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IP-BASED Interconnection Regulation Challenges

Sohila Abdalla Mohamed[1,*], Abdelrahim Ate[1]

[1] *Communication Engineering Department, Alneelain University, Khartoum, Sudan*
* Corresponding author: **Sohila Abdalla Mohamed** (Sohilafagiri@gmail.com).

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ABSTRACT The IP age of networks and services is increasing very quickly. Starting from its VoIP, NGN, and IMS to today's IP services landscape, which includes fixed and mobile high-definition (HD) voice, HD video calling, unified communications (UC), video conferencing, and telepresence, cooperation, instant messaging (IM), and the rich communication suite (RCS). Convergence is one of the most significant current trends in the ICT sector. It has changed the way services are delivered and obscured the distinction between fixed and mobile services. The transition to Next-Generation Networks (NGN) is the most important next phase in the ICT sector's convergence-driven evolution. In the realms of NGN, VoIP, and IMS, there is no PSTN equivalent; instead, there are "IP islands " that locate the total value of an IP service. The next basic step is to expand the arrive of those services across a totally interconnected cross-network premise in order to maximize their overall esteem among their target audiences. The liberalization of infrastructure services depends on managing the interconnection interface between the competitive and regulated sectors. This paper outlines regulation issues raised by IP-based interconnection and examine the current practices and procedural ways that being developed to address these concerns.

Keywords*:* Interconnection; Convergence; Regulation.

1. INTRODUCTION

The prevalence of broadband access connections has accelerated the uptake of modern services including HD voice, instant messaging (IM), HD, LD video calling, social media, over-the-top (OTT) television and conferencing. As the PSTN is phased out and fixed, and mobile broadband IP networks become more common, IP communications services exemplify the upcoming generation of revenue generator for service providers.

The following characteristics can feature these new services:

- **Attraction**: Because of their extensive use of IP, which enables robust real-time phone, video, and message capabilities, the services are very tempting to businesses and consumers.
- **Limited reach:** Because advanced services cannot rely on the old PSTN for interconnection among service providers, their capacity to produce network effects is limited. Income and margin prospects are limited to their local supporter impression without associate interconnection among other different networks.
- **Revenue potential**: As traditional services like POTS and SMS give way to services like voice over broadband (VoBB) and Rich Communication Suite (RCS), these services will constitute a larger share of telecom operator revenue. Network operators who made money profits TDM-based voice services are in the early phases of a multi-year transference to future all-IP

networks. As networks become more IP-based, so do services.

Traditional telecommunications administrators are transitioning away from the public switched telephone network (PSTN) and toward IP-based, full-service networks, dubbed as next-generation networks (NGNs). On a similar platform, NGNs coordinated PSTN and IP-based networks. According to the PSTN model, many administrators are required to oversee the entire network value chain. As a result, several NGNs are being installed with control and service-layer tasks that are similar to PSTN operations. The closed network model is a term that describes these types of networks [1].

As a result, interconnection is the key to unlocking endless value for clients, as it provides a passport to almost any network on the planet. The goal of interconnection is to ensure end-to-end service property and allow end user customers of interconnected administrators to decide how they communicate with one another.

Interconnection and access serve various functions from a regulatory standpoint, necessitating different regulatory methods. Trends in interconnection regulatory approaches will be discussed in this paper.

Interconnection is more than just a technical arrangement between different network components. It's also a business and administrative confrontation, owing to the way IP-based networks are evolving from previous models. When to talk about interconnection between IP networks – or, to put it another way, when we talk about the current model of IP interconnection –usually refer to interconnection processes that take place in the Internet environment, which is where IP networks were introduced and interconnected for the first time [2].

In packet-switched networks (including IP networks) a layered model is used to show the interactivity between several protocols. This enables one to visualize the functioning of the protocols that happening within all layer, as well as the functions that take place at any layer. In IP networks, the TCP/IP group of protocols are the most extensively used (See Figure 1). A classic symbol of IP networks that based the TCP/IP model are the ISP networks [3].

The NGN paradigm makes a major alteration to the network's core, it separates the transport and service layers (See Figure 2). The idea of isolating transport and service assignments originated in the world of IP-based networks, and it is intended to ensure the delivery of several services over a single infrastructure. The transition to NGN from PSTN, on the other hand, necessitates considerable changes in the all-network's core and access segments. Alterations of the center portion of the network are critical from an administrative angle, since they have a coordinate affect on the execution of interconnection.

