditional sources of revenue. This revenue will have to be replaced by new pricing models based on capacity and/or volume.

Dr. Blau anticipates that these new pricing models will reflect current models of Internet peering and transit. ISPs around the world manage to interconnect with no regulatory intervention. This system works with exceptional economic efficiency. Smaller carriers pay larger ones to carry their traffic, but they are incented to build out their own capacity when their customers have sufficient aggregate demand (i.e. when they are carrying enough traffic to cost-justify the investment). The system avoids free riding, and at the same time provides economic incentives to build out infrastructure when appropriate. Hopefully, interconnection arrangements in the NGN will move in the same direction, toward arrangements established purely through commercial arrangements and not through regulatory action.

Prospects for that are particularly good in the U.S., because the U.S. has competing infrastructure. Today, as Mr. Seki noted, cable providers have about 60% of the broadband market in the U.S.; by the end of the decade, Dr. Blau hopes that their might be about a 50-50 split between cable operators and traditional telecoms providers. Dr. Blau believes that wireless will make rapid advances in the U.S. in the coming years, at which point competitive forces will obviate the need for *ex ante* regulation of last mile facilities. At that point, selective *ex post* application of antitrust (competition law) can deal with any remaining problems that might emerge.²

Mr. Matt Bross, the CTO of British Telecom (BT), spoke of BT's strong emphasis on being a *global* player. BT feels strongly that voice is just an application running on the underlying broadband network. BT has committed some 10 billions pounds of investment over the next five years to that vision, and they have committed to turn off the traditional network. How did they get to that point?

² European readers should however recognize that U.S. antitrust law does *not* in general operate as a complement to *ex ante* sector regulation. There are important differences between U.S. antitrust law and European competition law.

BT's strategy rests on four pillars: (1) doing well with existing customers, (2) building strategic long term relationships, (3) growing what BT refers to as the "new wave", and (4) the new network. The "new wave", based on the networked IT business, the mobility business, and the broadband business, represents about 4.5 billion pounds of revenue per year. That corresponds to about a fourth of BT's gross revenue, and it is growing at a rate of some 32% year over year. Only 12% of BT's revenue comes from residential calls; the "new wave" businesses contribute far more to BT's profitability. To expand the "new wave" businesses, BT needs the new network.

BT is looking (1) to transform the customer experience, (2) to greatly accelerate our speed to market, and (3) to eliminate about a billion pounds per year in operating expense.

Competitive operators will want to have competitive access to BT's network in those areas where it is not cost-effective to build out themselves. This network enables BT to do that.

Speed to market is extremely important. BT cannot predict what customers want; for that matter, customers may not know what they want until they see it. Nobody would have predicted that consumers wanted ring tone downloads and SMS. BT thinks that it is more important to get the underlying building blocks right – things like presence, and messaging, and authentication, and content repurposing, and digital rights management, and storage – so as to have the ability to quickly construct whatever the customer truly needs from pieces already at hand.

BT has multiple networks that have been built up over time. PSTN, PDH, various IP networks. There are over 3,000 IT systems that support these networks – it is enormously complex. If BT collapse all of these networks in a single multi-service network, BT hopes to completely eliminate as many as 100,000 devices, and to arrive at a vastly simpler 21CN architecture based on IMS.

BT will have about 100 metro nodes in the UK. These metro nodes are where BT will do all of the service interworking. BT plans to use the same basic design around the world, thus concentrating the engineering effort in a limited number of locations.

By contrast, BT intends to implement only very simple functions in the Multi Service Access Nodes (MSANs) at the edge of the 21CN.

BT intends to have migrated a majority of their customers off of the traditional network and onto the 21CN at some point in 2009.

In the UK, BT has undertaken a huge and unprecedented public consultation process (Consult21) with the industry to explain what they are doing with the network, and the interconnection plans that they have in mind. They know that competitors need to understand the impacts on their investment plans, and they are working with competitors

to change and to adjust schedules so we can bring the industry with them as they go forward.

