5GAA Automotive Association

5GAA Webinar:

On the right road with C-V2X

June 11 at 10:00 PDT

Invitation for a discussion between 5GAA & US Road Infrastructure Owner-Operators on:

- ✓ **rich C-V2X technology ecosystem**
- ✓ **ongoing C-V2X deployment activities**
- ✓ **C-V2X solutions are available today**

Agenda

Introduction
Maxime Flament, 5GAA CTO

Existing commercial OBU and RSU solutions
Jason Ellis – Director, Automotive Business Development at Qualcomm

C-V2X Deployment Activities in Georgia, US
Alan Clelland – Vice President, West at Applied Information

Pre-deployment activities in Virginia, US
Anupam Malhotra – Director, Connected Vehicles & Data at Audi of America

Q&A
Moderated by Maxime Flament, 5GAA CTO

Practical Information

Q&A:

- After the presentations, there will be time for a Q&A session
- We kindly ask you to submit your questions in a **written form**, using the **question bar** rather than raising your hand

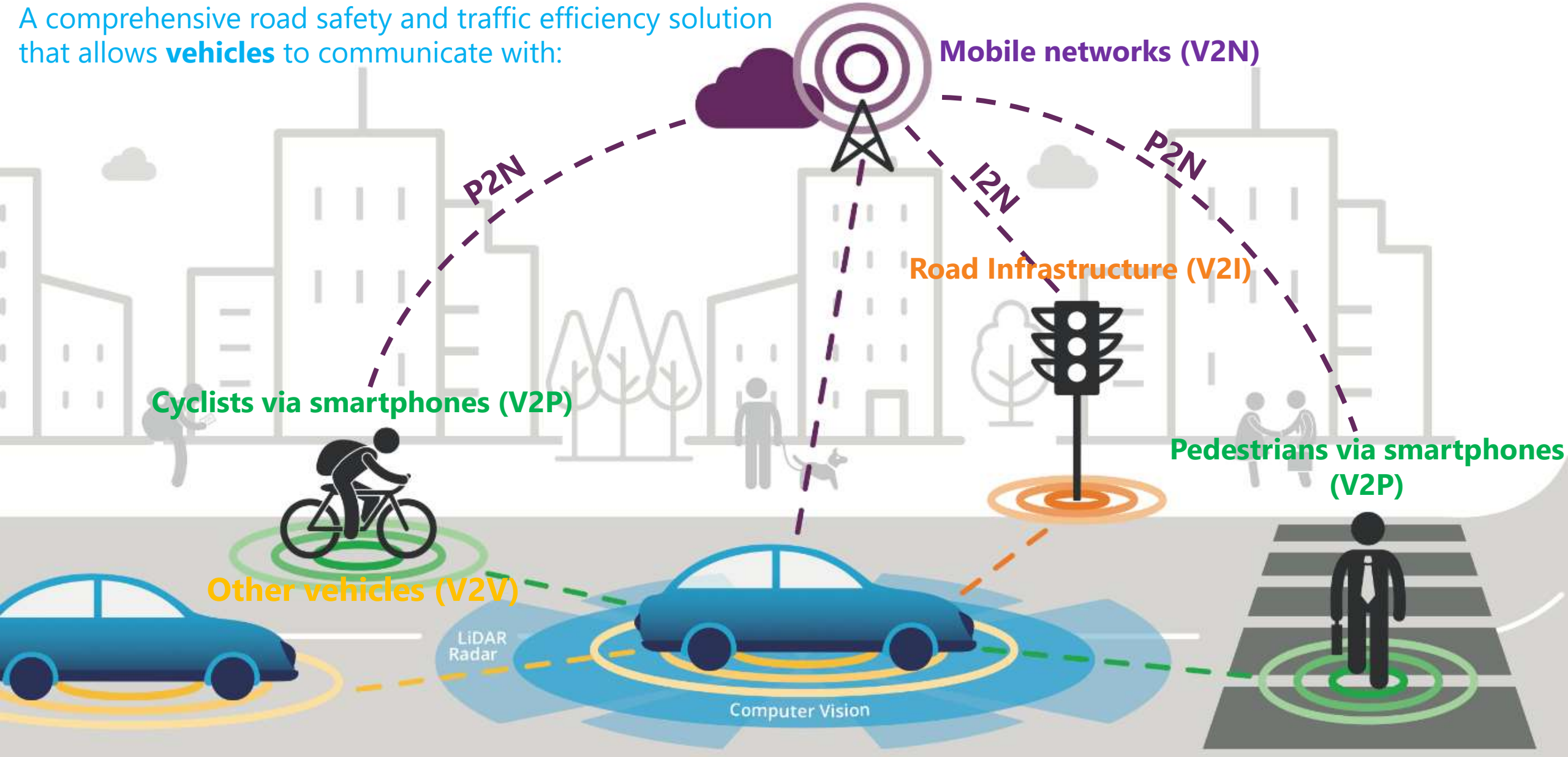
About 5GAA

- The 5G Automotive Association (5GAA) is a global, cross-industry organization of companies from the automotive, technology, and telecommunications industries (ICT), working together to develop end-to-end solutions for future mobility and transportation services.
- 5GAA supports the idea that 5G will be the ultimate platform to enable C-ITS and the provision of V2X.
- This webinar is an initiative under our “Friends of 5GAA” membership structure, designed specifically to engage with road infrastructure owners & operators (IOOs) and road authorities globally.


A1
AIRBUS
Airgain
ALPINE
AMERICAN TOWER
ANALOG DEVICES
Anritsu
envision:ensure
applied
ASKEY
AT&T
Audi
AUTOCRYPT
Autotalks
BAIC GROUP
Baidu 百度
宝能
BAONENG
Bell
BlackBerry
BMW GROUP
BOSCH
CETECOM
CHEMTRONICS
Automated Driving
中国移动
China Mobile
China unicom
CISCO
Cohda Wireless
commsignia
Continental
CTAG
DAIMLER
DANLAW
DEKRA
DENSO
Deutsche Messe
Dt&C
EDI
edgeconnex
EQUINIX
ERICSSON
中国一汽
FAW
FET
FCA
FEV
flex.
Ford
Fraunhofer
GEELY
GM
GRL
Gotell
here
HONDA
HUAWEI
HYUNDAI
MOTOR GROUP
HYUNDAI
MOBIS
iDIRECT
Infineon
intel
INTERDIGITAL
JAGUAR
LAND ROVER
KDDI
KEYSIGHT
TECHNOLOGIES
KPIT
kt
LEAR
LG
LINKS
lmt
MARELLI
MARBEN
microsec
MITSUBISHI ELECTRIC
Changes for the Better
molex
muRata
NAVINFO
Neusoft东软
NISSAN
MOTOR CORPORATION
NOKIA
noris network
docomo
OAKLAND UNIVERSITY
OKI
orange
Panasonic
PFU
PIRELLI
PSA
GROUPE
qorvo
QUALCOMM
QUECTEL
Build a Smarter World
GROUPE RENAULT
ROGERS
ROHDE&SCHWARZ
ROHM
SAIC
上汽集团
SAIC MOTOR
SAMSUNG
SAVARI
SGS
安亭·上海国际汽车城
Anting · Shanghai International Automobile City
SiriusXM
SK telecom
SKYWORKS
SoftBank
SONY
SPORTON LAB.
SUMITOMO ELECTRIC
Certification Center
Svyaz-sertificat
swift
NAVIGATION
TATA
TATA CONSULTANCY SERVICES
TE
TIM
Telefónica
TELUS
Tencent
腾讯
TERRANET
THALES
TNO
TÜVRheinland
Valeo
VENIAM
verizon
VIAVI
vodafone
Volkswagen
VOLVO
WNC
Wistron NeWeb Corp.
ZF
ZTE

What is C-V2X (Cellular-Vehicle to Everything)?

