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Ethernet Addressing and VLAN Configuration Specification

HHT HA1/MCE/VC1

Ethernet Addressing and VLAN Configuration Specification

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Revision

Version	Description	Date	Modified by
1.0	Initial Version for HA1, derived from HHT_Ethernet_Addressing_and_VLAN_Configuration_Specification_V2.2 of VX1	2020-09-23	ETH team
1.1	Temporary Version: Node configuration for APA has been added. Applies until usecase for APA to be pinned	2020-09-23	ETH team
1.2	1, Add address configuration for Wi-Fi use case in factory mode and normal mode. See chapter 2.3.2. 2, Modify REQ_ETH_VLAN_06 and Table 7 to define egress frames tagged or untagged from CGW Tx port in engineering debug SW and final frozen SW. 3, Modify REQ_ETH_VLAN_10 to make it more clear. 4, Delete REQ_ETH_VLAN_09. 5, Move “File Transfer” traffic to VLAN_00 in Table 2. 6, Modify REQ_ETH_IP_04 to make it more clear. 7, Modify IP address of IDCM SOFTAP AP interface to 192.168.53.1/24.	2021-02-05	ETH team
1.3	Make some corrections to REQ_ETH_VLAN_10 and REQ_ETH_IP_04.	2021-03-30	ETH team
1.4	1、Changed "VLAN tags" Colmun of "External Tester(OBD)" in Table 7 2、APA is added to VLAN_00_DIAG, resaulting in the following contents being changed a) Added VLAN_00_DIAG to APA in Table 7 b) Added IP address of APA to Table3, allowing APA to use VLAN_00 Diagnostic 3、Modification to REQ_ETH_PORT_01, and the PHY mode of APA shall thus be configured as slave.	2021-4-19	ETH team

1.5	1, Add RVM ETH node. Configure MAC address in Table 1, configure VLAN and IP address in Table 3, configure PHY mode in REQ_ETH_PORT_01. 2, Update VLAN and IP for APA in Table 3. 3, Update CGW switch port configuration for IDCM, ADCM and APA in Table 7. 4, Delete REQ_ETH_PORT_04, all egress and ingress traffic through the CGW switch port which connected to ADCM shall be tagged. Also update REQ_ETH_VLAN_03 and REQ_ETH_VLAN_04 for this change. 4, Delete Figure 1. 5, Update ADCM switch configuration in Table 9, update VLAN and IP configuration for ADCM in Table 3. 6, Add multicast address for VLAN_05 in Table 6.	2021-7-16	ETH team
1.6	1, Delete DSM, ARC, VSP, IEM, FSE-M node, add CCP, PBOX, LIDAR-1 node. Modify MAC and IP in Table 1, Table 3 and Table 5. 2, Because IEM is deleted, modify **REQ_ETH_VLAN_03, REQ_ETH_VLAN_04**, delete **REQ_ETH_IP_04.** 3, Remove double-tagged requirement for mirrored frames, delete **REQ_ETH_VLAN_07, REQ_ETH_PRI_03** and modify **REQ_ETH_VLAN_08.** 4, Modify Table 3 according to new topology. 5, Delete **REQ_ETH_IP_05,** 192.168.4.3 is not need for CGW_MCU. 6, Delete chapter 2.3.2 wireless requirement. To be determined for CCP in next version. 7, Modify **REQ_ETH_PORT_05** for CCP switch port configuration. 8, Modify **REQ_ETH_PORT_05- REQ_ETH_PORT_08**	2021-9-15	ETH team

