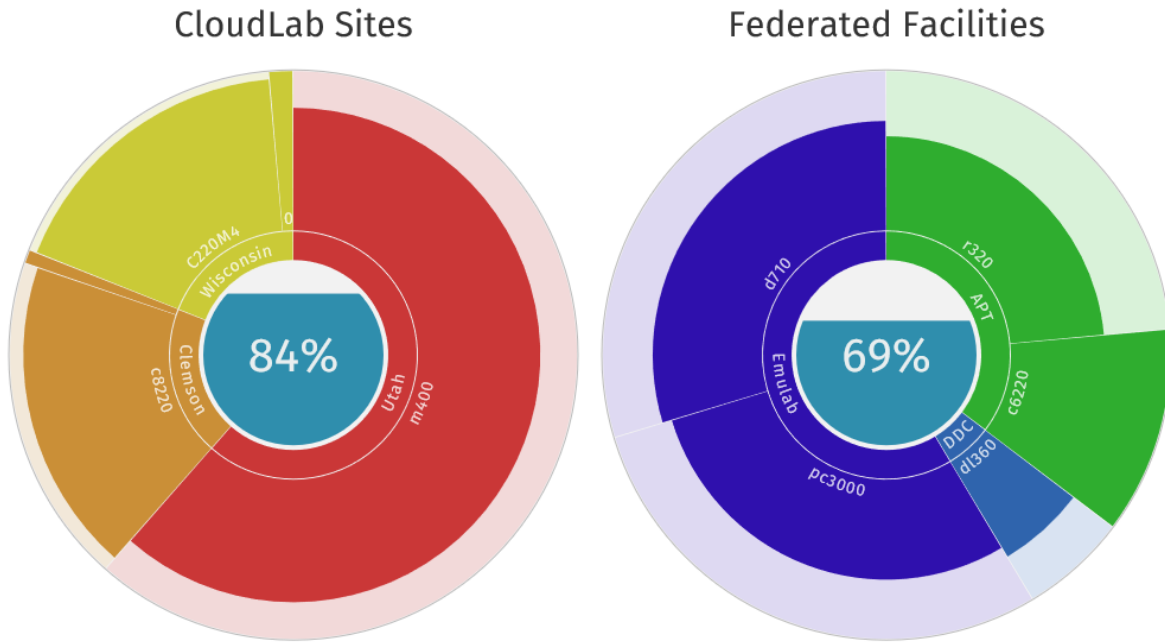


Cloudlab Brief Manual

Hardware:



There are a lot of different sites for cloudlab, some are owned by it, some are only federated by it.

- For cloudlab sites, the nodes are quite powerful (i.e. 2x8 cores, 128GB memory). But these sites usually have very limited available nodes. The only exception is Utah site. But nodes there are based on ARM architecture which may bring you a lot of trouble during development. **If you are looking for small cluster with monster capability nodes, then nodes at Wisconsin site and Clemson site are your choice.**
- For federated sites, the nodes are less powerful (i.e. 4-8 cores, 12-16GB memory, exceptions include c6220 which are as powerful as nodes in cloudlab site). **If you want large cluster with entry level performance nodes, then r320 from APT site should be a good choice.**

USAGE

I'll introduce some very basic usage of cloudlab, remember that I have just played with it for a few days, so there might be errors here and there in this note. For a more complete manual, visit:
<http://docs.cloudlab.us/>

Prerequisite:

1. Add an SSH key to your account
Actions -> Manage SSH Keys

For the add key, there is a public key blank need you to fill in. To generate the key, we use puttygen. You can download it from <http://www.chiark.greenend.org.uk/~sgtatham/putty/download.html>

2. Use puttygen to generate an private key, change the key comment to your account id and save the private key.

PuTTY Key Generator

File Key Conversions Help

Key

Public key for pasting into OpenSSH authorized_keys file:

```
ssh-rsa AAAAB3NzaC1yc2EAAAABJQAAAQEA196N6jGFSJp7UI0F
+Qc3a1PGMXvuvbrb/4cV0me182v5oVun+fXTJCqIU
+RKT5d6BT6s7SRQSF1WcQLIfR
+QmKz0GdDeSL9giZpN2TTS5ITzDg275LO6NYN1CCPwuiWKP9eOaGBqYZ2jFh8IHd
Jlu2mBDCDte/zCYI2vDE2BhUqhfMpoXnbNlwwIMPWWExC7UIReOm/Qwh3UpbWrCGM
```

