JSON-LD and RDF as a Model Transform Language

```
{
    "id": "patient:pat1",
    "dateOfBirth": "1998-01-01T00:00:00Z",
    "sex": "MALE",
    "taxonomy": {
        "id": "NCBITaxon:75857",
        "label": "American black duck"
    }
}
```


PhenoPackets Individual


```
{
  "resourceType": "Patient",
  "id": "pat1",
  "text": {"status": "generated"...},
  "identifier": [...],
  "active": true,
  "name": [...],
  "gender": "male",
  "contact": [...],
  "managingOrganization": {
    "reference": "Organization/1",
    "display": "ACME Healthcare, Inc"
  },
  "link": [...]
}
```


FHIR Patient

Community specific JSON


```
:pat1 a pkt:individual .
:pat1 a fhir:Patient .
:pat1 fhir:Patient.birthDate "1998-01-01T00:00:00+00:00"^^xsd:dateTime .
:pat1 fhir:Patient.gender "male" .
:pat1 fhir:Patient.gender "MALE" .
:pat1 fhir:Patient.name [
        fhir:HumanName.family "Donald" ;
        fhir:HumanName.given "Duck" ;
        fhir:HumanName.use "official"
    ] .
:pat1 pkt:taxonomy NCBITaxon:75857 .

NCBITaxon:75857 skos:preflabel "American black duck" .
```


Mapping point

Mapping point

RDF Triples

Shared RDF Equivalent


```
{
  "resourceType": "Patient",
  "id": "pat1",
  "text": {"status": "generated"...},
  "extension": [
    {  "url": "https://aehrc.github.io/fhir-phenopackets-ig/StructureDefinition-Taxonomy.html",
      "valueCodeableConcept": {
        "coding": [
          { "system":  "http://purl.obolibrary.org/obo/NCBITaxon_",
            "code": "75857",
            "display": "American black duck"
          }
    ] } } ],
  "identifier": [...],
  "active": true,
  "name": [...],
  "gender": "male",
  "birthDate": "1998-01-01",
  "contact": [...],
  "managingOrganization": {
    "reference": "Organization/1",
    "display": "ACME Healthcare, Inc"
  },
  "link": [...]
}
```

