Preparing for V2V, V2I & I2V: 5 Focus Areas to Understand

THE WHY: IMPORTANCE OF V2X AND CAV

1. Understand V2X Communication Technologies

VEHICLE TO EVERYTHING (V2X)

V2V + V2I + I2V = V2X

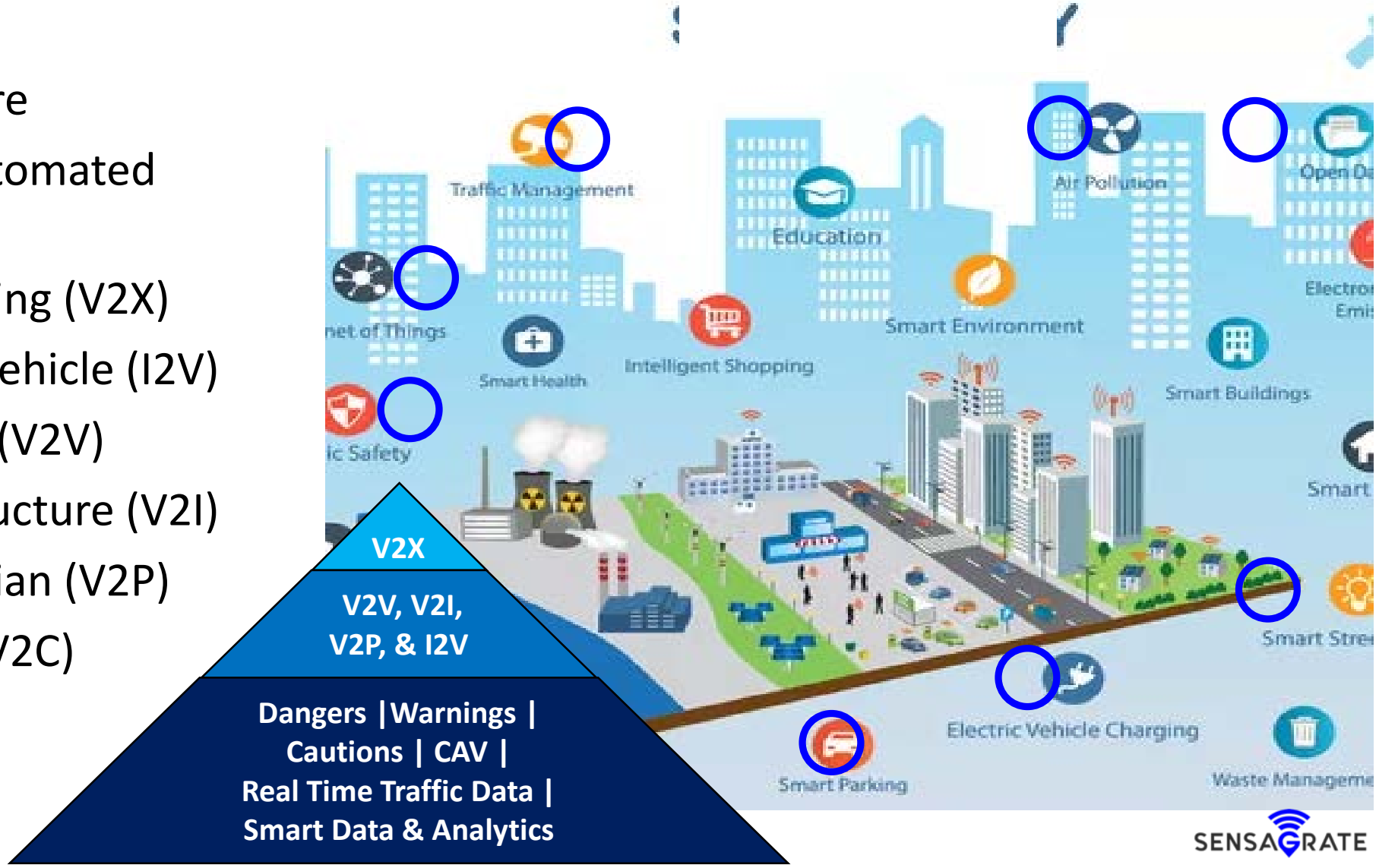
V2X COMMUNICATION TECHNOLOGIES

SMART CITIES DEFINED

Information and communication infrastructure (ICT) that allows smart devices (like smartphones, automobiles, thermostats, water meters) to connect to smart infrastructure (problem reporting, traffic signals and information, parking systems, the electric grid, billing systems) to improve quality of life and productivity in cities.

SMART INFRASTRUCTURE – CAV

- Smart infrastructure
- Connected and automated vehicles (CAV)
- Vehicle-to-Everything (V2X)
- Infrastructure-to-Vehicle (I2V)
- Vehicle-to-Vehicle (V2V)
- Vehicle-to-Infrastructure (V2I)
- Vehicle-to-Pedestrian (V2P)
- Vehicle-to-Cloud (V2C)



Building blocks to smart city mobility

SENSAGRATE

CONNECTED & AUTOMATED VEHICLES (CAV) DEFINED

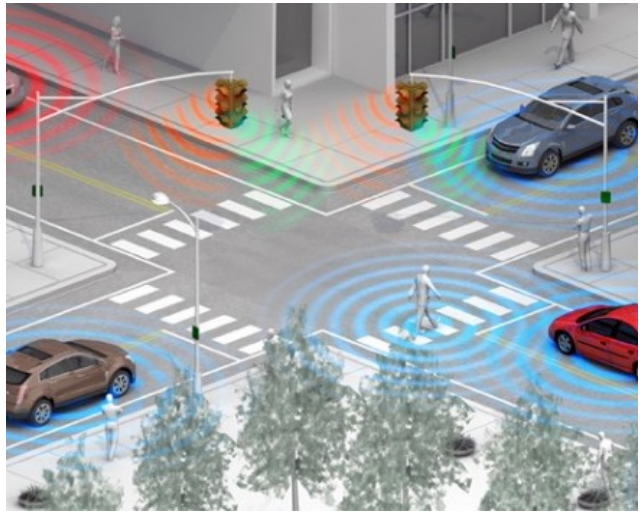
Vehicles capable of communicating with each (V2V), with roadside infrastructure, such as traffic control signals (I2V, V2I), or with other devices.