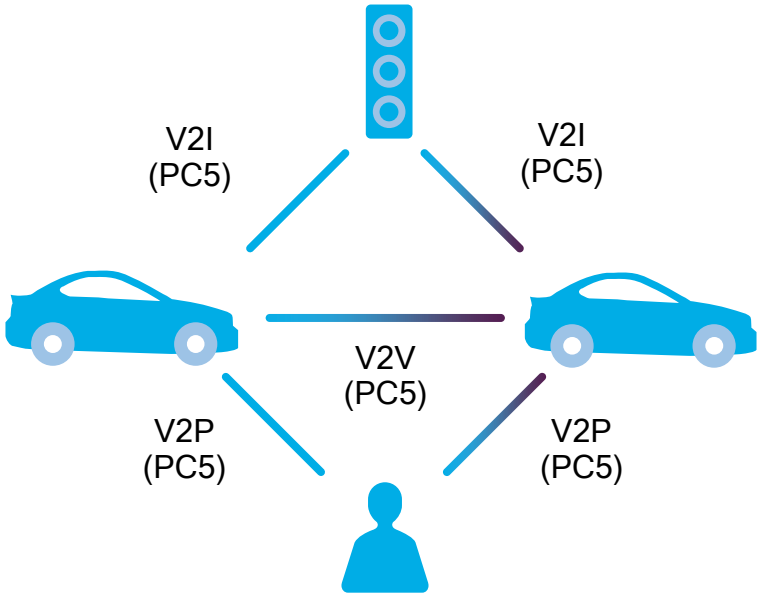
A comprehensive road safety and traffic efficiency solution that allows **vehicles** to communicate with:



C-V2X has two complementary communication modes

Direct (= Sidelink)

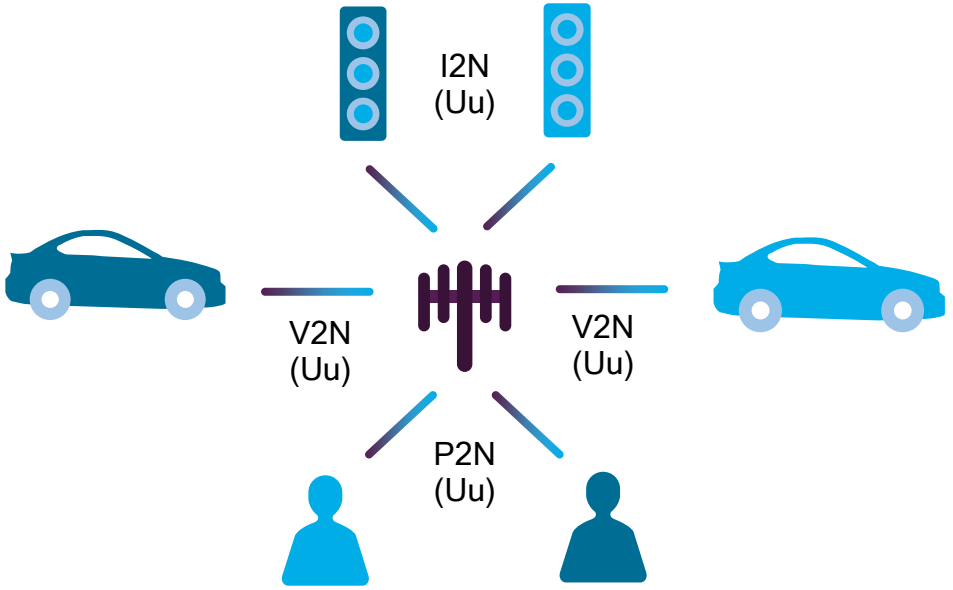
V2V, **V2I**, and **V2P** operating in ITS bands (e.g. ITS 5.9 GHz) independent of cellular network



Short range (<1/2 mile), location, speed
Implemented over 3GPP's "PC5 interface"

Network (= Up/Downlink)

V2N operates in traditional mobile broadband licensed spectrum



Long range (>1/2 mile), e.g. accident ahead
Implemented over "Uu interface"

Have a great webinar!

Publicly Announced C-V2X Commercial OBU and RSU Solutions Based on Qualcomm Platforms

Jason.Ellis@qti.qualcomm.com

Qualcomm

Non-NDA

11 June 2020

Jason Ellis
Director, Business Development
Automotive BU – Connected Car

Qualcomm

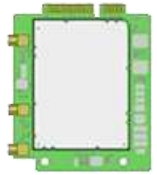
Qualcomm has a Vibrant Ecosystem of C-V2X Solutions

- Qualcomm offers 3 chipset platforms with C-V2X
  - MDM9150 (PC5, GNSS, Apps Processor)
    - https://www.qualcomm.com/products/qualcomm-9150-c-v2x-chipset
  - SnapDragon 4G Automotive Platform (4G/3G/2G Uu+PC5, Multi-Freq GNSS, Apps Processor)
    - https://www.qualcomm.com/products/snapdragon-automotive-4g-platform
  - SnapDragon 5G Automotive Platform (5G/4G/3G/2G Uu+PC5, Multi-Freq GNSS, Apps Processor)
    - https://www.qualcomm.com/products/snapdragon-automotive-5g-platform

- Qualcomm SA2150P is a fully integrated V2X platform, complementing above modems, along with OBS Aerolink security for complete and mature C-V2X solutions
  - https://www.qualcomm.com/news/releases/2020/01/06/qualcomm-introduces-comprehensive-platform-roadside-and-onboard-units

- Module manufacturers are shipping products today (automotive Tier2); others not listed due to NDAs:
  - Gosuncn
    - https://www.prnewswire.com/news-releases/geely-announces-work-with-qualcomm-and-gosuncn-to-launch-the-first-domestically-mass-produced-5g-and-c-v2x-enabled-vehicles-300802382.html
  - LG Innotek (LAM-V500)
    - http://www.lginnotek.com/en/itk_news/lg%ec%9d%b4%eb%85%b8%ed%85%8d-%ec%b0%a8%eb%9f%89%ec%9a%a9-c-v2x-%eb%aa%a8%eb%93%88-%ea%b0%9c%eb%b0%9c/
  - Neoway (A90)
    - http://www.neoway.com/news/article/47/170
  - Quectel (AG15, AG520R, AG550Q)
    - https://www.quectel.com/product/list/AutomotiveModule.htm
  - SimCOM (SIM8100)
    - https://www.simcom.com/product/SIM8100.html
  - WNC (WNC C-V2X)
    - http://www.wnc.com.tw/index.php?action=pro_cate_third_close&top_id=26&scid=123&tid=145
  - ZTE (ZM8350)
    - https://www.zte.com.cn/global/about/news/2-26-5