	according to new topology, delete **REQ_ETH_PORT_09.** 9, Modify VLAN name "VLAN_00_SOFTAP" to "VLAN_00_SOFTAP".		
1.7	1, Change CCP's name to IDCM. 2, Add IP address in VLAN_01 for IDCM_VDP. 3, Add IP address in VLAN_05 for IDCM_CIP. 4, Update Table 7 for IDCM_CIP and IDCM_VDP.	2021-12-30	ETH team
1.8	Due to change of HA1 Ethernet topology： 1, Modify Table 1, Add DSM node, rename PBOX to HPPM, rename IDCM_CIP/VDP/MCU to VX1 IDCM name. 2, Modify Table 3 for ECU IP address. 3, Modify **REQ_ETH_PORT_01**, **REQ_ETH_PORT_03, REQ_ETH_PORT_05, REQ_ETH_PORT_07, REQ_ETH_PORT_08** for switch PHY mode configuration. Due to new added IEM node： 4, Modify **REQ_ETH_VLAN_03, REQ_ETH_VLAN_04.** 5, Add REQ_ETH_IP_04 for IP routing requirement of IEM. 6, Modify Table 5, Add multicast address for IEM.	2022/01/27	ETH team
1.9	1、add new VLAN_11 for IDCM_MPU_Android、TBOX used to Paid traffic ; **REQ_ETH_VLAN_01**: add VLAN_11; **REQ_ETH_IP_01:** add new IP for IDCM_MPU_Android、TBOX related to VLAN_11; **REQ_ETH_PRI_01:** assign VLAN_11 with priority level 1； **REQ_ETH_PORT_03：** assign CGW switch with VLAN_11 **REQ_ETH_PORT_05:** assign IDCM switch with VLAN_11 2、**REQ_ETH_VLAN_01 :** ADAS and IOV interaction use case shall use VLAN_04; **REQ_ETH_IP_01:** delete IP/192.168.05.4 for	2022/02/14	ETH team

	IDCM_MPU_Android in VLAN_05； **REQ_ETH_PORT_03：** delete VLAN_05 of Port IDCM_SW; **REQ_ETH_PORT_05：** delete VLAN_05 of Port CGW_SW and IDCM_MPU； 3、Add HPPM NRTK Service use VLAN_01,related to TBOX and HPPM; **REQ_ETH_IP_01:** add new IP of VLAN_01 for HPPM **REQ_ETH_PORT_03:** assign CGW switch port of HPPM with VLAN_01; 4、Add HPPM Locate Service use VLAN_04, related to TBOX、IDCM and HPPM; **REQ_ETH_IP_01:** add new IP of VLAN_04 for HPPM ; **REQ_ETH_PORT_03:** assign CGW switch port of HPPM with VLAN_04;		
2.0	Add MCE Project, add ARC , VSP and FSE	2022/02/23	ETH team
2.1	1、VC1 Project：add new ECU ARHUD，use the same MAC address and IP address of ARC ; 2、**REQ_ETH_IP_01：** delete IP address 192.168.04.20 of RVM； **REQ_ETH_PORT_05：** delete VLAN_04 of RVM; 3、VC1 Project ： add new ECU ELM , use the same MAC address and IP address of DLP ; 4、**REQ_ETH_IP_01：** delete IP address 192.168.05.22 of HPPM； **REQ_ETH_PORT_03:** delete VLAN_05 of HPPM and OBD； 5、**REQ_ETH_IP_01：** HD Map use VLAN_01 , delete IP address 192.168.05.01 of TBOX； **REQ_ETH_PORT_03:** delete VLAN_05 of TBOX、ADCM_SW； **REQ_ETH_PORT_06：** delete VLAN_05 of CGW_SW ;	2022/4/28	ETH team
2.2	1、VC1 Project：HH OTA , IDCM flash other Ethernet	2022/6/10	ETH team

	ECU using VLAN_00_Diagnostic（IDCM download package from Cloud using VLAN_00）; **REQ_ETH_VLAN_01:** update VLAN_00 and VLAN_00_DIAG ; **REQ_ETH_IP_01:** assign IP Address for VLAN_00_Diagnostic ; Chapter 2.6.1 : update the Switch configuration of CGW/IDCM/BDCM/VDCM; **2**、VC1/MCE Project: FSE-M only keep Android，delete QNX system , cancel Switch of FSE-M; Delete IP Address and Mac address of FSE-M_MPU_QNX; Delete **REQ_ETH_PORT_09.**		

CONTENT

1 General

1.1 Scope of the document

This document specifies the requirements for vehicle Ethernet addressing and VLAN configuration.

This document applies to HA1/VC1/VX1-MCE Network Platform Development of Human Horizons Technology Co., Ltd. (The following abbreviations HHT), and may also applies to subsequent models of HHT.

