JSON at Work: Schema

Tom Marrs

@TomMarrs

About Me …

livingsocial

O'REILLY

dzone
fresh links for developers
REFCARDZ

NFJS
No Fluff Just Stuff.com

GREAT INDIAN DEVELOPER SUMMIT

HTML

What's The Point?

Drive API Design with JSON Schema

Our Agenda

Your Takeaway

Core JSON Schema + JSON Workflow

We’re Not Covering

REST

Deep JS

Other Languages

Examples and Slides

https://github.com/tmarrs/presentations/tree/master/JSON-at-Work-Schema

Where Are We?

What is JSON Schema?

Validate Structure + Format

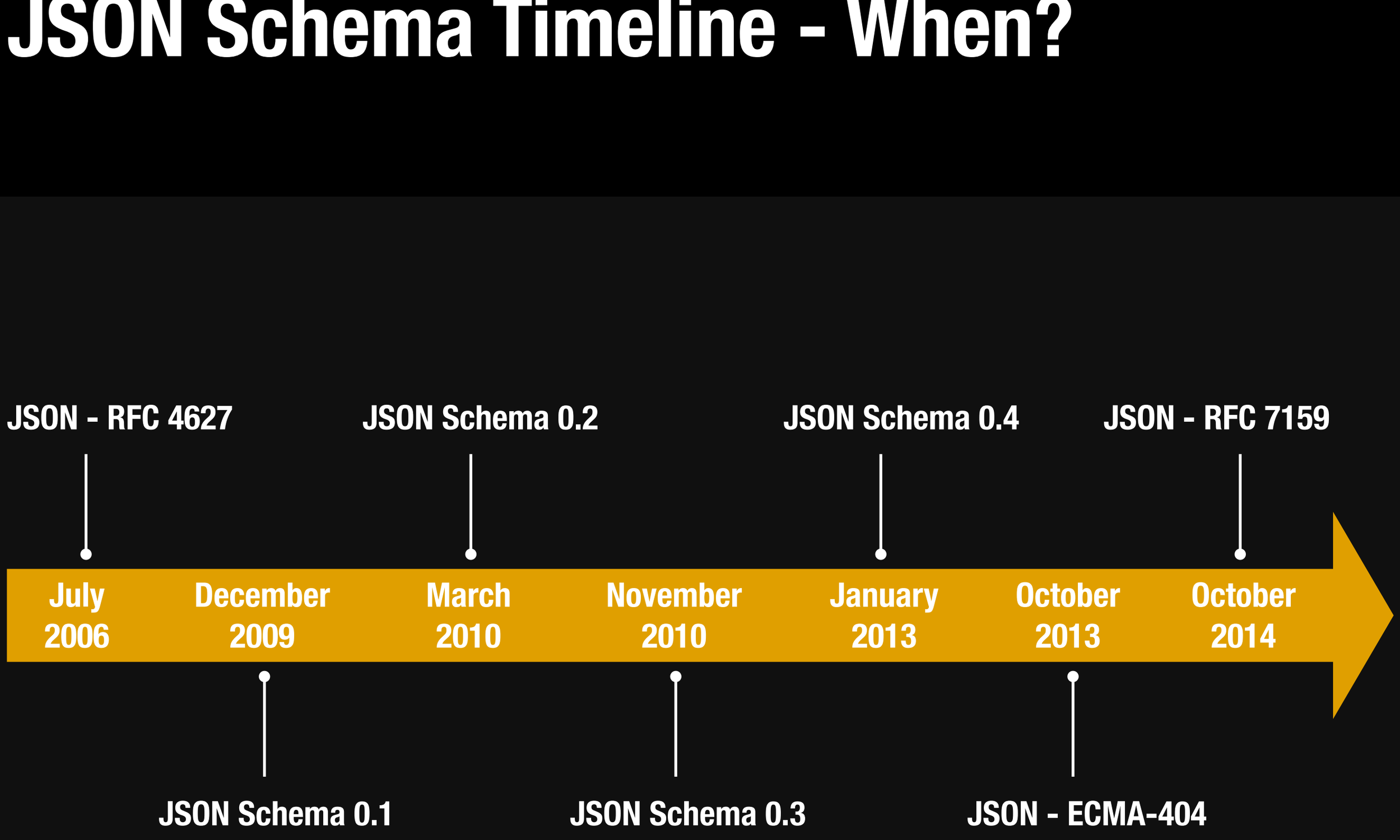
Basic JSON Schema

```
1
2  {
3     "$schema": "http://json-schema.org/draft-04/schema#",
4     "type": "object",
5     "properties": {
6       "email": {
7         "type": "string"
8       },
9       "firstName": {
10        "type": "string"
11      },
12      "lastName": {
13        "type": "string"
14      }
15    }
16 }
```

Basic JSON - Document

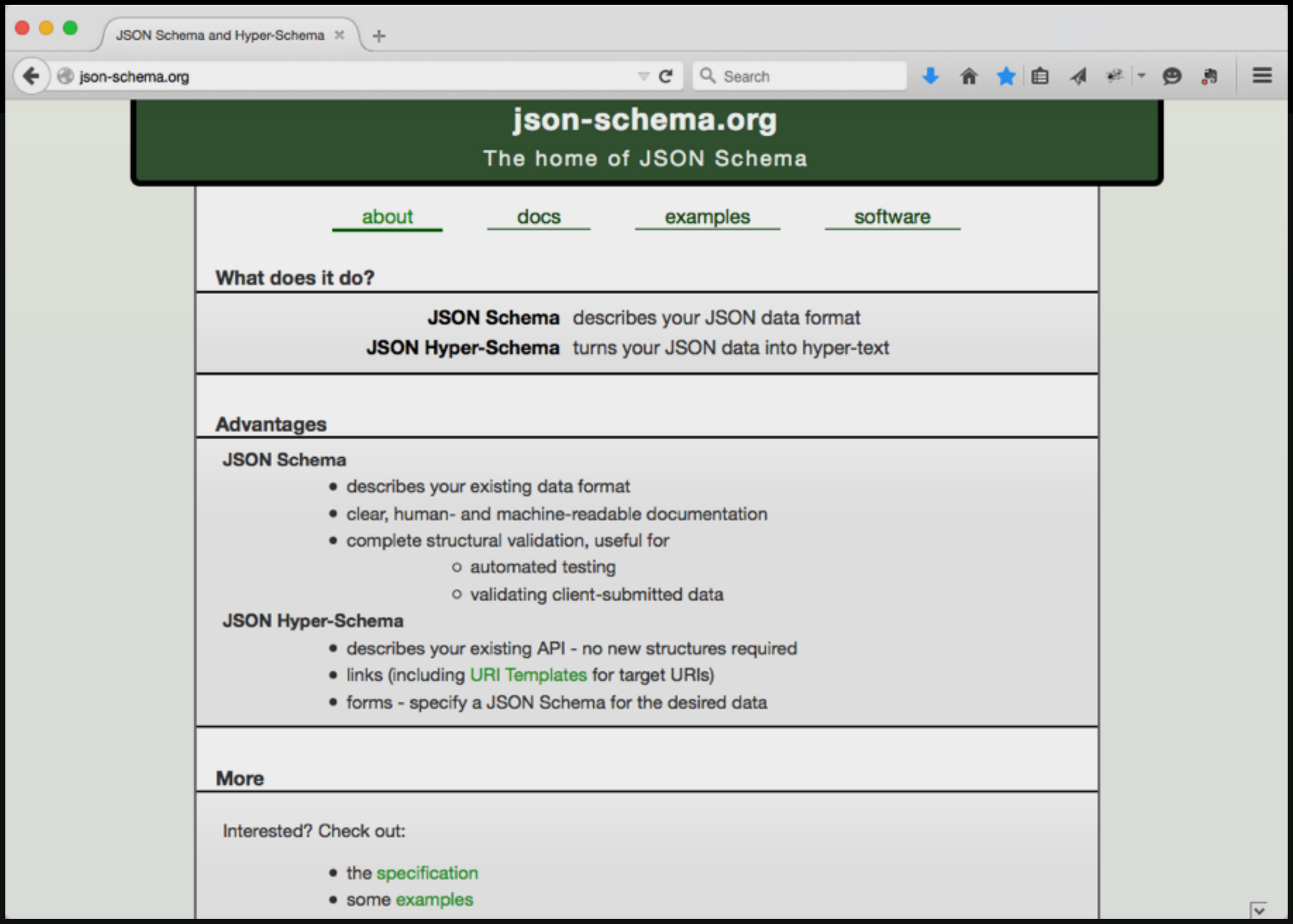
```
2  {
3     "email": "larsonrichard@ecratic.com",
4     "firstName": "Larson",
5     "lastName": " Richard"
6  }
```

JSON Schema Timeline - When?

