iNetwork – a GSM Compliant IP-based Communication Platform

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Abstract

Enterprise communication systems require data, voice, and mobile communication services. However, the cost to maintain many disparate networks is high. We propose iNetwork, an IP-based communication system complied with GSM to provide these services at an integrated platform. Furthermore, an iNetwork system can cooperate with other iNetwork, Internet, PSTN or GSM systems to provide global services.

1. Introduction

It is important for enterprise staffs to access data, voice, and mobile communication services within or outside the enterprise. This requirement is usually achieved via separate communication systems. It is inconvenient to users to switch between different systems, and the cost to maintain many disparate systems is also fairly high. An integrated platform that provides services of data, voice, and mobile communication capability is a solution. [4]

Enterprise data and voice services are usually based on TCP/IP networks and PBX plus *Public Switched Telephone Network* (*PSTN*), respectively. These two systems can be integrated by IP telephony technique. [4] As for mobile services in this research, *Global System for Mobile communication* (*GSM*) is chosen because it is the most prevalent mobile communication system in the world and the data communication capability it provides. [5]

In this paper, we propose an IP-based communication platform, *iNetwork*, which complies with GSM that converges mobile, data, and voice services to a single enterprise communication system as shown in Fig. 1. An iNetwork user can access services of the enterprise communication system directly and transparently with proper equipment within and outside the enterprise network. Since iNetwork infrastructure is based on IP backbone, the construction and communication cost is low.

To provide global communication services, iNetwork should support interworking capability between enterprise network and PSTN or GSM as shown in Fig. 1. This feature requires a unified identification mechanism to identify entities of iNetwork, GSM, and PSTN. Therefore, two significant issues present in iNetwork design: 1) the integration of heterogeneous communication systems, and 2) the addressing and localization of iNetwork users.

The integration of heterogeneous network systems consists of the backbone convergence and communication model integration. In iNetwork design, communication backbones of data, voice and GSM systems are converged to IP network based on IP-telephony technique. To integrate GSM services with IP-telephony communication model, we reorganize and implement GSM functions as IP-based software components to provide GSM services over IP communication infrastructure.

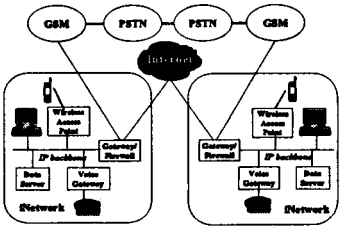

Fig. 1 **iNetwork interworking with GSM and PSTN**

The integration of communication models requires a global network space over iNetwork, PSTN, and GSM systems. To provide a global view of integrated network, the email-like (i.e., *user@host*) SIP addressing method is adapted as iNetwork naming mechanism. [1] A SIP address represents an individual user rather than a network entity. The *host* represents the physical domain and location. Users have to register to iNetwork system to apply access right of iNetwork services. As a restriction, the *user* part must be a digit string that can be recognized by traditional telecommunication systems.

2. iNetwork architecture

The first challenge to implement GSM services over IP network is to recompose GSM functions and to take advantages of IP-based communication properties to reduce communication cost and to enhance service efficiency. The iNetwork architecture as shown in Fig. 2 is proposed for the IP-based GSM services.

iNetwork components include Gateway, Location Server (LS), iNetwork Server, Application Node (AP Node), BTS and translator. PC and GSM MS are network equipments to access iNetwork services. All iNetwork components are addressable to SIP addressing method.

Gateway provides protocol translations of IP, MAP and SS7. *LS* is responsible for user register and localization

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services to assist in identifying and localizing users. Every user in an iNetwork service region must register to the LS of the region. *AP Node* is where the extended functions and services reside. *iNetwork Servers* are coordinators in iNetwork system that support MAP services and SIP methods. iNetwork Servers also perform APIs to facilitate the development of add-on services and applications. A *Meta Server* is an auxiliary location register unit in GSM network that supports name resolution and address translation between different systems and networks to reduce call redirection frequency. A GSM *Base Transition Station (BTS)* consists of RF transmitters, receivers, and signaling equipment to communicate with GSM terminals. *Translator* work with BTS is a gateway between IP network and BTS.

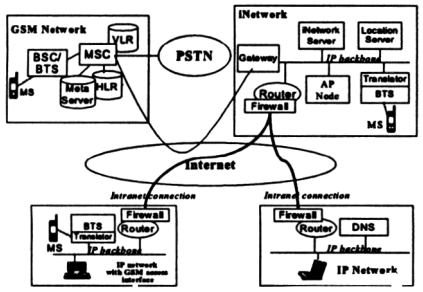

Fig. 2 **iNetwork enterprise communication model**

3. iNetwork Communication Model

Establishing iNetwork systems over Internet and Intranets as enterprise communication platform will save system construction and maintenance costs. Since iNetwork software components are convenient to be distributed over IP networks, iNetwork system can take advantages of IP networks to construct a communication model as shown in Fig. 2.

iNetwork components in different subnetworks connect with each other by Intranet or Internet to perform a complete iNetwork communication system. This model includes the privacy and security of Intranet and the prevalence and convenience of public networks. The domain-based communication hierarchy of IP networks reflects the iNetwork hierarchical administration model. With respect to the growth of network, this model will extend the administration scale of network to provide efficient communication services.

The interworking of iNetwork, PSTN, and GSM networks ensures a global communication environment to provide mobile, data, and voice services.

4. Conclusions

Mobile communication is a trend of networking. However, personalization, mobility, and costs are important issues. In this paper we propose iNetwork, an IP-based GSM compliant communication platform that provides mobile, voice, and data services. Also an interworking model with PSTN and GSM is proposed to perform global services. With the property of global user localization and a complete network space, iNetwork system as enterprise communication platform can utilize existed IP network infrastructure to facilitate mobile data and voice communications regardless of the geographical location and physical network system.

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