
infrared Documentation

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InfraRed is a plugin based system that aims to provide an easy-to-use CLI for Ansible based projects. It aims to leverage the power of Ansible in managing / deploying systems, while providing an alternative, fully customized, CLI experience that can be used by anyone, without prior Ansible knowledge.

The project originated from Red Hat OpenStack infrastructure team that looked for a solution to provide an “easier” method for installing OpenStack from CLI but has since grown and can be used for *any* Ansible based projects.

Welcome to infrared's documentation!

1.1 Bootstrap

1.1.1 Setup

Clone *infrared* 2.0 from GitHub:

```
git clone https://github.com/redhat-openstack/infrared.git
```

Make sure that all [prerequisites](#) are installed. Setup [virtualenv](#) and [install](#) from source using [pip](#):

```
cd infrared
virtualenv .venv && source .venv/bin/activate
pip install --upgrade pip
pip install --upgrade setuptools
pip install .
```

Warning: It's important to upgrade `pip` first, as default `pip` version in RHEL (1.4) might fail on dependencies

Note: *infrared* will create a default [workspace](#) for you. This workspace will manage your environment details.

1.1.2 Development

For development work it's better to install in editable mode and work with master branch:

```
pip install -e .
```

Change default `IR_HOME` variable to point to Infrared directory:

```
export IR_HOME=/path/to/infrared/directory/
```

1.1.3 Provision

In this example we'll use `virsh` provisioner in order to demonstrate how easy and fast it is to provision machines using *infrared*.

Add the `virsh` plugin:

```
infrared plugin add plugins/virsh
```

Print `virsh` help message and all input options:

```
infrared virsh --help
```

For basic execution, the user should only provide data for the mandatory parameters, this can be done in two ways:

- 1) *CLI*
- 2) *Answers File*

CLI

Notice the only three mandatory paramters in `virsh` provisioner are:

- `--host-address` - the host IP or FQDN to ssh to
- `--host-key` - the private key file used to authenticate to your `host-address` server
- `--topology-nodes` - type and role of nodes you would like to deploy (e.g: `controller:3 == 3 VMs that will act as controllers`)

We can now execute the provisioning process by providing those parameters through the CLI:

```
infrared virsh --host-address $HOST --host-key $HOST_KEY --topology-nodes  
↪ "undercloud:1,controller:1,compute:1"
```

That is it, the machines are now provisioned and accessible:

```
TASK [update inventory file symlink] *****  
      [[ previous task time: 0:00:00.306717 = 0.31s / 209.71s ]]  
changed: [localhost]  
  
PLAY RECAP *****  
compute-0           : ok=4   changed=3   unreachable=0   failed=0  
controller-0       : ok=5   changed=4   unreachable=0   failed=0  
localhost          : ok=4   changed=3   unreachable=0   failed=0  
undercloud-0       : ok=4   changed=3   unreachable=0   failed=0  
hypervisor         : ok=85  changed=29  unreachable=0   failed=0  
  
      [[ previous task time: 0:00:00.237104 = 0.24s / 209.94s ]]  
      [[ previous play time: 0:00:00.555806 = 0.56s / 209.94s ]]  
      [[ previous playbook time: 0:03:29.943926 = 209.94s / 209.94s ]]  
      [[ previous total time: 0:03:29.944113 = 209.94s / 0.00s ]]
```

Note: You can also use the auto-generated ssh config file to easily access the machines

Answers File

Unlike with *CLI*, here a new answers file (INI based) will be created. This file contains all the default & mandatory parameters in a section of its own (named `virsh` in our case), so the user can easily replace all mandatory parameters. When the file is ready, it should be provided as an input for the `--from-file` option.

Generate Answers file for *virsh* provisioner:

```
infrared virsh --generate-answers-file virsh_prov.ini
```

Review the config file and edit as required:

Listing 1: `virsh_prov.ini`

```
[virsh]
host-key = Required argument. Edit with any value, OR override with CLI: --host-key=
↳<option>
host-address = Required argument. Edit with any value, OR override with CLI: --host-
↳address=<option>
topology-nodes = Required argument. Edit with one of the allowed values OR override,
↳with CLI: --topology-nodes=<option>
host-user = root
```

Note: `host-key`, `host-address` and `topology-nodes` don't have default values. All arguments can be edited in file or overridden directly from CLI.

Note: Do not use double quotes or apostrophes for the string values in the answers file. *Infrared* will NOT remove those quotation marks that surround the values.

Edit mandatory parameters values in the answers file:

```
[virsh]
host-key = ~/.ssh/id_rsa
host-address = my.host.address
topology-nodes = undercloud:1,controller:1,compute:1
host-user = root
```

Execute provisioning using the newly created answers file:

```
infrared virsh --from-file=virsh_prov.ini
```

Note: You can always overwrite parameters from answers file with parameters from CLI:

```
infrared virsh --from-file=virsh_prov.ini --topology-nodes="undercloud:1,controller:1,
↳compute:1,ceph:1"
```

Done. Quick & Easy!

1.1.4 Installing

Now let's demonstrate the installation process by deploy an OpenStack environment using RHEL-OSP on the nodes we have provisioned in the previous stage.

Undercloud

First, we need to enable the tripleo-undercloud plugin:

```
infrared plugin add plugins/tripleo-undercloud
```

Just like in the provisioning stage, here also the user should take care of the mandatory parameters (by CLI or INI file) in order to be able to start the installation process. Let's deploy a TripleO Undercloud:

```
infrared tripleo-undercloud --version 10 --images-task rpm
```

This will deploy OSP 10 (Newton) on the node `undercloud-0` provisioned previously.

Infrared provides support for upstream RDO deployments:

```
infrared tripleo-undercloud --version pike --images-task=import \  
    --images-url=https://images.rdoproject.org/pike/rdo_trunk/current-tripleo/  
↪stable/
```

This will deploy RDO Pike version (OSP 11) on the node `undercloud-0` provisioned previously. Of course it is possible to use `--images-task=build` instead.

Overcloud

Like previously, need first to enable the associated plugin:

```
infrared plugin add plugins/tripleo-overcloud
```

Let's deploy a TripleO Overcloud:

```
infrared tripleo-overcloud --deployment-files virt --version 10 --introspect yes --  
↪tagging yes --deploy yes
```

```
infrared cloud-config --deployment-files virt --tasks create_external_network,forward_  
↪overcloud_dashboard,network_time,tempest_deployer_input
```

This will deploy OSP 10 (Newton) overcloud from the undercloud defined previously. Given the topology defined by the *Answers File* earlier, the overcloud should contain: - 1 controller - 1 compute - 1 ceph storage

1.2 Setup

1.2.1 Supported distros

Currently supported distros are:

- Fedora 25, 26, 27
- RHEL 7.3, 7.4, 7.5

Warning: Python 2.7 and virtualenv are required.

1.2.2 Prerequisites

Warning: sudo or root access is needed to install prerequisites!

General requirements:

```
sudo yum install git gcc libffi-devel openssl-devel
```

Note: Dependencies explained:

- git - version control of this project
- gcc - used for compilation of C backends for various libraries
- libffi-devel - required by [cffi](#)
- openssl-devel - required by [cryptography](#)

Closed [Virtualenv](#) is required to create clean python environment separated from system:

```
sudo yum install python-virtualenv
```

Ansible requires [python binding for SELinux](#):

```
sudo yum install libselinux-python
```

otherwise it won't be able to run modules with copy/file/template functions!

Note: libselinux-python is in [Prerequisites](#) but doesn't have a pip package. It must be installed on system level.

Note: Ansible requires also **libselinux-python** installed on all nodes using copy/file/template functions. Without this step all such tasks will fail!

1.2.3 Virtualenv

infrared shares dependencies with other OpenStack products and projects. Therefore there's a high probability of conflicts with python dependencies, which would result either with infrared failure, or worse, with breaking dependencies for other OpenStack products. When working from source, [virtualenv](#) usage is recommended for avoiding corrupting of system packages:

```
virtualenv .venv
source .venv/bin/activate
pip install --upgrade pip
pip install --upgrade setuptools
```

Warning: Use of latest “pip“ is mandatory, especially on RHEL platform!

Note: On Fedora 23 with EPEL repository enabled, [RHBZ#1103566](#) also requires

```
dnf install redhat-rpm-config
```

1.2.4 Installation

Clone stable branch from Github repository:

```
git clone https://github.com/redhat-openstack/infrared.git
```

Install infrared from source:

```
cd infrared
pip install .
```

1.2.5 Development

For development work it’s better to install in editable mode and work with master branch:

```
pip install -e .
```

Change default `IR_HOME` variable to point to Infrared directory:

```
export IR_HOME=/path/to/infrared/directory/
```

1.2.6 Ansible Configuration

Config file(`ansible.cfg`) could be provided to get custom behavior for Ansible.

Infrared try to locate the Ansible config file(`ansible.cfg`) in several locations, in the following order:

- `ANSIBLE_CONFIG` (an environment variable)
- `ansible.cfg` (in the current directory)
- `ansible.cfg` (in the Infrared home directory)
- `.ansible.cfg` (in the home directory)

If none of this location contains Ansible config, InfraRed will create a default one in Infrared’s home directory

```
1 [defaults]
2 host_key_checking = False
3 forks = 500
4 timeout = 30
5 force_color = 1
6
7 [ssh_connection]
8 pipelining = True
9 ssh_args = -o ControlMaster=auto -o ControlPersist=60s
```

Note: Values for *forks*, *host_key_checking* and *timeout* have to be the same or greater.

1.2.7 Bash completion

Bash completion script is in `etc/bash_completion.d` directory of git repository. To enable global completion copy this script to proper path in the system (`/etc/bash_completion.d`):

```
cp etc/bash_completion.d/infrared /etc/bash_completion.d/
```

Alternatively, just source it to enable completion temporarily:

```
source etc/bash_completion.d/infrared
```

When working in virtualenv, might be a good idea to add import of this script to the virtualenv activation one:

```
echo ". $(pwd)/etc/bash_completion/infrared" >> ${VIRTUAL_ENV}/bin/activate
```

1.3 Configuration

Infrared uses the `IR_HOME` environment variable which points where infrared should keep all the internal configuration files and workspaces.

By default the `IR_HOME` points to `~/.infrared` in user home directory. If it does not exist a new one will be created.

To change that default location user can simply set `IR_HOME`, for example:

```
$ IR_HOME=/tmp/newhome ir workspace list
```

This will generate default configurations files in the specified directory.

1.3.1 Defaults from environment variables

Infrared will load all environment variables starting with `IR_` and will transform them in default argument values that are passed to all modules.

This means that `IR_FOO_BAR=1` will do the same thing as adding `--foo-bar=1` to infrared CLI.

Infrared uses the same precedence order as Ansible when it decide which value to load, first found is used:

- command line argument
- environment variable
- configuration file
- code (plugin spec default) value

1.3.2 Ansible configuration and limitations

Usually *infrared* does not touch the settings specified in the ansible configuration file (`ansible.cfg`), with few exceptions.

Internally *infrared* use Ansible environment variables to set the directories for common resources (callback plugins, filter plugins, roles, etc); this means that the following keys from the Ansible configuration files are ignored:

- `callback_plugins`
- `filter_plugins`
- `roles_path`

It is possible to define custom paths for those items setting the corresponding environment variables:

- `ANSIBLE_CALLBACK_PLUGINS`
- `ANSIBLE_FILTER_PLUGINS`
- `ANSIBLE_ROLES_PATH`

1.4 Workspaces

With *workspaces*, user can manage multiple environments created by *infrared* and alternate between them. All runtime files (Inventory, hosts, ssh configuration, `ansible.cfg`, etc...) will be loaded from a workspace directory and all output files (Inventory, ssh keys, environment settings, facts caches, etc...) will be generated into that directory.

Create: Create new workspace. If name isn't provided, *infrared* will generate one based on timestamp:

```
infrared workspace create example
Workspace 'example' added
```

Note: The create option will not switch to the newly created workspace. In order to switch to the new workspace, the `checkout` command should be used

Inventory: Fetch workspace inventory file (a symlink to the real file that might be changed by *infrared* executions):

```
infrared workspace inventory
/home/USER/.infrared/workspaces/example/hosts
```

Checkout Switches to the specified workspace:

```
infrared workspace checkout example3
Now using workspace: 'example3'
```

Creates a new workspace if the `--create` or `-c` is specified and switches to it:

```
infrared workspace checkout --create example3
Workspace 'example3' added
Now using workspace: 'example3'
```

Note: Checked out workspace is tracked via a status file in `workspaces_dir`, which means checked out workspace is persistent across shell sessions. You can pass checked out workspace by environment variable `IR_WORKSPACE`, which is non persistent

```
ir workspace list
| Name      | Is Active  |
|-----+-----|
| bee       | True       |
| zoo       |            |

IR_WORKSPACE=zoo ir workspace list
| Name      | Is Active  |
|-----+-----|
| bee       |            |
| zoo       | True       |

ir workspace list
| Name      | Is Active  |
|-----+-----|
| bee       | True       |
| zoo       |            |
```

Warning: While `IR_WORKSPACE` is set *ir workspace checkout* is disabled

```
export IR_WORKSPACE=zoo
ir workspace checkout zoo
ERROR 'workspace checkout' command is disabled while IR_WORKSPACE_
↪environment variable is set.
```

List: List all workspaces. Active workspace will be marked.:

```
infrared workspace list

+-----+-----+
| Name      | Active  |
+-----+-----+
| example   |        |
| example2  | *      |
| rdo_testing |       |
+-----+-----+
```

Note: If the `--active` switch is given, only the active workspace will be printed

Delete: Deletes a workspace:

```
infrared workspace delete example

Workspace 'example' deleted
```

Delete multiple workspaces at once:

```
infrared workspace delete example1 example2 example3

Workspace 'example1' deleted
Workspace 'example2' deleted
Workspace 'example3' deleted
```

Cleanup: Removes all the files from workspace. Unlike delete, this will keep the workspace namespace and keep it active if it was active before.:

```
infrared workspace cleanup example2
```

Export:

Package workspace in a tar ball that can be shipped to, and loaded by, other *infrared* instances:

```
infrared workspace export

The active workspace example1 exported to example1.tar
```

To export non-active workspaces, or control the output file:

```
infrared workspace export -n example2 -f /tmp/look/at/my/workspace

Workspace example2 exported to /tmp/look/at/my/workspace.tgz
```

Note: If the `-K/--copy-keys` flag is given, SSH keys from outside the workspace directory, will be copied to the workspace directory and the inventory file will be changed accordingly.

Import: Load a previously exported workspace (local or remote):

```
infrared workspace import /tmp/look/at/my/new-workspace.tgz
infrared workspace import http://free.ir/workspaces/newworkspace.tgz

Workspace new-workspace was imported
```

Control the workspace name:

```
infrared workspace import /tmp/look/at/my/new-workspace --name example3

Workspace example3 was imported
```

Node list: List nodes, managed by a specific workspace:

```
infrared workspace node-list
| Name          | Address      | Groups
↔ |
|-----+-----+-----|
↔---|
| controller-0 | 172.16.0.94 | overcloud_nodes, network, controller, openstack_
↔nodes |
| controller-1 | 172.16.0.97 | overcloud_nodes, network, controller, openstack_
↔nodes |

infrared workspace node-list --name some_workspace_name
```

`--group` - list nodes that are member of specific group.

Group list: List groups and nodes in them, managed by a specific workspace:

```
infrared workspace group-list
| Name          | Nodes
|-----+-----|
| overcloud_nodes | controller-0, compute-0, compute-1
| undercloud     | undercloud-0
```

Note: To change the directory where Workspaces are managed, edit the `workspaces_base_folder` option. Check the [Infrared Configuration](#) for details.

1.5 Plugins

In *infrared 2.0*, *plugins* are self contained Ansible projects. They can still also depend on common items provided by the core project. Any ansible project can become an 'infrared' plugin by adhering to the following structure (see [tests/example](#) for an example plugin):

```
tests/example
├── main.yml           # Main playbook. All execution starts here
├── plugin.spec       # Plugin definition
├── roles              # Add here roles for the project to use
│   └── example_role
│       ├── tasks
│       └── main.yml
```

Note: This structure will work without any `ansible.cfg` file provided (unless common resources are used), as Ansible will search for references in the relative paths described above. To use an `ansible.cfg` config file, use absolute paths to the plugin directory.

1.5.1 Plugin structure

Main entry

infrared will look for a playbook called `main.yml` to start the execution from.

Note: If you want to use other playbook to start from - simply add it into config section in `plugin.spec`:

```
config:
  plugin_type: other
  entry_point: your-playbook.yml
  ...
```

Plugins are regular Ansible projects, and as such, they might include or reference any item (files, roles, var files, ansible plugins, modules, templates, etc...) using relative paths to current playbook. They can also use roles, callback and filter plugins defined in the `common/` directory provided by *infrared* core.

An example of `plugin_dir/main.yml`:

```

1 - name: Main Play
2   hosts: all
3   vars_files:
4     - vars/some_var_file.yml
5   roles:
6     - role: example_role
7   tasks:
8     - name: fail if no vars dict
9       when: "provision is not defined"
10      fail:
11
12     - name: fail if input calls for it
13       when: "provision.foo.bar == 'fail'"
14       fail:
15
16     - debug:
17         var: inventory_dir
18         tags: only_this
19
20     - name: Test output
21       vars:
22         output_file: output.example
23       file:
24         path: "{{ inventory_dir }}/{{ output_file }}"
25         state: touch
26       when: "provision is defined"

```

Plugin Specification

infrared gets all plugin info from `plugin.spec` file. Following *YAML* format. This file defines the CLI flags this plugin exposes, its name and its type.

```

config:
  plugin_type: provision
  entry_point: main.yml
  # roles_path: ../ # Optional, contains relative path to a role
subparsers:
  example:
    description: Example provisioner plugin
    include_groups: ["Ansible options", "Inventory", "Common options", "Answers_
↪file"]
  groups:
    - title: Group A
      options:
        foo-bar:
          type: Value
          help: "foo.bar option"
          default: "default string"

        flag:
          type: Flag
          help: "flag option"

        dictionary-val:
          type: KeyValueList
          help: "dictionary-val option"

```

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```

- title: Group B
  options:
    iniopt:
      type: IniType
      help: "Help for '--iniopt'"
      action: append
      ansible_variable: 'ini_file'

    nestedlist:
      type: NestedList
      help: "Help for '--nestedlist'"
      action: append

- title: Group C
  options:
    uni-dep:
      type: Value
      help: "Help for --uni-dep"
      required_when: "req-arg-a == yes"

    multi-dep:
      type: Value
      help: "Help for --multi-dep"
      required_when:
        - "req-arg-a == yes"
        - "req-arg-b == yes"

    either-dep:
      type: Value
      help: "Help for --either-dep"
      required_when:
        - "req-arg-a == yes or req-arg-b == yes"

    req-arg-a:
      type: Bool
      help: "Help for --req-arg-a"

    req-arg-b:
      type: Bool
      help: "Help for --req-arg-b"

- title: Group D
  options:
    deprecated-way:
      type: Value
      help: "Deprecated way to do it"
    new-way:
      deprecates: deprecated-way
      type: Value
      help: "New way to do it"

- title: Group E
  options:
    tasks:
      type: ListOfFileNames
      help: |

```

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```

↪ "ListOfFileNames" and has
↪ for --help it
↪ dir' value, and

```

This is example for option which is with type auto propagation of "Allowed Values" in help. When we ask will look in plugin folder for directory name as 'lookup_dir' value, and will add all file names to "Allowed Values"

```
lookup_dir: 'post_tasks'
```

Config section:

- Plugin type can be one of the following: provision, install, test, other.
- **Entry point is the main playbook for the plugin. by default this will refer to main.yml file** but can be changed to ant other file.
- **roles_path:** This is optional and it might be used when the plugin refers to a role which is introduced by that plugin. The roles_path then relatively points (from plugin.spec location) to the role. Let's take a look at the following example of an ansible role (can be as a standalone project) which is also an infrared plugin

```

my_role
├── defaults
│   └── main.yml
├── infrared_plugin
│   ├── main.yml           # Main playbook. All execution starts here
│   └── plugin.spec       # Plugin definition
└── tasks                 # Tasks of the role
    └── main.yml

```

In the above example main.yml calls my_role. In order to help infrared find the role, roles_path within config section needs to be set to ../ to point to the ansible role called from infrared_plugin/main.yml

To access the options defined in the spec from your playbooks and roles use the plugin type with the option name. For example, to access dictionary-val use {{ provision.dictionary.val }}.

