RW-WLAN-nX-MAC-SW-RN

Release Note

RW-WLAN-nX-MAC-SW-RN-v6_4_5

Version 6.4.5

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RivieraWaves
http://www.rivierawaves.com/

Table of Contents

1 Bugs and Features

1.1 Feature (#10045): [11ac / 11ax] Update diagnostic ports muxing & embedded LA.

1.1.1 Description

- Embedded LA should be updated to support 2 memories configuration (128bits or 64bits wide).

> - For the 128bits configuration, 16bits are used for the LA features (triggers & time counter) & 112bits are used for diag port capture (7x16bits).

> - For the 64bits configuration, 16bits are used for the LA features (triggers & time counter) & 48bits are used for diag port capture (3x16bits).

- Diagnostic ports muxing should be updated to support 16bits diag ports selection.

- The MAC/PHY interface diagnostic port should be updated to be 16bits wide, with RX/TX signal muxing.

- Dynamic masking of MAC/PHY interface diagnostic port should be added to allow capture only TX/RX Vector & some bytes of the MAC header.

1.1.2 SW impacts

Modified files:

SW/macsw/plf/refip/src/driver/la/la.c

1.2 Feature (#10187): [DRV] Allow un-official channels when custregd is used

1.2.1 Description

PHY team wants to be able to do measure on non-official wifi channel (to avoid interferences with "real" wifi traffic).

In order to be able to re-use @iw dev xx set freq xxxx@ for configuration, the driver must report support for such channel.

Obviously this should only be enabled when custregd parameter is set.

1.2.2 SW impacts

Modified files:

SW/rwnx_drv/fullmac/rwnx_main.c

SW/rwnx_drv/rwnx_mod_params.h

SW/rwnx_drv/rwnx_msg_rx.c

SW/rwnx_drv/softmac/rwnx_main.c

SW/rwnx_drv/rwnx_mod_params.c

1.3 Bug (#10197): [WTS] [11N] DUT advertises Greenfield as supported feature in association request when using HE hardware version (Not supported)

1.3.1 Description

System under Test

RW-RISC-V-KARST-FMAC-016

[[http://rwvalid.frso.rivierawaves.com/?page=wifi&menu=wifi_wts&s_menu=wifi_wts_sys&part=getReleaseInfo&release_id=231]]

SW CONFIG

* Lmac: 6.2.0.0-svn38857

* Driver: 6.2.0.0-svn38856

* OS - 4.20.2-ceva-v7

HW CONFIG

* FPGA Version: 2019_06_07_17_27_STA_1x1_CBW40_LDPC_MAC39049_MODEM39049

* Signature : CEVA-V7 HE RISC-V (c0ca4000)

* Date : 2019/06/07 17h27m54s

* SVN rev : MAC=39049 MODEM=39049

Test Report

* [[http://rwvalid.frso.rivierawaves.com/?page=wifi_wts_report&tr_id=1071]]

Test Cases

* N-5.2.35_GN - Basic Association in 802.11n Environment [20MHz] [2.4GHz] [1SS]

* N-5.2.35_AN - Basic Association in 802.11n Environment [20MHz] [5GHz] [1SS]

* N-5.2.43_1SS - Overlapping BSS on the Extension Channel [40MHz] [5GHz] [1SS]

* N-5.2.53 - Support for WPA2/AES if WPA/TKIP is supported [2.4GHz]

Issue

DUT advertises Greenfield as supported feature in association request when using HE hardware (Shall not be supported)

PING are failing due to the fact that test-bed AP is using Greenfield packets for traffic.

1.3.2 SW impacts

Modified files:

SW/rwnx_drv/rwnx_msg_rx.c

SW/rwnx_drv/softmac/rwnx_main.c

SW/rwnx_drv/fullmac/rwnx_main.c

1.4 Bug (#10309): [DRV] Kernel panic when mactrace is triggered just before unloding the driver

1.4.1 Description

When a test is over, if no assert is found then MVT will force a mactrace just before unloading the driver.

On my side this cause almost every time a kernel panic in rwnx_fw_trace_read (not sure why this hasn't been observed/reported by the MVT team though).

1.4.2 SW impacts

Modified files:

SW/rwnx_drv/rwnx_debugfs.c

SW/rwnx_drv/rwnx_platform.c

SW/rwnx_drv/rwnx_utils.c

1.5 Bug (#10326): [MACSW] The computation of the number of bytes we can put in a HE TB is not accurate enough

1.5.1 Description

When attempting to convert a TX duration in a number of bytes for a given MCS/BW/etc., we expect the duration to be expressed in units of 32us. This is done like that because the TXOP value has such units. However when computing HE TB transmission parameters, converting the TB duration from us to units of 32us prior to compute the number of bytes for this duration is not accurate because of the rounding done. It is therefore preferable to first do the multiplication, which gives a result 32 times higher than expected, and then do the division by 32.

A consequence of this issue is a number of bytes we can put in the HE TB lower than allowed, which is not efficient for the throughput.

1.5.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

1.6 Feature (#10330): [MACSW] In monitor mode, control frames such as BA or HE Trigger shall be forwarded to upper layers

1.6.1 Description

This shall be the case as long as monitor mode is not enabled in parallel of an AP/STA/etc. interface.

1.6.2 SW impacts

Modified files:

SW/macsw/ip/lmac/import/v21/MAC_CORE.xls

SW/macsw/ip/lmac/import/v21/MAC_PL.xls

SW/macsw/ip/lmac/src/hal/hal_machw.c

SW/macsw/ip/lmac/src/mm/mm.c

SW/macsw/ip/lmac/src/rx/rxl/rxl_cntrl.c

SW/macsw/ip/lmac/src/rx/rxl/rxl_hwdesc.h

SW/macsw/ip/lmac/src/rx/rxl/v20/rxl_hwdesc.c

SW/macsw/ip/lmac/src/rx/rxl/v10/rxl_hwdesc.c

1.7 Bug (#10332): [HE] Multi-STA BA can be sent as a broadcast frame

1.7.1 Description

When transmitted to several STA (which is obviously the intended behavior with this frame), the multi-STA BA frame is sent as broadcast. We therefore need to change the checks done on ADDR1 upon a BA reception.

