Making Sense of Schema-on-Read

Modeling JSON

KENT GRAZIANO, CHIEF TECHNICAL EVANGELIST | KentGraziano

About me

- Chief Technical Evangelist, Snowflake Computing
- Oracle ACE Director, Alumni (DW/BI)
- OakTable Network
- Blogger – The Data Warrior
- Certified Data Vault Master and DV 2.0 Practitioner
- Former Member: Boulder BI Brain Trust (#BBBT)
- Member: DAMA Houston & DAMA International
- Data Architecture and Data Warehouse Specialist
  - 30+ years in IT
  - 25+ years of Oracle-related work
  - 20+ years of data warehousing experience
- Author & Co-Author of a bunch of books (Amazon)
- Past-President of ODTUG and Rocky Mountain Oracle User Group

3 years in stealth + 3 years GA

Founded 2012 by industry veterans with over 120 database patents

Over $850M in venture funding from leading investors

First customers 2014, general availability 2015

800+ employees
Over 2000 customers today

Fun facts:

Queries processed in Snowflake per day:	Largest single table:	Largest number of tables single DB:	Single customer most data:	Single customer most users:
100 million	**68 trillion rows**	**200,000**	**> 40PB**	**> 10,000**

AGENDA

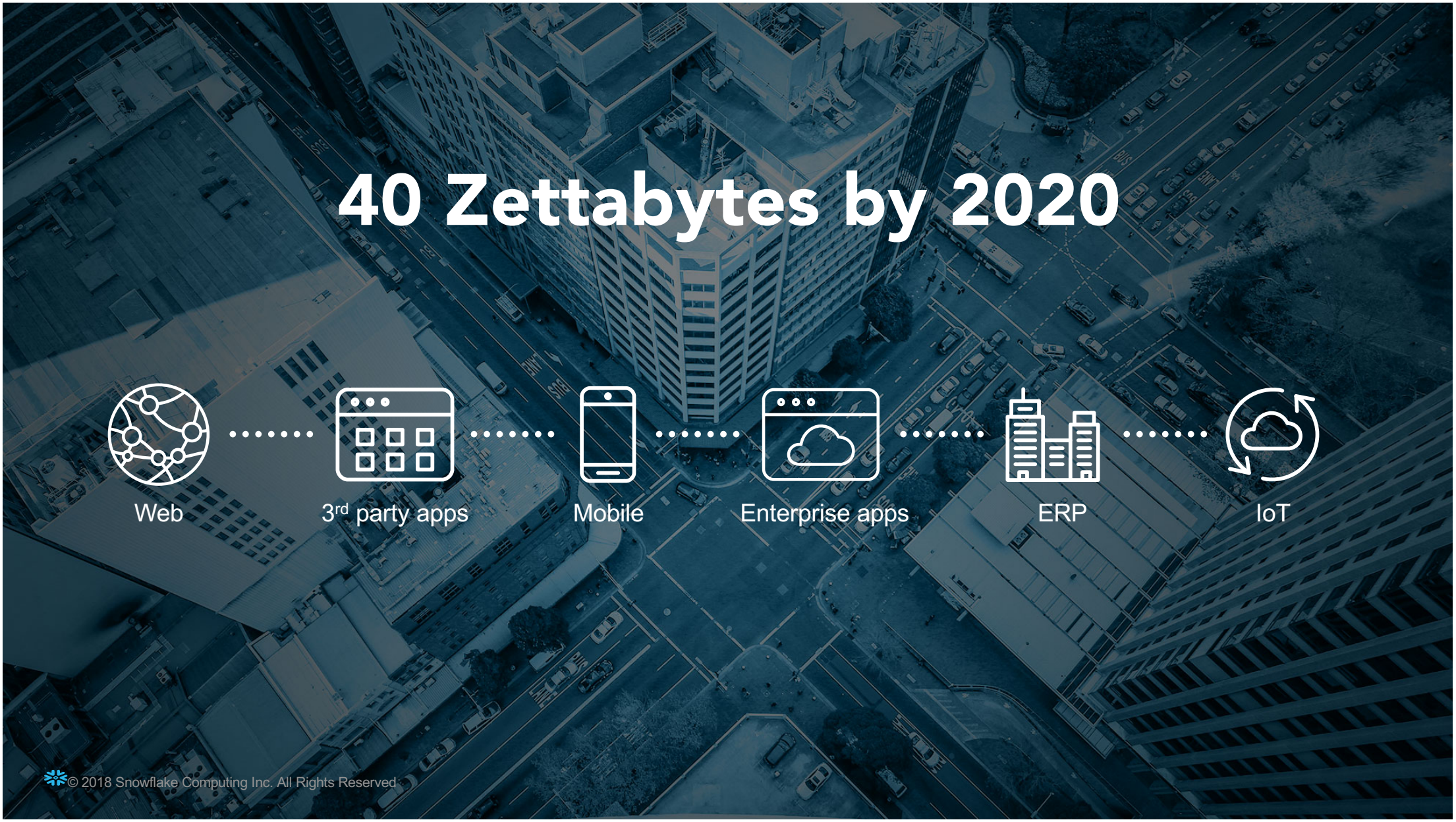
- Schema-on-Read vs Schema-on-Write
- Why we still need data modeling
- What is JSON?
- Example JSON #1
  - Simple 3NF model
  - Simple Data Vault model
- Example JSON #2
  - 3NF model
  - Data Vault model

Defining Terms

- Schema-on-Read
  - Popularized in document stores and NoSQL dbs
  - No upfront modeling
  - No predefined structure
  - Called semi-structured or flexible-structure data
    - Can change contents and structure over time
  - Load & Go
    - Agile!

Defining Terms

- Schema-on-Write
  - What we do in RDBMS today
  - Requires knowing the structure in advance
  - Upfront modeling & table design required
  - Must map source data to the database tables
  - ETL/ELT may break if the source data changes



It’s not the data itself

it’s how you take full advantage of the insight it provides

Who needs data modeling anyway?

- We all do!
- To take advantage of all this data, we have to use it
- Schema-on-Read
  - There is a SCHEMA – which means a model!
- To query the data requires knowing the structure
  - Which means the MODEL of the data or “document”
- Few reporting or BI tools can infer the schema
  - So we have to transform it, somehow
  - Load to tables and columns?
  - Expose with a SQL view?

What is JSON?

- Java
- Script
- Object
- Notation

A minimal, readable format for ***structuring*** data.

It is used primarily to transmit data between a server and a web application, as an alternative to XML

Why worry about JSON?

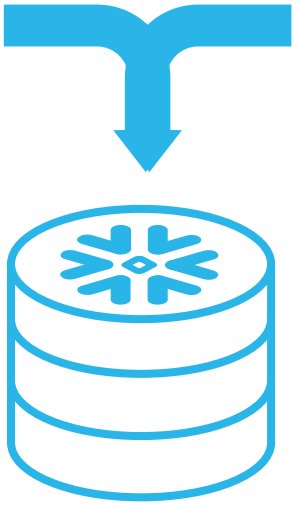
- There is LOTS of it out there
- JavaScript is popular
- REST API's for IoT & Mobile
- Application and web logs – Social Media
- Self-describing so very portable
- Open datasets published in JSON
  - Data.gov
  - Datasf.org
  - Data.cityofNewYork.us
- Opportunity for analysis!

JSON Support with SQL

Structured data

Apple	101.12	250	FIH-2316
Pear	56.22	202	IHO-6912
Orange	98.21	600	WHQ-6090

All Your Data!

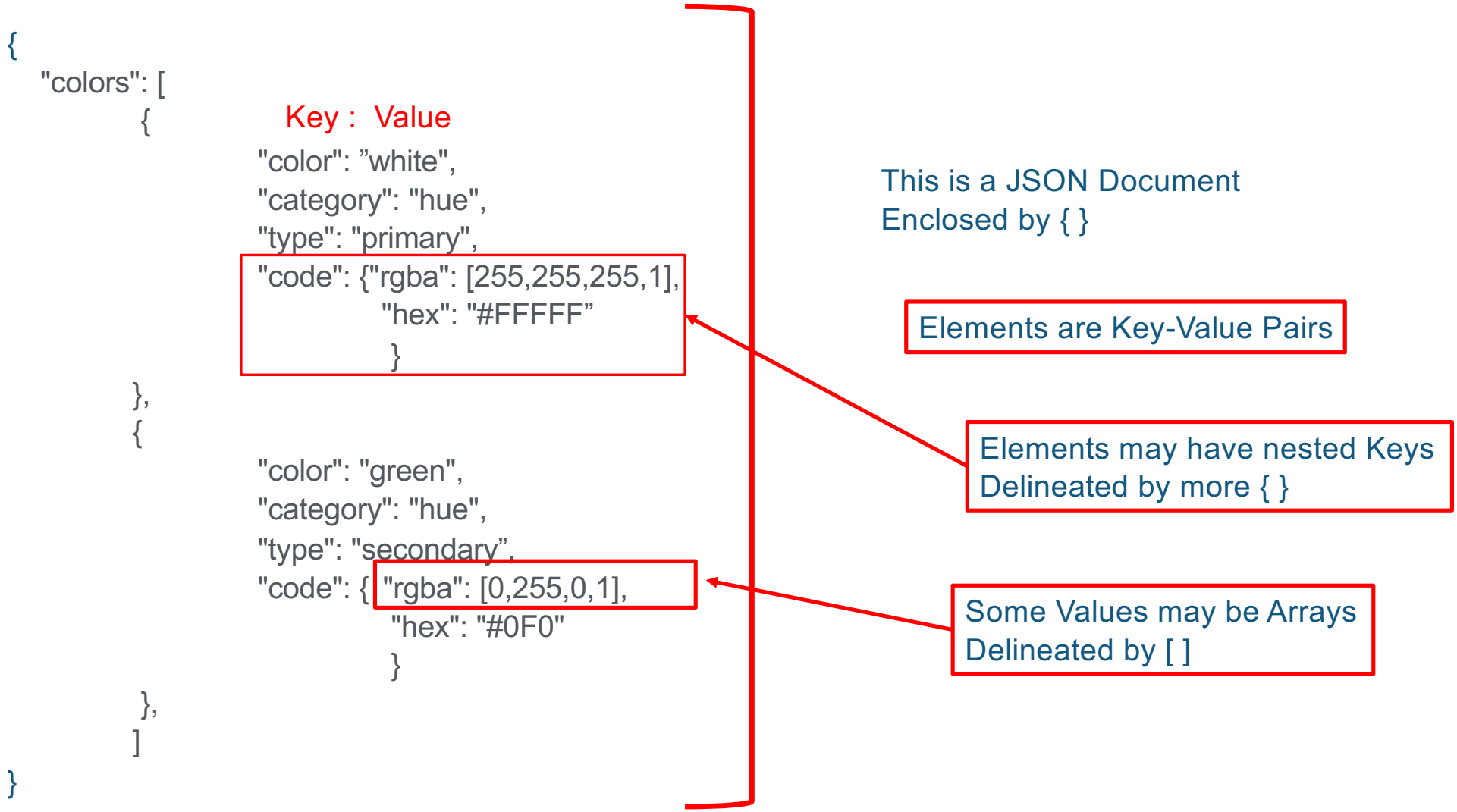


Semi-structured data
(e.g. JSON, Avro, XML)

```
{    "firstName": "John",
     "lastName": "Smith",
     "height_cm": 167.64,
     "address": {
          "streetAddress": "21 2nd Street",
          "city": "New York",
          "state": "NY",
          "postalCode": "10021-3100"
     },
     "phoneNumbers": [
          { "type": "home", "number": "212 555-1234" },
          { "type": "office", "number": "646 555-4567" }
     ]
}
```

