



## LAB: RPKI

### Part-1: Installing RPKI-Prover Validator

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In Part 1, you will install an RPKI Validator. There are a few validators available, and in this section, there are steps for installing the RPKI-Prover Validator. For more detail about installing other validators refer to the APNIC blog - <https://blog.apnic.net/2019/10/28/how-to-installing-an-rpki-validator/>

RPKI-Prover is a routing security initiative written in the Haskell programming language, for more information refer to <https://github.com/lolepezy/rpki-prover>

The steps to complete this section are:

- SSH to the server
- Update software
- Install required software
- Install Stack
- Install RPKI-Prover validator
- Update RPKI cache

#### Login Details

- Username `apnic` and password `training` .

#### Lab Setup

For this lab, we will use [RPKI-Prover](#) as the relying party or the RPKI validator.

1. Login to the server (SSH using the username and password given above), where **X** is your group number:

```
ssh apnic@192.168.30.X
```

NOTE: Type `yes` if asked about wanting to continue connecting

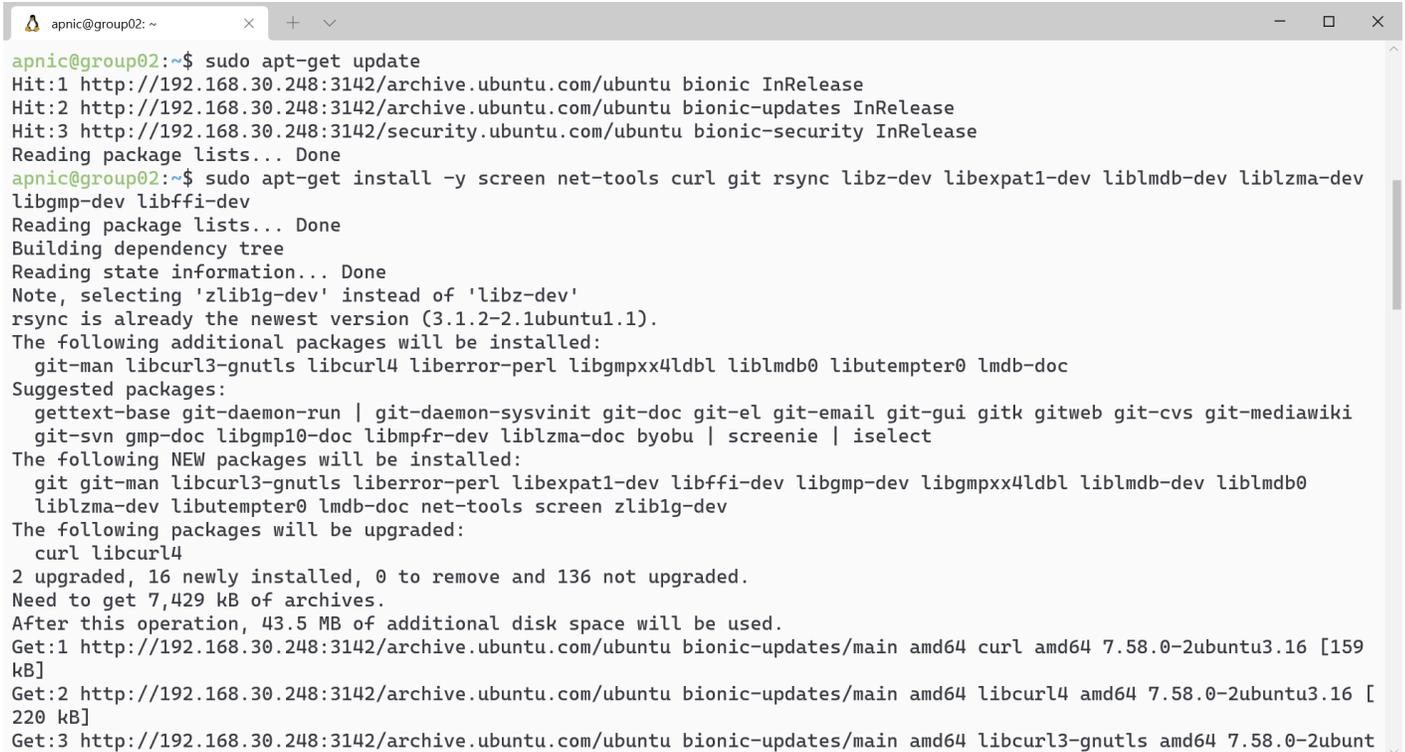
Password = `training`

## 2. Update the repository

```
sudo apt update
```

## 3. Install the required software:

```
sudo apt-get install -y screen net-tools curl git rsync \  
libz-dev libexpat1-dev liblmbd-dev liblzma-dev libgmp-dev libffi-dev
```



```
apnic@group02: ~  
apnic@group02:~$ sudo apt-get update  
Hit:1 http://192.168.30.248:3142/archive.ubuntu.com/ubuntu bionic InRelease  
Hit:2 http://192.168.30.248:3142/archive.ubuntu.com/ubuntu bionic-updates InRelease  
Hit:3 http://192.168.30.248:3142/security.ubuntu.com/ubuntu bionic-security InRelease  
Reading package lists... Done  
apnic@group02:~$ sudo apt-get install -y screen net-tools curl git rsync libz-dev libexpat1-dev liblmbd-dev liblzma-dev  
libgmp-dev libffi-dev  
Reading package lists... Done  
Building dependency tree  
Reading state information... Done  
Note, selecting 'zlib1g-dev' instead of 'libz-dev'  
rsync is already the newest version (3.1.2-2.1ubuntu1.1).  
The following additional packages will be installed:  
  git-man libcurl3-gnutls libcurl4 liberror-perl libgmpxx4ldbl liblmbd0 libutempter0 lmbd-doc  
Suggested packages:  
  gettext-base git-daemon-run | git-daemon-sysvinit git-doc git-el git-email git-gui gitk gitweb git-cvs git-mediawiki  
  git-svn gmp-doc libgmp10-doc libmpfr-dev liblzma-doc byobu | screenie | iselect  
The following NEW packages will be installed:  
  git git-man libcurl3-gnutls liberror-perl libexpat1-dev libffi-dev libgmp-dev libgmpxx4ldbl liblmbd-dev liblmbd0  
  liblzma-dev libutempter0 lmbd-doc net-tools screen zlib1g-dev  
The following packages will be upgraded:  
  curl libcurl4  
2 upgraded, 16 newly installed, 0 to remove and 136 not upgraded.  
Need to get 7,429 kB of archives.  
After this operation, 43.5 MB of additional disk space will be used.  
Get:1 http://192.168.30.248:3142/archive.ubuntu.com/ubuntu bionic-updates/main amd64 curl amd64 7.58.0-2ubuntu3.16 [159  
kB]  
Get:2 http://192.168.30.248:3142/archive.ubuntu.com/ubuntu bionic-updates/main amd64 libcurl4 amd64 7.58.0-2ubuntu3.16 [  
220 kB]  
Get:3 http://192.168.30.248:3142/archive.ubuntu.com/ubuntu bionic-updates/main amd64 libcurl3-gnutls amd64 7.58.0-2ubunt
```

## 4. Download and install Stack

```
curl -sSL https://get.haskellstack.org/ | sh
```

```
apnic@group02: ~$ curl -sSL https://get.haskellstack.org/ | sh
Detected Linux distribution: ubuntu

Installing dependencies...

Already installed!

Using generic bindist...

  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left   Speed
100  138    100  138     0     0    196     0  --:--:--  --:--:--  --:--:--   196
100  637    100  637     0     0    595     0  0:00:01  0:00:01  --:--:--  4649
100 17.1M    100 17.1M     0     0 7211k     0  0:00:02  0:00:02  --:--:-- 28.1M
Installing Stack to: /usr/local/bin/stack...

About to use 'sudo' to run the following command as root:
  install -c -o 0 -g 0 -m 0755 /tmp/tmp.qkV5NnKorq/stack /usr/local/bin
in order to copy 'stack' to the destination directory.

[sudo] password for apnic:

-----

Stack has been installed to: /usr/local/bin/stack

WARNING: '/home/apnic/.local/bin' is not on your PATH.
Stack will place the binaries it builds in '/home/apnic/.local/bin' so
for best results, please add it to the beginning of PATH in your profile.
```

## 5. Optional: Add ~/.local/bin to the path variable

```
mkdir -p /home/apnic/.local/bin
echo $PATH
tail -5 ~/.profile
source "$HOME/.profile"
echo $PATH
```

```
WARNING: '/home/apnic/.local/bin' is not on your PATH.
Stack will place the binaries it builds in '/home/apnic/.local/bin' so
for best results, please add it to the beginning of PATH in your profile.

apnic@group02:~$ mkdir -p /home/apnic/.local/bin
apnic@group02:~$ echo $PATH
/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games
apnic@group02:~$ source "$HOME/.profile"
apnic@group02:~$ echo $PATH
/home/apnic/.local/bin:/usr/local/sbin:/usr/local/bin:/usr/sbin:/usr/bin:/sbin:/bin:/usr/games:/usr/local/games
apnic@group02:~$ tail -5 ~/.profile

# set PATH so it includes user's private bin if it exists
if [ -d "$HOME/.local/bin" ] ; then
    PATH="$HOME/.local/bin:$PATH"
fi
apnic@group02:~$ |
```

## 6. Download the RPKI-Prover github repository

```
git clone https://github.com/lolepezy/rpki-prover.git
```

```
apnic@group02:~$ git clone https://github.com/lolepezy/rpki-prover.git
Cloning into 'rpki-prover'...
remote: Enumerating objects: 8242, done.
remote: Counting objects: 100% (1904/1904), done.
remote: Compressing objects: 100% (626/626), done.
remote: Total 8242 (delta 1133), reused 1713 (delta 1003), pack-reused 6338
Receiving objects: 100% (8242/8242), 1.66 MiB | 2.78 MiB/s, done.
Resolving deltas: 100% (5190/5190), done.
apnic@group02:~$ cd rpki-prover
apnic@group02:~/rpki-prover$ |
```

