

Mid-Term Presentation 15 / 16 March 2022

# How to derive “Top Goals” systematically?

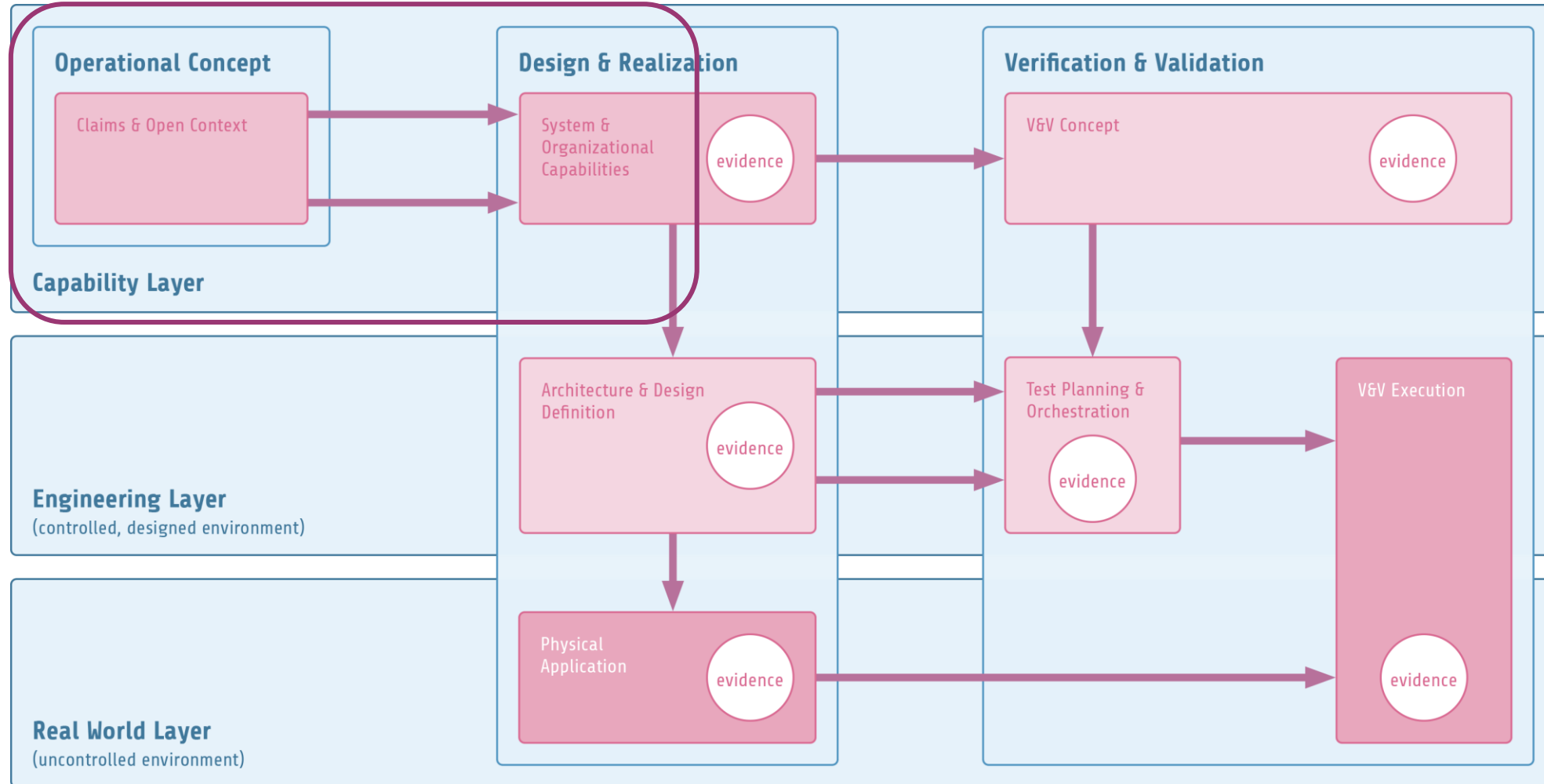
Tino Brade, Robert Bosch GmbH

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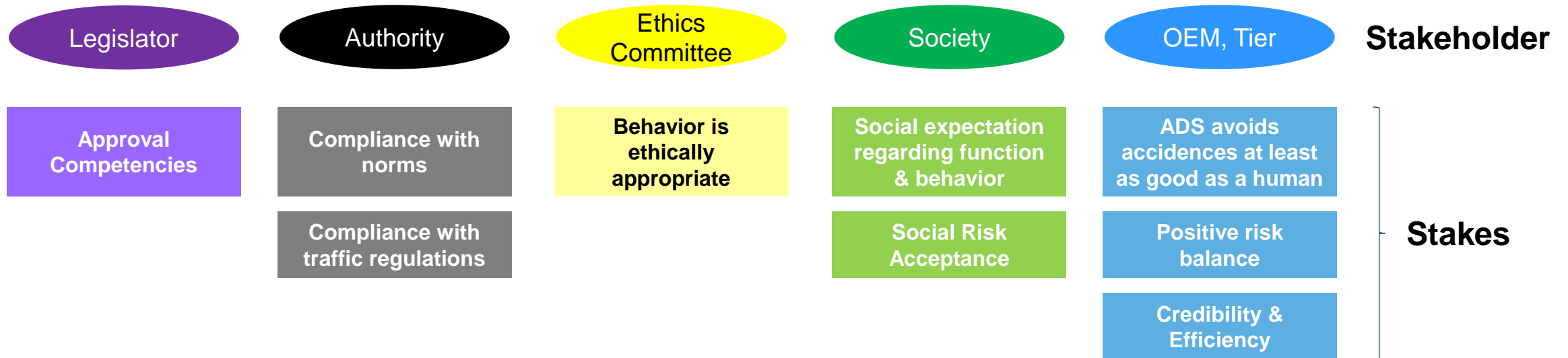
# V&V Process in Assurance Framework