If there are any inconsistencies between this document and others, please handle as follows:

1) ECU Component Technical Specifications take precedence over this document;
2) The legislations related take precedence over this document.

2 Addressing and VLAN configuration

2.1 MAC addresses

REQ_ETH_MAC_01: Unless for CGW_MPU, all Ethernet ECUs shall use static MAC address for in-vehicle communication in Table 1. A locally unique MAC address shall be assigned to each CGW_MPU.

Node	MAC address(Hex)
TBOX	36-7C-7C-00-00-01
CGW_MPU	Byte 1: 0x36. Byte 2: Production date – Year, packed BCD format. Byte 3: Production date – Month, packed BCD format. Byte 4: Production date – Day, packed BCD format. Byte 5-6: Product serial number, packed BCD format, 0000-9999.
CGW_MCU	36-7C-7C-00-00-03
IDCM_MPU_Android	36-7C-7C-00-00-04
ADCM_MPU	36-7C-7C-00-00-05
ADCM_MCU	36-7C-7C-00-00-06
VDCM_MPU	36-7C-7C-00-00-07
VDCM_MCU	36-7C-7C-00-00-08
BDCM_MPU	36-7C-7C-00-00-09
BDCM_MCU	36-7C-7C-00-00-0A
DSM	36-7C-7C-00-00-0B
ARC/ARHUD	36-7C-7C-00-00-0C
VSP	36-7C-7C-00-00-0D
DLP/ELM	36-7C-7C-00-00-0E
FSE-M_MPU_Android	36-7C-7C-00-00-0F
IDCM_MPU_QNX	36-7C-7C-00-00-10
APA	36-7C-7C-00-00-12
RVM	36-7C-7C-00-00-13

HPPM	36-7C-7C-00-00-15
LIDAR-1	36-7C-7C-00-00-16

Table 1 MAC address assignment

REQ_ETH_MAC_02: All switches shall learn the MAC addresses from the Ethernet traffic. The aging time for address table entries in switches shall be set to 300 seconds.

REQ_ETH_MAC_03: All switches shall flood the ingress broadcast and multicast Ethernet frames to all other switch ports that has the same VLAN membership with the ingress frame.

REQ_ETH_MAC_04: All switches shall not flood the ingress unicast Ethernet frames with unknown destination MAC address and shall discard it.

2.2 VLAN list

REQ_ETH_VLAN_01: The VLAN tags used for all in-vehicle Ethernet use cases shall follow Table 2. For more details about each Ethernet use case and involved ECUs, refer to related component technical specification or Ethernet use case documents.

VLAN Name	VLAN ID (Decimal)	Related Ethernet use case
VLAN_00	100	OTA Flash（Bosch）, OTA Cloud Channel , IDPS, Data Upload, File Transfer (e.g. NFS)
VLAN_01	101	Online Services
VLAN_02	102	DLP ISD , video stream
VLAN_03	103	xCall
VLAN_04	104	TBOX Service, BISW, IVEEC, SOA, ADAS-IOV Interact
VLAN_05	105	HD map, Lidar
VLAN_06	106	Reserved;
VLAN_07	107	Network Management
VLAN_00_DIAG	108	Diagnostic VLAN , OTA Flash (HH)
VLAN_04_INTERNAL	109	Internal communication between MPU and MCU inside ECU
VLAN_00_SOFTAP	110	Hot spot
VLAN_11	111	Paid Traffic
VLAN_00_EXT_DIAG	120	VLAN tag used only by CGW external diagnostic 100BASE-TX port. This tag is not routed in the vehicle.

Table 2 VLAN ID assignment

REQ_ETH_VLAN_02: Tagged VLAN according to IEEE 802.1Q shall be supported.

REQ_ETH_VLAN_03: All vehicle internal communication shall be VLAN tagged unless for the links IDCM-IEM.

REQ_ETH_VLAN_04: Untagged frames in all vehicle internal switch ports shall be dropped unless for the links IDCM-IEM.

REQ_ETH_VLAN_05: Ingress tagged frames shall be dropped if the ingress port is not a member of the

frame's VLAN id, and the frame is only allowed to exit those ports that are member of the frame's VLAN id.

REQ_ETH_VLAN_06: Tagged frames sent outside from CGW 100 BASE-TX switch port shall preserve or discard VLAN tag according to Table 6.

REQ_ETH_VLAN_08: Double-tagged frames shall be dropped on each port.

REQ_ETH_VLAN_10: The vehicle external untagged traffic incoming on CGW 100 BASE-TX switch port shall be tagged with VLAN_00_EXT_DIAG as default VLAN tag.

REQ_ETH_VLAN_11: VLAN_04_INTERNAL is used for all internal communication between MPU and MCU for ECUs which only exposes MPU outside.

2.3 IP Address assignment

2.3.1 Wired communication

REQ_ETH_IP_01: All IP addresses for in-vehicle wired communication shall be assigned statically according to Table 3.

Node	VLAN_00	VLAN_01	VLAN_02	VLAN_03	VLAN_04	VLAN_05	VLAN_06	VLAN_07	VLAN_00 DIAG	VLAN_04 _INTERNAL	VLAN_00 _SOFTAP	VLAN_11 Paid Traffic	Subnet IDCM-IEM
TBOX	192.168.00.1	192.168.01.1	-	192.168.03.1	192.168.04.1	-	-	-	192.168.08.1	-	192.168.10.1	192.168.11.1	-
CGW_MPU	192.168.00.2	-	-	-	192.168.04.2	-	-	-	192.168.08.2	-	-		-
CGW_MCU	192.168.00.3	-	-	-	-	-	-	-	192.168.08.3	-	-		-
IDCM_MPU_Android	192.168.00.4	192.168.01.4	192.168.02.4	192.168.03.4	192.168.04.4	-	-	-	192.168.08.4	-	192.168.10.4	192.168.11.4	192.168.30.1
ADCM_MPU	192.168.00.5	192.168.01.5	-	-	192.168.04.5	192.168.05.5	-	-	192.168.08.5	192.168.09.5	-		-
ADCM_MCU	-	-	-	-	-	-	-	-	-	192.168.09.6	-		-
VDCM_MPU	192.168.00.7	-	-	-	192.168.04.7	-	-	-	192.168.08.7	192.168.09.7	-		-
VDCM_MCU	-	-	-	-	-	-	-	-	-	192.168.09.8	-		-
BDCM_MPU	192.168.00.9	-	-	-	192.168.04.9	-	-	-	192.168.08.9	192.168.09.9	-		-
BDCM_MCU	-	-	-	-	-	-	-	-	-	192.168.09.10	-		-
DSM	192.168.00.11	-	-	-	192.168.04.11	-	-	-	192.168.08.11	-	-		-
ARC/ARHUD	192.168.00.12	-	-	-	192.168.04.12				192.168.08.12				
VSP	192.168.00.13	192.168.01.13	-	-	192.168.04.13				192.168.08.13				
DLP/ELM	192.168.00.14	-	192.168.02.14	-	-	-	-	-	192.168.08.14	-	-		-
IEM/DVR	-	-	-	-	-	-	-	-	-	-	-		192.168.30.2
FSE-M_MPU_Android	192.168.00.16	192.168.01.16	192.168.02.16	-	192.168.04.16	-	-	-	192.168.08.16	-	-	192.168.11.16	
IDCM_MPU_QNX	192.168.00.17				192.168.04.17				192.168.08.17		-		
APA	192.168.00.19				192.168.04.19				192.168.08.19				

RVM	192.168.00.20		192.168.02.20						192.168.08.20				
HPPM	192.168.00.22	192.168.01.22			192.168.04.22				192.168.01.22				
LIDAR-1	192.168.00.23					192.168.05.23		-	192.168.08.23				

Table 3 IP address assignment

REQ_ETH_IP_02: 192.168.08.2 is used for in-vehicle diagnostic communication between CGW_MPU and other Ethernet ECUs. For communication between CGW_MPU and external diagnostic tester, an external IP address is assigned by DHCP.

REQ_ETH_IP_03: The network mask for all IPv4 address assigned above is 255.255.255.0.

