
salt-sproxy Documentation

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Salt plugin to automate the management and configuration of network devices at scale, without running (Proxy) Minions.

Using `salt-sproxy`, you can continue to benefit from the scalability, flexibility and extensibility of Salt, while you don't have to manage thousands of (Proxy) Minion services. However, you are able to use both `salt-sproxy` and your (Proxy) Minions at the same time.

CHAPTER 1

Why salt-sproxy

`salt-sproxy` can be used as a standalone tool to manage your devices without having any further requirements, as well as an extension to your existing Salt environment (if you already have). In other words, if you have a Salt installation where you manage some network devices and servers, installing `salt-sproxy` on your Master will allow you to run any Salt command as always, e.g., executing `salt * test.ping` and `salt-sproxy * test.ping` will have the exact same effect, and result. On top of that, using `salt-sproxy` allows you to manage other devices for which you don't run (Proxy) Minions for.

Of course, if you don't already have Salt, no problem, you can start managing your devices straight away, check out the [quick start steps](#).

In brief, here are some benefits you can get by using *salt-sproxy*:

- Say goodbye to the burden of managing hundreds of system services for the Proxy Minion processes.
- Reuse your existing extension modules, templates, Pillars, States, etc., you may have already developed in your environment, transparently.
- You can run it locally, on your own computer.
- Python programming made a breeze - might go well with the [ISalt](#) package.
- Integrates easily with your existing Salt environment (if you have), by installing the package on your Salt Master.
- Can continue to leverage the event-driven automation and orchestration methodologies.
- Can continue using any of the usual [targeting mechanisms](#).
- REST API, see also [the Salt REST API](#) documentation.
- By sending events to a Salt Master, you are able to implement whatever auditing you need (e.g., what command was executed by who and when, etc.).
- Benefit from inheriting `_all_` the native Salt features and integrations contributed by thousands of users, and tested in hundreds of different environments, over almost a decade of development.

Is `salt-sproxy` a wrapper around `salt-ssh`?

No, nothing to do with *salt-ssh*. The core of *salt-sproxy* is a Runner loaded dynamically on runtime, that spins up a pool of child processes, each running a temporary light version of the Proxy Minion underneath; as soon as the execution is complete for a device, its associated Proxy Minion is shut down, and another one takes its place into the child processes bucket.

A source of confusion may also be the usage of the [Roster](#) interface, which, historically has only been used by *salt-ssh*, although the Roster is not tightly coupled with *salt-ssh*: it just happened to be the only use case so far. Essentially, the Roster simply provides a list of devices together with their credentials (e.g., similar to the *inventory* as dubbed in other automation frameworks) - and now has another use case in *salt-sproxy*.

CHAPTER 3

Install

Install this package where you would like to manage your devices from. In case you need a specific Salt version, make sure you install it beforehand, otherwise this package will bring the latest Salt version available instead.

The package is distributed via PyPI, under the name `salt-sproxy`.

Execute:

```
pip install salt-sproxy
```

See [Installation](#) for more detailed installation notes.

CHAPTER 4

Quick Start

See this recording for a live quick start:

In the above, `minion1` is a **dummy** Proxy Minion, that can be used for getting started and make the first steps without connecting to an actual device, but get used to the `salt-sproxy` methodology.

The Master configuration file is `/home/mircea/master`, which is why the command is executed using the `-c` option specifying the path to the directory with the configuration file. In this Master configuration file, the `pillar_roots` option points to `/srv/salt/pillar` which is where `salt-sproxy` is going to load the Pillar data from. Accordingly, the Pillar Top file is under that path, `/srv/salt/pillar/top.sls`:

```
base:
  minion1:
    - dummy
```

This Pillar Top file says that the Minion `minion1` will have the Pillar data from the `dummy.sls` from the same directory, thus `/srv/salt/pillar/dummy.sls`:

```
proxy:
  proxytype: dummy
```

In this case, it was sufficient to only set the `proxytype` field to `dummy`.

`salt-sproxy` can be used in conjunction with any of the available **Salt Proxy modules**, or others that you might have in your own environment. See <https://docs.saltstack.com/en/latest/topics/proxyminion/index.html> to understand how to write a new Proxy module if you require.

For example, let's take a look at how we can manage a network device through the **NAPALM Proxy**:

In the above, in the same Python virtual environment as previously make sure you have NAPALM installed, by executing `pip install napalm` (see <https://napalm.readthedocs.io/en/latest/installation/index.html> for further installation requirements, depending on the platform you're running on). The connection credentials for the `juniper-router` are stored in the `/srv/salt/pillar/junos.sls` Pillar, and we can go ahead and start executing arbitrary Salt commands, e.g., `net.arp` to retrieve the ARP table, or `net.load_config` to apply a configuration change on the router.

The Pillar Top file in this example was (under the same path as previously, as the Master config was the same):

```
base:  
  juniper-router:  
    - junos
```

Thanks to [Tesuto](#) for providing the virtual machine for the demos!

CHAPTER 5

Usage

First off, make sure you have the Salt [Pillar Top file](#) correctly defined and the `proxy` key is available into the Pillar. For more in-depth explanation and examples, check [this](#) tutorial from the official SaltStack docs.

Once you have that, you can start using `salt-sproxy` even without any Proxy Minions or Salt Master running. To check, can start by executing:

```
$ salt-sproxy -L a,b,c --preview-target
- a
- b
- c
```

The syntax is very similar to the widely used CLI command `salt`, however the way it works is completely different under the hood:

```
salt-sproxy <target> <function> [<arguments>]
```

Usage Example:

```
$ salt-sproxy cr1.thn.lon test.ping
cr1.thn.lon:
  True
```

One of the most important differences between `salt` and `salt-sproxy` is that the former is aware of the devices available, thanks to the fact that the Minions connect to the Master, therefore `salt` has the list of targets already available. `salt-sproxy` does not have this, as it doesn't require the Proxy Minions to be up and connected to the Master. For this reason, you will need to provide it a list of devices, or a [Roster file](#) that provides the list of available devices.

The following targeting options are available:

- `-E, --pcre`: Instead of using shell globs to evaluate the target servers, use pcre regular expressions.
- `-L, --list`: Instead of using shell globs to evaluate the target servers, take a comma or space delimited list of servers.
- `-G, --grain`: Instead of using shell globs to evaluate the target use a grain value to identify targets, the syntax for the target is the grain key followed by a globexpression: `"os:Arch"`.

- `-P, --grain-pcre`: Instead of using shell globs to evaluate the target use a grain value to identify targets, the syntax for the target is the grain key followed by a pcre regular expression: “os:Arch.*”.
- `-N, --nodegroup`: Instead of using shell globs to evaluate the target use one of the predefined nodegroups to identify a list of targets.
- `-R, --range`: Instead of using shell globs to evaluate the target use a range expression to identify targets. Range expressions look like `%cluster`.

Warning: Some of the targeting options above may not be available for some Roster modules.

To use a specific Roster, configure the `proxy_roster` (or simply `roster`) option into your Master config file, e.g.,

```
proxy_roster: ansible
```

Note: It is recommended to prefer the `proxy_roster` option in the favour of `roster` as the latter is used by Salt SSH. In case you want to use both salt-sproxy and Salt SSH, you may want to use different Roster files, which is why there are two different options.

salt-sproxy will evaluate both `proxy_roster` and `roster`, in this order.

With the configuration above, salt-sproxy would try to use the [ansible Roster module](#) to compile the Roster file (typically `/etc/salt/roster`) which is structured as a regular Ansible Inventory file. This inventory should only provide the list of devices.

The Roster can also be specified on the fly, using the `-R` or `--roster` options, e.g., `salt-sproxy cr1.thn.lon test.ping --roster=flat`. In this example, we'd be using the [flat Roster module](#) to determine the list of devices matched by a specific target.

When you don't specify the Roster into the Master config, or from the CLI, you can use salt-sproxy to target on or more devices using the `glob` or `list` target types, e.g., `salt-sproxy cr1.thn.lon test.ping (glob)` or `salt-sproxy -L cr1.thn.lon,cr2.thn.lon test.ping` (to target a list of devices, `cr1.thn.lon` and `cr2.thn.lon`, respectively).

Note that in any case (with or without the Roster), you will need to provide a valid list of Minions.

CHAPTER 6

Docker

There are Docker images available should you need or prefer: <https://hub.docker.com/r/mirceaulinic/salt-sproxy>.

You can see here the available tags: <https://hub.docker.com/r/mirceaulinic/salt-sproxy/tags>. `latest` provides the code merged into the `master` branch, and `allinone-latest` is the code merged into the `master` branch with several libraries such as [NAPALM](#), [Netmiko](#), [ciscoconfparse](#), or [Ansible](#) which you may need for your modules or Roster (if you'd want to use the [Ansible Roster](#), for example).

These can be used in various scenarios. For example, if you would like to use `salt-proxy` but without installing it, and prefer to use Docker instead, you can define the following convoluted alias:

```
alias salt-sproxy='f(){ docker run --rm --network host -v $SALT_PROXY_PILLAR_DIR:/etc/
↪salt/pillar/ -ti mirceaulinic/salt-sproxy salt-sproxy $@; }; f'
```

And in the `SALT_PROXY_PILLAR_DIR` environment variable, you set the path to the directory where you have the Pillars, e.g.,

```
export SALT_PROXY_PILLAR_DIR=/path/to/pillars/dir
```

With this setup, you would be able to go ahead and execute “as normally” (with the difference that the code is executed inside the container, however from the CLI it won't look different):

```
salt-sproxy minion1 test.ping
```

More usage examples

See the following examples to help getting started with salt-sproxy:

7.1 Usage Examples

7.1.1 salt-sproxy 101

This is the first example from the [Quick Start](#) section of the documentation.

Using the Master configuration file under [examples/master](#):

/etc/salt/master:

```
pillar_roots:
  base:
    - /srv/salt/pillar
```

The `pillar_roots` option points to `/srv/salt/pillar`, so to be able to use this example, either create a symlink to the `pillar` directory in this example, or copy the files. For example, if you just cloned this repository:

```
$ mkdir -p /srv/salt/pillar
$ git clone git@github.com:mirceaulinic/salt-sproxy.git
$ cp salt-sproxy/examples/master /etc/salt/master
$ cp salt-sproxy/examples/101/pillar/*.sls /srv/salt/pillar/
```

The contents of these two files:

/srv/salt/pillar/top.sls:

```
base:
  minion1:
    - dummy
```

/srv/salt/pillar/dummy.sls:

```
proxy:
  proxytype: dummy
```

Having this setup ready, you can go ahead and execute:

```
$ salt-sproxy minion1 test.ping
minion1:
    True

# let's display the list of packages installed via pip on this computer
$ salt-sproxy minion1 pip.list
minion1:
    -----
    Jinja2:
        2.10.1
    MarkupSafe:
        1.1.1
    PyNaCl:
        1.3.0
    PyYAML:
        5.1
    Pygments:
        2.4.0
    asn1crypto:
        0.24.0
    bcrypt:
        3.1.6
    bleach:
        3.1.0
    certifi:
        2019.3.9
    cffi:
        1.12.3
```

Alternative setup using Docker

1. Clone the salt-sproxy repository and change dir:

```
$ git clone https://github.com/mirceaulinic/salt-sproxy.git
$ cd salt-sproxy/
```

2. Using the allinone-latest Docker image (see [Docker](#)), you can run from this path:

```
$ docker run --rm -v $PWD/examples/101/pillar:/srv/salt/pillar/ \
  -ti mirceaulinic/salt-sproxy:allinone-latest bash
root@2c68721d93dc:/# salt-sproxy minion1 test.ping -l error
minion1:
    True
```

7.1.2 Using the Ansible Roster

To be able to use the Ansible Roster, you will need to have `ansible` installed in the same environment as `salt-sproxy`, e.g.,

```
$ pip instal ansible
```

Using the Master configuration file under [examples/ansible/master](#):

/etc/salt/master:

```
pillar_roots:
  base:
    - /srv/salt/pillar

proxy_roster: ansible
roster_file: /etc/salt/roster
```

Notice that compared to the previous examples, [101](#) and [NAPALM](#), there are two additional options: `roster_file` which specifies the path to the Roster file to use, and `proxy_roster` that tells how to interpret the Roster file - in this case, the Roster file `/etc/salt/roster` is going to be loaded as an Ansible inventory. Let's consider, for example, the following Roster / Ansible inventory which you can find at [examples/ansible/roster](#):

```
all:
  children:
    usa:
      children:
        northeast: ~
        northwest:
          children:
            seattle:
              hosts:
                edge1.seattle
            vancouver:
              hosts:
                edge1.vancouver
        southeast:
          children:
            atlanta:
              hosts:
                edge1.atlanta:
                edge2.atlanta:
            raleigh:
              hosts:
                edge1.raleigh:
        southwest:
          children:
            san_francisco:
              hosts:
                edge1.sfo
            los_angeles:
              hosts:
                edge1.la
```

The `pillar_roots` option points to `/srv/salt/pillar`, so to be able to use this example, either create a symlink to the pillar directory in this example, or copy the files. For example, if you just cloned this repository:

```
$ mkdir -p /srv/salt/pillar
$ git clone git@github.com:mirceaulinic/salt-sproxy.git
$ cp salt-sproxy/examples/ansible/master /etc/salt/master
$ cp salt-sproxy/examples/ansible/roster /etc/salt/roster
$ cp salt-sproxy/examples/ansible/pillar/*.sls /srv/salt/pillar/
```

The contents of these files:

/srv/salt/pillar/top.sls:

```
base:
  'edge1*':
    - junos
  'edge2*':
    - eos
```

With this top file, Salt is going to load the Pillar data from /srv/salt/pillar/junos.sls for edge1.seattle, edge1.atlanta, edge1.raleigh, edge1.sfo, and edge1.la, while loading the data from /srv/salt/pillar/eos.sls for edge2.atlanta (and anything that would match the edge2* expression should you have others).

/srv/salt/pillar/junos.sls:

```
proxy:
  proxytype: napalm
  driver: junos
  host: {{ opts.id | replace('.', '-') }}.salt-sproxy.digitalocean.cloud.tesuto.com
  username: test
  password: t35t1234
```

/srv/salt/pillar/eos.sls:

```
proxy:
  proxytype: napalm
  driver: eos
  host: {{ opts.id | replace('.', '-') }}.salt-sproxy.digitalocean.cloud.tesuto.com
  username: test
  password: t35t1234
```

Note that in both case the hostname has been set as {{ opts.id | replace('.', '-') }}.salt-sproxy.digitalocean.cloud.tesuto.com. opts.id points to the Minion ID, which means that the Pillar data is rendered depending on the name of the device; therefore, the hostname for edge1.atlanta will be edge1-atlanta.salt-sproxy.digitalocean.cloud.tesuto.com, the hostname for edge2.atlanta is edge2-atlanta.salt-sproxy.digitalocean.cloud.tesuto.com, and so on.

Having this setup ready, you can go ahead and execute:

```
$ salt-sproxy '*' --preview-target
- edge1.seattle
- edge1.vancouver
- edge1.atlanta
- edge2.atlanta
- edge1.raleigh
- edge1.la
- edge1.sfo

# get the LLDP neighbors from all the edge devices
$ salt-sproxy 'edge*' net.lldp
edge1.vancouver:
    ~~~ snip ~~~
edge1.atlanta:
    ~~~ snip ~~~
edge1.sfo:
    ~~~ snip ~~~
```

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```

edge1.seattle:
    ~~~ snip ~~~
edge1.la:
    ~~~ snip ~~~
edge1.raleigh:
    ~~~ snip ~~~
edge2.atlanta:
    ~~~ snip ~~~

```

Alternative setup using Docker

1. Clone the salt-sproxy repository and change dir:

```

$ git clone https://github.com/mirceaulinic/salt-sproxy.git
$ cd salt-sproxy/

```

2. Update examples/ansible/roster with your Ansible inventory.
3. Update examples/ansible/top.sls to ensure your Pillar Top file matches the name of the devices from your Roster / Ansible inventory. Also, update the examples/ansible/eos.sls, examples/ansible/junos.sls etc. files with your credentials to connect to your device(s).

To double check that the mapping is correct, you can execute:

```

$ docker run --rm -v $PWD/examples/ansible/master:/etc/salt/master \
  -v $PWD/examples/ansible/roster:/etc/salt/roster \
  -v $PWD/examples/ansible/pillar:/srv/salt/pillar/ \
  -ti mirceaulinic/salt-sproxy:allinone-latest bash

root@2c68721d93dc:/# salt-run pillar.show_pillar edge1.atlanta
proxy:
-----
proxytype:
  napalm
driver:
  junos
hostname:
  edge1-atlanta.salt-sproxy.digitalocean.cloud.tesuto.com
username:
  test
password:
  t35t1234

```

4. Using the allinone-latest Docker image (see [Docker](#)), you can run from this path:

```

$ docker run --rm -v $PWD/examples/ansible/master:/etc/salt/master \
  -v $PWD/examples/ansible/roster:/etc/salt/roster \
  -v $PWD/examples/ansible/pillar:/srv/salt/pillar/ \
  --network host \
  -ti mirceaulinic/salt-sproxy:allinone-latest bash

root@2c68721d93dc:/# salt-sproxy -N southwest test.ping
edge1.la:
  True
edge1.sfo:
  True

```

7.1.3 Using the File Roster

The **File Roster** allows you to easily manage the list of devices through an SLS file - that being any combination of the available **Roster modules**: Jinja+YAML, YAML, JSON, pure Python, JSON5, HJSON, etc.

By default, the Roster file is `/etc/salt/roster`, but you can have a different path by configuring `roster_file` (or `--roster-file` on the command line) to point to an alternative absolute path, e.g.,

```
/etc/salt/master
```

```
roster: file
roster_file: /path/to/roster/file
```

For starters, let's consider the following simple Roster SLS file:

```
/etc/salt/roster
```

```
device1: {}
device2: {}
```

To check that everything is properly configured, you can execute:

```
$ salt-sproxy \* --preview-target
- device1
- device2
```

As always, you'll need to provide the connection credentials, in the Pillar. That is, you can have a structure as the following Pillar top file:

```
/srv/pillar/top.sls
```

```
base:
  '*':
    - proxy
```

And the connection credentials - example using NAPALM:

```
/srv/pillar/proxy.sls
```

```
proxy:
  proxytype: napalm
  driver: junos
  hostname: {{ opts.id }}.example.com
  password: superS3kure
```

With this configuration, `device1` will try to connect to `device1.example.com`, and `device2` to `device2.example.com`, respectively, using the NAPALM Junos driver.

If you want more specific connection options per device, you can manage that in the Roster SLS file (under each device you can specify any connection argument to override the details from the `proxy` Pillar), e.g.,

```
/etc/salt/roster
```

```
device1:
  driver: eos
  hostname: different-hostname-for-device1.example.com
device2:
  password: m0reS3kure
```


Using the previous example, `device1` will connect to `different-hostname-for-device1.example.com` using the NAPALM EOS driver for Arista, while `device2` uses a different password.

In a similar way, you can provide static Grains per device, under the `grains` key, e.g.,

`/etc/salt/roster:`

```
device1:
  grains:
    site: site1
device2:
  grains:
    site: site2
```

If you prefer to manage a JSON structure instead:

`/etc/salt/roster:`

```
{
  "device1": {
    "grains": {
      "site": "site1"
    }
  },
  "device2": {
    "grains": {
      "site": "site2"
    }
  }
}
```

With that clarified, let's make the Roster SLS file more dynamic, and instead of managing the list of devices manually, have it auto-generated:

`/etc/salt/roster:`

```
{%- for i in range(50) %}
device{{ i }}:
  grains:
    site: site{{ i }}
{%- endfor %}
```

The example above provides a list of 50 devices. Although probably too simplistic for real-world usage, it may be sufficient to exemplify the use-case.

Remember that being interpreted as an SLS, you can also invoke Salt functions, using the `__salt__` global variable. For example, to retrieve and build the list of devices dynamically using an HTTP query, you can do, e.g.,

```
{%- set ret = __salt__.http.query('https://netbox.live/api/dcim/devices/',
↳decode=true) %}
{%- for device in ret.dict.results %}
{{ device.name }}:
  grains:
    site: {{ device.site.slug }}
{%- endfor %}
```

Ultimately, for higher complexity, consider using the [pure Python Renderer](#) whenever you need to put more business logic in selecting the devices you need to manage.

7.1.4 salt-sproxy with network devices

This is the second example from the [Quick Start](#) section of the documentation.

To be able to use this example, make sure you have NAPALM installed - see the complete installation notes from <https://napalm.readthedocs.io/en/latest/installation/index.html>.

Using the Master configuration file under [examples/master](#):

```
/etc/salt/master:
```

```
pillar_roots:
  base:
    - /srv/salt/pillar
```

The `pillar_roots` option points to `/srv/salt/pillar`, so to be able to use this example, either create a symlink to the `pillar` directory in this example, or copy the files. For example, if you just cloned this repository:

```
$ mkdir -p /srv/salt/pillar
$ git clone git@github.com:mirceaulinic/salt-sproxy.git
$ cp salt-sproxy/examples/master /etc/salt/master
$ cp salt-sproxy/examples/napalm/pillar/*.sls /srv/salt/pillar/
```

The contents of these two files:

```
/srv/salt/pillar/top.sls:
```

```
base:
  juniper-router:
    - junos
```

```
/srv/salt/pillar/junos.sls:
```

```
proxy:
  proxytype: napalm
  driver: junos
  host: juniper.salt-sproxy.digitalocean.cloud.tesuto.com
  username: test
  password: t35t1234
```

Having this setup ready, after you update the connection details, you can go ahead and execute:

```
$ salt-sproxy juniper-router test.ping
juniper-router:
  True

# retrieve the ARP table from juniper-router
$ salt-sproxy juniper-router net.arp
juniper-router:
  -----
  comment:
  out:
    I_
    -----
    age:
      849.0
    interface:
      fxp0.0
    ip:
```

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```

        10.96.0.1
        mac:
        92:99:00:0A:00:00
    I_
    -----
    age:
    973.0
    interface:
    fxp0.0
    ip:
    10.96.0.13
    mac:
    92:99:00:0A:00:00
    I_
    -----
    age:
    738.0
    interface:
    em1.0
    ip:
    128.0.0.16
    mac:
    02:42:AC:13:00:02
result:
    True

# apply a configuration change: dry run
$ salt-sproxy juniper-router net.load_config text='set system ntp server 10.10.10.1'
↪test=True
juniper-router:
-----
already_configured:
    False
comment:
    Configuration discarded.
diff:
    [edit system]
    + ntp {
    +     server 10.10.10.1;
    + }
loaded_config:
result:
    True

# apply the configuration change and commit
$ salt-sproxy juniper-router net.load_config text='set system ntp server 10.10.10.1'
juniper-router:
-----
already_configured:
    False
comment:
diff:
    [edit system]
    + ntp {
    +     server 10.10.10.1;
    + }
loaded_config:

```

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```
result:
  True
```

If you run into issues when connecting to your device, you might want to go through this checklist: <https://github.com/napalm-automation/napalm#faq>.

Note: For a better methodology on managing the configuration, you might want to take a look at the [State system](#), one of the most widely used State modules for configuration management through NAPALM being [Netconfig](#).

Alternative setup using Docker

1. Clone the salt-sproxy repository and change dir:

```
$ git clone https://github.com/mirceaulinic/salt-sproxy.git
$ cd salt-sproxy/
```

2. Update the examples/napalm/junos.sls file with your credentials to connect to your device.

3. Using the allinone-latest Docker image (see [Docker](#)), you can run from this path:

```
$ docker run --rm -v $PWD/examples/napalm/pillar/:/srv/salt/pillar/ \
  --network host \
  -ti mirceaulinic/salt-sproxy:allinone-latest bash
root@2c68721d93dc:/# salt-sproxy juniper-router test.ping
juniper-router:
  True
root@2c68721d93dc:/# salt-sproxy juniper-router net.load_config \
  text='set system ntp server 10.10.10.1' test=True
juniper-router:
  -----
  already_configured:
    False
  comment:
    Configuration discarded.
  diff:
    [edit system]
    +   ntp {
    +     server 10.10.10.1;
    +   }
  loaded_config:
  result:
    True
```

7.1.5 Using the NetBox Roster

To be able to use the NetBox Roster, you will need to have the `pynetbox` library installed in the same environment as `salt-sproxy`, e.g.,

```
$ pip install pynetbox
```

Using the Master configuration file under [examples/netbox/master](#):

/etc/salt/master:

```
pillar_roots:
  base:
    - /srv/salt/pillar

proxy_roster: netbox

netbox:
  url: https://url-to-your-netbox-instance
```

With this configuration, the list of devices is going to be loaded from NetBox, with the connection details provided under the `netbox` key.

Note: To set up a NetBox instance, see the installation notes from <https://netbox.readthedocs.io/en/stable/installation/>.

The `pillar_roots` option points to `/srv/salt/pillar`, so to be able to use this example, either create a symlink to the `pillar` directory in this example, or copy the files. For example, if you just cloned this repository:

```
$ mkdir -p /srv/salt/pillar
$ git clone git@github.com:mirceaulinic/salt-sproxy.git
$ cp salt-sproxy/examples/netbox/master /etc/salt/master
$ cp salt-sproxy/examples/netbox/pillar/*.sls /srv/salt/pillar/
```

The contents of these files highly depend on the device names you have in your NetBox instance. The following examples are crafted for device name starting with `edge1` and `edge2`, e.g., `edge1.atlanta`, `edge1.seattle` etc. If you have different device names in your NetBox instance, you'll have to update these Pillars.

`/srv/salt/pillar/top.sls:`

```
base:
  'edge1*':
    - junos
  'edge2*':
    - eos
```

With this top file, Salt is going to load the Pillar data from `/srv/salt/pillar/junos.sls` for `edge1.seattle`, `edge1.atlanta`, `edge1.raleigh`, `edge1.sfo`, and `edge1.la`, while loading the data from `/srv/salt/pillar/eos.sls` for `edge2.atlanta` (and anything that would match the `edge2*` expression should you have others).

`/srv/salt/pillar/junos.sls:`

```
proxy:
  proxytype: napalm
  driver: junos
  host: {{ opts.id | replace('.', '-') }}.salt-sproxy.digitalocean.cloud.tesuto.com
  username: test
  password: t35t1234
```

`/srv/salt/pillar/eos.sls:`

```
proxy:
  proxytype: napalm
  driver: eos
  host: {{ opts.id | replace('.', '-') }}.salt-sproxy.digitalocean.cloud.tesuto.com
  username: test
  password: t35t1234
```

Note that in both case the hostname has been set as `{{ opts.id | replace('.', '-') }}`. `salt-sproxy.digitalocean.cloud.tesuto.com`. `opts.id` points to the Minion ID, which means that the Pillar data is rendered depending on the name of the device; therefore, the hostname for `edge1.atlanta` will be `edge1-atlanta.salt-sproxy.digitalocean.cloud.tesuto.com`, the hostname for `edge2.atlanta` is `edge2-atlanta.salt-sproxy.digitalocean.cloud.tesuto.com`, and so on.

Having this setup ready, you can go ahead and execute:

```
$ salt-sproxy '*' --preview-target
- edge1.seattle
- edge1.vancouver
- edge1.atlanta
- edge2.atlanta
- edge1.raleigh
- edge1.la
- edge1.sfo
~~~ many others ~~~

# get the LLDP neighbors from all the edge devices
$ salt-sproxy 'edge*' net.lldp
edge1.vancouver:
    ~~~ snip ~~~
edge1.atlanta:
    ~~~ snip ~~~
edge1.sfo:
    ~~~ snip ~~~
edge1.seattle:
    ~~~ snip ~~~
edge1.la:
    ~~~ snip ~~~
edge1.raleigh:
    ~~~ snip ~~~
edge2.atlanta:
    ~~~ snip ~~~
```

Alternative setup using Docker

1. Clone the salt-sproxy repository and change dir:

```
$ git clone https://github.com/mirceaulinic/salt-sproxy.git
$ cd salt-sproxy/
```

2. Update `examples/netbox/master` with your NetBox details (URL and token).

Alternatively, for quick testing, you can also leave the existing values, to use the demo instance available at <https://netbox.live>.

3. Using the `allinone-latest` Docker image (see [Docker](#)), you can run from this path (at the repository root):

```
$ docker run --rm -v $PWD/examples/netbox/master:/etc/salt/master \
-v $PWD/examples/netbox/pillar:/srv/salt/pillar/ \
--network host \
-ti mirceaulinic/salt-sproxy:allinone-latest bash

root@2c68721d93dc:/# salt-sproxy '*' --preview-target
- edge1.vlcl
```

7.1.6 Using the Pillar Roster

You can think of the **Pillar Roster** as a Roster that loads the list of devices / inventory dynamically using the Pillar subsystem. Or, in simpler words, you can use any of these features from here: <https://docs.saltstack.com/en/latest/ref/pillar/all/index.html> to load the list of your devices, including: JSON / YAML HTTP API, load from MySQL / Postgres database, LDAP, Redis, MongoDB, etcd, Consul, and many others; needless to say that this is another pluggable interface and, in case you have a more specific requirement, you can easily extend Salt in your environment by providing another Pillar module under the `salt://_pillar` directory. For example, see this old yet still accurate article: https://medium.com/@Drew_Stokes/saltstack-extending-the-pillar-494d41ee156d.

The core idea is that you are able to use the data pulled via the Pillar modules once you are able to execute the following command and see the list of devices you're aiming to manage:

```
$ salt-run pillar.show_pillar
devices:
  - name: device1
  ...
```

It really doesn't matter where is Salt pulling this data from.

By default, the Pillar Roster is going to check the Pillar data for `*` (any Minion), and load it from the `devices` key. In other words, when executing `salt-sproxy pillar.show_pillar` the output should have at least the `devices` key. To use different settings, have a look at the documentation: [Pillar Roster](#).

Say we want to pull the list of devices from an HTTP API module providing the data in JSON format. In this case, we can use the `http_json` module.

If the data is available at <http://example.com/devices>, and you can verify, e.g., using `curl`:

```
$ curl http://example.com/devices
{"devices": [{"name": "router1"}, {"name": "router2"}, {"name": "switch1"}]}
```

That being available, we can configure the `http_json` External Pillar:

`/etc/salt/master:`

```
roster: pillar

ext_pillar:
  - http_json:
      url: http://example.com/devices
```

Now, let's verify that the data is pulled properly into the Pillar:

```
$ salt-run pillar.show_pillar
devices:
  - name: router1
  - name: router2
  - name: switch1
```

That being validated, salt-sproxy is now aware of all the devices to be managed:

```
$ salt-sproxy \* --preview-target
- router1
- router2
- switch1
```

As well as other target types such as `list` or `PCRE`:

```
# target a fixed list of devices:

$ salt-sproxy -L router1,router2 --preview-target
- router1
- router2

# target all devices with the name starting with "router",
# followed by one or more numbers:

$ salt-sproxy -E 'router\d+' --preview-target
- router1
- router2
```

The same methodology applies to any of the other External Pillar modules.

7.1.7 Salt REST API

Important: In the configuration examples below, for simplicity, I've used the `auto` external authentication, and disabled the SSL for the Salt API. This setup is highly discouraged in production.

Using the Master configuration file under `examples/salt_api/master`:

`/etc/salt/master`:

```
pillar_roots:
  base:
    - /srv/salt/pillar

file_roots:
  base:
    - /srv/salt/extmods

rest_cherrypy:
  port: 8080
  disable_ssl: true

external_auth:
  auto:
    '*':
      - '@runner'
```

The `pillar_roots` option points to `/srv/salt/pillar`, so to be able to use this example, either create a symlink to the pillar directory in this example, or copy the files. For example, if you just cloned this repository:

```
$ mkdir -p /srv/salt/pillar
$ git clone git@github.com:mirceaulinic/salt-sproxy.git
$ cp salt-sproxy/examples/salt_api/master /etc/salt/master
$ cp salt-sproxy/examples/salt_api/pillar/*.sls /srv/salt/pillar/
```

The contents of Pillar files:

`/srv/salt/pillar/top.sls`:

```
base:
  minion1:
```

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```
- dummy
juniper-router:
- junos
```

```
/srv/salt/pillar/dummy.sls:
```

```
proxy:
  proxytype: dummy
```

```
/srv/salt/pillar/junos.sls:
```

```
proxy:
  proxytype: napalm
  driver: junos
  host: juniper.salt-sproxy.digitalocean.cloud.tesuto.com
  username: test
  password: t35t1234
```

Note: The `top.sls`, `dummy.sls`, and `junos.sls` are a combination of the previous examples, [101](#) and [napalm](#), which is going to allow use to execute against both the dummy device and a real network device.

In the example Master configuration file above, there's also a section for the `file_roots`. As documented in [The Proxy Runner](#) section of the documentation, you are going to reference the [proxy Runner](#), e.g.

```
$ mkdir -p /srv/salt/extmods/_runners
$ cp salt-sproxy/salt_sproxy/_runners/proxy.py /srv/salt/extmods/_runners/
```

Or symlink:

```
$ ln -s /path/to/git/clone/salt-sproxy/salt_sproxy /srv/salt/extmods
```

With the `rest_cherryypy` section, the Salt API will be listening to HTTP requests over port 8080, and SSL being disabled (not recommended in production):

```
rest_cherryypy:
  port: 8080
  disable_ssl: true
```

One another part of the configuration is the external authentication:

```
external_auth:
  auto:
    '*':
      - '@runner'
```

This grants access to anyone to execute any Runner (again, don't do this in production).

With this setup, we can start the Salt Master and the Salt API (running in background):

```
$ salt-master -d
$ salt-api -d
```

To verify that the REST API is ready, execute:

```
$ curl -i localhost:8080
HTTP/1.1 200 OK
Content-Type: application/json
Server: CherryPy/18.1.1
Date: Wed, 05 Jun 2019 07:58:32 GMT
Allow: GET, HEAD, POST
Access-Control-Allow-Origin: *
Access-Control-Expose-Headers: GET, POST
Access-Control-Allow-Credentials: true
Vary: Accept-Encoding
Content-Length: 146

{"return": "Welcome", "clients": ["local", "local_async", "local_batch", "local_subset", "runner", "runner_async", "ssh", "wheel", "wheel_async"]}
```

Now we can go ahead and execute the CLI command from [example 101](#), by making an HTTP request:

```
$ curl -sS localhost:8080/run -H 'Accept: application/x-yaml' \
-d eauth='auto' \
-d username='mircea' \
-d password='pass' \
-d client='runner' \
-d fun='proxy.execute' \
-d tgt='minion1' \
-d function='test.ping' \
-d sync=True
return:
- minion1: true
```

Notice that eauth field in this case is auto as this is what we've configured in the external_auth on the Master.

Similarly, you can now execute the Salt functions from the [NAPALM example](#), against a network device, by making an HTTP request:

```
$ curl -sS localhost:8080/run -H 'Accept: application/x-yaml' \
-d eauth='auto' \
-d username='mircea' \
-d password='pass' \
-d client='runner' \
-d fun='proxy.execute' \
-d tgt='juniper-router' \
-d function='net.arp' \
-d sync=True
return:
- juniper-router:
  comment: ''
  out:
  - age: 891.0
    interface: fxp0.0
    ip: 10.96.0.1
    mac: 92:99:00:0A:00:00
  - age: 1001.0
    interface: fxp0.0
    ip: 10.96.0.13
    mac: 92:99:00:0A:00:00
  - age: 902.0
    interface: em1.0
    ip: 128.0.0.16
```

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```
mac: 02:42:AC:12:00:02
result: true
```

7.1.8 salt-sapi

Note: This functionality makes use of the `sproxy` and `sproxy_async` clients added in release 2020.2.0 through the `salt-sapi` entry point. See https://salt-sproxy.readthedocs.io/en/latest/salt_api.html and https://salt-sproxy.readthedocs.io/en/latest/salt_sapi.html for more details.

Important: In the configuration examples below, for simplicity, I've used the `auto` external authentication, and disabled the SSL for the Salt API. This setup is highly discouraged in production.

Using the Master configuration file under `examples/salt_sapi/master`:

`/etc/salt/master`:

```
pillar_roots:
  base:
    - /srv/salt/pillar

file_roots:
  base:
    - /srv/salt/extmods

rest_cherryypy:
  port: 8080
  disable_ssl: true

external_auth:
  auto:
    '*':
      - '@runner'
```

The `pillar_roots` option points to `/srv/salt/pillar`, so to be able to use this example, either create a symlink to the `pillar` directory in this example, or copy the files. For example, if you just cloned this repository:

```
$ mkdir -p /srv/salt/pillar
$ git clone git@github.com:mirceaulinic/salt-sproxy.git
$ cp salt-sproxy/examples/salt_sapi/master /etc/salt/master
$ cp salt-sproxy/examples/salt_sapi/pillar/*.sls /srv/salt/pillar/
```

The contents of Pillar files:

`/srv/salt/pillar/top.sls`:

```
base:
  minion1:
    - dummy
  juniper-router:
    - junos
```

`/srv/salt/pillar/dummy.sls`:

```
proxy:
  proxytype: dummy
```

/srv/salt/pillar/junos.sls:

```
proxy:
  proxytype: napalm
  driver: junos
  host: juniper.salt-sproxy.digitalocean.cloud.tesuto.com
  username: test
  password: t35t1234
```

Note: The `top.sls`, `dummy.sls`, and `junos.sls` are a combination of the previous examples, [101](#) and [napalm](#), which is going to allow use to execute against both the dummy device and a real network device.

In the example Master configuration file above, there's also a section for the `file_roots`. As documented in [The Proxy Runner](#) section of the documentation, you are going to reference the [proxy Runner](#), e.g.

```
$ mkdir -p /srv/salt/extmods/_runners
$ cp salt-sproxy/salt_sproxy/_runners/proxy.py /srv/salt/extmods/_runners/
```

Or symlink:

```
$ ln -s /path/to/git/clone/salt-sproxy/salt_sproxy /srv/salt/extmods
```

With the `rest_cherrypy` section, the Salt API will be listening to HTTP requests over port 8080, and SSL being disabled (not recommended in production):

```
rest_cherrypy:
  port: 8080
  disable_ssl: true
```

One another part of the configuration is the external authentication:

```
external_auth:
  auto:
    '*':
      - '@runner'
```

This grants access to anyone to execute any Runner (again, don't do this in production).

With this setup, we can start the Salt Master and the Salt API (running in background):

```
$ salt-master -d
$ salt-sapi -d
```

To verify that the REST API is ready, execute:

```
$ curl -i localhost:8080
HTTP/1.1 200 OK
Content-Type: application/json
Server: CherryPy/18.1.1
Date: Wed, 01 Jan 2020 07:58:32 GMT
Allow: GET, HEAD, POST
Access-Control-Allow-Origin: *
```

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```

Access-Control-Expose-Headers: GET, POST
Access-Control-Allow-Credentials: true
Vary: Accept-Encoding
Content-Length: 146

{"return": "Welcome", "clients": ["local", "local_async", "local_batch", "local_subset
↪", "runner", "runner_async", "sproxy", "sproxy_async", "ssh", "wheel", "wheel_async
↪"]}

```

Now we can go ahead and execute the CLI command from [example 101](#), by making an HTTP request:

```

$ curl -sS localhost:8080/run -H 'Accept: application/x-yaml' \
  -d eauth='auto' \
  -d username='mircea' \
  -d password='pass' \
  -d client='sproxy' \
  -d tgt='minion1' \
  -d fun='test.ping'
return:
- minion1: true

```

Notice that eauth field in this case is auto as this is what we've configured in the external_auth on the Master.

Similarly, you can now execute the Salt functions from the [NAPALM example](#), against a network device, by making an HTTP request:

```

$ curl -sS localhost:8080/run -H 'Accept: application/x-yaml' \
  -d eauth='auto' \
  -d username='mircea' \
  -d password='pass' \
  -d client='sproxy' \
  -d tgt='juniper-router' \
  -d fun='net.arp'
return:
- juniper-router:
    comment: ''
    out:
    - age: 891.0
      interface: fxp0.0
      ip: 10.96.0.1
      mac: 92:99:00:0A:00:00
    - age: 1001.0
      interface: fxp0.0
      ip: 10.96.0.13
      mac: 92:99:00:0A:00:00
    - age: 902.0
      interface: em1.0
      ip: 128.0.0.16
      mac: 02:42:AC:12:00:02
    result: true

```

Extension Modules

`salt-sproxy` is delivered together with a few extension modules that are dynamically loaded and immediately available. Please see below the documentation for these modules:

8.1 Extension Roster Modules

8.1.1 Ansible Roster

Read in an Ansible inventory file or script

Flat inventory files should be in the regular ansible inventory format.

```
[servers]
salt.gtmanfred.com ansible_ssh_user=gtmanfred ansible_ssh_host=127.0.0.1 ansible_ssh_
↳port=22 ansible_ssh_pass='password'

[desktop]
home ansible_ssh_user=gtmanfred ansible_ssh_host=12.34.56.78 ansible_ssh_port=23_
↳ansible_ssh_pass='password'

[computers:children]
desktop
servers

[names:vars]
http_port=80
```

then `salt-ssh` can be used to hit any of them

```
[~]# salt-ssh -N all test.ping
salt.gtmanfred.com:
    True
home:
```

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```

    True
[~]# salt-ssh -N desktop test.ping
home:
    True
[~]# salt-ssh -N computers test.ping
salt.gtmanfred.com:
    True
home:
    True
[~]# salt-ssh salt.gtmanfred.com test.ping
salt.gtmanfred.com:
    True

```

There is also the option of specifying a dynamic inventory, and generating it on the fly

```

#!/bin/bash
echo '{
  "servers": [
    "salt.gtmanfred.com"
  ],
  "desktop": [
    "home"
  ],
  "computers": {
    "hosts": [],
    "children": [
      "desktop",
      "servers"
    ]
  },
  "_meta": {
    "hostvars": {
      "salt.gtmanfred.com": {
        "ansible_ssh_user": "gtmanfred",
        "ansible_ssh_host": "127.0.0.1",
        "ansible_sudo_pass": "password",
        "ansible_ssh_port": 22
      },
      "home": {
        "ansible_ssh_user": "gtmanfred",
        "ansible_ssh_host": "12.34.56.78",
        "ansible_sudo_pass": "password",
        "ansible_ssh_port": 23
      }
    }
  }
}'

```

This is the format that an inventory script needs to output to work with ansible, and thus here.

```

[~]# salt-ssh --roster-file /etc/salt/hosts salt.gtmanfred.com test.ping
salt.gtmanfred.com:
    True

```

Any of the [groups] or direct hostnames will return. The 'all' is special, and returns everything.

`_roster.ansible.targets` (*tgt*, *tgt_type*='glob', ***kwargs*)

Return the targets from the ansible inventory_file Default: /etc/salt/roster

8.1.2 File Roster

Load the list of devices from an arbitrary SLS file.

To use this module, you only need to configure the `--roster` option to `file` (on the CLI or Master config), and if the Roster SLS file is in a different location than `/etc/salt/roster`, you'd also need to specify `--roster-file` (or `roster_file` in the Master config).

```
_roster.file.targets (tgt, tgt_type='glob', **kwargs)
```

Return the targets from the sls file, checks opts for location but defaults to `/etc/salt/roster`

8.1.3 NetBox Roster

Load devices from [NetBox](#), and make them available for salt-ssh or salt-sproxy (or any other program that doesn't require (Proxy) Minions running).