- **Top goals** demand activities to realize expectations regarding
  - the testing method &
  - how the test method should be used to test an “autonomous driving system” (ADS)
  
- We developed a systematic way to derive “Top Goals”
  - **Fundamental idea:**
    - Derive abstractions from expectations & decompose abstraction
    - Extract top goals out of decompositions
  
  - **Benefits:**
    - *Completeness* due to systematic decomposition
    - *Efficiency* due to the consideration of redundancies, contradictions & concretizations

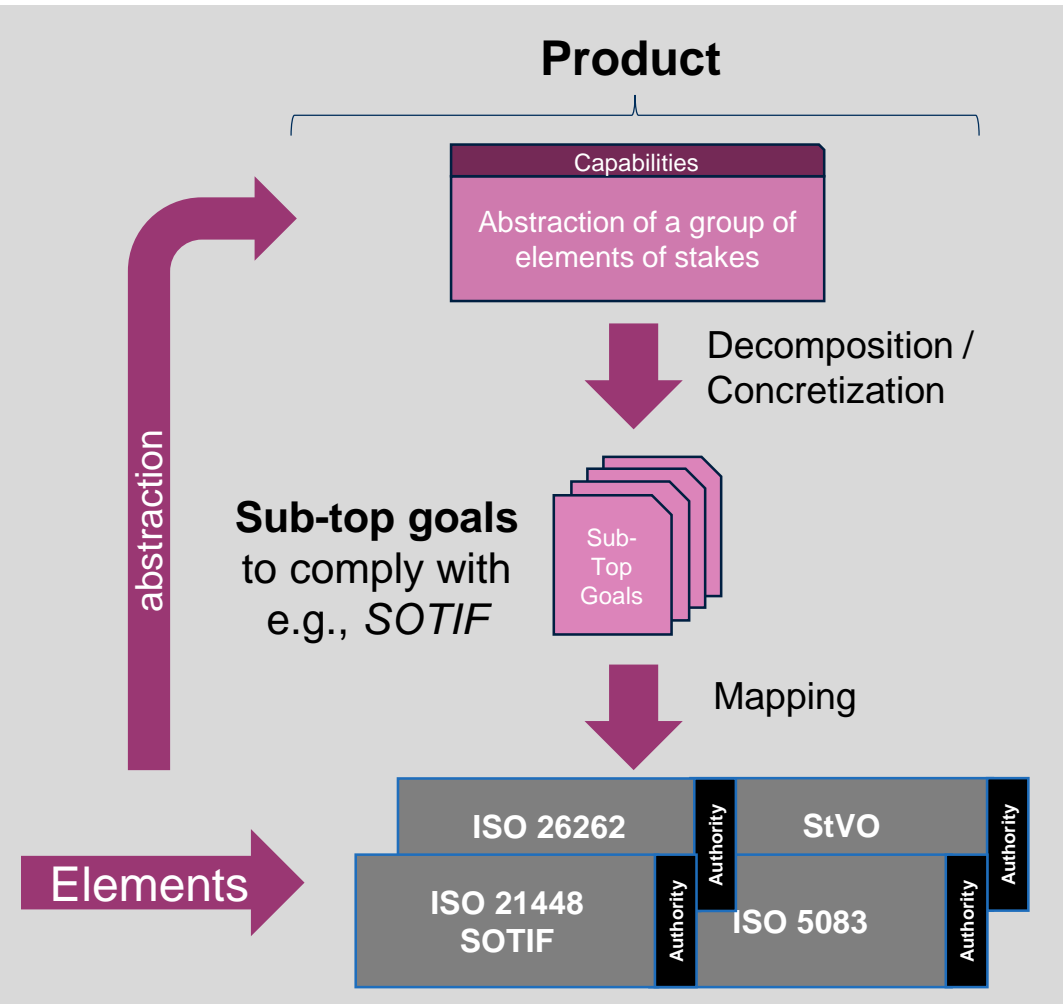
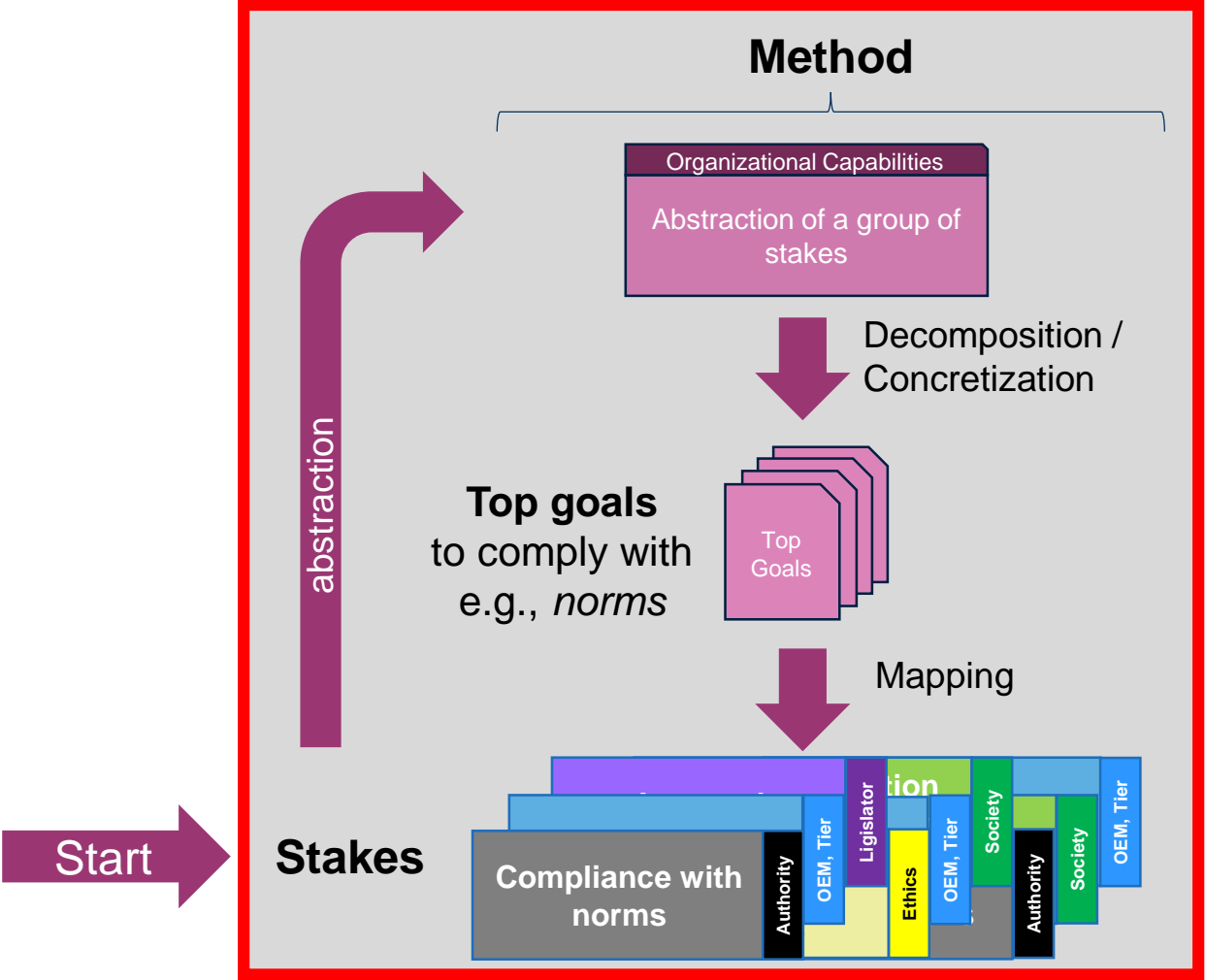
# Starting Point – Inputs for Top Goals

