



Safe crossing by means of C-ITS technologies

Focus: Vulnerable Road Users (VRUs)

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C-ITS Forum

Vernetzt. Sicher. Harmonisiert.

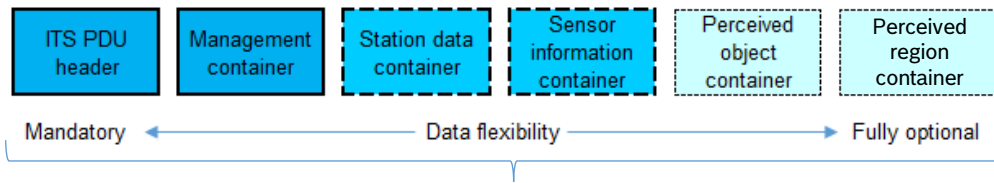
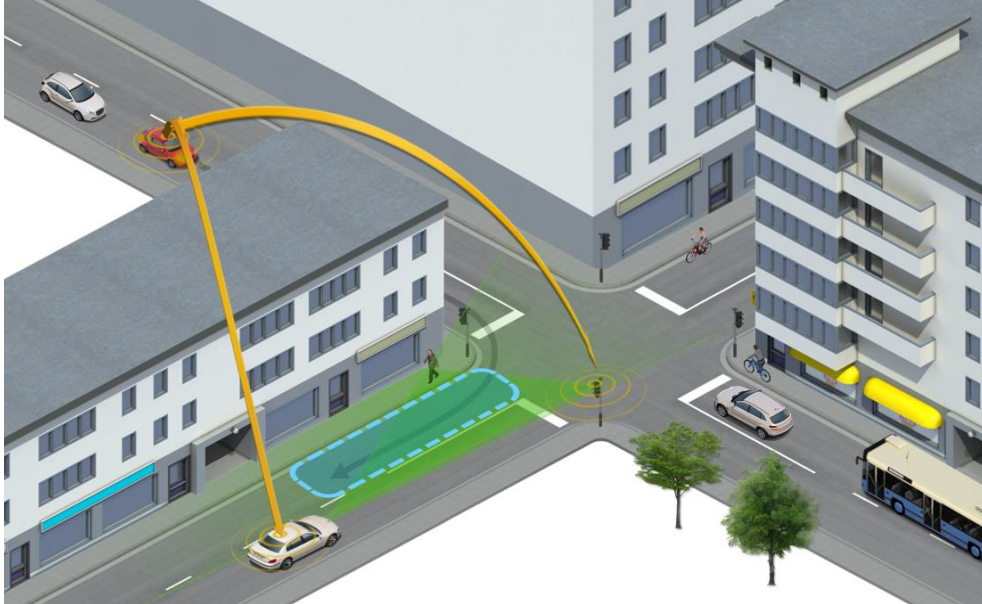
25. & 26.02.2025, Frankfurt/Main



V2X Infrastructure Deployment

Collective Perception

Day 2 V2X services are intended to share **enhanced status and environment information**.



Collective Perception Message (CPM)

Collective Perception provides significant enhancements with regard to basic awareness services:

- Supports sharing of **non-connected road users and objects**.
- Supports **infrastructure-based operation** (can be placed strategically, e.g., in especially relevant traffic environments).
- Significantly increases the **number of data sources** (enhancing e.g., trust, accuracy, misbehavior detection).
- Supports sharing of **clearance information** (drivable regions, unknown regions).

V2X Infrastructure Deployment

Collective Perception

- We **highly appreciate V2X Infra Deployment**

- because infrastructure **can „see“ all traffic participants**,
 - equipped and non-equipped,
 - including VRUs,
 - with high reliability and quality
- because it **can provide clearance information** (the space is free, you can go!)
- because this way, it **will leverage the experiancability** of V2X traffic participants and hence foster V2X deployment on car side
- because of potential **synergies with non-safety applications** like green wave or green light priorities

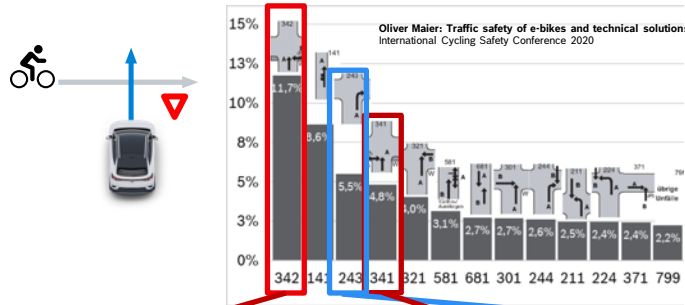
- Still, there is also **additional benefit in equipping VRUs with V2X**

