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| ToR TTF T039 (Ref. Body ISG CIM) |
| Version: 3.0 |
| Author: Giuseppe Tropea – Date: 2023-07-25 |
| Last updated by: ETSI Secretariat – Date: 2024-02-27 |
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Terms of Reference –Testing Task Force Proposal

TTF T039 (Ref. Body ISG CIM)

NGSI-LD Distributed Operations and Interoperability Test Specification - Phase 3

Summary information

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| Approval status | Approved by Ref. Body (doc ref: CIM(23)000145r1) | | **YES** |
| Reference Body | Ref. Body ISG-CIM | | |
| ETSI Funding | **Maximum budget : 80 000 EUR + 3 000 EUR Travel** | | |
| Minimum of 4 ETSI Members Support | **YES** | | |
| Time scale | **From** | 2024-05-02 | |
| **To** | 2025-06-15 | |
| Work Items | * D1:    [RGS/CIM-0027v211](http://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69110) (GS CIM 027 V2.1.1) NGSI-LD Testing Framework: Test Purposes Description Language (TPDL) TTF3 D1 * D2:    [RGS/CIM-0012v311](http://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69111) (GS CIM 012 V3.1.1) NGSI-LD Test Suite Structure TTF3 D2 * D3.1:   [RGS/CIM-0013v311](http://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69112) (GS CIM 013 V3.1.1) NGSI-LD Test purposes descriptions TTF3 D3.1 * D3.2: [DGS/CIM-0053](http://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69116) (GS CIM 053 V1.1.1) NGSI-LD Test purposes descriptions for Distributed Operations TTF3 D3.2 * D4:   [RGS/CIM-0014v311](http://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69113) (GS CIM 014 V3.1.1) NGSI-LD Test suite TTF3 D4 * D5:   [RGR/CIM-0015v311](http://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69114) (GR CIM 015 V3.1.1) NGSI-LD Testing environment validation TTF3 D5   D6:   [DGS/CIM-0054](http://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69117) (GS CIM 0054 V1.1.1) NGSI-LD Interoperability tests specification TTF3 D6   * D7:   [RGS/CIM-0029v211](http://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69115) (GS CIM 029 V2.1.1) NGSI-LD Implementation Conformance Statement TTF3 D7 | | |
| TTF Roadmap reference | 2024 | | |

Part I –TTF Technical Proposal

# Rationale & Objectives

## Rationale

The ISG CIM group has defined an API for exchange of information (data and metadata, including e.g. relationships between entities and properties of properties) with the intent that the associated protocol (called NGSI-LD) becomes the “glue” between different kinds of applications and databases associated with Smart services. Furthermore, the protocol makes it easy (indeed, mandatory) to reference the definitions of all the terms and parameters in the data, hence overcoming one of the biggest issues with data exchange: namely that the precise meaning and provenance of the initial information is lost. This will enable a huge improvement for reliability of analytics and AI systems which need to control the scope and quality of their input data. Furthermore, the protocol is intended to be adopted by a very wide range of developers desiring a simple means to let their Apps interact with a variety of data sources.

However, these advantages will not occur if the protocol is not well understood and not well implemented. Already there are at least four open-source implementations (FIWARE Foundation, NEC, EGM, KETI), and the community of users also includes many small teams and SMEs and even hobbyists. Therefore, it is essential that the developers have access to not only the standard but also to a test specification and a testing environment to check that their work is (and remains) conformant to the ETSI NGSI-LD specification and can interoperate.

The developers 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, because, as a number of deployments are taking place, new components (e.g. for data ingestion, event processing, visualisation, etc.) get developed and interact through the NGSI-LD API of the Context Broker.

Therefore, it is very important to maintain and update the set of ETSI-approved conformance test cases, because the NGSI-LD specification is quickly evolving, with new features that are requested by real-life use cases.

As an example, since version v1.6, the NGSI-LD protocol fully defines Distributed Operations, whereby information about entities can live at several different servers owned by independent (but federated) institutions, and it can be conveniently requested by querying one entry point that gathers and merges the matching entities or attributes of one entity. Distributed Operations spawn complex multi-Broker architectures and correspondingly complex test cases.

## Objectives of the work to be executed

The main objective of the project is to extend and improve the existing NGSI-LD API conformance test suite for the purpose of:

* Broadening the coverage of the existing test cases, by testing corner-cases and a wider number of error conditions
* Covering the Distributed Operations cases
* Extending it to the latest features, introduced with newer versions of the NGSI-LD API
* Creating a more complete interoperability test suite to be used during a Plugtest event.

At the time of the previously funded TTF T026, related to v1.6 of the NGSI-LD specification, there were no Context Brokers fully compliant with v1.6, especially for what concerns the Distributed Operations. Hence, during TTF T026, just a preliminary set of test cases for Distributed Operations was produced and executed.

Furthermore, when Distributed Operations are tested, for each test there is a case where all parts of the System Under Test are identical (i.e. several replicas of the same Context Broker) and a companion case where the different Context Brokers composing the SUT come from different suppliers. Hence, there is a strong interdependence among a conformance test case for a Distributed Operation and the interoperability test case in the same scenario. For this reason, the present work will produce two separate deliverables (D3.1 and D3.2), thus separating the conformance tests for Distributed Operations (multiple Brokers, D3.2) from the conformance tests concerning one single Context Broker (D3.1).

A main objective of the work will be to correlate the tests for Distributed Operations with the interoperability tests, with the side benefit of establishing an ETSI methodology for producing a rigorous test suite in cases where the SUT is an API (rather than a more traditional physical device) that additionally interconnects a network (or hierarchy) of nodes conforming to the protocol.

An additional objective of the proposed TTF is then to review issues identified since the past TTF T026, correct the issues and ensure a complete coverage of the specification requirements.

Furthermore, the deliverables will be extended and updated so as to cover newer versions of the NGSI-LD API. As of August 2023, version v1.7 has already been published, and version v1.8 is forecasted for publishing during late 2023/early 2024. The proposed TTF work will cover new features of v1.7 and possibly v1.8.

In order to produce automatized and standardized test suites, existing tests are implemented in a specific programming language (Robot framework). The new tests that will be developed will use the same programming language and the same testing environment as the existing tests.

Note: one output of the work is a set of test cases written in a specific programming language. The copyright for such code snippets remains with ETSI. The right of use, modification, inclusion in open-source projects, running in commercial or non-commercial test suites is explicitly granted so long as the original source is cited.

## Previous funded activities in the same domain

ISG-CIM benefited from a TTF (TTF T026) in 2023. It resulted in the production of seven deliverables:

* [DGS/CIM-0027](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=66894): NGSI-LD Testing Framework: Test Purposes Description Language (TPDL) TTF2 D1
* [DGS/CIM-0012v211](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=66895): NGSI-LD Test Suite Structure TTF2 D2
* [DGS/CIM-0013v211](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=66896): NGSI-LD Test purposes description TTF2 D3
* [DGS/CIM-0014v211](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=66897): NGSI-LD Test suite TTF2 D4
* [DGR/CIM-0015v211](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=66898): NGSI-LD Testing environment validation TTF2 D5
* [DGS/CIM-0028](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=66899): NGSI-LD Interoperability tests specification TTF2 D6
* [DGS/CIM-0029](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=66911): NGSI-LD Implementation Conformance Statement TTF2 D7

## Consequences if not agreed

As described in the Rationale section, the major risk to avoid is the development of many different implementations of NGSI-LD which are not conformant to the standard (and more specifically to new features introduced in the specification in version v1.6, v1.7 and possibly v1.8).

Side-benefits of this TTF, which would not be available if the work is unfunded, are:

* Definition of a clear methodology for both conformance and interoperability testing of protocols that interconnect (potentially large) networks of nodes implementing the protocol itself.
* Add to the ETSI in-house knowledge base with the experiences in using the Robot Framework testing programming language.

If this TTF is not agreed, the production of conformance test specifications for the latest releases of NGSI-LD will not be possible or will be significantly delayed, at the risk of making them irrelevant to the industry, since the latest versions introduce important novel features and the release cycle for the specification is fast.

There is a risk that implementations will not be interoperable, especially the ones involving federated deployments and interoperable Context Brokers from different vendors. This can lead to much longer integration times for operators as they look to piece together an CIM system, and a general loss of confidence of the industry towards standardized Context Information Management itself.

In addition, the last years have seen the development of a wider adoption of the NGSI-LD specification which has been adopted in India by IUDX and formally incorporated in BIS[[1]](#footnote-2) standard, while South-Korea, with the support from KETI and TTA, is using NGSI-LD for the deployment of a smart city initiative. The test cases and testing environment might become cited in global projects, showing once again the value of ETSI as a centre of expertise.

# ETSI Members Support

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| **#** | **ETSI Member** | **Supporting delegate** |
| 1 | NEC | Lindsay Frost |
| 2 | EGM | Franck Le Gall |
| 3 | FIWARE Foundation | Fernando Lopez |
| 4 | CNIT | Giuseppe Tropea |
| 5 | Sfera s.r.l. | Marco Cavalli |
| 6 | Telefonica S. A. | Ignacio Dominguez Martinez |

