

Clonezilla for ONIE

A Switch and Full Rack Storage Operations Integrator

Open. Together.

Jim Chen

Northwestern
University

Starlight

Steven Shiau

NCHC

NARLabs/Taiwan



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Outline

- Overview of Clonezilla for ONIE switch and full rack storage
 - Why?
 - Use case
- Architecture of the software
 - The mechanism
 - Screenshots
 - Demo at poster session

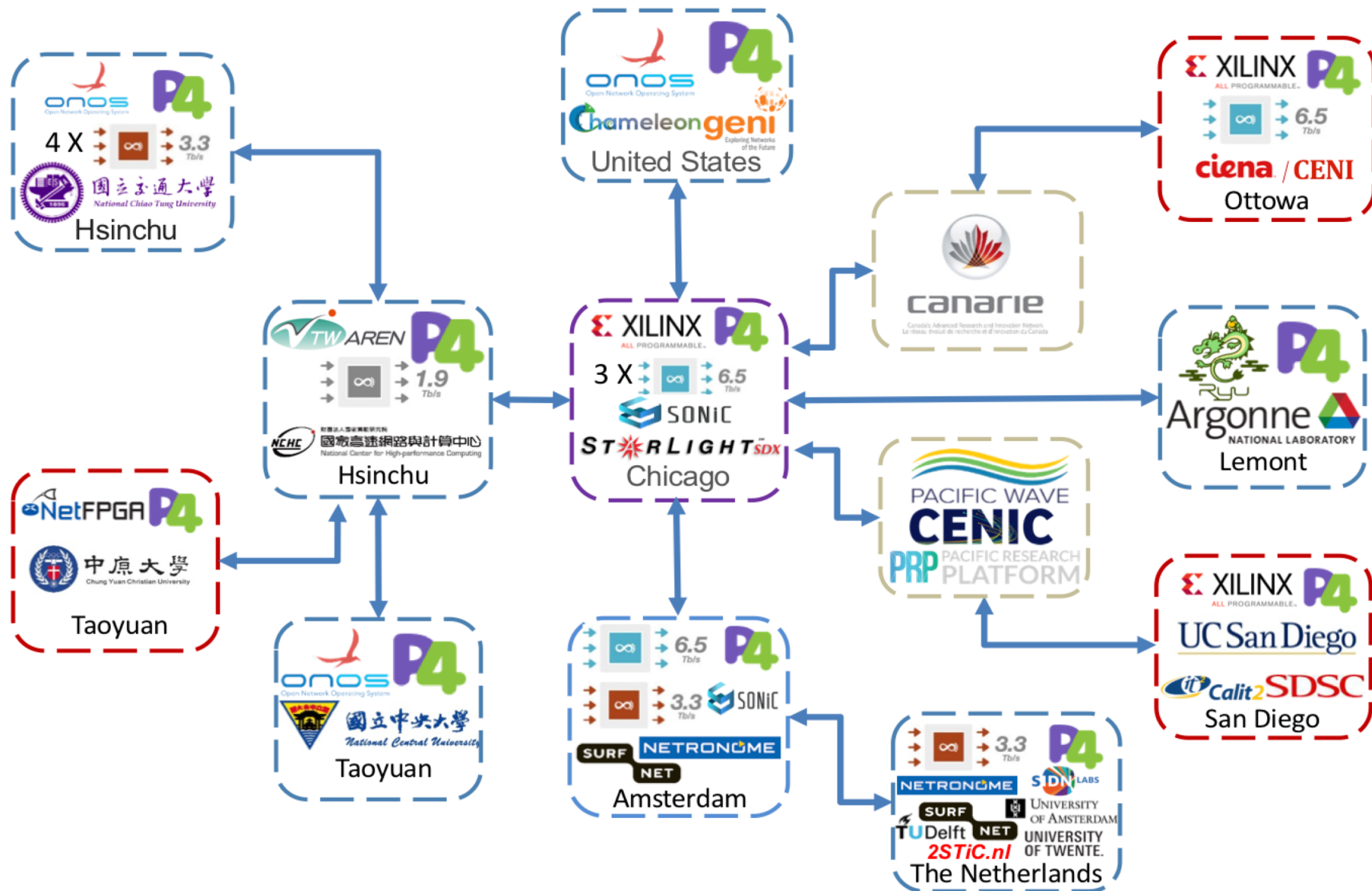
Clonezilla-System Deployment/Provisioning



Clonezilla for ONIE-Motivation

- Clonezilla for ONIE Drivers
 - Programmable switches evolution
 - DevOp workflow in production support
- Switch and full rack storage operations
 - Backup/Restore independent from NOS
 - Sector or partition level operation
 - Single tool to support different storage operations in switches and systems.

