

# Unattended System Deployment for Cloud and Big Data Computing Environment

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*clonezilla.org*

Q4, 2016

TAIWAN

www.nchc.org.tw



# Outline

- Introduction to Clonezilla
  - Features
  - Updates since 2016 Spring
- Unattended system deployment
  - Live boot parameters
  - Ansible
- Big data system deployment
  - Clonezilla-BD
- Q&A



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# System imaging and cloning - backup



You want to crash!!!  
I show you how to crash!!!

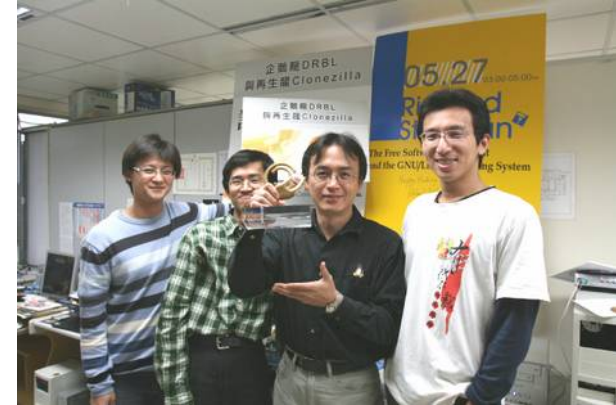
image source: [maggiesfarm.anotherdotcom.com](http://maggiesfarm.anotherdotcom.com)  
[www.compsults.com](http://www.compsults.com), and [jervisdabreo.com](http://jervisdabreo.com)

# Massive system deployment



# About us

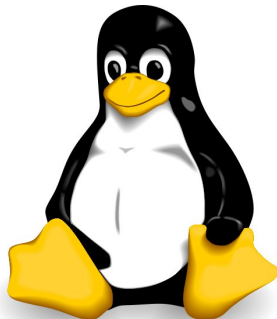
- Developers of the free software DRBL, Clonezilla and more...
- Steven is also the maintainer of GParted live CD
- From Taiwan, working for the NPO NCHC (National Center for High-Performance Computing)



Taiwan image source: wikipedia.org

# What is Clonezilla?

- A partition and disk imaging/cloning utility similar to True image® or Ghost®
- GPL license
- A bare metal recovery tool for



\*1



\*2



\*3



\*4

**VMFS**

VMware  
ESX/ESXi

\*5



**MINIX**

\*6



\*Logo source: (1) Larry Ewing, Simon Budig and Anja Gerwinski, (2) Apple, (3) Microsoft, (4) Marshall Kirk McKusick, (5) VMWare (6) Distrowatch.com

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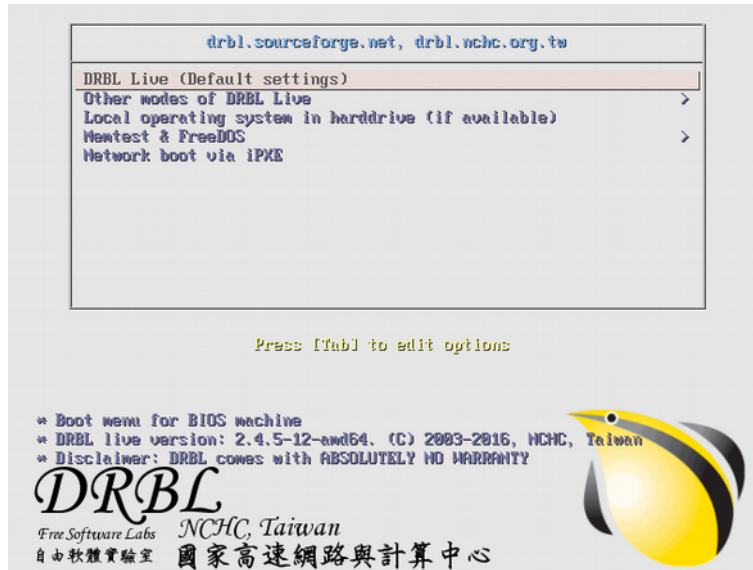
# Clonezilla Features

