Docker Compose Installation & Setup Guide.

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1. Overview

NS1’s Private DNS is a solution that can be installed on customers’ networks. It is the software version of NS1’s industry-leading SaaS platform, bringing DNS and traffic management capabilities out of the cloud and into owned environments.

2. Before You Begin

This guide assumes the reader has familiarity with the principles of DNS, networking, and working knowledge of Docker and container-based systems.

2.1. System Requirements

The following sections contain both hard requirements and general guidance (e.g. hardware) for the system. For questions or concerns about target environments, please contact support@ns1.com for more information.

2.1.1. Hardware

The following is the minimum hardware recommended to run a single container image:

- 2 CPUs
- 2 GB RAM
- 20 GB of free disk space

Important note: NS1 highly recommends monitoring disk usage on each host to prevent service disruption.

2.1.2. Operating Systems

- Linux Ubuntu 18.04 (Docker CE 18.05 Edge and higher only) / 17.04 / 16.04 / 14.04 x64
- CentOS 7 x86
- Red Hat x86_64

Important note: If running multiple containers on the same host machine, a Linux kernel must support the SO_REUSEPORT socket option to allow multiple sockets on the same host to bind to the same port.

Important note: Running Private DNS on Mac OS or Windows 10 Pro / Enterprise 64-bit is not supported by NS1.

2.1.3. Docker

To run multi-container applications with Docker Compose, Private DNS **requires** Docker Version **17.03.x or 17.06.x (CE or EE)** or higher. More information about Docker requirements along with installation steps is found at the following locations:

- Docker: https://docs.docker.com/engine/installation/
- Docker Compose: https://docs.docker.com/compose/install/.

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2.1.4. Software

Web interface configuration was designed to work with current Evergreen browser versions. Note that newer versions of each browser may be available since this release and therefore may not be tested yet by NS1. The following browser versions were tested prior to this release:

- Chrome 67.0.3396.87 (Official Build) (64-bit)
- Firefox 58.0
- Edge 41.16299.15
- EdgeHTML 16.16299
- Safari 11.0.2

2.1.5. Network

While configuring the system, IPv4 addresses are recommended. Access to the public internet is required to pull the latest container images from my.nsone.net.

Important notes:

- For private networks without access to the public internet, NS1 recommends pulling the container images on a separate machine first before transferring contents to a hard disk or volume which is accessible by the private network.
- If available, it is highly recommended to add each image version to a private container registry.

The following network protocols are used by the system: HTTP/HTTPS, UDP, TCP, TLS.

2.2. Securing System Access

Host Access. Access to host machines on which each container is running should be secured to system administrators only. NS1 *highly* recommends that administrators and operators should be required to access this machine via secure shell (SSH) connection.

Basic Auth. To further secure containers' web configuration interface, operators must sign in using "Basic Auth" credentials. By default, Private DNS initializes Username to `ns1` and Password to `private`.

Limiting Port Visibility. The web container should only be viewable on ports 80 and 443 from the localhost.

2.3. Transport Layer Security

By default all network communication between the various Private DNS containers, management portal and API endpoints, as well as the main portal and API endpoints is encrypted using self signed certificates that are generated at initial runtime of each container. It is expected behavior for a browser certificate trust warning to appear when navigating to the web configuration interfaces of each container for the first time. Proceed following the on screen browser instructions.

There are up to three different TLS configurations depending on the container:

TLS Configuration	Description	Availability
`Transport TLS`	`This configuration manages how communication between the various containers is encrypted and verified.`	• Data • Web • Xfr • Dns • Cache
`Management TLS`	`This configuration manages how communication between clients and the management interface is encrypted and verified.`	• Data • Web • Xfr • Dns • Cache
`Web TLS`	`This configuration manages how communication between clients and the main NS1 portal and API is encrypted and verified.`	• Web

The web container uses a self-signed certificate. As a result, a certificate trust warning may appear when making API calls or visiting the NS1 portal in a web browser. It is safe to ignore this validation warning. You can replace this certificate with a custom certificate at a later time.

3. Installation

This section provides instructions on installation using docker-compose.

3.1. Accessing Files & Images

NS1 hosts the installation files and container images within the NS1 Portal. NS1's Customer Success team will send an email invitation to Private DNS customers directing them to https://my.nsone.net/. Once a password is created, navigate to the Downloads page.

Container images can now be downloaded locally, unzipped, and pushed to a private container registry.

Alternatively, use your API key to run the following command or download and run the command here:

```
sh <(curl -Ls
https://raw.githubusercontent.com/ns1/ns1-privatedns/master/get-privatedns.sh -o -) -k
APIKEY
```

Then download the compose file here:

```
wget https://raw.githubusercontent.com/ns1/ns1-privatedns/master/docker-compose.yml
```

Important note: It is a violation of the NS1 license agreement to push container images to a repository which is *not* for exclusive use by the licensee. Pushing images to a public registry is unlawful redistribution of the software.

