



San Francisco | March 4–8 | Moscone Center

A large, abstract graphic in the top right corner consists of numerous thin, colored lines (blue, yellow, orange) radiating from a central point, resembling a network or a sunburst.

BETTER.

SESSION ID: PRV-W03

Connected Cars: A Security and Privacy by Design Study 10 Years in the Making

Ed Adams

CEO

Security Innovation, Inc.

@AppSec

Dr. Larry Ponemon

Founder

The Ponemon Institute

#RSAC

A little about us...

Ed Adams, CEO of Security Innovation

- CEO by day; engineer by trade (and heart)
- Mechanical Engineer, Software Engineer
- Distinguished Research Fellow, The Ponemon Institute
- Privacy by Design Ambassador, Canada
- In younger days, built non-lethal weapons systems for Federal Government



Larry's turn...

Founder, The Ponemon Institute

- Well-known think tank
- Publishes Research on Security & Privacy
- Advisory Committee for Online Access and Security for U.S. Federal Trade Commission
- The White House appointed him to Data Privacy and Integrity Advisory Committee for Department of Homeland Security
- Two California State task forces on privacy and data security laws
- Former Cryptographer, Professor, and Navy Communications Officer
- Super Hero (at least in my mind)





Cars are already part of IoT (Internet of Things)



What enables IoT?



Software runs the world (even hardware)

Software Run the World in the Oddest of Places

787 Dreamliner



2016 Ford F150



F22 Raptor

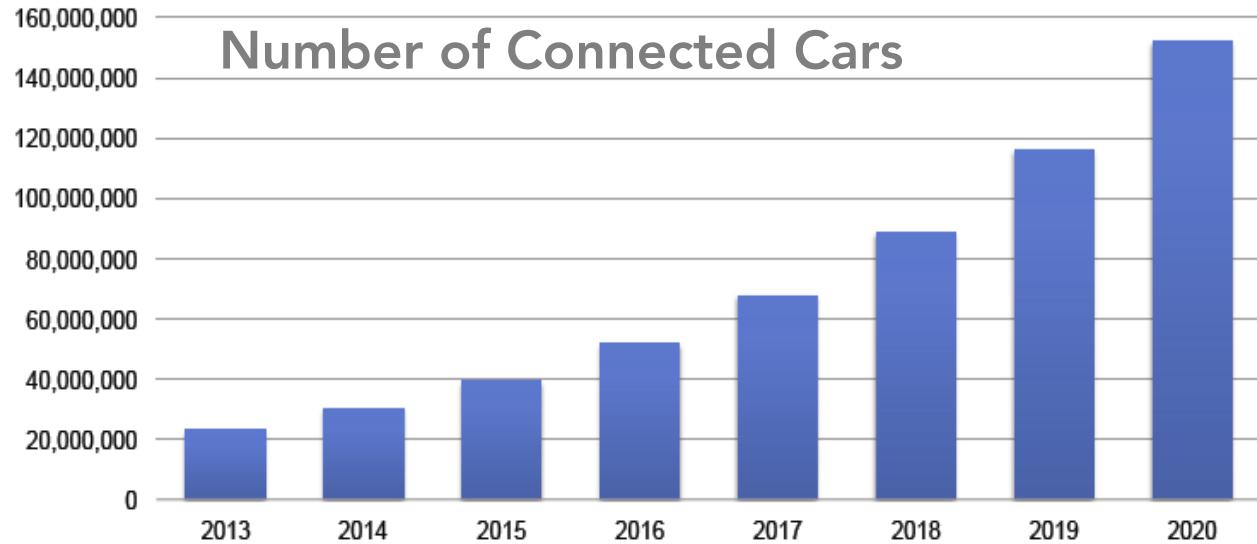


6.5M Million
Lines of Code

130 Million
Lines of Code
and
100 ECUs
50 antennae, 15 frequencies
5 Networks
2 miles of cable
10+ Operating Systems
Exabyte of data per year

