Technical Seminar 2021

ASAM SCDL Status Report

ASAM SCDL Project Leader
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10:20 – 10:50 CEST

ASAM
Association for Standardization of
Automation and Measuring Systems

Agenda

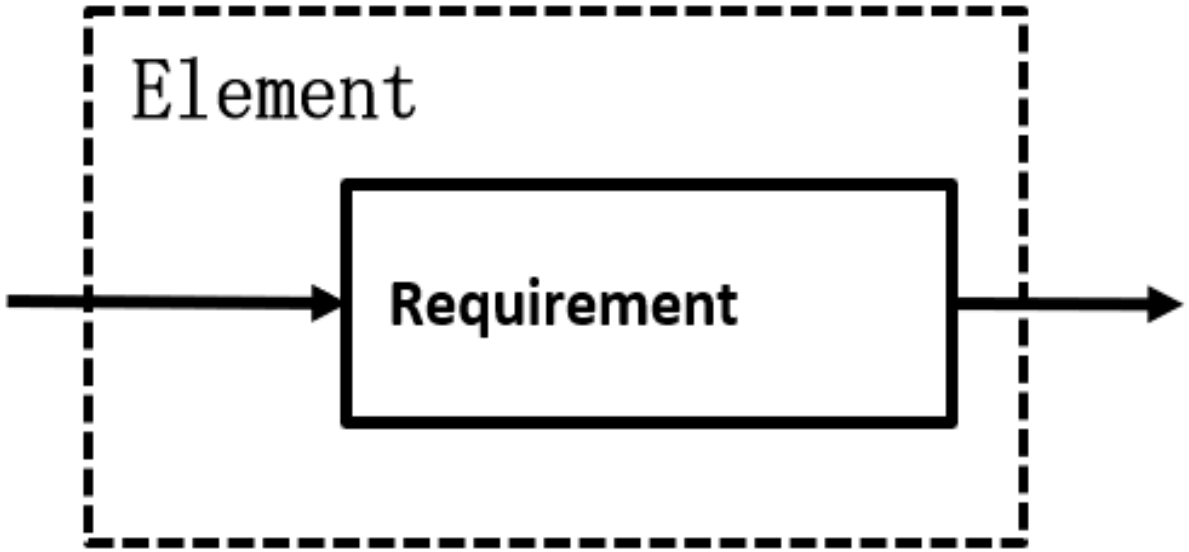
1	What is ASAM SCDL
2	Why ASAM SCDL is needed
3	Example of ASAM SCDL notation

1. What is ASAM SCDL

What is ASAM SCDL

For Modeling

- ASAM Safety Concept Description Language
- Characterized with functional block diagram based on graphical expression



What is ASAM SCDL

For Safety

- Modeling language for Safety Requirements / Safety Concept:
  - Following ISO 26262:2018 original intention;

- Especially focusing on key factors such as:
  - Requirements;
  - Interaction between Requirements;
  - Elements;
  - Allocation of requirements to elements
  - ASIL assignment;
  - Decomposition;
  - Freedom From Interference;

  and so on.

What is ASAM SCDL

For ISO 26262

- ASAM SCDL supports effective and efficient implementation of the requirements related to the following specified in ISO 26262:2018:
  - Part 3 Clause 7: Functional safety concept;
  - Part 4 Clause 6: Technical safety concept;
  - Part 5 Clause 6: Specification of hardware safety requirements;
  - Part 5 Clause 7: Hardware design;
  - Part 6 Clause 6: Specification of software safety requirements;
  - Part 6 Clause 7: Software architectural design;
  - Part 8 Clause 6: Specification and management of safety requirements;
  - Part 9 Clause 5: Requirements decomposition with respect to ASIL tailoring;
  - Part 9 Clause 6: Criteria for coexistence of elements;
  - Part 9 Clause 7: Analysis of dependent failures; and
  - Part 9 Clause 8: Safety analyses.

2. Why ASAM SCDL is needed

Why ASAM SCDL is needed?

First motivation

- ISO 26262 requires semi-formal notations for Safety Requirements specification especially for higher ASIL : C & D with ++. (e.g. Part8-6)

Table 1 — Specifying safety requirements Methods

Ref. ISO 26262-8:2018

Methods		ASIL			
		A	B	C	D
1a	Informal notations for requirements specification	++	++	+	+
1b	Semi-formal notations for requirements specification	+	+	++	++
1c	Formal notations for requirements specification	+	+	+	+

"++" indicates that the method is highly recommended

"+" indicates that the method is recommended

Why ASAM SCDL is needed

First motivation

- What is semi-formal notation in the context of the ISO 26262 standard?

