JSON-LD Update

State of JSON-LD in 2017

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http://greggkellogg.net/presentations/JSON-LD-Update-DC-2017/

Quite Successful Format

- The October 2016 Common Crawl reports over 2.1 million (out of 34 million) domains include JSON-LD [1] (highest is Microdata at 2.5 million).

- JSON-LD is one of the formats supported by schema.org, in addition to Microdata and RDFa [2].

- JSON-LD is a required format in the Linked Data platform [3].

- JSON-LD is becoming popular for many other REST APIs.

[1] webdatacommons.org/structureddata/#results-2016-1
[2] http://blog.schema.org/2013/06/schemaorg-and-json-ld.html
[3] https://www.w3.org/TR/ldp/

Keys to Success

- A primary goal was to allow JSON developers to use it as if it is normal JSON.

  The syntax is designed to not disturb already deployed systems running on JSON, but provide a smooth upgrade path from JSON to JSON-LD. Since the shape of such data varies wildly, JSON-LD features mechanisms to reshape documents into a deterministic structure which simplifies their processing [4].

- JSON-LD allows developers to focus on the JSON, but modelers to get back to the RDF data model for semantic analysis and validation.

[4] https://www.w3.org/TR/json-ld/

JSON-LD – Key Features

- Add `@context` to JSON to associate terms (properties) with IRIs which define them.

  - Describe the expected types for string values of properties

    - IRI, Dates, Numbers, …

    - Treat collections as lists or sets.

- Encourage the use of well-known identifiers for entities, and provide typing (`@id` and `@type`).

- (much more, see <u>JSON-LD 1.0</u> for a complete feature set).

JSON-LD 1.1

- It's been over three years since JSON-LD 1.0 was published, and feature requests have been mounting:

  - 36 issues addressed since 1.0 (15 still open)

  - Use objects to index into collections, rather than only array form

    - Previously restricted to `@index` and `@language`. Now available on `@id` and `@type`.

    - Can include `@set` with other container types (e.g.: `"@container": ["@set", "@language"]`).

  - Framing, never complete in 1.0. Now provides ability to match on `@id`, inclusive or exclusive `@type`, property values, and specifics of a value object. Supports framing of datasets, not just graphs.

  - Contexts scoped to terms: property values or entities using a given type term can overlay terms-specific contexts.

  - Ignore some elements of JSON structure.

  - Abstract from JSON-itself, allowing for <u>YAML</u>, <u>CBOR</u> and other LD representations.

Version Announcement

- For backwards compatibility, version 1.1 must be specified to use new 1.1 features (may be through API).

```json
{
  "@context":
  {
    "@version": 1.1,
    "schema": "http://schema.org/",
    "name": "schema:name",
    "body": "schema:articleBody",
    "words": "schema:wordCount",
    "post": {
      "@id": "schema:blogPost",
      "@container": "@id"
    }
  },
  "@id": "http://example.com/",
  "@type": "schema:Blog",
  "name": "World Financial News",
  …
}
```

@id Maps

```json
{
  "@context":
  {
    "@version": 1.1,
    "schema": "http://schema.org/",
    "name": "schema:name",
    "body": "schema:articleBody",
    "words": "schema:wordCount",
    "post": {
      "@id": "schema:blogPost",
      "@container": "@id"
    }
  },
  "@id": "http://example.com/",
  "@type": "schema:Blog",
  "name": "World Financial News",
  "post": {
    "http://example.com/posts/1/en": {
      "body": "World commodities were up today with heavy trading of crude oil...",
      "words": 1539
    },
    "http://example.com/posts/1/de": {
      "body": "Die Werte an Warenbörsen stiegen im Sog eines starken Handels von Rohöl...",
      "words": 1204
    }
  }
}
```

Nested Properties

```json
{
  "@context": {
    "@version": 1.1,
    "skos": "http://www.w3.org/2004/02/skos/core#",
    "labels": "@nest",
    "main_label": {"@id": "skos:prefLabel"},
    "other_label": {"@id": "skos:altLabel"},
    "homepage": {"@id": "http://schema.org/description", "@type": "@id"}
  },
  "@id": "http://example.org/myresource",
  "homepage": "http://example.org",
  "labels": {
    "main_label": "This is the main label for my resource",
    "other_label": "This is the other label"
  }
}
```

