

Root Server System Operational Information

Abstract

Root Server Operators make certain operational details and other information available on the root-servers.org public web site [[Website](#)]. This is the same information used to populate the map of root server locations, and provides links to other resources such as contact addresses, RSSAC001 statements, and RSSAC002 metrics. This information is available for download in YAML and JSON formats from the website.

The purpose of this document is to describe the content and location of this operational information.

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1. Background

In March 2014, the Root Server Operators redesigned their public web site, www.root-servers.org [[Website](#)]. A new feature of this site was an interactive map showing the location of root server instances.

Since August 2014 the operational data has been available for download in YAML file format, and more recently also in JSON format.

Since its initial development, the operational data has been expanded in purpose to convey additional information, including references to other resources. Currently, the following types of information are provided:

- Root Server Operator's organization
- IPv4 and IPv6 service addresses
- Autonomous System Number and peering policy
- Root server webpage and contact email
- Anycast site locations
- Identifier naming convention
- Links to RSSAC001 statements
- Links to RSSAC002 data and other statistics

The remaining sections of this document describe the format, meaning, and location of available operational information.

2. Structure and Format

The operational information can be downloaded in either YAML or JSON file formats. Examples are provided in [Appendix A.1](#) and [Appendix A.2](#). The top level is a YAML mapping or JSON object having the following keys:

2.1. Operator

The name of the organization operating the root name server.

2.2. Homepage

The URL of the homepage for the root name server.

2.3. IPv4

The IPv4 address of the root name server.

2.4. IPv6

The IPv6 address of the root name server.

2.5. ASN

The Autonomous System Number (ASN) under which the RSO announces routes for the root name server. Note that some RSOs might use additional or different ASNs for individual sites, as described in [Section 2.16.12](#) and [Section 2.16.13](#). The one given here can be considered the primary ASN.

2.6. Contact Email

An optional email address that can be used to contact the RSO.

2.7. Peering Policy

An optional URL for the RSO's published peering policy.

2.8. Identifier Naming Convention

Optional text describing the site naming convention used for identifying different instances of this root name server.

2.9. BGP Community Convention

Optional text describing the BGP Community convention used for identifying different sites of this root name server.

2.10. BGP Extended Community Convention

Optional text describing the BGP Extended Community convention used for identifying different sites of this root name server.

2.11. BGP Large Community Convention

Optional text describing the BGP Large Community convention used for identifying different sites of this root name server.

2.12. RSSAC001

An optional URL for the RSO's published RSSAC001 [\[RSSAC001\]](#) statement.

2.13. RSSAC002

An optional URL for the RSO's published RSSAC002 [\[RSSAC002\]](#) metrics. The URL should correspond to what the RSSAC002 document calls <base-url>.

Note: This key was previously named just 'RSSAC' when this was the only RSSAC-related information that RSOs were publishing.

2.14. Statistics

An optional URL for the RSO's published data and statistics. In some cases this is the same as the RSSAC002 URL.

2.15. Updated

An ISO 8601 formatted UTC date and time indicating the date and time that the RSO's information was most recently updated.

When using the common time function named "strftime", the format string "%Y-%m-%dT%H:%M:%SZ" generates an appropriate value, such as "2022-07-06T12:34:56Z".

2.16. Sites

A YAML sequence or JSON array of mappings describing where root name server instances are located. Since the original and primary purpose of this data is to populate the interactive map, a site essentially corresponds to a geographic location such as a town or city.

An RSO may provide the service from multiple instances at a single location, for example from multiple datacenters in the same city. In this case, the RSO may choose to either:

- group multiple instances together under a single site, and set the Instances counter to a value greater than one; or
- place individual instances into individual sites, setting Instances to one, and have multiple sites with the same location data.

The latter approach is necessary when different instances at one location have different site parameters, such as global/local scope, IPv4/IPv6 support, or BGP routing attributes.

Each site mapping / object has the following keys:

2.16.1. Type

Either the keyword Global or Local, reflecting the anycast reachability scope as defined in Section 2 of [\[RFC4786\]](#).

2.16.2. Country

An ISO 3166-1 alpha-2 country code.

2.16.3. Town

The name of a city or town.

