

FUTURE  
INTERNET  
PPP

# Testing a webservices based ecosystem using MBT: the case of the Future Internet Public Private Partnership (FI-PPP)

## Developing trust & confidence in the FI-PPP

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# Introduction

# FI-PPP Introduction

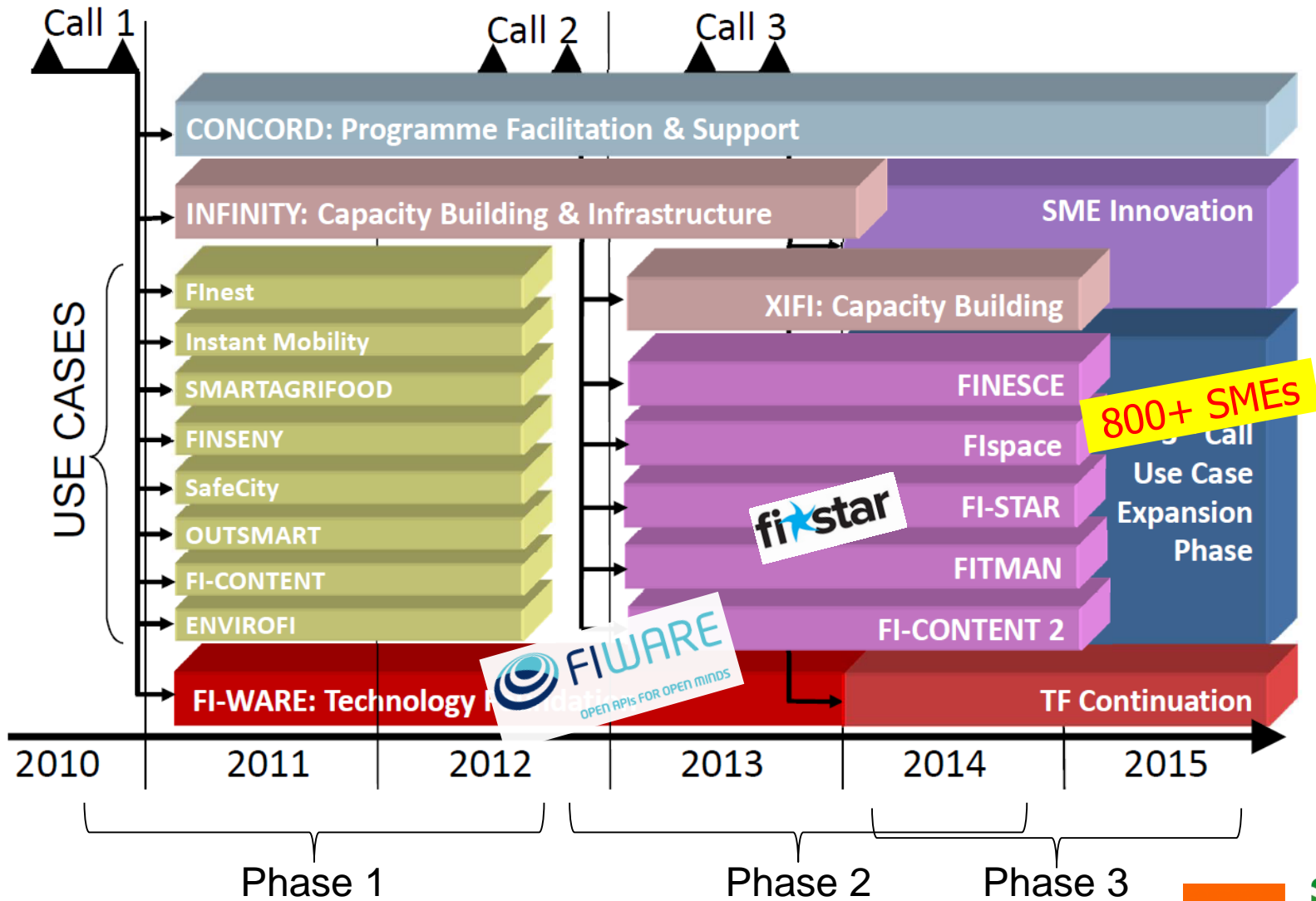
- The European Commission has launched the Future Internet Public-Private Partnership program (FI-PPP) :
  - Shared vision for harmonised European scale technology platforms and their implementation
  - Integration and harmonisation of the relevant policy, legal, political and regulatory frameworks
  - Based on a generic, open and standard platform (enablers) and meeting point (cloud deployment) around which a dynamic innovation ecosystem can be created engaging developers and entrepreneurs

