Validated Healthcare Directory Implementation Guide

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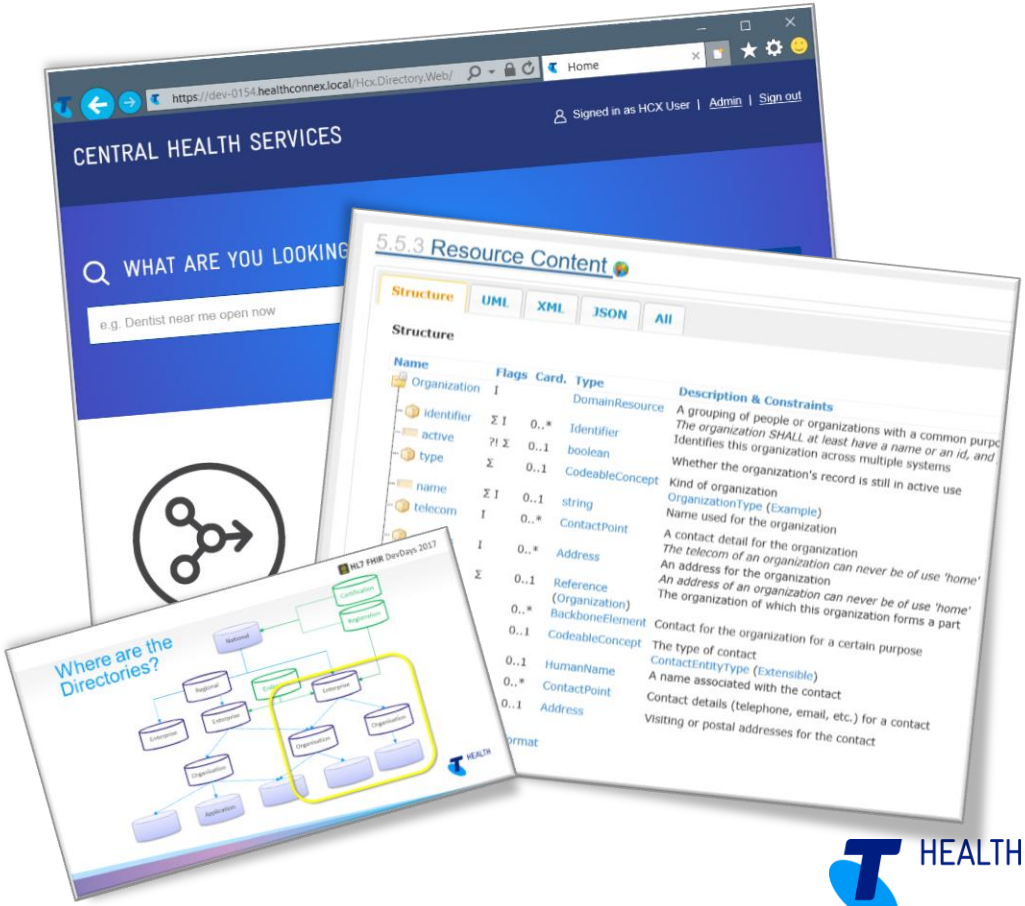
Itinerary

Telstra Health Directory Experience

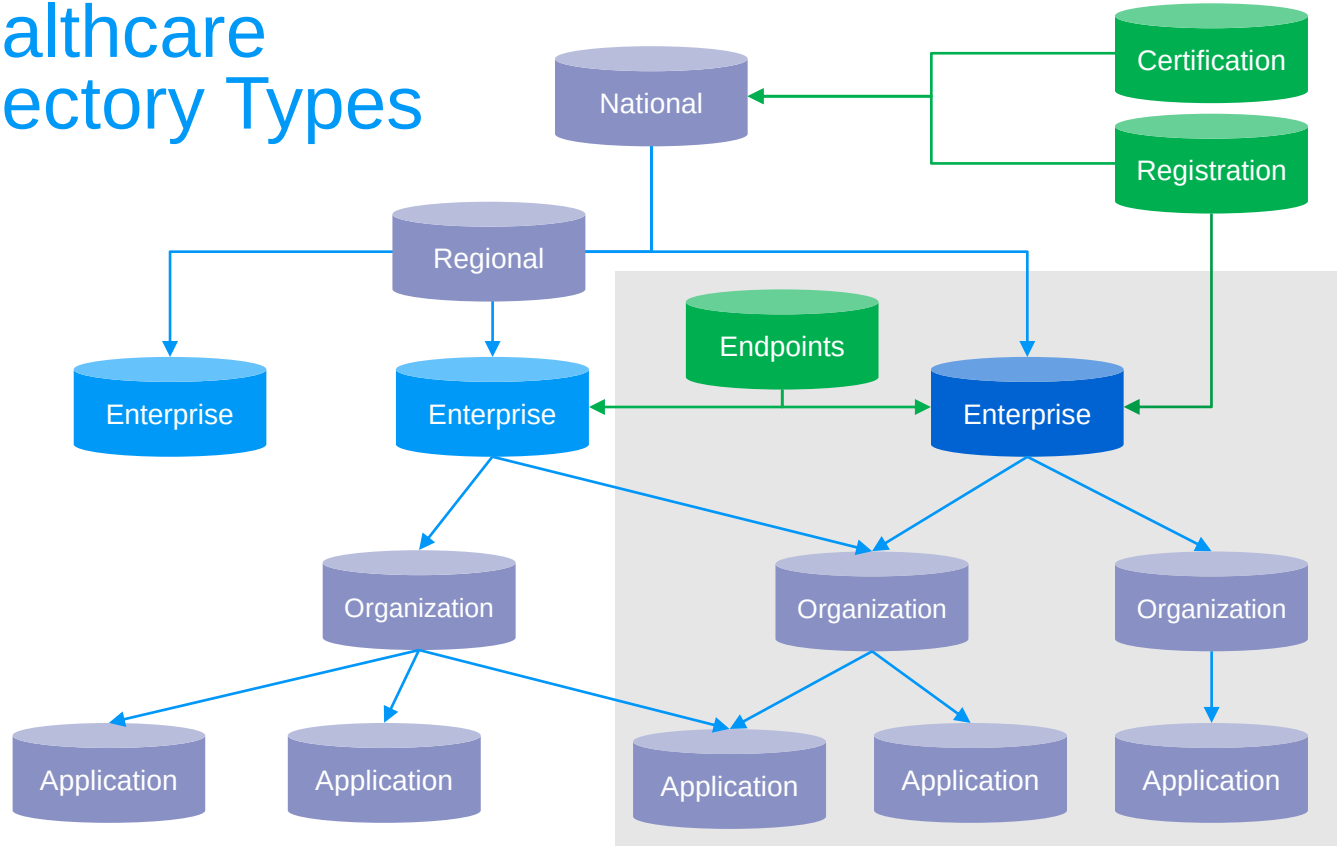
HL7 FHIR - Updates

Validated Healthcare Directory IG

Next steps for the VhDir IG



Healthcare Directory Types



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How good is your directory data?