Method	syntax	semantics	Example of description technique
Informal notation [3.80]	Definition can be incomplete	Definition can be incomplete	Natural Language;
Semi-formal notation [3.149]	Completely defined	Definition can be incomplete	Structured And Design Technique(SADT); Unified Modeling Language (UML); System Modeling Language (SysML);
Formal notation [3.63]	Completely defined	Completely defined	Z notation (Zed); NuSMV (symbolic model checker); Prototype Verification System (PVS); Vienna Development Method (VDM).

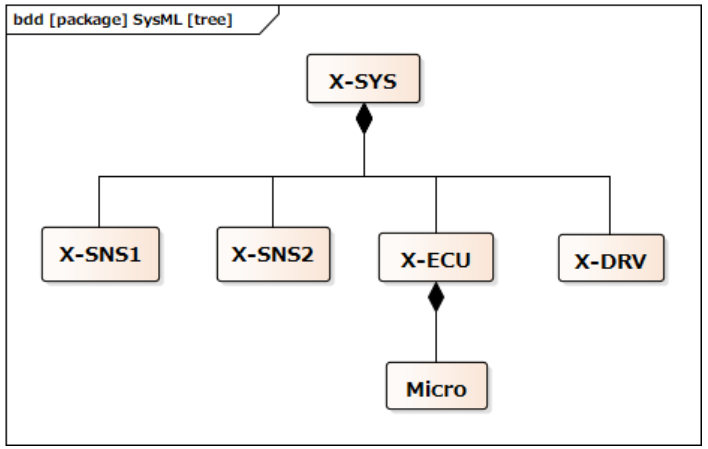
Ref. ISO 26262-1:2018; ISO 26262-8:2018

Why ASAM SCDL is needed

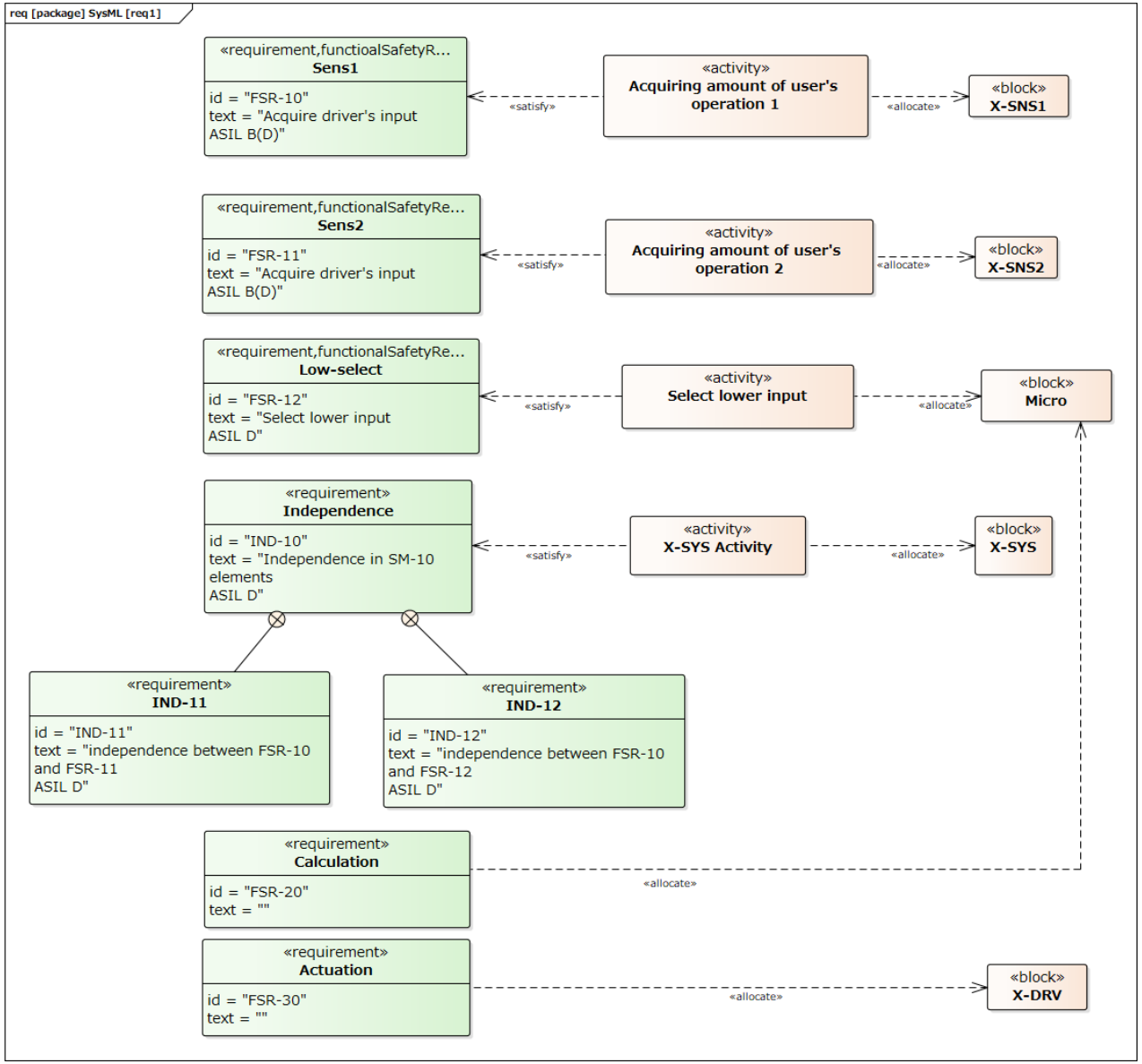
Second motivation

- Safety Concept expressed using SysML

A safety architecture example of redundant input sensor



Structure diagram



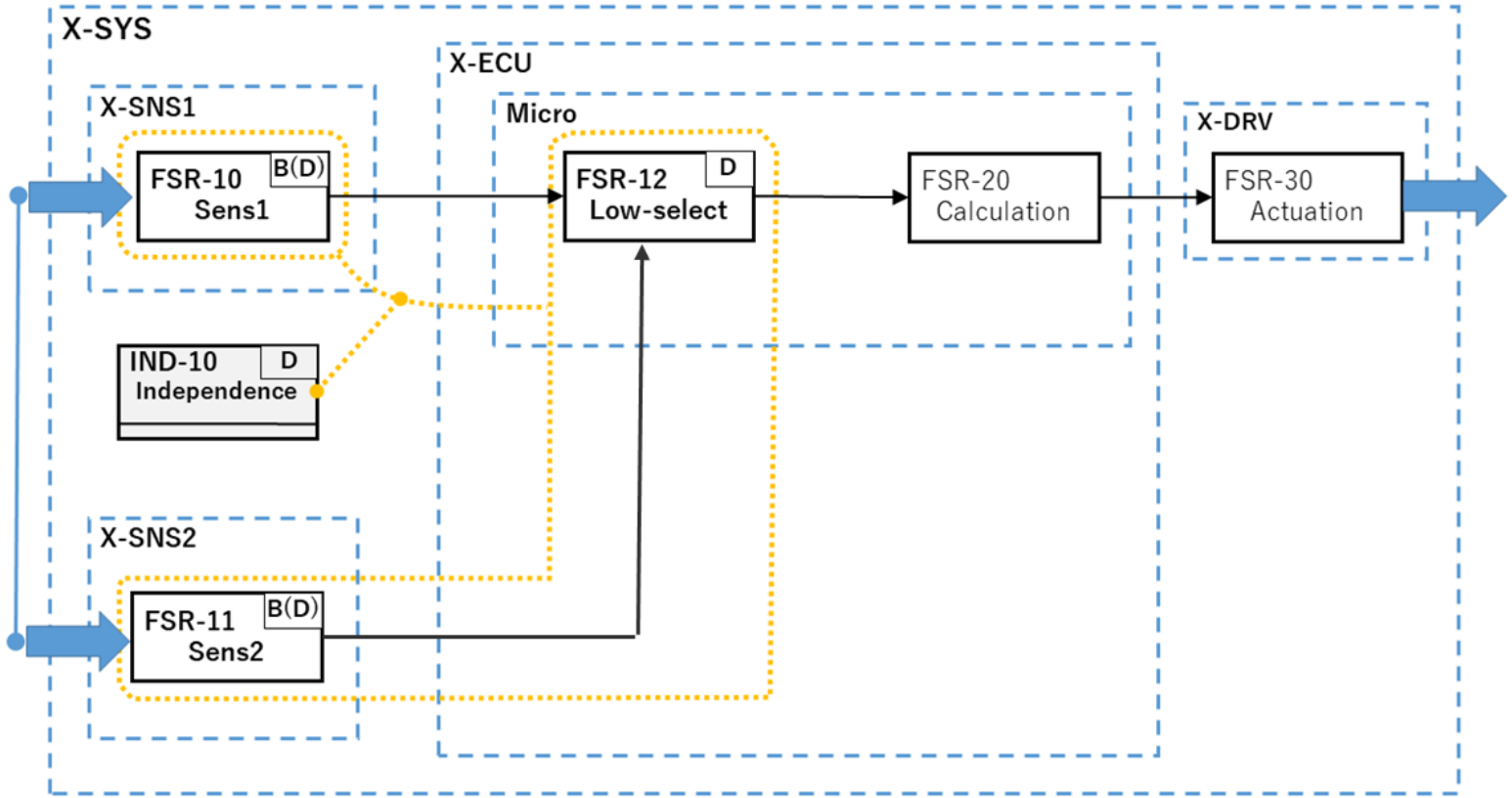
Requirement diagram

Why ASAM SCDL is needed

Second motivation

Safety Concept expressed using ASAM SCDL

A safety architecture example of redundant input sensor, the same as the SysML example.



