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Title	**Efficient channel measurement report request and response mechanism for MMR network**
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Re:	This contribution is response to call for technical comments and contributions (IEEE 802.16j-07/007r2)
Abstract	This contribution proposes an efficient channel measurement report request and response mechanism for MMR network.
Purpose	To discuss and adopt the proposed text into the P802.16j baseline document.
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Efficient channel measurement report request and response mechanism for MMR network

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1. Introduction

In 16j system, MMR-BS needs to know channel status of RSs and MSs to determine an appropriate path in the network [1]. This contribution proposes an efficient channel measurement report request and response mechanism for MMR network, defining new management messages (REP-REQ-ADV and REP-RSP-AGG).

2. Background

In the IEEE 802.16e-2005 standard [2], REP-REQ and REP-RSP message are defined. BS can request an MS to report channel status (SINR, CINR) using REP-REQ message and this message is sent to each MS using basic CID, by unicast manner.

In 16j system, MMR-BS needs to know channel status of RSs and MSs to determine an appropriate path in the network (Authors presented a contribution regarding multi-hop path selection using REP-REQ and REP-RSP messages in the Relay TG of the 802.16 session #47 [1]). If REP-REQ and REP-RSP are used, MMR-BS needs to send multiple REP-REQs to RSs and MSs (Figure 1), and each RS and MS replies by REP-RSP message to MMR-BS (Figure 2), therefore it will consume bandwidth resource.

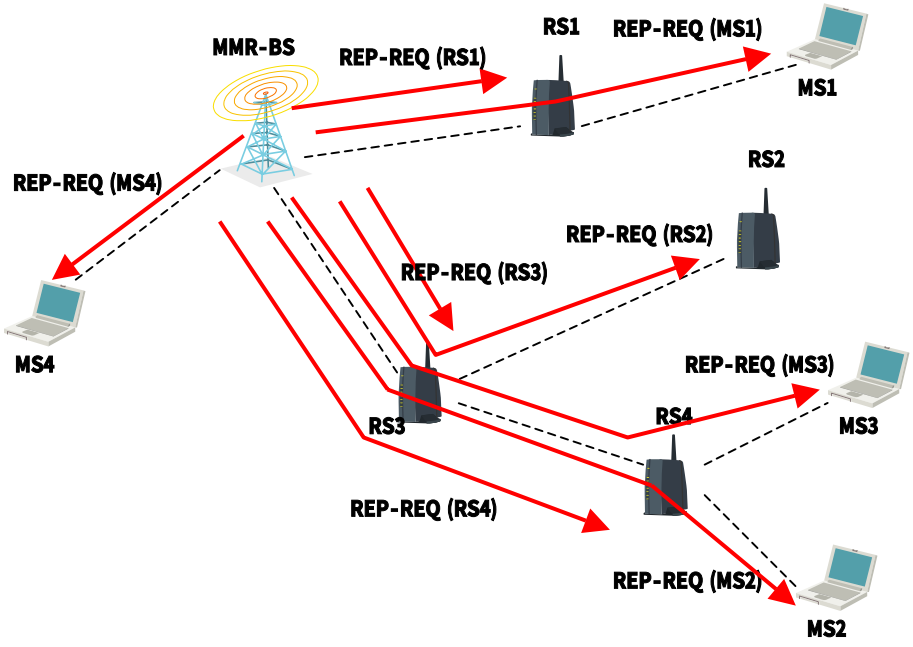

Figure 1 Sending REP-REQ to RSs and MSs in 16j system

* Part of this project is funded by Ministry of Internal Affairs and Communications of the Japanese Government.

