

AUTOMOTIVE CYBER-SECURITY

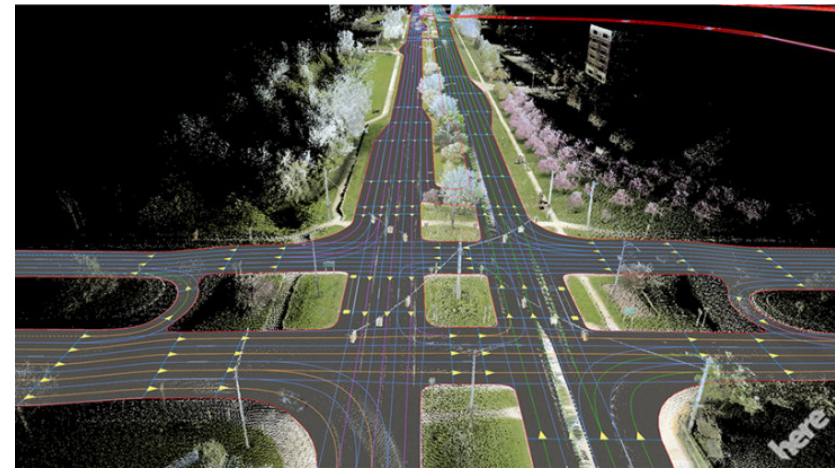
Security considerations for
intelligent transportation

Josh VanWynsberghe / Automotive Systems Engineer - AAA

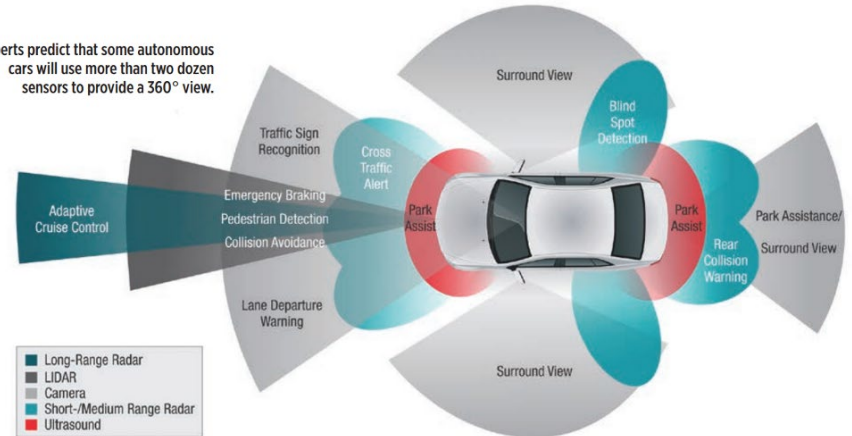


Autonomous Vehicle Data

- Sensor fusion of LIDAR, camera and radar data.
- High-definition GPS maps with lane mapping.
- On board super-computer to process massive amounts of sensor data.

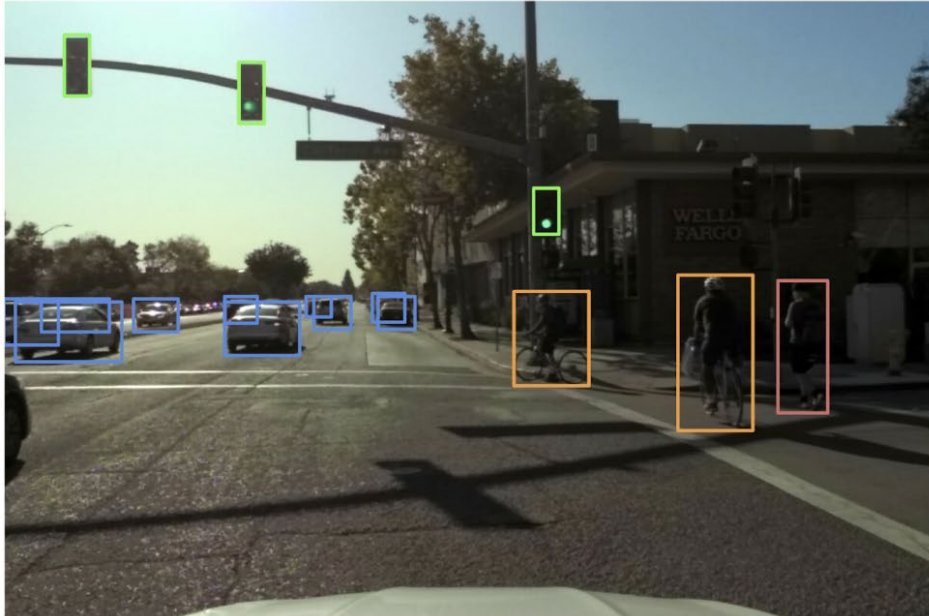


Experts predict that some autonomous cars will use more than two dozen sensors to provide a 360° view.



Autonomous Vehicle Perception and Data Transfer.

- Sensor systems to perceive surroundings / generate HD maps.
- Fusion of sensor data to validate detected object is real.
- AV can generate **4,000GB** of data per day.
- Require high-speed connectivity to datacenters.



Camera Classification



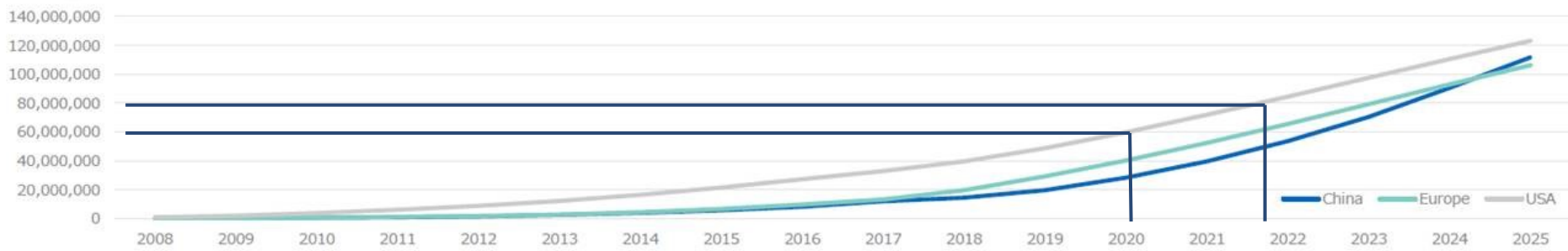
Lidar Point Cloud Map

Automotive industry is rapidly evolving.

- 80 million VIO with embedded connectivity by 2022.
- Approximately 20 million new connected vehicles added in two years (2020-2022)
- **Three top-selling manufacturers in the US will sell only connected vehicles by 2020****



Vehicles in Operation with Embedded Connectivity

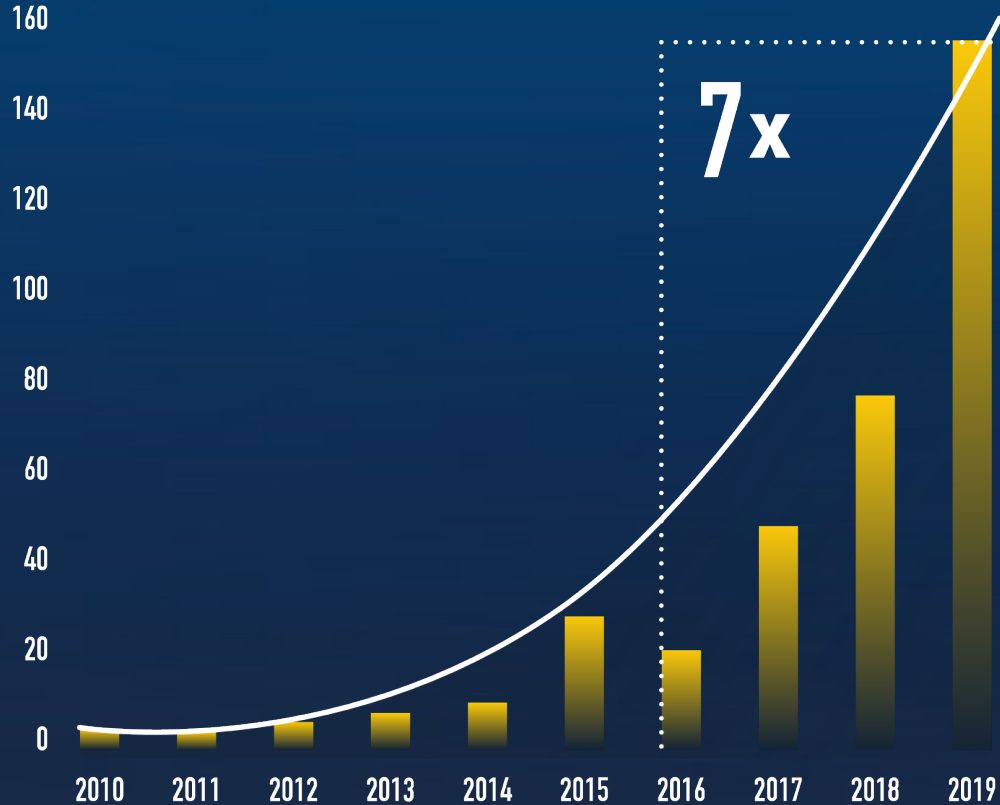


Data source: SBD Automotive © 2018

**<https://www.consumerwatchdog.org/sites/default/files/2019-07/KILL%20SWITCH%20%20207-29-19.pdf>

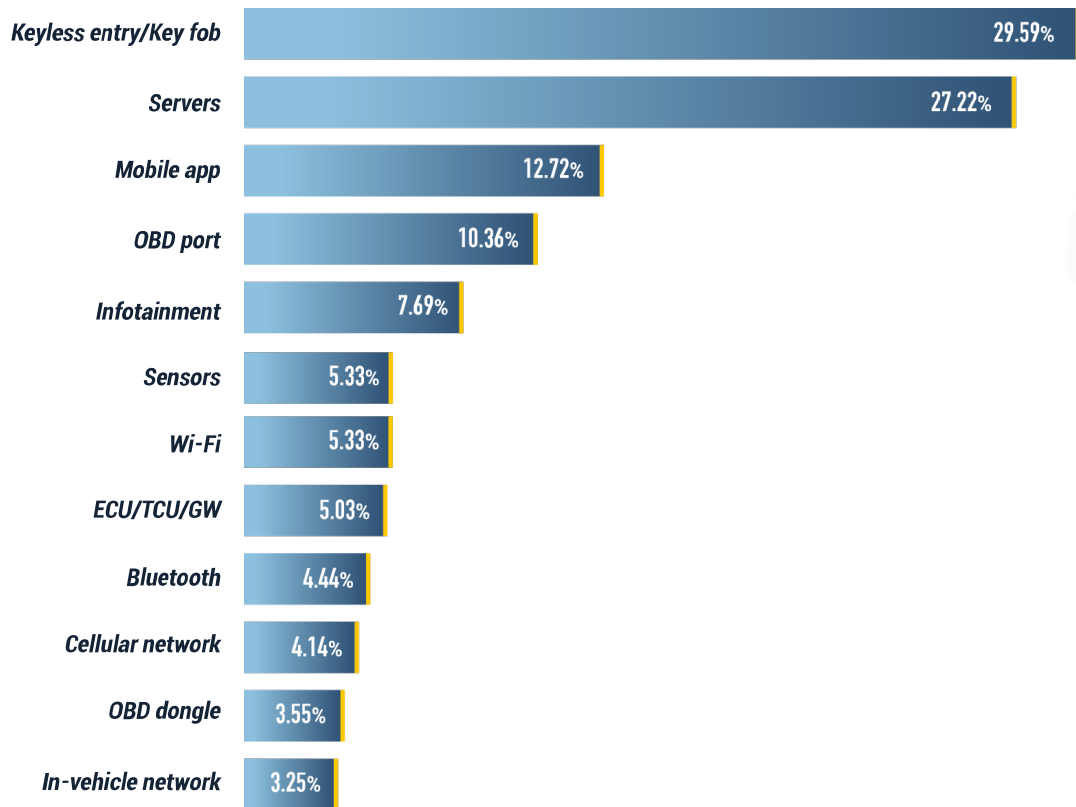
RAPID GROWTH OF AUTOMOTIVE CYBER INCIDENTS

Number of Cyber Incidents 2010-2019



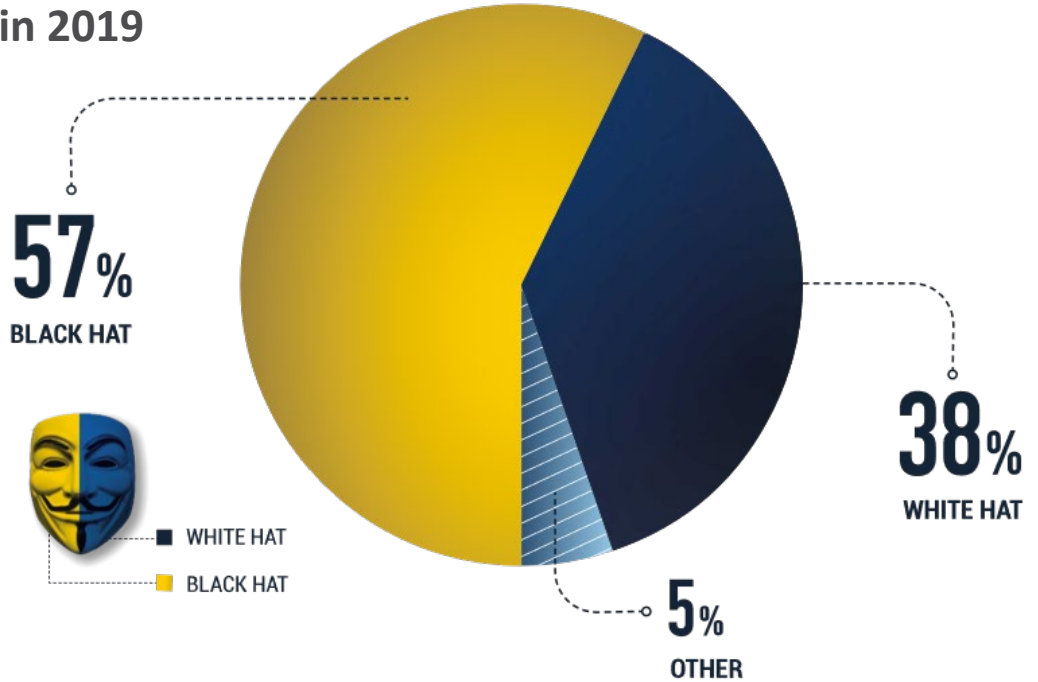
TOP AUTOMOTIVE CYBER ATTACK VECTORS

Breakdown of Top Attack Vectors 2010-2019



BLACK HAT - MAJORITY OF INCIDENTS IN 2019

Black Hat vs. White Hat Incidents in 2019



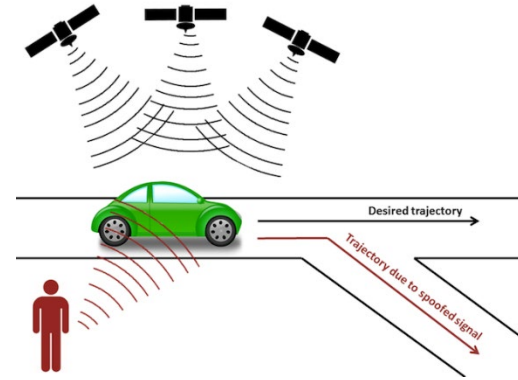
Auto Cyber Attack- Key Fob Relay Attack

- AAA partner ADAC tested 237 vehicles for keyless attacks
- 99% of vehicles tested could be stolen using relay attack.



Auto Cyber Attack- Spoofing

- Researchers hacked Tesla model 3 to navigate off-road by spoofing GPS.
- Tesla autopilot stopped with projected images
- Vehicle accelerated to 85mph by small piece of tape on 35mph sign.



Auto Cyber Attack- Remote Control

- Researchers remotely control Jeep in simulated cyber attack -2015



AUTOMOTIVE CYBERSECURITY SOLUTION LANDSCAPE

BUG BOUNTIES

SAE / Auto-ISAC

REGULATIONS AND ENFORCEMENT

IMPROVING SECURITY BY DESIGN

VEHICLE TEST AND EVALUATION



AUTO BUG BOUNTY PROGRAMS

Company	Program Started	Additional Information	Bug Bounty Program
UBER	December 2014	1,345 resolved reports. Total bounties paid: \$2,317,163. Average bounty range: \$500 - \$750. Top bounty range: \$4,000 - \$50,000	https://hackerone.com/uber/hackactivity