- Free ([GPL](#)) Software
- File systems supported:
  - [Ext2/3/4](#), [ReiserFS](#), [Reiser4](#), [XFS](#), [JFS](#), [HFS+](#), [BrfFS](#), [F2fs](#), [UFS](#), [Minix](#), [VMFS](#), [F2FS](#), [NILFS2](#), [FAT](#) and [NTFS](#)
  - Supports [LVM2](#)
  - Support some [hardware RAID](#) chips (by kernel)
- [Smart copying](#) for supported filesystem. For unsupported file systems sector-to-sector copying is done via [dd](#).
- Boot loader : [syslinux](#), [grub 1/2](#) ; [MBR](#) and hidden data (if exist)
- [Serial console](#)
- Unattended mode
- One image restoring to multiple local devices
- [Multicast](#) supported in Clonezilla Server Edition (SE)
- The image format is transparent, open and flexible

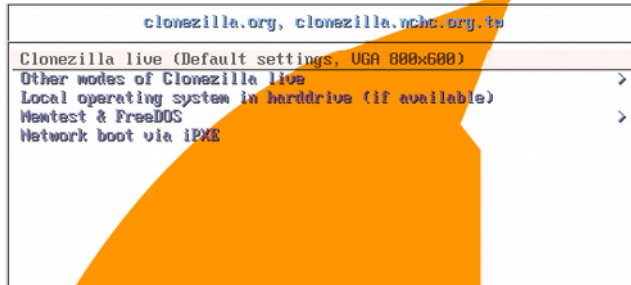




# DRBL live, i.e. Clonezilla Server Edition



# Clonezilla Live

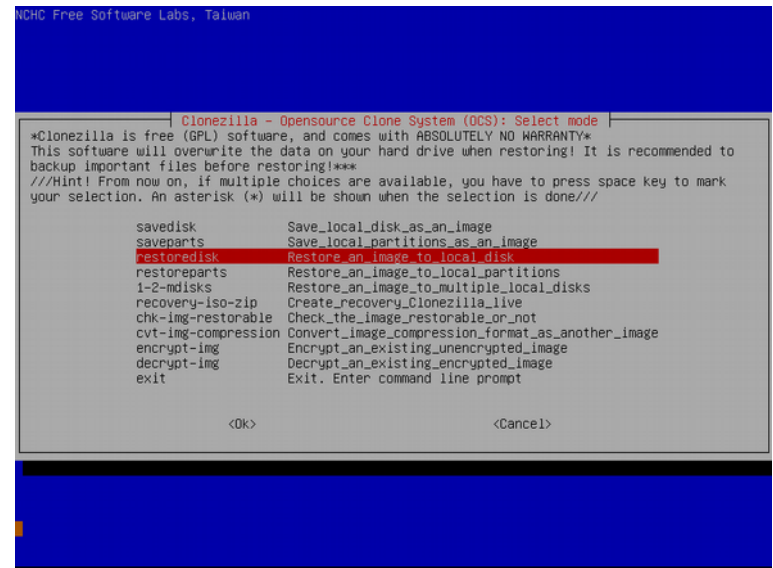


Press [F6] to edit options

Automatic boot in 25 seconds...

- \* Boot menu for BIOS machine
- \* Clonezilla live version: 2.4.5-20-amd64. (C) 2003-2016, NCHC, Taiwan
- \* Disclaimer: Clonezilla comes with ABSOLUTELY NO WARRANTY

**Clonezilla** *Free Software Labs*  
National Center for High-Performance Computing  
Taiwan



# Developers

- Steven Shiau
- K. L. Huang
- Ceasar Sun
- Jazz Wang
- Thomas Tsai
- Jean-Francois Nifenecker
- Louie Chen
- Nagappan Alagappan



# Language file contributors

- English (en\_US): Dylan Pack.
- German (de\_DE): Michael Vinzenz.
- Hungarian (hu\_HU): Greg Marki
- Spanish (es\_ES): Juan Ramón Martínez and Alex Ibáñez López.
- French (fr\_FR): Jean-Francois Nifenecker and Jean Francois Martinez.
- Italian (it\_IT): Gianfranco Gentili.
- Japanese (ja\_JP): Akira Yoshiyama and Annie Wei.
- Brazilian Portuguese (pt\_BR): Marcos Pereira da Silva Cruz.
- Russian (ru\_RU): Anton Pryadko and Igor Melnikov.
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- Turkish (tr\_TR): Ömer YILDIZ
- Simplified Chinese (zh\_CN): Zhiqiang Zhang and Liang Qi.
- Traditional Chinese (zh\_TW): T. C. Lin.