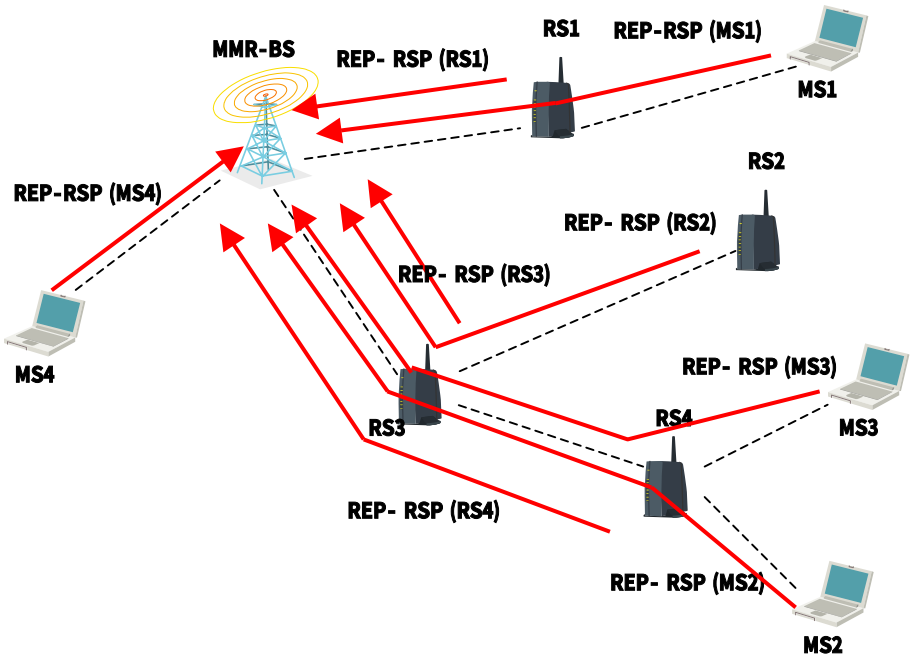

Figure 2 Sending REP-RSP to MMR-BS in 16j system

3. Proposed Method

We propose to define new management messages:

- REP-REQ-ADV (Report Request Advertisement) to advertise a channel measurement report request to all RSs in the MMR-cell
- REP-RSP-AGG (Report Response Aggregation) to aggregate multiple channel measurement reports at RS and to send to the MMR-BS.

MMR-BS sends REP-REQ-ADV message to neighboring RSs, and conventional REP-REQ messages to neighboring MSs. When RS receives REP-REQ-ADV, it forwards this message to neighboring RSs, and creates REP-REQ messages on behalf of the MMR-BS, and send them to neighboring MSs (Figure 3). REP-REQ-ADV message is sent to all RSs by broadcast manner, it will save bandwidth consumption compared to the conventional REP-REQ message sent by unicast manner. In addition, MS can receive a conventional REP-REQ message, therefore it doesn't need any specification change.

After receiving REP-REQ-ADV message, RS waits for receiving REP-RSP messages from neighboring RSs and/or MSs. If RS receives them, it aggregates these messages. RS starts the waiting timer when it receives REP-REQ-ADV message from MMR-BS, and when the timeout occurs, RS creates REP-RSP-AGG message aggregating multiple channel measurement reports received by neighboring RSs and/or MSs, and send it to MMR-BS (Figure 4). It will save band consumption compared to the conventional method using REP-RSP messages. If RS receives REP-REQ-AGG messages from neighboring RSs before its timeout, it can aggregate them as well. After the timeout, RS simply forwards received REP-RSP or REP-RSP-AGG to MMR-BS. The waiting timer at RS is used to avoid the serious delay of channel measurement report delivery to MMR-BS.

