Haduzilla - Building hadoop cluster with Debian preseed

黑肚龍：無人值守自動安裝 Hadoop 叢集

Jazz Wang

Yao-Tsung Wang

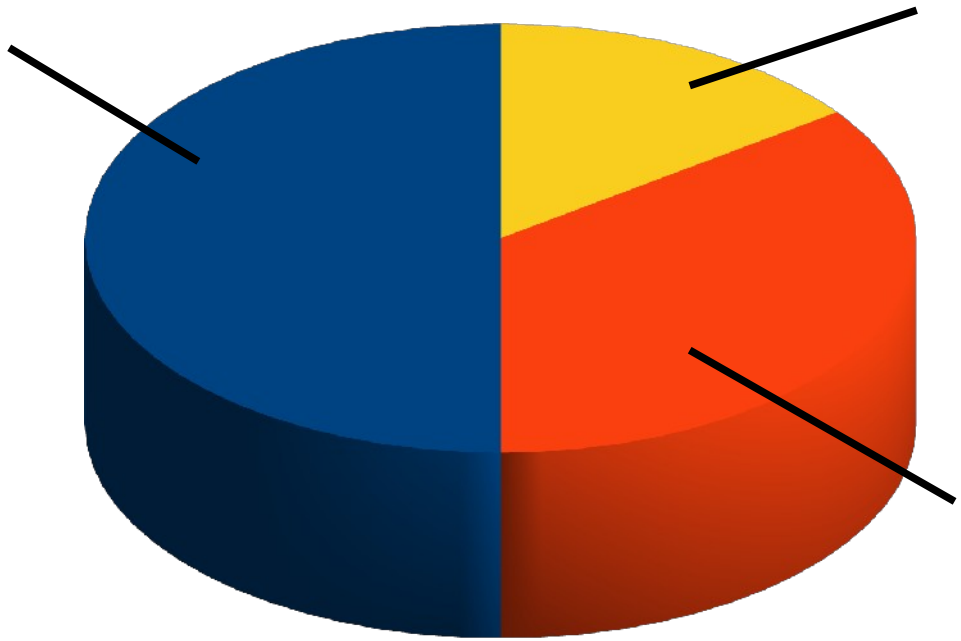
jazz@nchc.org.tw

Powered by DRBL

WHO AM I？這傢伙是誰啊？JAZZ？

- 講者介紹：
  - Jazz Yao-Tsung Wang @ NCHC / NCTU ECE Master
  - 國網中心　王耀聰　副研究員 / 交大電控八九級碩士
  - jazz@nchc.org.tw
- 所有投影片、參考資料與操作步驟均在網路上
- All the slides could be found at
  - http://trac.nchc.org.tw/cloud

FOSS End User
FOSS 使用者
Debian/Ubutnu
Access Grid
Motion/VLC
Red5
Debian Router
DRBL/Clonezilla
Hadoop

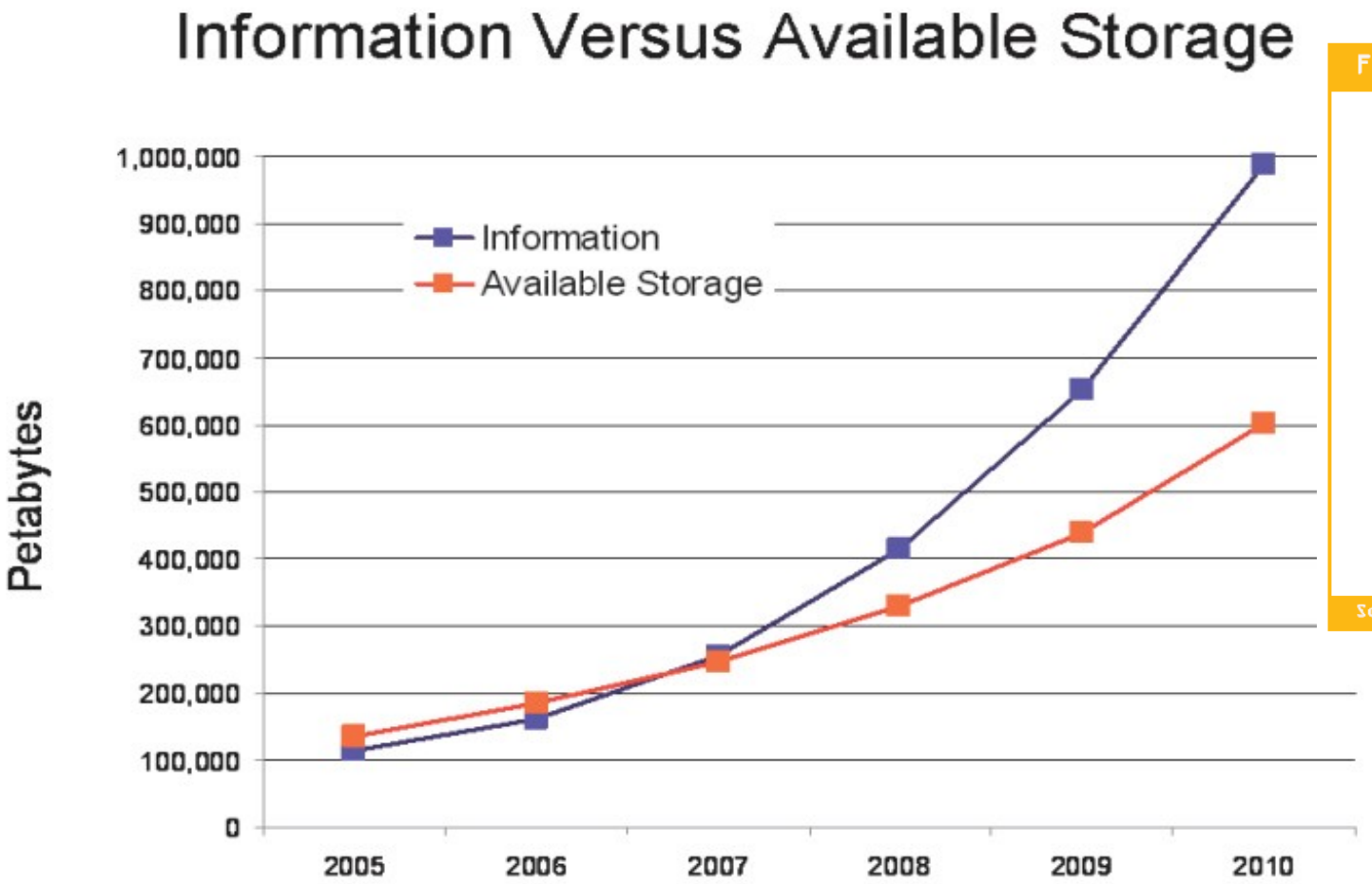


FOSS Developer
行動力薄弱的開發者
TRTC WSU/
Hadop4Win /
Haduzilla / Ezilla

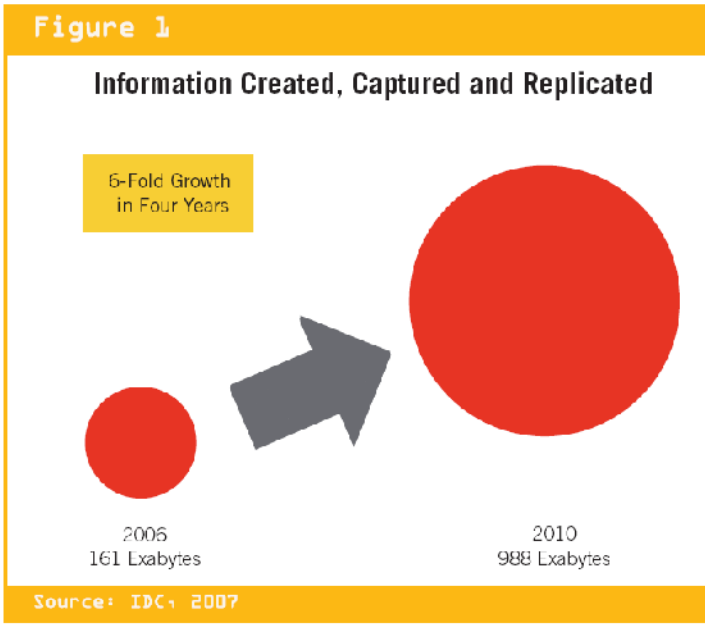
FOSS Promoter
自由軟體推廣者
DRBL/Clonezilla
Partclone/Tuxboot
Hadoop Ecosystem

Let's start with a story of DATA!!

Data Explosion!! 始於 2007 的「資料大爆炸」時代



Source: IDC, 2007

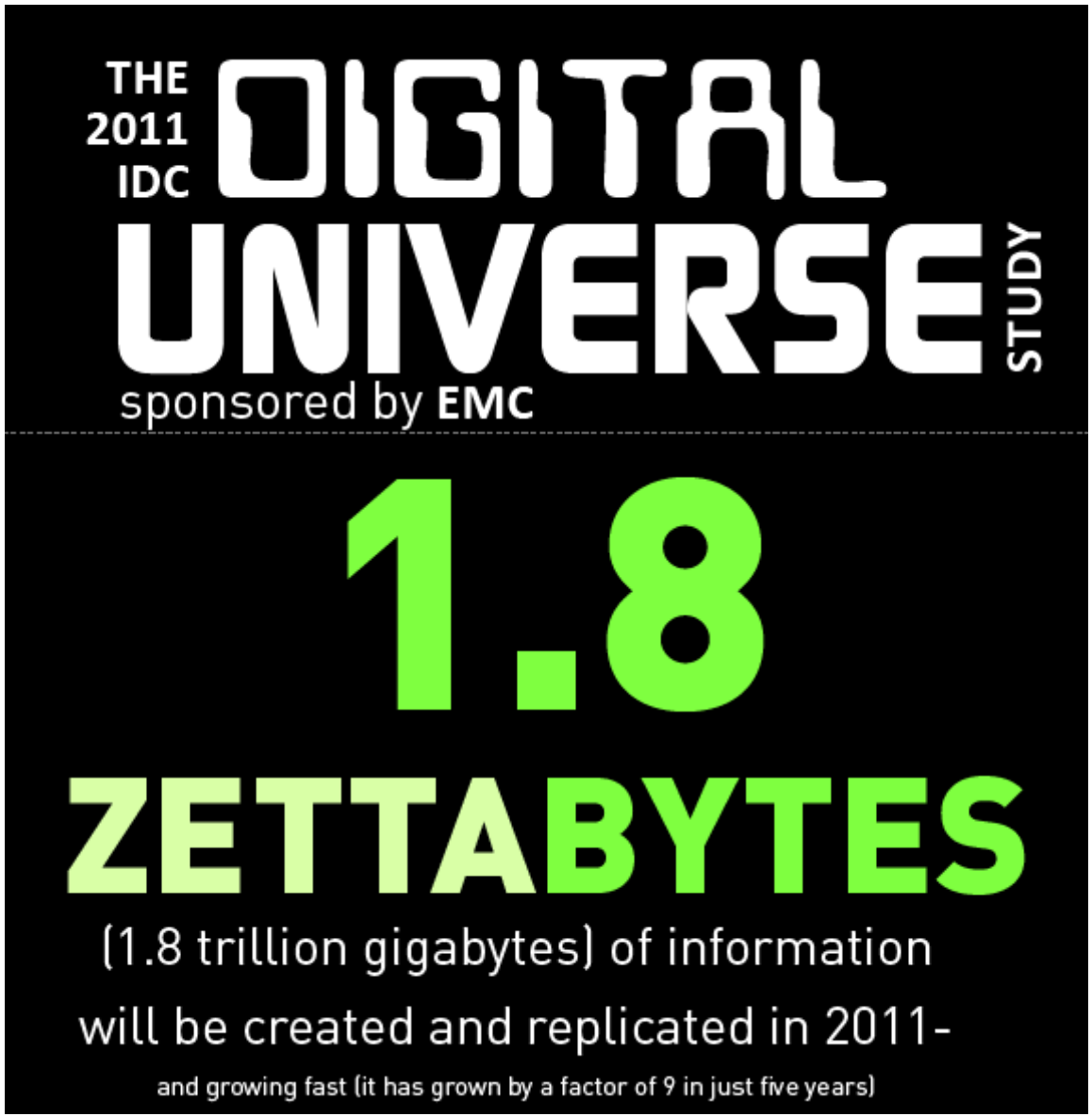


2007 年，IDC 預估
2010 年會成長六倍！
（相較 2006 年）

2006 161 EB
2010 988 EB（預測）

出處：The Expanding Digital Universe,
A Forecast of Worldwide Information Growth Through 2010,
March 2007, An IDC White Paper - sponsored by EMC
•http://www.emc.com/collateral/analyst-reports/expanding-digital-idc-white-paper.pdf

Digital Universe expanded 1.6x each year!! 每年約 1.6 倍



追蹤歷年的 IDC 數據：

2006	161	EB
2007	281	EB
2008	487	EB
2009	800	EB (0.8 ZB)
2010	988	EB (預測)
2010	1200	EB (1.2 ZB)
2011	1773	EB (預測)
2011	1800	EB (1.8 ZB)

景氣差而成長趨緩？
或受新技術抑制？

出處：Extracting Value from Chaos,
June 2011, An IDC White Paper - sponsored by EMC
http://www.emc.com/collateral/about/news/idc-emc-digital-universe-2011-infographic.pdf

Now we all need to store and process BIG DATA!!

What is Hadoop ?

用一句話解釋 *Hadoop* 是什麼 ??

Hadoop is a software platform that lets one easily write and run applications that process vast amounts of data.

Hadoop 是一個讓使用者簡易撰寫並執行處理海量資料應用程式的軟體平台。

亦可以想像成一個處理海量資料的生產線，只須學會定義 *map* 跟 *reduce* 工作站該做哪些事情。

Features of Hadoop ...
Hadoop 這套軟體的特色是 ...

- **海量　Vast Amounts of Data**
  - 擁有儲存與處理大量資料的能力
  - Capability to STORE and PROCESS vast amounts of data.
- **經濟　Cost Efficiency**
  - 可以用在由一般 PC 所架設的叢集環境內
  - Based on large clusters built of commodity hardware.
- **效率　Parallel Performance**
  - 透過分散式檔案系統的幫助，以致得到快速的回應
  - With the help of HDFS, Hadoop have better performance.
- **可靠　Robustness**
  - 當某節點發生錯誤，能即時自動取得備份資料及佈署運算資源
  - Robustness to add and remove computing and storage resource without shutdown entire system.

Which companies are powered by Hadoop ??
有哪些公司在用 *Hadoop* 這套軟體 ??

- Yahoo is the key contributor currently.
- IBM and Google teach Hadoop in universities …
- http://www.google.com/intl/en/press/pressrel/20071008_ibm_univ.html
- The New York Times used 100 Amazon EC2 instances and a Hadoop application to process 4TB of raw image TIFF data (stored in S3) into 11 million finished PDFs in the space of 24 hours at a computation cost of about $240 (not including bandwidth)

  – from http://en.wikipedia.org/wiki/Hadoop
- http://wiki.apache.org/hadoop/AmazonEC2
- http://wiki.apache.org/hadoop/PoweredBy

Tweeter

- A9.com
- ADSDAQ by Contextweb
- EHarmony
- Facebook Facebook
- Fox Interactive Media
- IBM
- ImageShack
- ISI
- Joost
- Last.fm
- Powerset
- The New York Times
- Rackspace
- Veoh
- Metaweb

Hadoop in production run ....
商業運轉中的 *Hadoop* 應用 ....

