

# JSON-LD



# JSON

```
{  
  "homepage": "http://me.markus-lanthaler.com",  
  "name": "Markus Lanthaler",  
  "workplaceHomepage": "http://www.tugraz.at/"  
}
```

This is the person's id!

<http://xmlns.com/foaf/0.1/name>

<http://xmlns.com/foaf/0.1/workplaceHomepage>

<http://xmlns.com/foaf/0.1/Person>

*How to represent semantic data in JSON?*



# JSON-LD

```
{  
  "homepage": "http://me.markus-lanthaler.com",  
  "name": "Markus Lanthaler",  
  "workplaceHomepage": "http://www.tugraz.at/"  
}
```

This is the person's id!

<http://xmlns.com/foaf/0.1/name>

<http://xmlns.com/foaf/0.1/workplaceHomepage>

<http://xmlns.com/foaf/0.1/Person>

---

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

*JSON Linked Data (JSON-LD)*  
[json-ld.org](http://json-ld.org)



# JSON-LD to Turtle

---

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

*JSON Linked Data (JSON-LD)*  
*json-ld.org*



# JSON-LD to Turtle

<<http://me.markus-lanthaler.com>>

---

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

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*[json-ld.org](http://json-ld.org)*



# JSON-LD to Turtle

```
<http://me.markus-lanthaler.com>  
  a      http://xmlns.com/foaf/0.1/Person”;
```

---

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

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*json-ld.org*



# JSON-LD to Turtle

```
<http://me.markus-lanthaler.com>  
  a      http://xmlns.com/foaf/0.1/Person";  
  <http://xmlns.com/foaf/0.1/name>  
    "Markus Lanthaler";
```

---

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

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# JSON-LD to Turtle

```
<http://me.markus-lanthaler.com>
  a      http://xmlns.com/foaf/0.1/Person";
  <http://xmlns.com/foaf/0.1/name>
    "Markus Lanthaler";
  <http://xmlns.com/foaf/0.1/workplaceHomepage>
    <http://www.tugraz.at/"> .
```

---

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

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# Some reserved keys in JSON-LD

- **@type**: signifies that the JSON object with the @type key has a particular RDF type (or several types)
- **@id**: signifies that the JSON object with the @id key is identified by a particular IRI
- **@value**: signifies that a value is a literal
- **@context**: signifies a JSON object that contains the context (or semantic mapping) for the other objects in the same JSON array
- **@base**, **@graph**, **@language**, **@vocab**, ...



# JSON-LD context

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



# Another JSON-LD context

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



# JSON-LD forms

- The same graph can be expressed in several different ways:
  - expanded form: *expansion* removes context by pushing semantics out into the objects
  - compact form: *compaction* simplifies the objects by pulling semantics back into the context
  - *flattened* form: normalised form for easier parsing by computer – has both expanded and compact variant
- ...all these forms are easier to program than “free” JSON-LD, because they are more regular



# Programming JSON-LD



# Expansion

- Goals:
  - removing the contextual information object
  - pushing it out into the other objects
  - ensuring all values are in a regular form
- Steps:
  - expanding all properties to absolute IRIs
  - expressing all values in arrays in expanded form
- The most verbose and regular way of writing JSON-LD:
  - all contextual information is stored locally with each value



# Expansion (before)

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



# Expansion (after)

```
[
  {
    "@id": "http://me.markus-lanthaler.com/",
    "http://xmlns.com/foaf/0.1/name": [
      { "@value": "Markus Lanthaler" }
    ],
    "http://xmlns.com/foaf/0.1/homepage": [
      { "@id": "http://www.markus-lanthaler.com/" }
    ]
  }
]
```





# Compaction

- The opposite of extraction
  - based on a user-supplied context object
- Goals:
  - condensing contextual information into an object
  - pulling it out of the other objects
  - expressing data in application specific terms
  - making data easier to read for humans
  - make data easy to program against
- Steps:
  - condenses properties with IRIs
  - adds a @context to the array



# Compaction (before)

```
{
  "@id": "http://me.markus-lanthaler.com/",
  "http://xmlns.com/foaf/0.1/name": [
    { "@value": "Markus Lanthaler" }
  ],
  "http://xmlns.com/foaf/0.1/homepage": [
    { "@id": "http://www.markus-lanthaler.com/" }
  ]
}
```

+

```
{ "@context": {
  "name": "http://xmlns.com/foaf/0.1/name",
  "homepage": {
    "@id": "http://xmlns.com/foaf/0.1/homepage",
    "@type": "@id"
  }
}}
```



# Compaction (after)

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



# Flattening

- Expansion:
  - ensures that a document is in a uniform structure
- Flattening:
  - also ensures that the shape of the data is deterministic
- Steps:
  - all properties of a node are collected in a single JSON object
  - all blank nodes are labeled with a blank node identifier
- Flattening makes it easier to process JSON-LD data



# Flattening (before)

```
{
  "@context": {
    "name": "http://xmlns.com/foaf/0.1/name",
    "knows": "http://xmlns.com/foaf/0.1/knows"
  },
  "@id": "http://me.markus-lanthaler.com/",
  "name": "Markus Lanthaler",
  "knows": [
    {
      "name": "Dave Longley"
    }
  ]
}
```



# Flattening (after – expanded form)

```
[ {  
  "@id": "_:t0",  
  "http://xmlns.com/foaf/0.1/name": [  
    { "@value": "Dave Longley" }  
  ]  
},  
{  
  "@id": "http://me.markus-lanthaler.com/",  
  "http://xmlns.com/foaf/0.1/name": [  
    { "@value": "Markus Lanthaler" }  
  ],  
  "http://xmlns.com/foaf/0.1/knows": [  
    { "@id": "_:t0" }  
  ]  
}] }
```



# Flattening (after – compacted form)

```
{
  "@context": {
    "name": "http://xmlns.com/foaf/0.1/name",
    "knows": "http://xmlns.com/foaf/0.1/knows"
  },
  "@graph": [
    {
      "@id": "_:t0",
      "name": "Dave Longley"
    },
    {
      "@id": "http://me.markus-lanthaler.com/",
      "name": "Markus Lanthaler",
      "knows": { "@id": "_:t0" }
    }
  ]
}
```