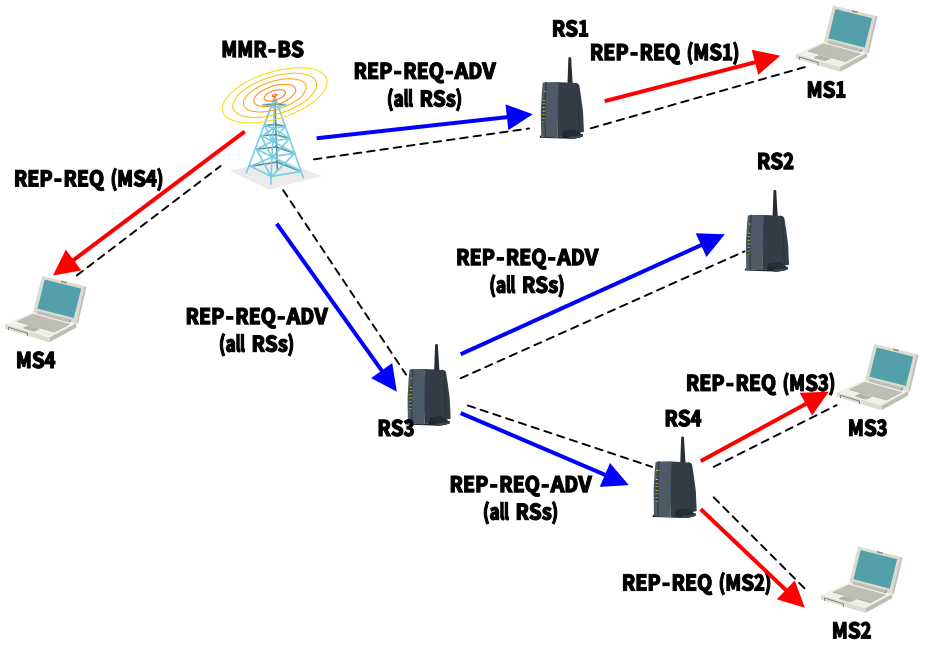

Figure 3 Sending REP-REQ-ADV to RSs

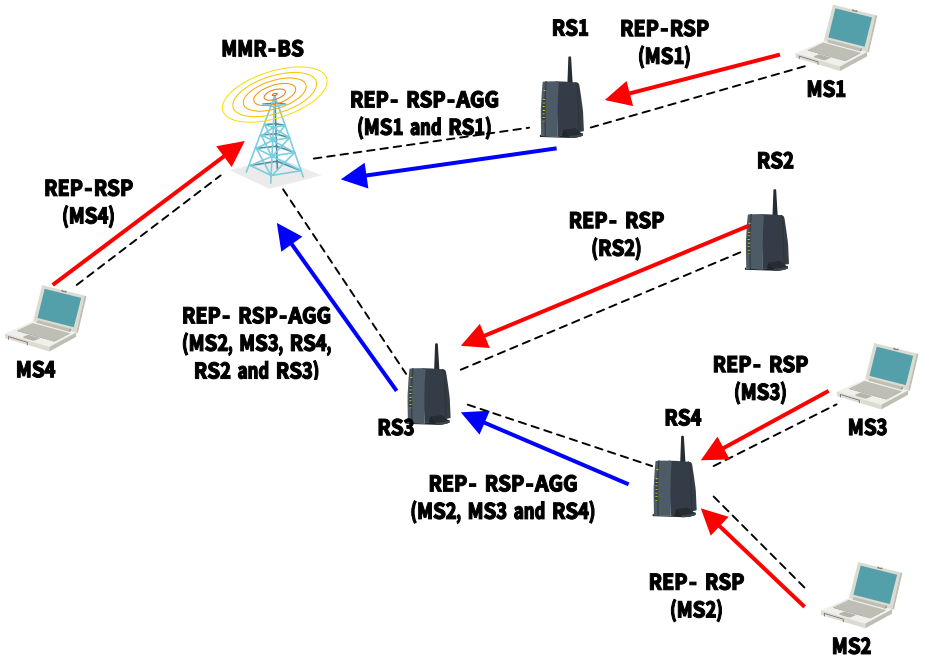

Figure 4 Sending REP-REQ-AGG to MMR-BS

Figure 5 shows the flow chart of receiving REP-REQ-ADV at RS, and Figure 6 shows flow chart of waiting for channel measurement reports (REP-RSP and/or REP-RSP-AGG) at RS.

