



# RDAP: What's Next?

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# Limitations of (port-43) WHOIS

- ⦿ Unformatted
- ⦿ Not internationalized
- ⦿ Unauthenticated
- ⦿ Insecure
- ⦿ Unable to provide differentiated service
- ⦿ Non-extensible
- ⦿ No bootstrapping mechanism
- ⦿ Lack of standardized redirection/reference

# History on Replacing the WHOIS Protocol

- ⦿ SSAC's SAC 051 Advisory (19 Sep 2011):  
*The ICANN community should evaluate and adopt a replacement domain name registration data access protocol*
- ⦿ Board resolution adopting SAC 051 (28 October 2011)
- ⦿ Roadmap to implement SAC 051 (4 June 2012)
- ⦿ Registration Data Access Protocol (RDAP) community development within IETF working group started in 2012
- ⦿ Contractual provisions in .com, .name, .biz, .info, .org, 2012 Registry Agreement and 2013 Registrar Accreditation Agreement
- ⦿ RDAP Request for Comments (RFCs) published in March 2015

# RDAP Goals

- ⦿ Intended to replace the WHOIS (port-43) protocol
- ⦿ Provides flexibility to support various policies
- ⦿ Provide benefits improving on weaknesses in the WHOIS protocol
- ⦿ Designed with the knowledge of a now mature industry

# RDAP Features

- ⦿ Structured queries and responses
- ⦿ Modern (RESTful API, JSON responses)
  - ⦿ Web application friendly
- ⦿ Extensible, while managed
  - ⦿ IANA registry to list extensions
- ⦿ Authentication/authorization capabilities
  - ⦿ Through standard web
- ⦿ Flexible method for identifying authoritative sources

# RDAP Examples

## ⦿ Queries:

- <https://example.com/rdap/domain/blah.example.com>
- [https://example.com/rdap/domains?name=example\\*.com](https://example.com/rdap/domains?name=example*.com)
- <https://example.com/rdap/nameserver/ns1.example.co>
- <https://example.com/rdap/ip/192.0.2.0>
- <https://example.com/rdap/autnum/12>

## ⦿ Responses (two pages long for one response):

```
{
  "objectClassName" : "domain",
  "handle" : "XXXX",
  "ldhName" : "xn--fo-5ja.example",
  "unicodeName" : "foo.example",
  "variants" :
  [
    {
      "relation" : [ "registered", "conjoined" ],
      "variantNames" :
      [
        {
          "ldhName" : "xn--fo-cka.example",
          "unicodeName" : "foo.example"
        },
        {
          "ldhName" : "xn--fo-fka.example",
```

# Open Questions

- ⦿ How long after RDAP deployment to turn off (port-43) WHOIS?
- ⦿ Should the requirement to offer web-based (HTML) RDDS remain?
- ⦿ How to map current RDDS (WHOIS) policy and contractual requirements in RDAP?



# Need for an RDAP Profile

- ⦿ Why do we need an RDAP profile?
  - ⦿ RFC must, should, etc...
  - ⦿ RDAP RFCs are transport protocols
    - ⦿ Do not specify which elements are required
    - ⦿ What are the details of the elements, etc.
- ⦿ Evolution from WHOIS to RDAP
- ⦿ Mapping the WHOIS ICANN requirements (RA, RAA, Advisories) to the new protocol using RDAP features, including updating terminology (RDDS = WHOIS, web + RDAP)

# RDAP Protocol Compliance

Topic	Reference
<p>The RDAP service MUST be compliant with the following Internet Engineering Task Force (IETF) documents:</p> <ul style="list-style-type: none"><li>o RFC7480 - HTTP Usage in the Registration Data Access Protocol (RDAP)</li><li>o RFC7481 - Security Services for the Registration Data Access Protocol (RDAP)</li><li>o RFC7482 - Registration Data Access Protocol Query Format (RDAP)</li><li>o RFC7483 - JSON Responses for the Registration Data Access Protocol (RDAP)</li><li>o RFC7484 - Finding the Authoritative Registration Data Service (RDAP)</li></ul>	<p>RFC7480, 7481, 7482, 7483, 7484</p>
<p>The RDAP service MUST only support HTTPS</p>	<p>IAB Statement</p>

# Profile (cont.)

Topic	Reference
The RDAP service MUST support both GET and HEAD types of HTTP methods. HEAD requests are used to verify the existence of an object in the database, as specified in RFC7480	RFC7480, S4.1
RDAP extensions, if used, MUST be registered in the IANA RDAP Extensions registry, as defined in RFC7480	RFC7480, S6
RDAP conformance object: an rdapConformance object MUST be present in the topmost object of every response. It MUST contain the conformance level of the RDAP protocol and of any extension, as specified in RFC7483	RFC7483, S4.1

