Delivering Data Layers the Smart Way with NDS.Live

an NDS Association webinar
March 25, 2021

Navigation Data Standard

NDS.Live webinars

<u>Watch online:</u>

1. The advantages of using NDS.Live for Intelligent Speed Assistance (ISA)

- Recording of the webinar held on February 4, 2021
→ https://nds-association.org/nds-live-isa-webinar/

2. What is NDS.Live?

- Recording of the webinar held on February 25, 2021
→ https://nds-association.org/nds-live-webinar-2-recap/

3. Reducing Data Consumption with NDS.Live

- Recording of the webinar held on February 25, 2021
→ https://nds-association.org/nds-live-webinar-3-recap/

<u>Today:</u>

4. Delivering Data Layers the Smart Way with NDS.Live

Recording on YouTube soon. Link to video will be posted on LinkedIn and the NDS Association website.

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Your hosts and speakers today

Fabian Klebert

Technical Coordinator for the NDS
Association
&
CEO at Klebert Engineering

Philip Hubertus

Senior Product Manager
Automotive Products
HERE Technologies

Agenda

- NDS & Market Needs (15 mins)
  - Platforms and Scale
  - Features relying on Map Data
  - Connectivity and Data Freshness

- NDS.Live (20 mins)
  - From basics to design principles to Smart Layers
  - Modularity and how is enables scale from basic assistance features, to navigation, to fully automated driving

- Live Q&A (20 mins) – be ready to be on camera ☺

Navigation Data Standard

NDS is THE worldwide standard for map data in automotive eco-systems

Navigation Data Standard

NDS is THE worldwide

worldwide coverage and global adoption

standard for map data

one specification with enough flexibility
for a customized user experience

data model (structure & semantics),
storage format, interfaces, protocols

in automotive eco-systems

in-vehicle applications, companion applications, cloud applications, vehicle related services,
supporting navigation, driver assistance and autonomous driving
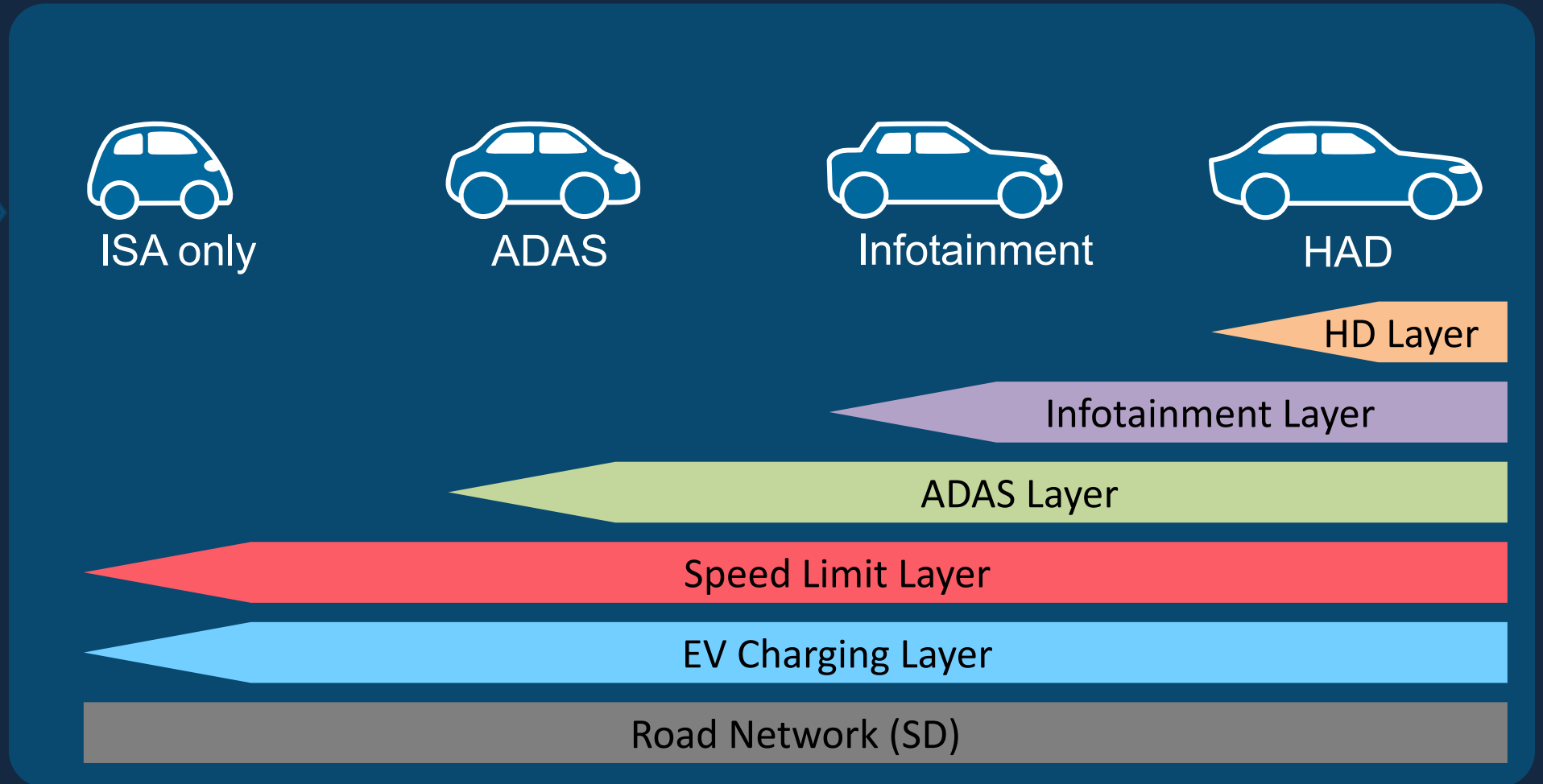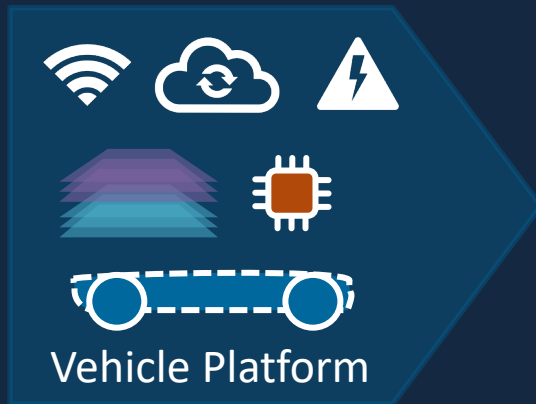
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NDS Association members

