

Backup as a service with Clonezilla

Steven Shiau
clonezilla.org
Q4, 2015



Outline

- Introduction to Clonezilla
 - Features
 - Updates since 2015 Summer
- Backup as a service with Clonezilla
 - Basic ideas
 - How
 - Use cases
- Q&A



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System imaging and cloning - backup



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

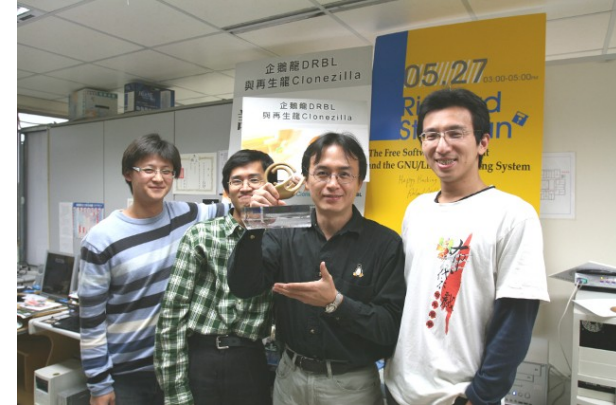
image source: maggiesfarm.anotherdotcom.com
www.compsults.com, and jervisdabreo.com

Massive system deployment



About us

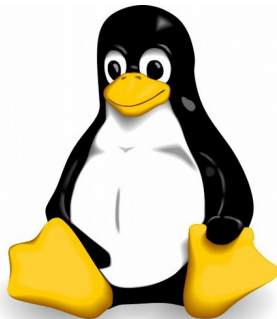
- Developers of the free software DRBL, Clonezilla and more...
- Steven is also the maintainer of GParted live CD
- From Taiwan, working for the NPO NCHC (National Center for High-Performance Computing)



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



TAIWAN

www.nchc.org.tw



Clonezilla Feature

- Free ([GPL](#)) Software
- File systems supported:
 - [Ext2/3/4](#), [ReiserFS](#), [Reiser4](#), [XFS](#), [JFS](#), [HFS+](#), [BrFS](#), [F2fs](#), [UFS](#), [Minix](#), [VMFS](#), [F2FS](#), [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

drbl.sourceforge.net, drbl.nchc.org.tw

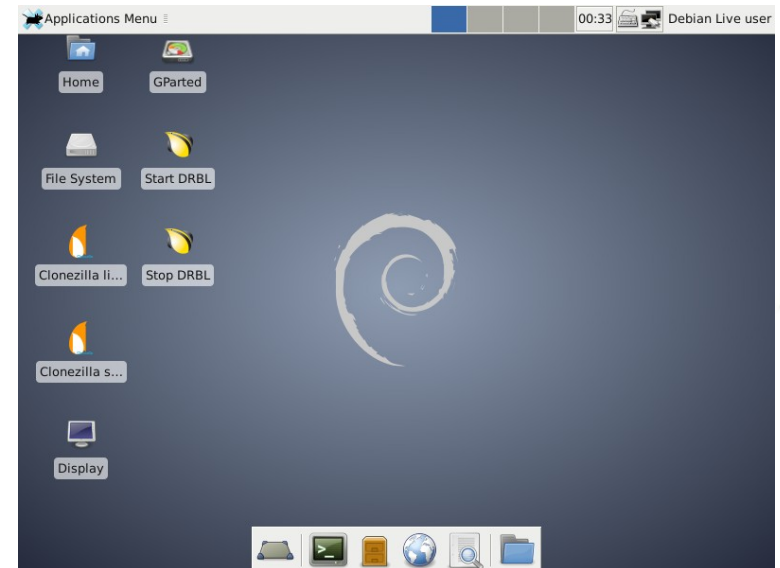
DRBL Live (Default settings)

- Other modes of DRBL Live >
- Local operating system in harddrive (if available) >
- Newtest & FreeDOS >
- Network boot via IPXE

Press [Tab] to edit options

* Boot menu for BIOS machine
* DRBL live version: 2.2.0-15-1686-pae. (C) 2003-2013, NCHC, Taiwan
* Disclaimer: DRBL comes with ABSOLUTELY NO WARRANTY

