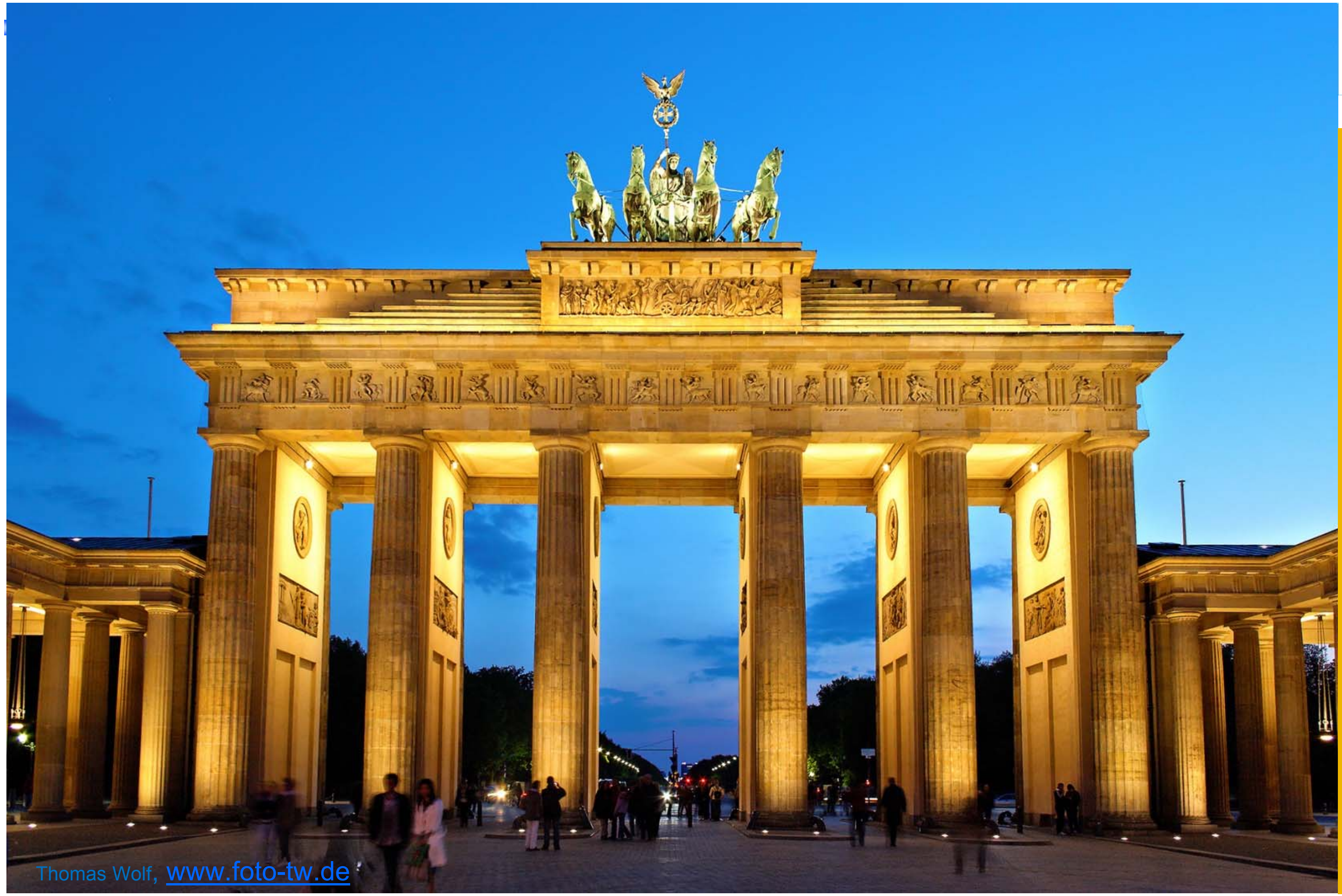
WELCOME at the Gate to a New World


Thomas Wolf, www.foto-tw.de

NAVINFO

NDS Association: **Automotive Grade Map Technology for Automated Driving**

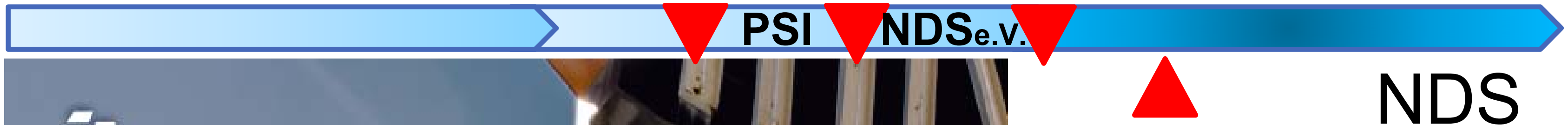
Beijing, 28.07.2015

Dr. Volker Sasse - Dr. GuoWenhui

Navigation Data Standard
PSF Physical Storage Format

NAVINFO

The Progress of NDS



1992 CAR Navi touched the Markets 2002 Navigation every where 2012 NDS touched the markets

NDS 2015

Navigation Data Standard
PSF Physical Data Format
36° 10'29" N – 115° 08'13" W
What is the easiest way to get there?
Reach your business goals with standardised map format solutions

NDS Association:

Automotive Grade Map Technology for Automated Driving

Automotive Grade Map Technology for Auto Drive

Our Goal is to get from A to B

1. Carriage, car, containers transport us on road, rail, water, air
2. Autonomously, by auto pilot, automatically asap
3. Information integrators inject intelligence supporting the goal
4. Modelling the world is the ultimate foundation of the system

A
B
PEED
IMIT
55
The right people make the journey.
Leading the way together.
Where exactly are we going?
Easy access to anywhere.

NDS is part of a Big Change of Our World

1. Our primary focus is technically, but has influence beyond this
2. The diversity of members is a platform for extended discussion
3. We are discussing cooperations e.g. with VDA, Ertico, Genivi,…
