

Attachment 4-1-2

End-to-End Network Systems Architecture

WiMAX Forum Network Architecture

(Stage 2: Architecture Tenets, Reference Model and Reference Points)
[Part 0]

Release 1.1.0

Note: This Document is reproduced without any modification with the consent of the WiMAX Forum®, which owns the copyright in them.



WiMAX Forum Network Architecture

(Stage 2: Architecture Tenets, Reference Model and Reference Points)

[Part 0]

Release 1.1.0

July 11, 2007

WiMAX Forum Proprietary

Copyright © 2005-2007 WiMAX Forum. All Rights Reserved.

Copyright Notice, Use Restrictions, Disclaimer, and Limitation of Liability.

Copyright 2007 WiMAX Forum. All rights reserved.

The WiMAX Forum® owns the copyright in this document and reserves all rights herein. This document is available for download from the WiMAX Forum and may be duplicated for internal use, provided that all copies contain all proprietary notices and disclaimers included herein. Except for the foregoing, this document may not be duplicated, in whole or in part, or distributed without the express written authorization of the WiMAX Forum.

Use of this document is subject to the disclaimers and limitations described below. Use of this document constitutes acceptance of the following terms and conditions:

THIS DOCUMENT IS PROVIDED “AS IS” AND WITHOUT WARRANTY OF ANY KIND. TO THE GREATEST EXTENT PERMITTED BY LAW, THE WiMAX FORUM DISCLAIMS ALL EXPRESS, IMPLIED AND STATUTORY WARRANTIES, INCLUDING, WITHOUT LIMITATION, THE IMPLIED WARRANTIES OF TITLE, NONINFRINGEMENT, MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. THE WiMAX FORUM DOES NOT WARRANT THAT THIS DOCUMENT IS COMPLETE OR WITHOUT ERROR AND DISCLAIMS ANY WARRANTIES TO THE CONTRARY.

Any products or services provided using technology described in or implemented in connection with this document may be subject to various regulatory controls under the laws and regulations of various governments worldwide. The user is solely responsible for the compliance of its products and/or services with any such laws and regulations and for obtaining any and all required authorizations, permits, or licenses for its products and/or services as a result of such regulations within the applicable jurisdiction.

NOTHING IN THIS DOCUMENT CREATES ANY WARRANTIES WHATSOEVER REGARDING THE APPLICABILITY OR NON-APPLICABILITY OF ANY SUCH LAWS OR REGULATIONS OR THE SUITABILITY OR NON-SUITABILITY OF ANY SUCH PRODUCT OR SERVICE FOR USE IN ANY JURISDICTION.

NOTHING IN THIS DOCUMENT CREATES ANY WARRANTIES WHATSOEVER REGARDING THE SUITABILITY OR NON-SUITABILITY OF A PRODUCT OR A SERVICE FOR CERTIFICATION UNDER ANY CERTIFICATION PROGRAM OF THE WiMAX FORUM OR ANY THIRD PARTY.

The WiMAX Forum has not investigated or made an independent determination regarding title or noninfringement of any technologies that may be incorporated, described or referenced in this document. Use of this document or implementation of any technologies described or referenced herein may therefore infringe undisclosed third-party patent rights or other intellectual property rights. The user is solely responsible for making all assessments relating to title and noninfringement of any technology, standard, or specification referenced in this document and for obtaining appropriate authorization to use such technologies, technologies, standards, and specifications, including through the payment of any required license fees.

NOTHING IN THIS DOCUMENT CREATES ANY WARRANTIES OF TITLE OR NONINFRINGEMENT WITH RESPECT TO ANY TECHNOLOGIES, STANDARDS OR SPECIFICATIONS REFERENCED OR INCORPORATED INTO THIS DOCUMENT.

IN NO EVENT SHALL THE WiMAX FORUM OR ANY MEMBER BE LIABLE TO THE USER OR TO A THIRD PARTY FOR ANY CLAIM ARISING FROM OR RELATING TO THE USE OF THIS DOCUMENT, INCLUDING, WITHOUT LIMITATION, A CLAIM THAT SUCH USE INFRINGES A THIRD PARTY’S INTELLECTUAL PROPERTY RIGHTS OR THAT IT FAILS TO COMPLY WITH APPLICABLE LAWS OR REGULATIONS. BY USE OF THIS DOCUMENT, THE USER WAIVES ANY SUCH CLAIM AGAINST THE WiMAX FORUM AND ITS MEMBERS RELATING TO THE USE OF THIS DOCUMENT.

