

Cooperative Automated Transportation (CAT) Coalition
Peer Exchange & Outreach Working Group
Friday January 18, 2019
Webinar Recap and Summary of Action Items

Summary of Action Items

- This working group will transition to meeting every 6 months. Any members wishing to raise topics in between webinars or to call an intermediate webinar is encouraged to email Ed and Dean at: catoutreachwg@gmail.com.
- Any working group members that will be attending conferences or meetings involving emergency responders and who may be interested in presenting CAT topics to this group are encouraged to email Ed and Dean to initiate discussions.
- Next webinar scheduled for July 19, 2019

Webinar Topic Recap

Agenda Item #1 - Welcome & Future Webinar Meeting Frequency

Ed Seymour (Chair) welcomed members to the webinar. Ed informed members that this group will be transitioning to a meeting frequency of every 6 months. He encouraged members to email him and Dean Deeter in between webinars if there is an outreach topic they would like to pursue or a message they would like to convey to the group. Ed offered that it is possible to call intermediate webinars in between the twice-yearly webinars.

Agenda Item #2 - Facilitate Outreach & Peer Exchange

Two peer exchange presentations were shared during the January webinar:

1. *5GAA and IOO Community Outreach*
 - Presented by Doug Hohulin (Nokia) & Jim Misener (Qualcomm)
2. Summary of CDOT – Panasonic CAV Partnership
 - Presented by Chris Armstrong, Panasonic

Copies of both presentations are attached to this summary.

Agenda Item #3 - Identification of More Formal Outreach Needs and Approaches

Time did not allow the working group to discuss this topic during the January webinar. The agenda topics will be raised during the next webinar.

This working group had previously discussed conducting outreach to emergency responders to educate them about CAT opportunities and activities.

Action: Any working group members that will be attending conferences or meetings involving emergency responders and who may be interested in presenting CAT topics to this group are encouraged to email Ed and Dean to initiate discussions.

Agenda Item #4 - Associations Announcements of Upcoming Meetings, Conference, Webinars

Carlos Alban (ITS America) updated members that ITS America is creating a Mobility on Demand Alliance, and will be conducting a Mobility on Demand Roundtable on January 28, 2019.

Blaine Leonard updated members that the next SPaT Challenge Webinar will be conducted on January 22, 2019.

Close

Ed closed the meeting and recognized the working group will cover the agenda item related to more formal outreach on the next webinar. Ed noted that the next webinar is currently planned for July 19, 2019, but he will review whether there is a conflict with this date.

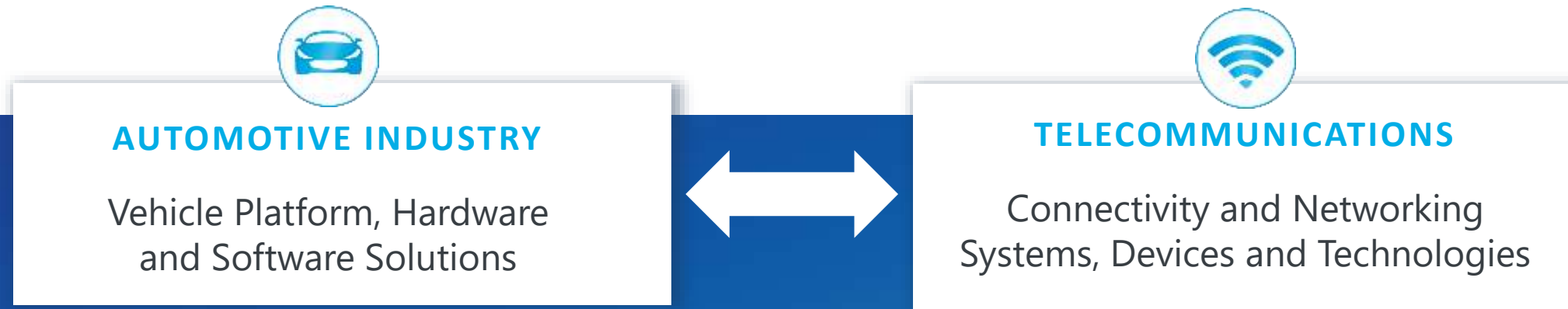


5G Automotive Association, pioneering digital transformation in the automotive industry

Learn more at
WWW.5GAA.ORG

Connected mobility for vehicles, people and transport infrastructure

5GAA brings together the automotive and telecommunications industries to accelerate the global deployment of Cellular Vehicle-To-Everything (C-V2X) as a first step towards a fully integrated intelligent transport system with 5G



5GAA unites 100+ members* from around the world working together on all aspects of C-V2X including technology, standards, spectrum, policy, regulations, testing, business models and go-to-market

5GAA: A Global Cross Industry Association

September 2016

- “Audi, BMW Group, Daimler AG are teaming with Ericsson, Huawei, Intel, Nokia, and Qualcomm to create the 5G Automotive Association (5GAA), which will help develop, test, and promote 5G standards”
- “Scope of the alliance is focused on bringing connectivity solutions to market addressing technical, business, and regulatory challenges”

Q4 2018

- ▶ 5GAA unites +100 members working together to:
 - Deliver innovation for road safety, connectivity and sustainability
 - Accelerate cooperative, connected, automated mobility
 - Develop 360° solutions for SMART mobility services
 - Pave the way towards 5G mobility

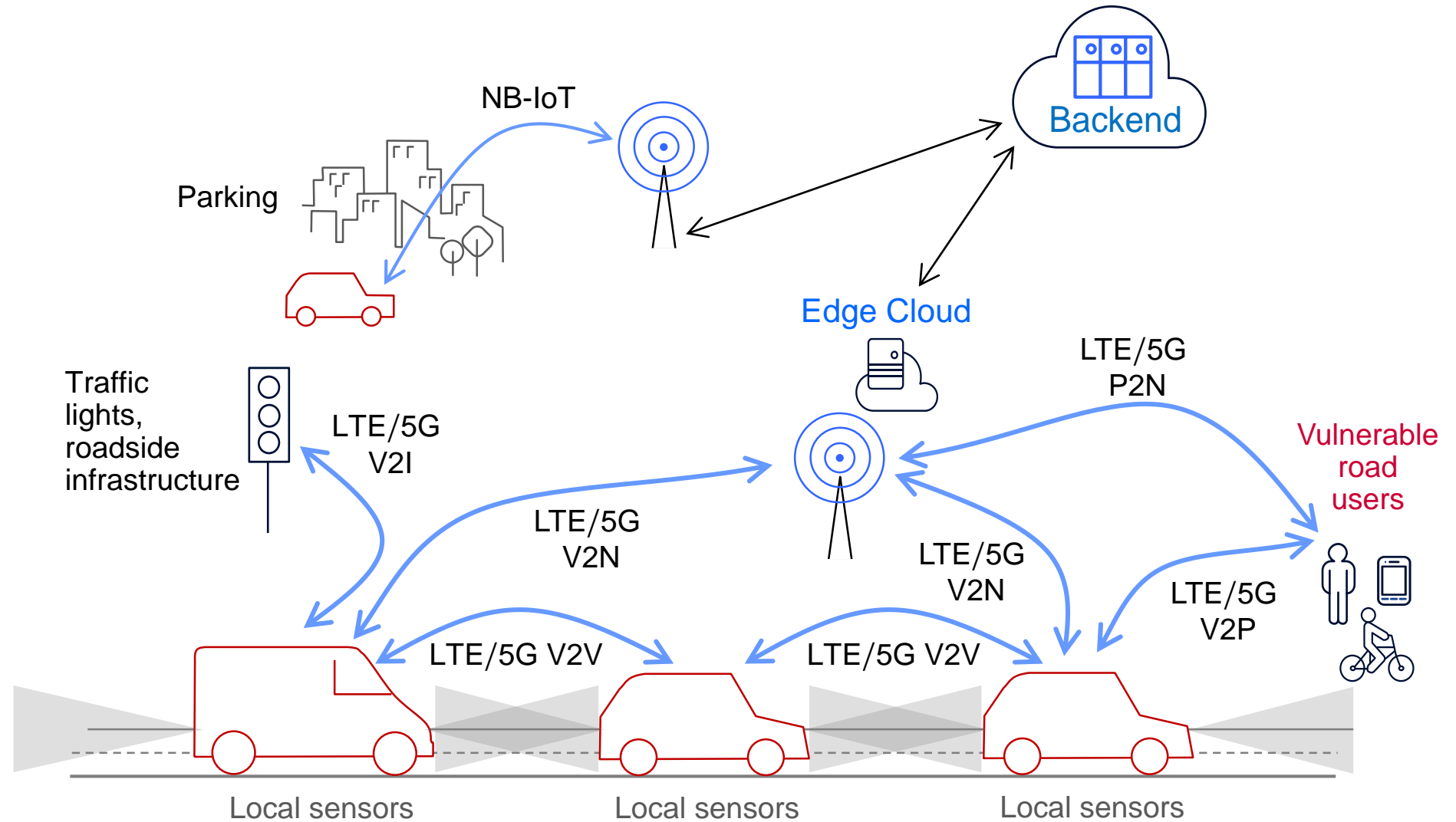




Cellular-V2X (C-V2X)

C-V2X is a unified technology platform which integrates:

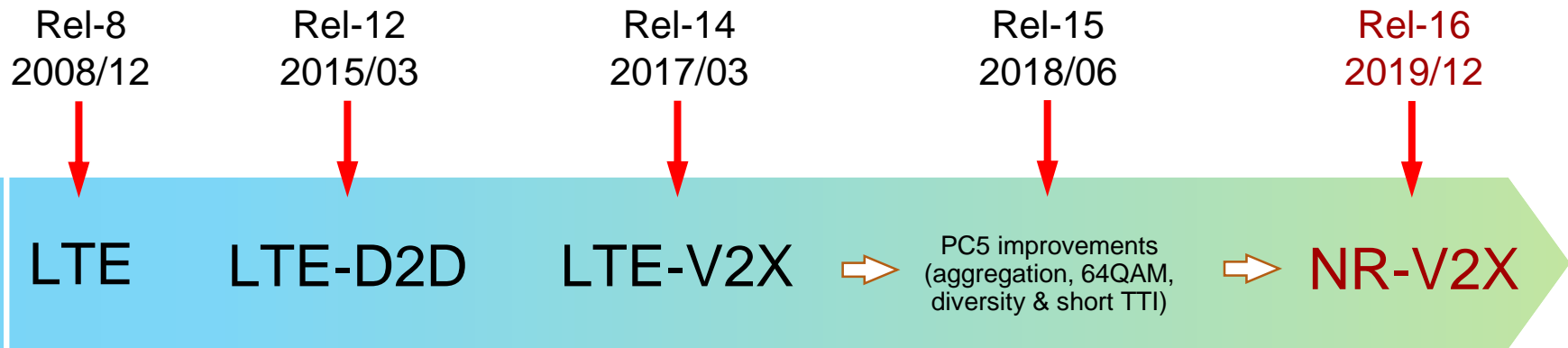
- **Short-range**, network-less, direct communications (LTE-V2X **PC5** today)
- **Long-range** cellular network communications (LTE-V2X **Uu** today)



3GPP time plan: from LTE-V2X to 5G NR-V2X



- ❑ Current version of C-V2X is called **LTE-V2X** as part of 3GPP Rel-14 & 15.
- ❑ **NR-V2X** as part of Rel-16 comes as an improvement to support automated driving.
- ❑ NR-V2X will **complement, co-exist** and **support interworking** with LTE-V2X.



- ❑ NR-V2X **study item** started in **June 2018**.
- ❑ Subsequent NR-V2X work item by **December 2019**.

5GAA Technical Working Areas and Working Groups

5GAA Organisational Structure and Working Groups



5GAA Working Areas



New Radio

“Define the next step” -
accelerate definition of **5G-V2X** based on 5G New
Radio



Push V2N

Ensure functional rollout of
V2N based applications
in order to reach broad
penetration fast



Joint Ecosystem

Create a joint eco
system between
**car – smartphone -
home**



Vehicle to Smart Device

**V2X-based vehicle
interface** for
smartphone controlled
functions



Edge Computing

Undertline Edge
Computing as one of the
**key elements of the
connected future**



Interoperability

Ensure **cross OEM** cars
and **cross operator**
networks can „speak“ with
each other



5GAA Working Group Activity Overview (i)

Use-Cases, Testing, Evaluation and Business Models

- Definition and development of use-cases and derived harmonised service level requirements from safety to more advanced use-cases,
- Coordination of joint 5GAA testing and evaluation efforts, as well as collation and discussion of available results and findings from external testing activities;
- Organisation of C-V2X multi-OEM demonstrations of various use-cases including V2V/I/P already demonstrated in Washington DC and Paris (e.g. Emergency Electronic Brake Lights or Vulnerable Road User Protection);
- Joint development and discussion of viable business models and go-to-market strategies for the future of C-V2X enabled Cooperative, Connected and Automated Mobility;
- Development of 5GAA C-V2X Roadmap (chipset availability, OEM schedule, infrastructure testing, spectrum, all towards full commercial deployment).

5GAA Working Group Focus (ii)

System Architecture, Standards and Spectrum

- Define, develop and recommend system architectures and interoperable end-to-end solutions to address use cases and services of interest
- Discuss and define preferred specifications for C-V2X System Architecture to contribute to the technical of various Standards Development Organisations (SDOs)
- Discuss and formulate optimal approaches to the use of spectrum, and liaise with standards and spectrum bodies e.g. CEPT accordingly

| | “Friends of 5GAA” (informal group) | 5GAA Not-For-Profit Membership | Special Advisory Status for public entities |
|------------------------------|--|---|--|
| Eligibility | Public interface - no specific condition but primarily aimed at road operators | Only not-for-profit organisations (incl. but not limited to research institutions, governmental organisations or registered associations) | Limited exclusively to not-for-profit public entities (state or local governments and their related agencies) |
| Application procedure | Simple subscription via dedicated mailing list accessible via 5GAA website | Regular membership application procedure incl. approval by 5GAA Board (proof of not-for-profit legal status must be provided upon request) | Subject to the signature of a Memorandum of Understanding (incl. confidentiality & IPR provisions) and its approval by the 5GAA Board |
| Benefits | <ul style="list-style-type: none"> • Dedicated landing page on 5GAA website for subscription • Access to dedicated quarterly newsletter reporting on 5GAA on-going work and publications • Ad hoc webinars on topics of relevance for the connected mobility community • Invitation to 5GAA public events • No commitment towards the association | <ul style="list-style-type: none"> • Same rights & duties towards the association as any regular member • Full participation to Working Group activities and possibility to incorporate contributions into 5GAA outputs | <ul style="list-style-type: none"> • Can send observers to 5GAA Working Group meetings and other relevant meetings • Can access mailing lists & WG documents incl. drafts • Right to make written contributions but only for information purposes • Not bound by the 5GAA external positions |
| Voting Rights | N/A | Yes (as a General Member) | N/A |
| Membership Fees | N/A | USD 5,000 per year | N/A |

Example of 5GAA Past Road Operator Workshop/Seminar

- [C-V2X Workshop and Demonstration for North American Transportation Planning and Road Operator Community](#)– Qualcomm
- [5GAA pioneering digital transformation in the automotive industry](#) – 5GAA Chairman
- [The C-V2X Proposition](#) – Ford
- [5G Perspective on Connecting Cars](#) – Strategy Analytics, Inc
- [Connected Vehicle Implementation Activity in Northern Virginia](#) – Virginia Tech Transport Tech
- [V2X Product Life Cycle Management](#)– Savari
- [Economics of C-V2X The Mobile Network Operator and Support for Alternative Deployment Models](#) – AT&T
- [Six C-V2X Demonstrations](#)

26/04/2018 5GAA, Audi, Ford and Qualcomm Showcase C-V2X Direct Communications Interoperability to Improve Road Safety

<http://5gaa.org/news/5gaa-audi-ford-and-qualcomm-showcase-c-v2x-direct-communications-interoperability-to-improve-road-safety-2/>

Qualcomm Audi-Ford demonstration video

<https://www.qualcomm.com/invention/technologies/lte/advanced-pro/cellular-v2x/ecosystem/>

<http://5gaa.org/news/5gaa-presents-c-v2x-workshop-for-north-american-transportation-planning-and-north-american-road-operators/>

| | “Friends of 5GAA” (informal group) | 5GAA Not-For-Profit Membership | 5GAA Regular Membership | Special Advisory Status for public entities |
|--|---------------------------------------|--------------------------------------|---------------------------------------|---|
| I am a private road operator (e.g. SANEF, TransUrban, CINTRA, Tokyo Metropolitan Expressway) | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| I am a public road operator (e.g. Highways England, State DOT) | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> * | <input checked="" type="checkbox"/> |
| I am a for-profit research organisation or consultancy (e.g. Ricardo) | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> |
| I am a public research institute attached to a Ministry or Federal Government Agency (e.g. BAST in Germany, DOE National Lab in the US) | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> * | <input checked="" type="checkbox"/> |
| I am a Ministry or Governmental Agency | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> * | <input checked="" type="checkbox"/> |

**possible option if organisation wishes to apply for higher membership category than “General” e.g. Gold*

For more information, please email us at 5gaa-liaison@5gaa.org

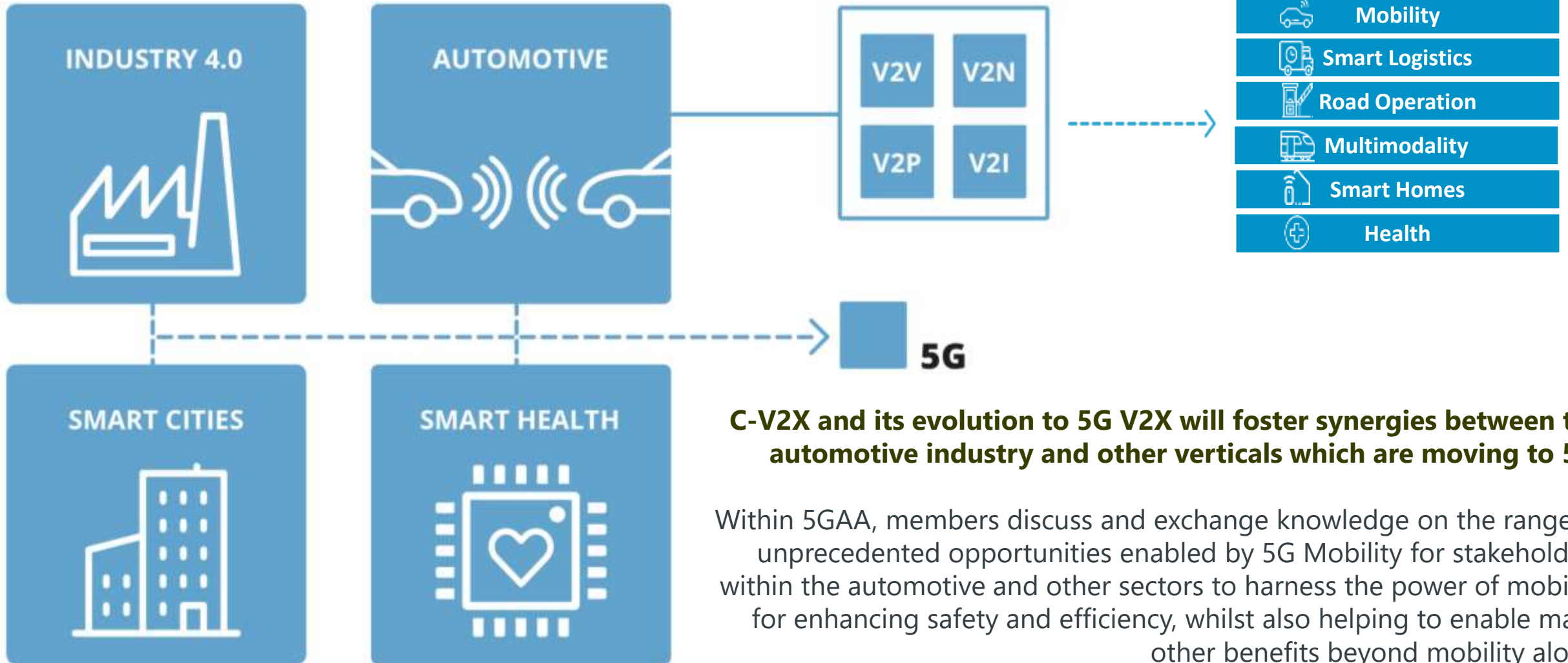
To subscribe to "Friends of 5GAA," we have created a survey monkey link:
[https://www.surveymonkey.co.uk/r/5GAA Friends](https://www.surveymonkey.co.uk/r/5GAA_Friends)

