

Consideration of technical issues to support WG Letter Ballot 13 comments against the consolidated IEEE802.16 draft, P802.16-REVd/D1.

IEEE 802.16 Presentation Submission Template (Rev. 8.3)

Document Number:

IEEE S802.16d-03/67

Date Submitted:

2003-11-10

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Venue:

Session#28, Albuquerque, NM

Base Document:

IEEE C802.16d-03/67.

Purpose:

To support the understanding behind the comments and resolutions proposed in Letter Ballot 13 concerning draft **P802.16-REVd/D1**.

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Directed Mesh in 802.16

Supporting Contribution IEEE802.16d-2003_67
and Comments 322 to 340 inc. in IEEE802.16-03/53

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November 2003

Directed Mesh (DM)

- A network of inter-connected nodes using steerable and substantially directional antennas.
- The directionality implies no ‘broadcast’ capability, and the use of ‘private’ transmissions with a low expectation of interference with other nodes.

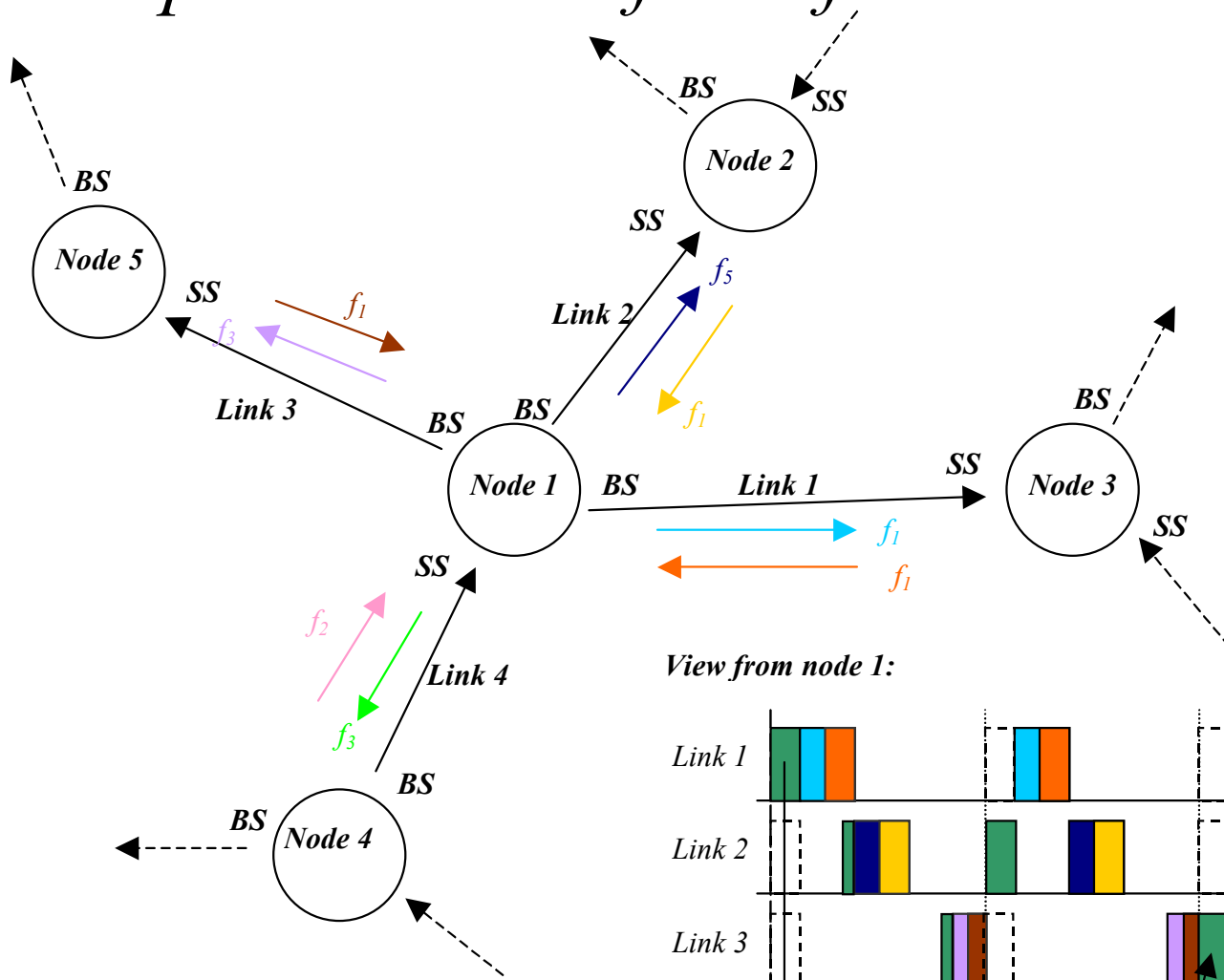
Purpose and Scope