- Infrastructure Deployment will focus on / start with dedicated areas (like traffic hot spots, signalized intersections etc) -- but **most bicycle-to-car accidents do not happen** at locations that are prone to Infra Deployment (see next pages)

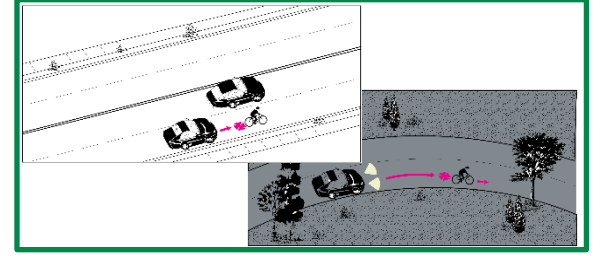
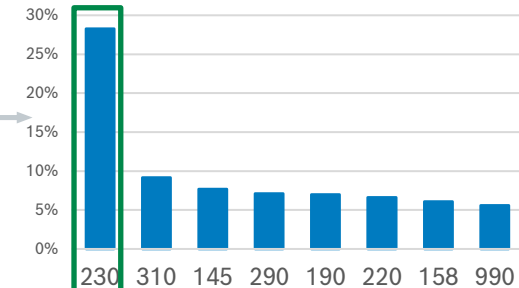
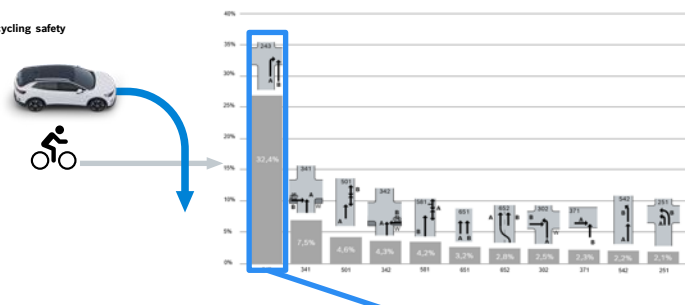
Accident Research

Most relevant Car2Bike Accident Scenarios

EU GIDAS: Bike2Car



EU GIDAS: Bike2Truck

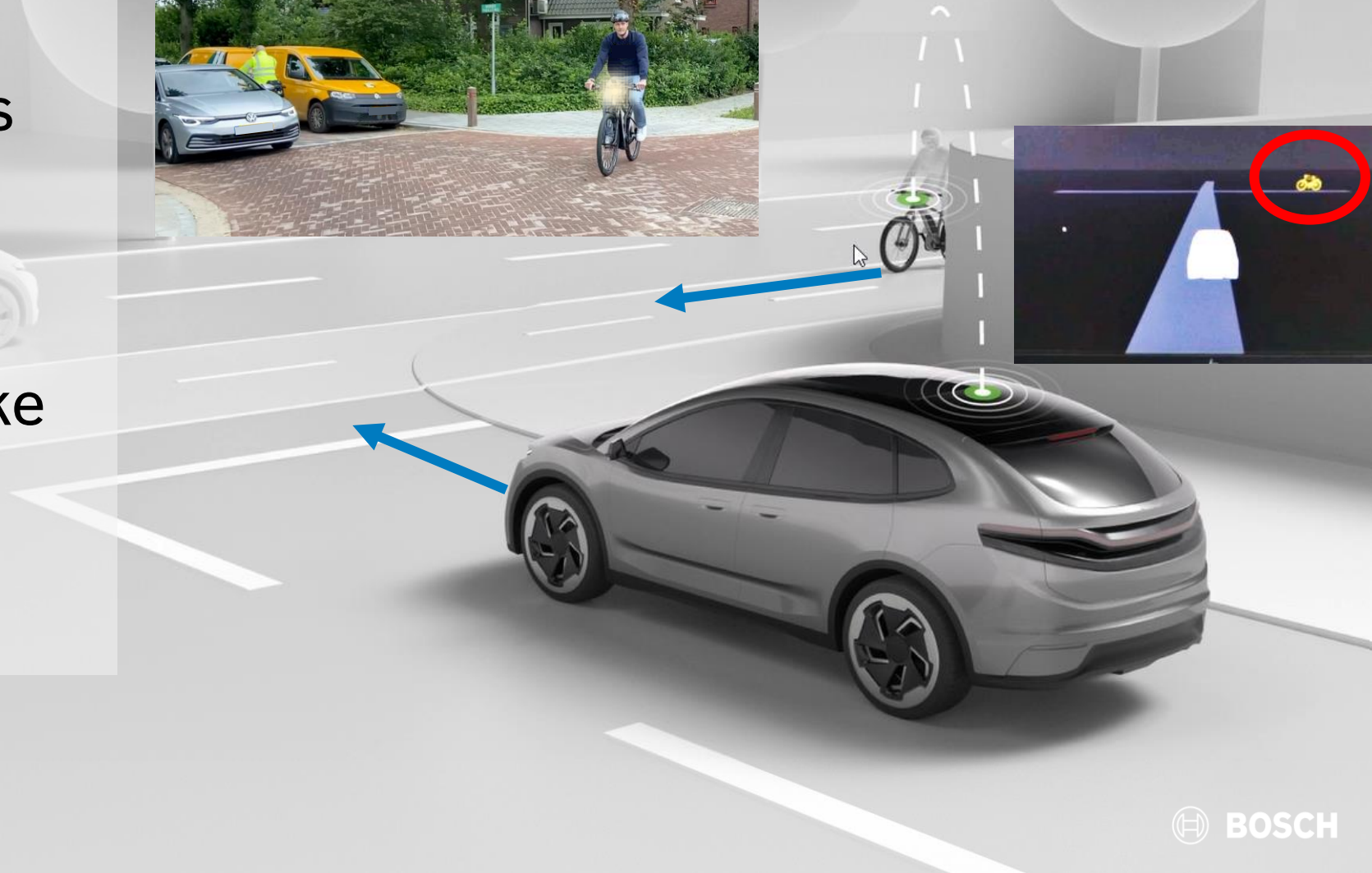


Crossing scenario

Right(& left)turn scenario

Cyclist on rural road scenario

Vehicle-to-X communication can make cyclists digitally visible – in the car or by increasing the visibility of the bike (e.g. with V2X-triggered flashing lights)



Different requirements for specific use cases

Requirements depend on scenario,
time to collision and solution approach

Accuracy (Position and Time)

Trustworthiness (Safety, Security)

Timeliness (update frequency)

Time To Collision

Information **Driver Awareness** **Warning** Intervention



Basic System Profiles (BSP) from **Car2Car Communication Consortium** contain requirements for sets of use cases and further details

Car2Car Consortium BSP and ETSI CAM Message Standardisation



CAMv1: (since 2010)

Content: Position, Heading, Speed, Vehicle Type etc
Use Cases: mainly car-based, basic awareness use cases



Driver Awareness

Basic System Profile 1

Content: defines first set of (mainly car and infrastructure) use cases and related requirements



CAMv2 (since 2022, ongoing improvements)

Content: Position, Heading, Speed, Vehicle (sub-)Types, Path and Intention Prediction, Stability indicator, improved options to describe LaneType and Position

Use Cases: scenarios with mixed vehicle types, advanced use cases

Basic System Profile 2 (in progress)

Content: defines extended set of use cases (with multiple types of traffic participants) and related requirements

→ CAMv1 and Car2Car Basic System Profile 1 are **mature** for mutual **awareness** use cases

→ CAMv2 and Car2Car Basic System Profile 2 will allow additional, more safety critical use cases

