

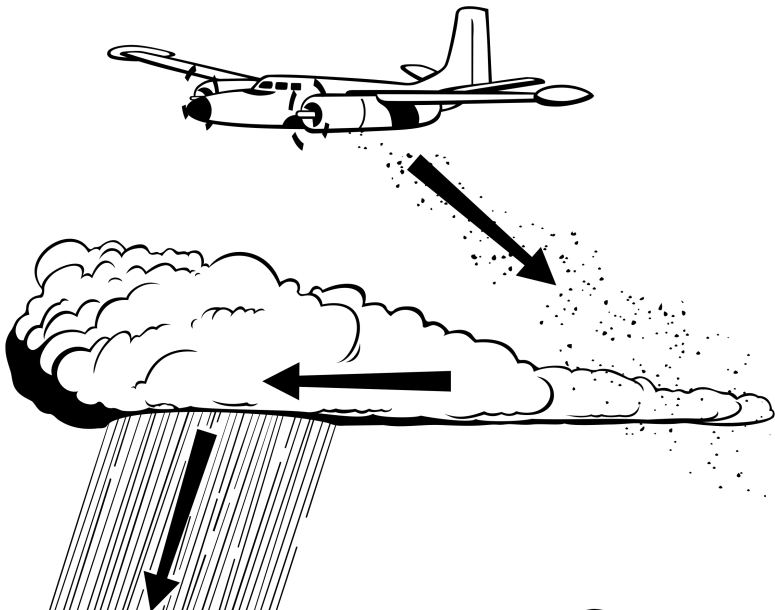
# Dirty Clouds Done Dirt Cheap

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May 11, 2017

<https://github.com/mtreinish/dirty-clouds-done-dirt-cheap>

## Building a Cloud



# Scope of the Project

- ▶ Pretend to be a sysadmin with no prior OpenStack knowledge
- ▶ Try to rely only on install docs and google searches
- ▶ \$1500 USD Budget
- ▶ Build a basic compute cloud:
  - ▶ Keystone
  - ▶ Glance
  - ▶ Nova
  - ▶ Neutron
- ▶ Install Ocata from tarballs
- ▶ No automation or pre-existing install scripts

# Buying Hardware

- ▶ Maximize core count per USD
- ▶ Second priority is amount of RAM per core
- ▶ Machines don't need to be fast (that costs money!)

ebay<sup>tm</sup>

## The Servers

|                        |   |
|------------------------|---|
| Model                  | PowerEdge R610                                    |
| Processor              | 2x Intel Xeon E5540                               |
| Memory Installed       | 32GB Total Memory; 8 x 4 GB DDR3                  |
| Hard Drives            | 2x 146GB 10K SAS Hard Drive                       |
| RAID Controller        | Dell PowerEdge R610 Perc 6i                       |
| Ethernet               | 2x Dual Port Embedded Broadcom NetXtreme II 5709c |
| Return Policy/Warranty | 60 days Money Back Or Exchange                    |

**\$215 Each!!**



## Quirks with the servers

- ▶ Super stripped down:
  - ▶ No management interface
  - ▶ No redundant power supply
- ▶ 4x8GB of RAM not 8x4GB
- ▶ Memory installed in wrong slots
- ▶ Dead RAID controller battery
- ▶ Came with 15k RPM hard drives not 10k RPM
- ▶ Came pre-installed with Windows Server 2012 (and default password Apple123)
- ▶ At full fan speed **>70 dB**

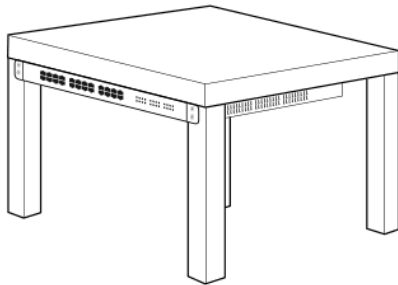


# LackRack

<https://wiki.eth0.nl/index.php/LackRack>

- ▶ Use a LACK side table from Ikea
- ▶ 19 inch width between legs
- ▶ Can fit 8U
- ▶ Lots of color choices
- ▶ \$9.99 USD