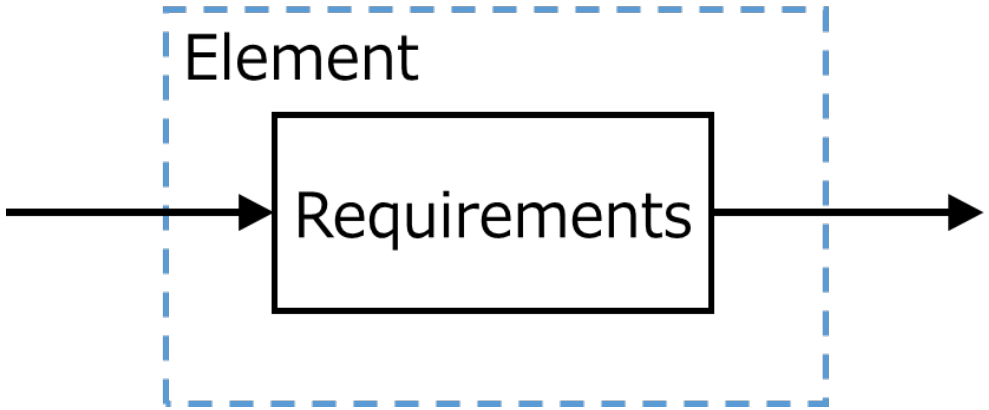
Why ASAM SCDL is needed

Second motivation

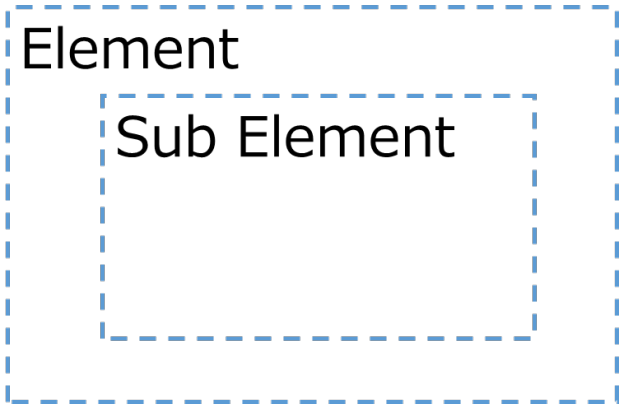
ASAM SCDL helps to understand the architecture intuitively

A type of familiar block diagrams

- Requirements can be overlapped onto elements.
- Elements can be overlapped, as the hierarchical structure.