BT has always been an innovative place, but they see the need to innovate the way in which they do innovation today. They have to harness innovation globally for the benefit of their stakeholders and investors. To create real durable differentiable value today, it takes far more than a good product. They have to make changes to BT's whole organization to bring all of this to fruition.

Mr. Bross went on to discuss the architecture of 21CN – this is best seen on his slides. Two areas that he touched on that are particularly interesting are (1) the desirability of a configurable or automated Main Distribution Frame (MDF) as a means of deploying “broadband dialtone”; and (2) launching FTTH as an alternative to VDSL.

BT's *Openreach* represents a radical approach, based on BT's agreements with Ofcom. Openreach will own and operate all of the access assets – all of the copper, and the fibre, and the frames, and the VANs. Openreach will have its own board reporting in to the BT group board. The Openreach CEO should be motivated to provide equivalent access to underlying bottlenecks to BT and to competitive operators. BT is committed to providing competitors with absolutely equivalent access to the Openreach facilities, including equivalent access to truck rolls.

Mr. Bross feels that these arrangements are good not only for the public, but also good for BT. As regulation is focused on the real bottlenecks, BT hopes to receive regulatory relief on the downstream businesses in order to enable BT to compete effectively. BT also hopes to achieve the regulatory clarity that it needs in order to invest in NGN.

There were several questions to Mr. Bross as to whether the Consult21 process would deal only with legacy interconnection or with new NGN interconnection issues. Mr. Bross responded that it was dealing with both. Prof. Cave asked how to strike the right balance between BT's cost savings on the one hand, and the economic impact on competitors as a result of a migration undertaken unilaterally by BT. Bross said that BT was confident that with (A) the 100 metro nodes, plus (B) the more widely distributed DWDM infrastructure, BT would be able to make the cost neutral to competitors. Mr. Bross added that all of this was still under discussion, still preliminary, but he felt that BT was making good progress with the small number of competitors who were concerned.

Steve Hewson from MCI said, as a competitor operating in the UK, that he felt that BT's transparency and openness in these consultations had been extremely helpful. He added that many issues remained unresolved as to the risk of stranding the assets of competitors. For a company like MCI that operates in many markets, this kind of open dialogue is key to sustained viability and investment.

Session V

Telco models of the future

Chair: Mr. Scott Marcus

SIPGATE business model

Thilo Salmon, General Manager, Sipgate, Germany

Migration from PSTN to NGN

Dr. Frank Schmidt, Senior Executive Vice President, Regulatory Affairs, T-Com, Germany

In this panel, a founder and technologist from a new Internet-based VoIP service provider (Sipgate) and a senior regulatory executive from Deutsche Telekom described their different visions of the world to come.

Of particular interest are their contrasting views as to (1) whether innovation is likely to take place in the core of the network or at the edge, and (2) how interconnection should be approached in the NGN world.

Mr. Salmon asked the participants for a show of hands: Who was using the Internet Service Provider's email service? Who reads news on the ISP's web portal? Who uses the search engine on the ISP's home page? Very few hands went up on the last questions. Mr. Salmon's point was that tying application services to the underlying transport will not work in today's converged world.

Beyond that, there is very little money for voice service in the long run. Why tie the voice service to the access when there is really very little money in voice?

Moreover, the companies that have succeeded with new Internet-based services – real estate, book retailing, used cars, employment – were generally not the companies that had been market leaders in the traditional world.

In the world of the future, some services will be provided by the underlying access providers, but some will not. How are these two worlds to coexist?

Mr. Salmon noted that interconnection in the traditional PSTN world was a heavily regulated nightmare. Echoing Mr. Blau's earlier remarks, Mr. Salmon said that IP interconnection is unregulated, is completely successful, and that the associated agreements are largely the same worldwide and are technology-neutral. What is it that future interconnection agreements must settle, anyway?

There was a time when everyone thought that ATM – with an underlying theme of uniformity and standardization for both voice and data – was the way forward. ATM was used, but it was not ultimately the way forward.

Going forward, interconnection needs to be technology neutral. Further, when you interconnect higher level services, there should be no assumptions as to what is going on in the lower levels of the network.

