

Internet Number Registry Services the Next Generation

RDAP

Overview

- What are registry services
- Today's registry services
- Next generation registry services

What are registries

- Organizations running registry services
 - With authority for registration of some 'public resource'
- Public databases describing status of resources
 - Land titles, vehicle registrations, phone numbers
 - Domain Names
 - Internet Number Resources (INRs) – IPv4, IPv6, ASNs
- Internet address registries
 - RIRs, NIRs, LIRs
 - Authoritative registry/database function
 - Public registry service function

APNIC registry services

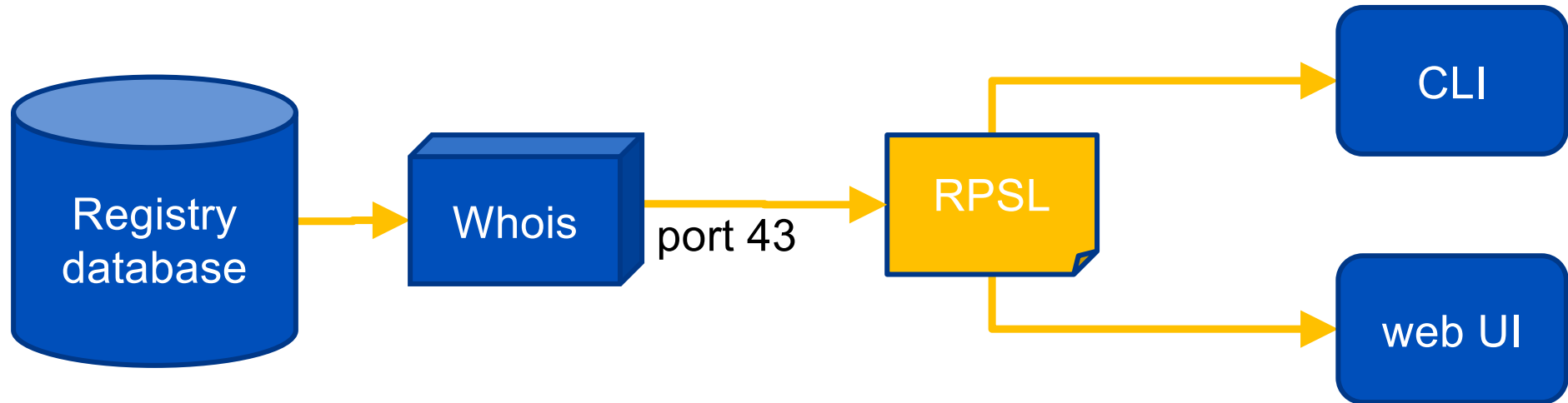
- Whois
 - Public registry lookup service
- Registration Data Access Protocol (RDAP) (NEW since 2015)
 - API for access to “whois” registry data
- Resource Public Key Infrastructure (RPKI) (since 2010)
 - PKI for INRs

Whois

Whois

- Query service on TCP port 43 (RFC 812, 1982)
- Two databases in one
 - Public network management database
 - Routing Registry (RR)
- Very simple, limited service

Whois at APNIC



Whois command line

```
$ whois -h whois.apnic.net 2001:0DED:8000::/48
% [whois.apnic.net]
% Whois data copyright terms    http://www.apnic.net/db/dbcopyright

% Information related to '2001:ded:8000::/48'

% Abuse contact for '2001:ded:8000::/48' is 'contact@iifon.org'

inet6num:      2001:ded:8000::/48
netname:       IIFON-IN
descr:         India Internet Foundation
country:       IN
org:           ORG-IIF1-AP
admin-c:       IIFA2-AP
tech-c:        IIFA2-AP
status:        ASSIGNED PORTABLE
mnt-by:        APNIC-HM
mnt-routes:    MAINT-IIFON-IN
mnt-irt:        IRT-IIFON-IN
remarks:       -----
remarks:       To report network abuse, please contact mnt-irt
remarks:       For troubleshooting, please contact tech-c and admin-c
remarks:       Report invalid contact via www.apnic.net/invalidcontact
remarks:       -----
last-modified: 2018-08-31T13:00:58Z
source:        APNIC
```

Query to port 43

RPSL response

Whois www interface

APNIC



APNIC Whois Search

To assist you with debugging problems, this whois query was received from IP Address:

2001:dc0:2001:210:f1b5:d3be:32f4:2e84

If you experience problems with this form, try the legacy search form.