# Partners

- The following companies either embed Clonezilla in their products or promote Clonezilla:

– Linmin



– eRacks Open Source Systems



– Miracle Linux





# Changes and new features from 2016/Q1

- Inspect the files **checksum** in the partition. To use it, enable "-gmf" option in expert mode when saving an image and enable "-cmf" option when restoring image. For disk to disk clone, use "-cmf" option.
- **Support /dev/nbd device**
- Add supporting for **grub on EBR** (Extended Boot Record) imaging and cloning.
- When mounting **image repository**, it is able to browse the directories **recursively**.
- Add support for boot parameter **ocs\_preload\***. It can be used to fetch tarall/zip/sh files from http(s), ftp, tftp, and local URL then extract to /opt/.
- Image repository can be auto mounted with boot parameter **ocs\_repository** in URI format, e.g.  
`ocs_repository="dev:///dev/sdf1"` or `ocs_repository="smb://wa-domain;jack:mypass@192.168.7.25/images"`.



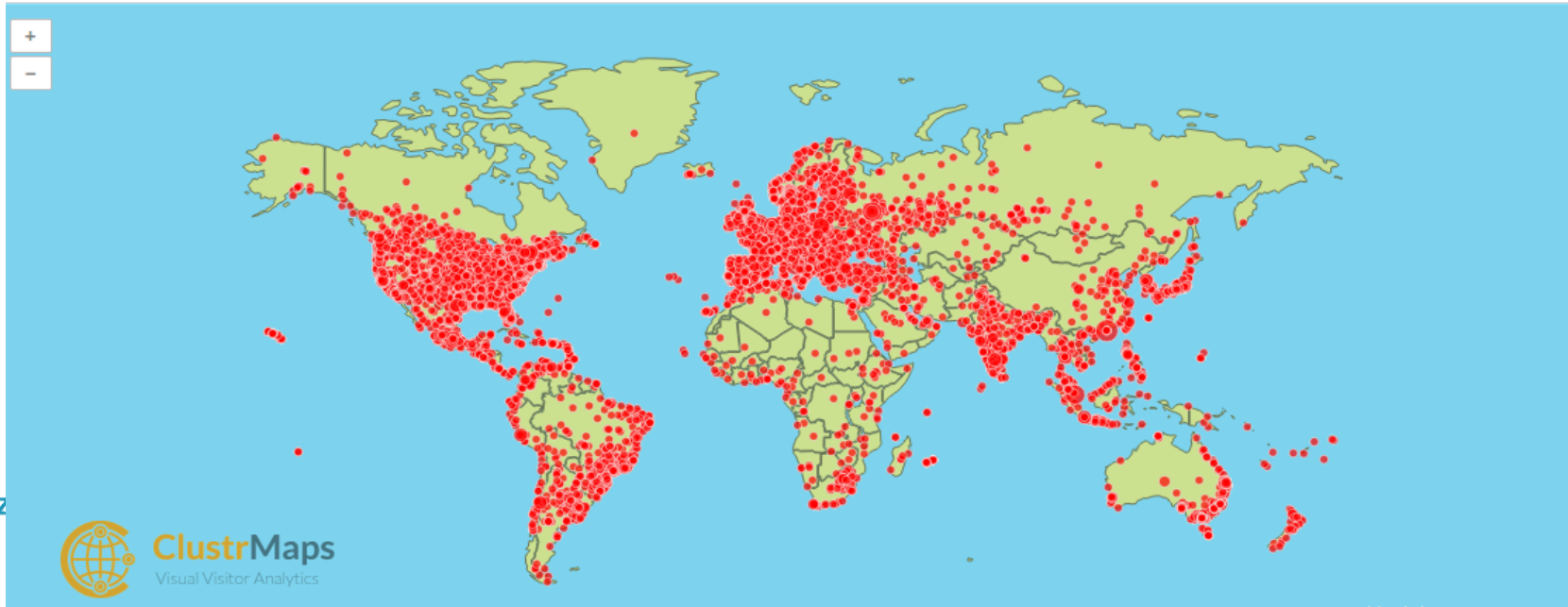
# Changes and new features from 2016/Q1 (Continued)

