Testing Semantic Interoperability

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Roadmap

- Introduction
- Testing Semantic Interop
- Survey
- Conclusion

Introduction

- Interoperability - key to achieve the full potential of the IoT market.
- Due to the highly dynamic nature of the IoT, a strong need of interoperability at data level has emerged so that it becomes easier to combine/aggregate, process, manage and store the data/event coming from heterogeneous data sources.
- Semantic interoperability is a way to address the problem.

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Introduction

- We need tests that validate the semantic compliance and interoperability among IoT systems.
    - To boost the acceptance and adoption of the semantic technologies by the IoT market.

- Testing semantic interoperability is identified as a gap in the current IoT research and industrial initiatives.

- SemTest, an Industrial Extension of EU H2020 F-Interop project addresses this part.

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Two Types of Testing

- Conformance testing
  - To test if a piece of semantic data conform to a reference ontology

- Interoperability testing
  - To check if two parties understand correctly the exchanged semantic data

Requirements – Conformance Test

- Lexical check

- Syntactic check
  - Untyped of resources and literals
  - Ill-formed URIs
  - Problematic prefix and namespaces
  - Unknown classes and properties

- Semantic checks
  - Cardinality inconsistency
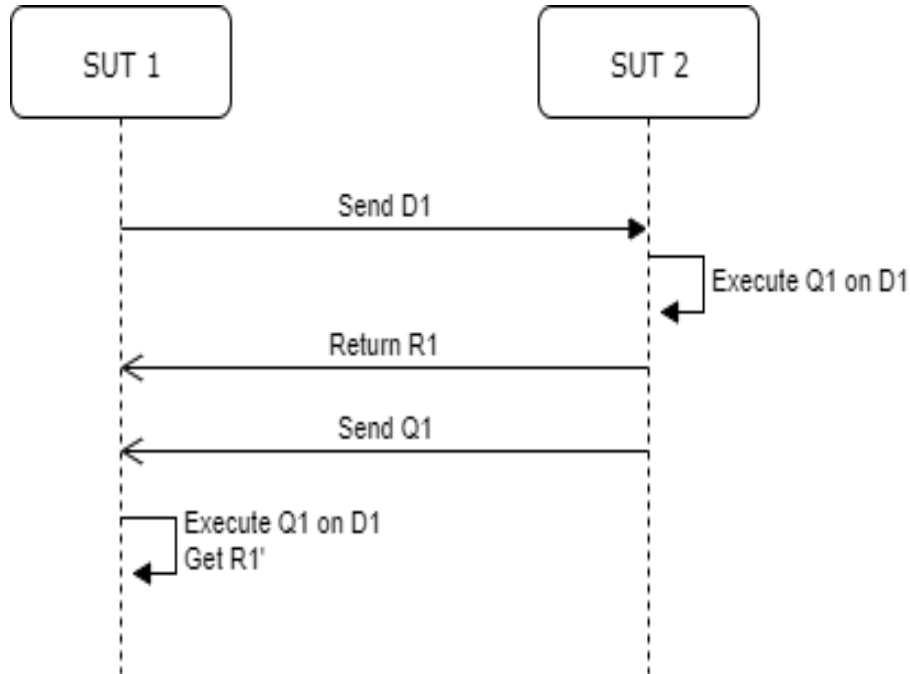 - Problematic relationship or inheritance

Conformance Test Scenario
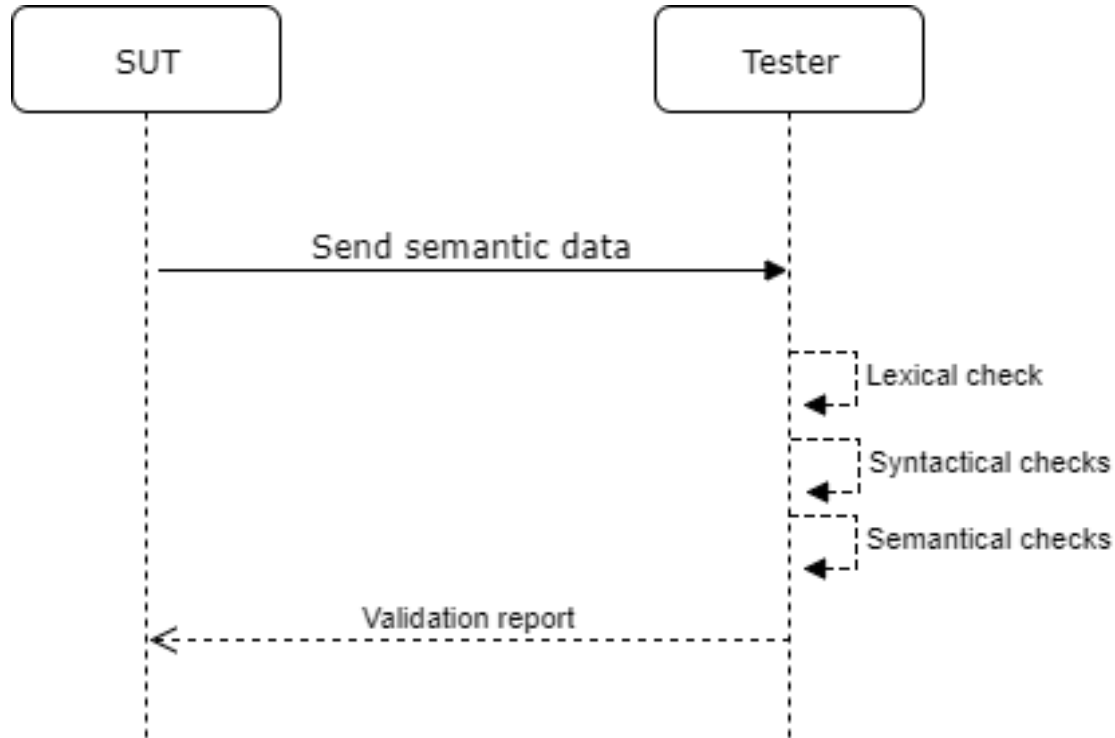
Requirements – Semantic Interop Test