- February 19, 2008
- Yahoo! Launches World's Largest Hadoop Production Application
- http://developer.yahoo.net/blogs/hadoop/2008/02/yahoo-worlds-largest-production-hadoop.html

Number of links between pages in the index	roughly 1 trillion links
Size of output	over 300 TB, compressed!
Number of cores used to run single Map-Reduce job	over 10,000
Raw disk used in the production cluster	over 5 Petabytes

You can store and process BIG DATA via Large Cluster!!

Common method to deploy Cluster in Labs

1. Setup one **Template** machine

2. **Cloning** to multiple machine

3. **Configure** Settings

↓

4. Install **Job Scheduler**

↓

5. Running **Benchmark**

Challenges of common method in Labs

Add New User Account ?

Upgrade Software ?

How to share user data ?

Configuration Syncronization

How to deploy 4000+ Nodes ?!

資料標題：Scaling Hadoop to 4000 nodes at Yahoo!
資料日期：September 30, 2008

Total Nodes	**4000**
Total cores	**30000**
Data	**16PB**

	500-node cluster		4000-node cluster	
	write	**read**	**write**	**read**
number of files	990	990	14,000	14,000
file size (MB)	320	320	360	360
total MB processes	316,800	316,800	5,040,000	5,040,000
tasks per node	2	2	4	4
avg. throughput (MB/s)	**5.8**	**18**	**40**	**66**

- Make Hadoop deployment *agile*
- Integrate with dynamic cluster deployments

Source: Deploying hadoop with smartfrog
http://people.apache.org/~stevel/slides/deploying_hadoop_with_smartfrog.pdf

SmartFrog - HPLabs' CM tool

- Language for describing systems to deploy —everything from datacentres to test cases
- Runtime to create *components* from the model
- Components have a lifecycle
- LGPL Licensed, Java 5+

http://smartfrog.org/

Source: Deploying hadoop with smartfrog
http://people.apache.org/~stevel/slides/deploying_hadoop_with_smartfrog.pdf

If you need to deploy in Cloud - try Puppet

如果要在 Amazon EC2 上佈署 Hadoop 等軟體，可以考慮 Puppet
因爲作業系統已由虛擬機器的範本裝好了，只能用「有碟」的作法！

hstack

Blog

Hadoop/HBase automated deployment using Puppet

with 23 comments

Introduction

72 tweets

retweet

Deploying and configuring Hadoop and HBase across clusters is a complex task. In this article I will show what we do to make it easier, and share the deployment recipes that we use.

For the tl;dr crowd: go get the code here.

Cool tools

Before going into how we do things, here is the list of tools that we are using, and which I will mention in this article. I will try to put a link next to any tool-specific term, but you can always refer to its specific home-page for further reference.

- Hudson – this is a great CI server, and we are using it to build Hadoop, HBase, Zookeeper and more
- The Hudson Promoted Builds Plug-in – allows defining operations that run after the build has finished, manually or automatically
- Puppet – configuration management tool We don't have a dedicated operations team to hand off a list of instructions on how we want our machines to look like. The operations team helping us just makes sure the servers are in the rack, networked and powered up, but once we have a set of IPs (usually from IPMI cards) we're good to go ourselves. We are our own devops team, and as such we try to automate as much as possible, where possible, and using the tools above helps a lot.

https://github.com/hstack/puppet
http://hstack.org/hstack-automated-deployment-using-puppet/
http://www.cioinsight.com/images/stories/slideshows/SS_142511_CIO_TechSkills/

Can I install ONE server to deploy hadoop cluster ?

Yes, use DRBL to deploy Hadoop

- Need to build new debian packages
- drbl-hadoop – Mounting local disk for HDFS and MapReduce

```
svn co http://trac.nchc.org.tw/pub/grid/drbl-hadoop-0.1/
```

- hadoop-register – for multiuser registration and ssh client

```
svn co http://trac.nchc.org.tw/pub/cloud/hadoop-register
```

About hadoop.nchc.org.tw

- DRBL Server x 1 Node (hadoop)
- DRBL Client x 20 Nodes (hadoop101~hadoop120)
- **Powered by Debian Squeeze 6.0.4**

使用者註冊頁面 Hadoop-Register

Hadoop 帳號申請

帳號:

密碼:

登入 重填

新增帳號 忘記密碼 操作問題回報

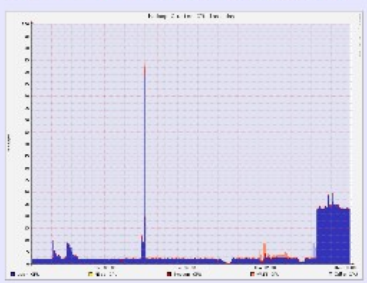
歡迎加入討論群組，以利接收即時公告事宜

家目錄空間吃緊中，請盡量上傳至HDFS後，清除家目錄檔案，謝謝！

註冊人數: 1460 / 1999 人

MapReduce 狀態 | HDFS 狀態

過去 24 小時 CPU 負載 - 查詢完整系統負載:



Running Jobs Quick Links

Jobid	Priority	User	Name	Map % Complete	Map Total	Maps Completed	Reduce % Complete
job_201104290234_0905	NORMAL	h1196	PA: Local Apriori over input: n/1mpy54 /input, with minSup: 15000, ep: 0.5	100.00%	10	10	100.00%
			PA: Local Apriori over				

NameNod

Started:	F
Version:	0
Compiled:	S
Upgrades:	T

Browse the filesyst
Namenode Logs

Cluster Summary

2079646 files and

WARNING : There a

Configured Cap
DFS Used
Non DFS Used

網站帳號 jazzwang E-mail [redacted] 姓名 王耀聰 電話 0 單位 0 用途 0 主機帳號 h998 主機密碼 [redacted] 登出

檔案(F) 編輯(E) 檢視(V) 歷史(Y) 工具(T) 說明(H)

1. hadoop.nchc.org.tw

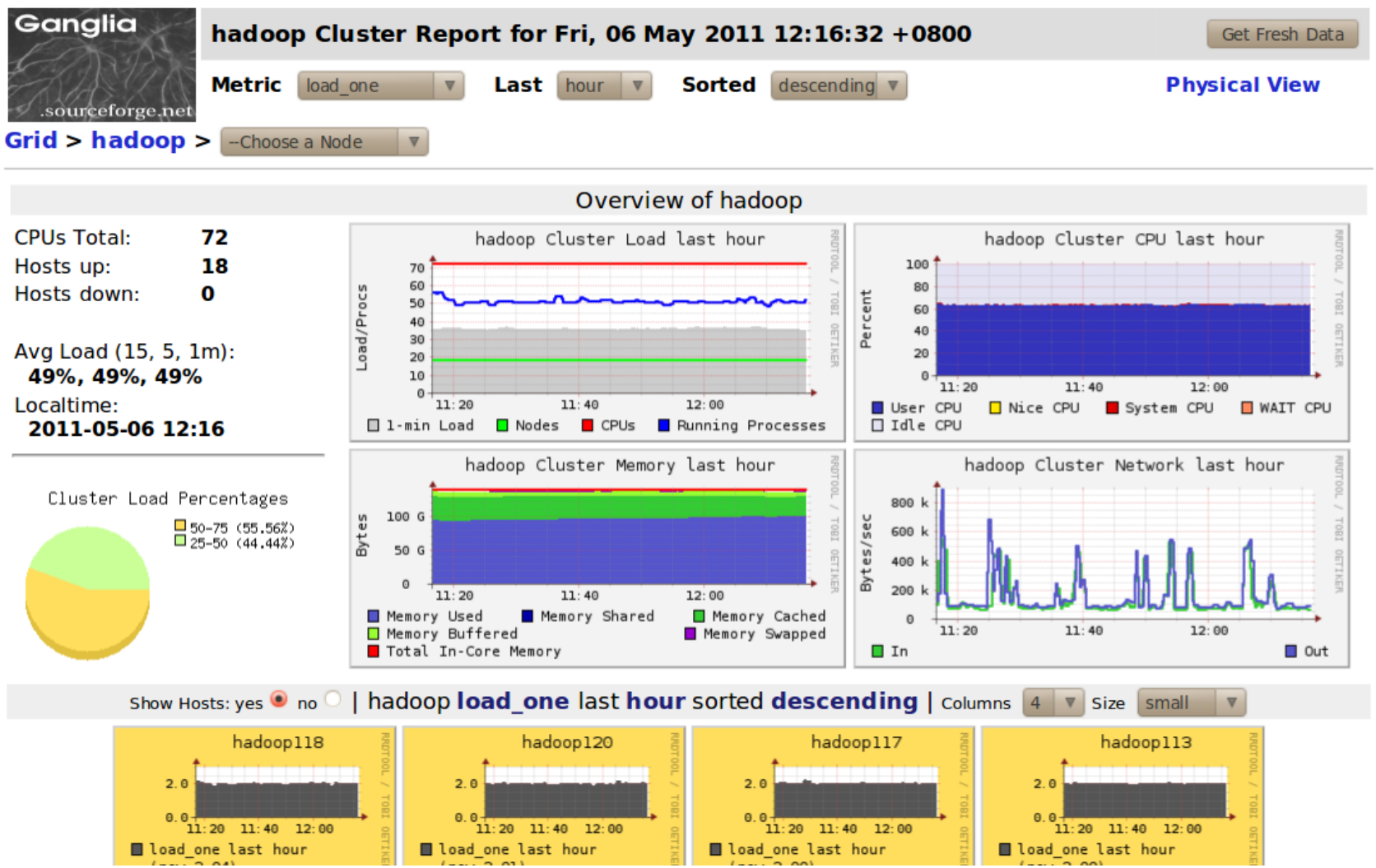
```
Linux hadoop 2.6.32-5-amd64 #1 SMP Wed Jan 12 03:40:32 UTC 2011 x86_64

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Tue Apr 26 15:45:44 2011 from nat235.dynamic.cs.nctu.edu.tw
h998@hadoop:~$
```

Powered by Zterm

http://zhouer.org/ZTerm/

系統狀態監控 Ganglia

- 採用自由軟體 Ganglia 來蒐集電腦叢集的負載狀態
- http://ganglia.sourceforge.net/

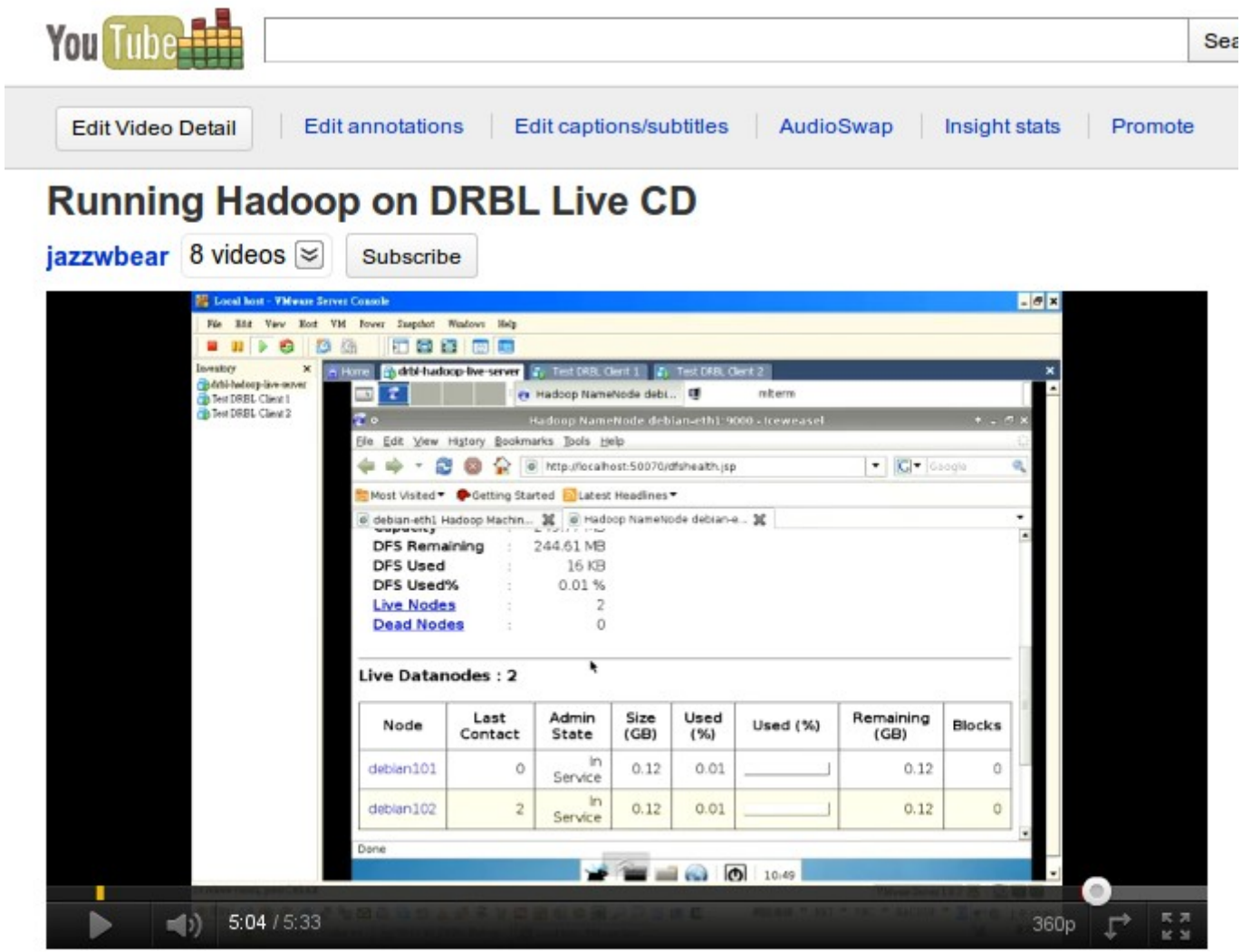


DRBL+Hadoop=Haduzilla 黑肚龍系統架構

Can you help me to deploy my own multiuser hadoop cluster like hadoop.nchc.org.tw?

In 2009, DRBL-Hadoop Live CD released ...

舊影片： http://www.youtube.com/watch?hl=en&v=Ix4WigGvE_A
下載點： http://drbl-hadoop.sf.net



But I want it
installed to disks
for production
….
What should I do ?

On 11 Feb 2011, 4$ shared about preseed!

感謝 4$ 大大分享 Debian 6.0 自動化安裝

FourDollars Blog

GNU/Linux, Debian/Ubuntu, Mac OS X, Free Software/Open Source Software, Freeware, and Programming.

