tudy Paper on Trends in onvergence and Regulatory ractices

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ced level programming along with latest circuit designing techniques have made it e to merge the telecom and broadcasting services for delivery to the end customer using e IP platform. It has now become possible for a cable operator to provide telephony and band services and similarly we can see the mobile TV services being provided in advanced of the world. This shows that telecom and broadcasting networks are now supporting the es of each other. This has opened new business avenues for service providers and also many challenges for regulators in terms of establishing new licensing/regulatory regime. **egulatory regimes which discriminate between service providers on account of services g bottleneck in way of convergence.** The aim of this paper is to explore the trends in rgence and the associated regulatory reforms required for Pakistan Telecom Sector. It e noted that PTA came up with CVAS regime and on the recommendations of MOITT it inally introduced as data license and voice license. This was a major step towards reducing se categories which were no more required as per the international trend.

Introduction

egulators around the world are working on regulatory reforms to take care of convergence elecommunications and broadcasting markets. They want to support the provision of verged services with the objective of promoting the innovation, the reduction of prices and ncrease of efficiency in the provision of services.

he legacy networks the regulatory frameworks were often based on wireline, wireless or adcasting services. The markets were divided into local and long distance segments. ivergence has blurred these boundaries. In light of this, the regulatory reforms for iverged systems should focus on:

a. Introduction of the principles of technology and service neutrality

b. Greater flexibility in key aspects of existing regulatory framework like licensing which includes rights and obligations of operators, interconnection framework, numbering, QoS, universal service, and spectrum use. There are two main approaches in licensing reforms:

   - *Regulators have simplified the licensing structure* which involves the consolidation of different services in a single licence/unified licence.
   - Reduction of the administrative requirements to enter a telecom market. It means that regulators, instead of giving a service specific license, establish a general authorisation to allow more services or the establishment of registration system that replace licences or general authorisations. One extreme of this approach is open entry.

The regulatory reforms stated above are indeed vital as the importance of this subject has been recognized at the highest level; including World Summits for Information Society (WSIS). Decisions taken in WSIS have been indorsed by UN General Assembly. Major developments during the period 2002-2006 have occurred in the telecommunication/ICT environments that have significant and far-reaching implication including [1]

- The convergence of technological platforms for telecommunications, information delivery, broadcasting and computing and the deployment of common network infrastructures for multiple telecommunication services and applications;
- The continued growth, albeit uneven across countries, of the Internet and other IP-based platforms and related applications, and the deployment of national and regional IP-based backbone networks;
- The continuing rapid development of wireless and mobile radio communications, and their convergence with both fixed telephony and broadcasting services;
- The need for high-quality, demand-driven international standards, which are developed rapidly, in line with the principles of global connectivity, openness, affordability, reliability, interoperability and security;
- the substantial investment of resources being made by service providers and equipment manufacturers for standards-making in next-generation networks (NGNs);
- the emergence of key technologies, including radio-frequency identification (RFID) and sensor-network technologies, which will be, among others, vehicles for creating new services and applications, enhancing efficiency in a revolutionary way and thereby promoting the building of the information society;
- The conviction, as set out in para. 15 of the Tunis Commitment, adopted by WSIS, that ICTs are, among others, effective tools to promote peace, security and stability;
- the delivery of audiovisual services and applications over a wide variety of platforms, including both fixed and mobile networks, resulting in increased competition for media distribution;
- the continuing trend towards separation of regulatory and operational functions and the creation of many new independent telecommunication regulatory bodies, in particular in developing countries and regional economic areas, as well as the growing role of regional organizations, in order to ensure the consistency and predictability of regulatory frameworks, and encourage capital investment.

[1] This text and the following sub-paragraphs are copied verbatim from 2 of Annex 1 of Plenipotentiary Resolution 71, apart from the last four years" to "during the period 2002-2006".