In order to have a market for services and for transport, you need to have separate interconnection agreements for each. “If we intermingle them,” Mr. Salmon asserted, “then we won’t have a market for services at all.”

Decoupling services from transport is pro-innovation, because it enables a great many application developers to innovate at the edge of the network. This is greatly preferable to limiting innovation to the small number of firms that control the transport network.

Dr. Frank Schmidt presented the next address on behalf of Mr. Achim Berg, who was called away at the last minute.

Dr. Schmidt spoke of the old world, and the challenges of migration from the old world to the new.

Today, there are new pressures on telecoms providers: increasing competition, the decline in voice revenues and the consequent drive to find new revenue streams, the need to cut costs and achieve greater efficiency, and the risk that today’s equipment might not be maintainable in the future as the industry evolves in new directions.

Traditional carriers today are faced with a conundrum: Should they follow an evolutionary approach, or a revolutionary approach? Should they migrate the network step by step, with an extended period of parallel operation, or should they go for a full replacement “big bang” approach? In contrast to BT’s, T-Com is taking a more cautious and conservative approach.

NGN is an important enabler of innovation. The integration of NGN can provide numerous cost savings – optimizing utilization, energy consumption, and space. At the same time, the integration of the NGN with existing systems may pose challenges. The greater concentration of the NGN network (in the sense that many services share common underlying transmission facilities) may increase the risk of catastrophic outages. Finally, the potential cost of an extended transition period reduces the potential cost savings. Thus, raw cost savings alone may not represent a compelling argument for a transition.

T-Com envisages three stages of migration: (1) Interconnection of the PSTN and the NGN, (2) shifting services from the PSTN while creating new NGN services, and (3) replacement of the PSTN. T-Com is currently in stage 1.

In the past, T-Com had two separate networks with only limited modes of interconnection. T-Com sees the next step as interconnection for voice functionality. Moving to the next stage will require interconnection gateways, telephone application servers, and other infrastructure to enable IP telephones to work seamlessly with the PSTN. Authentication, Authorization, and Accounting (AAA) functions are particularly relevant.

Dr. Schmidt does not expect that T-Com will introduce many new services on the PSTN; instead, most new services will be introduced into the new NGN world.

T-Com expects that the process of migrating customers to the NGN could last until 2012; however, T-Com can move that date either forward or back to reflect subsequent developments.

Mr. Salmon responded to a question by explaining that his *unit costs* were not very sensitive to the number of users. In other words, his costs are roughly linear in the number of users.

Dr. Scholl asked about the interoperability of SIP implementations. Mr. Salmon explained that the initial lack of test suites for SIP had been a problem that required them to work closely with vendors.

Mr. Salmon responded to a question about peering versus transit arrangements. This led to a discussion about network neutrality – will providers find it profitable to interfere with VoIP traffic? In the IP world, there is no real distinction between call origination and call termination. So far, his sense is that the normal economic model of peering and transit is absolutely fine for VoIP – they have experienced no problems to date. SigGate peers with about 50 IP networks.

Dr. Schmidt went on to observe that different operators might have to cooperate to complete a call. Each operator needs to recover its costs. Peering is unregulated, and is associated with the notions of symmetry. Dr. Schmidt argued that, for networks of significantly different size, peering may not be the appropriate model; rather, it may be appropriate to reflect the different sizes and the different cost structures of the networks.

Prof. Cave asked how competitors who currently depend on SMP offerings would be impacted as T-Com progressed through the three stages of deployment. Dr. Schmidt explained that for purchasers of LLU or of wholesale DSL, things would not change rapidly. For LLU, there would be scarcely any impact from these changes. What will change over time is the interconnection environment. Migration of interconnection from

the PSTN world to the IP world poses real challenges, which are being studied intensively here in Germany. At the same time, the issues may be a bit less pressing in Germany (in comparison to the UK) because T-Com does not envision an abrupt transition.