Key fingerprint: ssh-rsa 2048 fb:e5:d1:19:0f:4f:ac:5b:23:b8:ca:64:23:9b:43:0f

Key comment: zlu12@vols.utk.edu

Key passphrase:

Confirm passphrase:

Actions

Generate a public/private key pair **Generate**

Load an existing private key file **Load**

Save the generated key **Save public key** **Save private key**

Parameters

Type of key to generate:
☐ SSH-1 (RSA) ☒ SSH-2 RSA ☐ SSH-2 DSA

Number of bits in a generated key: 2048

3. Copy the public key to fill in the public key blank in step 1 and click add key

CloudLab - Instantiate a Proc CloudLab - My SSH Key X use private key in putty - Gc +

cloudlab.us/ssh-keys.php

Gmail Academic UTK temp server CloudLab - My

Home Manual Actions zlu12 logged in Logout

The Wisconsin cluster is in the midst of a major expansion, and will have limited resources for the next few days

Current Usage: 0 Node Hours, Prev Week: 466, Prev Month: 466

ssh-rsa-zlu12@vols.utk.edu Delete

ssh-rsa-zlu12@vols.utk.edu Delete

Add Key

Upload a file or paste it in the text box. This will allow you to login using your favorite ssh client. Without a SSH key, you will be limited to using a shell window in your browser. Don't know how to generate your SSH key? See [this tutorial](#).

Key

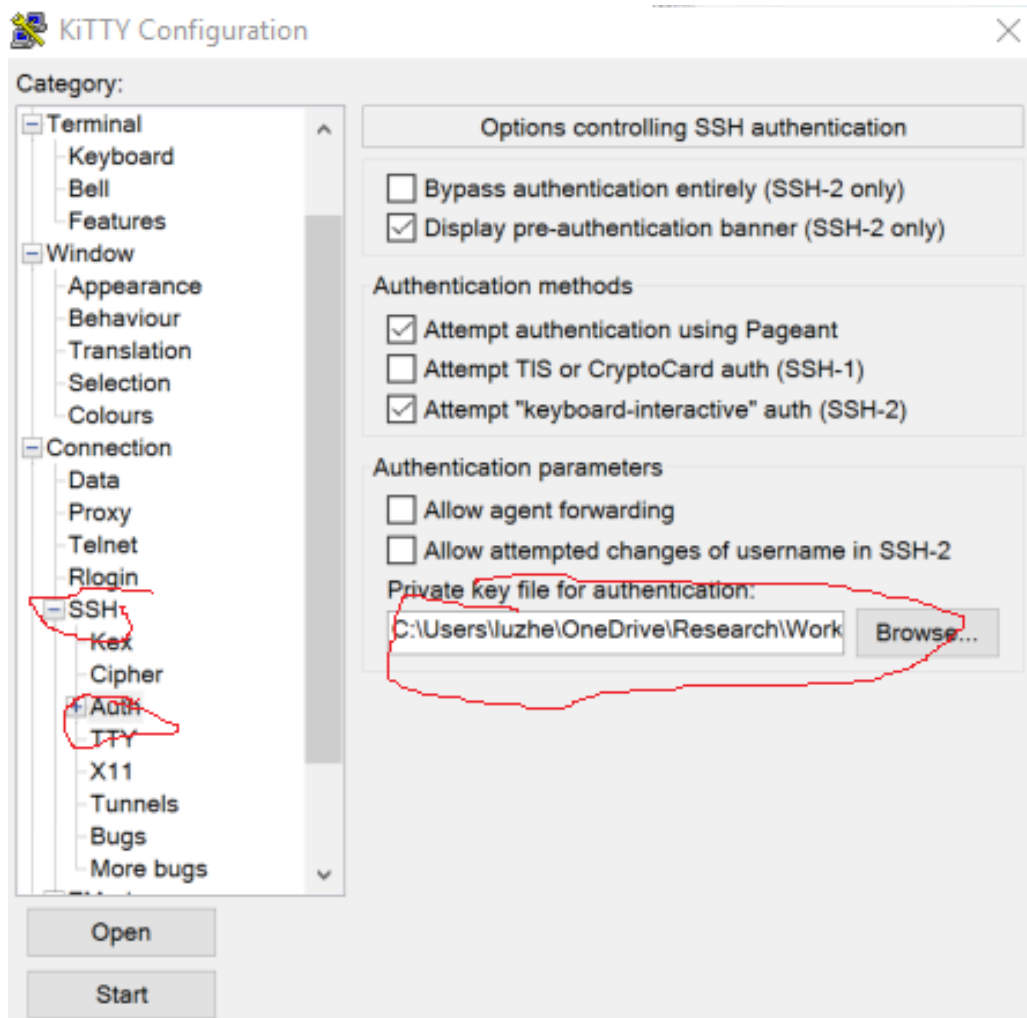
ssh-rsa
AAAAB3NzaC1yc2EAAAABJQAAAAQEA196N6jGFSJp7UI0F+Qc3a1PGMXvuvbrb/4cV0me182v5oVun+IXTJCqI
U+RKT5d6BT6s7SRQSF1WcQLfR+QmKz0GdDeSL9giZpN2TTS5ITzDg275LO6NYN1CCPwuiWKP9eOaGBq
YZ2jFhJSIHdJlu2mBDCDtc/zCYI2vDE2BhUqhMpxnbNlwwIMPWWExC7UIReOm/Qwh3UpbWrCGMJ1FGS3xq1
fkkcVkvOET9N2G/ow2IDtEGesxj1GehD4Y9waozxiY0+IGivoETa34/sEaGsOvXbRBqDCPYM8nCLMdcEsWgFuu
DCdi9OnOAgAJDHPWm61xm4J1/5jnZhkgPw== zlu12@vols.utk.edu

