ASAM Regional Meeting North America

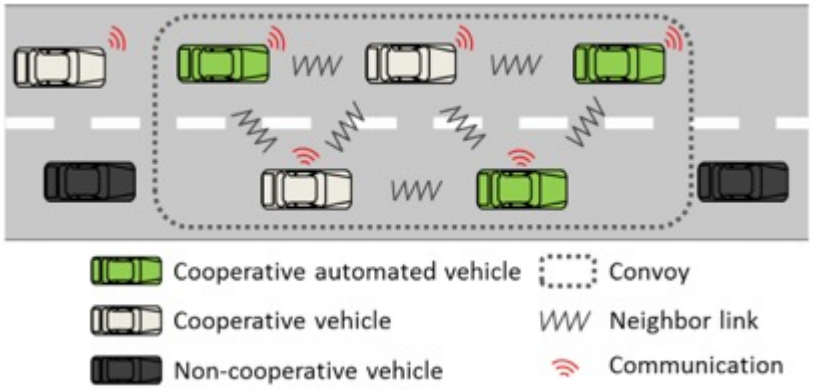
Update on IAMTS activities and collaboration with ASAM

Prof. Dr. Joachim Taiber
Founder & Managing Director IAMTS

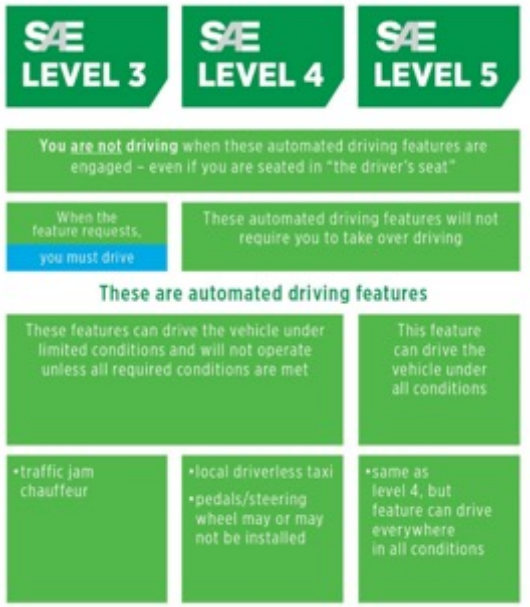
The inspiration of IAMTS when it was founded in 2019

What are the *regulatory* and *technologica*l challenges in advanced mobility to enable automated driving and how can IAMTS contribute with a milestone oriented roadmap approach related to **testing and standardization** to meet these challenges?

How to efficiently verify & validate SAE L3/L4/L5 vehicles for type approval and commercial deployment?



Source: IEEE



Source: SAE

Segmentation of “Advanced Mobility Testing”

Shorter term Technology Focus → 2025

5G networks
Stationary conductive high power charging
Level 3 automation
C-V2X
Coordinated driving
Zonal computing within vehicle network

Longer term Technology Focus → 2030

6G networks
Dynamic wireless charging
Megawatt charging
Level 4 automation
Cooperative Driving/Collision free driving
Distributed computing including edge network

Testing focus: Safety Security Interoperability Regulatory Compliance

Source: IAMTS

From vehicle centric towards advanced mobility ecosystem testing

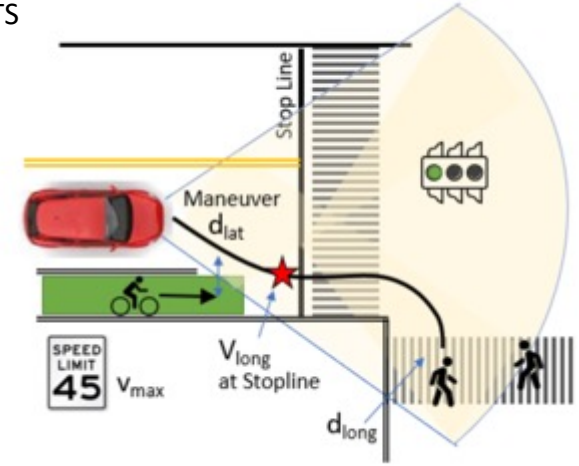
BMW Proving Ground in Aschheim

Source: Google Earth

AVL Zalazone CAV testbed, IAMTS Symposium June 2022

Source: IAMTS

Source: 4activesystem



Source: AVSC SAE ITC

How to build trust between vehicle system and road infrastructure operator

Source: CAVNUE

What are the strategic goals of IAMTS ?

