Clonezilla: your future imaging, cloning and deployment system

Steven Shiau, Ceasar Sun,

Jazz Wang, Thomas Tsai

http://clonezilla.org

National Center for High-Performance Computing

Taiwan

Q4, 2013

Outline

- Introduction to Clonezilla
  - Features
  - How
  - Limitations
  - Use cases
- Q&A

System imaging and cloning - backup

image source: maggiesfarm.anotherdotcom.com
www.compsults.com, and jervisdabreo.com

Massive system deployment

About us

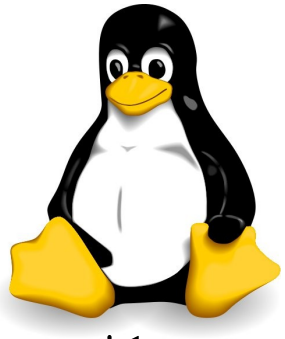
- Developers of the free software DRBL, Clonezilla and more...
- Steven is also the maintainer of GParted live CD
- From Taiwan, working for the NPO NCHC (National Center for High-Performance Computing)

NCHC 財團法人國家實驗研究院 國家高速網路與計算中心
National Center for High-Performance Computing
Better HPC Better Living

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

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*3

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VMFS

VMware ESX/ESXi

*5

*6

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

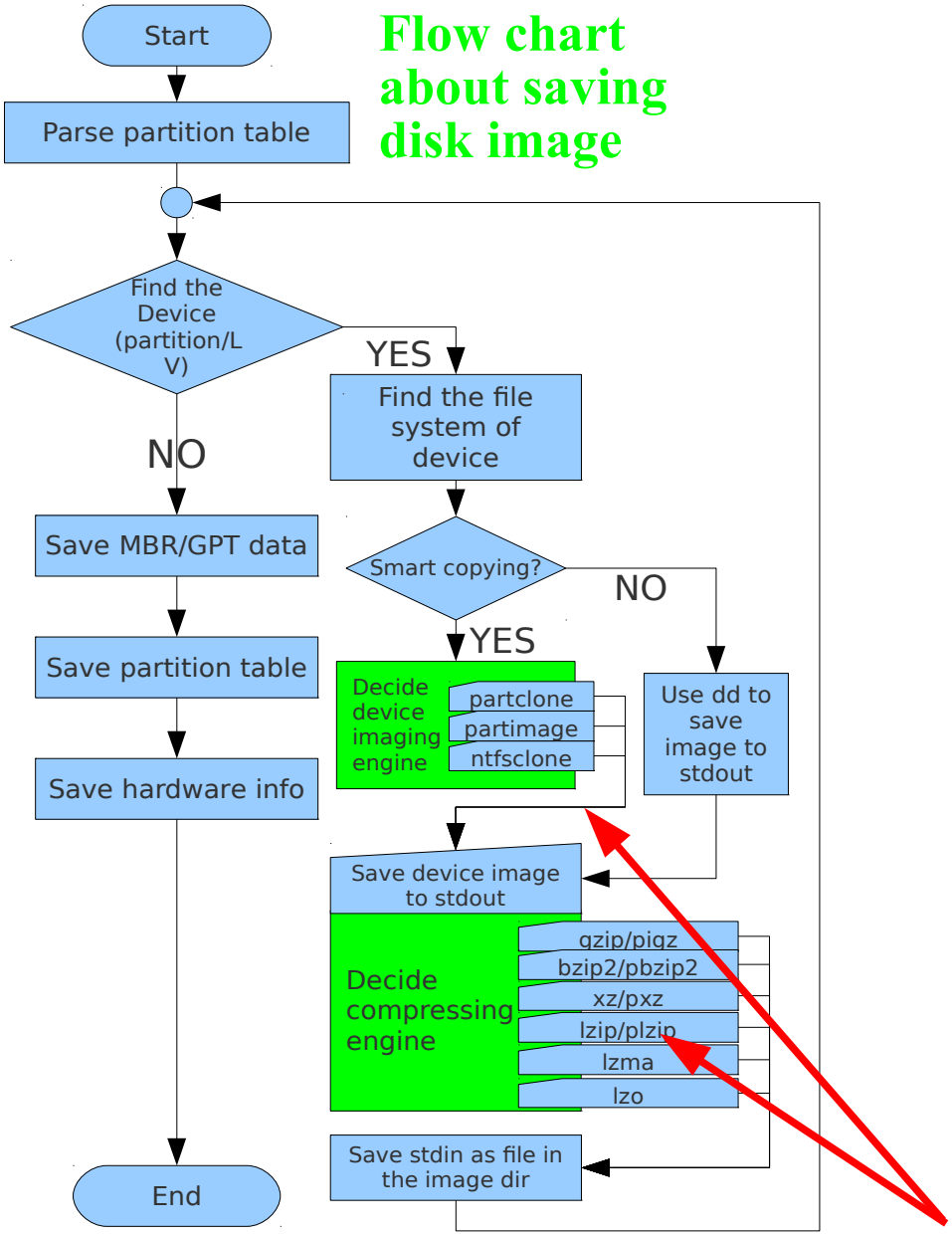
Clonezilla Feature

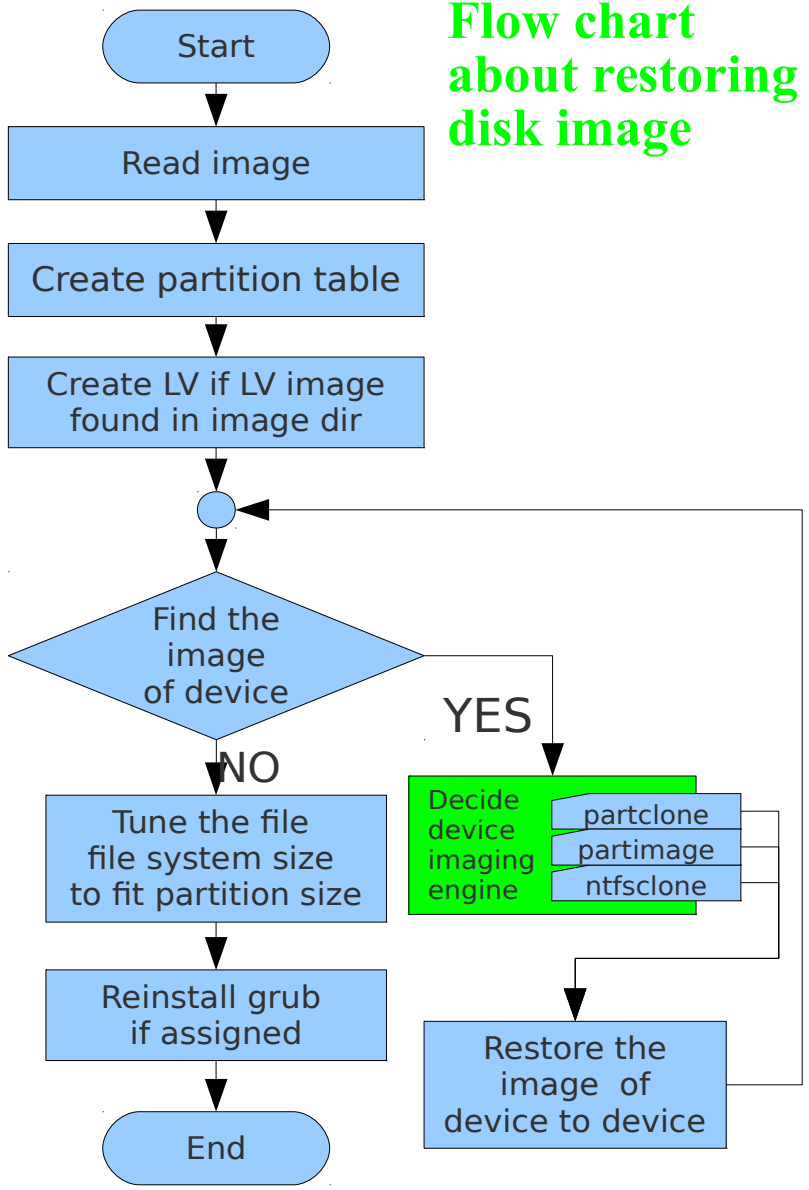
- Free (GPL) Software
- File systems supported:
  - Ext2/3/4, ReiserFS, Reiser4, XFS, JFS, HFS+, BrtFS, UFS, Minix, VMFS, FAT and NTFS
  - Supports LVM2
  - Support some hardware RAID chips (by kernel)
- Smart copying for supported filesystem. For unsupported file systems sector-to-sector copying is 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

Clonezilla

- Clonezilla [OCS (Opensource Clone System)]
  - Integrate Partclone (http://partclone.org/), Partimage, ntfsclone 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 type of release
  - Live edition
  - Server edition (SE)