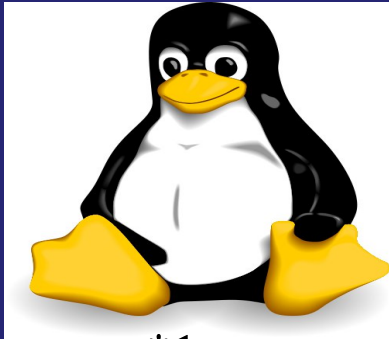
International P4 Experimental Networks (i-P4EN)



- ## i-P4EN
- ### Use Cases:
- Network Testbeds
 - ScienceDMZ-Campuses
 - Research Platforms
 - Network Exchanges
 - NFV-Cloud with switches

What is Clonezilla?

- A partition and disk imaging/cloning utility similar to True image[®] or Ghost[®]
- GPL license
- A system provisioning, bare metal recovery tool for



*1



*2



*3



*4

VMFS

VMware
ESX/ESXi

*5



MINIX



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*6

*Logo source: (1) Larry Ewing, Simon Budig and Anja Gerwinski, (2) Apple, (3) Microsoft, (4) Marshall Kirk McKusick, (5) VMWare (6) Distrowatch.com

Machine Room Deployment & Provisioning



- Server nodes
- Compute nodes
- Storage nodes



- Network switches



Clonezilla



until...

