

Clonezilla : A Next Generation Clone Solution for Cloud

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<http://clonezilla.org>, <http://drbl.org>
National Center for High-Performance Computing
Taiwan

Q3, 2012

Outline

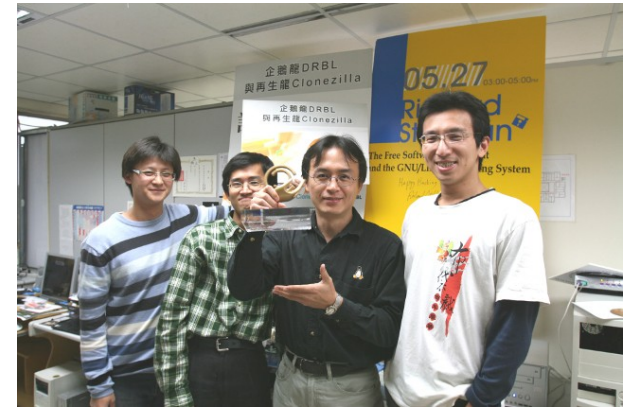
- Introduction to Clonezilla
 - A Quick Demo as a Beginning
 - Feature/How/Limitation/Image Architecture
 - Comparison with Live and Server Edition(SE)
 - A Toolkit for Windows Mass Deployment : DRBL-Winroll
 - A Possible Solution in Cloud : Cloudboot
- Cases of Usages
 - Unattended Recovery CD or USB
 - Mass Deployment with Multicast by SE
 - One Image to Multi Devices Deployment
- Q&A

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About us

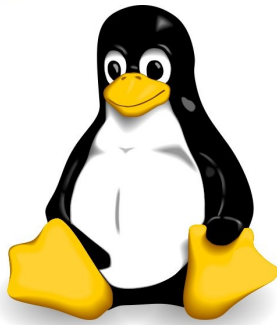
- From Taiwan, working for the NPO NCHC (National Center for High-Performance Computing)
- Developers of free/open-source software:
 - DRBL, [Clonezilla](#)
 - [DRBL-Winroll](#), Tux2live
 - Partclone, Tuxboot, [Cloudboot](#)
 - ... more



Taiwan image source: wikipedia.org

What is Clonezilla?

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



*1



*2



*3



*4



*5

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



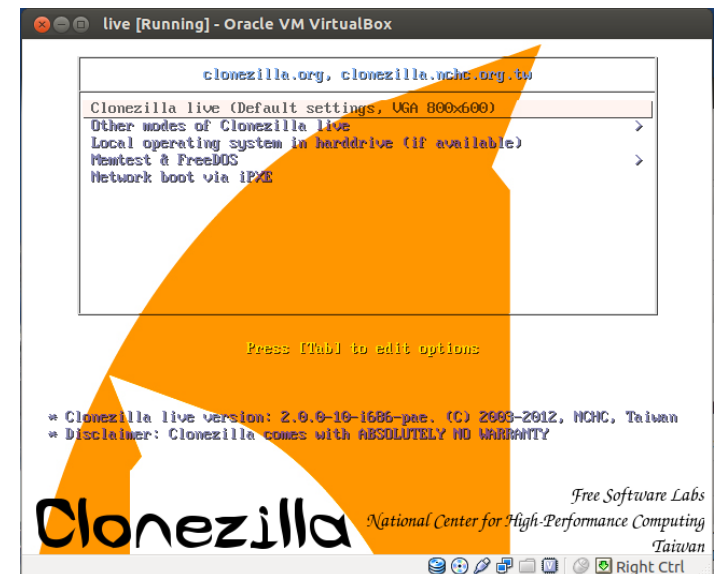
A Quick Demo as a Beginning

- Restore a bare hard disk by Clonezilla Live
 - <http://clonezilla.org/clonezilla-live.php>
- A pre-saving image Ubuntu 12.04 system
 - Text mode only. The whole system uses about 1.0 GB space. Using grub2 as **boot loader**.
 - /dev/sda1 is used as swap partition
 - /dev/sda2 on / and /dev/sda3 on /home with **ext4 and reiserfs**
- Use sshfs as repository

```
Clonezilla: モードを選択して下さい
*** Clonezilla はフリーソフト (GPL) で、無保証です ***
このソフトウェアはリストア時に HDD 上の全データを上書きします！リストア前にコピー先 HDD
上の重要ファイルをバックアップする事をお勧めいたします！
【ヒント!!複数の選択肢がある場合、スペースキーを押して選択対象に印を付けて下さい。
星印(*)は選択された事を示します】
モードを選択して下さい:

savedisk      ローカルディスクをイメージに保存
saveparts     ローカルパーティションをイメージに保存
restoredisk  イメージをローカルディスクにリストア
restoreparts  イメージをローカルパーティションにリストア
1-2-mdisks   複数のローカルディスクに1イメージをリストア
recovery-iso-zip リカバリ用のClonezilla_Liveディスクを作成
chk-img-restorable イメージが復元可能かどうかをチェック
exit         終了。コマンドラインプロンプトに移行します

<OK>          <Cancel>
```



Clonezilla (再生龍)

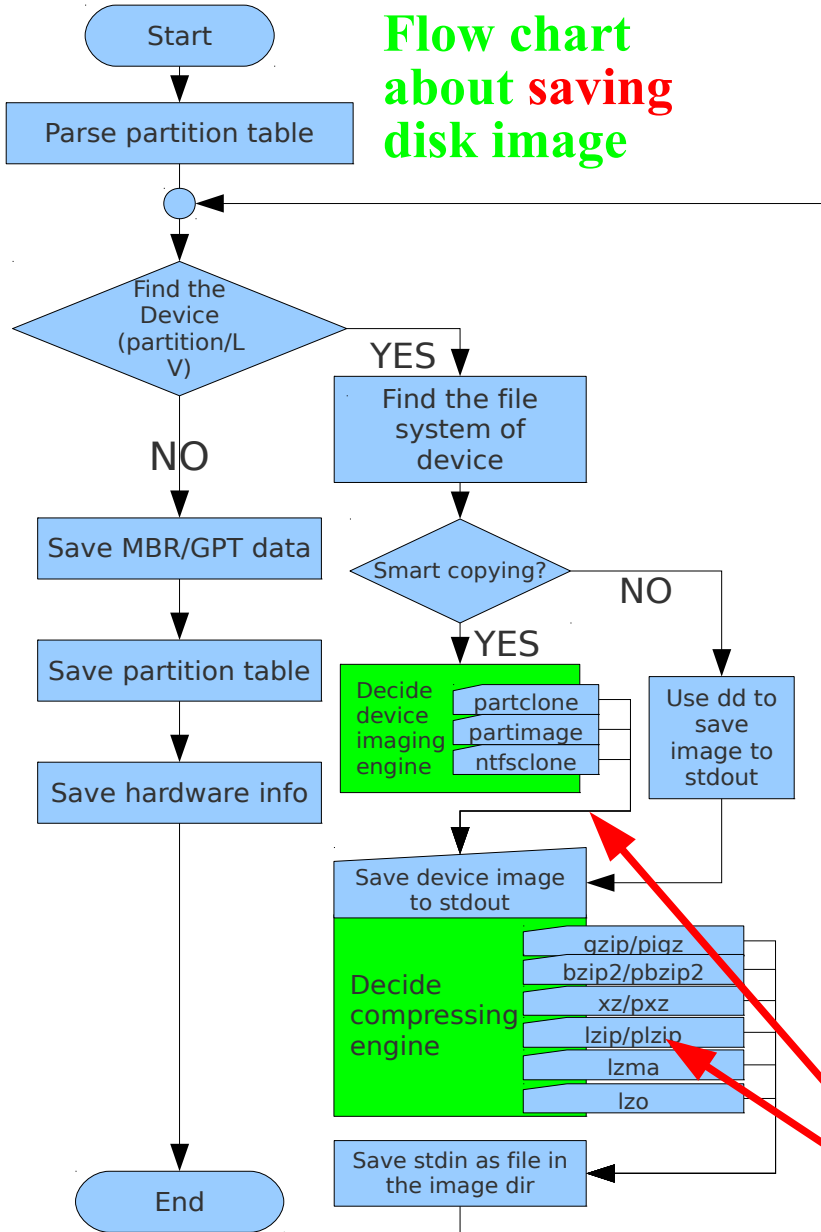
- Clonezilla [OCS (OpenSource Clone System)]
 - Integrate **Partclone** (<http://partclone.org/>), Partimage, ntfscclone and **udpcast**¹ (<http://udpcast.linux.lu/>)
- What does it handle ?
 - **Physical data** : basic unit is **partition**, then LVM, and part of hardware RAID
 - **Partition table / Boot sector** : (MBR:446+64+2, GPT, EFI)
 - **Hidden data** : data between boot sector and 1st partition
- **Block-based recovery**, is different from
 - File base recovery : **Differential / Incremental** backup
 - Hardware recovery (recovery card) : **Instant** recovery
- Two kind of release
 - **Live** edition
 - **Server** edition (SE)

