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Registration Data Access Protocol Basic Search Processing
draft-hollenbeck-weirds-rdap-search-02

Abstract

This document describes path segments and query parameters needed to construct HTTP URLs that may be used to search for and retrieve registration information from registries (including both Regional Internet Registries (RIRs) and Domain Name Registries (DNRs)) using "RESTful" web access patterns. It also describes a method of encoding responses using Javascript Object Notation (JSON).

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1. Conventions Used in This Document

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in RFC 2119 [RFC2119].

1.1. Acronyms and Abbreviations

DNR: Domain Name Registry
IDN: Internationalized Domain Name
RDAP: Registration Data Access Protocol
RIR: Regional Internet Registry

2. Introduction

This document describes a specification for registration data search functions using a RESTful web service. The search functions are implemented using the Hypertext Transfer Protocol (HTTP) [RFC2616].

Lookup processing as specified in [I-D.ietf-weirds-rdap-query] is used when a client wishes to retrieve information associated with a data object represented by a character string that exactly matches a particular key. There is no provision for partial string pattern matching to represent unknown characters or multiple result possibilities. Experience with WHOIS [RFC3912] implementation and

operation has shown that people are often unsure of exact spellings and they often want to receive multiple results that match a particular pattern. This specification is intended to meet that need for the Registration Data Access Protocol (RDAP).

3. Query and Search Parameters

RDAP search path segments are formed using a concatenation of the plural form of the object being searched for, a forward slash character ('/', ASCII value 0x002F), and an HTTP query string. The HTTP query string is formed using a concatenation of the question mark character ('?', ASCII value 0x003F), the JSON object value associated with the object being searched for, the equal sign character ('=', ASCII value 0x003D), and the search pattern. For the domain and entity objects described in this document the plural objects forms are "domains" and "entities". The JSON object value is "name". One could construct a query string for an entity email address using the "email" object name, but that is beyond the scope of this specification.

3.1. Domain Search

Syntax: domains/?name=<domain search pattern>

Searches for domain information are of the form /domains/?name=XXXX, where XXXX is a search pattern representing a fully-qualified domain name [RFC4343] in a zone administered by the server operator of a DNR. The following path would be used to find DNR information for domain names matching the "example*.com" pattern:

```
/domains/?name=example*.com
```

Internationalized Domain Names (IDNs) in U-label format [RFC5890] can also be used as search patterns (see Section 4).

Note that this search is relevant to DNRs, not RIRs.

3.2. Entity Search

Syntax: entities/?name=<entity search pattern>

Searches for entity information are of the form /entities/?name=XXXX, where XXXX is a search pattern representing an entity name as specified in Section 7.1 of [I-D.ietf-weirds-json-response]. The following path would be used to find DNR information for DNR entity names matching the "Bobby Joe*" pattern.

```
/entities/?name=Bobby%20Joe*
```

URLs MUST be properly encoded according to the rules of [RFC3986]. In the example above, "Bobby Joe*" is encoded to "Bobby%20Joe*".

4. Search Processing

Searching occurs either on whole strings or on partial strings. Partial string searching uses the asterisk ('*', ASCII value 0x002A) character to match zero or more characters. The location or number of occurrences of the asterisk character is not dictated by this specification. Some servers might support the asterisk in a trailing location only (e.g. "/domains/example*.com") while others may allow it a leading location (e.g. "/domains/*example.com"), or within strings, or even in multiple locations.

If a server receives a search request but cannot process the request because it does not support a particular style of partial match searching, it SHOULD return an HTTP 422 [RFC4918] error. When returning a 422 error, the server MAY also return an error response body as specified in Section 12 of [I-D.ietf-weirds-json-response] if the requested media type is one that is specified in [I-D.ietf-weirds-using-http].

Because Unicode characters may be combined with another Unicode character or characters, partial matching is not feasible across combinations of Unicode characters. Servers SHOULD NOT partially match combinations of Unicode characters where a Unicode character may be legally combined with another Unicode character or characters. Clients MUST NOT issue a partial match search of Unicode characters where a Unicode character may be legally combined with another Unicode character or characters. Partial match searches with incomplete combinations of characters where a character must be combined with another character or characters are invalid. Partial match searches with characters that may be combined with another character or characters are to be considered non-combined characters (that is, if character x maybe combined with character y but character y is not submitted in the search string then character x is a complete character and no combinations of character x are to be searched).

Because Unicode characters may be combined with another Unicode character or characters, partial matching requires that a server maintain a list of valid character combinations to be considered a match. When comparing DNS U-labels, servers SHOULD use the code points specified in [RFC5892] to determine partial matches. When comparing entity names, servers SHOULD use the normalization rules and code points specified by [I-D.ietf-precis-nickname] to determine partial matches.

Clients SHOULD NOT submit search requests with partial matching for DNS A-labels. A-labels represent an encoding that can only be reconstructed properly when the label is complete.

