16jm Ad Hoc Group Report for Session #55

IEEE 802.16 Presentation Submission Template (Rev. 9)

Document Number:

    IEEE C802.16m-08/500

Date Submitted:

    2008-05-

Source: Ad Hoc Group Chairs

Rakesh Taori	,	Voice:	+82-31-280-9635
Samsung Advanced Institute of Technology		E-mail:	rakesh.taori@samsung.com
Mt. 14-1 Nongseo-Dong, Ginheung Gu, Yongin-si, 446-712, South Korea			

Peiying Zhu		
Nortel Networks	E-mail:	pyzhu@nortel.com

Source:

    Base document

Venue:

    Macau, China

Base Contribution:

    None

Purpose:

    For discussion of the content in TGm and possible adoption of the proposed text in the 16m SDD.

16jm Ad Hoc Group Report for Session #55

Prepared by

16jm Ad Hoc Group Chairs

Rakesh Taori and Peiying Zhu

Outline

- Background: March Meeting Results
- AHG tasks between Mar-May meetings
- Short summary of the Activity (Process)
- Recommendations of the AHG
  - 16j/16m Interoperability (Connection Chart)
  - Scope of 16m Relay
  - Basic Constructs for 16m Relay Frame Structure

Background: March Meeting Discussions

- The following was discussed
  - Decision on Legacy RS support
  - 16j/16m Interoperability (Connection Chart)
  - 16m Relay Scope
- The following was agreed unanimously
  - Text related to Legacy RS support (See SDD (08/003r1), page 8, lines 3-6)
  - 16m Relay should consider
    - TDD and FDD modes for Duplexing.
    - MS awareness of Relay.
    - Multicarrier operation.
    - Out-of-band relay operation.
    - Tree topology for infrastructure stations.
- It was established that the following needed more discussion
  - 16j/16m Interoperability (Connection Chart)
  - 16m Relay Scope
    - Discuss Usage models to derive scope.

Tasks for the AHG between March and May

- Finalize 16j/16m interoperability chart
  - Clarify the definition of entities in the chart.
- Use the Usage Models to derive 16m relay scope
  - Select Usage models for 16m relay from among 16j Usage models + any additional new usage models
  - Derive 16m relay scope (at least finalize topology).
- 16m Relay Frame Structure with legacy support
- Deal with relay-related contributions
  - March meeting submissions deferred to the Relay AHG.

Discussions on the Connection Chart: Process

- AHG was provided with initial material for discussion
  - Material composed by the chairs.
    - Provided in the form of a PPT file (Connections_chart-AHG.ppt)
  - Material based on discussions at the March meeting.
    - March-meeting straw Polls were used as a guide.
  - Group was asked to review and voice objections on the connections shown
  - Deadline for opinions: 25th April AOE.
- SDD text drafted by the chairs and circulated for review.
  - File circulated for review: AHG-Recom-ConnectionChart.pdf
- AHG recommendations to be submitted to the TG at the May meeting.

Discussions on 16m Relay Scope: Process

- Call for Submission for 16m Usage Model was issued
  - 16j Usage Models to be used a basis
  - Changes to 16j Usage models, if any, were requested.
  - New Usage Models for 16m relay, were requested.
  - Deadline for usage model submissions: 7th April AOE.
- 16m Relay Scope
  - Based on submissions, chairs composed a list of 9 elementary relay constructs to support the relay usage model submissions and conducted a straw poll.
  - E-mail straw poll was carried for identifying the scope of 16m relay.
  - Deadline for straw poll: 25th April AOE
- Based on the straw poll results, chairs drafted text for inclusion in SDD and circulated it for review.
  - File circulated for review: AHG-Recom-UsageModel-Constructs.pdf
- AHG recommendations to be submitted to the TG at the May meeting.