首頁 | Software Development | Debian Package

2011年2月11日星期五

$4 的 Debian 6.0 自動化安裝

製作可開機安裝 Debian 6.0 的 USB Stick

首先去下載 debian-6.0.2.1-i386-businesscard.iso (46M) 回來
然後再準備一個 USB Stick 接上電腦，如果 mount 在 Linux 系統上的話記得先 umount 掉
以 root 權限執行 (這裡假設 USB Stick 的 Device Node 位於 /dev/sdc)

```
# cat debian-6.0.2.1-i386-businesscard.iso > /dev/sdc
```

這樣就可以製作出可開機安裝 Debian 6.0 的 USB Stick 沒錯就是這樣製作的
這是 Debian 6.0 以後的新功能 hybrid CD/DVD image 不過只有在 i386/amd64 上面有作用

準備好要安裝的電腦跟可以透過有線網路 DHCP 上網的網路環境

現在這隻 USB Stick 可以接上任何可以使用 USB Stick 開機的電腦上開機就會看到：

訂閱
發表文章
留言
企鵝星球

Source: http://fourdollars.blogspot.tw/2011/02/4-debian-60.html

We install Base System of GNU Debian Linux

with Debian Installer and Preseed ……

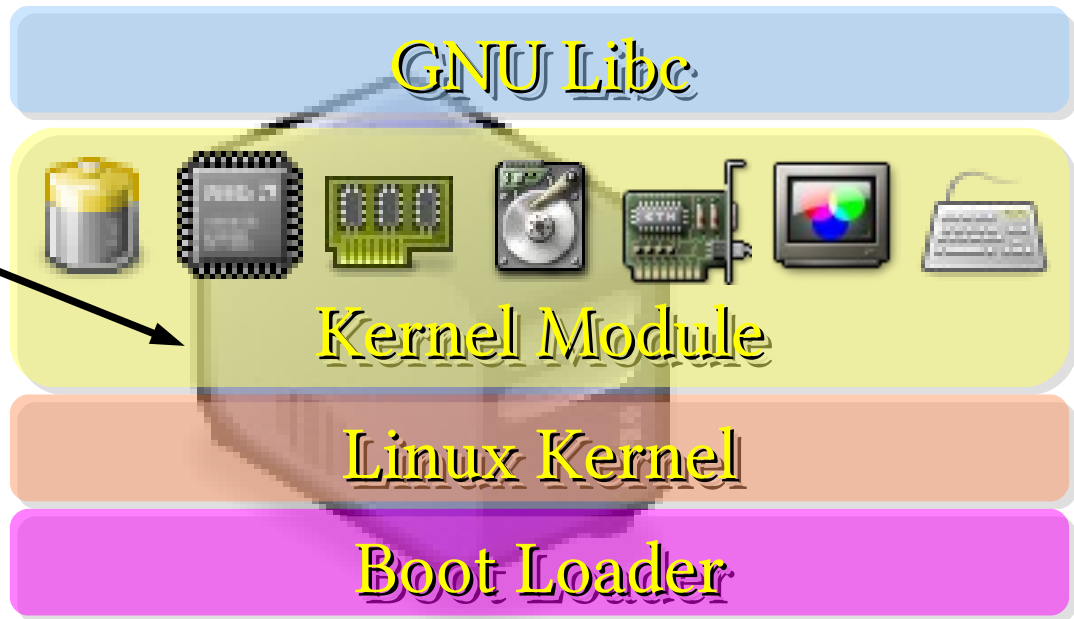
According to http://example.com/d-i/squeeze/preseed.cfg

It will install (1) Base Packages of Debian 6.0.4

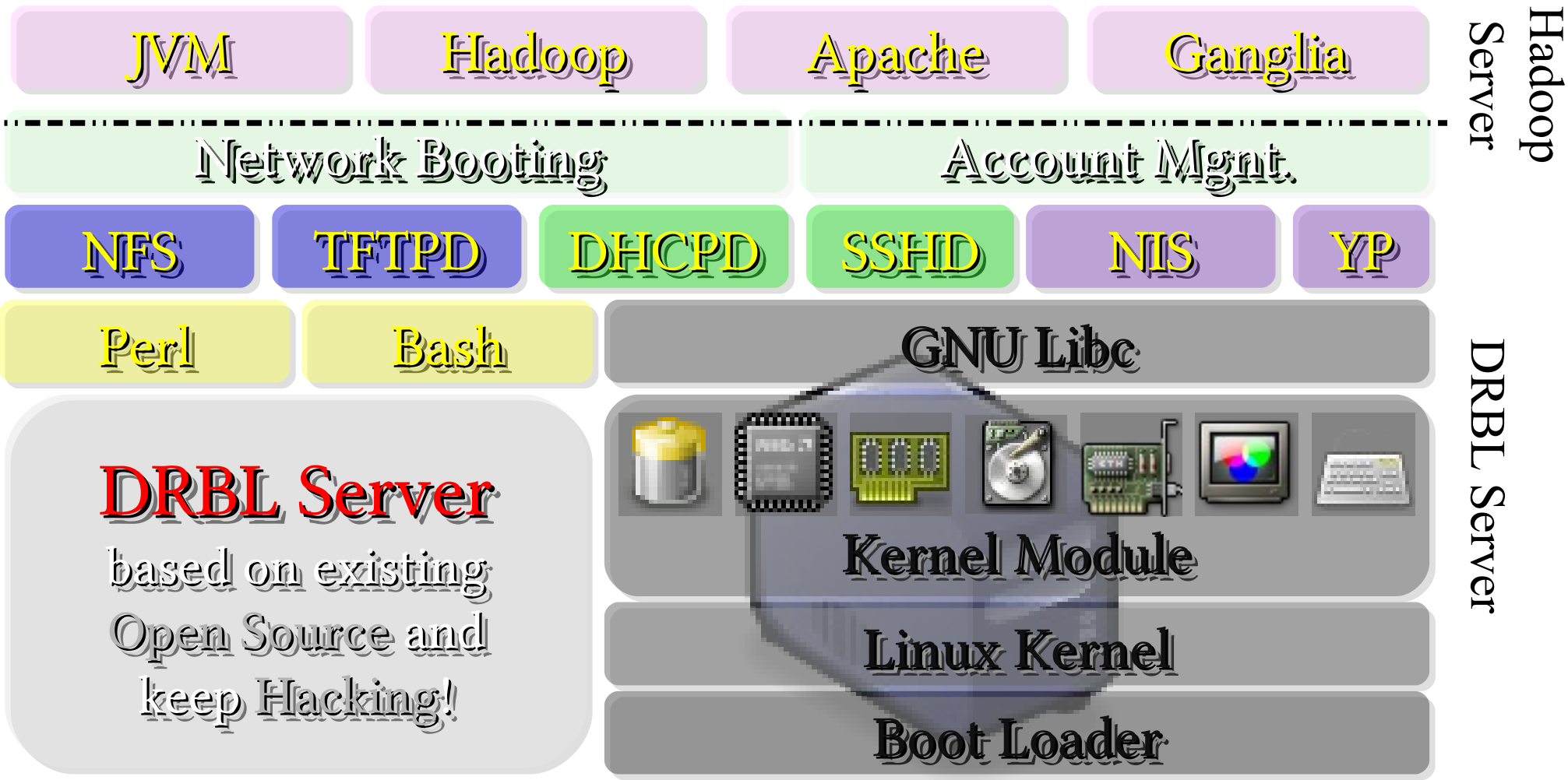
(2) DRBL, JVM, Hadoop, etc….

(3) Run late_command script

Debian Netinst CD

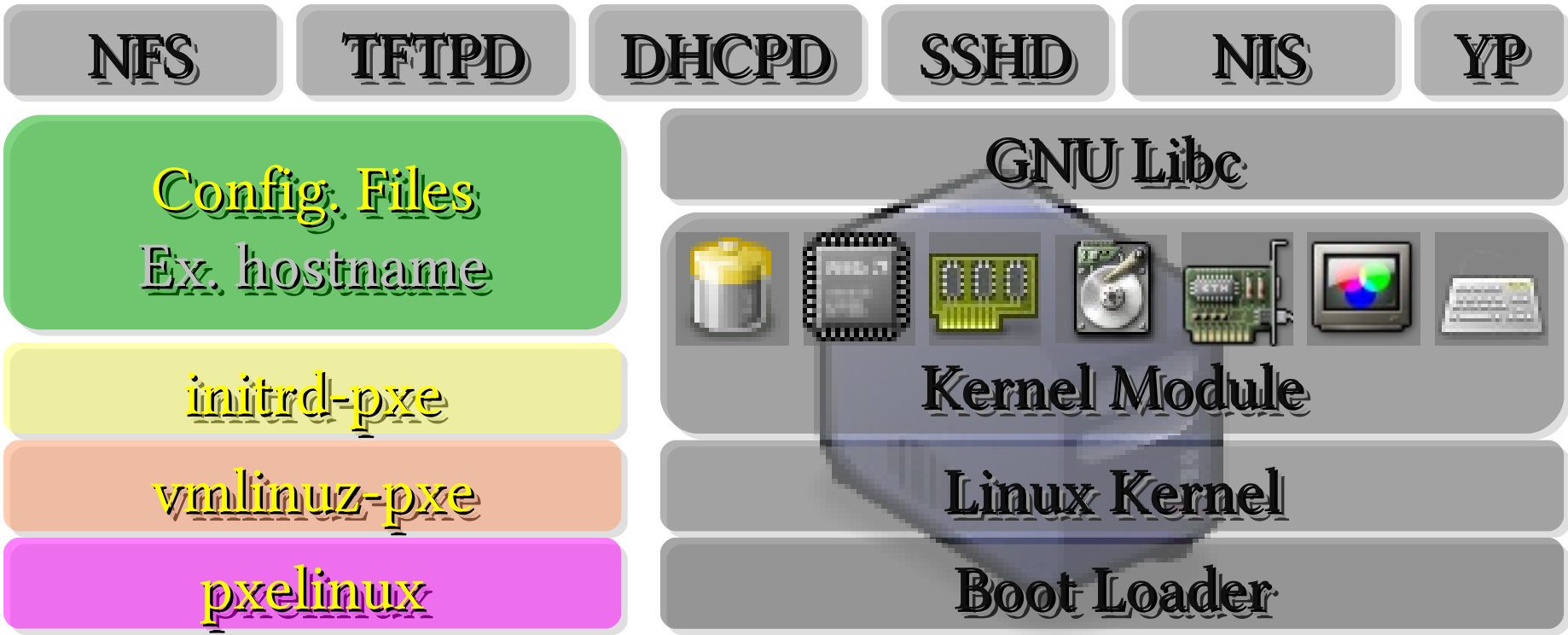


Reboot. It had installed **DRBL package** and **rc.local script** will configure it as **DRBL Server**.
There are lots of service needed:
SSHD, DHCPD, TFTPD, NFS Server, NIS Server, YP Server ...



DRBL Server
based on existing Open Source and keep Hacking!

rc.local script will run "drblsrv" & "drblpush", there will be pxelinux, vmlinux-pex, initrd-pxe in TFTPROOT, and different configuration files for each DRBL Client in NFSROOT



Then, we enable PXE function in BIOS for each DRBL Client nodes.