Clonezilla Feature

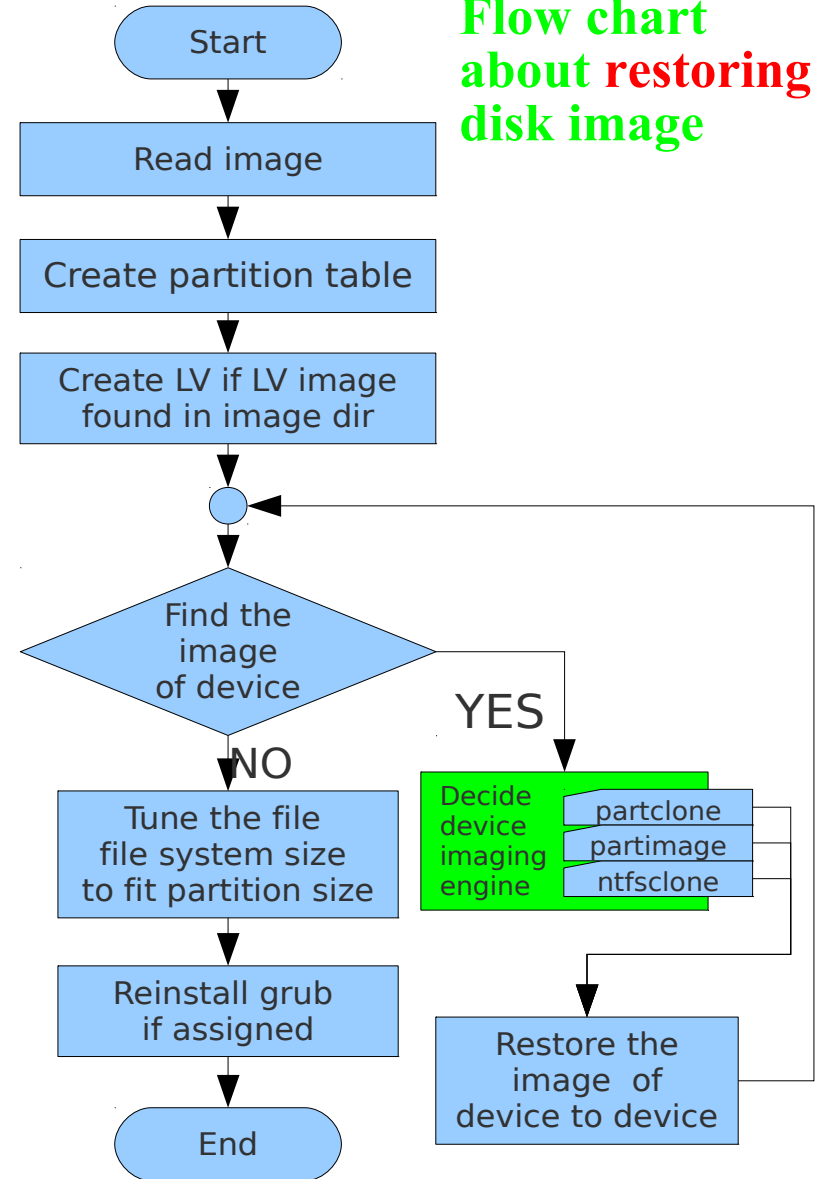
- Free (GPL) Software
- File systems supported:
 - Ext2/3/4, ReiserFS, Reiser4, XFS, JFS, BtrFS, HFS+, UFS, VMFS, FAT and NTFS
 - Supports LVM2
 - Support some hardware RAID chips (by kernel)
- Smart copying for supported filesystem. For unsupported file systems sector-to-sector copying is done via dd.
- 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
- Use Clonezilla-live as client OS on server edition

Save and Restore procedure of Clonezilla

Flow chart about saving disk image



Flow chart about restoring disk image



Imaging and compressing engines can be easily added

Open and Flexible Format of Clonezilla Image

```
root@debian:~# ls -alFh /home/partimag/lucid-img/
total 220M
```

```
drwxr-xr-x 2 root root 512 07:12 ./ image name
```

```
drwxr-xr-x 7 root root 168 07:12 ../
```

```
-rw-r--r-- 1 root root 420 07:12 disk
```

```
-rw-r--r-- 1 root root 34K 07:12 Info-dmi.txt
```

```
-rw-r--r-- 1 root root 18K 07:12 Info-lshw.txt
```

```
-rw-r--r-- 1 root root 1.4K 07:12 Info-lspci.txt
```

```
-rw-r--r-- 1 root root 260 07:12 Info-packages.txt
```

```
-rw-r--r-- 1 root root 10 07:12 parts
```

```
-rw----- 1 root root 216M 07:12 sda1.ext4-ptcl-img.gz.aa real data of partition
```

```
-rw----- 1 root root 2.3M 07:12 sda5.ext4-ptcl-img.gz.aa disk C.H.S. value via sfdisk
```

```
-rw-r--r-- 1 root root 36 07:11 sda-chs.sf Use dd to save MBR and other hidden data
```

```
-rw-r--r-- 1 root root 1.0M 07:11 sda-hidden-data-after-mbr
```

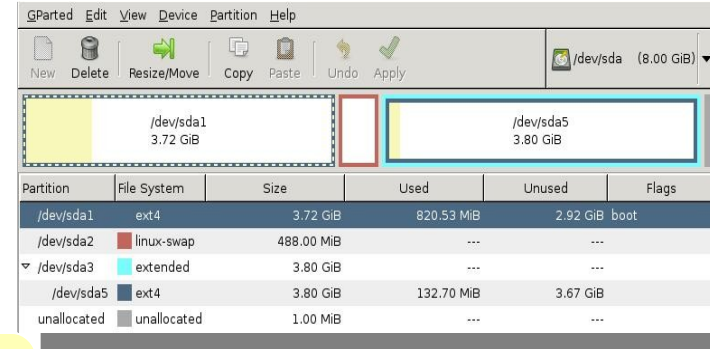
```
-rw-r--r-- 1 root root 512 07:11 sda-mbr
```

```
-rw-r--r-- 1 root root 434 07:11 sda-pt.parted partition info from parted and sfdisk
```

```
-rw-r--r-- 1 root root 310 07:11 sda-pt.sf
```

```
-rw-r--r-- 1 root root 53 07:12 swappt-sda2.info
```

UUID and label info of sda2 (swap partition)



Comparison :

Live vs SE(Server Edition)

	Live	SE(Server Edition)
Support	The same for: File system, LVM/Boot loader/Hidden data	
Installation	None, just boot and go	Need to install DRBL package (or use <i>DRBL Live</i> , but still need to configure)
Basic OS	Debian/Ubuntu	Depends on OS installed
Multicast/ Broadcast	None (still "udpcast" package included, only be used on SE*)	Yes (only unicast can be used when image save)
Portable	Easy	Hard
Extra effort	<ul style="list-style-type: none">• Storage preparation• Step by step via user	<ul style="list-style-type: none">• Installation, configuration• pxe/etherboot required in clients
Usage	<ul style="list-style-type: none">• Single machine usage• System recovery CD/DVD	<ul style="list-style-type: none">• Mass deployment• Central management

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.
- 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.
- Simplified Chinese (zh_CN): Zhiqiang Zhang and Liang Qi.
- Traditional Chinese (zh_TW): T. C. Lin.

```
Choose language
Which language do you prefer:
de_DE.UTF-8 German | Deutsch
en_US.UTF-8 English
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
zh_CN.UTF-8 Chinese (Simplified) | 简体中文
zh_TW.UTF-8 Chinese (Traditional) | 正體中文 - 臺灣
```

Bugs Report/Patches

- cbeazer
- nj-dude
- Asou Y.S. Chang
- Manuel Borchers
- **Miracle Linux corporation**
- Bill Marohn
- Orgad Shaneh
- Chris Cooper
- lukas666
- John Ouzts
- Juergen Chiu
- username8
- martinr88
- Yung-Jen Yu
- jeff-optimize
- gsusterman
- wellurs
- dersucker
- Patrick Verner
- Adam Walker
- ...

