

Clonezilla: Clone As Free As You Want

Steven Shiau, Ceasar Sun,
Jazz Wang, Thomas Tsai

<http://clonezilla.org>

National Center for High-Performance Computing

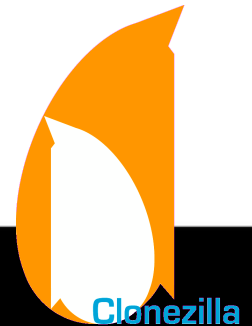
Taiwan

Q3, 2011



Outline

- Introduction to Clonezilla
 - Feature/How/Limitation
 - Introduction to Image architecture
 - Demo
 - Save/Restore A System by Clonezilla live
- Advanced Usages
 - Unattended recovery CD or USB flash drive
 - Pre-process and post-process when restoring a system
 - Unattended recovery with a file server
 - A customized live CD for remote troubleshooting
 - Serial console and PXE booting usage
- Q&A



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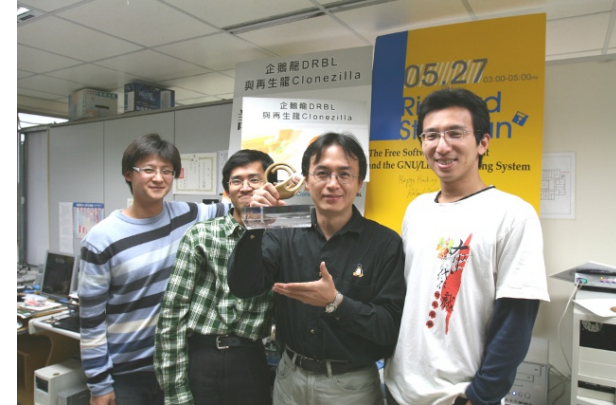
- Unattended recovery CD or USB flash drive
- Pre-process and post-process when restoring a system
- Unattended recovery with a file server
- A customized live CD for remote troubleshooting
- Serial console and PXE booting usage

■ Q&A



About us

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



Taiwan image source: wikipedia.org

TAIWAN

www.nchc.org.tw

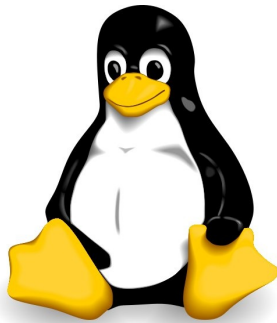


National Applied Research Laboratories



What is Clonezilla?

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



*1



*2



*3



*4

New added !

VMFS

**VMware
ESX/ESXi**

*5

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



Clonezilla

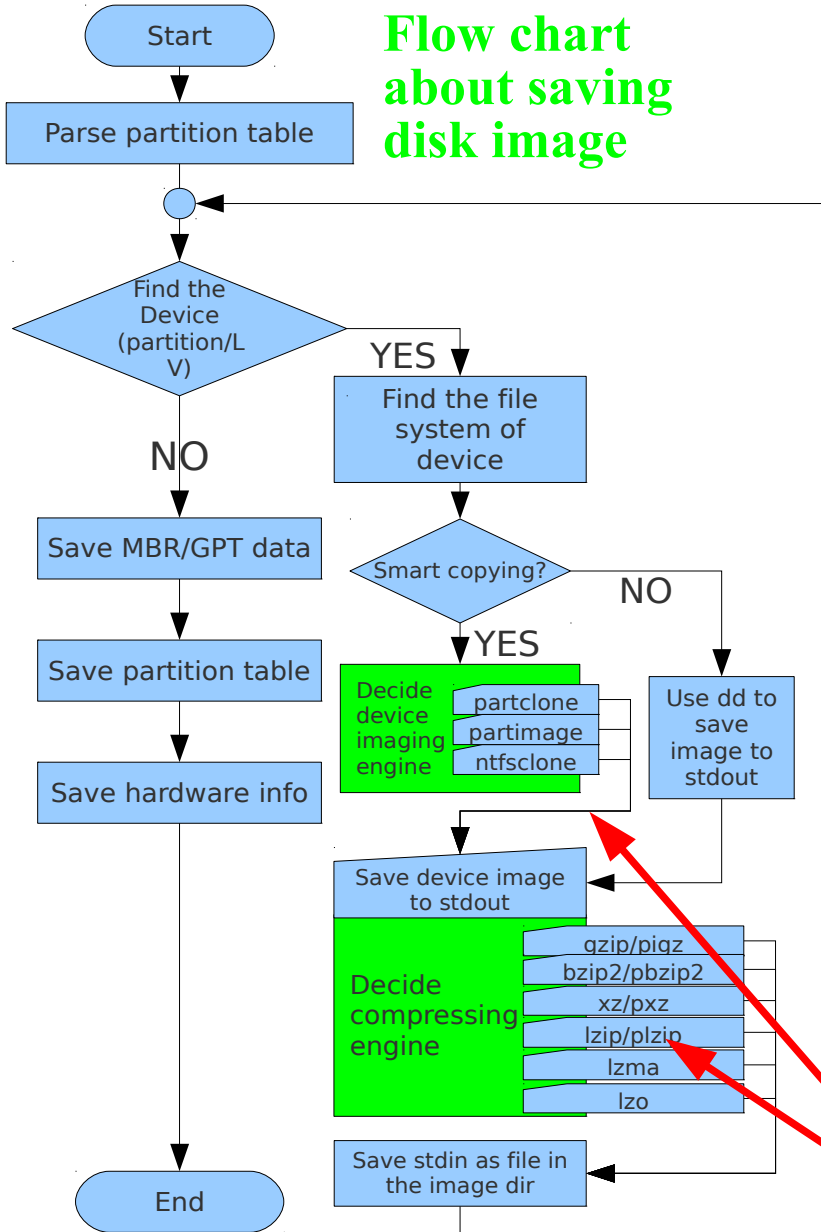
- Clonezilla [OCS (Opensource Clone System)]
 - Integrate **Partclone** (<http://partclone.org/>), Partimage, ntfscclone and **udpcast**¹ (<http://udpcast.linux.lu/>)
- What does it handle ?
 - **Physical data** : basic unit is **partition**, then LVM, and part of hardware RAID
 - **Partition table / 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 type of release
 - **Live** edition
 - **Server** edition (SE)

Clonezilla Feature

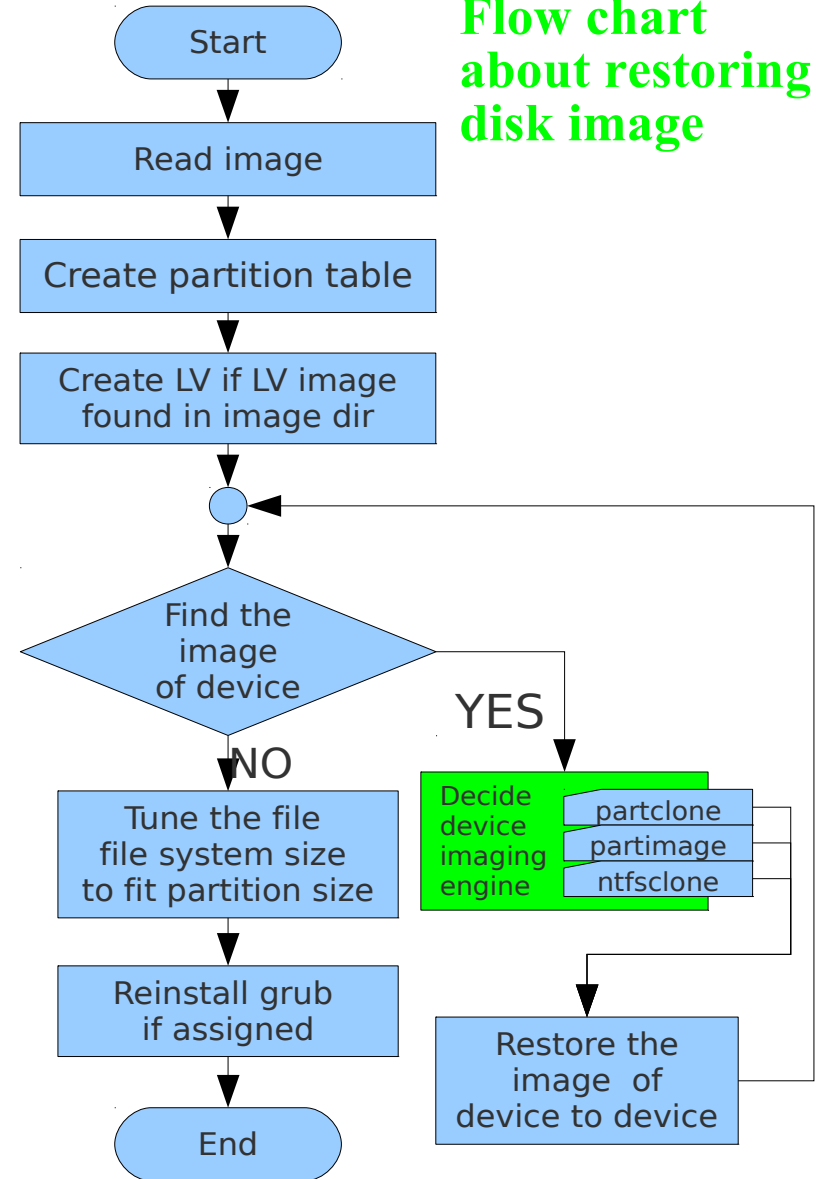
- Free ([GPL](#)) Software
- File systems supported:
 - [Ext2/3/4](#), [ReiserFS](#), [Reiser4](#), [XFS](#), [JFS](#), [HFS+](#), [BrtFS](#), [UFS](#), [VMFS](#), [FAT](#) and [NTFS](#)
 - Supports [LVM2](#)
 - Support some [hardware RAID](#) chips (by kernel)
- Handle boot loader : [Grub 1/2](#) are 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)
- 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@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
```

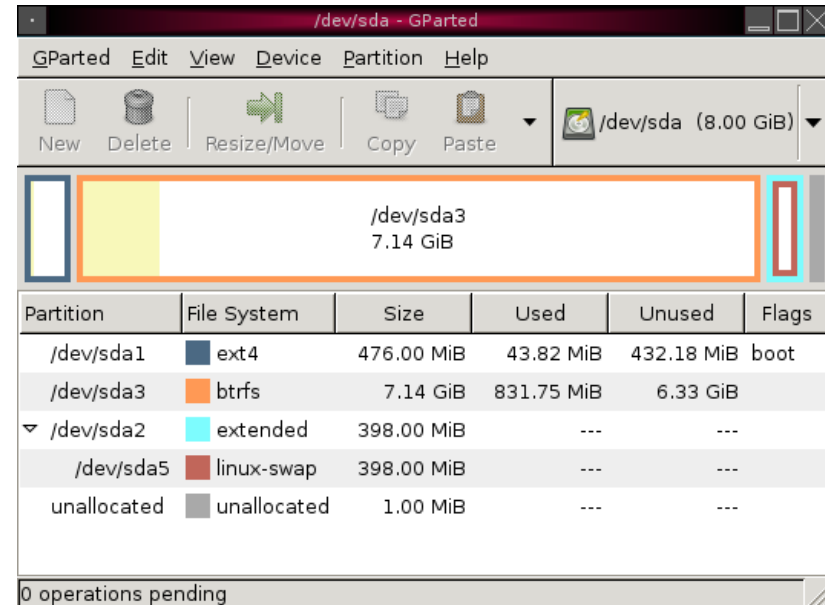
```
-rw-r--r-- 1 root root 442 Jan 24 02:21 sda-pt.parted
```

```
-rw-r--r-- 1 root root 310 Jan 24 02:21 sda-pt.sf
```

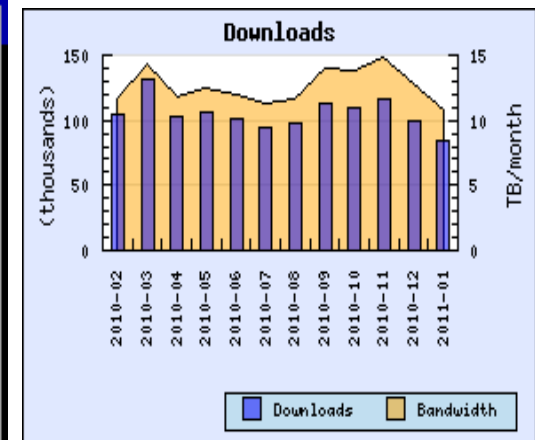
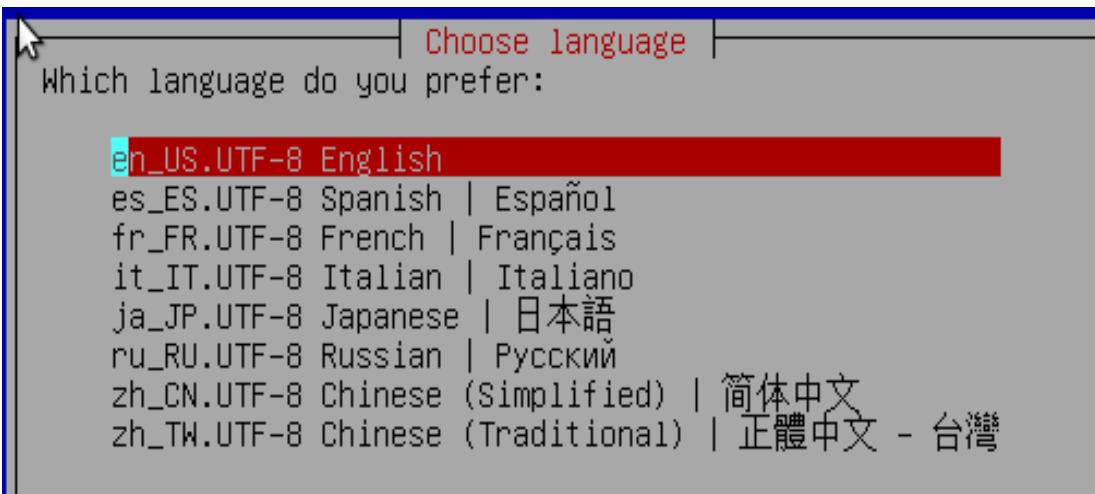
```
-rw----- 1 root root 17M Jan 24 02:21 sda1.ext4-ptcl-img.gz.aa
```

```
-rw----- 1 root root 329M Jan 24 02:21 sda3.btrfs-ptcl-img.gz.aa
```

```
-rw-r--r-- 1 root root 53 Jan 24 02:23 swappt-sda5.info
```



Clonezilla Users Worldwide



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By Eric Griffith

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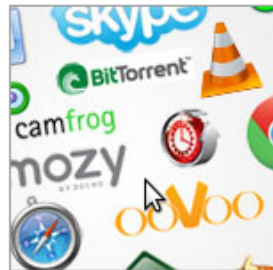
Submit



Email



Print



Backup/Synch/Storage

18. Create Synchronicity

<http://synchronicity.sourceforge.net>

Windows | Portable

Launch the app, create a profile for folders/files you want to synchronize or back up between internal, external, and

network drives, schedule synch times, and let it run. Create Synchronicity is small, works from a USB flash drive, and is so easy you don't even need to know drive letters to work it.

19. Clonezilla

<http://www.clonezilla.org>

This open-source software doesn't install on your system. It's a LiveCD that you can boot from a disk. Then you use the old-fashioned interface to do a complete clone of your hard disk drive. It's probably overkill for home, but it does the trick when you have to replicate a drive on multiple systems.

20. Comodo Time Machine

<http://www.comodo.com/home/data-storage-encryption/data-recovery.php>

Windows

System Restore in Windows works pretty well to get you back to a working state from a crash, but Comodo Time Machine (no relation to Apple's) goes a little farther, giving

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Disk Utilities

Displays

E-mail/Collaboration

File Transfers

- PC Magazine
- The Best Free Software of 2011
- Backup/Synch/Storage category



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

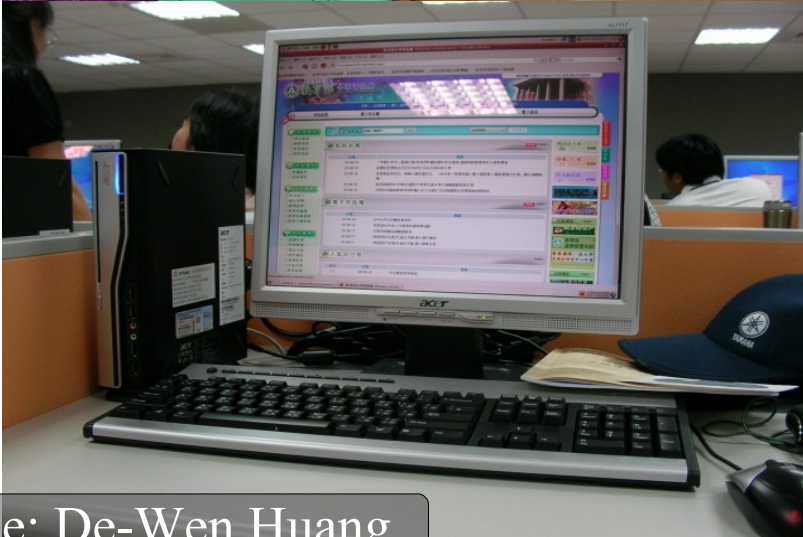
- Juergen Chiu
- Canonical Ltd. Taipei, Taiwan
- Clonezilla helps me a lot in system backup, recovery and ISO image creating
 - "In my job, I need to handle different type of system and create the ISO image for customers. Your great tool, Clonezilla, helps me a lot in system backup, recovery and ISO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

- 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

- 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)





Clonezilla Live Demo (1)

- Clonezilla Live
 - <http://clonezilla.org/clonezilla-live>
- A running Ubuntu 10.10 system
 - Text mode only. The whole system uses about 900 MB space. Use grub2 as boot loader.
 - /dev/sda1 on / and /dev/sda5 on /home with **ext4**
 - /dev/sda2 is used as swap partition
- Use Clonezilla live to save the whole disk as an image
 - Use sshfs as repository



Clonezilla Live Demo (2)

- A running Ubuntu 10.10 system
 - Text mode only. The whole system uses about 900 MB 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

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■ Q&A





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**
 - Choose "**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>
```





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:

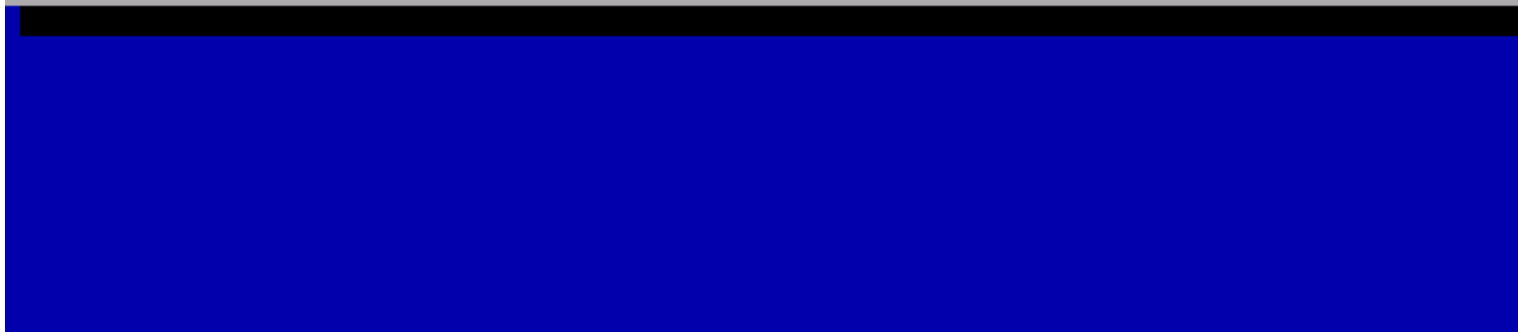
```
append initrd=/live/initrd.img boot=live config noswap nolocales edd=on nomodeset noprompt ocs_prerun1="dhclient -v eth0" ocs_prerun2="sleep 2" ocs_prerun3="mount -t nfs 192.168.120.254:/home/partimag /home/partimag" ocs_live_run="ocs-sr -g auto -e1 auto -e2 -b -r -j2 -p reboot restoredisk squeeze-updated-20110711 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 sda  
This command is also saved as this file name for later use if necessary: /tmp/ocs-squeeze-updated-20110711-2011-07-12-08-57  
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-1.2.9-12-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`
 - `sudo cp filesystem.squashfs.new ~/zip-tmp/live/filesystem.squashfs`
 - `cd ~/zip-tmp ; sudo zip -r ../clonezilla-live.new.zip ./*`

Future Work

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



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

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



Questions ?