4. Continuous growing of the consortium

Smart support on the way.

Highlevel Feature Set

NDS achievements in the last Year (1 of 4)

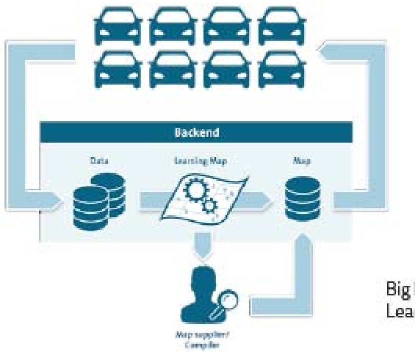
- **Speedup work towards cloud integration and autonomous driving, strengthened special Working Groups**
- **Worked on a new certification bench approach for the MAP**
- **Introduced 'Fast Track Extensions' speeding up development processes**
- **Released new NDS Version with new features and optimizations**
- **Improved interoperability and backwards compatibility**

This route comes highly recommend.

Success stories from 2014

NDS achievements…, legal context (2 of 4)

- **Cross License Agreement among members**
- **Self-commitment rules regarding fairness w.r.t. 3rd parties**
- **Special SQLite usage contract**
- **Evaluation contract for 3rd parties like start-ups for Auto Drive**



Big Loop:
Learning map forAutonomous Driving

It's full speed down the open road.

The fast lane forward

Backend
It's full speed down the open road.
The fast lane forward
Big Loop:
Learning map forAutonomous Driving

NDS achievements…, event context (3 of 4)

- **Organized NDS Roadshow in Korea and USA, also Public Days**
- **Invitation to all companies in the relevant car industry**
- **Presentation in 1st CES Shanghai – Conferences in Baden-Baden and ITS Bordeaux**
- **Organized NDS Working/User Groups (WG>NDS UG) for Japan and USA**