Interconnection is divided into service-oriented interconnection and connectivity-oriented interconnection when the core network's activities are split (See Figure 3) [5]. As a result, switching to the model of NGN will have a number of consequences for existing PSTN connectivity, including:

- various services may necessitate various service-oriented interconnections, but once gained, connectivity for multiple services may remain the same.
- The two types of oriented interconnections might occur at different physical locations.
- There will be fewer service-oriented interconnection spots than connectivity-oriented interconnection spots since service control functions will be center on in the NGN.

In comparison to a PSTN network, the numeral of points of interconnection (PoIs) in an NGN will be decreased overall.

The physical and logical connective of NGN domains is the Service-oriented Interconnection (SoIx) that enables carriers and service providers to present services over NGN, including control, signaling, and routing, it presents a specific scale of interoperability. This is applying for multimedia services and carrier-grade voice which delivered over an IP network. The scale of interoperability relies for example on Quality of Service, services, and security.

Focused on connectivity-oriented Interconnection (CoIx), is the physical and logical joining of carriers and service providers using simple IP connections, regardless of the interoperability levels. Because of this sort of IP interconnection is unaware of the specified end-to-end service, so the service-specific network performance, security needs and QoS are not required. Some services may provide a set level of interoperability, which is not excluded by this definition. On the other hand, only service-oriented interconnection (SoIx), fully meets NGN interoperability criteria [4].

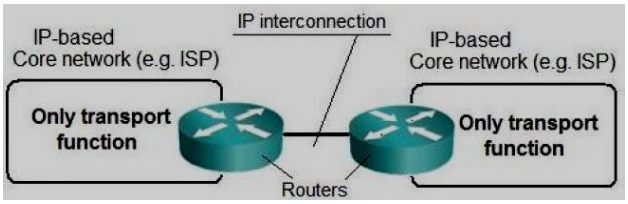

Fig. 1. Interconnection between Packet-Switched Networks [4].

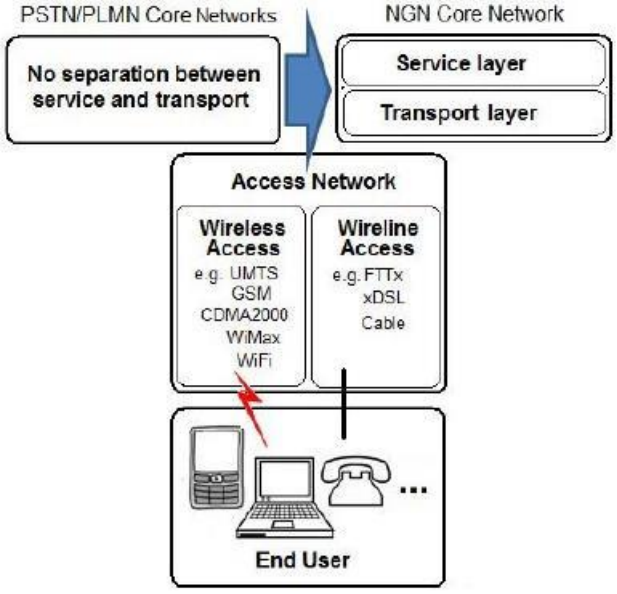

Fig. 2. Separation of Layers in NGN Core Networks [4].

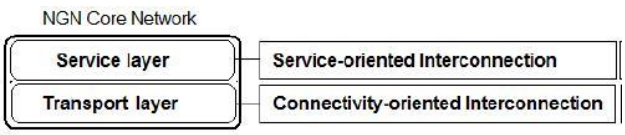

Fig. 3. Implementation of NGN Interconnection [2].

2. Interconnection Challenges in a Converging Environment

Each IP Models provide:

- Numerous networks, multiple services on a single platform.
- services based on Packet – video, data, voice.
- Bundled consumer packages are becoming more widely available.
- Triplex performs (TV, broadband, voice) and quaternary perform (TV, broadband, voice, mobile).
- customer election of services, means of comfort, and invention have all increased.
- The boundary between the core and the access network shifts as fiber penetration into the access network increases.

Although convergence allows users to get several services or only one service on an individual platform or appliance, it also allows them to get any specific service on various platforms or appliances, there are many IP Network interconnection and regulatory challenges:

1. interconnection to the central unit.
   - Service quality is a major concern.
   - Issues relating to interoperability.
2. Structure, QoS, packet prioritization, and filtering protocols.
3. Quotes strategy.
   - The pay model for PSTN callers vs. the pay model for internet receivers.
4. NGN accessibility.
   - Access becomes more difficult as fiber enters deeper into the network Institutional Structure.
   - That no new bottleneck economical constraint emerges.

