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ConnRAD – Connectivity and Resilience for Automated Driving

ConnRAD
Connectivity & Resilience for automated Driving Functions in Germany

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Concept for safe V2X

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Overview

SG1: The sender shall not provide faulty information

- The sender must be **approved on delivery of correct meta data** to describe the payload
- The approval must be **certified** by 3rd party (e.g., TÜV) as trust anchor

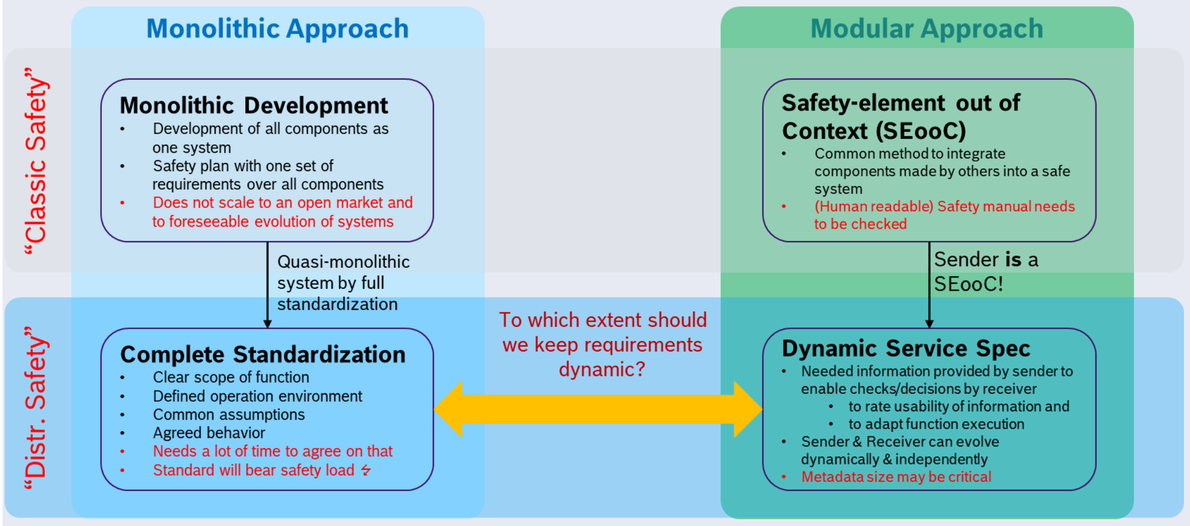
SG2: The receiver shall not misinterpret received information

- The receiver needs **meta data**, which describes the payload and **enables rating usability of information**
  - → Quality of information
  - → Service Specification containing
    - Capability of information generation
    - Qualification of safety assurance

Standardization

- Format and protocol of data exchange
- Interpretation rules of data

Challenge of V2X



Service Specification

Properties	Sender	Receiver	Examples
	Service Specification	**Service Demand**	
Capabilities	Ability to provide certain (meta-) data	Needed capabilities of (meta-) data to realize a safety-critical function	• Minimum object size • Min/max object speed • Supported object classes
Constraints & Boundary Conditions	• Boundary conditions under which the capability is given • Current conditions	• Boundary conditions of sender • Current conditions	• Atmospheric conditions • Lighting conditions • Infrastructure monitoring support
Safety & Security Qualification	Provided safety & security protection of the (meta-) data	Required safety & security protection of the (meta-) data	• Sensor/Fusion qualification • Sensor redundancy/diversity • Error detection mechanism

Replaced by up-to date Capabilities matching the current conditions

Meta Data Approach

Quality

The receiver must know the **quality** with which the information is delivered

- How exact is the information?
- How up-to-date is the information?

Capabilities

The receiver must know the **capabilities** of the sender to provide information

- What information can / can not be provided?
- What are the limits of information provision?

Safety Qualification

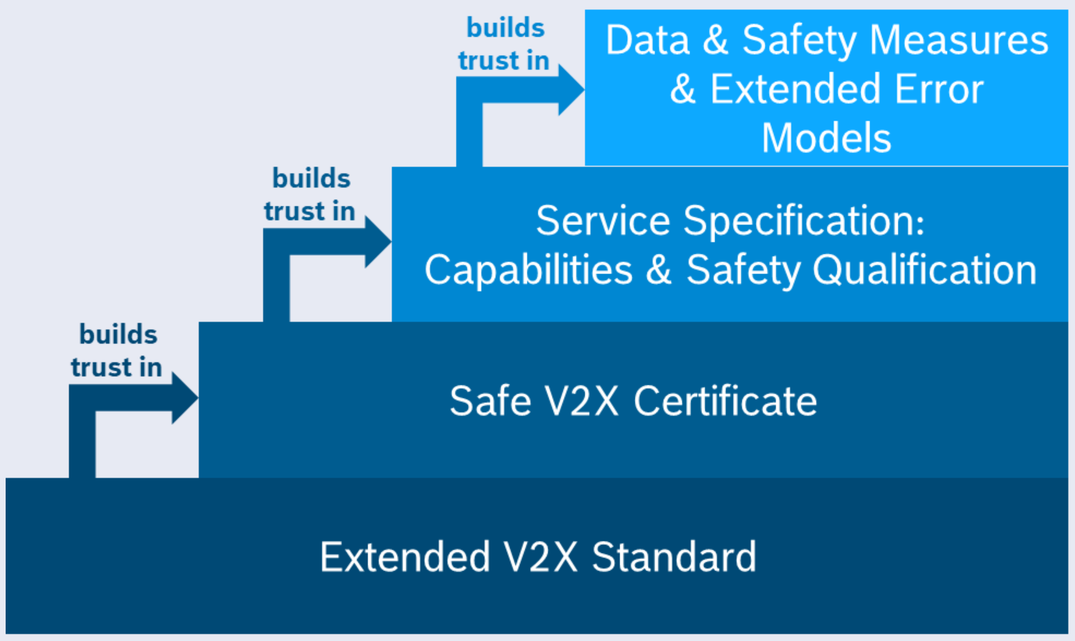
The receiver must know the **safety qualification** of information

- How good is the information safeguarded against errors?
- What are residual error rates?

Service Specification

Meta Data

Trust Concept



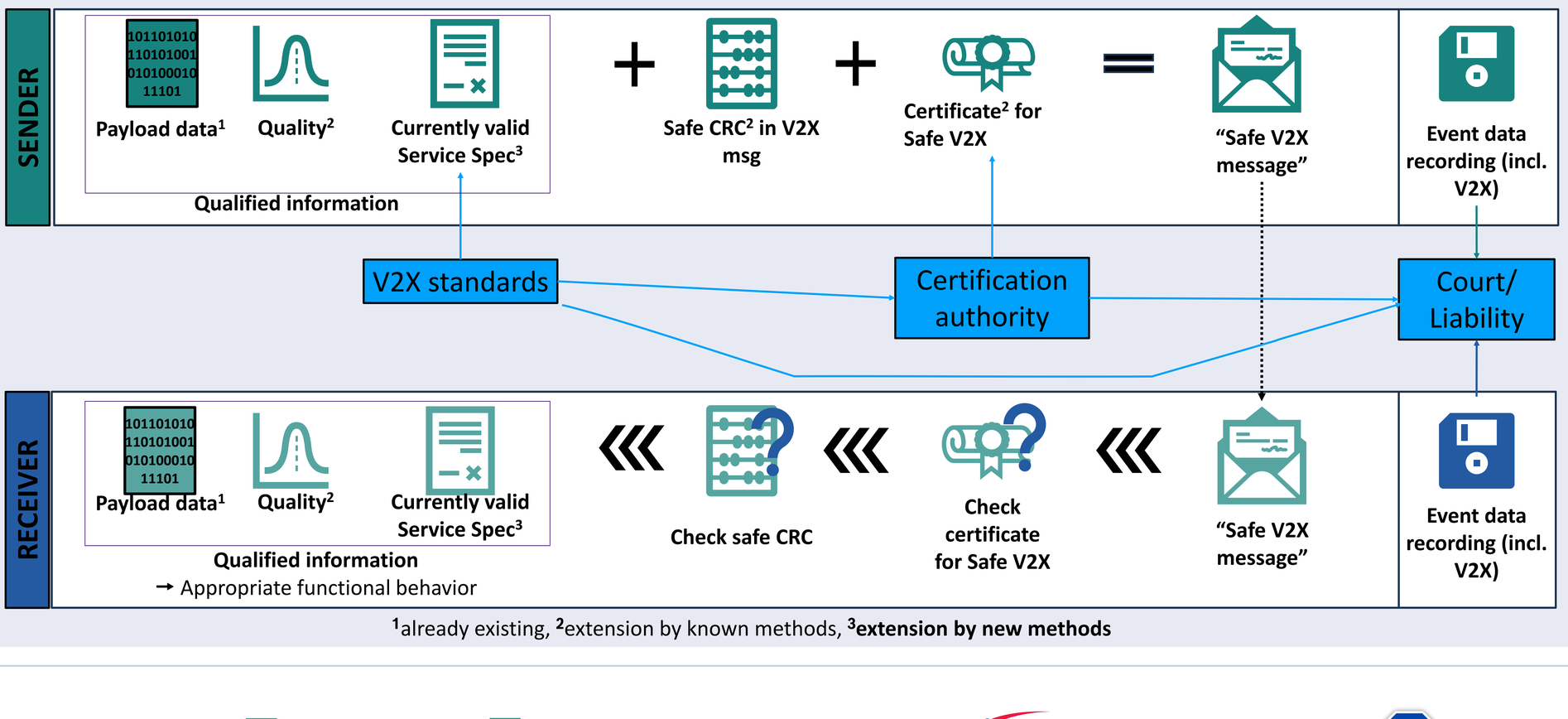
- V2X data as standardized yet (e.g., without major changes)
- Error models: add/extend more complex error descriptions (e.g., PDFs, ...)

- Capabilities: describe functional capabilities of sender (e.g., which information can be provided ...)
- Safety Qualification: Qualification level and failure probability.

- Certificate like existing V2X certification & PKI
- Assertion: "Sender generates valid service specs" based on Extended V2X Standards

- Defines mandatory & optional (meta-) data content and formats
- Definition of interpretation rules
- Definition of verification and certification procedures

Processing Chain



[1]already existing, [2]extension by known methods, [3]**extension by new methods**