FRAMEWORK FOR ACCESS NETWORK SELECTION IN 3GPP IMS

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Abstract

3GPP Release 6 system aims to support various and multiple IP-CANs (IP Connectivity Access Networks) for IMS service access. In this environment, overlapping of cell coverage between IP-CANs that use the different access technologies occurs. Therefore a subscriber needs to select the appropriate IP-CAN considering the supported QoS level, the charging policy, the requested service, and etc. In this paper, we propose the framework for access network selection in 3GPP IMS.

1. Introduction

3GPP [1] is an organization for IMT-2000 standardization in Europe. It defines the IMS [2] (IP Multimedia Subsystem) service in addition to simple Internet access service using GPRS [3]. IMS is an upper layer service beyond simple IP connectivity service using GPRS, WLAN, and etc. In the present Release 6, 3GPP are standardizing specifications to enable IMS service over various and multiple IP-CANs such as GPRS, WLAN, Bluetooth, and etc [4]. In this various and multiple IP-CANs environment, overlapping of cell coverage between IP-CANs using the different access technologies occurs. Therefore subscriber needs to select the appropriate IP-CAN considering the supported QoS level, the charging policy, the requested service, and etc. In this paper we propose the framework that enables access network technology selection in 3GPP IMS.

In section 2, the 'IMS Commonality and Interoperability between Core Networks' concept defined by 3GPP is presented. In section 3, we propose the framework and algorithm that enable access network selection in 3GPP IMS. In section 4, we summarize the proposed framework and efficiency of the proposed framework.

2. IMS Commonality and Interoperability between Core Networks

In April, 2002, 3GPP and 3GPP2 [5] decided that IMS subsystem have to operate over the various access technology networks that provide the IP connectivity. After this decision, 3GPP is modifying the specifications of Release 6.

Figure 1 shows the concept, 'IMS Commonality and Interoperability between Core Networks'. In this concept, IMS service is accessed through IP-CAN based on GPRS, CDMA2000 Packet Data Network, or WLAN. Subscriber's terminal is equipped with multiple wireless interface cards. Geographical coverage of various IP-CANs may be overlapped.

GPRS-based IP-CAN consists of Node B, RNC, SGSN, and GGSN. CDMA2000-based IP-CAN consists of BTS, BSC, PCF, and PDSN. WLAN-based IP-CAN consists of Access Point, Distribution System, Portal, Router, WAG (WLAN Access Gateway), PDGW (Packet Data Gateway) [6], [7].

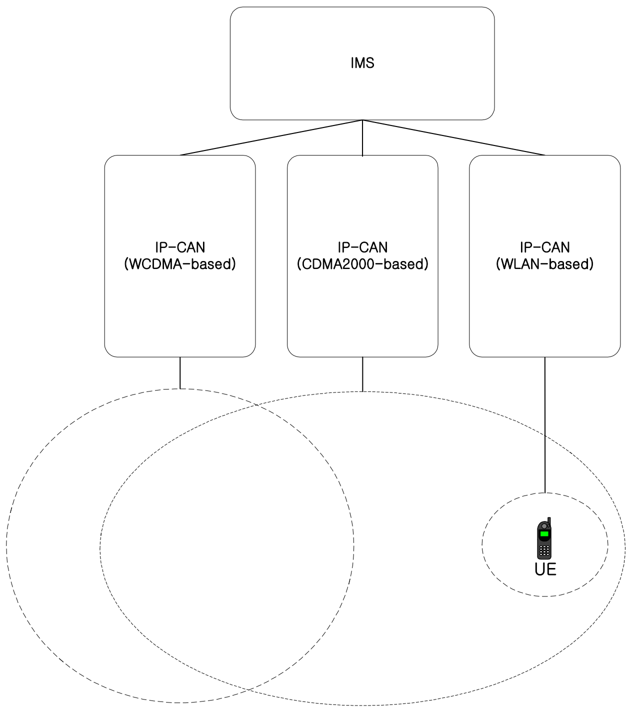

Figure 1. IMS Commonality and Interoperability between Core Networks

3. IP-CAN Selection Framework and Algorithm

In environment that different IP-CANs are overlapped, the subscriber wants to select the most appropriate IP-CAN that support subscriber's requested service, that has the preferred charging policy, and whose network state is not overloaded, etc. To enable subscriber to select the preferred IP-CAN, IMS Core Network need to give the subscriber the related information such as IP-CAN's charging policy, network state (e.g., data rate, delay, and etc.). This IP-CAN selection method will make the subscriber's charge less, the call setup time shorter, the call setup success probability higher, and the IP-CAN's utilization larger. In this section, we propose the framework and algorithm for IP-CAN selection.

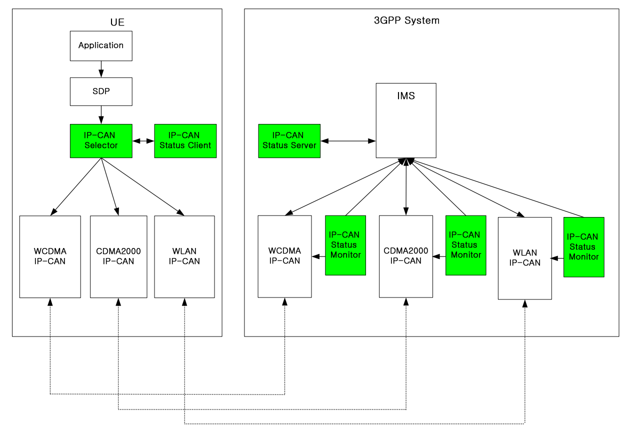

Figure 2. 3GPP IMS Release 6 Architecture modified for IP-CAN Selection Function

Figure 2 shows the 3GPP IMS Release 6 architecture modified for IP-CAN selection. UE (User Equipment) consists of the requested application, the SDP [8] derived from application, the IP-CAN selector that selects the appropriate IP-CAN, the IP-CAN status client that stores the IP-CAN status information received from IP-CAN status server, and various IP-CANs that send and receive the application data actually. 3GPP system consists of IMS that is main subsystem, the IP-CAN status server that collects, stores, and sends the IP-CAN status information to the IP-CAN status client, the IP-CAN status monitor that checks the IP-CAN status and sends the result to the IP-CAN status server, and various IP-CANs that send and receive the application data actually.

The IP-CAN selection mechanism works as follows. The application of UE tries to setup a call using the SIP [9]

Invite message. The SIP Invite message has a SDP parameter, which represents the characteristics of the call such as audio, video, application, data, and control, and data rate. Each IP-CAN has an IP-CAN status monitor module that monitors delay, data rate, etc. of the IP-CAN, and reports the result to the IP-CAN status server. The IP-CAN status client sends the IP-CAN status request message to the IP-CAN status server when UE registers to IMS, the SIP Invite message is generated, or periodically. The IP-CAN status server that receives the IP-CAN status request message sends the IP-CAN status information to IP-CAN status client. The IP-CAN status information is collected by IP-CAN status monitor of each IP-CAN. IP-CAN status client stores the IP-CAN status information, and use it as a reference to choose the appropriate IP-CAN when UE setups a call. IP-CAN selector directs the call setup message to the chosen IP-CAN.

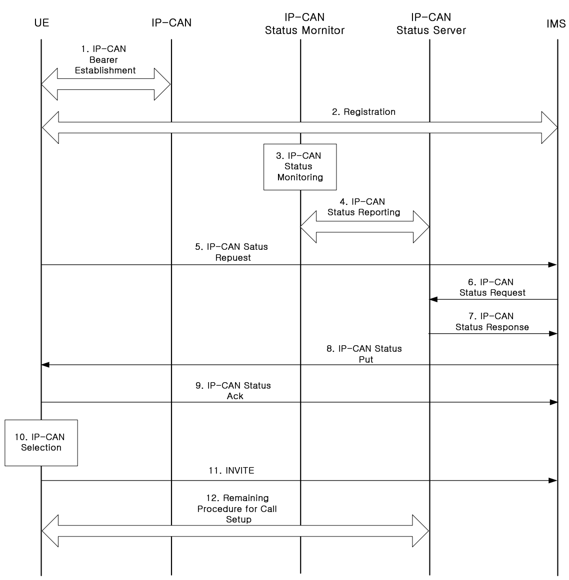

Figure 3. IP-CAN Selection Signaling Flow

Figure 3 shows the signaling flow for the proposed architecture. In step 1, UE establishes the IP-CAN bearer. In step 2, UE registers to IMS. In step 3, IP-CAN status monitor examines the IP-CAN, and in step 4, reports the result to IP-CAN status server. In step 5, UE requests the IP-CAN status. In step 6, IMS relays it to IP-CAN status server. In step 7, IP-CAN status server replies to it with the IP-CAN status information. In step 8, IMS sends the IP-CAN status information to UE. In step 9, UE sends acknowledgement. In step 10, UE chooses the most appropriate IP-CAN for the subscriber. In step 11, UE sends the SIP Invite message. In step 12, the remaining procedures for call setup proceeds.

4. Conclusion

In this paper, we proposed the IP-CAN selection architecture and algorithm for 3GPP IMS Release 6. The proposed architecture makes it possible that a subscriber chooses the most appropriate IP-CAN considering the supported delay, data rate, and charging policy of the IP-CAN, and the subscriber's application.

The proposed IP-CAN selection method will make the subscriber's charge less, the call setup time shorter, the call setup success probability higher, and the IP-CAN's utilization larger.

[References]

[1] 3GPP, http://www.3gpp.org

[2] 3GPP TS 23.228 IP Multimedia Subsystem, Stage 2

[3] 3GPP TS 23.060 General Packet Radio Service(GPRS), Stage 2

[4] 3GPP TR 23.864 IMS Commonality and Interoperability between IMSs

[5] 3GPP2, http://www.3gpp2.org

[6] 3GPP TS 23.234 3GPP System to Wireless Local Area Network (WLAN) Interworking

[7] Crow, B.P. Widjaja, I. Kim, L.G. Sakai, P.T., "IEEE 802.11 Wireless Local Area Networks," IEEE Communications Magazine, pp. 116-126, Sept 1997.

[8] RFC 2317, SDP : Session Description Protocol, April 1998

[9] RFC 2543, SIP : Session Initiation Protocol, March 1999