Save and Restore procedure of Clonezilla

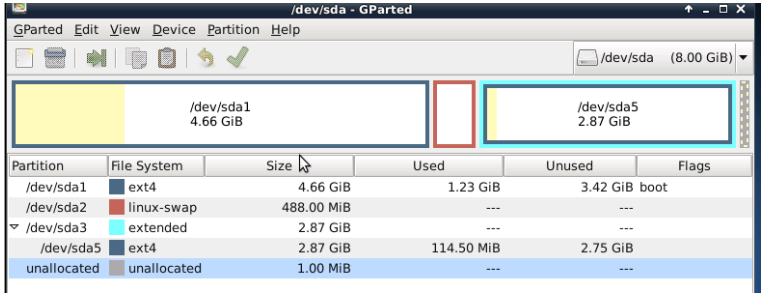




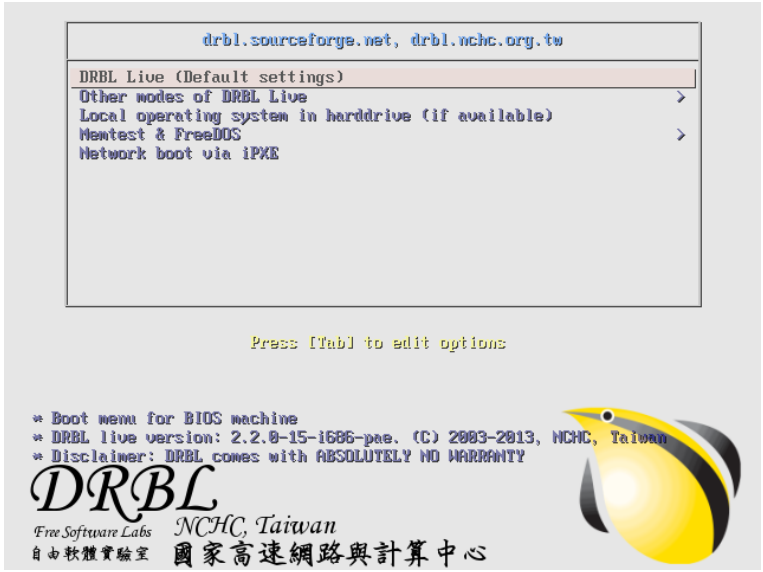
Imaging and compressing engines can be easily added

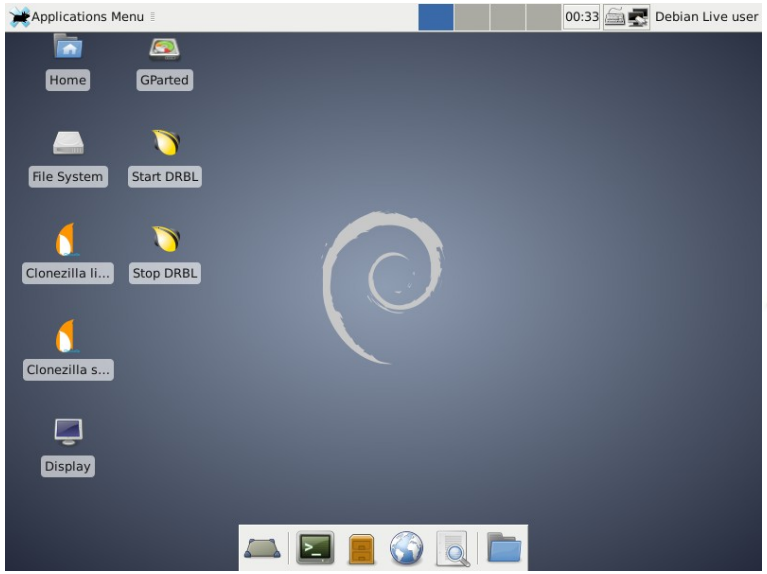
Open and Flexible Format of Clonezilla Image

```
$ ls -alFh /home/partimag/precise-20120503/
total 330M
drwxr-xr-x  2 root root 4.0K May  3 15:23 ./
drwxr-xr-x 68 root root  12K May  5 16:19 ../
-rw-r--r--  1 root root   69 May  3 15:23 clonezilla-img
-rw-r--r--  1 root root    4 May  3 15:23 disk
-rw-r--r--  1 root root 171K May  3 15:23 Info-dmi.txt
-rw-r--r--  1 root root  80K May  3 15:23 Info-lshw.txt
-rw-r--r--  1 root root 4.5K May  3 15:23 Info-lspci.txt
-rw-r--r--  1 root root  239 May  3 15:23 Info-packages.txt
-rw-r--r--  1 root root   10 May  3 15:23 parts
-rw-------  1 root root 328M May  3 15:23 sda1.ext4-ptcl-img.gz.aa
-rw-------  1 root root 1.5M May  3 15:23 sda5.ext4-ptcl-img.gz.aa
-rw-r--r--  1 root root   36 May  3 15:22 sda-chs.sf
-rw-r--r--  1 root root 1.0M May  3 15:22 sda-hidden-data-after-mbr
-rw-r--r--  1 root root  512 May  3 15:22 sda-mbr
-rw-r--r--  1 root root  443 May  3 15:22 sda-pt.parted
-rw-r--r--  1 root root  310 May  3 15:22 sda-pt.sf
-rw-r--r--  1 root root   53 May  3 15:23 swappt-sda2.info
```