BIOS PXE | BIOS PXE | BIOS PXE | BIOS PXE

NFS | TFTPD | DHCPD | SSHD | NIS | YP

Config. Files
Ex. hostname

initrd-pxe

vmlinuz-pxe

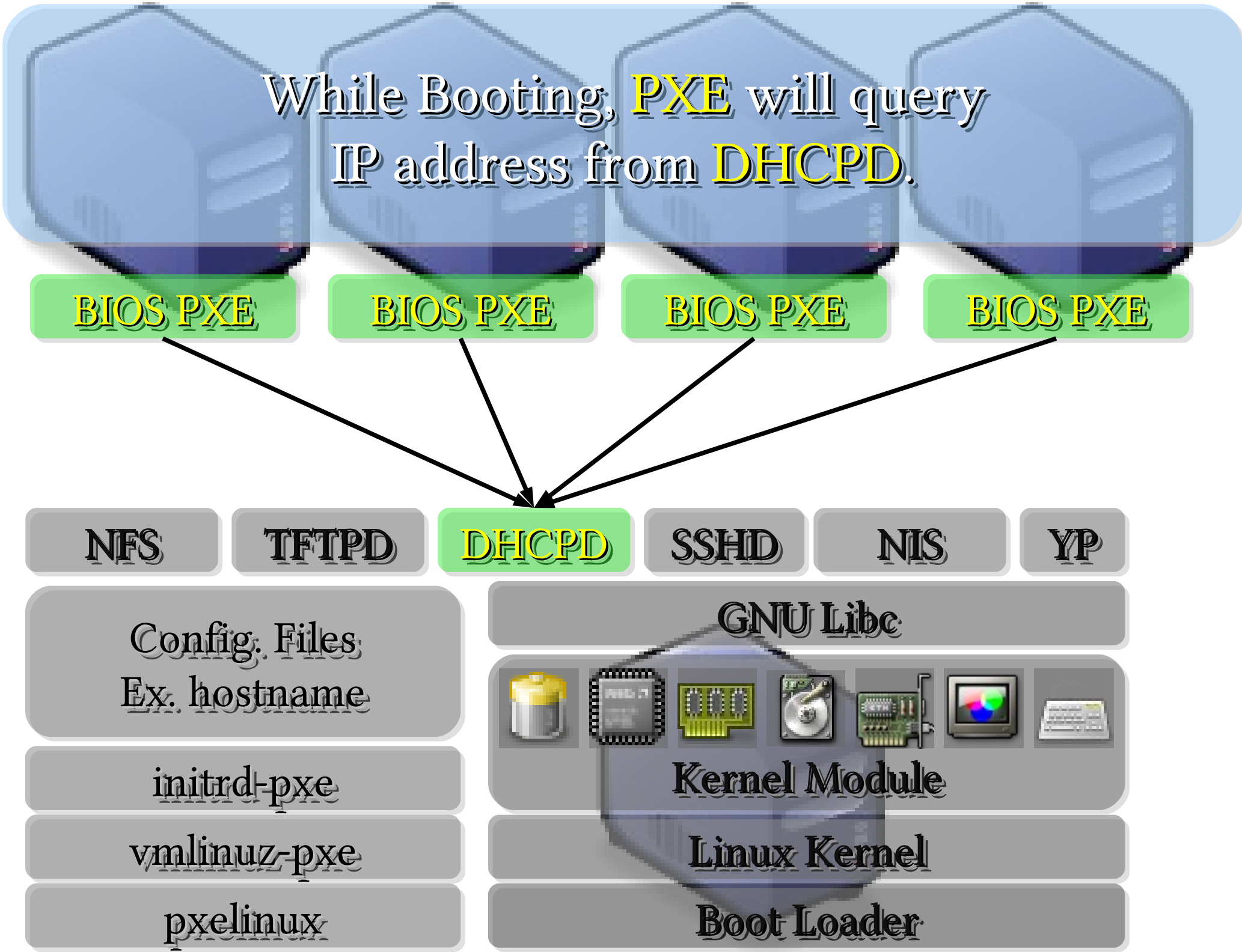
pxelinux

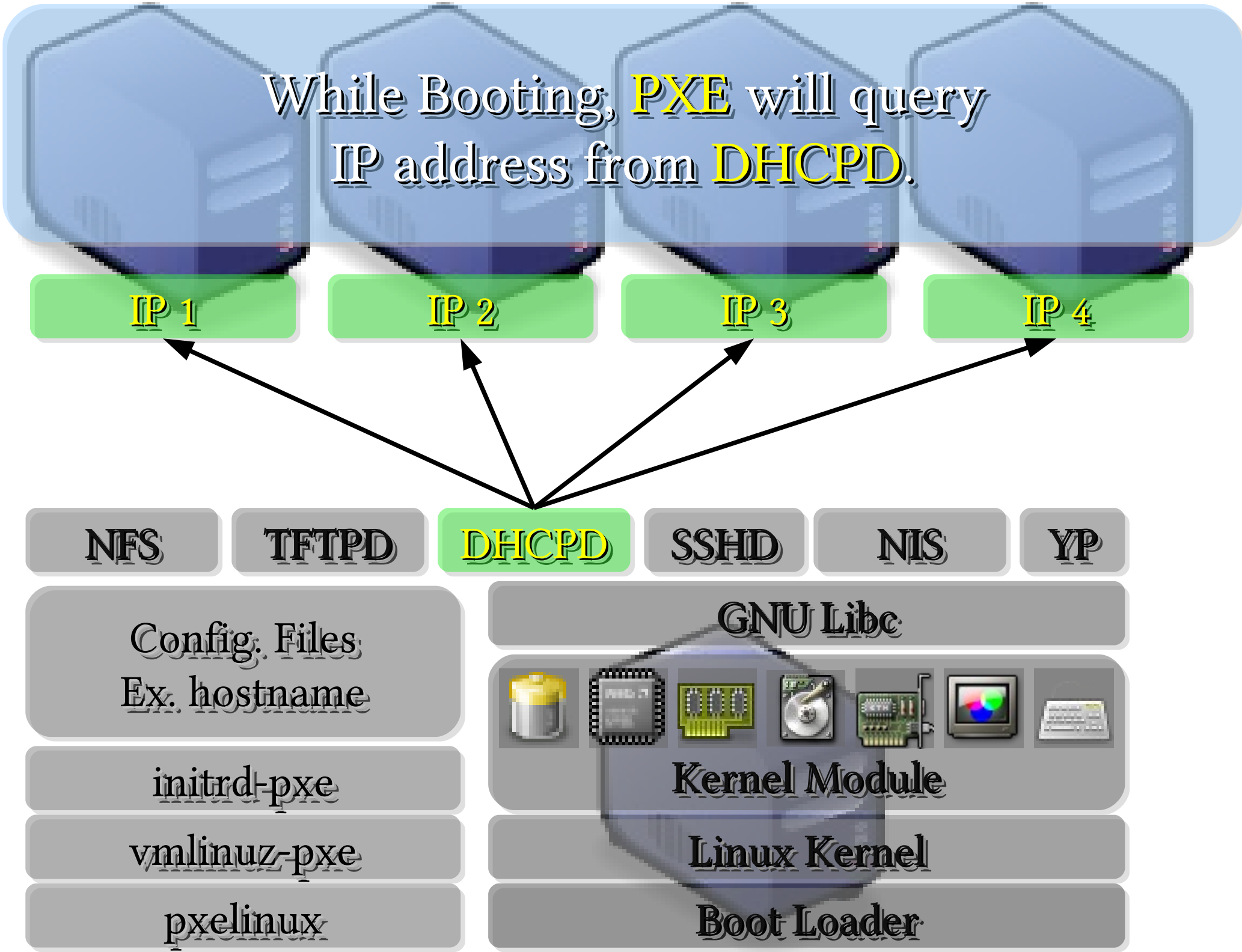
GNU Libc

Kernel Module

Linux Kernel

Boot Loader


While Booting, PXE will query
IP address from DHCPD.
BIOS PXE
BIOS PXE
BIOS PXE
BIOS PXE
NFS
TFTPD
DHCPD
SSHD
NIS
YP
Config. Files
Ex. hostname
initrd-pxe
vmlinuz-pxe
pxelinux
GNU Libc
Kernel Module
Linux Kernel
Boot Loader


While Booting, PXE will query
IP address from DHCPD.
IP 1
IP 2
IP 3
IP 4
NFS
TFTPD
DHCPD
SSHD
NIS
YP
Config. Files
Ex. hostname
initrd-pxe
vmlinuz-pxe
pxelinux
GNU Libc
Kernel Module
Linux Kernel
Boot Loader

After PXE get its IP address, it will download booting files from TFTPD.

IP 1 | IP 2 | IP 3 | IP 4

NFS | TFTPD | DHCPD | SSHD | NIS | YP

Config. Files
Ex. hostname

initrd-pxe

vmlinuz-pxe

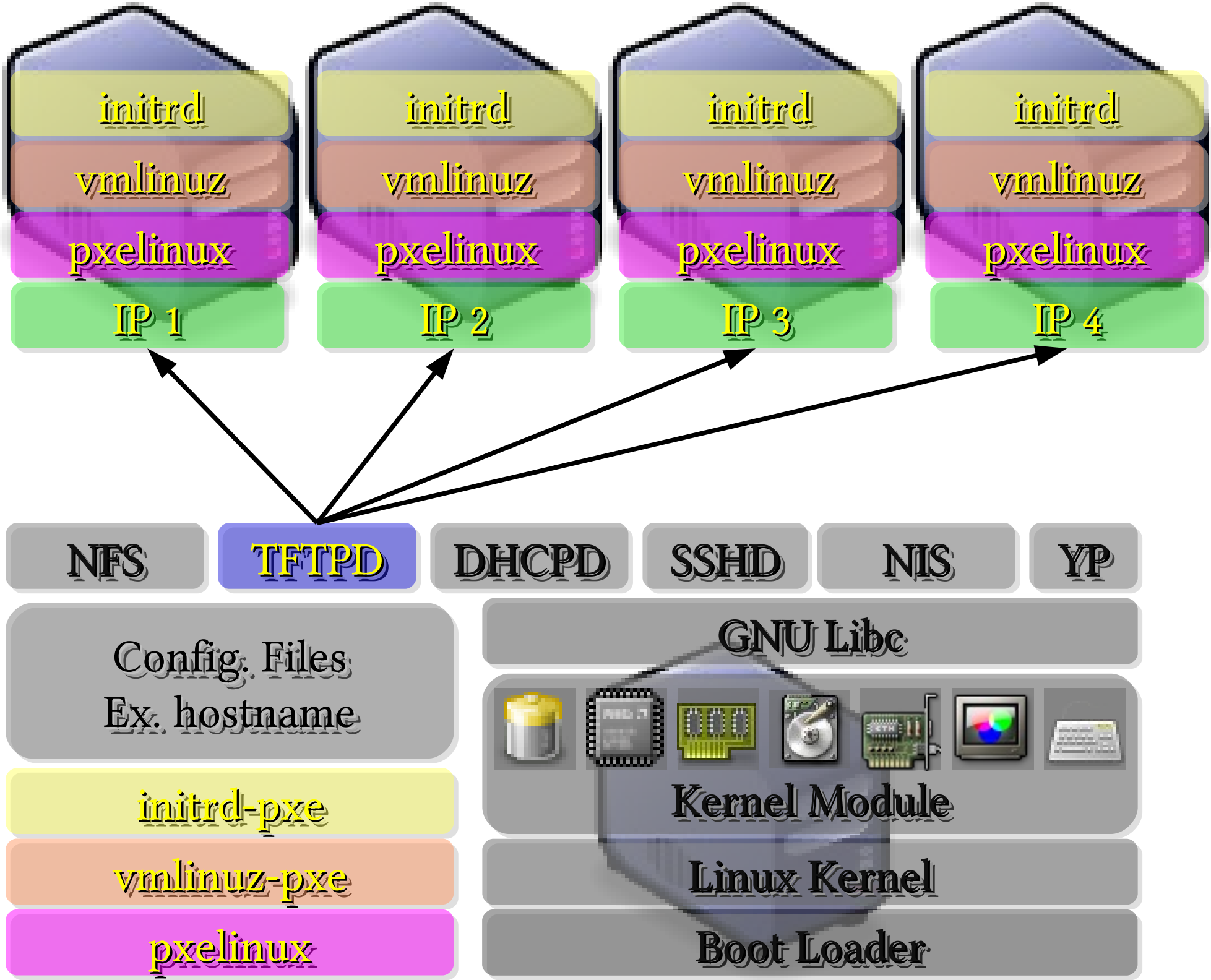
pxelinux

GNU Libc

Kernel Module

Linux Kernel

Boot Loader


initrd
vmlinuz
pxelinux
IP 1
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pxelinux
IP 3
initrd
vmlinuz
pxelinux
IP 4
NFS
TFTPD
DHCPD
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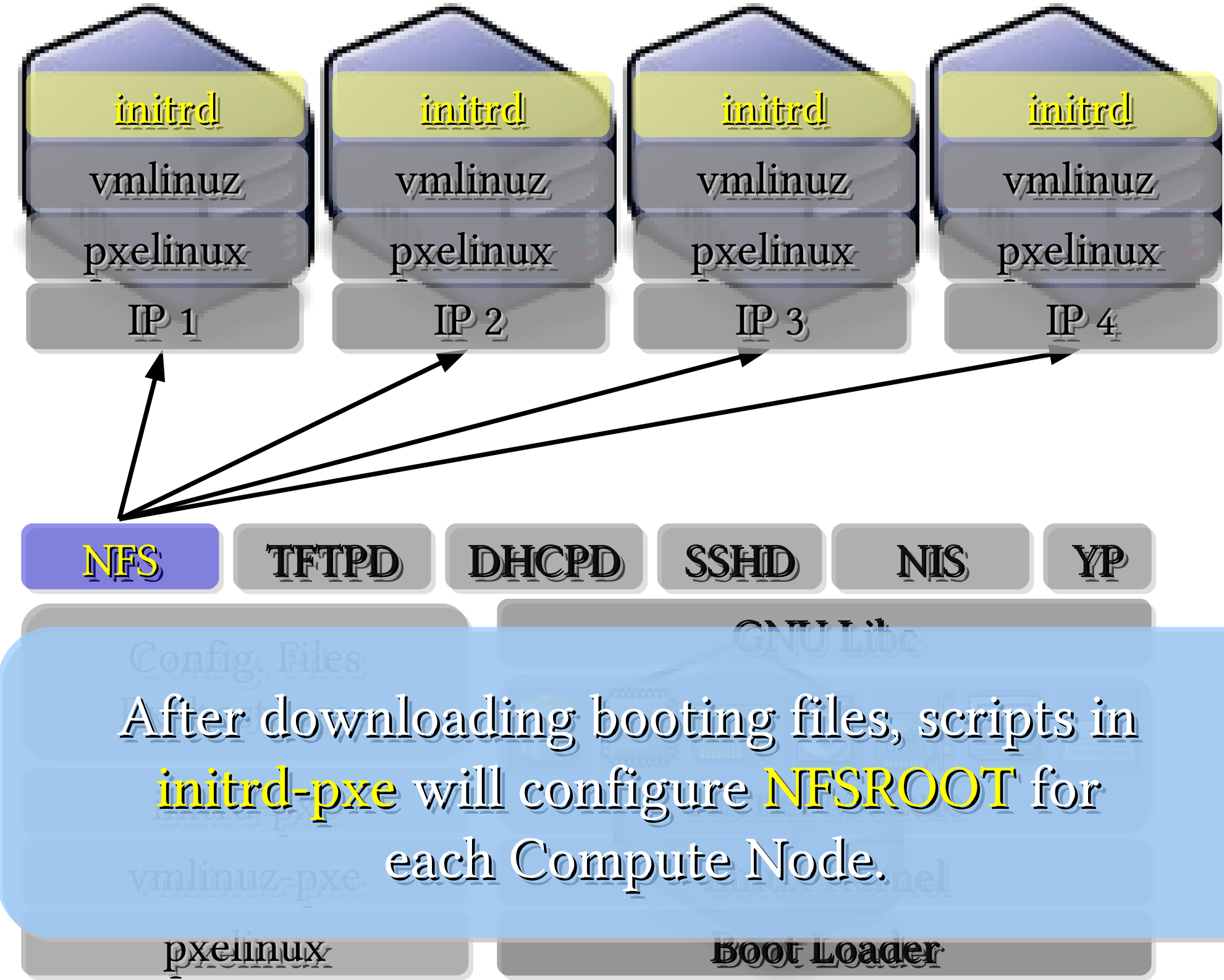
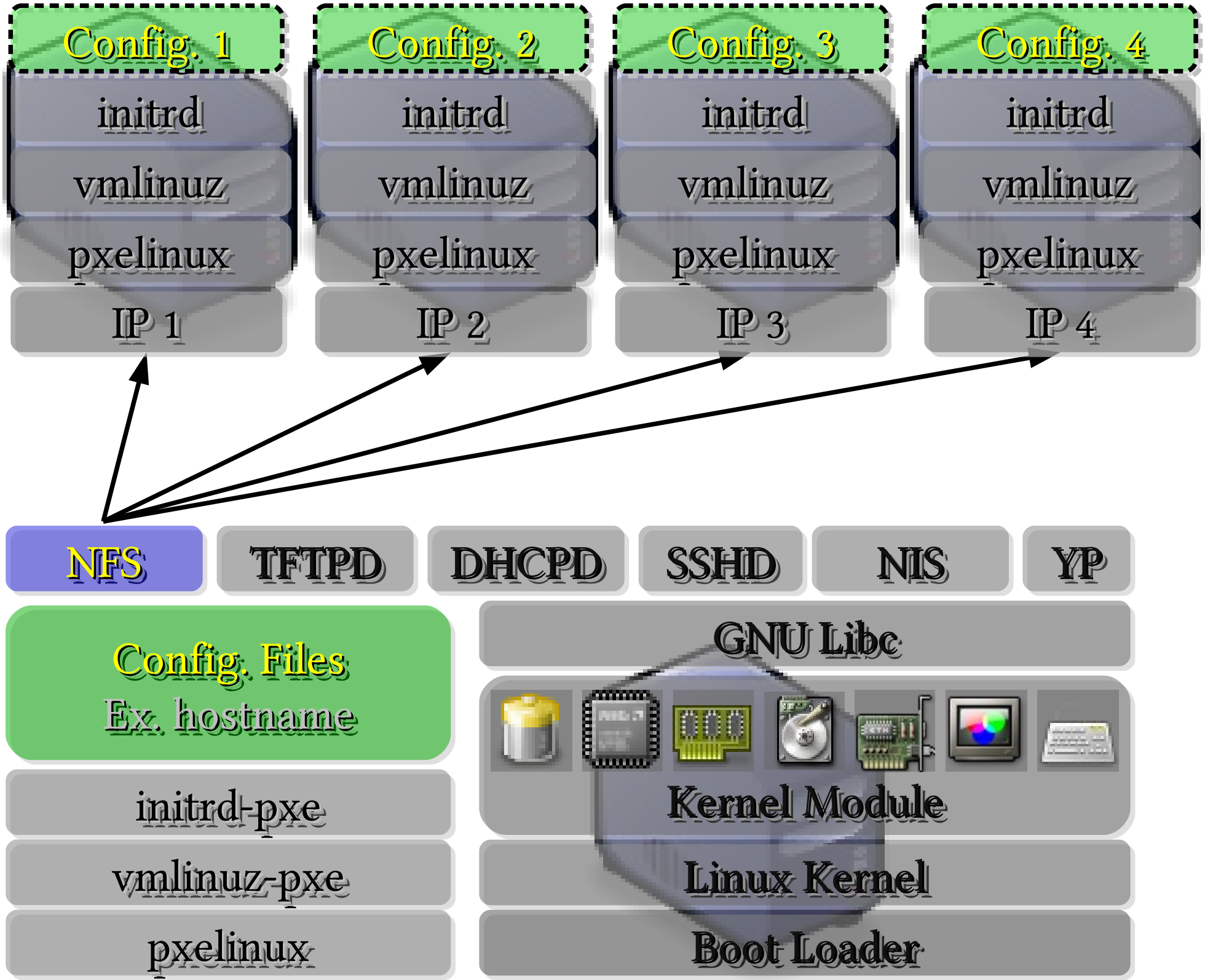
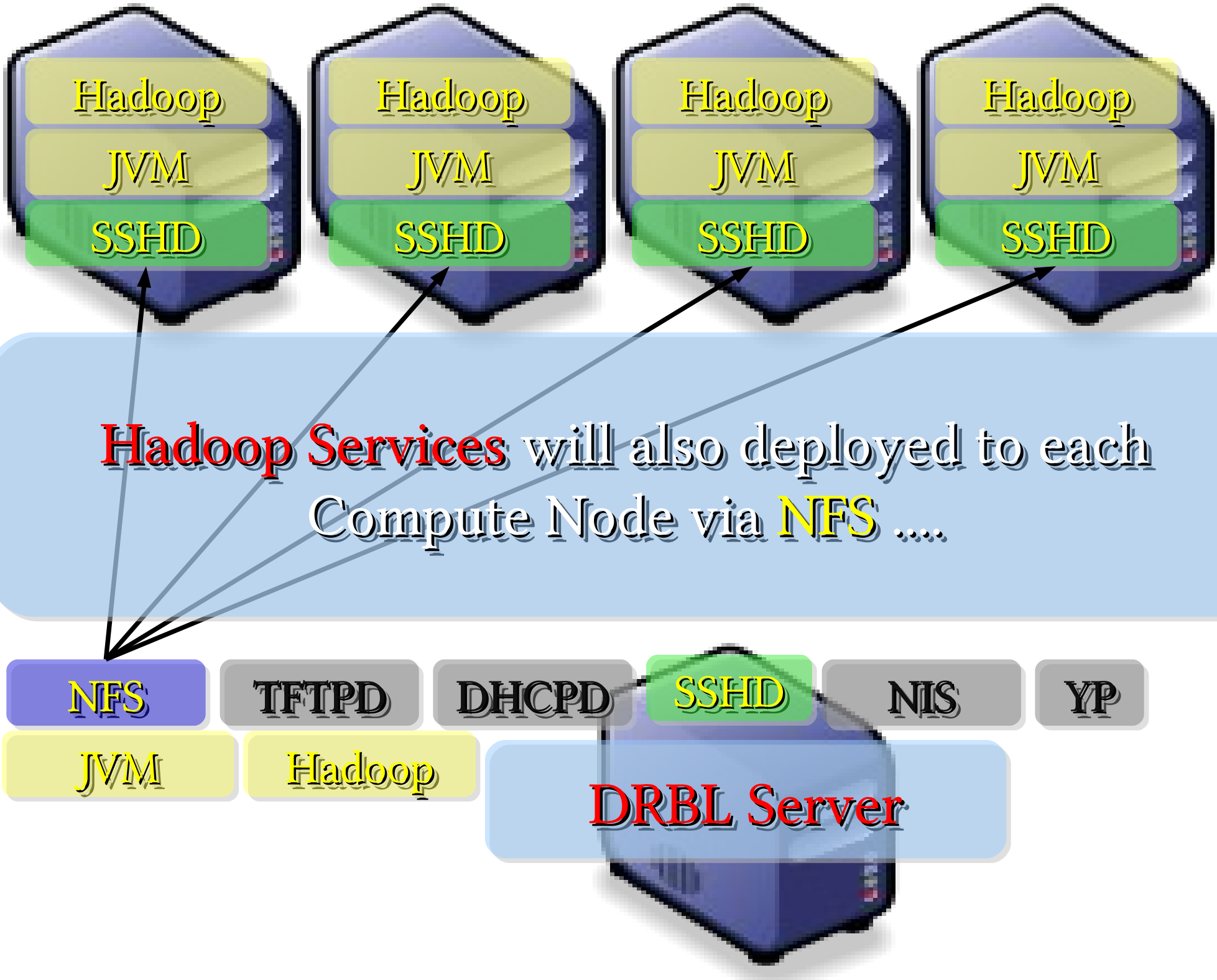
NIS
YP
Config. Files
Ex. hostname
initrd-pxe
vmlinuz-pxe
pxelinux
GNU Libc
Kernel Module
Linux Kernel
Boot Loader

