



WiMAX Forum® Network Requirements

Recommendations and Requirements for
WiMAX ASN Local Routing of the Bearer Traffic

WMF-T31-126-R020v01

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1. Introduction (Informative)

2 Considering that various IP-based local services (e.g. video calls) demand more transport resources, WiMAX®
3 operators and vendors have identified the need for efficient use of transport resources. Statistically, large portions of
4 the services remain localized, e.g., some conversational VoIP services do not leave local areas; therefore,
5 unnecessary backhauling of the Bearer Traffic between User Devices as defined in [2] can be avoided. At the same
6 time, extremely stringent delay limits are also required for delay sensitive services, whilst transport and processing
7 delay per hop are critical factors; hence, reducing hops in the end to end paths can reduce the overall latency. Local
8 Routing of the Bearer Traffic between MSs is considered as supportive to meet the requirements. Local Routing
9 technology is a solution for saving ‘backhaul’ capacity where Bearer Traffic from a WiMAX MS/SS is sent to an
10 ASN Local Routing function which shortcuts Bearer Traffic destined for another WiMAX MS/SS that is considered
11 “locally” situated.

12
13 This document defines stage 1 requirements specification for ASN Local Routing feature of Bearer Traffic for the
14 broadband wireless networks based on WiMAX Forum Certified™ products. It describes usage scenarios and
15 functional requirements for ASN Local Routing of Bearer Traffic. Architecture details shall be specified in stage-2
16 and stage-3 specifications based on the requirements outlined in this document.

2. Objective and Scope

The objective of this specification is to identify use case scenarios and to define requirements to enable ASN Local Routing of Bearer Traffic. The scope of the specification is as follows:

- To identify use cases to support ASN Local Routing of Bearer Traffic
- Policy control for ASN Local Routing of Bearer Traffic
- To identify the support for service flow and QoS management for ASN Local Routing of Bearer Traffic
- Backward compatibility to legacy network equipment, including Rel 1.0, Rel 1.5 and Rel 1.6.
- Provisioning/activation/deactivation for ASN Local Routing of Bearer Traffic
- To identify the support for mobility applications of ASN Local Routing.

The full objectives of this work item will be divided into phases, with the first phase focusing on the ASN Local Routing of the Bearer Traffic at the ASN-GW. The second phase may include local routing at the BS and/or WFAP.

Changes to the current Mobility features in Release 1.5 [1] are out of scope.

3. Abbreviations, Definitions, and Conventions (*Informative*)

3.1 Conventions (*Informative*)

The key words “MUST”, “MUST NOT”, “REQUIRED”, “SHALL”, “SHALL NOT”, “SHOULD”, “SHOULD NOT”, “RECOMMENDED”, “MAY”, and “OPTIONAL” in this document are to be interpreted as described in RFC 2119 [5].

3.2 Abbreviations and Acronyms (*Informative*)

ASN	Access Service Network
BS	Base Station
GW	Gateway
IP	Internet Protocol
MS	Mobile Station
NAP	Network Access Provider
NSP	Network Service Provider
QoS	Quality of Service
SF	Service Flow
SS	Subscriber Station
VoIP	Voice over IP
WFAP	WiMAX Femto Access Point

3.3 Definitions (*Informative*)

For phase 1 implementation of Local Routing, the Local Routing Control Point & the Local Routing Enforcement Point MAY be the same.

3.3.1 ASN Local Routing

ASN Local Routing is a function to optimize media data (bearer) traffic delivery between two end points by locally routing the packets within WiMAX access network.,.

3.3.2 ASN Local Routing Enforcement Point

ASN Local Routing Enforcement Point is an ASN node (WFAP, BS, ASN-GW) which has Local Routing capability and is responsible for enforcing local routing of media data traffic.

3.3.3 ASN Local Routing Policy

ASN Local Routing Policy (ex. PCC) is a set of rules that controls the Local Routing behavior. The rules reside with the NSP and are forwarded to the NAP for enforcement.