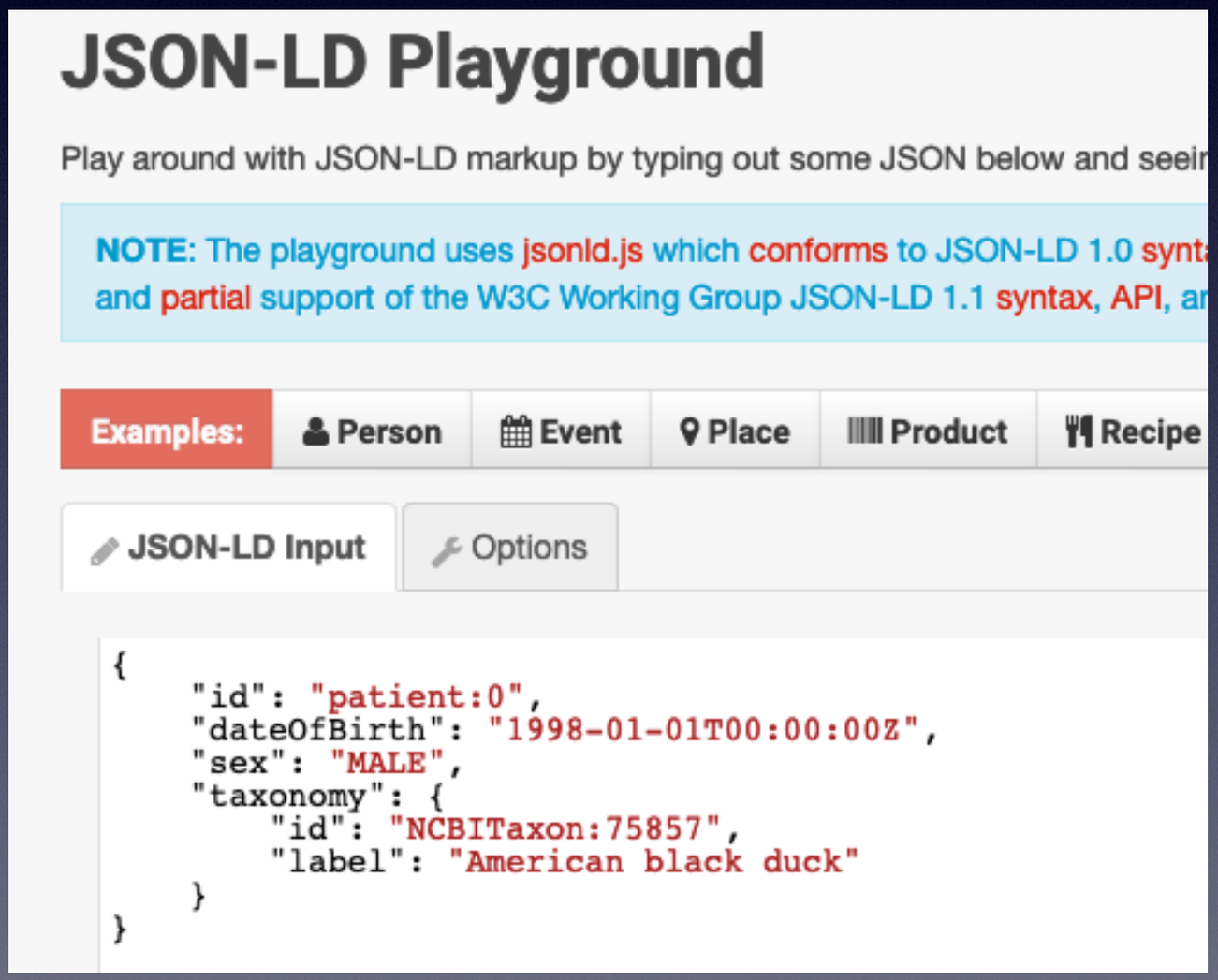

Information from PhenoPackets

Enhanced FHIR Patient

Shared JSON

Start with vanilla JSON

https://phenopackets-schema.readthedocs.io/en/latest/individual.html



https://tinyurl.com/sqkg7bz

Context provides the Semantics and RDF mapping

JSON-LD Input | Options | Document URL

```
{
  "@context": {
    "FHIR": "http://hl7.org/fhir/",
    "PHENO": "http://phenopackets.org/",
    "XSD": "http://www.w3.org/2001/XMLSchema#",
    "NCBITaxon": {"@id": "http://purl.obolibrary.org/obo/NCBITaxon_", "@prefix": true},
    "SKOS": "http://www.w3.org/2004/02/skos/core#",
    "NCIT": "http://purl.obolibrary.org/obo/NCIT_",
    "patient": "FHIR:patient/",

    "id": "@id",
    "sex": "FHIR:Patient.gender",
    "dateOfBirth": {
      "@id": "FHIR:Patient.birthDate",
      "@type": "XSD:date"
    },
    "taxonomy": {"@id": "PHENO:taxonomy", "@context": {"label": "SKOS:preflabel"}}
  },
  "@type": "PHENO:individual",

    "id": "patient:0",
    "dateOfBirth": "1998-01-01T00:00:00Z",
    "sex": "MALE",
    "taxonomy": {
        "id": "NCBITaxon:75857",
        "label": "American black duck"
    }
}
```

Expanded | Compacted | Flattened | Framed | N-Quads | Normalized | Table | Visualized | Signed with RSA | Signed with Bitcoin

```
<http://hl7.org/fhir/patient/0> <http://hl7.org/fhir/Patient.birthDate> "1998-01-01T00:00:00Z"^^<http://www.w3.org/2001/XMLSchema#date> .
<http://hl7.org/fhir/patient/0> <http://hl7.org/fhir/Patient.gender> "MALE" .
<http://hl7.org/fhir/patient/0> <http://phenopackets.org/taxonomy> <http://purl.obolibrary.org/obo/NCBITaxon_75857> .
<http://hl7.org/fhir/patient/0> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://phenopackets.org/individual> .
<http://purl.obolibrary.org/obo/NCBITaxon_75857> <http://www.w3.org/2004/02/skos/core#preflabel> "American black duck" .
```

https://tinyurl.com/t4m777z

Convert RDF to JSON-LD Expanded Form

RDF JSON-LD

JSON-LD Input | Options

```
[
  {
    "@type": [
      "http://phenopackets.org/individual"
    ],
    "http://hl7.org/fhir/Patient.birthDate": [
      {
        "@type": "http://www.w3.org/2001/XMLSchema#date",
        "@value": "1998-01-01T00:00:00Z"
      }
    ],
    "@id": "http://hl7.org/fhir/patient/0",
    "http://hl7.org/fhir/Patient.gender": [
      {
        "@value": "MALE"
      }
    ],
    "http://phenopackets.org/taxonomy": [
      {
        "@id": "http://purl.obolibrary.org/obo/NCBITaxon_75857",
        "http://www.w3.org/2004/02/skos/core#preflabel": [
          {
            "@value": "American black duck"
          }
        ]
      }
    ]
  }
]
```

Expanded | Compacted | Flattened | Framed | N-Quads | Normalized

RDF Turtle

```
<http://hl7.org/fhir/patient/0> a :individual ;
    fhir:Patient.birthDate "1998-01-01"^^xsd:date ;
    fhir:Patient.gender "MALE" ;
    :taxonomy <http://purl.obolibrary.org/obo/NCBITaxon_75857> .

<http://purl.obolibrary.org/obo/NCBITaxon_75857> skos:preflabel "American black duck" .
```

All Identical

RDF NTriples

```
<http://hl7.org/fhir/patient/0> <http://hl7.org/fhir/Patient.birthDate> "1998-01-01T00:00:00Z"^^<http://www.w3.org/2001/XMLSchema#date> .
<http://hl7.org/fhir/patient/0> <http://hl7.org/fhir/Patient.gender> "MALE" .
<http://hl7.org/fhir/patient/0> <http://phenopackets.org/taxonomy> <http://purl.obolibrary.org/obo/NCBITaxon_75857> .
<http://hl7.org/fhir/patient/0> <http://www.w3.org/1999/02/22-rdf-syntax-ns#type> <http://phenopackets.org/individual> .
<http://purl.obolibrary.org/obo/NCBITaxon_75857> <http://www.w3.org/2004/02/skos/core#preflabel> "American black duck" .
```