Discussion on 16m Frame Structure: Process

- Call for Submission for 16m Relay Frame Structure was issued
  - Deadline (7th April AOE).
- Based on the submissions, chairs drafted a document (focused on In-Band, TDD, 2-hop) to be used as a starting point for discussion (file: 16mRelayFS-AHG.pdf). An initial proposal with the following high-level constructs were circulated for discussion:
  - Multiplexing Legacy and 16m
    - Down Link
    - Up Link
  - Multiplexing Access Link and Relay Link Operations in the Legacy Zone
    - According to Legacy operation (16j).
  - Multiplexing Access Link and Relay Link Operations in the 16m zone
    - Down Link
    - Up Link
  - Terminology
  - Comments to be received by 1st May AOE
- Based on the received comments the chairs identified "consensus points" and drafted SDD text for AHG recommendation
  - File circulated for review: AHG-Recom-FS-Constructs-r1.pdf
- AHG recommendations to be submitted to the TG at the May meeting.

Documents circulated for AHG Review and Discussion

- AHG discussion summary and recommendations on Connection Chart
  - File: "AHG-Recom-ConnectionChart.pdf"
  - Identical contents uploaded as C80216m-08_497.pdf
- AHG recommendation for Usage Model Constructs
  - File: "AHG-Recom-UsageModel-Constructs.pdf"
  - Identical contents uploaded as C80216m-08_498.pdf
- AHG recommendation for 16m relay frame structure constructs.
  - File: "AHG-Recom-FS-Constructs-r1.pdf"
  - Identical contents uploaded as C80216m-08_499.pdf

AHG Recommendations
on
16j/16m Interoperability
(Connection Chart)

SDD Text for 16j/16m Relay Connection Chart
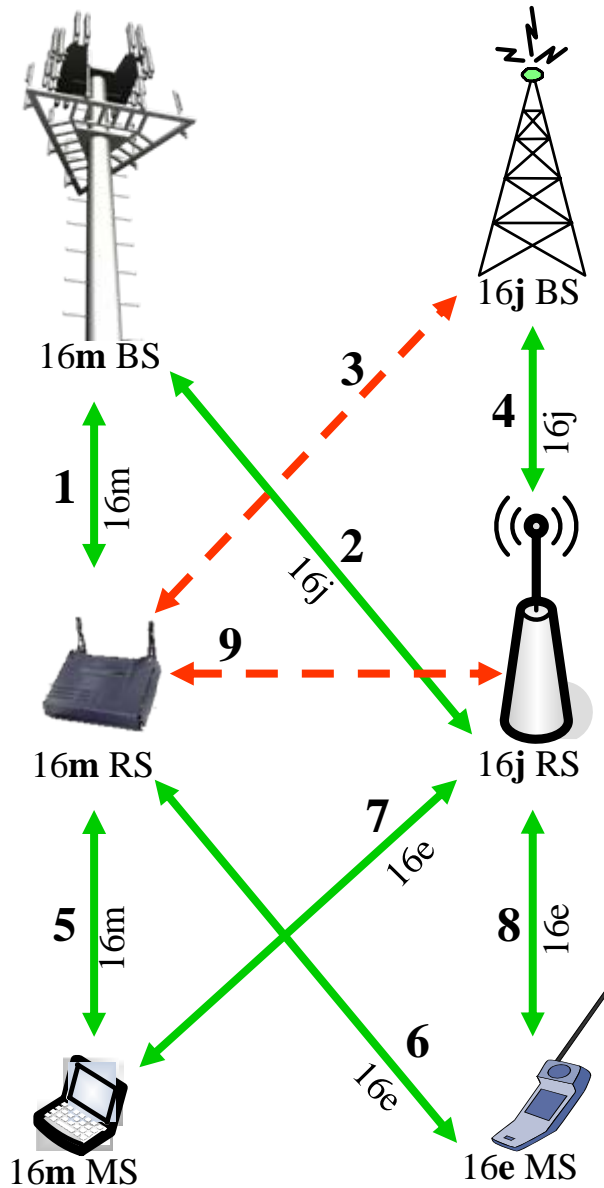
Connection #	Connected Entities	Protocol used	Supported (Y/N)
1	16m BS -16m RS	16m	Y
2	16m BS - 16j RS	16j	Y
3	16m RS – 16j BS	N/A	N
4	16j BS - 16j RS	16j	Y
5	16m RS - 16m MS	16m	Y
6	16m RS - 16e MS	16e	Y
7	16m MS – 16j RS	16e	Y
8	16j RS - 16e MS	16e	Y
9	16m RS – 16j RS	N/A	N