overlapping requirements and elements



Hierarchy structure of elements

3. Example of ASAM SCDL notation

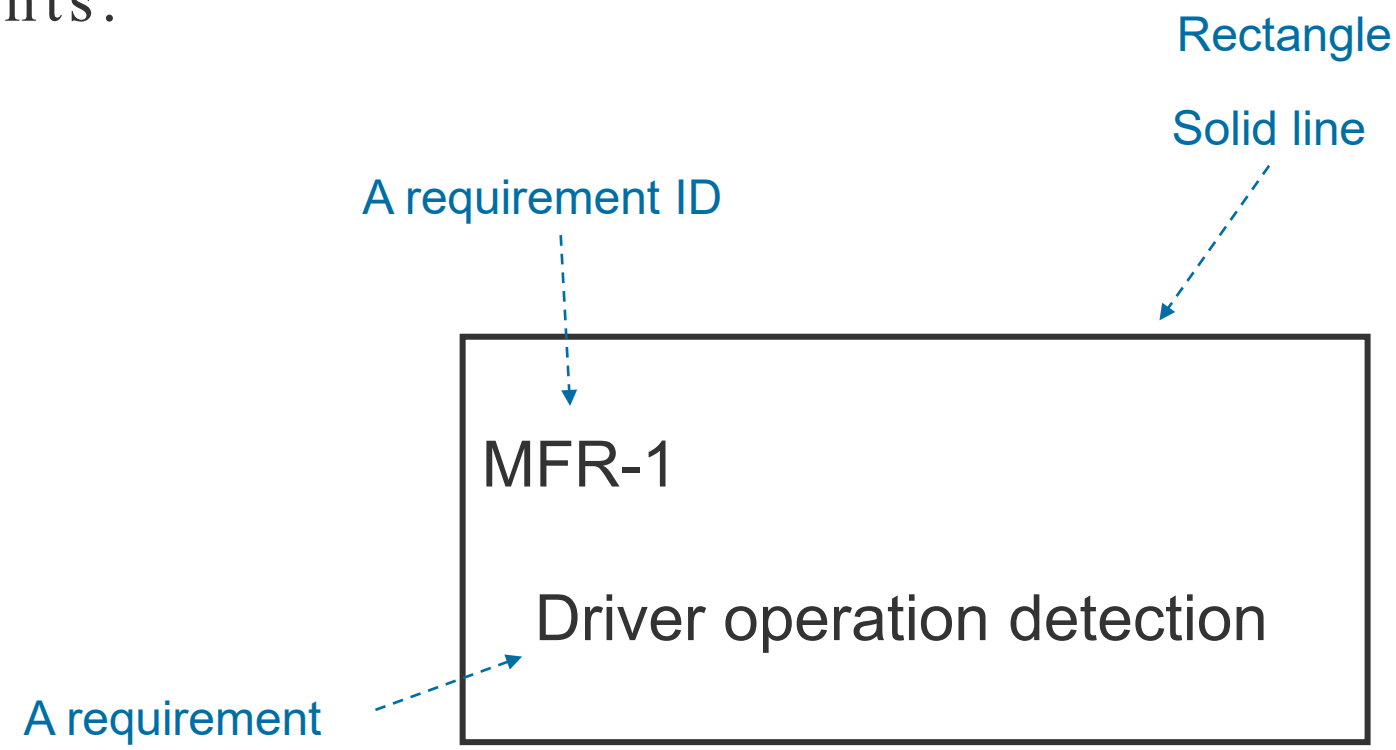
Example of ASAM SCDL notation

Definition of symbols

- Requirements

A requirement represents:

- functionality,
- role, or
- Behavior.



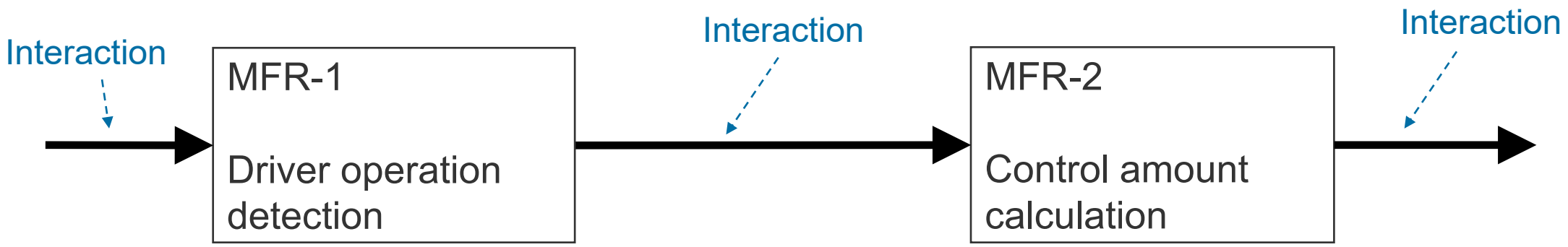
Example of ASAM SCDL notation

Definition of symbols

Interactions

A interaction represents:

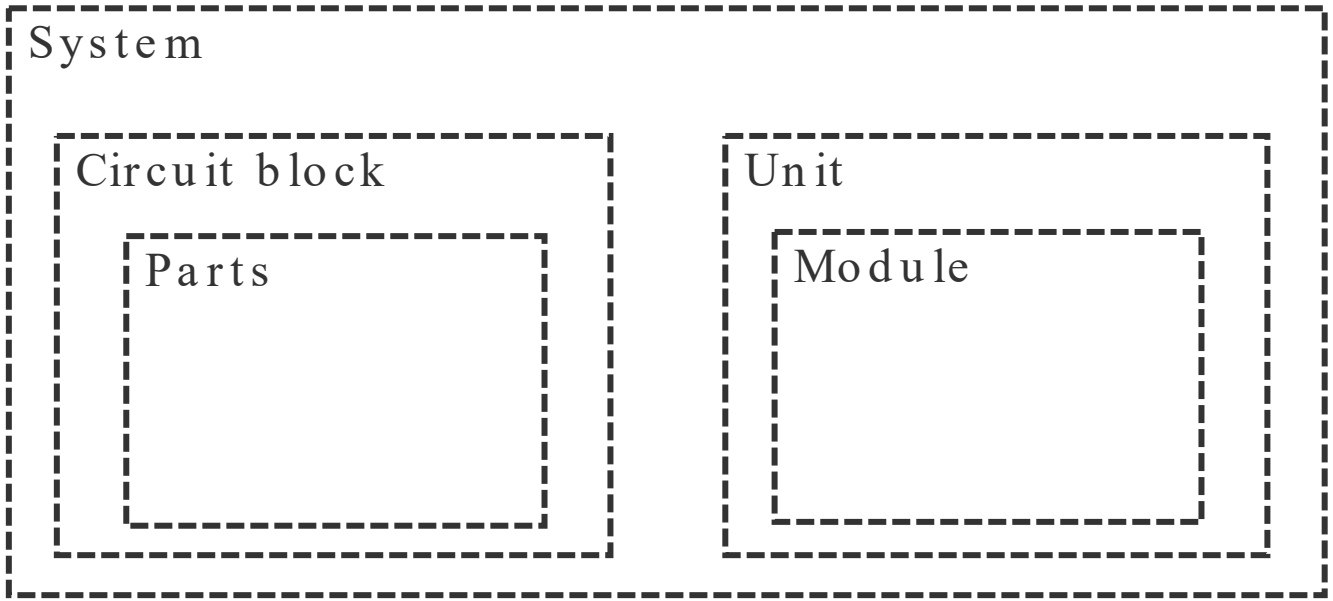
- Exchange of information,
- Signals, or
- Messages between requirements.



