Hands on JSON

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About me

Software Architect at Syncro Soft

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- 15+ years of XML technology experience
- Contributor for various XML-related open source projects
- Editor of Schematron QuickFix specification developed by a W3C community group

Agenda

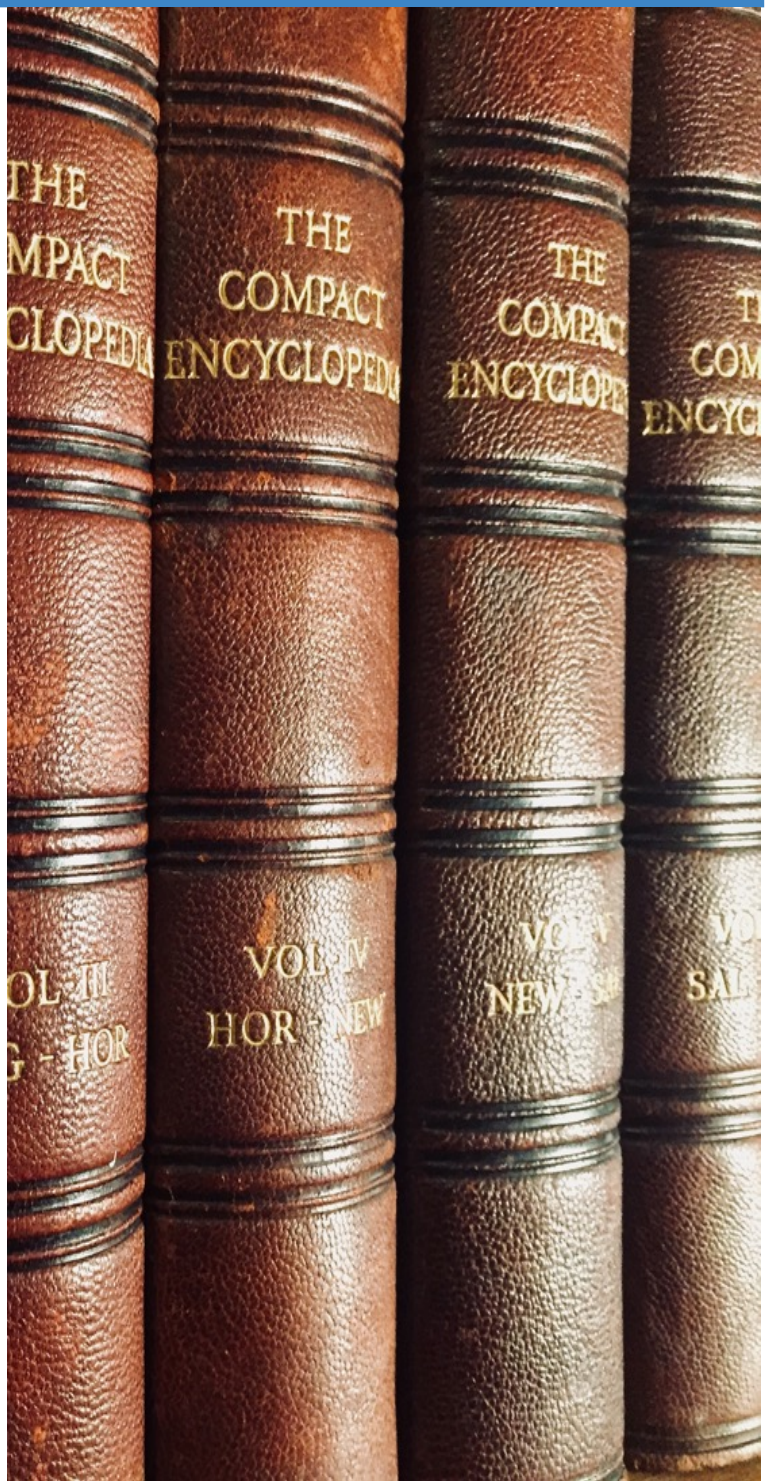
- JSON Documents Structure
- Validating JSON Documents
- Querying and Transforming JSON Documents
- Converting JSON Documents

JSON

(JavaScript Object Notation)

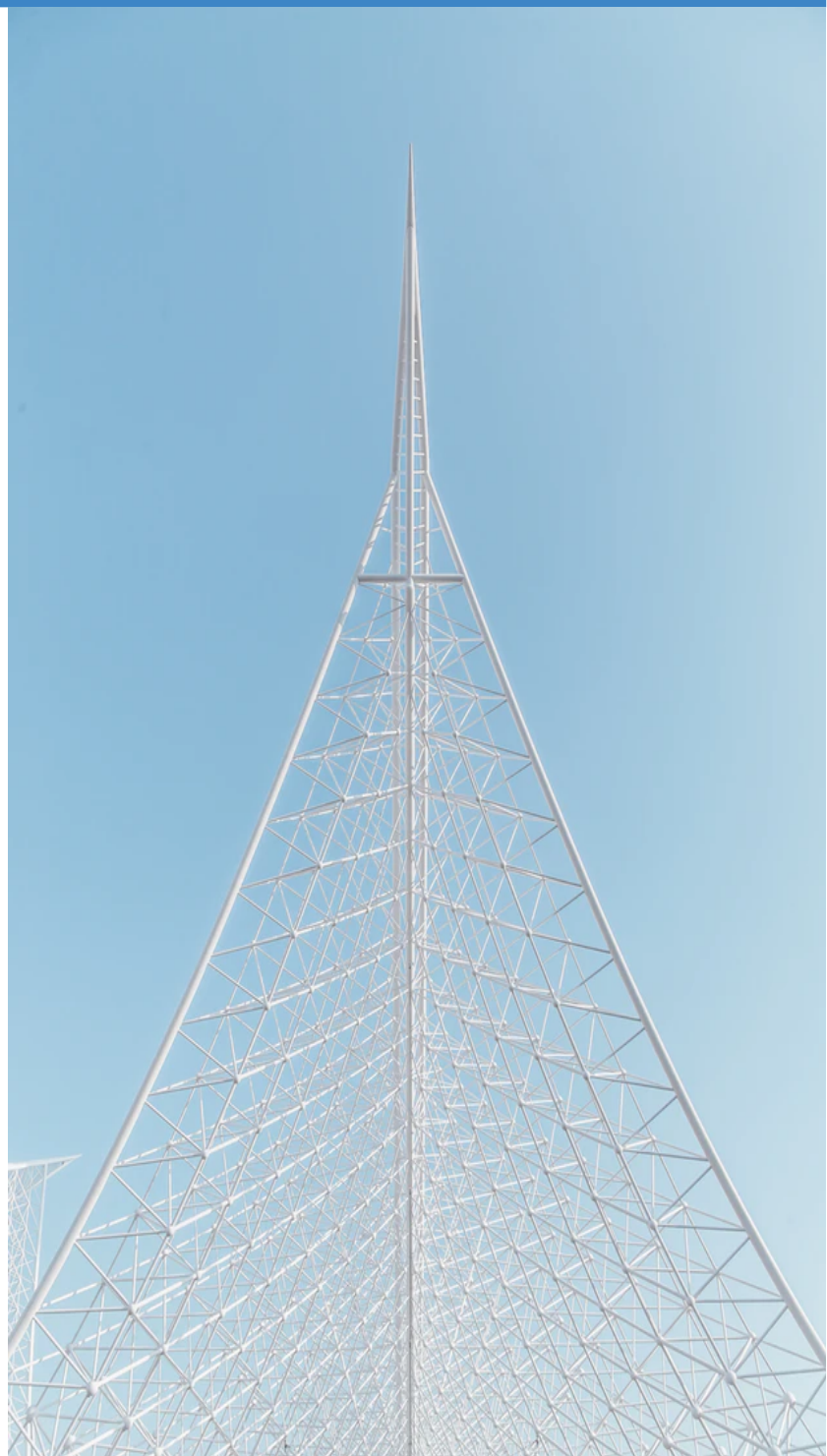
- Data representation format
- Used for API and Configs
- Lightweight and easy to read/write

http://json.org



JSON Documents Structure

- JSON Data – name/value pair
- JSON Object {...}
- JSON Array [...]



