



## **WiMAX Forum<sup>®</sup> Network Requirements**

Requirements for WiMAX Priority Access for Emergency  
Telecommunications Service (ETS)

**WMF-T31-122-R020v01**

WMF Approved

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**WiMAX Forum Proprietary**

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## 1. Introduction (Informative)

This is the first of a three-stage, Priority Access for Emergency Telecommunications Service (ETS) system specification for broadband wireless networks based on WiMAX Forum Certified™ products. This document specifies requirements and recommendations for such ETS systems from the perspective of network operators deploying WiMAX® networks. It also describes usage scenarios, in addition to providing functional requirements, and performance guidelines. Architecture and call flow details will be specified in Stage 2, with Stage 3 providing specifications based on requirements outlined in this document.

This requirements specification document will be governed by the objectives and bylaws of the WiMAX Forum™. While the requirements are aligned with the IEEE 802.16 suite of standards, there may be elements of the solution which require standardization efforts beyond the IEEE 802.16 standards and some elements which may be covered by other standards bodies. Throughout the rest of this document, the terms *WiMAX networks* and *WiMAX technology* will be used to loosely refer to the networks and technology that are the focus of this specification.

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## 2. Objective and Scope

The objective of this Specification is to identify use cases and to define system requirements in order to support Priority Access for ETS in public WiMAX® networks. In this document, Priority Access for ETS is abbreviated as ETS.

The overall scope of this Specification includes the following:

- Define realistic usage scenarios (e.g., voice/video/data services, network entry, connection establishment and maintenance, handover, and roaming) for a WiMAX system supporting ETS.
- Define service and network requirements for the WiMAX Network to support ETS priority indication and priority treatment, based on the usage scenarios.
- Identify the management requirements for the WiMAX systems supporting ETS (e.g., user priority level provisioning, security, accounting)
- Define requirements on WiMAX air-interface technologies that may be necessary to support ETS.

This ETS Release 2.0 document describes the enhanced ETS features, such as the support of IEEE 802.16m air interface [1] [2] [3] and WiMAX-SIM, in addition to the ETS features mentioned in the previous ETS release [4].

---

## 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
ASP	Application Service Provider
BS	Base Station
CSN	Connectivity Service Network
DN	Directory Number
ES	Emergency Service
ETS	Emergency Telecommunications Service
IMS	IP Multimedia Subsystem
IP	Internet Protocol
ISP	Internet Service Provider
MS	Mobile Station
NAP	Network Access Provider
NSP	Network Service Provider
SIM	Subscriber Identity Module
SPWG	Service Provider Working Group
SS	Subscriber Station
URL	Uniform Resource Locator
VSP	VoIP Service Provider
VoIP	Voice over IP

### 3.3 Definitions (*Informative*)

Note: for terms not defined in this section, please see reference [6]

#### 3.3.1 Emergency Telecommunications Service (ETS)

*ETS is a national service, providing priority telecommunications to the ETS-authorized user (i.e., an ETS Service User) in times of disaster and emergency (ITU-T Study Group 2) [7].*

1

2 ETS voice/video/data services support with the WiMAX network includes a WiMAX Network Access Provider  
3 (NAP, that manages the ASN to provide WiMAX access) and Network Service Provider (NSP, that manages the  
4 CSN to provide WiMAX access management and IP connectivity and owns the subscribers), in addition to possibly  
5 a separate VoIP Service Provider (VSP, for voice over IP services), Video over IP Service Provider (for video over  
6 IP services), and Application Service Provider (ASP, for data services). Alternative combinations are possible. For  
7 example, a NSP may serve the roles of a NAP, a VSP and a Video over IP Service Provider, and/or an ETS ASP.

8

9 An ETS service is invoked on a per application basis, e.g. ,voice, video, or data services (Web access, e-mail, SMS,  
10 instant messaging, file transfer, and data transport service) [8].

11

12 ETS data transport service is a subset of ETS data service, where priority treatment is only provided to data  
13 transport. The other ETS data services provide priority treatment for application processing at servers as well as  
14 priority treatment for the data transport to/from the servers. In the context of the WiMAX network and the phase 1  
15 effort for ETS data services, the focus is on the ETS data transport service.

