5G V2V Collision Warning - CHN

Instrument Cluster Interface Specification (Based on CDC)

FNV

Approved by (dept, name, phone)	Issued by (dept, name, phone)
China DI/Cluster	ADAS/DAT, Dandan Chen(dchen97)

1.0 5G V2V Collision Warning - CHN Cluster/CDC

1.1 Functional Description

This STSS handles the functions associated with the 5G V2V Collision Warning - CHN feature, hereafter called V2V feature or V2V.

V2V feature is intended to assist the driver in driving situations that provides an imminent risk for collision. If V2V feature is enabled to display warnings, when there is some risk for collision, there is a collision warning message popup on cluster and chime to inform driver.

Note: The V2V system shall have the same priority level as the FCW system, which is the highest HMI priority of all systems in the vehicle. FCW shall occupy V2V if both activate at the same time or V2V activates earlier.

1.2 Interfaces

1.2.1 Interface Context Diagram (I/O Block Diagram)

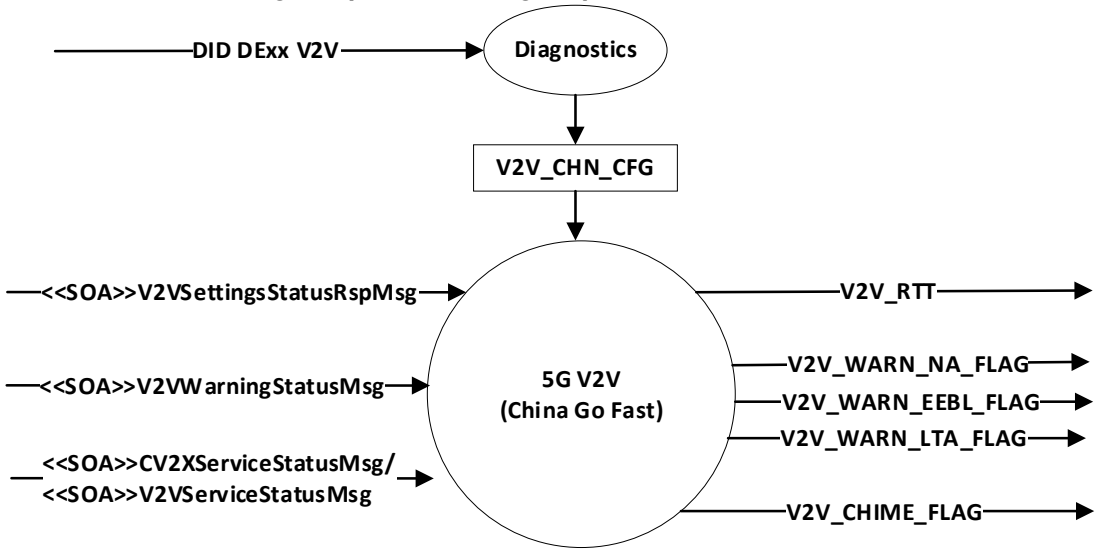

Figure 2.1 V2V Context Diagram

Note: Only one of <<SOA>>CV2XServiceStatusMsg and <<SOA>>V2VServiceStatusMsg exists.

1.2.2 Inputs

SOA messages inputs are from V2V application SW on TCU, details could be found in SPSS.

1.2.2.1 CV2XServiceStatusMsg

This is provided by TCU C-V2X Service Server, it is used to provide the CV2X TCU module status to subscribers. The CV2X System Server publishes this data On Change with the following data structure.

