

Understanding simulation requirements: Approaches and use cases

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VMAD SG2: Simulation
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Evaluation continuum

Digital World



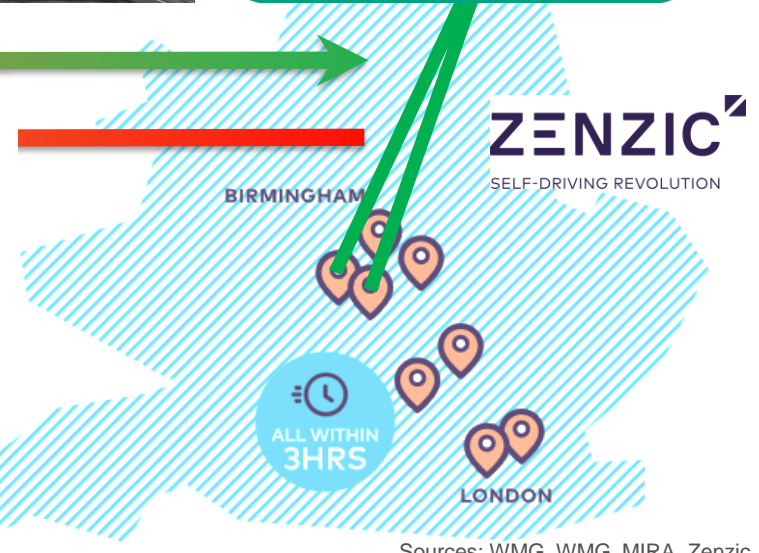
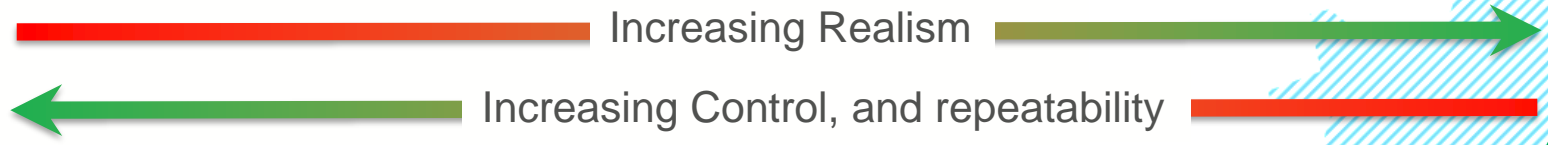
Simulated Environment



