FIXED MOBILE CONVERGENCE (FMC)

A TYPICAL FMC NETWORK

IN THIS ISSUE

1.0   Introduction :

Fixed Mobile Convergence (FMC) in simple terms & broader sense can be defined as the convergence of Fixed (wire line) and Mobile (wireless) networks, services and terminals. FMC will enable the subscriber to access a wide variety of communication, information and/or entertainment services, with consistent quality of service regardless of the device and the underlying network over which those applications run or the user's location. The diagrammatic representation of FMC is given in Figure1.
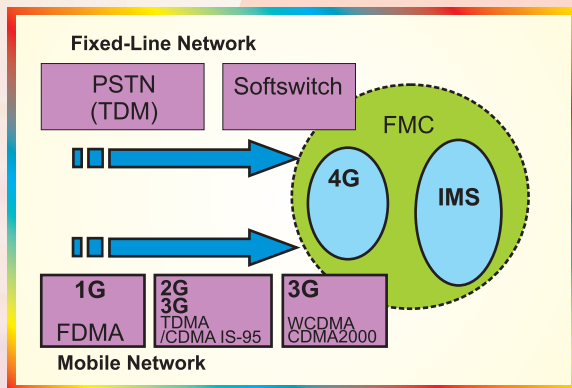

Fig. 1

2.0   Principles of Fixed Mobile Convergence (FMC) :

The Principles of Fixed Mobile Convergence (FMC) basically revolves around the fact that the same services are available to the user whatever the access network i.e, services subscriptions are not linked to access networks. There is complete service continuity and ubiquity, whether at home or at office; on the move or on the pause; irrespective of the access network technology, as shown in Figure 2.

3.0   Key advantages of FMC
3.1   Seamlessness :

(a)   Seamlessness at terminal and network level e.g. calls handover: Calls originating on the fixed network can move to a wireless network and vice versa, or between different wireless

networks such as Wireless Fidelity (Wi-Fi) and 2G, with no interruption or change in service quality.

(b)   Seamlessness at the service level e.g. transferring applications from one network platform to another

3.2   User flexibility in access methods:

User can use the most appropriate access technology, such as WiFi or cellular, based on criteria such as current location, required application, quality of service and call tariffs.
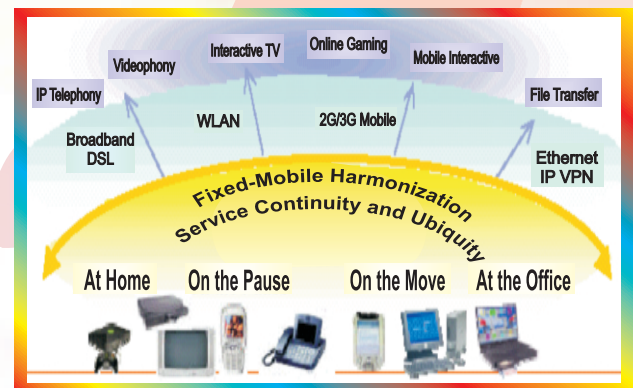

Fig.2

3.3   Single terminal:

A converged subscriber terminal will allow users to use only single terminal instead of different terminals (e.g. a fixed-line phone, Internet access terminal, mobile phone, Personal Digital Assistant (PDA), laptop etc.) presently being used, depending on access (e.g. fixed line, mobile, internet) or application (e.g. voice & data at home or on move, Short Message Service).

3.4   Personalisation:

The availability of converged terminal will enable users to have a unified identity instead of present multiple identities .For instance identity for fixed line subscription, identity for mobile subscription, or identity for (Wi-Fi) subscription etc. It will also enable the user to have a single personalised address book, mail box etc.