3.2. Configuring Compose Files

The example `docker-compose.yml` provided in the installation directory will start a single container of each service on one host machine. In-line comments provide more information about specific parameters. Configuration management tools and other infrastructure as code frameworks are highly recommended to orchestrate a production-grade deployment.

3.3. Installation Commands

Execute `docker-compose.yml` to start containers and volumes for installation. Pass in the image version at the command line using the TAG parameter as shown below.

```
 TAG=1.0.2 docker-compose -p privatedns up -d
```

Important note: Upgrading the host machine's version of Docker Compose is recommended. See https://docs.docker.com/compose/install/#upgrading for more information.

4. Setup & Configuration

When first setting up the system, the data container should be configured first. Configuration of other containers can be done in any order.

4.1. Setup with CLI

Using the command line, the system is set up using the supd application. For usage information of supd, add the `--help` or `-h` option. For example, the xfr container's supd help is accessed with the following command:

```
docker exec privatedns_xfr_1 supd --help
```

4.1.1. Common CLI Setup Options

Certain fields are common and shared among all containers. To view the usage information of the run command for the specific container. For example,

```
docker exec privatedns_data_1 supd run --help
```

The following table describes shared options for the run command.

Options	Description
`--recovery`	Used by the system to recover from a failed configuration
`--bootstrap`	Used by the system when first standing up with no configuration available
`-f, --force`	overwrite any existing config options with CLI parameters
`--pop_id [value]`	This specifies the location (datacenter/pop) of the server where the data container is running
`--server_id [value]`	This identifies a specific server in a location where the data container is running
`--enable_ops_metrics [value]`	If enabled this will export system metrics to the specified metrics database(s)
`--transport_enable_tls [value]`	Enable or disable transport TLS encryption, to use for communicating with other cluster members. (defaults to True)
`--default_transport_tls_settings [value]`	Use the predefined TLS settings for transport networking

--manual_transport_tls_settings [value]	Define the TLS settings for transport networking, when using manually mounted certificates
--manual_transport_tls_crl_file [value]	The CRL certificate to use for verifying client certificates revocation status, when communicating between cluster members
--manual_transport_tls_sni_zone [value]	The zone to use for TLS verification purposes, when communicating between cluster members
--manual_transport_tls_client_cert_verfiy [value]	Whether or not to enforce strict certificate verification, when communicating between cluster members. NOTE: You must set 'TLS certificate zone' for this to work with custom certificates
--manual_transport_tls_version [value]	The minimum TLS version to enforce, when communicating between cluster members
--manual_transport_tls_ciphers [value]	The set of TLS ciphers to use, when communicating between cluster members
--management_enable_tls [value]	Enable or disable management TLS encryption, to use for communicating with other cluster members. (defaults to True)
--default_management_tls_settings [value]	Use the predefined TLS settings for management networking
--manual_management_tls_settings [value]	Define the TLS settings for management networking, when using manually mounted certificates
--manual_management_tls_cert_bundle [value]	The combined certificate/key PEM file to present, when communicating between cluster members
--manual_management_tls_crl_file [value]	The CRL certificate to use for verifying client certificates revocation status, when communicating between cluster members
--manual_management_tls_client_cert_verfiy [value]	Whether or not to enforce strict certificate verification, when communicating between cluster members
--manual_management_tls_version [value]	The minimum TLS version to enforce, when communicating between cluster members
--manual_management_tls_ciphers [value]	The set of TLS ciphers to use, when communicating between cluster members
-h, --help	output usage information

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4.1.2. Data CLI Setup

To see the data container's unique configuration options, view the usage information of the run command.

```
docker exec privatedns_data_1 supd run --help
```

The following table describes options specific to the data container.

Options	Description
--number_of_stats_processors [value]	The number of processors to run for query metrics
--query_metrics_ttl [value]	Duration to keep query metrics.
--telegraf_output_ns1_data [value]	None
--telegraf_output_ns1_data_enabled [value]	Use the default metrics store
--telegraf_output_influxdb [value]	Enable InfluxDB output for operational metrics
--telegraf_output_influxdb_data_host [value]	Hostname of InfluxDB host
--telegraf_output_influxdb_database [value]	InfluxDB Database Name
--telegraf_output_influxdb_enable_auth [value]	Enable user/password authentication for InfluxDB
--telegraf_output_influxdb_username [value]	InfluxDB User
--telegraf_output_influxdb_password [value]	InfluxDB Password
--telegraf_output_influxdb_enable_tls [value]	Enable TLS for InfluxDB
--telegraf_output_influxdb_server_pem_key [value]	The PEM key for the InfluxDB server
--telegraf_output_influxdb_ca_pem_key [value]	The CA key used for validation if provided
--telegraf_output_influxdb_crt [value]	The CRT for the InfluxDB server
--telegraf_output_elasticsearch [value]	Enable Elasticsearch output for operational metrics

