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| ToR STF 676 (Ref. Body ISG CIM) |
| Version: 1.4 |
| Author: Franck Le Gall – Date: 2023-07-15 |
| Last updated by: ETSI Secretariat – Date: 2023-10-12 |
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**Terms of Reference –Specialist Task Force Proposal**

**STF 676 (Ref. Body ISG CIM)**

**Usage domains mappings**

Summary information

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| --- | --- | --- |
| Approval status | Approved by Ref. Body ISG CIM (doc ref: CIM(23)000112r2)  | **YES** |
| Approved by Board#144 (19 - 21 September 2023) | **YES** |
| Reference Body | Ref. Body ISG CIM |
| ETSI Funding | **Maximum budget : 108  000 EUR** |
| Minimum of 4 ETSI Members Support | **YES** |
| Time scale | **From** | 2024-02-01 |
|  | 2025-01-31 |
| Work Items  | D1: [DGS/CIM-047](http://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69096)  (GS CIM 047) "OpenAPI specification for NGSI-LD API"  D2: [DGR/CIM-048](http://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69097) (GR CIM 048) "Handling of data catalogues and data services with NGSI-LD"D3: [DGR/CIM-049](http://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69098)  (GR CIM 049) "Usage of geo-information"D4: [DGS/CIM-050](http://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69099)  (GS CIM 050) "Aligning with geo-information"D5: [DGR/CIM-051](http://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69100)  (GR CIM 051) "Using NGSI-LD in the context of Building Information Management (BIM)"D6: [DGR/CIM-052](http://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=69101)  (GR CIM 052) "VR and AR for Smart Learning: Guidelines for using NGSI-LD to train personnel in Smart Industries" |
| Board priority | [ETSI STF funding criteria](https://portal.etsi.org/STF/STFs/Funding/ETSIbudget.aspx)

|  |  |
| --- | --- |
| **Priority Criteria** | **X** |
| Maintenance of standards in mature domains |  |
| Innovation in mature domains |  |
| Emerging domains for ETSI | X |
| Horizontal activities (quality, security, etc.) |  |
| Societal good / environmental |  |

 |

Part I – STF Technical Proposal

# Rationale & Objectives

## Rationale

The ETSI 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 specification (called NGSI-LD) become the “glue” between all kinds of applications, platforms and databases associated with services in many applicative domains. Furthermore, the protocol makes it mandatory but easy 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 enables a huge improvement in reliability of analytics and AI systems which need to control the scope and quality of their input data. Furthermore, the protocol is being adopted by a very wide range of developers desiring a simple means to let their Apps interact with a variety of data sources.

Beyond interoperability, new challenges are appearing as the NGSI-LD specification is being used more widely. The emergence of EU data spaces makes it mandatory to properly refer to available data sets and data services. Information is more and more contextualised with respect to its geographical characteristics, and it appears mandatory to properly interact with geo-intensive applicative domains such as building information management (BIM). At the same time new visualisation, such as augmented reality (AR) and virtual reality (VR) are emerging and used in applications such as e-learning ones. Finally, to further support NGSI-LD adoption by software developers, publication of the specification in developers’ friendly formats such as openAPI become a requirement.

The ISG CIM committee has neither all the required resources nor all the competencies to tackle all these aspects.

## Objectives of the work to be executed

This STF request concentrates on developing five different axis:

* Publishing the NGSI-LD API specification using the OpenAPI specification.
* Recommending an approach to encode dataset and data services metadata within an NGSI-LD format using Data Catalog Vocabulary (DCAT) and its Application Profile (DCAT-AP) representation.
* Deepening the methods to represent and interact with 2D/3D geo-information in NGSI-LD.
* Analysing and recommending options to interconnect NGSI-LD based information systems with Building Information Management considering interoperating with Industry Foundation Classes (IFC) and CityGML specification.
* Developing guidelines for using the NGSI-LD API in Smart Learning applications augmented with VR/AR and mapping of at least one Smart Learning standard to NGSI-LD.

This effort aims to complement on-going activities in ETSI ISG CIM related to the development of the specification and its associated testing framework.

**The timescale of the STF is voluntarily short (11 months) to keep aligned with the market pace adoption of data platforms.**

## Previous funded activities in the same domain

An STF was funded in 2021 (STF627) with the focus of handling data aspects related to privacy, provenance, representation and connection to IoT platforms. Results have been incorporated in ETSI ISG CIM work, and the new STF will build upon latest version the NGSI-LD specification.

|  |  |  |  |
| --- | --- | --- | --- |
| **Reference** | **Title** | **Version** | **Status** |
| [DGS/CIM-0019 (GS CIM 019)](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=63595)  | Handling of provenance information in NGSI-LD  | 1.1.1 | Publication (2022-08-11) |
| [DGR/CIM-0021 (GR CIM 021)](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=63597)  | Usage of external data models with NGSI-LD API | 1.1.1 | Publication (2022-08-23) |
| [DGR/CIM-0018 (GR CIM 018)](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=63594)  | Enabling chain of trust from Content Sources to Content Consumers | 1.1.1 | Publication (2022-09-02) |
| [DGR/CIM-0020 (GR CIM 020)](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=63596)  | Guidelines for the deployment of Smart City and Communities data platforms  | 1.1.1 | Publication (2022-12-20) |
| [DGR/CIM-0022 (GR CIM 022)](https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=63598)  | NGSI-LD/oneM2M interworking proxy proposal  | 1.1.1 | Publication (2022-12-21) |