2.16.4. Latitude

Geographic latitude in decimal degrees notation.

2.16.5. Longitude

Geographic longitude in decimal degrees notation.

2.16.6. Instances

Number of anycast instances at this location.

Note: number of instances is not specifically defined (e.g., as servers vs racks vs datacenters). Each RSO is free to determine this value however they like, as it may pertain to their individual services.

2.16.7. Identifiers

Optional sequence of instance identifiers in operation at this location. These are expected to be in the same format as described in the top level "Identifier Naming Convention" element, or as one might see in response to a HOSTNAME.BIND query to the root name server, or as returned by the DNS Name Server Identifier (NSID) option [RFC5001].

2.16.8. IPv4

Boolean value indicating whether or not this location provides service over IPv4.

2.16.9. IPv6

Boolean value indicating whether or not this location provides service over IPv6.

2.16.10. Status

An optional field indicating the operational status of the site, whose value is one of the following: operational, suspended, or decommissioned.

Note that as part of normal operations RSOs may temporarily take sites out of service without updating this field. In general this field represents a site's long term status, rather than its short term status.

2.16.11. BGP Site Identifier

Optional value used for identifying this location using a BGP Community.

The value of this element is to be used in the top level "BGP Community Convention", "BGP Extended Community Convention" and/or "BGP Large Community Convention" elements.

2.16.12. BGP Origin AS

Optional ASN used as origin for BGP advertisements of the root server prefix at this location. If this field is not specified, the originating AS is assumed to be the value of the top-level ASN field.

2.16.13. BGP Intermediate AS

Optional ASN appended to BGP advertisements of the root server prefixes at this location, used to uniquely identify the site.

2.16.14. ID

A mandatory string used to track sites between updates. IDs may consist of letters, numbers, underscores or hyphens with a maximum of 64 characters.

2.16.15. Created

An optional, ISO 8601 formatted UTC date and time indicating the date and time that the site was created.

When using the common time function named "strftime", the format string "%Y-%m-%dT%H:%M:%SZ" generates an appropriate value, such as "2022-07-06T12:34:56Z".

2.16.16. Updated

An optional, ISO 8601 formatted UTC date and time indicating the date and time that the site's information was most recently updated.

When using the common time function named "strftime", the format string "%Y-%m-%dT%H:%M:%SZ" generates an appropriate value, such as "2022-07-06T12:34:56Z".

3. Download Location

The operational information for each root server identity can be downloaded in YAML format at the following URL:

```
https://root-servers.org/root/<letter>/yaml/
```

Where <letter> is replaced by the mnemonic letter for the root name server (i.e., A through M).

Similarly, the same information can be downloaded in JSON format at the following URL:

```
https://root-servers.org/root/<letter>/json/
```

4. Informative References

- [RFC4786] Abley, J. and K. Lindqvist, "Operation of Anycast Services", BCP 126, RFC 4786, DOI 10.17487/RFC4786, December 2006, <<https://www.rfc-editor.org/info/rfc4786>>.
- [RFC5001] Austein, R., "DNS Name Server Identifier (NSID) Option", RFC 5001, DOI 10.17487/RFC5001, August 2007, <<https://www.rfc-editor.org/info/rfc5001>>.
- [RSSAC001] RSSAC Caucus, "Service Expectations of Root Servers Operators", 4 December 2015, <<https://www.icann.org/en/system/files/files/rssac-001-root-service-expectations-04dec15-en.pdf>>.
- [RSSAC002] RSSAC Caucus, "RSSAC Advisory on Measurements of the Root Server System", 12 March 2020, <<https://www.icann.org/en/system/files/files/rssac-002-measurements-root-12mar20-en.pdf>>.

[Website] Root Server Operators, "Root Server Operators Web Site", April 2024, <<https://www.root-servers.org>>.

