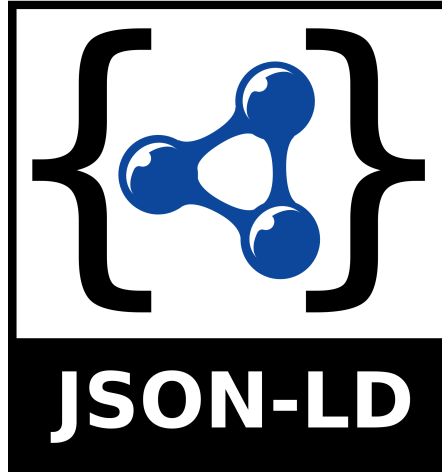


JSON-LD



JSON as an XML Alternative

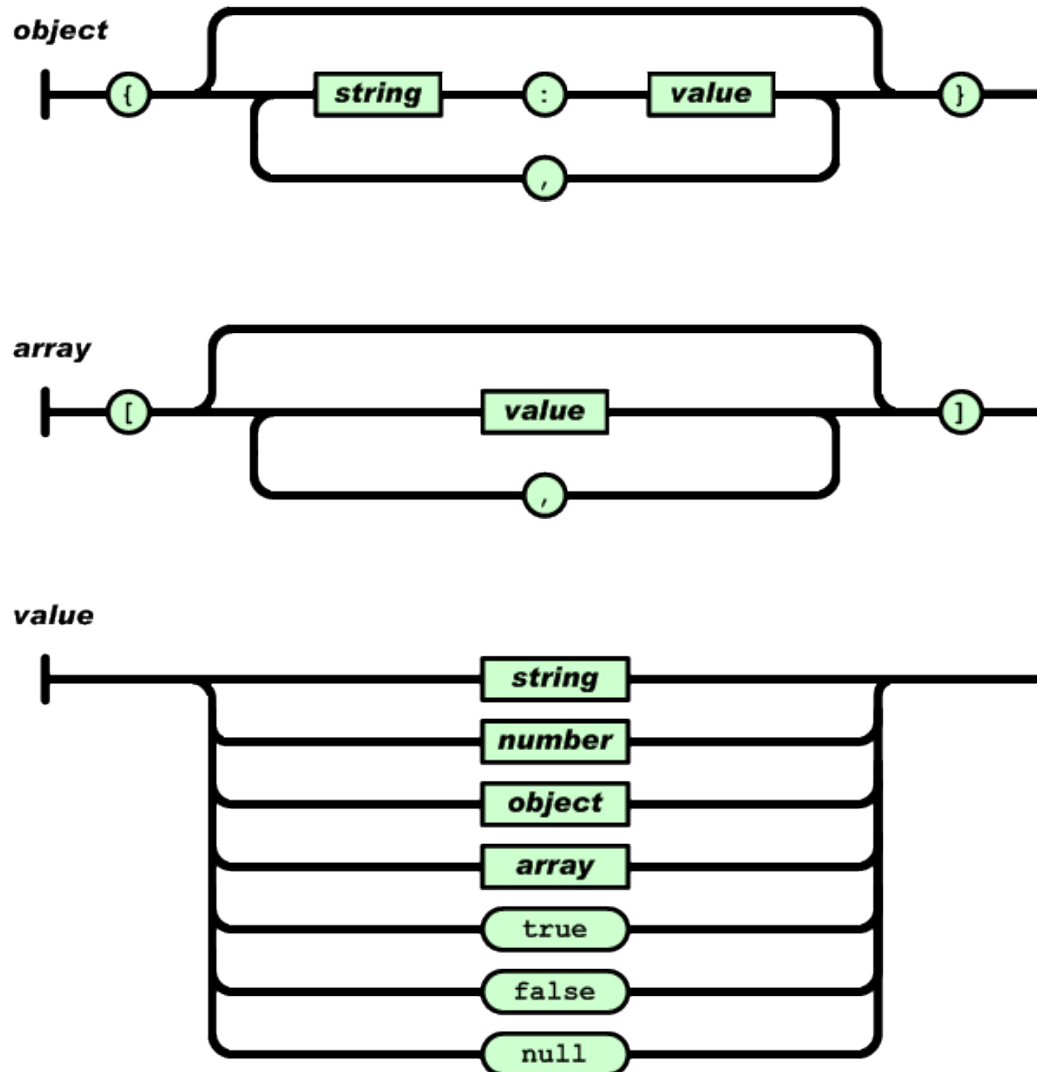
- Light-weight XML alternative for data-interchange
- JSON = JavaScript Object Notation
 - It's really language independent
 - Most programming languages can easily read it and instantiate objects
- Defined in [RFC 4627](#)
- Started gaining traction ~2006, now widely used
- <http://json.org/> has more information

