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Why the Industry Needs a Common Vehicle Interface Initiative
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
“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

From Signal to Service Oriented Architectures

Thousands of signals exchanged between ECUs
Thank you!

Visit GENIVI:
http://www.genivi.org
http://projects.genivi.org

Contact us:
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Niclas Gyllenram
Director Software Development
Volvo Cars
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.
Time

Growth

Incremental Improvements

Model T

1900

Today

2000

2100

“Modern” Cars

25 GB of data is created per hour of normal driving

Autonomy

Connectivity

Electrification

Autonomous Car

1 – 4 terabytes of data per hour of driving

Source: Intel

CAMERAS

20 – 40 MB Per Second

RADAR

10 – 100 KB Per Second

SONAR

10 – 100 KB Per Second

GPS

~ 50 KB Per Second

LIDAR

10 – 70 MB Per Second

1900

2000

2100

Time

Ford

ICE
One Connected Vehicle Contains

- 40+ Modules
- 10k Trouble Codes
- 40 Warning Lights
- 10k Data Points
- 500+ Signals
- Deep Data
- ECU Internal Data

PT
ADAS
ABS
Body
HMI
IP
GW
Restraint

40+ Modules

10k Trouble Codes
40 Warning Lights

10k Data Points

500+ Signals

Deep Data

ECU Internal Data
It's a Great Vision!
But what does reality look like?
How Are Other Industries Doing It?

CAN In Automation has Established an entity to create “Device Profiles” - LINK.

**Data Collection Software**

**Application Software**

**Device Drivers & Smart Devices Software**

Tier-1 A Tier-1 B Tier-1 C Tier-1 D

Mutually Agreed Abstraction

**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

Combined with improved compute performance through module consolidation

Courtesy: QNX
The compute capability of Domain Consolidation Opens New Opportunities for Advanced Data Collection

TOMORROW

- 6-10 Domain/Area Mega-controllers
- Consolidated software system
- Coordinated operations
- Reduced weight, cost, & complexity
What Should Those Data Structures Look Like?

How do you scale them across industry?

How do we share insights with our supply base?

How do we link them to Cloud Interfaces?
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
What Scripting tools and capabilities should we be using as an industry in an embedded environment?

- Python?
- Lua?
- Scala?

How do we manage safety and privacy regulations with scripting?
We aren’t waiting for a full industry consensus to derive value today.
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.
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

John W. Schmotzer
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