

JSON Schema

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Verteilte Anwendungssysteme, WS 17/18

Agenda

- Einführung
- Grundlagen
- Fortgeschrittene Techniken
- Übung

Einführung



Was ist JSON?

- Java Script Object Notation
- Kompaktes Datenformat
- JSON-Dokument = gültiges JavaScript
- Unabhängig von Programmiersprache
- Codierung in UTF-8

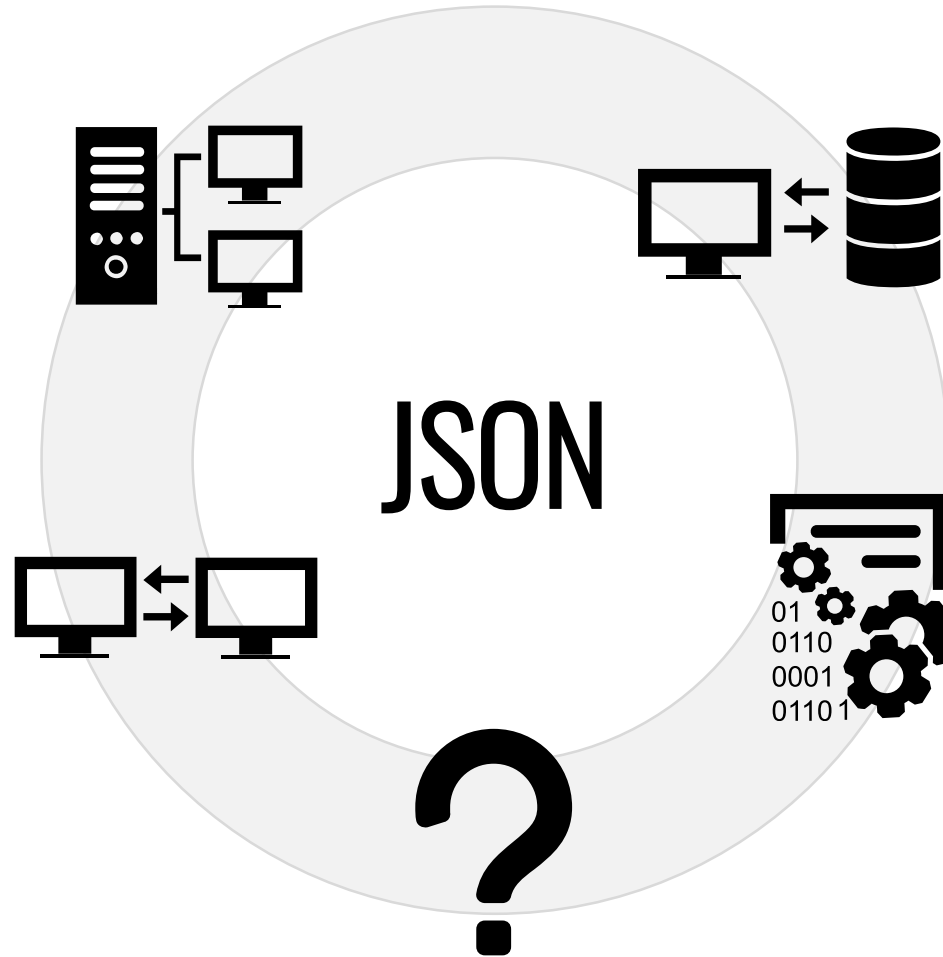
```
{  
  "topic": "JSON Schema",  
  "date": "2017-12-12",  
  "speaker": "Daniel Flasch"  
}
```

Die Syntax

- Objektaufbau mit Key/Value
- Komma als Trennzeichen
- Datentypen
 - Objekte { }
 - Arrays []
 - Zahlen: 42/4.2
 - Strings " "
 - Boolean true/false
 - null

```
{
  "firstName": "John",
  "lastName": "Smith",
  "isAlive": true,
  "age": 27,
  "address": {
    "streetAddress": "21 2nd Street",
    "city": "New York",
    "state": "NY",
    "postalCode": "10021-3100"
  },
  "phoneNumbers": [
    {
      "type": "home",
      "number": "212 555-1234"
    },
    {
      "type": "mobile",
      "number": "123 456-7890"
    }
  ]
}
```

Wofür wird es verwendet?