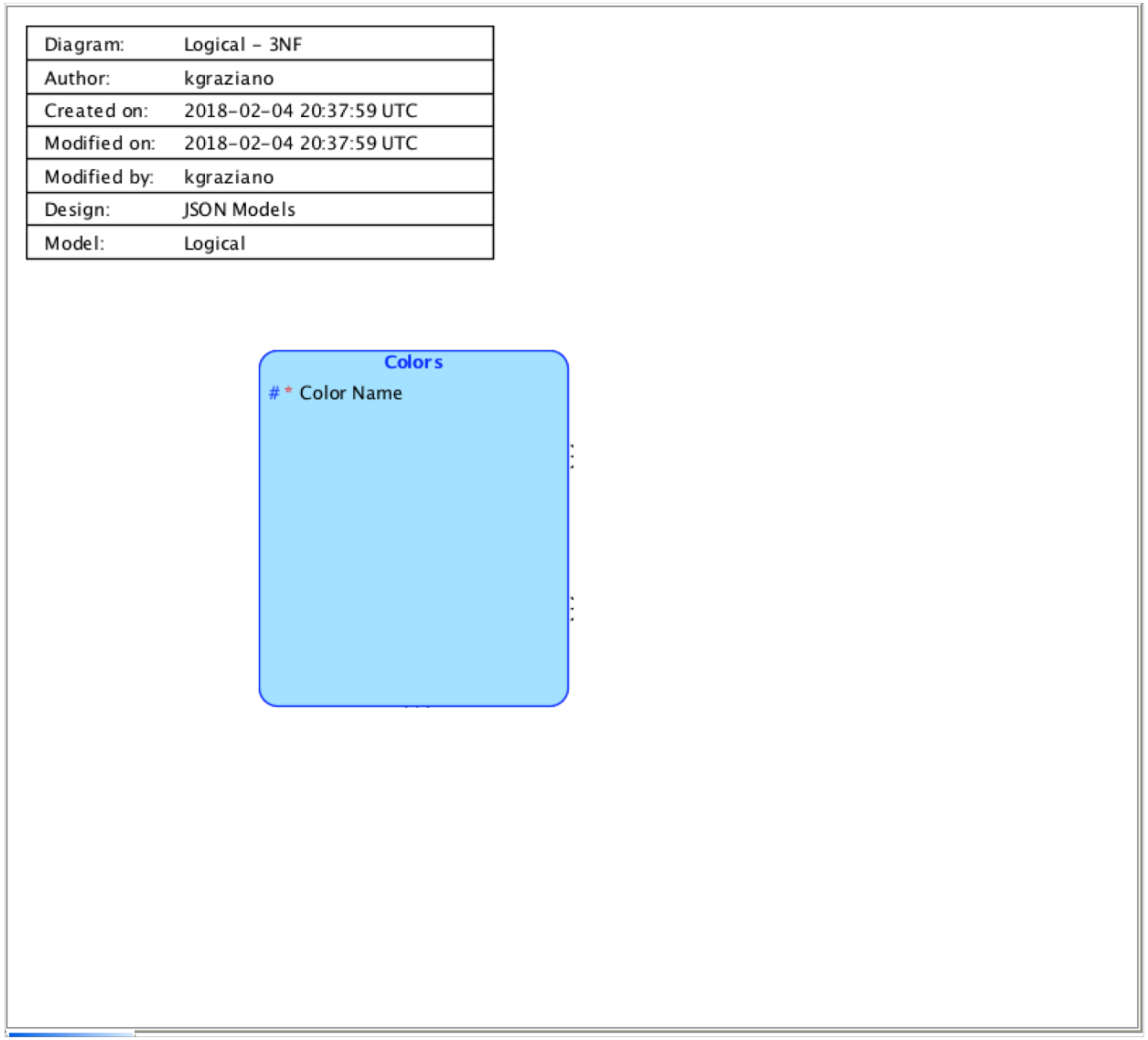
```
select v:lastName::string as last_name
from json_demo;
```

JSON Example #1



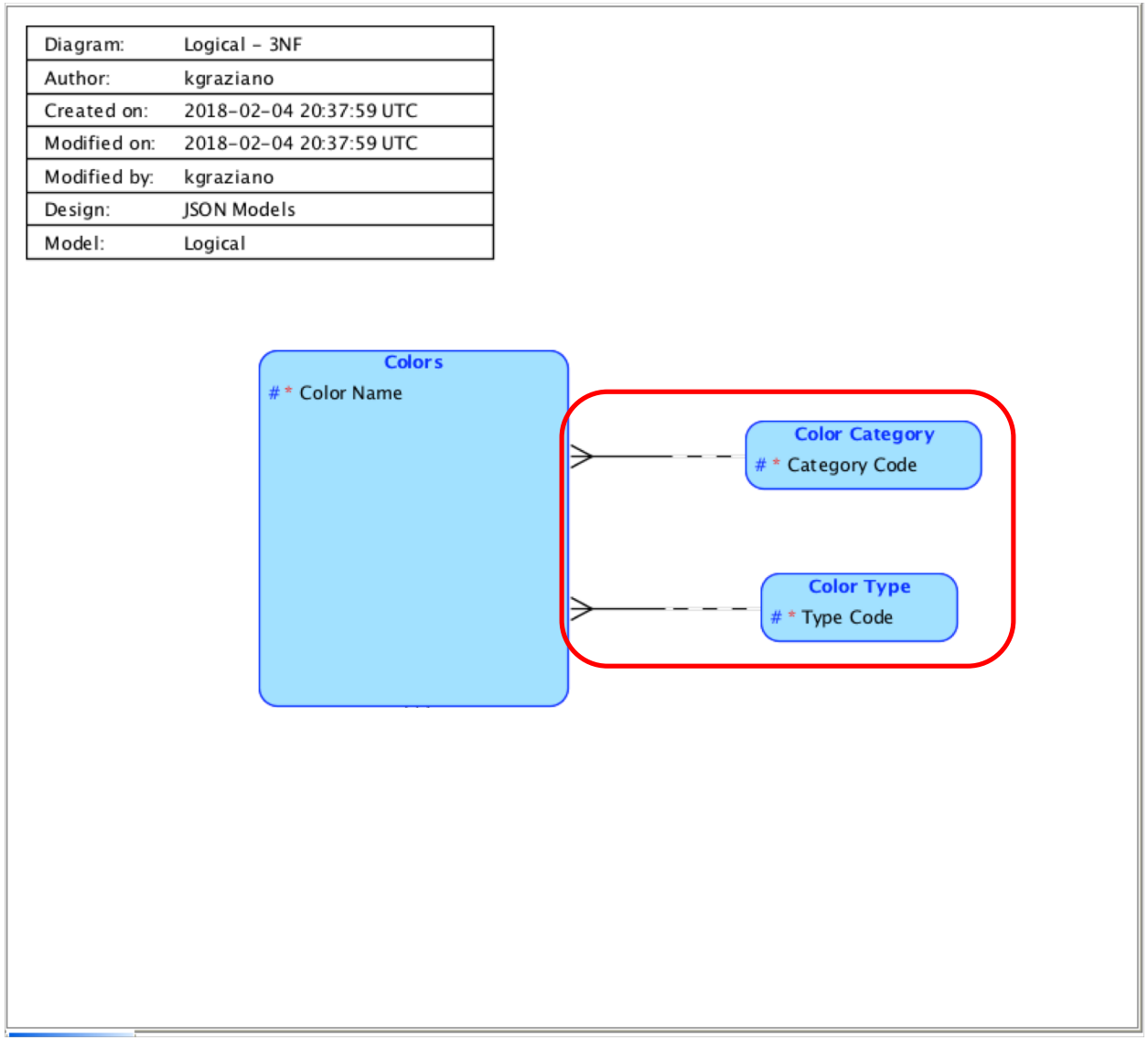
JSON as 3NF – Logical Model

```
"colors": [
        {
        "color": ”white",
        "category": "hue",
        "type": "primary",
        "code":
            {
              "rgba": [255,255,255,1],
               "hex": "#FFFFFF”
             }
        }
        ]
```



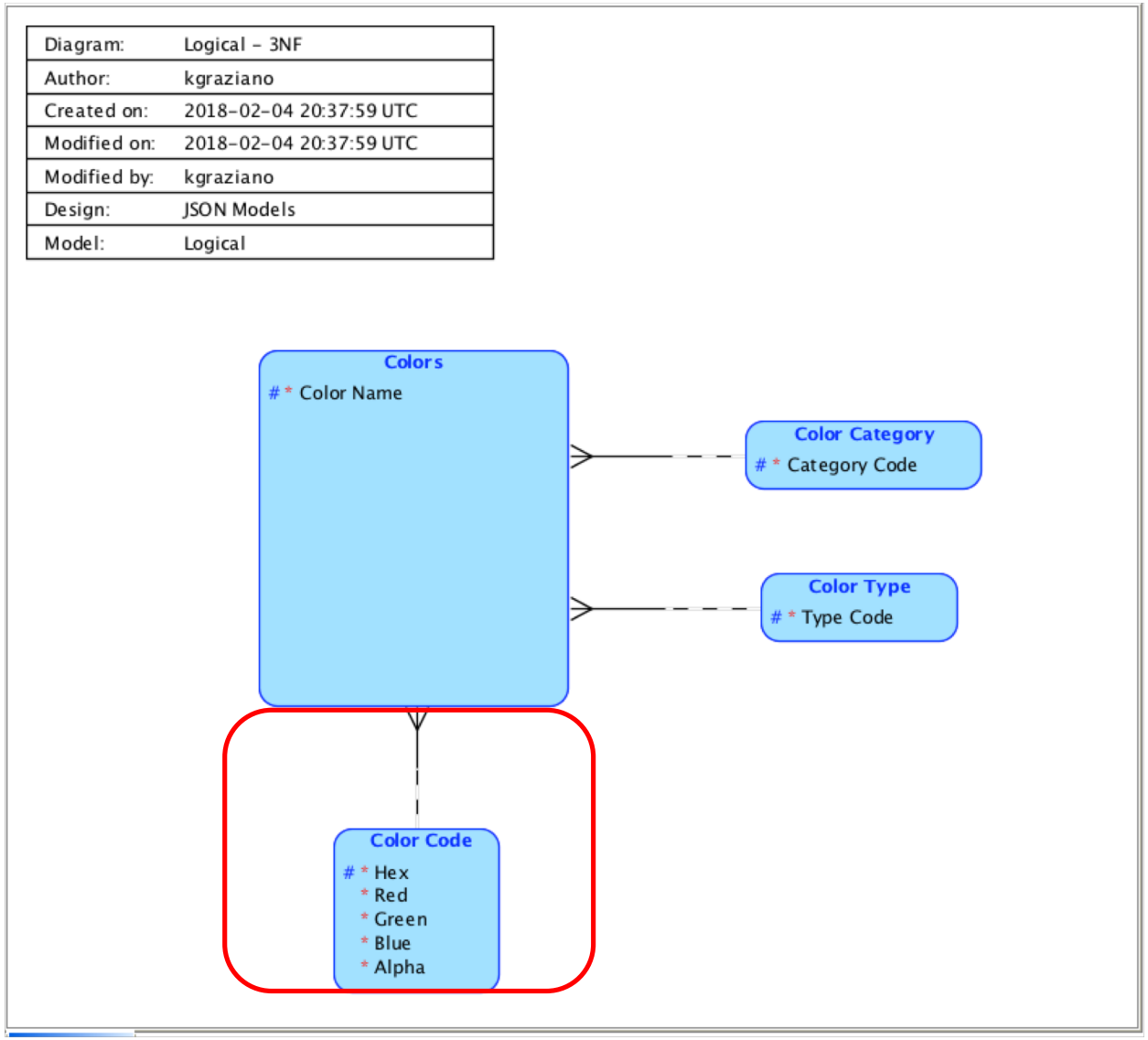
JSON as 3NF – Logical Model

```
"colors": [
          {
          "color": ”white",
          "category": "hue",
          "type": "primary",
          "code":
              {
                "rgba": [255,255,255,1],
                 "hex": "#FFFFFF”
               }
          }
          ]
```



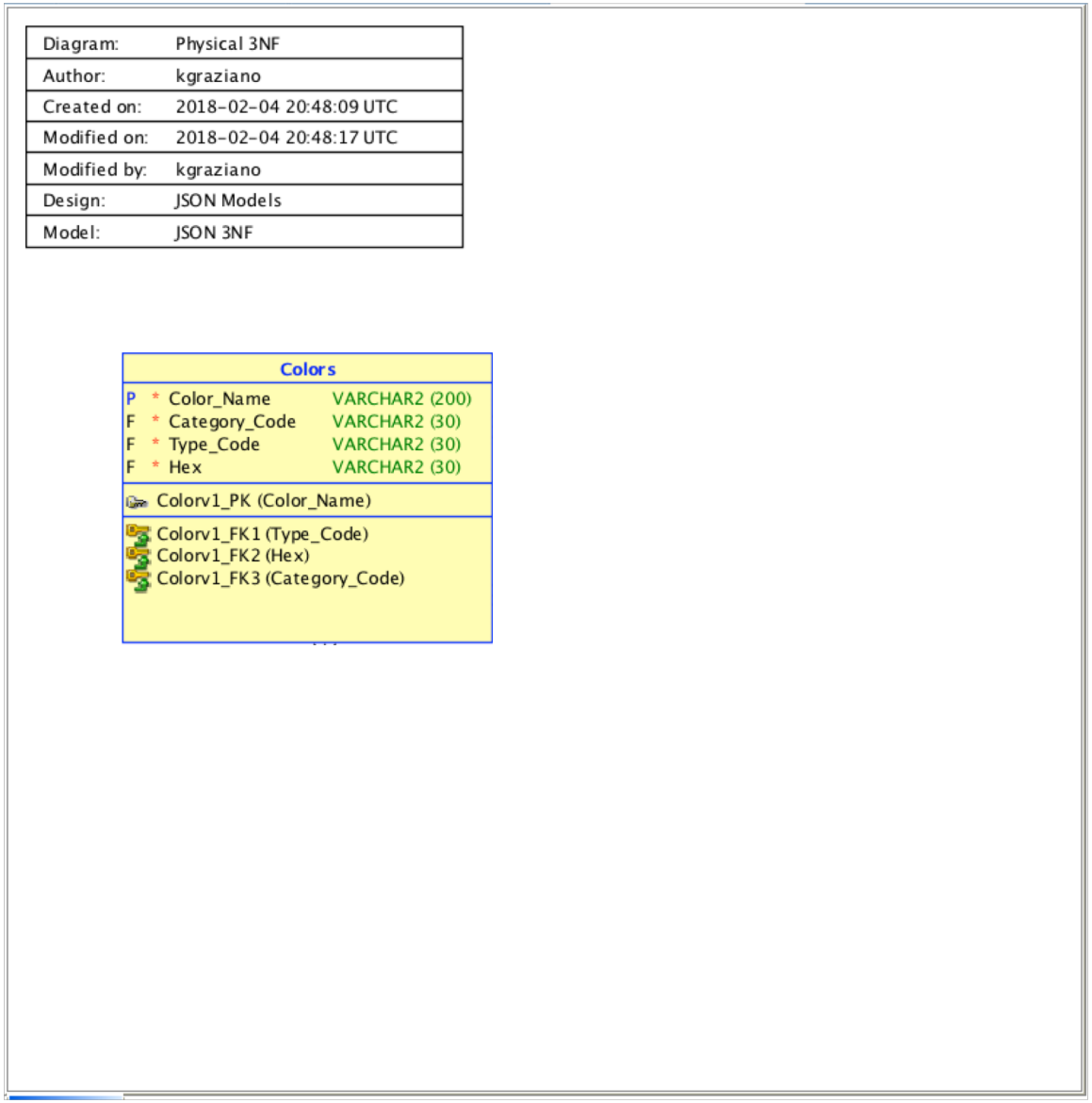
JSON as 3NF – Logical Model

```
"colors": [
        {
        "color": ”white",
        "category": "hue",
        "type": "primary",
        "code":
            {
              "rgba": [255,255,255,1],
               "hex": "#FFFFFF”
            }
        }
        ]
```