- ▶ Where do we get Top Goals from? - Unfortunately, Top Goals **cannot** simply be transcribed because top goals refer to **requirements** which are currently not regulated/defined
- ▶ But we can **elicitate expectations** from stakeholders that have stakes which we must realize



Note that stakes are not necessarily complete since we provide an *exemplary* method

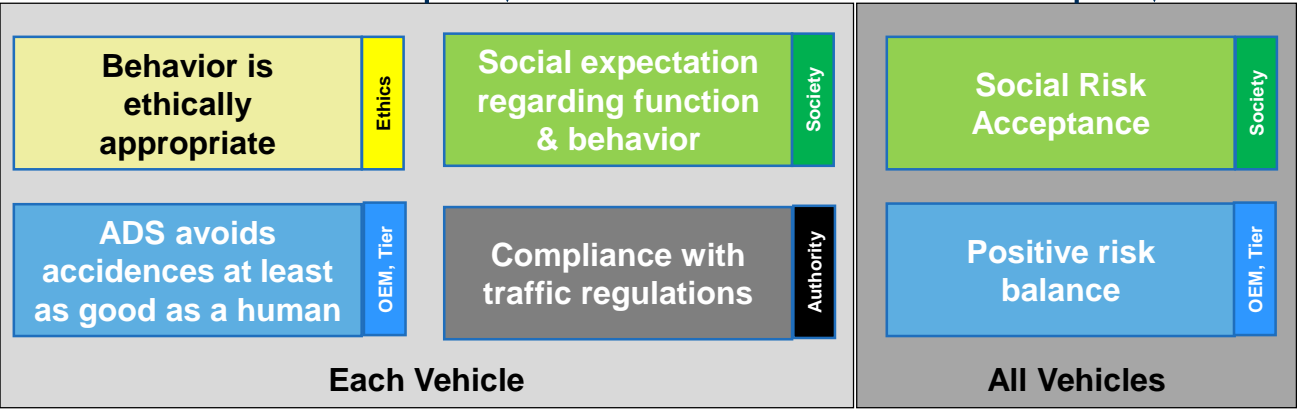
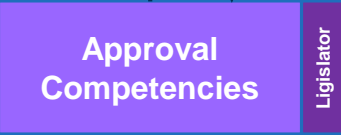
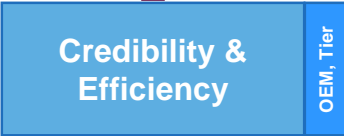
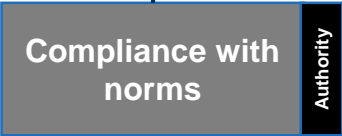
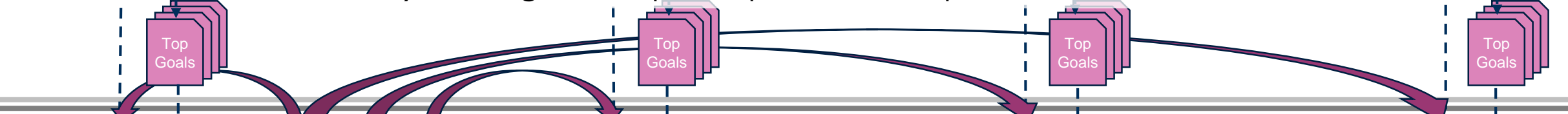
See “Capability-based architecture for automated vehicles in urban environment”