# Generic Enablers (GEs)

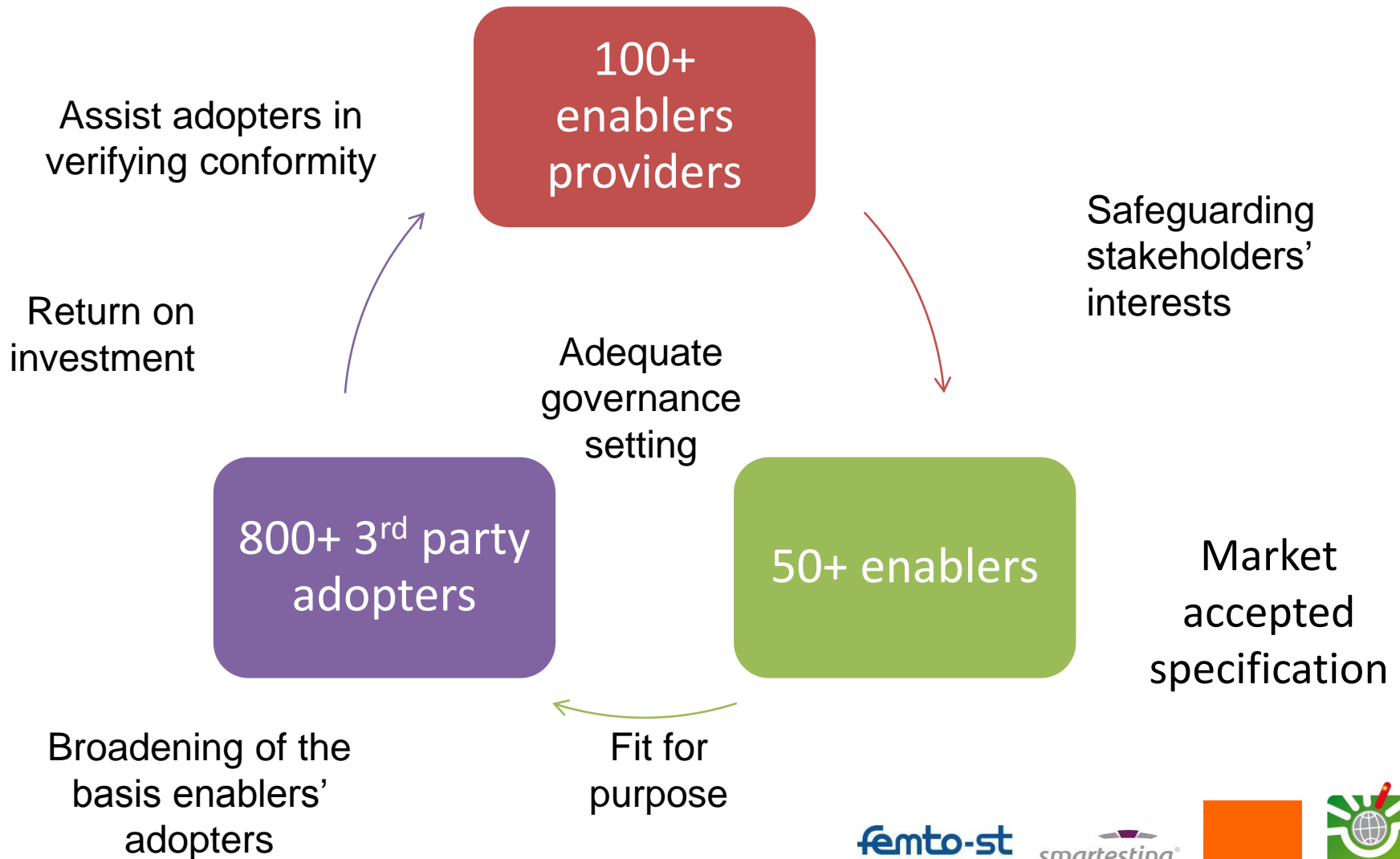
- A Generic Enabler (GE):
  - set of general-purpose **platform functions** available through **APIs**
  - Building with other GEs a [Reference Architecture](#)
- [GE Specifications](#) are open (public and royalty-free)
- **GE implementation (GEi):**
  - Platform product that implements a given GE Open Spec
  - There might be multiple compliant GEis of each GE Open Spec
  - Available FI-WARE GEis published on the [FIWARE Catalogue](#)
- **The project will deliver at least one reference implementation of GEs**