The NDS format specification is defined by the members of the NDS association.
This includes world leading OEMs, system vendors, solution providers, and navigation data providers.

NDS.Live - SmartLayer

Vehicle Platform

ISA only

ADAS

Infotainment

HAD

HD Layer

Infotainment Layer

ADAS Layer

Speed Limit Layer

EV Charging Layer

Road Network (SD)

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Data Needs: Uses Cases and Data Freshness

Freshness →

Use Cases / Shelf-life	**Static** Data that stays valid for long periods of time, with typically only small fractions changing over time. This is what classical versioned map data is about.	**Dynamic** Changing data with limited temporal validity (days/hours). Age checks must be used to determine if the dynamic information can be applied.	**Live** Transient data with momentary validity. For example, such data may be a vehicle's state/e-Horizon, a route, or a search result. Applications either use it right away or discard it.
Universal Data that is generally relevant for a broad set of use cases or as a general reference for all other data	Roads or display data	Construction sites	Traffic light phase Variable Message Signs
Collective Data is relevant to a specific group of use cases. Examples for this are ISA, ADAS, navigation as well as vehicle types (cars vs. trucks), engine types (electric vs. fuel)	POI (OEM brand specific)	EV charging station avail.	Dynamic speed limits, Parking spot availability (automated valet parking)
Individual For specific use cases, data could be generated/bundled based on individual requests.	Indoor parking map	POI (sport event)	MPP, routing, search

