

Network Working Group  
Internet-Draft  
Intended status: Standards Track  
Expires: May 30, 2013

A. Newton  
ARIN  
S. Hollenbeck  
Verisign Labs  
November 26, 2012

**Unified Registration Data Access Protocol Query Format**  
**draft-ietf-weirds-rdap-query-01**

Abstract

This document describes uniform patterns to construct HTTP URLs that may be used to retrieve registration information from registries (including both Regional Internet Registries (RIRs) and Domain Name Registries (DNRs)) using "RESTful" web access patterns.

Status of this Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <http://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on May 30, 2013.

Copyright Notice

Copyright (c) 2012 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

## Table of Contents

<a href="#">1.</a>	<a href="#">Conventions Used in This Document</a>	<a href="#">3</a>
<a href="#">1.1.</a>	<a href="#">Acronyms and Abbreviations</a>	<a href="#">3</a>
<a href="#">2.</a>	<a href="#">Introduction</a>	<a href="#">3</a>
<a href="#">3.</a>	<a href="#">Path Segment Specification</a>	<a href="#">4</a>
<a href="#">3.1.</a>	<a href="#">IP Network Path Segment Specification</a>	<a href="#">4</a>
<a href="#">3.2.</a>	<a href="#">Autonomous System Path Segment Specification</a>	<a href="#">5</a>
<a href="#">3.3.</a>	<a href="#">Domain Path Segment Specification</a>	<a href="#">5</a>
<a href="#">3.4.</a>	<a href="#">Name Server Path Segment Specification</a>	<a href="#">6</a>
<a href="#">3.5.</a>	<a href="#">Entity Path Segment Specification</a>	<a href="#">6</a>
<a href="#">4.</a>	<a href="#">Extensibility</a>	<a href="#">6</a>
<a href="#">5.</a>	<a href="#">Internationalization Considerations</a>	<a href="#">7</a>
<a href="#">6.</a>	<a href="#">IANA Considerations</a>	<a href="#">7</a>
<a href="#">7.</a>	<a href="#">Security Considerations</a>	<a href="#">7</a>
<a href="#">8.</a>	<a href="#">Acknowledgements</a>	<a href="#">7</a>
<a href="#">9.</a>	<a href="#">References</a>	<a href="#">8</a>
<a href="#">9.1.</a>	<a href="#">Normative References</a>	<a href="#">8</a>
<a href="#">9.2.</a>	<a href="#">Informative References</a>	<a href="#">9</a>
<a href="#">Appendix A.</a>	<a href="#">Path Segment Specification for Search Queries</a>	<a href="#">9</a>
<a href="#">Appendix B.</a>	<a href="#">Change Log</a>	<a href="#">10</a>
	<a href="#">Authors' Addresses</a>	<a href="#">10</a>



## **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

RDAP: Registration Data Access Protocol

RIR: Regional Internet Registry

## **2. Introduction**

This document describes a specification for querying registration data using a RESTful web service and uniform query patterns. The service is implemented using the Hypertext Transfer Protocol (HTTP) [[RFC2616](#)].

The protocol described in this specification is intended to address deficiencies with the WHOIS protocol [[RFC3912](#)] that have been identified over time, including:

- o Lack of standardized command structures,
- o lack of standardized output and error structures,
- o lack of support for internationalization and localization, and
- o lack of support for user identification, authentication, and access control.

The patterns described in this document purposefully do not encompass all of the methods employed in the WHOIS and RESTful web services of all of the RIRs and DNRs. The intent of the patterns described here are to enable lookups of networks by IP address, autonomous system numbers by number, reverse DNS meta-data by domain, domains by name, name servers by name, registrars by name, and entities (such as contacts) by identifier. It is envisioned that each registry will continue to maintain NICNAME/WHOIS and/or RESTful web services specific to their needs and those of their constituencies, and the information retrieved through the patterns described here may reference such services.

WHOIS services, in general, are read-only services. Therefore URL [[RFC3986](#)] patterns presented here are only applicable to the HTTP [[RFC2616](#)] GET and HEAD methods.



