MUSICC

Multi User Scenario Catalogue for Connected Autonomous Vehicles

Vision for MUSICC

Zeyn Saigol

Principal Technologist | 24th June 2019

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The challenge

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Why is HAV verification hard?

- An automated driving system (ADS) is far more complex than previous automotive cyber-physical systems
- It must cope with:
  - chaotic behaviour of other road users
  - complex junctions, variability in roads
  - weather and perceptual challenges

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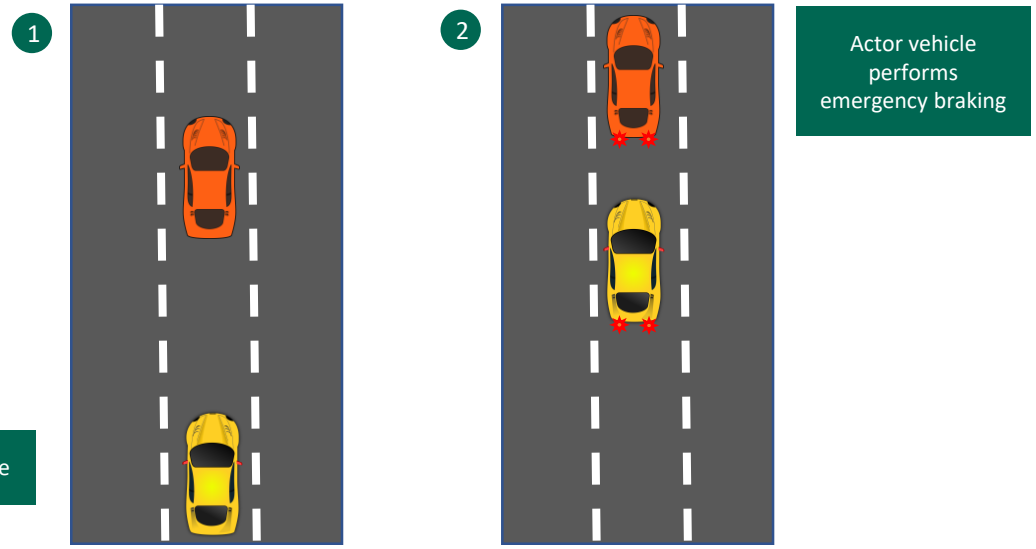
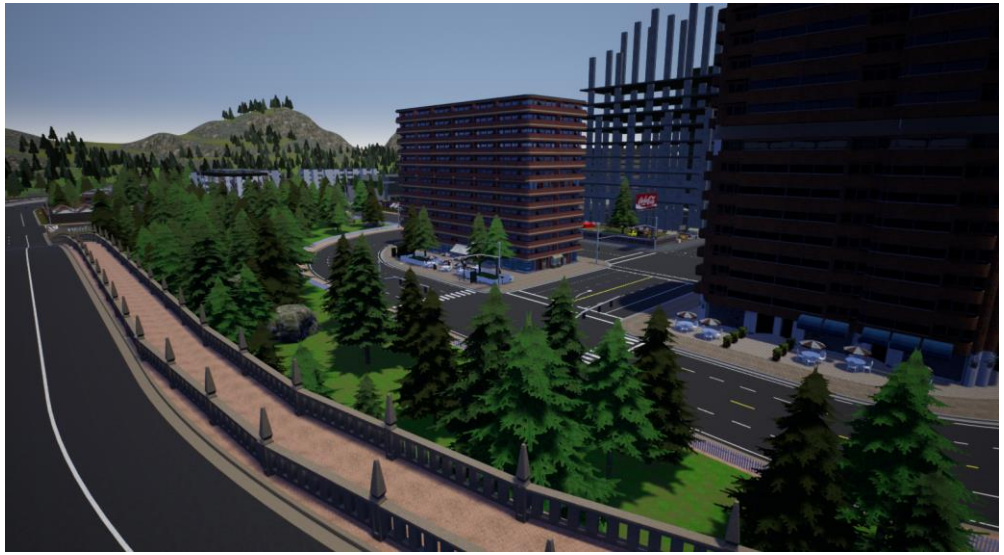
Solutions for HAV verification

Can't test on public roads: "To demonstrate that fully autonomous vehicles have a fatality rate of 1.09 fatalities per 100 million miles [...] with a fleet of 100 autonomous vehicles being test-driven 24 h a day, 365 days a year at an average speed of 25 miles per hour, this would take about 12.5 years."[1]



Scenarios: avoid uninformative testing



CARLA Simulator

Simulation: run tests much more efficiently

[1] "Driving to safety: How many miles of driving would it take to demonstrate autonomous vehicle reliability?" Nidhi Kalra & Susan M. Paddock, RAND Corporation 2016. https://www.rand.org/pubs/research_reports/RR1478.html

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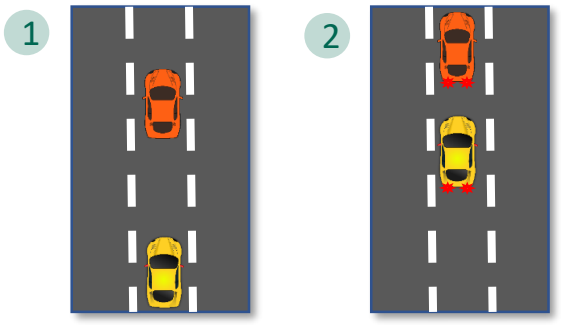
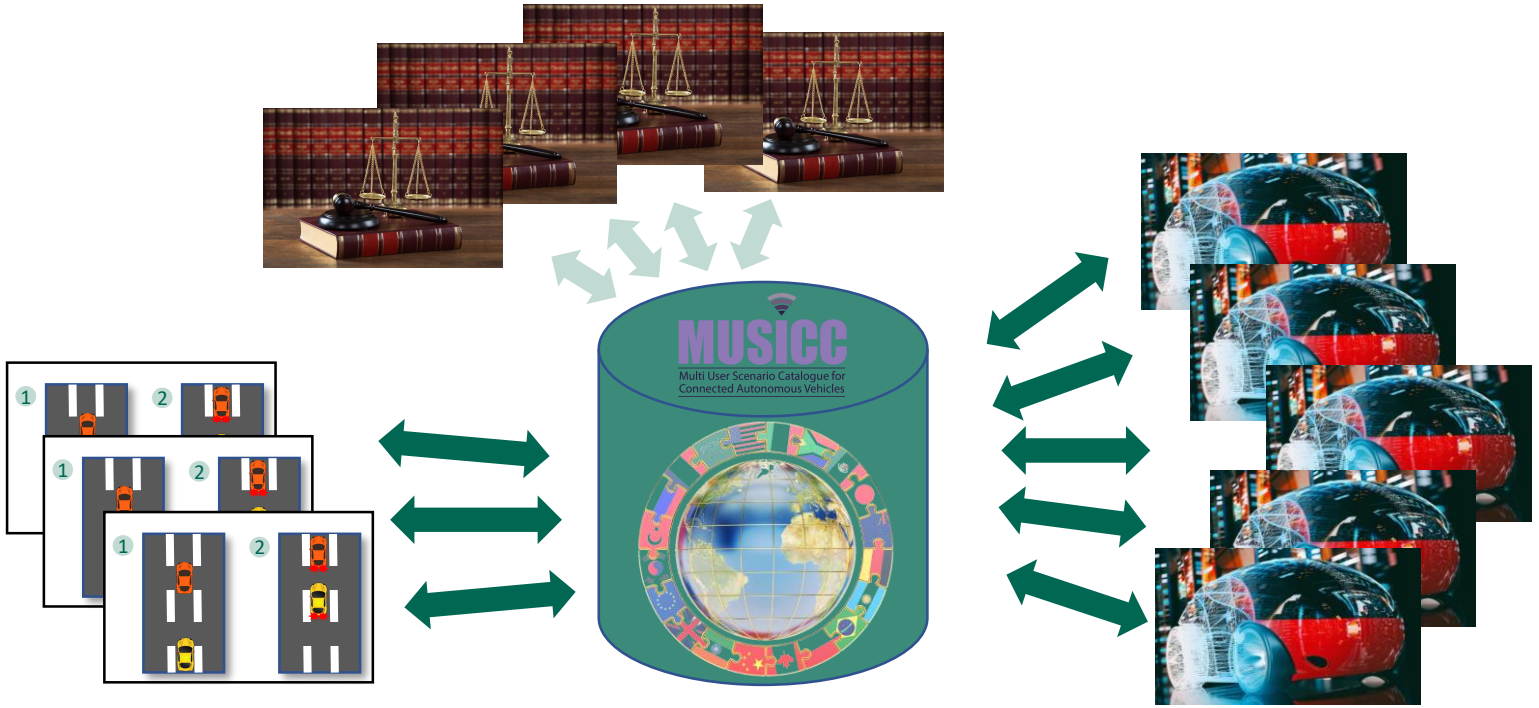
What does this mean for regulation?



- Traditionally regulations specify a concise, explicit performance standards
- Most stakeholders are clear that scenarios represent the most effective way of specifying the test cases for certification
  - Given enough scenarios at the right level of abstraction, almost all cases can be captured



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Objectives and approach

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Objectives:

- Create a language to describe scenarios, aligned with industry standards
- Build an open, online library for HAV certification scenarios

Approach:

- Proof-of-concept project, Apr 2018 – Mar 2020
- Close collaboration with vehicle manufacturers, ADS developers, organisations with expertise in HAV validation, and regulators

MUSICC scope and context

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Incoming scenarios

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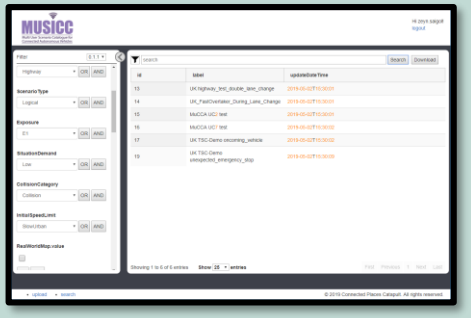
Scenario library

Export API



Web Interface
- Browse scenarios
- Support for import
- Basic editing

Regulatory testing

UNECE WP.29

MUSICC scope and context

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- We've now built this
- Our philosophy is to learn-by-doing
- Some of the doing and learning must come from the community!

Incoming scenarios

Scen
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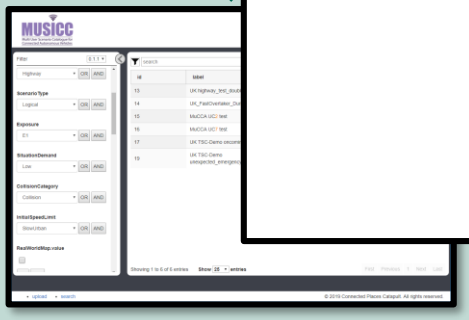

- Basic editing

y testing

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Step 1: Create a common scenario format

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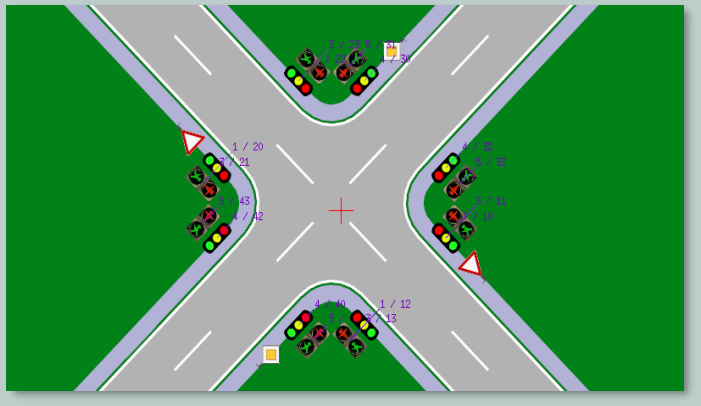
The Scenario Description Language (SDL) is a key part of MUSICC's deliverables.

- 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

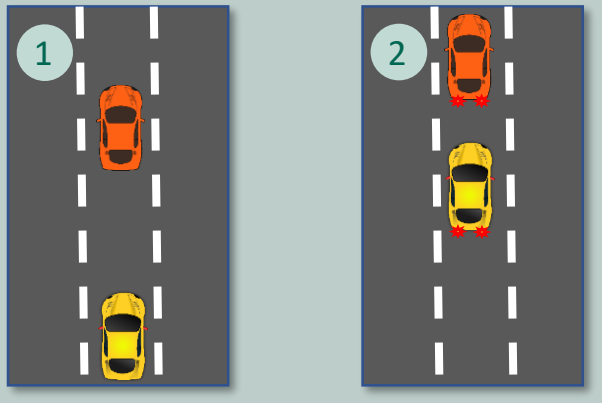
MUSICC scenario description language

MUSICC Scenario Record
- Metadata
- Parameter stochastics
- Ego goal
- 3D models

OpenDRIVE Record



OpenSCENARIO Record



The SDL has been developed based on:

- Stakeholder input, especially the September 2018 MUSICC workshop
- Industry-standard formats (ASAM OpenX)

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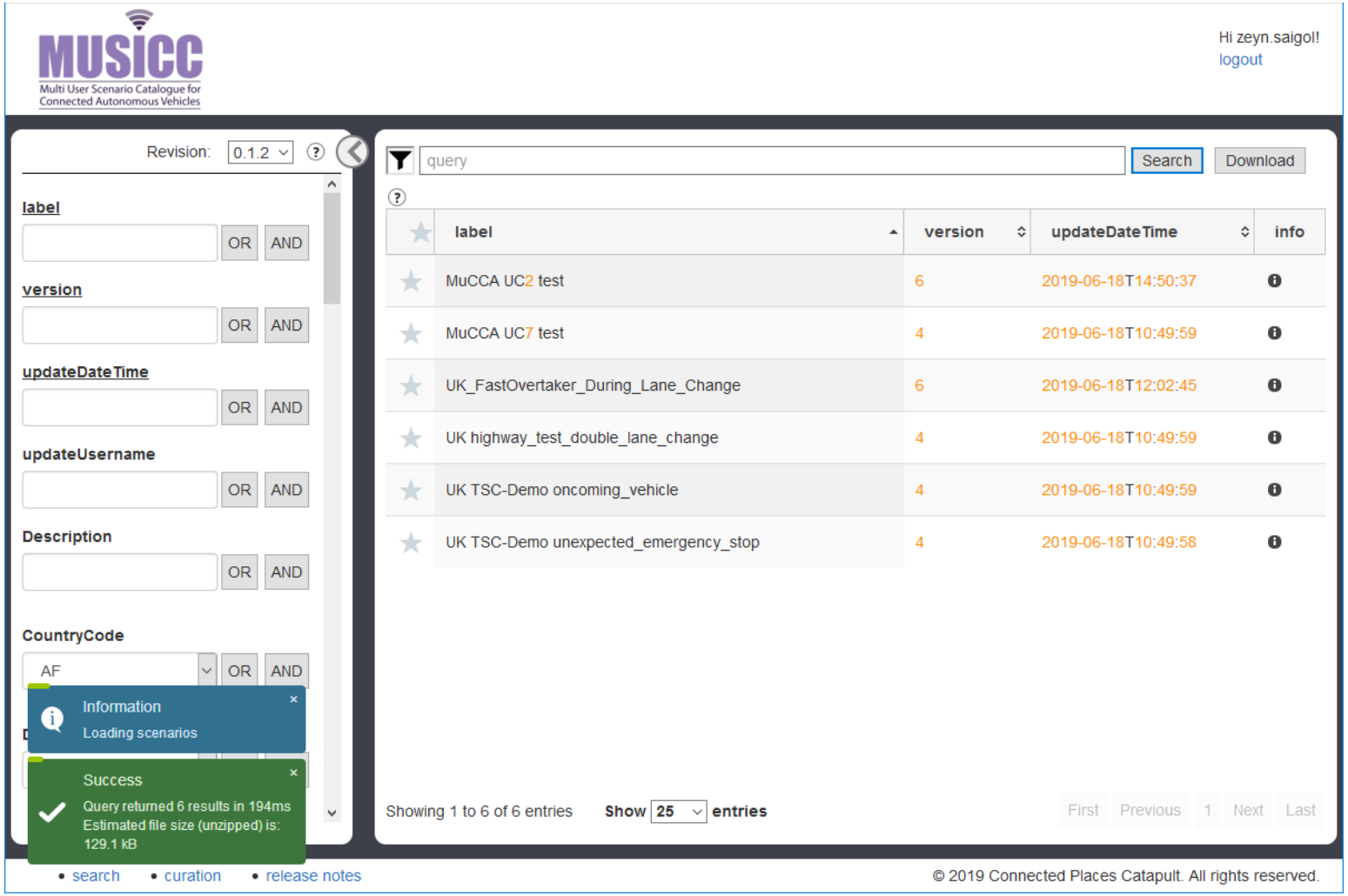
Step 2: Create a online DB system



To be demoed this afternoon…

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What is the vision for MUSICC?