Controlled Environment



Public Environment

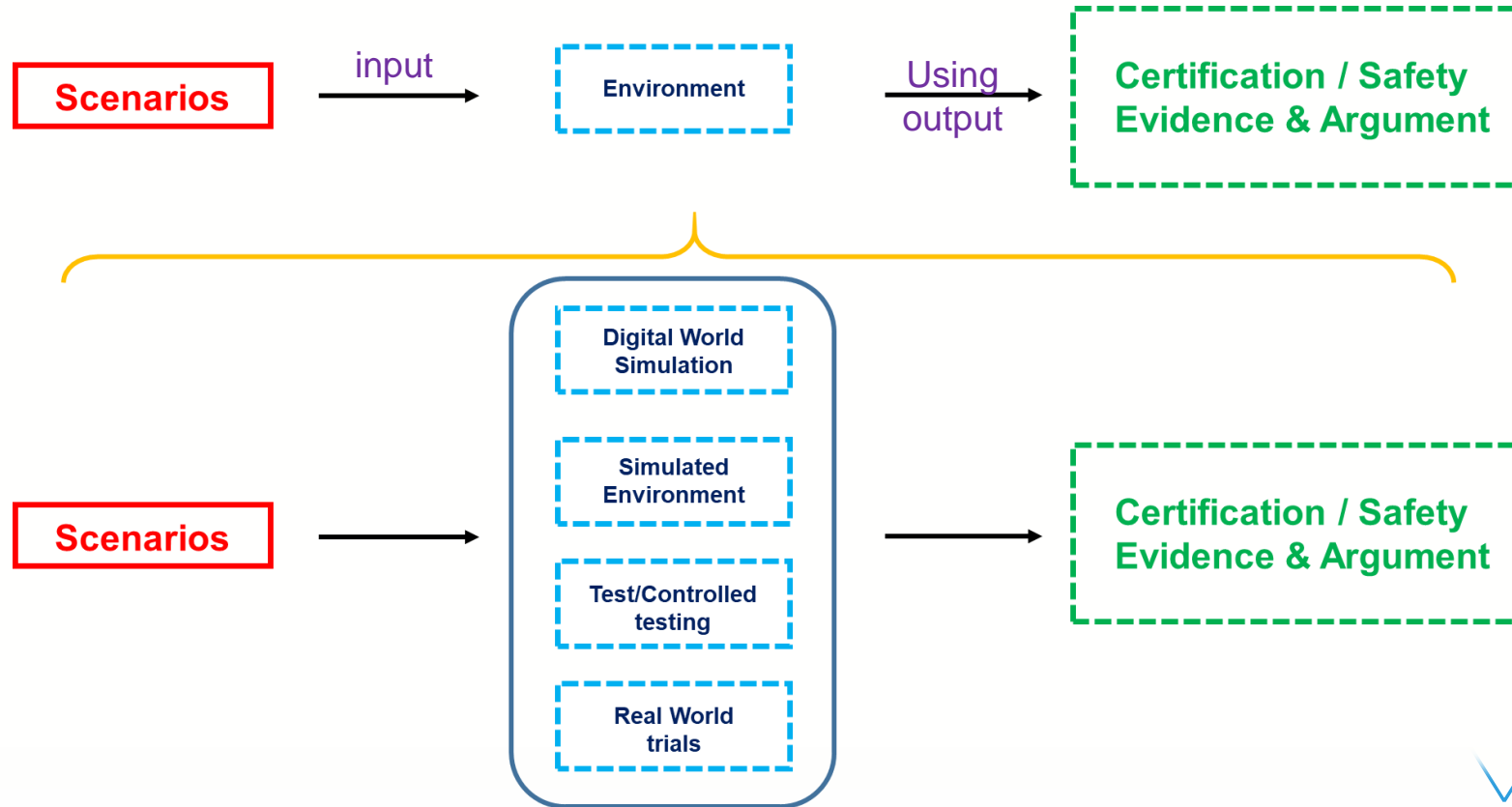


A springboard for scalable, real-world future mobility technologies and services.