Table yyy

Key
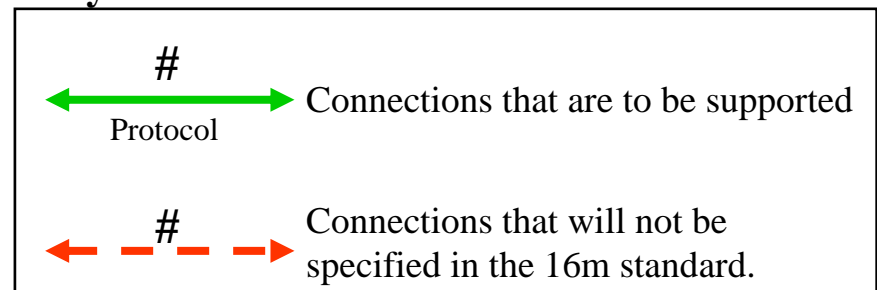
Figure xxx

SDD Text for 16j/16m Relay Connection Chart

- Insert after Legacy Support Text in line 6, on page 8 of the SDD (08/003r1).

  – Figure xxx and Table yyy, show the 16m relay related interfaces that are to be supported and those which are not required to be supported in the 802.16 specification. Only the interfaces involving RSs (16m and legacy RS) are shown.

  – The 16j BS, shown in Figure xxx is referred to as an MR-BS in the 16j draft amendment. Figure xxx and Table yyy also indicate the specific 802.16 protocol that is to be used for supporting the particular connection.

Ad Hoc Group Recommendation
on
The Scope of 16m Relay

Usage Model Straw Poll Results

Basic Construct	Entities	Consider (%)	Consolidated Results
Multi-Hop Relay (Tree Infrastructure)	BS↔RS1↔RS2 ↔MS	79%	Consider: 15 Do not Consider: 4
Mobile Relay	BS↔Mobile RS↔MS	58%	Consider: 11 Do not Consider: 8
MS - MS Direct Communication	MS1↔MS2	42%	Consider: 8 Do not Consider: 11
MS relaying for an out of coverage MS	BS↔MS1↔MS2	32%	Consider: 6 Do not Consider: 13
RS - RS Direct communication (Mesh Infrastructure)	RSx ↔ RSy	32%	Consider: 6 Do not Consider: 13
Local Forwarding	MS1↔RS↔MS2	63%	Consider: 12 Do not Consider: 7
Shared BS	Shared BSs (BS1, BS2)↔RS↔MS	68%	Consider: 13 Do not Consider: 6
RS group	BS↔RS group↔MS.	68%	Consider: 13 Do not Consider: 6
MS relaying for an in coverage MS	BS↔MSx↔Msy	37%	Consider: 7 Do not Consider: 12

Result Summary

- Unanimous Support
  - None
- >75% support
  - Multi-hop Relay, more than 2-hop
- >50% support
  - Mobile-RS (BS – Mobile RS – MS)
  - Local Forwarding (MS – RS - MS)
  - Shared BS ([BS1, BS2] – RS - MS)
  - RS groups (BS – [RS1, RS2, .., RSn] – MS).
- <50% support
  - MS-MS direct communication
  - RS-RS direct communication (Mesh Infrastructure)
  - MS relaying for an out-of-coverage MS
  - MS relaying for an in-coverage MS.
- Other comments
  - Transmission schemes such as simultaneous UL/DL Transmission, Full Duplex Relay, etc. (which are not bound to any specific construct) to be considered in FS discussions.
- There were comments to use the survey only as a means to prioritize the 16m relay work.

AHG Recommendation

- Usage models constructs with >75% support to should be included in the scope of 16m relay.

- Usage models constructs with >50% support, should be considered for inclusion in the 16m relay.

