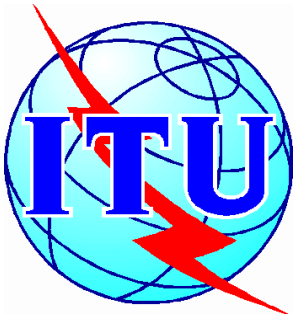
ITU-D Workshop for the Arab region on Interconnection and Next Generation Networks
Addressing the regulatory challenges
Manama (Bahrain) 2- 3 May 2007

QoS regulations in a converged IP/NGN environment



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1. Why do carriers move to NGN?

Why do carriers move to NGN?

NGN implementation incentives

Three key incentives drive network providers' decisions when implementing NGN promising savings potential and customer satisfaction improvements.

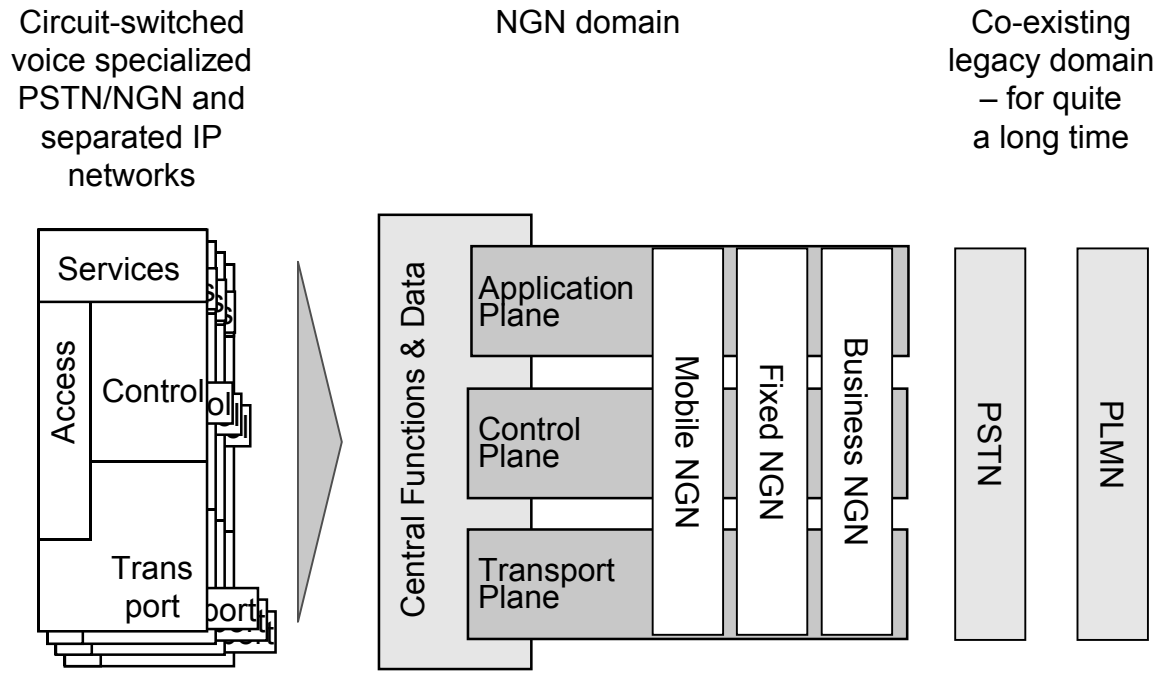
Incentives		Network Providers
Network and technology optimization	■ Optimization of cost structure ■ Simplification and standardization of processes ■ Extension of asset useful life ■ Displace of cable competition, offering of triple play services ■ Creation of future oriented infrastructure	TELECOM ITALIA BT
Business and system transformation	■ Establishment of a future oriented telecommunication company, which remains competitive in a convergent world ■ Increase of productivity (turnover and costs) ■ Buildup of capabilities to ensure competitiveness in the face of intense competition and the severe regulation regime	kpn
Implementation of new services	■ Generation of competitive advantage through a migration that is in line with customer services ■ Positioning of the business segment within ICT ■ Development of new services	Deutsche Telekom &

Why do carriers move to NGN?

Characteristics of NGN

This is due to the advantageous characteristics of NGNs when compared to circuit switched voice specialized PSTN.

PSTN vs. NGN Networks



Basic Concept

- One core access network and a multi-service platform
- Use of shared platform based on IP with high-capacity switching from multiple services
- Move of services to server-based applications
- Fixed and mostly service-independent costs
- Support of multiple last mile technologies
- Broadband capabilities with end-to-end QoS

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2. **The importance of QoS**

The importance of QoS

Overview

Today's telco industry is facing some major challenges driving changes in the existing PSTN and Internet world.

Major challenges

Market capitalization

Growing bandwidth demand

Google

SECOND LIFE

myspace.com a place for friends

YouTube Broadcast Yourself™

The 'Crowding-Out Problem'

The 'Flat-Rate Problem'

The 'Hot-Potato Problem'

The importance of QoS

QoS as the crux

QoS enabled IP networks is the crux to deal with key challenges in the telco industry while ensuring economic growth.