5. Search Results

The method to return search results described here is not limited to the /domains or /entities searches defined in this document. It can also be used by future specifications to define search results for other types of registration data.

Search results are returned in a JSON object. This object contains data structures as outlined in Section 5 of [I-D.ietf-weirds-json-response] (e.g. "rdapConformance", "notices", etc...) and an array called "results" containing the objects that are a result of the search. For the /domains (Section 3.1) and /entities (Section 3.2) searches, the entity object class and the domain object class are defined in [I-D.ietf-weirds-json-response].

To identify the type of object returned in the "results" array, each object SHOULD contain a JSON string named "objectClass" (see Section 4.2 of [I-D.ietf-weirds-json-response] regarding the inclusion of new JSON data in object classes). For domains, the string MUST be "domain" and for entities the string MUST be "entity".

Servers SHOULD signify their compliance with this specification by including the string "domain_entity_search_level_0" in the "rdapConformance" array.

```
{
  "rdapConformance" :
  [
    "rdap_level_0",
    "domain_entity_search_level_0"
  ],
  ...
  "results" :
  [
    {
      "handle" : "1-XXXX",
      "name" : "1.example.com",
      "objectClass" : "domain",
      ...
    },
    {
      "handle" : "2-XXXX",
      "name" : "2.example.com",
      "objectClass" : "domain",

```

```

    } ...
  ]
}
```

Figure 1

6. Internationalization Considerations

TBD. Give guidelines for how a local policy could work for searching.

7. IANA Considerations

This document does not specify any IANA actions.

8. Security Considerations

Security services for the operations specified in this document are described in "Security Services for the Registration Data Access Protocol" [I-D.ietf-weirds-rdap-sec]. Additional considerations that are specific to search functionality are described here.

Search functionality typically requires more server resources (such as memory, CPU cycles, and network bandwidth) when compared to basic lookup functionality. This increases the risk of server resource exhaustion and subsequent denial of service due to abuse. This risk can be mitigated by developing and implementing controls to restrict search functionality to identified and authorized clients. If those clients behave badly, their search privileges can be suspended or revoked. Rate limiting as described in Section 5.5 of "Using the Registration Data Access Protocol (RDAP) with HTTP" [I-D.ietf-weirds-using-http] can also be used to control the rate of received search requests. Server operators can also reduce their risk by restricting the amount of information returned in response to a search request.

9. Acknowledgements

The authors would like to acknowledge the following individuals for their contributions to this document: Ning Kong, Linlin Zhou.

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Appendix A. Change Log

Initial -00: First draft individual submission.
-01: Changed HTTP error code from 500 to 422 in Section 4. Added a normative reference to RFC 4918.
-02: Updated Security Considerations. Added IDN processing text in Section 3.1.

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Registration Data Access Protocol RESTful Searching
draft-zhou-weirds-rdap-restful-search-00

Abstract

This document describes the searchability details of the Registration Data Access Protocol (RDAP). It specifies basic and extended searching parameters, defines the JSON (JavaScript Object Notation) formats of searching and responding data structure and also proposes the specification of boolean search functionality.

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1. Introduction

A searchable RDAP service is a HTTP (Hypertext Transfer Protocol) based function which supports multiple searching parameters and boolean search capabilities. This document describes the specifications for searching parameters, searching response formats, boolean search function and some security consideration about RDAP searchability.

First the RESTful query URI formats for searching specific information are defined. There are 5 basic searching types and some extended searching parameters that may be used according to the New gTLD Applicant Guide Book. The basic searching types, including search of IP, AS (Autonomous System) number, domain, name server and entity, that are consistent with the query types defined in draft-ietf-weirds-rdap-query [I-D.ietf-weirds-rdap-query].

The second section of this document describes the boolean search function that supports a set of search criteria like AND, OR, NOT.

The third part of this document gives some response data format specified in JSON and proposes some consideration on ordering and paging.

Finally, this document talks about some security issues that should be considered to avoid abuses of this searchability feature.

2. Searching Parameters

In this section, basic and extended searching parameters are mainly presented. The combination of following parameters can also be used as searching parameters.

2.1. Basic Search

Basic search means 5 types of searching parameters which includes IP, AS number, domain, name server and entity.

2.1.1. IP Search

Syntax: /search/?ip=<IP address> or ip/?address=<CIDR format>

IP search parameter is either an IPv4 RFC 1166 [RFC1166] or IPv6 RFC 5952 [RFC5952] address (i.e. XXX) or an IPv4 or IPv6 CIDR RFC 4632 [RFC4632] notation address block (i.e. XXX/YY).