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Data review of 9,684 providers in a sample data set

Duplicate data	No:	%
The number of duplicate provider records [Full Name]	550	5%
The number of duplicate [Provider Numbers]	962	9%
Missing data		
Number of providers missing a [First Name] and or a [Last Name]	0	0
Number of providers with missing or invalid [Provider Number]	315	3%
Number of providers without a complete [Practice Address]	833	8%
Number of providers without a [Work Phone Number]	230	2%
Number of providers without a [Fax]	1,419	14%
Number of providers without a [Secure Messaging] endpoint ID	9,984	100%
Number of providers without a [Email]	8,814	91%
Out of date data		
Number of providers that are [Inactive] or [Retired]	625	6%

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Data review of 9,684 providers against a central directory

Missing data	No:	%
Number of providers with a [Provider Number] that can be updated	1	0%
Number of providers not listed in the Central directory	3,380	34%
Number of providers with a [Practice Address] that can be updated	427	4%
Number of providers with a closed [Practice Address] in the Central Directory	87	0%
Number of providers with a [Work Phone #] that can be updated	30	0%
Number of providers with a [Fax] that can be updated	75	0%
Number of providers with a [Email] can be updated	169	1%
Number of providers with [Secure Messaging] that can be updated	3,495	36%
Additional data		
Additional providers that are in the Central Directory in the sample Region	1,440	14%
Additional providers that are in the Central Directory	70,099	




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NPPES Data

~6M Providers (5,984,668)

- ~1.5M Sole Proprietors (1,480,872)
- Has duplicate rows in it
- Stale data
- CSV does have issues in its generation
- Inconsistent formatting

~203k Non Primary Practice Locations

- 8k cities

~6k Endpoint records

- Websites, email address

Quality Issues

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Australian FHIR Directories

National Human Services Directory

- Implemented STU3
- Pending Release
- Reviewing VhDir for next release
- Renewed their validation sources

- *Implementing Bulk Data access (still in progress)*

Secure Messaging Program

- Implemented STU3
- Federated FHIR Directories
- Migrating to R4
- Live across 3 messaging vendors
- 2 General practice systems
- Local Australian Messaging Directory IG

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Telstra Health – Enterprise Provider Directory

Real-time Parent Data Source(s)

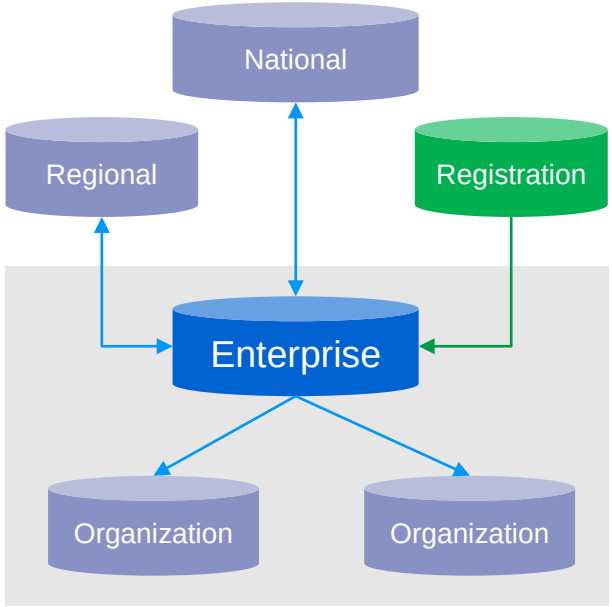
- Australian NHSD – (incl. National Identifiers)

Additional Local Content

- Customizable Data/UI
- Content Moderation
- Exception Management
- Organization Enterprise Specific data/Identifiers
- Payroll support data
- Secure Messaging Identifiers/Details

Realtime Outbound Data Feeds

- HL7 V2 (MFN)
- FHIR® REST
- Event Queue



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Enterprise Provider Directory – Real Benefits

Administration Benefits

- **Reduction in manual data entry**
  - Content synchronised from parent directory
  - Single point of entry/moderation
  - Data shared to connected systems
- Reduces the time to onboard internal providers
- Appropriate subset of data sent to connected systems

Point of Care Benefits

- Saves ~20 minutes during patient admission
- Removes the need to manually verify provider information (~124 calls per day)
- **Improved communication** with healthcare providers, so patients receive timely follow up care post discharge
- Able to locate practitioners/facilities to service a patients needs
- Timely processing of Lab results due to **accurate addressing** of electronic messaging

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HL7 FHIR - Updates

Since we last met

Where did we start, what did we change?

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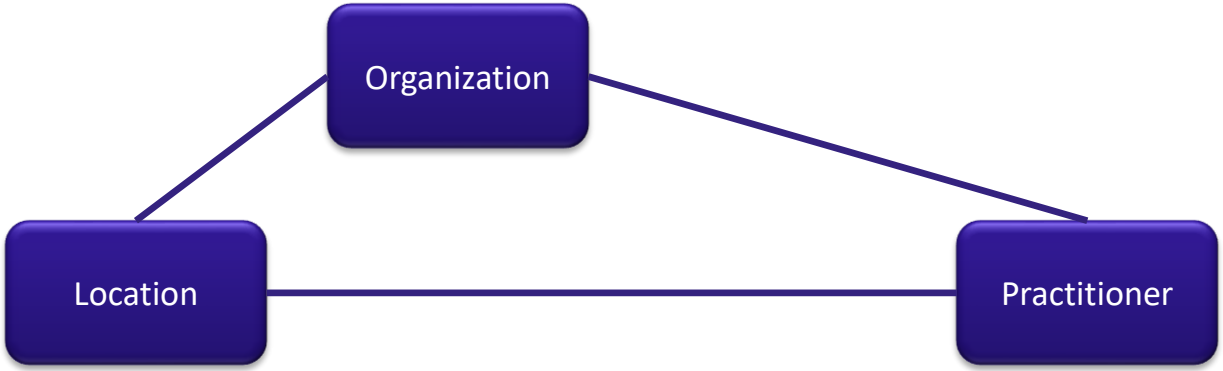
DSTU1