1.7.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/rx/rxl/v20/rxl_hwdesc.c

SW/macsw/ip/lmac/src/tx/txl/txl_cfm.c

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

SW/macsw/ip/lmac/src/rx/rxl/v10/rxl_hwdesc.c

1.8 Feature (#10341): [HE] Report statistics about HE TB transmissions

1.8.1 Description

When testing HE TB it would be useful to get information about the PHY characteristics of the HE TB (i.e. MCS/RU/etc.), the success rate of the transmissions, and the size of the A-MPDUs put in the HE TB PPDU. These information could be advertised in the same way they are advertised by the Rate Control.

1.8.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/hal/hal_desc.h

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

SW/macsw/ip/lmac/src/tx/txl/txl_he.h

SW/macsw/ip/umac/src/me/me_task.c

SW/macsw/ip/umac/src/me/me_task.h

SW/macsw/ip/umac/src/rc/rc.c

SW/macsw/ip/umac/src/rc/rc.h

SW/macsw/modules/mac/src/mac_frame.h

SW/rwnx_drv/ipc_shared.h

SW/rwnx_drv/lmac_msg.h

SW/rwnx_drv/rwnx_debugfs.c

SW/macsw/plf/refip/src/driver/ipc/ipc_shared.h

1.9 Feature (#10343): add [HE] in PHY Features for HE FPGA release

1.9.1 Description

Currently in dmesg: PHY features: [NSS=1][CHBW=40][LDPC]

expected : PHY features: [NSS=1][CHBW=40][LDPC] [HE]

1.9.2 SW impacts

Modified files:

SW/rwnx_drv/rwnx_mod_params.c

1.10 Feature (#10357): [DRV] Add support for linux kernel version 5.2

1.10.1 Description

1.10.2 SW impacts

Modified files:

SW/rwnx_drv/fullmac/Makefile

SW/rwnx_drv/fullmac/rwnx_main.c

SW/rwnx_drv/fullmac/rwnx_rx.c

SW/rwnx_drv/softmac/Makefile

SW/rwnx_drv/rwnx_compat.h

1.11 Feature (#10362): [HE] Update riu register for throughput improvement

1.11.1 Description

Disable of AGC DC compensation improves throughput.

1.11.2 SW impacts

Modified files:

SW/macsw/plf/refip/src/driver/phy/phy_karst.c

1.12 Feature (#10371): [HE] Increase average size of A-MPDUs transmitted over HE TB

1.12.1 Description

In order to maximize the throughput when HE TB is used, it is required to fill as much as possible the HE TB PPDUs that are allocated by the AP. Until now we are just able to split a A-MPDU that would not fit the HE TB PPDU. However it is also required to be able to concatenate several MPDUs.

1.12.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/tx/tx_swdesc.h

SW/macsw/ip/lmac/src/tx/txl/txl_agg.c

SW/macsw/ip/lmac/src/tx/txl/txl_agg.h

SW/macsw/ip/lmac/src/tx/txl/txl_cntrl.c

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

SW/macsw/ip/lmac/src/tx/txl/txl_he.h

SW/macsw/ip/umac/src/apm/apm.c

1.13 Bug (#10390): [LMAC] LMAC firmware doesn't compile with MAC=v21

1.13.1 Description

1.13.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

1.14 Feature (#10415): [TOOLS] Update get_mem_info.pl to show code/data split

1.14.1 Description

If code/data are loaded in the same memory, get_mem_info.pl simply show the total.

It would be useful to get the split Code/Data

1.14.2 SW impacts

Modified files:

SW/macsw/tools/get_mem_info.pl

1.15 Feature (#10416): [DRV] Update list of register to save/restore for HE FPGA

1.15.1 Description

When using reload command with the fhost driver, the driver will:

- save some registers

- reload the firmware

- restart the firmware

- restore the saved registers

For now the registers saved are only diags registers but since they have been modifed for HE FPGA it is necessary to update the driver.

1.15.2 SW impacts

Modified files:

SW/rwnx_drv/reg_access.h

SW/rwnx_drv/rwnx_platform.c

SW/rwnx_drv/rwnx_platform.h

SW/rwnx_drv/rwnx_v7.c

SW/rwnx_drv/rwnx_dini.c

1.16 Feature (#10461): [FMAC] Add the possibility to choose at startup which type of PS mode is used (i.e. dynamic or static)

1.16.1 Description

Currently in FullMAC the system is always configured in Dynamic PS Mode (DPSM), whereas in SoftMAC it is possible to choose at system start whether static or dynamic should be used. Having this possibility in FullMAC too makes sense, and could be required for TWT certification testing.

1.16.2 SW impacts

Modified files:

SW/macsw/ip/umac/src/me/me.h

SW/macsw/ip/umac/src/me/me_task.c

SW/macsw/ip/umac/src/me/me_task.h

SW/rwnx_drv/ipc_shared.h

SW/rwnx_drv/lmac_msg.h

SW/rwnx_drv/rwnx_mod_params.c

SW/rwnx_drv/rwnx_mod_params.h

SW/rwnx_drv/rwnx_msg_tx.c

SW/macsw/plf/refip/src/driver/ipc/ipc_shared.h

1.17 Bug (#10470): [HE] ASSERT (!(genirq_pending & NXMAC_PHY_ERR_BIT)) observed when HE TB is used

1.17.1 Description

PHY errors are reported by the modem from time to time since the improvements done on the size of HE TB PPDUs.

1.17.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/tx/txl/txl_agg.c

1.18 Bug (#10475): [FMAC] Mobility Domain element wrongly added in authentication request

1.18.1 Description

Incorrect test leads to adding 'Mobility Domain' Element when Fast transition authentication is not used.

