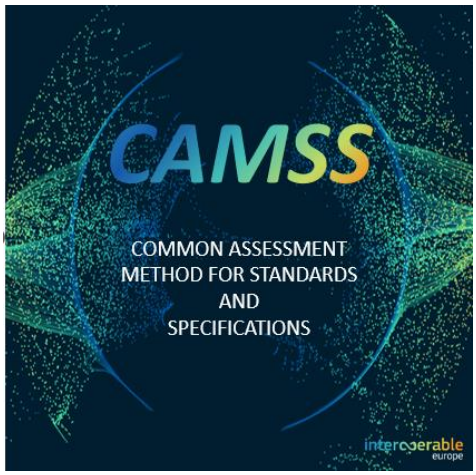

ASSESSMENT SUMMARY v1.0.0

YAML Ain't Markup Language (YAML)[1]

YAML Language Development Team [2]

[1] YAML Specification: https://yaml.org/spec/1.2.2/

[2] YAML Language Development Team: https://yaml.org/spec/1.2.2/ext/team/

Change Control

Modification	Details
Version 1.0.0	
Initial version	

TABLE OF CONTENT

1. INTRODUCTION

The present document is a summary of the assessment of YAML carried out by the CAMSS Team using the CAMSS EIF assessment scenario. The purpose of this scenario is assessing the compliance of a standard or specification with the European Interoperability Framework (EIF)[3].

2. ASSESSMENT SUMMARY

Designed by the YAML Language Development Team, YAML is a human-friendly, cross language, unicode-based data serialization language designed around the common native data types of dynamic programming languages. It is broadly useful for programming needs ranging from configuration files to internet messaging to object persistence to data auditing and visualization. Moreover, YAML's adaptability makes it a versatile choice across a wide spectrum of applications. From configuration management to data exchange and automation, YAML's usability spans various domains, offering an accessible and structured means to represent and manage data. Data exchange in a common language and a better readability can be useful for interoperability between public administrations, in order to establish an unic workframe.

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 fully supports the principles setting context for EU actions on interoperability:

- **Subsidiarity and proportionality**

  YAML is included in 1 national catalogue of recommended specifications. It belongs to France[4]. The National Interoperability Framework (NIF) of France is fully aligned with at least 2 out of 3 sections of the European Interoperability Framework (EIF) according to the National Interoperability Framework Observatory (NIFO) factsheets[5].

The specification fully supports the principles setting context for EU actions on interoperability:

- **Openness**

[3] European Interoperability Framework: https://ec.europa.eu/isa2/eif_en

[4] France National catalogue:

http://references.modernisation.gouv.fr/sites/default/files/Referentiel_General_Interoperabilite_V2.pdf

[5] NIFO factsheets: https://joinup.ec.europa.eu/collection/national-interoperability-framework-observatory-nifo/nifo-factsheets

The YAML language is known for its versatility and human-friendly data serialization format. It finds applications in various programming needs, including configuration files, internet messaging, object persistence, data auditing, and visualization. Even complex projects like the "Integrated Open Access Materials Modelling Innovation Platform for Europe" [6] leverage YAML for workflow generation due to its structured format and market acceptance.

Looking ahead, the YAML Language Development Team is actively defining a formal process for future changes to the language itself. This process, following an RFC (Request for Comments) model [7], is expected to be finalized in the coming weeks.

Furthermore, YAML integrates seamlessly with Kubernetes[8], a container orchestration platform. Kubernetes objects, essentially registries defining the state of a cluster, are often described in YAML. These objects specify details like the applications running in containers, resource allocation for those applications, and their behavior regarding restarts and updates.

Finally, it's worth noting that YAML is licensed under a royalty-free and fair, reasonable, and non-discriminatory (FRAND) basis.

- **Transparency**

  YAML's structured format makes it a valuable tool for documenting administrative procedures. By breaking down procedures into hierarchical tasks within a YAML document, clarity and understandability are significantly enhanced. This structured approach also proves beneficial for listing rules and services.

  Furthermore, YAML can act as a supporting technology for API design and service exposure. Some API specifications leverage YAML to define the structure of both API requests and responses. This approach using YAML for interface definition and documentation fosters clear communication between developers and administrators regarding service structure, endpoints, methods, and parameters.

- **Reusability**

  YAML is a data serialization model that can be used in any domain. It is designed to be human-friendly and work well with modern programming languages for common everyday tasks.

- **Technological neutrality and data portability**

[6] "Integrated Open Access Materials Modelling Innovation Platform for Europe" project: https://cordis.europa.eu/project/id/953167

[7] RFC process: https://github.com/yaml/yaml-spec/blob/main/.github/contributing.md

[8] Kubernetes reference: https://kubernetes.io/es/docs/concepts/overview/working-with-objects/kubernetes-objects/

YAML can be implemented in any platform, and it is independent of any technology and platform. One of the design goals of YAML is data portability between programming languages. An example can be found in the processes and models section, where it is explained that one measure to maximize data portability is separating properties needed for serialization and presentation.

YAML is designed to be extensible and it allows partial implementations. One of the extensions available is the Core schema[9], which is an extension of the JSON schema[10], allowing for a more human-readable presentation of the same types.

For the partial implementations, the specification can be used to create simple configuration files, thus ignoring more complex features. In addition, it can be adopted and implemented gradually, depending on the organization's needs.

YAML can be customized by adjusting key-value pairs, lists, and nested structures. Moreover, settings can be configured, and data structures can be defined and constructed.

The Technical Specification partially supports the principles related to generic user needs and expectations:

- **User-centricity**
  YAML allows for efficient reuse of relevant information through anchors, aliases, and references[11]. Anchors enable defining reusable content, while aliases let you reuse these anchors throughout the document. Additionally, references can merge different mappings, allowing you to combine and use them at any point, enhancing flexibility and reducing redundancy.

- **Inclusion and accessibility**
  Clear and well-structured YAML can enhance e-accessibility by making it easier for screen readers and other assistive technologies to interpret the content. Moreover, including comments describing the purpose of specific settings or options can benefit developers, testers, and maintainers, improving overall accessibility.

- **Privacy**
  The purpose of YAML is not related to transparency aspects, and no projects related to privacy that utilize YAML have been discovered.

- **Security**

  One of the primary purposes of YAML is to establish a common language that facilitates data exchange between organizations. While YAML can enhance data exchange, it is not designed to

[9] Core Schema extension: https://yaml.org/spec/1.2.2/#103-core-schema

[10] JSON Schema: https://yaml.org/spec/1.2.2/#json-schema

[11] Anchors and aliases reference: https://yaml.org/spec/1.2.2/#3222-anchors-and-aliases

guarantee security in this process. However, when used alongside other specifications and applications, YAML can help improve the security of data exchange.

YAML's specification also supports data processing but does not inherently ensure security. To address security concerns, external mechanisms such as encryption or security measures implemented in the systems processing the YAML data can be utilized.

And although YAML does not guarantee data accuracy, its structure and readability aid in manual review and integration with data validation tools. Consequently, when combined with other applications or specifications, YAML can contribute to more accurate data processing.

- **Multilingualism**
  The data structure of YAML could facilitate the understanding in different languages. Despite this, the main purpose of YAML is not to be used in multilingual context.

The Technical Specification partially supports the foundation principles for cooperation among public administrations:

- **Administrative Simplification**

  YAML's structured format allows data exchange between different systems and services, facilitating interoperability and integration. Additionally, public services can use YAML to define workflows and automation scripts, improving efficiency and reducing manual intervention. Moreover, one of YAML's goals is to ensure portability between programming languages. Its specification promotes data exchange between organizations, enhancing interoperability. This makes YAML ideal for implementing digital services, supporting the principle of digital-first by enabling seamless integration and efficient communication across various platforms and systems.

- **Preservation of information**
  YAML is not specifically designed for the long-term preservation of data, information, or electronic records. One of its functions is to transmit and store data in a human-readable and easy-to-write format. However, organizations can leverage YAML in conjunction with other practices to contribute to the long-term preservation of relevant information. For example, it is possible to store and transmit python objects using YAML format.