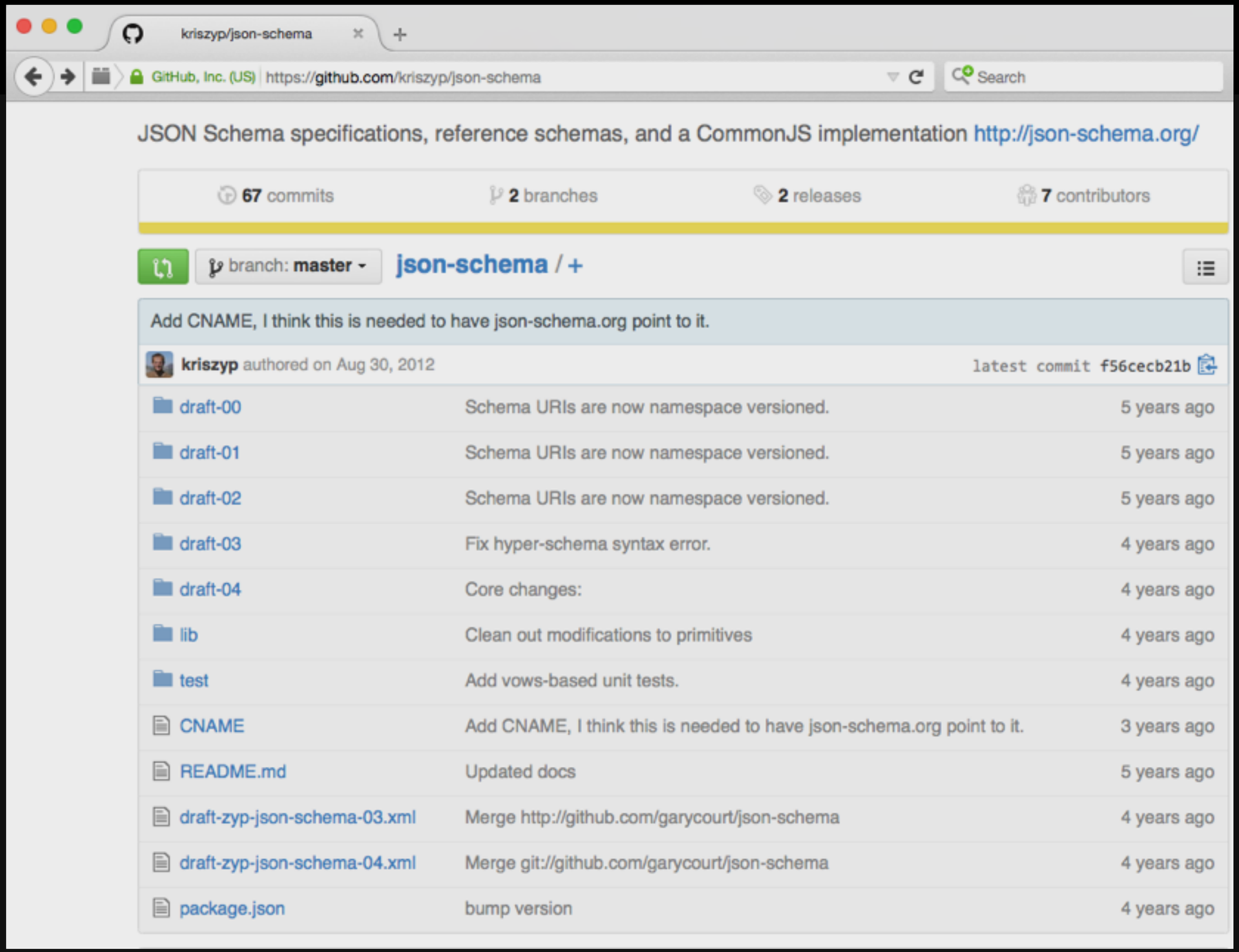


The Journey …

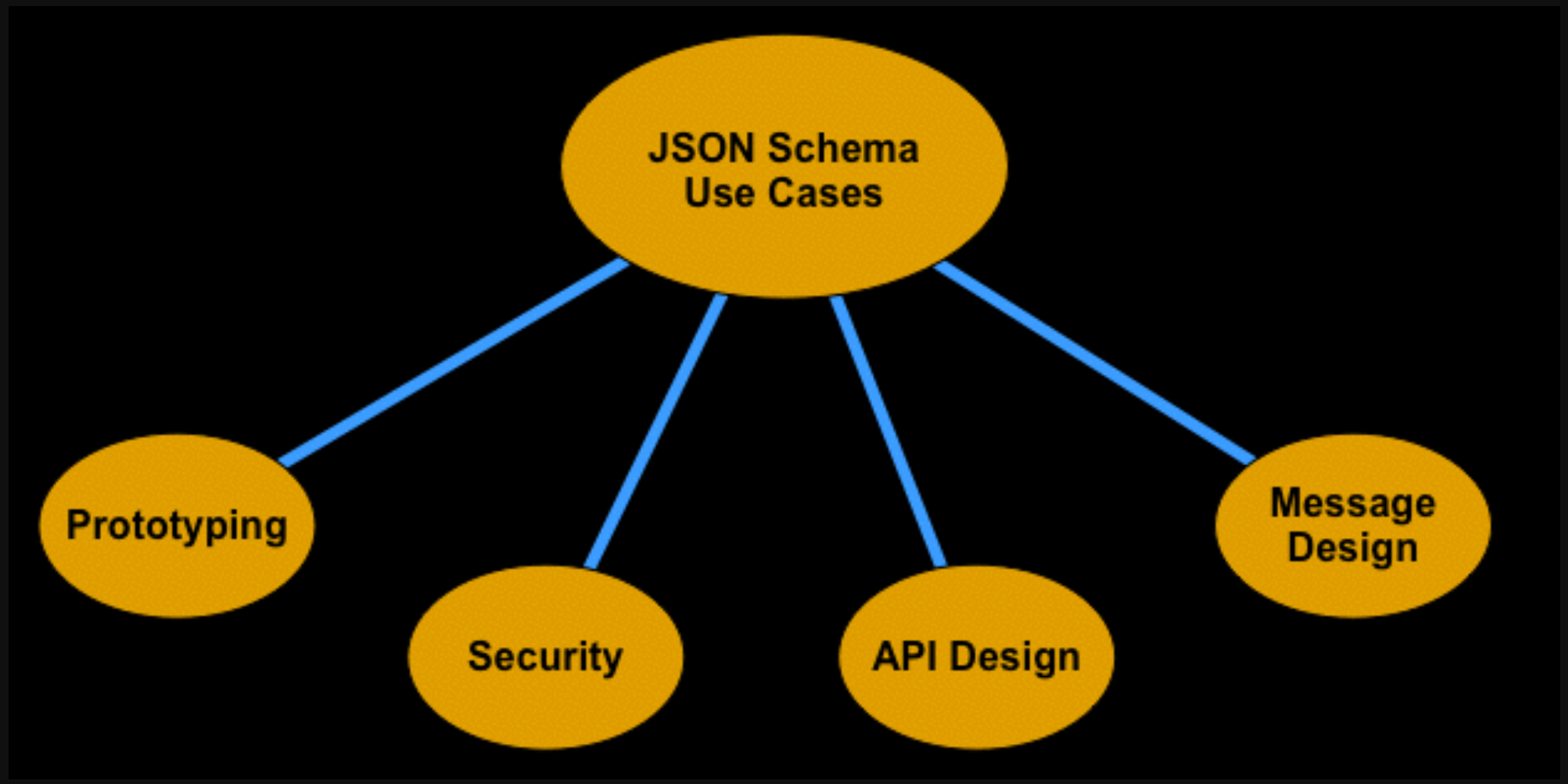
json-schema.org



JSON Schema on GitHub



Where Does JSON Schema Fit?



Who uses JSON Schema?

MuleSoft™

heroku

node.js

Swagger

IBM developerWorks®

Google Developers

Why isn’t JSON Validation Enough?

Semantics	Structure
Schema + Instance Document	Instance Document
Meaning	Well-formed - Valid JSON
Ex: Person, Order	Syntax

Haven’t We Seen This Before?

