

# JSON Schema

## The good, the bad, the ugly

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## What is JSON?

- Format for structured data
- Human- and machine readable
- It's not XML (no namespaces, no markup semantics)
- De-facto web data interchange format
- Native JavaScript data format

Example:

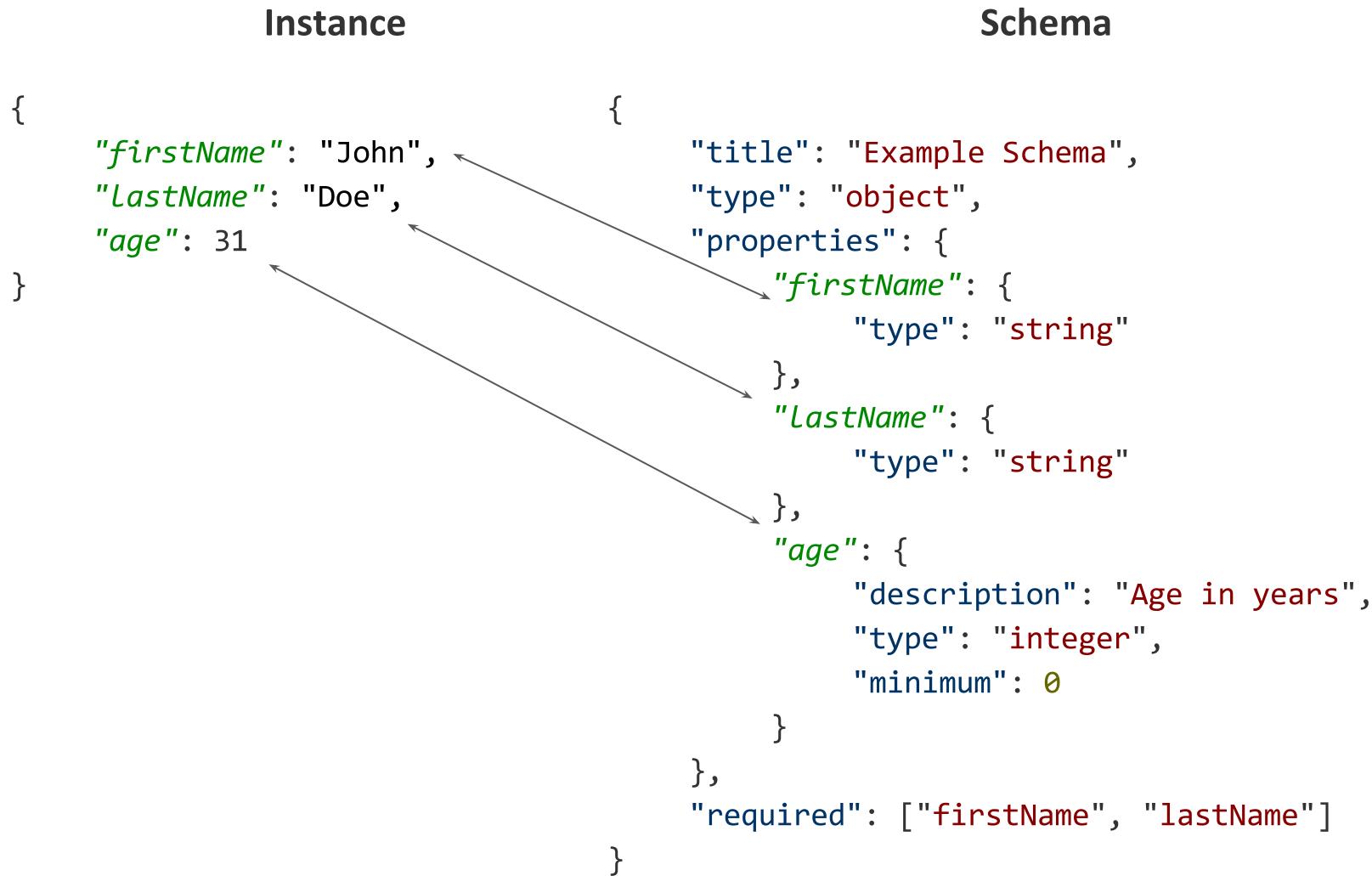
```
{  
  "firstName": "John",  
  "LastName": "Doe",  
  "age": 31  
}
```

