What is JSON?

What is JSON?

Wh ON?

- JavaScript friendly

- JavaScript friendly
- Developer readable

- JavaScript friendly
- Developer readable
- Lightweight

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- Lightweight

{JSON}

- JavaScript friendly
- Developer readable
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JSON

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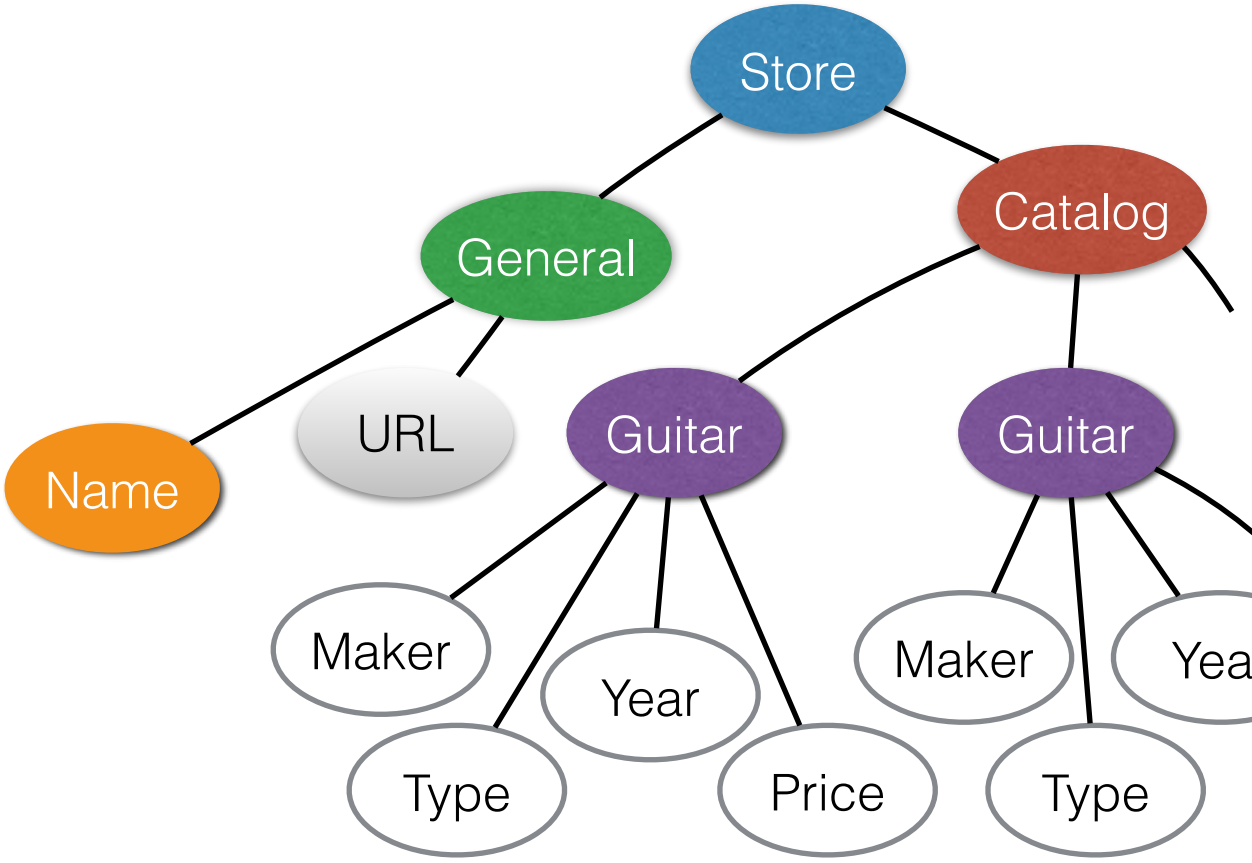
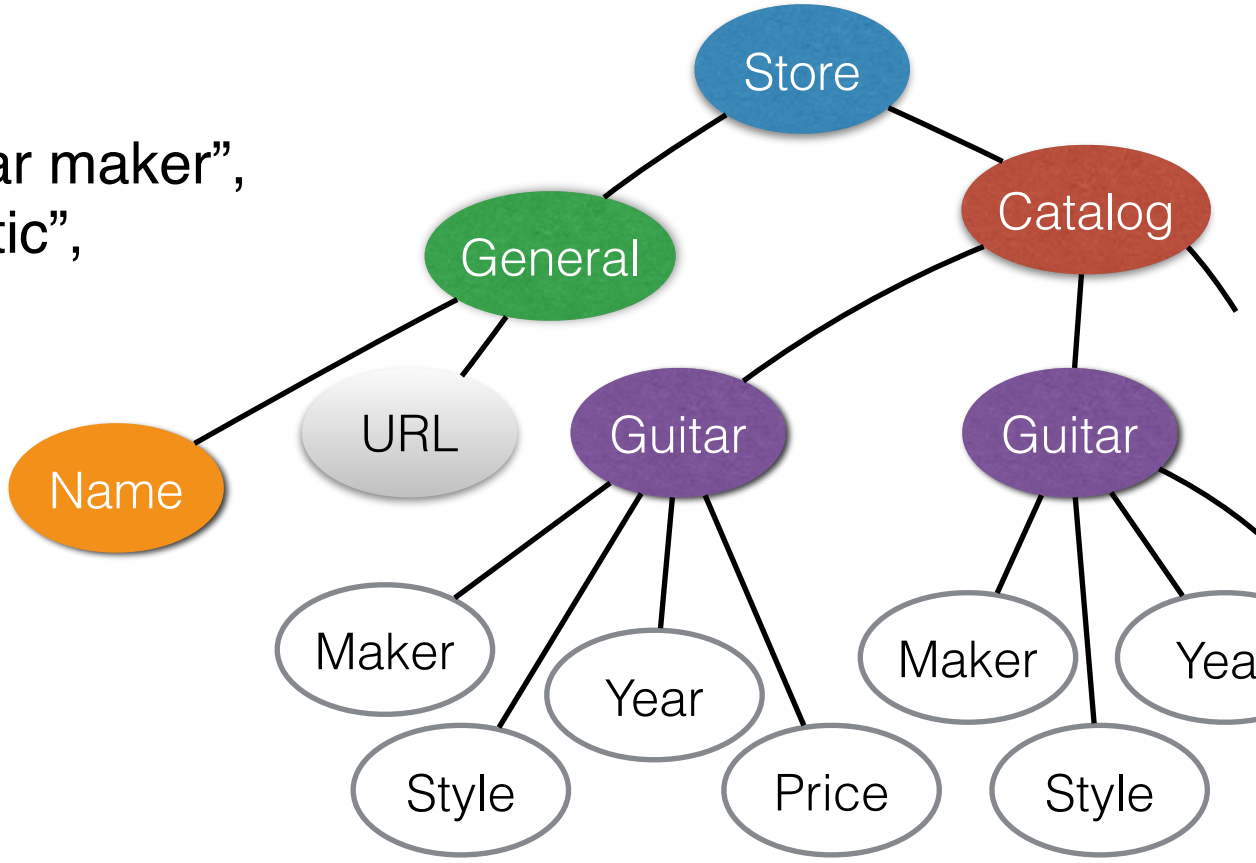