Partners

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

- Linmin



- eRacks Open Source Systems



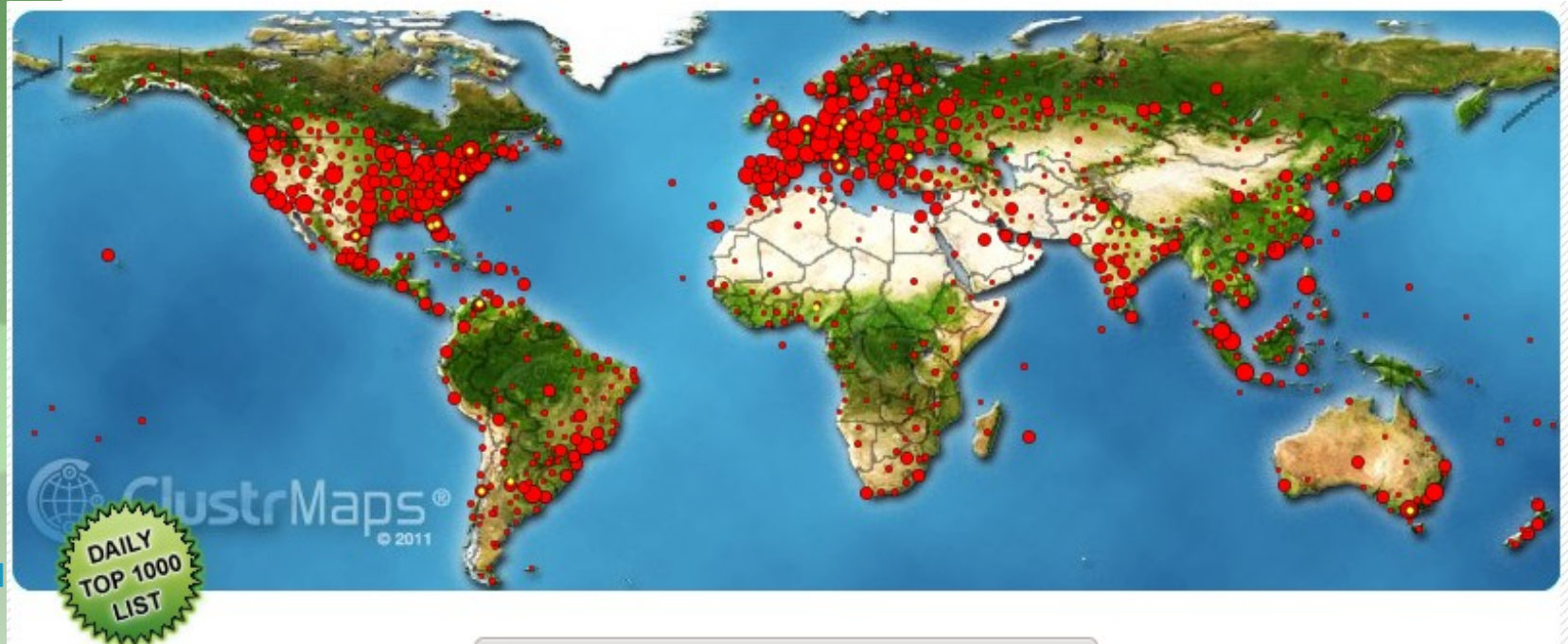
- Miracle Linux



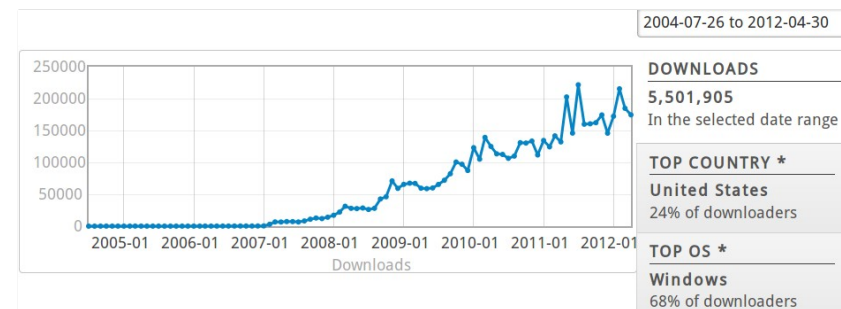
- Clonezilla/DRBL are members of OIN (*Open Invention Network*)



Clonezilla Users Worldwide



de_DE.UTF-8 German | Deutsch
en_US.UTF-8 English
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
zh_CN.UTF-8 Chinese (Simplified) | 简体中文
zh_TW.UTF-8 Chinese (Traditional) | 正體中文 - 臺灣



>5,500,000 downloads

* ~ 2012/04/30

DRBL-Winroll:

