

Open Source, Linux & DRBL Alternative Approach for Setting Up a Classroom

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<http://drbl.sourceforge.net>

Free Software Labs

**National Center for High-Performance
Computing (NCHC)**

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NCHC

Outline

- **Opensource free software, GNU/Linux**
- **Thin client maybe not thin**
- **The diskless or systemless solution - DRBL**

Question

- **What's the difference ?**
 - **Free Software**
 - **Open Source Software**
 - **Freeware**
- **Running a Linux server ?**
- **Running a Linux desktop ?**

Free Software and Open Source

- **“Free Software”** term author – Richard Stallman
- **“Open Source”** term author – Eric Raymond
- Richard Stallman and supporters of free software do not agree that the name 'free software' can be replaced by 'open source'
- **Free software: freedom to Use, Copy, Modify and Distribute**
- **Freeware: only free of charge, but no freedom**

Software Revolution

- **Freedom to use, copy, modify and distribute**
- **Legal**
- **Software almost free of charge**
- **Charge service**

Software Revolution

The screenshot displays a Linux desktop environment with several applications running:

- VLC media player:** A window titled "VLC media player" showing playback controls and a playlist editor. The playlist includes:
 - 1. Beatles - Imagine 3:04
 - 2. Bryan Adams - Cloud Number Nine 4:09
 - 3. Bryan Adams - Here I Am 4:32
 - 4. Bryan Adams - Here I Am 4:32
 - 5. Shania Twain and Bryan White - From ... 4:40
 - 6. Bryan Adams - You Cant Take Me 2:56
 - 7. Bryan Adams - Here I Am 4:32
- Beamer presentation:** A window titled "投影片" (Presentation) showing a slide titled "Multimedia player" with the following content:
 - vlc (video lan client)
 - <http://www.videolan.org>
 - Cross platform - Linux, M\$ Windows, Mac OS
 - Play VCD/DVD/streaming video/audio
 - xmms (X Multimedia System)
 - <http://www.xmms.org/>
 - Similar to winamp in M\$ windows
 - Play mp3, wav and streaming music
 - Online music: <http://www.shoutcast.com>
- XMMS:** A window titled "X MULTIMEDIA SYSTEM" showing playback controls and a playlist editor.
- GAIM login window:** A window titled "登入" (Login) for the GAIM instant messaging client, featuring a login form with fields for "帳號(A):" (Account) and "密碼(P):" (Password), and buttons for "帳號清單(C)" (Account List), "偏好設定(B)" (Preferences), and "登入(S)" (Login).

The desktop environment includes a taskbar at the bottom with icons for applications like "應用程式", "位置", "系統", and "登入". The system tray shows the date and time as "6月20日(二) 22:40".

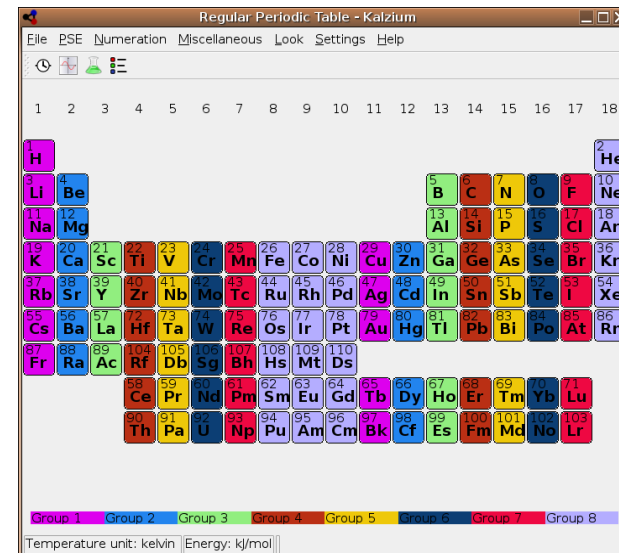
OLPC – One Laptop per Child

- **International project by MIT, USA**
- **Run open source free system:
Fedora**
- **\$100 in 2008**