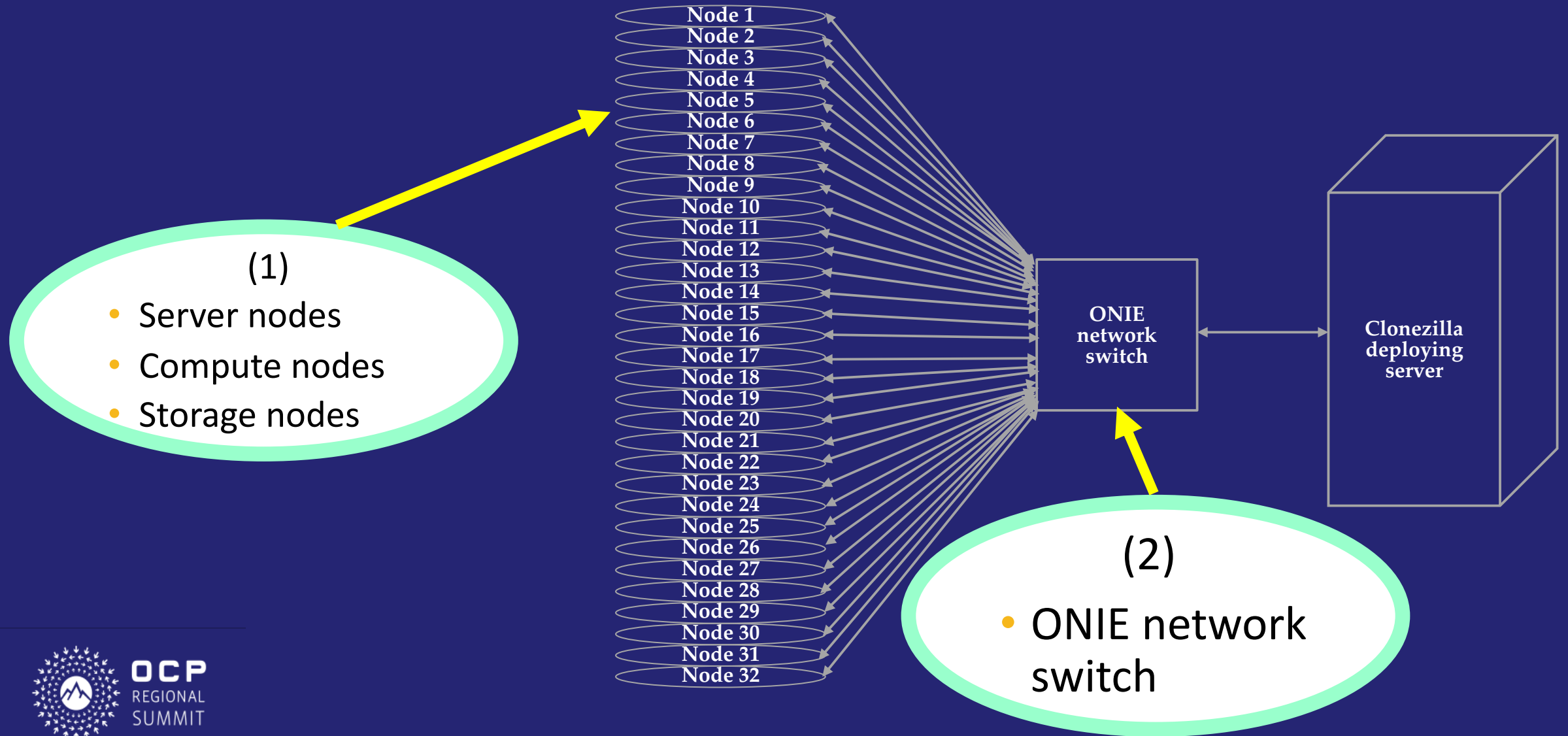


Open Network Install Environment

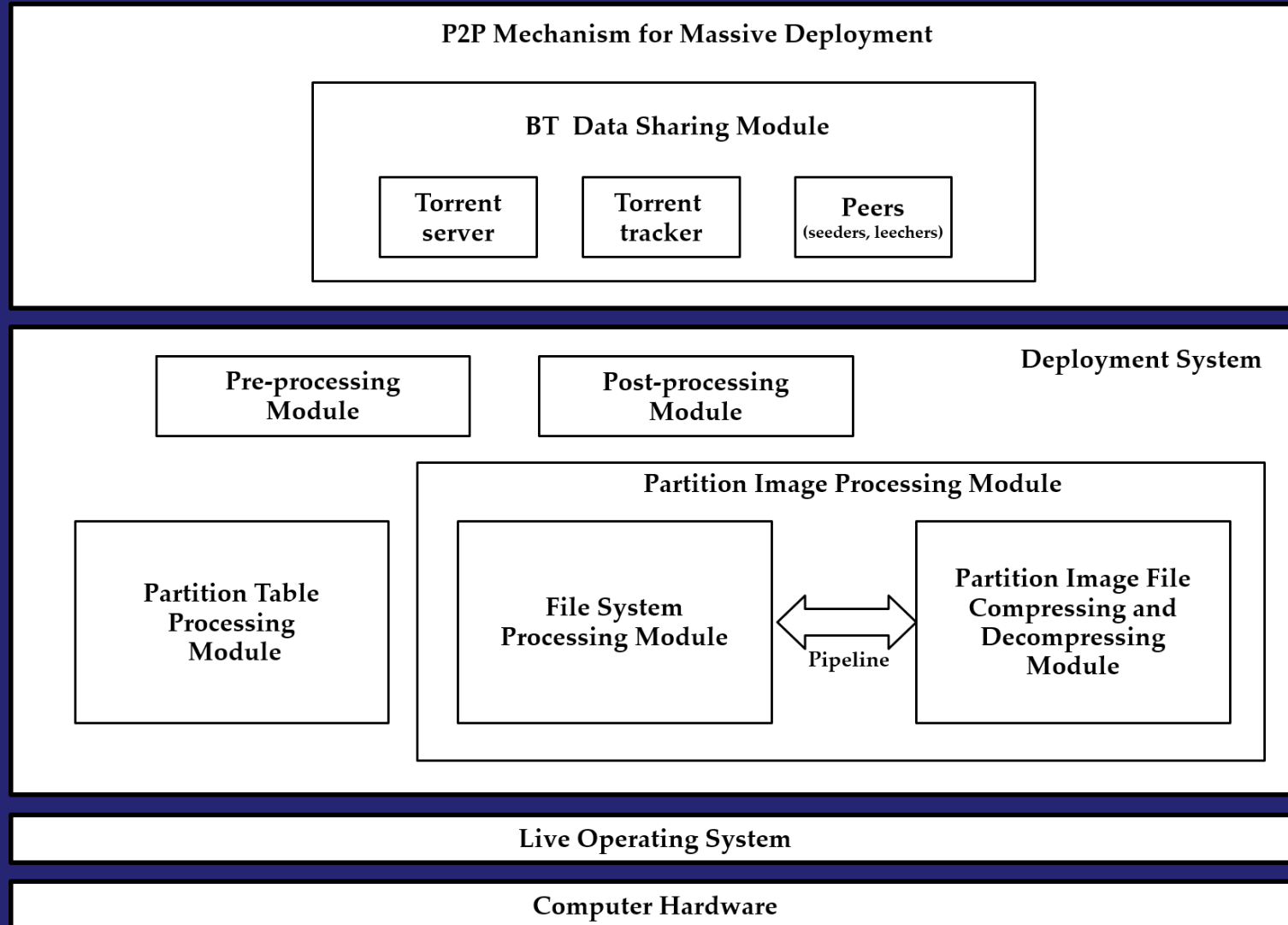
onie

Machine Room Deployment & Provisioning

(1) Nodes (2) ONIE network switch



(1) Massive deployment for nodes Clonezilla live with BT mechanism



(1) Massive deployment for nodes

Clonezilla live with BT mechanism

- P2P solution – Use BT protocol to distribute the block data of the file system
- Solve the issue: insufficient temporary storage space to store the whole system image