- continuing market liberalization, in particular in developing countries, including greater competition, private-sector participation and licensing of new market entrants;
- the trend in a number of Member States to regulate telecommunications/ICTs with less reliance on sectoral regulation in competitive markets;
- encouraging the effective use of telecommunications/ICTs and recent technologies during critical emergencies, as a crucial part of disaster early warning, mitigation, management and relief strategies;
- ongoing challenges relating to capacity-building, in particular for developing countries, in the light of rapid technological innovation and increased convergence;
- significant differences and shortages, within and amongst Member States, both in deployment of telecommunication/ICT infrastructures and in the capability to use them to access information (i.e., the digital divide), particularly the lack of high capacity national backbone networks in developing countries, which would constrain the smooth introduction of the next generation networks;
- Increased awareness of the role of ICTs as a tool for the development of society;
- The important role of multilingualism is to enable all countries to participate fully in and contribute to ITU's work, and in creating a global information society opens to all.

NGN networks are rapidly proliferating and telecom operators prefer them over the legacy works. This has raised many challenges for the regulators around the world.

above list of developments clearly spells out the importance of convergence and regulatory orms needed for its support.

2. Technical Perspective of Convergence

ITU-T Recommendation Q. 1761, 3.1 defines convergence as the coordinated evolution of formerly discrete networks towards uniformity in support of services and applications.

In light of above definition, it is no more voice, data and video service, rather in the converged environment, it is packet based service. Fixed and mobile networks are changing to ubiquitous networks providing seamless connectivity. Voice and data networks are merging. The trend for voice is shifting from PSTN network to mobile network. This has caused the transformation of the telecom industry which includes:

- The emergence of VoIP;
- The migration to an all-IP environment;
- The influence of the Internet, especially in VoIP and peering
- The emergence of Peer-to-Peer (P2P) technologies (e.g., Skype). The Skype is one of the most popular VOIP service present around. It is based on peer to peer communication.

Alternatively it can be said that networks have merged. e.g in case of legacy environment, there were separate networks for voice, data and Cable TV services. In the converged environment single network (NGN) can support such services.

2.1 Fixed Mobile Convergence (FMC)

It is the convergence of Fixed (wireline) and Mobile (wireless) networks, services and terminal ITU-T recommendation Q.1761 highlights principles and requirements for convergence of fix and existing IMT-2000 Systems. FMC according to Q.1761 is *"Mechanism by which an **IMT-20** user can have his basic voice as well as other services through a fixed network as per subscription options, capability of the access technology."*

The ETSI has defined it as:

"Fixed Mobile Convergence (FMC) is concerned with the provision of network capabilities wi are independent of the access technique. This does not imply the physical convergence networks. It is concerned with the development of converged network architecture supporting standards. This set of standards may be used to offer fixed, mobile or hybrid servi

An important feature of fixed mobile convergence is the separation of the subscriptions services from individual access points and terminals and to allow users to access a consisten of services from any fixed or mobile terminal via any compatible access point. An imp

sion of this principle is related to internetwork roaming; users should be able to roam een different networks and to be able to use the same consistent set of services through visited networks."

se of networks, FMC means that same network (access & core) is used for fixed and mobile ces. Therefore an IMT-2000 mobile network user should be able to register in a fixed ork to obtain the same set of services normally available in the subscriber's home ork, except terminal mobility. Subscriber's registration, authentication and access to er service profile server of the home network by the visiting fixed network need to be ed. This particular case of convergence would apply in areas where 3G radio technology is vailable. In such cases the fixed network should provide the access to user.

e are different access means under consideration for IMT2000 user. These are[2]:

Multiple IMT-2000 Family members.

Fixed access, with seamless mobility with mobile systems : xDSL, Cable, narrowband (for IP services), WLAN in hot spots (e.g., WISP), etc.

Digital Audio Broadcast (DAB).

iously one cannot expect to have one terminal in such diversified access means; therefore it ossible to have different terminals to access same set of services in different networks.

