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INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS
AND NEXT-GENERATION NETWORKS

Next Generation Networks – Generalized mobility

Mobility management for interworking between WiMAX and UMTS

Recommendation ITU-T Y.2812



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Recommendation ITU-T Y.2812

Mobility management for interworking between WiMAX and UMTS

Summary

Recommendation ITU-T Y.2812 describes the mobility management framework for interworking between WiMAX and UMTS networks. The mobility management framework in this Recommendation focuses on vertical handover control in the transport stratum of next generation networks (NGNs) when a user equipment with multiple interfaces moves across those two different wireless access networks. The requirements, functional architecture and procedural information flows are given to specify the vertical handover control functionality.

History

Edition	Recommendation	Approval	Study Group
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Keywords

Mobility management, NGN, UMTS, vertical handover, WiMAX.

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Introduction

This Recommendation describes the mobility management (MM) architecture between WiMAX and UMTS technologies in next generation networks (NGNs). This work has been motivated from the observation that NGN continues to evolve toward the accommodation of various wireless access technologies. Accordingly, it is required to specify the detailed architecture and procedures to practically apply the NGN MM framework to the environment accommodating those various access technologies.

The MM architecture in this Recommendation is designed on the basis of the MM framework for NGN, which is described in the following Recommendations:

- ITU-T Q.1707/Y.2804: Generic framework of mobility management for next generation networks [ITU-T Q.1707];
- ITU-T Q.1708/Y.2805: Framework of location management for NGN [ITU-T Q.1708];
- ITU-T Q.1709/Y.2806: Framework of handover control for NGN [ITU-T Q.1709];
- ITU-T Y.2018: Mobility management and control framework and architecture within the NGN transport stratum [ITU-T Y.2018].

Recommendation ITU-T Y.2812

Mobility management for interworking between WiMAX and UMTS

1 Scope

This Recommendation describes the mobility management (MM) framework for interworking between WiMAX and UMTS networks where each access network would be operated by different service providers or different network management systems. In this Recommendation, the functional architecture focuses on IP mobility support for user equipment (UE) moving between those two different access networks. The functional architecture described in this Recommendation may be referred as a building block to be used to extend toward the other wireless access networks in next generation networks (NGNs).

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

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|----------------|--|
| [ITU-T G.1000] | Recommendation ITU-T G.1000 (2001), <i>Communications quality of service: A framework and definitions</i> . |
| [ITU-T Q.1706] | Recommendation ITU-T Q.1706/Y.2801 (2006), <i>Mobility management requirements for NGN</i> . |
| [ITU-T Q.1707] | Recommendation ITU-T Q.1707/Y.2804 (2008), <i>Generic framework of mobility management for next generation networks</i> . |
| [ITU-T Q.1708] | Recommendation ITU-T Q.1708/Y.2805 (2008), <i>Framework of location management for NGN</i> . |
| [ITU-T Q.1709] | Recommendation ITU-T Q.1709/Y.2806 (2008), <i>Framework of handover control for NGN</i> . |
| [ITU-T Y.2001] | Recommendation ITU-T Y.2001 (2004), <i>General overview of NGN</i> . |
| [ITU-T Y.2011] | Recommendation ITU-T Y.2011 (2004), <i>General principles and general reference model for Next Generation Networks</i> . |
| [ITU-T Y.2012] | Recommendation ITU-T Y.2012 (2010), <i>Functional requirements and architecture of next generation networks</i> . |
| [ITU-T Y.2018] | Recommendation ITU-T Y.2018 (2009), <i>Mobility management and control framework and architecture within the NGN transport stratum</i> . |
| [ITU-T Y.2701] | Recommendation ITU-T Y.2701 (2007), <i>Security requirements for NGN release 1</i> . |

3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

3.1.1 functional architecture [ITU-T Y.2012]: A set of functional entities and the reference points between them used to describe the structure of an NGN. These functional entities are separated by reference points, and thus, they define the distribution of functions.

NOTE – The functional entities can be used to describe a set of reference configurations. These reference configurations identify which reference points are visible at the boundaries of equipment implementations and between administrative domains.

3.1.2 functional entity [ITU-T Y.2012]: An entity that comprises an indivisible set of specific functions. Functional entities are logical concepts, while groupings of functional entities are used to describe practical, physical implementations.

3.1.3 host-based mobility management [ITU-T Q.1707]: A mobility management scheme in which the MM signalling is performed based on (or controlled by) the user equipment (UE).

3.1.4 network-based mobility management [ITU-T Q.1707]: A mobility management scheme in which the MM signalling is performed (or controlled) by the network entities, on behalf of the UE.

3.1.5 next generation network [ITU-T Y.2001]: A packet-based network able to provide telecommunication services and able to make use of multiple broadband, QoS-enabled transport technologies and in which service-related functions are independent from underlying transport-related technologies. It enables unfettered access for users to networks and to competing service providers and/or services of their choice. It supports generalized mobility which will allow consistent and ubiquitous provision of services to users.

3.1.6 mobility [ITU-T Q.1706]: The ability for the user or other mobile entities to communicate and access services irrespective of changes of the location or technical environment.

3.1.7 mobility management [ITU-T Q.1706]: The set of functions used to provide mobility. These functions include authentication, authorization, location updating, paging, download of user information and more.

3.1.8 quality of service [ITU-T G.1000]: The collective effect of service performances, which determine the degree of satisfaction of a user of the service.

3.1.9 transport stratum [ITU-T Y.2011]: That part of the NGN which provides the user functions that transfer data and the functions that control and manage transport resources to carry such data between terminating entities (see also clause 7.1 of [ITU-T Y.2011]).

