

MOB_NBR-ADV design recommendations for IEEE 802.16m mobility management

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Venue: IEEE 802.16m-08/024 Call for Comments and Contributions on Project 802.16m System Description Document (SDD), on the topic of “upper MAC concepts - mobility management”.

Base Contribution:

Purpose: Discussion and approval of the proposal into the IEEE 802.16m System Description Document

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<<http://standards.ieee.org/guides/bylaws/sect6-7.html#6>> and <<http://standards.ieee.org/guides/opman/sect6.html#6.3>>.

Further information is located at <<http://standards.ieee.org/board/pat/pat-material.html>> and <<http://standards.ieee.org/board/pat>>.

MOB-NBR-ADV in the reference system

- Neighbor Advertisement message (MOB_NBR-ADV) necessary for optimized HO
- MOB_NBR-ADV broadcasts system configuration of neighbor BSs
- MOB_NBR-ADV in the reference system [2] works well in a deployment with non-overlay cells of same type

```
MOB_NBR-ADV
```

```
{
```

```
For BS = 1:k
```

```
{
```

```
BS_ID
```

```
delta configuration info in TLV;
```

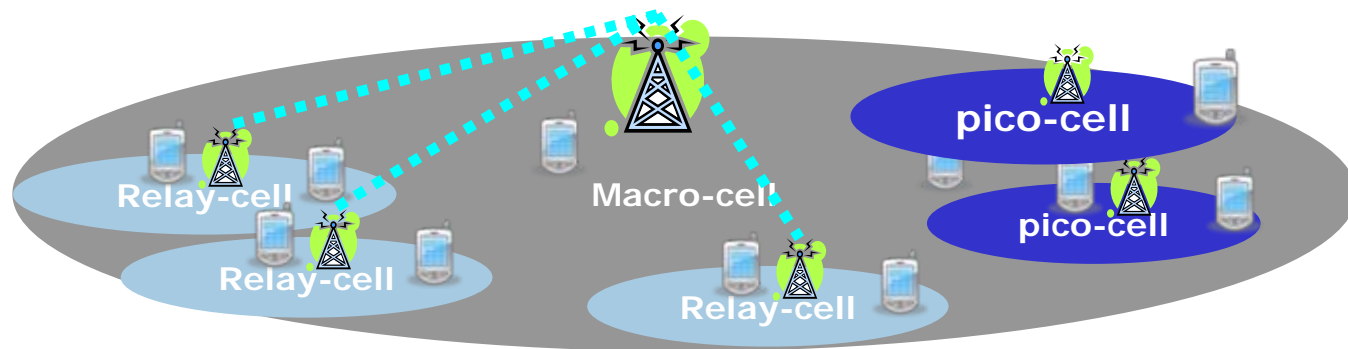
```
}
```

```
}
```

```
//good overhead reduction when neighbors  
have similar configuration parameters
```

Motivations to design a new NBR-ADV format

- IEEE 802.16m will support different cell types with possible overlay deployment [1]
 - Macro, micro, pico, femto cells
 - Overlay of a macro cell with smaller cells for load balancing
- current NBR-ADV format may cause huge overhead
 - Possibly too many neighbors
 - Neighbors may be different cell type and thus different configurations from S-BS, making the delta information on system configuration still large



An heterogeneous overlay network

Design target for 16m NBR-ADV

- The message format should allow overhead reduction in various deployment scenarios
 - Heterogeneous cell type/configurations
 - Overlay with possibly dense deployment
 - Femto-cell is a special case, high density and non-public access, and thus should not be in NBR-ADV broadcast
- The message format should allow flexible broadcast schedule
 - Common and unique configuration parameters
 - Timing-varying and static configuration parameters

Classification of system parameters in NBR-

ADV

- Common part (per cell type)
 - Configured to be the same across the network
 - Shared by a cell type

| Name | Length (bits) | Note |
|--------------|---------------|-----------------------------|
| Multiplexing | 1 | TDD/FDD |
| Bandwidth | 2 | 5M, 10M, 20M in the 16m SDD |
| CP | 2 | 1/32 1/16 1/8 1/4 |

Examples of configuration parameters in the common part

- Unique part
 - Each BS may have independent configuration
 - Dynamic state information

| Name | Length (bits) | Note |
|----------------|---------------|------------------------------------|
| HO types | 8 | H-HO, MD-HO, FBSS, BS-Controlled |
| Trigger/Action | variable | Handover trigger/action definition |
| load | TBD | Cell loading information |

Examples of configuration parameters in the unique part

Optimized encoding in NBR-ADV

- Type-Length-Value (TLV) format
 - Enable overhead reduction when cells are similarly configured
 - Suitable for selective broadcast (only delta information)
- Fixed-length format
 - Predefined format eliminates TLV overhead
 - Suitable for frequent broadcast
- To balance overhead and flexibility
 - NBR-ADV supports both formats
 - Mapping of parameters to which format is FFS