FSBT: file system blocks transferring

Partclone Image Structure

Image description	Bitmap	Block 1 Raw data	Block 3 Raw data	Block 4 Raw data	Block 5 Raw data	
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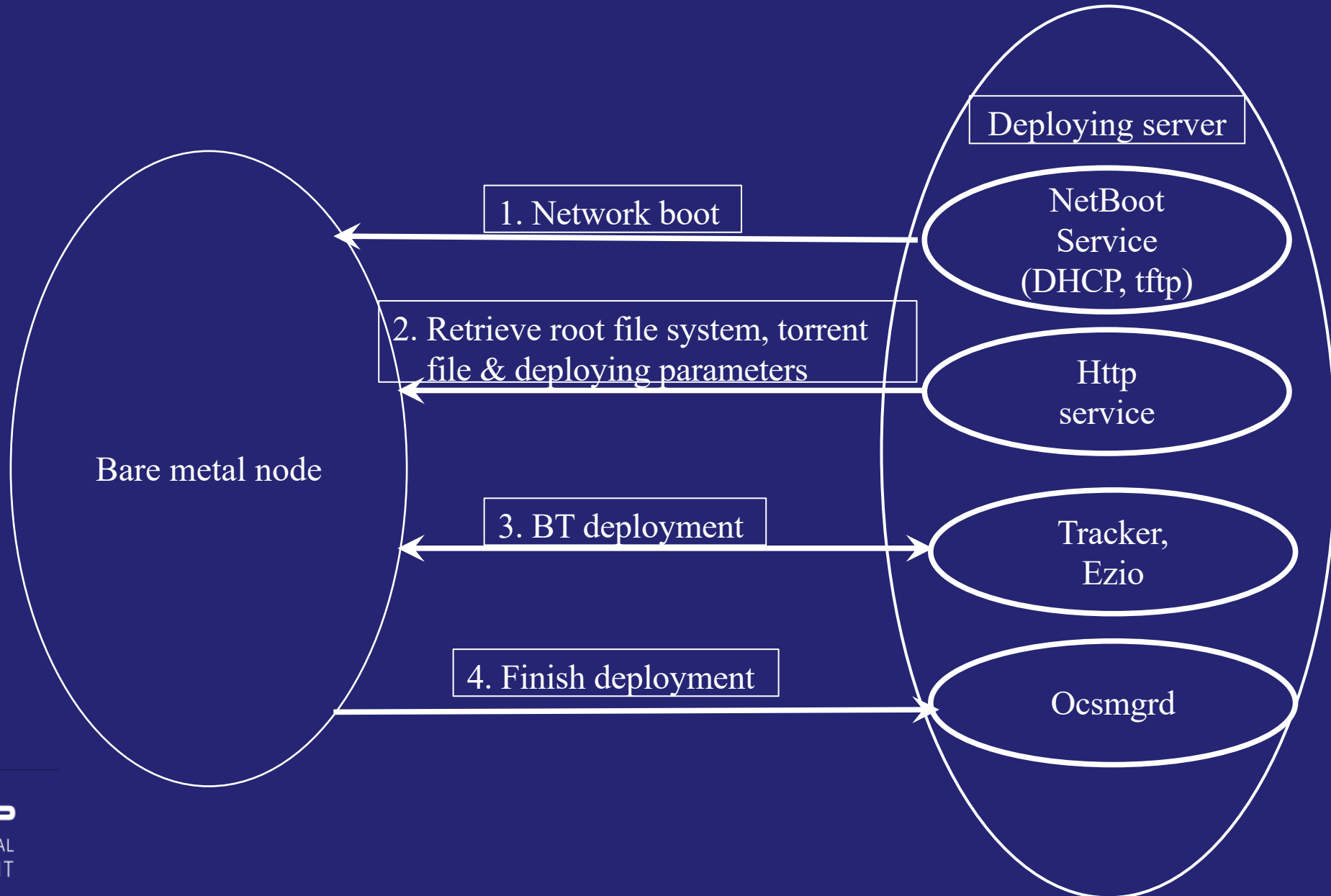
Ezio Torrent Structure

Announce (Tracker)	Piece length	First file		Second file		Rest of files		Pieces (check sums)
		Name (block offset)	Length (block size)	Name (block offset)	Length (block size)			
http://x.x.x. x/announce	16 KBs	0x0000	4 KBs	0x2000	12 KBs			Hash values

Partition Structure

Block ID	Block 1	Block 2	Block 3	Block 4	Block 5	
Offset	0x0000	0x1000	0x2000	0x3000	0x4000	
Bitmap	Used	Unused	Used	Used	Used	

