

ETNO Reflection Document in response to ERG consultation on Regulatory Principles of IP-IC/NGN Core (ERG (08) 26 rev1)

Executive Summary

- A strict separation of transport and service layer as discussed in the consultation document would not allow the end-to-end quality of service necessary to provide high quality time-critical services in an NGN environment.
- Managed NGNs are a prerequisite for the fully secure networks of the future. The public Internet could not assure security and integrity of networks and services as, e.g., required by the new proposals on security of networks for the EU regulatory framework.
- The number and location of different PoIs will emerge in line with technical developments, QoS-requirements and traffic and service development and will be subject to subsequent change as operations get optimised. Defining a number of PoI ex-ante could lead to an artificial and more costly network structure than otherwise needed.
- The notion of a “local level of interconnection” appears no longer to be a meaningful category in an NGN.
- Standards ensuring interoperability of networks and services for NGNs are being developed in the international standardisation processes. NRAs’ powers to ensure interconnection should not be used unless persistent problems in end-to-end connectivity occur in the future.
- In order to foster IP-NGN deployment the regulator should look at existing regulatory constraints on PSTN and remove them as far as they are obsolete in an IP environment.
- To advance NGN interconnection and create regulatory certainty for market players, the best solution is to apply the Calling Party’s Network Pays logic to IP-based NGN-interconnection, at least for voice services. A mandated Bill&Keep regime would induce market distortions, lead to technical inefficiencies and fewer incentives to invest in quality of service and would cause high transaction costs.

A. Introduction

ETNO welcomes the opportunity to express its view on the ERG Consultation Document on Regulatory Principles of IP-IC/NGN Core (ERG (08) 26rev1.

Many ETNO member companies are currently in the process of developing and designing NGN networks. While an intense and informed debate over NGN regulatory principles is important, we urge ERG to not preclude the outcome of market developments, e.g. in relation to charging models or network management/quality of service by envisaging regulatory solutions without thorough evidence of real competition problems on the markets in question. The consultation document covers a range of issues in NGN core and service interconnection where monopolistic bottlenecks, which traditionally existed in fixed access networks, are largely absent and where therefore interconnection and access solutions need not *a priori* be of regulatory nature.

ETNO believes that the migration to NGNs is working in a satisfactory manner driven by market forces, along with the interconnection model of the PSTN covered by current ex-ante regulation co-existing with other, less or unregulated forms of interconnection in the IP world.

In the following, please find our comments on the detailed questions of the consultation document.

B. Consultation questions:

1. A.4.1 Separation of transport and service

Considering that according to the ITU definition of NGNs where service-related functions are independent from underlying transport-related technologies, how do you evaluate the concepts of transport interconnection and service interconnection as defined in the document?

In the ERG document, transport interconnection is defined as *“physical and logical linking of networks based on simple IP connectivity irrespective of the levels of interoperability. It is characterised by the absence of the service-related signalling, implying that there is no end-to-end-service awareness”*.¹

Service interconnection is seen as strictly separated from the transport level and is defined as *“including solely service-specific aspects. It consists of logical linking of network domains, having access and control of resources including the control of signalling (i.e. session based service-related signalling).”* It is also stated that interconnection between services from different operators re-

¹ See ERG (2008), Consultation Document on Regulatory Principles of IP-IC/NGN Core, p. 3.

quires a minimum set of technical (e.g. defined by a SLA) and commercial conditions to be fulfilled by both operators.²

However, if it is the objective to assure and guarantee service-specific quality of service (QoS) and security to the customer especially to offer a substitute for PSTN services (in particular voice services), in ETNO's view such transport and service level should not be regarded as strictly separated. Otherwise, as the document states itself "*consequently, service-specific quality of service and security requirements [would] not necessarily [be] assured*".³

Certainly, today's internet functions that way and a lot of services have been created on it. But these are services which do not need a higher than the average transport quality of the internet. Examples for such services are web-browsing or e-mailing which are so-called elastic services. If there isn't enough bandwidth on the network, these services are only delayed, without affecting the user's experience. But for other, especially time critical services (so called inelastic services) this mechanism does not assure quality of service.⁴