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



Clonezilla Live

```
clonezilla.org, clonezilla.nchc.org.tw
Clonezilla live (Default settings, VGA 800x600)
Other modes of Clonezilla live >
Local operating system in harddrive (if available) >
Newtest & FreeDOS
Network boot via IPXE
```

Press [Tab] to edit options

- * Boot menu for BIOS machine
- * Clonezilla live version: 2.4.2-10-1686-pae. (C) 2008-2015, NCHC, Taiwan
- * Disclaimer: Clonezilla comes with ABSOLUTELY NO WARRANTY

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

```
NCHC Free Software Labs, Taiwan

Clonezilla - Opensource Clone System (OCS): 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///

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
1-2-mdisks        Restore_an_image_to_multiple_local_disks
recovery-iso-zip  Create_recovery_Clonezilla_live
chk-img-restorable Check_the_image_restorable_or_not
cvt-img-compression Convert_image_compression_format_as_another_image
encrypt-img       Encrypt_an_existing_unencrypted_image
decrypt-img       Decrypt_an_existing_encrypted_image
exit              Exit. Enter command line prompt

<OK>              <Cancel>
```

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.
- Slovak (sk_SK): Ondrej Dzivy Balucha
- 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



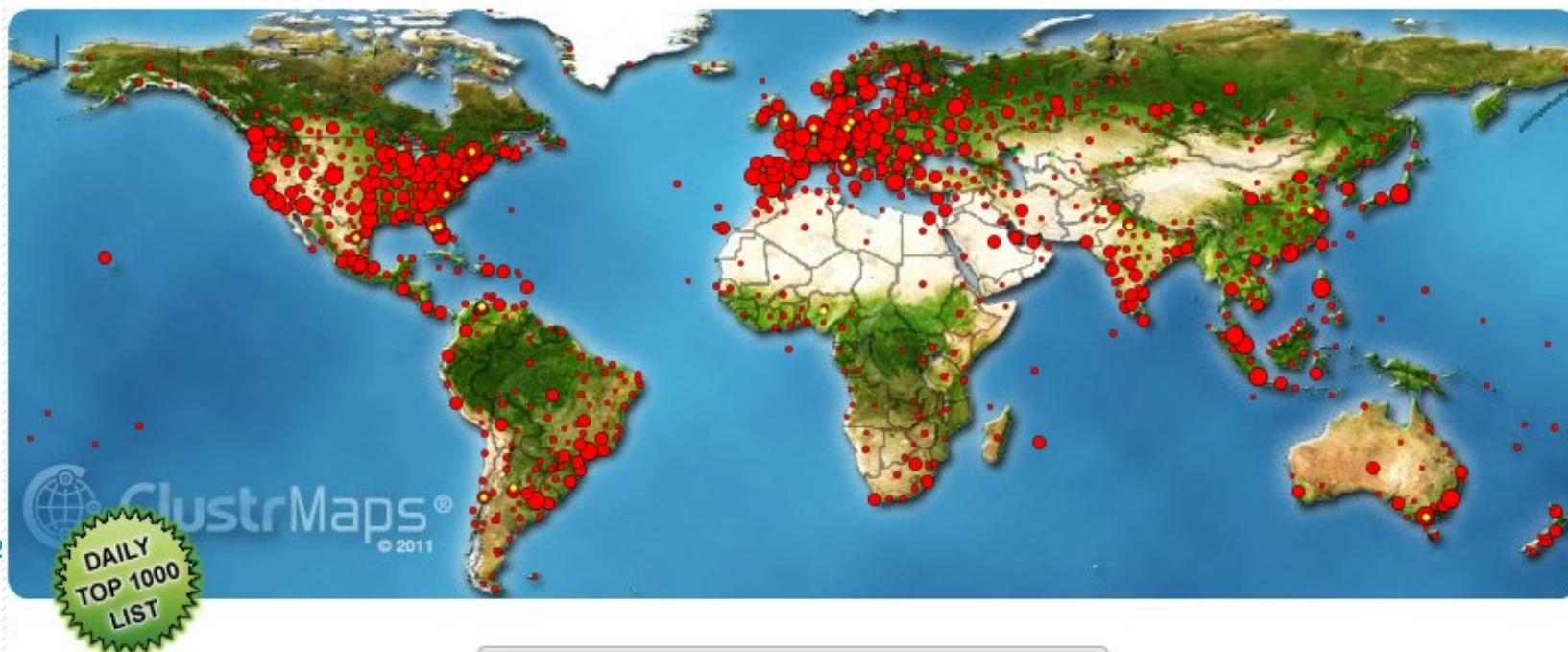


Changes and features from 2015 Summer

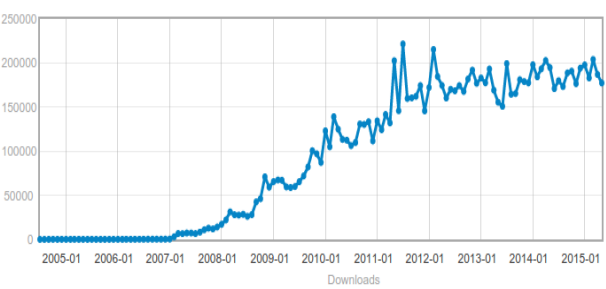
- Clonezilla live uses **overlay file system** instead of aufs due to Linux kernel was updated to v4.
- Supports **VMFS partition \geq 256 GB**.
- **NVME device** is supported.
- **Proportional GPT partition layout** could be created by the option "-k1".
- Clonezilla SE supports **uEFI network booting clients**.



Clonezilla Users Worldwide



ca_ES.UTF-8	Catalan		Català
de_DE.UTF-8	German		Deutsch