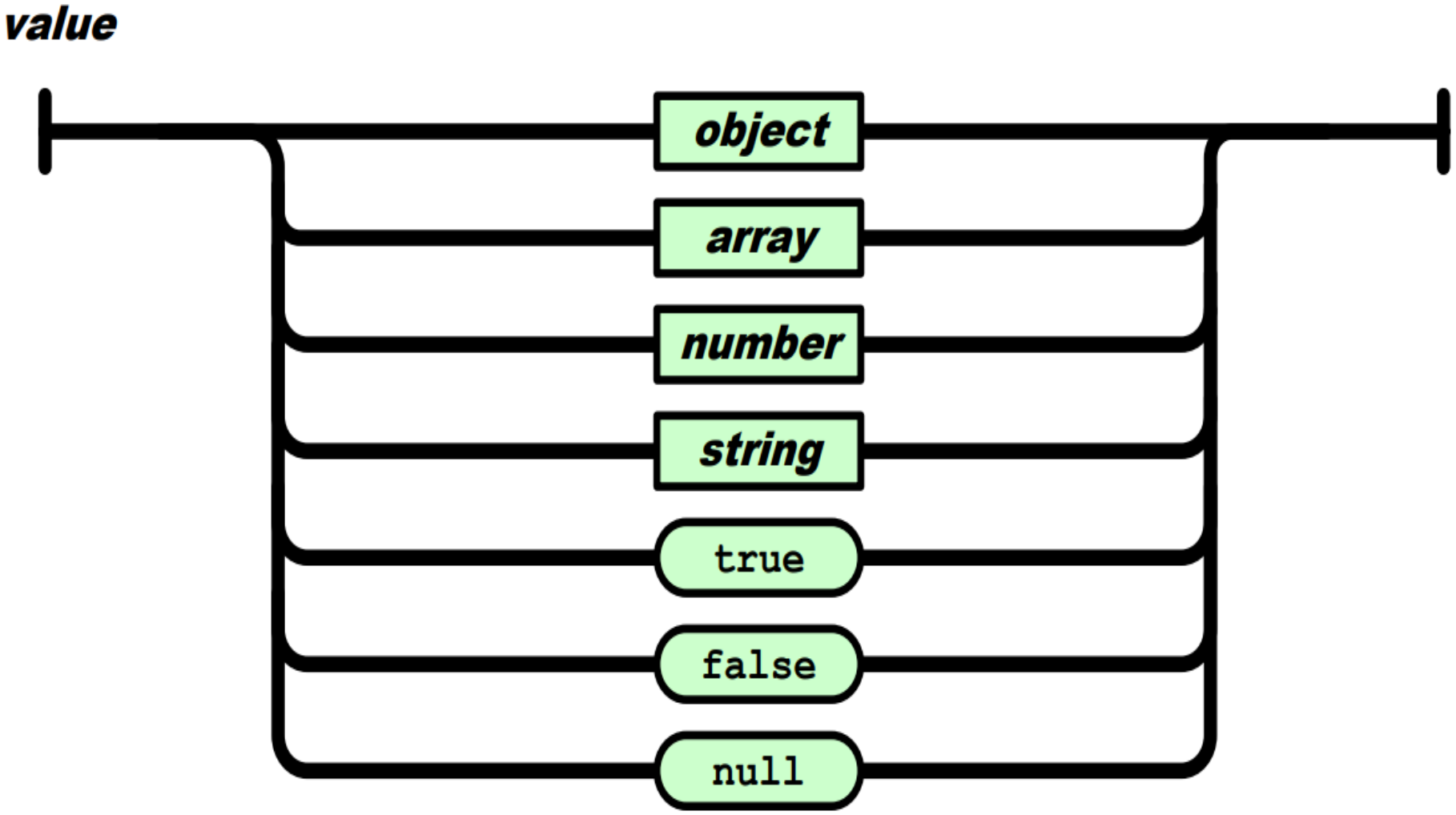
JSON Data

”firstname”: ”Jane”

- A collection of name/value pairs
- The name in double quotes, followed by a colon, followed by a value

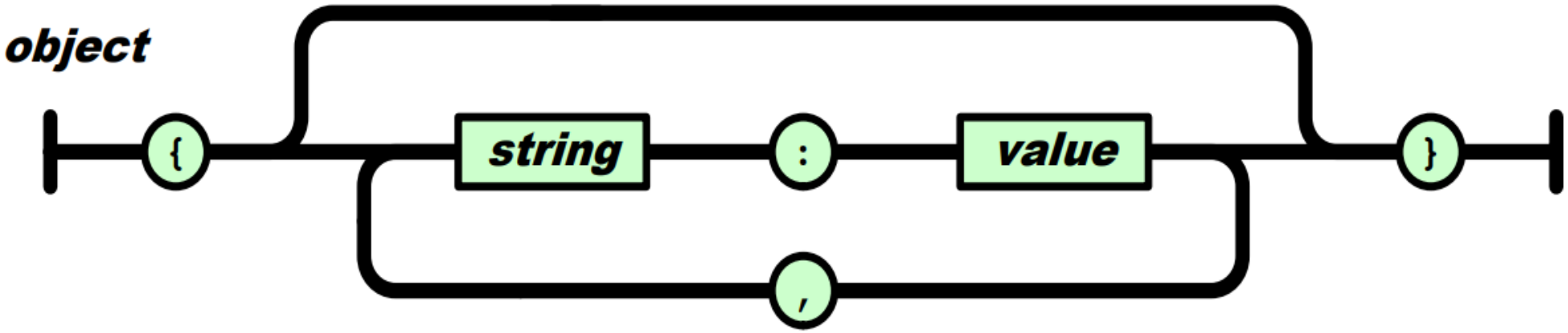
Value

{...}, [...], 2, "one", true, null



Object

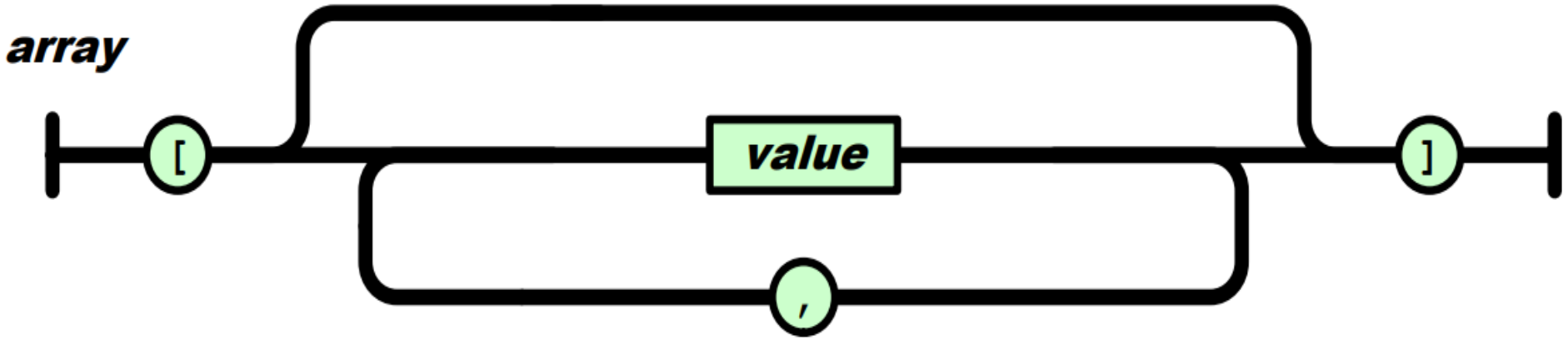
{”firstname”: ”Jane”, ”lastname": ”Doe”}



