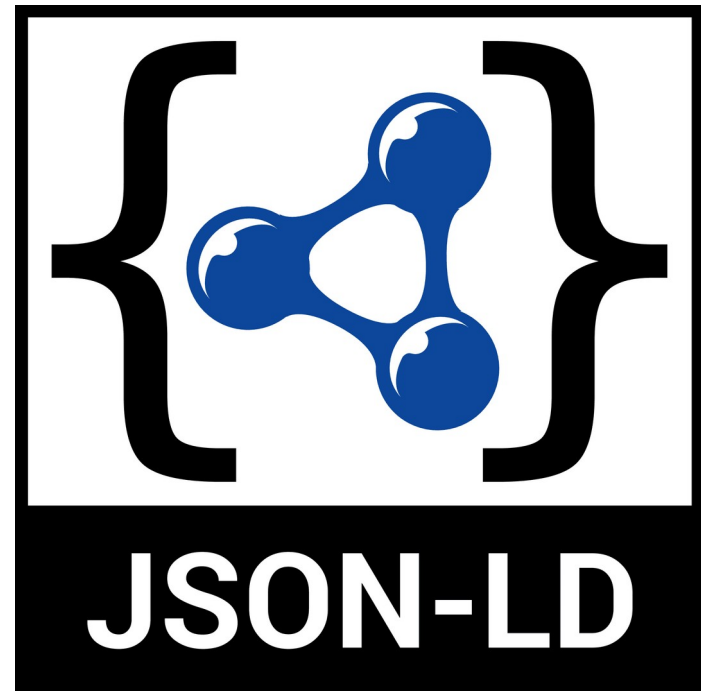


JSON-LD

Gilles Landais (CDS)
ASOV, mars 2024



JSON-LD motivations

Structurer des Données sérialisées en JSON

- Sérialisation en JSON de RDF
- Permet de structurer des documents JSON en proposant des mots clés qui suivent une sémantique
- Alternative au XML (XSD)
- Un des formats accepté par DataCite
- Format accepté par Google Dataset Search (basé su schema.org)

RDF

- Sémantique IVOA : <https://ivoa.net/rdf/>
- wikidata



Strasbourg Astronomical Data Center / DOIs

[10.26093/cds/vizier.22620008](https://cdsarc.cds.unistra.fr/viz-bin/cat/J/ApJS/262/8)

[Update DOI \(Form\)](#)

[Update DOI \(File Upload\)](#)

Findable

Metadata Export

[DataCite XML](#)

[DataCite JSON](#)

[Schema.org JSON-LD](#)

[BibTeX](#)

DOI created

December 5, 2022 at 22:14:52 UTC

DOI registered

December 5, 2022 at 22:14:53 UTC

DOI last updated

February 9, 2024 at 18:58:14 UTC

URL

<https://cdsarc.cds.unistra.fr/viz-bin/cat/J/ApJS/262/8>

Metadata

```
{
  "@context": "https://raw.githubusercontent.com/codemeta/codemeta/master/codemeta.jsonld",
  "@type": "Dataset",
  "@id": "https://doi.org/10.26093/cds/vizier.22620008",
  "identifier": [
    {
      "@type": "PropertyValue",
      "propertyID": "internal ID",
      "value": "J/ApJS/262/8"
    },
    {
      "@type": "PropertyValue",
      "propertyID": "ivoid",
```

- Codemeta JSON
- Summary View
- DataCite XML
- DataCite JSON
- Schema.org JSON-LD**
- Citeproc JSON
- Codemeta JSON
- BibTeX
- RIS
- JATS XML

JSON-LD



Caractéristiques JSON-LD

- Première version 2010
- Standard W3C , actuellement V1.1 : <https://www.w3.org/TR/json-ld11/>
- JSON linked Data (<https://json-ld.org/>)
- Internet media type : application/ld+json
- Permet de sérialiser une sémantiques
- Permet de décrire des données à partir d'une sémantique
- En théorie, il est possible d'annoter un document JSON avec une entête JSON-LD

Exemple

@context : URI vers la sémantique qui décrit les attributs utilisés : 'name', 'born', 'spouse'

```
{
  "@context": "https://json-ld.org/contexts/person.jsonld",
  "@id": "http://dbpedia.org/resource/John\_Lennon",
  "name": "John Lennon",
  "born": "1940-10-09",
  "spouse": "http://dbpedia.org/resource/Cynthia\_Lennon"
}
```