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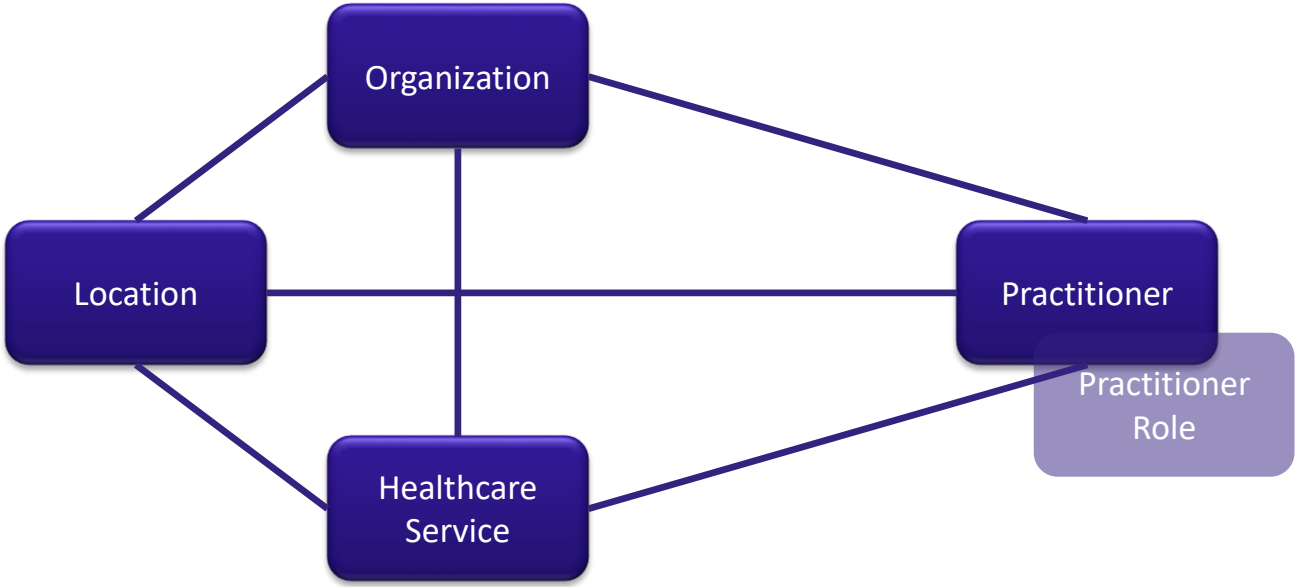
DSTU2



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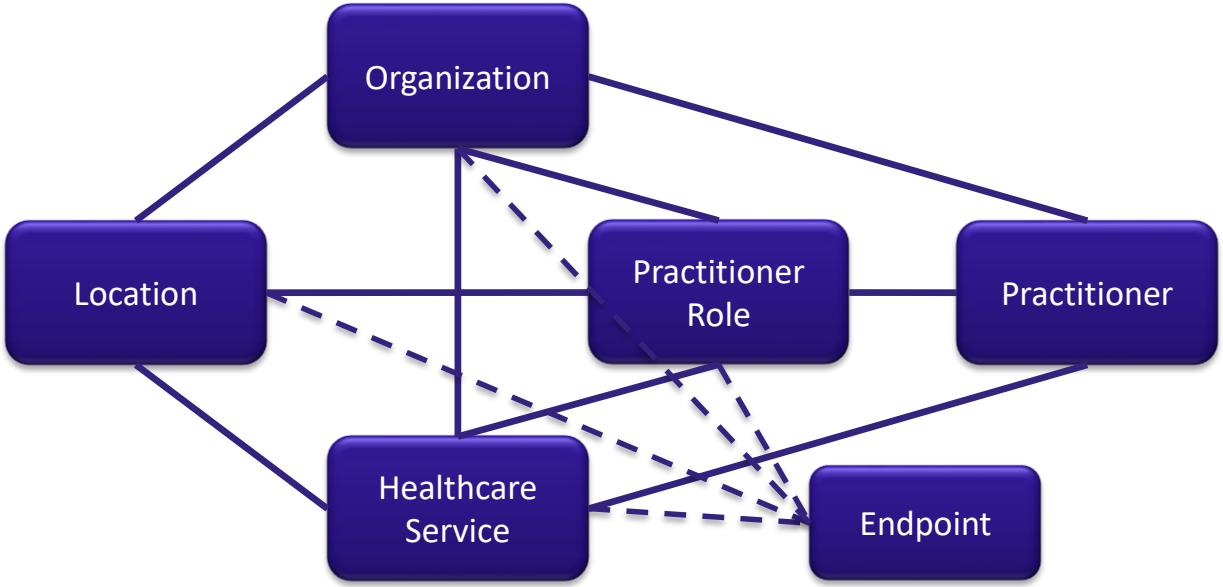
STU3