Dr. Neumann asked about the operating costs of parallel copper-fibre networks. Dr. Schmidt said that DT had looked at the issue, and felt that it did not make economic sense to massively replace the copper with fibre. Neither the copper from the cabinet to the subscriber nor the copper from the MDF to the cabinet should be replaced for customers who are using it only to place normal voice calls. There are no plans to replace the copper plant, nor is there a plan to migrate to fibre even for customers with a need for higher bandwidth. T-Com envisions parallel operation for some years. Line sharing will move from the MDF to the cabinet, but voice will go into the DLE for the time being. There will be evolution in the long term, to be sure, but T-Com does not expect to make large changes in the next two or three years.

Dr. Blau asked about interconnection in an IP environment. What would preclude commercially negotiated arrangements, in distinction from a regulatory solution? Mr. Salmon responded that what mattered in the context of the EU was cost-based settlement. His firm, as previously noted, tries to enter into as many Bill and Keep arrangements as possible, and already has more than a dozen such arrangements in place. Dr. Schmidt, by contrast, argued that as long as service providers use the network, there should be some kind of compensation. Saying that there should be a fair and mutual exchange of value was fine in principle, but as long as an Internet Telephony Service Provider (ITSP) did not operate a transport network, it seemed to him that they were not an appropriate partner for a Bill and Keep interconnection arrangement because they could not provide the same service that they were receiving. The ITSP was being paid by its customer; who was paying the carrier? What can the carrier do on the retail side, particularly as regards bundled service? Dr. Schmidt argued further that the interconnection issue could not be considered in isolation from these retail services issues, but noted that it was difficult to bring those discussions together.

Mr. Salmon responded in turn to this last assertion by noting that, to the extent that VoIP is delivered over the transport network provider's conventional Internet access service, then the network provider's customer is already paying for the Internet transmission and nothing further is needed. That should be settled by the carriers, typically on a Bill and Keep basis. An NGN service, like a next generation carrier Preselection service, is something else – Mr. Salmon did not think that it was necessarily appropriate for such a service to be settled on a Bill and Keep basis.

In response to a follow-up question, Dr. Schmidt said that he felt that the real question was the degree to which the current Calling Party Pays (CPP) call termination model should be carried over to the NGN world. This might make sense, but many questions, especially as regards Quality of Service, have not yet been resolved. Is there a differ-

ence between voice over the NGN, and voice over the public Internet? Perhaps there should be a difference as to how termination fees are handled in the two cases? Dr. Schmidt noted that he was not necessarily arguing that traditional per-minute fees were appropriate going forward, but he saw the need to take a cautious, reasoned, step by step approach going forward. Should there be differences based on distance, or point of interconnection? Should there be per minute charging, capacity charging, volume based charging, or what?

Session VI

Regulatory models for investment, infrastructure and innovation – The Regulators' Panel

Chair: Dr. Karl-Heinz Neumann

Matthias Kurth, President of Federal Network Agency, Germany

Gabrielle Gauthey, Member of the Board ARCEP, France

Keiichiro Seki, Director, International Economic Affairs, MIC (Communications Ministry), Japan

With this panel, the conference ended largely where it began, wrestling with the twin challenges of finding, first, the appropriate balance between service competition and infrastructure competition, and second, an equally important and equally elusive balance between enabling competition and addressing competitive bottlenecks on the one hand, and encouraging innovation and investment on the other.

Mme. Gabrielle Gauthey used the fixed broadband market in France to explain regulatory developments in France, and also to explain what might be anticipated in the future.

Two or three years ago, France had been lagging a bit in broadband deployment, but today the market for broadband is booming. By the end of year, France will have over 9 million broadband subscribers.

Broadband in France is delivered almost exclusively over DSL. Wireless is still emerging, while cable accounts for only 7% of subscribers. Where some other countries in Europe and in North America could be viewed as 2.5 countries (with competition between telecoms, cable modem, and to some extent wireless), France is definitely a 1 or 1.5 country. Competitive bottlenecks will persist for a long, long time.

There are specific aspects that must be considered. The ARCEP is engaged in public consultations about the technical aspects of VDSL on the local loop. In particular, they are trying to understand the impact that VDSL deployment might have on the investments that new entrants have made for access at the MDF.

The ARCEP is also of the opinion that fibre deployment deep in the network might be far more feasible, in an economic sense, for business parks than for purely residential areas.