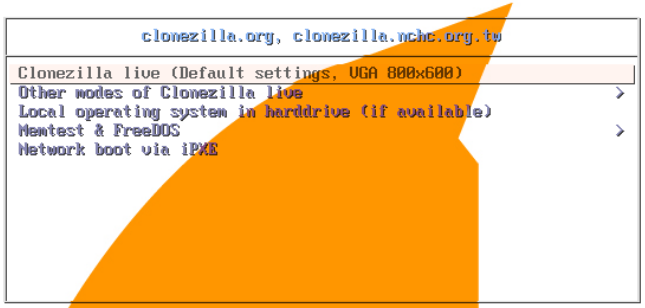


DRBL live,
i.e. Clonezilla Server Edition



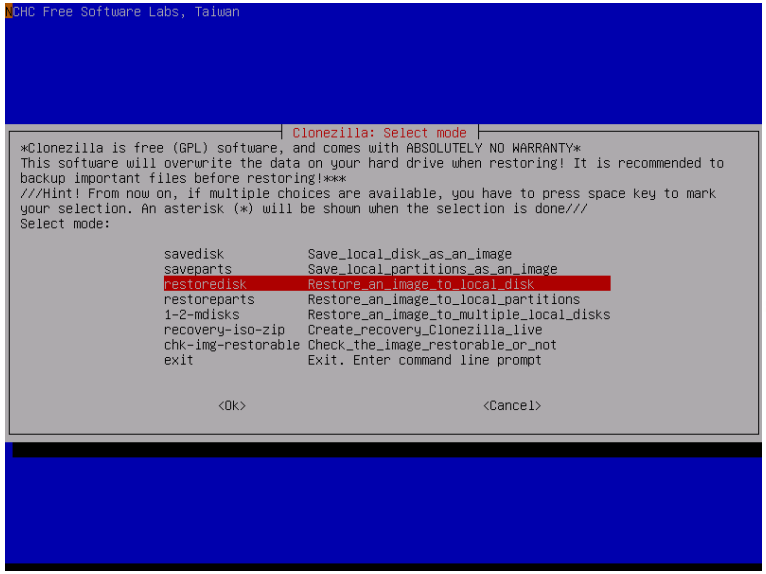


Clonezilla Live



Clonezilla

Free Software Labs
National Center for High-Performance Computing
Taiwan



Clonezilla live and DRBL live are downstreams of Debian Live

- Debian live downstream: Amnesic Incognito, Canaima, Canonical OEM Services, Clonezilla live, Debian Eee PC, Debian KDE, DRBL live, FAI, GParted, Grml...
- Boot parameters of Debian Live also work for Clonezilla live and DRBL live
- More on http://live.debian.net/project/downstream/

Ref: http://live.debian.net/project/about/

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.

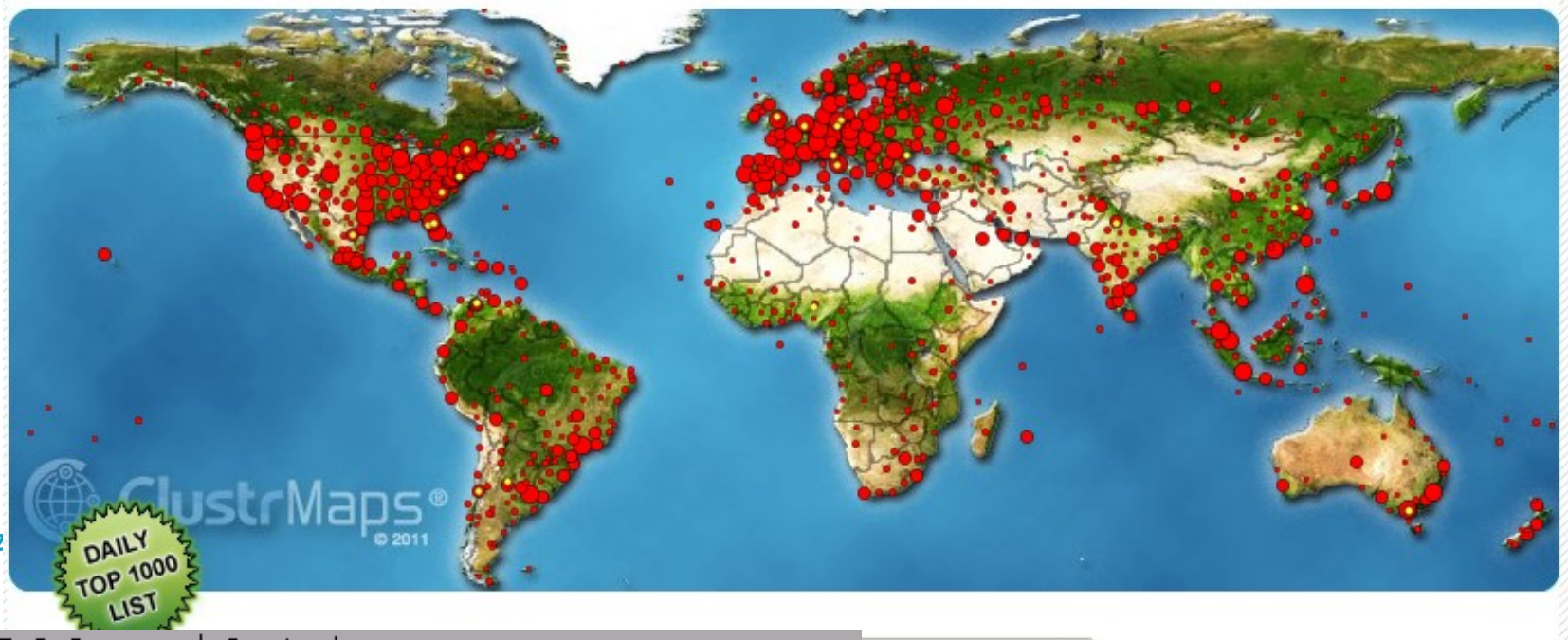
Bugs Report/Patches

- 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-aptimize
- 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 Users Worldwide

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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
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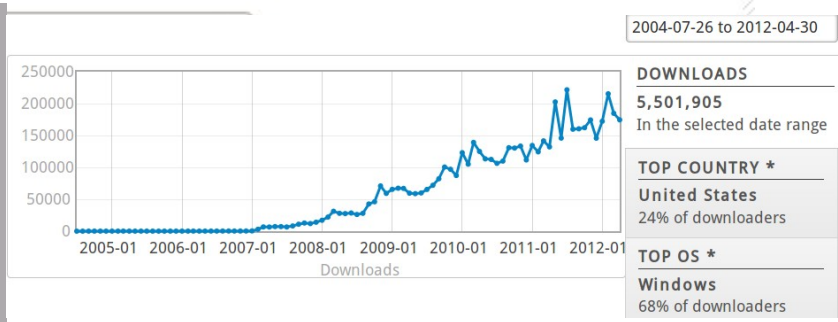

>8,500,000 downloads

Project of the Month, January 2010

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 Wonen, 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

Clonezilla @ Linux Journal

- In Linux Journal, January 2011
- Report Clonezilla project and the 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 | Email | Print

+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

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Bittorrent & Blogging/Journ
Browsers, Calendar/PIM & Clipboard
Communicatior Conferencing & Disk Utilities

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

Clonezilla

PC PCMAG.COM

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

InfoWorld: The Best Open Source Admin Tools 2013

Bossie Awards 2013: The best open source admin tools

InfoWorld's top picks among all the handy open source tools that make life easier for sys admins