- Add **entry points** by using boot parameters `ocs_savedisk_prerun`, `ocs_saveparts_prerun`, `ocs_restoredisk_prerun`, and `ocs_restoreparts_prerun`
- **`/opt/overwrite-all-boot-param`, `/opt/overwrite-part-boot-param`**
  - Downloaded from root of `ocs_preload` or other ways
  - “`overwrite-all-boot-param`” -> overwrite whole `/proc/cmdline`,
  - “`overwrite-part-boot-param`” -> only overwrite part of `/proc/cmdline`. Especially those “`ocs_*`” parameters.
- In summary, the boot parameters to be run in order:
  1. `ocs_prerun*` (might overwrite `/proc/cmdline`)
  2. `ocs_preload`
  3. `ocs_repository`
  4. `ocs_savedisk_prerun/ocs_saveparts_prerun/ocs_restoredisk_prerun/ocs_restoreparts_prerun`
  5. `ocs_postrun*`

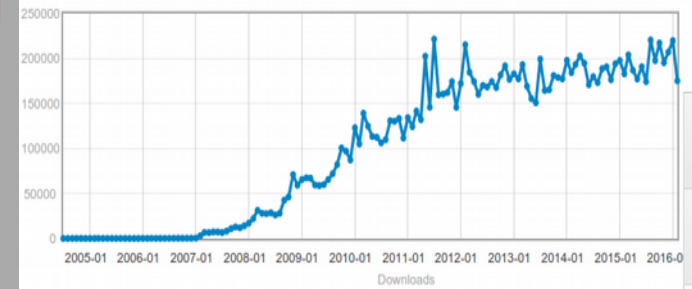
# Clonezilla Users Worldwide

● = Recent/Now ● = Older than 24 hours

566,431 total visits for: Jan, 2016



ca_ES.UTF-8	Catalan		Català
de_DE.UTF-8	German		Deutsch
en_US.UTF-8	English		
hu_HU.UTF-8	Hungarian		Magyar
es_ES.UTF-8	Spanish		Español
fr_FR.UTF-8	French		Français
it_IT.UTF-8	Italian		Italiano
ja_JP.UTF-8	Japanese		日本語
pt_BR.UTF-8	Brazilian Portuguese		Português do Brasil
ru_RU.UTF-8	Russian		Русский
sk_SK.UTF-8	Slovak		Slovenský
tr_TR.UTF-8	Turkish		Türkçe
zh_CN.UTF-8	Chinese (Simplified)		简体中文
zh_TW.UTF-8	Chinese (Traditional)		正體中文 - 臺灣



<b>DOWNLOADS</b>	<b>13,986,549</b>
In the selected date range	
<b>TOP COUNTRY *</b>	<b>United States</b>
24% of downloaders	
<b>TOP OS *</b>	<b>Windows</b>
70% of downloaders	

**>13,000,000** downloads



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# Live boot parameters for unattended deployment

- Preset language and keyboard
  - locales=en\_US.UTF-8 keyboard-layouts=us
- Remember the boot parameters to be run in this order:
  - ocs\_prerun → ocs\_preload → ocs\_repository → ocs\_savedisk\_prerun/ocs\_saveparts\_prerun/ocs\_restoredisk\_prerun/ocs\_restoreparts\_prerun → ocs\_postrun
- E.g.
  - boot=live union=overlay username=user config components quiet noswap edd=on nomodeset locales=en\_US.UTF-8 keyboard-layouts=us ocs\_prerun1="dhclient -v eth0" ocs\_repository="nfs://192.168.56.254:/home/partimag" ocs\_live\_run="ocs-sr -g auto -e1 auto -e2 --batch -r -j2 -scr -k1 -p true restoredisk xenial-x64-20161104 sda" ocs\_live\_extra\_param="" ocs\_live\_batch="no" vga=788 ip= net.ifnames=0 nosplash i915.blacklist=yes radeonhd.blacklist=yes nouveau.blacklist=yes vmwgfx.enable\_fbdev=1 ocs\_postrun1="mount /dev/sda1 /mnt" ocs\_postrun2="rm -f /mnt/etc/resolv.conf; echo nameserver 160.194.192.17 > /mnt/etc/resolv.conf" ocs\_postrun3="chroot /mnt/ apt-get update; chroot /mnt/ apt-get -y install python" ocs\_postrun4="reboot"