Free education software

- **Mathematics**
 - Kbuch
 - kpercentage
 - kmplot
 - Tuxmath
 - Dr. Geo
- **English**
 - Kmessedwords
 - ktouch
 - Tuxtyping
 - Stardict
- **Kstar, Kalzium**

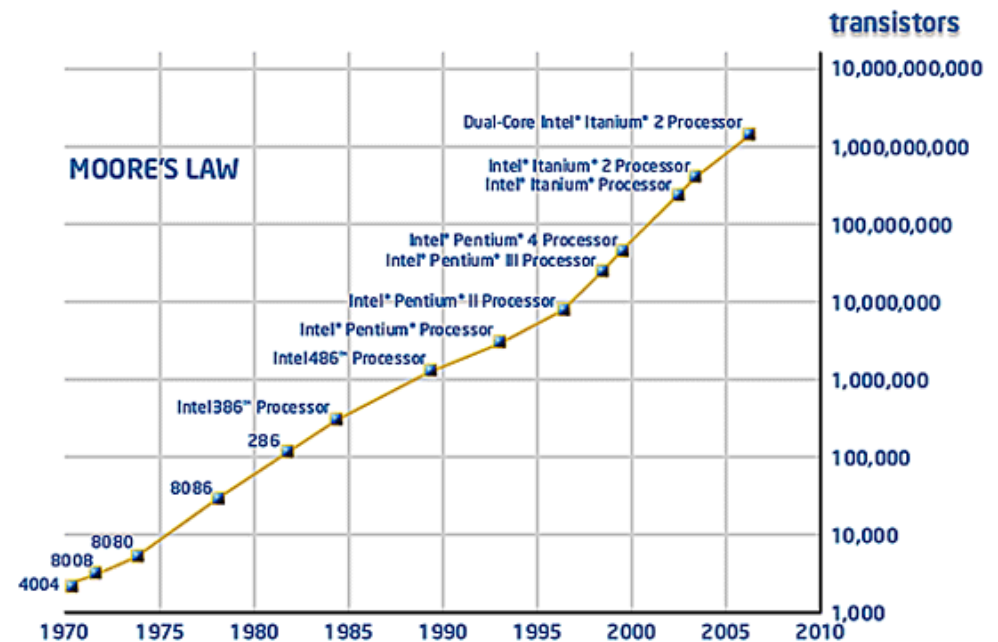
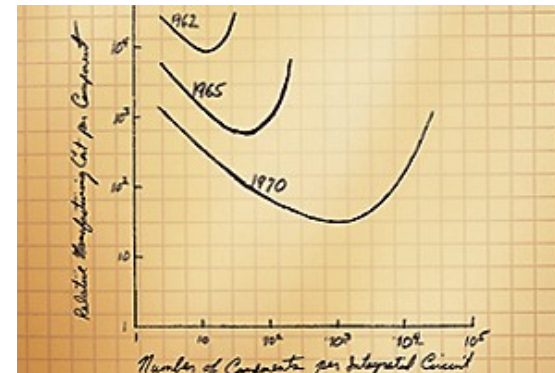


Internet – The window to the world

- **Linus Torvalds' Linux**
- **Wikipedia**
- **Google/Yahoo/eBay...**
- **OpenOffice.org, Firefox, Thunderbird...**
- **Fastest PC is not necessary for this purpose**
 - **Choose affordable PC, choose the right one to fit your need**
- **We should not have too many limitations about Internet use**