However, as networks evolve, there is an opportunity for various industries to handle interconnection and access challenges [6].

3. MIGRATION TO Next-generation networks

A key question that considers IP-based inter-connection is the extent to which interconnection

regulation will be required in the NGN's coming world. How does the introduction of NGN affect market power, and the simplicity with which bypass and duplication may be accomplished?

This section addresses interconnection from an economical, Technical, and regulatory standpoint, in an IP-based NGN context.

For IP-based NGNs, there is currently no theory corresponding or practice. To a first order, it is plausible to anticipate that the economic dynamics motivating NGN market players will be identical to those motivating their parallel who manage networks that are most similar to IP-based NGNs today.

The majority of the globe employs the Calling Party's Network Pays (CPNP) method; however, Bill and Keep, a less generally used approach, has a number of features, especially for countries with a high level of ICT service developed. It is logical for a country to assess whether its aggregate interconnection arranging could profitably transition to Bill and Keep at the time of migration to an NGN.

Call termination prices are under pressure as a result of the migration to NGN, and existing call ending arrangements may become unsustainable in the future. If this is the case, how will such nations– particularly developing countries – fund overall service? In the world of the NGN, how much, if any, subsidization of universal access or universal service is required in NGN?

A distinguishing characteristic of next Generation has significant regulatory politics consequences. Interconnection regulation has always been predicated on a close interaction amidst the network and the service. The conventional technique for inter-carrier indemnification relies on wholesale payments from the service provider initiating the call to the service provider ending the call to recompense (mainly) for the usage of the network to end the call. If the termination service provider and termination network provider are the same, the system might theoretically perform similarly to how it does now. If, on the other hand, these are various institutional entities (as the definition of an NGN explicitly states), it's hard to consider how a system based purely on current models could possibly function in the future. For example, the user may have a contract with the network operator of NGN to take out the access to broadband Internet network, and independent contract with other party the service provider of VOIP (that do not run in its own network), but each provider will not have a contract with another one [7].

The first challenge is that there are no network charges for the independent VoIP service. It has network expenses that differ significantly from those of a traditional fixed operator. Last-mile facilities, particularly the local loop, account for a large portion of a traditional operator's expense. In this scenario, the cost is absent - broadband connection serves a similar purpose, but the client already pays the broadband network provider for it [8].

The second challenge is even if the service provider wanted to, there is no way for it to pass those payments to the network operator.

The third challenge is that the service provider often has limited access into the network operator's operations, and vice versa. The TCP/IP protocol group, which underpins both the Internet and the NGN, purposely to layers protocols and hides information to make network design and evolution easier. As a result, a separate VoIP provider is not equipped to track network use, and in the ordinary course of business, it may not even be known of the provider of broadband service with whom the customer has engaged. In contrast, the network provider can treat the traffic it transports as undistinguished bits, not needing to knowing of the kind of the traffic unless it requires special treatment (differentiated Quality of Service [QoS]). As a result, the network operator is unable to account for the services that operate across its network, and the service provider is unable to account for the use of the implicated networks [9].

The regulator might easily handle these difficulties by determining that integrated firms that provide both network and voice telephony services should be paid termination fees, whereas independent service providers should not.

A variety of regulatory processes and studies examining the impact of IP-based interconnection have been assessed by many countries.

The UK's national regulatory authority (NRA), has been in the foreground of handling with NGN migration issues, owing to British Telecom's (BT) commitment to migrate quickly to an NGN and get rid of the current "conventional" PSTN network [10].

BT's market advantage on the local loop would not be eliminated by switching to an NGN anytime soon, according to Ofcom.

The primary criteria important to compensation provisions for BT's 21CN migration, according to Ofcom [11], are:

- The reach to which BT decides these modifications unilaterally without consulting the industry.
- The distribution of the gains that arise as a result of these changes.
- The life expectancy of any legacy connection tools that was in use at the time of the shift.
- The proportion to which communication providers make recent interconnect investments after being informed of impending developments that would have an impact on that investment.
- The additional expense incurred as a direct result of having purchase of new interconnects tools.

Ofcom identified many interconnected elements in the present regulatory and market climate that could affect BT's and competitors' profitability, including:

- The rising risk of 21CN implementation for BT and its shareholders.
- The lower unit costs of operating for 21CN in the long run.
- Losses to competitors as a result of stranded interconnection facility investments.
- BT's expense of simultaneously supplying old and new SMP products throughout the changeover phase.

The German BNetzA established a study set on IP-based network interconnection, which published its eventual report at the ending of 2006. The report emphasizes the need of separating service and network, as well as the implications of centralizing control assignments [12].

The report indicates that it is now impossible to forecast what will happen in terms of the numeral of interconnection points, due to both technical and financial considerations. From a regulatory standpoint, the numbered of interconnection points should be commensurate with efficient network architecture for both the incumbent and rivals to the extent possible, and should strive to keep stranded investments to a minimum for all parties involved.

IP-based networks place a strong emphasis on quality from beginning to end. The report realizes the importance of offering several types of service and lists four options: best efforts service, data service, streaming service, and real-time service.

Unit costs for NGNs are expected to be lower than for present networks; yet, market participants may find that a quick shift to these forward-looking costs too disruptive. A gliding path may be more appropriate in situations where the network consists of a combine of circuits witched and technologies of NGN. In the concentration network, Bill and Keep are also advised, but in the core network, CPNP on an Element Based freightage basis is recommended.

The report contains a lot of information, but it doesn't come to any solid conclusions about whether long-term interconnection regime is best (CPNP, Bill and Keep, or a hybrid of the two), or about how long it will take to transition from present to futurity arrangements [13].

The Indian TRAI released a deliberation paper on NGNs at the beginning of 2006. The interconnectivity section is largely intended to elicit feedback from stakeholders. The TRAI expresses worry that a dominant operator may refuse to provide competitors new forms of interconnection, thereby legacy services may be discontinued or amended at any time, putting them at a disadvantage, Competitors suffer as a result. The TRAI asks a series of inquiries, including:

- do the independent VoIP providers with interconnection privileges be able to cancel calls?
- What types of interconnection services should be used in the future? Should the NGN interconnection "include merely [the NGN] Core, Access and Core or the entire three-layer, in addition of Service?"

- Should interconnection billing continue to be focused distance and time, or should it shift to quality, capacity, and class of service as soon as possible?
- What, if any, obligations should the incumbent have to keep offering older products of interconnection?
- What should be done during the transition term to the NGN?
- forasmuch the intricacy of interconnection problems, is an independent consultation focused solely on interconnection problems essential?

As part of their 2006 examination of the Saudi Telecommunications Company's Reference Interconnection Offer, the Saudi Communications and Information Technology Commission (CITC) briefly evaluated IP-based interconnection (STC). notice that IP traffic does not fit well to per minute pricing, and it is technically challenging to differentiate one type of traffic (e.g., voice traffic) from other (e.g., http traffic) because many distinct types of traffic may be transported simultaneously at the same time via one interconnection link. This raises issues about how service providers should charge for interconnection, and the issues are particularly complex when traffic has to be passed from a circuit-switched to an IP environment, or vice versa. The CITC believes that interconnection to NGNs will be an important issue in the Kingdom in future, and intends to begin a process of analysis and consultation to arrive at an optimal set of regulations for NGN interconnection within the Kingdom."

4. INTERCONNECTION EVOLUTION

The European Telecommunications Standards Institute (ETSI) TISPAN (Telecommunications and Internet-converged Services and Protocols for Advanced Networking) was established in 2003 and has played a vital role in the development of the Next Generation Networks (NGN) specifications.

By December 2005, NGN Release 1 had been completed, providing industry with the open standards needed to begin developing, testing, and implementing the first systems of NGN. For SIP-based applications, the NGN Release 1 characteristics followed the 3GPP IMS (IP Multimedia Subsystem) standard, but also introduced extra functional blocks and subsystems to support not-SIP applications.

By 2008, NGN Release 2 had been released, allowing IMS or non-IMS-based IPTV, Home Networks and devices, and NGN interconnection with another networks.

TISPAN has been obliged to the third version of NGN specifications since early 2008, and is presently searching at IP network interconnection and NGN security improvements, among other things.

NGN operational architecture is divided into two levels, as described by ETSI architecture: IP connectivity transport level and service level.

The following components can be found at the service level:

- Core IP Multimedia Subsystem (IMS).
- IP television (IP TV) (including, broadcasting, streaming and multimedia applications and contents).
- PSTN/ISDN Emulation Subsystem (PES).
- mutual components (e.g., components utilized by various subsystems).
- Other subsystems.