## Market impact

Presented by the European Commission in February 2020, the European Digital Single Market Strategy aims to make Europe a world leader in the data-driven economy. To this end, the new European legal framework under construction purports to facilitate access, sharing and responsible reuse of data in compliance with the Union’s values, including the protection of personal data. While the Data Governance Act (DGA) will become enforceable in September 2023, creating the framework, processes and structures to facilitate data sharing, the Data Act (« DA »), still as a draft, is intended to establish harmonized rules on the ethical and responsible sharing and use of data. On this ground, a series of European Data Spaces will be created and will require means to detail inventories of all data assets through common formats.

The second topic proposed in this STF relates to the proper handling of geo-information in NGSI-LD system, acknowledging the use of geospatial data has increased in a wide variety of areas such as legislative & policy development, the allocation & management of natural resources, defence & public safety purposes, and spatial planning. Geoinformation plays a vital role in urban development and increasing productivity in different industry verticals. The Europe geographic information system (GIS) market size reached US$ 2.5 Billion in 2022. Looking forward, IMARC Group ([link](https://www.imarcgroup.com/europe-geographic-information-system-market)) expects the market to reach US$ 3.9 Billion by 2028, exhibiting a growth rate (CAGR) of 7.2% during 2023-2028.

Geoinformation is also fuelling the concept of city information modelling (CIM) which was presented by Khemlani[[1]](#footnote-2) in 2007. With the development of building information modelling (BIM) technology, Khemlani extended and applied information modelling from the building level to the city level. Therefore, CIM was initially accepted as a form of BIM technology specifically applied to cities. Going beyond, the Vienna Local Data Platform builds upon FIWARE context broker to link the objects of the Digital geoTwin (virtual semantic 3D city model that contains all the objects of the city) with other data and information, e.g., demographic and socio-economic data, energy consumption, maintenance management and real-time sensor data, allows the creation of a City Information Model (CIM) for planning and simulation as the basis for a ‘living’ Digital Twin of the City of Vienna. From Research and market ([link](https://www.researchandmarkets.com/report/building-information-modeling)), the global market for Building Information Modeling (BIM) estimated at US$6.6 Billion in the year 2022, is projected to reach a revised size of US$22.1 Billion by 2030, growing at a CAGR of 16.4% over the analysis period 2022-2030. Software, one of the segments analysed in the report, is projected to record a 16.1% CAGR and reach US$12.4 Billion by the end of the analysis period. Considering the ongoing post-pandemic recovery, growth in the Services segment is readjusted to a revised 17.4% CAGR for the next 8-year period. It is thus a not too be missed opportunity and the Vienna city demonstration highlighted the need to make interoperable the NGSI-LD specification with IFC BIM standards and CityGML city information models to build the expected contextualised digital representation of the city.

Such usage of information requires more and more advanced visualisation technologies and NGSI-LD based systems are required to interact with such advanced visualisations. Taking the example of training, virtual reality has brought a new change to digitalization. It has become easier to experience the real world by setting different environmental conditions. According to International Data Corporation's (IDC) ([link](https://www.idc.com/getdoc.jsp?containerId=prEUR250718823)) Worldwide Augmented and Virtual Reality Spending Guide, European augmented reality and virtual reality (AR/VR) spending will reach $1.1 billion and $3.4 billion, respectively, in 2023. By 2027, AR/VR spending will reach $10.5 billion, growing at a 24.9% CAGR for 2022–2027. Though AR/VR spending has been revised down since the previous forecast due to high inflation and other macroeconomic conditions, spending will grow 32.0% this year. This shows how AR and VR are strategic technologies to support organizations' business goals.

## Consequences if not agreed

A small fraction of the work described in this STF request is possible within ETSI ISG CIM, however the key missing factor which ETSI ISG CIM members cannot supply is in-depth expertise in several of the external data modelling addressed in this STF as described in detail later in this report. Since the key goal of this STF is to leverage the ETSI work on NGSI-LD, to provide guidance on using NGSI-LD based systems in other areas such as Data spaces and BIM, the disadvantage of not completing this STF is that interoperability remains fragmented and ETSI's role "at the heart of digital" is not fully realized. There is no specific "deadline" to realize the goals of the STF, however it is very clear that commercial and proprietary offerings will meanwhile proliferate due to the identified market activity.

# Relation with ETSI strategy and priorities

The activity to be performed by this STF directly relates to the ISG mission of enabling cross-domain interoperability of data sharing. It supports the ETSI Strategy ([link](https://www.etsi.org/images/files/Brochures/ETSI_Strategy-brochure.pdf)) mission to develop standards that enable a sustainable and securely connected society to:

* create high quality standards for global use and with low time-to-market, and
* establish leadership in key areas impacting members’ future activities.

This action is of strategic interest for ETSI because of the potential to attract new members in the areas of European dataspaces (launched by the European Commission in the domains of agriculture, finance energy, public administration, mobility, health, etc.), but also in domains related to geoinformation such as building information management or smart learning.

