IEEE P802.11
Wireless LANs

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| Resolution for CID 65 “Remove PCF”  |
| Date: 2017-09 |
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Abstract

This submission proposes a resolution for CID 65.

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| --- | --- | --- | --- | --- | --- | --- |
| CID | Commenter | Clause  | Page  | Line | Comment | Proposed |
| 65 | Graham Smith | 9.4.2.5 | 845 | 40 | Time to remove PCF ? | Remove, also at 1008 L45, 1312 L20, P1399L10, P1438 L 24 (10.4) |

CID 65 PCF

9.4.2.5 CF Parameter Set element

*The PCF mechanism is obsolete. Consequently, this subclause might be removed in a later revision of the standard.*

10.4 PCF

*The PCF mechanism is obsolete. Consequently, this subclause might be removed in a later revision of the standard*

***point coordination function (PCF):*** *A class of possible coordination functions in which the coordination function logic is active in only one station (STA) in a basic service set (BSS) at any given time that the network is in operation.*

***contention free period (CFP):*** *The time period during the operation of a point coordination function (PCF) when the right to transmit is assigned to stations (STAs) solely by a point coordinator (PC), allowing frame exchanges to occur between members of the basic service set (BSS) without contention for the wireless medium (WM).*

HCCA uses “Hybrid coordination function (HCF) AND at 681.25 we read “frames transmitted during the CFP using the HCF”. Also 770.34 “QoS AP (HC) uses CFP for delivery, but does not send CF-Polls to non-QoS STAs”

HOWEVER, at 1483.6 we read “Under HCF, the basic unit of allocation of the right to transmit onto the WM is the TXOP”. So although we have the concept of CFP, we do not use the CF Parameter Set.

So CFP can exist outside of PCF and is defined at 10.22.3.2.2. CFP generation. Hence we should only remove all references to PCF and PC and related text and check if CFP refers to HCCA – if so leave it.

107 instances of PCF, 142 instances of PC, 181 instances of CFP

Need to create editor instructions.

PIFS not to be deleted. Also need to look at contention –free (CF)

**We need to keep PIFS** Can we re-define PIFS not using PCF? It is in between SIFS and DIFS. SIFS is ‘short’, and DIFS is “DCF”. Originally PIFS was the priority access for a PCF but now the PC is replaced by the HC. Hence it should be termed “HIFS”. Can’t see that flying, but how about “**PIFS = Priority interframe space**?” I like it!

Redefine PIFS as “Priority Interframe Space”.

Remove 10.2.3

Remove 10.4 in its entirety.

RESOLUTION

REVISED

149.1 modify as follows:

“**contention free period (CFP):** The time period when the right to transmit is assigned to stations (STAs) allowing frame exchanges to occur between members of the basic service set (BSS) without contention for the wireless medium (WM).”

149.7 modify as follows:

“**contention period (CP):** The time period outside of the contention free period (CFP) in a basic service set (BSS)..”

149.12 change controlled access phase (CAP) as follows:

“**controlled access phase (CAP):** A time period during which the hybrid coordinator (HC) maintains control of the medium, after gaining medium access by sensing the channel to be idle for a priority interframe space (PIFS) duration. It might span multiple consecutive transmission opportunities (TXOPs) and can contain polled TXOPs.”

181.2 change “point (coordination function) interframe space” to “priority interframe space”

162.49 delete “point coordination function (PCF)” lines 49 to 52.

180.47 delete "PC point coordinator"

180.49 delete “PCF point coordination function”

676.8 change the following type and subtype combinations to "Reserved":

CF-End +CF-Ack

Data +CF-Ack

Data +CF-Poll

Data +CF-Ack +CF-Poll

CF-Ack (no data)

CF-Poll (no data)

CF-Ack +CF-Poll (no data)

680.32 delete "CF-Ack (no data), CF-Poll (no data), CF-Ack +CF-Poll (no data), "

681.26 Table 9-5 delete entire row “0 0 1 Fixed value under point coordination function (PCF) within frames transmitted during the CFP.”

681.29 change the reserved values to 0-16383 (from 1-16383)

710.6 delete clause 9.3.1.7 (CF-End +CF-Ack frame format)

728.25 modify as follows:

For Data frames of subtype Null (no data), QoS Null (no data), QoS CF-Ack (no data), QoS CF-Poll (no data), and QoS CF-Ack +CF-Poll (no data), the Frame Body field is null (i.e., has a length of 0octets); these subtypes are used for MAC control purposes. For Data frames of subtypes QoS Data, QoS Data +CF-Ack, QoS Data +CF-Poll, and QoS Data +CF-Ack +CF-Poll, the Frame Body field contains an MSDU (or fragment thereof) or A-MSDU after any encapsulation for security. For Data frames of subtype QoS Data that are transmitted by a mesh STA, the Frame Body field also contains a Mesh Control field, as described in 9.2.4.7.3 (Mesh Control field).