VEHICLE TO EVERYTHING (V2X)

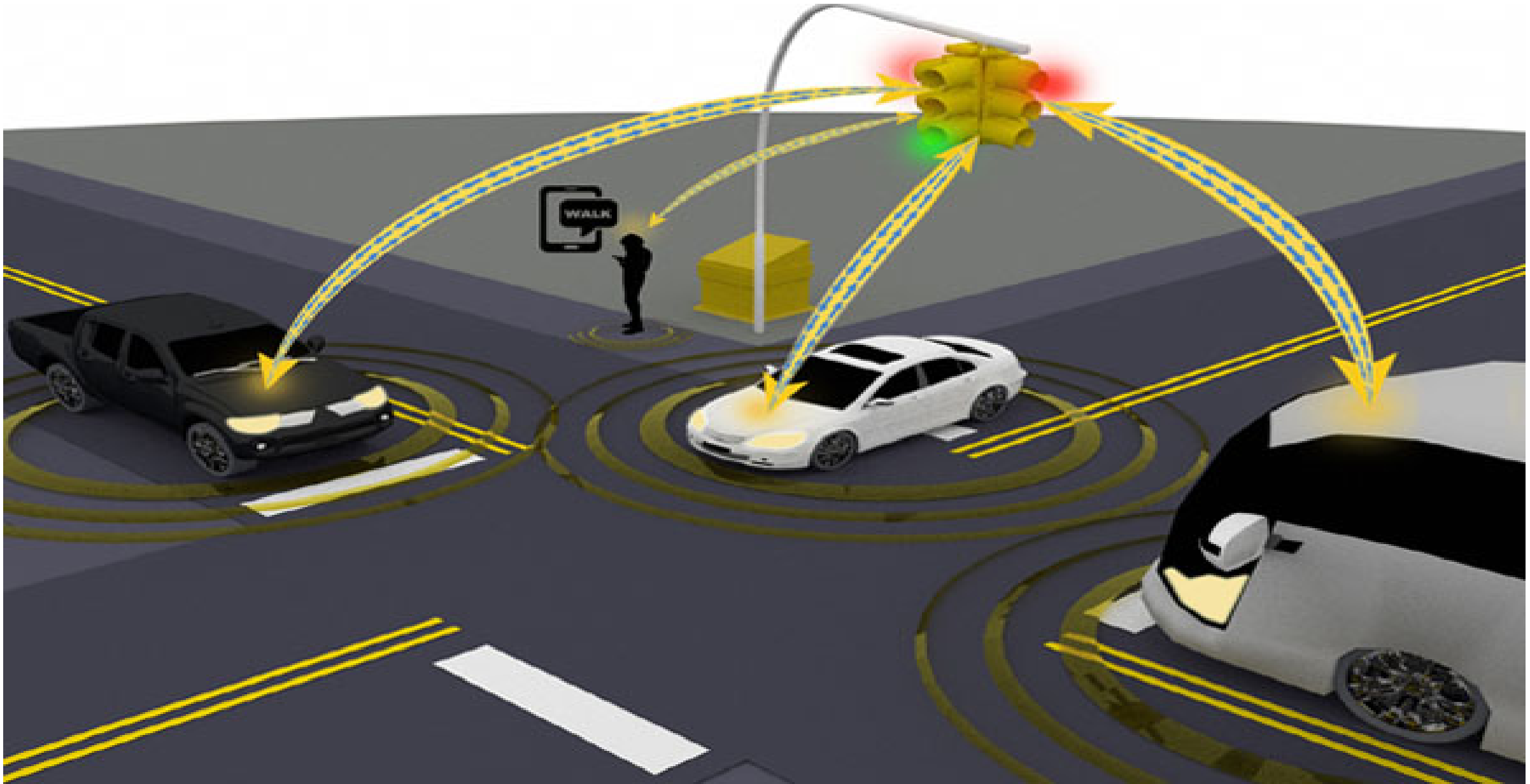
Driving View

Aerial View

VEHICLE TO VEHICLE (V2V)



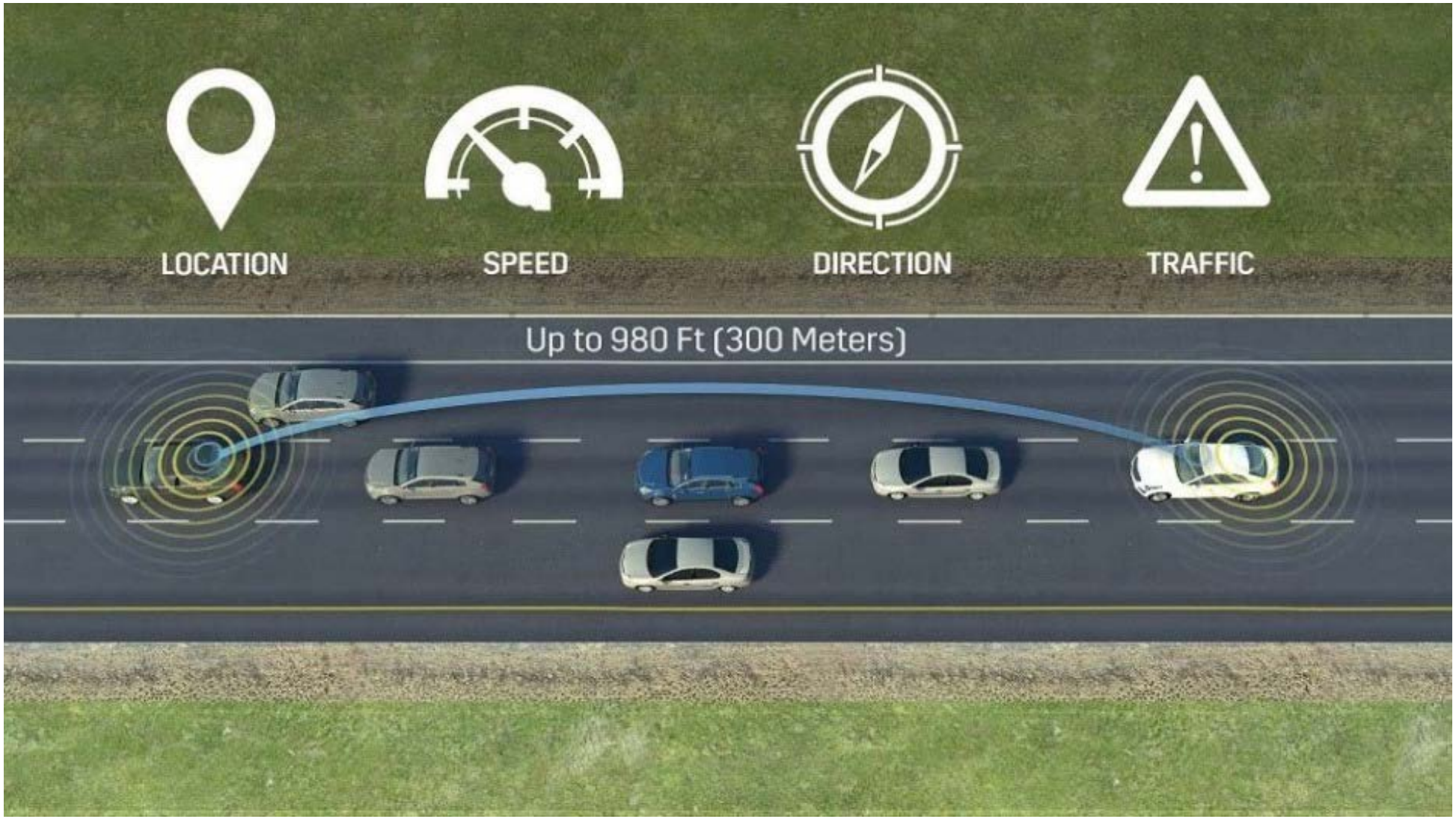
VEHICLE TO INFRASTRUCTURE (V2I)



