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3GPP2 S.R0124-0 v1.0

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Version 1.0



3RD GENERATION
PARTNERSHIP
PROJECT 2
"3GPP2"

Ultra Mobile Broadband Network Architecture Model

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REVISION HISTORY

Document	Date	Description
S.R0124-0 v1.0	April 2008	Initial publication

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1 PURPOSE AND SCOPE

This document provides the Network Architecture Model (NAM) for the Ultra Mobile Broadband™ (UMB™)¹ system. The NAM supports the requirements in [1] and the Phase II requirements in [2].

The UMB system provides an additional Access Network (AN) to the overall architecture document in the AllIP NAM [3]. Except as documented in this document, all reference points and network entities in [3] are hereby incorporated by reference. Note: If not explained in this document, then refer to AllIP NAM [3].

1.1 References

1.1.1 Informative References

- [1] 3GPP2 S.R0121-0 v1.0, Network Evolution for 3GPP2 Networks, May 2007.
- [2] 3GPP2 S.R0113-0 v2.0 cdma2000 Enhanced Packet Data Air Interface System – System Requirements Document, June 2007.
- [3] 3GPP2 S.R0037-B v1.0, IP Network Architecture Model for cdma2000 Spread Spectrum Systems, June 2007.

1.2 Acronyms

AAA	Authentication, Authorization and Accounting
AGW	Access Gateway
AN	Access Network
AS	Application Server
AT	Access Terminal
BCMCS	Broadcast-Multicast Service
BGCF	Breakout Gateway Control Function
BR	Border Router
BSC	Base Station Controller
BTS	Base Transceiver System
CAN	Converged Access Network
CDG	CDMA Development Group
CDMA	Code Division Multiple Access
CMIP	Client Mobile Internet Protocol
CSCF	Call Session Control Function
DB	Database

¹ Ultra Mobile Broadband™ and (UMB™) are trade and service marks owned by the CDMA Development Group (CDG).

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DSI	Dynamic Subscriber Information	3
eBS	Evolved Base Station	4
ePDIF	Evolved Packet Data Interworking Function	5
EIR	Equipment Identity Register	6
EML	Element Management Layer	7
FA	Foreign Agent	8
HA	Home Agent	9
HLRe	Home Location Register Emulation	10
HRPD	High Rate Packet Data	11
HRPD-AN	High Rate Packet Data Access Network	12
HSS	Home Subscriber Server	13
IMS	IP Multimedia Subsystem	14
IP	Internet Protocol	15
LMA	Local Mobility Anchor	16
LMSDS	Legacy Mobile Station Domain Support	17
LTE	Long Term Evolution	18
MAP	Mobile Application Part	19
MGCF	Media Gateway Control Function	20
MGW	Media Gateway	21
MM	Mobility Manager	22
MMD	Multimedia Domain	23
M-NE	Managed-Network Entity	24
MRFC	Media Resource Function Controller	25
MRFP	Media Resource Function Processor	26
MS	Mobile Station	27
MSCe	Mobile Switching Center Emulation	28
NAM	Network Architecture Model	29
NML	Network Management Layer	30
OSA	Open Service Access	31
OSF	Operations Systems Function	32
OSS	Operations Support System	33
PCF	Packet Control Function	34
PCRF	Policy and Charging Rules Function	35
PDE	Position Determining Entity	36
PDSN	Packet Data Service Node	37
PMIP	Proxy Mobile Internet Protocol	38
PSTN	Public Switched Telephone Network	39
QoS	Quality of Service	40
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RLP	Radio Link Protocol
RNC	Radio Network Controller
SAE	System Architecture Evolution
SCPe	Service Control Point Emulation
S-CSCF	Serving CSCF
SGW	Signaling Gateway
SIP	Session Initiation Protocol
SMS-GW	Short Message Service Gateway
SRNC	Session Reference Network Controller
UMB	Ultra Mobile Broadband
UMB-AN	Ultra Mobile Broadband Access Network
VAAA	Visiting Authentication, Authorization and Accounting Server
VCC AS	Voice Call Continuity Applications Server

2 ARCHITECTURE MODELS

2.1 3GPP2 UMB Network Architecture Model

Figure 2.1-1 presents the network entities and associated reference points that comprise an Internet Protocol (IP)-based evolved network architecture model for the UMB system.

The styles of lines and rectangles used in Figure 2.1-1 are:

Dashed Rectangle	Network Entity or group of entities defined in [3]
Dashed Cloud	Network defined in [3]
Solid Line	Reference Point defined in this document.
Solid Rectangle	Network Entity or group of entities defined in this document.
Solid Cloud	Network defined in this document.

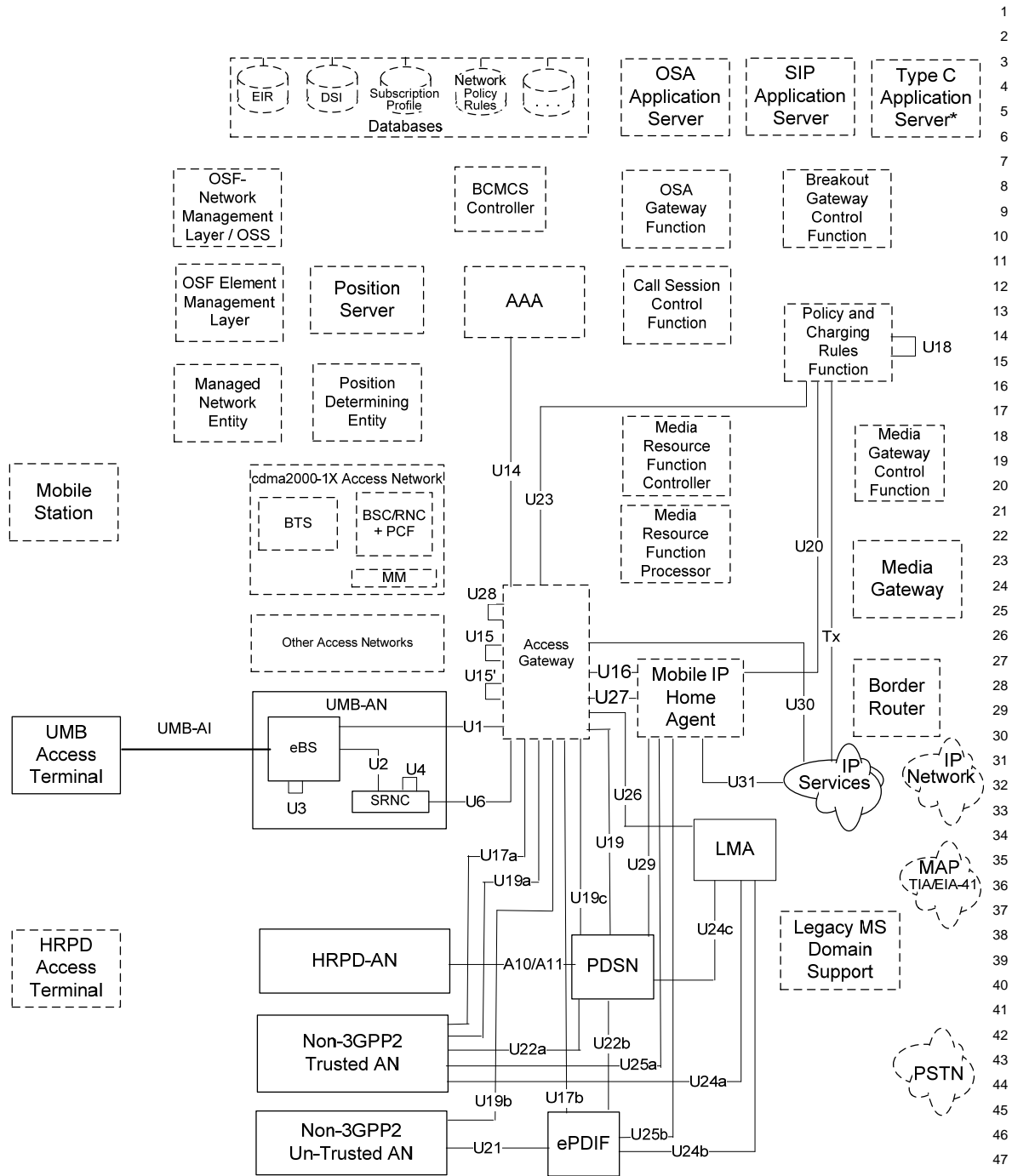


Figure 2.1-1 UMB System Network Architecture Model

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The NAM should be interpreted as follows:

- a. The network entities are functional representations.
- b. A network entity represents a group of functions, not necessarily a physical device. The physical realization of a network entity is an implementation issue. A manufacturer may choose any physical implementation of network entities, either individually or in combination, as long as the implementation meets the functional requirements. Sometimes, for practical specifications reasons, the functional network entity is interpreted as a physical device.
- c. A reference point is a conceptual point that divides two groups of functions. It is not necessarily a physical interface. One or more interfaces may be defined to support each reference point.
- d. Each reference point corresponds to at least one standardized interface.
- e. An interface is comprised of a standardized set of procedures, messages, and protocols. Interface specification is beyond the scope of this document.
- f. A “Collective Entity” contains encompassed network entities that are an instance of the collective (e.g., UMB Access Network).

2.2 Network Entities

2.2.1 Access Gateway (AGW)

The Access Gateway (AGW) is an entity that provides the user’s “point of IP connectivity” to the network. That is, the AGW is in effect the first-hop router for the mobile terminal. The AGW performs layer 3 services and above, including hot-lining, accounting, policy enforcement, etc.

Additional information regarding the AGW, IP Multimedia Domain, Legacy MS Domain, and Broadcast/Multicast Service (BCMCS) is contained in [3].

A split AGW configuration separates the AGW into a Serving-AGW (srv-AGW) and an Anchor-AGW (anc-AGW).

2.2.2 Access Network

The Access Network is a network component that may support both the Multimedia and Legacy MS Domains.

The access network may perform mobility management functions for registering, authorizing, authenticating and paging IP based terminals, independent of circuit based terminals. The access network may perform handoffs within an access

network and between access networks of the same technology and may support handoffs between access networks of differing technologies.

2.2.2.1 cdma2000 Access Network

The cdma2000-1X Access Network and the HRPD AN are known as the cdma2000^{®2} Access Network contained in [3].

2.2.2.1.1 cdma2000-1x Access Network

The cdma2000-1X access network contains the Base Transceiver System (BTS), Base Station Controller (BSC), Radio Network Controller (RNC), Mobility Manager (MM), and the Packet Control Function (PCF).

2.2.2.1.2 High-Rate Packet Data Access Network (HRPD-AN)

The HRPD-AN is a node in the HRPD legacy packet data network.

2.2.2.2 Other Access Networks

The Other Access Network is defined in [3].

2.2.2.3 UMB Access Network

The UMB access network is group of network entities consisting of eBSs and SRNCs.

2.2.2.3.1 Evolved Base Station (eBS)

The Evolved Base Station (eBS) provides the over-the-air signaling and user data transport that is used by the Access Terminal (AT) for connectivity to the radio access network.

The functions of the eBS include:

- Over-the-air transmission of packets
- Encryption/decryption of packets at the Radio Link Protocol (RLP) level for over-the-air transmission/reception.
- Scheduling for over-the-air transmission
- Policy enforcement for over-the-air transport.
- Header Compression

2.2.2.3.2 Session Reference Network Controller (SRNC)

This functional entity is responsible for maintaining radio access specific information for the AT in the UMB radio converged access network. The SRNC

² cdma2000[®] is the trademark for the technical nomenclature for certain specifications and standards of the Organizational Partners (OPs) of 3GPP2. Geographically (and as of the date of publication), cdma2000[®] is a registered trademark of the Telecommunications Industry Association (TIA-USA) in the United States.

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3 is responsible for maintaining the session reference (session storage point for
4 negotiated air interface context) idle state management, and providing paging
5 control functions when the AT is idle. The SRNC is an authenticator also
6 responsible for access authentication of the AT.
7
8

9 **2.2.2.4 Non-3GPP2 Access Network**

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11 This is not a functional entity, but a representation of non-3GPP2 access network
12 that may be either trusted or un-trusted.
13
14

15 **2.2.2.4.1 Non-3GPP2 Un-trusted Access Network**

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17 If the access network is un-trusted, then the AT can use the Evolved Packet Data
18 Interworking function (ePDIF) to connect the 3GPP2 operator's network to
19 access that network.
20
21

22 **2.2.2.4.2 Non-3GPP2 Trusted Access Network**

23
24 If the access network is trusted, then the access network connects directly to the
25 AGW (i.e. without using the ePDIF).
26
27

28 **2.2.3 Authentication, Authorization and Accounting (AAA)**

29 This functional entity provides authentication, authorization, and accounting
30 functions with respect to the AT's use of the network resources.
31

32 Additional information regarding the AAA is contained in [3].
33

34 A visited AAA is the AAA in the network that is serving the call.
35

36 **2.2.4 Application Server**

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38 The NAM for the Application Server is contained in [3].
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40

41 **2.2.5 BCMCS Controller**

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43 The NAM for the BCMCS Controller is contained in [3].
44
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46 **2.2.6 Border Router (BR)**

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48 The NAM for the BR is contained in [3].
49
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51 **2.2.7 Breakout Gateway Control Function (BGCF)**

52
53 The NAM for the BGCF is contained in [3].
54
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56 **2.2.8 Call Session Control Function (CSCF)**

57
58 The NAM for the CSCF is contained in [3].
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2.2.9 Databases (DB)

The NAM for the DB is contained in [3]. The DB contains the Equipment Identity Register (EIR), Dynamic Subscriber Information, Network Policy Rules, Subscriber Profile, and other information.

