

The C-V2X Deployment Journey toward Next Generation Mobility

August 7 台 09:00 AM (PDT) 12:00 PM (EDT)

This webinar is the continuation of the 5GAA webinar series tailored for US Road Infrastructure Owner-Operators. The webinar will show

- that C-V2X deployment and end-to-end services are very real – and transformational
- on the 'entrance ramp' to C-V2X use of 5.9 GHz with the impeding FCC rulemaking
- ✓ the rich C-V2X technology ecosystem
- ✓ the ongoing C-V2X deployment activities
- ✓ end-to-end services to be delivered in the new future

Agenda

Introduction

Jim Misener, 5GAA Board Member/Qualcomm

Agencies Continue to Break CV Barriers!

Alan Clelland, Vice President, West at Applied Information

Neutral Host Digital Infrastructure For Intelligent Transportation

Youssef Abdelilah, Global Innovation – Office of CTO at American Tower

The role of MNOs in the Future of Transportation

Jyoti Sharma, Manager of Technology Strategy & Architecture at Verizon

Multi-Access Edge Computing (MEC) for C-V2X

Suman Sehra, Global Director at Intel and Ming Lei, Senior Platform Architect at Intel

Q&A

Moderated by Jim Misener, 5GAA Board Member/Qualcomm

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Practical Information

- Attendees are by default on mute to avoid background noise
- The web-conference has two parts:
 - Speakers presentations (50 minutes)
 - Q&A session (40 minutes)
- We kindly ask you to submit your questions in a written form, using the question bar rather than raising your hand

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Have a great webconference!



Agencies Continue to Break CV Barriers!

Alan Clelland Applied Information



Prior Presentation

- Showcased Deployments using C-V2X technologies in Georgia:
 - City of Marietta
 - 1st city in the United States to deploy a city-wide C-V2X (C2N) cellular-based connected vehicle system
 - City of Alpharetta
 - Mixture of intersections with DSRC and C-V2X Direct and Network







Day 1 Applications provided Clear Benefits to the cities and their Residents/Road Users

- Emergency Response times decreased and lives saved
- Transit schedule adherence improved
- Cost savings in city operations
- Better monitoring of infrastructure equipment leading to higher availability









The C-V2X Deployments Continue.....

- The Nimitz Corridor Project, Hawaii
 - Joint project between Hawaii DOT and the University of Hawaii
 - First deployment of dual mode/dual active equipment
 - Qualcomm C-V2X chip set used
 - Assessment of technology and applications including:
 - Emergency Vehicle Preemption
 - Transit Signal Priority
 - Traffic Signal Efficiency Improvements
 - Red Light Violation Warning
 - Pedestrian in Crosswalk Warning



Dual Mode/Dual Active now in Operation!!







The Nimitz Corridor





... with Cities, too!

- City of Arlington, TX
 - City desire to continue initial investment in CV applications through C-V2X Direct and Network
 - Piggy-backs on existing fiber network
 - Emergency Vehicle Priority
 - 31 intersections
 - 10 vehicles





Conclusions Drawn/Results so far?

- C-V2X deployments continue and are **gaining momentum** when they :
 - Support Day 1 applications with clear benefits
 - Protect the agency's investment through future-proofing
- Nimitz Corridor is the pre-cursor to the Hawaii DOT's announced intention to equip all the islands



Thank you!

Alan Clelland Applied Information Inc aclelland@appinfoinc.com

Neutral Host Digital Infrastructure For Intelligent Transportation

Site #282706, 160' monopole tower, Woburn, MA

Youssef Abdelilah

Office of the CTO

7th August 2020

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American Tower Overview¹

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A Leading Independent Tower Provider and The Largest Neutral Host Infrastructure Provider in the U.S.

New Technology Transform New Digital Infrastructure

- Holistic and system level approach
- New paradigm to meet the new and fast changing emerging technologies
- ATC as a Neutral Host digital infrastructure provider can play a valuable role in intelligent transportation including C-V2X
- Private, local and federal collaboration and ecosystem

There are several infrastructure options transit leaders could consider to promote shared ridership.



Leverage the right spectrum and the right technology solution for the right use case at much lower TCO

Neutral Host Smart Intersection for C-V2X



Goal is to develop shared digital infrastructure to enable C-V2X adoption

Sensor Fusion for Smart Intersection



Single contact for easy operation, monitoring, and unified data analytics for multi-RAT technologies

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ATC Paris2Connect Active Case Study

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Paris2connect: Digital Shared Infrastructure for Smart City & C-V2X/AV



Vision of Smart City of the future- Attractive, Resilient, Low Carbon, Sustainable, People-Centered, Inclusive

Neutral Host for Accelerating CV2X Market Adoption



Source of data : Brownstein Hyatt Farber Schreck, K&L Gates, June 2020

Deploy shared digital infrastructure today's technologies and tomorrow's innovations to speed up the adoption of intelligent transportation including C-V2X, Autonomous Vehicle

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The role of MNOs in the Future of Transportation

Jyoti Sharma Technology Strategy Verizon

August 7, 2020





Building blocks of 5G



All-band (low-band, midband and millimeter wave) spectrum

Fiber

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- Significant fiber deployments in
 60 major markets outside VZ ILEC
 footprint to drive densification.
- Multi-year project and Verizon has committed to invest \$1.05 billion on new fiber-optic cable from Corning.



