



# Symposium on Interoperability and Data Spaces

Welcome

# Agenda morning session



## Welcome

- Keynote to the vision of digitalisation, Alexander Markowetz
- Activities on the European SET-Plan, Stavros Stamatoukos, DG Energy
- Introduction of activities in the energy sector: CEtPartnership, HE project int:net

## Data Space development and interoperability in the different sectors

- **Healthcare:** myHealth@EU
- **Agriculture:** standardisation activities
- **Energy:** Project EDDIE, Project ENERSHARE, Project OMEGA-X
- **Transportation:** Project DeployEMDS
- **Public Services:** X-Road® 8 "Spaceship"

## Lunch Break

14:00 Behind the scenes tour (IHE) Connectathon test floor

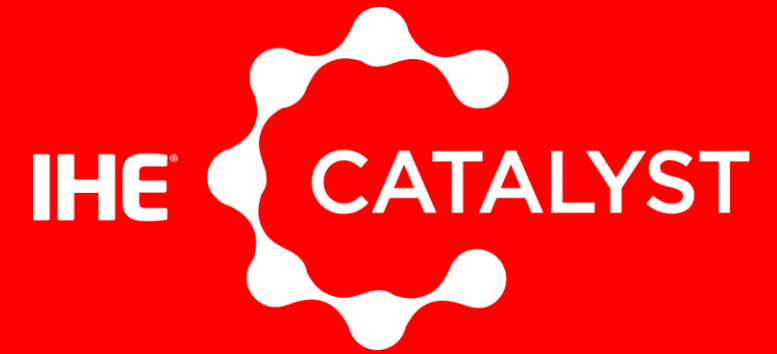
**15:00 Interactive Session on practical views to interoperability testing**

**16:30 Closing**



# Testing in the healthcare sector

Alexander Berler



# Testing in the healthcare sector

Enabling healthcare delivery for EU citizens



**Alexander Berler**, MSc, PhD BME  
IHE Catalyst, Strategic Business Development Director



## Challenges along a patient's journey

### Awareness



Early symptoms not recognized

### Diagnosis



Diagnostics not part of all check-ups or not reimbursed



Poor physician-patient communication

Complex medication for co-morbid patients



### Therapy

Side effects and drug-drug interactions



Intentional & non-intentional non-adherence



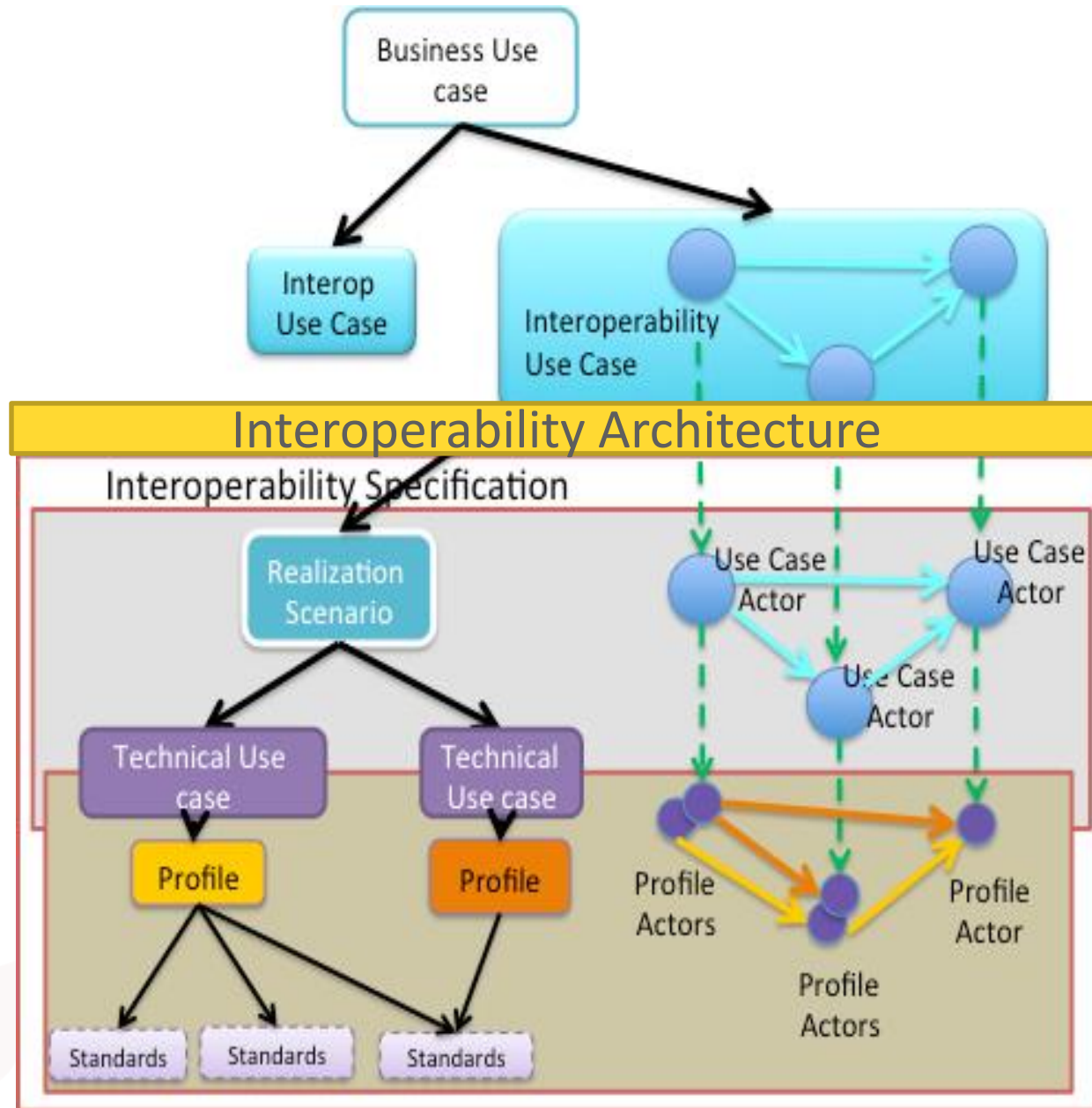
Fear & anxiety



### Monitoring

Social withdrawal, avoidance, isolation





eHealth Business cases

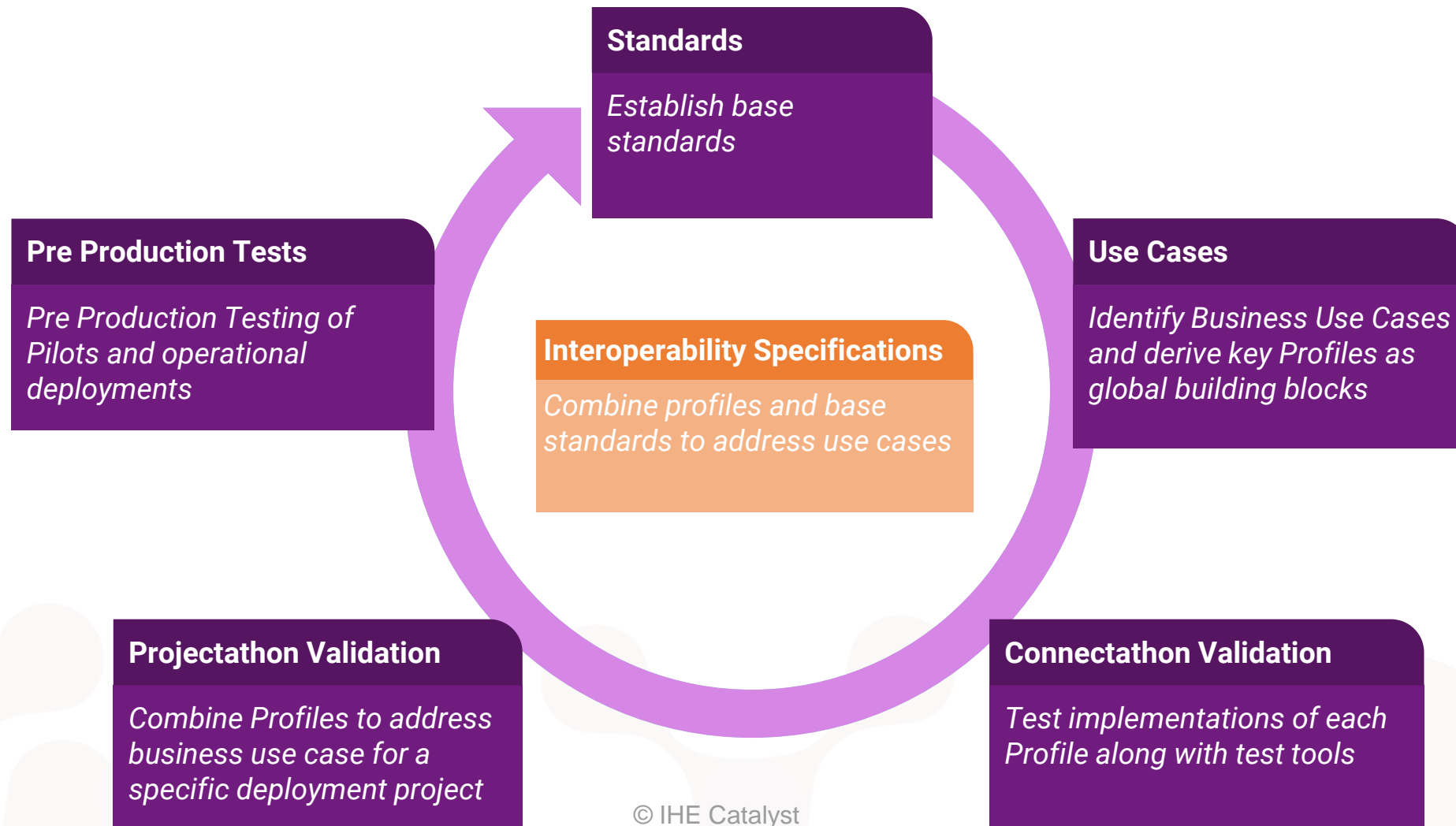
Uses Cases to be defined that include interoperability functions