eh_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



DOWNLOADS	12,187,605
In the selected date range	
TOP COUNTRY *	United States
24% of downloaders	
TOP OS *	Windows
70% of downloaders	

>12,000,000 downloads

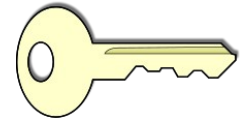
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Backup as a service

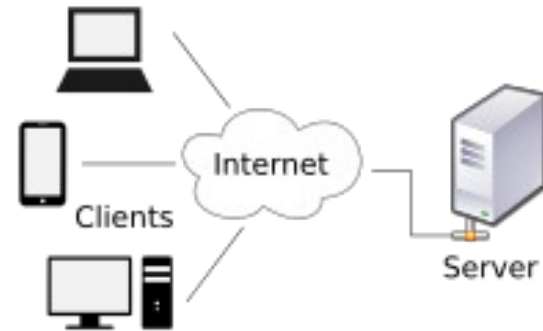
- Requirement for **system backup**:
 - Local and cloud backup
 - **Security**
 - Flexibility
 - Bare-metal recovery
- Image-based backup by Clonezilla
 - Image repo: local, NFS, CIFS, SSHFS, WebDAV
 - AES 128 bits (or 256 bits)



Images source: wikipedia.org

Backup as a service server side

- BaaS server
 - Server provides one of the following service
 - WebDAV
 - SSHFS
 - CIFS
 - NFS
 - OpenStack Swift
 - Amazon S3



- FOSS solutions:

- OwnCloud
- FreeNAS
- GNU/Linux + Apache WebDAV/SSHFS/CIFS/NFS
- OpenStack Swift
- ...



Backup as a service

client side: interactive mode



- Clonezilla live \geq 2.4.2-10
 - Boot Clonezilla live on the machine you want to backup
 - Configure network connection
 - Choose image repository:

- SSHFS
- CIFS
- NFS
- WebDAV
- S3
- Swift

```
Mount Clonezilla image directory
Before cloning, you have to assign where the Clonezilla image will be saved to or read from. We
will mount that device or remote resources as /home/partimag. The Clonezilla image will be saved
to or read from /home/partimag.
Select mode:

local_dev      Use local device (E.g.: hard drive, USB drive)
ssh_server     Use SSH server
samba_server   Use SAMBA server (Network Neighborhood server)
nfs_server     Use NFS server
webdav_server  Use WebDAV server
s3_server      Use_AWS_S3_server
swift_server   Use_OpenStack_swift_server
enter_shell    Enter command line prompt. Do it manually
skip           Use existing /home/partimag (Memory! *NOT RECOMMENDED*)

<OK>          <Cancel>
```