The ERG consultation document suggests, that in this case "*one has to modify and adapt the IP transport technology in a way that connections with reliable and fixed transmission characteristics (transport classes) are possible*".⁵ However, transport classes are not enough to guarantee high quality for such services. In fact, coordination between service and transport level with regard to the specific transport class and the available bandwidth in this transport class is needed. For that reason 3GPP is standardizing a so-called Resource Admission Control Subsystem (RACS) in the context of IMS (IP Multimedia Subsystem). ETSI TISPAN has integrated this IMS-specification in their NGN-standardization also for fixed networks.

As the paper states, its definition of transport and service interconnection differs from the ETSI TISPAN definition of "service oriented interconnection" which also includes transport related information.⁶ This is surprising: a study by WIK carried out for the EU-Commission states in contrast to the present consultation paper that the IMS-specification is also implemented in the latest ITU-recommendation for NGN analogue to the ETSI TISPAN-specification.⁷

The WIK study also states that it is possible to implement a basic voice service easily by just implementing servers on the service level. But if the objective is to guarantee the service-specific high quality for voice services this can only be offered if the transport level could assure the necessary bandwidth. These mechanisms are not available in the public internet be-

² See ERG (2008), *idem*, p. 4.

³ See ERG (2008), *idem*, p. 3.

⁴ See also ERG (2008), *idem*, p. 57.

⁵ ERG (2008), Consultation Document on Regulatory Principles of IP-IC/NGN Core, p. 57.

⁶ See ERG (2008), *idem*, p. 4, footnote 46.

⁷ See WIK Consult (2008), The Future of IP Interconnection: Technical, Economic, and Public Policy Aspects, Study for the European Commission, p. 118.

cause the service level is completely independent of the transport level. Therefore, the WIK study concludes that the public internet and its strict separation of service and transport level is inappropriate for the realization of high quality voice service.⁸

The consultation document itself states that *“in principle any service can be realised with a specified quality level, if the performance objectives of the service can be met by the network”*.⁹ This however implies that there is a linkage between service and transport level. Moreover, the ERG describes the additional NGN-functions in comparison to the simple IP-Network in chapter B.3.2 in more detail, stating itself that¹⁰

- the access to the NGN is controlled, i.e. there is an admission control, user profile management and dedicated bandwidth allocation for different services;
- the transmission of data is service-specific and managed through bandwidth allocation by specific NGN-protocols and policies;
- there are standardized interfaces at the transport and service layer that allow 3rd parties to connect to NGNs, use its resources and offer their own services;
- through the implementation of stringent policies and signalling mechanisms, end-to-end services are controlled and the necessary network resources are allocated and maintained during the use of service.

So NGN-interconnection has to compass a linkage between service and transport level. Furthermore every network operator who wants to offer high quality services has a strong incentive to ensure high quality also over network boundaries. Network operators will have the incentive to agree and support such QoS classes between the involved interconnection partners allowing effective and efficient high quality any-to-any interconnection.

Furthermore with separated transport and service levels the fulfilment of other regulatory obligations like legal interception, routing of emergency calls, caller location or correctness of billing as well as the assurance of security couldn't be realized.

Strong competition at the service level, as emphasised by ERG, is also encouraged in case the ETSI TISPAN specification of NGN with the linkage between service and transport level is implemented. Independent service providers could also use the service specific transport for the assurance of service specific quality of service and features by appropriate wholesale products. Every network operator will have the incentive to open up and standardize the interfaces on its platforms via such wholesale products to generate additional traffic on its network, which would mean no special regulatory intervention would be needed.

⁸ See WIK Consult (2008), idem, p. 116.

⁹ See ERG (2008), idem, p. 49.

¹⁰ See ERG (2008), idem, p. 49f.

It appears from the statements of the consultation document that ERG and NRAs will have to decide whether they support managed NGNs or whether they content themselves with only Best-Effort-networks like the public internet with, and in doing so be fully aware of the consequences of such decision.