This modular component-based design enables the establishment of service-level subsystems capable of developing new commercial services while also supporting older services such as POTS (Plain Old Telephone Service). It also enables for the use of additional pre-defined subsystems that have been imported and adapted from another standardization bodies.

SIP, Diameter, and H.248 are the three main signaling and control protocols used in the TISPAN NGN architecture.

Variety of ways could be used in interconnection between NGN TISPAN and other networks, Interconnection can occur between one NGN and one PSTN/ISDN, two NGNs or an NGN and other IP-based networks, with the latter two

possibilities being defined by legacy networks [14].

Regardless of whether NGN is the original or destination network, the PSTN/ISDN Emulation Subsystem (PES) and Core IP Multimedia Subsystem (IMS) have connections that are standardized with it.

Interconnection has an effect on both the TDM based and IP involved levels of the TISPAN NGN architecture.

Interconnection with other IP-based networks is handled differently depending on the subsystems involved, although it is often handled by an IBCF (Interconnection Border Control Function) existence at the service level and I-BGF at the transport level. In addition, each subsystem can have additional functionality or employ other means for interconnection.

The interconnection tasks are contained in the IBCF entity in the event of interconnections to/from Core IMS or PES subsystems, and more information are accessible in the ETSI standard ES 282 001.

The IC interface is used to connect to external networks that allow complaint profiles using the TISPAN NGN protocol. If there are another non-compliant TISPAN NGN protocols engaged, interconnection can be accomplished using the Iw interface and IWF. The service control subsystem and that unit communicate with each other via Ib. as an example, Interconnection can take the form of a mapping between the H.323 suite of protocols and the SIP profile used in the TISPAN subsystems, or between multiple SIP profiles and TISPAN profiles, as shown in figure 4.

Three communication options may be available through the inter-operator IP essential network:

1- Transport-Only Connectivity: This type does not take into account the services and can be utilized to transport public IP traffic amidst two Communications Providers (security standards are important).

2- Bilateral Service Transit Connectivity: Inter-operator IP essential network or IPX, upholding connections between any form of Service Provider for interworking, a variety of IP services on a dual basis with end-to-end QoS, and interconnection billing as illustrated in Figure 5.

3- Multilateral Service Transit for pure IP connectivity or "session- based" services: Communications providers were linked indirectly for specialized "session-based" services, with the inter-operator IP basic network serving as a transit operator with ensured QoS. The transit service in this scenario is a multilateral one between Communications Providers.

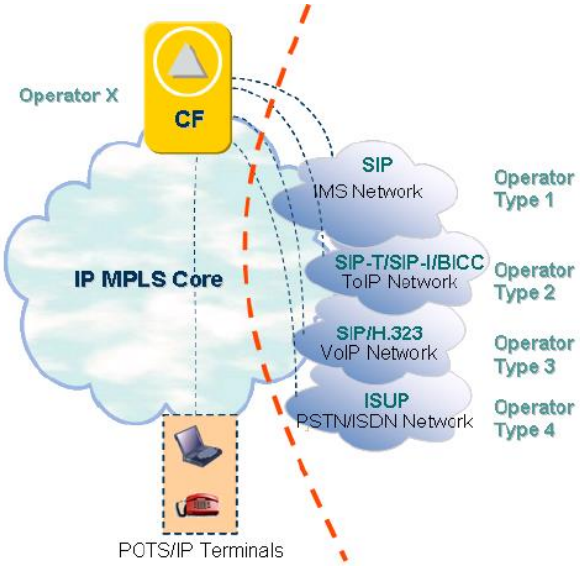

Fig. 4. Interconnection between NGNs and different type of IP-Based Networks [2]

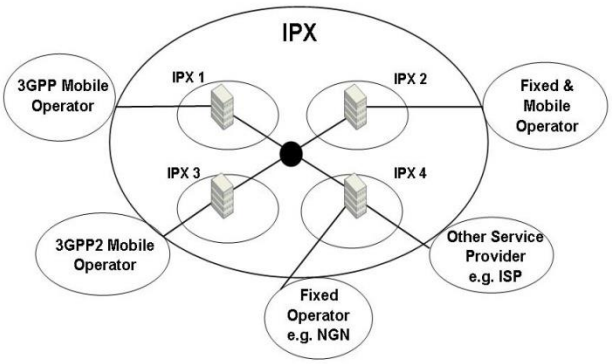

Fig. 5. IP exchange [2]

The GSMA's IPX model was used as a reference sample, while 3GPP offered technical requirements for IMS connectivity and TISPAN

providing a technical specification for NGN features.