Mme. Gauthey and her colleagues do not want to hinder new investments. At the same time, they are not willing to tolerate remonopolization of the local loop. Mme. Gauthey

thinks that France, as a 1.5 country, will continue to be subject to large scale access bottlenecks for some time. How is the ARCEP to deal with that?

They need to make a clear distinction between new, risky investments and new, innovative services (i.e. emerging markets).

In France, the ARCEP has made judicious use of the full range of regulatory instruments available to it, including bitstream access, LLU and line sharing. Some might say that the ARCEP is micro-managing, but they are achieving excellent results. This is resulting in substantial investment and innovation by France Telecom *and* on the part of competitive entrants.

Mme. Gauthey does not see regulation as an all or nothing matter. In France, there are numerous institutions (including the *Caisse de Depots*) that can collectively help to ensure that financing is available for these new and risky investments. Operators *must* be able to earn an adequate return on these investments; at the same time, they *must not* foreclose access to competitors. Mme. Gauthey sees the need to find some way "... of allowing a reasonable rate of return on these new and risky investments without foreclosing the access, which for us is still a long-lasting bottleneck," ... to competitors.

Mr. Seki addressed the group again, this time with a primary focus on regulation.

He began by noting that competition historically started with long distance services, but subsequently deepened, to the point where Japan now experiences competition on the local loop.

The regulatory challenges going forward in Japan seem to be similar to those in Europe: replacement of the copper loop, the migration to softswitches, changes in the location of nodes, and the need for new modes of interconnection.

Dr. Seki proceeded to make regulatory comparisons to many areas of the world as regards broadband regulation and the broadband marketplace. In the unique circumstances of the United States, regulatory asymmetries persist in the obligations placed on DSL providers in comparison with those placed on cable modem providers, even though they compete for the same end customers in the same market. Given that the market share of cable is in the range of 60%, the FCC is now taking steps to deregulate DSL providers so as to achieve rough regulatory parity.

At the same time, the recent mergers (SBC/AT&T and Verizon/MCI) will lead to the disappearance of the distinction between local and long distance service in the Internet space.

In Japan, NTT East and NTT West are structurally separated from the other business companies operating under the NTT holding company. Their business scope is defined and constrained by law.

Mr. Seki finds the recent arrangements between Ofcom and BT to be very interesting. The mechanisms that are being put in place merit study, including the use of separate branding, use of a distinct headquarters location, and creation of an Equivalence of Input compliance board. These new UK mechanisms are similar to the approach that Japan has taken, using structural separation in order to ensure that competitors benefit from equivalence of input. Mr. Seki also thinks that this approach will work well for access to optical fibre.

Australia has taken similar steps to achieve wholesale-retail operational separation for Telstra.

There are a number of regulatory challenges that the Japanese MIC is paying particular attention to just now in conjunction with the migration to the new world of fibre and NGN.

First, going forward, the MIC does not see unbundling *per se* as problematic, but they see challenges in setting the right prices for unbundling and for interconnection. These prices need to reward investment appropriately. As previously noted, they also think that appropriate regulatory price setting can help to shorten the transition period to NGN. Finally, proper regulatory price setting serves to mitigate the risk of protracted free riding.

Second, they seek to achieve deep fibre deployment, not only by the incumbent, but also by competitors. The local loop and the associated backhaul network do, of course, represent a bottleneck to the extent that it is not economically feasible to replicate them. Beyond that, however, they think that there are a great many invisible and non-price-based impediments to the deployment of new fibre. By addressing these more subtle barriers, they hope to encourage more fibre deployment by competitors and by the incumbent.

Third, they see the need to stimulate more demand at the consumer level by addressing impediments to take-up of innovative new services – for example, IPTV.

In the past, regulators might have concentrated on underlying infrastructure. Today, that is no longer appropriate. As technological and market convergence progress, it is increasingly important to take a holistic view across the layers of the network. For example, Yahoo BB is not just a portal provider but also a broadband provider. Conversely, NTT is moving up the stack into the application layer. And broadcasters are moving to the IP world at the same time. Regulation cannot take a static view; rather, it needs to recognize that the structure of the industry is evolving rapidly.