Example

```
{ "firstName": "John",  
  "lastName" : "Smith",  
  "age"       : 25,  
  "address"   :  
    { "streetAdr" : "21 2nd Street",  
      "city"      : "New York",  
      "state"     : "NY",  
      "zip"       : "10021"},  
  "phoneNumber":  
    [ { "type" : "home",  
        "number": "212 555-1234"},  
      { "type" : "fax",  
        "number" : "646 555-4567"} ]  
}
```

- This is a JSON object with five key-value pairs
- Objects are wrapped by curly braces
- There are no object IDs
- Keys are strings
- Values are numbers, strings, objects or arrays
- Arrays are wrapped by square brackets

The BNF is simple



Evaluation

- JSON is simpler than XML and more compact
 - No closing tags, but if you compress XML and JSON the difference is not so great
 - XML parsing is hard because of its complexity
- JSON has a better fit for OO systems than XML, but not as extensible
- Preferred for simple data exchange by many
- MongoDB: 'NoSQL' database for JSON objects
- ElasticSearch: Lucene-based IR system using JSON to represent documents

JSON-LD

JSON-LD: [2014 W3C recommendation](#) for representing RDF data as JSON objects

```
{ "@context": {  
  "name": "http://xmlns.com/foaf/0.1/name",  
  "homepage": {  
    "@id": "http://xmlns.com/foaf/0.1/workplaceHomepage",  
    "@type": "@id"  
  },  
  "Person": "http://xmlns.com/foaf/0.1/Person"  
},  
"@id": "http://me.markus-lanthaler.com",  
"@type": "Person",  
"name": "Markus Lanthaler",  
"homepage": "http://www.tugraz.at/"  
}
```

In the beginning

```
{  
  "name": "Manu Sporny",  
  "homepage": "http://manu.sporny.org/",  
  "image": "http://manu.sporny.org/images/manu.png"  
}
```

A bit better

```
{  
  "http://schema.org/name": "Manu Sporny",  
  "http://schema.org/url": { "@id": "http://manu.sporny.org/" }  
  "http://schema.org/image":  
    { "@id": "http://manu.sporny.org/images/manu.png" }  
}
```

- The '@id' keyword means 'This value is an identifier that is an IRI'

Define a context

```
{ "@context":  
  {  
    "name": "http://schema.org/name", % [1]  
    "image": {  
      "@id": "http://schema.org/image", % [2]  
      "@type": "@id" % [3]  
    },  
    "homepage": {  
      "@id": "http://schema.org/url", % [4]  
      "@type": "@id" % [5]  
    }  
  }  
}
```

[1] means 'name' is short for

'http://schema.org/name'

[2] means 'image' is short for

'http://schema.org/image'

[3] means a string value associated with 'image' should be interpreted as an identifier that is an IRI

[4] means 'homepage' is short for

'http://schema.org/url'

[5] means a string value associated with 'homepage' should be interpreted as an identifier that is an IRI

Reference an external context

```
{  
  "@context": "http://json-ld.org/contexts/person.jsonld",  
  "name": "Manu Sporny",  
  "homepage": "http://manu.sporny.org/",  
  "image": "http://manu.sporny.org/images/manu.png"  
}
```

Add context inline

```
{ "@context":  
  {  
    "name": "http://schema.org/name",  
    "image": {  
      "@id": "http://schema.org/image",  
      "@type": "@id"  
    },  
    "homepage": {  
      "@id": "http://schema.org/url",  
      "@type": "@id"  
    }  
  },  
  "name": "Manu Sporny",  
  "homepage": "http://manu.sporny.org/",  
  "image": "http://manu.sporny.org/images/manu.png"  
}
```

External Context?

- Fetch <http://json-ld.org/contexts/person.jsonld>
curl <http://json-ld.org/contexts/person.jsonld>
Returns a JSON object defining the context
- Fetch <http://schema.org/>
curl -L <http://schema.org/>
 - Returns HTML page, since its default application/type is HTML
- Fetch
curl --header "Accept: application/ld+json" -L
<http://schema.org/>

Making assertions about things

```
{  
  "@context": {  
    ...  
    "Restaurant": "http://schema.org/Restaurant",  
    "Brewery": "http://schema.org/Brewery"  
  }  
  "@id": "http://example.org/places#BrewEats",  
  "@type": [ "Restaurant", "Brewery" ],  
  ...  
}
```

Adding a default vocabulary

```
{  
  "@context": {  
    "@vocab": "http://schema.org/"  
  }  
  "@id": "http://example.org/places#BrewEats",  
  "@type": "Restaurant",  
  "name": "Brew Eats"  
  ...  
}
```