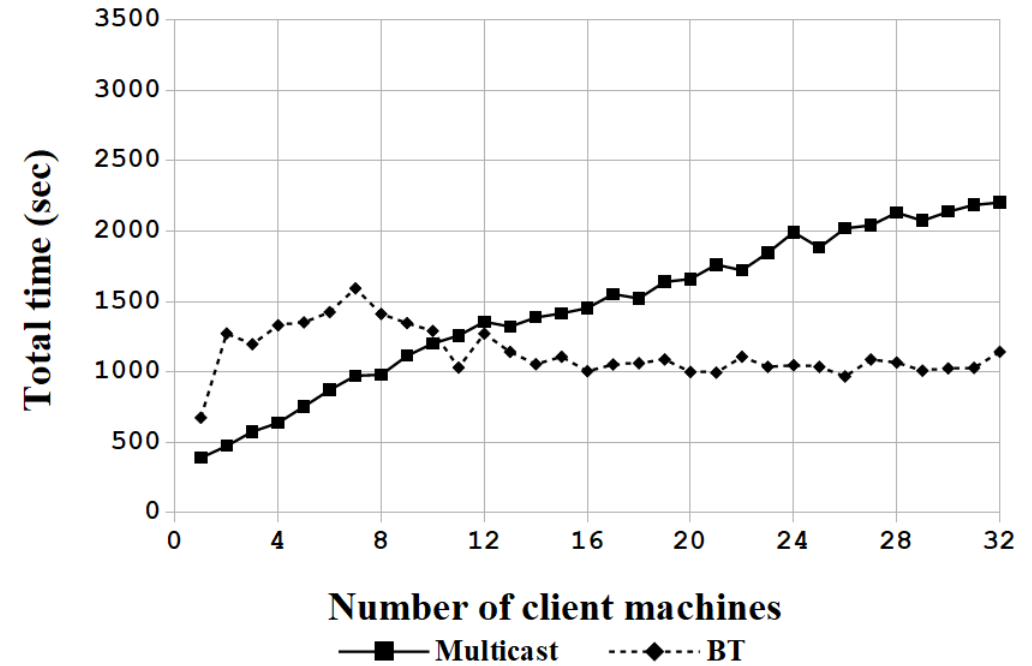
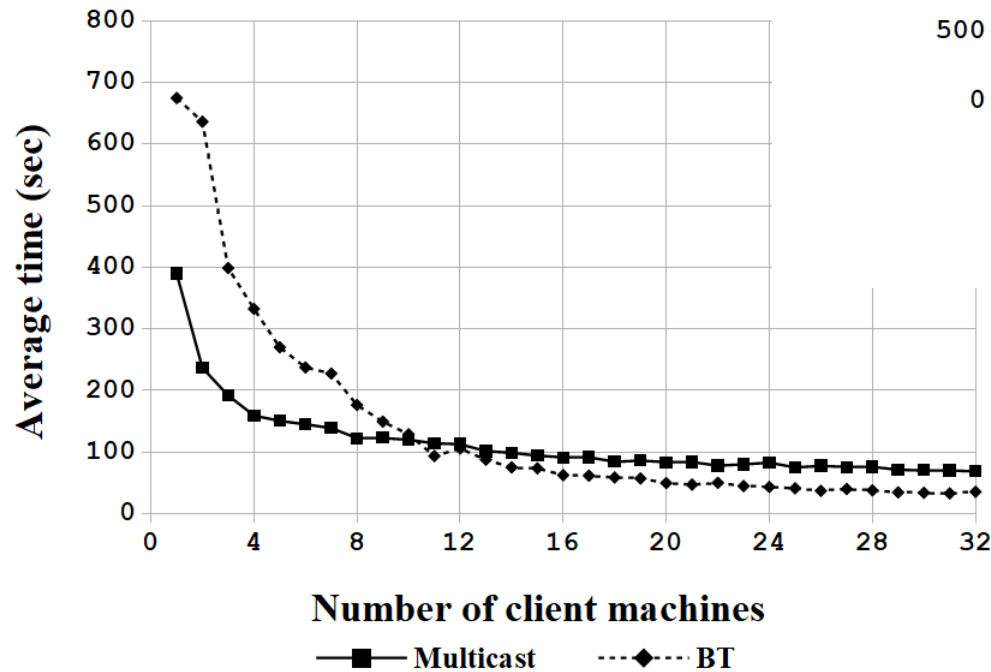
(1) Massive deployment for nodes Clonezilla live with BT mechanism



