Keyword Management Service Application Program Interface

1 Introduction

The Keyword Management Service (KMS) is a RESTful web service for maintaining keywords (science keywords, platforms, instruments, data centers, locations, projects, services, resolution, etc.) in the GCMD/IDN system. It allows access to the keywords maintained in the Keyword Management System as SKOS Concepts (RDF, JSON, OWL) or as XML <<Concept /> objects. Simple Knowledge Organization System (SKOS) is a standard defined for representation of thesauri, classification schemes, taxonomies, subject-heading systems, or any other type of controlled vocabulary. SKOS is built upon RDF and RDFS, and its main objective is to enable easy publication of controlled structured vocabularies for the Semantic Web. SKOS is currently developed within the W3C framework. Section 1.1 contains a list of attributes associated with a SKOS Concept.

1.1 SKOS Concept

- concept scheme (e.g., science keywords, platforms, instruments, etc.)
- concept id (globally unique, read only)
- broader - list of broader concepts
- narrower - list of narrower concepts
- related - list of related concepts
- definition- one per language
- pref label - preferred, one per language
- pref symbol - image of the concept, second phase but interface should support it's addition
- alt labels - list, multiple per language
- alt symbol - image, second phase but interface should support it's addition
- hidden labels - list (common misspellings), second phase?
- change note - list of changes, human and computer inserted sorted by time
  - date - computer managed
  - note

2 REST paths

Accessing the SKOS concepts is made possible through the following list of REST-based paths: 2.1 Connections, 2.2 Concept Resource, 2.3 Concepts - Root, 2.4 Concepts - By Pattern, 2.5 Concepts - By Concept Scheme + Pattern, 2.6 Concepts By Alternate Label Resource, 2.7 Concepts By Full Path Resource, 2.8 Concepts Name Resource, 2.9 Concepts Relation Resource, 2.10 Concept Schemes Resource, 2.11 Concept Versions Resource, 2.12 Concepts In Concept Scheme Resource. See additional detailed information below.

2.1 Connections

The /KMS/ server infrastructure monitors inbound traffic and attempts to prevent over usage such as a Denial of Service (DoS) attack. To do this, the server will only allow so many connections per time interval and total connections at any given time. The current values are:

- 64 connections at one time
- 50 started connections within 5 seconds.

If processing records synchronously, then put a 100ms delay between each call. Alternatively mark the start time at the beginning of a block of records, then after processing 50 records check the elapsed execution time. If the elapsed execution time is less then 5 seconds, add a sleep for the difference. The generic logic of this work flow is below:

1. Start
2. Save timestamp₁ (in ms), reset counter₁
3. Loop
   a. process record
   b. ++counter₁
   c. if counter₁ ≥ 50
      i. save timestamp₂ (in ms)
      ii. if timestamp₂ - timestamp₁ < 5,000ms then sleep for 5,000ms - (timestamp₂ - timestamp₁)
4. End

2.2 Concept Resource

<table>
<thead>
<tr>
<th>Complete details of the concept with the given conceptid</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>URL</strong></td>
</tr>
<tr>
<td><strong>Method</strong></td>
</tr>
</tbody>
</table>
| **HTTP Accepts** | • application/rdf+xml  
| | • application/xml |
| **Path Params** | • conceptId |
| **Query Params** | • version  
| | • case  
| | • format:  
| | • "xml"  
| | • "rdf" (default) |
| **Form Params** | • none |
| **HTTP Headers** | • Content-MD5  
| | • Last-Modified |
| **Returns** | • media types: "application/xml",  
| | • "application/rdf+xml"  
| | • "application/json"  
| | • Error code: 404 Not Found (identifier not found) |
2.3 Concepts - Root

Returns list of all root concepts (that are at the top of the hierarchy) as conceptBriefs

<table>
<thead>
<tr>
<th>URL</th>
<th>/concepts/root</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
<td>GET</td>
</tr>
<tr>
<td>HTTP Accepts</td>
<td></td>
</tr>
<tr>
<td>Path Params</td>
<td>none</td>
</tr>
<tr>
<td>Query Params</td>
<td>version, case, format (&quot;xml&quot;, &quot;rdf (default)&quot;)</td>
</tr>
<tr>
<td>Form Params</td>
<td>none</td>
</tr>
<tr>
<td>HTTP Headers</td>
<td></td>
</tr>
<tr>
<td>Returns</td>
<td>media types: &quot;application/xml&quot;, &quot;application/rdf+xml&quot;</td>
</tr>
</tbody>
</table>
2.4 Concepts - By Pattern

Returns a list of all concepts that match a given pattern across all concept schemes

<table>
<thead>
<tr>
<th>URL</th>
<th>/concepts/pattern/{pattern}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
<td>GET</td>
</tr>
<tr>
<td>HTTP Accepts</td>
<td>application/xml</td>
</tr>
<tr>
<td>Path Params</td>
<td>pattern</td>
</tr>
<tr>
<td></td>
<td>conceptScheme</td>
</tr>
<tr>
<td>Query Params</td>
<td>version</td>
</tr>
<tr>
<td></td>
<td>case</td>
</tr>
<tr>
<td></td>
<td>format</td>
</tr>
<tr>
<td></td>
<td>&quot;xml&quot;</td>
</tr>
<tr>
<td></td>
<td>&quot;rdf&quot; (default)</td>
</tr>
<tr>
<td>Form Params</td>
<td>none</td>
</tr>
</tbody>
</table>
### HTTP Headers
- Content-MD5

### Returns
- media types
  - "application/xml"
  - "application/rdf+xml"

### Examples

Request for a list of concepts that match a given pattern: https://gcmdservices.gsfc.nasa.gov/kms/concepts/pattern/OCEANS?format=rdf

```xml
<?xml version="1.0" encoding="utf-8" standalone="yes"?>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
  xmlns:skos="http://www.w3.org/2004/02/skos/core#">
  <gcmd:termsOfUse xmlns:gcmd="http://gcmd.gsfc.nasa.gov/"
    xmlns:skos="http://www.w3.org/2004/02/skos/core#">
    See https://gcmd.nasa.gov/r/l/TermsOfUse
  </gcmd:termsOfUse>
  <skos:Concept xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:skos="http://www.w3.org/2004/02/skos/core#">
    <skos:prefLabel xml:lang="en">OCEANS</skos:prefLabel>
    <skos:broader rdf:resource="10206308-a9dd-41e8-8ba4-056c1160842a" />
    <skos:narrower rdf:resource="251c87cd-03b3-464f-8390-8ede2feca2fca" />
    <skos:narrower rdf:resource="a031952d-9ef0-4ba5-9966-5f87ab9dfda" />
    <skos:narrower rdf:resource="346c6e65-801a-4af1-9652-48d02905bca" />
    <skos:narrower rdf:resource="e3b178eb-2d47-41db-aba1-43a05e9e2956" />
    <skos:narrower rdf:resource="e3b6f63-616f-4f15-995c-387c6d9652c" />
    <skos:narrower rdf:resource="a0480d5-1064-48fd-8a8e-10399e1" />
    <skos:narrower rdf:resource="1ee8a323-0ba1-2b597-508906c527c8e" />
    <skos:narrower rdf:resource="aa54e02-0a26-477e-4b4a-427e60ae1b8f" />
    <skos:narrower rdf:resource="6eb3b91b-8508-4988-8b78-9d018f6d8089" />
    <skos:narrower rdf:resource="45782c4-4b30-4d26-bed8-6c2887dbac90" />
    <skos:narrower rdf:resource="c16bda61-353b-4668-a2f2-bbb9878b6fa" />
    <skos:narrower rdf:resource="bfa56100-6eb5-4e69-9633-2986a3b45508" />
    <skos:narrower rdf:resource="f27ad52c-3dfd-4788-851a-427e60ae1b8f" />
    <skos:narrower rdf:resource="0517ae1f-7617-4f3b-80cb-64917803285" />
    <skos:narrower rdf:resource="a46016d7-e571-403a-ab37-7223fd74e68e" />
    <skos:narrower rdf:resource="d73e969a-4b66-4713-8d63-fa3cbb1e2dc3" />
    <skos:narrower rdf:resource="bb04ee83-5f49f-898d-20bb6e92bc93" />
    <skos:narrower rdf:resource="ce4b25c6-e3d69-4cf1-8416-c365f9b1b2c" />
    <skos:narrower rdf:resource="b6fd22ab-dca7-4d7a-a812-9134b35695b" />
    <skos:narrower rdf:resource="e3bc0693-52eb-4ebd-a39e-e77e96409072" />
    <skos:narrower rdf:resource="68f93a0c-1525-4f5a-9545-5d94191a3dfb" />
</skos:Concept>
</rdf:RDF>
```
2.5 Concepts - By Concept Scheme + Pattern

Returns list of all concepts within specified concept scheme that match a given pattern

<table>
<thead>
<tr>
<th>URL</th>
<th>/concepts/concept_scheme/{conceptScheme}/pattern/{pattern}</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
<td>GET</td>
</tr>
</tbody>
</table>
| HTTP Accepts | • Accept:application/rdf+xml  
              • Accept:application/xml |
| Path Params | • conceptScheme: chronounits,  
discipline, horizontalresolutionrange, idnnode, instruments, isotopiccategory, locations, platforms, projects, providers, rucontenttype, sciencekeywords, temporalresolutionrange, verticalresolutionrange  
• pattern |
| **Query Params** | • version  
• case  
• format  
  • "xml" - same as "Accept:application/xml"  
  • "rdf" (default) - Accept:application/rdf+xml  
  • "text/csv" - report |
| **Form Params** | • none |
| **HTTP Headers** | • Content-MD5  
• Last-Modified |
| **Returns** | • media types  
  • "application/xml"  
  • "application/rdf+xml"  
  • "application/json" |
Examples

Request for a list of concepts that match a given pattern within a given concept scheme: https://gcmdservices.gsfc.nasa.gov/kms/concepts/concept_scheme/discipline/pattern/water?format=rdf

```xml
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<rdf:RDF xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:skos="http://www.w3.org/2004/02/skos/core#"
    xmlns:gcmd="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:skos:Concept xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:skos="http://www.w3.org/2004/02/skos/core#"
    rdf:about="7209c13f-eee0-4dd0-ada8-732900b58e61"
    xml:base="https://gcmdservices.gsfc.nasa.gov/kms/concept/"

    <skos:prefLabel xml:lang="en">FRESHWATER ECOLOGY</skos:prefLabel>
    <skos:broader rdf:resource="d4d928d7-099b-4d4a-8f97-c92a09cdef8a7"/>
</skos:Concept>

<skos:Concept xmlns:rdf="http://www.w3.org/1999/02/22-rdf-syntax-ns#"
    xmlns:skos="http://www.w3.org/2004/02/skos/core#"
    rdf:about="386b6504-2d13-442d-8ffa-9fab8d82f3a4"
    xml:base="https://gcmdservices.gsfc.nasa.gov/kms/concept/"

    <skos:prefLabel xml:lang="en">FRESHWATER</skos:prefLabel>
    <skos:broader rdf:resource="e0b60b65-5850-4165-ba4b-e68adef249b"/>
</skos:Concept>
</rdf:RDF>

Request a CSV format:

https://gcmdservices.gsfc.nasa.gov/kms/concepts/concept_scheme/discipline/pattern/water?format=csv

Terms Of Use: See https://gcmd.nasa.gov/r/l/TermsOfUse
Keyword Version: Jun122017

Discipline_Name,Subdiscipline
"EARTH SCIENCE","FRESHWATER"
"ECOLOGY","FRESHWATER ECOLOGY"

2.6 Concepts By Alternate Label Resource

Returns a concept with an alternate label
### 2.7 Concepts By Full Path Resource

<table>
<thead>
<tr>
<th>URL</th>
<th><code>/concept/full_path/</code></th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
<td>GET</td>
</tr>
<tr>
<td>HTTP Accepts</td>
<td>application/json</td>
</tr>
</tbody>
</table>

#### Examples

Request for a concept with an alt label: [https://gcmdservices.gsfc.nasa.gov/kms/concept/alt_label/Aura?scheme=platforms](https://gcmdservices.gsfc.nasa.gov/kms/concept/alt_label/Aura?scheme=platforms)