An example of the proposed NBR-ADV

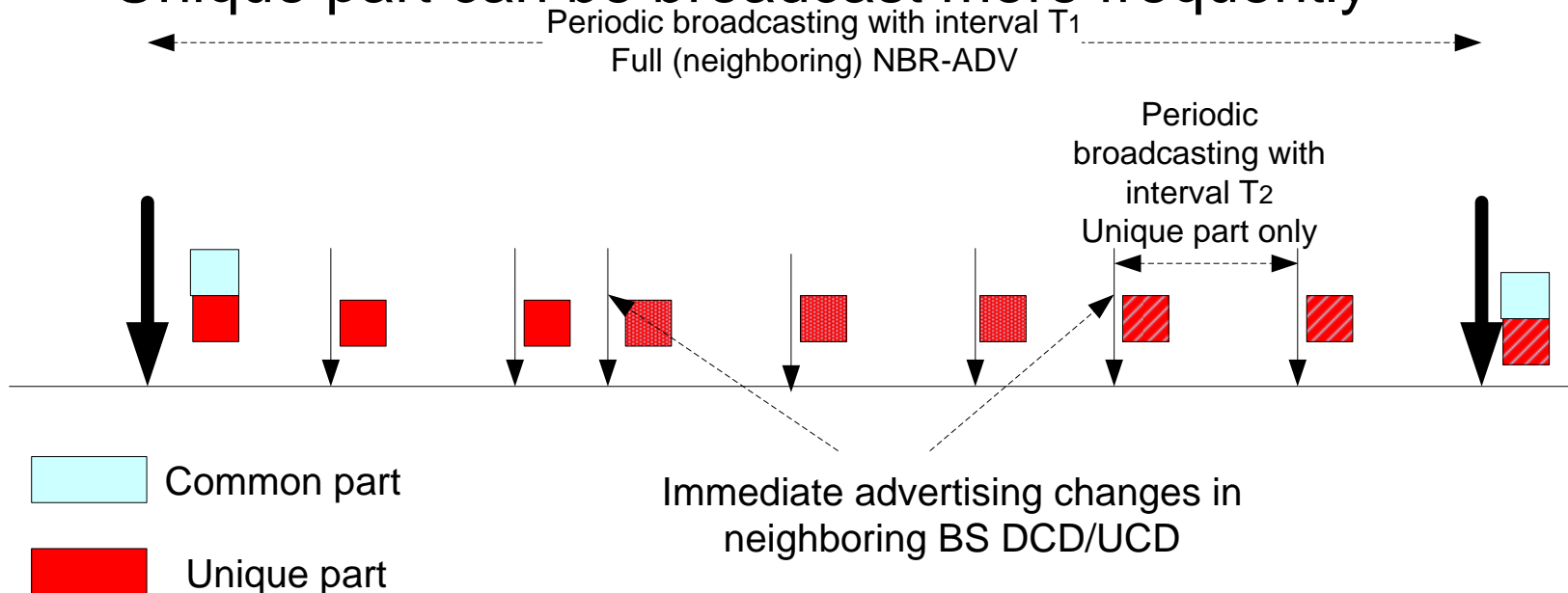
NBR-ADV

```
{  
  For cell-type = 0:m  
  {  
    [common part (cell specific)] //optional based on broadcast schedule  
    //First BS in this cell type  
    For BS = 1  
    {  
      BS_ID  
      other configuration info in TLV; //A typical cell in this cell type  
    }  
    //other BS in this cell type  
    For BS = 2:k  
    {  
      BS_ID  
      delta TLV; //Only delta information  
                  From the typical cell above  
    }  
  }  
}
```

Loop by cell types allows compression

Broadcast scheme

- Common part can be broadcast less frequently
 - TBD version number for common part frequently
 - Not likely change frequently
 - MS can cache common part history
- Unique part can be broadcast more frequently



Proposed IEEE 802.16m SDD text change

Insert the following text into MAC Layer clause (Chapter 10 in [IEEE 802.16m-08/003r1])

----- Text Start -----

10.x Handover procedures

Overlay handover is supported to allow load balancing across different cell types.

10.x.1 Network topology acquisition

10.x.1.1 Network topology advertisement

The serving BS periodically broadcasts NBR-ADV message so that MS may learn the network topology for handover preparation. The NBR-ADV message sorts neighbor BSs(RSs) according to their cell types. Within each cell type, configuration parameters are classified into common part and unique part. Either fixed-length or TLV encoding is used and the format mapping for each parameter is FFS. In NBR-ADV broadcast, a typical cell is chosen for each cell type so that other entries in the same cell type only requires delta information for overhead reduction. The BS can adaptively broadcast common part and unique part at different frequencies for overhead reduction.

NBR-ADV broadcast does not include femto-cells.

----- Text End -----

Reference

- [1] IEEE 802.16m-08/016r3, “Draft IEEE 802.16m System Description Document (SDD)”
- [2] IEEE Std 802.16e-2005