A toolkit for MS-Windows Mass Deployment

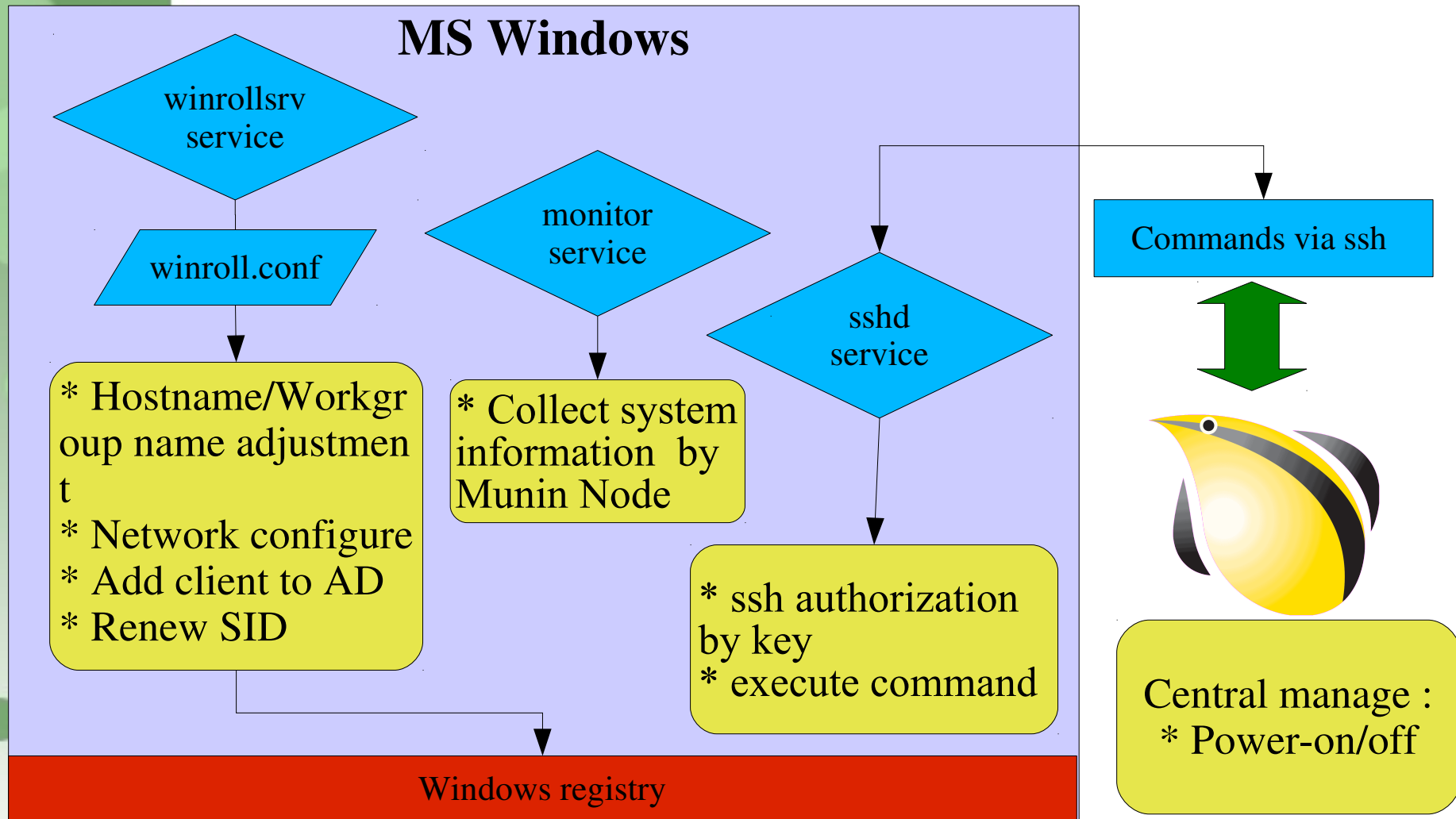
- **Goal**

- Adjust Windows **Hostname**, **Workgroup** name, SID automatically
 - For working in MS Network (Neighborhood)/NetBIOS protocol
- Provide **network** auto-setup function
- Provide auto-add to **AD** domain function *NEW from v1.3.0*
- Provide **system monitor** function in Windows clients *NEW from v1.3.1*
- Provide **central management** via ssh command
 - Via ssh daemon

- **Feature**

- Windows application : easy to install
- Independent service : Only need a DHCP server on LAN (or use auto-network configuration)
- Suit for mass deployment clone tool (ex: Clonezilla, Ghost, Acronis True Image)
- Central management via ssh (ex; 'dcs' command in DRBL)

DRBL-Winroll Framework



Cloudboot -

A framework for booting from cloud resource

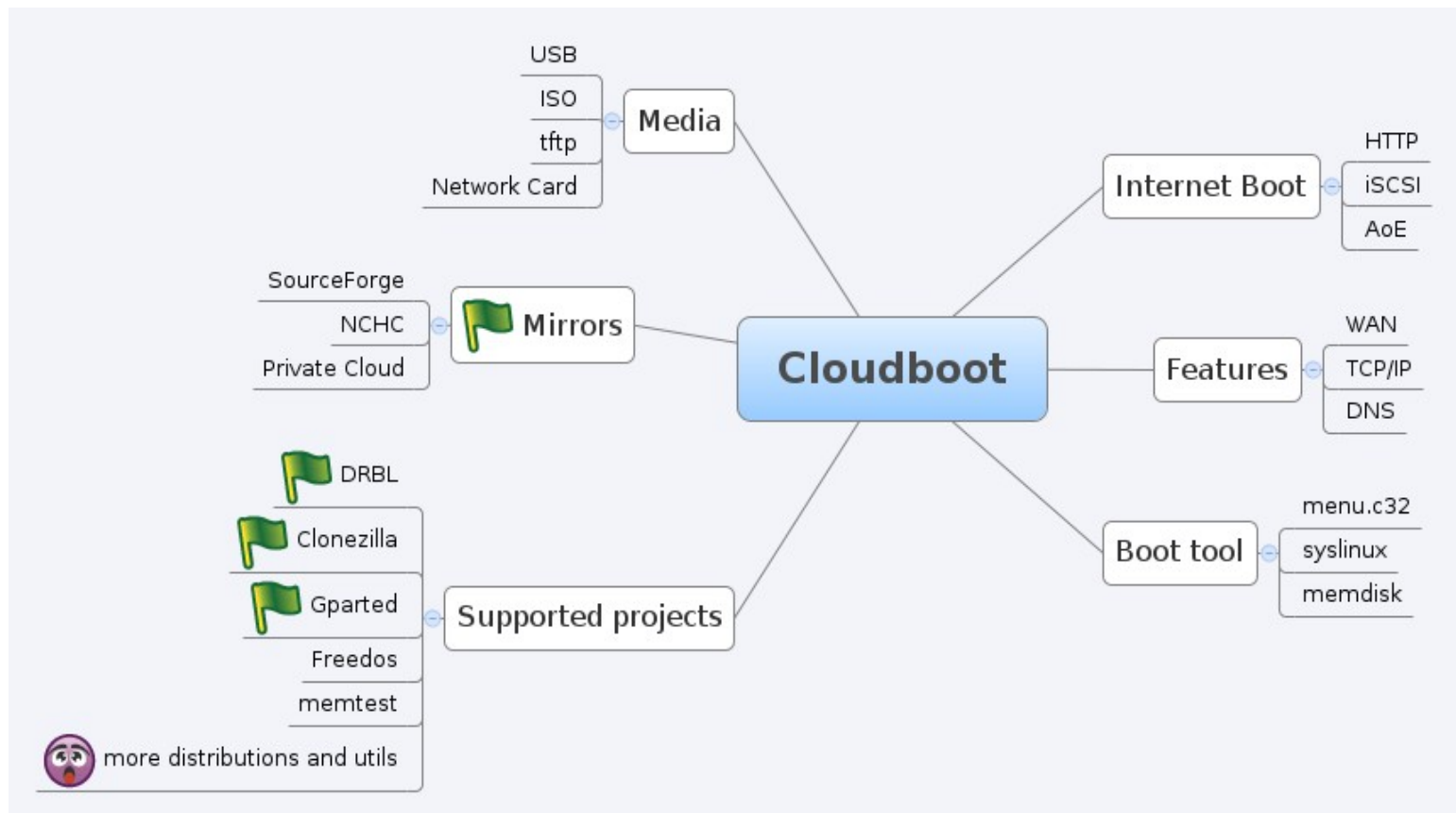
Feature

- A framework : Allow PCs to boot from cloud resources
- Booting special system or utility on any computer with a wired Internet connection
 - DRBL Live, Clonezilla Live, GParted, ... etc
 - Linux netinstall
- Easy to build your private Cloudboot service
- Ready for global Cloudboot
- Developing, beta version
- License - GNU General Public License (GPL)

<http://cloudboot.org>

Cloudboot Framework

- Based on iPXE, PHP & syslinux
- Use **iPXE Script** to access cloud boot resource. Then **PHP Script** accept command from iPXE and create **syslinux style MENU** for net-booting use.



clonezilla-stable	
clonezilla-stable Cloud Kernel from sf	>
clonezilla-stable Cloud Kernel from nchc	>
clonezilla-stable Cloud Kernel from local	>
clonezilla-stable Cloud ISO from sf	>
clonezilla-stable Cloud ISO from nchc	>
clonezilla-stable Cloud ISO from local	>

Press (Tab) to edit options

@rbl-stable	
drbl-stable Cloud Kernel from sf	>
drbl-stable Cloud Kernel from nchc	>
drbl-stable Cloud Kernel from local	>
drbl-stable Cloud ISO from sf	>
drbl-stable Cloud ISO from nchc	>
drbl-stable Cloud ISO from local	>

Press (Tab) to edit options

gparted-stable	
gparted-stable Cloud Kernel from sf	>
gparted-stable Cloud Kernel from nchc	>
gparted-stable Cloud Kernel from local	>
gparted-stable Cloud ISO from sf	>
gparted-stable Cloud ISO from nchc	>
gparted-stable Cloud ISO from local	>