2. A. 6 Structure of the document

Do you see other issues regarding regulatory principles of IP-Interconnection/NGN core that should be dealt with?

The discussion about the optimal interconnection regime should better take into account the incentives for investment. The analysis of Bill&Keep is currently focussed on the elimination of the termination monopoly and the decrease of management/transaction costs for the NRAs.

Further analysis of the following aspects is needed:

- How could QoS-classes on the one hand be technically realised, when on the other hand transport and service level are separated?
- Further analysis of investment incentives in QoS under Bill&Keep-Regime
- Analysis of the effects of Bill&Keep for today's business models (e.g. Call by Call and Preselection as well as Premium rate services).
- Specificities of different technologies, e.g. the technical characteristics of mobile networks have to be taken into consideration when discussing costing and pricing issues.
- The conclusion that the Bill & Keep charging model is the reason for high ARPU in Honk Kong should be further studied, analysing other factors which might influence this and the impact of B&K on incentives for investments.

3. B.3.3.1 Number of network nodes and points of interconnection (PoI)

Can you make more precise statements on the number of network nodes and/or points of interconnection in NGNs?

The development of NGN is still at the very beginning in nearly all member states. Most network operators are still at the planning process so no valid statement could be made today. Furthermore there are still a lot of uncertainties about factors which will influence the number of PoI. Technical developments, QoS, traffic and service development (e.g. whether PoIs can be used for different kinds of services and usage) will determine how the network structure will evolve - and thus determine the possible number of PoI. Moreover, this will in a 5-15 years timeframe be subject to change and evolution, depending on best practice in operations etc.

Defining the number of PoI ex-ante could lead to an artificial and more costly network structure than otherwise needed.

As mentioned above, in ETNO's view the transport and service level shouldn't be separated so it is questionable if there are separate PoI only for the transport level and separate POI only for service level in a NGN.

As the ERG document asserts, in general the traffic in an IP-network becomes less dependent on distance and bigger interconnection pipes are more efficient than smaller ones. The same applies for more centralised interconnection points.¹¹ So the efficient amount of PoI in a NGN will generally be lower than in today's PSTN and points may be more centralised.

4. B.3.3.2 Definition of local interconnection

- a. Is there an equivalent in NGNs to the concept of local interconnection as known from PSTNs?**
- b. What do you consider to be the locations for the lowest level of interconnection (physical and/or service), e.g. the broadband remote access servers (BRAS)?**
- c. Could the maximum number of PoI offered be considered equivalent to local interconnection?**

As voice services will be more and more nomadic, the definition of "local" interconnection will probably no longer be meaningful in the context of wide-scale NGN deployment. "Local" interconnection was mainly justified by:

- distance dependent costs in the context of TDM based architectures and,
- predictable location of subscribers assigned with geographic numbers.

The location of the customer has no relation to the location of the NGN platform. In theory, in an NGN network, not considering scalability issues, a platform can manage customers of a whole national territory, thus the notion of geography inherent to a local level of interconnection appears to no longer be a very meaningful category.

Also, the evolution of wireless communications (including mobile) will make the definition of local interconnection more difficult, whereby traffic patterns may change regardless of location.

When considering what the lowest possible level of service interconnection could be, it should be noted that IP interconnection needs interconnection functions (routing charging, security, filtering, codecs translation) which are centralised on equipments which can not be located below a certain level of the network.

¹¹ See ERG (2008), *idem*, p. 51

The development of NGN is still at the beginning in nearly all member states, so neither the questions about local interconnection nor the question about maximum number of PoI can be definitely answered at this stage. As also highlighted above, the NGN is a more centralized network and the influence of distance on cost is less relevant. Additionally if it holds true that the efficient amount of PoI could be very small particularly for voice, then there is no comparable local interconnection for voice in an NGN as in today's PSTN. In this case the mentioned BRAS would not be the efficient level for local interconnection because it would imply a number of PoI which could be too high.

