CONNECTING THE MOBILITY WORLD WITH 5G-V2X
C-V2X Ignites Automotive Connected Revolution

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Sr. VP, Product Management
Qualcomm Technologies, Inc.
Precise positioning
Lane-level accuracy anywhere, anytime

Bluetooth
For high quality voice and audio

Wi-Fi
For in-car experiences and car OEM services

4G/5G
For car OEM services

4G/5G
For driver and passengers

C-V2X Direct Communications
For car-to-infrastructure communication

C-V2X Direct Communications
For car-to-car communication

Car connectivity in the 5G era
Heterogeneous connectivity
Secure, virtualized wireless links
Advanced Positioning
Multi-environment implementation

4G/5G is referring to C-V2X network communications (i.e. V2N); C-V2X Direct Communications is referring to V2V, V2I, V2P
Smart transportation infrastructure supported by our foundational technologies

- Artificial intelligence
- Mobile Edge Compute
- Sensor fusion
- Multimode 4G/5G
- C-V2X Direct Communications
- Precise positioning
- Computer vision
- Power management
- Security

**Smart RSU/Small cell**
- 4G/5G small cell
- Integrated C-V2X support
- Infrastructure-to-vehicle (I2V)
- AI/perception and sensor fusion
- AI-based camera, radar, lidar
- Precise positioning and 3D HD mapping

**Smart connected cars**
- 4G/5G support
- Integrated C-V2X support
- Precise positioning
- AI/perception and sensor fusion
Qualcomm® Connected Car Reference Design, Gen 2

Qualcomm® Snapdragon™ Automotive 4G/5G platforms

Application Processor
With telematics SDK

Stack apps
Multicore CPU
VEPP
Security verifies

Multicore DSP
Accelerator
ECDSA

Rel-15 5G NR
Standalone
Non-standalone
FDD
TDD

Rel-14 LTE Advanced Pro
FD-MIMO
Up to 5 aggregated LTE carriers

Rel-14/Rel-15 C-V2X
5G / 4G spectrum sharing
Dual SIM Dual Active (DSDA)
Multi-frequency GNSS with QDR3
RF management with envelope tracking
On-board processing with telematics SDK and apps
IP acceleration (IPA)

Memory
RF front-end
RF ICs + antenna modules
HSM
PMIC
SDRs
Wi-Fi 6 BT5.1

Qualcomm Connected Car Reference Design and Qualcomm Snapdragon Automotive 4G/5G Platforms are products of Qualcomm Technologies, Inc. and/or its subsidiaries
1. Elliptic Curve Digital Signature Algorithm, 2. Vision Enhanced Precise Positioning
Strong C-V2X momentum globally

- **Sep 2016** 5GAA Founded
- **Jan 2017** ConVeX trial in Germany announced
- **Mar 2017** Rel-14 C-V2X spec finalized
- **Sep 2017** First C-V2X chipset introduced
- **Jun 2018** 1st US deployment in Denver
- **Oct 2018** Multi-OEM performance evaluation of C-V2X
- **Nov 2018** Reaches 100 members
- **Jan 2019** Cooperative driving live interactive demos in Las Vegas:

**2016**
- **Sep** Founded

**2017**
- **Jan** ConVeX trial announced
- **Mar** Rel-14 C-V2X spec finalized
- **Sep** First C-V2X chipset introduced

**2018**
- **Jun** 1st US deployment
- **Oct** Multi-OEM performance evaluation

**2019**
- **Jan** Cooperative driving live interactive demos

**2016-2019**
- **C-V2X momentum globally**
Colorado DOT CDOT C-V2X Deployment Program
Helping bring a comprehensive ecosystem together

Working across industries to forge sustainable relationships, unlocking new value
5GAA Automotive Association
Airgain • Alpine Electronics • Analog Devices • Anritsu EMEA Ltd
AT&T • Audi BAIC • Beijing University • Bell Mobility • BMW • Bosch
CATT • Cetecom • China TransInfo • China Unicom • CMCC
Continental Daimler • Danlaw • DEKRA Denso • Deutsche Telekom
Ericsson • FEV • Ficosa • Ford • Fraunhofer Gemalto Hirschman Car
Hitachi Automotive US • Honda • Huawei Infinon • Intel Inteldigital
Jaguar Land Rover • Juniper • KDDI • Keysight • KT • Laird Tech • LG
Murata • Nissan • Nokia • NTT DoCoMo • OKI • Orange • P3 Group
Panasonic • Proximus • PSA • Qualcomm • Rohde & Schwarz Rohm
SAIC • Samsung • Savari • SIAC • SK Telecom • Skyworks Softbank
Sumitomo • Telefonica • Telekom Austria • Telstra • TÜV • Valeo
Veriam • Verizon • Viavi • Vodafone • Volkswagen • ZF • ZTE

Key participants
driving global C-V2X activities with Qualcomm Technologies

Ford
PSA
BMW
Daimler
SAIC
China Domestic OEMs
Continental
Bosch
LG
ZTE
Quectel
Lear
Valeo
WNC
CMCC
AT&T
DoCoMo
CMRI
McCain
Kapsch
SWARCO
Genvict
Nebula
R&S
Datang
Ficosa
And more ...

Tremendous traction across regions and broad industry sectors
From standards completion to independent field testing to early commercialization