JSON Schema	XML Schema
No Reference	Instance Document references Schema
No Namespace - Yes!	Namespace Misery
.json	.xsd

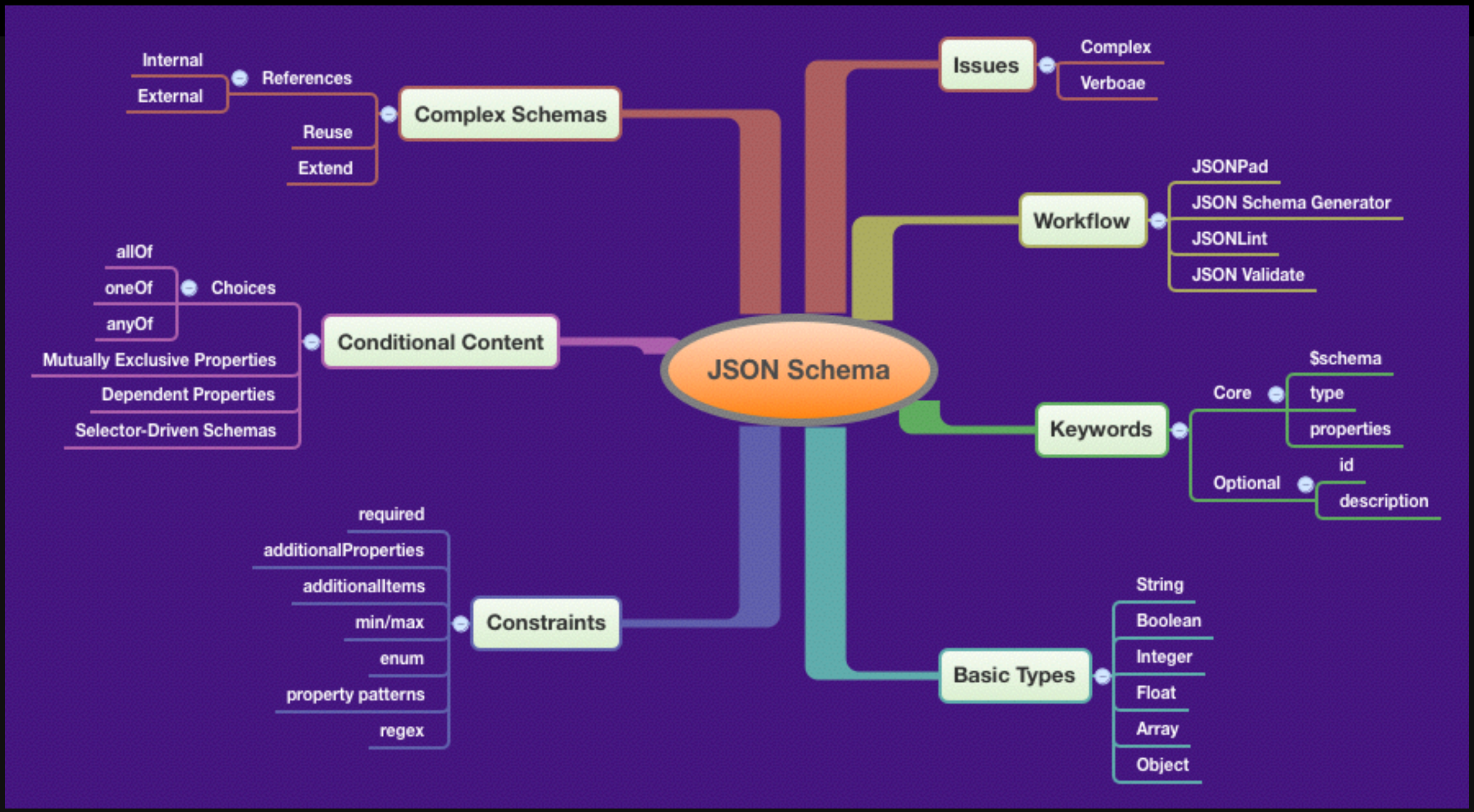
Where Are We?