1.7 Million
Lines of Code

Connected Vehicle Market



Five-year Economic Value Between \$98-152 billion

BI INTELLIGENCE

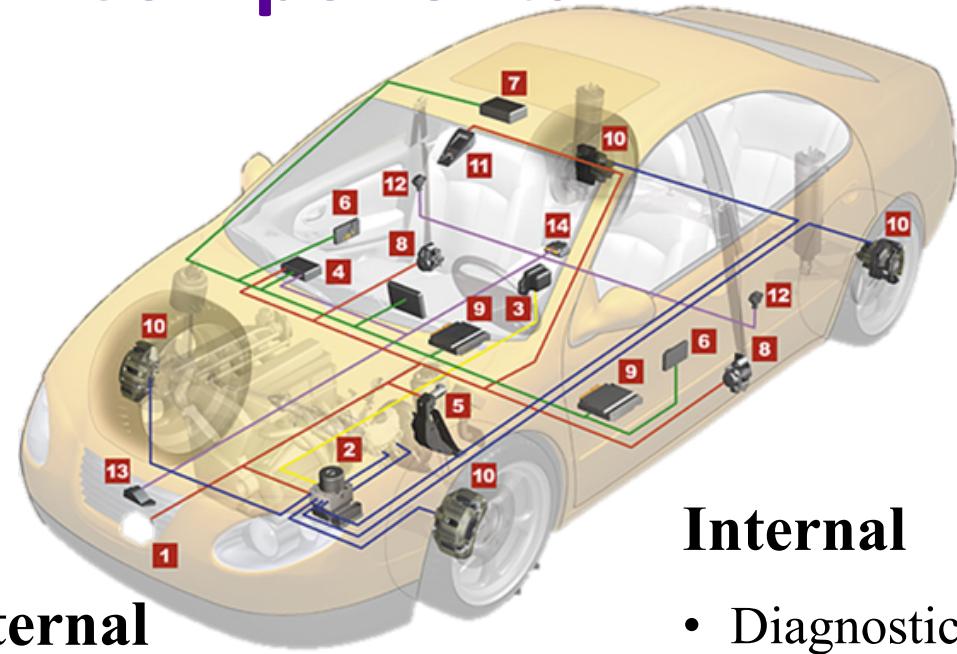
Transparency
Market Research
In-depth Analysis. Accurate Results

Allied Market ResearchTM
Diligent Intelligence - Improved Growth

RESEARCHANDMARKETS



(just a few) Software-managed Car Components



Internal

- Diagnostic Port
- CD/DVD
- USB/SD card
- Aux input
- CAN Bus
- Mobile phone

External

- Bluetooth
- Internet
- Wi-Fi
- Key fob
- Tire Pressure Monitors
- DSRC

The Hacker Threat isn't Slowing



Hackers Will Soon Be Trying to Send Your Driverless Car Off a Cliff

A good 'spoof' could 'stop Teslas in their tracks.'

By Eleanor Cummins on July 15, 2017

Filed Under Cars, Data, Hackers, Satellites, Security, Silicon Valley & Tesla

Mashable

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Volkswagen suppressed a paper about car hacking for 2 years

Hacker jury rigs Amazon Echo into voice-controlled remote start

Aug 3rd 2016 at 8:05AM

Jeep hackers return to take over your steering wheel

FOLLOWUP Feb 25th 2016 at 10:55AM

Nissan disables Leaf app due to hacking concerns

How Self-Driving Cars Will Threaten Privacy

Automated vehicles will learn everything about you—and influence your behavior in ways you might not even realize.

Posted on July 7, 2017 by Bryan Johnston

REPORT Aug

Hackers

Car hacking danger grows with move to autonomous vehicles

Emergence of connected, non-human controlled cars is giving rise to unforeseen dangers, U.S. experts believe

