

Novel FMC network composition methods in 3W (WiBro, WiFi and WCDMA) environments

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Abstract— FMC networks provide consistent and seamless services to users regardless of access and core transport layer. Though FMC based services are provided by several TelCo's, all of them are based on specialized methods, not on standards. KT in Korea has already deployed 3W (WiBro, WiFi, and WCDMA) based FMC networks. KT now is seeking the methods how to maximize integration effects between KT and KTF. First of all, 3W based service deployment and FMC solutions how to integrate and mix up heterogeneous access networks are essential. In this paper, we propose the FMC deployment strategies considering 3W based transport networks. And, we provide the FMC introduction strategies in EPC environments which follow in hereafter LTE network introduction. We also provide IMS based FMC strategies and methods how to deploy FMC networks considering VoLGA standardization plans which recently are in the process of study. Through this paper, we can provide model cases of FMC network composition methods from hereafter 3W environments.

Keywords— FMC, fixed mobile convergence, 3W, WiBro, WiFi, WCDMA

I. INTRODUCTION

As the demand of mobile communication services grows in early 1990s, the number of wireless communication subscribers grows as equal as that of wired communication services. At the same time, the above two methods have competed with each other in lots of TelCo's. Consequently, every service provider comes to perceive that the number of subscribers cannot guarantee benefits any longer. Nowadays Telco's greatest concern is how to increase the number of subscribers and receiving benefits by providing effective services.

Recent deregulation of communication restriction also gets rid of the barrier of wired and wireless communication service providers. Many Telco's do not limit their business area to wired or wireless services only. In the above conditions, FMC is proposed as new network composition method [1][2].

Many Telco's drive FMC based services by integrating wired and wireless networks. KT(Korea Telecom) also has deployed 3W(WiBro, WiFi and WCDMA) based FMC services using the synergy of merger with KTF(Korea

Telecom Freetel). FMC mobiles also were released in 4th quarter, 2009.

In this paper, we propose the FMC deployment strategies considering 3W based transport networks. And, we provide the FMC introduction strategies in EPC environments which follow in hereafter LTE network introduction.

We also provide IMS based FMC strategies and methods how to deploy FMC networks considering VoLGA standardization plans which recently are in the process of study.

II. WHAT IS FMC

The vision of FMC is for people to utilize one device with one number, one address book and one VMS(voice mail system), taking advantage of less expensive, high-speed connectivity in their office setting, fixed-line home environment or public hotspot location, while enjoying wide-ranging mobility on existing Public Mobile Networks[3]. In other words, FMC represents the combination of all networks, content, applications, services, devices, and management so that users do not have to manually toggle between the wireless and wired devices. For businesses with an increasingly mobile workforce, FMC creates a unified workspace – one-number ring to all devices, call continuity across devices, consolidated fixed and mobile call history and voicemails, etc. – to boost employee productivity. For consumers, FMC creates the connected home where you can watch movie, sports, and news with continuity across TV, mobile phone, PC, and gaming console screens [4].

FMC should provide the subscriber a consistent user experience regardless of location and time with no interruption of service when roaming between fixed-line and mobile networks. The goal of FMC is to break the paradox that arises from the fragmentation of communications channels and to make multiple channels (networks) appear and behave as a single channel thus restoring the core value of enterprise communications; improved productivity and accessibility as mentioned above. Another important advantage of FMC is cost-reduction that is most powerful reason. It is known that cost can be reduced by 15~40% using voice over WLAN solution compared to that of mobile phone or fixed-line phone[5].

More concrete effects of FMC can be divided into two categories as shown in Table 1 – for customers and for service providers.

Table 1. Effects of FMC

Customer	1. Call continuity in the office - device, number, mail 2. Various productivity improvement - Conferencing call - Simultaneous ring of wireless and fixed phone - Web to call - Easy intranet access - Presence notification - Call screening - Various routing rules
Service Provider	1. Subscriber satisfaction 2. OPEX reduction 3. Effective service option management 4. Platform independence 5. Reuse of existing networks