Press (Tab) to edit options

Clonezilla

Free Software Labs
National Center for High-Performance Computing
Taiwan

DRBL

Free Software Labs
NCHC, Taiwan
自由軟體實驗室 國家高速網路與計算中心



Gnome Partition Editor

ISOLINUX 4.02 debian-20101014 EHDD Copyrig

iPXE ISO boot image

Loading ipxe.krn...ready.

iPXE initialising devices...ok

iPXE 1.0.0+ -- Open Source Network Boot Fi

Features: VLAN HTTP iSCSI DNS TFTP AoE SRP

Welcome to CLOUDBOOT

Current Network status:

net0: 52:54:00:12:34:56 using rtl8139 on P

[Link:up, TX:0 TXE:0 RX:0 RXE:0]

a) AUTO config network (Default)

b) Getting IP address from DHCP Server

c) Manual config network

d) Entering iPXE Shell

e) Config iPXE all options

clonezilla-stable Cloud
clonezilla-testing Cloud
clonezilla-alternative-stable Cloud
clonezilla-alternative-testing Cloud
drbl-stable Cloud
drbl-testing Cloud
drbl-unstable Cloud
gparted-stable Cloud
gparted-testing Cloud
other Cloud

Cloudboot

Free Software Labs NCHC, Taiwan

FreeBOS 1.0 Final (2006-July-30) INSTALLATION/LIVE CD	
1. Install to harddisk using FreeBOS SETUP (default)	
2. FreeBOS Safe Mode (don't load any drivers)	
3. FreeBOS Live CD with HIMEM + KMC006	
4. FreeBOS Live CD with HIMEM only	
5. FreeBOS Live CD only	

FreeBOS is a trademark of Jim Hall 1994-2006

```

FreeBOS 1.0 07-30
Intel Core Gen2 2491 MHz
L1 Cache: 32K 25603 MB/s
L2 Cache: 256K 20420 MB/s
L3 Cache: 3072K 191639 MB/s
Memory : 512M 40041 MB/s
Chipset :

```

4K e020

Press =F1= to enter Fail-Safe Mode

[11] Select a language

Choose the language to be used for the installation process. The selected language will also be the default language for the installed system.

Language:

Albanian	- Shqip
Arabic	- عربي
Asturian	- Asturianu
Basque	- Euskara
Belarusian	- Беларуская
Bosnian	- Bosanski
Bulgarian	- Български
Catalan	- Català
Chinese (Simplified)	- 中文(简体)
Chinese (Traditional)	- 中文(繁體)
Croatian	- Hrvatski
Czech	- Čeština
Danish	- Dansk

Select from Menu (12345), or press (ENTER) (Selection=2) 4

Singlestepping (F8) is: OFF

Clonezilla @ Linux Journal



- In Linux Journal, January 2011
- Report Clonezilla project and show in cover headline

Clonezilla –
High Performance Open- Source
Cloning

<http://www.linuxjournal.com/>

One of The Best Free Software of 2012

The Best Free Software of 2012

It's the fifth year of PCMag's look at the best stuff you don't have to pay for, and it's our biggest list of great free software yet.



By Eric Griffith

April 2, 2012

17 Comments



+1 170



Share



Tweet 958



Share 102

113

Digg



94

BACKUP/SYNC

24. Bvckup

<http://www.bvckup.com/>

Windows

Try not to think about how to pronounce Bvckup. Just know that when it comes to onsite backup, you now have a friend. It can handle real-time backup, copy only modified parts of files, and it doesn't take much memory to run. Get it now; it's only free while in beta testing.

25. Create Synchronicity

<http://synchronicity.sourceforge.net>

Windows | Portable

This small, multi-lingual program can run locally or portably to back up or sync files you specify when you create a profile.

26. Clonezilla Live

<http://www.clonezilla.org>

Contents

The Best Free Software of 2012

Anti-Malware & App Launchers

Archivers & Audio

Backup/Sync

Bittorrent & Blogging/Journaling

Browsers, Calendar/PIM & Clipboard

Communication & Conferencing & Disk Utilities

- PC Magazine
- The Best Free Software of 2012
- Backup/Sync category



<http://www.pcmag.com/article2/0,2817,2381535,00.asp>

Use case in enterprise

- Nagappan Alagappan from VMware
 - Palo Alto, CA, USA
 - “As a product company, we need to test our product in all popular operating system, when exploring different opportunity, we found Clonezilla appropriate, Reason: It support all the Linux distribution (RedHat, SUSE, Ubuntu, Mandriva) and different file system, which we use (ext3, ext4, reiserfs)”
 - Initially evaluated Clonezilla live and found a very good performance, Windows XP image restoration 7 minutes, Ubuntu 3 minutes, SUSE / RHEL 5 minutes from a NFS server.
 - Later we (in VMware) have implemented a service, which will automate the Clonezilla reimaging part, without any manual intervention.”

Use case in enterprise

- Juergen Chiu
- Canonical Ltd. Taipei, Taiwan
- Clonezilla helps me a lot in **system backup, recovery and ISO image creating**
 - "In my job, I need to handle different type of system and create the ISO image for customers. Your great tool, Clonezilla, helps me a lot in system backup, recovery and ISO image creating. **I only need to download the Clonezilla zip file, and create the bootable usb key in few easy steps, then I can use that key to backup the systems and create the ISO image by the same key.** And the key is just the recovery partition as I need. All procedures take me only about 1 hour to finish all stuffs. I love your tool and that is really cover all functions what I need to have in Linux system recovery scope. Clonezilla is the best all-in-one tool that I have never seen before."

Use case in enterprise

MIRACLE System Savior(MSS)

- As an Disaster Recovery Solution in enterprise:
- HP Blade Server with multipath in Storage Area Network. VMWae EXSi Server with Red Had Enterprise Linux, Windows guests.
- Backup/Recovery systems in just few minutes.



Use case in community



- Christian , WMOC 2012 , Germany
- World Masters Orienteering Championships
- Use Clonezilla and DRBL-Winroll to deploy over 20 laptop for the contest.
 - “All runners carried a transponder chip on their fingers, to which the control stations they had to find and "punch" wrote timestamps. After they reached the finish line, we read out their transponder chips to check if they completed the course and calculate their times. In the tent there are five laptops with their operators and printers. Overall we had over 20 laptops in use for readout, problem handling, results printing, publishing, entries management, radio control times, speaker support etc.”



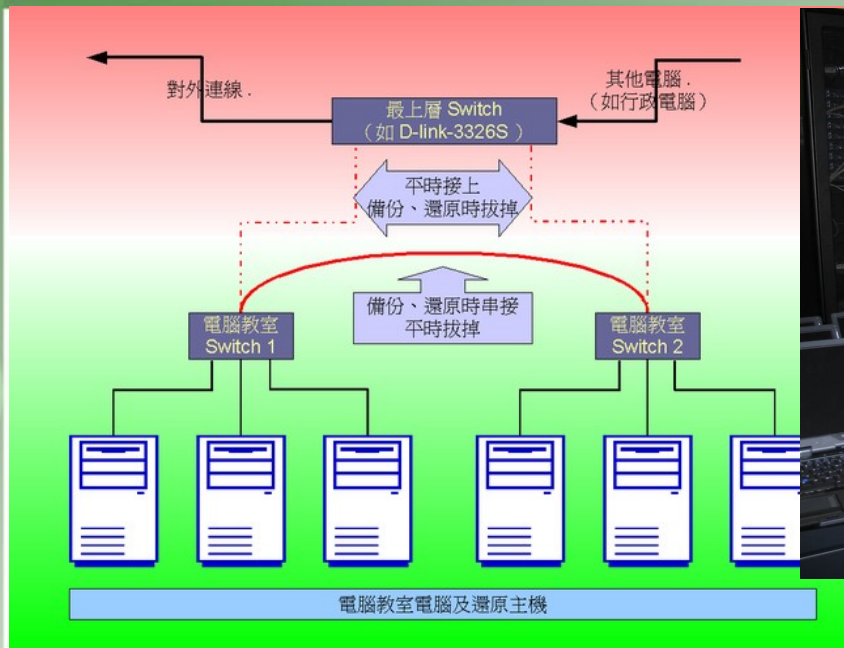
Source: Christian
<http://wmoc2012.de> and <http://goslarsche.de>

