



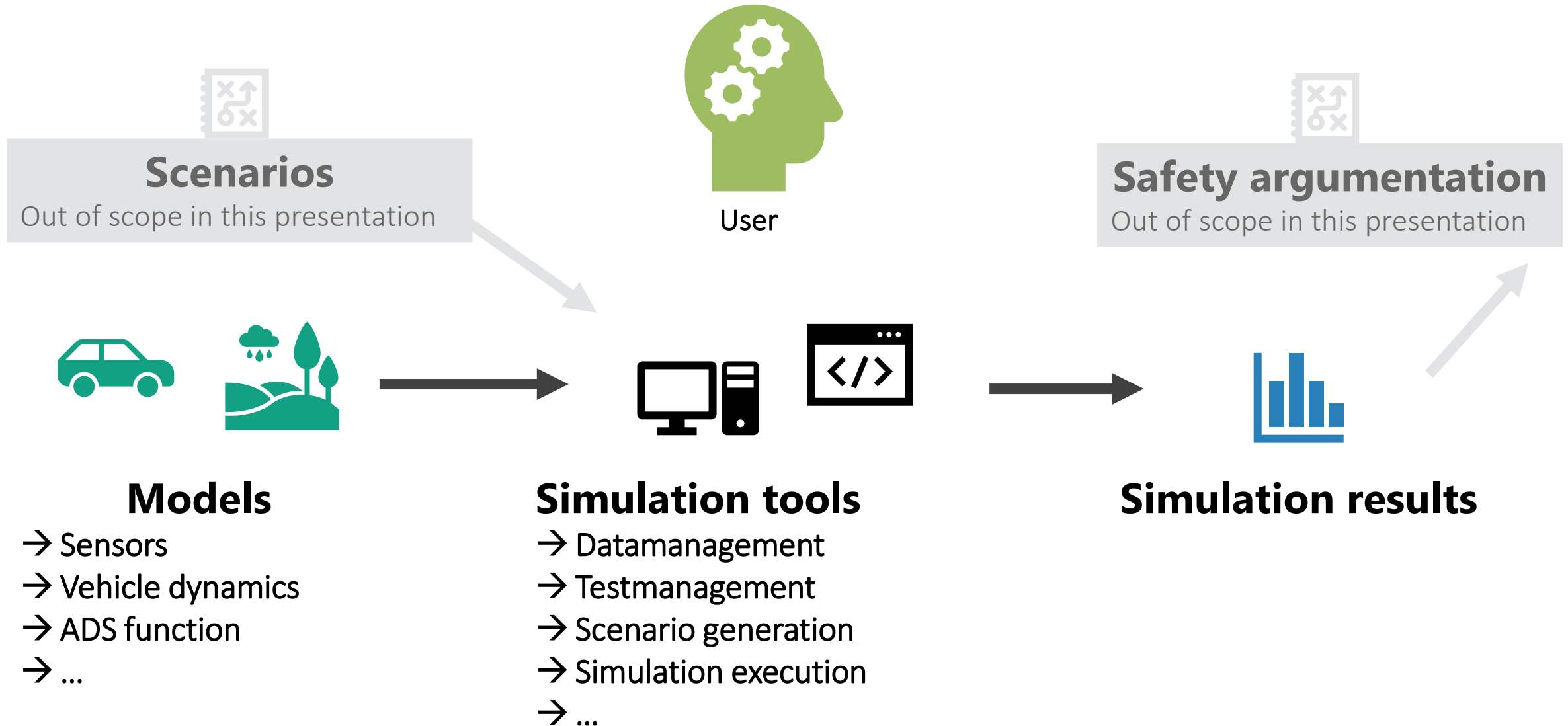
VMAD SG2:Simulation

REQUIREMENTS FOR VIRTUAL VALIDATION

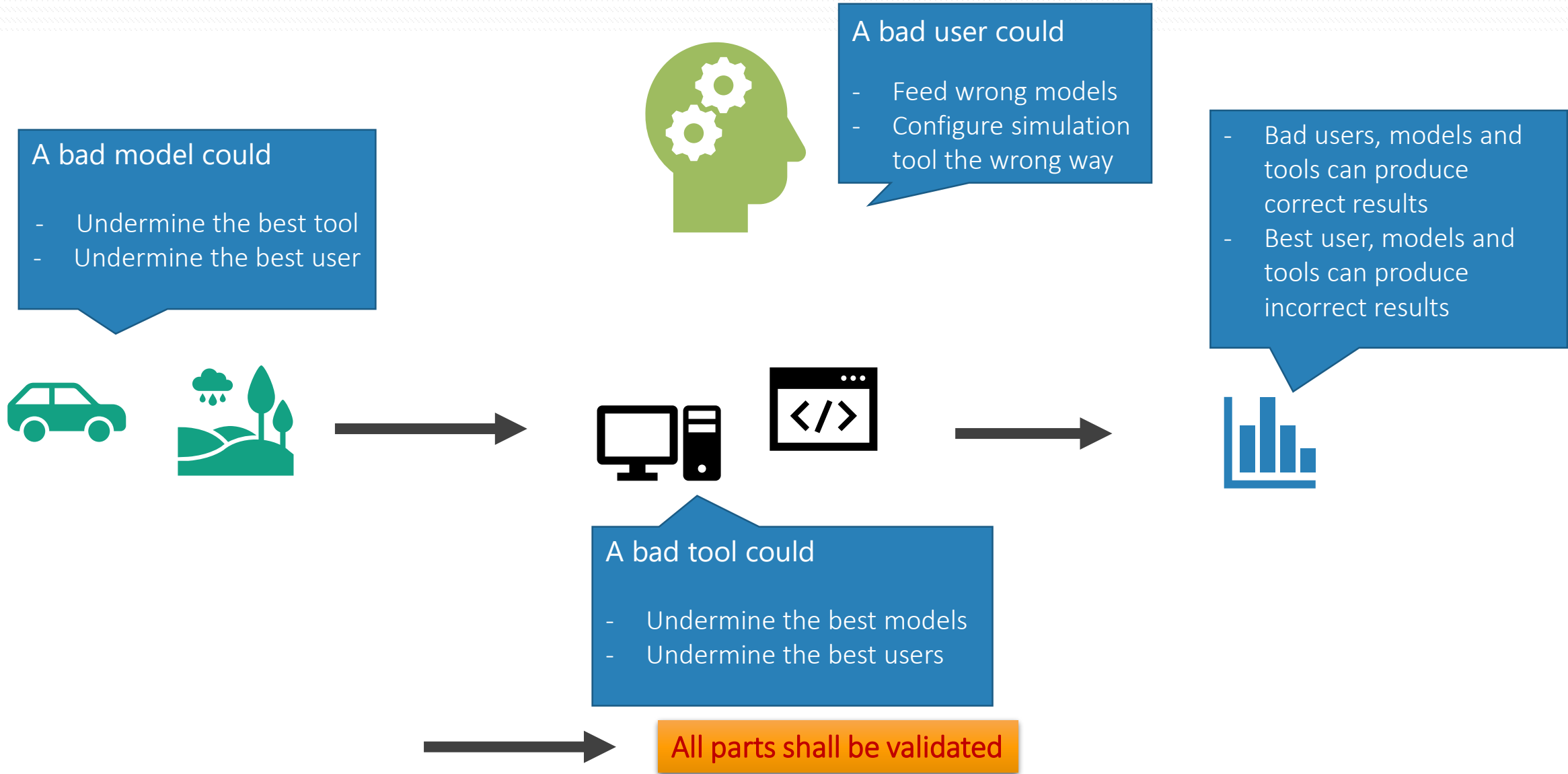
03 MARCH 2021

Christoph MIETHANER
CITA REPRESENTATIVE – TÜV SÜD

ESSENTIAL PARTS FOR ADS SIMULATION



ESSENTIAL PARTS FOR ADS SIMULATION

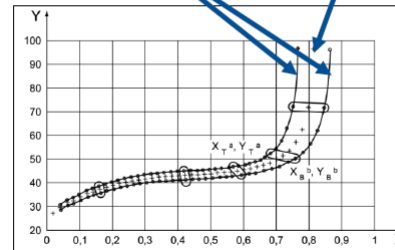


MODEL VALIDATION



Vehicle dynamics model

Tolerance band around Simulation
for physical tests



Deterministic model validation

ISO 19364:2016

Passenger cars — Vehicle dynamic simulation and validation — Steady-state circular driving behaviour

ISO 19365:2016

Passenger cars — Validation of vehicle dynamic simulation — Sine with dwell stability control testing

ISO/DIS 22140

Passenger cars — Validation of vehicle dynamics simulation — Lateral transient response test methods

Applicable standards



All models must be validated according state of the art or state of research

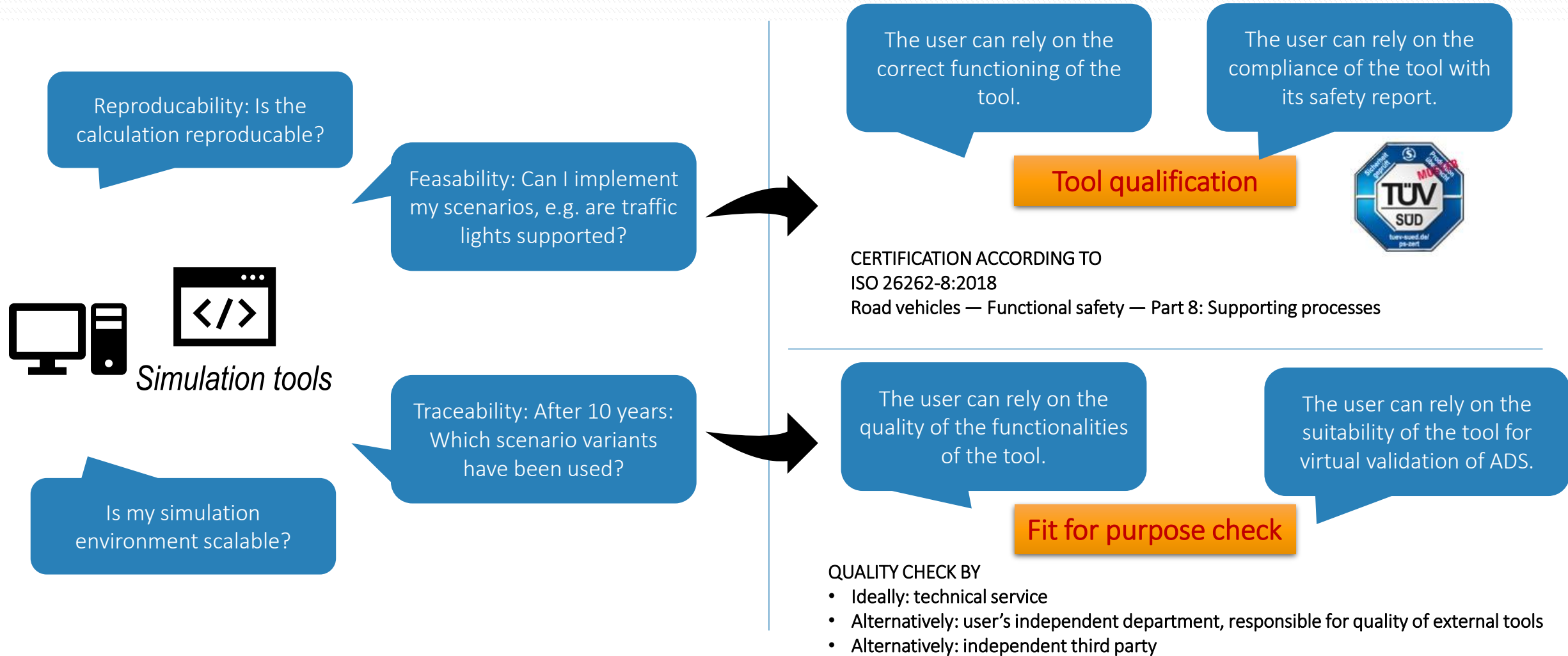


Models have dedicated scenarios & metrics for validation defined by standards

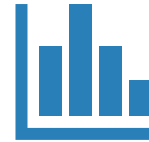
More details in presentation VMAD-SG2-11-02 from AVL:

<https://wiki.unece.org/download/attachments/117510393/VMAD-SG2-11-02%20AVL%20Presentation%20rev..pdf?api=v2>

TOOL QUALIFICATION & VALIDATION



VALIDATION OF SIMULATION RESULTS



- Technical services shall perform spot checks for correlation between simulation results and test track results
- Validation scenarios & evaluation metrics for simulation results should be the same [in principle] as for ADS validation, because virtual validation of ADS should produce same results for the evaluation metric in the same scenarios as on test track.
- Test track results must not be resimulated to avoid manipulation of simulation results
- Validation scenarios must not match training scenarios for the simulation

More details in presentation VMAD-SG2-11-02 from AVL:

<https://wiki.unece.org/download/attachments/117510393/VMAD-SG2-11-02%20AVL%20Presentation%20rev..pdf?api=v2>

IT'S ABOUT TRUST IN VIRTUAL VALIDATION (1/2)



Model documentation

Applied processes for model validation according state of the art or state of research

Calculation of model accuracy



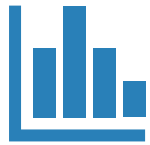
Simulation tool documentation

Documentation of the used tool (version, configuration etc.) for traceability

Documentation of tool qualification

Documentation of fit for purpose check

IT'S ABOUT TRUST IN VIRTUAL VALIDATION (2/2)



Simulation results documentation

Submission of all simulation results for traceability and reproducibility purposes

Submission of training and validation scenarios to ensure validation by technical service won't happen with training scenarios

Proof that the ADS passed all simulations under consideration of all uncertainties for simulation results, under consideration of model accuracy



User documentation

Documentation of experience & educational background

Documentation of trainings, certificates

Documentation of regular practice in simulation area



THANK YOU

www.citainsp.org

Rue du Commerce 123 - 1000 Brussels, Belgium

+32 (0)2 469 06 70

secretariat@citainsp.org