Commerical C-V2X RSU and OBU Products Shipping Today From:

- Applied Information
  - https://appinfoinc.com/applied-information-cv2x-testing-in-metro-atlanta/
- Chemtronics
  - http://chemtronics-automateddriving.co.kr/en/home-2/
- Cohda Wireless
  - https://cohdawireless.com/cohda-wireless-c-v2x-evaluation-kit-prepped-for-real-world-trials/
- Commsignia
  - https://www.commsignia.com/hardware/
- Danlaw
  - https://www.danlawinc.com/v2x-hardware/
- Ficosa
  - https://www.ficosa.com/wp-content/uploads/2018/12/Ficosa_On_Board_Unit_C_V2X.pdf
- Genvict
  - http://www.genvict.com/en/product/Default.aspx?id=10000566
- iSmartWays Technology
  - http://ismartways.com/solution.php
- Kapsch TrafficCom
  - https://connectedvehicles.kapsch.net
- Lacroix City
  - https://www.lacroix-city.com/activities/v2x/products/
- Nebula Link
  - http://www.nebula-link.com/Product/view/id/4
- Neusoft
  - https://www.reachauto.com/
- Savari
  - https://savari.net/technology/road-side-unit/

- RED certified products bring C-V2X commercial readiness to Europe
  - https://www.qualcomm.com/news/releases/2020/03/10/qualcomm-announces-significant-progress-toward-commercial-introduction-c

- Some product announcements were delayed due to COVID-19, which are not yet listed because the PR was postponed. Even more solutions are NDA-only, and a number are in development. C-V2X connected cars are also coming shortly.

- Products include aftermarket OBU, factory-fit Telematics/C-V2X TCUs, RSUs, Dual-Radio RSUs, RSU+eNB

Thank you

Follow us on:

For more information, visit us at:

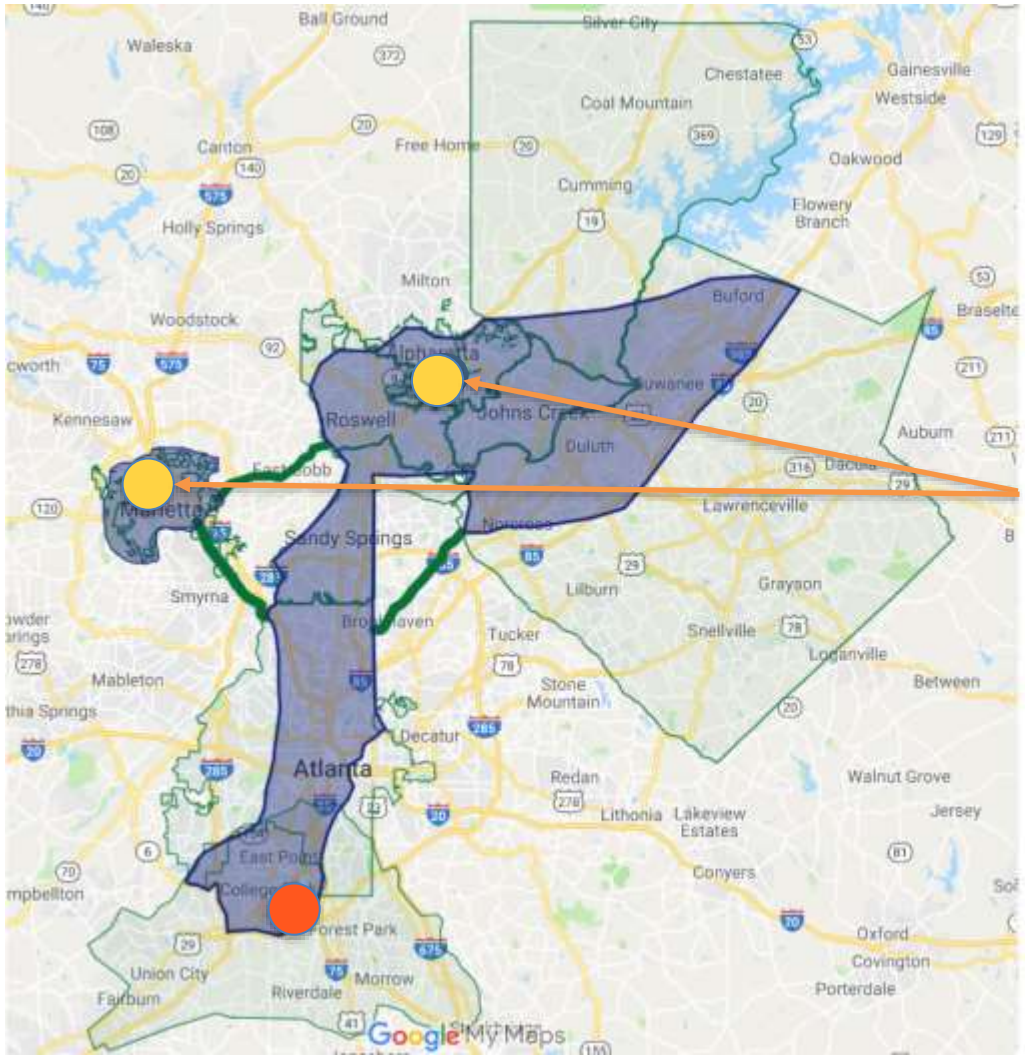
www.qualcomm.com & www.qualcomm.com/blog

Cities Lead CV Deployments Too!

Alan Clelland
Applied Information

The Georgia Experience

- Local agencies in the Atlanta metro region collaborating to deploy over 1000 contiguous CV intersections
- C-V2X deployments:
  - Marietta
  - Alpharetta



