Bare Metal Recover by Open Source Software

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http://drbl.nchc.org.tw, http://drbl.org

http://clonezilla.nchc.org.tw, http://clonezilla.org

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Outline

- Introduction to Bare Metal Recovery
  - Bare Metal Recovery and the Available Software
  - Comparisons
- Introduction to Clonezilla
- Demo
  - Restore A System by The Open Source Tool
    - Clonezilla live
- Q&A

- I am from Clonezilla project, so that makes me biased. I will do my best though...

Bare Metal Recovery

- From whatis.com
  - In disaster recovery, a bare metal restore is the process of reformatting a computer from scratch after a catastrophic failure.
  - Typically the process involves reinstalling the operating system and software applications and then, if possible, restoring data and configurations..
- **Available types:**
  - Block-based (image) recovery (e.g. 'dd')
  - File-based recovery (e.g. 'cp', 'tar', 'rsync'...)
- **Save a lot of time if choose right toolkit**

Bare Metal Recover Tools

	URL	Version
Clonezilla live	clonezilla.org	1.2.6-59
FOG	www.fogproject.org	0.29
Fsarchiver	www.fsarchiver.org	0.6.12
G4L	g4l.sourceforge.net	0.35
Mondo Rescue	www.mondorescue.org	2.2.9.4
Partimage	partimage.org	0.6.9
Acronis® True Image	www.acronis.com	2011
Norton Ghost™	www.symantec.com	15.0

Open Source Software

Proprietary Software

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

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

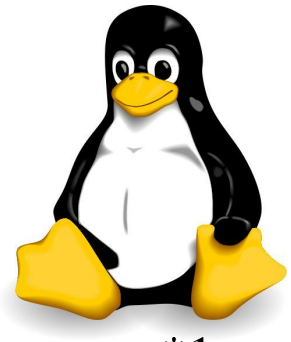
	ext2/3	ext4	reiserfs	reser4	xfs	jfs	btrfs
Clonezilla	Y	Y	Y	Y	Y	Y	Y
FOG	Y	N	Y	N	Y	Y	N
Fsarchiver	Y	Y	Y	Y	Y	Y	Y
G4L	Y	N	Y	N	Y	Y	N
Mondo Rescue	Y	Y	Y	Y	Y	Y	Y
Partimage	Y	N	Y	N	Y	Y	N
True Image	Y	Y	N	N	N	N	N
Ghost	Y	N	N	N	N	N	N

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

What is Clonezilla?

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



*1

*2

*3

New added !