Vergleich XML und JSON

Gemeinsamkeiten

- Selbstbeschreibend
- Hierarchischer Aufbau

Vorteile JSON { ... }

- Geringerer Overhead
- Einfaches Parsen
- Native Verwendung im JS-Umfeld

```
{"employees": [  
  { "firstName": "John", "lastName": "Doe" },  
  { "firstName": "Anna", "lastName": "Smith" },  
  { "firstName": "Peter", "lastName": "Jones" }  
]}
```

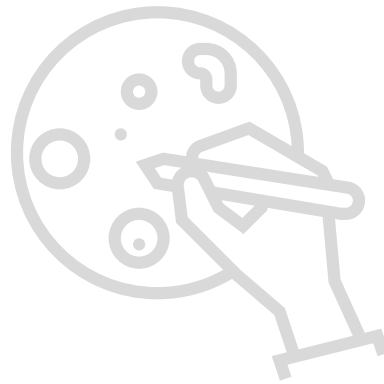
```
<employees>  
  <employee>  
    <firstName>John</firstName> <lastName>Doe</lastName>  
  </employee>  
  <employee>  
    <firstName>Anna</firstName> <lastName>Smith</lastName>  
  </employee>  
  <employee>  
    <firstName>Peter</firstName> <lastName>Jones</lastName>  
  </employee>  
</employees>
```

Was ist JSON Schema?

- Äquivalent zu XML-Schema für JSON
- Ist selbst JSON-basiert
- Für Validierung und Dokumentation
- Bisher nur im Entwurf-Status

```
{
  "$schema": "http://json-schema.org/schema#",
  "title": "Product",
  "type": "object",
  "required": ["id", "name"],
  "properties": {
    "id": {
      "type": "number",
      "description": "Product identifier"
    },
    "name": {
      "type": "string",
      "description": "Name of the product"
    },
    "price": {
      "type": "number",
      "minimum": 0
    }
  }
}
```


$\{\checkmark, \times\}$ Grundlagen



Deklarationen und Metadaten

- Sind **optional**
- **\$schema** beschreibt die Schema-Version
- **\$id** dient als Identifizierung
- **title** gibt Schema einen Titel
- **description** beschreibt das Schema genauer

```
{  
  "$schema": "http://json-schema.org/schema#",  
  "$id": "http://yourdomain.com/schemas/myschema.json",  
  "title": "some title for your schema",  
  "description": "place to describe schema"  
}
```

Einfachstes Schema

```
{ }
```

```
42
```

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

```
{  
  "an": [  
    "arbitrarily",  
    "nested" ],  
  "data": "structure"  
}
```

Type-Schlüsselwort

- Typ definieren
- Einschränkung des Wertebereichs
- Mehrere Datentypen möglich

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

```
{ "type": ["number", "string"] }
```

42

"I'm a string"

true

42

"I'm a string"

Elementare Datentypen

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

```
{ "type" : "boolean" }
```

```
{ "type" : "number" }
```

42

"I'm a string"

42

true

false

"I'm a string"

4.2

42

Arrays

```
{ "type" : "array" }
```

42

```
["one","two","three"]
```

Objekte

```
{  
  "type": "object"  
}
```

```
"John Doe"
```

```
{  
  "name": "John Doe",  
  "age": 28  
}
```

```
{  
  "name": "John Doe",  
  "age": 28,  
  "phone": "012-2345-67"  
}
```

Objekt-Eigenschaften

```
{  
  "type": "object",  
  "properties": {  
    "name": {  
      "type": "string"  
    },  
    "age": {  
      "type": "number"  
    }  
  }  
}
```

```
{  
  "name": "John Doe",  
  "age": "28"  
}
```

```
{  
  "name": "John Doe",  
  "age": 28  
}
```

```
{  
  "name": "John Doe",  
  "age": 28,  
  "phone": "012-2345-67"  
}
```