Jeeps in Texas

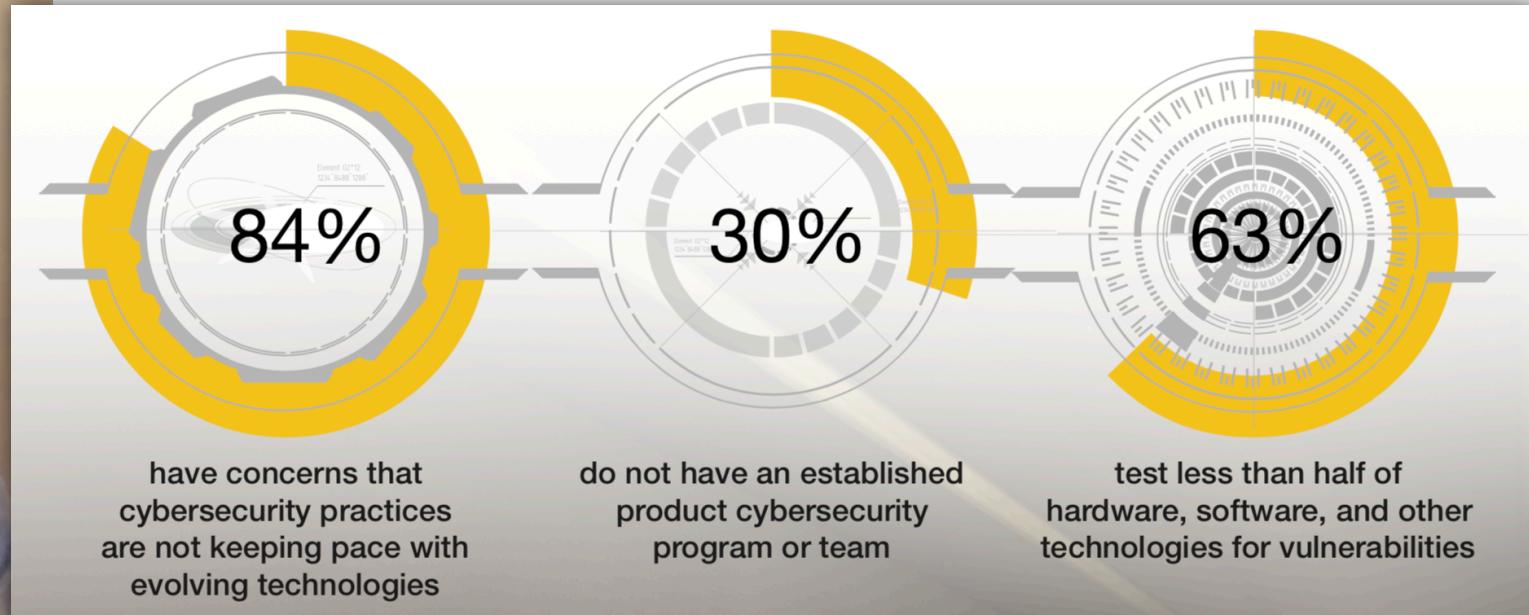
Thieves used FCA DealerCONNECT software to carry out their crimes.