*This activity falls into the “Emerging domains for ETSI” criteria identified in* [*BOARD(19)123\_014*](http://docbox.etsi.org/Board/2019_Board/BOARD%2819%29123_014_STF_priority_criteria_update.docx) *as explained in the following table.*

|  |  |
| --- | --- |
| **Priority Criteria** | Rationale |
| Maintenance of standards in mature domains |  |
| Innovation in mature domains |  |
| **Emerging domains for ETSI** | * Potential to attract new members in data spaces domains
* Connection to the BIM initiatives related to City information modelling
* Connection to AR/VR enhanced Smart learning
 |
| Horizontal activities (quality, security, etc.) |  |
| Societal good / environmental |  |

# ETSI Members Support

|  |  |  |
| --- | --- | --- |
| **#** | **ETSI Member** | **Supporting delegate** |
| 1 | EGM | Franck Le Gall |
| 2 | NEC | Martin Bauer |
| 3 | Fiware Foundation | Jason Fox |
| 4 | Telefonica | Ignacio Dominguez |
| 5 | CNIT | Giuseppe Tropea |
| 6 | SFERA | Marco Cavalli |

# Deliverables

## Base documents

|  |  |  |
| --- | --- | --- |
| **Document** | **Title** | **Status** |
| ETSI GS CIM 009 V1.7.1 | Context Information Management (CIM); NGSI-LD API | Published  |
| ETSI GS CIM 006 V1.2.1 | Context Information Management (CIM); Information Model | Published |
| ETSI GR CIM 017 V1.1.1 | Context Information Management (CIM); Feasibility of NGSI-LD for Digital Twins | Published |
| ETSI GR CIM 020 V1.1.1 | Context Information Management (CIM); NGSI-LD; Guidelines for the deployment of Smart City and Communities data platforms | Published |
| ETSI GR ARF 004-1 V1.2.1 | Augmented Reality Framework (ARF); Interoperability Requirements for AR components, systems and services; Part 1: Overview | Published |
| ETSI GR ARF 005 V 1.1.1 | Augmented Reality Framework (ARF); Open APIs for the Creation and Management of the World Representation | Published |
| Directive 2007/2/EC | The EU’s infrastructure for spatial information (Inspire) | Published |
| DCAT-AP 3.0.0 | DCAT Application Profile for data portals in Europe | Published |
| DCAT V3 | Data Catalog Vocabulary (DCAT) - Version 3 | [W3C Working Draft](https://www.w3.org/standards/types#WD) 07 March 2023 |
| ISO 16739-1:2018 | Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries | Published |
| CityGML 3.0 | CityGML | Published |
| OGC API | OGC Web API Standard | Published |
| SCORM 2.0 | Sharable Content Object Reference Model (SCORM) | Published |
| xAPI-Spec | Experience API (xAPI) specification | Published |

## New deliverables

| **Deliv.** | **Work Item code****Standard number** | **Working title****Scope** | **Expected date for publication** |
| --- | --- | --- | --- |
| D1 | DGS/CIM-047 (GS CIM 047) | **Working title**: OpenAPI specification for NGSI-LD API***Scope***: OpenAPI is a popular standard for building REST APIs in a language-agnostic way. OpenAPI specifications can improve the documentation of the API, and they can also be used to generate stub code for clients and servers in multiple programming languages. Having an OpenAPI specification for the NGSI-LD API would help developers implement NGSI-LD in their applications. | December 2024 |
| D2 | DGR/CIM-048 (GR CIM 048) | **Working title**: Handling of data catalogues and data services with NGSI-LD**Scope**: The **DCAT Application Profile** (DCAT-AP) is a specification based on W3C's Data Catalog vocabulary (DCAT) for describing public sector and other open datasets in Europe. Its basic use case is to enable a cross-data portal search for datasets and make public sector data better searchable across borders and sectors. This report proposes a mapping to enrich NGSI-LD datasets with metadata aligned with DCAT/DCAT-AP definitions.  | September 2024 |
| D3 | DGR/CIM-049 (GR CIM 049) | **Working title**: Usage of geo-information**Scope**: This Work Item reports about the usage of OGC WFS and OGC API as well as INSPIRE directive’s requirements. Furthermore, it reports about what standard-based encoding such as GeoJSON, GML, GeoPackage, CityGML and IFC are currently used in smart communities, detailing the coverage. | November 2024 |
| D4 | DGS/CIM-050 (GS CIM 050) | **Working title**: Aligning with geo-information**Scope**: This Work Item specifies how to make geodata accessible as Linked Data. It specifies how to share spatial (and spatio-temporal) data, and how to make them interoperable with, within, and between systems and territories. It also specifies how to both establish and maintain the number of connections between NGSI-LD entities and their geographical 2D/3D representations. | December 2024 |
| D5 | DGR/CIM-051 (GR CIM 051) | **Working title**: Using NGSI-LD in the context of Building Information Management (BIM)**Scope**: This report analyses and describes an optimised solution to make use of NGSI-LD in the context of Building Information Management (BIM). It builds upon Industry Foundation Classes (IFC), a common data model for building industry technology and CityGML which handles information related to topological and semantic properties of a geographical area including buildings, to propose a comprehensive approach for context management (including temporal aspects) in BIM deployments. | January 2025 |
| D6 | DGR/CIM-052 (GR CIM 052) | **Working title**: VR and AR for Smart Learning: Guidelines for using NGSI-LD to train personnel in Smart Industries**Scope**: Selection of relevant and representative implementations, methodologies and standards used to train personnel in Smart Industries. It creates guidelines for the usage of the NGSI-LD API in Smart Learning applications augmented with VR/AR and mapping of at least one Smart Learning standard to NGSI-LD. | January 2025 |

STF experts will be appointed as deliverables rapporteurs based on their allocated budget over the corresponding tasks.