3.3.4 ASN Local Routing Control Point

ASN Local Routing Control Point is the entity where Local Routing Policy is available and which is responsible for controlling Local Routing behavior.

3.3.5 ASN Local Routing Point

ASN Local Routing Point consists of ASN Local Routing Control Point and/or ASN Local Routing Enforcement Point

1 4. References

- 2 [1] Requirements and Recommendations For Release 1.5 WiMAX Forum® Air Interface
3 [2] Recommendation and Requirements for Networks based on WiMAX Forum Certified Products,
4 DRAFT-T31-126-R020v01-A_ASN-Local-Routing-Requirements.docx
5 [3] [WMF-T31-011-R016v01 WiMAX Roaming Exchange Dynamic Routing & Roaming Svcs](#)
6 [Requirements](#).
7 [4] WMF-T33-109-R015v01 WiMAX Forum Network Architecture detailed Protocols and Procedures
8 Policy and Charging Control.
9 [5] RFC 2119 Key words for use in RFCs to Indicate Requirement Levels

5. Use Cases (Informative)

5.1 Use Case 1 ASN Local Routing at Serving ASN (Phase 1)

Background:

Bob and Carl are WiMAX users attaching to the same Serving ASN MAXASN1 under the domain of network access provider MAXNAP1. MAXNAP1 has a contractual agreement with network service provider MAXNSP1 which is selected by Bob and Carl during the network attachment. Bob initiates a video conversation to Carl for business negotiation. Bob and Carl have compatible codecs and video clients and there is no media server involved in the handling and management of the video conversation.

Expected outcome #1:

Bob and Carl establish a video conversation through MAXASN1. Bearer Traffic is locally routed at MAXASN1 to the destination and does not route through the MAXASN1 to the MAXNSP1.

Expected outcome #2:

MAXNSP1 is capable of obtaining the charging information for the video conversation.

Note: This is a stationary case, in this use case Bob and Carl do not move out of their serving ASN. In the following use cases, if mobility is not mentioned then they are stationary use cases.

5.2 Use Case 2 ASN Local Routing Based on Operator Policy (Phase 1)

Background:

Bob and Carl are WiMAX users attaching to the same Serving ASN MAXASN1 under the domain of network access provider MAXNAP1. MAXNAP1 has a contractual agreement with network service provider MAXNSP1 which is selected by Bob and Carl during network attachment. Danny and Eric are WiMAX enterprise users both attaching to the Serving ASN MAXASN2 under the domain of network access provider MAXNAP1. Danny and Eric also select MAXNSP1 during network attachment. The network operator MAXNSP1 may have one or more of the following ASN Local Routing Policy options:

Option 1: all services originated from and destined for users both attaching to a same access service network entity (not specified) can be locally routed.

Option 2: all users' VoIP call (excluding video conversation) services can be locally routed if there is no need for media server to be involved in the conversation.

Option 3: all services originated from and destined for users both attaching to a specific access service network entity (e.g. MAXASN2) can be locally routed.

Bob initiates a video conversation to Carl for business negotiation. Bob and Carl have compatible codecs and video clients. At the same time Bob initiates downloading music and films from a remote server. Danny initiates a VoIP call to Eric for business discussion. Danny and Eric have compatible codecs and video clients. In these two cases there is no media server involved in the handling and management of the conversations.

Expected outcome #1:

Per operator policy option 1, Bob and Carl establish a video conversation through MAXASN1, Bearer Traffic is locally routed at MAXASN1 to the destination and does not route through the MAXASN1 to the MAXNSP1. However, since Bob's downloading service can not be locally routed, it is routed through the MAXASN1 to the MAXNSP1.

1 Per operator policy option 1, Danny and Eric establish a VoIP call through MAXASN2, Bearer Traffic is locally
2 routed at MAXASN2 to the destination and does not route through the MAXASN2 to the MAXNSP1.

3

4 *Expected outcome #2:*

5 Per operator policy option 2, Bob and Carl establish a video conversation with the Bearer Traffic routed through the
6 MAXASN1 to the MAXNSP1, i.e., video conversation between them is not locally routed. Meanwhile, Bob's
7 downloading service is routed through the MAXASN1 to the MAXNSP1.

