



HL7 FHIR Towards Achieving the Interoperability of Social Determinants of health

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TWO Main Concepts



Health Data Interoperability

The Ability of two health systems to exchange data.

Social Determinants of Health

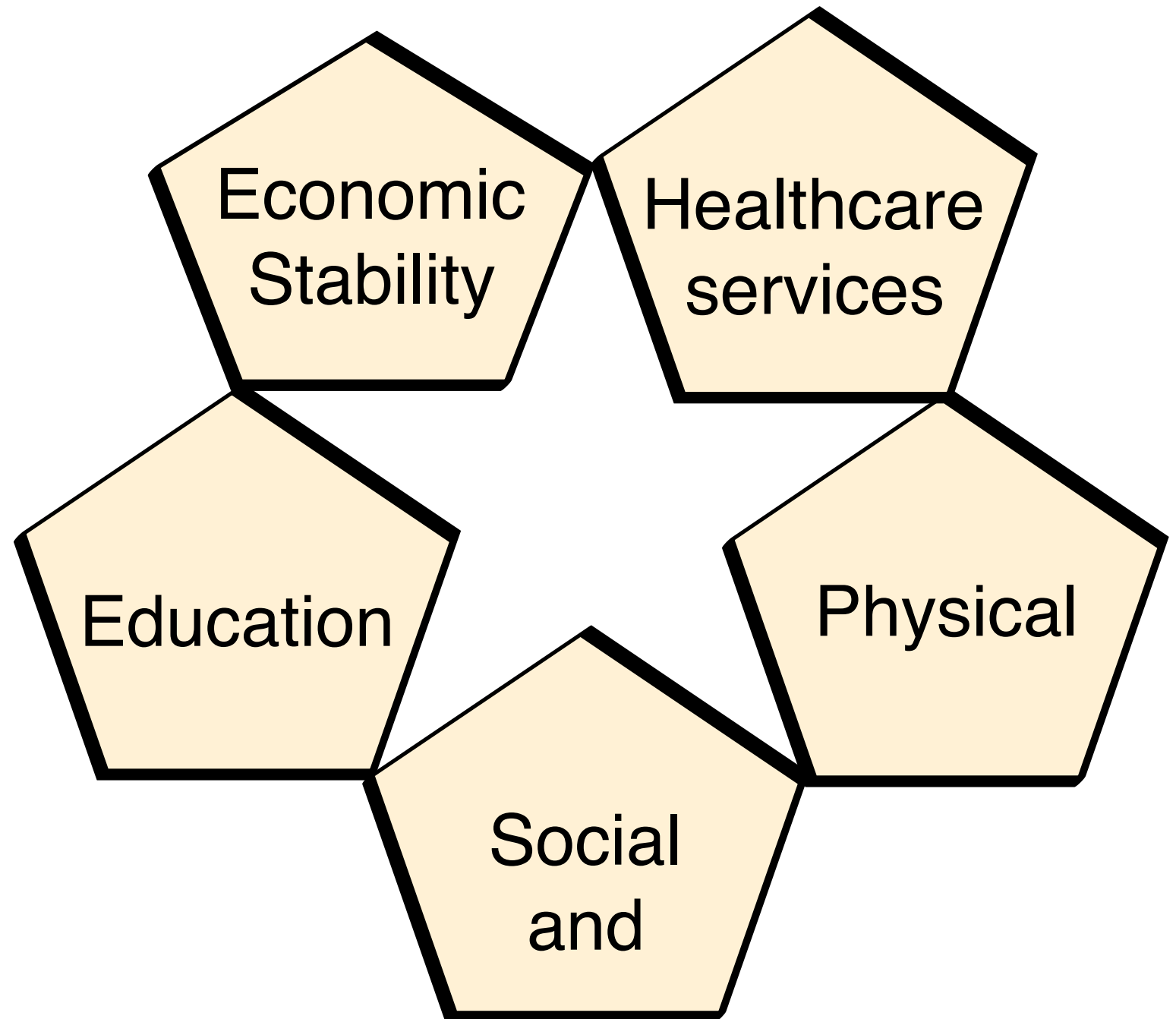