Clonezilla Used in Taiwan's "National PCs"



Source: De-Wen Huang

Use case in Education



Limitations of Clonezilla

- The destination partition must be **equal** or **larger** than the source one
- Recovery Clonezilla live with **multiple CDs or DVDs** is not implemented yet
- Differential/incremental backup is not implemented yet
- Live imaging/cloning is not implemented yet
- Software RAID/fake RAID is not supported by default (extra manual processing is required)



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Save an image

- Clonezilla Live
 - <http://clonezilla.org/clonezilla-live>
- A running Ubuntu 12.04 system
 - Text mode only. The whole system uses about 1.3 GB space. Using grub2 as boot loader.
 - /dev/sda1 is used as swap partition
 - /dev/sda2 on / and /dev/sda3 on /home with **ext4** and **reiserfs**
- Use Clonezilla live to save the whole disk as an image
 - Use sshfs as repository



Clonezilla Live Demo (2)

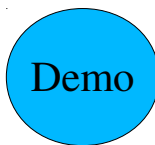
Unattended recovery CD or USB flash drive

- Scenario: your customer need a recovery solution
- How:
 - Have **an image ready** first
 - Use a machine with RAM \geq 768 MB
 - Boot Clonezilla live
 - **Mount the image repository**
 - Select "**recovery-iso-zip**" option then follow the steps

```
Clonezilla: Select mode
*Clonezilla is free (GPL) software, and comes with ABSOLUTELY NO WARRANTY*
This software will overwrite the data on your hard drive when restoring! It is recommended to
backup important files before restoring!***
///Hint! From now on, if multiple choices are available, you have to press space key to mark
your selection. An asterisk (*) will be shown when the selection is done///
Select mode:

savedisk          Save_local_disk_as_an_image
saveparts         Save_local_partitions_as_an_image
restoredisk       Restore_an_image_to_local_disk
restoreparts      Restore_an_image_to_local_partitions
recovery-iso-zip  Create_recovery_Clonezilla_live
chk-img-restorable Check_the_image_restorable_or_not
exit              Exit. Enter command line prompt

<OK>                <Cancel>
```



Mass Deployment with Multicast by SE

- Scenario: to deploy PCs in computer classroom with one image
- How:
 - Have **an image ready** first
 - Select multicast to restore disk
 - Installation and configuration ready with Clonezilla SE (DRBL Live)
 - Boot DRBL live,
 - **Configure Clonezilla SE environment : network / sshfs as image repository**
 - Choose "**multicast**" and "**restoredisk**" option then follow the steps

One Image to Multi Devices Deployment

- Scenario: to deploy USB sticks with same image one time
- How:
 - Have **an image ready** first
 - Use sshfs as image repository
 - Mount 4 hard disk to simulate USB sticks
 - Boot DRBL Live CD,
 - **Mount the image repository**
 - Choose "**1-2-mdisks**" and "**restoredisk**" option then follow the steps



Future Work/Wishlist

- Software RAID/FakeRAID support
- File-based imaging
- Recovery Clonezilla live with multiple CDs or DVDs
- More file systems support, ZFS, Minix...
- Encryption file system support. Encryption for the image
- Scheduling
- VLAN setting
- ISCSI source disk
- Password protection
- LVM without partition
- GUI
- ...



Other projects we have...

- DRBL (Diskless Remote Boot in Linux)
- DRBL-winroll
- Tux2live
- Partclone
- Tuxboot
- Cloudboot (beta)

Other cloud relative in NCHC

- Ezilla
- Haduzilla
- Crawlzilla



Partclone

Support multi file system backup

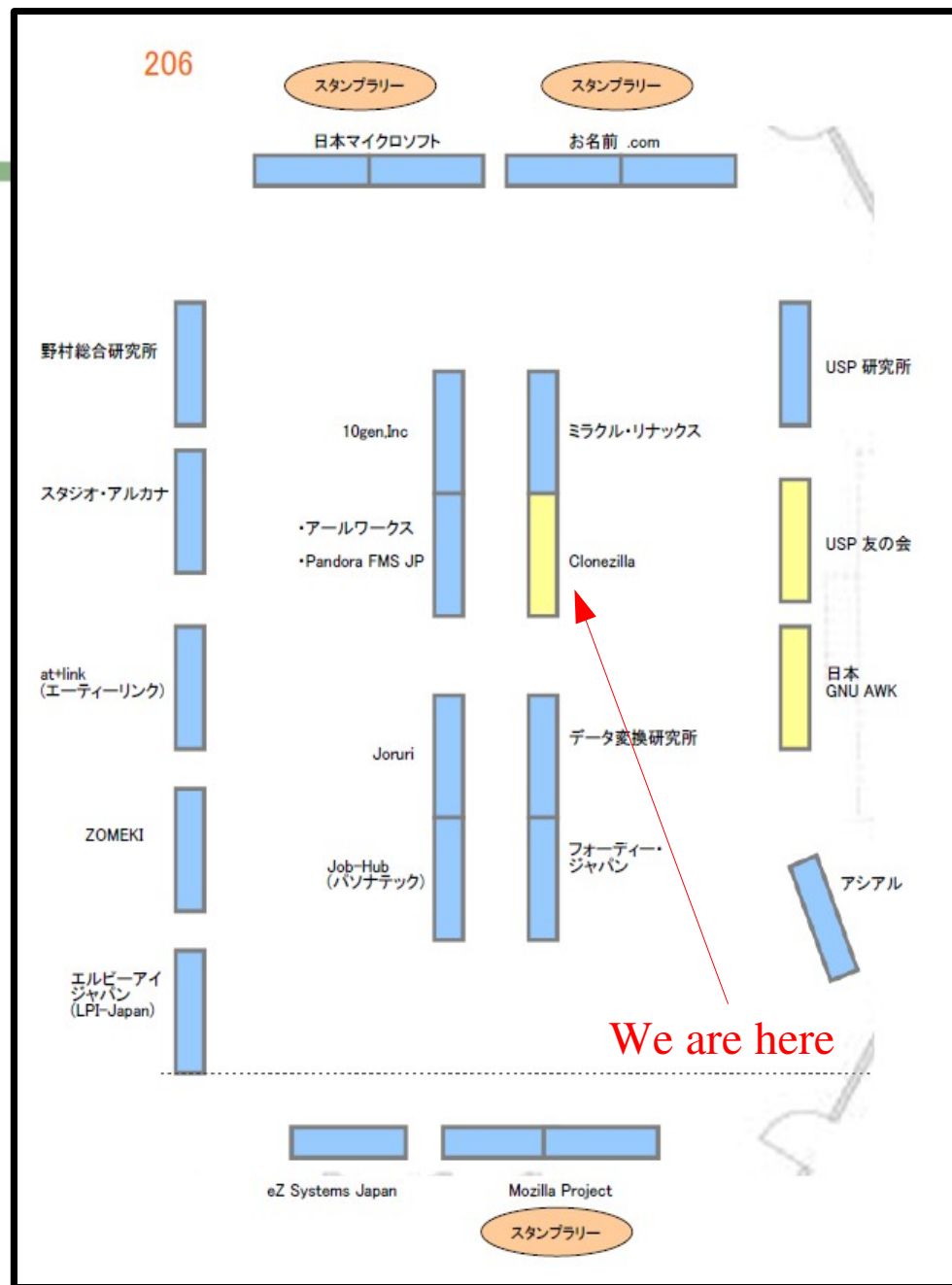


Tux2live

Build your Linux live system from HD

Our Booth...

- 展示スペース,
2F, Room 206
- More detail for:
 - Other projects
 - Demonstrations
 - Instructions
 - Others



Reference

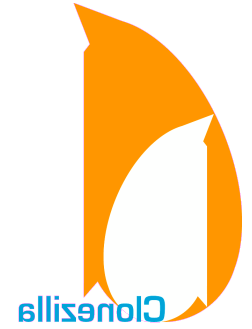
- Clonezilla
 - *<http://clonezilla.org>*
- DRBL
 - *<http://drbl.org>*
- DRBL-Winroll
 - *<http://www.drbl-winroll.org>*
- Debian Live
 - *<http://live.debian.net/manual/>*
- Syslinux
 - *<http://syslinux.zytor.com>*
- Gparted
 - *<http://gparted.sf.net>*

Questions ?