III.3W BASED FMC NETWORKS

A. Single FMC

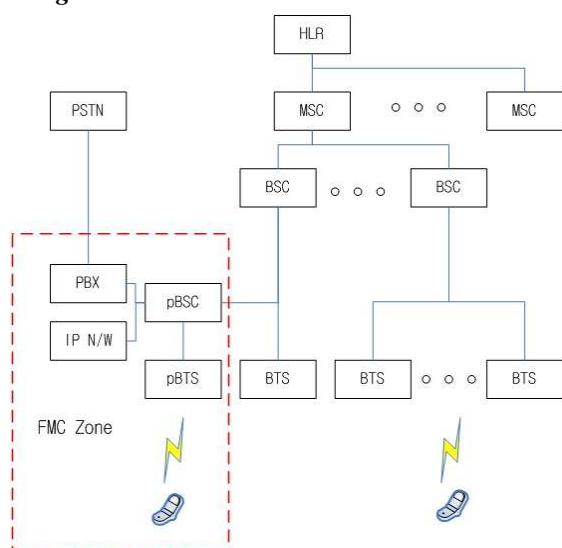


Figure 1. Single FMC network configuration

Single FMC means the network is composed of circuit based networks. There is no WLAN network. In the early 2000s in Korea, WPBX concept was introduced. Using WPBX, subscribers can communicate with one another without rate in the offices. Only the call outside the office is charged for the normal mobile communication rate since the call is communicated by mobile networks. Strictly speaking, that is deployed by CDMA network. Free or charged call is decided according to the fact whether the mobile phone is located Intra or outside the specified zone. In this case, the function of mobile phones can be extended to single number

policy, PBX based specific features – call feature, dial plan, directory services, and reduction of OPEX through intra office access.

KT has already launched single FMC named N-Zone service. Fig. 1 shows the network configuration of N-Zone. Strict to say, N-Zone can be categorized into FMS service. In this paper, however, FMC means a broad sense of combination of fixed and mobile solutions. In FMC zone, conversation between mobile users is made only through pBTS(private BTS), thus call traffic does not affect PLMN. In this manner, efficient traffic control and network optimization can be done. Calls in FMC zone are free of charge or provided at a reduced price.

B. Dual FMC

Dual FMC can be derived by interconnection of mobile communication network. That provides voice and messaging services in use of standard based SIP client. In dual FMC area, a user can be connected to intranet through WiFi based Wireless LAN, not through mobile communication networks. In this case, multiple APs(Access Points) are needed so that users can connect up to WiFi wireless LAN.

Mobile devices has the ability to access circuit based network and WiFi wireless LAN, thus mobile device needs not depend on only mobile communication network. Dual FMC should provide mobility of mobile devices. Therefore, mobile devices can connect up to the PBX intranet through both circuit based mobile communication network and WiFi wireless LAN. Generally, the charge using WiFi wireless LAN is cheaper than circuit network.

Dual FMC method has many advantages. First, it provides broad coverage of two kinds of networks. Second, user can use voice mail of public mobile communication network and private PBX network simultaneously. Third, it guarantees service scalability by deploying SIP based networks. As a result, we can expect the evolution into UC(Unified Communication)[6].

C. 3W Based FMC

In 3W based FMC, mobile VoIP is essential method. VoIP services are becoming more common as electronic communications services are shifting to IP-based networks. VoIP based Telephony services, that is when identified as Public Electronic Communications services, could be the future telephony service replacing traditional PSTN telephony services one day.

The phenomenon of FMC is enhanced by the technological advancements in core and access networks. The new network capabilities are one of the enablers to offer convergent multimedia services built upon the NGNs, which are shared core networks for all types of access and services and packet mode transport.

Also the price decrease of VoIP network termination equipment has enabled operators and service providers to bring about complex, low-cost services such as mobile over broadband or VoIP over WiFi or VoIP over 3G.

KT(Korea Telecom) is now about to deploy 3W based FMC services. In this strategy, access transport domain is composed of three kinds of access network – WiBro network, WiFi

wireless LAN network and WCDMA CS network. Moreover, LTE network can be included considering next generation networks.

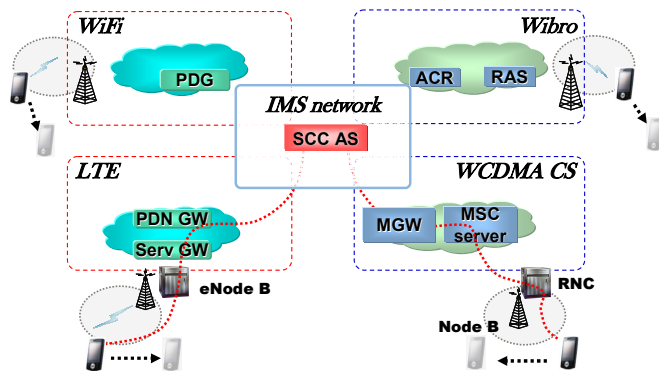


Figure 2. 3W Based FMC network configuration using IMS network

Fig 2 shows the 3W based FMC network configuration. In this case, we consider IMS networks as the session control domain. We can also consider another configuration such as VoLGA(Voice over LTE via Generic Access) method as shown in Fig 3 [7].

