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| Re: | Recirculation Ballot #14b Announcement |
| Abstract | In order to minimize the session information which are inactive for long time, Keep Alive mechanism is introduced for OFDMA MSS. After configured number of silence to Keep Alive message, BS purges inactive session information for session information storage optimization. |
| Purpose | Discuss and Adopt as the session information management mechanism for OFDMA MSS |
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# OFDMA Keep Alive Mechanism for Session Information Management

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## 1. Problem Statements

Using the OFDMA mechanism, the periodic ranging timer is controlled by the SS, not the BS. And the BS cannot tell which SS sent the CDMA ranging request. If the MSS does not send any MAC message or packet data traffic directed to BS, BS is agnostic which MSS(awake, idle, sleep) stays normal within the serving area of that BS or not. It's possible that some MSS may moved to other BS area, or be powered down, went to shadow coverage or battery is detached abruptly.

During aforementioned abnormal situation goes on, lots of MSS power down without notice to BS etc. And lots of garbage session information run out of session information storage. If the target BS somehow does not get source BS ID from MSS, or MSS does not request source BS to purge all the session information before traversal, then session information will not be purged by source BS. Inactive session information grows over time and may cause system failure due to database runout if appropriate measure is not taken.

## 2. Overview of Proposed Solution

The MSS and BS shall monitor the traffic flowing on the downlink connection and uplink connection, respectively, directed to-or-from the MSS. If either the MSS or the BS detects a period of inactivity of at least *Session Close Time/Number of KeepAlive* hours, it may send a KeepAliveRequest message. The recipient of the message shall respond by sending the KeepAliveResponse message. When a KeepAliveResponse message is received, the MSS shall not send another KeepAliveRequest message for at least *Session Close Time/Number of KeepAlive* hours.

If either the MSS or the BS does not detect any traffic from the other-side directed to it for a period of at least *Session Close Time* hours, BS shall purge the session information of that MSS, and the MSS shall also purges the session information related with that BS.

If the value *of Session Close Time* is set to zero, the MSS and BS shall not send or expect KeepAlive messages, and shall disable the transitions occurring as a consequence of not receiving these messages.

| Name | Length | Description |
|---|---|---|
| *Session Close Time* | 1 byte | Default is 48 hours. 0 means disable KeepAlive messages; all other values are in hours. |
| *Number of KeepAlive* | 1 byte | Default is 3. |

## 3. Proposed Changes to IEEE 802.16e/D3

*[Add the following after 6.3.21 MSS Idle Mode]*

6.3.22 Session Information Management for OFDMA

The MSS and BS shall monitor the traffic flowing on the downlink connection and uplink connection, respectively,

directed to-or-from the MSS. If either the MSS or the BS detects a period of inactivity of at least *Session Close Time/ Number of KeepAlive* hours, it may send a KeepAliveRequest message. The recipient of the message shall respond by sending the KeepAliveResponse message. When a KeepAliveResponse message is received, the MSS shall not send another KeepAliveRequest message for at least *Session Close Time/Number of KeepAlive* hours.

If either the MSS or the BS does not detect any traffic from the other-side directed to it for a period of at least *Session Close Time* hours, BS shall purge the session information of that MSS and MSS shall also purge the session information related with that BS. If the value of *Session Close Time* is set to zero, the MSS and BS shall not send or expect KeepAlive messages, and shall disable the transitions occurring as a consequence of not receiving these messages.

*[in Section 6.3.2.3 MAC Management messages]*

*[Change Table 14a as shown]*

| Type | Message | Message Description | Connection |
|---|---|---|---|
| 60 | MOB-HO-IND | HO indication message | basic |
| 61 | KA-REQ | KeepAlive request message | primary |
| 62 | KA-RSP | KeepAlive response message | primary |
| ~~61~~63-255 | *reserved* | | |

*[Add the following after 6.3.2.3.58 BS Broadcast Paging(MOB_PAG-ADV) message]*

6.3.2.3.59 KeepAlive request(KA-REQ) message

This message is sent when either the MSS or the BS detects a period of inactivity of at least *Session Close Time/ Number of KeepAlive* hours.

Table 1 KA-REQ message format

| Syntax | Size | Notes |
|---|---|---|
| KeepAlive_Message_Format(){ | | |
| Management Message Type = 61 | 8 bits | |
| Transaction ID | 16 bits | |
| TLV Encoded Attributes | Variable | TLV specific |
| } | | |

6.3.2.3.60 KeepAlive response(KA-RSP) message

This message is sent when either the MSS or the BS receives KeepAlive request message.

Table 2 KA-RSP message format

| Syntax | Size | Notes |
|---|---|---|
| KeepAlive_Message_Format(){ | | |
| Management Message Type = 62 | 8 bits | |
| Transaction ID | 16 bits | |
| Confirmation Code | 8 bits | |
| TLV Encoded Attributes | Variable | TLV specific |
| } | | |

11.7 **REG-REQ/RSP management message encodings**

*[Insert immediately before the start of section 11.8]*

11.7.11 Keep Alive parameters

11.7.11.1 Session Close Time

The value of this field specifies the inactivity period, in hours, after which both the MSS and the BS purges the session information related with the MSS.

| Type | Length | Value | Scope |
|---|---|---|---|
| 20 | 1 | Default is 48 hours. 0 means disable keepAlive messages; all other values are in hours. | REG-RSP |

11.7.11.2 Number of KeepAlive

| Type | Length | Value | Scope |
|---|---|---|---|
| 21 | 1 | Default is 3. | REG-RSP |

*[Change 12.1.1.4.8 as shown]*

**12.1.1.4.8 REG-RSP**

— Secondary Management CID
— Uplink CID Support
— Vendor ID Encoding (if present in REG-REQ)
— PKM Flow Control (if present in REG-REQ or changed from default)
— DSx Flow Control (if present in REG-REQ or changed from default)
— MCA Flow Control (if present in REG-REQ or changed from default)
— IP version (if present in REG-REQ or changed from default)
— MAC CRC support (if present in REG-REQ or changed from default)
— Multicast Polling Group CID support (if present in REG-REQ or changed from default)
**— Session Close Time(default = 48 hours)**
**— Number of KeepAlive(default = 3)**
— Vendor-specific information (Compound, only allowed if Vendor ID present in REG-REQ, and extensions provided)
— Vendor ID
— Vendor-specific extensions
— HMAC Tuple