As mentioned under question 3 it also has to be examined if the efficient amount of PoI varies with the different services handed over to other networks (e.g. voice, data).

5. C.1 Existing and proposed Framework

How do you assess the proposed Framework in the light of migration process towards NGNs, their technical characteristics and economic implications? Are the proposals suited to address the specific challenges that these present?

The new section on security and integrity of networks and services, proposed by the European Commission as Art. 13a and 13b of the Framework Directive, can only be implemented by managed NGN with the implementation of specific network elements like session border controller etc. To enhance the security, e.g. only the IP-address of the Session border controller should be published to prevent misuse of the customers IP-address, i.e. it is important not to show the user's IP-address. The public Internet could not assure such security and integrity of networks and services.

6. C.3.1 Interoperability issues

What type of interoperability requirement do you consider necessary?

Standardized end-to-end services, including interfaces are important in an NGN environment. Network operators have a strong incentive to ensure connectivity between networks and interoperability of services. Industry is pursuing initiatives to foster interoperable solutions open to all operators and service providers, such as the IPX. Overall, market developments do not point in any way to a need for ex-ante intervention in interconnection to ensure interoperability in NGN networks.

For instance for voice services, NGN protocols offer many options to handle functionalities. Agreements can be signed between operators to provide a minimum of interoperability of services when they pass a network border (media codecs, protocols...). Another direction that can help operators to provide VoIP services with high quality of service will be to include in these agreements a chapter restricting the number of shared codec types at

interconnection interfaces. In order to ensure the best interoperability in the short term such agreements will be beneficial if they are defined by operators and, in case they fall in an area covered by regulation, only approved by NRAs, as it was the case in the PTSN.

Moreover, as pointed out in the ERG document it could be differentiated between vendor and operator interoperability. Whereas vendor interoperability should lead to open and standardised interfaces implying the possibility for the operator to get the same equipment from different vendors. So the operator may have the opportunity to buy from several vendors. Regulatory intervention in this area is not needed because each operator has the incentive to choose standardized network equipment specified by the worldwide standardization bodies. So every vendor will have the incentive to produce its products in line with the standardization process.

Concerning operator interoperability, it also has to be mentioned that every operator has the incentive to interconnect with other networks to enable any-to-any-communication. Due to strong competition on the telecommunications market no operator is in the position to deny interconnection with other networks so otherwise customers will change their network operator. On this basis, every network operator will also have the incentive to realize the interconnection by open and standardized interfaces. Otherwise interconnection and as a consequence any-to-any-communication fails. Furthermore standardized interfaces lead to lower costs for the operator.

Moreover the network operators will generally also have the incentive to provide open and standardized interfaces for service providers to generate traffic on their network and to increase and optimise network utilization.

Due to network operators' own incentives to interconnect, the powers reserved under the EU framework to ensure end-to-end connectivity through interconnection, under Art. 5 Access Directive should generally not be applied in an NGN context.

7. C. 3.2 Impact of charging mechanisms on transport bottlenecks

How do you assess different wholesale charging mechanisms in the light of the transport-related bottlenecks?

Wholesale charging mechanisms should not be evaluated in isolation in the light of their effects on transport-related bottlenecks but taking into account in entirety their effects on competition, network investment and consumer benefits (s. Q 11 below).

8. C.3 Bottlenecks and SMP positions

Do you see other areas (potential bottlenecks) for regulatory intervention?

In order to foster IP-NGN deployment the regulator should look at existing regulatory constraints on PSTN and remove them as far as they are obsolete in an IP environment. If regulatory constraints should be maintained, they should be as light as possible in order to facilitate the migration process on a commercial basis.

Regarding QoS and interoperability s. Q 9 below and Q 6 above: due to strong competition network operators have no incentive to worsen QoS or discriminate customers concerning QoS, because otherwise the end-user would switch to a competitor. Moreover network operators will benefit from standardized interfaces and network elements offered by different vendors. So network costs could be reduced and interoperability between NGNs could be assured. Furthermore third party service providers are enabled to offer their services in more than one NGN.