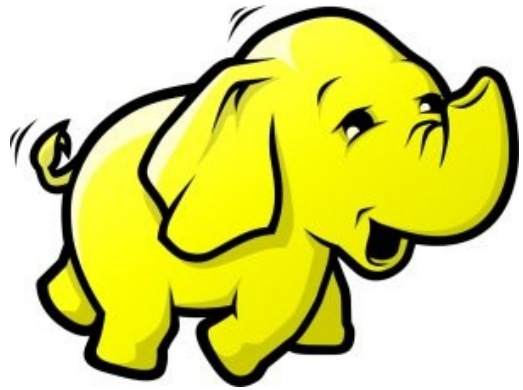

initrd
vmlinuz
pxelinux
IP 1
initrd
vmlinuz
pxelinux
IP 2
initrd
vmlinuz
pxelinux
IP 3
initrd
vmlinuz
pxelinux
IP 4
NFS
TFTPD
DHCPD
SSHD
NIS
YP
After downloading booting files, scripts in initrd-pxe will configure NFSROOT for each Compute Node.

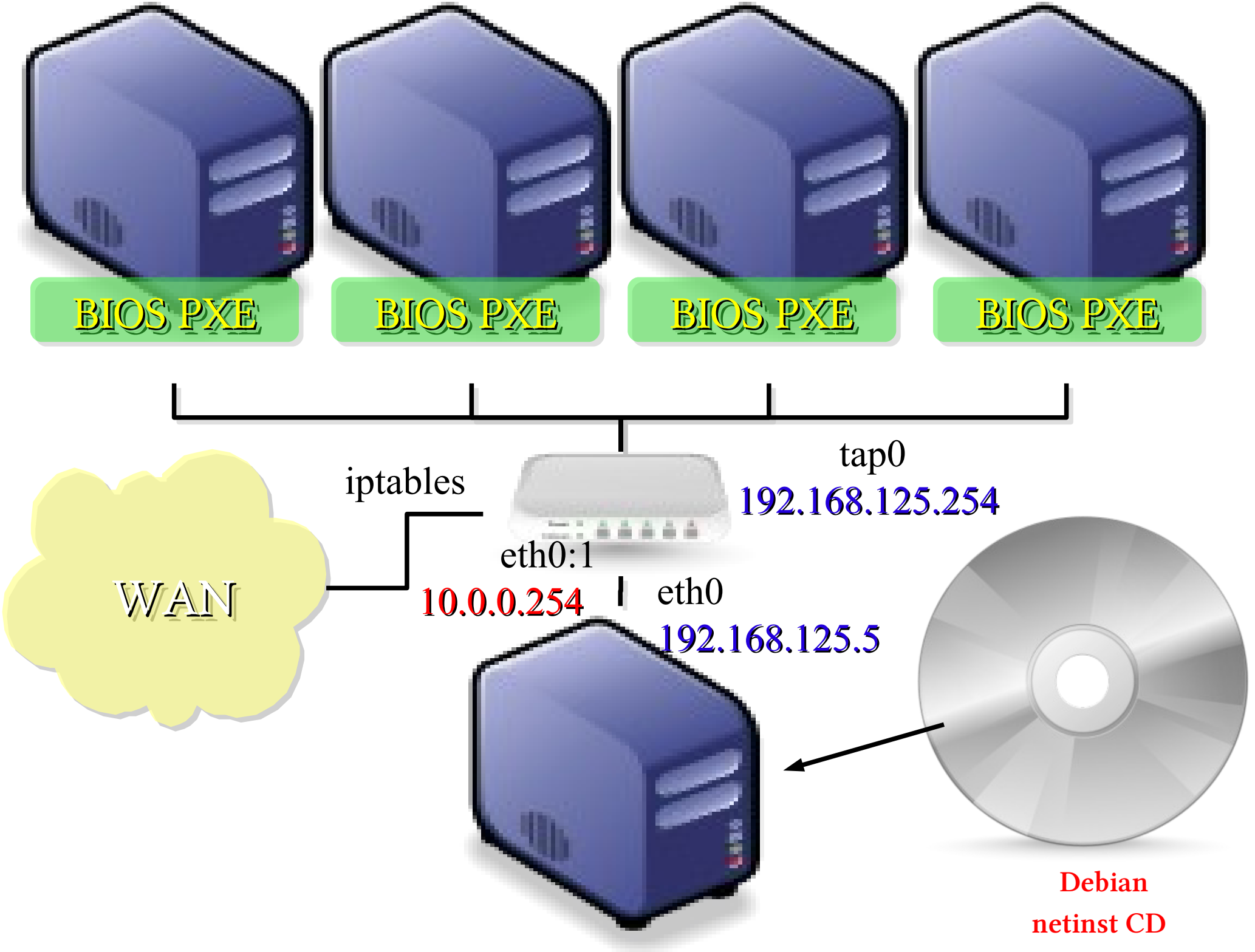

Config. 1
Config. 2
Config. 3
Config. 4
initrd
vmlinuz
pxelinux
IP 1
IP 2
IP 3
IP 4
NFS
TFTPD
DHCPD
SSHD
NIS
YP
Config. Files
Ex. hostname
initrd-pxe
vmlinuz-pxe
pxelinux
GNU Libc
Kernel Module
Linux Kernel
Boot Loader

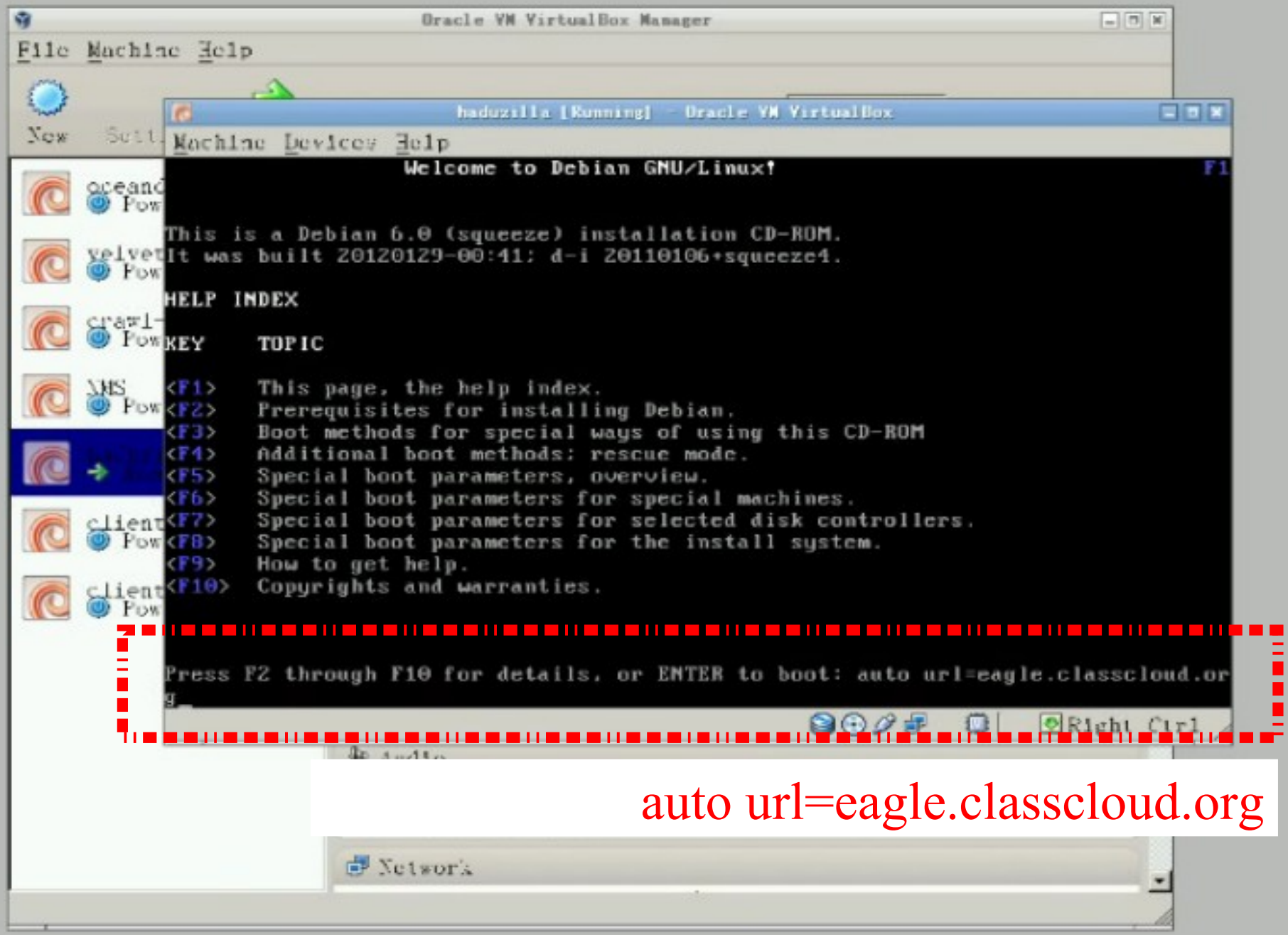

Hadoop
JVM
SSHD
Hadoop
JVM
SSHD
Hadoop
JVM
SSHD
Hadoop
JVM
SSHD
Hadoop Services will also deployed to each Compute Node via NFS ....
NFS
TFTPD
DHCPD
SSHD
NIS
YP
JVM
Hadoop
DRBL Server

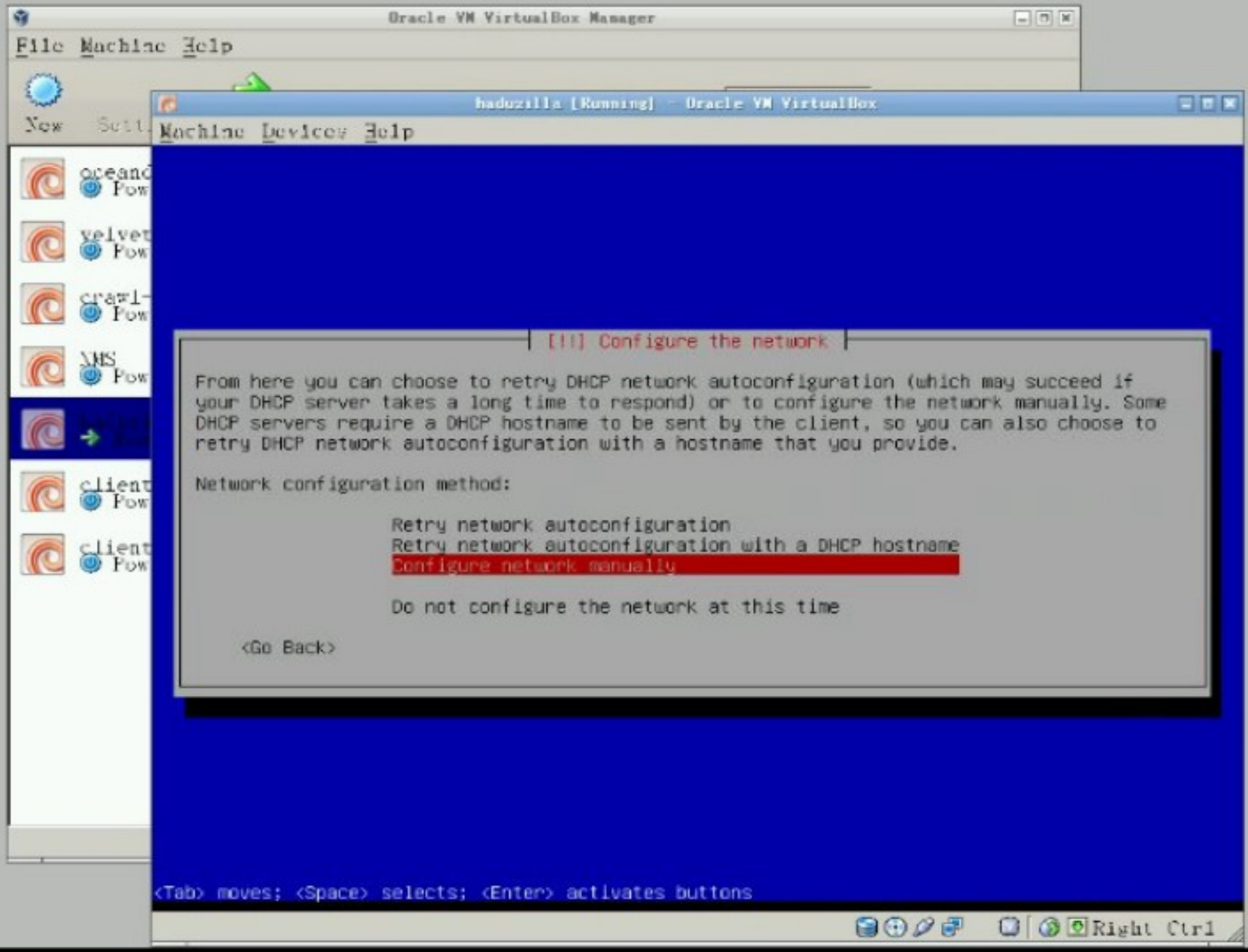
Demo

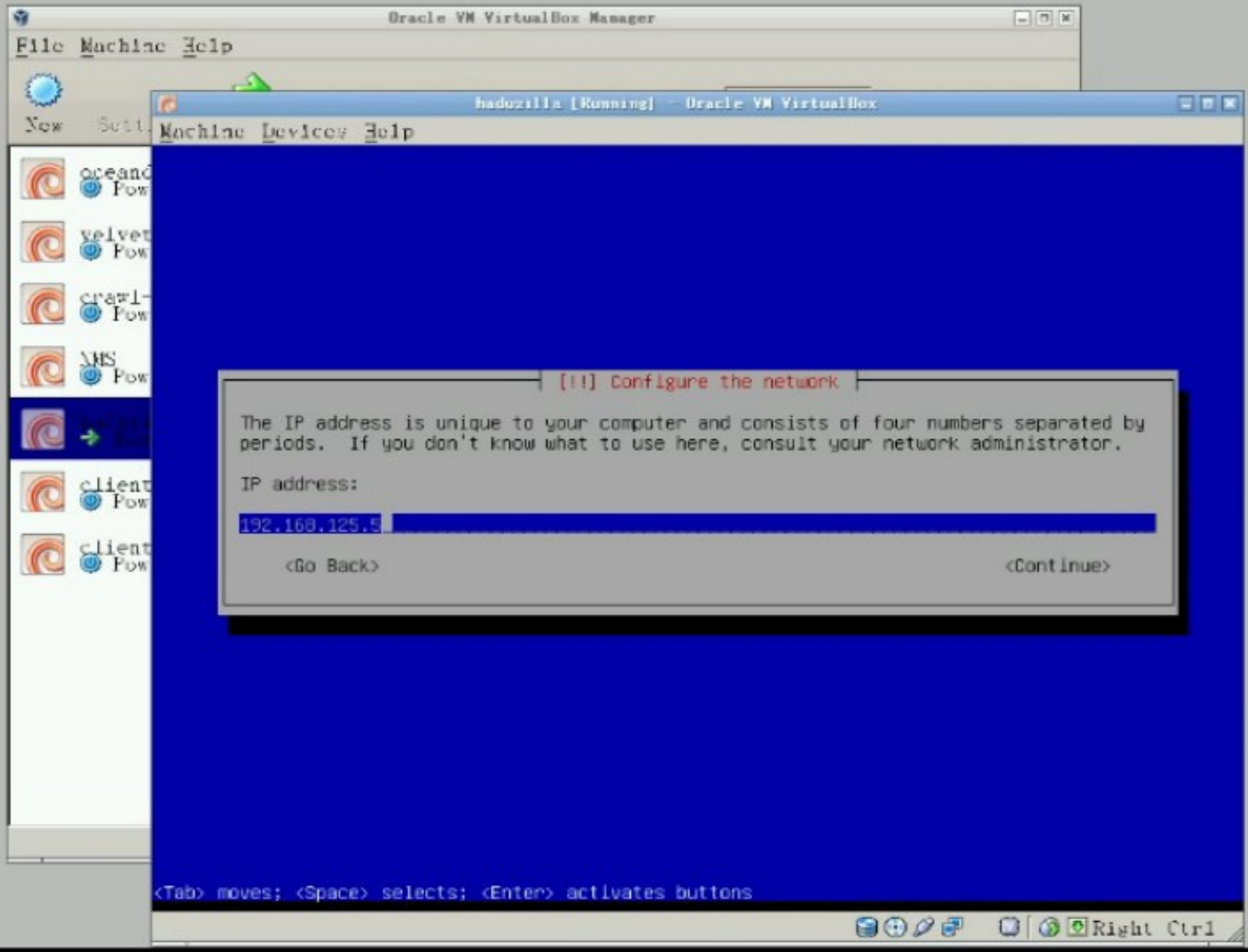
Jazz Wang
Yao-Tsung Wang
jazz@nchc.org.tw

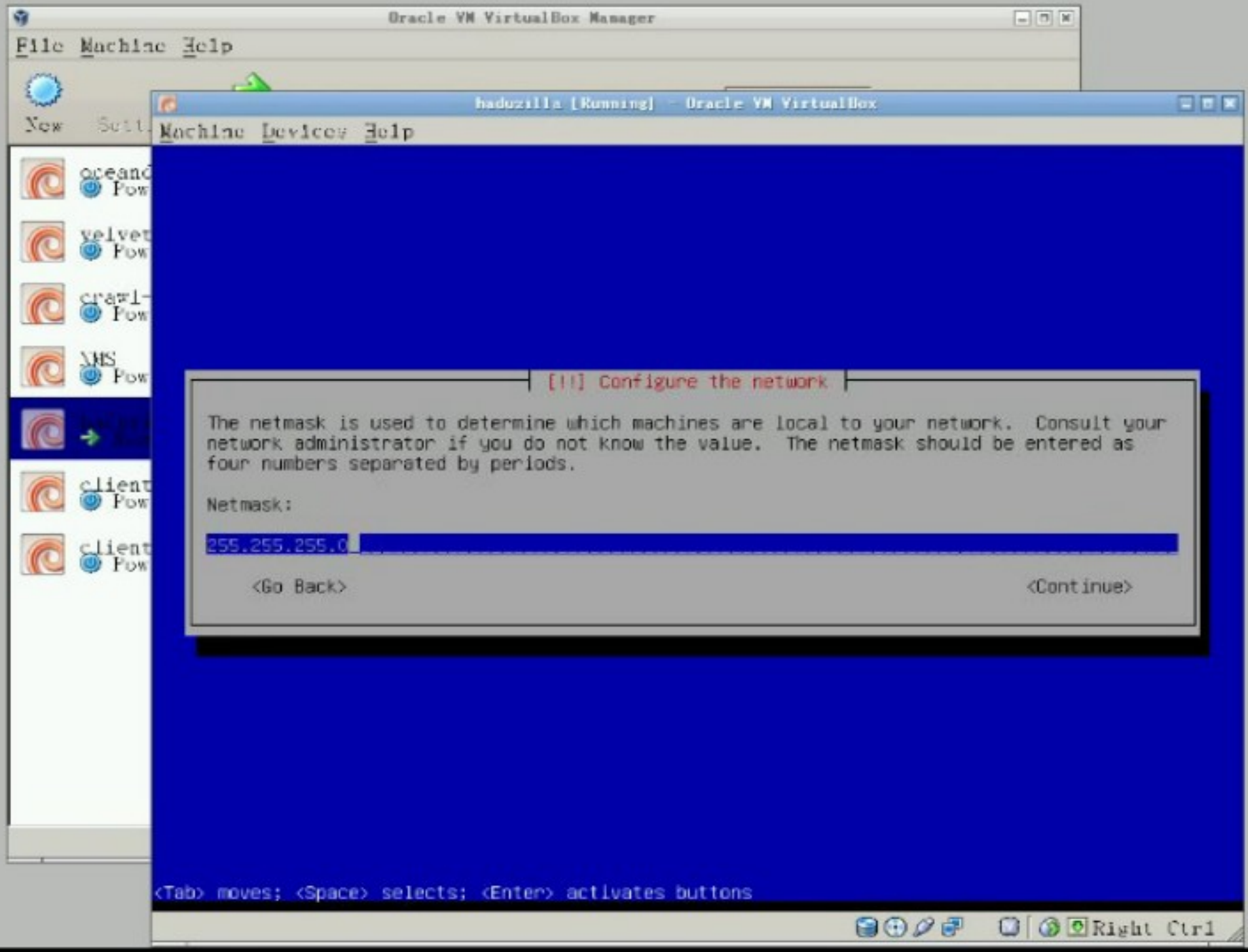


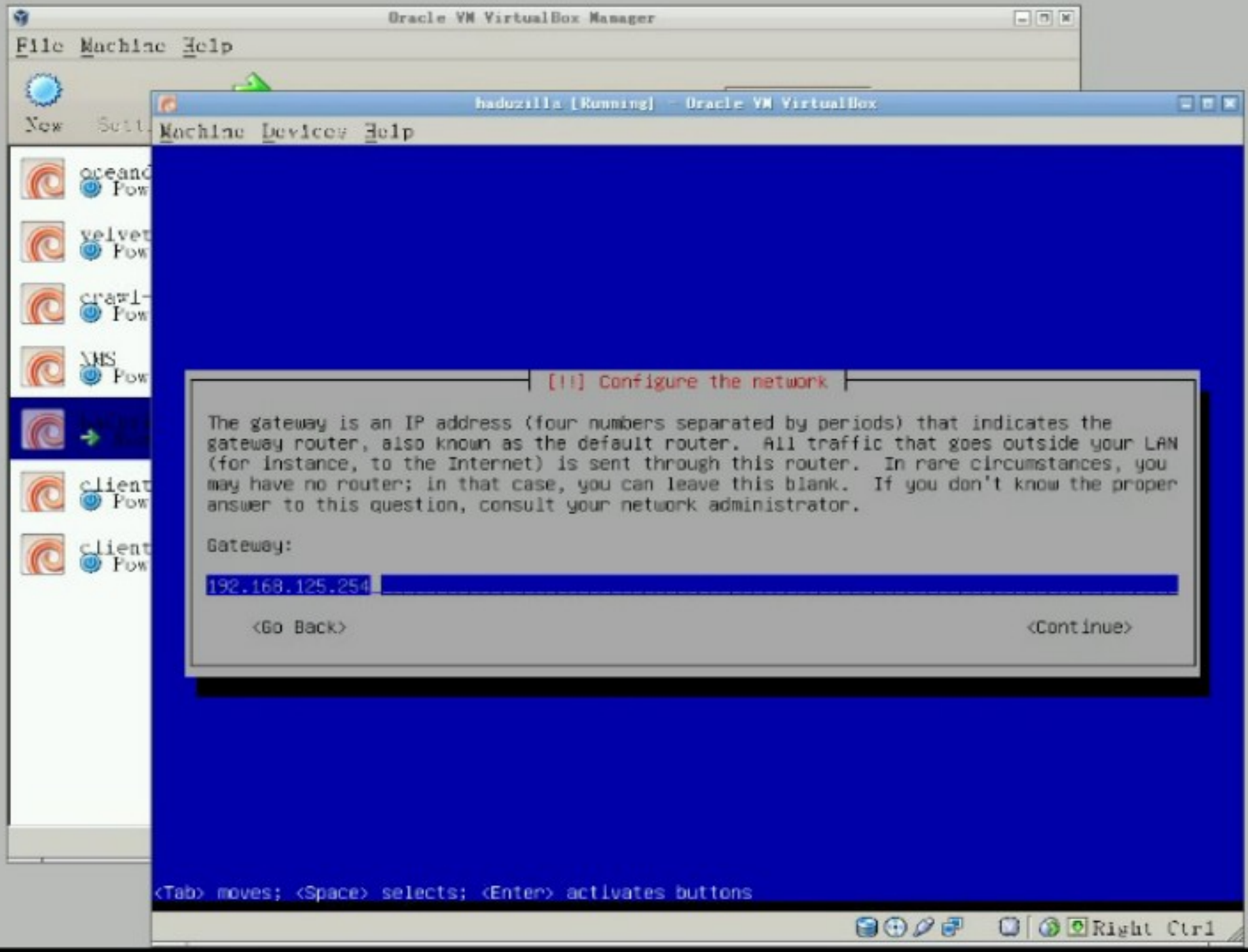

BIOS PXE
BIOS PXE
BIOS PXE
BIOS PXE
tap0
192.168.125.254
iptables
WAN
eth0:1
10.0.0.254
eth0
192.168.125.5
Debian
netinst CD