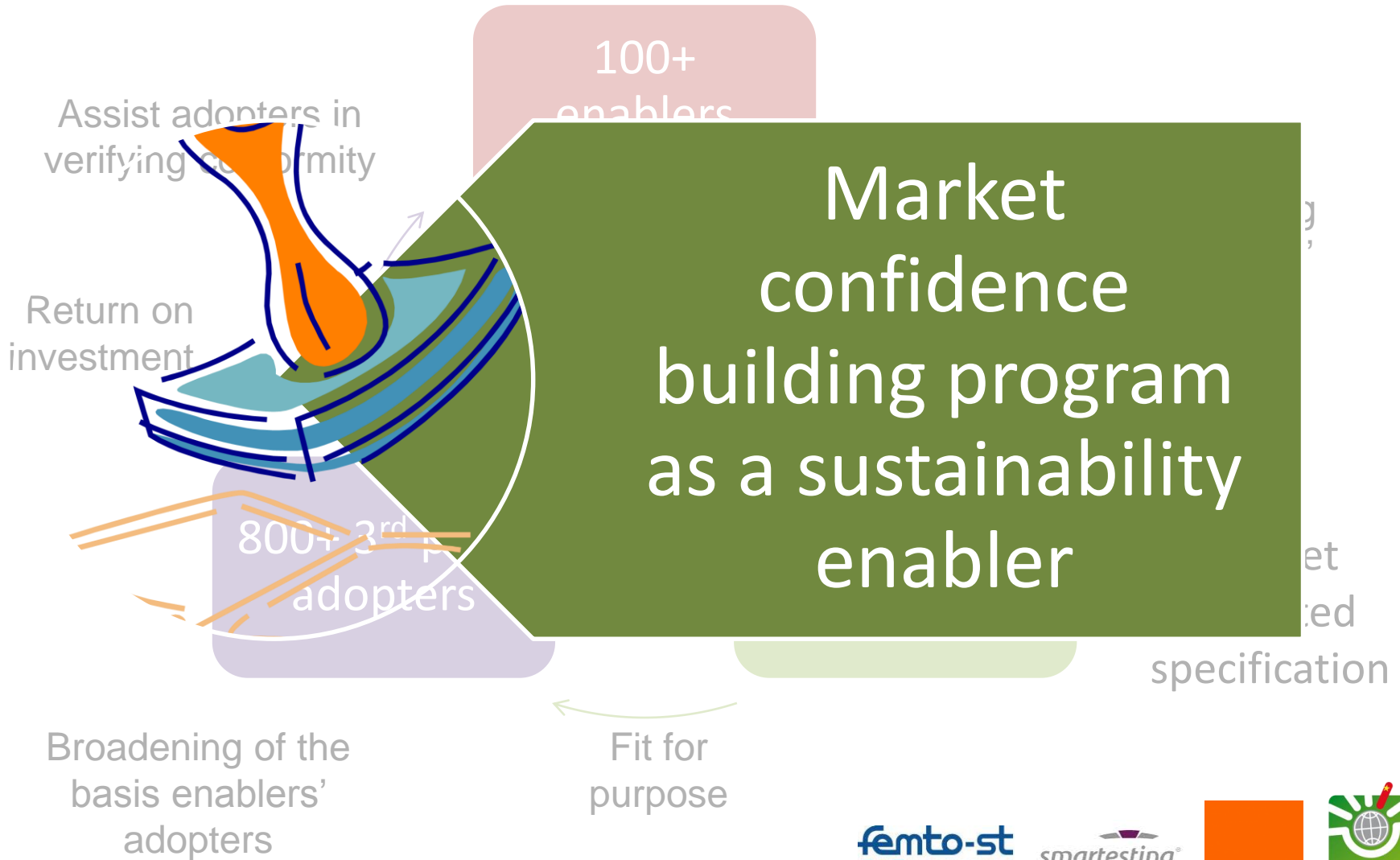
# The FI-PPP Program



# FIWARE uptake ...



... requires market confidence



# Challenges

- **Number and culture/profile heterogeneity of actors**
  - Increased timespan for consensus building
  - Diversity of tools and methods for testing
- **Openness**
  - Enablers APIs publicly opened
  - Open-source implementations of enablers
  - Testing suites and tools to follow the same logic
- **Funding**
  - Priorities not set on testing

