

Linked Urban Data

Author: Arnaud Sahuguet

Date: Apr 1, 2024

Motivation

We want to explore the creation of a knowledge graph for all data pertaining to a city.

We will look at both asset data (e.g. public libraries, police precincts, etc.) and operations data (e.g. crime stats, school attendance, etc.)

The goals are

1. Making sure this is possible
2. Proposing best practices for representing the information
3. Proposing a way to generate and publish the data
4. Showing some concrete examples where value can be derived from it

See my short [linkedin article](#).

Github repo = https://github.com/sahuguet/linked-urban-data/tree/main/linked_data

Example 0: NYC org structure

<https://www.nyc.gov/assets/home/downloads/pdf/office-of-the-mayor/misc/NYC-Organizational-Chart.pdf>

```
# Using Schema.org

@prefix s: <http://schema.org/> .
@prefix skos: <http://www.w3.org/2004/02/skos/core#> .

<https://www.nyc.gov/site/planning> a s:Organization ;
    skos:prefLabel "Department of City Planning" ; # Should we
    have the NYC prefix in the same"
    skos:altLabel "DCP" ;
    skos:altLabel "NYC Planning" ;
    s:url "https://www.nyc.gov/site/planning/"
.

<https://www.nyc.gov/html/dot/> a s:Organization ;
    skos:prefLabel "Department of Transportation" ;
    skos:altLabel "DOT" ;
    skos:altLabel "NYC DOT" ;
    s:url "https://www.nyc.gov/html/dot/"
    s:sameAs
    "https://en.wikipedia.org/wiki/New_York_City_Department_of_Transportation"
.
```

```
<https://www.nycgovparks.org/> a s:Organization ;
    skos:prefLabel "Department of Parks & Recreation" ;
    skos:altLabel "Parks & Rec" ;
    s:url "https://www.nycgovparks.org/"
.
```

Maybe a better approach using [W3C's Organization ontology](#).

```
# using W3C org

@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix org: <http://www.w3.org/ns/org#> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
@prefix sh: <http://shadow.gov> .

# Define the larger organization, NYC
sh:NYC a org:Organization ;
    org:identifier "NYC" ;
    org:organizationName "New York City" .

# Define the NYC Department of Transportation as a sub-organization of NYC
sh:NYCDOT a org:Organization ;
    org:identifier "NYCDOT" ;
    org:organizationName "NYC Department of Transportation" ;
    org:subOrganizationOf sh:NYC .

# Define the role of CTO
sh:CTO a org:Role ;
    org:roleTitle "Chief Technology Officer" .

# Define a post that embodies the role of CTO within the NYCDOT
sh:CTOPost a org:Post ;
    org:role sh:CTO ;
    org:postIn sh:NYCDOT ;
    org:postHolder sh:JeffPerson .

# Define Jeff as a person holding the post
sh:JeffPerson a foaf:Person ;
    foaf:name "Jeff" .

sh:DeputyMayorForOperations a org:Role ;
    org:roleTitle "Deputy Mayor For Operations".

# Define the role of Chief Climate Officer.
sh:CCO a org:Role ;
    org:roleTitle "Chief Climate Officer" ;
    org:reportsTo sh:DeputyMayorForOperations.
```

Or another one for Parks using W3C org.

```
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
```

```

@prefix org: <http://www.w3.org/ns/org#> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
@prefix sh: <http://shadow.gov> .

# Define the larger organization, NYC
sh:NYC a org:Organization ;
    org:identifier "NYC" ;
    org:organizationName "New York City" .

sh:DepartmentOfParksAndRecreation a org:Organization ;
    org:organizationName "Department of Parks and Recreation" ;
    org:subOrganizationOf sh:NYC ;
.

# Define the job of Deputy Mayor for Housing and Economic Development
sh:DeputyMayorForHousingAndEconomicDevelopment a org:Post ;
    skos:prefLabel "Deputy Mayor for Housing and Economic Development" ;
.

# Define the job of Commissioner for Parks & Rec
sh:CommissionerOfParksAndRecreation a org:Post ;
    skos:prefLabel "Commissioner of Parks and Recreation" ;
    org:postIn sh:DepartmentOfParksAndRecreation ;
    org:headOf sh:DepartmentOfParksAndRecreation ;
    org:reportsTo sh:DeputyMayorForHousingAndEconomicDevelopment ;
    org:heldBy [ a foaf:Person ; foaf:name "Susan Donoghue" ] ;
.

# Define the job of First Deputy Commissioner for Parks & Rec
sh:FirstDeputyCommissionerOfParksAndRecreation a org:Post ;
    skos:prefLabel "First Deputy Commissioner of Parks and Recreation" ;
    org:postIn sh:DepartmentOfParksAndRecreation ;
    org:headOf sh:DepartmentOfParksAndRecreation ;
    org:reportsTo sh:CommissionerOfParksAndRecreation ;
    org:heldBy [ a foaf:Person ; foaf:name "Iris Rodriguez-Rosa" ] ;
.