16

17 The priority capabilities of ETS voice and video services are invoked at session set up on a call/session by  
18 call/session basis. The priority capabilities of ETS voice and video are revoked with the call/session disconnect. The  
19 ETS data transport service is invoked by the ETS Service User and stay up until the Service User revokes this  
20 service. During this period, the data transport of all data services will receive priority treatment.

21

22 There are two layers for priority indication and treatment: the access/network layer which is WiMAX specific, and  
23 the service layer which is access independent.

### 24 **3.3.2 WiMAX Priority Treatment**

25 *WiMAX priority treatment refers to applying network mechanisms that support allocation of radio and network*  
26 *resources for ETS services preceding non-ETS services in connection establishment and maintenance.*

27

28 The end-to-end priority treatment for an ETS service involves providing priority treatment on the connections in the  
29 originating access network, terminating access network, and any existing transit network(s). In this document, focus  
30 is on the cases where ETS support is needed at the originating and terminating WiMAX access network.

31

### 32 **3.3.3 ETS-Access Number (ETS-AN)**

33 *ETS-AN is a phone number designated for invoking ETS with an ETS Service Provider via ETS Service User*  
34 *authorization (e.g., using a Personal Identification Number (PIN)) and a subsequently indicated Directory Number*  
35 *(DN) for the called party.*

36

37 For example, in legacy government ETS (GETS) voice service in the U.S.A, the ETS-ANs are 710-NCS-GETS  
38 (i.e., 710-627-4387) and specific 8YY-NXX-XXXX toll-free numbers.

39

40 The access number is applied to circuit-switched voice service today. It can also be applied for video/voice over IP  
41 service.

42

### 3.3.4 ETS-Feature Code (ETS-FC)

*ETS-FC is a feature code preceding a Directory Number (DN) that is designated to invoke ETS using subscription-based authentication.*

For example, in Wireless Priority Service (WPS) for priority cellular voice service in the U.S.A., the ETS-FC is \*272.

ETS-AN and ETS-FC use a DN in ETS invocation. An extension of the ETS invocation methods is to use a Uniform Resource Locator (e.g. [ngngets@ncs.com](mailto:ngngets@ncs.com)), ETS-URL, in place of a DN.

### 3.3.5 ETS Invocation

*ETS, is invoked by a user via a key sequence in the MS/SS and then sent into the network.*

For examples, an ETS invocation can be made by dialing an ETS-AN string (or ETS-FC) or by clicking a sequence of menus and icons in an ETS web portal.

An ETS-AN or ETS-FC string dialed in the MS is passed to and processed by the network for priority access in the case of on-demand ETS invocation by a user, i.e., the MS does not need to have ETS-specific capabilities to process the string for priority access and session set-up.

In this document, the ETS invocation methods for voice and video services are limited to the use of ETS-AN and ETS-FC. The ETS invocation methods for data transport services are limited to the use of ETS-URL and Web HTTP request.

### 3.3.6 ETS Revocation

*An ETS revocation by the user may be triggered by a key sequence in the MS/SS for ETS data transport service. In session based services, a session disconnect by the ETS Service User will disconnect ETS in the network.*

For examples, an ETS revocation can be made by a keypad touch in the MS/SS or a click sequence of menus and icons in an ETS web portal.

### 3.3.7 ETS Service Provider

*An ETS Service Provider is a WiMAX Network Service Provider (NSP) contracted with the ETS authorization government organization to provide ETS data/voice/video services with its associated NAP, VSP, Video over IP Service Provider, and ASP.*

Note that in the case where the contracted NSP is an MVNO, or when the user is roaming, the serving NAP may not have a direct association with (i.e. be under the direct control of) the contracted NSP.

The associated NAP, VSP, Video over IP Service Provider, and ASP with the ETS Service Provider can be contracted with the ETS authorization government organization separately or through the ETS Service Provider.

1  
2 For example, the ETS authorization government organization in the U.S.A. is the National Communications System  
3 (NCS).

