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| Re: | Solicitation of input contributions by IEEE 802.16’s Study Group on the WirelessMAN Radio Interface in Heterogeneous Networks (HetNet Study Group <http://ieee802.org/16/sg/het>) for IEEE 802.16’s Session #80 of 16-19 July 2012 | |
| Abstract | This document describes the considerations for cooperation among base stations in the multi-tier network project. | |
| Purpose | To request that HetNet Study Group discuss the considerations for the multi-tier network project | |
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Considerations in the multi-tier network project

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# Introduction

The new project to amend the existing IEEE 802.16 standard for multi-tier networks is being planned. The amendment project is to specify mechanisms for cooperation among base stations in multi-tier networks with enhanced interference mitigation, mobility management, and power management.

To enable the cooperation among base stations across the multiple tiers, we should consider deployment scenarios such as connectivity in the multi-tier network.

# Considerations

1. Multi-tier network framework

We can consider that macro base station (BS) and small BSs including micro, pico, and femto BSs cooperate to achieve the cell capacity enhancement and the user throughput enhancements. We can also consider a scenario where a small BS cooperates with other small BSs.

In this multi-tier network, the macro BS and small BSs may be connected in a wireless manner. The wireless link can be used to reduce CAPEX/OPEX between macro BS and small BSs, and to ease the deployment of small BSs. Through the wireless link between macro BS and small BS, the channel information and user context can be shared among BSs.

As mentioned and shown in Figure 1, a group of small BSs cooperates to increase the system coverage and capacity. To efficiently form and manage cooperative small BSs, the interference management in cooperative small BSs is of high importance. The enhanced interference management schemes such as cooperative small BSs joint scheduling, coordinated beam-forming, and small BS precoding with small BSs coordination can be used.



Figure 1 An example of single RAT multi-tier network framework

2. Deployments of cooperative small BSs

We can achieve higher system capacity by increasing the number of small BSs. However, it may cause serious interference problem if small BSs do not cooperate with other small BSs. One possible way for the interference problem can be a cooperative cluster of small BSs. To form a cluster of small BSs, the system may keep candidate group lists based on physical information of each small BS (e.g. location), which is called a physical cluster. Each user may be served in a subset of a physical cluster, which is called a logical cluster. In order to determine logical clusters, several factors such as user’s SINR (signal-to-interference and noise ratio), user mobility, their requested service rates, or nearby other BSs’ interference, should be considered. Also, a cluster of cooperative small BSs may be dynamically reconfigured by adding or subtracting small BSs.



Figure 2 Deployments of cooperative small base stations

# Reference

[1] 16-12-0136-00-Gdoc, “Hierarchical Network Study Report,” January, 2012.

[2] 16-12-0388-01-Shet, “Standardization of Multi-tier Networks: Proposed PAR and Five Criteria,” May, 2012.