RSA Conference 2019

Cybersecurity Practices: Automotive Industry



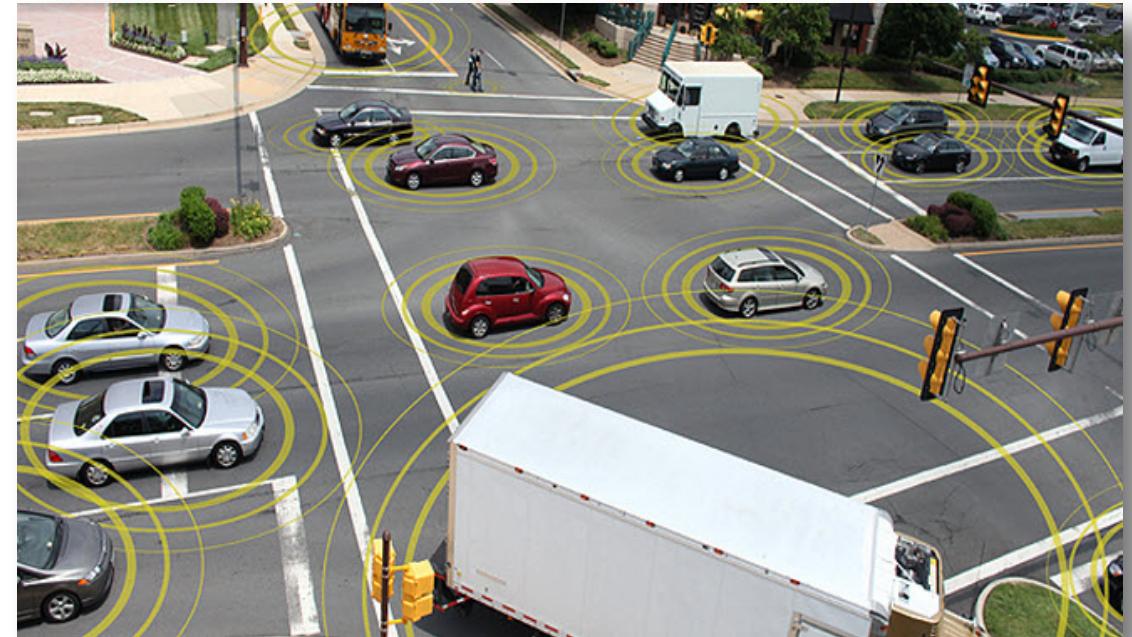
Software Security Is Not Keeping Pace



Source: *A Study of Automotive Industry Cybersecurity Practices* – Ponemon Institute, 2019
research@ponemon.org

Connected Car Positive Benefits & Features

- Navigation and Traffic
- Entertainment
- Safety
- Driving support
- Health and well-being
- Vehicle condition



Traffic Safety

- 40,200 US road deaths, and 4,600,000 injuries in 2016
- 7% increase over 2015. Rising for past 3 years.
- Fatalities and injuries = \$300B/year
- Congestion = \$230B/year
- Leading cause of death for ages 15-34 in US
- Driver error accounts for 94% of crashes



Technology Evolution
Passive → Active → Proactive

V2V USES A WIRELESS PROTOCOL



A Most Promising Solution – V2X

- Vehicle-to-Vehicle (V2V) Communication
- Vehicle-to-Infrastructure (V2I)
- Vehicle-to-RSE (road-side equipment)
- Vehicle-to-AMD (after-market device)
- Vehicle-to- VRU (vulnerable road user)



Source: U.S. DOT

V2X Sample Use Cases

- Intersection Movement Assist
- Emergency Brake Light notification
- Forward Collision warning
- Rain, Ice, Fog and Pothole warnings
- Do Not Pass warning
- Eco driving
- Truck platooning



Source: U.S. DOT

V2X

- “New technology” 10 years in the making
- Uses short-range DSRC radio (802.11p)
 - May co-exist with 5G cellular
- 10 situational messages per second/car
- The world’s largest PKI infrastructure
 - Over 1 Billion certificates per year
 - Pseudonym Certificates to provide anonymity
 - Misbehavior reporting to revoke credentials
- Privacy and Security are critical success factors
 - Privacy By Design: user-centric approach to systems engineering taking privacy into account at each step



Source: U.S.DOT

More on Privacy by Design

Will the government be able to track my every move?

Will I be issued automatic speeding tickets everywhere?

Will I be at even more risk to car hacking?

Will terrorists be able to cause mass havoc using V2V?