### 5 **3.3.8 ETS Service User**

6 *An ETS Service User is an individual authorized by the ETS authorization government organization to use ETS. The*  
7 *ETS Service User is assigned a user priority level.*

8  
9 ETS service authorization is done through checking a credential (e.g., PIN, password, secure ID, user information in  
10 SIM card, combination of MS ID and DN for the MS) provided by a user or transmitted by the MS.

### 12 **3.3.9 ETS-subscribed Service User**

13 *An ETS-subscribed Service User is an ETS Service User that has a subscription to ETS with an ETS Service*  
14 *Provider and is associated with service profile stored inside the network. The service profile includes the user*  
15 *priority level (assigned by the ETS authorization organization) in addition to the associated MS/SS identifier.*

16  
17 An ETS Service User can also use any MS/SS (not associated with an ETS subscription) and by using, for example,  
18 the ETS-AN and a PIN for network authorization. Subscription-based ETS services will only be invoked on that  
19 MS/SS (assumes appropriate credentials such as that on a SIM) associated with the service profile.

20  
21 ETS assumes the availability of corresponding public network services, with the addition of priority treatment  
22 capabilities. It is expected that the ETS Service User will have a subscription to the public services, in addition to  
23 the corresponding ETS services.

24  
25 An ETS Service User with an ETS-subscribed MS can invoke ETS via ETS-FC.

26  
27 For example in the U.S.A., an ETS Service User with an ETS-subscribed MS can invoke ETS by dialing \*272 and a  
28 DN.

### 30 **3.3.10 User Priority Level**

31 *The User Priority Level is the priority level associated with each ETS Service User. An ETS Service User with a*  
32 *higher User Priority Level should get higher priority treatment than the ETS Service User with a lower User*  
33 *Priority Level in the network supporting ETS.*

34  
35 For example, five (5) User Priority Levels are used for ETS in the U.S.A. for ETS Service Users supporting National  
36 Security / Emergency Preparedness (NS/EP) [9], such as commander in chief, federal emergency management,  
37 national security staff, CEOs of key financial institution, and first responder leadership.

---

## 4. References

- 1
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- 17 Emergency Telecommunications Service (GETS), Phase 1, Voice Service, Issue 1, Dec. 2007.
- 18 [10] WiMAX Forum, Architecture, Detailed Protocols and Procedures, WiMAX-SIM Application on
- 19 UICC, Oct. 2009.
- 20 [11] Requirements for WiMAX Air Interface System Profile Release 2.0, Version 1.0, June 2009.

---

## 1 **5. Assumptions**

- 2       • WiMAX pre-paid subscribers cannot subscribe to ETS services.
- 3       • The CSN of the originating or terminating WiMAX network for ETS data/voice/video services
- 4       connects to an IP transit network if a transit network exists.
- 5       • International roaming is for future study.
- 6       • Inter-radio-technology (e.g., WiMAX to EVDO) handover is for future study.

---

## 6. ETS Use Cases (Informative)

### 6.1 Use Case – 1: Priority Access on Connection Establishment

*Background:*

Bob is an ETS-subscribed Service User, who subscribes to the ETS Service Provider MAX. Bob's MS is powered on and has completed initial network entry, which attaches to the MAX WiMAX network. Bob witnessed a disaster and tried to originate a session (e.g., voice or video) to John. However, due to network congestion, Bob receives a network connection failure indication. Bob then invokes ETS (e.g., using ETS-FC+DN) for priority treatment in the MAX network to set up a session to John, where John is a WiMAX user.

Note that at the system level, the network includes the originating WiMAX network that Bob's MS is attached to, the terminating WiMAX network John is attached to, and an IP core network connecting these two WiMAX networks.

Expected Outcome #1.1: Bob's ETS invocation is successfully executed by all the network segments. Bob establishes the session with John with priority treatment in the WiMAX network.

Expected Outcome #1.2: In case of network congestion in the originating WiMAX network, application data (voice or video media) invoked by Bob's ETS session gets priority treatment based on Bob's User Priority Level, with possible delay while non-ETS session requests may be rejected in the originating WiMAX network.

Expected Outcome #1.3: In case of network congestion in the terminating WiMAX network, Bob's ETS session gets priority treatment based on Bob's User Priority Level with possible delay while non-ETS session requests may be rejected in the terminating network, regardless whether John is an ETS Service User or not.