JSON-LD Framing
RDF —> JSON

JSON-LD Input | Options | Document URL

```
[
  {
    "@type": [
      "http://phenopackets.org/individual"
    ],
    "http://hl7.org/fhir/Patient.birthDate": [
      {
        "@type": "http://www.w3.org/2001/XMLSchema#date",
        "@value": "1998-01-01T00:00:00Z"
      }
    ],
    "@id": "http://hl7.org/fhir/patient/0",
    "http://hl7.org/fhir/Patient.gender": [
      {
        "@value": "MALE"
      }
    ],
    "http://phenopackets.org/taxonomy": [
      {
        "@id": "http://purl.obolibrary.org
/obo/NCBITaxon_75857",
```

JSON-LD Frame | Frame URL

```
{
  "@context": {
    "FHIR": "http://hl7.org/fhir/",
    "PHENO": "http://phenopackets.org/",
    "XSD": "http://www.w3.org/2001/XMLSchema#",
    "NCBITaxon": {
      "@id": "http://purl.obolibrary.org/obo/NCBITaxon_",
      "@prefix": true
    },
    "SKOS": "http://www.w3.org/2004/02/skos/core#",
    "NCIT": "http://purl.obolibrary.org/obo/NCIT_",
    "patient": "FHIR:patient/",
    "id": "@id",
    "sex": "FHIR:Patient.gender",
    "dateOfBirth": {
      "@id": "FHIR:Patient.birthDate",
      "@type": "XSD:date"
    },
    "taxonomy": {
      "@id": "PHENO:taxonomy",
      "@context": {
```

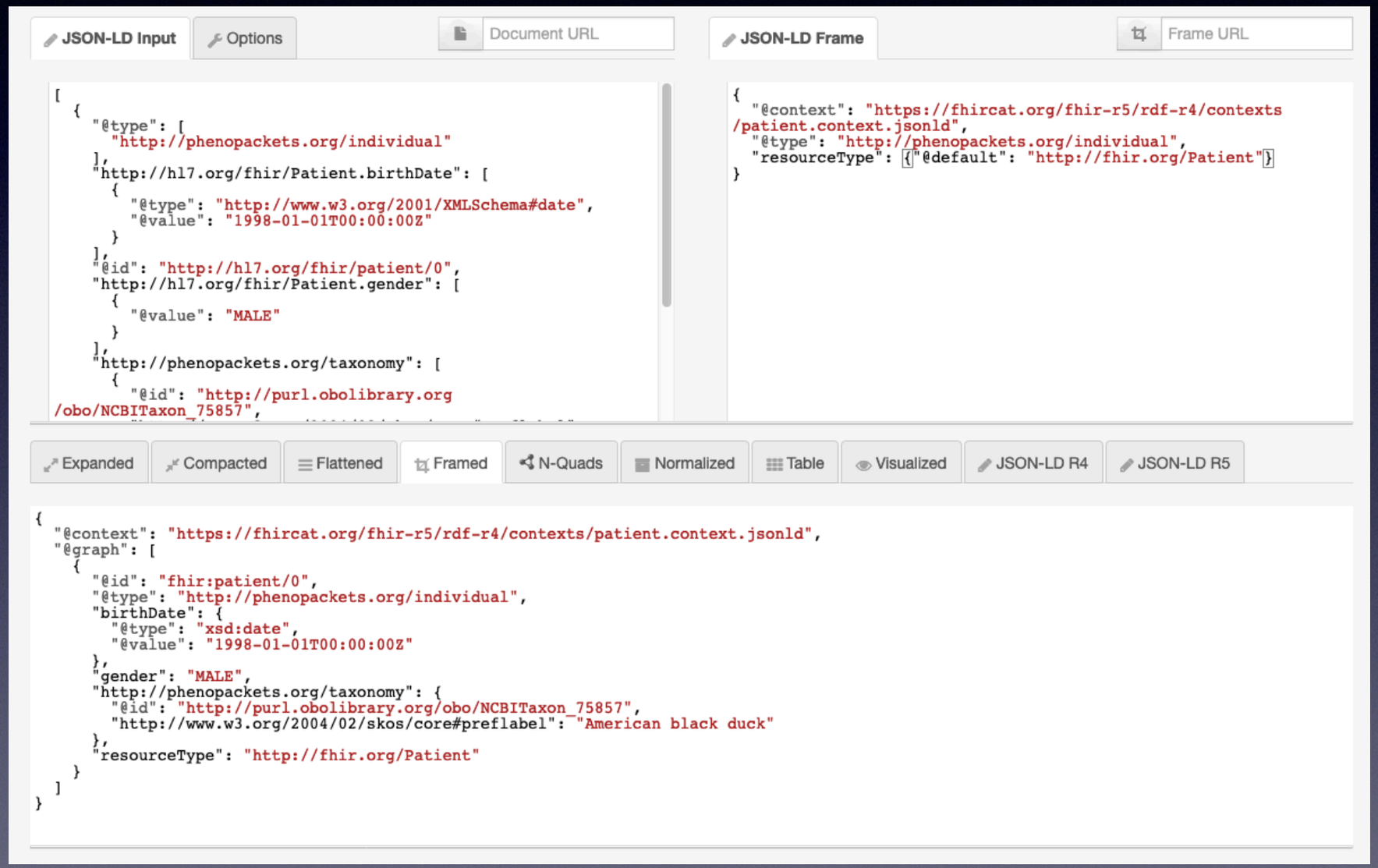
Expanded | Compacted | Flattened | Framed | N-Quads | Normalized | Table | Visualized | Signed with RSA | Signed with Bitcoin

```
    "sex": "FHIR:Patient.gender",
    "dateOfBirth": {
      "@id": "FHIR:Patient.birthDate",
      "@type": "XSD:date"
    },
    "taxonomy": {
      "@id": "PHENO:taxonomy",
      "@context": {
        "label": "SKOS:preflabel"
      }
    }
  },
  "id": "patient:0",
  "@type": "PHENO:individual",
  "dateOfBirth": "1998-01-01T00:00:00Z",
  "sex": "MALE",
  "taxonomy": {
    "id": "NCBITaxon:75857",
    "label": "American black duck"
  }
}
```

```
  },
  "id": "patient:0",
  "@type": "PHENO:individual",
  "dateOfBirth": "1998-01-01T00:00:00Z",
  "sex": "MALE",
  "taxonomy": {
    "id": "NCBITaxon:75857",
    "label": "American black duck"
  }
}
```