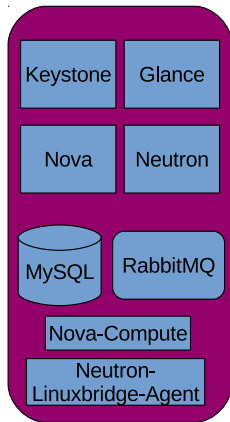
# LACKRACK



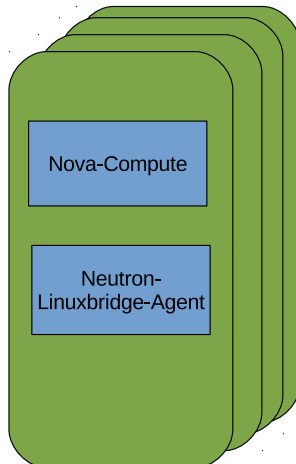




# Installing OpenStack



altocumulus01



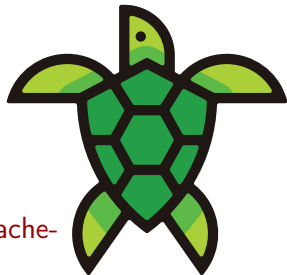
altocumulus{02..05}

# Installing OpenStack Services

1. Download service tarball
2. Create service users
3. Install binary requirements
4. Create service dirs in /etc and /var/lib
5. Copy etc/ from tarball into /etc/\$Service
6. pip install the tarball
7. Follow install guide on project configuration and setup

# Setting Up Keystone

- ▶ 2 config options
- ▶ Install guide doesn't have instructions on apache wsgi app setup
- ▶ Google search found:  
<https://docs.openstack.org/developer/keystone/apache-httpd.html>



# KEYSTONE

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# Python Requirements aren't fun

```
ERROR keystone Traceback (most recent call last):
ERROR keystone   File "/usr/local/bin/keystone-wsgi-admin", line 51, in <module>
ERROR keystone     application = initialize_admin_application()
ERROR keystone   File "/usr/local/lib/python2.7/dist-packages/keystone/server/wsgi.py", line
    132, in initialize_admin_application
ERROR keystone     config_files=_get_config_files())

...

ERROR keystone   File "/usr/local/lib/python2.7/dist-packages/paste/deploy/loadwsgi.py", line
    640, in find_egg_entry_point
ERROR keystone     pkg_resources.require(self.spec)
ERROR keystone   File "/usr/lib/python2.7/dist-packages/pkg_resources/__init__.py", line 943,
    in require
ERROR keystone         needed = self.resolve(parse_requirements(requirements))
ERROR keystone   File "/usr/lib/python2.7/dist-packages/pkg_resources/__init__.py", line 834,
    in resolve
ERROR keystone         raise VersionConflict(dist, req).with_context(dependent_req)
ERROR keystone ContextualVersionConflict: (requests 2.13.0 (/usr/local/lib/python2.7/dist-
    packages), Requirement.parse('requests!=2.12.2,!=2.13.0,>=2.10.0'), set(['oslo.policy']))
```

# Setting up Glance

- ▶ Straightforward configuration:
  - ▶ Auth
  - ▶ Image Directories
  - ▶ Database



# GLANCE

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## Don't forget to create glance store directory

```
[req-8ff7f7d2-a4a5-4558-b5a9-9ecca139675f 20f283024ffd4bf4841a8d33bdb4f385 6
c3fc6392e0c487e85d57afe5a5ab2b7 - default default] Error in store configuration. Adding
images to store is disabled.
Traceback (most recent call last):
  File "/usr/local/lib/python2.7/dist-packages/glance/api/v2/image_data.py", line 116, in
    upload
    image.set_data(data, size)
...
  File "/usr/local/lib/python2.7/dist-packages/glance_store/backend.py", line 426, in
    store_add_to_backend
    verifier=verifier)
  File "/usr/local/lib/python2.7/dist-packages/glance_store/capabilities.py", line 223, in
    op_checker
    raise op_exec_map[op](**kwargs)
StoreAddDisabled: Configuration for store failed. Adding images to this store is disabled.
```