The WiMAX Forum reserves the right to modify or amend this document without notice and in its sole discretion. The user is solely responsible for determining whether this document has been superseded by a later version or a different document.

“WiMAX,” “Mobile WiMAX,” “Fixed WiMAX,” “WiMAX Forum,” “WiMAX Certified,” “WiMAX Forum Certified,” the WiMAX Forum logo and the WiMAX Forum Certified logo are trademarks of the WiMAX Forum. Third-party trademarks contained in this document are the property of their respective owners.

Document Structure

- Note:** See §3.0 References in *WiMAX Forum Network Architecture [Part 1]* for references cited in this document.
- This document is the first part of *WiMAX Forum Network Architecture*, which includes the following parts:

Part 0	<ul style="list-style-type: none"> • Document Structure • Revision History
Part 1	<ul style="list-style-type: none"> • Section 1 - Document Scope • Section 3 - References used in the document • Section 4 - Tenets for WiMAX Network System Architecture • Section 5 - Identifiers: List of identifiers used in a WiMAX network • Section 6 - Network Reference Model, a logical representation of the network architecture.
Part 2	<ul style="list-style-type: none"> • Section 7 - Functional Design and Decomposition • Section 8 - ASN Profile Introduction
Part 3	Informative Annexes for Stage 2 <ul style="list-style-type: none"> • Annex A: WiMAX NWG Reference Architecture Deployment Scenarios • Annex B: MS Movement with FA change, no PC change • Annex C: ASN-GW Selection Protocol • Annex D: ‘RRM’: Spare Capacity Report per QoS Profiles • Annex E: Ethernet Operational Behavior • Annex F: TECHNICAL ANNEX: SUPPORT OF REAL TIME SERVICES
Stage 2 Abbreviations	<ul style="list-style-type: none"> • Section 1- Abbreviations, Acronyms, Definitions and Conventions used in the document
3GPP	<ul style="list-style-type: none"> • WiMAX Interworking
3GPP2	<ul style="list-style-type: none"> • WiMAX Interworking
WiMAX Interworking with DSL	<ul style="list-style-type: none"> • WiMAX Interworking with DSL

Revision History

Date	Revision
February 18, 2005	Accepted contributions/changes from F2F meeting in NJ. File name changed from “050130_NWG_BaselineSubmission_01r1_TenetsRef_Model” to “050218_NWG_STAGE2.doc” (Using web site revision management)
March 14, 2005	Incorporated changes from 050309_NWG_03_AAA.doc, Section 2 Updates, Stage 2 Tenets update, and Basic IP address management – 01r3
April 20, 2005	Added RRM changes from file “050418_RRM_1r6.doc” Approved at the Malaga Spain meeting

Date	Revision
June 17, 2005	<p>Added the following contributions (file names):</p> <ul style="list-style-type: none"> • 050602_NWG_05_Client_MIP_Architecture-accepted; • 050605_NWG_07_EAP_Arch_Accepted; • 050607_NWG_01r8_PMIP-Inter-ASN-mobility-accepted; • 050607_NWG_NRM-Accepted; • 050609_NWG_01-Intra-ASN-mobility_R6_v03_accepted; • 050609_NWG_Intra-ASN_R4_03_accepted; • 050610_NWG-QoS_accepted
June 22, 2005	<p>Added the table of figures and the following contribution (file name):</p> <p>050606_NWG_R3MM_PMIP-Security</p>
July 5, 2005	Added contribution 050629_NWG_RRM-Stage2-updates-accepted
July 6, 2005	RRM corrections and missing text from previous RRM contribution
August 8, 2005	<p>Added the following contributions (file names):</p> <ul style="list-style-type: none"> • 050609_NDS-r2 Huawei edits meeting edits • 050627_NWG_FranceTelecom_02_3GPPInterworking • 050701_NWG_Sprint_01_IPv6_Address_Management_Section_632-Revision 1 • 050701_NWG_Sprint_02_Ipv6_Address_Management_Section_7 3 2 • 050703_NWG_02_EAP_Arch_modif_proposal(sm)2accepted • 050706_NWG_Sprint_02_3GPP2_Interworking-Revision_2 • 050706_NWG_Sprint_03_Mobile_Ipv6_Architecture • 050707_NWG_Huawei_Comments_(Intra_ASN_R4_03_accepted)_v1 • 050707_NWG_Huawei_Comments_(Intra_ASN_R4_R6_v03)_v1_accepted • 050707-NWG-QoS-Framework-Accepted • 050708_NWG_Stage2_rev4c PMN-AAA Key(Lucent) • 050712_NWG_siem_STAGE2-6-10(RRM)corr-accepted • 050714_NWG_DLS_Interworking-v14 • 050714_NWG_Emergency_Service_v1 • 070805-eth-cs-specification_stage2r2 • 050714_NWG_Inter-NAP-Mobility-harmonized • 050223_NWG_IP Address Management-1r6 • 050805_NWG_Functional_Decomposition_Paging-1r5
September 5, 2005	<p>Added the following contributions (file names):</p> <ul style="list-style-type: none"> • 050824_NWG_Huawei_Comments_Intra_ASN_Data path modify proposal.doc • 050822_NWG_Huawei_Intra_ASN_R4_HO_flow_proposal.doc • 08-16-05_NWG_WiMAX Stage 2 – Text for NRM functional