4.0   Definitions :

As per International Telecommunication Union (ITU-T) Recommendation Q.1761: Principles and Requirements for Convergence of Fixed and Existing IMT-2000 Systems, the definition of Fixed Mobile Convergence is : *Mechanism by which an IMT-2000 user can have his basic voice as well as other services through a fixed network as per his subscription options, capability of the access technology.*

As per European Telecommunications Standards Institute (ETSI) : *Fixed Mobile Convergence (FMC) is concerned with the provision of network capabilities which are independent of the access technique. This does not imply the physical convergence of networks. It is concerned with the development of converged network architecture and supporting standards. This set of standards may be used to offer fixed, mobile or hybrid services.*

An important feature of fixed mobile convergence is the separation of the subscriptions and services from individual access points and terminals and to allow users to access a consistent set of services from any fixed or mobile terminal via any compatible access point. An important extension of this principle is related to internetwork roaming, users should be able to roam between different networks and to be able to use the same consistent set of services through those visited networks.

5.0   Expected benefits :
5.1   For the user:

i)   Cost reduction: convergence of services or bundling of services could reduce the cost for basic communications.

ii)   Convenient usage of the bundled services, i.e. easier configuration, single billing and settlement of account with only one operator.

iii) Seamless service experience, whenever and wherever it is, the end-user could enjoy the same experience only relevant with the capabilities of the terminal.

5.2   For the Operator :

i)   Bundling of services due to Convergence of different services

ii)   Cost reduction (network deployment and operation)

iii) Reuse the fixed-line assets from traditional fixed operators and mixed operators.

iv)   Provide better coverage and QoS to end-users from traditional mobile operators.

6.0   Network Environment:

The following are among the access mechanisms envisaged:

i)   Multiple IMT-2000 family members.

ii)   Broadband wireless access such as WiFi, Worldwide Interoperability for Microwave Access (WiMAX) etc.

iii) Fixed access such as xDSL, Cable, legacy PSTN systems

iv)   Legacy mobile systems such as CDMA, GSM etc.

It should be noted that the various systems listed above encompass different bandwidth capability, as well as different access technologies (not only General Packet radio Service (GPRS), Wideband Code Division multiple Access (W-CDMA), (CDMA2000) and other radio systems, but also xDSL, cable, etc.) It is therefore not expected that a single multimode terminal will handle so many different types of access. Rather, it is anticipated that users' access will be via use of a range of terminals, some of them capable of multimode operation. Consequently to ensure the terminal and personal mobility across the various systems/networks their will be a requirement of intermediate elements for providing adaption among different network systems.

A typical network architecture proving FMC is shown on the front page. It shows various access networks, radio-based (GSM, CDMA, WLAN and WCDMA) and DSL-based along with the respective nodes for these different accesses as given on the next page :

i)   For the UMTS network – Serving GPRS Support Node (SGSN) and Gateway GPRS Support Node (GGSN)

ii)   For the CDMA network – Packet Data Serving Node (PDSN)

iii)   For PSTN interconnection - Media Gateways (MGW)

iv)   For Network Address Translation (NAT) – Session Border Gateways (SBGs)

7.0   FMC Network Capabilities :

i)   Access independence - FMC network should be access-independent, thereby implying that the network should be able to offer services to its subscribers, regardless of how they access into the network.

ii)   Unified authentication and authorization mechanism - FMC network should provide unified authentication and authorization mechanism. For various users, the data relating to authentication and authorization may be different, and the parameters in the related messages may also be different, but the procedure for handling the various parameters and other related data should be unified.

iii)   Uniform routing mechanism - The routing of the call should only depend on the operator's policy, independent of the access technologies.

iv)   Uniform charging and management - FMC network should provide a uniform charging and management mechanism to collect accounting information or manage the data relating to subscriber.

v)   Service - Capabilities to access different Application Servers or Service Platforms should be provided.

vi)   Quality of Service - QOS mechanisms to meet the user and service requirements, such as dynamic negotiation of QOS parameters between service layer and bearer layer, across access network and core network, should be supported.

vii)   Inter-working - Inter-working with the existing network, e.g. legacy PSTN network should be supported.

viii)   Reliability requirements - A mechanism should be provided to ensure reliability of communication, and should support appropriate overload control mechanism and failover mechanism.

ix)   Security requirements - Security mechanisms should be provided to meet the service requirements.

x)   Public Services Issues - e.g. Emergency Communication should be supported.

xi)   Support of multiple networks-Circuit-switched networks, packet-switched networks as well as converged networks should be supported.