New Emerging types of Data

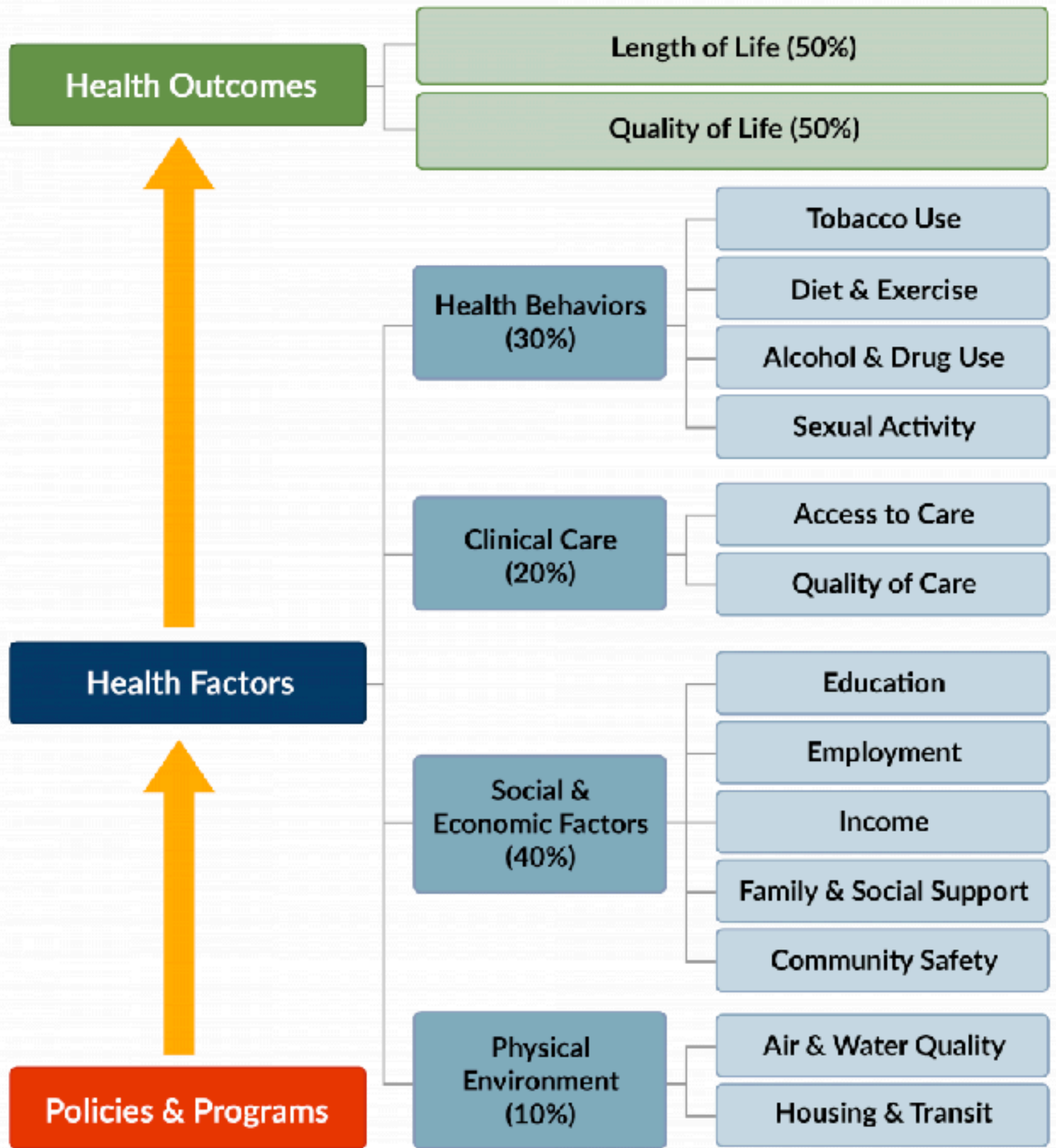
Social Determinants Of Health Data

NON- MEDICAL FACTORS

WHICH AFFECT

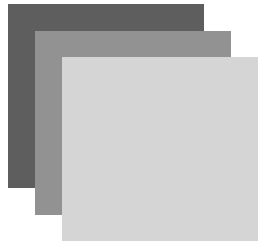
HUMAN HEALTH







Health data Standards



SNOMED-CT

HL7-FHIR

ICD

LOINC

IHE

DICOM

ADA

OpenMRS



What is FHIR

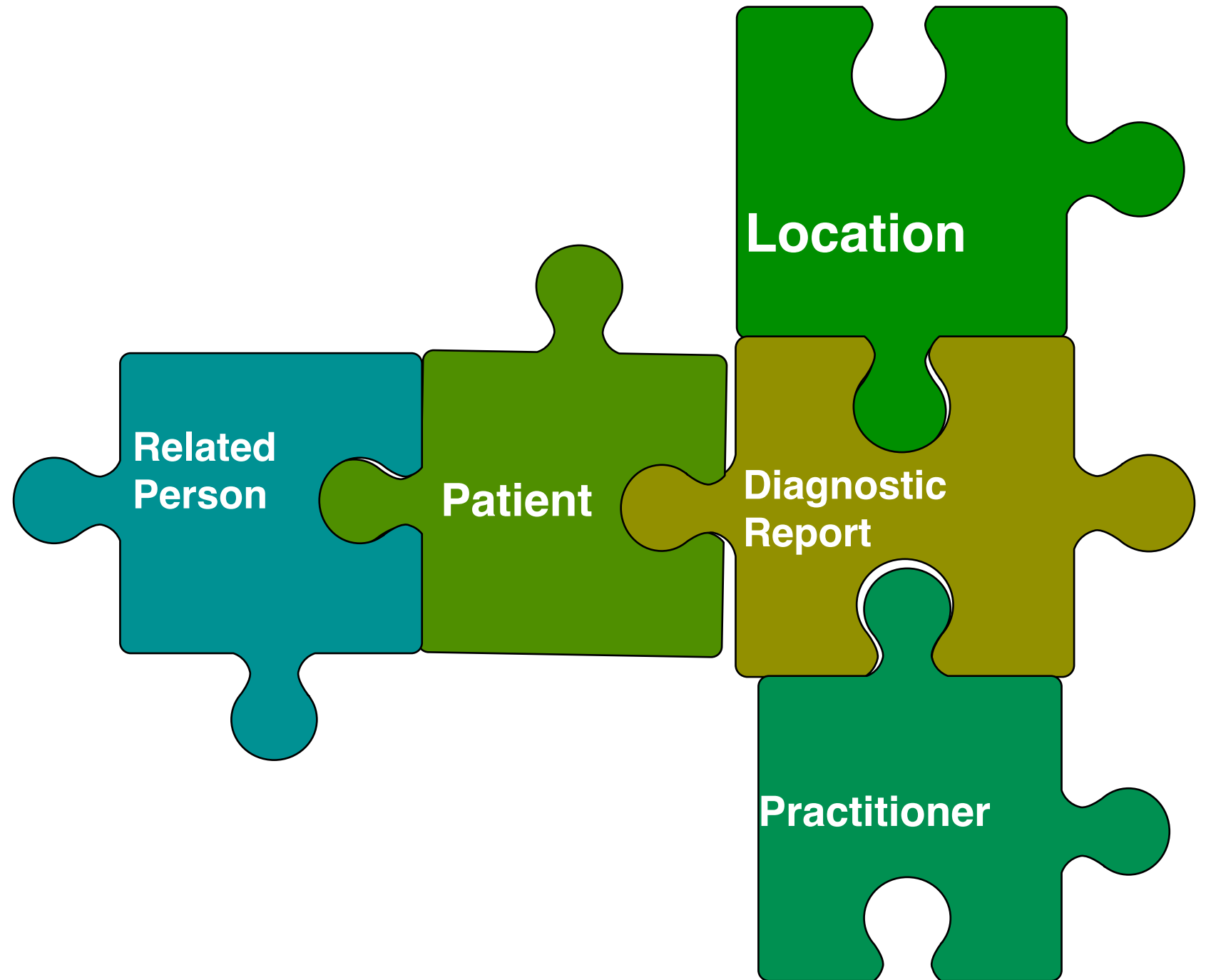