5GAA's FCC Waiver Filing & Latest US Regulatory Updates

- The 5.9 GHz band is currently designated for ITS, but FCC rules issued in 2003 limit the band to only DSRC technology.
- On November 21, 2018, 5GAA filed a request to the FCC for a Waiver to permit C-V2X technology to be deployed in the upper 20 MHz of the 5.9 GHz band (5.905 to 5.925).
- A grant of the waiver will allow for immediate deployment of C-V2X-enabled safety applications as the FCC considers how to modernize the entire 5.9 GHz band.
- 5GAA PETITION FOR WAIVER to the FCC
<https://ecfsapi.fcc.gov/file/11212224101742/5GAA%20Petition%20for%20Waiver%20-%20Final%2011.21.2018.pdf>

Collaboration and partnerships

5G - Major Industry Verticals and Automotive Enabled Applications



C-V2X and its evolution to 5G V2X will foster synergies between the automotive industry and other verticals which are moving to 5G.

Within 5GAA, members discuss and exchange knowledge on the range of unprecedented opportunities enabled by 5G Mobility for stakeholders within the automotive and other sectors to harness the power of mobility for enhancing safety and efficiency, whilst also helping to enable many other benefits beyond mobility alone.



Ecosystem Cooperation



VDT Alliance





Thank you!

For more information please contact us on
5gaa-liaison@5gaa.org

Panasonic

CDOT V2X Deployment Program

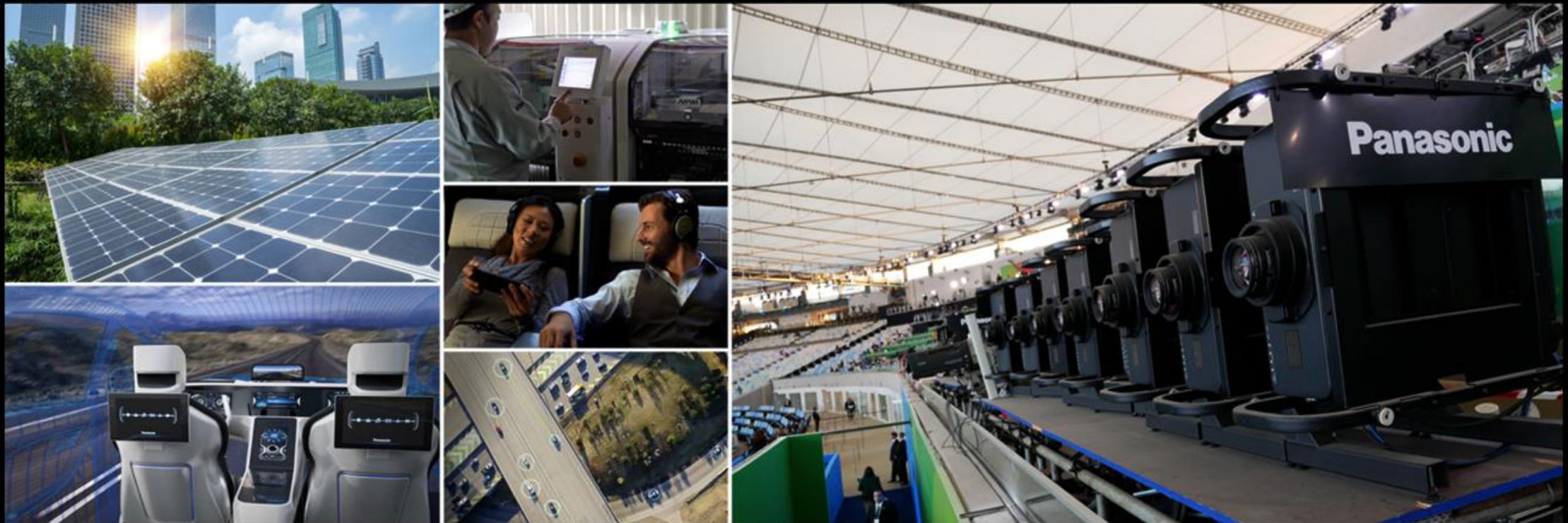
Panasonic Cirrus | 01.18.19



You know us for our consumer products ...