728.24-35 modify as follows:

For Data frames of subtype Null (no data), QoS Null (no data), QoS CF-Poll (no data), and QoS CF-Ack +CF-Poll (no data), the Frame Body field is null (i.e., has a length of 0 octets); these subtypes are used for MAC control purposes. For Data frames of subtype Data, the Frame Body field contains all of, or a fragment of, an MSDU after any encapsulation for security. For Data frames of subtypes QoS Data, QoS Data +CF-Ack, QoS Data +CF-Poll, and QoS Data +CF-Ack +CF-Poll, the Frame Body field contains an MSDU (or fragment thereof) or A-MSDU after any encapsulation for security. For Data frames of subtype QoS Data that are transmitted by a mesh STA, the Frame Body field also contains a Mesh Control field, as described in 9.2.4.7.3 (Mesh Control field).

728.48 delete “Within all Data frames sent by STAs during the CFP under PCF, the Duration field is set to 32 768.”

732.30 delete “Within all Management frames sent by STAs during the CFP under PCF, the Duration field is set to the value 32 768.”

733.48 Table 9-27 delete entire row “7 CF Parameter Set” and renumber “Order” column appropriately

748.63 Table 9-34 delete entire row “7 CF Parameter Set” and renumber “Order” column appropriately

769.4 change B2 and B3 from CF Pollable and CF-Poll Request to Reserved

769.44 - 770.41 delete the text between these lines ("A non-AP STA sets .... Probe Response frame that it transmitted."), including Table 9-43 (Non-AP STA usage of QoS, CF-Pollable, and CF-Poll Request) and Table 9-44 (AP usage of QoS, CF-Pollable, and CF-Poll Request)

845.40 delete 9.4.2.5 entirely

847.11 delete “A PC might decline to set bits in the TIM for CF-Pollable STAs it does not intend to poll (see 11.2.3.7 (AP operation during the CFP)).”

961.56 delete “10.4.4 (PCF transfer procedure),”

1397.8 delete “the point coordination function (PCF),”

1397.11 delete “10.4 (PCF),”

1397.22 delete “The PCF mechanism is obsolete. Consequently, the PCF mechanism might be removed in a later revision of the standard.”

1397.59 delete “PCF,”

1397.61 delete “— The PCF is optionally present in nonmesh STAs and absent otherwise.”

1398.12 Figure 10-1 delete dotted box and text “Point Coordination Function (PCF). Also delete the text and line to this box “Required for Contention- Free Services for non-QoS STA, optional otherwise”. Re dimension the figure as appropriate.

1398.12 delete “PCF,” from the text at the right.

1399.9 delete Clause “10.2.3 PCF” in its entirety

1399.42-48 modify as shown below:

"The QoS facility includes an additional coordination function called HCF that is usable only in QoS network configurations. The HCF shall be implemented in all QoS STAs except mesh STAs. Instead, mesh STAs implement the MCF. The HCF combines functions from the DCF with some enhanced, QoS-specific mechanisms and frame subtypes to allow a uniform set of frame exchange sequences to be used for QoS data transfers. The HCF uses both a contention based channel access method, called the enhanced distributed channel access (EDCA) mechanism for contention based transfer and a controlled channel access, referred to as the HCF controlled channel access (HCCA) mechanism, for contention free transfer."

1402.56 delete “, and operates under rules that are different from the PC of the PCF"

1402.63 modify as shown below:

" 10.2.4.3 HCF controlled channel access (HCCA)

The HCCA mechanism uses a QoS-aware centralized coordinator, called a hybrid coordinator (HC). The HC is collocated with the AP of the BSS and uses the HC’s higher priority of access to the WM to initiate frame exchange sequences and to allocate TXOPs to itself and other STAs in order to provide limited-duration CAPs for contention free transfer of QoS data.

The HC traffic delivery and TXOP allocation may be scheduled to meet the QoS requirements of a particular TC or TS. TXOP allocations and contention free transfers of QoS traffic might be based on the HC’s BSS-wide knowledge of the amounts of pending traffic belonging to different TS and/or TCs and are subject to BSS-specific QoS -policies.

Implementers are cautioned that QoS STAs are not required to interpret data subtypes that include QoS +CF-Ack in frames not addressed to themselves unless they set the Q-Ack subfield in the QoS Capability element to 1.

The HCF protects the transmissions during each CAP using the virtual CS mechanism.