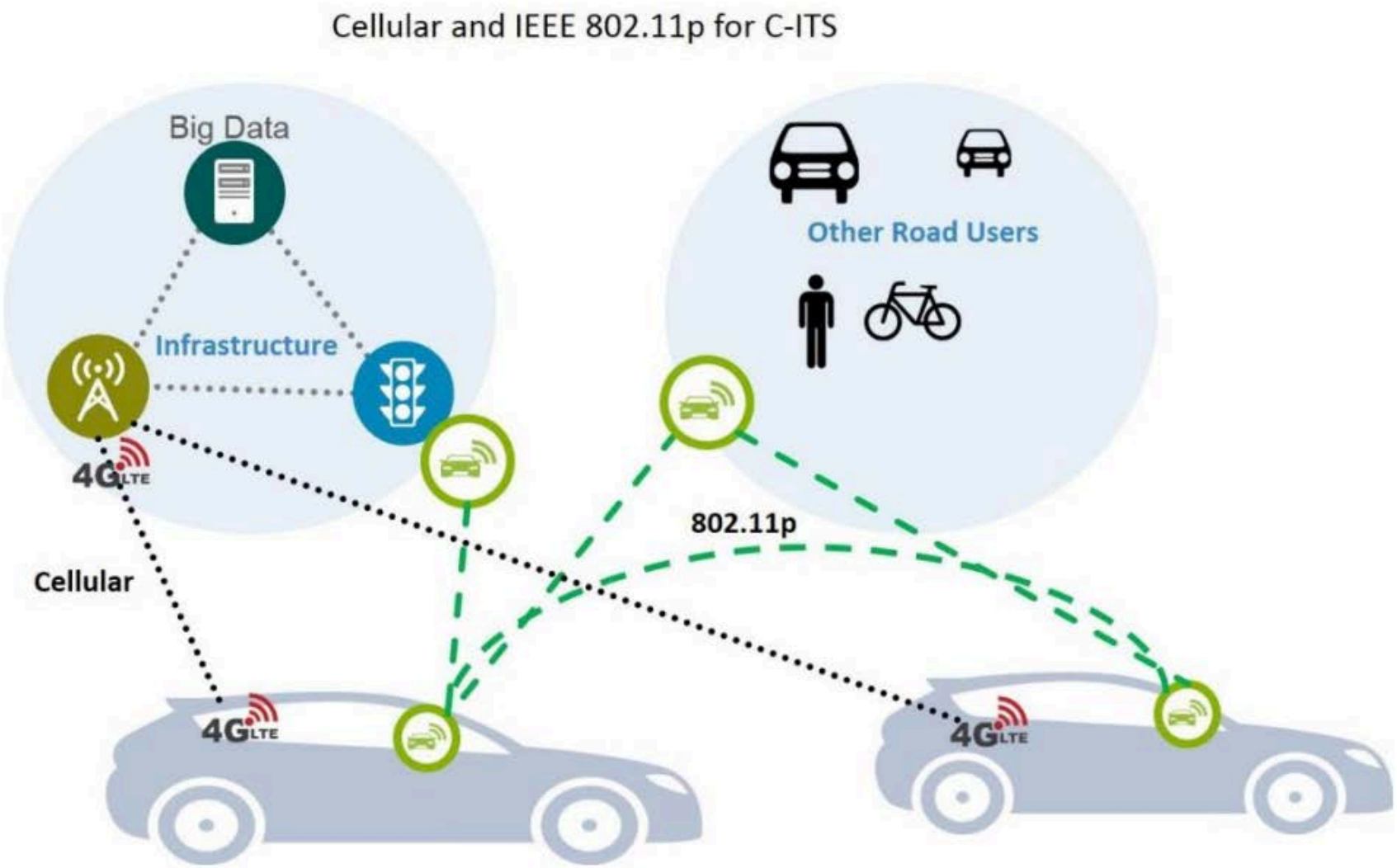
INFRASTRUCTURE TO VEHICLE (I2V)

SENSAGRATE

VEHICLE TO INFRASTRUCTURE (V2I)



DSRC VS. 5G



Siemens - Why 802.11p beats LTE and 5G for V2x

CELLULAR VEHICLE-TO-EVERYTHING (C-V2X)

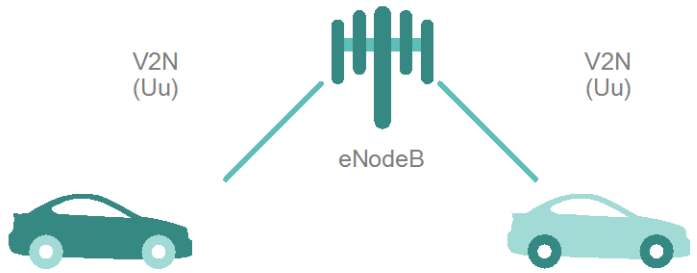
C-V2X defines two complementary communication modes