# Profile (cont.)

Topic	Reference
RDAP services <b>MUST</b> be available over both IPv4 and IPv6 transport	RA Spec 6 s1.5, RAA s3.3.1
RDAP servers <b>SHOULD</b> avoid inserting JSON members that are not part of a registered extension	RFC7480, s6

# Responses to RDAP Queries

Topic	Reference
Internationalized (IDN) RDAP queries of domains MUST be supported if the target TLD supports internationalized domains	RA S 6 1.4, RAA RDDS 1. and RAA AROS 3, ICANN idn-guidelines-2011-09-02-en
Servers MAY include a language identifier member in RDAP objects, with the exception of jCard objects, as described in RFC7483 section 4.4	RFC7483 4.4
RDAP servers MAY answer requests with data in multiple languages, if the data is available	RFC7480 9.2

# Profile (cont.)

Topic	Reference
JCard contact objects MAY include language property parameters for the contact names (n, fn), organization (org) and address (adr) properties	RFC7483 4.4, RFC6350 5.1, RFC7095
The content of RDAP answers is expected to be the same across all RDDS services	RA S 4 1.
The case sensitiveness of the data returned in RDAP responses MUST be preserved	RDDS Clarification Advisory 19



# Profile (cont.)

Topic	Reference
Leading and trailing space or spaces SHOULD NOT appear in the RDAP data	RDDS Clarification Advisory 16.
RDAP responses MUST NOT contain carriage return and line feed characters, except in JCard unstructured addresses. As described in RFC7483 section 4.3, large fields such as notices and remarks may be divided in separate strings to improve readability	RDDS Clarification Advisory 20
The RDAP server terms of service MUST be specified in the “notices” object in the topmost JSON object of the response	RA S 4 1.5 and 1.7.2, RAA RDDS S 1.4.2

# Profile (cont.)

Topic	Reference
<p>In contact entities, the Phone Number elements are inserted as “tel” properties with a “voice” type parameter. Optional Fax Number elements are inserted as “tel” properties with a “fax” type parameter, as specified in RFC6350, the vCard Format Specification</p>	<p>RA S 4 1.5.2 and 1.6.2, RAA RDDS S 1.4.2</p>
<p>RDAP Help queries MUST be answered and provide a reference (link) to usage information, policy and other explanatory material</p>	<p>RFC7483 7</p>
<p>Truncated responses MUST contain a notices member describing the reason of the truncation. The notices object type MUST be of the form “Response truncated due to {authorization load unexplainable reason}”</p>	<p>RFC7483 9</p>

# Profile (cont.)

Topic	Reference
Truncated <u>objects</u> MUST contain a remarks member describing the reason of the truncation. The remarks object type MUST follow the form “Result set truncated due to {authorization load unexplainable reason}”	RFC7483 9

# Responses to Domain Name RDAP Queries

# Profile

Topic	Reference
The top-level “notices” object MUST contain the name of the responding server, a short description and a referral URL within its “links” member	RA S 4 1.5 and 1.7.2, RAA RDDS S 1.4.2
The top-level "domain" object MUST contain the Domain ID in the “handle” member	RA S 4 1.5.2, RAA RDDS S 1.4.2
The top-level "domain" object MUST contain the a-label form of the domain in the “ldhName” member	RFC7483 5.3, RDDS Clarification Advisory 5

# Profile (cont.)

Topic	Reference
The top-level "domain" object MUST contain the internationalized Domain Name in u-label form in the "unicodeName" member, if the domain name is an IDN	RFC7483 5.3, RDDS Clarification Advisory 6
The top-level domain object MUST contain a list of all current domain statuses in the "status" member. The status MUST be valid status types per IANA's RDAP JSON Values registry	RA S 4 1.8, RAA RDDS S 1.5, RFC7483 4.6, 10.2.2
The domain object MUST contain a publicIDs member to identify the IANA registrar identifier from IANA's Registrar ID registry. The "type" value of the publicIDs object MUST be equal to "IANA Registrar ID"	RA S 4 1.5.2 and 1.10.3, RAA RDDS S 1.4.2, RFC7483 4.8, 5.3