Mixing vocabularies

```
{"@context":  
  {  
    "xsd": "http://www.w3.org/2001/XMLSchema#",  
    "foaf": "http://xmlns.com/foaf/0.1/",  
    "foaf:homepage": { "@type": "@id" },  
    "picture": { "@id": "foaf:depiction", "@type": "@id" }  
  },  
  "@id": "http://me.markus-lanthaler.com/",  
  "@type": "foaf:Person",  
  "foaf:name": "Markus Lanthaler",  
  "foaf:homepage": "http://www.markus-lanthaler.com/",  
  "picture":  
    "http://twitter.com/account/profile_image/markuslanthaler"  
}
```

Embedding other objects

```
{  
  ...  
  "name": "Manu Sporny",  
  "foaf:knows":  
  {  
    "@type": "Person",  
    "name": "Gregg Kellogg",  
  }  
  ...  
}
```

Google looks for JSON-LD

- Google looks for and uses some JSON-LD markup (e.g., for organizations)
- Put a JSON-LD object in head or body of web page wrapped with script tags:

```
<script type="application/ld+json">
```

```
{...}
```

```
</script>
```



You are on the UMBC subnet and probably at school. Go outside! It's a beautiful day... **84°F**

eBiquity Blog

- do not be a gl***hole, use face-block.me!
- google mooc: making sense of data
- stardog unleashed: md semantic web meetup. from the

Latest Paper Additions

- usm community cloud: vcl-based academic cloud
- cloud data management policies: security and privacy checklist
- tkoml: a scripting tool for

Latest eBiquity News

- ebiquity student karuna joshi's ibm ph.d. fellowship renewed for 2012-13
- ebiquity student karuna joshi receives ibm ph.d. fellowship
- yun peng receives award from

Latest eBiquity Events

- prob: a tool for tracking provenance and reproducibility of big data experiments
- tutorials by center for hybrid multicore productivity research students

```
17 <script type="text/javascript" src="https://apis.google.com/js/plusone.js"></script>
18 <script type="application/ld+json">
19 {
20   "@context": "http://schema.org",
21   "@type": "http://schema.org/EducationalOrganization",
22   "http://schema.org/address": {
23     "@type": "http://schema.org/PostalAddress",
24     "http://schema.org/addressCountry": "USA",
25     "http://schema.org/addressLocality": "Baltimore",
26     "http://schema.org/addressRegion": "Maryland",
27     "http://schema.org/postalCode": "21250",
28     "http://schema.org/streetAddress": "University of Maryland, Baltimore County, 1000 Hilltop Circle"
29   },
30   "http://schema.org/description": "The UMBC Ebiquity Research Group consists of faculty and students from
the Department of Computer Science and Electrical Engineering (CSEE) of the University of Maryland,
Baltimore County (UMBC), located in Baltimore, Maryland.",
31   "http://schema.org/name": "UMBC Ebiquity Research Lab",
32   "http://schema.org/url": "http://ebiquity.umbc.edu",
33   "email": "ebiquity@gmail.com",
34   "faxNumber": "1-410-455-3969",
35   "telephone": "1-410-455-3000",
36   "logo": {"@id": "http://ebiquity.umbc.edu/img/ebq_logo.png" },
37   "member": [
38     {
39       "@type": "Person",
40       "email": "mailto:finin@umbc.edu",
41       "image": "http://umbc.edu/~finin/images/headshot.jpg",
42       "jobTitle": "Professor",
43       "name": "Tim Finin",
44       "telephone": "1-410-455-3522",
45       "url": "http://umbc.edu/~finin/"
46     }
47   ]
48 }
49 </script>
50
51 </head>
```

https://search.google.com/structured-data/testing-tool

Error

Structured Data Testing Tool

< > ↺ ⋮

VPN 🔒

search.google.com/structured-data/testing-tool?url=http%3A%2F%2Febiquity.umbc.edu%2F

♥️ 📄

Google

Structured Data Testing Tool

⋮ Sign in

🌐 http://ebiquity.umbc.edu/

NEW TEST ⚙️

1 <html>

2 <head>

3 <title>UMBC ebiquity research group</title>

4 <meta http-equiv="Content-Language" content="en_US" />

5 <meta name="viewport" content="width=device-width, initial-scale=1">

6 <script language="JavaScript" src="/js/menus.js" type="text/javascript"></script>

7 <link rel="stylesheet" type="text/css" href="/css/styles.css" />

8 <link rel="shortcut icon" href="/favicon.ico" />

9 <base href="http://ebiquity.umbc.edu" />

10

11

12

13 <script src="http://www.google-analytics.com/urchin.js" type="text/javascript">

