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Requirements4.0

Peter Nicke – ReConf 2019

Industrie4.0

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Development1.0

Islands instead of connected and interacting things

Conventional Specification

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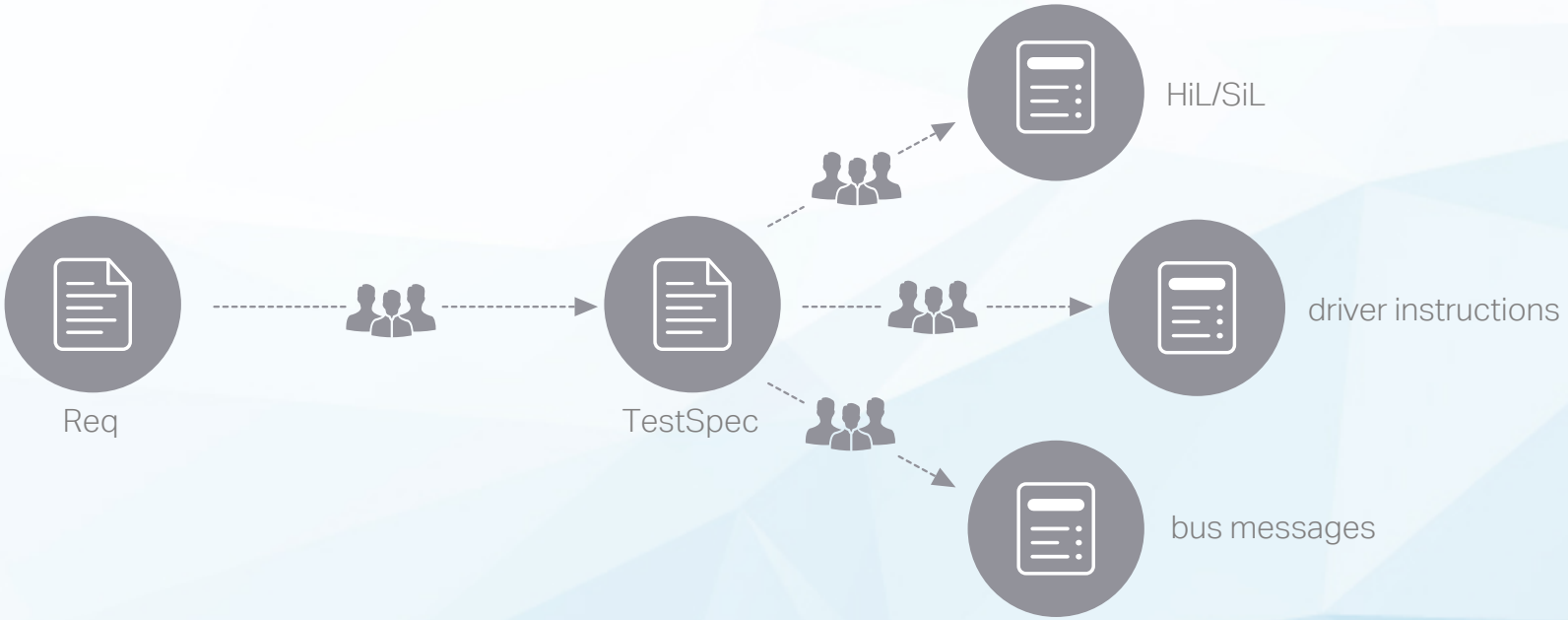
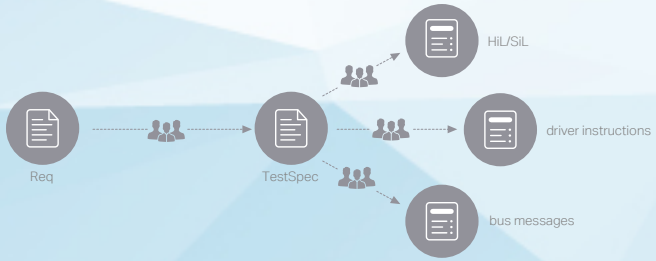


Conventional Specification

Mit Diagnosesoftware die Funktion Parken-Bremsen auskodieren (CAN-BR: Codierung ECU-1: Codierung in PARK, dafür Entwicklungs-cbf erforderlich). Drei Zündungswechsel durchführen (Übernahme Kodierung).
Mit Diagnossesoftware die Botschaften
Parken_BRK_RQ (z.B. Parken_BrkMd_Rq) und
Parken_BRK_RS (z.B. Parken_BrkMd_Stat) beobachten

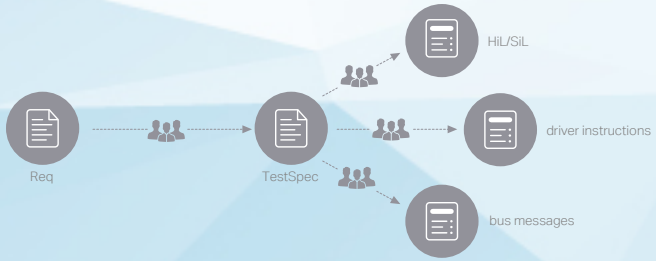
- Language Issue
- Different variants in one TestChase
- unnecessary information
- Unlegibility
- unambiguous
- ...



