“Credibility Assessment”
Cornerstone of validation

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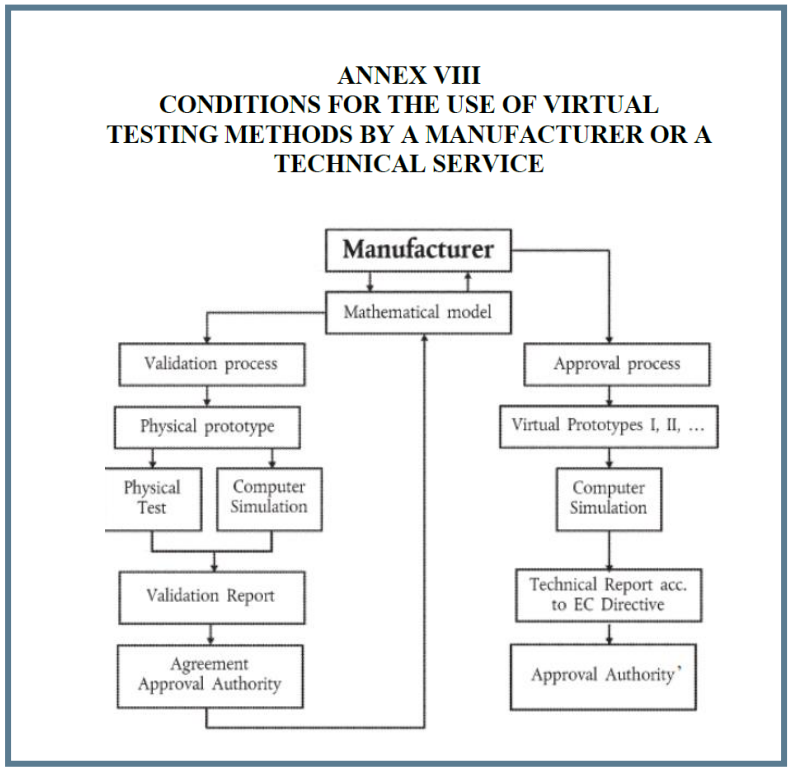
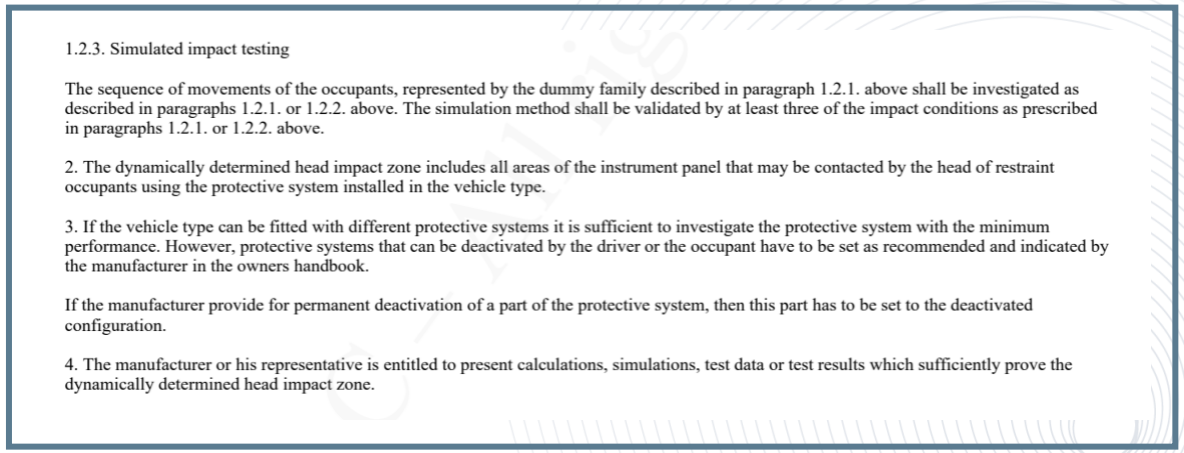
Current Applications

Today, there are two possibilities to replace physical TA tests with simulation results

1. Application at European level of the ‘virtual testing’ annex to the framework type-approval regulation (2018/858 Annex VIII).