Network communications

V2N on “Uu” interface operates in traditional mobile broadband licensed spectrum

Uu interface

e.g. accident 2 kilometer ahead

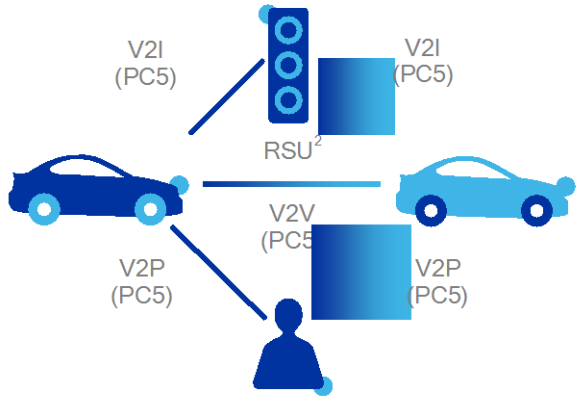


Direct communications

V2V, V2I, and V2P on “PC5” interface[1], operating in ITS bands (e.g. ITS 5.9 GHz) independent of cellular network

PC5 interface

e.g. location, speed



1. PC5 operates on 5.9GHz; whereas, Uu operates on commercial cellular licensed spectrum 2. RSU stands for roadside unit.

https://www.qualcomm.com/media/documents/files/accelerating-c-v2x-commercialization.pdf

USE CASE APPLICATIONS

Application Use Cases	V2V	V2I	I2V
Red Light Violation Warning (RLVW)		X	X
Curve Speed Warning (CSW)		X	X
Stop Sign Gap Assist (SSGA)		X	X
Spot Weather Impact Warning (SWIW)	X	X	
Reduced Speed/Work Zone Warning (RSWZ)	X	X	X

USE CASE APPLICATIONS

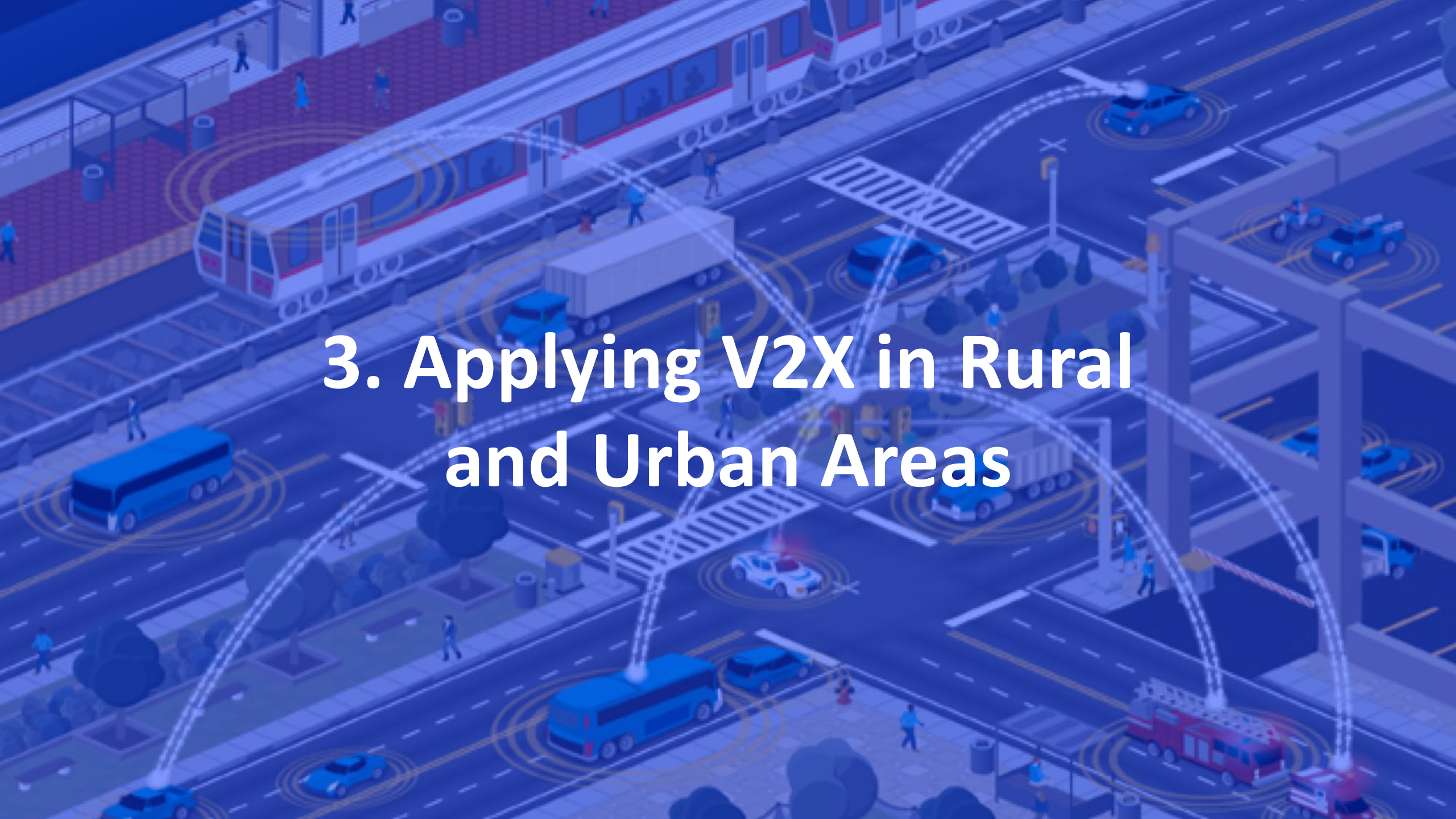
Application Use Cases	V2V	V2I	I2V
Pedestrian in Signalized Crosswalk Warning (Transit)		X	X
Traffic Signal Timing/Priority		X	
Blind Intersection Alerts	X		X
Collision Avoidance Safety Systems	X		
Forward Collision Warning / Emergency Electronic Brake Light	X		

USE CASE APPLICATIONS

Application Use Cases	V2V	V2I	I2V
Blind Spot Warning and Lane	X		
Do-Not-Pass Warning	X		X
Intersection Movement Assist	X		X
Cooperative Adaptive Cruise Control	X		
Automatic access control/parking access		X	

2. Importance of Big Data and Analytics

DATA: BIG DATA IS GOLD



3. Applying V2X in Rural and Urban Areas

APPLYING TO RURAL ITS: WILDLIFE DETECTION

Courtesy of Colorado Department of Transportation.
https://www.cpr.org/news/story/cdot-challenges-innovators-to-help-solve-rural-road-dangers

APPLYING TO RURAL ITS: WILDLIFE DETECTION

Safety Notification – I2V Situational Awareness and Environmental to Vehicle Warning