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

AAA	Authentication, Authorization and Accounting
ABG-FE	Access Border Gateway Functional Entity
AN	Access Network
AN-FE	Access Node Functional Entity
AP	Access Point

AR-FE	Access Relay Functional Entity
ASN	Access Service Network
BBM	Break-Before-Make
BCE	Binding Cache Entry
BS	Base Station
CCoA	Co-located CoA
CMIP	Client Mobile IP
CN	Correspondent Node
CoA	Care-of-Address
DHCP	Dynamic Host Configuration Protocol
GGSN	Gateway GPRS Supporting Node
GPRS	General Packet Radio Service
HA	Home Agent
HDC-FE	Handover Decision and Control Functional Entity
HoA	Home Address
IBG-FE	Interconnection Border Gateway Functional Entity
IMSI	International Mobile Subscriber Identity
IP	Internet Protocol
L2HE-FE	Layer 2 Handover Execution Functional Entity
L3HEF	Layer 3 Handover Execution Function
LMA	Local Mobility Anchor
MAG	Mobile Access Gateway
MBB	Make-Before-Break
MIH	Media Independent Handover
MIIS	MIH Information Server
MIP	Mobile IP
MLM-FE	Mobility Location Management Functional Entity
MM	Mobility Management
MMCF	Mobility Management and Control Function
MUE	Mobile UE
NACF	Network Attachment Control Function
NAC-FE	Network Access Configuration Functional Entity
NGN	Next Generation Network
NID-FE	Network Information Distribution Functional Entity
PDN	Packet Data Network
PDP	Packet Data Protocol
PMA	Proxy Mobile Agent

PMIP	Proxy MIP
PRRP	Proxy RRP
PRRQ	Proxy RRQ
QoS	Quality of Service
RNC	Radio Network Controller
RRP	Registration Reply
RRQ	Registration Request
SAE	System Architecture Evolution
SGSN	Serving GPRS Supporting Node
TUP-FE	Transport User Profile Functional Entity
UE	User Equipment
UMTS	Universal Mobile Telecommunications System
WiMAX	Worldwide Interoperability for Microwave Access

5 Conventions

None.

6 Requirements for WiMAX and UMTS interworking

6.1 Harmonization with IP-based core networks

The NGN is envisaged to be IP-based. Accordingly, the mobility management (MM) protocols for NGN should be IP-based or, at least, well-harmonized with IP technology for its efficient and integrated operation in such future networks [ITU-T Q.1706].

In the NGN environment, various access networks could be interconnected to each other through the IP-based core network. Therefore, the MM architecture between WiMAX and UMTS networks also should be designed to be easily applied to IP-based networks and services.

6.2 Service continuity

The MM architecture for WiMAX-UMTS interworking should support seamless handover control functions to maintain session continuity of a user equipment (UE) moving between different access networks (ANs). Furthermore, those handover control mechanisms should provide fast handovers to support non-real time and real time service continuity (e.g., file downloading, VoIP and video streaming).

To support service continuity during a handover, a UE's attachment change between different ANs should be hidden to the service/application layer by IP-based MM mechanisms. It is also required to reduce the communication service disruption due to a handover into the range that does not terminate ongoing services.

6.3 QoS support

The MM mechanisms for WiMAX-UMTS interworking could support QoS-guaranteed handovers to provide seamless real time multimedia services such as VoIP and IPTV, as well as conventional best-effort services. However, the required level of QoS could be different according to the types of ANs, service characteristics, user requirements and handover policy of operators.

Occasionally, after detecting the presence of both WiMAX and UMTS networks, it should be possible for a user to choose to connect to one of the networks based on the QoS policies driven by service characteristics and user requirements. That is, a UE should be able to dynamically change its connection from one attachable AN to another according to the QoS level needed for a particular service (e.g., bandwidth availability, time delay, packet loss ratio, etc.).

6.4 Service compatibility

To support a UE's mobility within a single AN, the operators are likely to use their own MM mechanisms designed for a specific access technology. Thus the MM mechanism for NGN must be able to effectively harmonize with those existing MM protocols for various ANs. Especially, the MM mechanism for WiMAX-UMTS interworking should be well harmonized with the existing intra-AN MM architectures for WiMAX and UMTS networks which were developed by other SDOs (e.g., 3GPP/3GPP2, WiMAX Forum, etc.).

6.5 Service context transfer

When a UE moves across different ANs, the context information of ongoing sessions, including QoS level, security method, AAA mechanism and data compression type in use, might be helpful in performing a vertical handover. The information can be used to minimize the latency involved in handing the session over to new serving entities. The proper use of context transfer mechanism could substantially reduce the amount of overhead in the servers required to support QoS, security, AAA, and so on.

6.6 Interworking with the established AAA and security schemes

The MM protocols for NGN must specify how a user (or UE) is authenticated, authorized, accounted and secured for services using the standard authentication, authorization and accounting (AAA) and security mechanisms. [ITU-T Q.1706].

Because the operators generally have their own AAA and security schemes for their access networks, the MM architecture for interworking between different access technologies in NGN should carefully consider the compatibility with those existing AAA and security schemes.

6.7 Policy-based and dynamic network selection

The NGN could support a user to choose to connect to one of the attachable ANs based on QoS level, cost, security level, etc. When a UE moves between WiMAX and UMTS networks, the MM architecture for interworking between those networks should allow the UE to choose a target AN for handover according to the pre-defined user/operator policy or by the dynamic selection procedure.

7 Functional architecture for interworking between WiMAX and UMTS

This clause describes the functional architecture for interworking between WiMAX and UMTS networks, which is harmonized with the NGN architecture. Figure 7-1 shows the high-level functional architecture to accommodate WiMAX and UMTS network components into the NGN MM architecture. The general NGN architecture shown has been simplified in order to better focus on the objectives of this Recommendation.