## What is JSON Schema?

- A JSON Document
- Format to describe the structure of JSON instances
- Minimal Core define base concepts
- Extensions
  - Validation
  - Hyper-Schema
  - more to come?

```
{  
    "title": "Example Schema",  
    "type": "object",  
    "properties": {  
        "firstName": {  
            "type": "string"  
        },  
        "lastName": {  
            "type": "string"  
        },  
        "age": {  
            "description": "Age in years",  
            "type": "integer",  
            "minimum": 0  
        }  
    },  
    "required": ["firstName", "lastName"]  
}
```

## How does it look like?



## Does it matter?

Yes! 😊

- [Heroku](#) (Heroku Platform API)
- [OpenAPI/Swagger](#) (Entity descriptions)
- [Google Discovery API](#) (Meta-Service for Google APIs)
- ...



## How we got here

We're heavy users the Eclipse Modeling Framework ([EMF](#)).

*EMF is a modeling framework and code generation facility for building tools and other applications based on a structured data model [which essentially is a subset of UML].*

- Strong believe in benefits of structured data definitions
- Searched for structured data definitions for JSON
- Ended up embracing JSON Schema

→ JSON Schema allows us to re-use our expertise in the web



[Happ Traveler by GDJ](#)



The Good

## The good parts - Overview

- Interoperable/Polyglot
- Validation
- API Documentation
- Form generation
- Code generation
- Testing



## Interoperable/Polyglot

- Usage of same data definition on Client/Server
- Language agnostic
- It is just JSON
- There is a JSON Schema for the JSON Schema
- Lots of libraries consuming JSON Schemata
- Good documentation

> Interoperable/Polyglot  
Validation  
Form-based UIs  
API Documentation  
Code generation  
Testing



<https://www.flickr.com/photos/wiredwitch/11330858474/>

## Validation

- Shared definition
- More readable than code
- Unified format
- Cross-platform
- Can be updated at runtime
- **BUT:** not all use-cases can be covered with a schema

Interoperable/Polyglot  
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<https://openclipart.org/detail/170188/simple-tick-and-cross>

## Form-based UIs

- Derive your UI from a Schema
- For mass deployment of forms, this approach is:
  - Faster (rapid prototyping + customization)
  - Less tedious to maintain
  - Less error-prone
- Examples:
  - [Angular Schema Form](#) (Angular)
  - [JSON Forms](#) (Angular)
  - [react-jsonschema-form](#)

Interoperable/Polyglot  
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'paper notes' by crisg

## API Documentation

- Probably most prominent use: Swagger/OpenAPI
- Describes RESTful API
- Also acts as a Sandbox for API exploration
- Enables generation of stubs (see “Code generation”)
- OpenAPI/Swagger usage:
  - gettyimages
  - github
  - gmail
  - Youtube
  - Instagram
  - Slack
  - Trello
  - xkcd

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[HTTP://IMGS.XKCD.COM/COMICS/PHILOSOPHY.PNG](http://imgs.xkcd.com/comics/philosophy.png)

## xkcd OpenAPI/Swagger Schema (1/2)

```
[...] // General API info like basePath, host, etc.  
"paths": {  
    "/info.0.json": { ... },  
    "/{comicId}/info.0.json": {  
        "get": {  
            "description": "Fetch comics and metadata by comic id.\n",  
            "parameters": [  
                {  
                    "in": "path",  
                    "name": "comicId",  
                    "required": true,  
                    "type": "number"  
                }  
            ],  
            "responses": {  
                "200": {  
                    "description": "OK",  
                    "schema": { "$ref": "#/definitions/comic" }  
                }  
            }  
        }  
    }  
}  
[...]
```

Interoperable/Polyglot  
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## xkcd OpenAPI/Swagger Schema (2/2)

```
"definitions": {  
    "comic": {  
        "properties": {  
            "alt": { "type": "string" },  
            "day": { "type": "string" },  
            "img": { "type": "string" },  
            "link": { "type": "string" },  
            "month": { "type": "string" },  
            "news": { "type": "string" },  
            "num": { "type": "number" },  
            "safe_title": { "type": "string" },  
            "title": { "type": "string" },  
            "transcript": { "type": "string" },  
            "year": { "type": "string" }  
        },  
        "type": "object"  
    }  
}
```