Scoped Contexts

```json
{
  "@context": {
    "@version": 1.1,
    "name": "http://schema.org/name",
    "interest": {
      "@id":"http://xmlns.com/foaf/0.1/interest",
      "@context": {"@vocab": "http://xmlns.com/foaf/0.1/"}
    }
  },
  "name": "Manu Sporny",
  "interest": {
    "@id": "https://www.w3.org/TR/json-ld/",
    "name": "JSON-LD",
    "topic": "Linking Data"
  }
}
```

Scoped Contexts (@type)

```
{
  "@context": {
    "@version": 1.1,
    "name": "http://schema.org/name",
    "interest": "http://xmlns.com/foaf/0.1/interest",
    "Document": {
      "@id": "http://xmlns.com/foaf/0.1/Document",
      "@context": {"@vocab": "http://xmlns.com/foaf/0.1/"}
    }
  },
  "@type": "Person",
  "name": "Manu Sporny",
  "interest": {
    "@id": "https://www.w3.org/TR/json-ld/",
    "@type": "Document",
    "name": "JSON-LD",
    "topic": "Linking Data"
  }
}
```

Improve Compact IRIs

- Previously, when compacting, compact IRIs could be created that were not intended.

  - E.g., defining a term "sport" could cause the creation of a term "sport:sEvent", where "schema:sportsEvent" was intended.

  - Now, terms only used for creating Compact IRIs if the term ends with a ":" or the value of the term is an IRI ending with "/" or "#".

Open Issues

- Add an `@graph` container type [#195].

- Unmapped JSON values [#333].

- Remove unnecessary use of `@graph` in framed output [#435].

- Improve use of language maps with values not having a language [#480].

- HTTP Request profile to specify compaction context or frame [#491].

JSON-LD 1.1 Timeline

- All work being done in Community Group [5][6].

- With enough interest, a Working Group could be spun up to create a Recommendation, and possibly address additional requirements.

  - Suggested Plenary for TPAC 2017

- Expect community drafts to complete in Q4 2017 (Please comment to help get approved).

  - Ruby implementation conforms to all changes in CG specs.

    - Live at Ruby RDF Distiller.

  - Changes likely easily applied to Python, Javascript, PHP, Java, C#, Go and other implementations.

  - Still no publicly available implementation in "C".

[5] https://www.w3.org/community/json-ld/
[6] http://json-ld.org

Related Topics for using JSON-LD

Shape Expressions (ShEx)

- ShEx [7] is used for validating graph patterns, similar to, but less complex then SHACL.

  - JSON grammar is JSON-LD/RDF. Also has Compact Grammar.

```json
{ "type":"Schema", "shapes": [{
    "id": "http://schema.example/PersonShape",
    "type": "Shape", "expression": {
      "type": "TripleConstraint",
      "predicate": "http://xmlns.com/foaf/0.1/
name"
    }
  }, {
    "id": "http://schema.example/EmployeeShape":,
    "type": "Shape", "expression": {
      "type": "EachOf", "shapeExprs": [
        "http://schema.example/PersonShape",
        { "type": "TripleConstraint",
          "predicate": "http://schema.example/
employeeNumber" }
      ]
    }
  }]
}
```

```
ex:PersonShape {
  foaf:name .
}

ex:EmployeeShape {
  &ex:PersonShape ;
  ex:employeeNumber .
}
```

[7] https://shexspec.github.io/spec

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Decentralized Identifiers

- The WebDHT [8] proposes to use the block-chain for as an identifier space with immutable content in the block chain.

    - Content is a JSON-LD document, so may be used as the target of a `@context`.

    - Content will not change, so may be cached or distributed out-of-band.

    - Content signed to guarantee veracity.

[8] http://opencreds.org/specs/source/webdht/

Linked Data Signatures

- Mechanism for signing Linked Data documents [9]

  - Part of the work of the Digital Verification Community Group [10]
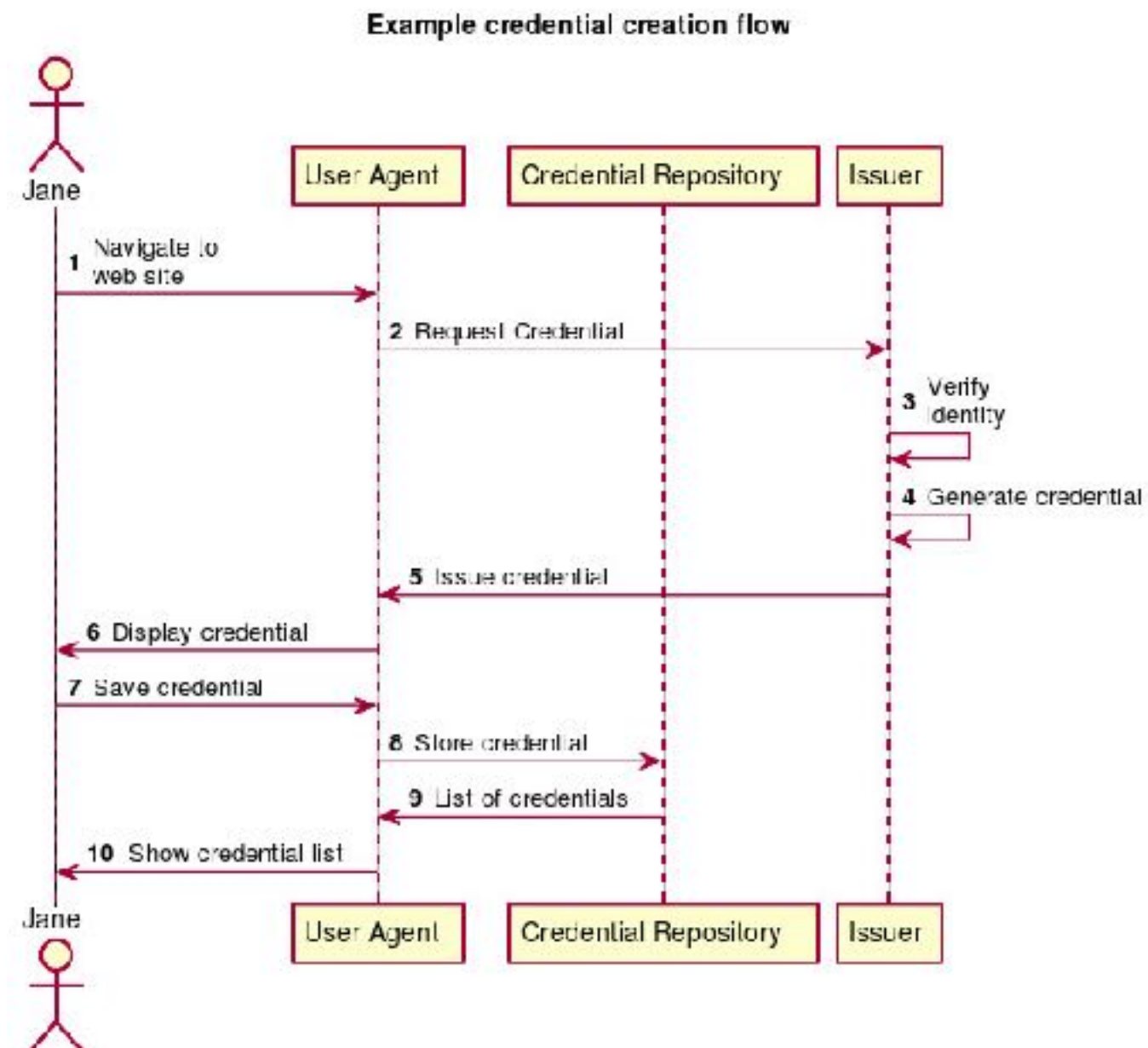
```
{
  "@context": "https://w3id.org/identity/v1",
  "title": "Hello World!",
  "signature": {
    "type": "LinkedDataSignature2015",
    "creator": "http://example.com/i/pat/keys/5",
    "created": "2011-09-23T20:21:34Z",
    "domain": "example.org",
    "nonce": "2bbgh3dgjg2302d-d2b3gi423d42",
    "signatureValue": "OGQzNGVkMzVm4NTIyZTkZDY...NmExMgoYzI43Q3ODIyOWM32NjI="
  }
}
```

[9] https://w3c-dvcg.github.io/ld-signatures/
[10] https://w3c-dvcg.github.io/

Verifiable Claims

- Close to becoming a Working group [12].

  - Could be a source of identity for WoT.