## II.) Challenge: derive capabilities out of clustered top stakes



## III.) Challenge: decompose capabilities until top stakes can be linked



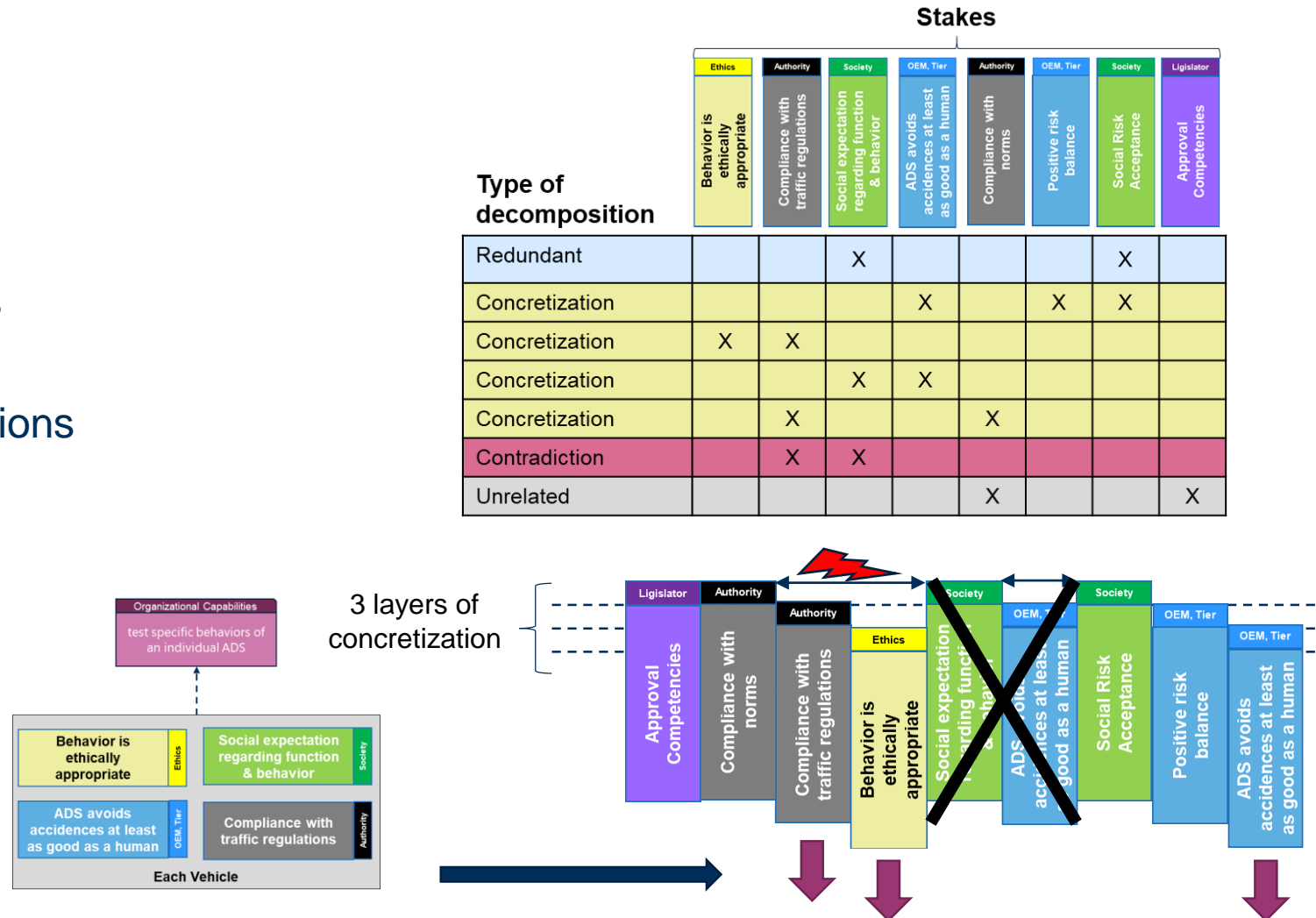
## I.) Challenge: cluster top stakes w.r.t. time phases

# Decomposition of Capabilities 1/4

## Do

1. Analyzing top stakes w.r.t.
  - similarities
    - a. redundant decompositions
    - b. concretizations of decompositions
  - no similarities
    - c. contradictions among decompositions
    - d. unrelated decompositions
2. Linguistic break down of capabilities & use external sources
3. Determine interrelated decompositions
4. Use disbelief regarding capabilities to add missing decompositions

