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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FI-WARE fi star

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Introduction

FI-PPP Introduction

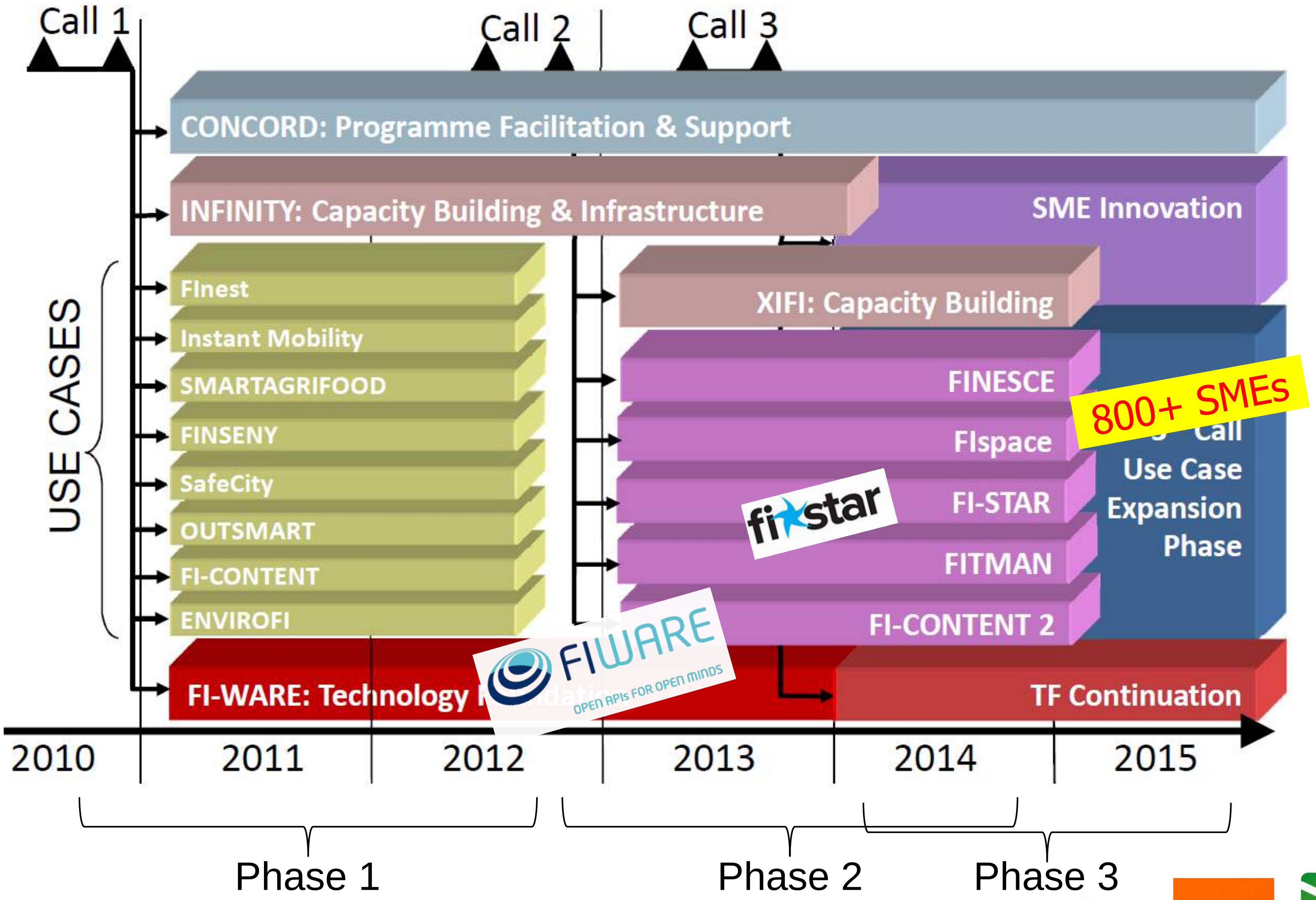
- The European Commission has launched the Future Internet Public-Private Partnership program (FI-PPP) :
  - Shared vision for harmonised European scale technology platforms and their implementation
  - Integration and harmonisation of the relevant policy, legal, political and regulatory frameworks
  - 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