% APNIC found the following authoritative answer from: whois.apnic.net

% [whois.apnic.net]
% Whois data copyright terms <http://www.apnic.net/db/dbcopyright.html>

% Information related to '2001:ded:8000::/48'

% Abuse contact for '2001:ded:8000::/48' is 'contact@iifon.org'

```
inet6num:      2001:ded:8000::/48
netname:       IIFON-IN
descr:         India Internet Foundation
country:       IN
org:           ORG-IIF1-AP
admin-c:       IIFA2-AP
tech-c:        IIFA2-AP
status:        ASSIGNED PORTABLE
mnt-by:        APNIC-HM
mnt-routes:    MAINT-IIFON-IN
mnt-irt:        IRT-IIFON-IN
remarks:
-----
remarks:       To report network abuse, please contact mnt-irt
remarks:       For troubleshooting, please contact tech-c and admin-c
remarks:       Report invalid contact via www.apnic.net/invalidcontact
remarks:       -----
last-modified: 2018-08-31T13:00:58Z
source:        APNIC
```

HTML wrapper

Same RPSL response

Whois – limitations

- ‘Blob’ query and result formats
 - Automation is difficult
 - Registry-specific queries and responses
- No authentication/authorization/accounting model
 - Built for public service only
- Most servers serve US-ASCII only
 - i18n is undefined
- No redirection
 - User/client must find the right server

RDAP

Registration Data Access Protocol

RDAP

- RDAP is the successor to the ageing WHOIS protocol
- Like WHOIS, RDAP provides...
 - Access to registration data: domain names, ASNs, and IP addresses
- Unlike WHOIS, RDAP provides...
 - Structured request and response semantics
 - Differentiated access
 - Internationalization
 - Redirection

RDAP: designed for automation

- Query: REST
 - REpresentational State Transfer — via HTTP
 - Inherits many useful features from HTTP/HTTPS
 - Query defined within URL issued to RESTful server

example: <https://rdap.apnic.net/ip/2001:dc0:2001:11::194>
- Response: JSON
 - JavaScript Object Notation
 - Translates directly into data types in modern programming languages like JavaScript/HTML5, Java, Perl, Python, Ruby

RDAP access control

- REST allows for service differentiation
 - General public vs authorized access
 - Public vs privileged information
 - Rate limiting and so forth
- Implemented using standard web authentication
 - OAuth, OpenID under development in IETF draft process

