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Autonomous Vehicle Cybersecurity

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Background

Secmation is a growing business located Raleigh, NC, specializing in Cybersecurity R&D and Product Development in cybersecure applications for uncrewed and autonomous systems.

We’re Hiring New Grads and Interns
www.secmation.com

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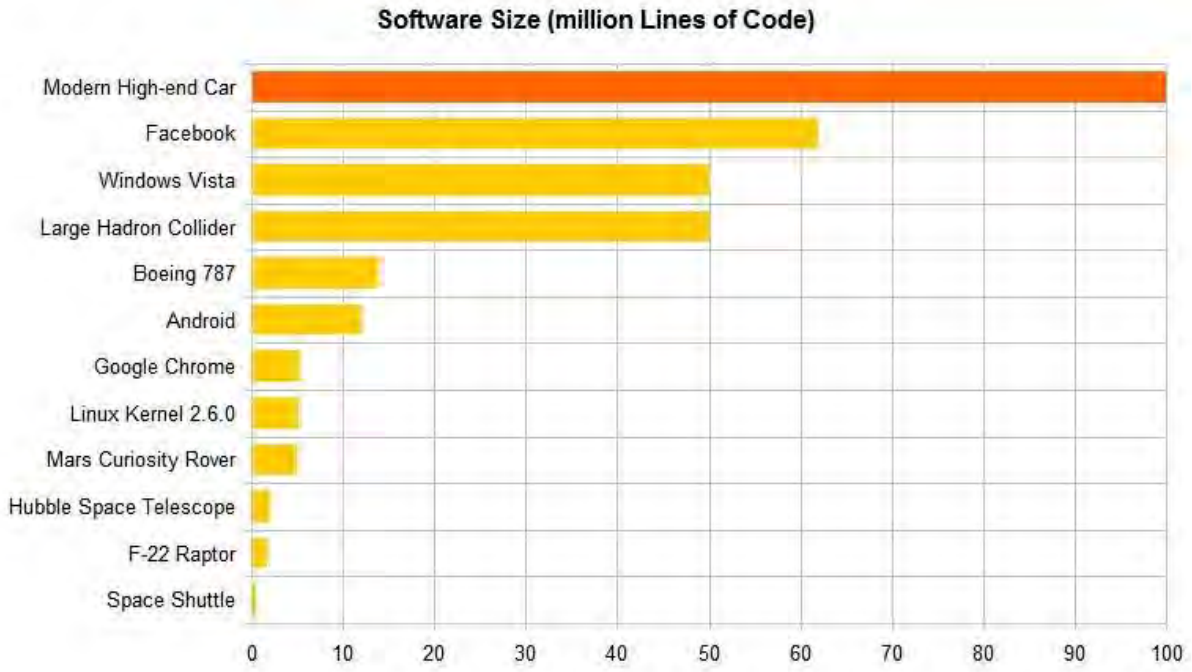
“This Car Runs on Code”



- Current automobiles have ~100M lines of code
- That is before all the “real” self driving features are added in the future
- Will be increasing to 200-300M lines of code near term
- Code comes from multiple vendors the automaker must integrate and ensure they function correctly
- ***But what about cybersecurity?***