Specifications of TISPAN support two methods of connecting between NGNs:

1- Direct: Interconnection in this mode indicates to the interconnection of two network domains without the use of a mediator network domain.

2- Indirect: This permits two network domains to communicate via one or more mediator network domains and it operate as transit networks. The transit functionality is provided by the mediator network domain(s) to the domain(s) of another network, Figure 6 illustrates this.

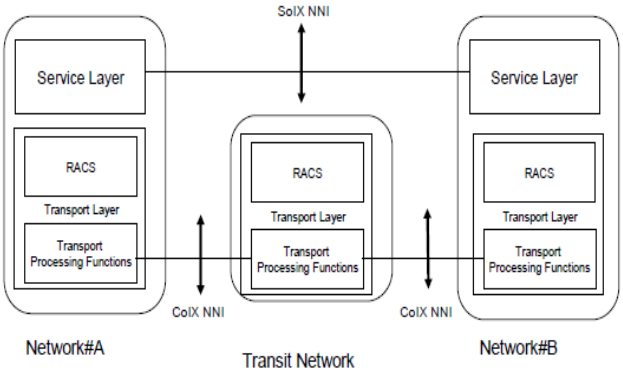

Fig. 6. Indirect connection [9]

5. RECOMMENDATION

The regulatory experience shows, that it is not easy to cope with Telecom interconnection issues. Because of the transfer to IP networks, the previous link between the service and the network has been broken, allowing independent service providers to arise [15].

As we go into an IP environment, the conception of interconnection fees is changing:

- There are fewer changeable charges based on traffic volume.
- More capacity-based fixed costs between operators.
- It is possible that the total value of interconnection fees amidst operators would decrease.
- Investments are still being driven by voice revenues.
- Operators' primary source of revenue is still the voice.

Different nations will have devised different approaches to dealing with market power in terms of interconnection and access.

IP voice connectivity costs would need to begin higher than the charge of a hypothetical stand-alone NGN, because doing so would result an arbitrage chance where (for example) migration expenses would not be recovered. However, because these IP voice devices are less expensive to produce than [existing] narrowband connectivity components, they may be priced lower. Finally, one day in future, while all traffic is routed through IP voice interconnect and all immigration / PSTN charges have been returned, IP interconnect price locating will reflect the NGN's costs, providing an adequate average of return.

There are a range of issues need to be considered, including the extent to which regulatory curative would be required in the future, the number of interconnection points that might be wanted, the proper method for determining regulated pricing and costs in an NGN setting.

The most important aspects of migration reparations arrangements are the following:

- The apportionment of the gains that arise as a result of these changes.
- The life expectancy of any legacy connection equipment that was in use at the time of the shift.
- The range to which communication providers make new interconnect investments after being informed of impending developments that would have an impact on that investment.
- The extra expense incurred as a direct result of having to bring up investment in new interconnects apparatus.

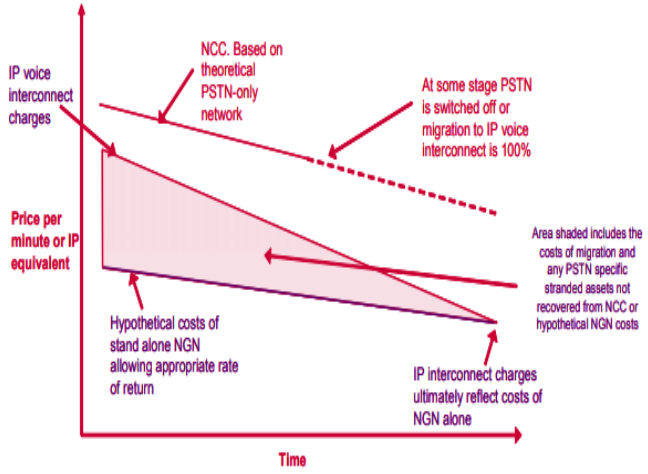

Fig. 7. Voice Interconnect cost recovery [Source: Ofcom] [4].