Method Type	On Change
QoS Level	Default
Retained	Yes

R/O	Name	Type	Literals	Value	Description
Request (_Rq)					
-	-	-	-	-	N/A
Response (_Rsp)					
R	msgID	uint8		0-255	
R	status	uint8		0 - 4	0=n/a 1=normal 2=Standby 3=Failure-temp 4=Failure-permanent

1.2.2.2 V2VSettingsStatusRspMsg

The full message is defined in the table below. The minimum set of data that will always be included is:
- Current Saved V2V Feature/Warning on/off Setting Status
- Current Saved V2V Sensitivity high/normal/low Setting Status

Method Type	One Shot
QoS Level	Default
Retained	Yes

R/O	Name	Type	Literals	Value	Description
Request (_St)					
R	system_time	uint64	-	-	Vehicle system time in milliseconds
R	v2v_warn_on_off_setting	uint32	-	-	0 – inactive; 1 – on; 2 - off
R	v2v_warn_sensitivity_setting	unit32	-	-	0 – inactive; 1 – low; 2 – normal; 3 - high
R	v2v_bsm_tx_on_off_setting (reserved)	uint32	-	-	0 – inactive; 1 – on; 2 -off
R	v2v_sub_features_on_off_setting (reserved)	uint32	-	-	Bit 0: reserved Bit 1: EEBL Bit 2: LTA Bit 3: IMA Bit 4 – Bit 31: reserved 0x0: off 0x1: on
R	v2v_reserved_setting (reserved)	uint32	-	-	reserved

1.2.2.3 V2VWarningStatusMsg

The full message is defined in the table below. The minimum set of data that will always be included is:
- V2V Warning Type

Method Type	Event Periodic
QoS Level	Default
Retained	No

R/O	Name	Type	Literals	Value	Description
Request (_St)					
R	system_time	uint64	-	-	Vehicle system time in milliseconds
O	protocol_version	uint32	-	-	0 – initial version
R	v2v_warn_type	uint32	-	-	0 – No warning; 1- EEBL; 2 – LTA; 3 – IMA L (reserved); 4 – IMA R (reserved)

1.2.2.4 V2VServiceStatusMsg

The full message is defined in the table below. The minimum set of data that will always be included is:

- Status

Method Type	OnChange
QoS Level	Default
Retained	Yes

R/O	Name	Type	Literals	Value	Description
Request (_Rq)					
-	-	-	-	-	N/A
Response (_Rsp)					
R	system_time	uint64	-	-	Vehicle system time in milliseconds
R	status	uint8	-	-	0=n/a 1=normal 2=Standby 3=Failure-temp 4=Failure-permanent

1.2.3 Outputs

Table 2.1 State Chart for V2V RTT, Warning Display and Chime

Inputs					Outputs				
Operational-Mode	**V2V_CHN_CFG**	**<<SOA>>V2VSettingsStatusRspMsg with data v2v_warn_on_off_setting**	**<<SOA>>CV2XServiceStatusMsg/ V2VServiceStatusMsg with data status**	**<<SOA>>V2VWarningStatusMsg with data v2v_warn_type**	**V2V_RTT**	**V2V_WARN_NA_FLAG**	**V2V_WARN_EEBL_FLAG**	**V2V_WARN_LTA_FLAG**	**V2V_CHIME_FLAG**
Normal	Enabled (0x1)	1=on	4=failure-permanent	X	ON -RED(0x3)	ACT	Ina	Ina	Ina
			NOT 1 or 4	X	ON-AMBER(0x2)	Ina	Ina	Ina	Ina
			1=normal	NOT 0, 1 or 2	ON-AMBER(0x2)	Ina	Ina	Ina	Ina
			1=normal	1=EEBL	ON-GREEN(0x1)	Ina	ACT	Ina	ACT
			1=normal	2=LTA	ON-GREEN(0x1)	Ina	Ina	ACT	ACT
			1=normal	0=No warning	ON-GREEN(0x1)	Ina	Ina	Ina	Ina
All Other Cases					Off (0x0)	Ina	Ina	Ina	Ina

X = Don't Care
Ina = INACTIVE (0x0)
ACT = ACTIVE (0x1)

Note: Only one of <<SOA>>CV2XServiceStatusMsg and <<SOA>>V2VServiceStatusMsg exists.

Table 2.2 Parameters of V2V Warning

Parameter Name	MC WARNING MESSAGE ID	Text	Default Value
V2V_WARN_EEBL_FLAG	W992493V2VCHN	"Attention! Front Emergency Braking. " “注意！ 前车急刹”	Ina
V2V_WARN_LTA_FLAG	W992492V2VCHN	"Attention! Vehicle oncoming. " “注意！ 前方来车”	Ina
V2V_WARN_NA_FLAG	W999999V2VCHN	"V2X not available, please go to the dealer for maintenance." “车车协同故障，请联系经销商维修。”	Ina

1.3 Function/Performance

1.3.1 Operational Modes

Table 3.1 Operational Modes

Mode	Differentiating Vehicle Conditions
Sleep Mode	5G V2V Cluster Information Disabled
Limited Mode	5G V2V Cluster Information Disabled
Normal Mode	5G V2V Cluster Information – ability to change the settings and display warnings, RTTs & Chime Enabled / Disabled
Crank Mode	5G V2V Cluster Information – ability to change the settings and display warnings, RTTs & Chime Enabled / Disabled

1.3.2 Voltage Levels

None

1.3.3 Human-Machine Interface

1.3.3.1 Visual

1.3.3.1.1 Indicator Graphics / Display Format

RTTs (examples, for reference only, final HMI to be provided by HMI UX/UI team):

Warnings displays (examples, for reference only, final HMI to be provided by HMI UX/UI team):

W992493V2VCHN (EEBL)	W992492V2VCHN (LTA)	W999999V2VCHN (NA)
		

Table 3.2 Alerts definition

ID	Seq. #	System Name	Warn Type	Time Out	LM	Icon	Message Color	Chime Type: (Reference Only) (Yes/No)
W992493V2VCHN (EEBL)	21	V2V Collision V2V_WARN_EEBL	RGA	n/a	No	**TBD**	Red	Yes
W992492V2VCHN (LTA)	21	V2V Collision V2V_WARN_LTA	RGA	n/a	No	**TBD**	Red	Yes

Note: W992493V2VCHN(EEBL) and W992492V2VCHN(LTA) should have the priority just after W3296 FCW_WARN. If global alerts list uses the same sequence number as W992493V2VCHN(EEBL) and W992492V2VCHN(LTA) someday, then the sequence number of W992493V2VCHN and W992492V2VCHN should be updated according to the new alerts.

Table 3.3 Warnings definition

ID	Seq. #	System Name	Warn Type	Time Out	LM	Icon	Message Color	Chime Type: (Reference Only) (Yes/No)
W999999V2VCHN (NA)	3299	V2V Collision V2V_WARN_NA	SC*	n/a	No	**TBD**	Amber	No

Note: If global warning list used the same sequence number as W999999V2VCHN someday, then the sequence number of W999999V2VCHN should be updated accordingly to the new warnings.

1.3.3.1.2 Indicator Color Coordinates

None.

1.3.3.2 Audio

Arbitration Sequence	Warning	Chime status flag	Brand_Cfg	Last Chime Sounded	Priority	Concurrency	InfoCAN Signal: Chime_Directionality	InfoCAN Signal: Chime_Time_Criticality	InfoCAN Signal: Chime_Vol_Level	InfoCAN Signal: IPC_Attn_Info_Audio	InfoCAN Signal: Off_Time_Btwn_Chime	InfoCAN Signal: Chime_Occurence	InfoCAN Signal: Chime	InfoCAN Signal: AdjustableChimeVol_Rq	InfoCAN Signal: ChimeId_No_Rq
589	V2V Collision Avoidance	V2V_Chime_Status_Flag	X	22	0x6	0x0	0x2	0x1	0x0	0x6	0x1	0x1	0x17	0x0	OxFE

Note: EEBL and LTA share the same chime as FCW. The IPC shall arbitrate and generate sound warning to alert the driver and send the chime request to the audio system. The audio shall be used to alert the driver of an impending collision, at the same time as the visual warning. Please be noted that ChimeId_No_Rq should be unique for V2V Chime.

1.3.3.3 Switch Control Logic

There is an ‘OK’ button for the V2V not available warning message. The V2V not available warning message will be displayed on the cluster, and the driver could minimize the V2V not available warning message by clicking the ‘OK’ button.

If the failure is not repaired, the V2V permanent failure warning message will be displayed again for certain time before driver minimizes it through the ‘OK’ button on the new ignition cycle.

“OK” button is not needed for EEBL and LTA warning message.

1.3.4 System Accuracy

1. RTT and warning display should be displayed within 100ms after corresponding SoA message received.
2. Chime should be generated synchronized with corresponding V2V Collision (EEBL & LTA) warning display (within 70ms after corresponding signal received).
3. Once V2V and FCW activate at the same time, the HMI shall respond to the FCW system as higher priority.

1.3.5 Operation: Performance and Functional

1.3.5.1 5G V2V Flowchart

Figure 3.1 shows the display and chime on cluster logic for 5G V2V.

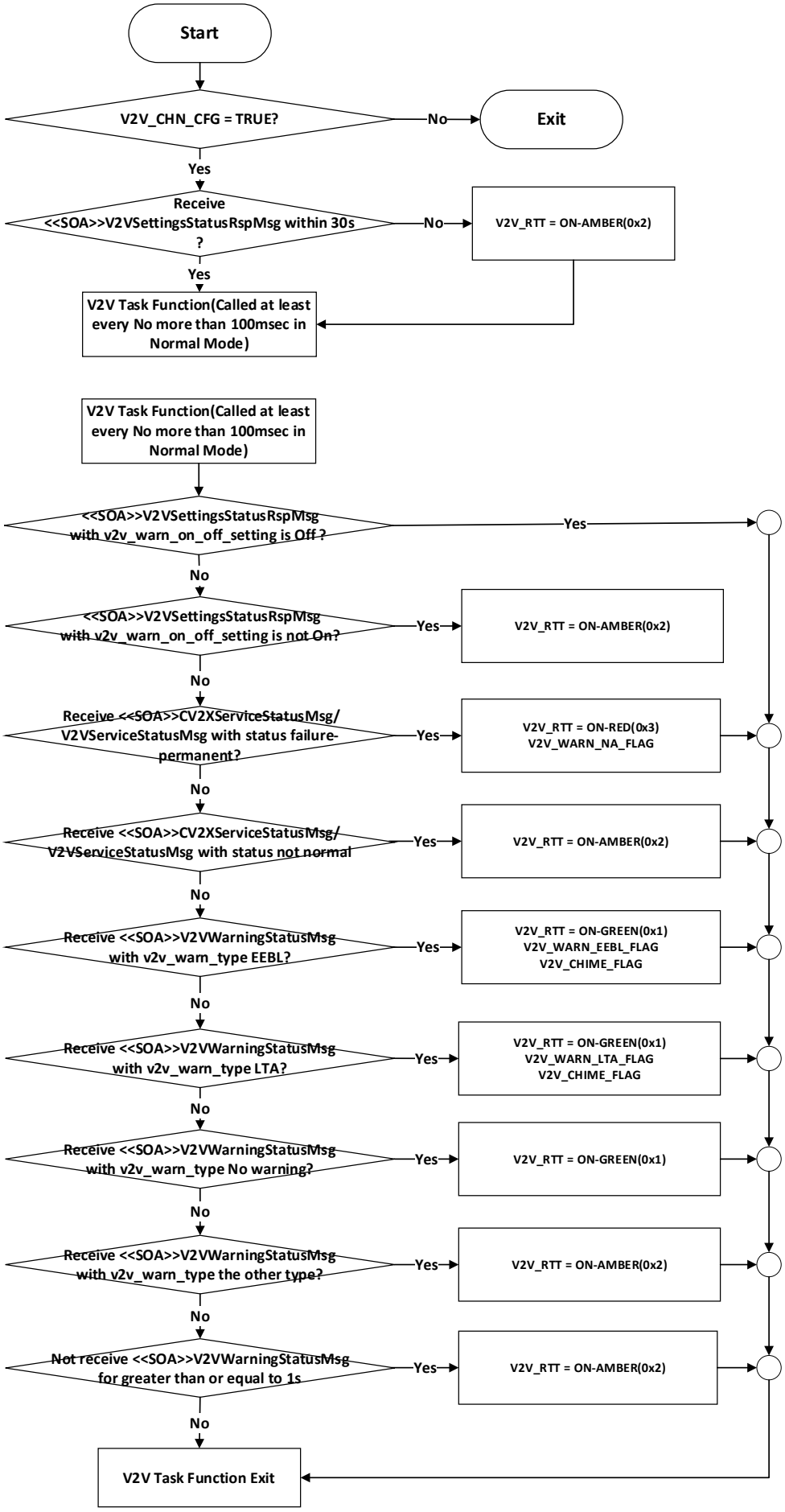

Figure 3.1 Display and chime on cluster logic for 5G V2V

Note: the execution period will be further discussed for determination to meet the system accuracy, currently suggest using 50msecs.

1.3.5.2 Operation Description (supports algorithm flowchart)

V2V settings are at IVI instead of cluster.

1.3.5.3 Personalization Feature Number Definition:

None

1.3.5.4 Function Safety Classification (EMC)

Class B.

1.3.5.5 Memory Storage

None.

1.3.5.6 Prove Out

None.

1.3.5.7 Reconfigurable Telltale

Refer to 1.3.3.1

1.3.5.8 Message Center Msg

Refer to table3.1 and table3.2, alerts and warnings definition.

1.4 Error Handling

1.4.1 Missing Message Strategy

If event periodic SOA message V2VWarningStatusMsg is not received in 30s, then amber RTT is generated.

1.5 Diagnostics

1.5.1 Self Test

None.

1.5.2 Engineering Test Mode

Not Applicable.

1.5.3 Part II Performance

1.5.3.1 DID $DExx