--telegraf_output_elasticsearch_data_host [value]	Elasticsearch Host
--telegraf_output_elasticsearch_sniff_cluster [value]	Enable sniffing Elasticsearch for additional hosts in cluster
--telegraf_output_elasticsearch_timeout [value]	Timeout for Connecting to Elasticsearch
--telegraf_output_elasticsearch_index [value]	Elasticsearch Index
--telegraf_output_elasticsearch_enable_auth [value]	Enable user/password authentication for Elasticsearch
--telegraf_output_elasticsearch_username [value]	Elasticsearch Username
--telegraf_output_elasticsearch_password [value]	Elasticsearch Password
--telegraf_output_elasticsearch_enable_tls [value]	Enable TLs for Elasticsearch
--telegraf_output_elasticsearch_server_pem_key [value]	The PEM key for the Elasticsearch server
--telegraf_output_elasticsearch_ca_pem_key [value]	The CA key used for validation of Elasticsearch
--telegraf_output_elasticsearch_crt [value]	The CRT for the Elasticsearch server
--telegraf_output_elasticsearch_enable_managed_template [value]	Whether to have the metrics process or Elasticsearch manage the template
--telegraf_output_elasticsearch_template_name [value]	The name of the elasticsearch template
--telegraf_output_elasticsearch_overwirte_template [value]	Whether to be able to overwrite an existing template
--telegraf_output_opentsdb [value]	Enable OpenTSB output for operational metrics
--telegraf_output_opentsdb_host [value]	OpenTSDB Hostname

--telegraf_output_opentsdb_batch_size [value]	Batch Size of writes to OpenTSDB
--telegraf_output_graphite [value]	Enable graphite output for operational metrics
--telegraf_output_graphite_host [value]	Graphite server hostname
--telegraf_output_graphite_timeout [value]	Timeout for connecting to graphite
--telegraf_output_graphite_template [value]	Template format for metrics in graphite
--telegraf_output_graphite_enable_tls [value]	Enable TLS for graphite
--telegraf_output_graphite_server_pem_key [value]	The PEM key for the graphite server
--telegraf_output_graphite_ca_pem_key [value]	The CA PEM key used for validation of graphite server
--telegraf_output_graphite_crt [value]	The CRT for the graphite server

4.1.3. DNS CLI Setup

To see the dns container's unique configuration options, view the usage information of the run command.

```
docker exec privatedns_dns_1 supd run --help
```

The following table describes options specific to the dns container.

Options	Description
--data_host [value]	Hostname or IP address of the data or cache container
--num_metrics_procs [value]	The number of processors running to collect metrics for DNS queries
--metrics_flush_interval [value]	Interval for flushing metrics to the data container
--dns_recv_buffer [value]	The size in bytes of the UDP receive buffers used by the dns server. A setting of '0' uses the OS defined default value.
--num_trex_procs [value]	Number of Authoritative DNS server processes to run

--enable_ops_metrics [value]	Whether to send operational metrics to the data container
--operation_mode [value]	Controls whether the server will act as **authoritative** server or **recursive** resolver
--external_resolver [value]	IP address of resolver to handle ALIAS record resolution and queries for non-authoritative zones if recursive mode is enabled. Builtin resolver will be used if this option is not specified
--forward_zones [value]	Additional zones and their authoritative servers to be configured in the resolver as forwarded zones. This allows the zones to be resolved if they are not delegated from public DNS hierarchy

4.1.4. Web CLI Setup

To see the web container's unique configuration options, view the usage information of the run command.

```
docker exec privatedns_web_1 supd run --help
```

The following table describes options specific to the web container.

Options	Description
--data_host [value]	Hostname or IP address of data container
--api_hostname [value]	Hostname to use for API calls (bootstrap, organization management require this to be set)
--portal_hostname [value]	Hostname to use for portal access
--web_enable_tls [value]	Enable or disable web TLS encryption, to use for communicating with the portal interface and api. (defaults to True)
--default_web_tls_settings [value]	Use the predefined TLS settings for web networking.
--manual_web_tls_settings [value]	Define the TLS settings for web networking, when using manually mounted certificates.
--manual_web_tls_cert_bundle [value]	The combined certificate/key PEM file to present, when communicating between cluster members.
--manual_web_tls_crl_file [value]	The CRL certificate to use for verifying client certificates revocation status, when communicating between cluster members.
--manual_web_tls_force_redir [value]	Enable or disable forcing redirect of http traffic to https, for the web facing portal and api. (defaults to

	True)
--manual_web_tls_client_cert_verfiy [value]	Whether or not to enforce strict certificate verification, when communicating between cluster members.
--manual_web_tls_version [value]	The minimum TLS version to enforce, when communicating between cluster members.
--manual_web_tls_ciphers [value]	The set of TLS ciphers to use, when communicating between cluster members.
--nameservers [value]	List of default name servers to set as NS records for new zones. The first server in the list is also used as primary name server in the SOA record. For example, ['ns1.example.net', 'ns2.example.net'].
--hostmaster_email [value]	E-mail address to set as hostmaster in the SOA record for new zones.