ANNEX VIII
CONDITIONS FOR THE USE OF VIRTUAL TESTING METHODS BY A MANUFACTURER OR A TECHNICAL SERVICE



1.2.3. Simulated impact testing

The sequence of movements of the occupants, represented by the dummy family described in paragraph 1.2.1. above shall be investigated as described in paragraphs 1.2.1. or 1.2.2. above. The simulation method shall be validated by at least three of the impact conditions as prescribed in paragraphs 1.2.1. or 1.2.2. above.

2. The dynamically determined head impact zone includes all areas of the instrument panel that may be contacted by the head of restraint occupants using the protective system installed in the vehicle type.

3. If the vehicle type can be fitted with different protective systems it is sufficient to investigate the protective system with the minimum performance. However, protective systems that can be deactivated by the driver or the occupant have to be set as recommended and indicated by the manufacturer in the owners handbook.

If the manufacturer provide for permanent deactivation of a part of the protective system, then this part has to be set to the deactivated configuration.

4. The manufacturer or his representative is entitled to present calculations, simulations, test data or test results which sufficiently prove the dynamically determined head impact zone.

2. Use of the virtual testing possibilities envisaged directly in the regulations by technical field.

Current Applications

Differentiate well the numerical approaches used in the context of a certification

1. Relative approach to determine the worst-case cases within an application scope that will be assessed through physical testing.

2. ‘Virtual testing’ to replace physical certification results with results from tools and simulation methods that have been previously correlated evaluated.

Current Applications

Virtual testing: UTAC procedure for validating a virtual testing methodology

CORRELATION

Scope of validity

- Condition Parameters
- Solicitation Settings
- Structural Settings
- Fixed or variable parameters

Pre-processing

- Object
- Structure Model
- Limit conditions
- Load Assumptions

Processing

- Software Version
- Bill of Material
- Repeatability and stability

Post-processing

- Initial Assessment
- Optimized evaluation


PROCEDURE VALIDATION METHODE ESSAI VIRTUEL

FI HOM 000 004 FR | Révision 01 | 1/19

Procédure de validation d'une méthode d'essai virtuel suivant la Directive cadre 2018/858/CE, Annexe VIII ou les processus réglementaires UNECE

	RÉDACTEUR	VÉRIFICATEUR	APPROBATEUR
Date :	10/04/2019		
Signature :			
Nom :	Fabrice HERVELEU	Julie SCARPA	Béatrice LOPEZ DE RODAS

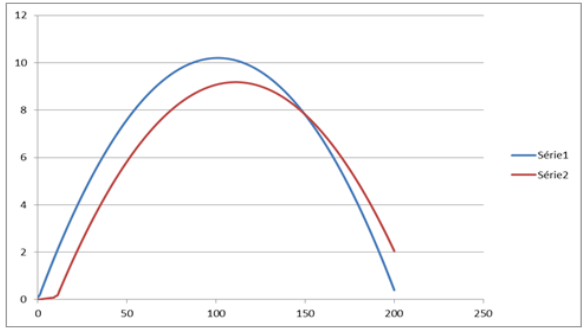
Cette instruction est applicable dès réception et au plus tard deux semaines après la date d'approbation.

$$I = \frac{\max(0, T_{f\_extr} * T_{g\_extr})}{\max(T_{f\_extr}^{\ 2}, T_{g\_extr}^{\ 2})}$$

$$P = 1 - \sqrt{\frac{\sum_n \max(|f(t_n)|, |g(t_n)|) \cdot \left(1 - \frac{\max(0, |f(t_n)| * |g(t_n)|)}{\max(\delta, f(t_n)^2, g(t_n)^2)}\right)^2}{\sum_n \max(|f(t_n)|, |g(t_n)|)}}$$

$$A = \frac{\max(0, f_{extr} * g_{extr})}{\max(f_{extr}^{\ 2}, g_{extr}^{\ 2})}$$

$$E = 1 - \sqrt{\frac{(1-E1)^2 + (1-E2)^2}{2}}$$



CORRELATION

I = 90,99%
A = 90,00%
P = 95,11%
E = 82,33%
G = 89,61% (sans pondération)
C = 88,63% (sans pondération)

