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| Project | **IEEE 802.16 Broadband Wireless Access Working Group <**<http://ieee802.org/16>**>** | |
| Title | **Proposed System Requirements on Mobility Management** | |
| Date Submitted | **2012-09-12** | |
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| Re: | In response to Call for Contributions: Multi-Tier Networks IEEE 802.16 Working Group (IEEE 802.16-12-0507-02-Shet) | |
| Abstract | System requirements on mobility management are proposed | |
| Purpose | To discuss and adopt the proposed text in the System Requirement Document (SRD) on IEEE P802.16q Multi-tier Networks | |
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# Proposed System Requirments on Mobility Management

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# Introduction

This contribution has been prepared in response to Call for Contributions on Multi-tier Networks (IEEE 802.16-12-0507-02-Shet). According to the approved IEE 802.16q PAR (IEEE 802.16-12-0394-05-Gdoc), the scope of this project includes inter-BS cooperation to enhnace interference mitigation, mobility management, and base station power management.

This contirbution considers functional requirements required to enhance mobility management in multi-tier networks. General requirements and functional requirements on other technical areas included in the approved PAR will be considered in other contributions (See contributions included in 3. References in this contribution).

# Mobility Management in Multi-tier Networks

Figure 1 shows an example of multi-tier deployment scenario. In multi-tier deployment, a large number of small cells such as pico cells, femto cells and fixed/mobile relays are overlaid by a macro cell. In addition, there may also be various interfaces between macro cell and small cells. For example, fixed small cells such as pico cells and femto cells may communicate with the macro cell through wired backhaul interface, while relay station communicates with the macro cell through wireless link. We have tried to figure out what is a technicla challenge insuch mulit-tier deployment scenario from mobility management perspective.



Figure 1. Example of Multi-tier Deployment Scenario

## Small Cell Detection in Multi-tier Networks

In single-tier networks, a serving base station broadcast system information of neighboring base stations and a mobile station searches for a preferred cell based on the neighbor list provided by the serving base stations. However, its’ not easy for a serving base station to broadcast system information of all neighboring cells in multi-tier networks because the number of neighboring cells is very large as shown in Figure 1. So, in multi-tier networks, the serving base stations (macro/pico/femto base stations) shall be able to provide system information of neighboring cells in efficient way or provide the minimum information required for efficient cell search instead of full system information to decrease the overhead.

In case small cells are deployed on different frequencies to decrease interference to a macro cell, the mobile station shall stop the communication with the macro cell during scanning for such small cells. The impact to mobile station power consumption depends on how often and for how long the mobile station performs inter-frequency measurement. Therefore, an efficient cell detection shall be supported in multi-tier deployment scenario to minimize the impact on power consumption of the mobile station.

## Cell Selection/Reselection in Multi-tier Networks

In general, a mobile station selects/reselects a target cell based on quality of DL signal and service continuity in single-tier networks. However, additional selection criteria shall be considered in multi-tier deployment scenario. For example, a mobile station with high mobility should maintain connectivity with a macro cell to decrease the number of HO although quality of signal from neighboring small cells is better than the macro cell. Thorefore, a mobile station shall be able to select/reselect a target cell based on various metric such as cell type preference, cell load, mobilty, etc.

# References

1. IEEE 802.16-12-0394-05-Gdoc, “PAR and Five Criteria for P802.16q Multi-tier Networks”
2. IEEE 802.16-12-0136-00-Gdoc, “Hierarchical Network Study Report”
3. 3GPP TR 36.839, “Evolved Universal Terrestrial Radio Access (E-UTRA); Mobility enhancements in heterogeneous networks”
4. 16-12-0532-00-000q, “Overall System Requirements on IEEE 802.16q Multi-tier Network”
5. 16-12-0533-00-000q, “Proposed System Requirements on Base Station Power Management for IEEE 802.16q Networks”
6. 16-12-0534-00-000q, “System Requirements on Interference Management for IEEE 802.16q Multi-tier Networks”

# Proposed Texts

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**X Functional Requirement**

**X.1 Mobility Management in Multi-tier Networks**

X.1.1 Efficient cell discovery shall be supported

X.1.1.1 Efficient detection of cell ID, cell type and subscription type shall be supported.

X.1.1.2 Energy efficient and optimized cell search for neighboring small cells on different frequencies shall be supported.

X.1.1.3 Energy efficient and optimized cell search for neighboring small cells not broadcast by a Macro cell shall be supported.

X.1.1.4 Cell search shall differentiate access triggering conditions for each cell type.

X.1.2 Efficient cell selection/reselection to a preferred type of cells shall be supported.

X.1.2.1 Cell selection/reselection based on various factors shall be supported. (e.g., cell type preference, cell load, mobility of a mobile station, etc)

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