Note: the vars-dict defined by *Complex option types* is nested under plugin_type root key, and passed to Ansible using --extra-vars meaning that any vars file that has plugin_type as a root key, will be overridden by that vars-dict. See [Ansible variable precedence](#) for more details.

Include Groups

A plugin can reference preset control arguments to be included in its CLI

Answers File: Instead of explicitly listing all CLI options every time, *infrared* plugins can read their input from INI answers file, using --from-file switch. use --generate-answers-file switch to generate such file. It will list all input arguments a plugin accepts, with their help and defaults. CLI options still take precedence if explicitly listed, even when --from-file is used.

Common Options:

- --dry-run: Don't execute Ansible playbook. Only write generated vars dict to stdout
- --output: Redirect generated vars dict from stdout to an explicit file (YAML format).
- --extra-vars: Inject custom input into the vars dict

Inventory: Load a new inventory to active `workspace`. The file is copied to workspace directory so all `{{ inventory_dir }}` references in playbooks still point to workspace directory (and not to the input file's directory).

Note: This file permanently becomes the workspace's inventory. To revert to original workspace the workspace must be cleaned.

Ansible options:

- `--verbose`: Set ansible verbosity level
- `--ansible-args`: Pass all subsequent input to Ansible as raw arguments. This is for power-users wishing to access Ansible functionality not exposed by *infrared*:

```
infrared [...] --ansible-args step;tags=tag1,tag2;forks=500
```

Is the equivalent of:

```
ansible-playbook [...] --step --tags=tag1,tag2 --forks 500
```

Complex option types

Infrared extends `argparse` with the following option types. These options are nested into the vars dict that is later passed to Ansible as extra-vars.

- **Value:** String value.
- **Bool:** Boolean value. Accepts any form of YAML boolean: `yes/no`, `true/false` `on/off`. Will fail if the string can't be resolved to this type.
- **Flag:** Acts as a flag, doesn't parse any value. Will always return `true`.
- **IniType:** Value is in `section.option=value` format. `append` is the default action for this type, so users can provide multiple args for the same parameter. .. warning:: The *IniType* option is deprecated, use *NestedDict* instead of.
- **NestedDict:** Value is in `section.option=value` format. `append` is the default action for this type, so users can provide multiple args for the same parameter. Example:

```
infrared example --foo option1=value1 --foo option2=value2
```

```
{"foo": {"option1": "value1",
         "option2": "value2"}}
```

- **NestedList:** The *NestedList* option inherits *NestedDict* attributes and differs from *NestedDict* by value format. It composes value as list of dictionaries. Example:

```
infrared example --foo option1=value1 --foo option1=value2
```

```
{"foo": [{"option1": "value1"},
         {"option1": "value2"}]}
```

- **KeyValueList:** String representation of a flat dict `--options option1:value1,option2:value2` becomes:

```

{"options": {"option1": "value1",
            "option2": "value2"}}

```

The nesting is done in the following manner: option name is split by `-` delimiter and each part is a key of a dict nested in side the previous one, starting with `plugin_type`. Then value is nested at the inner-most level. Example:

```

infrared example --foo-bar=value1 --foo-another-bar=value2 --also_foo=value3

```

```

{
  "provision": {
    "foo": {
      "bar": "value1",
      "another": {
        "bar": "value2"
      }
    },
    "also_foo": "value3"
  }
}

```

- **FileValue** The absolute or relative path to a file. Infrared validates whether file exists and transform the path to the absolute.
- **VarFile**

Same as the FileValue type but additionally Infrared will check the following locations for a file:

- `argument/name/option_value`
- `<spec_root>/defaults/argument/name/option_value`
- `<spec_root>/var/argument/name/option_value`

In the example above the CLI option name is `--argument-name`. The VarFile suites very well to describe options which point to the file with variables.

For example, user can describe network topologies parameters in separate files. In that case, all these files can be put to the `<spec_root>/defaults/network` folder, and plugin specification can look like:

```

config:
  plugin_type: provision
  entry_point: main.yml
subparsers:
my_plugin:
  description: Provisioner virtual machines on a single Hypervisor using_
↪libvirt
  groups:
    - title: topology
      options:
        network:
          type: VarFile
          help: |
            Network configuration to be used
            __LISTYAMLS__
          default: default1_3_nets

```

Then, the cli call can looks simply like:

```
infrared my_plugin --network=my_file
```

Here, the 'my_file' file should be present in the `/{defaults|var}/network` folder, otherwise an error will be displayed by the Infrared. Infrared will transform that option to the absolute path and will put it to the `provision.network` variable:

```
provision.network: /home/user/.../my_plugin/defaults/my_file
```

That variable is later can be used in Ansible playbooks to load the appropriate network parameters.

Note: Infrared automatically checks for files with `.yaml` extension. So the `my_file` and `my_file.yaml` will be validated.

- **ListOfVarFiles** The list of files. Same as `VarFile` but represents the list of files delimited by comma (`,`).
- **VarDir** The absolute or relative path to a directory. Same as `VarFile` but points to the directory instead of file

Placeholders

Placeholders allow users to add a level of sophistication in options help field.

- **__LISTYAMLS__**: Will be replaced with a list of available YAML (`.yaml`) file from the option's settings dir.
| Assume a plugin with the following directory tree is installed:

```
plugin_dir
├── main.yaml           # Main playbook. All execution starts here
├── plugin.spec        # Plugin definition
├── vars               # Add here variable files
│   ├── yamlsomt
│   │   ├── file_A1.yaml # This file will be listed for yamlsomt
│   │   └── file_A2.yaml # This file will be listed also for yamlsomt
│   └── another
│       └── yamlsomt
│           ├── file_B1.yaml # This file will be listed for another-yamlsomt
│           └── file_B2.yaml # This file will be listed also for another-
↪yamlsomt
```

Content of `plugin_dir/plugin.spec`:

```
plugin_type: provision
description: Example provisioner plugin
subparsers:
  example:
    groups:
      - title: GroupA
        yamlsomt:
          type: Value
          help: |
            help of yamlsomt option
            __LISTYAMLS__

        another-yamlsomt:
          type: Value
          help: |
```

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```
help of another-yamlsopt option
__LISTYAMLS__
```

Execution of help command (`infrared example --help`) for the ‘example’ plugin, will produce the following help screen:

```
usage: infrared example [-h] [--another-yamlsopt ANOTHER-YAMLSOPT]
                        [--yamlsopt YAMLSOPT]

optional arguments:
  -h, --help            show this help message and exit

GroupA:
  --another-yamlsopt ANOTHER-YAMLSOPT
                        help of another-yamlsopt option
                        Available values: ['file_B1', 'file_B2']
  --yamlsopt YAMLSOPT  help of yamlsopt option
                        Available values: ['file_A1', 'file_A2']
```

Required Arguments

InfraRed provides the ability to mark an argument in a specification file as ‘required’ using two flags:

1. ‘required’ - A boolean value tell whether the arguments required or not. (default is ‘False’)
2. ‘required_when’ - **Makes this argument required only when the mentioned argument is given and the condition is True.** More than one condition is allowed with YAML list style. In this case the argument will be required if all the conditions are True.

For example, take a look on the `plugin.spec` (‘Group C’) in *Plugin Specification*

Roles Dependencies

If a plugin depended on one or more Ansible role, it’s possible to mention them in a file. InfraRed makes use of Ansible Galaxy to install the roles file, therefore, the requirements for it should be exactly the same like in Ansible Galaxy:

1. The file need to be in YAML format.
2. The name of the file should be either `requirements.yml` or `requirements.yaml`

For more details, please take a look on [Ansible Galaxy documentation](#).

Argument Deprecation

To deprecate an argument in InfraRed, you need to add flag ‘deprecates’ in newer argument

When we use a deprecated argument, InfraRed will warn you about that and it will add the new argument in Ansible parameters with the value of the deprecated

For example, take a look on the `plugin.spec` (‘Group D’) in *Plugin Specification*

1.5.2 Plugin Manager

The following commands are used to manage *infrared* plugins

Add: *infrared* will look for a `plugin.spec` file in each given source and register the plugin under the given plugin-type (when source is 'all', all available plugins will be installed):

```
infrared plugin add tests/example
infrared plugin add example example2
infrared plugin add <git_url> [--revision <branch/tag/revision>]
infrared plugin add all
```

Note: "--revision" works with one plugin source only.

List: List all available plugins, by type:

```
infrared plugin list
```

Type	Name
provision	example
install	
test	

```
infrared plugin list --available
```

Type	Name	Installed
provision	example foreman openstack virsh	*
install	collect-logs packstack tripleo-overcloud tripleo-undercloud	
test	rally tempest	

Note: Supported plugin types are defined in plugin settings file which is auto generated. Check the [Infrared Configuration](#) for details.

Remove: Remove the given plugins (when name is 'all', all plugins will be removed):

```
infrared plugin remove example example2
infrared plugin remove all
```

Freeze: Output installed plugins with their revisions in a [registry file format](#). When you need to be able to install somewhere else the exact same versions of plugins use freeze command:

```
infrared plugin freeze > registry.yaml
```

Import: Installs all plugins from the given registry file. The registry file can be either path to local file or to URL:

```
infrared plugin import plugins/registry.yaml
infrared plugin import https://url/to/registry.yaml
```

Update: Update a given Git-based plugin to a specific revision. The update process pulls the latest changes from the remote and checks out a specific revision if given, otherwise, it will point to the tip of the updated branch. If the “--skip_reqs” switch is set, the requirements installation will be skipped:

```
ir plugin update [--skip_reqs] [--hard-reset] name [revision]
```

Execute: Plugins are added as subparsers under `plugin` type and will execute the [main playbook](#):

```
infrared example
```

1.5.3 Registry Files

Registry files are files containing a list of plugins to be installed using the infrared plugin import. These files are used to hold the result from infrared plugin freeze for the purpose of achieving repeatable installations. The Registry file contains a pinned version of everything that was installed when infrared plugin freeze was run.

Registry File Format

The registry file is following the YAML format. Each section of the registry file contains an object which specifies the plugin to be installed:

- `src`: The path to the plugin. It can be either local path or git url
- `src_path`: (optional) Relative path within the repository where infrared plugin can be found.
- `rev`: (optional) If the plugin source is git, this allows to specify the revision to pull.
- `desc`: The plugin description.
- `type`: Plugin type can be one of the following: `provision`, `install`, `test`, `other`.

Example of a registry file:

```
---
plugin_name:
  src: path/to/plugin/directory
  rev: some_revision_hash
  src_path: /path/to/plugin/in/repo
  desc: Some plugin description
  type: provision/test/install/other
```

1.5.4 How to create a new plugin

Note: Check [COOKBOOK](#) for the quick guide on how to create a plugin.

1.6 Topology

A topology is a description of an environment you wish to provision. We have divided it into two, *network topology* and *nodes topology*.

1.6.1 Nodes topology

Before creating our environment, we need to decide how many and what type of nodes to create. The following format is used to provide topology nodes:

```
infrared <provisioner_plugin> --topology-nodes NODENAME:AMOUNT
```

where NODENAME refers to files under `vars/topology/nodes/NODENAME.yml` (or `defaults/topology/nodes/NODENAME.yml`) and AMOUNT refers to the amount of nodes from the NODENAME we wish to create.

For example, if we choose the `Virsh` provisioner:

```
infrared virsh --topology-nodes undercloud:1,controller:3 ...
```

The above command will create 1 VM of type `undercloud` and 3 VMs of type `controller`

For any node that is provided in the CLI `--topology-nodes` flag, *infrared* looks for the node first under `vars/topology/nodes/NODENAME.yml` and if not found, under `default/topology/nodes/NODENAME.yml` where we supply a default set of supported / recommended topology files.

Lets examine the structure of topology file (located: `var/topology/nodes/controller.yml`):

```
name: controller           # the name of the VM to create, in case of several of the same
↳type, appended with "-#"
prefix: null              # in case we wish to add a prefix to the name
cpu: "4"                  # number of vCPU to assign for the VM
memory: "8192"           # the amount of memory
swap: "0"                 # swap allocation for the VM
disks:                    # number of disks to create per VM
  disk1:                  # the below values are passed `as is` to virt-install
    import_url: null
    path: "/var/lib/libvirt/images"
    dev: "/dev/vda"
    size: "40G"
    cache: "unsafe"
    preallocation: "metadata"
interfaces:               # define the VM interfaces and to which network they should be
↳connected
  nic1:
    network: "data"
  nic2:
    network: "management"
  nic3:
    network: "external"
external_network: management # define what will be the default external network
groups:                   # ansible groups to assign to the newly created VM
```

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```

- controller
- openstack_nodes
- overcloud_nodes
- network

```

For more topology file examples, please check out the default [available nodes](#)

To override default values in the topology dict the extra vars can be provided through the CLI. For example, to add more memory to the controller node, the `override.controller.memory` value should be set:

```

infrared virsh --topology-nodes controller:1,compute:1 -e override.controller.
↪memory=30720

```

1.6.2 Network topology

Before creating our environment, we need to decide number and types of networks to create. The following format is used to provide topology networks:

```

infrared <provisioner_plugin> --topology-network NET_TOPOLOGY

```

where `NET_TOPOLOGY` refers to files under `vars/topology/network/NET_TOPOLOGY.yml` (or if not found, `defaults/topology/network/NET_TOPOLOGY.yml`)

To make it easier for people, we have created a default network topology file called: `3_nets.yml` (you can find it under each provisioner plugin `defaults/topology/network/3_nets.yml`) that will be created automatically.

For example, if we choose the [Virsh](#) provisioner:

```

infrared virsh --topology-network 3_nets ...

```

The above command will create 3 networks: (based on the specification under `defaults/topology/network/3_nets.yml`)

data network - an isolated network # management network - NAT based network with a DHCP # external network - NAT based network with DHCP

If we look in the `3_nets.yml` file, we will see this:

```

networks:
  net1:
    <snip>
  net2:
    name: "management"           # the network name
    external_connectivity: yes   # whether we want it externally accessible
    ip_address: "172.16.0.1"     # the IP address of the bridge
    netmask: "255.255.255.0"
    forward:                     # forward method
      type: "nat"
    dhcp:                         # omit this if you don't want a DHCP
      range:                     # the DHCP range to provide on that network
        start: "172.16.0.2"
        end: "172.16.0.100"
        subnet_cidr: "172.16.0.0/24"
        subnet_gateway: "172.16.0.1"
    floating_ip:                 # whether you want to "save" a range for
↪assigning IPs

```

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```

    start: "172.16.0.101"
    end: "172.16.0.150"
net3:
  <snip>

```

To override default values in the network dict the extra vars can be provided through the CLI. For example, to change ip address of net2 network, the `override.networks.net2.ip_address` value should be set:

```

infrared virsh --topology-nodes controller:1,compute:1 -e override.networks.net2.ip_
↵address=10.0.0.3

```

1.7 Interactive SSH

This plugin allows users to establish interactive ssh session to a host managed by *infrared*. To do this use:

```

infrared ssh <nodename>

```

where ‘nodename’ is a hostname from inventory file.

For example

```

infrared ssh controller-0

```

1.8 New In infrared 2.0

1.8.1 Highlights

1. **Workspaces:** Added [Workspaces](#). Every session must be tied to an active workspace. All input and output file are taken from, and written to, the active workspace directory. which allows easy migration of workspace, and avoids accidental overwrites of data, or corrupting the working directory. The deprecates `ir-archive` in favor of `workspace import` and `workspace export`
2. **Stand-Alone Plugins:** Each plugins is fully contained within a single directory. [Plugin structure](#) is fully defined and plugins can be loaded from any location on the system. “*Example plugin*” shows contributors how to structure their Ansible projects to plug into *infrared*
3. **SSH:** Added ability to establish interactive ssh connection to nodes, managed by workspace using `workspace’s inventory infrared ssh <hostname>`
4. **Single Entry-Point:** `ir-provisioner`, `ir-installer`, `ir-tester` commands are deprecated in favor of a single `infrared` entry point (`ir` also works). Type `infrared --help` to get the full usage manual.
5. **TripleO:**
 - `ir-installer ospd` was broken into two new plugins:**
 - **TripleO Undercloud:** Install undercloud up-to and including overcloud image creation
 - **TripleO Overcloud:** Install overcloud using an existing undercloud.
6. **Answers file:** The switch `--generate-conf-file` is renamed `--generate-answers-file` to avoid confusion with configuration files.

7. **Topoloy:** The topology input type has been deprecated. Use *KeyValueList* to define node types and amounts, and `include_vars` to add relevant files to playbooks, see [Topology](#) description for more information
8. **Cleanup:** the `--cleanup` options now accepts boolean values. Any YAML boolean is accepted (“yes/no”, “true/false”, “on/off”)
9. **Bootstrap:** On virtual environmants, [tripleo-undercloud](#) can create a snapshot out of the undercloud VM that can later be used to bypass the installation process.

1.8.2 Example Script Upgrade

infrared v2	infrared v1
<pre> ## CLEANUP ## infrared virsh -v -o cleanup.yml \ --host-address example.redhat.com \ --host-key ~/.ssh/id_rsa \ --kill yes ## PROVISION ## infrared virsh -v \ --topology-nodes undercloud:1, ↪controller:1,compute:1 \ --host-address example.redhat.com \ --host-key ~/.ssh/id_rsa \ --image-url http://www.images.com/ ↪rhel-7.qcow2 ## UNDERCLOUD ## infrared tripleo-undercloud -v mirror_ ↪tlv \ --version 9 \ --build passed_phase1 \ --ssl true \ --images-task rpm ## OVERCLOUD ## infrared tripleo-overcloud -v \ --version 10 \ --introspect yes \ --tagging yes \ --deploy yes \ --deployment-files virt \ --network-backend vxlan \ --overcloud-ssl false \ --network-protocol ipv4 ## POST TASKS ## infrared cloud-config -v \ -o cloud-config.yml \ --deployment-files virt \ --tasks create_external_network, ↪forward_overcloud_dashboard,network_ ↪time,tempest_deployer_input ## TEMPEST ## infrared tempest -v \ --config-options "image.http_ ↪image=http://www.images.com/cirros. ↪qcow2" \ --openstack-installer tripleo \ --openstack-version 9 \ --tests sanity # Fetch inventory from active workspace WORKSPACE=\$(ir workspace list awk '/*/ ↪{print \$2}') ansible -i .workspaces/\$WORKSPACE/hosts_ ↪all -m ping </pre>	<pre> ## CLEANUP ## ir-provisioner -d virsh -v \ --topology-nodes=undercloud:1, ↪controller:1,compute:1 \ --host-address=example.redhat.com \ --host-key=~/.ssh/id_rsa \ --image-url=www.images.com/rhel-7. ↪qcow2 \ --cleanup ## PROVISION ## ir-provisioner -d virsh -v \ --topology-nodes=undercloud:1, ↪controller:1,compute:1 \ --host-address=example.redhat.com \ --host-key=~/.ssh/id_rsa \ --image-url=http://www.images.com/rhel- ↪7.qcow2 ## OSPD ## ir-installer --debug mirror tlv ospd -v - ↪o install.yml \ --product-version=9 \ --product-build=latest \ --product-core-build=passed_phase1 \ --undercloud-ssl=true \ --images-task=rpm \ --deployment-files=\$PWD/settings/ ↪installer/ospd/deployment/virt \ --network-backend=vxlan \ --overcloud-ssl=false \ --network-protocol=ipv4 ansible-playbook -i hosts -e @install. ↪yaml \ playbooks/installer/ospd/post_install/ ↪create_tempest_deployer_input_file.yml ## TEMPEST ## ir-tester --debug tempest -v \ --config-options="image.http_ ↪image=http://www.images.com/cirros. ↪qcow2" \ --tests=sanity.yml ansible -i hosts all -m ping </pre>
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1.9 Advance Features

1.9.1 Injection points

Different people have different use cases which we cannot anticipate in advance. To solve (partially) this need, we structured our playbooks in a way that breaks the logic into standalone plays. Furthermore, each logical play can be overridden by the user at the invocation level.

Lets look at an example to make this point more clear. Looking at our `virsh` main playbook, you will see:

```
- include: "{{ provision_cleanup | default('cleanup.yml') }}"
  when: provision.cleanup|default(False)
```

Notice that the `include`: first tried to evaluate the variable `provision_cleanup` and afterwards defaults to our own `cleanup` playbook.

This condition allows users to inject their own custom cleanup process while still reuse all of our other playbooks.

Override playbooks

In this example we'll use a custom playbook to override our cleanup play and replace it with the process described above. First, lets create an empty playbook called: `noop.yml`:

```
---
- name: Just another empty play
  hosts: localhost
  tasks:
    - name: say hello!
      debug:
        msg: "Hello!"
```

Next, when invoking *infrared*, we will pass the variable that points to our new empty playbook:

```
infrared virsh --host-address $HOST --host-key $HOST_KEY --topology-nodes $TOPOLOGY --
↪kill yes -e provision_cleanup=noop.yml
```

Now lets run see the results:

```
PLAY [Just another empty play] *****
TASK [setup] *****
ok: [localhost]

TASK [say hello!] *****
                [[ previous task time: 0:00:00.459290 = 0.46s / 0.47s ]]
ok: [localhost] => {
  "msg": "Hello!"
}

msg: Hello!
```

If you have a place you would like to have an injection point and one is not provided, please [contact us](#).

1.9.2 Infrared Ansible Tags

Stages and their corresponding Ansible tags

Each stage can be executed using ansible plugin with set of ansible tags that are passed to the infrared plugin command:

Plugin	Stage	Ansible Tags
virsh	Provision	pre, hypervisor, networks, vms, user, post
tripleo-undercloud	Undercloud Deploy	validation, hypervisor, init, install, shade, configure, deploy
	Images	images
tripleo-overcloud	Introspection	validation, init, introspect
	Tagging	tag
	Overcloud Deploy	loadbalancer, deploy_preparation, deploy
	Post tasks	post

Usage examples:

The ansible tags can be used by passing all subsequent input to Ansible as raw arguments.

Provision (virsh plugin):

```
infrared virsh \  
  -o provision_settings.yml \  
  --topology-nodes undercloud:1,controller:1,compute:1 \  
  --host-address <my.host.redhat.com> \  
  --host-key </path/to/host/key> \  
  --image-url <image-url> \  
  --ansible-args="tags=pre,hypervisor,networks,vms,user,post"
```

Undercloud Deploy stage (tripleo-undercloud plugin):

```
infrared tripleo-undercloud \  
  -o undercloud_settings.yml \  
  --mirror tlv \  
  --version 12 \  
  --build passed_phase1 \  
  --ansible-args="tags=validation,hypervisor,init,install,shade,configure,deploy"
```

Tags explanation:

- **Provision**
 - pre - Pre run configuration
 - Hypervisor - Prepare the hypervisor for provisioning
 - Networks - Create Networks
 - Vms - Provision Vms
 - User - Create a sudoer user for non root SSH login
 - Post - perform post provision tasks
- **Undercloud Deploy**
 - Validation - Perform validations
 - **Hypervisor - Patch hypervisor for undercloud deployment**

- * Add rhos-release repos and update ipxe-roms
- * Create the stack user on the hypervisor and allow SSH to hypervisor
- Init - Pre Run Adjustments
- Install - Configure and Install Undercloud Repositories
- Shade - Prepare shade node
- Configure - Configure Undercloud
- Deploy - Installing the undercloud
- **Images**
 - Images - Get the undercloud version and prepare the images
- **Introspection**
 - Validation - Perform validations
 - Init - pre-tasks
 - Introspect - Introspect our machines
- **Tagging**
 - Tag - Tag our machines with proper flavors
- **Overcloud Deploy**
 - Loadbalancer - Provision loadbalancer node
 - Deploy_preparation - Environment setup
 - Deploy - Deploy the Overcloud
- **Post tasks**
 - Post - Perform post install tasks

1.9.3 Virthost packages/repo requirements

Virsh

UEFI mode related binaries

For Virthost with RHEL 7.3, OVMF package is available in the supplementary channel, please install the package from there and rerun the command. If the Virthost use different OS or OS version, please check below.

According to [usage UEFI with QEMU](#) there is only one way to get the UEFI mode boot working with VMs, that often requires by Ironic team due to lack of hardware or impossibility to automate mode switching on baremetal nodes.

1. Add repo with OVMF binaries:

```
yum-config-manager --add-repo http://www.kraxel.org/repos/firmware.repo
```

2. Install OVMF binaries:

```
yum install -y edk2.git-ovmf-x64
```

3. Update QEMU config adding the following to the end of the `/etc/libvirt/qemu.conf` file:

```
nvrnm = [  
    "/usr/share/edk2.git/ovmf-x64/OVMF_CODE-pure-efi.fd:/usr/share/edk2.git/ovmf-  
    ↪x64/OVMF_VARS-pure-efi.fd"  
]
```

4. Restart libvirt service:

```
systemctl restart libvirtd
```

IPv6 related host adjustments, which will also be required by UEFI

When UEFI is in use, libvirt will require additional setup on the host, for IPv6 to be enabled:

1. Configure `accept_ra = 2` in `sysctl`:

```
echo "net.ipv6.conf.all.accept_ra = 2" > /etc/sysctl.d/55-acceptra.conf
```

2. Enable the IPv6 related NAT modules:

```
modprobe nf_nat_ipv6
```

1.10 Contact Us

1.10.1 Team

Frank Jansen	fjansen@redhat.com
Oleksii Baranov	obaranov@redhat.com
Mailing List	rhos-infrared@redhat.com

1.10.2 GitHub

Issues are tracked via [GitHub](#). For any concern, please create a [new issue](#).

1.10.3 IRC

We are available on `#infrared` irc channel on `freenode`.

1.11 Contribute

1.11.1 Red Hatters

RedHat Employees should submit their changes via review.gerrithub.io. Only members of the `rhosqeauto-core` group on GerritHub can submit and approve patches, while members of `rhosqeauto-contrib` can submit patches. You can ask any of the current members to be added to the appropriate group.

You can use `git-review` (`dnf/yum/pip install`). To initialize the directory of `infrared` execute `git review -s`. Every patch needs to have *Change-Id* in commit message (`git review -s` installs post-commit hook to automatically add one).

For some more info about `git review` usage, read [GerritHub Intro](#) and [OpenStack Infra Manual](#).

1.11.2 Non Red Hatters

Non-RedHat Employees should file pull requests to the [InfraRed project](#) on GitHub.

1.11.3 Release Notes

Infrared uses `reno` tool for providing release notes. That means that a patch can include a `reno` file (release notes) containing detailed description what the impact is.

A `reno` file is a YAML file written in the `releasenotes/notes` directory which is generated using the `reno` tool this way:

```
$ tox -e venv -- reno new <name-your-file>
```

where `<name-your-file>` can be:

- `bugfix-<bug_name_or_id>`
- `newfeature-<feature_name>`
- `apichange-<description>`
- `deprecation-<description>`

Refer to the `reno` documentation for the full list of sections.

1.11.4 When a release note is needed

A release note is required anytime a `reno` section is needed. Below are some examples for each section. Any sections that would be blank should be left out of the note file entirely.

upgrade A configuration option change (deprecation, removal or modified default), changes in core that can affect users of the previous release. Any changes in the Infrared API.

security If the patch fixes a known vulnerability

features New feature in Infrared core or a new major feature in one of a core plugin. Introducing of the new API options or CLI flags.

critical Bugfixes categorized as Critical and above in Jira.

fixes Bugs with high importance that have been fixed.

Three sections are left intentionally unexplained (`prelude`, `issues` and `other`). Those are targeted to be filled in close to the release time for providing details about the soon-ish release. Don't use them unless you know exactly what you are doing.

1.12 OVB deployment

Deploy TripleO OpenStack on virtual nodes provisioned from an [OpenStack cloud](#)

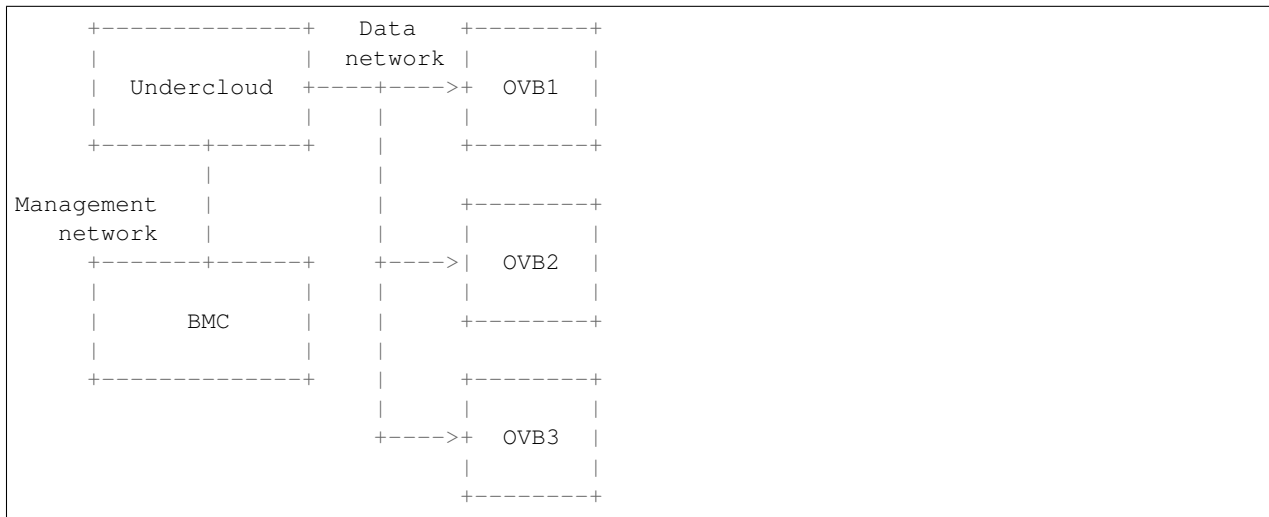
In a TripleO OpenStack deployment, the undercloud need to control the overcloud power management, as well as serve its nodes with an operating system. Trying to do that inside an OpenStack cloud requires some modification from the client side as well as from the OpenStack cloud

The **OVB** (openstack virtual baremetal) project solves this problem and we strongly recommended to read its documentation prior to moving next in this document.

1.12.1 OVB architecture overview

An OVB setup requires additional node to be present: Baremetal Controller (BMC). This nodes captures all the IPMI requests dedicated to the OVB nodes and handles the machine power on/off operations, boot device change and other operations performed during the introspection phase.

Network architecture overview:



The BMC node should be connected to the management network. *infrared* brings up an IP address on own management interface for every Overcloud node. This allows *infrared* to handle IPMI commands coming from the undercloud. Those IPs are later used in the generated `instackenv.json` file.

For example, during the introspection phase, when the BMC sees the power off request for the OVB1 node, it performs a shutdown for the instance which corresponds to the OVB1 on the host cloud.

1.12.2 Provision ovb nodes

In order to provision ovb nodes, the **openstack provisioner** can be used:

```
ir openstack -vvvv -o provision.yml \
  --cloud=qeos7 \
  --prefix=example-ovb- \
  --topology-nodes=ovb_undercloud:1,bmc:1,ovb_controller:1,ovb_compute:1 \
  --topology-network=3_nets_ovb \
  --key-file ~/.ssh/example-key.pem \
  --key-name=example-jenkins \
  --image=rhel-guest-image-7.4-191
```

The `--topology-nodes` options should include the `bmc` instance. Also instead of standard `compute` and `controller` nodes the appropriate nodes with the `ovb` prefix should be used. Such `ovb` node settings file holds several additional properties:

- instance image details. Currently the `ipxe-boot` image should be used for all the ovb nodes. Only that image allows to boot from the network after restart.
- ovb group in the groups section
- network topology (NICs' order)

For example, the `ovb_compute` settings can hold the following properties:

```
node_dict:
  name: compute
  image:
    name: "ipxe-boot"
    ssh_user: "root"
  interfaces:
    nic1:
      network: "data"
    nic2:
      network: "management"
    nic3:
      network: "external"
  external_network: external

  groups:
    - compute
    - openstack_nodes
    - overcloud_nodes
    - ovb
```

The `--topology-network` should specify the topology with at 3 networks: `data`, `management` and `external`:

- `data` network is used by the TripleO to provision the overcloud nodes
- `management` is used by the BMC to control IPMI operations
- `external` holds floating ip's and used by *infrared* to access the nodes

DHCP should be enabled only for the external network.

infrared provides the default `3_nets_ovb` network topology that allows to deploy the OVB setup.

The `--image` option should point to existing in OpenStack Glance image This value affects nodes, except configured to boot an `ipxe-boot` image

1.12.3 Install OpenStack with TripleO

To install OpenStack on ovb nodes the process is almost standard with small deviation.

The undercloud can be installed by running:

```
infrared tripleo-undercloud -v \
  --version 10 \
  --images-task rpm
```

The overcloud installation can be run with:

```
infrared tripleo-overcloud -v \
  --version 10 \
  --deployment-files ovb \
```

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```
--public-network=yes \  
--public-subnet=ovb_subnet \  
--network-protocol ipv4 \  
--post=yes \  
--introspect=yes \  
--tagging=yes
```

Here some ovb specific option should be considered:

- if host cloud is not patched and not configured for the OVB deployments the `--deployment-files` should point to the ovb templates to skip unsupported features. See the *OVB limitations* for details
- the `--public_subnet` should point to the subnet settings to match with the OVB network topology and allocation addresses

Fully functional overcloud will be deployed into the OVB nodes.

1.12.4 OVB limitations

The OVB approach requires a host cloud to be **patched and configured**. Otherwise the following features will **NOT** be available:

- Network isolation
- HA (high availability). Setup with more than 1 controller, etc is not allowed.
- Boot from network. This can be worked around by using the `ipxe_boot` image for the OVB nodes.

1.13 Troubleshoot

This page will list common pitfalls or known issues, and how to overcome them

1.13.1 Ansible Failures

Unreachable

Symptoms:

```
fatal: [hypervisor]: UNREACHABLE! => {"changed": false, "msg": "Failed to connect to   
↪the host via ssh.", "unreachable": true}
```

Solution:

When Ansible fails because of UNREACHABLE reason, try to validate SSH credentials and make sure that all host are SSH-able.

In the case of `virsh` plugin, it's clear from the message above that the designated hypervisor is unreachable. Check that:

1. `--host-address` is a reachable address (IP or FQDN).
2. `--host-key` is a **private** (not **public**) key file and that its permissions are correct.

3. `--host-user` (defaults to `root`) exits on the host.
4. Try to manually ssh to the host using the given user private key:

```
ssh -i $HOST_KEY $HOST_USER@$HOST_ADDRESS
```

1.13.2 Virsh Failures

Cannot create VM's

Symptoms:

Virsh cannot create a VM and displays the following message:

```
ERROR    Unable to add bridge management port XXX: Device or resource busy
Domain installation does not appear to have been successful.
Otherwise, you can restart your domain by running:
  virsh --connect qemu:///system start compute-0
otherwise, please restart your installation.
```

Solution:

This often can be caused by the misconfiguration of the hypervisor. Check that all the `ovs` bridges are properly configured on the hypervisor:

```
$ ovs-vsctl show

6765bb7e-8f22-4dbe-848f-eaff2e94ed96
Bridge brbm
  Port "vnet1"
    Interface "vnet1"
      error: "could not open network device vnet1 (No such device)"
  Port brbm
    Interface brbm
      type: internal
ovs_version: "2.6.1"
```

To fix the problem remove the broken bridge:

```
$ ovs-vsctl del-br brbm
```

Cannot activate IPv6 Network

Symptoms:

Virsh fails on task 'check if network is active' or on task 'Check if IPv6 enabled on host' with one of the following error messages:

```
Failed to add IP address 2620:52:0:13b8::fe/64 to external
Network 'external' requires IPv6, but modules aren't loaded...
```

Solution:

Ipv6 is disabled on hypervisor. Please make sure to enable IPv6 on the hypervisor before creating network with IPv6, otherwise, IPv6 networks will be created but will remain in 'inactive' state.

One possible solution on RH based OSes, is to enable IPv6 in kernel cmdline:

```
# sed -i s/ipv6.disable=1/ipv6.disable=0/ /etc/default/grub
# grub2-mkconfig -o /boot/grub2/grub.cfg
# reboot
```

1.13.3 Frequently Asked Questions

Where's my inventory file?

I'd like to run some personal Ansible playbook and/or "ad-hoc" but I can't find my inventory file

All Ansible environment files are read from, and written to, [workspaces](#) Use `infrared workspace inventory` to fetch a symlink to the active workspace's inventory or `infrared workspace inventory WORKSPACE` for any workspace by name:

```
ansible -i `infrared workspace inventory` all -m ping

compute-0 | SUCCESS => {
  "changed": false,
  "ping": "pong"
}
compute-1 | SUCCESS => {
  "changed": false,
  "ping": "pong"
}
controller-0 | SUCCESS => {
  "changed": false,
  "ping": "pong"
}
localhost | SUCCESS => {
  "changed": false,
  "ping": "pong"
}
hypervisor | SUCCESS => {
  "changed": false,
  "ping": "pong"
}
undercloud-0 | SUCCESS => {
  "changed": false,
  "ping": "pong"
}
```

1.14 Temporary Workarounds

The page displays temporary hacks that were merged to Infrared(IR) code. Since the core team is small and these fixes are tracked manually at the moment, we request the user to review the status of the hacks/BZs.

Plugin in which the hack is included Bugzilla/Issue User/#TODO =====
=====

1.15 Baremetal deployment

Infrared allows to perform baremetal deployments.