## 7. Install RPKI-Prover

```
cd rpki-prover
stack install rpki-prover:rpki-prover
```

```
apnic@group02: ~/rpki-prover x + v - □ x
Receiving objects: 100% (8242/8242), 1.66 MiB | 2.78 MiB/s, done.
Resolving deltas: 100% (5190/5190), done.
apnic@group02:~$ cd rpki-prover
apnic@group02:~/rpki-prover$ stack install rpki-prover:rpki-prover
Cloning 98630fb39ac34fe209ef03a3d6eb21c9a7a551cb from https://github.com/lolepezy/lmdb-high-level.git
Cloning f094fe1a81fe57a2ba42ef919af02bbc7f0b6dcb from https://github.com/lolepezy/hs-certificate.git
Cloning f094fe1a81fe57a2ba42ef919af02bbc7f0b6dcb from https://github.com/lolepezy/hs-certificate.git
Cloning d2c7ad66af4e79c7a8f8d5e6c324ea3ff2739277 from https://github.com/kowainik/co-log.git
Cloning d2c7ad66af4e79c7a8f8d5e6c324ea3ff2739277 from https://github.com/kowainik/co-log.git
Cloning 2dbc1be58473b631e170391a89d063f38812ce44 from https://github.com/lolepezy/wai
Cloning 2dbc1be58473b631e170391a89d063f38812ce44 from https://github.com/lolepezy/wai
Cabal file info not found for hw-ip-2.4.2.0, updating
Selected mirror https://hackage.haskell.org/
Downloading root
Waiting to acquire cache lock on /home/apnic/.stack/pantry/hackage/hackage-security-lock
Acquired cache lock on /home/apnic/.stack/pantry/hackage/hackage-security-lock
Released cache lock on /home/apnic/.stack/pantry/hackage/hackage-security-lock
Selected mirror https://hackage.haskell.org/
Downloading timestamp
Downloading snapshot
Downloading mirrors
Cannot update index (no local copy)
Downloading index
Waiting to acquire cache lock on /home/apnic/.stack/pantry/hackage/hackage-security-lock
Acquired cache lock on /home/apnic/.stack/pantry/hackage/hackage-security-lock
Released cache lock on /home/apnic/.stack/pantry/hackage/hackage-security-lock
Updated package index downloaded
Calculating hashes to check for hackage-security rebases or filesystem changes
No old cache found, populating cache from scratch
Populating cache from file size 751470592, hash 85bf51b787a26f21817a510d62f21f821e9487732ad4e482618a55c7241a6d2e
Populating package index cache ...
Processed 34400 cabal files
Preprocessing executable 'rpki-prover-static' for rpki-prover-0.1.0.0...

[1 of 2] Compiling Main
[2 of 2] Compiling Paths_rpki_prover
Linking .stack-work/dist/x86_64-linux/Cabal-3.2.1.0/build/rpki-prover-static/rpki-prover-static ...
/home/apnic/.stack/programs/x86_64-linux/ghc-8.10.4/lib/ghc-8.10.4/process-1.6.9.0/libHSprocess-1.6.9.0.a(runProcess.o):
runProcess.c:function runInteractiveProcess: warning: Using 'getpwuid_r' in statically linked applications requires at r
untime the shared libraries from the glibc version used for linking
/home/apnic/.stack/programs/x86_64-linux/ghc-8.10.4/lib/ghc-8.10.4/process-1.6.9.0/libHSprocess-1.6.9.0.a(runProcess.o):
runProcess.c:function runInteractiveProcess: warning: Using 'initgroups' in statically linked applications requires at r
untime the shared libraries from the glibc version used for linking
/home/apnic/.stack/snapshots/x86_64-linux/a7901e2d3242a0086bcd23277de190c8cb4cd4f2c95f93b8a459affae9bf714d/8.10.4/lib/x8
6_64-linux-ghc-8.10.4/network-3.1.1.1-F91Y9KbLQh5FWIKWxm6vtC/libHSnetwork-3.1.1.1-F91Y9KbLQh5FWIKWxm6vtC.a(HsNet.o):func
tion hsnet_getaddrinfo: warning: Using 'getaddrinfo' in statically linked applications requires at runtime the shared li
braries from the glibc version used for linking
rpki-prover > copy/register
Installing library in /home/apnic/rpki-prover/.stack-work/install/x86_64-linux/a7901e2d3242a0086bcd23277de190c8cb4cd4f2c
95f93b8a459affae9bf714d/8.10.4/lib/x86_64-linux-ghc-8.10.4/rpki-prover-0.1.0.0-LRpxFKHhLxPH6rx4zx11HC
Installing executable rpki-prover in /home/apnic/rpki-prover/.stack-work/install/x86_64-linux/a7901e2d3242a0086bcd23277d
e190c8cb4cd4f2c95f93b8a459affae9bf714d/8.10.4/bin
Installing executable rpki-prover-static in /home/apnic/rpki-prover/.stack-work/install/x86_64-linux/a7901e2d3242a0086bc
d23277de190c8cb4cd4f2c95f93b8a459affae9bf714d/8.10.4/bin
Registering library for rpki-prover-0.1.0.0..
Completed 213 action(s).
Copying from /home/apnic/rpki-prover/.stack-work/install/x86_64-linux/a7901e2d3242a0086bcd23277de190c8cb4cd4f2c95f93b8a4
59affae9bf714d/8.10.4/bin/rpki-prover to /home/apnic/.local/bin/rpki-prover

Copied executables to /home/apnic/.local/bin:
- rpki-prover
apnic@group02:~/rpki-prover$ |
```