Call 1

Call 2

Call 3

CONCORD: Programme Facilitation & Support

INFINITY: Capacity Building & Infrastructure

SME Innovation

USE CASES

FInest

Instant Mobility

SMARTAGRIFOOD

FINSENY

SafeCity

OUTSMART

FI-CONTENT

ENVIROFI

XIFI: Capacity Building

FINESCE

FIspace

FI-STAR

FITMAN

FI-CONTENT 2

800+ SMEs

Call

Use Case Expansion Phase

fi-star

FIWARE

OPEN APIs FOR OPEN MINDS

FI-WARE: Technology Foundation

TF Continuation

2010

2011

2012

2013

2014

2015

Phase 1

Phase 2

Phase 3

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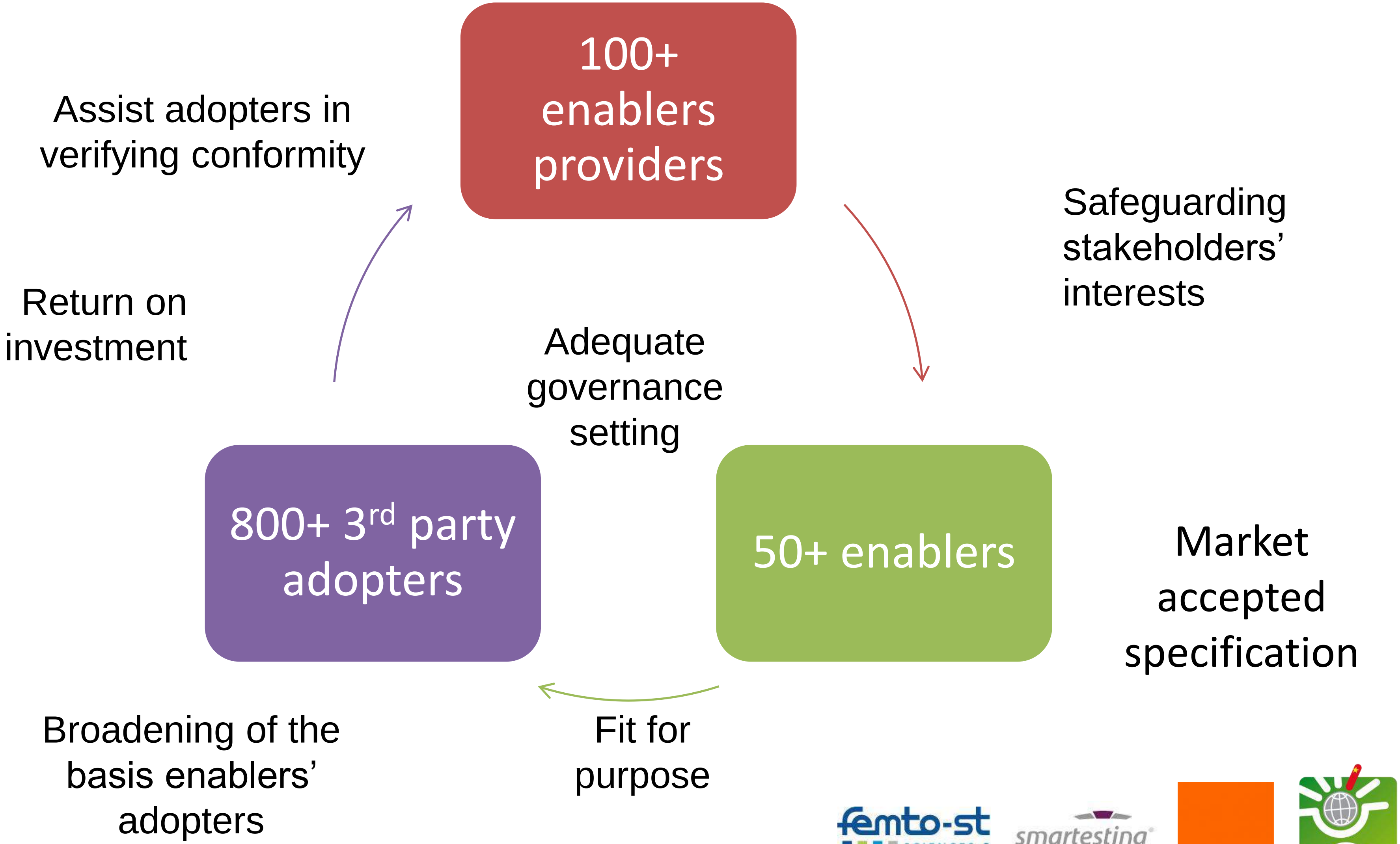
FIWARE uptake …



100+ enablers providers

Assist adopters in verifying conformity

Safeguarding stakeholders' interests

Return on investment

Adequate governance setting

800+ 3rd party adopters

50+ enablers

Market accepted specification

Broadening of the basis enablers' adopters

Fit for purpose

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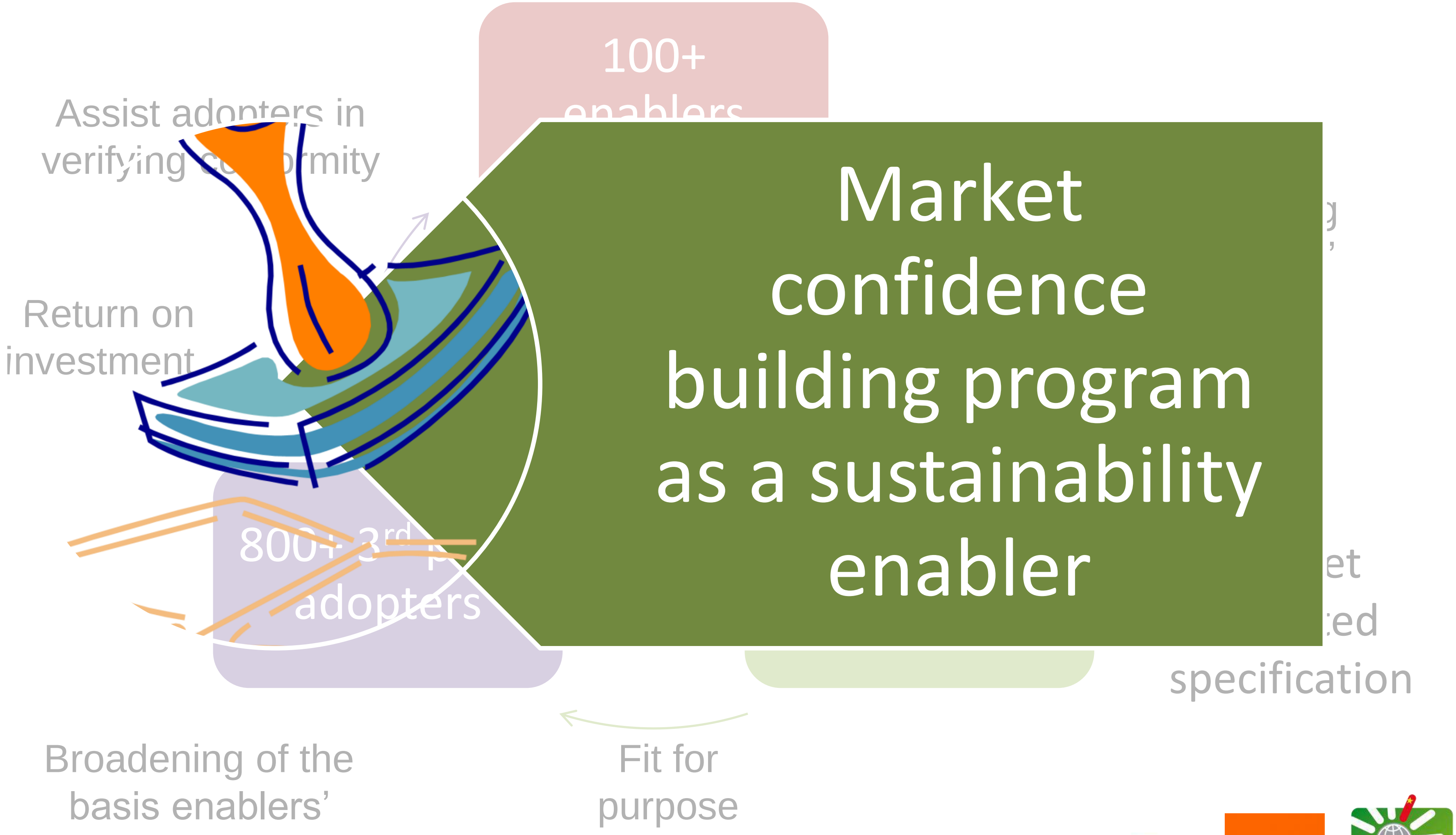
… requires market confidence