What are good specifications?

- Good „Legability“
  - Quickly comprehensible
  - Unique / not interpretable
  - Uniform for different specifications
- Efficiently created
- maintainability (change management)
- support of test automation
- Evaluable (KPIs)
- Duable
- Reusable
- …

→ Key-Word Driven Testing



What are good specifications?

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Action:

1) *SCN::Park_Brake[off]*
2) *IgnitionCycle[3]*

Expectation

- *SIG_FR::PARK_BRK_RQ[xyz]*

KeyWord-Driven Testing

KeyWord-Driven Testing

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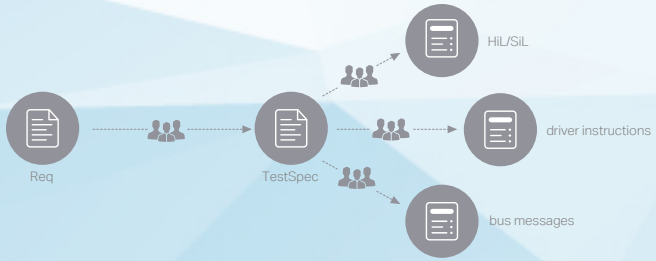
„... testing using test cases composed from keywords“

„Keyword-Driven Testing is a test case specification approach that is commonly used to support test automation ...“

„The fundamental idea in Keyword-Driven Testing is to provide a set of "building blocks", referred to as keywords, which can be used to create manual or automated test cases without requiring detailed knowledge of programming or test tool expertise.“

„The ultimate goal is to provide a basic, unambiguous set of keywords comprehensive enough so that most, if not all, required test cases can be entirely composed of these keywords. The vocabulary included in these dictionaries or libraries of keywords is, therefore, a reflection of the language and level of abstraction used to write the test cases, and not of any standard computer programming language.„



* ISO/IEC/IEEE DIS-2 29119-5

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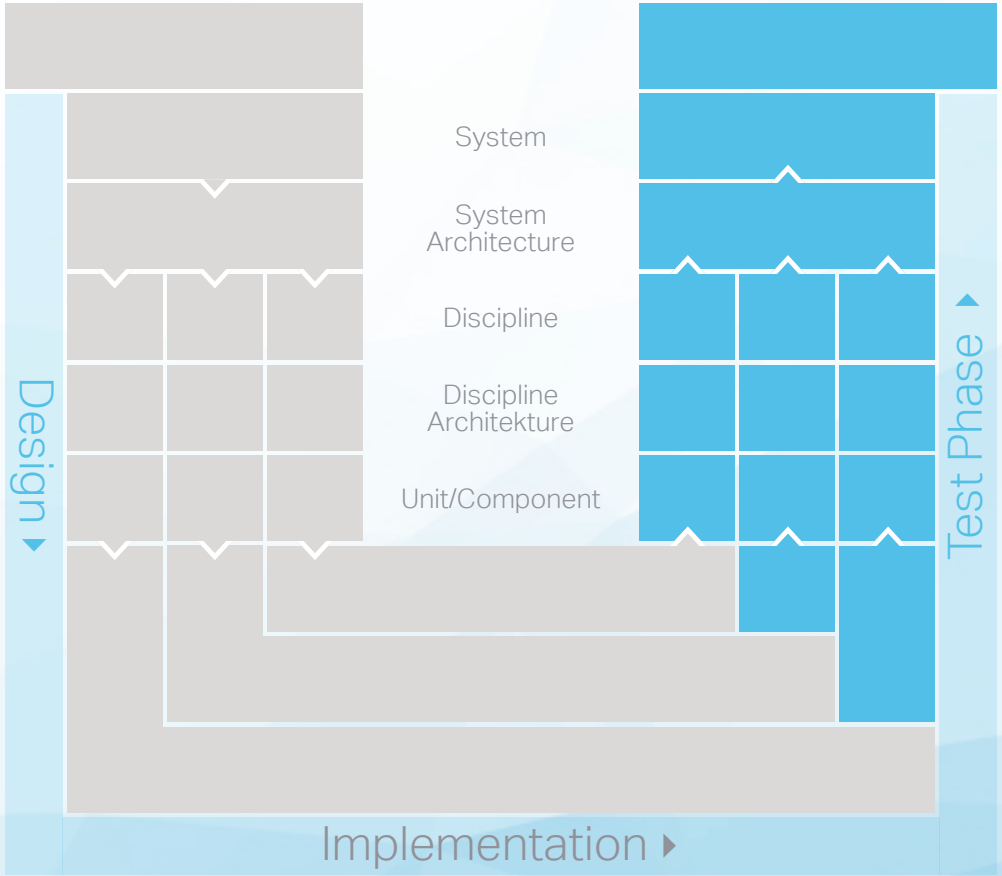

What's about the left side?