Interoperability architecture

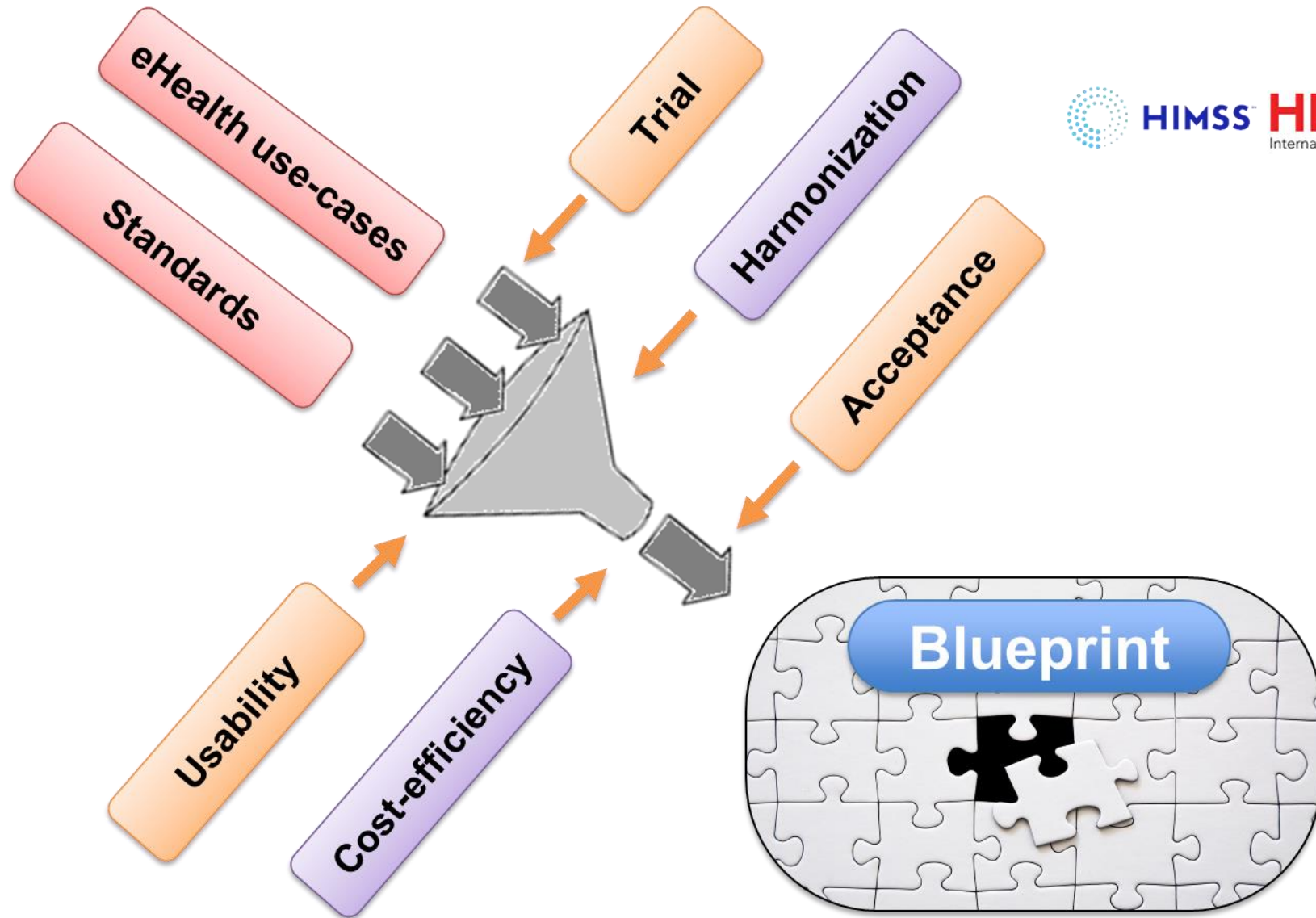
Realisation scenarios and Interoperability Specifications

TESTING Strategy

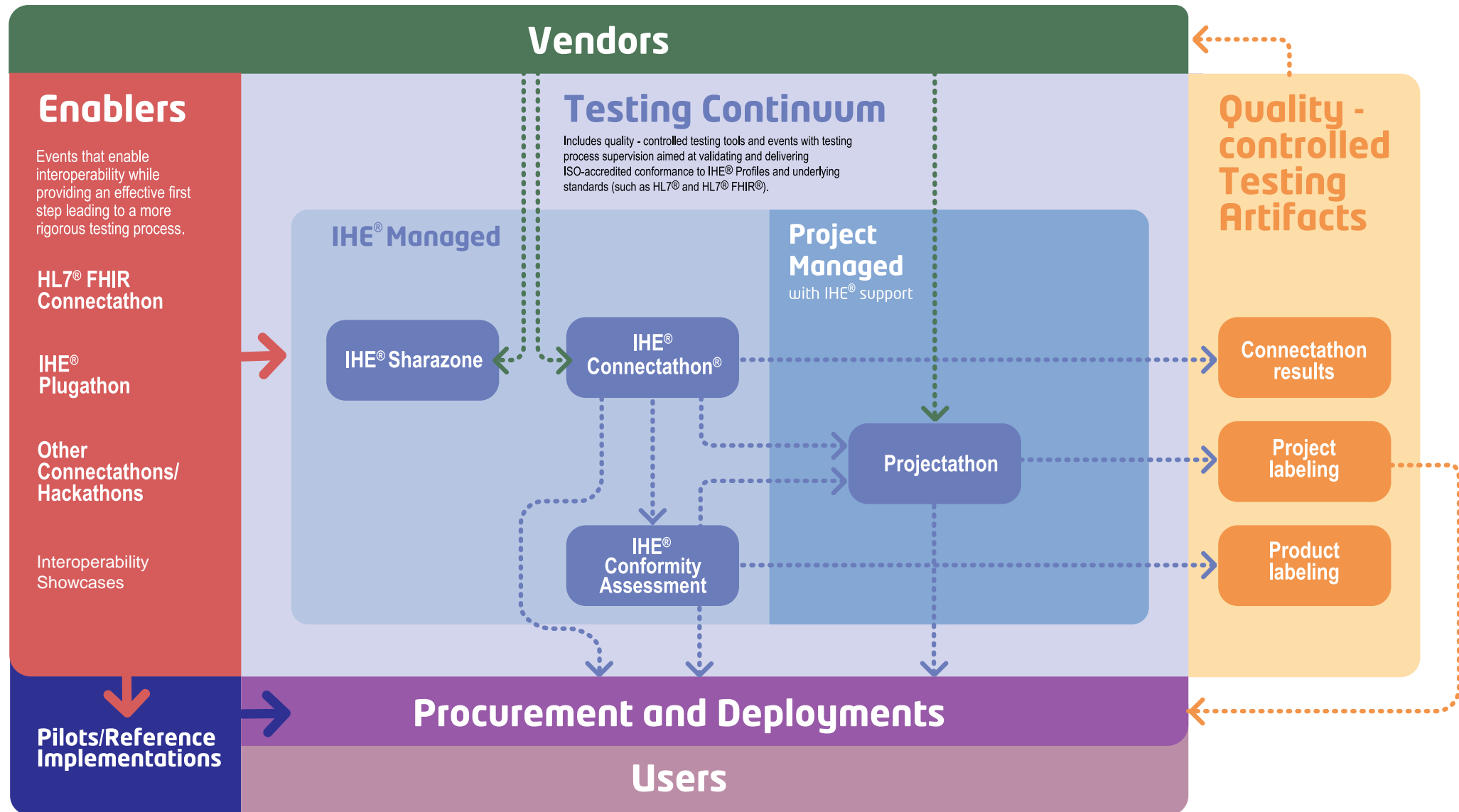
# Realizing Interoperability is about teamwork



