



Electronic Communications Committee (ECC)
within the European Conference of Postal and Telecommunications Administrations (CEPT)

A MODEL FOR INTERCONNECTION IN IP-BASED NETWORKS

Vilnius, October 2005

EXECUTIVE SUMMARY

The Report presents a model for interconnection in IP-based networks where there is separation of service provision and connectivity. The model is presented for discussion and does not represent a policy view of CEPT or its members.

The model is based on the provision of a high quality connectivity platform that can be used for new and third party services where interconnection charges are based on capacity rather than usage. Retail and access charges can be based on either usage or capacity. Quality can be handled on a class rather than a service basis and can be included in the charging for access.

The new model differs from the current plans for the NGN being discussed in ETSI and ITU-T but is similar to the main aspects of one of the models used by the mobile operators for the GRX, which may also become the basis for the provision of the IP Multimedia Subsystem, and it is also used for services on the Internet.

The reasons for presenting this model are:

- A model is needed that is compatible with the easy introduction of new and third party services
- The cost basis of the networks has changed and the backbone network is now relatively inexpensive
- The retail market is moving away from call charges and towards flat rate charges and the retail and interconnection charges need to be matched as closely as possible to reduce arbitrage risks.

The model described here is not a completed solution and is not the only conceivable model. Further discussion and work would be needed to resolve all issues satisfactorily but such discussion is best held in dialogue with all interested parties. The description provided should, however, be sufficient for the main aspects to be considered and evaluated.

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A model for interconnection in IP-based networks

1 INTRODUCTION

Telecommunications operators are starting to implement IP-based networks as a replacement for or addition to circuit switched networks both for the provision of telephony and its related services such as fax and also for the provision of new services, including the opportunity for allowing third part provision of services. These new networks are commonly called Next Generation Networks.

The change to IP-based networks offers an opportunity to introduce new commercial models for interconnection that are better suited to the development of future services than the current time and distance (usage) based model. Furthermore the inherent ability for IP-based networks to separate services and connectivity provides a more effective method of promoting service competition than facilities such as carrier selection and pre-selection.

In terms of the market, the traditional telecommunications operators are having to compete increasingly with the provision of services over the public Internet and the adoption of a new model should offer simplifications and cost savings that will help them as the market changes. The model proposed here is not the only new model to be considered and the consultation on the report has shown that the mobile operators in particular are actively considering new models and looking at adapting charging differently to different services. These considerations are much to be welcomed, and it is hoped that this report will be an input to these discussions. However three points need to be emphasised:

- The telcos will increasingly have to compete with the Internet and the Internet uses the model outlined here
- The approach of the telcos, which links service provision with connectivity, adds costs compared to the Internet and whilst it is capable of supporting a variety of charging models it may be less competitive and it may be worthwhile for the telcos to consider a simpler and cheaper approach that is closer to the Internet.
- The Internet allows "innovation without permission" and this is an extremely attractive and fertile environment for the development of new services. In contrast the linkage of services with connectivity being adopted by the telcos will make the provision of new and third party services more complex.

The model presented here is a proposal for discussion and does not represent a policy of the ECC.

Because the purpose of the report is to stimulate discussion, and because several valuable inputs have been received during the consultation, the inputs are attached in Annex 1.

2 DEFINITIONS

GRX backbone: The GPRS Roaming eXchange, which is an international shared transit or backbone network that is run by various commercial entities but coordinated by the GSM Association for the support of GPRS roaming traffic and which may be extended for the support of IMS. The GRX has a form and structure that is similar to that of the public Internet and it uses public IP addresses but is not connected to the public Internet.

Next Generation Networks (NGN): A general term used for networks with a packet-based architecture that will replace the ISDN/GSM2+ generation of networks. In this report the term is used for networks run and controlled by the telcos in contrast to the public Internet.

IP Multimedia subsystem (IMS): The IP-based network planned for the support of both voice and data services within the third generation mobile networks based on the 3GPP standards.