Market confidence building program as a sustainability enabler

Broadening of the basis enablers' adopters

Fit for purpose

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

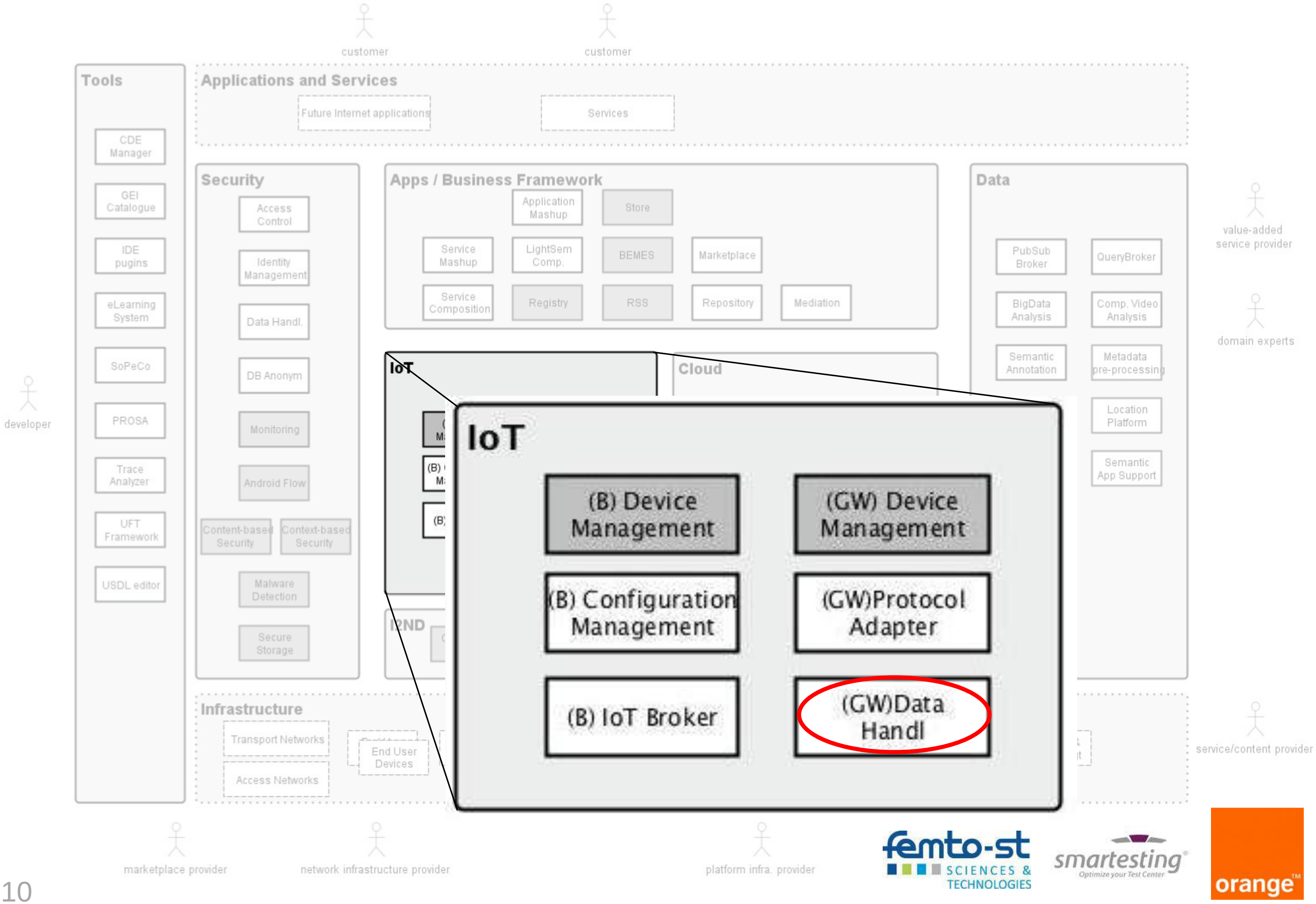
- Multiply convincing arguments
- Present information under different perspectives

- Deploy tool chain welcoming 3rd party tools

- Participate into sustainability plan definition

Case study: Internet of Things (IoT)