4.1.5. Xfr CLI Setup

To see the xfr container's unique configuration options, view the usage information of the run command.

```
docker exec privatedns_xfr_1 supd run --help
```

The following table describes options specific to the xfr container.

Options	Description
--data_host [value]	Hostname or IP address of data container

4.2. Setup with Web Interface

Each container has a web interface for manual configuration.

4.2.1. Data Setup

To set up the data container via web interface:

1. Open a web browser to `https://<data-hostname-ip>:3300`

   Note: The configuration port 3300 is set in the docker-compose file.

Optional configurations include:

2. Under the Identifiers grouping, enter a **Location ID** (datacenter/pop) of the server where the container is run and **Server ID** to identify the specific host machine of the container.
3. Under the Operational Details grouping, enter the **Number of Metrics Processors** and the **Query Metrics TTL** to determine how long query metrics are retained.
4. **Enable Metrics Export** is configured to collect operational telemetry and application metrics locally by default. Other export options allow metrics to also feed into the following external data stores: InfluxDB, Elasticsearch, OpenTSDB, and Graphite.
   a. Each additional option besides of Default Internal Metrics requires additional parameters to ensure successful connection to the external data store.
   b. **InfluxDB** requires a Host, Database Name, Username, InfluxDB Password and SSL/TLS key information to securely connect.
   c. **Elasticsearch** cluster requires Hosts, Timeout, Index Name, Username, Password, optional Template, and SSL/TLS information to securely connect.
   d. **OpenTSDB** export requires a Host and Batch Size.
   e. **Graphite** requires a Host, Timeout, Template, and SSL/TLS information to securely connect.
5. Under the TLS Settings grouping, choosing to use **Defaults** for **Transport TLS** and **Management TLS** will operate with the system's self-signed certificates which were generated on startup.
   a. Manual Settings will require either bind mounting the certificates to Xyz or uploading a certificate bundle by visiting the **Certs and Files** page.

Important note: If Enable Metrics Export is enabled on other containers, they will send operational metrics back to data for aggregation and export to other data stores.

4.2.2. DNS Setup

Before continuing with the dns container(s), the data container must be configured already. For each dns container, to set up the dns container via web interface:

1. Open a web browser to `https://<dns-hostname-ip>:3301`
2. Under the Data Container Connection grouping, enter the **Data Host**.
3. To configure metrics settings under the Operational Details grouping, choose a **Number of Query Metrics Processors**. NS1 recommends at least 2.
4. Enter a **Metrics Flush Interval** to determine at what interval metrics get sent back to data. NS1 recommends 10s for this value.
5. Enter a **DNS UDP Receive Buffer Length** in bytes. A setting of '0' uses the OS defined default value.
6. Enter the **Number of Authoritative DNS Servers**. NS1 recommends at least 2.
7. Under Resolving Configuration, toggle whether the container will operate as an **Authoritative Server** or **Recursive Resolver**.

Optional configurations include:

8. Entering a **Location ID** (datacenter/pop) of the server where the container is run
9. **Server ID** to identify the specific host machine of the container
10. An **External Resolver**'s IP can be set to handle ALIAS record resolution and also queries for non-authoritative zones in Recursive Resolver mode. By default, the container's built in resolver will be used if this value is not specified.
11. **Forwarded Zones** can be added individually with a Domain and one or more forwarding IP Addresses and Port.
12. Under the TLS Settings grouping, choosing to use **Defaults** for **Transport TLS** and **Management TLS** will operate with the system's self-signed certificates which were generated on startup.
    a. Manual Settings will require either bind mounting the certificates to Xyz or uploading a certificate bundle by visiting the **Certs and Files** page.

4.2.3. Web Setup

Before continuing with the web container, the data container must be configured already. To set up the web container via web interface:

1. Open a web browser to `https://<web-hostname-ip>:3302`
2. Under the Data Container Connection grouping, enter the **Data Host**.
3. Enter an **API Hostname** which will be used for feed URLs.
4. Enter a **Portal Hostname** at which users can reach the NS1 Portal running in the web container.