Expected Outcome #1.4: Bob's ETS invocation does not pre-empt (un-voluntarily release) other ETS Service Users or non-ETS users' sessions in either the originating or the terminating networks.

Expected Outcome #1.5: After successful ETS video or voice service invocation, the data packets of the ETS video or voice services are scheduled and transmitted over the ETS Service Provider's network with priority over non-ETS data packets.

### 6.2 Use Case – 2: On-Demand Invocation/Revocation/Treatment for ETS Data Transport Service

*Background:* An ETS Service User, Bob, invokes the ETS data transport service for all his data applications (e.g., Web access, e-mail, SMS, IM, file transfer) via submitting a message to a particular page via HTTP/HTTPS, being prompted for credentials and authorized at an ETS Authorization Server. With the successful ETS data transport service invocation and the associated ETS authorization in the network, Bob performs his data applications. When Bob wants to stop the ETS data transport service for all data applications, Bob initiates an ETS data transport service revocation with the network via his MS/SS.

1 Expected Outcome #2.1: All the ETS data services from Bob, after the ETS data transport service invocation (and  
2 before the ETS data transport service revocation), will receive priority treatment in the ETS Service Provider's  
3 network.

4  
5 Expected Outcome #2.2: As a result of ETS data transport service invocation request, an ETS Authorization Server  
6 in the ETS Service Provider's network interacts with Bob (e.g., via HTTP/HTTPS) to perform ETS authorization,  
7 such as collecting and validating credentials from the MS/user.

8  
9 Expected Outcome #2.3: After successful ETS data transport service invocation, the data packets of the ETS data  
10 services are scheduled and transmitted over the ETS Service Provider's network with priority over non-ETS data  
11 packets.

### 14 **6.3 Use Case – 3 : Priority Service Continuity During Handover**

15 *Background:*

16 Bob is an ETS Service User of ETS Service Provider MAX. Bob has an active ETS-authorized service (voice, video  
17 telephony, or data transport) session on when Bob moves across the service boundary of the serving base station  
18 BS1 and near the target base station BS2 in MAX's network. Bob's MS goes through a handover process from BS1  
19 to BS2, where the BS2 capacity is near full.

20  
21 Expected Outcome #3.1: Bob's active ETS session is given a higher priority when handing over from BS1 to BS2  
22 compared to the sessions initiated from non-ETS users in Max's network.

### 24 **6.4 Use Case – 4: Priority Treatment in WiMAX Roaming for Voice/Video 25 Session**

26 *Background:*

27 Bob, who is an ETS-subscribed Service User of ETS Service Provider MAX1, roams into NSP MAX2's (which may  
28 or may not be an ETS Service Provider) network and originates a voice/video session, where MAX1 and MAX2  
29 have established a roaming agreement, including ETS services.

30  
31 Expected outcome #4.1: Bob's user priority level is available in MAX1 and needs to be sent to MAX2.

32  
33 Expected outcome #4.2: Bob's bill contains the roaming and non-roaming charging for both ETS usage and non-  
34 ETS service usage from MAX1 and MAX2.

35  
36 Note that the priority treatment at roaming should be applied for ETS data transport services also.

## 6.5 Use Case – 5: Priority Treatment for Voice/Video Sessions with WiMAX at either the Originating or Terminating Network

*Background:*

Bob, an ETS Service User of ETS Service Provider MAX, using his WiMAX MS originates an ETS voice session to an ETS Service User, Mary, who receives the voice call/session with a PSTN phone. After this voice call/session ends, Mary originates another ETS voice session to Bob's MS.

Expected outcome #5.1: Bob's ETS voice session to Mary receives WiMAX priority treatment in both Bob's (originating) WiMAX network and Mary's (terminating) PSTN network.

Expected outcome #5.2: Mary's ETS voice call/session to Bob receives WiMAX priority treatment in the MAX network, assuming the PSTN has ETS capabilities thus allowing the ETS priority indication to be passed from the PSTN to the inter-network interface to the MAX CSN.