https://tinyurl.com/tau2nn9

You Don’t have to use the Same Context (!!!)



https://tinyurl.com/qu9rexk

Note: Work in Progress

JSON-LD Context

The “secret sauce”

Plain ‘ol JSON

```
{
  “name": “BigCocoInc",
  "type": "Company",
  "people": {
     "Sam": {
        "name": {
         first": "Sam",
        "last": "Smith"
      },
     "employees": ["Melissa", "Dazhi"]
   },
   "Melissa": {
      "name": {
        "last": "Johnson"
      }
   },
   "Dazhi": {
  }
}
```

Context

```
{
  "@context": {
    "sdo": "http://schema.org/",
    "foaf": "http://xmlns.com/foaf/0.1/",
    "co": "http://companies.com/",
    "@base": "http://companies.com",
    "type": "@type",
    "name": "@id",
    "people": {
      "@id": "sdo:employee",
      "@container": "@id",
      "@context": {
           "name": "sdo:name",
        "first": "foaf:givenName",
        "last": "foaf:familyName",
        "employees": {
          "@reverse": "co:reports_to",
          "@type": "@id"
        }
      }
    }
```

RDF

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix co: <http://companies.com/> .
@prefix sdo: <http://schema.org/> .

co:BigCocoInc a co:Company ;
    sdo:employee co:Dazhi,
        co:Melissa,
        co:Sam .

co:Dazhi co:reports_to co:Sam .

co:Melissa co:reports_to co:Sam ;
    sdo:name [ foaf:familyName "Johnson" ] .

co:Sam sdo:name [ foaf:familyName "Smith" ;
            foaf:givenName "Sam" ] .
```

http://tinyurl.com/tbmkhzp

JSON-LD Context

- A mapping between:
  - json names and URI's
  - json values and types + representation
- Context and JSON can be *completely* separate
  - Either add in an "@context" or can applied completely separately
  - Contexts can be URL's (!!)

https://raw.githubusercontent.com/fhircat/fhir_rdf_validator/master/tutorial/company.context.jsonld

JSON-LD Context

The “secret sauce”

Slightly Edited JSON

```
{
  "@context": "https://raw.githubusercontent.com/fhircat/
fhir_rdf_validator/master/tutorial/company.context.jsonld",
  "name": "BigCocoInc",
  "type": "Company",
  "people": {
    "Sam": {
      "name": {
        "first": "Sam",
        "last": "Smith"
      },
      "employees": [
        "Melissa",
        "Dazhi"
      ]
    },
    "Melissa": {
      "name": {
        "last": "Johnson"
      }
    },
    "Dazhi": {}
  }
}
```

RDF

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix co: <http://companies.com/> .
@prefix sdo: <http://schema.org/> .

co:BigCocoInc a co:Company ;
    sdo:employee co:Dazhi,
        co:Melissa,
        co:Sam .

co:Dazhi co:reports_to co:Sam .

co:Melissa co:reports_to co:Sam ;
    sdo:name [ foaf:familyName "Johnson" ] .

co:Sam sdo:name [ foaf:familyName "Smith" ;
            foaf:givenName "Sam" ] .
```

http://tinyurl.com/whgprn2

JSON-LD Framing

Makes it bidirectional (!)

Plain ‘ol JSON

```
{
 ,
  "name": "BigCocoInc",
  "type": "Company",
  "people": {
    "Sam": {
      "name": {
        "first": "Sam",
        "last": "Smith"
      },
      "employees": [
        "Melissa",
        "Dazhi"
      ]
    },
    "Melissa": {
      "name": {
        "last": "Johnson"
      }
    },
    "Dazhi": {}
  }
}
```

http://tinyurl.com/tgxu78k

RDF

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix co: <http://companies.com/> .
@prefix sdo: <http://schema.org/> .

co:BigCocoInc a co:Company ;
    sdo:employee co:Dazhi,
        co:Melissa,
        co:Sam .

co:Dazhi co:reports_to co:Sam .

co:Melissa co:reports_to co:Sam ;
    sdo:name [ foaf:familyName "Johnson" ] .

co:Sam sdo:name [ foaf:familyName "Smith" ;
            foaf:givenName "Sam" ] .
```

Frame

