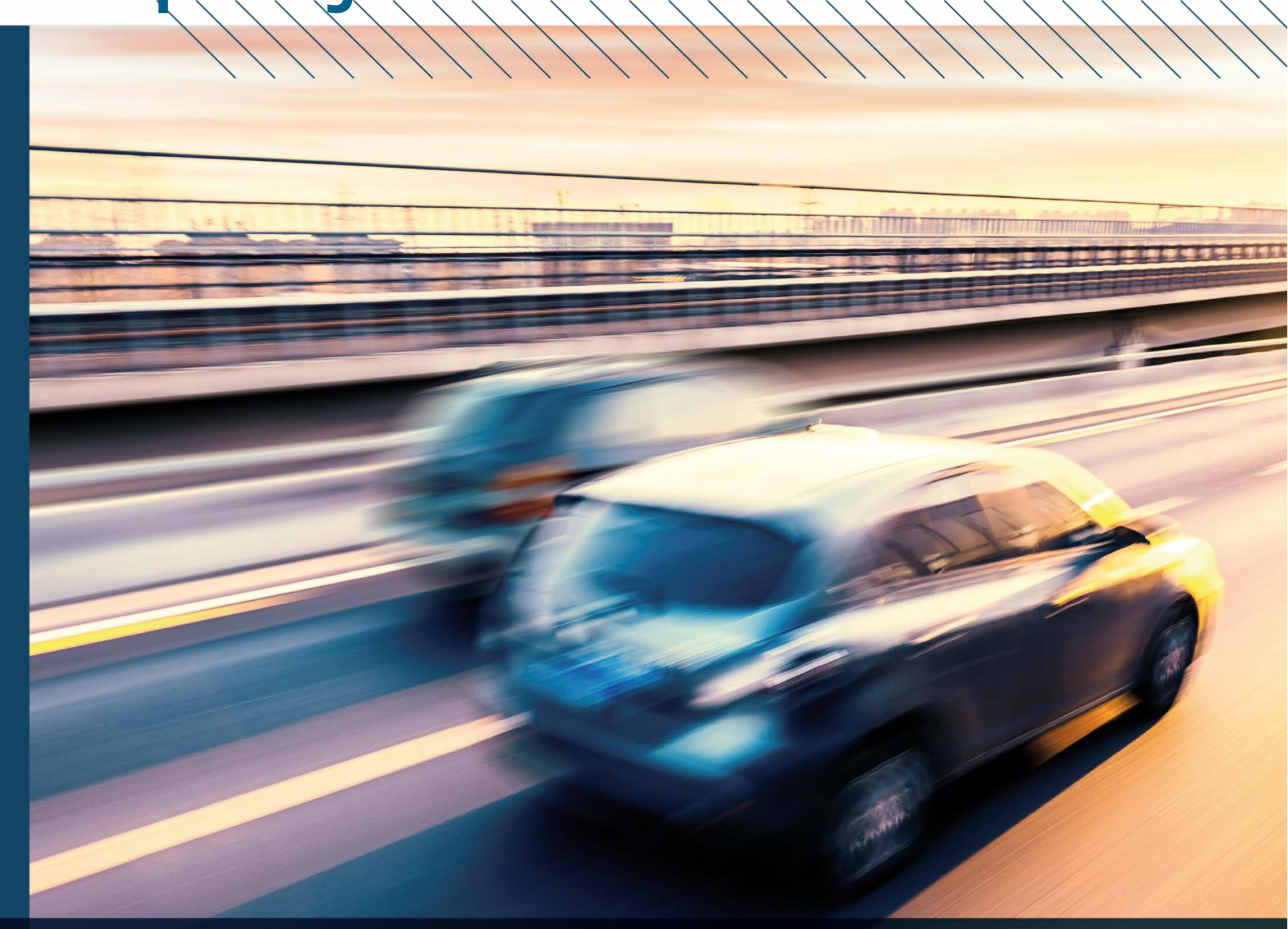


Requirements & Conditions – Stand 4

SCENARIO DESCRIPTION



Scenarios do not necessarily mean scenarios

What is the content of a scenario and how is it described?
How can scenarios be utilized in a development process?

Scenarios are a key element of the PEGASUS test concept.

The term **Scenario** has different contents and representations in a development process.

The concept phase describes scenarios with natural language on a high level of abstraction.

Technical development and test case generation have demand for a representation with parameter spaces in the physical state space.

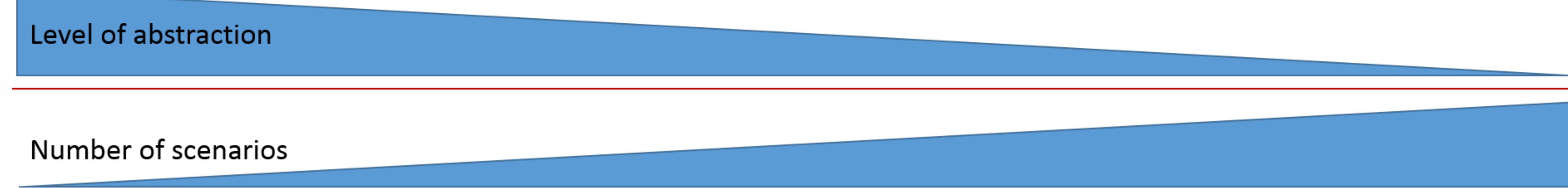
The test case execution and assessment needs distinctively defined scenarios in common data formats.

