

# IETF Update on RDAP

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# From Whois to RDAP

- RDAP:
  - Registration Data Access Protocol
  - replacement of whois
  - structured data (JSON)
  - modern query method (http RESTFUL)
  - flexible and modern data structure (i18n,...)
  - AAA
  - Combined Numbers and Names access protocol
  - ...
- See good summary (Scott Hollenbeck, Circleid, [http://www.circleid.com/posts/20150121\\_where\\_do\\_old\\_protocols\\_go\\_to\\_die/](http://www.circleid.com/posts/20150121_where_do_old_protocols_go_to_die/))

# (Incomplete) RDAP in 3 slides

(for people who know what whois is)

# RDAP Query

- Numbers:
  - <https://example.com/rdap/ip/192.0.2.0/24>
  - <https://example.com/rdap/ip/2001:db8::0>
  - <https://example.com/rdap/autnum/12>
- Names:
  - <https://example.com/rdap/domain/blah.example.com>
  - <https://example.com/rdap/domain/xn--fo-5ja.example>
  - <https://example.com/rdap/domain/2.0.192.in-addr.arpa>
- Others:
  - <https://example.com/rdap/nameserver/ns1.example.com>
  - <https://example.com/rdap/entity/MY-HANDLE>
- Search:
  - [https://example.com/rdap/domains?name=example\\*.com](https://example.com/rdap/domains?name=example*.com)

# RDAP Response

- {
- "entities": [
  - {
  - "handle": "100001-RR",
  - "links": [
    - {
    - "href": "http://rdap.example.org/rdap/entity/100001-RR",
    - "rel": "self",
    - "type": "application/rdap+json",
    - "value": "http://rdap.example.org/rdap/entity/100001-RR"
    - }
  - ],
- ... 378 lines later... (pretty printing), or 7800 octets later.
- }

# RDAP Response

- Returns:
  - handles
  - objects (numbers, names, ns, )
  - links (hrefs...)
  - notices/remarks (terms of use, unauthorized access, server is down for maintenance,...)
  - events (created, last-changed, ...)
  - entities (as vcards in json)
  - status (locked, ...)
  - dnssec
  - ...

Ok, but where do I send the query to?

# Bootstrap

- Problem: how to find the authoritative RDAP server for this object.
  - reliably (from authoritative sources)
  - dynamically (when a new tld, address prefix, ... is just assigned)
  - flexible: allows various services (https and http, ...)



# Bootstrap

- Different methods were looked at.
  - in-DNS: RR at the apex; in a separate tree.
  - IANA registry
- Evaluated based on various criteria, such as:
  - capability to be used in Javascript
  - no dependency on new RR records
  - “simple”
- None was “perfect”. Choose the least pain (hopefully)

# Bootstrap

- IANA registry
  - using current IANA mechanisms with current assignees of objects. Modelled on how whois entries are updated.
- in JSON format
  - first IANA registry in JSON!
- Flexible
  - can do “anything” you want
- Simple

# Current Registries

## IANA IPv4 Address Space Registry

### Last Updated

2014-10-14

### Registration Procedure(s)

Allocations to RIRs are made in line with the Global Policy published at [<http://www.icann.org/en/resources/policy/global>]  
All other assignments require IETF Review.

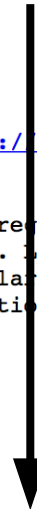
### Description

The allocation of Internet Protocol version 4 (IPv4) address space to various registries is listed here. Originally, all the IPv4 address spaces was managed directly by the IANA. Later parts of the address space were allocated to various other registries to manage for particular purposes or regional areas of the world. RFC 1466 [[RFC1466](#)] documents most of these allocations.