As a corollary, this means that regulators need to consider potential foreclosure effects where a provider tries to leverage market power across layers. Equally important is technological neutrality – between, for example, wired and wireless operators.

In the upper layers, it is equally important to ensure that users have access to content and applications. It is incredibly important to ensure that competitors can gain access to bottleneck facilities.

From a process perspective, the migration to NGN will be demanding. It is vitally important to maintain an open dialogue between incumbents and competitors.

Analogously, maintaining dialogue and global cooperation among policy-makers is incredibly important.

In the question and answer period, Dr. Neumann returned to Mme. Gauthey's advocacy of encouraging investment but not permitting remonopolization. How does one strike an appropriate balance between these two perhaps conflicting goals?

Mme. Gauthey responded that the European regulatory framework has provided some tools to deal with this. She does not see the two as polar opposites. The question is not whether to grant access or not, but rather at what price? There must be a third way that grants access while allowing incumbents a reasonable rate of return on their investments.

Dr. Neumann then asked Mr. Kurth for his views on the notion of granting incumbents a "regulatory holiday" from access obligations – an idea that has been very much in the news in Germany in recent days. How would you seek to balance the two?

Mr. Kurth began by observing that there were many layers to contend with, not only in German regulation but also in overall European regulation. In the public debate, people often race ahead to discuss potential remedies to competitive problems. Under the European regulatory framework within which Germany operates, as do the French, one does not speak of remedies until one has first clearly analyzed the market. We are simply not there yet. Also, the markets are mixed together. Unbundling at the curb is already possible under existing German law. That has nothing to do with, for instance, the bitstream access market.

Secondly, when it comes to the market review, you cannot define a market in terms of infrastructure. You have to define it in terms of products or services. Determining whether a new capability corresponds to a truly new market is a complex determination. In the case of fibre deployment, is it a new market, or is it the old market but just a little faster? The BNetzA has already received a "serious doubts" letter from the European Commission on this point, and it may turn into a veto, but the question remains: Is it

appropriate to rule out forever the possibility of a new market emerging? If the Commission holds to this position, it begs the question: What, if anything, does the language about “emerging markets” in the Framework Directive signify if no new market can ever emerge?

“We have to be honest”, continued Mr. Kurth. Will T-Com be willing to continue to invest in FTTH when hardly any of their customers demand more speed than ADSL2+ provides? Do they really need this new network? This is all very hypothetical to date; they have not announced their intent to provide any specific new product.

It is vital to ensure competition on the existing DSL market, and furthermore to ensure that innovative successor offerings are available from that environment. Arcor, for example, has announced a triple play offering with a speed of 26 Mbps. Speeds well beyond that should be achievable.

The BNetzA’s position and that of the European Commission are not as far apart as one might imagine. The BNetzA would, however, like to maintain the option of recognizing an emerging market at some point.

If an operator does a risky investment, the regulator should find a way to apply a risk premium. For that matter, there needs to be some form of risk sharing between the incumbent and the competitors who benefit from the enhancements to the incumbent’s network.

It is unfortunate that this has become such a contentious issue. T-Com and the competitors might otherwise have reached some kind of accommodation as regards such a risk premium.

It is not yet clear whether *ex ante* regulation of this market is necessary. If a company is investing some billions of Euros into a new network, they may have sufficient commercial incentives to sell that capacity to other operators in order to realize some revenue. This would be worth exploring. And it would still be possible to intervene *ex post* under competition law if that turned out to be necessary.

The BNetzA would like to balance the need for competitive entry against the need for investment.

Dr. Neumann observed that Japan has higher penetration of very high speed lines than does Europe. What recommendation would you make to Europeans?

Mr. Seki observed that one does not leap to FTTH in a single bound. It must be done gradually, and in steps. It was first necessary to make DSL available to competitors, and at appropriate prices. Once DSL use was widespread, user demand for greater speed eventually drove fibre deployment.

Condominium and apartment buildings, especially new ones, are much more hospitable environments for FTTH deployments than are single family homes.