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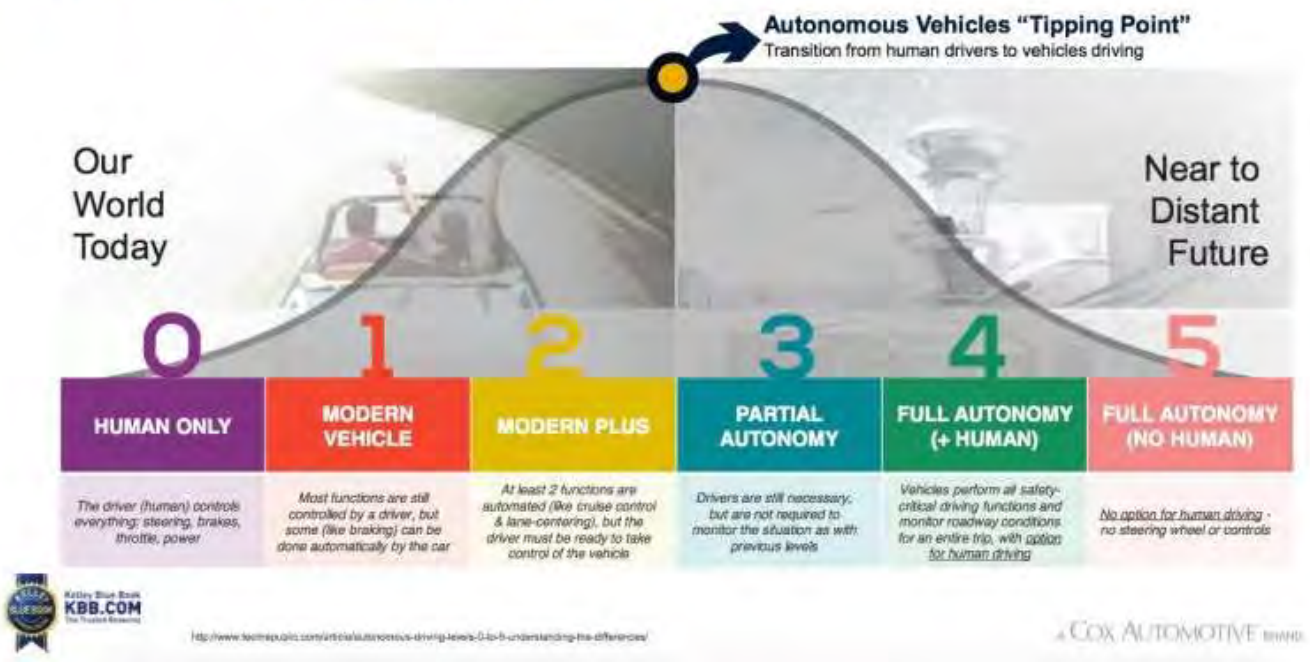
Self Driving Levels

The levels of Autonomous Vehicles



- We have a long way to go to get to "full self driving" in any environment or condition
- All applications you see now (e.g., robot taxis) all are in constrained/limited environments with $$$ sensor systems
- There is a much shorter path to develop attacks to disrupt it….
- ***…and not enough attention on preventing attacks until "something bad happens"***

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Modern Car Vulnerabilities

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From Ferrari to Ford, Cybersecurity Bugs Plague Automotive Safety

Security vulnerabilities plague automakers, and as vehicles become more connected, a more proactive stance on cybersecurity will be required — alongside regulations.

Nathan Eddy
Contributing Writer, Dark Reading
January 06, 2023

Source: Christopher Vincenti via Alamy Stock Photo

- A quick Google search brings up the current state of automotive cybersecurity. Not ideal, but better than a few years ago.
- Example of known vulnerabilities from https://samcurry.net/web-hackers-vs-the-auto-industry/
- Hyundai/Genesis
  - Fully remote lock, unlock, engine start, engine stop, precision locate, flash headlights, and honk vehicles using only the victim email address
  - Fully remote account takeover and PII disclosure via victim email address (name, phone number, email address, physical address)
  - Ability to lock users out of remotely managing their vehicle, change ownership

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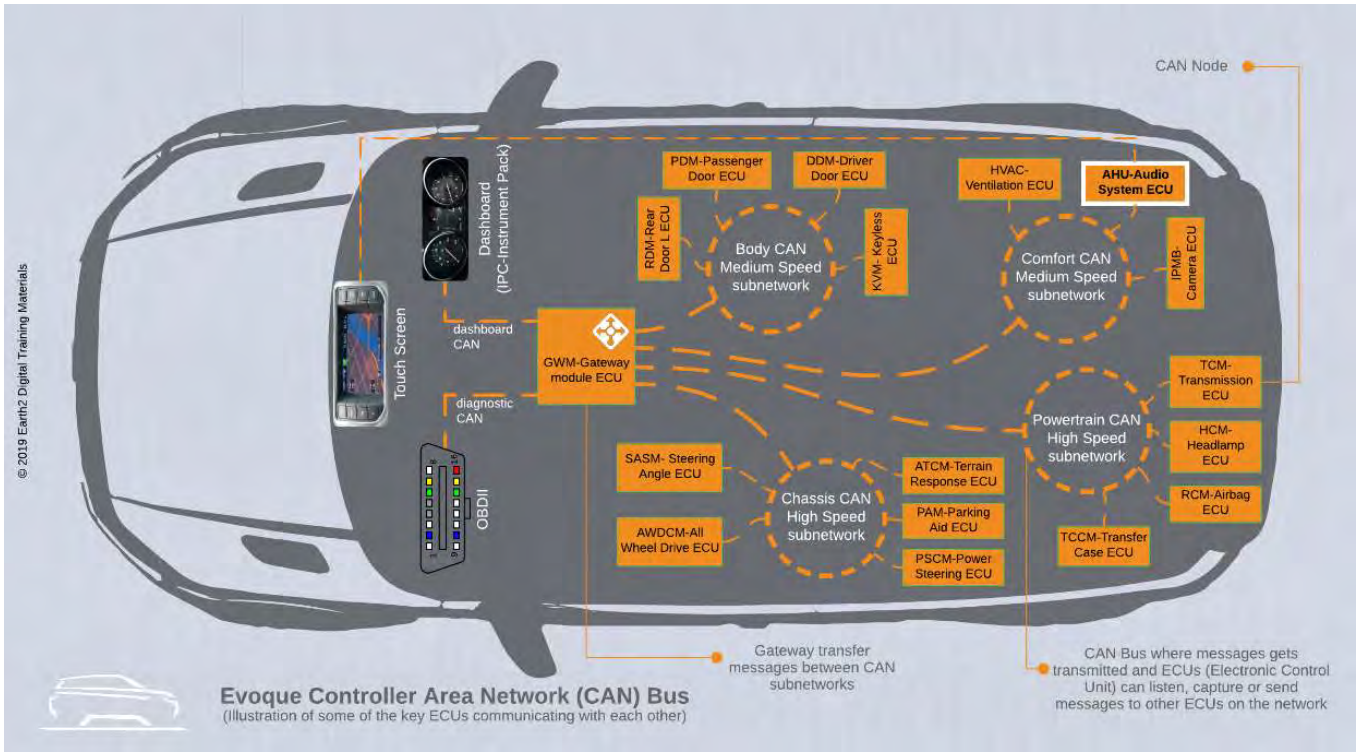
Modern Car Vulnerabilities



- CANBus is the industry standard for vehicle communications
- ***CANBus is not encrypted or authenticated***
- Presents an easy entry point for direct vehicle access or remote access through a compromised Electronic Control Unit (ECU)

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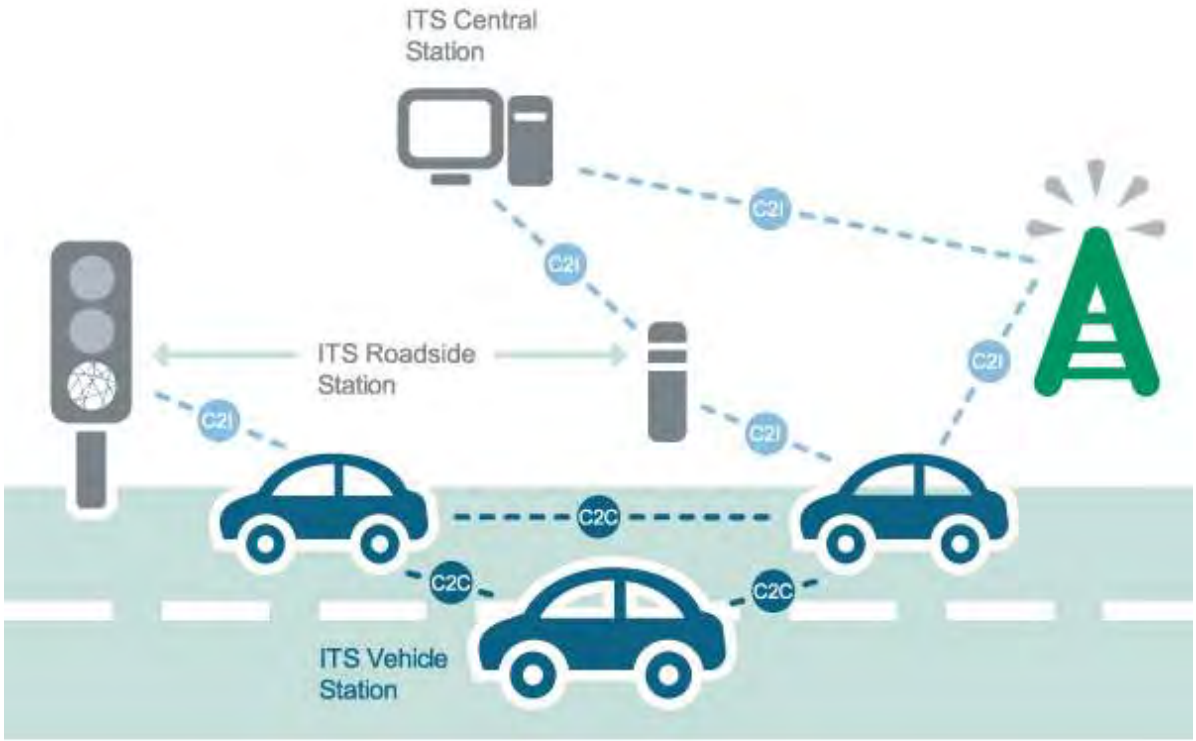
Vehicle to Vehicle Comms (V2V)