> IAMTS to facilitate global market introduction of L3/L4/L5 vehicles by advancing and developing harmonized test methodologies, test processes, testbeds and test tools for certification of various regulatory regimes

> IAMTS to help reach an optimal mix of virtual and physical testing in blended test environments where deviations of virtual test results from physical tests stay in acceptable tolerances

> IAMTS to define the capabilities of cyberphysical testbeds to be able to measure operational robustness (safety, security) of a CAV complete system and its subsystems as well as required infrastructure in different ODD's

> IAMTS to define the capabilities of cyberphysical testbeds to be able to measure the impact of mixed CAV fleet systems on traffic flow in different ODD's which could lead to mutual driving behavior adaptions of human and robotic drivers

CAV: Connected and Automated Vehicle ODD: Operational Design Domain

IAMTS is driven by global best-practice and benchmarking

> Define **best practice** to ensure consistent, replicable and reliable testing (scenarios, virtual and physical validation and certification methods, testbed capabilities)

> Understand where **worldwide testbeds** are which meet relevant capability criteria (global directory) to get them ready for global certification

Source: TILKE

Source: FDOT

Source: CATARC

IAMTS Working Groups & Study Groups

WG1

GLOBAL TEST SCENARIO LIBRARY

WG2

GLOBAL ADVANCED MOBILITY TESTBEDS

WG3

CORRELATION OF PHYSICAL AND SIMULATION TESTING

WG4

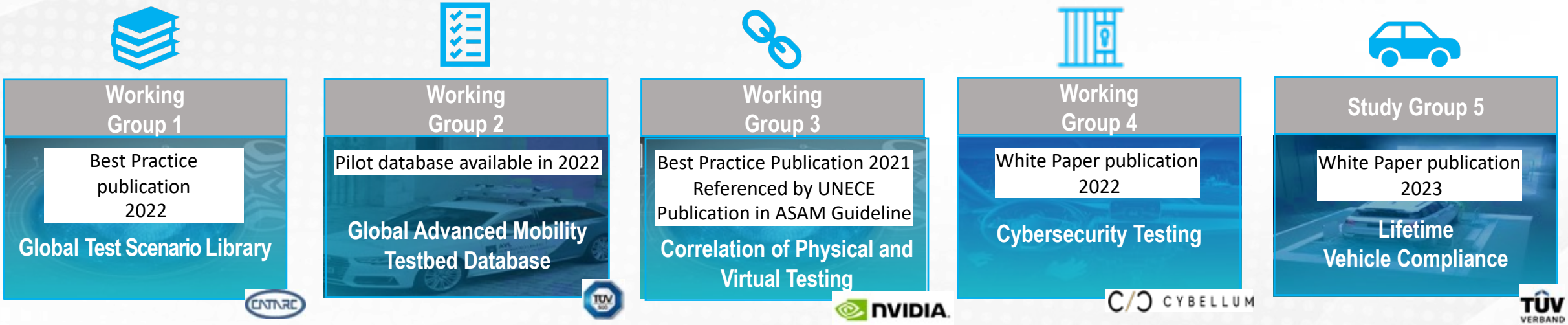
CYBERSECURITY TESTING

SG5 IAMTS|CITA

CAV LIFECYCLE COMPLIANCE

TESTBED DATABASE

Content development approach of IAMTS



Timeline

Rapid, Iterative, Immediate Deliverables

3-12 months

Input from Stakeholders

Project Sponsor → **TLC and Board Approval** → **Enlist Consortium Contributors** → **Form Global Working Group** → **Specification or Paper**

Benefits

- Functional Speed
- Provide stakeholders with something for immediate use and reference
- Kickstart standards development
- Focus on asynchronous work and remote meetings rather than in-person meetings to save costs and time for participants