Fast **H**ealth **I**nteroperability **R**esources

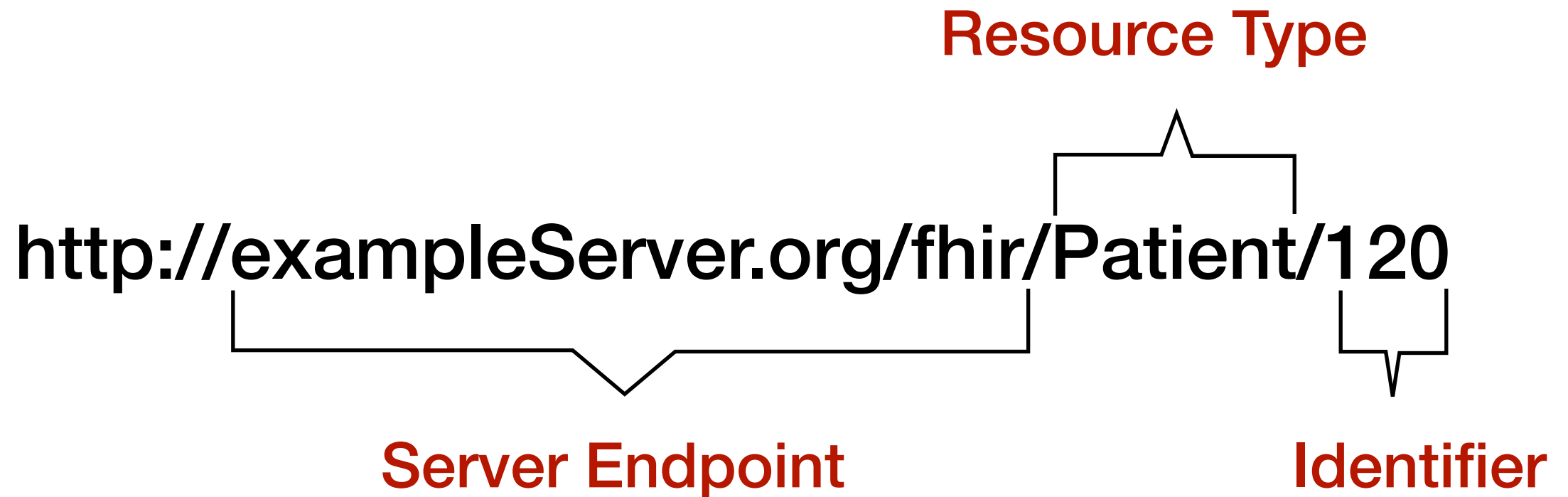
- The Latest HL7 Standard for exchanging electronic healthcare information
- A set of modular components called “Resources”
- Exchange resources between systems using RESTFul API.

ALL it's about "Resources"