- Choose encryption

- Not ready
for S3 &
Swift

```
Clonezilla advanced extra parameters | Mode: savedisk
Do you want to encrypt the image?
If yes, eCryptfs program will be used to encrypt the image. It uses industry-standard
cryptographic ciphers, key generation, and passphrase protection mechanisms. Without your
salt/passphrase or private key, nobody will be able to retrieve your data.
//NOTE// You have to remember the passphrase, otherwise the image will _NOT_ be usable in the
future.

Not to encrypt the image
-enc Encrypt the image

<OK>          <Cancel>
```



Backup as a service

client side: almost unattended



- Clonezilla live \geq 2.4.2-10
 - Pre-seed configuration in the boot parameters, e.g:

- `locales=en_US.UTF-8`
- `keyboard-layouts=NONE`
- `ocs_prerun1="dhclient -v eth0"`
- `ocs_prerun2="ocs-tune-conf-for-webdav"`
- `ocs_prerun3="mount -t davfs -o noexec http://192.168.120.254:8080/share/ /home/partimag"`
- `ocs_live_run="ocs-sr -q2 -j2 -z1p -enc -p true savedisk myimg sda"`

//NOTE// volume size is based on the free memory due to davfs2 cache mechanism limitation.



Boot parameters

clonezilla.org, clonezilla.nchc.org.tw

Clonezilla live (Default settings, VGA 800x600)
Other modes of Clonezilla live >
Local operating system in harddrive (if available)
Memtest & FreeDOS >
Network boot via iPXE

```
> /live/vmlinuz initrd=/live/initrd.img boot=live union=overlay username=user  
config components quiet noswap edd=on nomodeset nodmraid ocs_live_run="ocs-live-general" ocs_live_extra_param="" ocs_live_batch=no vga=788 ip= net.ifnames=0  
nocplash 1915.blacklist=yes radeonhd.blacklist=yes nouveau.blacklist=yes vmlinuz.enable_fbdev=1 locales=en_US.UTF-8 keyboard-layouts=NONE ocs_prerun1="dhc  
lient -v eth0" ocs_prerun2="ocs-tune-conf-for-webdav" ocs_prerun3="mount -t dav  
fs -o noexec http://192.168.56.1/share/ /home/partimag" ocs_live_run="ocs-br -  
q2 -j2 -zip -enc -p true savedisk myimg sda"
```

Clonezilla

Free Software Labs
National Center for High-Performance Computing
Taiwan

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Booting

```
Sending on LPF/eth0/08:00:27:e5:d7:37
Sending on Socket/fallback
DHCPDISCOVER on eth0 to 255.255.255.255 port 67 interval 7
DHCPDISCOVER on eth0 to 255.255.255.255 port 67 interval 10
DHCPCREQUEST of 192.168.56.3 on eth0 to 255.255.255.255 port 67
DHCPOFFER of 192.168.56.3 from 192.168.56.1
DHCPACK of 192.168.56.3 from 192.168.56.1
bound to 192.168.56.3 -- renewal in 142 seconds.
*****
Now run "ocs_prerun2": ocs-tune-conf-for-webdav...
Tuning davfs2 parameters in /etc/davfs2/davfs2.conf
*****
Now run "ocs_prerun3": mount -t davfs -o noexec http://192.168.56.1/share/ /home/partimag...
Please enter the username to authenticate with server
http://192.168.56.1/share/ or hit enter for none.
Username: steven
Please enter the password to authenticate user steven with server
http://192.168.56.1/share/ or hit enter for none.
Password:
Setting the TERM as linux
Starting /usr/sbin/ocs-sr at 2015-10-23 14:06:39 UTC...
*****
Clonezilla image dir: /home/partimag
*****
Shutting down the Logical Volume Manager
Finished Shutting down the Logical Volume Manager
Selected device [sda] found?
The selected devices: sda
*****
//NOTE// You have to remember the passphrase, otherwise the image will _NOT_ be usable in the future
*** Enter the passphrase to encrypt the image: myimg ***
(It will not be echoed in the screen)
*** Re-enter to verify the passphrase for encrypting the image: myimg ***
(It will not be echoed in the screen)
```

WebDAV
authorization

passphrase
for
encryption

Files in the encrypted image dir

```
-rw-r--r-- 1 www-data www-data 12K 10月 23 23:07 blkdev.list
-rw-r--r-- 1 www-data www-data 12K 10月 23 23:07 blkid.list
-rw-r--r-- 1 www-data www-data 16K 10月 23 23:09 clonezilla-img
-rw-r--r-- 1 www-data www-data 12K 10月 23 23:08 dev-fs.list
-rw-r--r-- 1 www-data www-data 12K 10月 23 23:09 disk
-rw-r--r-- 1 www-data www-data 141 10月 23 23:09 ecryptfs.info
-rw-r--r-- 1 www-data www-data 12K 10月 23 23:08 Info-dmi.txt
-rw-r--r-- 1 www-data www-data 20K 10月 23 23:08 Info-firmware.txt
-rw-r--r-- 1 www-data www-data 12K 10月 23 23:08 Info-lspci.txt
-rw-r--r-- 1 www-data www-data 12K 10月 23 23:08 Info-packages.txt
-rw-r--r-- 1 www-data www-data 12K 10月 23 23:09 Info-saved-by-cmd.txt
-rw-r--r-- 1 www-data www-data 12K 10月 23 23:09 parts
-rw-r--r-- 1 www-data www-data 95M 10月 23 23:08 sda1.ext4-ptcl-img.gz.aaa
-rw-r--r-- 1 www-data www-data 95M 10月 23 23:08 sda1.ext4-ptcl-img.gz.aab
-rw-r--r-- 1 www-data www-data 95M 10月 23 23:08 sda1.ext4-ptcl-img.gz.aac
-rw-r--r-- 1 www-data www-data 71M 10月 23 23:09 sda1.ext4-ptcl-img.gz.aad
-rw-r--r-- 1 www-data www-data 724K 10月 23 23:09 sda5.ext4-ptcl-img.gz.aaa
-rw-r--r-- 1 www-data www-data 12K 10月 23 23:07 sda-chs.sf
-rw-r--r-- 1 www-data www-data 1.1M 10月 23 23:07 sda-hidden-data-after-mbr
-rw-r--r-- 1 www-data www-data 12K 10月 23 23:07 sda-mbr
-rw-r--r-- 1 www-data www-data 12K 10月 23 23:08 sda-pt.parted
-rw-r--r-- 1 www-data www-data 12K 10月 23 23:09 sda-pt.parted.compact
```

The only plain text file in the image dir, Others are encrypted

```
# This image was saved with ecryptfs
disk_of_img="sda"
parts_of_img="sda1 sda5"
time_of_img="2015-0220-0650"
disks_size_all_of_img=" 8590MB"
```

Volume size reset by ocs-tune-conf-for-webdav

AES is not currently known to be susceptible to known-plaintext attacks.



Demo - Save an image to WebDAV

- Server side:
 - WebDAV, provided by the running Ubuntu 14.04 system with enabled Apache2 WebDAV
 - URL: `http://192.168.56.1/share/`
- Client side:
 - Use Clonezilla live to 2.4.2-61 with preseeded boot parameters to save a local disk as an image
 - `locales=en_US.UTF-8 keyboard-layouts=NONE`
 - `ocs_prerun1="dhclient -v eth0"`
 - `ocs_prerun2="ocs-tune-conf-for-webdav"`
 - `ocs_prerun3="mount -t davfs -o noexec http://192.168.56.1/share/ /home/partimag"`
 - `ocs_live_run="ocs-sr -q2 -j2 -z1p -enc -p true savedisk myimg sda"`

Conclusion

- With **image encryption**, you can provide BaaS for system imaging to **multiple users in the same image repository**.
- Due to the file system support issue, the ecryptfs has a compatible issue with **s3fs** (for S3) and **cloudfuse** file (for Swift) systems. We will keep improving it.
- WebDAV service is **more flexible**. However, there might be some limits. E.g. single file size limit on the server side. Therefore you have to make sure it's compatible with Clonezilla.

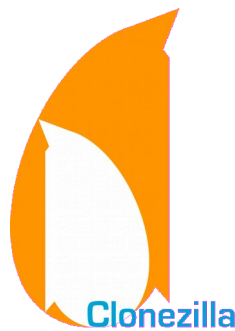
Reference

- Clonezilla: <http://clonezilla.org>
- DRBL: <http://drbl.org>



Questions ?

Great!



?????

