



The Sequoia Project® Healthcare Directory Implementation Guide

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Version 1.0

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1. INTRODUCTION

The Sequoia Project® Healthcare Directory is designed to accommodate the needs of Sequoia Project initiatives including the eHealth Exchange and Carequality. For the eHealth Exchange, the directory is the successor to the original UDDI-based directory. For Carequality, the directory is the authoritative representation of the Carequality community of Implementers and their Connections. The primary use case for the directory is the acquisition of organization-level information, including electronic end points. The Sequoia Project is a heavily engaged member of the three main organizations creating the technical standards used by the directory, including the Argonaut Project, HL7, and IHE International. Many of the characteristics of the current FHIR Provider Directory Standard for Trial Use v3 reflect Sequoia Project contributions to, and requirements of, the standard.

2. CLAIMED RIGHTS AND ACKNOWLEDGEMENTS

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3. AUDIENCE

This document is intended for software engineers, architects, configuration managers, and project managers involved with the creation, deployment, and run-time operational support of client software using The Sequoia Project Healthcare Directory. It is assumed that the reader has at least minimal exposure to the HL7 FHIR Standard for Trial Use and directory concepts in general. Deployment teams are expected to be proficient in the curation of directory data, and have access to expertise, within their organizations, in secure deployment architectures (X.509, TLS, security best practices, etc.).

4. DESIGN CONCEPTS

The Sequoia Project Healthcare Directory is an implementation of the Argonaut FHIR Provider Directory work (http://argonautwiki.hl7.org/index.php?title=Implementation_Guide#Provider_Directory) and the current HL7 FHIR Standard for Trial Use v3 (STU3) version 1.8.0 (<http://hl7.org/fhir/directory.html>) which, as of the time of this writing, is incorporating the Argonaut work (potentially with some changes). The Sequoia Project's overall approach is to leverage the base Argonaut and HL7 FHIR work, with respect to provider directory use cases and resources, with only minimal added constraints.

5. ANTICIPATED ROADMAP

The version 1.0 Healthcare Directory is anticipated to remain stable from its initial deployment until the FHIR trial standard become stable and fully balloted by the HL7 community. At that point, the Sequoia Project Healthcare Directory will be updated to version 2.0 to reflect the balloted version of the FHIR standard. Operationally, we anticipate providing sufficient overlap between version 1.0 and 2.0 of the Sequoia Healthcare Directory to allow for a graceful migration by vendors, Carequality Implementers, Carequality Connections, and eHealth Exchange Participants. Specifically Sequoia plans to operate the 1.0 provider directory for approximately 1 year after version 2.0 is put into production use. During that 1 year period of time, all users of the directory are expected to complete their migration to version 2.0. After 1 year of dual operation, the 1.0 directory will be decommissioned.

6. ENVIRONMENTS

Sequoia maintains three distinct Healthcare Directory environments:

- 1) Development (DEV)
- 2) Validation (VAL)
- 3) Production (PROD)

Each of these environments has distinct features and security considerations, as further outlined below, but each is secured using an API Key, and, with the exception of the DEV environment, 2-Way TLS with Mutual Authentication. For more information on TLS requirements, see Section 8 below. For more background on the API Key, including how to obtain one for each environment, see Section 9 below.

All three directories have implemented a “honey pot” for defensive security reasons. The honey pot results in long time out delays for any request that is not valid for the supported functionality and use cases. For example, most attackers without special knowledge send commands such as “GET /favicon.gif” or “POST /contact.html” to probe the server of interest. The Sequoia Project Healthcare Directory will only respond to requests such as these after a several minute delay which has the effect of slowing down attacking systems. This also can have the effect of reducing the efficiency of developmental and testing activities, and thus the honey pot can be disabled on a case-by-case basis. Note that the PROD honey pot cannot be disabled. To disable the honey pot, please send an email to techsupport@sequoiaproject.org to initiate the process of obtaining an API key for DEV or PROD.

The various directory environments are secured using TLS and using an API key. In DEV, TLS is not used to allow for convenient message capture. In DEV, the API key automatically disables the honey pot logic and enables diagnostic stack traces. In VAL and PROD, TLS successful connection establishment is mandatory requiring a VAL or PROD, respectively, Sequoia Project x.509 certificate using either the eHealth Exchange or the Carequality security domains.

6.1. The Development Directory (DEV)

The Development directory is designed to accommodate client software development activities and is configured specifically to accomplish this objective. Unlike the VAL or PROD environments, the DEV directory does not implement TLS security. The DEV API key is required in DEV and automatically disables the honey pot and enables the return of detailed diagnostic information to the client software including stack traces, and human readable messages that may assist the client software development team in tracking down problems more efficiently. To obtain the base URL for DEV, please request access by sending an email to techsupport@sequoiaproject.org.

6.2. The Validation Directory (VAL)

The Validation directory environment is designed to emulate PROD as closely as possible while still maintaining complete partitioning between VAL and PROD. TLS connections are required using FIPS-compatible cipher suites. The VAL environment also differs from PROD in that VAL

only has synthetic data. VAL requires the use of the VAL API key. To obtain the base URL for VAL, please request access by sending an email to techsupport@sequoiaproject.org.

6.3. The Production Directory (PROD)

The PROD environment is reserved for limited testing and for bona fide production operational use. Extensive testing, or excessive use resulting in performance degradation will be noted and brought to the attention to the offending party for collaboration and remediation. To obtain the base URL for PROD please request access by sending an email to techsupport@sequoiaproject.org.

The PROD environment is curated by Sequoia Project staff who will rely heavily upon the users of the directory to provide high quality information. In the case of the Carequality Directory (see Section 15 below), Carequality Implementers are specifically responsible for submitting complete and accurate information about any Carequality Connections or organizational sub-entities that they wish to include in the Healthcare Directory.

7. THEORY OF OPERATION/PROCESSING MODEL

The directory supports an operational model by which the client software retrieves the contents of the directory in a single RESTful call. Clients may include an optional parameter indicating their preferred data format for the response (JSON vs XML). Additional capabilities may be added in the future if needed by organizations using the directory. A successful call results in a document returned containing a FHIR Bundle, which contains Entries for each Organization resource in the directory. The Organization resource will contain general information about the entity being described, such as its general office address(es), telephone numbers, etc. Inside the Organizationresource, and Contained resources, are Endpoint resources which specify the technical web services end points for an entity listed in the directory. The Endpoint resource structure has been extended by Sequoia to meet the needs of its use cases, including more detailed information than is present in the base FHIR Endpoint resource type. The extension semantics and syntactic structure are discussed in detail below.

For efficiency, the client software may use cache control mechanisms to specify a retrieval of the entries, i.e. Organization resources and their children, that have been modified since a specific date/time. HTTP etags are also implemented by the Sequoia Project directory allowing for easy change detection logic. The returned document also contains embedded date/time stamps indicating the most recent update to that element.

Once the client software receives the HTTP response from the Sequoia directory, it is expected to robustly process success or failure conditions. An example response is presented below in Section 13.

8. SECURITY / ACCESS CONTROL MODEL

Client software must be configured to use 2-Way-TLS with mutual authentication. This approach provides assurance to both sides of any transaction that the other party is authentic.

Client x.509 private keys must be managed using best practices, such as, without limit:

- OWASP
- FBCA
- NIST FIPS
- The Sequoia Project technical support knowledge base

9. API KEY

As previously mentioned, access to each directory environment requires the presentation of a valid API Key. The API key is a value that is unique to each client and for each environment. The key serves to perform several functions:

- 1) It allows the Sequoia Project Healthcare Directory server to immediately, and efficiently, discard invalid queries, such as those from an unauthorized client software package.
- 2) It allows for audit logging of requests.
- 3) It allows the server to provide more detailed diagnostics to client applications.
- 4) It allows The Sequoia Project to identify the organization associated with errant queries, excessive utilization, or other issues.

To obtain an API key please send an email to techsupport@sequoiaproject.org. Once your email has been received by the tech support system, you will automatically be assigned a ticket ID, and an automatic response will be sent to your organization to acknowledge receipt of your email. If

you do not receive an automatic response, then the support system likely did not receive your email.

One key will be needed for each environment. A key intended for VAL cannot successful be used in PROD, for example.

To present the key upon an API call to the Sequoia directory, the following syntax must be used:

```
GET http://<base-url>/Organization/?apikey=1234
```

or

```
GET https://<base-url>/Organization/?apikey=1234
```

Where the value “1234” is replaced by your API key value

10. SECURITY CONSIDERATIONS

The nature of RESTful calls, even those occurring inside an HTTPS (TLS) secure tunnel, exposes the entire URL to some intermediaries between client software and the Sequoia Project Healthcare Directory server. Specifically, various logging software, such as within low-level TLS libraries, or client stacks, may log the URL in its entirety, in plain text format. Full URLs should not be shared with others (such as would occur when an end-user copy/pastes the URL for diagnostic purposes with a peer) because they contain client API Keys. If you are testing the Sequoia Healthcare Directory using a web browser, then the browser may store the URL, including the API Key, in the browser history. If the client software library is written in JavaScript, then attacks such as the Proxy Auto Conf (PAC) vulnerability may also expose the URL and the API key. Other scripting languages used for retrieval or debugging may also contain this value hard-coded. In the event you reasonably suspect that your API key has been obtained by an unauthorized party, then please email Sequoia technical support to request a new key and to ask that the prior key be retired. Note that the actual risk from a compromised API Key is mitigated by the requirement, outside of the DEV environment, to establish a TLS connection using a Sequoia Project-issued x.509 certificate.

As discussed elsewhere, since access to the VAL and PROD directory servers require a Sequoia-issued x.509 end entity certificate, your organization should protect your environment and the private key associated with that environment using all applicable IT best practices for the use of

keys used to establish secure connections AND authenticate connectivity. Such practices are outside the scope of this document, but should include, without limitation, practices such as never backing up or moving a private key off of the environment for which it is intended to be used, never sharing the private key, restricting access to the private key to need-to-know only staff, and deploying it in a securely managed data center.

11. CRUD OPERATION

1) Create Operation

Functionality: Append one or bundle of organizations to orgs hash array.

-Request

Request Url: post <https://localhost:3030/fhir-stu3/1.0.0/Organization/create>

Params:

apikey: ApiKey to check permission of create operation.

_format: xml or json(only xml works at this moment)

Body:

One organization or bundle of organizations.

Internal Function:

createOrganization(orgs, new_org)

-Response

Success:

status: 200

body:

```
<OperationOutcome xmlns="http://hl7.org/fhir">
  <text>
    <status value="generated"/>
    <div xmlns="http://www.w3.org/1999/xhtml">
      <h1>Operation Outcome</h1>
      <table border="0">
        <tr>
          <td style="font-weight: bold;">success</td>
          <td></td>
          <td>
            <pre>New organization was added successfully.</pre>
          </td>
        </tr>
      </table>
    </div>
  </text>
</OperationOutcome>
```

```

        </div>
    </text>
    <issue>
        <severity value="information"/>
        <code value="processing"/>
        <diagnostics value="New organization was added successfully."/>
    </issue>
</OperationOutcome>

```

Error:

```

status: 403
body:
<OperationOutcome xmlns="http://hl7.org/fhir">
  <text>
    <status value="generated"/>
    <div xmlns="http://www.w3.org/1999/xhtml">
      <h1>Operation Outcome</h1>
      <table border="0">
        <tr>
          <td style="font-weight: bold;">error</td>
          <td>[]</td>
          <td>
            <pre>#Error issue here</pre>
          </td>
        </tr>
      </table>
    </div>
  </text>
  <issue>
    <severity value="error"/>
    <code value="processing"/>
    <diagnostics value=#Error issue here />
  </issue>
</OperationOutcome>

```

2) Retrieve Operation

Functionality: Retrieve organizations which are matched with search query

-Request

Request Url: get <https://localhost:3030/fhir-stu3/1.0.0/Organization>

Params:

apikey: ApiKey to check permission of retrieve operation

_format: xml or json(only xml works at this moment)

query: To filter organizations(only one of queries below)

_id=string: Return organization of which id equals to _id

_zip=string: Return organizations of which postal code equals to _zip

_active=true or false: Return organizations of which active equals to true or false

_identifier=string: Return organizations of which identifier equals to _identifier

_name=string: Return organizations of which displayname or at least one of aliases starts with _name

_name:contains=string: Return organizations of which displayname or at least one of aliases contains _name

_name:exact=string: Return organizations of which displayname or at least one of aliases is same as _name

For example:

_name=Texas (would match "texas organization" and "TEXAS")

_name:exact=Texas (would match "Texas" but not "Texas organization" and not "TEXAS")

_name:contains=Texas (would match "Texas" and "Texas organization" and "TEXAS" and "Company in Texas USA")

_lastUpdated=(compare)dateString

gt: Return organizations of which lastUpdated is greater than _lastUpdated

ge:Return organizations of which lastUpdated is not less than _lastUpdated

lt: Return organizations of which lastUpdated is less than _lastUpdated

le:Return organizations of which lastUpdated is not greater than _lastUpdated.

eq:Return organization of which lastUpdated is equal to _lastUpdated.

ne:Return organization of which lastUpdated is not equal to _lastUpdated.

For example:

_lastUpdated=gt2017-12-31(would match "2017-12-31T00:00:01" and "2018-02-03T21:32:09" but not match "2017-12-30T23:59:59")

`_lastUpdated=eq2017-12-30`(would match "2017-12-30T00:00:01" but not match "2017-12-31T00:00:01" or "2017-12-29T23:59:59")

Internal Function:

`searchOrganizations(orgs, query_hash)`

-Response

Bundle of searched Organizations by query.

3) Update Operation

Functionality: Update one organization of a certain id into new organization

-Request

Request Url: post <https://localhost:3030/fhir-stu3/1.0.0/Organization/update>

Params:

`apikey`: ApiKey to check permission of update operation

`_format`: xml or json(only xml works at this moment)

`_id`: ID of organization to update

Body:

One Organization

Internal Function to update:

`updateOrganization(orgs, new_org, org_id)`

-Response

Success:

`status`: 200

`body`:

```
<OperationOutcome xmlns="http://hl7.org/fhir">
```

```
  <text>
```

```
    <status value="generated"/>
```

```
    <div xmlns="http://www.w3.org/1999/xhtml">
```

```
      <h1>Operation Outcome</h1>
```

```
      <table border="0">
```

```
        <tr>
```

```
          <td style="font-weight: bold;">success</td>
```

```
          <td>[]</td>
```

```
        <td>
```

```
          <pre>Organization with id:#{params[:_id]} has been updated
```

```
successfully.</pre>
```

```
        </td>
```

```
      </tr>
```

```
    </div>
```

```
  </div>
```

```
</text>
```

```

<issue>
  <severity value="information"/>
  <code value="processing"/>
  <diagnostics value="Organization with id:#{params[:_id]} has been
updated successfully."/>
</issue>
</OperationOutcome>

```

Error:

```

status: 403
body:
<OperationOutcome xmlns="http://hl7.org/fhir">
  <text>
    <status value="generated"/>
    <div xmlns="http://www.w3.org/1999/xhtml">
      <h1>Operation Outcome</h1>
      <table border="0">
        <tr>
          <td style="font-weight: bold;">error</td>
          <td>]</td>
          <td>
            <pre>#Error issue here</pre>
          </td>
        </tr>
      </table>
    </div>
  </text>
  <issue>
    <severity value="error"/>
    <code value="processing"/>
    <diagnostics value=#Error issue here />
  </issue>
</OperationOutcome>

```

4) Delete Operation

Functionality: Remove one organization with certain ID from orgs array without gap
-Request

Request Url: post <https://localhost:3030/fhir-stu3/1.0.0/Organization/delete>

Params:

apikey: ApiKey to check permission of delete operation

_format: xml or json(only xml works at this moment)

_id: ID of Organization to delete

Internal Function to delete:

removeOrganization(orgs, org_id)

-Response

Success:

status: 200

body:

```
<OperationOutcome xmlns="http://hl7.org/fhir">
  <text>
    <status value="generated"/>
    <div xmlns="http://www.w3.org/1999/xhtml">
      <h1>Operation Outcome</h1>
      <table border="0">
        <tr>
          <td style="font-weight: bold;">success</td>
          <td>]</td>
          <td>
            <pre>Organization with id:#{params[:_id]} is deleted success
fully.</pre>
          </td>
        </tr>
      </table>
    </div>
  </text>
  <issue>
    <severity value="information"/>
    <code value="processing"/>
    <diagnostics value="Organization with id:#{params[:_id]} is deleted
successfully."/>
  </issue>
</OperationOutcome>
```

Error:

status: 403

body:

```
<OperationOutcome xmlns="http://hl7.org/fhir">
  <text>
    <status value="generated"/>
```

```

<div xmlns="http://www.w3.org/1999/xhtml">
  <h1>Operation Outcome</h1>
  <table border="0">
    <tr>
      <td style="font-weight: bold;">error</td>
      <td>]</td>
      <td>
        <pre>#Error issue here</pre>
      </td>
    </tr>
  </table>
</div>
</text>
<issue>
  <severity value="error"/>
  <code value="processing"/>
  <diagnostics value=#Error issue here />
</issue>
</OperationOutcome>

```

5) Validate Operation

- Request

Request Url: post <https://localhost:3030/fhir-stu3/1.0.0/Organization/validate>

Params:

apikey: ApiKey for filtering users.

_format: xml or json(only xml works at this moment)

Body:

One or bundle of Organizations.

Internal Function:

checkValidationOrganization(request, requestText)

-Response

Success:

status 200

body:

```

<OperationOutcome xmlns="http://hl7.org/fhir">
  <text>
    <status value="generated"/>
    <div xmlns="http://www.w3.org/1999/xhtml">
      <h1>Operation Outcome</h1>
      <table border="0">

```

```

        <tr>
          <td style="font-weight: bold;">information</td>
          <td>[]</td>
          <td>
            <pre>No issues detected during validation</pre>
          </td>
        </tr>
        <tr>
          <td style="font-weight: bold;">information</td>
          <td>[]</td>
          <td>
            <pre>No issues detected during validation</pre>
          </td>
        </tr>
      </table>
    </div>
  </text>
<issue>
  <severity value="information"/>
  <code value="informational"/>
  <diagnostics value="No issues detected during validation"/>
</issue>
<issue>
  <severity value="information"/>
  <code value="informational"/>
  <diagnostics value="No issues detected during validation"/>
</issue>
</OperationOutcome>

```

Error:

status 403

body:

```

<OperationOutcome xmlns="http://hl7.org/fhir">
  <text>
    <status value="generated"/>
    <div xmlns="http://www.w3.org/1999/xhtml">
      <h1>Operation Outcome</h1>
      <table border="0">
        <tr>

```

```

        <td style="font-weight: bold;">error</td>
        <td>[]</td>
        <td>
            <pre>#Error issue here</pre>
        </td>
    </tr>
</table>
</div>
</text>
<issue>
    <severity value="error"/>
    <code value="processing"/>
    <diagnostics value=#Error issue here />
</issue>
</OperationOutcome>

```

6) Three ruby methods for reading, writing and deleting the existing Ruby orgs[] array of a hash structure from a YAML file.(Current YAML file name: CRUD_Operations.yaml)

- Read method

Name: readFromYaml(orgs)

Functionality:

Initialize orgs hash array from a YAML file.

If CRUD_Operations.yaml file does not exist, then it doesn't initialize orgs hash array.

If other process is reading or writing from/to YAML file, then it will wait until that process releases lock and then lock YAML file and read from YAML file.

After reading from YAML file, then it will release lock of YAML file.

- Write method

Name: writeToYaml(orgs)

Functionality:

Append orgs hash array to YAML file.

If CRUD_Operations.yaml file does not exist, then it will create a new one and then write.

If other process is reading or writing from/to YAML file, then it will wait until that process releases lock and then lock YAML file and write to YAML file.

After writing to YAML file, then it will release lock of YAML file.

- Delete method

Name: deleteYaml()

Functionality:

Rename current yaml file to store as temporary and for making it reusable.

If other process is reading or writing to/from YAML file, then it will wait until that process releases lock and then lock YAML file and rename it.

After rename YAML file, then it will release lock of YAML file.

7) Add longitude/latitude regarding address.

Name: addPosition(orgs)

Functionality:

Read all entries in the orgs[] hash array and by using google geocoding api, add a new element in the Ruby organization hash with longitude and latitude.

If Ruby organization has already longitude and latitude, then it won't change it.

For example:

Original:

```
<address>
  <use value="work"/>
  <type value="both"/>
  <line value="311 Arsenal St. "/>
  <city value="Watertown"/>
  <state value="MA"/>
  <postalCode value="2472"/>
  <country value="US"/>
</address>
```

New:

```
<address>
  <use value="work"/>
  <type value="both"/>
  <line value="311 Arsenal St. "/>
  <city value="Watertown"/>
  <state value="MA"/>
  <postalCode value="2472"/>
  <country value="US"/>
  <position>
    <longitude value="-71.1097453"/>
    <latitude value="42.3504819"/>
  </position>
</address>
```

8) Add Access Control

Purpose:

To restrict operations that is not in their allowed list of organizations.

For this:

One apikey will have operation permissions(“C”:Create,“R”:Retrieve,“U”:Update, “D”:Delete) to clarify permissions for that apikey and also one managingOrg value to make organization to be restricted from operations by that apikey. At this moment, retrieve operation is allowed for all apikeys.

For example:

If apikey is "SgnCVcywvqKXMsBprE7jQFTfP6JxaL2u4D9NtRib5k-zYGdoAm", permission is “CRD” and manaingOrg is “athenahealth”, then it means that users who use this apikey can create organizations(when they create organizations, “athenahealth” will be set as the value of manaingOrg of them.)

They can also retrieve organizations.

And also they can delete organizations of which value of manaingOrg is “athenahealth”.

But they cannot update organizations.

Internal Function:

checkPermission(apikey, org, operation)

9) Create user interface for CRUD operations.

- Create

Sequoia Provider Directory Uploader

Interaction:

ApiKey:

Format:

Content:

Please browse to a properly formatted JSON directory file for one or more organizations:

ApiKey and Content cannot be empty. And only xml is working at this moment.

- Retrieve

Sequoia Provider Directory Uploader

Interaction:

ApiKey:

Format:

Content:

Search Param

Please browse to a properly formatted JSON directory file for one or more organizations:

ApiKey and Search value cannot be empty. On search params dropdown list, you can select queries.

And also only xml is working at this moment.

- Update

Sequoia Provider Directory Uploader

Interaction: id:

ApiKey:

Format:

Content:

Please browse to a properly formatted JSON directory file for one or more organizations:

Id, ApiKey and Content cannot be empty. And also only xml is working at this moment.

- Delete

Sequoia Provider Directory Uploader

Interaction: id:

ApiKey:

Format:

Content:

Please browse to a properly formatted JSON directory file for one or more organizations:

Id and ApiKey cannot be empty. Only xml is working at this moment.

- Validate

Sequoia Provider Directory Uploader

Interaction:

ApiKey:

Format:

Content:

Please browse to a properly formatted JSON directory file for one or more organizations:

ApiKey cannot be empty. Only xml is working at this moment.

10) Add special SSL certificate function

Original Sinatra only accepts privateKey and Certificate as File Object.

To make it more robust regarding security, it saves the privateKey and certificate in local variables and use them.

To do that I changed original Sinatra as followings:

```
#sinatra_ssl.rb
require 'sinatra'

module Sinatra
  class Application
    def self.run!
      super do |server|
        certificate_content = ssl_certificate
      end
    end
  end
end
```

```
key_content = ssl_key
server_options = {
  :Host => bind,
  :Port => port,
  :SSLEnable => true,
  :SSLCertificate => OpenSSL::X509::Certificate.new(certificate_content),
  # 123456 is the Private Key Password
  :SSLPrivateKey => OpenSSL::PKey::RSA.new(key_content,"123456")
}
end
end
end
end
```

And also you need to change configuration of Sinatra as followings:

```
#FHIRserver.rb
class << settings
  def server_settings
    {
      :backend => MyThinBackend,
      :verify_peer => false
    }
  end
end
set :ssl_certificate, @certificate
set :ssl_key, @privateKey
@privateKey is the content of privateKey.key file.
@certificate is the content of certificate.crt file.
```

12. TESTING

Organizations are encouraged to test their initial client software against the Sequoia DEV environment before attempting to establish connections in VAL or PROD.

13. OPERATIONAL CONSIDERATIONS

In order to efficiently operate the directory, and to help ensure short response times, the PROD Sequoia Project Healthcare Directory must be queried no more often than once every hour for general operational use. More frequent queries are acceptable for short periods of time if needed for PROD testing, configuration, or similar activities. Prolonged intervals of queries at a more frequent interval than once per hour will result in temporary suspension of access until the problem is remediated.

The directory itself is hosted on a cluster of computers that can be relatively easily scaled horizontally to ensure sufficient response times. The cluster is operationally monitored using predictive analytics and is sized with conservatively excess capacity.

14. EXAMPLES

14.1. XML Example

Retrieve all organizations:

```
GET http://<base-url>/fhir-stu3/1.0/Organization/
```

Sample response:

```
Request headers:  
Accept: */*
```

```
Request parameters:  
_format=json  
Apikey=<your key>  
_count=2
```

```
Response headers:  
HTTP/1.1 200 OK  
Content-Type: application/xml; charset=utf-8  
X-Custom-Value: Copyright(c) 2016-17 The Sequoia Project. All rights reserved.  
Business confidential.  
X-Powered-By: The Sequoia Project Healthcare Directory Server  
Server: Undisclosed  
Cache-Control: public, must-revalidate, max-age=3600  
Expires: 2017-02-19 12:27:06 -0600  
ETag: "8f6f26c0-d8f6-0134-16be-05343c7258ab"  
Content-Length: 32638
```

X-Content-Type-Options: nosniff
 Connection: keep-alive

```
<?xml version="1.0"?>
<!--The Sequoia Project Healthcare Directory. Copyright(c) 2015-2017 The Sequoia
Project. All rights reserved. Business confidential.-->
<Bundle xmlns="http://hl7.org/fhir">
  <!--Start of header elements-->
  <id value="ea32c220-d8f5-0134-16b8-05343c7258ab"/>
  <meta>
    <lastUpdated value="2017-02-19T11:22:29-06:00"/>
  </meta>
  <type value="searchset"/>
  <total value="2"/>
  <link>
    <relation value="self"/>
    <url value="/Organization?_format=xml"/>
  </link>
  <search>
    <mode value="match"/>
  </search>
  <!--The entry object is repeated for each organization listed in the directory-->
  <entry>
    <fullUrl value="/Organization/Organization-1"/>
    <resource>
      <Organization>
        <!--The ID value is subject to change-->
        <id value="Organization-1"/>
        <meta>
          <versionId value="1"/>
          <lastUpdated value="2017-02-19T11:22:29-06:00"/>
        </meta>
        <!--This is the XCA/XCPD HomeCommunityID OID in URN format-->
        <identifier>
          <use value="official"/>
          <system value="http://www.hl7.org/oid"/>
          <value value="Org-Identifier"/>
        </identifier>
        <active value="Org-Status"/>
        <name value="Org-DisplayName"/>
        <alias value="Org-OtherNames"/>
        <!--The contact object is repeated for each person listed in the
directory-->
        <contact>
          <purpose value="Person01-ContactType"/>
          <name>
            <use value="official"/>
            <given value="Person01-Name"/>
            <telcom>
              <ContactPoint>
                <system value="phone"/>
                <value value="Person01-Phone"/>
                <use value="work"/>
              </ContactPoint>
              <!--General address for this specific person-->
              <address>
                <use value="work"/>
              </address>
            </telcom>
          </name>
        </contact>
      </Organization>
    </resource>
  </entry>
</Bundle>
```



```

    <type value="both"/>
    <line value="Person01-StreetAddress"/>
    <line value=""/>
    <city value="Person01-City"/>
    <postalCode value="Person01-ZIPCodePostalCode"/>
    <country value="Person01-Country"/>
  </address>
</telcom>
</name>
</contact>
<contact>
  <purpose value="Person02-ContactType"/>
  <name>
    <use value="official"/>
    <given value="Person02-Name"/>
    <telcom>
      <ContactPoint>
        <system value="phone"/>
        <value value="Person02-Phone"/>
        <use value="work"/>
      </ContactPoint>
      <!--General address for this specific person-->
      <address>
        <use value="work"/>
        <type value="both"/>
        <line value="Person02-StreetAddress"/>
        <line value=""/>
        <city value="Person02-City"/>
        <postalCode value="Person02-ZIPCodePostalCode"/>
        <country value="Person02-Country"/>
      </address>
    </telcom>
  </name>
</contact>
<!--General organizational physical and mailing address-->
<address>
  <use value="work"/>
  <type value="both"/>
  <line value="818 N German Avenue"/>
  <line value="Suite 500"/>
  <city value="Belleville"/>
  <state value="MI"/>
  <postalCode value="48111"/>
  <country value="US"/>
</address>
<!--If this is a Carequality Connection, then the partOf object points to
the Carequality Implementer-->
<!--If this is a eHealth Exchange Sub-Participant, then the partOf object
points to the eHealth Exchange Participant-->
<!--If this is a lower-level organization, then the partOf object points
to the immediate parent organization-->
<!--If this is a top-level organization, then the partOf object is not
specified-->
<partOf>
  <Reference>
    <!--Home Community ID of parent org, if any-->
    <identifier>
      <use value="official"/>

```

```

        <type value="HCID"/>
        <system value="http://www.hl7.org/oid/">
        <value value="1.2.3.4.1"/>
    </identifier>
</Reference>
</partOf>
<!--The Endpoints are represented as contained resources and are repeated
as needed-->
<contained>
    <Endpoint>
        <!--Home Community ID-->
        <identifier>
            <use value="official"/>
            <type value="HCID"/>
            <system value="http://www.hl7.org/oid/">
            <value value="Endpoint01-HomeCommunityID"/>
        </identifier>
        <!--Assigning Authority ID-->
        <identifier>
            <use value="official"/>
            <type type="AAID"/>
            <system value="http://www.hl7.org/oid/">
            <value value="Endpoint01-AssigningAuthorityID"/>
        </identifier>
        <connectionType>
            <system value="http://hl7.org/fhir/subscription-channel-type"/>
            <code value="IHE-XCA"/>
        </connectionType>
        <name value="Endpoint01-DisplayName"/>
        <managingOrganization/>
        <address value="Endpoint01-URL"/>
        <payloadMimeType value="text/xml"/>
        <payloadType>
            <coding>
                <system value="urn:oid:1.3.6.1.4.1.19376.1.2.3"/>
                <code value="Endpoint01-ContentTypesSupported"/>
            </coding>
        </payloadType>
        <extension
url="https://sequoiaproject.org/StructureDefinition/Endpoint/main/1.0.0">
            <extension url="Transaction">
                <valueString value="Endpoint01-SupportedTransactions"/>
            </extension>
            <!--Is this gateway an initiator or responder actor-->
            <extension url="Actor">
                <valueCodeableConcept>
                    <coding>
                        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Actor/1.0.0"/>
                        <value value="Responding Gateway"/>
                    </coding>
                </valueCodeableConcept>
            </extension>
            <!--Version of the service as per the eHealth Exchange
specifications-->
            <extension url="Version">
                <valueCodeableConcept>
                    <coding>

```

```

        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Version/1.0.0"/>
        <value value="2.0"/>
        </coding>
        </valueCodeableConcept>
        </extension>
        <!--Initiative specific list of use cases supported-->
        <extension url="UseCases">
        <valueCodeableConcept>
        <coding>
        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/UseCases/1.0.0"/>
        <value value="Endpoint01-UseCasesSupported"/>
        </coding>
        </valueCodeableConcept>
        </extension>
        <!--PurposesOfUse Value Set for SAML header and/or access control-->
        <extension url="PurposesOfUse">
        <valueCodeableConcept>
        <coding>
        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/PurposesOfUse/1.0.0
"/>
        <value value="Endpoint01-PurposeOfUseAllowed"/>
        </coding>
        </valueCodeableConcept>
        </extension>
        <!--Roles Value Set for SAML header and/or access control-->
        <extension url="Roles">
        <valueCodeableConcept>
        <coding>
        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Roles/1.0.0"/>
        <value value="Endpoint01-RolesAllowed"/>
        </coding>
        </valueCodeableConcept>
        </extension>
        <!--IPAs of gateway, may repeat-->
        <extension url="IPA">
        <valueCodeableConcept>
        <coding>
        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/IPA/1.0.0"/>
        <value value="Endpoint01-IPAddress"/>
        </coding>
        </valueCodeableConcept>
        </extension>
        </extension>
        </Endpoint>
    </contained>
    <contained>
    <Endpoint>
        <!--Home Community ID-->
        <identifier>
        <use value="official"/>
        <type value="HCID"/>
        <system value="http://www.hl7.org/oid"/>
        <value value="Endpoint02-HomeCommunityID"/>

```

```

</identifier>
<!--Assigning Authority ID-->
<identifier>
  <use value="official"/>
  <type type="AAID"/>
  <system value="http://www.hl7.org/oid"/>
  <value value="Endpoint02-AssigningAuthorityID"/>
</identifier>
<connectionType>
  <system value="http://hl7.org/fhir/subscription-channel-type"/>
  <code value="IHE-XCA"/>
</connectionType>
<name value="Endpoint02-DisplayName"/>
<managingOrganization/>
<address value="Endpoint02-URL"/>
<payloadMimeType value="text/xml"/>
<payloadType>
  <coding>
    <system value="urn:oid:1.3.6.1.4.1.19376.1.2.3"/>
    <code value="Endpoint02-ContentTypesSupported"/>
  </coding>
</payloadType>
<extension
url="https://sequoiaproject.org/StructureDefinition/Endpoint/main/1.0.0">
  <extension url="Transaction">
    <valueString value="Endpoint02-SupportedTransactions"/>
  </extension>
  <!--Is this gateway an initiator or responder actor-->
  <extension url="Actor">
    <valueCodeableConcept>
      <coding>
        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Actor/1.0.0"/>
        <value value="Responding Gateway"/>
      </coding>
    </valueCodeableConcept>
  </extension>
  <!--Version of the service as per the eHealth Exchange
specifications-->
  <extension url="Version">
    <valueCodeableConcept>
      <coding>
        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Version/1.0.0"/>
        <value value="2.0"/>
      </coding>
    </valueCodeableConcept>
  </extension>
  <!--Initiative specific list of use cases supported-->
  <extension url="UseCases">
    <valueCodeableConcept>
      <coding>
        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/UseCases/1.0.0"/>
        <value value="Endpoint02-UseCasesSupported"/>
      </coding>
    </valueCodeableConcept>
  </extension>

```

```

        <!--PurposesOfUse Value Set for SAML header and/or access control-->
        <extension url="PurposesOfUse">
            <valueCodeableConcept>
                <coding>
                    <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/PurposesOfUse/1.0.0
"/>
                    <value value="Endpoint02-PurposeOfUseAllowed"/>
                </coding>
            </valueCodeableConcept>
        </extension>
        <!--Roles Value Set for SAML header and/or access control-->
        <extension url="Roles">
            <valueCodeableConcept>
                <coding>
                    <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Roles/1.0.0"/>
                    <value value="Endpoint02-RolesAllowed"/>
                </coding>
            </valueCodeableConcept>
        </extension>
        <!--IPAs of gateway, may repeat-->
        <extension url="IPA">
            <valueCodeableConcept>
                <coding>
                    <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/IPA/1.0.0"/>
                    <value value="Endpoint02-IPAddress"/>
                </coding>
            </valueCodeableConcept>
        </extension>
    </Endpoint>
</contained>
<contained>
    <Endpoint>
        <!--Home Community ID-->
        <identifier>
            <use value="official"/>
            <type value="HCID"/>
            <system value="http://www.hl7.org/oid"/>
            <value value="Endpoint03-HomeCommunityID"/>
        </identifier>
        <!--Assigning Authority ID-->
        <identifier>
            <use value="official"/>
            <type type="AAID"/>
            <system value="http://www.hl7.org/oid"/>
            <value value="Endpoint03-AssigningAuthorityID"/>
        </identifier>
        <connectionType>
            <system value="http://hl7.org/fhir/subscription-channel-type"/>
            <code value="IHE-XCA"/>
        </connectionType>
        <name value="Endpoint03-DisplayName"/>
        <managingOrganization/>
        <address value="Endpoint03-URL"/>
        <payloadMimeType value="text/xml"/>
    </Endpoint>
</contained>

```



```

<payloadType>
  <coding>
    <system value="urn:oid:1.3.6.1.4.1.19376.1.2.3"/>
    <code value="Endpoint03-ContentTypesSupported"/>
  </coding>
</payloadType>
<extension
url="https://sequoiaproject.org/StructureDefinition/Endpoint/main/1.0.0">
  <extension url="Transaction">
    <valueString value="Endpoint03-SupportedTransactions"/>
  </extension>
  <!--Is this gateway an initiator or responder actor-->
  <extension url="Actor">
    <valueCodeableConcept>
      <coding>
        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Actor/1.0.0"/>
        <value value="Responding Gateway"/>
      </coding>
    </valueCodeableConcept>
  </extension>
  <!--Version of the service as per the eHealth Exchange
specifications-->
  <extension url="Version">
    <valueCodeableConcept>
      <coding>
        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Version/1.0.0"/>
        <value value="2.0"/>
      </coding>
    </valueCodeableConcept>
  </extension>
  <!--Initiative specific list of use cases supported-->
  <extension url="UseCases">
    <valueCodeableConcept>
      <coding>
        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/UseCases/1.0.0"/>
        <value value="Endpoint03-UseCasesSupported"/>
      </coding>
    </valueCodeableConcept>
  </extension>
  <!--PurposesOfUse Value Set for SAML header and/or access control-->
  <extension url="PurposesOfUse">
    <valueCodeableConcept>
      <coding>
        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/PurposesOfUse/1.0.0
"/>
        <value value="Endpoint03-PurposeOfUseAllowed"/>
      </coding>
    </valueCodeableConcept>
  </extension>
  <!--Roles Value Set for SAML header and/or access control-->
  <extension url="Roles">
    <valueCodeableConcept>
      <coding>
        <system

```



```

value="https://sequoiaproject.org/StructureDefinition/Endpoint/Roles/1.0.0"/>
  <value value="Endpoint03-RolesAllowed"/>
    </coding>
  </valueCodeableConcept>
</extension>
<!--IPAs of gateway, may repeat-->
<extension url="IPA">
  <valueCodeableConcept>
    <coding>
      <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/IPA/1.0.0"/>
      <value value="Endpoint03-IPAddress"/>
        </coding>
      </valueCodeableConcept>
    </extension>
  </extension>
</Endpoint>
</contained>
</Organization>
</resource>
</entry>
<!--The entry object is repeated for each organization listed in the directory-->
<entry>
  <fullUrl value="/Organization/Organization-2"/>
  <resource>
    <Organization>
      <!--The ID value is subject to change-->
      <id value="Organization-2"/>
      <meta>
        <versionId value="1"/>
        <lastUpdated value="2017-02-19T11:22:29-06:00"/>
      </meta>
      <!--This is the XCA/XCPD HomeCommunityID OID in URN format-->
      <identifier>
        <use value="official"/>
        <system value="http://www.hl7.org/oid"/>
        <value value="urn:oid:1.2.3.4"/>
      </identifier>
      <active value="Active"/>
      <name value="The Sequoia Project"/>
      <alias value="Other Names"/>
      <!--The contact object is repeated for each person listed in the
directory-->
      <contact>
        <purpose value="Operations"/>
        <name>
          <use value="official"/>
          <given value="Eric"/>
          <family value="Heflin"/>
          <telcom>
            <ContactPoint>
              <system value="phone"/>
              <value value="512-555-1212"/>
              <use value="work"/>
            </ContactPoint>
            <!--General address for this specific person-->
            <address>

```

```

        <use value="work"/>
        <type value="both"/>
        <line value="100 Main St"/>
        <line value=""/>
        <city value="Austin"/>
        <postalCode value="78737"/>
        <country value="US"/>
    </address>
</telcom>
</name>
</contact>
<contact>
    <purpose value="Technical "/>
    <name>
        <use value="official"/>
        <given value="Eric"/>
        <family value="Heflin"/>
        <telcom>
            <ContactPoint>
                <system value="phone"/>
                <value value="512-555-1212"/>
                <use value="work"/>
            </ContactPoint>
            <!--General address for this specific person-->
            <address>
                <use value="work"/>
                <type value="both"/>
                <line value="100 Main St"/>
                <line value=""/>
                <city value="Austin"/>
                <postalCode value="78737"/>
                <country value="US"/>
            </address>
        </telcom>
    </name>
</contact>
<!--General organizational physical and mailing address-->
<address>
    <use value="work"/>
    <type value="both"/>
    <line value="818 N German Avenue"/>
    <line value="Suite 500"/>
    <city value="Belleville"/>
    <state value="MI"/>
    <postalCode value="48111"/>
    <country value="US"/>
</address>
<!--If this is a Carequality Connection, then the partOf object points to
the Carequality Implementer-->
    <!--If this is a eHealth Exchange Sub-Participant, then the partOf object
points to the eHealth Exchange Participant-->
    <!--If this is a lower-level organization, then the partOf object points
to the immediate parent organization-->
    <!--If this is a top-level organization, then the partOf object is not
specified-->
    <partOf>
        <Reference>
            <!--Home Community ID of parent org, if any-->

```

```

    <identifier>
      <use value="official"/>
      <type value="HCID"/>
      <system value="http://www.hl7.org/oid/">
      <value value="1.2.3.4.1"/>
    </identifier>
  </Reference>
</partOf>
<!--The Endpoints are represented as contained resources and are repeated
as needed-->
<contained>
  <Endpoint>
    <!--Home Community ID-->
    <identifier>
      <use value="official"/>
      <type value="HCID"/>
      <system value="http://www.hl7.org/oid/">
      <value value="urn:oid:1.2.3.4.1"/>
    </identifier>
    <!--Assigning Authority ID-->
    <identifier>
      <use value="official"/>
      <type type="AAID"/>
      <system value="http://www.hl7.org/oid/">
      <value value="urn:oid:1.2.3.4.3"/>
    </identifier>
    <connectionType>
      <system value="http://hl7.org/fhir/subscription-channel-type"/>
      <code value="IHE-XCA"/>
    </connectionType>
    <name value="Carequality Patient Discovery"/>
    <managingOrganization/>
    <address value="https://xyz.com/service/patidisc.svc"/>
    <payloadMimeType value="text/xml"/>
    <payloadType>
      <coding>
        <system value="urn:oid:1.3.6.1.4.1.19376.1.2.3"/>
        <code value="All"/>
      </coding>
    </payloadType>
    <extension
url="https://sequoiaproject.org/StructureDefinition/Endpoint/main/1.0.0">
      <extension url="Transaction">
        <valueString value="XCPD ITI-55"/>
      </extension>
      <!--Is this gateway an initiator or responder actor-->
      <extension url="Actor">
        <valueCodeableConcept>
          <coding>
            <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Actor/1.0.0"/>
            <value value="Responding Gateway"/>
          </coding>
        </valueCodeableConcept>
      </extension>
      <!--Version of the service as per the eHealth Exchange
specifications-->
      <extension url="Version">

```

```

        <valueCodeableConcept>
          <coding>
            <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Version/1.0.0"/>
              <value value="2.0"/>
            </coding>
          </valueCodeableConcept>
        </extension>
        <!--Initiative specific list of use cases supported-->
        <extension url="UseCases">
          <valueCodeableConcept>
            <coding>
              <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/UseCases/1.0.0"/>
                <value value="QueryBasedDocumentExchange"/>
            </coding>
          </valueCodeableConcept>
        </extension>
        <!--PurposesOfUse Value Set for SAML header and/or access control-->
        <extension url="PurposesOfUse">
          <valueCodeableConcept>
            <coding>
              <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/PurposesOfUse/1.0.0
"/>
                <value value="Treatment"/>
            </coding>
          </valueCodeableConcept>
        </extension>
        <!--Roles Value Set for SAML header and/or access control-->
        <extension url="Roles">
          <valueCodeableConcept>
            <coding>
              <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Roles/1.0.0"/>
                <value value="All"/>
            </coding>
          </valueCodeableConcept>
        </extension>
        <!--IPAs of gateway, may repeat-->
        <extension url="IPA">
          <valueCodeableConcept>
            <coding>
              <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/IPA/1.0.0"/>
                </coding>
          </valueCodeableConcept>
        </extension>
      </extension>
    </Endpoint>
  </contained>
<contained>
  <Endpoint>
    <!--Home Community ID-->
    <identifier>
      <use value="official"/>
      <type value="HCID"/>
      <system value="http://www.hl7.org/oid"/>
    </identifier>
  </Endpoint>
</contained>

```

```

        <value value="urn:oid:1.2.3.4.1"/>
    </identifier>
    <!--Assigning Authority ID-->
    <identifier>
        <use value="official"/>
        <type type="AAID"/>
        <system value="http://www.hl7.org/oid"/>
        <value value="urn:oid:1.2.3.4.3"/>
    </identifier>
    <connectionType>
        <system value="http://hl7.org/fhir/subscription-channel-type"/>
        <code value="IHE-XCA"/>
    </connectionType>
    <name value="Carequality Query for documents"/>
    <managingOrganization/>
    <address value="https://xyz.com/service/query.svc"/>
    <payloadMimeType value="text/xml"/>
    <payloadType>
        <coding>
            <system value="urn:oid:1.3.6.1.4.1.19376.1.2.3"/>
            <code value="All"/>
        </coding>
    </payloadType>
    <extension
url="https://sequoiaproject.org/StructureDefinition/Endpoint/main/1.0.0">
        <extension url="Transaction">
            <valueString value="XCA ITI-38"/>
        </extension>
        <!--Is this gateway an initiator or responder actor-->
        <extension url="Actor">
            <valueCodeableConcept>
                <coding>
                    <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Actor/1.0.0"/>
                    <value value="Responding Gateway"/>
                </coding>
            </valueCodeableConcept>
        </extension>
        <!--Version of the service as per the eHealth Exchange
specifications-->
        <extension url="Version">
            <valueCodeableConcept>
                <coding>
                    <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Version/1.0.0"/>
                    <value value="2.0"/>
                </coding>
            </valueCodeableConcept>
        </extension>
        <!--Initiative specific list of use cases supported-->
        <extension url="UseCases">
            <valueCodeableConcept>
                <coding>
                    <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/UseCases/1.0.0"/>
                    <value value="QueryBasedDocumentExchange"/>
                </coding>
            </valueCodeableConcept>

```



```

</extension>
<!--PurposesOfUse Value Set for SAML header and/or access control-->
<extension url="PurposesOfUse">
  <valueCodeableConcept>
    <coding>
      <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/PurposesOfUse/1.0.0
"/>
      <value value="Treatment"/>
    </coding>
  </valueCodeableConcept>
</extension>
<!--Roles Value Set for SAML header and/or access control-->
<extension url="Roles">
  <valueCodeableConcept>
    <coding>
      <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Roles/1.0.0"/>
      <value value="All"/>
    </coding>
  </valueCodeableConcept>
</extension>
<!--IPAs of gateway, may repeat-->
<extension url="IPA">
  <valueCodeableConcept>
    <coding>
      <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/IPA/1.0.0"/>
      </coding>
  </valueCodeableConcept>
</extension>
</Endpoint>
</contained>
<contained>
  <Endpoint>
    <!--Home Community ID-->
    <identifier>
      <use value="official"/>
      <type value="HCID"/>
      <system value="http://www.hl7.org/oid"/>
      <value value="urn:oid:1.2.3.4.1"/>
    </identifier>
    <!--Assigning Authority ID-->
    <identifier>
      <use value="official"/>
      <type type="AAID"/>
      <system value="http://www.hl7.org/oid"/>
      <value value="urn:oid:1.2.3.4.3"/>
    </identifier>
    <connectionType>
      <system value="http://hl7.org/fhir/subscription-channel-type"/>
      <code value="IHE-XCA"/>
    </connectionType>
    <name value="Carequality Retrieve documents"/>
    <managingOrganization/>
    <address value="https://xyz.com/service/retrieve-mtom.svc"/>
    <payloadMimeType value="text/xml"/>
  </Endpoint>
</contained>

```



```

<payloadType>
  <coding>
    <system value="urn:oid:1.3.6.1.4.1.19376.1.2.3"/>
    <code value="All"/>
  </coding>
</payloadType>
<extension
url="https://sequoiaproject.org/StructureDefinition/Endpoint/main/1.0.0">
  <extension url="Transaction">
    <valueString value="XCA ITI-39"/>
  </extension>
  <!--Is this gateway an initiator or responder actor-->
  <extension url="Actor">
    <valueCodeableConcept>
      <coding>
        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Actor/1.0.0"/>
        <value value="Responding Gateway"/>
      </coding>
    </valueCodeableConcept>
  </extension>
  <!--Version of the service as per the eHealth Exchange
specifications-->
  <extension url="Version">
    <valueCodeableConcept>
      <coding>
        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Version/1.0.0"/>
        <value value="2.0"/>
      </coding>
    </valueCodeableConcept>
  </extension>
  <!--Initiative specific list of use cases supported-->
  <extension url="UseCases">
    <valueCodeableConcept>
      <coding>
        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/UseCases/1.0.0"/>
        <value value="QueryBasedDocumentExchange"/>
      </coding>
    </valueCodeableConcept>
  </extension>
  <!--PurposesOfUse Value Set for SAML header and/or access control-->
  <extension url="PurposesOfUse">
    <valueCodeableConcept>
      <coding>
        <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/PurposesOfUse/1.0.0
"/>
        <value value="Treatment"/>
      </coding>
    </valueCodeableConcept>
  </extension>
  <!--Roles Value Set for SAML header and/or access control-->
  <extension url="Roles">
    <valueCodeableConcept>
      <coding>
        <system

```

```
value="https://sequoiaproject.org/StructureDefinition/Endpoint/Roles/1.0.0"/>
  <value value="All"/>
  </coding>
</valueCodeableConcept>
</extension>
<!--IPAs of gateway, may repeat-->
<extension url="IPA">
  <valueCodeableConcept>
    <coding>
      <system
value="https://sequoiaproject.org/StructureDefinition/Endpoint/IPA/1.0.0"/>
    </coding>
  </valueCodeableConcept>
</extension>
</extension>
</Endpoint>
</contained>
</Organization>
</resource>
</entry>
</Bundle>
```

14.2. JSON Example

Request JSON response format:

```
GET http://<base-url>/fhir-stu3/1.0/Organization/?\_format=json
```

Request XML response format:

```
GET http://<base-url>/fhir-stu3/1.0/Organization/?\_format=xml
```

Note: use of https is required in VAL and PROD.

Request headers:
Accept: */*

Request parameters:
_format=json
Apikey=<your key>
_count=2

Response headers:
HTTP/1.1 200 OK
Content-Type: application/json+fhir; charset=utf-8
X-Custom-Value: Copyright(c) 2016-17 The Sequoia Project. All rights reserved.
Business confidential.
X-Powered-By: The Sequoia Project Healthcare Directory Server
Server: Undisclosed
Cache-Control: public, must-revalidate, max-age=3600
Expires: 2017-02-19 12:23:25 -0600

ETag: "0b5cc6c0-d8f6-0134-16ba-05343c7258ab"
Content-Length: 45417
X-Content-Type-Options: nosniff
Connection: keep-alive

```
{
  "Bundle": {
    "xmlns": "http://hl7.org/fhir",
    "id": {
      "value": "0b5dff40-d8f6-0134-16bc-05343c7258ab"
    },
    "meta": {
      "lastUpdated": {
        "value": "2017-02-19T11:23:25-06:00"
      }
    },
    "type": {
      "value": "searchset"
    },
    "total": {
      "value": "2"
    },
    "link": {
      "relation": {
        "value": "self"
      },
      "url": {
        "value": "/Organization?_format=json"
      }
    },
    "search": {
      "mode": {
        "value": "match"
      }
    },
    "entry": [
      {
        "fullUrl": {
          "value": "/Organization/Organization-1"
        },
        "resource": {
          "Organization": {
            "id": {
              "value": "Organization-1"
            },
            "meta": {
              "versionId": {
                "value": "1"
              },
              "lastUpdated": {
                "value": "2017-02-19T11:23:25-06:00"
              }
            },
            "identifier": {
              "use": {
                "value": "official"
              },
              "system": {
```

```

        "value": "http://www.hl7.org/oid/"
    },
    "value": {
        "value": "Org-Identifier"
    }
},
"active": {
    "value": "Org-Status"
},
"name": {
    "value": "Org-DisplayName"
},
"alias": {
    "value": "Org-OtherNames"
},
"contact": [
    {
        "purpose": {
            "value": "Person01-ContactType"
        },
        "name": {
            "use": {
                "value": "official"
            },
            "given": {
                "value": "Person01-Name"
            },
            "telcom": {
                "ContactPoint": {
                    "system": {
                        "value": "phone"
                    },
                    "value": {
                        "value": "Person01-Phone"
                    },
                    "use": {
                        "value": "work"
                    }
                }
            },
            "address": {
                "use": {
                    "value": "work"
                },
                "type": {
                    "value": "both"
                },
                "line": [
                    {
                        "value": "Person01-StreetAddress"
                    },
                    {
                        "value": ""
                    }
                ],
                "city": {
                    "value": "Person01-City"
                },
                "postalCode": {

```

```

        "value": "Person01-ZIPCodePostalCode"
      },
      "country": {
        "value": "Person01-Country"
      }
    }
  },
  {
    "purpose": {
      "value": "Person02-ContactType"
    },
    "name": {
      "use": {
        "value": "official"
      },
      "given": {
        "value": "Person02-Name"
      },
      "telcom": {
        "ContactPoint": {
          "system": {
            "value": "phone"
          },
          "value": {
            "value": "Person02-Phone"
          },
          "use": {
            "value": "work"
          }
        }
      },
      "address": {
        "use": {
          "value": "work"
        },
        "type": {
          "value": "both"
        },
        "line": [
          {
            "value": "Person02-StreetAddress"
          },
          {
            "value": ""
          }
        ],
        "city": {
          "value": "Person02-City"
        },
        "postalCode": {
          "value": "Person02-ZIPCodePostalCode"
        },
        "country": {
          "value": "Person02-Country"
        }
      }
    }
  }
}

```

```

    }
  },
  "address": {
    "use": {
      "value": "work"
    },
    "type": {
      "value": "both"
    },
    "line": [
      {
        "value": "818 N German Avenue"
      },
      {
        "value": "Suite 500"
      }
    ],
    "city": {
      "value": "Belleville"
    },
    "state": {
      "value": "MI"
    },
    "postalCode": {
      "value": "48111"
    },
    "country": {
      "value": "US"
    }
  },
  "partOf": {
    "Reference": {
      "identifier": {
        "use": {
          "value": "official"
        },
        "type": {
          "value": "HCID"
        },
        "system": {
          "value": "http://www.hl7.org/oid/"
        },
        "value": {
          "value": "1.2.3.4.1"
        }
      }
    }
  },
  "contained": [
    {
      "Endpoint": {
        "identifier": [
          {
            "use": {
              "value": "official"
            },
            "type": {

```



```

        "value": "HCID"
      },
      "system": {
        "value": "http://www.hl7.org/oid/"
      },
      "value": {
        "value": "Endpoint01-HomeCommunityID"
      }
    },
    {
      "use": {
        "value": "official"
      },
      "type": null,
      "system": {
        "value": "http://www.hl7.org/oid/"
      },
      "value": {
        "value": "Endpoint01-AssigningAuthorityID"
      }
    }
  ],
  "connectionType": {
    "system": {
      "value": "http://hl7.org/fhir/subscription-channel-type"
    },
    "code": {
      "value": "IHE-XCA"
    }
  },
  "name": {
    "value": "Endpoint01-DisplayName"
  },
  "managingOrganization": null,
  "address": {
    "value": "Endpoint01-URL"
  },
  "payloadMimeFormat": {
    "value": "text/xml"
  },
  "payloadType": {
    "coding": {
      "system": {
        "value": "urn:oid:1.3.6.1.4.1.19376.1.2.3"
      },
      "code": {
        "value": "Endpoint01-ContentTypesSupported"
      }
    }
  },
  "extension": {
    "url":
    "https://sequoiaproject.org/StructureDefinition/Endpoint/main/1.0.0",
    "extension": [
      {
        "url": "Transaction",
        "valueString": {
          "value": "Endpoint01-SupportedTransactions"
        }
      }
    ]
  }
}

```

```

    }
  },
  {
    "url": "Actor",
    "valueCodeableConcept": {
      "coding": {
        "system": {
          "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Actor/1.0.0"
        },
        "value": {
          "value": "Responding Gateway"
        }
      }
    }
  },
  {
    "url": "Version",
    "valueCodeableConcept": {
      "coding": {
        "system": {
          "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Version/1.0.0"
        },
        "value": {
          "value": "2.0"
        }
      }
    }
  },
  {
    "url": "UseCases",
    "valueCodeableConcept": {
      "coding": {
        "system": {
          "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/UseCases/1.0.0"
        },
        "value": {
          "value": "Endpoint01-UseCasesSupported"
        }
      }
    }
  },
  {
    "url": "PurposesOfUse",
    "valueCodeableConcept": {
      "coding": {
        "system": {
          "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/PurposesOfUse/1.0.0"
        },
        "value": {
          "value": "Endpoint01-PurposeOfUseAllowed"
        }
      }
    }
  }
},

```

```

        {
          "url": "Roles",
          "valueCodeableConcept": {
            "coding": {
              "system": {
                "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Roles/1.0.0"
              },
              "value": {
                "value": "Endpoint01-RolesAllowed"
              }
            }
          }
        },
        {
          "url": "IPA",
          "valueCodeableConcept": {
            "coding": {
              "system": {
                "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/IPA/1.0.0"
              },
              "value": {
                "value": "Endpoint01-IPAddress"
              }
            }
          }
        }
      ]
    }
  },
  {
    "Endpoint": {
      "identifier": [
        {
          "use": {
            "value": "official"
          },
          "type": {
            "value": "HCID"
          },
          "system": {
            "value": "http://www.hl7.org/oid/"
          },
          "value": {
            "value": "Endpoint02-HomeCommunityID"
          }
        },
        {
          "use": {
            "value": "official"
          },
          "type": null,
          "system": {
            "value": "http://www.hl7.org/oid/"
          },
          "value": {

```

```

        "value": "Endpoint02-AssigningAuthorityID"
      }
    },
    "connectionType": {
      "system": {
        "value": "http://hl7.org/fhir/subscription-channel-type"
      },
      "code": {
        "value": "IHE-XCA"
      }
    },
    "name": {
      "value": "Endpoint02-DisplayName"
    },
    "managingOrganization": null,
    "address": {
      "value": "Endpoint02-URL"
    },
    "payloadMimeFormat": {
      "value": "text/xml"
    },
    "payloadType": {
      "coding": {
        "system": {
          "value": "urn:oid:1.3.6.1.4.1.19376.1.2.3"
        },
        "code": {
          "value": "Endpoint02-ContentTypesSupported"
        }
      }
    },
    "extension": {
      "url":
"https://sequoiaproject.org/StructureDefinition/Endpoint/main/1.0.0",
      "extension": [
        {
          "url": "Transaction",
          "valueString": {
            "value": "Endpoint02-SupportedTransactions"
          }
        },
        {
          "url": "Actor",
          "valueCodeableConcept": {
            "coding": {
              "system": {
                "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Actor/1.0.0"
              },
              "value": {
                "value": "Responding Gateway"
              }
            }
          }
        }
      ]
    },
    {
      "url": "Version",

```

```

        "valueCodeableConcept": {
          "coding": {
            "system": {
              "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Version/1.0.0"
            },
            "value": {
              "value": "2.0"
            }
          }
        }
      },
      {
        "url": "UseCases",
        "valueCodeableConcept": {
          "coding": {
            "system": {
              "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/UseCases/1.0.0"
            },
            "value": {
              "value": "Endpoint02-UseCasesSupported"
            }
          }
        }
      },
      {
        "url": "PurposesOfUse",
        "valueCodeableConcept": {
          "coding": {
            "system": {
              "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/PurposesOfUse/1.0.0"
            },
            "value": {
              "value": "Endpoint02-PurposeOfUseAllowed"
            }
          }
        }
      },
      {
        "url": "Roles",
        "valueCodeableConcept": {
          "coding": {
            "system": {
              "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Roles/1.0.0"
            },
            "value": {
              "value": "Endpoint02-RolesAllowed"
            }
          }
        }
      },
      {
        "url": "IPA",
        "valueCodeableConcept": {
          "coding": {

```

```

        "system": {
          "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/IPA/1.0.0"
        },
        "value": {
          "value": "Endpoint02-IPAddress"
        }
      }
    ]
  },
  {
    "Endpoint": {
      "identifier": [
        {
          "use": {
            "value": "official"
          },
          "type": {
            "value": "HCID"
          },
          "system": {
            "value": "http://www.hl7.org/oid/"
          },
          "value": {
            "value": "Endpoint03-HomeCommunityID"
          }
        },
        {
          "use": {
            "value": "official"
          },
          "type": null,
          "system": {
            "value": "http://www.hl7.org/oid/"
          },
          "value": {
            "value": "Endpoint03-AssigningAuthorityID"
          }
        }
      ],
      "connectionType": {
        "system": {
          "value": "http://hl7.org/fhir/subscription-channel-type"
        },
        "code": {
          "value": "IHE-XCA"
        }
      },
      "name": {
        "value": "Endpoint03-DisplayName"
      },
      "managingOrganization": null,
      "address": {
        "value": "Endpoint03-URL"
      }
    }
  }
}

```



```

    },
    "payloadMimeType": {
      "value": "text/xml"
    },
    },
    "payloadType": {
      "coding": {
        "system": {
          "value": "urn:oid:1.3.6.1.4.1.19376.1.2.3"
        },
        "code": {
          "value": "Endpoint03-ContentTypesSupported"
        }
      }
    },
    },
    "extension": {
      "url":
"https://sequoiaproject.org/StructureDefinition/Endpoint/main/1.0.0",
      "extension": [
        {
          "url": "Transaction",
          "valueString": {
            "value": "Endpoint03-SupportedTransactions"
          }
        },
        {
          "url": "Actor",
          "valueCodeableConcept": {
            "coding": {
              "system": {
                "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Actor/1.0.0"
              },
              "value": {
                "value": "Responding Gateway"
              }
            }
          }
        },
        {
          "url": "Version",
          "valueCodeableConcept": {
            "coding": {
              "system": {
                "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Version/1.0.0"
              },
              "value": {
                "value": "2.0"
              }
            }
          }
        }
      ]
    },
    {
      "url": "UseCases",
      "valueCodeableConcept": {
        "coding": {
          "system": {
            "value":

```

```

"https://sequoiaproject.org/StructureDefinition/Endpoint/UseCases/1.0.0"
  },
  "value": {
    "value": "Endpoint03-UseCasesSupported"
  }
}
},
{
  "url": "PurposesOfUse",
  "valueCodeableConcept": {
    "coding": {
      "system": {
        "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/PurposesOfUse/1.0.0"
      },
      "value": {
        "value": "Endpoint03-PurposeOfUseAllowed"
      }
    }
  }
},
{
  "url": "Roles",
  "valueCodeableConcept": {
    "coding": {
      "system": {
        "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Roles/1.0.0"
      },
      "value": {
        "value": "Endpoint03-RolesAllowed"
      }
    }
  }
},
{
  "url": "IPA",
  "valueCodeableConcept": {
    "coding": {
      "system": {
        "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/IPA/1.0.0"
      },
      "value": {
        "value": "Endpoint03-IPAddress"
      }
    }
  }
}
]
}
}
},

```

```

{
  "fullUrl": {
    "value": "/Organization/Organization-2"
  },
  "resource": {
    "Organization": {
      "id": {
        "value": "Organization-2"
      },
      "meta": {
        "versionId": {
          "value": "1"
        },
        "lastUpdated": {
          "value": "2017-02-19T11:23:25-06:00"
        }
      },
      "identifier": {
        "use": {
          "value": "official"
        },
        "system": {
          "value": "http://www.hl7.org/oid/"
        },
        "value": {
          "value": "urn:oid:1.2.3.4"
        }
      },
      "active": {
        "value": "Active"
      },
      "name": {
        "value": "The Sequoia Project"
      },
      "alias": {
        "value": "Other Names"
      },
      "contact": [
        {
          "purpose": {
            "value": "Operations"
          },
          "name": {
            "use": {
              "value": "official"
            },
            "given": {
              "value": "Eric"
            },
            "family": {
              "value": "Heflin"
            }
          },
          "telcom": {
            "ContactPoint": {
              "system": {
                "value": "phone"
              },
              "value": {

```

```

        "value": "512-555-1212"
      },
      "use": {
        "value": "work"
      }
    },
    "address": {
      "use": {
        "value": "work"
      },
      "type": {
        "value": "both"
      },
      "line": [
        {
          "value": "100 Main St"
        },
        {
          "value": ""
        }
      ],
      "city": {
        "value": "Austin"
      },
      "postalCode": {
        "value": "78737"
      },
      "country": {
        "value": "US"
      }
    }
  }
},
{
  "purpose": {
    "value": "Technical "
  },
  "name": {
    "use": {
      "value": "official"
    },
    "given": {
      "value": "Eric"
    },
    "family": {
      "value": "Heflin"
    },
    "telcom": {
      "ContactPoint": {
        "system": {
          "value": "phone"
        },
        "value": {
          "value": "512-555-1212"
        },
        "use": {
          "value": "work"
        }
      }
    }
  }
}

```

```

    }
  },
  "address": {
    "use": {
      "value": "work"
    },
    "type": {
      "value": "both"
    },
    "line": [
      {
        "value": "100 Main St"
      },
      {
        "value": ""
      }
    ],
    "city": {
      "value": "Austin"
    },
    "postalCode": {
      "value": "78737"
    },
    "country": {
      "value": "US"
    }
  }
}
]
},
"address": {
  "use": {
    "value": "work"
  },
  "type": {
    "value": "both"
  },
  "line": [
    {
      "value": "818 N German Avenue"
    },
    {
      "value": "Suite 500"
    }
  ],
  "city": {
    "value": "Belleville"
  },
  "state": {
    "value": "MI"
  },
  "postalCode": {
    "value": "48111"
  },
  "country": {
    "value": "US"
  }
}

```

```

    },
    "partOf": {
      "Reference": {
        "identifier": {
          "use": {
            "value": "official"
          },
          "type": {
            "value": "HCID"
          },
          "system": {
            "value": "http://www.hl7.org/oid/"
          },
          "value": {
            "value": "1.2.3.4.1"
          }
        }
      }
    },
    "contained": [
      {
        "Endpoint": {
          "identifier": [
            {
              "use": {
                "value": "official"
              },
              "type": {
                "value": "HCID"
              },
              "system": {
                "value": "http://www.hl7.org/oid/"
              },
              "value": {
                "value": "urn:oid:1.2.3.4.1"
              }
            },
            {
              "use": {
                "value": "official"
              },
              "type": null,
              "system": {
                "value": "http://www.hl7.org/oid/"
              },
              "value": {
                "value": "urn:oid:1.2.3.4.3"
              }
            }
          ],
          "connectionType": {
            "system": {
              "value": "http://hl7.org/fhir/subscription-channel-type"
            },
            "code": {
              "value": "IHE-XCA"
            }
          }
        }
      }
    ]
  },

```



```

    "name": {
      "value": "Carequality Patient Discovery"
    },
    "managingOrganization": null,
    "address": {
      "value": "https://xyz.com/service/patidisc.svc"
    },
    "payloadMimeType": {
      "value": "text/xml"
    },
    "payloadType": {
      "coding": {
        "system": {
          "value": "urn:oid:1.3.6.1.4.1.19376.1.2.3"
        },
        "code": {
          "value": "All"
        }
      }
    },
    "extension": {
      "url":
"https://sequoiaproject.org/StructureDefinition/Endpoint/main/1.0.0",
      "extension": [
        {
          "url": "Transaction",
          "valueString": {
            "value": "XCPD ITI-55"
          }
        },
        {
          "url": "Actor",
          "valueCodeableConcept": {
            "coding": {
              "system": {
                "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Actor/1.0.0"
              },
              "value": {
                "value": "Responding Gateway"
              }
            }
          }
        }
      ]
    },
    {
      "url": "Version",
      "valueCodeableConcept": {
        "coding": {
          "system": {
            "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Version/1.0.0"
          },
          "value": {
            "value": "2.0"
          }
        }
      }
    }
  ],

```

```

        {
          "url": "UseCases",
          "valueCodeableConcept": {
            "coding": {
              "system": {
                "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/UseCases/1.0.0"
              },
              "value": {
                "value": "QueryBasedDocumentExchange"
              }
            }
          }
        },
        {
          "url": "PurposesOfUse",
          "valueCodeableConcept": {
            "coding": {
              "system": {
                "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/PurposesOfUse/1.0.0"
              },
              "value": {
                "value": "Treatment"
              }
            }
          }
        },
        {
          "url": "Roles",
          "valueCodeableConcept": {
            "coding": {
              "system": {
                "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Roles/1.0.0"
              },
              "value": {
                "value": "All"
              }
            }
          }
        },
        {
          "url": "IPA",
          "valueCodeableConcept": {
            "coding": {
              "system": {
                "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/IPA/1.0.0"
              }
            }
          }
        }
      ]
    }
  },
  {

```

```

"Endpoint": {
  "identifier": [
    {
      "use": {
        "value": "official"
      },
      "type": {
        "value": "HCID"
      },
      "system": {
        "value": "http://www.hl7.org/oid/"
      },
      "value": {
        "value": "urn:oid:1.2.3.4.1"
      }
    },
    {
      "use": {
        "value": "official"
      },
      "type": null,
      "system": {
        "value": "http://www.hl7.org/oid/"
      },
      "value": {
        "value": "urn:oid:1.2.3.4.3"
      }
    }
  ],
  "connectionType": {
    "system": {
      "value": "http://hl7.org/fhir/subscription-channel-type"
    },
    "code": {
      "value": "IHE-XCA"
    }
  },
  "name": {
    "value": "Carequality Query for documents"
  },
  "managingOrganization": null,
  "address": {
    "value": "https://xyz.com/service/query.svc"
  },
  "payloadMimeFormat": {
    "value": "text/xml"
  },
  "payloadType": {
    "coding": {
      "system": {
        "value": "urn:oid:1.3.6.1.4.1.19376.1.2.3"
      },
      "code": {
        "value": "All"
      }
    }
  },
  "extension": {

```

```

        "url":
"https://sequoiaproject.org/StructureDefinition/Endpoint/main/1.0.0",
        "extension": [
            {
                "url": "Transaction",
                "valueString": {
                    "value": "XCA ITI-38"
                }
            },
            {
                "url": "Actor",
                "valueCodeableConcept": {
                    "coding": {
                        "system": {
                            "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Actor/1.0.0"
                        },
                        "value": {
                            "value": "Responding Gateway"
                        }
                    }
                }
            },
            {
                "url": "Version",
                "valueCodeableConcept": {
                    "coding": {
                        "system": {
                            "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Version/1.0.0"
                        },
                        "value": {
                            "value": "2.0"
                        }
                    }
                }
            },
            {
                "url": "UseCases",
                "valueCodeableConcept": {
                    "coding": {
                        "system": {
                            "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/UseCases/1.0.0"
                        },
                        "value": {
                            "value": "QueryBasedDocumentExchange"
                        }
                    }
                }
            },
            {
                "url": "PurposesOfUse",
                "valueCodeableConcept": {
                    "coding": {
                        "system": {
                            "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/PurposesOfUse/1.0.0"

```

```

        },
        "value": {
          "value": "Treatment"
        }
      }
    },
    {
      "url": "Roles",
      "valueCodeableConcept": {
        "coding": {
          "system": {
            "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Roles/1.0.0"
          },
          "value": {
            "value": "All"
          }
        }
      }
    },
    {
      "url": "IPA",
      "valueCodeableConcept": {
        "coding": {
          "system": {
            "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/IPA/1.0.0"
          }
        }
      }
    }
  ]
}
},
{
  "Endpoint": {
    "identifier": [
      {
        "use": {
          "value": "official"
        },
        "type": {
          "value": "HCID"
        },
        "system": {
          "value": "http://www.hl7.org/oid/"
        },
        "value": {
          "value": "urn:oid:1.2.3.4.1"
        }
      },
      {
        "use": {
          "value": "official"
        },
        "type": null,

```

```

        "system": {
          "value": "http://www.hl7.org/oid/"
        },
        "value": {
          "value": "urn:oid:1.2.3.4.3"
        }
      }
    ],
    "connectionType": {
      "system": {
        "value": "http://hl7.org/fhir/subscription-channel-type"
      },
      "code": {
        "value": "IHE-XCA"
      }
    },
    "name": {
      "value": "Carequality Retrieve documents"
    },
    "managingOrganization": null,
    "address": {
      "value": "https://xyz.com/service/retrieve-mtom.svc"
    },
    "payloadMimeType": {
      "value": "text/xml"
    },
    "payloadType": {
      "coding": {
        "system": {
          "value": "urn:oid:1.3.6.1.4.1.19376.1.2.3"
        },
        "code": {
          "value": "All"
        }
      }
    },
    "extension": {
      "url":
"https://sequoiaproject.org/StructureDefinition/Endpoint/main/1.0.0",
      "extension": [
        {
          "url": "Transaction",
          "valueString": {
            "value": "XCA ITI-39"
          }
        },
        {
          "url": "Actor",
          "valueCodeableConcept": {
            "coding": {
              "system": {
                "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Actor/1.0.0"
              },
              "value": {
                "value": "Responding Gateway"
              }
            }
          }
        }
      ]
    }
  }

```



```

    }
  },
  {
    "url": "Version",
    "valueCodeableConcept": {
      "coding": {
        "system": {
          "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Version/1.0.0"
        },
        "value": {
          "value": "2.0"
        }
      }
    }
  },
  {
    "url": "UseCases",
    "valueCodeableConcept": {
      "coding": {
        "system": {
          "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/UseCases/1.0.0"
        },
        "value": {
          "value": "QueryBasedDocumentExchange"
        }
      }
    }
  },
  {
    "url": "PurposesOfUse",
    "valueCodeableConcept": {
      "coding": {
        "system": {
          "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/PurposesOfUse/1.0.0"
        },
        "value": {
          "value": "Treatment"
        }
      }
    }
  },
  {
    "url": "Roles",
    "valueCodeableConcept": {
      "coding": {
        "system": {
          "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/Roles/1.0.0"
        },
        "value": {
          "value": "All"
        }
      }
    }
  }
},

```

```

    {
      "url": "IPA",
      "valueCodeableConcept": {
        "coding": {
          "system": {
            "value":
"https://sequoiaproject.org/StructureDefinition/Endpoint/IPA/1.0.0"
          }
        }
      }
    }
  ]
}

```

15. DIRECTORY DOCUMENT SEMANTICS

The directory document is returned following the current version of the Argonaut Provider Directory work group, as of this writing. Below is an annotated example documenting key aspects of the structure.

```

<?xml version="1.0"?>
<Bundle xmlns="http://hl7.org/fhir">
  <id value="70f78821-bd90-0134-f350-152dc5587e3b"/>
  <meta>
    <lastUpdated value="2017-01-15T20:38:05+00:00"/>
  </meta>
  <type value="searchset"/>
  <total value="1"/>
  <link>
    <relation value="self"/>
    <url value="http://52.26.91.242:80//Organization?_format=xml"/>
  </link>
  <entry>
    <fullUrl value="http://52.26.91.242:80//Organization/Organization-1"/>
    <resource>
      <Organization>
        <id value="Organization-1"/>
        <meta/>
        <versionId value="1"/>
        <lastUpdated value="2017-01-15T20:38:05+00:00"/>
        <identifier>
          <use value="official"/>
          <system value="http://www.hl7.org/oid"/>
          <value value="1.2.3.4.1"/>

```

These values change each time the bundle is updated and can help client software detect new content.

Start of Organization resource.

```

</identifier>
<identifier>
  <use value="official"/>
  <type>
    <coding>
      <system value="http://hl7.org/fhir/v2/0203"/>
      <code value="PRN"/>
      <display value="Provider number"/>
    </coding>
    <text value="US National Provider Identifier"/>
  </type>
  <system value="http://hl7.org/fhir/sid/us-npi"/>
  <value value="999999991"/>
</identifier>
<identifier>
  <use value="official"/>
  <type>
    <coding>
      <system value="http://hl7.org/fhir/v2/0203"/>
      <code value="TAX"/>
      <display value="Tax ID number"/>
    </coding>
    <text value="US Employer Identification Number"/>
  </type>
  <system value="http://hl7.org/fhir/sid/us-tax"/>
  <value value="000000001"/>
</identifier>
<active value="true"/>
<name value="State Datahub"/>
<telecom>
  <system value="phone"/>
  <value value="(734) 555-6282"/>
  <use value="work"/>
</telecom>
<address>
  <line value="818 N German Avenue"/>
  <city value="Belleville"/>
  <district value="Wayne County"/>
  <state value="MI"/>
  <postalCode value="48111"/>
</address>
<contained>
  <Endpoint>
    <id value="ep-1"/>
    <status value="active"/>
    <name value="Saint Luke's Hospital of Kansas City"/>
    <managingOrganization>
      <reference value="Organization/393872"/>
    </managingOrganization>
    <connectionType>
      <system value="http://hl7.org/fhir/subscription-channel-type"/>
      <code value="email"/>
    </connectionType>
    <address value="mailto:stluke101@operations.cernerdirect.com"/>
    <payloadFormat value="CDA"/>
    <payloadType>
      <coding>
        <system value="urn:oid:1.3.6.1.4.1.19376.1.2.3"/>
      </coding>
    </payloadType>
  </Endpoint>
</contained>

```

Start of a contained Endpoint resource.

```

        <code value="urn:ihe:pcc:xphr:2007"/>
        <display value="HL7 CCD Document"/>
    </coding>
</payloadType>
<payloadType>
    <coding>
        <system value="urn:oid:1.3.6.1.4.1.19376.1.2.3"/>
        <code value="urn:ihe:pcc:xds-ms:2007"/>
        <display value="XDS Medical Summaries"/>
    </coding>
</payloadType>
<payloadType>
    <coding>
        <system value="urn:oid:1.3.6.1.4.1.19376.1.2.3"/>
        <code value="urn:hl7-org:sdwg:ccda-structuredBody:1.1"/>
        <display value="C-CDA constraints using a structured body"/>
    </coding>
</payloadType>
<payloadType>
    <coding>
        <system value="urn:oid:1.3.6.1.4.1.19376.1.2.3"/>
        <code value="urn:hl7-org:sdwg:ccda-nonXMLBody:1.1"/>
        <display value="C-CDA constraints using a non structured body."/>
    </coding>
</payloadType>
</Endpoint>
</contained>
</Organization>
<search>
    <mode value="match"/>
</search>
</resource>
</entry>
</Bundle>

```

1.1.1 Value Sets

1.1.1.1 Bundle/entry/resource/Organization/contained/Endpoint/connectionType

Code	Display	Definition
ihe-xcpd	IHE XCPD	IHE Cross Community Patient Discovery Profile (XCPD) - http://wiki.ihe.net/index.php/Cross-Community_Patient_Discovery
ihe-xca	IHE XCA	IHE Cross Community Access Profile (XCA) - http://wiki.ihe.net/index.php/Cross-Community_Access

ihe-xdr	IHE XDR	IHE Cross-Enterprise Document Reliable Exchange (XDR) - http://wiki.ihe.net/index.php/Cross-enterprise_Document_Reliable_Interchange
ihe-xds	IHE XDS	IHE Cross-Enterprise Document Sharing (XDS) - http://wiki.ihe.net/index.php/Cross-Enterprise_Document_Sharing
ihe-iid	IHE IID	IHE Invoke Image Display (IID) - http://wiki.ihe.net/index.php/Invoke_Image_Display
dicom-wado-rs	DICOM WADO-RS	DICOMweb RESTful Image Retrieve - http://dicom.nema.org/medical/dicom/current/output/chtml/part18/sect_6.5.html
dicom-qido-rs	DICOM QIDO-RS	DICOMweb RESTful Image query - http://dicom.nema.org/medical/dicom/current/output/chtml/part18/sect_6.7.html
dicom-stow-rs	DICOM STOW-RS	DICOMweb RESTful image sending and storage - http://dicom.nema.org/medical/dicom/current/output/chtml/part18/sect_6.6.html
dicom-wado-uri	DICOM WADO-URI	DICOMweb Image Retrieve - http://dicom.nema.org/dicom/2013/output/chtml/part18/sect_6.3.html
hl7-fhir-rest	HL7 FHIR	Interact with the server interface using FHIR's RESTful interface. For details on its version/capabilities you should connect the the value in Endpoint.address and retrieve the FHIR CapabilityStatement.
hl7-fhir-msg	HL7 FHIR Messaging	Use the servers FHIR Messaging interface. Details can be found on the messaging.html page in the FHIR Specification. The FHIR server's base address is specified in the Endpoint.address property.
hl7v2-mllp	HL7 v2 MLLP	HL7v2 messages over an LLP TCP connection

secure-email	Secure email	Email delivery using a digital certificate to encrypt the content using the public key, receiver must have the private key to decrypt the content
direct-project	Direct Project	Direct Project information http://build.fhir.org/valueset-endpoint-connection-type.html

1.1.1.2 *Bundle/entry/resource/Organization/contained/Endpoint/connectionType*

<http://build.fhir.org/valueset-endpoint-status.html>

Code	Display	Definition
active	Active	This endpoint is expected to be active and can be used
suspended	Suspended	This endpoint is temporarily unavailable
error	Error	This endpoint has exceeded connectivity thresholds and is considered in an error state and should no longer be attempted to connect to until corrective action is taken
off	Off	This endpoint is no longer to be used
entered-in-error	Entered in error	This instance should not have been part of this patient's medical record.
test	Test	This endpoint is not intended for production usage.

1.1.1.3 *Bundle/entry/resource/Organization/contained/Endpoint/payloadType*

<http://build.fhir.org/valueset-endpoint-payload-type.html>

This value set includes codes from the following code systems:

Include all codes defined in <http://hl7.org/fhir/endpoint-payload-type>

Include these codes as defined in urn:oid:1.3.6.1.4.1.19376.1.2.3

Code	Display
urn:ihe:pcc:handp:2008	History and Physical Specification
urn:ihe:pcc:xphr:2007	HL7 CCD Document
urn:ihe:pcc:aps:2007	IHE Antepartum Summary
urn:ihe:pcc:xds-ms:2007	XDS Medical Summaries
urn:ihe:pcc:xphr:2007	Personal Health Records
urn:ihe:pcc:edr:2007	Emergency Department Referral (EDR)
urn:ihe:pcc:edes:2007	Emergency Department Encounter Summary (EDES)
urn:ihe:pcc:apr:handp:2008	Antepartum Record (APR) - History and Physical
urn:ihe:pcc:apr:lab:2008	Antepartum Record (APR) - Laboratory
urn:ihe:pcc:apr:edu:2008	Antepartum Record (APR) - Education
urn:ihe:pcc:irc:2008	Immunization Registry Content (IRC)
urn:ihe:pcc:crc:2008	Cancer Registry Content (CRC)
urn:ihe:pcc:cm:2008	Care Management (CM)
urn:ihe:pcc:ic:2009	Immunization Content (IC)
urn:ihe:pcc:tn:2007	PCC TN
urn:ihe:pcc:nn:2007	PCC NN
urn:ihe:pcc:ctn:2007	PCC CTN

urn:ihe:pcc:edpn:2007	PCC EDPN
urn:ihe:pcc:hp:2008	PCC HP
urn:ihe:pcc:ldhp:2009	PCC LDHP
urn:ihe:pcc:lds:2009	PCC LDS
urn:ihe:pcc:mds:2009	PCC MDS
urn:ihe:pcc:nds:2010	PCC NDS
urn:ihe:pcc:ppvs:2010	PCC PPVS
urn:ihe:pcc:trs:2011	PCC TRS
urn:ihe:pcc:ets:2011	PCC ETS
urn:ihe:pcc:its:2011	PCC ITS
urn:ihe:iti:bppc:2007	Basic Patient Privacy Consents
urn:ihe:iti:bppc-sd:2007	Basic Patient Privacy Consents with Scanned Document
urn:ihe:iti:xdw:2011:workflowDoc	XDW Workflow Document
urn:ihe:iti:dsg:detached:2014	DSG Detached Document
urn:ihe:iti:dsg:enveloping:2014	DSG Enveloping Document
urn:ihe:iti:xds-sd:pdf:2008	PDF embedded in CDA per XDS-SD profile
urn:ihe:iti:xds-sd:text:2008	Text embedded in CDA per XDS-SD profile
urn:ihe:lab:xd-lab:2008	CDA Laboratory Report
urn:ihe:rad:TEXT	Radiology XDS-I Text
urn:ihe:rad:PDF	Radiology XDS-I PDF

urn:ihe:rad:CDA:ImagingReportStructuredHeadings:2013	Radiology XDS-I Structured CDA
urn:ihe:card:imaging:2011	Cardiac Imaging Report
urn:ihe:card:CRC:2012	Cardiology CRC
urn:ihe:card:EPRC-IE:2014	Cardiology EPRC-IE
urn:ihe:dent:TEXT	Dental Text
urn:ihe:dent:PDF	Dental PDF
urn:ihe:dent:CDA:ImagingReportStructuredHeadings:2013	Dental CDA
urn:ihe:pat:apsr:all:2010	Anatomic Pathology Structured Report All
urn:ihe:pat:apsr:cancer:all:2010	Anatomic Pathology Structured Report Cancer All
urn:ihe:pat:apsr:cancer:breast:2010	Anatomic Pathology Structured Report Cancer Breast
urn:ihe:pat:apsr:cancer:colon:2010	Anatomic Pathology Structured Report Cancer Colon
urn:ihe:pat:apsr:cancer:prostate:2010	Anatomic Pathology Structured Report Cancer Prostate
urn:ihe:pat:apsr:cancer:thyroid:2010	Anatomic Pathology Structured Report Cancer Thyroid
urn:ihe:pat:apsr:cancer:lung:2010	Anatomic Pathology Structured Report Cancer Lung
urn:ihe:pat:apsr:cancer:skin:2010	Anatomic Pathology Structured Report Cancer Skin
urn:ihe:pat:apsr:cancer:kidney:2010	Anatomic Pathology Structured Report Cancer Kidney

urn:ihe:pat:apsr:cancer:cervix:2010	Anatomic Pathology Structured Report Cancer Cervix
urn:ihe:pat:apsr:cancer:endometrium:2010	Anatomic Pathology Structured Report Cancer Endometrium
urn:ihe:pat:apsr:cancer:ovary:2010	Anatomic Pathology Structured Report Cancer Ovary
urn:ihe:pat:apsr:cancer:esophagus: 2010	Anatomic Pathology Structured Report Cancer Esophagus
urn:ihe:pat:apsr:cancer:stomach: 2010	Anatomic Pathology Structured Report Cancer Stomach
urn:ihe:pat:apsr:cancer:liver:2010	Anatomic Pathology Structured Report Cancer Liver
urn:ihe:pat:apsr:cancer:pancreas: 2010	Anatomic Pathology Structured Report Cancer Pancreas
urn:ihe:pat:apsr:cancer:testis:2010	Anatomic Pathology Structured Report Cancer Testis
urn:ihe:pat:apsr:cancer:urinary_bladder:2010	Anatomic Pathology Structured Report Cancer Urinary Bladder
urn:ihe:pat:apsr:cancer:lip_oral_cavity:2010	Anatomic Pathology Structured Report Cancer Lip Oral Cavity
urn:ihe:pat:apsr:cancer:pharynx:2010	Anatomic Pathology Structured Report Cancer Pharynx
urn:ihe:pat:apsr:cancer:salivary_gland:2010	Anatomic Pathology Structured Report Cancer Salivary Gland
urn:ihe:pat:apsr:cancer:larynx:2010	Anatomic Pathology Structured Report Cancer Larynx
urn:ihe:pharm:pre:2010	Pharmacy Pre

urn:ihe:pharm:padv:2010	Pharmacy PADV
urn:ihe:pharm:dis:2010	Pharmacy DIS
urn:ihe:pharm:pml:2013	Pharmacy PML
urn:hl7-org:sdwg:ccda-structuredBody:1.1	For documents following C-CDA constraints using a structured body.
urn:hl7-org:sdwg:ccda-nonXMLBody:1.1	For documents following C-CDA constraints using a non structured body.

1.1.1.4 Carequality Policy Assertions

Proposed addition: We propose adding a new EndPoint data element indicating if the described Initiating Gateway supports sending policy assertions or not. If the Initiating Gateway supports sending the Carequality policy assertion statements (as per the Carequality Implementation Guide), then the Bundle/entry/resource/Organization/contained/Endpoint/payloadType Healthcare Directory will contain one or more of the following values:

This value is mandatory and may not be left empty or missing in the Healthcare Directory.

Data Value	Description	Comments
InitiateSendAssertNone	The Initiating Gateway does not send Carequality policy assertions.	The Initiating Gateway will not send Carequality assertions and will silently fail to parse responses with Carequality Policy assertion data.
InitiateSendAssertSome	The Initiating Gateway can send Carequality policy assertions, but may not send an assertion in all cases.	An assertion will be sent if the Initiating Gateway determines that it is appropriate. In some cases the assertion will not be sent, such as if the Initiating

		Gateway does not have a policy assertion.
InitiateSendAssertAll	The Initiating Gateway can send Carequality policy assertions, and will send an assertion in all cases.	A populated assertion data element will be sent if the Initiating Gateway determines that it is appropriate. In some cases the assertion cannot be populated and, in this case, will be sent as an empty assertion data element.
InitiateReceiveAssertNone	The Initiating Gateway has no awareness of responses to it that contain Carequality policy assertions.	Responses to the Initiating Gateway that contain Carequality policy assertions will not result in syntax parsing errors by the Initiating Gateway, and will be ignored by the Initiating Gateway.

On the Responding Gateway side, the responder gateway EndPoint description in the Healthcare Directory must populate Bundle/entry/resource/Organization/contained/Endpoint/payloadType with one or more of the following values:

Data Value	Description	Comments
RespondSendAssertNone	The Responding Gateway does not send Carequality policy assertion information in the response.	
RespondSendAssertSome	The Responding Gateway can send Carequality policy assertions in the response,	

	but may not send an assertion response in all cases.	
RespondSendAssertAll	The Responding Gateway can send Carequality policy assertions in responses, and will send an assertion in responses in all cases.	

16. EHEALTH EXCHANGE AND CAREQUALITY HEALTHCARE DIRECTORY DIFFERENCES

Separate Healthcare Directory PROD environments are maintained for the Carequality Directory and for the eHealth Exchange directory. The DEV and VAL environments are identical across those two initiatives.

17. SUMMARY/NEXT STEPS

This document covers what The Sequoia Project believes is the minimal information necessary to successfully understand the approach and connect to the Sequoia Project Healthcare Directory environments. The Sequoia Project will endeavor to maintain the directory with a high degree of stability with respect to the structure of the entries and the processing model until FHIR matures. FHIR has many additional capabilities that are not considered to be important, at this time, for Sequoia Project initiatives, including queries, historical version retrieval, and more. The Sequoia Project welcomes feedback on additional capabilities that may help participants use the directory more effectively. Any subsequent changes to the directory will be implemented in a backward compatible manner, if possible.

Sequoia Project staff are available to assist to a limited extent for organizations needing additional information about the directory.

18. FAQ

Question 1: Will the Sequoia Project directory change as FHIR evolves?

Answer: The Sequoia Project is seeking to maintain the directory, largely as is, until FHIR reaches final ballot status as a full standard. We do not, at this time, anticipate changing the Sequoia directory to maintain lock-step with the FHIR standard as it evolves, until the standard is complete. This approach is intended to provide a high degree of stability for client software packages, and to avoid the associated effort involved with an ever-changing environment.

Question 2: Does my organization need an API key to access the Healthcare Directory?

Answer: Yes. The API key helps The Sequoia Project efficiently, and securely, manage the directory for the benefit of all clients.

Question 3: Will my organization be able to publish to the Sequoia Project Healthcare Directory using the API?

Answer: If your organization is interested in this capability, please provide feedback to The Sequoia Project expressing interest, and the anticipated value to your organization, for this capability.

Question 4: Can client software retrieve individual organizations?

Answer: Not at this time. But please let The Sequoia Project know if this capability is important to you and what use cases drive this requirement.

Question 5: Can client software use FHIR query parameters?

Answer: Not at this time. But please let The Sequoia Project know if this capability is important to you and what use cases drive this requirement.

Question 6: What is the directory technology stack?

Answer: The Sequoia Project Healthcare Directory is based on original Sequoia Project source code, written in Ruby, using the Sinatra framework, a purpose-built in-memory database. We considered existing solutions and rejected each due to bloated capabilities, performance, production quality robustness, and lag time in implementing the Argonaut structure as enhanced by The Sequoia Project.

Question 7: Does the Sequoia Project directory support federation?

Answer: In theory it should support federation. But a use case has not been advanced at this time requiring such, thus this is untested functionality.

Question 8: Does the directory contain patients or physicians?

Answer: No. At this time the directory only contains organizations, contacts at those organizations, and relationships between organizations. The current directory maintains two levels of depth. For the eHealth Exchange, the directory contains Participants, and optionally sub-participants. For Carequality, the directory contains Implementers and Connections. In the future, the directory may contain more information, as driven by approved use cases.

19. REFERENCES

- ▶ Argonaut Project:
http://argonautwiki.hl7.org/index.php?title=Implementation_Guide#Provider_Directory
- ▶ HL7 STU3:
<http://hl7.org/fhir/2017Jan/index.html>
- ▶ The Sequoia Project
<http://sequoiaproject.org>

20. DOCUMENT CHANGE CONTROL

Version	Date	Contributors	Description
1.0 DRAFT	2017-02-01	Author: Eric Heflin Reviewers: Theresa Wiebold, Dawn Van Dyke, Didi Davis, Matt Blackmon	Initial release.
1.01 DRAFT	2017-04-12	Author Eric Heflin	Added new element indicating if a given Initiating Gateway or Responding Gateway

			supports policy assertions. Added value set definitions in section 14.
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