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Help bring a certification framework to life

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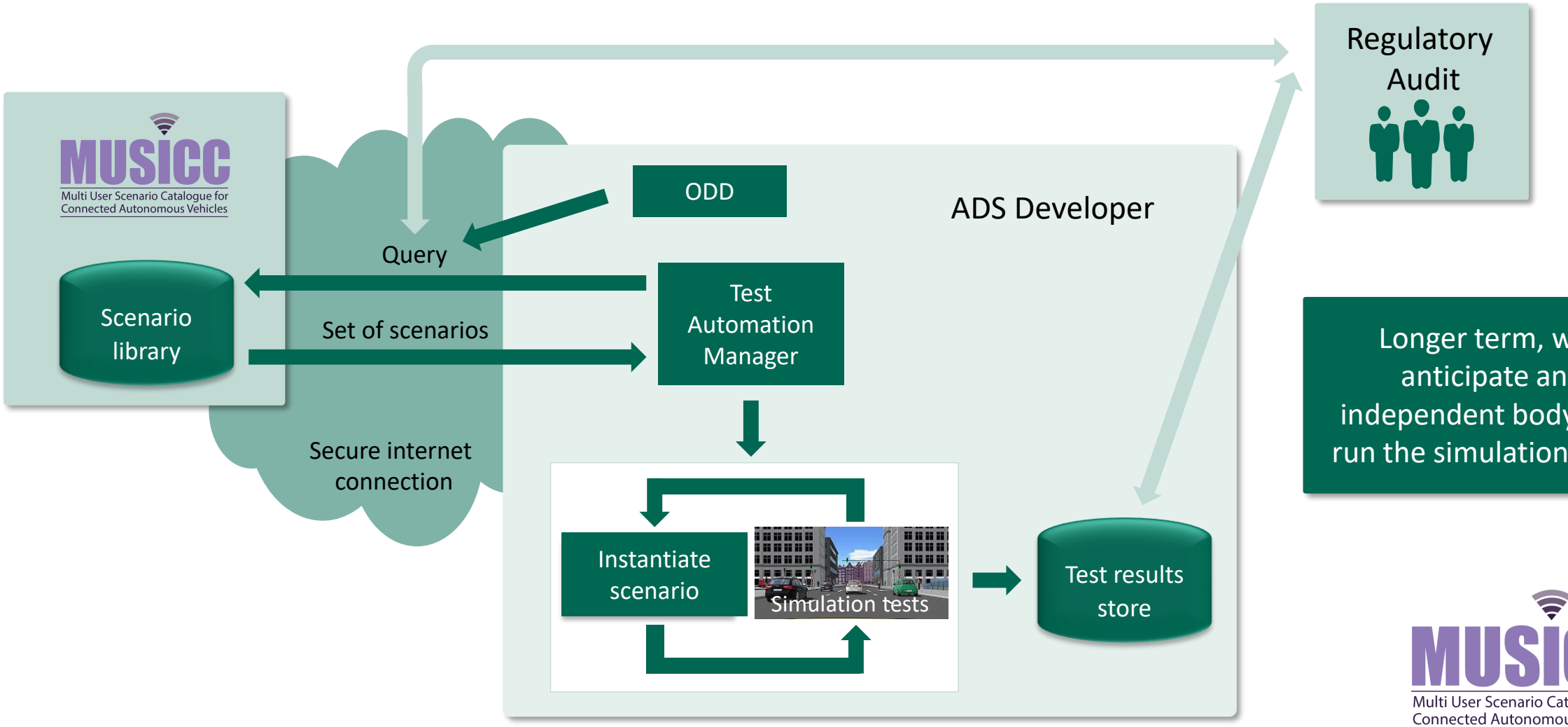

