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| Re: | IEEE802.16j-06/027: “Call for Technical Proposals regarding IEEEP802.16j” |
| Abstract | This contribution proposes the method of synchronization for MBS transmission among BS and RS. |
| Purpose | Text proposal for P802.16j Baseline Document. |
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# A proposal for synchronous MBS transmission in MR

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## Introduction

This contribution proposes the method of synchronization for MBS transmission among MR-BS and RS.

## Details

In Multicast and Broadcast Service (MBS) for MR, especially for Multi-BS MBS, data traffic of MBS will be broadcasted among not only BS but also RS.

As mentioned in section 6.3.23.2.2 “Performance enhancement with macro diversity” of 802.16e specification [1], from the receiving performance point of view, transmission of broadcast data from MR-BS and RS should be synchronized.

In order to synchronize the timing of MBS data sent from both MR-BS and RS, MBS data should be transmitted with three steps, as shown in Fig. 1.

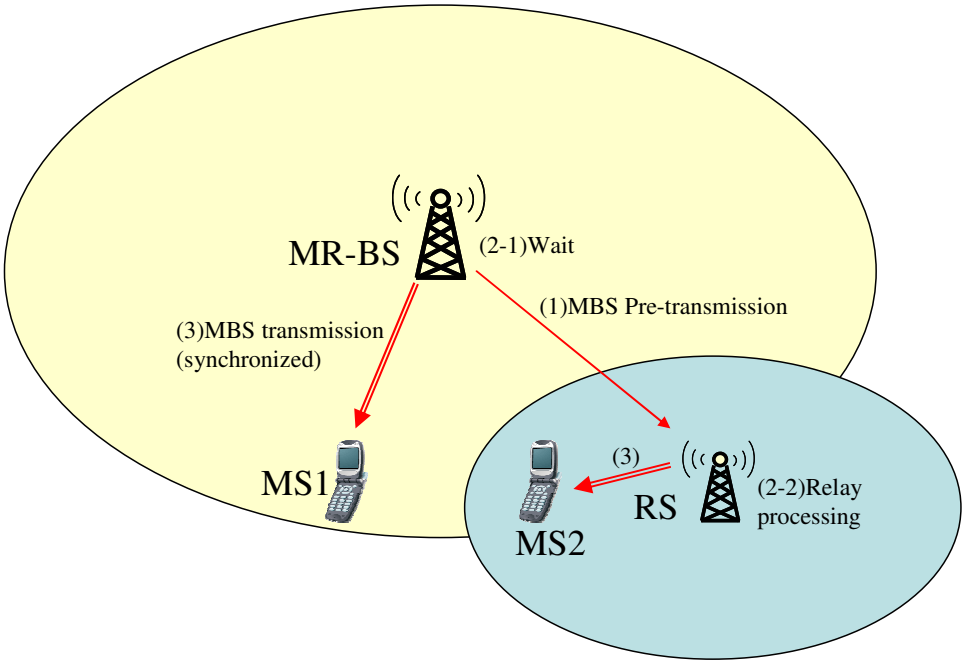
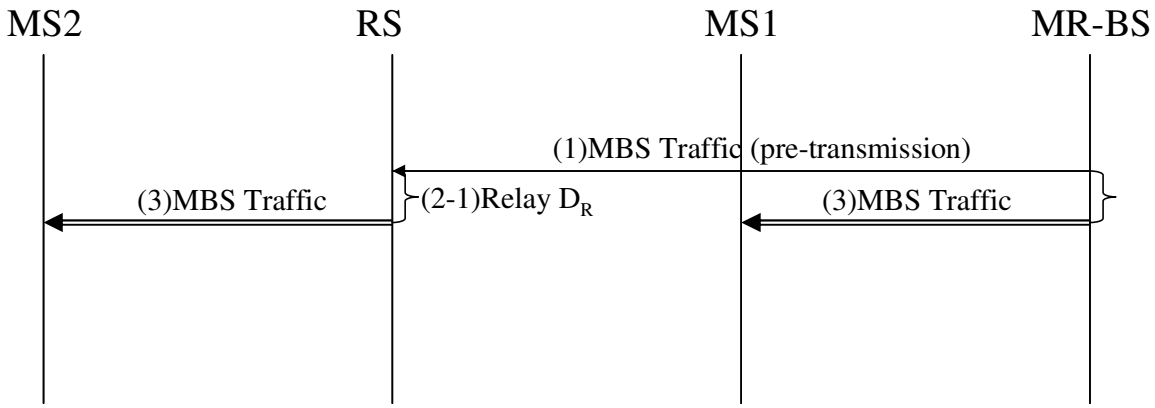



Fig. 1 Synchronized transmission for MBS traffic in MR




$D_R$ : Relay processing delay of RS

Fig. 2 Transmission sequence of MBS traffic in MR

For the following method, it assumes that frame synchronization among MR-BS and RS is established in a same MBS zone.

(1)Pre-transmission from MR-BS to RS

Firstly, MR-BS sends MBS data to RS as pre-transmission earlier than formal transmission time. For this pre-transmission, MR-BS use a multicast connection corresponded to RS multicast CID [2] over the R-DL.

(2-1)MR-BS waits for relay processing in RS and (2-2)Relay processing in RS

It takes $D_R$ that MBS data received at RS is relayed to MS(MS2 in Fig.1), in that period, MR-BS maintains MBS data sent to RS as pre-transmission and waits for relay processing in RS. Here, it assumes that RS relays MBS data within a fixed $D_R$ delay.

(3)Synchronous transmission from both MR-BS and RS.

Secondly, after $D_R$ since pre-transmission, RS send MBS data to MS (MS2) and MR-BS also send same MBS data synchronously. For these transmissions, MR-BS and RS use broadcast connection for MBS over the access link.

In order for MR-BS to wait $D_R$, MR-BS needs to know $D_R$ of RS. The value of $D_R$ will be given to the MR-BS as a capability parameter of SBC-REQ message.

Note that additional capability parameter for RS is proposed with other contribution [3].

Consider the case that there are multiple RS exist and each delay of RS are not same, as shown in Fig.3. In such case, MR-BS shall examine the maximum delay of RS and notify all RS of it. After the time notified by MR-BS,

all RS and MR-BS formally transmit MBS data to MS synchronously with the slowest RS. Such the maximum delay will be notified in SBC-RSP message.

If the MR-BS detects that the maximum delay of RS is replaced with the greater value, MR-BS may send unsolicited SBC-RSP message and notifies all RS of it.

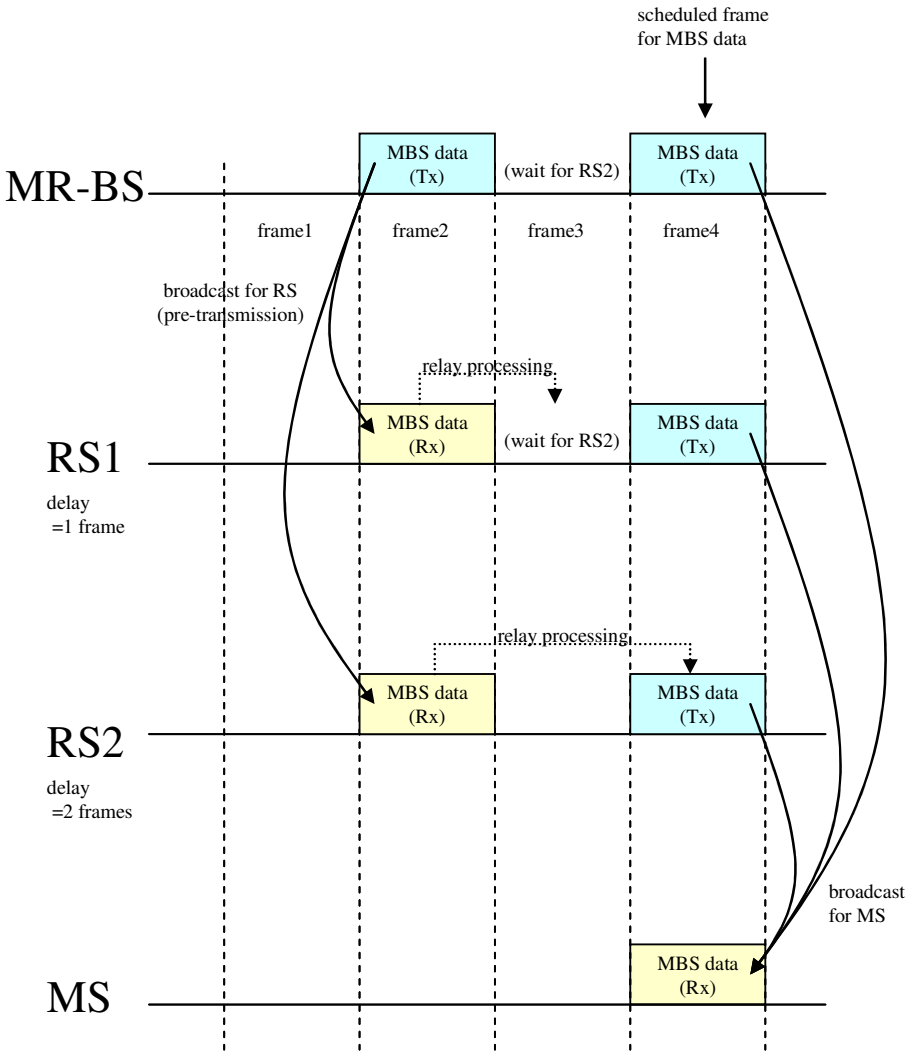



Fig.3 Synchronized MBS data transmission (different RS delay)

## Conclusion

According to this transmission method, MBS data which is received at MS under MR-BS or RS is synchronized exactly. If MS moves between MR-BS and RS, MS can receive MBS data without any discontinuance.

## Specific text changes

- 6.3.23.2.2 Performance enhancement with macro diversity

*Insert the following text at the end of 6.3.23.2.2:*

For MR, MBS transmission in a group of MR-BS and RS shall also be synchronized. The RS delay, $D_R$, is given to MR-BS as a capability parameter of SBC-REQ message. MR-BS sends MBS data over the R-DL as a pre-transmission $D_R$ frame earlier than the normal MBS transmission over access link. MR-BS shall wait for $D_R$ frames, then send MBS data again over the access link.

If multiple RSs with different delay performance existing, MR-BS shall firstly examine the maximum delay of RSs, which is $D_M$, and notify it to all RSs by SBC-RSP message. MR-BS sends MBS data over the R-DL as a pre-transmission $D_M$ frame earlier than the normal MBS transmission over access link. MR-BS shall wait for $D_M$ frames, then send MBS data again over the access link. All RSs shall use $D_M$ as the delay to transmit MBS data over access link. If the MR-BS detects that the delay of a RS is greater than the examined maximum delay, it shall update the current maximum RS delay parameter by this greater value. Also, MR-BS needs to send an unsolicited SBC-RSP message to all RSs to notify the change of the maximum RS delay.

- 11.8 SBC-REQ/RSP management message encodings

*Insert new subclause 11.8.3.7:*

11.8.3.7.X Maximum RS Downlink Delay for MBS Zone

| Type | Length | Value | Scope |
|---|---|---|---|
| TBA | 1 | Maximum RS Downlink Delay for MBS Zone (unit: frame) | SBC-RSP |

## References

[1] IEEE 802.16e-2005

[2] IEEE C802.16j-06/289, “RS Multicast CID for 802.16j”

[3] IEEE C802.16j-06/143, “Network entry procedure for non-transparent relay station”