This document does not describe the results or entities returned from issuing the described URLs with an HTTP GET. It is envisioned that other documents will describe these entities in various serialization formats, such as JavaScript Object Notation (JSON, [[RFC4627](#)]).

Additionally, resource management, provisioning and update functions are out of scope for this document. Registries have various and divergent methods covering these functions, and it is unlikely a uniform approach for these functions will ever be possible.

While HTTP contains mechanisms for servers to authenticate clients and for clients to authenticate servers (from which authorization schemes may be built), both authentication of clients and servers and authorization for access to data are out-of-scope of this document. In general, these matters require "policy" and are not the domain of technical standards bodies.

### **3. Path Segment Specification**

The uniform patterns start with a base URL [[RFC3986](#)] specified by each registry or any other service provider offering this service. The base URL will be appended with resource type specific path segments. The base URL may contain its own path segments (e.g. `http://example.com/...` or `http://example.com/restful-WHOIS/...` ).

The resource type path segments are:

- o 'ip': IP networks and associated data referenced using either an IPv4 or IPv6 address.
- o 'autnum': Autonomous system registrations and associated data referenced using an AS Plain autonomous system number.
- o 'domain': Reverse DNS (RIR) or domain name (DNR) information and associated data referenced using a fully-qualified domain name.
- o 'nameserver': Used to identify a name server information query.
- o 'entity': Used to identify an entity information query.

#### **3.1. IP Network Path Segment Specification**

Syntax: `ip/<IP address>` or `ip/<CIDR prefix>/<CIDR length>`

Queries for information about IP networks are of the form `/ip/XXX/...` or `/ip/XXX/YY/...` where the path segment following 'ip' is either an IPv4 [[RFC1166](#)] or IPv6 [[RFC5952](#)] address (i.e. XXX) or an IPv4 or IPv6 CIDR [[RFC4632](#)] notation address block (i.e. XXX/YY).

Semantically, the simpler form using the address can be thought of as a CIDR block with a length of 32 for IPv4 and a length of 128 for IPv6. A given specific address or CIDR may fall within multiple IP networks in a hierarchy of networks, therefore this query targets the



"most-specific" or lowest IP network which completely encompasses it in a hierarchy of IP networks.

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

```
/ip/192.0.2.0
```

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

```
/ip/192.0.2.0/24
```

### **3.2. Autonomous System Path Segment Specification**

Syntax: autnum/<autonomous system number>

Queries for information regarding autonomous system number registrations are of the form /autnum/XXX/... where XXX is an autonomous system number [[RFC5396](#)]. In some registries, registration of autonomous system numbers is done on an individual number basis, while other registries may register blocks of autonomous system numbers. The semantics of this query is such that if a number falls within a range of registered blocks, the target of the query is the block registration, and that individual number registrations are considered a block of numbers with a size of 1.

For example, to find information on autonomous system number 65551, the following path would be used:

```
/autnum/65551
```

### **3.3. Domain Path Segment Specification**

Syntax: domain/<domain name>

Queries for domain information are of the form /domain/XXXX/..., where XXXX is a fully-qualified domain name [[RFC4343](#)] in either the in-addr.arpa or ip6.arpa zones (for RIRs) or a fully-qualified domain name in a zone administered by the server operator (for DNRs). Internationalized domain names represented in A-label format [[RFC5890](#)] are also valid domain names.

The following path would be used to find information describing the zone serving the network 192.0.2/24:

```
/domain/2.0.192.in-addr.arpa
```





The following path would be used to find information for the example.com domain name:

```
/domain/example.com
```

### **3.4. Name Server Path Segment Specification**

Syntax: nameserver/<name server name>

The <name server name> parameter represents a fully qualified name as specified in [RFC 952](#) [[RFC0952](#)] and [RFC 1123](#) [[RFC1123](#)]. Internationalized names represented in A-label format [[RFC5890](#)] are also valid name server names.