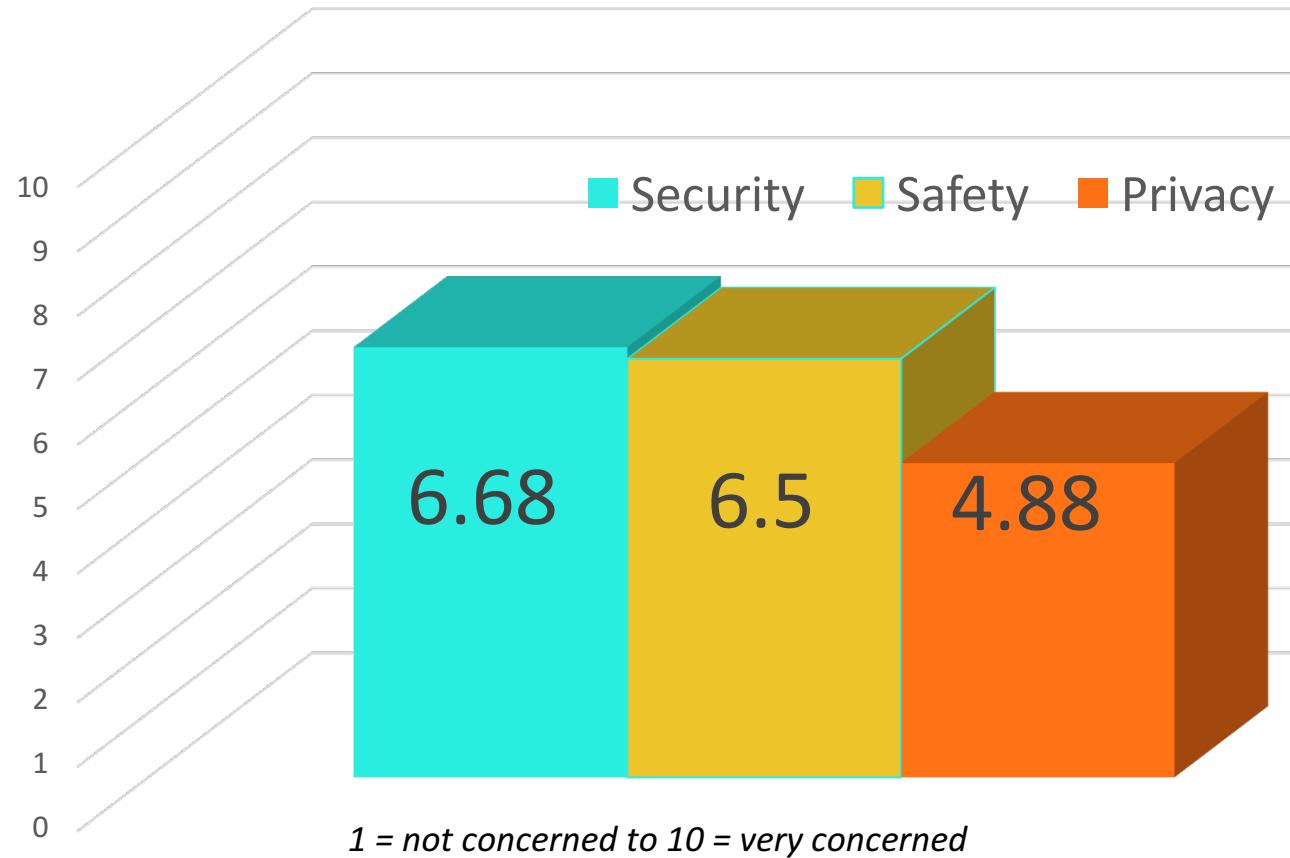
- Privacy by Design addresses these (and more) by:
 1. Proactive not reactive
 2. Preventative not remedial
 3. Privacy as the default setting
 4. Privacy embedded into design
 5. Full functionality – positive-sum, not zero-sum
 6. End-to-end security – full lifecycle protection
 7. Visibility and transparency – keep it open
 8. Respect for user privacy – keep it user-centric