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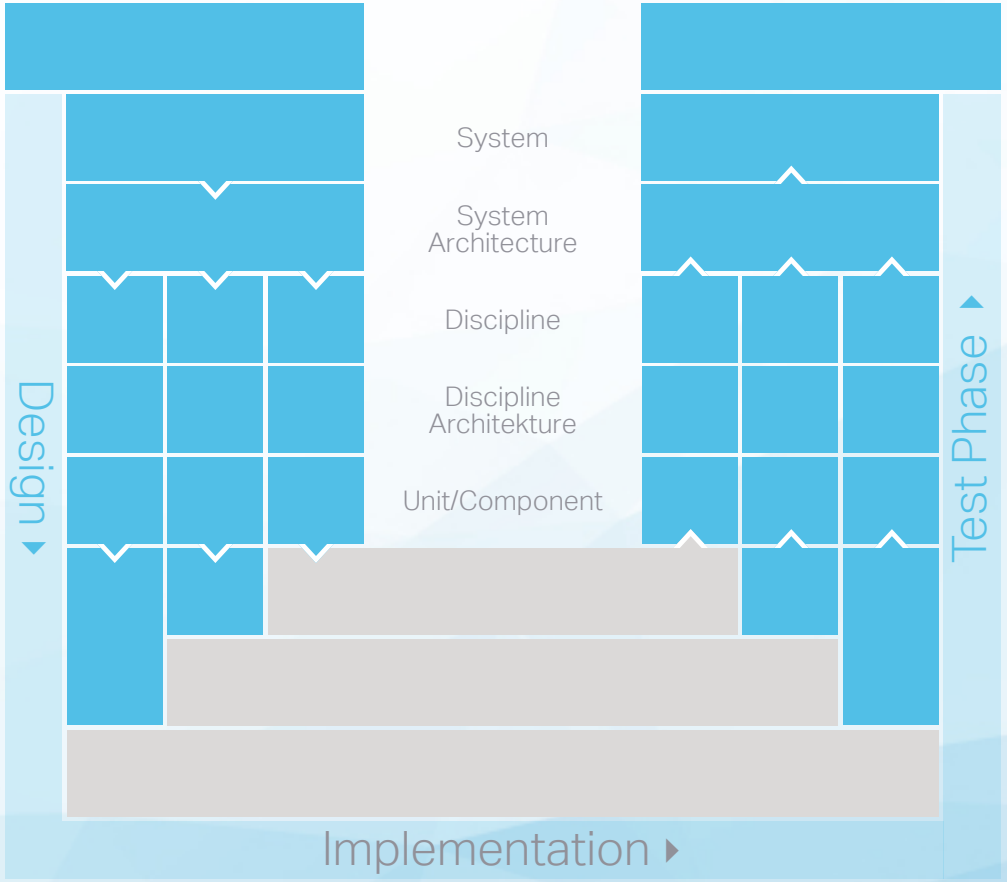

Requirements vs. TestCases

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- No “Given-When-Than”
  - *Given .. put the system in a known state*
  - *When .. describe the key action*
  - *Than .. observe outcomes*
- Sentence construction

→ *Special syntax is required*
→ *Requirement Design Rules*

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"Readability was one of the major objectives for developing PiRo"

PiRo :: SmartRequirements

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Requirement

IF ENV::Road(gravel, 1 lane) AND
IF ENV::Location(City) AND,
IF INF::TrafficLight(Green to Red),
The System shall EGO::Speed(0kph)