The following path would be used to find information for the ns1.example.com name server:

```
/nameserver/ns1.example.com
```

### **3.5. Entity Path Segment Specification**

Syntax: entity/<handle>

The <handle> parameter represents an entity (such as a contact, registrant, or registrar) identifier. For example, for some DNRs contact identifiers are specified in [RFC 5730](#) [[RFC5730](#)] and [RFC 5733](#) [[RFC5733](#)].

The following path would be used to find information for the entity associated with handle CID-4005:

```
/entity/CID-4005
```

## **4. Extensibility**

This document describes path segment specifications for a limited number of objects commonly registered in both RIRs and DNRs. It does not attempt to describe path segments for all of the objects registered in all registries. Custom path segments can be created for objects not specified here using the process described in Section TBD of "Using HTTP for RESTful Whois Services by Internet Registries" [[I-D.ietf-weirds-using-http](#)].

Custom path segments can be created by prefixing the segment with a unique identifier followed by an underscore character (0x5F). For example, a custom entity path segment could be created by prefixing "entity" with "custom\_", producing "custom\_entity". Servers SHOULD



ignore unrecognized path segments.

## **5. Internationalization Considerations**

There is value in supporting the ability to submit either a U-label (Unicode form of an IDN label) or an A-label (ASCII form of an IDN label) as a query argument to an RDAP service. Clients with graphical user interfaces may prefer a U-label since this is more visually recognizable and familiar than A-label strings, but clients of programmatic interfaces may wish to submit and display A-labels or may not be able to input U-labels with their keyboard configuration. In the interest of protocol simplicity, A-labels (the "wire format" of IDNs) are the only labels supported by this specification.

Internationalized domain and name server names can contain character variants and variant labels as described in [RFC 4290](#) [[RFC4290](#)]. Clients that support queries for internationalized domain and name server names MUST accept service provider responses that describe variants as specified in "JSON Responses for the Registration Data Access Protocol" [[I-D.ietf-weirds-json-response](#)].

## **6. IANA Considerations**

This document does not specify any IANA actions.

## **7. 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](#)]. As we identify specific use cases for which security services are needed they will be described here.

## **8. Acknowledgements**

This document is derived from original work on RIR query formats developed by Byron J. Ellacott of APNIC, Arturo L. Servin of LACNIC, Kaveh Ranjbar of the RIPE NCC, and Andrew L. Newton of ARIN. Additionally, this document incorporates DNR query formats originally described by Francisco Arias and Steve Sheng of ICANN and Scott Hollenbeck of Verisign.

The authors would like to acknowledge the following individuals for their contributions to this document: TBD.



## 9. References

### 9.1. Normative References

- [I-D.ietf-weirds-json-response]  
Newton, A. and S. Hollenbeck, "JSON Responses for the Registry Data Access Protocol (RDAP)",  
[draft-ietf-weirds-json-response-00](#) (work in progress),  
September 2012.
- [I-D.ietf-weirds-rdap-sec]  
Hollenbeck, S. and N. Kong, "Security Services for the Registration Data Access Protocol",  
[draft-ietf-weirds-rdap-sec-00](#) (work in progress),  
September 2012.
- [I-D.ietf-weirds-using-http]  
Newton, A., Ellacott, B., and N. Kong, "Using the Registration Data Access Protocol (RDAP) with HTTP",  
[draft-ietf-weirds-using-http-00](#) (work in progress),  
September 2012.
- [RFC0952] Harrenstien, K., Stahl, M., and E. Feinler, "DoD Internet host table specification", [RFC 952](#), October 1985.
- [RFC1123] Braden, R., "Requirements for Internet Hosts - Application and Support", STD 3, [RFC 1123](#), October 1989.
- [RFC1166] Kirkpatrick, S., Stahl, M., and M. Recker, "Internet numbers", [RFC 1166](#), July 1990.
- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), March 1997.
- [RFC2616] Fielding, R., Gettys, J., Mogul, J., Frystyk, H., Masinter, L., Leach, P., and T. Berners-Lee, "Hypertext Transfer Protocol -- HTTP/1.1", [RFC 2616](#), June 1999.
- [RFC3986] Berners-Lee, T., Fielding, R., and L. Masinter, "Uniform Resource Identifier (URI): Generic Syntax", STD 66, [RFC 3986](#), January 2005.
- [RFC4290] Klensin, J., "Suggested Practices for Registration of Internationalized Domain Names (IDN)", [RFC 4290](#), December 2005.
- [RFC4343] Eastlake, D., "Domain Name System (DNS) Case Insensitivity Clarification", [RFC 4343](#), January 2006.



- [RFC4632] Fuller, V. and T. Li, "Classless Inter-domain Routing (CIDR): The Internet Address Assignment and Aggregation Plan", [BCP 122](#), [RFC 4632](#), August 2006.
- [RFC5396] Huston, G. and G. Michaelson, "Textual Representation of Autonomous System (AS) Numbers", [RFC 5396](#), December 2008.
- [RFC5730] Hollenbeck, S., "Extensible Provisioning Protocol (EPP)", STD 69, [RFC 5730](#), August 2009.
- [RFC5733] Hollenbeck, S., "Extensible Provisioning Protocol (EPP) Contact Mapping", STD 69, [RFC 5733](#), August 2009.
- [RFC5890] Klensin, J., "Internationalized Domain Names for Applications (IDNA): Definitions and Document Framework", [RFC 5890](#), August 2010.
- [RFC5952] Kawamura, S. and M. Kawashima, "A Recommendation for IPv6 Address Text Representation", [RFC 5952](#), August 2010.

## **[9.2.](#) Informative References**

- [RFC3912] Daigle, L., "WHOIS Protocol Specification", [RFC 3912](#), September 2004.
- [RFC4627] Crockford, D., "The application/json Media Type for JavaScript Object Notation (JSON)", [RFC 4627](#), July 2006.

## URIs

- [1] <[https://www.arin.net/resources/whoisrws/whois\\_api.html](https://www.arin.net/resources/whoisrws/whois_api.html)>
- [2] <<http://www.w3.org/DesignIssues/MatrixURIs.html>>
- [3] <<http://whois.arin.net/ui>>
- [4] <<http://dnrd.verisignlabs.com/dnrd-ap/>>

## **[Appendix A.](#) Path Segment Specification for Search Queries**

All of the path segments described in this document identify patterns for exact-match lookups of data elements. We have explicitly omitted specifications for search queries in the interest of first focusing on more basic protocol operations. Once we understand how exact-match queries will work we will attempt to define specifications for search queries.





It is important to note that there are already multiple implementations of RESTful RDAP-like prototypes that provide search capabilities. For example:

The American Registry for Internet Numbers (ARIN) has published an API [1] (see [Section 4.4.2](#)) that describes using plural forms of path segment identifiers (e.g. "domains") and Matrix URIs [2] to indicate that a client is requesting a list of values when searching for RIR registration data. A prototype service [3] that implements this API is up and running.

Verisign has deployed a prototype service [4] that implements searches for DNR registration data using HTML query strings (e.g. "?\_PRE") to identify search parameters. For example, "http://dnrd.verisignlabs.com/dnrd-ap/domain/verisign?\_PRE" performs a search for domain names with a "verisign" prefix.

The specifications that are eventually added to this document will likely combine features from these and other examples of running code.

## [Appendix B](#). Change Log

Initial -00: Adopted as working group document.

-01: Added "Conventions Used in This Document" section. Added normative reference to [draft-ietf-weirds-rdap-sec](#) and some wrapping text in the Security Considerations section.

## Authors' Addresses

Andrew Lee Newton  
American Registry for Internet Numbers  
3635 Concorde Parkway  
Chantilly, VA 20151  
US

Email: [andy@arin.net](mailto:andy@arin.net)  
URI: <http://www.arin.net>



Scott Hollenbeck  
Verisign Labs  
12061 Bluemont Way  
Reston, VA 20190  
US

Email: [shollenbeck@verisign.com](mailto:shollenbeck@verisign.com)

URI: <http://www.verisignlabs.com/>