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EV Charging Example

NDS.Live - Basics
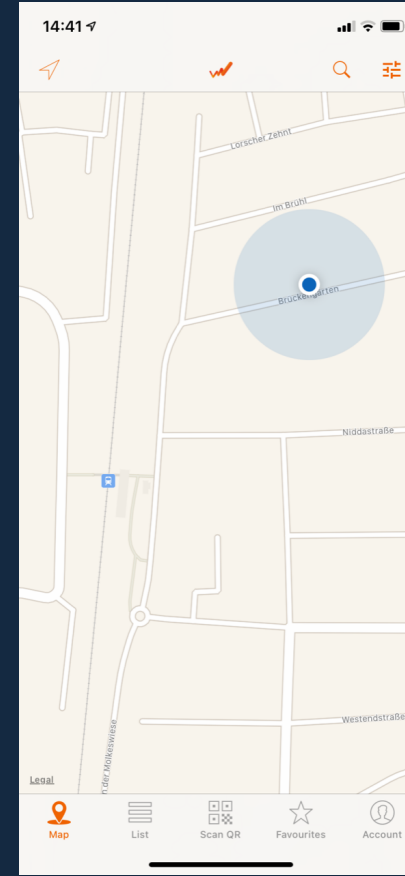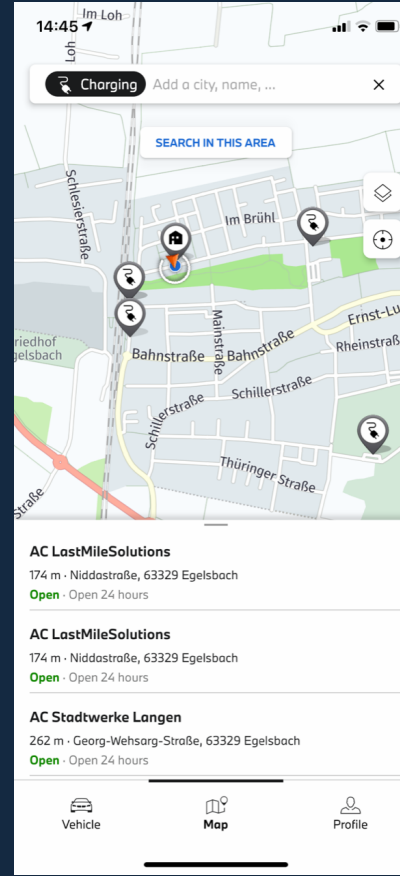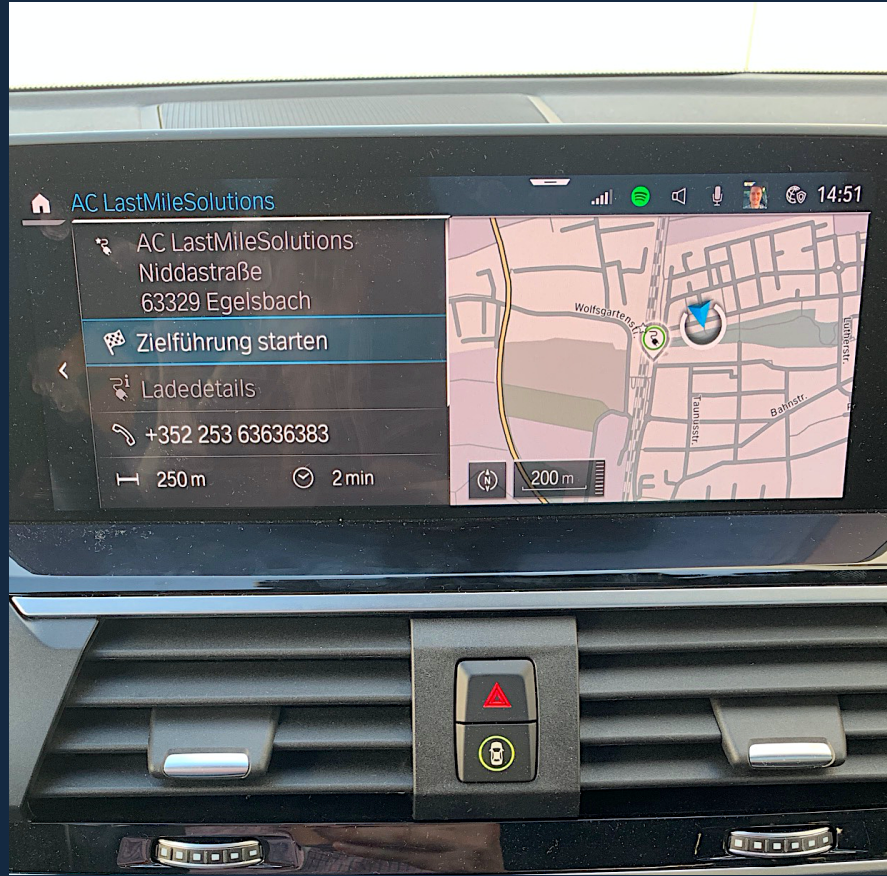
„NDS.Live is not a database,
it is a distributed map data system"

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NDS.Live is ready now!

NDS.Live Joint Development Team is working on first SD & HD map ADAS services and clients!

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NDS.Live - Design Considerations & Data Consumption

NDS.Live Design Considerations

- **Multiple Data Vendors and Sources**
Where is data stored (cloud, edge, vehicle) and who offers it?

- **Streaming and Dynamic Data**
As an addition to embedded map data, support continuous updates in high frequency (incl. real-time)

- **Embedded & Distributed Applications**
Provide a unified way to access online services that offers basic functionality, like search or routing

- **Modular Design**
Parts of the standard can be developed and used independently

- **Prepared for ADAS & Autonomous Driving**
Provide highly detailed data and keep functional safety in mind

NDS.Live Data Consumption

- **NDS.Live data is either organized as …**
  - tiles
  - paths
  - objects

- **NDS.Live data services allow for**
  - downloading and storing of data
  - streaming and caching of data
  - requesting tiles, paths, or objects for immediate use

- **NDS.Live data services can be accessed by**
  - OEM or system vendor cloud-based clients (B2B) as a proxy for distribution to vehicles
  - Directly by connected vehicle clients (B2C)
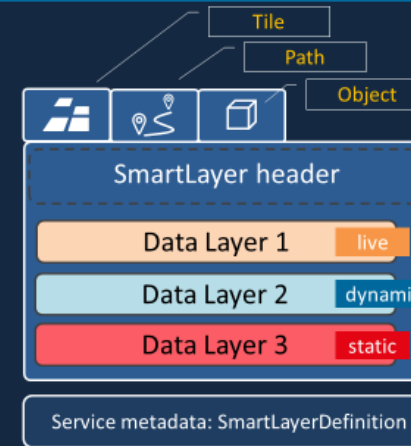
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Recap from previous webinars