Test Case

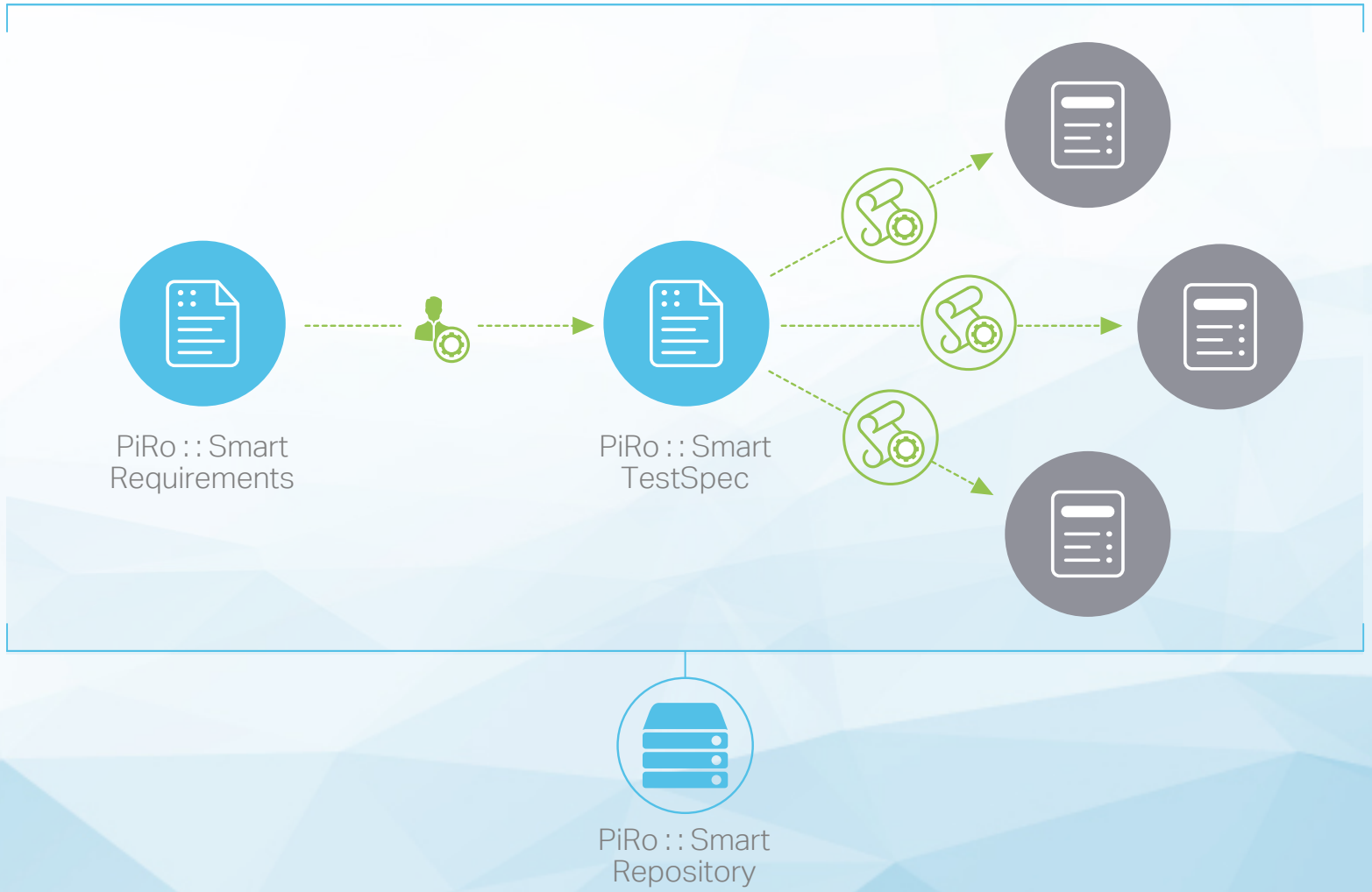
Precondition:
ENV::Road(gravel, 1 lane)
ENV::Location(City)

Action:
INF::TrafficLight(Green to Red)

Expectation
EGO::Speed(0kph)

A given set of environmental conditions enables the creation of a complete test set (weather, Day/Night, …)

Requirements4.0



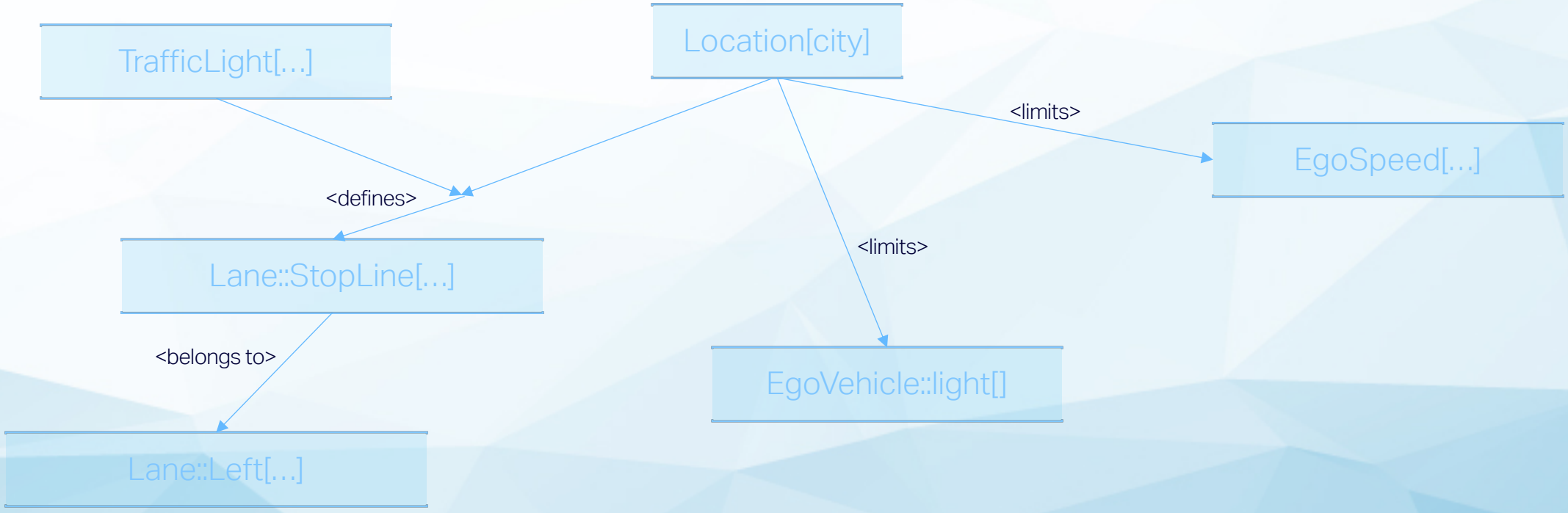
Tooling

work smarter not harder

Ontology

Explaining the world by Entities and their Relations

"… an ontology encompasses a representation, formal naming and definition of the categories, properties and relations between the concepts, data and entities that substantiate one, many or all domains" (Wikipedia, 14.01.2019)