**NOTE:** Please be patient as this will take a long time to complete

8. Create the folder structure to store the cache and Trust Anchor Locator (TAL) files

```
sudo ./mkdirs.sh /etc/rpki-prover
ls -lash /etc/rpki-prover
```

```
apnic@group02: ~/rpki-prover × + ▾
apnic@group02:~/rpki-prover$ sudo ./makedirs.sh /etc/rpki-prover
[sudo] password for apnic:
Creating directory layout in /etc/rpki-prover
apnic@group02:~/rpki-prover$ ls -lash /etc/rpki-prover/
total 24K
4.0K drwxr-xr-x  6 root root 4.0K Oct  5 00:51 .
4.0K drwxr-xr-x 67 root root 4.0K Oct  5 00:51 ..
4.0K drwxr-xr-x  2 root root 4.0K Oct  5 00:51 cache
4.0K drwxr-xr-x  2 root root 4.0K Oct  5 00:51 rsync
4.0K drwxr-xr-x  2 root root 4.0K Oct  5 00:51 tals
4.0K drwxr-xr-x  2 root root 4.0K Oct  5 00:51 tmp
apnic@group02:~/rpki-prover$
```

9. View RPKI-Prover's help

```
rpki-prover --help
```

```
apnic@group02:~/rpki-prover$ rpki-prover --help
RPKI prover, relying party software for RPKI

Usage: rpki-prover [--initialise] [--agree-with-arin-rpa]
                  [--rpki-root-directory STRING]... [--cpu-count NATURAL]
                  [--reset-cache] [--revalidation-interval INT64]
                  [--cache-lifetime-hours INT64]
                  [--rrdp-refresh-interval INT64]
                  [--rsync-refresh-interval INT64] [--rrdp-timeout INT64]
                  [--rsync-timeout INT64] [--http-api-port WORD16]
                  [--lmdb-size INT64] [--with-rtr] [--rtr-address STRING]
                  [--rtr-port INT16] [--log-level STRING] [--dont-fetch]
                  [--strict-manifest-validation]

Available options:
-h,--help           Show this help text
--initialise        If set, the FS layout will be created and TAL files
                   will be downloaded.
--agree-with-arin-rpa This is to indicate that you do accept (and maybe
                   even have read) ARIN Relying Party Agreement and
                   would like ARIN TAL to be downloaded.
--rpki-root-directory STRING
                   Root directory (default is ${HOME}/.rpki/). This
                   option can be passed multiple times and the last one
                   will be used, it is done for convenience of
                   overriding this option with dockerised version.
--cpu-count NATURAL
                   CPU number available to the program (default is 2).
                   Note that higher CPU counts result in bigger memory
                   allocations.
--reset-cache       Reset the LMDB cache i.e. remove ~/.rpki/cache/*.mdb
                   files.
--revalidation-interval INT64
                   Re-validation interval in seconds, i.e. how often to
                   re-download repositories are updated and certificate
                   tree is re-validated. Default is 13 minutes, i.e. 780
                   seconds.
--cache-lifetime-hours INT64
                   Lifetime of objects in the local cache, in hours
                   (default is 72 hours)
--rrdp-refresh-interval INT64
                   Period of time after which an RRDp repository must be
                   updated, in seconds (default is 120 seconds)
--rsync-refresh-interval INT64
                   Period of time after which an rsync repository must
                   be updated, in seconds (default is 11 minutes, i.e.
                   660 seconds)
--rrdp-timeout INT64
                   Timeout for RRDp repositories, in seconds. If
                   fetching of a repository does not finish within this
                   timeout, the repository is considered unavailable
--rsync-timeout INT64
                   Timeout for rsync repositories, in seconds. If
                   fetching of a repository does not finish within this
                   timeout, the repository is considered unavailable
--http-api-port WORD16
                   Port to listen to for http API (default is 9999)
--lmdb-size INT64  Maximal LMDB cache size in MBs (default is 32768,
                   i.e. 32GB). Note that about 1Gb of cache is required
                   for every extra 24 hours of cache life time.
--with-rtr          Start RTR server (default is false)
--rtr-address STRING
                   Address to bind to for the RTR server (default is
                   localhost)
--rtr-port INT16   Port to listen to for the RTR server (default is
                   8283)
--log-level STRING
                   Log level, may be 'error', 'warn', 'info', 'debug'
                   (case-insensitive). Default is 'info'.
--dont-fetch       Don't fetch repositories, expect all the objects to
                   be cached (mostly used for testing, default is
                   false).
--strict-manifest-validation
                   Use the strict version of RFC 6486
                   (https://datatracker.ietf.org/doc/draft-ietf-sidrops-6486bis/02/
                   item 6.4) for manifest handling (default is false).

apnic@group02:~/rpki-prover$
```

**NOTE:** If this command doesnt work, it is because the path is not up to date. Try this command

```
~/local/bin/rpki-prover --help
```

10. Enable a screen session and start RPKI-Prover and accept the ARIN Trust Anchor Locator (TAL) agreement.

```
screen
sudo ~/local/bin/rpki-prover --rpki-root-directory \
/etc/rpki-prover --agree-with-arin-rpa
```