Data layers
... can be freely configured
... come as tiles, paths, objects

SmartLayers get served over
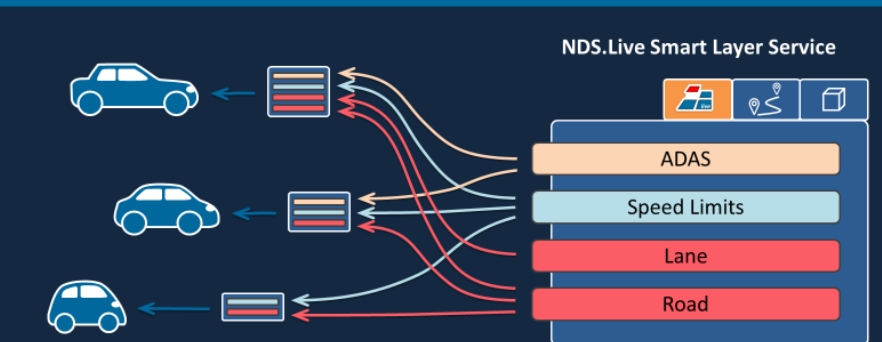web or in car

NDS.Live Smart Layer – Summary

Tile
Path
Object

SmartLayer header

Data Layer 1 — live
Data Layer 2 — dynamic
Data Layer 3 — static

Service metadata: SmartLayerDefinition

SmartLayer container
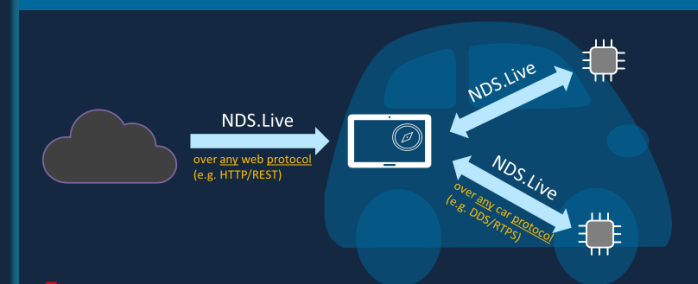... all have the same layout
... differ only in geospatial coverage
... contain layers from different specification modules
... serve all data lifetimes

One configuration per service

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NDS.Live – Not tied to any transport protocol

NDS.Live
NDS.Live
over any web protocol (e.g. HTTP/REST)
NDS.Live
over any car protocol (e.g. DDS/RTPS)

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NDS.Live SmartLayer – Configuration flexibility

NDS.Live Smart Layer Service

ADAS
Speed Limits
Lane
Road

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What data layers are available already?

Road topology

Road geometry

Lane topology

Lane geometry

Road surface geometry

Road ADAS

Road rules

Road characteristics

Road localization

Lane ADAS

Lane rules

Lane characteristics

Lane localization
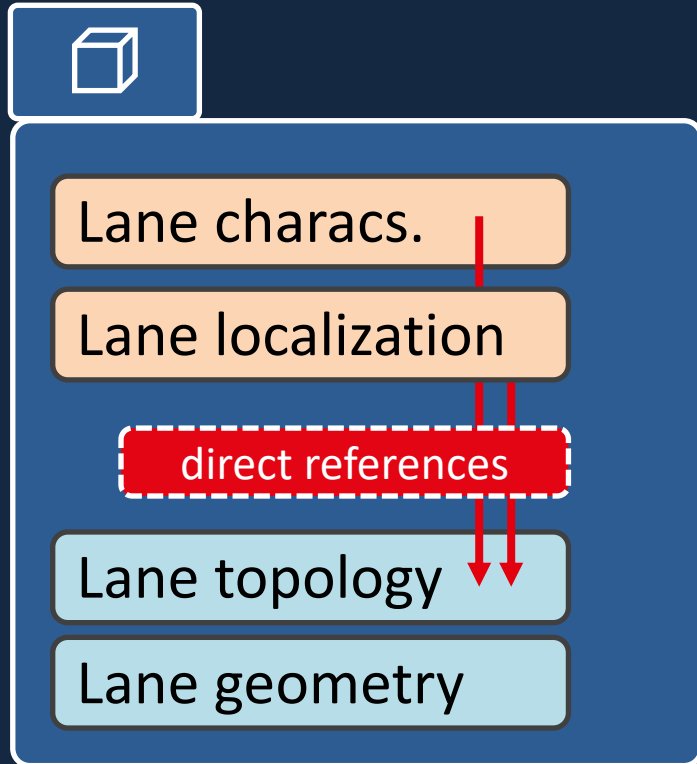
POI

Region rules

Display

Routing Data

<more...>

official releases

alpha/beta releases

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Smart Layering 101

Smart layer consists of arbitrary amount of

… Feature layers

… Geometry layers

… Attribute layers

and uses either direct or indirect references

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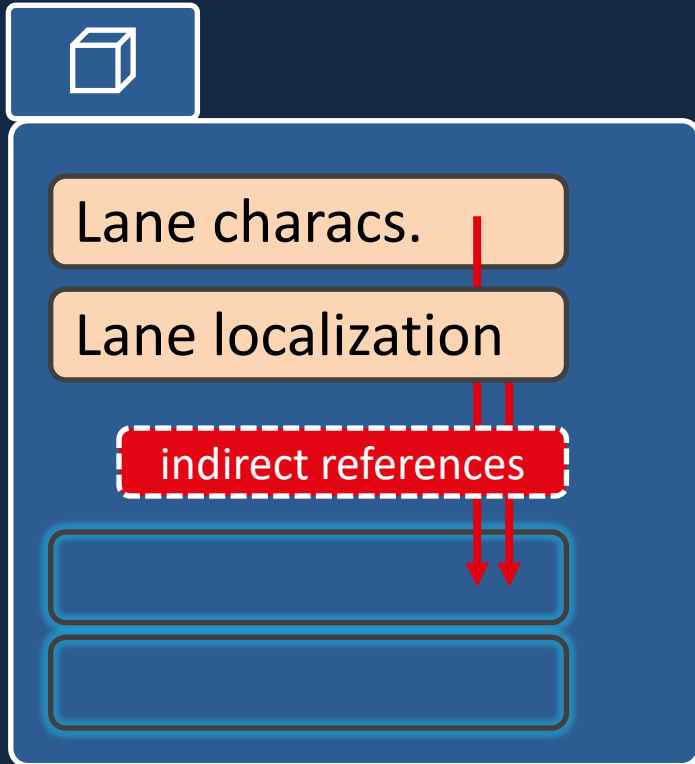
Smart Layering 101

Smart layer consists of arbitrary amount of
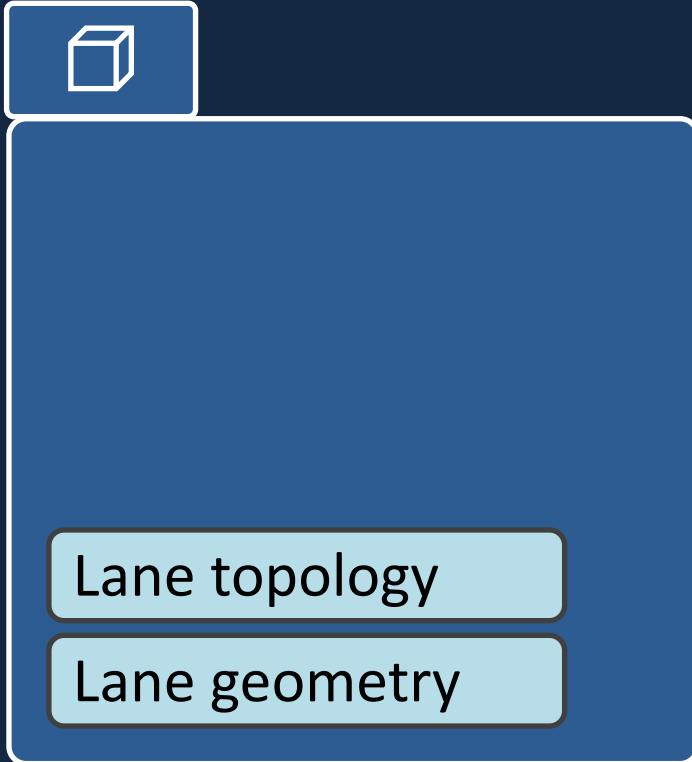
... **Feature** layers

... **Geometry** layers

... **Attribute** layers

and uses either **direct** or **indirect** references

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Smart Layering 101

Smart layer consists of arbitrary amount of

... Feature layers

... Geometry layers

... Attribute layers

and uses either direct or indirect references

Lane topology

Lane geometry

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Smart Layering 101 – using multiple layers of same type

Fine granular layering

Road rules — speed limits

Road rules — warning signs & traffic lights

Road rules — restrictions

Road topology

Road geometry

Simple layering

Road rules — speed limits
warning signs & traffic lights
restrictions

Road topology

Road geometry

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Smart Layering 101 – using multiple layers of same type

Fine granular layering

- Road rules → speed limits
- Road rules → warning signs & traffic lights
- Road rules → restrictions
- Road topology
- Road geometry

Simple layering

- Road rules → speed limits
  warning signs & traffic lights
  restrictions
- Road topology
- Road geometry

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Smart Layering 101 – using multiple layers of same type