Deployment readiness

Hurdles

1) Lack of public knowledge of V2X advantages

■ Promotion Videos / Podcasts

Explanatory Video by Commsignia w/ VW, Autotalks, Bosch



Visinary video by Autotalks w/ VW, Bosch & Commsignia



Bosch Podcast: from KNOW-HOW to WOW

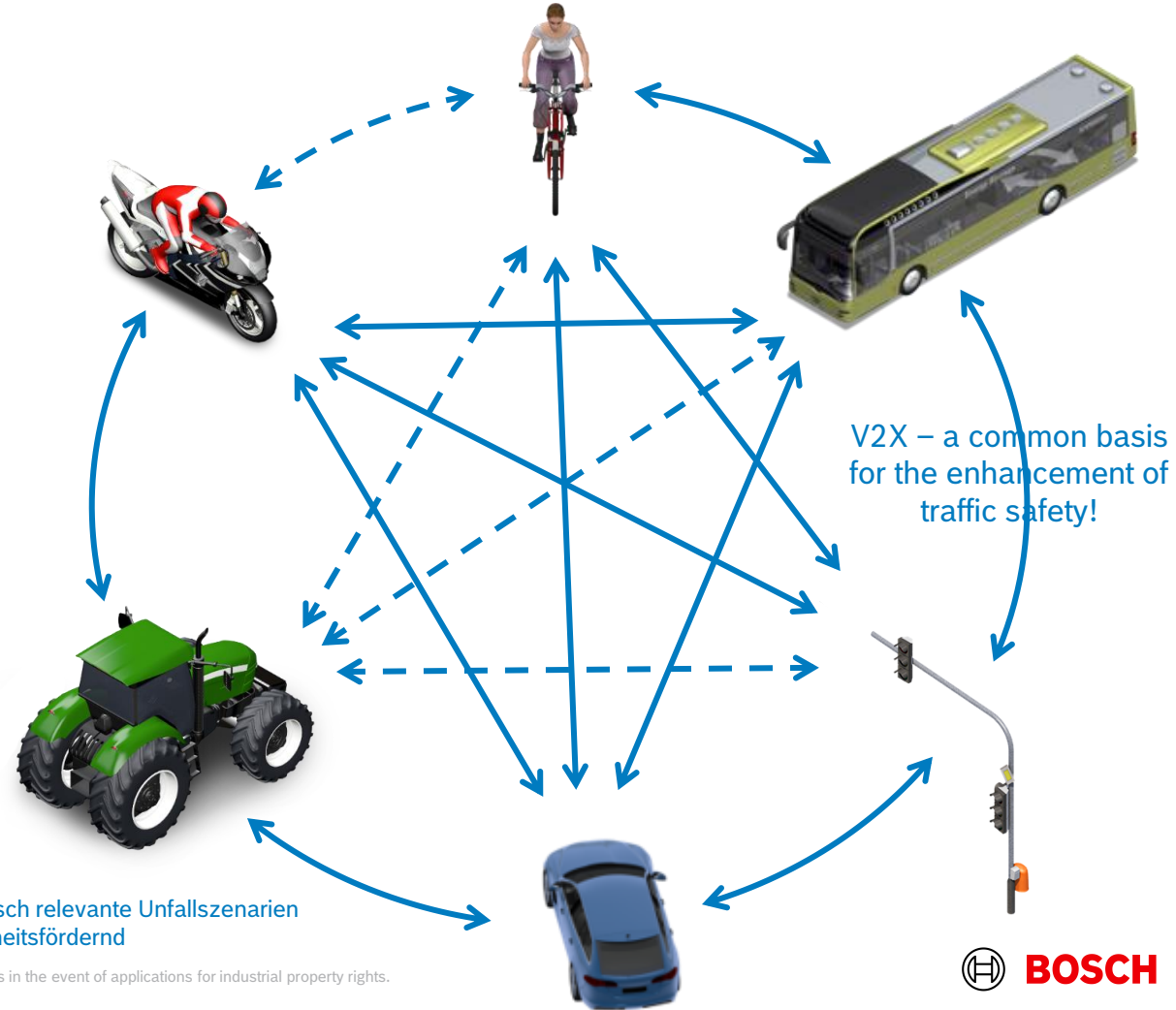


■ Common demonstrations

We plan common **ecosystem demonstrations** in 2025 with cars, agriculture, cars and bicycles – **is public transport and infrastructure is interested to join?**

■ Press Releases

Auto, cycling and tech innovators launch Coalition for Cyclist Safety based on V2X deployments



Hurdles

2) Positioning accuracy (esp. for future use cases)

- **As of today,**

- we think that current available positioning accuracy is already enabling several awareness-based use cases
- Car2Car Basic System profile defines required positioning accuracies