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time saving

resources saving

increased Quality

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BackUp

Requirements4.0

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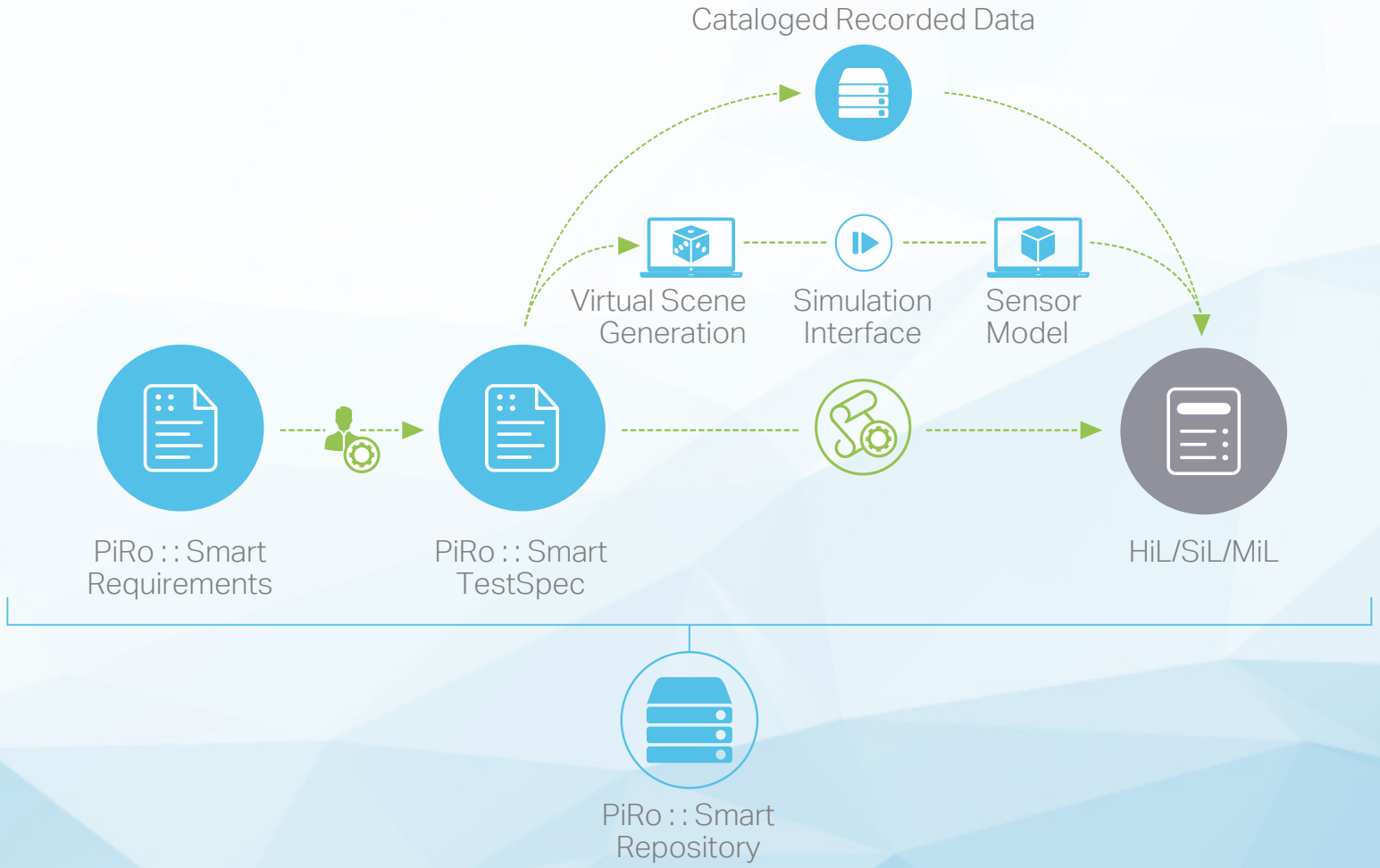

PiRo Syntax

From KeyWords to Phrases

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<Argument>

KeyWord[Argument]

„DetectionRange[200]“

PiRo Syntax

From KeyWords to Phrases

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<class>

Class::KeyWord

„param::DetectionRange“

PiRo Syntax

From KeyWords to Phrases

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<system>

System::KeyWord

„Lidar::DetectionRange“

PiRo Syntax

From KeyWords to Phrases

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The Maximum PiRo Phrase

Class::System::KeyWord[Argument]

„param::Lidar::DetectionRange[200]“

PiRo ... what is it?

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... an extended approach to realize KeyWords

... a meta language

... an approach to express specifications as abstractly as possible while making it precise enough to interpret and execute it automatically.