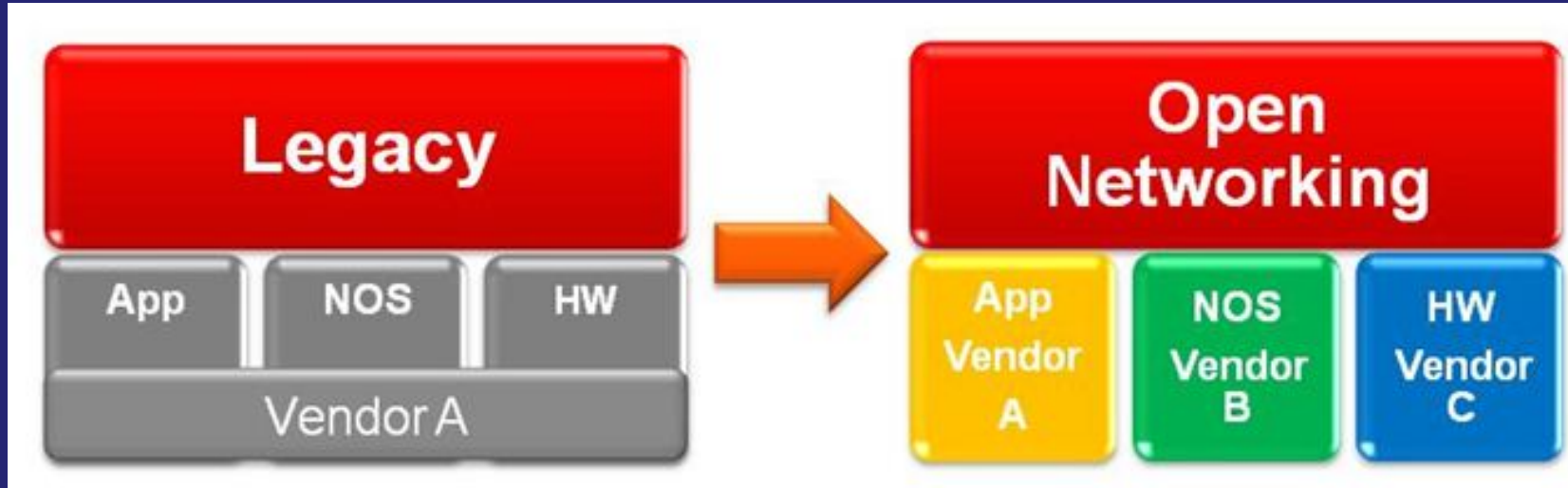
(1) Massive deployment for nodes

Clonezilla live with BT mechanism

- Massive deployment in large-scale computers - BT & multicast



(2) Deployment for ONIE Switch



Created by
Cumulus Networks
in 2012

Adopted by
Open Compute
project in 2013

bare metal,
white box

open source,
open networking
hardware

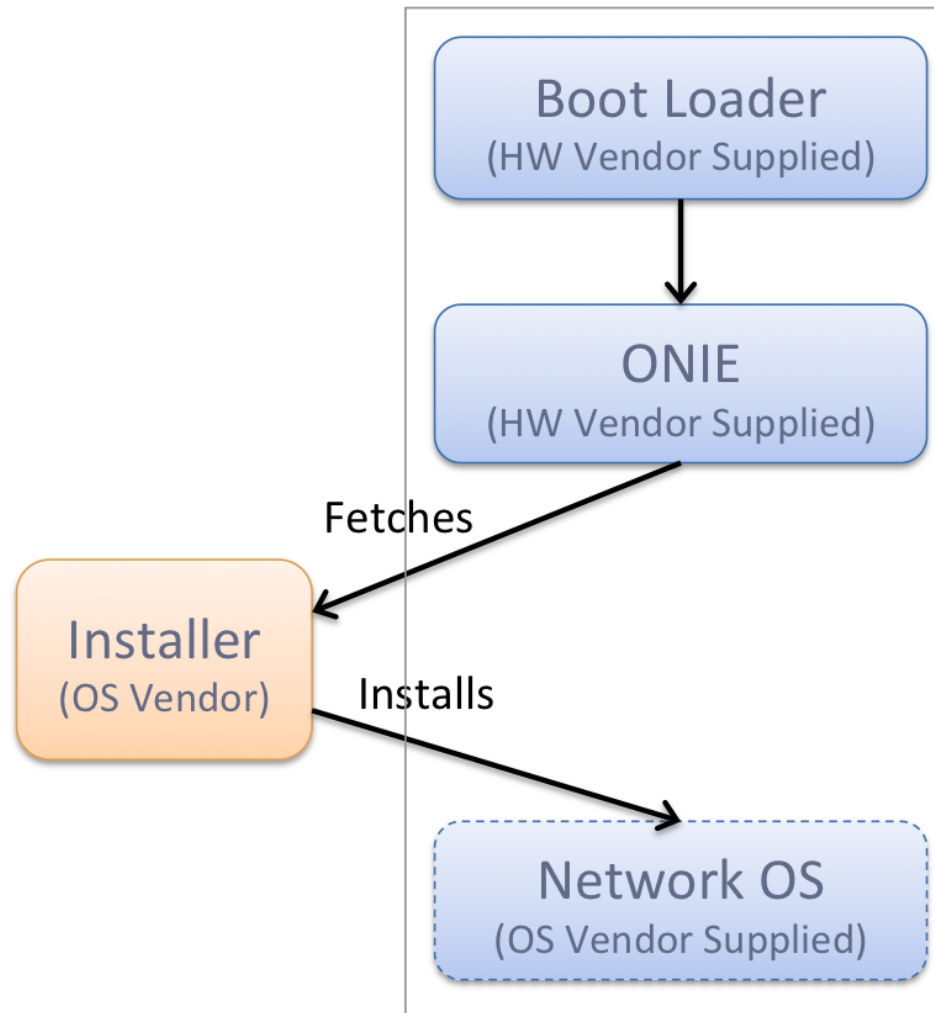
ONIE compatible NOS

Vendor	OS	Base
Big Switch Networks	Switch Light	Debian
Cumulus Networks	Cumulus Linux	Debian
Dell	Force 10 Operating System (FTOS)	NetBSD
HPE	OpenSwitch	Yocto
Mellanox	MLNX_OS	Debian
Lenovo	cNOS	Yocto
Lenovo	eNOS	Yocto
OCP	ONL	Debian
Pica8	PicOS	Debian
Pluribus Networks	Netvisor OS	Illumos/CentOS