Organization
Location
Practitioner Role
Practitioner
Healthcare Service
Endpoint

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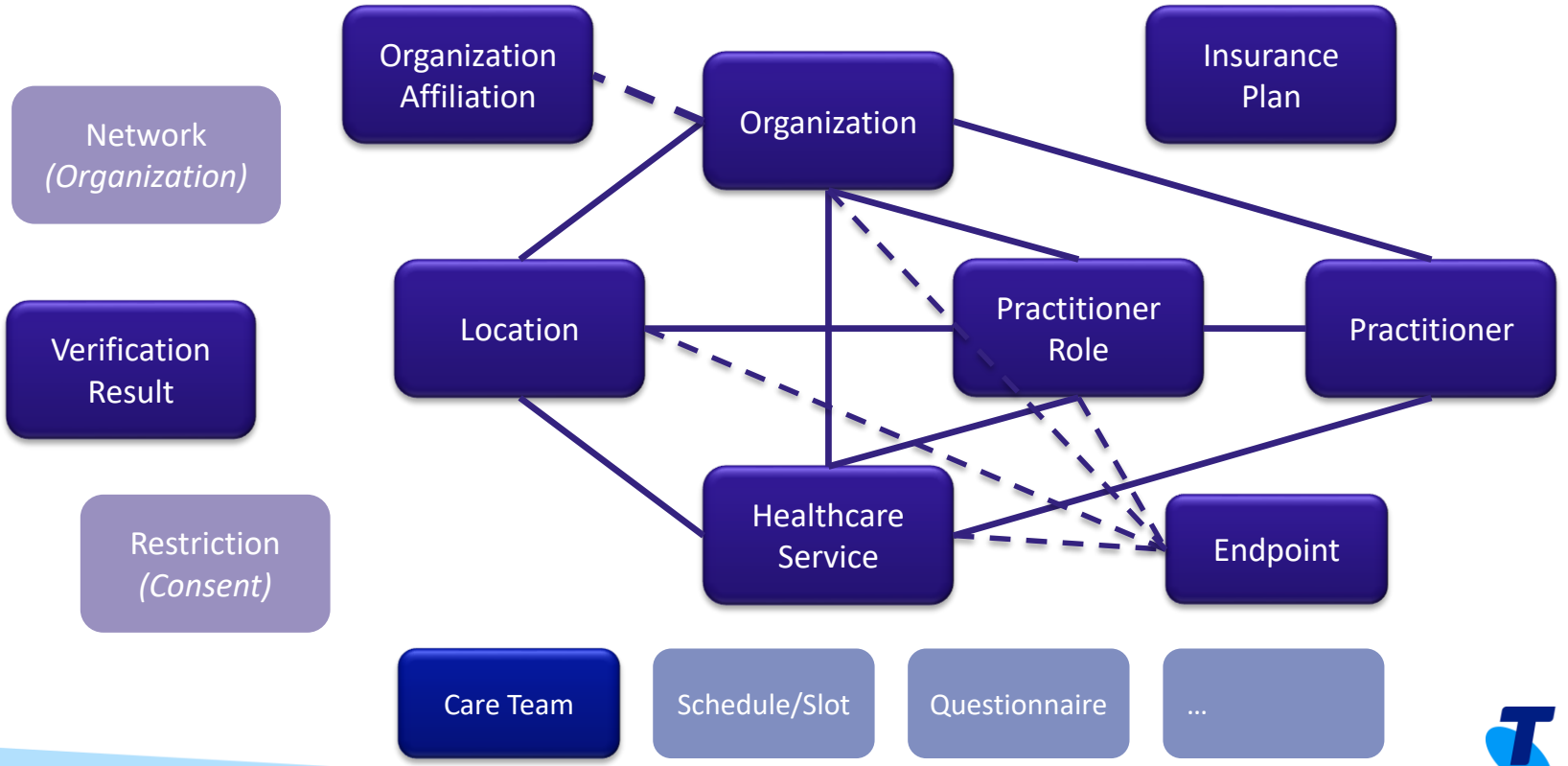
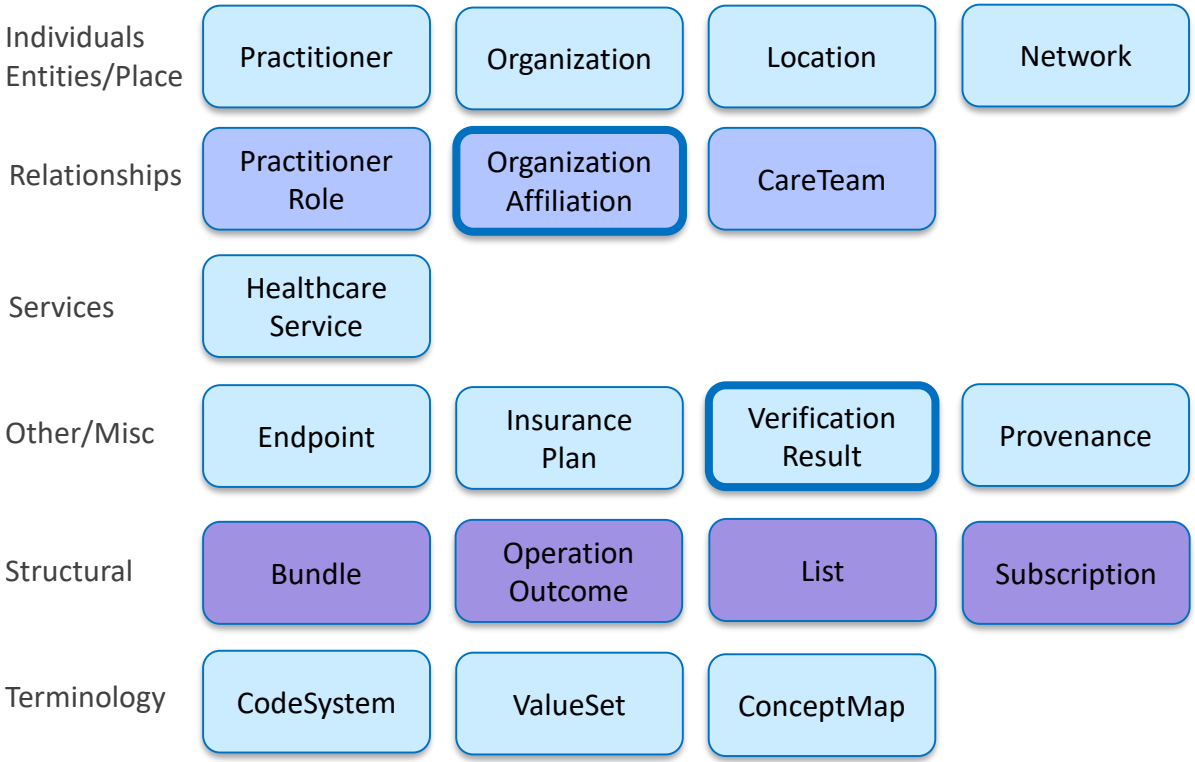
R4


Organization Affiliation
Organization
Insurance Plan
Network (Organization)
Location
Practitioner Role
Practitioner
Verification Result
Healthcare Service
Endpoint
Restriction (Consent)
Care Team
Schedule/Slot
Questionnaire
...

Directory Resources



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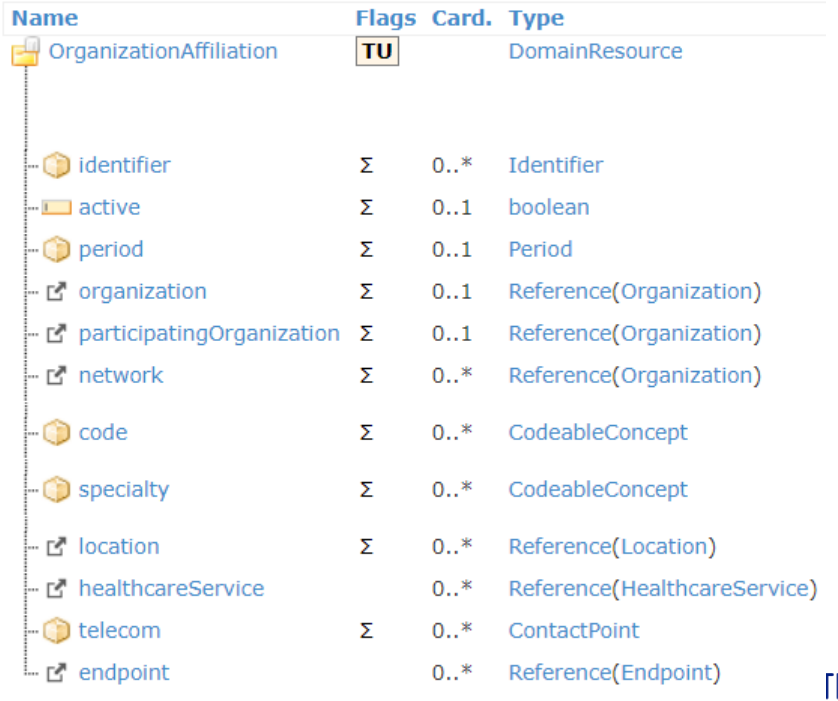
Organization Affiliation