Building Blocks

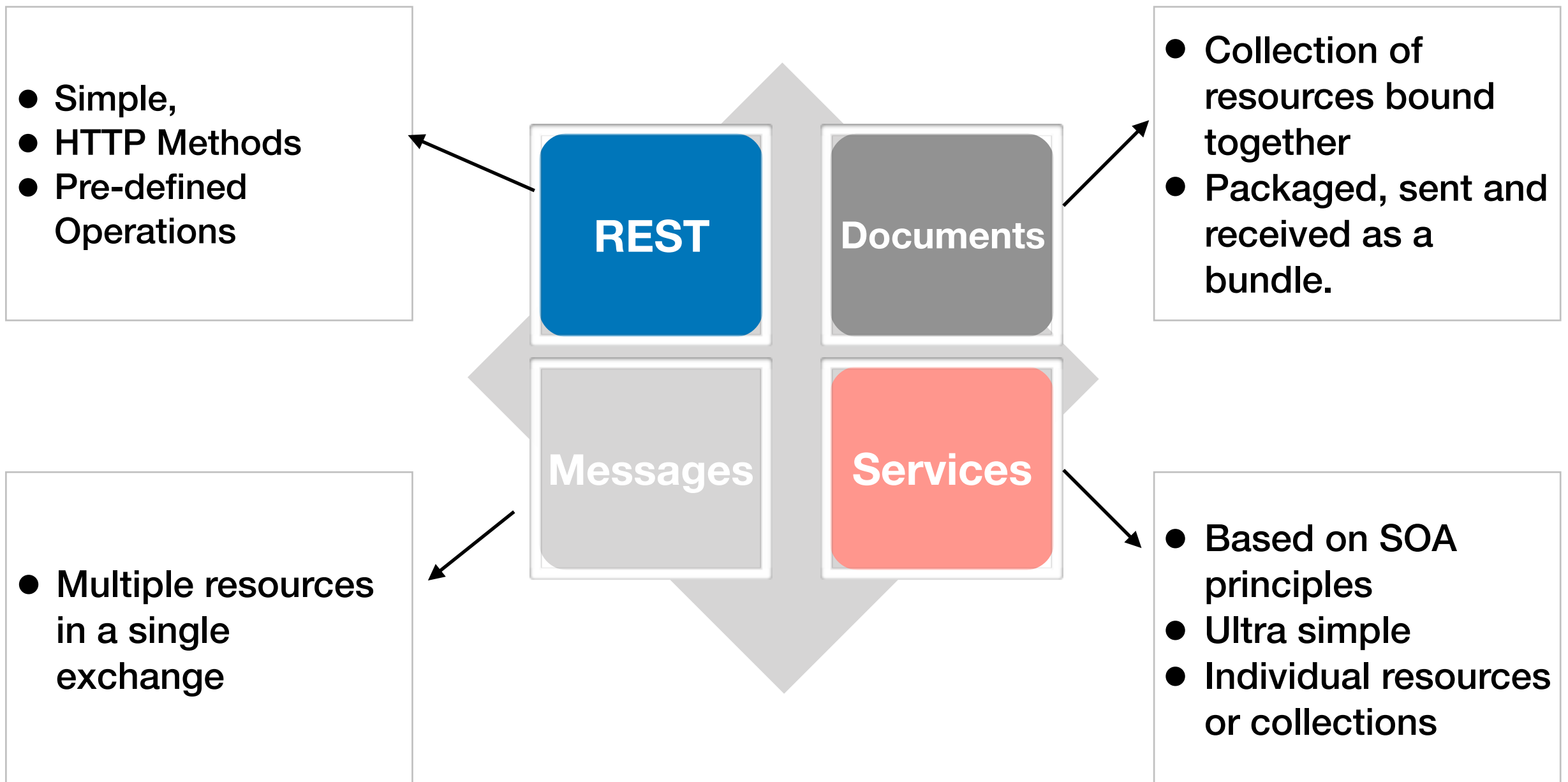


A resource's REST Identify

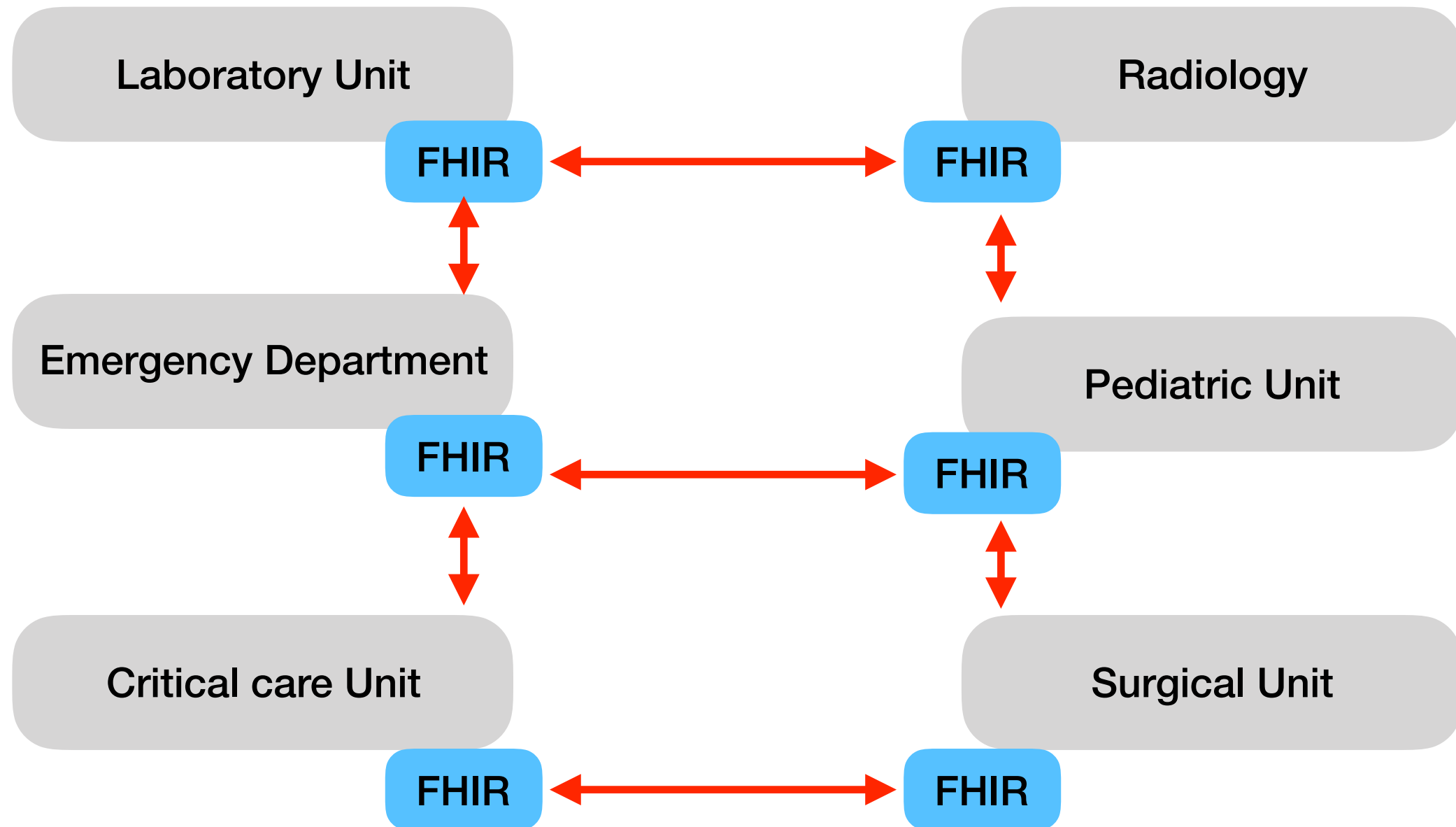


Paradigms

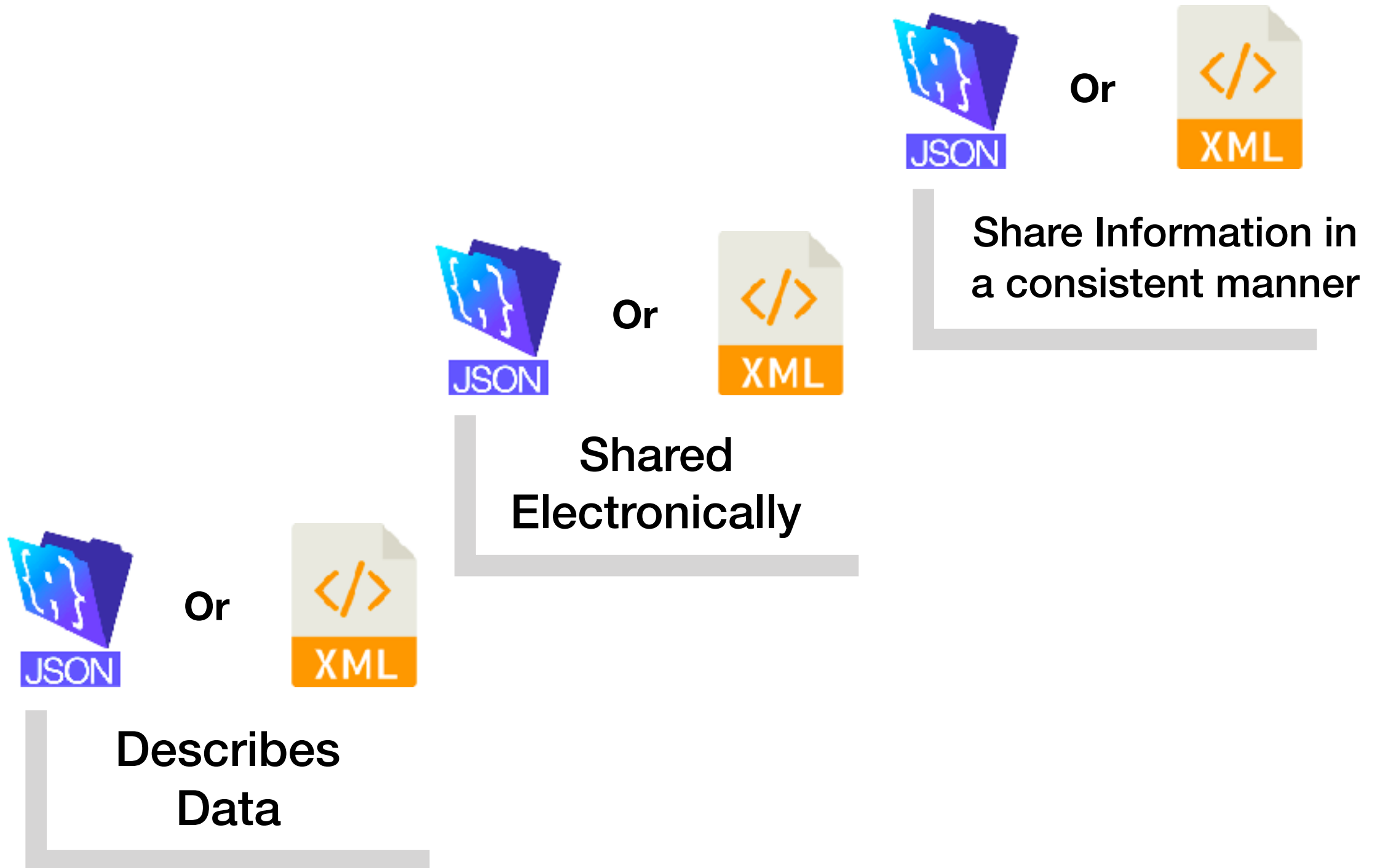
- FHIR supports Four Paradigms



Disparate Systems can communicate



FHIR: Services





SDH and Health IT



- Incorporate SDH data into diagnosis, predictions, decisions making
- Integrate them into healthcare services
- Enable their interoperability

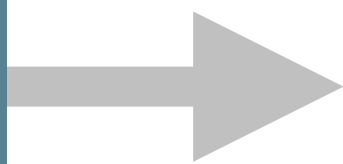


Problem Statement



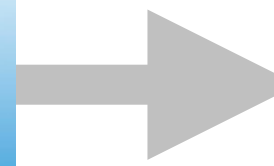
- Data not available
- Data are from different sources
- Complexity, Multiplicity, diversity

Project Goals



A blue rectangular box representing storage. On the left is a black and white icon of a database cylinder. To the right of the icon, the text "RDBMS" is written in large, bold, black letters, and "Interview Questions" is written in smaller, black letters below it.

