IEEE P802.22
Wireless RANs

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| CID7 Resolution - LB2 Recirculation  |
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Abstract

This document provides comment resolutions for CID 7 in LB2 re-circulation contained 22-14/130r1.

R0: initial version of this document

R1: Second version, additional changes to section 7.24 to address CID 7

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This document provides resolutions for comment CID7 in the LB2 re-circulation comment database (DCN 22-14/130r1).

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 7 | 7.6.1.2 | 1 | 45 | 1 | TR | In 7.6.1.2, we only briefly mentioned the Extended type subheader. This subheader has a Channel Aggregation subtype. No where in 7.6.1.2 or 7.24 is this subheader and its options discussed, nor is there any distinction between how MAC PDUs are transmitted using this subheader when multi-channel operation is enabled. | Add text in section 7.24 to define how channel aggregation modes are configured when CA is enabled. Add/modify text in section 7.24 to clarify the difference between trasnsmitting in “Transmit Diversity” or “Bulk Transmission Mode” when CA is enable. Add/modify text in section 8.4.2.1.1/8.4.2.3 to clarify how the PN values of MPDUs are to be treated given whether “Transmit Diversity” or “Bulk Transmission Mode” is enabled for multi-channel operation. Refer to section 3 of 22-14/82r0 and section 7 of 22-14/128r0 |

In this document we provide a slight modification to the text in section 8.4.2.3 and 8.4.2.1.1 to address how the PN counter and PN\_WINDOW should be handled when multi-channel operations are engaged for “Bulk Transmission” or “Transmit Diversity” methods of transmitting PDUs in the DS/US on each CHU that is enabled.

To avoid issues with how the PN counter and PN\_WINDOW are handled, three modifications to the existing draft are added. The first modification is the addition of text to first subsection in sectio 7.24 is added to provide a description for how the multi-channel operation mode is selected for operation and how a CPE exchanges data with the BS using the selected mode. The second modification is to the “CPE Operational Capability” IE in Section 7.7.7.3.4.13 to allow the BS to set which mode a CPE is to use. The third modification is removing the “Aggregation Type” field of the Table F1 (Channel Aggregation Subheader). Given the second modification, having this field in the Table F1 seems redundant.

***Modify the text in section 8.4.2.3 of base standard as follows***

***<Start of Modification>***

On receipt of a PDU the receiving CPE or BS shall decrypt and authenticate the PDU consistent with the NIST GCM specification configured as specified in 8.4.2.2.

Packets that are found to be not authentic shall be discarded.

Receiving BS or CPEs shall maintain a record of the highest value PN and MMP\_PN received for each SA. The receiver shall maintain a PN window whose size is specified by the PN\_WINDOW\_SIZE parameter for SAs and management connections as defined in Table 272. The setting of PN\_WINDOW\_SIZE shall take into account the number of active CPE-CHUs when the network is configured to work in multi-channel operation with “Bulk Tranmsission” mode.

When single or multi-channel operation is engaged, a~~A~~ny received PDU with a PN lower than the beginning of the PN window shall be discarded as a replay attempt. The receiver shall track PNs within the PN window. ~~Any PN that is received more than once shall be discarded as a replay attempt. Upon reception of a PN, which is greater than the end of the PN window, the PN window shall be advanced to cover this PN.~~

When the network is configured for single-channel operation, any PN that is received more than once shall be discarded as a replay attempt. When the network is configured for multi-channel operation in “Transmit Diversity” mode, any PN that is received more than once on all active CHUs shall be discarded as a replay attempt. When the network is configured for multi-channel operation in “Bulk Transmission” mode, any PN that is received more than once on one or more of the active CHUs shall be discarded as a replay attempt. Upon reception of a PN, which is greater than the end of the PN window, the PN window shall be advanced to cover this PN.