# Maximum budget

## Task summary/Manpower Budget

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| --- | --- |
| **Task short description** | Budget (EUR) |
|
| T0 - Project Management | 10 000 |
| T1 - OpenAPI specification for NGSI-LD API | 20 000 |
| T2 - Defining metadata for NGSI-LD dataset based on DCAT/DCAT-AP definitions | 10 000 |
| T3 - Specifying usage of geo-information with NGSI-LD | 25 000 |
| T4 - Describing the use of NGSI-LD in the context of building information management (BIM) | 20 000 |
| T5 - VR and AR for Smart Learning: Guidelines for using NGSI-LD to train personnel in Smart Industries | 20 000 |
| **TOTAL** | 105 000  |

## Travel budget

An amount of 3 000€ is required for STF experts to participate in 2 or 3 **external** events.

Part II – Details on STF Technical Proposal

# Tasks, Technical Bodies and other stakeholders

## Organization of the work

ETSI will perform this work by the creation of an ETSI STF, reporting the milestones to the ETSI ISG CIM, according to the planned ISG meeting and additional dates agreed by the ISG officials. ETSI ISG CIM will have an active role providing technical guidance and contributing to this work.

The STF will report to the ETSI ISG CIM during Ordinary or Plenary meetings, on demand. The STF will have regular access to technical advice by attending rapporteur calls (currently weekly) for the NGSI-LD API.

An STF Steering Committee (STF-SC) and mailing list will be set up by STF in order to perform the steering of the STF, verifying progress and proposing intermediate reporting needs. The STF-SC will consist of

* ETSI ISG CIM Chair and Vice-Chairs,
* ETSI Secretariat Support Officer
* STF Leader (after selected),

The technical content described in section 7 relies on reviewing materials about external platforms and ontologies, which will be acquired and analysed through liaisons of ETSI ISG CIM, consultation, workshops, and close collaboration with some members of the main external organizations listed in sections 6.3 and 6.4.

In particular the STF will:

* organize periodic internal meetings of the STF to share the latest content produced
* organize periodic meetings with the STF-SC to consult on the latest advances
* attend the ETSI ISG CIM meetings and report on its activities, presenting drafts of the latest technical content produced for comments
* organize reviews of its draft documents by the stakeholders described in sections 6.3 and 6.4, in addition to the ETSI ISG CIM members
* organize workshop and participate to events with the scope to disseminate, facilitate and assist the understanding and the adoption of NGSI-LD by the industry and widespread the use of cross-domain data model and API for exchange of context information.

## Tasks for which the STF support is necessary

It has become apparent within ETSI ISG CIM that the identified acceleration in market adoption of the NGSI-LD specification needs to be accompanied with new specifications and usage guidelines to comply with emerging requirements related to increase usage of data platforms and data spaces over the world.

The ETSI ISG CIM cannot perform this additional work in a reasonable timeframe on the sole basis of voluntary resources and competencies.

## Other interested ETSI Technical Bodies

Interactions are foreseen with the following ETSI Reference Bodies:

* **ETSI ISG ARF**: will be consulted regarding aspects related to 3D representation and visualisation of information
* **ETSI ISG CDM** : will be consulted in respect with the handling of geo-information.

## Other stakeholders

* **OGC**: consulted in respect with their data and API specification for geographical information systems as well as CityGML specification.
* **W3C**: consulted in respect with their DCAT specification for representation of datasets and data services.
* **European Commission DG Joint Research Centre (JRC)**: to be consulted in respect with the INSPIRE directive
* **EC JoinUp group**: to be consulted regarding the use of DCAT-AP

Part III: Execution of Work

# Work plan, time scale and resources

## Task description

### Task 0 – Project management

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| **Task 0 (T0)** | **Project management** |
| **Objectives** | * Technical lead of the STF
* Manage the resources assigned to this project
* Chair periodic meetings of the STF
* Ensure that the project stays on track and meets all milestone delivery dates
* Identify if/when there are impediments that may affect the delivery of the project at an early stage so that stakeholders can help mitigate potential risks
 |
| **Input** | * Periodic meetings of this STF, reflecting interactions (as shown below).
* The tasks and schedule in this STF.
 |
| **Output** | * Progress reports, including report to the ETSI ISG CIM after each Steering Committee meeting summarizing the current status of this STF.
* Intermediate reports to the STF Steering Committee
* Final report
* In addition, an open workshop will be organised and promoted to present results from the different tasks.
 |
| **Interactions** | The Steering Committee for this STF will be consulted for guidance throughout the STF. There will be regular interactions between the experts and the STF Steering Committee.The ISG CIM will review the progress of the ToR tasks. |
| **Resources required** |  Skills in agile project management, resource planning, reporting, and coordination |