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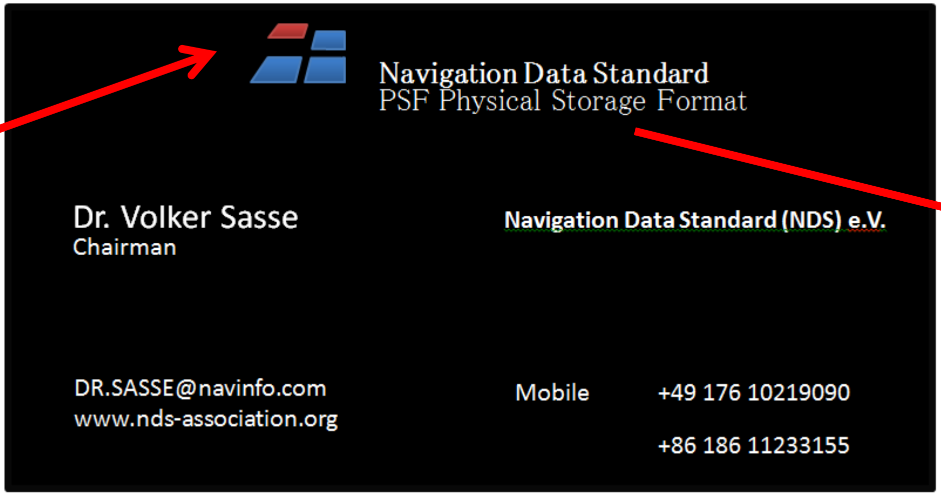
Reach your business goals with standardised map format solutions

NDS achievements…, advertisement context (4 of 4)

- **See new teaser video explaining NDS on web site**
- **We provide NDS advertisement flyer with success stories**
- **See NDS Wikipedia articles in different languages (English & Chinese & German & Japanese online)**
- **Extension of the NDS association web site with NDS products and tools**



Navigation Data Standard
PSF Physical Storage Format

Dr. Volker Sasse
Chairman

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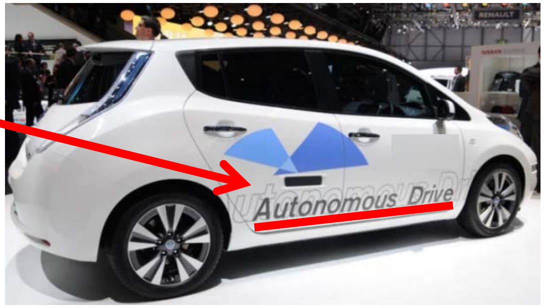
Autonomous Drive

More than a PSF

Automotive Grade Map Technology for Auto Drive

36° 10'29" N – 115° 08'13" W
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NDS Members

Map Data Providers

here
TOMTOM
高德 AutoNavi
NAVINFO
MAPPERS
ZENRIN

Compiler Developers

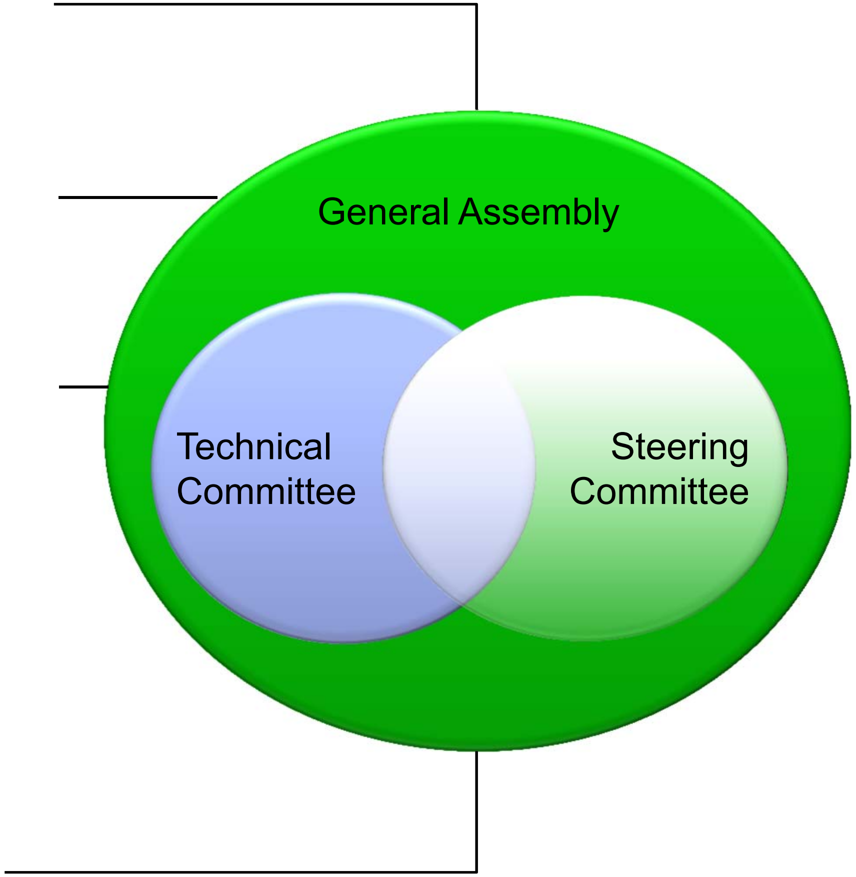
System Providers

MXNAVI
HARMAN
ALPINE Mobile Media Solutions
AISIN AW CO.,LTD.
Elektrobit
BOSCH
NAVIS-AMS Navis Automotive Systems
GARMIN
TechniSat
MITSUBISHI ELECTRIC Changes for the Better
DENSO
clarion
Panasonic
Neusoft Automotives
Continental
NNG
KOTEI

Service Providers

Car Manufacturers

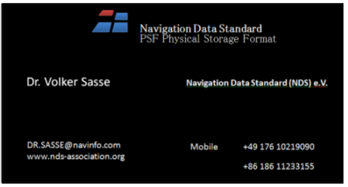
DAIMLER
VOLKSWAGEN AKTIENGESELLSCHAFT