## Setting up Nova

- ▶ Database migrations are slower, took about 3mins
- ▶ Don't forget the placement API, no docs on apache setup
- ▶ novnc is problematic from source
- ▶ Set *force\_config\_drive* option to true



# NOVA

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## Requirements still aren't fun

```
ERROR nova Traceback (most recent call last):
ERROR nova   File " /usr/local/bin/nova-api", line 10, in <module>
ERROR nova     sys.exit(main())
ERROR nova   File " /usr/local/lib/python2.7/dist-packages/nova/cmd/api.py", line 59, in main
ERROR nova     server = service.WSGIService(api, use_ssl=should_use_ssl)

...

ERROR nova   File " /usr/local/lib/python2.7/dist-packages/pkg_resources/__init__.py", line
2324, in require
ERROR nova     items = working_set.resolve(reqs, env, installer, extras=self.extras)
ERROR nova   File " /usr/local/lib/python2.7/dist-packages/pkg_resources/__init__.py", line
859, in resolve
ERROR nova     raise VersionConflict(dist, req).with_context(dependent_req)
ERROR nova ContextualVersionConflict: (pbr 1.10.0 (/usr/local/lib/python2.7/dist-packages),
Requirement.parse('pbr>=2.0.0'), set(['oslo.i18n', 'oslo.log', 'oslo.context', 'oslo.
utils']))
```

# You need a sudoers file

```
ERROR nova Traceback (most recent call last):
ERROR nova   File "/usr/local/bin/nova-api", line 10, in <module>
ERROR nova     sys.exit(main())
ERROR nova   File "/usr/local/lib/python2.7/dist-packages/nova/cmd/api.py", line 59, in main
ERROR nova     server = service.WSGIService(api, use_ssl=should_use_ssl)
ERROR nova   File "/usr/local/lib/python2.7/dist-packages/nova/service.py", line 309, in
ERROR nova     __init__
ERROR nova     self.manager = self._get_manager()

...

ERROR nova   File "/usr/local/lib/python2.7/dist-packages/nova/utils.py", line 180, in execute
ERROR nova     return processutils.execute(*cmd, **kwargs)
ERROR nova   File "/usr/local/lib/python2.7/dist-packages/oslo_concurrency/processutils.py",
ERROR nova     line 400, in execute
ERROR nova     cmd=sanitized_cmd)
ERROR nova   ProcessExecutionError: Unexpected error while running command.
ERROR nova   Command: sudo nova-rootwrap /etc/nova/rootwrap.conf iptables-save -c
ERROR nova   Exit code: 1
ERROR nova   Stdout: u''
ERROR nova   Stderr: u'sudo: no tty present and no askpass program specified\n'
ERROR nova
```

