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Re:	IEEE 802.16jm usage model proposal
Abstract	Propose relay usage models to enhance 802.16m coverage performance
Purpose	Discussion and approval by TGm
Notice	
Release	
Patent Policy	

Relay Usage Models for IEEE 802.16m

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1. Introduction

This contribution is provided in response to the call for contributions issued by IEEE 802.16jm on 2008-03-25. Relay usage models are presented for multihop relay in IEEE 802.16m.

2. Key features for 802.16m multihop relay

According to SRD of 802.16m **Error! Reference source not found.**, 802.16m system shall achieve its target to meet IMT-Advanced requirements without inclusion of the relay stations. Furthermore, 802.16m should enable relays to satisfy the requirements for some specific 16m relay usage scenarios.

Relay for 802.16m should be simple and efficient, acting as a supplementary option to ensure the performance demands of those specific 16m relay usage models.

We could use relay for many scenarios in real network. However, it does not mean we have to use relay for those scenarios. Therefore, to select scenarios for specific 16m usage model, we have to make sure there is clear benefit to use relay, rather than to use other technologies, such as Pico Basestation, Repeater, Radio on Fiber (RoF), and FemtoCell etc.

We consider the key requirements of 802.16m multihop relay as follows:

- To enable cell coverage extension, including in-building coverage;
- To support specifically emergency occasions, e.g. disaster, etc.

3. Usage model of 802.16m and 802.16m multihop relays

1. 16m Relay Usage Model I: Coverage Extension

Since the 802.16m BS system shall meet all requirements specified in SRD including coverage, the cell edge performance shall be guaranteed by the 16m BS system by network planning.

On the other hand, the potential coverage hole in 16m BS operation shall be in fact limited, and it is normally easy to be identified and further fixed at network planning stage.

Some areas, which are not covered by 16m BS, may not be an economic way to be covered by deploying a new 16m BS. For example, those small areas, which are neighboring a 16m BS cell, do not need expensive 16m BSs to provide the coverage. It would be an appropriate choice to deploy 16m RS to cover those areas. Fig. 3.1 presents the "Coverage extension" usage model.