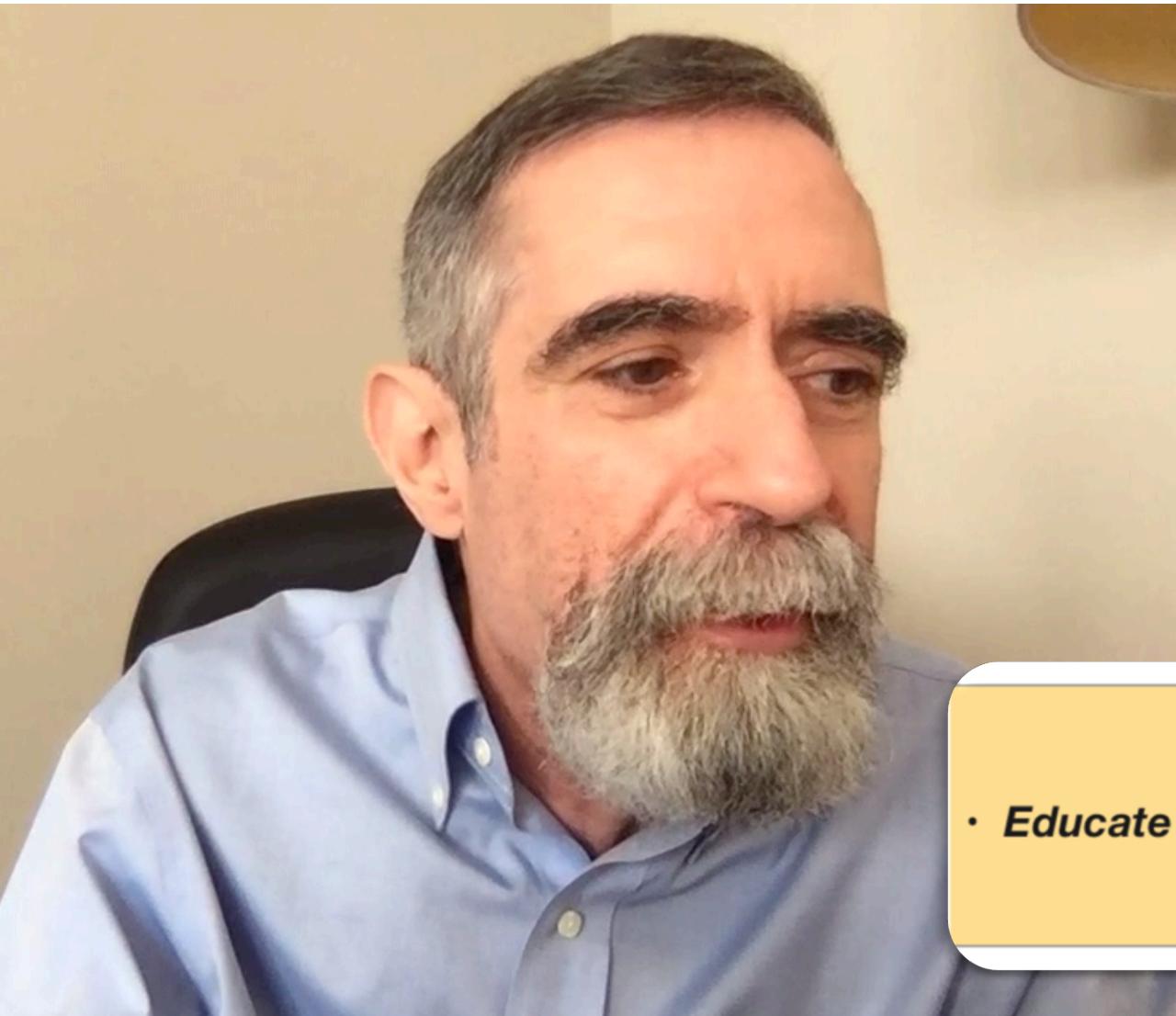
How Important is Privacy & Security?



Concern about security, safety, and privacy in connected cars



How Important is Privacy & Security?



Education on Secure Coding Methods not being Prioritized

What activities does your organization employ to secure automotive software/technology/components?

- *Educate developers on secure coding methods*

33%

How Important is Privacy & Security?



28%

Percentage of consumer respondents who claimed they would never again buy a car from their brand if it had been hacked.