1.18.2 SW impacts

Modified files:

SW/macsw/ip/umac/src/me/me_mgmtframe.c

1.19 Bug (#10476): [HE] Still some assertions observed in HE TB

1.19.1 Description

When performing HE TB testing with two stations transmitting to the AP, we still observe some assertions from time to time (e.g. PHY errors)

1.19.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/tx/txl/txl_agg.c

1.20 Feature (#10479): [MACSW] Update complete A-MPDU THD list in the debug dump

1.20.1 Description

Currently when a debug dump is forwarded to the host upon an assertion check failure, the list of THD which is uploaded starts with the first THD on which the FW is waiting an updated status from the HW. In case of a A-MPDU, the first THD uploaded can therefore be a MPDU THD in the middle of the A-MPDU, the BAR THD or the A-THD if the A-MPDU transmission has not started. However the THD linked list of a A-MPDU remains valid until the BA is received for this A-MPDU, so it is possible to upload it completely (i.e. from the A-THD to the BAR THD) at any time during the A-MPDU transmission. This can be useful to analyze the full content of a A-MPDU causing a failure of the system.

1.20.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/tx/txl/txl_cntrl.c

1.21 Bug (#10481): Increase IPC config buffer size

1.21.1 Description

The configuration buffer is currently too small in IPC, which causes a return error message.

1.21.2 SW impacts

Modified files:

SW/macsw/plf/refip/src/driver/ipc_fhost/ipc_shared.h

1.22 Bug (#10485): [HE] MAC HW HE TB TX status sometimes not correct

1.22.1 Description

When transmitting a stream in HE TB, we sometimes get an assertion showing that the FW is waiting for a THD status to be set to DONE by the HW, but this status is not updated. however the status of subsequent packets within the A-MPDU transmitted in the HE TB PPDU are correctly updated. It is noticeable that the packet on which the status is not updated is always a small frame (less than 100 bytes).

1.22.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

1.23 Bug (#10503): [HE] A-MSDU transmission over HE TB immediately leads to PHY error

1.23.1 Description

1.23.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/tx/txl/txl_cntrl.c

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

1.24 Bug (#10504): [HE] Better compute the allowed length to be transmitted over HE TB

1.24.1 Description

The algorithm currently implemented for this computation is not taking into account all the required parameters. Moreover some rounding still cause the computation to give an allowed length lower than the actual one. Most of the time this is not an issue, but it happens in some cases (e.g. if aggregation is not enabled) that the AP allocates precisely the HE TB for a single MPDU, and because of the approximate computation done by the FW, no MPDU can be pushed for transmission.

1.24.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/rwnx/rwnx_config.h

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

SW/macsw/ip/lmac/src/tx/txl/txl_he.h

SW/macsw/config/scutils.py

1.25 Bug (#10510): [HE] Issues in BSRP certification test

1.25.1 Description

The certification environment reports issues when running the BSRP test (5.53), causing the test to fail. The first encountered issue is the ACK policy of the transmitted QoS-NULL frame which is indicated as "Normal Ack", instead of "No Ack" expected by the test environment.

1.25.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

1.26 Feature (#10541): [HE] Handle the HE TB cancelled interrupt

1.26.1 Description

When a HE trigger frame having the CS bit set is received by the HW, it is supposed to monitor the CCA and VCS during the SIFS time between the trigger frame reception and the HE TB transmission. If either the CCA or VCS is high during that time, the HE TB transmission is cancelled by the HW and an interrupt is asserted to the FW.

Upon this interrupt the FW unchains the programmed HE TB, and could either reprogram it later or consider it as a failed transmission (thus causing retries of the MPDUs).

1.26.2 SW impacts

Modified files:

SW/macsw/ip/lmac/import/v21/MAC_CORE.xls

SW/macsw/ip/lmac/import/v21/MAC_PL.xls

SW/macsw/ip/lmac/src/tx/txl/txl_agg.c

SW/macsw/ip/lmac/src/tx/txl/txl_cntrl.c

SW/macsw/ip/lmac/src/tx/txl/txl_he.h

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

1.27 Bug (#10553): [HE] BSS color not set correctly in HE TB frames

1.27.1 Description

For HE SU frames the BSS color present in the preamble is taken from the value located in the policy table. However in HE TB it is not the case, and the value is taken from a HW register which is not set currently.

1.27.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/mm/mm_task.c

SW/macsw/ip/lmac/src/mm/mm_task.h

SW/macsw/ip/lmac/src/sta/sta_mgmt.h

SW/macsw/ip/umac/src/me/me_task.c

SW/macsw/ip/umac/src/me/me_utils.c

SW/macsw/ip/umac/src/me/me_utils.h

SW/macsw/ip/umac/src/sm/sm.c

SW/macsw/ip/umac/src/sm/sm_task.c

SW/rwnx_drv/ipc_shared.h

SW/rwnx_drv/lmac_msg.h

SW/macsw/plf/refip/src/driver/ipc/ipc_shared.h

1.28 Bug (#10559): [MACSW] Improve windows build

1.28.1 Description

After support request It appears that firmware on windows platform (only test risc-v) doesn't work 'out of the box'.

1.28.2 SW impacts

Modified files:

SW/macsw/config/scutils.py

SW/macsw/tools/scons-local-1.0.1/SCons/Tool/riscv32.py

SW/macsw/tools/scons-local-1.0.1/SCons/Platform/__init__.py

1.29 Bug (#10569): [DRV] VHT capabilities not correctly set if only 20M or 40M BW is supported

1.29.1 Description

Some capabilities, such as the MCS map, or the highest TX and RX throughput, are currently not well configured when the device supports only 20M or 40M BW.

1.29.2 SW impacts

Modified files:

SW/rwnx_drv/rwnx_mod_params.c

1.30 Bug (#10586): [HE] Check if minimal resources are allocated by the AP in the trigger frame

1.30.1 Description

When receiving a trigger frame the FW computes the maximum size (PSDU length) we can put in the HE TB. If no MPDU fits in this size, then a QoS-NULL frame is transmitted. However it may happen (it has been seen in some WiFi6 certification tests) that the AP does not allocate enough resources, even for a QoS-NULL transmission. In such case we should just send a NDP, i.e. a packet with a null length.