## 6.6 Use Case – 6: Priority Treatment for ETS and other Priority/Emergency Services

*Background:*

During network congestion, ETS Service User, Bob, invokes the ETS service while other non-ETS users with commercial (e.g., platinum, gold, silver, bronze), emergency service (e.g., 911 in the U.S.), or network management priority also attempt to access and connect to the WiMAX network.

Expected Outcome #6.1: The ETS Service User has higher User Priority Level than that associated with non-ETS users except that those who perform critical network management specified by the ETS Service Provider to support the network operation. These critical network management users may have equal or higher priority.

## 6.7 Use Case – 7: Priority Access at MS Power On and Service Invocation.

*Background:*

Bob is an ETS-Subscribed Service User of the ETS Service Provider MAX. In a disaster area, Bob powers on his MS when the network is in a congestion condition. After successful network entry, Bob invokes an ETS service using the ETS-AN method.

Expected Outcome #7.1: Bob's ETS-Subscribed MS gets access to MAX's network with a possible delay, while non-ETS-Subscribed MSs may be blocked.

Expected Outcome #7.2: Bob's sessions from his ETS-Subscribed MS gets priority treatment before ETS invocation and after ETS invocation.

Expected Outcome #7.3: If Bob borrows a MS not associated with any ETS-Subscribers from his colleague and invokes an ETS service, Bob sessions from the MS do not get priority treatment before ETS invocation and get priority treatment only after successful authorization and invocation of ETS services.

## 6.8 Use Case – 8: Interaction Between Priority Subscription Indication in Device and WiMAX-SIM

*Background:*

The following three providers involved in this use case:

- WiMAXGo is a WiMAX NAP providing various services through its WiMAX access, including support for ETS.
- NetworkZ is an NSP providing voice and data services through its CSN and IMS infrastructure and has these conditions:
  - Has an interworking agreement with WiMAXGo for WiMAX access for its subscribers.
  - Provides ETS services to subscribers.
  - Uses a WiMAX-SIM [10] to identify, authenticate and authorize subscribers use of IMS, and ETS.
- WiSP is an NSP only providing data services through its CSN and has these conditions:
  - Has an interworking agreement with WiMAXGo for WiMAX access for its subscribers
  - Does not support ETS data services
  - Uses WiMAX MS credentials to identify, authenticate and authorize use of data services.

Bob is an ETS subscriber through NetworkZ and has arrived at an industrial accident site requiring activation of priority service. However, since Bob's own MS has completely drained his battery, Bob is unable to use his associated device. Bob borrows a fully charged WiMAX device from onlooker Roger who is a subscriber of WiSP. Bob inserts his WiMAX-SIM in the borrowed device to use ETS.

Expected outcome #8.1: Bob is able to activate ETS through NetworkZ based on his WiMAX-SIM identity. This use of Bob's ETS subscription overrides any ETS subscription information (or lack of) that may be in the MS.

Expected outcome #8.2: When Bob removes his WiMAX-SIM from Roger's borrowed WiMAX MS, any active ETS services associated with Roger's MS are terminated. ETS subscription, which may be stored on the MS, (or non-subscription) will revert to Roger's subscription with WiSP.

Expected outcome #8.3: Bob is able to access and activate all ETS services through NetworkZ, to the extent supported by Roger's MS while Bob's WiMAX-SIM is connected to Roger's MS. For example if Roger's MS does not have video capability, then Bob will not be able to use ETS video services even if Bob is subscribed to ETS video services.

Expected outcome #8.4: Bob's single ETS subscription controls access to all available ETS services which is a combination of Bob's subscription, Roger's WiMAX MS capabilities, NetworkZ and WiMAXGo's ETS support.

---

## 7. Requirements (Conditional Normative)

The following sections describe a list of requirements to support ETS. It should be noted that ETS is an optional service for the network, but if supported these requirements define the expected behavior.

The Priority Access for ETS feature enables ETS Service Users to make priority treatment during network congestion conditions for which the requirements specified in this document are intended. A network congestion condition exists when new service attempts are blocked by the network due to a lack of radio and/or network resource(s).

Although the regulations on ETS for different countries may vary, the requirements in this section are deemed applicable for interoperability and priority treatment purposes in the context of WiMAX® systems supporting ETS unless they conflict with regional requirements.