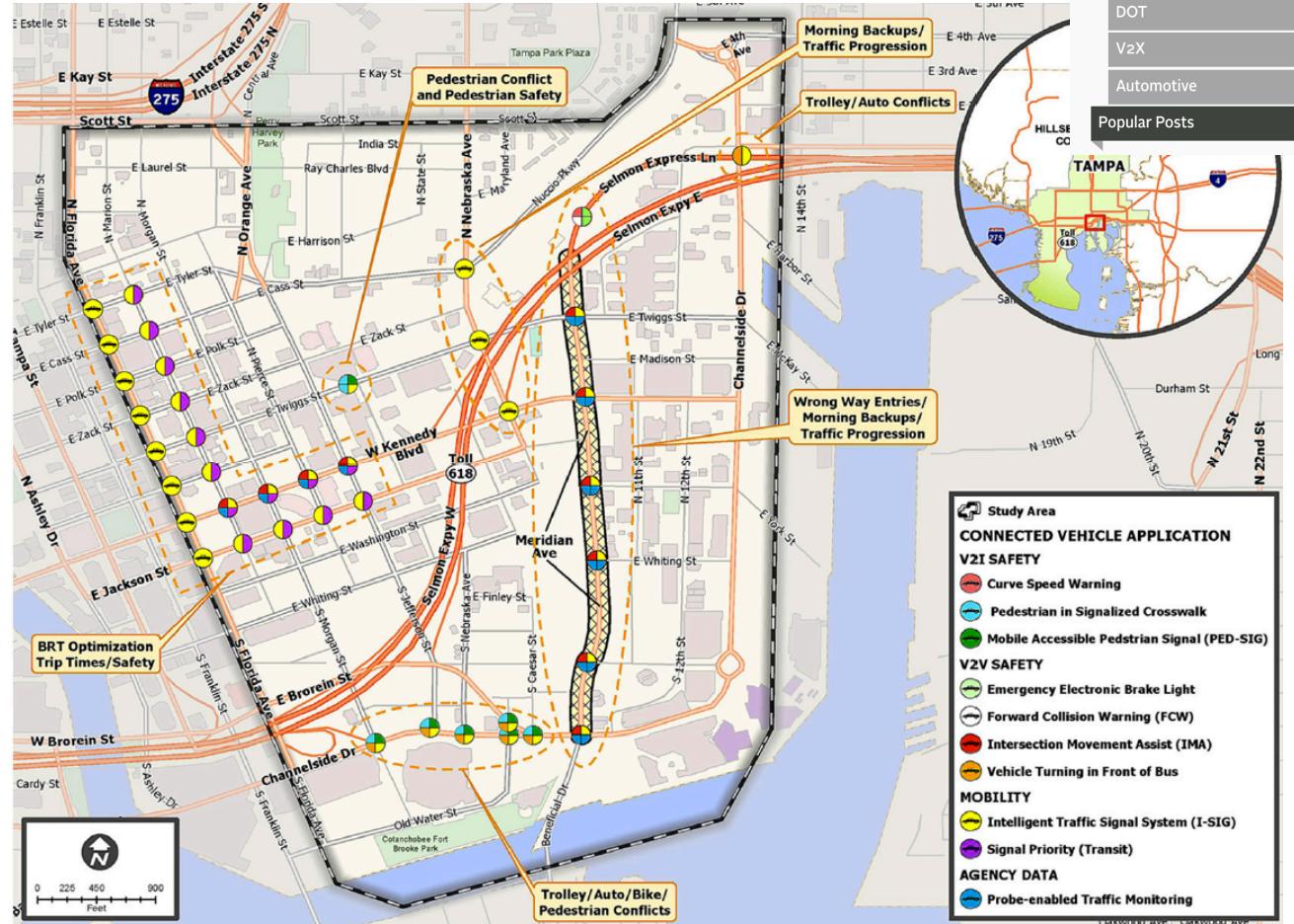
Source: Morpace survey – SBD, 2017

V2X Pilots

- Ann Arbor Safety Pilot extended to 30,000 vehicles
- New York, 10,000 vehicles testing city safety
- Wyoming, improving I-80 trucking efficiency
- Many EU and Asia Pacific pilots
- All major manufacturers engaged
- Standards set but plenty of room to innovate and add value



Tampa Implementation



V2X tech makes Tampa commutes safer, faster, less confusing

Posted Feb 21, 2017 by Kristen Hall-Geisler (@kristenhg)



Use cases

- ✓ Morning Backups And Congestion
- ✓ Wrong-Way Entries
- ✓ Pedestrian Safety
- ✓ Transit Signal Priority Optimization
- ✓ TECO Line Streetcar Conflicts
- ✓ Enhanced Signal Coordination

US V2X “Mandate”

- US Government planned to make V2X mandatory in 2020
- Automakers supportive
 - Successful pilots confirm value
 - Several large OEMs already using V2X
- European and Asian activity increasing without mandate
- Recent VW announcement will kick-start industry, mandate or not



Volkswagen Jumps on the V2V Bandwagon, Plans to Launch System in 2019

Volkswagen plans to use V2V to warn drivers of traffic hazards.