Store
General
Catalog
Name
URL
Guitar
Guitar
Maker
Year
Type
Price
Maker
Type

JSON data

```
{
    “general”: {
        “name”: “Amazing Guitars”,
        “url”: “amazinguitars.com”
    },
    “catalog”: [
        {“maker”: “Guitar maker”,
         “style”: “Acoustic”,
         “year”: 2010,
         “price”: 1000},
        { … }
    ]
}
```



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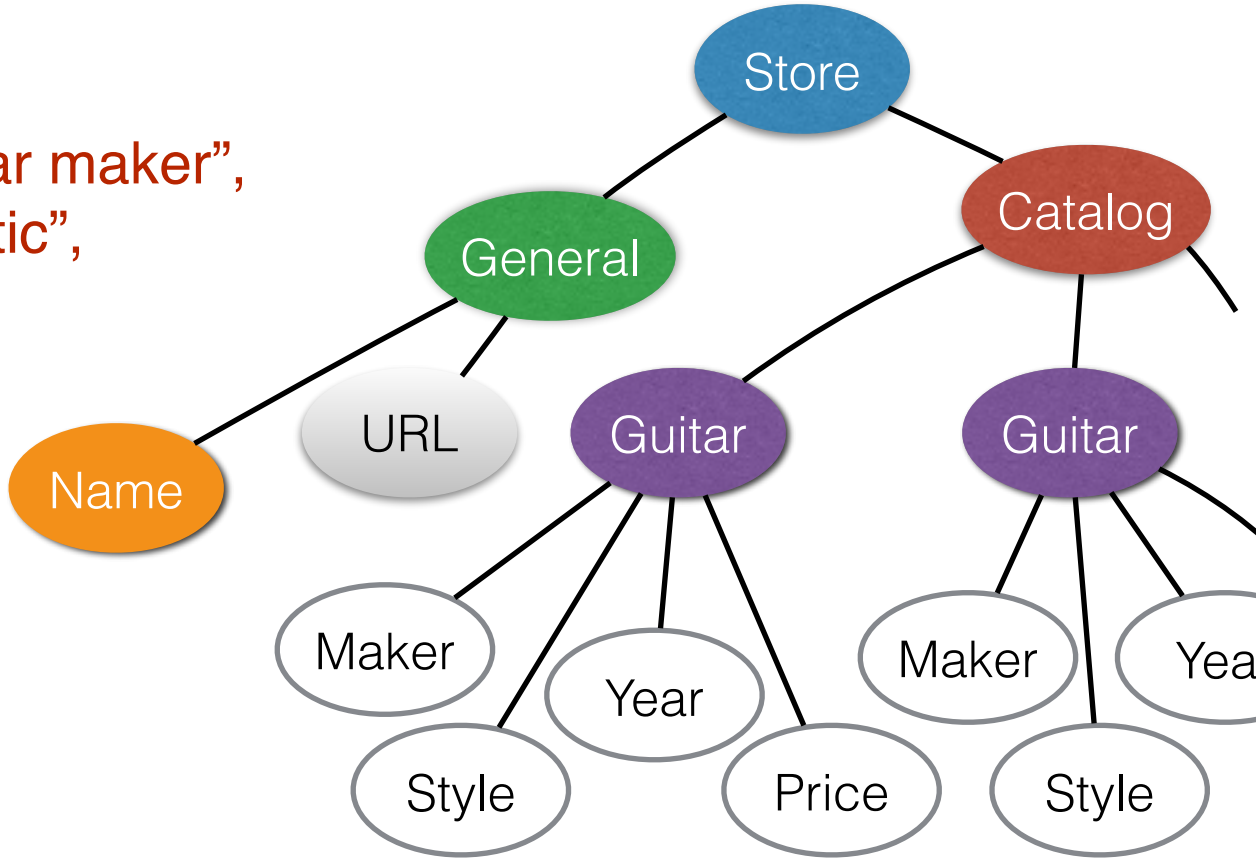