FIWARE architecture



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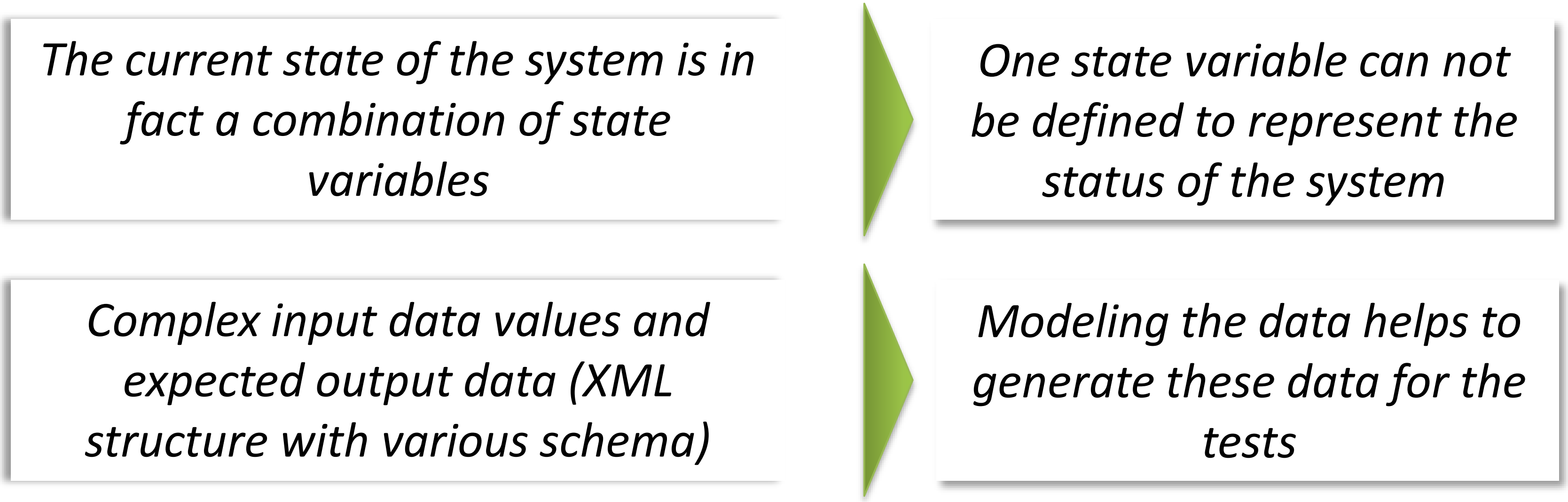
MBT for Webservices

- Webservices: Events may occur whatever the current state is



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

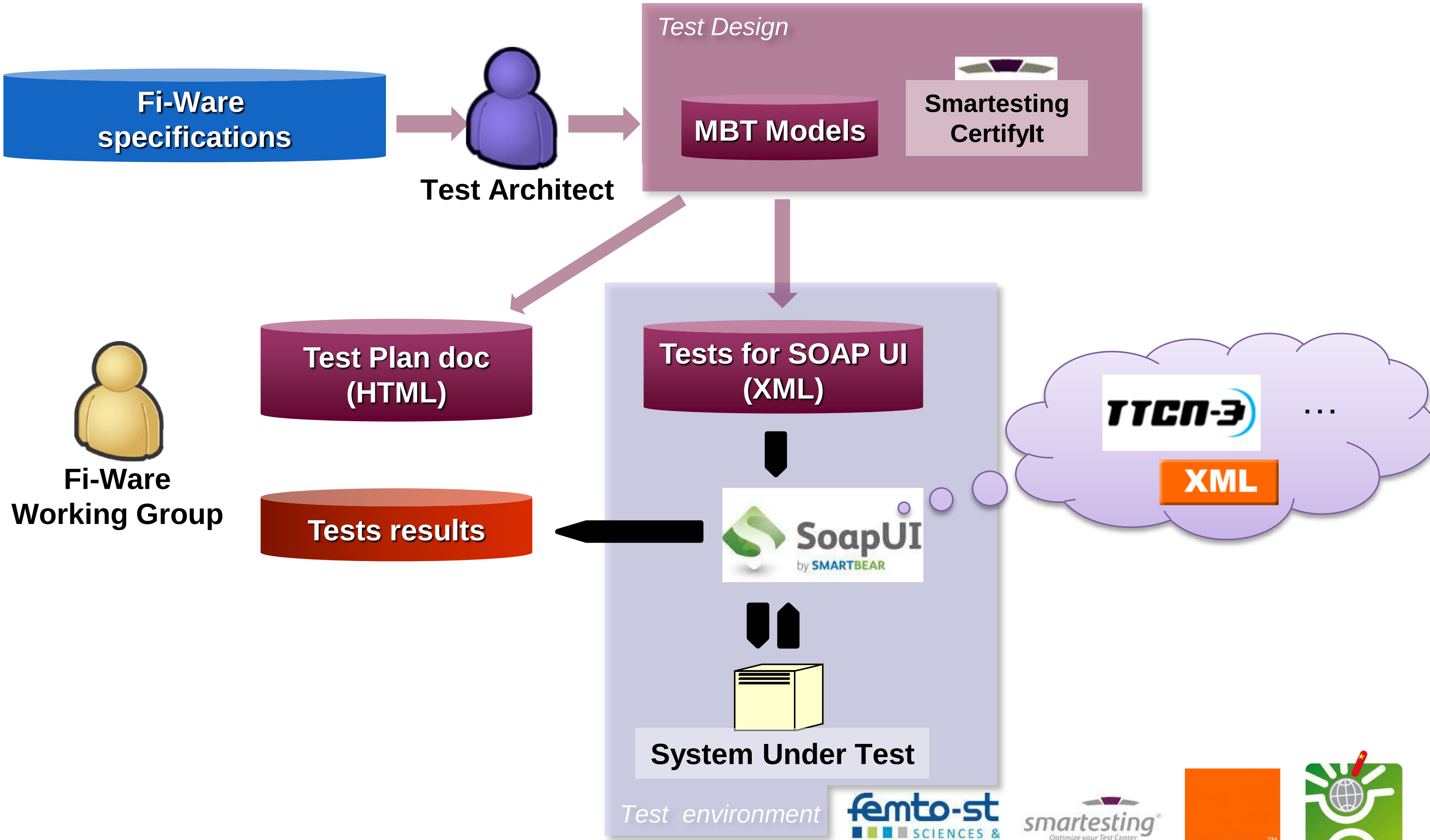
One state variable can not be defined to represent the status of the system