Load from file Clear Form

Add Key

Powered by emulab Question or comment? Join the Help Forum Supported by NSF © 2015 The University of Utah

4. In the future when you need to access nodes in your experiments, use the private key you generated (for putty, specify your key file in SSH->AUTH as shown in following figure). This key will be automatically valid for all your future experiments, you don't have to regenerate it for each experiment.



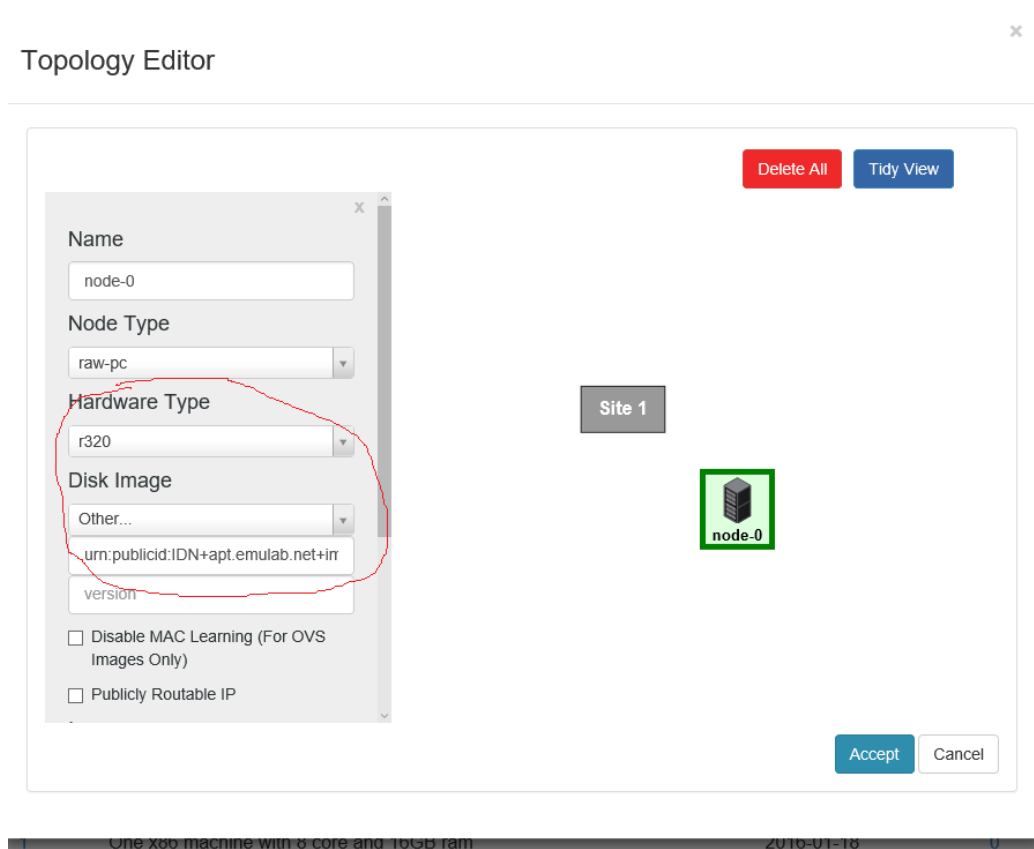
Create a profile and start an experiment (cluster):