8.0   Solutions for FMC :

Cordless Telephony Profile (CTP) and Unlicensed Mobile Access (UMA) standards are interim FMC solutions that enable operators to offer FMC services to only a limited extent, whereas IP Multimedia Subsystems (IMS) standard by 3rd Generation Partnership Protocol (3GPP) is considered as a solution for complete FMC. CTP and UMA are, therefore, generally referred to as 'pre-IMS solutions, as shown in Figure 3.
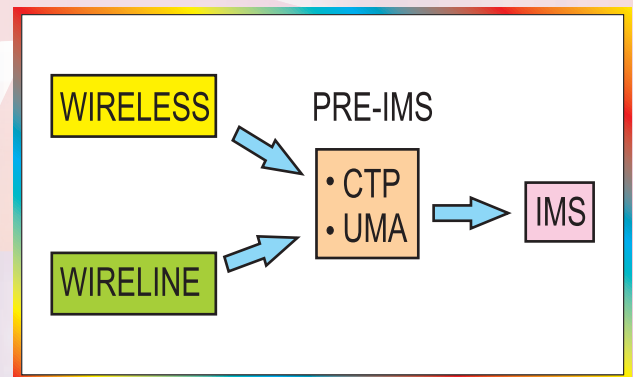

Fig.3

i)   Cordless Telephony Profile (CTP) is a profile defined within the Bluetooth specification, by the Bluetooth Special Interest Group, which allows a Bluetooth-enabled mobile phone to be used as a cordless telephone when it is

within a range of a Bluetooth CTP access point. CTP is thus a way of adding limited mobility - cordlessness - to the fixed network. CTP acts as an application on the device - which is sometimes a mobile phone and sometimes a hands-free headset. Mobile and fixed access are only loosely converged in CTP. The mobile device retains its GSM number, whereas the CTP access point uses the number associated with the fixed line to which it is attached.

ii) Unlicensed Mobile Access (UMA) provides access to GSM and GPRS mobile services over unlicensed spectrum technologies, including Bluetooth and WLAN 802.11. By deploying UMA technology, service providers can enable subscribers to roam and handover between cellular networks and public and private unlicensed wireless networks using dual-mode mobile handsets. With UMA, subscribers receive a consistant user experiance for their mobile voice and data services as they transition between networks. The UMA solution has now become a 3GPP standard named Global Area Network (GAN).
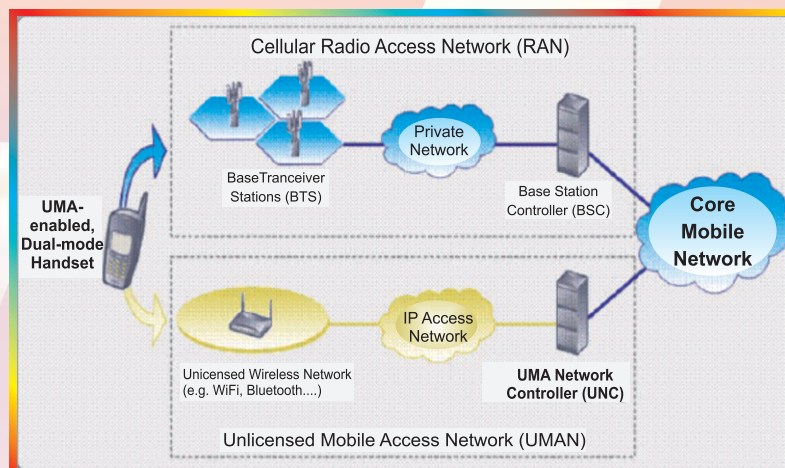

Figure 4 : UMA based Solution

In the UMA based solution, the inter-networking of calls from cellular to Unlicensed Mobile Network (*e.g.* WiFi, Bluetooth) will occur via UMA Network Controllers (UNC) that enable call hand offs on dual mode handheld devices, as shown in Figure 4.