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



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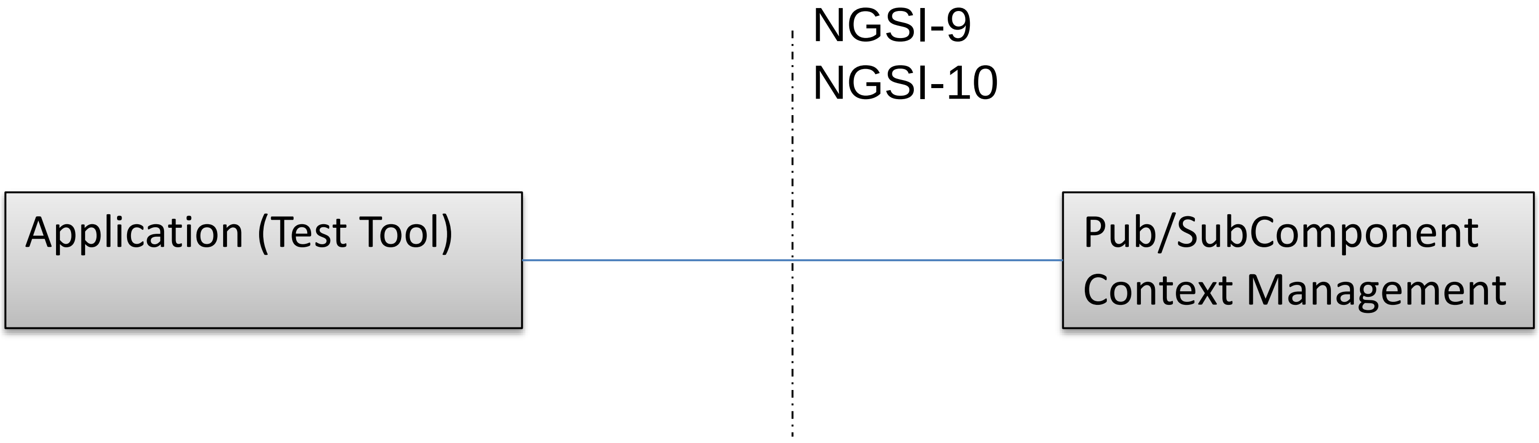
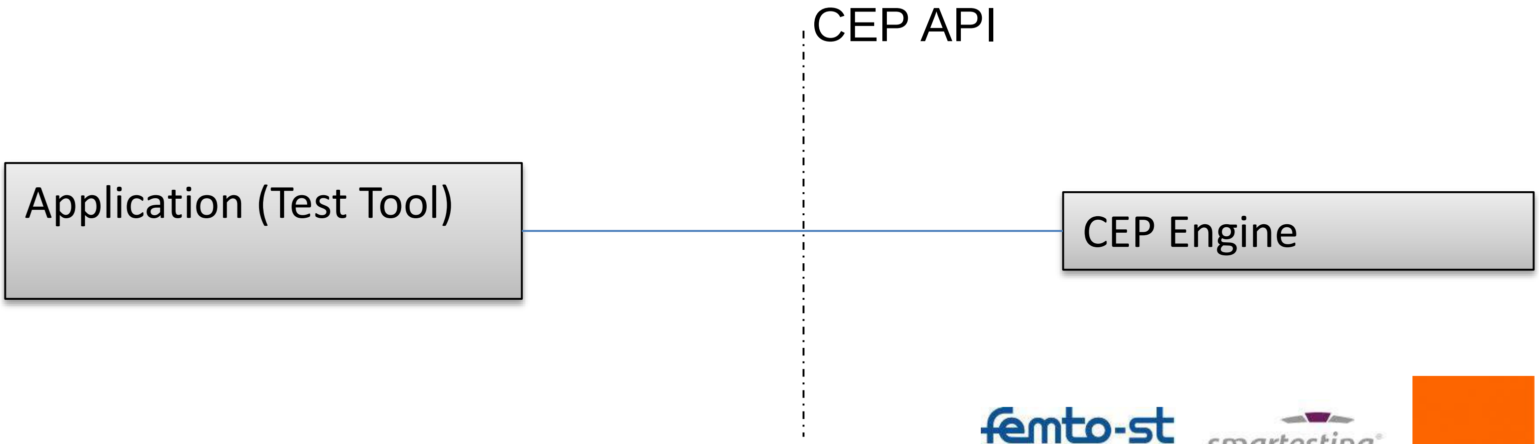
Fi-Ware specifications

Fi-Ware Specifications Sample DataHandling


NGSI-9
NGSI-10

Application (Test Tool)

Pub/SubComponent Context Management

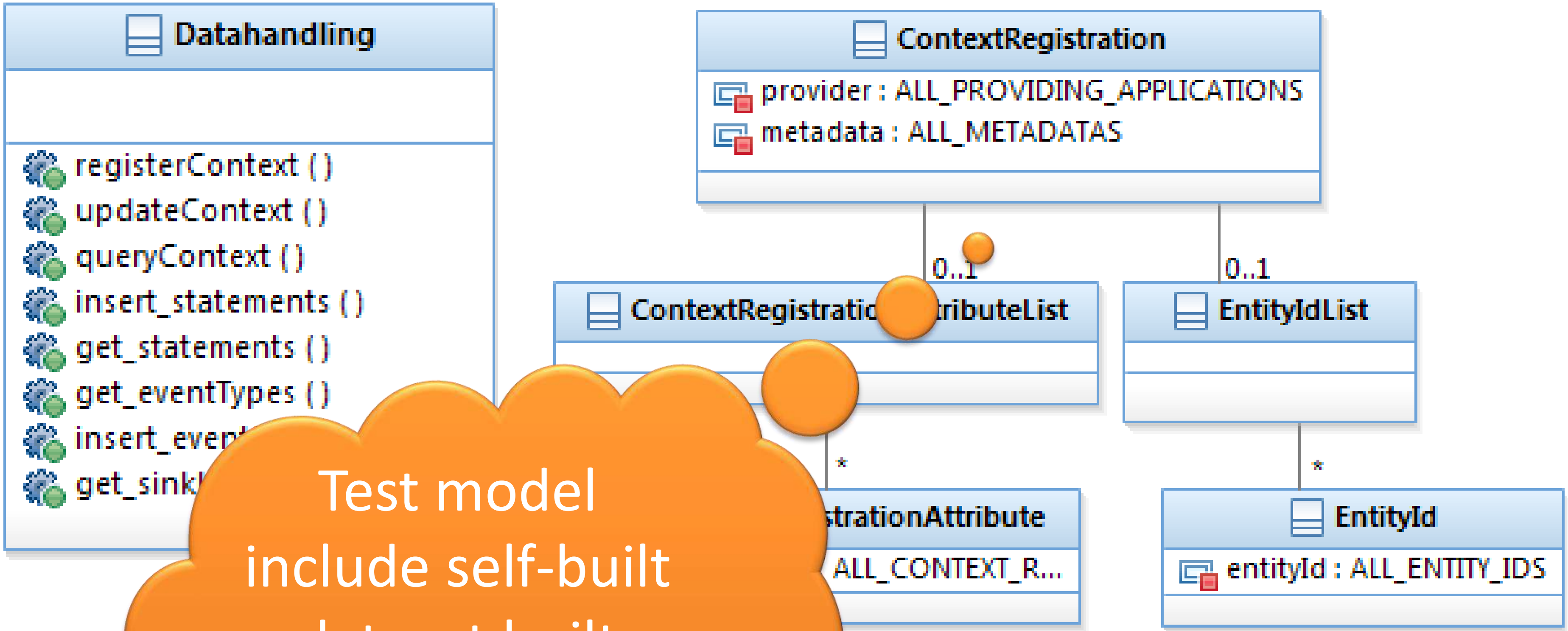

CEP API

Application (Test Tool)

CEP Engine

MBT Models

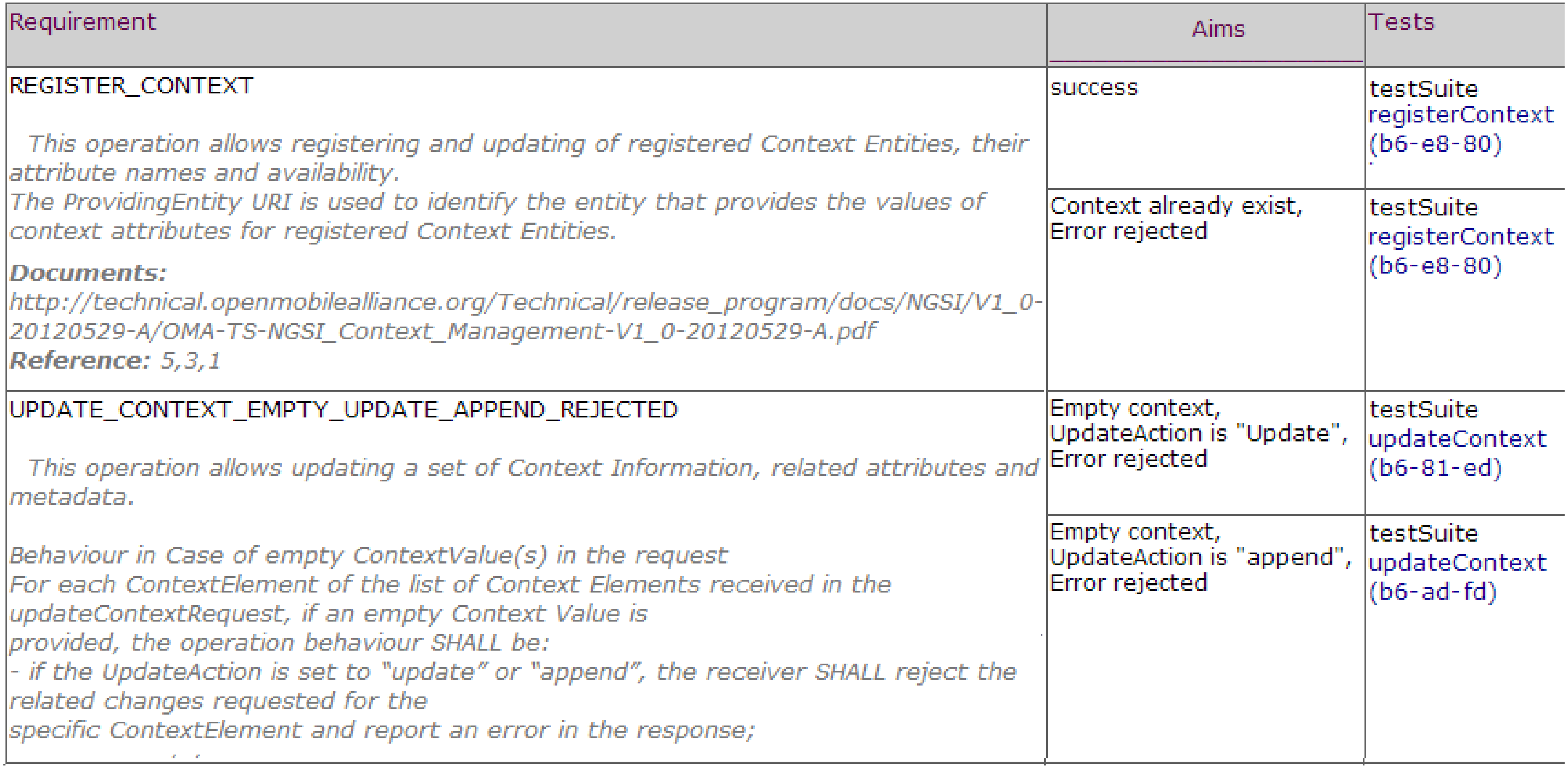
MBT Models sample



Test model include self-built dataset built from defined constraints

Test Plan doc (HTML)