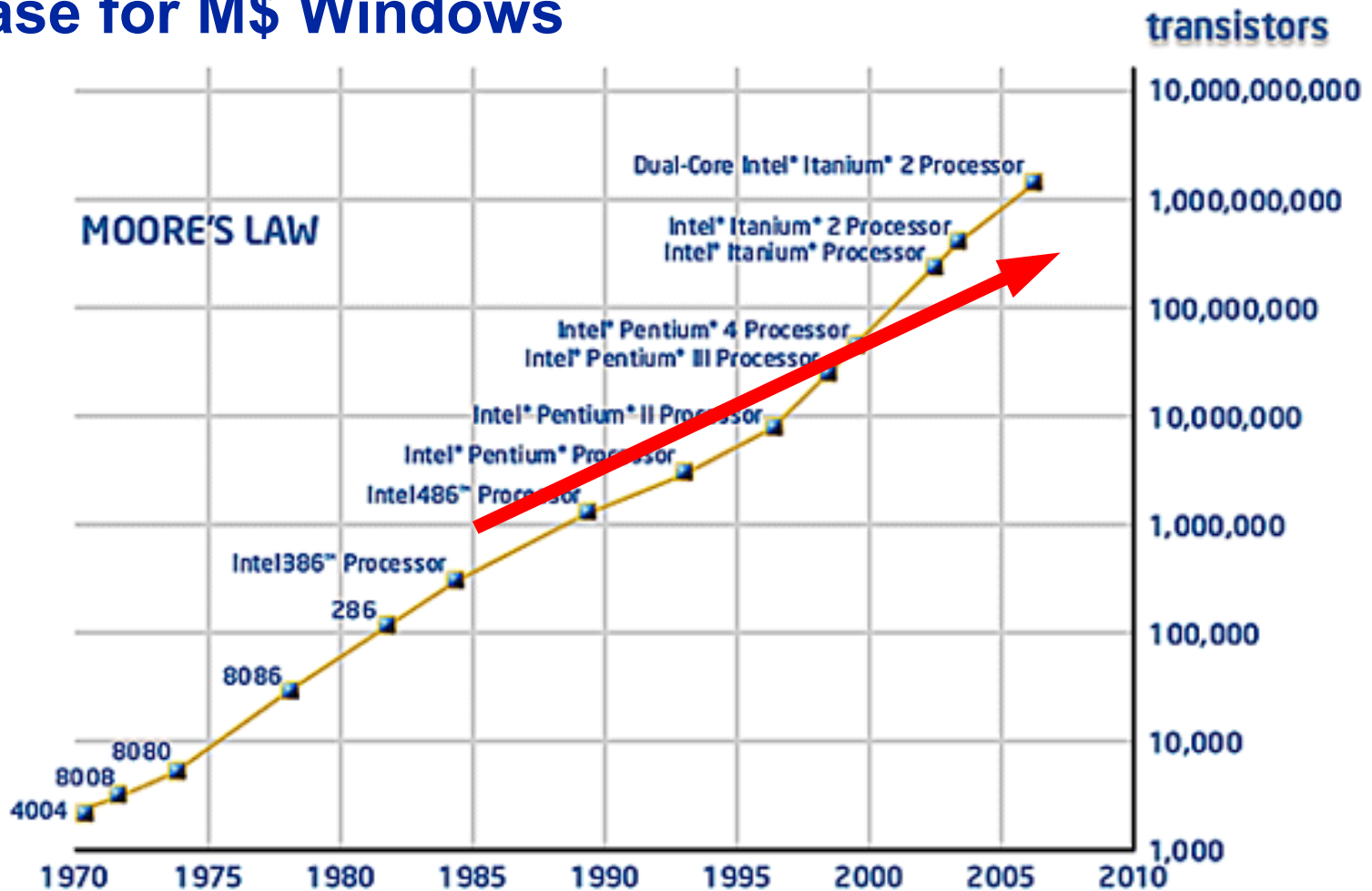
Moore's Law

- The number of transistors on a chip doubles about every two years. (Sometimes quoted as every 18 months) (From <http://www.intel.com/technology/mooreslaw>)
- Moore's Law means **more performance**
- Moore's Law also means **decreasing costs**