Optional configurations include:

5. Entering a **Location ID** (datacenter/pop) of the server where the container is run
6. **Server ID** to identify the specific host machine of the container.
7. Under the Operational Details grouping, one more more **Nameservers** can be added along with a **Hostmaster E-mail** address to be associated with new zones' SOA records.
8. Under the TLS Settings grouping, choosing to use **Defaults** for **Transport TLS**, **Management TLS** , and **Web TLS** will operate with the system's self-signed certificates which were generated on startup.
    a. Manual Settings will require either bind mounting the certificates to Xyz or uploading a certificate bundle by visiting the **Certs and Files** page.

4.2.4. Xfr Setup

Before continuing with the xfr container, the data container must be configured already. To set up the xfr container via web interface:

1. Open a web browser to `https://<xfr-hostname-ip>:3303`
2. Under the Data Container Connection grouping, enter the **Data Host**.

Optional configurations include:

3. Entering a **Location ID** (datacenter/pop) of the server where the container is run
4. **Server ID** to identify the specific host machine of the container
5. Under the TLS Settings grouping, choosing to use **Defaults** for **Transport TLS**, **Management TLS** , and **Web TLS** will operate with the system's self-signed certificates which were generated on startup.
    a. Manual Settings will require either bind mounting the certificates to Xyz or uploading a certificate bundle by visiting the **Certs and Files** page.

5. Administrative Actions

Administrative actions are included with each container for operations such as restarting a service or creating backups.

5.1. Admin Actions with CLI

Actions can be executed on the command line for each container.

5.1.1. Data CLI Actions

To see available actions of the dns container, view the usage information of supd.

```
docker exec privatedns_data_1 supd --help
```

The following table describes action commands.

Commands	Description
generate_runtime_logs	Generates an archive of runtime reports in /ns1/data/log/health/
update_basic_auth [options]	Sets and updates your basic authorization credentials to the container's configuration UI
backup_db	Dumps database to data/backup/<timestamp>.tgz
restart_maindb	This will cause an outage for API and XFR (zone transfer) services.
restart_metricsdb	This will cause an outage for metrics.
restart_msg_svs	This will cause an outage for data container services.
restart_metrics_svs	This will cause an outage for operational metrics.
restart_in_mem_db	This will cause an outage for creation of portal sessions
health [options]	run all health checks. returns a json-formatted object in k:v format
version	print the standalone version number. You can also use -V. versionfile is located at /etc/version
run [options]	run ansible via flags or environment variables. flags supercede environment vars. Defaults to ignoring existing config.yml
viewconfig [options]	Lists all current config parameters; adding -a will display all available parameters, even null values

5.1.2. DNS CLI Actions

To see available actions of the dns container, view the usage information of supd.

```
docker exec privatedns_dns_1 supd --help
```

The following table describes action commands.

Commands	Description
generate_runtime_logs	Generates an archive of runtime reports in /ns1/data/log/health/
update_basic_auth [options]	Sets and updates your basic authorization credentials to the container's configuration UI
restart_dns	This will cause an outage for DNS.
restart_caching	This will cause DNS caching to be delayed.
restart_metrics	This will cause an outage for metrics reporting.
restart_resolver	This will cause an outage for DNS
health [options]	run all health checks. returns a json-formatted object in k:v format
version	print the standalone version number. You can also use -V. versionfile is located at /etc/version
run [options]	run ansible via flags or environment variables. flags supercede environment vars. Defaults to ignoring existing config.yml
viewconfig [options]	Lists all current config parameters; adding -a will display all available parameters, even null values

5.1.3. Web CLI Actions

To see available actions of the the web container, view the usage information of supd.

```
docker exec privatedns_web_1 supd --help
```

The following table describes action commands.

Commands	Description
generate_runtime_logs	Generates an archive of runtime reports in /ns1/data/log/health/
update_basic_auth	Sets and updates your basic authorization credentials to

[options]	the container's configuration UI
restart_apid	Restarting the API Service will cause an outage for the API.
health [options]	run all health checks. returns a json-formatted object in k:v format
version	print the standalone version number. You can also use -V. versionfile is located at /etc/version
run [options]	run ansible via flags or environment variables. flags supercede environment vars. Defaults to ignoring existing config.yml
viewconfig [options]	Lists all current config parameters; adding -a will display all available parameters, even null values

5.1.4. Xfr CLI Actions

To see available actions of the xfr container, view the usage information of supd.

```
docker exec privatedns_xfr_1 supd --help
```

The following table describes action commands.

Commands	Description
generate_runtime_logs	Generates an archive of runtime reports in /ns1/data/log/health/
update_basic_auth [options]	Sets and updates your basic authorization credentials to the container's configuration UI
restart_xfr_svs	This action restarts zone transfer services. Zone transfers will be unavailable during the restart.
health [options]	run all health checks. returns a json-formatted object in k:v format
version	print the standalone version number. You can also use -V. versionfile is located at /etc/version
run [options]	run ansible via flags or environment variables. flags supercede environment vars. Defaults to ignoring existing config.yml
viewconfig [options]	Lists all current config parameters; adding -a will display all available parameters, even null values

5.2. Admin Actions with the Web Interface

Actions are found on their own tab of each container configuration page.