### Task 1 – OpenAPI specification for NGSI-LD API

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| **Task 1** | **OpenAPI specification for NGSI-LD API** |
| **Objectives** | The goal of this task is the definition of an OpenAPI specification for the NGSI-LD API. (GS CIM 009)  |
| **Input** | The existing OpenAPI code initiated for release 1.6.1 of the NGSI-LD specification (GS CIM 009 V1.6.1) and available in GitLab (<https://forge.etsi.org/rep/cim/NGSI-LD/-/tree/1.6.1?ref_type=heads>) will be used as the baseline for this work. |
| **Output** | D1 : DGS/CIM-047 (GS CIM 047) “OpenAPI specification for NGSI-LD API”The task will produce OpenAPI code for the latest release of the NGSI-LD specification (i.e., 1.7.1 and the upcoming version v1.8.1, which is forecasted for publishing during late 2023/early 2024) in the ETSI forge. Documentation will be provided, along with examples that help users understand how the NGSI-LD API works.Work achieved will also be presented in an open workshop for promotion of activities |
| **Interactions** | Interactions will mostly occur with the ISG CIM members involved in the development of the API specification as well as with external developers such as the ones from the FIWARE community. |
| **Resources required** | Strong expertise in OpenAPI development is required in order to properly handle the coverage of the NGSI-LD API specification |

### Task 2 – Defining metadata for NGSI-LD dataset based on DCAT/DCAT-AP definitions

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| **Task 2** | **Defining metadata for NGSI-LD dataset based on DCAT/DCAT-AP definitions** |
| **Objectives** | The DCAT Application Profile (DCAT-AP) is a specification based on W3C's Data Catalogue vocabulary (DCAT) for describing public sector datasets and other open datasets in Europe. Its basic use case is to enable a cross-data portal search for datasets and data services, and make public sector data better searchable across borders and sectors. This report proposes a mapping to enrich NGSI-LD datasets with metadata aligned with DCAT/DCAT-AP definitions.  |
| **Input** | The following specifications/reports:* ETSI GS CIM 009 V1.8.1
* ETSI GS CIM 006 V1.2.1

The following standards:* [W3C DCAT vocabulary v3](https://www.w3.org/TR/vocab-dcat-3/)
* [DCAT Application Profile for data portals in Europe](https://joinup.ec.europa.eu/collection/semic-support-centre/solution/dcat-application-profile-data-portals-europe/about)
 |
| **Output** | DGR/CIM-048 (GR CIM 048) "Handling of data catalogues and data services with NGSI-LD".A Group report will be produced describing the usage of DCAT/DCAT-AP information within an NGSI-LD model. Its use will be illustrated with examples. Work achieved will also be presented in an open workshop for promotion of activities. |
| **Interactions** | Interactions with ETSI ISG CIM on a regular basis will be required to get an external view and expertise on the use of the NGSI-LD specification. The STF should also liaise and consult with the European open data portal and the EC JoinUp group and their guidelines for using DCAT in Europe.  |
| **Resources required** | Practical experience in using DCAT/DCAT-AP in an NGSI-LD environment is required. |

### Task 3 – Specifying usage of geo-information with NGSI-LD

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| **Task 3** | **Specifying usage of geo-information with NGSI-LD** |
| **Objectives** | The goal of this task is to specify how to share spatial (and spatio-temporal) data, make them interoperable with, within, and between systems and territories. This can include data about ‘assets’ such as people, streetlights, buildings, or organisations. The task will* select representative use cases to be analysed under the data models and geographic information management perspective
* analyse how to deal with the different geo-related standards in the context of ETSI standards for Context Information.
 |
| **Input** | The following specifications/reports:* ETSI GS CIM 009 V1.8.1
* ETSI GS CIM 006 V1.2.1

The following standards or software:* OGC API – Common – Part 1: Core; v1.0, ref. 19-072. <https://www.ogc.org/standard/ogcapi-common/>
* OGC Web Feature Service (WFS) (<https://www.ogc.org/standard/wfs/>)

  |
| **Output** | D3: DGR/CIM-049 (GR CIM 049) "Usage of geo-information"D4: DGS/CIM-040 (GS CIM 050) "Aligning with geo-information"The task will deliver a group report D3 describing the different usage of geo-information on areas relevant for NGSI-LD and a group specification D4 describing the interaction with geographical 2D/3D representations in NGSI-LD.Work achieved will also be presented in an open workshop for promotion of activities. |
| **Interactions** | Close interactions with ETSI ISG CIM on a regular basis will be required to get an external view and expertise on the use of the NGSI-LD specification. |
| **Resources required** | Expertise and field experience in the use of 2D/3D geo-information in both local and global contexts is required. The expert should in particular be knowledgeable on OGC standards (OGC API, OGC WFS). This expertise should be complemented by a good understanding of the NGSI-LD specification. |

### Task 4 – Describing the use of NGSI-LD in the context of building information management (BIM)

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| **Task 4** | **Describing the use of NGSI-LD in the context of building information management (BIM)** |
| **Objectives** | This task will analyse and describe an optimised solution to make use of NGSI-LD in the context of Building Information Management (BIM). It will build upon Industry Foundation Classes (ifc), a common language for building industry technology and CityGML which handles information related to topological and semantic properties of a geographical area including buildings, to propose a comprehensive approach for context management (including temporal aspects) in BIM deployments. |
| **Input** | The following specifications/reports:* ETSI GS CIM 009 V1.8.1
* ETSI GS CIM 006 V1.2.1