Breakdown in three abstraction levels:

- Functional
- Logical
- Concrete

Structure of contents based on a 5 layer model.

Functional scenarios	Logical scenarios	Concrete scenarios
Base road network: three-lane motorway in a curve, 100 km/h speed limit indicated by traffic signs	Base road network: Lane width [2.3..3.5] m Curve radius [0.6..0.9] km Position traffic sign [0..200] m	Base road network: Lane width [3.2] m Curve radius [0.7] km Position traffic sign [150] m
Stationary objects: -	Stationary objects: -	Stationary objects: -
Moveable objects: Ego vehicle, traffic jam; Interaction: Ego in maneuver „approaching“ on the middle lane, traffic jam moves slowly	Moveable objects: End of traffic jam [10..200] m Traffic jam speed [0..30] km/h Ego distance [50..300] m Ego speed [80..130] km/h	Moveable objects: End of traffic jam 40 m Traffic jam speed 30 km/h Ego distance 200 m Ego speed 100 km/h
Environment: Summer, rain	Environment: Temperature [10..40] °C Droplet size [20..100] µm	Environment: Temperature 20 °C Droplet size 30 µm



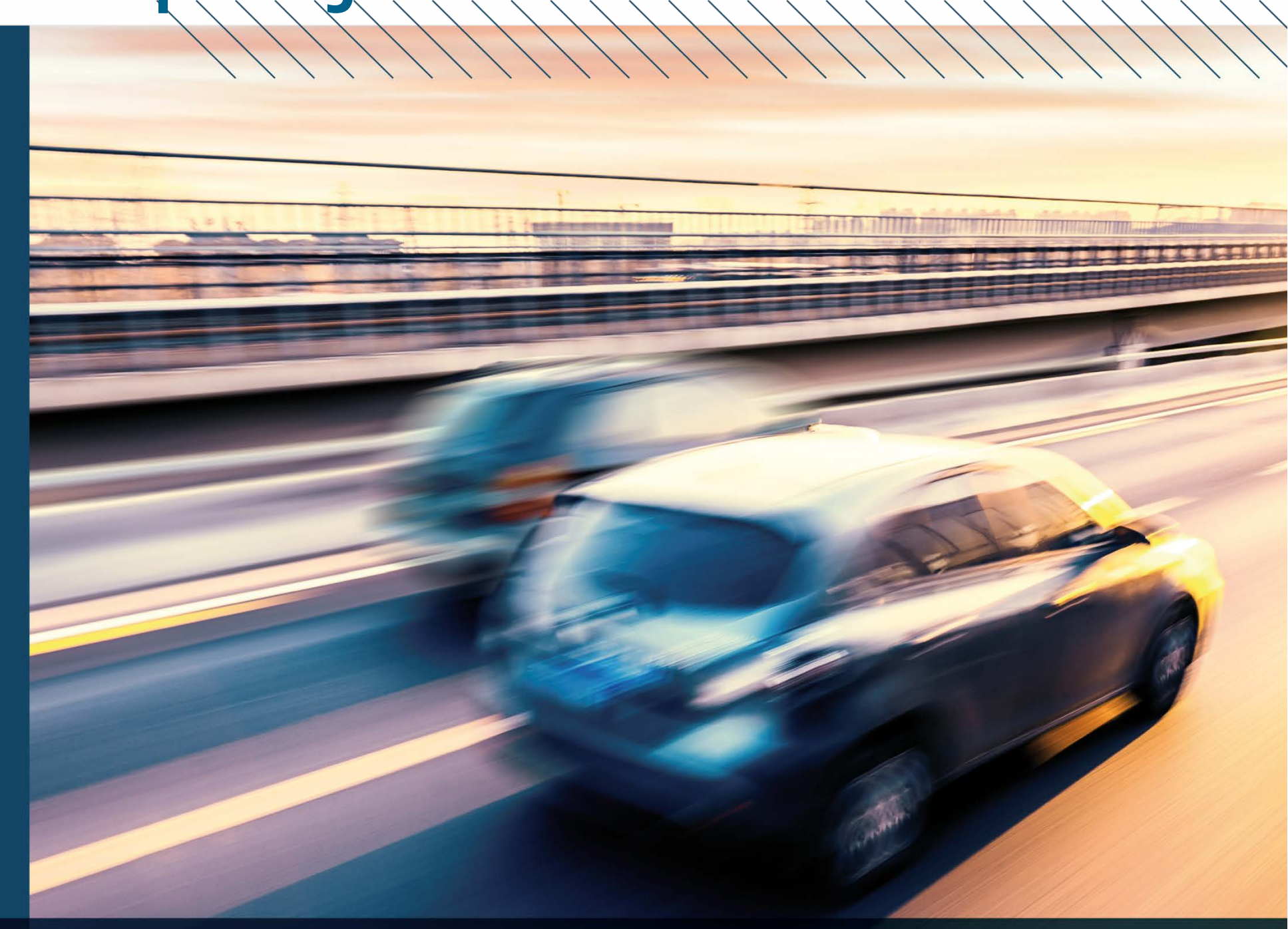
Abstraction levels of scenarios:
 Functional scenarios contain natural language.
 Logical scenarios describe parameter spaces in the state space.
 Concrete scenarios depict a concrete representative of a logical scenario.