Make sure that the following options are configured on the Master:

```
netbox:
  url: <NETBOX_URL>
  token: <NETBOX_USERNAME_API_TOKEN (OPTIONAL)>
  keyfile: </PATH/TO/NETBOX/KEY (OPTIONAL)>
```

If you want to pre-filter the devices, so it won't try to pull the whole database available in NetBox, you can configure another key, `filters`, under `netbox`, e.g.,

```
netbox:
  url: <NETBOX_URL>
  filters:
    site: <SITE>
    status: <STATUS>
```

Hint: You can use any NetBox field as a filter.

Important: In NetBox v2.6 the default view permissions changed, so salt-sproxy may not be able to get the device list from NetBox by default.

Add `EXEMPT_VIEW_PERMISSIONS = ['*']` to the `configuration.py` NetBox file to change this behavior. See <https://github.com/netbox-community/netbox/releases/tag/v2.6.0> for more information

```
_roster.netbox.targets (tgt, tgt_type='glob', **kwargs)
```

Return the targets from NetBox.

8.1.4 Pillar Roster

Load the list of devices from the Pillar.

Simply configure the `roster` option to point to this module, while making sure that the data is available. As the Pillar is data associated with a specific Minion ID, you may need to ensure that the Pillar is correctly associated with the Minion configured (default `*`), under the exact key required (default `devices`). To adjust these options, you can provide the following under the `roster_pillar` option in the Master configuration:

minion_id: `*` The ID of the Minion to compile the data for. Default: `*` (any Minion).

pillar_key: devices The Pillar field to pull the list of devices from. Default: `devices`.

saltenv: base The Salt environment to use when compiling the Pillar data.

pillarenv The Pillar environment to use when compiling the Pillar data.

Configuration example:

```
roster: pillar
roster_pillar:
  minion_id: sproxy
  pillar_key: minions
```

With the following configuration, when executing `salt-run pillar.show_pillar sproxy` you should have under `minions` the list of devices / Minions you want to manage.

Hint: The Pillar data can either be provided as files, or using one or more External Pillars. Check out <https://docs.saltstack.com/en/latest/ref/pillar/all/index.html> for the complete list of available Pillar modules you can use.

`_roster.pillar.targets` (*tgt, tgt_type='glob', **kwargs*)
Return the targets from External Pillar requested.

8.2 Extension Runners

8.2.1 Proxy Runner

Salt Runner to invoke arbitrary commands on network devices that are not managed via a Proxy or regular Minion. Therefore, this Runner doesn't necessarily require the targets to be up and running, as it will connect to collect the Grains, compile the Pillar, then execute the commands.

class `_runners.proxy.SProxyMinion` (*opts, context=None*)

Create an object that has loaded all of the minion module functions, grains, modules, returners etc. The `SProxyMinion` allows developers to generate all of the salt minion functions and present them with these functions for general use.

gen_modules (*initial_load=False*)

Tell the minion to reload the execution modules.

CLI Example:

```
salt '*' sys.reload_modules
```

class `_runners.proxy.StandaloneProxy` (*opts, unreachable_devices=None*)

`_runners.proxy.execute` (*tgt, salt_function=None, tgt_type='glob', roster=None, pre-view_target=False, target_details=False, timeout=60, with_grains=True, with_pillar=True, preload_grains=True, preload_pillar=True, default_grains=None, default_pillar=None, args=(), batch_size=10, batch_wait=0, static=False, events=True, cache_grains=True, cache_pillar=True, use_cached_grains=True, use_cached_pillar=True, use_existing_proxy=False, no_connect=False, test_ping=False, target_cache=False, target_cache_timeout=60, preload_targeting=False, invasive_targeting=False, failhard=False, summary=False, verbose=False, show_jid=False, progress=False, hide_timeout=False, sync_roster=False, sync_modules=False, sync_grains=False, sync_all=False, returner="", returner_config="", returner_kwargs=None, **kwargs*)

Invoke a Salt function on the list of devices matched by the Roster subsystem.

tgt The target expression, e.g., `*` for all devices, or `host1, host2` for a list, etc. The `tgt_list` argument must be used accordingly, depending on the type of this expression.

salt_function The name of the Salt function to invoke.

tgt_type: glob The type of the `tgt` expression. Choose between: `glob` (default), `list`, `pcr`, `range`, or `nodegroup`.

roster: None The name of the Roster to generate the targets. Alternatively, you can specify the name of the Roster by configuring the `proxy_roster` option into the Master config.

preview_target: False Return the list of Roster targets matched by the `tgt` and `tgt_type` arguments.

preload_grains: True Whether to preload the Grains before establishing the connection with the remote network device.

default_grains: Dictionary of the default Grains to make available within the functions loaded.

with_grains: True Whether to load the Grains modules and collect Grains data and make it available inside the Execution Functions. The Grains will be loaded after opening the connection with the remote network device.

default_pillar: Dictionary of the default Pillar data to make it available within the functions loaded.

with_pillar: True Whether to load the Pillar modules and compile Pillar data and make it available inside the Execution Functions.

arg The list of arguments to send to the Salt function.

kwargs Key-value arguments to send to the Salt function.

batch_size: 10 The size of each batch to execute.

static: False Whether to return the results synchronously (or return them as soon as the device replies).

events: True Whether should push events on the Salt bus, similar to when executing equivalent through the `salt` command.

use_cached_pillar: True Use cached Pillars whenever possible. If unable to gather cached data, it falls back to compiling the Pillar.

use_cached_grains: True Use cached Grains whenever possible. If unable to gather cached data, it falls back to collecting Grains.

cache_pillar: True Cache the compiled Pillar data before returning.

cache_grains: True Cache the collected Grains before returning.

use_existing_proxy: False Use the existing Proxy Minions when they are available (say on an already running Master).

no_connect: False Don't attempt to initiate the connection with the remote device. Default: `False` (it will initiate the connection).

test_ping: False When using the existing Proxy Minion with the `use_existing_proxy` option, can use this argument to verify also if the Minion is responsive.

target_cache: True Whether to use the cached target matching results.

target_cache_timeout: 60 The duration to cache the target results for (in seconds).

CLI Example:

```
salt-run proxy.execute_roster edge* test.ping
salt-run proxy.execute_roster junos-edges test.ping tgt_type=nodegroup
```

`_runners.proxy.execute_devices` (*minions*, *salt_function*, *with_grains=True*, *with_pillar=True*, *preload_grains=True*, *preload_pillar=True*, *default_grains=None*, *default_pillar=None*, *args=()*, *batch_size=10*, *batch_wait=0*, *static=False*, *tgt=None*, *tgt_type=None*, *jid=None*, *events=True*, *cache_grains=True*, *cache_pillar=True*, *use_cached_grains=True*, *use_cached_pillar=True*, *use_existing_proxy=False*, *existing_minions=None*, *no_connect=False*, *roster_targets=None*, *test_ping=False*, *preload_targeting=False*, *invasive_targeting=False*, *failhard=False*, *timeout=60*, *summary=False*, *verbose=False*, *progress=False*, *hide_timeout=False*, *returner=""*, *returner_config=""*, *returner_kwargs=None*, ***kwargs*)

Execute a Salt function on a group of network devices identified by their Minion ID, as listed under the `minions` argument.

minions A list of Minion IDs to invoke `function` on.

salt_function The name of the Salt function to invoke.

preload_grains: True Whether to preload the Grains before establishing the connection with the remote network device.

default_grains: Dictionary of the default Grains to make available within the functions loaded.

with_grains: False Whether to load the Grains modules and collect Grains data and make it available inside the Execution Functions. The Grains will be loaded after opening the connection with the remote network device.

preload_pillar: True Whether to preload Pillar data before opening the connection with the remote network device.

default_pillar: Dictionary of the default Pillar data to make it available within the functions loaded.

with_pillar: True Whether to load the Pillar modules and compile Pillar data and make it available inside the Execution Functions.

args The list of arguments to send to the Salt function.

kwargs Key-value arguments to send to the Salt function.

batch_size: 10 The size of each batch to execute.

static: False Whether to return the results synchronously (or return them as soon as the device replies).

events: True Whether should push events on the Salt bus, similar to when executing equivalent through the `salt` command.

use_cached_pillar: True Use cached Pillars whenever possible. If unable to gather cached data, it falls back to compiling the Pillar.

use_cached_grains: True Use cached Grains whenever possible. If unable to gather cached data, it falls back to collecting Grains.

cache_pillar: True Cache the compiled Pillar data before returning.

cache_grains: True Cache the collected Grains before returning.

use_existing_proxy: False Use the existing Proxy Minions when they are available (say on an already running Master).

no_connect: False Don't attempt to initiate the connection with the remote device. Default: `False` (it will initiate the connection).

test_ping: False When using the existing Proxy Minion with the `use_existing_proxy` option, can use this argument to verify also if the Minion is responsive.

CLI Example:

```
salt-run proxy.execute "['172.17.17.1', '172.17.17.2']" test.ping driver=eos_
↪username=test password=test123
```

```
_runners.proxy.salt_call(minion_id, salt_function=None, unreachable_devices=None,
                        failed_devices=None, with_grains=True, with_pillar=True,
                        preload_grains=True, preload_pillar=True, default_grains=None,
                        default_pillar=None, cache_grains=True, cache_pillar=True,
                        use_cached_grains=True, use_cached_pillar=True,
                        use_existing_proxy=False, no_connect=False, jid=None, ro-
                        ster_opts=None, test_ping=False, tgt=None, tgt_type=None,
                        preload_targeting=False, invasive_targeting=False, failhard=False,
                        timeout=60, returner="", returner_config="", returner_kwargs=None,
                        args=(), **kwargs)
```

Invoke a Salt Execution Function that requires or invokes an NAPALM functionality (directly or indirectly).

minion_id: The ID of the Minion to compile Pillar data for.

salt_function The name of the Salt function to invoke.

preload_grains: True Whether to preload the Grains before establishing the connection with the remote network device.

default_grains: Dictionary of the default Grains to make available within the functions loaded.

with_grains: True Whether to load the Grains modules and collect Grains data and make it available inside the Execution Functions. The Grains will be loaded after opening the connection with the remote network device.

preload_pillar: True Whether to preload Pillar data before opening the connection with the remote network device.

default_pillar: Dictionary of the default Pillar data to make it available within the functions loaded.

with_pillar: True Whether to load the Pillar modules and compile Pillar data and make it available inside the Execution Functions.

use_cached_pillar: True Use cached Pillars whenever possible. If unable to gather cached data, it falls back to compiling the Pillar.

use_cached_grains: True Use cached Grains whenever possible. If unable to gather cached data, it falls back to collecting Grains.

cache_pillar: True Cache the compiled Pillar data before returning.

cache_grains: True Cache the collected Grains before returning.

use_existing_proxy: False Use the existing Proxy Minions when they are available (say on an already running Master).

no_connect: False Don't attempt to initiate the connection with the remote device. Default: `False` (it will initiate the connection).

jid: None The JID to pass on, when executing.

test_ping: False When using the existing Proxy Minion with the `use_existing_proxy` option, can use this argument to verify also if the Minion is responsive.

arg The list of arguments to send to the Salt function.

kwargs Key-value arguments to send to the Salt function.

CLI Example:

```
salt-run proxy.salt_call bgp.neighbors junos 1.2.3.4 test test123
salt-run proxy.salt_call net.load_config junos 1.2.3.4 test test123 text='set_
↪system ntp peer 1.2.3.4'
```

8.3 Execution Modules

8.3.1 NetBox Execution Module

NetBox

Module to query NetBox

codeauthor Zach Moody <zmoody@do.co>

maturity new

depends pynetbox

Note: This code, distributed as part of `salt-sproxy`, has been copied from the main Salt project, maintained by SaltStack, to provide various enhancements and fixes to the original module.

The following config should be in the minion config file. In order to work with `secrets` you should provide a token and path to your private key file:

```
netbox:
  url: <NETBOX_URL>
  token: <NETBOX_USERNAME_API_TOKEN (OPTIONAL)>
  keyfile: </PATH/TO/NETBOX/KEY (OPTIONAL)>
```

New in version 2018.3.0: This module has been introduced in Salt release 2018.3.0.

In `salt-sproxy`, this module has been included beginning with version 2019.10.0.

`_modules.netbox.create_circuit` (*name, provider_id, circuit_type, description=None*)

New in version 2019.2.0.

Create a new Netbox circuit

name Name of the circuit

provider_id The netbox id of the circuit provider

circuit_type The name of the circuit type

asn The ASN of the circuit provider

description The description of the circuit

CLI Example:

```
salt myminion netbox.create_circuit NEW_CIRCUIT_01 Telia Transit 1299 "New Telia_
↳circuit"
```

`_modules.netbox.create_circuit_provider` (*name, asn=None*)

New in version 2019.2.0.

Create a new Netbox circuit provider

name The name of the circuit provider

asn The ASN of the circuit provider

CLI Example:

```
salt myminion netbox.create_circuit_provider Telia 1299
```

`_modules.netbox.create_circuit_termination` (*circuit, interface, device, speed, xconnect_id=None, term_side='A'*)

New in version 2019.2.0.

Terminate a circuit on an interface

circuit The name of the circuit

interface The name of the interface to terminate on

device The name of the device the interface belongs to

speed The speed of the circuit, in Kbps

xconnect_id The cross-connect identifier

term_side The side of the circuit termination

CLI Example:

```
salt myminion netbox.create_circuit_termination NEW_CIRCUIT_01 xe-0/0/1 myminion_
↳10000 xconnect_id=XCON01
```

`_modules.netbox.create_circuit_type` (*name*)

New in version 2019.2.0.

Create a new Netbox circuit type.

name The name of the circuit type

CLI Example:

```
salt myminion netbox.create_circuit_type Transit
```

`_modules.netbox.create_device` (*name, role, model, manufacturer, site*)

New in version 2019.2.0.

Create a new device with a name, role, model, manufacturer and site. All these components need to be already in Netbox.

name The name of the device, e.g., edge_router

role String of device role, e.g., router

model String of device model, e.g., MX480

manufacturer String of device manufacturer, e.g., Juniper

site String of device site, e.g., BRU

CLI Example:

```
salt myminion netbox.create_device edge_router router MX480 Juniper BRU
```

`_modules.netbox.create_device_role` (*role, color*)

New in version 2019.2.0.

Create a device role

role String of device role, e.g., router

CLI Example:

```
salt myminion netbox.create_device_role router
```

`_modules.netbox.create_device_type` (*model, manufacturer*)

New in version 2019.2.0.

Create a device type. If the manufacturer doesn't exist, create a new manufacturer.

model String of device model, e.g., MX480

manufacturer String of device manufacturer, e.g., Juniper

CLI Example:

```
salt myminion netbox.create_device_type MX480 Juniper
```

`_modules.netbox.create_interface` (*device_name, interface_name, mac_address=None, description=None, enabled=None, lag=None, lag_parent=None, form_factor=None*)

New in version 2019.2.0.

Attach an interface to a device. If not all arguments are provided, they will default to Netbox defaults.

device_name The name of the device, e.g., edge_router

interface_name The name of the interface, e.g., TenGigE0/0/0/0

mac_address String of mac address, e.g., 50:87:89:73:92:C8

description String of interface description, e.g., NTT

enabled String of boolean interface status, e.g., True

lag Boolean of interface lag status, e.g., True

lag_parent String of interface lag parent name, e.g., ae13

form_factor Integer of form factor id, obtained through `_choices` API endpoint, e.g., 200

CLI Example:

```
salt myminion netbox.create_interface edge_router ae13 description="Core uplink"
```

`_modules.netbox.create_interface_connection` (*interface_a, interface_b*)

New in version 2019.2.0.

Create an interface connection between 2 interfaces

interface_a Interface id for Side A

interface_b Interface id for Side B

CLI Example:


```
salt myminion netbox.create_interface_connection 123 456
```

`_modules.netbox.create_inventory_item` (*device_name*, *item_name*, *manufacturer_name*=None, *serial*=", *part_id*", *description*=")

New in version 2019.2.0.

Add an inventory item to an existing device.

device_name The name of the device, e.g., edge_router.

item_name String of inventory item name, e.g., Transceiver.

manufacturer_name String of inventory item manufacturer, e.g., Fiberstore.

serial String of inventory item serial, e.g., FS1238931.

part_id String of inventory item part id, e.g., 740-01234.

description String of inventory item description, e.g., SFP+-10G-LR.

CLI Example:

```
salt myminion netbox.create_inventory_item edge_router Transceiver part_id=740-
↪01234
```

`_modules.netbox.create_ipaddress` (*ip_address*, *family*, *device*=None, *interface*=None)

New in version 2019.2.0.

Add an IP address, and optionally attach it to an interface.

ip_address The IP address and CIDR, e.g., 192.168.1.1/24

family Integer of IP family, e.g., 4

device The name of the device to attach IP to, e.g., edge_router

interface The name of the interface to attach IP to, e.g., ae13

CLI Example:

```
salt myminion netbox.create_ipaddress 192.168.1.1/24 4 device=edge_router_
↪interface=ae13
```

`_modules.netbox.create_manufacturer` (*name*)

New in version 2019.2.0.

Create a device manufacturer.

name The name of the manufacturer, e.g., Juniper

CLI Example:

```
salt myminion netbox.create_manufacturer Juniper
```

`_modules.netbox.create_platform` (*platform*)

New in version 2019.2.0.

Create a new device platform

platform String of device platform, e.g., junos

CLI Example:

```
salt myminion netbox.create_platform junos
```

`_modules.netbox.create_site` (*site*)

New in version 2019.2.0.

Create a new device site

site String of device site, e.g., BRU

CLI Example:

```
salt myminion netbox.create_site BRU
```

`_modules.netbox.delete_interface` (*device_name*, *interface_name*)

New in version 2019.2.0.

Delete an interface from a device.

device_name The name of the device, e.g., edge_router.

interface_name The name of the interface, e.g., ae13

CLI Example:

```
salt myminion netbox.delete_interface edge_router ae13
```

`_modules.netbox.delete_inventory_item` (*item_id*)

New in version 2019.2.0.

Remove an item from a devices inventory. Identified by the netbox id

item_id Integer of item to be deleted

CLI Example:

```
salt myminion netbox.delete_inventory_item 1354
```

`_modules.netbox.delete_ipaddress` (*ipaddr_id*)

New in version 2019.2.0.

Delete an IP address. IP addresses in Netbox are a combination of address and the interface it is assigned to.

id The Netbox id for the IP address.

CLI Example:

```
salt myminion netbox.delete_ipaddress 9002
```

`_modules.netbox.filter` (*app*, *endpoint*, ****kwargs**)

Get a list of items from NetBox.

app String of netbox app, e.g., dcim, circuits, ipam

endpoint String of app endpoint, e.g., sites, regions, devices

kwargs Optional arguments that can be used to filter. All filter keywords are available in Netbox, which can be found by surfing to the corresponding API endpoint, and clicking Filters. e.g., role=router

Returns a list of dictionaries

```
salt myminion netbox.filter dcim devices status=1 role=router
```

`_modules.netbox.get` (*app*, *endpoint*, *id=None*, ****kwargs**)

Get a single item from NetBox.

app String of netbox app, e.g., dcim, circuits, ipam

endpoint String of app endpoint, e.g., sites, regions, devices

Returns a single dictionary

To get an item based on ID.

```
salt myminion netbox.get dcim devices id=123
```

Or using named arguments that correspond with accepted filters on the NetBox endpoint.

```
salt myminion netbox.get dcim devices name=my-router
```

`_modules.netbox.get_circuit_provider` (*name*, *asn=None*)

New in version 2019.2.0.

Get a circuit provider with a given name and optional ASN.

name The name of the circuit provider

asn The ASN of the circuit provider

CLI Example:

```
salt myminion netbox.get_circuit_provider Telia 1299
```

`_modules.netbox.get_interfaces` (*device_name=None*, ***kwargs*)

New in version 2019.2.0.

Returns interfaces for a specific device using arbitrary netbox filters

device_name The name of the device, e.g., edge_router

kwargs Optional arguments to be used for filtering

CLI Example:

```
salt myminion netbox.get_interfaces edge_router name="et-0/0/5"
```

`_modules.netbox.get_ipaddresses` (*device_name=None*, ***kwargs*)

New in version 2019.2.0.

Filters for an IP address using specified filters

device_name The name of the device to check for the IP address

kwargs Optional arguments that can be used to filter, e.g., family=4

CLI Example:

```
salt myminion netbox.get_ipaddresses device_name family=4
```

`_modules.netbox.make_interface_child` (*device_name*, *interface_name*, *parent_name*)

New in version 2019.2.0.

Set an interface as part of a LAG.

device_name The name of the device, e.g., edge_router.

interface_name The name of the interface to be attached to LAG, e.g., xe-1/0/2.

parent_name The name of the LAG interface, e.g., ae13.

CLI Example:

```
salt myminion netbox.make_interface_child xe-1/0/2 ae13
```

`_modules.netbox.make_interface_lag` (*device_name*, *interface_name*)

New in version 2019.2.0.

Update an interface to be a LAG.

device_name The name of the device, e.g., `edge_router`.

interface_name The name of the interface, e.g., `ae13`.

CLI Example:

```
salt myminion netbox.make_interface_lag edge_router ae13
```

`_modules.netbox.openconfig_interfaces` (*device_name=None*)

New in version 2019.2.0.

Return a dictionary structured as standardised in the `openconfig-interfaces` YANG model, containing physical and configuration data available in Netbox, e.g., IP addresses, MTU, enabled / disabled, etc.

device_name: None The name of the device to query the interface data for. If not provided, will use the Minion ID.

CLI Example:

```
salt '*' netbox.openconfig_interfaces
salt '*' netbox.openconfig_interfaces device_name=cr1.thn.lon
```

`_modules.netbox.openconfig_lacp` (*device_name=None*)

New in version 2019.2.0.

Return a dictionary structured as standardised in the `openconfig-lacp` YANG model, with configuration data for Link Aggregation Control Protocol (LACP) for aggregate interfaces.

Note: The `interval` and `lacp_mode` keys have the values set as `SLOW` and `ACTIVE` respectively, as this data is not currently available in Netbox, therefore defaulting to the values defined in the standard. See `interval` and `lacp-mode` for further details.

device_name: None The name of the device to query the LACP information for. If not provided, will use the Minion ID.

CLI Example:

```
salt '*' netbox.openconfig_lacp
salt '*' netbox.openconfig_lacp device_name=cr1.thn.lon
```

`_modules.netbox.slugify` (*value*)

‘ Slugify given value. Credit to Django project https://docs.djangoproject.com/en/2.0/_modules/django/utils/text/#slugify

`_modules.netbox.update_device` (*name*, ****kwargs**)

New in version 2019.2.0.

Add attributes to an existing device, identified by name.

name The name of the device, e.g., `edge_router`

kwargs Arguments to change in device, e.g., `serial=JN2932930`

CLI Example:

```
salt myminion netbox.update_device edge_router serial=JN2932920
```

`_modules.netbox.update_interface` (*device_name*, *interface_name*, ***kwargs*)

New in version 2019.2.0.

Update an existing interface with new attributes.

device_name The name of the device, e.g., edge_router

interface_name The name of the interface, e.g., ae13

kwargs Arguments to change in interface, e.g., mac_address=50:87:69:53:32:D0

CLI Example:

```
salt myminion netbox.update_interface edge_router ae13 mac_  
↪address=50:87:69:53:32:D0
```


9.1 Quick Start

This is a configuration example to quickly get started with `salt-sproxy`.

9.1.1 1. Install `salt-sproxy`

Run `pip install salt-sproxy` either at root, or within a virtual environment.

If you don't know how to install `pip`, see this document: <https://pip.pypa.io/en/stable/installing/>.

For setting up a virtual environment, check out <https://virtualenv.pypa.io/en/stable/installation/>.

If you have more specific requirements for the `salt-sproxy` installation, see *Installation*.

9.1.2 2. Build the list of devices

Say you have a list of devices you want to manage. For ease, you can put them into a file:

`/etc/salt/roster`

```
router1:
  driver: junos
router2:
  driver: iosxr
switch1:
  driver: eos
fw1:
  driver: panos
  host: fw1.firewall1.as1234.net
```

Note: The `/etc/salt/roster` file can use any of the available SLS formats (combinations of the Salt *Renderer modules*) - Jinja + YAML, YAML, JSON, pure Python, JSON5, HJSON, etc.

For more examples, see also *Using the File Roster*.

9.1.3 3. Configure

Apply the following configuration:

```
/etc/salt/master
```

```
roster: file
```

This is all you need at minimum, however, you may have more specific requirements which you can customise using the configuration options documented in <https://docs.saltstack.com/en/latest/ref/configuration/master.html>.

9.1.4 4. Prepare the connection credentials

In a file, say `/srv/pillar/proxy.sls`, you'll need the following structure:

```
proxy:
  proxytype: <proxy type>
  username: <username>
  password: <password>
  host: <host>
```

Where `proxy type` is the name of one of the available Proxy modules, either Salt native (<https://docs.saltstack.com/en/latest/ref/proxy/all/index.html>), or developed in your own environment.

Note: Either of these fields (i.e., `proxytype`, `username`, `password`, `host`) can be specified in the list of devices in the Pillar above (step 2). Generally, in this file, you put the list of parameters that are globally available to any devices. For example, if you're using the same username to manage all devices, you don't need to put it in the Pillar defined at *step 2*, but rather set it here.

Example:

```
proxy:
  proxytype: napalm
  username: salt
  password: SaltSPr0xyRocks!
  host: {{ opts.id }}.as1234.net
```

The trick in the SLS above is the `host` field, which is rendered differently for each device; for instance, the hostname for the device `router1` would be `router1.as1234.net`, and so on. As an exception, at *step 2*, for `fw2` we defined a most specific `host` field, so `salt-sproxy` is going to use that one instead.

In the same way you can build custom dynamically rendered fields, as your business logic requires, making use of the flexibility of the SLS file format (which is by default Jinja + YAML, see [this](#) for more information).

Tip: If you want to use your own username / SSH key for authentication, you can configure the following:

```
username: {{ salt.envIRON.get('USER') }}
```

The configuration above, would dynamically use the username currently logged in, which could be particularly useful for shared environments where multiple users (with potentially different access levels) can log in and run Salt commands.

To authenticate using your SSH key, you need to set the `password` field blank / empty string (i.e., `password: ''`).

As for using a custom private SSH key, you should check the documentation of the Proxy module of choice. For example, if you're using [NAPALM](#), the location of the SSH key would be configured under the `optional_args` key, e.g.,

```
proxy:
  proxytype: napalm
  username: {{ salt.envIRON.get('USER') }}
  password: ''
  host: {{ opts.id }}.as1234.net
  optional_args:
    key_file: /path/to/priv/key
```

Granted you have the structure above in the `/srv/pillar/proxy.sls` file, as a last step, you only need to include it into the Pillar top file:

```
/srv/pillar/top.sls
```

```
base:
  '*':
    - proxy
```

9.1.5 5. Happy automating!

With these three files (`/etc/salt/roster`, `/etc/salt/master`, and `/srv/pillar/proxy.sls`) configured as described, you can now start automating your network, e.g.,

```
$ salt-sproxy router1 net.arp
# ... snip ...

$ salt-sproxy -L router1,router2 net.load_config \
  text='set system ntp server 10.10.10.1'
# ... snip ...

$ salt-sproxy router2 napalm.junos_rpc 'get-validation-statistics'
# ... snip ...

$ salt-sproxy \* net.cli 'request system zeroize'
```

9.2 Installation

The base installation is pretty much straightforward, `salt-sproxy` is installable using `pip`. See <https://packaging.python.org/tutorials/installing-packages/> for a comprehensive guide on the installing Python packages.

Either when installing in a virtual environment, or directly on the base system, execute the following:

```
$ pip install salt-sproxy
```

If you would like to install a specific Salt version, you will firstly need to instal Salt (via `pip`) pinning to the desired version, e.g.,

```
$ pip install salt==2018.3.4
$ pip install salt-sproxy
```

9.2.1 Easy installation

We also provide a script to install the system requirements: <https://raw.githubusercontent.com/mirceaulinic/salt-sproxy/master/install.sh>

Usage example:

- Using curl

```
$ curl sproxy-install.sh -L https://raw.githubusercontent.com/mirceaulinic/salt-
↳sproxy/master/install.sh
# check the contents of sproxy-install.sh
$ sudo sh sproxy-install.sh
```

- Using wget

```
$ wget -O sproxy-install.sh https://raw.githubusercontent.com/mirceaulinic/salt-
↳sproxy/master/install.sh
# check the contents of sproxy-install.sh
$ sudo sh sproxy-install.sh
```

- Using fetch (on FreeBSD)

```
$ fetch -o sproxy-install.sh https://raw.githubusercontent.com/mirceaulinic/salt-
↳sproxy/master/install.sh
# check the contents of sproxy-install.sh
$ sudo sh sproxy-install.sh
```

One liner:

Warning: This method can be dangerous and it is not recommended on production systems.

```
$ curl -L https://raw.githubusercontent.com/mirceaulinic/salt-sproxy/master/install.
↳sh | sudo sh
```

See <https://gist.github.com/mirceaulinic/bdbbcbfbc3588b1c8b1ec7ef63931ac6> for a sample one-line installation on a fresh Fedora server.

The script ensures Python 3 is installed on your system, together with the virtualenv package, and others required for Salt, in a virtual environment under the `$HOME/venvs/salt-sproxy` path. In fact, when executing, you will see that the script will tell where it's going to try to install, e.g.,

```
$ sudo sh install.sh

Installing salt-sproxy under /home/mircea/venvs/salt-sproxy

Reading package lists... Done

~~~ snip ~~~

Installation complete, now you can start using by executing the following command:
. /home/mircea/venvs/salt-sproxy/bin/activate
```

After that, you can start using it:

```
$ . /home/mircea/venvs/salt-sproxy/bin/activate
(salt-sproxy) $
(salt-sproxy) $ salt-sproxy -V
Salt Version:
    Salt: 2019.2.0
    Salt SProxy: 2019.6.0b1

Dependency Versions:
    Ansible: Not Installed
    cffi: 1.12.3
    dateutil: Not Installed
    docker-py: Not Installed
    gitdb: Not Installed
    gitpython: Not Installed
    Jinja2: 2.10.1
    junos-eznc: 2.2.1
    jxmlease: 1.0.1
    libgit2: Not Installed
    M2Crypto: Not Installed
    Mako: Not Installed
    msgpack-pure: Not Installed
    msgpack-python: 0.6.1
    NAPALM: 2.4.0
    ncclient: 0.6.4
    Netmiko: 2.3.3
    paramiko: 2.4.2
    pycparser: 2.19
    pycrypto: 2.6.1
    pycryptodome: Not Installed
    pyeapi: 0.8.2
    pygit2: Not Installed
    PyNetBox: 4.0.6
    PyNSO: Not Installed
    Python: 3.6.7 (default, Oct 22 2018, 11:32:17)
    python-gnupg: Not Installed
    PyYAML: 5.1
    PyZMQ: 18.0.1
    scp: 0.13.2
    smmap: Not Installed
    textfsm: 0.4.1
    timelib: Not Installed
    Tornado: 4.5.3
    ZMQ: 4.3.1

System Versions:
    dist: Ubuntu 18.04 bionic
    locale: UTF-8
    machine: x86_64
    release: 4.18.0-20-generic
    system: Linux
    version: Ubuntu 18.04 bionic
```

9.2.2 Upgrading

To install a newer version, you can execute `pip install -U salt-sproxy`, however this is also going to upgrade your Salt installation. So in case you would like to use a specific Salt version, it might be a better idea to install the specific salt-sproxy version you want. You can check at <https://pypi.org/project/salt-sproxy/#history> the list of available salt-sproxy versions.

Example:

```
$ pip install salt-sproxy==2019.6.0
```

9.3 Using the Roster Interface

While from the CLI perspective salt-sproxy looks like it works similar to the usual salt command, in fact, they work fundamentally different. One of the most important differences is that salt is aware of what Minions are connected to the Master, therefore it is easy to know what Minions would be matched by a certain target expression (see <https://docs.saltstack.com/en/latest/topics/targeting/> for further details). In contrast, by definition, salt-sproxy doesn't suppose there are any (Proxy) Minions running, so it cannot possibly know what Minions would be matched by an arbitrary expression. For this reasoning, we need to “help” it by providing the list of all the devices it should be aware of. This is done through the Roster interface; even though this Salt subsystem has initially been developed for salt-ssh.

There are several Roster modules natively available in Salt, or you may write a custom one in your own environment, under the `salt://_roster` directory.

To make it work, you would need to provide two configuration options (either via the CLI, or through the Master configuration file. See *Command Line and Configuration Options*, in particular `-r` (or `-roster`), and `--roster-file` (when the Roster module loads the list of devices from a file).

For example, let's see how we can use the *Ansible Roster*.

9.3.1 Roster usage example: Ansible

If you already have an Ansible inventory, simply drop it into a file, e.g., `/etc/salt/roster`.

Note: The Ansible inventory file doesn't need to provide any connection details, as they must be configured into the Pillar. If you do provide them however, they could be used to override the data compiled from the Pillar. See *Overriding Pillar data* for an example.

With that in mind, let's consider a very simply inventory, e.g.,

`/etc/salt/roster:`

```
[routers]
router1
router2
router3

[switches]
switch1
switch2
```

Reference this file, and tell salt-sproxy to interpret this file as an Ansible inventory:

/etc/salt/master:

```
roster: ansible
roster_file: /etc/salt/roster
```

To verify that the inventory is interpreted correctly, run the following command which should display all the possible devices salt-sproxy should be aware of:

```
$ salt-sproxy \* --preview-target
- router1
- router2
- router3
- switch1
- switch2
```

Then you can check that your desired target matches - say run against all the routers:

```
$ salt-sproxy 'router*' --preview-target
- router1
- router2
- router3
```

Hint: If you don't provide the Roster name and the path to the Roster file, into the Master config file, you can specify them on the command line, e.g.,

```
$ salt-sproxy 'router*' --preview-target -r ansible --roster-file /etc/salt/roster
```

The default target matching is `glob` (shell-like globbing) - see [Target Selection](#) for more details, and other target selection options.

Important: Keep in mind that some Roster modules may not implement all the possible target selection options.

Using the inventory above, we can also use the **PCRE** (Perl Compatible Regular Expression) matching and target devices using a regular expression, e.g.,

```
$ salt-sproxy -E 'router(1|2).?' --preview-target
- router1
- router2
$ salt-sproxy -E '(switch|router)1' --preview-target
- router1
- switch1
```

The inventory file doesn't necessarily need to be flat, can be as complex as you want, e.g.,

```
all:
  children:
    usa:
      children:
        northeast: ~
        northwest:
          children:
            seattle:
```

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```
    hosts:
      edge1.seattle
  vancouver:
    hosts:
      edge1.vancouver
  southeast:
    children:
      atlanta:
        hosts:
          edge1.atlanta:
          edge2.atlanta:
      raleigh:
        hosts:
          edge1.raleigh:
  southwest:
    children:
      san_francisco:
        hosts:
          edge1.sfo
      los_angeles:
        hosts:
          edge1.la
```

Using this inventory, you can then run, for example, against all the devices in Atlanta, to gather the LLDP neighbors for every device:

```
$ salt-sproxy '*.atlanta' net.lldp
edge1.atlanta:
  ~~~ snip ~~~
edge2.atlanta:
  ~~~ snip ~~~
```

Targeting using groups

Another very important detail here is that, depending on the structure of the inventory, and how the devices are grouped, you can use these groups to target using the `-N` target type (nodegroup). For example, based on the hierarchical inventory file above, we can use these targets:

```
# All devices in the USA:
$ salt-sproxy -N usa --preview-target
- edge1.seattle
- edge1.vancouver
- edge1.atlanta
- edge2.atlanta
- edge1.raleigh
- edge1.la
- edge1.sfo

# All devices in the North-West region:
$ salt-sproxy -N northwest --preview-target
- edge1.seattle
- edge1.vancouver

# All devices in the Atlanta area:
$ salt-sproxy -N atlanta --preview-target
```

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```
- edge1.atlanta
- edge2.atlanta
```

The nodegroups you can use for targeting depend on the names you've assigned in your inventory, and sometimes may be more useful to use them vs. the device name (which may not contain the area / region / country name).

Overriding Pillar data

In the Roster file (Ansible inventory) you may prefer to have more specific connection credentials for some particular devices. In this case, you only need to specify them directly under the device, or using `host_vars` as normally; for example, let's consider the inventory from the above, with the difference that now `edge1.raleigh` has more specific details:

```
all:
  children:
    usa:
      children:
        northeast: ~
        northwest:
          children:
            seattle:
              hosts:
                edge1.seattle
            vancouver:
              hosts:
                edge1.vancouver
        southeast:
          children:
            atlanta:
              hosts:
                edge1.atlanta:
                edge2.atlanta:
            raleigh:
              hosts:
                edge1.raleigh:
                  username: different
                  password: not-the-same
        southwest:
          children:
            san_francisco:
              hosts:
                edge1.sfo
            los_angeles:
              hosts:
                edge1.la
```

With this Roster, `salt-sproxy` will try to authenticate using the username and password specified. The same goes to the rest of the other credentials and fields required by the Proxy module you're using, i.e., `port`, `optional_args`, etc. - check the Salt documentation to understand what fields you have available.

Configuring static Grains

In a similar way to overriding Pillar data for authentication (see the paragraph above), you can equally configure static Grains per device, by simply providing them under the `grains` key, e.g.,

```
all:
  children:
    usa:
      children:
        northeast: ~
        northwest:
          children:
            seattle:
              hosts:
                edge1.seattle
            vancouver:
              hosts:
                edge1.vancouver
        southeast:
          children:
            atlanta:
              hosts:
                edge1.atlanta:
                edge2.atlanta:
              grains:
                role: transit
                site: atl01
            raleigh:
              hosts:
                edge1.raleigh:
            southwest:
              children:
                san_francisco:
                  hosts:
                    edge1.sfo
                los_angeles:
                  hosts:
                    edge1.la
```

With the Roster above, derived from the previous examples, the `edge2.atlanta` device is going to have two static Grains associated, i.e., `site` and `role` with the values as configured in the Roster.

9.3.2 Loading the list of devices from the Pillar

The Pillar subsystem is powerful and flexible enough to be used as an input providing the list of devices and their properties.

To use the *Pillar Roster* you only need to ensure that you can access the list of devices you want to manage into a Pillar. The Pillar system is designed to provide data (from whatever source, i.e., HTTP API, database, or any file format you may prefer) to one specific Minion (or some / all). That doesn't mean that the Minion must be up and running, but simply just that one or more Minions have access to this data.

In the Master configuration file, configure the `roster` or `proxy_roster`, e.g.,

```
roster: pillar
```

By default, the Pillar Roster is going to check the Pillar data for `*` (any Minion), and load it from the `devices` key. In other words, when executing `salt-sproxy pillar.show_pillar` the output should have at least the `devices` key. To use different settings, have a look at the documentation: *Pillar Roster*.

Consider the following example setup:

```
/etc/salt/master
```



```
pillar_roots:
  base:
    - /srv/salt/pillar

roster: pillar
```

```
/srv/salt/pillar/top.sls
```

```
base:
  '*':
    - devices_pillar
  'minion*':
    - dummy_pillar
```

```
/srv/salt/pillar/devices_pillar.sls
```

```
devices:
  - name: minion1
  - name: minion2
```

```
/srv/salt/pillar/dummy_pillar.sls
```

```
proxy:
  proxytype: dummy
```

With this configuration, you can verify that the list of expected devices is properly defined:

```
$ salt-run pillar.show_pillar
devices:
  |_
  -----
  name:
    minion1
  |_
  -----
  name:
    minion2
```

Having this available, we can now start using salt-sproxy:

```
$ salt-sproxy \* --preview-target
- minion1
- minion2
```

When working with Pillar SLS files, you can provide them in any format, either Jinja + YAML, or pure Python, e.g. generate a longer list of devices, dynamically:

```
/srv/salt/pillar/devices_pillar.sls
```

```
devices:
  {% for id in range(100) %}
  - name: minion{{ id }}
  {%- endfor %}
```

Or:

```
/srv/salt/pillar/devices_pillar.sls
```

```
#!/py

def run():
    return {
        'devices': [
            'minion{}'.format(id_)
            for id_ in range(100)
        ]
    }
```

Note: The latter Python example would be particularly useful when the data compilation requires more computation, while keeping the code readable, e.g., execute HTTP requests, or anything you can usually do in Python scripts in general.

With either of the examples above, the targeting would match:

```
$ salt-sproxy \* --preview-target
- minion0
- minion1

~~~ snip ~~~

- minion98
- minion99
```

As the Pillar SLS files are flexible enough to allow you to compile the list of devices you want to manage using whatever way you need and possibly coded in Python. Say we would want to gather the list of devices from an HTTP API:

/srv/salt/pillar/devices_pillar.sls

```
#!/py

import requests

def run():
    ret = requests.post('http://example.com/devices')
    return {'devices': ret.json() }
```

Or another example, slightly more advanced - retrieve the devices from a MySQL database:

/srv/salt/pillar/devices_pillar.sls

```
#!/py

import mysql.connector

def run():
    devices = []
    mysql_conn = mysql.connector.connect(host='localhost',
                                         database='database',
                                         user='user',
                                         password='password')

    get_devices_query = 'select * from devices'
    cursor = mysql_conn.cursor()
    cursor.execute(get_devices_query)
```

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```

records = cursor.fetchall()
for row in records:
    devices.append({'name': row[1]})
cursor.close()
return {'devices': devices}

```

Important: Everything with the Pillar system remains the same as always, so you can very well use also the External Pillar to provide the list of devices - see <https://docs.saltstack.com/en/latest/ref/pillar/all/index.html> for the list of the available External Pillars modules that allow you to load data from various sources.

Check also the *Using the Pillar Roster* example on how to load the list of devices from an External Pillar, as the functionality you may need might already be implemented and available.

Configuring static Grains

Using the `devices_pillar.sls` file from the previous examples, you can provide static Grains per device, under the `grains` key, e.g.,

```
/srv/salt/pillar/devices_pillar.sls
```

```

devices:
  {% for id in range(100) %}
  - name: minion{{ id }}
    grains:
      site: site{{ id }}
  {%- endfor %}

```

In this case, the Grains data is dynamically generated through the Jinja loop, however it could be provided in any way you'd prefer. Executing the following command, you can check that the Grains data is properly distributed:

```

$ salt-sproxy minion17 grains.get site
minion17:
    site17

```

9.3.3 Roster usage example: NetBox

The *NetBox Roster* is a good example of a Roster modules that doesn't work with files, rather gathers the data from NetBox via the API.

Note: The NetBox Roster module is currently not available in the official Salt releases, and it is distributed as part of the `salt-sproxy` package and dynamically loaded on runtime, so you don't need to worry about that, simply reference it, configure the details as documented and start using it straight away.

To use the NetBox Roster, simply put the following details in the Master configuration you want to use (default `/etc/salt/master`):

```

roster: netbox

netbox:
  url: <NETBOX_URL>

```

You can also specify the `token`, and the `keyfile` but for this Roster specifically, the `url` is sufficient.

To verify that you are indeed able to retrieve the list of devices from your NetBox instance, you can, for example, execute:

```
$ salt-run salt.cmd netbox.filter dcim devices
# ~~~ should normally return all the devices ~~~

# Or with some specific filters, e.g.:
$ salt-run salt.cmd netbox.filter dcim devices site=<SITE> status=<STATUS>
```

Once confirmed this works well, you can verify that the Roster is able to pull the data:

```
$ salt-sproxy '*' --preview-target
```

In the same way, you can then start executing Salt commands targeting using expressions that match the name of the devices you have in NetBox:

```
$ salt-sproxy '*atlanta' net.lldp
edge1.atlanta:
    ~~~ snip ~~~
edge2.atlanta:
    ~~~ snip ~~~
```

Enhanced Grain targeting

When NetBox Roster pulls the data from NetBox via the API, from the `dcim` app, `devices` endpoint, it retrieves additional information about the device, e.g.,

```
{
  "count": 1,
  "next": null,
  "previous": null,
  "results": [
    {
      "id": 1,
      "name": "edge1.vlcl",
      "display_name": "edge1.vlcl",
      "device_type": {
        "id": 1,
        "url": "https://netbox.live/api/dcim/device-types/1/",
        "manufacturer": {
          "id": 5,
          "url": "https://netbox.live/api/dcim/manufacturers/5/",
          "name": "Juniper",
          "slug": "juniper"
        },
        "model": "MX960",
        "slug": "mx960",
        "display_name": "Juniper MX960"
      },
      "device_role": {
        "id": 7,
        "url": "https://netbox.live/api/dcim/device-roles/7/",
        "name": "Router",
        "slug": "router"
      }
    }
  ]
}
```

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```

    },
    "tenant": null,
    "platform": {
      "id": 3,
      "url": "https://netbox.live/api/dcim/platforms/3/",
      "name": "Juniper Junos",
      "slug": "juniper-junos"
    },
    "serial": "",
    "asset_tag": null,
    "site": {
      "id": 1,
      "url": "https://netbox.live/api/dcim/sites/1/",
      "name": "VLC1",
      "slug": "vlc1"
    },
    "rack": {
      "id": 1,
      "url": "https://netbox.live/api/dcim/racks/1/",
      "name": "R1",
      "display_name": "R1"
    },
    "position": 1,
    "face": {
      "value": 0,
      "label": "Front"
    },
    "parent_device": null,
    "status": {
      "value": 1,
      "label": "Active"
    },
    "primary_ip": null,
    "primary_ip4": null,
    "primary_ip6": null,
    "cluster": null,
    "virtual_chassis": null,
    "vc_position": null,
    "vc_priority": null,
    "comments": "",
    "local_context_data": null,
    "tags": [],
    "custom_fields": {},
    "created": "2019-08-12",
    "last_updated": "2019-08-12T11:08:21.706641Z"
  }
]
}

```

All this data is by default available in the Grains when targeting, so you can use the *Grain* to match the devices you want to run against.

Examples:

- Select devices under the `router` role:

```
salt-sproxy -G netbox:device_role:role test.ping
```

- Select devices from the `vlc1` site:

```
salt-sproxy -G netbox:site:slug:vlc1 test.ping
```

9.3.4 Other Roster modules

If you may need to load your data from various other data sources, that might not be covered in the existing Roster modules. Roster modules are easy to write, and you only need to drop them into your `salt://_roster` directory, then it would be great if you could open source them for the benefit of the community (either submit them to this repository, at <https://github.com/mirceaulinic/salt-sproxy>, or to the official [Salt repository](#) on GitHub)

9.4 Managing Static Grains

Grains are generally a delicate topic in Salt, particularly on Proxy Minions which need to be able to connect to the remote device to collect the Grains, while the connection credentials may depend on the Grains themselves - that becomes a chicken and egg type problem!

In *salt-sproxy*, you can configure static Grains, in different ways. One of the easiest is adding static data under the `grains` (or `sproxy_grains` or `default_grains`) key in the Master config file, for example:

```
/etc/salt/master
```

```
grains:
  salt:
    role: proxy
```

The static Grains configured in this way are going to be shared among all the devices / Minions managed via *salt-sproxy*.

Important: The static Grains configured in these ways are available to be used in your target expressions. For example, the above can be used, e.g., `salt-sproxy -G salt:role:proxy --preview-target`.

To configure more specific Grains per device, or groups of devices, you have the following options:

9.4.1 Static Grains in File

To configure static Grains for one specific device, you can put your data as described in <https://docs.saltstack.com/en/latest/topics/grains/#grains-in-etc-salt-grains>, more specifically under the `/etc/salt/proxy.d/` directory. For example, if you'd want to configure for the device `router1`, you'd have the following file:

```
/etc/salt/proxy.d/router1/grains
```

```
role: router
```

9.4.2 Static Grains in Roster

Some *Extension Roster Modules* allow you to put static Grains granularly. See, for example *Configuring static Grains* (for the *Pillar Roster*) or *Configuring static Grains* (for the *Ansible Roster*).

9.5 Targeting

Targeting devices is largely based on the Roster interface. This is the starting point, where *salt-sproxy* know what devices you want to manage. The Roster interface can be a Pillar file, an Ansible inventory file, a NetBox instance and so on. See [Using the Roster Interface](#) for more details, usage examples and documentation for each of the available Roster options.

To put it in other words, the Roster provides the totality (or the universe) of devices you have. When you're executing a command, you may want to execute a command against all these devices, or only a subset of them. There are several targeting selection mechanisms, as presented below.

Targeting in *salt-sproxy*, from an user perspective, is very similar to the native Salt targeting - however, the implementation is fundamentally different (again, please see [Using the Roster Interface](#) for more details on this); that's why the targeting in *salt-sproxy* comes with some caveats you should be aware of.

Tip: Before executing any command, it may be a good idea to check that your target matches the devices you want to run against, by using the `--preview-target` CLI option, e.g.,

```
salt-sproxy -G netbox:role:router --preview-target
```

See also:

When targeting making use of Grains or Pillar data that depend on the device characteristics (such as interfaces, IP addresses, OS version, platform details, and so on), or other properties retrieved from other systems, such as APIs, databases, etc., *salt-sproxy* needs cached data which is obtained `_only_` after the (first) execution is complete. To do so, you have a number of options: once *salt-sproxy* is installed and configured, you can run `salt-sproxy '*' test.ping` or similar to execute across all the devices and cache their data.

Alternatively, you may want to look at `-invasive-targeting` or `-preload-targeting` options. These two options would allow you to work around this caveat, however bear in mind they'll evaluate - and eventually connect to - every device *salt-sproxy* is aware of, in order to determine which devices match your target.

9.5.1 Glob

Shell-style globbing on the device name / Minion ID.

See <https://docs.saltstack.com/en/latest/topics/targeting/globbering.html#globbering>

Examples:

- Match all the devices *salt-sproxy* knows about:

```
salt-sproxy '*' test.ping
```

- Match `edge1` and `edge3` devices:

```
salt-sproxy 'edge[1,3]' test.ping
```

9.5.2 PCRE

PCRE stands for Perl Compatible Regular Expression, so you can target against devices with the name matching the regular expression.

See also: <https://docs.saltstack.com/en/latest/topics/targeting/globbering.html#regular-expressions>

Example: match top of rack switches with the name ending in a digit:

```
salt-sproxy -E '.*-tor\d' napalm.junos_rpc get-route-summary-information table=mpls.0
```

9.5.3 List

A list of device names.

Example: execute a command on three devices `edge1`, `edge2`, and `edge3`:

```
salt-sproxy -L 'edge1,edge2,edge3' net.arp
```

9.5.4 Grain

Targeting using Grain data.

This is a tricky subject. Unlike the native Salt, *salt-sproxy* doesn't have access to device data before connecting to it (i.e., it can't possibly know device details before even connecting to it). You can however target using Grain data, but there are some caveats, and it's up to you to decide whether you want performance or limit the resource consumption. Generally, Grain targeting won't work at the first execution, as *salt-sproxy* needs cached data. An alternative would be using the `--invasive-targeting` or `--preload-targeting` options, but that has a price (see <https://salt-sproxy.readthedocs.io/en/latest/opts.html#cmdoption-invasive-targeting> for more details).

See also:

See also: *Managing Static Grains*. Static Grains are always available, and can be anytime used in your targeting, without any restrictions.

An exception is the *NetBox Roster* module which provides an additional set of Grains you can use, under the `netbox` key. See the *Enhanced Grain targeting* section for more details.

Examples: match devices on their role:

```
salt-sproxy -G role:router test.ping
```

9.5.5 Grain PCRE

As the `grain` targeting, but instead of exact matching, can match on a regular expression on the Grain value.

Note: This targeting mechanism has the same caveats as the *Grain*.

Example: match the devices from multiple sites (e.g., `lon1`, `lon2`, etc.)

```
salt-sproxy -P site:lon\d test.ping
```

9.5.6 Pillar

Targeting using Pillar data.

Similarly to the Grain targeting, this is possible but with one caveats when you're not running active Minions: *salt-sproxy* needs this data cached in order to evaluate the target and determine which devices match, however using the CLI

(and configuration file) options `--invasive-targeting` or `--preload-targeting`, you can work around this limitation. Once you've executed once, the data will be cached, and you can use it for future targets.

Hint: If you want to target against statically defined Pillar, whenever possible, static Grains may be a better fit for your use case. Have a look at [Managing Static Grains](#).

Example:

```
salt-sproxy -I proxy:user:salt --preview-target
```

9.5.7 Pillar PCRE

As the `pillar` targeting, but instead of exact matching, can match on a regular expression on the Pillar value.

Note: This targeting mechanism has the same caveats as the [Pillar](#).

Hint: If you want to target against statically defined Pillar, whenever possible, static Grains may be a better fit for your use case. Have a look at [Managing Static Grains](#).

Example: match the devices from multiple sites, based on the hostname pattern (e.g., `lon1`, `lon2`, etc.)

```
salt-sproxy -J proxy:host:.*lon\d --preview-target
```

9.5.8 Compound

You can mix all the matchers above. See <https://docs.saltstack.com/en/latest/topics/targeting/compound.html> for more details and notes.

Example: match edge routers 1 and 3 from multiple sites

```
salt-sproxy -C 'edge[1,3] and G@role:router and P@site:lon\d' net.1ldp
```

9.6 Command Line and Configuration Options

There are a few options specific for `salt-sproxy`, however you might be already familiar with a vast majority of them from the `salt` or `salt-run` Salt commands.

Hint: Many of the CLI options are available to be configured through the file you can specify through the `-c` (`--config-dir`) option, with the difference that in the file you need to use the longer name and underscore instead of hyphen. For example, the `--roster-file` option would be configured as `roster_file: /path/to/roster/file` in the config file.

--version

Print the version of Salt and Salt SProxy that is running.

--versions-report

Show program's dependencies and version number, and then exit.

-h, --help

Show the help message and exit.

-c CONFIG_DIR, --config-dir=CONFIG_dir

The location of the Salt configuration directory. This directory contains the configuration files for Salt master and minions. The default location on most systems is `/etc/salt`.

--config-dump

New in version 2020.2.0.

Print the complete salt-sproxy configuration values (with the defaults), as YAML.

-t, --timeout

The time in seconds to await for a device to reply. Default: 60 (seconds).

When a device is not replying within this time, it is a good idea to increase the timeout value. The return when the device is slowly responding is `Minion did not return. [No response]`. When used in conjunction with `--summary`, the device will be counted under `# of devices that did not return`, but not `# of devices returned`. Moreover, salt-sproxy will exit with non-zero code, and the `ERROR: Minions returned with non-zero exit code` message will be displayed at the end.

-d, --doc, --documentation

New in version 2020.7.0.

Return the documentation for the module functions available for any Minion flavour. Note, if a specific function is available only when running under a specific Minion, you'll need to execute `sys.doc` instead.

Accepted syntax:

```
$ salt-sproxy <function> -d
$ salt-sproxy <target> <function> -d
$ salt-sproxy -d
```

(The latter syntax would return the documentation for all the Minion functions)

Example:

```
$ salt-sproxy test.ping -d
test.ping:

Used to make sure the minion is up and responding. Not an ICMP ping.

Returns ``True``.

CLI Example:

    salt '*' test.ping
```

-r, --roster

The Roster module to use to compile the list of targeted devices.

--roster-file

Absolute path to the Roster file to load (when the Roster module requires a file). Default: `/etc/salt/roster`.

--invasive-targeting

New in version 2020.2.0.

The native *salt-sproxy* targeting highly depends on the data you provide mainly through the Roster system (see also [Using the Roster Interface](#)). Through the Roster interface and other mechanisms, you are able to provide static Grains (see also [Managing Static Grains](#)), which you can use in your targeting expressions. There are situations when you may want to target using more dynamic Grains that you probably don't want to manage statically.

In such case, the `--invasive-targeting` targeting can be helpful as it connects to the device, retrieves the Grains, then executes the requested command, *only* on the devices matched by your target.

Important: The maximum set of devices you can query is the devices you have defined in your Roster – targeting in this case helps you select a subset of the devices *salt-sproxy* is aware of, based on their properties.

Caution: While this option can be very helpful, bear in mind that in order to retrieve all this data, *salt-sproxy* initiates the connection with ALL the devices provided through the Roster interface. That means, not only that resources consumption is expected to increase, but also the execution time would similarly be higher.

--preload-targeting

New in version 2020.2.0.

This is a lighter derivative of the `--invasive-targeting` option (see above), with the difference that *salt-sproxy* is not going to establish the connection with the remote device to gather the data, but will just load all the possible data without the connection. In other words, you can look at it like a combination of both `--invasive-targeting` and `-no-connect` used together.

This option is useful when the Grains and Pillars you want to use in your targeting expression don't depend on the connection with the device itself, but they are dynamically pulled from various systems, e.g., from an HTTP API, database, etc.

--sync

Deprecated since version 2020.2.0: This option has been replaced by `--static` (see below).

Whether should return the entire output at once, or for every device separately as they return.

-s, --static

New in version 2020.2.0: Starting with this release, `--static`, replaces the previous CLI option `--sync`, with the same functionality.

Whether should return the entire output at once, or for every device separately as they return.

--async

New in version 2020.7.0.

Instead of waiting for the job to run only print the job id of the started execution and return immediately, while the job continues to run in the background.

This will only log a warning like: Running in asynchronous mode. Results of this execution may be collected by attaching to the master event bus or by examining the master job cache, if configured. This execution is running under tag salt/run/20200717101228363090.

Tip: If you have the `events: true` (or `--events` on the CLI) option enabled, you'll also see the individual returns from every device, on the event bus. See [Event-Driven Automation and Orchestration](#) for more information.

--cache-grains

Deprecated since version 2020.10.0: This argument has been defaulted to `True`, and replaced with `--dont-cache-grains`, having a flipped action (i.e., do not attempt to cache the Grains).

Cache the collected Grains. Beware that this option overwrites the existing Grains. This may be helpful when using the `salt-sproxy` only, but may lead to unexpected results when running in *Mixed Environments*. That said, when running together with `--use-existing-proxy`, there shouldn't be any issues, as `salt-sproxy` will attempt to use the existing (Proxy) Minion if any, otherwise it will write the collected Grains to the cache, which is a safe operation in this case (i.e., it won't overwrite the Grains of an existing Minion).

--dont-cache-grains

New in version 2020.10.0.

Do not attempt to cache the Grains after execution is complete. This is generally discouraged, particularly if you want to use the `-G` or any targeting combination that requires Grains.

--cache-pillar

Deprecated since version 2020.10.0: This argument has been defaulted to `True`, and replaced with `--dont-cache-pillar`, having a flipped action (i.e., do not attempt to cache the Pillar).

Cache the collected Pillar. Beware that this option overwrites the existing Pillar. This may be helpful when using the `salt-sproxy` only, but may lead to unexpected results when running in *Mixed Environments*. That said, when running together with `--use-existing-proxy`, there shouldn't be any issues, as `salt-sproxy` will attempt to use the existing (Proxy) Minion if any, otherwise it will write the compiled Pillar to the cache, which is a safe operation in this case (i.e., it won't overwrite the cached Pillar of an existing Minion).

--dont-cache-pillar

New in version 2020.10.0.

Do not attempt to cache the Pillar after execution is complete. This is generally discouraged, particularly if you want to use the `-I` or any targeting combination that requires Pillar.

--no-cached-grains

Do not use the cached Grains (i.e., always collect Grains).

--no-cached-pillar

Do not use the cached Pillar (i.e., always re-compile the Pillar).

--no-grains

Do not attempt to collect Grains at all. While it does reduce the runtime, this may lead to unexpected results when the Grains are referenced in other subsystems.

--no-pillar

Do not attempt to compile Pillar at all. While it does reduce the runtime, this may lead to unexpected results when the Pillar data is referenced in other subsystems.

-b, --batch, --batch-size

The number of devices to connect to in parallel.

--batch-wait

New in version 2020.2.0.

Wait a specific number of seconds after each batch is done before executing the next one.

-p, --progress

New in version 2020.2.0.

Display a progress graph to visually show the execution of the command across the list of devices.

Note: As of release 2020.2.0, the best experience of using the progress graph is in conjunction with the `-s /`

`--static` option, otherwise there's a small display issue.

--hide-timeout

New in version 2020.2.0.

Hide devices that timeout.

--failhard

New in version 2020.2.0.

Stop the execution at the first error.

--summary

New in version 2020.2.0.

Display a summary of the command execution:

- Total number of devices targeted.
- Number of devices that returned without issues.
- Number of devices that timed out executing the command. See also `-t` or `--timeout` argument to adjust the timeout value.
- Number of devices with errors (i.e., there was an error while executing the command).
- Number of unreachable devices (i.e., couldn't establish the connection with the remote device).

In `-v` / `--verbose` mode, this output is enhanced by displaying the list of devices that did not return / with errors / unreachable.

Example:

```
-----
Summary
-----
# of devices targeted: 10
# of devices returned: 3
# of devices that did not return: 5
# of devices with errors: 0
# of devices unreachable: 2
-----
```

--show-jid

New in version 2020.2.0.

Display `jid` without the additional output of `-verbose`.

-v, --verbose

New in version 2020.2.0.

Turn on command verbosity, display `jid`, devices per batch, and detailed summary.

--preview-target

Show the devices expected to match the target, without executing any function (i.e., just print the list of devices matching, then exit).

--sync-roster

Synchronise the Roster modules (both salt-sproxy native and provided by the user in their own environment).
Default: `True`.

--sync-modules

New in version 2019.10.0.

Load the Execution modules provided together with salt-sproxy. Beware that it may override the Salt native modules, or your own extension modules. Default: `False`.

You can also add `sync_modules: true` into the Master config file, if you want to always ensure that salt-sproxy is using the Execution modules delivered with this package.

--sync-grains

New in version 2019.10.0.

Synchronise the Grains modules you may have in your own environment.

--sync-all

New in version 2020.2.0.

Load the all extension modules provided with salt-sproxy, as well as your own extension modules from your environment.

--saltenv

New in version 2020.2.0.

The Salt environment name where to load extension modules and files from.

--events

Whether should put the events on the Salt bus (mostly useful when having a Master running). Default: `False`.

Important: See *Event-Driven Automation and Orchestration* for further details.

--use-existing-proxy

Execute the commands on an existing Proxy Minion whenever available. If one or more Minions matched by the target don't exist (or the key is not accepted by the Master), salt-sproxy will fallback and execute the command locally, and, implicitly, initiate the connection to the device locally.

Note: This option requires a Master to be up and running. See *Mixed Environments* for more information.

Important: When using this option in combination with a Roster, salt-sproxy will firstly try to match your target based on the provided Roster, and then only after that will execute the Salt function on the targets, and on the existing Proxy Minions, best efforts. For example, if your target matches two devices, say `router1` and `switch1`, and there's an available Proxy Minion running for `router1`, then the Salt function would be executed on the `router1` existing Minion, over the already established connection, while for `switch1` the connection is going to be initialised during run time.

If you want to bypass the Roster matching, and target *only* existing (Proxy) Minions, make sure you don't have the `roster` or `proxy_roster` options configured, or execute with `-r None`, e.g.,

```
$ salt-sproxy \* --preview-target --use-existing-proxy -r None
```

The command above would be the equivalent of the following Salt command: `salt * --preview-target`.

--no-connect

New in version 2019.10.0.

Do not initiate the connection with the remote device. Please use this option with care, as it may lead to unexpected results. The main use case (although not limited to) is executing Salt functions that don't necessarily require the connection, however they may need Pillar or Grains that are associated with each individual device. Such examples include HTTP requests, working with files, and so on. Keep in mind that, as the connection is

not established, it won't re-compile fresh Grains, therefore it'll be working with cached data. Make sure that the data you have available is already cached before executing with `--no-connect`, by executing `grains.items` and / or `pillar.items`. The point of this functionality is to speed up the execution when dealing with a large volume of execution events (either from the CLI or through the *The Proxy Runner*), and when the connection is not actually absolutely necessary.

--test-ping

New in version 2019.10.0.

When executing with `--use-existing-proxy`, you can use this option to verify whether the Minion is responsive, and only then attempt to send out the command to be executed on the Minion, otherwise executed the function locally.

Note: Keep in mind that this option generates an additional event on the bus for every execution.

--no-target-cache

New in version 2019.10.0.

Avoid loading the list of targets from the cache.

Changed in version 2020.3.0: This option now defaults to `True`.

--pillar-root

New in version 2020.2.0.

Set a specific directory as the base pillar root.

--file-root

New in version 2020.2.0.

Set a specific directory as the base file root.

--states-dir

New in version 2020.2.0.

Set a specific directory to search for additional States.

-m, --module-dirs

New in version 2020.2.0.

Specify one or more directories where to load the extension modules from. Multiple directories can be provided by passing `-m` or `--module-dirs` multiple times.

--file-roots, --display-file-roots

Display the location of the salt-sproxy installation, where you can point your `file_roots` on the Master, to use the *Proxy Runner* and other extension modules included in the salt-sproxy package. See also *The Proxy Runner*.

--save-file-roots

Save the configuration for the `file_roots` in the Master configuration file, in order to start using the *Proxy Runner* and other extension modules included in the salt-sproxy package. See also *The Proxy Runner*. This option is going to add the salt-sproxy installation path to your existing `file_roots`.

-i, --ignore-host-keys

New in version 2020.10.0.

By default ssh host keys are honored and connections will ask for approval. Use this option to disable `StrictHostKeyChecking`.

--no-host-keys

New in version 2020.10.0.

Fully ignores ssh host keys which by default are honored and connections would ask for approval. Useful if the host key of a remote server has changed and would still error with `--ignore-host-keys`.

--identities-only

New in version 2020.10.0.

Execute SSH with `-o IdentitiesOnly=yes`. This option is intended for situations where ssh-agent offers many different identities and allow ssh to ignore those identities and use the only one specified in options.

--priv

New in version 2020.10.0.

Specify the SSH private key file to be used for authentication.

--priv-passwd

New in version 2020.10.0.

Specify the SSH private key file's passphrase when required.

9.6.1 Logging Options

Logging options which override any settings defined on the configuration files.

-l LOG_LEVEL, --log-level=LOG_LEVEL

Console logging log level. One of all, garbage, trace, debug, info, warning, error, quiet. Default: error.

--log-file=LOG_FILE

Log file path. Default: `/var/log/salt/master`.

--log-file-level=LOG_LEVEL_LOGFILE

Logfile logging log level. One of all, garbage, trace, debug, info, warning, error, quiet. Default: error.

9.6.2 Target Selection

The default matching that Salt utilizes is shell-style globbing around the minion id. See <https://docs.python.org/2/library/fnmatch.html#module-fnmatch>.

See also:*Targeting***-E, --pcre**

The target expression will be interpreted as a PCRE regular expression rather than a shell glob.

-L, --list

The target expression will be interpreted as a comma-delimited list; example: `server1.foo.bar,server2.foo.bar,example7.quo.qux`

-G, --grain

The target expression matches values returned by the Salt grains system on the minions. The target expression is in the format of `<grain value>:<glob expression>`; example: `'os:Arch*'`

This was changed in version 0.9.8 to accept glob expressions instead of regular expression. To use regular expression matching with grains, use the `-grain-pcre` option.

-P, --grain-pcre

The target expression matches values returned by the Salt grains system on the minions. The target expression is in the format of `<grain value>:<regular expression>`; example: `'os:Arch.*'`

-N, --nodegroup

Use a predefined compound target defined in the Salt master configuration file.

-R, --range

Instead of using shell globs to evaluate the target, use a range expression to identify targets. Range expressions look like `%cluster`.

Using the Range option requires that a range server is set up and the location of the range server is referenced in the master configuration file.

9.6.3 Output Options

--out

Pass in an alternative outputter to display the return of data. This outputter can be any of the available outputters:

`highstate`, `json`, `key`, `overstatestage`, `pprint`, `raw`, `txt`, `yaml`, `table`, and many others.

Some outputters are formatted only for data returned from specific functions. If an outputter is used that does not support the data passed into it, then Salt will fall back on the `pprint` outputter and display the return data using the Python `pprint` standard library module.

Note: If using `--out=json`, you will probably want `--static` as well. Without the sync option, you will get a separate JSON string per minion which makes JSON output invalid as a whole. This is due to using an iterative outputter. So if you want to feed it to a JSON parser, use `--static` as well.

--out-indent OUTPUT_INDENT, --output-indent OUTPUT_INDENT

Print the output indented by the provided value in spaces. Negative values disable indentation. Only applicable in outputters that support indentation.

--out-file=OUTPUT_FILE, --output-file=OUTPUT_FILE

Write the output to the specified file.

--out-file-append, --output-file-append

Append the output to the specified file.

--no-color

Disable all colored output

--force-color

Force colored output

Note: When using colored output the color codes are as follows:

green denotes success, red denotes failure, blue denotes changes and success and yellow denotes a expected future change in configuration.

--state-output=STATE_OUTPUT, --state_output=STATE_OUTPUT

Override the configured `state_output` value for minion output. One of 'full', 'terse', 'mixed', 'changes' or 'filter'. Default: 'none'.

--state-verbose=STATE_VERBOSE, --state_verbose=STATE_VERBOSE

Override the configured `state_verbose` value for minion output. Set to True or False. Default: none.

9.6.4 Configuration file options

All the previous options can be provided via the CLI, as in-line arguments, as well as configured in the configuration file. There are however options that are available only through the configuration file:

`target_use_cache_grains``

Whether targeting should look up into the existing cache to compute the list of matching devices. This option may be particularly useful when using one of the following targeting mechanisms: `-G` (grain), `-P` (grain PCRE), or `-C` (compound). Default: `True` (it will check the cache).

`target_use_cache_pillar``

Whether targeting should look up into the existing cache to compute the list of matching devices. This option may be particularly useful when using one of the following targeting mechanisms: `-I` (pillar), `-J` (pillar PCRE), or `-C` (compound). Default: `True` (it will check the cache).

9.7 Managing remote Unix and Windows machines via SSH

New in version 2020.7.0.

Using *salt-sproxy*, besides regular Minions, regular Proxy Minions, and standalone Proxy Minions (managed by *salt-sproxy* itself), you can also manage arbitrary machines via SSH, in the same way as you'd normally do through *salt-ssh*. In fact, this is actually done through the *SSH Proxy Module* shipped together with this package, which in turn invokes *salt-ssh* internals. While *salt-ssh* has been part of the Salt suite for years, it has always been decoupled from the rest. One of the evident implications is that you manage some devices by running *salt*, and others by running *salt-ssh*. *salt-sproxy* aims to abstract that away, and provide a single, uniform methodology for managing whatever flavours of Salt you want, through the same command and offering the same features.

In essence, using the *SSH Proxy Module*, *salt-sproxy* spins up a temporary Proxy Minion locally, which means you can use it to manage arbitrary machines over SSH, and you can continue using the usual *Targeting* mechanisms, or execute Salt commands over the REST API (see also *salt-sapi*).

Important: As this feature depends on two external modules, provides with *salt-sproxy*, you will need to make sure your installation is aware of those. You have multiple options here:

- Execute passing the `--sync-proxy` and `--sync-executors` on the command line.
 - Set `sync_proxy: true` and `sync_executors: true` in the Master config file.
 - Configure the `file_roots` on the Master, as detailed in *The Proxy Runner*, then execute `salt-run saltutil.sync_all` (or `saltutil.sync_proxymodules + saltutil.sync_executors`, if you only want the SSH code, ignoring anything else). See also *Salt SProxy Best Practices*.
-

9.7.1 Pillar

The configuration is aligned to the general Proxy Minion standards: put the connection details and credentials under the `proxy` key in the Proxy config or Pillar.

host The IP address or the hostname of the remote machine to manage.

port Integer, the port number to use when establishing the connection (defaults to 22).

user The username required for authentication.

passwd The password used for authentication.

priv Absolute path to the private SSH key used for authentication.

priv_passwd The SSH private key password.

timeout: 30 The SSH timeout. Defaults to 30 seconds.

sudo: False Execute commands as sudo.

tty: False Connect over tty.

sudo_user The username that should execute the commands as sudo.

remote_port_forwards Enable remote port forwarding. Example: 8888:my.company.server:443. Multiple remote port forwards are supported, using comma-separated values, e.g., 8888:my.company.server:443, 9999:my.company.server:80.

identities_only: False Execute SSH with `-o IdentitiesOnly=yes`. This option is intended for situations where ssh-agent offers many different identities and allow ssh to ignore those identities and use the only one specified in options.

ignore_host_keys: False By default ssh host keys are honored and connections will ask for approval. Use this option to disable `StrictHostKeyChecking`.

no_host_keys: False Fully ignores ssh host keys which by default are honored and connections would ask for approval. Useful if the host key of a remote server has changed and would still error with `ignore_host_keys`.

winrm: False Flag that tells Salt to connect to a Windows machine. This option requires the `saltwinshell` to be installed.

For example, let's say you put the following in the Pillar:

```
/srv/salt/pillar/ssh.sls
```

```
proxy:
  proxytype: ssh
  host: srv.example.com
  user: test
  passwd: test
```

```
/srv/salt/pillar/top.sls
```

```
base:
  srv:
    - ssh
```

Assuming that your configuration is correct, you can then start executing Salt commands as usual, to manage the remote machine:

```
$ salt-sproxy 'srv' pkg.install ack
srv:
-----
  ack:
-----
      new:
          2.24-1
      old:
  libfile-next-perl:
-----
      new:
          1.16-2
      old:
  libgdbm-compat4:
```

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```

-----
new:
  1.18.1-4
old:
libgdbm6:
-----
new:
  1.18.1-4
old:
libperl5.28:
-----
new:
  5.28.1-6
old:
perl:
-----
new:
  5.28.1-6
old:
perl-modules-5.28:
-----
new:
  5.28.1-6
old:

$ salt-sproxy 'srv' state.apply
srv:
-----
      ID: vim
  Function: pkg.installed
     Result: True
  Comment: All specified packages are already installed
  Started: 16:38:22.981459
  Duration: 57.998 ms
   Changes:
-----
      ID: ack
  Function: pkg.installed
     Result: True
  Comment: All specified packages are already installed
  Started: 16:38:23.039783
  Duration: 42.267 ms
   Changes:

Summary for sproxy
-----
Succeeded: 2
Failed:    0
-----
Total states run:    2
Total run time: 100.265 ms

```

9.8 Salt SProxy Best Practices

Note: This document refers to best practices in regards to optimising the usage of *salt-sproxy*.

To refer to the Salt best practices concerning the structure of the configuration files, see [this](#) document.

In order to simplify the default usage, *salt-sproxy* tries to load Grains, Roster, and Execution Modules; this adds an execution overhead everytime you invoke a Salt command through *salt-sproxy*, of approximatively 0.5s up to 1 second. In some cases, this can be reduced or even removed entirely by configuring one or more of the options below, depending on your use case.

9.8.1 TL;DR

To speed up the execution, you can add the *salt-sproxy* installation path to your `file_roots` settings in the Master config (see [The Proxy Runner](#) for more notes on how to do this), and execute `salt-run saltutil.sync_all`. At the same time, add the following in the Master config:

```
sync_grains: false
sync_roster: false
sync_modules: false
```

Important: Once you have these settings enabled, while it will speed up the *salt-sproxy* execution and make it more efficient, if you have custom Grains or Execution Modules in your own environment, you will need to take care that they are properly sync'ed on your Master. That is, execute `salt-run saltutil.sync_all` or equivalent whenever you update your modules. Examples include: manually execute `salt-run saltutil.sync_all` (not recommended), a cron on the same, or if you have a Salt Master running you can have it automatically sync those for you by adding a [scheduled job](#), e.g.,

```
schedule:
  sync_all:
    function: saltutil.sync_all
    minutes: 5
```

The example configuration snippet above would ensure that your custom modules are sync'ed every 5 minutes.

If for some reason you can't do this for one or more of these modules, check out the recommendations below for each of them.

9.8.2 salt-sproxy core Runner

Another contributor to the *salt-sproxy* execution speed is the [The Proxy Runner](#) which is the very core of *salt-sproxy*. That said, if this Runner is already "well known" to the Salt filesystem, it'll make it more efficient.

Tip: If you have a Master already running, the execution may be up to 5 seconds faster.

In this case, you will need to follow the notes from [The Proxy Runner](#) to update your `file_roots` settings, and run `salt-run saltutil.sync_runner`.

Remember that you'll need to re-run that in case you re-install *salt-sproxy*, Salt, or remove the Salt cache.

Of course, you can always have a scheduled job that does it for you, either a cron job, or a [scheduled job](#) if you have a Salt Master running, e.g., re-sync Runners every hour:

```
schedule:
  sync_runners:
    function: saltutil.sync_runner
    minutes: 60
```

9.8.3 Disable Grains

If you don't have any custom Grains modules in your environment, you can disable the load, by configuring `sync_grains: false` in your Master configuration file.

Tip: If you do have custom Grains in your environment, you can disable the *salt-sproxy* automatic sync by adding `sync_grains: false` to your Master configuration, and sync the Grains manually or automatically whenever you update (or create) your modules: `salt-run saltutil.sync_grains`.

Additionally, disabling the load of some specific Grains modules (whether your own, or natively available in Salt), may speed up your setup. Configure `disable_grains` in your Master config, as a list of Grains modules to avoid loading when executing through *salt-sproxy*.

Example:

```
disable_grains:
  - esxi
```

9.8.4 Disable Execution Modules

If you don't have any custom Execution modules in your own environment, and you don't make use of the modules shipped together with *salt-sproxy* (see `execution-modules`), you can disable the load by configuring `sync_modules: false` in your Master configuration file.

Tip: If you do have custom modules in your environment, you can disable the *salt-sproxy* automatic sync by adding `sync_modules: false` to your Master configuration, and sync the modules manually or automatically whenever you update (or create) your modules: `salt-run saltutil.sync_modules`.

Additionally, disabling the load of some specific Execution modules (whether your own, natively available in Salt, or provided through *salt-sproxy*), may speed up your setup. Configure `disable_modules` in your Master config, as a list of modules to avoid loading when executing through *salt-sproxy*.

Example:

```
disable_modules:
  - pip
  - statuspage
```

9.8.5 Disable Roster Sync

If you use one of the Roster modules provided with this package, or from your own sources, *salt-sproxy* would attempt to sync only the Roster module you reference in `roster:` or using the `--roster` CLI argument. Even so, this may be time and resource consuming, so it'd may be optimal to disable the default behaviour by setting `sync_roster: false` in the Master configuration. Similarly to the previous sections, if you'd like to use a custom module in your own environment, you can sync them by running `salt-run saltutil.sync_roster`.

9.8.6 Disable Events

If you don't need the *Event-Driven Automation and Orchestration*, you can gain a few execution seconds by disabling this so *salt-sproxy* doesn't attempt to send execution events to an nonexistent Master (or you simply don't need / use those events).

9.8.7 File open limit

As *salt-sproxy* runs locally, it means it starts the processes and initializes the connection on the local computer. Every new process creates a process file, and every new connection creates at least one more file as well. That said, depending on your operating system and configuration, you may hit the hard limit for max open files. For example, on Unix operating systems, `ulimit -Hn` will tell you the max open files number. If you hit any issues, consider increasing this limit.

9.9 The Proxy Runner

The *Proxy Runner* is the core functionality of *salt-sproxy* and can be used to trigger jobs as *Reactions to external events*, or invoked when *Using the Salt REST API*.

In both cases mentioned above you are going to need to have a Salt Master running, that allows you to set up the Reactors and the Salt API; that means, the *proxy Runner* needs to be available on your Master. To do so, you have two options:

9.9.1 1. Reference it from the salt-sproxy installation

After installing *salt-sproxy*, you can execute the following command:

```
$ salt-sproxy --file-roots
salt-sproxy is installed at: /home/mircea/venvs/salt-sproxy/lib/python3.6/site-
↳ packages/salt_sproxy

You can configure the file_roots on the Master, e.g.,

file_roots:
  base:
    - /home/mircea/venvs/salt-sproxy/lib/python3.6/site-packages/salt_sproxy

Or only for the Runners:

runner_dirs:
  - /home/mircea/venvs/salt-sproxy/lib/python3.6/site-packages/salt_sproxy/_runners
```

1.a. Update the file_roots and / or runner_dirs manually

As suggested in the output, you can directly reference the *salt-sproxy* installation path to start using the *proxy Runner* (and other extension modules included in the package).

After updating the master configuration file, make sure to execute `salt-run saltutil.sync_all` or `salt-run saltutil.sync_runners`.

1.b. Use the `--save-file-roots` CLI argument to update the master config

A simpler alternative is executing with `--save-file-roots` which adds the path for you, and synchronizes the extension modules provided together with e.g.,

```
$ salt-sproxy --save-file-roots
/home/mircea/venvs/salt-sproxy/lib/python3.6/site-packages/salt_sproxy added to the
↳file_roots:

file_roots:
  base:
    - /home/mircea/venvs/salt-sproxy/lib/python3.6/site-packages/salt_sproxy

Now you can start using salt-sproxy for event-driven automation, and the Salt REST
↳API.
See https://salt-sproxy.readthedocs.io/en/latest/salt\_api.html
and https://salt-sproxy.readthedocs.io/en/latest/events.html for more details.
```

Note: While this option will preserve the configuration you have (but appending another path to `file_roots` and /or `runner_dirs`), it may re-arrange (visually) the contents - however without any side effects.

9.9.2 2. Copy the source file

You can either download it from https://github.com/mirceaulinic/salt-sproxy/blob/master/salt_sproxy/_runners/proxy.py, e.g., if your `file_roots` configuration on the Master looks like:

```
file_roots:
  base:
    - /srv/salt
```

You are going to need to create a directory under `/srv/salt/_runners`, then download the proxy Runner there:

```
$ mkdir -p /srv/salt/_runners
$ curl -o /srv/salt/_runners/proxy.py -L \
  https://raw.githubusercontent.com/mirceaulinic/salt-sproxy/master/salt_sproxy/_
↳runners/proxy.py
```

Note: In the above I've used the `raw` like from GitHub to ensure the source code is preserved.

Alternatively, you can also put it under an arbitrary path, e.g., (configuration on the Master)

```
runner_dirs:
  - /path/to/runners
```

Downloading the proxy Runner under that specific path:

```
$ curl -o /path/to/runners/proxy.py -L \
  https://raw.githubusercontent.com/mirceaulinic/salt-sproxy/master/salt_sproxy/_
↳runners/proxy.py
```


9.10 Proxy Modules

9.10.1 SSH Proxy Module

SSH Proxy

Manage a remote host via SSH, using a Proxy Minion. This module doesn't have any external dependencies, as it makes use of the native Salt internals used for salt-ssh, therefore managing the remote machine by uploading a lightweight Salt version on the target host, then invokes Salt functions over SSH (using the `ssh` binary installed on your computer or wherever this Proxy Minion runs).

Note: To manage machines running Windows, you will need to install the `saltwinshell` library.

Pillar

The configuration is aligned to the general Proxy Minion standards: put the connection details and credentials under the `proxy` key in the Proxy config or Pillar.

host The IP address or the hostname of the remove machine to manage.

port Integer, the port number to use when establishing he connection (defaults to 22).

user The username required for authentication.

passwd The password used for authentication.

priv Absolute path to the private SSH key used for authentication.

priv_passwd The SSH private key password.

timeout: 30 The SSH timeout. Defaults to 30 seconds.

sudo: False Execute commands as sudo.

tty: False Connect over tty.

sudo_user The username that should execute the commands as sudo.

remote_port_forwards Enable remote port forwarding. Example: `8888:my.company.server:443`. Multiple remote port forwardings are supported, using comma-separated values, e.g., `8888:my.company.server:443,9999:my.company.server:80`.

identities_only: False Execute SSH with `-o IdentitiesOnly=yes`. This option is intended for situations where ssh-agent offers many different identities and allow ssh to ignore those identities and use the only one specified in options.

ignore_host_keys: False By default ssh host keys are honored and connections will ask for approval. Use this option to disable `StrictHostKeyChecking`.

no_host_keys: False Fully ignores ssh host keys which by default are honored and connections would ask for approval. Useful if the host key of a remote server has changed and would still error with `ignore_host_keys`.

winrm: False Flag that tells Salt to connect to a Windows machine. This option requires the `saltwinshell` to be installed.

Example Pillar:

```
proxy:
  proxytype: ssh
  host: srv.example.com
  user: test
  passwd: test
  port: 2022
```

`_proxy.ssh.call` (*fun*, **args*, ***kwargs*)

Call an arbitrary Salt function and return the output.

`_proxy.ssh.grains` ()

Invoke grains.items from the thin Salt on the remote machine, in order to return here the Grains.

`_proxy.ssh.init` (*opts*)

Init the SSH connection, and execute a simple call to ensure that the remote device is reachable, otherwise throw an error.

`_proxy.ssh.initialized` ()

Proxy initialized properly?

`_proxy.ssh.module_executors` ()

Return the list of executors that should invoke the Salt functions.

`_proxy.ssh.ping` ()

Execute “echo” on the remote host to ensure it’s still accessible.

`_proxy.ssh.shutdown` (*opts*)

Buh-bye...

9.11 Event-Driven Automation and Orchestration

9.11.1 Execution Events

Even though `salt-sproxy` has been designed to be an on-demand executed process (as in opposite to an always running service), you still have the possibility to monitor what is being executed, and potentially export these events or trigger a [Reactor](#) execution in response.

Note: To be able to have events, you will need to have a Salt Master running, and preferably using the same Master configuration file as `salt-sproxy`, to ensure that they are both sharing the same socket object.

Using the `--events` option on the CLI (or by configuring `events: true` in the Master configuration file), `salt-sproxy` is going to inject events on the Salt bus as you’re running the usual Salt commands.

For example, running the following command (from the [salt-sproxy with network devices](#) example):

```
$ salt-sproxy juniper-router net.arp --events
```

Watching the event bus on the Master, you should notice the following events:

```
$ salt-run state.event pretty=True
20190529143434052740 {
  "_stamp": "2019-05-29T14:34:34.053900",
  "minions": [
    "juniper-router"
  ]
}
```

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```

}
proxy/runner/20190529143434054424/new      {
  "_stamp": "2019-05-29T14:34:34.055386",
  "arg": [],
  "fun": "net.arp",
  "jid": "20190529143434054424",
  "minions": [
    "juniper-router"
  ],
  "tgt": "juniper-router",
  "tgt_type": "glob",
  "user": "mircea"
}
proxy/runner/20190529143434054424/ret/juniper-router      {
  "_stamp": "2019-05-29T14:34:36.937409",
  "fun": "net.arp",
  "fun_args": [],
  "id": "juniper-router",
  "jid": "20190529143434054424",
  "return": {
    "out": [
      {
        "interface": "fxp0.0",
        "mac": "92:99:00:0A:00:00",
        "ip": "10.96.0.1",
        "age": 926.0
      },
      {
        "interface": "fxp0.0",
        "mac": "92:99:00:0A:00:00",
        "ip": "10.96.0.13",
        "age": 810.0
      },
      {
        "interface": "em1.0",
        "mac": "02:42:AC:13:00:02",
        "ip": "128.0.0.16",
        "age": 952.0
      }
    ],
    "result": true,
    "comment": ""
  },
  "success": true
}

```

As in the example, above, every execution pushes at least three events:

- Job creation. The tag is the JID of the execution.
- Job payload with the job details, i.e., function name, arguments, target expression and type, matched devices, etc.
- One separate return event from every device.