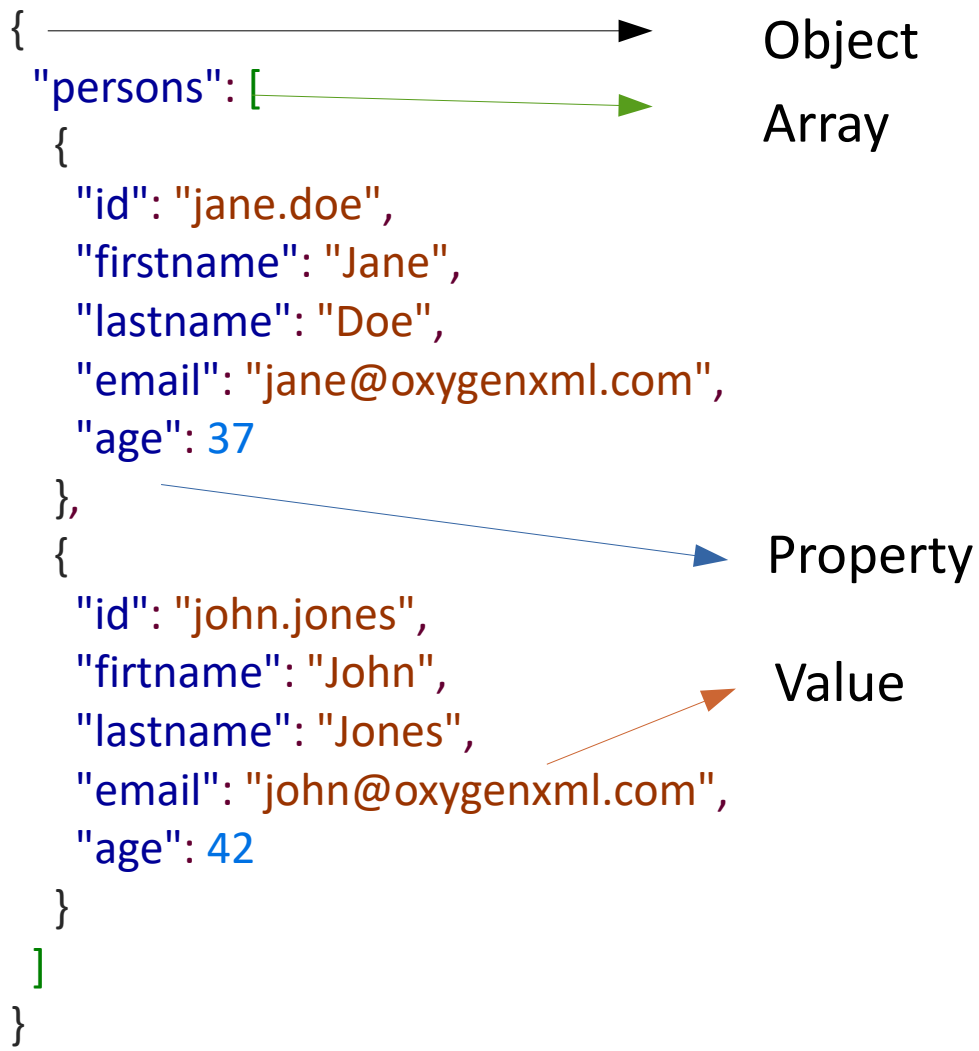
Array

[{”firstname”: ”Jane”, ”lastname": ”Doe”},

{”firstname”: ”John”, ”lastname": ”Jones”}]



Example


{
"persons": [
{
"id": "jane.doe",
"firstname": "Jane",
"lastname": "Doe",
"email": "jane@oxygenxml.com",
"age": 37
},
{
"id": "john.jones",
"firtname": "John",
"lastname": "Jones",
"email": "john@oxygenxml.com",
"age": 42
}
]
}
Object
Array
Property
Value

Validating JSON Documents

- Checking Well-Formedness in JSON Documents
- Validating JSON Documents Against JSON Schema
- Validating JSON Schema According to the Specification

Checking Well-Formedness

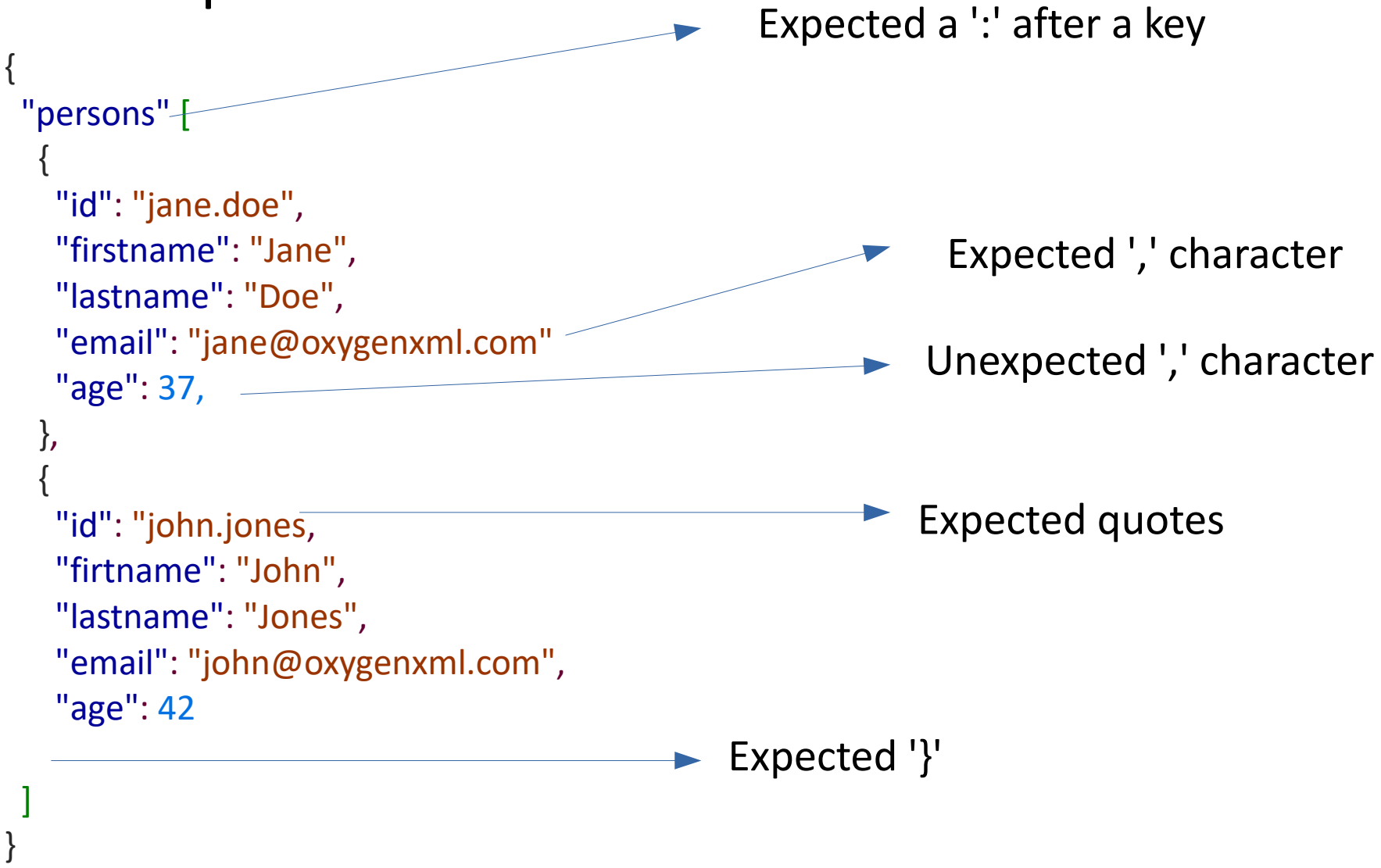
Check if the JSON document respects the JSON specification

```
{
  "id": "jane.doe",
  "firstname": "Jane",
  "lastname": "Doe",
  "email": "jane@oxygenxml.com",
  "age": 37
}
```