```
{ "@context": [
  "https://raw.githubusercontent.com/fhircat/fhir_rdf_validator/master/tutorial/
company.context.jsonld",
   {
     "@vocab": "http://company.com/",
     "@base": "http://company.com/"
   }
 ],
 "@type": "co:Company"
}
```

Multiple Contexts

Community A JSON

```
{
  “name": “BigCocoInc",
  "type": "Company",
  "people": {
     "Sam": {
        "name": {
         first": "Sam",
        "last": "Smith"
      },
     "employees": ["Melissa", "Dazhi"]
   },
   "Melissa": {
      "name": {
        "last": "Johnson"
      }
   },
   "Dazhi": {
  }
}
```

Context 1

```
{
  "@context": {
    "sdo": "http://schema.org/",
    "foaf": "http://xmlns.com/foaf/0.1/",
    "co": "http://companies.com/",
    "@base": "http://companies.com",
    "type": "@type",
    "name": "@id",
    "people": {
      "@id": "sdo:employee",
      "@container": "@id",
      "@context": {
           "name": "sdo:name",
        "first": "foaf:givenName",
        "last": "foaf:familyName",
        "employees": {
          "@reverse": "co:reports_to",
          "@type": "@id"
        }
      }
    }
```

Shared RDF

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix co: <http://companies.com/> .
@prefix sdo: <http://schema.org/> .

co:BigCocoInc a co:Company ;
    sdo:employee co:Dazhi,
        co:Melissa,
        co:Sam .

co:Dazhi co:reports_to co:Sam .

co:Melissa co:reports_to co:Sam ;
    sdo:name [ foaf:familyName "Johnson" ] .

co:Sam sdo:name [ foaf:familyName "Smith" ;
            foaf:givenName "Sam" ] .
```

Multiple Contexts

Communit B JSON

```
{
  “COMP”: “BigCocoInc",
  "type": "Company",
  "people": {
     "Sam": {
        "name": {
         first": "Sam",
        "last": "Smith"
      },
     "employees": ["Melissa", "Dazhi"]
   },
   "Melissa": {
      "name": {
        "last": "Johnson"
      }
   },
   "Dazhi": {
  }
}
```

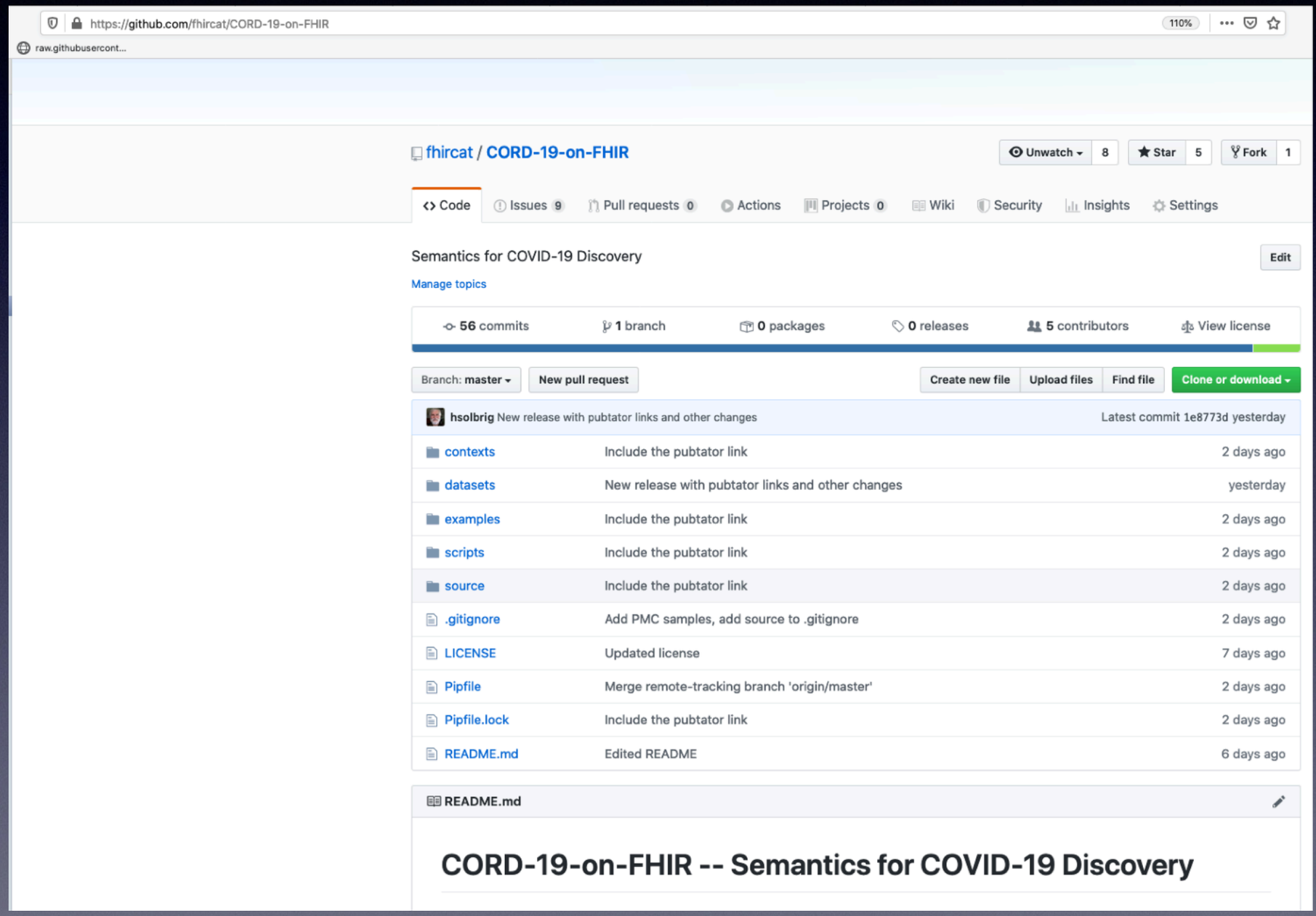
Context 2

```
{
  "@context": {
    "sdo": "http://schema.org/",
    "foaf": "http://xmlns.com/foaf/0.1/",
    "co": "http://companies.com/",
    "@base": "http://companies.com",
    "type": "@type",
    “COMP": "@id",
    "people": {
      "@id": "sdo:employee",
      "@container": "@id",
      "@context": {
           "name": "sdo:name",
        "first": "foaf:givenName",
        "last": "foaf:familyName",
        "employees": {
          "@reverse": "co:reports_to",
          "@type": "@id"
        }
      }
    }
```