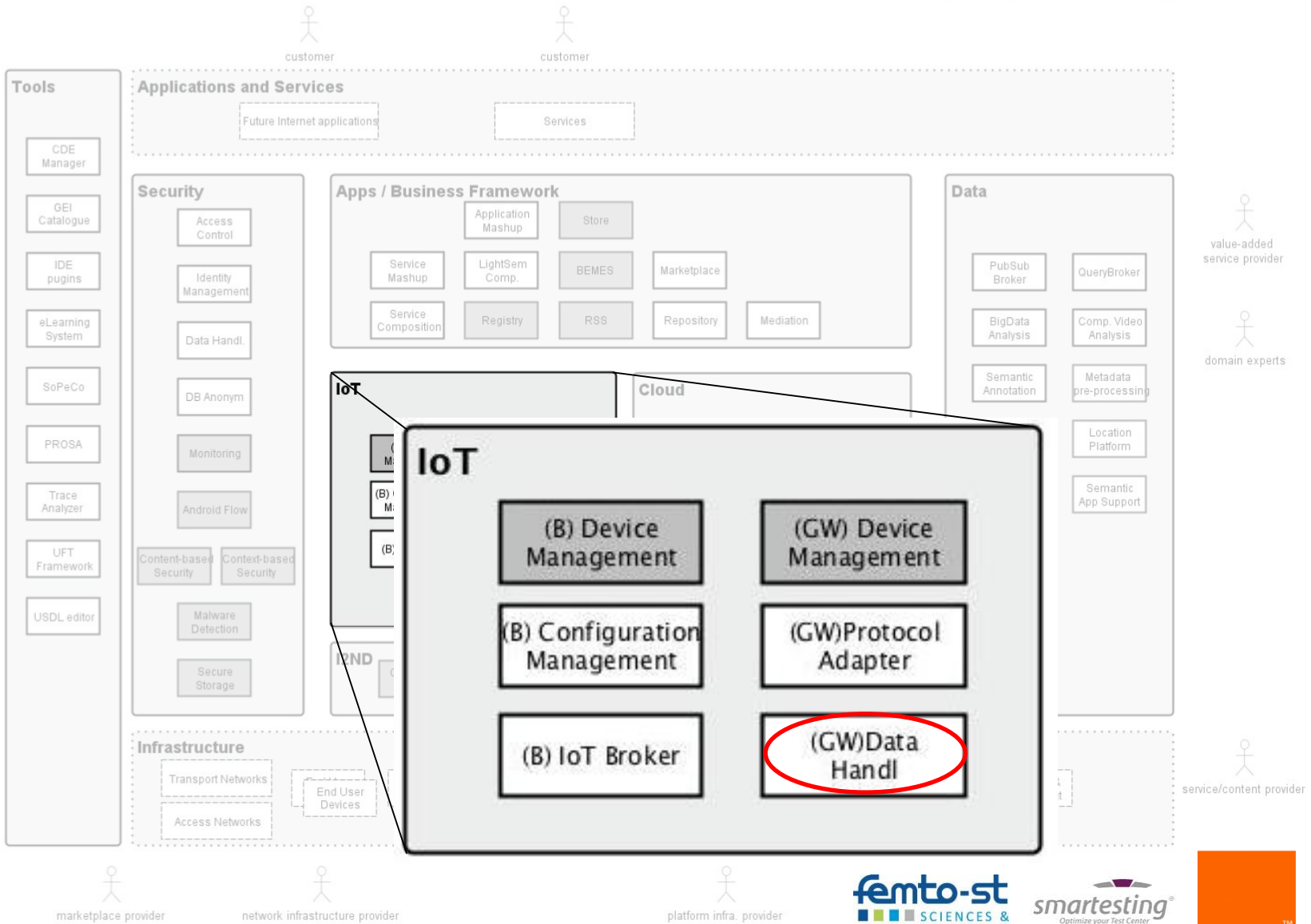
# Approach

- Multiply convincing arguments
- Present information under different perspectives
- Deploy tool chain welcoming 3<sup>rd</sup> party tools
- Participate into sustainability plan definition



