Industrial Modeling

YANGsters

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Disclaimer

- YANG is a general-purpose modeling language
- There are many purpose-built models for many different industries

- This is a first attempt to describe how and where the worlds collide

- Also… There are some summaries below that were created by ChatGPT
  - The queries used to generate the material are provided at the end

What is fit for purpose for Automotive Modeling?

- Depends on needs/use-case
  - in-car network (entertainment, engine control, climate, etc.)
  - telemetry (crash detection, performance)
  - car-car communication
  - car-traffic device communication
  - car-cloud
- Depends on use-cases
- Multiple models can be used together
- Architecture of in-car network
- Architecture of between-car network
- Architecture of cloud-car network

eBusiness Standards

YANG (but models need to be written)

XML or JSON encoding of YANG

NETCONF / RESTCONF

ECLASS summary (inspired by ChatGPT)

- ECLASS (formerly know as ECL@SS)
- ECLASS is a standardized classification system for products and services, designed to facilitate the exchange of information across different information systems and business processes. It stands for "Electronic Classification of Products, Services, and Activities" and was originally developed in Germany in the late 1990s.
- ECLASS provides a hierarchical structure for organizing products and services into categories and subcategories, using a standardized set of codes and descriptors. This allows businesses to more easily and accurately exchange product and service data with each other, as well as with customers and suppliers.
- ECLASS is widely used in various industries, including automotive, chemical, and manufacturing, among others. It is also recognized as a standard by the International Organization for Standardization (ISO) and the European Committee for Standardization (CEN).
- ECLASS is not an ISO standard, but it is recognized by ISO as a reference classification system for products and services. ISO has published several standards that use ECLASS as a reference classification system, such as ISO 22745 (which specifies a methodology for the exchange of product data using XML), ISO 8000 (which specifies data quality standards for master data), and ISO 13584 (which specifies a data model for the exchange of product data). Additionally, ECLASS has been incorporated into various industry-specific standards and guidelines, such as the VDA Automotive Industry Guideline 4984 for the exchange of product data in the automotive industry.

ECLASS Example

- Here are some examples of ECLASS codes that can be used to classify different components and systems in a car network:
  - ECLASS code 29-18-01: This code is used to classify electronic control units (ECUs) used in automotive systems, such as engine control modules, transmission control modules, and anti-lock brake system modules.
  - ECLASS code 29-20-01: This code is used to classify sensors used in automotive systems, such as temperature sensors, pressure sensors, and position sensors.
  - ECLASS code 29-22-01: This code is used to classify actuators used in automotive systems, such as motors, solenoids, and valves.
  - ECLASS code 29-24-01: This code is used to classify connectors used in automotive systems, such as CAN bus connectors, Ethernet connectors, and USB connectors.
  - ECLASS code 29-26-01: This code is used to classify cables and wires used in automotive systems, such as power cables, signal cables, and coaxial cables.

COVESA (from: COVESA Wiki)

- The Connected Vehicle Systems Alliance (COVESA)
  - Focus is connected vehicle systems including in-vehicle, at-edge and in-cloud services, interfaces and data exchange.
  - Projects
    - Vehicle Signal Specification (VSS)
    - Cooperative Intersection Collision Avoidance System (CICAS)
    - Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) communication protocols.
- Vehicle Signal Specification (VSS)
  - VSS is being adopted or required in industry software platforms, such as its use in the AWS Fleetwise platform.
  - The W3C specification for vehicle data exchange protocol - Vehicle Information Service Specification (VISS) is based on data in VSS format.
  - VSS is being linked into other data projects like the Open Insurance Think Tank (OPIN) data definitions.

Use of NETCONF and YANG

- Serves a different purpose than ECLASS or other eBusiness Standards
- Many YANG models have been created to describe network topologies and network connectivity services
- Controlling and monitoring time synchronization also is being well defined in YANG models
- There are similar concepts like product and service catalogs
- Further study of how YANG models are used in Automotive/Aerospace/Internet of Things and how they are integrated into an end-to-end eBusiness solution is needed

References

- ETIM, ECLASS & Co - What, Why, How | pimcore.com
- The Connected Vehicle Systems Alliance (COVESA)
- https://chat.openai.com/chat
  - ECLASS for Car Network example
  - COVESA Vehicle Signal Specification