```

Open questions

1. At least 3 different url schemes: nyc.gov/site/XXXX, nyc.gov/html/XXXX and vanity url.
2. Should the name contain NYC or New York City as a prefix
3. Should I use s:sameAs to reference the Wikipedia page?
4. How do we represent org hierarchy?
5. How do we represent org relationships, e.g. "is regulated by"
6. How do we represent the agency leadership? Schema.org has employee and member. They don't capture the leadership element.

Example 1: NYPD precincts

This is my police precinct:

<https://www.nyc.gov/site/nypd/bureaus/patrol/precincts/28th-precinct.page> .

Here is a screenshot of the page.

New York's Finest



NYPD

বাংলা Translate Text-Size

Home

About

Bureaus

Services

Stats

Media

Careers

Policies

Search

Patrol

Transit, Housing & Transportation

Investigative

Administrative

Find Your Precinct

[Precincts](#)

Find Your Build the Block Meeting

Neighborhood Policing

Special Operations

[f](#) [x](#) [t](#) [Share](#)
[Print](#)

28th Precinct

Overview

Commanding Officer: Captain Albert F. Rodriguez

The 28th Precinct serves the central portion of Harlem. The precinct is home to the historic Apollo Theater, the Adam Clayton Powell Harlem State Office Building, and the Studio Museum in Harlem.

[Follow @nypd28pct](#)
[Like](#)

[Crime Statistics \(PDF\)](#)
[Crime Statistics \(Excel\)](#)

Contact Information

2271-89 8th Ave.
New York, NY, 10027-5319

Precinct: (212) 678-1611

Community Affairs: (212) 678-1622

Crime Prevention: (212) 678-1614 - Wayne Lowe - E-mail: wayne.lowe@nypd.org

Domestic Violence Officer: (212) 678-1628 - [E-mail](#)

Youth Coordination Officer: (212) 678-1636 - [E-mail](#)

Auxiliary Coordinator: (212) 678-1615

Detective Squad: (212) 678-1608

Specialized Units/NCO: (212) 678-2655



Get to Know Your Neighborhood Coordination Officers

Find your sector. Find your NCOs.

[Neighborhood Coordination Officers](#), or NCOs, are your local problem solvers. They spend all of their working hours within the confines of their assigned sectors, actively engaging with local community members and residents. In this role, they have an opportunity to become more intimately aware of the neighborhood, its residents, and any related problems extremely well.

Use the map and list below to find your sector and your NCOs. Feel free to email your officers directly, or contact your local precinct, to discuss ongoing crime or quality-of-life issues.

Community Council

President Leman Jake McGhee



NCO Supervisor	SGT Pedro Flores	PEDRO.FLORES@nypd.org
A	PO Matthew Grieve	MATTHEW.GRIEVE@nypd.org
A	PO Mohamed Islam	MOHAMED.ISLAM@nypd.org
B	PO Ruby Esparza	RUBY.ESPARZA@nypd.org
B	PO Tania Martinez	TANIA.MARTINEZ@nypd.org
C	PO Jenna Crawford	JENNA.CRAWFORD@nypd.org
C	PO Eddie Pena	EDDIE.PENA@nypd.org
D	PO Thomas McGuire	THOMAS.MCGUIRE@nypd.org

Vice President Staci Ramos

Recording Secretary Tammy Sorey

Sergeant at Arms Cleveland Manley

Treasurer Pharein Griffith

Meetings: Community Council meetings typically take place on the second Wednesday of each month at 6:30 PM on the second floor of Touro College (231 West 124th Street); excluding recess during summer months (July/August).