- **In future,**

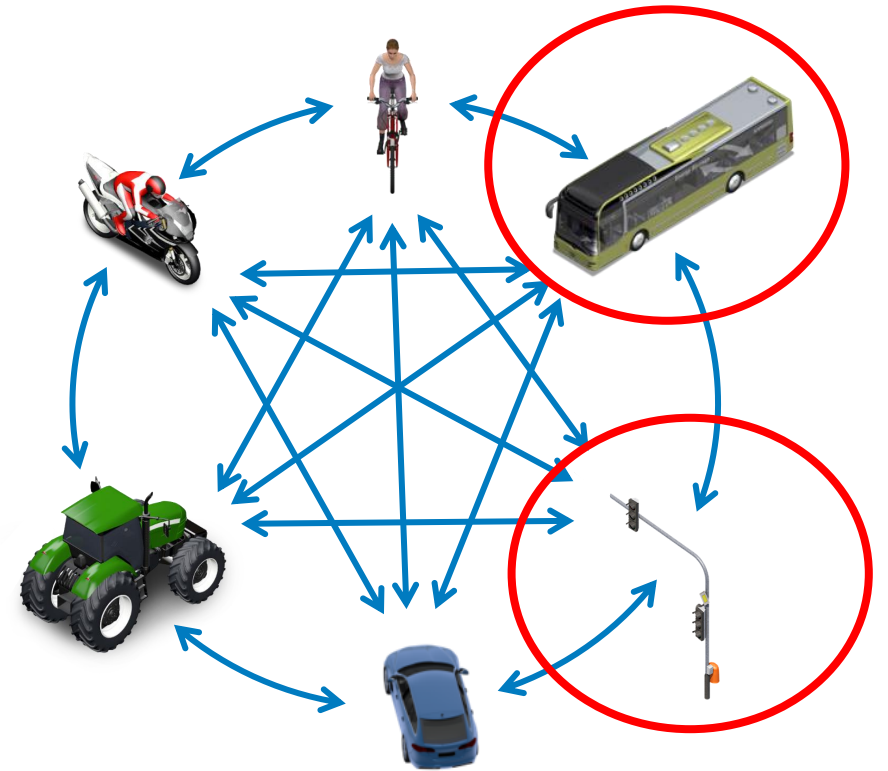
- for more advanced use cases, an improved positioning accuracy is required (e.g. 2stage-brake)
- Technology for good positioning accuracy is getting more and more affordable, and new technologies emerge

Hurdles

3) V2X Deployment

- **We need deployment, since V2X only works this way!**

- on infra and on vehicle side
- **Public transport and intelligent infrastructure** can pave the way and boost experiencability and received benefit on vehicle and VRU side



- **A Coalition for cyclist Safety** has formed,

- with the goal to make cycling safer with V2X and to foster V2X deployment (see next pages)

COALITION
FOR
CYCLIST SAFETY



Safer roads for all road users

Commitments as “Call to Action” response!

- Partners of Coalition for Cyclist Safety are committed to make progress in creating safer roads based on V2X, also for cyclists.
- Stakeholders signed their commitment to address four vital elements of a strategy specifically aimed at improving road safety for vulnerable cyclists:
 - We will individually develop, implement and deploy C-V2X solutions, components and applications that facilitate road safety in North America.
 - We will together closely collaborate with advocates for cyclists in establishing this safety and sustainability ecosystem.
 - We will work with regulators and road operators across all levels of government with the goal of deploying policies that are clear and meet relevant infrastructure needs.
 - We will together begin this initiative in North America and assess options to undertake similar efforts in Europe and other global regions.

Declaration of Intent

CALL TO ACTION RESPONSE:
Industry initiative to advance deployment of Vehicle-to-Cyclist safety technology

May 19th, 2023

The Safety Problem

"Traffic crashes cost tens of thousands of American lives a year – a national crisis on our roadways – and everyone has an important role to play in addressing it," said U.S. Transportation Secretary Pete Buttigieg. "Today we are issuing a national call to action and asking all Americans – including private industry, non-profit and advocacy organizations, and every level of government – to join us in acting to save lives on our roadways."¹

The U.S. Department of Transportation created this strategy in response to the fact that traffic deaths in America steadily decreased for decades, but then surged during the early days of the pandemic in 2020, have remained stubbornly high with nearly 43,000 people killed in 2021. The Department already received many voluntary commitments, and the call is still open.²

Fatalities among bicyclists rapidly increasing

People biking suffer disproportionately from serious injuries and fatalities when a crash occurs compared to people in vehicles. Moreover, fatalities among bicyclists have been increasing faster than roadway fatalities overall in the past decade.³ From 2011 to 2020, bicyclist and other cyclist fatalities increased by 38% from 682 in 2011 to 938 in 2020.⁴

Bicycling has grown in popularity across the United States and provides many environmental, economic, and health benefits. Many people rely on biking as their primary mode of transportation. A safer transportation system makes people the priority. This approach requires all road users to work together using all available tools to help achieve zero injuries and fatalities on Nation's roadways.⁵ We need road and street systems that are trusted and safe for all road users.