Appendix A. Examples

A.1. YAML Example

This appendix contains an example in YAML format for one of the root name servers.

```
ASN: 394353
BGP Community Convention: ''
BGP Extended Community Convention: ''
BGP Large Community Convention: ''
Contact Email: b-poc@isi.edu
Homepage: http://b.root-servers.org/
IPv4: 170.247.170.2
IPv6: 2801:1b8:10::b
Identifier Naming Convention: b<N>-<IATA Code>
Operator: Information Sciences Institute
Peering Policy: ''
RSSAC001: ''
RSSAC002: http://b.root-servers.org/rssac/
Sites:
- BGP Intermediate AS: null
  BGP Origin AS: null
  BGP Site Identifier: ''
  Country: NL
  Created: '2023-11-28T20:00:41Z'
  ID: ams
  IPv4: true
  IPv6: true
  Identifiers:
  - b1-ams
  - b2-ams
  - b3-ams
  - b4-ams
  Instances: 1
  Latitude: 52.366
  Longitude: 4.894
  Status: operational
  Town: Amsterdam
  Type: Global
  Updated: '2024-02-23T22:43:01Z'
- BGP Intermediate AS: null
  BGP Origin AS: null
  BGP Site Identifier: ''
  Country: US
  Created: '2023-11-28T20:00:41Z'
  ID: lax
  IPv4: true
  IPv6: true
  Identifiers:
  - b1-lax
  - b2-lax
  - b3-lax
  - b4-lax
  Instances: 1
  Latitude: 34.05
  Longitude: -118.25
  Status: operational
  Town: Los Angeles
  Type: Global
  Updated: '2024-02-23T22:43:01Z'
- BGP Intermediate AS: null
  BGP Origin AS: null
  BGP Site Identifier: ''
```

```
Country: US
Created: '2023-11-28T20:00:41Z'
ID: mia
IPv4: true
IPv6: true
Identifiers:
- b1-mia
- b2-mia
- b3-mia
- b4-mia
Instances: 1
Latitude: 25.775
Longitude: -80.209
Status: operational
Town: Miami
Type: Global
Updated: '2024-02-23T22:43:01Z'
- BGP Intermediate AS: null
  BGP Origin AS: null
  BGP Site Identifier: ''
  Country: US
  Created: '2023-11-28T20:00:41Z'
  ID: iad
  IPv4: true
  IPv6: true
  Identifiers:
  - b1-iad
  - b2-iad
  - b3-iad
  - b4-iad
  Instances: 1
  Latitude: 38.944
  Longitude: -77.456
  Status: operational
  Town: Reston
  Type: Global
  Updated: '2024-02-23T22:43:01Z'
- BGP Intermediate AS: null
  BGP Origin AS: null
  BGP Site Identifier: ''
  Country: CL
  Created: '2023-11-28T20:00:41Z'
  ID: scl
  IPv4: true
  IPv6: true
  Identifiers:
  - b1-scl
  - b2-scl
  - b3-scl
  - b4-scl
  Instances: 1
  Latitude: -33.45
  Longitude: -70.667
  Status: operational
  Town: Santiago
  Type: Global
  Updated: '2024-02-23T22:43:01Z'
- BGP Intermediate AS: null
```

```
BGP Origin AS: null
BGP Site Identifier: ''
Country: SG
Created: '2023-11-28T20:00:41Z'
ID: sin
IPv4: true
IPv6: true
Identifiers:
- b1-sin
- b2-sin
- b3-sin
- b4-sin
Instances: 1
Latitude: 1.283
Longitude: 103.833
Status: operational
Town: Singapore
Type: Global
Updated: '2024-02-23T22:43:01Z'
Statistics: https://b.root-servers.org/rssac/
Updated: '2024-02-23T22:43:01Z'
```

