IEEE AUTONOMOUS DRIVING WORKING GROUP OVERVIEW

(ADWG)

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Chair Of ADWG

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IEEE Vehicular Technology Society
Intelligent Transportation Systems (VT/ITS)

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SPONSOR SC

OVERVIEW

IEEE Vehicular Technology Society

IEEE Intelligent Transportation Systems Society

- Sponsored by two IEEE societies
- **Individual method** applied
- More 70 members e.g. from GM, Ford, Waymo, Changan Automotive, Geeley Auto, etc.

- Two ongoing projects:
  - **P3344 -** Standard for Scenario Representation for Autonomous Driving
  - **P3412 -** Standard for Autonomous Driving Architecture (ADA)

- Two whitepapers (in progress, **CFP**)
  1. Simulation, testing, validation and verification of Autonomous Driving
  2. Autonomous Driving architecture – enabling intelligent, automated and connected vehicles and transportation

- Meetings:
  - Monthly virtual meetings (Every 3rd Weds)

IEEE STANDARDIZATION METHODS: INDIVIDUAL VS ENTITY

	Individual	Entity (aka Corporate)
Description	• Participants are individual technical experts • Individuals represent themselves • Each IEEE SA individual member has 1 vote • Ballot groups are made up of a minimum of 10 individuals • Ballot group participants must be IEEE-SA individual members • **Working Group participation does not need IEEE-SA membership**	• Participants are "legal entities," i.e., companies, universities, government bodies, etc. • Designated representative and alternate representative for the entity • Entity sends representatives to meetings • Each entity has one vote • Requires a minimum of 3 IEEE SA corporate members to initiate an Entity project • Requires a minimum of 5 IEEE SA corporate member entities
Comparison	• More cost-effective for participation: individual membership $284 ($63 current IEEE member, $25 student member) per person per year • Suitable to academia and universities • Usually, slower pace for stds spec development • Traditional IEEE model, with 80% of projects • Holding popularity in traditional IEEE Societies / SCs, e.g., PES, CS/802, etc.	• Entity membership: $4,200 to $16,000 per entity per year • Suitable to industry orgs / groups • Usually, faster pace for stds spec development • Relatively new model, ~20% of projects

"Individual" method is used for the ADWG

PRINCIPALS OF ADWG

Innovation

Focus on the fundamental issues e.g. unified architecture and sim/reconstruction/ testing/validation/verification of AD scenarios for dynamic behaviors, corner cases and probabilistic scenarios, trustable and explainable AI for AD etc., to enable the success of the AD long term objective towards L4/L5 in terms of R&D and regulatory/commercial use

Openness

Engage with all interested parties (individual experts/ talents) from academia, industry and research to participate and contribute

Collaboration

Cooperate with open-source communities and other SDOs to meet industry need from forward looking perspective

OVERALL APPROACH

- **Innovation driven**
  - Support of industry need，collaborate with leading research institutions, e.g. UC Berkely, UMich, Tsinghua，USTC, Baidu etc，and business leaders, e.g. Ford, GM, Changan, Geeley etc.
- **Standard endorsed**
  - Open for all interested parties (academia, research, industry)
  - Make use of IEEE as base，in conjunction with IEEE academia (Society) + Standards（SA)
  - Actively influence on ISO、SAE、ASAM etc
- **Open source implemented**
  - Leverage with Carla Open Source Sim platform and its leaderboard Challenge
  - As well as open source ecosystem including industry/research/academia partners