Relationship between 2 organizations – where isn't part of an org hierarchy

Maybe also be associated with a Network, and constrain specific other references to the relationship

Code defines the nature of the relationship

- services provided by participating Org to the Organization
- Hospitals association member
- Distinct organizations forming a partnership (e.g. Cancer centre)



Name	Flags	Card.	Type
OrganizationAffiliation	TU		DomainResource
identifier	Σ	0..*	Identifier
active	Σ	0..1	boolean
period	Σ	0..1	Period
organization	Σ	0..1	Reference(Organization)
participatingOrganization	Σ	0..1	Reference(Organization)
network	Σ	0..*	Reference(Organization)
code	Σ	0..*	CodeableConcept
specialty	Σ	0..*	CodeableConcept
location	Σ	0..*	Reference(Location)
healthcareService		0..*	Reference(HealthcareService)
telecom	Σ	0..*	ContactPoint
endpoint		0..*	Reference(Endpoint)

Validation (Verification Result)

Consider this as extended provenance data

Where did this data come from?

- Might only apply to a section of the resource
- How did we get it
- When was it last refreshed

Attestation

- Who asserts that this is the current data?

Verification

- How was the content verified as valid
- When was it checked, when will it next be checked?

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New Operations – Geo-spatial

Near point(s)

- Search for location based on proximity to a geo-code co-ordinate
  - Optionally within a specified distance
- Old definition had limitations
  - Only works with single geocode point
  - Unable to work with chaining, or reverse chaining
- New syntax fixes these issues

Contains point(s)

- Location extended with boundary shape definition (geo-json)
- Search for location that has a boundary that contains a specific point
  - Works with chaining, reverse chaining and multiple points

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Validated Healthcare Directory

Implementation Guide – Overview and current status

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HL7 Validated Healthcare Services Directory

The Office of the National Coordinator for Health Information Technology

Targets centralized and distributed directories

ONC assisted with development

Profiles core FHIR Specification

- Lead to new resources

Initial draft of Implementation Guide

- STU1 publication imminent
- Universal Implementation Guide

Next version of the IG will provide the concrete US bound profiles and terminologies