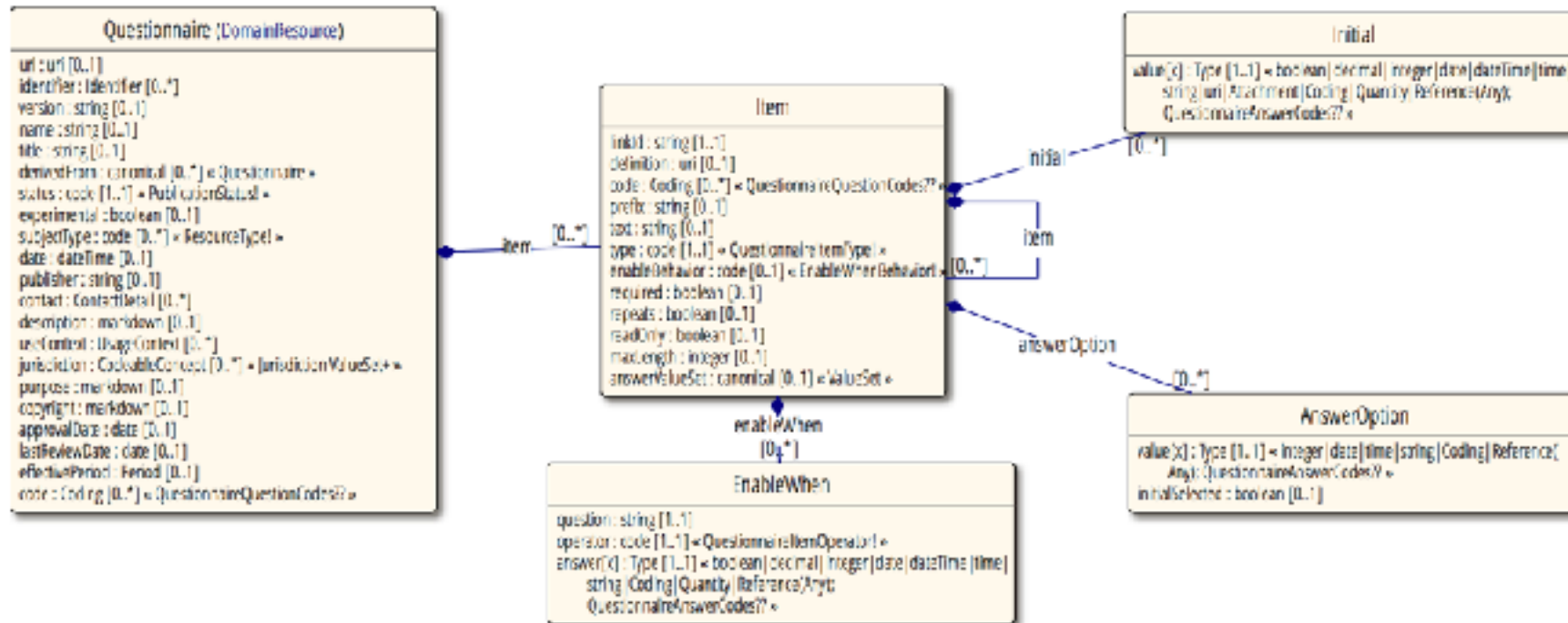
Storage



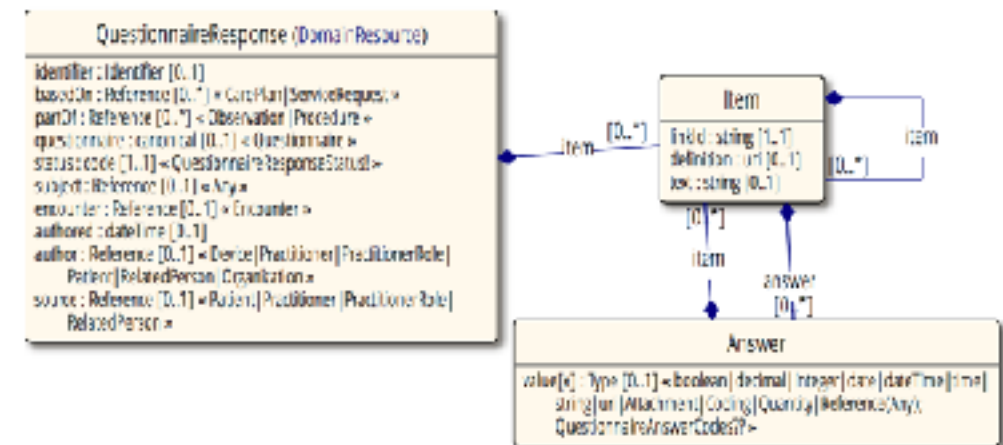
FHIR

TWO FHIR Resources

Questionnaire



QuestionnaireResponse



Map SDH Data into FHIR Resources

Data

Social Determinants

Determinant Id
Date of Survey
Type of Survey
Determinant 1
Determinant 2
.....

Answers

Answer Id
Questions
Respondent
Date of Interview
Response 1
Response 2

Respondent

Id
First Name, Family Name
Location
Date of Birth

Map to

Map to

Map to

FHIR Resources

Questionnaire

Identifier
Date
Purpose
Item 1
Item 2
....