5.2.1. Data Actions

The container's actions can be executed from the Actions tab of the Configuration Manager page.

Actions	Description
Generate Runtime Report	Generates an archive of runtime reports in /ns1/data/log/health/
Set Basic Auth Credentials	Sets and updates your basic authorization credentials to the container's configuration UI
Backup Database	Dumps database to data/backup/<timestamp>.tgz
Restart Main Database	This will cause an outage for API and XFR (zone transfer) services.
Restart Metrics Database	This will cause an outage for metrics.
Restart Messaging Service	This will cause an outage for data container services.
Restart Metrics Service	This will cause an outage for operational metrics.
Restart in Memory Database	This will cause an outage for creation of portal sessions

5.2.2. DNS Actions

The container's actions can be executed from the Actions tab of the Configuration Manager page.

Actions	Description
Generate Runtime Report	Generates an archive of runtime reports in /ns1/data/log/health/
Set Basic Auth Credentials	Sets and updates your basic authorization credentials to the container's configuration UI
Restart Authoritative DNS Servers	This will cause an outage for DNS.

Restart Caching Service	This will cause DNS caching to be delayed.
Restart Metrics Service	This will cause an outage for metrics reporting.
Restart Recursive DNS Service	This will cause an outage for DNS

5.2.3. Web Actions

The container’s actions can be executed from the Actions tab of the Configuration Manager page.

Actions	Description
Generate Runtime Report	Generates an archive of runtime reports in /ns1/data/log/health/
Set Basic Auth Credentials	Sets and updates your basic authorization credentials to the container’s configuration UI
Restart API Service	Restarting the API Service will cause an outage for the API.

5.2.4. Xfr Actions

The container’s actions can be executed from the Actions tab of the Configuration Manager page.

Actions	Description
Generate Runtime Report	Generates an archive of runtime reports in /ns1/data/log/health/
Set Basic Auth Credentials	Sets and updates your basic authorization credentials to the container’s configuration UI
Restart XFR Service	This action restarts zone transfer services. Zone transfers will be unavailable during the restart.

6. Import New GeoIP Data

The dns container images ships with a built-in GeoIP database to facilitate geographic routing. This authoritative nameserver is populated from the free version of Maxmind GeoIP2's database files which NS1 has licensed for redistribution.

If available, a paid version of Maxmind's GeoIP database files can be uploaded to each dns container for more precise geo routing.

Important note: The dns container currently supports binary databases formatted according to MaxMind DB File Format Specification v2.0.

1. Open a web browser to the dns container's **Certs and Files** page.
2. Replace the default GeoIP-City.mmdb file by selecting **Upload**, browse to the file, and select **Open**.
3. Replace the default GeoIP-ASN.mmdb file by selecting **Upload**, browse to the file, and select **Open**.
4. Navigate to the **Configuration Manager** page, select the **Actions** tab, and select **Restart Authoritative DNS Service**. When successfully restarted, the new GeoIP data is loaded.

7. Upgrading

When a new version of a container is released, admins may choose to upgrade the docker containers to apply the latest features and bug fixes to the system.

If a new version of one or more container images is available, admins should download the images from https://my.nsone.net/. All containers can be updated at once with docker-compose.

In the `docker-compose.yml` file, the `${TAG}` parameter allows you to choose the image tag at the command line. For example,

1. First, stop the system.

   ```
   docker-compose -p privatedns stop
   ```

2. Remove the existing images and volumes.

   ```
   docker-compose -p privatedns rm && docker volume prune
   ```

3. And finally, bring the system up again passing in a different image tag at the command line. In the `docker-compose.yml` file, the `${TAG}` parameter allows you to choose the image tag at the command line.

   ```
   TAG=1.0.1 docker-compose -p privatedns up -d
   ```

Important note: Rollback to previous versions is also possible using the same process and specifying the previous container image (e.g. 1.0.0).

8. Uninstalling

System uninstallation is simple. To remove the entire system, including volume data, execute the following:

```
docker-compose -p privatedns down -v
```

Important note: This command *is* destructive and will remove volumes. Ensure data is backed up appropriately.

9. Appendix A. Bootstrap an Operator

When no operators exist in the main database, the bootstrap endpoint is enabled. Once the system is ready for use, an initial operator must be boostrapped. Below is an example cURL command.

```
curl -X POST \
  https://{{web-host}}/v1/ops/bootstrap \
  -H 'Content-Type: application/json' \
  -d '{
      "user": "root",
      "name": "Root Operator",
      "email": "ops@example.com",
      "password": "rootpassword"
}'
```

Important Notes:

- Bootstrap can only be performed once.
- Save the API Key (`key`) and 2FA Secret (`secret`) of the first operator created during bootstrap. If the API Key is lost and no other operators are created yet, the system is rendered unmanageable and a new instance must be deployed.
- The options `-k` or `--insecure` are needed on a cURL command if a valid SSL/TLS certificate has not been uploaded for use by the web container. See Transport Layer Security for more information about adding custom certificates.
- Password length should be between 10 and 255 characters.