Note: Overcloud templates for the deployment should be prepared separately.

- 1) Undercloud provision step. Foreman plugin will be used in this example.

```
infrared foreman -vv \
  -o provision.yml \
  --url foreman.example.com \
  --user foreman_user \
  --password foreman_password \
  --host-address name.of.undercloud.host \
  --host-key /path/to/host/key \
  --role baremetal,undercloud,tester
```

- 2) Deploy Undercloud.

```
infrared tripleo-undercloud -vv \
  -o undercloud-install.yml \
  --config-file path/to/undercloud.conf \
  --version 11 \
  --build 11 \
  --images-task rpm
```

- 3) Deploy Overcloud.

For baremetal deployments, in order to reflect the real networking, templates should be prepared by the user before the deployment, including `instackenv.json` file. All addition parameters like storage (ceph or swift) disks or any other parameters should be added to the templates as well.

```
...
"cpu": "2",
"memory": "4096",
"disk": "0",
"disks": ["vda", "vdb"],
"arch": "x86_64",
...

infrared tripleo-overcloud -vv \
  -o overcloud-install.yml \
  --version 11 \
  --instackenv-file path/to/instackenv.json \
  --deployment-files /path/to/the/templates \
  --overcloud-script /path/to/overcloud_deploy.sh \
  --network-protocol ipv4 \
  --network-backend vlan \
  --public-network false \
  --introspect yes \
  --tagging yes \
  --deploy yes

infrared cloud-config -vv \
  -o cloud-config.yml \
```

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```
--deployment-files virt \  
--tasks create_external_network,forward_overcloud_dashboard,network_time,  
↪tempest_deployer_input
```

1.16 Beaker

Provision baremetal machines using Beaker.

1.16.1 Required arguments

- `--url`: URL of the Beaker server.
- `--password`: The password for the login user.
- `--host-address`: Address/FQDN of the baremetal machine to be provisioned.

1.16.2 Optional arguments

- `--user`: Login username to authenticate to Beaker. (default: admin)
- `--web-service`: For cases where the Beaker user is not part of the kerberos system, there is a need to set the Web service to RPC for authentication rather than rest. (default: rest)
- `--ca-cert`: For cases where the beaker user is not part of the kerberos system, a CA Certificate is required for authentication with the Beaker server.
- `--host-user`: The username to SSH to the host with. (default: root)
- `--host-password`: User's SSH password
- `--host-key`: User's SSH key
- `--image`: The image to use for nodes provisioning. (Check the "sample.yml.example" under vars/image for example)
- `--cleanup`: Release the system

Note: Please run `ir beaker --help` for a full detailed list of all available options.

1.16.3 Execution example

Provision:

```
ir beaker --url=beaker.server.url --user=beaker.user --password=beaker.password --  
↪host-address=host.to.be.provisioned
```

Cleanup (Used for returning a loaned machine):

```
ir beaker --url=beaker.server.url --user=beaker.user --password=beaker.password --  
↪host-address=host.to.be.provisioned --cleanup=yes
```

1.17 Foreman

Provision baremetal machine using Foreman and add it to the inventory file.

1.17.1 Required arguments

- `--url`: The Foreman API URL.
- `--user`: Foreman server login user.
- `--password`: Password for login user
- `--host-address`: Name or ID of the target host as listed in the Foreman server.

1.17.2 Optional arguments

- `--strategy`: Whether to use Foreman or system `ipmi` command. (default: `foreman`)
- `--action`: Which command to send with the power-management selected by `mgmt_strategy`. (default: `cycle`)
- `--wait`: Whether wait for host to return from rebuild or not. (default: `yes`)
- `--host-user`: The username to SSH to the host with. (default: `root`)
- `--host-password`: User's SSH password
- `--host-key`: User's SSH key
- `--host-ipmi-username`: Host IPMI username.
- `--host-ipmi-password`: Host IPMI password.
- `--roles`: Host roles
- `--os-id`: An integer represents the operating system ID to set
- `--medium-id`: An integer represents the medium ID to set

Note: Please run `ir foreman --help` for a full detailed list of all available options.

1.17.3 Execution example

```
ir foreman --url=foreman.server.api.url --user=foreman.user --password=foreman.  
↪password --host-address=host.to.be.provisioned
```

1.18 OpenStack

Provision VMs on an exiting OpenStack cloud, using native ansible's [cloud modules](#).

1.18.1 OpenStack Cloud Details

- **--cloud:** reference to OpenStack cloud credentials, using `os-client-config`. This library expects properly configured `cloud.yml` file:

Listing 2: clouds.yml

```
clouds:
  cloud_name:
    auth_url: http://openstack_instance:5000/v2.0
    username: <username>
    password: <password>
    project_name: <project_name>
```

`cloud_name` can be then referenced with `--cloud` option:

```
infrared openstack --cloud cloud_name ...
```

`clouds.yml` is expected in either `~/.config/openstack` or `/etc/openstack` directories according to [documentation](#):

Note: You can also omit the cloud parameter, and *infrared* will sourced `openstackrc` file:

```
source keystonerc
infrared openstack openstack ...
```

- **--key-file:** Private key that will be used to ssh to the provisioned VMs. Chosen matching public key will be uploaded to the OpenStack account, unless `--key-name` is provided
- **--key-name:** Name of an existing *keypair* under the OpenStack account. *keypair* should hold the public key that matches the provided private `--key-file`. Use `openstack --os-cloud cloud_name keypair list` to list available keypairs.
- **--dns:** A Local DNS server used for the provisioned networks and VMs. If not provided, OpenStack will use default DNS settings, which, in most cases, will not resolve internal URLs.

1.18.2 Topology

- **--prefix:** prefix all resources with a string. Use this with shared tenants to have unique resource names.

Note: `--prefix "XYZ"` will create router named `XYZrouter`. Use `--prefix "XYZ-"` to create `XYZ-router`

- **--topology-network:** Description of the network topology. By default, 3 networks will be provisioned with 1 router. 2 of them will be connected via the router to an external network discovered automatically (when more than 1 external network is found, the first will be chosen).

The following is an example of a `3_nets.yml` file:

```
---
networks:
  net1:
    external_connectivity: no
```

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```
name: "data"
ip_address: "192.168.24.254"
netmask: "255.255.255.0"
net2:
  external_connectivity: yes
  name: "management"
  ip_address: "172.16.0.1"
  netmask: "255.255.255.0"
  forward: nat
  dhcp:
    range:
      start: "172.16.0.2"
      end: "172.16.0.100"
    subnet_cidr: "172.16.0.0/24"
    subnet_gateway: "172.16.0.1"
  floating_ip:
    start: "172.16.0.101"
    end: "172.16.0.150"
net3:
  external_connectivity: yes
  name: "external"
  ipv6:
    ip_address: "2620:52:0:13b8::fe"
    prefix: "64"
    dhcp:
      range:
        start: "2620:52:0:13b8::fe:1"
        end: "2620:52:0:13b8::fe:ff"
  ip_address: "10.0.0.1"
  netmask: "255.255.255.0"
  forward: nat
  dhcp:
    range:
      start: "10.0.0.2"
      end: "10.0.0.100"
    subnet_cidr: "10.0.0.0/24"
    subnet_gateway: "10.0.0.1"
  floating_ip:
    start: "10.0.0.101"
    end: "10.0.0.150"
nodes:
  default:
    interfaces:
      - network: "data"
      - network: "management"
      - network: "external"
    external_network:
      network: "management"
  novacontrol:
    interfaces:
      - network: "data"
      - network: "management"
    external_network:
      network: "management"
  odl:
    interfaces:
```

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```
- network: "management"
external_network:
network: "management"
```

- **--topology-nodes:** *Key-Value-List* description of the nodes. A floating IP will be provisioned on a designated network.

For more information about the structure of the topology files and how to create your own, please refer to [Topology](#) and [Virsh plugin](#) description.

- **--image:** default image name or id for the VMs use `openstack --os-cloud cloud_name image list` to see a list of available images
- **--cleanup Boolean.** Whether to provision resources, or clean them from the tenant. *Infrared* registers all provisioned resources to the [workspace](#) on creation, and will clean only registered resources:

```
infrared openstack --cleanup yes
```

1.19 Virsh

Virsh provisioner is explicitly designed to be used for setup of virtual environments. Such environments are used to emulate production environment like [tripleo-undercloud](#) instances on one baremetal machine. It requires one prepared baremetal host (designated `hypervisor`) to be reachable through SSH initially.

1.19.1 Hypervisor machine

Hypervisor machine is the target machine where *infrared*'s virsh provisioner will create virtual machines and networks (using libvirt) to emulate baremetal infrastructure.

As such there are several specific requirements it has to meet.

Generally, It needs to have **enough memory and disk** storage to hold multiple decent VMs (each with GBytes of RAM and dozens of GB of disk). Also for acceptable responsiveness (speed of deployment/testing) just <4 threads or low GHz CPU is not a recommended choice (if you have old and weaker CPU than current mid-high end mobile phone CPU you may suffer performance wise - and so more timeouts during deployment or in tests).

Especially, for [Ironic](#) (TripleO) to control them, those **libvirt VMs** need to be bootable/controllable for **iPXE provisioning**. And also extra user has to exist, which can ssh in the hypervisor and control (restart...) libvirt VMs.

Note: *infrared* is attempting to configure or validate all (most) of this but it's may be scattered across all provisioner/installer steps. Current *infrared* approach is stepped toward direction to be more idempotent, and failures on previous runs shouldn't prevent successful execution of following runs.

What **user has to provide:**

- have machine with **sudoer user ssh access** and **enough resources**, as minimum requirements for one VM are:
 - VCPU: 2|4|8
 - RAM: 8|16
 - HDD: 40GB+
 - in practice disk may be smaller, as they are thin provisioned, as long as you don't force writing all the data (aka Tempest with `rhel-guest` instead of `cirros` etc)

- **RHEL-7.3** and **RHEL-7.4** are tested, **CentOS** is also expected to work
 - may work with other distributions (best-effort/limited support)
- **yum repositories** has to be **preconfigured** by user (foreman/...) before using *infrared* so it can install dependencies
 - esp. for *infrared* to handle `ipxe-roms-qemu` it requires either **RHEL-7.{3|4}-server channel**

What **infrared** takes care of:

- `ipxe-roms-qemu` package of at least version `2016xxyy` needs to be installed
- other basic packages installed
 - `libvirt, libguestfs{-tools, -xfs}, qemu-kvm, wget, virt-install`
- **virtualization support** (VT-x/AMD-V)
 - ideally with `nested=1` support
- `stack` user created with polkit privileges for `org.libvirt.unix.manage`
- **ssh key** with which *infrared* can authenticate (created and) added for `root` and `stack` user, ATM they are handled differently/separately:
 - for `root` the `infrared/id_rsa.pub` gets added to `authorized_keys`
 - for `stack` `infrared/id_rsa_undercloud.pub` is added to `authorized_keys`, created/added later during installation

First, Libvirt and KVM are installed and configured to provide a virtualized environment. Then, virtual machines are created for all requested nodes.

1.19.2 Topology

The first thing you need to decide before you deploy your environment is the `Topology`. This refers to the number and type of VMs in your desired deployment environment. If we use OpenStack as an example, a topology may look something like:

- 1 VM called `undercloud`
- 1 VM called `controller`
- 1 VM called `compute`

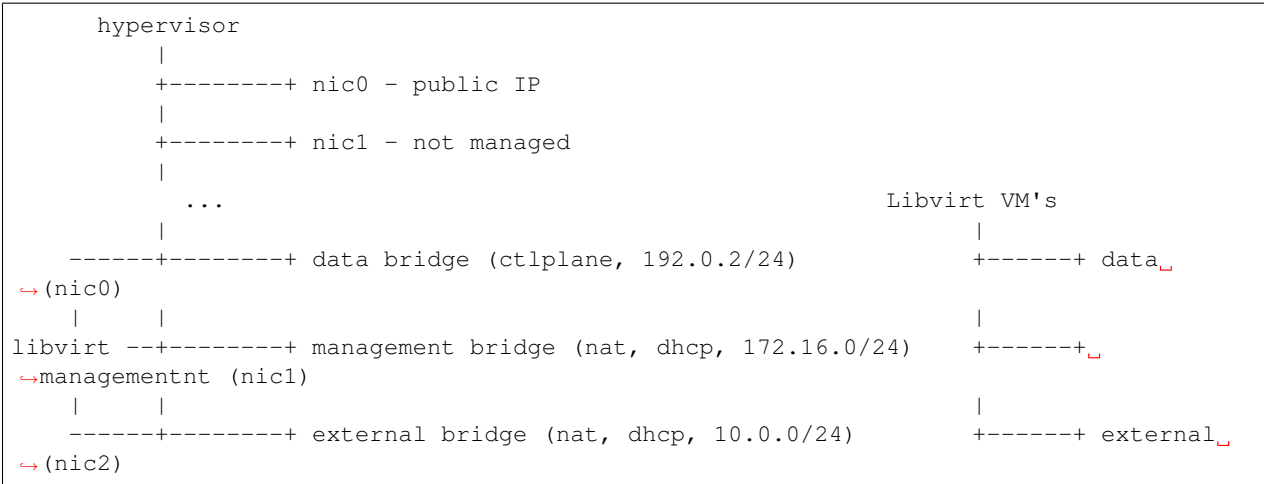
To control how each VM is created, we have created a YAML file that describes the specification of each VM. For more information about the structure of the topology files and how to create your own, please refer to [Topology](#).

Please see [Bootstrap](#) guide where usage is demonstrated.

- **--host-memory-overcommit** By default memory overcommitment is false and provision will fail if Hypervisor's free memory is lower than required memory for all nodes. Use `--host-memory-overcommit True` to change default behaviour.

Network layout

Baremetal machine used as host for such setup is called *hypervisor*. The whole deployment is designed to work within boundaries of this machine and (except public/natted traffic) shouldn't reach beyond. The following layout is part of default setup defined in [plugins defaults](#):



On *hypervisor*, there are 3 new bridges created with libvirt - data, management and external. Most important is data network which does not have DHCP and NAT enabled. This network can later be used as `ctlplane` for OSP director deployments ([tripleo-undercloud](#)). Other (usually physical) interfaces are not used (`nic0`, `nic1`, ...) except for public/natted traffic. External network is used for SSH forwarding so client (or Ansible) can access dynamically created nodes.

NAT Forwarding

By default, all networks above are **NATed**, meaning that they private networks only reachable via the *hypervisor* node. *infrared* configures the nodes SSH connection to use the *hypervisor* host as proxy.

Bridged Network

Some use-cases call for **direct access** to some of the nodes. This is achieved by adding a network with `forward: bridge` in its attributes to the network-topology file, and marking this network as external network on the relevant node files.

The result will create a virtual bridge on the *hypervisor* connected to the main NIC by default. VMs attached to this bridge will be served by the same LAN as the *hypervisor*.

To specify any secondary NIC for the bridge, the `nic` property should be added to the network file under the bridge network:

```

net4:
  name: br1
  forward: bridge
  nic: eth1
  
```

Warning: Be careful when using this feature. For example, an *undercloud* connected in this manner can disrupt the LAN by serving as an unauthorized DHCP server.

Fore example, see `tripleo node` used in conjunction with `3_net_1_bridge` network file:

```

infrared virsh [...] --topology-nodes ironic:1,[...] --topology-network 3_net_1_
↳bridge [...]
  
```

1.19.3 Workflow

1. Setup libvirt and kvm environment
2. Setup libvirt networks
3. Download base image for undercloud (`--image-url`)
4. Create desired amount of images and integrate to libvirt
5. Define virtual machines with requested parameters (`--topology-nodes`)
6. Start virtual machines

Environments prepared such in way are usually used as basic virtual infrastructure for [tripleo-undercloud](#).

Note: Virsh provisioner has idempotency issues, so `infrared virsh ... --kill` must be run before re-provisioning every time to remove libvirt resources related to active hosts from workspace inventory or `infrared virsh ... --cleanup` to remove ALL domains and networks (except 'default') from hypervisor.

1.19.4 Topology Extend

- `--topology-extend`: Extend existing deployment with nodes provided by topology. If `--topology-extend` is True, all nodes from `--topology-nodes` will be added as new additional nodes

```
infrared virsh [...] --topology-nodes compute:1,[...] --topology-extend yes [...]
```

1.19.5 Topology Shrink

- `--remove-nodes`: Provide option for removing of nodes from existing topology:

```
infrared virsh [...] --remove-nodes compute-2,compute3
```

Warning: If try to extend topology after you remove node with index lower than maximum, extending will fail. For example, if you have 4 compute nodes (compute-0,compute-1,compute-2,compute-3), removal of any node different than compute-3, will cause fail of future topology extending.

1.19.6 Multiply environments

In some use cases it might be needed to have multiply environments on the same host. Virsh provisioner currently supports that with `--prefix` parameter. Using it user can assign a prefix to created resources such as virtual instances, networks, routers etc.

Warning: `--prefix` shouldn't be more than 4 characters long because of libvirt limitation on resources name length.