1.30.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

1.31 Bug (#10591): [HE] RU26 shall be disabled when operating on DFS channel in some conditions

1.31.1 Description

Sending a HE TB PPDU in a 26-tone RU can cause false radar alarms on overlapping APs not supporting this (i.e. all non-HE APs, and HE APs not advertising OBSS Narrow Bandwidth RU in UL OFDMA Tolerance Support).

Non-AP HE STAs shall not reply to trigger frames allocating a 26-tone RU, when the above conditions are true (operation on DFS channel, and presence of OBSS not advertising the support for the OBSS Narrow Bandwidth RU in UL OFDMA Tolerance).

1.31.2 SW impacts

Modified files:

SW/macsw/ip/lmac/import/v21/MAC_CORE.xls

SW/macsw/ip/lmac/src/chan/chan.c

SW/macsw/ip/lmac/src/chan/chan.h

SW/macsw/ip/lmac/src/mm/mm_task.c

SW/macsw/ip/lmac/src/mm/mm_task.h

SW/macsw/ip/lmac/src/scan/scan.c

SW/macsw/ip/umac/src/apm/apm_task.c

SW/macsw/ip/umac/src/me/me_task.c

SW/macsw/ip/umac/src/me/me_utils.c

SW/macsw/ip/umac/src/sm/sm.c

SW/macsw/modules/mac/src/mac_types.h

SW/macsw/plf/refip/src/driver/ipc/ipc_shared.h

SW/macsw/plf/refip/src/driver/phy/phy.h

SW/macsw/plf/refip/src/driver/phy/phy_aetnensis.c

SW/macsw/plf/refip/src/driver/phy/phy_custom_rf.c

SW/macsw/plf/refip/src/driver/phy/phy_karst.c

SW/macsw/plf/refip/src/driver/phy/phy_mxd.c

SW/macsw/plf/refip/src/driver/phy/phy_sdmb2b.c

SW/macsw/plf/refip/src/driver/phy/phy_sim.c

SW/macsw/plf/refip/src/driver/phy/phy_trident.c

SW/rwnx_drv/ipc_shared.h

SW/rwnx_drv/lmac_mac.h

SW/rwnx_drv/lmac_msg.h

SW/rwnx_drv/rwnx_msg_tx.c

SW/macsw/plf/refip/src/driver/phy/phy_elma.c

1.32 Feature (#10594): [PHY] Align example PHY driver with Karst one

1.32.1 Description

Recent updates in the Karst driver shall be ported to the example PHY driver

1.32.2 SW impacts

Modified files:

SW/macsw/plf/refip/src/driver/phy/phy_custom_rf.c

1.33 Bug (#10601): [11ax] TX timeout on beacon queue because of CCA

1.33.1 Description

1.33.2 SW impacts

Modified files:

SW/macsw/plf/refip/import/modem/v30/MDM_CFG.xls

SW/macsw/plf/refip/src/driver/phy/phy_karst.c

SW/macsw/plf/refip/src/driver/phy/phy_custom_rf.c

1.34 Bug (#10609): [MACSW] RIFS support shall be disabled when using HE HW

1.34.1 Description

HE HW does not support RIFS in reception, and its shall therefore be disabled in the MAC HW and PHY register, in order to avoid false detection of RIFS causing PHY lock.

1.34.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/hal/hal_machw.c

SW/macsw/plf/refip/src/driver/phy/phy_karst.c

SW/macsw/plf/refip/src/driver/phy/phy_custom_rf.c

1.35 Bug (#10612): [DRV] Custregd processed after sending channel information to firmware

1.35.1 Description

When driver is loaded with custregd parameter set, the custom regulatory is applied at cfg80211 after sending channels configuration to the firmware.

Moreover the 'reg_notifier' callback is not called when setting custom_regulatory meaning that driver will not update channel configuration to the firmware.

Thus channel flags at firmware level may not be aligned with regulatory set in cfg80211

1.35.2 SW impacts

Modified files:

SW/rwnx_drv/fullmac/rwnx_main.c

SW/rwnx_drv/rwnx_mod_params.c

1.36 Bug (#10614): [HE] ASSERT (!(irq_status & RIU_IRQMACCCATIMEOUTMASKED_BIT))

1.36.1 Description

On recent HE FPGAs (starting Oct 4, 2019) this assertion is observed quite often, e.g. when doing passive scanning. It could not be observed before because the CCA timeout interrupt was not connected to the interrupt controller within the FPGA on older FPGAs, so the issue may not be a recent one.

1.36.2 SW impacts

Modified files:

SW/macsw/plf/refip/src/driver/phy/phy_karst.c

1.37 Feature (#10617): [TRACE] Add possibility to synchronize fw trace with LA trace

1.37.1 Description

I would sometimes be useful to be able to synchronize a fw trace with a LA trace.

The problem is that FW trace uses MAC HW counter as timestamp whereas LA traces are timestamped using LA clock (independent of MAC clock).

It is then required to somehow trace the correlation between those 2 counters.

1.37.2 SW impacts

Modified files:

SW/macsw/plf/refip/import/SYSCTRL.xls

SW/macsw/plf/refip/src/driver/sysctrl/sysctrl.c

SW/macsw/plf/refip/src/driver/la/la.c

1.38 Bug (#10630): [HE][PHY] Enable MU-MIMO RX in modem

1.38.1 Description

In PHY driver for HE modem the MU-MIMO feature is not enabled, so let's do it if it is supported by the MDM.

1.38.2 SW impacts

Modified files:

SW/macsw/plf/refip/src/driver/phy/phy_karst.c

SW/macsw/plf/refip/src/driver/phy/phy_custom_rf.c

1.39 Bug (#10631): [HE] Don't disable reception when computing BFM report

1.39.1 Description

In the MU BFRP calibration procedure, the sequence of reception is as follows, from the STA point of view:

<pre>

| RX NDPA | <-SIFS-> | RX NDP | <-SIFS-> | RX MU_BFRP | <-SIFS-> | TX BFR |

| | ...BFR Computing... | |

</pre>

The transmission of the BFR is done as a HE TB PPDU, meaning that all the STAs involved in the calibration are sending simultaneously in the RUs allocated by the AP in the MU BFRP frame. By default the MAC HW disables the reception after the NDP reception (i.e. just before the report computation by the PHY), to avoid getting a corrupted report due to subsequent reception during the computation. This is an issue because the MU BFRP transmission could start while the report is being computed, and its reception could therefore not be possible, causing the calibration sequence to fail because no report is transmitted.

It is therefore required to keep the RX enabled while computing the report. Starting from SVN r40116, the HE HW fixes the issue of possible corruption of the report by a subsequent reception, so keeping the reception active during the report computation is not problematic anymore.

1.39.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/hal/hal_machw.c

1.40 Feature (#10632): [HE] Use PSDU length computation from HW

1.40.1 Description

Starting from SVN r40116, the MAC HW computes the maximum PSDU length that can be put in a HE TB frame from the parameters received in the trigger frame. In order to avoid doing this quite long computing in the SW anymore, let's use the info computed by the HW.

1.40.2 SW impacts

Modified files:

SW/macsw/ip/lmac/import/v21/MAC_PL.xls

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

1.41 Feature (#10633): [HE] Get the UPH value to be used from a HW register

1.41.1 Description

Upon each trigger frame reception (regardless it is one to be handled by HW or SW), the MAC HW computes the value to be put in the +HTC field of the MPDUs transmitted in the HE TB (i.e. the UPH). Starting from SVN r40129, this value is now available in a register. Let's take it from there.

1.41.2 SW impacts

Modified files:

SW/macsw/ip/lmac/import/v21/MAC_PL.xls

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

SW/macsw/modules/mac/src/mac_frame.h

SW/macsw/ip/lmac/src/tpc/tpc.c

1.42 Feature (#10634): [HE] Indicate the buffer status (BSR) in the +HTC HE Variant

1.42.1 Description

When transmitting frames to a HE AP, we allocate space for the +HTC field, because we have to put the UPH information in this field when the MPDU is transmitted in a HE TB PPDU. In case the MPDU is transmitted as a HE SU frame, we can use the +HTC field to indicate our buffering status to the AP. If the computing of the status is too long to be done on each MPDU, we can do it periodically or only if it was not done for a long time, and use the latest computed value when building the +HTC field.

1.42.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/rwnx/rwnx_config.h

SW/macsw/ip/lmac/src/sta/sta_mgmt.c

SW/macsw/ip/lmac/src/sta/sta_mgmt.h

SW/macsw/ip/lmac/src/td/td.c

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

SW/macsw/ip/lmac/src/tx/txl/txl_he.h

SW/macsw/ip/umac/src/txu/txu_cntrl.c

1.43 Bug (#10640): [DRV] Setting of channel TX power to FW can overflow the fields used in API messages

1.43.1 Description

When sending channel information to the FW, the driver also indicates the maximum TX power that can be used on the channel. However this value is given by Linux upper layers as an int, whereas the FW API message fields for the TX power are int8_t. When the max TX power configured in Linux is greater than 127dBm (e.g. when custom regulatory is used), the information passed to the FW is therefore not correct.

1.43.2 SW impacts

Modified files:

SW/rwnx_drv/rwnx_msg_tx.c

1.44 Bug (#10652): [PHY] Don't disable HTSTF gain update anymore in 20MHz BW

1.44.1 Description

According to PHY team, this improves beamformed receptions, and has theoretically no impact on other receptions.

1.44.2 SW impacts

Modified files:

SW/macsw/plf/refip/src/driver/phy/phy_karst.c

1.45 Bug (#10665): [MACSW] BA agreement sometimes not established whereas it should be

1.45.1 Description

Currently to know if we should establish a BA agreement for a STA/TID pair we consider the following:

* Ensure last trial to establish a BA agreement for this pair is not too recent (not done in the last second), in order to avoid wasting time and power trying to establish the agreement with a peer consistently rejecting it

* Check if the duration between the last two consecutive packets pushed for TX for the pair is less than 500us, in order to detect if "much" traffic is available for this STA/TID

* Check if peer is not in PS state (we consider that a peer in PS does not require a lot of traffic)

However the 2nd check is sometimes causing the BA agreement not to be established, whereas it should be. For example in case HE TB is used, the trigger frame is most of the time sent once every 5ms. If for some reason the pending BA agreement is deleted by the AP (this was observed in one certification test case), then we would not build A-MPDU anymore and we would therefore transmit and confirm only one packet every 5ms. In such case the BA agreement would never be established anymore, because of the maximal 500us duration we expect between two packets pushed.

1.45.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/sta/sta_mgmt.c

SW/macsw/ip/lmac/src/sta/sta_mgmt.h

SW/macsw/ip/umac/src/bam/bam.h

SW/macsw/ip/umac/src/bam/bam.c

1.46 Feature (#10667): [MACSW] Add Multiple BSSID feature, acting as STA role

1.46.1 Description

STA HE certification makes mandatory the support of Multiple BSSID feature. This feature enables the advertisement of information for BSSIDs using a single Beacon or Probe Response frame instead of multiple Beacon and Probe Response frames, each corresponding to a single BSSID. The Multiple BSSID capability also enables the indication of buffered frames for multiple BSSIDs using a single TIM element in a single beacon.

This feature is defined in 802.11-2016, chapters 11.1.3.8 Multiple BSSID procedure, 11.11.14 Multiple BSSID set, and all related chapters.

Multiple BSSID feature consists in delivering the information about all the BSSIDs/SSIDs located in a given AP in a single beacon frame. The BSSID sending the beacon frame is known as the Transmitted BSSID, other BSSIDs being called Nontransmitted BSSIDs.