3 REASONS FOR MOVING TO A NEW MODEL

3.1 Support of new services

If NGNs are to support new services and third party services then they need to support these services over network boundaries. The existing usage based charging for interconnection would mean that there would need to be interconnection agreements and charging arrangements at each interconnection point for each service carried over that point and the practical problems of establishing such arrangements for many different new services would be formidable. These practical problems would constitute a huge barrier to the roll-out of new services and innovators would give service innovators a strong incentive to use the Internet instead of the NGNs. The new model therefore needs to separate service provision and connectivity in the same way as the Internet does. This means therefore that we need to consider separately:

- Interconnection (interoperability) at the service level
- Interconnection at the connectivity level.

3.2 Changes to cost structures

Developments in technology and huge economies of scale from the customer premises market have resulted in the costs of core or backbone networks dropping substantially. The existing regulatory and commercial models are built on the assumption of an expensive core or backbone network hence the focus on competition in long distance and international calls through carrier selection and the development of services such as freephone. Figure 1 shows the existing cost model in simplified form. In practice the backbone may be composed of several separate interconnected transit networks.

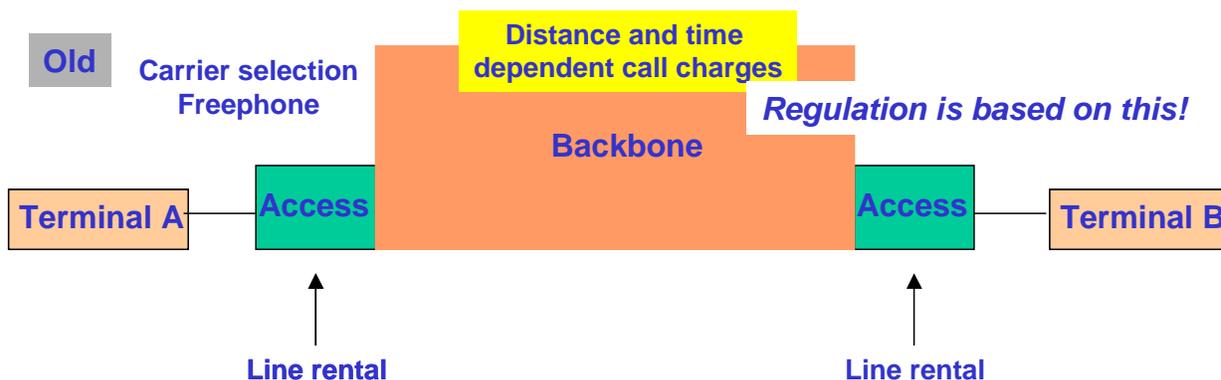


Figure 1: Existing cost model

Figure 2 shows the new cost model.

