ASSESSMENT SUMMARY v1.0.0

JavaScript Object Notation (JSON) (ECMA-404)[1]

ECMA[2]

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[1] JSON specification: https://www.ecma-international.org/wp-content/uploads/ECMA-404_2nd_edition_december_2017.pdf

[2] ECMA website: https://www.ecma-international.org/

Change Control

Modification	Details
Version 1.0.0	
Initial version	

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1. INTRODUCTION

The present document is a summary of the assessment of **JSON** carried out by CAMSS using the CAMSS Assessment EIF scenario[3]. The purpose of this scenario is to assess the compliance of a standard or specification with the European Interoperability Framework (EIF)[4].

2. ASSESSMENT SUMMARY

The JavaScript Object Notation (JSON) is a lightweight, text-based, language-independent syntax for defining data interchange formats. It was derived from the ECMAScript programming language, but is programming language independent. JSON defines a small set of structuring rules for the portable representation of structured data. It also provides a simple and human-readable way to represent structured data as text. JSON is language-independent, meaning it can be used with any programming language, not just JavaScript.

JSON has been created by the European association for standardizing information and communication systems (ECMA International). Founded in 1960 under the name of the European Computer Manufacturers Association, ECMA International is an industry association dedicated to the standardisation of information and communication systems.

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**
  JSON is included in 9 national catalogues of recommended specifications[5]. They belong to Cyprus, Denmark, Finland, France, Iceland, Malta, The Netherlands, Slovakia and Slovenia. The National Interoperability Framework (NIF) of France and The Netherlands 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[6]) factsheets.

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[3] CAMSS Assessment EIF Scenario 6.0.0: https://joinup.ec.europa.eu/collection/common-assessment-method-standards-and-specifications-camss/solution/camss-assessment-eif-scenario/release/600

[4] ISA[2] programme: https://ec.europa.eu/isa2/eif_en

[5] CAMSS List of standards:

https://joinup.ec.europa.eu/collection/common-assessment-method-standards-and-specifications-camss/camss-list-standards

[6] NIFO Factsheets: https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/digital-publicadministration-factsheets-2022

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

- **Openness**

  The adoption of JSON fosters the publication of data as open data by means of providing structured data and the usage of non-proprietary formats. Moreover, there is an existing extension of JSON which aims to help and support the Linked Open Data environments. The extension has been developed by the W3C working group specifically in charge of JSON-LD[7] development.

  JSON is available for its use, study and implementation at Ecma International and IETF's webpages. Moreover, Ecma International's purpose is to make available the developed standards and specifications in a non-discriminatory basis and free of charges. Following his directives, JSON's Technical Committee[8] is the group in charge of developing and maintaining the specification, as well as proposing reviews in order for stakeholders and interested communities to contribute to its improvement, nonetheless, these are not open to the general public. Currently, JSON is a widely used specification for data interchange between applications and platforms. It is used in REST API applications[9] in order to ensure data exchange. The number of JSON applications are extensively used for the creation of solutions, including innovative ones.

- **Transparency**

  JSON is a specification used for data exchange between different platforms, this fact facilitates the visibility and comprehensibility of administration's data. Moreover, it eases the communication between administrations enhancing the decision-making process. Likewise, it facilitates the definition and implementation of interfaces, thus enabling the accessibility to public administration services.

- **Reusability**

  JSON is a sector agnostic and language-independent specification that can be reused in any business domain requiring a common format to exchange data between different programs.

- **Technological neutrality and data portability**

  The JSON language-independent data interchange format makes it technology and platform-agnostic. Given its flexibility-by-design, JSON supports extensions, customisations and partial implementations, allowing data to not contain all the expected fields, or to incorporate additional ones in order to include extra metadata or define application-specific attributes while still adhering to the overall JSON format. It can also enable data portability by supporting data exchange applications and systems using disparate languages.

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[7] JSON-LD: https://json-ld.org

[8] JSON Technical Committee: https://tools.ietf.org/html/rfc8259

[9] JSON API specification: https://jsonapi.org/

***The specification partially supports the principles related to generic user needs and expectations*:**

- **User-centricity**
  As a key enabler for the data exchange and interchange between administrations and stakeholders, JSON enhances the communication and information exchange across borders between public administrations. The flexibility of JSON's hierarchical structure allows for implicit reuse by organizing related information within nested objects. Developers can design their JSON structures to facilitate reuse or referencing based on the specific requirements of their applications or systems.

- **Inclusion and accessibility**
  While JSON does not directly relate to e-accessibility, there can be found resources that allow for JSON to create Accessible Rich Internet Applications (ARIA) widgets. Therefore, it can enable e-accessibility if combined with other specifications.

- **Privacy**
  The nature of JSON does not include privacy features. It is not related to data confidentiality or the protection of personal information. These features indeed are to be achieved implementing additional security and privacy layers.

- **Security**
  JSON does not include built-in features for secure processing, encryption, or access control. However, the security of data exchange and processing using JSON depends on the implementation and the systems handling the JSON data. Same rationale applies when it comes to data integrity and data accuracy, where additional security practices may need to apply cryptographic techniques, access control and data validation mechanisms.

- **Multilingualism**
  JSON is a data-interchange format is used by APIs, which are involved in the delivery of information between platforms, and in consequence service delivery. This fact makes JSON an element that fosters the delivery of European public services, including multilingual ones.

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

- **Administrative Simplification**
  JSON has the potential to contribute to the administrative burden reduction insofar it allows the exchange and consumption of data from different administration stakeholders, thus reducing the non-digital data exchange. Moreover, as it facilitates the exchange of structured information between different components or layers of a digital service delivery system, JSON can also be a good enabler of digital service delivery channels.

- **Preservation of information**

  The purpose of JSON is not related to long-term preservation of electronic records. Therefore this criterion is considered not applicable to this specification.

- **Assessment of effectiveness and efficiency**

  There are already existing documents and studies assessing the JSON's features and performance. There can be found an effectiveness assessment in this academic paper of a comprehensive comparison between XML and JSON[10], or a study assessing the efficiency of JSON for data retrieval in big data[11].

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**

  JSON is associated with EIRA[12] ABBs in the EIRA Library of Specifications (ELIS)[13]. More specifically, JSON can define the interoperability aspects of the "Machine to machine interface" ABB of the EIRA Technical View, the "Data Quality Service" and "Data Quality Component" of the EIRA Technical Application view, the "Legal Act Representation" , "Representation" and "Open Data" of the EIRA Semantic view. In terms of conformance, there exist different types of validators depending on the users' needs such as the JSON Test suite[14], or the JSON Compare[15]. Moreover,

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[10] Behaviour based Comparative analysis of XML and JSON web technologies:

https://www.researchgate.net/profile/Hanif_Ullah/publication/321361853_Behavior_based_Comparative_analysis_of_XML_and_JSON_web_technologies/links/5a1eb56f0f7e9b9d5e000bfd/Behavior-based-Comparative-analysis-of-XML-and-JSON-web-technologies.pdf

[11] Efficiency of JSON for Data Retrieval in Big Data:
https://www.researchgate.net/profile/KamirYusof/publication/320045078_Efficiency_of_JSON_for_Data_Retrieval_in_Big_Data/links/5a3f14ea458515f6b0456f54/Efficiency-of-JSON-for-Data-Retrieval-in-Big-Data.pdf

[12] EIRA: https://joinup.ec.europa.eu/collection/european-interoperability-reference-architecture-eira/solution/eira/release/v500

[13] ELIS: https://joinup.ec.europa.eu/collection/common-assessment-method-standards-and-specifications-camss/solution/elis/elis-dashboard

[14] JSON Test suite: https://github.com/nst/JSONTestSuite

[15] JSON Compare: https://jsoncompare.com/#!/simple/

the specification is recommended and appears in the ICT national catalogues of 9 European Member States. It can be said it is being supported by EU institutions given that it is being distributed through the Joinup platform, and appears to be used by the EUROPEANA[16] cross-border project, among others.

- **Legal Interoperability**
Ecma International, the standards development organisation developing JSON, is a European non-profit organisation dedicated to the standardisation of information and communication systems. Ecma's development of standards and technical reports is done in co-operation with the appropriate national, European, and international organisations. Therefore, JSON is a European standard.

- **Organisational interoperability**
JSON provides a flexible and widely supported format for representing structured data, which can be leveraged in combination with appropriate process modelling languages and notations to facilitate the modelling and execution of business processes. By agreeing to use JSON as a common
language for data representation, organizations can enhance their interoperability, and streamline communication and collaboration across different systems and entities, thus fostering organisational interoperability agreements.

- **Semantic Interoperability**
The Joinup platform hosts several discussion forums about the implementation and usefulness of JSON regarding technical interoperability aspects and serialization methods.

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[16] EUROPEANA website: https://pro.europeana.eu/resources/apis/search

3. ASSESSMENT RESULTS

This section presents an overview of the results of the CAMSS assessments for **JSON** 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 is 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	100/100 (100%)	100%	Seamless
Core interoperability principles	1680/1700 (92%)	100%	Seamless
Principles related to generic user needs and expectations	940/1200 (88%)	58%	Sustainable
Foundation principles for cooperation among public administrations	500/500 (88%)	80%	Seamless
Interoperability layers*	980/1000 (67%)	100%	Seamless
Overall Score	3600/3900 (92%)[17]	87%	

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

With an 87% of assessment strength, this assessment can be considered representative of the specification compliance with the EIF principles and recommendations.

The Overall Automated Score of 92% (3600/3900) demonstrates that the specification supports the European Interoperability Framework in the domains where it applies.

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[17] See the "results interpretation" section of the CAMSS Assessment EIF Scenario Quick User Guide:

https://joinup.ec.europa.eu/collection/common-assessment-method-standards-and-specifications-camss/solution/camss-assessment-eif-scenario/results-visualisation-and-interpretation