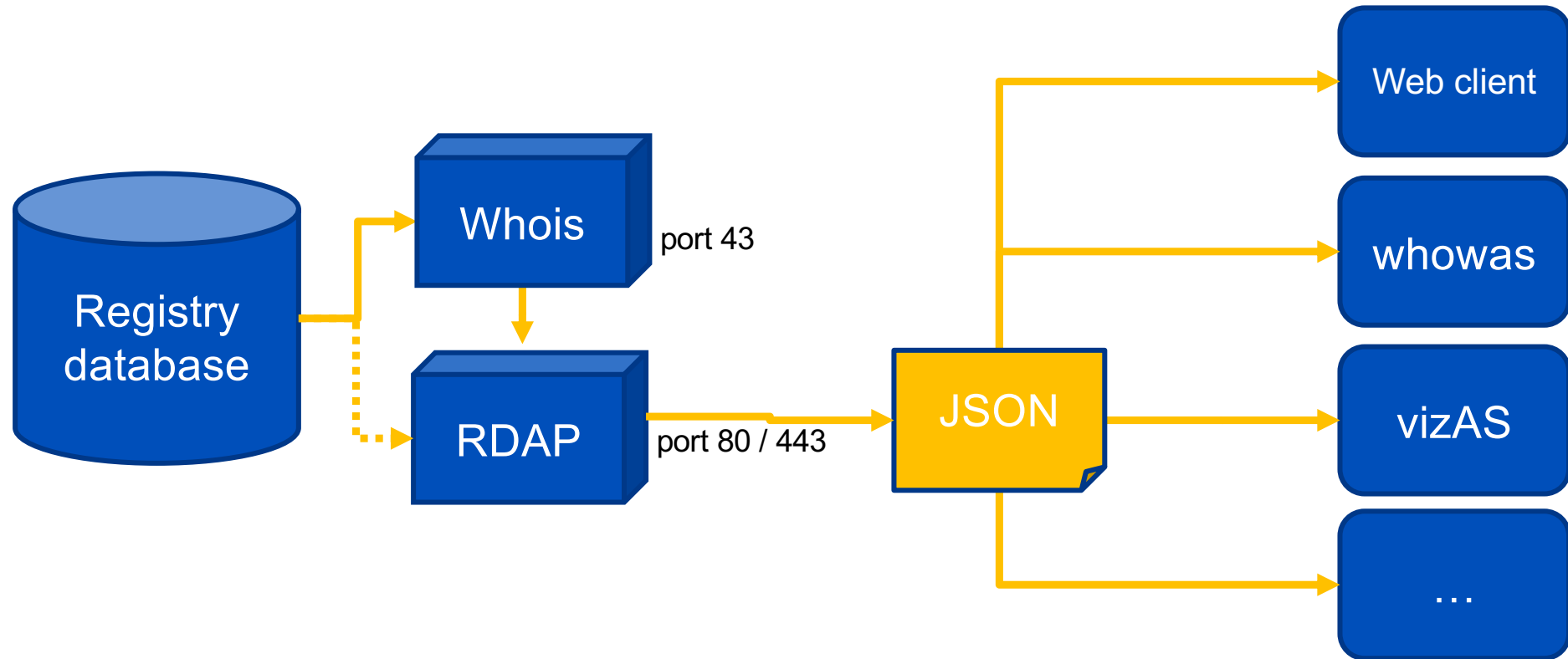
RDAP internationalization

- RDAP content is UTF-8 encoded UNICODE
- Normally RDAP fetches all encodings
 - Client gets to pick preference
 - But server could use client 'language hint' via HTTP

RDAP query redirection

- RDAP uses HTTP mechanism to redirect
 - '302 redirect temporary' points to temporary URL for this query
 - In case query is for resource that server knows is held elsewhere
- Globally coordinated redirection
 - IANA registry of all delegations in RDAP with base URL
- Result: RDAP can find 'most specific' registry
 - No more 'this record has moved' responses!

