IEEE P802.11  
Wireless LANs

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| “TGme Resolution to CIDs on Annex G” | | | | |
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Abstract

Contains changes required for removing references to ANNEX G

Satisfying CIDS 81 and 109

Also proposes resolution for CID 565

**CID 81**

“Delete Annex G.

"frame exchange sequence: A sequence of frames specified by Annex G"

If not in Annex G then by definition it is not a valid sequence? That's dangerous. There is much doubt that Annex G is accurate and up to date.”

**CID 109**

Annex G is incomplete as it should include all frame exchange sequences in the specification. The annex should be updated or the information in the Annex should be moved else where in the specification and Annex G should be deprecated or removed.

**CID 565**

Delayed block ack has been deprecated. While the body text has been removed, there are still delayed BA sequences in Annex G, i.e., BlockAck +delayed Ack and BlockAckReq +delayed Ack.

Proposed Change

Remove the delayed row in Table G-1.

At 4363.28, replace txop-part-requiring-ack with the following (removing BlockAckReq and BlockAck):

txop-part-requiring-ack = Data +individual [+null] | Data +individual [+null] + QoS +normal-ack;

At 4366.23, replace ht-ack-sequence with the following (note the change in bracketing to disambiguate the "or"):

ht-ack-sequence = Data[+HTC]+individual[+null][+QoS+normal-ack][+mu-user-respond other users] (Ack[+HTC] | NDP-Ack);

At 4370.36, delete the following term:

(BlockAck+HTC+trq+delayed (Ack+sounding | Ack+HTC+ndp-announce NDP))

At 4371.32, delete the following term:

(BlockAckReq+HTC+csi-request+delayed+sounding (Ack+a-mpdu Management+action-no-ack+csi+a-mpdu-end))

At 4372.1, delete the following term:

(BlockAckReq+HTC+csi-request+delayed+ndp-announce Ack NDP Management+action-no-ack +csi)

**BACKGROUND**

The investigation into ANNEX G has been carried out in the 802.11 ARC SC.

The “problem” is that a “frame exchange sequence” is presently defined as :

It was agreed that ANNEX G is not complete as well as being very “unfriendly”.

An approach was agreed upon:

1. Define anew “frame exchange sequence”
   * Determine and agree what its characteristics are
2. Check uses of “frame exchange” in text and edit as required to make sure correct terminology used (i.e., if the “exchange” is really an “exchange sequence”, or vice versa)

Then

1. Make decision on what to do with Annex G
   * Delete
   * Re-define use – Normative or informative?
   * Re-write in more friendly manner

21/1143 lists the occurances of “frame exchange sequence(s)” in D0.0.

Each instance was looked at by the ARC SC and the following “rules/features” for “frame exchange sequence” were determined from different sections and references:

* Within a frame exchange sequence, packets separated by SIFS/PIFS
* Multiple frame exchange sequences allowed within a TXOP.
  + Limited to TXOP duration
  + frame exchange sequences within a polled TXOP, or HC TXOP, or EDCA TXOP separated by SIFS,
  + CMMG STA waits PIFS between frame exchange sequences.
* MU TXOP FIG.10-13 and 10-14 is one frame exchange sequence.
  + Not restriced to 2 specific STAs (as first assumed)
  + Exchange desires to keep control of the WM
* End of frame exchange sequencewhen RA or TA changes from first packet. (This may be OK for an MU case?)
* The shared state (e.g., power save) shall not change during a frame exchange sequence.
* Assumed that Beam forming and Beam tracking uses frame exchange sequences
  + Hence calling them frame exchange sequences is correct.
* ASEL is not frame exchange sequence but “frame exchanges”
  + Needs editing
* GAS frame exchanges are not frame exchange sequences.
  + Needs editing

Attempts for a definition that encompassed all the features/rules proved very elusive, exceptions were apparent.

The one characteristic that defines the frame exchange sequence is:

***frame exchange sequence***: a sequence of frames that maintains control of the wireless medium.

This “simple” description seems to work and describes the main feature in that a frame exchange sequence maintains control of the wireless medium, e.g., a 4–way handshake is a frame exchange consisting of 4 frame exchange sequences.