**Note:** Make sure to read the ARIN Relying Party Agreement (RPA) at <https://www.arin.net/resources/manage/rpki/rpa.pdf> before proceeding.

```
apnic@group02: ~/rpki-prover x + v
apnic@group02:~/rpki-prover$ sudo ~/.local/bin/rpki-prover --rpki-root-directory /etc/rpki-prover --agree-with-arin-rpa
[Info] [05 Oct 2021 01:00:33.140 +00:00] Root directory is set to /etc/rpki-prover.
[Warning] [05 Oct 2021 01:00:33.140 +00:00] /etc/rpki-prover/cache/current doesn't exist, resetting LMDB.
[Info] [05 Oct 2021 01:00:33.164 +00:00] Created application context: Config {talDirectory = "/etc/rpki-prover/tals",
tmpDirectory = "/etc/rpki-prover/tmp", cacheDirectory = "/etc/rpki-prover/cache", parallelism = Parallelism {cpuParallelism = 4, ioParallelism = 64}, rsyncConf = RsyncConf {rsyncRoot = "/etc/rpki-prover/rsync", rsyncTimeout = 420s}, rrdpConf = RrdpConf {tmpRoot = "/etc/rpki-prover/tmp", maxSize = Size 1073741824, rrdpTimeout = 420s}, validationConfig = ValidationConfig {revalidationInterval = 780s, rrdpRepositoryRefreshInterval = 120s, rsyncRepositoryRefreshInterval = 660s, dontFetch = False, manifestProcessing = RFC6486}, httpApiConf = HttpApiConfig {port = 9999}, rtrConfig = Nothing, cacheCleanupInterval = 7200s, cacheLifetime = 259200s, oldVersionsLifetime = 36000s, storageCompactionInterval = 86400s, lmbdSize = Size 32768}
[Info] [05 Oct 2021 01:00:33.165 +00:00] Reading TAL files from /etc/rpki-prover/tals
[Info] [05 Oct 2021 01:00:33.166 +00:00] Successfully loaded 5 TALs.
[Info] [05 Oct 2021 01:00:33.168 +00:00] Validating all TAs, world version WorldVersion 1633395633168170463
[Info] [05 Oct 2021 01:00:33.168 +00:00] Fetching TA certificate from https://rrdp.arin.net/arin-rpki-ta.cer..
[Info] [05 Oct 2021 01:00:33.168 +00:00] Fetching TA certificate from https://rpki.apnic.net/repository/apnic-rpki-root-iana-origin.cer..
[Info] [05 Oct 2021 01:00:33.168 +00:00] Fetching TA certificate from https://rpki.ripe.net/ta/ripe-ncc-ta.cer..
[Info] [05 Oct 2021 01:00:33.169 +00:00] Fetching TA certificate from https://rpki.afrinic.net/repository/AfriNIC.cer..
[Info] [05 Oct 2021 01:00:33.170 +00:00] Fetching TA certificate from https://rrdp.lacnic.net/ta/rta-lacnic-rpki.cer..
[Info] [05 Oct 2021 01:00:33.343 +00:00] Fetching https://rrdp.apnic.net/notification.xml.
[Info] [05 Oct 2021 01:00:34.366 +00:00] Fetching https://rrdp.arin.net/notification.xml.
[Info] [05 Oct 2021 01:00:34.432 +00:00] https://rrdp.apnic.net/540874ea-d7b4-42d9-9f2f-476250c24b92/36455/snapshot.xml: downloading snapshot.
[Info] [05 Oct 2021 01:00:34.833 +00:00] Fetching https://rrdp.lacnic.net/rrdp/notification.xml.
[Info] [05 Oct 2021 01:00:34.834 +00:00] https://rrdp.arin.net/8fe05c2e-047d-49e7-8398-cd4250a572b1/48760/snapshot.xml: downloading snapshot.
[Info] [05 Oct 2021 01:00:34.970 +00:00] Fetching https://rrdp.afrinic.net/notification.xml.
```