BY STEPHEN EDELSTEIN JUNE 28, 2017

Government Interest



FEATURED

Feb 9th 2015 at 5:16PM

autoblog

New report says most car companies couldn't counter a cyber attack

Sen. Ed Markey Says Automakers 'Haven't Done Their Part' To Keep Drivers Safe

"Drivers shouldn't have to choose between being connected and being protected"



Tracking & Hacking:
Security & Privacy Gaps Put American
Drivers at Risk



ED MARKEY
United States Senator for Massachusetts

FEBRUARY 2015
WWW.MARKEY.SENATE.GOV

Government Takes Action

The Security and Privacy in Your Car (Spy) Act

Cybersecurity Standards

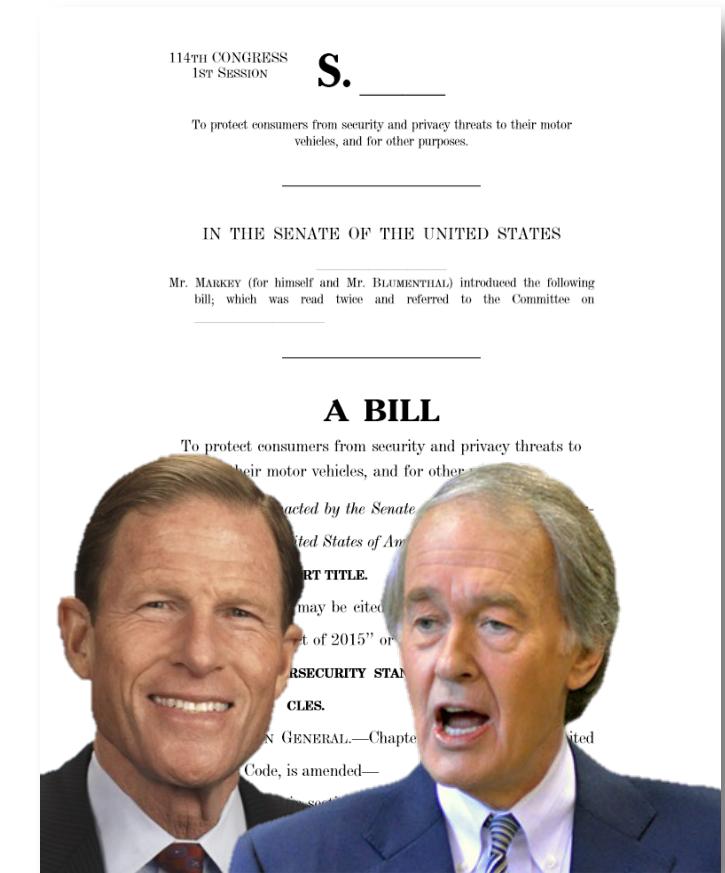
- Hacking protection
- Data security
- Hacking mitigation

Privacy standards

- Transparency
- Consumer choice
- Marketing prohibition

Cyber dashboard

- A window sticker showing how well the car protects the security and privacy of the owner.



Information Sharing & Access Center



Remaining Challenges

- PKI governance and ownership
- Equipment and infrastructure certification
- Multi-application operations
- Standardization
- Cross-border issues and harmonization of trust
- Autonomous Vehicle Considerations
- Sharing with other wireless users of the radio-frequency spectrum
- Developing and managing data security and addressing public perceptions related to privacy



Final Thoughts

- It is still hard to hack cars en masse
- Useful parallels to traditional IT
 - Build software systems like buildings and bridges
 - Testing for validation of good behavior (vs. vulnerability discovery)
 - EDUCATE teams on software security and privacy
- Car makers are being pro-active
- Pilot programs proving value
- What can you do?
 - Volunteer for pilot implementations
 - Get involved in local standards organizations
 - Plenty of available jobs in the automotive security world
 - Take a free training course on software security



KEEP
CALM
AND
DRIVE

DRIVE

RSA® Conference 2019

Thank you!

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