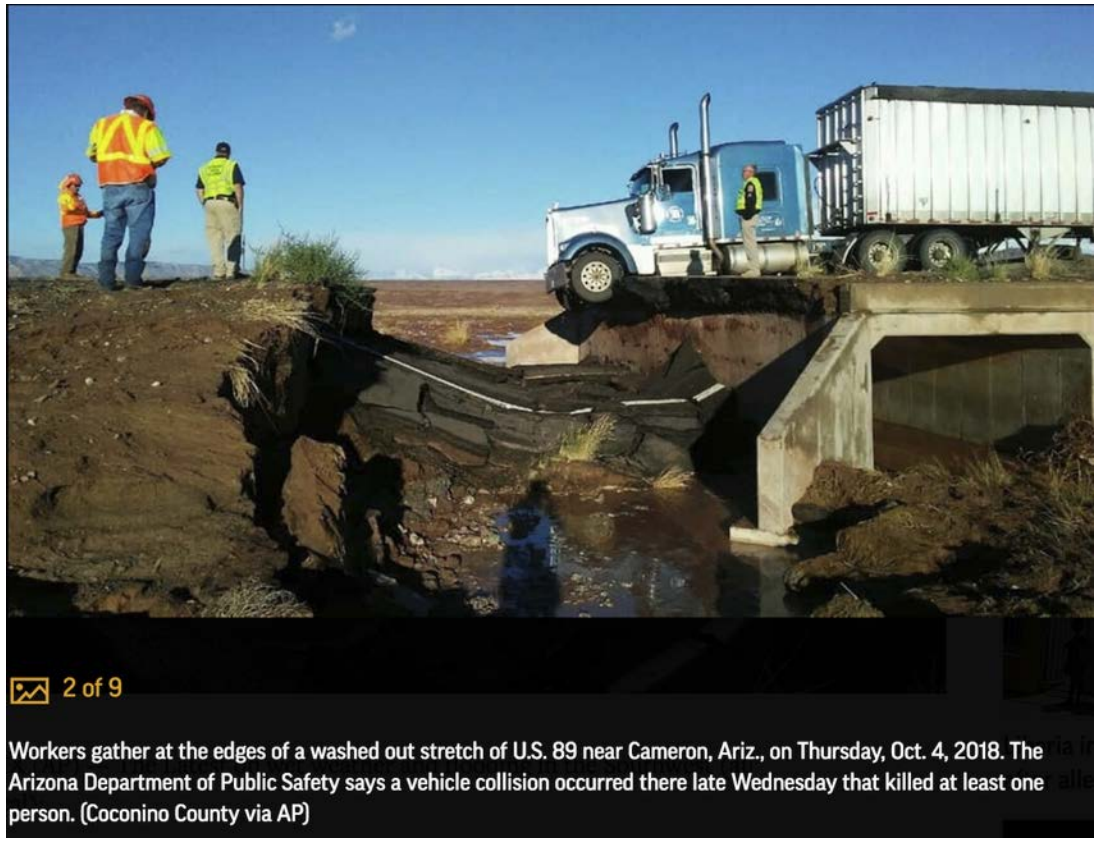
APPLYING TO RURAL ITS: WASHES AND FLOODING IN AZ

Safety Notification – I2V Situational Awareness and Spot Weather Impact Warning (SWIW)*

Courtesy of AZ Family 3 and 5 - Firefighters rescue drivers stranded in flooded Phoenix wash
https://www.azfamily.com/news/firefighters-rescue-drivers-stranded-in-flooded-phoenix-wash/article_8031ff94-c66d-11e8-9aff-83cbfcc09a98.html

APPLYING TO RURAL ITS: WASHES AND FLOODING IN AZ

Safety Notification – I2V Situational Awareness and Spot Weather Impact Warning (SWIW)*



Body Of Man Pulled From Flooded Arizona wash

By ASSOCIATED PRESS • OCT 5, 2018

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Google+
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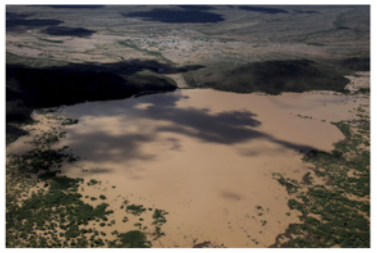


In this Tuesday, Oct. 2, 2018 photo provided by the Tohono O'odham Nation Dept. of Public Safety, is flooding near the Menagers Dam community in Arizona. The southern Arizona dam that had been at risk of breaking and flooding a small village held steady Wednesday, Oct. 3, as the lake behind it receded after being swollen with runoff from the remnants of Tropical Storm Rosa.

CREDIT TOHONO O'ODHAM NATION DEPT. OF PUBLIC SAFETY VIA AP

Authorities in northwestern Arizona say a man has died after his car was swept into a flooded wash bed.

The Mohave County Sheriff's Office says a rescue helicopter located the body of 34-year-old Joshua Allen Carlisle of Golden Valley on Thursday about 2 miles (3.2 kilometers) from where his vehicle went into the wash during a storm.

Deputies say they had received reports late Wednesday of an SUV becoming submerged.

A water rescue team found the vehicle a little over half a mile (0.8 kilometers) from the road along the wash bank.

Courtesy of Associated Press - The Latest: Body of man pulled from flooded Arizona wash
https://www.apnews.com/b0f2ebc8c9fe4fd786032d53225cf942

APPLYING TO RURAL ITS: HIGH COUNTRY AND SNOW

Safety Notification – I2V Situational Awareness and Spot Weather Impact Warning (SWIW)*