Objekt-Pflicht-Eigenschaften

```
{  
  "type": "object",  
  "properties": {  
    "name": {  
      "type": "string"  
    },  
    "age": {  
      "type": "number"  
    }  
  },  
  „required“: [“name“, “age“]  
}
```

```
{  
  "name": "John Doe",  
}
```

```
{  
  "name": "John Doe",  
  "age": 28  
}
```

```
{  
  "name": "John Doe",  
  "age": 28,  
  "phone": "012-2345-67"  
}
```

Fortgeschrittene Techniken



Arrays (1/3)

- Verwendung des Schlüsselworts **item**
- Festlegung eines Datentyps für alle Elemente

```
{  
  "type": "array",  
  "items": {  
    "type": "number"  
  }  
}
```

["one", "two"]

[1, "two", 3]

[1, 2, 3]

Arrays (2/3)

- Prüfung von Tupeln

```
{
  "type": "array",
  "items": [
    {
      "type": "number"
    },
    {
      "type": "string"
    },
    {
      "type": "string",
      "enum": ["Street", "Avenue"]
    }
  ]
}
```

[24, "Sussex", "Drive"]

[1600, "Pennsylvania", "Avenue"]

["Street"]

[10, "Street"]

Arrays (3/3)

- Prüfung auf Länge mit minItems/maxItems

```
{  
  "type": "array",  
  "minItems": 2,  
  "maxItems": 3  
}
```

`["Street"]`

`[10, "Street"]`

`[24, "Sussex", "Drive"]`

- Prüfung auf Einzigartigkeit

```
{  
  "type": "array",  
  "uniqueItems": true  
}
```

`[1,1]`

`[1,2]`

Konkrete Wertebereiche

```
{  
  "type": "string",  
  "enum": ["red", "yellow", "green"]  
}
```

```
{  
  "type": "integer",  
  "enum": [1,2]  
}
```

42

"blue"

"yellow"

1

2

3

Komplexe Wertebereiche

- allOf/anyOf/oneOf/not

```
{  
  "allOf": [  
    { "type": "string" },  
    { "maxLength": 5 }  
  ]  
}
```

```
{ "not": { "type": "string" } }
```

5

"string to long"

"short"

10

"strings not allowed"

Wiederverwendung von Definitionen (1/2)

- Definitionen in gleicher/anderer Datei möglich
- Referenzieren mit **\$ref** Schlüsselwort
- Nach **\$ref** folgt der **Pfad** zur Definition
- Beispiel verweist auf externe Datei
 - **definitions.json** ist die Datei
 - **#** steht für das Wurzelement
 - **address** für den **Schlüssel** address, hinter der die Definition liegt

```
{ "$ref": "definitions.json#/address" }
```


Wiederverwendung von Definitionen (2/2)

```
{
  "definitions": {
    "address": {
      "type": "object",
      "properties": {
        "street_address": { "type": "string" },
        "city":           { "type": "string" },
        "state":          { "type": "string" }
      },
      "required": ["street_address", "city", "state"]
    },
  },
  "type": "object",
  "properties": {
    "billing_address": {
      "$ref": "#/definitions/address"
    },
    "shipping_address": {
      "$ref": "#/definitions/address"
    }
  }
}
```

```
{
  "shipping_address": {
    "street_address": "1600 Pennsylvania Avenue NW",
    "city": "Washington",
    "state": "DC"
  },
  "billing_address": {
    "street_address": "1st Street SE",
    "city": "Washington",
    "state": "DC"
  }
}
```

$\{\checkmark, x\}$ Übung

Links

- Präsentation

- <https://git.io/vbBcw> (PowerPoint)
- <https://git.io/vbBcA> (PDF)

- Übungsseite

- 194.95.221.248:8080

- Quellen

- <http://json-schema.org/>
- <https://spacetelescope.github.io/understanding-json-schema/>