Open Source — **Innovation**

Standardization
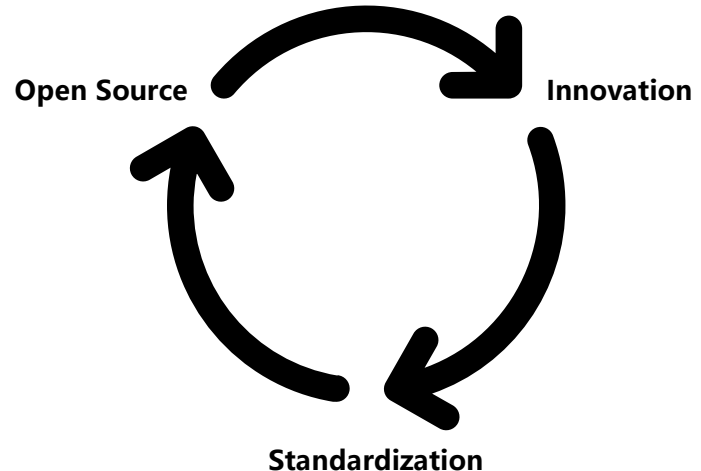
SOW

P3344: This standard mainly specifies a representation of traffic scenarios for the training and validation of autonomous driving (AD) systems

P3412: This standard aims to define a unified reference architecture for intelligent, automated and connected vehicles and transportations denoted as Autonomous Driving Architecture (ADA).

Other potential works:

-**Recommended practices** on AD
-**Guides** on AD usage by industry
-Innovative **research papers** on approaches and methods e.g. readability,
interpretability, reliability, trustworthy, …
-**Whitepapers/bluepapers**

Management & operations

Meetings:
- **Monthly plenary call**: WG level, web, every 3rd Weds
- **Biweekly subgroup call**: Subgroup level, web
- **Quarterly hybrid meeting**: WG Level, hybrid (in person/web)
- **Annual in person meeting**: WG level, in person

Management:
- May add more vice chairs, subgroup chairs and liaison officers as needed
corresponding to the works and activities

P3344	P33412	Recommended practices, Guide…	Open sources

White/blue papers/research reports…
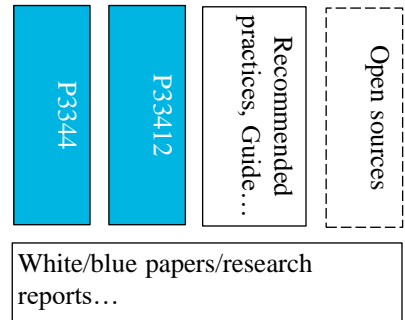
P3344 MISSION STATEMENT

Objective

To create a state-of-the-art Scenario Modeling Specification by building upon existing SDL techniques and integrating cutting-edge research in data-driven AI-based behavior models.

Approach

Capitalizing on the IEEE community's strengths in AI research, fostering industry collaboration, and leveraging standard influences. Embracing open-source community principles such as prioritizing code development, promoting open datasets, and encouraging open competitions to drive innovation and progress.

Significance

Addressing industry pain points and ensuring the relevance of the developed standard by effectively resolving real-world challenges faced by practitioners.

Inclusivity

Establishing an international collaboration platform that brings together individuals from academia, industry, regulatory agencies, and standard-setting bodies to collectively contribute their expertise and insights.

SCENARIO MODELING SPECIFICATION FRAMEWORK

Ecosystem	Metrics & Benchmark	Development and Test

IDE	Cloud Native Test Platform	Scenario Exchange	Competition	Scenario DB	Certification	Test Generator	SIL/HIL	Trouble-shooting	Release