4. Existing Technologies

CURRENT TECHNOLOGIES

DEPLOYMENTS IN THE US

New York City

NYCDOT Pilot

Tampa Bay

THEA Pilot

Wyoming

WYDOT Pilot

Michigan

Arizona

Denver

Executive Order creating the Institute for Automated Mobility

CDOT | ROADX

DEPLOYMENTS IN THE US

5. Prepare with a Plan for Development and Deployment

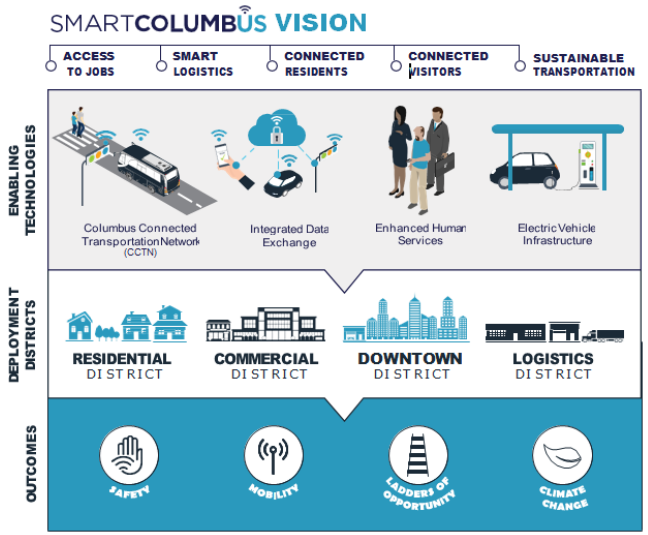
ESTABLISH A VISION AND PLAN AS A CITY AND REGION

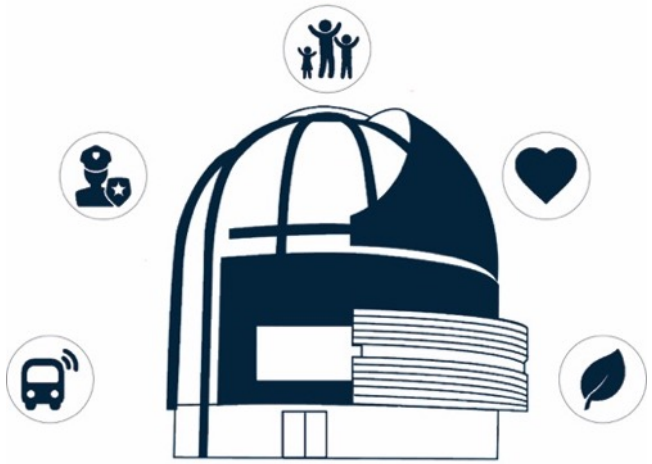
GREATER PHOENIX: A SMART REGION

The Smart Region plan is about intentionally collaborating with regional partners to adopt and scale solutions that transform Greater Phoenix. This transformation brings together diverse stakeholders to enhance quality of life and well-being for all residents.

Meeting of the Minds webinar, "The A to Zs of Arizona's Quest to Become a Smart City Tech Hub." http://meetingoftheminds.org/cal/the-a-to-zs-of-arizonas-quest-to-become-a-smart-city-tech-hub