- Communication level check

- Lexical/format level check

- Data processing check

Semantic Interop Testing Scenario

Objective	Test the semantic processing results from two systems
Pre-test condition	SUT1 and SUT2 both have semantic query processing capability Transmitted semantic data (D1) have been validated its conformance SPARQL query Q1 is prepared
Test Sequence	
Step	Description
1	SUT 1 sends its semantic data D1 annotated to SUT 2
2	SUT 2 executes query Q1 upon the semantic data received D1, for example, to execute a query to get the resources that has X property(ies). SUT 2 gets result of the execution R1
3	SUT 2 sends the result R1 to SUT 1.
4	SUT 2 sends the query Q1 to SUT 1
5	SUT 1 executes the received query Q1 upon D1 and gets the result R1'
6	SUT 1 compares R1 and R1'. R1 and R1' are equivalent

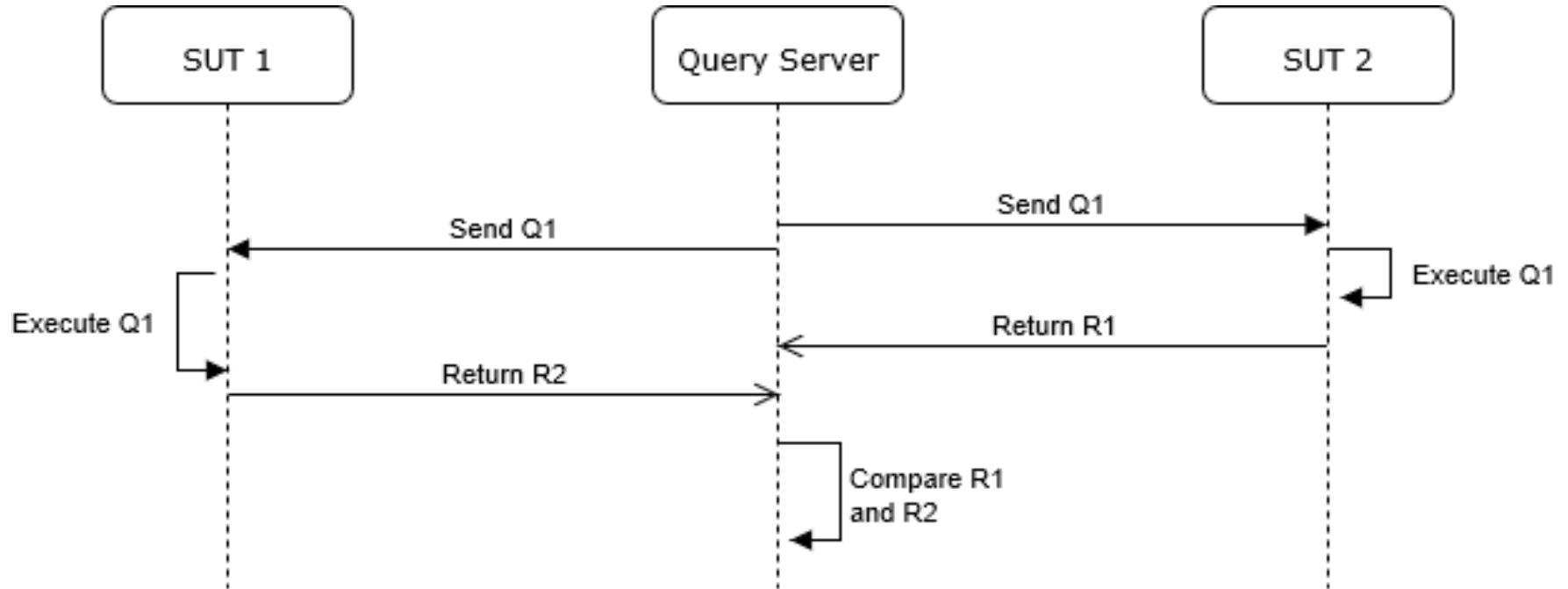INSTITUT CARNOT Télécom & Société numérique