1. In cloudlab, the first thing is to configure the cluster you want. To do this, you need create a profile first and start an experiment based on that profile (just like classes and objects in OO).
2. There are two ways to create a profile:
 - a. Simple way: copy from an already available profile.
Actions -> Start experiment -> Change profile -> Pick a profile that is closest to your needs-> Copy profile-> Modify the profile as you want (refer to step 3) -> Create
 - b. Advanced way: build your own from scratch.
Actions -> Create profile -> Configure the profile as you want (refer to step 3) -> Create
3. Configure / modify the profile
There are several ways to do this:

- a. 'Topology' can give you a more intuitive and clear view of the structure of cluster.
- b. 'Source' is a more general way to do this.

I will introduce the 'topology' way in the following, for the 'source' way, you can read source from other available profile and learn how to use it.

- c. Thing to configure in 'topology':
click topology to start topology editor



- i. To specify the site you want to build the cluster, click the node and choose the according **hardware type** (i.e. r320 for APT site).
 - ii. To specify the image, click the node and choose the according **disk image** (i.e. Ubuntu 14.04). You can also **use your own image** here by choosing 'other' and specify the urn, this is very useful for continuing research.
4. Start your experiment
 Actions -> Start experiment -> Change profile to the one you want to use -> Parameterize (optional) -> Finalize (here you can choose site, but are limited to the hardware type you specified in your profile) -> Finish.
 The experiments usually take some time to boot, especially when you use your own image, when the status shows ready.

5. Connect to nodes

Click List view and the command provided to connect to nodes will be shown

The screenshot shows the CloudLab web interface. At the top, there's a navigation bar with 'Home', 'Manual', and 'Actions' menus, a logo, and a 'Logout' button. A yellow banner below the navigation bar states: 'The Wisconsin cluster is in the midst of a major expansion, and will have limited resources for the next few days'. Below this, a status bar shows 'Current Usage: 0.02 Node Hours, Prev Week: 466, Prev Month: 466'. The main content area has a green header 'Your experiment is ready!' with a right arrow. Below this is a box containing experiment details: Name: test, State: ready, Profile: one-node, Created: Jan 19 2016 9:50 AM, Expires: Jan 20 2016 1:50 AM (in 16 hours). At the bottom of this box are buttons: Sliver, Clone, Snapshot, Copy, Extend, and Terminate. Below the details box is a table with tabs: Topology View, List View (selected), Manifest, and node-0 x. The table has columns: ID, Node, Type, SSH command (if you provided your own key), and Actions. The first row shows node-0, apt174, r320, and the SSH command 'ssh -p 22 zlu12@apt174.apt.emulab.net' is highlighted with a red circle. The Actions column has a gear icon.

ID	Node	Type	SSH command (if you provided your own key)	Actions
node-0	apt174	r320	ssh -p 22 zlu12@apt174.apt.emulab.net	

Create and use your own image:

Experiments/Clusters on cloudlab are only available for a short period of time, even though you can extend it you need to terminate it eventually. When you terminate your experiments, **all your work on the hard disk will be swiped**. To avoid set up develop environment every time you build a cluster, you can create an image and use it in future experiments to continue your work.

1. Select the experiment from which you want to create an image
Action -> My experiments -> select the experiment you want

2. Create an image

Note: Files in your home directory will not be saved. It is highly recommended that you put all your files in /local directory

clone/snapshot (read the description for their difference) -> create

This may take a few minutes depend on the size of the image. Upon success, there will be a screen shown the urn of the image. **Save the urn for later use.**

The Wisconsin cluster is in the midst of a major expansion, and will have limited resources for the next few days

Current Usage: 0.02 Node Hours, Prev Week: 466, Prev Month: 466 ⓘ

Your experiment is ready! ➤

Name: test
State: ready
Profile: one-node
Created: Jan 19 2016 9:50 AM
Expires: Jan 20 2016 1:50 AM (in 16 hours)