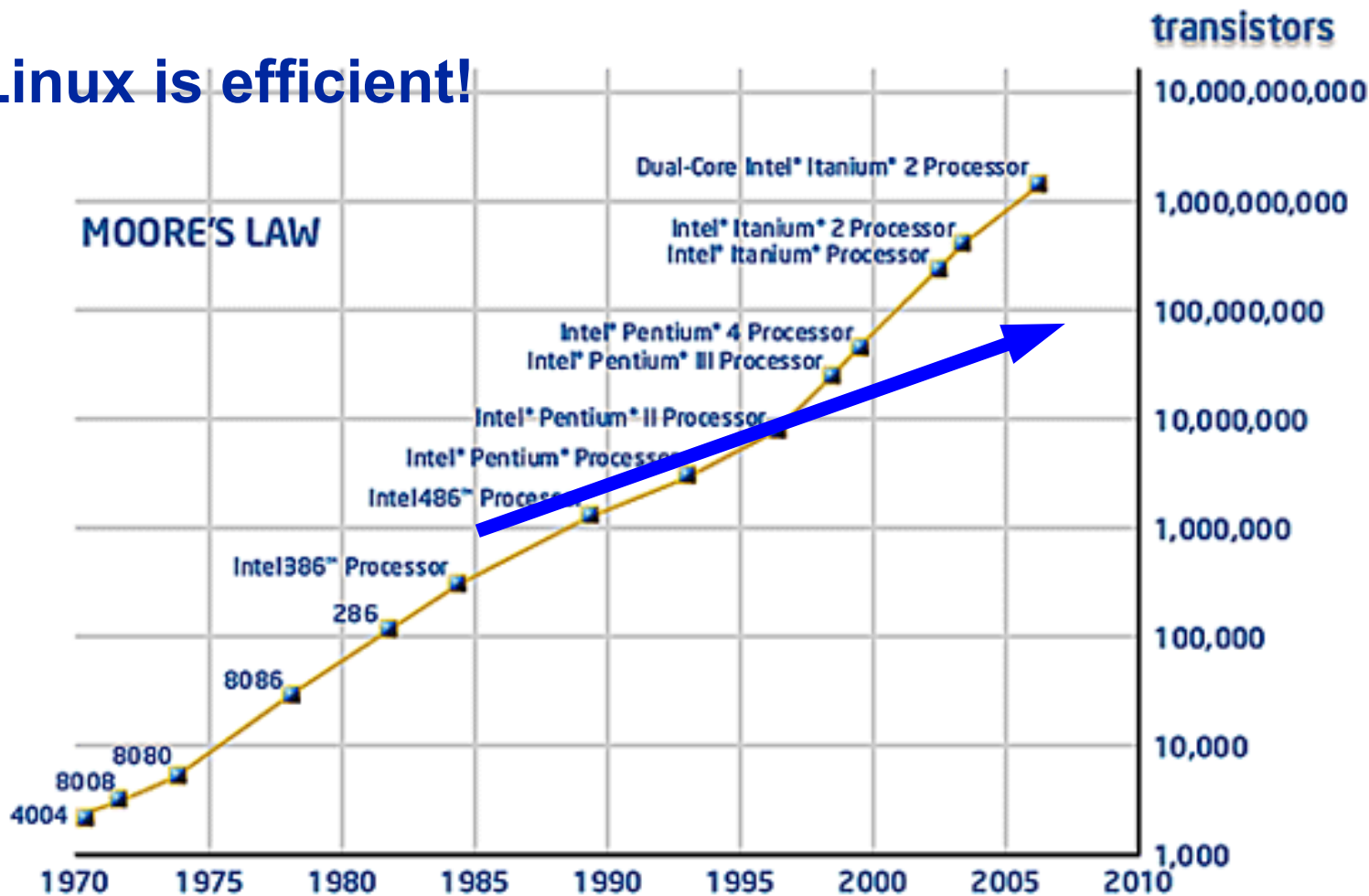
Gates' Law

- The speed of proprietary software **halves** every 18 months.
 - The case for M\$ Windows



How about that in GNU/Linux ?