```
{
    "termsOfUse": "See http://gcmd.nasa.gov/r/l/TermsOfUse",
    "keywordVersion": "8.5",
    "schemeVersion": "2017-09-14 14:48:28",
    "lastModifiedDate": "2016-10-13 16:39:46.0",
    "id": 287847,
    "uuid": "59d2e030-5377-4b5b-92ce-f488d418c45f",
    "prefLabel": "AURA",
    "altLabels": [
        {"text": "Aura"},
        {"category": "primary","text": "Earth Observing System, Aura"}
    ],
    "resources": [
        {"type": "IMAGE","url": "http://gcmd.gsfc.nasa.gov/KeywordSearch/default/images/aura.gif"}
    ],
    "isLeaf": "true",
    "broader": [
        {"id": 287601,
         "uuid": "3466ed1-2fbb-49bf-ab0b-dc08731d502b",
         "prefLabel": "Earth Observation Satellites",
         "conceptScheme": "platforms",
         "isLeaf": "false"
        }
    ]
}
```
2.8 Concepts Name Resource

Returns a concept by the concept short name

<table>
<thead>
<tr>
<th>URL</th>
<th>/concept/short_name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
<td>GET</td>
</tr>
<tr>
<td>HTTP Accepts</td>
<td><em>application/json</em></td>
</tr>
</tbody>
</table>
### Path Params
- short_name

### Query Params
- version
- scheme
- format
- case

### Form Params
- none

### HTTP Headers
- Content-MD5

### Returns
- "application/json"

### Examples
Request for a concept by short name: https://gcmdservices.gsfc.nasa.gov/kms/concept/short_name/ESIP?scheme=projects

```
{
  "termsOfUse": "See http://gcmd.nasa.gov/r/l/TermsOfUse",
  "keywordVersion": "8.5",
  "schemeVersion": "2017-09-20 10:44:51",
  "id": 293099,
  "uuid": "5f139d40-4050-4a8e-bd2b-fcae1cfe3d01",
  "prefLabel": "ESIP",
  "altLabels": [
    {"category": "primary","text": "Earth Science Information Partners Program"}
  ],
  "isLeaf": "true",
  "broader": [
    {"id": 292305,
     "uuid": "24cf4b0e-4464-4ed6-8f0c-415a6d79",
     "prefLabel": "D - F",
     "conceptScheme": "projects",
     "isLeaf": "false"
    }
  ],
  "conceptScheme": {"name": "projects","longName": "Projects"}
}
```

### 2.9 Concepts Relation Resource

<table>
<thead>
<tr>
<th>Returns a list of concepts with their relationships</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>URL</strong></td>
</tr>
<tr>
<td><strong>Method</strong></td>
</tr>
<tr>
<td><strong>HTTP Accepts</strong></td>
</tr>
<tr>
<td><strong>Path Params</strong></td>
</tr>
<tr>
<td>Query Params</td>
</tr>
<tr>
<td>--------------</td>
</tr>
<tr>
<td>• scheme</td>
</tr>
<tr>
<td>• relation_type</td>
</tr>
<tr>
<td>• case</td>
</tr>
</tbody>
</table>

| Form Params |   | none |

| HTTP Headers |   | none |

| Returns      |   | "application/json" |

### Examples

Request for a list of instruments and their relationship to a platform (MODIS flies on AQUA and TERRA): [https://gcmdservices.gsfc.nasa.gov/kms/concept_relation/?scheme=instruments&relation_type=is_on_platform](https://gcmdservices.gsfc.nasa.gov/kms/concept_relation/?scheme=instruments&relation_type=is_on_platform)

```json
{
  "prefLabel": "MODIS",
  "scheme": "instruments",
  "uuid": "2878f334-35dc-47a7-a3ae-8c5daladccd3",
  "relatedConcepts": [
    {
      "prefLabel": "AQUA",
      "relationType": "is_on_platform",
      "uuid": "ea7fd15d-190d-43f3-bdd3-75f5d88dc3f8",
      "scheme": "platforms"
    },
    {
      "prefLabel": "TERRA",
      "relationType": "is_on_platform",
      "uuid": "80eca755-c564-4616-b910-a4d387b7c54",
      "scheme": "platforms"
    }
  ]
}
```

Request for a list of platforms and their relationship to an instrument (AQUA has a MODIS instrument): [https://gcmdservices.gsfc.nasa.gov/kms/concept_relation/?scheme=platforms&relation_type=has_instrument](https://gcmdservices.gsfc.nasa.gov/kms/concept_relation/?scheme=platforms&relation_type=has_instrument)

```json
{
  "prefLabel": "AQUA",
  "scheme": "platforms",
  "uuid": "ea7fd15d-190d-43f3-bdd3-75f5d88dc3f8",
  "relatedConcepts": [
    {
      "prefLabel": "AMSR-E",
      "relationType": "has_instrument",
      "uuid": "736038ef-clae-47c7-a50e-729474eb3b1",
      "scheme": "instruments"
    },
    {
      "prefLabel": "AMSU-A",
      "relationType": "has_instrument",
      "uuid": "2a393a42-ecf9-4137-b1ea-1c2569384ba4",
      "scheme": "instruments"
    }
  ]
}
```
2.10 Concept Schemes Resource

<table>
<thead>
<tr>
<th>Returns a list of all the concept schemes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>URL</strong></td>
</tr>
<tr>
<td><strong>Method</strong></td>
</tr>
<tr>
<td><strong>HTTP Accepts</strong></td>
</tr>
<tr>
<td><strong>Path Params</strong></td>
</tr>
<tr>
<td>Query Params</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td>Form Params</td>
</tr>
<tr>
<td>HTTP Headers</td>
</tr>
<tr>
<td>Returns</td>
</tr>
</tbody>
</table>

**Examples**

Request for a list of all the concept schemes: [https://gcmdservices.gsfc.nasa.gov/kms/concept_schemes/](https://gcmdservices.gsfc.nasa.gov/kms/concept_schemes/)