ECMA-404 The JSON Data Interchange Standard

http://json.org/

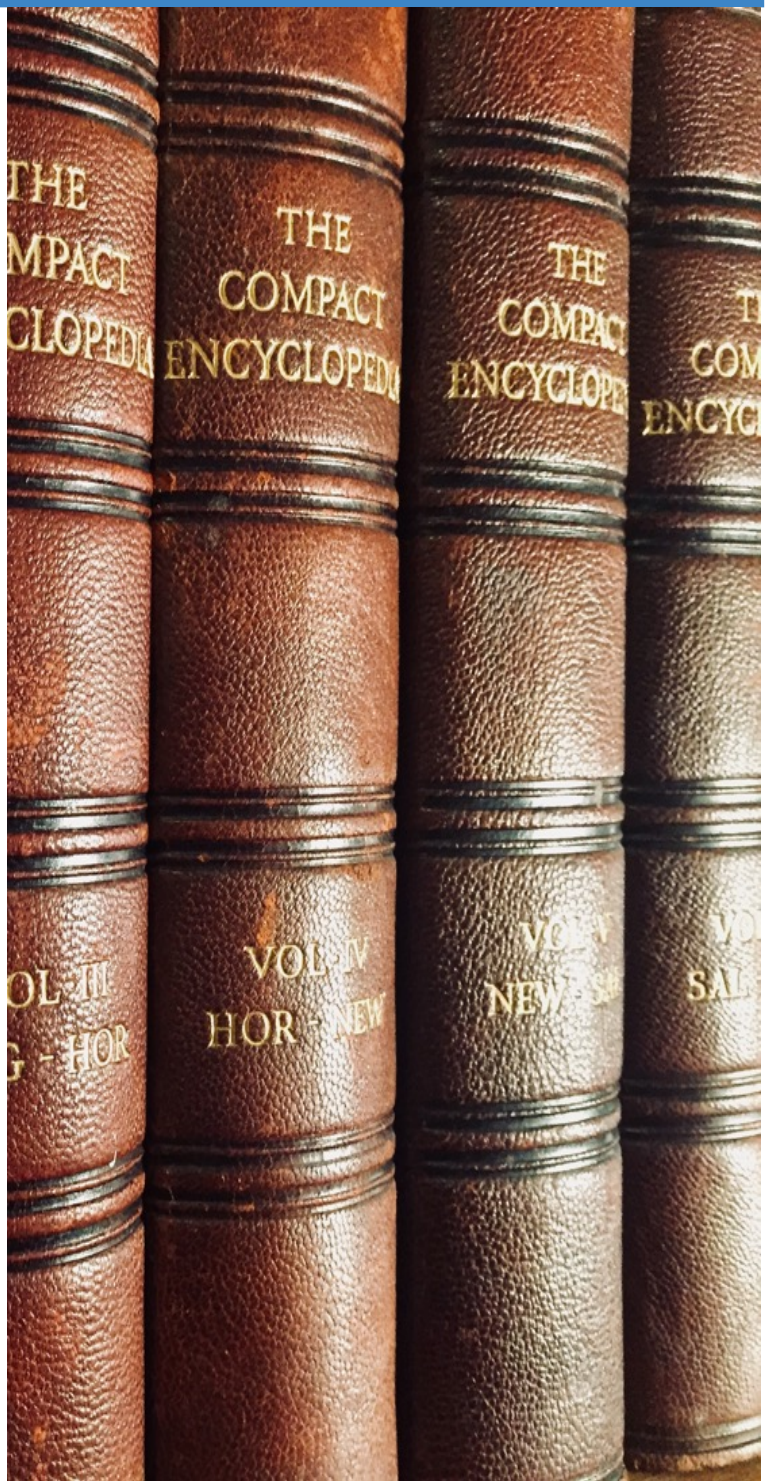
Example


Expected a ':' after a key
{
"persons" [
{
"id": "jane.doe",
"firstname": "Jane",
"lastname": "Doe",
"email": "jane@oxygenxml.com"
"age": 37,
},
{
"id": "john.jones,
"firtname": "John",
"lastname": "Jones",
"email": "john@oxygenxml.com",
"age": 42
]
}
Expected ',' character
Unexpected ',' character
Expected quotes
Expected '}'

JSON Schema

JSON Schema is a vocabulary that allows you to annotate and validate JSON documents

http://json-schema.org



Defining JSON Schema

- Similar to XML Schema, RNG, or DTD
- Written in JSON
- Used to define the structure of a JSON data

```
{"type": "string"}
```

JSON Schema

```
"I'm a string"
```

JSON Instance

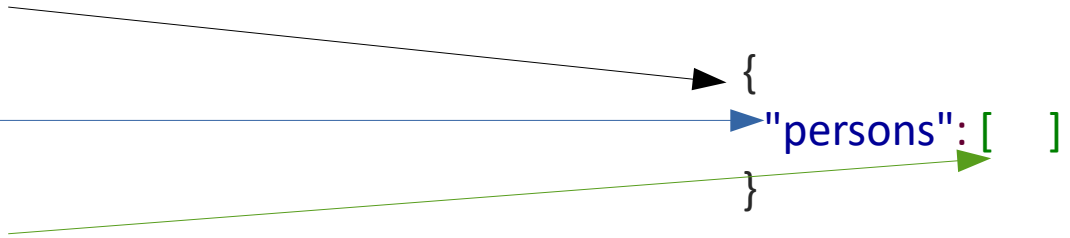
Example

JSON Schema

```
{
  "type": "object",
  "properties": {
    "persons": {
      "type": "array"
    }
  }
}
```