Block Num	Block Description	Size (bits)	Byte(s)	Bit(s)	State: Description	"0"	"1"	Default	Comments/ Information
PACKETED BLOCKS									
$0A	Option Content (B&A)	1	42	2	V2V_CHN_CFG	Disabled	Enabled	0	Disabled means the feature is not present in the vehicle.
$0A	Option Content (B&A)	1	42	1	V2V_CHN_CFG_EEBL (reserved)	Disabled	Enabled	0	Reserved
$0A	Option Content (B&A)	1	42	0	V2V_CHN_CFG_LTA (reserved)	Disabled	Enabled	0	Reserved
$0A	Option Content (B&A)	1	43	7	V2V_CHN_CFG_IMA (reserved)	Disabled	Enabled	0	Reserved
	*Byte and bit location to be identified in Part II Specification for this cluster.								

Note: please be aligned with file/workbook “China CDC Config” DE0A sheet.

1.5.3.2 Supported Diagnostic Trouble Codes (DTCs)

None.

1.6 Reference Specification

1. 5G V2V Collision Warning - CHN SPSS

2. China CDC Config
3. Audio Generated DNA Chimes- Cluster Chime Arbitrator - CGEA v8.28
4. Global_Msg_List_ver108_Released_3_31_2022.xlsx

1.7 Revision History

Revision Level	Name	Change Description	Date
1.0	Chen Dandan (dchen97)	Initial release.	April 29, 2022
1.1	Chen Dandan (dchen97) Zheng Dong (dzheng14)	1. Changed feature name from “5G V2V (China Go Fast)” to “5G V2V Collision Warning - CHN”. 2. Updated Seq# in table 3.2 and 3.3 to integers. 3. Added note for V2V task function execution period. 4. Updated DIDs.	October 27, 2022
1.2	Chen Dandan (dchen97) Zheng Dong (dzheng14)	1. Added V2VServiceStatusMsg definition, updated it in figure 2.1 and table2.1 added it in figure 3.1. 2. Table 2.1: Corrected failure-permanent value of CV2XServiceStatusMsg/ V2VServiceStatusMsg. 3. Figure 3.1: Added V2VWarningStatusMsg timeout handling and invalid V2VSettingsStatusRspMsg handling.	March 13, 2023