

Coordinated and Balanced Growth Between Telecom Networks and Internet

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Abstract:

As two existing networks, the telecom network and the Internet differ greatly in terms of business patterns, service quality, security and regulations, whilst technical development makes services provided by the two networks penetrate each other. This article describes the status quo of the telecom network and the Internet as well as the problems faced by each of them, analyzes the causes of those problems, and makes suggestions on coordinated and balanced development of the telecom network and the Internet.

Customers' demands are evolving from pure voice communication to overall information services. Operators are continuing their improvement of total service capabilities, especially in multi-network, multi-service, and multi-terminal information services. The telecom operators are making breakthrough of the dependence on voice services as with traditional telecom operations. The characteristics of multi-network, multi-service, and multi-terminal are becoming a symbol of a modern integrated information service provider. Currently the Internet is undergoing continual technological innovations with rapidly emerging types of services, and even greater progress has been made in the operation patterns and service contents. In point of network scale, the Internet has entered into a phase of rapid growth. From the point of application innovations, three "upstarts" of the Internet—video, search, and wireless—are not only growing at a fast pace but also gradually going band-broadened and mobilized. Their penetration into the traditional telecom services becomes even faster. In such a context, there is a hot topic of integrating the telecom network with the Internet. The telecom network is evolving into the packet-based NGN, while the Internet is

evolving into the Next Generation Internet (NGI). Both NGN and NGI are packet-based networks. Everyone believes the telecom network and the Internet are to be converged, but the problems are in which layer they are converged, where they are differentiated from each other, and how they grow in future^[1-3].

1 Status Quo of Telecom Network and Internet

Over a long time the telecom network and the Internet run distinct network systems and operation patterns, which have caused diversity in services, user/terminals, access methods and networking technologies. However, the growth and changes of the networking technologies are resulting in mutual penetration of services as well as the trend of convergence of users and terminals, and the networking technologies are affecting and penetrating each other.

1.1 Services

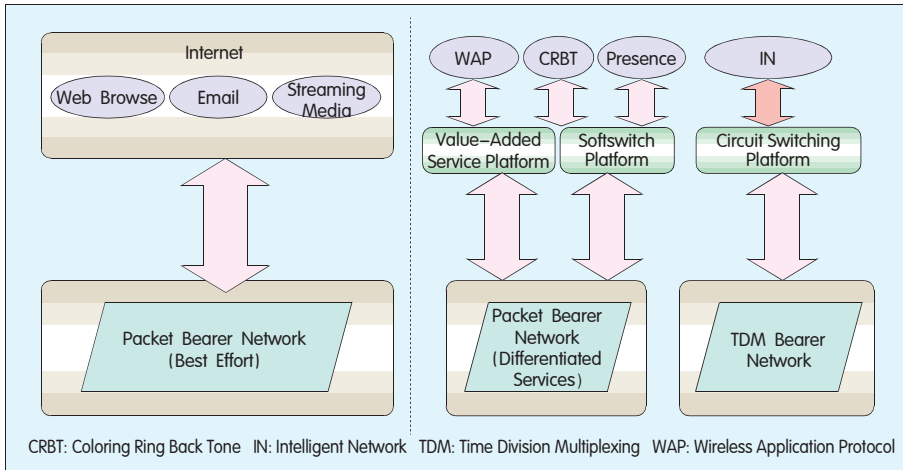
Traditional telecom network provides two types of services: terminal service (such as voice and short message) and bearer service (such as bearer lease and Internet access). The services provided by the Internet include voice

communication service (such as Skype), information/content service (such as news and content search), and industrial service (such as Ctrip and e-commerce).

It can be seen that there is no obvious border between the services of the telecom network and the Internet. On the one hand, the penetration of the Internet into the traditional telecom industry is going faster. For example the voice services with the traditional telecom network are also provided now by the Internet, and the users can enjoy the streamed media, mobile phone search, short message addressing services and more through their mobile phone terminals. On the other hand, the telecom operators are taking advantage of the rich information resources with the Internet to provide users with some comprehensive and integrated information services.

1.2 Users/Terminals

Terminals are the point that is closest to users in the whole value chain and also the implementator of services. Two sets of completely different terminal devices have always been used for the telecom network and the Internet. As the key terminals for the telecom network, fixed-line telephone and mobile phone are characterized by simplicity and



▲ Figure 1. Architectures of telecom networks and the Internet.

flexibility, while the powerful and intelligent PC and laptop used as the terminals of the Internet are not comparable in terms of mobility and flexibility. Despite of compact or mini laptops being launched by more and more vendors, they cannot get rid of the binds with Internet terminals by the roots.