Sliver

Clone

Snapshot

Copy

Extend

Terminate

Topology View List View Manifest node-0 ✕



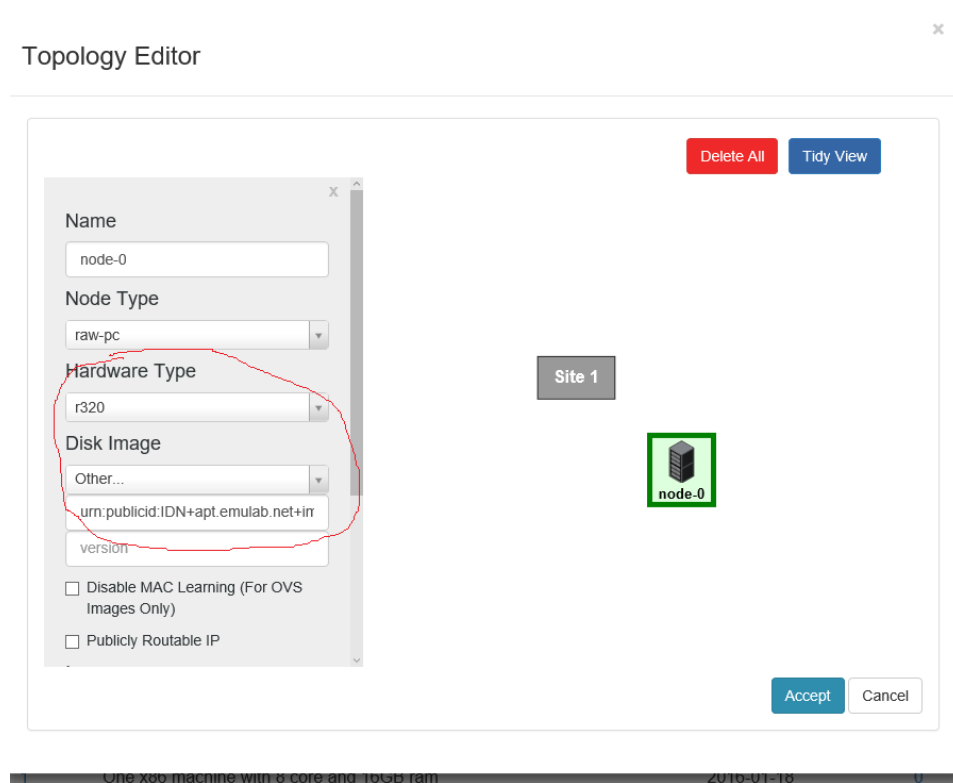
Click on a node for more options. Click and drag to move things around.

Run Linktest

Refresh Status

3. Use the image

When create/edit your profile, in topology view, click the node and choose other for disk image.
Fill in the blank below with the urn provided in step 2