- Maybe just half of that in Gates' law, i.e. the speed of GNU/Linux system is **maybe 3 fourths** every 18 months.
 - GNU/Linux is efficient!



A thin client is not really a thin client!

- It's a “thin” client for M\$ windows XP/Vista
- **BUT it's a POWERFUL client for GNU/Linux**
 - GNU/Linux is efficient!
 - With enough memory, you can run a full GNU/Linux, not simplified version on it.



Via C7 CPU 1.0 Ghz, 512 MB DDR or DDR2 RAM

DRBL (Diskless Remote Boot in Linux) Server

- A DRBL server is just a **normal desktop PC** running GNU/Linux
- **It can serve 40 clients!**



INTEL Pentium 3.0GHz CPU, 1 GB RAM, 250 GB HD

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Free Software Smart Classroom, FSSC

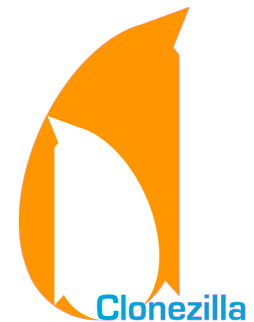


- Free software projects developed by NCHC Free Software Labs
- Our goal
 - FSSC (Free Software Smart Classroom)
 - DRBL, Clonezilla
 - Multicast VNC
 - Access Grid, E-learning
 - Cluster computing
 - Grid computing



DRBL and Clonezilla

- **DRBL**
 - **Diskless or systemless environment**
- **Clonezilla**
 - **A partitioning and disk cloning utility similar to Symantec Ghost or Rembo.**
 - **Unicast or multicast clone**



DRBL

- Network is everywhere, cheap, and fast
- In DRBL
 - The harddrive bus cable is replaced by network cable
 - All DRBL clients share 1 harddrive in the server

Diskfull
PC



=



+



+



Diskless
PC



Server

DRBL - Diskless Remote Boot in Linux

- ✓ **Save you money**

- No harddrive in clients
- Software is free, freedom and no charge



- ✓ **Save you time**

- All programs are in 1 server, and installed once
- One command to shutdown/reboot/power on all clients

- ✓ **Make your life easier**

- ✓ No disk failure in client
- ✓ Client machines are plug-and-play
- ✓ Flexible environment in computer classroom
 - **Linux & M\$ Windows can coexist**

DRBL and LTSP

- **Since there is LTSP, why DRBL ?**
 - Centralized resource vs. distributed resource
 - Thin client vs. powerful client
 - **Some people want to play 3D game or video in client**
 - Special features for DRBL
 - **Clonezilla**
 - **One command to switch client environment**
 - DRBL, FreeDOS, OS in local HD, memtest...
 - **Linux network installation**
 - DRBL is not suitable for old machines/thin clients
 - Choose what you need

Installation

- <http://drbl.sf.net>
- **GNU/Linux distributions – continuous link mode**
 - **i386/X86-64 platform**
 - Debian, Ubuntu, B2D, RedHat, Fedora, Mandriva, CentOS, OpenSuSE, SuSE
- **Small Linux distributions – fire and forget mode**
 - DSL, **PuppyLinux**, INSERT, PLD, GeeXbox
- **4 steps to install**
 - Install GNU/Linux
 - Install DRBL package
 - Configure server
 - Configure client

DRBL



server



switch



client nodes



pxe/etherboot

DHCP — IP —>

pxe/etherboot

192.168.0.1

TFTP — kernel —>

boot

NFS — file system —>

/, /usr, /home ...