By InfoWorld staff, InfoWorld, September 17, 2013

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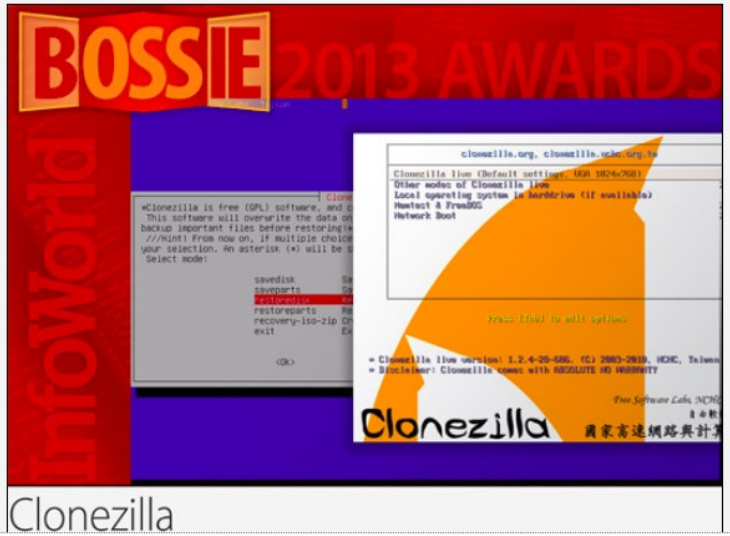


Clonezilla

Sys admins will love this open source clone of Norton Ghost. The Clonezilla disk imaging software supports major partition and file system types, and a server edition of the program can clone multiple computers simultaneously from a single disk image. Clonezilla can also take advantage of multicast to push images to large numbers of computers if they support PXE booting and Wake-on-LAN.

For maximum cloning efficiency, Clonezilla saves (and restores) only the disk blocks actually in use on supported file systems. For imaging Windows computers, Clonezilla can use the open source drbl-winroll to handle hostnames,

http://www.infoworld.com/slideshow/119968/bossie-awards-2013-the-best-open-source-admin-tools-226964#slide5 [3/4] 1

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

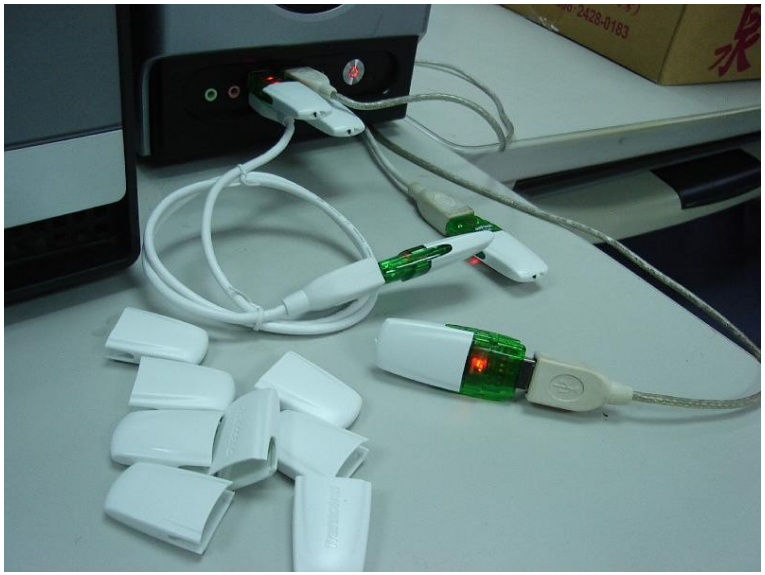
- Juergen Chiu
- Canonical Ltd. Taipei, Taiwan
  - Clonezilla helps me a lot in system backup , recovery and ISO image creating
    - "In my job, I need to handle different type of system and create t he ISO image for customers. Your great tool, Clonezilla, helps m e a lot in system backup, recovery 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 s ystems 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

- 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!"

Use case in Education

- Alvin Su
  - Shen-Mei Elementary School, Taiwan
- Cloned more than 100 USB flash drives , each with 3 GB OS and data. Every batch 8 USB flash drives, ~ 30 mins



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)

Changes and features from July/2012

- Path changed. All the Clonezilla-related files are now in /usr/sbin/, /usr/bin/, and /usr/share/drbl/. No more in /opt/drbl/.
- With options -k1 and -icds, now it's possible to restore image from larger source image to smaller disk.
- Minix support
- Multipath devices, e.g. /dev/cciss/c0d0, are now supported natively.
- No more linking them to /dev/sd[a-z]. Therefore now LVM on cciss device are supported.
- Xen disk (/dev/xvd[a-z]) was added as a supported device.
- Three log files are added: /var/log/clonezilla.log, /var/log/ocs-netcfg.log and /var/log/ocs-mount.log
- Imaging/Cloning performance has been improved. User reported about 80% more.

