Unpacking the Domain Controller

What Should be Inside, and Why?

STRATEGY ANALYTICS

STRATEGY ANALYTICS AUTOMOTIVE PRACTICE

Autonomous Vehicles

CONNECTED MOBILITY

Powertrain, Body, Chassis & Safety

In-Vehicle UX

Infotainment & Telematics

Individual Report Purchases

- Wide range of forecast and analysis available

Syndicated Research Services

- 12-month subscription
- Access to all historical reports
- Full inquiry support from analysts

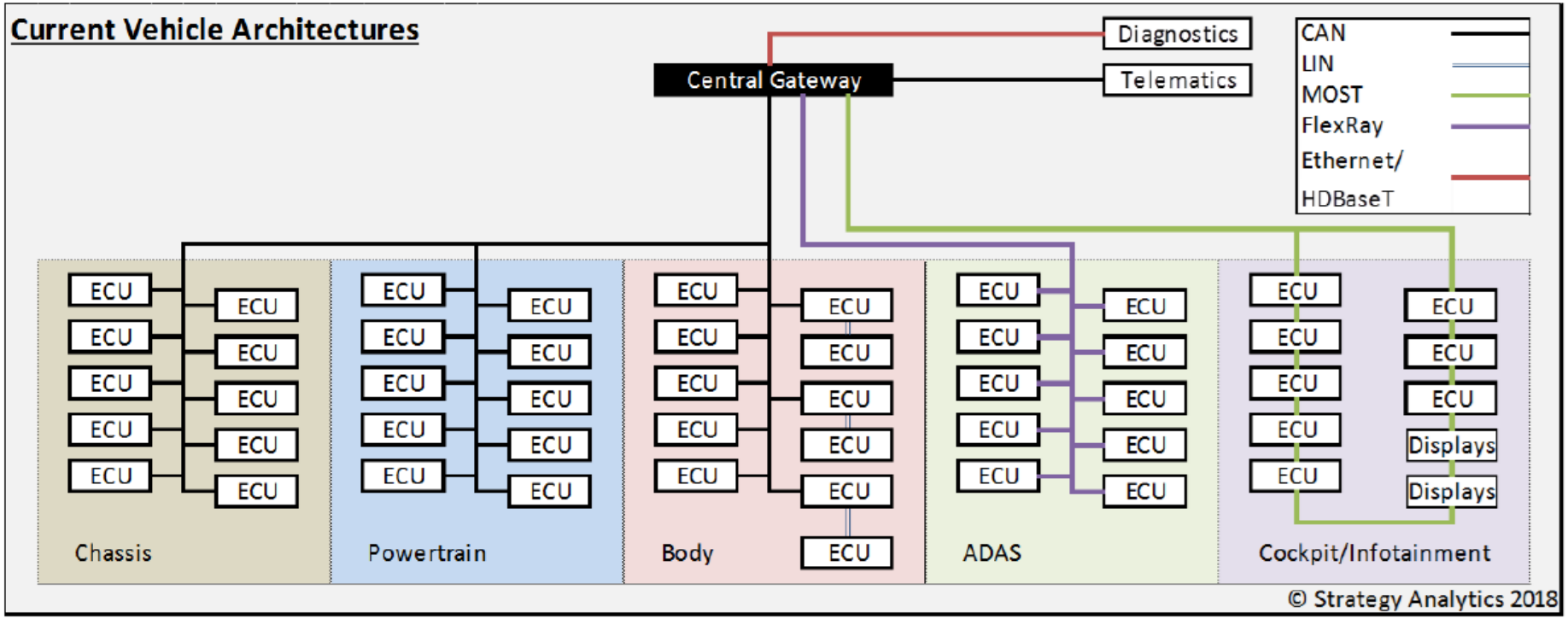
Custom Research Under NDA

- Proprietary Research/Strategy Consulting
- B2B and B2C capabilities

Thought Leadership

- Technology Assessment & White Papers
- Workshops

CURRENT VEHICLE ARCHITECTURES



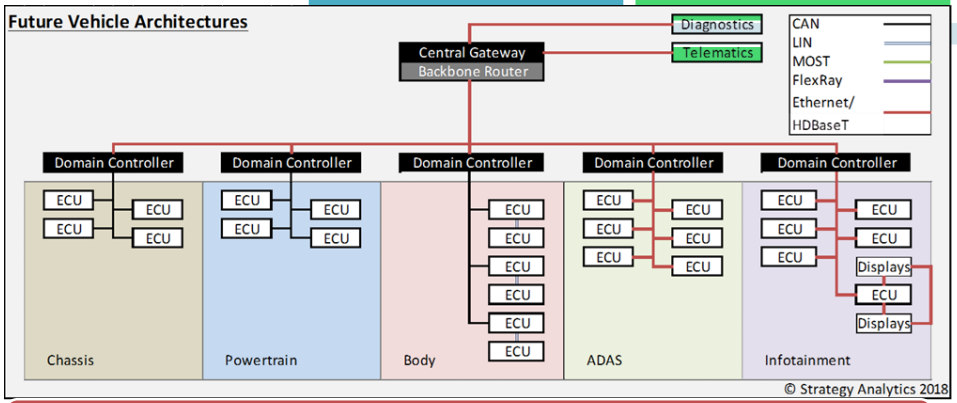
THE IMPACT OF VEHICLE ARCHITECTURES

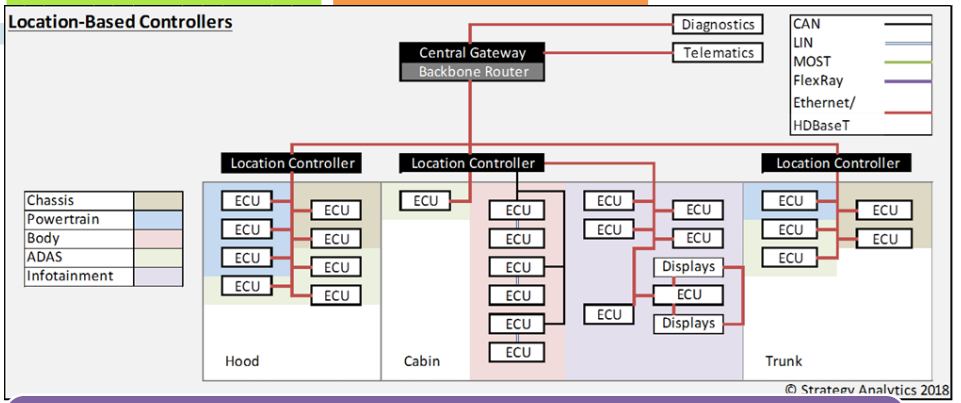
Autonomous Vehicles

Infotainment & Telematics

ADAS

Connected vehicle





Centralization trend

H/W – S/W Decoupling

However, NO E/E architecture commonality between OEMs today, nor in the future – due to differing product mix priorities driving individual E/E optimization

Control centralized based on the **location (zone) in the vehicle** of the function, reducing cabling costs & weight

Much more cross-domain partner integration required

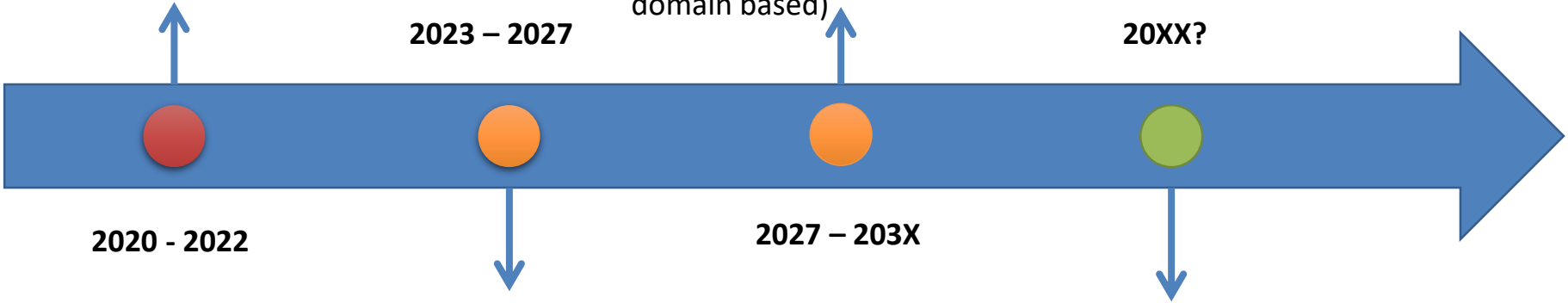
DOMAIN CONTROLLERS – STILL AT AN EARLY STAGE OF DEPLOYMENT

STRATEGY ANALYTICS

Distributed EE Architecture (limited domain consolidation, primarily via CDCs, some ADAS DC)

Location or zone-based EE Architecture (select, premium OEMs begin shift to zone-based architecture. L2+ and higher likely to be zone or domain based)

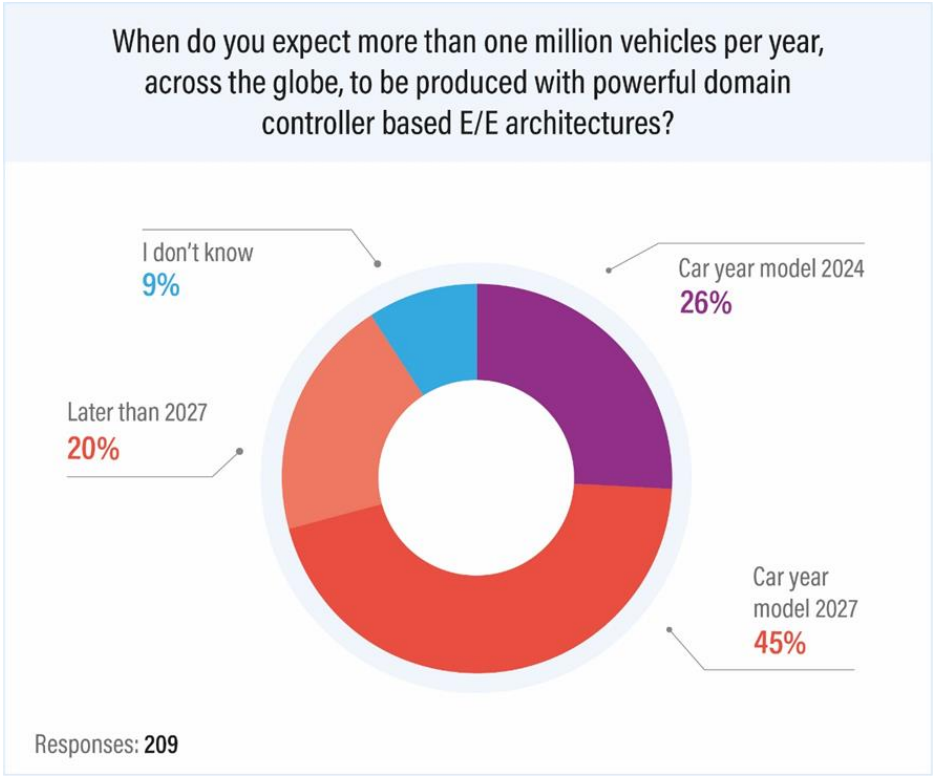
Major Tier 1s told SA that centralized processing is a core trend – high speed backbones (Ethernet, etc. needed)



Domain Controller Architecture (number of CDCs increases, ADAS DC growth in luxury vehicles – L2+ systems are a driver. All eyes on VW MEB centralized compute implementation

Fully Centralized Processing Architecture (future proposed architecture; unknown if auto industry will actually embrace this approach)

FULL DOMAIN-BASED 2027+ IN VOLUME?

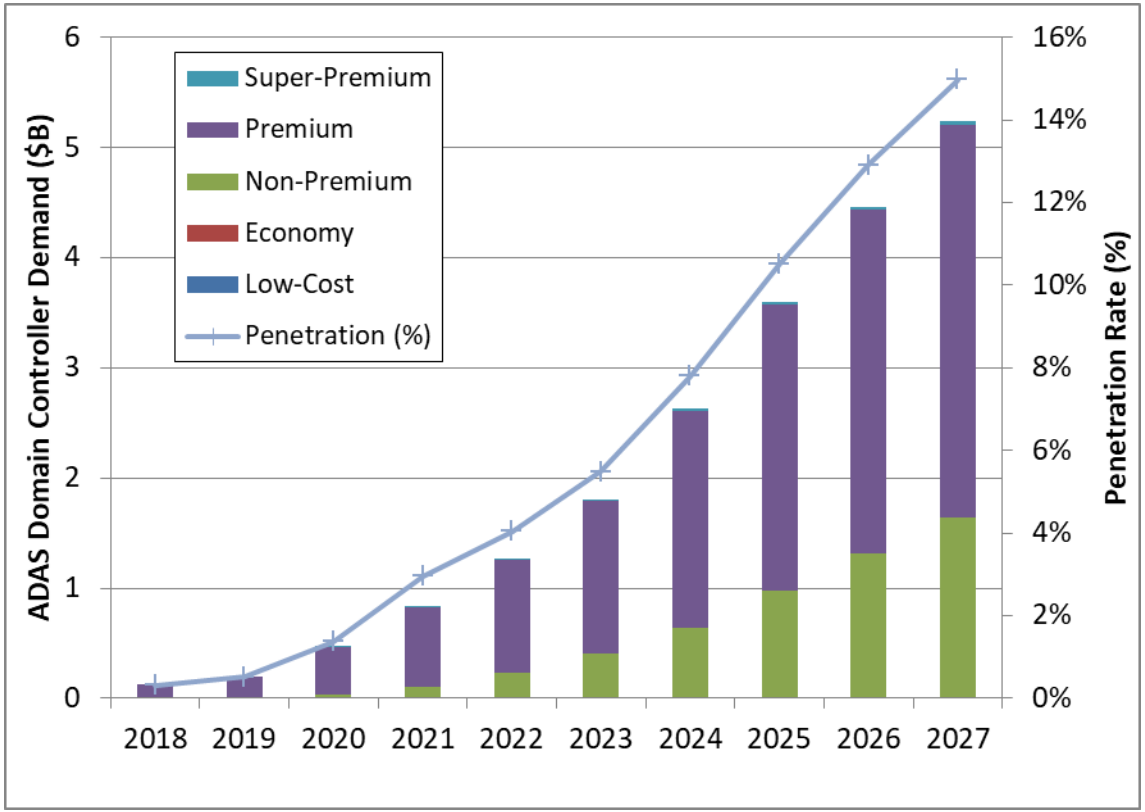


- Almost two-thirds of respondents (65%) saw any volume deployment of domain-controller based architectures as only happening in MY 2027 or later

Source: Strategy Analytics / Aurora Labs 2020 Automotive Software Survey

ADAS DOMAIN CONTROLLERS

- Strategy Analytics expects demand for central processing units to emerge mainly on higher-end vehicles and premium brands offering a significant degree of automated driving technology, or heavily integrated ADAS functionality



Source: AVS Strategy Analytics Nov 2020

ADAS DOMAIN CONTROLLERS: NO "ONE-SIZE-FITS-ALL" SOLUTION

STRATEGY ANALYTICS

- Strategy Analytics knows of a T1 Vendor that it has developed a range of at least 4 ADAS domain controllers
  - In discussions with Strategy Analytics, it was stated that "if the customer wanted a fifth or sixth design then that's what they would have to do..." **Economies of scale were not yet readily apparent**
  - They typically contain multiple processors, especially at the higher end, with combined processor content ranging from "a few **tens of dollars**" to "**hundreds of dollars**"
- Software content and sourcing also an area of **uncertainty**
  - Current designs typically mix software from multiple vendors
  - VW in very public moves to bring more software **in-house**

SO WHAT ARE THE SILICON REQUIREMENTS FOR AV?
NOBODY KNOWS!

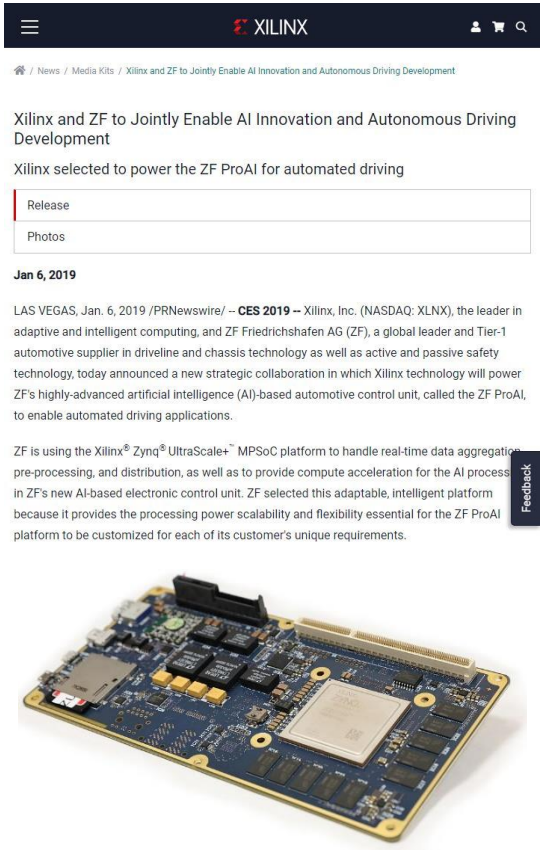
STRATEGY ANALYTICS

- Multiple levels of uncertainty:
  - Sensors: How many? Type? Resolution? Interface?
  - How will functionality need to evolve over the life of the domain controller?
  - How will functionality need to evolve over life of an individual vehicle?

- Possible Approaches (not exclusive!):
  - Design and build a “does-it-all” single SoC?
    - Costly and risky?
  - Include (multiple?) dedicated accelerators?
    - Will they still accelerate tomorrows AI networks & topologies?
  - Go for massive GPU power
    - “Brute force” can lead to power consumption and optimization challenges?
  - Build in flexibility and programmability from the get-go
    - Bigger initial challenges if you have little experience with pSoC / FPGA?

ADAS DC SILICON PROVIDERS

- ADAS Domain Controllers will likely continue to be **heterogeneous compute environments** with multiple silicon vendors for some time to come:
  - E.g. Audi zFAS features NVIDIA, Mobileye, Altera & Infineon processors
- Two high-profile AV ecosystems are emerging in the West
  - **NVIDIA**-centric (e.g. Daimler)
  - Intel **Mobileye**-centric (e.g. BMW)
  - Both of these have very strong platform plays and software stacks, which can be a mixed blessing…
- **Xilinx** is a "quiet" player with a strong role to play with its programmable SoCs / FPGAs
  - Currently ranked #2 behind Mobileye for front camera image processing
  - Strategy Analytics still sees a very strong role for programmable devices for many years to come



CONCLUSIONS

Architecture change is coming – **ALTHOUGH HIGH-VOLUME FULLY DOMAIN-ARCHITECTED VEHICLES MAY BE SOME WAY OFF IN VOLUME, DOMAIN CONTROLLERS ARE HERE!**

ADAS is now 25 years old – **FPGAs/pSoCs ARE STILL USED TODAY. "THEY WILL BE DESIGNED OUT WHEN REQUIREMENTS SOLIDIFY" HAS NOT HAPPENNED YET…**

Future AV requirements are still highly uncertain – **THIS IS VERY MUCH THE CASE FOR THE SENSOR SUITE. IN ADDITION, NEW AI NETWORK TOPOLOGIES CONTINUE TO EMERGE**

Strategy Analytics expects most vendors to continue to adopt a heterogeneous compute environment for ADAS/AV controllers – **FPGA/pSoC VERY MUCH HAVE A ROLE**

Key questions: **AM I LOOKING AT THE WHOLE PICTURE AND ENTIRE LIFECYCLE?**
DOES MY CHOSEN SOLUTION GIVE THE FLEXIBILITY I NEED?

Any Questions?

Ian Riches
VP – Global Automotive Practice
iriches@strategyanalytics.com