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DTS FHIR Terminology Service: Searching in DTS FHIR

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Table of Contents

1	Overview	2
2	Search Format.....	2
3	Parameters.....	3
3.1	All Resources and Search Result Parameters.....	3
3.2	CodeSystem Search Parameters	5
3.3	ValueSet Search Parameters.....	7
4	Modifiers	9
5	Prefixes.....	10
6	Sorting.....	11
7	Returned Results.....	11
8	Examples	12

1 Overview

The search functionality in the DTS FHIR Terminology Service allows identification of existing ValueSets and CodeSystems that meet specified criteria. These resources can be returned by searching on various supported attributes that exist on the resources.

Modifiers may also be used to for special processing of results, such as finding an exact match.

Additionally, prefixes may be used to specify an interpretation of a search value, such as searching for resources with IDs greater than a specified value.

This guide is intended to outline the format used to create searches, as well as the different parameters, modifiers, and prefixes that are available to help narrow down the search results as desired. While discussions below highlight ValueSet searches, operations with CodeSystems are similar.

2 Search Format

FHIR search enables the identification of ValueSets or CodeSystems based on the values of certain of their attributes. The form of search is:

base-url/ValueSet?selector { & selector } ... or

base-url/CodeSystem?selector { & selector } ...

where

selector := parameter{:modifier}={prefix :}value {, {prefix:}value} ...

Note: those items in { } are optional parameters in your search syntax

Each *selector* specifies a test on a candidate ValueSet or CodeSystem resource. If the test evaluates to true, the resource is accepted. The object returned from the search is the set of accepted resources.

Additional Notes and Restrictions:

- *Parameters* can appear in any order.
- The semantics of multiple *selectors* (“&”) is an AND of the *selector* tests.
- The semantics of multiple *values* (“,”) is an OR of the *value* tests.
- A *modifier* is not permitted when multiple *values* are present.
- *Prefixes* are not allowed when a *modifier* is present.
- Searches executed on *ValueSet* or *CodeSystem* resources, without specifying a business version, will return results across all versions.
- Searches with special characters must use the ASCII equivalents to be processed successfully

Search requests are sent to the DTS FHIR Terminology Service server by entering the search query in a web browser, or any other HTTP resource, like POSTMAN or a custom web API. Results are made available through the web browser as FHIR Bundle objects.

3 Parameters

The table below describes the common parameters supported in search. In the paths below, “Resource” refers to either “ValueSet” or “CodeSystem”. The “VS” and “CS” columns indicate whether the specified search parameter is supported for each respective resource.

3.1 All Resources and Search Result Parameters

Name	Data Type	VS	CS	Description	Path
_id	string	yes	yes	The id of the resource	Resource.id
_lastUpdated	date	yes	yes	The last update date of the resource	Resource.meta.lastUpdated; Accesses time of query for CodeSystem or modified date for ValueSet
_tag	token	no	no	The tag of the resource	
_profile	uri	no	no	The Profile associated with the resource	
_security	token	no	no	The Security label associated with a resource	
_text	string	no	no	The resource narrative	
_content	string	no	no	The entire content of the resource	
_list	string	no	no	The resources in a nominated list	
_has	string	no	no	Resources selected based on the properties of resources that refer to them	
_type	token	no	no	Specified resource type the search applies to	
_sort	N/A	yes	yes	Result sort order; see Sorting below	
_count	N/A	yes	yes	Limits size of return set	
_include	string	no	no	Other resources to include in the search results that search matches point to	
_revinclude	string	no	no	Other resources to include in the search results when they refer to search matches	

_summary	string	yes	yes	Just return the summary elements	
_total	N/A	no	no	The number of resources that match the search parameters	
_elements	N/A	no	no	Specific set of elements to be returned	
_contained	N/A	no	no	Modifies search to include/exclude contained resources	
_containedType	N/A	no	no	Returns only container or only contained resources	
_page	N/A	yes	yes	Jumps to specific page of return set	
_query	string	no	no	A custom named query	
_filter	N/A	no	no	Modifies the search query format	