The penetration of the Internet into the telecom network is reflected by one of the important signals that user demands are evolving from traditional communication services to the experiential services that are bound up with life and have diversified types. Now, most major telecom manufacturers are releasing smart phones and Personal Digital Assistants (PDAs), which are regarded as the representative of terminals for the integration of the two networks. Both terminals share the same characteristics—they not only inherit the powerful functions of Internet terminals but also introduce the convenience and mobility with telecom network terminals.

1.3 Service Access Methods

Telecom networks provide the traditional users with the access methods including twisted pair and GSM/CDMA 1X. Meanwhile, the telecom operators leverage the traditional telecom network resources and data network to provide Internet accesses, including dial-up via the Public Switched Telephone Network (PSTN), GPRS/CDMA 1X, Digital Subscriber Lines (xDSL), Local Area Network (LAN), and Wireless Local Area Network (WLAN).

It can be seen from the service

access methods that the Internet users are the data users in telecom network. The Internet accesses are implemented majorly through the access network, voice network, or data network of the telecom operators. If the Internet is regarded as a service network, the telecom network is providing bearer for the Internet.

1.4 Network Technologies

As two existing networks, the telecom network and the Internet vary in operations, business patterns, service quality, security, and regulation matters due to the discrepancy in their initial design ideas. Figure 1 illustrates the model of the existing network architectures of the telecom network and the Internet.

Though similar services are available in the telecom network and the Internet, including voice and multimedia services, they differ in many aspects, such as QoS and security, due to the discrepancy in initial design ideas.

(1) Service Control

In the Internet the users get involved in the application innovations and service provisioning, and it is difficult for the network operators to predict the services and thus manage the services to be provided. The most possible way is to manage the network service they are accessing. The backbone network operator as the channel provider is providing the interconnection services for the access service providers, and the access service providers provide direct access of the services for the users. The

content providers are in a peer position with the users, and the user can provide services and use the services available on the network. The mechanism to provide services and the business patterns are different. The services of the telecom network are provided under the network control to realize security and guaranteed quality, so it is possible to charge the services specifically. In contrast, the services of the Internet are implemented by user terminals while the network's only function is a channel for the best-effort peer-to-peer transfer, so the users only pay for the related accesses, as well as the related content usage to the content providers.

Since the services of the telecom network are provided by the operators, the operators and network equipment execute management and control over the services to be used by the users.

(2) QoS

Since the telecom network and Internet are providing services at different layers, the mechanism to realize service quality may also be different.

The telecom network provides services at the service/application layer, thus is able to perceive the type of the services and then reserve resources for the sessions or other mechanism (non-session services) of the specific services according to the network resources. So, the end-to-end QoS can be guaranteed for the user (or surely in a coarse management manner). The internet provides services at the network layer and only needs to guarantee the access resources for the users. For such a versatile and global-scale network, it is difficult for the Internet to guarantee end-to-end service quality for the users. Also, the service quality of the service layer is not the duty for the network operators.

The telecom network and Internet are two implementations of network to meet different demands of people. Just like the consumption of clothes, some like brand fashions, enjoy high quality and pay higher prices, but the others prefer plain clothes at acceptable prices. So, the two networks bring diversifications of network services. Despite some known constraints, the Internet demonstrates advantages in such aspects as cheap prices and flexible services, and that is

the reason why it is growing and accepted by people at such a quick pace. If added with the characteristics of the telecom network, the Internet is not the Internet anymore. As long as people needs are concerned, the Internet will maintain its presence and growth with its inherent traits.

(3) Security

Since the telecom network provides the service/application-layer services and has to perceive user services, the security of the user service is surely necessary in service provisioning. The services out of the service network or unsecure information flow shall be rejected by the network. Telecom network provides the network-layer services and need not perceive the Internet services, and it is difficult to know the information for the Internet, so the network supervision mechanism is necessary to monitor the whole network from the point of the state security and regulation demands.