5 layer model for description of scenarios

Street level (L1) • Geometry and topology • Condition, boundaries	Level 1: Description of street layout and condition of the surface.
Traffic infrastructure (L2) • Construction barriers • Signs, traffic guidance	Level 2: Traffic guidance infrastructure like signs, barriers, and markings.
Temporal modifications L1 und L2 (L3) • Geometry and topology overlay • Time dependent > 1 day	Level 3: Temporary overlay of topology and geometry for temporal construction sites.
Movable objects (L4) • Dynamic, movable • Interactions, maneuvers	Level 4: Description of traffic participants and objects including interactions based on maneuvers.
Environment conditions (L5) • Influence on properties of other levels	Level 5: Modeling of environment conditions like weather and daytime including influence on level 1 to 4.



SCENARIO DESCRIPTION



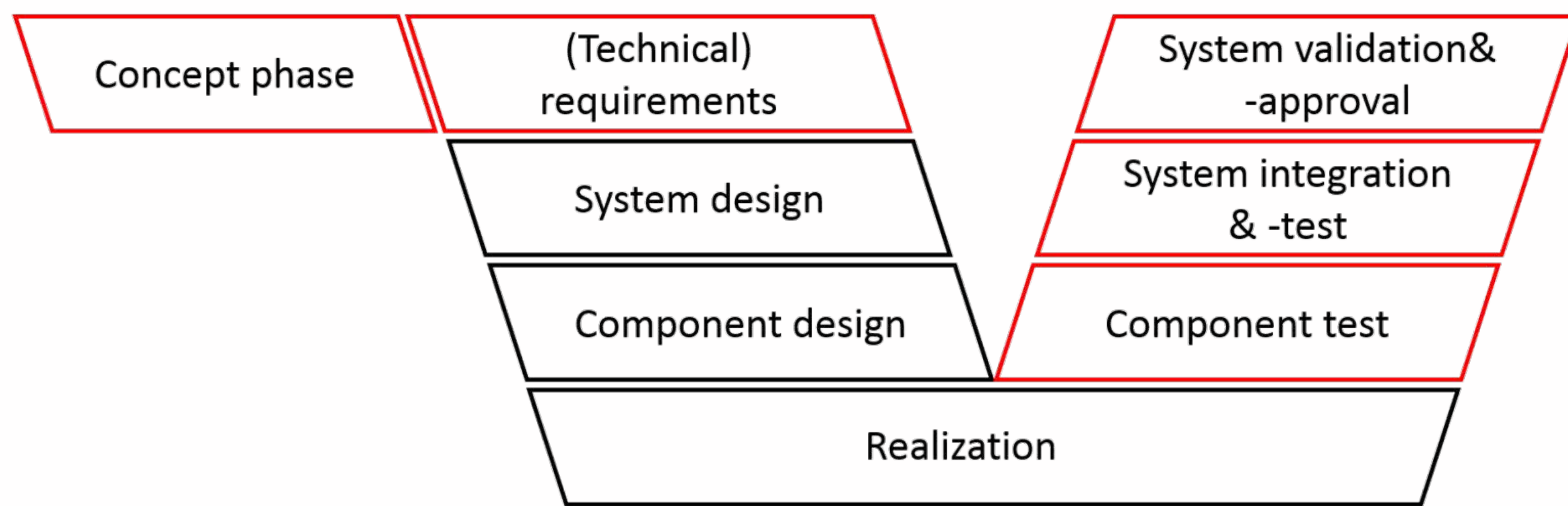
Usage of scenarios in the development process

Which process phases can use scenarios?

Which requirements are demanded by process phases?

➔ V-model based development processes (e.g. ISO 26262) define the state of the art for development of automated driving functions.

➔ Scenarios can be used in multiple process phases. The usage in different phases demands inconsistent requirements on the manner of representation of scenarios.



V-model based development process based on ISO 26262: Red frames highlight a possible usage of scenarios for system specification, realization or testing.

Concept phase

- Scenarios must be expressed in natural language
- Scenarios must be readable and understandable for human experts
- The vocabulary must be defined consistent and in atomic terms

System development

- Scenarios must describe parameter ranges for system states
- Scenarios must be organized in a formal representation for parameter ranges (data formats)

Test and validation

- Scenarios must be described as detailed as necessary to be conducted in testing methods and tools
- Scenarios must be described distinct and must not leave possibilities for interpretation (reproducibility)
- Scenarios must be efficiently readable for computer applications