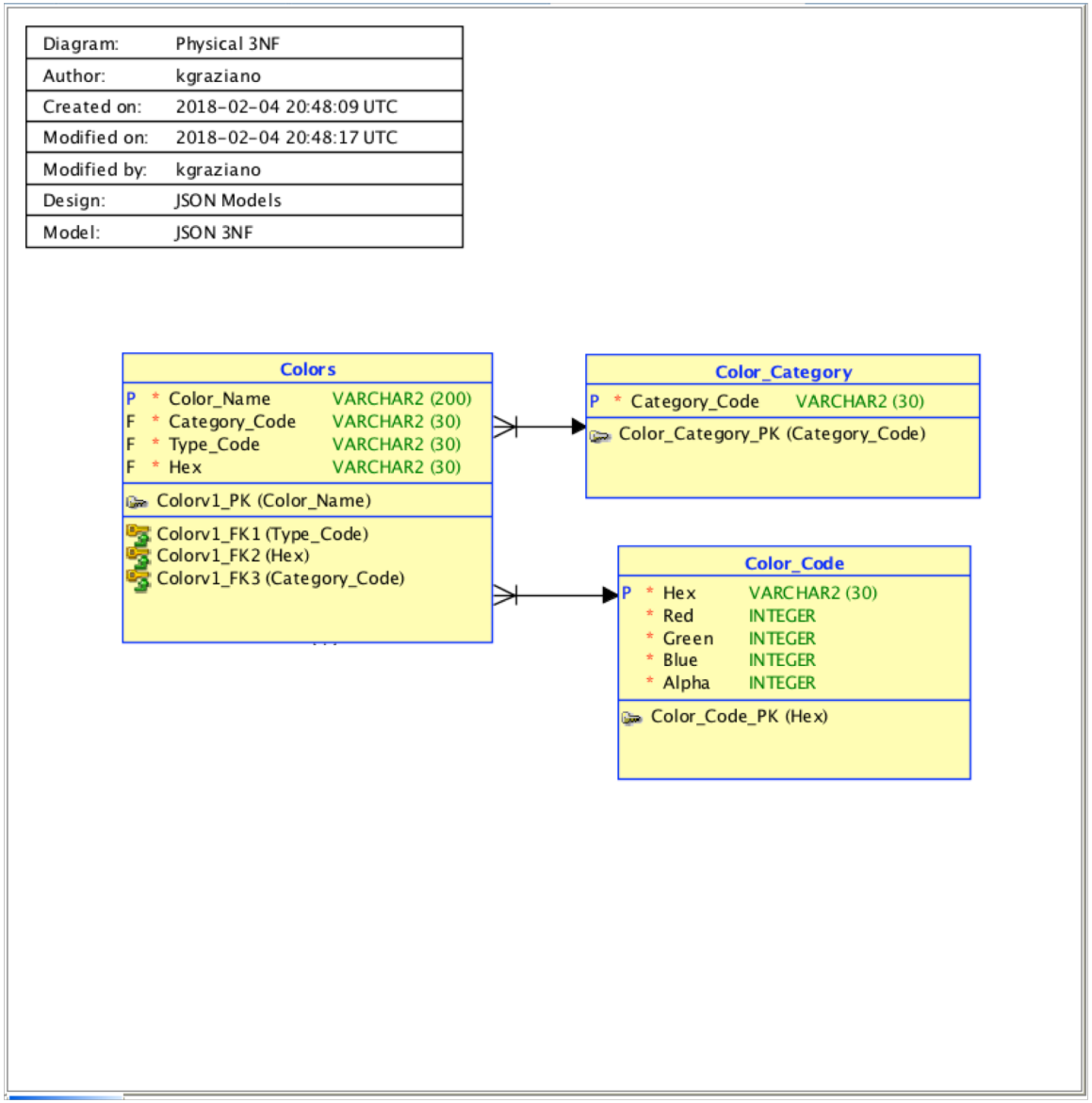
JSON as 3NF – Schema Model

```
"colors": [
          {
          "color": ”white",
          "category": "hue",
          "type": "primary",
          "code":
              {
                "rgba": [255,255,255,1],
                 "hex": "#FFFFFF”
               }
          }
          ]
```



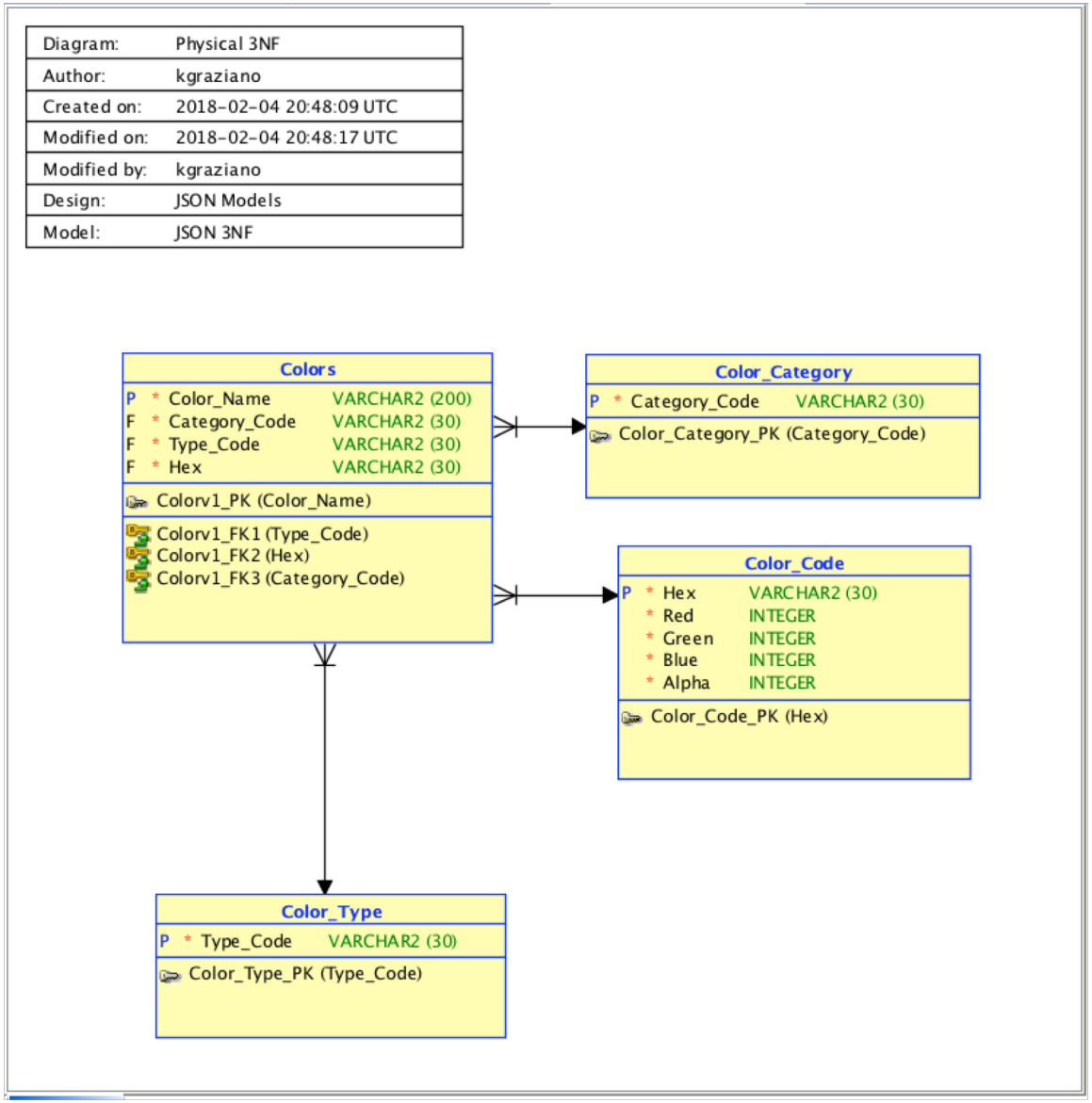
JSON as 3NF – Schema Model

```
"colors": [
          {
          "color": ”white",
          "category": "hue",
          "type": "primary",
          "code":
              {
                "rgba": [255,255,255,1],
                 "hex": "#FFFFFF”
               }
          }
          ]
```



JSON as 3NF – Schema Model

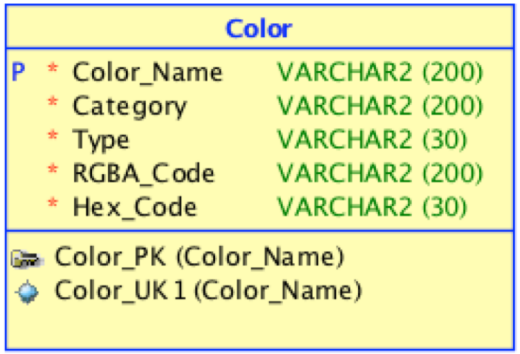
```
"colors": [
          {
          "color": ”white",
          "category": "hue",
          "type": "primary",
          "code":
              {
                "rgba": [255,255,255,1],
                 "hex": "#FFFFFF”
               }
          }
          ]
```



JSON as Denormalized – Relational Model

```
"colors": [
          {
          "color": ”white",
          "category": "hue",
          "type": "primary",
          "code":
              {
                "rgba": [255,255,255,1],
                 "hex": "#FFFFFF”
               }
          }
          ]
```

Diagram:	Denormalized
Author:	kgraziano
Created on:	2018-02-04 20:50:48 UTC
Modified on:	2018-02-04 20:50:55 UTC
Modified by:	kgraziano
Design:	JSON Models
Model:	JSON 3NF

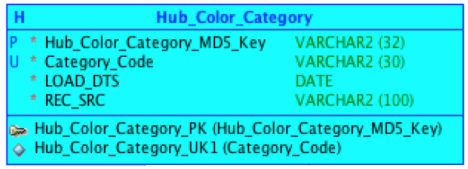


Data Vault Style

JSON as Data Vault

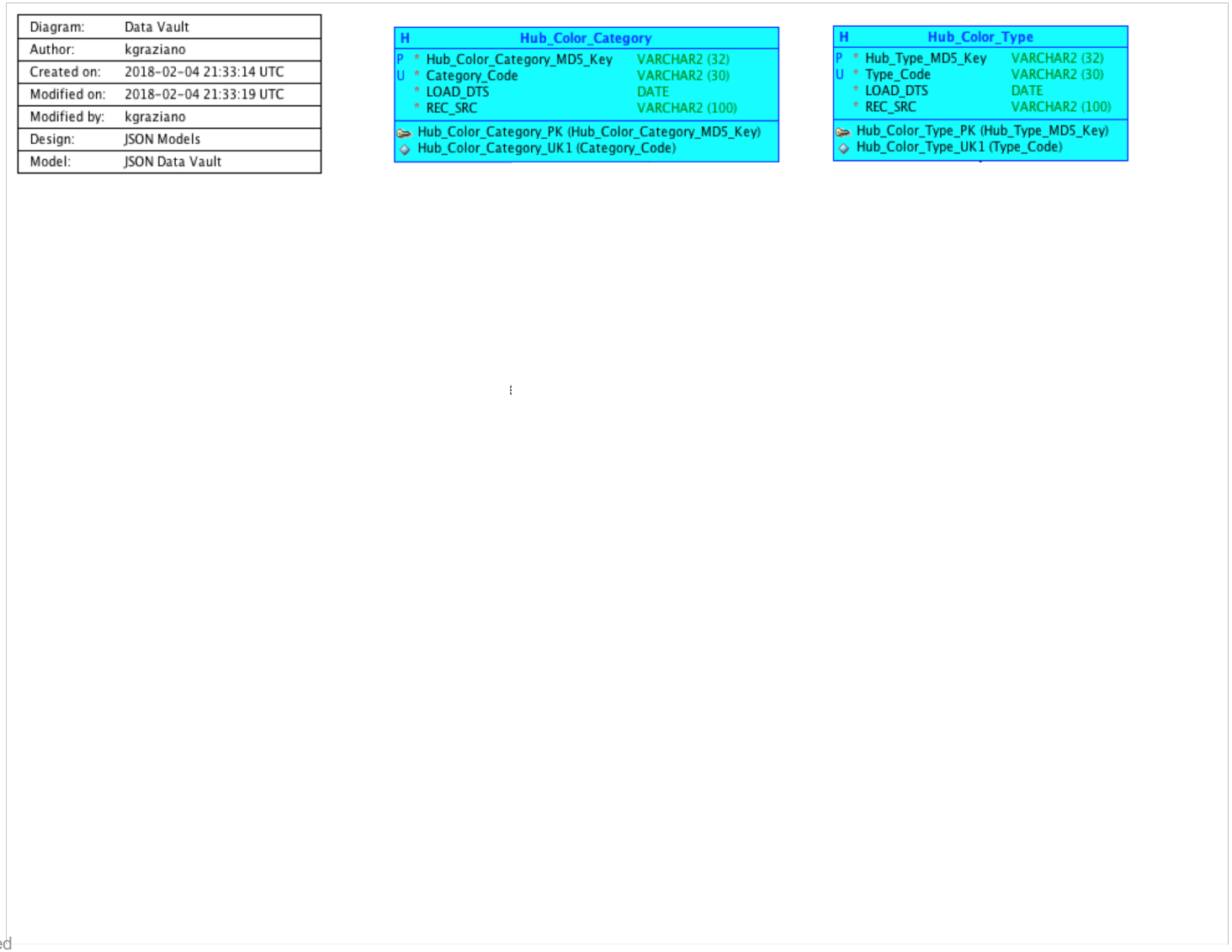
```
 "colors": [
 {
"color": ”white",
"category": "hue",
"type": "primary",
"code":
 {
   "rgba": [255,255,255,1],
    "hex": "#FFFFFF”
  }
}
              ]
```