JSON Instance

```
{
"persons": [    ]
}
```



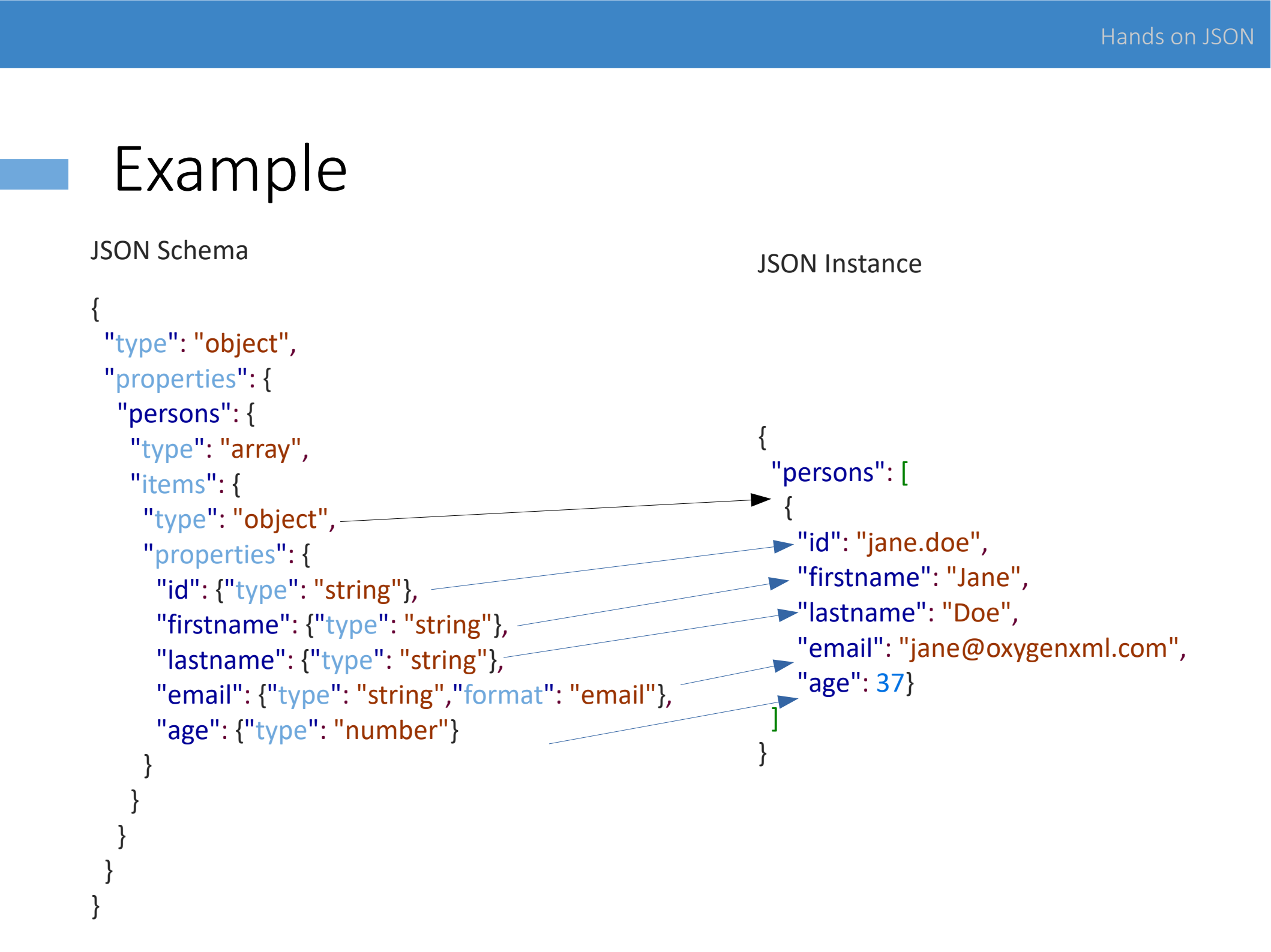
Example

JSON Schema

```
{
 "type": "object",
 "properties": {
  "persons": {
   "type": "array",
   "items": {
    "type": "object",
    "properties": {
     "id": {"type": "string"},
     "firstname": {"type": "string"},
     "lastname": {"type": "string"},
     "email": {"type": "string","format": "email"},
     "age": {"type": "number"}
    }
   }
  }
 }
}
```

JSON Instance

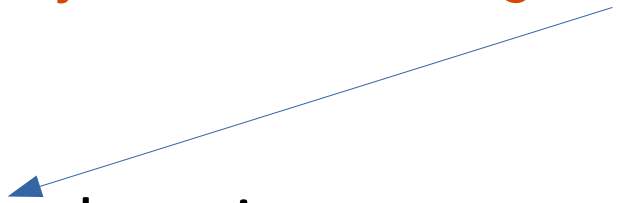
```
{
 "persons": [
  {
   "id": "jane.doe",
   "firstname": "Jane",
   "lastname": "Doe",
   "email": "jane@oxygenxml.com",
   "age": 37}
  ]
}
```



JSON Schema Definition

- It is recommended to to have the schema definition on the first level

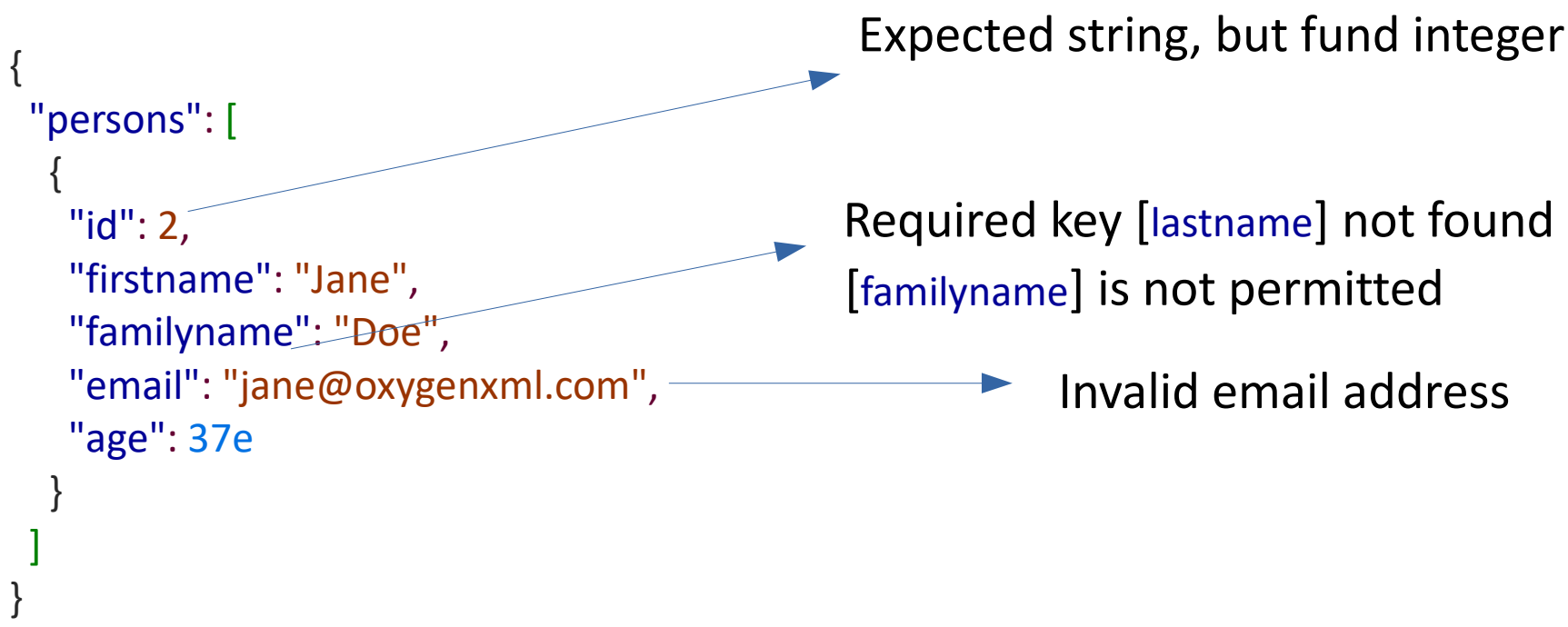
```
"$schema": "http://json-schema.org/draft-07/schema#"
```



- JSON Schema used versions:
  - Draft 4
  - Draft 6
  - Draft 7
  - Draft 8

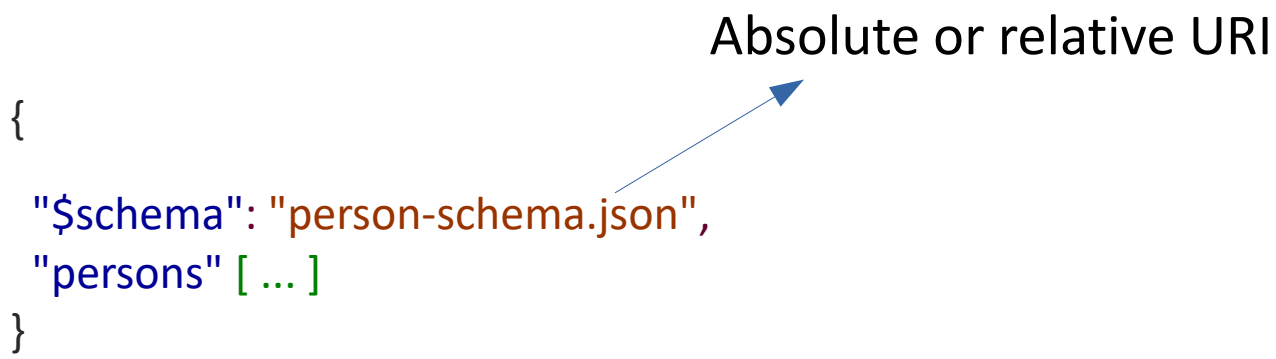
Validating with JSON Schema

- Check if the JSON instance respects the definitions



Associate JSON Schema

- Associating a Schema to JSON Documents
  - Directly in JSON document – using $schema property
  - In application options