RDF

```
@prefix foaf: <http://xmlns.com/foaf/0.1/> .
@prefix co: <http://companies.com/> .
@prefix sdo: <http://schema.org/> .

co:BigCocoInc a co:Company ;
    sdo:employee co:Dazhi,
        co:Melissa,
        co:Sam .

co:Dazhi co:reports_to co:Sam .

co:Melissa co:reports_to co:Sam ;
    sdo:name [ foaf:familyName "Johnson" ] .

co:Sam sdo:name [ foaf:familyName "Smith" ;
            foaf:givenName "Sam" ] .
```

Another Example



Metadata File

```
sha,source_x,title,doi,pmcid,pubmed_id,license,abstract,publish_time,authors,journal,Microsoft Academic Paper ID,WHO #Covidence,has_full_text,full_text_file
,Elsevier,Intrauterine virus infections and congenital heart disease,10.1016/0002-8703(72)90077-4,,4361535,els-covid,"Abstract The etiologic basis for the vast majority of cases of congenital heart disease remains largely undefined. Viruses have been considered to b
 likely candidates since the recognition of the association between intrauterine rubella and congenital heart disease. Although the pathogenesis of cardiovascular defects is poorly understood, information gained from the study of congenital rubella syndrome suggest
 mechanisms such as focal endothelial cell damage, resulting in obliteration of vascular supply, decreased growth rate, and shortened survival time of certain cells, and disturbed DNA replication in cells whose chromosomes were damaged secondary to the effects of v
 replication may be operative in the production of defects in the developing fetus. In addition to rubella there is suggestive, but not conclusive, evidence that Coxsackie B3 and B4 virus infections during pregnancy can result in the birth of infants with a variety
 types of congenital heart lesions and that intrauterine mumps virus infection may be etiologically related to the postnatal development of endocardial fibroelastosis (EFE). Although there are a number of other viruses that are potential etiologic agents of congeni
 heart disease, the current status of information is inadequate to allow even suggestive associations to be made. The most profitable areas for future investigation appear to be: (1) the epidemiology of congenital heart disease, (2) prospective studies of the assoc
 of maternal viral infection with abnormal offspring, (3) the in-depth virologic investigation of the infant with a cardiac defect, and (4) the development of experimental animal models of congenital heart disease. Successful control of virus-induced congenital hea
 disease will depend on the results of these investigations and the development of vaccines against the identified causative viruses and/or safe and effective antiviral chemotherapy for the woman in early gestation who is infected with a known teratogenic agent.",
 1972-12-31,"Overall, James C.",American Heart Journal,,,False,custom_license
,Elsevier,Coronaviruses in Balkan nephritis,10.1016/0002-8703(80)90355-5,,6243850,els-covid,,1980-03-31,"Georgescu, Leonida; Diosi, Peter; Buțiu, Ioan; Plavoșin, Livia; Herzog, Georgeta",American Heart Journal,,,False,custom_license
,Elsevier,Cigarette smoking and coronary heart disease: new evidence and old reactions,10.1016/0002-8703(80)90356-7,,7355701,els-covid,,1980-03-31,"Friedman, Gary D",American Heart Journal,,,False,custom_license
aecbc613ebdab36753235197ffb4f35734b5ca63,Elsevier,Clinical and immunologic studies in identical twins discordant for systemic lupus erythematosus,10.1016/0002-9343(73)90176-9,,4579077,els-covid,"Abstract Middle-aged female identical twins, one of whom had systemic
 erythematosus (SLE), were evaluated for immunologic reactivity to previous antigenic challenges, including primary immunization with a foreign antigen, keyhole limpet hemocyanin (KLH). These two women had lived together for all of their 58 years and neither was re
 anti-inflammatory or immunosuppressive drugs at the time of these studies. Both twins demonstrated comparable 7S and 19S humoral antibody response to KLH, as well as similar viral antibody titers. However, the twin with SLE was anergic to common antigens,
 streptokinase-streptodornase, Trichophyton and Candida; furthermore delayed hypersensitivity to KLH did not develop after immunization. This observed discrepancy between humoral and cellular immunity in genetically similar subjects may be significant in the pathog
 of SLE.",1973-08-31,"Brunner, Carolyn M.; Horwitz, David A.; Shann, Mary K.; Sturgill, Benjamin A.; Davis, John S.",The American Journal of Medicine,,,True,custom_license
,Elsevier,"Epidemiology of community-acquired respiratory tract infections in adults Incidence, etiology, and impact",10.1016/0002-9343(85)90361-4,,4014285,els-covid,"Abstract Upper respiratory tract infections are the most common types of infectious diseases among
  It is estimated that each adult in the United States experiences two to four respiratory infections annually. The morbidity of these infections is measured by an estimated 75 million physician visits per year, almost 150 million days lost from work, and more than
 billion In costs for medical care. Serotypes of the rhinoviruses account for 20 to 30 percent of episodes of the common cold. However, the specific causes of most upper respiratory infections are undefined. Pneumonia remains an important cause of morbidity and mor
 for nonhospitalized adults despite the widespread use of effective antimicrobial agents. There are no accurate figures on the number of episodes of pneumonia that occur each year in ambulatory patients. In younger adults, the atypical pneumonia syndrome Is the mos
  clinical presentation; Mycoplasma pneumoniae is the most frequently Identified causative agent. Other less common agents include Legionelia pneumophila, influenza viruses, adenoviruses, and Chiamydia. More than half a million adults are hospitalized each year wit
 pneumonia. Persons older than 65 years of age have the highest rate of pneumonia admissions, 11.5 per 1,000 population. Pneumonia ranks as the sixth leading cause of death in the United States. The pathogens responsible for community-acquired pneumonlas are changi
 Forty years ago, Streptococcus pneumoniae accounted for the majority of infections. Today, a broad array of community-acquired pathogens have been implicated as etiologic agents Including Leglonella species, gram-negative bacilli, Hemophilus influenzae, Staphyloco
 aureus and nonbacterial pathogens. Given the diversity of pathogenic agents, it has become imperative for clinicians to establish a specific etiologic diagnosis before initiating therapy or to consider the diagnostic possibilities and treat with antimicrobial agen
 are effective against the most likely pathogens.",1985-06-28,"Garibaldi, Richard A.",The American Journal of Medicine,,,False,custom_license
212e990b378e8d267042753d5f9d4a64ea5e9869,Elsevier,Infectious diarrhea: Pathogenesis and risk factors,10.1016/0002-9343(85)90367-5,,2861742,els-covid,"Abstract Our understanding of the pathogenesis of infectious, especially bacterial, diarrhea has increased dramatica
```

