Towards A Common Data Model

Ken Vaughn

ISO/TC 204/WG 1 Convenor

A presentation for IEO/IEC JTC1 WG11

19 July 2019

Agenda

Launching a Common Data Model

- Background
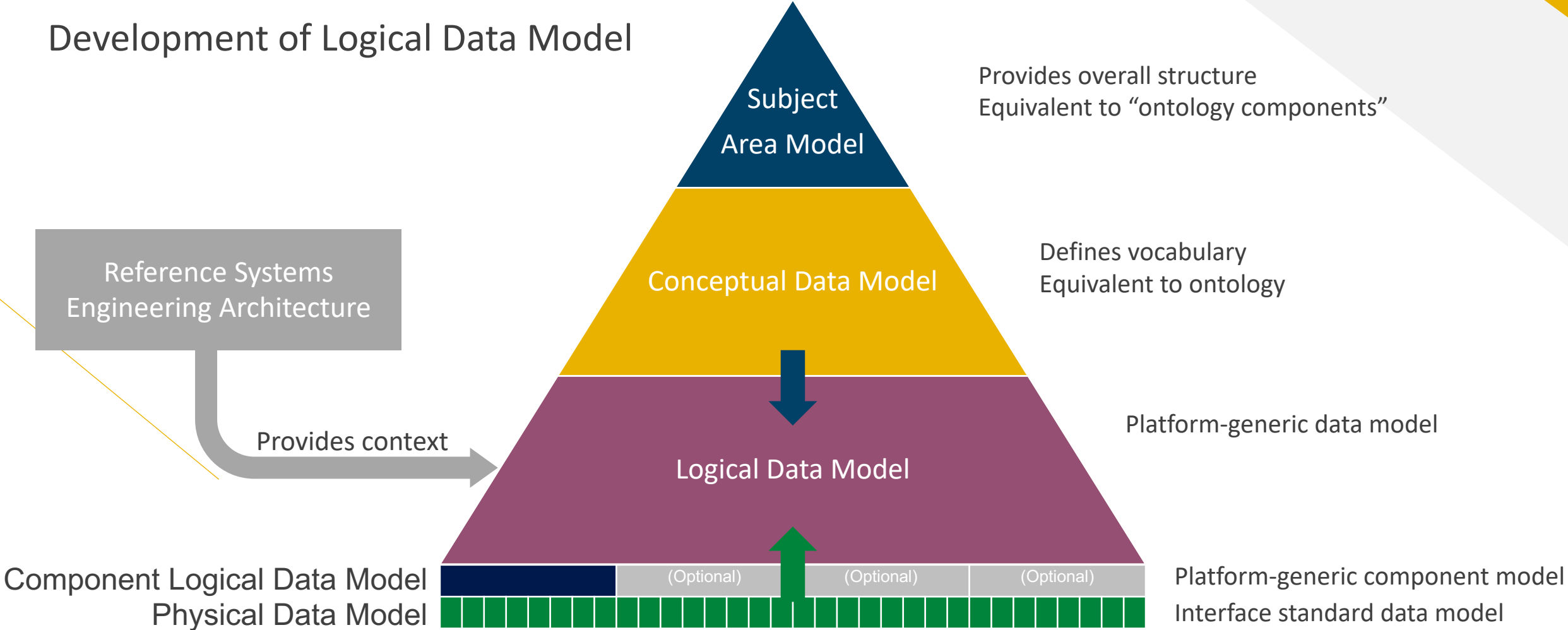- Proposed Structure
- Next Steps

Background

- Multiple interface standards developed in silos
  - Multiple ISO TC 204 WGs
  - Other Standards Development Organizations (SDOs)
  - Non-SDO efforts
  - Long-term need to integrate with Smart Cities and Internet of Things
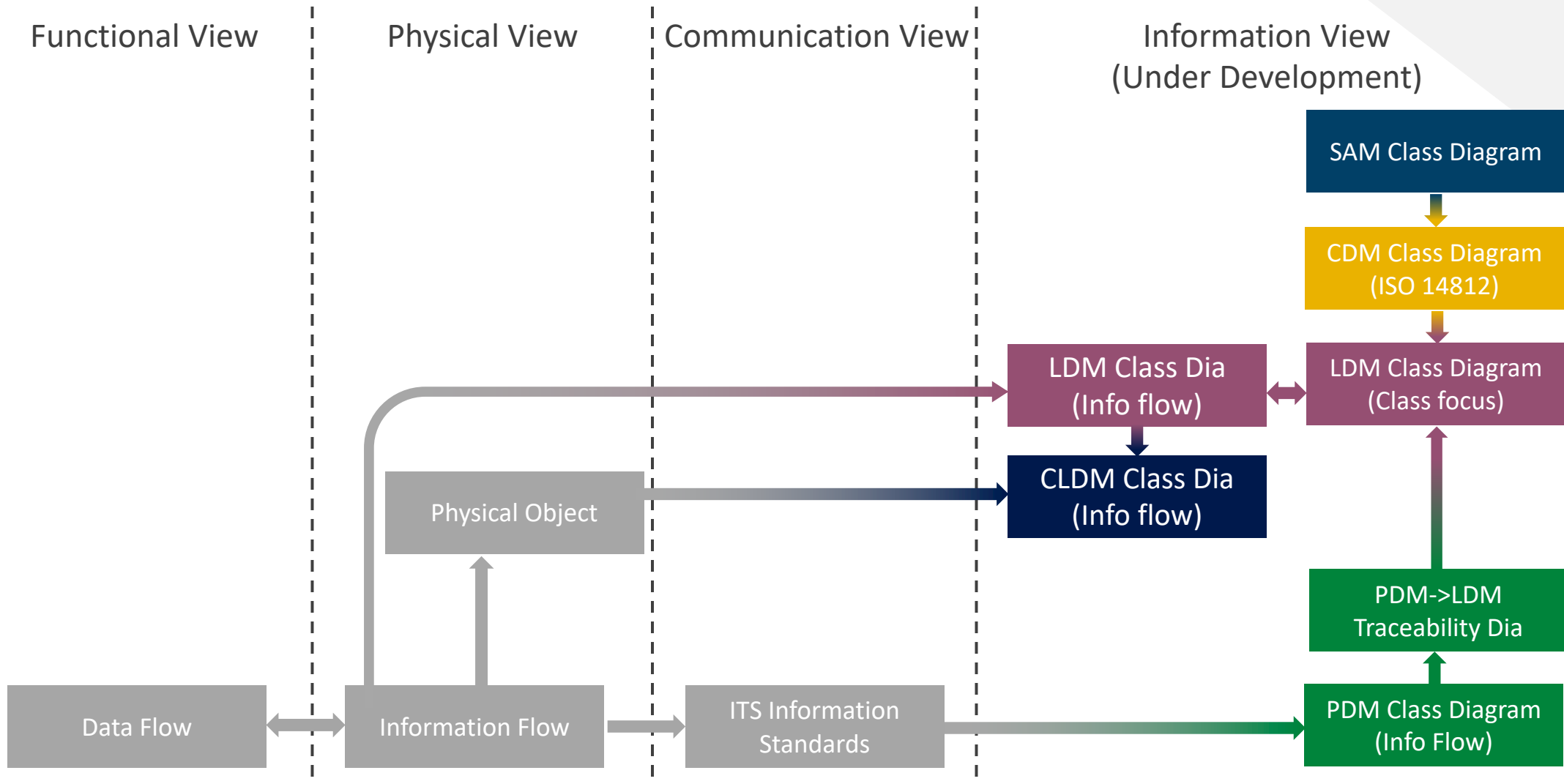- Need a common definition of core data