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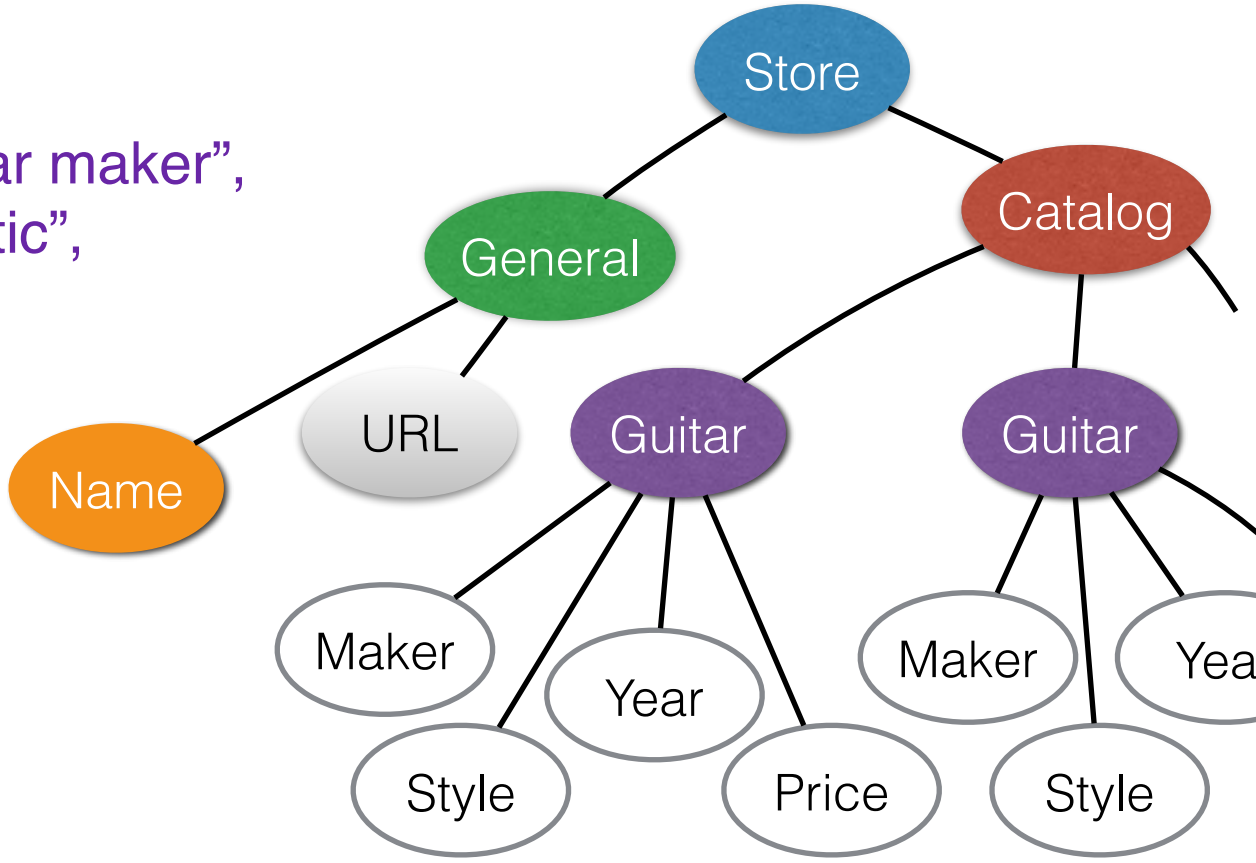
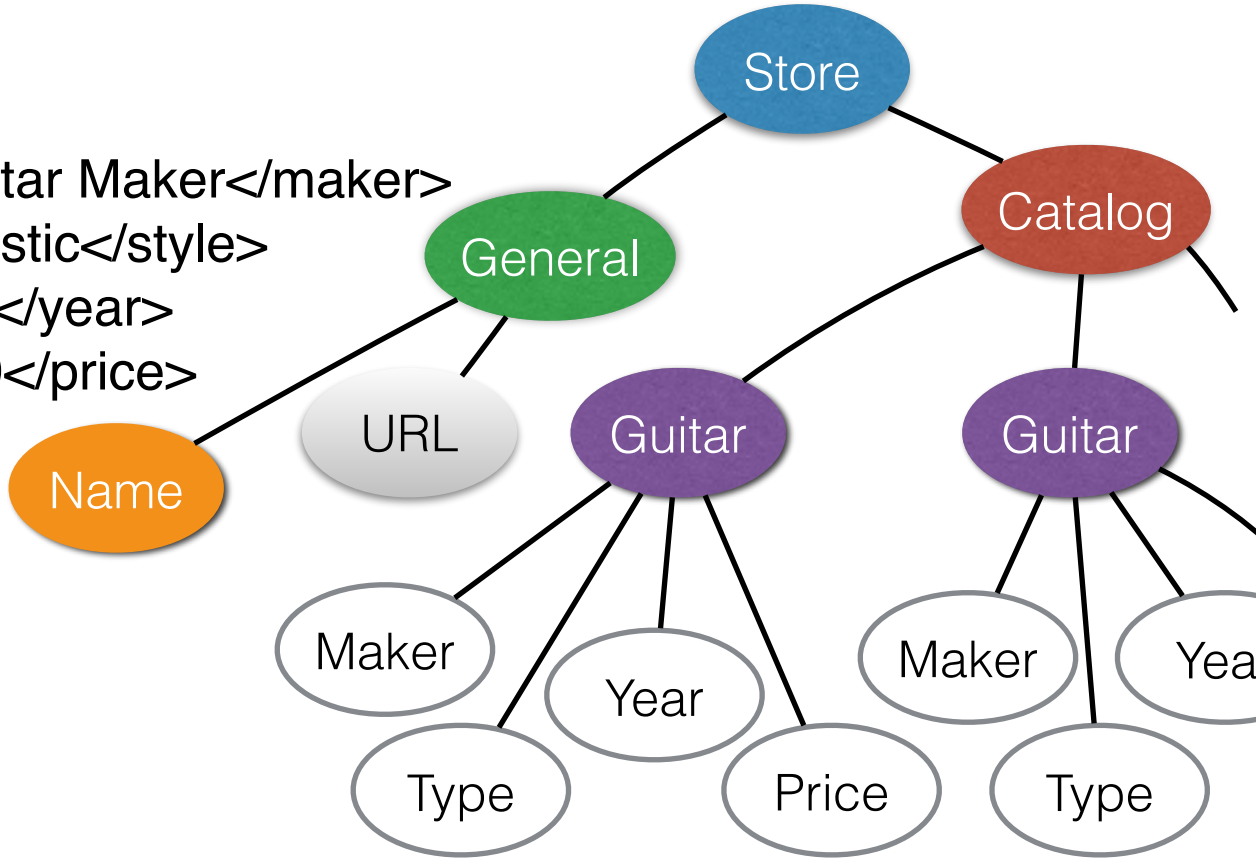