The beacon of the Transmitted BSSID includes an additional information element called Multiple BSSID element (chapter 9.4.2.46). Only a subset of the Nontransmitted BSSIDs information is advertised via this element (e.g BSSID, SSID, etc.), whereas most of the information is common to all BSSIDs: The Timestamp and Beacon Interval fields, DSSS Parameter Set, IBSS Parameter Set, Country, Channel Switch Announcement, Extended Channel Switch Announcement, Wide Bandwidth Channel Switch, Transmit Power Envelope, Supported Operating Classes, IBSS DFS, ERP Information, HT Capabilities, HT Operation, VHT Capabilities, and VHT Operation elements are not included in the Nontransmitted BSSID Profile subelement; the values of these elements for each nontransmitted BSSID are always the same as the corresponding transmitted BSSID element values.

1.46.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/mm/mm.c

SW/macsw/ip/lmac/src/mm/mm_task.c

SW/macsw/ip/lmac/src/mm/mm_task.h

SW/macsw/ip/lmac/src/ps/ps.c

SW/macsw/ip/lmac/src/rx/rxl/rxl_cntrl.c

SW/macsw/ip/lmac/src/sta/sta_mgmt.c

SW/macsw/ip/lmac/src/sta/sta_mgmt.h

SW/macsw/ip/lmac/src/vif/vif_mgmt.c

SW/macsw/ip/lmac/src/vif/vif_mgmt.h

SW/macsw/ip/umac/src/me/me.h

SW/macsw/ip/umac/src/me/me_mgmtframe.c

SW/macsw/ip/umac/src/me/me_task.c

SW/macsw/ip/umac/src/scanu/scanu.c

SW/macsw/ip/umac/src/scanu/scanu.h

SW/macsw/ip/umac/src/scanu/scanu_task.c

SW/macsw/ip/umac/src/sm/sm_task.c

SW/macsw/modules/mac/src/mac.h

SW/macsw/modules/mac/src/mac_frame.h

SW/macsw/modules/mac/src/mac_ie.c

SW/macsw/modules/mac/src/mac_ie.h

SW/macsw/modules/mac/src/mac_types.h

SW/rwnx_drv/fullmac/rwnx_main.c

SW/rwnx_drv/ipc_shared.h

SW/rwnx_drv/lmac_mac.h

SW/rwnx_drv/lmac_msg.h

SW/rwnx_drv/rwnx_compat.h

SW/rwnx_drv/rwnx_mod_params.c

SW/rwnx_drv/rwnx_msg_tx.c

SW/macsw/plf/refip/src/driver/ipc/ipc_shared.h

1.47 Bug (#10672): [HE] Multi-STA BlockAck bitmap not fully copied

1.47.1 Description

When receiving a BlockAck frame, the ssc_bitmap field of the received BA is copied in the AGG descriptor for deferred processing in the TXL_CFM module. However in case of Multi-STA BlockAck (mostly received as a response to the HE TB frames), the length of the copy is not correct, and therefore the last 2 bytes of the bitmap are always missing.

Most of the APs we tested against are putting the ack bits corresponding to the received MPDUs at the beginning of the bitmap, thus hiding this bug. However some APs (e.g. Intel) are putting the ack bits at the end of the bitmap, which leads to MPDUs never considered as acknowledged and retried up to the lifetime expiry even if they are correctly received by the AP. The resulting throughput is therefore very poor.

1.47.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

1.48 Feature (#10674): [HE] Add missing HE PHY capabilities

1.48.1 Description

According to PHY team there are various HE PHY capabilities missing in the he_capa element. Some of these features have already been tested in WiFi certification.

1.48.2 SW impacts

Modified files:

SW/rwnx_drv/rwnx_mod_params.c

1.49 Feature (#10678): [DRV] Don't enable HE support for kernel versions less than 4.20

1.49.1 Description

HE was supported in Linux starting from version 4.19. However at that time it was based on Draft2.0 of the 802.11ax standard, and the size of the MAC and PHY capabilities, as well as several bits inside those fields have been modified between Draft2.0 and Draft3.0. The first kernel supporting the capabilities format still in use today was the 4.20. It is therefore reasonable to deprecate the HE support for 4.19, and enable it only starting from 4.20.

1.49.2 SW impacts

Modified files:

SW/rwnx_drv/fullmac/rwnx_main.c

SW/rwnx_drv/rwnx_msg_tx.c

SW/rwnx_drv/softmac/rwnx_main.c

SW/rwnx_drv/rwnx_mod_params.c

1.50 Feature (#10697): [HE] Include UPH in QoS-Null frames sent as HE TB

1.50.1 Description

When no MPDU has to be transmitted upon reception of a basic trigger frame, a simple QoS-Null frame is sent. Today we don't include a +HTC HE Variant field with the UPH value in this frame, and HE APs are fully OK with that. However the pre-correction certification test is checking the UPH value in the QoS-Null, and we therefore have to include it.

1.50.2 SW impacts

Modified files:

SW/macsw/modules/mac/src/mac_frame.h

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

1.51 Bug (#10699): [HE] PHY errors when transmitting a HE TB stream of small packets

1.51.1 Description

When sending a stream of small UDP packets (e.g. 100 bytes) in HE TB, some PHY errors are observed. The error is also observed in WiFi6 certification on test 5.61, when packets of 250 bytes are used.

1.51.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/tx/txl/txl_agg.c

SW/macsw/ip/lmac/src/tx/txl/txl_agg.h

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

1.52 Bug (#10709): [HE] HE TB shall be enabled only when STA is connected to AP

1.52.1 Description

When disconnecting from AP, the HE TB feature is not disabled. The MAC HW is then still able to receive trigger frames (if they include the AID that was previously assigned to us) and attempts to reply with HE TB in that case, for example during the scanning procedure. It should not be the case.

1.52.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/chan/chan.c

SW/macsw/ip/lmac/src/mm/mm_task.c

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

1.53 Feature (#10726): [MACSW] Use mac_chan_op struct whenever possible

1.53.1 Description

Currently the struct mac_chan_op contains @tx_power@ and @flags@ fields that I believe are useless.

