+ Clonezilla for ONIE
A Switch and Full Rack Storage Operations Integrator

Open. Together.

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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

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

- Network Testbeds
- SienceDMZ-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 VMFS

*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

Images source: www.nchc.org.tw; www.dell.com

- Server nodes
- Compute nodes
- Storage nodes
- Network switches

Open Network Install Environment

until...
Machine Room Deployment & Provisioning

(1) Nodes (2) ONIE network switch

(1)
- Server nodes
- Compute nodes
- Storage nodes

(2)
- ONIE network switch

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

P2P Mechanism for Massive Deployment

- BT Data Sharing Module
  - Torrent server
  - Torrent tracker
  - Peers (seeders, leechers)

Deployment System

- Pre-processing Module
- Post-processing Module
- Partition Image Processing Module
  - File System Processing Module
  - Partition Image File Compressing and Decompressing Module

Live Operating System

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

Bare metal node

1. Network boot
2. Retrieve root file system, torrent file & deploying parameters
3. BT deployment
4. Finish deployment

Deploying server
- NetBoot Service (DHCP, tftp)
- Http service
- Tracker, Ezio
- Ocsmgrd
Massive deployment in large-scale computers - BT & multicast

(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

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

Source: https://www.opencompute.org/wiki/Networking/ONIE/NOS_Status
Inside ONIE: initial system boot

First Time Boot Up

- Boot Loader (HW Vendor Supplied)
  - Low Level boot loader, configures CPU complex
  - Loads and boots ONIE from flash

- ONIE (HW Vendor Supplied)
  - Linux OS with Busybox
  - Configures management Ethernet interface
  - Locates and executes installer from network
  - Provides tools and environment for installer

- Installer (OS Vendor)
  - Available from network or USB
  - Linux executable
  - Installs vendor OS into mass storage

- Network OS (OS Vendor Supplied)

Source: https://opencomputeproject.github.io/onie/
## NOS Interface

<table>
<thead>
<tr>
<th>Action</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reinstalling</td>
<td>Reinstalling a different NOS</td>
</tr>
<tr>
<td>Uninstalling</td>
<td>Uninstalling/wiping the system clean</td>
</tr>
<tr>
<td>Rescue</td>
<td>Rescue and recovery</td>
</tr>
<tr>
<td>Updating</td>
<td>Updating ONIE</td>
</tr>
<tr>
<td></td>
<td>Updating the machine CPLD/FPGAs and BIOS firmware</td>
</tr>
</tbody>
</table>

Source: https://opencomputeproject.github.io/onie/
Inside ONIE: subsequent system boots

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

- **Boot Loader** (HW Vendor Supplied)
  - Low Level boot loader, configures CPU complex
  - Loads and boots OS vendor’s installed OS

- **ONIE** (HW Vendor Supplied)
  - Still exists in the flash, but is not used
  - Available for uninstall / re-install operations

- **Network OS** (OS Vendor Supplied)
  - Configures Switching ASIC
  - Runs Network Protocols
  - Provides CLI

Source: https://opencomputeproject.github.io/onie/
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-beta2e4a1fe391

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

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 (140.118.17.130:80)
installer: 100% [================================================================]| 273M 0:00:00 ETA
ONIE: Executing installer: http://stevenshiau.org/clonezilla-live-onie/clonezilla-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 noextract dhcp from r losis/conf/live/iso/live-media=ram ocs_live_run=ocs-live-general live-getty console=ttys0,115200n8 vmlinuz
ed 4:0:0:0. [sda] Synchronizing SCSI cache
kexec: Starting new kernel

** Rescue Mode Enabled **

ONIE:// # random: nonblocking pool is initialized
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...

Images source: virtualbox.org; onie.org
Reference

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