# Creating Global Blueprints







# What is Gazelle?

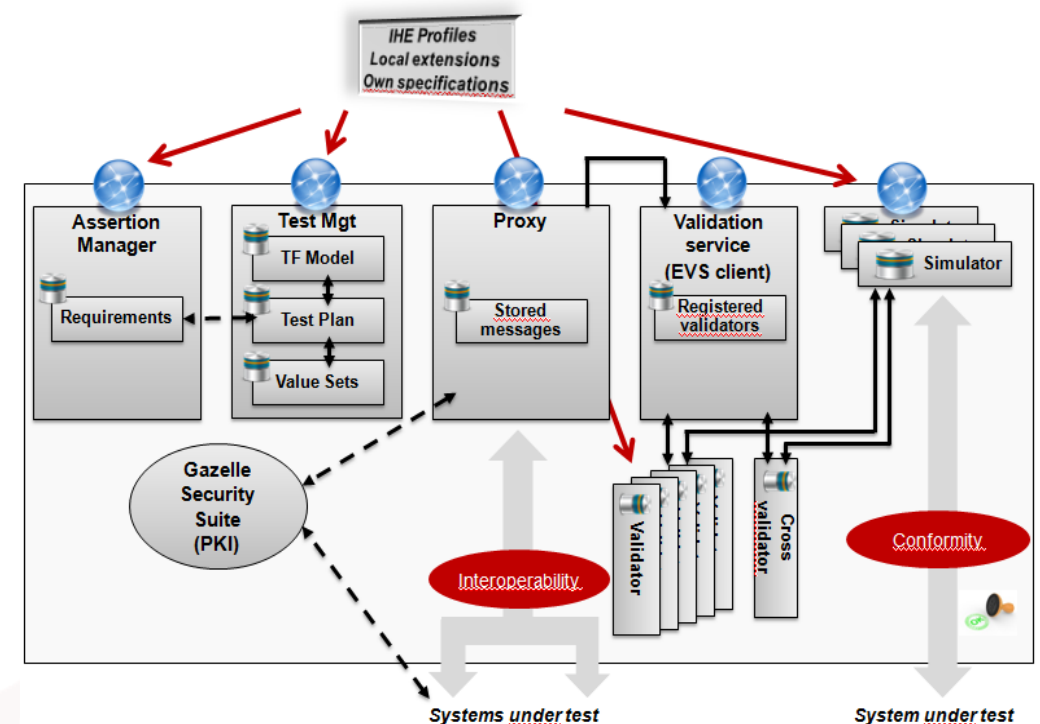
Gazelle is the eHealth interoperability and conformity testing platform that has been supporting the IHE Connectathon for the last 15 years.

## Long run project

- Has been developed for 20 years
- More than 2M lines of code

## It integrates about 100 components :

- A test management tools oriented toward interoperability & conformance testing
- A suite of IHE actor simulators
- A suite of IHE conformance checking tools
- A suite of tools for testing support
- Tools for data generation
- Tools for automation of testing



# What is Gazelle?

**Gazelle** delivered either as an in-house version or a cloud-based version. It includes:

## Test Management

manages test campaigns from start to finish

## Assertion Manager

manages IHE Profile specifications assertions. Links them to test plans in Test Manager

## Proxy

captures on-the-wire messages exchanged between products to validate conformance.

## Security Suite

verifies conformance to Security protocols.

## Validation Services

conformance verification of services, messages, documents.

## Simulators

emulate IHE actors and facilitate testing of stand-alone eHealth products.

# What is Gazelle?



## Gazelle Core

### Test Management

User Management

Interoperability model management

Test Plan Management

Test Management

System & Product management

TM API

### EVSCient

Validator Management

Message Content Analyser

EVSCient API

Gazelle Proxy

Assertion Manager

### Gazelle Security Suite

PKI

TLS testing

XUA Testing

Audit message testing

## Gazelle Tools

### HL7 Validator

HL7 v2 Validator

HL7 v3 Validator

Gazelle Object Checker

HTTP Validator

DCC Validator

CDA Validator

X validator

Schematron Validator

FHIR Validator

### XDStarClient

XD\* Validators

XD\* Simulator Clients

IUA Simulator

Demographic Data Server

HPD Simulator

Order Manager

Patient Registry

Patient Manager

SVS simulator

STS simulator

## Ecosystem Tools

### NIST

NIST XDSTools

NIST FHIR Toolkit

HL7 IGAMT



Central Data Repository



MITRE HL7® FHIR®



ITB XML/JSON Validators



AHDIS Matchbox



ART-DECOR



DCM4CHEE

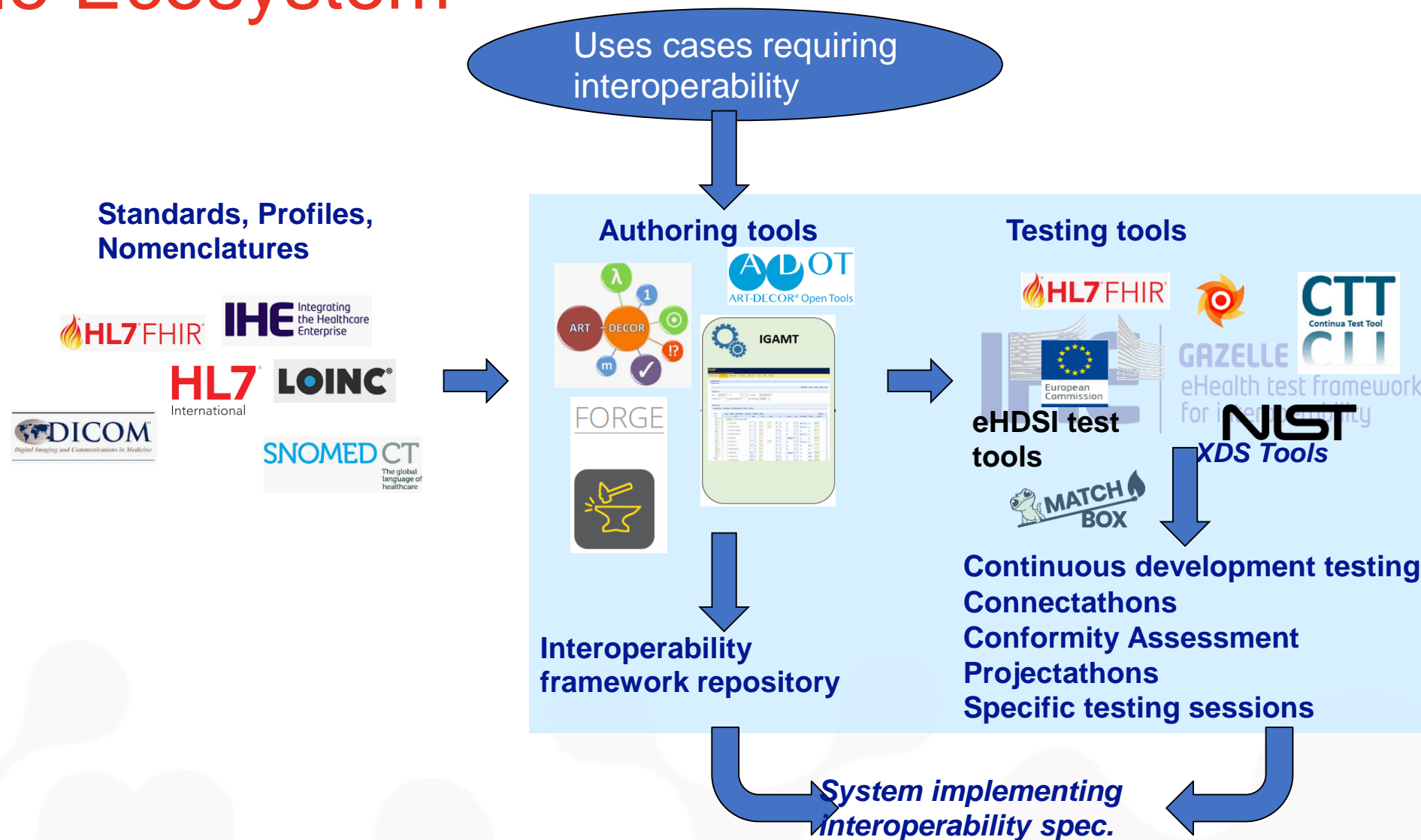


GE Dccheck (licence tool)