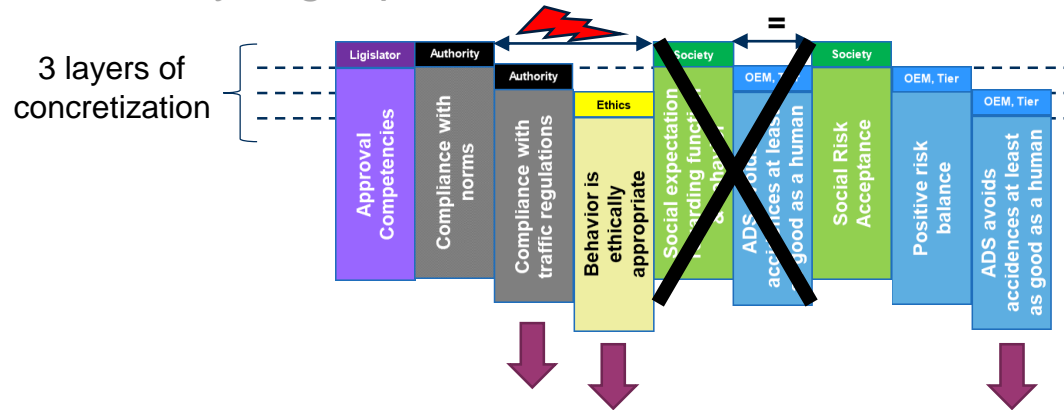
**While** - Top Stakes cannot be linked



# Decomposition of Capabilities 2/4

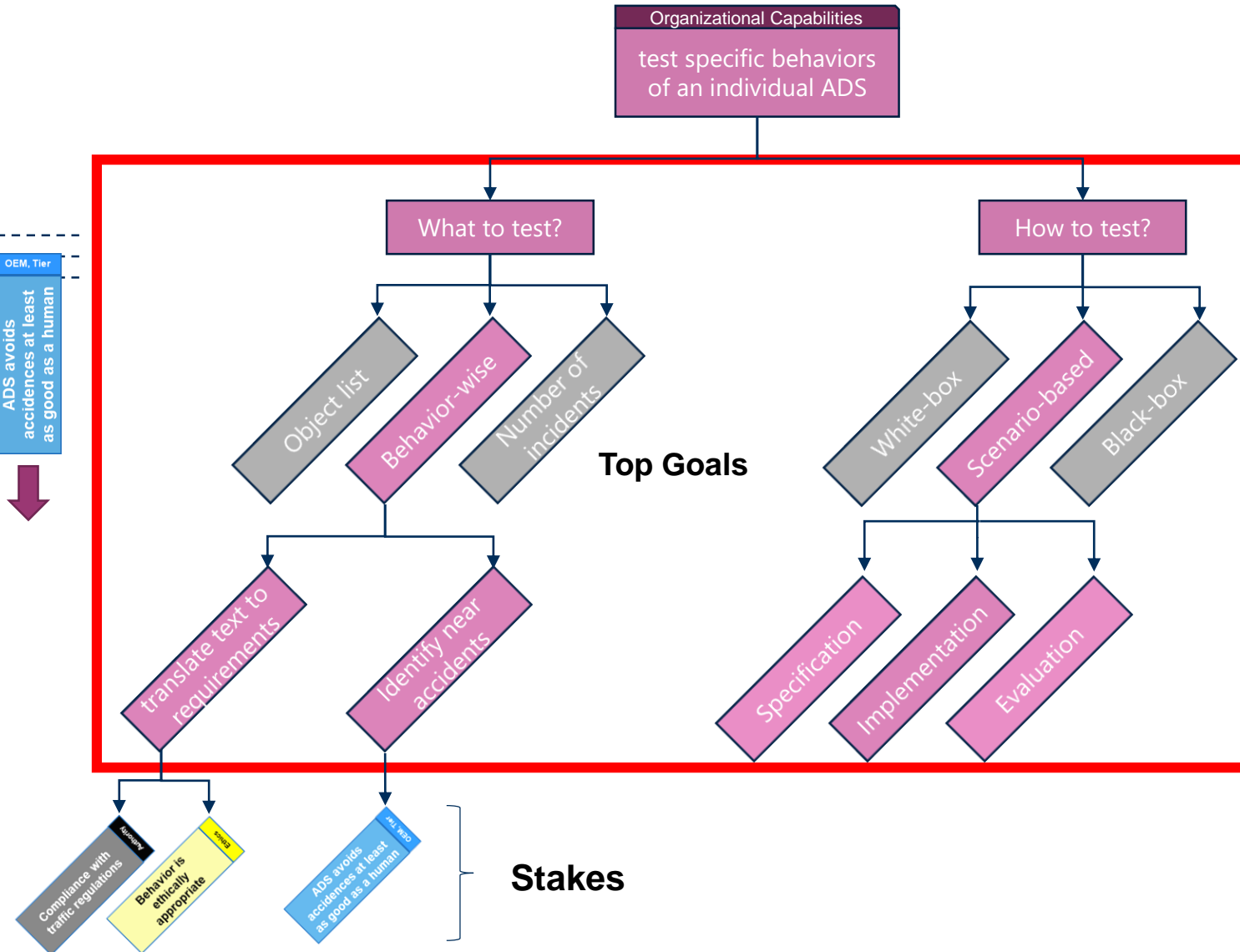
Do

1. Analyzing top stakes w.r.t.



2. Linguistic break down of capabilities & use external sources
3. Determine interrelated decompositions
4. Use disbelief regarding capabilities to add missing decompositions