A “frame exchange sequence” is a sequence of frames exchanged between STAs that the STAs do not want to be interrupted.

A series of frame exchanges within a TXOP also meets this description, BUT first the definition

***transmission opportunity (TXOP):*** *An interval of time during which a particular quality-of-service (QoS)station (STA) has the right to initiate frame exchange sequences onto the wireless medium (WM)*

This we declare shows the difference. TXOP is a time interval, and the frame exchanges within it are frame exchange sequences.

Section 10.23.2.3 concerns “**multiple frame transmissions**” within a TXOP. In particular, there is a sentence

*Multiple frame transmission within the TXOP occurs when an EDCAF retains the right to access the medium following the completion of a frame exchange sequence, such as on receipt of an Ack frame.*

“multiple frame transmission” needs to be addressed as it is somewhat confusing as we know that multiple frame exchange seqiuences take place within a TXOP and “multiple frame transmissions” should be the same concept and this is not clear.

There are 35 instances of “multiple frame transmissions” but many refer to Clause 10.23.2.8. which we need to first edit.

**This is addressed in a separate document.**

**PROPOSAL**

1. Change definition to:

***frame exchange sequence***: a sequence of frames that maintains control of the wireless medium.

1. List the edits in the text to
   1. remove references to ANNEX G
   2. correct wrong references to “frame exchange”
      1. correct “frame exchange” to “frame echange sequence” where sequence controls the WM
      2. correct “frame exchange sequence(s)” to “frame exchange(s)” where frame exchange(s)” do not control the WM.
2. Propose changes related to “multiple frame exchanges” (in a separate document).

Note: in D0.3 388 instances of “frame exchange” (22 in Contents, Figures, and Tables)

**No changes are given for Annex G itself.**

**RESOLUTION for CID 565**

**ACCEPT**

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**RESOLUTION for CIDs 81, 109**

**REVISED**

Make following changes (reference D 0.3):

At 191.20

Change

***frame exchange sequence*:** A sequence of frames specified by Annex G.

To

***frame exchange sequence***: a sequence of frames that maintains control of the wireless medium.

“Annex G” deletions

9.2.4.1.7, P878.49

Delete “(see Annex G)”

10.3.2.9, P2047.50

Delete “(see Annex G)

10.3.2.11, P2052.61

Delete “(see Annex G)

10.3.3., P2072.19

Delete “as decribed in Annex G”

10.3.4.4, P2076.47

Delete “(decribed in Annex G)”

10.23.2.2, P2152.50

Delete “(see Annex G)”

10.23.2.8, P2163.39

Delete “(see Annex G)”

10.3.2.11, P2052.61

Delete “(see Annex G)”

10.3.3, P2072.19

Delete “, as decribed in Annex G”

10.3.4.4 P2076.47

Delete “(decribed in Annex G)”

10.23.2.2, P2152.50

Delete “(decribed in Annex G)”

10.23.2.8, P2163.39

Delete “(see Annex G)”

10.23.2.10, P2168.11

Delete “(using the terminology of Annex G)”

10.45.2.4.4, P2517.2

Delete “, as decribed in Annex G and”

11.2.3.1, P2632.41

Delete “, as decribed in Annex G”

11.2.3.2, P2634.61

Delete “(decribed in Annex G)”

11.2.7.1, P2670.39, 44

Delete “as decribed in Annex G”

11.2.7.2.2, P2671

Delete “(as decribed in Annex G)”

11.2.7.3.2, P2675.26

Delete “(as decribed in Annex G)”

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“Frame exchange(s)” corrections

4.3.22.5.5, P287.22

Change “frame exchanges” to “frame exchange sequences”

9.2.5.3, P928.42

Change “frame exchanges” to “frame exchange sequences”

9.3.1.3 P932.25

Change “frame exchange” to “frame exchange sequence”.

9.3.1.13, P951.15

Change “frame exchange” to “frame exchange sequence”.

