LINKING HEALTHCARE COMMUNITIES

# Healthcare Provider Directory Prototype

Office of the National Coordinator for Health IT

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# Healthcare Provider Directory Prototype

- Purpose
  - Explore the technical considerations required to build a healthcare directory for federal partners

- Goals
  - Deliver working software that demonstrates multiple facets of a successful healthcare provider directory
    - Explore relevant standards: RESTful APIs, IHE HPD protocols, FHIR
    - Expose human and machine interfaces for maximum flexibility
    - Handle complex queries
    - Analyze approaches for information verification and reliability
  - Explore implementing Call to Action from the Draft ONC Interoperability Roadmap

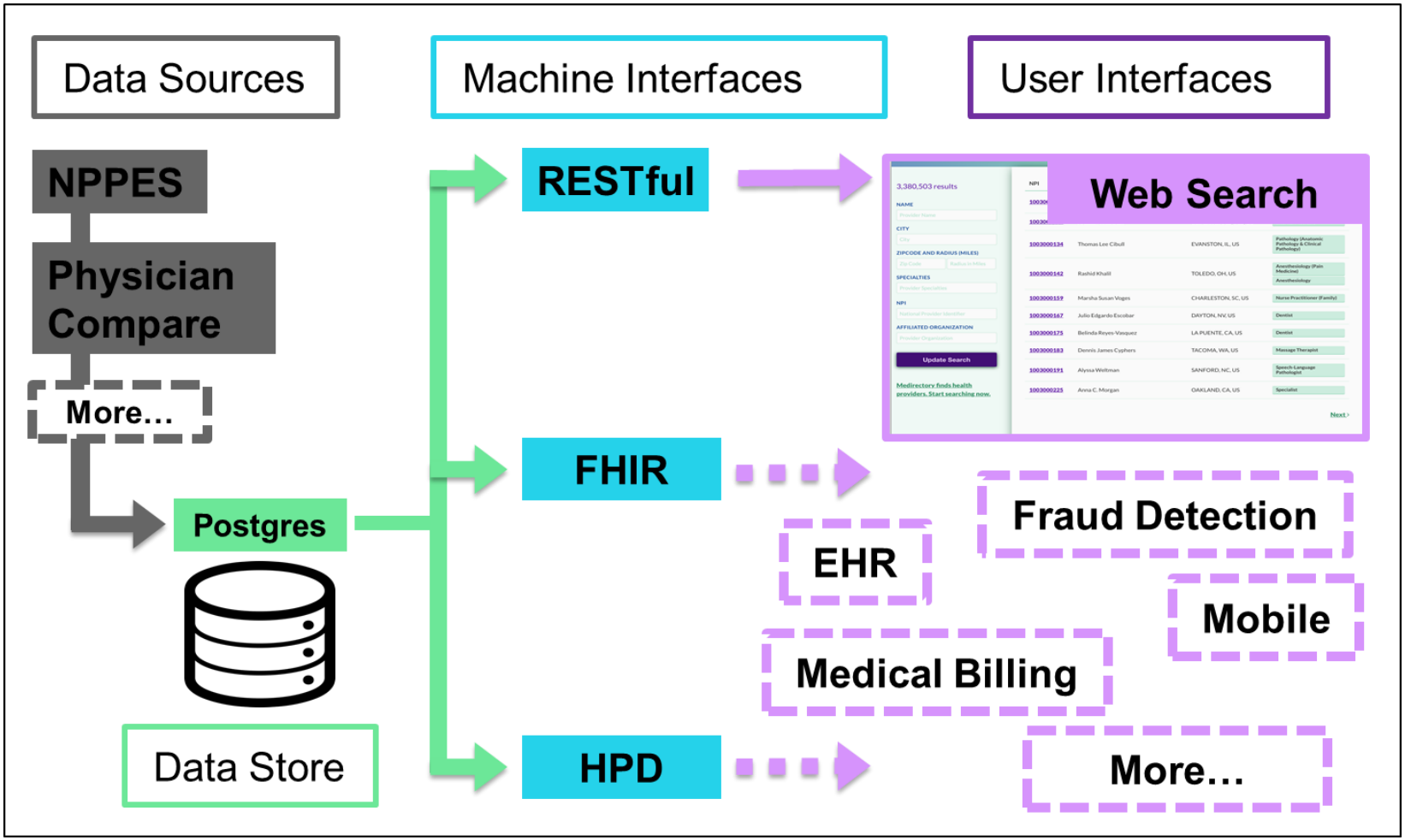
    "Block 4 Core Technical Standards and Functions, *2015-2017: ONC will recommend to CMS that* ***NPPES implement support for the provider directory information query API and data model as specified in the IHE HPD Profile****. CMS should maintain Direct addresses and ESI in NPPES*"

  - Provide useful input to the FHA Healthcare Directory Workgroup efforts

# Prototype Functionality Implemented

- Data set populated using the NPPES provider and organization data and the Physician Compare organization mapping data
- Robust RESTful interface, designed for machine-to-machine communication, supporting
  - Search by basic information like name, location, specialty, and NPI
  - Complex queries using organizational relationships
  - Search using Boolean operators such as OR, AND, and NOT
  - Geospatial search, searching within a radius
- Web interface to demonstrate interactions with the RESTful interface, essentially a JavaScript client to the RESTful interface
- FHIR interface, supporting Practitioner and Organization FHIR resources
- IHE HPD protocol support (SOAP + DSML)

# High Level Architecture




*Solid lines indicate implemented interfaces, dashed lines indicate potential interfaces

# Machine Interface Implementations

1. Basic RESTful Interface
2. FHIR RESTful Interface
3. IHE HPD

# Basic RESTful Interface

- Designed for machine-to-machine communication
- Simple example, searching for  a provider by name and specialty

Request →

```
GET /api/v1/providers?q=smith+pediatrics
```

Response ←

```
{
  "meta": {
    "totalResults": 850,
    "resultsPerPage": 10
  },
  "providers": [
    {
      "npi": 1366603326,
      "last_name_legal_name": "HERZOG",
      "first_name": "KATHERINE",
      "middle_name": "SMITH",
...
```

# RESTful Interface Complex Queries

- More complex example, parameterized searching for a provider by name, specialty, and organization

```
GET /api/v1/providers?name=smith&organization=hopkins&taxonomy=Pediatrics
```


```
{
  "meta": {
    "totalResults": 3,
    "resultsPerPage": 10
  },
  "providers": [
    {
      "npi": 1871525105,
      "last_name_legal_name": "SMITH-RESAR",
      "first_name": "LINDA",
...
```

# User Interfaces

- A single RESTful backend can support multiple user interfaces
  - Each user interface can be designed to target a different group of users with their own usage scenarios
  - A machine interface can also be integrated into existing tools and workflows in addition to supporting new tools
  - All interfaces can share the querying power of the backend interface
- The following slides show examples of one user interface built to communicate with and demonstrate the RESTful API

# Basic Query

27,471 results

QUERY

Smith

Update Search

Medirectory finds health providers. Start searching now.

| NPI | NAME | PRACTICE LOCATION | SPECIALTIES |
|---|---|---|---|
| 1023083326 | Larry Dean Smith | FORT MADISON, IA, US | Optometrist |
| 1194883777 | Robert Holland Smith | ROSWELL, GA, US | Dentist |
| 1578538245 | Carolyn Ruth Smith | FORT MADISON, IA, US | Optometrist |
| 1598823213 | Christopher Holland Smith | ROSWELL, GA, US | Dentist |
| 1043378664 | Frederick Jarden Meadows | ROSWELL, GA, US | Dentist |
| 1295714145 | Kristin Kay Maus | FORT MADISON, IA, US | Optometrist |
| 1396991204 | Kenisha Emica Hoyle-Smith | HEMPHILL, TX, US | Licensed Vocational Nurse |
| 1790880094 | Troy .L Smith | ALVA, OK, US | Optometrist<br>Eyewear Supplier (Equipment, not the service) |
| 1932495991 | Daniel Ross Sliwinski | FORT MADISON, IA, US | Optometrist |
| 1003215351 | Tracy Lynn Turman | FORT SMITH, AR, US | Physical Therapist |

Next ›

# Detailed Information

return to results



## ♂ David Lee Smith

1083637961

### GROUP AFFILIATIONS

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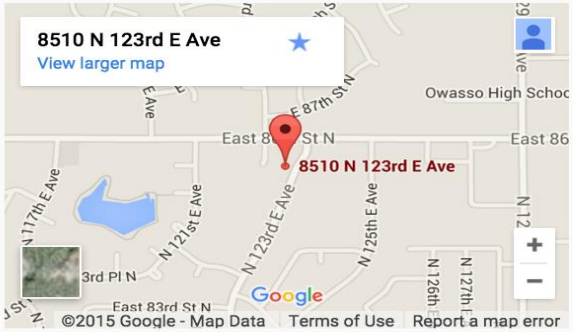
### PRACTICE LOCATION INFORMATION

(918) 272-1138
(918) 274-2931

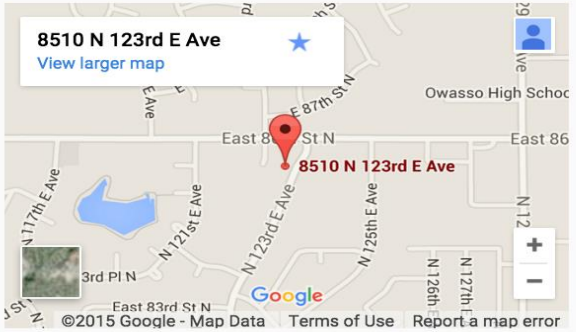
8510 North 123rd East Avenue
OWASSO, OK, 74055, US




### MAILING INFORMATION

(918) 272-1138
(918) 274-2931

8510 North 123rd East Avenue
OWASSO, OK, 74055, US




### LICENSES

| SPECIALTY | LICENSE NUMBER | STATE |
|---|---|---|
| Family Medicine | 2231 | OK |


# Complex Parameterized Query

3 results

NAME
smith

CITY
City

ZIPCODE AND RADIUS (MILES)
Zip Code
Radius in Miles

SPECIALTIES
Pediatrics

NPI
National Provider Identifier

AFFILIATED ORGANIZATION
hopkins

Update Search

Medirectory finds health providers. Start searching now.

| NPI | NAME | PRACTICE LOCATION | SPECIALTIES |
|---|---|---|---|
| 1871525105 | Linda Smith-Resar | BALTIMORE, MD, US | Internal Medicine (Hematology & Oncology)<br>Pediatrics (Pediatric Hematology-Oncology) |
| 1043314214 | Hermon W Smith | BALTIMORE, MD, US | Pediatrics |
| 1669478335 | Rachelle Ann Smith | BALTIMORE, MD, US | Internal Medicine<br>Pediatrics |

All results shown.

# Searching For Organizations

17 results

**ORGANIZATION NAME**

hopkins

**CITY**

City

**ZIPCODE AND RADIUS (MILES)**

Zip Code | Radius in Miles

**SPECIALTIES**

Pediatrics

**NPI**

National Provider Identifier

**AFFILIATED PROVIDER**

Organization Affiliated Provider

**AUTHORIZED OFFICIAL**

Organization Authorized Official

Update Search

Medirectory finds health providers. Start searching now.

| NPI | NAME | PRACTICE LOCATION | SPECIALTIES |
|---|---|---|---|
| 1649267170 | Johns Hopkins University | BALTIMORE, MD, US | Pediatrics (Pediatric Gastroenterology) |
| 1285621714 | Johns Hopkins University | BALTIMORE, MD, US | Pediatrics (Pediatric Pulmonology) |
| 1902072283 | Hopkins County Physician Services | SULPHUR SPRINGS, TX, US | Obstetrics & Gynecology; Urology; Surgery; Pediatrics; Orthopaedic Surgery; Otolaryngology (Plastic Surgery within the Head & Neck); Family Medicine |
| 1568459097 | Johns Hopkins University | BALTIMORE, MD, US | Pediatrics (Pediatric Emergency Medicine) |
| 1659368181 | Johns Hopkins University | BALTIMORE, MD, US | Pediatrics (Pediatric Rheumatology) |
| 1023018413 | Johns Hopkins University | BALTIMORE, MD, US | Pediatrics (Pediatric Allergy/Immunology) |
| 1467639260 | Johns Hopkins Community Physicians, Inc. | BALTIMORE, MD, US | Internal Medicine; Pediatrics; Obstetrics & Gynecology; Family Medicine |

# Searching With Partial Information Using *

1 results

NAME

Kul*

CITY

Brooklyn

ZIPCODE AND RADIUS (MILES)

Zip Code | Radius in Miles

SPECIALTIES

Dentist

NPI

National Provider Identifier

AFFILIATED ORGANIZATION

Provider Organization

Update Search

Medirectory finds health providers. Start searching now.

| NPI | NAME | PRACTICE LOCATION | SPECIALTIES |
|---|---|---|---|
| 1285870238 | Susana George Kulangara | BROOKLYN, NY, US | Dentist |

All results shown.

# Searching With Uncertain Information Using OR

2 results

NAME

Kane

CITY

Chicago OR Miami

ZIPCODE AND RADIUS (MILES)

Zip Code | Radius in Miles

SPECIALTIES

Pediatrics

NPI

National Provider Identifier

AFFILIATED ORGANIZATION

Provider Organization

Update Search

Medirectory finds health providers. Start searching now.

| NPI | NAME | PRACTICE LOCATION | SPECIALTIES |
|---|---|---|---|
| 1205072238 | Murray Lee Kane | MIAMI, FL, US | Pediatrics |
| 1215959515 | Jason Marc Kane | CHICAGO, IL, US | Pediatrics (Pediatric Critical Care Medicine) |

All results shown.


# Geospatial Search

2 results

NAME

Smith

CITY

City

ZIPCODE AND RADIUS (MILES)

21202 | 0.5

SPECIALTIES

Pediatrics

NPI

National Provider Identifier

AFFILIATED ORGANIZATION

Provider Organization

Update Search

Medirectory finds health providers. Start searching now.

| NPI | NAME | PRACTICE LOCATION | SPECIALTIES |
|---|---|---|---|
| 1043314214 | Hermon W Smith | BALTIMORE, MD, US | Pediatrics |
| 1669478335 | Rachelle Ann Smith | BALTIMORE, MD, US | Internal Medicine<br>Pediatrics |

All results shown.

# Machine Interface Implementations

1. Basic RESTful Interface
2. FHIR RESTful Interface
3. IHE HPD Interface

# FHIR RESTful Interface

- HL7 next generation standards framework
- Simple example, searching for  a provider by name

Request →

```
GET /fhir/practitioners.json?name=smith
```

Response ←

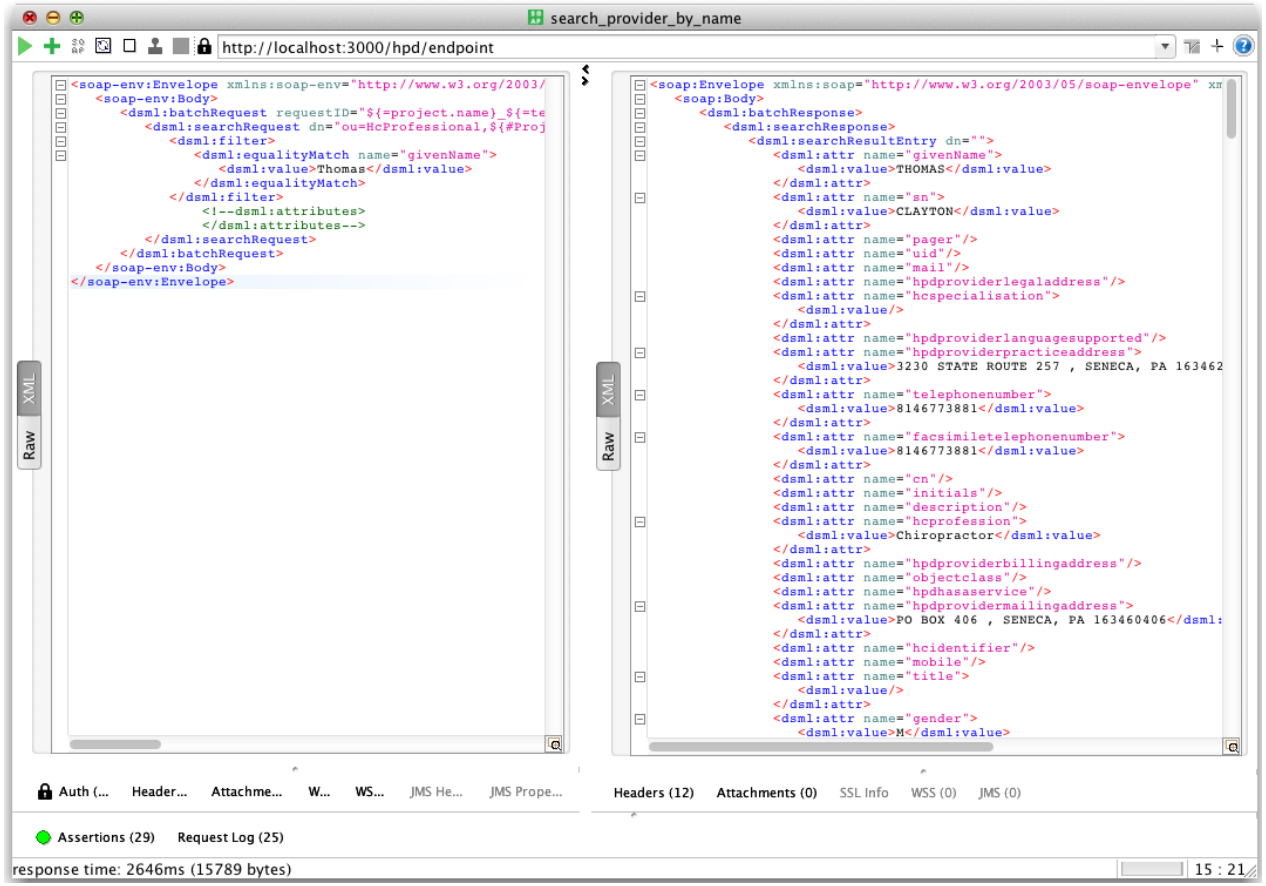
```
{
  "total": 21782,
  "entry": [
    {
      "resource": {
        "resourceType": "Practitioner",
        "name": {
          "resourceType": "HumanName",
          "use": "official",
          "text": "ZADIE SMITH",
          "family": [
            "SMITH"
          ],
...
```

# Machine Interface Implementations

1. Basic RESTful Interface
2. FHIR RESTful Interface
3. IHE HPD Interface

# IHE HPD Interface

- SOAP and DSML based standards framework supporting Healthcare Provider Directories



# Analysis of Machine Interface Approaches

| Interface | Standards Basis | History Of Adoption | Domain Requirement Support | Ease of Development |
|---|---|---|---|---|
| IHE HPD | Only current standard directed primarily at supporting healthcare directories | Many pilot efforts have explored implementation | Extensions to the base standard (ie HPD+) have been created to address specific needs such as supporting the S&I Provider Directory data model, which includes ESI. | Use of SOAP and DSML creates significant development overhead |
| FHIR | Upcoming HL7 standard that supports healthcare directory concepts | Wide interest but not yet broadly adopted | Not targeted towards health care directory specific requirements, but can be extended using FHIR profiles | RESTful approach streamlines implementation, but use of profiles would add overhead |
| Basic REST | Uses common internet standards, but not formalized to healthcare directory domain | Widely used with broad success across many domains, though not necessarily specifically to healthcare directories | Can easily be tailored to domain specific needs like complex queries, complex provider and organization relationships, geospatial search, and ESI | Lowest implementation overhead of all approaches |

# Findings and Lessons Learned

- This prototype successfully demonstrated key technical considerations of a Healthcare Directory
  - Machine-to-machine interfaces provide the flexibility needed to support diverse usage scenarios and workflows
  - User interfaces with advanced functionality for complex queries and geospatial searching are straight forward to implement with a RESTful backend
- IHE HPD is significantly more difficult to implement than simpler RESTful approaches, including custom interfaces or FHIR based interfaces
  - Therefore, the ONC Interoperability Roadmap's Call to Action should favor RESTful approaches over IHE HPD implementations
- Using RESTful approaches covers the high-impact technical considerations from the FHA HcDir Workgroup

# Challenges

- Data stewardship and governance is the primary challenge for developing a Provider Directory
  - Identifying good sources of existing data is difficult
  - Ensuring data validity and keeping data updated is a challenge
- Distinct target environments may have distinct querying requirements

# Recommended Next Steps

- Conduct pilots of Healthcare Directories
  - Validate current understanding of requirements
  - Gain practical understanding of real world challenges, issues, costs, impacts, etc.
  - Get feedback from end users before large investments make it difficult to change directions
  - Learn best practices that can be applied to larger deployments
  - Ideally perform pilots at multiple sites with diverse usage scenarios to ensure lessons learned are broadly applicable

# Project Deliverables

- The project completed September 2015
- Deliverable goals are to
  - Communicate all results and lessons learned
  - Transparently support any possible follow-on FHA or agency Healthcare Directory pilot projects
- Project deliverables include
  - Open source project source code
  - Complete instructions for setup or deployment
  - API documentation supporting developer integration
  - See https://github.com/Medirectory/medirectory
  - This final presentation documenting approach, results, lessons learned and recommended next steps