Dicom3tools

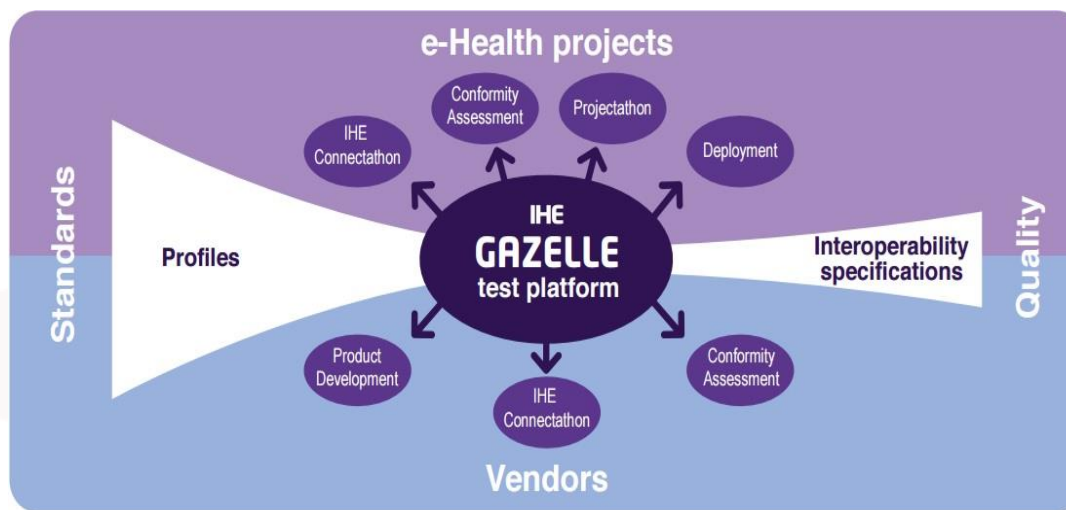
# Gazelle Ecosystem



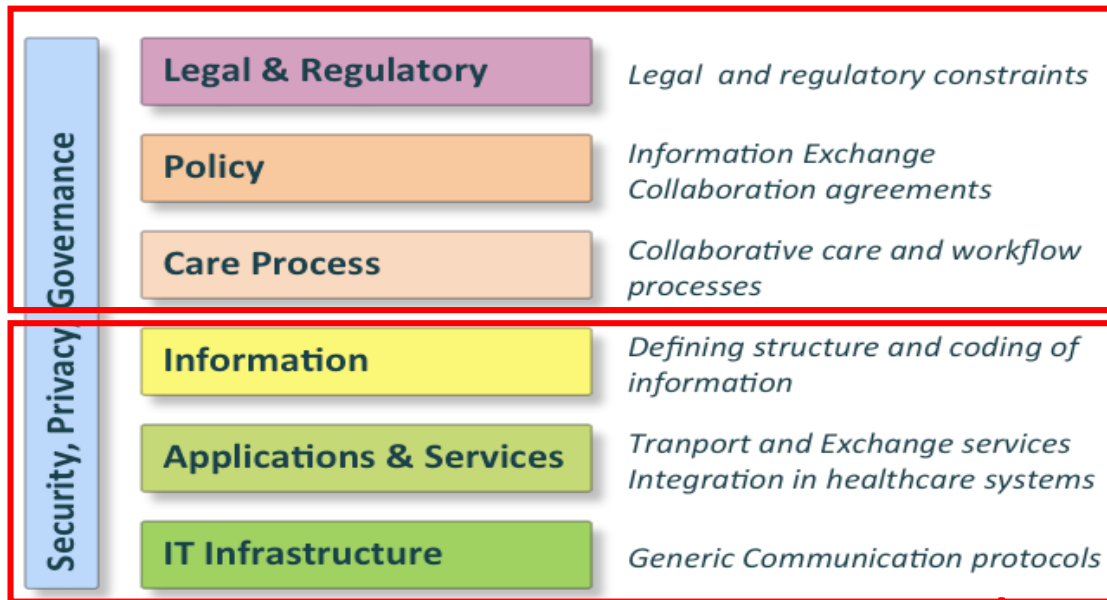
# Gazelle is about connecting people and tools



Thank You



# Interoperability Frameworks and Ecosystems for Deployment



Use Cases  
End User Needs



Standards Development pipeline



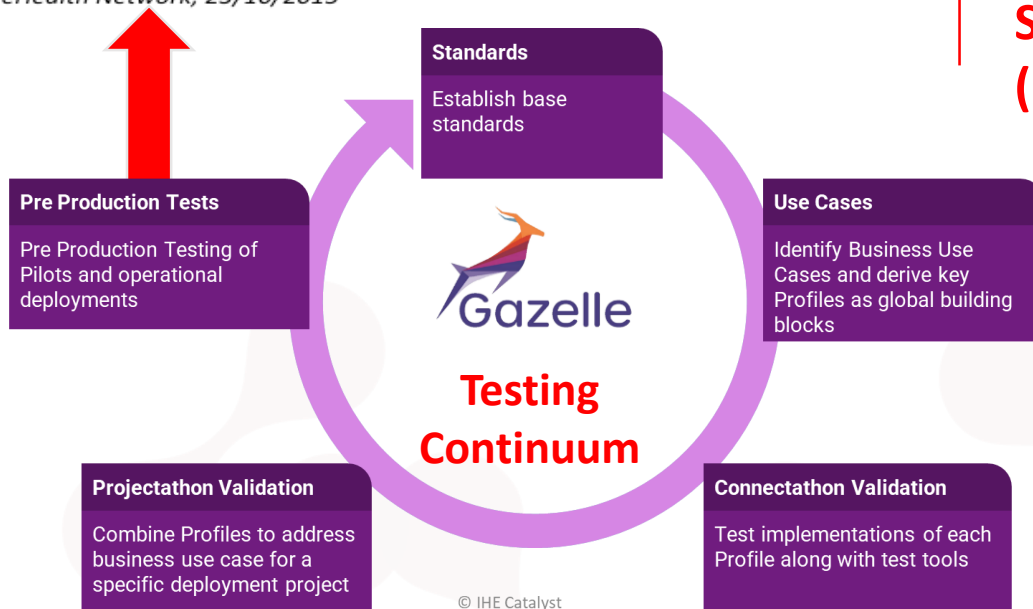
Non-for-profit!

IHE



Interoperability Specifications (IS)

From Refined ehealth European Interoperability Framework  
EU eHealth Network, 23/10/2015



- |                                                                                                                                                                        |                                                                                                                                              |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• <u>Open Source</u> Test tools</li> <li>• Connectathons</li> <li>• Tested products</li> <li>• Conformity assessment</li> </ul> | <ul style="list-style-type: none"> <li>• Whitepaper</li> <li>• Standards</li> <li>• IHE Profile(s)</li> <li>• Testable FHIR IG(s)</li> </ul> |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|

Enabling Implementation and Adoption

# 32 countries and territories of the Americas together

## RELAC SIS 4.0: Information Systems and Digital Health in the Americas

Regional Meeting & Connectathon, Nov 12-15, São Paulo, Brazil



Pan American  
Health  
Organization



Inter-American  
Development Bank

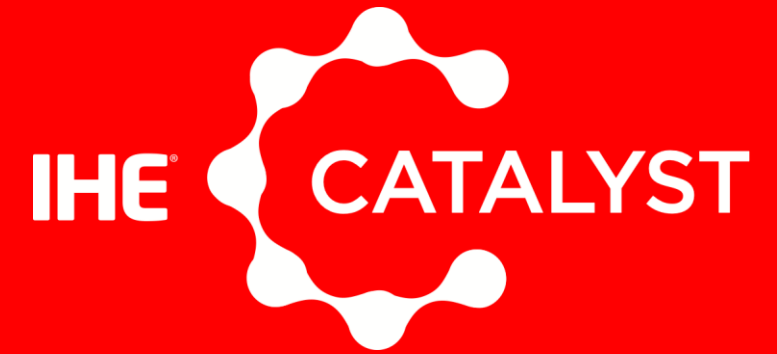
ATHENS  
DIGITAL  
HEALTH  
WEEK

15-19th January 2024 | Royal Olympic Hotel

[www.athensdigitalhealth.eu](http://www.athensdigitalhealth.eu)