9.4.1.14, P1059.30

Change “frame exchanges” to “frame exchange sequences”

9.4.2.199, P1581.4

Change “frame exchanges” to “frame exchange sequences”

9.2.4.255.2, P1681.55, 56

Change “frame exchanges” to “frame exchange sequences”

9.2.4.255.3, P1682.34, 35

Change “frame exchanges” to “frame exchange sequences”

9.2.4.255.4, P1683.32, 33

Change “frame exchanges” to “frame exchange sequences”

10.3.2.2., P2033.20, 23

Change “frame exchange” to “frame exchange sequence”.

10.3.2.6, P2045.6

Change “frame exchange” to “frame exchange sequence”.

10.3.4.3, P2075.51

Change “frame exchange” to “frame exchange sequence”.

10.3.4.3, P2076.27

Change “frame exchange” to “frame exchange sequence”.

10.3.4.3, P2076.33

Change in two places, “frame exchange” to “frame exchange sequence”

10.3.4.3, P2076.34

Change “frame exchange” to “frame exchange sequence”

10.3.5, P2079.5

Change “frame exchanges” to “frame exchange sequences”

10.3.5, P2079.14

Change “frame exchange” to “frame exchange sequence”

10.6.6.2, P2092.43

Change “frame exchange” to “frame exchange sequence”

10.23.2.7, P2160.58

Change “frame exchange” to “frame exchange sequence”

10.23.2.8, P2161.51

Change “frame exchange” to “frame exchange sequence”

10.23.2.8, P2164.16, 25

Change “frame exchange” to “frame exchange sequence”

10.25.8.4, P2233.10

Change “frame exchanges” to “frame exchange sequences”

10.25.8.4, P2233.52

Change “frame exchange” to “frame exchange sequence”

10.25.8.4, P2233.60

Change “frame exchange” to “frame exchange sequence”

(Note to Editor, “Figure ()” needs correcting)

10.25.8.4, P2234.22

Change title Figure 10-45 “frame exchange” to “frame exchange sequence”

10.25.8.4, P2234.54

Change title Figure 10-46 “frame exchange” to “frame exchange sequence”

10.25.8.4, P2234.60

Change “frame exchanges” to “frame exchange sequences”

10.27.1, P2241.58, 59

Change “frame exchanges” to “frame exchange sequences”

10.27.6, P2250.6

Change “frame exchange” to “frame exchange sequence”

10.34.2.3, P2282.27

Change “frame exchange” to “frame exchange sequence”

10.34.2.4.2, P2284.33

Change “frame exchange” to “frame exchange sequence”

10.24.2.4.3, P2285.59, 61

Change “frame exchange” to “frame exchange sequence”

10.24.2.4.3, P2287.42, 45

Change “frame exchange” to “frame exchange sequence”

10.35.2, P2296.15, 29

Delete “sequence”

10.35.2, P2298.22

Delete “sequence”

10.39.2, P2319.42, 45

Change “frame exchanges” to “frame exchange sequences”

10.39.3, P2321.37, 41

Change “frame exchanges” to “frame exchange sequences”

10.39.3, P2322.37, 63

Change “frame exchanges” to “frame exchange sequences”

10.39.4, P2323.11

Change “frame exchange” to “frame exchange sequence”

10.39.4, P2323.22, 47

Change “frame exchange” to “frame exchange sequence”

10.39.5, P2324.7

Change “frame exchange” to “frame exchange sequence”

10.39.6.2.1, P2327.13, 23

Change “frame exchange” to “frame exchange sequence”

10.39.6.2.1, P2327.46, 56

Change “frame exchange” to “frame exchange sequence”

10.39.6.6.3, P2339.54

Change “frame exchange” to “frame exchange sequence”

10.39.8.1, P2347.22

Change “frame exchange” to “frame exchange sequence”

10.39.8.1, P2348.1

Change “frame exchange” to “frame exchange sequence”

10.39.8.1, P2348.3

Change “frame exchange” to “frame exchange sequence”

10.39.12.4.3, P2360.29

Change “frame exchange” to “frame exchange sequence”

10.39.12.4.4, P2364.62

Change “frame exchange” to “frame exchange sequence”

10.42.6.2, P2420.33

Change “frame exchange” to “frame exchange sequence”

10.42.10.2.4.6, P2468.32

Change “frame exchange” to “frame exchange sequence”