- In case of services, FMC means that same service is obtained by customer in different kind of networks using different terminals.
- In case of terminals, FMC means that same terminal is used for accessing services offered by different networks. According to ITU[3]

"By standardizing access technology independent User Identity Module (UIM), any user ould be able to move anywhere in the world carrying UIM as a global roaming instrument. e user would not be required to carry highly complex multi mode radio technology terminal uipment. Instead the UIM would be compatible with all kinds of user terminals catering for y wireless or wireline access. Globally applicable mobile terminals supporting all the MT-2000 family member interfaces are still being developed and may not be widely available r some time."

2.2 Benefits of FMC

here are a number of benefits of FMC for the user which include:

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[2] ITU Q.1761
[3] ITU Q.1761

- Bundling of services reduces the cost for consumer.
- Convenient usage of the bundled services (Configuration, single billing)
- Seamless service experience.
- Provide services to a mobile user in an area where a radio network is not deployed
- Better utilization of radio spectrum in IMT-2000 networks
- Initial deployment of IMT-2000 network in small pockets would become attractive.

Similarly the benefits for the operators include:

- Network deployment and operational cost reduction.
- Bundling of services and offering better packages to consumer.
- Reuse the fixed line assets.

2.3 IP Multimedia Subsystem

The most prominent solution of FMC is IMS (IP multimedia subsystem). It is a standard that defines a generic architecture based on SIP which allows multiple real-time applications to run across a single network. According to IBM, IP Multimedia Subsystem (IMS) is a set of specifications that describes the Next Generation Networking (NGN) architecture for implementing IP based telephony and multimedia services. Although it was initially designed by the 3rd Generation Partnership Project (3GPP) for mobile networks, newer releases of IMS are designed to be access- agnostic so that it can be used by any type of access method, be it a fixed line, GSM, CDMA2000, WCDMA, Wireline broadband access, WiFi or WiMax. IMS defines a complete architecture and framework that enables the convergence of voice, video, data and mobile network technology over an IP-based infrastructure. The important landmarks in development of this most significant standard are:

- In 3GPP Release 5, "Session Initiated Protocol" (SIP), defined by the Internet Engineering Task Force (IETF), was chosen as the main protocol for IMS.
- In 3GPP Releases 6 and 7 additional features were included like presence and group management, interworking with WLAN and CS based systems, and fixed broadband access.
- 3rd Generation Partnership Project 2 (3GPP2), also standardized their own version of IMS which was quite similar to 3GPP's version with suitable adjustments.
- On top of IMS infrastructure, there is a service standardization process. For this purpose Open Mobile Alliance (OMA) plays an important role on specifying and developing IMS service standardization. The services defined by OMA are built on top of IMS

infrastructure, such as Instant Messaging (IM), Presence service, and group management Service.

Benefits of IMS

benefits of IMS are:

- Reduced time for delivering the new services to customers. Through the standard interfaces in IMS, the new services developed by third party can be made part of network.

- IMS is capable of enabling Quality of Service within the IP network which improves and guarantees the transmission quality. This is not the case in BE (Best Effort) QoS networks (which are typical in many wireless broadband networks), in which no BW is reserved for any user. An operator can only define "Maximum Sustaining Rate' for BE users, i.e. restrict them to reach a particular value.

- The operators need readily available charging schemes which could be used according to service type. IMS allows the operators to determine how to charge the users based on service types, i.e. they can choose to charge user by the number of bytes transferred, by the session duration (time-based), or perform any new type of charging.

5 IMS Architecture

S consists of different layers each responsible for specific function. The following figure ows a typical structure of IMS network.The IMS architecture provides a variety of choices for ers to choose end-point devices. The IMS devices such as computers, mobile phones, PDAs, d digital phones are able to connect to the IMS infrastructure via the network. Other types of vices, such as traditional analog telephone phones, although they are not able to connect to IP network directly, are able to establish the connection with these devices via a PSTN teway. The functions of various layers are: