Installation

Version 23.8.1, 12 September 2023

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1. RBFS and Tools Installation

Introduction

RtBrick software is delivered via different means: **RBFS** (RtBrick Full Stack) software is delivered as custom RtBrick container images (also called *RBFS container images*) which can be used for virtual topologies on x86 servers or as custom RtBrick ONL installer images that be used on supported white box switches.

Image stores containing the container and ONL installer images are published on https://releases.rtbrick.com/ and updated when new image versions are available.

In addition to RBFS, other RtBrick software is delivered in the Debian package format to be used on supported Ubuntu Linux distribution (currently the only supported Ubuntu release is 22.04 LTS Jammy). We usually refer to this category of software as *RtBrick Tools*. The software delivered as Debian packages is composed of a set of CLI tools and/or daemons meant to facilitate working with RBFS containers and the RBFS API.

Debian package repositories containing the packages are published on https://releases.rtbrick.com/ and updated when new package versions are available.

Managed Software Download

The RtBrick managed software download functionality enables authenticated users to download and install the RtBrick software (packages or images). Access to *image stores* and *Debian package repositories* on https://releases.rtbrick.com/ is **restricted** through the use of TLS mutual authentication with TLS client certificates (TLS client certificates can be self-signed).

In order to gain access to the **restricted** *image stores* and *Debian package repositories* on https://releases.rtbrick.com/, perform the following steps:

Step 1: Customer must generate a client certificate

To help (facilitate) this step RtBrick provides the rtb-apt tools. For more information, see the section The RtBrick APT tool (rtb-apt).

Step 2: Customer must send a client certificate to RtBrick

Step 3: RtBrick will approve and trust client's certificate

Step 4: Customer can now use usual rtb-apt, apt, rtb-image tools to download RtBrick software

> ⚠️ rtb-image must be at least version 1.3.0 to correctly work with managed downloads.

The RtBrick APT tool (rtb-apt)

rtb-apt is an APT (https://wiki.debian.org/Apt) helper application that provides an easier way of managing the system configuration of RtBrick package repositories (https://wiki.debian.org/DebianRepository) which can then be used with the usual apt commands to install RtBrick software.

Some RtBrick package repositories require authentication via TLS client certificates and rtb-apt provides commands for managing those specific repositories and the required apt authentication configuration.

rtb-apt is a statically compiled Linux 64bit executable, currently verified to run correctly on **Ubuntu 22.04**. It is provided through a direct download link.

Install rtb-apt

Before you install rtb-apt, please ensure that you have installed the following software:

- GNU Privacy Guard (GPG), which is used by apt to validate package repositories. To install GPG, enter the following command:

```
¬ sudo apt install gnupg
```

- HTTPS support for apt, required to be able to access package repositories via HTTPS.

```
¬ sudo apt install apt-transport-https ca-certificates
```

Here is how to download and install rtb-apt. This shows the URL where the latest version of rtb-apt is available for download:

```
¬ curl -o /tmp/rtb-apt https://releases.rtbrick.com/_/dl/sw/rtb-
apt/latest/linux_amd64/rtb-apt  \
    && sudo mv /tmp/rtb-apt /usr/local/bin/      \
    && sudo chown root:root /usr/local/bin/rtb-apt  \
    && sudo chmod 0755 /usr/local/bin/rtb-apt
```

Verify if rtb-apt is at least version 2.0.0:

```
¬ rtb-apt --version
2.0.0
```

Generate a TLS client certificate

The example below shows how to generate a TLS client certificate using rtb-apt.

```
¬ sudo rtb-apt auth generate
A new self-signed TLS client certificate has been generated for this system:

Subject:     CN=bb59a25d-6b38-4f3c-81e0-065e525c8335,OU=rtb-apt
Valid until: 2024-09-06 10:30:26 +0000 UTC

The following additional auto-generated information is included in the certificate
and could be used to uniquely identify this system:

DNS names:       [hostname.example.net]
Email addresses: [root@hostname.example.net user@hostname.example.net]
< ...................................... >

If you already have a working account on https://portal.rtbrick.com then you can
use the Self-Service section there to upload this certificate. If you DO NOT yet
have an account on https://portal.rtbrick.com then please send the certificate to
your RtBrick contact person:

-----BEGIN CERTIFICATE-----
MIIHHzCCBYegAwIBAgIRAJcI5pqSK9O+g6yJGB15i7YwDQYJKoZIhvcNAQELBQAw
QTEQMA4GA1UECxMHcnRiLWFwdDEtMCsGA1UEAxMkYmI1OWEyNWQtNmIzOC00ZjNj
< ...................................... >
NuLIKfmwrcyXmzAOe1bRtlJrRw0zofxX4rFcMmJReNqOV0obP5r7TCtnWtAqkFx/
7JJa
-----END CERTIFICATE-----
```

Identify and add RtBrick debian package repositories

Find available repositories

The example below shows how to find the available repositories:

```
¬ sudo rtb-apt repo list
Group              Repository     Distribution     Release Active  Restricted
releases/latest    rtbrick-tools  ubuntu           jammy   No      No
releases/23.8.1    rtbrick-tools  ubuntu           jammy   No      No
releases/23.9.1    rtbrick-tools  ubuntu           jammy   No      No
releases/23.10.1   rtbrick-tools  ubuntu           jammy   No      No
releases/23.11.1   rtbrick-tools  ubuntu           jammy   No      No
releases/23.12.1   rtbrick-tools  ubuntu           jammy   No      No

< ...................................... >

¬ sudo rtb-apt repo show releases/latest/rtbrick-tools
Group        releases/latest
Description Packages repositories in the releases/latest group are updated with
new package versions for every final or
            bugfix release.

    Repository      rtbrick-tools
    Description     Packages for any RtBrick software not part of RBFS and meant
to run on an standalone Linux system (usually
                    Ubuntu). A standalone Linux system will be any non-RBFS
container and non-ONL Linux system. These packages can
                    be tools like rtb-image or rtb-ansible but also software like
ctrld or apigwd.
    Distribution    ubuntu
    Release         jammy
    Active          No
    Restricted      No
```

Activate a repository

The example below shows how to activate a specific repository. rtb-apt will add the required configuration in /etc/apt/ such as that the repository can then be used with commands like apt update and apt install:

```
¬ sudo rtb-apt repo activate releases/latest/rtbrick-tools
```

The activated repository is added to */etc/apt/sources.list.d/rtbrick.list.*:

```
¬ cat /etc/apt/sources.list.d/rtbrick.list
deb [arch=amd64 signed-by=/etc/rtbrick/RtBrick-Support.pubkey.asc]
https://releases.rtbrick.com/_/latest/ubuntu/jammy/rtbrick-tools     jammy
rtbrick-tools
```

Verify active repositories

```
¬ sudo rtb-apt repo list
Group              Repository      Distribution      Release Active  Restricted
releases/latest    rtbrick-tools   ubuntu            jammy   Yes     Yes   <<<<<<<<
releases/23.8.1    rtbrick-tools   ubuntu            jammy   No      No
releases/23.9.1    rtbrick-tools   ubuntu            jammy   No      No
< ........................................ >
```

Verify access (authentication) for the active package repositories

Some of the RtBrick package repositories are *restricted* meaning that they require the client application (apt in this case) to authenticate with a TLS client certificate. The TLS client certificate for the current system must trusted by RtBrick. This is achieved either by uploading it in the Self-Service section of https://portal.rtbrick.com (if you already have a valid account on https://portal.rtbrick.com) or by sending your certificate to your RtBrick contact person.

Expected output BEFORE the TLS client certificate is trusted by RtBrick

```
¬ sudo rtb-apt auth check
Repository: releases/latest/rtbrick-tools ... restricted ... TLS client
certificate NOT accepted
```

Expected output AFTER the TLS client certificate is trusted by RtBrick

```
¬ sudo rtb-apt auth check
Repository: releases/latest/rtbrick-tools ... restricted ... TLS client
certificate accepted
```

Install a package from an RtBrick package repository

Once the TLS client certificate for the current system is trusted by RtBrick and once RtBrick package repositories have been activated with rtb-apt the usual apt commands can be used to install the RtBrick software contained in those package repositories.

In the example below we will install the rtbrick-imgstore package which provides the rtb-image CLI tool.

```
¬ sudo apt update
Hit:1 https://releases.rtbrick.com/_/latest/ubuntu/jammy/rtbrick-tools jammy
InRelease
Hit:3 http://archive.ubuntu.com/ubuntu jammy InRelease
Get:4 http://archive.ubuntu.com/ubuntu jammy-updates InRelease [119 kB]
Get:7 http://archive.ubuntu.com/ubuntu jammy-backports InRelease [109 kB]
Get:8 http://archive.ubuntu.com/ubuntu jammy-security InRelease [110 kB]
Get:9 http://archive.ubuntu.com/ubuntu jammy-updates/main amd64 Packages [970 kB]
Get:10 http://archive.ubuntu.com/ubuntu jammy-updates/universe amd64 Packages [979
kB]
< ....................................... >

¬ sudo apt install rtbrick-imgstore
Reading package lists... Done
Building dependency tree... Done
Reading state information... Done
The following NEW packages will be installed:
  rtbrick-imgstore
0 upgraded, 1 newly installed, 0 to remove and 46 not upgraded.
Need to get 7,731 kB of archives.
After this operation, 26.3 MB of additional disk space will be used.
Get:1 https://releases.rtbrick.com/_/latest/ubuntu/jammy/rtbrick-tools
jammy/rtbrick-tools amd64 rtbrick-imgstore amd64 3.3.0 [7,731 kB]
Fetched 7,731 kB in 0s (41.4 MB/s)
Selecting previously unselected package rtbrick-imgstore.
< ....................................... >
```

Verify access (authentication) for image stores

The rtb-image command (CLI tool) provided by the rtbrick-imgstore package is used to interact with *image stores*. The *image stores* are used for delivery of RBFS container images and RtBrick ONL installer images.

Similarly to package repositories some of the image stores are *restricted* meaning that they require the client application (rtb-image in this case) to authenticate with a TLS client certificate. rtb-image will re-use the TLS client certificate already generated by rtb-apt for the current system.

View available image stores

The example below shows how to view the available image stores:

```
¬ sudo rtb-image stores list

Index   UUID                                 Name        RemoteURL
Active  Restricted
0       af73c0a6-40e7-4775-b74b-aadafeabe86d   latest
```

```
https://releases.rtbrick.com/_/images/latest    Yes    No
1        c4c896b0-52c5-4343-8a21-e2ca3ea440f1    resources
https://releases.rtbrick.com/_/resources         No     No
2                                                 22.5.1
https://releases.rtbrick.com/_/images/22.5.1     No     No
3                                                 22.6.1
https://releases.rtbrick.com/_/images/22.6.1     No     No
4                                                 22.7.1
https://releases.rtbrick.com/_/images/22.7.1     No     No

< ....................................... >
```

Activate a restricted image store

The example below shows how to activate a (possibly restricted) image store:

```
¬ sudo rtb-image stores activate 0
```

Verify access to image stores

If the TLS client certificate for the current system is already trusted by RtBrick you can use rtb-image to download images.

The example below shows how to verify the access to the image stores:

```
¬ sudo rtb-image auth check
Image store: latest (af73c0a6-40e7-4775-b74b-aadafeabe86d) ... restricted ... TLS
client certificate accepted
```

And how to download an RBFS container image for the *virtual* platform and run a test container with it:

```
¬ sudo rtb-image update
Local image store cached copy updated to: Store:
/var/cache/rtbrick/imagestores/af73c0a6-40e7-4775-b74b-aadafeabe86d Version:
0.9.102 ValidUntil: 2023-09-23 07:03:28

¬ sudo rtb-image list -p virtual -r spine -v latest

Store: /var/cache/rtbrick/imagestores/af73c0a6-40e7-4775-b74b-aadafeabe86d
Version: 0.9.102 ValidUntil: 2023-09-23 07:03:28

UUID                               Version Filename
Format  Role    Platform    Cached
af7108e0-95b3-4e25-91a4-a2cee7a63a38    23.6.1  rbfs-cont/rbfs-spine-virtual-
23.6.0-g8daily.202306210...    lxd     spine   virtual     false

¬ sudo rtb-image pull af7108e0-95b3-4e25-91a4-a2cee7a63a38
rbfs-spine-virtual-23.6.0-g8daily.20230621060657+Bmaster.Cf5ebfbd4.tar.zst.sha512
225 B / 225 B [=================================================] 100.00%
```

```
0s
rbfs-spine-virtual-23.6.0-g8daily.20230621060657+Bmaster.Cf5ebfbd4.tar.zst.asc 833
B / 833 B [=============================================================] 100.00%
0s
rbfs-spine-virtual-23.6.0-g8daily.20230621060657+Bmaster.Cf5ebfbd4.tar.zst 435.06
MiB / 435.06 MiB [====================================================] 100.00%
4s
rbfs-spine-virtual-23.6.0-g8daily.20230621060657+Bmaster.Cf5ebfbd4.tar.zst:
decompressing 100 B / 100 B [==========================================]
100.00% 10s
af7108e0-95b3-4e25-91a4-a2cee7a63a38 downloaded as
/var/cache/rtbrick/imagestores/af73c0a6-40e7-4775-b74b-aadafeabe86d/rbfs-
cont/rbfs-spine-virtual-23.6.0-g8daily.20230621060657+Bmaster.Cf5ebfbd4

¬ sudo rtb-image run -n testRBFScont01 af7108e0-95b3-4e25-91a4-a2cee7a63a38
2023-09-08 15:15:11 UTC INF creating container testRBFScont01 with image version:
23.6.1 image uuid: af7108e0-95b3-4e25-91a4-a2cee7a63a38
2023-09-08 15:15:11 UTC INF Trying to start container container=testRBFScont01
2023-09-08 15:15:11 UTC INF Waiting for container IP addresses
container=testRBFScont01
2023-09-08 15:15:15 UTC INF Updating /etc/hosts entry address=10.0.3.96
container=testRBFScont01
2023-09-08 15:15:15 UTC INF Container was started container=testRBFScont01

¬ rssh testRBFScont01
Logging into testRBFScont01 as supervisor ...

+------------------------------------------------------------------+
|                                                                  |
    RBFS container testRBFScont01 running on ubuntu2204host:
        Date:       Fri Sep  8 15:15:23 UTC 2023
        Uptime:     up

    Image metadata:
        UUID:       af7108e0-95b3-4e25-91a4-a2cee7a63a38
        Version:    23.6.1
        Role:       spine
        Platform:   virtual
        Format:     lxd
        Build date: 2023-06-21 06:06:57 UTC
        Based on:   Ubuntu 18.04.6 LTS
|                                                                  |
+------------------------------------------------------------------+

supervisor@testRBFScont01>ubuntu2204host:~ $
```

RtBrick Tools and Packages

The RtBrick tools are distributed in the Debian (apt) package format in one of the rtbrick-tools debian (apt) package repositories as described in the *RtBrick Tools Installation Guide* section *1.3* step *3*.

rtbrick-toolkit

Version 23.8.1

The rtbrick-toolkit package has been updated to version 23.8.1 to match the corresponding RBFS release and has been updated to depend on the following RtBrick tools packages with these exact versions:

- rtbrick-imgstore 3.3.0

- rtbrick-apt-helper 2.0.1

- rtbrick-ansible 5.1.4

- rtbrick-apigwd 0.11.1

- rtbrick-ctrld `0.22.0

- rtbrick-lxcd 0.1.0

- rtbrick-robot-infrastructure 3.1.0

- rtbrick-fabric-ztp 2.1.0

> rtbrick-ansible version 5.0.1 is compatible with the new RBFS RESTCONF hierarchy that was introduced with RBFS version 23.4.1. Therefore, rtbrick-ansible version 5.0.1 is backward-incompatible and will not work correctly with RBFS versions older than 23.4.1.

Understanding RBFS Release Versioning

An RBFS release can be defined as a set of software packages (currently, in the Debian package format). However, it is delivered as an image, either a container (LXC/LXD) image or as a complete ONL installation image. The ONL installation image may or may not contain a container image pre-installed in it. An image can be defined as the archived root file system of a Linux OS installation with the needed software packages pre-installed and with a default configuration. In the current context, the terms 'RBFS release' and 'image' can be used interchangeably.

RtBrick uses a versioning scheme called rtbver for RBFS release versioning. An rtbver version string is syntactically similar to SEMVER 2.0, but semantically different. For the RBFS releases, the first 2 numbers of a version is YEAR.MONTH (corresponding to the MAJOR.MINOR of SEMVER). For example, the first RBFS

release in a calendar month is 22.4.1. If a second RBFS release occurs in the same calendar month gets version as 22.4.2. The RBFS release in the next calendar month will have a version (for example) 22.5.1 irrespective of how many RBFS releases occurred in the previous calendar month.

The rtbver scheme also supports four-number versioning, such as 22.4.1.1. This four-number version is used for maintenance releases. Maintenance releases are built only when required, based on and for an already existing RBFS release (such as 22.4.1.1 for 22.4.1.).

RtBrick Tools Installation

The installation of RtBrick tools is split into several steps, as follows:

> **The following commands and outputs are validated only for Ubuntu 22.04.**

Step 1: Removing any existing RtBrick tools Debian packages

Some of the RtBrick tools Debian packages have changed and have been upgraded several times. If some the RtBrick tools packages are already installed, it might be necessary to remove the currently installed versions:

apt list --installed | egrep -i rtbrick | awk -F '/' '{print $1;}' | xargs sudo apt remove -y

Among other output, you will get the following:

The following packages will be REMOVED:

```
rtbrick-ansible rtbrick-imgstore rtbrick-lxc-tools
```

Step 2: Please use rtb-apt to configure debian package repositories

Step 3: Update the local apt package cache

We then have to update the local apt package cache: sudo apt update

Step 5: Install 3rd-party dependencies

Some RtBrick tools packages might have dependencies on 3rd-party software which cannot be delivered though the RtBrick package repositories.

Currently the rtbrick-ansible package depends on Ansible. For installing Ansible, you can use the official documentation that can be found at https://docs.ansible.com/ansible/latest/installation_guide/intro_installation.html#installing-ansible-on-ubuntu.

One very important dependency of *rtbrick-ansible* is Ansible itself. **Make sure you have the latest version of Ansible installed, before trying to install rtbrick-ansible!**

Step 6: Install a specific RtBrick tool package

For example, in order to install the rtbrick-ansible package, if the steps above have been completed successfully is it sufficient to run the following command:

sudo apt install rtbrick-ansible

RtBrick tools packages

rtbrick-toolkit

The rtbrick-toolkit is a meta package that can be used to install all the tools needed to work with RBFS images (container or ONL installer) and with the RBFS API in one command:

sudo apt install rtbrick-toolkit

The rtbrick-toolkit meta package depends and thus automatically installs the following packages:

- rtbrick-imgstore
- rtbrick-ansible
- rtbrick-apigwd
- rtbrick-ctrld
- rtbrick-robot-infrastructure

If only part of the functionality is required each package can be installed individually.

rtbrick-ansible

To speed up the process of RBFS container bring up, the rtbrick-ansible package provides the rtb-ansible command which is an ansible based automation solution used to create and maintain topologies of RBFS containers and optionally to configure the RtBrick applications in each container.

The rtbrick-ansible package can be installed with the following command:

sudo apt install rtbrick-ansible

More information about rtb-ansible and how to use it is available in the **RtBrick Automation Using Ansible** manual.

rtbrick-imgstored

This package provides the rtb-image CLI utility which is RtBrick's image store handling tool. An image store (imgstore) is a versioned, checksumed and cryptographically signed store of versioned files. It was developed and optimized with the primary goal of storing and distributing Linux OS and Linux container images however it can be used to store any kind of files.

An image store is for images what an apt repository is for Debian packages. It also has some similarities with a docker registry (not to be confused with a docker repository).

The rtb-image command is used for interacting with an image store accessible via HTTP(s), making a local cache of that image store that can later be used to start LXC containers running RBFS.

```
rtbrick@access-test:~$ sudo apt search rtbrick-imgstore
Sorting... Done
Full Text Search... Done
rtbrick-imgstore/bionic,now 2.1.1-xdaily.20220531062114+Cc35c1aa0-bionic amd64
[installed]
  RtBrick image store handling tool

rtbrick-imgstore-server/bionic 0.9.0-
internal.20210615185257+Bdevelopment.C506acfa4-focal amd64
  RtBrick Image Store Upload Server
```

```
rtbrick@access-test:~$ sudo apt show rtbrick-imgstore
Package: rtbrick-imgstore
Version: 2.1.1-xdaily.20220531062114+Cc35c1aa0-bionic
Priority: extra
Section: rtbrick-tools
Maintainer: RtBrick Support <support@rtbrick.com>
Installed-Size: 29.4 MB
Provides: rtbrick-imgstore
Depends: liblxc-common, liblxc1, lxc, zstd
Replaces: rtbrick-imgstore
Download-Size: 11.1 MB
APT-Manual-Installed: yes
APT-Sources: https://pkg.rtbrick.net/_/latest/ubuntu/rtbrick-tools bionic/rtbrick-
tools amd64 Packages
Description: RtBrick image store handling tool
 RtBrick package tracker UUID=89989764-69f8-4848-a066-8f8db2360253

N: There are 139 additional records. Use the '-a' switch to see them.
```

The tool (the binary) has in it embedded the GPG public key of support@rtbrick.com, identity which is used to sign all RtBrick images and the image store itself.

Common usage of rtb-image

rtb-image has enough versatility, but a few options are commonly used:

- containers list - List all the LXC containers which are created on the **local** system.

- show [<flags>] <UUID> - Show details of image identified by UUID. By default, this shows the image in the local cached copy of the store.

- run --name=NAME [<flags>] <UUID> - Run an LXC container using the specified image. The container must not be already created.

- list [<flags>] <UUID> - List all the images in the store. By default, this lists the images in the local cached copy of the store.

rtb-image list flags

Value	Description
-o, --remote	List images directly from the remote store and not from the local cached copy.
-d, --detailed	List detailed information about images.
-f, --format=FORMAT	List only images with a specific format.

Value	Description
-r, --role=ROLE	List only images with a specific role. Currently, roles are spine, accessleaf, and consolidated-bng.
-p, --platform=PLATFORM	List only images for a specific platform.
-v, --ver-range=VER-RANGE	List only images versions that fall in the provided version range. See the syntax for version ranges at https://godoc.org/github.com/blang/semver#Range . The hardcoded strings 'latest' or 'newest' will always filter down to a single image, the one considered the newest according to the sorting rules for versions.
-l, --limit=LIMIT	Limit the list of returned images to the the l newest images.

An important part of rtb-image is that it is used to create a local cache of the remote RtBrick image repo. This is done using the rtb-image update command:

```
rtbrick@access-test:~$ sudo rtb-image update
Local image store cached copy updated to: Store:
/var/cache/rtbrick/imagestores/847c6ecd-df58-462e-a447-38c620a12fe1 Version:
0.22.6360 ValidUntil: 2195-05-21 12:27:50.527696657 +0000 UTC
```

Then we can list the local copies:

```
rtbrick@access-test:~$ sudo rtb-image list

Store: /var/cache/rtbrick/imagestores/847c6ecd-df58-462e-a447-38c620a12fe1
Version: 0.22.6360 ValidUntil: 2195-05-21 12:27:50.527696657 +0000 UTC

UUID                                   Version
Filename                                         Format          Role
Platform    Cached
decbae82-6726-4816-92f7-ea0da4948c9b    22.6.0-
g8daily.20220605220704+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer    l2bsa              qax         false
d9bad050-d03e-4c65-beb4-0dbcefbb155f    22.6.0-
g8daily.20220605220704+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer    consolidated-bng   qax         false
f26833f0-c431-411e-a1b2-a8a0af3467e8    22.6.0-
g8daily.20220605220700+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer    accessleaf         qmx         false
fa129e98-c2a3-487d-a5ac-6c10a7c9b67e    22.6.0-
g8daily.20220605220700+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
```

```
installe...   onl-installer   accessleaf       q2c          false
fa52399e-a2d8-48f0-8ad0-5b17b69b826d    22.6.0-
g8daily.20220605220700+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer   spine            qmx          false
4f2677b7-da1f-4afb-8195-391144701983    22.6.0-
g8daily.20220605220700+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer   spine            q2c          false
4a347812-5ae3-496b-a07f-658ce1e4f8de    22.6.0-
g8daily.20220605215030+Bmaster.C8dd...   rbfs-cont/rbfs-l2bsa-qax-22.6.0-
g8daily.20...   lxd           l2bsa            qax          false
2346b546-9066-45bc-b104-ea9dbcfe21d5    22.6.0-
g8daily.20220605215029+Bmaster.C8dd...   rbfs-cont/rbfs-consolidated-bng-qax-
22.6.0...   lxd           consolidated-bng   qax          false
90668764-e1d7-4abb-8a35-de44e89e2cf4    22.6.0-
g8daily.20220605215028+Bmaster.C8dd...   rbfs-cont/rbfs-spine-q2c-22.6.0-
g8daily.20...   lxd           spine            q2c          false
2b4a4e88-271b-49ef-8622-df3d6b4ec044    22.6.0-
g8daily.20220605215028+Bmaster.C8dd...   rbfs-cont/rbfs-accessleaf-q2c-22.6.0-
g8dai...   lxd           accessleaf       q2c          false
0f2b85ec-7642-4ac7-8f2f-09969dbd7600    22.6.0-
g8daily.20220605215028+Bmaster.C8dd...   rbfs-cont/rbfs-spine-qmx-22.6.0-
g8daily.20...   lxd           spine            qmx          false
bb8c20ad-4015-43cf-aee1-a7531956cb13    22.6.0-
g8daily.20220605215028+Bmaster.C8dd...   rbfs-cont/rbfs-accessleaf-qmx-22.6.0-
g8dai...   lxd           accessleaf       qmx          false
72b4e586-b231-4fb8-b727-8d57bcdba6ad    22.6.0-
g8daily.20220605215021+Bmaster.C8dd...   rbfs-cont/rbfs-consolidated-bng-virtual-
22...   lxd           consolidated-bng   virtual    false
8e917833-f028-4d92-b748-2ecc0873cbc2    22.6.0-
g8daily.20220605215021+Bmaster.C8dd...   rbfs-cont/rbfs-accessleaf-virtual-22.6.0-
g...   lxd           accessleaf       virtual    false
95ba662b-e45a-4503-aef5-1056525a0814    22.6.0-
g8daily.20220605215021+Bmaster.C8dd...   rbfs-cont/rbfs-l2bsa-virtual-22.6.0-
g8dail...   lxd           l2bsa            virtual    false
067b4fc0-e633-4197-bd53-8467bf8a1af6    22.6.0-
g8daily.20220605215021+Bmaster.C8dd...   rbfs-cont/rbfs-spine-virtual-22.6.0-
g8dail...   lxd           spine            virtual    false
fd52536e-bd16-421d-a883-da263768aeb6    22.6.0-
g8daily.20220605102529+Bmaster.C2f0...   rtbrick-onl-base/rtbrick-onl-base-22.6.0-
g...   onl-installer   rtbrick-onl-base   hw         false
97110f63-8d57-420a-8d6a-a5f5f89d3d5b    22.6.0-
g8daily.20220605102529+Bmaster.C8dd...   rtbrick/ubuntu-bionic-22.6.0-
g8daily.20220...   lxd           rtbrick-ubuntu-base all      false
11193467-3253-4eba-bed9-cb145d6a6ce4    22.6.0-
g8daily.20220605100017+Bmaster.Cd2a...   opennetworklinux/ONL-HEAD_ONL-OS10_2022-
06...   onl-installer   onl-base         hw         false
2a8b3a59-7db0-40a2-828b-4c2ee4b8ee9a    22.6.0-
g8daily.20220604220631+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer   consolidated-bng   qax        false
cde5779e-21c5-460b-976e-f5ee2cce8454    22.6.0-
g8daily.20220604220631+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer   l2bsa            qax          false
8a311a17-5d66-47e5-8b70-85b8b1777371    22.6.0-
g8daily.20220604220627+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer   spine            q2c          false
168de847-95d3-4812-b198-64707749dd57    22.6.0-
g8daily.20220604220626+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer   accessleaf       qmx          false
48d921d4-8882-4df1-9455-041d979be419    22.6.0-
g8daily.20220604220626+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer   accessleaf       q2c          false
```

```
5175525c-4fdc-445a-93ff-75cd5ad4f733     22.6.0-
g8daily.20220604220625+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer   spine              qmx          false
1d0f73fd-8888-4c92-86e1-b5405d085ec8     22.6.0-
g8daily.20220604214821+Bmaster.C8dd...   rbfs-cont/rbfs-l2bsa-qax-22.6.0-
g8daily.20...   lxd             l2bsa              qax          false
1eb22e3e-9ef6-44a4-86ed-ffbd11cdc224     22.6.0-
g8daily.20220604214820+Bmaster.C8dd...   rbfs-cont/rbfs-consolidated-bng-qax-
22.6.0...   lxd             consolidated-bng   qax          false
4777df7b-132e-4294-8e38-df2de3a8ba7b     22.6.0-
g8daily.20220604214816+Bmaster.C8dd...   rbfs-cont/rbfs-accessleaf-q2c-22.6.0-
g8dai...   lxd             accessleaf         q2c          false
72d910ba-25d4-4726-a543-3d349630763d     22.6.0-
g8daily.20220604214816+Bmaster.C8dd...   rbfs-cont/rbfs-accessleaf-qmx-22.6.0-
g8dai...   lxd             accessleaf         qmx          false
0c3186cc-ce6e-4747-99da-24cb18625b62     22.6.0-
g8daily.20220604214816+Bmaster.C8dd...   rbfs-cont/rbfs-spine-q2c-22.6.0-
g8daily.20...   lxd             spine              q2c          false
c91a0af4-16e5-4f25-b515-1200a85ead42     22.6.0-
g8daily.20220604214815+Bmaster.C8dd...   rbfs-cont/rbfs-spine-qmx-22.6.0-
g8daily.20...   lxd             spine              qmx          false
e44a2be2-ebff-423b-a3fb-4fcda2542ef5     22.6.0-
g8daily.20220604214812+Bmaster.C8dd...   rbfs-cont/rbfs-consolidated-bng-virtual-
22...   lxd             consolidated-bng   virtual     false
2e585361-579f-4001-92d4-736aa79e24f3     22.6.0-
g8daily.20220604214811+Bmaster.C8dd...   rbfs-cont/rbfs-l2bsa-virtual-22.6.0-
g8dail...   lxd             l2bsa              virtual     false
aec6df05-8883-47b2-98fe-83c2030d0391     22.6.0-
g8daily.20220604214811+Bmaster.C8dd...   rbfs-cont/rbfs-spine-virtual-22.6.0-
g8dail...   lxd             spine              virtual     false
952bfaa0-b597-48a4-9006-d4d006509bcc     22.6.0-
g8daily.20220604214810+Bmaster.C8dd...   rbfs-cont/rbfs-accessleaf-virtual-22.6.0-
g...   lxd             accessleaf         virtual     false
9cb9842e-2bb2-46dc-a43c-dc1b1f3acd52     22.6.0-
g8daily.20220603220408+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer   consolidated-bng   qax          false
32623f70-3ffb-43e4-ba3b-1d351d8bf71b     22.6.0-
g8daily.20220603220408+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer   l2bsa              qax          false
f65ae5fc-aa3b-4ed1-8d4b-d0559ccba9eb     22.6.0-
g8daily.20220603220404+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer   accessleaf         qmx          false
3205637e-aa2a-4f5e-95fa-05ef36c1ae7d     22.6.0-
g8daily.20220603220403+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer   spine              q2c          false
c6e2589f-df88-414e-b163-721a8336bcef     22.6.0-
g8daily.20220603220403+Bmaster.C2f0...   rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer   spine              qmx          false
```

rtbrick-fabric-ztp

This package provides an implementation of a Zero-Touch Provisioning (ZTP)
server. This is needed for automatic provisioning of switches newly installed in a
network, where the ZTP-server provides installation/upgrade images for the
switches.

The rtbrick-fabric-ztp package can be installed with the following command:

```
sudo apt install rtbrick-fabric-ztp
```

After installation, the server is running as a systemd-daemon by default on port 80 and taking ZTP configuration files from the location /var/rtbrick/ztp/configs/.

More information about the ZTP process and configuration can be found at the following link:

https://documents.rtbrick.com/current/ztp/ztp_guide_online.html

Image formats and ONL image installation for supported hardware

RtBrick images delivered through the RtBrick image store and the rtb-image utility have 3 main attributes:

- format: This is the file format of in which the image is packaged and archived.

- role: The role inside a network of the device which will be running the image.

- platform: Identifies the hardware platform or virtualized environment in which the image can run.

RtBrick images mean to be used as containers in a virtualized environment will have format == lxd and platform == virtual.

RtBrick images mean to be installed on supported whitebox switch hardware devices will have format == onl-installer and platform set accordingly to the specific switching hardware.

> You can see this using rtb-image list command and looking for the Format column.

ONL images

ONL images are generally installed using a Zero Touch Provisioning (ZTP) server. The [Installation] section applies for both virtual and hardware installations, with the difference that, when having a physical deployment (One with a ZTP server and switched running ONL images) we can install just the rtbrick-imgstore package on the ZTP server, since it doesn't have Ansible as dependency (Ansible not being a

part of the default Ubuntu repositories), and because generally you will not have containers running on the ZTP server itself.