JSON Schema Overview 1

Core JSON Schema 2

API Design with JSON Schema 3

Facets of JSON Schema



My JSON Schema Workflow

Model JSON Document

JSONPad

https://code.google.com/p/json-pad/

Generate JSON Document

JSON Generator

http://jsonschema.net/

Validate JSON Document

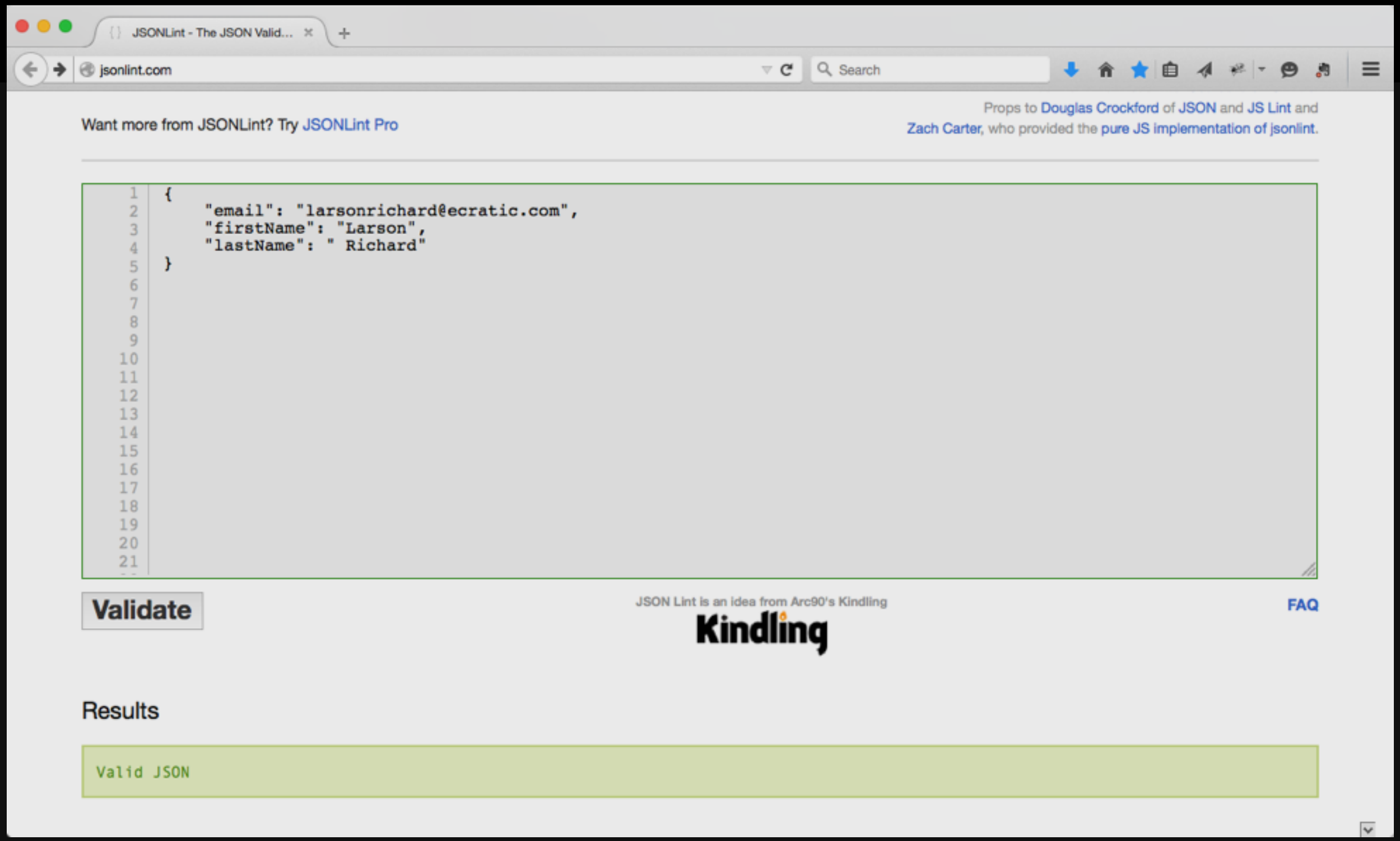
JSON Validate

http://jsonvalidate.com/

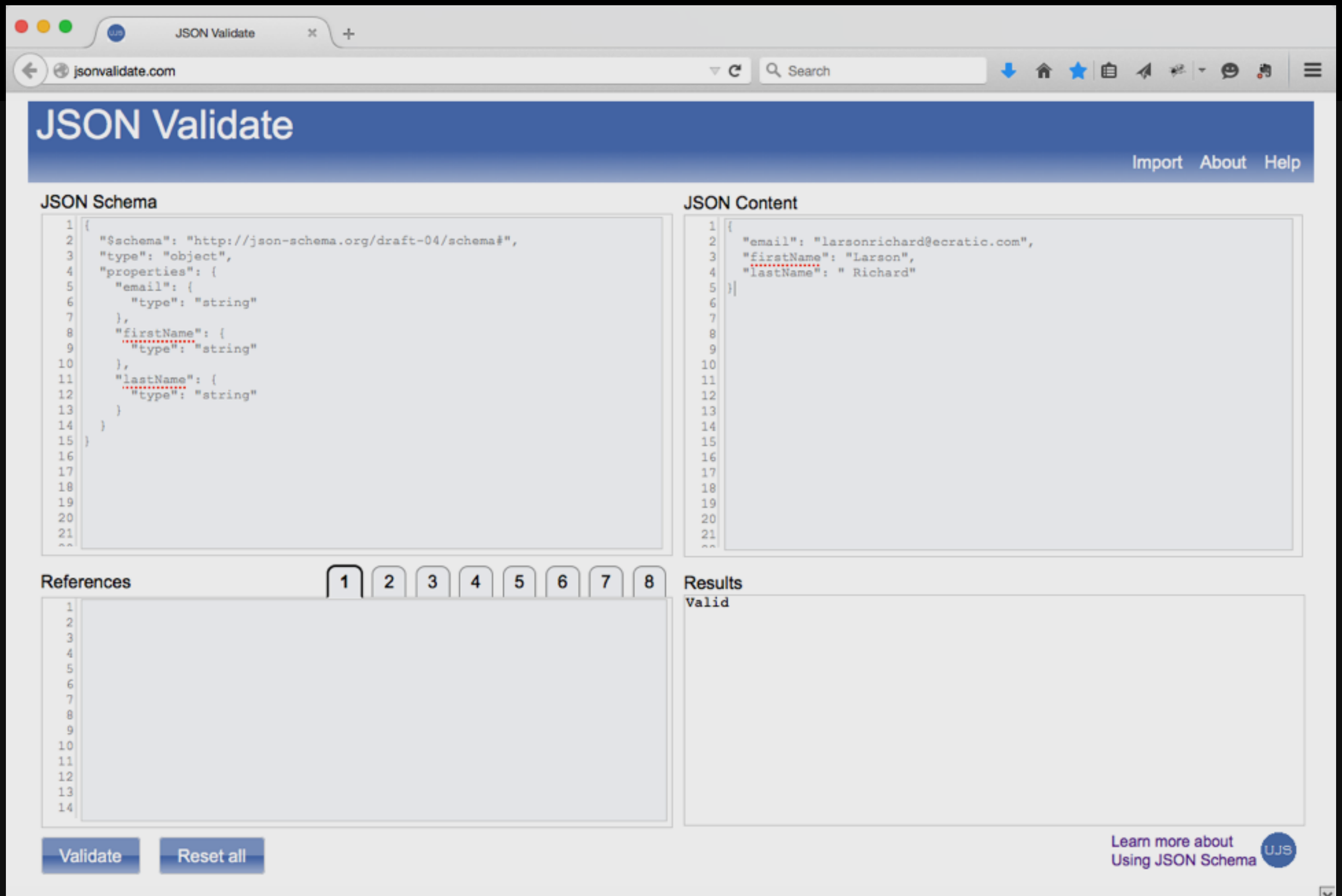
JSONLint

http://jsonlint.com

JSONLint


JSONLint - The JSON Valid...
jsonlint.com
Search
Want more from JSONLint? Try JSONLint Pro
Props to Douglas Crockford of JSON and JS Lint and
Zach Carter, who provided the pure JS implementation of jsonlint.
{
"email": "larsonrichard@ecratic.com",
"firstName": "Larson",
"lastName": " Richard"
}
Validate
JSON Lint is an idea from Arc90's Kindling
Kindling
FAQ
Results
Valid JSON

JSON Validate



Beware of Wonky WiFi - Hedge Your Bets!

PDD - Presentation-Driven Development

jsonlint

```
npm install -g jsonlint


jsonlint basic.json
```

https://github.com/zaach/jsonlint

ujs-jsonvalidate

```
npm install -g ujs-jsonvalidate
```

```
validate basic.json basic-schema.json
```

https://github.com/usingjsonschema/ujs-jsonvalidate-nodejs

Basic Keywords

Keyword	Definition
`$schema`	Specify JSON Schema version - `"$schema": "http://json-schema.org/draft-04/schema#"`
`type`	The data type - `"type": "string"`
`properties`	The fields for an object

Optional Keywords

Keyword	Definition
`id`	(1): Path to field (2): URI to Schema
`description`	For documentation

Basic Types - JSON Schema

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "type": "object",
  "properties": {
    "email": {
      "type": "string"
    },
    "firstName": {
      "type": "string"
    },
    "lastName": {
      "type": "string"
    },
    "age": {
      "type": "integer"
    },
    "postedSlides": {
      "type": "boolean"
    },
    "rating": {
      "type": "number"
    }
  }
}
```

Basic Types - JSON Document

```
{
    "email": "larsonrichard@ecratic.com",
    "firstName": "Larson",
    "lastName": " Richard",
    "age": 39,
    "postedSlides": true,
    "rating": 4.1
}
```

Where's the Validation?

Keyword	Definition
`additionalProperties`	enable/disable additional fields in an object
`required`	Which fields are required
`additionalItems`	enable/disable additional array elements

Basic Types Validation - JSON Schema

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "type": "object",
  "properties": {
    "email": {
      "type": "string"
    },
    "firstName": {
      "type": "string"
    },
    "lastName": {
      "type": "string"
    },
    "postedSlides": {
      "type": "boolean"
    },
    "rating": {
      "type": "number"
    }
  },
  "additionalProperties": false
}
```

Validation with Required - JSON Schema

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "type": "object",
  "properties": {
    "email": {
      "type": "string"
    },
    "firstName": {
      "type": "string"
    },
    "lastName": {
      "type": "string"
    },
    "postedSlides": {
      "type": "boolean"
    },
    "rating": {
      "type": "number"
    }
  },
  "additionalProperties": false,
  "required": ["email", "firstName", "lastName", "postedSlides", "rating"]
}
```

Validation with Required - JSON Doc

```
{
    "email": "larsonrichard@ecratic.com",
    "firstName": "Larson",
    "lastName": " Richard",
    "rating": 4.1
}
```

Number min/max - JSON Schema

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "type": "object",
  "properties": {
    "rating": { "type": "number", "minimum": 1.0, "maximum": 5.0 }
  },
  "additionalProperties": false,
  "required": ["rating"]
}
```

Number min/max - JSON Doc

```
{
  "rating": "4.2"
}
```

Simple Array - JSON Schema

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "type": "object",
  "properties": {
    "tags": {
      "type": "array",
      "items": {
        "type": "string"
      },
      "additionalItems": false
    }
  },
  "additionalProperties": false,
  "required": ["tags"]
}
```

Simple Array - JSON Doc

```
{
    "tags": ["fred"]
}
```

Array min/max - JSON Schema

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "type": "object",
  "properties": {
    "tags": {
      "type": "array",
      "minItems": 2,
      "maxItems": 4,
      "items": {
        "type": "string"
      },
      "additionalItems": false
    }
  },
  "additionalProperties": false,
  "required": ["tags"]
}
```

Array min/max - JSON Doc

```
{
    "tags": ["fred", "a"]
}
```

Array Enum - JSON Schema

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "type": "object",
  "properties": {
    "tags": {
      "type": "array",
      "minItems": 2,
      "maxItems": 4,
      "items": {
        "type": "string",
        "enum": [
          "Open Source", "Java", "JavaScript", "JSON", "REST"
        ]
      },
      "additionalItems": false
    }
  },
  "additionalProperties": false,
  "required": ["tags"]
}
```

Array Enum - JSON Doc