Metro Atlanta CV-1K Project

CV 1K

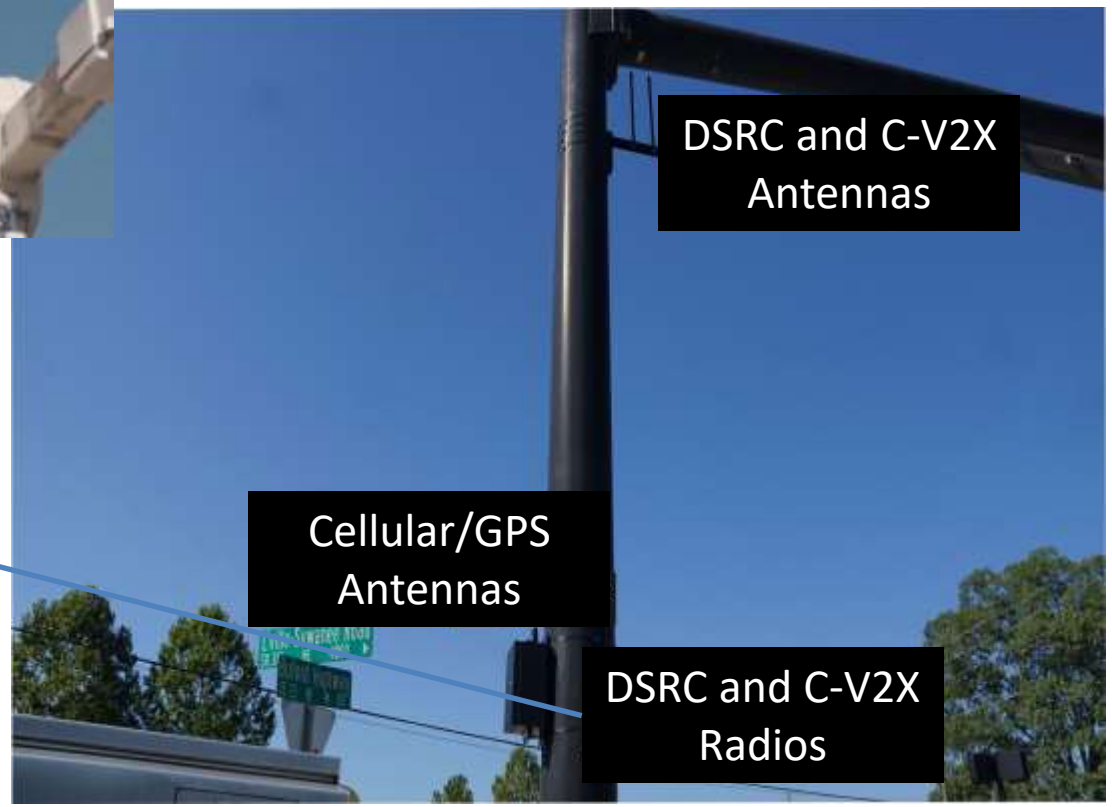
Poltical Boundaries

Marietta/Alpharetta

Hartsfield Jackson Airport

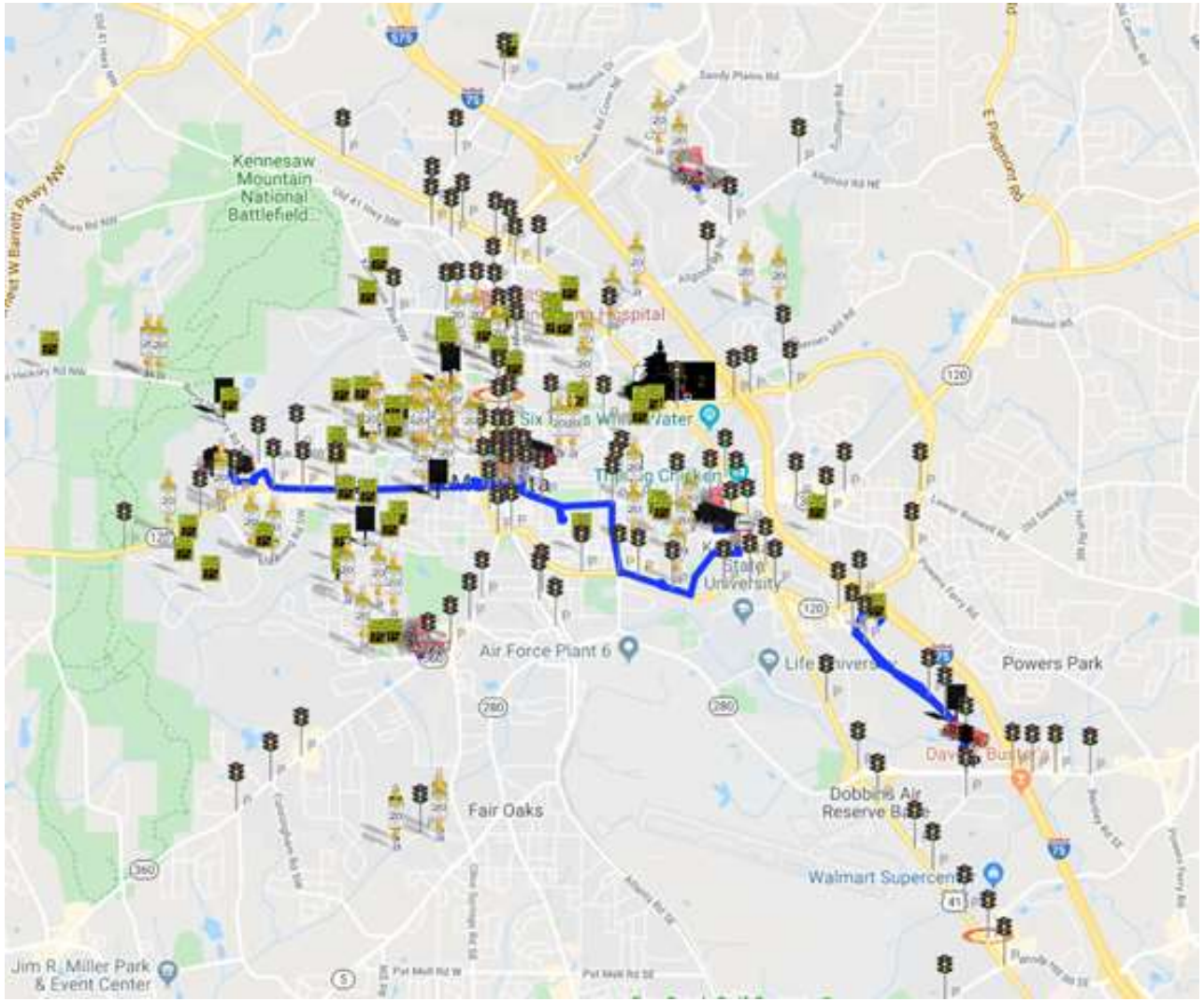
applied INFORMATION

Applied Information C-V2X Deployment Approach



Marietta, GA

- 1st city in the United States to deploy a city-wide C-V2X (V2N) cellular-based connected vehicle system
- Protecting Vulnerable Road Users through smartphone CV Applications



Marietta, GA

Equipped Components:

- 120 Connected Intersections
- 30 Emergency Vehicles
- 70 Buses
- 40+ Radar Feedback Signs
- 40+ Timed School Beacons
- DMS Signs
- Public V2X Smartphone app (using SAE J2735 & SAE J2945

Applications:

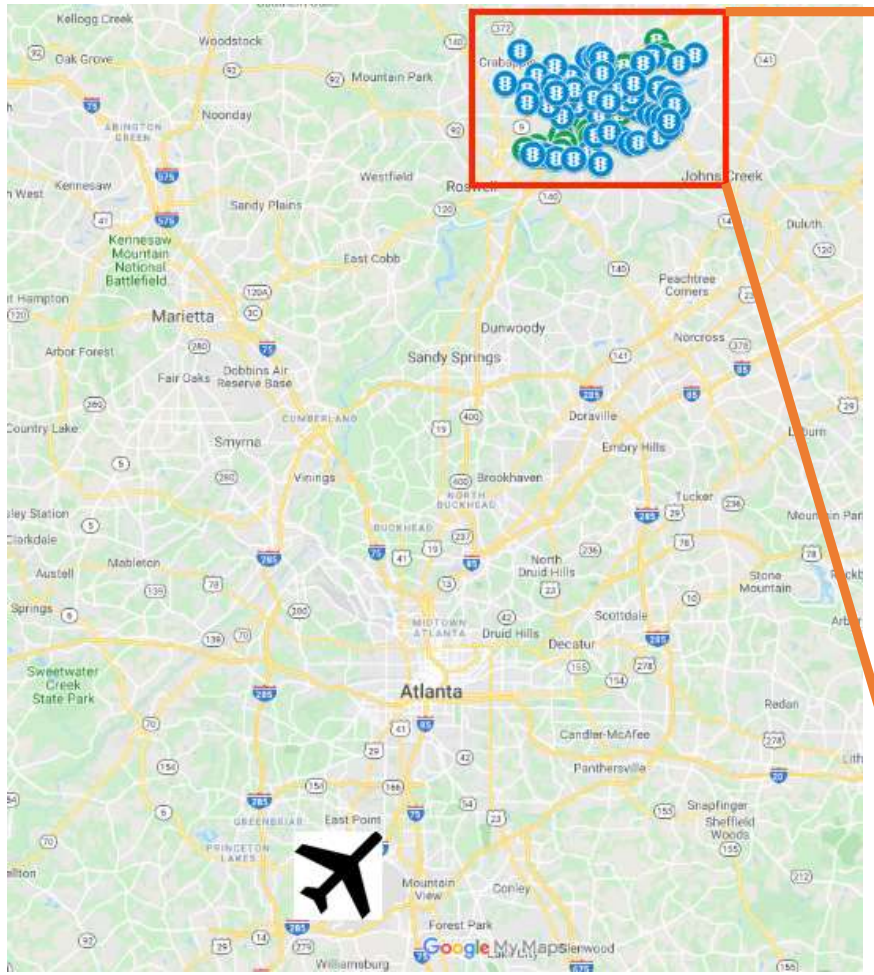
- Emergency Vehicle Preemption
- Cyclist and Pedestrian collision detection
- Pedestrian detection at Crosswalks
- Transit Signal Priority
- Smart school zones, work zones, and speed zones
- DMS Sign Annunciation
- Remote Monitoring and Maintenance

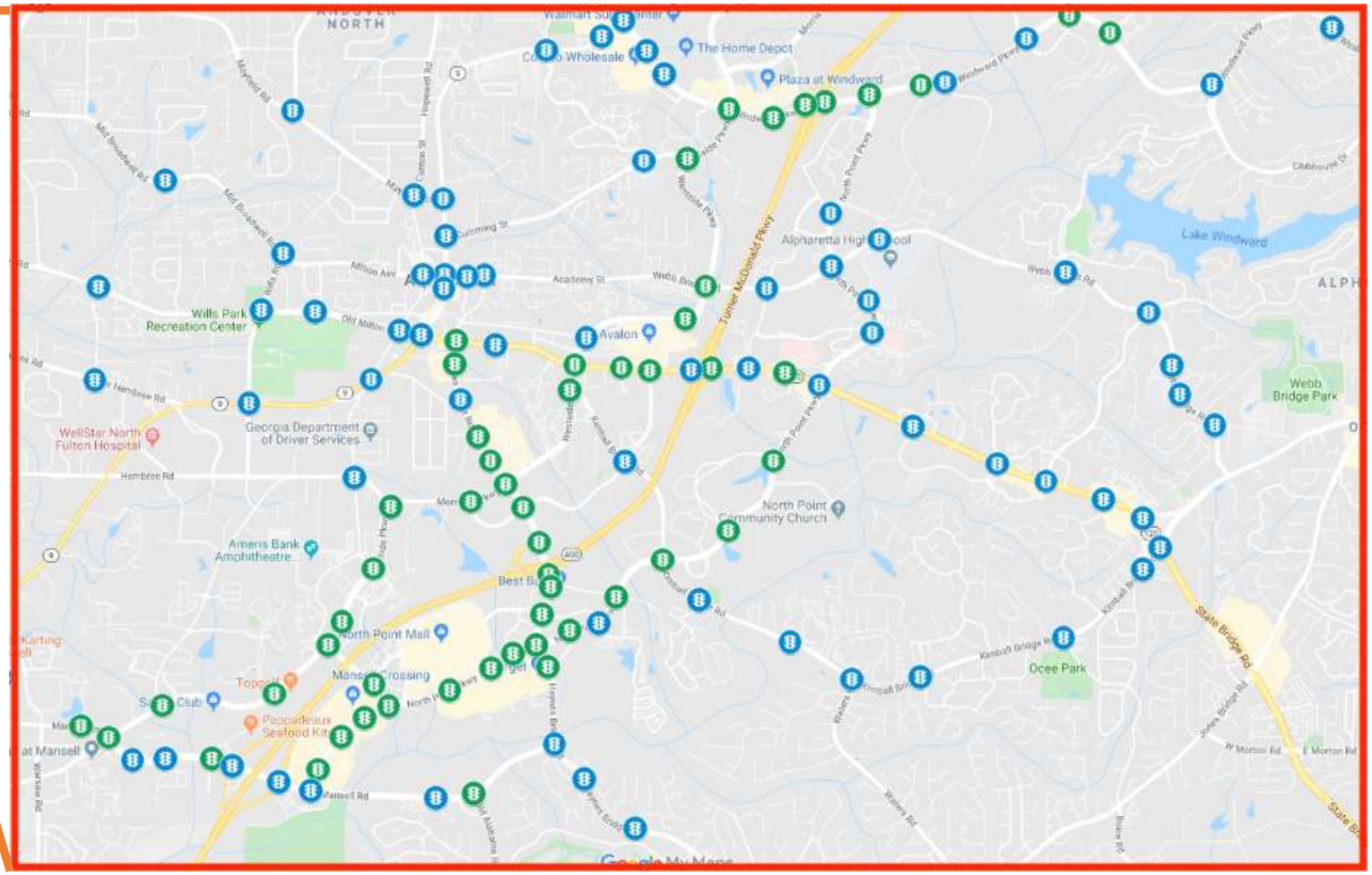
Protecting Vulnerable Road Users through a smartphone CV Application

Results

- Remote monitoring and maintenance for all intersections within the city.
  - Cost savings for city traffic operations staff
  - High availability of Connected Vehicle **equipment** that is **monitored** and maintained **24/7**
- Emergency response
  - **Response times decreased** by an average of **one minute** per call
  - Additional lives saved from improved response times
  - Cost savings realized by not having to build new fire stations
- City-wide TSP to ensure buses arrive on time
- TravelSafely application being rolled out to the public (Public & Political perception is positive with plans on advertising the app from the city)
- Plan to install equipment on police and school buses

Alpharetta: Smart investment in a Connected Vehicle infrastructure





Greater Atlanta Area

● **C-V2X and DSRC** ● **C-V2N only**

On the right road with C-V2X

……. going beyond SPaT…..

- **Fire trucks** getting *preemption* at traffic lights
- **Transit buses** getting *priority* at traffic lights
- **School buses** interacting with passing vehicle traffic on streets
- **Freight trucks** getting green lights in off peak periods

…. and beyond the signalized intersection!