# Case study: Internet of Things (IoT)

# FIWARE architecture



# MBT for Webservices

- Webservices: Events may occur whatever the current state is

*The current state of the system is in fact a combination of state variables*

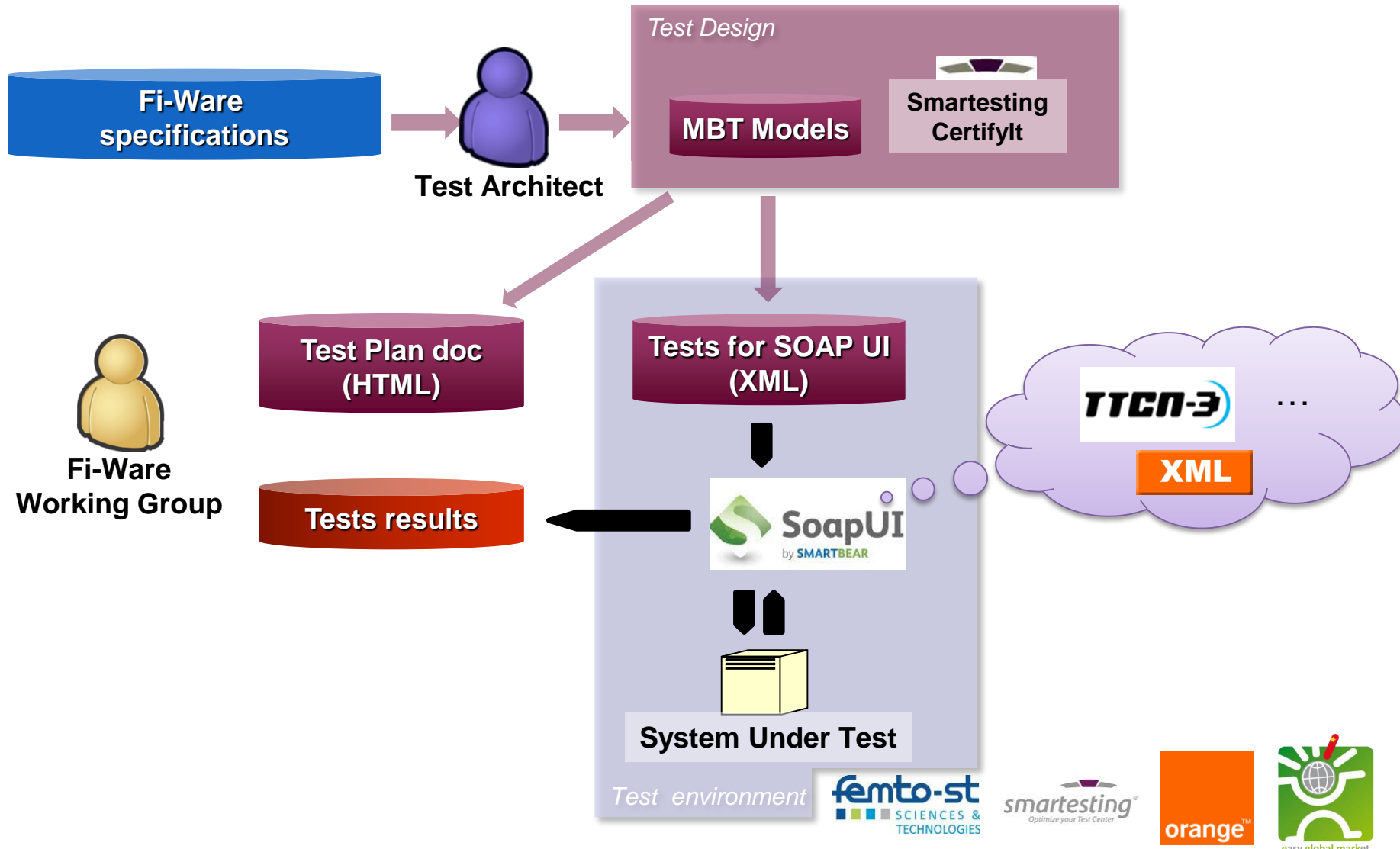
*One state variable can not be defined to represent the status of the system*

*Complex input data values and expected output data (XML structure with various schema)*