```
{
   "tags": ["Java", "REST"]
}
```

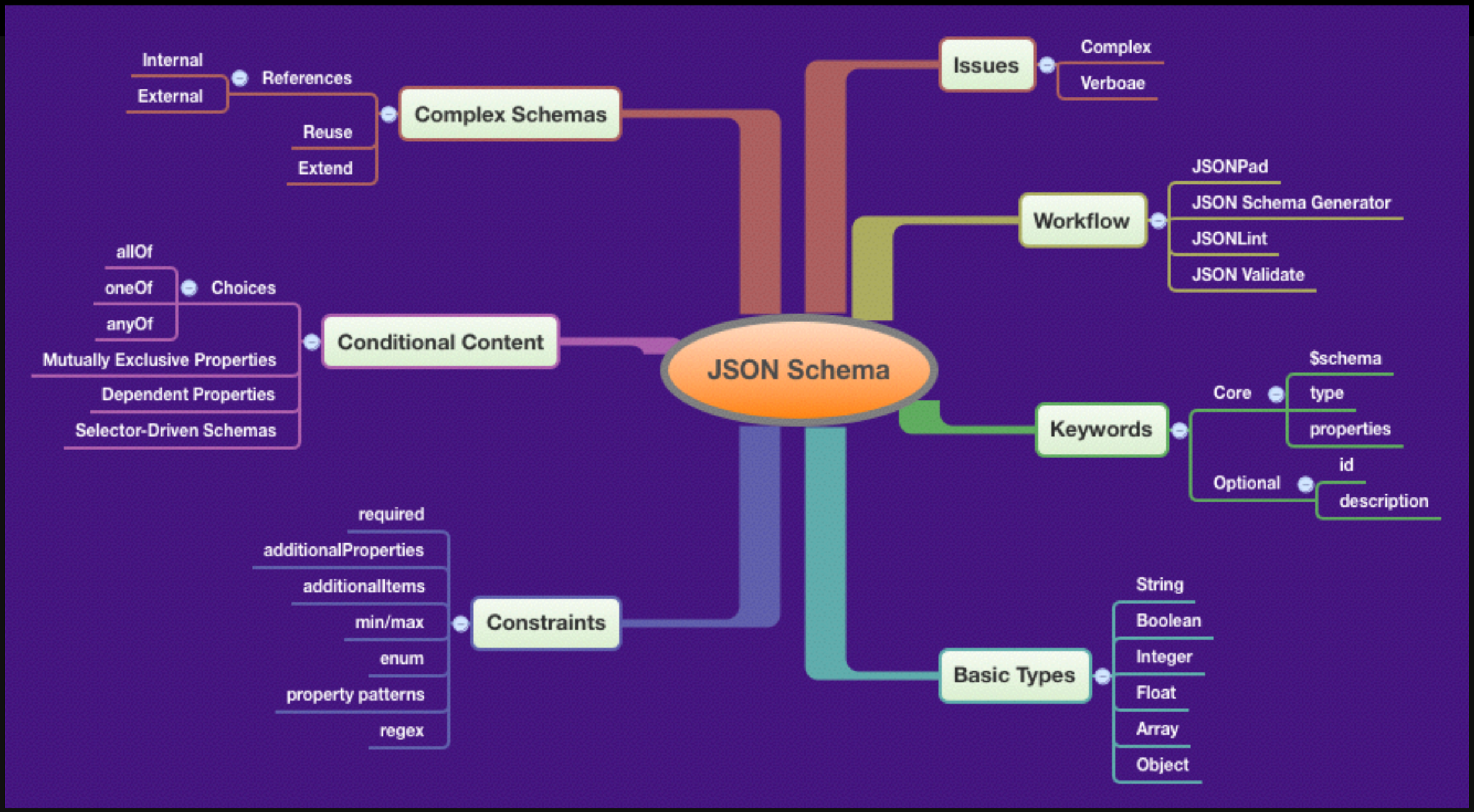
Named Object - JSON Schema

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "type": "object",
  "properties": {
    "speaker": {
      "type": "object",
      "properties": {
        "firstName": { "type": "string" },
        "lastName": { "type": "string" },
        "email": { "type": "string" },
        "postedSlides": { "type": "boolean" },
        "rating": { "type": "number" },
        "tags": {
          "type": "array",
          "items": { "type": "string" },
          "additionalItems": false
        }
      },
      "additionalProperties": false,
      "required": ["firstName", "lastName", "email",
                   "postedSlides", "rating", "tags"
      ]
    }
  },
  "additionalProperties": false,
  "required": ["speaker"]
}
```

Named Object - JSON Doc

```
{
  "speaker": {
    "firstName": "Larson",
    "lastName": " Richard",
    "email": "larsonrichard@ecratic.com",
    "postedSlides": true,
    "rating": 4.1,
    "tags": [
      "JavaScript", "AngularJS", "Yeoman"
    ]
  }
}
```

Facets of JSON Schema



Property Patterns - JSON Schema

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "type": "object",
  "properties": {
    "city": { "type": "string" },
    "state": { "type": "string" },
    "zip": { "type": "string" },
    "country": { "type": "string" }
  },
  "patternProperties": {
    "^line[1-3]$": { "type": "string" }
  },
  "additionalProperties": false,
  "required": ["city", "state", "zip", "country"]
}
```

Property Patterns - JSON Doc

```
{
    "line1": "555 Main Street",
    "line2": "#2",
    "city": "Denver",
    "state": "CO",
    "zip": "80231",
    "country": "USA"
}
```

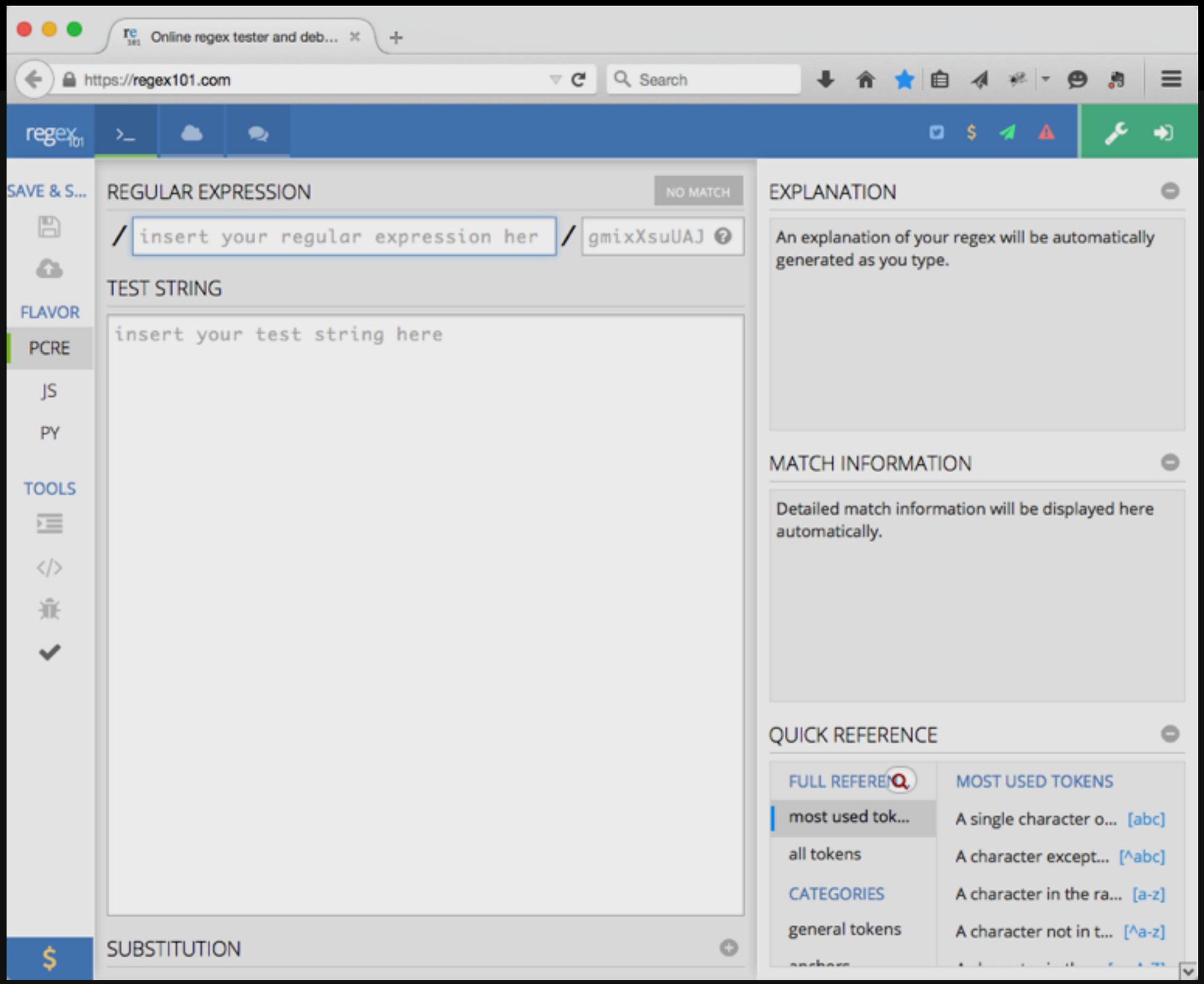
Regex - JSON Schema

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "type": "object",
  "properties": {
    "line1": { "type": "string" },
    "city": { "type": "string" },
    "state": { "type": "string" },
    "zip": {
      "type": "string",
      "pattern": "^[0-9]{5}(-[0-9]{4})?$"
    },
    "country": { "type": "string" }
  },
  "additionalProperties": false,
  "required": ["line1", "city", "state", "zip", "country"]
}
```

Regex - JSON Doc

```
{
    "line1": "555 Main Street",
    "city": "Denver",
    "state": "CO",
    "zip": "80231",
    "country": "USA"
}
```

Help!! I'm Awful at Regexp! - Regex101



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Regular-Expressions.info - ...

www.regular-expressions.info

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Regular-Expressions.info

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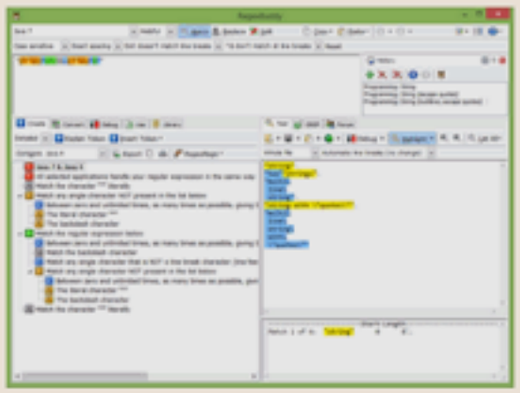