Changes and features from July/2012 (continued)

- Llive-build, live-boot and live-config 3.x used from Clonezilla live 2.2.0-1.
- Updating the boot entries of EFI NVRAM after system is restored.
- Booting on a uEFI secure boot enabled machine (ubuntu-based Clonezilla live, from Clonezilla live 20130924-raring.

Current work and planned developments

- Support uEFI PXE booting in Clonezilla SE machine
- LVM without partition
- Local CCISS disk to remote CCISS disk
- Using Dnsmasq in Clonezilla SE

Wishlist

- Software RAID/FakeRAID support
- P2V friendly
- File-based imaging
- Recovery Clonezilla live with multiple CDs or DVDs
- More file systems support, ZFS, ReFS...
- Encryption file system support. Encryption for the image
- Scheduling
- WLAN setting
- ISCSI source disk
- Password protection
- Super easy mode
- GUI
- ...

Imaging and cloning examples (Single machine)

- Create Windows Backup / Restore Partition with Clonezilla by Britec
  - http://www.youtube.com/watch?v=cEE_vn8E0Kk
- Backup with Clonezilla | LAS | s25e10
  - http://www.youtube.com/watch?v=mipCOMqirF0
- How To Backup AND Restore you Computer with CloneZilla! (BEST HD Tutorial!!)
  - http://www.youtube.com/watch?v=LS6VhLDw-io
- Disk to Disk Copy with Clonezilla
  - http://www.youtube.com/watch?v=YzxL95GmmYk
- How to Do a System Backup Using Clonezilla
  - http://www.youtube.com/watch?v=raYLbjQVCy4

Massive deployment examples

- Using Clonezilla to Clone 24 GB Windows 7 image to 13 Machines
  - http://www.youtube.com/watch?v=ZyEwSRg3F8U
- Install Windows XP on 33 Laptops Dell Latitude E6400 CloneZilla
  - http://www.youtube.com/watch?v=6JhMA9a2Z20
- Clonezilla Server - 26 Workstations, 15 Mins.
  - http://www.youtube.com/watch?v=6ibKs51ivpw
- Clonezilla 50+ computers mass imaging session
  - http://www.youtube.com/watch?v=U4zsqQFdStM
- Clonning with drbl clonezilla 120 machines simultaneously
  - http://www.youtube.com/watch?v=pUJzipioWE8
- ~8000 video clips about Clonezilla on youtube.

Other projects we have...

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

Partclone

Support multi file system backup

Tux2live

Build your Linux live system from HD

Reference

- Clonezilla: http://clonezilla.org
- DRBL: http://drbl.org
- GParted: http://gparted.org
- Debian Live: http://live.debian.net/manual/
- Syslinux: http://syslinux.org

Questions ?

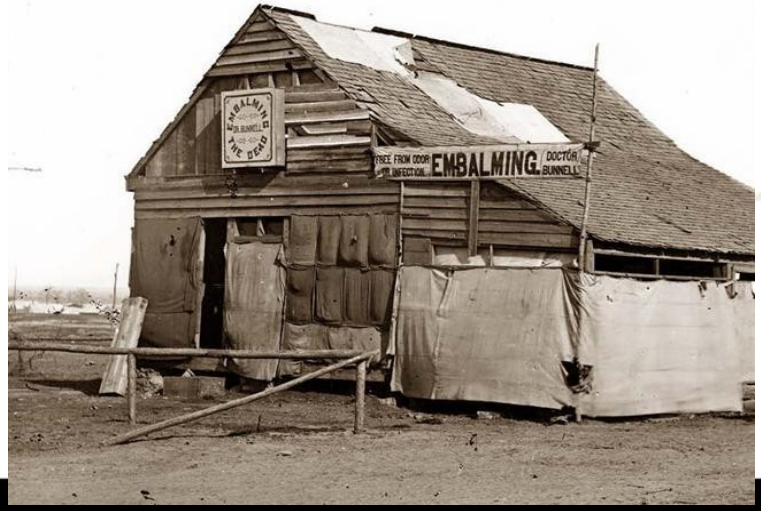
Great!

?????

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