BMW GROUP
MINI
Rolls-Royce Motor Cars Limited
VOLVO
HYUNDAI



General Assembly

Technical Committee

Steering Committee



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Automotive Grade Map Technology for Auto Drive

Photos by BMW

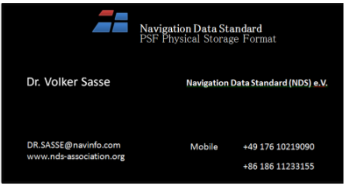
Photos by Volkswagen

Photos by Daimler

2013

2014

2015



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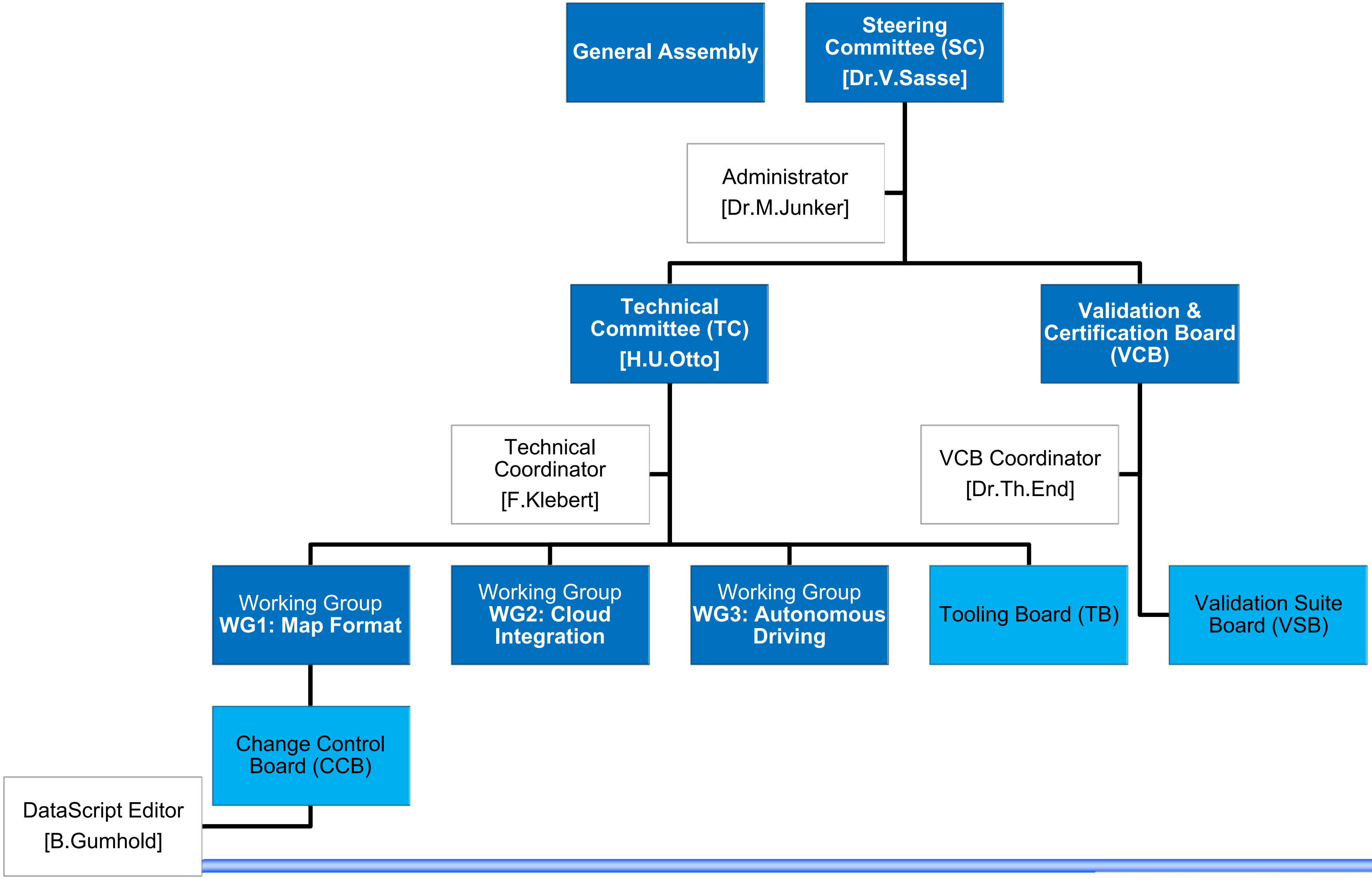
Automotive Grade Map Technology for Auto Drive