- **Assessment of effectiveness and efficiency**
  There are already existing studies and documents assessing and documenting YAML features and providing possible improvements of its performance among other aspects. There are two papers that can be useful to discover how YAML can be effective and effcient. In "Comparision between JSON and YAML for data serialization"[12] it is determined and discussed the primary differences

[12] "Comparision between JSON and YAML for data serialization" https://citeseerx.ist.psu.edu/document?repid=rep1&type=pdf&doi=636a2b04d98c0af8e9d6f59148352dd63af4f0c1

between two different serialization formats, namely YAML and JSON. In "YAML: A tool for hardware design visualization and capture"[13], is described an approach that helps to capture the structural aspects of a design at a high level of abstraction and enables the system designer to enter designs "schematically" using predefined structural and functional entities conforming to UML notation. Therefore, the specification can achieve different objectives alone or together with other specifications and helps to understand how YAML can be used for achieve complex targets using YAML only.

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

- **Interoperability governance**

  France has been found recommending YAML in their ICT National Catalogue[14]. Moreover, it has been used in European projects. Additionally, YAML is already associated with EIRA ABBs in the EIRA Library of Interoperability Specifications (ELIS)[15]. More specifically, YAML can define the interoperability aspects of the "Container", "Container Registry", and "Containers Manager" ABBs of the EIRA Technical Infrastructure View.

  Furthermore, YAML has been used in the OpenModel project[16]. In this project, YAML is used as a structured data format on which AiiDA workflows are based. The development of this project focuses on the high-level API, which facilitates the ability to dynamically generate AiiDA[17] workflows based on a YAML structured data format.

  Additionally, the YAML Test Suite[18] repository contains data for testing the correctness of YAML processors.

- **Legal interoperability**

  YAML is not listed as an official standard by European standardization organizations like CEN (European Committee for Standardization) or ETSI (European Telecommunications Standards Institute).

[13] "YAML: A tool for hardware design visualization and capture": https://ieeexplore.ieee.org/abstract/document/874023

[14] France National catalogue:

http://references.modernisation.gouv.fr/sites/default/files/Referentiel_General_Interoperabilite_V2.pdf

[15] EIRA Library of Interoperability Specifications (ELIS): https://joinup.ec.europa.eu/collection/common-assessment-method-standards-and-specifications-camss /solution/elis/release/600

[16] OpenModel Project: https://cordis.europa.eu/project/id/953167/reporting

[17] AiiDA Project: https://www.aiida.net/index.html

[18] YAML Test Suite: https://github.com/yaml/yaml-test-suite

- **Organisational interoperability**
  YAML can facilitate the modeling of business processes by providing a readable and structured format for defining workflows, configurations, and data exchanges. Moreover, the specification is easily readable by humans, and data can be exchanged between organizations, which helps to improve organizational interoperability.

- **Semantic interoperability**
  Several developer platforms discuss YAML extensively, one prominent example being Stack Overflow[19]. Stack Overflow operates as a community-driven forum where developers can ask questions, share insights, and provide solutions related to YAML.

[19] Stackoverflow YAML: https://stackoverflow.com/questions/tagged/yaml

3. ASSESSMENT RESULTS

This section presents an overview of the results of the CAMSS assessments for YAML. 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
EIF Principle setting the context for EU actions on interoperability	100/100 (100%)	100%	Seamless
Core interoperability principles	1680/1700 (99%)	94%	Seamless
Principles related to generic user needs and expectations	960/1200 (80%)	50%	Seamless
Foundation principles for cooperation among public administrations	500/500 (100%)	80%	Seamless
Interoperability layers*	820/1000 (84%)	100%	Seamless
Overall Score	3260/3700 (88%)	82%	

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

With 82% of assessment strength, this assessment can be considered representative of the high specification compliance with the EIF principles and recommendations. The Overall Automated Score of 88% demonstrates that YAML highly supports the European Interoperability Framework in the domains where it applies.