GRAB	August 2015	369 resolved reports. Total bounties paid: \$409,426. Average bounty range: \$200 - \$250. Top bounty range: \$2,000 - \$10,000.	https://hackerone.com/grab
FORD	January 2019	1,505 resolved reports.	https://hackerone.com/ford/hackactivity
GENERAL MOTORS	January 2016	1,035 resolved reports.	https://hackerone.com/gm/hackactivity
TESLA	2014	\$100 - \$15,000 per vulnerability, 417 resolved reports. Average payout (Aug-Oct 2019): \$1,352.	https://bugcrowd.com/tesla
TOYOTA	February 2018	349 resolved reports.	https://hackerone.com/toyota/
FCA	July 2016	\$150 - \$7,500 per vulnerability, 117 resolved reports. Average payout (Aug-Oct 2019): \$2,481.25	https://bugcrowd.com/fca
TOMTOM	April 2019	71 resolved reports.	https://hackerone.com/tomtom/
LYFT	May 2019		https://www.lyft.com/security
BLABLACAR	April 2018		https://yeswehack.com/programs/bug-bounty-program-blablacar
BMW	2015		https://www.bmwgroup.com/en/general/Security.html
DAIMLER			https://www.daimler.com/whitehat/

Automakers and mobility companies pay researchers to find bugs in software.



AAA Automotive Research- ADAS Systems

- Automatic Emergency Braking
- Blind Spot Monitoring
- Rear Cross Traffic Alert System
- Automated Parking Assistance Systems
- L2 Driver Assistance Testing
- Pedestrian Detection System
- ADAS System Repair Costs
- AV Survey
- ADAS Tech Names



Any questions?

