

AESIN ADAS and AV Verification and Validation Roadmap

Tim Edwards

Senior Consultant CAV Technologies – HORIBA MIRA

CAM Seminar Hall Sponsor

ZENZIC²

SELF-DRIVING REVOLUTION

AESIN: CAV Verification and Validation Roadmap

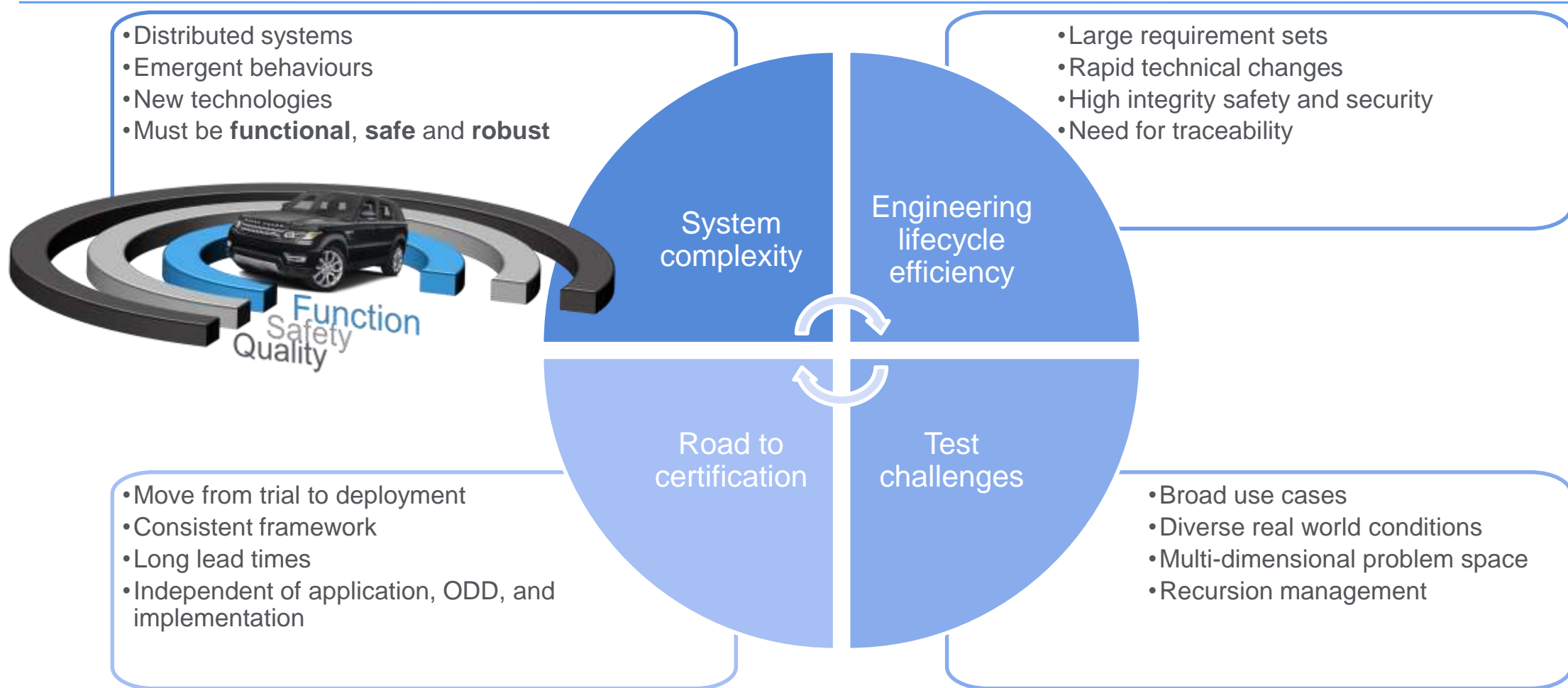
Tim Edwards, HORIBA MIRA

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Contributors



The importance of V&V for CAVs



The need for a V&V roadmap

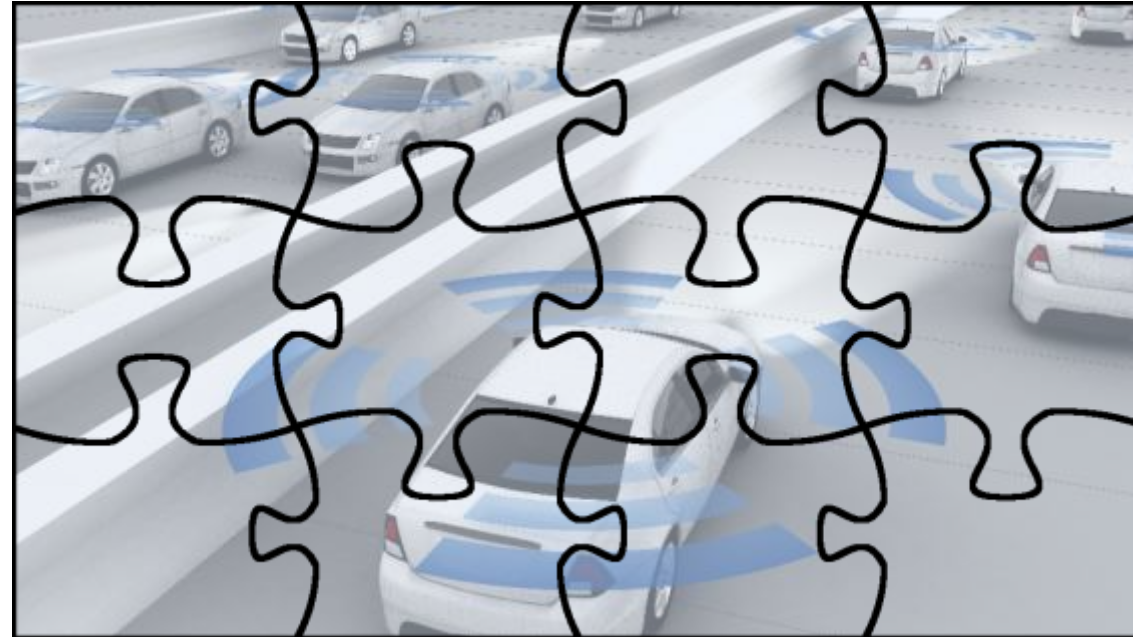
Engage stakeholders