REQ_ETH_IP_04: For communication between IDCM and IEM, use static IP address assigned in column “Subnet IDCM-IEM” for all traffic between this link. IDCM shall support IP routing for all other ECU’s traffic sent to IEM. All other ECUs (exclude IDCM and IEM) which want to access IEM shall add a routing entry in ECU routing table which assigns IDCM as the gateway to access IEM subnet.

2.4 Traffic priorities

REQ_ETH_PRI_01: The priority value (IEEE 802.1Q PCP) for each VLAN tag defined in Table 2 shall be assigned as Table 4.

Priority level (IEEE 802.1Q PCP)	**VLAN Name**
0 (lowest)	VLAN_00 VLAN_00_DIAG VLAN_00_SOFTAP VLAN_00_EXT_DIAG
1	VLAN_01 VLAN_11
2	VLAN_02
3	VLAN_03
4	VLAN_04 VLAN_04_INTERNAL
5	VLAN_05
6	VLAN_06
7 (highest)	VLAN_07

Table 4 Traffic priorities assignment

REQ_ETH_PRI_02: For single-tagged VLAN frame, the TPID of the VLAN tag is 0x8100(Customer VLAN tag).

REQ_ETH_PRI_04: For ECU which has a switch inside, Strict-priority scheme shall be used as port's scheduling mode for all switch ports.

2.5 Multicast address assignment

REQ_ETH_MUL_01: The multicast IP address used for each VLAN/subnet shall follow Table 5.

VLAN ID/Subnet	**Multicast address**	**Related use cases**
VLAN_00	239.0.0.1	SOME/IP SD
VLAN_03	239.0.3.1	SOME/IP SD
VLAN_04	239.0.4.1	SOME/IP SD
VLAN_05	239.0.5.1	SOME/IP SD
VLAN_04_INTERNAL	239.0.9.1	SOME/IP SD
Subnet IDCM-IEM(untagged)	239.0.30.1	SOME/IP SD

Table 5 Multicast IP address assignment

REQ_ETH_MUL_02: All ECUs which need to implement SOME/IP in the VLAN above shall be included in the corresponding multicast group.

2.6 ECU port configuration

The 100 BASE-T1 and 1000 BASE-T1 transceivers must be configured either as master or slave.

REQ_ETH_PORT_01: For ECUs which has no switch inside (that is TBOX, DSM, ARC/ARHUD, VSP ,APA, RVM, HPPM, DLP/ELM, LIDAR-1,FSE-M), the port PHY mode is configured as slave.

REQ_ETH_PORT_02: For ECUs which has switch inside, the switch port assignment is detailed in chapter 2.6.1.

2.6.1 Switch port assignment

Concrete rules for filtering and forwarding from one port to another shall be defined once the VLANs, the use cases, the ECU to switch port assignments are finalized. Following tables specify, for each switch, the port connections, the VLAN tags transported on those ports and the associated PHY master/slave configuration.

REQ_ETH_PORT_03: The port PHY mode and VLAN membership of CGW switch shall be configured as Table 6.

Connected Node		VLAN TAGs	Egress frames tagged or untagged	PHY config [Master/Slave]
TBOX		VLAN_00, VLAN_01, VLAN_03, VLAN_04, VLAN_00_DIAG VLAN_00_SOFTAP, VLAN_11	Tagged	Master
CGW_MPU		VLAN_00, VLAN_04, VLAN_00_DIAG, VLAN_00_EXT_DIAG	Tagged	N/A (no PHY)
CGW_MCU		VLAN_00, VLAN_00_DIAG	Tagged	N/A (no PHY)
IDCM_SW		VLAN_00, VLAN_01, VLAN_03, VLAN_04, VLAN_00_DIAG, VLAN_00_SOFTAP, VLAN_11	Tagged	Master
ADCM_SW		VLAN_00, VLAN_01, VLAN_04, VLAN_00_DIAG	Tagged	Master
VDCM_SW		VLAN_00, VLAN_04, VLAN_00_DIAG	Tagged	Master
BDCM_SW		VLAN_00, VLAN_04, VLAN_00_DIAG	Tagged	Master
HPPM		VLAN_00, VLAN_01, VLAN_04, VLAN_00_DIAG	Tagged	Master
APA		VLAN_00, VLAN_04, VLAN_00_DIAG	Tagged	Master
DSM		VLAN_00, VLAN_04, VLAN_00_DIAG	Tagged	Master
External Tester(OBD)	For engineering debug version software	VLAN_00, VLAN_01, VLAN_02, VLAN_03, VLAN_04, VLAN_06, VLAN_07, VLAN_00_EXT_DIAG, VLAN_00_SOFTAP, VLAN_11	Untagged for VLAN_00_EXT_DIAG; Tagged for all other VLAN.	Auto negotiation (100 Base-TX)
	For final frozen software	VLAN_00_EXT_DIAG	Untagged for VLAN_00_EXT_DIAG	