This presentation is about *data semantics*

Not data exchange mechanisms

Top-Down and Bottom-Up

Development of Logical Data Model

Subject Area Model — Provides overall structure. Equivalent to "ontology components"

Conceptual Data Model — Defines vocabulary. Equivalent to ontology

Logical Data Model — Platform-generic data model

Reference Systems Engineering Architecture — Provides context

Component Logical Data Model — Platform-generic component model

Physical Data Model — Interface standard data model

(Optional) (Optional) (Optional)
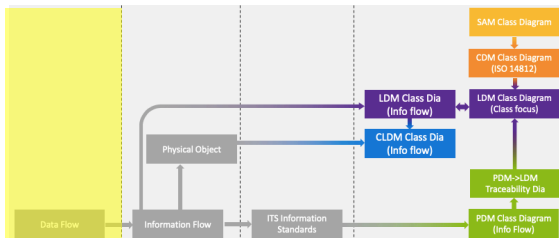
Inputs for Development

Use Case (Pre-Sys Eng Architecture)

- Example: Use case: Worker Safety
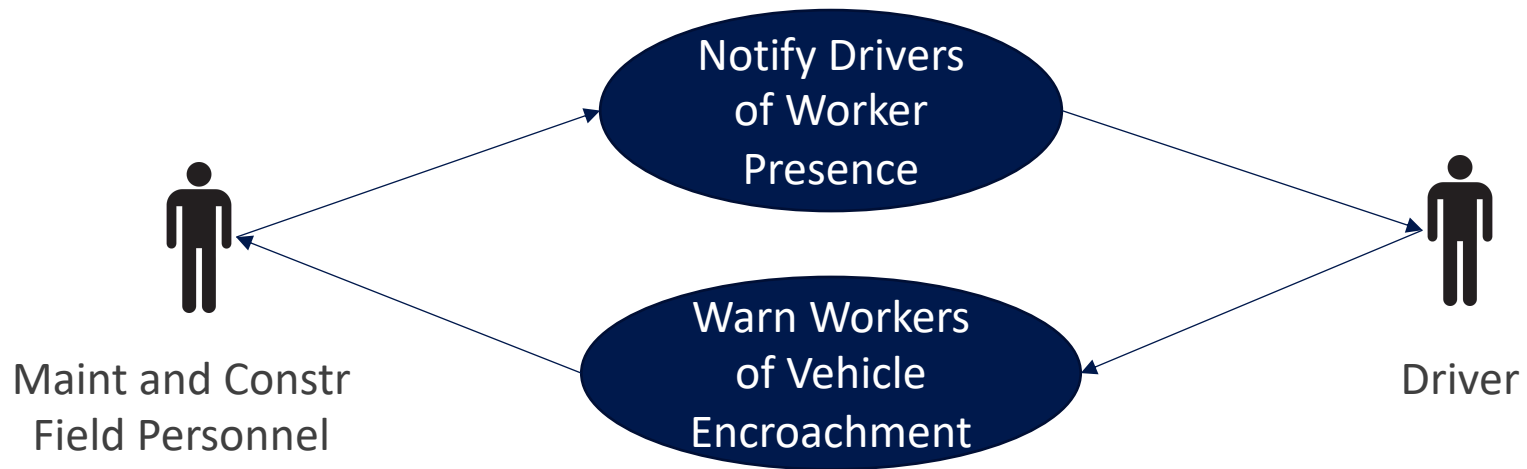
Architecture Functional View

- tv.ov-host_vehicle_location_for_other_vehicle

- It contains the location of the Host Vehicle that is being sent to the Other Vehicle.

5.12.10 Provide V2V Communications → tv.ov_host_vehicle_location_for_other_vehicle

http://htg7.org

Architecture Physical View

- Example: Physical View: Information Flow

- Vehicle location and motion
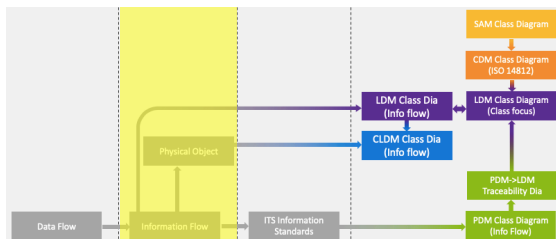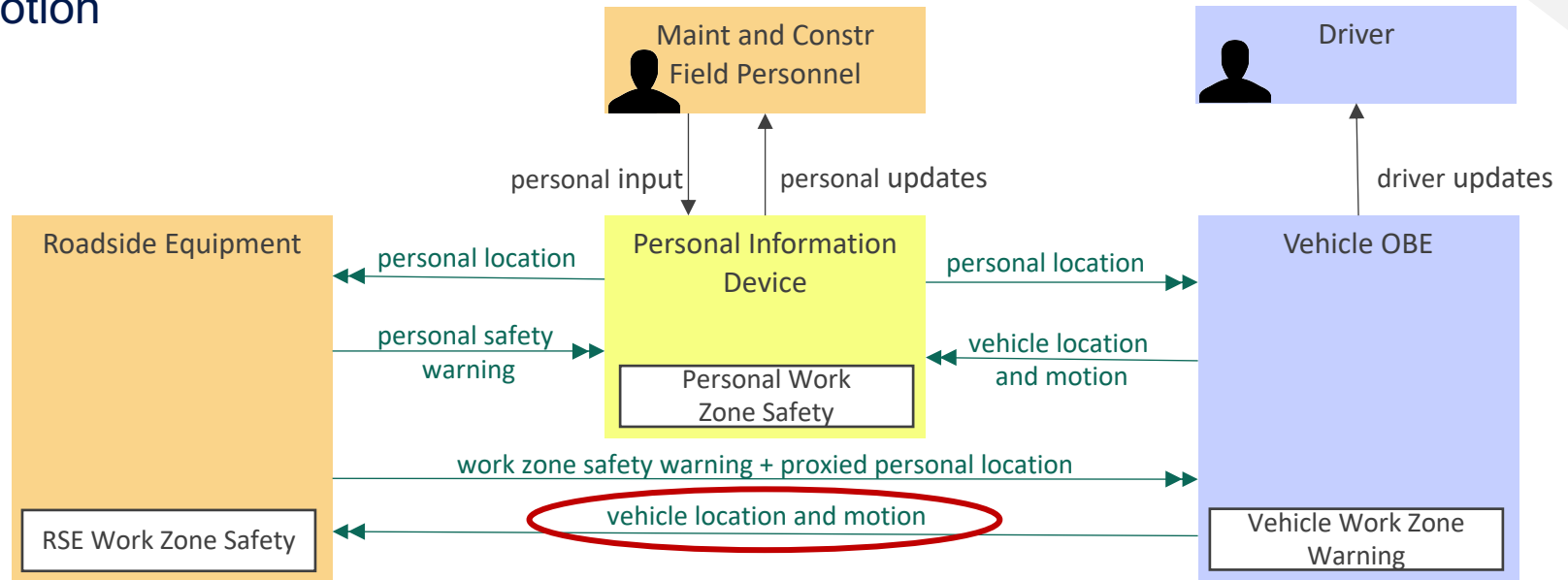
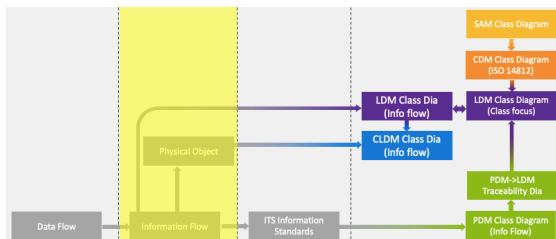# Physical View

Flow appears in multiple service packages:
- Curve speed warning
- Emergency vehicle pre-emption
- Freight signal priority
- Pedestrian in signalized crosswalk warning
- Queue warning
- Situational awareness
- Stop sign gap assist
- Transit signal priority
- V2V basic safety
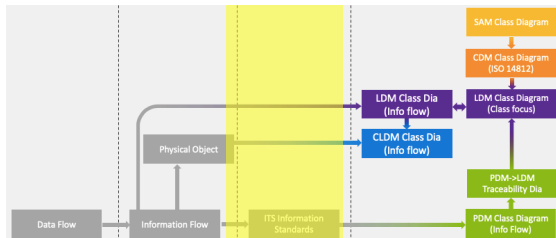- Etc.

Data is the same for every instance of the flow

http://htg7.org
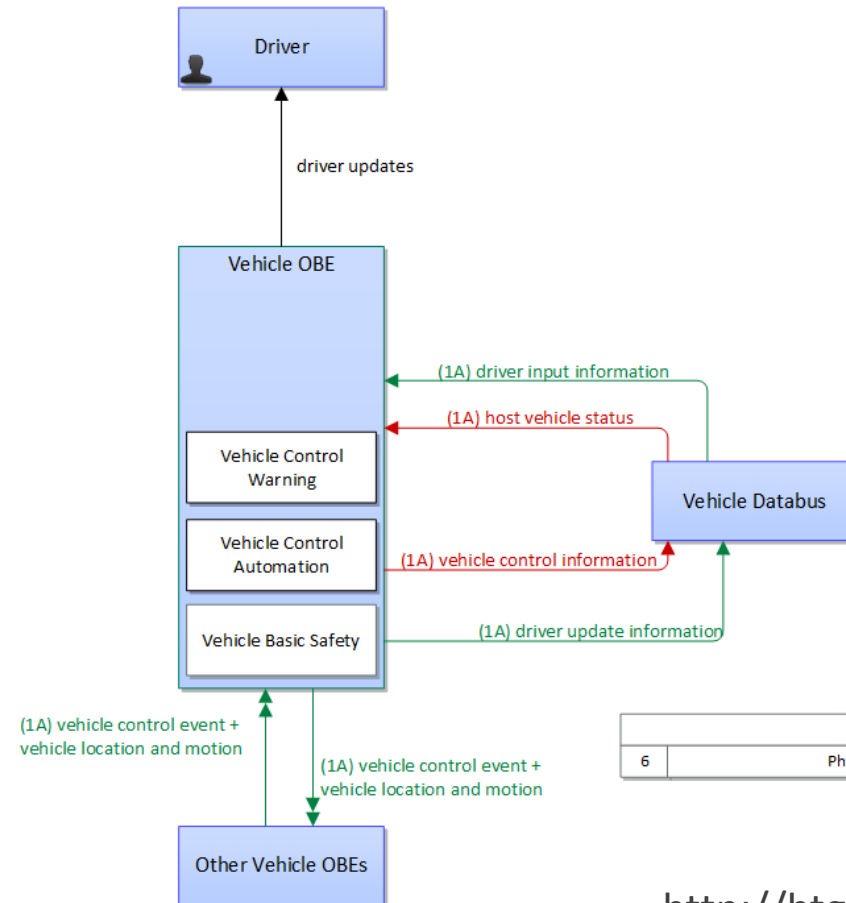
Comm View

Vehicle Location and Motion

Triple
Vehicle OBE to Other Vehicle OBEs: vehicle location and motion

Flow Description
Data describing the vehicle's location in three dimensions, heading, speed, acceleration, braking status, and size.

Solutions
US: SAE Basic Safety Messages - WAVE WSMP
EU: CA Service - FNTP/M5
EU: CA Service - BTP/GeoNetworking/G5

Solution Description
This solution is used within the E.U., and Australia. It combines standards associated with EU: CA Service with those for V-X: BTP/GeoNetworking/G5. The EU: CA Service standards include upper-layer standards required to implement V2x safety situation awareness information flows. The V-X: BTP/GeoNetworking/G5 standards include lower-layer standards that support broadcast, near constant, low latency vehicle-to-vehicle and vehicle-to-infrastructure communications using the ETSI GeoNetworking Bundle over the 5.9GHz spectrum.

ITS Info — Gap Gap — Click gap icons for more info.

ETSI 102 894-2 ⓘ
ETSI 102 638 ⓘ

Mgmt
ETSI 102 890-1 ⓘ
Bundle: G5 Congestion Control Management ⓘ

Facility
ETSI 302 637-2 ⓘ

TransNet
Bundle: GeoNetworking BTP ⓘ

SubNet
Bundle: ETSI ITS-G5 ⓘ

Security
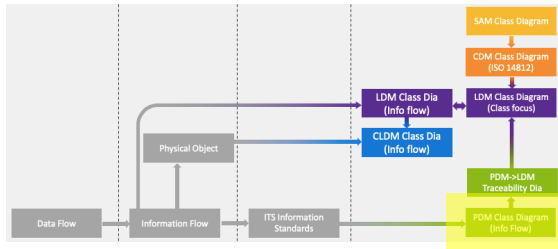Bundle: ETSI ITS-S Security Architecture ⓘ

Content of Standard

ETSI 102 894-2 defines structure to report the position of a vehicle
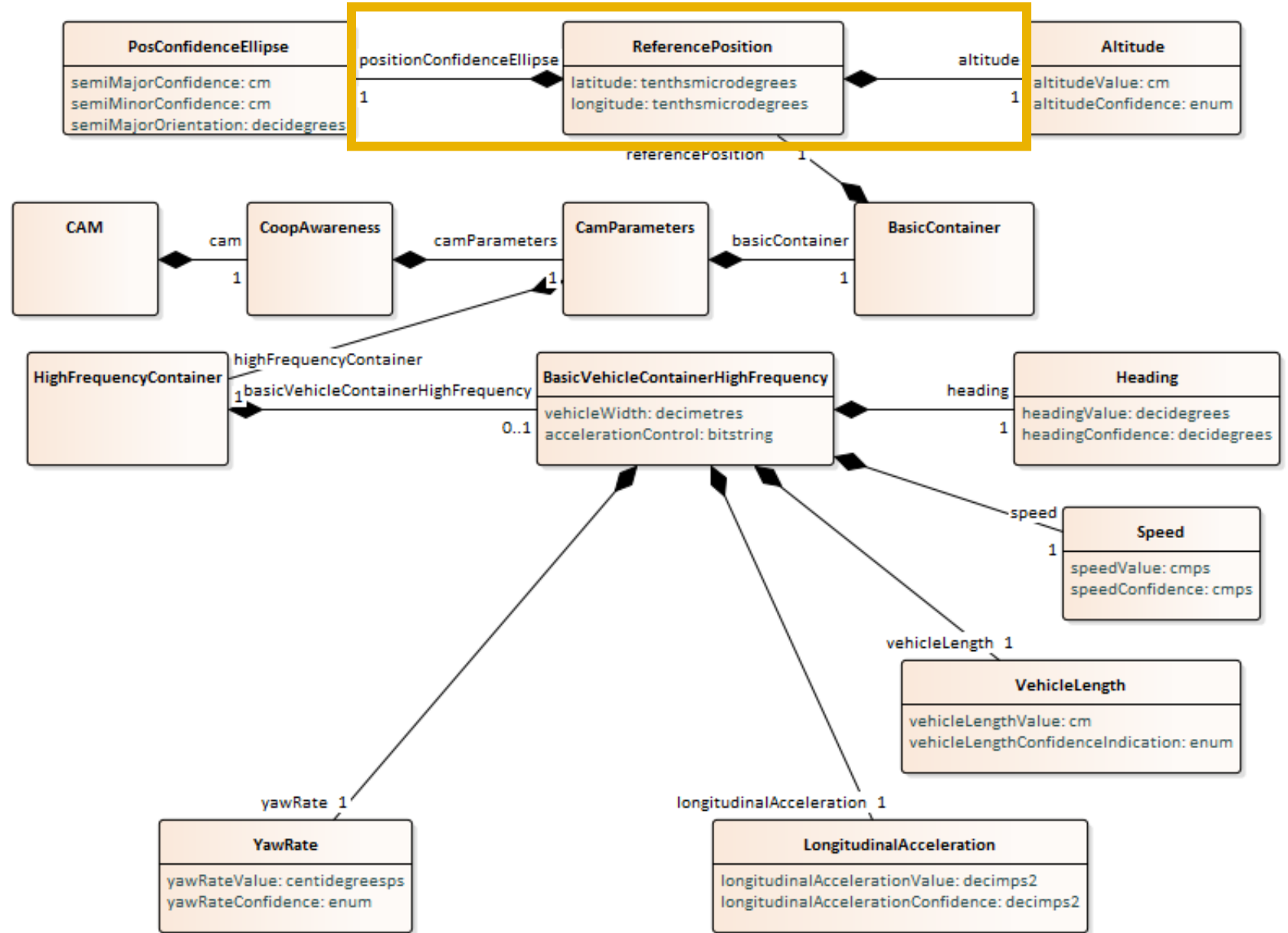
```
ReferencePosition ::= SEQUENCE {
    latitude                   Latitude,
    longitude                  Longitude,
    positionConfidenceEllipse  PosConfidenceEllipse ,
    altitude                   Altitude
}
```
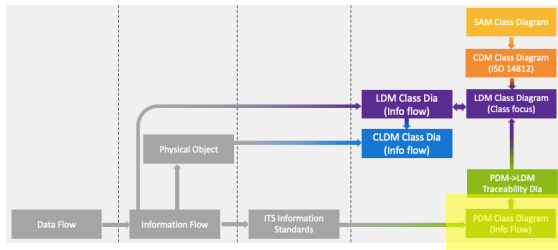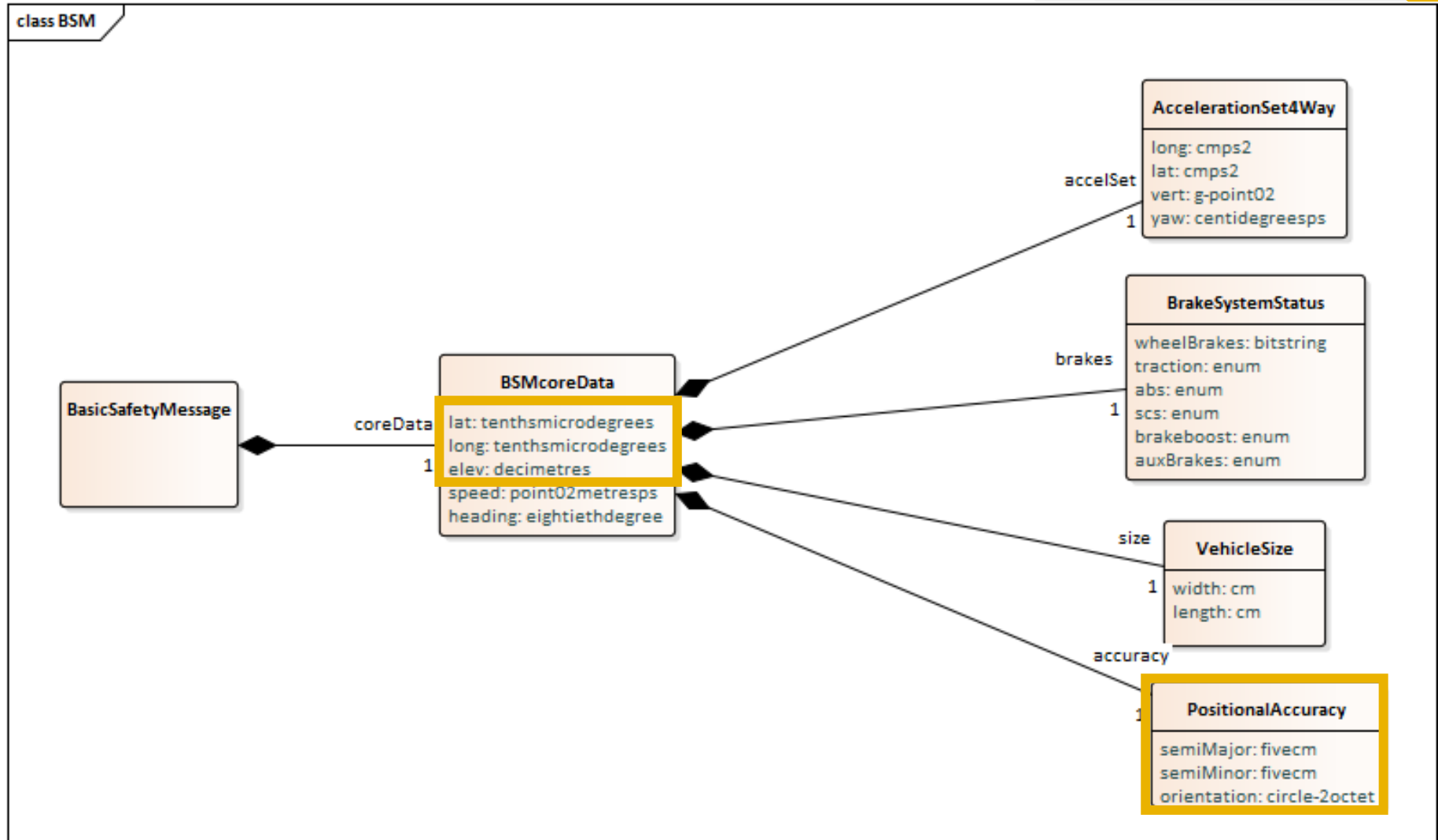
Info View

Physical Data Model: CAM

Information View

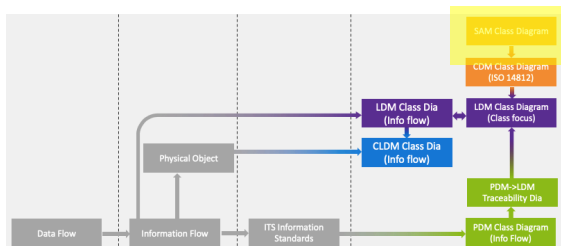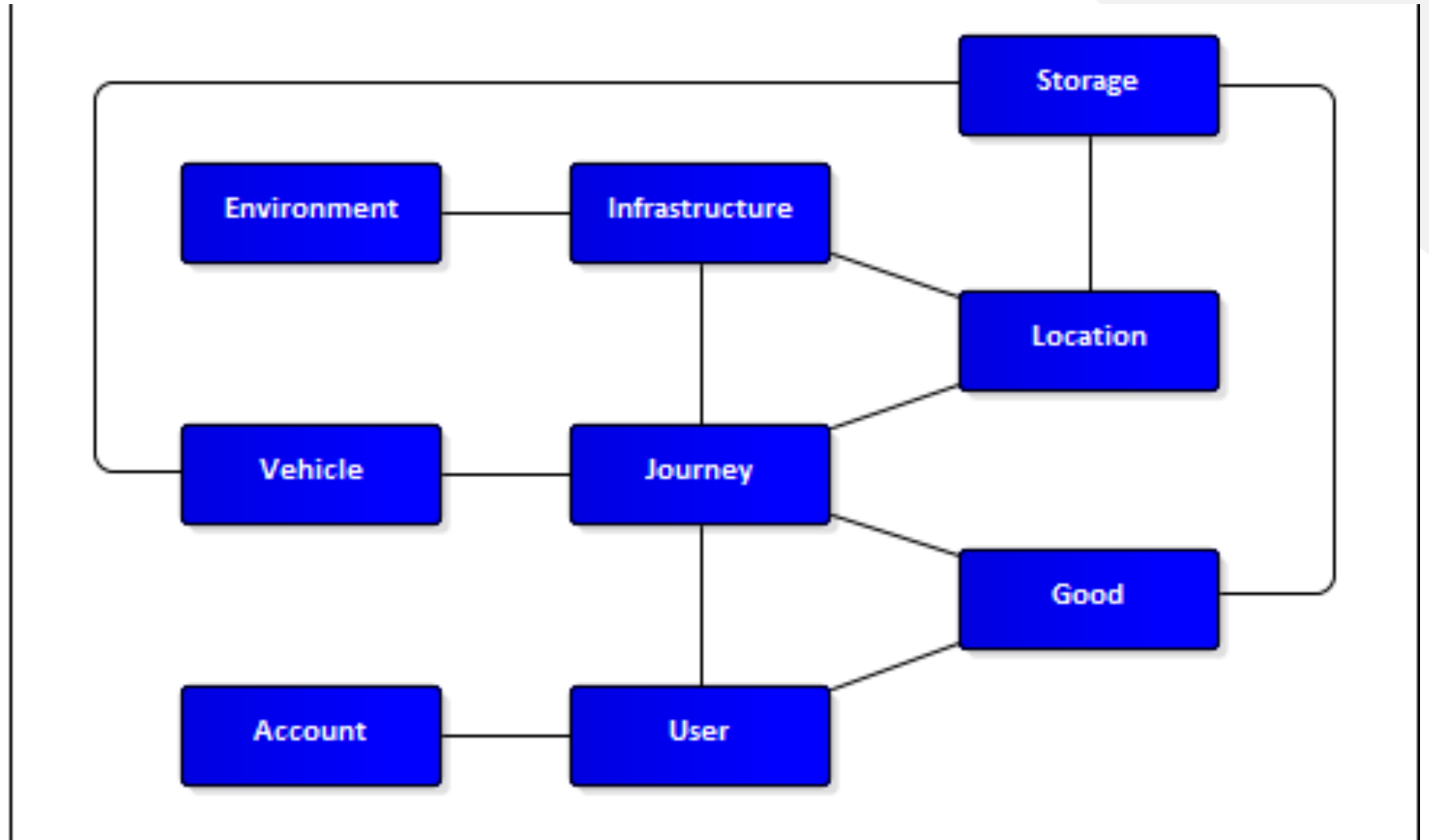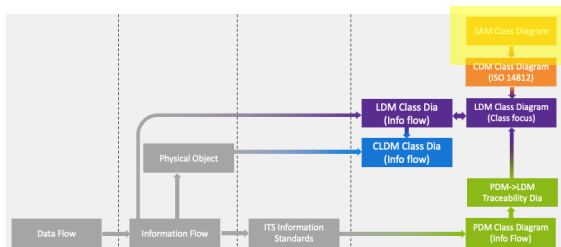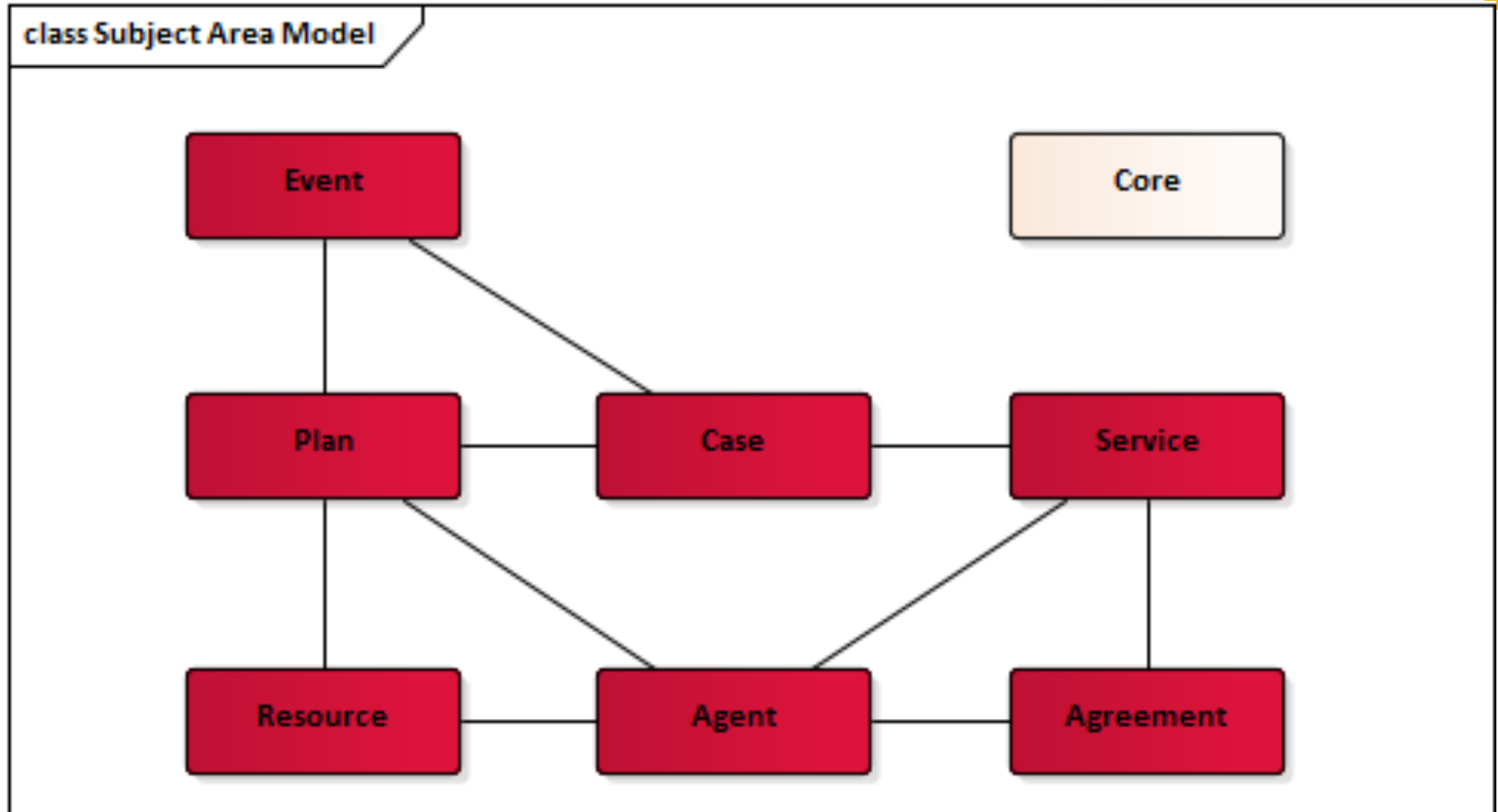Physical Data Model: BSM

Information View

Subject Area Model

Part 1: ITS Domain

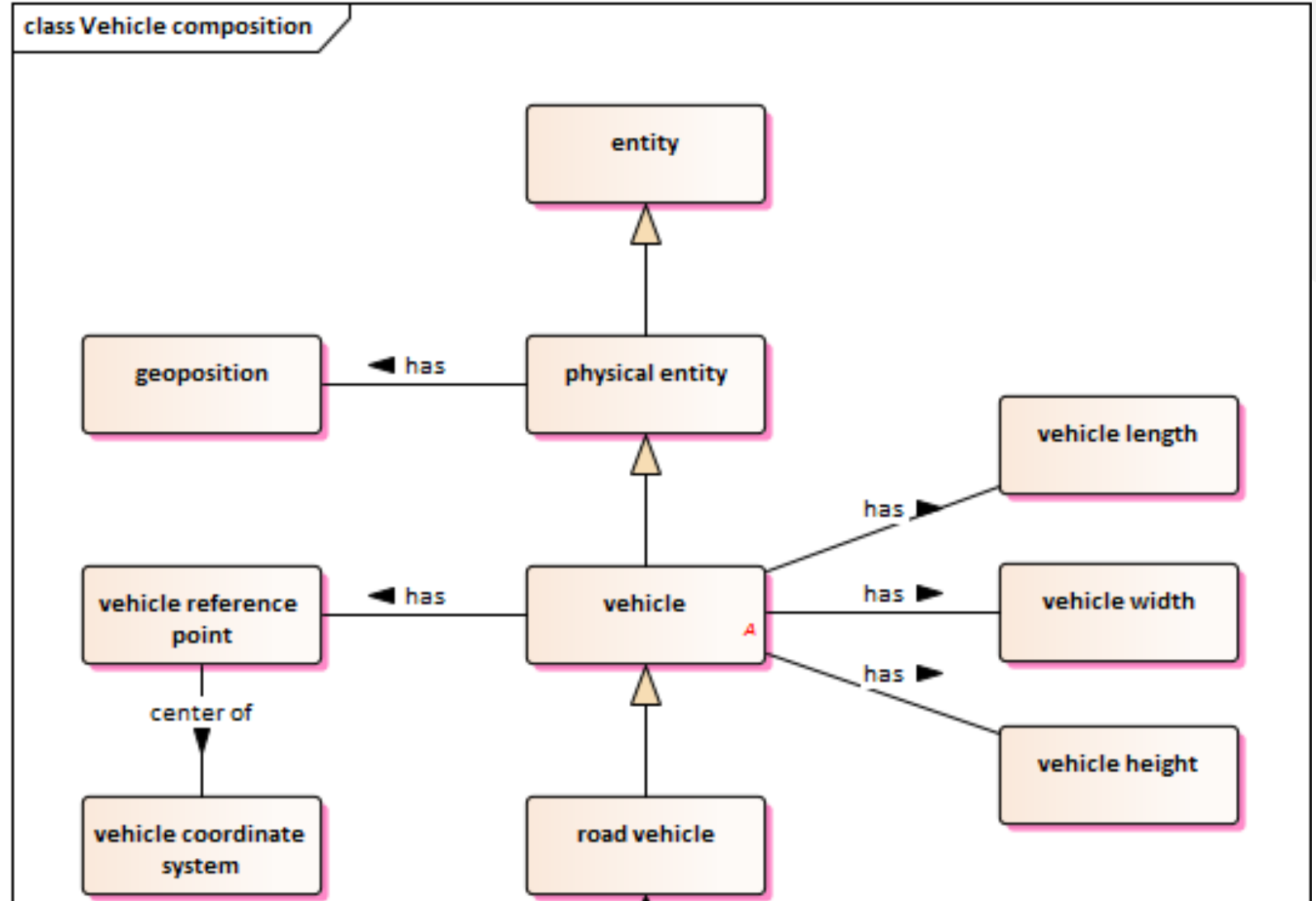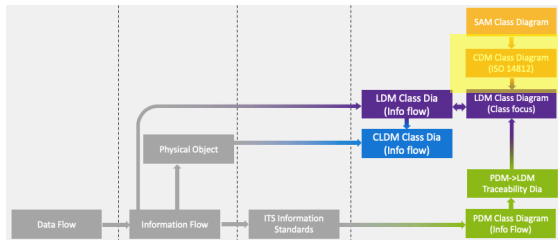# Information View

Subject Area Model

Part 2: Generic Business

Subject Area Model	ISO 30182	N539	N536	Queensland Gov't
Event	Event	Recurring Events		Event
Agent	Community, Organization, Person	Contact, Person, Organization	Household, Person, Organization, Contact	Party
User		Person	Person	
Resource	Object, Resource	Resource		
Service	Function, Method, Service	Activity	Transit, Activity	Activity
Location	Place	Spatial Location	Location	Location
Environment	Observation	Observations		Characteristic
Journey		Trip	Trip	
Plan	Plan		Land Use	Artefacts
Case	Case			
Agreement	Agreement			
Account	Account		Trip Cost, Travel Cost	
Infrastructure	Building	Transportation System, Building	Transportation Network, Building, Sensors	Assets
Vehicle		Vehicle	Vehicle	
Good		Resource		
Resource		Resource		
Storage		Parking	Parking	

Information View

Conceptual Data Model
(a.k.a., Vocabulary)

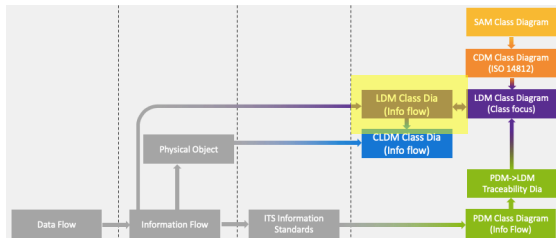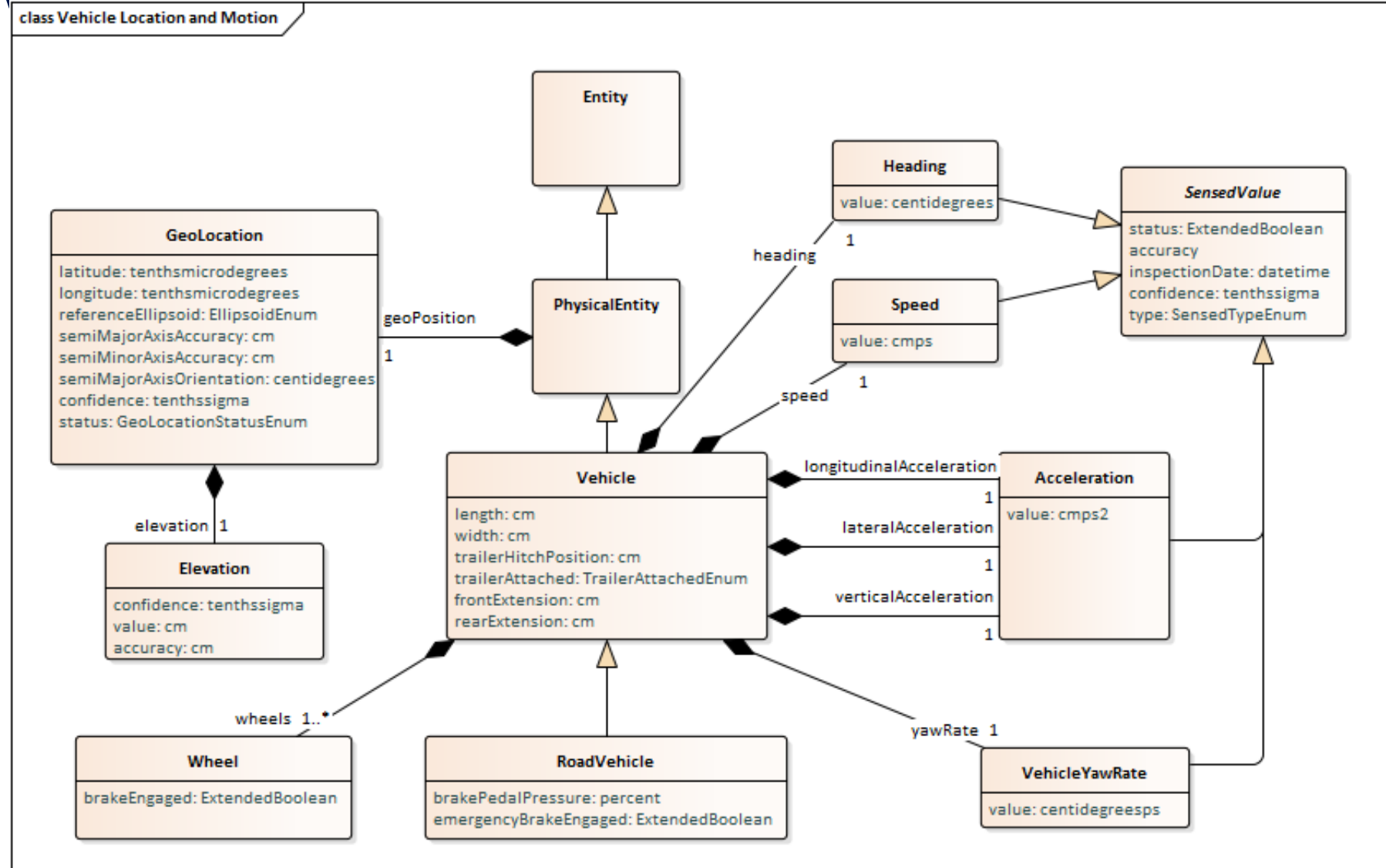https://github.com/ISO-TC204/iso14812

Information View

Logical Data Model

- Info Flow Focus for Vehicle Location and Motion
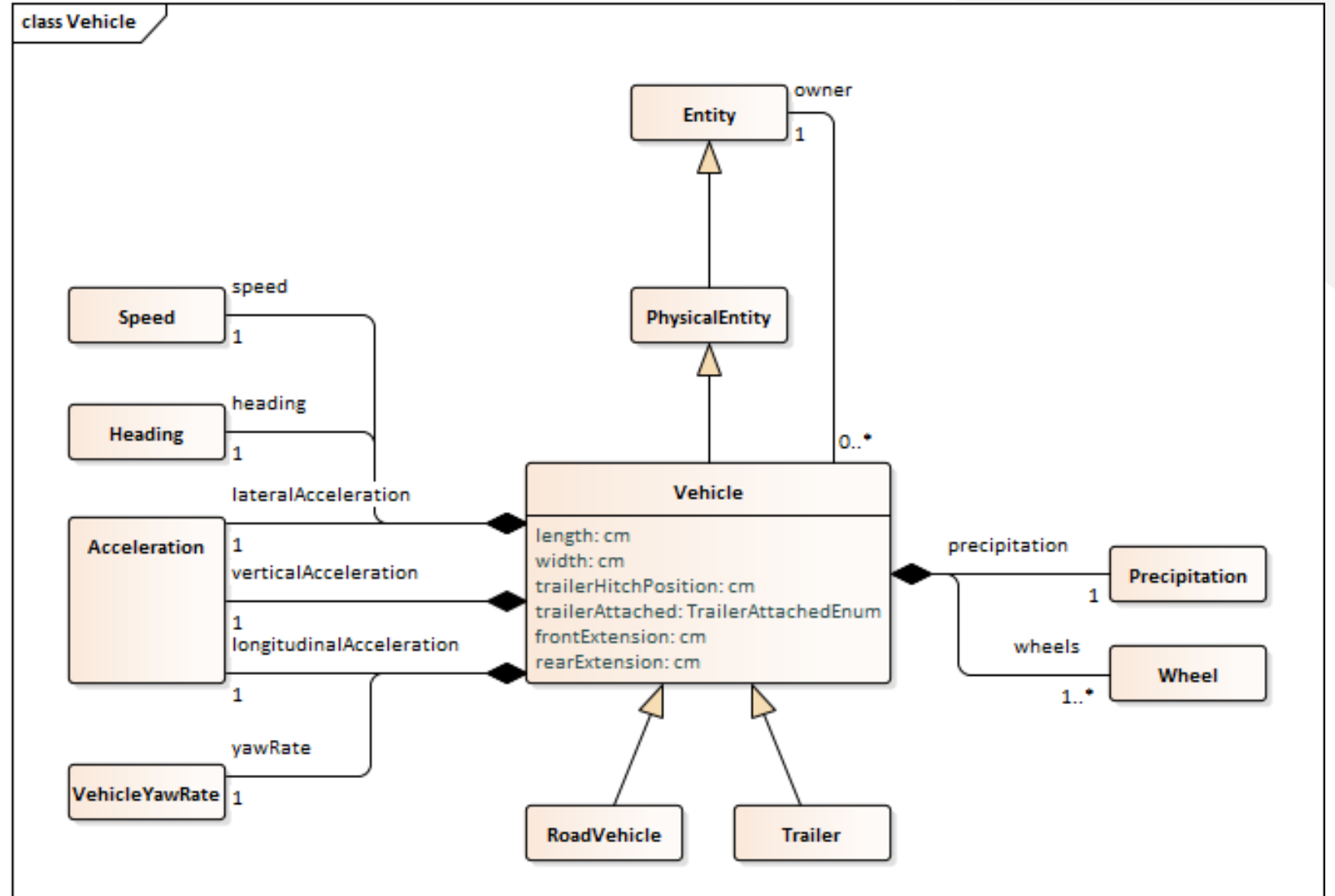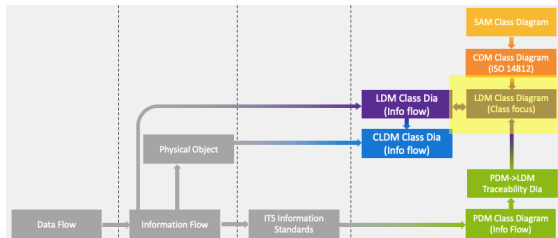
Information View

Logical Data Model: Data Element Metadata

- Class: GeoLocation

- Attribute: latitude

- Datatype: tenthsmicrodegrees

- Definition: geographic latitude of the GeoLocation with respect to the referenceEllipsoid

- Multiplicity: 1

- Confidentiality:
  - Create: Not applicable
  - Read: Sensitive
  - Update: Restricted
  - Delete: Not applicable

- Remarks: Tenths of a microdegree (i.e., 10^-7 degrees) equates to roughly 1cm of resolution.

- **WGs: Which WGs are interested in this definition**
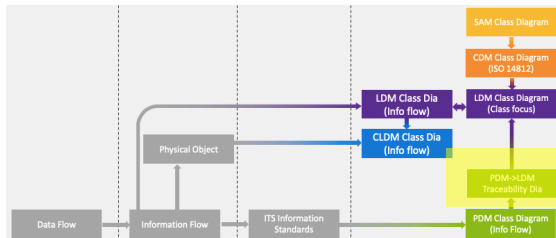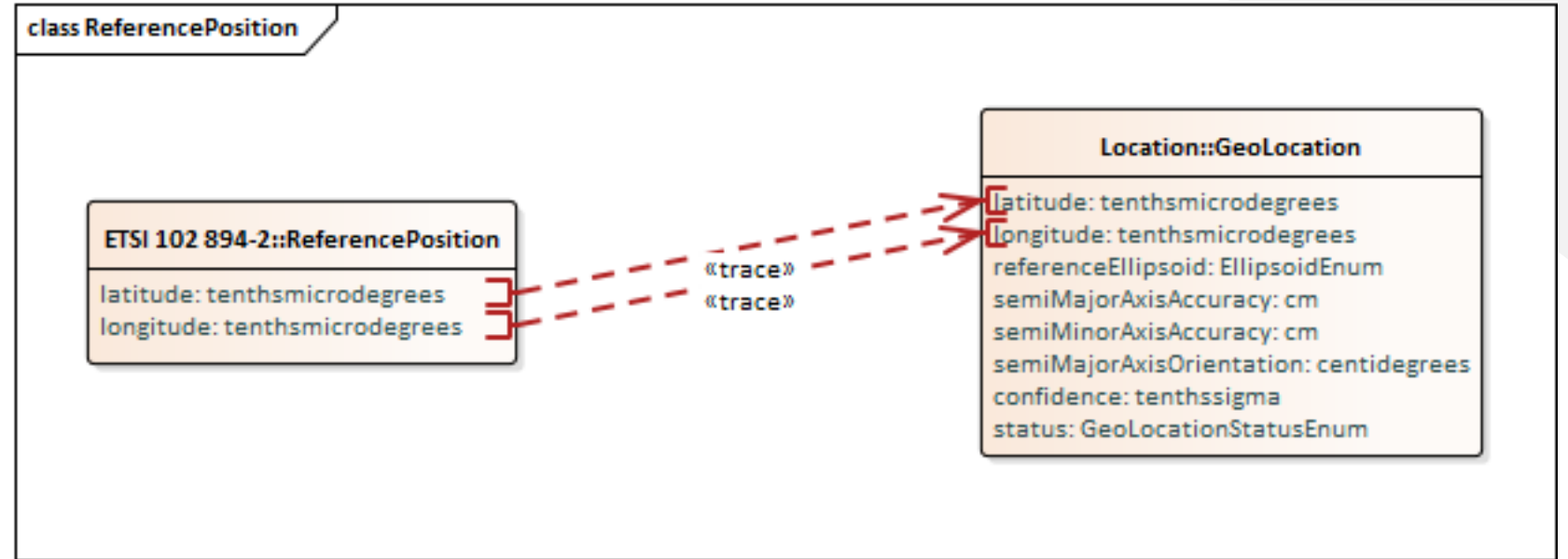
Information View

Logical Data Model

- Class Focus for Vehicle

Information View

Physical Model

- Traceability Focus

ITS Must Work with Others

- Contacts made with
  - Industrial Internet Consortium (IIC)
  - JTC 1/WG 11 *Smart Cities*
  - TC 211 *Geographic Information/Geomatics*
- *Others of interest*
  - World Wide Web Consortium (W3C)
  - JTC 1/SC 32 *Data management and interchange*
  - JTC 1/SC 41 *Internet of Things and related technologies*
  - TC 22 *Road Vehicles*
  - *IEC SEG 11 Sustainable Transport*

INDUSTRIAL INTERNET
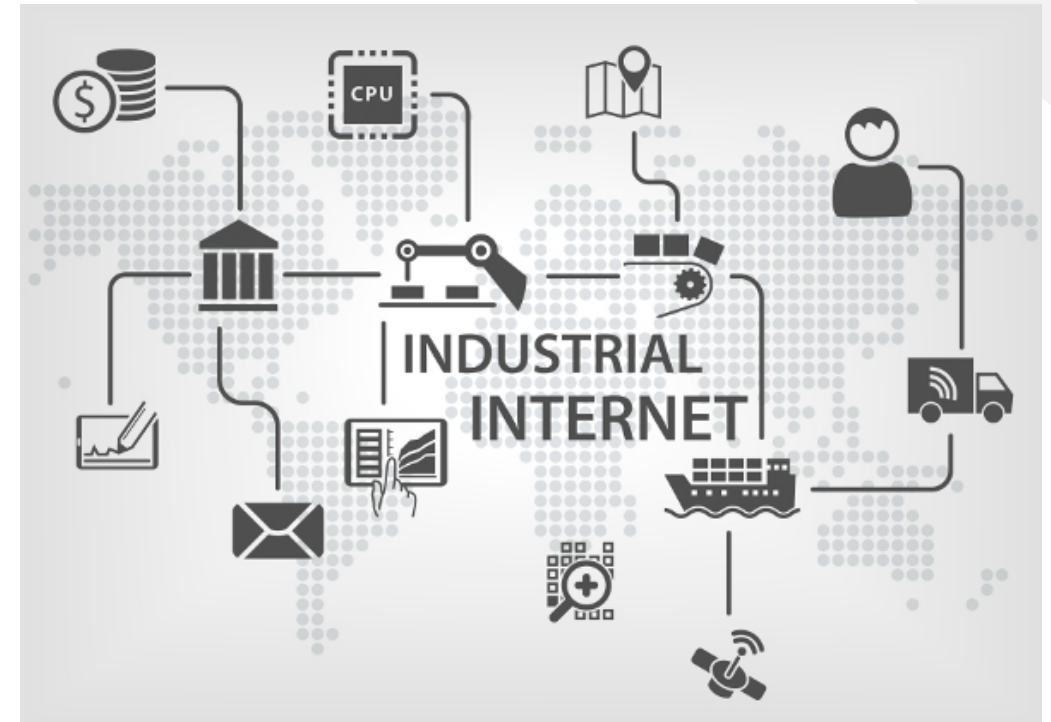
A Consistent Model

Practical Needs

- A consistent model for all relevant Standards Development Organizations and stakeholders
- A model that is coordinated with Smart Cities and beyond

Implications

- Data model needs to be readily accessible by all groups
- All groups need a sense of ownership (i.e., easy to submit comments)
- Mechanisms needed to notify parties of proposed changes relative to their content
- Standard ISO process does not satisfy these needs
- If we all follow the same rules, common toolsets can be developed
  - Data model needs to be available to all (no paywall)
  - Data usage and rules can be specific

Feedback

- Do we agree on the need to collaborate?

- Do we agree on the approach presented?

- What specific topics are worthy of collaboration?
  - The rules for modelling
  - The rules for documentation
  - Specifying common data

Thank You.

Next TC 204 Meeting: 14-18 Oct 2019, Singapore

Ken Vaughn

+1-571-331-5670

kvaughn@trevilon.com

www.trevilon.com