RDAP



RDAP JSON raw

```
$ curl https://rdap.apnic.net/ip/2001:0DED:8000::/48
```

```
{ "rdapConformance": [ "history_version_0", "cidr0", "rdap_level_0" ], "notices": [ { "title": "Source", "description": [ "Objects returned came from source", "APNIC" ] }, { "title": "Terms and Conditions", "description": [ "This is the APNIC WHOIS Database query service. The objects are in RDAP format." ], "links": [ { "value": "https://rdap.apnic.net/ip/2001:0DED:8000::/48", "rel": "terms-of-service", "href": "http://www.apnic.net/db/dbcopyright.html", "type": "text/html" } ] }, { "country": "IN", "events": [ { "eventAction": "last changed", "eventDate": "2018-08-31T13:00:58Z" } ], "name": "IIFON-IN", "remarks": [ { "description": [ "India Internet Foundation" ], "title": "description" }, { "description": [ "-----", "To report network abuse, please contact mnt-irt", "For troubleshooting, please contact tech-c and admin-c", "Report invalid contact via www.apnic.net/invalidcontact", "-----" ], "title": "remarks" } ], "type": "ASSIGNED PORTABLE", "ipVersion": "v6", "startAddress": "2001:ded:8000::", "endAddress": "2001:ded:8000:ffff:ffff:ffff:ffff:ffff", "links": [ { "value": "https://rdap.apnic.net/ip/2001:0DED:8000::/48", "rel": "self", "href": "https://rdap.apnic.net/ip/2001:ded:8000::/48", "type": "application/rdap+json" } ], "objectClassName": "ip network", "handle": "2001:ded:8000::/48", "entities": [ { "roles": [ "administrative", "technical" ], "events": [ { "eventAction": "last changed", "eventDate": "2016-09-09T10:32:54Z" } ], "vcardArray": [ "vcard", [ [ "version", { "text": "4.0" }, [ "fn", { "text": "India Internet Foundation administrator" ], [ "kind", { "text": "group" ], [ "adr", { "label": "Webel Bhavan, Moni Bhandar Roon 4A, Block EP & GP Salt Lake , Kolkata India 700091, kolkata West Ben" }, "text", [ "", "", "", "", "", "", "" ], [ "tel", { "type": "voice" }, "text", "+91-33-40087788" ], [ "tel", { "type": "fax" }, "text", "+91-33-40087788" ], [ "email", { "text": "contact@iifon.org" } ] ] ], "links": [ { "value": "https://rdap.apnic.net/ip/2001:0DED:8000::/48", "rel": "self", "href": "https://rdap.apnic.net/entity/IIFA2-AP", "type": "application/rdap+json" } ], "objectClassName": "entity", "handle": "IIFA2-AP", { "roles": [ "abuse" ], "events": [ { "eventAction": "last changed", "eventDate": "2016-09-09T10:32:55Z" } ], "vcardArray": [ "vcard", [ [ "version", { "text": "4.0" }, [ "fn", { "text": "IRT-IIFON-IN" ], [ "kind", { "text": "group" ], [ "adr", { "label": "Webel Bhavan, Moni Bhandar Roon 4A, Block EP & GP Salt Lake , Kolkata India 700091, kolkata West Ben" }, "text", [ "", "", "", "", "", "", "" ], [ "email", { "text": "contact@iifon.org" }, [ "email", { "pref": "1" }, "text", "contact@iifon.org" ] ] ], "links": [ { "value": "https://rdap.apnic.net/ip/2001:0DED:8000::/48", "rel": "self", "href": "https://rdap.apnic.net/entity/IRT-IIFON-IN", "type": "application/rdap+json" } ], "objectClassName": "entity", "handle": "IRT-IIFON-IN" } ], "cidr0_cidrs": [ { "v6prefix": "2001:ded:8000::", "length": 48 }, { "port43": "whois.apnic.net" } ] }
```

HTTP “get”

JSON format

RDAP JSON formatted

```
{
  - rdapConformance: [
    "history_version_0",
    "cidr0",
    "rdap_level_0"
  ],
  - notices: [
    - {
      title: "Source",
      - description: [
        "Objects returned came from source",
        "APNIC"
      ]
    },
    - {
      title: "Terms and Conditions",
      - description: [
        "This is the APNIC WHOIS Database query service. The objects are in RDAP format."
      ],
      - links: [
        - {
          value: "https://rdap.apnic.net/ip/2001:0DED:8000::/48",
          rel: "terms-of-service",
          href: "http://www.apnic.net/db/dbcopyright.html",
          type: "text/html"
        }
      ]
    }
  ],
  country: "IN",
  - events: [
    - {
      eventAction: "last changed",
      eventDate: "2018-08-31T13:00:58Z"
    }
  ],
  name: "IIFON-IN",
  - remarks: [
    - {
      - description: [
        "India Internet Foundation"
      ],
      title: "description"
    }
  ],
  entitles[0].vcardArray[1]
```

Browser with
json plugin

Structured result

RDAP client

The screenshot shows the RDAP Web interface for APNIC. The browser address bar displays `https://rdap-web.apnic.net/ip/2001:0DED:8000::/48`. The page title is "RDAP Web" and the main heading is "Search for Internet Resource Registration Data". A search input field contains the query `2001:0DED:8000::/48` and a "Search" button. The results are displayed in three columns: "Contacts", "General Information", and "Notices".

