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Multi-User Scenario Catalogue for CAVs (MUSICC)

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The Challenge – Assuring the Safety of Connected & Autonomous Vehicles

- Automation brings a step change in the complexity of software deployed on passenger vehicles.
- No longer possible to specify as traditional “rules-based” automotive software, so much harder to test.
- Not practical to certify Connected & Autonomous Vehicles (CAVs) by proving ground and road tests alone.
- Scenario-based simulation methods are gaining acceptance as the way forward, to achieve the required “mileage” and test coverage.
- To support both of these, there is a strong need for a common scenario definition language and database of scenarios.
- Underlines a need for open collaboration between regulators and industry.
- The MUSICC project is addressing this, to support the creation of future CAV regulations

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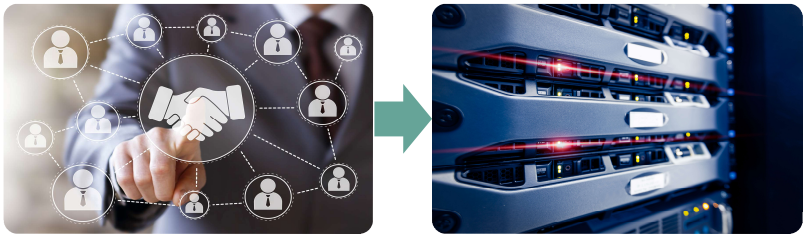
Objectives and Approach

Objectives:

- Create a standard language to describe scenarios
- Build an open and extensible library of scenarios for CAV certification
- Focus on simulation testing environments

Approach:

- 12-month proof-of-concept demonstration project.
- Close collaboration with vehicle manufacturers, developers, organisations with expertise in CAV validation and international regulators.
- Define a scenario format based on a wide consultation.
- Enable openly-accessible scenario platform.



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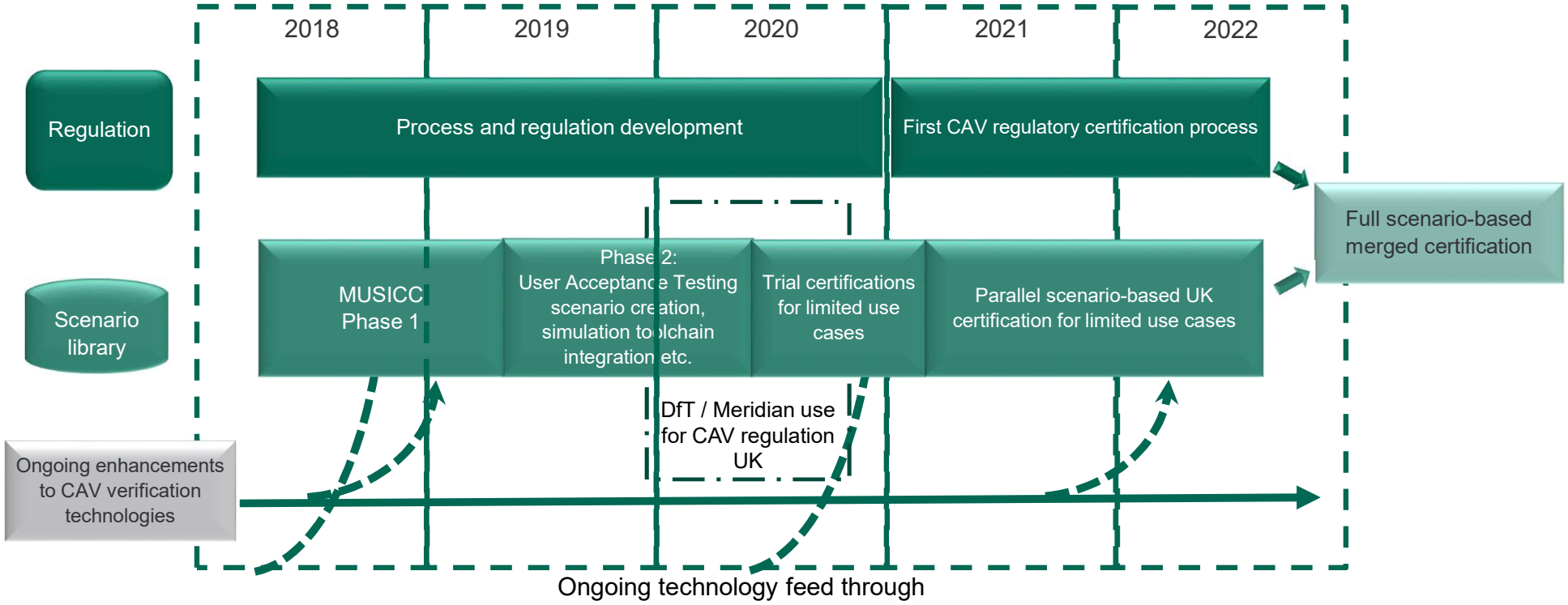
MUSICC and The Regulatory Roadmap



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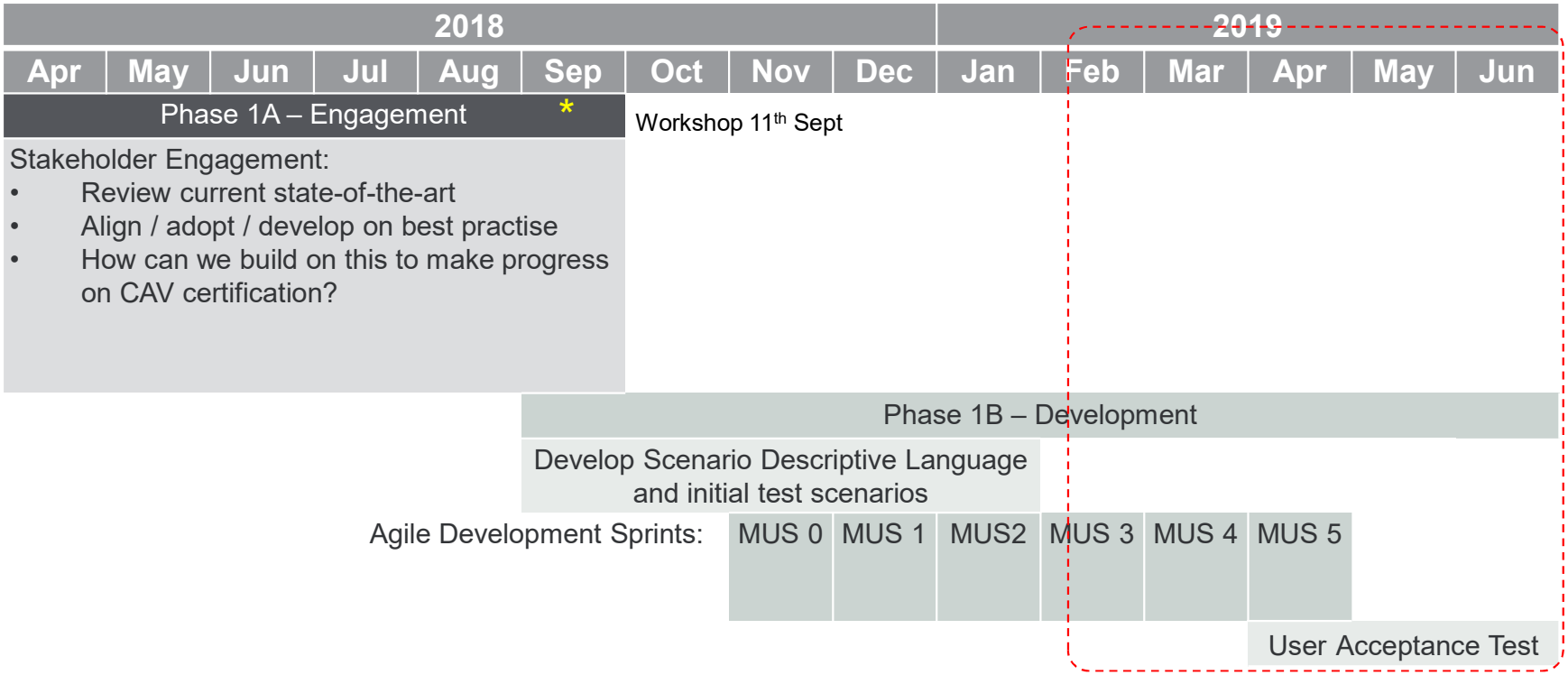
MUSICC Phase 1 Project Timeline



Aim: to produce a working, openly-accessible, easily extensible proof-of-concept system by end of **April 2019**

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Phase 2+ Scope

The following are out of scope for Phase 1 but are proposed for future Phases.