General Assembly

Steering Committee (SC) [Dr.V.Sasse]

Administrator [Dr.M.Junker]

Technical Committee (TC) [H.U.Otto]

Validation & Certification Board (VCB)

Technical Coordinator [F.Klebert]

VCB Coordinator [Dr.Th.End]

Working Group **WG1: Map Format**

Working Group **WG2: Cloud Integration**

Working Group **WG3: Autonomous Driving**

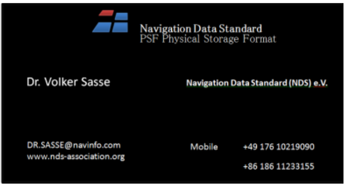
Tooling Board (TB)

Validation Suite Board (VSB)

Change Control Board (CCB)

DataScript Editor [B.Gumhold]

Automotive Grade Map Technology for Auto Drive

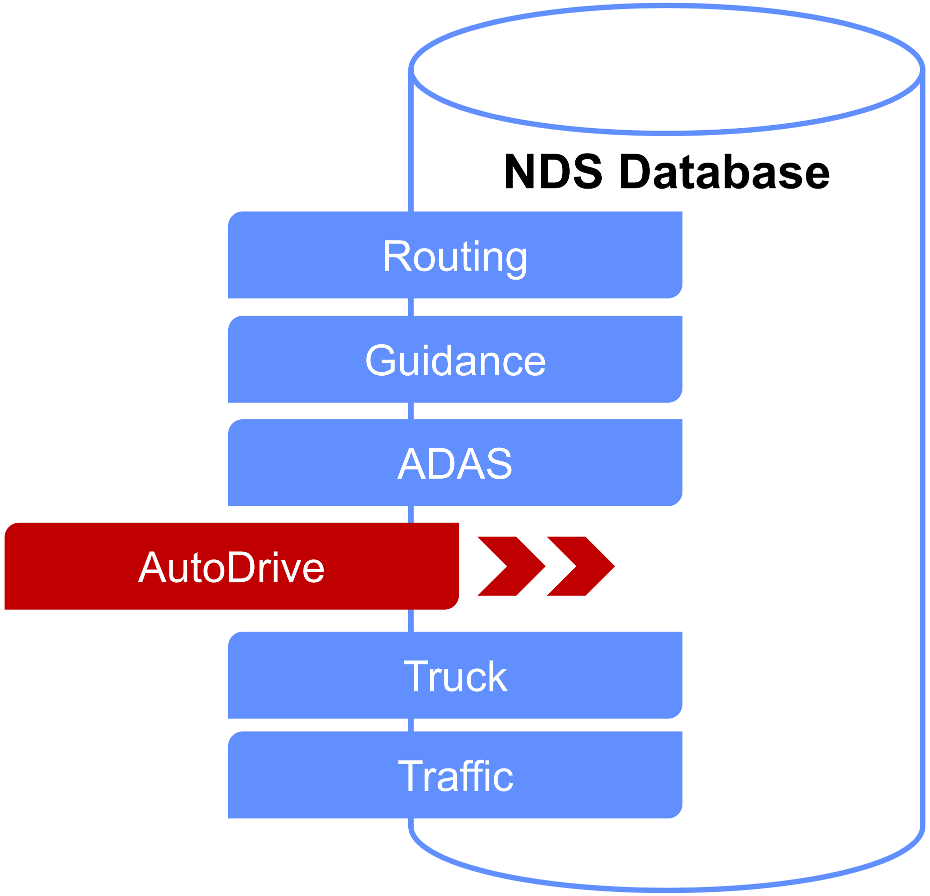


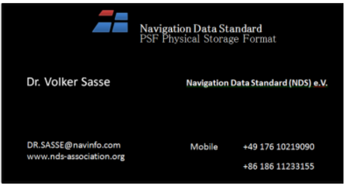
Working Group 3: Auto Drive

- **Definition**
  - WG3 is responsible for the development of all map features which are needed to support autonomous driving use cases.
- **Goals**
  - Define and update map requirements for autonomous driving
  - Develop proposals and change requests for NDS map format
- **Tasks**
  - Provide high quality requirements and use cases to support autonomous driving
  - Provide high quality documentation for all autonomous driving-related parts of NDS
  - Drive integration of innovations from the autonomous driving domain
  - Align with WG1 to make NDS format „autonomous driving capable“

NDS – AutoDrive features

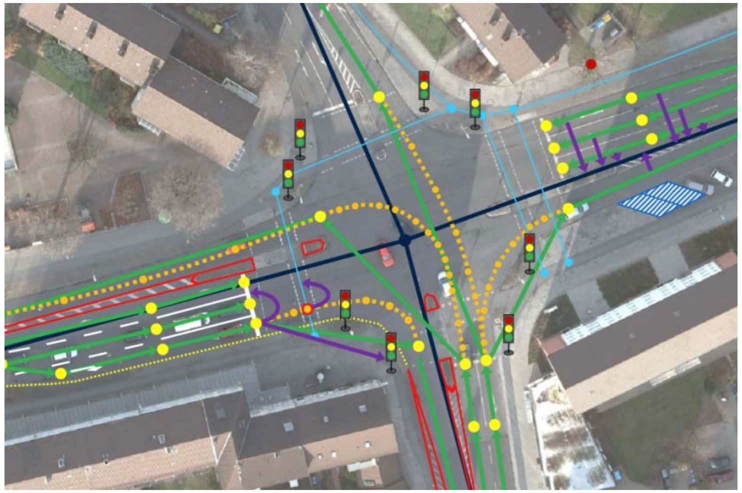
- **Seamless integration with NDS standard Infotainment map**
  - AutoDrive layer integrates in same way as other layers (e.g. guidance, ADAS, truck)
  - High re-use of Database Access code for standard applications
  - Already existing attributes can be assigned to HD lane model





Automotive Grade Map Technology for Auto Drive

Auto Drive



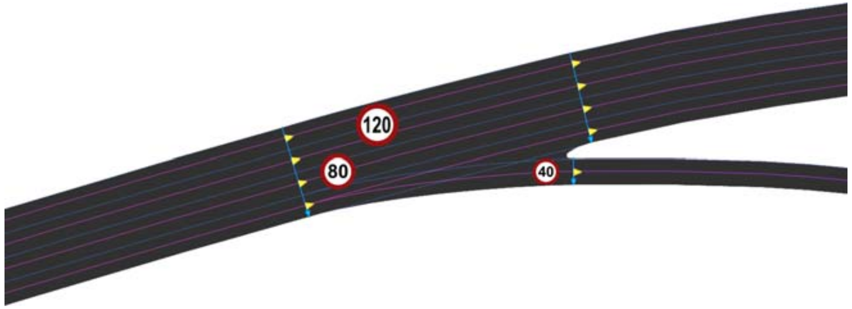
- **Auto Drive HD Lane model**
  - Introduction of advanced geometries