Diagram:	Data Vault
Author:	kgraziano
Created on:	2018-02-04 21:33:14 UTC
Modified on:	2018-02-04 21:33:19 UTC
Modified by:	kgraziano
Design:	JSON Models
Model:	JSON Data Vault



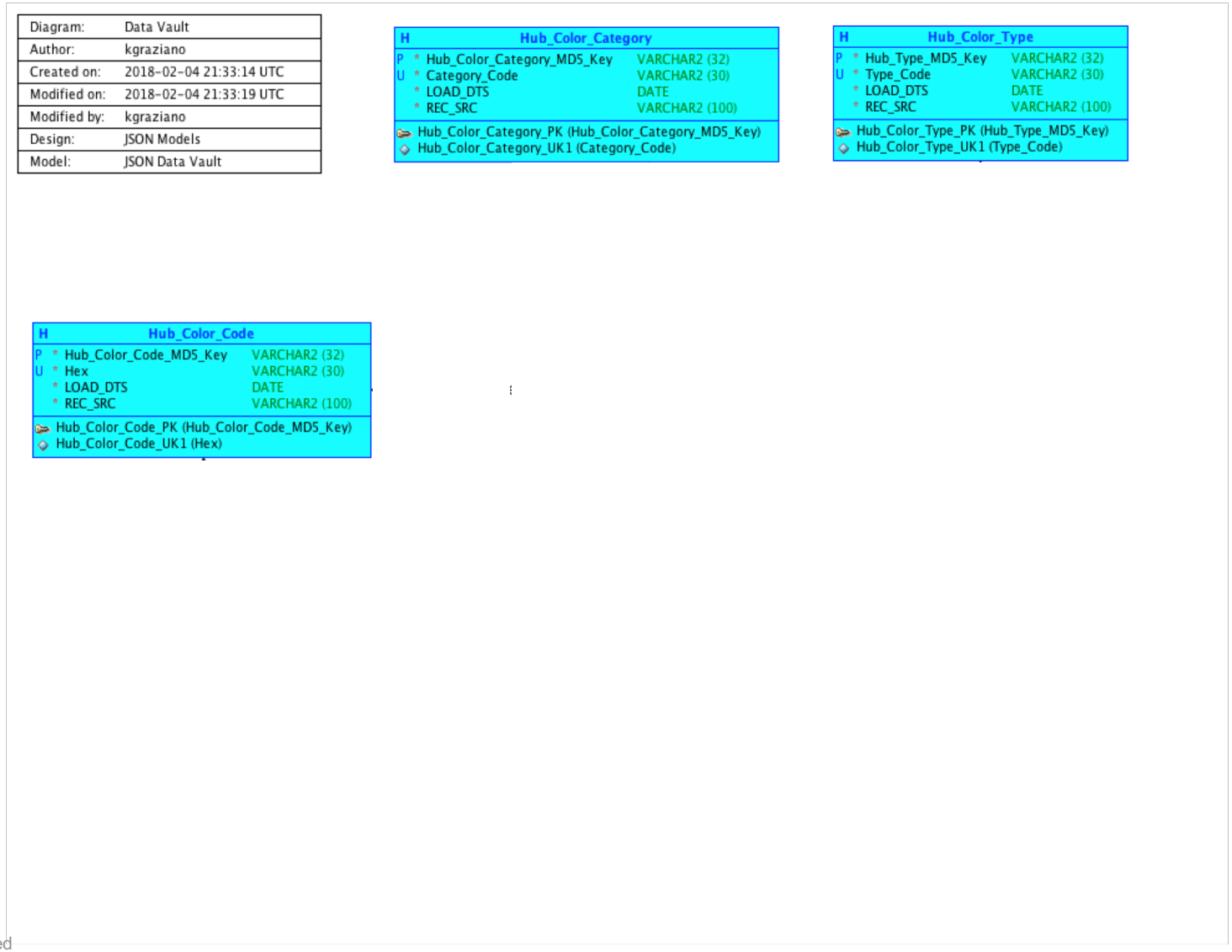
JSON as Data Vault

```
 "colors": [
 {
"color": ”white",
"category": "hue",
"type": "primary",
"code":
 {
   "rgba": [255,255,255,1],
    "hex": "#FFFFFF”
  }
}
            ]
```



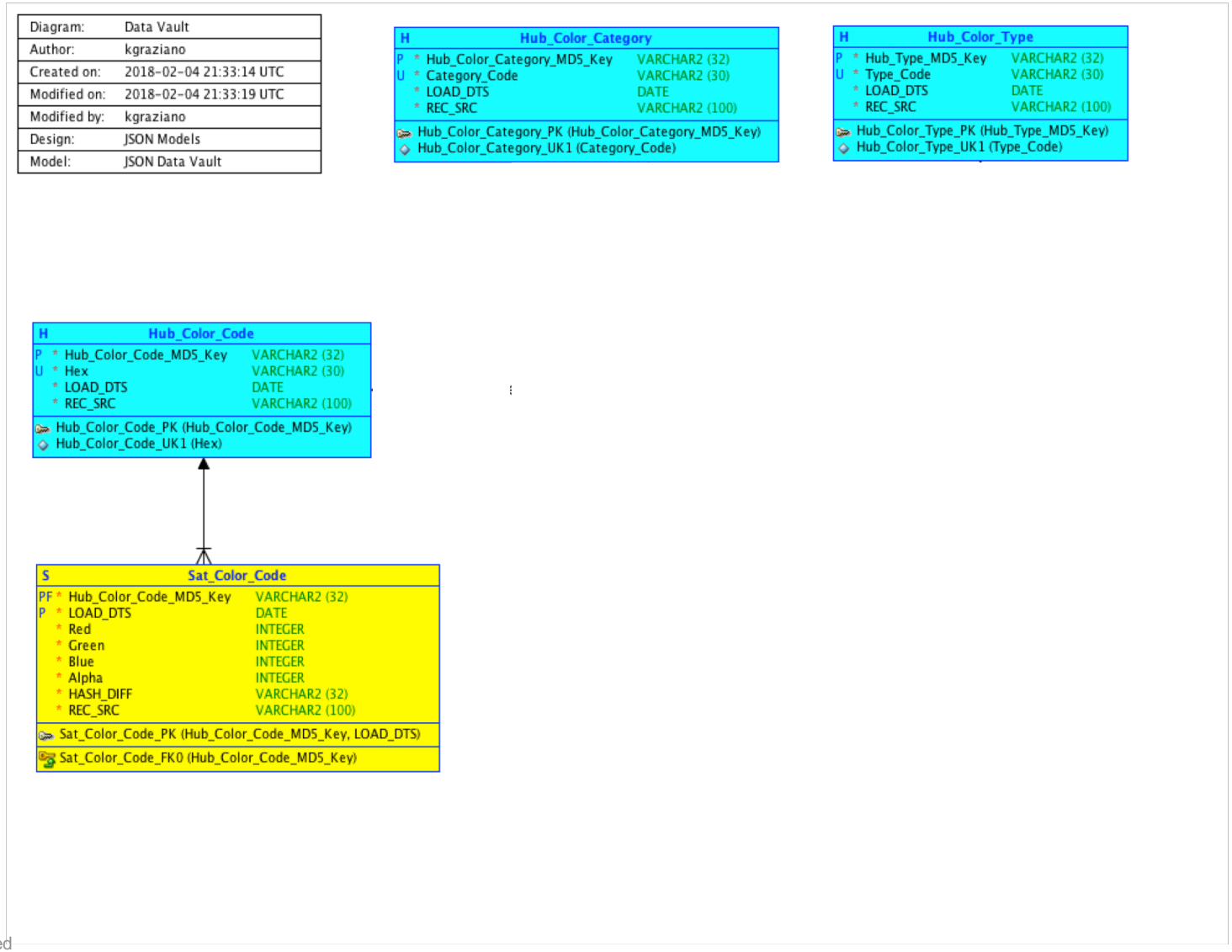
JSON as Data Vault

```
 "colors": [
 {
"color": ”white",
"category": "hue",
"type": "primary",
"code":
 {
   "rgba": [255,255,255,1],
   "hex": "#FFFFFF”
  }
}
            ]
```



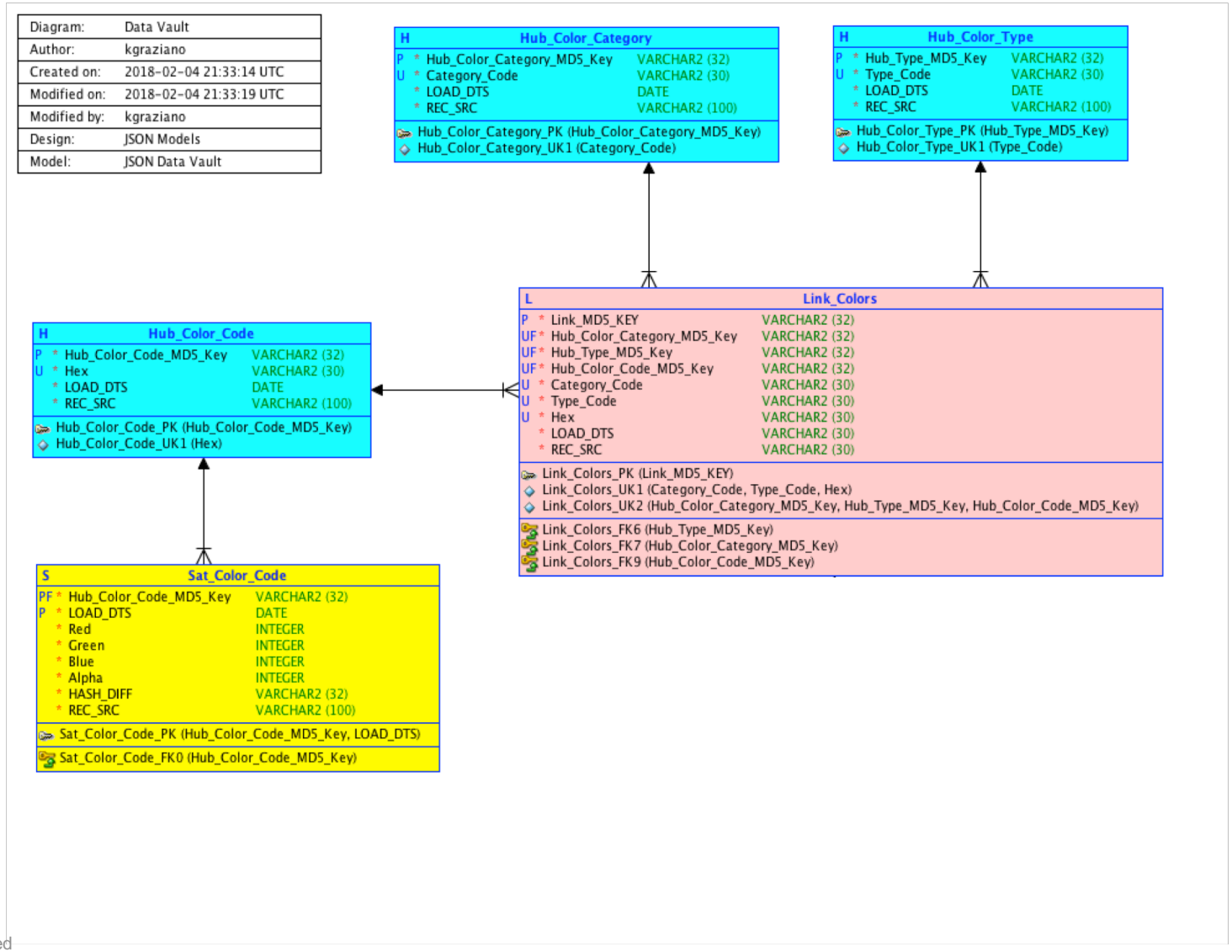
JSON as Data Vault

```
 "colors": [
 {
"color": ”white",
"category": "hue",
"type": "primary",
"code":
 {
  "rgba": [255,255,255,1],
   "hex": "#FFFFFF”
  }
}
            ]
```