Identify dependencies

Test assumptions

Build confidence

Inform strategy



Target investment

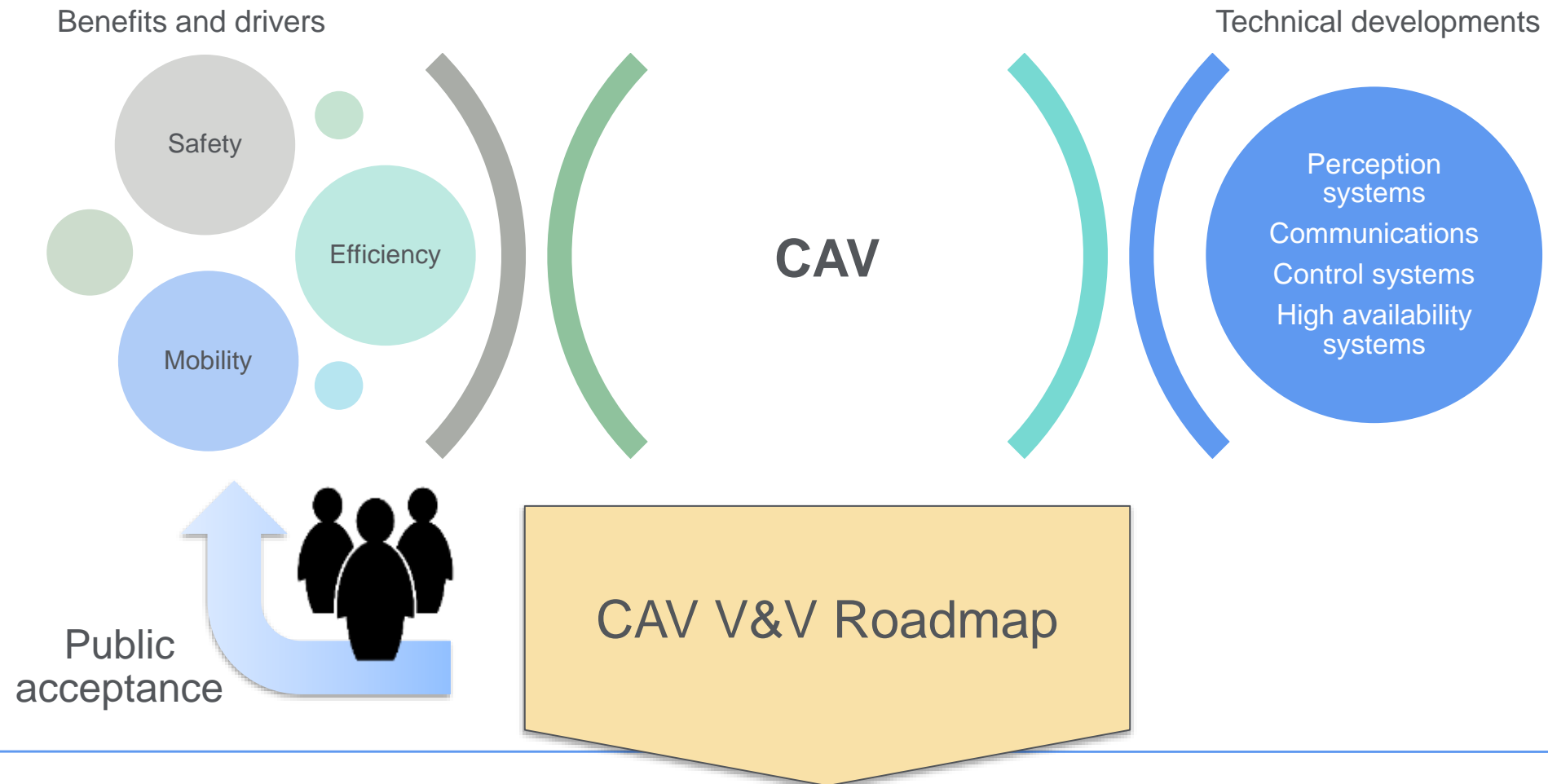
Seek interventions

Work collaboratively

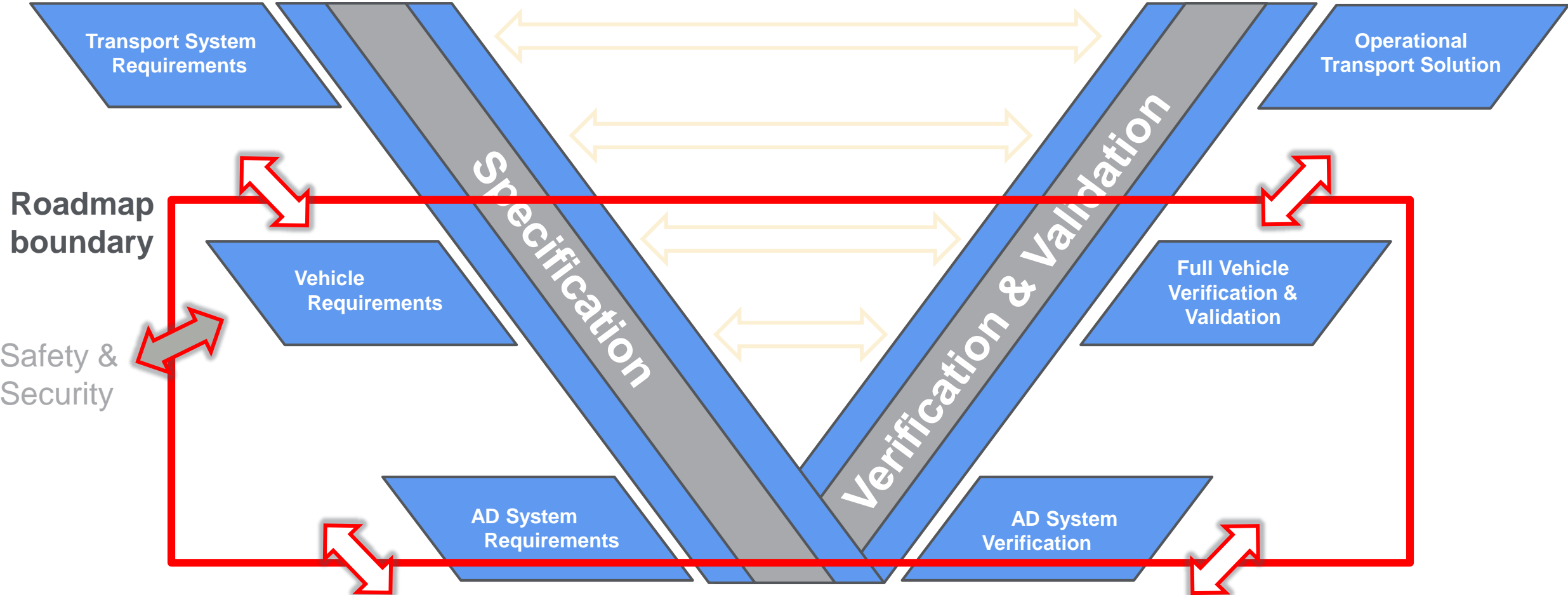