A STA may initiate multiple frame exchange sequences during a polled TXOP of sufficient duration to perform more than one such sequence.

The operation rules of the HCCA are defined in 10.22.3 (HCF controlled channel access (HCCA))."

1403.14 delete as shown “than those specified for HCF.”

1403.41 delete “PCF,” from title

1403.43 modify as follows:

“The DCF and the hybrid coordination function are defined so they may operate within the same BSS. The HCF access methods (controlled and contention based) operate sequentially when the channel is in CP. Sequential operation allows the polled and contention based access methods to alternate, within intervals as short as the time to transmit a frame exchange sequence, under rules defined in 10.22 (HCF).

1404.44 delete " during a CP "

1404.46 delete “— Sent during a CFP as individual frames obeying the rules of the PC medium access procedure, or”

1408.8 delete “use of the NAV in PCF is described in 10.4.3.3 (NAV operation during the CFP),”

1408.64 replace “PCF” with “priority”

1410.18 modify as follows:

“The SIFS shall be used prior to transmission of an Ack frame, a CTS frame, a PPDU containing a BlockAck frame that is an immediate response to either a BlockAckReq frame or an A-MPDU, a DMG CTS frame, a DMG DTS frame, a Grant Ack frame, a response frame transmitted in the ATI, and the second or subsequent MPDU of a fragment burst.. The SIFS may also be within a TXOP for any types of frames during the CFP.”

1410.61 delete “— A STA operating under the PCF, as described in 10.4 (PCF)”

1427.58 delete “DCF. The operational rules vary slightly between the DCF and the PCF.”

1428.1 delete “either in the absence of a PC, or in the CP of the PCF access method,”

1433.64 delete “using PCF or”

1438.24 delete clause “10.4 PCF” in its entirety.

1498.41-47 modify this paragraph as follows:

"The HC is a type of centralized coordinator that grants a STA a polled TXOP with duration specified in a QoS (+)CF-Poll frame. A STA may transmit multiple frame exchange sequences within given polled TXOPs, subject to the limit on TXOP duration."

1498.59 delete “The HC may also operate as a PC, providing (non-QoS) CF-Polls to associated CF-Pollable STAs using the frame formats, frame exchange sequences, and other applicable rules for PCF specified in 10.4 (PCF).”

1498.64 delete footnote 31

1499.20-42 delete the following 3 paragraphs:

"The HC may include a CF Parameter Set element in the Beacon frames it generates. This causes the BSS to appear to be a point-coordinated BSS to STAs. This causes STAs to set their NAVs to the CFPDurRemaining value in the CF Parameter Set element value at TBTT, as specified in 10.4.4.3 (Operation with overlapping point-coordinated BSSs). This prevents most -contention in the CFP by preventing nonpolled transmissions by STAs regardless of whether they are CF Pollable.

10.22.3.2.2 CFP generation

The HC may function as a PC that uses the CFP for delivery, generating a CFP as shown in Figure 10-20 (CFP/CP alternation), with the restriction that the CFP initiated by an HC shall end with a CF-End frame. The HC may also issue QoS (+)CF-Poll frames to associated STAs during the CFP. However, because the HC can also grant polled TXOPs, by sending QoS (+)CF-Poll frames, during the CP, the HC might not use the CFP for QoS data transfers.

Only an AP that also issues non-QoS CF-Poll frames to associated CF-Pollable A STA may end a CFP with a CF-End +CF-Ack frame and only when the CF-End +CF-Ack is acknowledging a reception from a CF-Pollable non-QoS STA. The use of a non-QoS CF-Poll frame by an AP to a QoS STA is deprecated (for further discussion; see 9.4.1.4 (Capability Information field))."

1499.45- modify this paragraph as shown below:

" When the HC needs access to the WM to start a TXOP, the HC shall sense the WM. When the WM is determined to be idle at the TxPIFS slot boundary as defined in 10.3.7 (DCF timing relations), the HC shall transmit the first frame of any permitted frame exchange sequence, with the duration value set to cover the TXOP. An HCCA TXOP shall not extend across a TBTT. The occurrence of a TBTT implies the end of the HCCA TXOP, after which the regular channel access procedure (EDCA or HCCA) is resumed. It is possible that no frame was transmitted during the TXOP. The shortened termination of the HCCA TXOP does not imply an error condition. CAPs are illustrated in Figure 10-29 (CAP periods)."

1500.10-13 in Figure 10-29 (CAP/CFP/CP periods), delete the following lines, arrows and text labels:



1500.19 change the figure title to "CAP periods", from "CAP/CFP/CP periods".