Modeling principles

Using Schema.org, we could look at the data as follows.

- We use the `PoliceStation` class.
- The contours of the precinct are represented using `areaServed`.
- We also define the contours of each neighborhood assigned to a NCO.
- The physical location of the building is defined using `PostalAddress`.
- The various contacts and phone numbers are defined using class `ContactPoint`.
- The NCO are defined using class `ContactPoint` as well.
- The crime stats documents are defined using class `Report` and attached to URI of the precinct.

Proposed Schema

```
@prefix sc: <http://purl.org/science/owl/sciencecommons/> .
@prefix s: <http://schema.org/> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .

[]
  a s:PoliceStation ;

  s:id <https://www.nyc.gov/site/nypd/bureaus/patrol/precincts/28th-precinct.page> ;
  s:sameAs <https://twitter.com/NYPD28Pct> ;
  s:sameAs <https://www.facebook.com/NYPD28pct/> ;

# we define the polygon for the precinct.
  s:areaServed [
    a s:GeoShape ; s:polygon "POLYGON(_____)"
  ] ;

# we define the polygon for each neighborhood
<https://www.nyc.gov/site/nypd/bureaus/patrol/precincts/28th-precinct.page/ncoA> a
s:AdministrativeArea ; s:name "28th Precinct - NCO A" ;
s:geo [ a s:GeoShape ; s:polygon "POLYGON(_____)" ] .

<https://www.nyc.gov/site/nypd/bureaus/patrol/precincts/28th-precinct.page/ncoB> a
s:AdministrativeArea ; s:name "28th Precinct - NCO B" ;
s:geo [ a s:GeoShape ; s:polygon "POLYGON(_____)" ] .

<https://www.nyc.gov/site/nypd/bureaus/patrol/precincts/28th-precinct.page/ncoC> a
s:AdministrativeArea ; s:name "28th Precinct - NCO C" ;
s:geo [ a s:GeoShape ; s:polygon "POLYGON(_____)" ] .

<https://www.nyc.gov/site/nypd/bureaus/patrol/precincts/28th-precinct.page/ncoD> a
s:AdministrativeArea ; s:name "28th Precinct - NCO AD" ;
s:geo [ a s:GeoShape ; s:polygon "POLYGON(_____)" ] .
```

```

s:address [
a s:PostalAddress ;
s:addressLocality "New York City" ;
s:addressRegion "New York" ;
s:postalCode "10027-5319" ;
s:streetAddress "2271-89 8th Ave"
] ;

s:contactPoint [
a s:ContactPoint ;
s:telephone "(212) 678-1611" ;
s:contactType "precinct" ;
], [
a s:ContactPoint ;
s:contactType "Community Affairs" ;
s:telephone "(212) 678-1622"
], [
a s:ContactPoint ;
s:contactType "Domestic Violence Officer" ;
s:telephone "(212) 678-1628" ;
s:email "28pctdvo@nypd.org"
], [
a s:ContactPoint ;
s:contactType "Crime Prevention";
s:email "wayne.lowe@nypd.org" ;
s:name "Wayne Lowe" ;
s:telephone "(212) 678-1614"
], [
a s:ContactPoint ;
s:contactType "Neighborhood Coordination Officer Supervisor" ;
s:name "SGT Pedro Flores" ;
s:email "PEDRO.FLORES@nypd.org"
], [
a s:ContactPoint ;
s:contactType "Neighborhood Coordination Officer" ;
s:name "PO Matthew Grieve" ;
s:email "MATTHEW.GRIEVE@nypd.org" ;
s:areaServed <https://www.nyc.gov/site/nypd/bureaus/patrol/precincts/28th-precinct.page/ncoA>
], [
a s:ContactPoint ;
s:contactType "Neighborhood Coordination Officer" ;
s:name "PO Mohamed Islam" ;
s:email "MOHAMED.ISLAM@nypd.org" ;
s:areaServed <https://www.nyc.gov/site/nypd/bureaus/patrol/precincts/28th-precinct.page/ncoA>
], [
a s:ContactPoint ;
s:contactType "Neighborhood Coordination Officer" ;
s:name "PO Ruby Esparza" ;
s:email "RUBY.ESPARZA@nypd.org" ;
s:areaServed <https://www.nyc.gov/site/nypd/bureaus/patrol/precincts/28th-precinct.page/ncoB>
]
;
s:url <https://www.nyc.gov/site/nypd/bureaus/patrol/precincts/28th-precinct.page>.

# We add the 2 documents (crime stats) referenced at the top of the page.
# We define documents related to the precinct.
<https://www.nyc.gov/assets/nypd/downloads/pdf/crime_statistics/cs-en-us-028pct.pdf> a s:Report ;
s:author
<https://www.nyc.gov/site/nypd/bureaus/patrol/precincts/28th-precinct.page> ;