```xml
```
2.11 Concept Versions Resource

Returns a list of the version types of the concepts

<table>
<thead>
<tr>
<th>URL</th>
<th>/version_type/</th>
</tr>
</thead>
<tbody>
<tr>
<td>Method</td>
<td>GET</td>
</tr>
<tr>
<td>HTTP Accepts</td>
<td>application/xml</td>
</tr>
<tr>
<td>Path Params</td>
<td>versionType</td>
</tr>
<tr>
<td>Query Params</td>
<td>none</td>
</tr>
<tr>
<td>Form Params</td>
<td>none</td>
</tr>
<tr>
<td>HTTP Headers</td>
<td>Content-MD5</td>
</tr>
<tr>
<td>Returns</td>
<td>&quot;application/xml&quot;</td>
</tr>
</tbody>
</table>

Examples

Request for a list of all the past published versions of the keywords: https://gcmdservices.gsfc.nasa.gov/kms/concept_versions/version_type/past_published

<versions xsi:noNamespaceSchemaLocation="http://gcmd.gsfc.nasa.gov/Aboutus/xml/kms/kms.xsd"><version id="23" creation_date="2016-08-02" type="PAST_PUBLISHED">8.4.1</version><version id="19" creation_date="2016-07-07" type="PAST_PUBLISHED">8.4</version><version id="17" creation_date="2016-06-21" type="PAST_PUBLISHED">8.3</version><version id="15" creation_date="2016-06-07" type="PAST_PUBLISHED">8.2</version><version id="13" creation_date="2015-04-03" type="PAST_PUBLISHED">8.1</version><version id="11" creation_date="2013-04-15" type="PAST_PUBLISHED">8.0</version><version id="3" creation_date="2012-10-09" type="PAST_PUBLISHED">7.0</version><version id="1" creation_date="2012-06-12" type="PAST_PUBLISHED">Jun122012</version></versions>

Request for a list of the published version of the keywords: https://gcmdservices.gsfc.nasa.gov/kms/concept_versions/version_type/published

<versions xsi:noNamespaceSchemaLocation="http://gcmd.gsfc.nasa.gov/Aboutus/xml/kms/kms.xsd">
<version id="25" creation_date="2017-04-24" type="PUBLISHED">8.5</version>
</versions>

Request a specific version of the keywords

https://gcmdservices.gsfc.nasa.gov/kms/concepts/concept_scheme/sciencekeywords/?format=xml&version=8.4.1

2.12 Concepts In Concept Scheme Resource

Returns a list of all the concepts for a given scheme

<p>| URL           | /concepts/concept_scheme/       |</p>
<table>
<thead>
<tr>
<th><strong>Method</strong></th>
<th>GET</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HTTP Accepts</strong></td>
<td>- application/xml</td>
</tr>
<tr>
<td><strong>Path Params</strong></td>
<td>- conceptScheme</td>
</tr>
</tbody>
</table>
| **Query Params** | - version  
- format  
- case |
| **Form Params** | - none |
| **HTTP Headers** | - Content-MD5 |
| **Returns** | - "application/xml"  
- "application/json"  
- "application/rdf+xml"  
- "text/csv" |

**Examples**
GLONASS or "Global Navigation Satellite System", is a space-based satellite navigation system operating in the radionavigation-satellite service. It provides an alternative to GPS and is the second navigational system in operation with global coverage and of comparable precision. Manufacturers of GPS devices say that adding GLONASS made more satellites available to them, meaning positions can be fixed more quickly and accurately, especially in built-up areas where the view to some GPS satellites is obscured by buildings. Smartphones generally tend to use the same chipsets and the versions used since 2015 receive GLONASS signals and positioning information along with GPS. Since 2012, GLONASS was the second most used positioning system in mobile phones after GPS. The system has the advantage that smartphone users receive a more accurate reception identifying location to within 2 meters.
3 Governance of Keywords

The Global Change Master Directory (GCMD) Keyword Governance and Community Guide Document, Version 1.0 provides the community with a comprehensive resource that describes the governance structures and process for reviewing proposed changes to the GCMD Keywords. The document includes an overview of the structure of the keywords, requirements and recommendations to consider when requesting keyword changes, and instructions for submitting change requests. The process described in this document will be the basis of all future GCMD Keyword reviews. The community is invited to provide feedback.

4 Keyword URLs

4.1 KMS API Capabilities (Links to an XML formatted file)
   • https://gcmdservices.gsfc.nasa.gov/kms/

4.2 KMS Static Directory
   • https://gcmdservices.gsfc.nasa.gov/static/kms/

4.3 Keywords Community Forum
   • https://earthdata.nasa.gov/gcmd-forum

5 Contact Us

If you have additional questions about the Keyword API, please contact us at: support@earthdata.nasa.gov, or post your question on the Keywords Community Forum.