# Profile (cont.)

Topic	Reference
<p>The domain object MUST contain the Name Servers information for the domain in the nameservers member. Each nameserver object MUST contain the following members: handle, ldhName, status, remarks, links. Each nameserver MAY contain the following members, if known: ipAddresses, unicodeName, port43, events</p>	<p>RA S 4 1.5.2, RAA RDDS S 1.4.2, RFC7483 5.2 and 5.3</p>
<p>The domain object MUST contain entities with the following roles (defined in IANA's RDAP JSON Values registry<sup>1</sup>), each of them with a handle and valid fields "fn," "n," "adr," "tel," "email": registrant, administrative, technical, registrar</p>	<p>RA S 4 1.5.2, RAA RDDS S 1.4.2, RDDS Clarification Advisory 27</p>
<p>The domain object MUST contain the following events: An event of evenAction type "registration," with the Creation Date of the domain. An event of eventAction type "expiration," with the Domain Expiration date of the domain. An event of evenAction type "last changed" containing the last update date and time</p>	<p>RA S 4 1.5.2 and RAA RDDS 1.4.2</p>

# Profile (cont.)

Topic	Reference
<p>The domain object MAY contain the following events:</p> <ul style="list-style-type: none"><li>o An event of eventAction type “last transferred,” with the last transferred date of the domain</li></ul>	RFC7483 10.2.3
<p>Contact entities SHOULD use jCard structured addresses</p>	RDDS Clarification Advisory 20, RFC7095
<p>If, for this domain, variants with a status of “registered” exist, the domain object SHOULD contain a “variants” member (RFC7483 section 10.2.5). The variants relation members MUST be values of the “domain variant relation” type in the IANA RDAP JSON Values registry</p>	RFC7483 5.3, RDDS Clarification Advisory 11



# Profile (cont.)

Topic	Reference
The status member value of RDAP nameserver and entity objects MUST conform to the values defined in IANA's RDAP JSON Values <sup>1</sup> of "status" type (originally defined in RFC7483 section 10.2.2)	RFC7483 5.3 and 10.2.2
The status member of a domain object MUST use an RDAP status that matches the EPP Status codes listed on ICANN's EPP Status Code ( <a href="https://www.icann.org/resources/pages/epp-status-codes-2014-06-16-en">https://www.icann.org/resources/pages/epp-status-codes-2014-06-16-en</a> )	RFC7483 4.6, 5.3 and 10.2.2, RA S 4 1.5.2 and 1.8, RAA RDDS S 1.4. and 1.5, RDDS Cl. Advisory 7
A domain object MUST contain a "remarks" member with a title "EPP Status Codes," a description containing the string "For more information on domain status codes, please visit <a href="https://icann.org/epp">https://icann.org/epp</a> " and a links member with the " <a href="https://icann.org/epp">https://icann.org/epp</a> " URL	RDDS Clarification Advisory 23, ICANN AWIP

# Profile (cont.)

Topic	Reference
The domain object MUST contain the secureDNS member and related data (specified in RFC7483 section 5.3 and annex D), if known by the server	RFC7483 5.3, RDDS Cl. Advisory 10., RA S 4 1.5.2, RAA RDDS S 1.4.2 and RAA AROS 1
The returned domain name object MUST contain registrant entities with the “registrant,” “technical” and “administrative” roles	RAA RDDS S 1.4.2, RDDS Cl. Advisory 46



# **Registry Registration Data Directory Services**

## **Responses to RDAP Queries**

Topic	Reference
<p>Registries offering searchable WHOIS service (per exhibit A of their Registry Agreement) MUST support RDAP search requests for domains and entities. Entities MUST be searchable by name search pattern as defined in RFC7482 section 3.2.3 in order to allow for searches by contact name or address. Nameserver object search is optional</p>	<p>RA S 4 1.10, RDDS Cl. Advisory 34, 40</p>
<p>Binary search capabilities (AND, OR) MUST be supported, when a RFC defining this capability is available</p>	<p>RA S 4 1.10.4</p>

# Registry Registration Data Directory Services

## Reporting Requirements

Topic	Reference
<p>Specification 3 of the RA specifies the format and content of the monthly reporting for registry operators. The following fields are added to the Registry Functions Activity Report under section 2:</p>	<p>RA S 3 1. and 2</p>

# Profile (cont.)

Field #	Field Name	Description
40	rdap-queries	Number of RDAP queries during the period.
41	rdap-rate-limit	Number of RDAP queries refused due to rate limiting for the period.
42	rdap-redirects	Number of HTTP redirects for the period.
42	rdap-authenticated	Number of authenticated RDAP queries for the period.
43	rdap-search-domain	Number of RDAP domain search queries for the period.
44	rdap-search-entity	Number of RDAP entity search queries for the period.
45	rdap-truncated-auth	Number of RDAP responses truncated due to authorization. Includes both results and object truncation events.
46	rdap-truncated-load	Number of RDAP responses truncated due to server load. Includes both results and object truncation events.
47	rdap-truncated-unexpl	Number of RDAP responses truncated due to unexplainable reasons. Includes both results and object truncation events.



# Registry Registration Data Directory Services

## Bootstrapping Requirements



Topic	Reference
<p>The base URL of RDAP services MUST be registered in the IANA Bootstrap Service Registry for Domain Name Space, as described in RFC7484. A separate entry is required for each TLD</p>	<p>RFC7484 4</p>
<p>When the RDAP service base URL need to be changed, the previous URL and the new one MUST remain in operation until the IANA Bootstrap Registry for Domain Name Space is updated</p>	<p>RFC7484 4</p>
<p>The bootstrap service entry must be populated only once the RDAP service is available over both IPv4 and IPv6 (A and AAAA records are present</p>	<p>RA S 6 1.5, RAA 3.3.1</p>



# Registry Registration Data Directory Services

## Entity RDAP Queries

# Profile

Topic	Reference
Registrar object lookup using an entity search on the “fn” field MUST be supported	RA S 4 1.6, 1.10.3
Registries MUST support queries for registrar objects using the IANA ID of the registrar, when a RFC defining this capability is available	RA S 4 1.10.4
The returned entity object MAY have a “notices” member containing the name of the responding server, a short description and a referral URL within its “links” member	RA S 4 1.6.2

# Profile (cont.)

Topic	Reference
<p>The returned object MUST contain entities with the following roles, each of them with a handle and valid fields “fn,” “n,” “adr,” “tel,” “email”:</p> <ul style="list-style-type: none"><li>o Registrar</li><li>o Administrative (registrar administrative)</li><li>o Technical (registrar technical)</li></ul>	RA S 4 1.6.2, RDDS Cl. Advisory 31
<p>The returned object MUST contain an event of evenAction type “last changed” containing the date and time of the last update</p>	



# **Registry Registration Data Directory Services**

## **Nameserver RDAP Queries**

Topic	Reference
Registries MUST support nameserver queries based on name server's name or name server's IP address (applies to glue records only)	RA S 4 1.10.3
The Server Name MUST be specified in the ldhName	RA S 4 1.7.2, RDDS Cl. Advisory 5.
All known glue record IPv4 and IPv6 addresses for the server MUST be listed in the ipAddresses member	RA S 4 1.7.2

# Profile (cont.)

Topic	Reference
The unicodeName member MAY be present if the nameserver has an IDN name	RDDS Cl. Advisory 6
The returned object MUST contain an entity with the “registrar” role when registry supports host objects	RDDS Cl. Advisory 27.
The returned object MAY have a “notices” member containing the name of the responding server, a short description and a referral URL within its “links” member	RDDS Cl. Advisory 27.

# Profile (cont.)

Topic	Reference
<p>The returned object MAY contain an event of evenAction type “last changed” containing the date and time of the last update</p>	



# Registrar Registration Data Directory Services

Responses to RDAP Domain  
Name Queries

# Profile

Topic	Reference
The returned domain name object MUST contain registrar entities with the “abuse” roles	RDDS Cl. Advisory 50
The returned domain name object MAY contain an entity with the “reseller” role	RDDS Cl. Advisory 51

# Registrar Registration Data Directory Services

RDAP Referrals

Topic	Reference
A Registrar that does not possess the information for a particular query MUST redirect the request to an appropriate party, as described in RFC7480 section 5.2	RFC7480 5.2

# Remaining Issues

# Remaining Issues

- ⦿ Extensible Provisioning Protocol (EPP) status codes not fully mapped into RDAP status codes
  - **Draft-gould-epp-rdap-status-mapping suggests to add RDAP codes to have a full mapping**
- ⦿ Lookup by IANA Registrar ID is not defined in base RDAP RFCs
  - To be updated
- ⦿ Logical operators for search criteria (AND, OR, NOT) are not defined in base RDAP RFCs
  - To be updated
- ⦿ How to provide Registrar RDAP base URL in the initial Registry RDAP response?
  - To be determined

# Conclusion and Next Steps

# Conclusion and Next Steps

- ⦿ RDAP Profile necessary for gTLD registry and registrar operators to adhere to existing policies and contractual terms
- ⦿ A few issues have been identified around underspecified topics in RFCs
- ⦿ Open question on when to retire WHOIS and whether to keep web-based (HTML) requirement
- ⦿ Question on how to provide reference to registrar data
- ⦿ RDAP Profile to be posted for Community Review



# Engage with ICANN



## Thank You and Questions

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