```

```
s:encodingFormat "application/pdf" .  
  
<https://www.nyc.gov/assets/nypd/downloads/excel/crime_statistics/cs-en-us-028pct.xlsx> a s:Report  
;  
s:author  
  
<https://www.nyc.gov/site/nypd/bureaus/patrol/precincts/28th-precinct.page> ;  
s:encodingFormat "application/vnd.ms-excel" .
```

Open questions

1. How to capture the social media accounts? sameAs seems to be doing the job. But it does not say this is a social account. You have to look at the URL to find out. Should we use ContactPoint?
2. For the physical location of the precinct, should we use address or location?
3. For the Crime Prevention line, we have the name of the person. ContactPoint does not have a specific property for that. Can we reuse name?
4. Should the polygon of the precinct be a value or a reference (we define the polygon somewhere else and we can reference it?).
5. The precinct is split into various neighborhoods, each of them managed by a NCO. How should we represent that?
6. To avoid repeating the NCO polygons, we define the regions as a resource we can reference.
7. We cannot say that the PoliceStation publishes a document. We can say it is the author of a document. Should we create a new attribute to avoid this passive voice?
8. Both documents are equivalent. They are just in 2 different data formats. How to best express this equivalence? Use sameAs?

Example 2: FDNY fire stations

FDNY does not have a dedicated page per station.

It has a page with all social media stuff at

<https://www.nyc.gov/site/fdny/connect/social-media/social-media.page> .

There is a list of fire stations at [FDNY Firehouse Listing | NYC Open Data](#) .

Wikipedia seems to have lots of information too at

https://en.wikipedia.org/wiki/List_of_New_York_fire_departments .

Boston has a page with all the fire stations listed; see

<https://www.boston.gov/departments/fire-operations/fire-department-phone-numbers-and-locations> .

Denver has a map: see

<https://www.denvergov.org/Government/Agencies-Departments-Offices/Agencies-Departments-Offices-Directory/Fire-Department/Contact/Fire-Stations>

We should also point to https://en.wikipedia.org/wiki/New_York_City_Fire_Department .

The schema should follow the one used for Police stations. But I would like to also capture some information about the personnel and the resources (engine, ladder, etc.).

I found a few datasets under FDNY.

The fire station listing uses an adhoc identifier that consists of the concatenation of engine + ladder + etc.

More interestingly, there is a concept of service area for battalions (see [here](#)).

Also, when reporting casualties (see [FDNY Line of Duty Deaths](#)), the fallen hero is identified by its unit, not the fire station they are housed at.

Also, the Wikipedia page about FDNY references the following hierarchy: division → battalion → fire house → fire company.

Another thing to consider, from a user experience point of view.

When you see a firetruck in the street, e.g. Ladder 40, that's the only information you have. You should have to figure out the engine or anything else when trying to look them up.

Modeling principles

For the URI, we use `fdny.nyc.gov` as the domain.

The unique id is the concatenation (using dashes) of the various units hosted inside the fire station.

- XXX Borough Command → B|Bx|M|Q|SI BC
- Engine 12 → E12
- Ladder 7 → L7
- etc.

When the fire station hosts more than one unit, we create an alternate name for each unit under `alternateName`.