A more experienced Salt user may have already noticed that the structure of these events is *very* similar to the usual Salt native events when executing a regular command using the usual `salt`. Let's take an example for clarity:

```
$ salt 'test-minion' test.ping
test-minion:
    True
```

The event bus:

```
$ salt-run state.event pretty=True
20190529144939496567 {
  "_stamp": "2019-05-29T14:49:39.496954",
  "minions": [
    "test-minion"
  ]
}
salt/job/20190529144939496567/new {
  "_stamp": "2019-05-29T14:49:39.498021",
  "arg": [],
  "fun": "test.ping",
  "jid": "20190529144939496567",
  "minions": [
    "test-minion"
  ],
  "missing": [],
  "tgt": "test-minion",
  "tgt_type": "glob",
  "user": "sudo_mulinic"
}
salt/job/20190529144939496567/ret/test-minion {
  "_stamp": "2019-05-29T14:49:39.905727",
  "cmd": "_return",
  "fun": "test.ping",
  "fun_args": [],
  "id": "test-minion",
  "jid": "20190529144939496567",
  "retcode": 0,
  "return": true,
  "success": true
}
```

That said, if you already have Reactors matching Salt events, in order to trigger them in response to salt-sproxy commands, you would only need to update the tag matching expression (i.e., besides `salt/job/20190529144939496567/new` should also match `proxy/runner/20190529143434054424/new` tags, etc.).

In the exact same way with other Engine types – if you already have Engines exporting events, they should be able to export salt-sproxy events as well, which is a great easy win for PCI compliance, and generally to monitor who executes what.

9.11.2 Reactions to external events

Using the *The Proxy Runner*, you can configure a Reactor to execute a Salt function on a (network) device in response to an event.

For example, let's consider network events from `napalm-logs`. To import the `napalm-logs` events on the Salt bus, simply enable the `napalm_syslog` Salt Engine on the Master.

In response to an `INTERFACE_DOWN` notification, say we define the following reaction, in response to events with the `napalm/syslog/*/INTERFACE_DOWN/*` pattern (i.e., matching events such as `napalm/`

```
syslog/iosxr/INTERFACE_DOWN/edge-router1,  napalm/syslog/junos/INTERFACE_DOWN/
edge-router2, etc.):

/etc/salt/master
```

```
reactor:
- 'napalm/syslog/*/INTERFACE_DOWN/*':
- salt://reactor/if_down_shutdown.sls
```

The `salt://reactor/if_down_shutdown.sls` translates to `/etc/salt/reactor/if_down_shutdown.sls` when `/etc/salt` is one of the configured `file_roots`. To apply a configuration change on the device with the interface down, we can use the `_runner.proxy.execute()` Runner function:

```
shutdown_interface:
runner.proxy.execute:
- tgt: {{ data.host }}
- function: net.load_template
- kwarg:
    template_name: salt://templates/shut_interface.jinja
    interface_name: {{ data.yang_message.interfaces.interface.keys()[0] }}
```

This Reactor would apply a configuration change as rendered in the Jinja template `salt://templates/shut_interface.jinja` (physical path `/etc/salt/templates/shut_interface.jinja`). Or, to have an end-to-end overview of the system: when the device sends a notification that one interface is down, in response, Salt is automatically going to try and remediate the problem (in the `shut_interface.jinja` template you can define the business logic you need). Similarly, you can have other concurrent reactions to the same, e.g. to send a Slack notification, and email and so on.

For reactions to `napalm-logs` events specifically, you can continue reading more at <https://mirceaulinic.net/2017-10-19-event-driven-network-automation/> for a more extensive introduction and the `napalm-logs` documentation available at <https://napalm-logs.readthedocs.io/en/latest/>, with the difference that instead of calling a Salt function directly, you go through the `_runner.proxy.execute()` or `_runner.proxy.execute_devices()` Runner functions.

9.12 Using the Salt REST API

To be able to use the Salt HTTP API, similarly to *Event-Driven Automation and Orchestration*, you will need to have the Salt Master running, and, of course, also the Salt API service.

As the core functionality is based on the *Proxy Runner*, check out first the notes from *The Proxy Runner* to understand how to have the `proxy` Runner available on your Master.

The Salt API configuration is unchanged from the usual approaches: see https://docs.saltstack.com/en/latest/ref/netapi/all/salt.netapi.rest_cherry.py.html how to configure and <https://docs.saltstack.com/en/latest/ref/cli/salt-api.html> how to start up the salt-api process.

Suppose we have the following configuration:

```
/etc/salt/master
```

```
rest_cherry.py:
port: 8080
ssl_cert: /etc/pki/tls/certs/localhost.crt
ssl_key: /etc/pki/tls/certs/localhost.key
```

Hint: Consider looking at the [Salt REST API](#) and [salt-sapi](#) examples for end-to-end examples on configuring the Salt API or salt-sapi, however the official Salt documentation should always be used as the reference.

9.12.1 Starting with salt-sproxy 2020.2.0

Beginning with the *salt-sproxy* release 2020.2.0, the usage has been simplified compared to previous versions, and a new API client has been added, named `sproxy`, together with its counter-part `sproxy_async` for asynchronous requests.

See also:

salt-sapi

In order to do so, instead of starting the usual `salt-api` process, you'd need to start a separate application named `salt-sapi` which is shipped together with *salt-sproxy*. Everything stay the exact same as usually, the only difference being the special `sproxy` and `sproxy_async` clients for simplified usage.

A major advantage of using the `sproxy` / `sproxy_async` clients is that the usage is very similar to the `local` / `local_async` clients (see https://docs.saltstack.com/en/latest/ref/netapi/all/salt.netapi.rest_cherry.py.html#usage), the arguments you'd need to being in-line with the ones from `LocalClient`: `tgt` (target expression) and `fun` (the name of the Salt function to execute) as mandatory arguments, plus a number of optional arguments documented at https://salt-sproxy.readthedocs.io/en/latest/runners/proxy.html#_runners.proxy.execute. See an usage example below.

Hint: If you are already using Salt API, and would like to make use of the `sproxy` / `sproxy_async` client(s), you may want to use the `salt-sapi` instead of the `salt-api` program, and you'll be able to use the Salt API as always, armed with the *salt-sproxy* clients as well.

Tip: As mentioned in https://docs.saltstack.com/en/latest/ref/netapi/all/salt.netapi.rest_cherry.py.html#best-practices,

Running asynchronous jobs results in being able to process [...] 17x more commands per second (as the `sproxy_async` requests make use of the `RunnerClient` interface).

Running with `sproxy_async` will return you a JID with you can then later use to gather the job returns:

Job returns can be fetched from Salt's job cache via the `/jobs/<jid>` endpoint, or they can be collected into a data store using Salt's Returner system.

See https://docs.saltstack.com/en/latest/ref/netapi/all/salt.netapi.rest_cherry.py.html#jobs for further details.

After starting the `salt-sapi` process, you should get the following:

```
$ curl -i localhost:8080
HTTP/1.1 200 OK
Content-Type: application/json
Server: CherryPy/18.3.0
Date: Thu, 02 Jan 2020 23:13:28 GMT
Allow: GET, HEAD, POST
Access-Control-Allow-Origin: *
Access-Control-Expose-Headers: GET, POST
Access-Control-Allow-Credentials: true
Vary: Accept-Encoding
Content-Length: 172
```

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```
{
  "return": "Welcome",
  "clients": [
    "local",
    "local_async",
    "local_batch",
    "local_subset",
    "runner",
    "runner_async",
    "sproxy",
    "sproxy_async",
    "ssh",
    "wheel",
    "wheel_async"
  ]
}
```

That means the *salt-sproxy* Salt API is ready to receive requests.

Usage examples:

```
$ curl -sS localhost:8080/run -H 'Accept: application/x-yaml' \
  -d eauth='pam' \
  -d username='mircea' \
  -d password='pass' \
  -d client='sproxy' \
  -d tgt='minion1' \
  -d fun='test.ping'
return:
- minion1: true
```

```
$ curl -sS localhost:8080/run -H 'Accept: application/json' \
  -d eauth='pam' \
  -d username='mircea' \
  -d password='pass' \
  -d client='sproxy_async' \
  -d tgt='minion\d' \
  -d tgt_type='pcre' \
  -d fun='test.ping' \
  {"return": [{"tag": "salt/run/20200103001109995573", "jid": "20200103001109995573"}]}
```

9.12.2 Before salt-sproxy 2020.2.0

After starting the *salt-api* process, we should get the following:

```
$ curl -i localhost:8080
HTTP/1.1 200 OK
Content-Type: application/json
Server: CherryPy/18.1.1
Date: Wed, 05 Jun 2019 07:58:32 GMT
Allow: GET, HEAD, POST
Access-Control-Allow-Origin: *
Access-Control-Expose-Headers: GET, POST
Access-Control-Allow-Credentials: true
Vary: Accept-Encoding
Content-Length: 146

{"return": "Welcome", "clients": [
  "local",
  "local_async",
  "local_batch",
  "local_subset",
  "runner",
  "runner_async",
  "ssh",
  "wheel",
  "wheel_async"
]}
```

That means the Salt API is ready to receive requests.

To invoke a command on a (network) device managed through Salt, you can use the *proxy Runner* to invoke commands on, e.g.,

```
$ curl -sS localhost:8080/run -H 'Accept: application/x-yaml' \
  -d eauth='pam' \
```

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```

-d username='mircea' \
-d password='pass' \
-d client='runner' \
-d fun='proxy.execute' \
-d tgt='minion1' \
-d function='test.ping' \
-d sync=True
return:
- minion1: true

```

Note that the execution is at the `/run` endpoint, with the following details:

- username, password, eauth as configured in the `external_auth`. See <https://docs.saltstack.com/en/latest/topics/eauth/index.html> for more details and how to configure external authentication.
- client is `runner`, as we're going to use the proxy Runner.
- fun is the name of the Runner function, in this case `__runners.proxy.execute()`.
- tgt is the Minion ID / device name to target.
- function is the Salt function to execute on the targeted device(s).
- sync is set as `True` as the execution must be synchronous because we're waiting for the output to be returned back over the API. Otherwise, if we only need to invoke the function without expecting an output, we don't need to pass this argument.

This HTTP request is the equivalent of CLI from the example *salt-sproxy 101*:

```
$ salt-sproxy minion1 test.ping
```

It works in the same way when execution function on actual devices, for instance when gathering the ARP table from a Juniper router (the equivalent of the `salt-sproxy juniper-router net.arp` CLI from the example *salt-sproxy with network devices*):

```

$ curl -sS localhost:8080/run -H 'Accept: application/x-yaml' \
-d eauth='pam' \
-d username='mircea' \
-d password='pass' \
-d client='runner' \
-d fun='proxy.execute' \
-d tgt='juniper-router' \
-d function='net.arp' \
-d sync=True
return:
- juniper-router:
  comment: ''
  out:
  - age: 891.0
    interface: fxp0.0
    ip: 10.96.0.1
    mac: 92:99:00:0A:00:00
  - age: 1001.0
    interface: fxp0.0
    ip: 10.96.0.13
    mac: 92:99:00:0A:00:00
  - age: 902.0
    interface: em1.0
    ip: 128.0.0.16

```

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```
mac: 02:42:AC:12:00:02
result: true
```

Or when updating the configuration:

```
$ curl -sS localhost:8080/run -H 'Accept: application/x-yaml' \
-d eauth='pam' \
-d username='mircea' \
-d password='pass' \
-d client='runner' \
-d fun='proxy.execute' \
-d tgt='juniper-router' \
-d function='net.load_config' \
-d text='set system ntp server 10.10.10.1' \
-d test=True \
-d sync=True
return:
- juniper-router:
  already_configured: false
  comment: Configuration discarded.
  diff: '[edit system]
+   ntp {
+     server 10.10.10.1;
+   }'
  loaded_config: ''
  result: true

$ curl -sS localhost:8080/run -H 'Accept: application/x-yaml' \
-d eauth='pam' \
-d username='mircea' \
-d password='pass' \
-d client='runner' \
-d fun='proxy.execute' \
-d tgt='juniper-router' \
-d function='net.load_config' \
-d text='set system ntp server 10.10.10.1' \
-d sync=True
return:
- juniper-router:
  already_configured: false
  comment: ''
  diff: '[edit system]
+   ntp {
+     server 10.10.10.1;
+   }'
  loaded_config: ''
  result: true
```

You can follow the same methodology with any other Salt function (including States) that you might want to execute against a device, without having a (Proxy) Minion running.

9.12.3 See Also

salt-sapi

New in version 2020.2.0.

`salt-sapi` is a program distributed together with *salt-sproxy*, to ease the usage of the Salt API by providing two additional clients: `sproxy` and `sproxy_async`.

The usage is the exact same as the native `salt-api` entry point, just enhanced with the mentioned clients for the `/run` URI.

See *Using the Salt REST API* or https://salt-sproxy.readthedocs.io/en/latest/salt_api.html for more details and usage examples.

Important: At the time being, `salt-sapi` is simply available as a Python program entry point, without providing the system service files. That said, in order for you to use the *salt-sapi* clients, you will need to provide a service file or edit the one you might have for `salt-api` already by configuring the path to `salt-sapi` (run `$ which salt-sapi` to find the installation path), e.g., `ExecStart=/usr/local/bin/salt-sapi`.

Example - start `salt-sapi` in debug mode:

```
$ salt-sapi -l debug
```

See the complete list of options by executing `salt-sapi --help`:

```
$ salt-sapi --help
Usage: salt-sapi [options]
salt-sapi is an enhanced Salt API system that provides additional sproxy and
sproxy_async clients, to simplify the usage of salt-sproxy through the Salt
REST API

Options:
  --version                show program's version number and exit
  -V, --versions-report    Show program's dependencies version number and exit.
  -h, --help               show this help message and exit
  -c CONFIG_DIR, --config-dir=CONFIG_DIR
                          Pass in an alternative configuration directory.
                          Default: '/etc/salt'.
  -d, --daemon             Run the salt-sapi as a daemon.
  --pid-file=PIDFILE       Specify the location of the pidfile. Default:
                          '/var/run/salt-sapi.pid'.

Logging Options:
  Logging options which override any settings defined on the
  configuration files.

  -l LOG_LEVEL, --log-level=LOG_LEVEL
                          Console logging log level. One of 'all', 'garbage',
                          'trace', 'debug', 'profile', 'info', 'warning',
                          'error', 'critical', 'quiet'. Default: 'warning'.
  --log-file=API_LOGFILE   Log file path. Default: '/var/log/salt/api'.
  --log-file-level=LOG_LEVEL_LOGFILE
                          Logfile logging log level. One of 'all', 'garbage',
                          'trace', 'debug', 'profile', 'info', 'warning',
                          'error', 'critical', 'quiet'. Default: 'warning'.

You can find additional help about salt-sapi issuing "man salt-sapi" or on
https://salt-sproxy.readthedocs.io and
https://docs.saltstack.com/en/latest/ref/cli/salt-api.html.
```

9.13 Mixed Environments

When running in a mixed environment (you already have (Proxy) Minions running, and you would also like to use the salt-sproxy), it is highly recommended to ensure that salt-sproxy is using the same configuration file as your Master, and the Master is up and running.

Using the `--use-existing-proxy` option on the CLI, or configuring `use_existing_proxy: true` in the Master configuration file, salt-sproxy is going to execute the command on the Minions that are connected to this Master (and matching your target), otherwise the command is going to be executed locally.

For example, suppose we have two devices, identified as `minion1` and `minion2`, extending the example [salt-sproxy 101](#):

`/srv/salt/pillar/top.sls:`

```
base:
  'minion*':
    - dummy
```

`/srv/salt/pillar/dummy.sls:`

```
proxy:
  proxytype: dummy
```

The Master configuration remains the same:

`/etc/salt/master:`

```
pillar_roots:
  base:
    - /srv/salt/pillar
```

Starting up the Master, and the `minion1` Proxy:

```
# start the Salt Master
$ salt-master -d

# start the Proxy Minion for ``minion1``
$ salt-proxy --proxyid minion1 -d

# accept the key of minion1
$ salt-key -y -a minion1

# check that minion1 is now up and running
$ salt minion1 test.ping
minion1:
  Test
```

In a different terminal window, you can start watching the Salt event bus (and leave it open, as I'm going to reference the events below):

```
$ salt-run state.event pretty=True
# here you will see the events flowing
```

Executing the following command, notice that the execution takes place locally (you can identify using the `proxy/runner` event tag):

```
$ salt-sproxy -L minion1,minion2 test.ping --events
minion1:
    True
minion2:
    True
```

The event bus:

```
20190603145654312094      {
  "_stamp": "2019-06-03T13:56:54.312664",
  "minions": [
    "minion1",
    "minion2"
  ]
}
proxy/runner/20190603145654313680/new      {
  "_stamp": "2019-06-03T13:56:54.314249",
  "arg": [],
  "fun": "test.ping",
  "jid": "20190603145654313680",
  "minions": [
    "minion1",
    "minion2"
  ],
  "tgt": [
    "minion1",
    "minion2"
  ],
  "tgt_type": "list",
  "user": "sudo_mircea"
}
proxy/runner/20190603145654313680/ret/minion1      {
  "_stamp": "2019-06-03T13:56:54.406816",
  "fun": "test.ping",
  "fun_args": [],
  "id": "minion1",
  "jid": "20190603145654313680",
  "return": true,
  "success": true
}
proxy/runner/20190603145654313680/ret/minion2      {
  "_stamp": "2019-06-03T13:56:54.538850",
  "fun": "test.ping",
  "fun_args": [],
  "id": "minion2",
  "jid": "20190603145654313680",
  "return": true,
  "success": true
}
```

As presented in *Event-Driven Automation and Orchestration*, there is one event for the job creating, then one for job start, and one event for each device separately (i.e., `proxy/runner/20190603145654313680/ret/minion1` and `proxy/runner/20190603145654313680/ret/minion2`, respectively).

Now, if we want to execute the same, but use the already running Proxy Minion for `minion1` (started previously), simply pass the `--use-existing-proxy` option:

```
$ salt-sproxy -L minion1,minion2 test.ping --events --use-existing-proxy
minion2:
    True
minion1:
    True
```

In this case, the event bus would look like below:

```
proxy/runner/20190603150335939481/new      {
  "_stamp": "2019-06-03T14:03:35.940128",
  "arg": [],
  "fun": "test.ping",
  "jid": "20190603150335939481",
  "minions": [
    "minion1",
    "minion2"
  ],
  "tgt": [
    "minion1",
    "minion2"
  ],
  "tgt_type": "list",
  "user": "sudo_mircea"
}
salt/job/20190603150335939481/new      {
  "_stamp": "2019-06-03T14:03:36.047971",
  "arg": [],
  "fun": "test.ping",
  "jid": "20190603150335939481",
  "minions": [
    "minion1"
  ],
  "missing": [],
  "tgt": "minion1",
  "tgt_type": "glob",
  "user": "sudo_mircea"
}
salt/job/20190603150335939481/ret/minion1  {
  "_stamp": "2019-06-03T14:03:36.147398",
  "cmd": "_return",
  "fun": "test.ping",
  "fun_args": [],
  "id": "minion1",
  "jid": "20190603150335939481",
  "retcode": 0,
  "return": true,
  "success": true
}
proxy/runner/20190603150335939481/ret/minion2      {
  "_stamp": "2019-06-03T14:03:36.245592",
  "fun": "test.ping",
  "fun_args": [],
  "id": "minion2",
  "jid": "20190603150335939481",
  "return": true,
  "success": true
}
```

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```
proxy/runner/20190603150335939481/ret/minion1      {
  "_stamp": "2019-06-03T14:03:36.247206",
  "fun": "test.ping",
  "fun_args": [],
  "id": "minion1",
  "jid": "20190603150335939481",
  "return": true,
  "success": true
}
```

In this sequence of events, you can notice that, in addition to the events from the previous example, there are two additional events: `salt/job/20190603150335939481/new` - which is for the job start against the `minion1` Proxy Minion, and `salt/job/20190603150335939481/ret/minion1` - which is the return from the `minion1` Proxy Minion. The presence of the `salt/job` event tags proves that the execution goes through the already existing Proxy Minion.

If you would like to always execute through the available Minions, whenever possible, you can add the following option to the Master configuration file:

```
use_existing_proxy: true
```

9.14 Large Scale Settings

The reference document remains https://docs.saltstack.com/en/latest/topics/tutorials/intro_scale.html with some small differences. Note however that if you're running in *Mixed Environments*, the notes from the *Using Salt at Scale* document must be followed in order to manage a large number of devices (i.e., thousands or tens of thousands).

When running salt-sproxy only - without relying on other existing Minions, it is still highly encouraged to use the batch mode when executing: https://docs.saltstack.com/en/latest/topics/tutorials/intro_scale.html#too-many-minions-returning-at-once Usage example:

```
$ salt-sproxy '*' state.highstate -b 20
```

This will only execute on 20 devices at once, while looping through all the targeted devices.

When running in an environment with a Salt Master running and pushing events on the bus as detailed in *Execution Events*, targeting a large number of devices may lead to a higher density of events which requires to increase the size of the event bus and other specific options, e.g., the ZeroMQ high-water mark and backlog - see <https://docs.saltstack.com/en/latest/ref/configuration/master.html#master-large-scale-tuning-settings> for more details and options.

9.15 Release Notes

9.15.1 Latest Release

2020.10.0

New Features

Added new arguments for the SSH functionality (which are similar to the Salt SSH options with the same naming):

- `--ignore-host-keys`: By default ssh host keys are honored and connections will ask for approval. Use this option to disable `StrictHostKeyChecking`.
- `--no-host-keys`: Fully ignores ssh host keys which by default are honored and connections would ask for approval. Useful if the host key of a remote server has changed and would still error with `--ignore-host-keys`.
- `--identities-only`: Execute SSH with `-o IdentitiesOnly=yes`. This option is intended for situations where ssh-agent offers many different identities and allow ssh to ignore those identities and use the only one specified in options.
- `--priv`: Specify the SSH private key file to be used for authentication.
- `--priv-password`: Specify the SSH private key file's passphrase when required.

Any of these CLI arguments can also be provided into the (Master) configuration file as global arguments for all the Minions, as well as individually, for every Proxy Minion.

Deprecations

The `--cache-grains` and `--cache-pillar` CLI arguments have been deprecated, as any Minion managed through salt-sproxy now caches the Grains and Pillars by default. If you want to prevent this, you can use the new `--dont-cache-grains` and / or `--dont-cache-pillar` options, or simply configure `cache_grains: false` and / or `cache_pillar: false` into the (Master) configuration.

See *Command Line and Configuration Options* for more details.

Improvements

When using the *salt-sapi* endpoint for the REST API, in order to have access to the `sproxy` and `sproxy_async` clients over HTTP calls, any configuration option is now passed on to *The Proxy Runner*.

Bug Fixes

- [#176](#) “*custom execution modules not working*”.
- [#169](#) “*Pillar targeting broken*” - which was due to an incorrectly handled caching mechanism. Pillar targeting should now work well (with the caveats documented in *Targeting*).
- [#179](#) “*using salt-sproxy as a replacement for salt-ssh*” - which was fixed in [#185](#). Thanks @dmacvicar!
- [#181](#) “*napalm grains not available during template rendering*” - fixed via [#187](#).

Questions

I would like to engage the community to discuss around the following question: *should enforce (internally) to -t 0 (i.e., wait till the device replies) on state.* functions?* [#182](#). Any thoughts would be very welcome, or just a simple vote would be sufficient.

9.15.2 Previous Releases

Release 2020.7.0

Explicit return when the Minion is not connected

When using *salt-sproxy* to execute against running (Proxy) Minions, it may happen sometimes that the Minion is not available for various reasons (e.g., key accepted, but the service is not fully started, etc.). When this happens, *salt-sproxy* now returns an explicit message `Minion did not return. [Not connected]` for better feedback on the command line.

Batch targeting using percent

Similar to the Salt `batch size` targeting, through *salt-sproxy* you can now divide the target in batches of size relative to the total number of devices matched by your target. For example, running `salt-sproxy -G os:junos -b 20% net.cli "show version"` would execute `show version` on the Junos devices, in 5 groups at a time.

NetBox Roster no longer depending on the NetBox module

In order to reduce the code overlap, the *NetBox Roster* module included in *salt-sproxy* has been designed to use code from the Salt native NetBox module. Due to bugs in older versions of Salt, the NetBox Roster wasn't properly working, and starting with this release this dependency has been removed, so the *salt-sproxy* NetBox Roster works equally well regardless on the underlying Salt version you're using.

Merge Pillar/Roster configuration into the Master opts

PR #115 and PR #124 allow one to provide the `proxy:` block also / only in the Master configuration, which simplifies the usage as you no longer have to provide any Pillar at all, or, at least, put in the Master configuration the details shared across your devices, e.g., username, password, proxy type, etc. For example:

```
/etc/salt/master
```

```
proxy:
  proxytype: napalm
  username: test
  password: test
```

If you'll want more dynamic data, you'll have to model that through the Pillar, as that's far more flexible than the Master config which is mainly for static data. Up to a degree, however, the Master configuration can be a little bit more dynamic, by making use of the `SDB` interface. Example:

```
# Define the "environ" SDB instance, using the env SDB module:
# https://docs.saltstack.com/en/latest/ref/sdb/all/salt.sdb.env.html

environ:
  driver: env

proxy:
  proxytype: napalm
  username: test
  password: sdb://environ/NAPALM_PASS
```

In the snippet above, the password will be dynamically retrieved from the `NAPALM_PASS` environment variable, so the `password` field will render to that value. In a similar way, using SDB modules, you can gather information from other resources, making use of other existing SDB modules, e.g., `Vault`, or `YAML` using the `gpg: true` option to decrypt GPG-encrypted data, or other SDB modules defined in your own environment. For greater flexibility, however, remember to use the Pillar features.

Optimise the execution speed

By loading only the Proxy module of choice (see [PR #143](#)), the execution time has been reduced by 2-3 seconds. In a similar way, *salt-sproxy* is now only loading the Roster module referenced (if any) which speeds up a little the initial startup.

You can further improve the performances in your own environment, by auditing what modules you require and / or if you make use of any custom modules at all. See also the new page [Salt SProxy Best Practices](#) for more detail recommendations.

Managing remote Unix and Windows machines via SSH

Using *salt-sproxy*, besides regular Minions, regular Proxy Minions, and standalone Proxy Minions (managed by *salt-sproxy* itself), you can now also manage arbitrary machines via SSH, in the same way as you'd normally do through *salt-ssh*. In fact, this is actually done through the *SSH Proxy Module* shipped together with this package, which in turn invokes *salt-ssh* internals. While *salt-ssh* has been part of the Salt suite for years, it has always been decoupled from the rest. One of the evident implications is that you manage some devices by running *salt*, and others by running *salt-ssh*. *salt-sproxy* aims to abstract that away, and provide a single, uniform methodology for managing whatever flavours of Salt you want, through the same command and offering the same features.

The configuration is very simple; for example, you can add the following to your Master configuration file:

```
/etc/salt/master
```

```
proxy:
  proxytype: ssh
  host: <IP address or hostname>
  user: <username>
  passwd: <password>
```

(You can also use SSH keys for authentication, see [Managing remote Unix and Windows machines via SSH](#) for more details, and other available options)

The you can start executing Salt commands as usual:

```
$ salt-sproxy 'srv' grains.get manufacturer
DigitalOcean

$ salt-sproxy 'srv' state.apply
srv:
-----
      ID: vim
  Function: pkg.installed
     Result: True
  Comment: All specified packages are already installed
  Started: 16:38:22.981459
 Duration: 57.998 ms
   Changes:
-----
      ID: ack
  Function: pkg.installed
     Result: True
  Comment: All specified packages are already installed
  Started: 16:38:23.039783
 Duration: 42.267 ms
   Changes:
```

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```
Summary for sproxy
-----
Succeeded: 2
Failed:    0
-----
Total states run:      2
Total run time: 100.265 ms
```

See also:

Please refer to *Managing remote Unix and Windows machines via SSH* for further details.

Other changes, enhancements, and bug fixes

- Improve the Grains and Pillar cache loading: [PR #117](#).
- Remove the Grains under the proxy Pillar: [PR #114](#).
- Correct nodegroups definition bug: [PR #128](#).
- Ensure that the execution timeout defaults to 60 seconds: [PR #144](#).
- Fix issue [#149](#): targeting cached pillar data doesn't appear to be working, in [PR #151](#).
- Added `-async` CLI argument: [PR #155](#).
- Added `-d / --documentation` CLI argument to display Minion modules docs: [PR #156](#).

Release 2020.3.0

This release brings a better integration with the existing Salt environment, as well as improved the performance for the devices managed through *salt-sproxy* exclusively.

Existing Salt environment

When install *salt-sproxy* in an environment where you're usually executing Salt commands from (i.e., typically on the Salt Master), *salt-sproxy* allows you to access and run commands against the existing Proxy Minions, or regular Minions. For example, let's say you execute the following from your existing Salt setup:

```
$ salt 'device*' test.ping
device7:
  True
device3:
  True
device1:
  True
device4:
  True
device5:
  True
device2:
  True
device6:
  True
```

After installing *salt-sproxy* on the Salt Master (e.g., `pip install salt-sproxy`), you'll be able to execute the following command with the same effect:

```
$ salt-sproxy 'device*' test.ping --use-existing-proxy
device7:
    True
device3:
    True
device1:
    True
device4:
    True
device5:
    True
device2:
    True
device6:
    True
```

To simplify the usage, you can put the following configuration option into the Salt Master configuration:

```
/etc/salt/master
```

```
use_existing_proxy: true
```

With this configuration, you can execute the above as: `salt-sproxy 'device*' test.ping`.

The execution time of the above command is now much faster compared to previous *salt-sproxy* releases, as it now invokes internal Salt code sequences, that makes the execution through *salt-sproxy* the equivalent of using *salt* with the `-b` (batch size) CLI argument.

That said, if you want to continue managing your existing minions (or some of them), as of today, and would like to manage some additional devices but without spinning up (Proxy) Minions for those, *salt-sproxy* will allow you do that. For example, in the networking context, you may want to manage some devices, such as routers, core switches, etc., using Proxy Minions - but others, more statical, such as console servers, OOB switches, and so on, you may not want to leverage Proxy Minions for them, and manage them through *salt-sproxy*. That said, *salt-sproxy* can help you benefit from both worlds at the same time: all you have to do is provide a Roster for those you don't want to spin up (Proxy) Minions for (see also [Using the Roster Interface](#)).

As a quick example, suppose you want to manage `device8` and `device9`, besides `device1` ... `device7` from the example above (which have Minions running). In that case, `device8` and `device9` would need to be provided in a Roster - for simplicity, let's consider the [File Roster](#):

```
/etc/salt/roster
```

```
device8:
  proxytype: junos
  host: <ip or dns name of host>
  username: <username>
  password: <secret>
device9:
  proxytype: napalm
  driver: <napalm driver>
  host: <ip or dns name of host>
  username: <username>
  password: <secret>
device10:
  proxytype: netmiko
  device_type: mellanox
```

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```
host: <ip or dns name of host>
username: <username>
password: <secret>
```

In the previous example, device8 would be managed through the [junos](#) Proxy module, while device9 using the [NAPALM](#) Proxy module, and device10 using the [Netmiko](#) Proxy module - see the documentation of each to understand what options are required.

In order to load the Roster file above, you will also need to update the Master configuration file:

```
/etc/salt/master
```

```
roster: file
use_existing_proxy: true
```

With these two files updated, you can now execute:

```
$ salt-sproxy 'device*' test.ping
device7:
  True
device3:
  True
device1:
  True
device4:
  True
device5:
  True
device2:
  True
device6:
  True
device8:
  True
device9:
  True
device10:
  True
```

Notice that the above uniformly returns the output from the existing Minions as well as those managed through *salt-sproxy* exclusively.

Tip: If you'd like to preserve the syntax your users are accustomed to, you may consider replacing `/usr/bin/salt` with `$(which salt-sproxy)`, then then syntax remains `salt 'device*' test.ping`.

Devices managed through *salt-sproxy* exclusively

There's no significant change from a functional perspective, however, the experience from the command line, for devices managed through *salt-sproxy* exclusively is now improved and the execution is faster, particularly when one or more devices are unreachable, or that's an error of another nature. Compared to the previous releases, an execution against a device starts immediately after the previous one completes - versus before when an entire batch was waiting for the previous entire batch to complete. As a result, the execution feels more similar to the usual *salt* command, even though you don't manage (Proxy) Minions services per se.

Summary events fired on the event bus

When executing a command with `--summary`, *salt-sproxy* not injects an event on the Salt bus (you'll need to have a Salt Master running for this). For example, at the end of the execution of the command from the example above, the following event would be seen on the bus:

```
proxy/runner/20200318131327481717/summary      {
  "_stamp": "2020-03-18T13:13:39.321346",
  "down_minions": [],
  "existing_minions": [
    "device1",
    "device2",
    "device3",
    "device4",
    "device5",
    "device6",
    "device7"
  ],
  "failed_minions": [],
  "fun": "test.ping",
  "fun_args": [],
  "jid": "20200318131327481717",
  "matched_minions": [
    "device1",
    "device2",
    "device3",
    "device4",
    "device5",
    "device6",
    "device7",
    "device8",
    "device9",
    "device10",
  ],
  "sproxy_minions": [
    "device8",
    "device9",
    "device10",
  ],
  "tgt": "device*",
  "tgt_type": "glob",
  "timeout_minions": [],
  "unreachable_devices": [],
  "user": "sudo_mulinic"
}
```

This event provides an event with report for what devices replied, and which are managed through *salt-sproxy*, etc., similar to the CLI summary.

Release 2020.2.0

This is considered the first mature release, with significant improvements around the targeting, new CLI options as well as other improvements and features.

Static Grains

With this release, static Grains can be configured easier for large (or all) groups of devices by having a `grains` section in the Master configuration file, e.g.,

```
/etc/salt/master
```

```
grains:
  salt:
    role: proxy
```

For more details check out the new section [Managing Static Grains](#).

Improved targeting

Targeting mechanisms have been revisited and rewrote almost from scratch, for a better user experience similar to when managing Proxy Minions and executing via the usual `salt` command.

On this occasion, there are two new CLI options added in this release: `--invasive-targeting` and `--preload-targeting`. The reasoning for adding these is that the native `salt-sproxy` targeting highly depends on the data you provide mainly through the *Roster* system (see also [Extension Roster Modules](#)). Through the Roster interface and other mechanisms, you are able to provide static Grains, which you can use in your targeting expressions. There are situations when you may want to target using more dynamic Grains that you probably don't want to manage statically, which may depend on various attributes retrieved *after* connecting to the device (e.g., hardware model, OS version, etc.). In such case, the `--invasive-targeting` targeting can be helpful as it connects to the device, retrieves these attributes / Grains, then executes the requested command, only on the devices matched by your target.

`--preload-targeting` works in a similar way, with the distinction that it doesn't establish the connection with the remote device, however your target expression depends on number of attributes retrieved from various systems depending on each individual device (or group of devices).

Using `--invasive-targeting` together with `--cache-grains` and / or `--cache-pillar` can speed up the run time when you execute next time (next run would be without `--invasive-targeting`), as the Grains / Pillar data is already available and will be used in determining the targets from your expression.

New Roster module: `file`

Using the new *File Roster*, you can provide the universe of devices `salt-sproxy` can possibly manage through an arbitrary SLS file (therefore this file can be provided in any of the supported format: Jinja+YAML, YAML, JSON, Python, etc. - see [the list of available Renderers](#) for more options). The path to this file defaults to `/etc/salt/roster`, or you can override it using the `roster_file` configuration option (or from the command line using `--roster-file`), providing the absolute path.

Example File Roster (as YAML):

```
/etc/salt/roster
```

```
device1:
  grains:
    site: site1
device2:
  grains:
    site: site2
```

Example File Roster (as Jinja+YAML) - manage 100 device, with a simple Jinja + YAML auto-generated Roster:

```
/etc/salt/roster
```

```
{%- for i in range(100) %}
device{{ i }}:
  grains:
    site: sitel
{%- endfor %}
```

Example File Roster (as JSON):

```
/etc/salt/roster
```

```
{
  "device1": {
    "grains": {
      "site": "sitel"
    }
  },
  "device2": {
    "grains": {
      "site": "sitel"
    }
  }
}
```

Using any of these, you'll be able to execute `salt-sproxy -G site:sitel test.ping` (to target all devices that have the site Grain set as `sitel`) or `salt-sproxy 'device*' test.ping`, etc.

Tip: Remember that being interpreted as an SLS, you can also invoke Salt functions, using the `__salt__` global variable. For example, to retrieve and build the list of devices dynamically using an HTTP query, you can do, e.g.,

```
{%- set ret = __salt__.http.query('https://netbox.live/api/dcim/devices/',
↳decode=true) %}
{%- for device in ret.dict.results %}
{{ device.name }}:
  grains:
    site: {{ device.site.slug }}
{%- endfor %}
```

As always, for higher complexity, consider using the [pure Python Renderer](#).

salt-sapi

In order to simplify the usage of the REST API calls to devices managed through *salt-sproxy*, beginning with this release, there's an additional program distributed with *salt-sproxy*, *salt-sapi* that leverages the usual Salt API features, and on top, it provides an additional client for *sproxy*.

Note: That means, instead of starting the usual `salt-api`, in order to execute REST calls through *sproxy*, you can start `salt-sapi` instead, using the exact same CLI arguments and configuration options. See [salt-sapi](#) for further information.

Example call before this release (without *salt-sapi*):

```
$ curl -sS localhost:8080/run -H 'Accept: application/x-yaml' \
-d eauth='pam' \
-d username='mircea' \
-d password='pass' \
-d client='runner' \
-d fun='proxy.execute' \
-d tgt='minion1' \
-d function='test.ping' \
-d sync=True
return:
- minion1: true
```

Example call starting with this release (through *salt-sapi*):

```
$ curl -sS localhost:8080/run -H 'Accept: application/x-yaml' \
-d eauth='pam' \
-d username='mircea' \
-d password='pass' \
-d client='sproxy' \
-d tgt='minion1' \
-d fun='test.ping'
return:
- minion1: true
```

Notice in the later call the client invoked is *sproxy*, while the *fun* field points straight to the Execution Function you want to execute (as in opposite to a more convoluted usage of both *fun* and *function* as previously).

See also:

Check out the [salt-sapi](#) example for configuring and using the *salt-sapi* interface.

New CLI options

New CLI options added in this release, to provide similar functionality to the usual *salt* command:

--batch-wait: Wait a specific number of seconds after each batch is done before executing the next one.

--hide-timeout: Hide devices that timeout.

--failhard: Stop the execution at the first error.

--progress / -p: Display a progress graph to visually show the execution of the command across the list of devices.

--summary: Display a summary of the command execution:

- Total number of devices targeted.
- Number of devices that returned without issues.
- Number of devices that timed out executing the command. See also *-t* or *--timeout* argument to adjust the timeout value.
- Number of devices with errors (i.e., there was an error while executing the command).
- Number of unreachable devices (i.e., couldn't establish the connection with the remote device).

In *-v* / *--verbose* mode, this output is enhanced by displaying the list of devices that did not return / with errors / unreachable.

Example:


```

-----
Summary
-----
# of devices targeted: 10
# of devices returned: 3
# of devices that did not return: 5
# of devices with errors: 0
# of devices unreachable: 2
-----

```

- `--show-jid`: Display the JID (Job ID).
- `--verbose / -v`: Turn on command verbosity, display jid, devices per batch, and detailed summary.
- `--pillar-root`: Set a specific directory as the base pillar root.
- `--states-dir`: Set a specific directory to search for additional States.
- `--module-dirs / -m`: Specify one or more directories where to load the extension modules from. Multiple directories can be provided by passing `-m` or `--module-dirs` multiple times.
- `--saltenv`: The Salt environment name where to load extension modules and files from.
- `--config-dump`: Print the complete salt-sproxy configuration values (with the defaults), in YAML format.

Returners

Using the `--return`, `--return-config`, and `--return-kwarg`s new CLI options, you can forward the execution results to various systems such as SQL databases, Slack, Syslog, or NoSQL systems, etc. - see [here](#) the list of natively available Returner modules you can use.

2019.10.0

This release includes several new features:

- Improved the granularity of the options that are loaded from the Roster. As such, this can be used to provide more specific connection parameters per device (or groups of devices). In other words, if you have one of more devices that need a more specific, username / password / port / etc. to establish the connection, you can put those into the Roster.

The available fields that you can use depend on what the Proxy module of choice requires, see <https://docs.saltstack.com/en/latest/ref/proxy/all/index.html> and check out the documentation of the Proxy module you're using.

You can also override the `proxytype` value, to use a different Proxy module per device.

For example, if you're using the *Pillar Roster*, you would typically have a structure as following:

```

devices:
  - name: device1
  - name: device2
  - name: device3

```

Where all three devices would be managed, say using the `napalm` Proxy module.

Say, if you'd like to change `device2` to be managed using the `junos` Proxy module instead, you can update the above as:

```
devices:
- name: device1
- name: device2
  proxytype: junos
- name: device3
```

In a similar way, if you require to authenticate to `device3` using a different username, you can override that as:

```
devices:
- name: device1
- name: device2
  proxytype: junos
- name: device3
  username: test-username
```

While the examples above are using the *Pillar Roster*, they would work in the same way with other Rosters, such as *Ansible Roster*, etc.

For a more complete example, make sure to take a look at *Quick Start*.

- Added `--no-connect` command line option, to be able to invoke Salt functions without necessarily establishing the connection with the remote device. See `--no-connect` for more details.
- New option `--test-ping` which can be used in combination with `--use-existing-proxy` to ensure that the existing (Proxy) Minion is alive / usable, before attempting to execute the command; when non-responsive, `salt-sproxy` will try to execute the code locally.
- Starting with this release, when targeting through a Roster, by default, the list of targets determined using your Roster of choice, is going to be cached locally. To deactivate this behaviour and re-compute the target at every execution, you can use the `--no-target-cache` option. This option can also be set in the configuration file as `no_target_cache: false`.
- Two new options `--sync-grains` and `--sync-modules` to re-sync the Execution or Grain modules that are delivered with the `salt-sproxy` package or from your own environment.

Important: If you are using the *NetBox Roster*, you might want to keep in mind that in Netbox v2.6 the default view permissions changed, so `salt-sproxy` may not be able to get the device list from Netbox by default.

Add `EXEMPT_VIEW_PERMISSIONS = ['*']` to the `NetBox configuration.py` file to change this behavior. See <https://github.com/netbox-community/netbox/releases/tag/v2.6.0> for more information.

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