For @tx_power@ there is already a field with the same name in the @struct vif_info_tag@ which should be enough.

@flags@ impact the channel in general and not just a specific operating channel so there is no point of specifying them for each operating channel.

Note: I didn't fully check the implication of removing those fields so it may not be possible (especially for soft mac).

1.53.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/chan/chan.c

SW/macsw/ip/lmac/src/mm/mm.h

SW/macsw/ip/lmac/src/mm/mm_task.c

SW/macsw/ip/lmac/src/mm/mm_task.h

SW/macsw/ip/lmac/src/sta/sta_mgmt.h

SW/macsw/ip/lmac/src/tdls/tdls.c

SW/macsw/ip/lmac/src/tdls/tdls_task.c

SW/macsw/ip/lmac/src/tdls/tdls_task.h

SW/macsw/ip/lmac/src/tpc/tpc.c

SW/macsw/ip/lmac/src/tpc/tpc.h

SW/macsw/ip/lmac/src/tx/txl/txl_frame.c

SW/macsw/ip/lmac/src/vif/vif_mgmt.c

SW/macsw/ip/umac/src/apm/apm_task.c

SW/macsw/ip/umac/src/apm/apm_task.h

SW/macsw/ip/umac/src/me/me.c

SW/macsw/ip/umac/src/me/me.h

SW/macsw/ip/umac/src/me/me_mgmtframe.c

SW/macsw/ip/umac/src/me/me_utils.c

SW/macsw/ip/umac/src/me/me_utils.h

SW/macsw/ip/umac/src/scanu/scanu.c

SW/macsw/ip/umac/src/sm/sm.c

SW/macsw/ip/umac/src/sm/sm_task.h

SW/macsw/ip/umac/src/txu/txu_cntrl.c

SW/macsw/modules/dbg/src/trace_compo.h

SW/macsw/plf/refip/src/driver/ipc/ipc_shared.h

SW/macsw/plf/refip/src/driver/phy/phy.h

SW/macsw/plf/refip/src/driver/phy/phy_aetnensis.c

SW/macsw/plf/refip/src/driver/phy/phy_custom_rf.c

SW/macsw/plf/refip/src/driver/phy/phy_karst.c

SW/macsw/plf/refip/src/driver/phy/phy_mxd.c

SW/macsw/plf/refip/src/driver/phy/phy_mxd.h

SW/macsw/plf/refip/src/driver/phy/phy_sdmb2b.c

SW/macsw/plf/refip/src/driver/phy/phy_sim.c

SW/macsw/plf/refip/src/driver/phy/phy_trident.c

SW/macsw/plf/refip/src/driver/phy/phy_trident.h

SW/rwnx_drv/ipc_shared.h

SW/rwnx_drv/lmac_msg.h

SW/rwnx_drv/rwnx_msg_rx.c

SW/rwnx_drv/rwnx_msg_tx.c

SW/macsw/plf/refip/src/driver/phy/phy_elma.c

1.54 Feature (#10733): [MACSW] Add the possibility to trace the key RAM upon assertion failure

1.54.1 Description

It is sometimes useful to get the content of the key RAM to debug a feature, so let's trace this as part of the debug dump forwarded to the host upon assertion check failures.

1.54.2 SW impacts

Modified files:

SW/macsw/config/scutils.py

SW/macsw/ip/lmac/src/rwnx/rwnx_config.h

SW/macsw/modules/dbg/src/dbg.c

SW/macsw/config/SConscript

1.55 Bug (#10736): [HE] When configured as a 20-MHz only STA, reception of 242-tone HE MU in a 40 MHz or 80MHz PPDU is not supported

1.55.1 Description

The bits indicating the support for this feature are currently set although they should not.

1.55.2 SW impacts

Modified files:

SW/rwnx_drv/rwnx_mod_params.c

1.56 Bug (#10740): [MACSW] Channel bandwidth not always correctly parsed from VHT Operation or Wide Bandwidth Channel Switch elements

1.56.1 Description

Currently parsing assume that if channel width==1 it is necessarily a 80MHZ channel.

This is no longer the case in 802.11-2016 so parsing code should be updated.

Note: In practice this doesn't change anything as we don't support 160MHZ no 80+80Mhz

1.56.2 SW impacts

Modified files:

SW/macsw/ip/umac/src/me/me_mgmtframe.c

SW/macsw/ip/umac/src/me/me_utils.c

SW/macsw/ip/umac/src/me/me_utils.h

SW/macsw/plf/refip/src/driver/phy/phy.h

1.57 Bug (#10791): [HE] MU EDCA parameters applied with delay

1.57.1 Description

When getting the acknowledgment of a HE TB packet, the MU EDCA procedure is started by triggering a kernel event, that will start the 8ms timer used for the MU EDCA. The MU EDCA parameters are therefore applied more than 8ms after the HE TB acknowledgment reception.

Doing like this triggers an error in the WiFi6 certification test. Indeed this test is checking in detail when the DUT applies the MU EDCA parameters, and our behavior causes the test to fail.

1.57.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/tx/txl/txl_cntrl.c

SW/macsw/ip/lmac/src/tx/txl/txl_he.h

SW/macsw/modules/ke/src/ke_event.c

SW/macsw/modules/ke/src/ke_event.h

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

1.58 Feature (#10812): [TRACE] Need to be able to support more than 256 files

1.58.1 Description

When supporting AP mode in FHOST the limit of 256 files is reached and as such it must be increased.

