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Why the Industry Needs a Common Vehicle Interface Initiative



### CVII

Katrin Matthes – Groupe Renault | October 2020



### **High Level Considerations for CVII**

- Different application types to be considered:
  - 1) On-board applications (not connected)
  - 2) Hybrid applications (running on-board and off-board)
  - 3) Off-board applications
- Requirements of these applications may be very different (e.g. in terms of cyber-security, functional safety, etc.)
- Access to on-board resources (sensors, data from processing outputs, HMI, etc.) is application specific
- CVII: Opportunity to specify Data formats for commonly used data sets (shared among a high number of applications, e.g. vehicle speed)





### Taking into account existing ecosystems



- APIs and SDKs are key ingredients to widely used application development platforms e.g.:
  - Google Automotive Services (GAS) Play Store
  - Android Auto (smart phone replication)
  - Apple CarPlay (smart phone replication)
- Standarised vehicle data formats and interfaces to be addressed in this context for relevant applications
- CVII is an opportunity to provide a common basis for various application and services platforms

### **From Signal to Service Oriented Architectures**



Thousands of signals exchanged between ECUs

"Service orientation means encapsulating data with the business logic that operates on the data, with the only access through a published service interface." Werner Vogels – VP & CTO @Amazon.com



GENIVI

# Thank you!

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Contact us:

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# Industry standards for vehicle data

# Industry Trends

It's amazing how much data is out there. The question is how do we put it in a form that's usable? ~Bill Ford





These market trends offer us the opportunity to once again rethink the relationship between a customer, their vehicle, and the connected world around them.



### USD 110

1st order systems

costs savings

## 2nd order quantified indirect advantages USD 65

2nd order unquantified indirect advantages USD ??

Courtesy: Roland Berger

Source: Boland Barder

Architecture will become service oriented, with new factors for differentiation.

#### Future layered in-vehicle and back-end architecture

	Cloud platform	n	Combine in-vehicle data with environmental data
Can	nectivity (back	-haul)	
User int hum	erface/user ex an-machine in	perience/ terface	
	Applications		Significant increase in number of applications
Art	ificial intellige Ivanced analy	nca/ tics	Analyze data for real-time decisions and autonomous driv
N c	iddleware lay	er/ em	Abstract applications from hardware
Ð	ectronic/electr hardware'	ical	
Sensors	Actustors	Power components	Closely controlled add-on app and modules due to safety considerations

#### Future factors for brand differentiation:

 Infotainment features requiring "plug and play" capabilities

 Autonomous capabilities including sensor-fusion algorithms as a complement to hardware

Safety features based on
 "fail-operational" behavior

 Software will move further down the stack to hardware (smart sensors)

 Stacks become horizontally integrated

 New layers will be added to the stack

Including operating system in status quo

McKinsey&Company

Courtesy: McKinsey & Company



#### Autonomous Car



### **One Connected Vehicle Contains**



#### 40+ Modules

10k TroubleCodes 40 WarningLights

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4010				.3		н	H	
40104	70100	00011	01013	U0104			H	1
00011	00104	90108	10100	00011			H	1
70100	01313	00104		99999			H	Т
		B1313	01113				H	1
01313					•		H	T
00011		00011	70100	00011	1 N N		H	1
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	00011	01313	01113		1			
01313	10101	00011	00011	01013	3			-
00011	01010	U0104	70100	00011	ε.			
U0101	10030	00011	11113	40100				-
00011	U0104	10100	10100	00011				-
10100		40104	40104	10000			L	÷
U0101	00011			40100				-
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00011			10101				Π.	-
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	20101	10100	10100	60011		н	H.	
	00000	00100	00100	10000		н	Π.	
20101	00011	11113	01113	00100		н	H.	
011110	49090	00011	00011	811113			H	L
00011	00000	00100	70100	00011			H	1
00104	20100	00011	011110	U0104			Н	L
00011		70100	20030	00011			H	1
90100	01313	00100		90000			H	Т
U0101		81313	01313				H	1
			00011		•		H	1
00011			10101	00011			H	T
	U0104		10101		ь. С		-	1
90101	01313	U0104		10100			H	۲
		01113	01313					1
	70100	00011	00011	01013	1			
00011	01313	U0104	10101	00011	κ.			

#### 10k DataPoints





It's a Great Vision! But what does reality look like?

ALC: U

### How Are Other Indu

CAN In Automation has Established an entity to create "Device Profiles" - LINK





Data Collection Software

Application Software

Low Level Device Abstraction Layer

Device Drivers & Smart Devices Software







#### Advanced Data Schema Design

We've gone as far as defining our own embedded data sets and data schemas to accelerate the utilization of data for scalable decision making around feature utilization, warranty cost improvement, and better customer experience

We recognize this only works if the data set reaches a significant market segment and economy of scale to support Tier I and Tier II needs as well.

# **ECU** Consolidation

Into a distributed central compute platform



#### TODAY

- 60-100 ECUs
- 6-8 operating systems
- Isolated operations
- Increasing cost & complexity



Sord

Combined with improved compute performance through module consolidation

Courtesy: QNX



#### TOMORROW

#### Courtesy:QNX

- 6-10 Domain/Area Mega-controllers
- Consolidated software system
- Coordinated operations
- Reduced weight, cost, & complexity

The compute capability of Domain Consolidation Opens New Opportunities for Advanced Data Collection Ford

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### What Should Those Data Structures Look Like?

How do you scale them across industry?

low do we share insights with our upply base?

How do we link them Cloud Interfaces? (美計人) ひんし

object 🕨 Signal 🕨 children 🕨 ADAS 🕨 👘

🗌 🔻 object {3}

: 8

÷ 🗉

- Attribute {3}
  - ▼ Signal {3}

 $\ensuremath{\mathsf{description}}$  : All signals that can dynamically be updated by the vehicle

- type : branch
- ▼ children {7}
- ▶ Body {3}
  ▶ Drivetrain {3}
- ▶ OBD {3}
- ► ADAS {3}
- ▶ Chassis {3}
- ▶ Vehicle {3}
- ▶ Cabin {3}
- ▼ Private {3}

description : Uncontrolled branch where non-public signals can be defined.

- type : branch
- ▼ children {0}
- (empty object)

Courtesy: GENIVI



With Proper Design, Legacy Vehicle Networks Can Handle Complex Data as well...





Courtesy: Vector Informatick GmbH



Without significantly impacting RAM and ROM Size Constraints for Limited Compute Modules.





How do we scale into lower level modules?

How do we incorporate them across OEM's?

Current Standards stop at basic Integer/float definitions

SWC	SWC ARA	Autosar Runtime enviro for adaptive appl	nment ications	SWC ARA	
API (tsync) Time	API (exec) Execution	API (com) Communication	Adaptive platfo	rm services	
Synchronization	Management	Management	Service (nm)	Service (diag)	
API (phm)	API (log)	API (per)	Network	Diagnostics	
Platform Health Management	Logging & Tracing	Persistency	Service (s2s)	Service (sm)	
API (iam)	API (rest)	API (crypto)	Signal to Service	State	
Identity Access Management	RESTful	Cryptography	Service	e (ucm)	
API (core)	POSIX PSE51 / C++ STL		Update & Configuration		
Core types	Operatin	g System	Management		



(Virtual) Machine / hardware



What Scripting tools and capabilities should we be using as an industry in an embedded environment?

- Python?
- Fnaš
- Scala?

How do we manage safety and privacy regulations with scripting?

### We aren't waiting for a full industry consensus to derive value today.

Ford

inell.



#### Predictive Features and Smart Vehicles

We leverage our Smart Vehicles for pre-production optimization of features and functionalities we are delivering for our customer base. Warren Detroit
Detroit
❀ New Layer
total\_eff 207.2172452889044

(WRSS





#### Smart Vehicles at Scale

Our mandate for 100% connectivity is unlocking new opportunities for our customers. The density of data our smart vehicles generate is staggering.

It allows us to have a new agility around insights on what products we want to provide for each region, new opportunities for efficient logistics, and a re-Imagination of the relationship between a customer and its vehicle.

# Thank You

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