IP Multimedia Subsystem (IMS) is a standard that defines a generic architecture based on SIP which allows multiple real-time applications to run across a single network.

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 based FMC solution is shown in Figure 5.

9.0 Standardization activities :

i) 3GPP (3rd Generation Parternership Project) has standardized IMS (IP Multimedia Services) which is free of access technologies. Adopting from the 3GPP IMS work, 3GPP2

(3rd Generation Parternership Project 2) has also standardized similar architecture, as IP Multimedia Domain (MMD).

ii) Unlicensed Mobile Access Consortium (UMAC) has provided an industry standard specification for Unlicensed Mobile Access (UMA) for GSM/GPRS services over Bluetooth and 802.11 with IP as the transport bearer. UMA permits continuity of mobile voice and data services across WLAN and cellular networks (such as GSM/GPRS) allowing users to roam between cellular networks and public/private unlicensed wireless networks.

A key output from FMCA Terminal working Group was Release 2.0 (May 2006) of the FMCA Product Requirement Definitions (PRD) and technical papers that contained specifications for the key Convergence technologies (Bluetooth CTP, WiFi GAN/UMA and Session Initiation Protocol (SIP) over WiFi).

iv) ITU is also working on recommendations for FMC. It has already released following Recommendations on FMC :
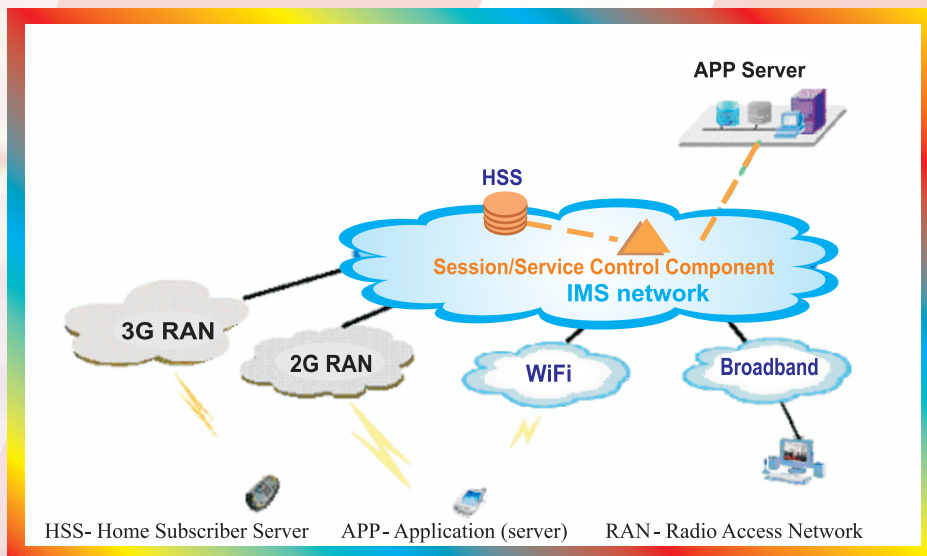

Figure 5 : IMS based FMC solution

iii) **Fixed-Mobile Convergence Alliance (FMCA)**, a global alliance of several telecom operators with the objective to accelerate the development of Fixed-Mobile Convergence products and services was discontinued in March, 2010. It had focused on the productisation of the Convergence technologies by collaborating closely with Standard Development, Specification & Certification Organizations (Standard Developing Organizations (SDO)/Fora) and wider vendor community in key areas.

➢ Q.1761 on Principles and Requirements for Convergence of Fixed and Existing IMT-2000 Systems.

➢ Q.1762/Y.2802 -Fixed-mobile convergence general requirements.