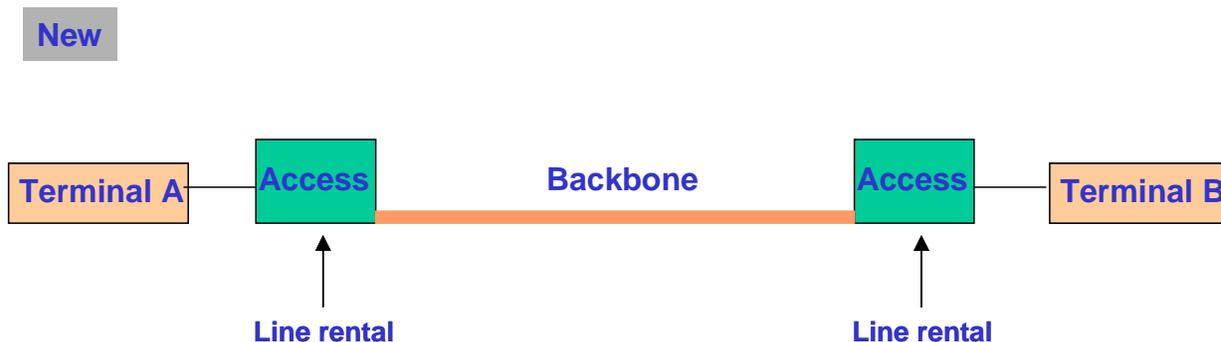


Figure 2: New cost model

The new cost model has applied to mobile networks for some time because of the high costs of radio access and the mobile operators are adopting a charging model similar to that proposed here for services on GPRS. The new cost model suggests that charging should change to capacity instead of usage for the basic connectivity. This charging model has been used in the Internet for many years. Furthermore a change to a new model may help to promote competition between different technologies.

3.3 Simplification

The reduction in costs means that a complex interconnection charging model is no longer justified and that a simpler approach should be sought.

Simplification comes from a combination of two changes:

- Separation of services and connectivity
- Adoption of peering (sender keeps all) between providers of the same service

A model that separates services and connectivity reduces the number of interconnection agreements needed because:

- the interconnection agreements for connectivity no longer need to reflect the charges for different services and
- the operators who are providing connectivity no longer need to know about the services carried over the interconnection points.

This is a dramatic simplification. Consider the following example. If there are three interconnected networks, two local, A and B, and a transit network, T, between them and there are N service providers on A and M on B each providing one unique service and wanting connectivity to all subscribers on A and B. This is shown in figure 3. The consequence is that the interconnection agreements between A and T, and between T and B need to cover explicitly $M+N$ different services.

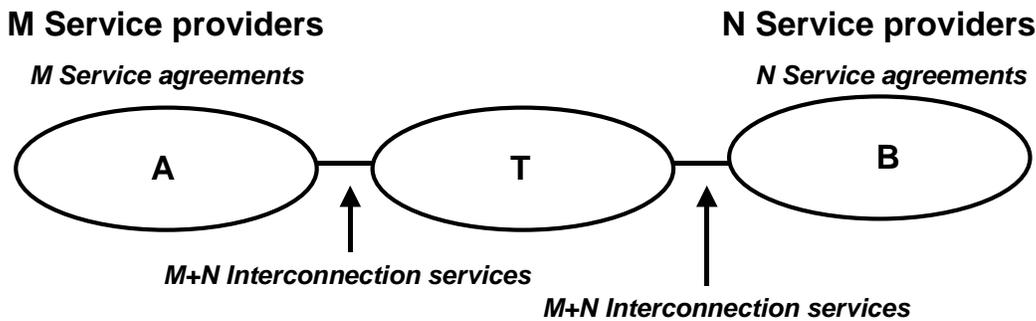


Figure 3: Unique services

If the services are standardised and common to the service providers so that each provides say S services with standardised tariffs as happens for telephony then the situation is as shown in Figure 4.

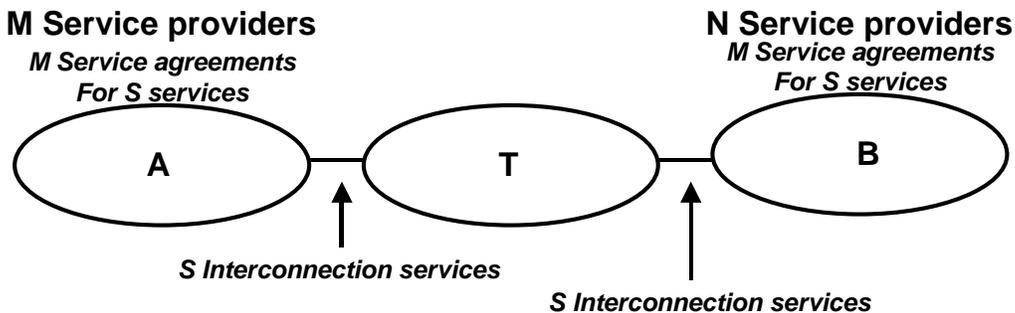


Figure 4: Standardised services

This provides some simplification, but the work in ETSI and ITU-T is not standardising services and so this simplification is not anticipated.

