DG Technologies Secure Diagnostics

Inspection Discussion
for
ADAS\ADS Vehicle Safety

Presented at the 2022 I/M Solutions Conference
New Orleans, LA 25 May 2022

Auto Pilot: Fool proof: I don't think so!

Yellow Cab-Tesla- Crashes into Ohio Convention Center

SAE 3016 : Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles

Advanced Driver Assistance System (ADAS)

Level 1: Driver Assistance

Level 2: Partial Driving Automation

Automated Driving System (ADS)

Utilize complex sensors, processing, algorithms, and controls to manage the entire ***Dynamic Driving Task*** (*DDT)* **and aspire to not introduce critical new crash scenarios.**

Level 3: Conditional Driving Automation

Level 4: High Driving Automation

Level 5: Full Driving Automation

Electronic Safety Systems

- are *vehicle* systems that sense and monitor conditions inside and outside the *vehicle*
- warn or intervene during a high-risk event or maneuver and are *driver* assistance systems
- provide momentary intervention during potentially hazardous situations
- Some examples are:
  - Electronic Stability Control (ESC)
  - Automatic Emergency braking (AEB),
  - Lane Keeping Assistance (LKA),
  - Driver Monitoring System (DMS)

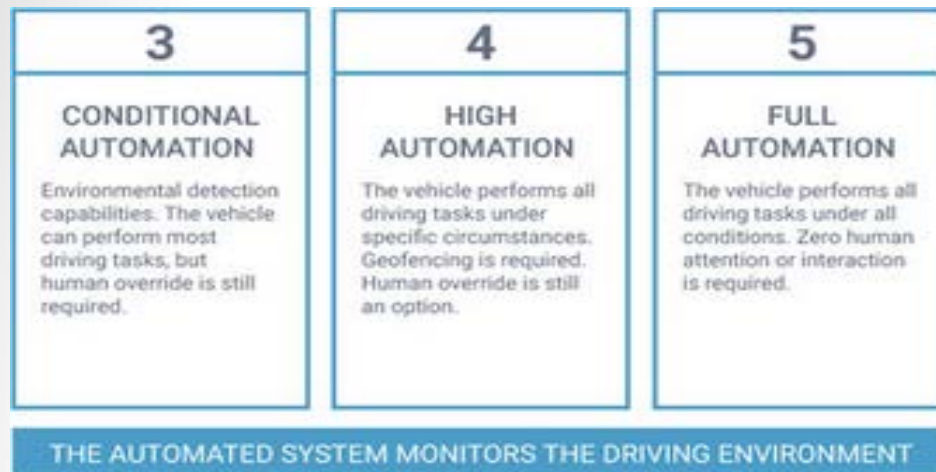## Advanced Driver Assistance System (ADAS)

- Active Safety Systems
  - Adaptive Cruise Control (ACC)
- Active Information System
  - Cross Traffic Alert (CTA)
  - Blind Spot Warning (BSW)
  - Forward/ Rear Collision Warning (FCW/RCW)
  - Lane Change Alert (LCA)
- Driver Information Systems
  - Traffic Information
  - Road Information
  - Driver Attention Alert
  - Route Planning & Guidance

AUTOMATED DRIVING SYSTEM (ADS)

The hardware and software that are collectively capable of performing the:

- entire **Dynamic Driving Task** (*DDT)* on a *sustained* basis,
- regardless of whether it is limited to a specific **Operational Design Domain** (*ODD*);
- The term ADS is used specifically to describe a Level 3, 4, or 5 *driving automation system*.

3	4	5
CONDITIONAL AUTOMATION	**HIGH AUTOMATION**	**FULL AUTOMATION**
Environmental detection capabilities. The vehicle can perform most driving tasks, but human override is still required.	The vehicle performs all driving tasks under specific circumstances. Geofencing is required. Human override is still an option.	The vehicle performs all driving tasks under all conditions. Zero human attention or interaction is required.

THE AUTOMATED SYSTEM MONITORS THE DRIVING ENVIRONMENT

SAE 3016 Automated Level Definitions

SAE Level	SAE Name	SAE Narrative Definition	Execution of Steering/ Acceleration/ Deceleration	Monitoring of Driving Environment	Fallback Performance of Dynamic Driving Task	System capability (driving modes)
Human Driver monitors the driving environment						
0	No Automation	Hands, feet, brain, eyes ON	Human Driver	Human Driver	Human Driver	N/A
1	Driver Assistance	Hands or feet OFF brain & eyes ON	Human Driver and Systems	Human Driver	Human Driver	Some Driving Modes
2	Partial Automation	Hands & feet OFF brain & eyes ON	System	Human Driver	Human Driver	Some Driving Modes
Automated driving system ("system") monitors the driving environment						
3	Conditional Automation	Hands, feet, eyes OFF Brain ON	System	System	Human Driver	Some Driving Modes
4	High Automation	Hands, feet, eyes, brain OFF – Constrained environments;	System	System	System	Some Driving Modes
5	Full Automation	Hands, feet, eyes, brain OFF Unconstrained	System	System	System	All Driving Modes

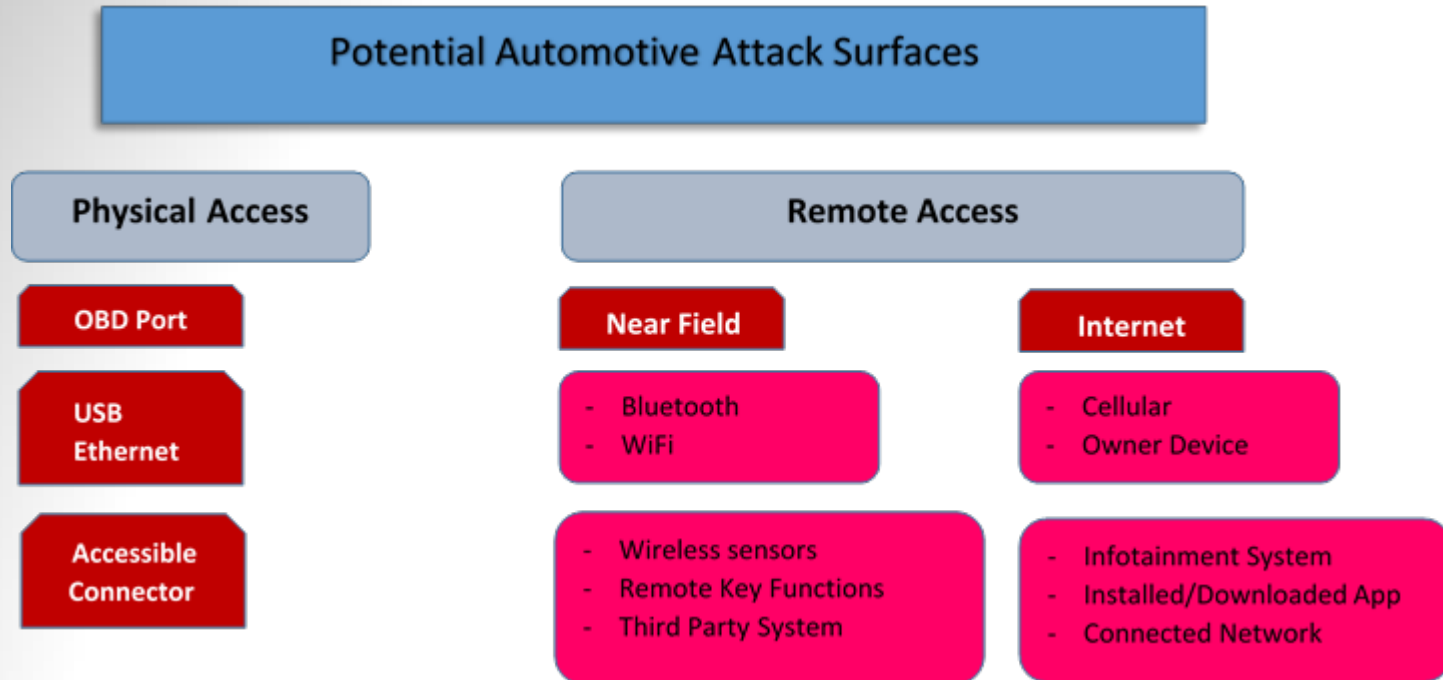## Current Safety Inspection Programs

1. Visual
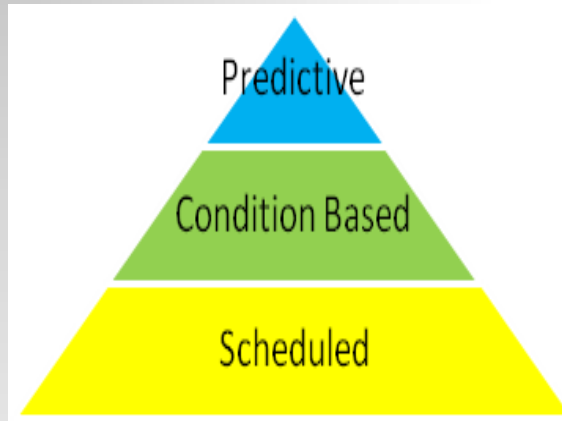2. ?...OBD Scan

OBD Safety Inspection

1. On Board Diagnostics...Not just for Emissions
   - Multiple Safety related Modules
   - Increased use of multiple protocols
2. Safety Systems Readiness
   - Deterioration – Tolerance Stacking
3. Detection for Tampering
   - By owner
   - By cyber attack

Cyber Security as a Safety Issue

Potential Automotive Attack Surfaces

Physical Access
- OBD Port
- USB Ethernet
- Accessible Connector

Remote Access

Near Field
- Bluetooth
- WiFi
- Wireless sensors
- Remote Key Functions
- Third Party System

Internet
- Cellular
- Owner Device
- Infotainment System
- Installed/Downloaded App
- Connected Network

Maintenance Techniques

Operational Data
-Digital Twin

Event Based

Periodic Time/Mileage

As is common in the Aircraft-Aviation Industry
- Approve and Monitor Fleet Maintenance Practices

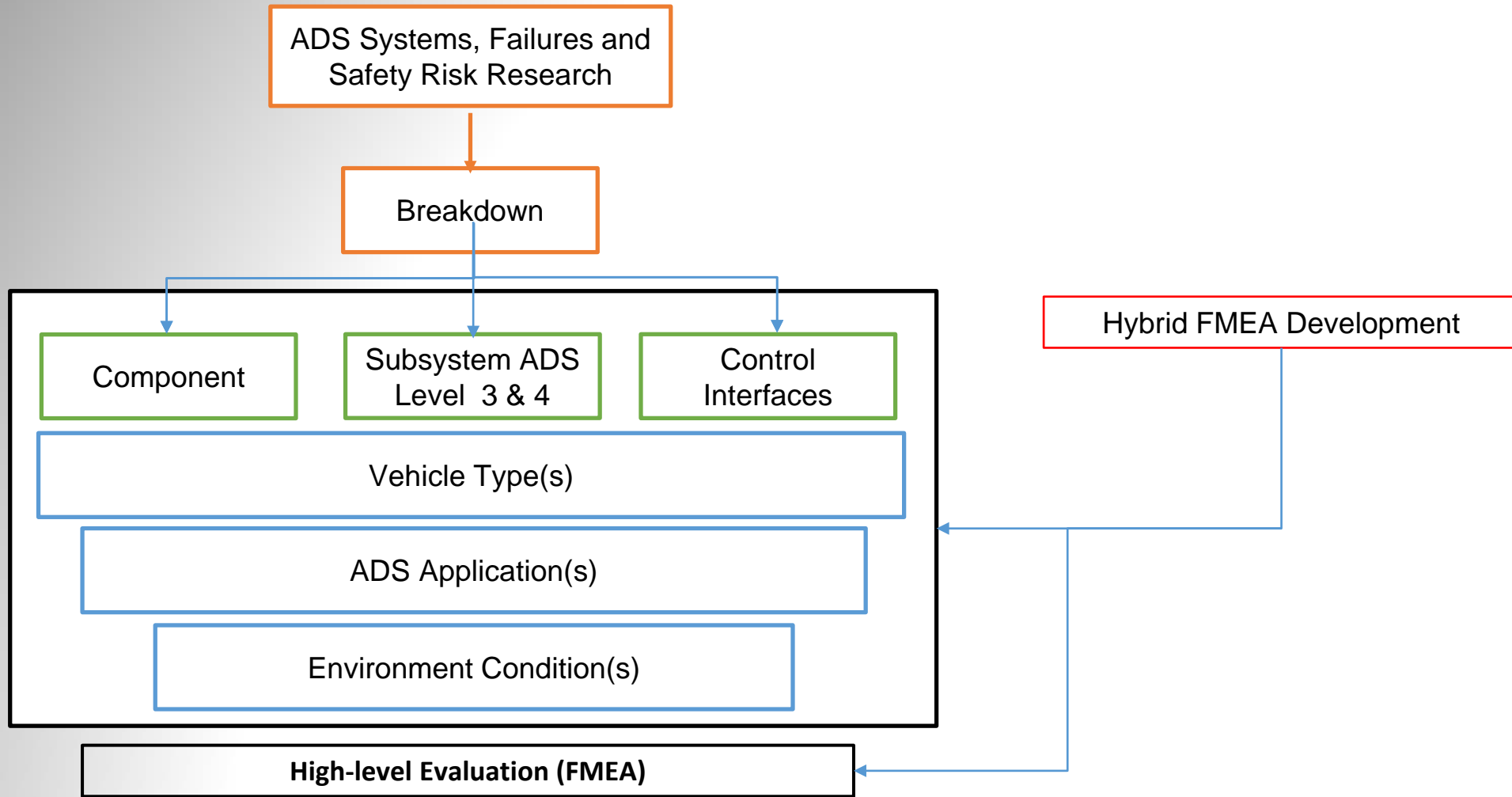# An ADAS Safety Program

What would it look like?

- Inspection at specific location(s)
- What systems would it include
- How much time
- Exceptions/ Waivers

What are the real challenges

-Time it would take for physical & OBD inspection

-Remote reporting…possible?

-Maintenance record review

-Private vehicles present unique challenges

Research Study Project

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