One participant asked for the panelists' views as to how line sharing might be provided at the Multi Service Access Node (or MSAN).³ The same questioner also asked how to accommodate bitstream access in an NGN that is not based on ATM (the typical means of interconnection to bitstream).

Mr. Kurth responded that these are difficult questions, and that it is still early days. He sees a great deal of opportunity for creating a public dialogue about issues such as these. He noted that it was not yet clear whether competitors would be significantly disadvantaged. Mr. Kurth maintains that the European regulatory framework is well suited to dealing with these issues.

Mr. Kurth also sees a need for a great deal of careful planning, with a well orchestrated "glide path" to the NGN.

Mme. Gauthey noted that the evolution is typically from shared access to full access as competitors climb the ladder of investment; however, if a competitor needs shared access, they can of course still have it.

Mr. Seki added that LLU was a necessary intermediate stage to achieving full facilities-based competition.

For unbundling of fibre at the local loop level, one might conceivably imagine using DWDM to implement LLU; however, it is not cost-effective at the level of the local loop. For long haul facilities, DWDM can be a good solution for implementing LLU.

Dr. Lennertz observed that the UK seemed to be well ahead of Germany in seeing the big picture. Openreach is a very forward-looking approach. Even so, might it possible to step back and envision a much broader solution? Can we think in a bigger picture? When transport has been commoditized, will there be competition for access to that commoditized transport?

Prof. Cave asked if there were any serious deficiencies in the current regulatory framework that inhibit innovation and investment.

The last questioner congratulated France on its excellent progress with wholesale broadband products, and asked if the future direction was to make LLU available in still smaller MDF environments, and if so what arguments would be used to advance this approach.

³ In BT's planned 21CN next generation network, they envision 6,000 MSAN locations, the same as the number of Main Distribution Frames. BT has expressed its intention to provide competitive access only at some 100 metro nodes, and not at the MSAN.

Mme. Gauthey responded that the ARCEP is in regular contact with Ofcom and with BT, and there is an overall review of the regulatory framework in process. The Openreach approach is interesting, and might make regulation easier. It is premature to say more.

The framework is well suited for dealing with new investment in fixed access; however, there is a lack of adequate tools today to deal with fixed and mobile convergence. The ARCEP finds this to be a serious challenge.

The reference offer for LLU is a huge contract with a plethora of complex pricing components. The ARCEP would like to see these prices decline over time, especially as regards the small MDFs. They are regularly consulting with France Telecom and with competitors. Last year, those talks resulted in agreements that reduced the costs, notably collocation and energy costs, by nearly 3 euro per line for the small MDFs. For large MDFs, the reduction is closer to 1 euro per line because the savings are amortized on the average over a much larger number of lines.

Mr. Kurth responded that Openreach looks good and sounds good, but it will be some time before it becomes clear whether it truly is as good as it looks.

Is the UK really ahead? In some areas, Mr. Kurth observed, the UK has been far behind. Germany began full LLU unbundling in 1998, well ahead of the most European nations, and Germany has now achieved about three million lines. The UK has only about 20,000 or 30,000 LLU lines.

Germany is missing some of the steps on Martin Cave's Ladder of Investment, but Germany had the highest step in place from Day #1. Today, Germany just needs to fill in some gaps.

As for impediments to investment, there are always individual movements in both directions. One should not over-react. At the end of the day, it is difficult to judge. Investment should follow its own interests. As regulators, maintained Mr. Kurth, we should be careful not to bias that investment. We should be as neutral as possible.

Mr. Seki responded by noting that Openreach should lead to deregulation of downstream markets. That should lead to greater competition in downstream markets. It is worth watching.

There could also be problems, Mr. Seki continued. Will the Access Service Division be profitable? Japanese experience with NTT East and West are that they may not have proper incentives to invest. We are still working on this.

STOKAB is a dark fibre provider (one of many) in Sweden, and it represents a very interesting case study. Last year, it operated in the red, but it has usually been profitable. Still, STOKAB's experience suggests that an entity that provides nothing other than bottleneck last mile facilities could perhaps be profitable.