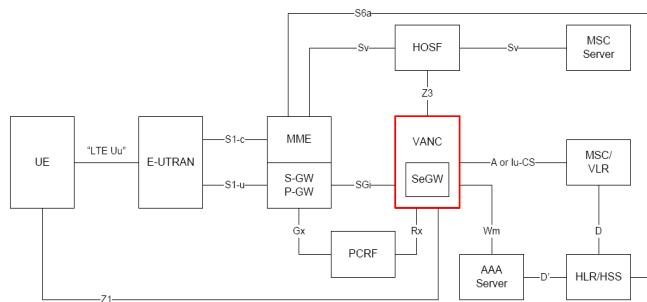


Figure 3. 3W Based FMC network configuration using VANC

In the Fig 3, IMS network does not exist. Instead of that, VANC(VoLGA Access Network Controller) is used which is a GAN controller as known from 3GPP GAN that has been modified to support CS services over EPS as specified by the VoLGA forum.

D. FMC Introduction Strategy

Now we intend to conclude which is the best way to deploy 3W based FMC policy. Almost the whole service operators provide their specific services in breach of global standards. That is why all the specific services should be ported into IMS networks to guarantee service continuity of legacy networks. This can cause many side effect and network quality deterioration. Although the networks evolve into next generation networks, it is predicted that circuit switched networks will remain for long.

WiFi service areas are scattered like spots, and each AP has the smallest area among above three access technologies. WiBro service areas are broader than those of WiFi, however, do not cover all coverage. That is to say, WiBro service areas exist like islands. WCDMA network has the broadest service area. According to above characteristics, we can conclude

that circuit switched services should be provided using only WCDMA CS network. This means that VANC based FMC policy is very effective. There is no need to port specific services into IMS control network. We can also expect that the impact of legacy network will be minimized. In this case, charge of calls should be reduced as if the call happened in WiFi network.

We also suggest data services be provided through WiFi network with most priority. If WiFi networks do not exist, mobile device should connect up to WiBro network. WCDMA PS(Packet Switched) network is attempted for lowest priority.

E. CS Migration Strategy

As LTE(Long Term Evolution) networks are considered to be deployed in the near future, we now provide how to migrate circuit switched network into LTE environment. In LTE networks, there are no CS networks, thus voice/SMS service is provided through PS networks. However, a lot of TelCo's intend to maintain CS networks as CS based services are still their main revenue sources. Consequently, it is desirable to evolve CS/PS networks into PS(LTE/EPC(Evolved Packet Core)) network slowly. Thus, MSC(MSC Server and MGW) should be evolved into e-MSC(enhanced MSC) which enables TelCo's to provide new IMS based services and current CS based services for their subscribers with current CS terminals by utilizing IMS service networks. E-MSC consists of MGC-like MSC and IM-MGW-like MGW. E-MSC also has the function of TAS(Telephony Application Server). The main advantages of the e-MSC are reduction of OPEX and CAPEX. E-MSC enables CS service users to utilize IMS as a common service platform for VoIP based services. This enables CS access networks to be connected to IMS networks such as NGN, WiBro, and LTE. This feature prevents operators from additional investment into the legacy CS mobile service platform, which will eventually be replaced by IMS after the launch of LTE. Another important advantage is that e-MSC provides IMS service access ability to legacy CS mobiles which will introduce new IMS based services to users. The e-MSC Solution also achieves IMS service consistency and mobility across various Access Technologies.

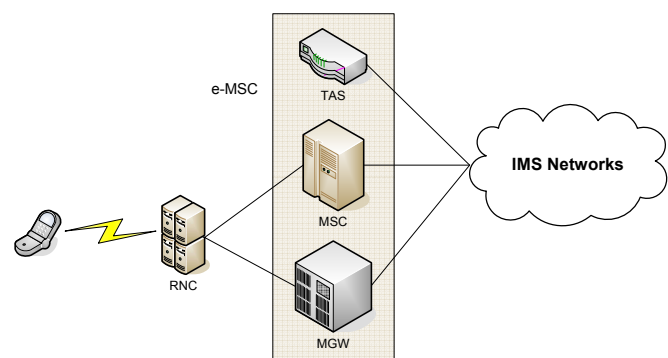


Figure 4. e-MSC Configuration

A general migration example without e-MSC is shown in the Fig 4. With the introduction of the LTE/EPC, TelCo's need to port CS services with legacy CS service features for IMS to

avoid service degradation and a consistent service behavior for their subscribers. For the mid-term migration phase, e-MSC provides good solutions by translating and transcoding the voice communication between UTRAN and LTE within the same operator network.

IV. CONCLUSIONS

In this paper, we proposed the FMC deployment strategies considering 3W based transport networks. And, we provided the FMC introduction strategies in EPC environments which follow in hereafter LTE network introduction.

We also provided IMS based FMC strategies and methods how to deploy FMC networks considering VoLGA standardization plans which recently are in the process of study. Finally, we touched the issue of CS migration strategy

briefly. This study further can be a basis material for service providers to implement the FMC network composition strategy.

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