- Creation of scenarios to populate the library (Phase 1 includes a nominal number of scenarios for prototype testing to prove the concept)
- Curation interface for scenario management
- Interfacing with existing simulation toolchains
- Defining what ‘good’ looks like – pass/fail criteria included in the scenario definition
- Creation of digital version of rules of the road

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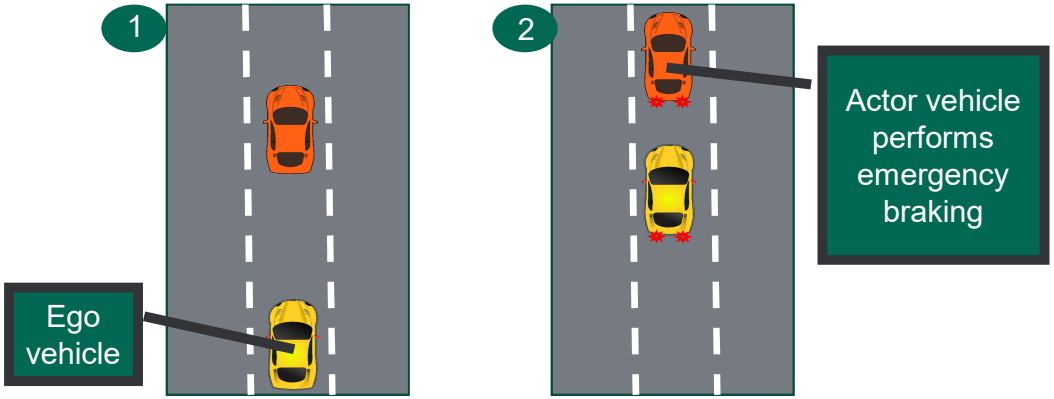
What's a scenario?



Coverage:

- Normal driving
- Edge and corner cases
- "Middle" cases (e.g. temporary cones closing a lane on a motorway)
- Every country + Operating Domain

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Scenarios for Regulation

Neutrality / Fairness

- Work with all ADS implementations
- Not be influenced by commercial goals
- Shouldn't constrain OEM USP features

May not require the full scope of development testing

- Different objectives & targets (safety focus)
- Results presented for different users
- Should support both randomisation and repeatability

Must work within the wider regulatory framework

Must work equally well across different regions

- For example, the UK drives on the left. Signage etc

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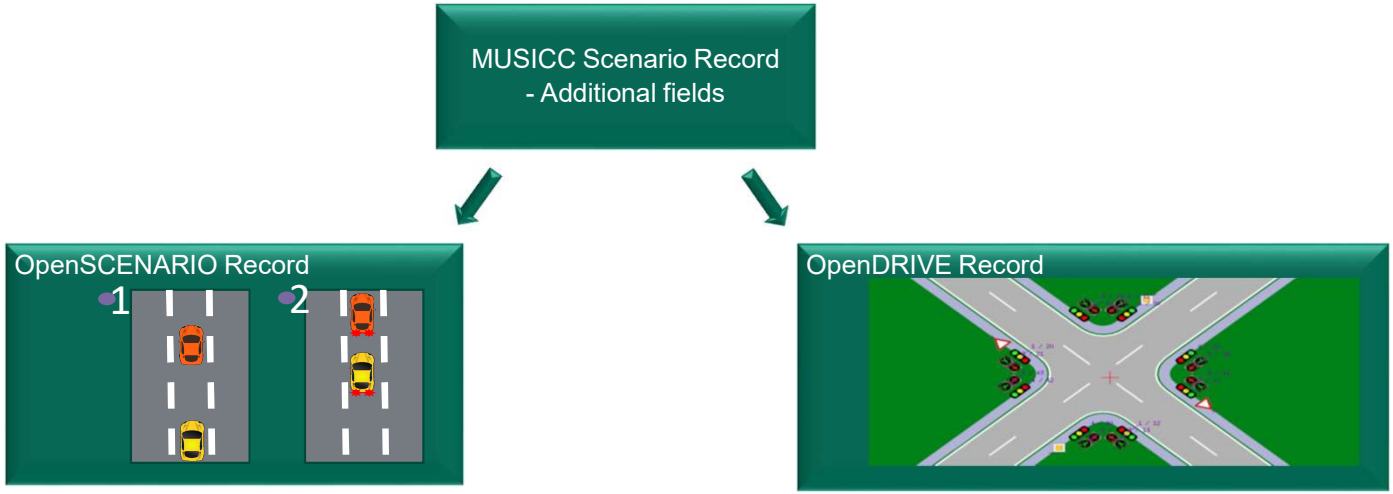
Scenario Description Language