Columbus Smart City Challenge Implementation Vision

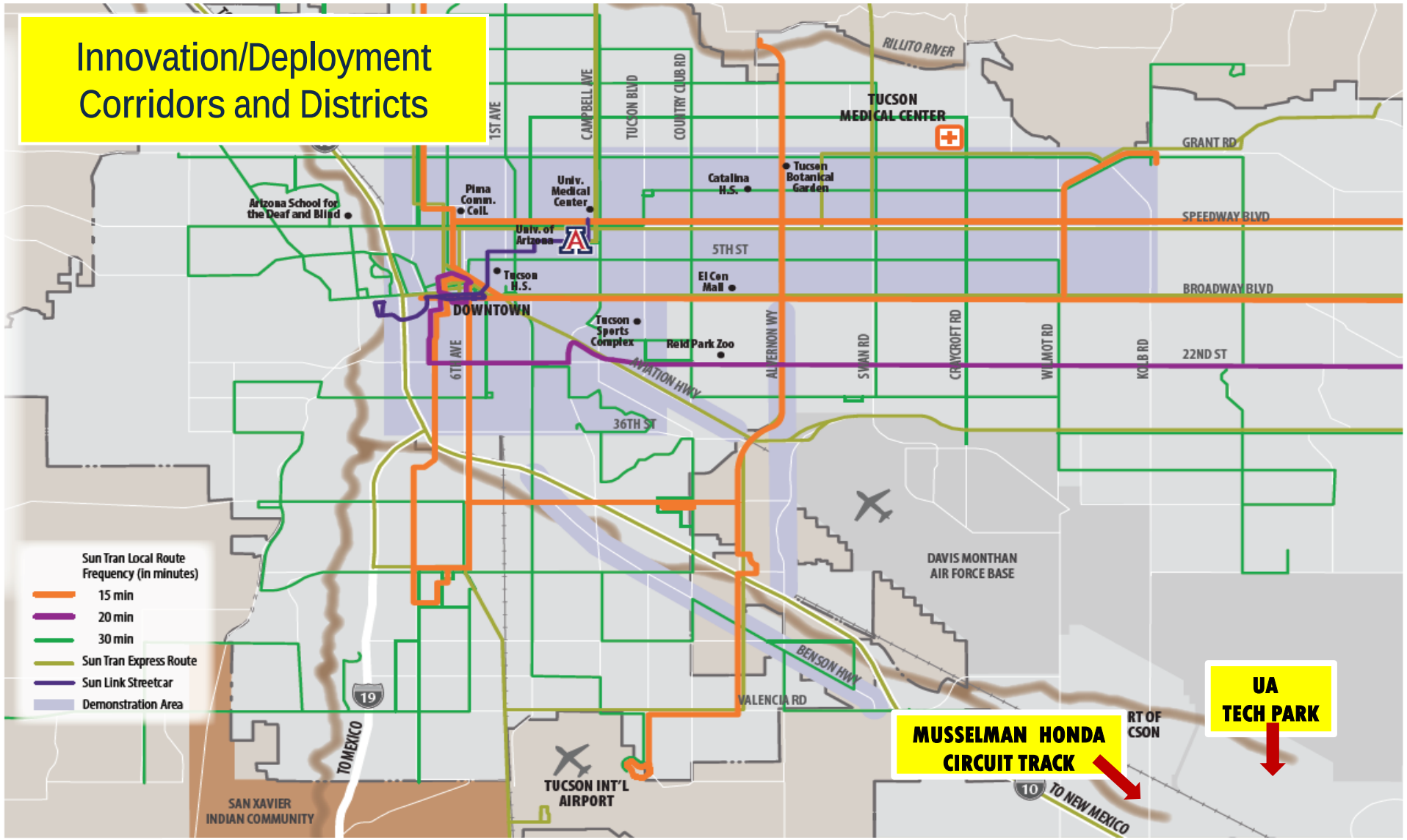




IDENTIFY CORRIDOR(S) TO LAUNCH AND DEPLOY TECHNOLOGY

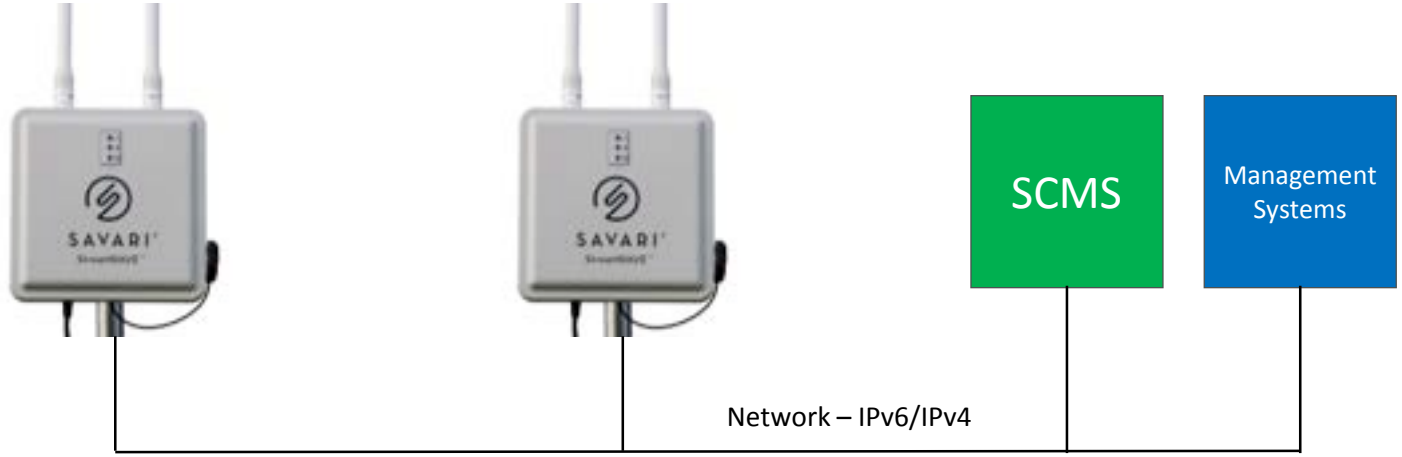
- ❑ High volume of driving, traffic, and congestion
- ❑ Increase mobility
- ❑ Improve public safety
- ❑ High arterial corridor with crashes/collisions
- ❑ High travel time
- ❑ High pedestrian involved crashes/collisions
- ❑ High volume of freight trucks

LIVING LAB CORRIDORS TUCSON, AZ

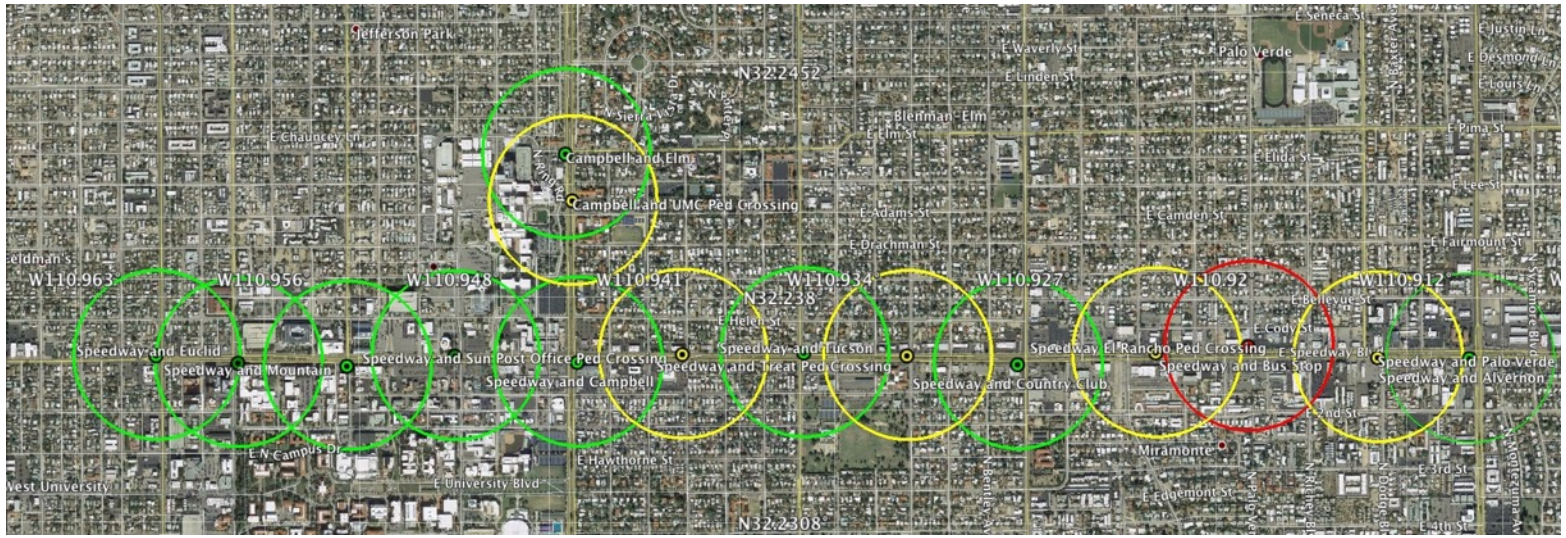


Jennifer Toothaker, City of Tucson - Smart Cities Council City Networks Task Force, "Transportation Networks: Building Intelligent Roadways/ Connected Vehicles", July 26, 2018

VISUAL EXAMPLE OF DEPLOYED DSRC



Fiber, Wireless, Cellular – low data demands, depends on applications



Tucson Living Transportation Laboratory, 300 meter (min) DSRC Deployment (approx. 3 miles)

Dr. Larry Head, University of Arizona - Smart Cities Council City Networks Task Force, “Transportation Networks: Building Intelligent Roadways/ Connected Vehicles”, July 26, 2018

AZ URBAN ILABS

A connected network of Innovation Sandbox Districts throughout the Region to design cities of the future and accelerate the development of next generation technology products processes, and services.

WHO'S INVOLVED? INTERGRATE WITH EVERYONE

- Local, Regional, and County Government Partners
- Regional Council Governments Partners
- Community and Industry Partners
- Education and Workforce Development Partners

RESOURCES


ARIZONA
CONNECTED VEHICLES
Maricopa County Deployment


SSARI


AZIDP
Institute for Digital Progress


TRB
TRANSPORTATION RESEARCH BOARD
OF THE NATIONAL ACADEMIES


5GAA
Automotive Association


NOCoE
National Operations Center of Excellence


AASHTO
THE VOICE OF TRANSPORTATION


SAE
INTERNATIONAL


Smart
Cities
Council


WIA
Wireless
Infrastructure
Association


STRONG
CITIES


CITY NETWORKS
TASK FORCE


Center for Advanced
Automotive Technology
C · A · A · T


DEPARTMENT OF TRANSPORTATION
UNITED STATES OF AMERICA

COMPLETE YOUR READINESS AND GET INVOLVED!!!