3.2 CodeSystem Search Parameters

Name	Type	Description	Expression	Supported?
code	token	A code defined in the code system	CodeSystem.concept.code	yes
content-mode	token	not-present example fragment complete supplement	CodeSystem.content	yes
context TU	token	A use context assigned to the code system	(CodeSystem.useContext.value as CodeableConcept)	no
context-quantity TU	quantity	A quantity- or range-valued use context assigned to the code system	(CodeSystem.useContext.value as Quantity) (CodeSystem.useContext.value as Range)	no
context-type TU	token	A type of use context assigned to the code system	CodeSystem.useContext.code	no
context-type-quantity TU	composite	A use context type and quantity- or range-based value assigned to the code system	On CodeSystem.useContext: context-type: code context-quantity: value.as(Quantity) value.as(Range)	no
context-type-value TU	composite	A use context type and value assigned to the code system	On CodeSystem.useContext: context-type: code context: value.as(CodeableConcept)	no
date	date	The code system publication date	CodeSystem.date	yes

description	string	The description of the code system	CodeSystem.description	yes
identifier	token	External identifier for the code system	CodeSystem.identifier	yes
jurisdiction	token	Intended jurisdiction for the code system	CodeSystem.jurisdiction	yes
language	token	A language in which a designation is provided	CodeSystem.concept.designation.language	no
name	string	Computationally friendly name of the code system	CodeSystem.name	yes
publisher	string	Name of the publisher of the code system	CodeSystem.publisher	yes
status	token	The current status of the code system	CodeSystem.status	yes
supplements	reference	Find code system supplements for the referenced code system	CodeSystem.supplements (CodeSystem)	no
system	uri	The system for any codes defined by this code system (same as 'url')	CodeSystem.url	yes
title	string	The human-friendly name of the code system	CodeSystem.title	yes
url	uri	The uri that identifies the code system	CodeSystem.url	yes
version	token	The business version of the code system	CodeSystem.version	yes

3.3 ValueSet Search Parameters

Name	Type	Description	Expression	Supported?
code	token	This special parameter searches for codes in the value set. See additional notes on the ValueSet resource	ValueSet.expansion.contains.code ValueSet.compose.include.concept.code	yes
context TU	token	A use context assigned to the value set	(ValueSet.useContext.value as CodeableConcept)	no
context-quantity TU	quantity	A quantity- or range-valued use context assigned to the value set	(ValueSet.useContext.value as Quantity) (ValueSet.useContext.value as Range)	no
context-type TU	token	A type of use context assigned to the value set	ValueSet.useContext.code	no
context-type-quantity TU	composite	A use context type and quantity- or range-based value assigned to the value set	On ValueSet.useContext: context-type: code context-quantity: value.as(Quantity) value.as(Range)	no
context-type-value TU	composite	A use context type and value assigned to the value set	On ValueSet.useContext: context-type: code context: value.as(CodeableConcept)	no
date	date	The value set publication date	ValueSet.date	yes
description	string	The description of the value set	ValueSet.description	yes
expansion	uri	Identifies the value set expansion (business identifier)	ValueSet.expansion.identifier	no

identifier	token	External identifier for the value set	ValueSet.identifier	yes
jurisdiction	token	Intended jurisdiction for the value set	ValueSet.jurisdiction	yes
name	string	Computationally friendly name of the value set	ValueSet.name	yes
publisher	string	Name of the publisher of the value set	ValueSet.publisher	yes
reference	uri	A code system included or excluded in the value set or an imported value set	ValueSet.compose.include.system	yes
status	token	The current status of the value set	ValueSet.status	yes
title	string	The human-friendly name of the value set	ValueSet.title	yes
url	uri	The uri that identifies the value set	ValueSet.url	yes
version	token	The business version of the value set	ValueSet.version	yes

4 Modifiers

Modifiers specify special processing of search tests. Available *modifiers* are:

Name	Applies to Type	Supported	Description
(none)	all	yes	For strings, case-insensitive, head match of <i>value</i> on candidate; for Token (Coding or codeableConcept) case-insensitive head match of value on the Code or Value; others, exact match
missing	all	yes	Tests for existence of attribute; <i>value</i> must be 'true' or 'false'
exact	string	yes	Case-sensitive, exact match of <i>value</i>
contains	string	yes	Case-insensitive contains value
text	token	no	Head matches against the text (display) portion of a Coding or codeableConcept
above	uri, token	uri only	Value head-matches candidate uri
below	uri, token	uri only	Candidate uri head-matches value
in	token	no	Value is a ValueSet URI, tests whether candidate Coding is in the ValueSet
not_in	token	no	Value is a ValueSet URI, tests whether candidate Coding is not in the ValueSet
not	token	yes	Reverses the sense of the test: status:not=draft
asc	_sort only	yes	Specifies an ascending sort
desc	_sort only	yes	Specifies a descending sort

5 Prefixes

Prefixes specify the interpretation of the supplied *value*. *Prefixes* are only supported when the *parameter* type is date or numeric. Currently, only Date and String search parameters are defined for ValueSets or CodeSystems. Note that *prefixes* are not permitted when a *modifier* is present.