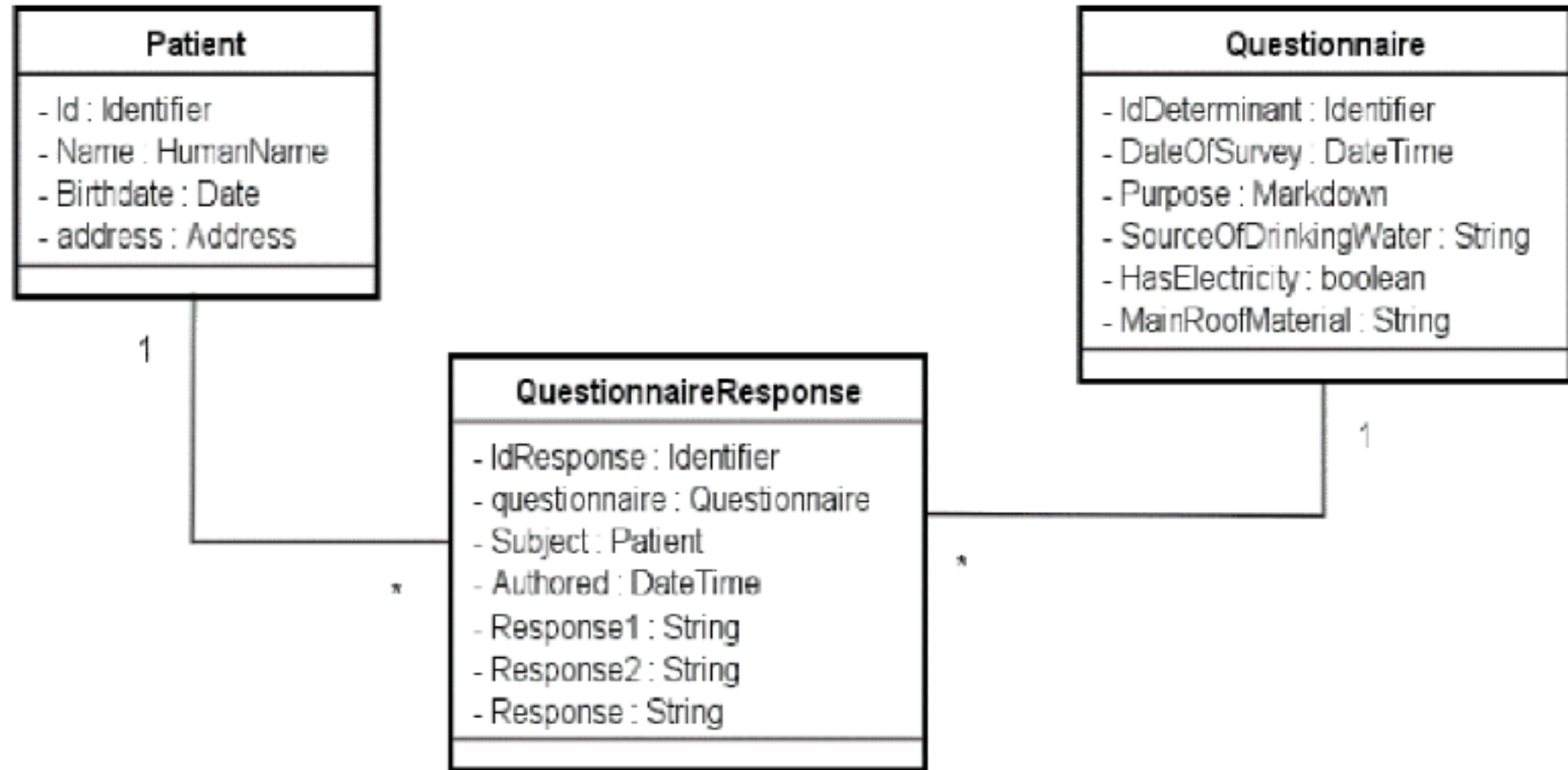
QuestionnaireResponse

Questionnaire (Reference)
Patient (Reference)
Authored
Item 1
Item 3

Patient

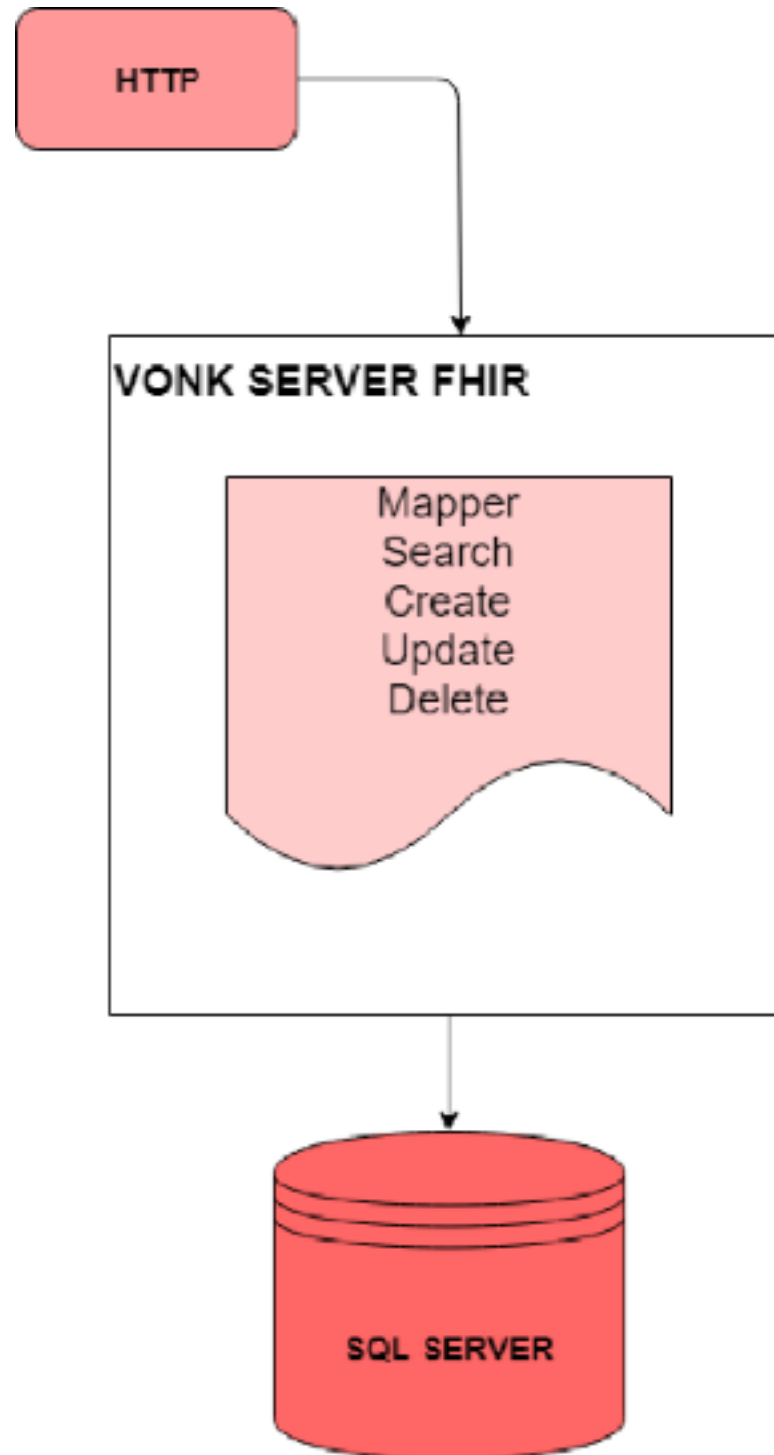
Identifier
Name(family, Given)
Address
BirthDate

Implementation : Data Model



Simplified Data Model


System Architecture




Operations

Get Method: <http://localhost:5020/Patient/2>
HTTP / 1.1 200 OK
Content-Type: application/json+fhir

```
{
  "resourceType": "Patient",
  "id": "2",
  "name": [
    {
      "family": "Nakamura",
      "given": [
        "Akiko"
      ]
    }
  ],
  "birthDate": "1986-06-01T00:00:00+09:00",
  "address": [
    {
      "city": "Sendai Miyagi"
    }
  ]
}
```



```
Get Method: http://localhost:5020/Questionnaire/1
HTTP / 1.1 200 OK
Content-Type: application/json+fhir
```



```
{
  "resourceType": "Questionnaire",
  "id": "1",
  "description": " DHS Survey Series Senegal",
  "purpose": " Mapping SDH data into FHIR resources",
  "item": [
    {
      "linkId": "Source Of Drinking Water",
      "text": "What is The source of your drinking water?",
      "type": "string",
      "required": true,
      "repeats": false
    },
```

```
    {
      "linkId": "Has electricity",
      "text": "Do you have electricity?",
      "type": "string",
      "required": true,
      "repeats": false
    },
    {
      "linkId": "Main Floor material",
      "text": "The main floor Material",
      "type": "string",
      "required": true,
      "repeats": false}
  ]
}
```

Get Method: http://localhost:5020/QuestionnaireResponse?subject:Patient_id=1
HTTP / 1.1 200 OK
Content-Type: application/json+fhir

```
{
  "resourceType": "Bundle",
  "id": "03f7c883-ae6c-4ab5-b3cd-3e86afb90f2c",
  "meta": {
    "versionId": "d9a14311-736d-47af-8ced-50988f164313",