XML data

```
<store>
    <general>
        <name>Amazing guitars</name>
        <url>amazinguitars.com</url>
    </general>
    <catalog>
        <guitar>
            <maker>Guitar Maker</maker>
            <style>Acoustic</style>
            <year>2010</year>
            <price>1000</price>
        </guitar>
        <guitar>
            …
        </guitar>
    </catalog>
</store>
```



JSON

Gaining popularity in Web App development

- Smaller than XML files
- More intuitive for developers

One disadvantage (until recently): no schema!

JSON

Gaining popularity in Web App development

- Smaller than XML files
- More intuitive for developers

Disadvantage (now): schema is yet under development

JSON SCHEMA

JSON SCHEMA

```
{
    type : object,
    properties : {
        maker : {type : string},
        style : {type : string },
        year : {type: int},
        price : {type : int}
    }
}
```

JSON SCHEMA

```
{
    type : object,
    properties : {
        maker : {type : string},
        style : {type : string },
        year : {type: int},
        price : {type : int}
    }
}
```

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JSON SCHEMA

- Initial draft by 2010
- Currently Draft 4 (2013)

JSON SCHEMA

- Initial draft by 2010
- Currently Draft 4 (2013)
- Droettboom provides good interpretation (2015)

Understanding JSON Schema

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Satisfiability of JSON Schema and Instance Validation

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Center for **Semantic Web** Research

SATISFIABILITY

Does this schema admit any valid document?

SATISFIABILITY

Does this schema admit any valid document?

INSTANCE VALIDATION

Does this document conforms to a schema?

Interesting features of JSON SCHEMA

- Possibly recursive definitions

```
{
  definitions: {
    address: {
      type: object,
      properties: {
        street_address: { type: string },
        city:           { type: string },
        state:          { type: string }
      }
    }
  }
}
```

- Possibly recursive definitions

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```
{
  definitions: {
    address: {
      type: object,
      properties: {
        street_address: { type: string },
        city:           { type: string },
        state:          { type: string }
      }
    }
  }
}
```

```
type: object,

properties: {
  billing_address: { $ref: #/definitions/address },
  shipping_address: { $ref: #/definitions/address }
}
```

- Boolean combinations of schemas

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

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

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

- Unique constraints

  “All my children are different JSON documents”

- Numeric constraints

  “I have between k and l children”

Complexity of satisfiability

- How to manage all these features
- Smaller fragments via alternating automata

Validation

- In PTIME

Validation

- In PTIME
- Could not find any tool that was working properly

Future Work

Several other important problems to solve

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- Using JSON schema in APIs

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- Automatic generation of documentation

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- Understanding Web workflows

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- …

Wrapping Up

There is a proposal for a schema definition for JSON

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- Need to understand this proposal
- Use it to design better tools

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Several other tools or standards are being proposed for JSON

- SOAP equivalent for JSON
- Query languages, templates
- DBMS based on JSON
- …