The following standards or software:* ISO 16739-1:2018 - Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries
* OGC CityGML 3.0. <https://www.ogc.org/standard/citygml/>

Many research papers on IFC / CityGML mapping approaches |
| **Output** | D5: DGR/CIM-051 (GR CIM 051) "Using NGSI-LD in the context of Building Information Management (BIM) "The task will deliver a group report D5 describing the use of the NGSI-LD specification in the context of BIM, considering IFC and CityGML. It will describe the mapping at the data model level, not searching for a 1:1 representation of NGSI-LD entities toward IFC classes and cityGML features but will be usage oriented to propose a solution aimed at improving user experience. Architectures for deployment of real time NGSI-LD / CityGML systems integration, with 3D visualisation capabilities will be proposed.Work achieved will also be presented in an open workshop for promotion of activities |
| **Interactions** | Interactions with ETSI ISG CIM on a regular basis will be required to get an external view and expertise on the use of NGSI-LD specification. |
| **Resources required** | Expertise and field experience in the use of BIM information is required. The expert should in particular be knowledgeable on IFC and CityGML standards. |

### Task 5 – VR and AR for Smart Learning: Guidelines for using NGSI-LD to train personnel in Smart Industries

|  |  |
| --- | --- |
| **Task 5** | **VR and AR for Smart Learning: Guidelines for using NGSI-LD to train personnel in Smart Industries** |
| **Objectives** | The increase in computing power, the release of powerful graphics engines, and the growing complexity of production processes in the Smart Industry justify the use of increasingly sophisticated 3D VR/AR applications used in corporate training. The purpose of this task is to study the current state of the art with the aim of describing the main implementations, methodologies, and standards used in this sector.Subsequently, a direct comparison of NGSI-LD with at least one Smart Learning standard (e.g. xAPI) is planned to establish the maturity level of NGSI-LD APIs, evaluating how the two systems can coexist and how to use NGSI-LD in this domain. The document will conclude with the description/Proof of Concept of at least one Smart Industry use case/architecture that demonstrates how the use of NGSI-LD can be leveraged to implement or support Smart Learning systems augmented with VR/AR. |
| **Input** | The following specifications/reports:* ETSI GS CIM 009 V1.8.1
* ETSI GS CIM 006 V1.2.1

The following standards or software:* Smart Learning standards (e.g. xAPI, SCORM)
* Data models to represent 3D elements/objects (e.g. GLTF)
* Graphic Engines (e.g. Unity, Three.js)
* Data models for VR/AR (e.g. PRESTO ontology)

Smart Industries use cases of usage of VR/AR and/or Smart Learning applications. |
| **Output** | D6: DGR/CIM-052 (GR CIM 052) "VR and AR for Smart Learning: Guidelines for using NGSI-LD to train personnel in Smart Industries"* A group report D6 will be drafted and will contain, in its first part, a review of technologies used for Smart Learning based on 3D representation of real environments. In this section it is expected to highlight what are the main procedures/workflows to represent VR/AR scenarios, when used for Smart Learning applications.
* The second part of the group report D6 will provide the mapping of xAPI to NGSI-LD, showing how the two standards may coexists. Also, in this section it is shown and discussed why NGSI-LD can be used to represent 3D environments for Smart Learning, and how the NGSI-LD API can support related applications.

At least one Proof of Concept of a Smart Industry use case should be presented related to Smart Learning and VR/AR to show limitations/benefits of the NGSI-LD API.Work achieved will also be presented in an open workshop for promotion of activities |
| **Interactions** | Interaction with the ISG CIM will take place as needed.In addition, interactions are expected to take place with:ISG ARF (Augmented Reality Framework) to be consulted for aspects related to the representation and communication of entities/objects in a 3D environment |
| **Resources required** | Contributions from 1 to 2 experts with proven knowledge of NGSI-LD and expertise in 3D representations for VR/AR and/or relevant Smart Learning standards, especially xAPI. |

## Milestones

**Milestone A – Initial detailed outline of deliverables available (early draft)**

|  |  |  |
| --- | --- | --- |
| Milestone | Description | Cut-Off Date |
| A | Early drafts (detailed outline and scopes) of deliverables D1, D2, D3 and D4 are available | 2024-02-28 |
| Reference Body Deliverable | Early Drafts accepted by Reference Body ISG CIM. Documents must be uploaded on the ISG CIM docbox at least two weeks before the start of the Ref. Body plenary |
| ETSI Deliverable | Progress Report of Milestone A approved by ISG CIM |

**Milestone B**

|  |  |  |
| --- | --- | --- |
| Milestone | Description | Cut-Off Date |
| B | Stable drafts of deliverables D1, D2, D3 and D4 availableEarly draft of deliverable D5 and D6 are available | 2024-05-31 |
| Reference Body Deliverable | Stable and early drafts accepted by Reference Body ISG CIMDocuments must be uploaded on the ISG CIM docbox at least two weeks before the start of the Ref. Body plenary |
| ETSI Deliverable | Progress Report of Milestone B approved by Reference Body ISG CIM |