9. C.4.2 Measures based on USO directive

- a. Do you consider sufficient to potentially regulate minimum quality (Art. 22 USD new para 3)?**
- b. Does this require additional regulation at the wholesale level?**
- c. What is your opinion on ERG's consideration that the power to set minimum quality of service requirements (both, on end-user and network level) should be entrusted directly to NRAs?**

a.) According to a proposal for Art. 22 (3) of the Universal Service Directive, the Commission would be allowed to adopt technical implementing measures concerning minimum quality of service requirements to be set by the NRA on undertakings providing public communications networks. This provision bears the risk, that technically inefficient specifications are determined by the Commission or regulators. ETNO believes that this task should primarily be attributed to the well established standardization bodies.

Every NGN operator will have the incentive to agree upon the set of QoS parameters to guarantee high quality service on network boundaries. Intervention that limits operators' ability to manage their network resources would risk in itself a significant degradation in QoS for customers.

Quality of service differentiation is key to tap the full potential of NGN. An overly intrusive involvement of regulation in this area would risk freezing a dynamic marketplace and slow innovation and investment. Quality of service is a means to enhance consumer welfare and foster added-value services in a context of competition for the benefit of customers in line with consumers' willingness to pay for enhanced services.

Therefore, operators shall directly manage their own networks and they are legitimately best placed to do so. Mandated quality of service would impede the flexibility needed to adjust and control capacity constraints according to particular circumstances. Without adequate and direct manage-

ment, operators would not be able for instance to avoid or limit congestion and to implement prioritisation of traffic when delivering real-time services.

Therefore, as mentioned, the quality of service parameters should be determined in today's well established standardisation process and not via regulatory intervention.

It is finally unjustified to suppose an *a priori* anti-competitive behaviour by operators and an assumption such as "therefore operators might have an incentive to degrade their best effort class" is not acceptable as a basis for drawing conclusions on quality of service. Also, if undertakings adopt anti-competitive behaviour, this should be tackled by competition law, in any market that does not fulfil the three criteria test contained in the Commission's Recommendation on relevant markets.

b) Service level agreements between operators already exist which are a sound tool for providing end-to-end quality of service to customers. The best approach is to let operators conclude commercial agreements allowing providers to make commitments on the guaranteed level of quality of service when delivering dedicated offers to their end-users. Furthermore, the Universal Service Directive only applies to retail offers and the question, if relevant, should not be set in this context.

As mentioned network operators will have an incentive to use standardized interfaces and network elements to assure interoperability between NGNs and to reduce network costs. The same holds true for the assurance of QoS parameters in each NGN but also over network boundaries. QoS parameters should be set by standardization bodies and be mutually agreed upon between the interconnecting partners. So no regulatory intervention at wholesale level will be needed to assure a specific QoS-level. Moreover setting a minimum quality by regulatory intervention would bear the risk of technical inefficiencies.

c) ETNO does not agree with the assumption that SMP operators would have an interest to degrade quality when they interconnect with a competitor. Indeed when its own clients encounter bad experiences when calling someone served by one of its competitors, they do not consider that their calls crosses several networks, some of these not being managed by their service provider. They attribute all the responsibility of the quality degradation they experience to their own provider! Indeed as end-customers do not have the ability to distinguish between On-net and Off-net calls, they cannot determine which provider causes the quality degradation.

10. C.5 Costing and Pricing

a. Do you agree with the description of the relevant change regarding to cost level, the cost drivers and the cost structure?

b. For a pricing regime under CPNP, which of the wholesale pricing regimes (EBC or CBC) do you consider more appropriate for IP Interconnection?

As mentioned the development of NGN is still in its early days, so telecommunications companies are still at the beginning of any in-depth analysis of cost drivers and cost structures of NGN.

As a general remark, we found that the consultation document does not sufficiently consider today's different network types, e.g. fixed vs. mobile networks and the distinct technological and economic characteristics of mobile networks. This is, however, particularly necessary in the context of costing and pricing because different network technologies lead to different networks costs which have to be taken into account.