De-Facto-Standards May be referred to SDO committees for formal standardization

SDO: Standards Development Organization

Governance structure of IAMTS

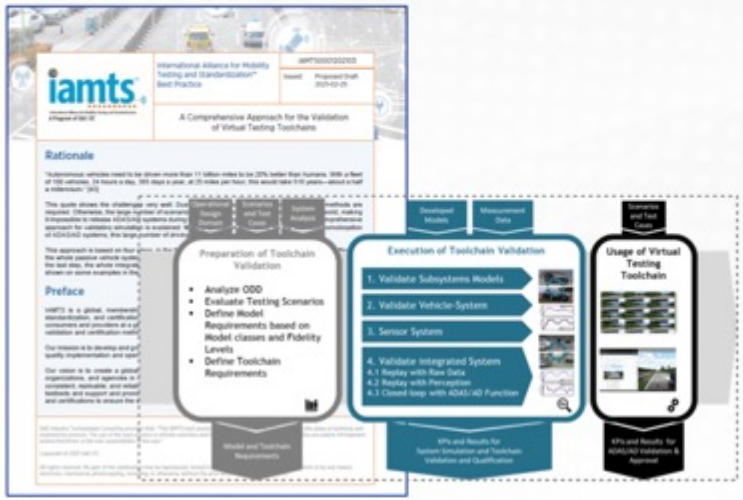
IAMTS Board	Technical Leadership Committee
Chairman: Alexander Kraus (TÜV SÜD) Vice Chairman: Prof. Dr. Zhixin Wu (CATARC) Secretary: Marijan Jozic (SAE International) Managing Directors: Christian Lausmann (TÜV SÜD) Prof. Dr. Joachim Taiber (ITIC)	Chairman: Georg List (AVL) Vice Chairman: Konstantinos Karachalios (IEEE) Working Group Leaders: Bolin Zhou (CATARC) Tuan Dong Quang (TÜV SÜD) Barnaby Simkin (Nvidia) Eddie Lazebnik (Cybellum) Richard Goebelt (TÜV Verband)

The **value proposition** of IAMTS is
to bring together an advanced mobility ecosystem to help develop
a **commonly accepted framework** of
testing scenarios, verification & validation, certification methods, and terminology to be applied to highly and fully automated driving in context of cyberphysical test infrastructure

As a community, we will develop and share **best practices** to ensure consistent, replicable, reliable testing and support **global harmonization** of **standards and certifications**.

Snapshot in the activities of IAMTS WG3

Define methods and processes to enable virtual testing methods for ADAS/AD validation focusing on the correlation process between the virtual and real world.



Step 1: IAMTS Reference Process for the correlation of the virtual and real world

Step 2: IAMTS Best Practices with Focus Fidelity Levels for Models and Toolchains

The need for virtual homologation

Current state

Application for Type Approval

KBA RDW snca

- Long and not predictable Homologation → high costs & long lead time
- Difficult for Manufactures to manage high scale software updates
- No global scalability and meaningful business case for OEMs, mobility provider and operator.

New Homologation set-up

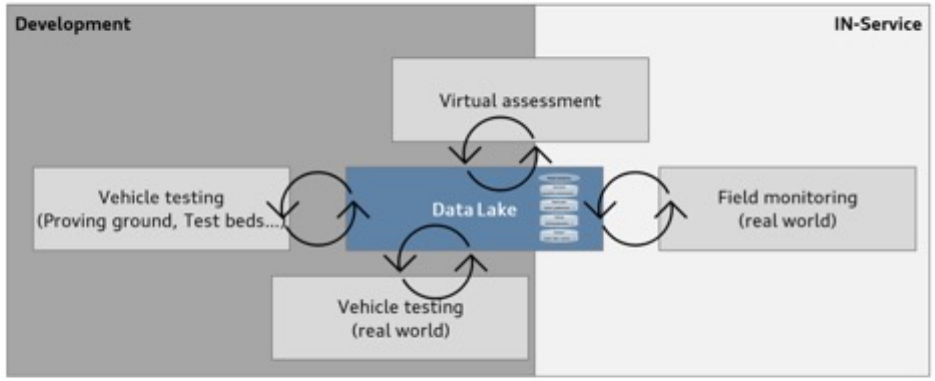
- Establish simulation as accepted & recognized new homologation approach
- Set the de-facto standard, to influence Standards and Regulations
- One-stop solution provider for OTA safety audit and certification for homogation and liabilitiy relevant topics