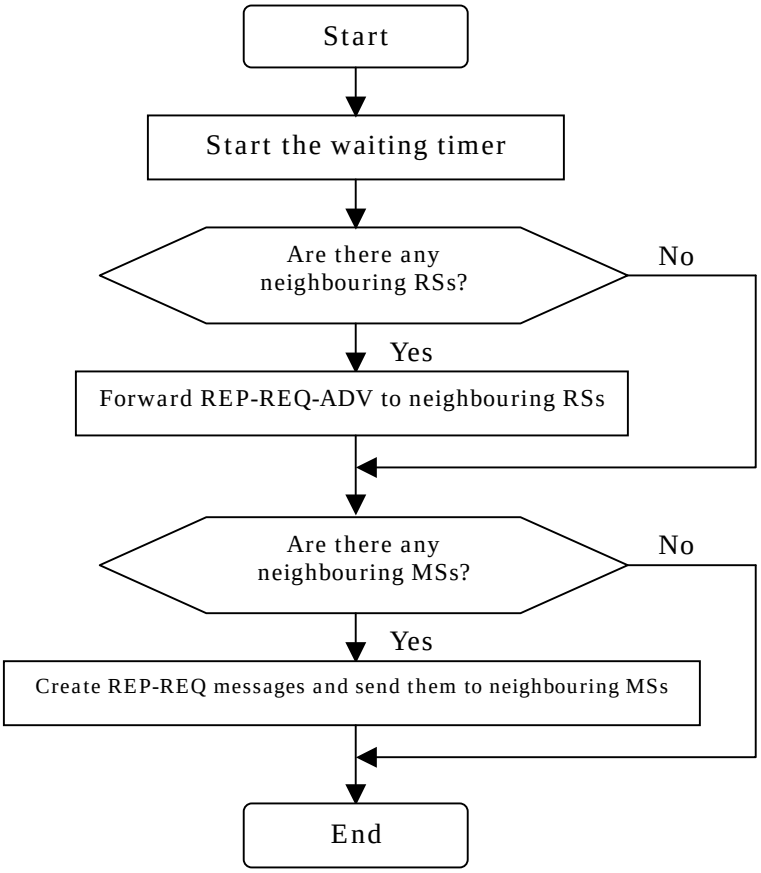

Figure 5 Flow chart of receiving REP-REQ-ADV at RS

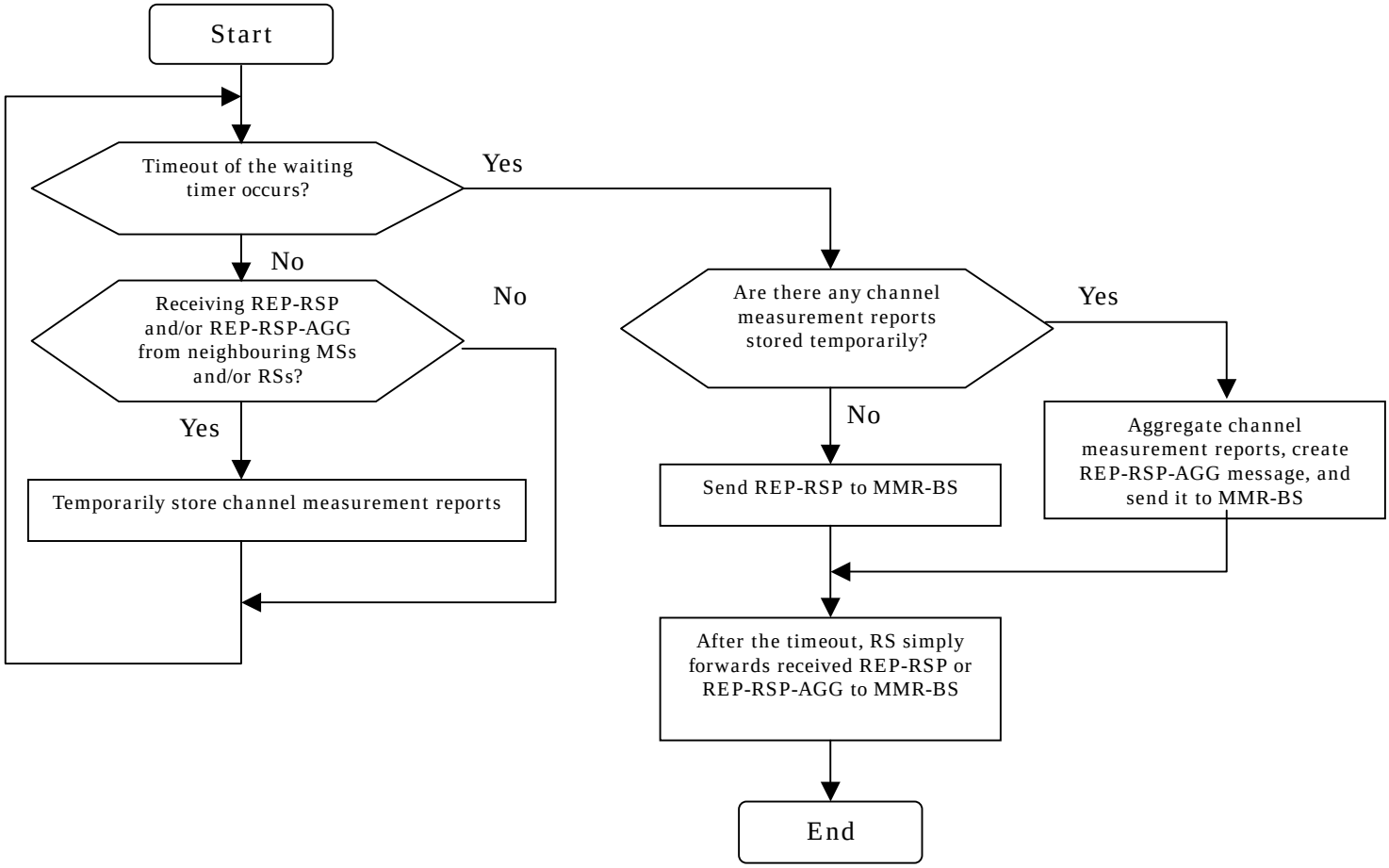

Figure 6 Flow chart of waiting for channel measurement reports (REP-RSP or REP-RSP-AGG) at RS

4. Proposed text changes

6.3.15.6 Requesting and reporting of measurements

[Insert the following text at the end of the subclause 6.3.15.6]

In MMR network, an efficient channel measurement report request and response mechanism can be used, as follows.