- A key element of the future of autonomous vehicles is communications
- An autonomous vehicle would not rely solely on its onboard intelligence/sensors
- The vehicle would get real-time data form multiple sources **INCLUDING** other neighboring cars
- ***Opens many different attack vectors that do not currently exist***

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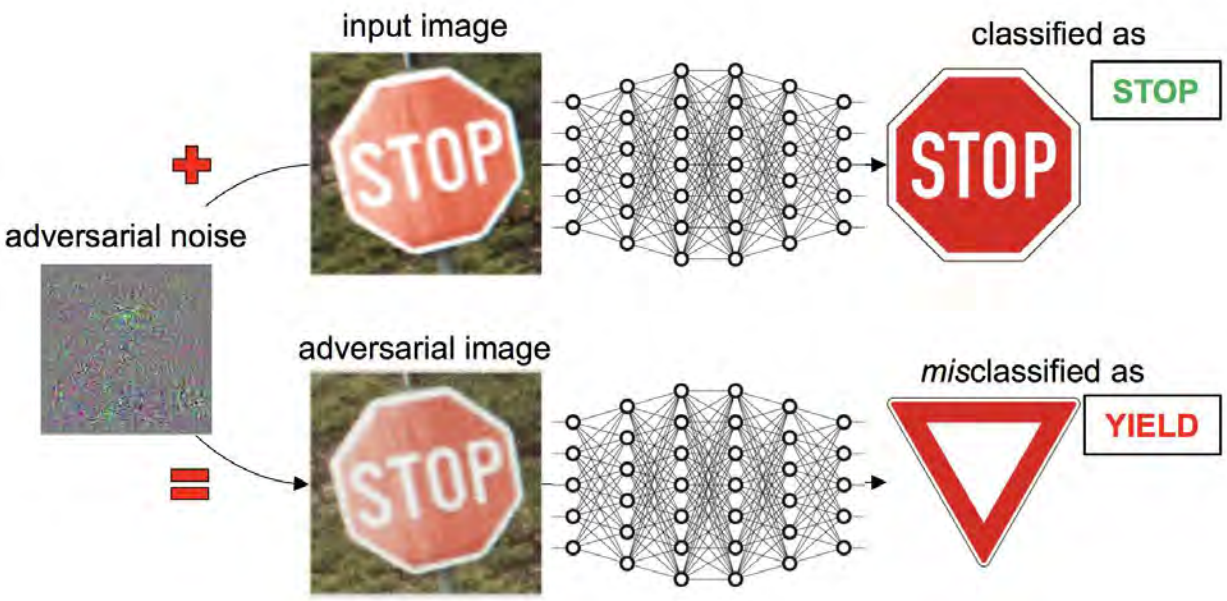
AI/Machine Learning



- Only being deployed now
- Will be a key part of future autonomous vehicle solutions
- Presents a new area of research in vulnerability analysis, attack design, and cybersecurity

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What Are Some Solutions?

- Establish cybersecurity standards for the automotive industry
  - Defines “best practices” which can eliminate many simple vulnerabilities
  - ***Provides mechanism for certification/compliance. Think like getting a “Crash Test Report” for the cybersecurity of a car you are planning to purchase***
- Better access to SW updates/patches
- Understanding you cannot have safety without cybersecurity.
  - **Active protection systems are SW based**
- Software Bill of Materials (SBOM) – Manufacturers must fully understand all vehicle SW supply chain and pedigree
- ***Different mindset – An automobile is a safety critical network of computers with wheels and must be treated as such***

SAE and ISO Publish Joint Automotive Cybersecurity Standard

2021-09-03 WARRENDALE, PA.

Standard is Supported by SAE's New Cybersecurity Training Program and Webcast

WARRENDALE, Pa. (September 3, 2021) – SAE International, in collaboration with the International Organization for Standardization (ISO), announced today the publishing of ISO/SAE 21434™ Standard: Road Vehicles – Cybersecurity Engineering. The standard helps the industry define a structured process to ensure cybersecurity is incorporated into the design of road vehicles, including systems, components software and connections of any external device or network.

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