# How about after the restored OS boots?

- Ansible
  - Free software from RedHat, <http://ansible.com>
- Required packages in the restored OS
  - Python
  - Ssh service
- For example
  - Machine “Cubs” has running Ubuntu 16.04 with python installed, ssh service is on
  - Machine “Indians” is the control panel, wants to install docker on Machine “Cubs” by Ansible



# How about after the restored OS boots?

- Only two steps, first define the host file
  - syntax: `servername options`
    - options:
      - `ansible_host` -- Remote Host IP
      - `ansible_user` -- Remote SSH User Name
      - `ansible_ssh_private_key_file` -- SSH Key
      - `ansible_ssh_pass` -- SSH Password for remote host
    - E.g.
      - `Cubs ansible_host=192.168.11.3 ansible_user=root ansible_ssh_private_key_file=...`



# How about after the restored OS boots?

- Second, write the playbook file “docker\_install.yml” to install docker by Ansible:

- name: Install docker and run service

- # use group

- hosts: DockerHost

- sudo: True

- tasks:

- name: Install docker with openSUSE Leap

- zypper: name={{ item }}

- with\_items:

- docker

- curl

- when: ansible\_distribution == "openSUSE Leap"

- name: Install docker with CentOS

- yum: name={{ item }}

- with\_items:

- docker

# How about after the restored OS boots?

- curl

```
when: ansible_distribution == "CentOS"
```

- name: Install docker with Ubuntu

```
apt: name={{ item }} update_cache=yes
```

```
with_items:
```

- docker.io

- curl

```
when: ansible_distribution == "Ubuntu"
```

- name: Create docker link with Ubuntu

```
shell: ln -sf /usr/bin/docker.io /usr/local/bin/docker
```

```
when: ansible_distribution == "Ubuntu"
```

```
#-----
```

- name: Set docker enable and run

```
service: name=docker state=started enabled=yes
```



# How about after the restored OS boots?

- On Machine Indians
  - Make sure Ansible is installed, if not
    - [http://docs.ansible.com/ansible/intro\\_installation.html](http://docs.ansible.com/ansible/intro_installation.html)
  - Run the command to install and start docker on machine Cubs:
    - `ansible-playbook docker_install.yml`



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# Big data system deployment

- **Massive: many nodes-> need massive deployment**
- **Complicated: system installation, big data applications**

Hadoop Variant	Apache	CDH	HDP	MapR
Description	Hadoop original project	Cloudera Distribution Hadoop	Hortonworks Data Platform (Yahoo subsidiary)	MapR Inc.
License	Apache license	Apache license	Apache license	Proprietary

Deployment from scratch	tools	Apache Ambari	Cloudera Manager	Apache Ambari (customized)	Proprietary
	OS	<ul style="list-style-type: none"> <li>• RHEL 5/6</li> <li>• CentOS 5/6</li> <li>• Oracle Linux 5/6</li> <li>• SLES 11</li> <li>• Ubuntu 12.04/14</li> <li>• Debian 7</li> </ul>	<ul style="list-style-type: none"> <li>• RHEL 5.7/6.4~6.6</li> <li>• Oracle Linux 5.6/6.4~6.6</li> <li>• SLES 11</li> <li>• Ubuntu 12.04/14.04</li> <li>• Debian 6/7.0/7,1</li> </ul>	<ul style="list-style-type: none"> <li>• RHEL 6x/7x</li> <li>• CentOS 6x/7x</li> <li>• Oracle Linux 6.x/7.x</li> <li>• SLES 11</li> <li>• Ubuntu 12.04/14.04</li> <li>• Debian 7x</li> </ul>	<ul style="list-style-type: none"> <li>• RHEL</li> <li>• SLES</li> <li>• Ubuntu</li> </ul>
	Notes	<ul style="list-style-type: none"> <li>• Older GNU/Linux</li> <li>• Apache Ambari 2.1.1.</li> </ul>	<ul style="list-style-type: none"> <li>• Newer GNU/Linux</li> <li>• License fee is required for deploying</li> </ul>	<ul style="list-style-type: none"> <li>• Newer GNU/Linux</li> <li>• Apache Ambari 2.1.1.(customized)</li> </ul>	Proprietary

# Why Clonezilla-BD?

- A big data deployment program via imaging way
- Easy way to deploy Hadoop cluster
- Pros
  - **Easy**: auto configuration, including accounts of services, keys, software configuration, services, etc.
  - **Compatible**: works for physical and virtual machine. Can be used with Clonezilla, True Image, etc.
- Two methods
  - **Node deployment**
  - **Clonezilla-SE**
- Requirement
  - All MAC addresses for computing nodes should be record in a file for deployment use