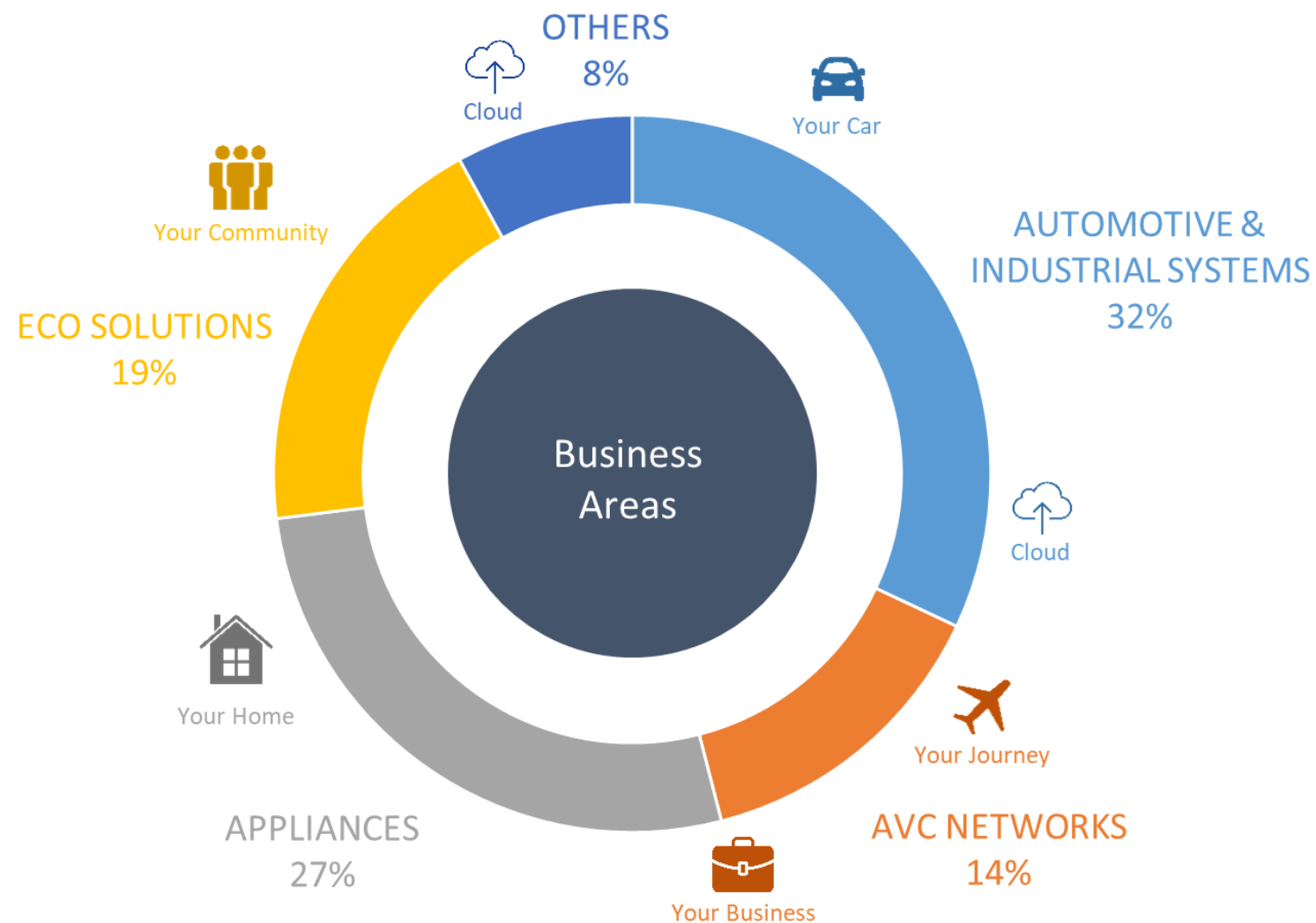


But we've evolved ...



A Better Life ... With A Lifetime of Technology

DNA of Consumer Electronics



Five (5) years, \$72 Million V2X Deployment Program

1. V2X TOC Data Platform
2. Open Access Framework
3. Production-Grade Deployment on Active, Open Roadways



Launched Jan 2017



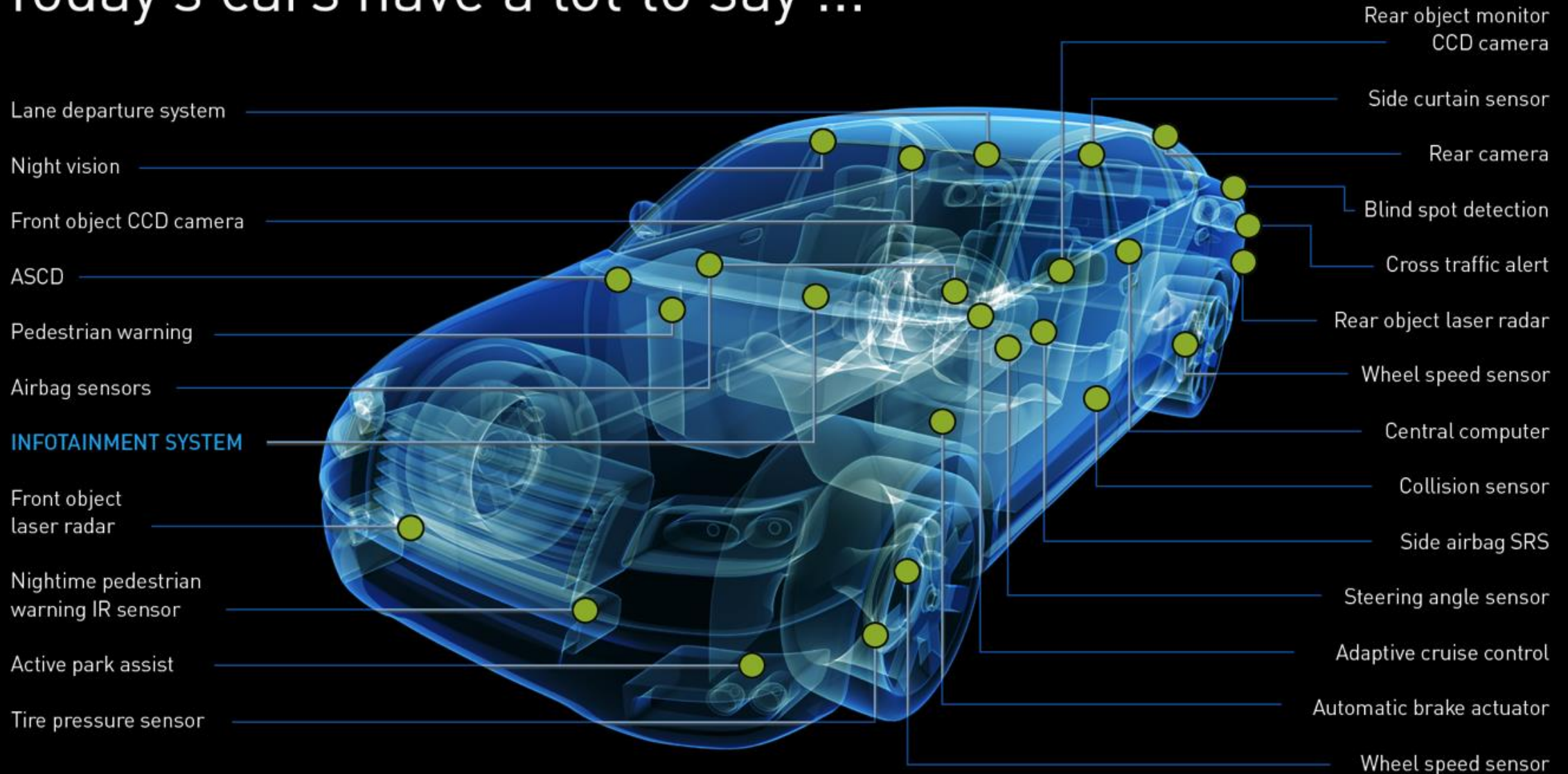
THE DENVER POST

BUSINESS > TECHNOLOGY

Panasonic working with Colorado to test self-driving vehicles on 90 miles of Interstate 70