Validating JSON Schema

- Check for well-formedness
- Validate accordingly to the Internet Engineering Task Force (IETF) Specification

Validating JSON with Schematron

- Specify the JSON structure using JSON Schema
- Express co-constraints and define custom rules using Schematron

Schematron for JSON

- Use XPath to express the rules

```
<sch:rule context="persons">
   <sch:assert test="number(age) > preceding-sibling::node()/age ">
      The person age must be grater than the previous person age </sch:assert>
</sch:rule>
```

Schematron using JSONPath

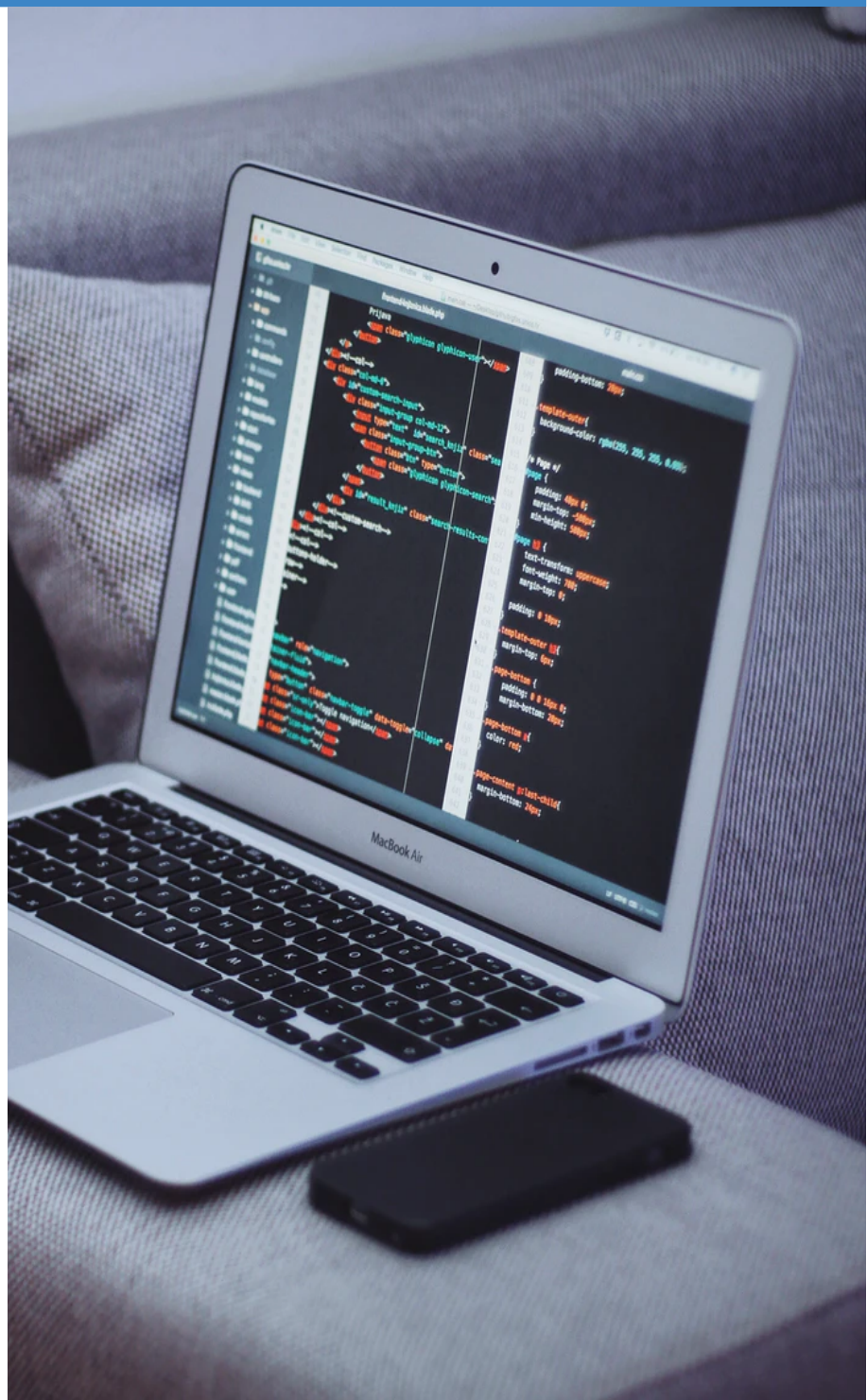
- Schematron reimagined for JSON with no whiff of XML/XPath
- Moved out of the XPath and use JSONPath

```
"rule": [
 {"context": "$.persons.*",
  "assert": [
   {"test": "(jp.query(contextNode,'$..age') >= 21",
    "message": "The person age must be grater than 21"
   }
  ]
 }
]
```

https://github.com/amer-ali/jsontron

Querying and Transforming

- Query using JSON Pointer, JSONiq, or XPath
- Transform JSON using JavaScript, XSLT, XQuery



JSON Pointer

Used to identify a specific value within a JSON document

#/persons/0/email

Matches first person email

Specification

https://tools.ietf.org/html/rfc6901

JSONiq

A query and processing language for JSON

www.jsoniq.org

```
let $stats := collection("stats")
for $access in $stats
group by $url := $access.url
return
{
  "url": $url,
  "avg": avg($access.response_time),
  "hits": count($access)
}
```

XPath

- Powerful language for queering XML documents
- Was adopted by applications also for JSON

/persons[2]/email

Matches second person email

Process JSON with JavaScript

- Most popular way to process JSON documents
- Multiple libraries

```
var json = '{"name":"John Doe", "age":42}';
obj = JSON.parse(json);

console.log(obj.name); // Result John Doe
console.log(obj.age); // Result 42
```