Date	Revision
	<p>decomposition</p> <ul style="list-style-type: none"> 08-16-05_NWG_Sprint Nextel_New Section 4_v05 050823_NWG_Sprint_01_MIPv6 Section 7.22 Updates 050812_NWG_Sprint_01_Additional MIPv6 Changes to Section 6 of Stage-2 Text – R02 05-08-16_NWG_Changes_to_section_6.18.2 050822_NWG_Huawei_Inter-NAP-Mobility_Multiple IP address comments.doc 050827_NWG_Siemens_10_STAGE2-DSL-Interworking.doc 050830 R1-NWG-AAA-RADIUS-Stage-2.doc 08-16-05_NWG_Sprint Nextel_New Section 4_v05 050826_NWG_VoIP_v2.doc 050826-NWG-IMS_WiMAX_integration.doc 050826-NWG-QoS Messages r3.doc 082505 WiMAX Key Transfer Correction – LU.doc 08-16-05_NWG_Sprint Nextel_New Section 4_v05 050831_NWG-Fn-Decomp_Ch6.doc 050825_NWG_SuggestedTextForIntraASNmobilitySec7_v01 050825_NWG_Siemens_Identifiers-List_r1.doc 050826_NWG_Motorola_10_PMN_Migration_r3.doc 050826_NWG_Motorola_PMIPKey_r1.doc
September 9, 2005	<ul style="list-style-type: none"> 050818_NWG_Huawei_Comments for Secure Location Update of Paging-r4.doc 050905_NWG_Siemens_channelbinding_r1.doc 050826-NWG-ND&S-Revised-Huawei.doc 050822_NWG_Huawei_Inter-NAP-Mobility_PMIP connection setup comment.doc Added Table List
September 11, 2005	<ul style="list-style-type: none"> 050826-NWG-ND&S-Revised-Huawei_r1.doc 050825_NWG_Siemens_Identifiers-List_r2.doc
September 12, 2005	Reformatted As Agreed in 050906_NWG_02_STAGE2-document-structure
September 13, 2005	<p>Re-applied contribution 050816_NWG_WiMAX Stage 2 – Text for NRM functional decomposition_v3</p> <ul style="list-style-type: none"> 050826_NWG_Sprint_01_MIPv6 Inter-NAP Mobility-R02 050912 wimax accounting stage 2 050912_NWG_STAGE2 – Navini Siemens Ethernet edits 050908_NWG_Huawei_EAP_Arch_modify proposal-r4_sanjay 050907_NWG-R3MM-function-5