Thank you!  
[aberler@ihe-catalyst.net](mailto:aberler@ihe-catalyst.net)



**Alexander Berler**, MSc, PhD BME  
IHE Catalyst, Strategic Business Development Director





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Mathias Uslar



# int:net

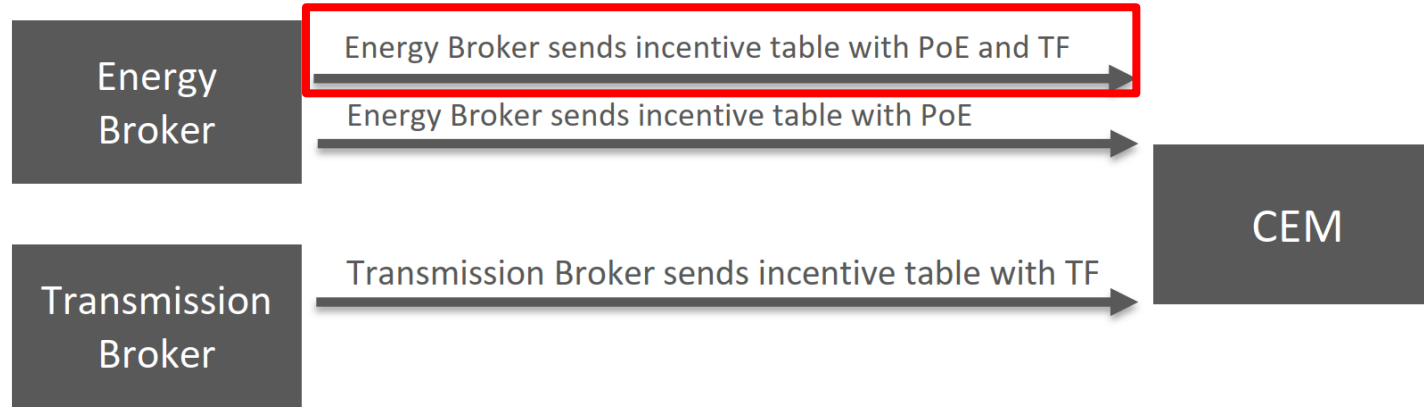
Interoperability Network for  
the Energy Transition

**Int:Net –  
Interoperability  
testing in energy  
Mathias USLAR**

- Use Case: Time of Use Tariff (TouT)
- Scenarios
- Data Model
- Example: Visualization of the Incentive Table
- Gazelle Integration
  - Transactions
  - Integration Profile
- Test Cases
  - Test Case 1: Gazelle for Conformance Testing
  - Test Case 2: Gazelle for Interoperability Testing

# Scenarios

## Providing Incentive Table to the Customer Energy Manager (CEM)

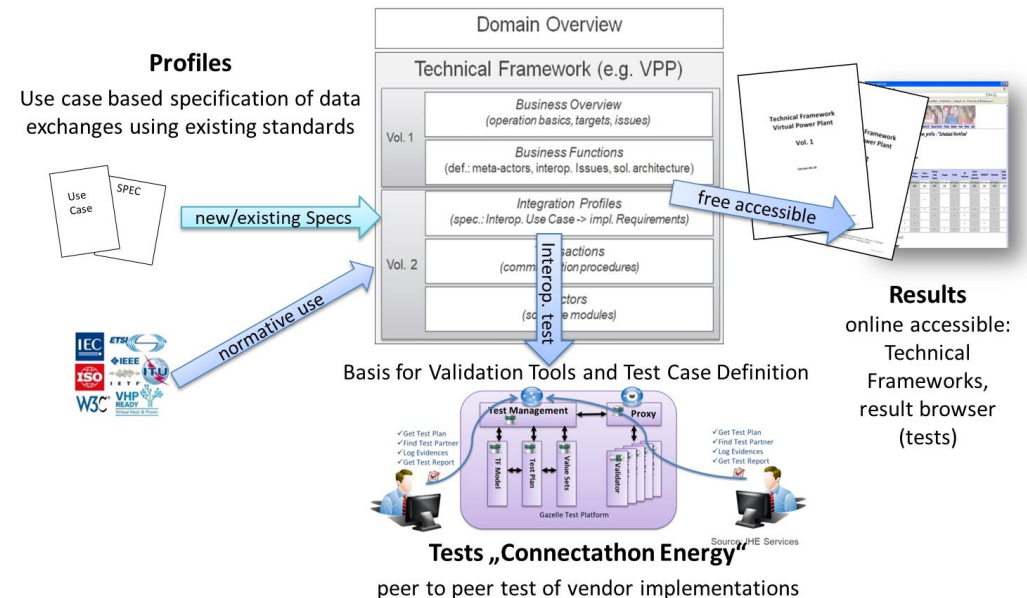
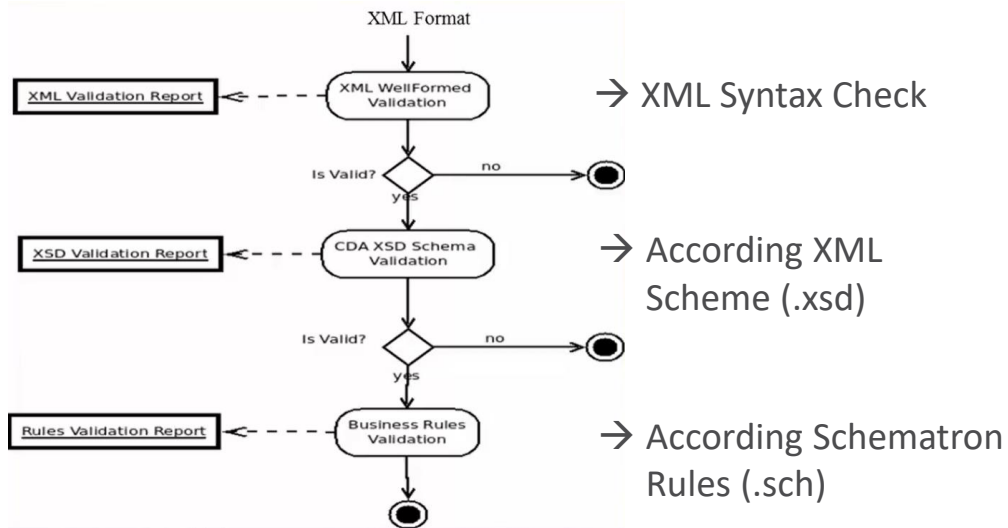


### Conformance Testing

Is a stand-alone process to ensure that the implementation conforms to specified standards and profiles, i.e., the implementation's outputs and responses are checked against patterns and rules.