*Modeling the data helps to generate these data for the tests*

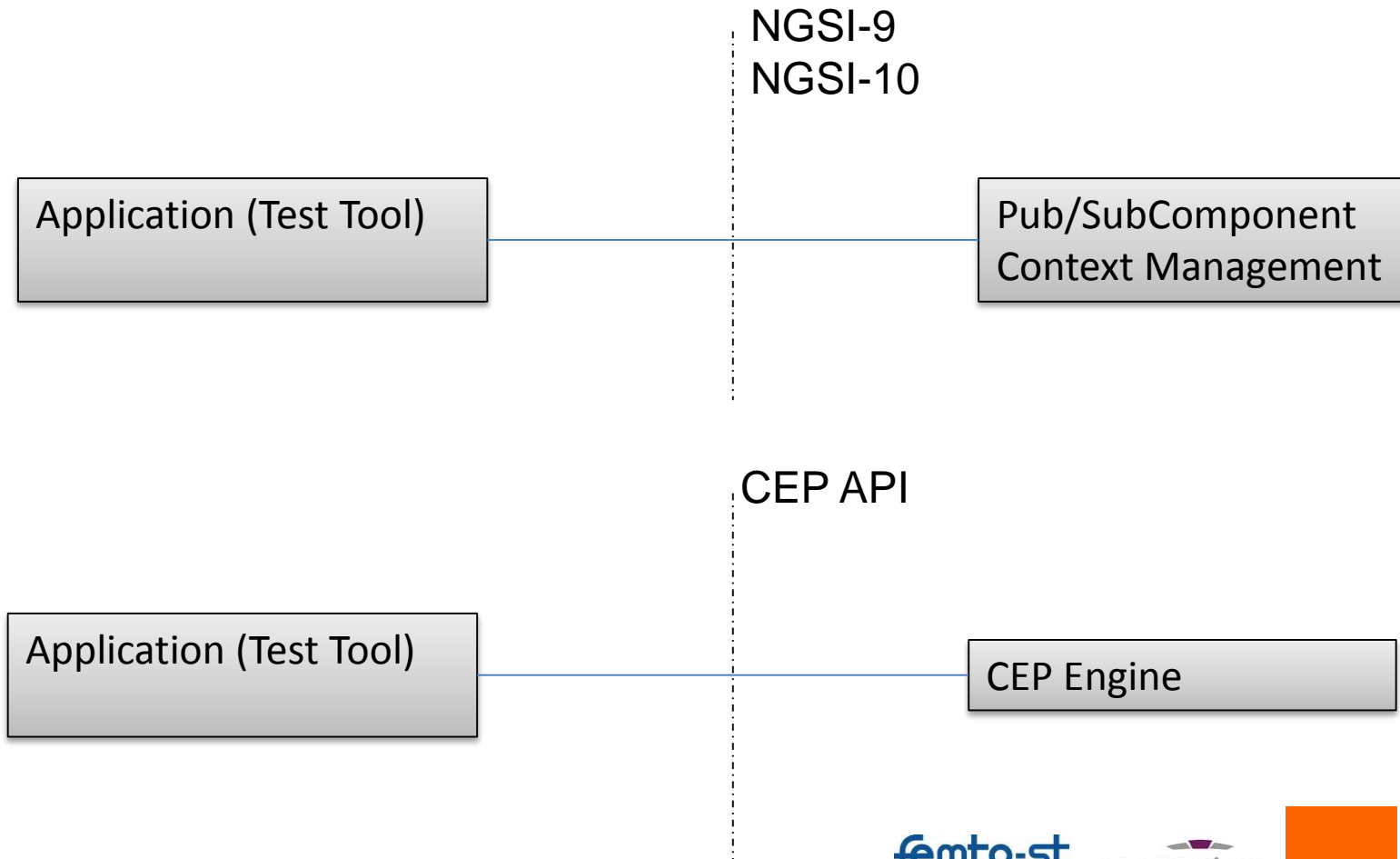
- Therefore a classical UML state machine is not relevant to model that system.
- It requires an event-oriented model based on (pre/)post conditions.