Contacts	
Abuse Contact	
Handle	IRT-IIFON-IN
Address	Webel Bhavan, Moni Bhandar Roon 4A, Block EP & GP Salt Lake , Kolkata India 700091, kolkata West Ben
Email	contact@iifon.org Preferred: contact@iifon.org
Administrative and Technical Contact	
Handle	IIFA2-AP
Address	Webel Bhavan, Moni Bhandar Roon 4A, Block EP & GP Salt Lake , Kolkata India 700091, kolkata West Ben
Email	contact@iifon.org

General Information	
Object	IP Network (ip network)
Handle	2001:ded:8000::/48
Start Address	2001:ded:8000::
End Address	2001:ded:8000:ffff:ffff:ffff:ffff
IP Version	v6

Notices	
Source	Objects returned came from source APNIC
Terms and Conditions	This is the APNIC WHOIS Database query service. The objects are in RDAP format. http://www.apnic.net/db/dbcopyright.html

Web-based client

Processed result

<https://rdap-web.apnic.net>

RDAP application (whowas)

APNIC WhoWas 203.110.240.0

203.110.240.0 - 203.110.247.255
203.0.0.0 - 203.255.255.255
202.0.0.0 - 203.255.255.255
0.0.0.0 - 255.255.255.255

2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019

04/09/2008 07:34 <26/08/2015 01:38 > <27/08/2015 04:12 >

network name	IITKGP-IN	network name	IITKGP-IN
network	203.110.240.0 - 203.110.247.255	network	203.110.240.0 - 203.110.247.255
country	IN	country	IN
type	ALLOCATED PORTABLE	type	ALLOCATED PORTABLE
description	Indian Institute Of Technology ,Kharagpur,India Education, Research and Development	description	Indian Institute Of Technology ,Kharagpur,India Education, Research and Development
remarks	ISP's IPV4 used by us will be returned to APNIC 20060601 ----- This object can only be updated by APNIC hostmasters. To update this object, please contact APNIC hostmasters and include your organisation's account name in the subject line. -----	remarks	ISP's IPV4 used by us will be returned to APNIC 20060601 ----- This object can only be updated by APNIC hostmasters. To update this object, please contact APNIC hostmasters and include your organisation's account name in the subject line. -----

handle	IRT-IITKGP-IN
name	IRT-IITKGP-IN
kind	group
address	Computer and Informatics Center Indian Institute of Technology, Kharagpur India
email	alokes@cc.iitkgp.ernet.in
email	alokes@cc.iitkgp.ernet.in

handle	AC853-AP
name	Alokes Chattopadhyay
kind	individual
address	Computer and Informatics Center Indian Institute of Technology, Kharagpur India
voice	+91-3222-28-1931
fax	+91-3222-255303
email	alokes@cc.iitkgp.ernet.in
remarks	ISP's IPV4 used by us will be returned to APNIC 20060601

handle	AC853-AP
name	Alokes Chattopadhyay
kind	individual
address	Computer and Informatics Center Indian Institute of Technology, Kharagpur India
voice	+91-3222-28-1931
fax	+91-3222-255303
email	alokes@cc.iitkgp.ernet.in
remarks	ISP's IPV4 used by us will be returned to APNIC 20060601