- To introduce specific enhancements that integrate options for a “Directed Mesh” (DM) configuration within the 802.16 standard.
- The options proposed supplement the PMP mode to accommodate DM behaviour across the entire frequency range using any PHY.
- No new specific mode is introduced to the standard. Nothing is deleted.
- Interoperability goals are not compromised.
- Based on enhancements or adaptation of existing elements of the draft.
- Producing minimal but focused proposals.

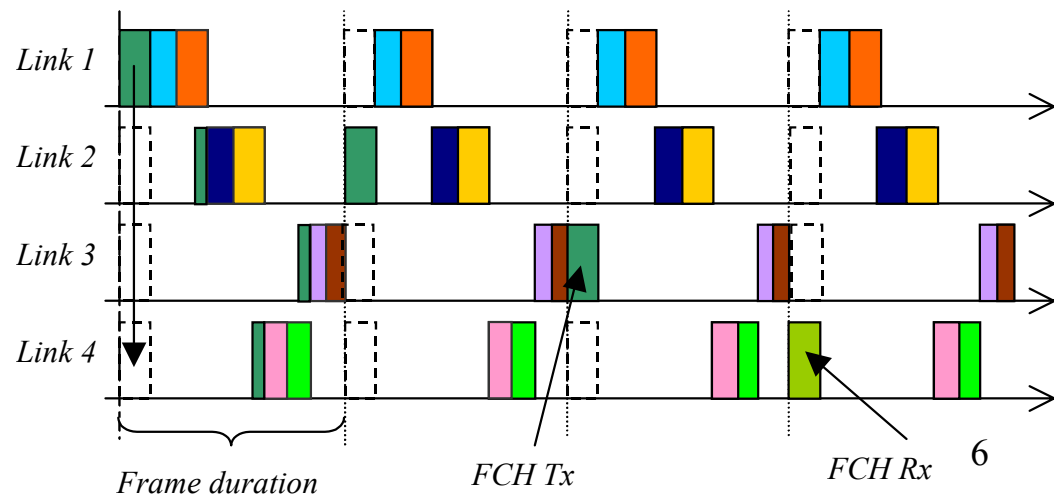
Proposal Areas

- Frame Structure
 - 9 comments, 333 to 337 plus 330,331,332 and 340 associated with use of the AAS option.
- Power Control
 - 5 comments, 322 to 326.
- 5 other comments associated with DFS and System Profiles.

Representation of DM frame structure



View from node 1:



DM frame structure: 2-11GHz

Allow DM to be supported via the AAS option. This provides for:

- Data burst preamble (TDMA style operation)
- Private FCH (DL-MAP, UL-MAP) transmission
- Unicasting private MAC message transmission
- Use of AAS-alert-slots for the benefit of substantially directional antenna systems