14 </script>

15 <script type="text/javascript"> _uacct = "UA-120147-16"; urchinTracker(); </script>

16 <script type="text/javascript" src="http://s20.sitemeter.com/js/counter.js? site=s20ebiquity"></script>

17 </script>

18 </head>

19 <body>

20 </body>

21 </html>

Detected

0 ERRORS 0 WARNINGS 2 ITEMS

Unspecified Type

0 ERRORS 0 WARNINGS 1 ITEM

EducationalOrganization

0 ERRORS 0 WARNINGS 1 ITEM

Structured Data Testing Tool

Loading Preview

search.google.com/structured-data/testing-tool?url=ebiquity.umbc.edu

Google

Structured Data Testing Tool

Sign In

http://ebiquity.umbc.edu/

NEW TEST

1<html>

2<head>

3<title>UMBC ebiquity research group</title>

4<meta http-equiv="Content-Language"

content="en_US" />

5<meta name="viewport" content="width=device-

width, initial-scale=1">

6<script language="JavaScript" src="/js/menus.js"

type="text/javascript"></script>

7<link rel="stylesheet" type="text/css"

href="/css/styles.css" />

8<link rel="shortcut icon" href="/favicon.ico" />

9<base href="http://ebiquity.umbc.edu" />

10

11

12

13<script src="http://www.google-

analytics.com/urchin.js" type="text/javascript">

</script>

14<script type="text/javascript">_uacct = "UA-

120147-16"; urchinTracker(); </script>

15<!-- <script type="text/javascript"

src="http://s20.sitemeter.com/js/counter.js?"

site=s20ebiquity"></script>

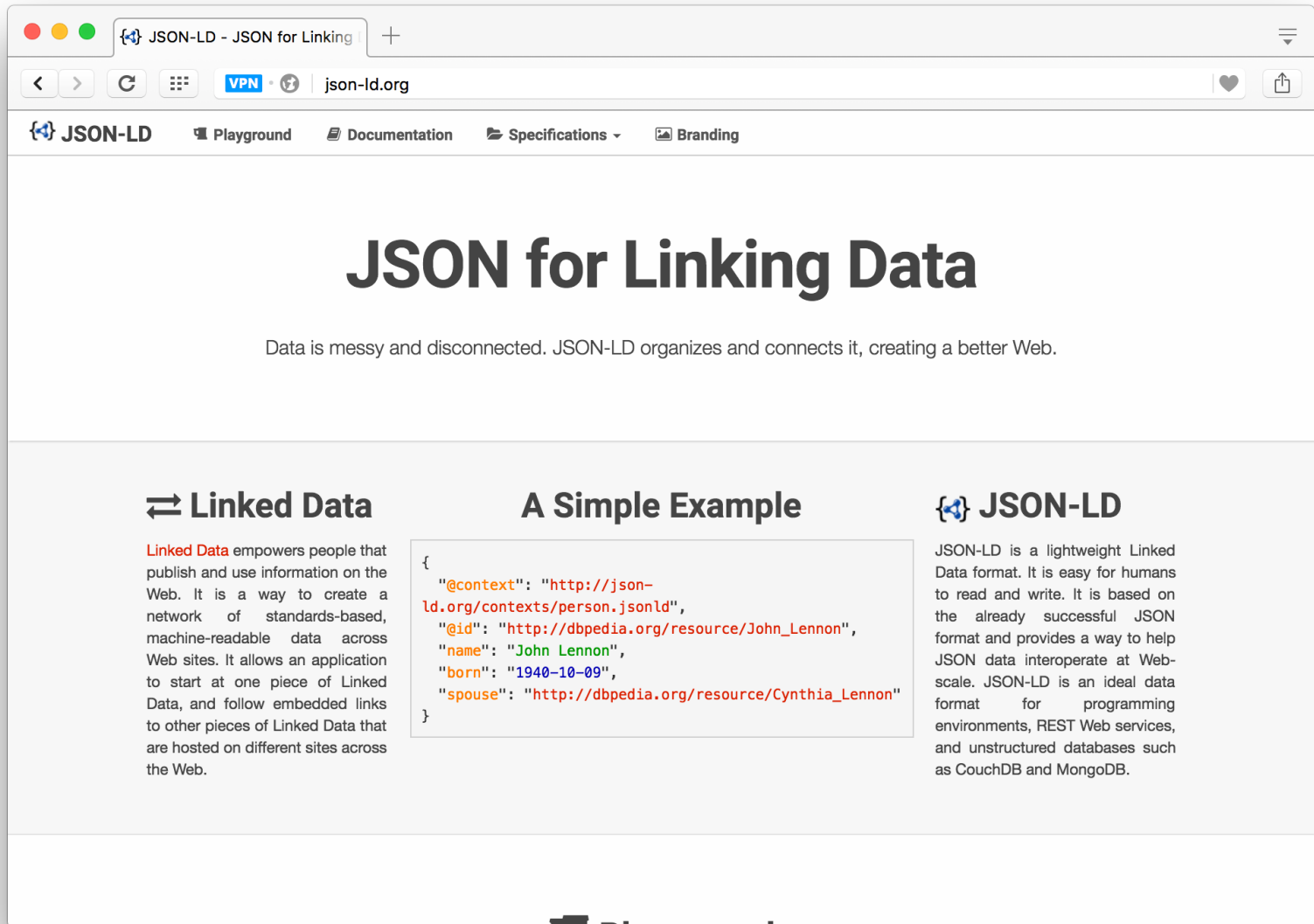
16<script type="text/javascript"

EducationalOrganization

All (1)

EducationalOrganization	PREVIEW	2 ERRORS	0 WAITING
@type	EducationalOrganization		
description	The UMBC Ebiquity Research Group consists of faculty and students from the Department of Computer Science and Electrical Engineering (CSEE) of the University of Maryland, Baltimore County (UMBC), located in Baltimore, Maryland.		
name	UMBC Ebiquity Research Lab		
url	http://ebiquity.umbc.edu		
email	ebiquity@gmail.com		
faxNumber	1-410-455-3069		

http://json-ld.org/

A screenshot of a web browser displaying the JSON-LD website. The browser's address bar shows 'json-ld.org'. The website's navigation bar includes links for 'JSON-LD', 'Playground', 'Documentation', 'Specifications', and 'Branding'. The main heading is 'JSON for Linking Data', followed by the tagline 'Data is messy and disconnected. JSON-LD organizes and connects it, creating a better Web.' Below this, there are three columns: 'Linked Data' explaining the concept, 'A Simple Example' showing a JSON-LD snippet for John Lennon, and 'JSON-LD' describing the format as a lightweight Linked Data format.

JSON-LD Playground Documentation Specifications Branding

JSON for Linking Data

Data is messy and disconnected. JSON-LD organizes and connects it, creating a better Web.

⇄ Linked Data

Linked Data empowers people that publish and use information on the Web. It is a way to create a network of standards-based, machine-readable data across Web sites. It allows an application to start at one piece of Linked Data, and follow embedded links to other pieces of Linked Data that are hosted on different sites across the Web.

A Simple Example

```
{
  "@context": "http://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

JSON-LD is a lightweight Linked Data format. It is easy for humans to read and write. It is based on the already successful JSON format and provides a way to help JSON data interoperate at Web-scale. JSON-LD is an ideal data format for programming environments, REST Web services, and unstructured databases such as CouchDB and MongoDB.



JSON-LD Playground

The screenshot shows the JSON-LD Playground web application. The browser's address bar displays the URL `json-ld.org/playground/`. The application's navigation bar includes links for JSON-LD, Playground, Documentation, Specifications, and Branding. The main heading is "JSON-LD Playground". Below it, a paragraph explains the playground's purpose: "Play around with JSON-LD markup by typing out some JSON below and seeing what gets generated from it at the bottom of the page. Pick any of the examples below to get started. The playground uses the `jsonld.js` JSON-LD processor which fully conforms to the JSON-LD Syntax and API specifications."

A row of example buttons is provided: "Examples:", "Person", "Event", "Place", "Product", "Recipe", "Library", and "Activity". To the right of these are buttons for "Permalink", "Gist", and "Shortcuts". Below the examples is a "JSON-LD Input" section with a "Document URL" input field. A large text area contains the following JSON-LD input:

```
{
  "@context": "http://schema.org/",
  "@type": "Person",
  "name": "Jane Doe",
  "jobTitle": "Professor",
  "telephone": "(425) 123-4567",
  "url": "http://www.janedoe.com"
}
```

At the bottom, a row of output format buttons is shown: "Expanded", "Compacted", "Flattened", "Framed", "N-Quads", "Normalized", and "Signed". The "Expanded" button is currently selected, and the output area below it shows the beginning of the expanded JSON-LD document: `[` and `{`.



Conclusion

- JSON-LD is a good solution to putting blocks of semantic data on web pages
- Aimed at publishing linked data, not ontologies, i.e., ABOX not TBOX
- Tools available for extracting RDF triples
- Search engines look for and use JSON-LD that use vocabularies they understand (i.e., schema.org)