2.2.10 Evolved Packet Data Interworking Function (ePDIF)

The evolved ePDIF provides connectivity from the Home Agent to an un-trusted non-3GPP2 network.

2.2.11 Home Subscriber Server

The NAM for the Home Subscriber Server (HSS) is contained in [3].

2.2.12 IP Multimedia Client

The NAM for the IP Multimedia Client is contained in [3].

2.2.13 IP Network

The NAM for the IP Network is contained in [3].

2.2.14 IP Services

IP Services comprise any IP based services provided by the operator or 3rd party. This may be part of the Internet or a closed network. The IP service network may include IP Multimedia Subsystem (IMS), Multimedia Domain (MMD), and other network entities in Figure 2.1-1.

2.2.15 Legacy MS Domain Support (LMSDS)

The NAM for LMSDS is contained in [3]. The LMSDS contains the Home Location Register emulation (HLRe), Mobile Switching Center emulation (MSCe), and Service Control Point emulation (SCPe).

2.2.16 Media Gateway (MGW)

The NAM for the MGW is contained in [3].

2.2.17 Media Gateway Control Function (MGCF)

The NAM for the MGCF is contained in [3].

2.2.18 Media Resource Function Controller (MRFC)

The NAM for the MRFC is contained in [3].

2.2.19 Media Resource Function Processor (MRFP)

The NAM for the MRFP is contained in [3].

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2.2.20 Mobile IP Home Agent (HA)

The Home Agent is like the home agent that exists in today's networks. It is used to provide a mobility solution to the AT in a 3GPP2 packet data network. However, in an evolved network, the home agent may also be used for inter-technology mobility.

Additional NAM information for the HA is contained in [3].

2.2.21 Mobile Station (MS)

The NAM for the MS is contained in [3].

2.2.22 Operations Systems Function (OSF)

The NAM for the OSF is contained in [3]. The OSF contains the Element Management Layer (OSF-EML), Network Management Layer/Operations Support System (OSF-NML/OSS), and Managed Network Entity (M-NE).

In addition to the managed network entities defined in [3], the following network entities may be managed: eBS, SRNC, LMA, ePDIF, HRPD-AN.

2.2.23 Packet Data Serving Node (PDSN)

The PDSN is the node that provides the user's point of IP connectivity in the legacy packet data network.

2.2.24 Policy and Charging Rules Function (PCRF)

This term refers to the rules provided by the PCRF to the AGW. The purpose of the PCC rule is to:

- a. - Detect a packet belonging to a service data flow,
- b. - Provide policy control for a service data flow, and to
- c. - Provide applicable charging parameters for a service data flow.

Additional NAM information for the PCRF is contained in [3].

2.2.25 Position Determining Entity (PDE)

The NAM for the PDE is contained in [3].

2.2.26 Position Server

The NAM for the position server is contained in [3].

2.2.27 Public Switched Telephone Network (PSTN)

The NAM for the PSTN is contained in [3].

2.2.28 Signaling Gateway (SGW)

The NAM for the SGW is contained in [3].

2.2.29 Short Message Service Gateway (SMS-GW)

The NAM for the SMS-GW is contained in [3].

2.2.30 Voice Call Continuity Application Server (VCC AS)

The NAM for the VCC AS is contained in [3].

2.3 Reference Points

2.3.1 A10/A11 PDSN – HRPD-AN

The A10/A11 reference point carries control (A11) and bearer (A10) information between the PDSN and HRPD-AN.

2.3.2 Tx PCRF -- Application Function

The Tx reference point carries control information between the PCRF and the Application Function in the IP Services network. Additional information for the Tx reference point is contained in [3].

2.3.3 UMB-AI AT -- eBS

The UMB air interface carries control and bearer information between the AT and the eBS.

2.3.4 U1 eBS -- AGW

The U1 reference point carries control and bearer information between the enhanced Base Station (eBS) and the Access GateWay (AGW). The U1 reference point includes interfaces for bearer transport (user data and signaling), Quality of Service (QoS), and accounting.

2.3.5 U2 eBS -- SRNC

The U2 reference point provides interfaces for carrying control information between the eBS and the SRNC.

2.3.6 U3 eBS -- eBS

The U3 reference point carries control and bearer information between eBSs. The U3 control interface includes tunnel management and active set management for the UMB air interface.

2.3.7 U4 SRNC -- SRNC

The U4 reference point carries control information between SRNCs. The U4 control interface includes inter-SRNC paging and session transfer.