Table 6 Port assignment for CGW switch

REQ_ETH_PORT_05: The port PHY mode and VLAN membership of IDCM switch shall be configured as Table 7.

Connected Node	VLAN TAGs	PHY config [Master/Slave]
CGW_SW	VLAN_00, VLAN_01, VLAN_03, VLAN_04, VLAN_00_DIAG, VLAN_00_SOFTAP, VLAN_11	Slave
IDCM_MPU	VLAN_00, VLAN_01, VLAN_02, VLAN_03, VLAN_04, VLAN_07, VLAN_00_DIAG, VLAN_00_SOFTAP, VLAN_11	N/A (no PHY)
ARC/ARHUD	VLAN_00, VLAN_04, VLAN_00_DIAG	Master
VSP	VLAN_00, VLAN_01, VLAN_04, VLAN_00_DIAG	Master
DLP/ELM	VLAN_00, VLAN_02, VLAN_00_DIAG	Master
RVM	VLAN_00, VLAN_02, VLAN_00_DIAG	Master
FSE-M	VLAN_00, VLAN_01, VLAN_02, VLAN_04, VLAN_07, VLAN_00_DIAG, VLAN_11	Master

Table 7 Port assignment for IDCM switch

REQ_ETH_PORT_06: The port PHY mode and VLAN membership of ADCM switch shall be configured as Table 8.

Connected Node	VLAN TAGs	PHY config [Master/Slave]
CGW_SW	VLAN_00, VLAN_01, VLAN_04, VLAN_00_DIAG	Slave
ADCM_MPU	VLAN_00, VLAN_01, VLAN_04, VLAN_05, VLAN_07 VLAN_00_DIAG, VLAN_04_INTERNAL	N/A (no PHY)
ADCM_MCU	VLAN_07, VLAN_04_INTERNAL	N/A (no PHY)
LIDAR-1	VLAN_00, VLAN_05, VLAN_07, VLAN_00_DIAG	Master

Table 8 Port assignment for ADCM switch

REQ_ETH_PORT_07: The port PHY mode and VLAN membership of VDCM switch shall be configured as Table 9.

Connected Node	VLAN TAGs	PHY config [Master/Slave]
CGW_SW	VLAN_00, VLAN_04, VLAN_00_DIAG	Slave
VDCM_MPU	VLAN_00, VLAN_04, VLAN_04_INTERNAL, VLAN_00_DIAG	N/A (no PHY)
VDCM_MCU	VLAN_04_INTERNAL	N/A (no PHY)

Table 9 Port assignment for VDCM switch

REQ_ETH_PORT_08: The port PHY mode and VLAN membership of BDCM switch shall be configured as Table 10.

Connected Node	VLAN TAGs	PHY config [Master/Slave]
CGW_SW	VLAN_00, VLAN_04, VLAN_00_DIAG	Slave
BDCM_MPU	VLAN_00, VLAN_04, VLAN_04_INTERNAL, VLAN_00_DIAG	N/A (no PHY)
BDCM_MCU	VLAN_04_INTERNAL	N/A (no PHY)