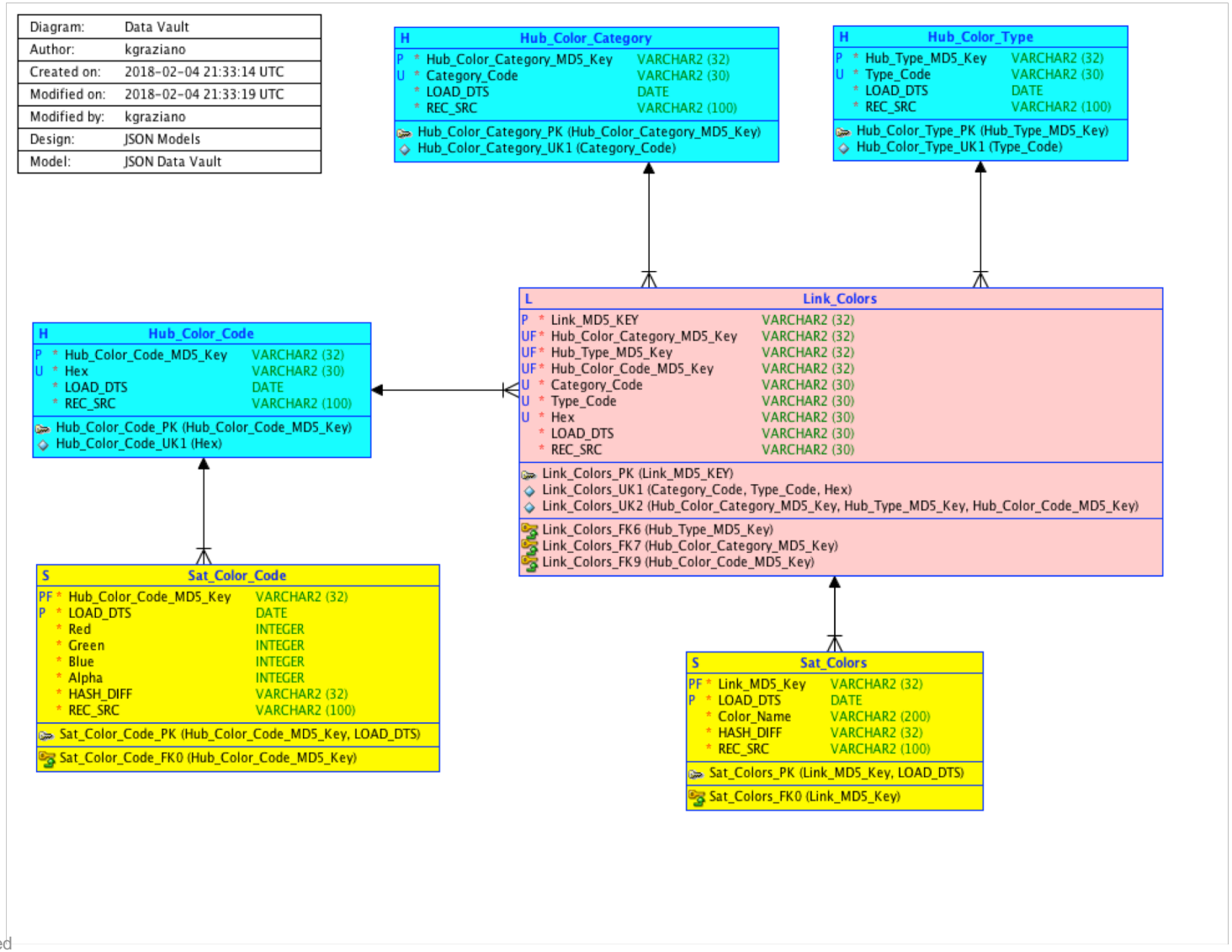
JSON as Data Vault

```
"colors": [
 {
"color": ”white",
"category": "hue",
"type": "primary",
"code":
 {
   "rgba": [255,255,255,1],
    "hex": "#FFFFFF”
  }
}
            ]
```



JSON as Data Vault

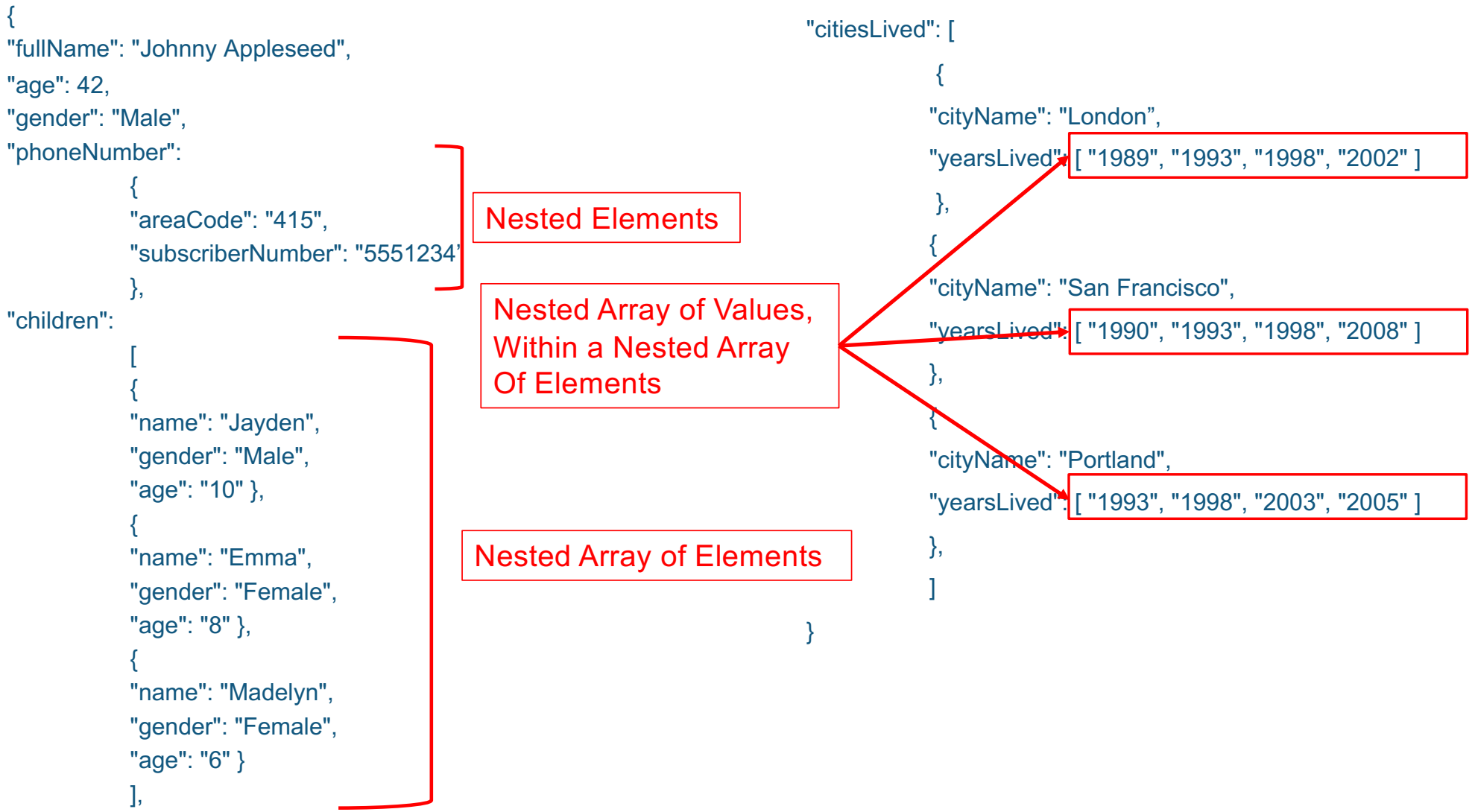
```
 "colors": [
 {
"color": ”white",
"category": "hue",
"type": "primary",
"code":
 {
   "rgba": [255,255,255,1],
    "hex": "#FFFFFF”
  }
}
            ]
```



What if the JSON changes?

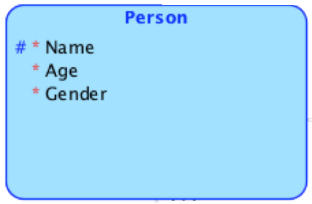
- That is the point of schema-on-read
  - No changes to ingest the data
    - NoSQL, Snowflake, Oracle
- Example
  - More attributes on Color Category or Color Type
    - Like “Description”
    - In a 3NF model
      - Add new columns to entities/tables
      - ALTER TABLE required
    - In a Data Vault model
      - Add new Sat tables on existing Hubs
        - CREATE TABLE required
        - No change required to existing tables

JSON Example #2



JSON as 3NF – Logical Model

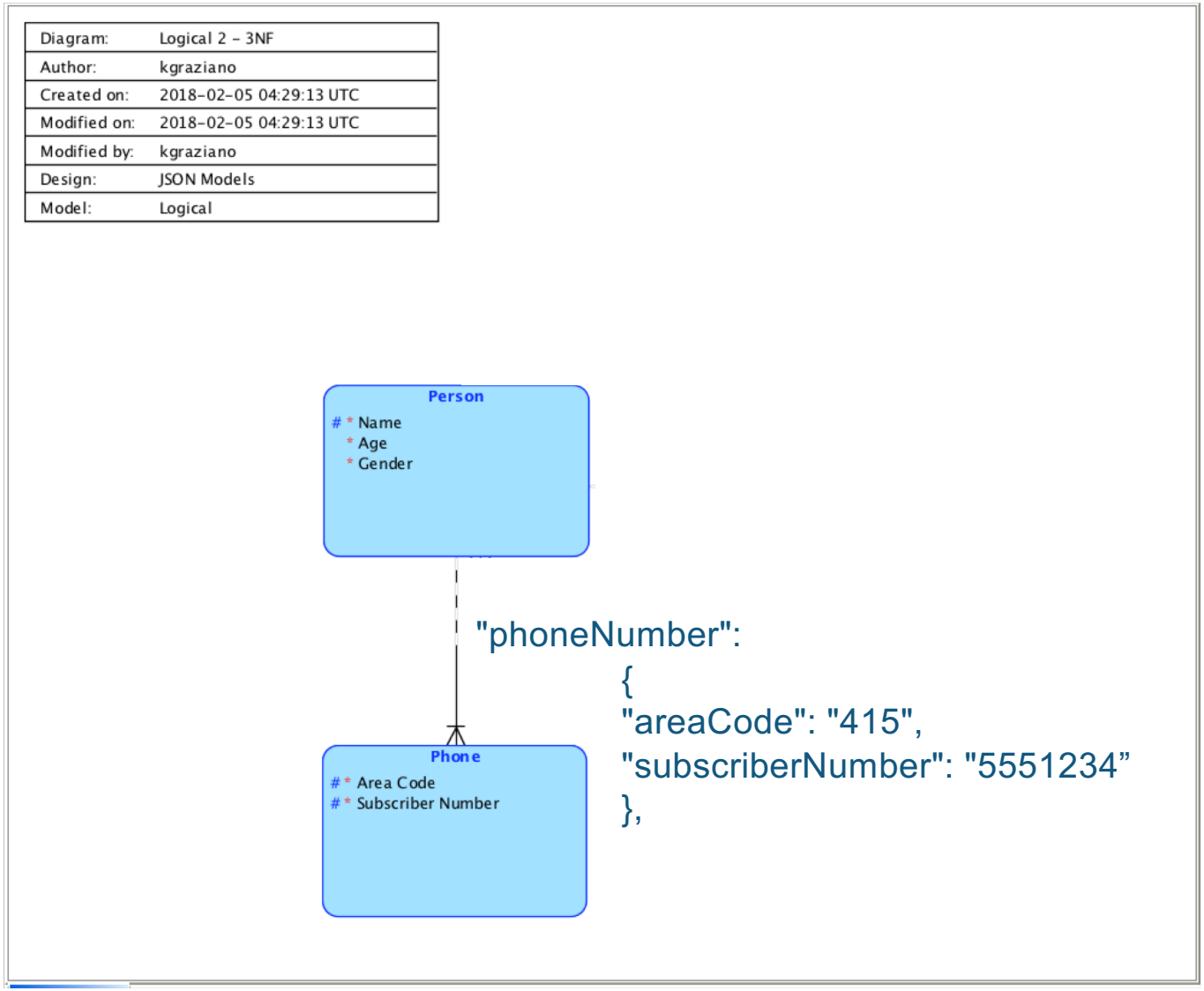
Diagram:	Logical 2 - 3NF
Author:	kgraziano
Created on:	2018-02-05 04:29:13 UTC
Modified on:	2018-02-05 04:29:13 UTC
Modified by:	kgraziano
Design:	JSON Models
Model:	Logical



"fullName": "Johnny Appleseed",
"age": 42,
"gender": "Male",

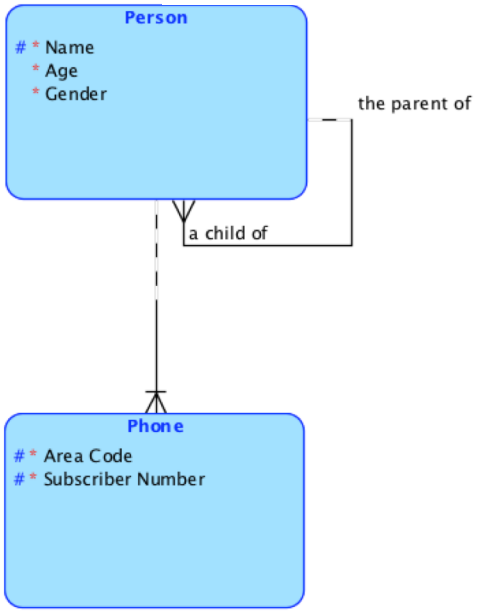
JSON as 3NF – Logical Model

Diagram:	Logical 2 - 3NF
Author:	kgraziano
Created on:	2018-02-05 04:29:13 UTC
Modified on:	2018-02-05 04:29:13 UTC
Modified by:	kgraziano
Design:	JSON Models
Model:	Logical