Indoor coverage may be included in this "coverage extension" usage model. However, it is also known that other cheaper methods could also be used for indoor coverage, such as Repeater, FemtoCell, and "Relay on Fiber" (or "Radio on Fiber"). However, how to make an appropriate selection should be considered in network planning stage, and is out of scope for the usage model discussions here.
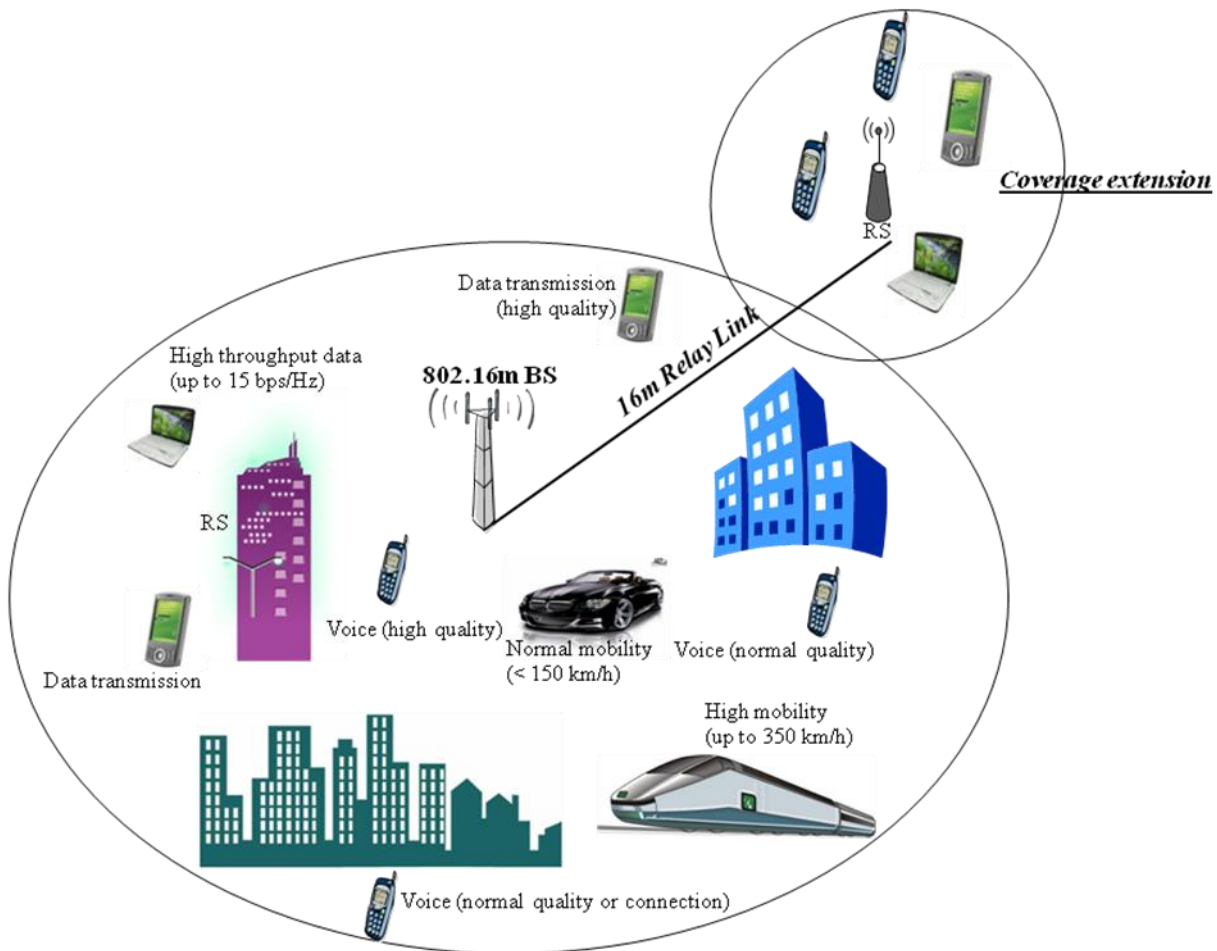
Fig. 1.   Relay Usage Model

"Coverage Extension" Usage model Requires:

- 16m RS shall have the same performance as 16m BS has, except for the coverage. 16m RS's coverage could less than 16m BS;

- For centralized scheduling RS, maximum number of Hops is two in "Coverage Extension" usage model;

- 16m RS is fixed (no mobility);

- Connecting a 16m RS to 16m BS should minimizes the impact to the capacity of the connected 16m BS cell. Therefore, the technologies to improve the spectrum efficiency in relay link should be considered and encouraged.