*4

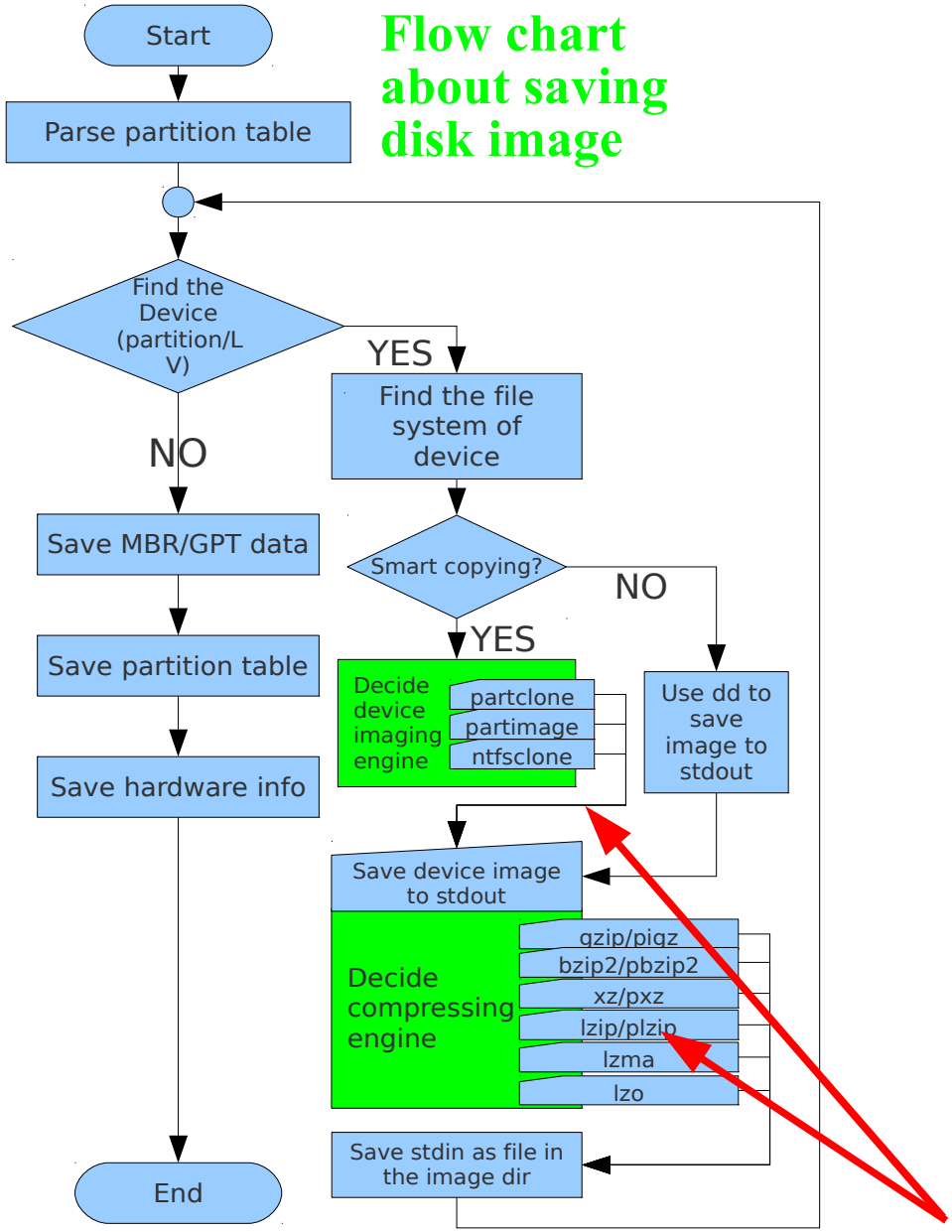
*5

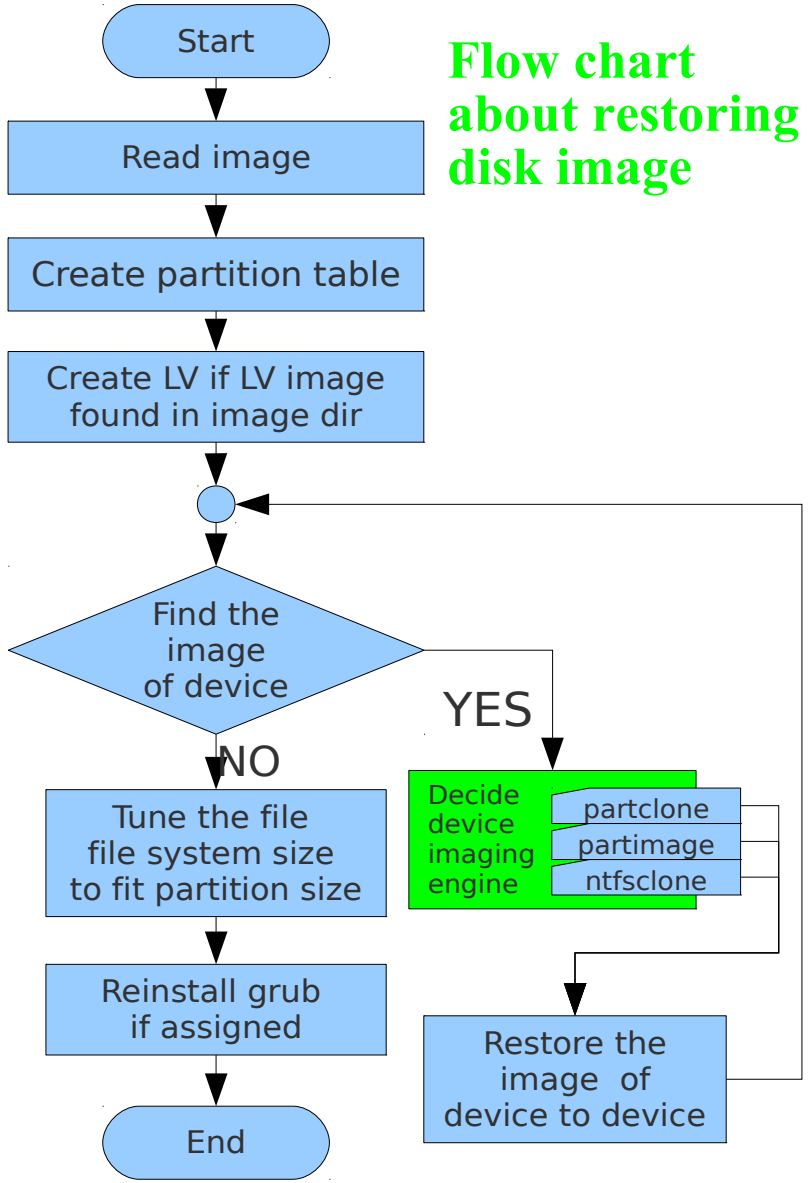
*Logo source: (1) Larry Ewing, Simon Budig and Anja Gerwinski, (2) Apple ,(3) Microsoft, (4) Marshall Kirk McKusick, (5) VMWare

Clonezilla Features

- Free (GPL) Software (Base on several existing softwares)
- File systems supported: Ext2/3/4, ReiserFS, Reiser4, XFS, JFS, HFS+, BrtFS, UFS, VMFS, FAT and NTFS
- Linux Logical Volume Manager 2(LVM2) stackable block device is supported
- Handle boot record : Grub 1/2 are supported ; MBR and hidden data (if exist)
- Serial console is supported
- Smart copying for supported filesystem. For unsupported file systems sector-to-sector copying is done via dd.
- Multicast supported in Clonezilla Server Edition (SE)
- Use Clonezilla-live as client environment in SE