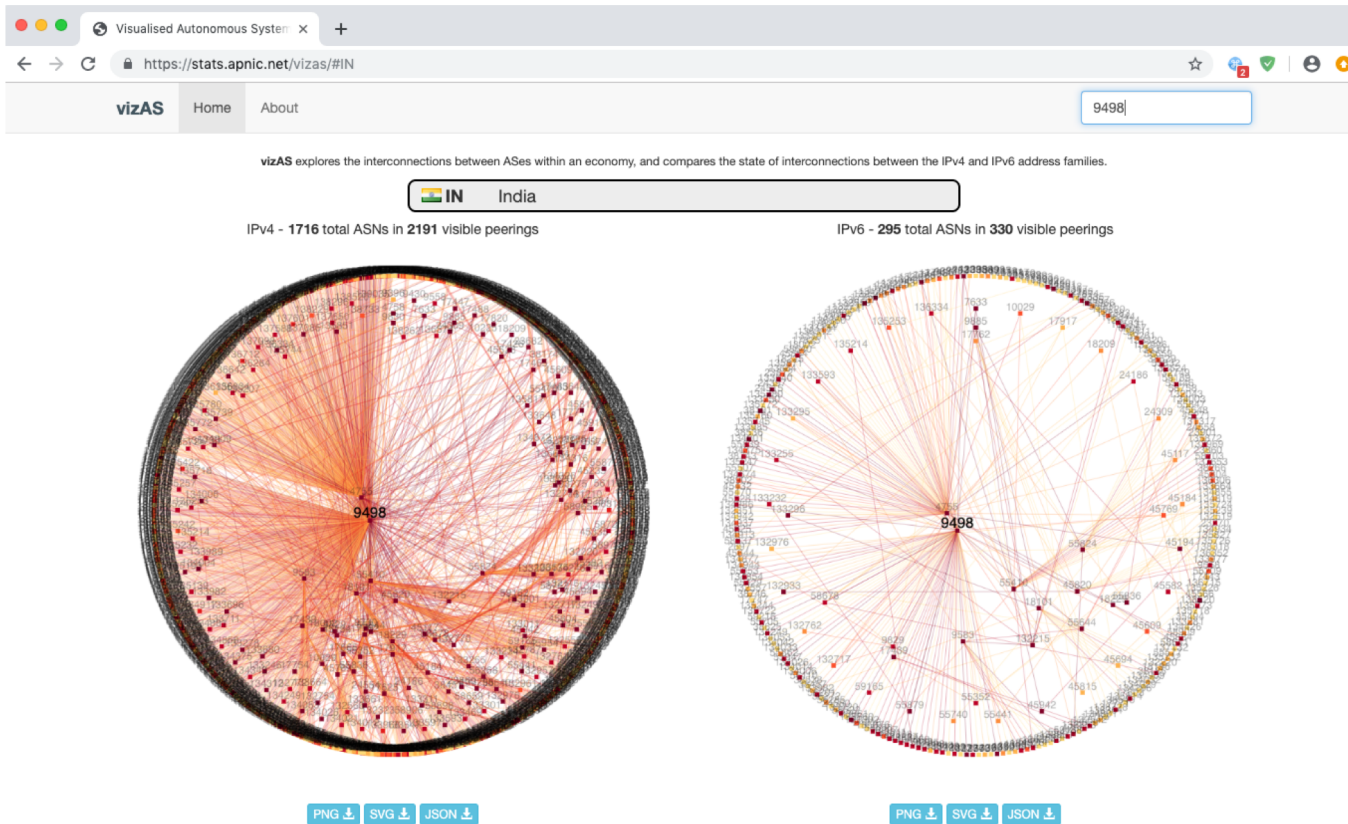
<https://www.apnic.net/whowas>

APNIC © 2017 APNIC ABN 42 081 528 010

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RDAP application (vizAS)



<https://www.apnic.net/vizas>

RDAP application (vizAS)

Visualised Autonomous System x +

https://stats.apnic.net/vizas/#IN;AS9498

vizAS Home About 9498

ASN 9498: BBIL-AP RDAP WHOIS

Registration Peers

Remarks

Description	BHARTI Airtel Ltd. 234, Okhla Industrial Estate, Phase-3 New Delhi-20, India		
-------------	--	--	--

Entities

NA40-AP	administrative technical	noc-dataprov@airtel.com	
IRT-BHARTI-IN	abuse	lpspamsupport@airtel.com	

Notices

Source	Objects returned came from source APNIC		
Terms And Conditions	This is the APNIC WHOIS Database query service. The objects are in RDAP format.		

Close

PNG SVG JSON PNG SVG JSON

BGP data collected 2019-06-25.

<https://www.apnic.net/vizas>

RDAP specifications

- RFC 7480 – HTTP Usage in RDAP
- RFC 7481 – Security Services for RDAP
- RFC 7482 – RDAP Query Format
- RFC 7483 – JSON Responses for RDAP
- RFC 7484 – Finding the Authoritative RDAP Service
- RFC 7485 – Inventory and Analysis of WHOIS Objects

APNIC RDAP Status

- First implemented May 2015
- Reimplemented into whoas late 2016
- Working with NIRs
 - Hope to serve <nir>.rdap.apnic.net more-specific service
- APNIC region-wide consistent service model goal for 2019
 - Working with NIRs and other RIRs
- RDAP does not include IRR data
 - Include subset of IRR data in RDAP?

Questions?

vivek@apnic.net