... a way to handle specifications agil

PiRo ... Phrase In Requirement Out

PiRo Systems Engineering GmbH

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- Founded 2016

- Projects
  - OEM/Tier1/Tier2/StartUp
  - Camera/Ultrasonic/Lidar/DomainController…

- Systems & Requirement Engineering
- Smart Requirements formalism (patent pending)
- SW products and Cloud Services since 2018 smaagile

- IEEE P2020 Member

»get complexity managed«

Systems Engineering

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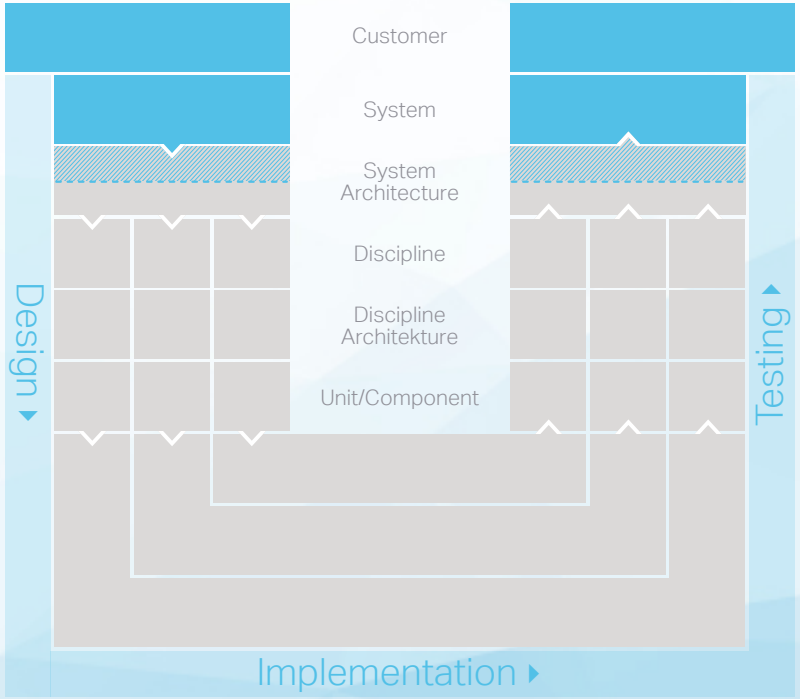
✓ Technical Project Management

- ✓ Requirement Engineering
- ✓ Requirements Management
- ✓ System Modeling
- ✓ System Architecture

»we understand what we specify«



- ✓ System Testing
- ✓ System Integration
- ✓ Reprocessing
- ✓ Virtual Validation
- ✓ Documentation

»work smarter not harder«

Technical know how & Expertise /. aSPICE & ISO26262 experts

Benefits of KeyWord-Driven Testing

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- Test case become clear and understandable
- Almost independent of targeted test domain
  - DriverTests
  - HiL-Tests
  - SignalLevel
  - ...
- Limited technical expertise required
- No need for rework TestCase in case of new Script Implementation
- Reusability
- Readability
- Faster TestCase creation
- Creating TestCases before TestInfrastructure is ready
- Increast quality
- ...

Benefits of KeyWord-Driven Testing

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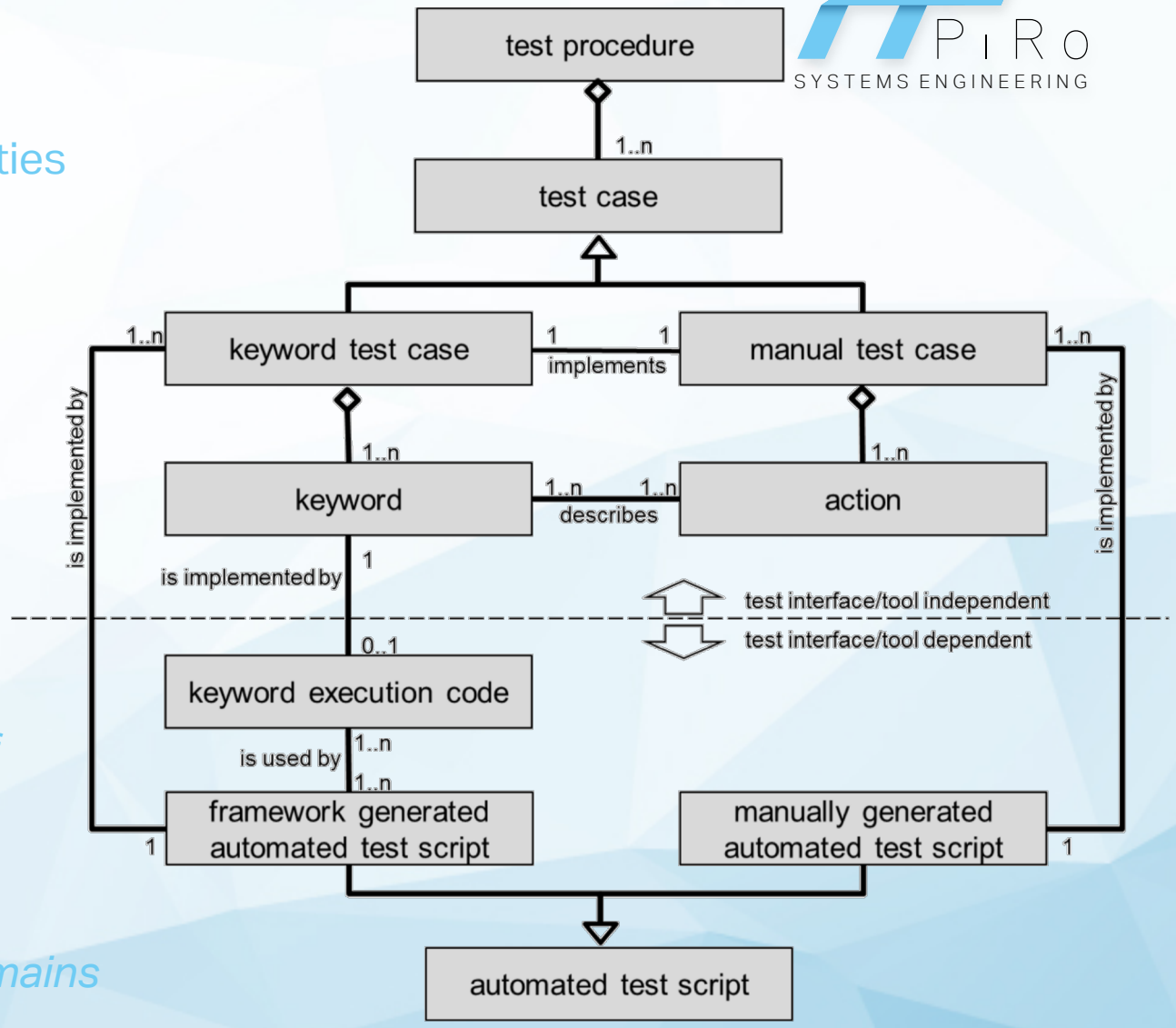
- Changing signals, parameters & Co. → changing just the repository
- *PiRo* supports UML, SysML and other modeling languages
- Reusable Phrases → creating specifications efficiently
- Tool Independant
- automaticaly generated recurring script structure (coding rules)
- Tracebility from Requirements to TestScript (content related)