10.42.10.2.4.6, P2468.46

Change in Title Figure 10-121 “frame exchange” to “frame exchange sequence”

10.42.10.2.4.6, P2470.23

Change “frame exchange” to “frame exchange sequence”

10.42.10.2.4.6, P2470.34

Change in Title Figure 10-123 “frame exchange” to “frame exchange sequence”

10.42.10.2.4.6, P2471.1

Change “frame exchange” to “frame exchange sequence”

10.42.10.2.4.6, P2471.20

Change in Title Figure 10-124 “frame exchange” to “frame exchange sequence”

10.42.10.3.1, P2471, 43

Change “frame exchanges” to “frame exchange sequences”

10.42.11.3, P2497.27, 55

Change “frame exchanges” to “frame exchange sequences”

10.42.11.5, P2503.18

Change “frame exchanges” to “frame exchange sequences”

10.49, P2540.31, 32, 33,

Change “frame exchanges” to “frame exchange sequences”

10.50.1, P2541.49

Change “frame exchanges” to “frame exchange sequences”

10.47.1, P2525.29

10.53.4, P2553.32

Change “frame exchange” to “frame exchange sequence”

10.53.4, P2554.31

Change “frame exchanges” to “frame exchange sequences”

10.53.4, P2554.7, 25, 27, 29, 31(x2), 42, 44

Change “frame exchange” to “frame exchange sequence”

10.54.4, P2554.48, 54

Change “frame exchange” to “frame exchange sequence”

10.54.4, P2555.27, 32, 63

Change “frame exchange” to “frame exchange sequence”

10.54.4, P2558.2, 13,

Change “frame exchange” to “frame exchange sequence”

10.53.5.2, P2559.24

Change “frame exchange” to “frame exchange sequence”

10.54.5.4, P2569.22

Change “frame exchanges” to “frame exchange sequences”

11.2.3.1, P2632.40

Change “frame exchange” to “frame exchange sequence”

11.2.3.2, P2634.60, 61

Change “frame exchange” to “frame exchange sequence”

11.2.3.2, P2635.62, 6, 20, 23,

Change “frame exchange” to “frame exchange sequence”

11.2.3.2, P2635.9,

Change “frame exchanges” to “frame exchange sequences”

11.2.3.12, P2649.59

Change “frame exchange” to “frame exchange sequence”

11.2.6, P2666.43

Change “frame exchange” to “frame exchange sequence”

11.2.7.1, P2670.39, 44

Change “frame exchange” to “frame exchange sequence”

11.2.7.2.2, P2671.46

Change “frame exchange” to “frame exchange sequence”

11.2.7.2.2, P2671.51, 52

Change “frame exchange” to “frame exchange sequence”

11.2.7.2.3, P2674.9

Change “frame exchange” to “frame exchange sequence”

11.2.7.3.2, P2675.25

Change “frame exchange” to “frame exchange sequence”

11.2.7.3.2, P2675.30, 31

Change “frame exchange” to “frame exchange sequence”

11.2.8, P2682.18

Change “frame exchanges” to “frame exchange sequences”

11.20.6.1, P2812.41

Change “frame exchange” to “frame exchange sequence”

11.22.3.2.1, P2872.37, 42, 49, 54

Delete “sequence”

11.22.3.2.1, P2875.1, 22, 27, 32,

Delete “sequence”

11.22.3.2.1, P2876.43,

Delete “sequence”

11.22.3.2.1, P2877.36,

Delete “sequence”

11.22.3.2.6, P2883.34, 40, 52

Delete “sequence”

11.27.1.1, P2923.35

Change “frame exchange” to “frame exchange sequence”

Figure 11-55 P2942.20

Change “frame exchange” to “frame exchange sequence”

11.46, P3010.25

Change “frame exchanges” to “frame exchange sequences”

14.14.7, P3343.18

Change “frame exchanges” to “frame exchange sequences”

14.14.8.2, P3343.61

Change “frame exchanges” to “frame exchange sequences”

14.14.9.1, P3345.25

Change “frame exchanges” to “frame exchange sequences”

23.3.12.2.1, P3887.31, 32

Change “frame exchange” to “frame exchange sequence”