If the operator was successfully added, a JSON response will provide information such as the 2FA Secret and API Key. For example,

```
{
"two_factor_auth": { "secret": "{{2fasecret}}", "type": "totp" },
"name": "Operator Name",
"id": "5b11a509d4f9fa0e5ec1373d",
"user": "operator",
"key": "{{operator_api_key}}",
"last_access": "2018-06-01T19:56:56.604228",
"password": "L0R3M1PSUm",
"email": "operator@example.com"
}
```

10. Appendix B: Managing Operators

After bootstrap, other operator users can be added to the system. An operator user has full access to every operation and all system data.

Important note: It is highly recommended to add additional operator users after bootstrapping the first operator. If the bootstrapped operator's API Key is lost and no other operators are created yet, the system is rendered unmanageable and a new instance must be deployed.

10.1. View Operator(s)

```
curl -X GET \
  https://{{web-host}}/v1/ops/operators/{{id}} \
  -H 'X-NSONE-Key: {{operator_api_key}}'
```

10.2. Create an Operator

```
curl -X PUT \
  https://{{web-host}}/v1/ops/operators \
  -H 'X-NSONE-Key: {{operator_api_key}}\
  -d '{
      "user": "operator",
      "name": "Operator Name",
      "email": "ops@email.com",
      "password": "mypassword"
}'
```

10.3. Update an Operator

```
curl -X POST \
  https://{{web-host}}/v1/ops/operators/{{id}} \
  -H 'Content-Type: application/json' \
  -H 'X-NSONE-Key: {{operator_api_key}}' \
  -d '{
    "name": "Changed Name",
    "email": "changed@email.com"
}'
```

10.4. Delete an Operator

```
curl -X DELETE \
  https://{{web-host}}/v1/ops/operators/{{id}} \
  -H 'X-NSONE-Key: {{operator_api_key}}'
```

Important note: Operators cannot delete their own accounts from the system. This ensures bootstrapping system users is a one-time event.

11. Appendix C: Managing Organizations

With the exception of operators, all users, zones, and records belong to an organization. To continue with the initial setup of Private DNS, an operator must create the first organization using the 'PUT' API call (Section 11.3) below.

11.1. View Organizations

```
curl -X GET \
  'https://{{web-host}}/v1/ops/orgs' \
  -H 'X-NSONE-Key: {{operator_api_key}}'
```

11.2. View an Organization

```
curl -X GET \
  'https://{{web-host}}/v1/ops/orgs/{{org_id}}' \
  -H 'X-NSONE-Key: {{operator_api_key}}'
```

11.3. Creating an Organization

```
curl -X PUT \
  'https://{{web-host}}/v1/ops/orgs' \
  -H 'X-NSONE-Key: {{operator_api_key}}' \
  -d '{"name": "Organization Name"}'
```

In response, an `org_id` is created along with a unique object `id`. The first organization in the Private DNS instance is set to 2000.

```
{
    "org_id": 2000,
    "name": "Organization Name",
    "id": "5b16cb703ca56f"
}
```

11.4. Update an Organization

```
curl -X POST \
  'https://{{web-host}}/v1/ops/orgs/{{org_id}}' \
  -H 'X-NSONE-Key: {{operator_api_key}}' \
  -d '{"name": "New Organization Name"}'
```

11.5. Delete an Organization

Deleting an organization removes *all* data associated with the organization including: API Keys, Users, Teams, Zone and Record data. For this reason, the DELETE operation can only be performed using an operator user's 2-factor authentication (2FA) token.

Important note: An operator's 2FA secret was returned in response to operator creation. A 2FA token can then be generated with any 6-digit TOTP generator that rotates at 30-second intervals.

```
curl -X DELETE \
  'https://{{web-host}}/v1/ops/orgs/{{org_id}}?token={123456}' \
  -H 'X-NSONE-Key: {{operator_api_key}}'
```

11.6. Reset a User's Password

Operators can generate a new invite token for users if passwords are forgotten.

```
curl -X POST \
'https://{{web-host}}/v1/ops/account/{{org_id}}/user/{{user-name}}/password/reset' \
  -H 'X-NSONE-Key: {{operator_api_key}}'
```

12. Appendix D: Managing API Keys, Users & Teams

API Keys, Users, and Teams are objects within an organization. Each can be managed by an organization member with sufficient privileges; however, operators also have the ability to act on behalf of an organization. This is necessary when setting up the first organization's users or API keys.