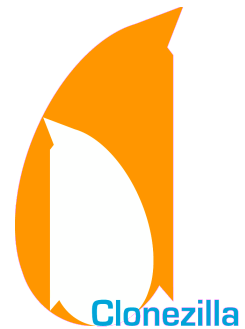
Great!



??????



Appendix



Bare Metal Recovery

- The term “Bare Metal” refers to a computer that does not contain an operating system and data.
- Bare Metal Recovery/Restore
 - It means to the process of restoring data to a "bare metal" component
 - Typically the process includes **reinstalling the operating system and software applications** and then, if possible, **restoring data and configurations..**
- When need to do ?
 - Mass deployment
 - Disaster recovery
 - Hardware replacement/crash
 -



Bare Metal Recovery (cont')

- **Available types:**
 - **Block-based** (image) recovery (e.g. 'dd')
 - **File-based** recovery (e.g. 'cp', 'tar', 'rsync'...)
 - **Mix both**: combine file base with block information
- **Use different tool for different purpose**
 - **Save a lot of time if choose right toolkit**



Terminology

- Raw copying*
 - A possibility to perform sector-by-sector copying of a whole **partition**
- Smart copying*
 - A possibility to **distinguish which portions of the partition** really contain data and to copy these only
- Live copying*
 - A drive or volume can be copied/imaged **while it is in use**, avoiding the need for booting into a separate operating system or Live CD.
- Smart copy full disk
 - A possibility to **distinguish which portions of the disk** really contain data and to copy these only

* The descriptions are from http://en.wikipedia.org/wiki/Comparison_of_disk_cloning_software

Bare Metal Recover Tools

	URL	Version
Clonezilla live	clonezilla.org	1.2.8-46
FOG	www.fogproject.org	0.30
Fsarchiver	www.fsarchiver.org	0.6.12
G4L	g4l.sourceforge.net	0.37
Mondo Rescue	www.mondorescue.org	2.2.9.6
Partimage	partimage.org	0.6.9*
Acronis® True Image	www.acronis.com	2011
Norton Ghost™	www.symantec.com	15.0

Free /Open Source Software

Proprietary Software

- About these comparisons:
Please let us know if the information in comparisons is not correct.

Comparison – General Info

	Interface	Provides Live USB	Provides Live CD	Live copying	Differential backup	Based on	License
Clonezilla	TUI	Y	Y	N	N	partclone	GPL
FOG	GUI	N	N	N	N	partimage	GPL
Fsarchiver	CML	Y	Y	Y	Y		GPL
G4L	TUI	Y	Y	N	N	g4u, dd, partimage, ntfsclone	GPL
Mondo Rescue	TUI	Y	Y	Y	Y	afio, mondi	GPL
Partimage	TUI	Y	Y	N	N		GPL
True Image	GUI	Y	Y	Y	Y	Proprietary	Proprietary
Ghost	GUI	Y	Y	Y	Y	Proprietary	Proprietary

Comparison – General Info(cont')

	Smart copy full disk (No LVM2, no firmware RAID)	Smart copy full disk with LVM2	Smart copy full disk with firmware RAID	Raw copying	Without server	Server/client
Clonezilla	Y	Y	N	Y	Y	Y
FOG	Y	N	N	Y	N	Y
Fsarchiver	N	N	N	N	Y	N
G4L	N	N	N	Y	N	Y
Mondo Rescue	Y	Y	N	Y	Y	N
Partimage	N	N	N	N	Y	Y
True Image	Y	Y	N	Y	Y	Y
Ghost	Y	N	N	Y	Y	Y

Comparison – **Smart** Copying File Systems of Linux



	ext2/3	ext4	reiserfs	reser4	xfs	jfs	btrfs
Clonezilla	Y	Y	Y	Y	Y	Y	Y
FOG	Y	N	Y	N	Y	Y	N
Fsarchiver	Y	Y	Y	Y	Y	Y	Y
G4L	Y	N	Y	N	Y	Y	N
Mondo Rescue	Y	Y	Y	Y	Y	Y	Y
Partimage	Y	N	Y	N	Y	Y	N
True Image	Y	Y	N	N	N	N	N
Ghost	Y	N	N	N	N	N	N

Comparison – **Smart** Copying File systems of Other Oses



	HFS+ (Mac)	FAT (MS Win)	NTFS (MS Win)	UFS (*BSD)	VMFS (Vmware Esx(i))
Clonezilla	Y	Y	Y	Y	Y
FOG	N	Y	Y	N	N
Fsarchiver	N	N	Y	N	N
G4L	N	Y	Y	N	N
Mondo Rescue	N	Y	N	N	N
Partimage	N	Y	Y	N	N
True Image	N	Y	Y	N	Y
Ghost	N	Y	Y	N	N



Advanced Usage with Clonezilla Live



Clonezilla Live Demo (2)

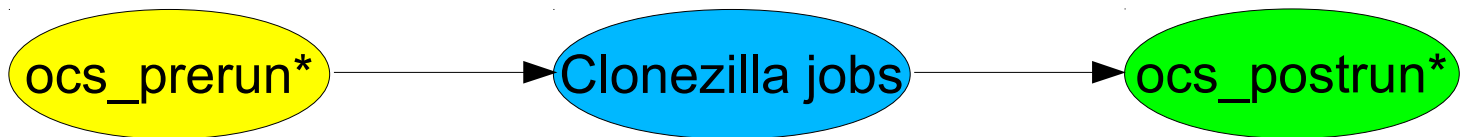
Restore an image

- A running Ubuntu 12.04 system
 - Text mode only. The whole system uses about 1.3 GB space
 - /dev/sda1 on / (grub2) and /dev/sda5 on / with **ext4**
 - /dev/sda3 is used as swap partition
- Destroy the whole system by:
 - `dd if=/dev/zero of=/dev/sda1 bs=1M count=10`
 - `dd if=/dev/zero of=/dev/sda3 bs=1M count=10`
 - `dd if=/dev/zero of=/dev/sda bs=1M count=10`
- Recover the whole system by Clonezilla live with a previous saved image via sshfs



Pre-process and post-process when restoring a system

- **Boot parameters provide a mechanism to preset some options => Set in the config file of isolinux, syslinux, pexelinux or grub.**
- Besides the boot parameters from Debian live, Clonezilla also provides **ocs_prerun*** and **ocs_postrun*** parameters
- **ocs_prerun*** is for pre-process, right before Clonezilla job is run and **ocs_postrun*** is for post-process, right after the Clonezilla job is done.
- **Limitation:** No double quotation mark (“) or single quotation mark (') in your command.