NIS — account —>

user login

pxe/etherboot

192.168.0.40

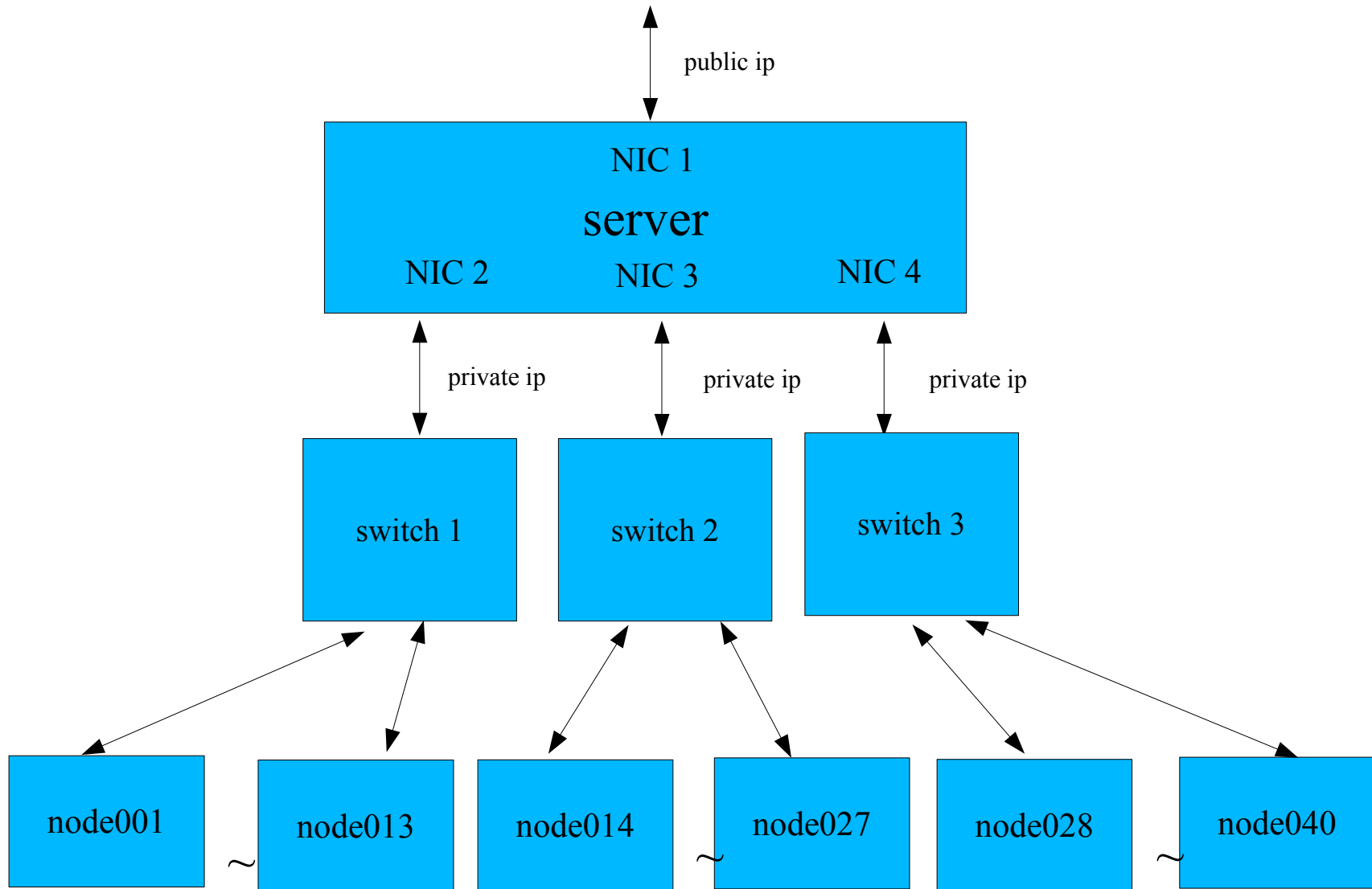
boot

/, /usr, /home ...

user login



DRBL Schematic



DRBL and Clonezilla

```
http://clonezilla.sf.net, http://clonezilla.nchc.org.tw

Clonezilla live
Clonezilla live (To RAM. Boot media can be removed later)
Clonezilla live (no framebuffer)
Clonezilla live (failsafe mode)
Local operating system in harddrive (if available)
FreeDOS
Memory test using Memtest86+
Network boot via etherboot
```

Press [Tab] to edit options

```
DRBL (http://drbl.nchc.org.tw, http://drbl.sf.net)

Ubuntu 7.04 Linux (DRBL mode, mostly local resources)
Local operating system (if available)
Memory test using Memtest86+
Puppy Linux (Rawdisk)
```

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<http://free.nchc.org.tw>

Clonezilla

- () remote-linux-txt Client_remote_Linux,_text_mode,_powerful_c
- () terminal Client_remote_Display_Linux,_terminal_mode
- () remote-memtest Client remote boot to run Memtest86,
- () remote-fdos Client remote boot to run FreeDOS
- () clonezilla-start Start clonezilla mode
- () clonezilla-stop Stop clonezilla mode
- () netinstall Network installation
- () local Client local boot (PXE client only)
- () reboot Reboot DRBL clients now
- () shutdown Shutdown DRBL clients now
- () Wake-on-LAN Turn on DRBL clients by Wake-on-LAN now
- () switch-pxe-menu Switch DRBL client menus
- () drbl-ssi Turn on or turn off the DRBL Single System Image mod
- () login-switch Switch_client_graphical_(X-window)_login_mode
- () others Other modes or commands

< OK > <Cancel>

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DRBL



Successful Story

- ✓ **Sin-Sing Elementary School, Tainan, Taiwan**
 - ✓ **Linux Golden Penguin, Taiwan, 2005**
 - ✓ **Photo courtesy of Su-Yen Tsai**



Successful Story

- ✓ **University of Louisville, Kentucky, USA**
- ✓ **Deploy laptop local OS by Clonezilla**
- ✓ **Photo courtesy of Matt Luckett**



Successful Story

- ✓ **Tokyo Christian University, Japan**
 - ✓ **DRBL**
 - ✓ **Photo courtesy of Frank Tuzi**