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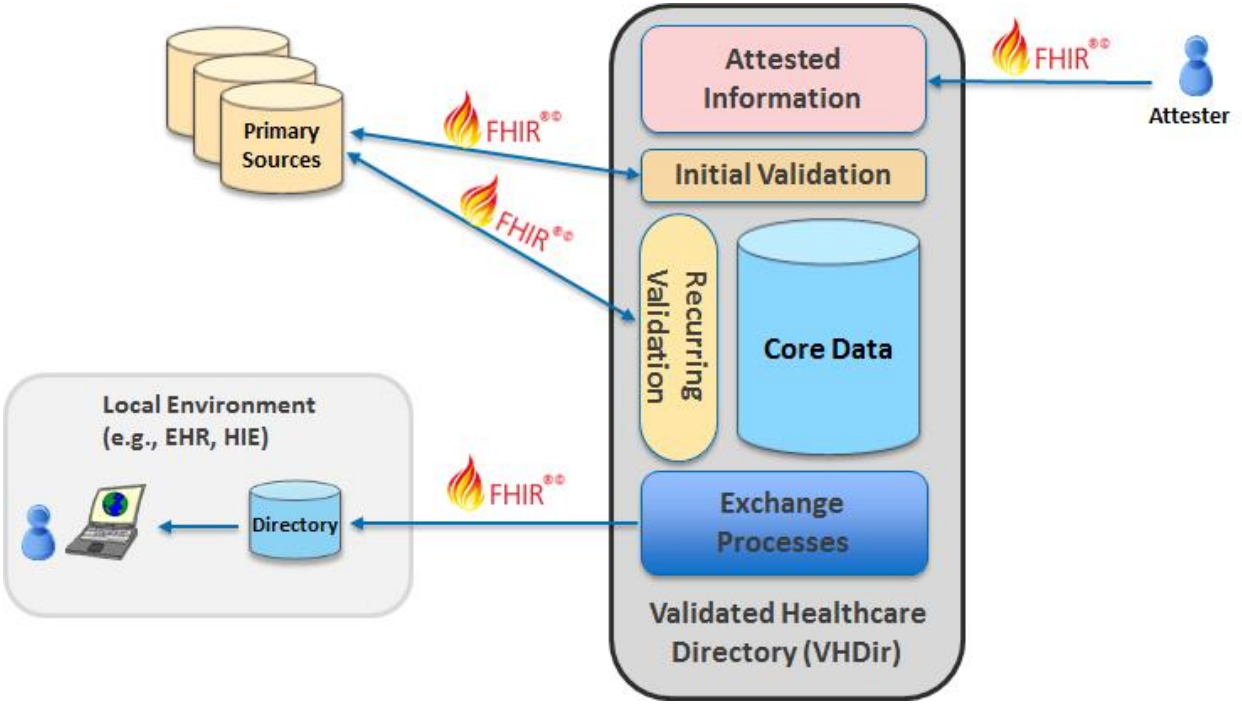
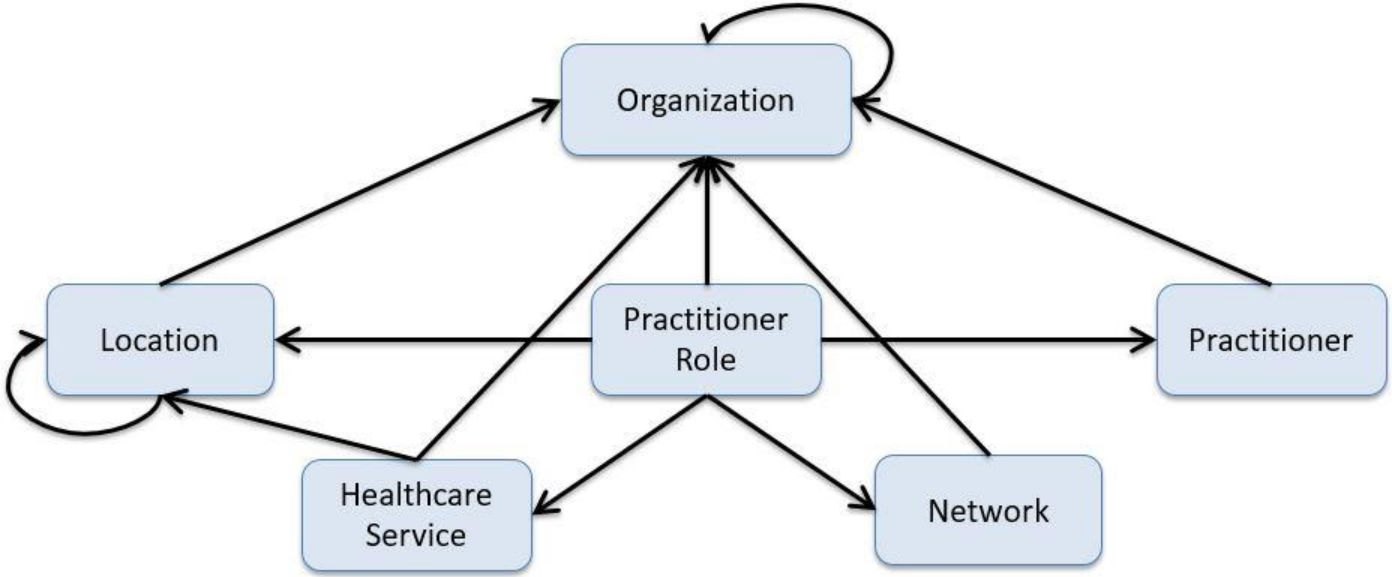
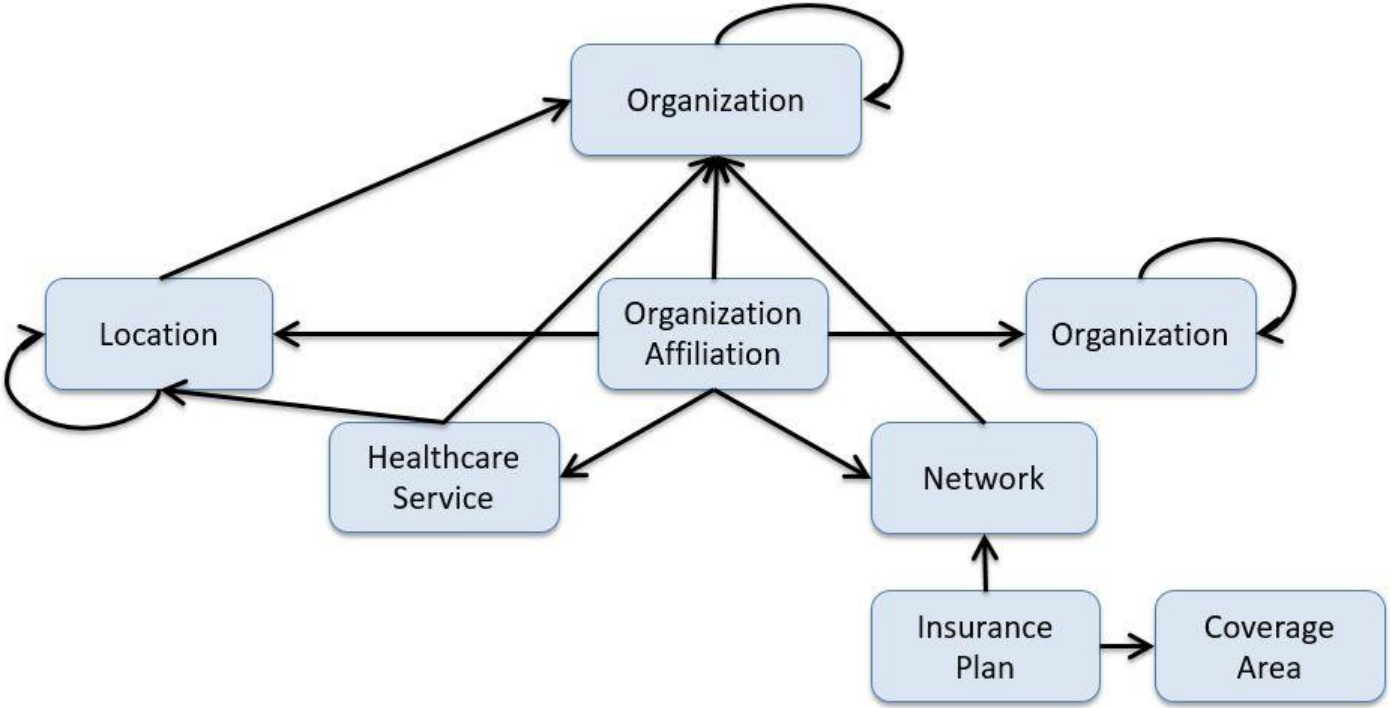
Conceptual Diagram