Proposed schema

```
@prefix s: <http://schema.org/> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .

<https://www.nyc.gov/site/fdny/>
  a s:Organization ;
  s:sameAs <https://twitter.com/FDNY> ;
  s:sameAs <https://www.facebook.com/FDNY> ;
  s:sameAs <https://instagram.com/fdny> ;
  s:sameAs <https://www.youtube.com/user/yourFDNY> .
```

```

@prefix s: <http://schema.org/> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .

<https://fdny.nyc.gov>
  a s:Organization ;
  s:sameAs <https://www.nyc.gov/site/fdny/> ;
  s:sameAs <https://www.wikidata.org/wiki/Q283207> ;
# We list their social media accounts.
  s:sameAs <https://twitter.com/FDNY> ;
  s:sameAs <https://twitter.com/joinfdny> ; # We don't capture the intent, which is recruiting.
  s:sameAs <https://www.facebook.com/FDNY> ;
  s:sameAs <https://instagram.com/fdny> ;
  s:sameAs <https://www.youtube.com/user/yourFDNY> .

# Manhattan Borough Command/Battalion 1/Engine 7/Ladder 1
<https://fdny.nyc.gov/MBC-B1-E7-L1> a s:FireStation ;
                                     s:name "FDNY Manhattan Borough Command/Battalion 1/Engine
7/Ladder 1" ;
                                     s:alternateName "FDNY Manhattan Borough Command" ;
                                     s:alternateName "FDNY Battalion 1" ;
                                     s:alternateName "FDNY Engine 7" ;
                                     s:alternateName "FDNY Ladder 1" ;
                                     s:address [
a s:PostalAddress ;
s:addressLocality "New York City" ;
s:addressRegion "New York" ;
s:postalCode "10007" ;
s:streetAddress "100 Duane Street"
] ;
.

# Engine 23
<https://fdny.nyc.gov/E23> a s:FireStation ;
                           s:name "FDNY Engine 23" ;
                           s:address [
a s:PostalAddress ;
s:addressLocality "New York City" ;
s:addressRegion "New York" ;
s:postalCode "10019" ;
s:streetAddress "215 W 58th Street"
] ;
.

# Brooklyn Borough Command/Division 11/Battalion 31/Engine 207/Ladder 110
<https://fdny.nyc.gov/BBC-D11-B31-E207-L110> a s:FireStation ;
                                              s:name "FDNY Brooklyn Borough Command/Division 11/Battalion 31/Engine
207/Ladder 110" ;
                                              s:alternateName "FDNY Brooklyn Borough Command" ;
                                              s:alternateName "FDNY Division 11" ;
                                              s:alternateName "FDNY Battalion 31" ;
                                              s:alternateName "FDNY Engine 207" ;
                                              s:alternateName "FDNY Ladder 110" ;
                                              s:address [
a s:PostalAddress ;
s:addressLocality "New York City" ;
s:addressRegion "New York" ;
s:postalCode "11201" ;
s:streetAddress "172 Tillary Street"
] ;
.

```

```

# Queens Borough Command
<https://fdny.nyc.gov/QBC> a s:FireStation ;
    s:name "FDNY Queens Borough Command" ;
    s:address [
        a s:PostalAddress ;
        s:addressLocality "New York City" ;
        s:addressRegion "New York" ;
        s:postalCode "11359" ;
        s:streetAddress "420A Weaver Ave"
    ] ;
.

# Staten Island Borough Command/Squad 8
<https://fdny.nyc.gov/SIBC-S8> a s:FireStation ;
    s:name "FDNY Staten Island Borough Command/Squad 8" ;
    s:alternateName "FDNY Staten Island Borough Command" ;
    s:alternateName "FDNY Squad 8" ;
    s:address [
        a s:PostalAddress ;
        s:addressLocality "New York City" ;
        s:addressRegion "New York" ;
        s:postalCode "10314" ;
        s:streetAddress "3730 Victory Boulevard"
    ] ;
.

# Marine 9
<https://fdny.nyc.gov/M9> a s:FireStation ;
    s:name "FDNY Marine 9" ;
    s:address [
        a s:PostalAddress ;
        s:addressLocality "New York City" ;
        s:addressRegion "New York" ;
        s:postalCode "10304" ;
        s:streetAddress "305 Front Street"
    ] ;
    s:telephone "+13475585075" ;
.

