Virtual mobile network - approach to research on 3G in Vietnam conditions

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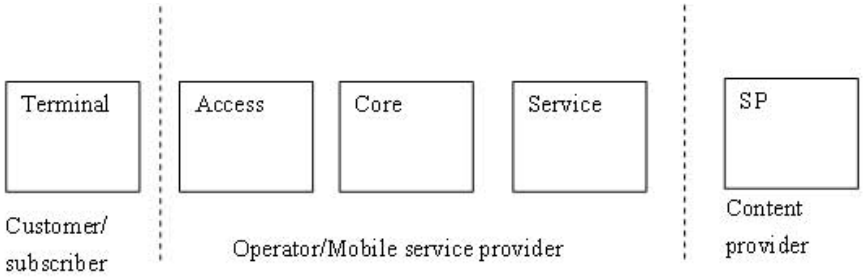
Similar to the convergence of fixed networks in the direction of NGN, mobile technologies are also in the process of converging to meet mobile customer requirements for bandwidth and service quality with the introduction of network. 2.5G, 3G generation mobile . Traffic flow (voice / data) on mobile network has also increased rapidly in recent times and since 1999 has exceeded demand on the wire line. Research in Vietnam on mobile networks is still very limited and is often just theoretical research with few actual products. The root cause of the problem is that the mobile network contains many difficult and proactive techniques in the current conditions of Vietnam.

This paper proposes a research and development plan to move to the new generation mobile network in accordance with the conditions of Vietnam.

1. Mobile network architecture

Similar to fixed network, mobile network includes classes: user terminal layer (access terminal), access layer (access), core network layer, service provider layer (services) with participation of customer-subscriber, service provider and content provider.



Class of terminals

The mobile terminal layer has the function to interface with users and access services from the core network, some functions include in mobile terminal: radio access protocols, translation access protocols service (call / data), signaling terminal to terminal, authentication (SIM), framework for user services, .

Access layer

The access layer in the mobile network uses radio access instead of wire usage methods as in fixed networks.

Built-in radio channel access protocols in terminals and base stations and perform some basic functions: Transmitting / receiving data via radio waves with acceptable reliability, encryption and resolution code, control power of the terminal emitters, radio resource management, transfer control, .

Access layer is the gateway causing many limitations in improving quality and bandwidth for services. Therefore, studies that address this problem are always the most important points in mobile network research. Studies in different directions have created different access techniques: time division, frequency division or code division. These methods are the basis for different types of mobile networks TDM, GSM, CDMA . And the most difference between mobile networks is also in this class.

Core layer (core)

The core of mobile network performs the following functions: switching transaction sessions, mobile management, signaling to establish calls between the core and terminal networks, inter-network signaling between core mobile networks, inter-network signaling with old networks .

Core layer consists of components: Switch (MSC), subscriber management (HLR, VLR, EIR, UAC), inter-network communication port (GMSC). Core layer components that perform subscriber management such as EIR, HLR, VLR are often similar in mobile networks and mobile generations because they are often part of database administration not related to network technology. The switching and inter-network port components of GSM and CDMA networks are in principle the same and different in protocols at specific interfaces.

Service class

The service layer functions to provide services in addition to basic subscriber services, which define the service and the specific requirements for each service. Entities of this class together with other components of the mobile network constitute a service offering: SMSC, WAPGW, MMSC, Streaming server .

2. The development of mobile networks

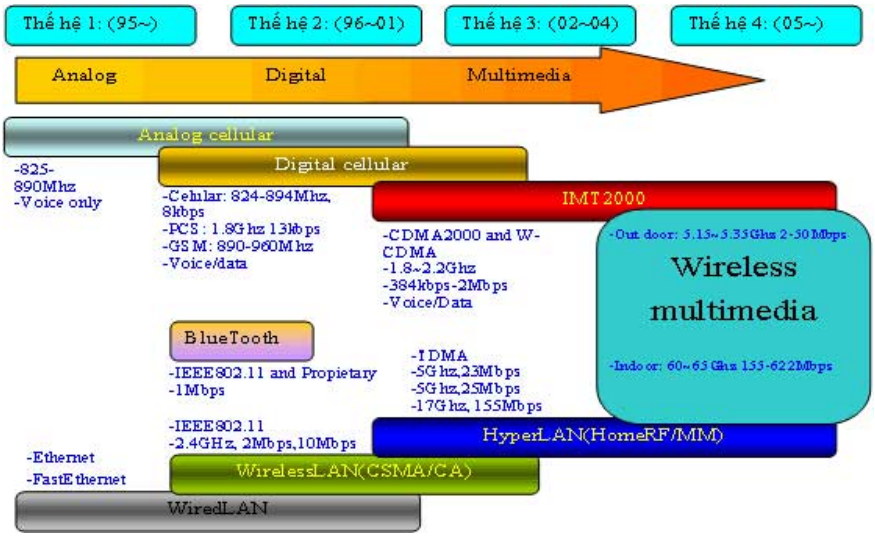
On fixed network, there is a process of convergence of technology and services between telecommunications and Internet networks based on IP packet switching technology, the term NGN- the next generation network is mentioned a lot in Lately year. The Internet is also growing day by day from low-speed modems, so far has developed more high-speed and more flexible access methods in which Wireless-LAN is really a challenge to mobile networks, although the capability Mobile is limited.

Faced with the development of the Internet with the new rich services of fixed networks, mobile service providers cannot satisfy the 2G mobile network that currently has only SMS and short messaging applications. Many major telecom organizations and international standardization organizations try to come up with a new mobile network architecture to adapt flexibly to the development of IP technology, which can well meet the needs of customers. new services. 3GPP is an open organization for standardizing mobile networks in the new generation with research and recommendations for mobile networks on the road to convergence.

3GPP has conducted research for different mobile networks but all have a common goal, which is the 3rd generation mobile network (3G). A series of recommendations and proposals were also accepted by the ITU in the 3G standard (IMT-2000).

Some big companies have reportedly developed 4G networks, although there are no specific recommendations and definitions about 4G, but it can be interpreted as a mobile network converging between 3G and Wireless-LAN. giving customers very high bandwidth and global mobility based on IP technology.

Figure 2 points through some landmarks and basic characteristics in the development of mobile-related technology and the future trend of mobile network convergence.



Wireless information technology trend

The trend towards 3G is not a complete change in technology, but is trying to upgrade existing networks step by step to ensure compatibility as well as to avoid over-investment of operators.

In Vietnam, it is also in the process of reaching the 3G mobile network generation, conducting theoretical studies, issuing standards for network interfaces, proposing plans to implement 3G testing in Vietnam and also has tested 3G in a narrow range on Mobifone and Vinaphone networks.

Existing mobile network operators and some new mobile service providers (Viettel, SPT, ETC .) implementing network upgrades or new equipment are still based on the route from 2G to 2.5G already. to 3G but no one has any direct investment in 3G.

3. Current status and propose research approach in Vietnam conditions

Assess the current state of research

Studies in Vietnam around the mobile sector in the past only focused on theoretical issues and technology deployment rather than product development research. This limitation, besides the general limitation of Vietnam in telecommunication research, is generally due to the concentration of the most complex technologies in mobile network technology and the specialized techniques to perform outside. Our accessibility

In the past few years, some units in Vietnam have invested in product-oriented research on mobile networks and for the first time these research products have participated or are able to participate in the network structure. and providing services for mobile networks in Vietnam 2G and 2.5G. These include CDIT with products: Short

messaging system-SMSC, Missed call reporting service system, Roaming subscriber notification system (2G), MMSC multimedia messaging system , The system provides WAP2.0 service, Video-streaming service (2.5G).

In general, these research products focus on the service delivery layer. Studies of core networks, access networks and terminals are still hardly mentioned.

Here , the author proposes the approach to research on mobile networks in the coming time in the condition of Vietnam to master each step and the whole technology in the near future.

Offer

Implementing the entire 3G mobile network is not feasible for Vietnam at this time. Although popular technologies are encroaching on specialized technologies, but not completely replaced, especially the technologies used in the terminal layer and the radio access layer. Wireless LAN is a trend but there are still many limitations that continue to be overcome in the future.

The most appropriate approach in terms of Vietnam would be to develop network components from the service layer, move through the core network layer and part of the access network. The current service class is almost owned by Vietnamese researchers, the core network layer and part of the access layer are the research interests in this article. This mastery study is done through virtual mobile network (virtual mobile) model.

In fact, the concept of virtual mobile networks is not the first to be mentioned, some suggestions are also introduced on the Internet, but these suggestions are only for a narrow range (for example, only for SMS services) term). The author virtual mobile network mentioned below carries a broader meaning, that is, a mobile network that is relatively similar to a mobile network.

4. Virtual mobile network

Virtual mobile networks are understood to be relatively functional mobile networks with real mobile networks but the components of the radio access layer are replaced by different ways. There are 2 solutions for virtual mobile network for implementing radio access layer:

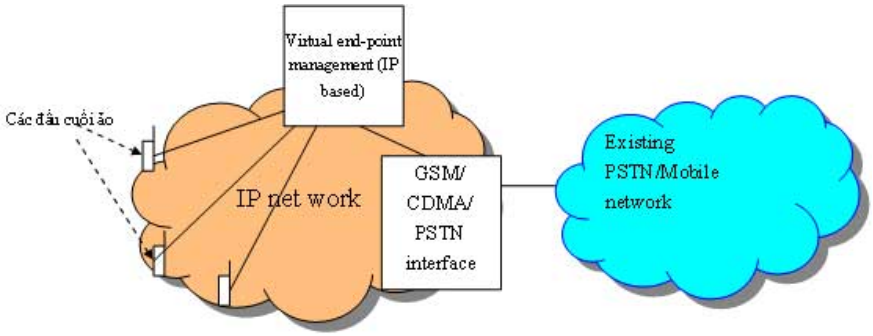
- *Solution 1:* Mobile terminal uses pure IP terminals (IP terminal)

- *Solution 2: Re-* use radio infrastructure of available service providers

The solution for virtual mobile networks here is implemented for both GSM and CDMA networks and also undergoes similar processes to 3G with a real mobile network. In CDMA and GSM mobile networks, the difference is concentrated in radio access techniques, while core network entities are similar, so in this paper, focusing on resolving core network studies, will taking up 3G from GSM network for analysis, suggestions and approaches can be similar.