```
infrared virsh [...] --topology-nodes compute:1,controller1,[...] --prefix foo [...]
```

Will create resource with `foo` prefix. Resources from different environments could be differentiated using prefix, and virsh plugin will take care so they will not interfere with each other in terms of networking, virtual instances etc.

Cleanup procedure also supports `--prefix` parameter allowing to cleanup only needed environment, if `--prefix` is not given all resources on hypervisor will be cleaned.

1.19.7 Advanced Settings

- `--serial-files`: When true, redirect the serial output to files that can be found under `'/var/log/sfiles'` on the Hypervisor.

1.20 TripleO Undercloud

Deploys a TripleO undercloud

1.20.1 Setup an Undercloud

- **`--version`: TripleO release to install.** Accepts either an integer for RHEL-OSP release, or a community release name (`Liberty`, `Mitaka`, `Newton`, etc...) for RDO release
- **`--build`: Specify a build date or a label for the repositories.** Supports any rhos-release labels. Examples: `passed_phase1`, `2016-08-11.1`, `Y1`, `Z3`, `GA` Not used in case of RDO.
- `--buildmods`: Let you the option to add flags to rhos-release:
 - `pin` - Pin puddle (dereference 'latest' links to prevent content from changing). This is the default flag.
 - `flea` - Enable flea repos.
 - `unstable` - This will enable brew repos or poodles (in old releases).
 - `none` - Use none of those flags.

Note: `--buildmods` and `--build` flags are for internal Red Hat users only.

- **`--enable-testing-repos`: Let you the option to enable testing/pending repos with rhos-release. Multiple values** have to be coma separated. Examples: `--enable-testing-repos rhel,extras,ceph` or `--enable-testing-repos all`
- **`--cdn` Register the undercloud with a Red Hat Subscription Management platform.** Accepts a file with subscription details.

Listing 3: `cdn_creds.yml`

```
server_hostname: example.redhat.com
username: user
password: HIDDEN_PASS
autosubscribe: yes
server_insecure: yes
```

For the full list of supported input, see the [module documentation](#).

Note: Pre-registered undercloud are also supported if `--cdn` flag is missing.

Warning: The contents of the file are hidden from the logged output, to protect private account credentials.

- **--from-source** Build tripleo components from the upstream git repository. Accepts list of tripleo components. The delorean project is used to build rpm packages. For more information about delorean, visit [Delorean documentation](#).

To deploy specific tripleo components from git repository:

```
infrared tripleo-undercloud --version 13 \  
  --from-source name=openstack/python-tripleoclient \  
  --from-source name=openstack/neutron,refs=refs/changes/REF_ID \  
  --from-source name=openstack/puppet-neutron
```

Note:

- This feature is supported by OSP 13 or RDO queens versions.
 - This feature is experimental and should be used only for development.
-

Note:

In case of **virsh** deployment **ipxe-roms-qemu** will be installed on hypervisor node.

This package can be found in a **rhel-server** repo in case of RedHat and in **Base** repo in case of CentOS

To deploy a working undercloud:

```
infrared tripleo-undercloud --version 10
```

For better fine-tuning of packages, see [custom repositories](#).

1.20.2 Overcloud Images

The final part of the undercloud installation calls for creating the images from which the OverCloud will be later created.

- Depending on `--images-task` these the undercloud can be either:
 - **build images:** Build the overcloud images from a fresh guest image. To use a different image than the default CentOS cloud guest image, use `--images-url` to define base image than CentOS. For OSP installation, you must provide a url of a valid RHEL image.
 - **import images from url:** Download pre-built images from a given `--images-url`.
 - **Download images via rpm:** Starting from OSP 8, TripleO is packages with pre-built images available via RPM.

To use different RPM, use `--images-url` to define the location of the RPM. You need to provide all dependencies of the remote RPM. Locations have to be separated with comma

Note: This option is invalid for *RDO* installation.

- Use `--images-packages` to define a list of additional packages to install on the OverCloud image. Packages can be specified by name or by providing direct url to the rpm file.
- Use `--images-remove-packages` to define a list of packages to uninstall from the OverCloud image. Packages must be specified by name.
- Use `--images-remove-no-deps-packages` to define a list of packages to force uninstall from the overcloud image. Packages must be specified by name and seperated by a comma. This is useful in a scenario where there is a requirment to uninstall a certain RPM package without removing its dependencies.

Note: This task executes `rpm -e --nodeps` command which will cause RPM DB to be out of sync

- `--images-cleanup` tells *infrared* do remove the images files original after they are uploaded to the undercloud's Glance service.

To configure overcloud images:

```
infrared tripleo-undercloud --images-task rpm
```

Note: This assumes an undercloud was already installed and will skip `installation` stage because `--version` is missing.

When using RDO (or for OSP 7), `rpm` strategy in unavailable. Use `import` with `--images-url` to download overcloud images from web:

```
infrared tripleo-undercloud --images-task import --images-url http://buildlogs.centos.org/centos/7/cloud/x86_64/tripleo_images/mitaka/delorean
```

Note: The RDO overcloud images can be also found here: <https://images.rdoproject.org>

If pre-packaged images are unavailable, tripleo can build the images locally on top of a regular cloud guest image:

```
infrared tripleo-undercloud --images-task build
```

CentOS or RHEL guest images will be used for RDO and OSP respectively. To use a different image specify `--images-url`:

```
infrared tripleo-undercloud --images-task build --images-url http://cloud.centos.org/centos/7/images/CentOS-7-x86_64-GenericCloud.qcow2
```

Note: building the images takes a long time and it's usually quicker to download them.

In order to update default overcloud image kernel provided by sources (for example RPM), with the latest kernel present on overcloud image, specify `overcloud-update-kernel`.

Note: when installing `kernel-rt` inside overcloud guest image, the latest RealTime kernel will be used instead of default kernel.

See the [RDO deployment](#) page for more details on how to setup RDO product.

1.20.3 Undercloud Configuration

Undercloud is configured according to `undercloud.conf` file. Use `--config-file` to provide this file, or let *infrared* generate one automatically, based on a sample file provided by the project. Use `--config-options` to provide a list of `section.option=value` that will override specific fields in it.

Use the `--ssl=yes` option to install enable SSL on the undercloud. If used, a self-signed SSL cert will be generated.

1.20.4 Custom Repositories

Add custom repositories to the undercloud, after installing the TripleO repositories.

- `--repos-config setup repos using the ansible yum_repository module`. Using this option enables you to set specific options for each repository:

Listing 4: `repos_config.yml`

```
---
extra_repos:
  - name: my_repo1
    file: my_repo1.file
    description: my_repo1
    baseurl: http://myurl.com/my_repo1
    enabled: 0
    gpgcheck: 0
  - name: my_repo2
    file: my_repo2.file
    description: my_repo2
    baseurl: http://myurl.com/my_repo2
    enabled: 0
    gpgcheck: 0
  ...
```

Note: This explicitly supports some of the options found in `yum_repository` module (name, file, description, baseurl, enabled and gpgcheck). For more information about this module, visit [Ansible yum_repository documentation](#).

Note: Custom repos generate by `--repos-config` can be uploaded to Overcloud guest image by specifying `--upload-extra-repos true`

- `repos-urls`: comma separated list of URLs to download repo files to `/etc/yum.repos.d`

Both options can be used together:

```
infrared tripleo-undercloud [...] --repos-config repos_config.yml --repos-urls "http://
↪/yoururl.com/repofile1.repo,http://yoururl.com/repofile2.repo"
```

1.20.5 TripleO Undercloud User

`--user-name` and `--user-password` define a user, with password, for the undercloud. According to TripleO guidelines, the default username is `stack`. User will be created if necessary. .. note:: Stack user password needs to be changed in case of public deployments

1.20.6 Backup

When working on a virtual environment, *infrared* can create a snapshot of the installed undercloud that can be later used to *restore* it on a future run, thus saving installation time.

In order to use this feature, first follow the *Setup an Undercloud* section. Once an undercloud VM is up and ready, run the following:

```
ir tripleo-undercloud --snapshot-backup yes
```

Or optionally, provide the file name of the image to create (defaults to “undercloud-snapshot.qcow2”). .. note:: the filename refers to a path on the hypervisor.

```
ir tripleo-undercloud --snapshot-backup yes --snapshot-filename custom-name.qcow2
```

This will prepare a qcow2 image of your undercloud ready for usage with *Restore*.

Note: this assumes an undercloud is already installed and will skip *installation* and *images* stages.

1.20.7 Restore

When working on a virtual environment, *infrared* can use a pre-made undercloud image to quickly set up an environment. To use this feature, simply run:

```
ir tripleo-undercloud --snapshot-restore yes
```

Or optionally, provide the file name of the image to restore from (defaults to “undercloud-snapshot.qcow2”). .. note:: the filename refers to a path on the hypervisor.

1.20.8 Undercloud Upgrade

Upgrade is discovering current Undercloud version and upgrade it to the next major one. To upgrade Undercloud run the following command:

```
infrared tripleo-undercloud -v --upgrade yes
```

Note: The *Overcloud* won't need new images to upgrade to. But you'd need to upgrade the images for OC nodes before you attempt to scale out nodes. Example for Undercloud upgrade and images update:

```
infrared tripleo-undercloud -v --upgrade yes --images-task rpm
```

Warning: Currently, there is upgrade possibility from version 9 to version 10 only.

Warning: Upgrading from version 11 to version 12 isn't supported via the tripleo-undercloud plugin anymore. Please check the tripleo-upgrade plugin for 11 to 12 [upgrade instructions](#).

1.20.9 Undercloud Update

Update is discovering current Undercloud version and perform minor version update. To update Undercloud run the following command:

```
infrared tripleo-undercloud -v --update-undercloud yes
```

Example for update of Undercloud and Images:

```
infrared tripleo-undercloud -v --update-undercloud yes --images-task rpm
```

Warning: Infrared support update for RHOSP from version 8.

1.20.10 Undercloud Workarounds

Allow injecting workarounds defined in an external file before/after the undercloud installation:

```
infrared tripleo-undercloud -v --workarounds 'http://server.localdomain/workarounds.  
↪.yml'
```

The workarounds can be either patches posted on review.openstack.org or arbitrary shell commands. Below is an example of a workarounds file:

```
---
pre_undercloud_deploy_workarounds:

  - BZ#1623061:
    patch: false
    basedir: ''
    id: ''
    command: 'touch /home/stack/pre_workaround_applied'

post_undercloud_deploy_workarounds:

  - BZ#1637589:
    patch: true
    basedir: '/usr/share/openstack-tripleo-heat-templates/'
    id: '601277'
    command: ''
```

TLS Everywhere

Setup TLS Everywhere with FreeIPA.

`tls-everywhere`: It will install FreeIPA on first node from `freeipa` group and it will configure undercloud for TLS Everywhere.

1.21 TripleO Upgrade

Starting with OSP12 the upgrade/update of a TripleO deployment can be done via the `tripleo-upgrade` plugin. `tripleo-upgrade` comes preinstalled as an InfraRed plugin. After a successful InfraRed overcloud deployment you need to run the following steps to upgrade the deployment:

Symlink roles path:

```
ln -s $(pwd)/plugins $(pwd)/plugins/tripleo-upgrade/infrared_plugin/roles
```

Set up undercloud upgrade repositories:

```
infrared tripleo-undercloud \  
  --upgrade yes \  
  --mirror ${mirror_location} \  
  --ansible-args="tags=upgrade_repos"
```

Upgrade undercloud:

```
infrared tripleo-upgrade \  
  --undercloud-upgrade yes
```

Set up overcloud upgrade repositories:

```
infrared tripleo-overcloud \  
  --deployment-files virt \  
  --upgrade yes \  
  --mirror ${mirror_location} \  
  --ansible-args="tags=upgrade_collect_info,upgrade_repos"
```

Upgrade overcloud:

```
infrared tripleo-upgrade \  
  --overcloud-upgrade yes
```

1.22 TripleO Overcloud

Deploys a TripleO overcloud from an existing undercloud

1.22.1 Stages Control

Run is broken into the following stages. Omitting any of the flags (or setting it to no) will skip that stage

- `--introspect` the overcloud nodes
- `--tag` overcloud nodes with proper flavors
- `--deploy` overcloud of given `--version` (see below)

1.22.2 Containers

- `--containers`: boolean. Specifies if containers should be used for deployment. Default value: True

Note: Containers are supported by OSP version ≥ 12 .

- **`--container-images-packages`: the pairs for container images and packages URL(s) to install into those images.** Container images don't have any yum repositories enabled by default, hence specifying URL of an RPM to install is mandatory. This option can be used multiple times for different container images.

Note: Only specified image(s) will get the packages installed. All images that depend on an updated image have to be updated as well (using this option or otherwise).

Example:

```
--container-images-packages openstack-opendaylight-docker=https://kojipkgs.
↪fedoraproject.org//packages/tmux/2.5/3.fc27/x86_64/tmux-2.5-3.fc27.x86_64.rpm,
↪https://kojipkgs.fedoraproject.org//packages/vim/8.0.844/2.fc27/x86_64/vim-minimal-
↪8.0.844-2.fc27.x86_64.rpm
```

- **--container-images-patch: comma, separated list of docker container images to patch using ‘/patched_rpm’ yum**
Patching involves ‘yum update’ inside the container. This feature is not supported when `registry-undercloud-skip` is set to True. Also, if this option is not specified, InfraRed auto discovers images that should be updated. This option may be used to patch only a specific container image(s) without updating others that could be normally patched.

Example:

```
--container-images-patch openstack-opendaylight,openstack-nova-compute
```

- **--registry-undercloud-skip: avoid using and mass populating the undercloud registry.** The registry or the `registry-mirror` will be used directly when possible, recommended using this option when you have a very good bandwidth to your registry.
- **--registry-mirror:** the alternative docker registry to use for deployment.
- **--registry-namespace:** the alternative docker registry namespace to use for deployment.
- **The following options define the ceph container:** `--registry-ceph-tag:` tag used with the ceph container. Default value: latest `--registry-ceph-namespace:` namespace for the ceph container

1.22.3 Deployment Description

- **--deployment-files: Mandatory.** Path to a directory, containing heat-templates describing the overcloud deployment. Choose `virt` to enable preset templates for virtual POC environment (`virsh` or `ovb`).
- **--instackenv-file:** Path to the `instackenv.json` configuration file used for introspection. For `virsh` and `ovb` deployment, *infrared* can generate this file automatically.
- **--version: TripleO release to install.** Accepts either an integer for RHEL-OSP release, or a community release name (Liberty, Mitaka, Newton, etc...) for RDO release
- **The following options define the number of nodes in the overcloud:** `--controller-nodes`, `--compute-nodes`, `--storage-nodes`. If not provided, will try to evaluate the existing nodes and default to 1 for compute/controller or 0 for storage.
- **--hybrid: Specifies whether deploying a hybrid environment.** When this flag is set, the user should pass to the `--instackenv-file` parameter a link to a JSON/YAML file. The file contains information about the bare-metals servers that will be added to the `instackenv.json` file during introspection.
- **--environment-plan/-p: Import environment plan YAML file that details the plan to be deployed by TripleO.** Beside specifying Heat environments and parameters, one can also provide parameters for TripleO Mistral workflows.

Warning: This option is supported by RHOSP version 12 and greater.

Below are examples of a JSON & YAML files in a valid format:

Listing 5: bm_nodes.yml

```
---
nodes:
- "name": "aaa-compute-0"
  "pm_addr": "172.16.0.1"
  "mac": ["00:11:22:33:44:55"]
  "cpu": "8"
  "memory": "32768"
  "disk": "40"
  "arch": "x86_64"
  "pm_type": "pxe_ipmitool"
  "pm_user": "pm_user"
  "pm_password": "pm_password"
  "pm_port": "6230"
- "name": "aaa-compute-1"
  "pm_addr": "172.16.0.1"
  "mac": ["00:11:22:33:44:56"]
  "cpu": "8"
  "memory": "32768"
  "disk": "40"
  "arch": "x86_64"
  "pm_type": "pxe_ipmitool"
  "pm_user": "pm_user"
  "pm_password": "pm_password"
  "pm_port": "6231"
```

Listing 6: bm_nodes.json

```
{
  "nodes": [
    {
      "name": "aaa-compute-0",
      "pm_addr": "172.16.0.1",
      "mac": ["00:11:22:33:44:55"],
      "cpu": "8",
      "memory": "32768",
      "disk": "40",
      "arch": "x86_64",
      "pm_type": "pxe_ipmitool",
      "pm_user": "pm_user",
      "pm_password": "pm_password",
      "pm_port": "6230"
    },
    {
      "name": "aaa-compute-1",
      "pm_addr": "172.16.0.1",
      "mac": ["00:11:22:33:44:56"],
      "cpu": "8",
      "memory": "32768",
      "disk": "40",
      "arch": "x86_64",
      "pm_type": "pxe_ipmitool",
      "pm_user": "pm_user",
      "pm_password": "pm_password",
      "pm_port": "6231"
    }
  ]
}
```

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```

    "pm_port": "6231"
  }
]
}

```

1.22.4 Overcloud Options

- `--overcloud-ssl`: Boolean. Enable SSL for the overcloud services.
- `--overcloud-use-dns-names`: Boolean. Use DNS names in the subject DN for the public certs.
- `--overcloud-debug`: Boolean. Enable debug mode for the overcloud services.
- `--overcloud-templates`: Add extra environment template files or custom templates to “overcloud deploy” command. Format:

Listing 7: sahara.yml

```

---
tripleo_heat_templates:
  - /usr/share/openstack-tripleo-heat-templates/environments/services/
  ↪sahara.yml

```

Listing 8: ovs-security-groups.yml

```

---
tripleo_heat_templates:
  []

custom_templates:
  parameter_defaults:
    NeutronOVSFirewallDriver: openvswitch

```

- `--overcloud-script`: Customize the script that will deploy the overcloud. A path to a *.sh file containing `openstack overcloud deploy` command. This is for advance users.
- `--heat-templates-basedir`: Allows to override the templates base dir to be used for deployment. Default value: “/usr/share/openstack-tripleo-heat-templates”
- `--resource-class-enabled`: Allows to enable or disable scheduling based on resource classes. Scheduling based on resource classes, a Compute service flavor is able to use the node’s `resource_class` field (available starting with Bare Metal API version 1.21) for scheduling, instead of the CPU, RAM, and disk properties defined in the flavor. A flavor can request exactly one instance of a bare metal resource class. For more information about this feature, visit [Openstack documentation](#).

To disable scheduling based on resource classes:

```

--resource-class-enabled False

```

Note:

- Scheduling based on resource classes is supported by OSP version ≥ 12 .
- Scheduling based on resource classes is enabled by default for OSP version ≥ 12 .

- **--resource-class-override:** Allows to create custom resource class and associate it with flavor and instances. The *node* field supports *controller* or *controller-0* patterns or list of nodes split by delimiter *:*. Where *controller* means any of nodes with such name, while *controller-0* is just that specific node.

Example:

```
--resource-class-override name=baremetal-ctr,flavor=controller,node=controller
--resource-class-override name=baremetal-cmp,flavor=compute,node=compute-0
--resource-class-override name=baremetal-other,flavor=compute,node=swift-
↪0:baremetal
```

1.22.5 Tripleo Heat Templates configuration options

- **--config-heat:** Inject additional Tripleo Heat Templates configuration options under “parameter_defaults” entry point. Example:

```
--config-heat ComputeExtraConfig.nova::allow_resize_to_same_host=true
--config-heat NeutronOVSPFirewallDriver=openvswitch
```

should inject the following yaml to “overcloud deploy” command:

```
---
parameter_defaults:
  ComputeExtraConfig:
    nova::allow_resize_to_same_host: true
  NeutronOVSPFirewallDriver: openvswitch
```

It is also possible to have . (dot) included in key by escaping it:

```
--config-heat "ControllerExtraConfig.opendaylight::log_levels.org\
↪opendaylight\.netvirt\.elan=TRACE"
```

should inject the following yaml to “overcloud deploy” command:

```
---
parameter_defaults:
  ControllerExtraConfig:
    opendaylight::log_levels:
      org.opendaylight.netvirt.elan: TRACE
```

- **--config-resource:** Inject additional Tripleo Heat Templates configuration options under “resource_registry” entry point. Example:

```
--config-resource OS::TripleO::BlockStorage::Net::SoftwareConfig=/home/stack/
↪nic-configs/cinder-storage.yaml
```

should inject the following yaml to “overcloud deploy” command:

```
---
resource_registry:
  OS::TripleO::BlockStorage::Net::SoftwareConfig: /home/stack/nic-configs/
↪cinder-storage.yaml
```

1.22.6 Controlling Node Placement

The default behavior for the director is to randomly select nodes for each role, usually based on their profile tag. However, the director provides the ability to define specific node placement. This is a useful method to:

- Assign specific node IDs
- Assign custom hostnames
- Assign specific IP addresses

Cookbook example

Note: Options are supported for OSP10+

- **--specific-node-ids:** Bool. Default tagging behaviour is to set properties/capabilities profile, which is based on the node_type for all nodes from this type. If this value is set to true/yes, default behaviour will be overwritten and profile will be removed, node id will be added to properties/capabilities and scheduler hints will be generated. Examples of node IDs include controller-0, controller-1, compute-0, compute-1, and so forth.
- **--custom-hostnames:** Option to provide custom Hostnames for the nodes. Custom hostnames can be provided as values or a env file. Examples:

```
--custom-hostnames controller-0=ctr-rack-1-0,compute-0=compute-rack-2-0,ceph-
↪0=ceph-rack-3-0
```

```
--custom-hostnames local/path/to/custom_hostnames.yaml
```

```
---
parameter_defaults:
  HostnameMap:
    ceph-0: storage-0
    ceph-1: storage-1
    ceph-2: storage-2
    compute-0: novacompute-0
    compute-1: novacompute-1
    controller-0: ctrl-0
    controller-1: ctrl-1
    controller-2: ctrl-2
    networker-0: net-0
```

Warning: When custom hostnames are used, after Overcloud install, InfraRed inventory will be updated with the new nodes names. Original node name will be stored as inventory variable named “original_name”. “original_name” can be used in playbooks as normal host var.

- **--predictable-ips:** Bool, assign Overcloud nodes with specific IPs on each network. IPs have to be outside DHCP pools.

Warning: Currently InfraRed only creates template for “resource_registry”. Nodes IPs need to be provided as user environment template, with option `-overcloud-templates`.

Example of the template:

```
---
parameter_defaults:
  CephStorageIPs:
    storage:
      - 172.16.1.100
      - 172.16.1.101
      - 172.16.1.102
    storage_mgmt:
      - 172.16.3.100
      - 172.16.3.101
      - 172.16.3.102
```

1.22.7 Overcloud Storage

- **--storage-external: Bool** If `no`, the overcloud will deploy and manage the storage nodes. If `yes` the overcloud will connect to an external, per-existing storage service.
- **--storage-backend:** The type of storage service used as backend.
- **--storage-config:** Storage configuration (YAML) file.
- **--ceph-osd-type:** For osp13 and above, sets the ceph deployment type to filestore or bluestore. Will default to bluestore if not specified. Currently we do not support non-lvm `ceph-osd-scenario` deployments for bluestore.
- **--ceph-osd-scenario:** For osp13 and above, sets the osd scenarios to `collocated`, `non-collocated` (for filestore) or `lvm` for bluestore). The latter will be used with `--ceph-osd-type bluestore` by default when using `--ceph-osd-type filestore`, `--ceph-osd-scenario` can be `collocated` or `non-collocated`.

Example 1 - non-collocated filestore:

```
infrared tripleo-overcloud \  
...  
--ceph-osd-type filestore \  
--ceph-osd-scenario non-collocated
```

Example 2 - lvm bluestore:

```
infrared tripleo-overcloud \  
...  
--ceph-osd-type bluestore \  
--ceph-osd-scenario lvm
```

1.22.8 Composable Roles

InfraRed allows to use custom roles to deploy overcloud. Check the [Composable roles](#) page for details.

1.22.9 Overcloud Upgrade

Warning: Before Overcloud upgrade you need to perform upgrade of [Undercloud](#)

Warning: Upgrading from version 11 to version 12 isn't supported via the tripleo-overcloud plugin anymore. Please check the tripleo-upgrade plugin for 11 to 12 [upgrade instructions](#).

Upgrade will detect Undercloud version and will upgrade Overcloud to the same version.

- `--upgrade`: Bool If *yes*, the overcloud will be upgraded.

Example:

```
infrared tripleo-overcloud -v --upgrade yes --deployment-files virt
```

- `--build`: target build to upgrade to
- **`--enable-testing-repos`: Let you the option to enable testing/pending repos with rhos-release. Multiple values have to be coma separated. Examples: `--enable-testing-repos rhel,extras,ceph` or `--enable-testing-repos all`**

Example:

```
infrared tripleo-overcloud -v --upgrade yes --build 2017-05-30.1 --deployment-files_
↪virt
```

Note: Upgrade is assuming that Overcloud Deployment script and files/templates, which were used during the initial deployment are available at Undercloud node in home directory of Undercloud user. Deployment script location is assumed to be “~/overcloud_deploy.sh”

1.22.10 Overcloud Update

Warning: Before Overcloud update it's recommended to update [Undercloud](#)

Warning: Overcloud Install, Overcloud Update and Overcloud Upgrade are mutually exclusive

Note: InfraRed supports minor updates from OpenStack 7

Minor update detects Undercloud's version and updates packages within same version to latest available.

- `--ocupdate`: Bool deprecates: `-update` If *yes*, the overcloud will be updated
- `--build`: target build to update to defaults to `None`, in which case, update is disabled. possible values: `build-date`, `latest`, `passed_phase1`, `z3` and all other labels supported by `rhos-release` When specified, `rhos-release` would be setup and used for minor updates.
- **`--enable-testing-repos`: Let you the option to enable testing/pending repos with rhos-release. Multiple values have to be coma separated. Examples: `--enable-testing-repos rhel,extras,ceph` or `--enable-testing-repos all`**

Example:

```
infrared tripleo-overcloud -v --ocupdate yes --build latest --deployment-files virt
```

Note: Minor update expects that Overcloud Deployment script and files/templates, used during the initial deployment, are available at Undercloud node in home directory of Undercloud user. Deployment script location is assumed to be “~/overcloud_deploy.sh”

- **--buildmods:** Let you the option to add flags to rhos-release:

`pin` - Pin puddle (dereference ‘latest’ links to prevent content from changing). This flag is selected by default

`flea` - Enable flea repos.

`unstable` - This will enable brew repos or poodles (in old releases).

`none` - Use none of those flags.

Note: `--buildmods` flag is for internal Red Hat usage.

1.22.11 Overcloud Reboot

It is possible to reboot overcloud nodes. This is needed if kernel got updated

- **--postreboot:** Bool If yes, reboot overcloud nodes one by one.

Example:

```
infrared tripleo-overcloud --deployment-files virt --postreboot yes
infrared tripleo-overcloud --deployment-files virt --ocupdate yes --build latest --
↳postreboot yes
```

TLS Everywhere

Setup TLS Everywhere with FreeIPA.

`tls-everywhere:` It will configure overcloud for TLS Everywhere.

1.23 Cloud Config

Collection of overcloud configuration tasks to run after Overcloud deploy (Overcloud post tasks)

1.23.1 Flags

- **--tasks:** Run one or more tasks to the cloud. separate with commas.

```
# Example:
infrared cloud-config --tasks create_external_network,compute_ssh,instance_ha
```

- **--overcloud-stack:** The overcloud stack name.

- **--resync:** Bool. Whether we need to resync services.

1.23.2 External Network

To create external network we need to specify in `--tasks` the task `create_external_network` and then use the flags above:

- **--deployment-files:** Name of folder in cloud's user on undercloud, which containing the templates of the overcloud deployment.
- **--network-protocol:** The overcloud network backend.
- **--public-net-name:** Specifies the name of the public network. .. note:: If not provided it will use the default one for the OSP version.
- **--public-subnet:** Path to file containing different values for the subnet of the network above.
- **--external-vlan:** An Optional external VLAN ID of the external network (Not the Public API network). Set this to `yes` if overcloud's external network is on a VLAN that's unreachable from the undercloud. This will configure network access from UnderCloud to overcloud's API/External(floating IPs) network, creating a new VLAN interface connected to ovs's `br-ctlplane` bridge. .. note:: If your UnderCloud's network is already configured properly, this could disrupt it, making overcloud API unreachable For more details, see: [VALIDATING THE OVERCLOUD](#)

```
# Example:
ir cloud-config --tasks create_external_network --deployment-files virt --public-
↪subnet default_subnet --network-protocol ipv4
```

1.23.3 Scale Up/Down nodes

- **--scale-nodes:** List of compute nodes to be added.

```
# Example:
ir cloud-config --tasks scale_up --scale-nodes compute-1,compute-2
```

- **--node-name:** Name of the node to remove.

```
# Example:
ir cloud-config --tasks scale_down --node-name compute-0
```

1.23.4 Ironic Configuration

- **vbmc-username:** VBMC username.
- **vbmc-password:** VBMC password.

Note: Necessary when Ironic's driver is 'pxe_ipmitool' in OSP 11 and above.

1.23.5 Workload Launch

- **--workload-image-url:** Image source URL that should be used for uploading the workload Glance image.
- **--workload-memory:** Amount of memory allocated to test workload flavor.
- **--workload-vcpu:** Amount of v-cpus allocated to test workload flavor.

- **--workload-disk:** Disk size allocated to test workload flavor.
- **--workload-index:** Number of workload objects to be created.

```
# Example:
ir cloud-config --workload-memory 64 --workload-disk 1 --workload-index 3
```

1.24 Tempest

Runs Tempest tests against an OpenStack cloud.

1.24.1 Required arguments

- **--openstack-installer:** **The installer used to deploy OpenStack.** Enables extra configuration steps for certain installers. Supported installers are: `tripleo` and `packstack`.
- **--openstack-version:** **The version of the OpenStack installed.** Enables additional configuration steps when version ≤ 7 .
- **--tests:** **The list of test suites to execute. For example: `network, compute`.** The complete list of the available suites can be found by running `ir tempest --help`
- **--openstackrc:** **The OpenStack RC file.** The absolute and relative paths to the file are supported. When this option is not provided, *infrared* will try to use the `keystonerc` file from the active workspace. The `openstackrc` file is copied to the tester station and used to configure and run Tempest.

1.24.2 Optional arguments

The following useful arguments can be provided to tune tempest tester. Complete list of arguments can be found by running `ir tempest --help`.

- **--setup:** **The setup type for the tempest.** Can be `git` (default), `rpm` or `pip`. Default tempest git repository is <https://git.openstack.org/openstack/tempest.git>. This value can be overridden with the `--extra-vars` cli option:

```
ir tempest -e setup.repo=my.custom.repo [...]
```

- **--revision:** **Specifies the revision for the case when tempest is installing from the git repository.** Default value is `HEAD`.
- **--deployer-input-file:** **The deployer input file to use for Tempest configuration.** The absolute and relative paths to the file are supported. When this option is not provided *infrared* will try to use the `deployer-input-file.conf` file from active workspace folder.

For some OpenStack versions(kilo, jun0, liberty) Tempest provides predefined deployer files. Those files can be downloaded from the git repo and passed to the Tempest tester:

```
BRANCH=liberty
wget https://raw.githubusercontent.com/redhat-openstack/tempest/$BRANCH/etc/
↪deployer-input-$BRANCH.conf
ir tempest --tests=sanity \
    --openstack-version=8 \
    --openstack-installer=tripleo \
    --deployer-input-file=deployer-input-$BRANCH.conf
```

- **--image:** Image to be uploaded to glance and used for testing. Path have to be a url. If image is not provided, tempest config will use the default.

Note: You can specify image ssh user with `--config-options compute.image_ssh_user=`

1.24.3 Tempest results

infrared fetches all the tempest output files, like results to the `tempest_results` folder under the active `workspace` folder:

```
ll .workspace/my_workspace/tempest_results/tempest-*
-rw-rw-r--. tempest-results-minimal.xml
-rw-rw-r--. tempest-results-neutron.xml
```

1.24.4 Downstream tests

The tempest plugin provides the `--plugin cli` option which can be used to specify the plugin url to install. This option can be used, for example, to specify a downstream repo with tempest tests and run them:

```
ir tempest --tests=neutron_downstream \
  --openstack-version=12 \
  --openstack-installer=tripleo \
  --plugin=https://downstrem.repo/tempest_neutron_plugin \
  --setup rpm
```

The plugin flag can also specify version of plugin to clone by separating the url and version with a comma:

```
ir tempest --tests=neutron_downstream \
  --openstack-version=12 \
  --openstack-installer=tripleo \
  --plugin=https://downstrem.repo/tempest_neutron_plugin,osp10 \
  --setup rpm
```

The `neutron_downstream.yml` file can reference the upstream project in case the downstream repo is dependant or imports any upstream modules:

```
---
test_dict:
  test_regex: ''
  whitelist:
    - "^neutron_plugin.tests.scenario.*"
  blacklist:
    - "^tempest.api.network.*"
    - "^tempest.scenario.test_network_basic_ops.test_hotplug_nic"
    - "^tempest.scenario.test_network_basic_ops.test_update_instance_port_admin_
↪state"
    - "^tempest.scenario.test_network_basic_ops.test_port_security_macspoofing_
↪port"
  plugins:
    upstream_neutron:
      repo: "https://github.com/openstack/neutron.git"
```

1.25 Collect-logs

Collect-logs plugin allows the user to collect files & directories from hosts managed by active workspace. A list of paths to be archived is taken from `vars/default_archives_list.yml` in the plugin's dir. Logs are being packed as `.tar` files by default, unless the user explicitly use the `--gzip` flag that will instruct the plugin to compress the logs with `gzip`. Also it supports 'sosreport' tool to collect configuration and diagnostic information from system. It is possible to use both logger facilities, log files from the host and sosreport.

Note: All nodes must have yum repositories configured in order for the tasks to work on them.

Note: Users can manually edit the `default_archives_list.yml` if need to add/delete paths.

Note: All nodes must have yum repositories configured in order for the tasks to work on them.

Note: To enable logging using all available facilities, i.e. host and sosreport use parameter `--logger=all`

Usage example:

```
ir collect-logs --dest-dir=/tmp/ir_logs
ir collect-logs --dest-dir=/tmp/ir_logs --logger=sosreport
```

1.26 Gabbi Tester

Runs telemetry tests against the OpenStack cloud.

1.26.1 Required arguments

- **--openstack-version:** The version of the OpenStack installed. That option also defines the list of tests to run against the OpenStack.
- **--openstackrc:** The OpenStack RC file. The absolute and relative paths to the file are supported. When this option is not provided, *infrared* will try to use the *keystonerc* file from the active workspace. The *openstackrc* file is copied to the tester station and used to run tests
- **--undercloudrc:** The undercloud RC file. The absolute and relative paths to the file are supported. When this option is not provided, *infrared* will try to use the *stackrc* file from the active workspace.

1.26.2 Optional arguments

- **--network:** Network settings to use. Default network configuration includes the `protocol` (ipv4 or ipv6) and `interfaces` sections:

```
network:
  protocol: ipv4
  interfaces:
    - net: management
      name: eth1
    - net: external
      name: eth2
```

- `--setup`: The setup variables, such as git repo name, folders to use on tester and others:

```
setup:
  repo_dest: ~/TelemetryGabbits
  gabbi_venv: ~/gbr
  gabbits_repo: <private-repo-url>
```

1.26.3 Gabbi results

infrared fetches all the output files, like results to the `gabbi_results` folder under the active `workspace` folder.

1.27 List builds

The List Builds plugin is used to list all the available puddles (builds) for the given OSP version.

Usage:

```
$ ir list-builds --version 12
```

This will produce output in ansible style.

Alternatively you can have a clean raw output by saving builds to the file and printing them:

```
$ ir list-builds --version 12 --file-output builds.txt &> /dev/null && cat builds.txt
```

Output:

```
2017-08-16.1 # 16-Aug-2017 05:48
latest # 16-Aug-2017 05:48
latest_containers # 16-Aug-2017 05:48
passed_phase1 # 16-Aug-2017 05:48
.....
```

1.28 Pytest Runner

Pytest runner provide option to execute test on Tester node

Usage:

```
$ ir pytest-runner
```

This will run default tests for container sanity

Optional arguments::

- `--run`: Whether to run the test or only to prepare for it. Default value is 'True'.
- `--repo`: Git repo which contain the test. Default value is 'https://code.engineering.redhat.com/gerrit/rhos-qe-core-installer'
- `--file`: Location of the pytest file in the git repo. Default value is 'tripleo/container_sanity.py'

1.29 OSPD UI tester

OSPD UI tests against the [undercloud](#) UI and works with RHOS10+.

1.29.1 Environment

To use the OSPD UI tester the following requirements should be met:

- 1) Undercloud should be installed
- 2) `instackenv.json` should be generated and put into the undercloud machine.
- 3) A dedicated machine (`uitester`) should be provisioned. This machine will be used to run all the tests.

InfraRed allows to setup such environment. For example, the [virsh](#) plugin can be used to provision required machines:

```
ir virsh -vvvv -o provision.yml \  
  --topology-nodes=ironic:1,controller:3,compute:1,tester:1 \  
  --host-address=example.host.redhat.com \  
  --host-key ~/.ssh/example-key.pem
```

Note: Do not include undercloud machine into the tester group by using the `ironic` node.

To install undercloud use the [tripleo undercloud](#) plugin:

```
ir tripleo-undercloud -vvvv \  
  --version=10 \  
  --images-task=rpm
```

To deploy undercloud with the [ssl](#) support run `tipleo-undercloud` plugin with the `--ssl yes` option or use special template which sets `generate_service_certificate` to `true` and sets the `undercloud_public_vip` to allow external access to the undercloud:

```
ir tripleo-undercloud -vvvv \  
  --version=10 \  
  --images-task=rpm \  
  --ssl yes
```

The next step is to generate `instackenv.json` file. This step can be done using the [tripleo overcloud](#) plugin:

```
ir tripleo-overcloud -vvvv \  
  --version=10 \  
  --deployment-files=virt \  
  --ansible-args="tags=init,instack" \  
  --introspect=yes
```

For the overcloud plugin it is important to specify the `instack` ansible tag to limit overcloud execution only by the generation of the `instackenv.json` file.

1.29.2 OSPD UI tester options

To run OSPD UI tester the following command can be used:

```
ir ospdui -vvvv \
  --openstack-version=10 \
  --tests=login \
  --ssl yes \
  --browser=chrome
```

Required arguments::

- `--openstack-version`: specifies the version of the product under test.
- `--tests`: the test suite to run. Run `ir ospdui --help` to see the list of all available suites to run.