This will take approximately 15 minutes to update. Wait until the message **Validated all TAs** appears before proceeding to the next step.

```
02110b/snapshot.xml: downloading snapshot.
[Info] [05 Oct 2021 01:03:04.382 +00:00] Fetched https://rpki.xindi.eu/rrdp/notification.xml, took 1693ms.
[Info] [05 Oct 2021 01:03:05.947 +00:00] Fetching https://ca.rg.net/rrdp/notify.xml.
[Warning] [05 Oct 2021 01:03:07.022 +00:00] Failed to fetch https://ca.rg.net/rrdp/notify.xml, will fall-back to the next one: rsync://ca.rg.net/rpki/RGnet-OU/.
[Info] [05 Oct 2021 01:03:07.022 +00:00] Fetching rsync://ca.rg.net/rpki/RGnet-OU/.
[Info] [05 Oct 2021 01:03:11.295 +00:00] Finished rsynching /etc/rpki-prover/rsync/ca.rg.net_rpki_RGnet_OU_.
[Info] [05 Oct 2021 01:03:11.421 +00:00] Fetched rsync://ca.rg.net/rpki/RGnet-OU/, took 4398ms.
[Info] [05 Oct 2021 01:03:11.422 +00:00] Fetching https://cb.rg.net/rrdp/notify.xml.
[Info] [05 Oct 2021 01:03:12.618 +00:00] https://cb.rg.net/rrdp/18557da4-9b93-4539-b0ec-cd0408f58bb4/snapshot/2704.xml: downloading snapshot.
[Info] [05 Oct 2021 01:03:12.785 +00:00] Fetched https://cb.rg.net/rrdp/notify.xml, took 1362ms.
[Info] [05 Oct 2021 01:03:12.800 +00:00] Fetching https://cc.rg.net/rrdp/notify.xml.
[Info] [05 Oct 2021 01:03:13.833 +00:00] https://cc.rg.net/rrdp/50b7c76f-2cb4-4868-93ac-590e9b098993/snapshot/2501.xml: downloading snapshot.
[Info] [05 Oct 2021 01:03:14.001 +00:00] Fetched https://cc.rg.net/rrdp/notify.xml, took 1200ms.
[Info] [05 Oct 2021 01:03:15.766 +00:00] Fetching https://rpki.caramelfox.net/rrdp/notification.xml.
[Info] [05 Oct 2021 01:03:16.759 +00:00] https://rpki.caramelfox.net/rrdp/2fc26f8f-1fa-4956-b24e-5bdf82ace1c5/175/snapshot.xml: downloading snapshot.
[Info] [05 Oct 2021 01:03:17.015 +00:00] Fetched https://rpki.caramelfox.net/rrdp/notification.xml, took 1248ms.
[Info] [05 Oct 2021 01:03:23.679 +00:00] Marked 73431 objects as used, 15843 manifests as valid, took 348ms.
[Info] [05 Oct 2021 01:03:23.757 +00:00] Validated https://rpki.ripe.net/ta/ripe-ncc-ta.cer, got 139498 VRPs, took 170588ms
[Info] [05 Oct 2021 01:03:47.421 +00:00] Fetched https://rpki-repo.registro.br/rrdp/notification.xml, took 74994ms.
[Info] [05 Oct 2021 01:03:48.817 +00:00] Marked 18920 objects as used, 3125 manifests as valid, took 93ms.
[Info] [05 Oct 2021 01:03:48.825 +00:00] Validated https://rrdp.lacnic.net/ta/rta-lacnic-rpki.cer, got 16583 VRPs, took 195655ms
[Info] [05 Oct 2021 01:03:49.045 +00:00] Validated all TAs, got 281147 VRPs, took 195876ms
[Info] [05 Oct 2021 01:03:50.171 +00:00] Cleanup: deleted 0 objects, kept 177005, deleted 0 dangling URLs, took 1126ms
[Info] [05 Oct 2021 01:03:50.171 +00:00] Done with deleting older versions, deleted 0 versions, took 0ms
```

**Note:** There may be some messages about **validation failed** or other types of error messages. These

can be ignored.

11. Detach from the screen session by pressing `Ctrl+a d` and confirm system is listening on port **9999**

```
netstat -ltnp
netstat -ltnp | grep 9999
```

```
apnic@group02:~/rpki-prover$ screen
[detached from 8951.pts-4.group02]
apnic@group02:~/rpki-prover$ netstat -ltnp
(Not all processes could be identified, non-owned process info
 will not be shown, you would have to be root to see it all.)
Active Internet connections (only servers)
Proto Recv-Q Send-Q Local Address           Foreign Address         State       PID/Program name
tcp        0      0 0.0.0.0:9999            0.0.0.0:*               LISTEN      -
tcp        0      0 127.0.0.53:53          0.0.0.0:*               LISTEN      -
tcp        0      0 0.0.0.0:22             0.0.0.0:*               LISTEN      -
tcp6       0      0 :::22                  :::*                    LISTEN      -
apnic@group02:~/rpki-prover$
```

12. Export the list of validated Route Origin Authorizations (ROAs) to a file

```
curl -s http://localhost:9999/api/vrps.csv | tee ~/rpki-prover-vrps.csv
```

```
apnic@group02: ~/rpki-prover x + v
apnic@group02:~/rpki-prover$ curl -s http://localhost:9999/api/vrps.csv | tee ~/rpki-prover-vrps.csv
asn,prefix,maxLength
AS0,2.57.180.0/22,24
AS0,5.57.80.0/22,22
AS0,23.4.85.0/24,24
AS0,23.173.176.0/24,24
AS0,23.211.114.0/23,24
AS0,27.111.228.0/22,24
AS0,36.255.56.0/22,24
AS0,37.49.232.0/23,24
AS0,37.49.236.0/22,24
AS0,43.243.22.0/23,23
AS0,43.243.152.0/22,24
AS0,45.6.52.0/22,32
AS0,45.12.44.0/22,22
AS0,45.12.200.0/22,24
AS0,45.15.52.0/22,22
AS0,45.67.44.0/22,24
AS0,45.82.192.0/22,22
AS0,45.90.160.0/22,24
AS0,45.127.172.0/22,22
AS0,45.136.60.0/22,22
AS0,45.151.204.0/22,22
AS0,45.158.64.0/22,22
AS0,45.158.64.0/24,24
AS0,45.158.65.0/24,24
AS0,45.158.66.0/24,24
AS0,45.158.67.0/24,24
AS0,45.184.144.0/22,32
AS0,45.227.0.0/22,32
AS0,46.17.152.0/21,21
AS0,46.143.204.0/22,22
```

13. View the first 10 validated ROA payloads

```
head ~/rpki-prover-vrps.csv
```

A list of Autonomous System Numbers (ASN), IP Prefix, and Max Length will be displayed.

```
apnic@group02:~/rpki-prover$ head ~/rpki-prover-vrps.csv
asn,prefix,maxLength
AS0,2.57.180.0/22,24
AS0,5.57.80.0/22,22
AS0,23.4.85.0/24,24
AS0,23.173.176.0/24,24
AS0,23.211.114.0/23,24
AS0,27.111.228.0/22,24
AS0,36.255.56.0/22,24
AS0,37.49.232.0/23,24
AS0,37.49.236.0/22,24
apnic@group02:~/rpki-prover$ grep -in AS131107 ~/rpki-prover-vrps.csv
219364:AS131107,202.125.96.0/24,24
219365:AS131107,2001:df2:ee00::/48,48
219366:AS131107,2406:6400::/32,36
apnic@group02:~/rpki-prover$ |
```

14. To search for ROAs for APNIC Training's `AS131107`

```
grep -in AS131107 ~/rpki-prover-vrps.csv
```

15. **Optional:** Sort the exported RPKI-prover's ROA payload outputs ready for comparison with another validator's output.

Sort the output

```
cd ~/
sort rpki-prover-vrps.csv > rpki-prover-vrps_sorted.csv
```

To sort the file, and ignore the header row

```
cat rpki-prover-vrps.csv | { head -n 1 ; sort; } > rpki-prover-vrps_sorted.csv
```

16. **Optional:** Compare ROA output with another validator's output.

Compare the output from Fort validator

```
diff -u fort_sorted.csv rpki-prover-vrps_sorted.csv
```

17. Stop the RPKI-Prover. Re-attach to the screen session and end the process by pressing `ctrl+c`

```
screen -r  
ctrl+c
```

# OPTIONAL

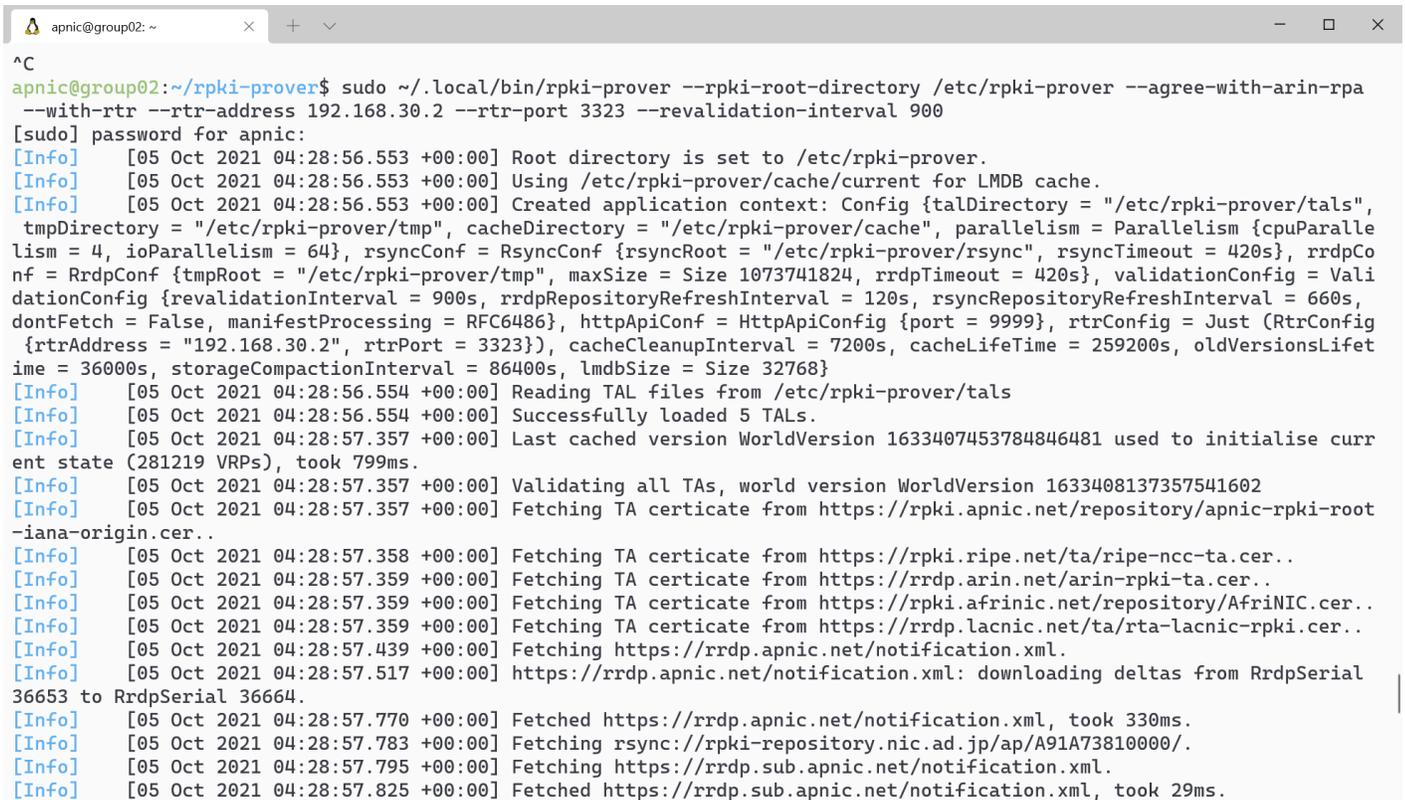
## Part-2: RTR session

### Validator side

RPKI-Prover can act as an RTR server, to allow RPKI enabled routers to connect to it and fetch the validated cache (ROA cache).

- IANA has specified a standard port `323` for RTR, which would require running RPKI-Prover as root.
- RPKI-Prover uses the default port `8283`
- To run RPKI-Prover as a RTR server listening on `192.168.30.X` (where X is your group number) and the port `3323` :

```
sudo ~/.local/bin/rpki-prover --rpki-root-directory \  
/etc/rpki-prover --agree-with-arin-rpa --with-rtr --rtr-address 192.168.30.X \  
--rtr-port 3323 --revalidation-interval 900 &
```



```
apnic@group02: ~  
^C  
apnic@group02:~/rpki-prover$ sudo ~/.local/bin/rpki-prover --rpki-root-directory /etc/rpki-prover --agree-with-arin-rpa  
--with-rtr --rtr-address 192.168.30.2 --rtr-port 3323 --revalidation-interval 900  
[sudo] password for apnic:  
[Info] [05 Oct 2021 04:28:56.553 +00:00] Root directory is set to /etc/rpki-prover.  
[Info] [05 Oct 2021 04:28:56.553 +00:00] Using /etc/rpki-prover/cache/current for LMDB cache.  
[Info] [05 Oct 2021 04:28:56.553 +00:00] Created application context: Config {talDirectory = "/etc/rpki-prover/tals",  
tmpDirectory = "/etc/rpki-prover/tmp", cacheDirectory = "/etc/rpki-prover/cache", parallelism = Parallelism {cpuParalle  
lism = 4, ioParallelism = 64}, rsyncConf = RsyncConf {rsyncRoot = "/etc/rpki-prover/rsync", rsyncTimeout = 420s}, rrdpCo  
nf = RrdpConf {tmpRoot = "/etc/rpki-prover/tmp", maxSize = Size 1073741824, rrdpTimeout = 420s}, validationConfig = Vali  
dationConfig {revalidationInterval = 900s, rrdpRepositoryRefreshInterval = 120s, rsyncRepositoryRefreshInterval = 660s,  
dontFetch = False, manifestProcessing = RFC6486}, httpApiConf = HttpApiConfig {port = 9999}, rtrConfig = Just (RtrConfig  
{rtrAddress = "192.168.30.2", rtrPort = 3323}), cacheCleanupInterval = 7200s, cacheLifeTime = 259200s, oldVersionsLifet  
ime = 36000s, storageCompactionInterval = 86400s, lmbdSize = Size 32768}  
[Info] [05 Oct 2021 04:28:56.554 +00:00] Reading TAL files from /etc/rpki-prover/tals  
[Info] [05 Oct 2021 04:28:56.554 +00:00] Successfully loaded 5 TALs.  
[Info] [05 Oct 2021 04:28:57.357 +00:00] Last cached version WorldVersion 1633407453784846481 used to initialise curr  
ent state (281219 VRPs), took 799ms.  
[Info] [05 Oct 2021 04:28:57.357 +00:00] Validating all TAs, world version WorldVersion 1633408137357541602  
[Info] [05 Oct 2021 04:28:57.357 +00:00] Fetching TA certificate from https://rpki.apnic.net/repository/apnic-rpki-root  
-iana-origin.cer..  
[Info] [05 Oct 2021 04:28:57.358 +00:00] Fetching TA certificate from https://rpki.ripe.net/ta/ripe-ncc-ta.cer..  
[Info] [05 Oct 2021 04:28:57.359 +00:00] Fetching TA certificate from https://rrdp.arin.net/arin-rpki-ta.cer..  
[Info] [05 Oct 2021 04:28:57.359 +00:00] Fetching TA certificate from https://rpki.afrinic.net/repository/AfriNIC.cer..  
[Info] [05 Oct 2021 04:28:57.359 +00:00] Fetching TA certificate from https://rrdp.lacnic.net/ta/rta-lacnic-rpki.cer..  
[Info] [05 Oct 2021 04:28:57.439 +00:00] Fetching https://rrdp.apnic.net/notification.xml.  
[Info] [05 Oct 2021 04:28:57.517 +00:00] https://rrdp.apnic.net/notification.xml: downloading deltas from RrdpSerial  
36653 to RrdpSerial 36664.  
[Info] [05 Oct 2021 04:28:57.770 +00:00] Fetched https://rrdp.apnic.net/notification.xml, took 330ms.  
[Info] [05 Oct 2021 04:28:57.783 +00:00] Fetching rsync://rpki-repository.nic.ad.jp/ap/A91A73810000/.  
[Info] [05 Oct 2021 04:28:57.795 +00:00] Fetching https://rrdp.sub.apnic.net/notification.xml.  
[Info] [05 Oct 2021 04:28:57.825 +00:00] Fetched https://rrdp.sub.apnic.net/notification.xml, took 29ms.
```

- If you dont specify the **revalidation-interval** time, by default the local repo will be updated and re-