2 Growth of Telecom Network and Internet

2.1 Analysis of Operation Patterns for Telecom Network and Internet

To discuss the growth of the telecom network and Internet, the operation pattern of the operators is an important factor to consider. A traditional telecom operator relies on the increase of infrastructure construction and subscriber base to grow its revenue. Once the subscriber base reaches saturation, revenue growth will depend on the addition of new services by increasing the Average Revenue Per User (ARPU) value. Yet most new services and information currently come from the Internet, which is open and versatile and can deliver almost all information and resources people need. There are higher and higher dependences on the Internet that is free and welcomed by most people.

A common problem faced by the telecom network and operators is the replacement of mobility, and the operation of the fixed-line telephone is getting into the corner from "volume increases without revenue increase" to the worse situation "volume decreases

with revenue decrease". According to the financial report 2006 of China Telecom, an unprecedented negative growth was seen with its predominant fixed-line voice service, with net profit of RMB 27.142 billion (including the earnings of set-up fee), a year-on-year drop of 2.8 percent. And, an unprecedented negative growth was seen with the fixed-line subscriber base of China Netcom, with net profit of RMB 12.96 billion, a drop of 6.7 percent.

Nonetheless, for traditional fixed-line operators, the income from voice services accounts for 70% of the total revenue and that for Internet services account mere 10% or so, of which nearly 90% is contributed by broadband services. For mobile operators, about 80% income is contributed by voice and short message services. Despite the drop of voice service's contribution to the total revenue of the operators, it is still the major source of income for telecom operators.

The operators in future can be generally divided into two types: channel provider and content/service provider. Then, the traditional telecom operators are just the network operators (channel providers). Some who do not regard the voice service as channel service may disagree with that. We have to say that it is different from content services. Indeed, the voice service provided by the traditional telecom network is not the generally known channel service, which adds the requirements for encoding/decoding, QOS, regulation, etc., in addition to providing a channel for voices. However, in next generation networks, the terminals will become more and more powerful, and some functionality that is originally implemented by the network will be moved onto the terminals. At that time, the voice service provided by the network operators will become a channel service, such as the voice service provided by the Internet. The service providers of the Internet are actually the content/service operators. Some may think that positioning the telecom operators as channel operators may hold back their transformation into integrated information service providers, and they will grow difficultly just by selling network traffic.

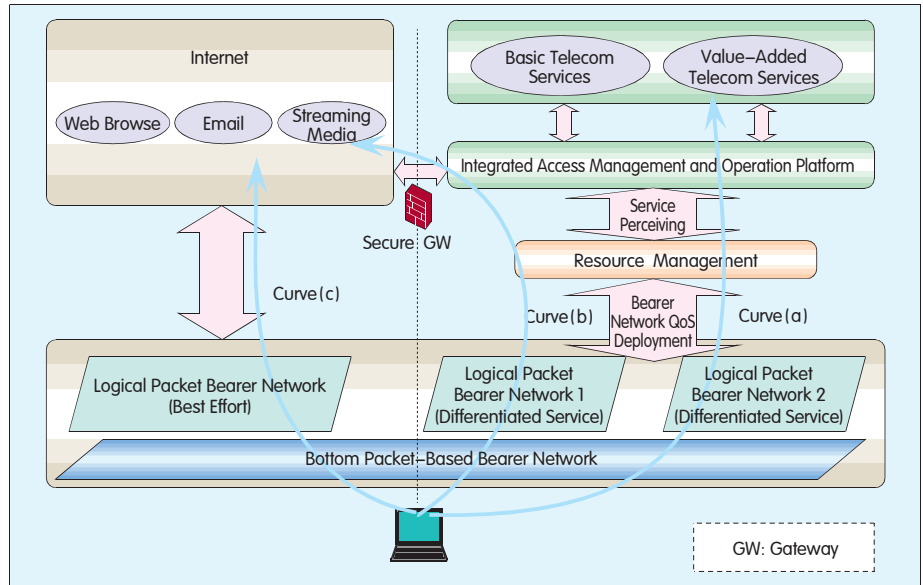
Telecom operators are in scale operation, and they grow by increasing subscriber quality, with the network characterized by whole line and whole net. The content and Internet service operators feature small scale, strong industrial specialty and fast change. Although telecom operators can provide some content/service-related services, it may be found that a huge operation company over a long run cannot adapt to the fast-changing content/service market with clear industrial characteristics. Just like a large shipping company which runs a small fashion shop at the same time, different targets and directions will naturally result in breakaway of the company.