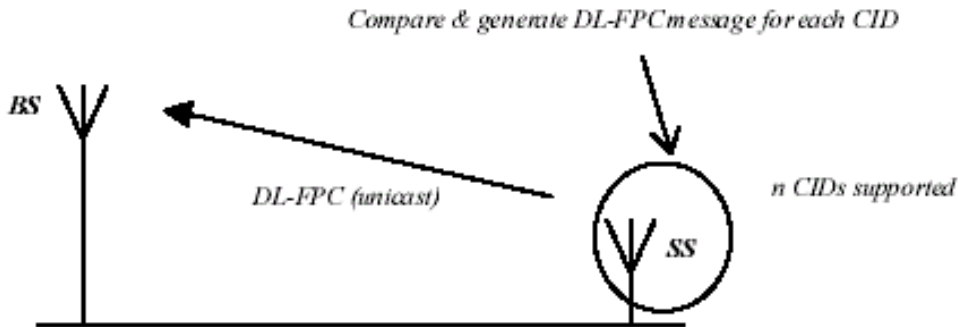
DM frame structure: 10-66GHz

- Modifications to provide a frame structure supporting the managed transmission of the FCH – DM has no broadcast capability.

Table 126— SC PHY synchronization field

Syntax	Size	Notes
PHY Synchronization Field() {		
Network Configuration Type (NCT)	4 bits	Flag to indicate network configuration type: 0 = PMP 1 = DM 2 = PtP 3...15 reserved
Frame Duration Code()	4 bits	
Frame Number	24 bits	
If(NCT==DM) { FCH expected	24bits	The number of frames before the Frame preamble and FCH will be transmitted again.
}		
}		

Downlink Fast Power Control



- DL-FPC is essential for DM's peer-to-peer architecture.
- Requires identification of CID in DL-MAP to ensure power control of the correct burst.

Table 84a —DL-FPC MAC message format (add section 6.4.2.3.41)

Syntax	Size	Notes
DL-FPC Message Format() {		
Management Message Type = 46	8 bits	
Power adjust	8 bits	(Signed 8 bit, 0.25 dB units)
}		

Efficiency gains for Fast Power Control

Table 83a — FPC code resolution

<i>Code</i>	<i>Meaning</i>
0000	No change
0001	Increase power by a dB
0010	Decrease power by a dB
0011	Increase power by $2a$ dB
0100	Decrease power by $2a$ dB
0101	Increase power by $4a$ dB
0110	Decrease power by $4a$ dB
0111	Increase power by $8a$ dB
1000	Decrease power by $8a$ dB
1001	Increase power by $16a$ dB
1010	Decrease power by $16a$ dB
1011	Increase power by $32a$ dB
1100	Decrease power by $32a$ dB
1101	Increase power by $64a$ dB
1110	Decrease power by $64a$ dB
1111	<i>Reserved</i>

- a is the *Power Control Difference Base Value* and is set in the UCD.
- It has a default value of 0.25dB.
- SS issues DL-FPC commands based on appropriate code. Non-linear range: ± 0.25 dB to ± 16 dB.

Table 279— UCD channel encoding (page 563)

Name	Type (1 byte)	Length	Value	PHY scope
Power Control Difference Base Value	20	1	0...255 (units of 0.125 dB) default 2 (0.25dB)	All

Efficiency gains for Fast Power Control

- Modifications to the FPC MAC message sees a reduction in the size of the *power field*.

Table 84 — Fast Power Control (FPC) MAC message format

Syntax	Size	Notes
Fast Power Control message format () {		
Management message type = 38	8 bits	
Number of stations	8 bits	
for (<i>i</i> =0; <i>i</i> <Number of stations; <i>i</i> ++) {		
Basic CID	16 bits	
Power adjust	8 bits	
Power Level Difference Code	4 bits	The coded difference in power level from that currently used.
}		
If !(byte_boundary) { Padding Nibble}	4 bits	<i>Padding to reach byte boundary</i>
}		

Enhancements to DFS option

To improve system efficiency it is proposed to allow the unsolicited transmission of a REP-RSP MAC message when any type of interference is detected, *extended from primary users interference only*. Benefits are:

- Reduce bandwidth for polling
- Reduce action due to polling delay