```

Example 3: NYC public schools

Concrete example = my kids school <https://www.schools.nyc.gov/schools/M185>



Public
Schools

Enrollment

Find a
School

Learning

School Life

Get Involved

Calendar

TeachHub

Employees



Select Language
Powered by Translate

Home > Find a School > The Locke School of Arts and Engineering

The Locke School of Arts and Engineering

District

20 West 112 Street, Manhattan, NY 10026

212-534-7490

212-831-8613

[School Website](#)

Overview

School Quality

Reports



School Number: M185



Accessibility: No Accessibility



Grades: PK,0K,01,02,03,04,05,SE



Geographic District: 3



Borough: Manhattan



School Contacts and Information

School Leader

[Jill Sinnott,Principal;Andrea Woodhouse,Principal](#)

Parent Coordinator

[Monica Vargas](#)

Respect for All Liaison

[Chisa Sealy](#)

Sexual Harassment Prevention Liaison

[Chisa Sealy](#)

[How to report bullying](#)

504 Coordinator

[Chisa Sealy](#)

Space

Not shared

District Borough Number

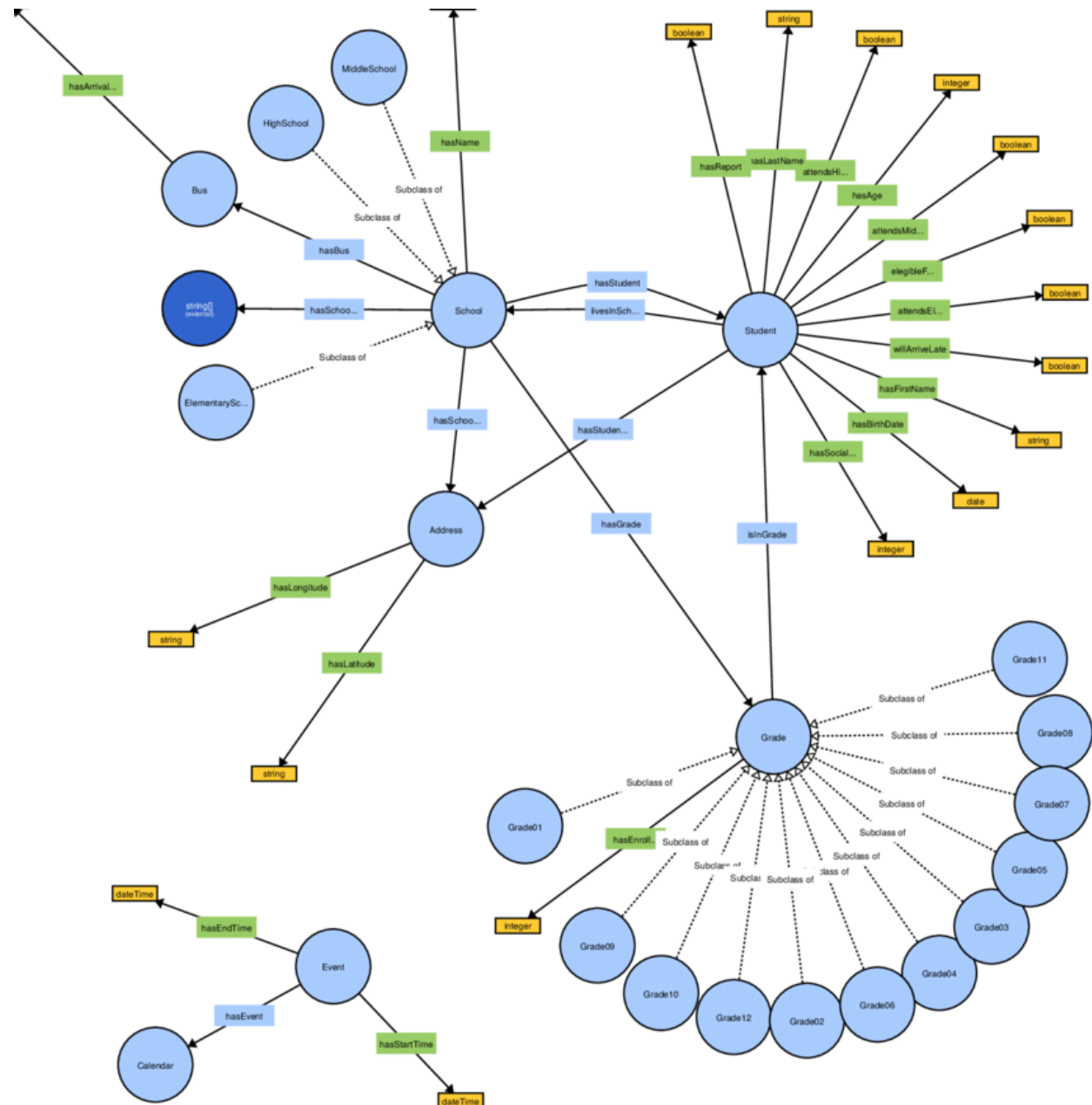
03M185

Modeling Principles

Schema.org does not have anything to talk about grades.

This paper proposes a detailed ontology to represent them (see [\(PDF\) An Education Ontology for Global City Indicators \(ISO 37120\)](#)).

Also



Source =

https://www.researchgate.net/figure/School-system-ontology-diagram-with-classes-properties-and-relationships-among-classes_fig4_325722776

Proposed Schema (work in progress)

```
@prefix s: <http://schema.org/> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .

# The Locke School of Arts and Engineering
<https://www.schools.nyc.gov/schools/M185>
  a s:School ;
  s:parentOrganizaton <https://www.schools.nyc.gov/> ;
  s:sameAs <https://www.lockearts.org/> ;
  s:sameAs <http://www.twitter.com/LockeSchoolNYC> ;
  s:sameAs <http://www.instagram.com/LockeSchoolNYC> ;
  s:sameAs <https://www.facebook.com/LockeSchoolNYC> ;
  s:address [
    a s:PostalAddress ;