JSON-LD



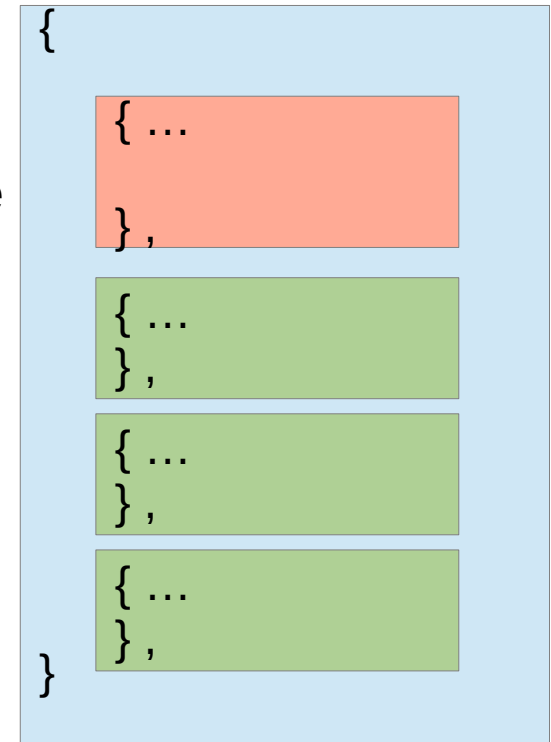
Structure d'un document JSON-LD

<https://www.w3.org/TR/json-ld11/>

- Définition des sémantique dans un contexte
- Structure de données :
 - Attribut /Valeur
 - Classe { ... } +- Objet d'un diag UML
ex DCAT : <https://www.w3.org/TR/vocab-dcat-2/>
 - Liste [...]

Contexte

Data



Mots clés JSON-LD

@id : définit une IRI

@base : base d'une IRI utilisé comme préfix

@context : définit les sémantique

@type : définit le type d'une ressource
(~ dmttype en MIVOT)

@value : spécifie une valeur

@list : spécifie une liste

@set : list sans ordre

@version in @context

@language : pour les texte, spécifie un language

...

JSON-LD



Sérialisation Turtle

```
<http://dbpedia.org/resource/John_Lennon > a <https://json-ld.org/contexts/person.jsonld>;  
  <http://xmlns.com/foaf/0.1/name> "John Lennon"  
  <http://schema.org/birthDate> "1940-10-09"^^<http://www.w3.org/2001/XMLSchema#date>  
  <http://schema.org/spouse> <http://dbpedia.org/resource/Cynthia_Lennon> .
```

Sérialisation JSON-LD (utilisation des URI comme attribut)

```
{  
  "@id": "http://dbpedia.org/resource/John_Lennon",  
  "http://xmlns.com/foaf/0.1/name": "John Lennon",  
  "http://schema.org/birthDate": {  
    "@type": "http://www.w3.org/2001/XMLSchema#date",  
    "@value": "1940-10-09"  
  },  
  "http://schema.org/spouse": {  
    "@id": "http://dbpedia.org/resource/Cynthia_Lennon"  
  }  
}
```

Sérialisation JSON-LD compacte et utilisant un contexte

@context : URI vers la sémantique qui décrit les attributs utilisés : 'name', 'born', 'spouse'

```
{  
  "@context": "https://json-ld.org/contexts/person.jsonld",  
  "@id": "http://dbpedia.org/resource/John_Lennon",  
  "name": "John Lennon",  
  "born": "1940-10-09",  
  "spouse": "http://dbpedia.org/resource/Cynthia_Lennon"  
}
```

JSON-LD



Sérialisation JSON-LD avec la définition du contexte

```
{
  "@context": {
    "xsd": "http://www.w3.org/2001/XMLSchema#",
    "name": "http://xmlns.com/foaf/0.1/name",
    "born": {
      "@id": "http://schema.org/birthDate",
      "@type": "xsd:date"
    },
    "spouse" :{
      "@id": "http://schema.org/spouse",
      "@type": "@id"
    }
  },
  "@id": "http://dbpedia.org/resource/John_Lennon",
  "name": "John Lennon",
  "born": "1940-10-09",
  "spouse": "http://dbpedia.org/resource/Cynthia_Lennon"
}
```