### Reference

[[RFC7249](#)]

### Available Formats



| Prefix | Designation                     | Date    | Whois           | Status [1] | Note |
|--------|---------------------------------|---------|-----------------|------------|------|
| 000/8  | IANA - Local Identification     | 1981-09 |                 | RESERVED   | [2]  |
| 001/8  | APNIC                           | 2010-01 | whois.apnic.net | ALLOCATED  |      |
| 002/8  | RIPE NCC                        | 2009-09 | whois.ripe.net  | ALLOCATED  |      |
| 003/8  | General Electric Company        | 1994-05 | whois.arin.net  | LEGACY     |      |
| 004/8  | Level 3 Communications, Inc.    | 1992-12 | whois.arin.net  | LEGACY     |      |
| 005/8  | RIPE NCC                        | 2010-11 | whois.ripe.net  | ALLOCATED  |      |
| 006/8  | Army Information Systems Center | 1994-02 | whois.arin.net  | LEGACY     |      |
| 007/8  | Administered by ARIN            | 1995-04 | whois.arin.net  | LEGACY     |      |
| 008/8  | Level 3 Communications, Inc.    | 1992-12 | whois.arin.net  | LEGACY     |      |
| 009/8  | IBM                             | 1992-08 | whois.arin.net  | LEGACY     |      |
| 010/8  | IANA - Private Use              | 1995-06 |                 | RESERVED   | [3]  |
| 011/8  | DoD Intel Information Systems   | 1993-05 | whois.arin.net  | LEGACY     |      |
| 012/8  | AT&T Bell Laboratories          | 1995-06 | whois.arin.net  | LEGACY     |      |
| 013/8  | Xerox Corporation               | 1991-09 | whois.arin.net  | LEGACY     |      |
| 014/8  | APNIC                           | 2010-04 | whois.apnic.net | ALLOCATED  | [4]  |
| 015/8  | Hewlett-Packard Company         | 1994-07 | whois.arin.net  | LEGACY     |      |
| 016/8  | Digital Equipment Corporation   | 1994-11 | whois.arin.net  | LEGACY     |      |

# Current Registries

## IPv6 Global Unicast Address Assignments

### Last Updated

2014-05-20

### Registration Procedure(s)

Allocations to RIRs are made in line with the Global Policy published at [<http://www.icann.org/en/resources/policy/global-addressing>]. All other assignments require IETF Review.

### Description

The allocation of Internet Protocol version 6 (IPv6) unicast address space is listed here. References to the various other registries detailing the use of the IPv6 address space can be found in the [[IPv6 Address Space registry](#)].

### Reference

[[RFC7249](#)]

### Note

The assignable Global Unicast Address space is defined in [[RFC4291](#)] as being the address block defined by the prefix 2000::/3. All address space in this block not listed in the table below is reserved by IANA for future allocation.

### Available Formats



| Prefix         | Designation | Date       | Whois           | Status    | Note  |
|----------------|-------------|------------|-----------------|-----------|---|
| 2001:0000::/23 | IANA        | 1999-07-01 | whois.iana.org  | ALLOCATED | 2001:0000::/23 is reserved for IETF Protocol Assignments [ <a href="#">RFC2928</a> ]. 2001:0000::/32 is reserved for TEREDO [ <a href="#">RFC4380</a> ]. 2001:0002::/48 is reserved for Benchmarking [ <a href="#">RFC5180</a> ]. 2001:10::/28 is reserved for ORCHID [ <a href="#">RFC4843</a> ]. For complete registration details, see [ <a href="#">IANA registry iana-ipv6-special-registry</a> ]. |
| 2001:0200::/23 | APNIC       | 1999-07-01 | whois.apnic.net | ALLOCATED |   |
| 2001:0400::/23 | ARIN        | 1999-07-01 | whois.arin.net  | ALLOCATED |   |
| 2001:0600::/23 | RIPE NCC    | 1999-07-01 | whois.ripe.net  | ALLOCATED |   |
| 2001:0800::/23 | RIPE NCC    | 2002-05-02 | whois.ripe.net  | ALLOCATED |   |
| 2001:0a00::/23 | RIPE NCC    | 2002-11-02 | whois.ripe.net  | ALLOCATED |   |
| 2001:0c00::/23 | APNIC       | 2002-05-02 | whois.apnic.net | ALLOCATED | 2001:db8::/32 reserved for Documentation [ <a href="#">RFC3849</a> ]. For complete registration details, see [ <a href="#">IANA registry iana-ipv6-special-registry</a> ].  |
| 2001:0e00::/23 | APNIC       | 2003-01-01 | whois.apnic.net | ALLOCATED |   |