Relationship Model

Relationships between Keyword-Driven Testing entities

- Manual vs. KeyWord TestCase
  - → *Old and new world can be combined*
- KeyWords without execution code
  - → *start writing test cases independent of The test infrastructure*
- TestCase independent of TestInfrastructure
  - → *one text case for different test domains*



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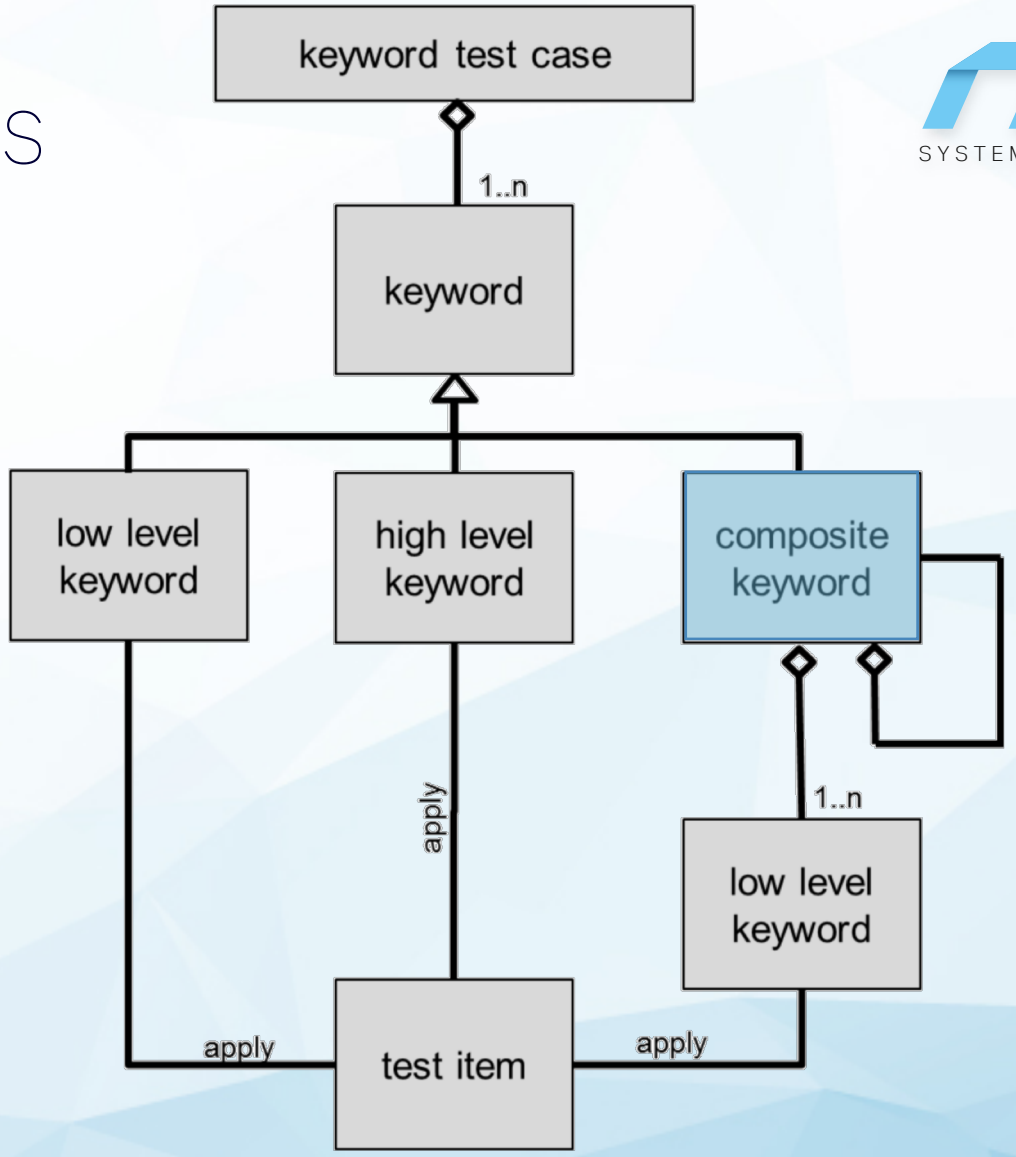
Composite KeyWords