Children riding bikes to school and a world class cyclist alike have been killed in traffic collisions in only the past few months. The time is now to unlock technology solutions that provide immediate solutions.

¹ U.S. Department of Transportation, "As Part of Major Push to Bring Down Traffic Deaths, USDOT Launches Roadway Safety Call to Action," U.S. Department of Transportation (February 2023)

² U.S. Department of Transportation, "As Part of Major Push to Bring Down Traffic Deaths, USDOT Launches Roadway Safety Call to Action," U.S. Department of Transportation (February 2023)

³ U.S. Department of Transportation, "https://www.transportation.gov/sites/dot.gov/files/2022-02/USDOT-National-Roadway-Safety-Strategy.pdf" (January 2022)

⁴ National Highway Traffic Safety Administration, https://www.nhtsa.gov/sites/nhtsa.gov/files/2023-03/Bicyclist-Field-As-Stop-Fact-Sheet_032123_v5_tag.pdf (March 2023)

⁵ National Highway Traffic Safety Administration, https://www.nhtsa.gov/sites/nhtsa.gov/files/2023-03/Bicyclist-Field-As-Stop-Fact-Sheet_032123_v5_tag.pdf (March 2023)

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Technologies can increase safety

Connected bikes are digitally visible and can alert cyclists and drivers. Cyclists have a particular safety ecosystem as they are often not even included in technological advancements should be inclusive of bicyclists to those who are most vulnerable.

Technology can bring safety benefits to all road users. With the Federal Communications Commission's recent decision to allow unlicensed devices to operate in the 5.9 GHz band, the industry can bring safety benefits to all road users. The Federal Communications Commission's decision will help saturate the market to unlock critical contributions to jointly reach a level of safety.

Industry can make progress in creating safer roads for cyclists

Automotive, automaker or bike manufacturer, in solving this challenge alone! All industry players and deliver their parts to build the V2X ecosystem. This includes governments at all levels, academic organizations, researchers, and beyond!

Working on a historic cross-industry initiative specifically aimed at improving road safety for cyclists and deploy C-V2X solutions, components and applications in North America. We will work with regulators and road operators across all levels of government with the goal of deploying policies that are clear and meet relevant infrastructure needs. We will together begin this initiative in North America and assess options to undertake similar efforts in Europe and other global regions.

Join our resources together to jointly resolve road safety issues.

U.S. Department of Transportation (February 2023)

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Coalition for Cyclist Safety

Partner overview as of February 2025

36 Partners

COALITION
FOR
CYCLIST SAFETY



ACCELL
GROUP



Autotalks

BMC
SWITZERLAND



BOSCH
Invented for Life

CANYON

C A R I A D

Cohda
Wireless
A DANLAW COMPANY

commsignia

COMODULE

DEKRA

DVR
Deutscher
Verkehrssicherheitsrat

esri

GAZELLE

G-HSA
Governors Highway Safety Association
The States' Voice on Highway Safety

Hochschule
für Technik
Stuttgart
University of Applied Sciences

ITS AMERICA

LG Electronics

lime

MARBEN



peopleforbikes

Qualcomm

REPLY
CONNECT

ROGERS™

SHIMANO

T

TELUS

SONY

SPECIALIZED

spoke

SRAM®

+STROMER-



THE LEAGUE
OF AMERICAN BICYCLISTS
since 1880

TREK

VELO@VILLE



Safe intersections with V2X – VRU / bicycle perspective

Summary

- First V2X Use Cases also for VRUs are ready to deploy
- To leverage full potential, broad V2X **deployment** is required – on infrastructure, public and private transport
- Future use cases will benefit from better **position accuracy**
- The potential of V2X **needs to be made better known**