CPU (32/64-bit)
✓ X86
✓ PowerPC
✓ ARM

Inside ONIE: initial system boot

First Time Boot Up



- Low Level boot loader, configures CPU complex
- Loads and boots ONIE from flash

- Linux OS with Busybox
- Configures management Ethernet interface
- Locates and executes installer from network
- Provides tools and environment for installer

- Available from network or USB
- Linux executable
- Installs vendor OS into mass storage

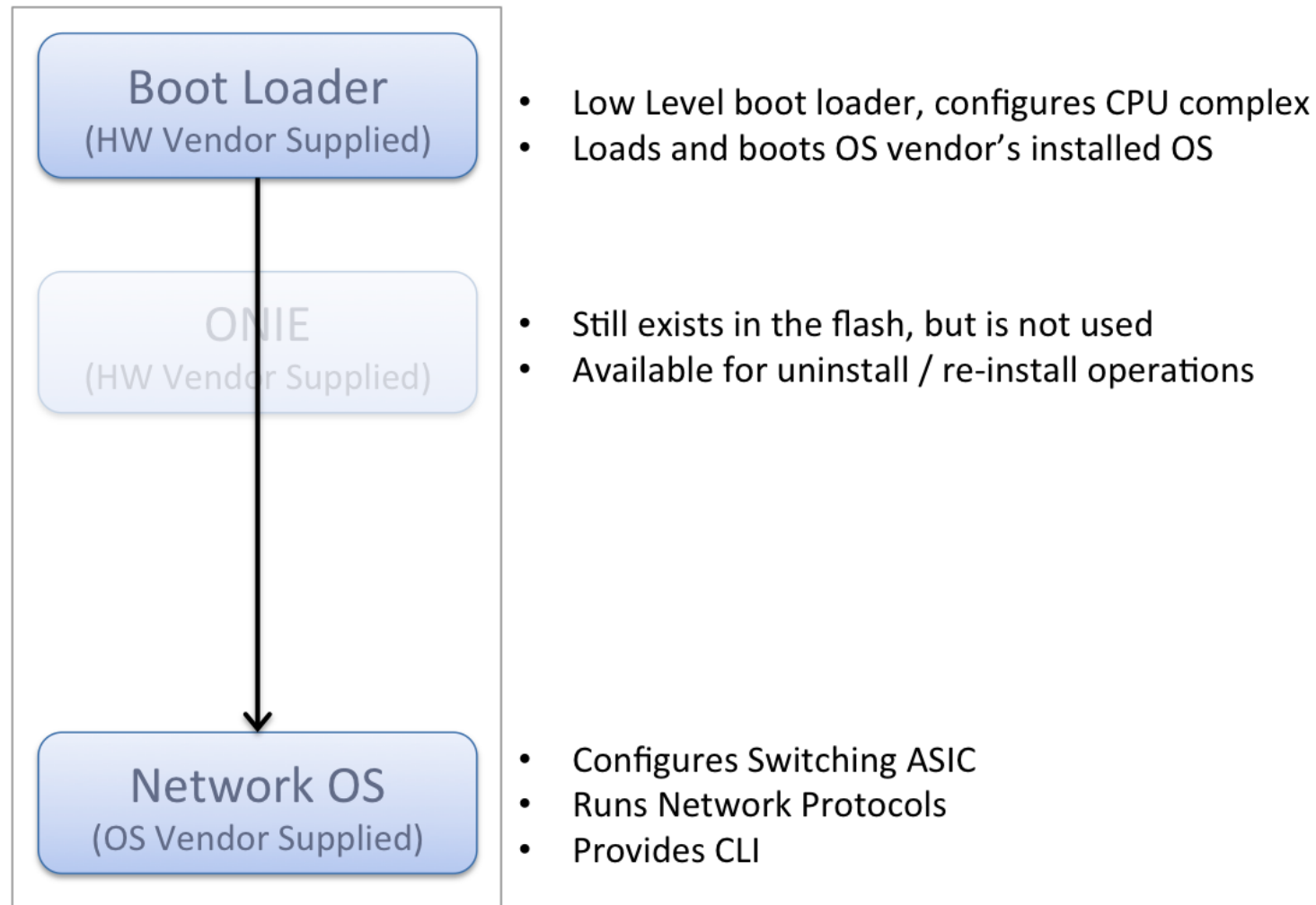
NOS Interface

where Clonezilla live starts...

Reinstalling	Reinstalling a different NOS
Uninstalling	Uninstalling/wiping the system clean
Rescue	Rescue and recovery
Updating	Updating ONIE
	Updating the machine CPLD/FPGAs and BIOS firmware

Inside ONIE: subsequent system boots

Vendor's OS is Already Installed. ONIE is **not** used.