Optional arguments::

- `--ssl`: specifies whether the undercloud was installed with ssl enabled or not. Default value is 'no'.
- `--browser`: the webdriver to use. Default browser is firefox
- `--setup`: specifies the config parameters for the tester. See [Advanced configuration](#) for details
- `--undercloudrc`: the absolute or relative path to the undercloud rc file. By default, the 'stackrc' file from the workspace dir will be used.
- `--topology-config`: the absolute or relative path to the topology configuration in json format. By default the following file is used:

```
{
  "topology": {
    "Controller": "3",
    "Compute": "1",
    "Ceph Storage": "3",
    "Object Storage": "0",
    "Block Storage": "0"
  },
  "network": {
    "vlan": "10",
    "allocation_pool_start": "192.168.200.10",
    "allocation_pool_end": "192.168.200.150",
    "gateway": "192.168.200.254",
    "subnet_cidr": "192.168.200.0/24",
    "allocation_pool_start_ipv6": "2001:db8:ca2:4::0010",
    "allocation_pool_end_ipv6": "2001:db8:ca2:4::00f0",
    "gateway_ipv6": "2001:db8:ca2:4::00fe",
    "subnet_cidr_ipv6": "2001:db8:ca2:4::/64"
  }
}
```

1.29.3 Advanced configuration

By default all the tester parameters are read from the `vars\setup\default.yml` file under the plugin dir. Setup variable file describes selenium, test repo and network parameters to use:

```
setup:
  selenium:
    chrome_driver:
```

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```

        url: http://chromedriver.storage.googleapis.com/2.27/chromedriver_linux64.
→zip
    firefox_driver:
        url: https://github.com/mozilla/geckodriver/releases/download/v0.14.0/
→geckodriver-v0.14.0-linux64.tar.gz
        binary_name: geckodriver
    ospdui:
        repo: git://git.app.eng.bos.redhat.com/ospdui.git
        revision: HEAD
        dir: ~/ospdui_tests
    network:
        dev: eth0
        ipaddr: 192.168.24.240
        netmask: 255.255.255.0

```

To override any of these value you can copy `vars\setup\default.yml` to the same folder with the different name and change any value in that yml (for example git revision). New setup config (without .yml extension) then can be specified with the `--setup` flag:

```

ir ospdui -vvvv \
  --openstack-version=10 \
  --tests=login \
  --setup=custom_setup

```

1.29.4 Debugging

The OSPD UI tester starts VNC server on the tester machine (by default on display :1). This allows to remotely debug and observe what is happening on the tester.

If you have direct network access to the tester, you can use any VNC client and connect. If you are using virtual deployment the tunneling through the hypervisor to the tester instance should be created:

```

client $> ssh -f root@myvirthost.redhat.com -L 5901:<tester ip address>:5901 -N

```

Then you can use VNC viewer and connect to the `localhost:5901`.

1.29.5 Known Issues

- Automated UI tests cannot be run on the Firefox browser when SSL is enabled on undercloud. Follow the following guide to fix that problem: https://access.redhat.com/documentation/en-us/red_hat_openstack_platform/10/html/director_installation_and_usage/appe-server_exceptions

1.30 RDO deployment

Infrared allows to perform RDO based deployments.

To deploy RDO on virtual environment the following steps can be performed.

- 1) Provision virtual machines on a hypervisor with the `virsh` plugin. Use CentOS image:

```
infrared virsh -vv \
  -o provision.yml \
  --topology-nodes undercloud:1,controller:1,compute:1,ceph:1 \
  --host-address my.host.redhat.com \
  --host-key /path/to/host/key \
  --image-url https://cloud.centos.org/centos/7/images/CentOS-7-x86_64-
↳GenericCloud.qcow2 \
  -e override.controller.cpu=8 \
  -e override.controller.memory=32768
```

2) Install the undercloud. Use RDO release name as a version:

```
infrared tripleo-undercloud -vv -o install.yml \
  -o undercloud-install.yml \
  --version pike
```

3) Build or import overcloud images from <https://images.rdoproject.org>:

```
# import images
infrared tripleo-undercloud -vv \
  -o undercloud-images.yml \
  --images-task=import \
  --images-url=https://images.rdoproject.org/pike/rdo_trunk/current-tripleo/
↳stable/

# or build images
infrared tripleo-undercloud -vv \
  -o undercloud-images.yml \
  --images-task=build \
```

Note: Overcloud image build process often takes more time than import.

4) Install RDO:

```
infrared tripleo-overcloud -v \
  -o overcloud-install.yml \
  --version pike \
  --deployment-files virt \
  --introspect yes \
  --tagging yes \
  --deploy yes

infrared cloud-config -vv \
  -o cloud-config.yml \
  --deployment-files virt \
  --tasks create_external_network,forward_overcloud_dashboard,network_time,tempest_
↳deployer_input
```

To install containerized RDO version (pike and above) the `--registry-*`, `--containers yes` and `--registry-skip-puddle yes` parameters should be provided:

```
infrared tripleo-overcloud \
  --version queens \
  --deployment-files virt \
  --introspect yes \
```

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```
--tagging yes \  
--deploy yes \  
--containers yes \  
--registry-mirror trunk.registry.rdoproject.org \  
--registry-namespace master \  
--registry-tag current-tripleo-rdo \  
--registry-prefix=centos-binary- \  
--registry-skip-puddle yes  
  
infrared cloud-config -vv \  
-o cloud-config.yml \  
--deployment-files virt \  
--tasks create_external_network,forward_overcloud_dashboard,network_time,tempest_  
↪deployer_input
```

Note: For the `--registry-tag` the following RDO tags can be used: `current-passed-ci`, `current-tripleo`, `current`, `tripleo-ci-testing`, etc

1.30.1 Known issues

1. Overcloud deployment fails with the following message:

```
Error: /Stage[main]/Gnocchi::Db::Sync/Exec[gnocchi-db-sync]: Failed to call_  
↪refresh: Command exceeded timeout  
Error: /Stage[main]/Gnocchi::Db::Sync/Exec[gnocchi-db-sync]: Command exceeded_  
↪timeout
```

This error might be caused by the <https://bugs.launchpad.net/tripleo/+bug/1695760>. To workaround that issue the `--overcloud-templates disable-telemetry` flag should be added to the `tripleo-overcloud` command:

```
infrared tripleo-overcloud -v \  
-o overcloud-install.yml \  
--version pike \  
--deployment-files virt \  
--introspect yes \  
--tagging yes \  
--deploy yes \  
--overcloud-templates disable-telemetry  
  
infrared cloud-config -vv \  
-o cloud-config.yml \  
--deployment-files virt \  
--tasks create_external_network,forward_overcloud_dashboard,network_time,  
↪tempest_deployer_input
```

1.31 SplitStack deployment

Infrared allows to perform [SplitStack](#) based deployment.

To deploy SplitStack on virtual environment the following steps can be performed.

1) Provision virtual machines on a hypervisor with the virsh plugin:

```
infrared virsh -o provision.yml \
  --topology-nodes undercloud:1,controller:3,compute:1 \
  --topology-network split_nets \
  --host-address $host \
  --host-key $key \
  --host-memory-overcommit False \
  --image-url http://cool_image_url \
  -e override.undercloud.disks.disk1.size=55G \
  -e override.controller.cpu=8 \
  -e override.controller.memory=32768 \
  -e override.controller.deploy_os=true \
  -e override.compute.deploy_os=true
```

2) Install the undercloud using required version(currently 11 and 12 was tested):

```
infrared tripleo-undercloud -o install.yml \
  -o undercloud-install.yml \
  --mirror tlv \
  --version 12 \
  --build passed_phase1 \
  --splitstack yes \
  --ssl yes
```

3) Install overcloud:

```
infrared tripleo-overcloud -o overcloud-install.yml \
  --version 12 \
  --deployment-files splitstack \
  --role-files default \
  --deploy yes \
  --splitstack yes
```

1.32 Composable Roles

InfraRed allows to define [Composable Roles](#) while installing OpenStack with tripleo.

1.32.1 Overview

To deploy overcloud with the composable roles the additional templates should be provided:

- nodes template: list all the roles, list of the services for every role. For example:

```
- name: ObjectStorage
  CountDefault: 1
  ServicesDefault:
    - OS::TripleO::Services::CACerts
    - OS::TripleO::Services::Kernel
    - OS::TripleO::Services::Ntp
    [...]
  HostnameFormatDefault: swift-%index%
- name: Controller
```

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```

CountDefault: 1
ServicesDefault:
  - OS::TripleO::Services::CACerts
  - OS::TripleO::Services::CephMon
  - OS::TripleO::Services::CephExternal
  - OS::TripleO::Services::CephRgw
  [...]
HostnameFormatDefault: controller-%index%

- name: Compute
  CountDefault: 1
  ServicesDefault:
    - OS::TripleO::Services::CACerts
    - OS::TripleO::Services::CephClient
    - OS::TripleO::Services::CephExternal
    [....]
  HostnameFormatDefault: compute-%index%

- name: Networker
  CountDefault: 1
  ServicesDefault:
    - OS::TripleO::Services::CACerts
    - OS::TripleO::Services::Kernel
    [...]
  HostnameFormatDefault: networker-%index%

```

- template with the information about roles count, flavors and other defaults:

```

parameter_defaults:
  ObjectStorageCount: 1
  OvercloudSwiftStorageFlavor: swift
  ControllerCount: 2
  OvercloudControlFlavor: controller
  ComputeCount: 1
  OvercloudComputeFlavor: compute
  NetworkerCount: 1
  OvercloudNetworkerFlavor: networker
  [...]

```

- template with the information about roles resources (usually network and port resources):

```

resource_registry:
  OS::TripleO::ObjectStorage::Net::SoftwareConfig: /home/stack/deployment_
↪files/network/nic-configs/osp11/swift-storage.yaml
  OS::TripleO::Controller::Net::SoftwareConfig: /home/stack/deployment_
↪files/network/nic-configs/osp11/controller.yaml
  OS::TripleO::Compute::Net::SoftwareConfig: /home/stack/deployment_files/
↪network/nic-configs/osp11/compute.yaml
  OS::TripleO::Networker::Ports::TenantPort: /usr/share/openstack-tripleo-
↪heat-templates/network/ports/tenant.yaml
  OS::TripleO::Networker::Ports::InternalApiPort: /usr/share/openstack-
↪tripleo-heat-templates/network/ports/internal_api.yaml
  OS::TripleO::Networker::Net::SoftwareConfig: /home/stack/deployment_files/
↪network/nic-configs/osp11/networker.yaml
  [...]

```

Note: The nic-configs in the infrared deployment folder are stored in two folders (`osp11` and `legacy`) depending on the product version installed.

InfraRed allows to simplify the process of templates generation and auto-populates the roles according to the deployed topology.

1.32.2 Defining topology and roles

Deployment approaches with composable roles differ for OSP11 and OSP12+ products.

For OSP11 user should manually compose all the roles templates and provide them to the deploy script. For OSP12 and above the tripleo provides the `openstack overcloud roles generate` command to automatically generate roles templates. See [THT roles](#) for more information about tripleo roles.

OSP12 Deployment

The Infrared provides there options to deploy openstack with composable roles in OSP12+.

1) Automatically discover roles from the inventory. In that case Infrared tries to determine what roles should be used basing on the list of the `overcloud_nodes` from the inventory file. To enable automatic roles discover the `--role-files` option should be set to `auto` or any other non-list value (not separated with `;`). For example:

```
# provision
ir virsh -vvvv
  --topology-nodes=undercloud:1,controller:2,compute:1,networker:1,swift:1 \
  --host-address=seal52.qa.lab.tlv.redhat.com \
  --host-key ~/.ssh/my-prov-key

# do undercloud install [...]

# overcloud
ir tripleo-overcloud -vvvv
  --version=12 \
  --deploy=yes \
  --role-files=auto \
  --deployment-files=composable_roles \
  [...]
```

2) Manually specify roles to use. In that case user can specify the list roles to use by setting the `--role-files` option to the list of roles from the [THT roles](#):

```
# provision
ir virsh -vvvv
  --topology-nodes=undercloud:1,controller:2,compute:1,messaging:1,database:1,
↪networker:1 \
  --host-address=seal52.qa.lab.tlv.redhat.com \
  --host-key ~/.ssh/my-prov-key

# do undercloud install [...]

# overcloud
ir tripleo-overcloud -vvvv
  --version=12 \
  --deploy=yes \
```

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```
--role-files=ControllerOpenstack,Compute,Messaging,Database,Networker \
--deployment-files=composable_roles \
[...]
```

3) User legacy OSP11 approach to generate roles templates. See detailed description below. To enable that approach the `--tht-roles` flag should be set to `no` and the `--role-files` should point to the IR folder with the roles. For example:

```
# provision
ir virsh -vvvv
  --topology-nodes=undercloud:1,controller:2,compute:1,networker:1,swift:1 \
  --host-address=seal52.qa.lab.tlv.redhat.com \
  --host-key ~/.ssh/my-prov-key

# do undercloud install [...]

# overcloud
ir tripleo-overcloud -vvvv
  --version=12 \
  --deploy=yes \
  --role-files=networker \
  --tht-roles=no \
  --deployment-files=composable_roles \
  [...]
```

OSP11 Deployment

To deploy custom roles, InfraRed should know what nodes should be used for what roles. This involves a 2-step procedure.

Step #1 Setup available nodes and store them in the InfraRed inventory. Those nodes can be configured by the provision plugin such as `virsh`:

```
ir virsh -vvvv
  --topology-nodes=undercloud:1,controller:2,compute:1,networker:1,swift:1 \
  --host-address=seal52.qa.lab.tlv.redhat.com \
  --host-key ~/.ssh/my-prov-key
```

In that example we defined a `networker` nodes which holds all the neutron services.

Step #2 Provides a path to the roles definition while installing the `overcloud` using the `--role-files` option:

```
ir tripleo-overcloud -vvvv
  --version=10 \
  --deploy=yes \
  --role-files=networker \
  --deployment-files=composable_roles \
  --introspect=yes \
  --storage-backend=swift \
  --tagging=yes \
  --post=yes
```

In that example, to build the composable roles templates, InfraRed will look into the `<plugin_dir>/files/roles/networker` folder for the files that corresponds to all the node names defined in the `inventory->overcloud_nodes` group.

All those role files hold role parameters. See *Role Description* section for details.

When role file is not found in the user specified folder InfraRed will try to use a default roles from the `<plugin_dir>/files/roles/default` folder.

For the topology described above with the networker custom role the following role files can be defined:

- `<plugin_dir>/files/roles/networker/controller.yml` - holds controller roles without neutron services
- `<plugin_dir>/files/roles/networker/networker.yml` - holds the networker role description with the neutron services
- `<plugin_dir>/files/roles/default/compute.yml` - a default compute role description
- `<plugin_dir>/files/roles/default/swift.yml` - a default swift role description

To deploy non-supported roles, a new folder should be created in the `<plugin_dir>/files/roles/`. Any roles files that differ (e.g. service list) from the defaults should be put there. That folder is then can be referenced with the `--role-files=<folder name>` argument.

1.32.3 Role Description

All the custom and defaults role descriptions are stored in the `<plugin_dir>/files/roles` folder. Every role file holds the following information:

- `name` - name of the role
- `resource_registry` - all the resources required for a role.
- `flavor` - the flavor to use for a role
- `host_name_format` - the resulting host name format for the role node
- `services` - the list of services the role holds

Below is an example of the controller default role:

```
controller_role:
  name: Controller

  # the primary role will be listed first in the roles_data.yaml template file.
  primary_role: yes

  # include resources
  # the following vars can be used here:
  # - ${ipv6_postfix}: will be replaced with _v6 when the ipv6 protocol is used
  ↪for installation, otherwise is empty
  # - ${deployment_dir} - will be replaced by the deployment folder location on
  ↪the undercloud. Deployment folder can be specified with the ospd --deployment flag
  # - ${nics_subfolder} - will be replaced by the appropriate subfolder with the
  ↪nic-config's. The subfolder value
  #       is dependent on the product version installed.
  resource_registry:
    "OS::TripleO::Controller::Net::SoftwareConfig": "${deployment_dir}/network/
  ↪nic-configs/${nics_subfolder}/controller${ipv6_postfix}.yaml"
  # required to support OSP12 deployments
  networks:
    - External
    - InternalApi
    - Storage
    - StorageMgmt
```

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```

- Tenant
# we can also set a specific flavor for a role.
flavor: controller
host_name_format: 'controller-%index%'

# condition can be used to include or disable services. For example:
# - "{% if install.version |openstack_release < 11 %}
↪OS::TripleO::Services::VipHosts{% endif %}"
services:
- OS::TripleO::Services::CACerts
- OS::TripleO::Services::CephClient
- OS::TripleO::Services::CephExternal
- OS::TripleO::Services::CephRgw
- OS::TripleO::Services::CinderApi
- OS::TripleO::Services::CinderBackup
- OS::TripleO::Services::CinderScheduler
- OS::TripleO::Services::CinderVolume
- OS::TripleO::Services::Core
- OS::TripleO::Services::Kernel
- OS::TripleO::Services::Keystone
- OS::TripleO::Services::GlanceApi
- OS::TripleO::Services::GlanceRegistry
- OS::TripleO::Services::HeatApi
- OS::TripleO::Services::HeatApiCfn
- OS::TripleO::Services::HeatApiCloudwatch
- OS::TripleO::Services::HeatEngine
- OS::TripleO::Services::MySQL
- OS::TripleO::Services::NeutronDhcpAgent
- OS::TripleO::Services::NeutronL3Agent
- OS::TripleO::Services::NeutronMetadataAgent
- OS::TripleO::Services::NeutronApi
- OS::TripleO::Services::NeutronCorePlugin
- OS::TripleO::Services::NeutronOvsAgent
- OS::TripleO::Services::RabbitMQ
- OS::TripleO::Services::HAproxy
- OS::TripleO::Services::Keepalived
- OS::TripleO::Services::Memcached
- OS::TripleO::Services::Pacemaker
- OS::TripleO::Services::Redis
- OS::TripleO::Services::NovaConductor
- OS::TripleO::Services::MongoDb
- OS::TripleO::Services::NovaApi
- OS::TripleO::Services::NovaMetadata
- OS::TripleO::Services::NovaScheduler
- OS::TripleO::Services::NovaConsoleauth
- OS::TripleO::Services::NovaVncProxy
- OS::TripleO::Services::Ntp
- OS::TripleO::Services::SwiftProxy
- OS::TripleO::Services::SwiftStorage
- OS::TripleO::Services::SwiftRingBuilder
- OS::TripleO::Services::Snmp
- OS::TripleO::Services::Timezone
- OS::TripleO::Services::CeilometerApi
- OS::TripleO::Services::CeilometerCollector
- OS::TripleO::Services::CeilometerExpirer
- OS::TripleO::Services::CeilometerAgentCentral
- OS::TripleO::Services::CeilometerAgentNotification

```

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```

- OS::TripleO::Services::Horizon
- OS::TripleO::Services::GnocchiApi
- OS::TripleO::Services::GnocchiMetricd
- OS::TripleO::Services::GnocchiStatsd
- OS::TripleO::Services::ManilaApi
- OS::TripleO::Services::ManilaScheduler
- OS::TripleO::Services::ManilaBackendGeneric
- OS::TripleO::Services::ManilaBackendNetapp
- OS::TripleO::Services::ManilaBackendCephFs
- OS::TripleO::Services::ManilaShare
- OS::TripleO::Services::AodhApi
- OS::TripleO::Services::AodhEvaluator
- OS::TripleO::Services::AodhNotifier
- OS::TripleO::Services::AodhListener
- OS::TripleO::Services::SaharaApi
- OS::TripleO::Services::SaharaEngine
- OS::TripleO::Services::IronicApi
- OS::TripleO::Services::IronicConductor
- OS::TripleO::Services::NovaIronic
- OS::TripleO::Services::TripleoPackages
- OS::TripleO::Services::TripleoFirewall
- "{% if install.version|default(undercloud_version) |openstack_release < 15
↪}OS::TripleO::Services::OpenDaylightApi{% endif %}"
- "{% if install.version|default(undercloud_version) |openstack_release < 15
↪}OS::TripleO::Services::OpenDaylightOvs{% endif %}"
- OS::TripleO::Services::SensuClient
- OS::TripleO::Services::FluentdClient
- OS::TripleO::Services::VipHosts

```

The name of the role files should correspond to the node inventory name without prefix and index. For example, for `user-prefix-controller-0` the name of the role should be `controller.yml`.

1.32.4 OSP11 Deployment example

To deploy OpenStack with composable roles on virtual environment the following steps can be performed.

- 1) Provision all the required virtual machines on a hypervisor with the virsh plugin:

```

infrared virsh -vv \
  -o provision.yml \
  --topology-nodes undercloud:1,controller:3,db:3,messaging:3,networker:2,
↪compute:1,ceph:1 \
  --host-address my.host.redhat.com \
  --host-key /path/to/host/key \
  -e override.controller.cpu=8 \
  -e override.controller.memory=32768

```

- 2) Install undercloud and overcloud images:

```

infrared tripleo-undercloud -vv -o install.yml \
  -o undercloud-install.yml \
  --version 11 \
  --images-task rpm

```

- 3) Install overcloud:

```
infrared tripleo-overcloud -vv \  
  -o overcloud-install.yml \  
  --version 11 \  
  --role-files=composition \  
  --deployment-files composable_roles \  
  --introspect yes \  
  --tagging yes \  
  --deploy yes  
  
infrared cloud-config -vv \  
-o cloud-config.yml \  
--deployment-files virt \  
--tasks create_external_network,forward_overcloud_dashboard,network_time,tempest_  
↪deployer_input
```

1.33 Tripleo OSP with Red Hat Subscriptions

1.33.1 Undercloud

To deploy OSP, the Undercloud *must be registered* to Red Hat channels.