Implementing the Evaluation Continuum



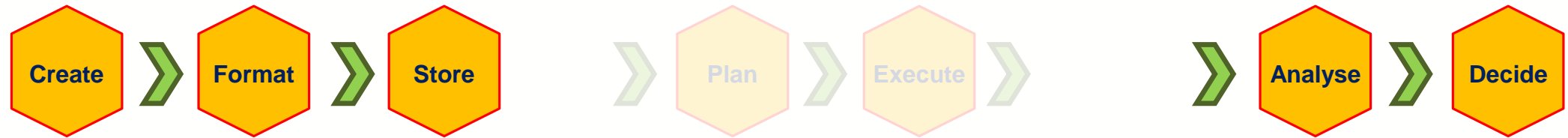
Implementing the Evaluation Continuum



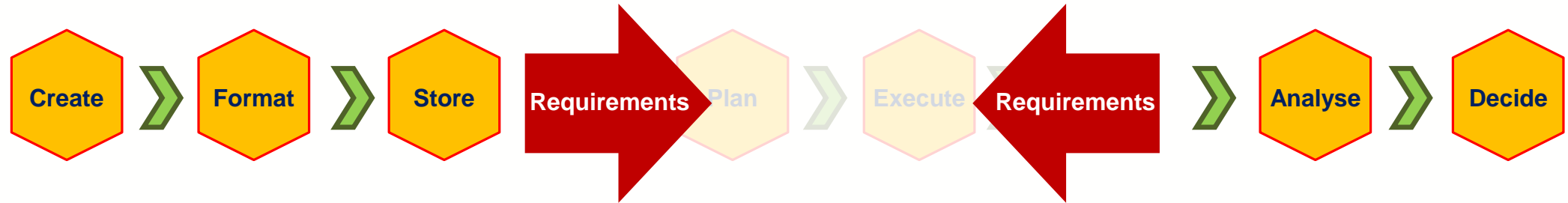
Implementing the Evaluation Continuum