The wireless access part of the mobile network at the moment is currently making a theoretical approach and will have a more specific proposal in the process of implementing the virtual mobile network.

Virtual mobile network architecture according to solution 1



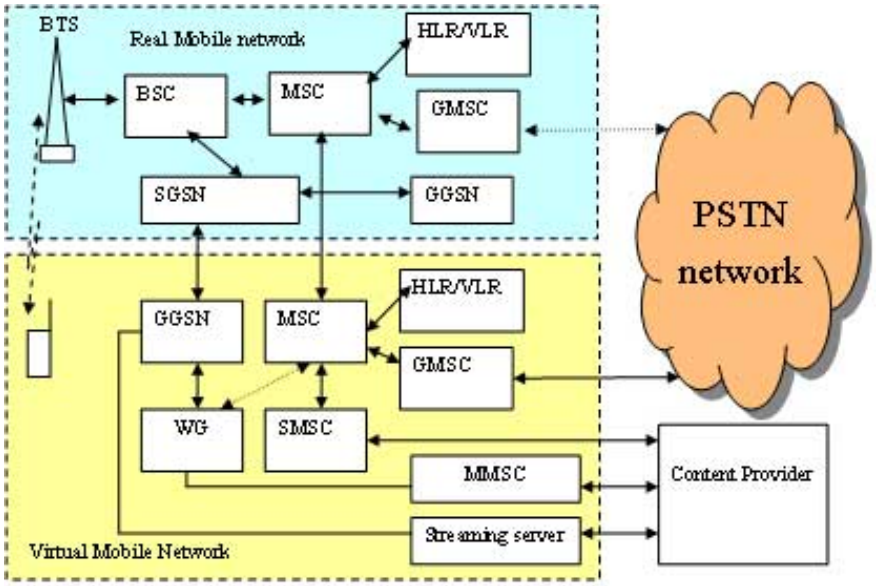
Virtual mobile network architecture according to solution 1

Under this solution, terminals are IP terminals (IP terminals) and take the form of VoIP phones on the Internet. Radio part: BTS, BSC are replaced by IP-based access techniques by VoIP signaling protocols; The cross-section between these elements on the IP is not as clear as the definition of mobile networks. However, these IP terminals can be anywhere on the Internet and core network and access network components ensure full functionality of finding / calling, positioning and registering as real mobile devices. In this model, there is temporarily no possibility of radio roaming between subscribers of different networks.

With this solution, compatibility requires only cross-sections with existing networks, half of the IP side is completely dependent on subjective design, for example, subscriber positioning, calling, transferring.

Virtual mobile network architecture according to solution 2

This solution sublies the network infrastructure of network operators available to the access layer, all signaling is routed back to the virtual network. This means that the mobile terminals are actually bundled in a digital range and managed by the virtual mobile network. The virtual mobile network here will include the components of the core layer and the service layer without including the radio access layer.



Solution 2

Virtual network elements under this solution are also based on IP but the cross-section is clearly defined as in the real mobile network. With this solution, virtual network elements are more like real network than plan 1, however, it is difficult to implement and implement more effectively than plan 1 because currently there is no business method by giving lease of radio infrastructure. This problem can be overcome by investing in several radio stations during testing. The compatibility of virtual network elements is higher because they actually control mobile terminals like today's mobile networks.

Virtual mobile network to 3G

The network elements of a 3G network will be similar to a 2.5G network while performing in order to finally achieve the All-IP version, where the MSC circuit switching elements, inter-network port at the core layer, BSC at The access layer will disappear for spaces with similar functions: SGSN, GGSN, MG (media-gateway) and Softswitch.

Researching on virtual mobile network is a network that has both practical meaning and theoretical meaning in that it is both feasible in implementation, and creates a test environment when we lack initiative in access technology. enter but still aim to be a mobile network with all the features that need to be in line with the general research trend of the world.

The most basic elements of virtual mobile system with the most basic services such as HLR, VLR can be developed immediately with limited initial capacity, signaling protocol around these first elements as MAP, IS41 will be added with no difficulties. The crux of these two elements is reliability and real-time levels in data processing, local studies of each of these aspects have also been conducted recently in some properties. products: Calling-card system, SMSC system, real-time charging system .

MSC, the call switching part of mobile virtual networks can be implemented on the basis of using IP-based call-servers such as SIP server, Softswitch, etc. Trends to use Softswitch as a call handling function for Mobile networks are an applied trend in the world. SIP servers or Softswitch . are also in the research or completion phase recently in Vietnam.

5. Conclusion

Many network elements of 3G are also the network elements of the Mobile virtual network mentioned above. Therefore, developing mobile virtual networks is an appropriate and feasible approach in the current conditions. After this time, we will have a high level of initiative in the generation of 3G, 4G mobile networks and especially training a research team specializing in mobile technology and shortening the gap between Vietnam and other countries in the world on mobile technology that Vietnam has lagged far behind in the past decades.

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