8 Per operator policy option 2, Danny and Eric establish a VoIP call through MAXASN2, Bearer Traffic is locally
9 routed at MAXASN2 to the destination and does not route through the MAXASN2 to the MAXNSP1.

10

11 *Expected outcome #3:*

12 Per operator policy option 3, with ASN Local Routing configured for MAXASN2 only, Bob and Carl establish a
13 video conversation with the Bearer Traffic routed through the MAXASN1 to the MAXNSP1, i.e., video
14 conversation between them is not locally routed. Meanwhile, Bob's downloading service is routed through the
15 MAXASN1 to the MAXNSP1.

16 Per operator policy option 3, Danny and Eric establish a VoIP call through MAXASN2, Bearer Traffic is locally
17 routed at MAXASN2 to the destination and does not route through the MAXASN2 to the MAXNSP1.

18 **5.3 Use Case 3 ASN Local Routing at Anchor ASN (Phase 1)**

19 *Background:*

20 Bob and Carl are WiMAX users attaching to different Serving ASNs (MAXASN1 and MAXASN2 respectively),
21 these two Serving ASNs are both anchored at Anchor ASN MAXASN3. MAXASN1, MAXASN2, MAXASN3 all
22 belong to NAPI. NAPI has a contractual agreement with network service provider MAXNSP3 which is selected by
23 Bob and Carl during the network attachment. Bob initiate a video conversation to Carl for business negotiation. Bob
24 and Carl have compatible codecs and video clients, there is no media server involved in the handling and
25 management of the video conversation.

26

27 *Expected outcome:*

28 Bob and Carl establish a video conversation through MAXASN3. Bearer Traffic is locally routed at MAXASN3 to
29 the destination and does not route through the MAXASN3 to the MAXNSP3.

30

31 Note: Anchor ASN is a logical entity, MAXASN3 can be collocated with either of MAXASN1 and MAXASN2.
32 This use case assumes that there is no FA relocation. ASN Local Routing will cease when the FA relocates.

33 **5.4 Use Case 4 ASN Local Routing for Roaming Case (Phase 1)**

34 *Background:*

35 Bob is a WiMAX user who has a subscription with MAXNSP1, Bob moves to a new city, Bob and WiMAX user
36 Carl are attaching to different Serving ASNs (MAXASN1 and MAXASN2 respectively) in the new city, these two
37 Serving ASNs are both anchored at Anchor ASN MAXASN3. MAXASN1, MAXASN2, MAXASN3 all belong to
38 NAPI. NAPI has a contractual agreement with network service provider MAXNSP3 which is selected by Bob and
39 Carl during the network attachment. MAXNSP1 and MAXNSP3 have mutual roaming agreements. Bob initiates a
40 video conversation to Carl for business negotiation. Bob and Carl have compatible codecs and video clients, there is
41 no media server involved in the handling and management of the video conversation and MAXNSP1 ASN Local
42 Routing policy allows ASN Local Routing for Bob.

43

1 *Expected outcome:*

2 MAXNSP1 ASN Local Routing policy is delivered to MAXNSP3, Bob and Carl establish a video conversation
3 through MAXASN3. Data traffic is locally routed at MAXASN3 and does not route through the MAXASN3 to the
4 MAXNSP3 if MAXNSP1 and MAXNSP3 have mutual agreements for ASN Local Routing.

5

6 Note: In this case, the ASN Local Routing takes place when FA does not relocate. ASN Local Routing will cease
7 when FA relocates.

8 **5.5 Use Case 5 Mobility with Anchor Point Change (Phase 1)**

9 *Background:*

10 Bob and Carl are WiMAX users attaching to the same Serving ASN MAXASN1 under the domain of network
11 access provider MAXNAP1. MAXNAP1 has a contractual agreement with network service provider MAXNSP1
12 which is selected by Bob and Carl during the network attachment. Bob has a subscription with MAXNSP1 that
13 video conversation service can be locally routed. Bob has initiated a video conversation to Carl for business
14 negotiation.