Road rules   speed limits

Configuration A

Road rules   speed limits

Road rules   warning signs & traffic lights

Road rules   restrictions

Road topology

Road geometry

Configuration B
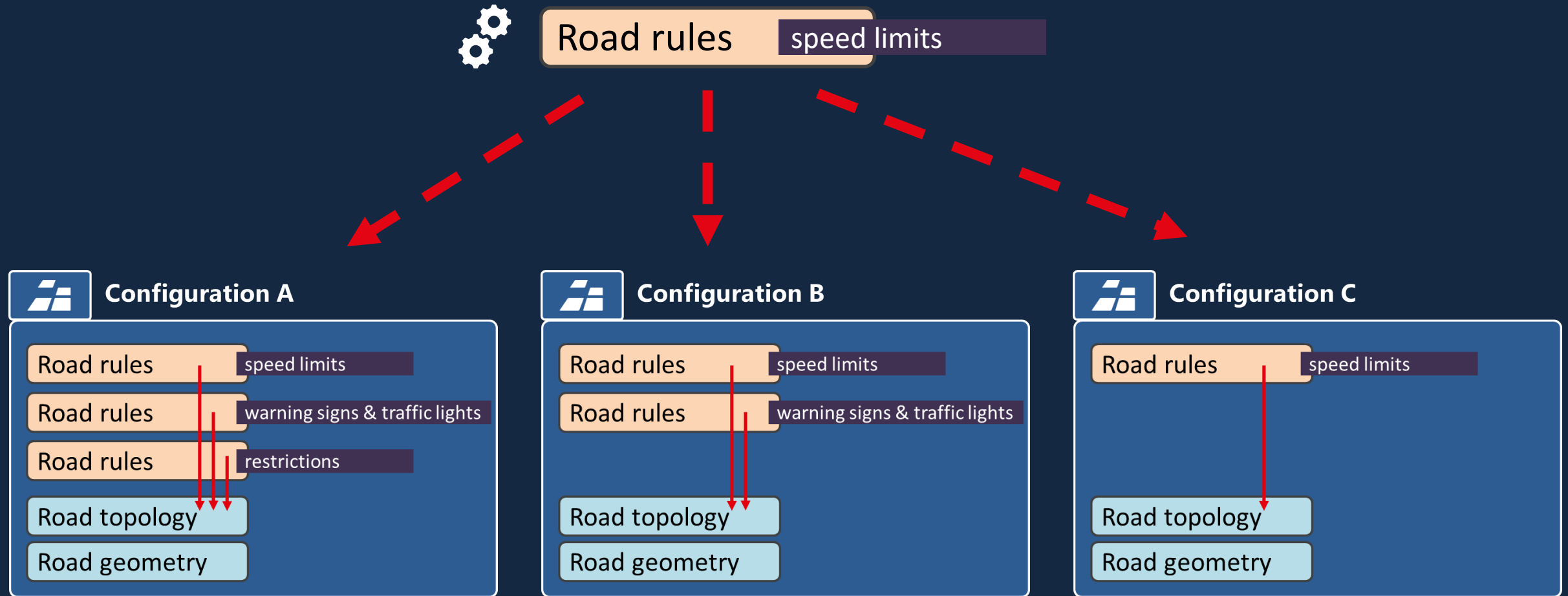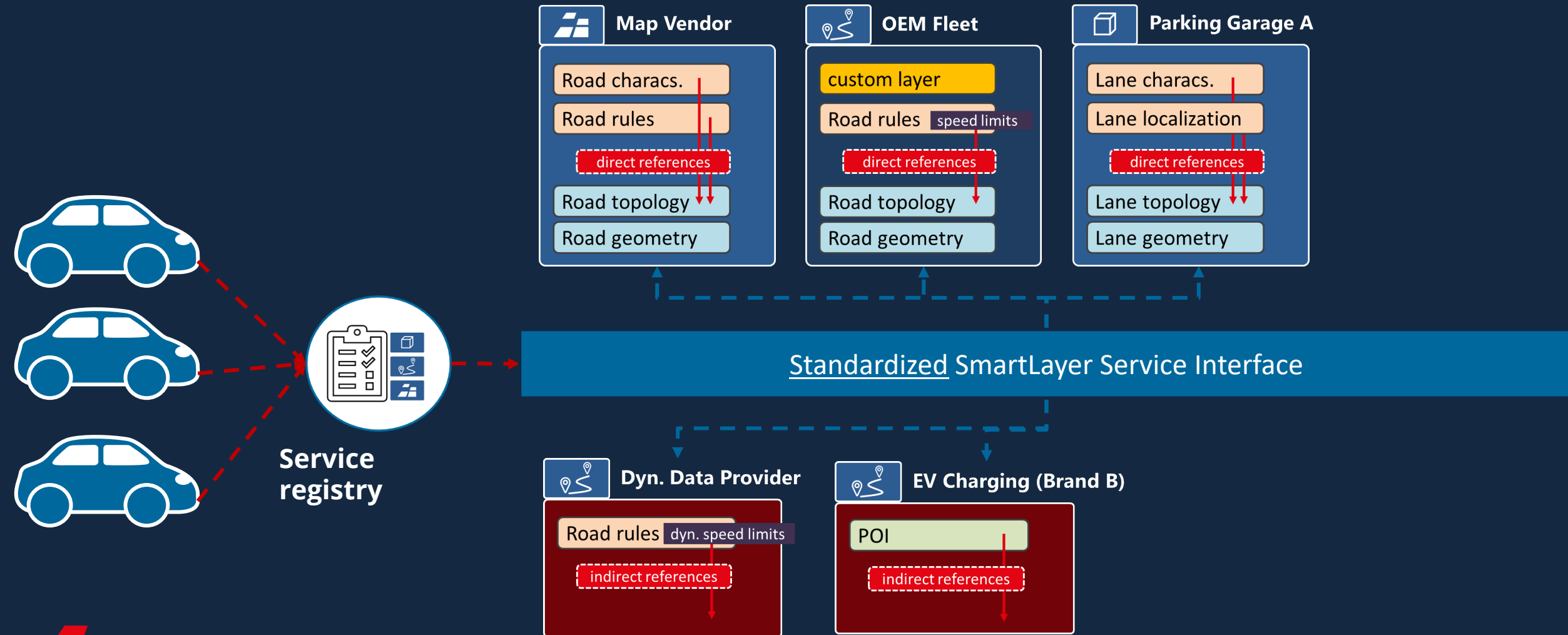
Road rules   speed limits