**While** - Top Stakes cannot be linked

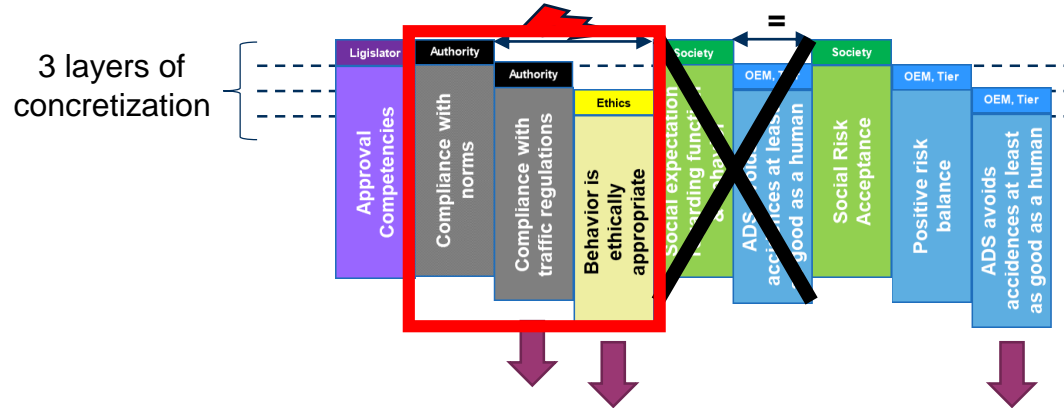




# Decomposition of Capabilities 3/4 – Compliance with Norms

Do

1. Analyzing top stakes w.r.t.

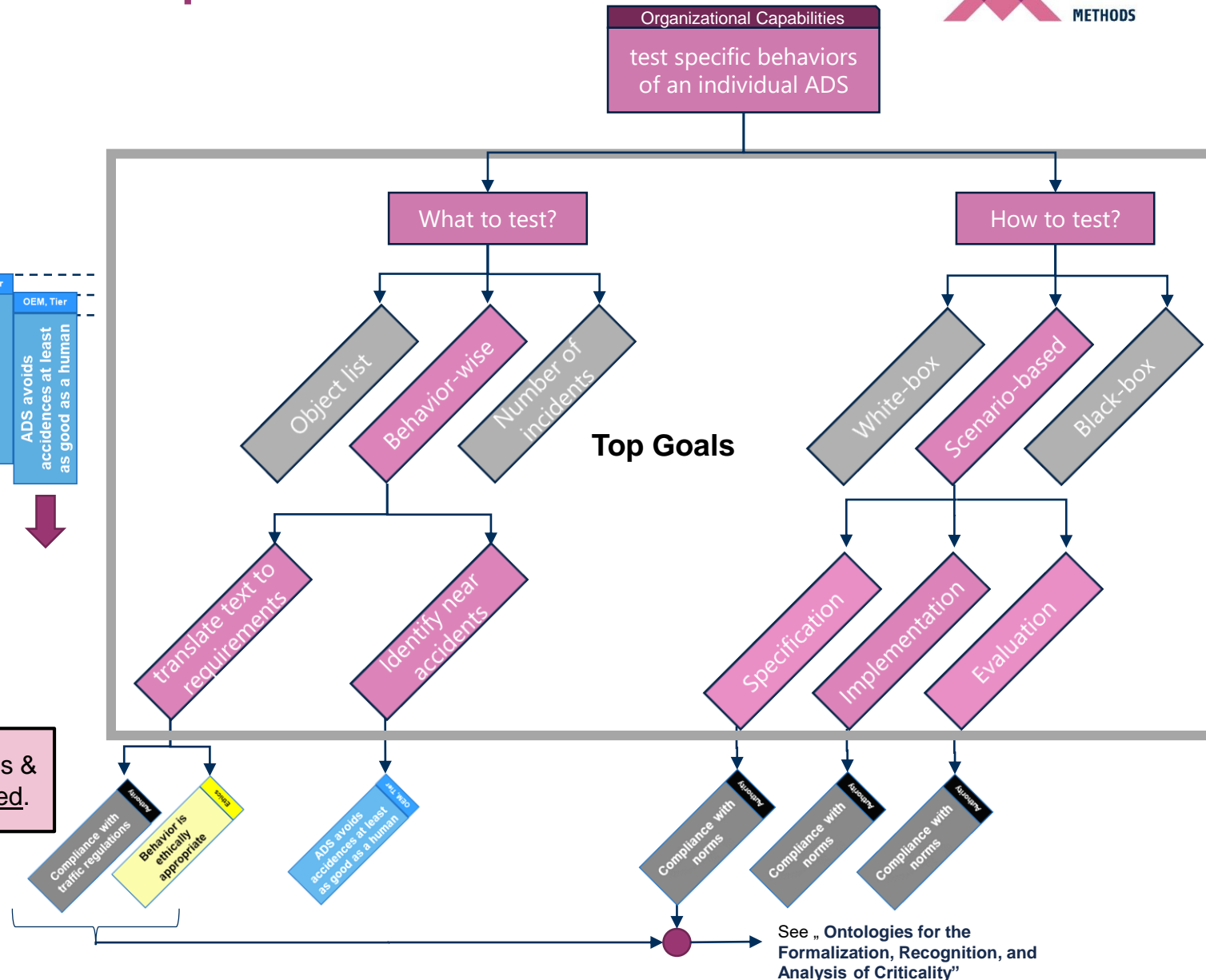


2. Linguistic break down of capabilities & use external sources

3. Determine interrelated decompositions

The specification of a scenario requires us to comply with norms & to *specify a scenario* so that traffic regulations can be expressed.