Example of ASAM SCDL notation

Definition of symbols

- Elements
  - Elements represent:
    - System, Components, Units, Modules, Parts, and Circuit blocks, etc.,
  - Elements can represent nested structures.

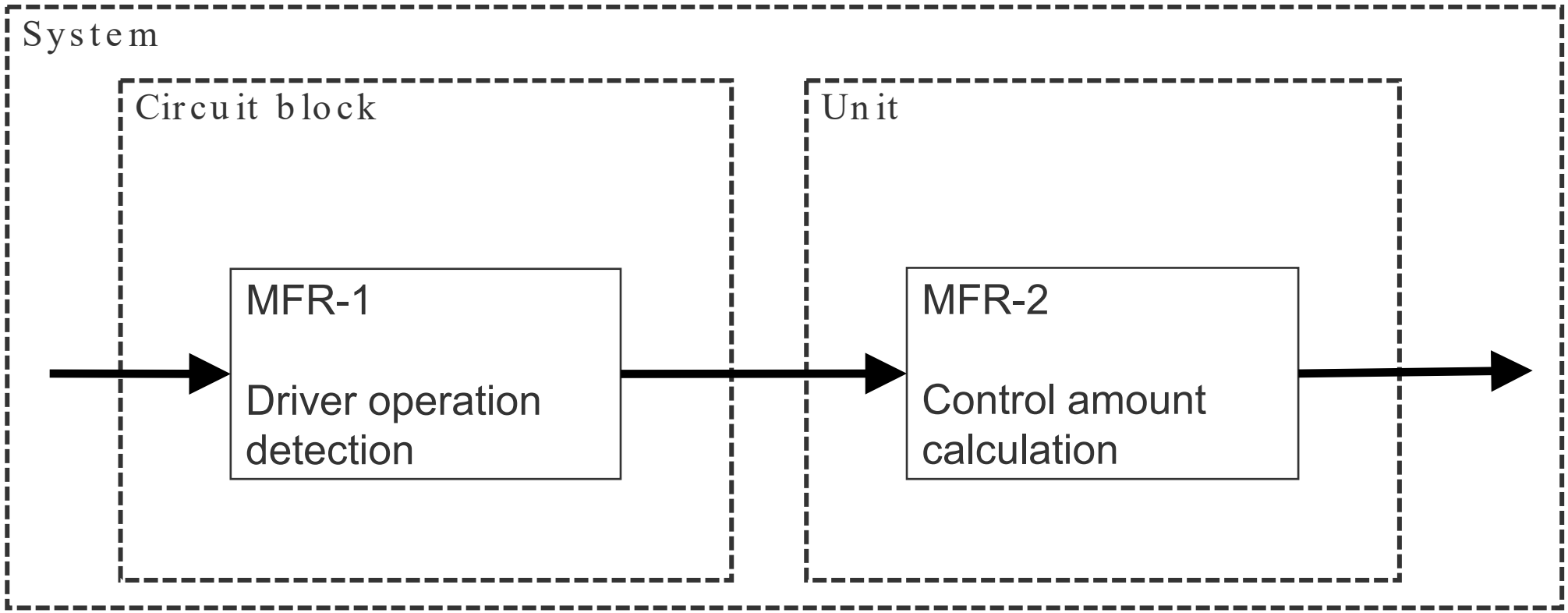


Example of ASAM SCDL notation

Combinations of symbols

- Allocation of requirements to elements

  A requirement allocates to an element which realizes the requirement

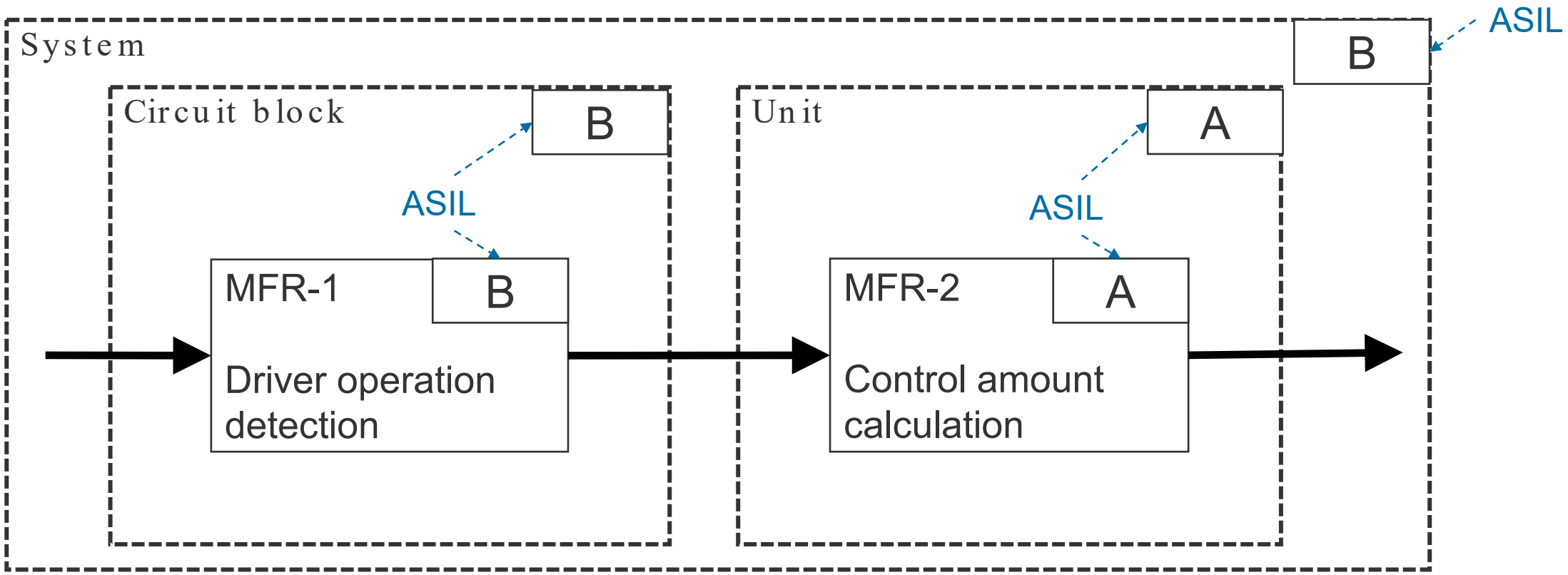