As more cars start talking to each other, state's roadways plan to be ready

Today's cars have a lot to say ...





105 million connected cars by 2022*

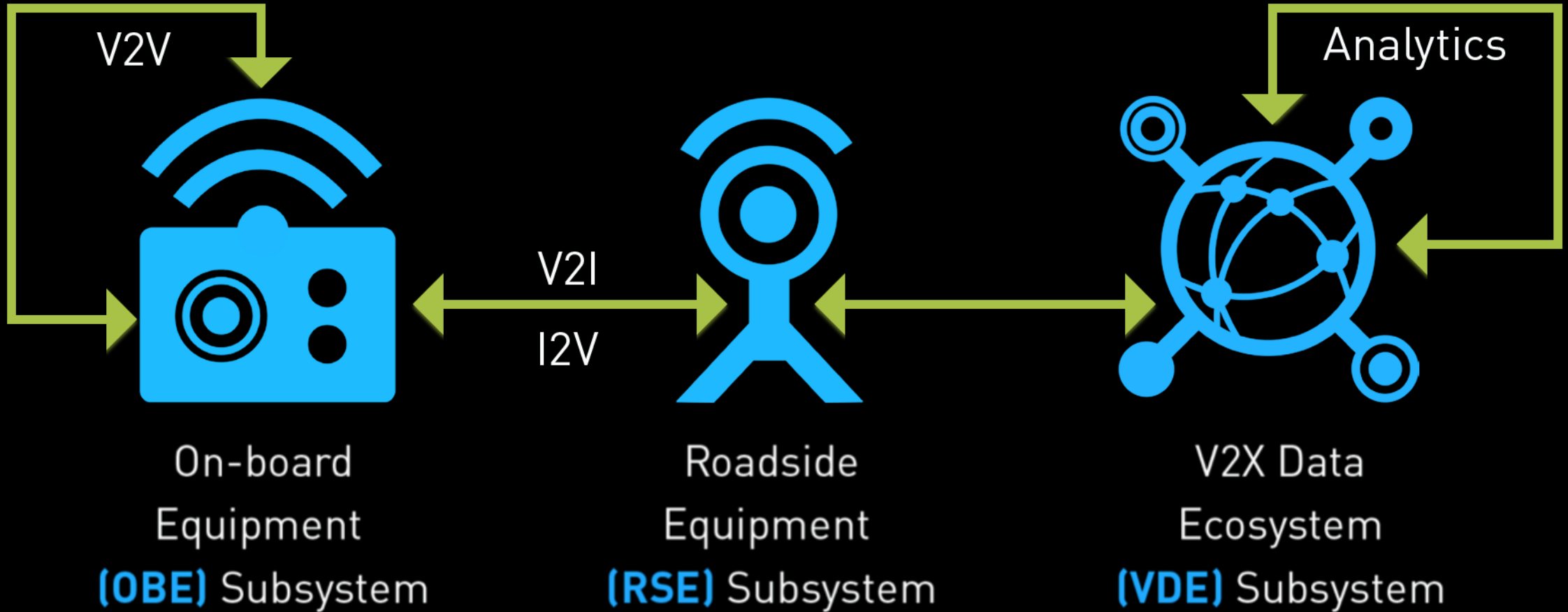
20 TB per hour

150 PB per year

Introducing PANASONIC CIRRUS



V2X System



Panasonic



Cloud Analytics

IoT/Edge

Open Ecosystem



Connected Devices,
Systems & Facilities

CDOT & 3rd Parties

Data Processing,
Data Analytics, Data Storage

Partners & 3rd Parties

Open Development Environment
for Services & Apps



TOC, NW Mgm,
Maintenance
Users



Universities,
Partners

Customer
Plug-ins

Visualization Layer

CDOT

XDOT1

XDOTn

Business Logic Layer

CDOT

XDOT1

XDOTn

Customer
Feature &
API Access

Feature/Application Layer

F1

F2

F3

F4

F5

F6

Fn

CDOT

XDOT1

XDOTn

SDK/Data API Layer

SDK

DAPI

Common Data
Streaming
IOT Platform

Data Processing, Storage
& Analytics Layer

Data Streaming
Data Aggregation
Data Analysis

Network
Management
Performance

Data Storage

IOT API Layer

V2X API

Camera API

Sensor API

ITS Data API

IOT Device/Source Layer

DSRC

C-V2X

Cam1

CamN

Sen1

SenN

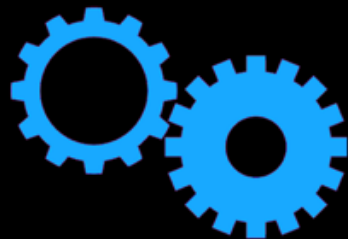
ITS
Data1

ITS
DataN

Open Ecosystem

Siloed to Connected

SDK/Data API Layer



IoT/Edge



Cloud Analytics



