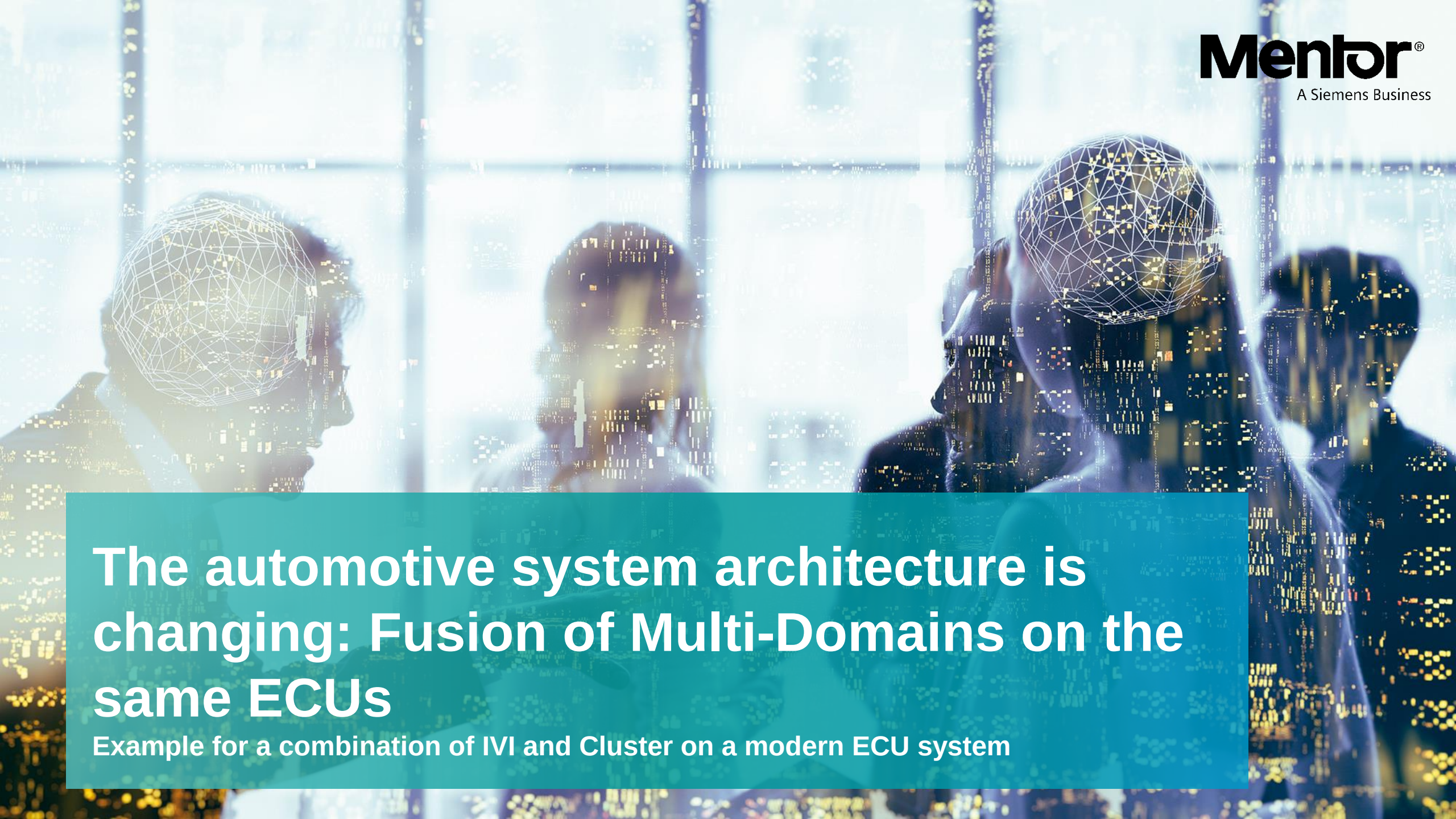
# Mentor, A Siemens Business

## Automotive Business Unit (ABU)

Cockpit Domain Consolidation

GENIVI 20th All Member Meeting



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# The automotive system architecture is changing: Fusion of Multi-Domains on the same ECUs

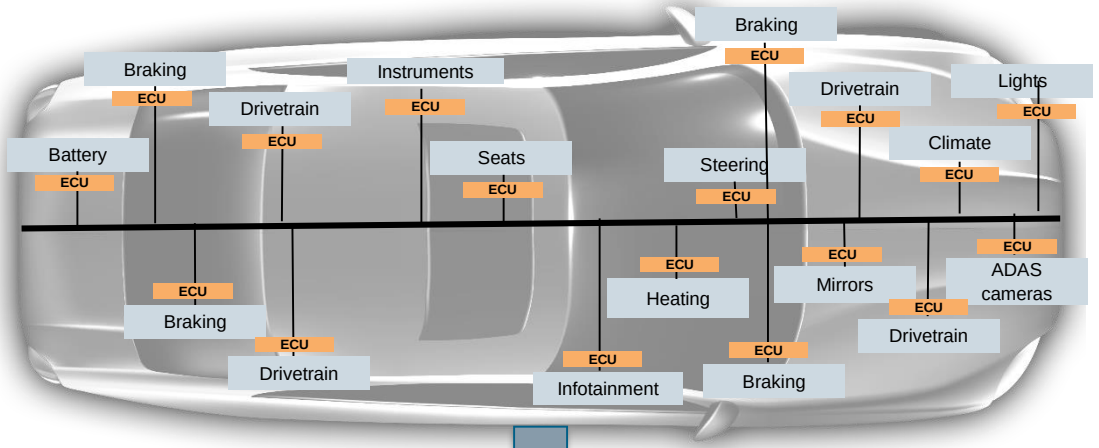
## Example for a combination of IVI and Cluster on a modern ECU system

# CCP – Central Compute Platform
# The Automotive Architecture is changing!

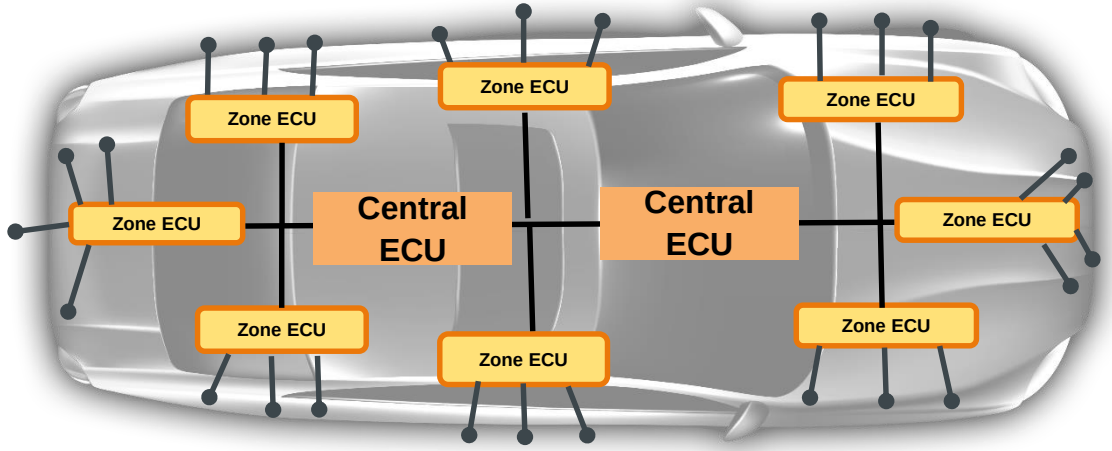
## Key architectural directions:

- A centralized computer system
- A set of vehicle zonal IO concentrators
- A highly scalable and modular EE hardware structure
- Software centric approach with a Service Oriented Architecture
- Real-time, deterministic capable Ethernet AVB/TSN network
- Tooling supporting software platform configuration and Agile Continuous Integration & Test Software development flow

Traditional System with several ECUs

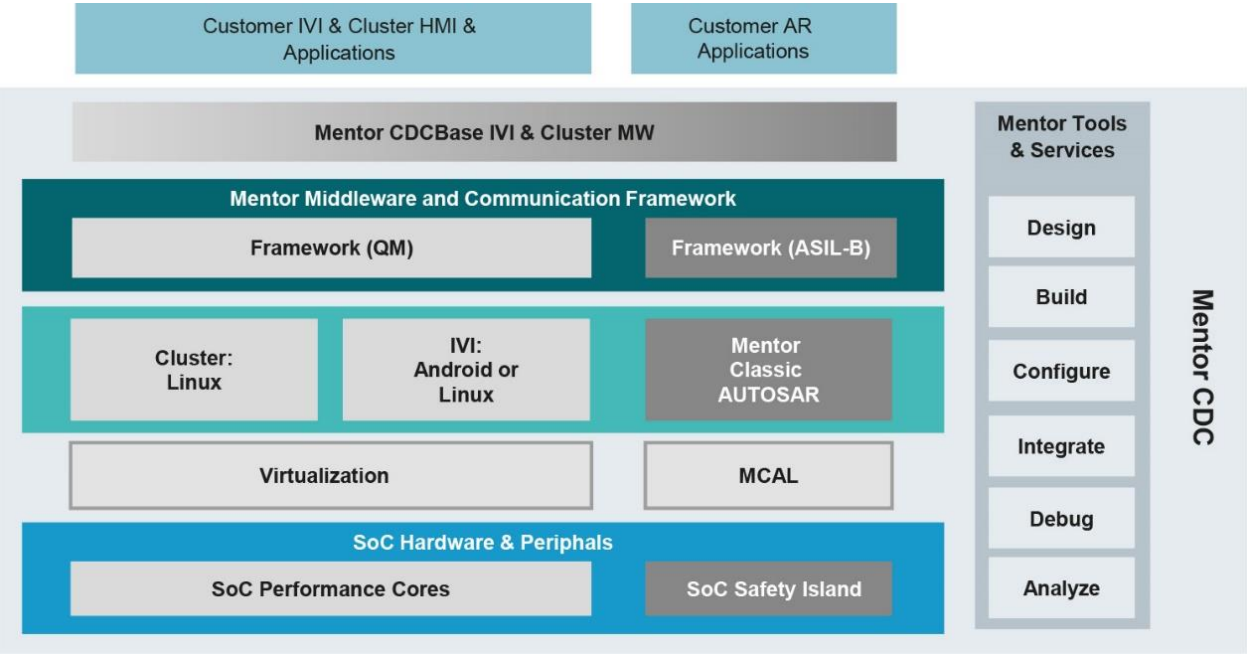



Vehicle as one system




Open | Secured | Universal

# Mentor CDC - Cockpit Domain Consolidation
# Next step towards Central Compute Platform






* Depending on customer requirements, OSS or 3rd party solutions will be integrated by Mentor. Additional costs are subject to project specifications.

**FEATURES AND BENEFITS:**

A platform ready for your project specific porting improving time & cost to market

Technical and functional safety concept

Software safety libraries (ASIL-B) & Safety Island for Safety, Entertainment and Automotive Audio features

Implement architectures for Shared Graphics, Video, Audio

IVI stack, Bluetooth*, Wi-Fi, Tuner*, CAN connectivity, Rear View Camera, Multi-Media playback*

Mentor AUTOSAR on Safety Island, MCAL integration

QM to ASIL domain communication including certification

QM Cluster (Linux) and IVI (Linux / Android)

**CDCBase** - A basis feature set ready to combine IVI & Cluster on high compute ECU systems.

# What are the challenges? How is this interesting for GENIVI?

Integrate several operating system on one ECU e.g. Linux, Android, adaptive AUTOSAR, RTOS

- Some components are needed for each/several operating systems and benefit from standardized interfaces and solutions
- Communication in between hypervised OSs not standardized (used to be vehicle bus between ECUs)
- Communication from OS to hypervisor not standardized
- Interfaces to drivers specific for each SoC
- Interaction of components of different safety standards
- OS decisions are typically OEM specific, there are lots of possible combinations
- Integration of GENIVI standardized components in Android followed by certification by Google makes usage of DRM and Play Store easier
- Standardize interfaces to security components: Trusted Execution Environment OS, Hardware Security Module

**GENIVI is already working on some of these topics and willing to expand the scope based on demand!**

# Challenges: Standard interface to Hypervisor

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**Challenge**

- Hypervisor interfaces vary between SoCs
- Drivers vary and are additionally dependent on operating systems
- Lots of possible combinations, big test effort

**What needs to be solved?**

- Standard interfaces to hypervisor
- Standard drivers
- Can be tested a lot easier on more different systems e.g. by reusing tests
- Test effort smaller for bigger test depth

**GENIVI Focus**

- Hypervisor Project – Virtual Device API standardization

# Challenges: Internal Communication

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**Challenge**

- CommonAPI / Some/IP only on Linux systems
- For Android no specific standard, using native Android mechanisms
- RTOS using propriety solutions

**What needs to be solved?**

- Integration on other operating systems to be able to directly use services offered in other components
- Transport between guest systems depends on used SoC
- Add end to end protection features like checksum & counters

**GENIVI Focus**

- Interface definition language based on CommonAPI (Franca IDL) available for
  - D-Bus
  - SOME/IP
  - Currently only for Linux

# Challenges: Standardize basic components (1/2)

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## Audio

### Challenge

- Mixing of sources from several domains (QM and ASIL) on one controller and to one speaker

### GENIVI Focus

- AudioManager available for Linux

## Graphics

### Challenge

- Handling and use cases of buffer sharing (which is SoC specific)
- DRM handling on Android (Trusted Execution Environment which is SoC specific)

### GENIVI Focus

- RAMSES already available for distributed rendering on several operating systems

# Challenges: Standardize basic components (2/2)

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## Lifecycle

### Challenge

- Lifecycle Master that controls guest system lifecycles
- Standardize interfaces from guest systems to master
- Standardize interfaces to hypervisor for shutdown, reset, suspend

### GENIVI Focus

- NSM (Node State Manager) available for Linux

## Logging

### Challenge

- Same base logging mechanism on all guest systems
- Synchronization and consolidation of all logs from all systems

### GENIVI Focus

- DLT (Diagnostic Log and Trace) available for Linux

# What are the next steps – where do we need to focus?

**The automotive system architecture is changing: Fusion of Multi-Domains on the same ECUs**
Example for a combination of IVI and Cluster (CDC) on a modern ECU system

- What are the key trends in the fusion of the automotive system architecture?
- How does the CDC fusion affect other domains in the car?
- How can we ensure safety relevant aspects with the fusion?
- Which standards do we need for an ECU / SoC for the fusion?
- How can we ensure that integration does not compromise cyber security of individual domains?
- What are Verification and Validation challenges?
- Which automotive interfaces do we need for future ECU / SoCs?
- Challenges to realize a high performance inter domain and inter SoC communication technologies?
- What domain consolidations could / will be next?


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Q & A


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Thank you for your attention!