Sérialisation JSON-LD avec la définition du contexte

```
{
  "@context": {
    "xsd": "http://www.w3.org/2001/XMLSchema#",
    "name": { "@id": " _:name", "@type": "xsd:string" },
    "born": { "@id": " _:born", "@type": "xsd:date" },
    "spouse": { "@id": " _:spouse", "@type": "@id" }
  },
  "@id": "http://dbpedia.org/resource/John_Lennon",
  "name": "John Lennon",
  "born": "1940-10-09",
  "spouse": "http://dbpedia.org/resource/Cynthia_Lennon"
}
```

Exemple de serialisation en JSON-LD fournie dans les landing page

- Sémantique : Schema.org <https://schema.org/>
- Exemple : <https://cdsarc.cds.unistra.fr/viz-bin/cat/J/AJ/894/142>



Google

vizier

10 parsec sample in the Gaia era first update
cdsarc.u-strasbg.fr
Updated Jun 30, 2021

74MHz VLA Low-frequency Sky Survey Redux (VLSSr)
cdsarc.u-strasbg.fr
Updated Nov 17, 2014

Galaxies and Clusters of Galaxies (CGCG)
vizier.cds.unistra.fr
Updated Oct 2, 1995

10 parsec sample in the Gaia era first update
J/A+A/650/A201
Ivo://cds.vizier/J/A+A/650/A201

Explore at: cdsarc.u-strasbg.fr

2 scholarly articles cite this dataset ([View in Google Scholar](#))

Unique Identifier
<https://doi.org/10.26093/cds/vizier.36500201>

Dataset updated
Jun 30, 2021

Dataset provided by
CDS

Description
VizieR Online Data Catalog: 10 parsec sample in the Gaia era first update(Reyle C., 2021)



<https://fair-checker.france-bioinformatique.fr/check>

Exemple de serialisation JSON-LD utilisées dans les landing page



- Exemple VizierR : <https://vizier.cds.unistra.fr/viz-bin/cat/J/AJ/137/226>
- Sémantique : <https://schema.org/>

Schema.org

```
{
  "@context": "http://schema.org/",
  "@type": "Dataset",
  "@id": "https://doi.org/10.26093/cds/vizier.51370226",
  "identifier": "https://doi.org/10.26093/cds/vizier.51370226",
  "alternateName": [
    "J/AJ/137/226", "ivo://cds.vizier/J/AJ/137/226"
  ],
  "url": "https://vizier.cds.unistra.fr/viz-bin/cat/J/AJ/137/226",
  "name": "Differential light curves of TV Tri",
  "description": "VizieR Online Data Catalog",
  "rights": "https://cds.unistra.fr/vizier-org/licences_vizier.html",
  "author": [
    { "givenName": "Yang Y.-G." },
    { "givenName": "Wei J.-Y." }
  ],
  "creator": {
    "@type": "Organization",
    "name": "CDS",
    "url": "https://cds.unistra.fr"
  },
  "datePublished": "26-Oct-2011",
  "isAccessibleForFree": true,
  "keywords": [
    "Eclipsing binary stars", "Optical astronomy, CCD photometry"
  ],
  "publication": "2009AJ....137..226Y"
}
```

le type de la ressource
<https://schema.org/Dataset>

Resource rdf décrivant les termes utilisés

IRI du document

Utilisation d'une liste d'auteurs :
<https://schema.org/author>

Objet Person « Organization »
<https://schema.org/Organisation>

JSON-LD



Exemple d'utilisation de 2 sémantiques existantes dans un contexte

Schema.org

 DublinCore

```
{
  "@context": [
    "http://schema.org",
    { "dcterms": "http://purl.org/dc/terms/" }
  ],
  "@type": "Dataset",
  "@id": "https://doi.org/10.26093/cds/vizier.1350",
  "identifier": [
    {
      "@type": "PropertyValue",
      "propertyID": "ivoid",
      "value": "ivo://CDS.VizieR/i/350"
    }
  ],
  "citation": [
    { "@id": "https://doi.org/10.5270/esa-1ugzkg7",
      "@type": "Dataset" },
    { "@id": "https://ui.adsabs.harvard.edu/abs/2021A+A...649A...1G",
      "@type": "ScholarlyArticle" }
  ],
  "dcterms:isReferencedBy": [
    { "@id": "https://doi.org/10.26093/cds/vizier.36510104",
      "@type": "Dataset" }
  ]
}
```

JSON-LD



Le coin du développeur

- API en Python, Java, C, TypeScript, Rust, ...