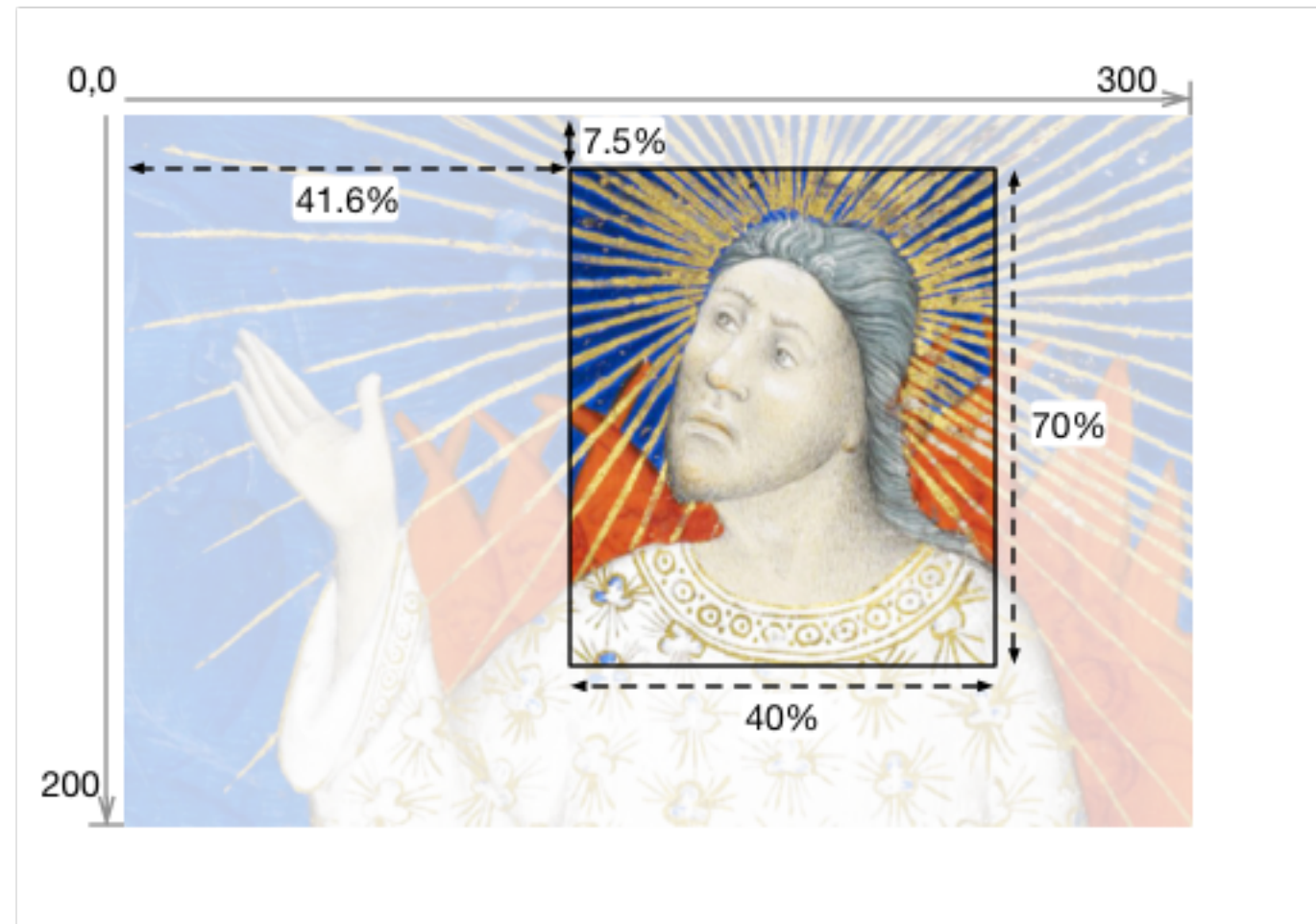- Defines a data model and syntax for making claims [13].

Example credential creation flow

[12] http://w3c.github.io/vctf/charter/proposal.html
[13] https://opencreds.github.io/vc-data-model/

International Image Interoperability Format

- IIIF uses JSON-LD 1.1 to allow @type and @id indexing and term-specific contexts

  - See http://iiif.io/api/image/2.1/

More Information

json-ld.org
json-ld.org/spec/latest/json-ld/
json-ld.org/spec/latest/json-ld-api/
json-ld.org/spec/latest/json-ld-framing/
github.com/json-ld/json-ld.org/issues
w3.org/community/json-ld/

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