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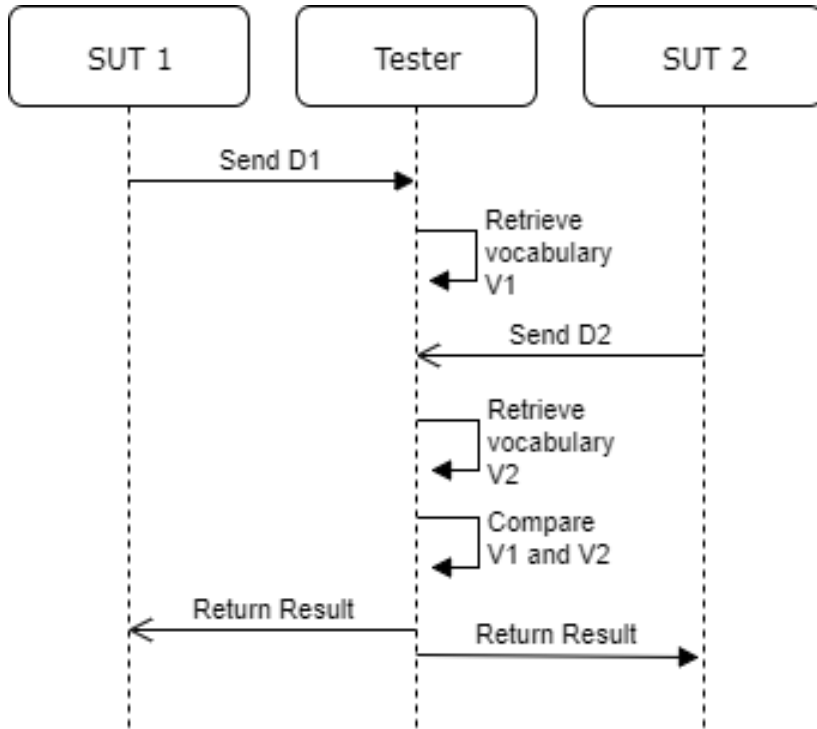
Semantic Interop Testing and oneM2M
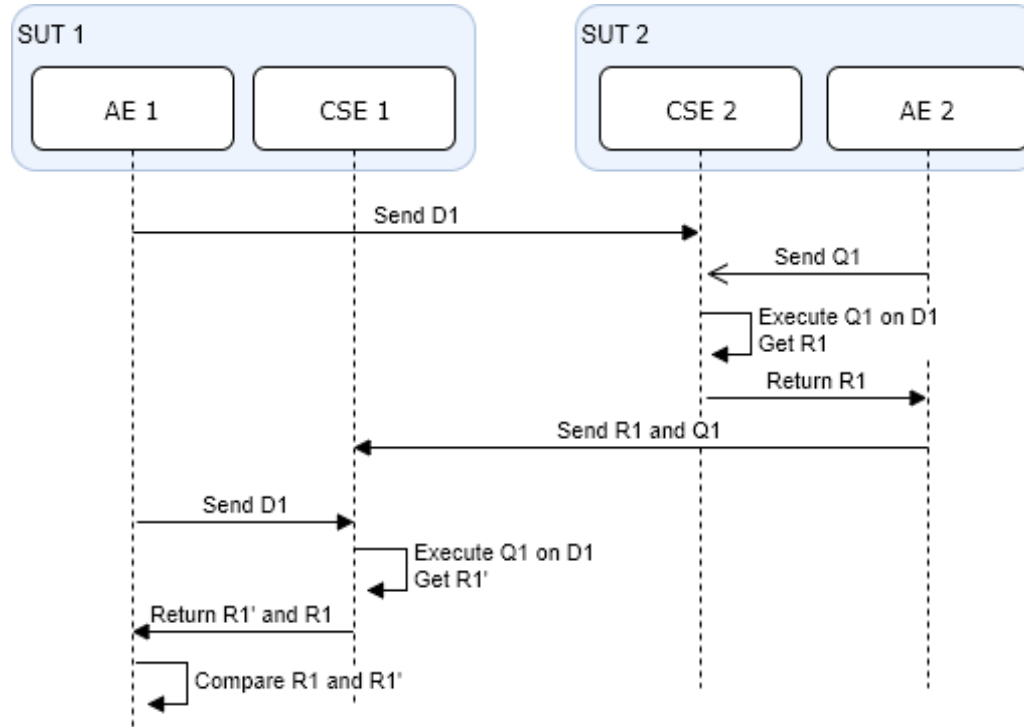
AE – Application Entity