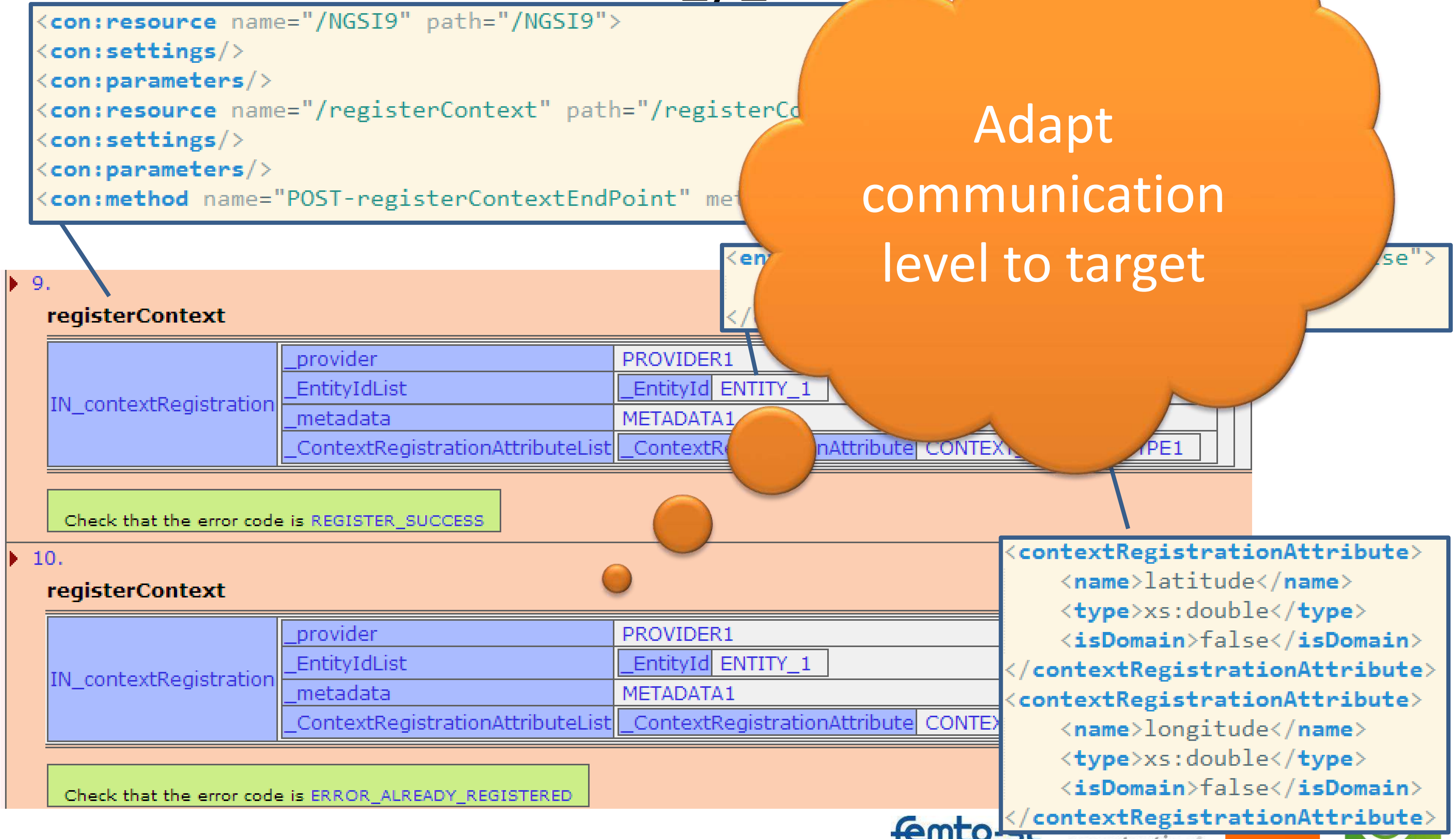
Test Plan Documentation Sample 1/2



Requirement	Aims	Tests
REGISTER_CONTEXT *This operation allows registering and updating of registered Context Entities, their attribute names and availability.* *The ProvidingEntity URI is used to identify the entity that provides the values of context attributes for registered Context Entities.* ***Documents:*** *http://technical.openmobilealliance.org/Technical/release_program/docs/NGSI/V1_0-20120529-A/OMA-TS-NGSI_Context_Management-V1_0-20120529-A.pdf* ***Reference:*** *5,3,1*	success	testSuite registerContext (b6-e8-80)
	Context already exist, Error rejected	testSuite registerContext (b6-e8-80)
UPDATE_CONTEXT_EMPTY_UPDATE_APPEND_REJECTED *This operation allows updating a set of Context Information, related attributes and metadata.* *Behaviour in Case of empty ContextValue(s) in the request* *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:* *- 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;*	Empty context, UpdateAction is "Update", Error rejected	testSuite updateContext (b6-81-ed)
	Empty context, UpdateAction is "append", Error rejected	testSuite updateContext (b6-ad-fd)

Test Plan doc (HTML)

Test Plan Documentation Sample 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
```