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2.3.8 U6 AGW -- SRNC

The U6 reference point carries control information for authentication, idle state management and paging between the SRNC and the AGW. Components of this interface are currently under study.

2.3.9 U14 AGW -- AAA

The U14 reference point carries control information between the anc-AGW and the AAA infrastructure via the Visited AAA server (VAAA). This reference point implements a signaling protocol to support user authentication, authorization and accounting.

2.3.10 U15 srv-AGW – srv-AGW

The U15 reference point carries carry control and bearer information between two Serving AGWs (srv-AGWs) to support inter-AGW mobility.

2.3.11 U15' srv-AGW – anc-AGW

The U15' reference point carries control and bearer information between the srv-AGW) and the Anchor (anc-AGW). The U15' reference point is not exposed if the srv-AGW and the anc-AGW are collocated.

2.3.12 U16 AGW -- HA

The U16 reference point carries control and bearer information between the AGW and the Home Agent (HA) for a split AGW configuration, and supports bearer transport and signaling for mobility as well.

2.3.13 U17 3GPP2 Network -- non-3GPP2 Network

The U17a reference point provides connectivity between the 3GPP2 network and a trusted non-3GPP2 network (e.g., 3GPP System Architecture Evolution (SAE)/Long Term Evolution (LTE) or WiMAX). The U17b reference point provides connectivity between the 3GPP2 network and an untrusted non-3GPP2 network via the ePDIF (e.g., a WiFi network).

2.3.14 U18 PCRF -- PCRF

The U18 reference point carries control information between a visited PCRF and home PCRF in order to transfer policy and charging rules between domains. The U18 reference point is the same as the Ty reference point.

2.3.15 U19 AGW – Specific Other Networks

The U19 reference point carries control and bearer information between an anc-AGW and the PDSN for split AGW configurations. The U19a reference point connects between an AGW and a Non-3GPP2 Trusted AN. The U19b reference point connects between an AGW and a Non-3GPP2 Un-trusted AN. The U19c reference point connects between an AGW and a PDSN.

2.3.16 U20 HA -- PCRF

The U20 reference point carries control information between the HA and the PCRF. The U20 reference point allows (QoS) policy and charging information to be conveyed to the HA.

2.3.17 U21 ePDIF – un-trusted non-3GPP2 access network

The U21 reference point carries control and bearer information between the ePDIF and an un-trusted non-3GPP2 access network.

2.3.18 U22 PDSN -- non-3GPP2 Network

The U22 reference point provides two separate interfaces: U22a and U22b. The U22a reference point carries control and bearer information between the PDSN and a trusted non-3GPP2 network. For this connection the ePDIF is not required to be on the data path. The U22b reference point, however, carries control and bearer information between the PDSN and an untrusted non-3GPP2 network. For this connection the ePDIF is required to be on the data path.

2.3.19 U23 PCRF -- AGW

The U23 interface carries control information from the (QoS) Policy and Charging Rules Function (PCRF) to the anc-AGW. The U23 reference point is the same as the Ty reference point.

2.3.20 U24 LMA -- Specific Other Network

The U24 reference point carries control and bearer information with Proxy Mobile Internet Protocol (PMIP) between the Local Mobility Anchor (LMA) and the trusted non-3GPP2 (U24a), and between the LMA and the ePDIF (U24b), and between the LMA and the PDSN (U24c), and supports handoff between a Converged Access Network (CAN) and another system.

2.3.21 U25 HA -- Specific Other Network

The U25 reference point carries control and bearer information with Client Mobile Internet Protocol (CMIP) between the HA and the trusted non-3GPP2 (U25a), and between the HA and the ePDIF (U25b), and supports handoff between a CAN and another system.

2.3.22 U26 LMA -- AGW

The U26 reference point carries control and bearer information with PMIP between the LMA and the AGW and supports handoff between AGWs.

2.3.23 U27 HA -- AGW

The U27 reference point carries control and bearer information with CMIP between the HA and the AGW for single (i.e. non-split) AGW configurations and supports handoff between AGWs.

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2.3.24 U28 AGW -- AGW

The U28 reference point carries control and bearer (optional) information between the AGWs for single (i.e. non-split) AGW configurations and supports fast inter-AGW handoff.

2.3.25 U29 HA -- PDSN

The U29 reference point carries control and bearer information between the HA and the PDSN.

2.3.26 U30 AGW – IP Services

The U30 reference point carries control and bearer information between the AGW and the IP Services network.

2.3.27 U31 HA – IP Services

The U31 reference point carries control and bearer information between the HA and the IP Services network.