CSE – Common Service Entity

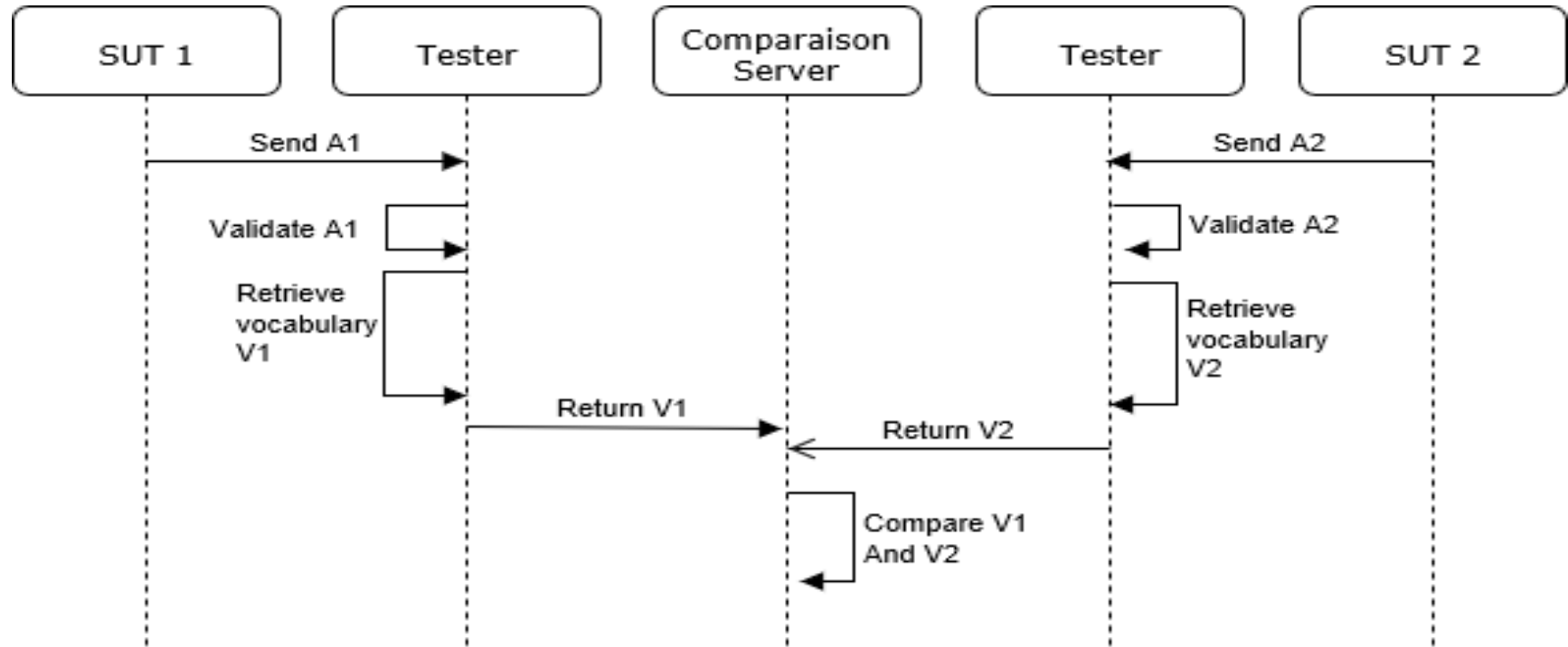# Semantic Interoperability Between Systems Scenario Architecture

Interoperability at Data Level

Objective	Test the semantic data for checking if they share the same vocabulary
Pre-test condition	Transmitted semantic data (D1 and D2) have been validated its conformance
Test Sequence	
Step	Description
1	SUT 1 submits semantic data D1 to a third-party module (Tester)
2	Tester retrieves the vocabulary of D1: V1
3	SUT 2 submits semantic data D2 to Tester
4	Tester retrieves the vocabulary of D2: V2
5	Tester compare V1 and V2. They are identical to be interoperable 100%
6	The result from the previous step is communicated to SUT 1 and SUT 2

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Data Level Interoperability Scenario Architecture

Survey

- Please complete our survey on Testing Semantic Interoperability (takes ~5 minutes)
    - https://goo.gl/forms/h3wgsyOpztxA3lSG2

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Conclusion

- Testing for semantic interoperability is necessary in IoT.

- We propose two types of tests.

- Test scenarios are proposed to implement the semantic conformance and interoperability tests.

- Future work - we will implement the tests within the F-interop platform and report our results.

Acknowledgement

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Thank You

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