# Current Registries

United States

**Email:** wayne@unitedtld.com

**Voice:** +1 425 298 2260

## Name Servers

| Host Name                  | IP Address(es)                       |
|----------------------------|--------------------------------------|
| demand.alpha.aridns.net.au | 37.209.192.7<br>2001:dcd:1:0:0:0:0:7 |
| demand.delta.aridns.net.au | 37.209.198.7<br>2001:dcd:4:0:0:0:0:7 |
| demand.gamma.aridns.net.au | 37.209.196.7<br>2001:dcd:3:0:0:0:0:7 |
| demand.beta.aridns.net.au  | 37.209.194.7<br>2001:dcd:2:0:0:0:0:7 |

## Registry Information

**URL for registration services:** <http://rightside.co/rightside-registry/>

**WHOIS Server:** whois.rightside.co

# Bootstrap Registry Update Process

- Envisioned process:
  - add a new rdap entry into existing registries for IP address prefixes and root zone
  - through current mechanism to update tld or address prefix records, get the rdap info and publish it into the new entry of existing registries
  - and refresh (programmatically) the JSON registry with the new changes

# New Version of the Registries

## IANA IPv4 Address Space Registry

### Last Updated

2014-10-14

### Registration Procedure(s)

Allocations to RIRs are made in line with the Global Policy published at [<http://www.icann.org/en/resources/policy/global>]. All other assignments require IETF Review.

### Description

The allocation of Internet Protocol version 4 (IPv4) address space to various registries is listed here. Originally, all the IPv4 address spaces was managed directly by the IANA. Later parts of the address space were allocated to various other registries to manage for particular purposes or regional areas of the world. RFC 1466 [[RFC1466](#)] documents most of these allocations.

### Reference

[[RFC7249](#)]

### Available Formats



Insert a new RDAP  
Server URL Column

| Prefix | Designation                     | Date    | Whois           | Status [1] | Note |
|--------|---------------------------------|---------|-----------------|------------|------|
| 000/8  | IANA - Local Identification     | 1981-09 |                 | RESERVED   | [2]  |
| 001/8  | APNIC                           | 2010-01 | whois.apnic.net | ALLOCATED  |      |
| 002/8  | RIPE NCC                        | 2009-09 | whois.ripe.net  | ALLOCATED  |      |
| 003/8  | General Electric Company        | 1994-05 | whois.arin.net  | LEGACY     |      |
| 004/8  | Level 3 Communications, Inc.    | 1992-12 | whois.arin.net  | LEGACY     |      |
| 005/8  | RIPE NCC                        | 2010-11 | whois.ripe.net  | ALLOCATED  |      |
| 006/8  | Army Information Systems Center | 1994-02 | whois.arin.net  | LEGACY     |      |
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| 008/8  | Level 3 Communications, Inc.    | 1992-12 | whois.arin.net  | LEGACY     |      |
| 009/8  | IBM                             | 1992-08 | whois.arin.net  | LEGACY     |      |
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| 012/8  | AT&T Bell Laboratories          | 1995-06 | whois.arin.net  | LEGACY     |      |
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### Last Updated

2014-05-20

### Registration Procedure(s)

Allocations to RIRs are made in line with the Global Policy published at <http://www.icann.org/en/resources/policy/global-addressing>.

All other assignments require IETF approval.

### Description

The allocation of Internet Protocol Version 6 (IPv6) address space is listed here. References to the various IPv6 address spaces can be found in the [IPv6 Address Space](#) table.

### Reference

[RFC7249](#)

### Note

The assignable Global Unicast Address space is defined in [RFC4291](#) as being the address block defined by the prefix 2000::/3. All address space in this block not listed in the table below is reserved by IANA for future allocation.

### Available Formats



Insert a new RDAP  
Server URL Column

| Prefix         | Designation | Date       | Whois           | Status    | Note   |
|----------------|-------------|------------|-----------------|-----------|--|
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| 2001:0200::/23 | APNIC       | 1999-07-01 | whois.apnic.net | ALLOCATED |  |
| 2001:0400::/23 | ARIN        | 1999-07-01 | whois.arin.net  | ALLOCATED |  |
| 2001:0600::/23 | RIPE NCC    | 1999-07-01 | whois.ripe.net  | ALLOCATED |  |
| 2001:0800::/23 | RIPE NCC    | 2002-05-02 | whois.ripe.net  | ALLOCATED |  |
| 2001:0a00::/23 | RIPE NCC    | 2002-11-02 | whois.ripe.net  | ALLOCATED |  |
| 2001:0c00::/23 | APNIC       | 2002-05-02 | whois.apnic.net | ALLOCATED | 2001:db8::/32 reserved for Documentation <a href="#">RFC3849</a> . For complete registration details, see <a href="#">IANA registry iana-ipv6-special-registry</a> .   |
| 2001:0e00::/23 | APNIC       | 2003-01-01 | whois.apnic.net | ALLOCATED |  |