**Milestone C**

|  |  |  |
| --- | --- | --- |
| Milestone | Description | Cut-Off Date |
| C | Final drafts of deliverables D2 and D3 are availableStable draft of deliverable D5 and D6 are available | 2024-07-31 |
| Reference Body Deliverable | Final, stable and early drafts accepted by Reference Body ISG CIMDocuments must be uploaded on the ISG CIM docbox at least two weeks before the start of the Ref. Body plenary |
| ETSI Deliverable | Progress Report of Milestone C approved by Reference Body ISG CIM |

**Milestone D**

|  |  |  |
| --- | --- | --- |
| Milestone | Description | Cut-Off Date |
| D | Final drafts of deliverables D1 and D4 availableD2 is published | 2024-09-30 |
| Reference Body Deliverable | Final and stable drafts approved by Reference Body ISG CIMDocuments must be uploaded on the ISG CIM docbox at least two weeks before the start of the Ref. Body plenary |
| ETSI Deliverable | Progress Report of Milestone D approved by Reference Body ISG CIM |

**Milestone E**

|  |  |  |
| --- | --- | --- |
| Milestone | Description | Cut-Off Date |
| E | Final drafts of deliverables D5 and D6 | 2024-11-30 |
| Reference Body Deliverable | Final drafts approved by Reference Body ISG CIMDocuments must be uploaded on the ISG CIM docbox at least two weeks before the start of the Ref. Body plenary |
| ETSI Deliverable | Final drafts D5 and D6 approved by Reference Body ISG CIM |

**Milestone F**

|  |  |  |
| --- | --- | --- |
| Milestone | Description | Cut-Off Date |
| F | Deliverables D1, D3, D4 published | 2024-12-31 |
| Reference Body Deliverable | Deliverables D1, D2, D3 and D4 are publishedDocuments must be uploaded on the ISG CIM docbox at least two weeks before the start of the Ref. Body plenary |
| ETSI Deliverable | Final Report of Milestone F approved by Reference Body ISG CIM |

**Milestone G**

|  |  |  |
| --- | --- | --- |
| Milestone | Description | Cut-Off Date |
| G | Deliverables D5 and D6 published | 2025-01-31 |
| Reference Body Deliverable | Deliverables D5 and D6 published  |
| ETSI Deliverable | STF closed |

## Task summary

|  |  |  |  |
| --- | --- | --- | --- |
| **Code** | **Task / Milestone**  | Target Date | Estimated Cost (EUR) |
| From | To |
| M0 | Start of work | 2024-02-01 |  |  |
| T0 | Project Management | 2024-02-01 | 2025-01-31 | 10 000 |
| T1 | OpenAPI specification for NGSI-LD API | 2024-02-01 | 2024-12-31 | 20 000 |
| T2 | Defining metadata for NGSI-LD dataset based on DCAT/DCAT-AP definitions | 2024-02-01 | 2024-09-30 | 10 000 |
| T3 | Specifying usage of geo-information with NGSI-LD | 2024-02-01 | 2024-12-31 | 25 000 |
| Milestone A | Early Drafts D1,D2,D3,D4 accepted by Reference Body ISG CIM. Documents must be uploaded on the ISG CIM docbox at least two weeks before the start of the Ref. Body plenaryProgress Report#1 to be approved by ISG CIM | 2024-02-28 |  |  |
| T4 | Describing the use of NGSI-LD in the context of building information management (BIM) | 2024-05-01 | 2024-12-31 | 20 000 |
| T5 | VR and AR for Smart Learning: Guidelines for using NGSI-LD to train personnel in Smart Industries | 2024-05-01 | 2024-12-31 | 20 000 |
| Milestone B | Stable drafts of deliverables D1, D2, D3 and D4 availableEarly draft of deliverable D5 and D6 are availableProgress Report#2 to be approved by ISG CIM | 2024-05-31  |  |  |
| Milestone C | Final drafts of deliverables D2 and D3 approved by ISG CIMStable draft of deliverable D5 and D6 are availableProgress Report#3 to be approved by ISG CIM | 2024-07-31 |  |  |
| Milestone D | Final drafts of deliverables D1 and D4 approved by ISG CIMD2 is publishedProgress Report#4 to be approved by ISG CIM | 2024-09-30 |  |  |
| Milestone E | Final drafts of deliverables D5 and D6 approved by ISG CIM | 2024-11-30 |  |  |
| MilestoneF | Deliverables D1, D2, D3 and D4 are publishedFinal report to be approved by ISG CIM | 2024-12-31 |  |  |
| MilestoneG | Deliverables D5 and D6 published, STF closed | 2025-01-31 |  |  |
|  | **105 000** |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Task/ Mil. | J | F | M | A | M | J | J | A | S | O | N | D | J |
| M0 |  | X |  |  |  |  |  |  |  |  |  |  |  |
| T0 |  |  |  |  |  |  |  |  |  |  |  |  |  |
| T1 (D1) |  | E |  |  | S |  |  |  | F |  |  | P (D1) |  |
| T2 (D2) |  | E |  |  | S |  | F |  | P (D2) |  |  |  |  |
| T3 (D3, D4) |  | E |  |  | S |  | F (D3) |  | F (D4) |  | P (D3) | P (D4) |  |
| T4 (D5) |  |  |  |  | E |  | S |  |  |  | F |  | P (D5) |
| T5 (D6) |  |  |  |  | E |  | S |  |  |  | F |  | P (D6) |
| MA |  | X |  |  |  |  |  |  |  |  |  |  |  |
| MB |  |  |  |  | X |  |  |  |  |  |  |  |  |
| MC |  |  |  |  |  |  | X |  |  |  |  |  |  |
| MD |  |  |  |  |  |  |  |  | X |  |  |  |  |
| ME |  |  |  |  |  |  |  |  |  |  | X |  |  |
| MF |  |  |  |  |  |  |  |  |  |  |  | X |  |
| MG |  |  |  |  |  |  |  |  |  |  |  |  | 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