Plan standardisation

Define supply chain

Roadmap context

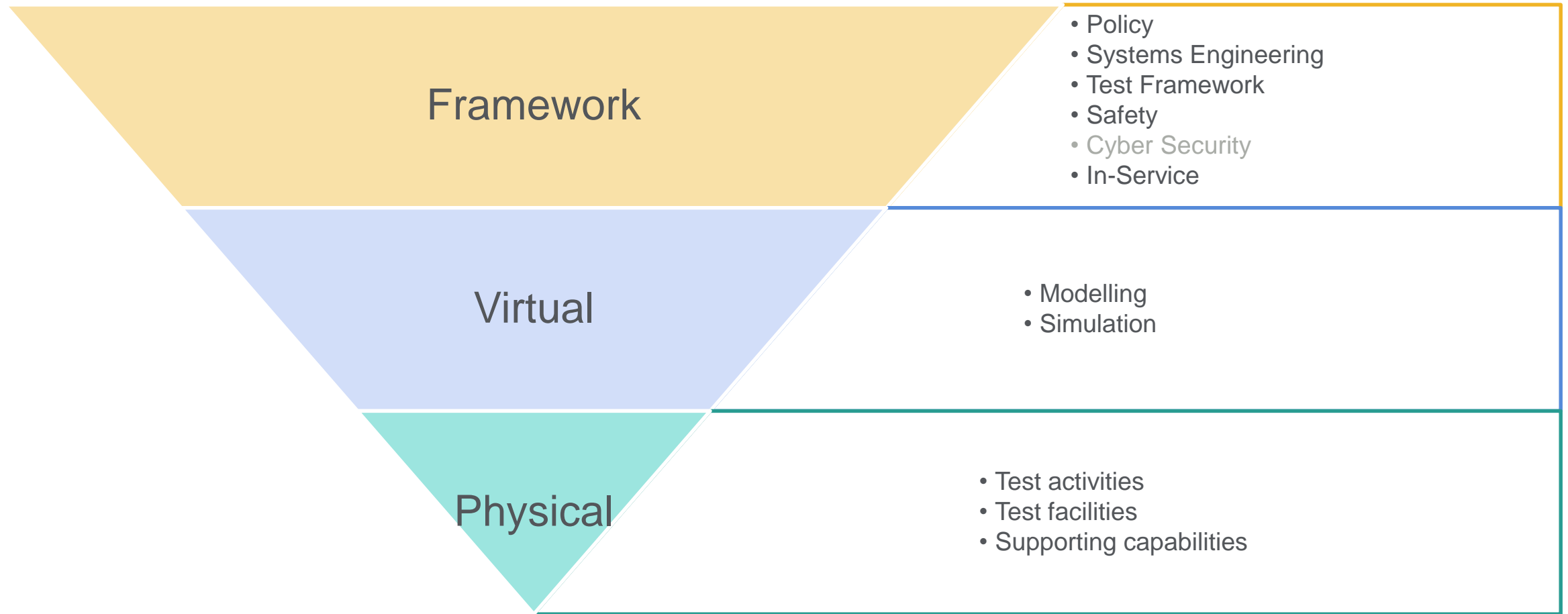


Roadmap boundary



Scope: **Vehicle centric** perspective, all levels of CAV are valid for consideration but our focus is **SAE Level 4 (+/- 1)**