Pre-process and post-process when restoring a system (cont')

- The order to run is:
 - `ocs_prerun1, ocs_prerun2, ocs_prerun3...`
 - `ocs_postrun1, ocs_postrun2, ocs_postrun3...`
- Examples
 - To do a file system check for 1st partition, use:
`ocs_prerun1="fsck /dev/sda1"`
 - To lease an IP address from a DHCP server:
`ocs_prerun1="dhclient -v eth0"`
 - To mount a file system and modify a file after restoring:
`ocs_postrun1="mount /dev/sda1 /mnt" ocs_postrun2="sed -i -e s/old/new/ /etc/hostname" ocs_postrun3="umount /mnt"`
- Boot parameters doc are available on <http://clonezilla.org>



Unattended recovery with a file server

- Scenario: You have **a file server** and want to use **a CD of Clonezilla (no image included)** to restore different machines
- How
 - Have **an image ready** on the file server first
 - Use boot parameters to make that, e.g. for NFS server:
 - append `initrd=/live/initrd.img boot=live config noswap nolocales edd=on nomodeset noprompt ocs_prerun1="dhclient -v eth0" ocs_prerun2="sleep 2" ocs_prerun3="mount -t nfs 192.168.120.254:/home/partimag /home/partimag" ocs_live_run="ocs-sr -g auto -e1 auto -e2 -b -r -j2 -p reboot restoredisk squeeze-updated-20110711 sda" ocs_live_extra_param="" ocs_live_keymap="NONE" ocs_live_batch="no" ocs_lang="en_US.UTF-8" vga=788 ip=frommedia nosplash`
 - Here we preset (1) the keymap as default (NONE, i.e. US keymap), (2) the language as English (en_US.UTF-8), (3) configure the network, (4) mount the image repository on NFS server, and (5) run the restoring command



Unattended recovery with a file server (cont')

- The complete command for ocs_live_run can be gotten from the Clonezilla wizard

```
Clonezilla - Opensource Clone System (OCS) | Mode: restoredisk
Choose the target disk(s) to be overwritten (ALL DATA ON THE ENTIRE DISK WILL BE LOST AND
REPLACED!!)
The disk name is the device name in GNU/Linux. The first disk in the system is "hda" or "sda",
the 2nd disk is "hdb" or "sdb"... Press space key to mark your selection. An asterisk (*) will
be shown when the selection is done:

sda 8590MB_VMware_Virtual_I_ata-VMware_Virtual_IDE_Hard_Drive_00000000000000000001
sdb 18.3GB_VMware_Virtual_I_ata-VMware_Virtual_IDE_Hard_Drive_11000000000000000001

<Ok>                                <Cancel>
```

```
*****
ps. next time you can run this command directly:
/opt/drbl/sbin/ocs-sr -g auto -e1 auto -e2 -c -r -j2 -p true restoredisk squeeze-updated-20110711 sd
a
This command is also saved as this file name for later use if necessary: /tmp/ocs-squeeze-updated-20
110711-2011-07-12-08-57
Press "Enter" to continue... _
```



A customized live CD for remote troubleshooting

- Scenario: Your customer want you to do a remote troubleshooting, however, he knows nothing about GNU/Linux.
- How
 - For remote troubleshooting, you need
 - Network connection after booting
 - Password for the account “user” need to be changed (The default password is “live”)
 - Ssh service is started automatically
 - `append initrd=/live/initrd.img boot=live config noswap nolocales edd=on nomodeset noprompt ocs_prerun1="dhclient -v eth0" ocs_prerun2="sleep 2" usercrypted=WwLqQXIdMIzoo ocs_daemonon="ssh" ocs_live_run="/bin/bash" ocs_live_keymap="NONE" ocs_live_batch="no" ocs_lang="en_US.UTF-8" vga=788 ip=frommedia nosplash`
 - The encrypted password of “user” was obtained by `echo YOUR_PASSWORD | mkpasswd -s`



Serial console and PXE booting usage

- Scenario: A cluster with serial console only, no VGA connection
- For serial console, 2 boot parameters are required to redirect the screen output:
 - **live-getty** and **console**, e.g. append them to the previous case:
 - `append initrd=/live/initrd.img boot=live config noswap nolocales edd=on nomodeset noprompt ocs_prerun1="dhclient -v eth0" ocs_prerun2="sleep 2" usercrypted=WwLqQXIdMIzoo ocs_daemonon="ssh" ocs_live_run="/bin/bash" live-getty console=ttyS0,38400n81 ocs_live_keymap="NONE" ocs_live_batch="no" ocs_lang="en_US.UTF-8" vga=788 ip=frommedia nosplash`



What if boot parameters can not do?

- In this case, modify the root file system. The difference is, it's **a read-only file system**.
- How → copy then rebuild
 - Unsquashfs the root file system “filesystem.squash” of Clonezilla live, modify it.
 - `mkdir ~/zip-tmp ~/squashfs-tmp`
 - `unzip clonezilla-live-1.2.12-55-i686-pae.zip -d ~/zip-tmp`
 - `cp ~/zip-tmp/live/filesystem.squashfs ~/squashfs-tmp`
 - `cd ~/squashfs-tmp; sudo unsquashfs filesystem.squashfs`
 - Modify the files in squashfs-root, e.g. add some files.



What if boot parameters can not do? (cont')

- Rebuild the new filesystem.squashfs and replace the original one ,then rebuild clonezilla-live zip file:
 - `sudo mksquashfs squashfs-root filesystem.squashfs.new -b 1024k -comp xz -Xbcj x86 -e boot`
 - `sudo cp filesystem.squashfs.new ~/zip-tmp/live/filesystem.squashfs`
 - `cd ~/zip-tmp ; sudo zip -r ../clonezilla-live.new.zip ./*`



Project of the Month, January 2010

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Project of the Month, January 2010

Clonezilla

Clonezilla is a partition or disk clone tool similar to Norton Ghost. It saves and restores only the used blocks in the hard drive. Two types of Clonezilla are available, Clonezilla live and Clonezilla SE (Server Edition). The filesystem supported by Clonezilla are: ext2, ext3, ext4, reiserfs, xfs, jfs of GNU/Linux, FAT, NTFS of MS Windows, and HFS+ of Mac OS. Therefore you can clone GNU/Linux, MS windows and Intel-based Mac OS whether they be 32-bit (x86) or 64-bit (x86-64) OS. For these file systems, only the used blocks in the partition are saved and restored. For unsupported file systems, a sector-to-sector copy is done by dd in Clonezilla.

Why and how did you get started?

On the 29th of March, 2003, the computers in the computer classrooms at the National Center for High-Performance Computing (NCHC, <http://www.nchc.org.tw>) were all upgraded. However, the deployment software did not support the new hardware. That's why we started the Clonezilla project. In the beginning, we started the Clonezilla server edition first, then, in 2007, Clonezilla live was created.

Who is the software's intended audience?

System administrators, that being, PC cluster administrators, computer classroom administrators, and of course anyone who needs a tool to clone or image his/her computer.

What are a couple of notable examples of how people are using your software?

* The National Computer Centre Women, Netherlands, used Clonezilla to, "clone a 3 GB image to 27 machines with an average speed was 2.4 GB/min."

* Cisco Systems used DRBL, "...in the design of our Cisco Computational Cloud cluster to multicast a 5 GB disk image to 64 machines simultaneously."

* Information Systems Security, Southbridge, Massachusetts, USA, said, "So far, I have cloned 1,084 systems using DRBL. By carefully following the instructions on the DRBL website, and using multicasting and dividing the number of systems into groups of 80-100 PCs at the time, it took me somewhere between 16-38 minutes for each group of PCs, using images of various operating systems that averaged 1 GB in size. DRBL has reduced the recovery/cloning factor by more than 500% as compared with the previous commercial solution [we were] using"

Project name: Clonezilla

Date founded: July 2004

Project page: <https://sourceforge.net/projects/clonezilla/>

Project Leader

Steven Shiau

Occupation: Researcher at the NCHC, Taiwan

Location: Hsinchu, Taiwan

Education: M. S. (Nuclear Engineering), National Tsing Hua University, Taiwan



Key Developers

Blake, Kuo-Lien Huang

Occupation: Open source hobbyist

Education: M. S.

Location: Hsinchu, Taiwan



Chenkai (Ceasar) Sun

Occupation: Associate Researcher at the NCHC, Taiwan

Education: M. S. (Department of Management Information System) National Sun Yat-Sen University, Kaohsiung, Taiwan

Location: Hsinchu, Taiwan



Yao-Tsung (Jazz) Wang

Occupation: Associate Researcher at the NCHC, Taiwan



Use case in enterprise

- Barny Sanchez
- Information Systems Security, Southbridge, Massachusetts
- Cloned **1,084** systems using DRBL (Clonezilla SE)
 - "I've used DRBL to clone 1,084 systems so far! It was simple! All I had to do was divide each system into groups of **80-100 PCs** and then use multicasting to do the cloning. It took anywhere from **16-38 minutes** to clone each system. The images of various operating systems averaged 1 GB in size. DRBL has reduced the recovery/cloning factor by **more than 500%** as compared to the commercial solution I used previously! You can imagine how happy my project managers are!"