QoS as the solution and its correlation to economic growth

Market capitalization

The 'Flat-Rate Problem'

Growing bandwidth demand

Google SECOND LIFE myspace.com a place for friends YouTube Broadcast Yourself

The 'Hot-Potato Problem'

The 'Crowding-Out Problem'

QoS enabled IP networks

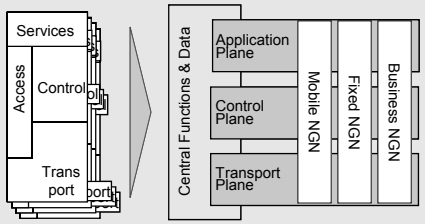
- Reduce OPEX
- Door opener for new service
- Increased economic efficiency
- Additional revenue streams

- **Higher productivity**
- **Innovations**
- **Subsequently, economic growth**

The importance of QoS

Implementing QoS

In order to implement QoS, the differentiated service model (DiffServ) provided by NGN allows managed quality while avoiding economic inefficiency and inflexibility.

Overprovision best effort	DiffServ	IntServ
■ Single class ■ No quality possible ■ Capacity driven	■ Prioritized classes ■ No absolute guarantee of quality ■ Managed quality guaranteed via monitored and reported service level agreements (SLAs)	■ Resource control ■ Absolute quality guarantee possible
Internet	**NGN**	**PSTN**
➡ Economically inefficient		➡ Inflexible

The importance of QoS

QoS based services

NGN will be able to transport different services with different quality requirements over one network. There are several service categorizes to be distinguished.

Service Categorization and QoS parameter

Type A: Real-time Services

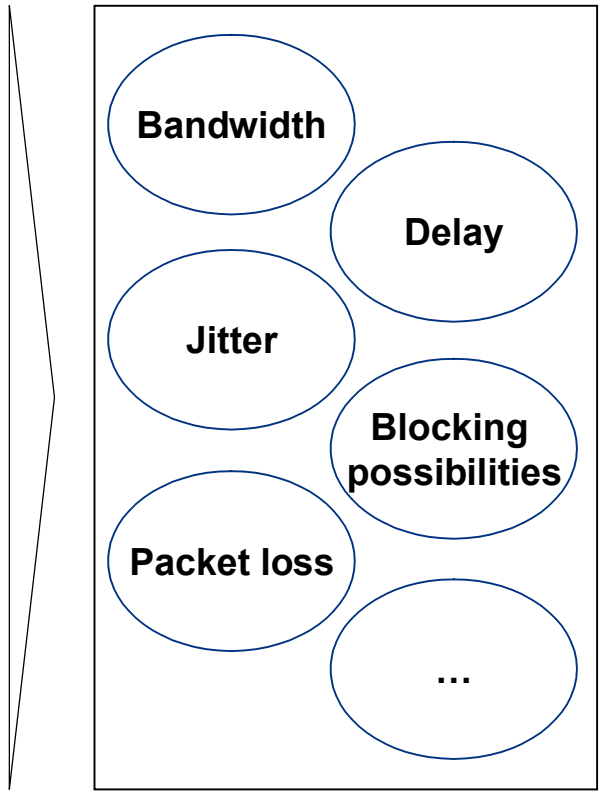
- E. g. voice and video telephony, IPTV
- Strict latency requirements

Type B: Interactive Data and Streaming Services

- E. g. web browsing and downloading
- Can tolerate limited amount of delay
- Transmission speed is still a key user requirement

Type C: Delay-Tolerant Services

- E.g. e-mail, file transfer
- Can tolerate more significant delays, without materially affecting the Quality of Service (QoS) perceived by the customer



Source: Davies, Hardt, Kelly

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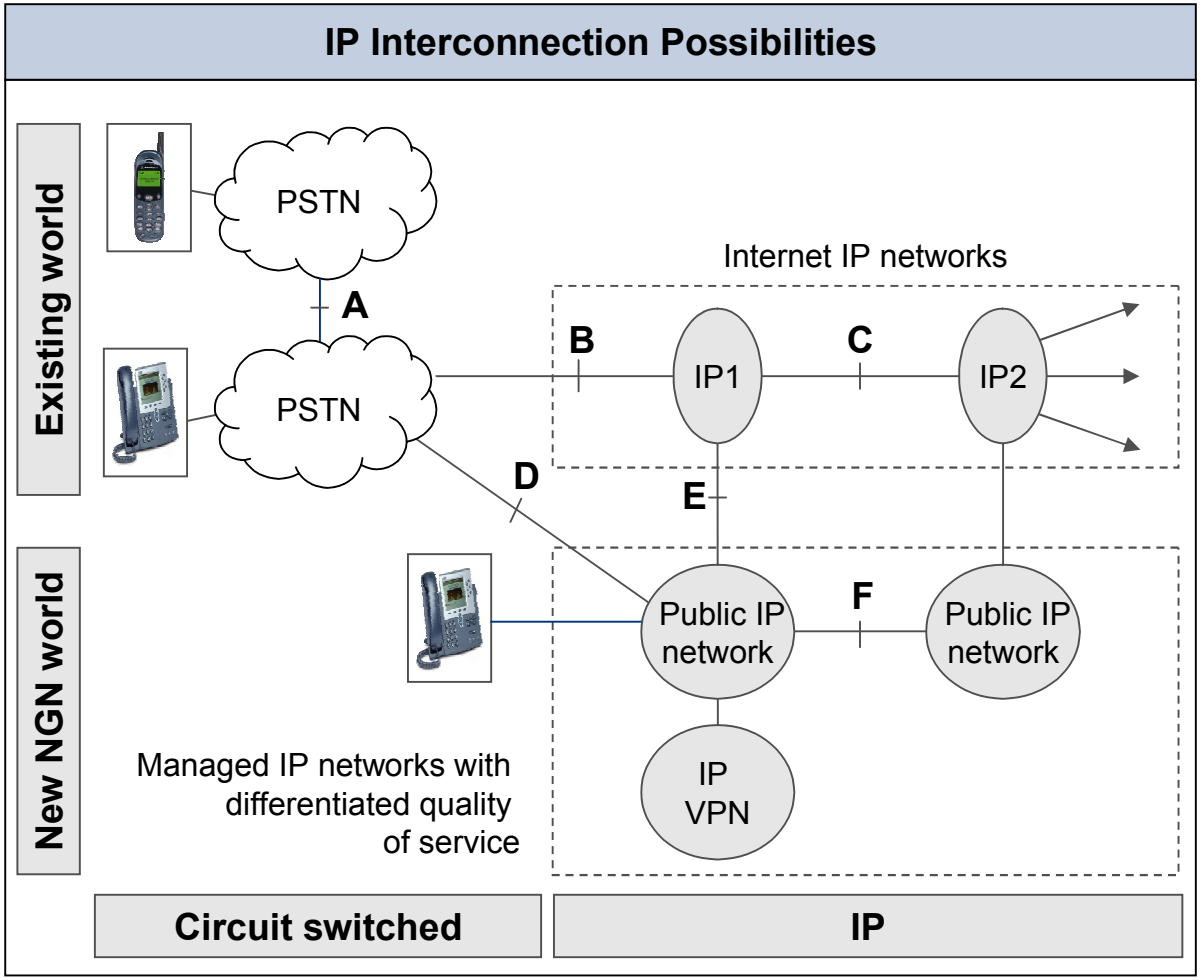
3. **Strategic considerations of carriers**

Strategic considerations of carriers

Interconnection possibilities

There a various logical interconnection points, however, this presentation focuses on interconnection between managed IP networks.



Remarks	
A	Interconnection between circuit switched networks
B	Interconnect between circuit-switched networks and best-efforts Internet IP networks
C	Peering/IP-transit: Interconnect between best-efforts Internet IP networks
E	Interconnect between best-efforts Internet IP networks and managed IP networks
D	Interconnect between circuit-switched networks and managed IP networks
F	Interconnect between managed IP networks

Strategic considerations of carriers

Voice over NGN vs. Voice over Internet

Differentiation of Voice over NGN and Voice over Internet is vital for avoiding arbitrage between PSTN/NGN and Internet based services, while ensuring service quality.

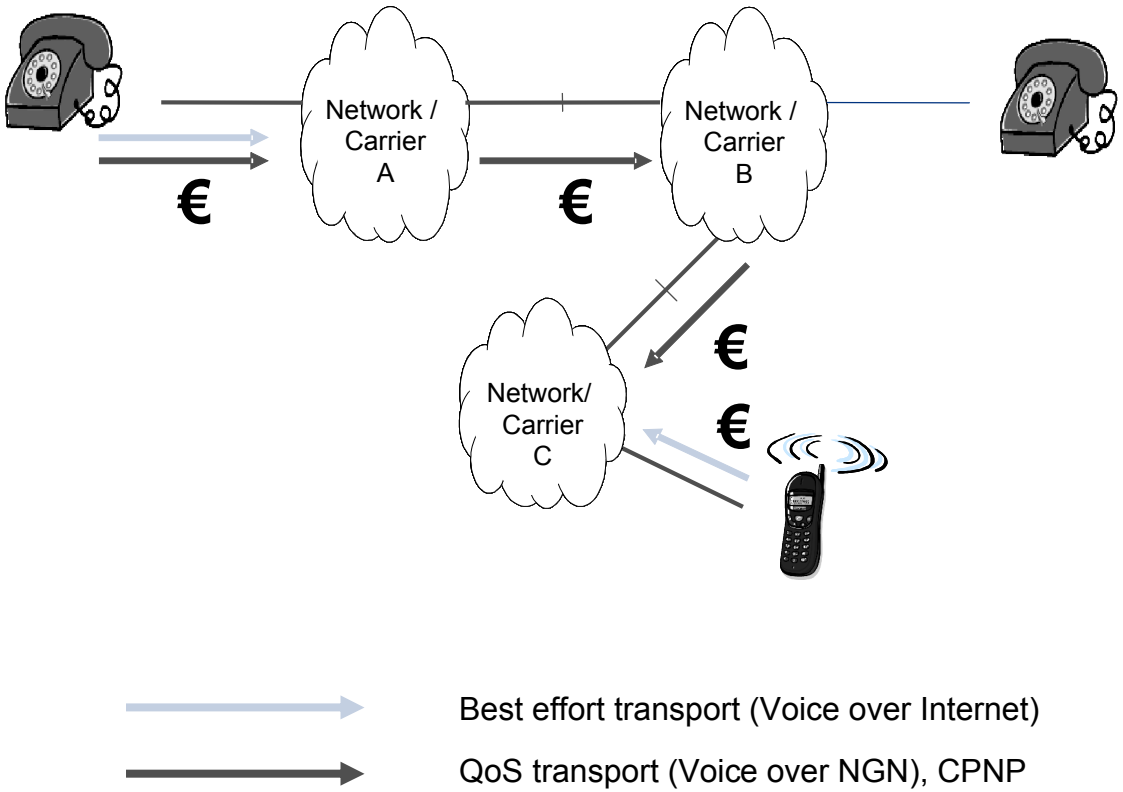
Voice over NGN	Voice over Internet
■ Accessibility of the called end customer with ensured quality ■ The terminating network provider who operates the number of the end customer B within its network, provides ● the complete added value from the point of interconnection up to the network termination point/ end user device in the mobile network and ● the termination service compliant with a defined and measurable quality parameter for the connection from the point of interconnection up to the end customer	■ Accessibility of the called end customer via VoInternet. ■ VoInternet is then the case when the requirements for VoNGN are not fulfilled ■ Within Calling Network Party Pays regime, different termination rates for VoNGN and VoInternet can be applied.

Strategic considerations of carriers

NGN business model voice

The voice business model in NGN should guarantee a 'perceived' voice quality similar to PSTN, but also Voice over Internet with lower quality will co-exist.

Voice businesses in an NGN



Remarks

- VoNGN should feature a „perceived" voice quality similar to PSTN
- For that, the Regulatory defines minimum quality parameters
- Quality parameter are e.g. Delay, Jitter, Packet Loss and Packet Error as well as Codecs (e.g. G.711), which should be ensured by appropriate SLAs
- VoInternet will also be possible based on the peering/IP-transit regime without QoS

Strategic considerations of carriers

Data over NGN vs. Data over Internet

Differentiation of Data over NGN and Data over Internet with a billing regime honoring E2E QoS is vital for establishing new services and infrastructure deployment.

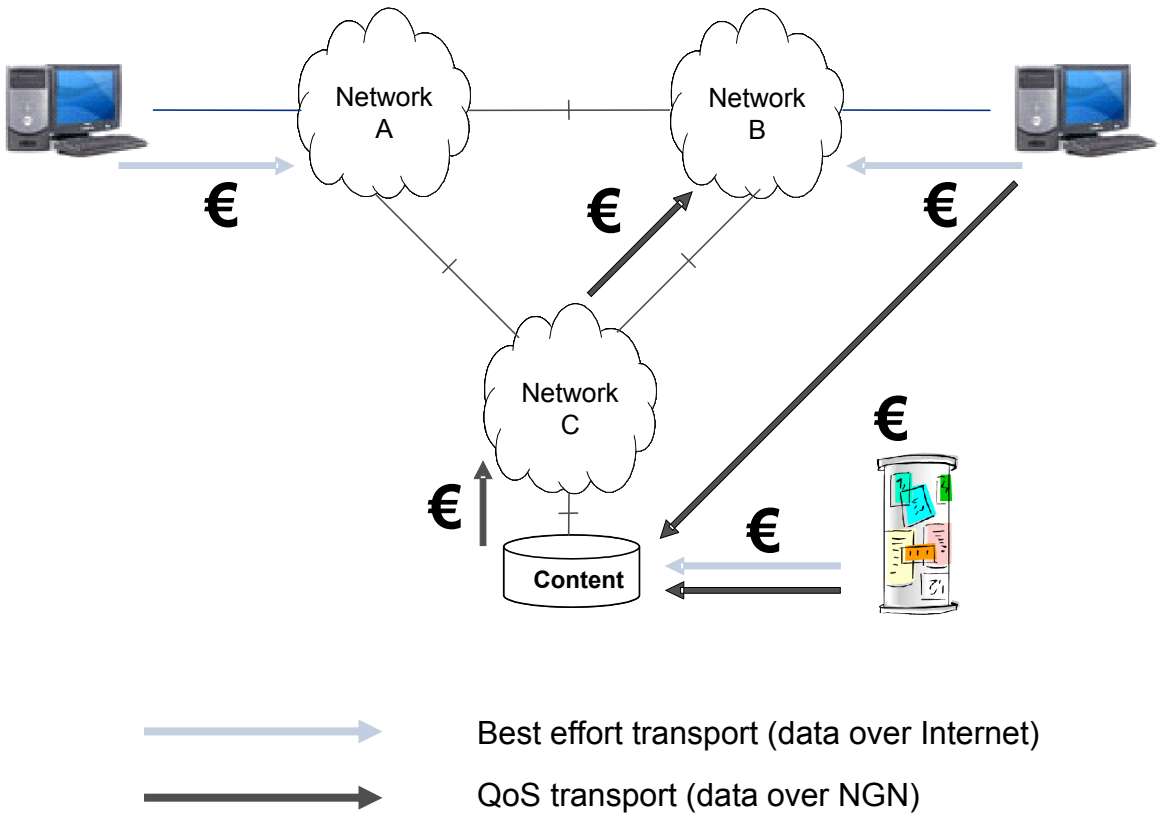
Data over NGN	Data over Internet
■ Honoring E2E QoS ■ Opening new additional revenue streams from content providers to carriers ■ Enabling bundling of content with quality transport ■ Solving the 'crowding out' challenge and the hot-potato problem ■ Increasing economic efficiency ■ Extension of existing Internet business model ■ SPNP as a possible interconnection model to allow investment incentives in QoS enabled networks	■ Availability of transport at low cost in off-peak hours remains ■ Continuation of existing peering/IP-transit regime