This is an example URL for the most specific network containing

192.0.2.0:

/search/?ip=192.0.2.0

This is an example URL for the most specific network containing 192.0.2.0/24:

/search/?ip=192.0.2.0%2f24

2.1.2. AS Number Search

Syntax: /search/?as=<autonomous system number>

Searches for information regarding autonomous system number registrations are of the form /autnum/?as=XXX where XXX is an autonomous system number RFC 5396 [RFC5396].

The following is an example URL for the AS number search.

/search/?as=65551

2.1.3. Domain Search

Syntax: /search/?domain=<domain names>

Searches for domain information are of the form /?domain=XXXX, where XXXX is a fully-qualified domain name RFC 4343 [RFC4343] in either the in-addr.arpa or ip6.arpa zones (for Regional Internet Registries (RIRs)) or a fully-qualified domain name in a zone administered by the server operator (for Domain Name Registries (DNRs)).

The example URL for searching domain name like example.com is defined below.

/search/?domain=example.com

2.1.4. Name Server Search

Syntax: /search/?ns=<name server names>

This parameter represents a fully qualified name as specified in RFC 952 [RFC0952] and RFC 1123 [RFC1123]. Internationalized names represented in A-label format RFC 5890 [RFC5890] are also valid name server names.

This is an example URL for the specific name server searching containing ns.example.com.

/search/?ns=ns.example.com

2.1.5. Entity Search

Syntax: /search/?entityID=<Entity Handle>

This parameter represents an entity (such as a contact, registrant, or registrar) identifier.

The example URL for searching entity handle such as CID0193 is defined below.

/search/?entityID=CID0193

2.2. Extended Search

This searchable function defined in New gTLD Applicant Guide Book should offer partial or exact match capabilities on some fields, such as contact name, city, street, postal code etc.. So besides the basic search parameters, other extended search parameters are also specified.

Syntax: /search/?keyword=<value>

Followings are some search examples that this functionality that would support.

1. The "entityname" field represents the names of a specified contact, registrant or registrar. This an example URL for the entity names search: /search/?entityname=James%20Blunt
2. The "street" parameter contains the entity's street address defined in RFC 5733 [RFC5733]. A street search example: /search/?street=123%20Example%20Dr
3. The "city" parameter contains the entity's city defined in RFC 5733 [RFC5733]. A city search example: /search/?city=Beijing
4. The "sp" parameter contains the entity's state or province defined in RFC 5733 [RFC5733]. A state or province search example: /search/?sp=VA
5. The "pc" parameter contains the entity's postal code defined in RFC 5733 [RFC5733]. A postal code search example: /search/?pc=100190
6. The "cc" parameter contains the entity's country code defined in RFC 5733 [RFC5733]. A country code search example: /search/

?cc=CN

3. Boolean Search

RIRs and DNRs shall offer Boolean search capabilities supporting, at least, the following logical operators to join a set of search criteria: AND, OR, NOT.

Any fields described above can be combined together by the boolean criteria to be the search input parameters. Partial-match and exact-match capabilities would also be offered by RIRs and DNRs. "*" is the replace mark for partial-match function. "&" mark represents AND, "+" mark means OR and "-" mark means that none of the input text is included in the response results.

An example is given below searching for entity name called James *** or Tom ***, registered domain name is xyz.com and country code is not CN.

/search/?entityname=James*+Tom*&domain=xyz.com&cc=-CN

4. Search Response Format

The search results will be returned in a JSON object, the format of which is discussed in the section 5 of draft-hollenbeck-weirds-rdap-search [I-D.hollenbeck-weirds-rdap-search]. Ordering and paging are taken into consideration in this document. Three JSON objects, which are "page", "total" and "orderby" are defined as below.

The server could specify the number of display results per page according to different registries' requirements. The search response will include the page number and total page number information in the results. "orderby" is the field using for ordering all the results.

```
{
  "results" :
  [
    {
      "handle" : "1-XXXX",
      "name" : "1.example.com",
      "objectClass" : "domain",
      ...
      "page" : "1",
      "total" : "10",
      "orderby" : "domain"
    },
    {
      "handle" : "2-XXXX",
      "name" : "2.example.com",
      "objectClass" : "domain",
      ...
      "page" : "1",
      "total" : "10",
      "orderby" : "domain"
    }
  ]
}
```

This response format is a preliminary design for future discussion. If the idea is adopted by the working group, the search URI including paging and ordering information should also be specified, such as `/search/?domain=example.com&page=1&orderby=domain`.

5. IANA Considerations

This document does not specify any IANA actions.

6. Security considerations

The service shall include appropriate precautions to avoid abuse of this feature.

A registrar or registrant may only login the searchable Whois system using their own ID and password, and may only search information related to their own domain names.

If a registrar, registrant or a third-party user wants to search others' information, they need to explain the reasonable purposes, commit to protect privacy and security, and sign an agreement at

first.

7. Acknowledgements

The authors especially thank the following individuals who gave their suggestions and contributions to this document: Kevin Tse.

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