Longer term, we anticipate an independent body will run the simulation tests

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MUSICC vision

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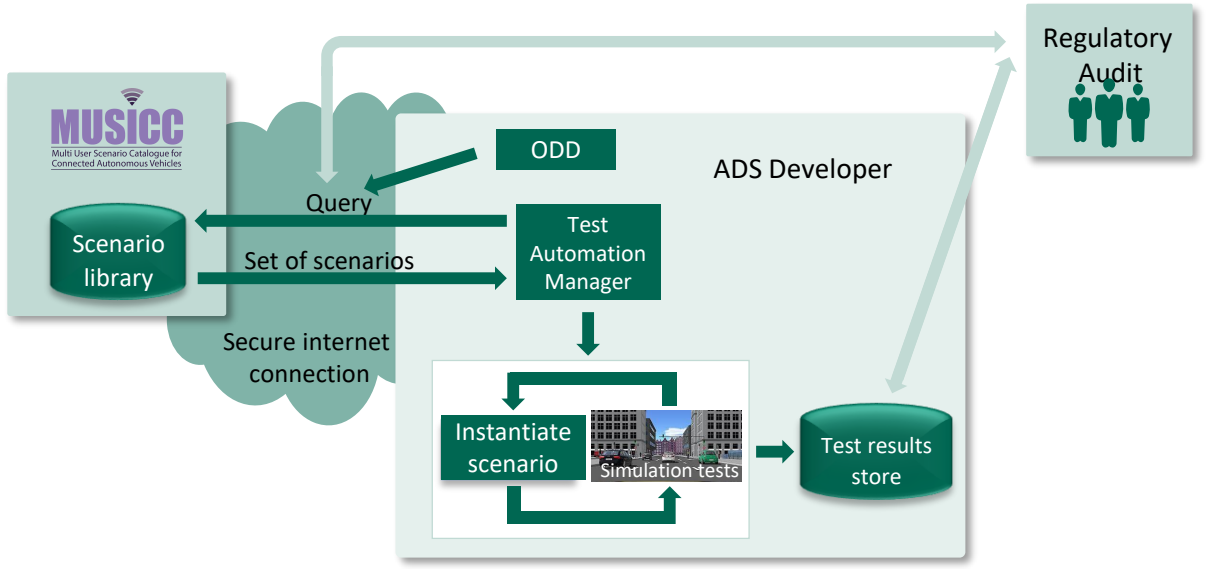