➢ Q.1763/Y.2803: FMC service using legacy PSTN or ISDN as the fixed access network for mobile network users.

v) IEEE 802.21 is also developing standards that will enable handover and interoperability

between heterogeneous network types including 802 and non-802 networks. 802.21 is an IEEE standard published in 2008. The standard supports algorithms enabling seamless handover between networks of the same type as well as handover between different network types also called Media independent handover (MIH) or vertical handover. The standard provides information to allow handing over to and from cellular, 802.11, 802.15, 802.16 and 3GPP networks through different handover mechanisms.

vi) Seamless Converged Communication Across Networks (SCCAN) Forum is an industry organization started in 2004, with founding members as Avaya, Motorola and Proxim. It supports an emerging open specification for the technologies that enable seamless converged communications. The SCCAN specification supports communication solutions for the convergence of Wi-Fi and cellular, voice, video and data, and wired and wireless networks. The mission of the forum is to enable and advance the utilization of seamless mobility communications solutions, by creating and fostering adoption of specifications and promoting interoperability. To support its mission, the SCCAN Forum will define and promote a set of interface specifications. The first generation specification will define, among other areas, the interoperation between dual-network (Wi-Fi/cellular) handsets, Wi-Fi infrastructure and IP based Private Branch Exchange (IP-PBXs). Such integration will also include enterprise-class features and will span wireless local area and cellular networks.

10.0 Conclusion:

FMC is a global trend for the telecom business of the future and this trend is currently being pushed forward by both fixed and mobile operators. FMC is evolving at network, terminal and service levels.

FMC will enable the user to have a uniform service experience, both while on the move and at the home /office. It will combine the convenience, freedom of movement and personalized services of the wireless world with the high quality and speed of fixed communications.

References:

1. ITU-T Recommendations Q.1761, Q.1762, Q.1763 and other related information on internet.

2. http://www.umatechnology.org

Important Activities of TEC during January 2011 to March 2011

GR Issued on :

- Network Time Protocol (NTP) Server,
- STM-1, STM-4, STM-16 & STM-64 Synchronous Multiplexer,
- Splice Protection Sleeves for Optical Fibre,
- Splice Protection Sleeves for Ribbon Optical Fibre,
- 3G Data Card,
- WCDMA Repeater,
- Lawful Interception of Mobile Network,
- Portable VSAT Terminal,
- Tower Mount Amplifier,
- Wimax CPE(Both indoor and outdoor)
- Long Term Evolution (LTE) & Evolved Packet Core (EPC)
- Fibre to the Antenna.

GR Revised on :

- Primary Reference Clock (Cesium Frequency Standards),
- Monitoring Equipment for Lawful Interception of PSTN,
- Cable House Wiring PVC (Tinned copper conductor insulated, taped and PVC sheathed),
- Optical Router,
- OTN Tester,
- 1.18 GHz High Performance Antenna,
- 7GHz SDH STM-1Microwave Equipment,
- Layer-4 to Layer-7 Switch,
- UTRAN-Rel-7,
- Broadband Wireless Access system,
- Permanently Lubricated HDPE Telecom Ducts,
- 7GHz Waveguide,
- LAN Switch,

- Intrusion detection System,
- 1.6GHz High Performance Antenna,
- Solar Photovolatic(SPV) power supply,
- Tabular Valve Regulated Lead Acid (VRLA) Battery based on GEL Technology.

IR Issued on:

- Asymmetric Digital Subscriber Line-2 plus (ADSL2+) System for Central Office and Remote Office Applications,
- Set top box FTTH,
- IPv6 Conformance Interoperability of networking components.

IR Revised on:

- PABX for Network connectivity.

Activities at National Telecommunication Academy

- One week in-service course on "Regulation and Dispute settlement",
- Two days workshop on "Handling Disciplinary cases",
- Two days workshop on"3G",
- Two days in-service course on"DDO: Duties and Functions,
- One week in-service course on" Wireless Planning and Spectrum Management",
- One week in-service course on"USO Fund".

Approvals issued by TEC during the period from January 2011 to March 2011

Interface Approvals.................45
Type Approvals 05
Certificate of Approvals...........12

DISCLAIMER : TEC Newsletter provides general technical information only and it does not reflect the views of DoT, TRAI or any other organisation. TEC/Editor shall not be responsible for any errors, omissions or incompleteness.