    s:streetAddress "20 West 112 Street" ;
    s:addressLocality "Manhattan" ;
    s:addressRegion "NY" ;
    s:postalCode "10026"
  ] ;
  s:telephone "212-534-7490" ;
  s:fax "212-831-8613" ;

  s:hasGrade "PK,OK,01,02,03,04,05,SE" ; # SE is not really a grade. It is an attribute of the
  school.
  s:offersSpecialEd "true"^^xsd:boolean ;
  s:isAccessible "false"^^xsd:boolean ;
  .

@prefix sc: <http://purl.org/science/owl/sciencecommons/> .
@prefix s: <http://schema.org/> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .

# The Locke School of Arts and Engineering
<https://www.schools.nyc.gov/schools/M185>

  a s:School ;

  s:parentOrganizaton <https://www.schools.nyc.gov/> ;
  s:sameAs <https://www.lockearts.org/> ;
  s:sameAs <http://www.twitter.com/LockeSchoolNYC> ;
  s:sameAs <http://www.instagram.com/LockeSchoolNYC> ;
  s:sameAs <https://www.facebook.com/LockeSchoolNYC> ;

  s:address [
    a s:PostalAddress ;
    s:streetAddress "20 West 112 Street" ;
    s:addressLocality "Manhattan" ;
    s:addressRegion "NY" ;
    s:postalCode "10026"
  ] ;

# Key personnel
  s:employee [
    a s:Person ;
    s:jobTitle "Principal" ;
    s:name "Jill Sinnott" ;
    s:email "jsinnott2@schools.nyc.gov" ;
```

```

] ;
  s:employee [
    a s:Person ;
    s:jobTitle "Sexual Harassment Prevention Liaison" ;
    s:name "Chisa Sealy";
    s:email "csealy4@schools.nyc.gov";
  ] ;

  s:telephone "212-534-7490" ;
  s:fax "212-831-8613" ;

# NEW STUFF
  s:hasGrade "PK,0K,01,02,03,04,05,SE"; # SE (special ed) is not really a grade. It is an
attribute of the school.
  s:hasSpecialEd "true"^^xsd:boolean ; # I would create a special property for it
  s:hasWheelchairAccessibleEntrance "false"^^xsd:boolean ;

# Opening hours
s:openingHoursSpecification [
  a s:OpeningHoursSpecification ;
  s:dayOfWeek s:Monday, s:Tuesday, s:Wednesday, s:Thursday, s:Friday ;
  s:opens "08:20:00"^^xsd:time ;
  s:closes "14:40:00"^^xsd:time ;
]

.