15 Bob and Carl establish a video conversation through MAXASN1. Bearer Traffic is locally routed at MAXASN1 to
16 the destination and does not route through the MAXASN1 to the MAXNSP1.

17 After a while, Bob hands over to another ASN MAXASN2 under the domain of network access provider
18 MAXNAP1 and thus, MAXASN2 becomes Bob's new Serving/Anchor ASN. MAXASN2 does not support ASN
19 Local Routing functionality.

20 It is assumed that in these cases Bob and Carl have compatible codecs and video clients, there is no media server
21 involved in the handling and management of the video conversation.

22

23 *Expected outcome #1:*

24 After handover takes place, Bob disconnects the original video conversation with Carl since the new NAP doesn't
25 support Local Routing. Bob then reestablishes a normal video conversation with Carl with the Bearer Traffic routed
26 through the MAXASN2 and MAXNSP1, i.e., Bearer Traffic routes through the core network.

27 Note: When anchor point changes, session continuity may be provided by the application layer. Session continuity at
28 the network layer is not guaranteed.

29 **5.6 Use Case 6 Mobility without Anchor Point Change (Phase 1)**

30 *Background:*

31 Bob and Carl are WiMAX users attaching to the same Serving ASN MAXASN1 under the domain of network
32 access provider MAXNAP1. MAXNAP1 has a contractual agreement with network service provider MAXNSP1
33 which is selected by Bob and Carl during the network attachment. Bob has a subscription with MAXNSP1 that
34 video conversation service can be locally routed. Bob has initiated a video conversation to Carl for business
35 negotiation.

36 Before handover, Bob and Carl establish a video conversation through MAXASN1. Bearer Traffic is locally routed
37 at MAXASN1 to the destination and does not route through the MAXASN1 to the MAXNSP1.

38 After a while, Bob moves to another ASN MAXASN2 under the domain of network access provider MAXNAP1
39 and handovers to it, thus MAXASN2 becomes Bob's new Serving ASN, but MAXASN1 is still Bob's Anchor ASN,
40 i.e., Bob does not change its anchor point.

41 It is assumed that in these cases Bob and Carl have compatible codecs and video clients, there is no media server
42 involved in the handling and management of the video conversation.

43

1 *Expected outcome 1:*

2 After handover takes place, the video conversation between Bob and Carl remains unchanged, Bearer Traffic is still
3 locally routed at MAXASN1.

4 Note: In this case, there is no FA relocation involved. If FA relocates ASN Local Routing will cease.

5 **5.7 Use Case 7 ASN Local Routing at WFAP (or BS) (Phase 2)**

6 *Background:*

7 Bob and Carl are WiMAX users attaching to the same WFAP MAXWFAP1 (or the same BS MAXBS1) controlled
8 by serving ASN MAXASN1 under the domain of network access provider MAXNAP1. MAXNAP1 has a
9 contractual agreement with network service provider MAXNSP1 which is selected by Bob and Carl during the
10 network attachment. Bob has a subscription with MAXNSP1 that Voice over IP service can be locally routed. Bob
11 has initiated a VoIP call to Carl for business negotiation.

12 Bob and Carl have compatible codecs and video clients, there is no media server involved in the handling and
13 management of the video conversation.

14

15 *Expected outcome:*

16 Bob and Carl establish a Voice over IP call with the media flow Bearer Traffic locally routed at MAXWFAP1 (or
17 MAXBS1) to the destination and does not route through the MAXWFAP1 (or MAXBS1) to the MAXNSP1.

18 **5.8 Use Case 8 ASN Local Routing at WFAP (or BS) with Anchor Point** 19 **Change (Phase 2)**

20 *Background:*

21 Bob and Carl are home/SoHo WiMAX users attaching to the same WFAP MAXWFAP1 (or WiMAX users
22 attaching to the same BS MAXBS1) controlled by serving ASN MAXASN1 under the domain of network access
23 provider MAXNAP1. MAXNAP1 has a contractual agreement with network service provider MAXNSP1 which is
24 selected by Bob and Carl during the network attachment. Bob has a subscription with MAXNSP1 that Voice over IP
25 service can be locally routed. Bob has initiated a VoIP call to Carl for business negotiation.

26 Before handover, Bob and Carl establish a Voice over IP call through MAXWFAP1 (or MAXBS1). Bearer Traffic
27 is locally routed at MAXWFAP1 (or MAXBS1) to the destination and does not route through the MAXWFAP1 (or
28 MAXBS1) to the MAXNSP1.

29 After a while, Bob moves to a new WFAP MAXWFAP2 (or MAXBS2) controlled by the same MAXASN1 and
30 handovers to it. MAXASN1 also support ASN Local Routing functionality.

31 It is assumed that in these cases Bob and Carl have compatible codecs and video clients, there is no media server
32 involved in the handling and management of the video conversation.

33

34 *Expected outcome #1:*

35 After handover takes place, a Voice over IP call between Bob and Carl is reestablished with the Bearer Traffic
36 locally routed at MAXASN1 to the destination and does not route through the MAXASN1 to the MAXNSP1, i.e.
37 ASN Local Routing point is changed from MAXWFAP1 (or MAXBS1) to MAXASN1.

38 Note: When the anchor point changes, session continuity may be provided by the application layer. Network layer
39 does not guarantee the session continuity.

40

6. Requirements (Conditional Normative)

The following sections describe a list of requirements to support the WiMAX® ASN Local Routing feature. It should be noted that the WiMAX ASN Local Routing feature is an optional feature for the network, but if supported, these requirements define the expected behavior. Note that all subsections in this section are conditional normative unless stated otherwise.

Normative requirements of [2] apply to WiMAX ASN Local Routing, except when explicitly stated in the requirements below. Requirements for WiMAX ASN Local Routing are intended to be part of WiMAX network releases beyond Rel 1.5 & it should be compatible with WiMAX Network releases before the availability of ASN Local Routing feature. ASN Local Routing SHALL not impact the air interface.

6.1 High-Level Functional Requirements

6.1.1 Network Requirements

R-[1] The WiMAX Network supporting ASN Local Routing SHALL support all applicable requirements of WiMAX Network Release 1.6 or later.

6.2 Overall System Requirements

System Requirements refer to the requirements that affect end-to-end functionality spanning the device, the Air-Interface and the Network.

R-[2] WiMAX ASN Local Routing SHALL support IPv4.

R-[3] WiMAX ASN Local Routing SHALL support IPv6.

R-[4] WiMAX ASN Local Routing SHALL support simultaneous IPv4 & IPv6 flows if dual stack is supported by the WiMAX Network.

R-[5] The WiMAX Network SHALL comply with the requirements described in [3] for a roaming subscriber when local routing is invoked.

R-[6] WiMAX ASN accounting SHALL be backward compatible with release 1.0, 1.5, and 1.6 without impacting the accounting record generation and their transport to the Home AAA even when the ASN is performing Local Routing.

6.3 Policy Control Requirements

R-[7] The ASN Local Routing Policy SHALL be under the home NSP control.

R-[8] The WiMAX Network SHALL support ASN Local Routing Policy transfer from NSP to NAP.

R-[9] The WiMAX Network SHALL support ASN Local Routing on a per-service flow granularity.

R-[10] The decision to enable ASN Local Routing on a particular service flow SHALL be based on operator policy (e.g., type of traffic, lawful intercept status, etc.)

Note: An operator can enable or disable local routing for all the service flows in a network.

R-[11] The Local Routing performed by the operator SHOULD follow the service flow based policy, example; PCC [4].

6.4 Service Flow and QoS Requirements

R-[12] The WiMAX Network SHOULD have the ability of reconfiguring a service flow to enable/disable ASN Local Routing after handover within the same ASN-GW.

1 Note: This handover requirement does not mandate providing session continuity at the network layer. Session
2 continuity may be provided at the application layer.