With the model proposed which separates the layers and introduces peering for services (as is the case for email), the situation is simplified as shown in Figure 5.

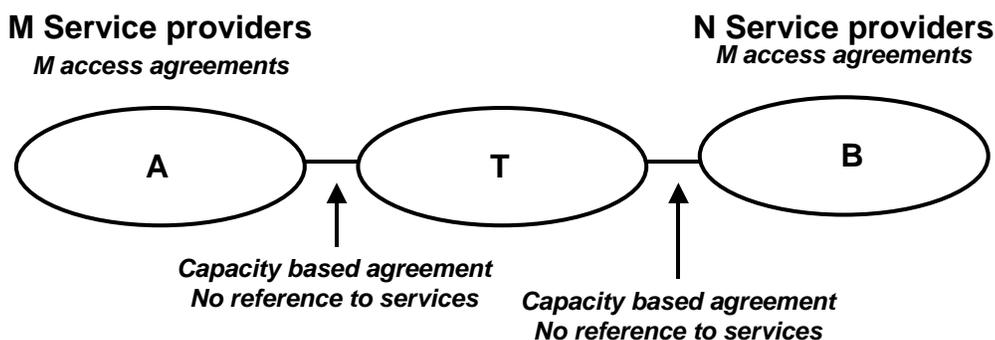


Figure 5: New model

The new model also reduces the costs of interconnection charging because it removes the need for the operators who provide connectivity to log service usage, although in practice this may not be removed completely because of the requirements for data retention for law enforcement.

3.4 Changes to the retail market

The existing retail market is changing with call prices dropping and many operators starting to offer flat rate tariffs where unlimited call volumes are offered for a fixed subscription. This generates the risk of arbitrage and the operators would benefit from having interconnection arrangements that better match the structure of the retail charges. This change is causing many commentators to say that the days of call charges are disappearing.

There is however a small number of high price calls remaining including calls to some countries, calls to mobiles and calls to premium rate services. The model needs to accommodate such calls.

The changes proposed in this Report, however, apply to all services and not just to calls.

4 THE PROPOSED INTERCONNECTION CONCEPT FOR NGN

The NGN is still at an early stage of development especially in relation to the interconnection arrangements. Although the work in ETSI and ITU-T is currently tending to assume the continuation of the "PSTN model" with usage based charges, the mobile operators are studying the development of their GRX backbone for the support of services on the IP Multimedia Subsystem, which is their equivalent of the fixed NGN.

The concept proposed for discussion here is that the NGN should consist of a high quality interconnected backbone network providing connectivity with a separation of connectivity and service provision. This arrangement would allow easy provision of new and third party services and would also allow class-based rather than service based measures to improve quality such as prioritisation in router queues.

At the connectivity level there would be separation between the access systems and the backbone.

This model for the NGN would create a multi-operator backbone platform where the new charging arrangements would apply. This platform would need to be connected to the existing PSTN with its usage based charging via gateways which would handle the special charging arrangements needed for the PSTN. In this way the new model could expand gradually as new operators join and migrate subscribers from the old model to the new. In practice the two models would co-exist for a number of years. This slow migration from old to new would allow operators to minimize their costs and maximize the returns from older technology which could continue to be used for subscribers who only need the PSTN. It would also allow new services to be provided as an overlay.

5 CHARGING

Subscribers would pay separately for connectivity and services, although a single organisation could provide both.

5.1 Connectivity charges

Subscribers would pay for connectivity by paying for access. The retail charges for access could be usage based or flat rate but the usage element would take account only of the volume of bits or packets and not the nature of the service provided. Where access is paid on a usage basis the subscriber would need to pay for incoming as well as outgoing communications. This is what happens at present with GPRS. In practice one would expect that usage based charges for access would be used only where the access systems have relatively high costs such as mobile radio. Also used for some broadband fixed access technologies.