***<End of Modification>***

***Modify the text in section 8.4.2.1.1 of draft as follows (existing modifications are in black underline, modifications on top of exisiting D3 draft are in blue)***

***<Start of Modification>***

**8.4.2.1.1 Packet number**

A PN (Packet Number) is prepended to a MAC PDU payload when a CPE is configured for a cryptographic suite other than x00. The PN value associated with a cryptographic suite selected for an SA can be 3bytes or 4bytes. A CPE cannot be configured for a multiple cryptographic suites that support both 3byte and 4byte PNs simultaneously across the SAs its configured for. Section 8.4.2.1.1.1 describes how a CPE and BS handle the operation of a 3byte PN, and Section 8.4.2.1.1.2 describes how a CPE and BS handle the operation of 4byte PN.

**8.4.2.1.1.1 3byte PN Procedure**

The MAC PDU payload shall be prefixed with a 3-byte PN ~~(Packet Number)~~, when the cryptographic suite selected for the SA is 0x01-0x05, and 0x08-0x0A. The PN shall be encoded in the MAC PDU least significant byte first. The PN shall not be encrypted.

The PN associated with an SA shall be set to 1 when the SA is established and when a new TEK is installed. Upon completion of initial authentication or reauthentication and after the MMP\_KEY has been derived has been derived, the MMP\_PN is set to 1. After each PDU transmission made during single channel operation or each PDU transmission that is to be copied across all active BS/CPE-CHUs during multi-channel operation in “Transmit Diversity” mode, the PN and MMP\_PN shall be incremented by 1. After each unique PDU transmission made on each active BS/CPE-CHU during multi-channe operation in “Bulk Transmission”, the PN and MMP\_PN shall be incremented by 1 on each active CHU in succession.

When admitting a CPE to an existing multicast/broadcast group, the BS will take the current value of the PN related to the newest generation of material for that GSA, and increment by 1 when establishing. The maximum number of CPEs that can be admitted to a multicast/broadcast group simultaneously is one half the PN\_WINDOW\_SIZE (see 8.4.2.3).

On DS connections, the PN shall be XORed with 0x800000 prior to encryption and transmission. This effectively splits the PN space into two ranges for DS (0x000000–0x7FFFFF) and DU (0x800001–0xFFFFFF); thereby avoiding collision of PN values when using a single PN for DS and DU. On DS connections, the PN shall be used without such modification.

Any tuple value of {PN, KEY} shall be handled as per the receive processing rules for treating the PN value as described in 8.4.2.3~~not be used more than once for the purposes of transmitting data~~. ~~This~~ These measures is known a protection against replay attacks. A new TEK shall be requested and transferred before the PN on either the CPE or BS reaches 0x7FFFFF~~FF~~. If the PN in either the CPE or BS reaches 0x7FFFFF~~FF~~ without new keys being installed, transport communications on that SA shall be halted until new TEKs are installed. In the case of the MMP\_KEY, if MMP\_PN expires, then current AK is invalidated and shall start Reauthentication.

**8.4.2.1.1.2 4byte PN Procedure**

The MAC PDU payload shall be prefixed with a 4-byte PN, when the cryptographic suite selected for the SA is 0x0C-0x14. The PN shall be encoded in the MAC PDU least significant byte first. The PN shall not be encrypted.

The PN associated with an SA shall be set to 1 when the SA is established and when a new TEK is installed. Upon completion of initial authentication or reauthentication and after the MMP\_KEY has been derived has been derived, the MMP\_PN is set to 1. After each PDU transmission made during single channel operation or each PDU transmission that is to be copied across all active BS/CPE-CHUs during multi-channel oepratio in “Transmit Diversity” mode, , the PN and MMP\_PN shall be incremented by 1. After each unique PDU transmission made on each active BS/CPE-CHU during multi-channe operation in “Bulk Transmission”, the PN and MMP\_PN shall be incremented by 1 on each active CHU in succession.

When admitting a CPE to an existing multicast/broadcast group, the BS will take the current value of the PN related to the newest generation of material for that GSA, and increment by 1 when establishing. The maximum number of CPEs that can be admitted to a multicast/broadcast group simultaneously is one half the PN\_WINDOW\_SIZE (see 8.4.2.3).