<https://json-ld.org/#developers>

Possibilité de convertir une
sérialisation RDF en une autre..

- Exemples : <https://json-ld.org/>

- (tentatives) de Validateurs

- <https://www.jsonschemavalidator.net/>
- <https://json-ld.org/playground/>

- RDF valideur :

- <https://www.w3.org/RDF/Validator/>
- <https://www.w3.org/2015/03/ShExValidata/>

```
from rdflib import Graph
```

```
g = Graph()  
result = g.parse("test_rdflib.json", format="json-ld")  
result.serialize(format="xml")
```





Examples: Person Event Place Product Recipe Library Activity

Permalink Gist Shortcuts

JSON-LD Input Options Document URL

```
{
  "@context": {
    "schema": "http://schema.org/",
    "name": "schema:name",
    "authors": { "@id": "schema:authors" }
  },
  "@type": "Dataset",
  "@id": "https://doi.org/10.26093/cds/vizier.51650051",
  "schema:name": "Stellar properties in SFRs from SDSS APOGEE-2 ",
  "authors": {
    "https://orcid.org/0000-0001-8600-4798": { "name": "Roman-Zuniga C.G." },
    "https://orcid.org/0000-0002-5365-1267": { "name": "Kounkel M." }
  },
  "schema:creator": {
    "@type": "Organization",
    "name": "CDS",
    "url": "https://cds.unistra.fr"
  },
  "schema:datePublished": "26-Oct-2011",
  "schema:isAccessibleForFree": "true"
}
```

Expanded Compacted Flattened Framed N-Quads Canonized Table Visualized Signatures

```
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/authors> _:b0 .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/creator> _:b3 .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/datePublished> "26-Oct-2011" .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/isAccessibleForFree> "true" .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/name> "Stellar properties in SFRs from SDSS APOGEE-2 " .
_:b0 <https://orcid.org/0000-0001-8600-4798> _:b1 .
_:b0 <https://orcid.org/0000-0002-5365-1267> _:b2 .
_:b1 <http://schema.org/name> "Roman-Zuniga C.G." .
_:b2 <http://schema.org/name> "Kounkel M." .
_:b3 <http://schema.org/name> "CDS" .
```

Examples: Person Event Place Product Recipe Library Activity

Permalink Gist Shortcuts

JSON-LD Input Options Document URL

```
{
  "@context": {
    "schema": "http://schema.org/",
    "name": "schema:name",
    "authors": { "@id": "schema:authors", "@container": "@id" }
  },
  "@type": "Dataset",
  "@id": "https://doi.org/10.26093/cds/vizier.51650051",
  "schema:name": "Stellar properties in SFRs from SDSS APOGEE-2 ",
  "authors": {
    "https://orcid.org/0000-0001-8600-4798": { "name": "Roman-Zuniga C.G." },
    "https://orcid.org/0000-0002-5365-1267": { "name": "Kounkel M." }
  },
  "schema:creator": {
    "@type": "Organization",
    "name": "CDS",
    "url": "https://cds.unistra.fr"
  },
  "schema:datePublished": "26-Oct-2011",
  "schema:isAccessibleForFree": "true"
}
```

Expanded Compacted Flattened Framed N-Quads Canonized Table Visualized Signatures

```
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/authors> <https://orcid.org/0000-0001-8600-4798> .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/authors> <https://orcid.org/0000-0002-5365-1267> .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/creator> _:b0 .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/datePublished> "26-Oct-2011" .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/isAccessibleForFree> "true" .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/name> "Stellar properties in SFRs from SDSS APOGEE-2 " .
<https://orcid.org/0000-0001-8600-4798> <http://schema.org/name> "Roman-Zuniga C.G." .
<https://orcid.org/0000-0002-5365-1267> <http://schema.org/name> "Kounkel M." .
_:b0 <http://schema.org/name> "CDS" .
```