Date	Revision
September 14, 2005	<p>Removed duplicate text on CMIP per Surest email showing the duplications</p> <p>Provided missed edits per Bala email</p> <p>Cleaned up figure 7-55 per Peretz email</p> <p>Corrected figures and edits per Achim's email</p> <p>Cleaned up formatting in the Accounting Section (7.13)</p> <p>Cleaned up formatting in the Hot-lining Section (7.14)</p> <p>Note: Was not able to Identify DSL Updates per Max's email This still needs addressing.</p>
September 15, 2005	<p>Corrected Figures 7-35, 7-105, A-8, and A-8</p> <p>Accepted all changes</p> <p>First Ballot Version</p>
November 29, 2005	Updated to address all initial round ballot comments as documented in 051122_Stage2_Comment_Tracking.xls
December 12, 2005	<p>Updated to address all the quality review comments as defined in 051211_Stage2_QR_Comment_Tracking.xls. EXCEPT</p> <p>9 – 11</p> <p>14</p> <p>23</p> <p>28</p> <p>33 – 34</p> <p>36 – 38</p> <p>41 – 43</p> <p>46 – 47</p> <p>49 – 68</p> <p>73 – 75</p> <p>77</p> <p>80 – 81</p> <p>84 – 85</p> <p>87 – 88</p> <p>91</p> <p>104-105</p> <p>These are all deferred for various reasons and need more input based on this version of the Stage-2</p>
December 14, 2005	<p>Corrected section numbering addressed additional Quality Review Comments. Open Comments to be addressed are:</p> <p>9, 10, 11, 14, 36, 52, 53, 54, 55, 56, 58, 59, 60, 62, 63, 64, and 65</p> <p>Note that comment 36 has a resolution, but the file cannot be located at this time.</p>
December 15, 2005	<p>Address comment QR36 and cleaned up some minor formatting issues.</p> <p>There are still 3 open issue that need resolving</p>

Date	Revision
	<ol style="list-style-type: none"> 1. Section 4.1.2 the NAI Identifier has an un-resolved [ref] needs resolving 2. Section 7.2.1.4 there is a large “Editors Note” that I am not sure I should remove or not. 3. QR9 regarding the 3GPP2 reference of the MIPv6 text needs to be addressed. Sprint is leading an effort to get reuse permission from 3GPP2 which should not be an issue since they have done this in the past.
February 6, 2006	<p>No technical changes to document</p> <p>This version simply broke the December 15, 2005 version into 4 separate parts to reduce the size of the document to keep it more manageable. The sections are as follows:</p> <p>Part 0 – This document – It contains to overall cover sheet, revision history, and document definitions</p> <p>Part 1 – Contains sections 1 through 6 and associated Table of Contents</p> <p>Part 2 – Contains section 7 and associated Table of Contents</p> <p>Part 3 – Contains all the Annexes and associated Table of Contents</p>
March 3, 2006	<p>Incorporated the following agreed contributions.</p> <ul style="list-style-type: none"> • 060106_NWG_Huawei_Requirements for Supporting MIPv6 Proxy DAD on the MS's CoA-r2.doc • 051104_NWG_Huawei_Change Stage2 HO Function Primitives_r2.doc • 051104_NWG_Huawei_CATR_Add Accounting Trigger_r2.doc • 051104_NWG_Huawei_CATR_Add New Action for Charging_accepted.doc • 051104_NWG_Huawei_CATR_Clarify In Prepaid of Charging_r2.doc • 051106_NWG_Huawei_CATR_Accounting proposal for Volume Count Stage 2-r2.doc • 051104_NWG_Huawei_Stage2 CMIP session termination-r1.doc • 051104_NWG_Huawei_CATR_Change Stage2 Data Path Primitives_r1.doc • 060118_NWG_Siemens&Alcatel_QoS-ArchModifProposal.doc • 060131_NWG_stage2_paging_modifications_final.doc • ASN Profiles Text Proposed Baseline v2.doc • 051205_NWG_Intel_stage2pagingchanges_tosupport_stage3r2.doc
April 14, 2006	<p>Incorporated the following agreed contributions.</p> <ul style="list-style-type: none"> • 060125_NWG_stage2_paging_modifications.doc • 060224_NWG_Siemens_stage2_annexA_update_r1.doc • 060321_NWG_Samsung_RefSec_r1.doc
April 20, 2006	<p>Incorporated the following agreed contributions.</p> <ul style="list-style-type: none"> • 060321_NWG_Siemens_stage2_AAA_update_r1.doc
August 08, 2006	<p>Incorporate comments resolution from V&V readiness ballot' in Stage 2 Part 0 and Stage 3</p>
August 9 th , 2006	<p>- Final V&V readiness draft</p>

Date	Revision
February 24 th , 2007	All accepted contributions from V&V implemented
July 11, 2007	Implemented all Stage 2 accepted contributions from 00000_r016_NWG-Rel-1[1].0.0-CR-Tracking-Spreadsheet.xls