# Deliverables

## Base documents

|  |  |  |
| --- | --- | --- |
| **Document** | **Title** | **Status** |
| ETSI GS CIM 006 V1.2.1 | Context Information Management (CIM) ; Information Model (MOD0) | Published June 2023 |
| ETSI RGS/CIM-0009v161 | Context Information Management (CIM); NGSI-LD API: NGSI-LD | Version 1.6.1 of the specification, published August 2022 |
| ETSI RGS/CIM-0009v171 | Context Information Management (CIM); NGSI-LD API: NGSI-LD | Version v1.7.1 of the specification, published June 2023 |
| ETSI RGS/CIM-0009v181 | Context Information Management (CIM); NGSI-LD API: NGSI-LD | New version of the specification, scheduled to be published when this TTF starts |
| ETSI DGS/CIM-0027 | NGSI-LD Testing Framework: Test Purposes Description Language (TPDL) TTF2 D1 | Currently in draft. Will be published before this TTF starts |
| ETSI DGS/CIM-0029 | NGSI-LD Implementation Conformance Statement TTF2 D7 | Currently in draft. Will be published before this TTF starts |
| ETSI RGS/CIM-00121v211 | NGSI-LD Test Suite Structure TTF2 D2 | Currently in draft. Will be published before this TTF starts |
| ETSI RGS/CIM-0013v211 | NGSI-LD Test Purposes Descriptions TTF2 D3 | Currently in draft. Will be published before this TTF starts |
| ETSI RGS/CIM-0014v211 | NGSI-LD Test Suite TTF2 D4 | Currently in draft. Will be published before this TTF starts |
| ETSI RGR/CIM-0015v211 | NGSI-LD Testing Environment Validation TTF2 D5 | Currently in draft. Will be published before this TTF starts |
| ETSI DGS/CIM-0028 | NGSI-LD Interoperability tests specification TTF2 D6 | Currently in draft. Will be published before this TTF starts |

## New deliverables

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| Deliv. | **Work Item code**  **Standard number** | **Full Title**  **Working title** | **Expected date for publication** |
| D1 | [RGS/CIM-0027v211 (GS CIM 027 V2.1.1)](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69110) | **Full Title**: cross-cutting Context Information Management (CIM); NGSI-LD Testing Framework: Test Purposes Description Language (TPDL)  Working title: **NGSI-LD Testing Framework: Test Purposes Description Language (TPDL) TTF3 D1**  Scope: it revises the test purpose description language, if needed | June 2025 |
| D2 | [RGS/CIM-0012v311 (GS CIM 012 V3.1.1)](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69111) | **Full Title**: Context Information Management (CIM); NGSI-LD Test Suite Structure  Working title: **NGSI-LD Test Suite Structure TTF3 D2**  Scope: it revises the organization and grouping of test cases based on the functionality to be tested (e.g. registration, subscription, query, etc.), especially due to novel functionality introduced in v1.6.1 onwards | June 2025 |
| D3.1 | [RGS/CIM-0013v311 (GS CIM 013 V3.1.1)](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69112) | **Full Title**: Context Information Management (CIM); NGSI-LD Test Purposes Descriptions  Working title: **NGSI-LD Test purposes description TTF3 D3.1**  Scope: it includes new abstract test cases, using the Test Purposes Description Language, both extending the coverage of existing functionality and adding new test cases for novel features introduced in version v1.6.1 onwards | June 2025 |
| D3.2 | [DGS/CIM-0053 (GS CIM 053 V1.1.1)](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69116) | **Full Title**: Context Information Management (CIM); NGSI-LD Test Suite; NGSI-LD Test purposes descriptions for Distributed Operations  Working title: **NGSI-LD Test purposes description for Distributed Operations TTF3 D3.2**  Scope: it creates new test cases, using the Test Purposes Description Language, covering the Distributed Operations introduced in v1.6.1 onwards | June 2025 |
| D4 | [RGS/CIM-014v311 (GS CIM 014 V3.1.1)](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69113) | **Full Title**: Context Information Management (CIM); NGSI-LD Test Suite  Working title: **NGSI-LD Test suite TTF3 D4**  Scope: it implements the Test Purposes Descriptions into Executable Test Cases that are in a form which can be run in the Test Execution Environment.  Note: Annex A should be normative and contain links to tests written in the Robot framework language | June 2025 |
| D5 | [RGR/CIM-0015v311 (GR CIM 015 V3.1.1)](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69114) | **Full Title**: Context Information Management (CIM); NGSI-LD Testing Environment Validation  Working title: **Testing environment validation TTF3 D5**  Scope: it checks that the extended tests run successfully in the test environment. Additionally, it allows to learn from use of the chosen test purposes description language and operating environment | June 2025 |
| D6 | [DGS/CIM-0054 (GS CIM 0054 V1.1.1)](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69117)  Same full title as GS CIM 028 with “3rd TTF” appended to the original Title (it works!) | **Full Title**: cross-cutting Context Information Management (CIM); NGSI-LD Interoperability tests specification 3rd TTF  Working title: **NGSI-LD Interoperability tests specification TTF3 D6**  Scope: it extends the draft interoperability test descriptions agreed with ISG CIM. This Work Item shall be converted/republished in GS CIM 028 V2.1.1 right after TTF2 GS CIM 028 V1.1.1 publication ! | June 2025 |
| D7 | [RGS/CIM-0029v211 (GS CIM 029 V2.1.1)](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69115) | **Full Title**: cross-cutting Context Information Management (CIM); NGSI-LD Implementation Conformance Statement  Working title: **NGSI-LD Implementation Conformance Statement TTF3 D7**  Scope: it updates the implementation conformance statement and related annexes | June 2025 |

# Maximum budget

## Task summary/Manpower Budget

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| **Task short description** | Budget (EUR) |
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| Task 0 – Project management | 5 000 € |
| Task 1 – Extend coverage of the Test Suite | 25 000 € |
| Task 2 – Implement test cases for single-Broker features introduced in version 1.6.1 | 20 000 € |
| Task 3 – Implement test cases for the Distributed Operations introduced in version 1.6.1 | 20 000 € |
| Task 4 – Extend interoperability test specification | 10 000 € |
| **TOTAL** | 80 000€ |

Note: access to multiple testbeds, running instances of a minimum of 3 NGSI-LD Context Brokers, to evaluate validity of the test cases, has been implemented and provided, over the duration of the past TTF, as volunteer contributions by ISG members.

During this TTF, the plan is to extend such volunteer contributions to include more Context Brokers and to create complex federated scenarios, to be used for evaluation of Distributed Operations for both conformance and interoperability.

All stakeholders interested in development and deployment of NGSI-LD systems can already use the workflow developed in the past TTF to open “issues” and interact with the TTF team.

## Travel budget

3000 euros

The TTF is expected to use virtual access to meet with the ISG CIM group regularly (in past TTF the team of Experts would meet with ISG CIM almost weekly, reporting progress), therefore no travel budget is used for that.

Assuming that an interop event is planned, at least two experts should attend it to handle questions/issues. Work is accounted under task T4 above.

## Other budget line

None

Part II – Details on TTF Technical Proposal

# Tasks, Technical Bodies and other stakeholders

## Organization of the work

The ISG CIM will be the steering committee monitoring the work. Joint teleconferences will be scheduled on average every two weeks, for 30-60 minutes, initially during the regular ISG CIM teleconference meetings on Wednesdays. Documents needing discussion and/or approval at those sessions must be uploaded to the ISG CIM at least 3 working days in advance of the call.

## The ISG CIM is responsible for contacting other standardisation groups for information or liaison or comment. Suggestions from the TTF experts are welcome. No specific coordination or alignment timetables exist.

## Other interested ETSI Technical Bodies

The ISG CIM will be the body to contact other ETSI bodies and expects to solicit comments from SmartM2M and ISG NFV regarding their relevant work.

## Other stakeholders

It is expected that the TTF will consult external stakeholders potentially interested by the TTF outcome. These will include:

* Developers willing to evaluate the compliance of their NGSI-LD implementation
* Authorities interested by the deployment of compliance testing activities, possibly leading to the setting up of certification framework, at the European (e.g. Living-In.eu) and global (e.g. IUDX/BIS, TTA, etc.) levels

Part III: Execution of Work

# Work plan, time scale and resources

## Task description

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| **Task 0** | **Project management** |
| **Objectives** | * Planning of all tasks, including meeting agendas and action lists * Planning timetable of deliverables, meetings, TTF teleconferences * Soliciting and noting and acting on comments from ISG CIM about project processes and results * Request clarifications from ISG CIM of any unclear timetables * Arrange the required f2f meetings, including if needed additional TTF-internal f2f meetings |
| **Input** | * Basis for planning is this ToR * ISG CIM meeting schedules are in the ETSI meeting scheduler (generally) |
| **Output** | * Action lists (and completion info) * Meetings and Deadlines lists * Progress and final reports |
| **Interactions** | * Interactions with ISG CIM * Interactions with ETSI secretariat |
| **Resources required** | * Basic project-management skills * The usual ETSI reporting tools (email accounts, TTF open areas) |

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| **Task 1** | **Extend coverage of the Test Suite** |
| **Objectives** | The coverage of the Test Suite developed in previous TTF T026 extends to all operations up to version v1.5. Nevertheless, due to the complex behaviour of the protocol, NGSI-LD operations can have several flags and options that, when combined, generate a very large set of possible test cases. The goal of Task 1 is to extend the coverage for the operations already implemented, so that more complex, real-life scenarios can be described, in order to test conformance of Context Brokers in greater detail. Task 1 will:   * Review the current coverage of the Test Suite and the status of implementation of the Test Cases. * Write new test cases that extend the coverage of existing features, e.g. relative to:   + Possible different output representations   + Language and Vocab Properties, Geo Properties   + Multi-typing and Scope   + Pagination of results   + Complex error conditions and error handling   + Corner cases * Bug fix the test cases   If needed, this Task will also:   * Upgrade the libraries used by the Test Suite to their last versions * Improve the error reporting capabilities. |
| **Input** | * Previous deliverables produced by TTF T026 * NGSI-LD API specifications produced by ISG CIM |
| **Output** | * Updated Test Descriptions and test cases * Updated and validated Robot implementations of the Test Descriptions and test cases * Updated Robot documentation of the changed Test Descriptions on ETSI Forge * Improved test environment * Progress of:   + D1 (RGS/CIM-0027v211)   + D2 (RGS/CIM-0012v311)   + D3.1 (RGS/CIM-0013v311)   + D4 (RGS/CIM-014v311)   + D5 (RGR/CIM-0015v311)   + D7 (RGS/CIM-0029v211) |
| **Interactions** | * Regular interaction between the experts and the TTF Steering Committee. * Interactions with external developers’ community to gather feedback |
| **Resources required** | Running instances of a minimum of 3 NGSI-LD Context Brokers to evaluate validity of the extended coverage  Conformance test development expertise (requirements collection, test definitions); Robot Framework and Python development expertise; REST API execution and validation expertise; |