Source: TUEV SUED (IAMTS Founding Member), IAMTS Symposium 2022

OEM view on advanced mobility testing

Build up efficient track/road testing for connected and automated vehicles

Possible long term approaches



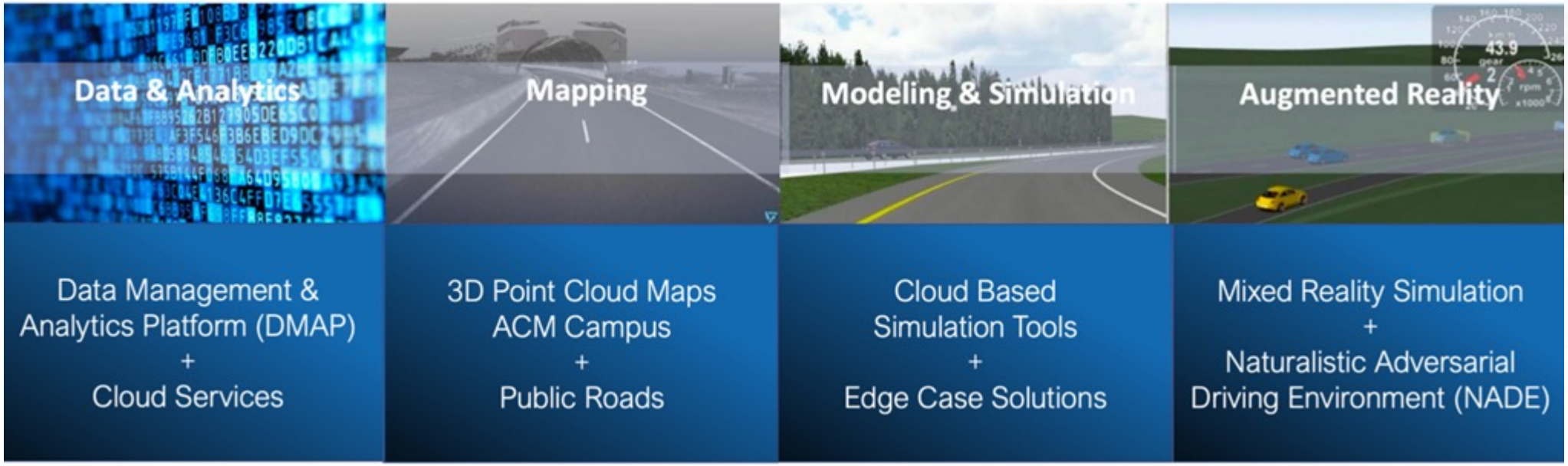
- Create all relevant driving scenarios in a virtual and physical environment
- Standardize driving scenarios for regulatory compliance and testbed interoperability
- Standardize V2X test-infrastructure
- Ensure Compliance to cybersecurity management
- Enable mixed test setup (physical, virtual)
- Enable virtual homolgation at life cycle

Source: Claudia Braun, Audi (IAMTS Strategic Member), IEEE ICCVE 2022

Advanced mobility testing through cloud platforms

ACM Autonomous Cloud

Access world-class AV development tools via a cloud consumption model without the upfront, multi-million investment

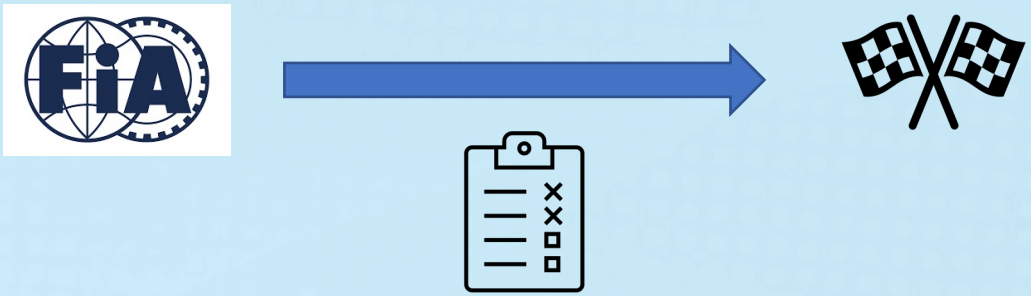


Source: ACM (American Center for Mobility, IAMTS member)

