

Integrating 3G and WLAN Services in a SIP-based VoIP System

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Abstract

We propose WLAN-based GPRS Support Node (WGSN), a solution for integrating 3G and WLAN services in a SIP-based VoIP system. We show that the 3G mechanisms can be re-used for WLAN user authentication and network access without introducing new procedures and without modifying the existing 3G network components. A WGSN prototype has been implemented in ITRI and NCTU Joint Research Center, where an interconnected SIP-based VoIP system is demonstrated.

Keywords: VoIP, SIP, WLAN, WGSN

3GPP Technical Specification 22.934 conducts a feasibility study on Third Generation (3G) system and Wireless LAN (WLAN) interworking that extends 3G services to the WLAN environment. In this interworking, WLAN serves as an access technology to the 3G system, which scales up the coverage of 3G services.

The WLAN radio network includes 802.11-based Access Points (APs) that provide radio access for the Mobile Stations (MSs). The WGSN acts as a gateway between the Packet Data Network (PDN) and the WLAN node, which obtains the IP address for an MS from a Dynamic Host Configuration Protocol (DHCP) server and routes the packets between the MS and the external PDN.

WGSN provides general Internet access and Voice over IP (VoIP) services based on Session Initiation Protocol (SIP). Since a Network Address Translator (NAT) is built in the WGSN node, the VoIP voice packets delivered by the Real Time Protocol (RTP) connection cannot pass through the WGSN node. This issue is resolved by implementing a SIP Application Level Gateway (ALG) in the WGSN node, which interprets SIP messages and modifies the source IP address contained in these SIP messages.

WGSN utilizes the existing Universal Mobile Telecommunications System (UMTS) authentication mechanism. That is, the WLAN authentication is performed through the interaction between an MS and the 3G Authentication Center, using 3G Subscriber Identity Module (SIM) card. Therefore, WGSN authentication architecture is as secured as existing 3G networks.

The WLAN authentication and network access procedures are exact the same as that for GPRS/UMTS. The WGSN node integrates both Serving GPRS Support Node (SGSN) and Gateway GPRS Support Node (GGSN) functionalities. Like an SGSN, the WGSN communicates with the Home Location Register (HLR) through the Gr interface. On the other hand, like a GGSN, the WGSN communicates with the external PDN via the Gi interface. Therefore, for other GPRS/UMTS networks, the WGSN node and the corresponding WLAN network are considered as a separate GPRS network. The WGSN node can be plugged in any 3G core network without modifying the existing 3G nodes. With the adoption of WGSN, it can help mobile operators facilitating the provisioning of WLAN and VoIP services.