ADAS & ADS applications

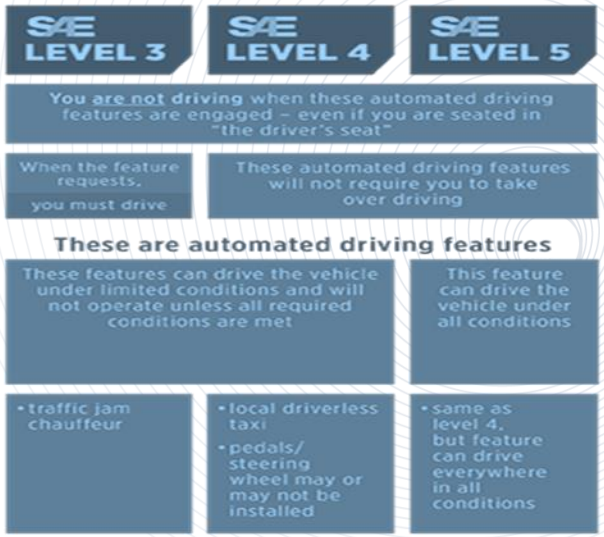
Advanced Driver Assistance Systems (ADAS)

Systems in which a function controlled by an electronic system or by the driver can be neutralized by a higher electronic control system/function.

Function to assist the human driver in performing dynamic control through sustained assistance in controlling lateral and/or longitudinal movements.

Automated Driving Systems

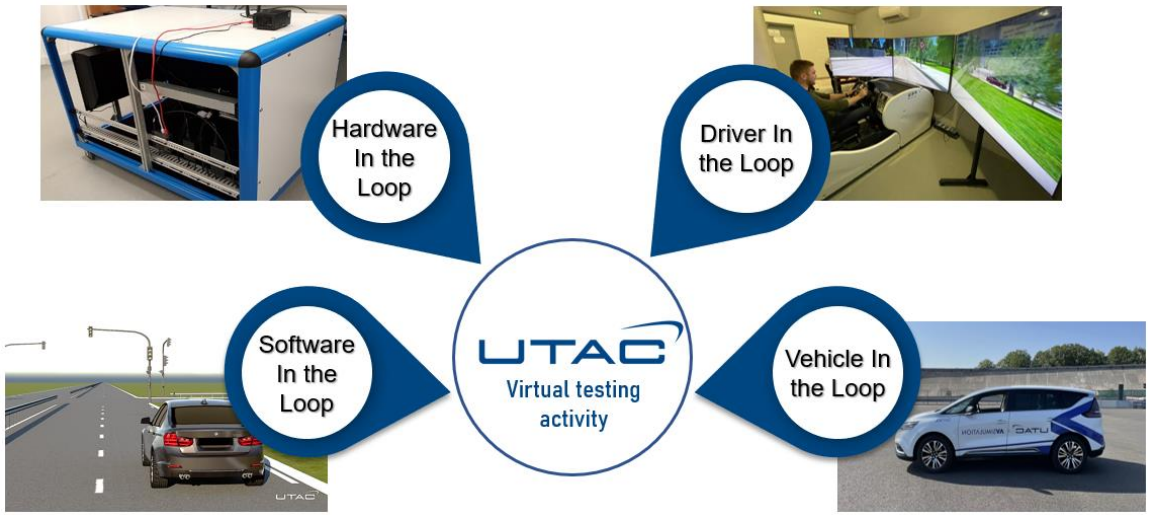
All hardware and software that are collectively capable of performing the entire dynamic driving task continuously, whether or not restricted to a specific operational design domain.