# Method 1- node deployment

Start



Basic OS Support:

- Debian x32/x64
- Ubuntu x32/x64

Install clz-bd

Setup network

Mac addresses

Install packages

packages

System config



Final template

Use image cloning tool to deploy

Hadoop Cluster

NN

DN-1

DN-2

DN-3

DN-4

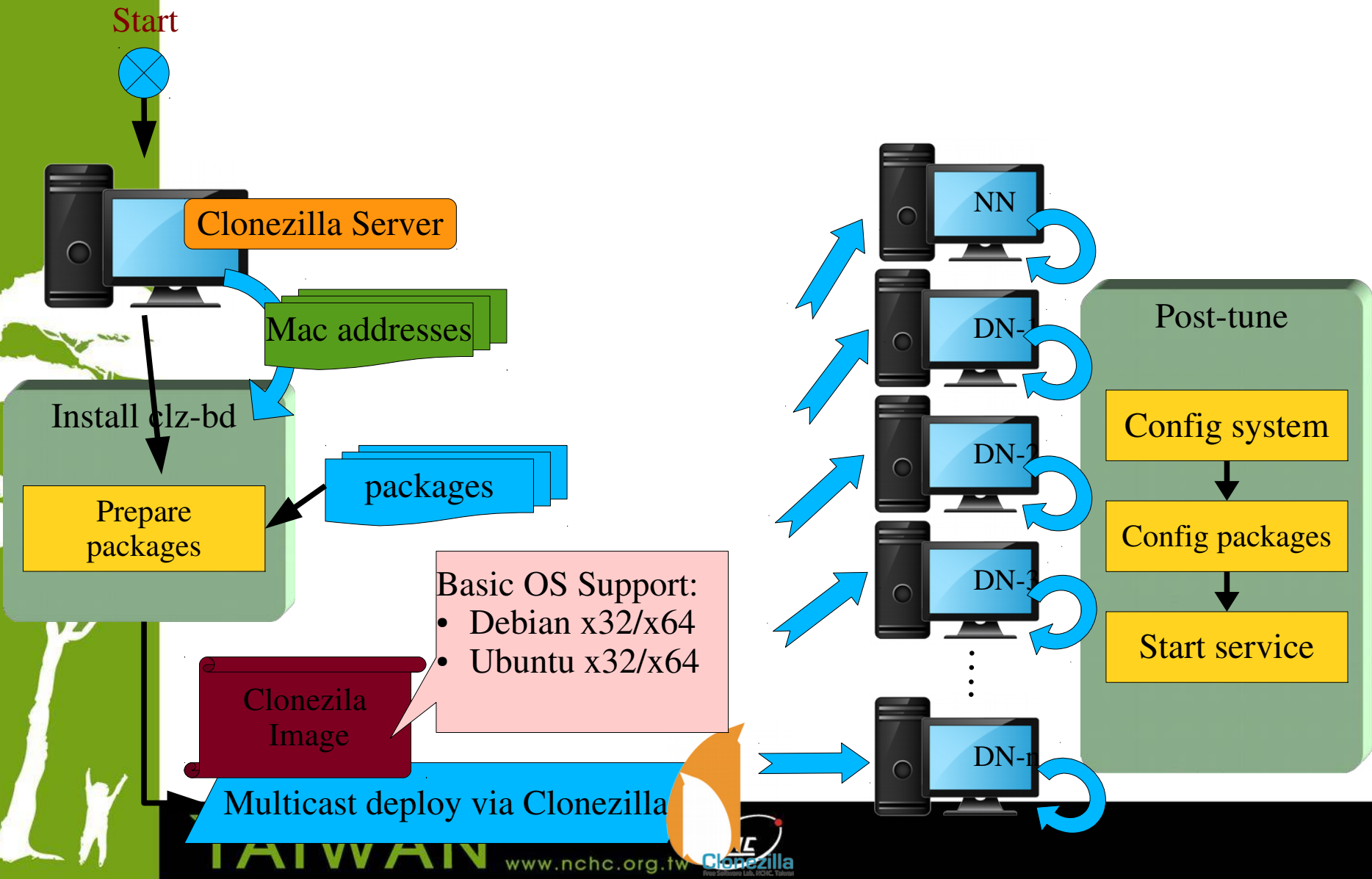
Post-tune

Config system

Config packages

Start service

# Method 2- Clonezilla-SE



# Project and Screenshot

The screenshot shows the Hadoop All Applications page. At the top left is the Hadoop logo. The page title is "All Applications" and it is logged in as "dr.who".