Road rules   warning signs & traffic lights

Road topology

Road geometry

Configuration C

Road rules   speed limits

Road topology

Road geometry

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Example: Multiple data vendors

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Example: Add more data vendors during product lifecycle

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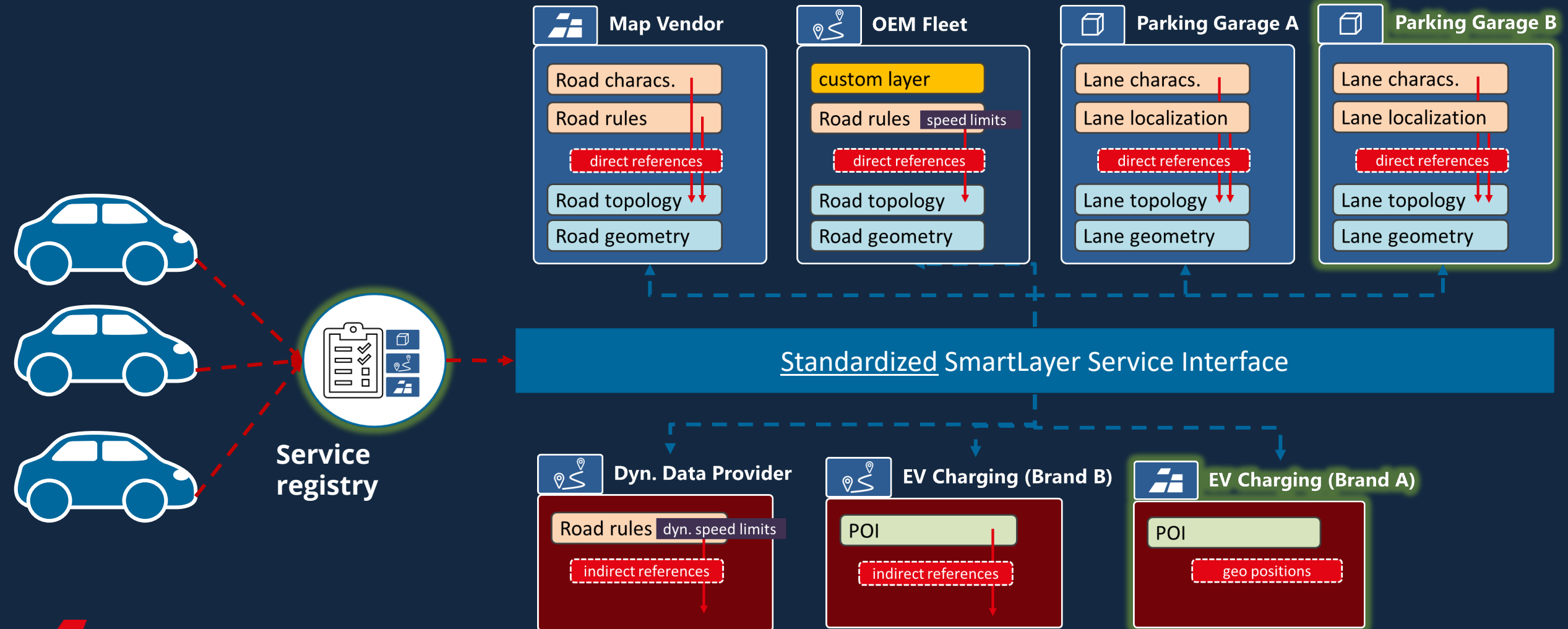
Example: adding application services

EV Range Projection
Application Service

Map Vendor
- Road characs.
- Road rules
- direct references
- Road topology
- Road geometry

OEM Fleet
- custom layer
- Road rules | speed limits
- direct references
- Road topology
- Road geometry

Parking Garage A
- Lane characs.
- Lane localization
- direct references
- Lane topology
- Lane geometry

Parking Garage B
- Lane characs.
- Lane localization
- direct references
- Lane topology
- Lane geometry

SmartLayer Service Interface

Horizon Assist
Application Service

Routing
Application Service

Dyn. Data Provider
- Road rules | dyn. speed limits
- indirect references

EV Charging (Brand B)
- POI
- indirect references

EV Charging (Brand A)
- POI
- geo positions

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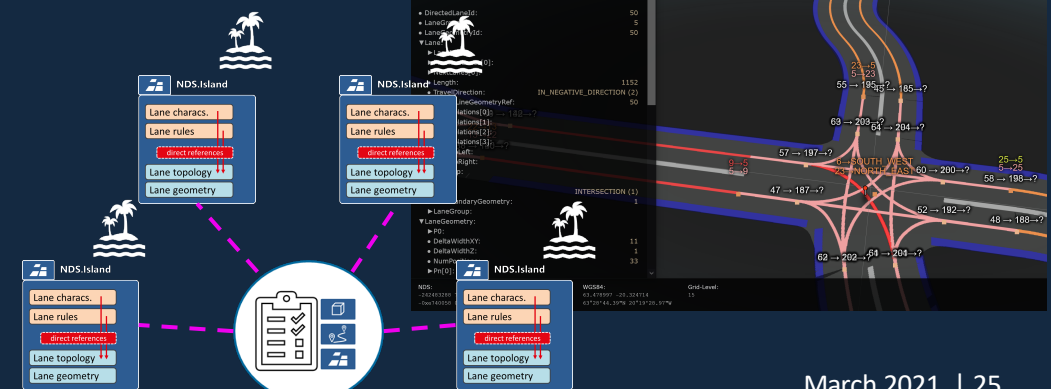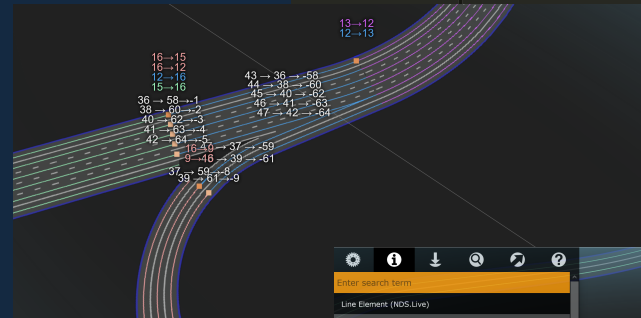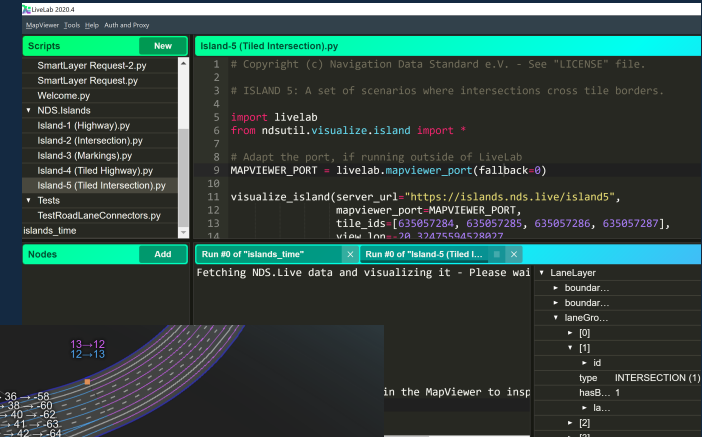# NDS.Islands – sample maps to demo SmartLayer concept

5 islands running as 5 SmartLayer services

… having different module versions

…. managed by a registry service

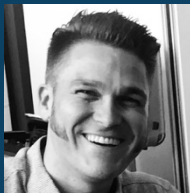Playground and reference for NDS.Live developers to master SmartLayer interfaces

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Q&A Panel

Ottó Nyírő
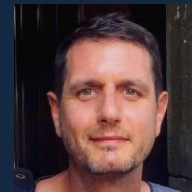Product Manager
NNG

Fabian Klebert
Technical Coordinator
NDS Association

Nico Glorius
Product Manager
NavInfo (Europe) B.V.
Vice Chairman NDS Association

Philip Hubertus
Senior Product Manager, Automotive
HERE Technologies

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Request an evaluation license for the NDS.Live spec from:

Markus Junker

NDS Association Administration
markus.junker@nds-association.org

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Contact the NDS Association

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