ETNO does not share the ERG's assessment that NGNs will become the accepted "modern equivalent asset" for core networks soon and the results of cost models based on legacy network valuations are irrelevant" (see ANNEX 4). From our point of view it is too early to determine costs of products and services (unit costs) based on hypothetical network structures, network elements and cost assumptions.

It is also still an assumption with no tested empirical evidence that NGN will lead to lower costs than today's PSTN. First, high investment costs occur to build up the NGN with low traffic volumes. They lead to higher average costs and have to be taken into account at least in the migration period. Otherwise no incentives for investment in NGN are given. The cost structure may be more complex for an NGN when specific demands for specific services may drive costs for other services. Another cost driver will be that the equipment is not fully mature and therefore may have either a shorter lifecycle or demand costly upgrades.

Probably there will also be a transition period in which the existing TDM network will coexist with the NGN-network. The duration of maintaining the legacy systems might be driven by regulatory requirements to run the TDM-system to enable alternative operators to connect their network based on the old technology. In this case it is not plausible that residual costs and stranded investments, as outlined in Annex 4, should not play a role in the calculation. Cost oriented tariffs have to bear the costs of the existing infrastructure as well as the costs of the new investment.

Given the very early phase of the overall NGN discussion, it is surprising that the PG is able to already determine that there is no evidence to suggest that implementing an NGN will significantly increase or decrease the risk element. The fact that currently only in a few member states of the EU significant efforts have been made to implement NGN-networks is a clear indicator for the very significant inherent, additional risks. ETNO members are convinced that this technological transition will increase the risk within the telecommunication sector. Assuming efficient capital markets, this

changing risk evaluation can only be determined by detailed market analyses and can not be based on a statement of the PG without any substance.

b.) In most member states there hasn't been any decision about the precise pricing regime yet because NGN-interconnection hasn't been offered until now. Only general remarks could be made today:

In general the pricing regime should cover costs and give incentives for investments. Otherwise no investments in NGN and even in NGA are given.

In the migration period the pricing regime for NGN-interconnection has to be set in a way that arbitrage potential between NGN-Interconnection and PSTN-interconnection is avoided.

11. C.6 Charging mechanisms

- a. **How do you assess the arguments with regard to the properties of the charging mechanisms CPNP and Bill&Keep raised in the sections C.6.2 - C.6.10?**
- b. **How can the migration process towards all-IP infrastructure be alleviated for the following options: 1.) long term goal CPNP, 2.) long term goal Bill&Keep? How do you evaluate the measures and options discussed here? Please also consider problems of practical implementation.**
- c. **Assuming that different charging mechanisms would apply in different Member States: would this imply specific problems (e.g. arbitrage)? If so, how could they be addressed?**
- d. **Do you consider that the issues mentioned here are comprehensive with regard to the application of Bill&Keep for IP-Interconnection?**

IP-interconnection should meet several objectives

Any IP-interconnection arrangement has to meet the following objectives:

- to give incentives for investments, *inter alia* in capacity and QoS
- to foster competition
- to give incentives for efficient network usage
- to minimize transaction costs
- to avoid regulatory induced arbitrage

These objectives would best be achieved by market negotiations.

Any discussion on NGN-interconnection should also differentiate between NGN-Interconnection in an All-IP-World and NGN-interconnection in a migration period with parallel existing networks (e.g. PSTN and NGN). The discussion of charging mechanisms in the consultation document appears very voice-driven. Specific characteristics of the different services should be kept in mind, because depending on the service, different charging mechanisms could be optimal.

Charging principles for NGN-interconnection

Within the discussion on NGN-interconnection and as mentioned in the consultation paper two principles are mainly discussed: the Calling Party's Network Pays-principle as today's PSTN interconnection approach and Bill & Keep.