3 **6.5 Backward Compatibility Requirements**

4 R-[13] The WiMAX Network supporting ASN Local Routing SHALL be backward compatible with legacy
5 WiMAX Network which does not support ASN Local Routing.

6 R-[14] Handover SHALL be supported between ASN that supports ASN Local Routing and ASN that does not
7 support ASN Local Routing.

8 Note: This handover requirement does not mandate providing session continuity at the network layer. Session
9 continuity may be provided at the application layer.

10 R-[15] A WiMAX ASN supporting local routing SHALL interwork with a legacy WiMAX CSN.

11 **6.6 Provisioning/Activation/Deactivation Requirements**

12 R-[16] The WiMAX Network SHALL support ASN Local Routing Policy provisioning and updates.

13 **6.7 Charging Requirements**

14 R-[17] The WiMAX Network SHALL identify the local routing sessions to enable different charging models.

15 **6.8 Security Requirements**

16 R-[18] The WiMAX ASN Local Routing SHALL NOT impact the security mechanism defined in WiMAX
17 Release 1.0 and Release 1.5.

18 **6.9 Lawful Interception Requirements**

19 Lawful Interception must always be done in accordance with the applicable national/regional laws and technical
20 regulations.

21 The requirements in this section address ASN Local Routing of communications subject to Lawful Interception.
22 These requirements are in addition to other Lawful Interception requirements that may exist for the particular
23 service to which is ASN Local Routing is applied (e.g., broadband access, VoIP).

24

25 R-[19] WiMAX ASN Local Routing implementation SHALL comply with the Lawful Intercept requirements of
26 [2].

27 R-[20] The WiMAX network SHALL ensure that communications being intercepted prior to the invocation of
28 ASN Local Routing continue to be intercepted by the WiMAX network after the invocation of ASN Local Routing.

29 R-[21] After invocation of ASN Local Routing, the WiMAX network SHALL continue to report Communication
30 Content (CmC) and/or Communication Identifying Information (CmII). Note national or regional laws and
31 technical regulations, if they exist, will apply (e.g., *In the Matter of Communications Assistance for Law
32 Enforcement Act, Third Report and Order*, CC Docket No. 97-213, 14 FCC Record 16794 (1999)).

33 R-[22] When intercept data (i.e., CmII and/or CmC) is reported both before and after the invocation of ASN Local
34 Routing, the intercept data reported before ASN Local Routing invocation SHALL be correlated with the intercept
35 data reported after ASN Local Routing invocation.

36 R-[23] For the traffic that is subject to Lawful intercept, the WiMAX network SHALL report the invocation of
37 ASN Local Routing, including identification of the network containing the ASN Local Routing Point, when
38 invocation of ASN Local Routing results in the WiMAX network no longer being able to report all CmII and/or
39 CmC. Accessing and reporting information on the invocation of ASN Local Routing and the network containing the
40 ASN Local Routing Point SHOULD be consistent with national/regional laws and technical regulations that may
41 exist related to the unobtrusiveness of the intercept.

1 Note that if the invocation of ASN Local Routing is transparent to the Collection Function (i.e., the WiMAX
2 network continues to report the same intercept data before and after ASN Local Routing invocation and there is no
3 change in the Delivery Function reporting of the intercept data) then the WiMAX network is not required to report
4 that invocation of ASN Local Routing.

5

6 Note; Related to the invocation of ASN Local Routing, the WiMAX network is expected to provide mechanisms
7 that allow flexibility in meeting national/regional Lawful Intercept requirements (e.g., balancing completeness
8 versus unobtrusiveness). Examples of this flexibility may include the ability to control the following, based on the
9 subscriber and ASN Local Routing Point

- 10 • When ASN Local Routing is or is not invoked, or
11 • When intercept data is or is not collected from a particular ASN Local Routing Point.

1 **7. Guidelines and Recommendations To Other WiMAX®**
2 **Workgroups**

- 3 • The ASN Local Routing feature SHALL not have any impact or any new requirement on the air
4 interface.
5 • Local Routing functionality SHALL not have any impact on the MS.
6