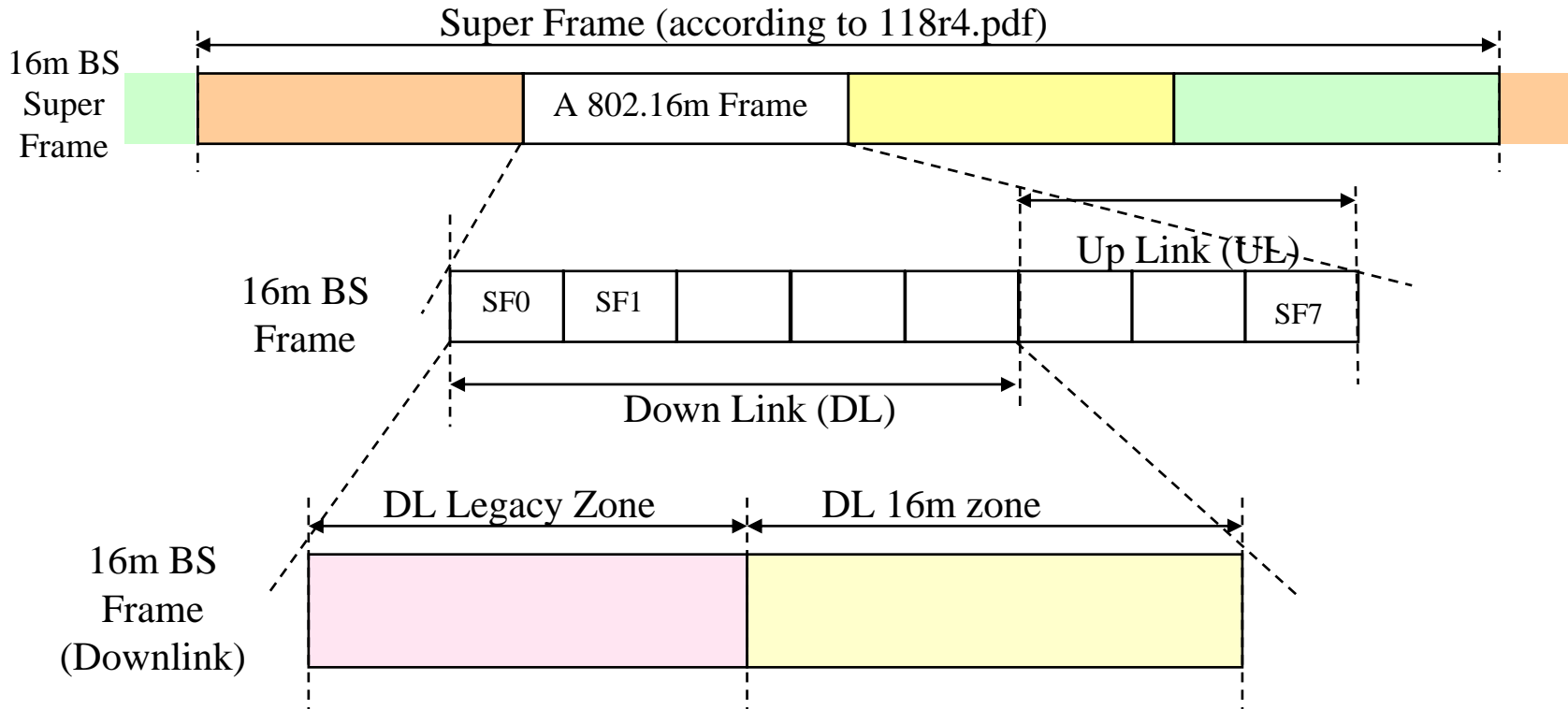- Usage models constructs with < 50% support should not be considered any further in TGm relay.

Text for specifying 16m Relay Scope
(Whether to include in SDD or SRD is to be discussed)

- The following text should be included in SDD or SRD to capture the scope of 16m relay
  - If the TG agrees to support constructs with >75% support,
    - [Proposed Text:] 16m should consider mechanisms for supporting more than 2- hop relay.
  - If the TG agrees to rule out the constructs with <50% support constructs,
    - [Proposed Text:] RS-RS communication among RSs on different paths is out of scope 16m relay. MS-MS direct communication and MS relaying is out of scope of 16m relay.
  - If the TG agrees to consider Mobile RS,
    - [Proposed Text:] 16m should consider mechanisms for supporting mobile relay.
  - If the TG agrees to consider Local forwarding
    - [Proposed Text:] 16m should consider mechanisms for enabling an RS to support data forwarding between its subordinate MSs.
  - If the TG agrees to consider Shared BS
    - • [Proposed Text:] 16m should consider mechanisms for enabling an RS to forward information to/from more than one 16m BSs.
  - If the TG agrees to consider RS group
    - [Proposed Text:] 16m should consider mechanisms for supporting RS grouping.