# New Version of the Registries

United States

**Email:** wayne@unitedtld.com

**Voice:** +1 425 298 2260

## Name Servers

| <u>Host Name</u>           | <u>IP Address(es)</u>                |
|----------------------------|--------------------------------------|
| demand.alpha.aridns.net.au | 37.209.192.7<br>2001:dcd:1:0:0:0:0:7 |
| demand.delta.aridns.net.au | 37.209.198.7<br>2001:dcd:4:0:0:0:0:7 |
| demand.gamma.aridns.net.au | 37.209.196.7<br>2001:dcd:3:0:0:0:0:7 |
| demand.beta.aridns.net.au  | 37.209.194.7<br>2001:dcd:2:0:0:0:0:7 |

## Registry Information

**URL for registration services:** <http://rightside.co/rightside-registry/>

**WHOIS Server:** whois.rightside.co

Insert a new RDAP  
Server URL Entry



# Bootstrap JSON Registry - Names

```
{  
  "version": "1.0",  
  "publication": "YYYY-MM-DDTHH:MM:SSZ",  
  "description": "Names RDAP Bootstrap Registry ",  
  "services": [  
    [  
      ["net", "com"],  
      [  
        "https://registry.example.com/myrdap/",  
        "http://registry.example.com/myrdap/",  
      ]  
    ],  
    [  
      ["xn--zckzah"],  
      [  
        "https://example.net/rdapxn--zckzah/",  
      ]  
    ]  
  ]  
}
```

# Bootstrap JSON Registry - Numbers

```
{  
  "version": "1.0",  
  "publication": "2024-01-07T10:11:12Z",  
  "description": "Numbers RDAP Bootstrap Registry.",  
  "services": [  
    [  
      ["1.0.0.0/8", "192.0.0.0/8"],  
      [  
        "https://rir1.example.com/myrdap/"  
      ]  
    ],  
    [  
      ["28.2.0.0/16", "192.0.2.0/24"],  
      [  
        "http://example.org/"  
      ]  
    ]  
  ]  
}
```

...

# Redirect

- One can redirect to another URL using standard HTTP Redirect method

# RDAP Non-IETF Activities

# RDAP Interop and Test Suite

- Interop sessions were conducted during multiple IETF
  - ~10 different implementations
- using a comprehensive (spec conformance) test suite
  - suite acts as a client testing against an RDAP server
  - ~150 tests
  - later with a web interface

# Example Output of Test Suite

Tests succeeded

|                   |    |  |     |  |
|-------------------|----|--|-----|--|
| ts_query_3_1_2_35 | OK | GET /rdap/autnum/1+1                       | 404 | { "description": ["No match for autnum \\"1 1\\"<br>"Terms of Use" ]}, "rdapConformance": ["rdap |
| ts_query_3_1_2_36 | OK | GET http://rdap.dnslab.jp:80/rdap/autnum/? | 404 | { "description": ["No match for autnum \\".\"",<br>"Terms of Use" ]}, "rdapConformance": ["rdap  |
| ts_query_3_1_2_36 | OK | GET /rdap/autnum/?                         | 404 | { "description": ["No match for autnum \\".\"",<br>"Terms of Use" ]}, "rdapConformance": ["rdap  |