- The Scenario Description Language is a key part of MUSICC's deliverables
  - Defines a format for representing scenarios (fields and data structures needed)
  - Stakeholders will be more willing to engage if a standardised or widely-compatible format is used



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Scenario Description Language

- Given the industry momentum of OpenSCENARIO, we will adopt it as our primary export format
- Internal format will be based heavily on OpenSCENARIO, with two additions:

METADATA
- Country(s) of applicability
- Road type
- Key characteristics (e.g. load shedding, snow, cut-in)
- ….

PARAMETER RANGES
- Likely to follow PEGASUS in defining uniform or Gaussian distribution
- Values to be randomly chosen on export of scenario

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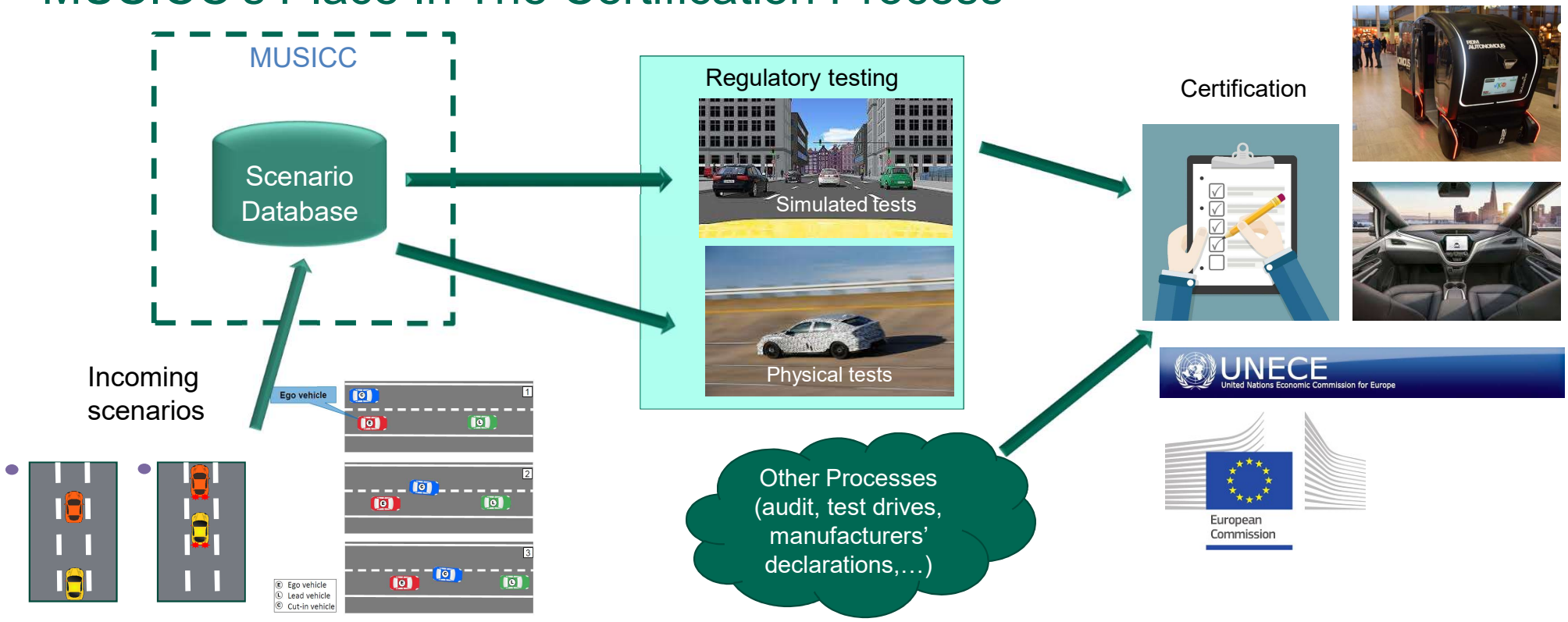
MUSICC's Place In The Certification Process