AHG Recommendation
on
16m Relay Frame Structure Constructs

Slide 6 from 16mRelayFS-AHG.pdf: Multiplexing Legacy RS and 16m RS in DL

Super Frame (according to 118r4.pdf)

16m BS Super Frame

A 802.16m Frame

16m BS Frame

SF0 | SF1 | | | | | | SF7

Up Link (UL)

Down Link (DL)

16m BS Frame (Downlink)

DL Legacy Zone

DL 16m zone

Possible Text for SDD: A 16m BS that supports relay stations shall multiplex communications with the legacy RSs (16j RSs) and the 16m RSs using TDM in the DL.

Slide 7 from 16mRelayFS-AHG.pdf: Multiplexing Legacy RS and 16m RS in UL

Super Frame (according to 118r4.pdf)

16m BS Super Frame

A 802.16m Frame

FDM for UL multiplexing

UL Legacy Zone

UL 16m zone

| SF0 | SF1 | | | | | | SF7 |

Down Link (DL)

Up Link (UL)

TDM for UL multiplexing

UL Legacy Zone | UL 16m zone
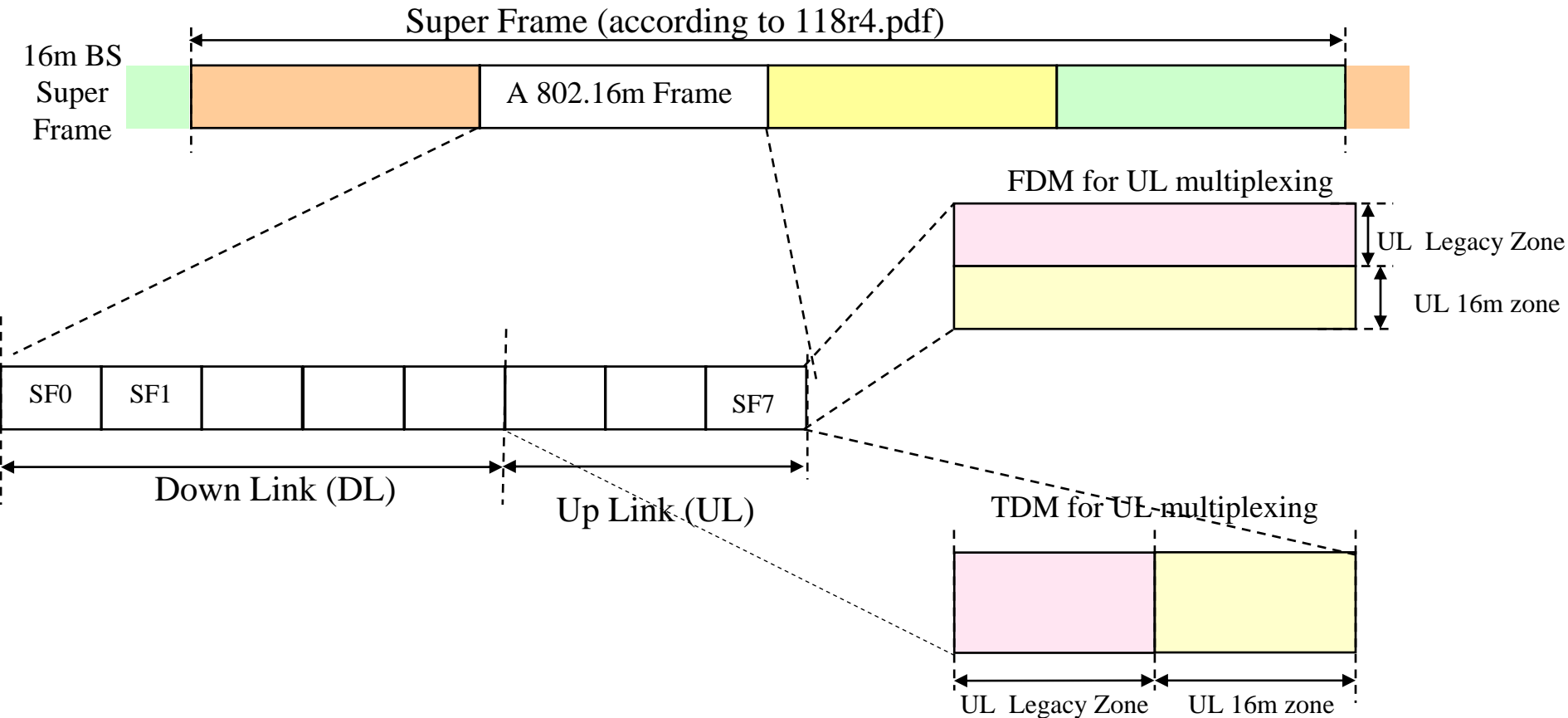
Possible Text for SDD: In the UL, the 16m BS should support TDM as well as FDM for multiplexing communications with the legacy RSs (16j RSs) and 16m RS