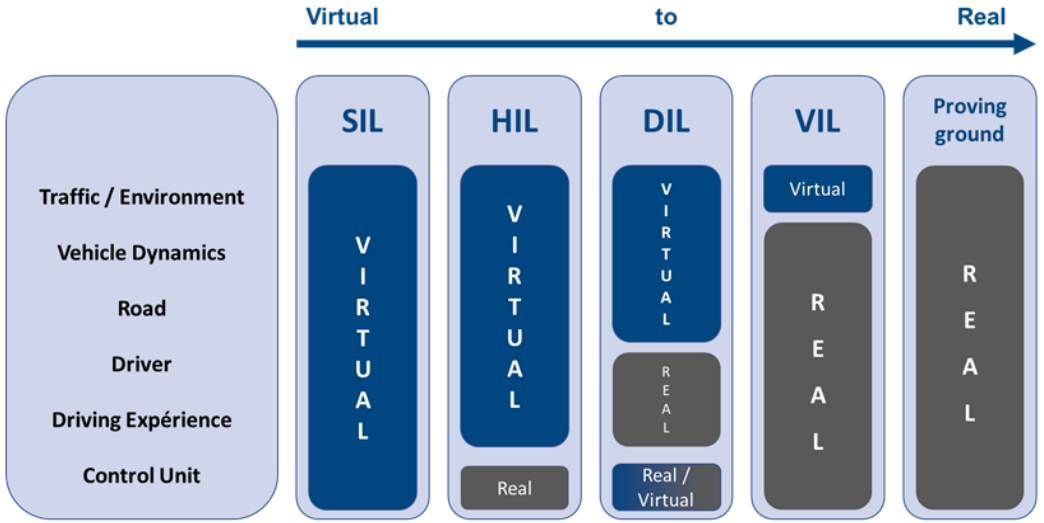


ADAS & ADS applications

Differentiate well the numerical approaches used in the context of a certification

1. An assessment of the security concept of the system, operating as expected by the user and free from unreasonable risks.