Prepare Clonezilla live for ONIE

Once per software version

Download Clonezilla
live ISO

Convert to ONIE self-
extracting boot file

Clonezilla live image

NOS Image store
(Networked or locally
attached)

ONIE network switch

Boot loader

ONIE

Clonezilla
live

Target NOS

Fetch (http, ftp, USB...)

Copy to Memory

Store, Recover,
Provision req.



Screenshots from Dell S4048-ON ONIE switch



```
GNU GRUB version 2.02-beta2+e4a1fe391

+-----+
| Open Network Linux |
| *ONIE               |
+-----+

Use the ^ and v keys to select which entry is highlighted.
Press enter to boot the selected OS, 'e' to edit the commands
before booting or 'c' for a command-line.
```

```
GNU GRUB version 2.02-beta2+e4a1fe391

+-----+
| ONIE: Install OS    |
| *ONIE: Rescue       |
| ONIE: Uninstall OS  |
| ONIE: Update ONIE   |
| ONIE: Embed ONIE    |
| PLATFORM-DELL-DIAG  |
+-----+

Use the ^ and v keys to select which entry is highlighted.
Press enter to boot the selected OS, 'e' to edit the commands
before booting or 'c' for a command-line.
```

```
Build Date: 2016-09-07T15:54-0700
Info: Mounting kernel filesystems... done.
Info: Mounting ONIE-BOOT on /mnt/onie-boot ...
Info: Using eth0 MAC address: e4:f0:04:91:37:a7
Info: Using eth1 MAC address: e4:f0:04:91:37:a8
Info: eth0: Checking link... up.
Info: Trying DHCPv4 on interface: eth0
ONIE: Using DHCPv4 addr: eth0: 192.168.0.94 / 255.255.255.0
Info: eth1: Checking link... down.
ONIE: eth1: link down. Skipping configuration.
ONIE: Failed to configure eth1 interface
Starting: dropbear ssh daemon...random: dropbear urandom read with 32 bits of en
tropy available
done.
Starting: telnetd... done.
discover: Rescue mode detected. Installer disabled.

Please press Enter to activate this console.
To check the install status inspect /var/log/onie.log.
Try this: tail -f /var/log/onie.log

** Rescue Mode Enabled **
ONIE:/ # random: nonblocking pool is initialized
```

```
ONIE:/ # onie-nos-install http://stevenshiau.org/clonezilla-live/onie/clonezilla
-live-2.6.0-37-amd64.iso-onie.bin
discover: Rescue mode detected. No discover stopped.
Info: Fetching http://stevenshiau.org/clonezilla-live/onie/clonezilla-live-2.6.0
-37-amd64.iso-onie.bin ...
Connecting to Stevenshiau.org (140.110.17.130:80)
installer 100% |*****| 273M 0:00:00 ETA
ONIE: Executing installer: http://stevenshiau.org/clonezilla-live/onie/clonezill
a-live-2.6.0-37-amd64.iso-onie.bin
Verifying image checksum ... OK.
Preparing image archive ... OK.
auto-detecting console...
using console=ttyS0,115200n8
Loading new kernel ...
kexec --load --initrd=initrd.img --append="boot=live nopersistent noeject dhcp f
romiso=/conf/live.iso live-media=ram ocs_live_run=ocs-live-general live-getty c
onsole=ttyS0,115200n8" vmlinuz
sd 4:0:0:0: [sda] Synchronizing SCSI cache
kexec: Starting new kernel
[ 0.000000] Linux version 4.19.0-1-amd64 (debian-kernel@lists.debian.org) (gc
c version 8.2.0 (Debian 8.2.0-13)) #1 SMP Debian 4.19.13-1 (2018-12-30)
[ 0.000000] Command line: boot=live nopersistent noeject dhcp fromiso=/conf/l
ive.iso live-media=ram ocs_live_run=ocs-live-general live-getty console=ttyS0,1
15200n8
```

Demo is available at poster session

- ONIE network switch backup or restore
 - Prepare Clonezilla live ONIE self-extracting boot file
 - `sudo ocs-iso-2-onie clonezilla-live-2.6.3-7-amd64.iso`
 - ONIE network switch
 - Simulate: Boot VM in Virtualbox with ONIE iso
 - Use serial console
 - Enter rescue mode
 - Switch to Clonezilla live
 - Backup, restore...



```
➤ git clone https://github.com/opencomputeproject/onie.git
➤ cd onie/build-config
➤ sudo apt-get update
➤ sudo apt-get install build-essential
➤ make debian-prepare-build-host
➤ make -j4 MACHINE=kvm_x86_64 all recovery-iso
➤ ../build/images/onie-recovery-x86_64-kvm_x86_64-r0.iso
```



onie



Reference

- <https://clonezilla.org>
- <http://onie.org>
- <https://github.com/opencomputeproject/onie>
- <https://www.opencompute.org>
- <https://www.icaair.org>
- <https://www.nchc.org.tw>