



# ASSESSMENT SUMMARY v1.0.0

**OASIS Topology and Orchestration Specification for Cloud Applications (TOSCA)<sup>1</sup>**

Organization for the Advancement of Structured Information Standards (OASIS)<sup>2</sup>

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<sup>1</sup> The TOSCA specification distribution homepage: <https://docs.oasis-open.org/tosca/TOSCA-Simple-Profile-YAML/v1.3/os/TOSCA-Simple-Profile-YAML-v1.3-os.html>

<sup>2</sup> The development organisation homepage: <https://www.oasis-open.org/>

# Change Control

| Modification         | Details |
|----------------------|---------|
| <b>Version 1.0.0</b> |         |
| Initial version      |         |

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## 1. INTRODUCTION

The present document is a summary of the assessment of the TOSCA carried out by CAMSS using the CAMSS Assessment EIF scenario<sup>3</sup>. The purpose of this scenario is assessing the compliance of a standard or specification with the European Interoperability Framework (EIF)<sup>4</sup>.

## 2. ASSESSMENT SUMMARY

The **OASIS Topology and Orchestration Specification for Cloud Applications (TOSCA)** is a language that supports the integration of a cloud-based web service topology. A field of applicability was the past CELAR<sup>5</sup> project, which was meant to provide automatic, multi-grained resource allocation for cloud applications and boost administrative performance at European level.

The TOSCA cloud-orchestration service provides both the structure of a cloud-based service and orchestration models describing the way the service is managed throughout its lifetime. This fact enables TOSCA to ease portability of cloud applications and services, as it lets cloud-based applications be independent of the supplier creating the service.

The specification has been developed by the Organization for the Advancement of Structured Information Standards (OASIS), which is an international community concerned with the development of open-source software and standards through collaboration in different domains, such as procurement, cybersecurity, Internet of Things, or the legal data exchange domain, among others. It is worth to note, that it has been developed by a large community and, as it is used, the ecosystem around it increases.

### 2.1. EIF Interoperability Principles

Interoperability principles are fundamental behavioural aspects that drive interoperability actions. They are relevant to the process of establishing interoperable European public services. They describe the context in which European public services are designed and implemented.

***The specification does not support the principles setting context for EU actions on interoperability:***

- **Subsidiarity and proportionality**

There is no Member State that includes the TOSCA in their National Interoperability Framework (NIF)<sup>6</sup> in alignment with the three categories of the European Interoperability Framework (EIF).

***The specification does support the principles setting context for EU actions on interoperability:***

- **Openness**

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<sup>3</sup> EUSurvey EIF Scenario: [https://ec.europa.eu/eusurvey/runner/EIFScenario\\_v500](https://ec.europa.eu/eusurvey/runner/EIFScenario_v500)

<sup>4</sup> The EIF homepage: [https://ec.europa.eu/isa2/eif\\_en](https://ec.europa.eu/isa2/eif_en)

<sup>5</sup> CELAR Project, Cloud Information System report: <https://cordis.europa.eu/project/id/317790/reporting>

<sup>6</sup> National Interoperability Framework (NIF): <https://joinup.ec.europa.eu/collection/national-interoperability-framework-observatory-nifo/nifo-factsheets>

TOSCA is a language for describing a cloud-based web service topology, its components, relationships, and the processes that manage them. Although the specification competes against other cloud-orchestration proprietary formats (such as the AWS CloudFormation Templates), TOSCA v1.3 is contributing to the creation of innovative solutions based on YAML<sup>7</sup>, which is also open source. Moreover, TOSCA helps to improve the deployment of cloud services and promotes the reusability of applications. The development process carried out by the OASIS TOSCA Technical Committee (TC)<sup>8</sup> is publicly accessible, and is transparent in the sense that it accepts external contributions from different stakeholders. In terms of availability, OData is publicly available for free at OASIS' webpage<sup>9</sup> and at an official GitHub repository<sup>10</sup>. It is licensed under the royalty-free basis for its implementation or study.

- **Transparency**

TOSCA offers the possibility to manage and orchestrate resources for the provisioning of cloud applications and services. As a language that describes the whole cloud-based web service topology of a service or application, as well as the processes that manage them, TOSCA ensures availability of interfaces with internal information systems. Data protection encompasses data confidentiality, integrity and access control. In terms of the protection of personal data managed by public administrations, TOSCA does not impose the use of any specific mechanism or technology for security considerations; security aspects should be obtainable by the user infrastructure.

- **Reusability**

TOSCA can be run in a container (or software unit) and offers the possibility to specify orchestration process models that enable the management of services, as well as their use in various domains, independently of the application context. Additionally, although TOSCA is widely known in the field of cloud computing, the specification can be used beyond the business-specific domain and allows its implementation across any business domain.

- **Technological neutrality and data portability**

TOSCA is to be used for a variety of cloud services and is not tied to any specific cloud paradigm. Nonetheless, cloud services execution and their lifecycle management are dependent on the availability of all the TOSCA corresponding artefacts (deployment and implementation artefacts) in all cloud environment use cases. In this sense, TOSCA artefacts should run in a self-contained manner in order to be as neutral as possible, not forgetting that any of the processes in its implementation are nowadays executed on a YAML file format.

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<sup>7</sup> YAML organisation: <https://yaml.org/?msckid=a6bea3c8a54111ecab41f643a9ac6465>

<sup>8</sup> OASIS TOSCA TC: [https://www.oasis-open.org/committees/tc\\_home.php?wg\\_abbrev=regrep](https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=regrep)

<sup>9</sup> TOSCA homepage: [https://www.oasis-open.org/committees/tc\\_home.php?wg\\_abbrev=tosca](https://www.oasis-open.org/committees/tc_home.php?wg_abbrev=tosca)

<sup>10</sup> OASIS TOSCA TC Github: <https://github.com/oasis-open/tosca-community-contributions>

Additionally, there is an attempt within the TOSCA TC to create a core TOSCA (TOSCA 2.0)<sup>11</sup> specification compatible with a variety of deployment use cases that would minimise the specification dependence on hosting technologies (thus minimising the drawbacks subsequent of Cloud Service ARchive (CSAR), which is the YAML file intended to ensure the availability of all artefacts of the specification.). TOSCA allows customisation but any kind of authoring process and extension might be difficult to implement, and will be only possible as long as each implementation fully supports all required functionality of the specification exactly as specified in the documentation. In terms of data portability, TOSCA does not impose the use of any specific mechanism or technology for enabling data portability.

***The specification does not support the principles related to generic user needs and expectations:***

- **User-centricity**

The purpose of TOSCA is not related to the implementation of the once-only principle. Therefore, this criterion does not apply to this specification.

- **Inclusion and accessibility**

The purpose of TOSCA is not related to e-accessibility. Therefore, this criterion is considered not applicable to this specification.

- **Security and privacy**

The purpose of TOSCA is not related to the secure and trustworthy exchange and processing of data. Therefore, this criterion is considered not applicable to this specification.

- **Multilingualism**

The purpose of TOSCA is not related to the delivery of multilingual public services. Therefore, this criterion is not applicable to this specification.

***The specification partially supports the foundation principles for cooperation among public administrations:***

- **Administrative Simplification**

TOSCA addresses interoperability within public administrations as it eases portability of cloud applications and services across their entire lifecycle, and because the specification is independent of the supplier creating the service. TOSCA may simplify the delivery of digital public services, but up to date there is no evidence of any specific application in public administrations not any evidence of TOSCA as a leading force in European public services. It is worth noting, however, that TOSCA fosters and simplifies digital exchange in network specific domains, such as

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<sup>11</sup> TOSCA 2.0 Draft version: [https://docs.oasis-open.org/tosca/TOSCA/v2.0/csd03/TOSCA-v2.0-csd03.html#\\_Toc56506175](https://docs.oasis-open.org/tosca/TOSCA/v2.0/csd03/TOSCA-v2.0-csd03.html#_Toc56506175)

research. It is the case of CELAR<sup>12</sup> and Indigo-DataCloud<sup>13</sup> projects, which aim to provide a contact point for European research centres to discover, access, use and reuse a wide range of resources for advanced data-driven activities.

- **Preservation of information**

TOSCA does not impose the use of any specific mechanism or technology for the long-term preservation of data/information/knowledge; data preservation aspects should be obtainable by the user infrastructure.

- **Assessment of effectiveness and efficiency**

After researched whether exist studies or documentation assessing the efficiency and effectiveness, any study or documentation has been found assessing the specification in terms of effectiveness and efficiency.

## 2.2. EIF Interoperability Layers

The interoperability model which is applicable to all digital public services includes:

- Four layers of interoperability: legal, organisational, semantic and technical;
- A cross-cutting component of the four layers, 'integrated public service governance';
- A background layer, 'interoperability governance'.

***The Specification partially supports the implementation of digital public services complying with the EIF interoperability model:***

- **Interoperability governance**

TOSCA can be mapped with the EIRA's ABB "Orchestration Component " from the Technical View. Besides CELAR and Indigo projects, the European Union is committed to the development of open-source utilities that can be used in industry as well as in research. It is the case of the RADON<sup>14</sup> project, where TOSCA is used as the project's Infrastructure as code (IaC) format centerstage.

Although there is no Member State recommending TOSCA in its ICT National Catalogue, TOSCA is included in the EUOS<sup>15</sup> European catalogue of standards. And, in terms of implementation conformity, TOSCA conformance can be manually assessed by following the TOSCA schema (CSAR) and the syntax and semantics defined in section 14 of the specification; besides, the specification

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<sup>12</sup> See CELAR's document 'Translational cancer detection pipeline over CELAR Application and Evaluation': <https://cordis.europa.eu/project/id/317790/reporting>

<sup>13</sup> Indigo-DataCloud: <https://www.indigo-datacloud.eu/#history>

<sup>14</sup> RADON Project: <https://radon-h2020.eu/>

<sup>15</sup> EUOS catalogue: <https://www.standict.eu/standards-repository>

conformance requirements can be automatically measured via the OASIS Test Assertion Markup Language, as exemplified in TOSCA Github<sup>16</sup>.

- **Legal Interoperability**

After checking the different standard catalogues at supra-national level, there is no evidence of TOSCA as a European standard.

- **Organisational interoperability**

TOSCA provides a metamodel (CSAR) facilitating the modelling of business processes. Apart from this service template, the specification describes the orchestration processes defining the process models that are used to manage a service throughout its lifetime. This contributes to the understanding of the interoperability capabilities of the specification's components, as TOSCA describes well-defined messages and protocols in different use cases; hence the specification enables the combination of components from different vendors and seamless service management.

- **Semantic Interoperability**

Apart from the TOSCA Technical Committee, there is active participation from external open communities that creates open information and encourages the publication of such data on international platforms (e.g. Github, Confluence<sup>17</sup>), including European platforms; however, this is not the case for national platforms.

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<sup>16</sup> OASIS TOSCA TC Github, tests folder: <https://github.com/oasis-open/tosca-community-contributions/tree/master/tests>

<sup>17</sup> TOSCA Confluence: <https://wiki.onap.org/display/DW/TOSCA+Task+Force>



### 3. ASSESSMENT RESULTS

This section presents an overview of the results of the CAMSS assessments for **TOSCA**. The CAMSS “Strength” indicator measures the reliability of the assessment by calculating the number of answered (applicable) criteria. On the other hand, the number of favourable answers and the number of unfavourable ones are used to calculate the “Automated Score” per category and an “Overall Score”.

| Category   | Automated Score | Assessment Strength | Compliance Level |
|--|-----------------|---------------------|------------------|
| Principle setting the context for EU actions on interoperability   | 20/100          | 100%                | Ad-hoc           |
| Core interoperability principles                                   | 1640/2100       | 90%                 | Sustainable      |
| Principles related to generic user needs and expectations          | 500/500         | 0%                  | Seamless         |
| Foundation principles for cooperation among public administrations | 260/500         | 80%                 | Essential        |
| Interoperability layers*   | 760/1100        | 100%                | Sustainable      |
| Overall Score  | 3180/4300       | 82%                 |                  |

*\*The technical interoperability layer is covered by the criteria corresponding to the core interoperability principle "Openness".*

With an 82% of assessment strength, this assessment can be considered representative of the specification compliance with the EIF principles and recommendations.

The Overall Automated Score of 73,95% (3180/4300) demonstrates that the specification partially supports the European Interoperability Framework in the domains where it applies.