### 7.1 Service Requirements

R-[1] The WiMAX system supporting ETS SHALL provide WiMAX priority treatment over the network for any ETS services originated by ETS Service Users in the WiMAX network or in another network.

R-[2] The WiMAX system supporting ETS SHALL NOT pre-empt any existing active sessions due to ETS Invocation as long as the existing active session is not performing a handover.

R-[3] The WiMAX system supporting ETS SHALL provide priority treatment to the ETS session terminating to a WiMAX user who may or may not be an ETS Service User.

R-[4] The WiMAX system supporting ETS SHOULD be able to provide network layer priority treatment and indication after the MS/SS communicates with the Application Function (AF) using service layer control protocols and the AF processes the ETS invocation from the MS/SS and informs the WiMAX network of user priority level.

R-[5] The WiMAX system supporting ETS SHOULD be able to provide air interface and network layer priority treatment and indication initiated from the MS associated with the ETS-subscribed Service User after authentication and before service invocation.

R-[6] The WiMAX system supporting ETS SHALL be able to provide air interface and network layer priority indication and treatment for ETS services when an application request is initiated by the MS over the air, if IEEE 802.16m is supported by the WiMAX Network.

R-[7] The WiMAX system supporting ETS SHALL be able to provide retail and wholesale accounting data.

R-[8] When WiMAX-SIM is supported by a WiMAX NAP for subscriber identity, authentication and authorization, the WiMAX network SHALL use the ETS subscription information contained on the WiMAX-SIM, overriding any ETS subscription information on the WiMAX MS.

R-[9] For an ETS-subscribed Service User using a WiMAX NAP supporting ETS and WiMAX-SIM subscriber identity, any NSP identity information contained on an WiMAX-SIM SHALL override any NSP identity information contained on the MS.

R-[10] When an ETS-subscribed Service User removes their WiMAX-SIM from a MS, all active ETS services associated with the MS SHALL be terminated.

1 R-[11] When an ETS-subscribed Service User removes their WiMAX-SIM from a MS, ETS subscription status  
2 and identity SHALL revert to any ETS status and identity that may have existed in the MS prior to the WiMAX-  
3 SIM.

## 4 **7.2 Operations, Administration, Maintenance, and Provisioning (OAM&P)** 5 **Requirements**

6 R-[12] The WiMAX network SHALL be able to provide charging/billing for ETS service usage and wholesale  
7 rating for ETS usage in case of roaming.

8 R-[13] The WiMAX network supporting ETS SHOULD support mitigation of various attacks, (e.g., Denial of  
9 Service (DoS) and Distributive Denial of Service (DDoS), etc.) from unauthorized ETS service invocations,

10 R-[14] The WiMAX network SHALL be able to provision a subscriber for support of ETS on the WiMAX  
11 network, including the subscriber's ETS User Priority Level.

12

## 13 **7.3 Air Interface Requirements**

14 R-[15] The WiMAX air interface SHOULD be able to grant priority access during network entry for the MS  
15 associated with an ETS-Subscribed Service User.

16 R-[16] The WiMAX air interface SHALL be able to provide priority access upon ETS service invocation, if IEEE  
17 802.16m is supported by the WiMAX Network.

18 R-[17] The WiMAX air interface SHOULD be able to provide priority treatment to an active priority access  
19 connection during handover.

20

21 *These three requirements correspond to the requirements 36-38 in the SPWG document "Requirements for WiMAX*  
22 *Air Interface System Profile Release 2.0, Version 1.0" [11].*

## 23 **7.4 Network Requirements**

24 R-[18] The WiMAX network SHALL be able to execute priority treatment for ETS services originated by the  
25 ETS Service User based on the User Priority Level of the ETS Service User.

26 R-[19] The WiMAX network SHOULD be able to support priority treatment for an active ETS service during  
27 handover.

28 R-[20] The WiMAX network SHOULD be able to provide priority treatment for ETS services initiated by an ETS-  
29 subscribed Service User during roaming, subject to roaming agreements between home NSP and visited NSP and  
30 visited NSP supports ETS service.

31