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Abstract	The contribution proposes the P802.16n System Requirement Document.
Purpose	To be discussed and adopted by TGn for the 802.16n
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P802.16n System Requirement Document

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1. Introduction

We propose the SRD structure and some contents to be general requirement and technical requirement for IEEE802.16n project.

Referring to IEEE802.16n PAR and 5Criteria, LMR(Land Mobile Radio) is explicitly considered as one of major issues to be discussed [1]. As presented in [2], LMR is to be used for public safety (e.g. Police border Control, Rescue and fire services), Public transportation (e.g. Train, Metro), Utilities industry (e.g. power, gas, water supply), Protection of large event (e.g. Olympic games), Protection of critical infrastructure (e.g. Airport), and Armed Forces (e.g. National Defense). One of the LMR supporting standards is developed by the project Terrestrial Trunked Radio (TETRA) technical body of the ETSI (Europe) [3]. However, with that technology, broadband services such as video conferencing, non-realtime video, bulk file transfer, and web browsing can not be supported. Recently, LTE is being considered as a candidate system of broadband PPDR(public protection and disaster relief) [4]. Considering these facts, the Broadband PPDR system should be one of major applications in IEEE 802.16n Project.

Regarding the application of IEEE802.16n in the area of PPDR system, e.g. TETRA, two possible scenarios may be considered. One is to coexist with legacy deployed PPDR system. In this scenario, IEEE802.16n will be needed mainly for data transmission with increased robustness. Here, increased robustness is to be expected by path redundancy and direct communication. Another is to use IEEE802.16n solely as a broadband PPDR system. This scenario will be applicable to the country without any deployment of legacy PPDR radio system, like Korea. In this scenario, several functional requirements of PPDR such as Push to Talk service and Group Call service shall be supported.

Herein, we propose to include the requirements not only for path redundancy and direct communication, but also for several functions to support PPDR service.

References

[1] IEEE 802.16 gman-10/0018r2 Draft PAR and Five Criteria from Greater Reliability In Disrupted Metropolitan Area Networks (GRIDMAN) Study Group

[2] C80216nrr-08/002 Land Mobile Radio evolution to Broadband

[3] ETSI ETR 265 Radio Equipment and systems(RES); Trans-European Trunked Radio(TETRA); Technical requirements specification for direct mode (DM) [1996]

[4] http://www.npstc.org/documents/700_MHz_BBTF_Final_Report_0090904_v1_1.pdf

2. Proposed requirements

1. Overview

The 802.16n amendment shall be developed in accordance with the P802.16 Project Authorization Request (PAR) and Five Criteria Statement [1].
According to the PAR, the standard shall be developed as an amendment to IEEE Std 802.16.
The resulting standard shall fit within the following scope:

This amendment specifies protocol enhancements to the IEEE 802.16 MAC for enabling increased robustness and alternate radio path establishment in degraded network conditions. Limited OFDMA PHY extensions are included for enabling operation with radio path redundancy and direct communication between subscriber stations. Also mobile base stations and mobile relay stations are supported. Support for enabling application specific specialized security suites is also provided.

And the standard will address the following purpose:

This amendment is intended to address higher reliability requirements that are not supported by IEEE Std. 802.16 presently.

In addition, one of main services is to support LMR service.
This amendment will be applicable to various classes of applications including

- Land Mobile Radio(LMR)
- Surveillance application
- Maritime/Airport communication
- Disaster Responder and Replacement

This amendment will support sophisticated services such as video Streaming and video conference

2. General Requirement

IEEE802.16n shall be able to support the requirement of Broadband LMR with or without coexistence of previous LMR system.
To support Broadband LMR requirement, IEEE802.16n shall support enhanced VoIP service such as PTT, group call, etc

3. Functional Requirement

This section contains the functional requirements to support for enabling operation with radio path redundancy and direct communication between subscriber stations described in the PAR [1]. In addition, this section describes emergency service, high level security, efficient VoIP call service, data service, and Push to Talk (PTT) as functional requirements.

3.1   Path Redundancy
FFS

3.2   Direct Communications

In the following subsection, functional requirements for the direct communication are listed.

3.2.1 Synchronization

Synchronization between transmitter side and receiver side should be maintained. Synchronization includes frame configuration as well as physical time synchronization. More specifically, when MS at the transmitter side sets up direct communication with intended receiver side MS, the MS at the transmitter side should provide time synchronization information in such a way that the MS at the receiver side maintains time synchronization with the MS at the transmitter side. Given that the time synchronization information is known, the MS at the receiver side should be able to configure the frame structure.

3.2.2 Addressing

Unique identification is required for each MS, such that the MS at the transmitter side can set up direct communication with the identification.

3.3 Emergency Service

Emergency service should be prioritized with the highest priority among other services. Upon receiving emergency service request, the MS at the transmitter side should stop transmission so that the emergency service is supported with the highest priority.

3.4 High Level Security

Regardless of MS access mode (Direct mode/Infrastructure mode), same level of security should be guaranteed. Meanwhile, security functionality should not impact the system performance especially for handover or direct mode operation.

3.5 Efficient VoIP Call support

Efficient VoIP call service should be supported. To this end, relevant QoS level should be supported. This QoS level should be also supported for Handover and direct communication.

3.5.2 Bandwidth Management

For efficient radio resource utilization, Flexible Bandwidth Allocation should be supported. Radio resource allocation should be based on measurement and report.

3.5.3 Description of Service supported in VoIP Call operation

VoIP call service should be provided for both Infrastructure mode and direct mode.

3.5.3.1 Individual Call

Individual call with individual identification should be supported. In addition, two way communications should be supported.

3.5.3.2 Group Call

Group call with group identification should be supported. In addition, two way communications should be supported. Group call can be initiated without any acknowledgement from the receiver side.

3.5.3.3 Broadcasting

Broadcasting for individual or group MS should be supported. In addition, one-way communication should be supported.

3.6   Data Service

Data service should be provided for both Infrastructure mode and direct mode. More specifically, both Point-to-point and Point-to-Multipoint transmission should be supported. Data service includes short data service and normal packet data service.

Short Data Service: data packet less than 140 byte
Normal Packet Data Service: data packet greater than 140byte ;

3.7 Push to Talk (PTT)

PTT function shall be supported in both Infrastructure/Direct Mode. In particular, PTT call set up time   should be quick. For detailed parameter, refer to section 4 performance requirement.
To avoid PTT channel starvation, one MS occupies only one PTT channel. Especially, occupied PTT channel shall be released after PTT talk state timer. When more than one MS are to access PTT channel at the same time, mechanism to resolve contention is required. To reduce delay, the following changeover mechanism should be supported.

- Individual Call: During one to one PTT session, changeover from the receive (PTT listener) to transmit state (PTT talker) should be supported without any call reestablishment.
- Group Call: During one to many PTT sessions, changeover from the receive (PTT listener) to transmit state (PTT talker) should be supported with small delay.

4. Performance Requirement

4.1 Direct Communication

4.1.1 Coverage Area

A typical requirement for coverage range is from 400m in urban areas to 1km to 2km in rural areas.

4.1.2 Call set up time

The call set up time is defined as time between a transmitting user pressing the push to talk (PTT) and the receiving terminal emitting audio

The maximum set-up time for all direct communication clear speech transmission is 150msec
The maximum set-up time for an emergency call requiring pre-emption is 500msec
(Note: if no pre-emption is required then the normal speech set-up time applies)

4.1.3 Call maintenance
For the purpose of call maintenance, the group or called party's individual number has to be transmitted at least every 1second