In above figure, the upper line ("NCC, basis on notional network of PSTN-only") indicates the predicted trend for the organized Network Charge Control (NCC) for BT's current wholesale narrow range interconnect. It decreases over time, due to BT's effectiveness is expected to grow over time. The efficacy of a network that is half PSTN and half NGN is tacitly assumed to progress at the same rate as BT's existing PSTN network. If the shift to NGN permits even higher efficiency savings, BT will profit over the cost controls' stated duration, which is 2005-2009 – the NCC scale will not be altered unless extraordinary circumstances arise.

The second line below, "IP voice interconnects charges" is a prospective NCC for a new overall SMP outputs that enables interconnection to narrow range services of voice. It's most likely some kind of IP interconnection. Given the fact that this interconnect offer has not yet to be determined, let alone performed, Although Ofcom has not sought to establish the level of these charges, the general consensus is that they should be lower than traditional voice connection prices, but yet high enough to allow BT to recoup the cost of transfer from the PSTN to the NGN.

The issue of NCC levels midst a period of cohabitation between conventional connection and modern IP-based interconnect is complicated. The Interconnect fees for IP-based interconnect should be cheaper to the extent that network charges are lower; yet, keeping multiple interconnection charges for the same service would Lead to result in minimum retail costs, Customers of the wholesale service would be pushed towards the new IP-based mode of connectivity, as a result it will lead to expedite the permitted rate of return, the Weighted Average Cost of Capital (WACC) and an already quick transformation risk.

Regulation must not obstruct service providers' capacity to earn a sensible return on sensible investments. For a company that is regulated, this usually entails calculating the Return on Investment (ROI) that will be regarded accepted for regulatory aims. Greater risks, as one could assume in the case of transformation to the NGN, should be accompanied by higher projected rewards.

Regulators usually calculate an appropriate ROI for the firm by estimating its Weighted Average Cost of Capital (WACC).

There are many options for NGN interconnection:

- Alteration of present regulatory frameworks.
- New retail price setting practices are being replicated at the wholesale level.
- Adaptable strategy.
- In order that the retail pricing models and cost circumstances may differ among services, markets, and networks, there is unlikely to be a single "one-size-fits-all" solution.

To get interconnection paradigms that are as efficient as possible in all situations:

- Dynamic effect must be taken into account.
- Maybe a mix of models used in different situations is the best way to promote an efficacious market?

Transformation to NGN will not eliminate worries about SMP in the short to medium term, thus effective regulation will remain a worry.

The efficacious regulatory model for pricing is based on two factors: the effective retail fees and the cost distribution.

NGN will offer a comprehensive range of services with a variety of price options. The following wholesale pricing methods must accommodate this diversity:

- Trends in the retail market towards bundling and fixed rate pricing could be reflected in the wholesale market by capacity-based price setting

- In order to provide effective networks, wholesale charges must take quality and traffic in consideration
- The voice, which continues to be the primary source of revenue and investment, is well agreeable in retail pricing model
- The transition to IP is anticipated to have an impact on wholesale charge accounting techniques
- In all cases, there is no sole IP interconnection model is outstanding

Regulators should therefore be cautious in imposing any particular NGN interconnection regulation as it might be fraught with risk.

Perhaps a mix of models used in different situations is the most effective way to create an efficacious market? Rather than determine a particular approach to interconnection regulation or transpose them from todays to NGN interconnect environment, maybe regulators should set out the criteria against which they would evaluate the models?

The main criteria:

- Whether the model would advance efficient outcomes for consumers?
- Whether it would maximize consumer's utility?

Role of regulators:

1- Regulate retail arranging only to the extent that they are required to alleviate market force deformations.
2- The regulator is entirely concerned with the repercussions of regulation of wholesale on retail conduct.

There are three main reasons to regulation at level of wholesale:

1- Encourage network interconnection: Wider networks are more worthy for the following reasons:
   - Widened connectivity - additional calling options (direct effect)
   - More supplementary merchandise means more options (indirect effect)
   - Economies of scope and scale-cheaper costs (indirect effect)
2- market force dominance
   - Encourage competition by making it easier to enter
   - Prices regulate protects consumers from the misuse of market power
3- interoperability coordination

Regulators may also employ alternative strategies, include:

- Benchmark – However, the results of such regulations are greatly reliant on the changes implemented. Benchmarking can lead to incomprehensible interconnection charges if modifications aren't made. The modifications are aimed at modeling interconnection fees without having sufficient comprehensive information on local cost inputs to do a full prospect charge analysis.
- Retail incomplete - However, the success of this strategy is contingent on the level of retail pricing. This strategy is typically employed when the downstream market is sufficiently competitive. Price regulation can be approached in a variety of ways [8].