### Interoperability Testing

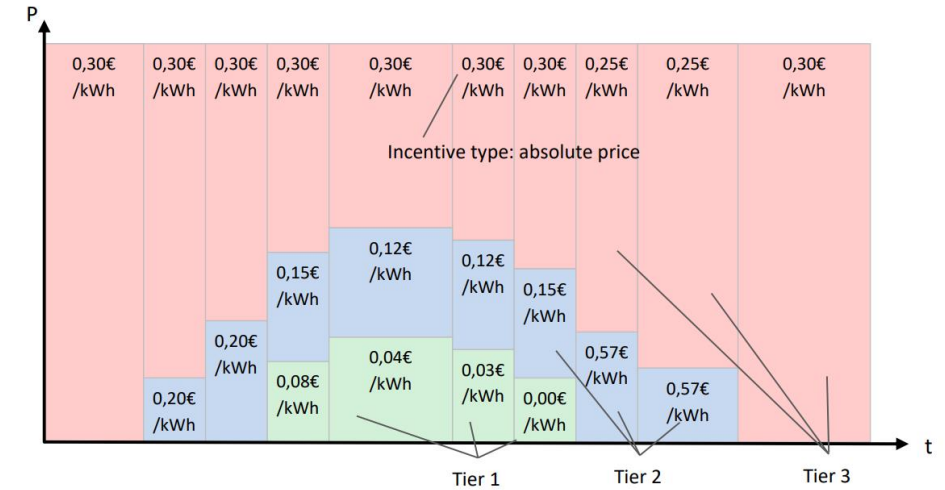
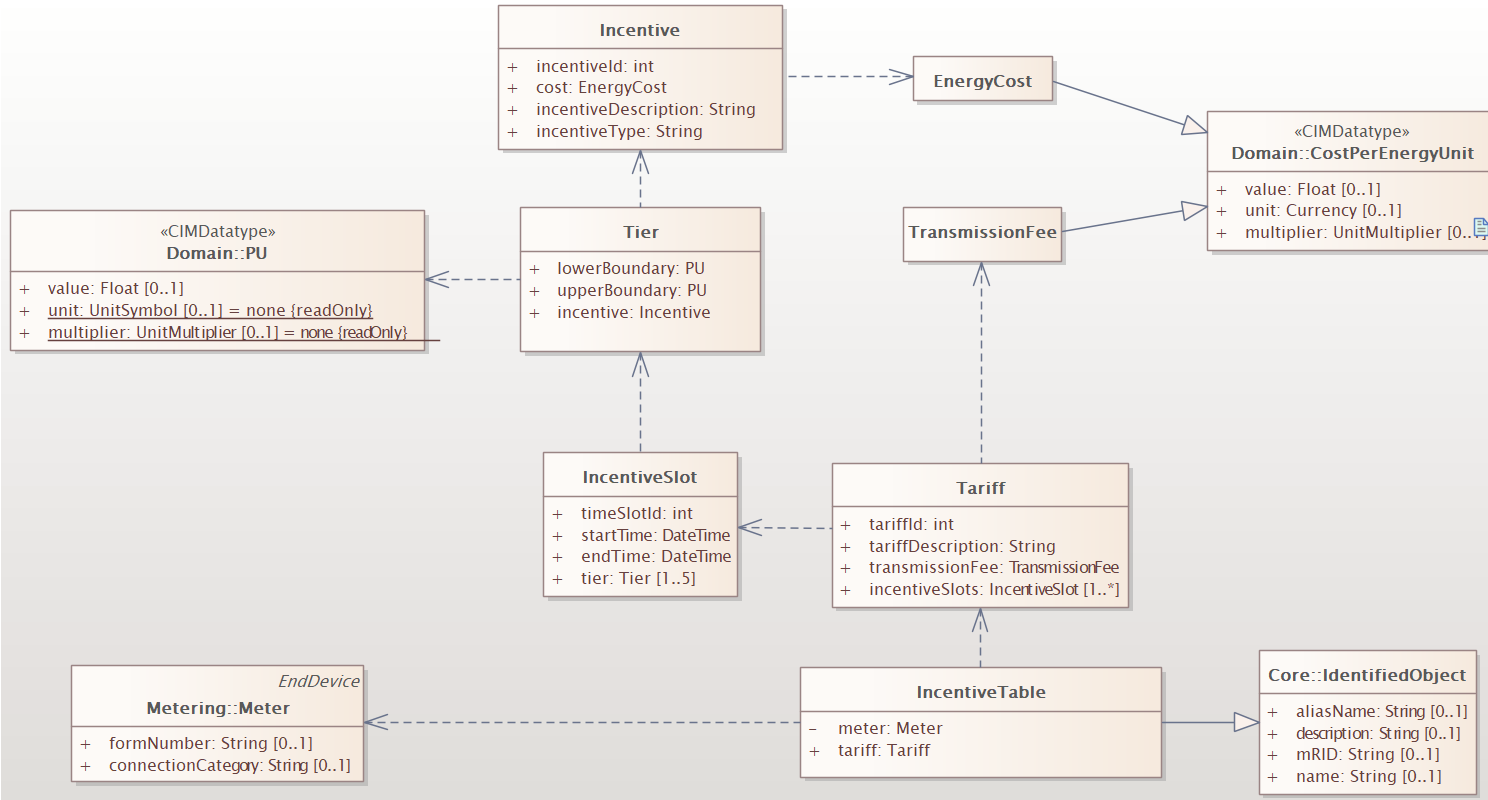
Is assessing the ability of two or more systems to exchange information and to make mutual use of the information exchanged.



<sup>1</sup> IES Cookbook: [https://www.smartgrids.at/files/smartgrids/Dateien/Dokumente/Dokumente/IES\\_cookbook.pdf](https://www.smartgrids.at/files/smartgrids/Dateien/Dokumente/Dokumente/IES_cookbook.pdf)

# Data Model – Time of Use Tariff

Simplified version of a possible CIM Profile





# Visualization of the Incentive Table

## Customer Energy Manager (CEM) Mock

Tariff-ID 1 (Meter ID: AB123456789) - Tariff Description for Power Consuming

Start Time	End Time	Tier ID (Type)	Interval	Price
2024-07-05 00:00:00	2024-07-06 01:00:00	1 (Relative)	0.0W - 2000.0W	0,08 EUR
		2 (Relative)	2001.0W - 4000.0W	0,15 EUR
		3 (Relative)	4001.0W - 50000.0W	0,30 EUR
		4 (Relative)	>50001.0W	0,40 EUR
2024-07-06 01:00:00	2024-07-06 07:00:00	2 (Relative)	0.0W - 4000.0W	0,15 EUR
		3 (Relative)	4001.0W - 50000.0W	0,30 EUR
		4 (Relative)	>50001.0W	0,40 EUR
2024-07-06 07:00:00	2024-07-06 21:00:00	3 (Relative)	>0.0W	0,30 EUR
		4 (Relative)	>50001.0W	0,40 EUR
2024-07-06 21:00:00	2024-07-06 23:00:00	2 (Relative)	0.0W - 4000.0W	0,15 EUR
		3 (Relative)	4001.0W - 50000.0W	0,30 EUR
		4 (Relative)	>50001.0W	0,40 EUR
2024-07-06 23:00:00	2024-07-07 01:00:00	1 (Relative)	0.0W - 2000.0W	0,08 EUR
		2 (Relative)	2001.0W - 4000.0W	0,15 EUR
		3 (Relative)	4001.0W - 50000.0W	0,30 EUR
		4 (Relative)	>50001.0W	0,40 EUR

Tariff-ID 1 (Meter ID: AB123456789) - Tariff Description for Power Generation

Start Time	End Time	Tier ID (Type)	Interval	Price
2024-07-05 00:00:00	2024-07-06 01:00:00	1 (Relative)	<0.0W	0,10 EUR
2024-07-06 01:00:00	2024-07-06 07:00:00	1 (Relative)	<0.0W	0,10 EUR
2024-07-06 07:00:00	2024-07-06 21:00:00	1 (Relative)	-1000.0W - 0.0W	-0,15 EUR
		2 (Relative)	-5000.0W - -1001.0W	-0,07 EUR
		3 (Relative)	<-5001.0W	0,10 EUR
2024-07-06 21:00:00	2024-07-06 23:00:00	2 (Relative)	-5000.0W - 0.0W	-0,07 EUR
		3 (Relative)	<-5001.0W	0,10 EUR
2024-07-06 23:00:00	2024-07-07 01:00:00	1 (Relative)	<0.0W	0,10 EUR




## Transaction Management

Search Criteria ✕

**Search By**

**Domain**

**Integration profile**

Id ▲	Keyword ▲	Name ▲	Description	Status ▲	Specifications ▲	Action
1	EB_IncentiveTable_PoE_DF	Energy Broker sends incentive table with PoE and DF	With this Scenario, the Actor Energy Broker sends incentive-based incentive tables with the price of energy and the delivery fee to the Actor CEM. There can be different incentive tables for the consumption of power and the production. Whether both incentive tables are supported by the CEM depends on the CEM's capability itself as well as the connected appliances within the building and their capability of producing energy. The Actor CEM shall always permit that the Actor Energy Broker sends an update for a supported incentive table. The Actor CEM may request towards Actor Energy Broker to get a modified or new incentive table.	Proposed		
2	EB_IncentiveTable_PoE	Energy Broker sends incentive table with PoE	With this Scenario, the Actor Energy Broker sends incentive-based incentive tables with the price of energy to the Actor CEM. NOTE Without the information of Scenario 3, the overall incentive values cannot be calculated completely. There can be different incentive tables for the consumption of power and the production. Whether both incentive tables are supported by the CEM depends on the CEM's capability itself as well as the connected appliances within the building and their capability of producing energy. The Actor CEM shall always permit that the Actor Energy Broker sends an update for a supported incentive table. The Actor CEM may request towards Actor Energy Broker to get a modified or new incentive table.	Proposed		
3	DB_IncentiveTable_DF	Delivery Broker sends incentive table with DF	With this Scenario, the Actor Delivery Broker sends incentive-based incentive tables with the delivery fee to the Actor CEM. NOTE Without the information of Scenario 2, the overall incentive values cannot be calculated completely. There can be different incentive tables for the consumption of power and the production. Whether both incentive tables are supported by the CEM depends on the CEM's capability itself as well as the connected appliances within the building and their capability of producing energy. The Actor CEM shall always permit that the Actor Delivery Broker sends an update for a supported incentive table. The Actor CEM may request towards Actor Delivery Broker to get a modified or new incentive table.	Proposed		

## Integration Profile: Incentive Table with PoE

Integration Profile Information

**Id:** 5

**Keyword:** IncentiveTable\_PoE

**Name:** Incentive Table with PoE

**Description:** Each incentive table with a tariff can have multiple tariff levels (called "tiers") which have one or more incentives (e.g., absolute price, CO2 emission, etc.). Based on the incentives, the CEM may calculate where to plan the consumption and production cycles of its managed appliances. At least, the absolute price shall be included in the incentive table. The costs/profits for the energy consumed/produced by the building are composed of several individual items, depending on the country's regulations, the contract, etc. The two main items are the price of energy (PoE) that is billed by the ESP and the Delivery Fee (DF) that is billed by the DSO. Depending on the overall system setup, either the Energy Broker combines both items within its incentive table ("total price" = PoE + DF), or they are transmitted separately by Energy Broker and Delivery Broker to the CEM.

