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Re:	Work Group Review of IEEE P802.16e/D2-2004
Abstract	Definitions and descriptions of different types of HO possible within an 802.16e system
Purpose	Discussion/Information
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Definitions for Handover Optimization Process

Introduction

This document is a result of discussions between participants of IEEE session #31, targeted at arriving at a common understanding of the 802.16e handover process, and possible optimization to the P802.16e/D2-2004.

Individual views

This section summarizes the views of individuals on what network structure is and what should be optimized.

Yong Chang:
Enable networks with 1 BS, 1 Sector and 1 frequency. Also enable Multi-sectored, BS at multiple frequencies. Enable various frequency assignment (=reuse) factors. Support a single BS, and also multiple BS with a RNC (Radio Network Controller).

Panyuh Joo:
Reuse =1 or reuse<1 should be supported. That is two BS can use close frequencies, or same frequency, and HO should be optimized per PHY.

Philip Barber:
Eventually we will arrive at a structure similar to 3G networks or above (4G). There will also exist, in parallel, a more simple structure. We should define multi-sector BS. Several frequencies are O.K., FA/Foreign network concept is O.K.

SungCheol Chang:
1-BS, 1 frequency assignment, 1-sector. Also enable multi-sector, multi-frequency assignment. One BS at one frequency is extended to multiple BS at the same location.

Yossi:
No service interruption during HO, Optimizations on ranging, optimizations for mobility effects like ping-pong, etc. Optimizing for sophisticated BS topologies that will enable air interface optimizations.

Yigal Eliaspur:
Multi-frequency or same frequency, multi-sector BS, transfer context on the backbone, handle ping-pong effect, optimize HO specifically per each PHY.

Yung Hahn:
In order to agree on L1/L2 we should agree on higher layer and put some definitions that everybody can agree on.

Vladimir Yanover:
We should compose an output paper for IEEE. We want to optimize HO, make it faster, when optimizations can be made base on PHY. We need to define several types of ‘families’, like BS that operate in one frequency, BS that are collocated, or BS that have a common controller, etc. and optimize HO for these ‘families’.

Iyer Prakash:
Distinction between Nomadic/full-mobility (=3G like, high speed, etc.). Support one sector or multiple sectors. There exist a variety of topologies/hierarchies, flat, IP cloud-router-BS, etc. We should try to concentrate on these aspects of the architecture that affect the standard. We need to relate to the issue of BS that have more than one operator. We need to support efficient, fast, no-packet-loss HO. We need to support low-power, and support inter multi-sector-BS, intra multi-sector-BS HO.

Yigal Leiba:
We should try to get to the solution in several stages, first do simple mobility and later add more sophisticated network structure that will enable 3G like performance. Should keep network structure as simple as possible. Only invent more complicated entities if it can be clearly shown that they enable significant optimizations. Try to avoid ending up like 3G in a very complicated structure. Optimize per the PHY capabilities whenever possible, but keep backwards compatibility.

Itzik Kitroser:
Define primitives between MAC and upper layers. Don't reinvent things that are already defined just because they exist in 3GPP. Try to use with 1-BS 1-frequency, do optimizations only when necessary, don't over-specify when you can avoid it.

Common understanding of the group

To summarize the individual views expressed above, it seems we should support BTS with 1-sector, 1-frequency at frequency assignment (=reuse) of 1, and also support BTS with multiple sectors, multiple frequencies at various frequency assignment. We should optimize HO based on the type (family) of network structure. We should optimize HO based on PHY capabilities and their enhancements, and account for mobility related effects (e.g. ping-pong).
We are only going to address issues within the scope of 802.16e.

HO scenario 802.16e is going to support

The following section discusses the type of HO scenarios 802.16e should support. For each scenario the underlying assumptions should be clearly identified, such that the scope of optimizations possible for the scenario is visible. The scenarios are summarized in the table below, and are all based on the following minimal assumptions:

1. HO occurs between single sector BTS
2. Each sector is at a different frequency
3. Frequency assignment (=reuse factor) is unknown
4. There is backbone communications between the sectors

Assumption	Backbone comm.. exist (Level 1)	Backbone comm.. exist (Level 2)	Backbone comm.. exist (Level 3)	Intra-BTS HO (on BTS with multiple sectors)	Specific PHY (i.e. PHY=x where x is SCa, OFDM or OFDMA	HO between sectors at the same frequency	BTS sector and MSS support MIMO	BTS sector and MSS support soft HO
Scenario name								
Semi-Nomadic								
Basic	X	X						
Basic-SCa	X	X			X=Sca			
Basic-OFDM	X	X			X=OFDM			
Basic-OFDMA	X	X			X=OFDMA			
Basic-Intra-BTS	X	X		X				
Basic-Same-freq.	X	X				X		
Basic-MIMO	X	X					X	
Basic-SHO	X	X						X
Advanced	X	X	X					
Advanced-SCa	X	X	X		X=Sca			
Advanced-OFDM	X	X	X		X=OFDM			
Advanced-OFDMA	X	X	X		X=OFDMA			
Advanced-Intra-BTS	X	X	X	X				
Advanced-Same-freq.	X	X	X			X		
Advanced-MIMO	X	X	X				X	
Advanced-SHO	X	X	X					X

The backbone communications has limitations with regards to capacity of latency. Since these limitations cannot be strictly defined, we chose instead to define a level of functionality than we can expect form the backbone,

Level 1: Only provision for invited ranging (and possibly basic capabilities of MSS) is available

Level 2: Security parameters and/or services flows information transfer

Level 3: Full MAC state-machine context transfer

List of documents in session #31 that were related to HO

TBD