It is expected that all STF participants have a basic knowledge of the NGSI-LD specification, including both property graph and web service API.

Up to 5 participants will be selected to ensure the following mix of competences:

|  |  |
| --- | --- |
| **Priority** | **Qualifications and competences** |
| High | OpenAPI specification |
| High | DCAT/DCAT-AP knowledge with field experience |
| High | OGC geostandards knowledge with field experience |
| High | BIM (IFC and CityGML) knowledge with field experience |
| High | AR/VR based smart learning standards (xAPI) knowledge with field experience |

Part IV: STF performance evaluation criteria

# Performance Indicators

|  |
| --- |
| **Select relevant Performance indicators applicable for these ToR (X)** |
| **Contribution from ETSI Members to STF work** |
| Direct financial contribution (co-funding) |  |
| Support to the STF work (e.g., provision of test–beds, organization of workshops, events) | X |
| Steering Group meetings (number of meetings / participants / duration) | Minimum 2 |
| Number of delegates directly involved in the review of the deliverables | 3 |
| Contributions/comments received from other Reference Bodies | X |
|  |  |
| **Contribution from the STF to ETSI work** |
| Contributions to Reference Body meetings (number of documents / meetings / participants) | 1 per month minimum |
| Contributions to other Reference Bodies | X |
| Presentations in workshops, conferences, stakeholder meetings | Minimum 3 |
|  |  |
| **Liaison with other stakeholders** |
| Stakeholder participation in the project (category, business area) |  |
| Cooperation with other standardization bodies | X |
| Potential interest of new members to join ETSI | X (exploring new areas) |
| Liaison to identify requirements and raise awareness on ETSI deliverables  | X (producing guidelines) |
| Comments received on drafts (e.g. on WEB site, mailing lists, etc.) |  |
|  |  |
| **Quality of deliverables** |
| Approval of deliverables according to schedule | X |
| Respect of time scale, with reference to start/end dates in the approved ToR | X |
| Comments from Quality review by Reference Body | X |
| Comments from Quality review by ETSI Secretariat | X |

Time recording

For reporting purposes, the STF experts shall fill in the time sheet provided by ETSI with the days spent for the performance of the services.

During the activity, the STF Leader shall collect the relevant information, as necessary to measure the performance indicators. The result will be presented in the Final Report.

# Document history

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Date** | **Author** | **Status** | **Comments** |
| 0.0 | 2023-07-15 | F. Le Gall | Creation |  |
| 0.1 | 2023-08-09 | ISG CIM | Review |  |
| 0.1pg | 2023-08-17 | P. Guillemin | Review | PWI creation |
| 1.1 | 2023-08-22 | F. Le Gall | Release candidate |  |
| 1.2 | 2023-08-23 | ISG CIM | Approved by ISG CIM |  |
| 1.3 | 2023-08-28 | ETSI Secretariat | Final | Updates before Board#144 submission |
| 1.4 | 2023-10-12 | ETSI Secretariat | Final | Update before CL publication |

Annex I Response to the Request for Proposals
CfE – STF 676 (ISG CIM)

Deadline: 30 November 2023

**If you are an ETSI Member \***

**ETSI membership status (Indicate your status):**

 Full

 Associate

 Observer

**If you are not an ETSI Member \***

Please indicate:

**Full name of the ETSI member supporting the application (list of ETSI members on etsi.org):**

-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Official contact name of the ETSI member supporting the application:**

-\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Note: A formal confirmation of the support from the Official contact is required (e.g. by e-mail sent to STFLINK@etsi.org) and an “ETSI Member Support Letter” will be required if you are selected.*

|  |
| --- |
| **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 STF 676 creation? | oIndicate 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 | 10 000 | . | . |
| 01 | OpenAPI specification for NGSI-LD API | 20 000 | . | . |
| 02 | Defining metadata for NGSI-LD dataset based on DCAT/DCAT-AP definitions | 10 000 | . | . |
| 03 | Specifying usage of geo-information with NGSI-LD | 25 000 | . | . |
| 04 | Describing the use of NGSI-LD in the context of building information management (BIM) | 20 000 | . | . |
| 05 | VR and AR for Smart Learning: Guidelines for using NGSI-LD to train personnel in Smart Industries | 20 000 | . | . |
| Total |  | 105 000 |  |  |

**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 – STF 676 (ISG CIM)

Deadline: 30 November 2023

**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. Khemlani, L. Autodesk University 2007. Available online: <http://www.aecbytes.com/newsletter/2007/issue_91.html> [↑](#footnote-ref-2)