Access payments may be quality related on a class rather than a service basis. This would match the quality issues well because the main quality problems are believed to lie in the access systems.

The access provider would pay the backbone network provider on a capacity basis for connection to the backbone.

Backbone operators would normally interconnect using peering.

5.2 Service charges

Subscribers could pay for services on a usage or flat rate basis but in practice payment for most lower cost services would probably be flat rate.

Service providers would not be constrained by the connectivity providers but would normally base interconnection charging on a sender keeps all basis as this means that services can be interconnected without needing commercial agreements and is one of the reasons why email has grown so rapidly. Email already uses this model.

5.3 Connection to the PSTN

Connection to the PSTN would be via gateways which would be run by service providers for their own subscribers or could be run independently as a "service" to other service providers (ie there could be a few gateway providers in each country who would serve many service providers all around the world for connections with the PSTN in that country).

5.4 Summary

Figure 6 shows the model and the retail and interconnection charging for calls and services within the new model. Say central transit model could have capacity charges. Say SP could be connected to middle transit operator via a different access network. Add access subscription for Terminal B.

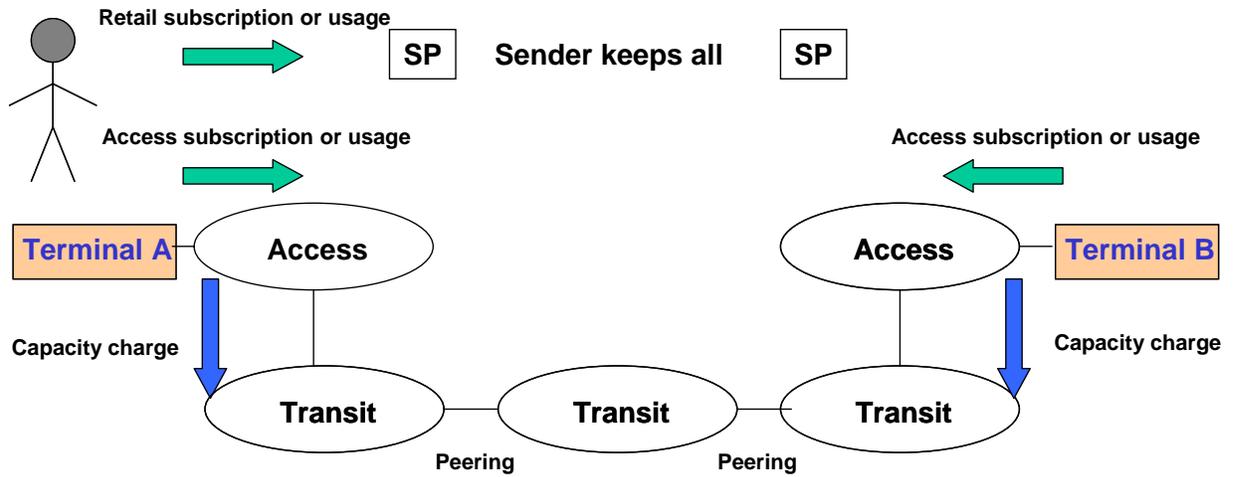


Figure 6: Charging within the new model

Figure 7 shows the model and the retail and interconnection charging for calls and services extended via gateway out to the old model.