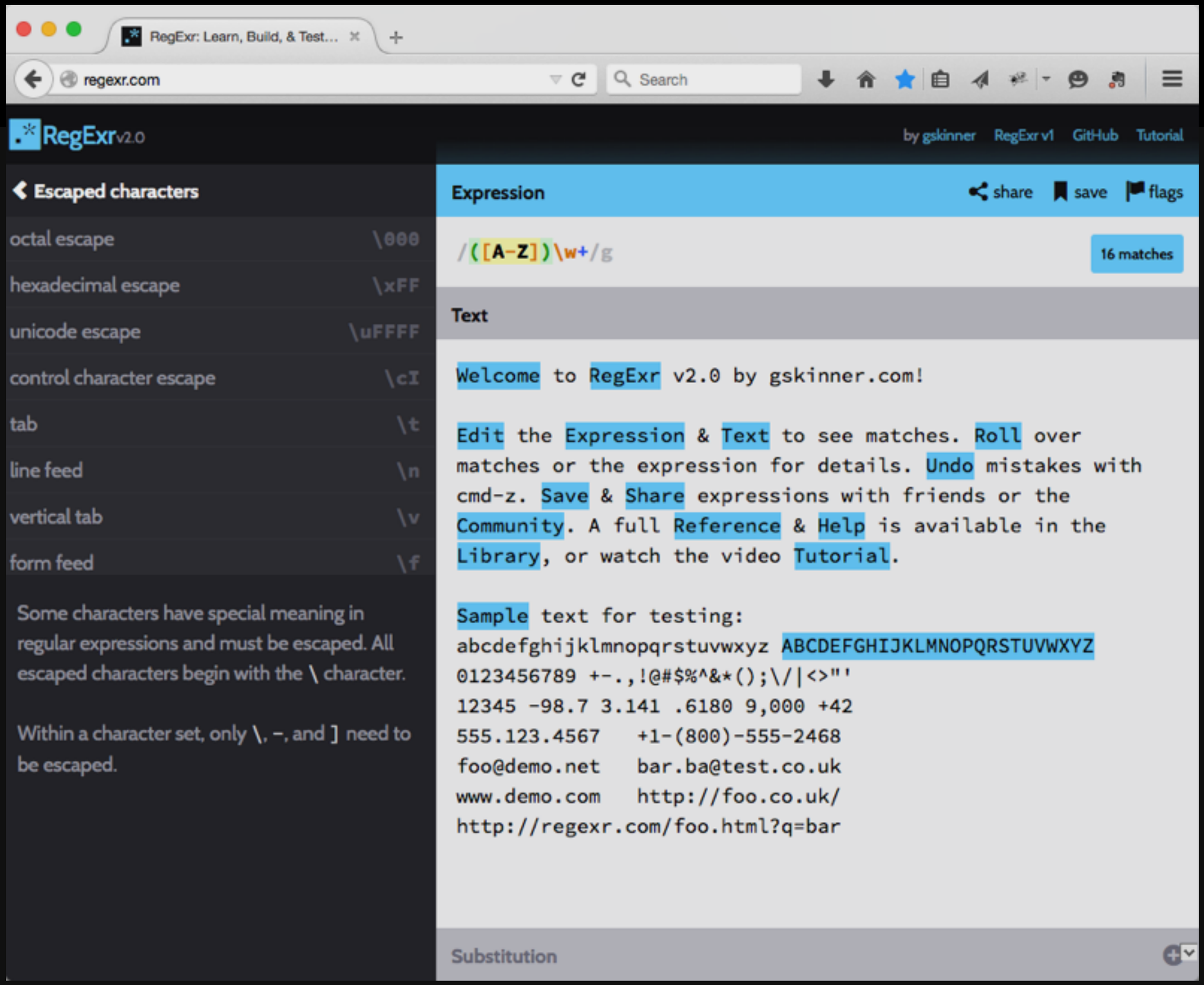
Easily create and understand regular expressions today.
Compose and analyze regex patterns with RegexBuddy's easy-to-grasp regex blocks and intuitive regex tree, instead of or in combination with the traditional regex syntax. Developed by the author of this website, RegexBuddy makes learning and using regular expressions easier than ever. Get your own copy of RegexBuddy now

Welcome to Regular-Expressions.info
The Premier website about Regular Expressions

A regular expression (regex or regexp for short) is a special text string for describing a search pattern. You can think of regular expressions as wildcards on steroids. You are probably familiar with wildcard notations such as *.txt to find all text files in a file manager. The regex equivalent is `.*\.txt$`.

But you can do much more with regular expressions. In a text editor like EditPad Pro or a specialized text processing tool like PowerGREP, you could use the regular expression `\b[A-Z0-9._%+-]+@[A-Z0-9.-]+\.[A-Z]{2,4}\b` to search for an email address. *Any* email address, to be exact. A very similar regular expression (replace the first `\b` with `^` and the last one with `$`) can be used by a programmer to check whether the user entered a properly formatted email address. In just one line of code, whether that code is written in Perl, PHP, Java, a .NET language, or a multitude of other languages.

Regexr


RegExr: Learn, Build, & Test...
regexr.com
Search
RegExr v2.0
by gskinner
RegExr v1
GitHub
Tutorial
Escaped characters
octal escape \000
hexadecimal escape \xFF
unicode escape \uFFFF
control character escape \cI
tab \t
line feed \n
vertical tab \v
form feed \f
Some characters have special meaning in regular expressions and must be escaped. All escaped characters begin with the \ character.
Within a character set, only \, -, and] need to be escaped.
Expression
share
save
flags
/([A-Z])\w+/g
16 matches
Text
Welcome to RegExr v2.0 by gskinner.com!
Edit the Expression & Text to see matches. Roll over matches or the expression for details. Undo mistakes with cmd-z. Save & Share expressions with friends or the Community. A full Reference & Help is available in the Library, or watch the video Tutorial.
Sample text for testing:
abcdefghijklmnopqrstuvwxyz ABCDEFGHIJKLMNOPQRSTUVWXYZ
0123456789 +-.,!@#$%^&*();\/|<>"'
12345 -98.7 3.141 .6180 9,000 +42
555.123.4567 +1-(800)-555-2468
foo@demo.net bar.ba@test.co.uk
www.demo.com http://foo.co.uk/
http://regexr.com/foo.html?q=bar
Substitution

Dependent Properties - JSON Schema

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "type": "object",
  "properties": {
    "businessName": { "type": "string" },
    "contactName": { "type": "string" },
    "line1": { "type": "string" },
    "city": { "type": "string" },
    "state": { "type": "string" },
    "zip": { "type": "string" },
    "country": { "type": "string" }
  },
  "additionalProperties": false,
  "required": ["line1", "city", "state", "zip", "country"],
  "dependencies": {
    "contactName": ["businessName"]
  }
}
```

Dependent Properties - JSON Doc

```
{
  "businessName": "My Conference, Inc.",
  "contactName": "Larson Richard",
  "line1": "555 Main Street",
  "city": "Denver",
  "state": "CO",
  "zip": "80231",
  "country": "USA"
}
```

References (Internal) - JSON Schema

```
{
  "$schema": "http://json-schema.org/draft-04/schema#",
  "type": "object",
  "properties": {
    "line1": { "type": "string" },
    "city": { "type": "string" },
    "state": { "type": "string" },
    "zip": { "$ref": "#/definitions/US_zipCode" },
    "country": { "type": "string" }
  },
  "additionalProperties": false,
  "required": ["line1", "city", "state", "zip", "country"],

  "definitions": {
    "US_zipCode": {
      "type": "string",
      "pattern": "^[0-9]{5}(-[0-9]{4})?$"
    }
  }
}
```

References (Internal) - JSON Doc

```
{
    "line1": "555 Main Street",
    "city": "Denver",
    "state": "CO",
    "zip": "80231",
    "country": "USA"
}
```

References (External) - JSON Schema

ex-13-external-ref-schema.json

References (Reused) - JSON Schema

ex-13-USCommonAddrSchema.json

References (External) - JSON Doc