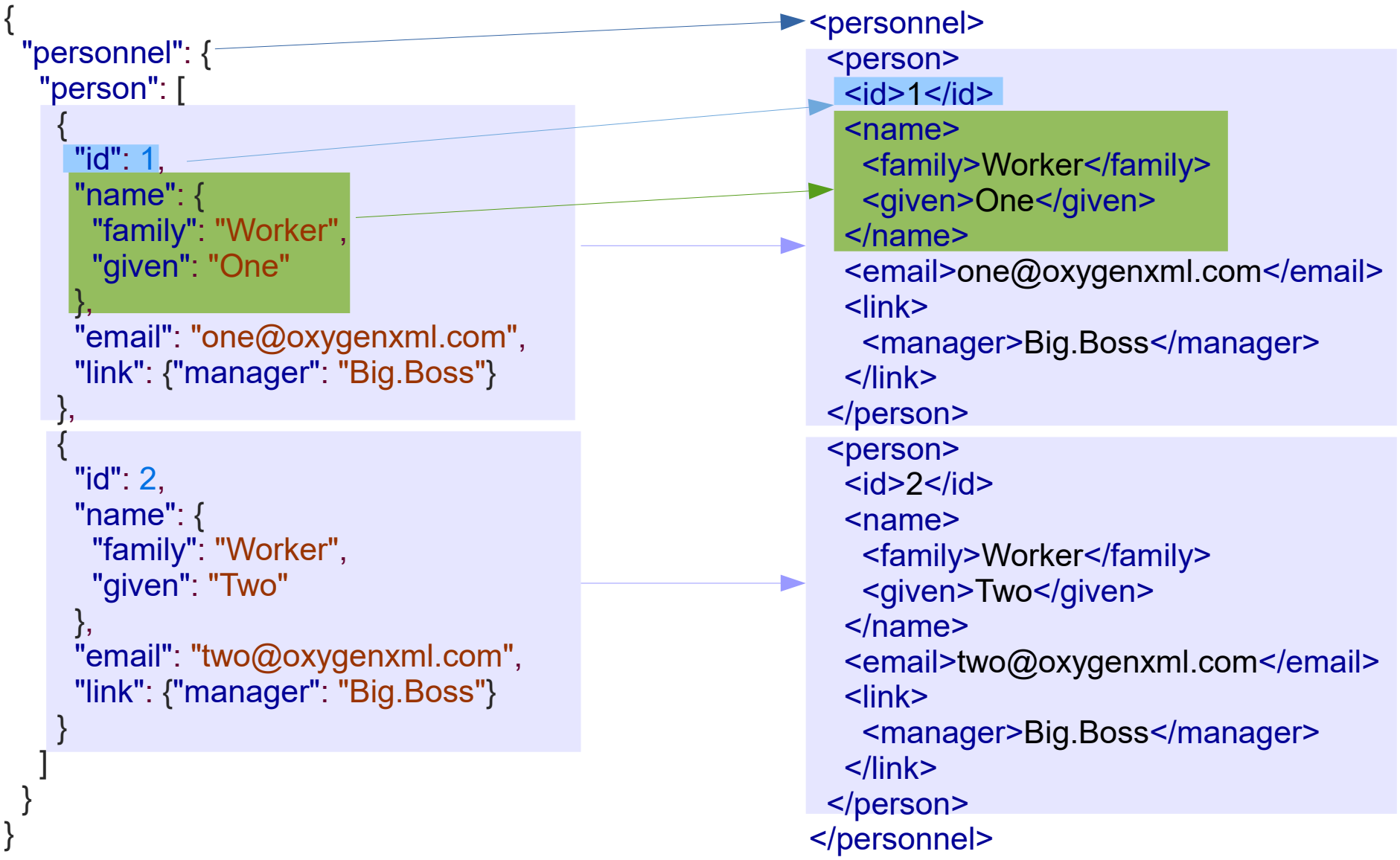
Transform using XSLT/XQuery

- Transform JSON Documents to Different Formats
- Different functions to process JSON document:
  - json-doc($href as xs:string?) as item()?
  - json-to-xml($json-text as xs:string?) as document-node()?

Converting JSON Documents

- JSON to XML and XML to JSON
- Convert using XSLT
- Online Converters

JSON to XML


{
"personnel": {
"person": [
{
"id": 1,
"name": {
"family": "Worker",
"given": "One"
},
"email": "one@oxygenxml.com",
"link": {"manager": "Big.Boss"}
},
{
"id": 2,
"name": {
"family": "Worker",
"given": "Two"
},
"email": "two@oxygenxml.com",
"link": {"manager": "Big.Boss"}
}
]
}
}
<personnel>
<person>
<id>1</id>
<name>
<family>Worker</family>
<given>One</given>
</name>
<email>one@oxygenxml.com</email>
<link>
<manager>Big.Boss</manager>
</link>
</person>
<person>
<id>2</id>
<name>
<family>Worker</family>
<given>Two</given>
</name>
<email>two@oxygenxml.com</email>
<link>
<manager>Big.Boss</manager>
</link>
</person>
</personnel>

JSON to XML Conversion Details

- A <JSON> element is added as root if the converted JSON has multiple properties on the first level

```
{
  "person": "one",
  "id": "personnel-id"
}
```

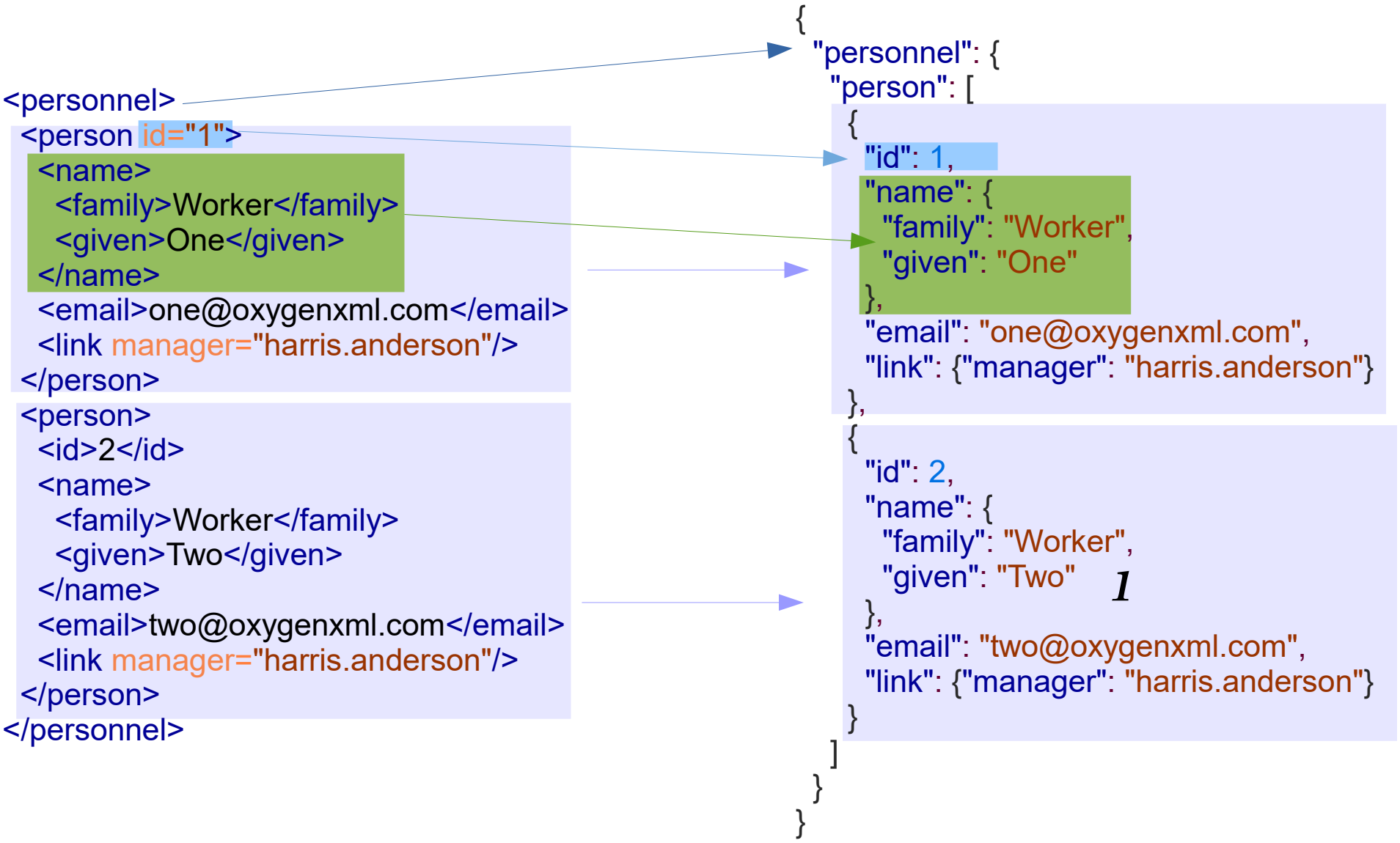
```
<JSON>
  <person>one</person>
  <id>personnel-id</id>
</JSON>
```

- An <array> element is added as root if the converted JSON is an array

```
[
  {"name": "Boss"},
  {"name": "Worker"}
]
```

```
<array>
  <array>
    <name>Boss</name>
  </array>
  <array>
    <name>Worker</name>
  </array>
</array>
```

XML to JSON


<personnel>
<person id="1">
<name>
<family>Worker</family>
<given>One</given>
</name>
<email>one@oxygenxml.com</email>
<link manager="harris.anderson"/>
</person>
<person>
<id>2</id>
<name>
<family>Worker</family>
<given>Two</given>
</name>
<email>two@oxygenxml.com</email>
<link manager="harris.anderson"/>
</person>
</personnel>
{
"personnel": {
"person": [
{
"id": 1,
"name": {
"family": "Worker",
"given": "One"
},
"email": "one@oxygenxml.com",
"link": {"manager": "harris.anderson"}
},
{
"id": 2,
"name": {
"family": "Worker",
"given": "Two"
},
"email": "two@oxygenxml.com",
"link": {"manager": "harris.anderson"}
}
]
}
}