New Radio

- Advanced coding and modulation
- Massive multiple input, multiple output (MIMO)
- Beamforming
- Flexible spectrum use
- Flexible/full duplex



Software defined networking (SDN)/network function virtualization (NFV) + 5G nextgeneration core (NGC)

- Network evolution & slicing
- Service-based architecture
- Operational agility
- Universal adaptive core

Mobile Edge Computing (MEC)

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Ultra-dense small cell deployment

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5G + MEC – Powering 4th Industrial Revolution





MEC: 5G currencies enable new use cases





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Six ways MEC delivers value

Better performance

Speed is the requirement and promise of transformation projects, and Verizon 5G Edge reduces application response times and performance latency. Edge computing reduces the latency that comes with compute and storage residing at faraway data centers.

Faster data access

Data is the new differentiator; the faster and better you are able to harness, process, analyze and use data, the clearer the advantage. Data can be acted on near where it's created, which can result in greater performance, contextually aware applications and improved security.

Greater efficiency

The Verizon 5G Edge platform with AWS preintegrates networking and compute services, which enables developers to easily configure and optimize their application through

end-to-end services. It provides highly reliable compute and network services.

Alignment of cloud and mobile

Verizon 5G Edge offers connectivity and device management solutions that enable enterprises to plan their mobile and cloud strategies together.

IoT expansion

The right edge approach is critical to meeting the rapid expansion of IoT, which is where Verizon 5G Edge comes in. It can even address IoT challenges such as energy use and battery life.

Accelerating transformation

Verizon 5G Edge can enable new applications across many industries—improving customer experiences, creating new efficiencies, etc. It might also help realize myriad AI applications.



C-V2X Use Cases transform the CAV experience

Infotainment



- Content Delivery and Updates
- 3D and HD Mapping
- Heads up Display AR
- Video Sharing between Vehicles

Safety

- ينانان **ب**
- Collision Avoidance
- Traffic Signal
 Detection
- See-Through
- Vulnerable Road User
- Left Turn Assist

General



- Over the Air (OTA) Vehicle Systems Updates
- Compute Offload
- Remote Vehicle
 Health Monitoring
- V2X Security

Smart City



- Smart Parking
- Emergency Vehicle
 Priority
- Green Light Optimization
- Visual Monitoring of Intersections
- Curbside Management





- Real Time Situational Awareness
- Teleoperations
- Truck Platooning



Public Private Partnership

- Cellular Vehicle to Everything (C-V2X) Solution supports broadcast messages to vehicles, pedestrians, and bicycles utilizing sophisticated computer vision on smart cameras and signal phase data from traffic cabinet.
- 4G/5G Communications Infrastructure 4G/5G radios, wireless network, Multi-Access Edge Compute (MEC) infrastructure and fiber backhaul used as foundational network supporting C-V2X communications in real time.
- Connect cloud based fleet management solution. Devices installed on board vehicles to track location, speed, diagnostics, and driver safety metrics. Compliments data from connected and autonomous (CAV) vehicles and C-V2X to offer additional safety insights.
- City Data Insights Cloud based central data repository provided as a managed service, which will serve as the data management platform for the program. Data to be collected from CAVs, C-V2X, Connect, and other sensor data made available by CCTA and municipalities.

AC/SC unified connectivity. Intelligently connecting the car to cloud and surroundings

Deployment Scope:

Leveraging 5G Infrastructure Deployment

- **GoMentum** proving grounds for testing solution before deployment to other locations
- Rossmoor providing shared AVs to serve elderly community
- County Hospital/Martinez autonomous shuttles to serve the disabled
- Personal Mobility on I-680 test the impact of CAV/C-V2X on personal mobility

verizon





Multi-Access Edge Computing (MEC) for C-V2X

Ming Lei (<u>ming.lei@intel.com</u>) Senior Platform Architect

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Intel Corporation

5GAA Webinar on "The C-V2X Deployment Journey toward Next Generation Mobility" August 7, 2020



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Outline

• Overview of Scenarios & Use Cases

- Smart Intersections Enabled by MEC and C-V2X
- Safety Service Enabled by MEC and C-V2X
- System Architecture
- From Concept to Proof





Overview of Scenarios & Use Cases



Smart Intersections Enabled by MEC and C-V2X

TODAY







Safety Service Enabled by MEC and C-V2X

- C-V2X is a connectivity technology and can be complemented by sensing capabilities deployed at the roadside
- Computer Vision can be used for the detection & classification of the road users, incidents & situations
- Safety Messages based on the Computer Vision Analytics are
 - Directly disseminated from RSUs to connected vehicles and other road participants (e.g. pedestrians)
 - Relayed from the source RSU to neighboring ones and transmitted to connected road participants, for a large scale of information dissemination



System Architecture



From Concept to Proof



Diagram source: Soo Jin Tan & Andrew Khor, Intel



Thank you !

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Questions?





Automotive Association

Thank you for joining!

For more information please contact: liaison@5gaa.org