In fact the telecom operators encounter some problems in the existing operation pattern, but still have chance to operate network. Currently the voice subscribers nearly reach saturation, and plus the decrease of ARPU of voice subscribers, the drop of voice service revenue has been an inevitable trend. New services are emerging one after another along with the consistent and fast growth of the Internet. Especially the emergence of wiki, bookmark, podcast, weblog, video search and mobile Web 2.0 is making the Internet an ocean of information and knowledge and drawing more and more dependence from people. Yet there are problems with the growth of Internet, such as Internet security, QoS as well as business pattern of the Service Providers/Content Providers (SPs/CPs). Now the SPs/CPs operate in a backward charging mode. But the companies' investments on advertisement are limited, and the "cake" of advertisement will not be endless even if "precision strike" is executed. Most companies except for several giants in the Internet industry are facing problems in growth. Joining hands between the telecom industry and Internet industry and creating a coordinated development environment is worth the reflection of all people involved.

An existing problem is as follows: the telecom operator controls the network resource and user resource but the operator provides the users with a best-effort channel. All Internet users crowd in that single channel, and the telecom operator is not making the most

of the network resources. The Internet contains rich information resources, but the backward charging mode of Internet services creates difficulty to the business pattern because the QoS cannot be guaranteed for the users. The users have to enjoy such kind of best-effort services, which limits the demands for quality services of users in some special circumstances, and limits the "refined" operation or "traffic-based" operation of the operator as well as the forward charging business mode of the SPs. For example, the NBA program is not broadcast on TV but on the Internet, and some users hope to watch the quality-guaranteed NBA program at certain charges. This kind of temporary free contents for the users impairs in long term the SPs' enthusiasm of service innovation and CPs' enthusiasm of content innovation, holds off the development of Internet services and finally causes degraded service quality for the users. Similarly, the business pattern of monthly flat fee for the Internet is also unfair for all users. The same payment for any usage in a month encourages the users to consume bandwidth maliciously, resulting in degraded service quality of the network.

While maintaining the current business patterns of the telecom network and Internet, it is necessary to explore another pattern: the users connect to a paid access channel of the network operator to request some service. This service or content comes from the Internet SP/CP, and the SP/CP and the network operator negotiate to provide a quality-guaranteed service channel from CP to the user. Similarly, SP can also serve the users by providing sufficient resources under the condition that the user has to pay the foreground network operator. Not providing such service/content, the network operators need to perceive the service/content so that the service revenue can be shared with the service providers, and also need to obtain the information so as to provide the related network resources for the user services. This service and operation pattern creates an opportunity of forward charging for Internet service providers and new development space for the network operators. It brings an option for the user to choose a paid but



▲ Figure 2. Architecture of the converged telecom network and Internet.

quality-guaranteed service.

2.2 Growth of Telecom and Internet Industries

In the future network operations, the telecom and Internet industries can exert their own advantages and characteristics.

(1) The telecom operator or the telecom industry shall set foot in the scale operation on the telecom infrastructure or value-style channel operation, and it shall be a development trend to charge by service traffic control or service (or application) perceiving.

(2) The Internet operator or Internet industry shall look at social informationalization, specific industrial applications and small scale operation, and staying in the advertisement operation pattern shall not be the development trend for the SP/CP.

(3) The telecom operation and Internet operation shall be integrated to provide integral and quality-guaranteed services and applications. A combination of free and paid operations shall be a trend in the future for a win-win situation of both sides and the flourishing industry.

2.3 Growth of Telecom Network and Internet

(1) Convergence of Telecom Network and Internet at Bearer Layer

Both the telecom network and Internet in the future will be packet-based

networks. Despite different service operators, the bearer networks are provided by network operators, as shown in Figure 2. Although the Internet has a best-effort logical network while the logic network of the telecom network is based on service perceiving and control, they can totally be integrated into one single physical bearer network because of the same bearer technology used.

(2) Basic Telecom Service Network
Due to the free and open characteristics and problems with the business pattern, the revenue of Internet is not comparable to that of the telecom network. Despite the downtrend of revenue of the telecom operators' voice service, especially the fixed-line voice service, due to the impact of data services with the Internet, the voice service is still the mainstream source of the revenue for the telecom operators and also an indispensable service for the users. This predestines the existence and future growth of the basic telecom network services of the telecom operators. This kind of service provisioning mode follows Curve (a), shown in Figure 2.