Test succeeded  
but with  
warning

|                  |         |   |     |  |
|------------------|---------|---|-----|--|
| ts_query_3_1_3_1 | WARNING | GET http://rdap.dnslab.jp:80/rdap/domain/example.dnslab | 200 | { "entities": [ { "handle": "100001-RR", "links"<br>"application/rdap+json", "value": "http://rdap.<br>["registrar"], "vcardArray": [ "vcard", [ [ "versi<br>"2"), "language-tag", "en" ], [ "fn", {"language<br>"type": "work" }, "text", "Japan Registry Servi<br>First Bldg. East 13F", "3-8-1 Nishi-Kanda", "1<br>"?????????????" ], [ "org", { "language": "<br>"type": "work" }, "text", [ "", "???????????? 1<br>"type": [ "work", "voice" ] ], "uri", "tel:+81.352<br>{"type": "work"}, "text", "dom-admin@jprs.co<br>CONTACT", "links": [ { "href": "http://rdap.dns<br>"application/rdap+json", "value": "http://rdap.<br>["registrant", "administrative", "technical" ], "<br>"language-tag", "ja" ], [ "lang", {"pref": "2"}, "l<br>"language": "en", "type": "work" }, "text", "Jap<br>"text", [ "", "Chiyoda First Bldg. East 13F", "3<br>{"language": "ja"}, "text", "?? ??" ], [ "org", { "<br>"language": "ja", "type": "work" }, "text", [ "", "<br>"pref": "1", "type": [ "work", "voice" ] ], "uri", "i<br>], [ "email", {"type": "work"}, "text", "kambe@<br>01-01T00:00:00.0Z" }, { "eventAction": "last t<br>"expiration", "eventDate": "2015-01-01T00:0<br>[ { "href": "http://rdap.dnslab.jp/rdap/domain/e<br>"http://rdap.dnslab.jp/rdap/domain/example.c<br>"href": "http://rdap.dnslab.jp/rdap/nameserve<br>"http://rdap.dnslab.jp/rdap/nameserver/ns01<br>"ns02.example.dnslab", "links": [ { "href": "htt<br>"application/rdap+json", "value": "http://rdap.<br>"nameserver" } ], "notices": [ { "description": [ "<br>"domain", "port43": "whois.jprs.jp", "publicIde<br>["rdap_level_0"], "secureDNS": {"delegationS<br>"clientRenewProhibited", "serverRenewProh<br>"clientUpdateProhibited", "serverUpdateProh |
|------------------|---------|---|-----|--|

Click on test for  
detailed  
analysis

|   |  |  |
|---|--|--|
| <pre>[REQUEST] {'Accept': 'application/rdap+json'}  [RESPONSE] [{"transfer-encoding": "chunked"}, {"set-cookie": "JSESSIONID=707AD329A079E09B6DE13619E4B398D8; Path=/; HttpOnly"}, {"server": "Apache/2.4.6 (CentOS) OpenSSL/1.0.1e-fips"}, {"date": "Thu, 25 Dec 2014 05:30:02 GMT"}, {"access-control-allow-origin": ""}, {"content-type": "application/rdap+json;charset=utf-8"}]  [DETAILS]  OK: Status is (200.) OK: The "rdapConformance" appears to be valid. OK: There seems to be a good "handle". OK: There seems to be a good "objectClassName". OK: "objectClassName" is expected value "domain". OK: There seems to be a good "handle". OK: There seems to be a good "objectClassName". OK: "objectClassName" is expected value "entity". OK: vCard seems valid. OK: The "roles" appear to be valid.</pre> |  | <pre>{   "entities": [     {       "handle": "100001-RR",       "links": [         {           "href": "http://rdap.dr           "rel": "self",           "type": "application/rd           "value": "http://rdap.c         }       ],       "objectClassName": "entity",       "roles": [         "registrar"       ],       "vcardArray": [         "vcard":</pre> |
|---|--|--|

# RDAP Interop and Test Suite

- helped to find bugs in specs, various inconsistencies or to improve clarity
- test suite still available for new implementations.  
contact [marc.blanchet@viagenie.ca](mailto:marc.blanchet@viagenie.ca) to get access.



# RDAP Workshop

- Registration Operations Group is planning to host an RDAP Workshop, Sunday prior to IETF 93.
  - Sunday July 19th, Prague, same venue as IETF
  - one on EPP scheduled for IETF92, March 22nd
- More info at <http://regiops.net>
- ML: <http://nlnetlabs.nl/mailman/listinfo/regops>

# Conclusion

- RDAP: modern replacement of whois
- using http RESTFUL and JSON
- bootstrap through a JSON-formatted IANA registry
- Interop testing and test suite. Workshop coming.
- Now, let's implement and use it

# References

- in RFC Publication Queue:
  - draft-ietf-weirds-bootstrap
  - draft-ietf-weirds-rdap-sec
  - draft-ietf-weirds-using-http
  - draft-ietf-weirds-json-response
  - draft-ietf-weirds-rdap-query