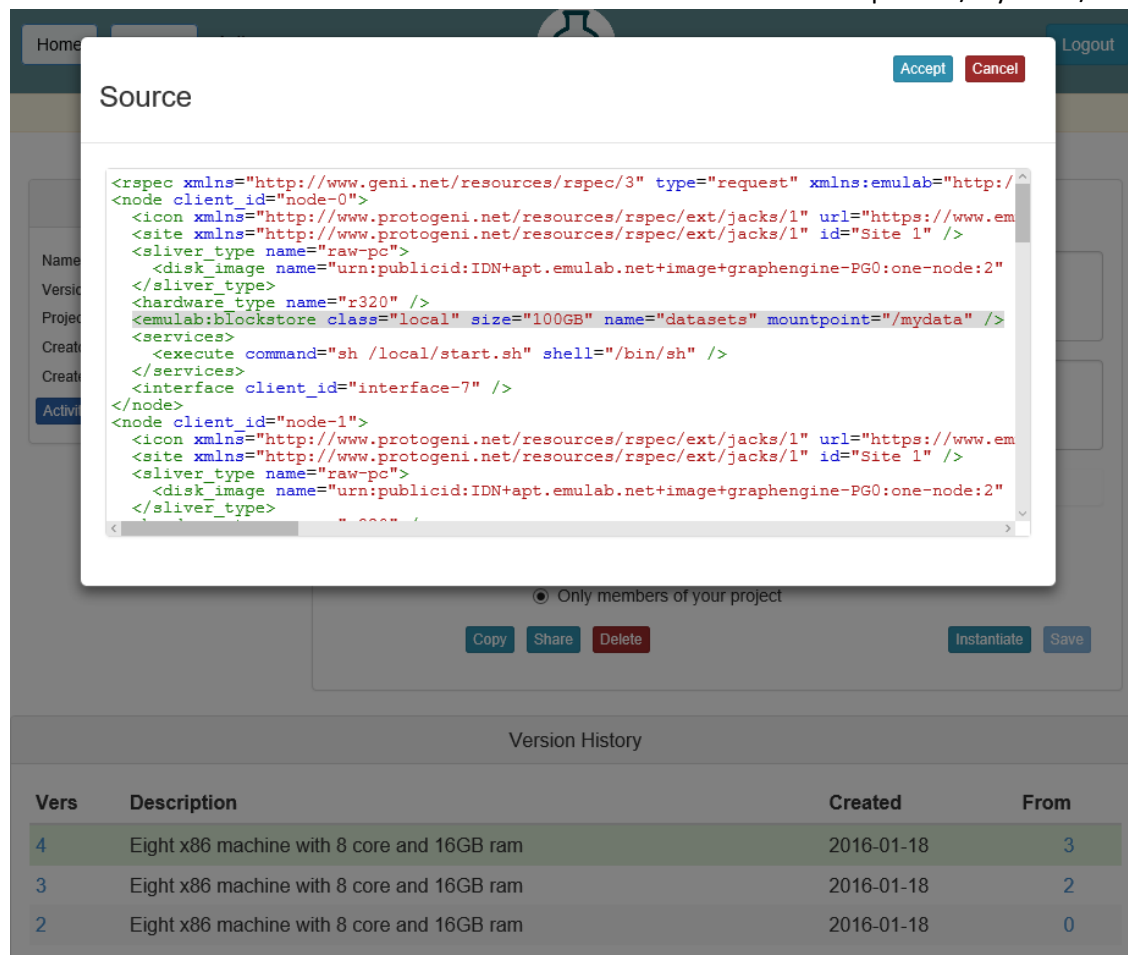
Add storage/dataset:

Since the default disk space is only around 15-20GB per node, you may find it too small for some purpose.

1. Add a storage:

When create/edit your profile, in **source view**, add the following line in the code:

```
<emulab:blockstore class="local" size="100GB" name="datasets" mountpoint="/mydata" />
```



The screenshot shows the 'Source' view of the emulab interface. A modal window titled 'Source' is open, displaying XML code for a node configuration. The code includes a blockstore configuration for 'datasets' with a size of 100GB and a mountpoint of /mydata. The code is as follows:

```
<rspec xmlns="http://www.geni.net/resources/rspec/3" type="request" xmlns:emulab="http://www.emulab.net/resources/rspec/ext/jacks/1" >
  <node client_id="node-0" >
    <icon xmlns="http://www.protogeni.net/resources/rspec/ext/jacks/1" url="https://www.emulab.net/resources/rspec/ext/jacks/1" id="Site 1" />
    <sliver_type name="raw-pc" >
      <disk_image name="urn:publicid:IDN+apt.emulab.net+image+graphengine-PG0:one-node:2" />
    </sliver_type>
    <hardware type="r320" />
    <emulab:blockstore class="local" size="100GB" name="datasets" mountpoint="/mydata" />
    <services >
      <execute command="sh /local/start.sh" shell="/bin/sh" />
    </services>
    <interface client_id="interface-7" />
  </node>
  <node client_id="node-1" >
    <icon xmlns="http://www.protogeni.net/resources/rspec/ext/jacks/1" url="https://www.emulab.net/resources/rspec/ext/jacks/1" id="Site 1" />
    <sliver_type name="raw-pc" >
      <disk_image name="urn:publicid:IDN+apt.emulab.net+image+graphengine-PG0:one-node:2" />
    </sliver_type>
  </node>
</rspec>
```

Below the modal window, there is a section for 'Version History' with a table showing the history of the configuration.

Vers	Description	Created	From
4	Eight x86 machine with 8 core and 16GB ram	2016-01-18	3
3	Eight x86 machine with 8 core and 16GB ram	2016-01-18	2
2	Eight x86 machine with 8 core and 16GB ram	2016-01-18	0

2. Add a dataset

I haven't successfully added any kind of dataset. I will update this once I succeeded.