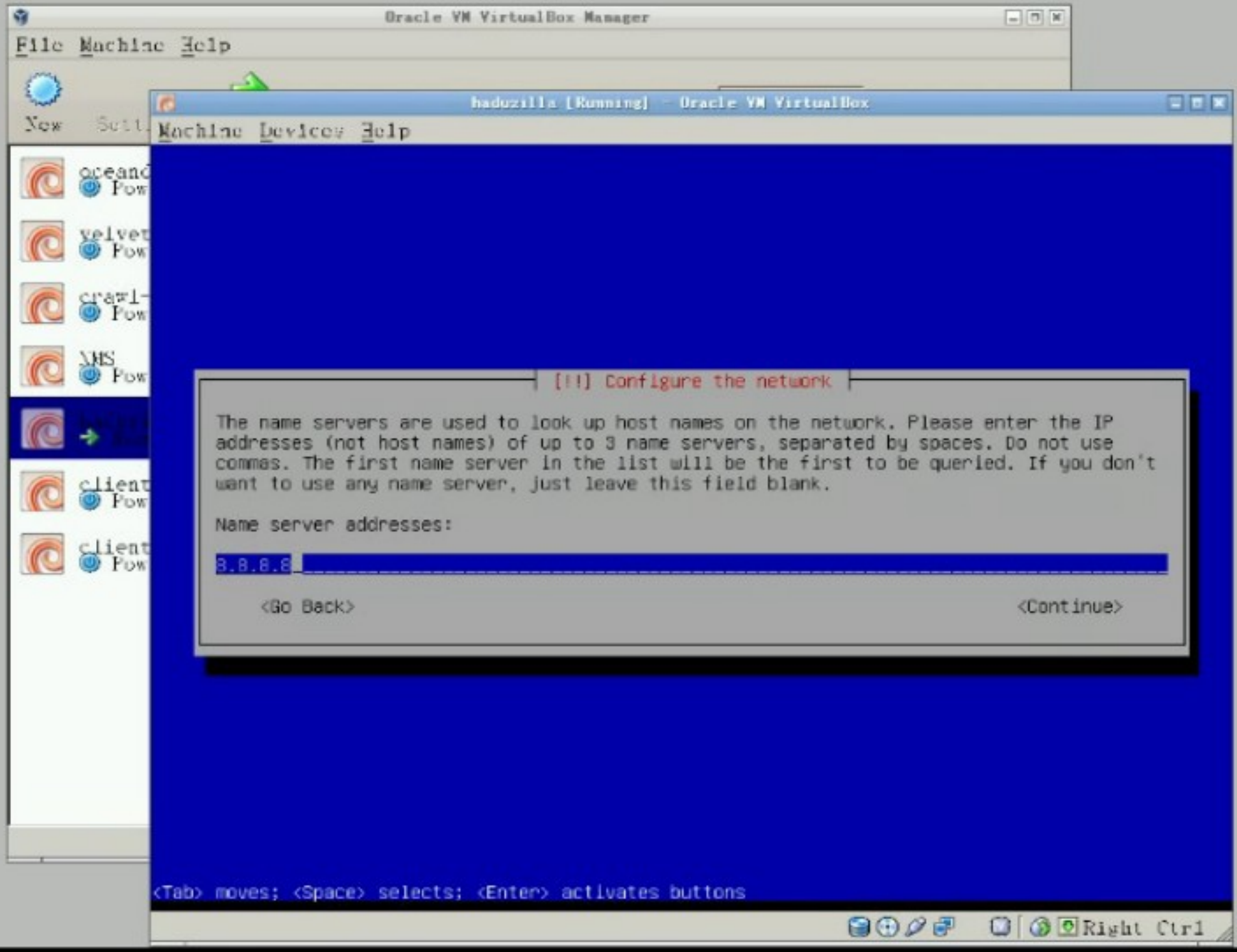

Oracle VM VirtualBox Manager
File Machine Help
New
haduzilla [Running] - Oracle VM VirtualBox
Machine Devices Help
Welcome to Debian GNU/Linux!
F1
This is a Debian 6.0 (squeeze) installation CD-ROM.
It was built 20120129-00:41: d-i 20110106+squeeze4.
HELP INDEX
KEY TOPIC
<F1> This page, the help index.
<F2> Prerequisites for installing Debian.
<F3> Boot methods for special ways of using this CD-ROM
<F4> Additional boot methods: rescue mode.
<F5> Special boot parameters, overview.
<F6> Special boot parameters for special machines.
<F7> Special boot parameters for selected disk controllers.
<F8> Special boot parameters for the install system.
<F9> How to get help.
<F10> Copyrights and warranties.
Press F2 through F10 for details, or ENTER to boot: auto url=eagle.classcloud.org
Right Ctrl
auto url=eagle.classcloud.org

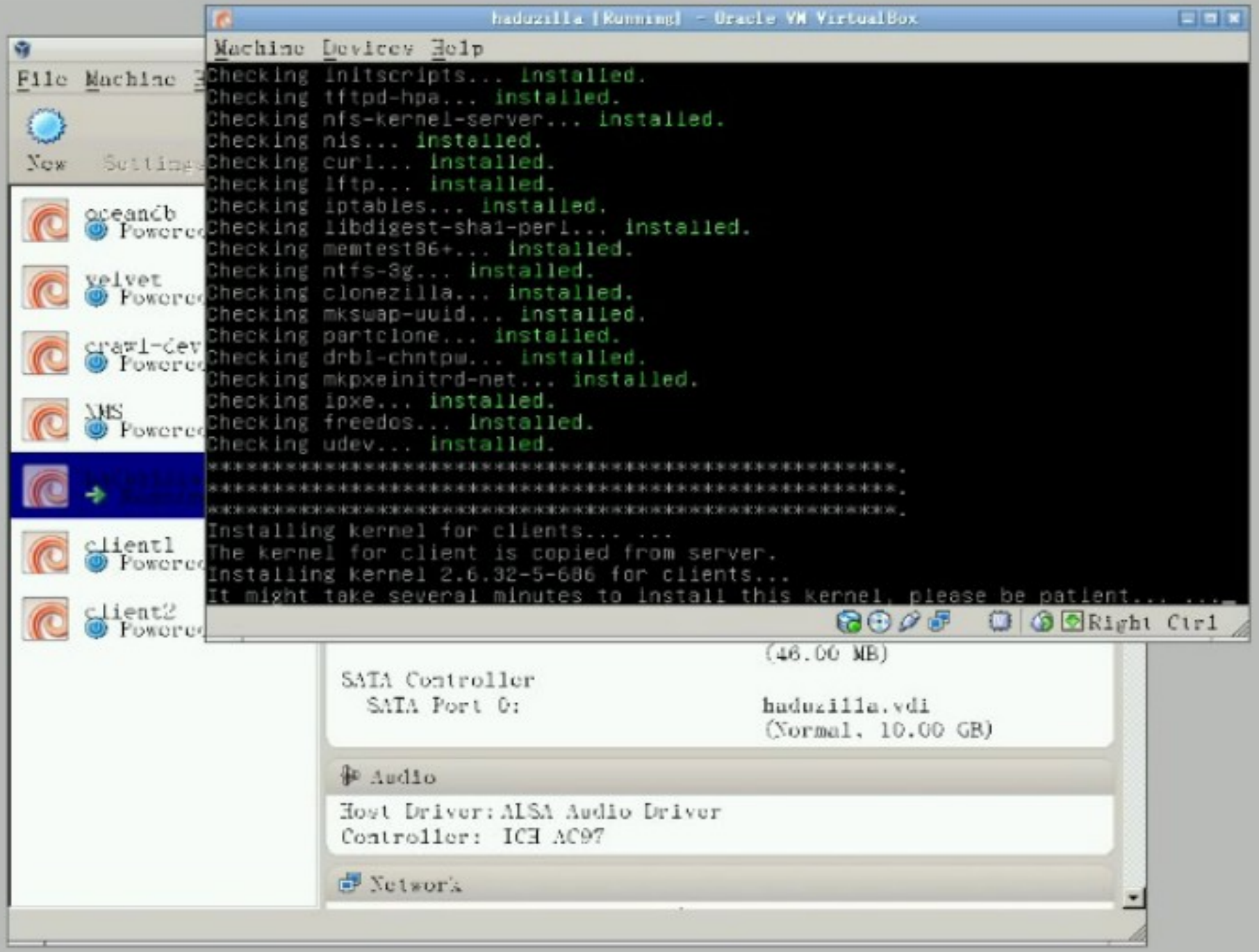

Oracle VM VirtualBox Manager
File Machine Help
New
haduzilla [Running] - Oracle VM VirtualBox
Machine Devices Help
[!!] Configure the network
From here you can choose to retry DHCP network autoconfiguration (which may succeed if your DHCP server takes a long time to respond) or to configure the network manually. Some DHCP servers require a DHCP hostname to be sent by the client, so you can also choose to retry DHCP network autoconfiguration with a hostname that you provide.
Network configuration method:
Retry network autoconfiguration
Retry network autoconfiguration with a DHCP hostname
Configure network manually
Do not configure the network at this time
<Go Back>
<Tab> moves; <Space> selects; <Enter> activates buttons
Right Ctrl

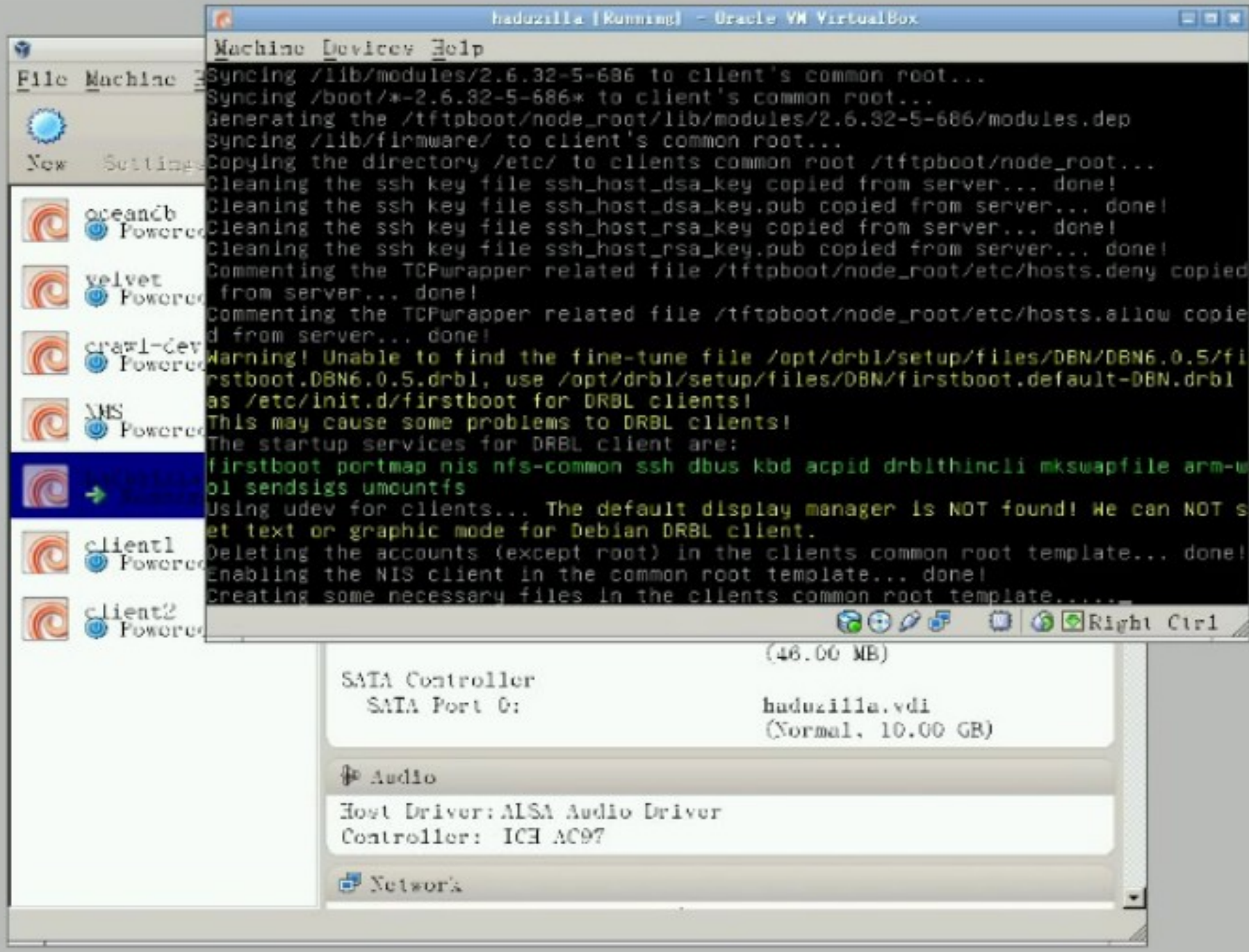

Oracle VM VirtualBox Manager
File Machine Help
New
hadozilla [Running] - Oracle VM VirtualBox
Machine Devices Help
[!!] Configure the network
The IP address is unique to your computer and consists of four numbers separated by periods. If you don't know what to use here, consult your network administrator.
IP address:
192.168.125.5
<Go Back>
<Continue>
<Tab> moves; <Space> selects; <Enter> activates buttons
Right Ctrl

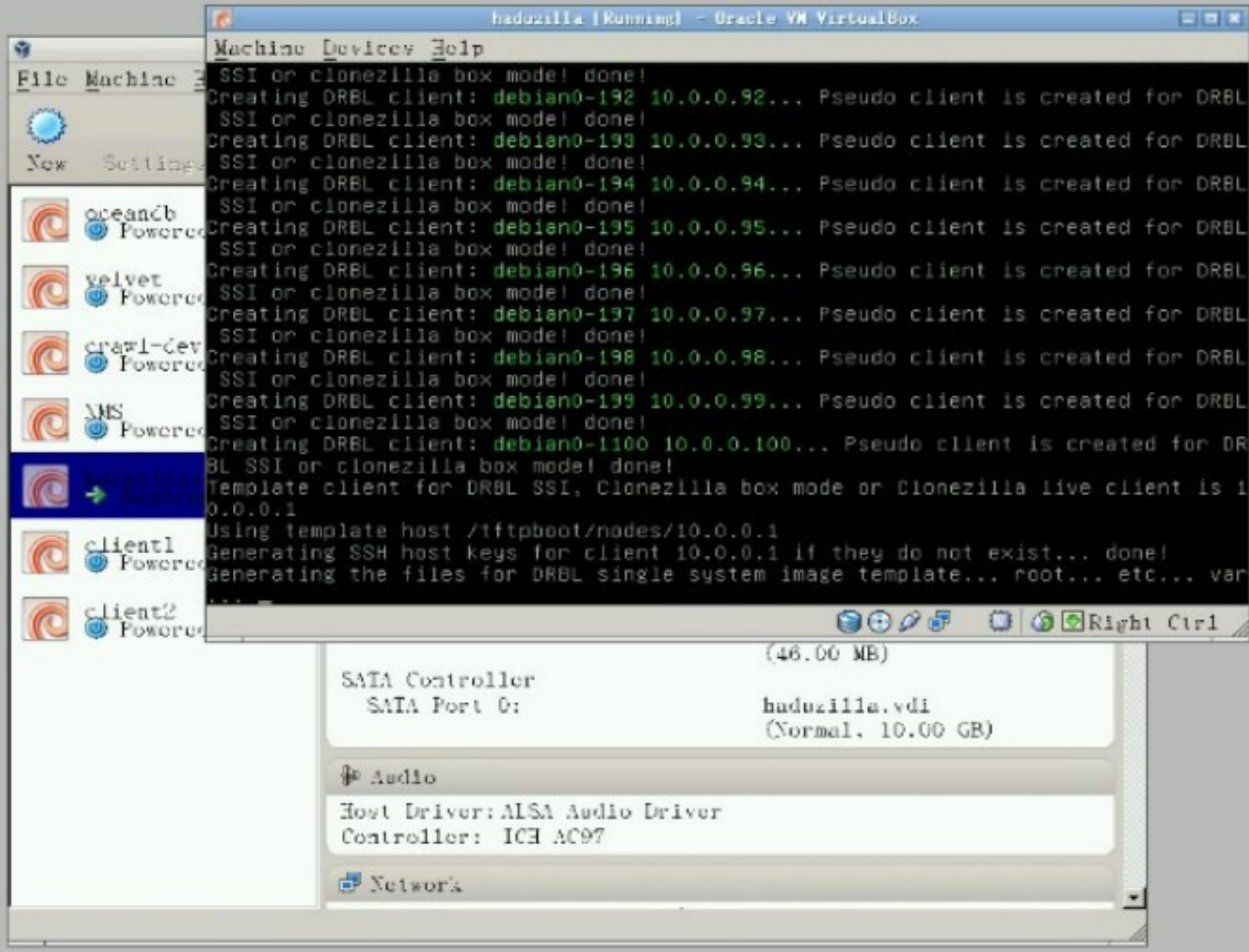

Oracle VM VirtualBox Manager
File Machine Help
New
haduzilla [Running] - Oracle VM VirtualBox
Machine Devices Help
[!!] Configure the network
The netmask is used to determine which machines are local to your network. Consult your network administrator if you do not know the value. The netmask should be entered as four numbers separated by periods.
Netmask:
255.255.255.0
<Go Back>
<Continue>
<Tab> moves; <Space> selects; <Enter> activates buttons
Right Ctrl