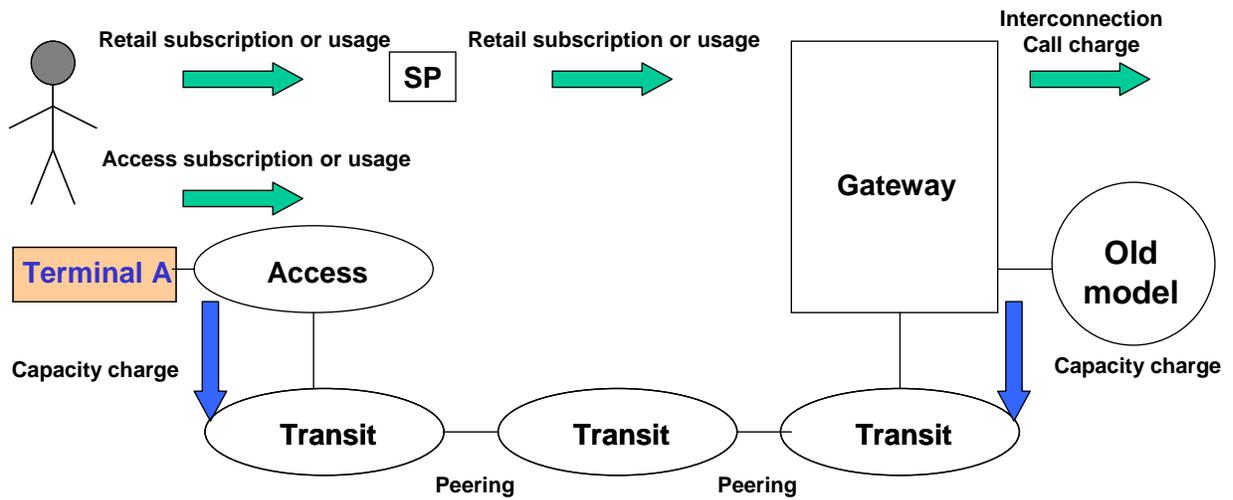


Figure 7: Charging for services connected to the old model

6 CONCLUSION AND NEXT STEPS

The ideas presented here need broad discussion within the industry. Unfortunately the standards bodies normally consider only technical issues and the fixed operators need a body similar to the GSM Association within which they can discuss issues such as this that involve both technical and commercial/operational aspects.

It is acknowledged that some NRAs have already initiated a debate on IP interconnection.

The overall intention is that a migration to a new and better model would not be imposed but would be market led on a voluntary basis.

ANNEX 1: CONSULTATION RESPONSES

Responses were received from one Government department, several fixed and mobile operators, and the GSMA. The main points made were:

- Discussions about interconnection are timely and welcome
- Operators welcome a voluntary approach to change
- Both fixed and mobile operators have no intention to break the connection between services and access with the introduction of NGN and IMS
- The model is only one alternative model; the GSMA is considering several models, which may be applied differently to different services. GSMA is actively studying the development of the GRX.

TRIS has discussed the responses to some extent and plans to discuss them further. However it considers that it is better to publish the report largely unchanged to stimulate further discussion and to include copies of the responses so that different opinions can be evaluated by the reader than to attempt to achieve resolution of all issues before publication. Ultimately it is the market that will resolve the issues and the competition between the NGNs and the Internet.

ECC PT TRIS is grateful to all respondents and willing to engage in further dialogue about the matters raised.

The responses are inserted as objects into the file and can be viewed by double clicking.

Response from BT:



"BT Response to
Models for IP interco

Response from Deutsche Telekom:

"Deutsche
Telekom_Report_75.l

Response from Federal Ministry of Economics and Labour, Germany

"With the draft report ECC introduces an interesting new model as a basis for further discussions for the interconnection in IP-based networks. In Germany as in other states the discussion about how to improve the current system has just started. We regard therefore this draft report as not anticipating the result of a broad discussion. We are looking forward to share our thoughts and ideas in an open discussion with administrations and other interested parties with the aim of creating a common model which fits the needs of IP-based networks better."

Response from France Telecom:

"France Telecom ECC
Report 75.pdf"

Response from GSMA:

"GSMA Response to
ECC consultation IP I

Response from Vodafone:



"Vodafone response
to EEC consultation.d