Outlook: Certification of Advanced Mobility Testbeds

FIA

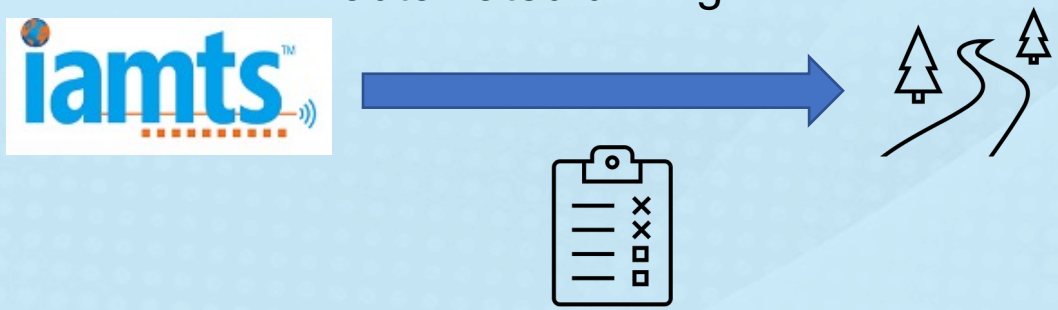
Federation Internationale de l‘Automobile (FIA) is certifying the safety level of racing circuits



Safety verification

IAMTS Outlook

IAMTS is certifying the testing capabilities of cyberphysical testbeds for highly and fully automated.driving



Testbed certification

Collaboration with ASAM

IAMTS is addressing primarily the community involved in the verification and validation of automated driving which requires both virtual and physical testing to provide standardized scenarios, validated tool chains and common criteria for CAV testbeds

ASAM provides standardized data formats (OpenDrive and OpenScenario) which are essential in enabling interoperability between virtual simulation tools for automated driving

Enables virtual homologation and type approval/regulatory compliance of automated driving systems in all key markets

Collaboration with ASAM

Dealing with test complexity to evaluate the safety and security of automated driving systems

To create complex cyberphysical test infrastructure environments with standardized components to enable large variety of test conditions

OpenSCENARIO 2.0 is an upcoming standard language to develop, verify and validate the safety and efficiency of automated driving systems (capturing dependencies between traffic actors and their behaviors)

Together IAMTS and ASAM provide a standardized system development framework for automated driving systems which is essential to achieve regulatory compliance

What are the key advantages of an IAMTS membership

> Access to world leading experts and organizations in CAV testing and certification

> Engagement in best practice development in global CAV testing and utilization of CAV test infrastructure which validates non-competitive and competitive aspects of each member's in-house and outsourced processes and methods and helps optimize resource allocation from a make and buy perspective

> Contributing to orchestration of regulatory alignment on global scale for L3/L4/L5 deployment through effective thought leadership in the ecosystem

> Involvement in acceleration of international standards development in CAV testing through open dialogue between stakeholders and knowledge transfer to most influential standardization committees

> Contributing to definition of certification criteria for cyberphysical CAV test infrastructure enabling more efficient vehicle certification in all major markets

About IAMTS

Scope:

A global, membership-based alliance of organizations involved in the testing, standardization and certification of advanced mobility systems and services.

Mission:

To develop and grow an international portfolio of advanced mobility testbeds that meet the highest quality implementation and operational standards.

STRATEGIC MEMBERS

Audi, CNTRC, IEEE Advancing Technology for Humanity, SAE International, TÜV Verband

CORE MEMBERS:

AVL, CAR Center for Automotive Research, KIAPI, NVIDIA

ACADEMIC PARTNERS

Florida Polytechnic University, M city, TAL TECH, virtual vehicle

BASE MEMBERS

3D Mapping Solutions, 4a Systems, American Center for Mobility, ibeo, CICV 国汽智联, DLR, dSPACE, GreenTEC CAMPUS, iTiC, KISTLER measure. analyze. innovate., SAIMO, 北汽信息 POLELINK, Tilke Engineers & Architects, TNO innovation for life, NSW Government Transport for NSW, The Transtec Group

JUNIOR MEMBERS

Cybellum, Digitrans, kontrol, retrospect, Smart Mobility Norway, TRI

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