JSON as 3NF – Logical Model

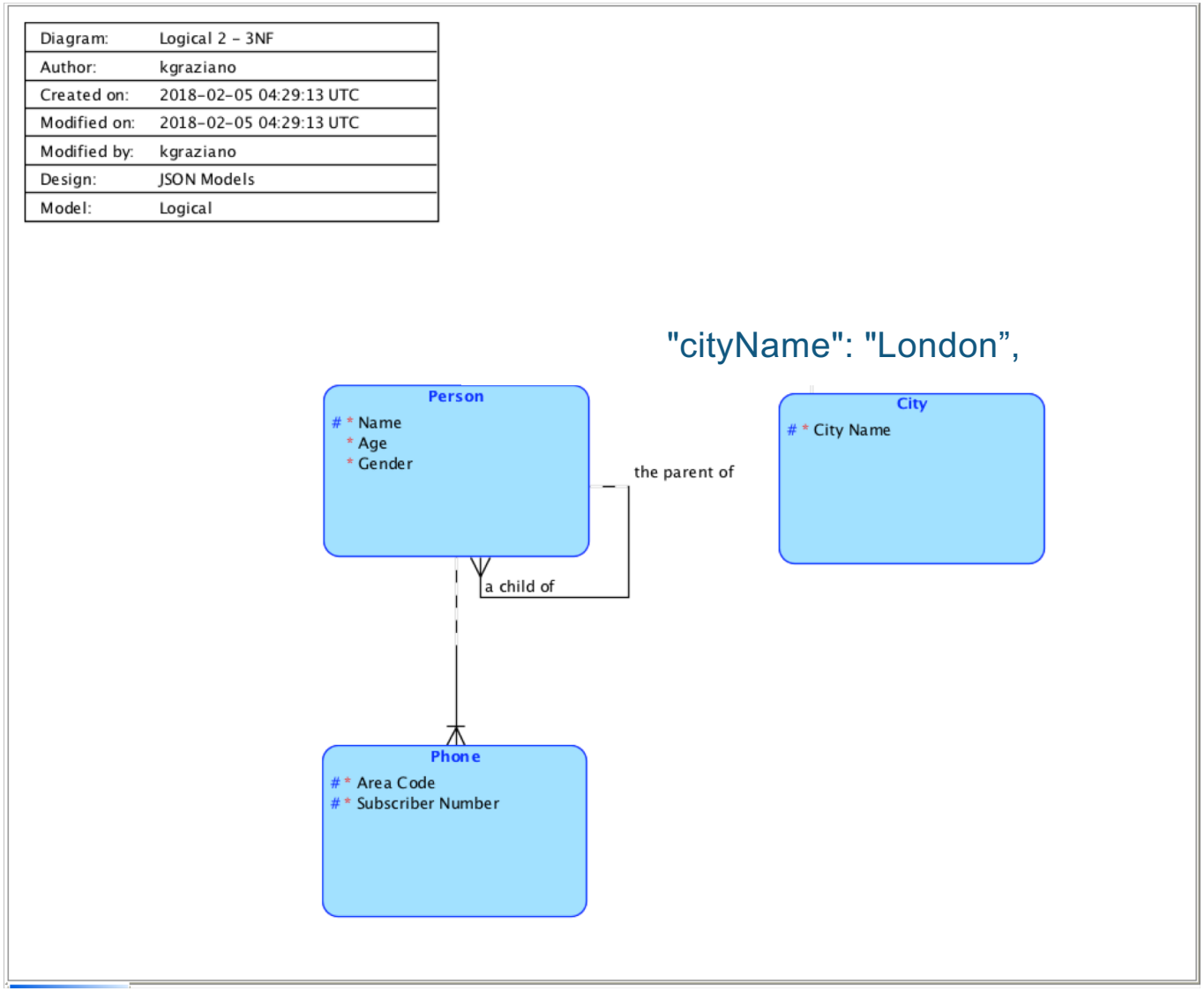
Diagram:	Logical 2 - 3NF
Author:	kgraziano
Created on:	2018-02-05 04:29:13 UTC
Modified on:	2018-02-05 04:29:13 UTC
Modified by:	kgraziano
Design:	JSON Models
Model:	Logical



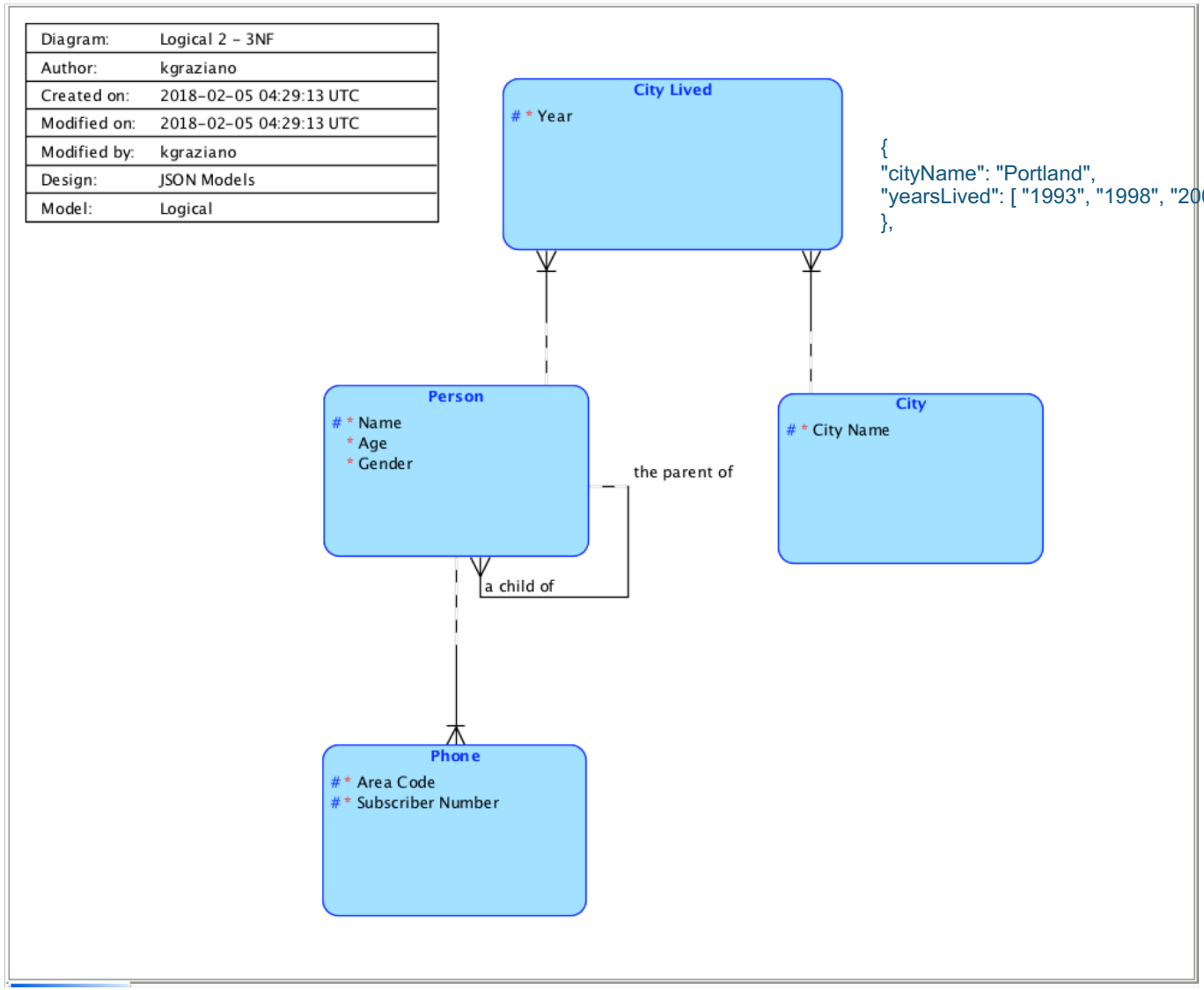

```
"children":
        [
        {
        "name": "Jayden",
        "gender": "Male",
        "age": "10" },
        {
        "name": "Emma",
        "gender": "Female",
        "age": "8" },
        {
        "name": "Madelyn",
        "gender": "Female",
        "age": "6" }
        ],
```

JSON as 3NF – Logical Model

Diagram:	Logical 2 - 3NF
Author:	kgraziano
Created on:	2018-02-05 04:29:13 UTC
Modified on:	2018-02-05 04:29:13 UTC
Modified by:	kgraziano
Design:	JSON Models
Model:	Logical

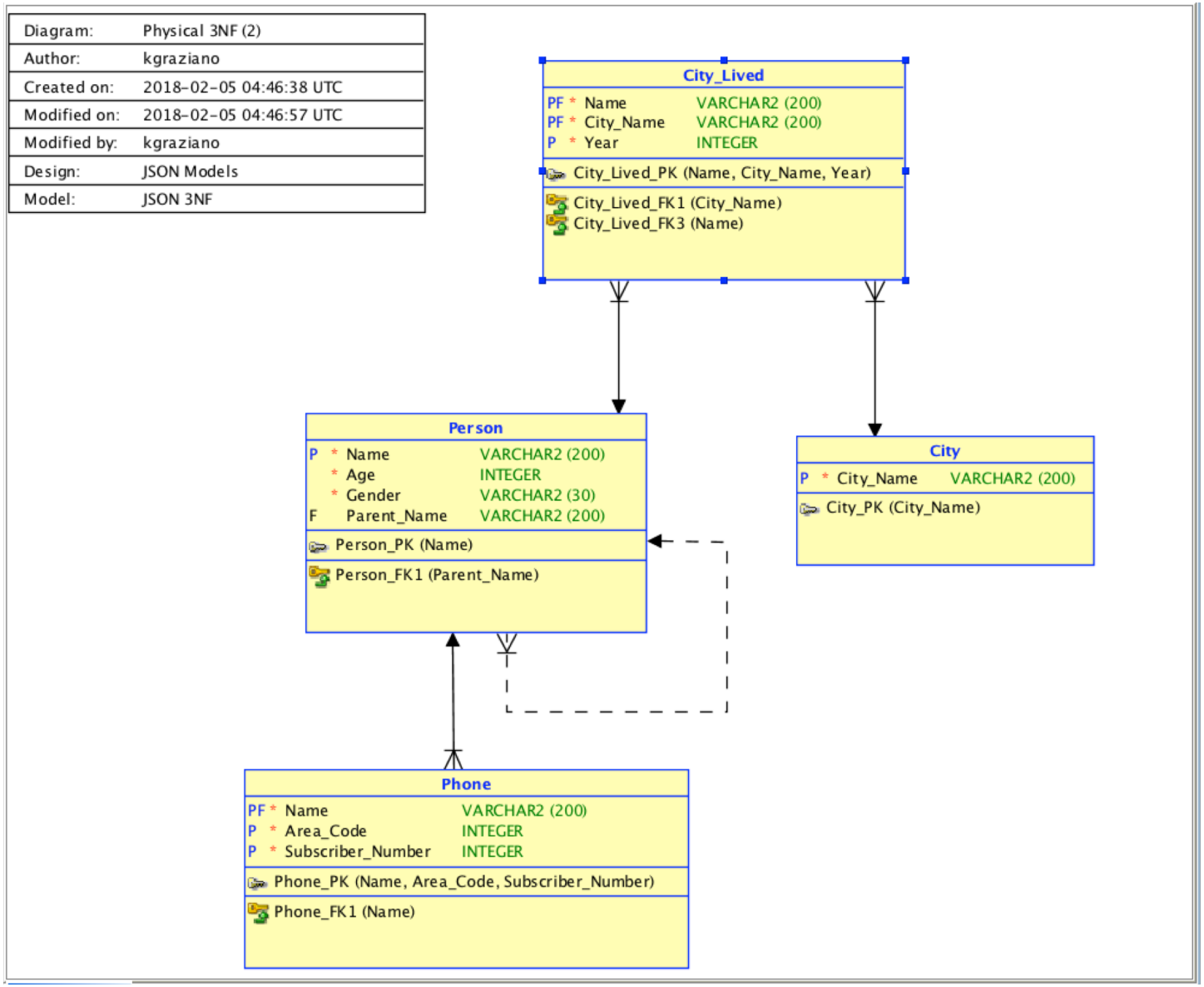


JSON as 3NF – Logical Model



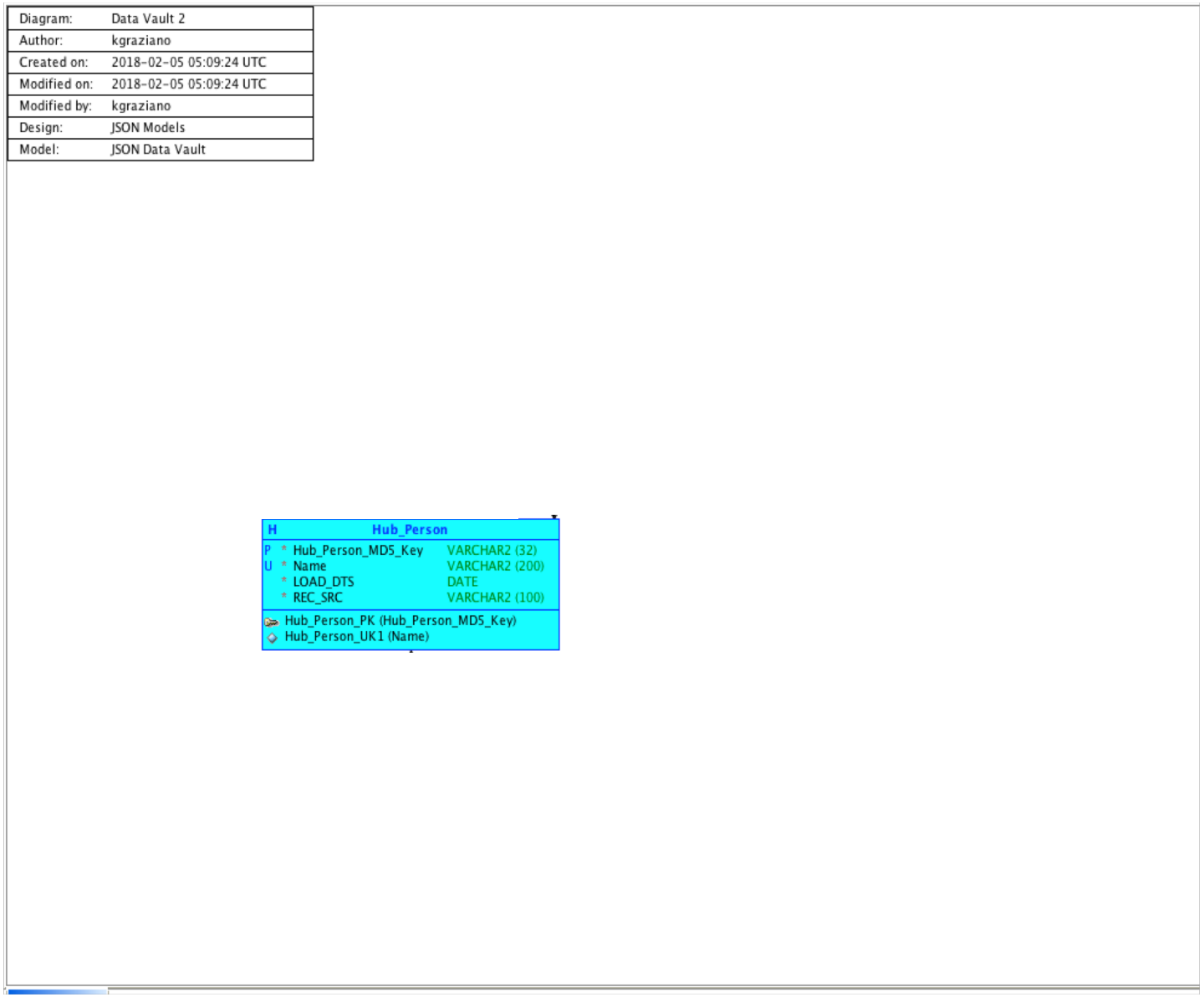
JSON as 3NF - Schema Model

- Can handle some JSON schema changes
  - Kids get a phone!
  - Kids move out!
- Extensions
  - More details on City
    - Add columns
  - More details on Children
    - Add columns or a dependent table



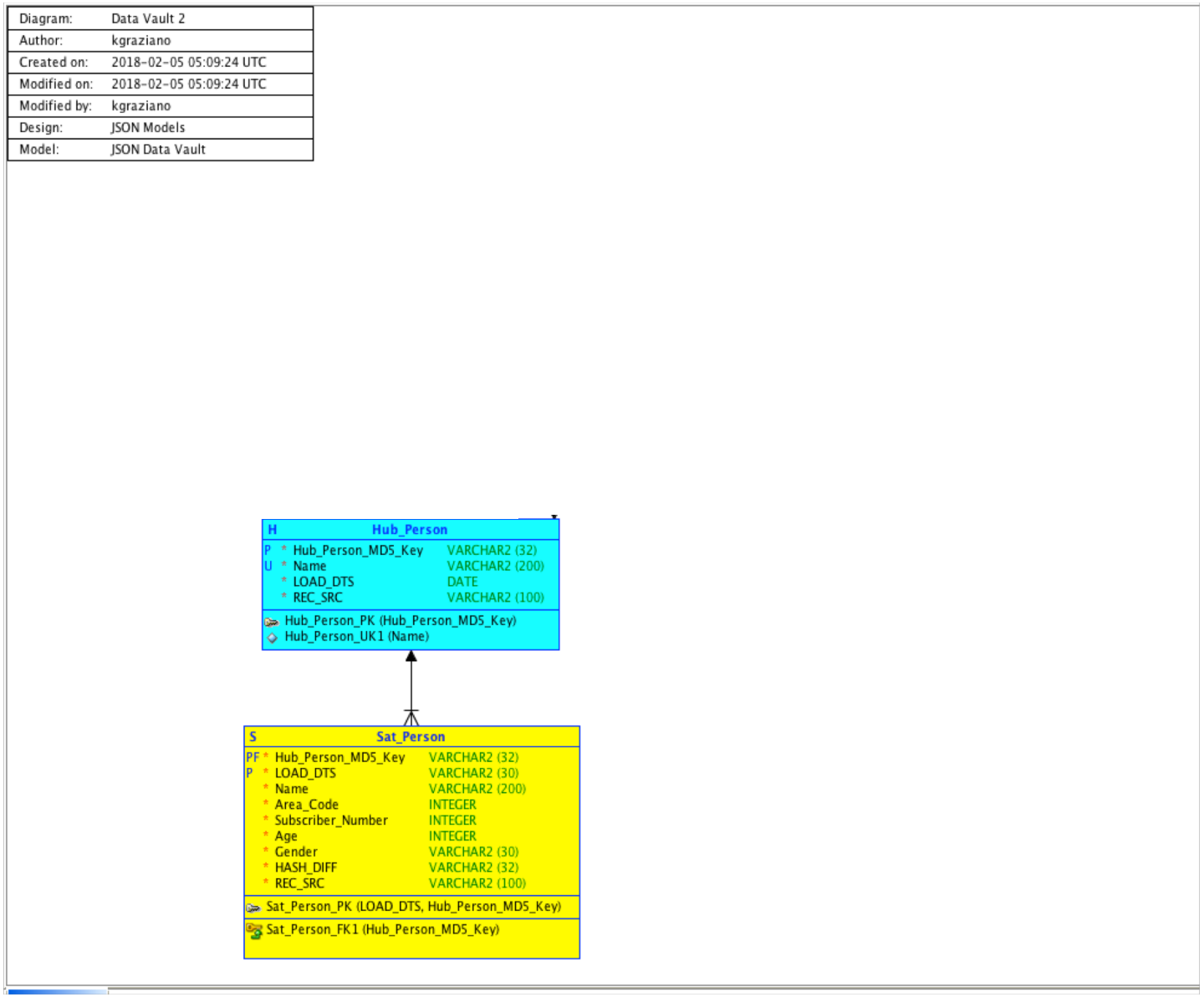
Data Vault Style

JSON as Data Vault

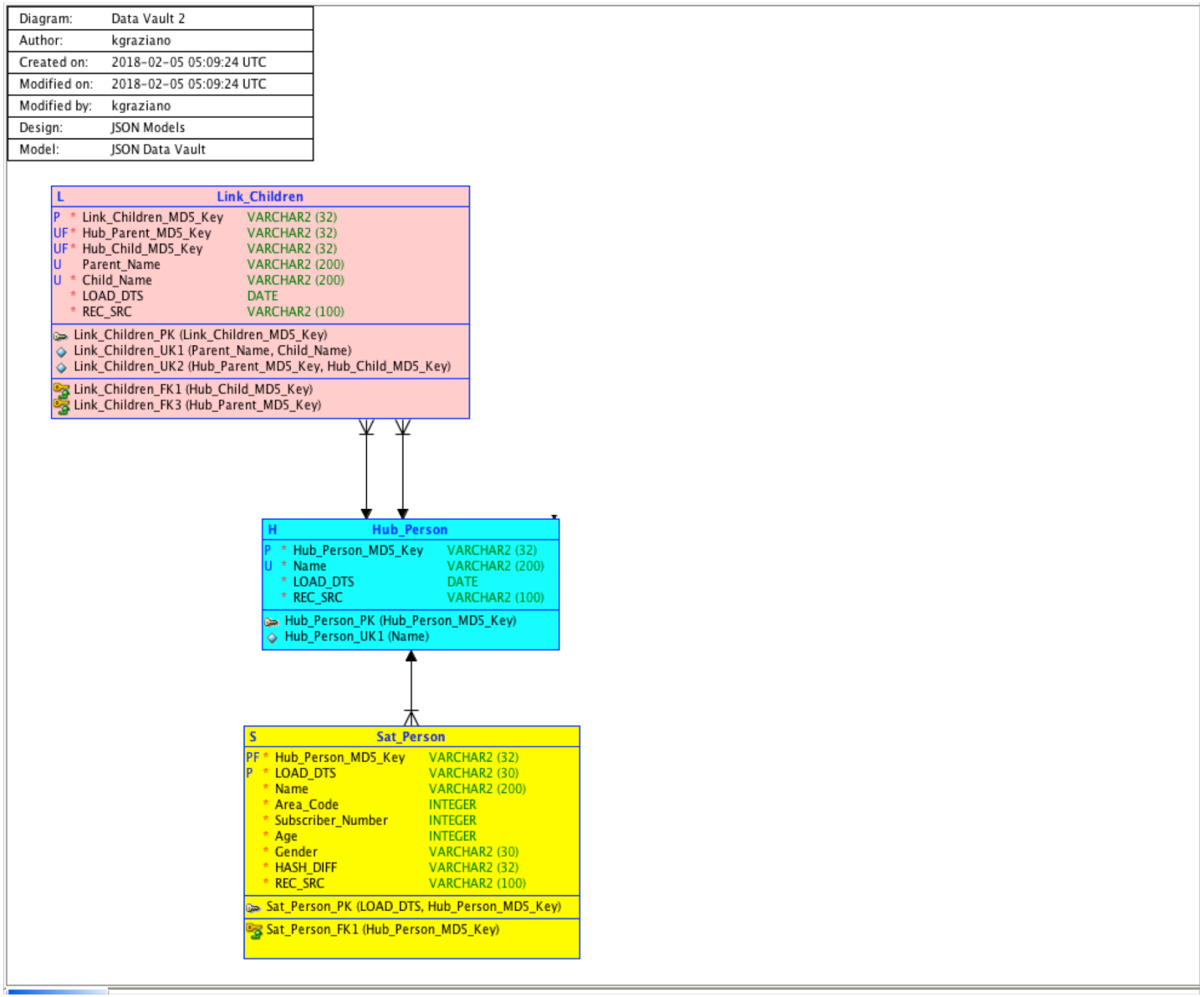


JSON as Data Vault

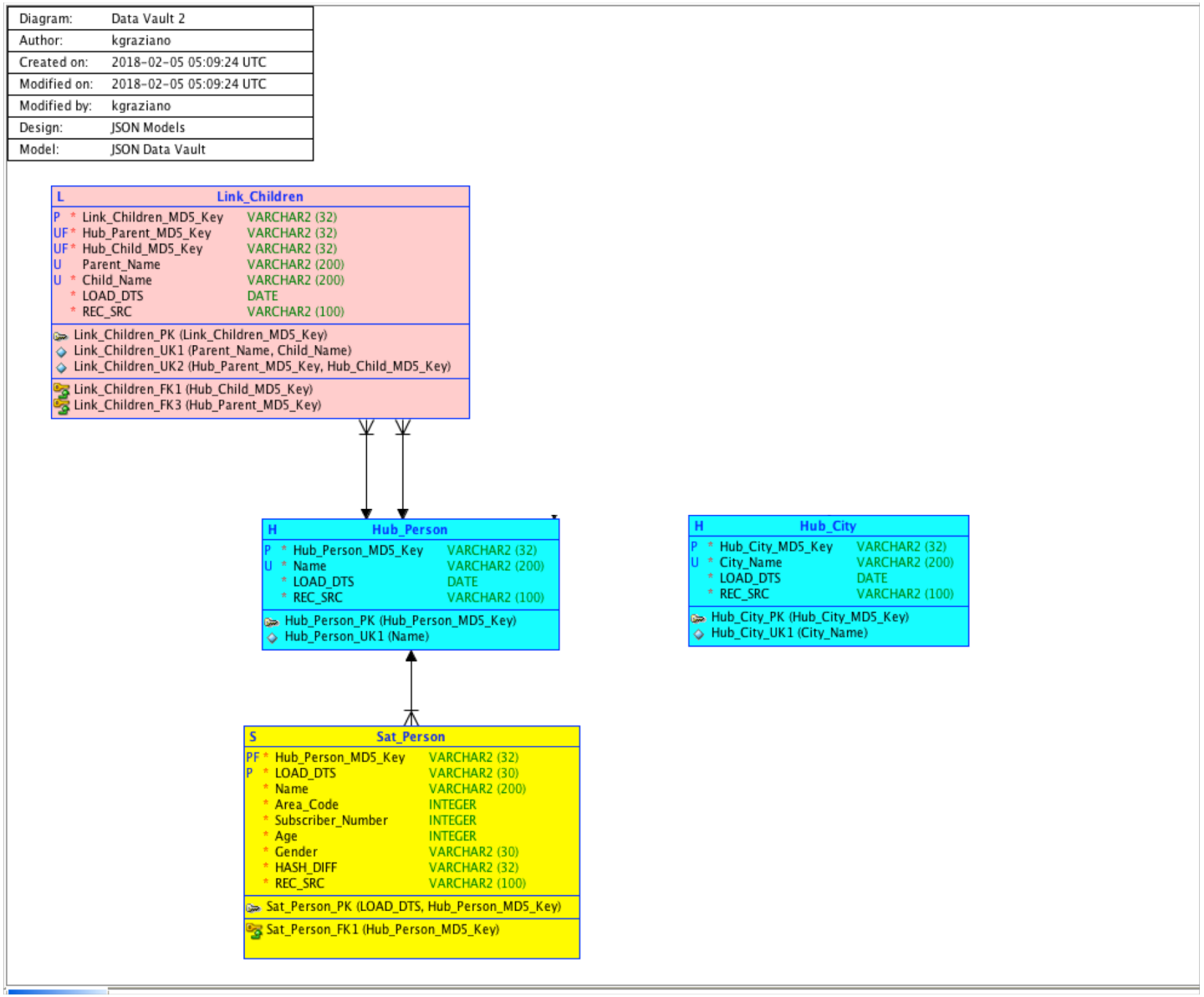
Diagram:	Data Vault 2
Author:	kgraziano
Created on:	2018-02-05 05:09:24 UTC
Modified on:	2018-02-05 05:09:24 UTC
Modified by:	kgraziano
Design:	JSON Models
Model:	JSON Data Vault



JSON as Data Vault

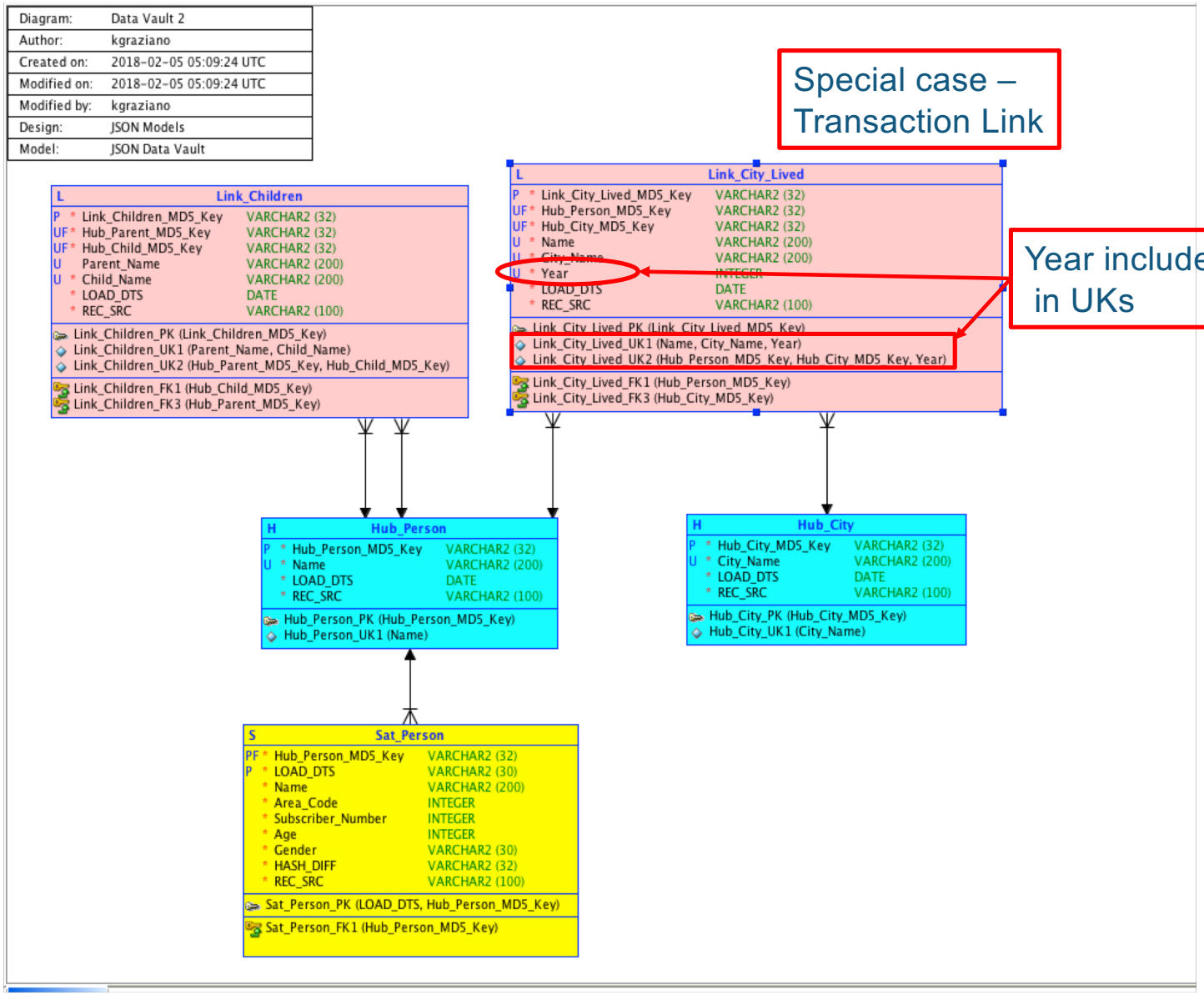


JSON as Data Vault



JSON as Data Vault

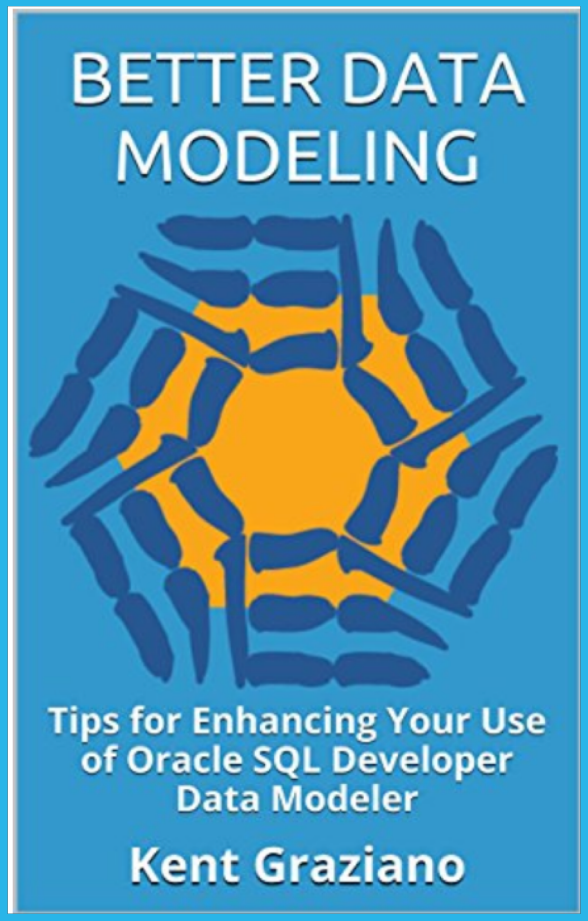
- Can handle some JSON schema changes
  - Two parents, same kids
  - Kids get a phone!
  - Kids move out!
- Easy Extensions
  - More details on City
    - Add a Sat
    - Add Link(s)
  - More details on Children
    - Add a Sat on Link



Conclusion

- We still need data models and data modelers
- Schema-on-Read does not mean there is no model
- To READ the data we must understand the SCHEMA
- In the DB world that means we need a model
  - Some model types can be easily extended for JSON changes
- Once the schema is understood
  - Can be expressed as any type of model
    - 3NF
    - Data Vault
    - Star
    - Denormalized
    - Object model
    - Etc.

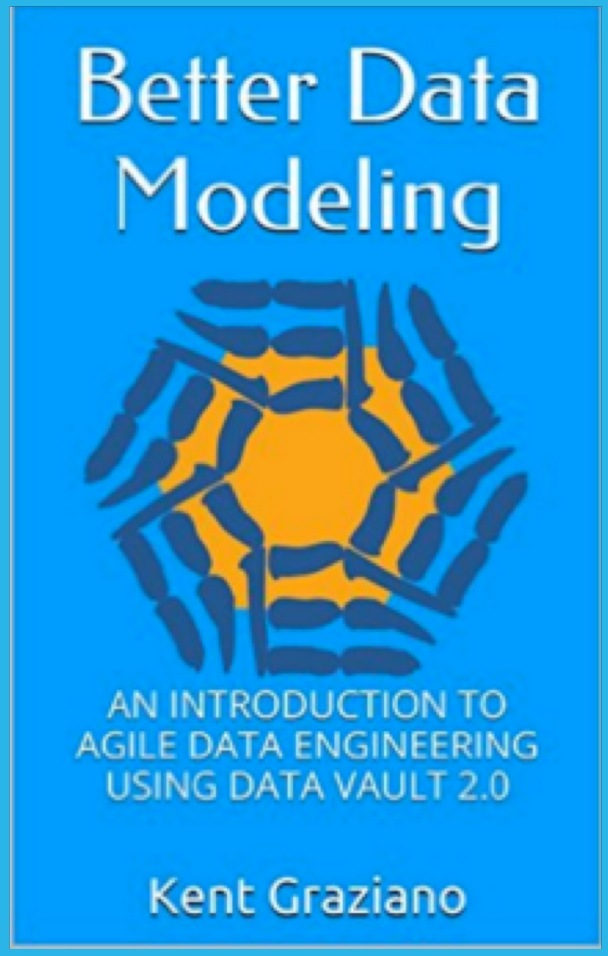
SHAMELESS PLUG:



Available on Amazon.com

https://www.amazon.com/Better-Data-Modeling-Enhancing-Developer-ebook/dp/B00UK75LYI/

SHAMELESS PLUG:



Available on Amazon.com

http://www.amazon.com/Better-Data-Modeling-Introduction-Engineering-ebook/dp/B018BREV1C/

Discover the performance, concurrency, and simplicity of Snowflake

As easy as 1-2-3!

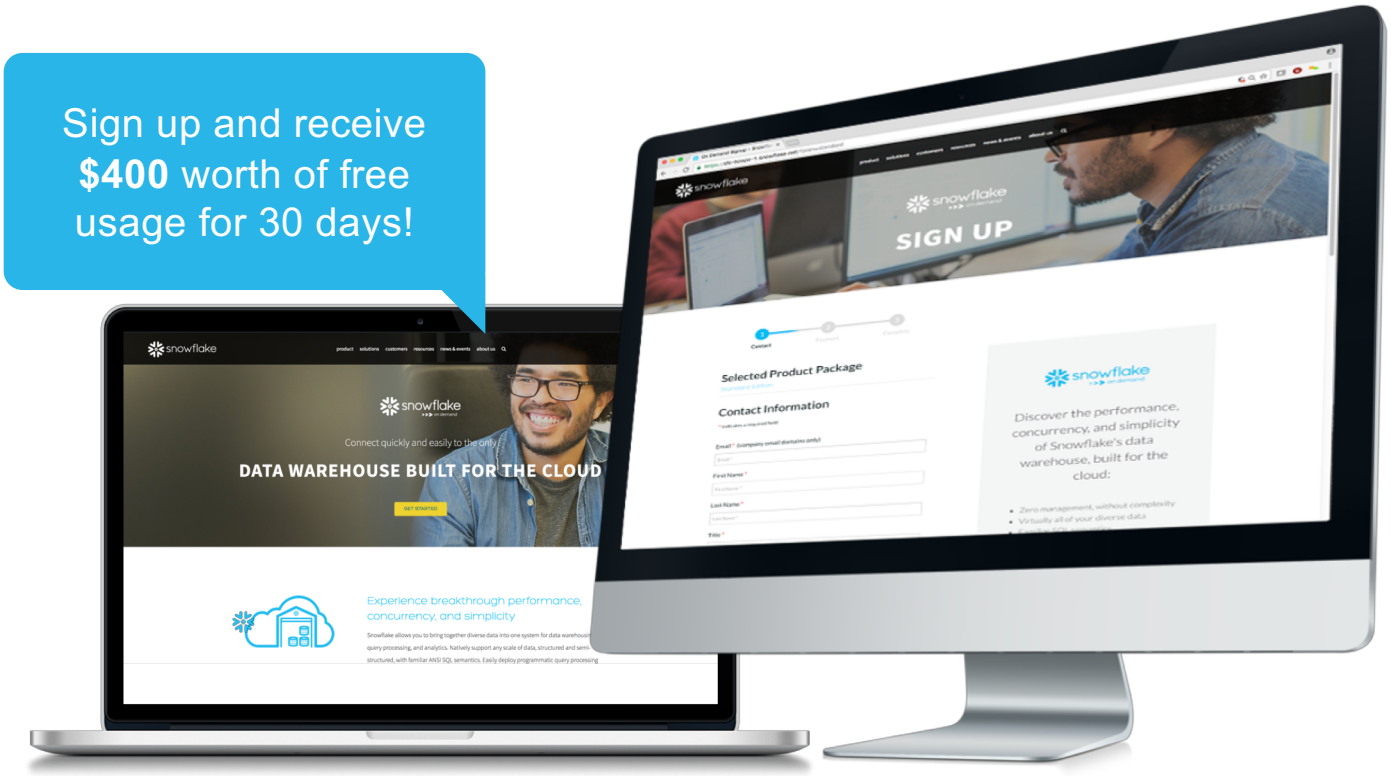
01 Visit Snowflake.com

02 Click “Try for Free”

03 Sign up & register

Snowflake is the only data warehouse built for the cloud. You can automatically scale compute up, out, or down—independent of storage. Plus, you have the power of a complete SQL database, with zero management, that can grow with you to support all of your data and all of your users. With Snowflake On Demand™, pay only for what you use.

Sign up and receive **$400** worth of free usage for 30 days!



Contact Information

Kent Graziano
Snowflake Computing
Kent.graziano@snowflake.com
On Twitter @KentGraziano

More info at
http://snowflake.com

Visit my blog at
http://kentgraziano.com

THANK YOU