Hacking (autonomous) Vehicles

A brief survey of recent work

SparkFun AVC

Updated: 17 September 2016

cryptotronix

Overview

1. Introduction

2. HOPE XI Talks

3. Blackhat 2016 Talks

4. DEF CON 2016 Tracks

5. DEF CON 2016 Car Hacking Village

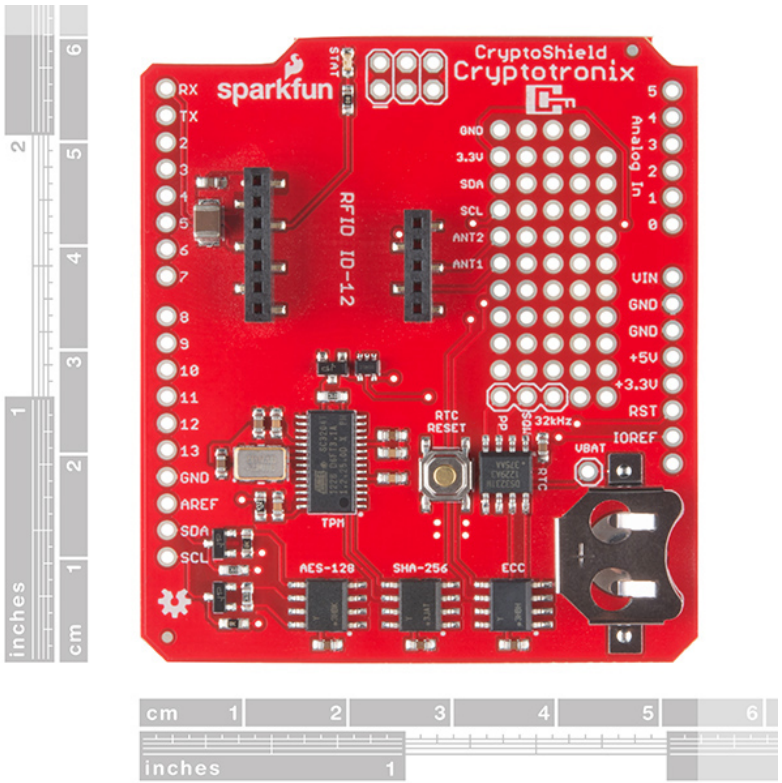
6. Conclusion

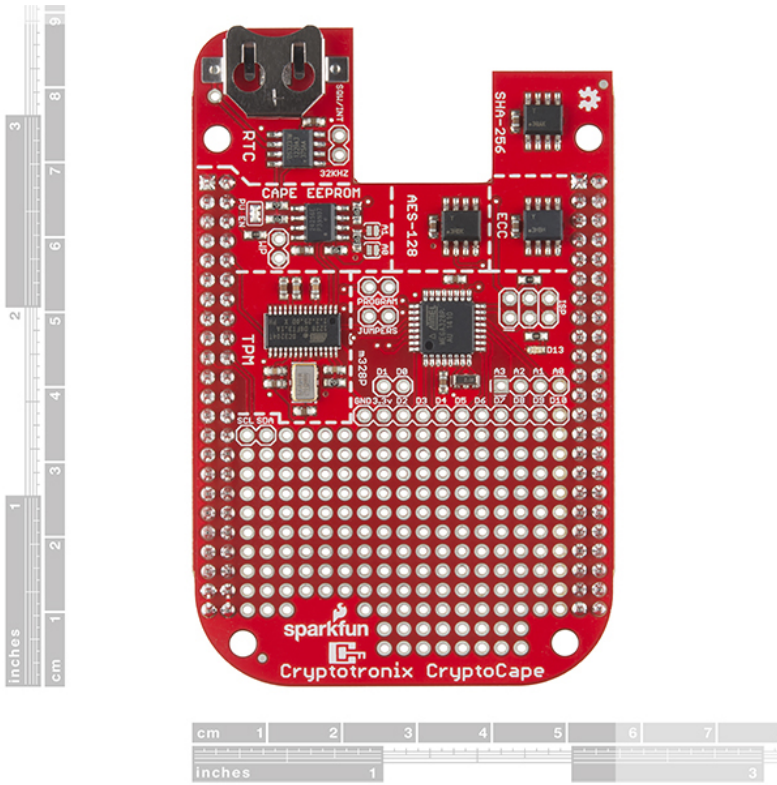
Introduction

Hi, I'm Josh!

- Owner of Cryptotronix
- SparkFun Hacker-in-Residence 2014
- CryptoCape & CryptoShield
- DEF CON 22: NSA Playset: CHUCKWAGON
- BSides Portland: Cryptowarez

CryptoThings





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Why this talk?

1. SparkFun is awesome
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3. I hope to see others giving security talks at SparkFun AVC!

Goal

Increase security awareness among hackers, makers, builders, and consumers!

Demotivating Quotes

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Cory Doctorow

A car is a computer that drives.

Demotivating Quotes

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Sandy Clark

1. *Everything is made of software.*
2. *Software is insecure.*

Therefore...

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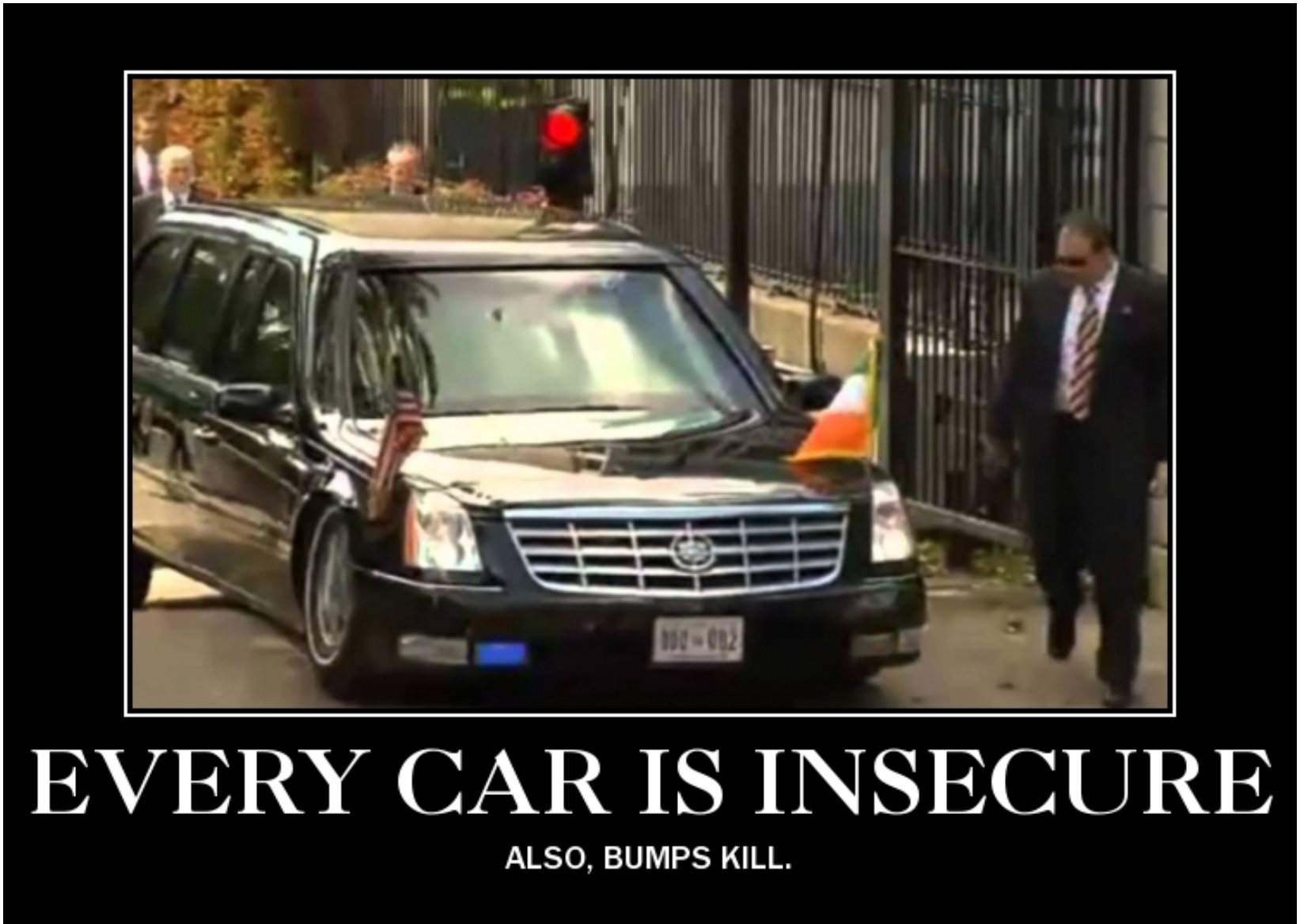
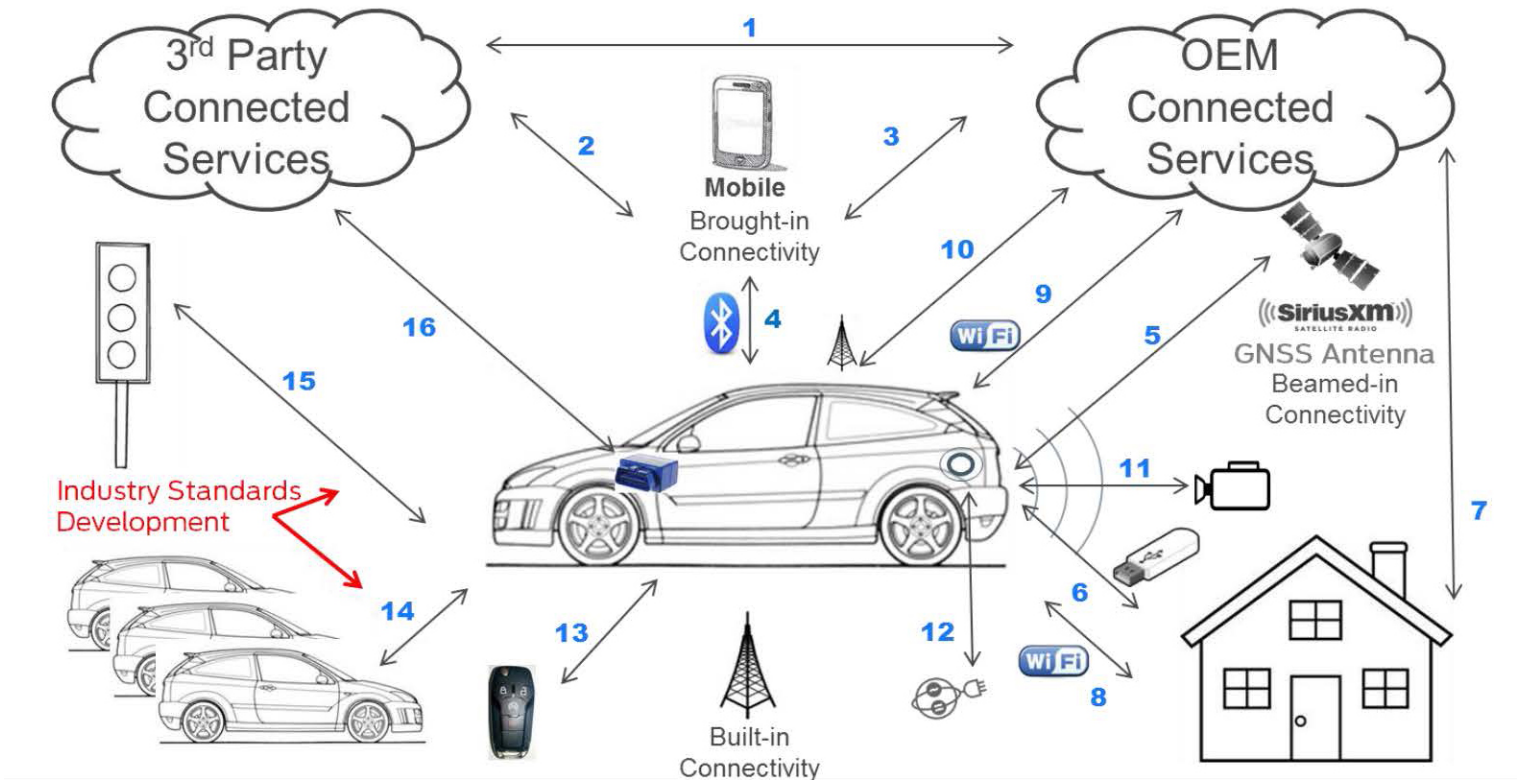


Connected Car



Source: http://articles.sae.org/14503/

CAN & OBDII

Related Tutorials

Getting Started with OBD-II

OCTOBER 8, 2015

A general guide to the OBD-II protocols used for communication in automotive and industrial applications.

CAN-Bus Shield Hookup Guide

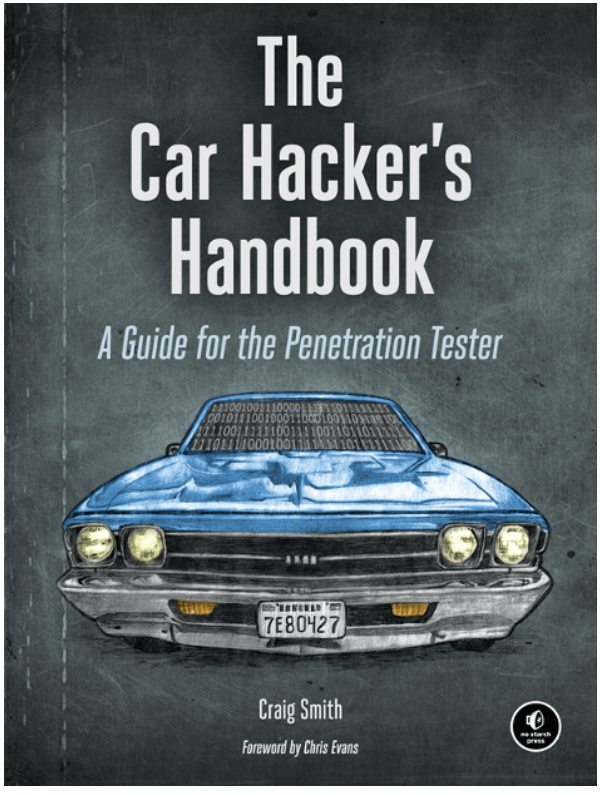
OCTOBER 8, 2015

A basic introduction to working with the CAN-Bus shield.

Source: `https://learn.sparkfun.com/tutorials/getting-started-with-obd-ii`

HOPE XI Talks

Car Hacking Tools - Craig Smith and Eric Evenchick



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- List of tools, how to create your own car hacking test bench, how to attack ECUs

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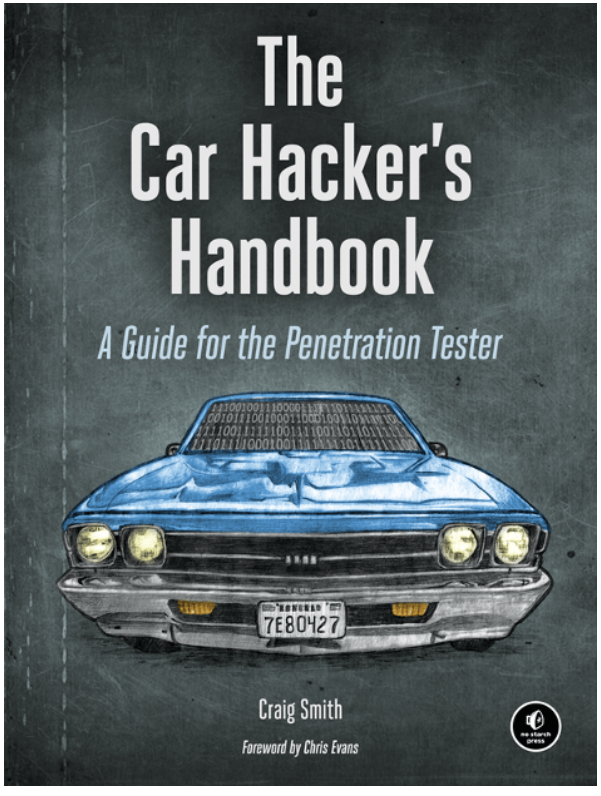

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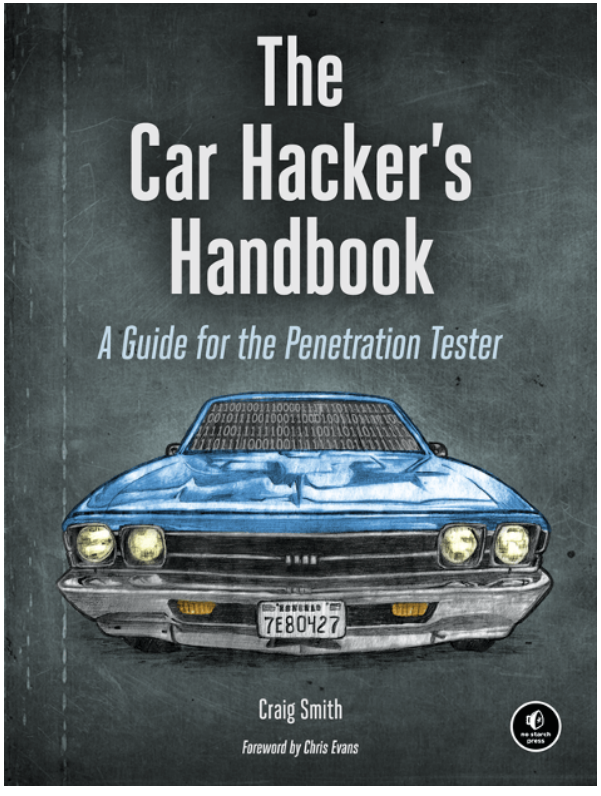

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- 50% off e-book from `nostarch.com`, use code JUSTBECAUSE.

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- CANtact - CAN to USB Converter based on the STM32F0
- CANtact-app `https://github.com/linklayer/cantact-app`
- Python library
- Open source hardware

Blackhat 2016 Talks

CANSPY - Arnaud Lebrun and Jonathan-Christofer Demay

Source: `http://ubm.io/2cBdRuA`

- Wanted a tool to meet the CAN timing constraints (up to 1Mbps, so no UART).
- Also needed a MITM configuration (multiple I/F).
- Open source framework
- STM32F4DISCOVERY Board
- Lots of RT firmware work
- `https://bitbucket.org/jcdemay/canspy`

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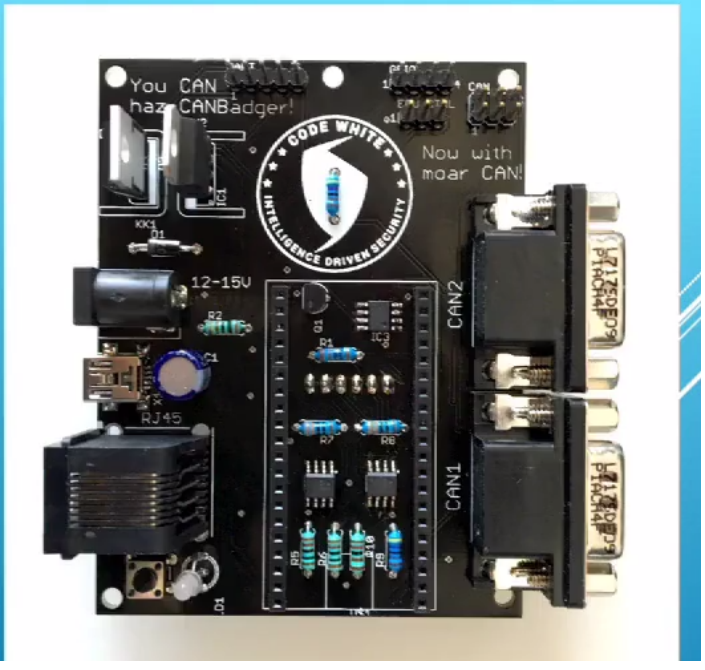
- Recommends IDS for CAN Bus.

DEF CON 2016 Tracks

CANBadger Hardware Overview

- Powered by mBed LPC1768 or LPCXPresso LPC1769
- 128KB XRAM
- 2x DB9 CAN Interfaces + 2x Debug headers
- SD card
- ECU Power control by software
- UART
- 4 GPIOs
- Standalone mode, USB mode (CDC Device), or Network mode
- Can be powered by PSU, External battery, or OBD2
- Has a blinky dual color LED. Everyone loves blinky LEDs, right?
- Complete board assembly under $25



CAN I Haz Secretz? Vidal & Noeischer

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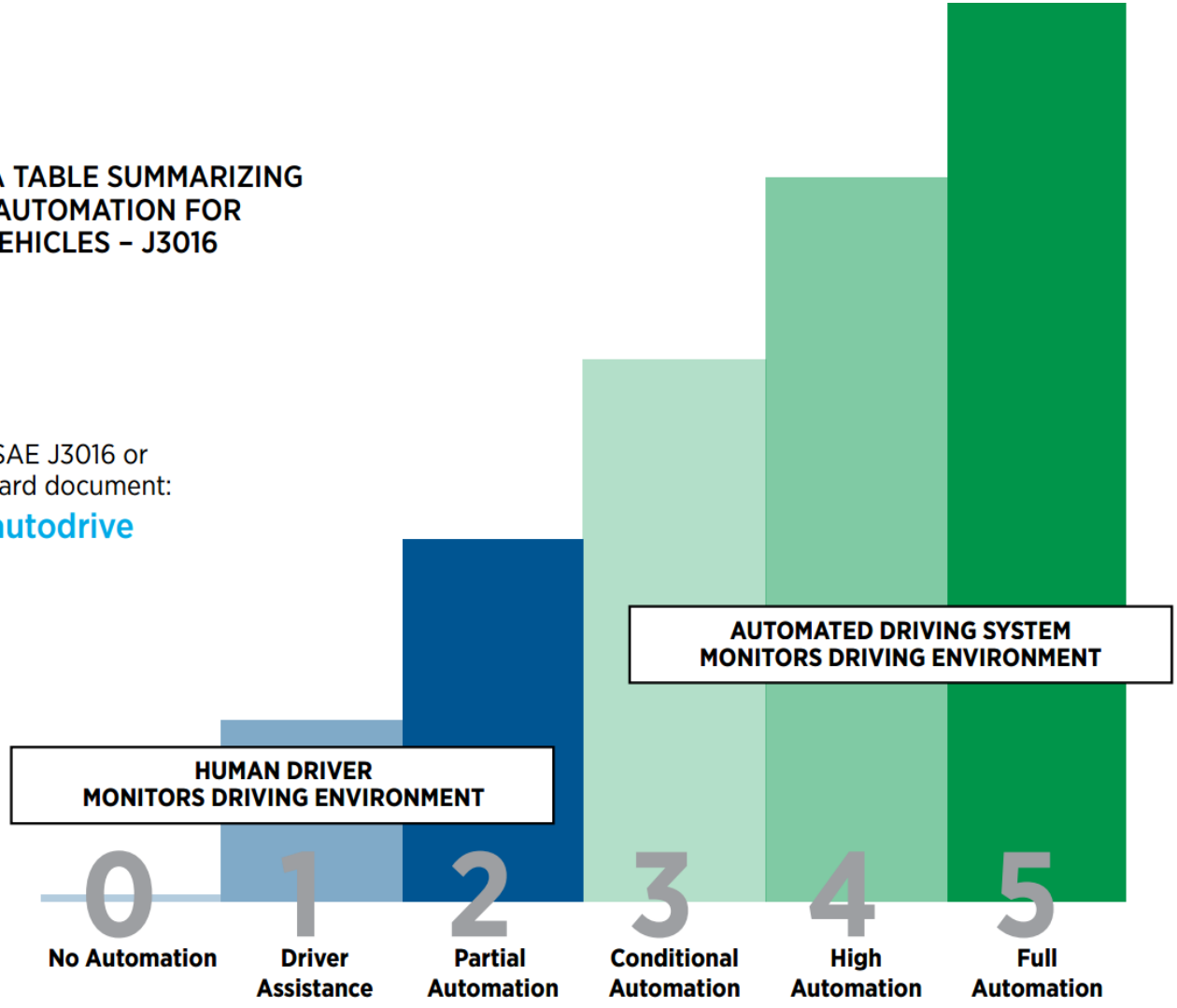
- CANBadger can control GPS via UART
- How do those insurance dongles work?
- CANBadger has emulator. Records data and playbacks.

Can you Trust Autonomous Vehicles–Liu,Yan,Xu

OVER FOR A TABLE SUMMARIZING
LEVELS OF AUTOMATION FOR
ON-ROAD VEHICLES – J3016

Learn more about SAE J3016 or
purchase the standard document:
www.sae.org/autodrive



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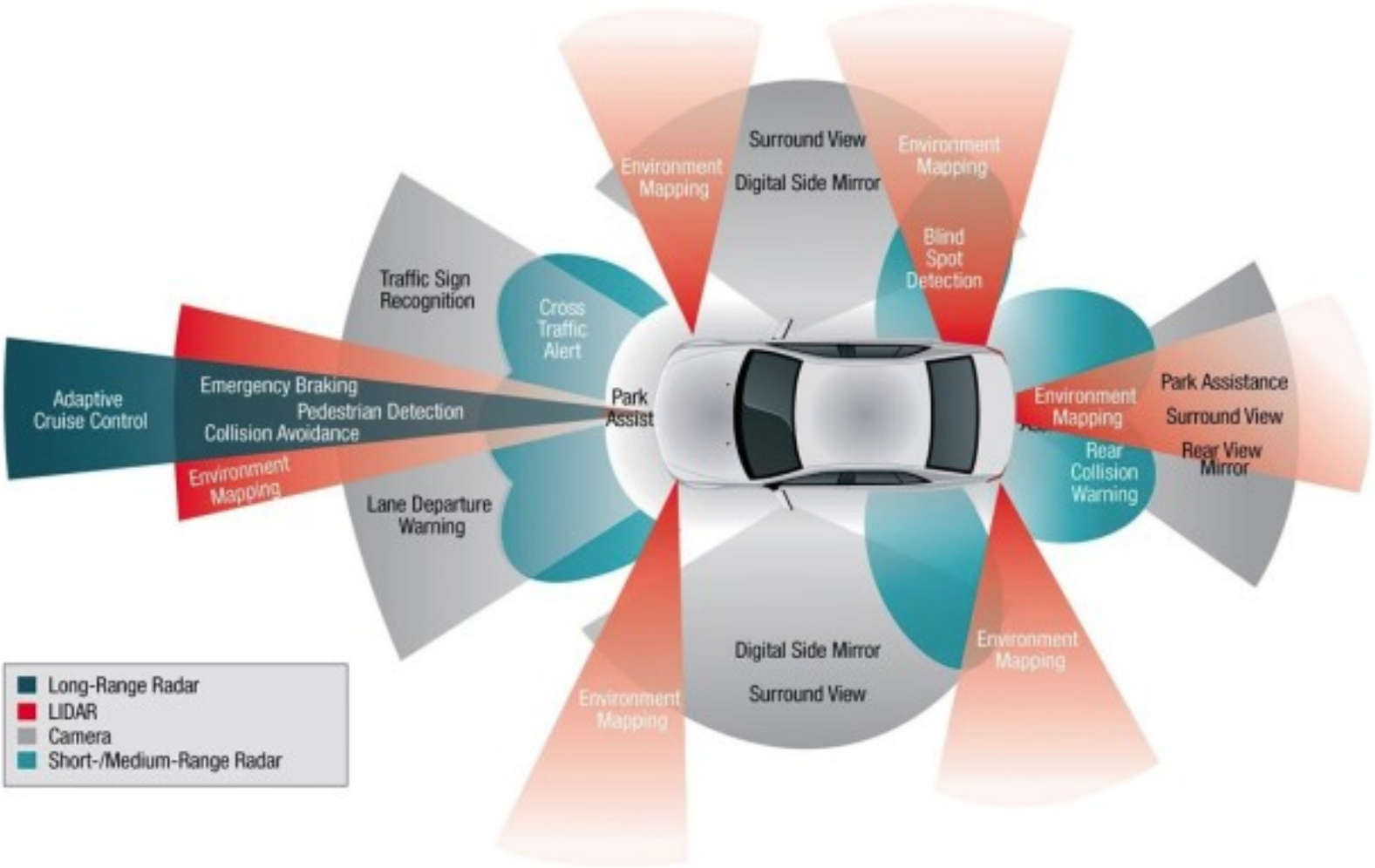

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- Takeaways
    1. Sensors should fail safe.
    2. sensor should have anomaly detection
    3. Redundancy: MIMO, different types, sensor data fusion

DEF CON 2016 Car Hacking Village

CHV Badge Nathan Hoch

CHV Badge

1. The badge supports 2x Dual Wire CAN (ISO 11898-2) channels with full gateway support.
2. Fully-controllable pass-through
3. Interrupt messages or drop it
4. Uses PAWN. `http://www.compuphase.com/pawn/pawn.htm`
5. The badge also sports a 128×128 color LCD which is fully accessible via the PAWN scripts.

Conclusion

Insights

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CAN Bus feels like the early Internet

Exploit the boundaries of assumptions.

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- Reliability engineering is security engineering.
- See Peter Neumann and *Computer Related Risks*

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Make AVC entries resilient to attacks

You know, like real-world systems should be!

Das Ende

- `www.cryptotronix.com`
- Just ask for Josh ;)