MMR-BS broadcasts REP-REQ-ADV message to all RSs in the MMR cell, and sends REP-REQ messages to neighboring MSs. When RS receives REP-REQ-ADV, it creates REP-REQ messages on behalf of the MMR-BS, and send them to neighboring MSs.

After receiving REP-REQ-ADV message, RS waits for receiving REP-RSP messages from neighboring RSs and/or MSs. If RS receives them, it aggregates these messages. RS starts the waiting timer when it receives REP-REQ-ADV message from MMR-BS, and when the timeout occurs, RS creates REP-RSP-AGG message aggregating multiple channel measurement reports received by neighboring RSs and/or MSs, and send it to MMR-BS. If RS receives REP-REQ-AGG messages from neighboring RSs before its timeout, it can aggregate them as well. After the timeout, RS simply forwards received REP-RSP or REP-RSP-AGG to MMR-BS. The waiting timer at RS is used to avoid the serious delay of channel measurement report delivery to MMR-BS.

[Add new subclause]

6.3.2.3.65 REP-REQ-ADV message

This broadcast message is sent by MMR-BS to all RSs in the MMR-cell. It is used to advertise a channel measurement report request to RSs. When RS receives this message, it forwards this message to neighboring RSs, and creates REP-REQ messages on behalf of the MMR-BS, and send them to neighboring MSs.

The differences between REP-REQ and REP-REQ-ADV are:

- REP-REQ-ADV message is sent to all RSs by broadcast manner,
- RS receiving this message creates REP-REQ messages on behalf of the MMR-BS, and send them to neighboring MSs

Table XXX – Channel measurement report request advertisement (REP-REQ-ADV) message format

Syntax	Size	Notes
Report_Request_Advertizement_Message_Format() {		
Management Message Type = XX	8 bits	
Report Request TLVs	*variable*	
}		

The REP-REQ-ADV message shall contain the following TLV encoded parameter:

Report Request

[Add new subclause]

6.3.2.3.66 REP-RSP-AGG message

When RS receives REP-RSP messages from neighboring RSs and/or MSs, it aggregates the content of multiple REP-RSP messages, create REP-RSP-AGG message and send it to MMR-BS. RS may also aggregate multiple REP-RSP-AGG messages received from neighboring RSs.

REP-RSP-AGG message format can contain multiple channel measurement reports, identified by MAC address of MS or RS.

Table XXX – Channel measurement report response aggregation (REP-RSP-AGG) message format

Syntax	Size	Notes
Report_Response_Aggregation_Message_Format() {		
Management Message Type = XX	8 bits	
NumberOfReports	8 bits	
for (i=0; i<NumberOfReports; i++){		
MAC address	48 bits	MAC address of MS or RS
Report Request TLVs	*variable*	
}		
}		

The REP-RSP-AGG message shall contain the following TLV encoded parameter:

Report Request

5. References

[1] IEEE 802.16j-07/079, “A new metric for multi-hop path selection”
[2] IEEE standard 802.16e-2005, “IEEE Standard for Local and metropolitan area networks, Part 16: Air Interface for Fixed Broadband Wireless Access Systems”
[3] IEEE 802.16j-06/013r3, “Multi-hop Relay System Evaluation Methodology (Channel Model and Performance Metric)”
[4] IEEE 802.16j-06/014r1, “Harmonized definitions and terminology for 802.16j Mobile Multihop Relay”
[5] IEEE 802.16j-06/015, “Harmonized Contribution on 802.16j (Mobile Multihop Relay) Usage Models”
[6] IEEE 802.16j-06/016r1, “Proposed Technical Requirements Guideline for IEEE 802.16 Relay TG”
[7] IEEE 802.16j-06/017r2, “Table of Contents of Task Group Working Document”
[8] IEEE 802.16j-06/026r2, “P802.16j Baseline Document”