@container n'est pas defini
⇒ empty node



Examples: Person Event Place Product Recipe Library Activity Permalink Gist Shortcuts

JSON-LD Input Options Document URL

```
{
  "@context": {
    "schema": "http://schema.org/",
    "name": "schema:name",
    "authors": {
      "@id": "schema:authors",
      "@container": "@set"
    },
    "@type": "Dataset",
    "@id": "https://doi.org/10.26093/cds/vizier.51650051",
    "schema:name": "Stellar properties in SFRs from SDSS APOGEE-2",
    "authors": [
      {
        "@id": "https://orcid.org/0000-0001-8600-4798",
        "name": "Roman-Zuniga C.G."
      },
      {
        "@id": "https://orcid.org/0000-0002-5365-1267",
        "name": "Kounkel M."
      }
    ],
    "schema:creator": {
      "@type": "Organization",
      "name": "CDS",
      "url": "https://cds.unistra.fr"
    },
    "schema:datePublished": "26-Oct-2011",
    "schema:isAccessibleForFree": true
  }
}
```

Expanded Compacted Flattened Framed N-Quads Canonized Table Visualized Signatures

```
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/authors> <https://orcid.org/0000-0001-8600-4798> .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/authors> <https://orcid.org/0000-0002-5365-1267> .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/creator> :b0 .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/datePublished> "26-Oct-2011" .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/isAccessibleForFree> true .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/name> "Stellar properties in SFRs from SDSS APOGEE-2" .
<https://orcid.org/0000-0001-8600-4798> <http://schema.org/name> "Roman-Zuniga C.G." .
<https://orcid.org/0000-0002-5365-1267> <http://schema.org/name> "Kounkel M." .
:b0 <http://schema.org/name> "CDS" .
```

@container avec un set

Examples: Person Event Place Product Recipe Library Activity Permalink Gist Shortcuts

JSON-LD Input Options Document URL

```
{
  "@context": {
    "schema": "http://schema.org/",
    "name": "schema:name",
    "authors": {
      "@id": "schema:authors",
      "@container": "@list"
    },
    "@type": "Dataset",
    "@id": "https://doi.org/10.26093/cds/vizier.51650051",
    "schema:name": "Stellar properties in SFRs from SDSS APOGEE-2",
    "authors": [
      {
        "@id": "https://orcid.org/0000-0001-8600-4798",
        "name": "Roman-Zuniga C.G."
      },
      {
        "@id": "https://orcid.org/0000-0002-5365-1267",
        "name": "Kounkel M."
      }
    ],
    "schema:creator": {
      "@type": "Organization",
      "name": "CDS",
      "url": "https://cds.unistra.fr"
    },
    "schema:datePublished": "26-Oct-2011",
    "schema:isAccessibleForFree": true
  }
}
```

Expanded Compacted Flattened Framed N-Quads Canonized Table Visualized Signatures

```
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/authors> :b1 .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/creator> :b0 .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/datePublished> "26-Oct-2011" .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/isAccessibleForFree> true .
<https://doi.org/10.26093/cds/vizier.51650051> <http://schema.org/name> "Stellar properties in SFRs from SDSS APOGEE-2" .
<https://orcid.org/0000-0001-8600-4798> <http://schema.org/name> "Roman-Zuniga C.G." .
<https://orcid.org/0000-0002-5365-1267> <http://schema.org/name> "Kounkel M." .
:b0 <http://schema.org/name> "CDS" .
:b1 <http://www.w3.org/1999/02/22-rdf-syntax-ns#first> <https://orcid.org/0000-0001-8600-4798> .
:b1 <http://www.w3.org/1999/02/22-rdf-syntax-ns#rest> :b2 .
:b2 <http://www.w3.org/1999/02/22-rdf-syntax-ns#first> <https://orcid.org/0000-0002-5365-1267> .
:b2 <http://www.w3.org/1999/02/22-rdf-syntax-ns#rest> <http://www.w3.org/1999/02/22-rdf-syntax-ns#nil> .
```

@container avec une liste



- Un standard W3C
- Un candidat pour fournir du JSON dans le cadre du VO
- Autres alternatives :
 - JSON schema
 - JSON api