```
<en                                                  se">

</
```

9.

registerContext

IN_contextRegistration	_provider	PROVIDER1	
	_EntityIdList	_EntityId	ENTITY_1
	_metadata	METADATA1	
	_ContextRegistrationAttributeList	_ContextR nAttribute	CONTEXT PE1

Check that the error code is REGISTER_SUCCESS

10.

registerContext

IN_contextRegistration	_provider	PROVIDER1	
	_EntityIdList	_EntityId	ENTITY_1
	_metadata	METADATA1	
	_ContextRegistrationAttributeList	_ContextRegistrationAttribute	CONTEX

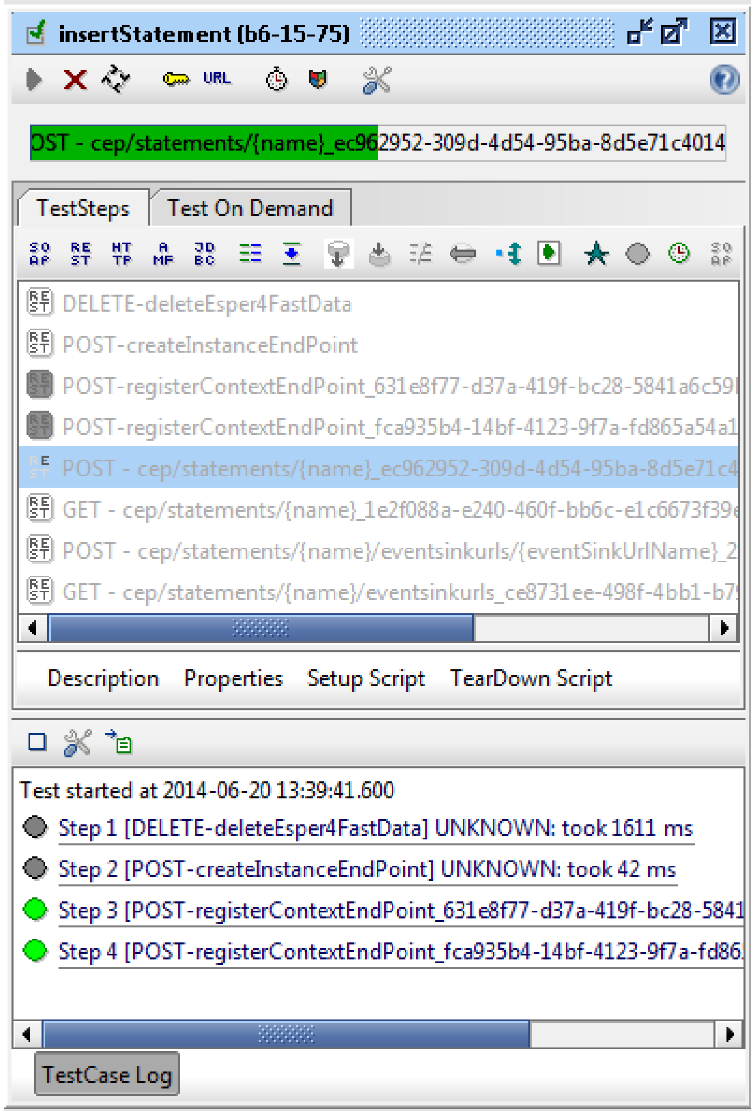
Check that the error code is ERROR_ALREADY_REGISTERED

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

Adapt communication level to target

Tests results

Test execution results for SOAP UI



insertStatement (b6-15-75)

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

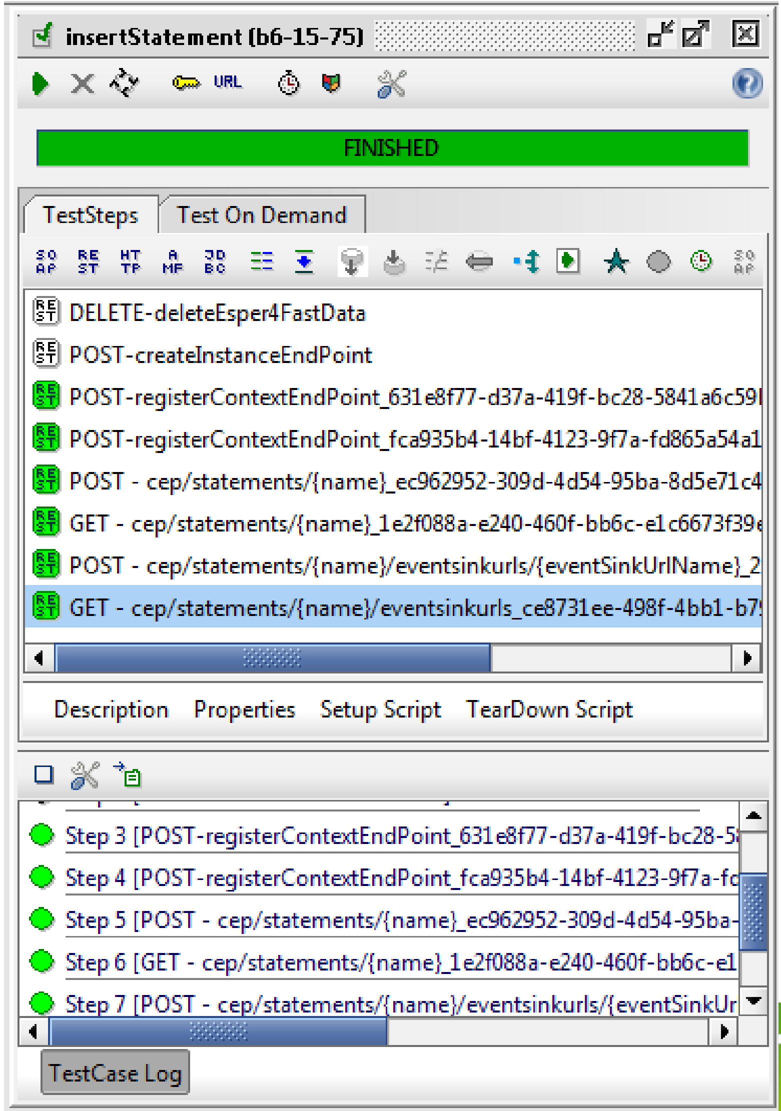
TestSteps | Test On Demand

- DELETE-deleteEsper4FastData
- POST-createInstanceEndPoint
- POST-registerContextEndPoint_631e8f77-d37a-419f-bc28-5841a6c59
- POST-registerContextEndPoint_fca935b4-14bf-4123-9f7a-fd865a54a1
- POST - cep/statements/{name}_ec962952-309d-4d54-95ba-8d5e71c4
- GET - cep/statements/{name}_1e2f088a-e240-460f-bb6c-e1c6673f39
- 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-bc28-5841
Step 4 [POST-registerContextEndPoint_fca935b4-14bf-4123-9f7a-fd86
```

TestCase Log



insertStatement (b6-15-75)

FINISHED

TestSteps | Test On Demand

- DELETE-deleteEsper4FastData
- POST-createInstanceEndPoint
- POST-registerContextEndPoint_631e8f77-d37a-419f-bc28-5841a6c59
- POST-registerContextEndPoint_fca935b4-14bf-4123-9f7a-fd865a54a1
- POST - cep/statements/{name}_ec962952-309d-4d54-95ba-8d5e71c4
- GET - cep/statements/{name}_1e2f088a-e240-460f-bb6c-e1c6673f39
- POST - cep/statements/{name}/eventsinkurls/{eventSinkUrlName}_2
- GET - cep/statements/{name}/eventsinkurls_ce8731ee-498f-4bb1-b7

Description | Properties | Setup Script | TearDown Script

```
Step 3 [POST-registerContextEndPoint_631e8f77-d37a-419f-bc28-5
Step 4 [POST-registerContextEndPoint_fca935b4-14bf-4123-9f7a-fc
Step 5 [POST - cep/statements/{name}_ec962952-309d-4d54-95ba-
Step 6 [GET - cep/statements/{name}_1e2f088a-e240-460f-bb6c-e1
Step 7 [POST - cep/statements/{name}/eventsinkurls/{eventSinkUr
```

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 identifiedModel is capitalizing the knowlegde, all generated assets are in sync
  - Approach replicable to other Enablers

Thank you!

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