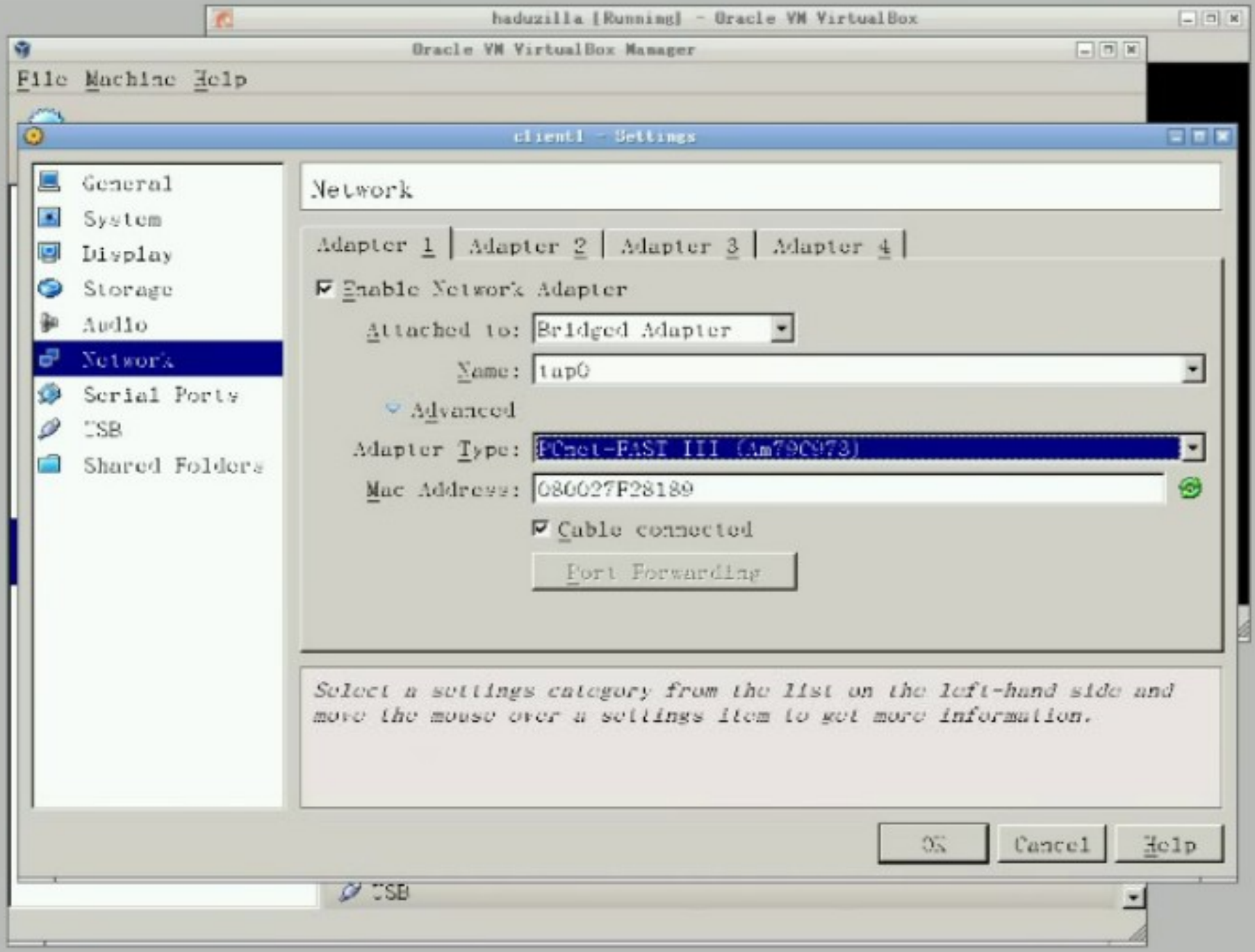

Oracle VM VirtualBox Manager
File Machine Help
New
hadozilla [Running] - Oracle VM VirtualBox
Machine Devices Help
[!!] Configure the network
The gateway is an IP address (four numbers separated by periods) that indicates the gateway router, also known as the default router. All traffic that goes outside your LAN (for instance, to the Internet) is sent through this router. In rare circumstances, you may have no router; in that case, you can leave this blank. If you don't know the proper answer to this question, consult your network administrator.
Gateway:
192.168.125.254
<Go Back>
<Continue>
<Tab> moves; <Space> selects; <Enter> activates buttons
Right Ctrl

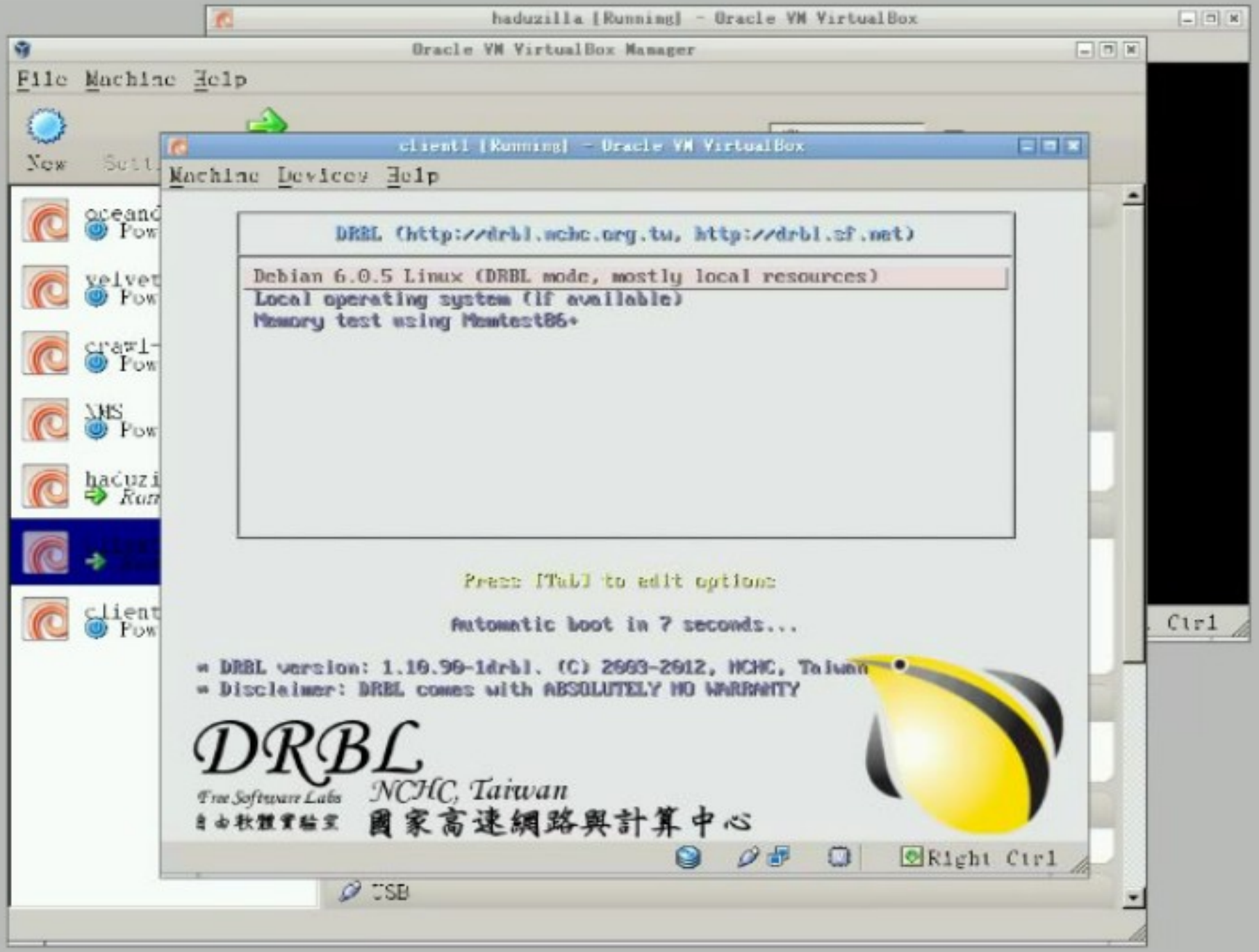

Oracle VM VirtualBox Manager
File Machine Help
New
haduzilla [Running] - Oracle VM VirtualBox
Machine Devices Help
[!!] Configure the network
The name servers are used to look up host names on the network. Please enter the IP addresses (not host names) of up to 3 name servers, separated by spaces. Do not use commas. The first name server in the list will be the first to be queried. If you don't want to use any name server, just leave this field blank.
Name server addresses:
8.8.8.8
<Go Back>
<Continue>
<Tab> moves; <Space> selects; <Enter> activates buttons
Right Ctrl


haduzilla [Running] - Oracle VM VirtualBox
Machine Devices Help
Checking initscripts... installed.
Checking tftpd-hpa... installed.
Checking nfs-kernel-server... installed.
Checking nis... installed.
Checking curl... installed.
Checking lftp... installed.
Checking iptables... installed.
Checking libdigest-sha1-perl... installed.
Checking memtest86+... installed.
Checking ntfs-3g... installed.
Checking clonezilla... installed.
Checking mkswap-uuid... installed.
Checking partclone... installed.
Checking drbl-chntpw... installed.
Checking mkpxeinitrd-net... installed.
Checking ipxe... installed.
Checking freedos... installed.
Checking udev... installed.
Installing kernel for clients... ...
The kernel for client is copied from server.
Installing kernel 2.6.32-5-686 for clients...
Right Ctrl
File Machine
New
oceanCb
velvet
crawl-dev
NMS
client1
client2
(46.00 MB)
SATA Controller
SATA Port 0:
haduzilla.vdi
(Normal, 10.00 GB)
Audio
Host Driver: ALSA Audio Driver
Controller: ICH AC97
Network


haduzilla [Running] - Oracle VM VirtualBox
Machine Devices Help
Syncing /lib/modules/2.6.32-5-686 to client's common root...
Syncing /boot/*-2.6.32-5-686* to client's common root...
Generating the /tftpboot/node_root/lib/modules/2.6.32-5-686/modules.dep
Syncing /lib/firmware/ to client's common root...
Copying the directory /etc/ to clients common root /tftpboot/node_root...
Cleaning the ssh key file ssh_host_dsa_key copied from server... done!
Cleaning the ssh key file ssh_host_dsa_key.pub copied from server... done!
Cleaning the ssh key file ssh_host_rsa_key copied from server... done!
Cleaning the ssh key file ssh_host_rsa_key.pub copied from server... done!
Commenting the TCPwrapper related file /tftpboot/node_root/etc/hosts.deny copied from server... done!
Commenting the TCPwrapper related file /tftpboot/node_root/etc/hosts.allow copied from server... done!
Warning! Unable to find the fine-tune file /opt/drbl/setup/files/DBN/DBN6.0.5/firstboot.DBN6.0.5.drbl, use /opt/drbl/setup/files/DBN/firstboot.default-DBN.drbl as /etc/init.d/firstboot for DRBL clients!
This may cause some problems to DRBL clients!
The startup services for DRBL client are:
firstboot portmap nis nfs-common ssh dbus kbd acpid drblthincli mkswapfile arm-wol sendsigs umountfs
Using udev for clients... The default display manager is NOT found! We can NOT set text or graphic mode for Debian DRBL client.
Deleting the accounts (except root) in the clients common root template... done!
Enabling the NIS client in the common root template... done!
Creating some necessary files in the clients common root template.....
Right Ctrl
File Machine
New
oceanCb
velvet
crawl-dev
XMS
client1
client2
(46.00 MB)
SATA Controller
SATA Port 0:
haduzilla.vdi
(Normal, 10.00 GB)
Audio
Host Driver: ALSA Audio Driver
Controller: ICH AC97
Network


haduzilla [Running] - Oracle VM VirtualBox
Machine Devices Help
SSI or clonezilla box mode! done!
Creating DRBL client: debian0-192 10.0.0.92... Pseudo client is created for DRBL
SSI or clonezilla box mode! done!
Creating DRBL client: debian0-193 10.0.0.93... Pseudo client is created for DRBL
SSI or clonezilla box mode! done!
Creating DRBL client: debian0-194 10.0.0.94... Pseudo client is created for DRBL
SSI or clonezilla box mode! done!
Creating DRBL client: debian0-195 10.0.0.95... Pseudo client is created for DRBL
SSI or clonezilla box mode! done!
Creating DRBL client: debian0-196 10.0.0.96... Pseudo client is created for DRBL
SSI or clonezilla box mode! done!
Creating DRBL client: debian0-197 10.0.0.97... Pseudo client is created for DRBL
SSI or clonezilla box mode! done!
Creating DRBL client: debian0-198 10.0.0.98... Pseudo client is created for DRBL
SSI or clonezilla box mode! done!
Creating DRBL client: debian0-199 10.0.0.99... Pseudo client is created for DRBL
SSI or clonezilla box mode! done!
Creating DRBL client: debian0-1100 10.0.0.100... Pseudo client is created for DR
BL SSI or clonezilla box mode! done!
Template client for DRBL SSI, Clonezilla box mode or Clonezilla live client is 1
0.0.0.1
Using template host /tftpboot/nodes/10.0.0.1
Generating SSH host keys for client 10.0.0.1 if they do not exist... done!
Generating the files for DRBL single system image template... root... etc... var
Right Ctrl
File Machine
New
oceanCb
velvet
crawl-dev
NMS
client1
client2
(46.00 MB)
SATA Controller
SATA Port 0:
haduzilla.vdi
(Normal, 10.00 GB)
Audio
Host Driver: ALSA Audio Driver
Controller: ICH AC97
Network


haduzilla [Running] - Oracle VM VirtualBox
Oracle VM VirtualBox Manager
File Machine Help
client - Settings
General
System
Display
Storage
Audio
Network
Serial Ports
USB
Shared Folders
Network
Adapter 1
Adapter 2
Adapter 3
Adapter 4
Enable Network Adapter
Attached to: Bridged Adapter
Name: tap0
Advanced
Adapter Type: PCnet-FAST III (Am79C973)
Mac Address: 080027F28189
Cable connected
Port Forwarding
Select a settings category from the list on the left-hand side and move the mouse over a settings item to get more information.
OK
Cancel
Help
USB


haduzilla [Running] - Oracle VM VirtualBox
Oracle VM VirtualBox Manager
File Machine Help
New
client1 [Running] - Oracle VM VirtualBox
Machine Devices Help
DRBL (http://drbl.nchc.org.tw, http://drbl.sf.net)
Debian 6.0.5 Linux (DRBL mode, mostly local resources)
Local operating system (if available)
Memory test using Memtest86+
Press [Tab] to edit option
Automatic boot in 7 seconds...
* DRBL version: 1.10.99-1drbl. (C) 2003-2012, NCHC, Taiwan
* Disclaimer: DRBL comes with ABSOLUTELY NO WARRANTY
DRBL
Free Software Labs
NCHC, Taiwan
國家高速網路與計算中心
Right Ctrl
USB
Ctrl

Show me the Source Code !

http://eagle.classcloud.org/d-i/squeeze/

New versions will be at github ....

http://github.com/jazzwang

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Slides - http://trac.nchc.org.tw/cloud

Jazz Wang
Yao-Tsung Wang
jazz@nchc.org.tw

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