A typical ONL image download will look as in the following snippet:

```
rtbrick@access-test:~$ sudo rtb-image update
Local image store cached copy updated to: Store:
/var/cache/rtbrick/imagestores/847c6ecd-df58-462e-a447-38c620a12fe1 Version:
0.22.6360 ValidUntil: 2195-05-21 12:27:50.527696657 +0000 UTC

rtbrick@access-test:~$ sudo rtb-image list --format onl-installer --platform qmx
--role spine --ver-range latest

Store: /var/cache/rtbrick/imagestores/847c6ecd-df58-462e-a447-38c620a12fe1
Version: 0.22.6360 ValidUntil: 2195-05-21 12:27:50.527696657 +0000 UTC

UUID                            Version
Filename                                Format        Role     Platform
Cached
fa52399e-a2d8-48f0-8ad0-5b17b69b826d    22.6.0-
g8daily.20220605220700+Bmaster.C2f0...  rtbrick-onl-installer/rtbrick-onl-
installe...   onl-installer   spine    qmx         false

rtbrick@access-test:~$ sudo rtb-image pull fa52399e-a2d8-48f0-8ad0-5b17b69b826d
rtbrick-onl-installer-spine-qmx-22.6.0-
g8daily.20220605220700+Bmaster.C2f0eae65.d.sha512 244 B / 244 B
[================================================================] 100.00% 0s
rtbrick-onl-installer-spine-qmx-22.6.0-
g8daily.20220605220700+Bmaster.C2f0eae65.d.asc 833 B / 833 B
[================================================================] 100.00%
0s
rtbrick-onl-installer-spine-qmx-22.6.0-g8daily.20220605220700+Bmaster.C2f0eae65.d
1.15 GiB / 1.15 GiB
[================================================================] 100.00% 5s
rtbrick-onl-installer-spine-qmx-22.6.0-g8daily.20220605220700+Bmaster.C2f0eae65.d:
decompressing 100 B / 100 B
[==========================================================] 100.00% 0s

rtbrick@access-test:~$ sudo rtb-image show fa52399e-a2d8-48f0-8ad0-5b17b69b826d

Store: /var/cache/rtbrick/imagestores/847c6ecd-df58-462e-a447-38c620a12fe1
Version: 0.22.6360 ValidUntil: 2195-05-21 12:27:50.527696657 +0000 UTC

UUID:              fa52399e-a2d8-48f0-8ad0-5b17b69b826d
Version:           22.6.0-g8daily.20220605220700+Bmaster.C2f0eae65
Creation Date:     2022-06-06 03:37:00 +0530 IST (7 hours ago)
Role:              spine
Platform:          qmx
Format:            onl-installer
Architecture:      amd64
Filename:          rtbrick-onl-installer/rtbrick-onl-installer-spine-qmx-22.6.0-
g8daily.20220605220700+Bmaster.C2f0eae65.d
FullPath/URL:      /var/cache/rtbrick/imagestores/847c6ecd-df58-462e-a447-
38c620a12fe1/rtbrick-onl-installer/rtbrick-onl-installer-spine-qmx-22.6.0-
g8daily.20220605220700+Bmaster.C2f0eae65.d
SHA512:
9a6b989edacf8daedc656dce310eb4ad680dc3cd5afd16a9c1783bb57ac78c97b4cc2d30fd0ac91edd
2ef7a86c7d6aea6441ef2ef0fbd16cd1f682f21601ed64
```

```
Base Image:         fd52536e-bd16-421d-a883-da263768aeb6
Embedded Packages:  18
Embedded Images:    1
Cached:             true
ExtractedPath:
```

In a design where the download of the image happens on a different server than the ZTP used for the actual installation, you can install the *rtbrick-imgstore* package, and move by some means (rsync, for example) the images from var/cache/rtbrick/imagestore/ of that internet-connected to the ZTP server.

The rtb-ssh CLI command

rtb-ssh is a script meant to ease connecting into an already running container. It was previously called **rssh** , and it was renamed, as it was causing confusion with Linux's restricted shell *rssh* package which is available in the official Ubuntu apt package repositories.

Besides renaming only minor some changes have been made to the **rtb-ssh** / **rssh** script.

The script is installed automatically as part of the rtbrick-imgstore package installation.

The script uses lxc-attach to create a connection to the container specified as the argument. While doing so, it uses the ubuntu user (currently the default user inside an RBFS container) to connect to the container, and uses the bash shell after opening the connection.

Before connecting, it clear the environment before attaching, so no undesired environment variables leak into the container. The variable container=lxc will be the only environment with which the attached program starts.

It only keeps the TERM variable, to have the same strings the user is currently using for clear screen, move cursor, etc.

The **rtb-ssh** is installed in the /usr/local/bin/ path (alongside rtb-image, etc.). For convenience and backwards compatibility the script is still also installed as **rssh** .

Manual installation of Images

The Open Network Install Environment (ONIE is an open-source project within the

Open Computer Project that provides an installation environment for bare-metal networking switches. ONIE is used to install different NOSes (network operating systems) on a target device.

The RtBrick ONL installer images are compatible with ONIE and thus can be used by ONIE to install an RtBrick ONL (Open Network Linux) on a target bare-metal switch.

Prerequisites

- Open Network Install Environment (ONIE) should be installed on the switch by the vendor of the switch. If it's unavailable with the switch, contact the switch vendor.

- The switch management interface has been provisioned with an IP address either manually configured or through DHCP.

- You need to set up necessary infrastructure to download RtBrick ONL installer images in your environment. Refer to the RtBrick Tools Installation Guide.

- You need to set up a HTTP server that will make available the downloaded images for ONIE to use. For more information information, see the following URL:

  https://opencomputeproject.github.io/onie/user-guide/index.html#installing-over-the-network

Installation Procedure

To install the ONL image, perform the following steps:

> On a fresh box, ONL prompt will not be available so skip to ONIE prompt section.

ONL prompt section:

Option 1: Manually select ONIE boot mode

1. Connect to console port

2. Reboot switch

```
root@bl1-pod1:~# reboot
```

3. Select "**ONIE**" from first selection menu

4. Select "**ONIE: Install OS**" from next selection menu

5. Install RBFS ONL image

Option 2: Preselect ONIE boot mode

1. Connect to console port

2. Select ONIE boot mode

```
root@onl>ufi03.q2c.u15.r4.nbg.rtbrick.net:~ # onl-onie-boot-mode --help
usage: onl-onie-boot-mode [-h] [--onie-only]
                          {install,rescue,uninstall,update,embed,diag,none}

positional arguments:
  {install,rescue,uninstall,update,embed,diag,none}

optional arguments:
  -h, --help            show this help message and exit
  --onie-only           Do not set ONIE boot menu option.
root@onl>ufi03.q2c.u15.r4.nbg.rtbrick.net:~ #

root@onl>ufi03.q2c.u15.r4.nbg.rtbrick.net:~ # onl-onie-boot-mode install
The system will boot into ONIE install mode at the next restart.
root@onl>ufi03.q2c.u15.r4.nbg.rtbrick.net:~ #
```

3. Reboot switch

```
root@onl>ufi03.q2c.u15.r4.nbg.rtbrick.net:~ # reboot
```

ONIE prompt section:

You need to update the URL of the ONL installer image location according to your own specific HTTP server configuration.

```
ONIE:/ # onie-discovery-stop
NOTICE: The 'onie-discovery-stop' command is deprecated and will be removed in
2019.02.
NOTICE: Use 'onie-stop' instead.
discover: installer mode detected.
Stopping: discover... done.

ONIE:/ # onie-nos-install http://server.example.net/_/images/latest/rtbrick-onl-
ins
taller/rtbrick-onl-installer-spine-q2c-21.9.1.d

discover: installer mode detected.
Stopping: discover... done.

Info: Attempting http://server.example.net/_/images/latest/rtbrick-onl-
installer/rtbrick-onl-installer-spine-q2c-21.9.1.d ...

Connecting to server.example.net (198.51.100.125)
installer 100% |*****************************| 1176M 0:00:00 ETA

ONIE: Executing installer: http://server.example.net/_/images/latest/rtbrick-onl-
installer/rtbrick-onl-installer-spine-q2c-21.9.1.d
```

2. RBFS Licensing

Overview

RBFS Licensing allows you to access the full functionality of your RtBrick FullStack (RBFS) installation. Rtbrick provides a 28-day evaluation license on request. It is not allowed to be used in production. Use a permanent or subscription license that has been purchased through RtBrick Sales. If you want to extend the evaluation period and get additional licenses, contact RtBrick Support.

Without any license installed on your system, you can evaluate RBFS for 7 days. You need to get an evaluation license or purchase an actual license within 7 days to use the full functionality of RBFS.

Obtaining Licenses

To obtain RBFS licenses, get in touch with the Support team by email: support@rtbrick.com

Installing a License

You can install a license by using the RBFS CLI or via the RESTCONF API. You should get a license encrypted string from Rtbrick and configure the same via CLI.

> When you upgrade your RBFS installation, the existing license should either get restored via saved configuration or it needs to be installed again.

To install a license, enter the following command:

Syntax

set system license <license_key>

Example

```
supervisor@rtbrick: cfg> set system license
"eyJzdGFydF9kYXRlIjogMTYxNTg3MTE3MCwgImVuZF9kYXRlIjogMTYxNTk1NzU3MH0=.Yx/XiFDFRzAt
```

```
XPUOaIoh5GqiXa+kOJBWp3LgDeJooVrl88mpPs2ZRMPC+k5HvoZDXvsreqRrqoFR3vk7S2PlqmLxYf0bNB
ly4d1hrloBwwFkFuJaiU/M+ZGPExgILdVyXumI88VYx8m/Z5SxEj0bFQGUy8UHRUYW/Ay8fhPfYejWuSgp
v3OrIThH9CVjlDmrp/k4yOuHyTz5gLgq4A0h33vB5O99aOIJW5UX4XDKvQqmqX5kytRlR1SseWuAbWKjUd
VOkf2Mk36IbF9/xAKier++LzXESpLMI+MT63AybSDHOBZydoMjLH9C6cPEfGHzWTIBNtT3679Tokf25EK1
Jw=="
```

The following example shows the running configuration.

```
supervisor@rtbrick: cfg> show config system
{
    "rtbrick-config:system": {
        "license": [
            {
                "license-key":
"eyJzdGFydF9kYXRlIjogMTYxNTg3MTE3MCwgImVuZF9kYXRlIjogMTYxNTk1NzU3MH0=.Yx/XiFDFRzAt
XPUOaIoh5GqiXa+kOJBWp3LgDeJooVrl88mpPs2ZRMPC+k5HvoZDXvsreqRrqoFR3vk7S2PlqmLxYf0bNB
ly4d1hrloBwwFkFuJaiU/M+ZGPExgILdVyXumI88VYx8m/Z5SxEj0bFQGUy8UHRUYW/Ay8fhPfYejWuSgp
v3OrIThH9CVjlDmrp/k4yOuHyTz5gLgq4A0h33vB5O99aOIJW5UX4XDKvQqmqX5kytRlR1SseWuAbWKjUd
VOkf2Mk36IbF9/xAKier++LzXESpLMI+MT63AybSDHOBZydoMjLH9C6cPEfGHzWTIBNtT3679Tokf25EK1
Jw=="
            }
        ]
    }
}
```

Installing Multiple Licenses

You can install multiple licenses. Additional licenses can be installed even when you have existing license(s). The license with the maximum evaluation period will be prioritised over others. When you have multiple evaluation licenses installed, the one that expires later takes higher priority compared to the other licenses.

Viewing the installed license

Syntax

show system license

Example

```
root@rtbrick: cfg> show system license
License Validity:
  License 1:
    Start date : Tue Mar 16 05:06:10 GMT +0000 2021
    End date   : Wed Mar 17 05:06:10 GMT +0000 2021
```

```
root@rtbrick: cfg>
```

After verifying the validity of the license, the license file will be installed at the following location:

```
/etc/rtbrick/license/rtbrick-license
```

Deleting a License

To delete a license, enter the following command:

Syntax

delete system license <license_key>

Example

```
supervisor@rtbrick: cfg> delete system license
"eyJzdGFydF9kYXRlIjogMTYxNTg3MTE3MCwgImVuZF9kYXRlIjogMTYxNTk1NzU3MH0=.Yx/XiFDFRzAt
XPUOaIoh5GqiXa+kOJBWp3LgDeJooVrl88mpPs2ZRMPC+k5HvoZDXvsreqRrqoFR3vk7S2PlqmLxYf0bNB
ly4d1hrloBwwFkFuJaiU/M+ZGPExgILdVyXumI88VYx8m/Z5SxEj0bFQGUy8UHRUYW/Ay8fhPfYejWuSgp
v3OrIThH9CVjlDmrp/k4yOuHyTz5gLgq4A0h33vB5O99aOIJW5UX4XDKvQqmqX5kytRlR1SseWuAbWKjUd
VOkf2Mk36IbF9/xAKier++LzXESpLMI+MT63AybSDHOBZydoMjLH9C6cPEfGHzWTIBNtT3679Tokf25EK1
Jw=="
```

License Expiry

When a license expires, you will not be able see the operational state of the system via CLI or BDS API.

Registered Address	Support	Sales
40268, Dolerita Avenue Fremont CA 94539		
+1-650-351-2251		+91 80 4850 5445
http://www.rtbrick.com	support@rtbrick.com	sales@rtbrick.com