A summary for recommendations to regulate IP interconnections are:

1- Stratify the minimal and commensurate regulation on IP Telephony.
2- The regulation's goals are to improve long-term clients benefit and encourage efficacious investment in the telecommunications industry.
3- Continue to serve as a facilitator, allowing the market to choose the form and speed of the switching to an IP-based operational, ambience.
4- Maintain "technology neutrality" as one of the regulatory principles for public telecommunications services and networks, including IP Telephony. Operators should be permitted to adopt any technology under their assigned licenses as long as they run within the rang authoritative and adhere to the licensees' restrictions.

5- There may be a number of IP Telephony services available on the market, each with its own set of functionalities and features to satisfy the needs of various user groups. Regulation of IP Telephony should not limit the variety and invention of IP Telephony services, Consumer demand and technology capability should be the driving forces.

6- Approach to licensing IP Telephony services. Class 1 services are those that have all of the characteristics of traditional telephone services and are wanted to meet the licensing requirements for providing local services of voice telephony. Class 2 services are the services does not contain all of the characteristics of traditional telephone services and are just submit to the most basic licensing requirements in order to keep consumer benefits and ensure fair contest.

7- Allow current licensees to run Class 1 and Class 2 services beneath their present licenses without having to apply for additional service-based operator licensees. specific license terms, on the other hand, are not relevant to the running of services of Class 2. They must call for suitable license revisions from the Regulator if they desire to waive the application of these licensing restrictions for the operation of Class 2 services. It entails the replacement of a license with an IP license, if appropriate, and/or the modification of specific restrictions under the current FC license in order to comply with the requirements.

8- Commitment of been fully comply with the conditions of license for its domestic telephony serving except if it states that its service is a Class 2 in all mart items (such as, announcements, rates, etc.) and notify clients about the abilities and restriction of service of the Class 2 it presents.

9- Each IP Telephony services that do not require a number assigning from the regulator should be classed and regulated as a Class 2 services if the service providers install or repair telecommunications tools in the nation to provide the services of IP Telephony.

10- Clients will have no influence over the quality of the broadband connection gained by Mode 3 service providers, and they will not be able to ensure the quality of overall service to clients. except if there is a business agreement in place between the broadband connection provider and the IP Telephony service supplier.

11- To recuperate the costs paid by Regulator in managing the licenses, the yearly licensing price for the new services-based operator license for Class 1 and 2 services will be established on a cost-recovery basis. The suggested price would comprise a constant component as well as a mutable component that might change depending on how many users the service providers serve.

12- To provide an equal opportunity between service-based and facilities-based operators, the same approach should be used to calculate license costs for Class 1 and 2 services that are allocate numbers from the national Numbering Plan under the services-based operator license.

13- The number portability should only apply to Class 1 services and not Class 2. Because traditional telephone services and Class 1 services share the same set of 8-digit numbers, they are considered to be of the same tier, Users of both Class 1 and traditional telephone services should be able to convey their numbers between and over these services, according to the Regulator. Class 1 service providers, whether services-based or facilities-based, are asked to support the number portability feature in this regard.

14- Regulators must collaborate with industry to provide the required rules and norms of conduct. In addition, the regulator would launch public awareness and consumer culturing campaigns.

6. CONCLUSION

Much will change as today's networks transform into tomorrow's Next Generation Networks, but some aspects will remain constant. Although the nature of competition may vary, authorities will continue to be concerned about competitively suffocations.

The shift to NGNs is an ideal time to rethink the entire interconnection policy. For a diversity of practical and technical causes, the CPNP overall arrangements that are currently in use around the world will be complicated or unattainable to continue without alteration in the future.

In the long run, arrangements that reflect the removal of a regulatory delegation for CPNP, similar to regulatory practicing in North America (Bill and Keep) and on Internet, may be the most suitable and prospective economical model. Those systems are cost-effective; they stimulate usage (although at a cost in terms of mobile penetration speed); they make the regulator's job easier by eliminating the need for regulatory rate putting; and they offer no conceptual or practical challenges in the NGN world.

In the short run, CPNP systems with more lower termination charge than those currently in use could be a good temporary step. CPNP arrangements with mobile ending costs of less than 0.01 USD per a one minute have been found to be convenient with the both of high use and quick uptake in India. By narrowing the prevalence between Bill and Keep and CPNP, the regulator also lessens the distress of a future migration to Bill and Keep arrangements, if one is required.

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