Open and Flexible Architecture of Clonezilla

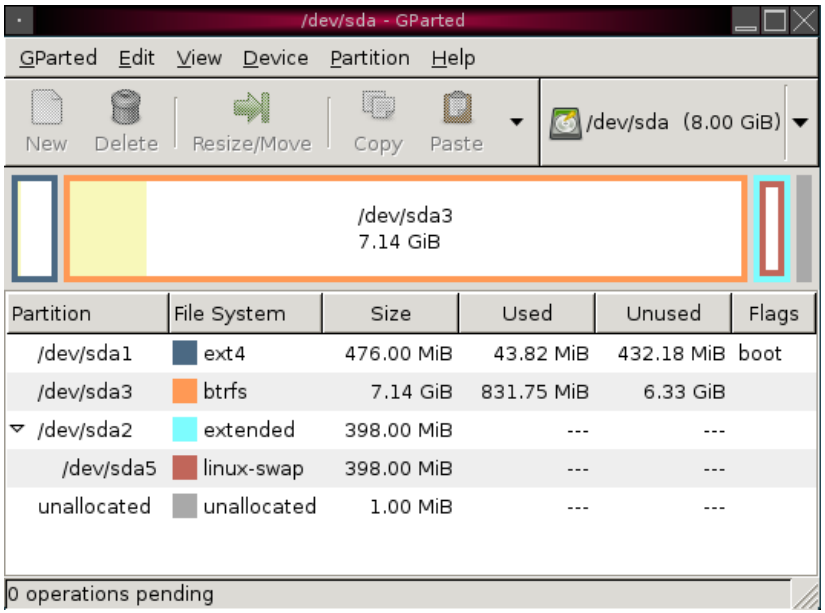




Imaging and compressing engines can be easily added

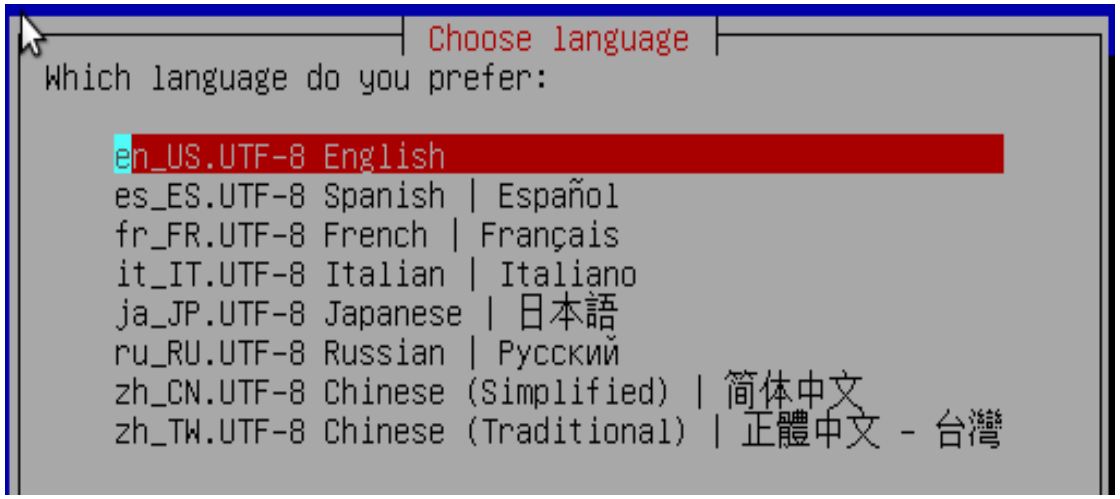
Open and Flexible Architecture of Clonezilla – Image format

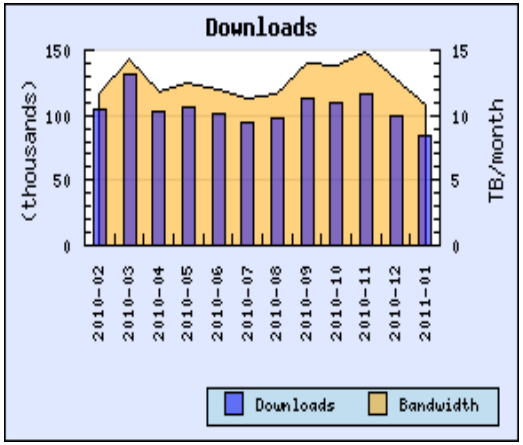
```
root@pc:/home/partimag/2011-01-23-thin.maverick$ ls -alh
total 346M
drwxr-xr-x 2 root root 4.0K Jan 24 02:23 .
drwxr-xr-x 4 root root   95 Jan 24 19:23 ..
-rw-r--r-- 1 root root 1002 Jan 24 02:23 Info-dmi.txt
-rw-r--r-- 1 root root 8.9K Jan 24 02:23 Info-lshw.txt
-rw-r--r-- 1 root root 1.2K Jan 24 02:23 Info-lspci.txt
-rw-r--r-- 1 root root  260 Jan 24 02:23 Info-packages.txt
-rw-r--r-- 1 root root    4 Jan 24 02:23 disk
-rw-r--r-- 1 root root   10 Jan 24 02:23 parts
-rw-r--r-- 1 root root   36 Jan 24 02:21 sda-chs.sf
-rw-r--r-- 1 root root 1.0M Jan 24 02:21 sda-hidden-data-after-mbr
-rw-r--r-- 1 root root  512 Jan 24 02:21 sda-mbr
-rw-r--r-- 1 root root  442 Jan 24 02:21 sda-pt.parted
-rw-r--r-- 1 root root  310 Jan 24 02:21 sda-pt.sf
-rw------- 1 root root  17M Jan 24 02:21 sda1.ext4-ptcl-img.gz.aa
-rw------- 1 root root 329M Jan 24 02:22 sda3.btrfs-ptcl-img.gz.aa
-rw-r--r-- 1 root root   53 Jan 24 02:23 swappt-sda5.info
```