If an operator is acting on behalf of an organization, appending exclamation point (`!`) plus the org_id (e.g. `!2000`) to an API key allows use of other endpoints described in NS1's Managed DNS API Documentation.

12.1. Example: Adding a New User to an Organization as Operator

For example, an operator can add a user with the following cURL command:

```
curl -X PUT \
  'https://{{web-host}}/v1/account/users/newuser' \
  -H 'X-NSONE-Key: {{operator_api_key}}!{{org_id}}' \
  -d '{"username":"newuser", "name":"New User","email":"newuser@exmple.com"}'
```

In response an invite token is generated for this user to set a password:

```
{
    "username": "newuser",
    "notify": {
        "billing": false
    },
    "permissions": {},
    "invite_token": "{{new_invite_token}}",
    "ip_whitelist_strict": false,
    "name": "New User",
    "teams": [],
    "ip_whitelist": [],
    "last_access": null,
    "2fa_enabled": false,
    "email": "newuser@example.com"
}
```

An operator can then send an invitation URL to the portal user for setting an initial password.

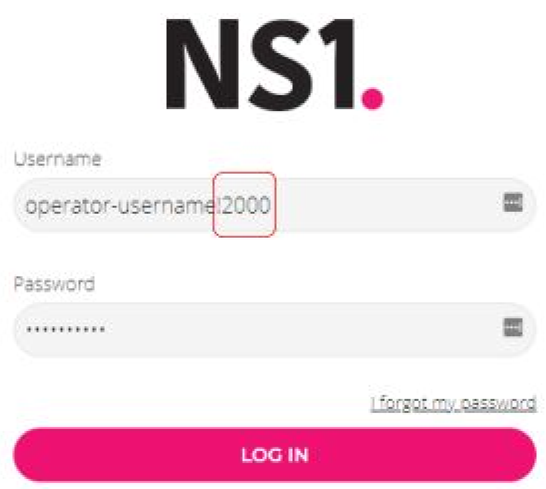
```
https://{{web-host}}/#/invite/{{new_invite_token}}
```

12.2. Example: Adding a Zone as Operator User

And a zone can be added for an organization’s account using the following cURL command:

```
curl -X PUT \
  'https://{{web-host}}/v1/zones/newzone.com' \
  -H 'X-NSONE-Key: {{operator_api_key}}!{{org_id}}' \
  -d  '{"zone":"newzone.com", "nx_ttl":60}'
```

In the same way an operator can use the API on behalf of an organization, the operator can also sign into the Private DNS portal by appending exclamation point (!) and org_id to the operator username of the login page.

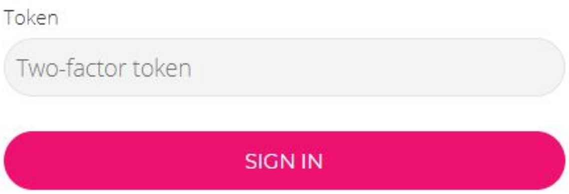


Username: operator-username!2000

Password: •••••••••••

Important notes:

- An operator singing into the portal on behalf of an organization is required to provide a 2-factor authentication (2FA) token.
- An operator’s 2FA secret was returned in response to operator creation. A 2FA token can then be generated with any 6-digit TOTP generator that rotates at 30-second intervals.



Token

Two-factor token

SIGN IN

13. Appendix E: Unavailable API Endpoints in Private DNS

The NS1 Managed DNS API Documentation describe endpoints which are not applicable to Private DNS including those pertaining to Account billing and overages. These endpoints will return a 404: Not Found response. The following is a list of non-applicable endpoints:

- Monitoring & Notifications
  - Monitoring Job endpoints
  - Notification List endpoints
- Account Management
  - Overage Alert endpoints
  - Plan and Billing endpoints
  - Payment method endpoints
- Pulsar
  - All Pulsar endpoints

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14. Appendix F: System Topologies

In a typical Private DNS deployment, core services (web, xfr, and data containers) are run in a control or “core” node. In an on-premise deployment, the system’s core node is typically deployed to the enterprise’s primary data. There can be (and usually are) more than one dns container running at the system’s edge in “edge nodes”. For local development or a proof of concept deployment, it is possible to run all containers on one host machine; however, it is recommended that *at least* dns be on its own host.

14.1. Architecting for Highly Available DNS

When initialized, each dns container caches authoritative zones and records; therefore, dns containers can continue serving DNS responses even if the system core services are unavailable. Depending on organization resources, prior experience, and preference, network administrators typically choose one of two strategies to achieve high availability (HA) of DNS services: anycasting with BGP or employing application- or appliance-based load balancers.

Important note: No matter the chosen HA strategy, when setting up more than one DNS service in multiple geographically distributed DNS nodes, filling in the Location ID and Server ID should be used to properly identify the host machine.