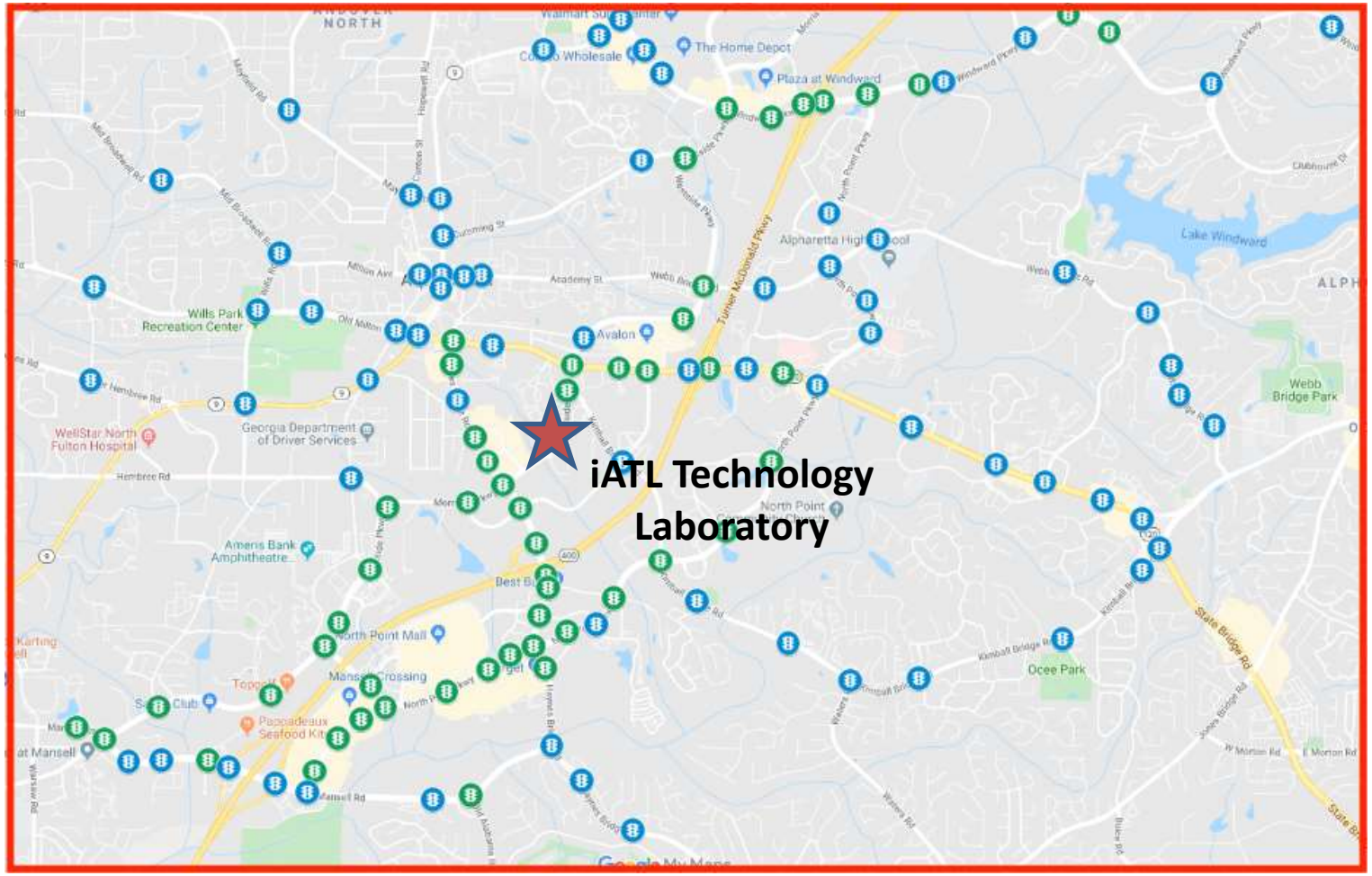
- **School zones, work zones, pedestrian crossings:** The traffic infrastructure beyond intersections
- **Free smart phone app** showing multiple use cases (and benefits of the Uu interface)
- **VRU support** (pedestrian and cyclists**)**
- **(Upcoming) Left turn assist:** Virtualized BSMs and PSMs

Deployment Showcase

The Infrastructure Automotive Technology Laboratory

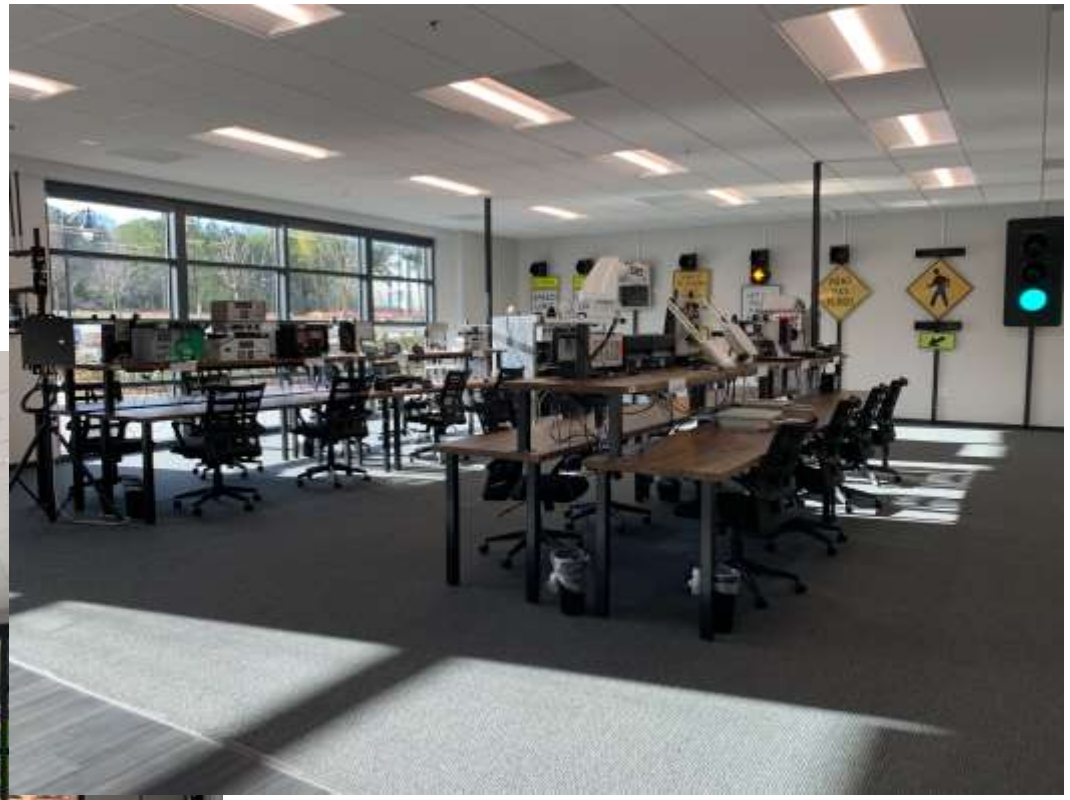
iATL™

Infrastructure Automotive Technology Laboratory



5GAA Automotive Association

The place to collaborate in CV!