**While** - Top Stakes cannot be linked

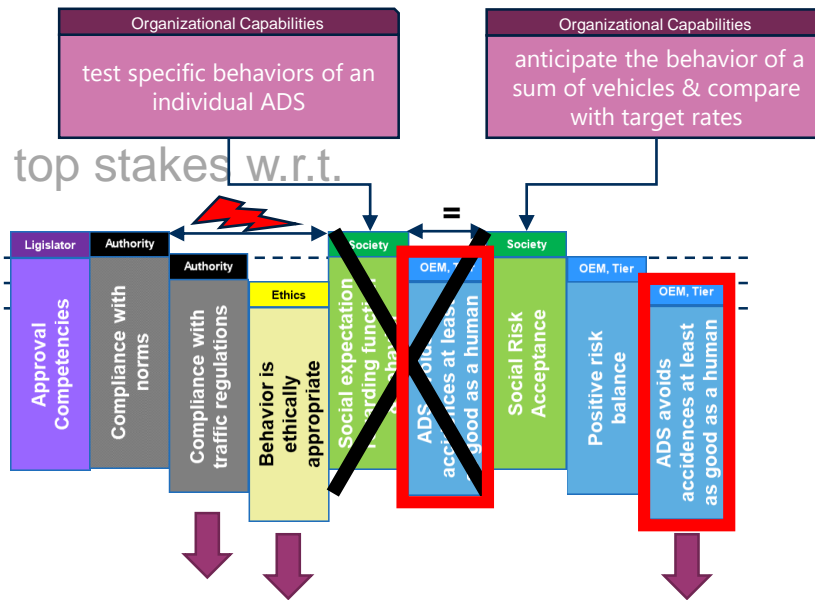


# Decomposition of Capabilities 3/4 – Social Risk Acceptance

Do

1. Analyzing top stakes w.r.t.

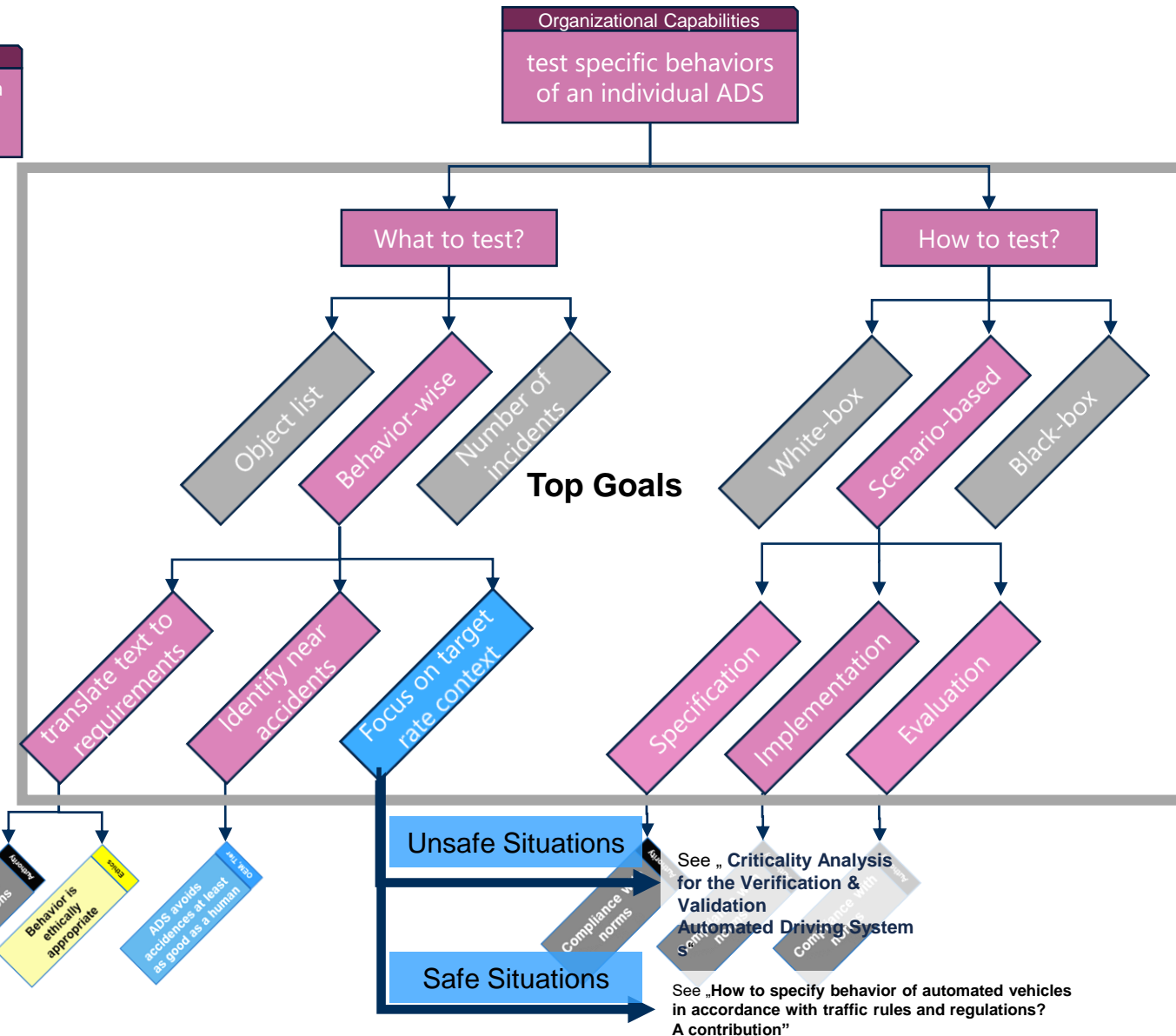
3 layers of  
concretization



2. Linguistic break down of capabilities & use external sources

3. Determine interrelated decompositions

The stake "ADS avoids accidents ... as good as human" is a concretization of two capabilities with different capabilities. Therefore, behavior-wise test require **focusing on target rates** because, otherwise, test results of this stake cannot contribute to the capability "anticipate the behavior of a sum of vehicles & compare with target rates".

