



# CyberSecurity for In-Vehicle Network



# Agenda

- Mega Trend of Automotive Industry
- Network and E/E Architecture
- Importance of CyberSecurity in Vehicle
- Challenges & Possible Solutions
- Examples of In-Vehicle Security Measures
- Conclusion



Less is more



More is less



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# **C**onected Cars

Protocol standard, more connectivity

# **A**utonomous Driving

More sensors, MCUs, connectivity

# **S**hared Mobility

Becomes economically viable with the introduction of autonomous vehicles

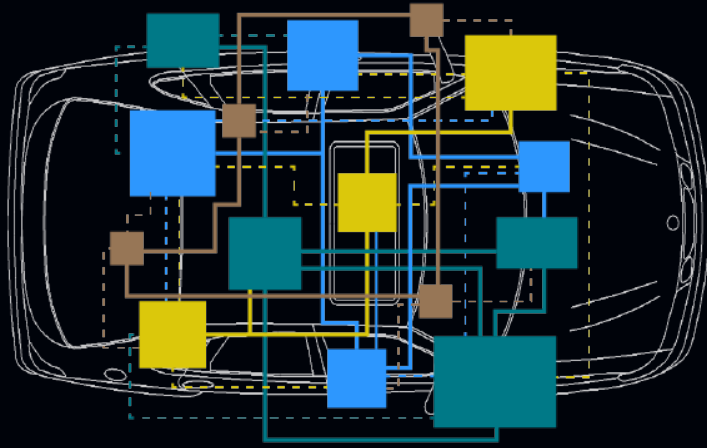
# **E**lectrification

Battery, vehicle weight, non-exhaust PM emissions

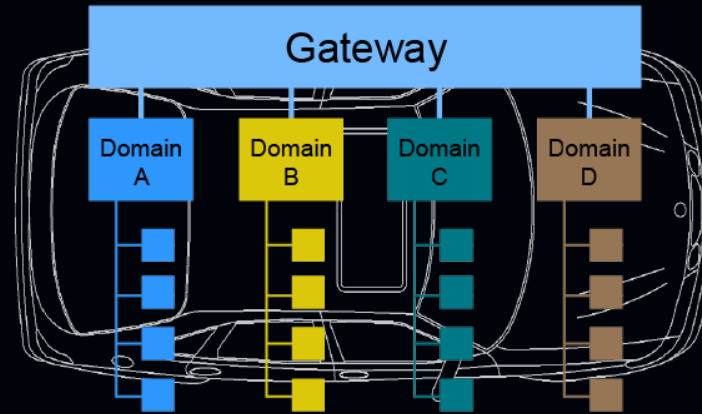
# C.A.S.E.

The background features two wireframe car models. The top car is shown from a side profile, with red sensor waves emanating from its front. The bottom car is shown from a front-three-quarter view, with blue sensor waves emanating from its front. The entire scene is set against a dark space background with a grid of light blue lines and scattered white stars.

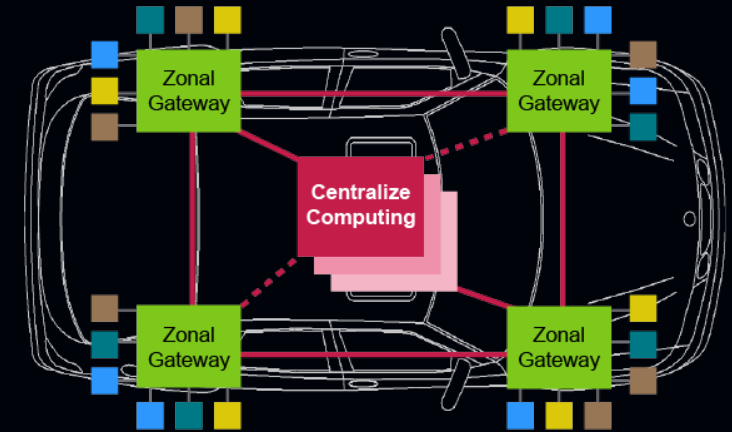
# Evolution of Automotive E/E Architectures



Yesterday



Today



Tomorrow

## Software Defined Car

# Importance of CyberSecurity

There is no safety without security

## Human Life

- Tires
- Chassis
- Windshield
- Lighting System
- Braking System
- Powertrain System
- ADAS System
- Gateway/Switch
- Sensor/Camera/Lidar



## Data

- Position
- Call Records
- PVR Records
- Browser Logs
- Transaction Certificate

# Challenges

More than 100M LoC (Lines of Code)

Conversion from Closed to Open System

Vulnerabilities in Supply Chain

Long Life Time Software

# Possible Measures

Reliable Coding Style (MISRA)

Standard & Regulation

Monitorable and Updatable Architecture



# Reliable Coding Style

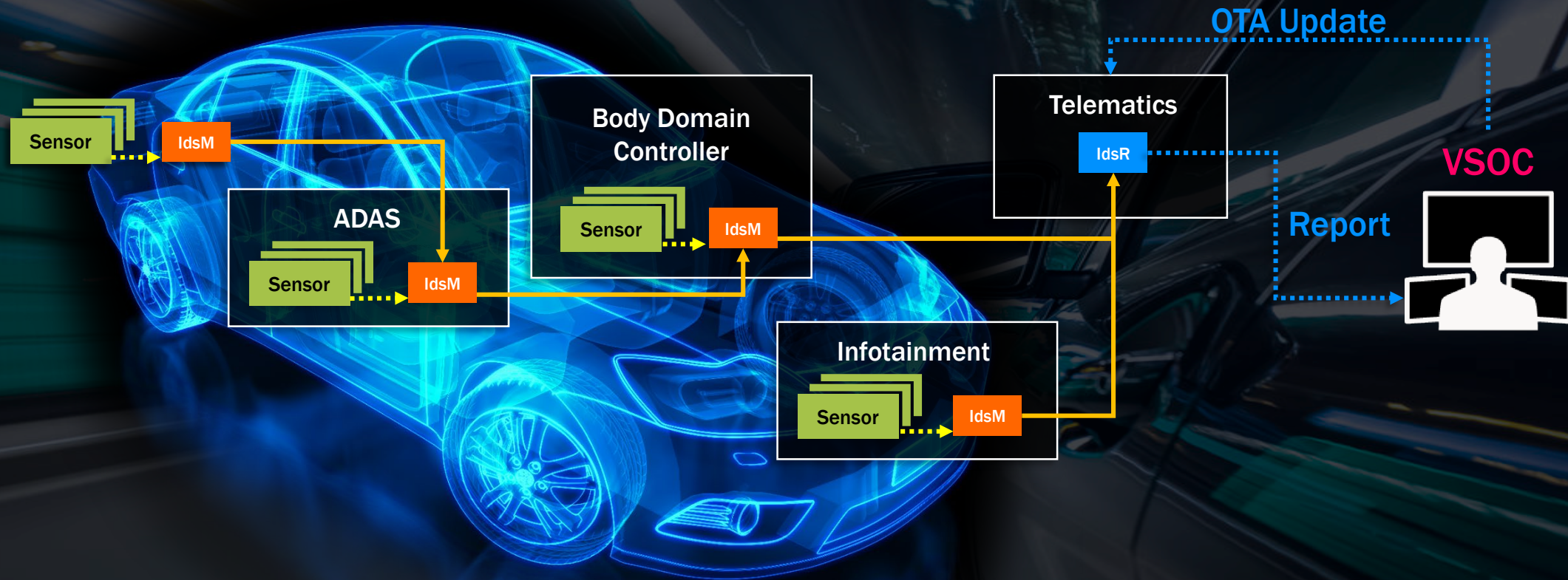
MISRA is a coding standard for embedded industries, including automotive, and was developed by the Motor Industry Software Reliability Association.



# Standards for CyberSecurity



# Monitorable and Updatable Architecture



## Intrusion-Detection System Manager (IdsM)

- Forwarding of IDS events to IDS Reporter via automotive protocol

## IDS Reporter (IdsR)

- Reporting of IDS events to vehicle security operations center

## Vehicle Security Operations Center (VSOC)

- Preventing, detecting, analyzing, and responding to cybersecurity incidents
- Updating security vulnerability countermeasures via OTA (Over The Air)

# Counter Measure Techniques

## Secure Operation

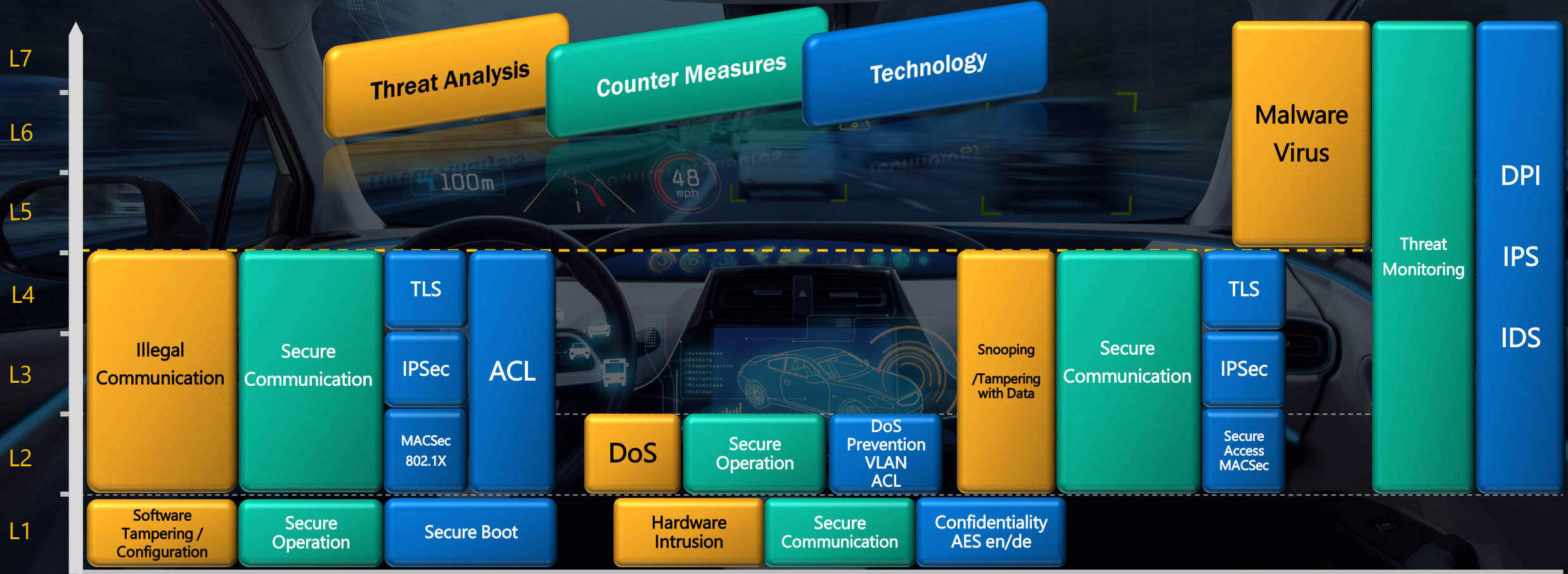
- Authentication
- Authorization
- Integrity
- Confidentiality
- Availability
- Non-Repudiation

## Secure Communication

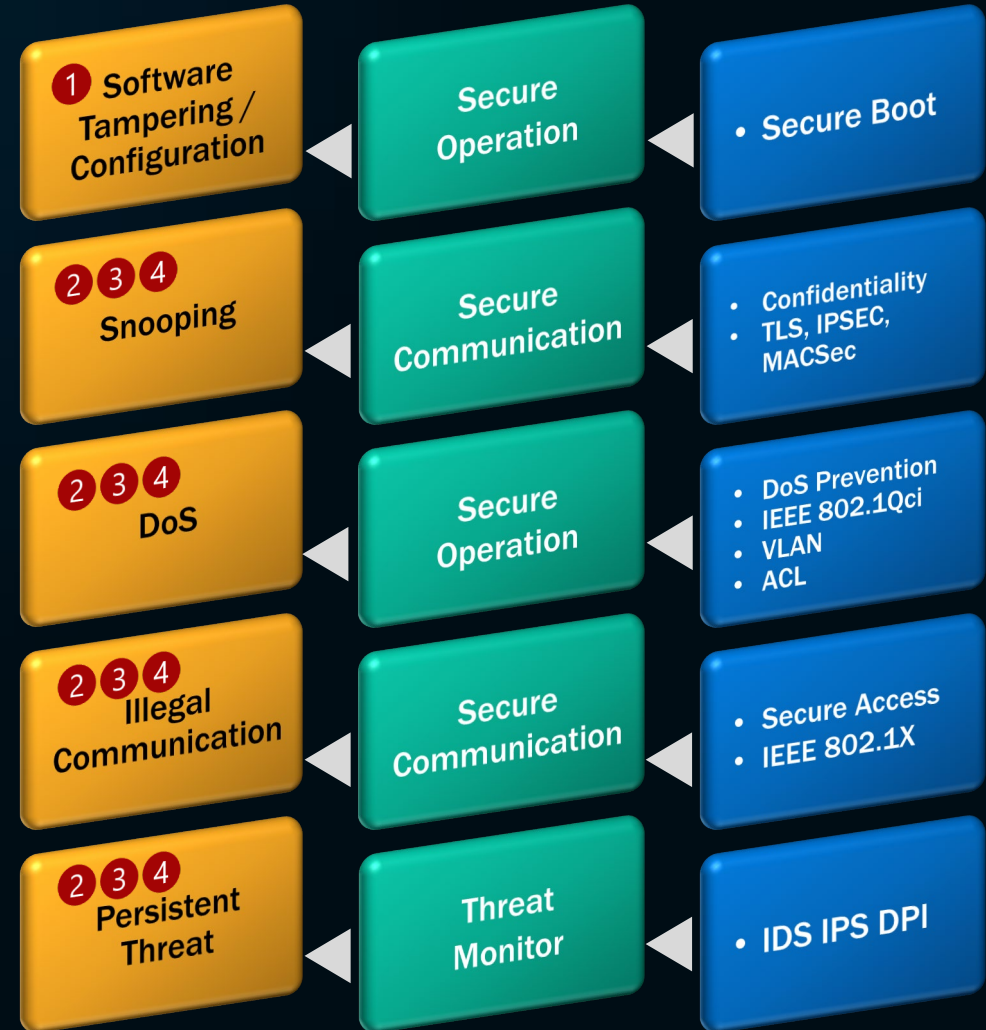
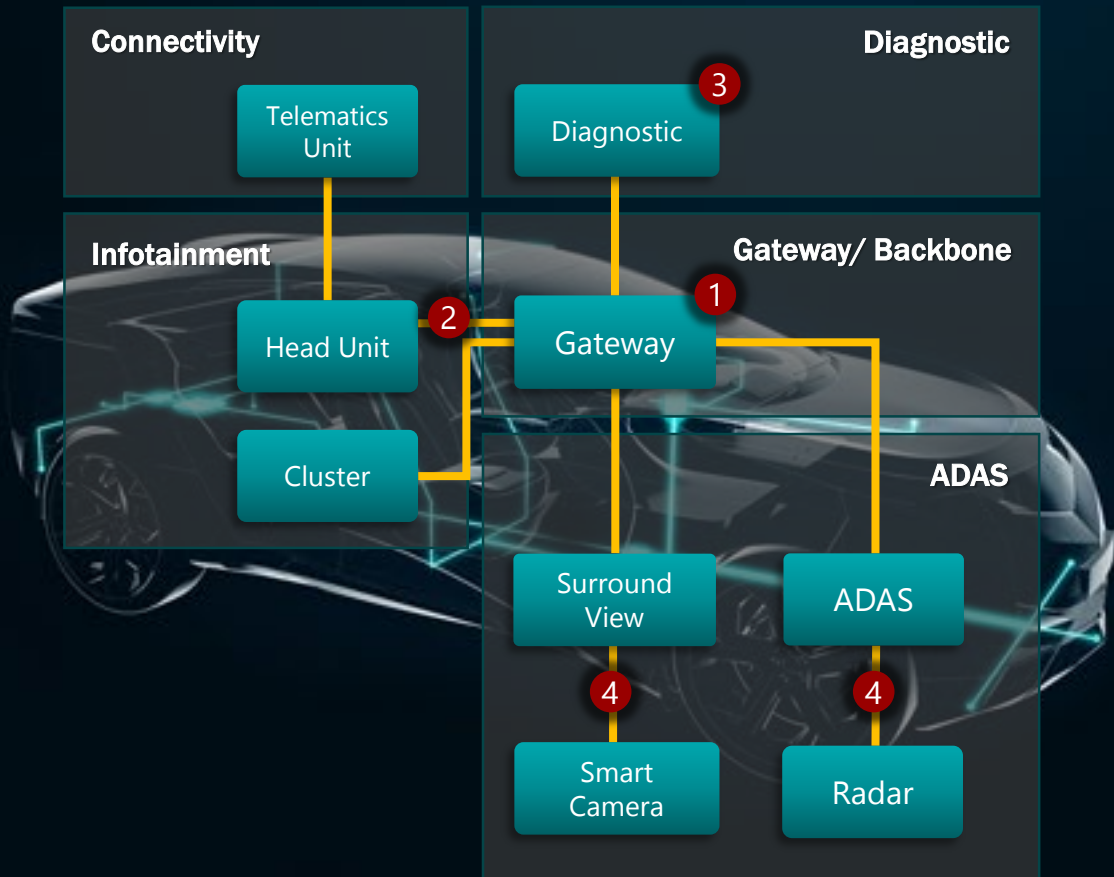
## Threat Monitor

- Sensitivity
- Traceability

# Matrix of Cybersecurity Measures



# Examples of In-Vehicle Security Measures



# Conclusion

- Zonal gateway + central computing architecture enable the 'Software Defined Car' that will be necessary for OEM's demands for differentiation
- There is no safety without cybersecurity
- Regulation and industry standards such as WP.29 and ISO21434 provide good guidelines, processes, and methodologies for the industry to ensure the integrity of security measures
- Cybersecurity measures, including threat analysis, counter measures, and technology were introduced through the OSI seven layer protocol

**Thank You**

