CV2X Product overview

CV2X or Cellular Vehicle to Everything is the latest, cutting-edge technology from Qualcomm Technologies, Inc. (QTI) aimed at collision avoidance and value-added services. CV2X enables the vehicles to communicate critical messages with everything around them, including other vehicles, infrastructure, and the network. CV2X is based on the 3GPP Release 14 standards for its first implementation and there are plans to continue introducing advanced features through the evolving 3GPP standards Release 15 and Release 16.

QTI plans numerous trials globally in 2018 to demonstrate the technical superiority of CV2X. The key component of these trials is the CV2X Development Platform that runs the new CV2X modem. The CV2X Development Platform will be integrated in the vehicles to enable over-the-air message exchanges with other vehicles having the same CV2X Development Platform (V2V communication) and can also be integrated with traffic lights for the V2I communication.

The CV2X Development Platform is not a reference design and is only a platform for conducting trials by various partners around the globe that QTI is partnering with.

The CV2X Development Platform includes the MDM9250 modem and supports the RFFE to enable 5.9 GHz transmission and reception of basic safety messages in the 5.9 GHz spectrum set reserved for ITS communications in some countries. It does not have the capability to run concurrent WAN (LTE) and CV2X, which is planned for future revisions of the CV2X Development Platform.

The CV2X Development Platform also houses the Qualcomm® Snapdragon™ 820A chipset for running the ITS stack from third-party vendors. The Snapdragon 820A chipset also runs the QTI-supplied software development kit to abstract the functionality of the CV2X modem and a kinematics framework to obtain fixes using GNSS and dead reckoning (based on the Qualcomm dead reckoning solution), running on the A7 processor of the MDM9250 and the vehicular information from the CAN interfaces on the car.

The CV2X platform enables demonstrations of V2V/V2I/V2P (vehicle to vehicle, vehicle to infrastructure, vehicle to pedestrian) and V2N (vehicle to network) functionalities.

The V2N functionality is implemented by the telematics control unit (MDM9250 CCARD). The V2V functionality is implemented by the CV2X Development Platform. The CCARD and CV2X Development Platform units communicate with each other via an Ethernet RJ-45 connection.
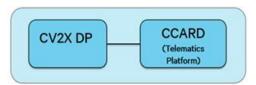

Figure 2-1 High-level block diagram of CV2X

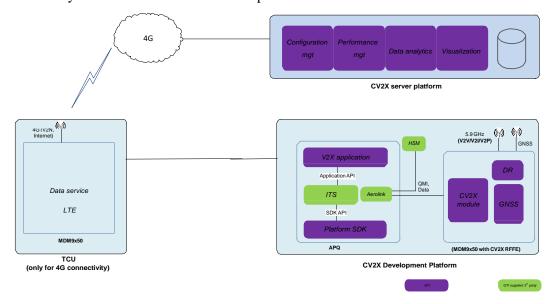Figure 2-2 is a system architecture of the CV2X platform.

Figure 2-2 CV2X platform system architecture

2.1 Features

The CV2X DP major features:

- CV2X 3GPP single channel radio

- 2.4 GHz Wi-Fi 802.11n connectivity

- GNSS supporting QDR3 (Qualcomm dead reckoning) for 10 Hz augmented location fixes (The QDR application must be running for CAN messages to be received.)

- 3x CAN interfaces to access vehicle data information

- HSM for storing private keys and signing ITS messages

- 1x 1000Base-T Ethernet using an RJ-45 connector

- USB 3.0 ports for debugging on both the MDM9250 and APQ8096AU modules

- 1x USB 2.0 host port on the APQ8096AU module

- The CV2X module RFFE supports the following bands:
    □ B46D: 5725–5825 MHz
    □ B47: 5850–5925 MHz

- Computing module (APQ8096AU) to run the ETSI and/or WAVE + SAE, China-SAE ITS stack

2.2 High-level architecture

Figure 2-3 illustrates the high-level architecture of the CV2X DP hardware. The CV2X module is an LGA module with the MDM9250 system on chip (SoC), power management IC, memory (NAND + LPDDR2), WTR5975 RF transceiver, and RF front-end for 5.9 GHz operation. The Indigo APQ8096AU SoM is a module including the APQ8096AU SoC, the PMIC8996AU power management IC, and LPDDR4 memory.
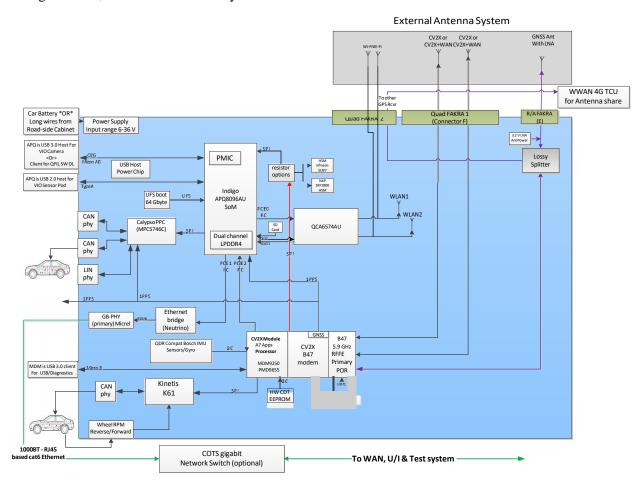

Figure 2-3 CV2X Development Platform high-level block diagram

2.2.1 Main components

The following is a list of major hardware components on the CV2X Development Platform (DP):

- MDM9250 module:
  - □ MDM9250 SoC
  - □ PMD9655 power management IC
  - □ WTR5975 transceiver

- □ LPDDR2/NAND MCP: MT29RZ4B2DZZHHWD-18I.84F (512 MB NAND + 256 MB LPDDR2)
- □ RF front-end components including power amplifiers, antenna switch modules, low noise amplifiers, and filters
- ■ APQ8096AU module:
  - □ APQ8096AU SoC
  - □ PM8996AU power management IC
  - □ LPDDR4 K4F6E3D4HB-MFCH memory (two memory parts of 2 GB each, totaling 4 GB)
- ■ Micro-SIM card slot (3FF)
- ■ QCA6574AU daughtercard
  - □ Wi-Fi: 2.4 GHz, 802.11n, 2×2
  - □ Bluetooth 4.2 + BLE
- ■ Toshiba TC9560XBG Ethernet
- ■ NXP Calypso MPC5746C MCU with support for CAN and LIN
- ■ NXP Kinetis K61 CAN MCU with support for CAN
- ■ BMI160 6-axis IMU
- ■ HSM: Infineon SLI97