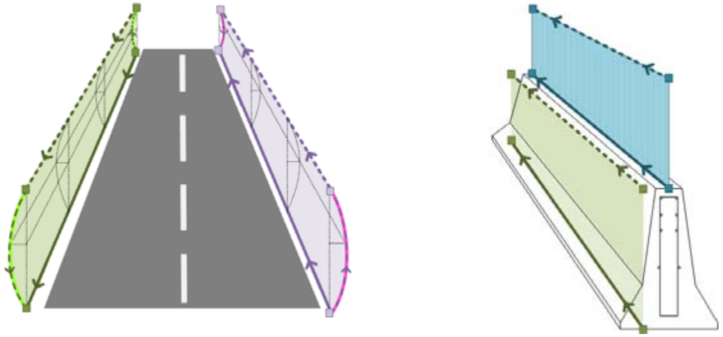
    Lane center line geometries
  - Lane boundary geometries and types

    (e.g. road markings, guardrails, walls, etc.)
  - Lane marking colors

    Connectivity model for simple and

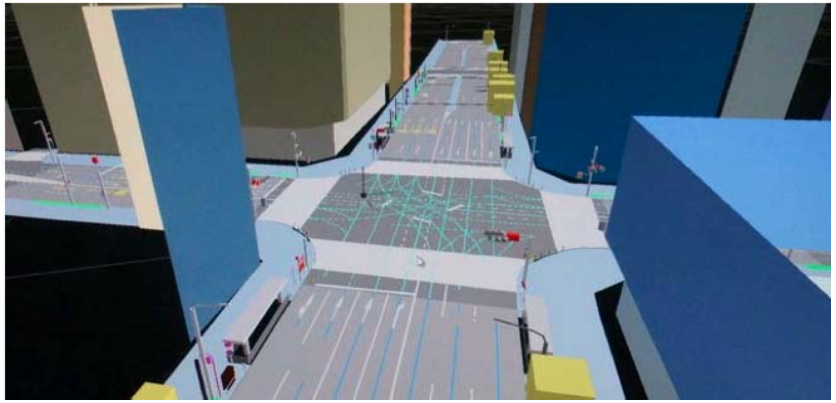
    complex intersections
  - Highly accurate attribution of lanes

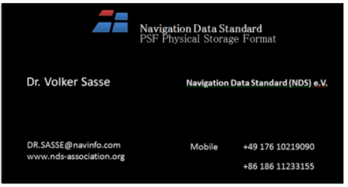




Automotive Grade Map Technology for Auto Drive

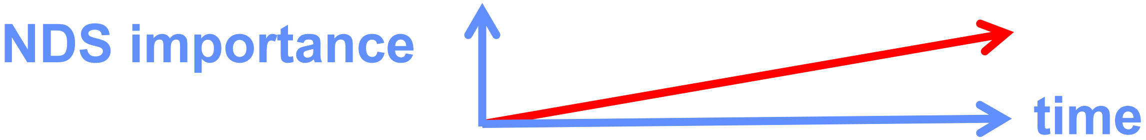
- **Auto Drive HD Positioning model**
  - 3D positioning objects (e.g. roadside furniture, house corners, overhead structures etc.)
  - Features several material types for improved sensor fusion results (e.g. concrete wall vs. transparent wall)





NDS steps in the next year

- Integrate more requirements of the HAD map onboard and off board
- Take care of more safety/security relevance aspects of HAD maps
- Represent the NDS association with special focus on future legal matters
- Extend re test new incremental update options including prototyping
- Focus on new solutions for voice recognition
- Integrate metropolitan traffic management requirements
- Intensify the cooperation with associations like VDA



NDS importance

time

More than a PSF

A GLOBAL AUTO DRIVE MAP

NDS provides the leading world-wide map standard for automotive grade use

< VISION >