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| **Task 2** | **Implement test cases for single-Broker features introduced in version 1.6.1** |
| **Objectives** | NGSI-LD specification is evolving on a regular basis, with fast release cycles. Context Brokers and applications willing to get NGSI-LD compliancy are interested in the most recent version of the specification.  While all versions should be covered uniformly and completely, resources availability makes it difficult.  Several novel features were introduced in version v1.6 of the NGSI-LD specification. While some of them were covered, in their basic form, in the past TTFT026, the coverage is far from complete.  This Task will thus start from the latest published version of the API specification (at the start of the TTF) to cover each feature of the latest version of the specification with a number of tests proportional to the complexity of the feature, building upon the test suite developed in TTF T026.  In the process, test cases relevant for intermediate version of the specification will be tagged as such so tests can be executed for all versions of the specification.  The test cases will be published as two deliverables: D3.1 and D3.2. Task 2 deals with D3.1, where tests for scenarios where the SUT is composed of a single Broker, are described. |
| **Input** | * Latest version of the NGSI-LD specification with list of features as listed in the ‘change history’ annex of the API specification |
| **Output** | * Expanded test suite (abstract and executable) covering relevant novel features of the API specification up to the latest published version, including:   + Updated and validated Robot implementations of the Test Descriptions and test cases   + Updated Robot documentation of the changed Test Descriptions on ETSI Forge. * Completion of:   + D3.1 (RGS/CIM-0013v311) * Significant progress of:   + D1 (RGS/CIM-0027v211)   + D2 (RGS/CIM-0012v311)   + D4 (RGS/CIM-014v311)   + D5 (RGR/CIM-0015v311)   + D7 (RGS/CIM-0029v211) |
| **Interactions** | * Regular interaction between the experts and the TTF Steering Committee. * Interactions with external developers’ community to gather feedback |
| **Resources required** | Running instances of a minimum of 3 NGSI-LD Context Brokers to evaluate validity of the test cases.  Conformance test development expertise (requirements collection, test definitions); Robot Framework and Python development expertise; REST API execution and validation expertise. |

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| **Task 3** | **Implement test cases for the Distributed Operations introduced in version 1.6.1** |
| **Objectives** | Since version v1.6, the NGSI-LD protocol fully defines Distributed Operations, whereby information about entities can live at several different servers owned by independent (but federated) institutions, and it can be conveniently requested by querying one entry point that gathers and merges the matching entities or attributes of one entity. Distributed Operations spawn complex multi-Broker architectures and correspondingly complex test cases.  The goal of this Task is to write TPDL test cases and implement them in Robot framework, for the Distributed Operations.  The test cases will be published as two deliverables: D3.1 and D3.2. Task 3 deals with D3.2, where tests for scenarios where the SUT is composed of multiple identical Brokers (several instances of a Broker from a single vendor), are described. |
| **Input** | * Results of Task 1 and Task 2 * Latest version of the NGSI-LD specification with list of features as listed in the ‘change history’ annex of the API specification |
| **Output** | * Expanded test suite (abstract and executable) covering relevant features of the API specification up to the latest published version, including:   + Updated and validated Robot implementations of the Test Descriptions and test cases   + Updated Robot documentation of the changed Test Descriptions on ETSI Forge. * Completion of:   + D1 (RGS/CIM-0027v211)   + D2 (RGS/CIM-0012v311)   + D3.1 (RGS/CIM-0013v311)   + D3.2 (DGS/CIM-0053)   + D4 (RGS/CIM-014v311)   + D5 (RGR/CIM-0015v311)   + D7 (RGS/CIM-0029v211) |
| **Interactions** | * Regular interaction between the experts and the TTF Steering Committee. * Interactions with external developers’ community to gather feedback |
| **Resources required** | Running instances of a minimum of 3 NGSI-LD Context Brokers to evaluate validity of the test cases  Conformance test development expertise (requirements collection, test definitions); Robot Framework and Python development expertise; REST API execution and validation expertise; Expertise in networking. |

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| **Task 4** | **Extend interoperability test specification** |
| **Objectives** | Several NGSI-LD Context Brokers and software modules connecting to them (e.g., data ingestion, event processing, security, visualisation) are being developed around the world.  Furthermore, NGSI-LD has gained much traction, and at least four different open-source implementations of Context Brokers exist.  It is thus possible to implement an Interoperability test cases specification where the scenarios used in Task 3 for Distributed Operations are tested also in the case where the Brokers are implemented by different vendors.  Moreover, organising an interoperability event that gathers together the existing implementations would help strengthening the specification.  Objectives of Task 4 will be:   * Development of a selection of interoperability tests based on NGSI-LD specification and the results of Task 3, going in parallel with Task 3 and using reciprocal feedback. * Definition of a clear methodology for both conformance and interoperability testing of protocols that interconnect (potentially large) networks of nodes implementing the protocol itself. * Supporting the preparation of the event and its integration phases, including participation to regular conference-calls; * Assisting with the execution of the event and the production of the event Report. |
| **Input** | * Feedback from Task 3 * This Task will interact with the ETSI PlugTest team to validate the direction taken and the requirements * NGSI-LD specification |
| **Output** | * Interoperability test specifications * Observations and issues to be listed in the event report and validated by ETSI CTI * Support provided as requested by ETSI CTI * Completion of:   + D6 (DGS/CIM-0054) * Possible revision of:   + D1 (RGS/CIM-0027v211)   + D2 (RGS/CIM-0012v311)   + D3.1 (RGS/CIM-0013v311)   + D3.2 (DGS/CIM-0053)   + D4 (RGS/CIM-014v311)   + D5 (RGR/CIM-0015v311)   + D7 (RGS/CIM-0029v211) |
| **Interactions** | * Regular interaction between the experts and the TTF Steering Committee. As well as ETSI CTI |
| **Resources required** | * 1 expert with practical experience in writing interoperability test scenarios and proven knowledge of the NGSI-LD specification |

## Milestones

Milestone A – Test suite extended and novel functionality introduced

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| --- | --- | --- |
| **Milestone** | **Description** | **Cut-Off Date** |
| **A** | Test Suite extended. Initiated coverage of novel single-Broker v1.6 features | 2024-07-31 |
| Reference Body Deliverable | D1, D2, D3.1, D4, D5, D7 early draft submitted to ISG CIM |
| ETSI Deliverable | Progress Report approved by using approved ETSI template approved by ISG CIM |

Milestone B – Novel functionality fully covered and coverage of Distributed Operations initiated

|  |  |  |
| --- | --- | --- |
| **Milestone** | **Description** | **Cut-Off Date** |
| **B** | Finished coverage of novel single-Broker features. Initiated coverage of Distributed Operations | 2024-12-31 |
| Reference Body Deliverable | D3.2 early draft  D6 early draft  D1, D2, D3.1, D4, D5, D7 stable draft submitted to ISG CIM |
| ETSI Deliverable | Interim Report approved by using approved ETSI template approved by ISG CIM |

Milestone C – TTF Closing

|  |  |  |
| --- | --- | --- |
| **Milestone** | **Description** | **Cut-Off Date** |
| **C** | TTF Closing | 2025-06-15 |
| Reference Body Deliverable | All deliverables published |
| ETSI Deliverable | Final Report approved by using approved ETSI template approved by ISG CIM |

## Task summary

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Code** | **Task / Milestone** | Target Date | | Estimated Cost (EUR) |
| From | To |
|  | Start of work | May. 2024 | |  |
| T0 | Project management | May 2024 | June. 2025 | 5 000 € |
| T1 | Extend coverage of the Test Suite | May. 2024 | Nov. 2024 | 25 000 € |
| Milestone A | Progress Report approved by ISG CIM  D1, D2, D3.1, D4, D5, D7 early draft submitted to ISG CIM | July. 2024 | |  |
| T2 | Implement test cases for single-Broker features introduced in version 1.6.1 | May. 2024 | Nov. 2024 | 20 000 € |
| Milestone B | Progress Report approved by ISG CIM  D3.2 early draft  D6 early draft  D1, D2, D3.1, D4, D5, D7 stable draft submitted to ISG CIM | Dec. 2024 | |  |
| T3 | Implement test cases for the Distributed Operations introduced in version 1.6.1 | Oct. 2024 | June. 2025 | 20 000 € |
| T4 | Extend interoperability test specification | Oct. 2024 | June. 2025 | 10 000 € |
| Milestone  C | Final Report approved by ISG CIM  D1, D2, D3.1, D3.2, D4, D5, D6, D7 Deliverables published, TTF closed | June. 2025 | |  |
|  | | | | **80 000 €** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Task/ Mil. | M | J | J | A | S | O | N | D | J | F | M | A | M | J |
| T0 |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T1 (D1, D2, D4, D5, D7) |  |  | E |  |  |  |  | S |  |  |  | F |  | P |
| T2 (D3.1) |  |  | E |  |  |  |  | S |  |  |  | F |  | P |
| T3 (D3.2) |  |  |  |  |  |  |  | E |  | S |  | F |  | P |
| T4 (D6) |  |  |  |  |  |  |  | E |  | S |  | F |  | P |
| MA |  |  | **X** |  |  |  |  |  |  |  |  |  |  |  |
| MB |  |  |  |  |  |  |  | **X** |  |  |  |  |  |  |
| MC |  |  |  |  |  |  |  |  |  |  |  |  |  | **X** |

E: Early draft accepted by ISG CIM

S: Stable draft accepted by ISG CIM

F: Final draft approved by ISG CIM

P : Publication (of GS or GR) by ETSI

# Expertise required

## Team structure

2 to 4 participants are required, to ensure the following mix of competences.

The ISG CIM Chair appoints a TTF Leader, in consultation with ETSI staff.

|  |  |
| --- | --- |
| **Priority** | **Qualifications and competences** |
| High | Knowledge of the NGSI-LD specification |
| High | Knowledge of test suites development with the ETSI formalism based on Robot framework |
| Medium | Knowledge of interoperability tests development and evaluation |

Part IV: TTF performance evaluation criteria

# Performance Indicators

The performance indicators must include qualitative and quantitative assessment of the following elements, as applicable:

|  |  |
| --- | --- |
| **Select relevant Performance indicators applicable for these ToR (X)** | |
| Contribution from ETSI Members to TTF work | |
| Steering Group meetings (number of meetings / participants / duration) | 3 meetings with ISG CIM |
| Number of delegates directly involved in the review of the deliverables | expect minimum 3 delegates on the decision points |
| Number of NGSI-LD implementations (endpoints) made available to TTF for evaluation of the test suite | At least 3 implementations of the NGSI-LD API specification should be tested if available. |
| **Contribution from the TTF to ETSI work** | |
| Contributions to ISG CIM meetings (number of documents / meetings / participants) | Updated draft WIs about every 4 – 6 weeks |
| **Liaison with other stakeholders** | |
| Stakeholder participation in the project (category, business area) | Min 3 Authorities dealing with compliance testing and having interest in certification framework deployment contacted to identify priority areas of interest |
| Comments received on drafts (e.g. on WEB site, mailing lists, etc.) | One webinar organised with feedback survey.  Min. 3 progress presentations made to developers community (e.g. FIWARE Technical Steering Committee) to gather feedback |
| **Quality of deliverables** | |
| Respect of time scale. Earlier delivery of results is highly appreciated. | Baseline is start/end dates in the approved ToR |
| Approval of deliverables according to schedule | Baseline is to get agreement of Drafts by ISG CIM within 4 weeks after deliverable schedule |
| Comments from Quality review by ISG CIM | Note the decisions of CIM on each WI and the handling of any requests for changes. |
| Comments from Quality review by ETSI Secretariat | *Stability of decision processes* |
| Deliverables approved by ISG CIM accepted by the ETSI Secretariat for publication | All deliverables published |

# Document history

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Date** | **Author** | **Status** | **Comments** |
| 0.0 | 2023-07-25 | Giuseppe Tropea | First draft |  |
| 0.1 | 2023-08-09 | ISG CIM | Revised draft | Approved PWIs |
| 0.1pg | 2023-08-17 | P. Guillemin | Review | PWI creation |
| 0.2 | 2023-08-21 | Giuseppe Tropea | Revised Final draft |  |
| 1.0 | 2023-08-23 | Martin Bauer | Approved by ISG CIM |  |
| 2.0 | 2024-02-07 | ETSI Secretariat | Final version Approved ISG CIM (January 2024) | Update before IKOM |
| 3.0 | 2024-02-27 | ETSI Secretariat | Final version | Update before CL |

nnex I Response to the Request for Proposals  
CfE – TTF T039 (REFERENCE BODY ISG CIM)   
Deadline: 29 March 2024

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Contractor information \*** | | | | |
|  | | | | |
| **Contractor name \*:**  *Indicate the Company/Organization Name* | |  | | |
|  | | | | |
| **Contact person for the technical aspects** | | **Contact person for Decision on ETSI financial offer to this project (if any)** | | |
| Title |  | Title |  | |
| First name |  | First name |  | |
| Last name |  | Last name |  | |
| Role |  | Role |  | |
| e-mail |  | e-mail |  | |
| Phone |  | Phone |  | |
|  | | | | |
|  | | **Yes** | | **No** |
| Do you or any employee of your Company/Organization hold an elected or appointed position in the Reference Body requesting the TTF T039 creation? | | o  Indicate in which position:  ----------------------------------- | | o |
| **If you are self-employed candidate:**  Do you currently have other contracts in progress with ETSI? | | o | | o |

All fields marked with an asterix (\*) are mandatory

**1.1 Introduction**

A short presentation of the technical structure responsible for this activity, e.g.:

* Business area, number of employees, link to WEB site,
* Department(s)/team(s)/experts in charge of the technical activities related to this Project,
* Reference to products/services of your Company/Organization or supporting Member to which the standards developed by this Project will apply,
* Motivation for your Company/Organization or supporting Member to participate in this Project.