Scenario Description Language

Scenario Builder	Environment Scenario Model	Behavior Model	Simulation

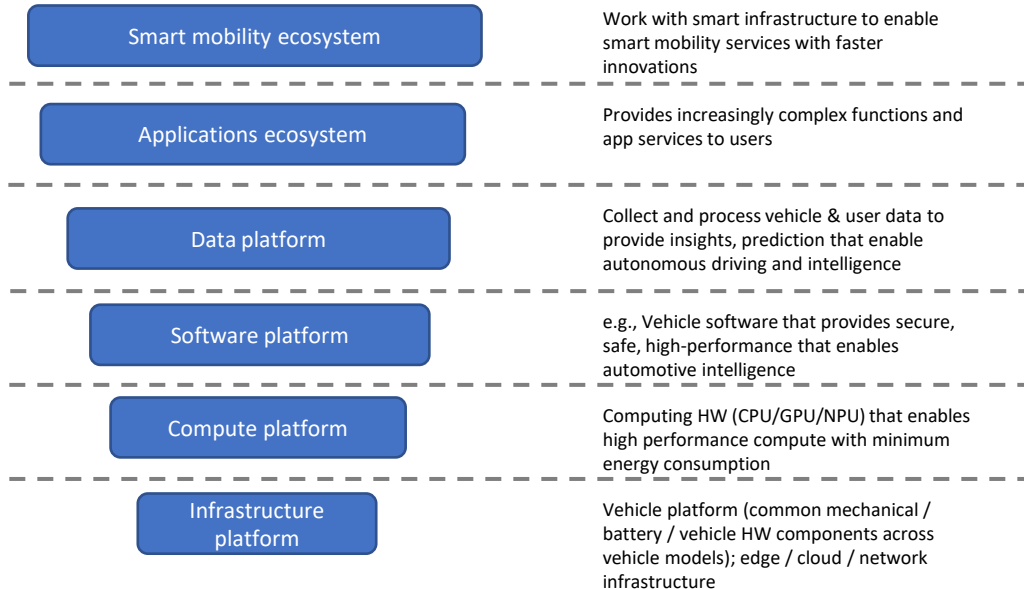| Scene Sampling	3D Env Reconstruction	Dynamic Behavior Mapping	Map	Env. Object Model	Other Participant Model	Vehicle Model	Sensor Model	Traffic Flow	Driving Behavior	Other Participant Behaviors	Digital Twin Mapping & Modeling	3D Scene Description	NPC Behavior Models	Photorealis tic Rendering	SDL Interface

P3412 ADA OBJECTIVES

- IEEE Standards, Guidelines and Blueprints for ADA, examples:
    - Unified reference architecture
    - Data closed-loop scheme
    - Interfaces and models
    - Validation, verification, and compliance.

- To coordinate global cross-industry initiatives that promote collaboration and complement competitive industry dynamics

- To unlock the potential of cross-industry and public-private collaboration to help improve safety, inclusivity, sustainability and overall system resilience

IEEE SA STANDARDS ASSOCIATION

AUTONOMOUS DRIVING ARCHITECTURE – A UNIFIED, INDUSTRY-WIDE, SCALABLE ARCHITECTURE

Layer	Description
Smart mobility ecosystem	Work with smart infrastructure to enable smart mobility services with faster innovations
Applications ecosystem	Provides increasingly complex functions and app services to users
Data platform	Collect and process vehicle & user data to provide insights, prediction that enable autonomous driving and intelligence
Software platform	e.g., Vehicle software that provides secure, safe, high-performance that enables automotive intelligence
Compute platform	Computing HW (CPU/GPU/NPU) that enables high performance compute with minimum energy consumption
Infrastructure platform	Vehicle platform (common mechanical / battery / vehicle HW components across vehicle models); edge / cloud / network infrastructure

CALL FOR PARTICIPATIONS

AUTONOMOUS DRIVING WHITEPAPERS

1. SIMULATION, TESTING, VALIDATION AND VERIFICATION (STVV) OF AUTONOMOUS DRIVING

2. AUTONOMOUS DRIVING ARCHITECTURE (ADA)
– ENABLING INTELLIGENT, AUTOMATED & CONNECTED VEHICLES AND TRANSPORTATION

IEEE Vehicular Technology Society
Intelligent Transportation Systems (VT/ITS)
Autonomous Driving Working Group (ADWG)

For additional information, contact the IEEE Autonomous Driving Working Group Chair, **Dong Sun**, at dsun@ieee.org , and IEEE SA Program Manager, **Soo Kim**, at s.h.kim@ieee.org.

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THANK YOU

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