# Model-Based Testing Process for Fi-Ware Interoperability Testing

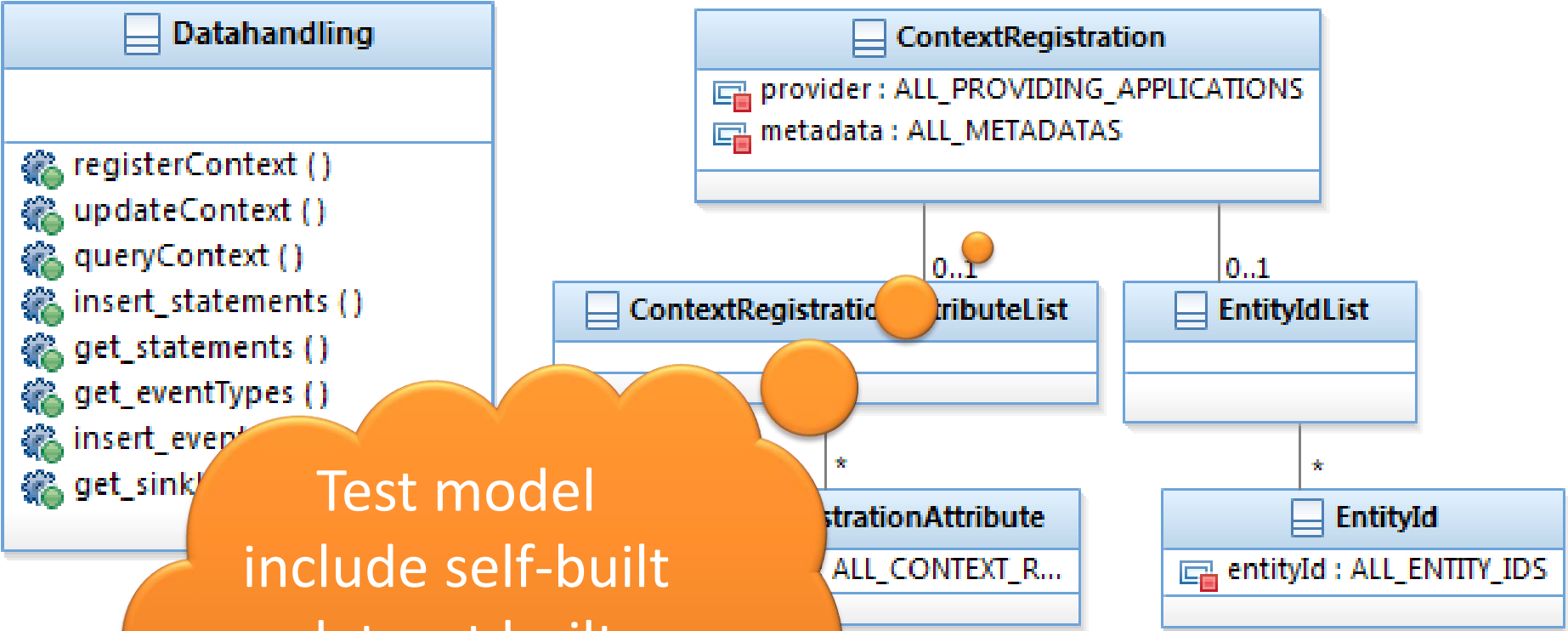


# Fi-Ware Specifications

## Sample Data Handling



# MBT Models sample



Test model include self-built dataset built from defined constraints

# Test Plan Documentation Sample

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| Requirement  | Aims  | Tests   |
|--|---|---|
| <p><b>REGISTER_CONTEXT</b></p> <p><i>This operation allows registering and updating of registered Context Entities, their attribute names and availability.<br/>The ProvidingEntity URI is used to identify the entity that provides the values of context attributes for registered Context Entities.</i></p> <p><b>Documents:</b><br/><a href="http://technical.openmobilealliance.org/Technical/release_program/docs/NGSI/V1_0-20120529-A/OMA-TS-NGSI_Context_Management-V1_0-20120529-A.pdf">http://technical.openmobilealliance.org/Technical/release_program/docs/NGSI/V1_0-20120529-A/OMA-TS-NGSI_Context_Management-V1_0-20120529-A.pdf</a></p> <p><b>Reference:</b> 5,3,1</p> | <p>success</p> <p>Context already exist,<br/>Error rejected</p>   | <p>testSuite<br/>registerContext<br/>(b6-e8-80)</p> <p>testSuite<br/>registerContext<br/>(b6-e8-80)</p> |
| <p><b>UPDATE_CONTEXT_EMPTY_UPDATE_APPEND_REJECTED</b></p> <p><i>This operation allows updating a set of Context Information, related attributes and metadata.</i></p> <p><i>Behaviour in Case of empty ContextValue(s) in the request<br/>For each ContextElement of the list of Context Elements received in the updateContextRequest, if an empty Context Value is provided, the operation behaviour SHALL be:</i></p> <p><i>- if the UpdateAction is set to "update" or "append", the receiver SHALL reject the related changes requested for the specific ContextElement and report an error in the response;</i></p>  | <p>Empty context,<br/>UpdateAction is "Update",<br/>Error rejected</p> <p>Empty context,<br/>UpdateAction is "append",<br/>Error rejected</p> | <p>testSuite<br/>updateContext<br/>(b6-81-ed)</p> <p>testSuite<br/>updateContext<br/>(b6-ad-fd)</p>     |



# Test Plan Documentation Sample

Test Plan doc  
(HTML)

2/2

```
<con:resource name="/NGSI9" path="/NGSI9">  
<con:settings/>  
<con:parameters/>  
<con:resource name="/registerContext" path="/registerCo  
<con:settings/>  
<con:parameters/>  
<con:method name="POST-registerContextEndPoint" me
```