iATL™

Infrastructure Automotive Technology Laboratory

5GAA Automotive Association

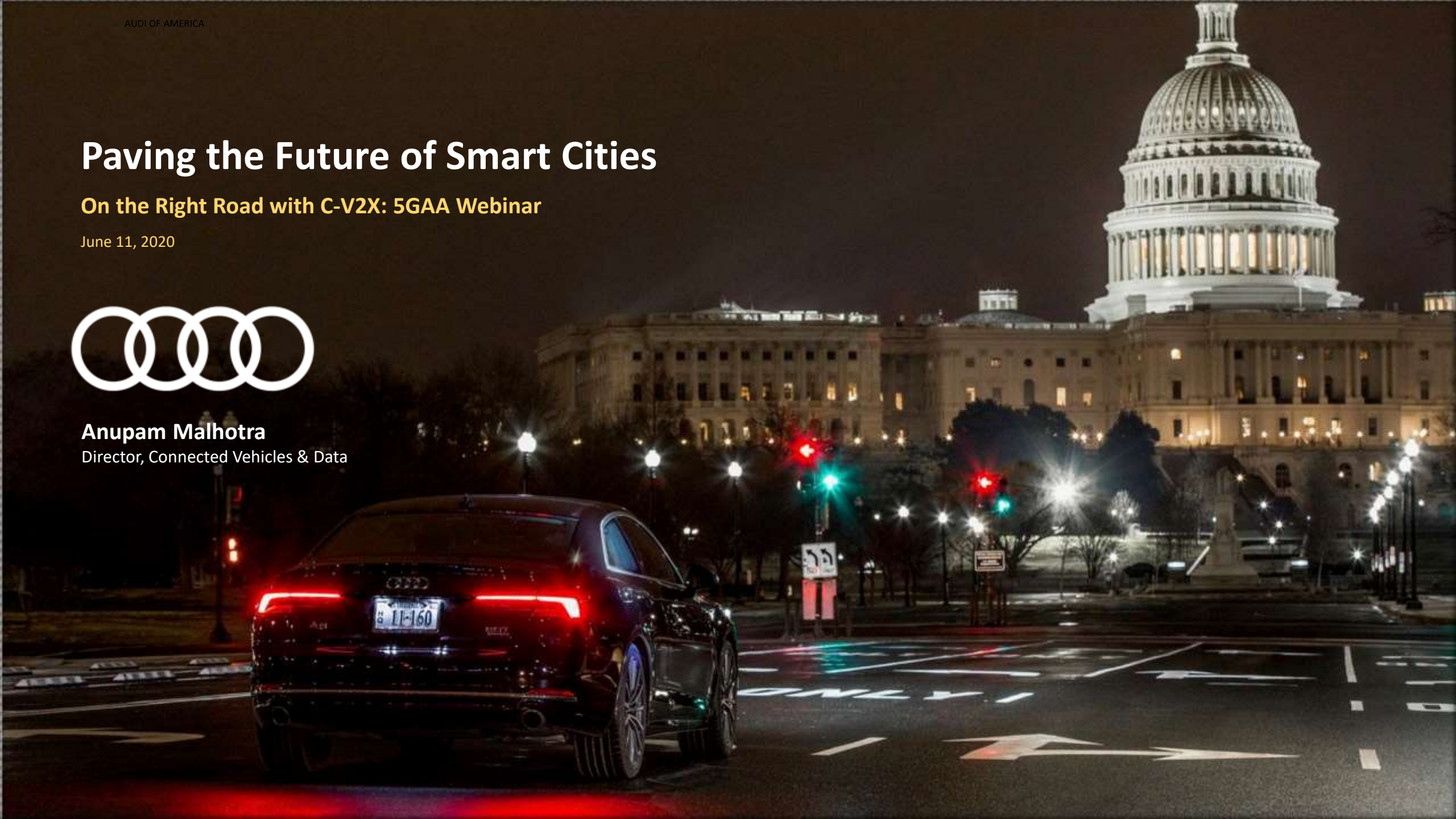
Thank you!