Example of ASAM SCDL notation

Combinations of symbols

- ASIL assignment

  The ASIL can be assigned to requirements and elements



Example of ASAM SCDL notation

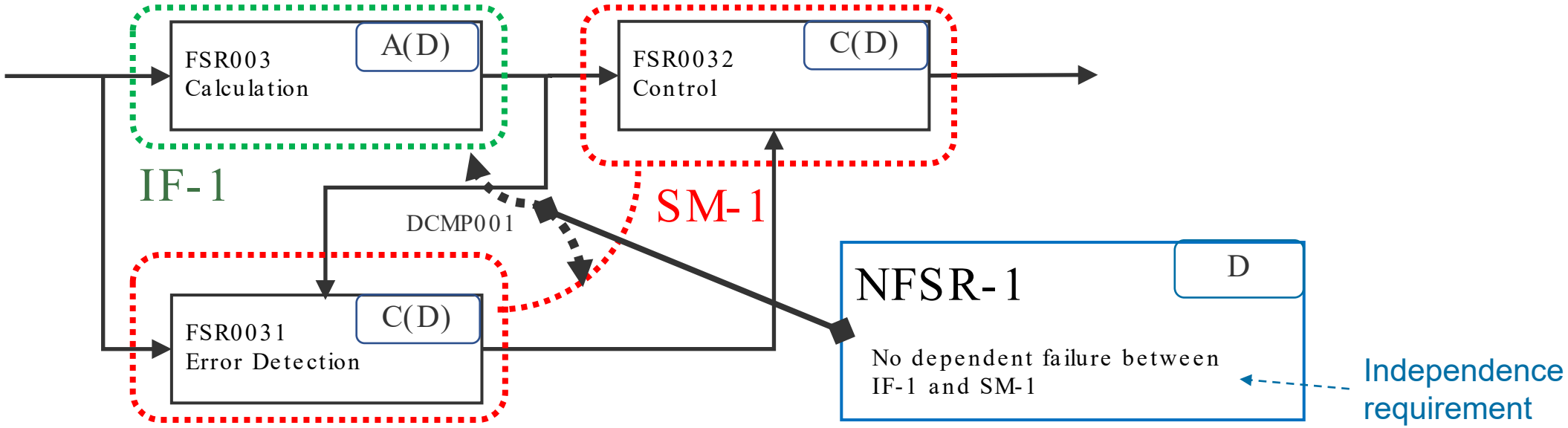
Combinations of symbols

Decomposition

The decomposition can be represented by the symbol of the independence requirement and a combination of symbols.

Example)

The diagram expresses a requirement for independence between the requirement group “IF-1” and “SM-1”.