Open Ecosystem

Cloud Analytics

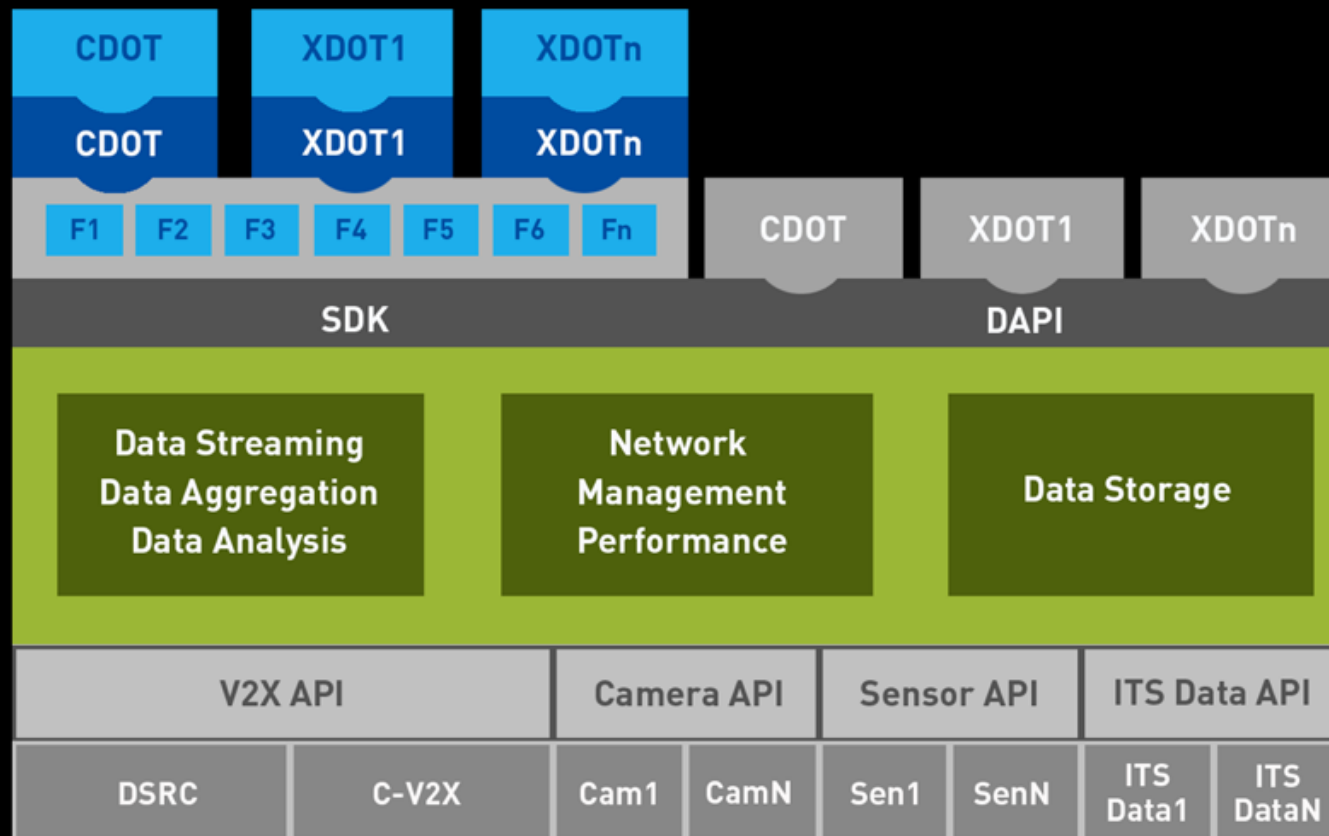
Hindsight to Foresight

Data Processing, Storage & Analytics Layer

IoT/Edge

Sense to Action

IoT API Layer



Panasonic
CIRRUS

Login ID

Ralph.Stevens@us.panasonic.com

Password

••••••••

[Forgot Password?](#)

LOG IN

Data available to Partners and Developers



Improved (V2X) traffic data



Traffic signal data



Live roadway construction data



Surface-level roadway weather data



Improved (V2X) maintenance data (snow plows, potholes)

Our intention is scale.




Roadside Infrastructure

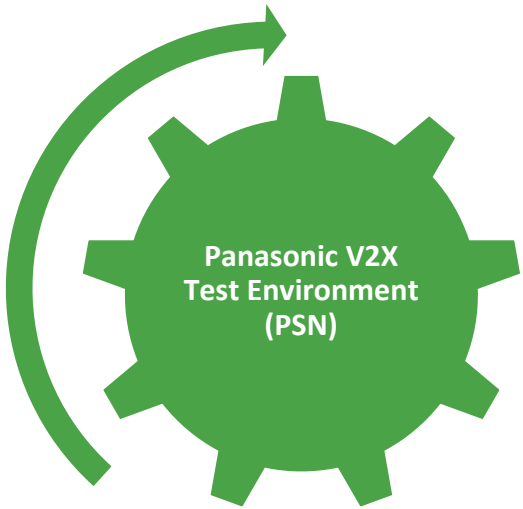


Vehicle Aftermarket



TMC Software

|  | Multi-State | National |
|---|---|--|
| 90 miles → 500 miles | 1000s of miles | + |
| 2,500 vehicles → 10,000 vehicles | 50k-100k vehicles | + |
| <u>Statewide:</u> State and Local roadways | <u>Regional:</u> Cross State borders | <u>National:</u> Cross National borders |



Panasonic V2X Test Environment

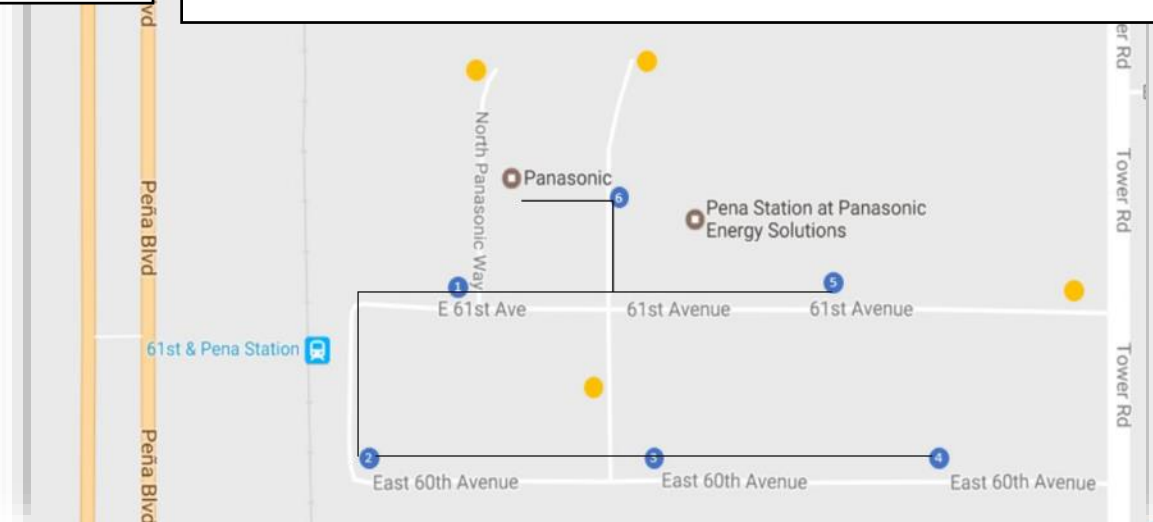
- Rapid Prototyping
 - DSRC deployment delivered in less than 6 months (Feb-Aug 2017)
 - C-V2X deployment delivered in less than 3 months (May-Jul 2018)
- Quick Stakeholder wins
 - Host regular V2X demonstrations and events
- Now Trusted as Proving Ground for Scale

