

Decade of Driving Progress: Insights and Innovations in Automotive Cybersecurity Research



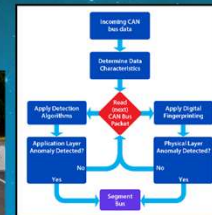
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May 2025

SwRI Highlights from Past Decade

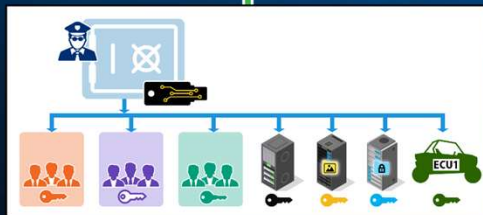
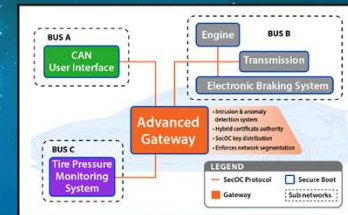
Pen-Testing, Infotainment, Consortium



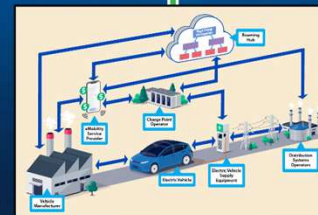
Intrusion Detection, Automated Vehicles



Zero Trust

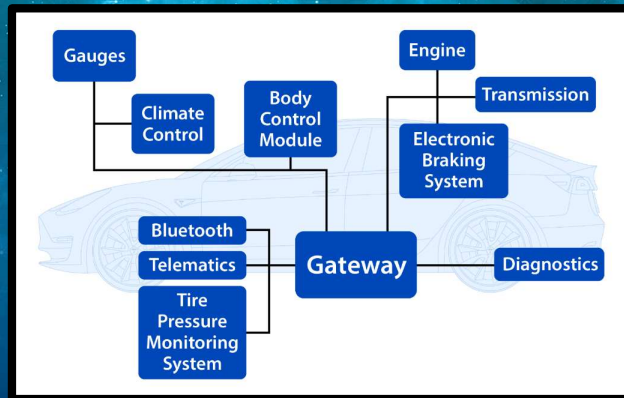


Uptane Alliance

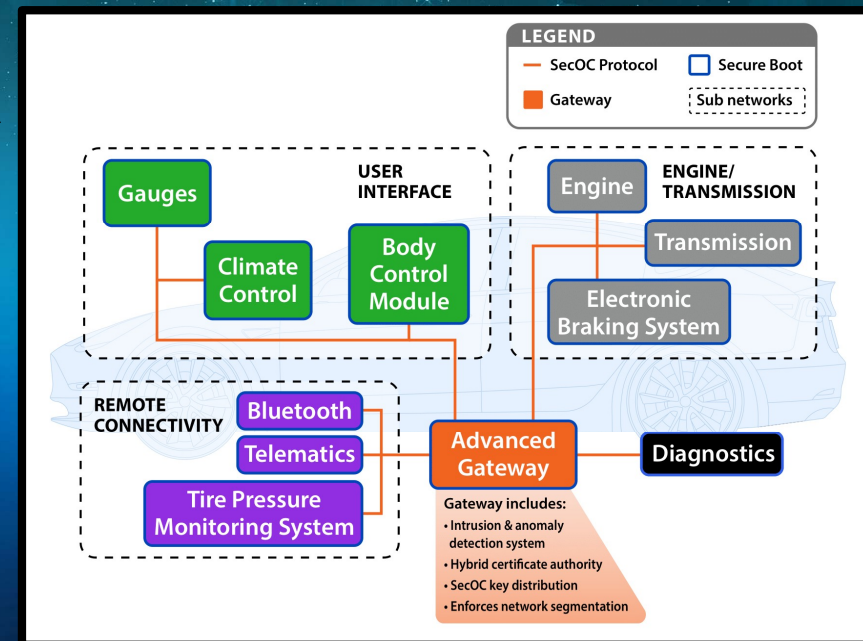


Electric Vehicles

SwRI Research and Development: Zero-Trust Architecture



Basic Automotive Network:
Controller Area Network Flexible Data-Rate (CAN FD) Bus



Zero Trust Architecture

- ◆ **DOD & NIST Zero Trust Architectures**
- ◆ **Key steps: Authentication, Monitoring, Cyber Policy Enforcement**

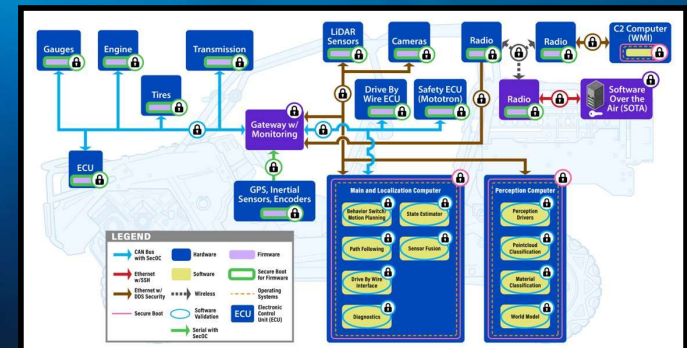
Next: Using Zero Trust for Automated Vehicles

SwRI Research Examples: Automated Vehicles

- ◆ Penetration Testing
- ◆ Cybersecurity for Robotics and Autonomous Systems Hardening (CRASH)



Spooing AV GPS

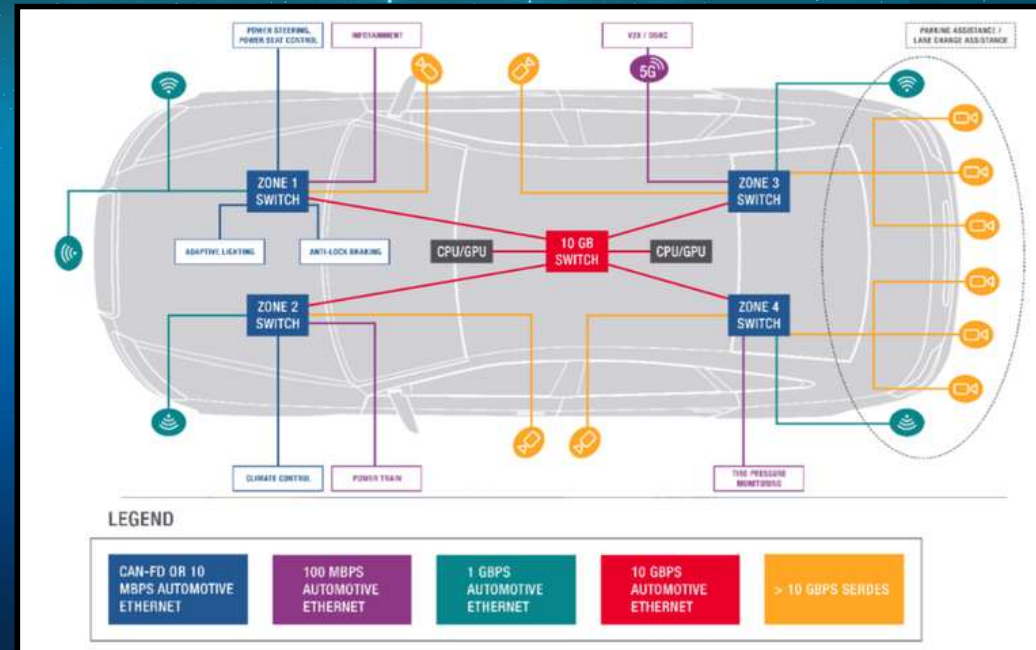


AV Zero Trust Architecture

Next: Automotive Industry Vehicle Architectures – Greatly Increased Complexity

On Vehicle Cybersecurity Highlights

- ◆ Initially, security wasn't a consideration
- ◆ Now industry using:
 - Wireless Communications Protected
 - MACsec, SecOC for authentication
 - Bus Separation via Gateway
 - Security by Design



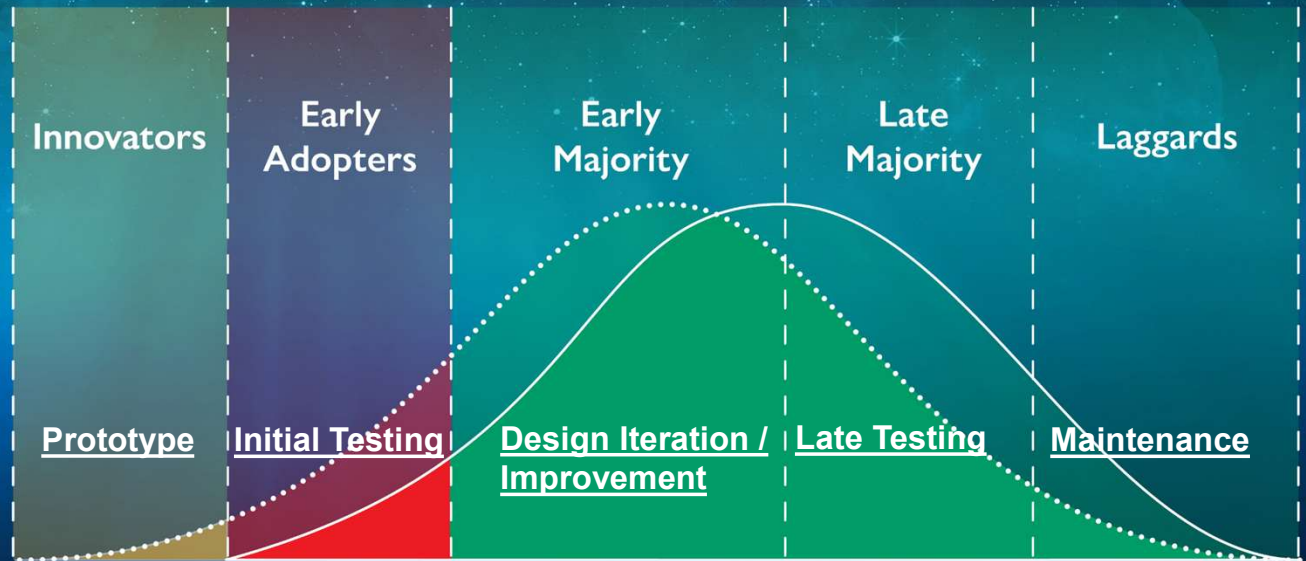
Example Vehicle Architecture from [keysight.com](https://www.keysight.com)

Vehicle architectures are more secure!

Pattern: Cybersecurity Lags Behind New Technology Advances

- ◆ **Where would these fall?**
 - Telematics/Cellular
 - **Connected EV Chargers**

- ◆ **Historical Example:**
 - Smart Grid



Technology Adoption Lifecycle and Cybersecurity Resource Funding Comparison

Next: Automotive Industry Highlights

Automotive Industry Highlights from Past Decade

- ◆ **Substantial improvement in automotive cybersecurity**
 - SAE/ISO Standards, UN R155
 - Penetration Testing
 - Advancement in Technology (E.g., Encryption, Monitoring)
- ◆ **Continuous information sharing – Auto-ISAC**
- ◆ **Diminished non-competitive cyber research**
- ◆ **New technology lacks cybersecurity**
 - Artificial Intelligence / Machine Learning, Electric Vehicles, Automated Vehicles

Going forward: we look forward to working on cybersecurity with automotive industry in new technology areas

Thank you!

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Check out the publications!

Publication: A Zero Trust Architecture for Automotive Networks

<https://www.sae.org/publications/technical-papers/content/2024-01-2793/>

Self Driving Security Publication:

<https://ndia-mich.org/images/events/gvsets/2024/papers/MOSA/2%2010PM%20Towards%20Deployment%20of%20a%20Zero%20Trust%20Architecture%20for%20Automated%20Vehicles.pdf>