**Status:** Proposed

**Document Section:**  
None

Back to integration profiles
Edit

```

graph TD
    DB[Delivery Broker] -- DB_IncentiveTable_DF --> CEM[Customer Energy Manager]
    EB[Energy Broker] -- EB_IncentiveTable_PoE_DF --> CEM
    EB -- EB_IncentiveTable_PoE --> CEM
    
```

Id	Keyword	Name	Description	Action
3	CEM	Customer Energy Manager	The Actor CEM manages the devices in the building in order to shift the load to times of lower costs (e.g., monetary costs, CO2 emission, etc.).	<a href="#">Search</a> <a href="#">Edit</a>
4	EB	Energy Broker	The Actor Energy Broker submits tariff information to the building. The tariff may include the delivery fee and the price of energy (PoE+DF) or only the latter (PoE).	<a href="#">Search</a> <a href="#">Edit</a>
5	DB	Delivery Broker	The Actor Delivery Broker sends tariff information into the building including the delivery fee only. This incentive is used by the Delivery Broker to motivate a CEM to shift the building's energy demand in times of lower costs that typically correlates with more available energy in the electricity grid.	<a href="#">Search</a> <a href="#">Edit</a>

# Test Case 1: Gazelle for Conformance Testing

Validation Results

CIM Validator Styled Result    CIM Validator Re

Validation Summary

Syntactic validation **PASSED**

Validation Summary

Schema validation **PASSED**

Validation Summary

Object Checker validation **FAILED**

Validation Summary

constraintDes  
locationInVali

constraintDes  
locationInVali



<b>constraintDescription</b>	lowerBoundary value should be less than or equal to upperBoundary value.
<b>locationInValidatedObject</b>	<code>/*:ResponseMessage[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:Payload[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:IncentiveTable[namespace-uri()='http://interop-project.com/profile/IncentiveScheme'][1]/tariff[1]/incentiveSlot[1]/tier[4]</code>
<b>constraintDescription</b>	The mRID value is not a valid UUID.
<b>locationInValidatedObject</b>	<code>/*:ResponseMessage[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:Payload[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:IncentiveTable[namespace-uri()='http://interop-project.com/profile/IncentiveScheme'][1]/mRID[1]</code>
<b>constraintDescription</b>	The last tier's upper boundary should be missing to represent infinity for consumption.
<b>locationInValidatedObject</b>	<code>/*:ResponseMessage[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:Payload[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:IncentiveTable[namespace-uri()='http://interop-project.com/profile/IncentiveScheme'][1]/tariff[1]/incentiveSlot[1]</code>
<b>constraintDescription</b>	The last tier's upper boundary should be missing to represent infinity for consumption.
<b>locationInValidatedObject</b>	<code>/*:ResponseMessage[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:Payload[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:IncentiveTable[namespace-uri()='http://interop-project.com/profile/IncentiveScheme'][1]/tariff[1]/incentiveSlot[4]</code>
<b>constraintDescription</b>	The first tier should start at 0 for consumption.
<b>locationInValidatedObject</b>	<code>/*:ResponseMessage[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:Payload[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:IncentiveTable[namespace-uri()='http://interop-project.com/profile/IncentiveScheme'][1]/tariff[1]/incentiveSlot[5]</code>
<b>constraintDescription</b>	The last tier's upper boundary should be missing to represent infinity for consumption.
<b>locationInValidatedObject</b>	<code>/*:ResponseMessage[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:Payload[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:IncentiveTable[namespace-uri()='http://interop-project.com/profile/IncentiveScheme'][1]/tariff[1]/incentiveSlot[5]</code>
<b>constraintDescription</b>	Overlapping boundaries detected between tiers within the same incentiveSlot.
<b>locationInValidatedObject</b>	<code>/*:ResponseMessage[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:Payload[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:IncentiveTable[namespace-uri()='http://interop-project.com/profile/IncentiveScheme'][1]/tariff[1]/incentiveSlot[3]</code>
<b>constraintDescription</b>	Overlapping time slots detected within the same tariff.
<b>locationInValidatedObject</b>	<code>/*:ResponseMessage[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:Payload[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:IncentiveTable[namespace-uri()='http://interop-project.com/profile/IncentiveScheme'][1]/tariff[1]</code>
<b>constraintDescription</b>	The incentive cost value is greater than 1.00, which is high but acceptable.
<b>locationInValidatedObject</b>	<code>/*:ResponseMessage[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:Payload[namespace-uri()='http://www.iec.ch/TC57/2008/schema/message'][1]/*:IncentiveTable[namespace-uri()='http://interop-project.com/profile/IncentiveScheme'][1]/tariff[1]/incentiveSlot[2]/tier[3]/incentive[1]/cost[1]</code>

# Test Case 1: Gazelle for Conformance Testing

## XSD Scheme



```
64     </xs:annotation>
65   </xs:element>
66   <xs:element name="Error" type="ErrorType" minOccurs="0"
67     maxOccurs="unbounded">
68     <xs:annotation>
69       <xs:documentation>Reply details describing one or more errors</xs:doc
70     </xs:annotation>
71   </xs:element>
72   <xs:element name="ID" type="xs:string" minOccurs="0"
73     maxOccurs="unbounded">
74     <xs:annotation>
75       <xs:documentation>Resulting transaction ID (usually consequence of c
76     </xs:annotation>
77   </xs:element>
78   <xs:any namespace="##other" processContents="lax"
79     minOccurs="0" maxOccurs="unbounded" />
80 </xs:sequence>
81 </xs:complexType>
82 <xs:complexType name="PayloadType">
83   <xs:annotation>
84     <xs:documentation>Payload container</xs:documentation>
85   </xs:annotation>
86   <xs:sequence>
87     <xs:element ref="is:IncentiveTable" minOccurs="1" />
88   </xs:sequence>
89 </xs:complexType>
90 <xs:complexType name="ReplayDetectionType">
91   <xs:annotation>
92     <xs:documentation>Used to detect and prevent replay attacks</xs:documentatic
93   </xs:annotation>
94   <xs:sequence>
```



```
<xs:complexType name="Incentive">
  <xs:sequence>
    <xs:element name="incentiveId" type="xs:int" minOccurs="1" maxOccurs="1"/>
    <xs:element name="incentiveType" type="xs:string" minOccurs="1" maxOccurs="1"/>
  </xs:sequence>
</xs:complexType>
<xs:element name="IncentiveSlot" type="IncentiveSlot"/>
<xs:complexType name="IncentiveSlot">
  <xs:sequence>
    <xs:element name="endTime" type="xs:string" minOccurs="1" maxOccurs="1"/>
    <xs:element name="startTime" type="xs:string" minOccurs="1" maxOccurs="1"/>
    <xs:element name="tier" type="Tier" minOccurs="1" maxOccurs="5"/>
    <xs:element name="timeSlotId" type="xs:int" minOccurs="1" maxOccurs="1"/>
  </xs:sequence>
</xs:complexType>
<xs:element name="IncentiveTable" type="IncentiveTable"/>
<xs:complexType name="IncentiveTable">
  <xs:sequence>
    <xs:element name="aliasName" type="xs:string" minOccurs="0" maxOccurs="1">
      <xs:annotation>
        <xs:documentation>The aliasName is free text human readable name of
The attribute aliasName is retained because of backwards compatibility between CIM rela
      </xs:annotation>
    </xs:element>
    <xs:element name="description" type="xs:string" minOccurs="0" maxOccurs="1">
      <xs:annotation>
        <xs:documentation>The description is a free human readable text des
      </xs:annotation>
    </xs:element>
    <xs:element name="mRID" type="xs:string" minOccurs="0" maxOccurs="1">
      <xs:annotation>
        <xs:documentation>Master resource identifier issued by a model auth
For CIMXML data files in RDF syntax conforming to IEC 61970-552, the mRID is mapped to
      </xs:annotation>
    </xs:element>
    <xs:element name="name" type="xs:string" minOccurs="0" maxOccurs="1">
      <xs:annotation>
        <xs:documentation>The name is any free human readable and possibly
      </xs:annotation>
    </xs:element>
    <xs:element name="meter" type="Meter" minOccurs="1" maxOccurs="1"/>
  </xs:sequence>
</xs:complexType>
```