A.2. JSON Example

```
{
  "ASN": 5927,
  "BGP Community Convention": "",
  "BGP Extended Community Convention": "",
  "BGP Large Community Convention": "",
  "Contact Email": "disa.columbus.ns.mbx.hostmaster-dod-nic@mail.mil",
  "Homepage": "http://disa.mil/g-root",
  "IPv4": "192.112.36.4",
  "IPv6": "2001:500:12::d0d",
  "Identifier Naming Convention": "groot-{theatre}{site}-{node}",
  "Operator": "Defense Information Systems Agency",
  "Peering Policy": "",
  "RSSAC001": "",
  "RSSAC002": "http://www.disa.mil/G-Root/G-Root-Stats",
  "Sites": [
    {
      "BGP Intermediate AS": null,
      "BGP Origin AS": null,
      "BGP Site Identifier": "",
      "Country": "US",
      "Created": "2024-02-15T14:59:55Z",
      "ID": "disa-cmh",
      "IPv4": true,
      "IPv6": true,
      "Identifiers": [
        "groot-con1-1",
        "groot-con1-2",
        "groot-con1-3"
      ],
      "Instances": 1,
      "Latitude": 39.9611755,
      "Longitude": -82.9987942,
      "Status": "operational",
      "Town": "Columbus",
      "Type": "Global",
      "Updated": "2024-02-21T19:27:23Z"
    },
    {
      "BGP Intermediate AS": null,
      "BGP Origin AS": null,
      "BGP Site Identifier": "",
      "Country": "US",
      "Created": "2024-02-15T14:59:55Z",
      "ID": "disa-hnl",
      "IPv4": true,
      "IPv6": true,
      "Identifiers": [
        "groot-pacl-1",
        "groot-pacl-2",
        "groot-pacl-3"
      ],
      "Instances": 1,
      "Latitude": 21.3069444,
      "Longitude": -157.8583333,
      "Status": "operational",
      "Town": "Honolulu",
      "Type": "Global",
    }
  ]
}
```

```
"Updated": "2024-02-21T19:27:23Z"
},
{
  "BGP Intermediate AS": null,
  "BGP Origin AS": null,
  "BGP Site Identifier": "",
  "Country": "IT",
  "Created": "2024-02-15T14:59:55Z",
  "ID": "disa-nap",
  "IPv4": true,
  "IPv6": true,
  "Identifiers": [
    "groot-eur2-1",
    "groot-eur2-2",
    "groot-eur2-3"
  ],
  "Instances": 1,
  "Latitude": 40.8517746,
  "Longitude": 14.2681244,
  "Status": "operational",
  "Town": "Naples",
  "Type": "Global",
  "Updated": "2024-02-21T19:27:23Z"
},
{
  "BGP Intermediate AS": null,
  "BGP Origin AS": null,
  "BGP Site Identifier": "",
  "Country": "US",
  "Created": "2024-02-15T14:59:55Z",
  "ID": "disa-sat",
  "IPv4": true,
  "IPv6": true,
  "Identifiers": [
    "groot-con2-1",
    "groot-con2-2",
    "groot-con2-3"
  ],
  "Instances": 1,
  "Latitude": 29.4241219,
  "Longitude": -98.4936282,
  "Status": "operational",
  "Town": "San Antonio",
  "Type": "Global",
  "Updated": "2024-02-21T19:27:23Z"
},
{
  "BGP Intermediate AS": null,
  "BGP Origin AS": null,
  "BGP Site Identifier": "",
  "Country": "DE",
  "Created": "2024-02-15T14:59:55Z",
  "ID": "disa-str",
  "IPv4": true,
  "IPv6": true,
  "Identifiers": [
    "groot-eurl-1",
    "groot-eurl-2",
```

```
    "groot-eur1-3"
  ],
  "Instances": 1,
  "Latitude": 48.7303646,
  "Longitude": 9.1079418,
  "Status": "operational",
  "Town": "Stuttgart",
  "Type": "Global",
  "Updated": "2024-02-21T19:27:23Z"
},
{
  "BGP Intermediate AS": null,
  "BGP Origin AS": null,
  "BGP Site Identifier": "",
  "Country": "JP",
  "Created": "2024-02-15T14:59:55Z",
  "ID": "disa-tyo",
  "IPv4": true,
  "IPv6": true,
  "Identifiers": [
    "groot-pac2-1",
    "groot-pac2-2",
    "groot-pac2-3"
  ],
  "Instances": 1,
  "Latitude": 35.7384505,
  "Longitude": 139.3269322,
  "Status": "operational",
  "Town": "Tokyo",
  "Type": "Global",
  "Updated": "2024-02-21T19:27:23Z"
}
],
"Statistics": "https://disa.mil/G-Root/G-Root-Stats",
"Updated": "2024-02-21T19:27:23Z"
}
```

Author's Address

Root Server Operators

URI: <https://root-servers.org/>