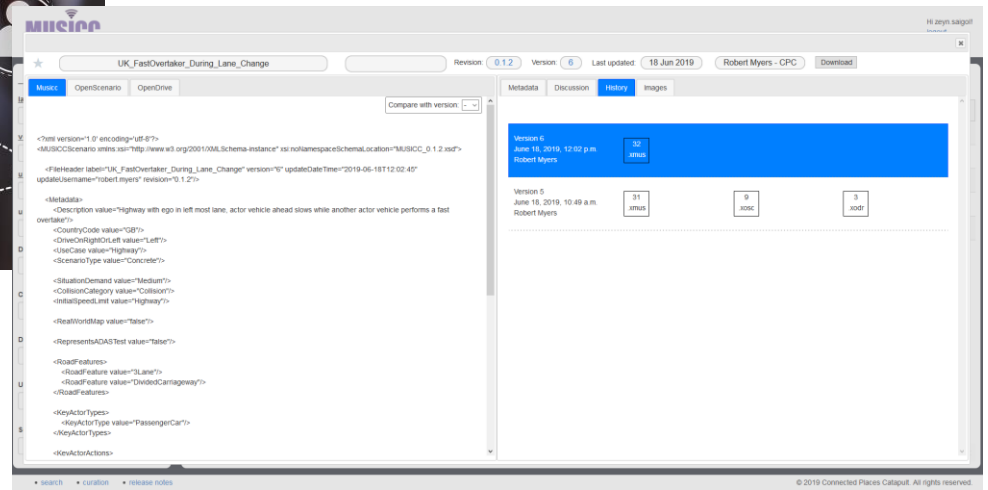

Timeline and plans

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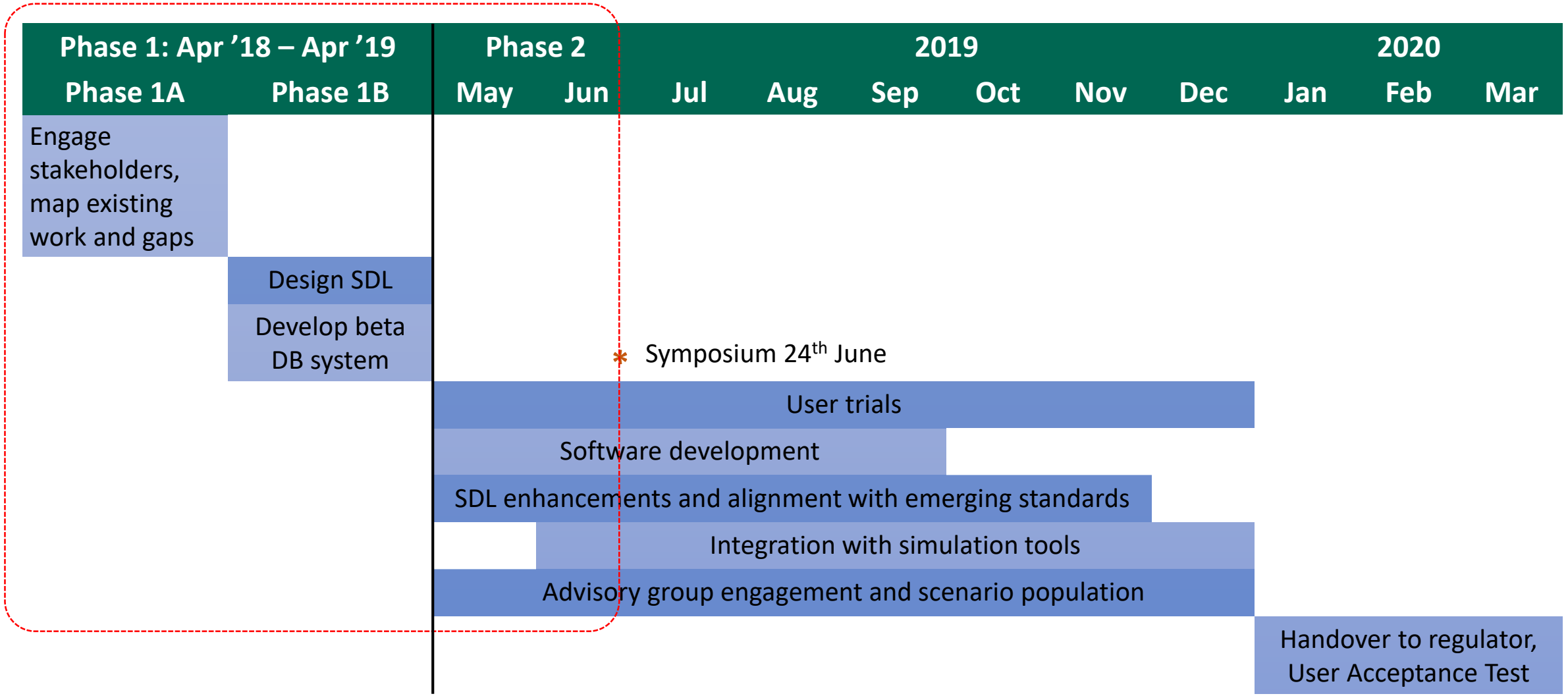

Scene setting for independent certification

- For example, US culture is to minimise regulation and rely on market forces

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- Mary Schiavo, former Inspector General at the US DoT, on the FAA:

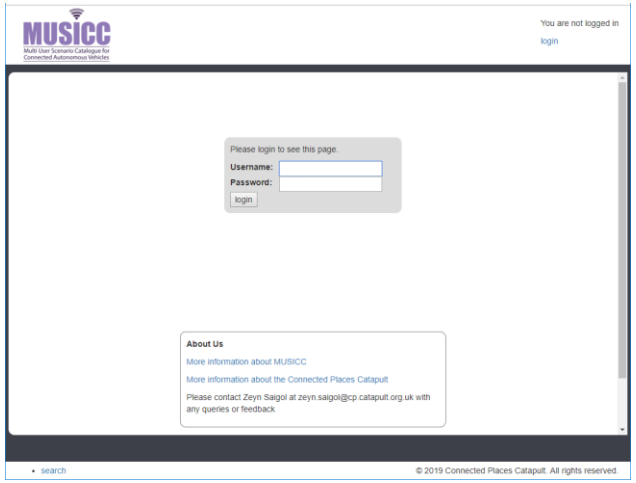
  "They pretend to inspect, and Boeing pretends to be inspected, when in fact Boeing is doing it all almost entirely by itself"[1]

- US senator Richard Blumenthal said the FAA had:

  "put the fox in charge of the henhouse"[1]

[1] "What went wrong inside Boeing's cockpit?"
Theo Leggett, https://www.bbc.co.uk/news/resources/idt-sh/boeing_two_deadly_crashes

User Trials: Invitation



The MUSICC system is officially open for beta users!

User trials will run until 29th Nov 2019.
To register, please email:
musicc-support@cp.catapult.org.uk

- Key benefit for participants is the chance to **influence the end shape of MUSICC**, and therefore indirectly influence the UK and UN's future CAV regulatory framework
  - Especially in terms of scenario formats and interoperability
- For the MUSICC team, our aim is to ensure we're building something that is both effective and acceptable to the community

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Thank you for your attention

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zeyn.saigol@cp.catapult.org.uk