Example of ASAM SCDL notation

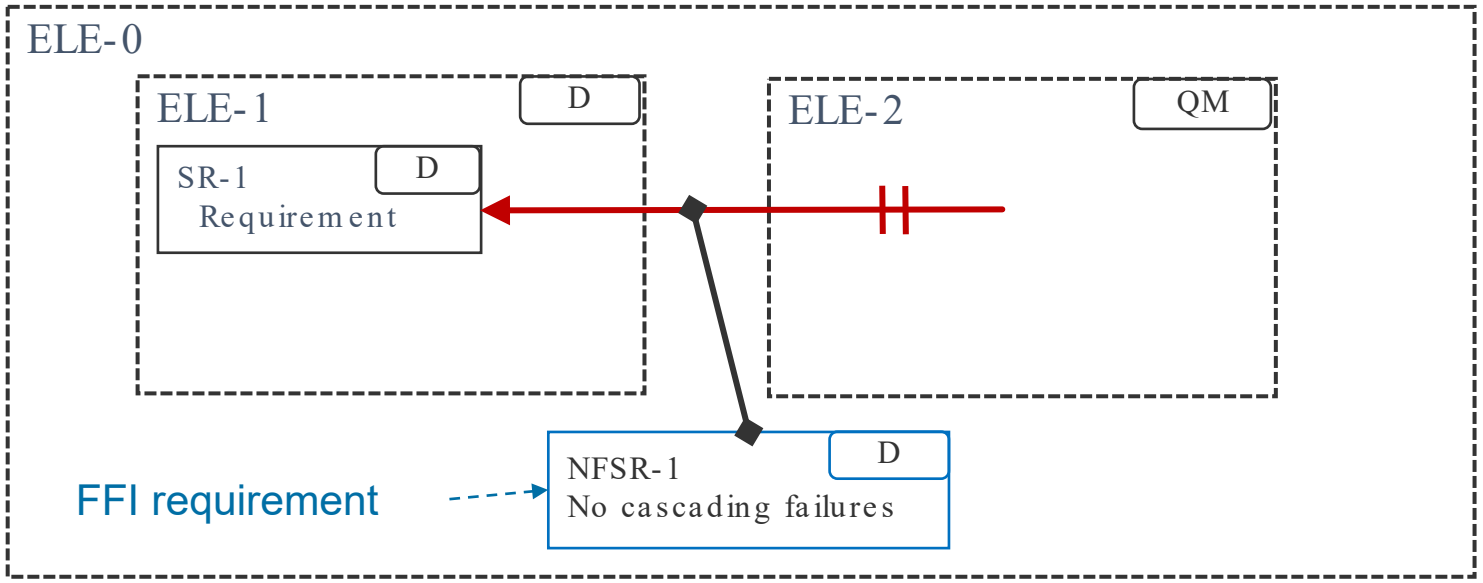
Combinations of symbols

Freedom From Interference

FFI requirement expression following 'Criteria for Coexistence‘.

Example)

The diagram expresses that the failure of ELE-2 should not affect the "SR-1 requirement".

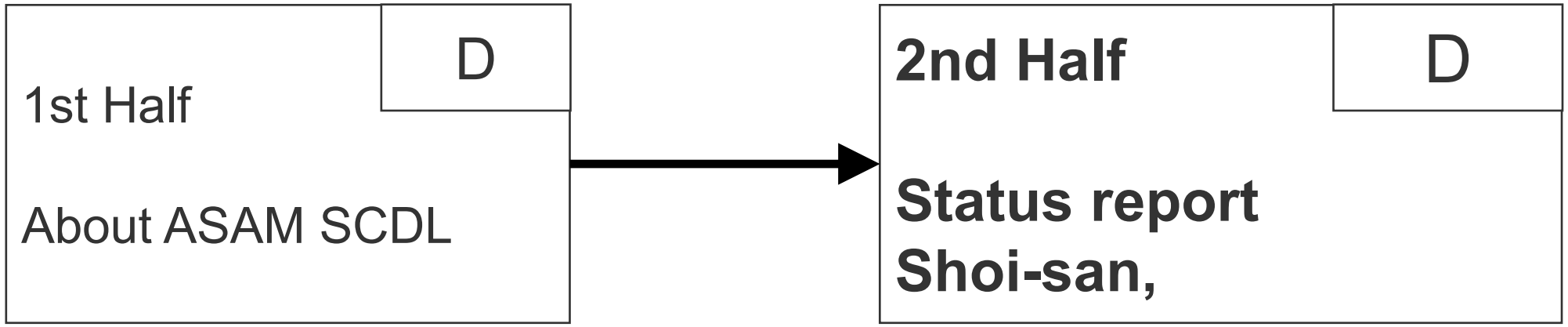


FFI: Freedom From Interference

In conclusion

- ASAM SCDL is one of the modeling language for system architectures
- ASAM SCDL supports ISO 26262 of the safety developments.
- ASAM SCDL is an intuitively understandable notation.

Next,



Thank you !