Top Level V&V Landscape for ADAS & AV



V&V Landscape for ADAS & AV



FRAMEWORK

Policy

Legislation

Regulation

Best practice

Systems Engineering

Systems modelling

Process

Item definition

Requirements Capture & Management

Design & Architecture

Implementation

Vehicle attributes

Test framework

Test phases

Test Scenarios

Test allocation

Safety

Functional Safety

"Behavioural safety"

Nominal safety

Safety argument

Formal methods

Cyber Security

Standards

Pen. Testing

In-service

OTA updates

Maintenance

Repair & modification

Calibration

Inspection & Test

VIRTUAL

Modelling

World model

Vehicle dynamics

Sensor model

Wireless comms

Elec & Software Arch.

Occupant

Simulation

Traffic simulation

Control system simulation

HiL & Emulation

Human factors

Occupants

Interfaces & IP

PHYSICAL

Test activities

Benchmarking

Characterisation

Correlation

Verification

Validation

Field Operational Trials

Test facilities

Controlled environment

Public env. testing

Supporting capabilities

Trial safety

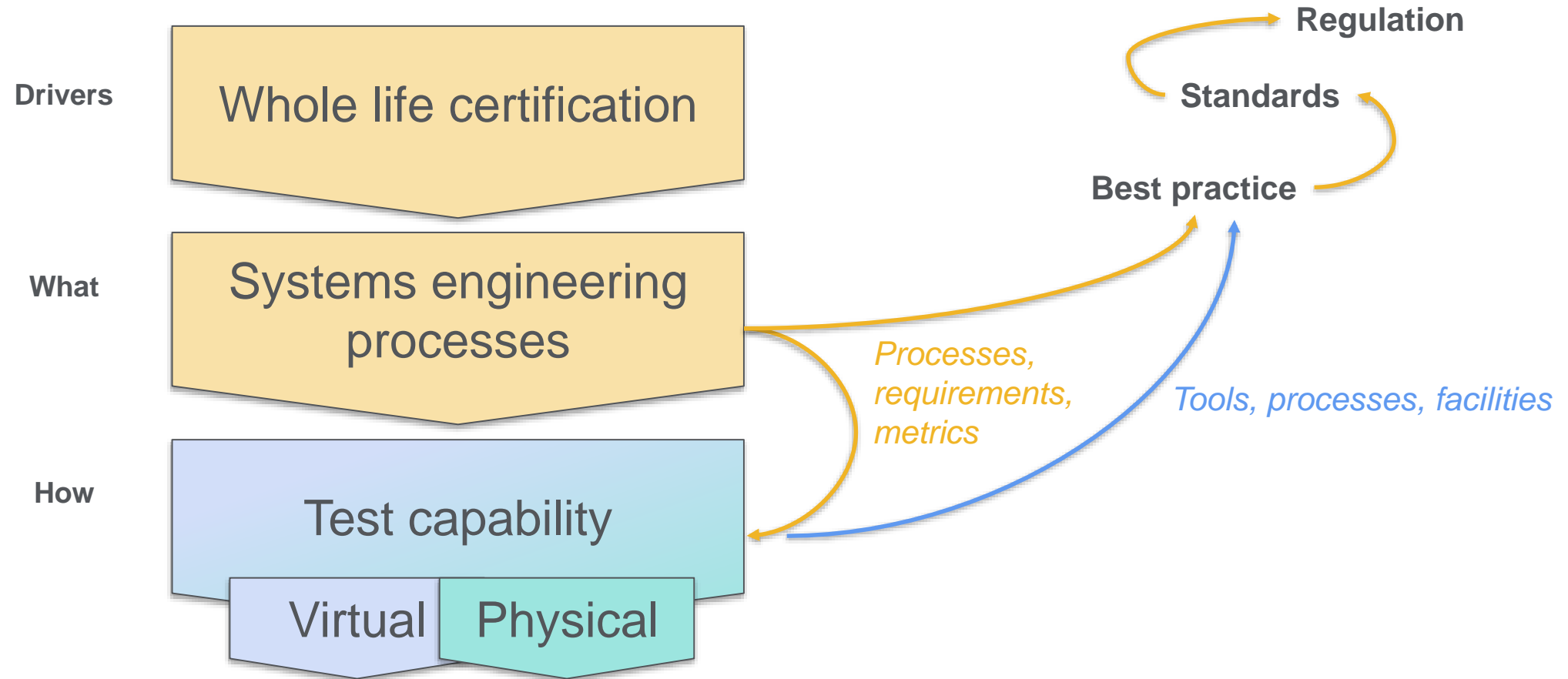
Test assets

Fault injection

Ground Truth

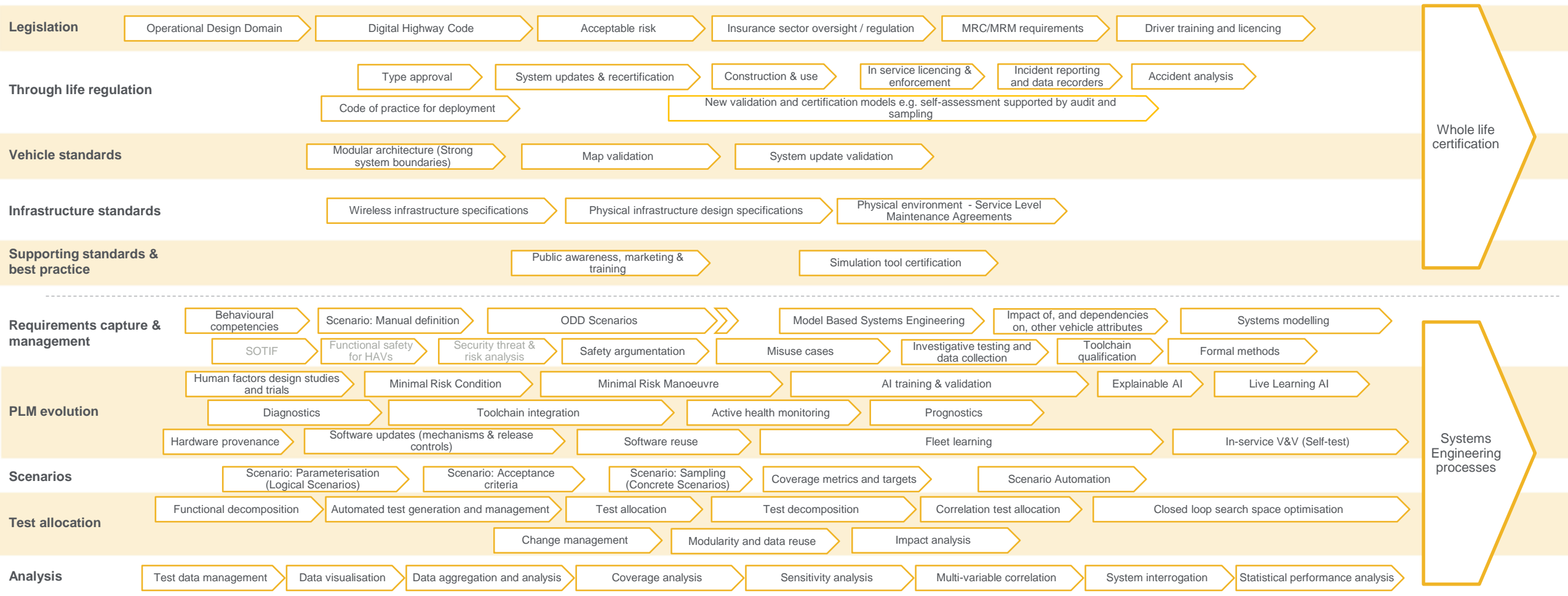
Data analysis

Roadmap structure



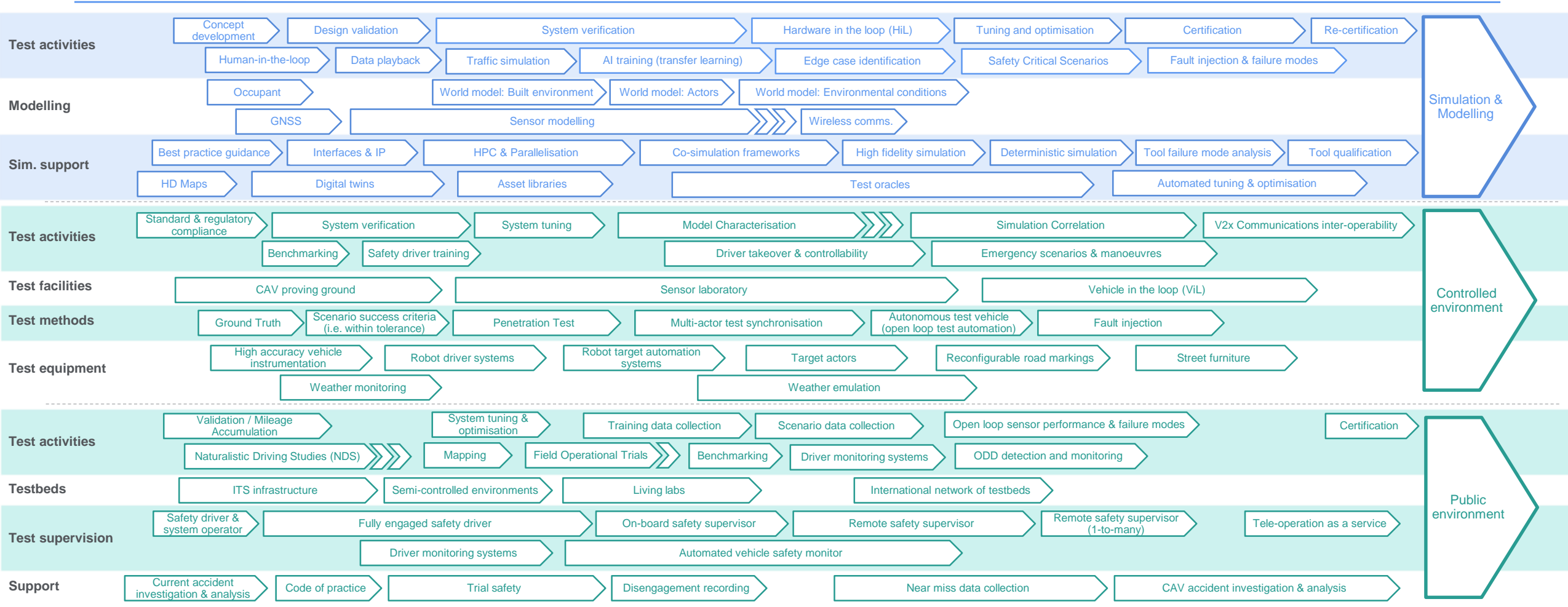
V&V Roadmap 1: Whole life certification & Systems Engineering

DRAFT



V&V roadmap 2: Test capability

DRAFT



Key roadmap stories



Trials to deployment to full lifecycle

Policy foundations – including new models for standard and regulatory approvals

Scenario based testing – realistic distributions of test cases, sampled for targeted and efficient testing. Context related acceptance criteria

Impact and dependencies on **other vehicle attributes**

Toolchain integration and evolution of **Product Lifecycle Management (PLM)**

Statistical validation arguments - evidence from full test programme, analysed for coverage and residual risk

Simulation for formal verification and validation – with associated tools, models and processes

Vehicle supervision – Moving from safety drivers towards operator and supervisor roles – including new monitoring and communication systems

Summary

- V&V is a critical enabler for CAV deployment
- Complex problem with inter-woven dependencies
- Road mapping should:
 - Challenge our understanding of the problem
 - Shape a clear and consistent message
 - Enable informed and targeted forward planning
- Next steps:
 - Final technical consultation on the roadmaps
 - Publication of a supporting white paper



Contact Details



Tim Edwards

BEng (Hons), MPhil, CEng, MIET

Senior Consultant
Connected and Autonomous Vehicles

Direct T: +44 (0)24 7635 5484
M: +44 (0)7787 280164
E: tim.edwards@horiba-mira.com

HORIBA MIRA Ltd.
Watling Street,
Nuneaton, Warwickshire,
CV10 0TU, UK

T: +44 (0)24 7635 5000
F: +44 (0)24 7635 8000

www.horiba-mira.com