**Cluster Metrics**

Apps Submitted	Apps Pending	Apps Running	Apps Completed	Containers Running	Memory Used	Memory Total	Memory Reserved	VCores Used	VCores Total	VCores Reserved	Active Nodes	Decommissioned Nodes	Lost Nodes	Unhealthy Nodes	Rebooted Nodes
0	0	0	0	0	0 B	16 GB	0 B	0	16	0	2	0	0	0	0

**User Metrics for dr.who**

Apps Submitted	Apps Pending	Apps Running	Apps Completed	Containers Running	Containers Pending	Containers Reserved	Memory Used	Memory Pending	Memory Reserved	VCores Used	VCores Pending	VCores Reserved
0	0	0	0	0	0	0	0 B	0 B	0 B	0	0	0

Below the metrics are two tables for application entries. The first table has columns: ID, User, Name, Application Type, Queue, StartTime, FinishTime, State, FinalStatus, Running Containers, Allocated CPU VCoers, Allocated Memory MB, Progress, and Tracking UI. The second table shows "Showing 0 to 0 of 0 entries".

[github.com/ceasar-sun/clz-bd](https://github.com/ceasar-sun/clz-bd)

```
ceasar@jessie-amd64: ~/tmp
Get network information ...
Input mac-ip pairs file, see sample: '/home/ceasar/tmp/clz-bd/conf/mac-list.sample.txt'. [Ctrl+C] to exit
/home/ceasar/mac-list.txt
Network :[10.0.2.0]
Netmask :[255.255.255.0]
Gateway :[10.0.2.254]
Start IP (also be master) :[10.0.2.1]
Total 3 nodes.
Last IP:[160.0.32.3]
Read '/home/ceasar/tmp/clz-bd/conf/mac-ip-hostname.lst' for detail.
Start to check pkg status ...
Hadoop : hadoop-2.5.0-cdh5.3.1.tar.gz is ready...
Use openjdk ? Give full path to use JDK package file. [n] to don't deal with Java. [Y/n/full-Path]
Generate ssk key for hadoop environment ...
Create key pairs : '/home/ceasar/tmp/clz-bd/conf/id_rsa', '/home/ceasar/tmp/clz-bd/conf/id_rsa.pub'
sending incremental file list
created directory /opt/clz-bd
./
LICENSE
18,047 100% 0.00kB/s 0:00:00 (xfr#1, to-chk=23/25)
README
```

The screenshot shows the GitHub repository page for "ceasar-sun/clz-bd". The repository is described as "Clonezilla for Big Data module". It has 42 commits, 1 branch, 3 releases, and 1 contributor. The current branch is "master" and the commit hash is "clz-bd / +".

The file list includes:

- conf (modified: conf/clz2bd-functions, 15 days ago)
- sbin (modified: README, 15 days ago)
- LICENSE (initial commit, 4 months ago)
- README (modified: README, 15 days ago)
- README.md (initial commit, 4 months ago)
- setup (renamed: deploy-bd.sh -> setup, 2 months ago)

The README.md file content is visible, showing the project name "clz-bd" and the description "Clonezilla for Big Data module".

# Demo

- **Deploy Ubuntu 16.04** (Machine Cubs)
  - Install package **python** right after Ubuntu 16.04 is restored.
- Use **Ansible to install docker** on Machine Cubs, turn on ansible service
- Start a docker environment “busybox”



# Conclusion

- With the **live boot parameters** from Clonezilla live, you can install packages and configure the restored OS **right after it's restored**.
- With **Ansible (or Puppet...)**, you can install packages and configure the restored OS **right after it's rebooted**.
- With **Clonezilla-BD**, you can deploy Hadoop cluster for big data computing.



# Reference

- Clonezilla: <http://clonezilla.org>
- DRBL: <http://drbl.org>
- Ansible: <http://docs.ansible.com/ansible/>
- Clonezilla-BD: <https://github.com/ceasar-sun/clz-bd>





# Questions ?

Great!



??????