- Be Involved in your local Smart City and Region Plan
- Connected and Automated Vehicles
- Autonomous Vehicles, Self Driving Buses, and Vehicle Fleets
- Education and Workforce Development
- Arrange a Site Visit or Tour of the Test Bed
- Prepare for New Federal Regulations and Standards
- Establish Open Data Policy
- Security and Privacy is IMPORTANT
- Validate and Test
- Knowledge Sharing and Best Practices
- Funding – Grants and Innovation Funds
- Community Involvement
- Community and Industry Partners
- Education and Workforce Development Partners

The Communication Platform

Connected IoT Sensors

- Performs object identification of vehicles, pedestrians, and cyclists
- Integrates with Smart Infrastructure
- Data is collected at intersections using a set of stationary LiDAR (light detection and ranging) sensors

Critical Data and AI

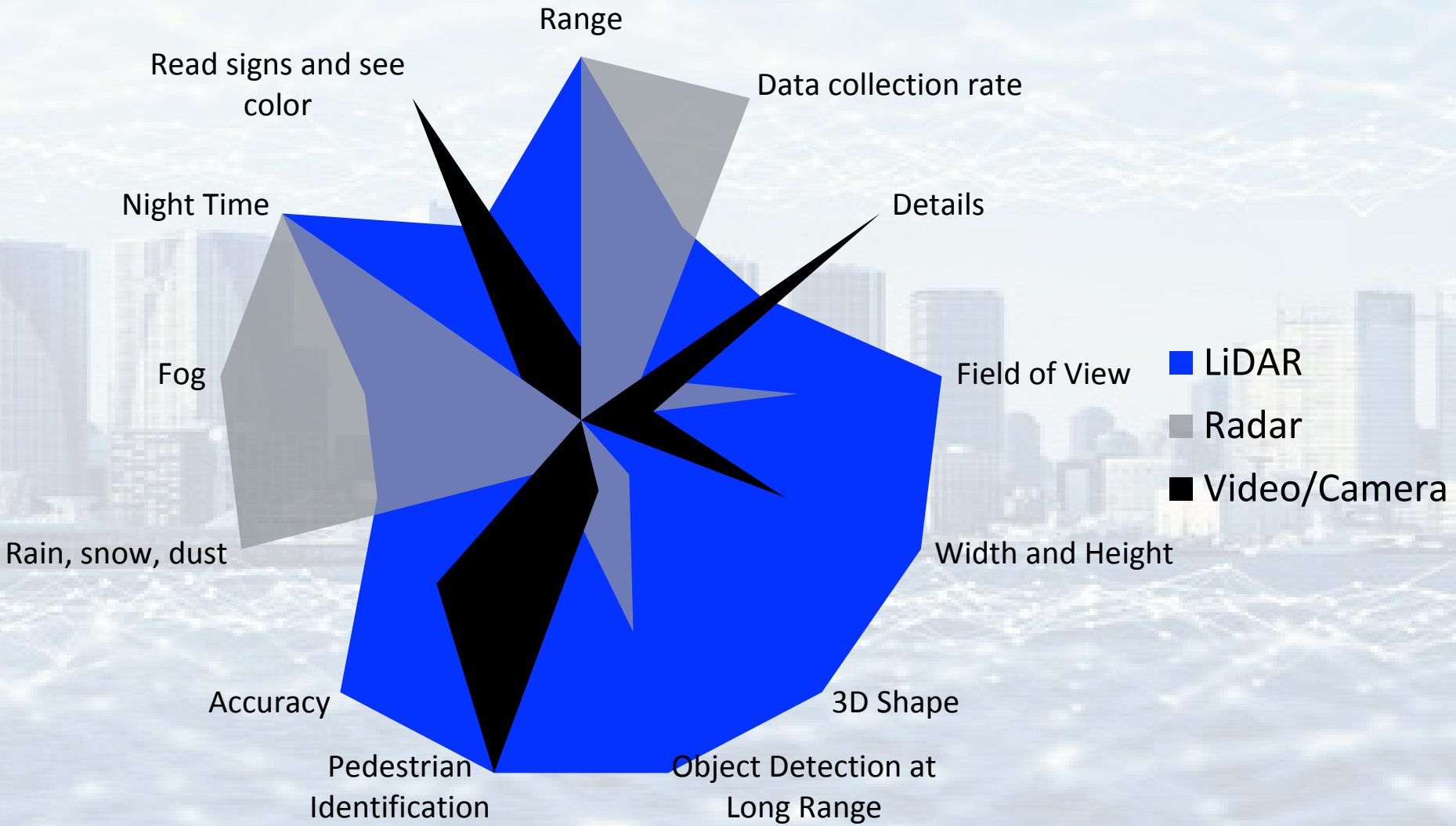
- Lightweight sensor data allows for immediate interpolation of important data points
- Real time, non-sensitive data
- Analyze traffic flow patterns easily with lightweight, critical data

Safer and Smarter Roadways

- Ease traffic congestion
- Improve transportation and public safety
- Communicate advance warnings for alerts and threats in the roadway to vehicles
- Prepare for smart city, connected and automatous vehicle (CAV), and vehicle-to-everything (V2X) readiness

CLOUD BASE PLATFORM

Why LiDAR



SENSAGRATE

A smart city infrastructure to vehicle (I2V) communication platform

Sensor Technology

- Object detection
- Integrates with Smart Traffic Lights

Critical Data

- Real-time data interpretation
- Non-sensitive data

Safer and Smarter Roadways

- Safer, smarter traffic analytics
- Range up to 200 meters in 360°

Benefits

- Improve roadway safety
- Cloud based communication platform
- Prepare for smart city and automatous vehicle readiness

Testbed Program Opportunity

- Deploy Sensagrate Temporary Ecosystem (STE) Units at strategic intersections
- Mounted or mobile deployment installation
- Testing performed in 30-day increments
- Multiple intersection deployment
- Reporting and metrics on traffic flow health and analysis

SENSAGRATE

Presentation Link

http://www.sensagrate.com/itsaz2018

Contact Us

Ease | Improve | Communicate | Prepare

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