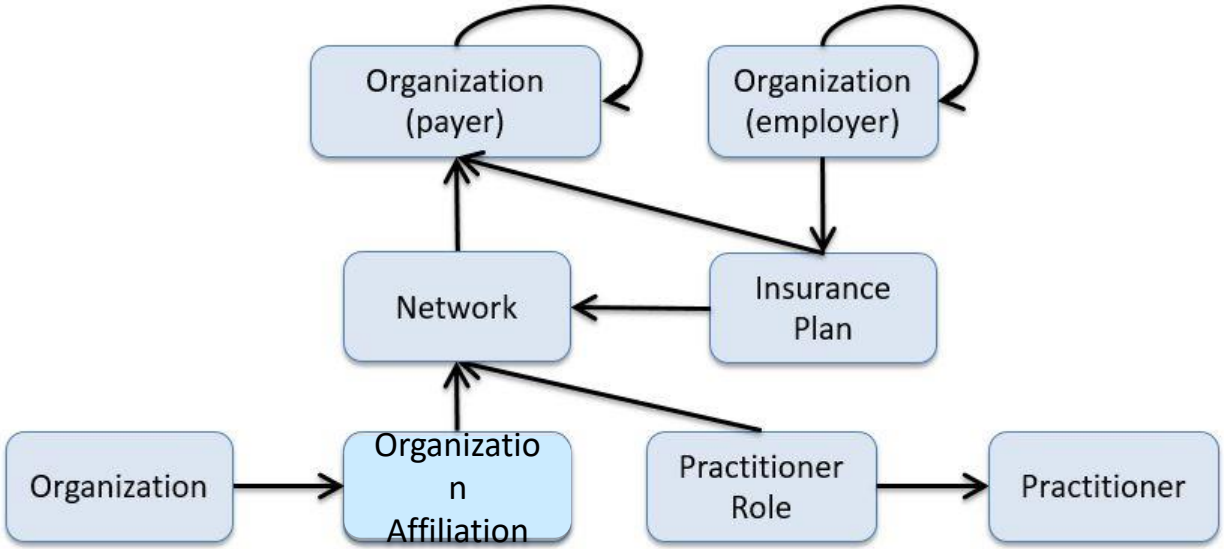
Practitioner Role



Organization Affiliation



Network/Insurance Plan



Attestation

- Attestation process supports multiple workflows
- Scope of data varies by attester
- Minimum necessary data varies by attester

Attester	Workflow	Scope	Minimum Data
Practitioner (licensed)	• Self attestation Authorized representative	Practitioner, PractitionerRole, Endpoint, CareTeam	Demographics, credentials, NPI
Organization (provider)	• Authorized representative	Organization, PractitionerRole, OrganizationRole, HealthcareService, CareTeam, Location, Endpoint	Demographics, accreditations, locations

Validation

- **Validation process:**
  - **»frequency of validation/revalidation, validation status, validation date, next scheduled date, type**
- **Primary source:**
  - **»Identity, how to communicate with the primary source, status/date of validation, availability of updates**
- **Attester:**
  - **»Identity of source/on behalf of (including certificates), attestation method, date, signature**
- **Validator:**
  - **»Identity (including certificate), signature**

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Usage Restriction (profile on Consent - contained)

An Extension usable on any property

A restriction Type

A reference to the “policy” of the restriction

Security Tag – The tagging to apply the set of user types that can access the detials

Reason – coded details of why the content is restricted

Unique to the Directory Bulk data as the policy information is shared as to the disclosure rules

Can’t apply on provision of data – as data provider can’t know all users, but implies the rules of disclosure of data

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Usage restriction – restrict an address

- Example Crisis Accomodation Women's shelter
  - Address is profiled to be subject to the restriction rules in the resource

```
<address>
  <extension
        url="http://hl7.org/fhir/uv/vhdir/StructureDefinition/usage-restriction">
    <valueReference>
      <reference value="#restrict"/>
    </valueReference>
  </extension>
  <line value="3300 Washtenaw Avenue, Suite 227"/>
  <city value="Ann Arbor"/>
  <state value="MI"/>
  <postalCode value="48104"/>
  <country value="USA"/>
 </address>
```

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Exchange

- **Scope of exchange, e.g.:**
  - **Find details about a specific provider/organization & their relationships**
  - **Find all providers/organizations in a geography (e.g. state, region)**
  - **Find all providers/organizations participating in a health insurance provider network**
  - **Find all providers taking a specific health plan**
  - **Find all providers/organizations offering a specific service**
  - **Find all providers that have a license validated in the last 6 months**
- **Exchange methods:**
  - **Real-time pull**
  - **Batch/bulk data (future)**
  - **Subscription (future)**

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Implementation Guide – Next Steps

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Validated Healthcare Directory IG Futures

- More connectathons and implementation experience
- More test data – synthetic directory
  - http://vhdir-demo.fhir.org
- Bulk Data
- Subscriptions
- US specific profiles/terminologies
- STU2 ballot

- Merge/link/unmerge?

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Questions?

https://www.youtube.com/watch?v=971-4LCrYVg

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Thank you

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Federated Directory

- Terminology
- Search parameters
- de-duplication
- Security
- Sorting
- Paging
- chaining

- GET calls afterwards
- Identifier/_id
- Rewriting references
- Github project as experiment
- Client or server side?

https://github.com/brianpos/FhirFederator/tree/master/FhirFederator/Models

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Geo-Spatial information – Location properties

Centre point:

- position (lat, long, alt)

Boundary:

- Extension - Attachment
- url = http://hl7.org/fhir/StructureDefinition/location-boundary-geojson
- contentType = application/geo+json
- Data value = base64 encoded geojson string
- url = a URL to a high-res version of the boundary
- Size = the byte size of the high-res (if you want to download it)

http://build.fhir.org/ig/HL7/VhDir/Location-wash-dc-metro.xml.html

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http://sqlonfhir-r4.azurewebsites.net/fhir/Location/vhdir-coverage-location-greater-boston-area

```
<Location >
    <id value="vhdir-coverage-location-greater-boston-area"/>
    <extension url="http://hl7.org/fhir/StructureDefinition/location-boundary-geojson" >
        <valueAttachment >
            <contentType value="application/vnd.geo+json"/>
            <data
value="eyJ0eXBlIjogIkZlYXR1cmVDb2xsZWN0aW9uIiwgImZlYXR1cmVzIjogW3sidHlwZSI6ICJGZWF0dXJlIiwgInByb3BlcnRpZXMiOiB7Ik5BTUUiOiAiR3JlYXRlciBCb3N0b24gQXJlYSJ9L
CAiZ2VvbWV0cnkiOiB7InR5cGUiOiAiTGluZVN0cmluZyIsICJjb29yZGluYXRlcyI6IFtbLTcwLjg4OTI4MjIyNjU2MjUsIDQyLjg2MTg3MzA4MDc0ODM0XSwgWy03MS40NzQzMDQxOTky
MTg3NSwgNDIuNTQ0OTg2NjczMTMyMzZdLCBbLTcxLjYwODg4NjcxODg4NjcxOD
M10sIFstNzEuNDA4Mzg2MjMwNDY4NzUsIDQyLjA1NzQ1MDIyMDI0Njg
wNzgxMjUsIDQxLjkzNDk3NjUwMDU0NjYwNF0sIFstNzAuOTU1MjAwMT
zk2OTddLCBbLTcwLjYzNjU5NjY3OTY4NzUsIDQyLjA4Mzk1NTEyNDEzNzA
zNzUsIDQyLjY2ODMwMDI3MTg5MDg1XSwgWy03MC44OTg
                <title value="GeoJSON for Greater Boston Area"/>
                <creation value="2019-01-09T22:31:59.827127Z"/>
            </valueAttachment>
    </extension>
    <name value="Greater Boston Area"/>
    <description value="Coverage Area for Greater Boston Area"/>
    <physicalType >
        <coding >
            <system value="http://terminology.hl7.org/CodeSyst
              <code value="jdn"/>
              <display value="Jurisdiction"/>
        </coding>
    </physicalType>
</Location>
```