Alan Clelland
Applied Information Inc
aclelland@appinfoinc.com

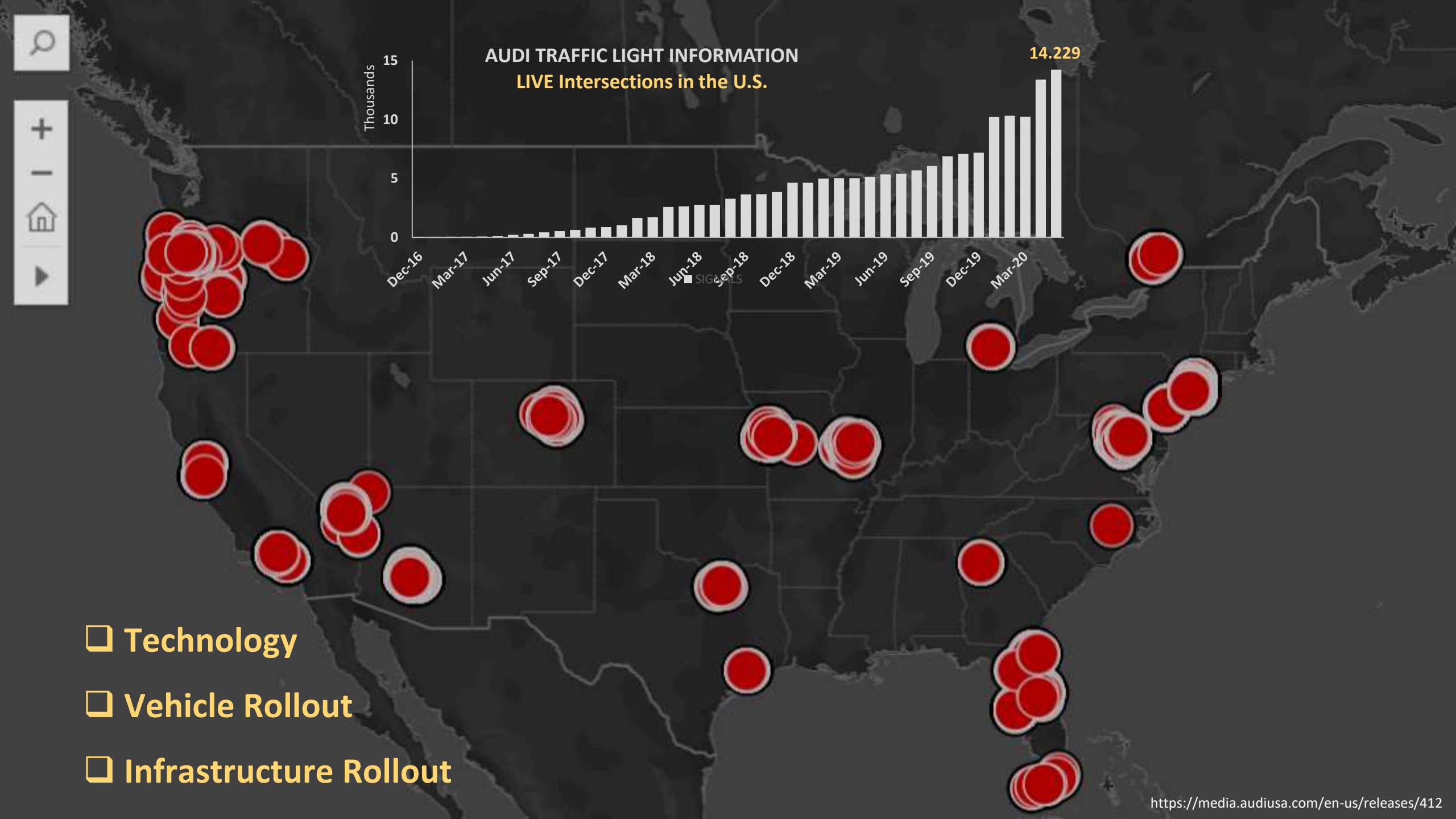
Paving the Future of Smart Cities

On the Right Road with C-V2X: 5GAA Webinar

June 11, 2020



Anupam Malhotra
Director, Connected Vehicles & Data



- ❑ Technology
- ❑ Vehicle Rollout
- ❑ Infrastructure Rollout

https://media.audiusa.com/en-us/releases/412

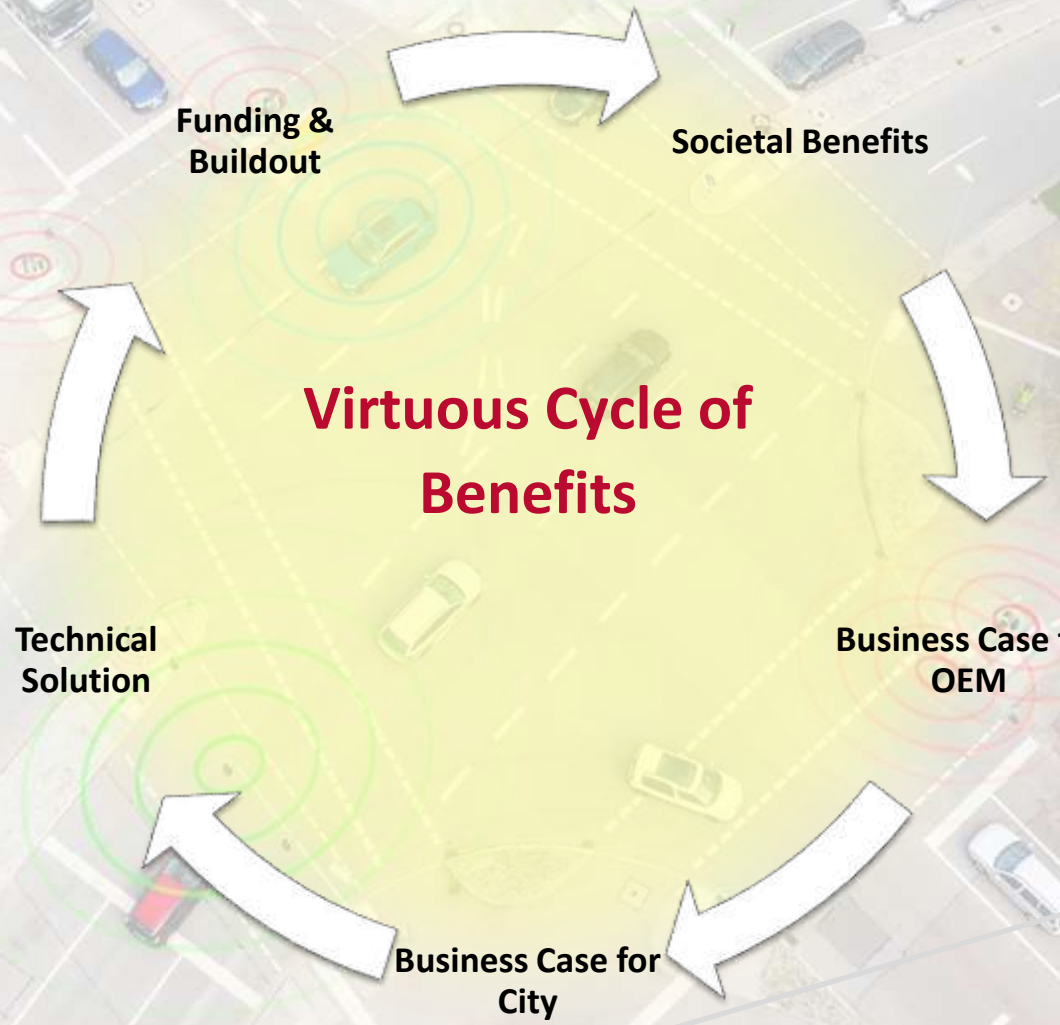
Audi of America, Virginia DOT and Qualcomm Announce Initial C-V2X Deployment in Virginia

- Joint efforts to launch initial deployment designed to help enhance safety on select Virginia roadways using C-V2X communications beginning in the third quarter of 2020
- Projects aimed at expanding safety use cases in the vital connected vehicle safety spectrum established by the FCC and proposed to be allocated for C-V2X
- Safety use cases enabled by C-V2X technologies hold potential to dramatically lower fatalities exceeding 36,000 people per year on U.S. roadways

Enabling the virtuous cycle is key to the realization of societal benefits!

- **Connected Tolling and similar Road-Usage Charging** services can provide a monetary life-line to support investments
- Roadside unit install costs can also be borne as part of the **5G build-out by carriers**
- **New data-driven services** can create further value

- Initial focus on DSRC, but **significant progress in Cellular-V2X, integrating short-range and "5G" communications,** shifts the landscape for Audi.
- **DSRC can no longer be considered a de-facto** standard but is an option that will compete in the market.



- **615K crashes** can be reduced with V2V technology
- **36K annual fatalities** on U.S. roads an be reduced with V2X
- **$800B of economic impact** through V2X services
- **Vulnerable Road Users** (bicyclists, pedestrians, construction workers, etc.) are a particularly important group that will benefit from active safety technology.

- **Monetizable services** initially planned for legacy V2X now possible with cellular.
- Existing Connected Services provide a **baseline business case** for building active safety services without high costs

Thank you

Q&A Session

Invitation for a discussion between 5GAA & US Road Infrastructure Owner-Operators on:

- ✓ **rich C-V2X technology ecosystem**
- ✓ **ongoing C-V2X deployment activities**
- ✓ **C-V2X solutions are available today**

Agenda

Introduction
Maxime Flament, 5GAA CTO

Existing commercial OBU and RSU solutions
Jason Ellis – Director, Automotive Business Development at Qualcomm

C-V2X Deployment Activities in Georgia, US
Alan Clelland – Vice President, West at Applied Information

Pre-deployment activities in Virginia, US
Anupam Malhotra – Director, Connected Vehicles & Data at Audi of America

Q&A
Moderated by Maxime Flament, 5GAA CTO

Thank you for joining!

For more information please contact:

liaison@5gaa.org