1.58.2 SW impacts

Modified files:

SW/macsw/modules/dbg/src/dbg_assert.c

SW/macsw/modules/dbg/src/dbg_assert.h

1.59 Bug (#10822): p2p_connect command FAIL

1.59.1 Description

| Platform:cevav7-13 |

| mac:fmac vX.X.X.X |

| drv_svn_version: svn40515M |

| fpga_type:HE |

| drv_build_info: build: lbernadin Dec 10 2019 10:03:43 |

| kernel_version:5.2.2 |

| cpu:RISC-V |

| drv:rwnx vX.X.X.X |

| FPGA1: MAC=40503 MODEM=40503 |

| mac_svn_version: svn40672M |

| Infos: CEVA-V7 HE RISC-V (c0ca4000) 2019/11/25 13h54m12s |

| mac_build_info: build: lbernadin Dec 10 2019 10:03:30

Command: wpa_cli -i wlp4s0 p2p_connect aa:0c:cc:dd:ee:ff pbc go_intent=7 freq=5180 ; echo FAIL

test: p2p_sl_com_tc_003

Last PASSED:

svn MAC - fmac vX.X.X.X - svn40500

svn Driver - rwnx vX.X.X.X - svn40469

fpga - MAC=39626 MODEM=39626

1.59.2 SW impacts

Modified files:

SW/macsw/ip/umac/src/scanu/scanu_task.c

SW/macsw/ip/umac/src/scanu/scanu.c

1.60 Bug (#10837): [MACSW] Fix compilation when traces and debug are disabled

1.60.1 Description

When compiling the FW for the estimation of the code/data size, all the debug features are disabled. However this is currently causing build errors.

1.60.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/tx/txl/txl_agg.c

SW/macsw/ip/lmac/src/tx/txl/txl_cntrl.c

SW/macsw/modules/dbg/src/trace_compo.h

SW/macsw/modules/macif/src/macif_fhost.c

SW/macsw/plf/refip/src/arch/risc-v/boot/riscv32/interrupt.c

SW/macsw/plf/refip/src/compiler/aps-gcc/compiler.h

SW/macsw/plf/refip/src/compiler/armgcc_4_8/compiler.h

SW/macsw/plf/refip/src/compiler/ceva-x-cc/compiler.h

SW/macsw/plf/refip/src/compiler/gcc/compiler.h

SW/macsw/plf/refip/src/compiler/gnuarm/compiler.h

SW/macsw/plf/refip/src/compiler/riscv32/compiler.h

SW/macsw/plf/refip/src/compiler/tl4/compiler.h

1.61 Bug (#10857): [MACSW] Update station PS mode also on Management frame

1.61.1 Description

Currently in AP mode, the firmware (in function rxl_pm_check) considers that a station leaves when it sends a Data frame without powermgt bit set but according 802.11-2016:

To change power management modes a STA shall inform the AP by completing a successful frame exchange (as described in Annex G) that is initiated by the STA. This frame exchange shall include a Management frame, Extension frame or Data frame from the STA, and an Ack or a BlockAck frame from

the AP.

So the test should be updated to also check mgmt frames.

This would also the benefit of fixing this particular test case:

- STA connect to the AP

- STA enters PS

- STA disconnect without informing the AP

- STA tries to reconnect.

Currently the firmware still consider the STA as connected and in PS to it won't answer the authentication.

note: It is also mentioned that powermgt bit is reserved in all management frames sent by a STA to AP with which it is not associated, but since @rxl_pm_check@ is called for known STA this is ok.

1.61.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/rx/rxl/rxl_cntrl.c

1.62 Feature (#10859): [PLF] Create LED driver

1.62.1 Description

Add a simple driver to control the green and red LEDs used for the connected door lock demo

1.62.2 SW impacts

Modified files:

SW/macsw/plf/refip/import/karst/virtex7/v30/KARST_IF.xls

SW/macsw/plf/refip/includelist.txt

SW/macsw/plf/refip/src/driver/led/led.h

SW/macsw/plf/refip/src/driver/sourcelist.txt

SW/macsw/plf/refip/src/driver/led/led.c

1.63 Bug (#10875): [KARST] Correctly set the TX gain table

1.63.1 Description

The HE HW provides the possibility to update the TX gain based on the value requested in the TX policy table (or by the MAC HW in case of HE TB). However the TX gain table programmed to the RF is not correct. The TX gain provided by the PHY team will now allow to set the power in an approximate range of -10dBm:10dBm.

1.63.2 SW impacts

Modified files:

SW/macsw/plf/refip/src/driver/phy/phy_karst.c

1.64 Bug (#9585): [FMAC] report TX status in the confirmation

1.64.1 Description

Currently in FMAC, the status in confirmation doesn't allow the host to determine if a single MPDU has been successfully sent or not.

This may not be an issue for data frame, as transport protocol will take care of this, but this is an issue for management frame.

Indeed if a management frame is not successfully sent then wpa_supplicant may decide to do something different.

1.64.2 SW impacts

Modified files:

SW/rwnx_drv/fullmac/rwnx_tx.c

1.65 Bug (#9743): [HE] HE TB transmissions shall include the HE variant HT control field

1.65.1 Description

Even if it is not absolutely required for the correct operation of HE TB, the standard and certification imposes that MPDUs transmitted as HE TB includes the HE variant HT control field containing the UPH control subfield. This subfield contains information that help the AP in its HE TB MCS selection process for the given STA.

1.65.2 SW impacts

Modified files:

SW/macsw/ip/lmac/src/tdls/tdls.c

SW/macsw/ip/lmac/src/tx/tx_swdesc.h

SW/macsw/ip/lmac/src/tx/txl/txl_agg.c

SW/macsw/ip/lmac/src/tx/txl/txl_agg.h

SW/macsw/ip/lmac/src/tx/txl/txl_buffer.h

SW/macsw/ip/lmac/src/tx/txl/txl_cntrl.c

SW/macsw/ip/lmac/src/tx/txl/txl_cntrl.h

SW/macsw/ip/lmac/src/tx/txl/txl_he.c

SW/macsw/ip/lmac/src/tx/txl/txl_he.h

SW/macsw/ip/umac/src/me/me_utils.c

SW/macsw/ip/umac/src/rc/rc.c

SW/macsw/ip/umac/src/rc/rc.h

SW/macsw/ip/umac/src/txu/txu_cntrl.h

SW/macsw/modules/mac/src/mac_frame.h

SW/macsw/ip/umac/src/txu/txu_cntrl.c