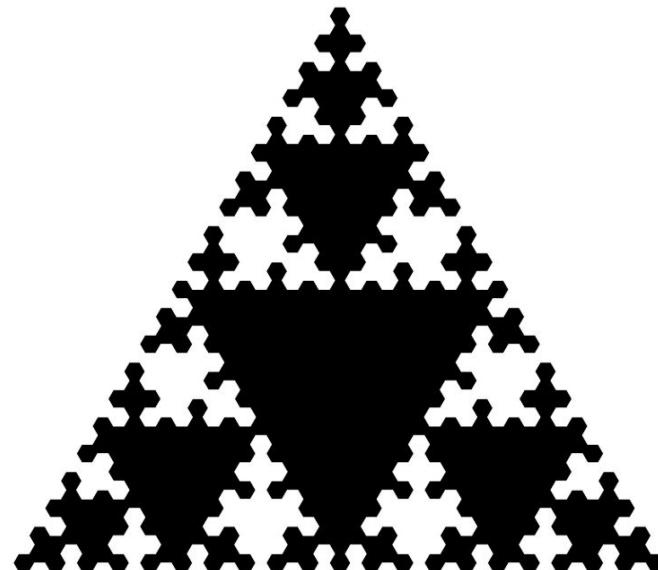
Interoperable/Polyglot  
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Testing



## Code generation

- Generate language-specific types
- Allows for rapid prototyping/scaffolding
- Examples
  - [jsonschema2pojo](#)
  - [dtsgenerator](#)
  - [heroics](#)

Interoperable/Polyglot  
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Testing



<https://openclipart.org/detail/50317/sierpinskis-triangle>

## Testing

- Generate random data to test your business logic
- Useful for testing webservices
- <https://www.npmjs.com/package/json-schema-faker> (JS)
- <https://www.npmjs.com/package/json-schema-test-data-generator> (JS)

Interoperable/Polyglot  
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-> Testing



<https://openclipart.org/detail/226237/car-accident-sign>



## The Bad

## The Bad (meta)

- The de-facto standard is draft v4
- ..it's a draft
- [v5 draft is already in the pipes](#)
- ..for over a year

Who drives the standard? Who's responsible for it?

BUT:

- Widespread use of v4
- Active Github community



## The Bad - Implementation

- No uniform error reporting format

```
[ {  
    "level": "error",  
    "schema": {  
        "loadingURI": "#",  
        "pointer": ""  
    },  
    "instance": {  
        "pointer": ""  
    },  
    "domain": "validation",  
    "keyword": "required",  
    "message": "object has missing required properties (["lastName\"])",  
    "required": [ "firstName", "lastName" ],  
    "missing": [ "lastName" ]  
} ]
```

VS.

```
[ { "field": 'data.lastName', "message": 'is required' } ]
```



- Plethora of validators for Javascript (which one to choose?) => ajv
- Writing schemas
  - happens mostly by hand
  - tedious & error-prone



The Ugly

## The Ugly (v4)

- Sometimes unclear semantics
  - additionalProperties in combination with anyOf, oneOf, allOf/required
    - <https://github.com/json-schema/json-schema/issues/116>
    - <https://github.com/json-schema/json-schema/issues/240>
  - Conflicting schemas that never validate
- Confusing parts
  - scope refining mechanics via id, relative URLs
    - <https://github.com/json-schema/json-schema/issues/17>
    - <https://github.com/json-schema/json-schema/issues/16>
  - type is a required keyword?
  - ...
- <https://github.com/json-schema/json-schema/issues>



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## Conclusion and Take-aways

*Warning:* Our opinion ahead ☺

- JSON Schema is a schema (meta-description) for JSON Instances
- JSON Schema is important, widely adopted and enables many applications
- You should definitely consider using JSON Schema if...
  - your application uses lots of JSON
  - your application needs to validate JSON often
  - your application uses multiple technology stacks
- To get started read (see refs slide): [JSON Schema Introduction by Space Telescope](#)
- Slides and Demo: <https://goo.gl/VUGmdp>



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Thank you!

## References

- Main Site: <http://json-schema.org/>
- Github Main Page: <https://github.com/json-schema/json-schema>
- Best Guide: <https://spacetelescope.github.io/understanding-json-schema/index.html>
- Validators:
  - <https://github.com/epoberezkin/ajv> (JS)
  - <https://github.com/geraintluff/tv4> (JS)
  - <https://github.com/daveclayton/json-schema-validator> (Java)
  - <https://github.com/eclipsesource/play-json-schema-validator> (Scala with Play)
- Extensive list of software: <http://json-schema.org/implementations.html>
- Examples from Demo: