FRED API Specification

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# Document Information

## Document Revision History

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| **Author** | **Version** | **Date** | **Rationale** |
| Mohawk College | 0.1 | 19-NOV-2012 | Initial Version |
| Mohawk College | 0.8 | 13-DEC-2012 | First draft for review |
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## Related Documents

This document relies on or references the following documents

|  |  |  |
| --- | --- | --- |
| **Name** | **Url** | **Relation** |
| Collaborative Health Platform | <http://tinyurl.com/c4zhyru> | High level system description / role description. |
| FRED API Docs | <http://tinyurl.com/bufahoz> | API Specifications v1.0 Proposed Draft |
| JSON Spec | <http://tools.ietf.org/html/rfc4627> | IETF JSON Specification |
| HTTP 1.1 Spec | <http://tools.ietf.org/html/rfc2616> | IETF HTTP Specification |
| HTTP Authentication Spec | <http://tools.ietf.org/html/rfc2617> | IETF HTTP Authentication |
| HTTP over TLS Spec | <http://tools.ietf.org/html/rfc2818> | IETF HTTP over TLS |

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# Introduction

## Overview of the FRED API

The FRED API represents a series of core functionalities (operations, data elements, etc.) which are intended to make facility registry implementations consistent at a wire level. The FRED API specification can be likened to the design of the Edison screw, it doesn’t prescribe what the bulb (the user experience) looks like, or what functionality the bulb provides, it merely identifies how the bulb interfaces with the electricity system.

The FRED API represents a basic operational contract. It is the expectation that if implementers follow this minimalist contract, clients and services can interoperate with minimal modification at the wire level. The FRED specification balances behavioral, syntactical and semantic contracts while still allowing variances within deployments/implementations to suit the needs to individual jurisdictions and user groups.

### Versioning of the FRED API Specification

All FRED API specifications published by the FRED team are assigned a unique version number in the format ***MAJOR.MINOR.REVISION***. These version numbers follow a semantic versioning pattern whereby:

1. ***REVISION*** is incremented for revisions to a ***MINOR*** version. These changes represent nonfunctional changes to the API.
2. ***MINOR*** version numbers are incremented when new functionality is introduced which is backwards compatible with existing functionality in the ***MAJOR*** version. ***MINOR*** versions numbers are semantically compatible with previous ***MINOR*** versions.
3. ***MAJOR*** version numbers are incremented when new functionality is introduced which is semantically incompatible with previous versions.

For example, a service implementing FRED API spec 1.1.0 can be consumed by clients implemented against the 1.0.0 version of the specification. A client implementing version 1.2.0 of the FRED API specification may consume services from registries implementing the 1.1.0 or 1.0.0 version of the API, however would not be capable of consuming 2.0.0 services.

## Definitions

1. “CHP” is used to describe the actors, transactions and roles described in the Collaborative Health Platform document released on the HUB in December 2011.
2. “Client” describes a consumer of health care services and it most often interchangeable with “patient”
3. “Facility” describes a logical place or point of care where health services are provided to clients.
4. “System” describes the overall health infrastructure, its components, interactions and actors. This term is often used to describe the overall health infrastructure in which the facility registry will operate
5. “Actor” is used to describe a series of responsibilities that a consumer or provider application must provide in order to participate in a clinical act. This term is interchangeable with “role” used in the CHP document.
6. “API” is used to describe an application programming interface which allows FRED Consumers to consume the services offered by the FRED Provider. It is the concrete data models and operations executed, at runtime, against application acting in the FRED Provider role.
7. “HIX” is a term used in the CHP document to describe a centralized health information exchange, and is used in this document in an informative manner.

## Purpose

This document seeks to describe the FRED interfaces at a wire level. It provides sufficient information for analysts, architects and systems integrators to decipher the behavioral and structural characteristics of compliant FRED facilities registries and consumers.

Neither this document nor the FRED API in general is intended to prescribe internal logic or data models for complaint systems (though there is an implied data model). Compliant systems may vary widely in their user interfaces or internal data models while still implementing the FRED specification.

## Collaborative Health Platform

This document is specifies both abstract data elements and concrete API definitions required for applications to maintain facility registry data. This functionality is a very close map to the abstract Facility Registry Service Supplier (ROL05) and Facility Registry Service Consumer (ROL06) roles defined in the CHP document.

This specification does not assume a full CHP infrastructure has been put in place, and has been specified to operate as a standalone service, or as part of a larger HIX. The specification will make reference to the CHP roles and interactions found between l. 535 (p. 24) and l. 635 (p. 27) of the CHP document.

# Reading this Document

This document will use several types of diagrams to illustrate how the actors within the system interact with one another. Where possible, this verbiage is aligned with the CHP roles/transactions, and many of the diagrams are common with the CHP framework document.

## Communications Diagrams

Communications diagrams are used to illustrate (at a high level) how consumer and provider roles interact with one another. Figure 1 illustrates a sample communication diagram whereby a consumer interacts with the service by executing transaction.



Figure - Sample communications diagram

It is important to note that these communications diagrams have no implied order; they are simply used to show what needs to be sent/received by the actors.

## Diagrams

All models are illustrated using schema visualizations. This format was chosen because at the time of this writing there are no formal, standardized ways to represent JSON data contracts.

As an example; the JSON object represented in Figure 2, would be visualized as Figure 3.

"identity" : {

"agency" : "foo",

"context" : "foo",

"id" : "foo",

"nonStandardElement" : false

}

Figure - Sample JSON structure

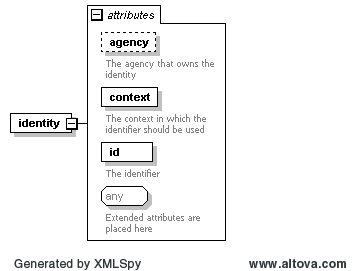


Figure - Sample model structure diagram

# FRED Transactions

All FRED transactions are RESTful operations against a collection of facility resources. All operations are performed against the facility resource which is further defined in “Facility Resource”. Any operation that deviates from or restricts the facility resource will declare these modifications in the message semantics section.

## Communication via HTTP

All actors which communicate with the facility registry must implement the HTTP transport (FRED transaction 1) as described in this section. Many standard stacks implement the HTTP transport itself, this section’s aim is not to specify HTTP, rather to constrain the meaning of HTTP aspects to facilitate interoperability between FRED actors.

### Scope

This transaction is global in scope. All actors must implement the “communicate via HTTP” transaction. Figure 4 illustrates the actors involved in this transaction.



Figure 4 - Actors communicating via HTTP

### Open Data Formats / Standards Referenced

This transaction makes use of the following standards:

* IETF RFC 2616 (HTTP 1.1)
* IETF RFC 4627 (JSON)

### Interactions

FRED implementers are expected to support the HTTP interactions described in Figure 5.



Figure 5 - HTTP interactions between FRED actors

All communications between actors MUST be performed over HTTP 1.1 and MUST use the appropriate HTTP headers as specified in RFC 2616.

### Triggering Events

All communications MUST be solicited from a data source or consumer to the facility registry. The facility registry MUST NOT assume that a consumer/data source is capable of processing HTTP request messages.

#### POST

In the scope of the FRED registry API, the HTTP POST verb is reserved for any operation whereby a data source wishes to create a discrete record on the facility registry. In all cases a POST will never update information on the facility registry.

A facility registry MUST respond to HTTP POST messages using one of the codes listed in Table 1.

#### PUT

The HTTP PUT verb in the scope of the FRED registry API is reserved for any operation whereby a data source wishes to update an already existing record in the facility registry. In all cases PUT operations will fail whenever the requested resource does not exist.

A facility registry MUST respond to HTTP PUT messages using one of the codes listed in Table 1.

#### DELETE

In the FRED API, the HTTP DELETE verb is reserved for operations whereby data is removed or obsoleted from the registry. In all cases DELETE operations will fail whenever the requested resource does not point to a discrete record in the facility registry.

A facility registry MUST respond to HTTP DELETE messages using one of the codes listed in Table 1.

#### GET

HTTP GET is reserved from any operation that retrieves data from the facility registry. The GET verb MUST NOT modify any data in the facility registry and is considered a read only operation. GET operations against a collection MUST result in a query, returning zero or more matching results, whereas GET operations performed against a single resource MUST return zero or one results.

### Response Messages

All operations executed against the facility registry will result in an HTTP response containing one of the codes listed in Table 1. Implementers MUST be capable of generating/interpreting all error codes marked R for the specified trigger event.

Table 1 – HTTP response codes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Code** | **Name** | **Opt** | **Scope** | **Trigger** |
| 200 | OK | R | All | Indicates that the specified action was successfully completed. A 200 response indicates that the registry did successfully perform the operation and the response contains the final result of the action. |
| 401 | Unauthorized | R | All | Raised when the client attempts to perform an operation against a resource which requires authorization. This error code indicates a challenge for client credentials. |
| 403 | Forbidden | R | All | Indicates that the client does not have the necessary permission to perform the specified operation against the requested resource. |
| 404 | Not Found | R | GET | Indicates that a resource was not found or is not available. |
| 405 | Not Allowed | R | All | Indicates that the requested operation is not allowed on the current resource (for example: DELETE on a collection) |
| 409 | Conflict | R | POST | Indicates that the facility registry has detected a conflict in the operation and has refused to perform the operation. |
| 410 | Gone | O | GET | Indicates that a resource did exist but has been permanently removed. |
| 415 | Unsupported Media Type | O | POST, PUT | Indicates that the content supplied in the request is not supported by the facility registry. |
| 422 | Invalid | R | POST, PUT | Indicates that the request is not well-formed, is missing data, or is semantically invalid and could not be processed by the facility registry. |
| 500 | Internal Server Error | R | All | Indicates that the server encountered an error while attempting to execute the desired action. |

Facility registries MAY provide detailed, structured error messages in JSON format to any client which has executed an operation resulting in an error. If implemented, the facility registry MUST use the structure illustrated in Figure 6.

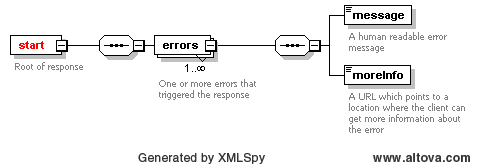


Figure 6 - Error message structure

Facility registries MAY leverage GZIP compression for response messages. When GZIP encoding is implemented, the registry MUST only apply GZIP compression when solicitors indicate support for decompression via the “Accept-Encoding” HTTP header.

Facility registry implementers MAY choose to leverage the HTTP headers “ETag” and/or “Cache-Control” if it is deemed necessary in the operating environment.

#### Examples

Figure 7 illustrates a sample response whereby the facility registry has determined the request to register a facility is invalid because of missing “name” and “coordinates” properties.

HTTP/1.1 422 INVALID

Content-Type: application/json

Date: Thu, 29 Nov 2012 15:36:56 GMT

Content-Length: XXX

Cache-Control: no-cache

{

"errors" : [

{

"message" : "Facility missing name",

"moreInfo" : "http://api.facilityregistry.org/errors/12345"

},

{

"message" : "Facility missing coordinates",

"moreInfo" : "http://api.facilityregistry.org/errors/32143"

}

]

}

Figure 7 - Sample error response

### URLs

Facility registries MUST expose all FRED functionality for semantically compatible versions of the FRED API specification at one or more base urls. This specification does not prescribe the base URL for FRED resources, however all facility registry base URLs:

* MUST identify which FRED specification (version) is implemented. This MAY be directly expressed in the URL (for example “v1.0”) or may be a semantic reference to the FRED API (for example if MOH has a spec labeled r2013 which leverages FRED 1.0 they may use r2013 in the URL)
* MUST NOT contain “facilities” as the last path portion on the URL
* Base URLs MUST be treated as permalinks. Once published, the base URL for that FRED version MUST NOT change (i.e. http://a.com/v1 will always point to v1)
* One base URL MAY expose resources using any version of the FRED specification that is semantically compatible with reported version (for example /v1 can be used to expose the most recent version of the 1.x FRED spec but cannot be used to expose 2.x FRED resources). For more information about FRED API versioning see “3.1.1 Versioning of the FRED API Specification” on page 4.

Examples of valid base URLs are:

* http://facilities.net/api/fred/1.0
* http://facilities.gov.ab/api/v1
* https://secure.facilities.org/api/fred/20130101
* http://v1.api.facility.org/

Examples of invalid base URLs are:

* http://facilities.net/fred (Does not expose the FRED version)
* http://facilities.net/api/fred/v1/v2 (Conflicting version numbers)
* http://facilities.net/api/fred/v1andv2 (Two semantically incompatible versions on the same base URL)

## Authenticate User / Secure Node

Facility registry implementers may choose to restrict access to certain functionality within their deployment of FRED services. The authenticate user / secure node (FRED transaction 2) provides a simple mechanism for attaining this functionality.

Implementers of facility registries MUST provide a mechanism for users to configure their facility registry to operate in a secured environment using TLS. Furthermore, facility registries MUST provide a mechanism of restricting access to portions of functionality using HTTP Basic Authentication.

All soliciting systems MUST be capable of connecting to facility registries which require secure communications via TLS and must be capable of performing appropriate user authentication when challenged by the facility registry (via the HTTP 401 response code).

### Scope

This transaction is global in scope. All actors must be capable of performing transaction. Figure 4 illustrates the actors involved in this transaction.



Figure 8 - Actors communicating via HTTP

### Open Data Formats / Standards Referenced

This transaction makes use of the following standards:

* IETF RFC 2617 (HTTP Authentication)
* IETF RFC 2818 (HTTP over TLS)

## Record and Maintain Facility Data

The record and maintain facility data transaction (FRED transaction 3) describes the processes under which a facility data source notifies the facility repository when new facilities are registered, or updated. This transaction fulfills FR03 (Register Facility) and FR05 (Update Facility) interactions identified in the CHP framework.

### Scope

The actors that are involved in this transaction are illustrated in Figure 9.



Figure – Record and maintain facility data actors

|  |  |
| --- | --- |
| **Actor** | **Purpose** |
| Facility Registry | Services facility data for an organization or jurisdiction. Responsible for the maintenance of that data over a long period of time and making that data available to other applications. |
| Facility Data Source | An application which is capable of generating or updating facility data. This application may provide a user interface for editing of facility details or may simply be an export function of a legacy system. |

### Open Data Formats / Standards Referenced

This transaction makes use of the following standards:

* IETF RFC2616 (HTTP 1.1)
* IETF RFC4627 (JSON)
* ISO 8601 (Date/Time Format)

### Interactions

Figure 10 illustrates the sequence of messaging between the Facility Data Source (FRED\_SRC) actor and Facility Registry (FRED\_REG).



Figure - Record and Maintain facility interactions

### Triggering Events

The facility data source will execute one of register facility or update facility events against the facility registry.

#### Register Facility

When a new facility has been added to the facility data source or when the facility data source deems it appropriate to share a facility it has not previously shared with a facility registry, it will notify the facility registry of this addition using the record facility transaction.

Changes to an existing record on the facility data source will trigger a revise facility action.

##### Message Semantics

**HTTP Method:** POST  
**Resource:** {base}/facilities  
**Content Type:** application/json  
Facility data sources MUST submit a JSON encoded facility resource as the payload of the HTTP message. All data sources MUST send the content-type header “application/json” which describes the type of data conveyed in the payload. If the data source supplies a content-type header which the registry does not support, the facility registry MUST respond with an HTTP 415.

###### “url” / “id” Element Restrictions

The “url” and “id” elements of the facility resource MUST NOT carry a value on the register facility request as this value is to be populated by the facility registry.

###### “createdAt” / “updatedAt” Element Restrictions

The “createdAt” and “updateAt” elements of the facility resource MUST NOT carry a value on the register facility request as these values are to be populated by the facility registry.

##### Examples

Figure 11 illustrates a sample request to create a facility named “Good Health Hospital”.

POST [http://example.com/api/fred/1.1/facilities HTTP/1.1](http://example.com/api/fred/1.1/facilities%20HTTP/1.1)

Content-Type: application/json

Host: [example.com](http://www.example.com)

Content-Length: XXX

{

"name" : "Good Health Hospital",

"active" : true,

"coordinates" : [ 1.69172, 29.52505 ],

"identifiers" : [

{

"agency" : "MOH",

"context" : "HR",

"id" : "20294"

},

{

"agency" : "UNICEF",

"context" : "DHIS",

"id" : "58845858"

}

],

}

Figure - Sample register facility operation

##### Expected Behavior

When the facility registry receives a request to register a facility, the facility registry will first check its current datastore to determine if an existing facility already exists. The matching algorithm used by the facility registry is not specified in this document and should be whatever algorithm is deemed appropriate for the deployment environment of the facility registry.

Depending on the outcome of the match one of two actions are to be taken by the facility registry:

1. If the facility registry determines that the facility has already been registered, it MUST return an HTTP 409 error signaling to the data source that the record already exists. The method by which the facility registry determines duplicate registrations is not specified in this document.
2. If the facility registry finds no matching facilities on file it will create the entry.

The facility registry MUST generate a universally unique identifier for all facilities which it registers, and MUST make this identifier available via the “id” element. The type of identifier generated is not specified in this document however it MAY be represented using a URI syntax and MUST be universally unique.

After the facility registry has completed its write operation, it MUST make the facility data available to consumers and MUST respond with an HTTP 200 code with the URL of the newly created facility in the format “{base}/facilities/{id}”. The facility registry MUST NOT allow updates or queries on facility records unless the write operation has been completed for the entire facility entry (partial data MUST NOT be disclosed or available for update).

#### Revise Facility

When a facility registration record changes in the facility data source’s datastore, it will notify the facility registry of this change using the revise facility operation.

##### Message Semantics

**HTTP Method:** PUT  
**Resource:** {base}/facilities/{id}  
**Content Type:** application/json  
Facility data sources MUST submit a JSON encoded facility resource as the payload of the HTTP message. All data sources MUST send the content-type header “application/json” which describes the type of data conveyed in the payload. If the data source supplies a content-type header which the registry does not support, the facility registry MUST respond with an HTTP 415.

Revision operations MUST be executed against the fully qualified URL for the resource which is being updated.

###### “url” / “id” Element Restrictions

The “url” and “id” elements of the facility resource MUST carry a value on the revise facility request and the values carried in these fields MUST match the system identifier and absolute URL of the resource being updated.

###### “createdAt” / “updatedAt” Element Restrictions

The “createdAt” and “updatedAt” elements of the facility resource MUST NOT carry a value on the revise facility request as these values are to be populated by the facility registry.

##### Examples

Figure 12 illustrates a sample update to the Good Health Hospital facility (identified as resource #10252152).

PUT http://example.com/api/fred/11/facilities/1304954 HTTP/1.1

Content-Type: application/json

Host: example.com

Content-Length: XXX

{

"name" : "Good Health Hospital",

"url" : "http://example.com/api/fred/1/facilities/1304954",

"id" : "urn:uuid:57A69100-26C4-4db4-897B-63F37866F0F5",

"active" : false,

"coordinates" : [ 1.69172, 29.52505 ],

"identifiers" : [

{

"agency" : "MOH",

"context" : "HR",

"id" : "20294"

},

{

"agency" : "UNICEF",

"context" : "DHIS",

"id" : "58845858"

}

]

}

Figure - Sample update facility message

##### Expected Behavior

When the facility registry receives a request to revise a facility, the facility registry MUST validate that the requested facility exists. If the requested target of revision (the facility to be updated) does not exist, the facility registry MUST reply with an HTTP 404 error.

If the facility resource exists, the facility registry MUST update its datastore with the new information and MUST respond with an HTTP 200 response code. The facility registry MUST only update fields that were provided in the update payload. Any fields missing MUST be considered unchanged. The facility registry MUST return a complete copy of the facility record containing the applied revisions.

#### Delete Facility

When a facility record is no longer relevant, or was created in error, the facility data source will notify the facility registry of this change using the delete/obsolete facility.

##### Message Semantics

**HTTP Method:** DELETE  
**Resource:** {base}/facilities/{id}

The request to delete a facility MUST NOT contain a payload.

##### Examples

Figure 13 illustrates a sample request to delete facility 1304954 from the facility registry.

DELETE http://example.com/api/fred/11/facilities/1304954 HTTP/1.1

Host: example.com

Figure 13 - Sample DELETE facility request

##### Expected Behavior

When the facility registry receives a request to delete a facility, the facility registry MUST validate that the facility exists. If the requested target of deletion does not exist, the facility registry MUST respond with an HTTP 404 error.

If the facility resource exists, the facility registry MUST delete the facility resource such that the record is no longer discoverable to consumers. The process by which the facility registry marks the facility as deleted is not specified in this document, and is left to implementers to determine the most appropriate method. If a deleted resource is requested by a consumer, the server MAY return an HTTP 410 error but MUST, at minimum, return an HTTP 404 error.

Once the record is deleted, the facility registry MUST return an HTTP 200 response with the URL of the deleted facility.

### Extended Properties

The facility registry MUST be capable of receiving facility resources which have extended properties and MUST be capable of storing the data contained within these extended elements. Any extended properties MUST be returned back to consumers when the resource is fetched.

There is no requirement that the facility registry be able to meaningfully process additional elements outside the scope of the core facility resource defined in “Facility Resource”.

## Query Facility Data

The query facility data transaction (FRED transaction 4) describes the process whereby a facility data consumer queries and consumes facility data from a facility registry.

### Scope

The actors that are involved in this transaction are illustrated in Figure 14.



Figure – Record and maintain facility data actors

|  |  |
| --- | --- |
| **Actor** | **Purpose** |
| Facility Registry | Services facility data for an organization or jurisdiction. Responsible for the executing of queries, and fetching of facility detail data. |
| Facility Data Consumer | An application which is capable of constructing and consuming queries against the facility registry. |

### Open Data Formats / Standards Referenced

This transaction makes use of the following standards:

* IETF RFC2616 (HTTP 1.1)
* IETF RFC4627 (JSON)

### Interactions

Figure 15 illustrates the sequence of messaging between the Facility Data Consumer (FRED\_CONSUMER) actor and Facility Registry (FRED\_REG).



Figure - Record and Maintain facility interactions

### Triggering Events

The facility registry consumer will execute one of query facility or get facility details to list and/or get facility details respectively.

#### Query Facilities

The query facilities trigger event instructs the facility registry to perform a general query on all available (non-deleted) facilities in the registry.

##### Message Semantics

**HTTP Method:** GET  
**Resource:** {base}/facilities.json

Facility data consumers MUST execute a GET against the facilities collection to initiate a query. Consumers MUST instruct the facility registry to return data in JSON format by appending an extension of “.json” to the request URL. If the facility data consumer supplies an extension which the registry does not understand the registry MUST respond with an HTTP 404 error code.

Consumers MUST pass query parameters to the facility registry via query parameters in the format *propertyName=filterValue*.

Query parameters MUST be passed as one value per parameter. Query parameters are identified in Table 2 and MUST map to core properties with the same name. Query parameter values MUST be URL encoded when sent to the facility registry service.

Table - Query facility property filter parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Opt** | **Formatⱡ** | **Description** | **Example** |
| active | R | Boolean | Performs a filter on the active field of the facility. | ?active=true |

ⱡ - See “Facility Resource” for formatting of these data-types

Implementers MAY choose to extend the available query parameters made available to consumers. When extended query parameters are implemented, they MUST be implemented such that:

* The name of the query parameter MUST exactly match the name of a property the parameter filters, and
* Repetitions of the same named parameter MUST be considered an OR operation. For example, if a facility registry supports filtering on creation date then a filter for all facilities created in January or February of 2012 would be represented as: “?createdAt=2012-01&createdAt=2012-02”, and
* Implementers MUST declare which extended query parameters they expose.

Query operations also expose a series of query control parameters. These parameters do not map directly to core facility properties are provided to control the result. Table 3 lists the query control parameters defined in the FRED service.

Table - Query facility query control parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Opt** | **Formatⱡ** | **Description** | **Example** |
| allProperties | R | Boolean | When specified, instructs the facility registry to return all properties stored for a facility resource. | ?allProperties=true |
| updatedSince | R | Date | Instructs the facility registry to limit the results to only those updated since the specified date. | ?updatedSince=2011-01-01 |
| fields | R | String[] | A list of comma-separated strings which identify which fields should be returned in the result. The name of the field MUST match the name of the field being returned. If the facility registry does not recognize one of the field names it MUST respond with an HTTP 422 error. | ?fields=name,id |

ⱡ - See “Facility Resource” for formatting of these data-types

Consumers MUST NOT pass more than one repetition of any one query control parameter.

##### Response Message Semantics

If successful, the facility registry MUST respond with a collection of facility resources structured as illustrated in Figure 16. The facility registry must respond with an HTTP 200 code and must carry the content-type of “application/json”.

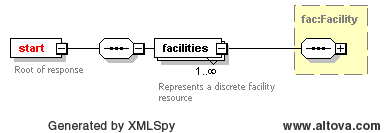


Figure 16 – Query facilities response structure

##### Examples

Figure 17 provides a sample response message where the facility registry has located two results matching the provided filter parameters.

HTTP/1.1 200 OK

Content-Type: application/json

Date: Thu, 29 Nov 2012 15:36:56 GMT

Content-Length: XXX

{

"facilities" : [

{

"name" : "Good Health Hospital",

"id" : "urn:uuid:57A69100-26C4-4db4-897B-63F37866F0F5",

"url" : "http://example.com/api/fred/1/facilities/1304954",

"active" : true,

"createdAt" : "2012-11-09T14:23:22Z",

"updatedAt" : "2012-12-09T14:55:23Z",

"coordinates" : [ 1.69172, 29.52505 ],

"identifiers" : [

{

"agency" : "MOH",

"context" : "HR",

"id" : "20294"

},

{

"agency" : "UNICEF",

"context" : "DHIS",

"id" : "58845858"

}

]

},

{

...

}

]

}

Figure - Sample query facilities response

Figure 18 illustrates an example of a failed query attempt. The registry is refusing to perform the query because it does not understand some of the query parameters provided.

HTTP/1.1 422 INVALID

Content-Type: application/json

Date: Thu, 29 Nov 2012 15:36:56 GMT

Content-Length: XXX

Cache-Control: no-cache

{

"errors" : [

{

"message" : "Don't understand query parameter 'isNotClosed'",

"moreInfo" : "http://api.facilityregistry.org/errors/102"

},

{

"message" : "Don't understand field parameter value 'acvite'",

"moreInfo" : "http://api.facilityregistry.org/errors/222"

}

]

}

Figure 18 - Sample query facilities error response

##### Expected Behavior

When the facility registry receives a request to query facilities it MUST validate the provided filter and query control parameters. If the facility registry does not understand all provided filter/control parameters it MUST respond with an HTTP 422 error. The error message must contain the query parameters provided that are not supported.

If the facility registry determines that it can reliably interpret the query it MUST perform the query synchronously (returning HTTP 200 and the results when available). The facility registry MUST return all results matching the provided query filter/control parameters. The response MUST be constructed as follows:

* When the “fields” control parameter is passed, the response MUST only contain the fields supplied, otherwise
* When the “allProperties” control parameter is set to “true”, the response MUST contain core and all extended properties, otherwise
* The response MUST only contain core properties.

#### Retrieve Facility

The query facilities trigger event instructs the facility registry to perform a retrieve on a specific facility in the registry.

##### Message Semantics

**HTTP Method:** GET  
**Resource:** {base}/facilities/{id}.json

Facility data consumers MUST execute an HTTP GET against the facility URL provided in the query response message. Consumers MUST instruct the facility registry to return data in JSON format by appending an extension of “.json” to the request URL. If the facility data consumer supplies an extension which the registry does not understand the registry MUST respond with an HTTP 404 error code.

The retrieve operation also exposes a series of response control parameters. Table 3 lists the response control parameters defined in the FRED service.

Table 4 - Retrieve facility query control parameters

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Parameter** | **Opt** | **Formatⱡ** | **Description** | **Example** |
| allProperties | R | Boolean | When specified, instructs the facility registry to return all properties stored for a facility resource. | ?allProperties=true |
| fields | R | String[] | A list of comma-separated strings which identify which fields should be returned in the result. The name of the field MUST match the name of the field being returned. If the facility registry does not recognize one of the field names it MUST respond with an HTTP 422 error. | ?fields=name,id |

ⱡ - See “Facility Resource” for formatting of these data-types

Consumers MUST NOT pass more than one repetition of any one response control parameter.

##### Response Message Semantics

If successful, the facility registry MUST respond with one and only one facility resource structured as illustrated in Figure 19. The facility registry must respond with an HTTP 200 code and must carry the content-type of “application/json”.



Figure 19 – Retrieve facility response structure

##### Examples

Figure 20 provides a sample response message where the facility registry has successfully located the specified facility resource.

HTTP/1.1 200 OK

Content-Type: application/json

Date: Thu, 29 Nov 2012 15:36:56 GMT

Content-Length: XXX

{

"facility" : {

"name" : "Good Health Hospital",

"id" : "urn:uuid:57A69100-26C4-4db4-897B-63F37866F0F5",

"url" : "http://example.com/api/fred/1/facilities/1304954",

"active" : true,

"createdAt" : "2012-11-09T14:23:22Z",

"updatedAt" : "2012-12-09T14:55:23Z",

"coordinates" : [ 1.69172, 29.52505 ],

"identifiers" : [

{

"agency" : "MOH",

"context" : "HR",

"id" : "20294"

},

{

"agency" : "UNICEF",

"context" : "DHIS",

"id" : "58845858"

}

]

}

}

Figure 20 - Sample query facilities response

##### Expected Behavior

When the facility registry receives a request to retrieve a facility which has not been registered, or which does not have a system identifier matching the provided id it MUST respond with an HTTP 404 error indicating that the resource was not found. If the facility with the specified identifier was registered and subsequently deleted, the facility registry MAY respond with a 410 error but MUST (at minimum) respond with an HTTP 404.

If the facility registry locates a facility with the matching system id, it MUST respond with an HTTP 200 response code. The response message MUST be constructed as follows:

* When the “fields” control parameter is passed, the response MUST only contain the fields supplied, otherwise
* When the “allProperties” control is set to “true”, the response MUST contain core and all extended properties, otherwise
* The response MUST only contain all core properties.

# Facility Resource

The facility resource referenced throughout this document represents a series of “core” attributes which all implementers of the MUST expose and meaningfully interpret.

Table 5 graphically illustrates the structure of the facility resource and identifies the core/extended properties.

Table 5 - Facility resource structure core attributes

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| C:\Users\fyfej\Documents\NETHOPE\facility.png | | | | | |
| **Property** | **Data type** | **Cardinality** | | | **Description** |
| **Register** | **Revise** | **Query** |
| name | String | 1 | | | The name of the facility |
| url | URL | 0 | 1 | | A URL to the resource instance on the facility registry. This is the permalink to facility resource instance. |
| id | String | A unique identifier generated by the facility registry. |
| active | Boolean | 1 | | | An indicator identifying whether the facility is actively in operation. |
| createdAt | Date/Time | 0 | | 1 | An ISO8601 timestamp indicating when the facility was created in the facility registry. |
| updatedAt | Date/Time | 0..1 | An ISO8601 timestamp indicating when the facility was last updated. MAY be null if the facility has not been updated. |
| coordinates | Decimal | 2 | | | The geo-location of the facility represented as longitude/latitude in that order. |
| identifiers |  | 0..\* | | | External facility identifiers. |
| agency | String | 1 | | | The agency which assigned the identifier. For example UNICEF or MOH |
| context | String | The context/external system in which the provided identifier is being used. |
| id | String | The external identifier itself. |