# Test Case 1: Gazelle for Conformance Testing

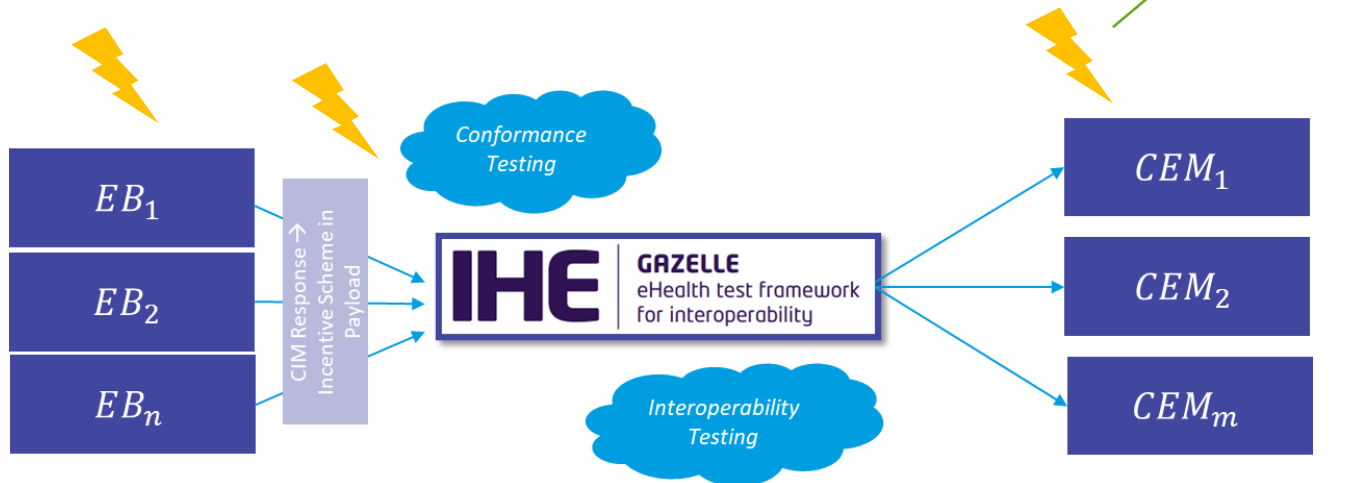
## Schematron



```
17 <sch:pattern id="uidid-check" >
23 </sch:pattern>
24
25 <!-- Rule for consumption scenario: tiers cover [0, ∞) -->
26 <sch:pattern id="consumption-check">
27   <sch:rule context="tariff[tariffDescription='Tariff Description for Power C
28     <!-- Ensure the first tier starts at 0 -->
29     <sch:assert test="tier[1]/lowerBoundary/value = 0" role="error">
30       The first tier should start at 0 for consumption.
31     </sch:assert>
32     <!-- Ensure the last tier's upper boundary is missing to represent infi
33     <sch:assert test="not(tier[last()]/upperBoundary/value)" role="error">
34       The last tier's upper boundary should be missing to represent infin
35     </sch:assert>
36   </sch:rule>
37 </sch:pattern>
38
39 <!-- Rule for ensuring no overlapping boundaries between tiers within the same
40 <sch:pattern id="overlapping-boundaries-check">
41   <sch:rule context="tariff/incentiveSlot">
42     <sch:assert test="every $i in 1 to count(tier) - 1 satisfies
43       (xs:integer(tier[$i]/upperBoundary/value) &lt; xs:integer(tier[$i +
44       Overlapping boundaries detected between tiers within the same incen
45     </sch:assert>
46   </sch:rule>
47 </sch:pattern>
48
49 <!-- Rule for ensuring each timeSlotId is unique within a tariff -->
50 <sch:pattern id="unique-timeslotid-check">
51   <sch:rule context="tariff">
52     <sch:assert test="count(distinct-values(incentiveSlot/timeSlotId)) = co
53     Each timeSlotId must be unique within a tariff.
54   </sch:assert>
55 </sch:rule>
56 </sch:pattern>
57
58 <!-- Rule for ensuring valid ISO 8601 date-time strings for startTime and endTi
59 <sch:pattern id="valid-datetime-check">
60   <sch:rule context="tariff/incentiveSlot">
61     <sch:assert test="matches(startTime, '^\\d{4}-\\d{2}-\\d{2}T\\d{2}:\\d{2}:\\d
62     The startTime is not a valid ISO 8601 date-time string.
63   </sch:assert>
64   <sch:assert test="matches(endTime, '^\\d{4}-\\d{2}-\\d{2}T\\d{2}:\\d{2}:\\d{2}
65
66 <!-- Rule for ensuring valid ISO 8601 date-time strings for startTime and endTime -->
67 <sch:pattern id="valid-datetime-check">
68   <sch:rule context="tariff/incentiveSlot">
69     <sch:assert test="matches(startTime, '^\\d{4}-\\d{2}-\\d{2}T\\d{2}:\\d{2}:\\d{2}(\\.\\d{3})?Z?&#x27;
70     The startTime is not a valid ISO 8601 date-time string.
71   </sch:assert>
72     <sch:assert test="matches(endTime, '^\\d{4}-\\d{2}-\\d{2}T\\d{2}:\\d{2}:\\d{2}(\\.\\d{3})?Z?&#x27;
73     The endTime is not a valid ISO 8601 date-time string.
74   </sch:assert>
75 </sch:rule>
76 </sch:pattern>
77
78 <!-- Rule for ensuring startTime is before endTime within the same incentiveSlot -->
79 <sch:pattern id="time-order-check">
80   <sch:rule context="tariff/incentiveSlot">
81     <sch:assert test="xs:dateTime(startTime) &lt; xs:dateTime(endTime)" role="error">
82       The startTime should be before the endTime within the same incentiveSlot.
83   </sch:assert>
84 </sch:rule>
85 </sch:pattern>
86
87 <!-- Rule for ensuring no overlapping time slots within the same tariff -->
88 <sch:pattern id="overlapping-times-check">
89   <sch:rule context="tariff">
90     <sch:assert test="
91       every $i in 1 to count(incentiveSlot) - 1 satisfies
92       xs:dateTime(incentiveSlot[$i]/endTime) &lt;= xs:dateTime(incentiveSlot[$i + 1]/sta
93     Overlapping time slots detected within the same tariff.
94   </sch:assert>
95 </sch:rule>
96 </sch:pattern>
```

# Test Case 2: Gazelle for Interoperability Testing

- Includes conformity testing
- Detection of faulty implementations
  - Winter/Summer Times
  - Value range problems (→ 16-bit Ariane 5)
  - ...



## Example: Winter Time to Summer Time

```

<incentiveSlot>
  <endTime>2024-03-31T02:59:59.999</endTime>
  <startTime>2024-03-30T22:00:00.000</startTime>
  <tier>
    <incentive>
      <cost>
        <unit>EUR</unit>
        <value>0.10</value>
      </cost>
      <incentiveDescription>Tier 1</incentiveDescription>
      <incentiveId>1</incentiveId>
      <incentiveType>Relative</incentiveType>
    </incentive>
    <lowerBoundary>
      </lowerBoundary>
    <upperBoundary>
      <unit>W</unit>
      <value>0</value>
    </upperBoundary>
  </tier>
  <timeSlotId>1</timeSlotId>
</incentiveSlot>
<incentiveSlot>
  <endTime>2024-03-31T07:00:00.000</endTime>
  <startTime>2024-03-31T03:00:00.000</startTime>
  <tier>

```

Tariff-ID 1 (Meter ID: AB123456789) - Tariff Description for Power Generation

Start Time	End Time	Tier ID (Type)	Interval	Price
2024-03-30 22:00:00	2024-03-31 03:59:59	1 (Relative)	<0.0W	0,10 EUR
2024-03-31 03:00:00	2024-03-31 07:00:00	1 (Relative)	<0.0W	0,10 EUR
2024-03-31 07:00:00	2024-03-31 21:00:00	1 (Relative)	-1000.0W - 0.0W	-0,15 EUR
		2 (Relative)	-5000.0W - -1001.0W	-0,07 EUR
		3 (Relative)	<-5001.0W	0,10 EUR



# Open Dialog about testing experience

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Invitation to all participants