Adapt  
communication  
level to target

9. registerContext

|                        |                                   |   |
|------------------------|-----------------------------------|---|
| IN_contextRegistration | _provider                         | PROVIDER1   |
|                        | _EntityIdList                     | <input type="text" value="_EntityId ENTITY_1"/>                       |
|                        | _metadata                         | METADATA1   |
|                        | _ContextRegistrationAttributeList | <input type="text" value="_ContextRegistrationAttribute CONTEXT..."/> |

Check that the error code is REGISTER\_SUCCESS

10. registerContext

|                        |                                   |  |
|------------------------|-----------------------------------|--|
| IN_contextRegistration | _provider                         | PROVIDER1  |
|                        | _EntityIdList                     | <input type="text" value="_EntityId ENTITY_1"/>                      |
|                        | _metadata                         | METADATA1  |
|                        | _ContextRegistrationAttributeList | <input type="text" value="_ContextRegistrationAttribute CONTEX..."/> |

Check that the error code is ERROR\_ALREADY\_REGISTERED

```
<contextRegistrationAttribute>  
<name>latitude</name>  
<type>xs:double</type>  
<isDomain>>false</isDomain>  
</contextRegistrationAttribute>  
<contextRegistrationAttribute>  
<name>longitude</name>  
<type>xs:double</type>  
<isDomain>>false</isDomain>  
</contextRegistrationAttribute>
```



# Test execution results for SOAP UI

insertStatement (b6-15-75)

OST - cep/statements/{name}\_ec962952-309d-4d54-95ba-8d5e71c4014

TestSteps Test On Demand

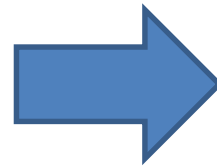
- DELETE - deleteEsper4FastData
- POST - createInstanceEndPoint
- POST - registerContextEndPoint\_631e8f77-d37a-419f-bc28-5841a6c591
- POST - registerContextEndPoint\_fca935b4-14bf-4123-9f7a-fd865a54a1
- POST - cep/statements/{name}\_ec962952-309d-4d54-95ba-8d5e71c4014
- GET - cep/statements/{name}\_1e2f088a-e240-460f-bb6c-e1c6673f39e
- POST - cep/statements/{name}/eventsinkurls/{eventSinkUrlName}\_2
- GET - cep/statements/{name}/eventsinkurls\_ce8731ee-498f-4bb1-b7

Description Properties Setup Script TearDown Script

Test started at 2014-06-20 13:39:41.600

- Step 1 [DELETE - deleteEsper4FastData] UNKNOWN: took 1611 ms
- Step 2 [POST - createInstanceEndPoint] UNKNOWN: took 42 ms
- Step 3 [POST - registerContextEndPoint\_631e8f77-d37a-419f-bc28-5841a6c591] SUCCESS: took 123 ms
- Step 4 [POST - registerContextEndPoint\_fca935b4-14bf-4123-9f7a-fd865a54a1] SUCCESS: took 123 ms

TestCase Log



insertStatement (b6-15-75)

FINISHED

TestSteps Test On Demand

- DELETE - deleteEsper4FastData
- POST - createInstanceEndPoint
- POST - registerContextEndPoint\_631e8f77-d37a-419f-bc28-5841a6c591
- POST - registerContextEndPoint\_fca935b4-14bf-4123-9f7a-fd865a54a1
- POST - cep/statements/{name}\_ec962952-309d-4d54-95ba-8d5e71c4014
- GET - cep/statements/{name}\_1e2f088a-e240-460f-bb6c-e1c6673f39e
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- Step 5 [POST - cep/statements/{name}\_ec962952-309d-4d54-95ba-8d5e71c4014] SUCCESS: took 123 ms
- Step 6 [GET - cep/statements/{name}\_1e2f088a-e240-460f-bb6c-e1c6673f39e] SUCCESS: took 123 ms
- Step 7 [POST - cep/statements/{name}/eventsinkurls/{eventSinkUrlName}\_2] SUCCESS: took 123 ms

TestCase Log

# Results

- MBT is applicable to web services
- Increase software quality & testing efficiency
  - Built relations with the development team
  - Identify inconsistency or ambiguity in specification
  - Bugs and regressions issues identified
  - Model is capitalizing the knowlegde, all generated assets are in sync
  - Approach replicable to other Enablers

# Thank you!

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