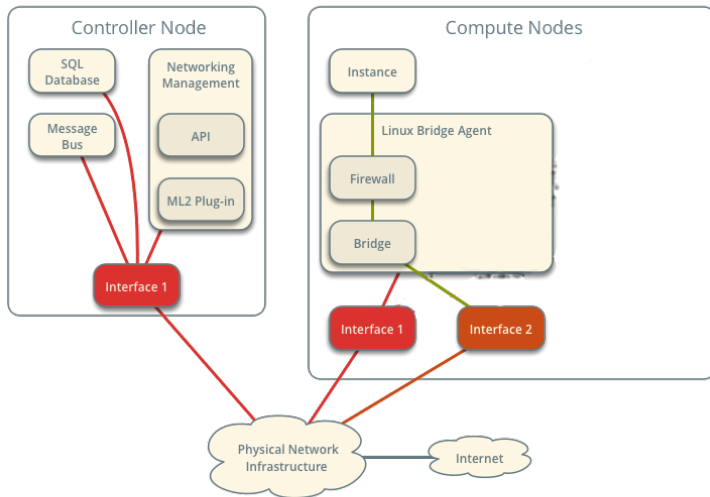
## Don't forget to create state directories

```
ERROR nova Traceback (most recent call last):
ERROR nova   File "/usr/local/bin/nova-api", line 10, in <module>
ERROR nova     sys.exit(main())
ERROR nova   File "/usr/local/lib/python2.7/dist-packages/nova/cmd/api.py", line 59, in main
ERROR nova     server = service.WSGIService(api, use_ssl=should_use_ssl)
ERROR nova   File "/usr/local/lib/python2.7/dist-packages/nova/service.py", line 311, in
ERROR nova     __init__
ERROR nova         self.app = self.loader.load_app(name)
ERROR nova   File "/usr/local/lib/python2.7/dist-packages/nova/wsgi.py", line 497, in load_app
ERROR nova
ERROR nova   ...
ERROR nova   File "/usr/local/lib/python2.7/dist-packages/nova/api/openstack/compute/cloudpipe
ERROR nova .py", line 55, in setup
ERROR nova     fileutils.ensure_tree(CONF.crypto.keys_path)
ERROR nova   File "/usr/local/lib/python2.7/dist-packages/oslo_utils/fileutils.py", line 40,
ERROR nova in ensure_tree
ERROR nova     os.makedirs(path, mode)
ERROR nova   File "/usr/lib/python2.7/os.py", line 157, in makedirs
ERROR nova     mkdir(name, mode)
ERROR nova   OSError: [Errno 13] Permission denied: '/usr/local/lib/python2.7/dist-packages/keys'
```

# Networking Configuration

## Linux Bridge - Provider Networks

### Overview



## Setting Up Neutron

- ▶ Too many configuration files
- ▶ Blindly copying pasting from install guide
- ▶ Rootwrap and sudo configuration are not documented
- ▶ First time I had to look at packages and/or devstack



# NEUTRON

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## Any guesses what this means

```
ERROR neutron.plugins.ml2.drivers.agent._common_agent [req-8c98874d-5436-4912-9db5-f675bfe4df5e - - - -] Error in agent loop. Devices info: {'current': set(['tap0ab3c3ba-09']), 'timestamps': {'tap0ab3c3ba-09': 9}, 'removed': set([]), 'added': set(['tap0ab3c3ba-09']), 'updated': set([])}
ERROR neutron.plugins.ml2.drivers.agent._common_agent Traceback (most recent call last):
ERROR neutron.plugins.ml2.drivers.agent._common_agent File "/usr/local/lib/python2.7/dist-packages/neutron/plugins/ml2/drivers/agent/_common_agent.py", line 453, in daemon_loop
ERROR neutron.plugins.ml2.drivers.agent._common_agent sync = self.process_network_devices(device_info)
ERROR neutron.plugins.ml2.drivers.agent._common_agent File "/usr/local/lib/python2.7/dist-packages/osprofiler/profiler.py", line 153, in wrapper
ERROR neutron.plugins.ml2.drivers.agent._common_agent return f(*args, **kwargs)
ERROR neutron.plugins.ml2.drivers.agent._common_agent File "/usr/local/lib/python2.7/dist-packages/neutron/plugins/ml2/drivers/agent/_common_agent.py", line 203, in process_network_devices
```

...

```
ERROR neutron.plugins.ml2.drivers.agent._common_agent execute_rootwrap_daemon(cmd, process_input, addl_env))
ERROR neutron.plugins.ml2.drivers.agent._common_agent File "/usr/local/lib/python2.7/dist-packages/neutron/agent/linux/utils.py", line 115, in execute_rootwrap_daemon
ERROR neutron.plugins.ml2.drivers.agent._common_agent return client.execute(cmd, process_input)
ERROR neutron.plugins.ml2.drivers.agent._common_agent File "/usr/local/lib/python2.7/dist-packages/oslo_rootwrap/client.py", line 129, in execute
ERROR neutron.plugins.ml2.drivers.agent._common_agent res = proxy.run_one_command(cmd, stdin)
ERROR neutron.plugins.ml2.drivers.agent._common_agent File "<string>", line 2, in run_one_command
ERROR neutron.plugins.ml2.drivers.agent._common_agent File "/usr/lib/python2.7/multiprocessing/managers.py", line 774, in _callmethod
ERROR neutron.plugins.ml2.drivers.agent._common_agent raise convert_to_error(kind, result)
```



## Setting up Compute Nodes

- ▶ Same basic formula
- ▶ Rinse and repeat 4 times
- ▶ Don't forget to run `nova discover_hosts` after bring it up

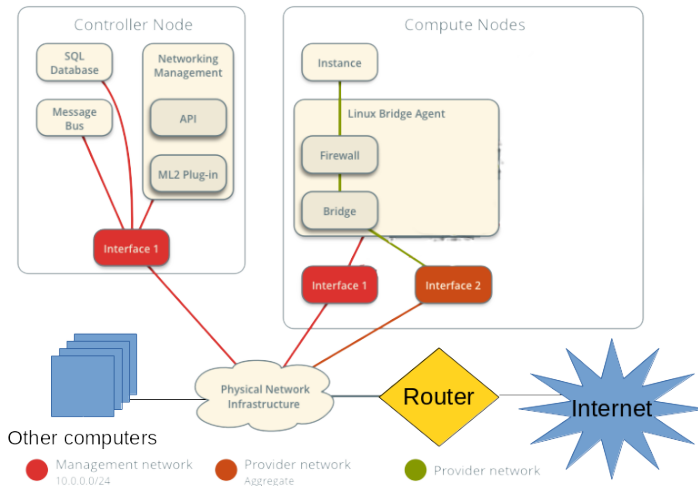


## Blank Images

```
DEBUG glance_store._drivers.filesystem [req-3163a1a7-4ca9-47e8-9444-cd8b865055fb 20f283024ffd4bf4841a8d33bdb4f385 6c3fc6392e0c487e85d57afe5a5ab2b7 - default default] Wrote 0 bytes to /var/lib/glance/images/e6735636-43d9-4fb0-a302-f3710386b689 with checksum d41d8cd98f00b204e9800998ecf8427e add /usr/local/lib/python2.7/dist-packages/glance_store/_drivers/filesystem.py:706
```

## Linux Bridge - Provider Networks

### Overview



What to do with your budget cloud?



# OpenStack Development

- ▶ Lots of capacity for running devstack
- ▶ A really good platform to develop and test OpenStack applications
- ▶

# Cloud Native Compute Workloads

- ▶ Good for running embarrassingly parallel workloads
- ▶ Each individual machine is slow, but a fair amount of parallel capacity.
- ▶ My example use case: <https://github.com/mtreinish/handbrakecloud>

# Virtualized Home Infrastructure

- ▶ Gives you the flexibility
- ▶ Also enables HA migration to public cloud



# Installation Pain Points

- ▶ Python Packaging:
  - ▶ Binary Dependencies
  - ▶ etc files (and any data files)
  - ▶ No dependency solver, always use upper constraints
- ▶ Debugging OpenStack requires a high level of competence

## Making OpenStack Better for Small Deployments

- ▶ Honestly, it's not that bad
- ▶  $\geq 90\%$  of the issues were because of using tarballs
- ▶ Networking and neutron is too confusing
- ▶ Work on improving logging and error reporting

## Why you don't want to do this

- ▶ 5x 1U Servers in your bedroom closet is not pleasant
- ▶ The power bill (at peak draw it's about 1.1kW for the rack)
- ▶ Don't get to spend \$1,328.37 on a weekend vacation

## Where to get more information

- ▶ openstack-dev ML [openstack-dev@lists.openstack.org](mailto:openstack-dev@lists.openstack.org)
- ▶ Ocata install guides <https://docs.openstack.org/project-install-guide/ocata/>
- ▶ Ocata network guides <https://docs.openstack.org/ocata/networking-guide/>