# ETSI GR CIM 015 V1.1.1 (2021-06)



## Context Information Management (CIM); NGSI<sup>I</sup>LD Testing Environment Validation (standards.iteh.ai)

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### Foreword

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ETSI GR CIM 015 V1.1.1 (2021-06) an produced by ETSI Industry Specification Group (ISG

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### Modal verbs terminology

In the present document "**should**", "**should not**", "**may**", "**need not**", "**will**", "**will not**", "**can**" and "**cannot**" are to be interpreted as described in clause 3.2 of the <u>ETSI Drafting Rules</u> (Verbal forms for the expression of provisions).

"must" and "must not" are NOT allowed in ETSI deliverables except when used in direct citation.

### **Executive summary**

The present document presents the results of the validation of the NGSI-LD Test Suite and its test environment. Besides the testing environment validation, it also provides experts who are implementing the NGSI-LD API specification a description of how to efficiently run the Test Suite and how it can be extended to add more permutations in the Test Cases. The present document concludes by listing the envisioned future work on the Test Suite to extend it and improve it as well as to maintain it for future versions of the NGSI-LD API.

### Introduction

The ISG CIM group has defined an API for exchange of information contextualized in time, space and relation to other information using a property graph model with the intent that the associated protocol (called NGSI-LD) becomes the "glue" between all kinds of applications and databases associated with services for Smart Cities, Smart Agriculture, Smart Manufacturing, etc.

To be successful, the NGSI-LD API specification needs to be well understood and well implemented. The community of users will not be solely highly professional engineers employed by big companies but will include many small teams and SMEs and even hobbyists. Therefore, it is essential that the developers have access to not only the standard but also a test specification and a testing environment to check that their work is (and remains) conform to the ETSI NGSI LD specification.

The developers will usually write integration tests to validate the behaviour of their NGSI-LD implementation, but it is important to assert compliance to the specification based on a test suite agreed by the group creating the API specification, i.e. ETSI ISG CIM. Therefore, it is very important to create a set of ETSI-approved test cases.

What is more, the existence of such a test suite will likely help to increase the adoption of the NGSI-LD specification by giving developers a ready to use and extensive set of sample tests.

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### 1 Scope

The present document presents the experience of running the Test Suite against a set of open-source context brokers implementing the NGSI-LD specifications.

It also gives some guidelines on how to use the Test Suite and how to expand it for simple use-cases like adding new permutations in a Test Case.

Finally, it presents some ideas for later improvements of the Test Suite.

# 2 References

### 2.1 Normative references

Normative references are not applicable in the present document.

### 2.2 Informative references

References are either specific (identified by date of publication and/or edition number or version number) or specific. For specific references, only the cited version applies. For non-specific references, the latest version of the referenced document (including any amendments) applies.

NOTE: While any hyperlinks included in this clause were valid at the time of publication, ETSI cannot guarantee their long-term validity.

The following referenced documents are not necessary for the application of the present document but they assist the user with regard to a particular subject area.

ETSI GR CIM 015 V1.1.1 (2021-06)

 [i.1]
 ETSI 6S. CIM.009 (Vh.3.1):: "Context Information Management (CIM); NGSI-LD API".

 NOTE:
 Available at

https://www.etsi.org/deliver/etsi\_gs/CIM/001\_099/009/01.03.01\_60/gs\_CIM009v010301p.pdf.

# 3 Definition of terms, symbols and abbreviations

3.1 Terms

Void.

### 3.2 Symbols

Void.

### 3.3 Abbreviations

For the purposes of the present document, the following abbreviations apply:

API	Application Programming Interface
CSR	Context Source Registration
HTML	HyperText Markup Language
HTTP	HyperText Transfer Protocol
NGSI-LD	Next Generation Service Interfaces Linked Data
TC	Test Case

XML eXtensible Markup Language

#### 4 **Tests Execution Options**

#### Introduction 4.0

All the NGSI-LD Test Cases can be executed by launching one single command, but it is also possible to run subsets of those tests.

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By specifying a folder when launching the Test Suite, all the tests inside that folder and subsequent subfolders will be executed. Folder selection is an easy way of selecting different tests groups. That also makes the folder structure an important asset on how to run tests subsets.

The generic command to execute tests is:

robot [options] robot\_files

Where the arguments are:

- options: options that can be included in the command;
- robot\_files: path to the file or folder where the tests files are stored.

#### Executing all tests 4.1 NDARD PREVIEW

The easiest way to run all the tests is to select a folder that has all the tests inside of it or inside of all its subfolders. In that case, the folder path "./TP/NGSI-LD" is a good choice.