Table 10 Port assignment for BDCM switch

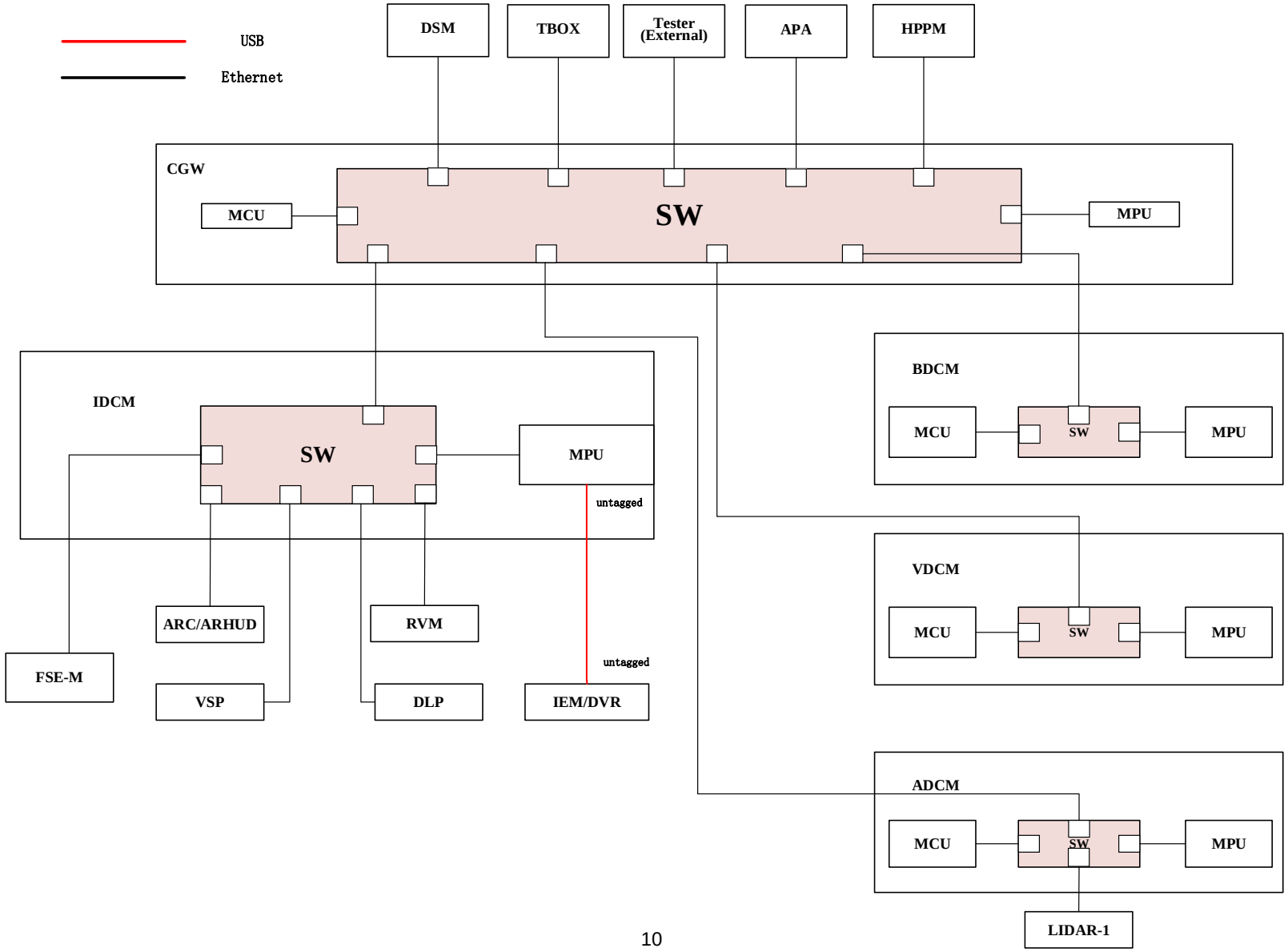
USB
Ethernet
DSM
TBOX
Tester (External)
APA
HPPM
CGW
MCU
SW
MPU
IDCM
SW
MPU
untagged
ARC/ARHUD
RVM
FSE-M
VSP
DLP
untagged
IEM/DVR
BDCM
MCU
SW
MPU
VDCM
MCU
SW
MPU
ADCM
MCU
SW
MPU
LIDAR-1

Figure 1 Ethernet Topology