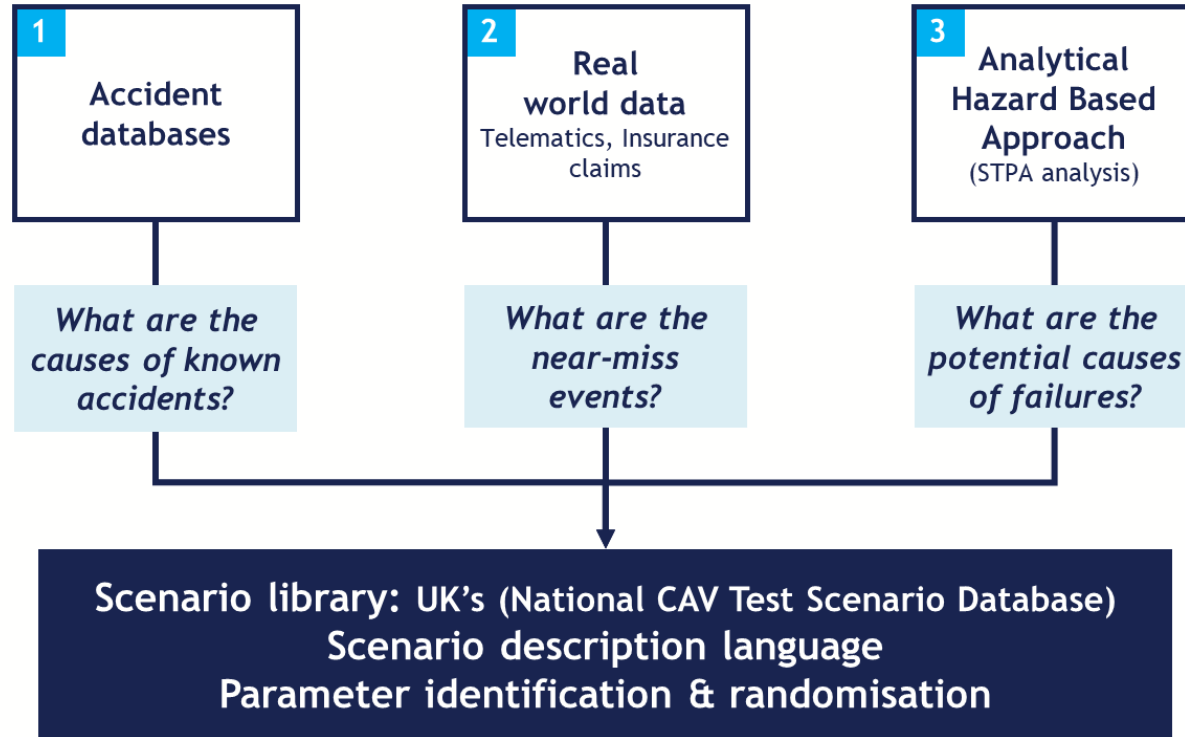
Implementing the Evaluation Continuum



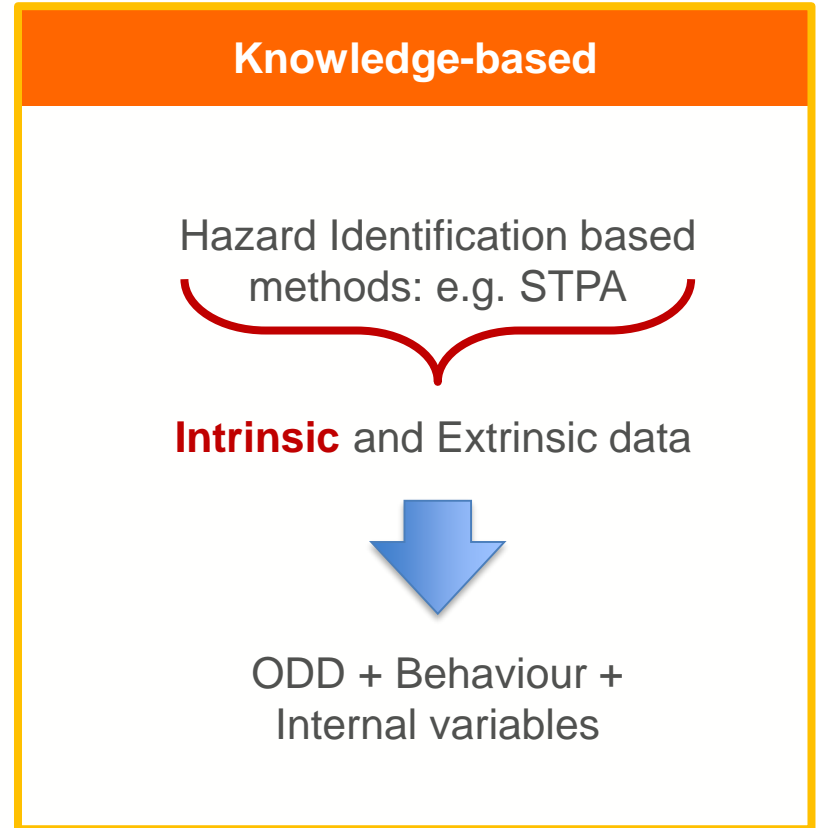
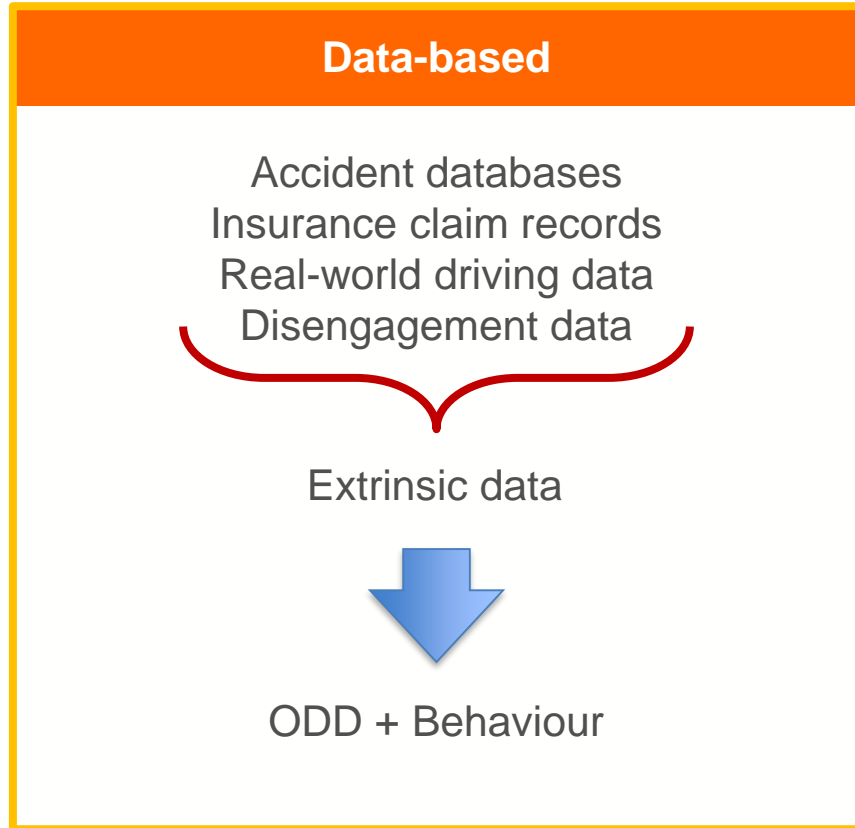
Implementing the Evaluation Continuum