The matching command is:

ETSI GR CIM 015 V1.1.1 (2021-06) robot ./TP/NGSI http://standards.iteh.ai/catalog/standards/sist/cb987215-0ae8-451f-a91b-09dff8d1d44d/etsi-gr-cim-015-v1-1-1-2021-06

#### 4.2 Executing tests subsets from a folder

When a folder is selected, it will only run the tests inside of it or inside of all its subfolders. For instance, to run all the tests related to the creation of an entity, the command is:

robot ./TP/NGSI-LD/ContextInformation/Provision/Entities/CreateEntity

#### 4.3 Executing tests from a single Test Case

To run all the tests in a specific Test Case file, e.g. 001\_01.robot, the command is:

```
robot TP/NGSI-
   LD/ContextInformation/Provision/Entities/CreateEntity/001_01.robot
```

#### **Results output** 4.4

An important feature is to output results when running tests. The results are comprised of three different files:

- log.html: logs information from the executed tests in HTML format
- output.xml: logs information from the executed tests in XML format .
- report.html: shows information about the success/failures of the executed tests

The command option to get the results output in a specific folder is -outputdir, followed by the path to the folder where the files will be created:

robot --outputdir ./results ./TP/NGSI-LD

#### 4.5 Overriding base URL

Overriding the base context broker URL can be dynamically specified by using the option variable and selecting the new URL. The command is:

robot --variable url:"new\_URL" ./TP/NGSI-LD

#### 4.6 Executing tests by specific tag

Another way of running tests subsets is executing tests matching a specified tag (see clause 6 for a list of available tags). E.g. for running tests related to an entity creation, the tag used is e-create, and the command is:

robot --include e-create ./TP/NGSI-LD

#### 4.7 Rerun failed tests

Another useful option is to execute tests that failed during a previous execution of the Test Suite. To use this feature the output.xml file is needed, and the command is:

robot --rerunfailedsuites./results/output.xmRFVFW (standards.iteh.ai)

### 5

Permutations ETSI GR CIM 015 V1.1.1 (2021-06) https://standards.iteh.ai/catalog/standards/sist/cb987215-0ae8-451f-a91b-

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#### 5.1 Introduction

Test cases are implemented using keyword or data driven approach, the major advantage of the second approach is that it makes the work easy for testing with different inputs and so adding new permutations (i.e. running the same Test Case with different test data and inputs and, sometimes, different expectations).

#### Data driven approach 5.2

Permutations of TCs with a data driven approach are the most readable and easier to change and extend. With this approach, the permutation is done by creating parameters for different scenarios, each scenario being a permutation.

For instance, the Test Purpose TP/NGSI-LD/CI/PROV/BE/003\_01, tagged with be-create, is a multi-permutation TC, it contains a keyword for Batch Entity Creation that takes the input from the Test Cases permutation table.

Since 4 entries are present in the Test Cases permutation table, the TC will execute the following 4 permutations:

- MinimalEntity: permutation to create a batch of minimal entities. •
- EntityWithSimpleProperties: permutation to create a batch of entities with simple properties.
- EntityWithSimpleRelationships: permutation to create a batch of entities with simple relationships. .
- EntityWithRelationshipsProperties: permutation to create a batch of entities with relationships of properties.

In this case, adding a new permutation is done by adding a new line in the Test Cases table with the filename that contains entities payload for the new permutation.

### 5.3 Keyword approach

In some cases, the data-driven approach is not applicable, especially when it is not possible to reuse the same base Test Case code for each permutation. In these cases, permutations of TCs are expressed in different files, each file implementing one permutation.

For instance, the Test Purpose TP/NGSI-LD/CI/CONS/DISC/027\_01, tagged with ed-attr, is an example of a TC with two permutations implemented in two separate files:

- 027\_01\_01.robot: permutation to retrieve detailed representation of an unknown NGSI-LD attribute that is expected to fail.
- 027\_01\_02.robot: permutation to retrieve detailed representation of an NGSI-LD attribute that is expected to succeed.

As already mentioned, each permutation is based on a custom keyword. To add a new permutation to such a TC, a new Test Case file has to be created along with a keyword that defines the TC workflow similar to what is done for other permutations but with the specifics of the new permutation.

# 6 Tags

### 6.0 Introduction

Tags allow to run groups of tests where each test contains the same selected tag.

There are two types of tags available: tags related to the resource and request being tested and tags that consist of a reference to the clause in the ETSI GS CIM 009 [11] that specifies the operation being tested.

# 6.1 Resource and request tags sist/cb987215-0ac8-451f-a91b-

The abbreviations used are:

- **e:** Entity
- **be**: Batch Entity
- ed: Entity Discovery
- te: Temporal Entity
- ea: Entity Attributes
- tea: Temporal Entity Attributes
- sub: Subscription
- csr: Context Source Registration
- csrsub: Context Source Registration Subscription.

The available tags are:

Subgroup 1.1:

- e-create
- e-delete
- be-create

- be-upsert
- be-update
- be-delete
- te-create
- te-update
- te-delete
- ea-append
- ea-update
- ea-partial-update
- ea-delete
- tea-append
- tea-delete
- tea-partial-update
- tea-instance-delete

### Subgroup 1.2:

- e-retrieve
- e-query
- te-retrieve
- te-query
- ed-types
- ed-types-details
- ed-type
- ed-attrs
- ed-attrs-details
- ed-attr

### Subgroup 1.3:

- sub-create
- sub-update
- sub-retrieve
- sub-query
- sub-delete
- sub-notification

### Subgroup 2.1:

• csr-create

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