**1.2 Proposed approach**

**Proposed contribution to tasks & related cost**

Identify the tasks to which your Company/Organization is proposing to contribute by filling-in the table below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tasks No** | **Tasks Description** | **Max Budget Allocated in Euro** | **Amount in Euro (mandatory)** | **% of whole Task (mandatory)** |
| 00 | Project management | 5000 |  |  |
| 01 | Extend coverage of the Test Suite | 25000 |  |  |
| 02 | Implement test cases for single-Broker features introduced in version 1.6.1 | 20000 |  |  |
| 03 | Implement test cases for the Distributed Operations introduced in version 1.6.1 | 20000 |  |  |
| 04 | Extend interoperability test specification | 10000 |  |  |
| **TOTAL** |  | **80000** |  |  |

**Amount in Euro (mandatory)**: Indicate the price offered for your contribution to the task(s)

**% of whole task (mandatory)**: Indicate to which percentage of the execution of the whole task your offer corresponds

Provide a description of the proposed approach, competences, reference to related activities:

* Explain which part of the task is corresponding to the requested percentage that your Company/Organization will handle,
* Explain the scope that your Company/Organization will cover,
* Explain your approach to the management of the quality and,
* Explain your approach to the management of the risks and their mitigation,
* Describe and justify the proposed costs to achieve this project objectives.

Annex II Terms and Conditions  
CfE – TTF T039 (REFERENCE BODY ISG CIM)   
Deadline: 29 March 2024

**2.1 Submission of Proposals**

All proposals in response to this CfE shall be submitted before the deadline indicated in thisCollective Letter, using exclusively the WEB application on the ETSI Portal at the following address: <https://portal.etsi.org/cfe>.

Proposals shall be composed of Curriculum Vitae of the proposed service providers’ personnel and the Annex I of this CfE duly filled-out.

Proposals that will be partial or incomplete at the deadline will not be accepted.

The Terms and Conditions in this Annex will apply.

**2.2 Modification and Withdrawal of Proposals**

Applicants may, without prejudice to themselves, modify or withdraw their proposal by written request, provided that the request is received by ETSI prior to the due date and time, at the address to which their proposal was submitted. The applicant may submit a new proposal provided that such new proposal is received prior to the deadline for responding which is specified in this Collective Letter.

**2.3 Assessment of Proposals**

The ETSI Director-General, in consultation with the Reference Body Chairman, is responsible for the selection of the service providers that will be contracted to perform this Project work. The ETSI Director-General and the Reference Body Chairman may be assisted by a Selection Panel to assess the applications received and make the final decision.

As per article 1.10.4 of the ETSI Directives, the Director-General may discard proposals that could be identified as creating potential conflict of interest.

The ETSI Secretariat will only communicate to the applicants the result of the selection (accepted or not accepted). Should applicants need more information on the rationale for the selection, they must address a formal request to the ETSI Director-General.

The following evaluation criteria will be applied to all proposals, in order of priority:

* Evidence that the applicant has the necessary structure and expertise to ensure delivery
* Reference to current or previous activities in the specific technical domain of this project
* Critical review of the most efficient way to achieve the objectives in this Project ToR
* Effective proposed approach/methodology for the execution of the tasks
* Implementation schedule
* Clear pricing policy

Compliance with the first two (2) criteria is mandatory.

Proposals that are not considered compliant with these criteria will be discarded.

Priority will be given to technical quality of the proposals. Pricing considerations will be taken into account to ensure that the best value for money is achieved. Compatibility with the maximum budget allocated to this Project will be verified before placing a Service Contract.

Following the assessment process, ETSI reserves the right to grant contracts to other than the cheapest proposals, to accept or reject any offer completely or in part, or to reject all proposals, without providing the reasons. If no offer is accepted, ETSI may decide to abandon the work or proceed in any other manner ETSI may select.

**2.4 IPR and confidentiality Agreements**

The information provided in this CfE, as well as the fact that the applicant has received the CfE, is considered confidential and protected under copyright laws. The applicant may not discuss, share, or use the information in this CfE for any purpose other than the response to this CfE.

ETSI will not disclose the content of any proposals to other applicants or any other party, with the exception of the persons involved in the assessment process described in §2.3 above.

However, ETSI reserves the right to make use of the information provided in this proposal to improve this project definition for the purpose of this CfE or any other manner in which ETSI may decide to proceed to select the service providers.

If successful, the applicant will be required to sign a Service Contract, which includes IPR and Confidentiality clauses aligned with the relevant policies in the ETSI Directives.

**2.5 Preparation cost**

ETSI will not be responsible for any costs or expenses that the applicant may incur in preparing and/or submitting the proposal.

**2.6 Service Contract**

A Service Contract will be proposed to the applicants that will be selected to perform the work.

Details on the Terms and Conditions of this contract can be found on the ETSI Portal, at the following address: <https://portal.etsi.org/STF/STFs/Contracts.aspx>

1. Indian Standard IS 18003 (Part 2): 2021, “Unified Data Exchange - Part 2 API Specifications “, https://iudx.org.in/wp-content/uploads/2021/07/18003-2.pdf [↑](#footnote-ref-2)