1501.20 delete ", or allow the channel to go into the CP"

1502.17 delete "dot11CFPMaxDuration (if during CFP),"

1502.44-49 modify this paragraph as shown below:

"If the HC has no more STAs to poll and it has no more Data, Management, BlockAckReq, or BlockAck frames to send, it may reset the NAVs of all QoS STAs in the BSS by sending a QoS CF-Poll frame with the RA matching its own MAC address and with the Duration/ID field set to 0."

1504.1-15 modify this paragraph as shown below:

"A QoS STA shall be able to receive QoS +CF-Ack frames. The HC may use QoS Data +CF-Ack frames to send frames to the same STA a SIFS after receiving the final transmission of the previous TXOP. The HC may also use QoS Data +CF-Ack frames to send frames to any other STA a SIFS after receiving the final transmission of the previous TXOP, if the STA that sent the final transmission of the previous TXOP has set the Q-Ack subfield in the QoS Capability element in the (Re)Association Request frame to 1. A STA shall respond to QoS Data frames having the Ack Policy subfield in the QoS Control field equal to Normal Ack with an Ack frame, unless the acknowledgment is piggybacked in which case it shall use a QoS +CF-Ack frame. Piggybacked frames are allowed only within TXOPs initiated by the HC. The HC shall not send a QoS Data frame containing a +CF-Ack with an Address 1 that does not correspond to the address of the STA for which the +CF-Ack is intended, unless the STA to which the +CF-Ack is intended, sets the Q-Ack subfield in the QoS Capability element in the (Re)Association Request frame. STAs are not required to be able to transmit QoS Data frames with subtypes that include +CF-Ack."

1505.15 delete ", during either the CP or CFP, and"

1700.35 delete “A STA shall use information from the CF Parameter Set element of all received Beacon frames, without

regard for the BSSID, to update their NAV as specified in 10.4.3.3 (NAV operation during the CFP).”

1700.38 edit “STAs in an infrastructure network or PBSS shall use information in received Beacon frames, DMG Beacon frames, or Announce frames only if the BSSID field is equal to the MAC address currently in use by the STA contained in the AP of the BSS or to the MAC address currently in use by the PCP of the PBSS.”

1719.61 delete “or during the CP of a BSS using the PCF,”

1721.51 delete “(no PCF operating)”

1721.55 delete “(no PCF operating)”

1721.22 delete “(no PCF operating)”

1721.23 delete “that no PCF is operating and”

1721.24 delete “(no PCF operating)”

2869.60 to 2870.26 delete PC4, PC4.1, PC4.2, PC4.3, PC4.4 and PC4.5

2870.28 delete PC5 and PC5.1 to PC5.3

2891.21 delete “10.4.3 (PCF access procedure)”

2891.24 delete FS2

2952.43delete “10.4.3 (PCF access procedure),”

3063.61 delete “dot11CFPMaxDuration OBJECT-TYPE” entirely

3472.3 delete “or PCF”

3472.20 delete “or PCF”

3472.38 delete “or PCF”

3472.56 delete “or PCF”

3582.6 delete “*CF,* Beacon contains a CFP element.”

3585.6-10 delete entries for CF, CF-Ack and CF-Poll

3586.50 delete

( [Beacon +DTIM ] {cf-sequence} [CF-End [+CF-Ack] ] )|

3586.63 - 3587.27 delete

(\* A cf-sequence expresses all of the sequences that may be generated within a contention free period. The

first frame in this sequence is sent by the AP. \*)

cf-sequence =

(\*Broadcast \*)

Beacon | Management+broadcast | Data +group [+QoS] |

(\* CF poll with data \*)

(Data +individual +CF-Poll [+CF-Ack]

(Data +individual +CF-Ack [Data +null +CF-Ack] |

Data +null +CF-Ack) ) |

(\* CF poll without data \*)

Data +individual +null +CF-Poll [+CF-Ack]

(Data +null |

(Data +individual (Data +null +CF-Ack | Ack) ) )|

(\* individual management \*)

(Management +individual Ack) |

(\* All of the sequences initiated by an HC \*)

hcf-sequence;

3587.32 modify as follows:

(\* An hcf-sequence represents all of the sequences that may be generated under HCCA. The sequence may be initiated by a STA using EDCA channel access. \*)

3589.19 modify as follows:

Data +CF-Ack + QoS;

3589.29 modify as follows:

Data +CF-Ack + QoS |

3742.20 modify as follows:

 The Overhead includes IFSs, Ack frames and QoS CF-Poll frames.

Editor please run a search for PCF, CFP, CP, PC, Point Coordination Function, Contention Free Period, Contention Period, Point Coordinator and mark any undeleted occurrences with '#pcfdeletion'.