{"type": "FeatureCollection", "features": [{"type": "Feature", "properties": {"NAME": "Greater Boston Area"}, "geometry": {"type": "LineString", "coordinates": [[-70.8892822265625, 42.86187308074834], [-71.47430419921875, 42.54498667313236], [-71.60888671875, 42.40317854182803], [-71.553955078125, 42.21021084387633], [-71.40838623046875, 42.05745022024682], [-71.15020751953125, 41.99011884096809], [-70.9991455078125, 41.934976500546604], [-70.9552001953125, 41.90840946591109], [-70.740966796875, 41.95131994679697], [-70.6365966796875, 42.08395512413707], [-70.7464599609375, 42.22648356137063], [-70.60638427734375, 42.66830027189085], [-70.8782958984375, 42.85985981506279]]}}]}

Geo-graphic location near search

GET [base]/Location?**near**=-83.694810|42.256500|11.20|km...

```
<entry>
   <resource>
      <Location> <!-- location details --> </Location>
   </resource>

   <search>
      <extension url="http://hl7.org/fhir/StructureDefinition/location-distance">
         <valueDistance >
               <!-- The distance that this location resource is from the provided point in the query -->
               <value value="10.5"/> </unit value="km"/>
         </valueDistance>
      </extension>
   </search>
</entry>
```

This is a special search that takes a string parameter (pipe separated):

latitude|longitude|distance|distance unit

If the distance/unit are not provided, the server may choose to enforce it's own restrictions, just as it does with paging.

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Geo-graphic location contains search

GET [base]/Location?**contains**=-83.694810|42.256500...

```
<Location>
    <extension url="http://hl7.org/fhir/StructureDefinition/location-boundary-geojson">
        <valueAttachment>
            <data value="eyJ0eXBlIjogIkZlYXR1cmVDb2xsZWN0…"/>
        </valueAttachment>
    </extension
</Location>
```

This is a special search parameter which can leverage a systems geo-spatial features to test that the geocoded point provided (expressed as [latitude]|[longitude] using the WGS84 datum) is contained by the boundary stored in the standard extension boundary-geojson

Support for multiple points can also be provided using the "," syntax which is interpreted as the location returned in the search contains at least 1 of the provided co-ordinates

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Synchronizing Directories

Selecting content

- Choose the scope from another data source

Retrieving content

- Search, GET, Bulk Data, out-of band
- Handle duplicate detection (or not)
- Updating/Merging with local content (if needed)

Detecting changes

- Update changed data
- Remove deleted data, data that moves out of scope
- Add new data that comes into scope

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Synchronizing Directories – Detecting changes (a)

Polling with Search criteria used for download

```
?(criteria)&_lastUpdate=2019-06-01T12:32:46+10:00
```

- This will miss content that was in the criteria, however updates move record out of criteria
- Deletions missed
- Requires polling

Polling with List membership

```
?_list=List/45&_lastUpdate=2019-06-01T12:32:46+10:00
```

- Only deletions are missed
- Requires management of a List resource by client on the server
- Client can remove entries from the List if they are no longer interested in them
- Requires polling

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Synchronizing Directories – Detecting changes (b)

Polling with no search criteria

```
?_lastUpdate=2019-06-01T12:32:46+10:00
```

- This will not miss changes, but deletions are missed
- If you retrieve most content from the database, this is ok
- Requires polling

Polling the history endpoint

```
_history?_since=2019-06-01T12:32:46+10:00&list=List/42
```

- This will not miss changes or deletions
- will get all changes to each resource, even if you are only interested in latest
- If you retrieve most content from the database, this is ok
- List filter can be utilised in history too! (optional)
- Requires polling

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Synchronizing Directories – Detecting changes (c)

Subscriptions (push)

- These reduce the overhead of constant polling
- Require client to have a location to push to
- Has same issues as search (as that's the essential basis of subscription)
- Misses deletions and items moving out of search criteria from initial load
- Can leverage the List style approach too
- Does not require polling ☺

So all options have some form of trade-off ☹

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Bulk Data and Directories

Great for sharing between systems

- Initial import
- Periodic updates
- Non transactional data

Basic parts of bulk data

- Scope of the data
- Format of the data extract*
- Async request and status tracking*
- Retrieving the completed extract
- Cleaning up afterwards *

http://build.fhir.org/ig/HL7/bulk-data-export

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Bulk Data Export

The Bulk Data IG defines the $export operation to kick off the processing

```
GET [base]/$export?_type=Organization,Location,Practitioner,
        PractitionerRole,HealthcareService,VerificationResult, ...
```

Returns a location to poll for checking when extraction is complete

Might take some time!

There is an optional set of search criteria you can apply to this operation, though this is still experimental.

As the processing can take significant time, the result has a transactionTime property which indicates the point up to which this was prepared, and any changes since this time are not captured

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Bulk Data Export - continued

Note: A healthcare directory may curate such an extract on a weekly or nightly process and just return this without needing to access the live system. This lowers the cost of preparation, but at the cost of the complete set being only up to a defined time, and then needing to request updates since that time.

Retrieving updates

Is the same as making the initial request, with the _since parameter

```
GET [base]/$export?_type=Organization,Location&_since=[transactionTime]
```

Same issues with sync using searching

Can use List parameter

Proposal to include deletions in this extract format

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Bulk Data Export - continued

Download the files

(normal http)

The DELETE the task (cleanup)

```
{
  "transactionTime": "[instant]",
  "request" :
"[base]/$export?_type=Organization,Location,Practitioner,PractitionerRole,HealthcareService",
  "requiresAccessToken" : true,
  "output" : [{
    "type" : "Practitioner",
    "url" : "http://serverpath2/practitioner_file_1.ndjson",
    "count" : 10000
  },{
    "type" : "Practitioner",
    "url" : "http://serverpath2/practitioner_file_2.ndjson",
    "count" : 3017
  },{
    "type" : "Location",
    "url" : "http://serverpath2/location_file_1.ndjson",
    "count" : 4182
  }],
  "deletions" : [{  // Note that this deletions property is a proposal, not part of the bulk data spec.
    "type" : "PractitionerRole",
    "url" : "http://serverpath2/practitionerrole_deletions_1.???",
    "count" : 23 // this is the number of bundles in the file, not the number of resources deleted
  }],
  "error" : [{
    "type" : "OperationOutcome",
    "url" : "http://serverpath2/err_file_1.ndjson",
    "count" : 439
  }]
}
```

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