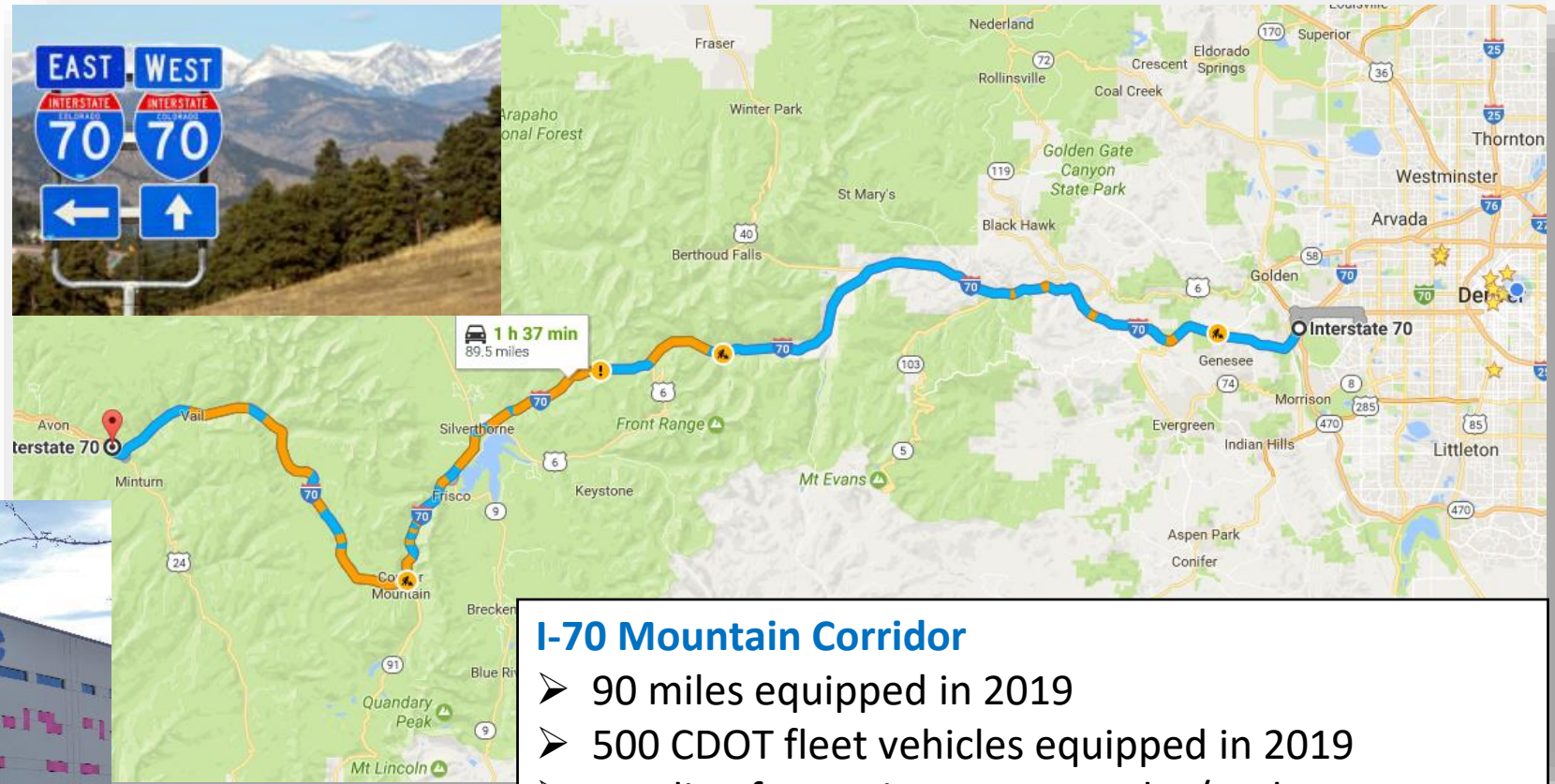
Indoor lab & garage V2X test environments

- Five (5) OEM test vehicles
- Hardware- & software-in-the-loop testing
- Complete V2X data simulation

Outdoor V2X test environment on controlled roadways

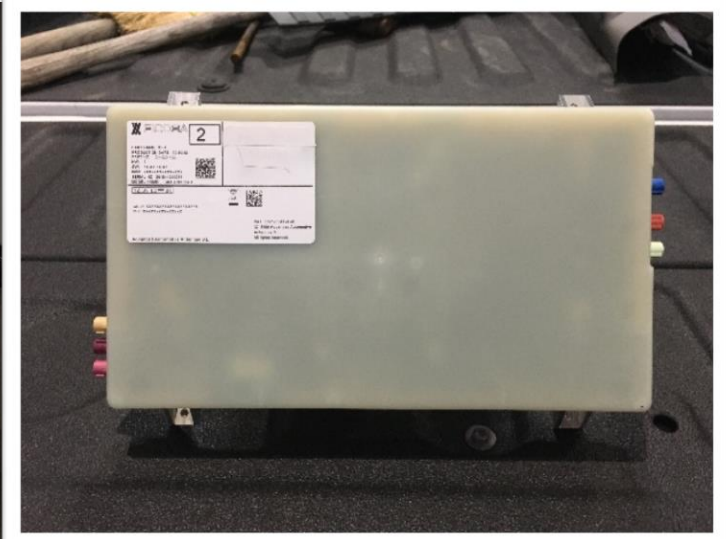
- Total of six (6) V2X roadside units for 100%
- Fiber backhaul communication with redundant ring design & managed network devices.
- Dedicated power to accessible, roadside utility cabinets.





- ### I-70 Mountain Corridor
- 90 miles equipped in 2019
 - 500 CDOT fleet vehicles equipped in 2019
 - Funding for equipment upgrades/replacements through 2021
 - High visibility, high impact corridor
 - Steep grades, sharp curves, tunnels, and extremes winter weather conditions

OBU Installs



I-70 Corridor RSU installs



Panasonic

A Better Life, A Better World