Material for discussion in TGm concerning Slides 6 and 7 (AHG recommendations)

- There is consensus on the SDD text in slides 6 and 7. No objection was raised. There were comments. New text is proposed based on the above.
  - [Quick Reference] Text already in the SDD (Page 8, lines 3-6):
    - A 16m BS that is capable of supporting a 16j RS, shall communicate with the 16j RS in the "legacy zone". The 16m BS is not required to provide 16j protocol support in the "16m zone". The design of 16m relay protocols should be based on the design of 16j wherever possible, although 16m relay protocols used in the "16m zone" may be different from 16j protocols used in the "legacy zone".
  - New SDD text for slides 6 and 7 (Proposed):
    - Insert in SDD Section 11.4.5, page 22:
      - A 16m BS that supports 16m relay stations shall communicate with the 16m RS in the 16m zone. The 16m BS shall multiplex the legacy zone and the 16m zone using TDM in the DL. In the UL, the 16m BS should support TDM as well as FDM for multiplexing legacy zone and the 16m zone.
- Based on the inputs received, there seem to be several ways in which FDM multiplexing can be realized in the UL. The question of exactly how legacy and 16m zones should be partitioned in the UL is not a relay-specific topic. It should be discussed/debated in the TG.

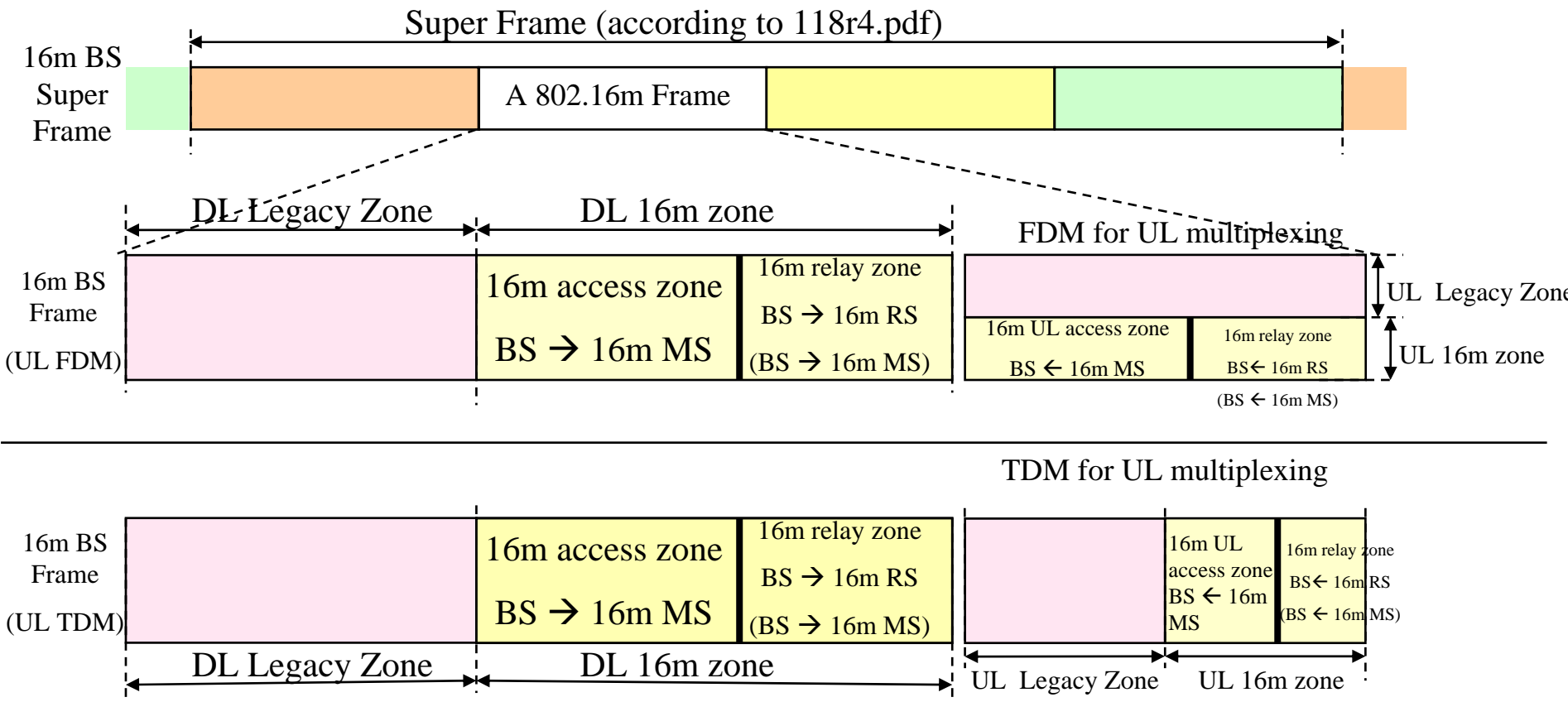# Slide 8 from 16mRelayFS-AHG.pdf: Multiplexing Access Link and Relay Link in Legacy Zone

- Possible text for SDD: The 16m specification shall not alter the legacy zone operation. The access link and the relay link communications in the legacy zone shall be multiplexed using TDM in the UL as well as DL in accordance with the 802.16j specifications.

Material for discussion in TGm concerning Slide 8 (AHG recommendations)

- There is consensus on the SDD text in slides 8. No objection was raised. There were comments. New text is proposed based on the above.

- New SDD text for slides 8 (Proposed):
  - Insert in SDD Section 11.4.5, page 22:
    - The 16m specification shall not alter the legacy zone operation. The access link and the relay link communications in the legacy zone shall be multiplexed in accordance with the 802.16j specifications.

Slide 9 from 16mRelayFS-AHG.pdf
Multiplexing Access and Relay Link in 16m zone

16m BS Super Frame

Super Frame (according to 118r4.pdf)

A 802.16m Frame

16m BS Frame (UL FDM)

DL Legacy Zone | DL 16m zone

| 16m access zone BS → 16m MS | 16m relay zone BS → 16m RS (BS → 16m MS) |

FDM for UL multiplexing

| 16m UL access zone BS ← 16m MS | 16m relay zone BS ← 16m RS |

UL Legacy Zone

UL 16m zone

(BS ← 16m MS)

TDM for UL multiplexing

16m BS Frame (UL TDM)

| 16m access zone BS → 16m MS | 16m relay zone BS → 16m RS (BS → 16m MS) |

| | 16m UL access zone BS ← 16m MS | 16m relay zone BS ← 16m RS (BS ← 16m MS) |

DL Legacy Zone | DL 16m zone

UL Legacy Zone | UL 16m zone

<u>Possible Text for SDD</u>: In the 16m zone, the 16m BS and the 16m RS shall multiplex the access link communications (16m BS – 16m MS, 16m RS – 16m MS) and the relay link communications (16m BS – 16m RS) using TDM in the UL as well as the DL.

Material for discussion in TGm concerning Slide 9 (AHG recommendations)

- There is no consensus for the SDD text on slide 9. Several comments were received.
- The received inputs can be categorized. Proposed modifications to the text aimed at:
  - capturing >2 hop relay support.
  - Facilitating bi-directional transmission to (or receiving from) super ordinate and subordinate stations at the same time.
  - Enabling simultaneous Tx/Rx to subordinate station and Rx from superodinate station (full duplex relaying).
  - 16j RS behavior in 16m zone (from 16m BS perspective).
- Most comments indicate that the "sub-zoning" within the 16m zone is rigid (makes it difficult to capture the intended features).
- Suggest that TG allocate time to discuss the frame structure constructs for the 16m zone based on the received contributions.