23.3.12.2.1.2, P3888,12, 13

Change “frame exchange” to “frame exchange sequence”

26., P4057.14

Change “frame exchange” to “frame exchange sequence”

26.2.6, P4062.26, 31

Change “frame exchange” to “frame exchange sequence”

26.2.61, P4062.32

Change “frame exchanges” to “frame exchange sequences”

26.2.8, P4067.26

Change “frame exchanges” to “frame exchange sequences”

26.5.1.1, P4085.21, 25

Change “frame exchange” to “frame exchange sequence”

26.5.1.1, P4085.19, 23

Change “frame exchanges” to “frame exchange sequences”

26.5.2.2.4, P4095.46, 50

Change “frame exchange” to “frame exchange sequence”

26.8.1, P4134.10

Change “frame exchanges” to “frame exchange sequences”

B.4.17.1, P4913.53

Change “frame exchange” to “frame exchange sequence”

B.4.17.1, P4914.6, 17, 27,

Change “frame exchange” to “frame exchange sequence”

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“frame sequence(s)” corrections

10.23.5.6, P2191.23

Delete “sequence”

10.35.2, P2297.59, 62

Change “frame sequence” to “frame exchange”

10.35.2, P2298.2, 4, 6,

Change “frame sequence” to “frame exchange”

10.54.5.3, P2568.44, 45, 52, 53

Change “frame sequence” to “frame exchange sequence”

11.22.3.2.1, P2872.20, 21, 22, 36, 41, 48

Change “frame sequence” to “frame exchange”

Figure 11-41, P2873.22

Change “GAS frame sequence” to “GAS frame exchange”

Figure 11-42, P2873.62

Change “GAS frame sequence” to “GAS frame exchange”

Figure 11-43, P2874.37

Change “GAS frame sequence” to “GAS frame exchange”

Figure 11-44, P2874.61

Change “GAS Query Request exchange sequence” to “GAS Query Request frame exchange”

Figure 11-45, P2875.22

Change “GAS Query Response exchange sequence” to “GAS Query Response frame exchange”

Figure 11-46, P2875.22

Change “fragment exchange sequence” to “fragment frame exchange”

Figure 11-47, P2877.36

Change “GAS frame exchange sequence” to “GAS frame exchange”

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“exchange sequence(s)” corrections

Table 9-21, P900.26

Change “sounding exchange sequence”, to “sounding frame exchange sequence”

10.29.2, P2254.42

Change “Reverse direction (RD) exchange sequence” to “Reverse direction (RD) frame exchange sequence”

10.29.2, P2254.45, 49, 51, 58

Change “exchange sequence” to “frame exchange sequence”

10.29.2, P2255.2, 17

Change “exchange sequence” to “frame exchange sequence” in two places

10.29.2, P2255.1

Change “exchange sequences” to “frame exchange sequences”

10.34.2.4.3, P2284.48

Change “sounding PPDU exchange sequence” to “sounding frame exchange sequence”

10.34.2.4.3, P2286.55

Change “sounding PPDU exchange sequence” to “sounding frame exchange sequence”

10.50.2, , P2543.38

Figure 10-147, in three places change “Exchange Sequence” to frame exchange sequence”

Change title of Figure 10-147 to “Example of BDT frame exchange sequences”

11.21.6.4, 2837.2,

Change “measurement exchange sequence” to measurement frame exchange”

11.21.6.4, P2837.48, Figure 11-39 title,

Change “measurement exchange sequence” to measurement frame exchange”

11.21.6.4, P2838.3,

Change “measurement exchange sequence” to measurement frame exchange”

11.21.6.4, P2838.57. Figure 11-39 title,

Change “measurement exchange sequence” to measurement frame exchange”

11.21.6.4, P2839.1, 65

Change “measurement exchange sequence” to measurement frame exchange”

11.21.6.4, P2839.57. Figure 11-40 title,

Change “measurement exchange sequence” to measurement frame exchange”

O.3, P5970.1

Change “exchange sequence” to “frame exchanges”

Line 39, Figure O-2 Title, change “exchange sequence” to “frame exchanges”