Name	Supported	Description
eq	yes	Candidate value is equal to specified <i>value</i> (default if no <i>prefix</i> present)
ne	yes	Candidate value is not equal to specified value
gt	yes	Candidate value is greater than specified value
lt	yes	Candidate value is less than specified value
ge	yes	Candidate value is greater than or equal to specified value
le	yes	Candidate value is less than or equal to specified value
sa	no	Candidate value starts after the specified value
eb	no	Candidate value ends before the specified value
ap	no	Candidate value is approximately equal to specified value

For entry of date *values*, a variety of formats, adapted from the basic FHIR format, can be used (using the Java DateFormat codes):

yyyy-MM-dd'T'HH:mm:ss.SSSXXX
yyyy-MM-dd'T'HH:mm:ss.SSS
yyyy-MM-dd'T'HH:mm:ss
yyyy-MM-dd'T'HH:mm
yyyy-MM-dd

Search parameters using date formats (date and _lastUpdated) are interpreted as *date intervals*. This affects date searches in the following ways:

?date=2018: The first second of “2018-1-1” up to (but not including) the first second of “2019-1-1”

?date= 2018-04: “2018-4-1” up to “2018-5-1”

date= 2018-01-01T00:00:00.000-05:00 (i.e Date values that specify a time containing “T”): These are “exact” searches and have an interval of one second

6 Sorting

The *_sort parameter* can be used to specify the sort order of the resulting resources. Two *modifiers* are available: **asc** and **desc**, which specify ascending and descending sort order respectively. The default is **asc**. The value sorted upon must be one of the search parameters. For the DTS FHIR Terminology Service, only one *_sort parameter* can be specified.

Other notes:

- When sorting, the actual sort value used is not returned explicitly by the server for each resource, just the resource contents.
- When sorting on string search parameters, sorting is performed on a case-insensitive basis.

7 Returned Results

Search results are returned in a FHIR Bundle object. The object contains the number of returned resources, the request URL (in the <link> element) and the selected resources themselves. The requestor can further limit the number of returned results through the *_count parameter*. Like the *_sort parameter*, this is another “meta” *parameter*, that is not part of the search criteria but affects the ultimate output. The *_count parameter* takes a single integer value.

Paging:

Search results can be further iterated using a combination of the *_count* and *_page* operators. This function is currently supported for ValueSets, CodeSystems and ConceptMaps. The returned XML in a paged search request will provide “**prev**” and “**next**” links to iterate between pages.

Note: The combination of *_sort* and *_count* can be used to return only the latest resource that meets particular criteria - set the criteria, and then sort by date in descending order, with *_count*=1. This way, the last matching resource will be returned.

In the event a search query is run without any sorting, paging, or count limitations, results are returned with a maximum of 50. This is done to improve the performance of the Search function and assist the user in narrowing down result sets. If the total count of the search results exceeds 50, a message suggesting using *_count* will be returned as well. (see example below)

GET ValueSet by Status=ACTIVE Response

```
<?xml version="1.0" encoding="UTF-8" standalone="yes"?>
<OperationOutcome xmlns="http://hl7.org/fhir" xmlns:ns2="http://www.w3.org/1999/xhtml">
  <id value="05dcd0d7-2072-4757-81c8-be1d3daa16c9"/>
  <issue id="6ae1c437-b1ce-4a5a-8655-8077a5041be2">
    <severity value="error"/>
    <code value="too-costly"/>
    <details>
      <text value="Query result set too large (632) for default cap of 50 results. To
narrow down results, use a more specific query or use the _count (and optionally _page)
parameter(s)."/>
    </details>
  </issue>
</OperationOutcome>
```

8 Examples

- Retrieve all ValueSets with a FHIR name that contains “Apelon”:
base-url/ValueSet?name:contains=Apelon
- Retrieve all the ValueSets with a FHIR _id beginning with “extensional” or “intensional”:
base-url/ValueSet?_id=extensional,intensional
- Retrieve all the ValueSets and sort in descending order by _id
base-url/ValueSet?_id:missing=false&_sort:desc=_id
- Retrieve the three most recent ValueSets that have been modified since 1/1/2014:
base-url/ValueSet?_lastUpdated=ge:2014-01-01&_sort:desc=_lastUpdated&_count=3
- Retrieve the 3rd page of search results for ConceptMaps, separated in multiple pages of 4 results each:
base-url/ConceptMap?url:missing=false&_count=4&_page=3
- Retrieve ValueSets that include or exclude a particular CodeSystem or an imported ValueSet:
base-url/ValueSet?reference=http://apelon.com/fhir/CodeSystem/fhir-example-cs