```
{
    "line1": "555 Main Street",
    "city": "Denver",
    "state": "CO",
    "zip": "80231",
    "country": "USA"
}
```

Where Are We?

JSON Schema Overview 1

Core JSON Schema 2

API Design with JSON Schema 3

Real World Use Case

Design/Implement API and Consumer in Parallel

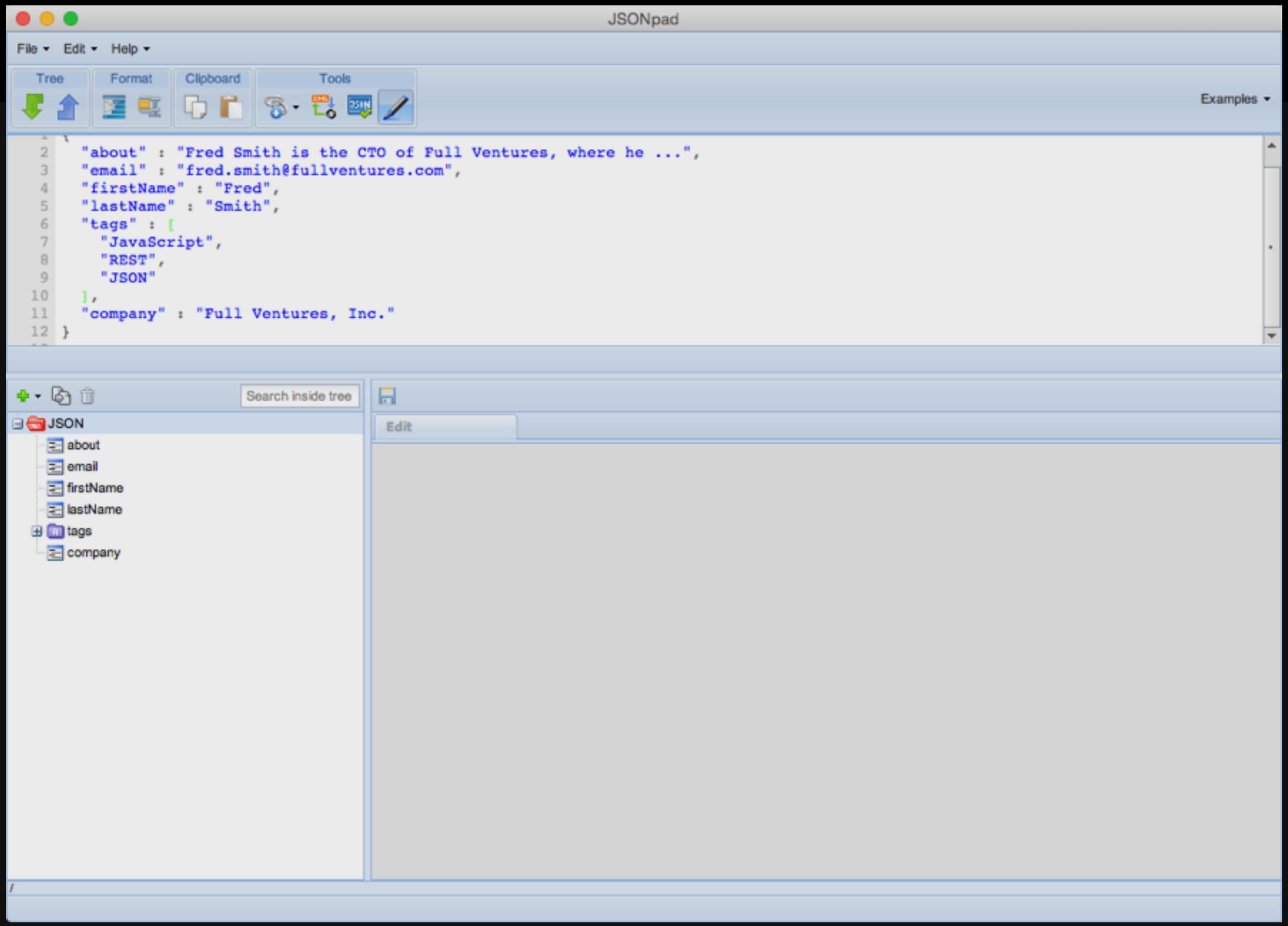
Our Scenario

Leverage JSON Schema to create a Stub REST API … without any code

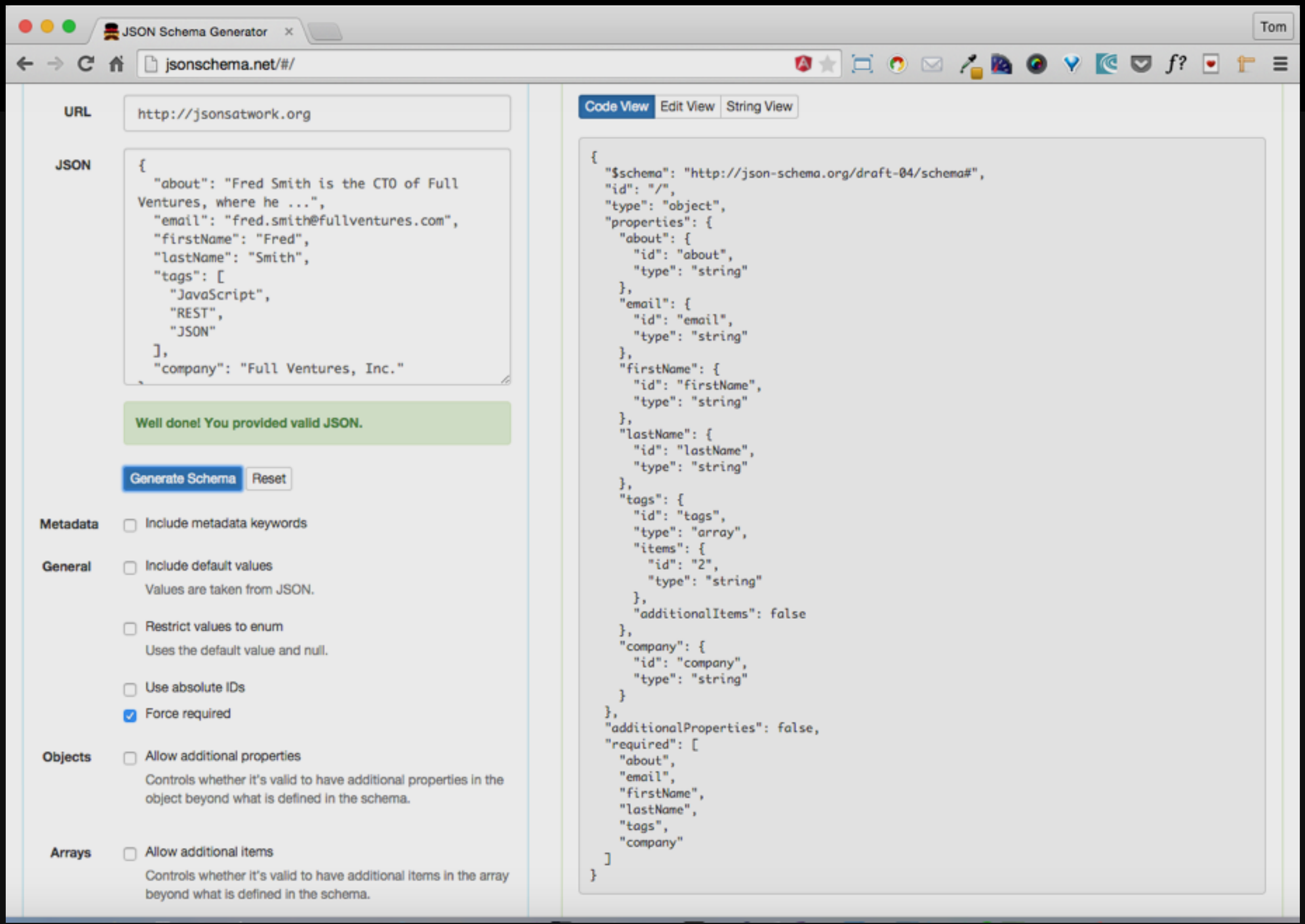
My JSON Schema Workflow for APIs

Model JSON Document	Generate JSON Schema	Validate JSON Document	Document JSON Schema (HTML)
JSONPad https://code.google.com/p/json-pad/	JSON Schema Generator http://jsonschema.net/	JSON Validate http://jsonvalidate.com/	Matic https://github.com/mattyod/matic/
		JSONLint http://jsonlint.com	Docson https://github.com/lbovet/docson

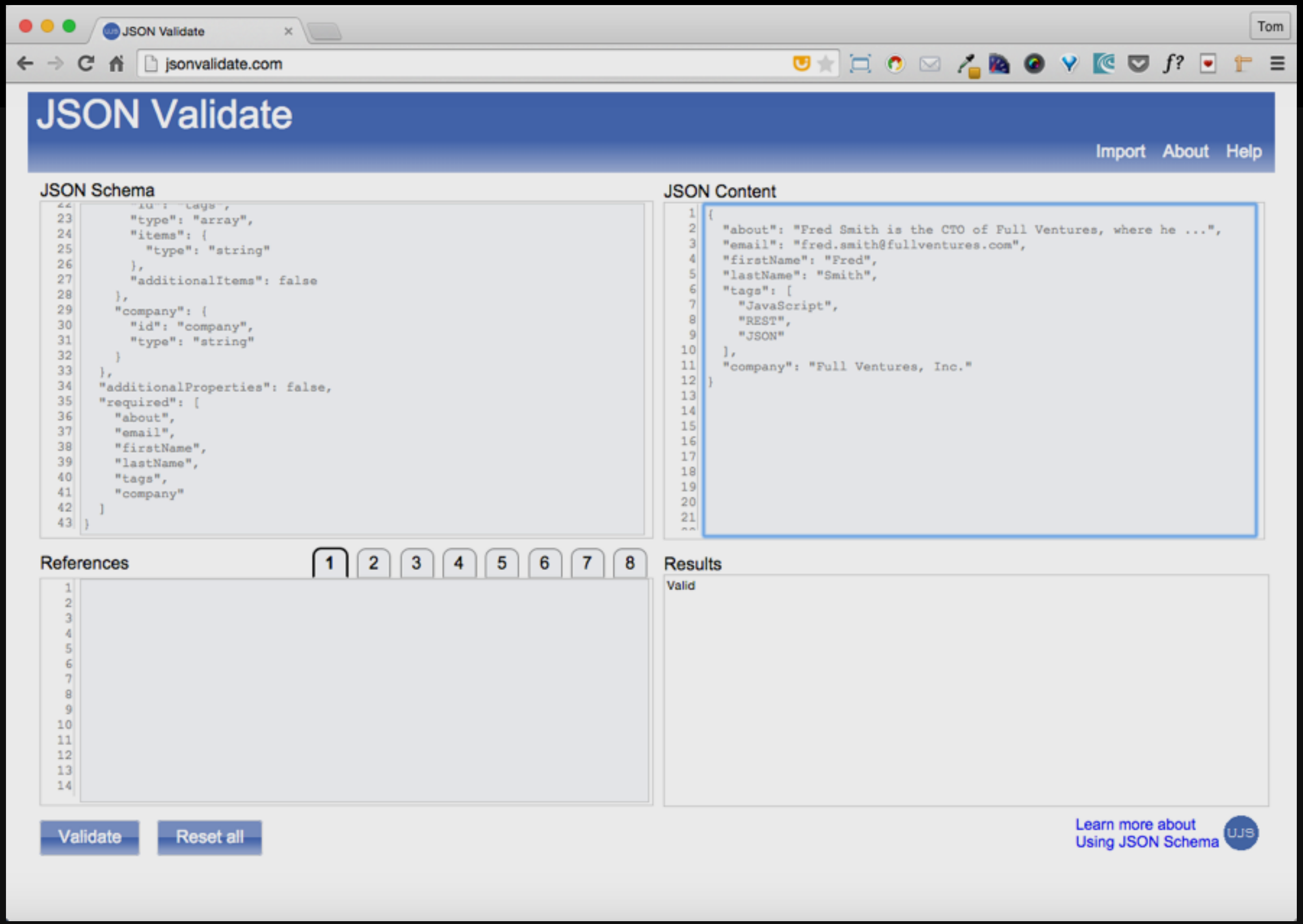
JSONPad Demo



JSON Schema Generator Demo



JSON Validate Demo



Matic