Clonezilla Users Worldwide

Clonezilla





>2,300,000 Clonezilla Downloads

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 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 ocover headline

Clonezilla –

High Performance Open-Source Cloning

http://www.linuxjournal.com/

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

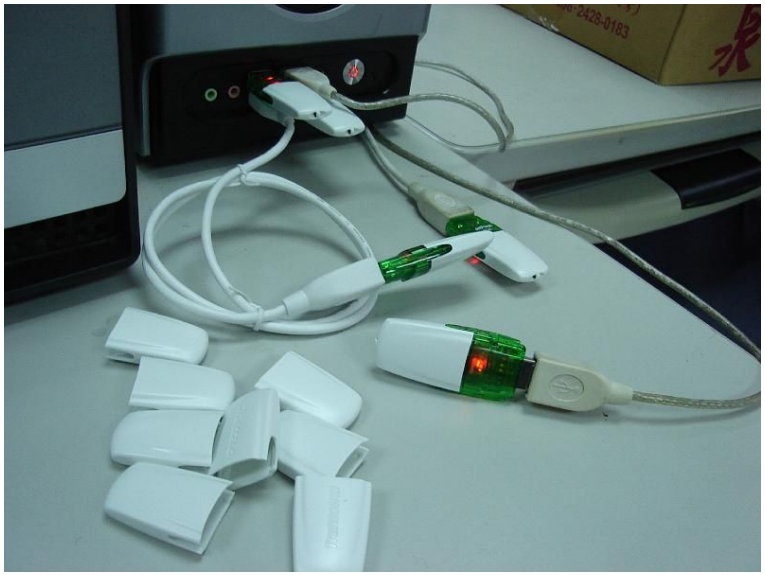
- Barny Sanchez
- Information Systems Security, Southbridge, Massachusetts
- Cloned 1,084 systems using DRBL (Clonezilla SE)
  - "I've used DRBL to clone 1,084 systems so far! It was simple! All I had to do was divide each system into groups of 80-100 PCs and then use multicasting to do the cloning. 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!"

Clonezilla Used in Taiwan's "National PCs"

Source: De-Wen Huang

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

- 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)
- The destination partition must be equal or larger than the source one
- Recovery Clonezilla live with multiple CDs or DVDs is not implemented yet

Future Work

- GUI
- Software RAID/FakeRAID support
- Recovery Clonezilla live with multiple CDs or DVDs
- More filesystem (ex: ZFS, exFat...) support
- Use File-based imaging
- Encryption filesystem support
- ...

Clonezilla Live Demo

- Clonezilla Live
  - http://clonezilla.org/clonezilla-live
- A running Ubuntu 10.10 system
  - Text mode only. The whole system uses about 900 MB space
  - /dev/sda1 on /boot (grub2) with ext4 and /dev/sda3 on / with btrfs
  - /dev/sda5 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=1
- Recover the whole system by Clonezilla live with a previous saved image vis sshfs

Clonezilla @ Open Day

Please come to DRBL/Clonezilla booth for detail !

DRBL / Clonezilla

Diskless Linux / Partition or disk clone tool

National Applied Research Laboratories
National Center for High-Performance Computing Free Software Lab, NCHC , TAIWAN

Questions ?

Reference:

http://drbl.nchc.org.tw
http://drbl.org
http://clonezilla.nchc.org.tw
http://clonezilla.org