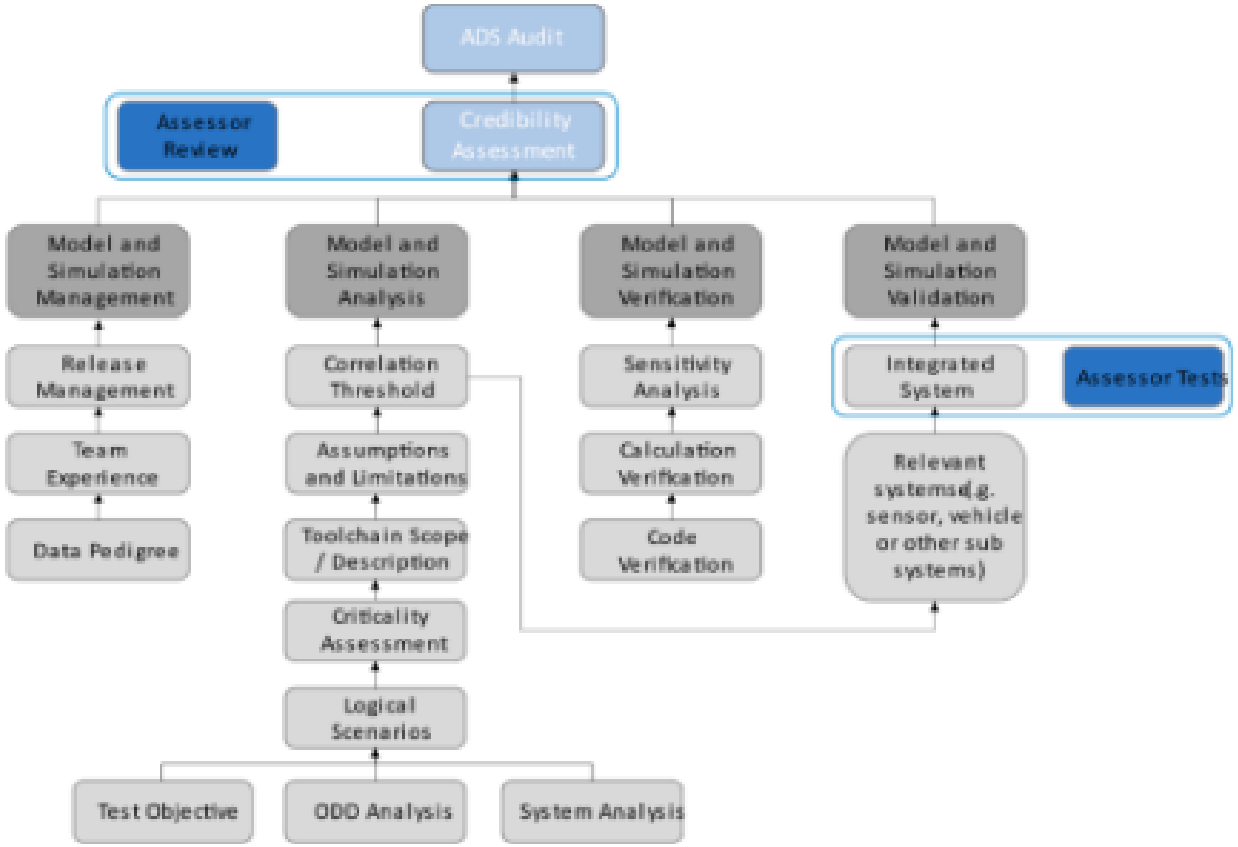


2. Carrying out “massive” simulations making it possible to cover a large number of driving situations and in particular the most dangerous or difficult to carry out in a real environment.

ADAS & ADS applications

Assessment and validation approach: credibility assessment

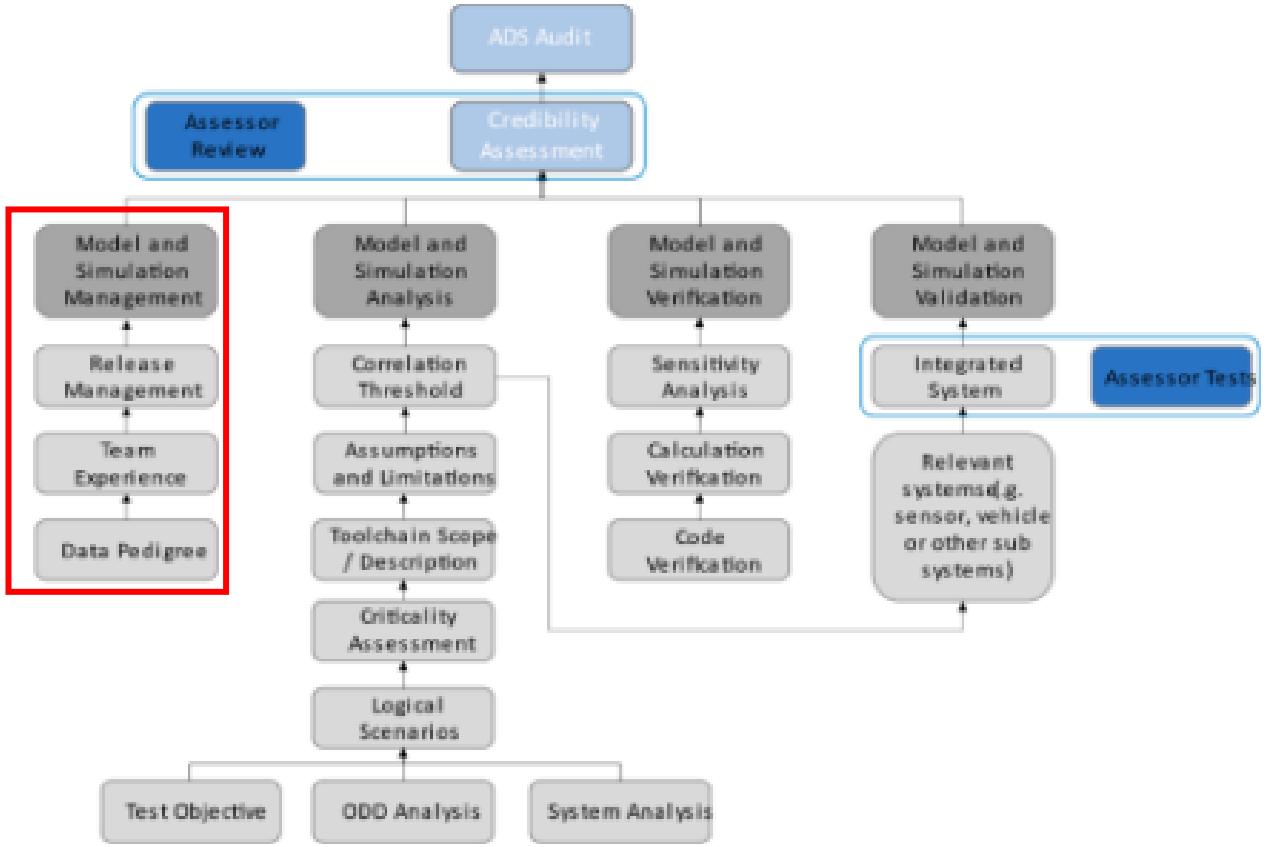
- ✓ Demonstration of simulation tool scope:
  - validity for the relevant scenario
  - validation performed for the simulation tool chain (simulation/physical correlation).
- ✓ Simulation should not be a substitute for the physical tests required by regulation.
- ✓ The ‘credibility assessment’ introduces a way to assess and formalize the credibility of modeling and simulation on the basis of quality assurance criteria for which confidence levels in the results can be indicated.



ADAS & ADS applications

Assessment and validation approach: credibility assessment

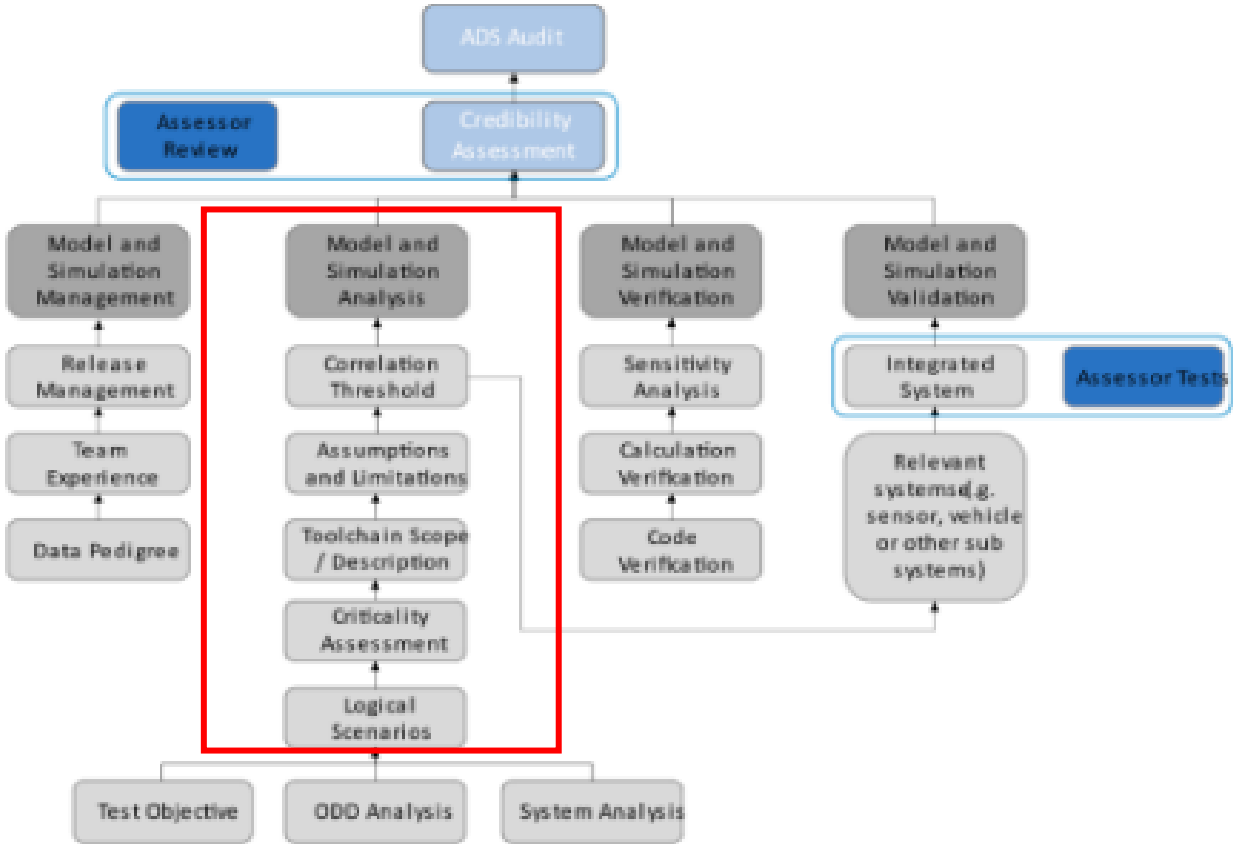
- ✓ Dynamic process with frequent modifications / releases that need to be monitored, documented and traced.
- ✓ The completeness, accuracy, consistency and traceability of data must be ensured throughout the distributions and the lifespan of a tool chain.
- ✓ Ensure the governance, maintenance and skills of the teams involved through an organizational plan.



ADAS & ADS applications

Assessment and validation approach: credibility assessment

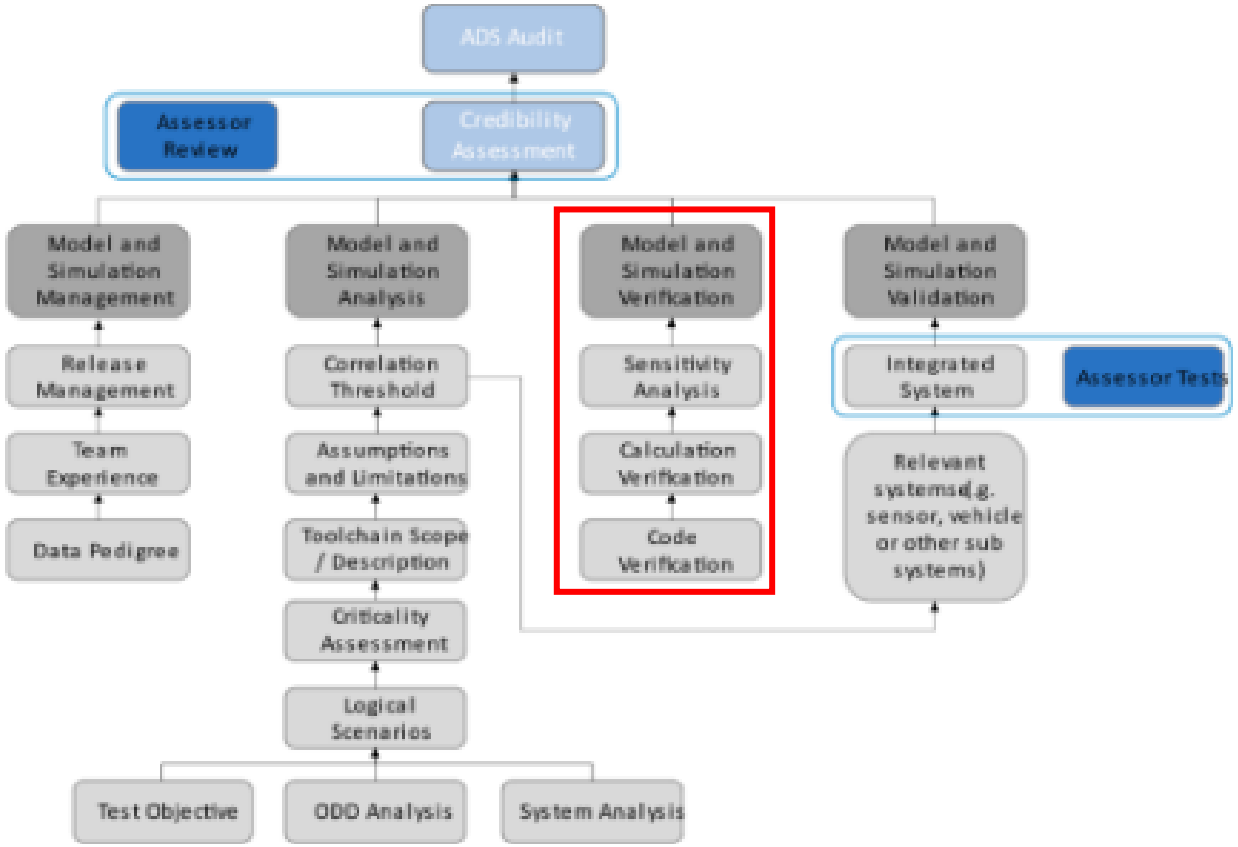
- ✓ Identify the parameter space that can be evaluated via simulation. Define the scope and limitations of the models and the sources of uncertainty that may affect the results.
- ✓ Describe the objectives and how the simulation data will be used to support the ADS validation strategy.
- ✓ Justification of assumptions taken, limitations of application and sources of uncertainty.
- ✓ Determine model responsibilities in the event of a safety error in the final product (similar approach to SOTIF).