```
npm install -g matic
```

```
npm install -g jade
```

```
matic
```

https://github.com/mattyod/matic

https://github.com/mattyod/matic-draft4-example

My JSON API Workflow

Model JSON Document

JSONPad

https://code.google.com/p/json-pad/

Generate JSON Document

JSON Generator

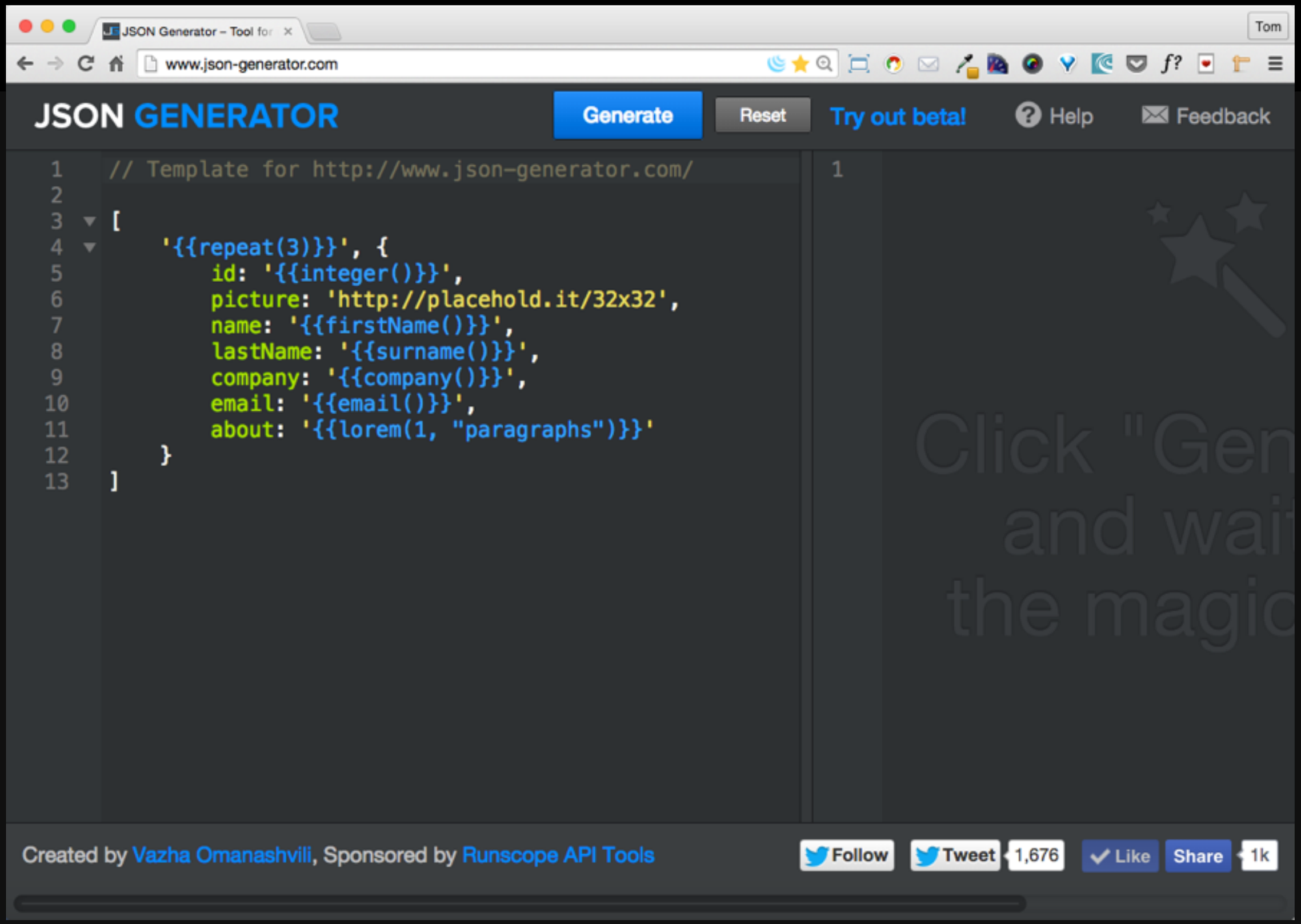
http://www.json-generator.com/

Deploy Stub REST API

JSON Server

https://github.com/typicode/json-server

JSON Generator Demo



JSON Server

```
npm install -g json-server
```

```
json-server speakers.json
```

http://localhost:3000/speakers

https://github.com/typicode/json-server

Our Agenda

Questions?

Tom Marrs

@TomMarrs

thomasamarrs@comcast.net

livingsocial

JSON Resources

JSON Spec - http://tools.ietf.org/html/rfc7159

ECMA 404 - http://www.ecma-international.org/publications/standards/Ecma-404.htm

JSON.org - http://www.json.org

JSONLint - http://www.jsonlint.com

JSON Resources

JSON Generator - http://www.json-generator.com/

JSONPad - https://code.google.com/p/json-pad/

JSON Editor Online - http://jsoneditoronline.org/

JSON Schema Resources

json-schema.org - http://json-schema.org/

JSON Schema Spec - http://json-schema.org/latest/json-schema-core.html

JSON Schema Validation Spec - http://json-schema.org/latest/json-schema-validation.html

JSON Hyper-Schema Spec - http://json-schema.org/latest/json-schema-hypermedia.html

JSON Schema Resources

Using JSON Schema - http://usingjsonschema.com/

JSON Validate - http://jsonvalidate.com/

Understanding JSON Schema - http://spacetelescope.github.io/understanding-json-schema/

jsonschema.net - http://jsonschema.net/

JSON Schema Resources

JSON Schema GitHub Repo - https://github.com/kriszyp/json-schema

JSON Schema Google Group - https://groups.google.com/forum/#!forum/json-schema

Put Some JSON Schema in your life - https://kreuzwerker.de/en/blog/posts/put-some-json-schema-in-your-life

JSON Pointer Spec - https://tools.ietf.org/html/rfc6901