Strategic considerations of carriers

NGN business model data

Data over NGN will ensure additional revenue streams for carriers in honoring E2E QoS in co-existence/extension of the known Internet model.

Data businesses in an NGN



Remarks

- Products are bundled in best effort (upstream) and quality transport (downstream)
- Network interconnection and QoS termination payments
- Maintaining of all existing mechanisms within the best effort classes with all the advantages of the Internet world

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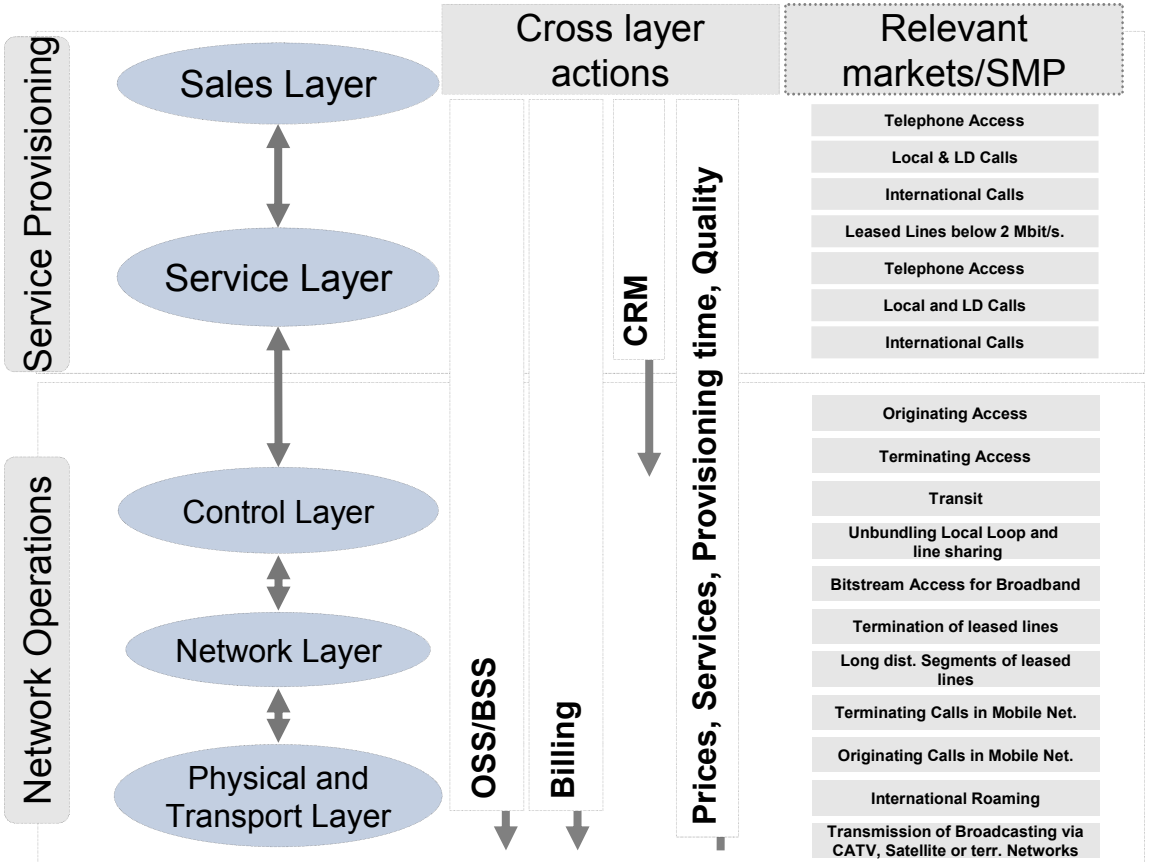
4. **Regulatory implications of QoS**

Regulatory implications of QoS

NGN regulatory bottlenecks

Separation of service and network layers creates a new environment for regulation. The main question remain how bottleneck services will change with the NGN introduction.

Market/Network Layers and Relevant Markets



Possible Developments

Network access will probably remain in the regulatory focus, but generally...

- ... regulatory concerns will shift upwards to the higher layers of the value chain (content related issues).
- NRA will have to assess the risk of anti-competitive practices associated with the use of control points of NGN.
- Cross layer activities of vertically integrated undertakings may be subject to allegations of abuse of market power.
- SMP analysis will get even more complex.

Regulatory implications of QoS

NGN regulatory bottlenecks

Control Points may be regarded as "bottlenecks" for the provision of upstream or downstream services but do not necessarily require regulatory intervention.

Possible Control Points in NGN

Network capabilities

- Control of interconnect and QoS
- Control of routing tables
- Termination capabilities
- Network coverage (peering arrangements)
- Identity, location
- Network Address Translators and firewalls

Elementary Services

- Application program-ming interfaces (API)
- Single user authentication
- Location determination function
- Digital Rights Mgmt.
- Call set-up capabilities
- Proprietary standards
- Interoperability

User access capabilities

- Unnecessary software and service bundles
- Walled Gardens
- Control handset and end-user device (limits service access if linked to specific device)
- Filter mechanisms and digital rights

Individual user information

- Access to customer information systems
- Ability to resolve names and numbers (who should administer ENUM servers?)
- Customer billing info
- Authentication
- Single logon and profile management
- Functions for determining location

Control Points could enable an operator to limit competition by imposing bundling or interoperability limitations

Regulatory implications of QoS

Key challenges for regulators

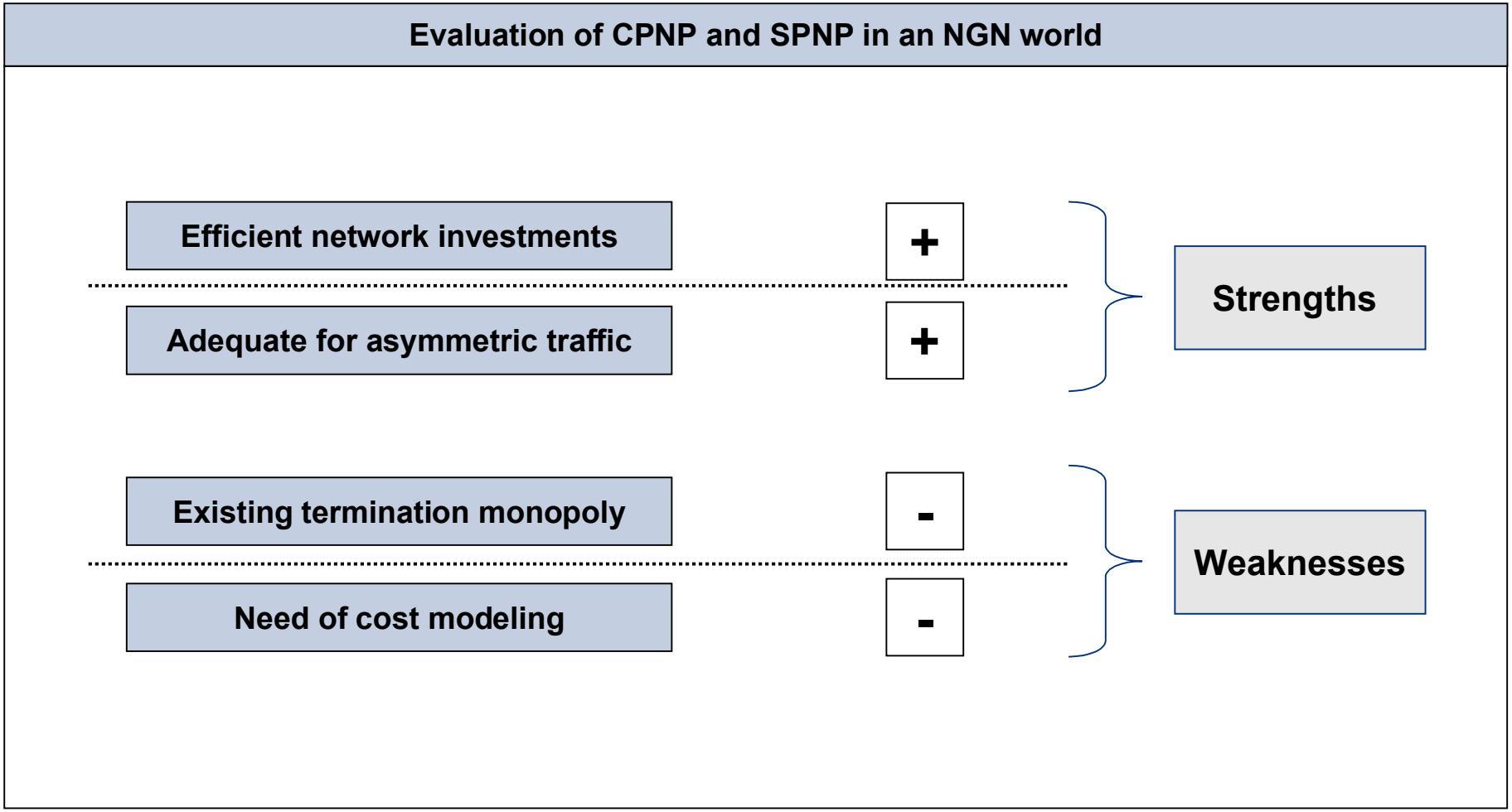
Regulator have to guarantee QoS between networks by establishing quality parameters and quality measurement systems based on an appropriate interconnection regime.

Quality parameter	Quality measurement	Interconnection regime
■ There is no standards ensuring E2E QoS across networks set for interconnected IP/MPLS networks. ■ Only bilateral agreements (SLAs etc.) facilitate QoS between networks so far. ■ Minimum quality parameters have to be defined: • Bandwidth • Delay • Jitter • Packet Loss • Blocking possibilities • …	■ Appropriate measurement procedures are necessary to ensure QoS parameters. ■ Key questions to be addressed are: • Are service commitments met? • Who provides the statistics for this? • Can sufficient information been disclosed? • What are responsibilities and compensation when commitments are not met? • Who is supervising?	■ The interconnection regime should provide incentives to invest into QoS enabled IP networks, but also consider regulatory implementation complexity. ■ CPNP/SPNP might be a viable option for investment incentives, but quite complex from a regulatory point of view. ■ Bill & Keep might be of less regulatory complexity, but might be also less favorable in terms of investment incentives.

Regulatory implications of QoS

Are SPNP and CPNP viable options?

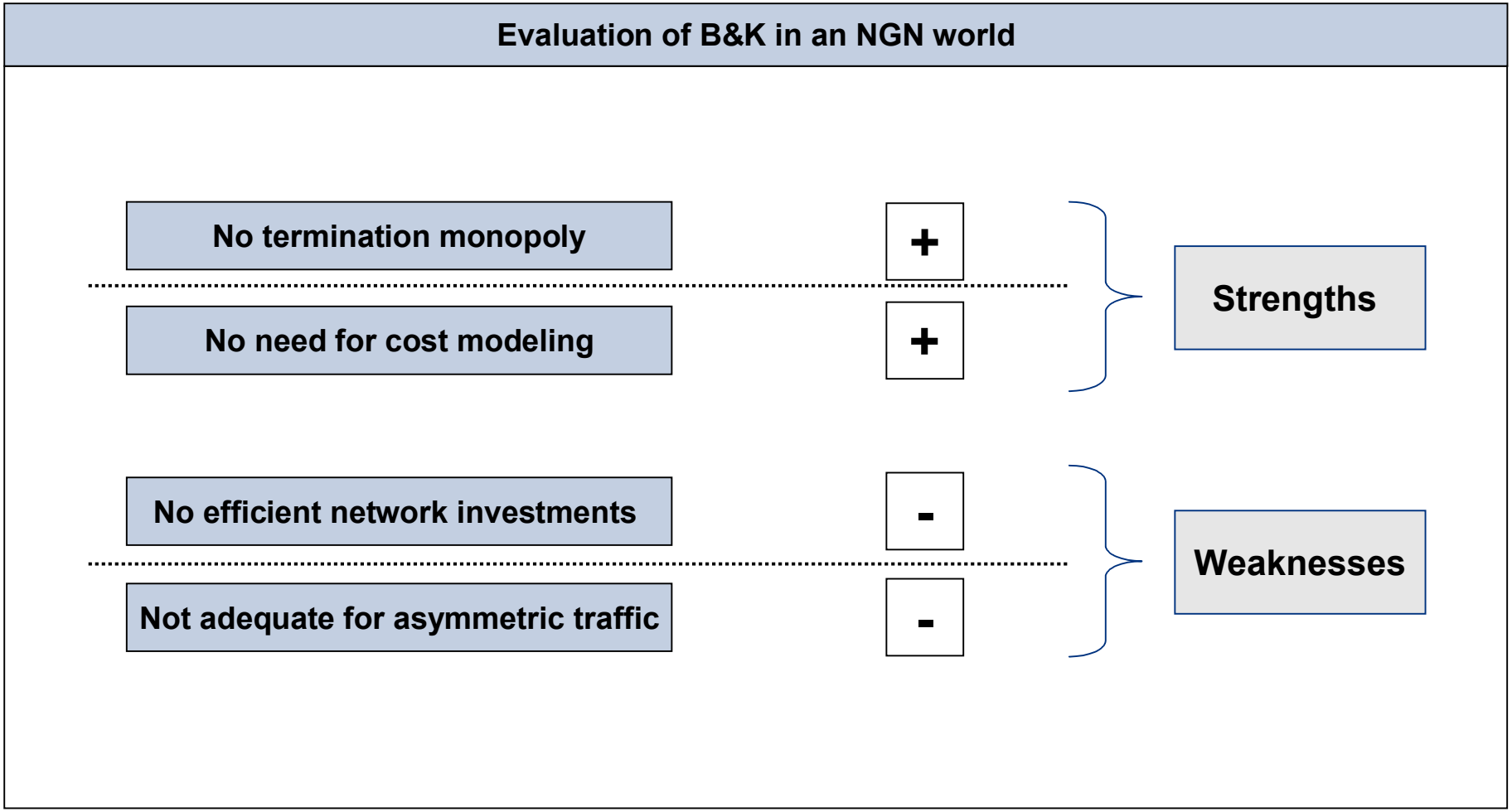
The principles behind CPNP/SPNP have been successfully implemented for many years, thus they might be viable options for NGN, but their weaknesses have to be discussed.



Regulatory implications of QoS

Is B&K a viable option?

Bill & Keep has some strong advantages and could be a potential solution in the long run, but its weaknesses should be taken into considerations by the regulators.