Slide 10 from 16mRelayFS-AHG.pdf
Text for 16m zone (Perspective of 16m/16j RSs).

1. Assuming that connection 6 in the connection chart is agreed, we need to define the operation of a 16m RS in terms in legacy zone and 16m zone
   - Possible text for SDD: A 16m RS shall communicate with the 16e MS in the "legacy zone".
2. Should the 16m zone and the legacy zone for 16m BS frame and the 16m RS frame be aligned (as shown in several contributions e.g. Nortel's)
   - If yes, possible text for SDD: The Legacy zone and 16m zone for the 16m entities shall be time aligned.
3. Can a 16j RS communicate with a 16e MS in the duration of the 16m zone? (as shown in several contribution e.g. Intel's 83r3?)
   - If yes, possible text for SDD: A 16j RS may communicate with 16e MSs during the 16m zone.
4. Can a 16m BS/RS communicate with 16m MSs in the UL/DL relay zone? (as shown in several contributions, e.g. Samsung's
   - If yes, possible text for SDD: In the relay zone of the16m zone, the 16m BS, or a 16m RS, may communicate with the 16m MS.
5. If the above is accepted, can a BS send/receive transmissions to/from MS spanning beyond the access or relay zone.
   - If yes, possible text for SDD: In the 16m zone, the 16m BS may send (or receive) frames to (or from) the 16m MS that start in the access zone (or relay zone) and finish in the adjacent relay zone (or access zone).

Material for discussion in TGm concerning Slide 10 (AHG recommendations)

- There is no objection to the 1st item.
  - New SDD text for the 1st bullet on slide 10 (Proposed):
    - Insert in SDD Section 11.4.5, page 22:
      - A 16m RS shall communicate with the 16e MS in the "legacy zone".
- There is one objection to the 2nd item.
  - New SDD text for the 2nd bullet on slide 10 (Proposed):
    - Insert in SDD Section 11.4.5, page 22:
      - The Legacy zone and 16m zone for the 16m entities shall be time aligned.
- For the other items, further discussion is needed.

Slide 11 from the Original Discussion Material (16mRelayFS-AHG.pdf)

-Original slides 11

- Comments Received on 11

- AHG Chairs' recommendations based on Received Comments

Slide 11 from 16mRelayFS-AHG.pdf Terminology

- Legacy Zone
  - where 16m BS communicates with 16j RS or 16e MS, and where 16m RS communicates with a 16e MS. The Legacy zone, if present, shall consist of 1 or more 16e Access Zone and 0 or more 16j Relay Zones.
- 16e Access Zone
  - where 16m BS or a 16m RS communicates with a 16e MS.
- 16j Relay Zone
  - where 16m BS communicates with a 16j RS.
- 16m Zone
  - where 16m BS communicates with 16m RS or 16m MS, and where 16m RS communicates with a 16m MS. The 16m zone shall consist of 1 or more 16m Access Zone and 0 or more 16m Relay Zones.
- 16m Access Zone
  - where 16m BS or 16m RS communicates with a 16m MS.
- 16m Relay Zone
  - where 16m BS communicates with a 16m RS.

Material for discussion in TGm concerning Slide 11 (AHG recommendations)

- Consensus possible on the first 4 terms of slide 11
  - Comments are pending.
- Insert in SDD Section 11.4.5, page 22:
  - Legacy Zone
    - where 16m BS communicates with 16j RS or 16e MS, and where 16m RS communicates with a 16e MS.
  - 16e Access Zone
    - where 16m BS, a 16j RS or a 16m RS communicates with a 16e MS.
  - 16j Relay Zone
    - where 16m BS communicates with a 16j RS.
  - 16m Zone
    - where 16m BS communicates with 16m RS or 16m MS, and where 16m RS communicates with other 16m entities (i.e. 16m BS, 16m RS or 16m MS).
- The terms that deal with sub-zoning within the 16m zone (last 2 terms on slide 11) need further discussion.