ADAS & ADS applications

Assessment and validation approach: credibility assessment

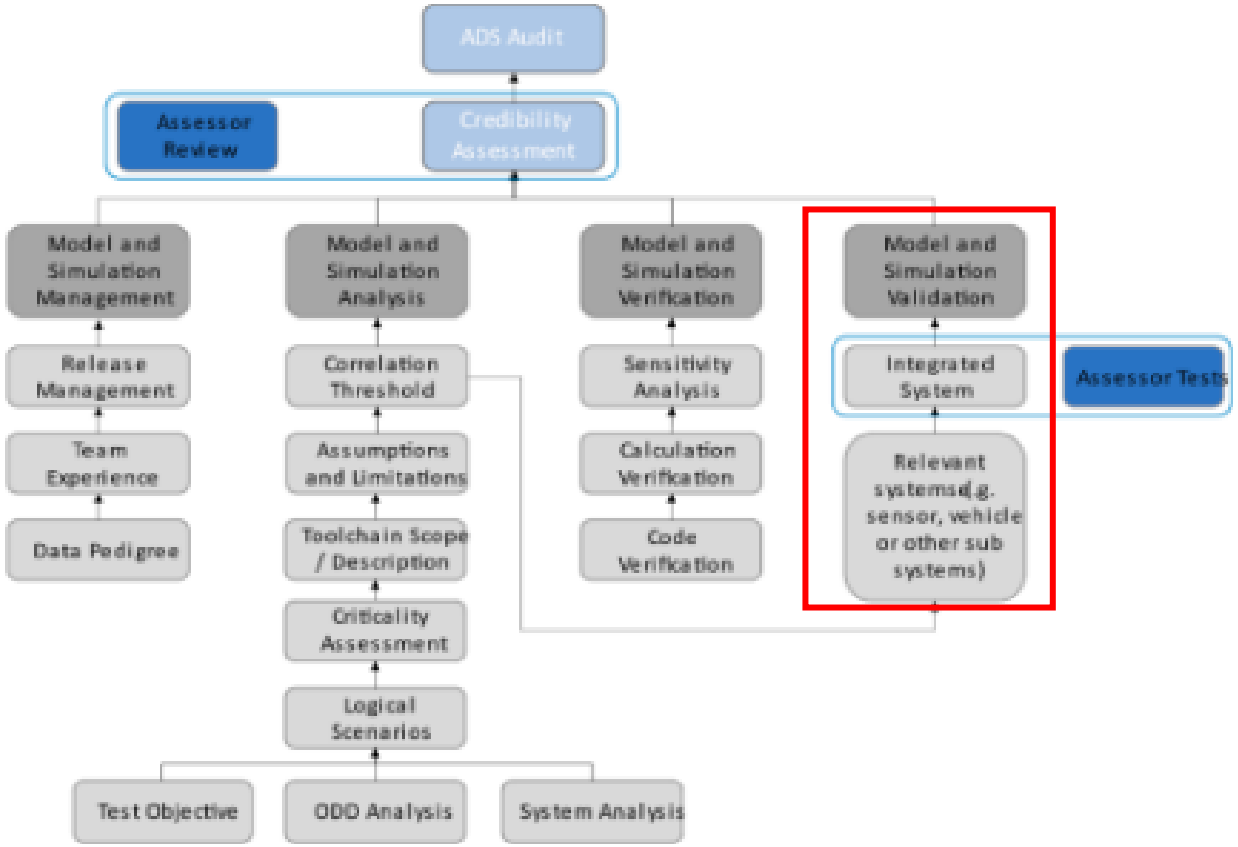
- ✓ Procedure based on a multi-stage approach.
- ✓ Code check: no logical defect, convergence, instability.
- ✓ Verification of calculation: estimation of numerical errors.
- ✓ Sensitivity analysis: How model output values are affected by changes in input values.



ADAS & ADS applications

Assessment and validation approach: credibility assessment

- ✓ The quantitative process of determining the degree to which a model or simulation is an accurate representation of the real world.
- ✓ Correlation performance indicators.
- ✓ Adjustment measures based on key performance indicators (Kpi) indicating statistical comparability between datasets.
- ✓ Definition of logical scenarios allowing validation in the target parameter space and at different model levels.



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