Scenario Content Generation



Scenario Content Generation



STPA Scenario Parametrisation

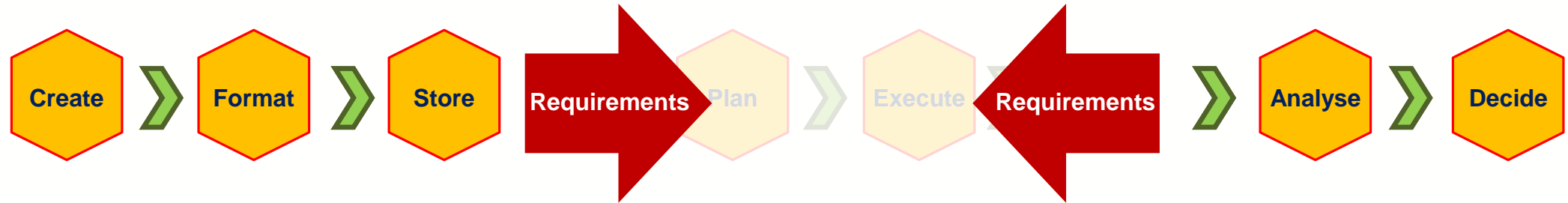
UCA #	UCA	Parameters				
		Scenery	Dynamic elements (exclusive of subject)	UCA specific context	UCA how (INTa = negate; INTb = same; EXT = same)	UCA how parameters
8b	Localization provides pose which doesn't match the ground truth	From scenery library	From dynamic elements library	pose doesn't match the ground truth	delay time which sensor data delayed	delay time which sensor data delayed

Scenario Type	Pass Criteria 1 (negate belief)	Pass Criteria 2 (negate because)	Observation points needed (Pass criteria + initial state observation)	Stimulation points needed
INTb	Obtaining Pose block shall not believe it has the correct pose	CE shall be high (i.e., sensor data is not coherent)	Measure CE, Measure sensor data coherency	sensor feeds, request to move, filter output

For more details about STPA based scenarios, please contact [Siddhartha Khastgir](#)



Implementing the Evaluation Continuum



Our Vision: To test or evaluate any new technology (infrastructure, communications and on-vehicle) in **representative** real world conditions with a **“driver” in the loop**



WMG's 3xD Simulator
for intelligent vehicles



UKAutodrive



AURRIGO
DRIVERLESS TECHNOLOGY

UKAutodrive

AURRIGO
DRIVERLESS TECHNOLOGY

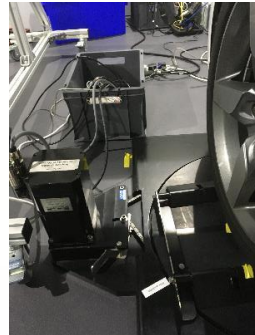
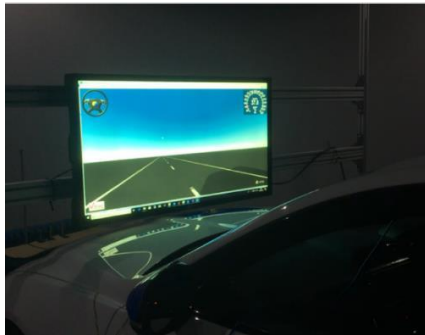
podzero

Test setup (use cases)



- UK Govt. (CCAV) funded project – INTACT
- Project partners: Aurrigo, WMG
- Low-speed shuttle closed-loop testing
- Injection **behind the** “physical” sensors
- Intrinsic & extrinsic scenario parameters

Test setup (use cases)



- UK Govt. (CCAV) funded project – SAVVY
- Project partners: AVL, WMG, Vertizan, Horiba MIRA
- Conventional vehicle
- Radar & camera based sensors
- Injection **in front** of the “physical” sensors
- Intrinsic & extrinsic scenario parameters



Summary

Simulation will inevitably play a key role in ADS verification & validation process.

Simulation fidelity is dependent on the input to it. (scenario content, format, pass criteria)

Simulation fidelity is also dependent how the evidence is going to be used.

Simulation fidelity is sub-divided into sensor, environment, vehicle dynamics etc. (to be treated separately).

Success will be dependent upon suitable collaboration and data sharing, nationally and internationally.



Thank you... Discussions...



CRUISE CONTROL

Cruise control sometimes known as speed limiter or auto-brake, is designed to automatically maintain the speed of a motor vehicle. This system is a non-safety-critical feature that allows the driver to maintain a steady speed as set by the driver.

Cruise Control

5G

5G is the fifth generation of mobile network technology. It is designed to be faster, more reliable, and more efficient than 4G. It is expected to be widely available by 2020.

BLUETOOTH

Bluetooth is a wireless technology standard for exchanging data over short distances from fixed and mobile devices, without cables. It is used for many applications, including mobile phones, laptops, and other devices.

START/STOP

START
STOP