The value for `pool` can be obtained by executing the following command on an existing registered host:

```
subscription-manager list --available --matches='Red Hat OpenStack' --pool-only
```

Define the subscription details:

Listing 9: undercloud_cdn.yml

```
---  
username: 'infrared.user@example.com'  
password: '123456'  
pool_ids: '1234567890abcdefghijklmnopqrstuv'
```

Warning: During run time, contents of the file are hidden from the logged output, to protect private account credentials.

For the full list of supported input, see the Ansible [module documentation](#).

Note: Pre-registered undercloud is also supported if `--cdn` flag is missing.

Deploy your undercloud. It's recommended to use `--images-task rpm` to fetch pre-packaged images that are only available via Red Hat channels:

```
infrared tripleo-undercloud --version 10 --cdn undercloud_cdn.yml --images-task rpm
```

Warning: `--images-update` is not supported with `cdn`.

1.33.2 Overcloud

Once the undercloud is registered, the overcloud can be deployed. However, the overcloud nodes will not be registered and cannot receive updates. While the nodes can be later registered manually, Tripleo provides a way to register them automatically on deployment.

According to the [guide](#) there are 2 heat-templates required. They can be included, and their defaults overridden, using a [custom templates file](#). For registration to the customer portal, the minimum required fields are:

- `rhel_reg_method`
- `rhel_reg_org`
- `rhel_reg_user` & `rhel_reg_password`
- `rhel_reg_pool_id`
- `rhel_reg_repos`

The value for `rhel_reg_org` can be obtained by issuing the following command on an existing registered host:

```
subscription-manager identity
```

The value for `rhel_reg_pool_id` can be obtained by executing the following command on an existing registered host:

```
subscription-manager list --available --matches='Red Hat OpenStack' --pool-only
```

Listing 10: `overcloud_cdn.yml`

```
---
tripleo_heat_templates:
  - /usr/share/openstack-tripleo-heat-templates/extraconfig/pre_deploy/rhel-
  ↪registration/rhel-registration-resource-registry.yaml
  - /usr/share/openstack-tripleo-heat-templates/extraconfig/pre_deploy/rhel-
  ↪registration/environment-rhel-registration.yaml

custom_templates:
  parameter_defaults:
    rhel_reg_activation_key: ""
    rhel_reg_org: "12345678"
    rhel_reg_pool_id: "1234567890abcdefghijklmnopqrstuv"
    rhel_reg_method: "portal"
    rhel_reg_sat_url: ""
    rhel_reg_sat_repo: ""
    rhel_reg_repos: "rhel-7-server-rpms, rhel-7-server-extras-rpms, rhel-7-server-
  ↪rh-common-rpms, rhel-ha-for-rhel-7-server-rpms, rhel-7-server-openstack-10-rpms, rhel-
  ↪7-server-rhceph-2-osd-rpms, rhel-7-server-rhceph-2-mon-rpms, rhel-7-server-rhceph-2-
  ↪tools-rpms, rhel-7-server-satellite-tools-6.2-rpms"
    rhel_reg_auto_attach: ""
    rhel_reg_base_url: ""
    rhel_reg_environment: ""
    rhel_reg_force: ""
    rhel_reg_machine_name: ""
    rhel_reg_password: "123456"
    rhel_reg_release: ""
    rhel_reg_server_url: ""
    rhel_reg_service_level: ""
    rhel_reg_user: "infrared.user@example.com"
    rhel_reg_type: ""
```

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```
rhel_reg_http_proxy_host: ""
rhel_reg_http_proxy_port: ""
rhel_reg_http_proxy_username: ""
rhel_reg_http_proxy_password: ""
```

Note: Please note that the `rhel_reg_repos` in the file above are for OSP 10.

Deploy the overcloud with the custom templates file:

```
infrared tripleo-overcloud --version=10 --deployment-files=virt --introspect=yes --
↳tagging=yes --deploy=yes --overcloud-templates overcloud_cdn.yml
```

1.34 Hybrid deployment

Infrared allows to deploy hybrid cloud. Hybrid cloud includes virtual nodes and baremetal nodes.

1.34.1 Create network topology configuration file

First the appropriate network configuration should be created. Most common configuration can include for 3 bridged networks and one nat network for virtual machines provisioning the following configuration can be used:

```
cat << EOF > plugins/virsh/vars/topology/network/3_bridges_1_net.yml
networks:
  net1:
    name: br-ctlplane
    forward: bridge
    nic: eno2
    ip_address: 192.0.70.200
    netmask: 255.255.255.0
  net2:
    name: br-vlan
    forward: bridge
    nic: enp6s0f0
  net3:
    name: br-link
    forward: bridge
    nic: enp6s0f1
  net4:
    external_connectivity: yes
    name: "management"
    ip_address: "172.16.0.1"
    netmask: "255.255.255.0"
    forward: nat
    dhcp:
      range:
        start: "172.16.0.2"
        end: "172.16.0.100"
        subnet_cidr: "172.16.0.0/24"
        subnet_gateway: "172.16.0.1"
    floating_ip:
      start: "172.16.0.101"
```

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```
end: "172.16.0.150"
```

```
EOF
```

Note: Change nic names for the bridget networks to match hypervisor interfaces.

Note: Make sure you have `ip_address` or `bootproto=dhcp` defined for the `br-ctlplane` bridge. This is need to setup ssh access to the nodes after deployment is completed.

1.34.2 Create configurations files for the virtual nodes

Next step is to add network topology of virtual nodes for the hybrid cloud: `controller` and `undercloud`. Interface section for every node configuration should match to the network configuration.

Add controller configuration:

```
cat << EOF >> plugins/virsh/vars/topology/network/3_bridges_1_net.yml
nodes:
  undercloud:
    interfaces:
      - network: "br-ctlplane"
        bridged: yes
      - network: "management"
    external_network:
      network: "management"
EOF
```

Add undercloud configuration:

```
cat << EOF >> plugins/virsh/vars/topology/network/3_bridges_1_net.yml
controller:
  interfaces:
    - network: "br-ctlplane"
      bridged: yes
    - network: "br-vlan"
      bridged: yes
    - network: "br-link"
      bridged: yes
    - network: "management"
  external_network:
    network: "management"
EOF
```

1.34.3 Provision virtual nodes with virsh plugin

Once node configurations are done, the `virsh` plugin can be used to provision these nodes on a dedicated hypervisor:

```
infrared virsh -v \
  --topology-nodes undercloud:1,controller:1 \
  -e override.controller.memory=28672 \
```

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```
-e override.undercloud.memory=28672 \  
-e override.controller.cpu=6 \  
-e override.undercloud.cpu=6 \  
--host-address hypervisor.redhat.com \  
--host-key ~/.ssh/key_file \  
--topology-network 3_bridges_1_net
```

1.34.4 Install undercloud

Make sure you provide the undercloud.conf which corresponds to the baremetal environment:

```
infrared tripleo-undercloud -v \  
--version=11 \  
--build=passed_phase1 \  
--images-task=rpm \  
--config-file undercloud_hybrid.conf
```

1.34.5 Perform introspection and tagging

Create json file which lists all the baremetal nodes required for deployment:

```
cat << EOF > hybrid_nodes.json  
{  
  "nodes": [  
    {  
      "name": "compute-0",  
      "pm_addr": "baremetal-mgmt.redhat.com",  
      "mac": ["14:02:ec:7c:88:30"],  
      "arch": "x86_64",  
      "pm_type": "pxe_ipmitool",  
      "pm_user": "admin",  
      "pm_password": "admin",  
      "cpu": "1",  
      "memory": "4096",  
      "disk": "40"  
    }  
  ]  
}  
EOF
```

Run introspection and tagging with infrared:

```
infrared tripleo-overcloud -vv -o prepare_instack.yml \  
--version 11 \  
--deployment-files virt \  
--introspect=yes \  
--tagging=yes \  
--deploy=no \  
-e provision_virsh_network_name=br-ctlplane \  
--hybrid hybrid_nodes.json
```

Note: Make sure to provide the 'provision_virsh_network_name' name to specify network name to be used for provisioning.

1.34.6 Run deployment with appropriate templates

Copy all the templates to the `plugins/tripleo-overcloud/vars/deployment/files/hybrid/` and use `--deployment-files hybrid` and `--deploy yes` flags to run tripleo-overcloud deployment. Additionally the `--overcloud-templates` option can be used to pass additional templates:

```
infrared tripleo-overcloud -vv \
  --version 11 \
  --deployment-files hybrid \
  --introspect=no \
  --compute-nodes 1 \
  --tagging=no \
  --deploy=yes \
  --overcloud-templates <list of templates>
```

Note: Make sure to provide the `--compute-nodes 1` option. It indicates the number of compute nodes to be used for deployment.

1.35 How to create a new plugin

This is a short guide how new plugin can be added to the Infrared. It is recommended to read [Plugins](#) section prior following steps from that guide.

1.35.1 Create new Git repo for a plugin

Recommended way to store Infrared plugin is to put it into a separate Git repo. So create and init new repo:

```
$ mkdir simple-plugin && cd simple-plugin
$ git init
```

Now you need to add two main files of every Infrared plugin:

- `plugin.spec`: describes the user interface of the plugin (CLI)
- `main.yml`: the default entry point ansible playbook which will be run by the Infrared

1.35.2 Create plugin.spec

The `plugin.spec` holds the descriptions of all the CLI flags as well as plugin name and plugin descriptions. Sample plugin specification file can be like:

```
config:
  plugin_type: other
  entry_point: main.yml
subparsers:
  # the actual name of the plugin
  simple-plugin:
    description: This is a simple demo plugin
    include_groups: ["Ansible options", "Common options"]
    groups:
      - title: Option group.
```

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```

options:
  option1:
    type: Value
    help: Simple option with default value
    default: foo
    ansible_variable: "myvar"
  flag:
    type: Bool
    default: False

```

Config section:

- **plugin_type:** Depending of what plugin is intended to do, can be `provision`, `install`, `test` or other. See [plugin specification](#) for details.
- **entry_point:** The main playbook for the plugin. by default this will refer to `main.yml` file but can be changed to ant other file.

Options::

- **plugin name under the subparsers** Infrared extends it CLI with that name. It is recommended to use dash-separated-lowercase-words for plugin names.
- **include_groups: list what standard flags should be included to the plugin CLI.** Usually we include “Ansible options” to provide ansible specific options and “Common Options” to get `--extra-vars`, `--output` and `--dry-run`. See [plugins include groups](#) for more information.
- **groups: the list of options groups** Groups several logically connected options.
- **options: the list of options in a group.** Infrared allows to define different types of options, set option default value, mark options as required etc. Check the [plugins option types](#) for details

1.35.3 Create main playbook

Now when plugin specification is ready we need to put some business logic into a plugin. Infrared collects user input from command line and pass it to the ansible by calling main playbook - that is configured as `entry_point` in `plugins.spec`.

The main playbook is a regular ansible playbook and can look like:

```

- hosts: localhost
  tasks:
    - name: debug user variables
      debug:
        var: other.option

    - name: check bool flag
      debug:
        msg: "User flag is set"
      when: other.flag

```

By default, all the options provided by user goes to the plugin type namespace. Dashes in option names translated to the dots (.). So for `--option1 bar` infrared will create the `other.option1: bar` ansible variable.

It's possible to assign a user defined ansible variable to an option by specifying `ansible_variable` in `plugin.spec`(refer to `plugin.spec` sample).

1.35.4 Push changes to the remote repo

Commit all the files:

```
$ git add .
$ git commit -m "Initial commit"
```

Add the URL to the remote repo (for example a GitHub repo) and push all the changes:

```
$ git remote add origin <remote repository>
$ git push origin master
```

1.35.5 Add plugin to the infrared

Now you are ready to install and use your plugin. Install infrared and add plugin by providing url to your plugin repo:

```
$ ir plugin add <remote repo>
$ ir plugin list
```

This should display the list of plugins and you should have your plugin name there:

Type	Name
provision	beaker
	virsh
~~~~~	
other	simple-plugin
	collect-logs

### 1.35.6 Run plugin

Run plugin with infrared and check for the help message:

```
$ ir simple-plugin --help
```

You should see user defined option as well as the common options like `--extra-args`.

Run `ir` command and check the playbook output:

```
$ ir simple-plugin --options1 HW --flag yes
```

## 1.36 Controlling Node Placement

### 1.36.1 Overview

The default behavior for the director is to randomly select nodes for each role, usually based on their profile tag. However, the director provides the ability to define specific node placement. This is a useful method to:

- Assign specific node IDs

- Assign custom hostnames
- Assign specific IP addresses

InfraRed support this method in `tripleo-overcloud` plugin.

## 1.36.2 Defining topology and controlling node placement

The examples show how to provision several nodes with `virsh` plugin and then how to use controlling node placement option during Overcloud Deploy.

### Topology

Topology include 1 undercloud, 3 controllers, 2 compute and 3 ceph nodes:

```
$ ir virsh -vvvv
  --topology-nodes=undercloud:1,controller:3,compute:2,ceph:3 \
  --host-address=seal52.qa.lab.tlv.redhat.com \
  --host-key ~/.ssh/my-prov-key \
  [...]
```

### Overcloud Install

This step require `Undercloud` to be installed and `tripleo-overcloud` introspection and tagging to be done:

```
$ ir tripleo-overcloud -vvvv
  --version=12 \
  --deploy=yes \
  --deployment-files=virt \
  --specific-node-ids yes \
  --custom-hostnames ceph-0=storage-0,ceph-1=storage-1,ceph-2=storage-2,compute-
↪0=novacompute-0,compute-1=novacompute-1,controller-0=ctrl-0,controller-1=ctrl-1,
↪controller-2=ctrl-2 \
  --predictable-ips yes \
  --overcloud-templates ips \
  [...]
```

**Warning:** Currently node IPs need to be provided as user template with `-overcloud-templates`

### InfraRed Inventory

After Overcloud install, InfraRed directory contains the overcloud nodes with their new hostnames:

```
$ ir workspace node-list
+-----+-----+-----+
↪-----+
| Name          | Address          | Groups          |
↪-----+-----+-----+
| undercloud-0  | 172.16.0.5      | tester, undercloud, openstack_nodes |
↪-----+-----+-----+
```

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```

+-----+-----+-----+
↪-----+
| hypervisor      | seal52.qa.lab.tlv.redhat.com | hypervisor, shade
↪
+-----+-----+-----+
↪-----+
| novacompute-0  | 192.168.24.9                  | overcloud_nodes, compute, openstack_
↪nodes
+-----+-----+-----+
↪-----+
| novacompute-1  | 192.168.24.21                 | overcloud_nodes, compute, openstack_
↪nodes
+-----+-----+-----+
↪-----+
| storage-2      | 192.168.24.16                 | overcloud_nodes, ceph, openstack_
↪nodes
+-----+-----+-----+
↪-----+
| storage-1      | 192.168.24.6                  | overcloud_nodes, ceph, openstack_
↪nodes
+-----+-----+-----+
↪-----+
| storage-0      | 192.168.24.18                 | overcloud_nodes, ceph, openstack_
↪nodes
+-----+-----+-----+
↪-----+
| ctrl-2         | 192.168.24.10                 | overcloud_nodes, network, controller,
↪ openstack_nodes |
+-----+-----+-----+
↪-----+
| ctrl-0         | 192.168.24.15                 | overcloud_nodes, network, controller,
↪ openstack_nodes |
+-----+-----+-----+
↪-----+
| ctrl-1         | 192.168.24.14                 | overcloud_nodes, network, controller,
↪ openstack_nodes |
+-----+-----+-----+
↪-----+

```

## 1.37 Controller replacement

The OSP Director allows to perform controller replacement procedure. More details can be found here: [https://access.redhat.com/documentation/en-us/red_hat_openstack_platform/13/html/director_installation_and_usage/sect-scaling_the_overcloud#sect-Replacing_Controller_Nodes](https://access.redhat.com/documentation/en-us/red_hat_openstack_platform/13/html/director_installation_and_usage/sect-scaling_the_overcloud#sect-Replacing_Controller_Nodes)

The `cloud-config` plugin automates that procedure. Suppose you already have a deployment with more than one controller.

First step is to extend existing deployment with a new controller node. For virtual deployment the `virsh` plugin can be used:

```

infrared virsh --topology-nodes controller:1 \
               --topology-extend True \
               --host-address my.hypervisor.address \
               --host-key ~/.ssh/id_rsa

```

Next step is to perform controller replacement procedure using `cloud-config` plugin:

```
infrared cloud-config --tasks=replace_controller \  
    --controller-to-remove=controller-0 \  
    --controller-to-add=controller-3 \  
    \
```

This will repalce controller-0 with the newly added controller-3 node. Nodes index start from 0.

Currently controller replacement is supported only for OSP13 and above.

### 1.37.1 Advanced parameters

In case the controller to be replaced cannot be connected by ssh, the `rc_controller_is_reachable` should be set to `no`. This will skip some tasks that should be performed on the controller to be removed:

```
infrared cloud-config --tasks=replace_controller \  
    --controller-to-remove=controller-0 \  
    --controller-to-add=controller-3 \  
    \ -e rc_controller_is_reachable=no
```

## 1.38 Standalone deployment

Infrared allows to deploy tripleo openstack in stancalone mode. This means that all the openstack services will be hosted on one node. See <https://blueprints.launchpad.net/tripleo/+spec/all-in-one> for details.

To start deployment the `standalone` host should be added to the inventory. For the virtual deployment, the `virsh` infrared plugin can be used for that:

```
infrared virsh --topology-nodes standalone:1 \  
    --topology-network 1_net \  
    --host-address myvirthost.redhat.common \  
    --host-key ~/.ssh/host-key.pem
```

After that start standalone deployment:

```
ir tripleo-standalone --version 14
```

## 1.39 In development

### 1.39.1 New Features

- Allow to specify target hosts for `collect-logs` plugin. Now user can limit the list of servers from wich IR should collect logs with the `-hosts` option:

```
infrared collect-logs --hosts undercloud
```

- add new `-tls-ca` option, allowing to install custom CA prior any deploy task.
- Added `reno` tool usage to generare release notes. Check <https://docs.openstack.org/reno/latest/> for details.
- Some nodes might use multiple disks. This means the director needs to identify the disk to use for the root disk during provisioning. There are several properties you can use to help the director identify it:

- model
- vendor
- serial
- size
- etc

This feature allows to configure root disk for a multi-disk nodes. Example:

```
--root-disk-override node=compute,hint=size,hintvalue=50
# will set a root disk to be a on a device with 50GB for all compute nodes

--root-disk-override node=controller-1,hint=name,hintvalue=/dev/sdb
# will set a root disk for controller-1 to be /dev/sdb
```

For more info please check official docs at: [https://access.redhat.com/documentation/en-us/red_hat_openshift_platform/10/html/director_installation_and_usage/chap-configuring_basic_overcloud_requirements_with_the_cli_tools#sect-Defining_the_Root_Disk_for_Nodes](https://access.redhat.com/documentation/en-us/red_hat_openshift_platform/10/html/director_installation_and_usage/chap-configuring_basic_overcloud_requirements_with_the_cli_tools#sect-Defining_the_Root_Disk_for_Nodes)





## CHAPTER 2

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### Indices and tables

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