Metadata to JSON

JSON-LD Input | Options | Document URL


```
{
  "sha": "a04811d55a6f779546cf0c2bf5d46982fb989908",
  "source_x": "PMC",
  "title": "Preliminary study on the tick population of Benin wildlife at the moment of its invasion by the Rhipicephalus microplus tic
(Canestrini, 1888)",
  "doi": "10.14202/vetworld.2018.845-851",
  "pmcid": "PMC6048076",
  "pubmed_id": "30034180",
  "license": "cc-by",
  "abstract": "BACKGROUND AND AIM: Rhipicephalus microplus (Rm) is one of the most problematic livestock tick species in the world. Its
rapid propagation and resistance to acaricides make it control difficult in the sub-region and Benin particularly. The aim of this work
was to check its presence in wildlife and to confirm the possible role of reservoir wildlife may play in the propagation of the
parasite. This will help to design more efficient control strategy. MATERIALS AND METHODS: This study was conducted from February to
March 2017 in the National Parks of Benin (Pendjari and W Park) and wildfowl's assembly and selling point in Benin. Ticks were manually
picked with forceps from each animal after slaughtering by hunters then stored in 70° ethanol. Collected ticks were counted and
identified in the laboratory using the identification key as described by Walker. RESULTS: Overall, seven species of ticks (Amblyomma
variegatum, Boophilus decoloratus, Rm, Boophilus spp., Hyalomma spp., Rhipicephalus sanguineus, Rhipicephalus spp.) were identified on
nine wild animal species sampled (Cane rat, wildcat, Hare, Doe, Cricetoma, Buffalo, Buffon Cobe, and Bushbuck and Warthog). The average
number of ticks varies from 3 to 6 between animal species, 3 to 7 between localities visited, and 2 to 5 between tick species. However,
these differences are statistically significant only for localities. Considering tick species and animal species, the parasite load of
Rm and Rhipicephalus spp. is higher; the buffalo being more infested. The analysis of deviance reveals that the abundance of ticks
observed depends only on the observed localities (p>0.05). However, the interactions between animal species and localities on the one
hand and between animal and tick species on the other hand, although not significant, have influenced the abundance of ticks as they
reduce the residual deviance after their inclusion in the model. CONCLUSIONS: This study reported the presence of Rm in wildlife of
Benin and confirmed its role in the maintenance and spread of the parasites. It is, therefore, an important risk factor that we must no
neglect in the epidemiological surveillance and ticks control strategies in the West African sub-region and particularly in Benin.",
  "publish_time": "2018 Jun 25",
  "authors": [
    "Adinci, Kossi Justin",
    "Akpo, Yao",
    "Adoligbe, Camus",
    "Adehan, Safiou Bienvenu",
    "Yessinou, Roland Eric",
    "Sodé, Akoeugnigan Idelphonse",
    "Mensah, Guy Appolinaire",
    "Youssao, Abdou Karim Issaka",
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  "journal": "Vet World",
  "has_full_text": "True",
  "full_text_file": "comm_use_subset",
  "id": "https://doi.org/10.14202/vetworld.2018.845-851",
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  "fhir_link": [
    "Commercial/Composition/a04811d55a6f779546cf0c2bf5d46982fb989908"
  ]
}
```