On DS connections, the PN shall be XORed with 0x80000000 prior to encryption and transmission. This effectively splits the PN space into two ranges for DS (0x00000000–0x7FFFFFFF) and DU (0x80000001–0xFFFFFFFF); thereby avoiding collision of PN values when using a single PN for DS and DU. On DS connections, the PN shall be used without such modification.

Any tuple value of {PN, KEY} shall be handled as per the receive processing rules for treating the PN value as described in 8.4.2.3~~not be used more than once for the purposes of transmitting data~~. ~~This~~ These measures is known a protection against replay attacks. A new TEK shall be requested and transferred before the PN on either the CPE or BS reaches 0x7FFFFFFF. If the PN in either the CPE or BS reaches 0x7FFFFFFF without new keys being installed, transport communications on that SA shall be halted until new TEKs are installed. In the case of the MMP\_KEY, if MMP\_PN expires, then current AK is invalidated and shall start Reauthentication.

***<End of Modification>***

***Add the following text at the end of 7.24 pg 156, line 55 of the current draft***

***<Start of Modification>***

Only one type of multi-channel transmission mode shall be in operation at a given time. This is accomplished via exchange of the “CPE Operational Capability” IE (see 7.7.7.3.4.13) in REG-REQ during CPE registration (see 7.14.2). When the A-BS responds it selects the multi-channel transmission mode, it sets the mode of the CPE in the “CPE Operational Capability” IE in the REG-RSP it sends back to the CPE. Once the CPE has been configured to use a multi-channel transmission mode the procedures used to add, switch, stop operation (see 7.24.1.1-7.24.1.4) can be engaged. When “Transmit Diversity” mode is selected, the same formatted MAC PDU is transmitted across all allocated channels. When “Bulk Transmission” mode is selected, a unique MAC PDU is transmitted across each allocated channel.

***<End of Modification>***

***Modify Table 62 in section 7.7.7.3.4.13 as follows (existing modifications are in black underline, modifications on top of exisiting D3 draft are in blue)***

***<Start of Modification>***

|  |  |  |  |
| --- | --- | --- | --- |
| **Element ID** | **Length****(bytes)** | **Value** | **Scope** |
| 16 | 1 | 0x00- Fixed (no relay)0x01: Portable (no relay)0x02: Centralized scheduling A-CPE (fixed)0x03: Distributed Scheduling A-CPE (fixed)0x04: Distributed scheduling A-CPE (portable Mode II)0x05: Fixed Multi-channel Bulk Transmission0x06: Fixed Multi-channel Transmit Diversity0x07: Portable Multi-channel Bulk Transmission0x08: Portable Multi-channel Transmit Diversity0x09-0xFF: Reserved~~0x04-0xFF: Reserved~~ | REG-REQ/RSP |

***<End of Modification>***

***Modify Table F1 “Channgel Aggreagtion Subheader format” as follows (existing modifications are in black underline, modifications on top of exisiting D3 draft are in blue)***

***<Start of Modification>***

|  |  |  |
| --- | --- | --- |
| **Syntax** | **Size** | **Notes** |
| Channel\_Aggregation\_Subheader\_Format() { |  |  |
| Extended Subheader Type | 8 bits | 0x01 = Channel Aggregation Extended Subheader |
| Aggregation ID | 16 bits | Indicates the sequence management ID of the transmitted data during multi-channel operation. The value of Aggregation ID is from 0 to 8191. The Aggregation ID shall be incremented by one after each transmission and shall be reset to 0 after the maximum value (8191). |
| ~~Aggregation Type~~ | ~~8 bits~~ | ~~This field specifies the aggregation type of the transmission.~~~~0x00: No aggregation.~~~~0x01: Diversity mode.~~~~0x02: Bulk transmission mode.~~~~0x03-0xFF: Reserved.~~ |
| } |  |  |

***<End of Modification>***