(3) Internet Service Offering Through Management and Operation Platform

In facing the challenging opportunities brought by fast and flourishing growth of the Internet, it has become a major trend for the telecom industry to build an open and

comprehensive access management and operation platform. This enables the telecom operators to make use most of its network resources and add support capability to new services and applications, so that they can work closely with various SPs/CPs and grow into integrated information service providers. This kind of service provisioning mode follows Curve (b), shown in Figure 2.

The operators will no more rest on simply collecting charges for Internet SPs/CPs, but provide a network of differentiated services to attract more users and SPs/CPs to use the network resources, which is well exemplified by the data services of China Mobile, and thus share the fruits of the thriving Internet industry. The advantages of the telecom operators are the network resources and user resources they are controlling. In the trend of packetized network and services, the telecom operation shall improve their power to provide differentiated services of the network, to meet the specific needs from the users, CPs/SPs and related service applications.

Along with the penetration of Internet services into the telecom network as well as the competition from Internet and other telecom operators, the recent growth trend of the fixed-line and mobile operators shows that the telecom operators, in addition to the existing basic telecom services, shall introduce Internet services at an accelerated pace to boost its competitiveness and revenue, including third-party application, contract with SPs/CPs for sharing user resources of telecom operators, charging system, marketing network, promotion channels, unified

customer services and more. The telecom operators can integrate network resources and capabilities with the applications/services provided by Internet SPs/CPs, to provide more enriched service features, and differentiated services for different applications, including QoS technology for the bearer network, service perceiving technology, the building of service platform for stronger control, and more.

The service mode of integrated access operation platform and SPs/CPs' quality guarantee may evolve the backward charging operation mode of SPs/CPs by providing portal website into a forward charging mode. That will be a win-win game: SPs/CPs will no more rest on the mere backward charging operations and quest for a forward charging operation mode by providing services of different levels for the users through the service operation platform of differentiated network channels and services; the telecom operators will be able to share the service incomes with SPs/CPs by means of service perceiving and differentiated network services.

(4) Existing Internet Service Offering

Through the integrated access management operation platform of the telecom operators, the user can access the SPs/CPs who have a contract with the telecom operators, to obtain various services. This will ensure the QoS as well as security to some extent, allowing different requirements of QoS for different users. Certainly the provisioning mode of the existing Internet services continue to exist, that is, the user directly accesses the Internet in various ways, and the telecom operators only provide a best-effort data transport channel, as

shown in Curve (c) in Figure 2.

3 Conclusion

The growth of the telecom and Internet is driven by technologies on one hand, and relies on the operators of the telecom network and Internet as well as their respective service provider, i.e., the telecom operators and SPs/CPs on the other hand. The analysis of the operation patterns of the service providers involves many aspects. This article attempts to raise some ideas for the growth of the telecom network and Internet in future by analysing the current service provisioning modes of the telecom operators and SPs/CPs. Any comments and advice are welcome from the readers.

References

- [1] ITU-T Recommendation Y.2213. NGN Service Requirements and Capabilities for Network Aspects of Applications and Services Using Tag-Based Identification [S]. 2008.
- [2] ITU-T TD 53 (NGN-GSI) Draft Recommendation Y.2111 Revision 1 (0.6.0). Resource and Admission Control Functions in Next Generation Networks [S]. 2006.
- [3] ITU-T TD 109 (NGN-GSI). Requirements for Support of Ubiquitous Sensor Network (USN) Applications and Services in NGN Environment [S]. 2008.

Biography

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Xu Heyuan is a chief engineer of the Institute of Communication Standards Research, the China Academy of Telecommunication Research (CATR) of the Ministry of Industry and Information Technology (MIIT). He is also a master advisor of the CATR, the team leader of the signaling and protocol working party of the Network Switching Technical Committee of China Association for Standardization, and a member of the science and technology committee of the MIIT.

Roundup

ZTE Tests Integrated NGN Solutions at GMI 2008

ZTE Corporation announced its participation in the Global MSF Interoperability (GMI) 2008 event held by the MultiService Forum (MSF) to advance the development of NGN. ZTE provided the interoperability capabilities of its IMS, wireless broadband access Infrastructure and IPTV Solutions in three of the five networked MSF GMI 2008 host sites around the world (the USA, P. R. China and the UK).

GMI 2008 is a worldwide multi-vendor interoperability test environment organized by the MSF, where critical next generation network elements are verified in a number of practical scenarios.

Previously, ZTE had successfully participated in the GMI 2006 at Verizon's lab, which focused on fixed mobile convergence supporting the IMS service framework.