## Extended Attributes

Facility resources may be extended by third parties to support implementation specific attributes (such as number of beds, status of facility, etc.). All extensions MUST be represented using uniquely named properties carrying one of the following simple types:

* String – A series of textual characters
* Integer – A whole number
* Decimal
* Boolean – A true or false value
* Date – In IS8601 format (example : 2012-12-25)
* Lists - A list of one of the following data types
  + Simple data types such as the code mnemonic of selected value(s) (example: “apple”,”orange”)
  + Implementation specific complex data

Figure 21 provides a sample facility resource with extended properties.

{

"facility" : {

"name" : "Good Health Hospital",

"id" : "urn:uuid:57A69100-26C4-4db4-897B-63F37866F0F5",

"url" : "http://example.com/api/fred/1/facilities/1304954",

"active" : true,

"createdAt" : "2012-11-09T14:23:22Z",

"updatedAt" : "2012-12-09T14:55:23Z",

"coordinates" : [ 1.69172, 29.52505 ],

"properties" : {

"numBeds" : 55,

"services" : [ "XR", "OBG", "TR" ],

"equipment" : [

{

"id" : 542,

"name" : "Microscope"

},

{

"id" : 942,

"name" : "Vaccine Fridge"

}

],

"manager" : "Smith, John",

"hasMaternity" : true

}

}

}

Figure 21 - Sample facility resource with extended properties

## RELAX NG schema

Figure 22 provides an informative compact RELAX NG schema describing the facility resource.

datatypes xs = "http://www.w3.org/2001/XMLSchema-datatypes"

start = element facility {

element name { text },

element url { xs:anyURI }?,

element id { text }?,

element active { xs:boolean },

element createdAt { xs:dateTime },

element updatedAt { xs:dateTime },

element coordinates { list { xs:decimal, xs:decimal } },

identifierContent\*,

element properties { extendedPropertyContent\* }

}

identifierContent = element identifiers {

element agency { text },

element context { text }?,

element id { xs:token }?

}

extendedPropertyContent = element \* {

(text |

xs:int |

xs:decimal |

xs:boolean |

xs:date |

xs:dateTime |

list { xs:string | xs:decimal } |

extendedPropertyContent+ )

}

errorContent = element errors {

element message { text },

element moreInfo { xs:anyURI }

}

Figure 22 - RELAX NG compact schema for facility registry

# XML Supplement

While the current version of the FRED API specification contains definitions for JSON formatted objects, implementers MAY choose to supplement the API with XML formatted data. This informative section supplements the FRED API and provides guidelines on XML formatting of resources.

The verbiage “SHOULD” will be used in place of “MUST” since this section is an informative supplement.

## Submission of XML Data

When XML data is submitted to the facility registry by a facility data source, the request content-type SHOULD be set to text/xml and MAY optionally include an encoding (i.e. text/xml;encoding=utf-8).

## XML Responses

When returning XML data to facility data consumers, the facility registry SHOULD use a content-type of text/xml and MAY optionally include an encoding. XML responses SHOULD be returned whenever the extension “.xml” is appended to the HTTP GET request.

## Structure of XML Resources

Requests SHOULD be formatted according to the RELAX NG schema provided on page 28. Figure 23 provides a sample XML facility resource which follows the RELAX NG schema.

<facility>

<name>Good Health Hospital</name>

<url>http://example.com/api/fred/1/facilities/1304954</url>

<id>urn:uuid:57A69100-26C4-4db4-897B-63F37866F0F5</id>

<active>true</active>

<createdAt>2012-11-09T14:23:22Z</createdAt>

<updatedAt>2012-12-09T14:55:23Z</updatedAt>

<coordinates>1.69172 29.52505</coordinates>

<identifiers>

<agency>MOH</agency>

<context>HR</context>

<id>20294</id>

</identifiers>

<identifiers>

<agency>UNICEF</agency>

<context>DHIS</context>

<id>58845858</id>

</identifiers>

<properties>

<numBeds>50</numBeds>

<services>XR OBG TR</services>

<manager>Smith, John</manager>

<equipment>

<id>542</id>

<name>Microscope</name>

</equipment>

<equipment>

<id>942</id>

<name>Vaccine Fridge</name>

</equipment>

</properties>

</facility>

Figure 23 - XML representation of a facility resource