    "lastUpdated": "2019-02-13T12:17:19.614+09:00"
  },
  "type": "searchset",
  "total": 1,
  "link": [
    {
      "relation": "self",
      "url": "/QuestionnaireResponse"
    }
  ],
  "entry": [
    {
      "fullUrl": "http://localhost:5020/QuestionnaireResponse/1",
      "resource": {
        "resourceType": "QuestionnaireResponse",
        "id": "1",
        "questionnaire": {
          "reference": "http://localhost:5020/Determinants/1"
        },
        "status": "completed",
        "subject": {
          "reference": "http://localhost:5020/Householder/2"
        }
      },

```

```
      "authored": "2015-08-01T00:00:00+09:00",
      "author": {
        "reference": "http://localhost:5020/Sow"
      },
      "item": [
        {
          "linkId": "Survey Purpose",
          "answer": [
            {
              "valueString": "DHS Survey Series"
            }
          ]
        },
        {
          "linkId": "Source of drinking Water",
          "answer": [
            {
              "valueString": "Public Tap"
            }
          ]
        },
        {
          "linkId": "Household with electricity ",
          "answer": [
            {
              "valueString": "True"
            }
          ]
        }
      ]
    }
  ]
}
```

Other Operations

The system handles appropriately other CRUD operations including:

- Create, Update and Delete a resource
- Sending *questionnaire* and *QuestionnaireResponse* to external FHIR servers.



Conclusion



- FHIR is a good standard which fits SDH data.
- Many benefits including extensible, support for modern web technologies,
- Good documentation and it is Open source.

Using *questionnaire* and *questionnaireResponse* to capture SDH is consistent and ubiquitous in healthcare.

Thank You