2. **16m Relay Usage Model II: Emergency/Rescure Usage Model**

For emergency/rescue occasions, nomadic relay is the best for fast network establish to provide **basic** connection and communications. This requires 16m RS to support self network configuration. Therefore, from 16m standard point of view, fast and self network entry needs to be well supported. Fig. 3.2 further explains this usage model.
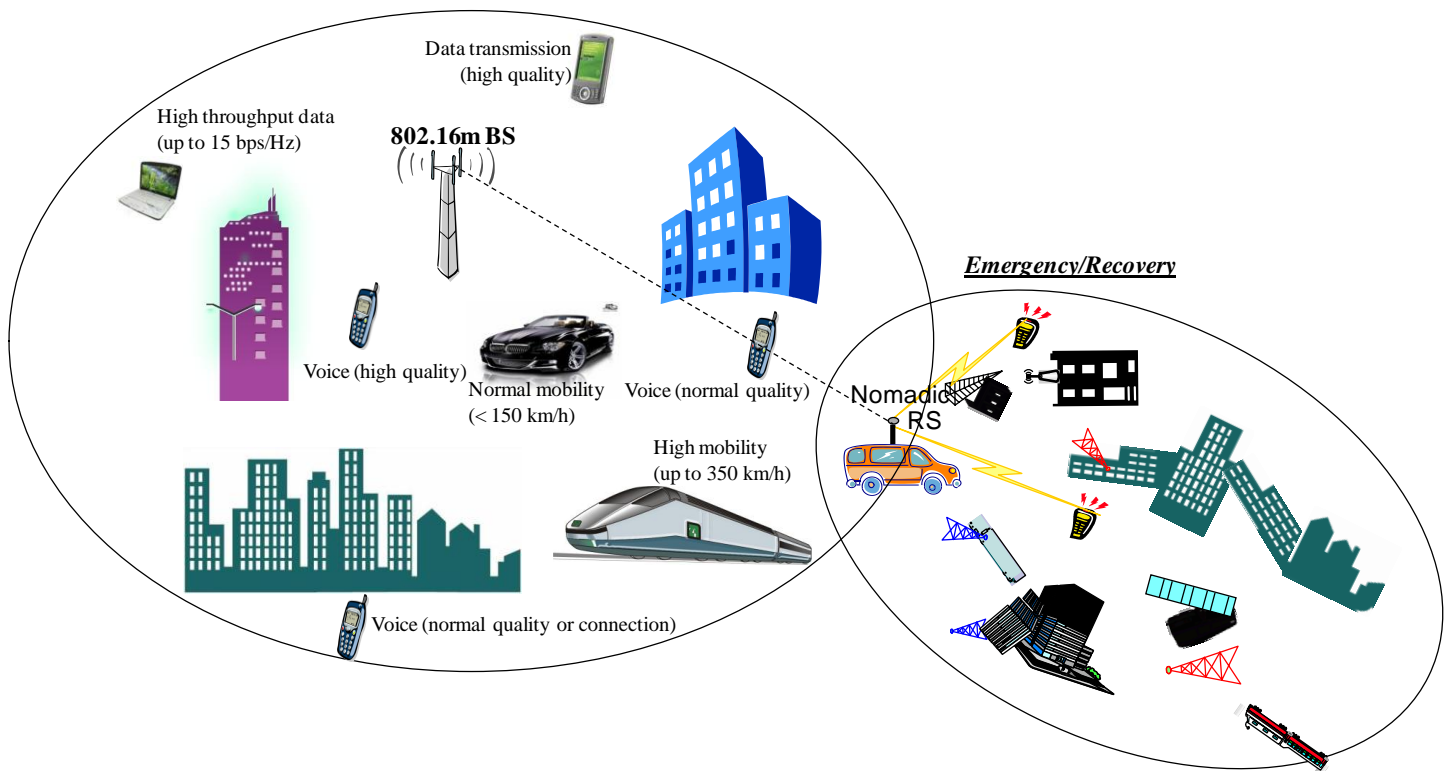
Fig. 3.2 Emergency/Rescue Usage Model

Emergency/Rescue Usage Model Requires:

1. 16m RS in emergency/rescue shall have the same performance as 16e BS has, except the coverage. 16m RS's coverage could less than 16e BS;

2. For centralized scheduling RS, maximum number of Hops is two in emergency/rescue usage model;

3. 16m RS is nomadic, but it should be assumed that the 16m RS does not have mobility once it has switched on and successfully got network entry;

4. Plug-and-Play feature: Fast and self network entry or self optimized network (SON) needs to be supported;

5. The impact to the capacity of the connected 16m BS cell should be ignored in this usage. Therefore, the technologies used in relay link can be simplified in this usage model to achieve lower cost in RS.

Reference

[1] IEEE 802.16m-07/002r4, TGm System Requirements Document (SRD) [as approved] (2007-10-19)