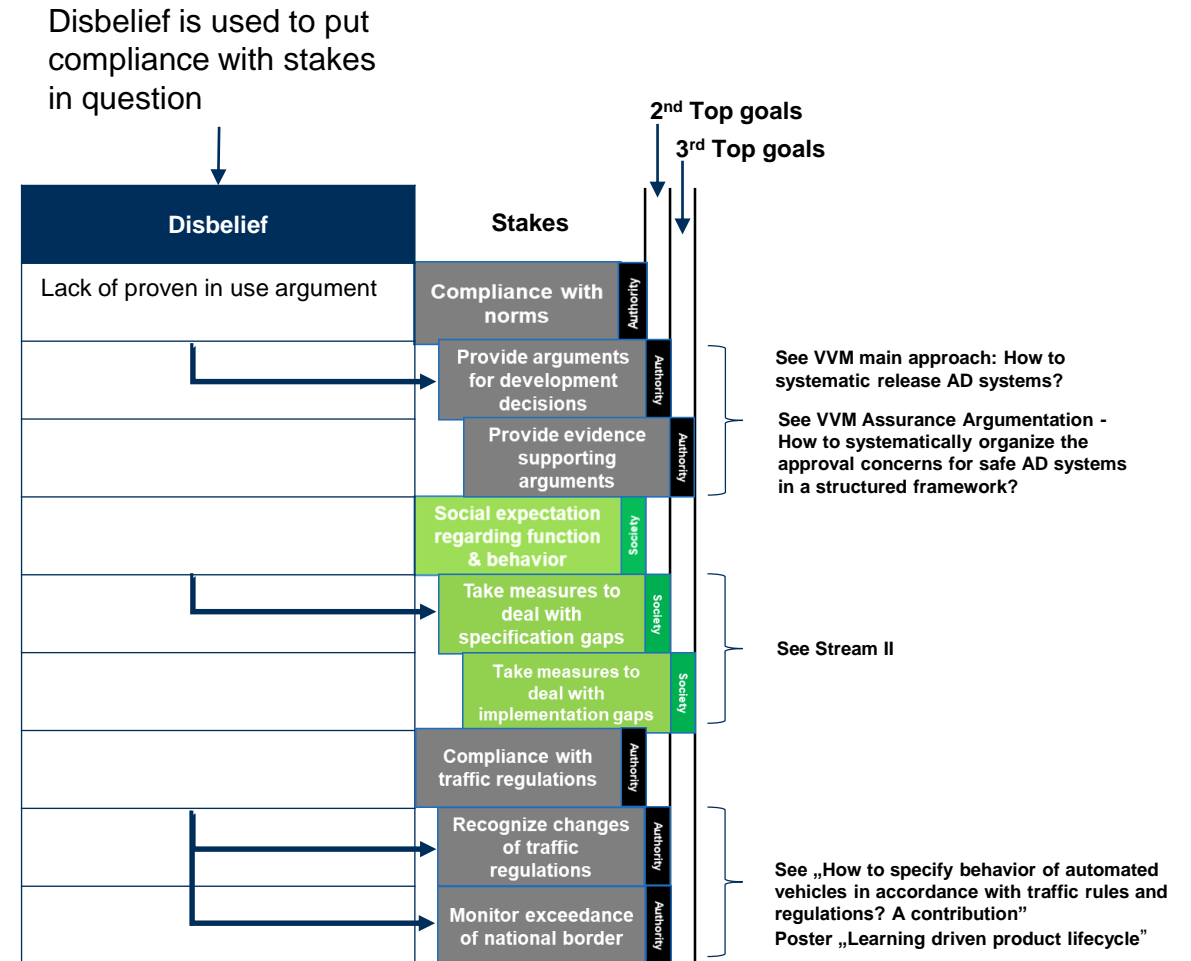


# Decomposition of Capabilities 4/4

## Do

1. Analyzing top stakes w.r.t.
  - similarities
    - a. redundant decompositions
    - b. concretizations of decompositions
  - no similarities
    - c. contradictions among decompositions
    - d. unrelated decompositions
2. Linguistic break down of capabilities & use external sources
3. Determine interrelated decompositions
4. Use disbelief regarding capabilities to add missing decompositions

**While** - Top Stakes cannot be linked



- **Top goals** demand activities to realize expectations of stakeholders regarding
  - the testing method &
  - how the test method should be used to test an ADS
- We developed a systematic way to derive “Top Goals” out of stakes
  - **Fundamental idea:**
    - Derive abstractions in form of capabilities out of clustered stakes
    - Decomposition steps to provide concretizations until stakes are reached
    - Extract top goals out of decompositions
  - **Peculiarities:**
    - *Completeness* due to iterative systematic method (disbelief)
    - *Efficiency* due to **early** consideration (frontloading) of redundancies, contradictions & concretizations

# Thank you!

Tino Brade, Robert Bosch GmbH



**A project developed by the  
VDA Leitinitiative  
autonomous and connected driving**

Supported by:



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by the German Bundestag