XML to JSON Conversion Details

- XML attributes are converted to properties

```
<person id="1"/>                    {"person": {"id": 1}}
```

- Multiple elements with the same name are converted into an array

```
<person/> <person/>                 "person": ["",""]
```

- Text in mixed content will be converted in a **#text** property

```
<p>This is an <b>example</b>!</p>   p": {"#text": "This is an","b": "example","#text1": "!"}
```

Convert using XSLT

- Library that converts XML to JSON using XSLT

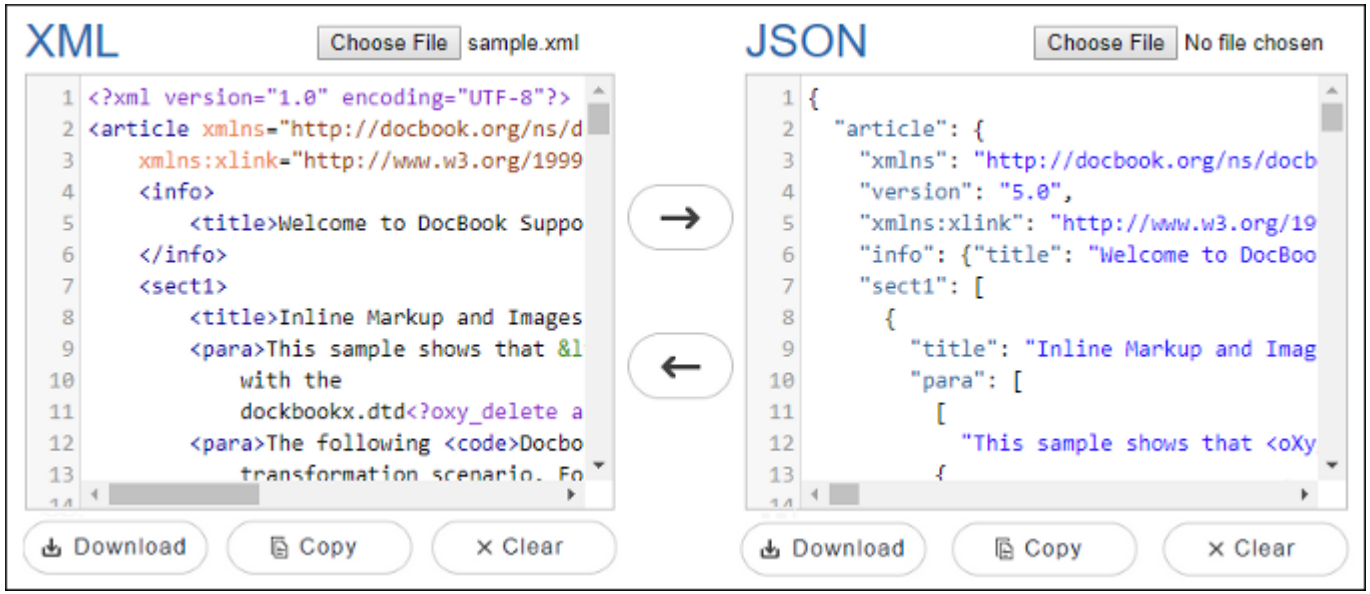
  https://github.com/bramstein/xsltjson

XSLT Specification for JSON

http://www.w3.org/TR/xslt-30/#json

Online Converter

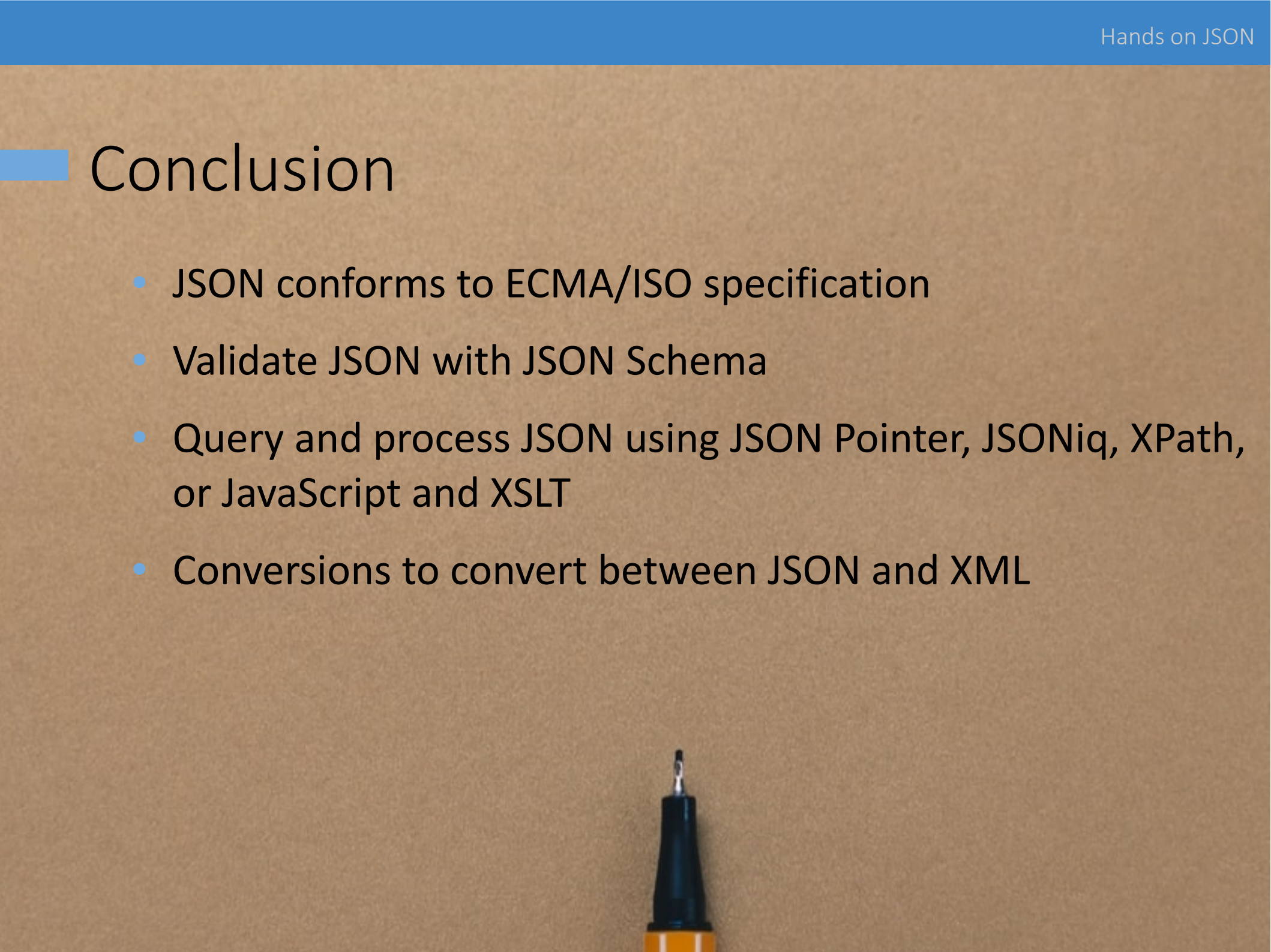
- Online XML to JSON Converters



Convert between XML and JSON

Conclusion

- JSON conforms to ECMA/ISO specification
- Validate JSON with JSON Schema
- Query and process JSON using JSON Pointer, JSONiq, XPath, or JavaScript and XSLT
- Conversions to convert between JSON and XML



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STUTTGART, 12. – 14. NOVEMBER

Questions?

https://sundt01.honestly.de

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