Known sites/users in Taiwan

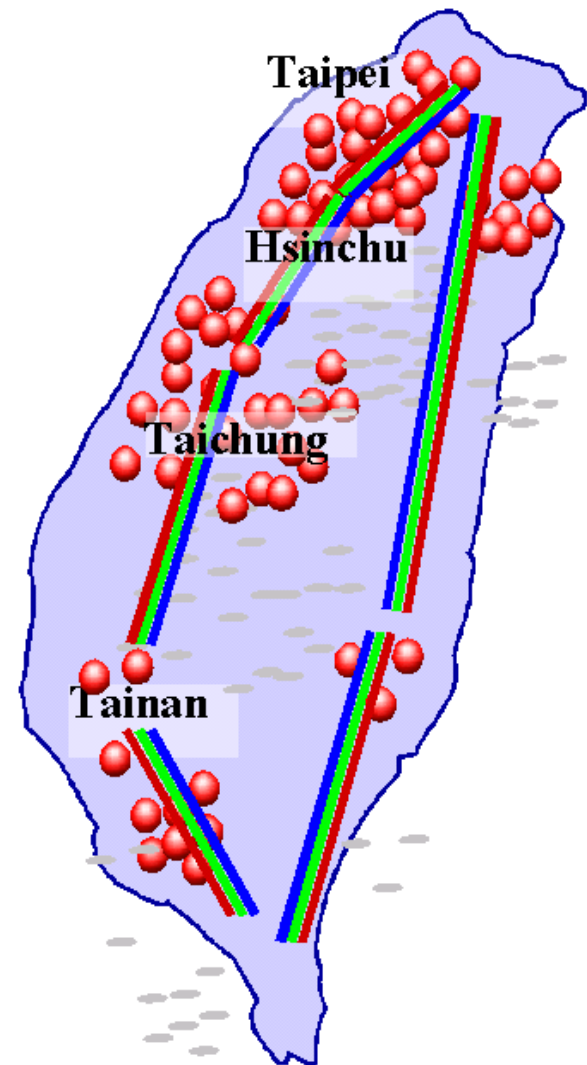
- **Known sites/users about 310**

- **Public Sector**

- **Primary/High school 102**
- **University 68**
- **Hospital 3**
- **TV station 1**
- **Government 7**
- **NPOs 18**

- **SMB 78**

- **Misc 35**



*Statistics on 2006/5/29

DRBL/Clonezilla around the world

- **Japan**
 - **Osaka Prefecture University**
 - **Tokyo Christian University**
- **Canada**
 - **Department of Education, Province of Nova Scotia**
- **Holland**
 - **NCCW (National Computer Centre Wonen)**
- **Indonesia**
 - **Index Opensource Cafe, Manado**



DRBL/Clonezilla around the world

- **Portugal**
 - **College ISPGaya**
- **USA**
 - **Internet Cafe @ Chicago**
 - **University of Louisville**
- **Sweden**
 - **SVK (Studio Västsvensk Konservering)**
- **Brazil, France, Germany, UK...**
- **More than 40K downloads for DRBL and Clonezilla**



Conclusion

- ✓ **What does DRBL do ?**
 - ✓ **Save you money**
 - ✓ **Save you time**
 - ✓ **Make your life easier**



Ask me about
**Free
Software**



It's all about freedom.

<http://www.fsf.org>

DRBL Demo in the lab

Using Ubuntu 7.04 in server

- ✓ The latest Ubuntu distribution, a lot of new features
- ✓ But it's buggy in NFS in kernel 2.6.20-15 and 2.6.20-16

- ✓ [bad_page+106/176] bad_page+0x6a/0xb0
- ✓ [free_hot_cold_page+355/368] free_hot_cold_page+0x163/0x170
- ✓ [<f904e577>] nfsd_read_actor+0x77/0x100 [nfsd]
- ✓ [do_generic_mapping_read+715/1392] do_generic_mapping_read+0x2cb/0x570
- ✓ [generic_file_sendfile+0/128] generic_file_sendfile+0x0/0x80
- ✓ [generic_file_sendfile+96/128] generic_file_sendfile+0x60/0x80
- ✓ [<f904e500>] nfsd_read_actor+0x0/0x100 [nfsd]
- ✓ [<f904d5a6>] nfsd_vfs_read+0x356/0x380 [nfsd]
- ✓ [<f904e500>] nfsd_read_actor+0x0/0x100 [nfsd]
- ✓ [<f904db01>] nfsd_read+0xe1/0x100 [nfsd]
- ✓ [<f90547c0>] nfsd3_proc_read+0xe0/0x1a0 [nfsd]
- ✓ [<f904920c>] nfsd_dispatch+0x8c/0x1d0 [nfsd]
- ✓ [<f9049180>] nfsd_dispatch+0x0/0x1d0 [nfsd]
- ✓ [<f8f1c981>] svc_process+0x3d1/0x730 [sunrpc]
- ✓ [<f8f1f654>] svc_recv+0x224/0x410 [sunrpc]
- ✓ [<f904988e>] nfsd+0x16e/0x290 [nfsd]
- ✓ [<f9049720>] nfsd+0x0/0x290 [nfsd]
- ✓ [kernel_thread_helper+7/16] kernel_thread_helper+0x7/0x10



- ✓ **Ubuntu 6.06 (LTS) is recommended if you prefer Ubuntu**

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Question ?

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National Center for High-Performance Computing