https://tinyurl.com/w884xgq

Add Semantics

JSON-LD Input | Options | Document URL

```
{
  "@context": {
    "@base": "http://fhircat.org/cord-19/metadata/",
    "dc": "http://purl.org/dc/terms/",
    "ncit": "http://ncicb.nci.nih.gov/xml/owl/EVS/Thesaurus.owl#",
    "sso": "http://semanticscholar.org/cv-research/",
    "whocv": "http://semanticscholar.org/cv-research/WHO#",
    "fhir": "http://hl7.org/fhir/",
    "xsd": "http://www.w3.org/2001/XMLSchema#",
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    "title": "dc:title",
    "fhir_link": {
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      }
    },
    "pubtator": {
      "@id": "sso:pubtator",
```

Expanded | Compacted | Flattened | Framed | N-Quads | Normalized | Table | Visualized | Signed with RSA | Signed with Bitcoin

```
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Adinci, Kossi Justin" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Adoligbe, Camus" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Akpo, Yao" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Farougou, Souaïbou" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Mensah, Guy Appolinaire" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Sinsin, Brice" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Sodé, Akoeugnigan Idelphonse" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Yessinou, Roland Eric" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/creator> "Youssao, Abdou Karim Issaka" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/identifier> "PMC6048076" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/identifier> <https://doi.org/10.14202/vetworld.2018.845-851>
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<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/identifier> <https://www.ncbi.nlm.nih.gov/pubmed/30034180> .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/issued> "2018 Jun 25"^^<http://www.w3.org
/2001/XMLSchema#date> .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/license> "cc-by" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://purl.org/dc/terms/title> "Preliminary study on the tick population of Benin
wildlife at the moment of its invasion by the Rhipicephalus microplus tick (Canestrini, 1888)" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://semanticscholar.org/cv-research/full_text_file> "comm_use_subset" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://semanticscholar.org/cv-research/has_full_text> "True" .
<https://doi.org/10.14202/vetworld.2018.845-851> <http://semanticscholar.org/cv-research/journal> "Vet World" .
```

https://tinyurl.com/w4o9m8r

Publish Context

JSON-LD Input | Options | Document URL


```
{
  "@context": "https://raw.githubusercontent.com/fhircat/CORD-19-on-FHIR/master/contexts/metadata.context.json",
  "sha": "a04811d55a6f779546cf0c2bf5d46982fb989908",
  "source_x": "PMC",
  "title": "Preliminary study on the tick population of Benin wildlife at the moment of its invasion by the Rhipicephalus microplus tick (Canestrini, 1888)",
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  "pmcid": "PMC6048076",
  "pubmed_id": "30034180",
  "license": "cc-by",
  "abstract": "BACKGROUND AND AIM: Rhipicephalus microplus (Rm) is one of the most problematic livestock tick species in the world. Its rapid propagation and resistance to acaricides make it control difficult in the sub-region and Benin particularly. The aim of this work was to check its presence in wildlife and to confirm the possible role of reservoir wildlife may play in the propagation of the parasite. This will help to design more efficient control strategy. MATERIALS AND METHODS: This study was conducted from February to March 2017 in the National Parks of Benin (Pendjari and W Park) and wildfowl's assembly and selling point in Benin. Ticks were manually picked with forceps from each animal after slaughtering by hunters then stored in 70° ethanol. Collected ticks were counted
```


https://tinyurl.com/twl3cvu

Batch Conversion

```python
import os

import jsonasobj
from rdflib import Graph

from scripts.metadata import METADATA_DIR, CONTEXT_DIR

CONTEXT = os.path.join(CONTEXT_DIR, 'metadata.context.json')
context_j = jsonasobj.load(CONTEXT)
BASE = context_j['@context']['@base']

n_converted = 0
for fname in os.listdir(METADATA_DIR):
    basename, ext = os.path.splitext(fname)
    if ext == '.json':
        g = Graph()
        g.parse(os.path.join(METADATA_DIR, fname), format="json-ld", context=CONTEXT, base=BASE)
        g.serialize(os.path.join(METADATA_DIR, basename + '.ttl'), format='ttl')
        n_converted += 1

print(f"*** {n_converted} files converted ***")
```

https://github.com/fhircat/CORD-19-on-FHIR/blob/master/scripts/metadata/json_to_rdf.py

Next Steps

https://fhircat.org/jsonld/playground/

Links

- JSON-LD Home page — everything you need to know about JSON-LD
- JSON-LD Playground — note that the source is available for this in github
- JSON-LD 1.1 Syntax Specification
- FHIR-RDF and JSON-LD working group site — note that the README isn't the best at the moment. Should change soon. Issues list is a bit of an entry point
- FHIR / JSON-LD Playground — a variation on the above playground specifically for FHIR
- These Slides