- **Calling Party's Network Pays - today's well-established interconnection approach**

Calling Party's Network Pays (CPNP) means that the network operator of the caller pays for the whole interconnection service or for the network usage in the other networks respectively. On the retail market the corresponding Calling Party Pays-principle (CPP) means that the calling party fully pays the costs of the call.

In economic literature, CPP is seen as being economically efficient since the caller usually has the greater benefit from the call.¹² He takes the initiative to speak to a special person at a special point of time whereas the called party has not the same freedom of choice. In the literature it is also stated that the called party benefits from the call, too, but to a lower extent than the caller. Following the efficient Ramsey-pricing-principle it is then economically efficient that the caller bears the full costs of the call. Moreover the caller also causes the costs as he can avoid those costs by choosing not to call. If the called party also had to pay when it is called similar to the Receiving Party Pays-principle (RPP), the called party only could avoid these costs by not accepting the call. The question then arises what is the value of a telephone access if the caller is worried accepting a call to avoid costs.

Due to the fact that network usage is always paid for, the CPNP-principle has the advantage that network operators can recoup their costs. This gives the necessary incentives for investments especially in higher network quality. Furthermore the transaction costs of implementation are low because it is well known and the billing systems already exist. Moreover CPNP induces efficient network usage as every network operator has the incentive to route the traffic as long as possible in its own network. CPNP also minimizes the SPIT-problem (SPIT = Spam over internet telephony) as the diffusion of SPIT would remain expensive.

- **Bill & Keep: an optimal principle for IP-Interconnection?**

Bill & Keep, when obliged by the regulator, has a lot of shortcomings. First of all, it is important to keep in mind that Bill & Keep in the Internet is the result of commercial negotiations without any regulatory intervention.

- **Bill & Keep in the Internet does not mean interconnection for free**

¹² See e.g. Wright, Julian (2003), „Bill and Keep as the Efficient Interconnection Regime?“, Review of Network Economics, Vol. 1, Issue 1, March 2002.

The often mentioned link between Bill & Keep and the public Internet is not appropriate. Bill & Keep is only one of several forms of interconnection billing schemes used by Internet providers. Even today, internet interconnection arrangements and network usage are not for free but interconnection and network utilisation is generally being paid for by the respective network operators.

In so-called peering arrangements, Bill & Keep is the efficient result of the negotiations of two network operators which regard each others' traffic as symmetric. Hence, Bill & Keep is more akin to a barter arrangement under equal partners. To the contrary, unequal or non-symmetric networks typically lead to an IP-Transit arrangement.

If companies do not peer, they usually enter provider-customer relationships and pay for traffic on a monthly basis, using capacity based charging, similar to standard leased line pricing. As an alternative, carriers can connect to internet exchanges, in which payment relates to the number of ports used (and therefore is also capacity based). Payment then is not made to an interconnected party, but to the internet exchange instead. Other companies prefer to negotiate interconnection agreements bilaterally rather than connect to such a multilateral platform. Multiple interconnection schemes have suited the internet well, without any obligation to interconnect. Interconnection schemes continue to evolve as the internet develops.

Hence, the interconnection arrangements of the Internet do not automatically imply free Bill & Keep interconnections. Only between two symmetric or equal networks Bill & Keep as a barter arrangement can be the voluntarily negotiated result.

- **Regulatory obliged Bill & Keep would induce market distortions**

A regulatory obliged Bill & Keep-approach would inevitably induce market distortions especially in the case of asymmetries. If symmetry is not fulfilled in a Bill & Keep-relationship, larger networks are disadvantaged because they bear higher network costs than small networks, which is the case if the market structure – for example in the fixed telephone sector – is very heterogeneous. There are various network operators with different network sizes and network costs. The same holds true for the mobile sector. Regulatory obliged Bill & Keep would therefore lead to massive market distortions.