- Composing of lower level KeyWords
- Create complex operations
- Define BaseScenarios
- Hide Parameters



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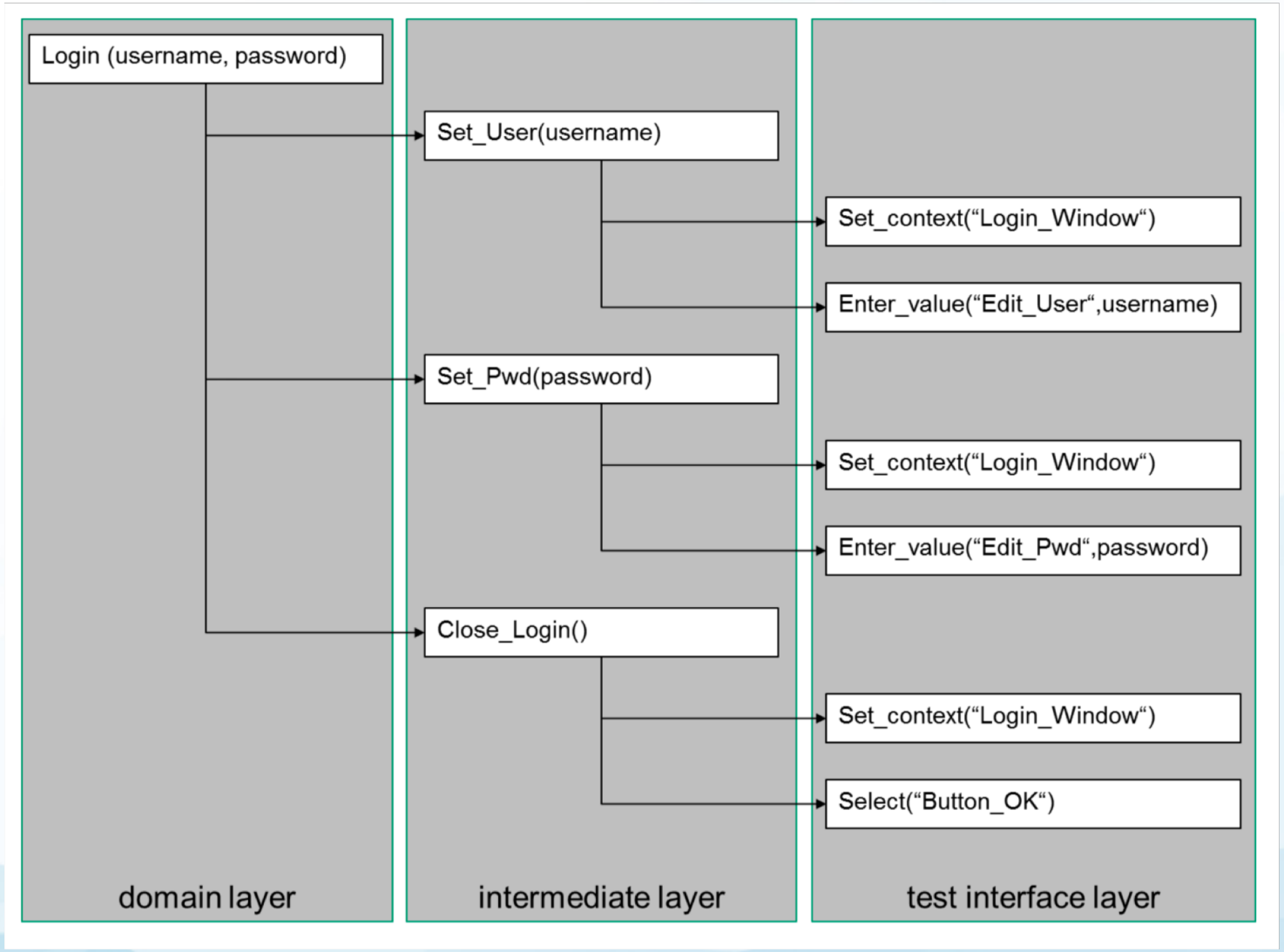

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