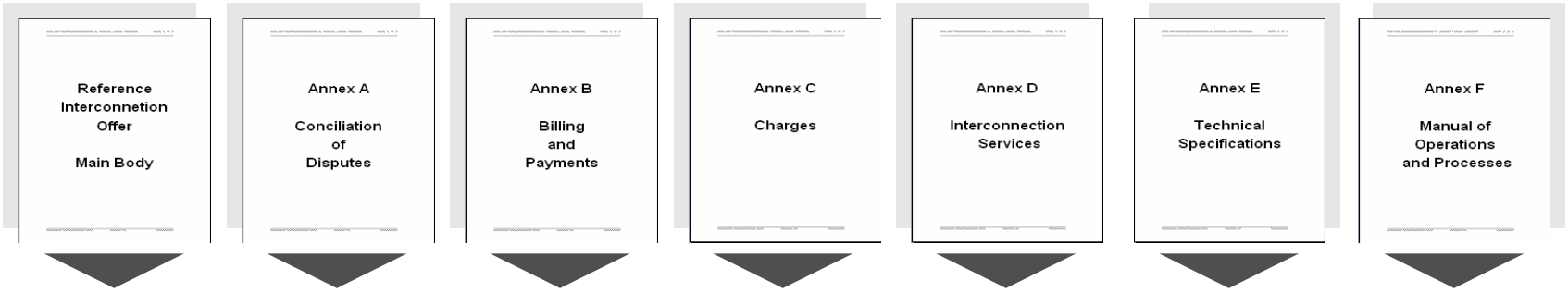


Regulatory implications of QoS

Practical implications: Reference Interconnection Offer

The importance of QoS regulation can be seen in the incumbents' RIOs, which requires a strategic review in order to accommodating new regulatory requirements.

Redesign of Reference Interconnection Offer



- One standardized Reference Offer applicable to all types of competitors
- Compensation for migration

- NGN adjudicator
- Multi-lateral industry groups

- Calling Party Network Pays?
- Bill and Keep?
- Peering?
- Price models: EBC, PoI, flat (single price)
- Per minute, usage based charging or single monthly, capacity based charging

- Retail minus, cost plus or unregulated
- FL-LRIC?
- WACC?
- Charges based on efficient network design

- Access, core network, application layer
- LLU, BSA, IC level
- CS/CPS, FRIACO
- Intra- and inter-nodal conveyance
- PPC, Ethernet access

- Services classes based on QoS: real time, streaming, data, best-effort services
- QoS parameters on network interface: delay, jitter, packet loss, p. error
- Signalling: SS7, SIP, H323, MGCP, H.248
- Physical interface: E1, STM-1 or other

- NGN OSS
- Walled gardens vs. net neutrality

Regulatory implications of QoS

Experiences from Germany

In December 2006, the German regulatory authority (BNetzA) published the Final Report of the IP-Interconnection working group.

Cornerstones of the Regulatory Discussion in Germany	
Number of PoIs	■ Not possible to predict number of PoIs ■ PoIs should follow an efficient network architecture for the incumbent and operators and minimize stranded investments for all concerned
Classes of services	■ Distinction between VoIP & VoNGN to avoid arbitrage between PSTN/NGN and Internet-based voice services and ensure quality across the networks for VoNGN ■ Four classes of service according to the QoS: real time service, streaming service, data service, and best efforts service
Single IC regime and a glide path	■ NGN unit cost will be lower but an immediate transition would be disruptive. Hence a glide path might be appropriate. ■ Single interconnection regime will reduce arbitrage and bypass, which might stem from different pricing for PSTN and NGN interconnection
Dual regime	■ Bill and Keep in the access network and CPNP on an Element Based Charging basis in the core network
Service portfolio	■ The PSTN-IC service portfolio should be gradually carried over to NGN-IC ■ Open service portfolio for further development of variety of services

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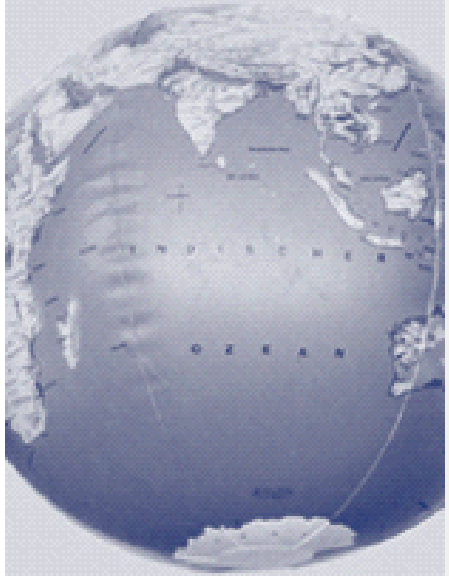
5. **Summary**

Summary

- The ICT industry is undergoing an inevitable evolution from circuit-switched voice specialized PSTN to general purpose IP-based NGNs.
- Both voice and data business models are facing major challenges driving changes in the existing PSTN and Internet world.
- QoS enabled IP based networks play a major role being the service model allowing managed quality.
- This leads to higher productivity, innovations and thus economic growth.
- Carriers will use QoS to develop new business models creating new regulatory challenges.
- Regulators have to define minimum quality parameters and effective quality measurement systems based on an appropriate interconnection regime.

Let's have some further discussions…



Thank you for your attention

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