Some proponents of Bill & Keep argue that the costs could be recovered by the implementation of the Receiving-Party-Pays-principle on the retail market by charging the own end-customers. However, the CPP-principle is well known by European consumers and it seems unrealistic to force them into a new and unfamiliar pricing principle, involving for the first time

costs for receiving calls. First reactions by consumer associations on the possibility of a CPP-regime in Europe have been very critical.¹³

- **Regulatory obliged Bill & Keep would induce technical inefficiencies**

Further problems of Bill & Keep are routing inefficiencies, the so-called hot potato-routing. Bill & Keep results in incentives for network operators to hand over the traffic to another network as soon as possible because usage is for free and transport over distance is not compensated. This leads to a classical free rider problem.

As mentioned in the consultation document, it is thought that this problem could be solved by network enlargement of smaller network operators. As also mentioned in the consultation document the network enlargement of smaller networks would however lead to inefficient investments which in turn induce economic inefficiencies due to the need to recoup these costs by higher retail prices.

To avoid such inefficient investments the consultation document proposes to raise the amount of points of interconnection. Besides the fact that in no country the final NGN network architecture is known today, regulatory determined and obliged amount and locations of the Points of Interconnection would lead to an artificial network structure which – especially in the context of NGN – definitely does not mean a technically or economically efficient network structure. This would lead to higher costs and thus to higher retail prices.

- **Regulatory obliged Bill & Keep will not minimize transaction costs**

Bill & Keep would not lead to a significant minimization of transaction costs. The existing billing systems will further be necessary for billing the traffic to specific service numbers (e.g. freephone numbers or premium rate services). Additionally, the traffic amount which is exchanged between the networks within a Bill & Keep-arrangement needs to be measured and monitored.

The main argument of the proponents of Bill & Keep is that Bill & Keep would solve an alleged termination monopoly problem and would therefore minimize transaction costs in the context of the regulatory process. However, this would only be true if the interconnection approach was fully market driven and determined solely by negotiations between market players. Otherwise, high transaction costs will arise in the context of the regulatory process, e.g. to determine the amount and location of the PoI.

In the context of the proposed “Dual Regime” it is also unclear how to handle the traffic of network operators who have not realized the maximum amount of Points of Interconnection set by the NRA. It seems ade-

¹³ Reference to the latest press articles on termination following Comm. V. Reding's FT interview

quate that those operators pay for network usage because they would not fulfil the precondition for attending the Bill & Keep-system within the Dual Regime. However, in doing so, the transaction costs would massively increase: besides monitoring traffic volume and billing the traffic to special service numbers, the traffic has to be additionally separated in respect to such network operators which would not be interconnected at the maximum amount of PoI

- **Regulatory obliged Bill & Keep would lead to an arbitrage problem**

From an international perspective the aforementioned problems will even increase, leading to great arbitrage problems and further distorting competition. The same holds true when only the European countries will adapt Bill & Keep and other regions in the world will continue CPNP as IP-interconnection approach.

- **Regulatory obliged Bill & Keep would lead to adverse selection**

Regulatory obliged Bill & Keep would also lead to adverse selection in the context of quality of service. As network operators would not get paid for the network usage, higher costs for better quality of service could not be recovered. Hence, the incentive to invest in better quality declines.

- **Bill & Keep would foster the SPIT-Problem**

Bill & Keep fosters the problem of SPIT (Spam over internet telephony) because the diffusion of a great amount of traffic would be nearly costless. Some argue that this problem could be solved by techniques like SPAM-filters, but in contrast to SPAM a SPIT-call cannot be filtered by some key words in advance. The content of the call does not become known until the called party accepts the call. Moreover, the problem with SPIT is not only the content of the call but calls occurring at all times of the day.

Principles for interconnection during migration

IP-Interconnection during the migration period has to meet the following principles in order to avoid arbitrage and to give incentives to invest in the network migration at all:

- Implementation of the same kind of interconnection regime in parallel networks (e.g. CPNP in both PSTN and NGN)
- Uniform pricing level of the interconnection services.

As CPNP is well-established for the PSTN and for mobile networks, it would hardly be possible to change this scheme without massive transaction costs and implementation problems. Overall, it seems therefore to be the best solution to apply the CPNP logic to IP-based NGN-interconnection, at least for voice services.