```

Example 4: NYC public libraries

Here is a [Colab](#) from 4 years ago for the scraping of the data

Here is my library: <https://www.nypl.org/locations/125th-street>

Modeling principles

We use <https://schema.org/Library> as the starting point.

Proposed Schema

```

@prefix s: <http://schema.org/> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .

<https://www.nypl.org/locations/125th-street> a s:Library ;
  s:address [
    a s:PostalAddress ;
    s:streetAddress "224 East 125th Street" ;
    s:addressLocality "New York" ;
    s:addressRegion "NY" ;
    s:postalCode "10035"
  ] ;

```

```

s:telephone "212-534-5050";
s:email "125stbranch@nypl.org" ;

# TODO: add polygon

s:openingHoursSpecification [
a s:OpeningHoursSpecification ;
s:dayOfWeek s:Monday, s:Tuesday, s:Wednesday, s:Thursday, s:Friday, s:Saturday ;
s:opens "11:00"^^xsd:time ;
s:closes "18:00"^^xsd:time ;
]
.

```

Example 5: NYC parks and playgrounds

Here is a [Colab](#) from 4 years ago for the scraping of the data.

<https://www.nycgovparks.org/facilities/playgrounds/364>

Activities and Facilities > Playgrounds > 110th Street Tot Lot

 Email
 Print
 Translate

110th Street Tot Lot

W 110-111 Sts, Riverside Dr
[Get directions, photos, and more information about Riverside Park](#)

Playground Hours: 7:00 a.m. to 6:00 p.m. (Nov. 1 â€“ March 1), 7:00 a.m. to 9:00 p.m. (March 2 â€“ Oct. 31)

 **Wheelchair Accessible**
This playground has ramps or transfer stations or accessible play elements (see "Accessible Play Elements" below.)

Amenities

Has Restrooms: No

Accessible Play Elements

Types of Accessible Play Features: None
Ramps: No
Mobility Transfer Systems: Yes
Accessible Swings (Under Age 5): No
Accessible Swings (Ages 5-12): No

Accessible Amenities

Companion Seating (Space in between benches for wheelchair users): No
Benches with backs and armrests: Yes
Accessible Game Tables: No
Accessible Drinking Fountains: No

Inclusive Play Elements

 **Sensory-Friendly Spaces for Children with Autism Spectrum Disorders:** Yes
Multi-Sensory Play Experiences for Children with Sensory Impairments: None

Opening hours vary by season. You can encode that using validFrom and validThrough. Some opening hours reference "dusk" and "dawn". How to encode that?

List of playgrounds =

https://data.cityofnewyork.us/Environment/Directory-of-Playgrounds/59gn-q4ai/about_data

Modeling principles

Things can get complicated; see <https://www.nycgovparks.org/parks/highbridge-park> .

Proposed Schema

```
@prefix s: <http://schema.org/> .

<https://www.nycgovparks.org/facilities/playgrounds/364>
  a s:Playground ;
  s:name "110th Street Tot Lot" ;
  s:address [
    a s:PostalAddress ;
    s:streetAddress "W 110-111 Sts, Riverside Dr" ;
    s:addressLocality "New York" ;
    s:addressRegion "NY"
  ] ;
  s:openingHoursSpecification [
    a s:OpeningHoursSpecification ;
    s:validFrom "2023-11-01" ;
    s:validThrough "2024-03-01" ;
    s:opens "07:00:00" ;
    s:closes "18:00:00" ;
  ], [
    a s:OpeningHoursSpecification ;
    s:validFrom "2024-03-02" ;
    s:validThrough "2024-10-31" ;
    s:opens "07:00:00" ;
    s:closes "21:00:00" ;
  ] ;
  s:isAccessibleForFree "true"^^xsd:boolean ;
  s:amenityFeature [
    a s:LocationFeatureSpecification ;
    s:name "Wheelchair Accessible" ;
    s:value "true"^^xsd:boolean
  ]
.
```

Resources

- [Linked Data Patterns](#)
- public-schemaorg@w3.org

- https://d-scholarship.pitt.edu/33172/7/ETD_Dissertation_Benner-9.1.17.pdf (about accessibility)
- <https://github.com/UKGovLD/ukl-registry-poc/wiki/Principles-and-concepts>