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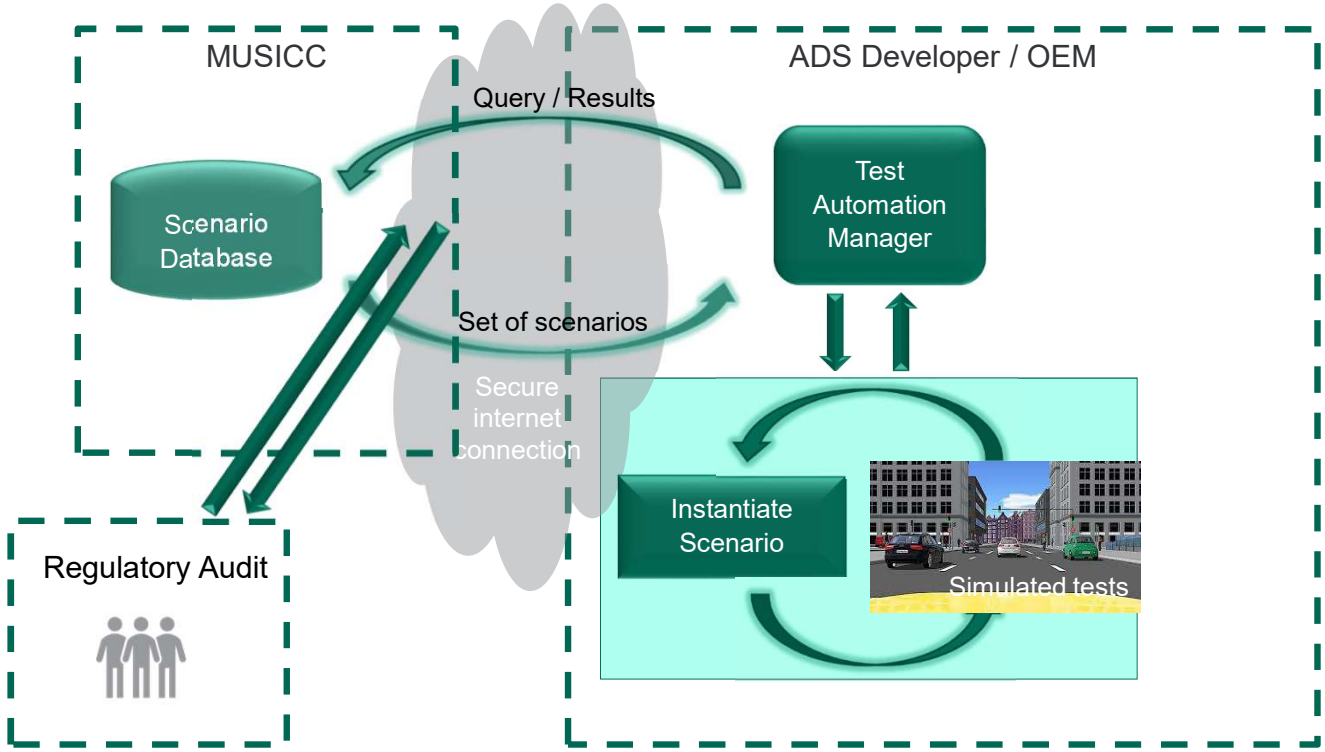
MUSICC's Place In The Test Tool Chain



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Moving Britain Ahead

April 2019