Open Network Install Environment (ONIE)
Linux Plumbers 2015

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Agenda

- What is It?
- ONIE Design Approach
- ONIE Technical Deep Dive
ONIE - Open Network Install Environment

Modern, Efficient OS Installer

- Network OS Installer
- Improve Loading Dock to Rack Experience
ONIE - Open Network Install Environment

Industry Support

- Sub-project with the Open Compute Project
- Enables open network hardware ecosystem
- Community Supported
Create an Ecosystem for Bare Metal Switches

Before ONIE

The Appliance Model

- **OS Vendors** wrote their own platform dependent OS installer and integration layer
- **Hardware Vendors** maintained separate SKUs for each combination of OS and platform
- **End Users** could not change the OS, it was an appliance
ONIE Smooths out the Rough Edges

- **Hardware Vendors** maintain a single ONIE SKU for each hardware platform. Opens up the distribution channels.
- **OS Vendors** target a common installer format. Speeds time to market.
- **End Users** can pick and choose among a variety of Operating Systems. Automated mega-scale OS and hardware provisioning is now possible.
Technical Deep Dive

How Does ONIE Work?

- Leverages the Linux kernel and BusyBox
- A few state machines to manage network interfaces and image discovery methods
- Shell scripting is the programming language
Anatomy of a Network Switch

(Management Interfaces)
- Serial Console
- Ethernet Management Port

(CPU)
- SoC
- DRAM

(DRIVE)
- Boot Flash
- Mass Storage

(Ports)
- 10Gb Port
- 40Gb Port
- Other Ports...

(Data Plane)
- Switching ASIC
- PCIe

- Switching ASIC
Management Interfaces

- **Boot Flash**
- **Mass Storage**
- **CPU SoC**
- **DRAM**
- **Switching ASIC**
- **Serial Console**
- **Ethernet Mgmt Port**

(Management Interfaces)

(Data Plane)

- 10Gb Port
- 10Gb Port
- 40Gb Port
- 40Gb Port
Bare Metal Install - First Time Boot Up

Boot Loader
- Low Level boot loader, configures CPU complex
- Loads and boots ONIE

ONIE
- Linux Kernel with Busybox
- Configures management Ethernet interface
- Locates and executes an OS installer
- Provides tools and environment for installer

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

Installer (OS Vendor)

Network OS (OS Vendor Supplied)

ONIE (HW Vendor Supplied)

Boot Loader (HW Vendor Supplied)
Subsequent Reboots - OS is Already Installed

Boot Loader
- Low Level boot loader, configures CPU complex
- Loads and boots OS vendor’s installed OS

ONIE
- Still exists, but is not used
- Available for uninstall / re-install operations

Network OS
- Configures Switching ASIC
- Runs Network Protocols
- Provides CLI
Network OS Installer Discovery and Install Behavior

Configure Network Interface
- Uses DHCPv4, DHCPv6
- Configures Ethernet interface for IPv4 / IPv6
- Configures DNS and hostname

Locate Installer
- Determines the location of an installer executable
- Examines local file systems, e.g. USB flash drives
- Uses DHCP options and IPv6 Neighbors

Run Installer
- Downloads installer via URL
- Launches installer
IPv4 / IPv6 HTTP and TFTP Waterfall

Info: Fetching http://10.0.1.251/onie-installer-x86_64-dell_s6000_s1220-r0 ...
Info: Fetching http://10.0.1.251/onie-installer-x86_64-dell_s6000_s1220 ...
Info: Fetching http://10.0.1.251/onie-installer-dell_s6000_s1220 ...
Info: Fetching http://10.0.1.251/onie-installer-x86_64 ...
Info: Fetching http://10.0.1.251/onie-installer ...
Info: Fetching http://fe80::206:67ff:fe24:679b0.0000000e+00th0/onie-installer-x86_64-dell_s6000_s1220-r0 ...
Info: Fetching http://fe80::206:67ff:fe24:679b0.0000000e+00th0/onie-installer-x86_64-dell_s6000_s1220 ...
Info: Fetching http://fe80::206:67ff:fe24:679b0.0000000e+00th0/onie-installer-dell_s6000_s1220 ...
Info: Fetching http://fe80::206:67ff:fe24:679b0.0000000e+00th0/onie-installer-x86_64 ...
Info: Fetching http://fe80::206:67ff:fe24:679b0.0000000e+00th0/onie-installer ...
Info: Fetching tftp://10.0.1.251/44-38-39-00-68-00/onie-installer-x86_64-dell_s6000_s1220-r0 ...
Info: Fetching tftp://10.0.1.251/0A2A0020/onie-installer-x86_64-dell_s6000_s1220-r0 ...
Info: Fetching tftp://10.0.1.251/0A2A002/onie-installer-x86_64-dell_s6000_s1220-r0 ...
Info: Fetching tftp://10.0.1.251/0A2A002/onie-installer-x86_64-dell_s6000_s1220-r0 ...
Info: Fetching tftp://10.0.1.251/0A2A0/0/onie-installer-x86_64-dell_s6000_s1220-r0 ...
Info: Fetching tftp://10.0.1.251/0A2A/0/onie-installer-x86_64-dell_s6000_s1220-r0 ...
Info: Fetching tftp://10.0.1.251/0A2/0/onie-installer-x86_64-dell_s6000_s1220-r0 ...
GET /onie-installer HTTP/1.1
Host: 192.168.1.240
User-Agent: onie/1.0 (Linux-4.1.3-onie+2015.08; BusyBox-v1.20.0)
Connection: close
ONIE-Serial-Number:
ONIE-ETH-Addr: 44:38:39:00:68:00
ONIE-Vendor-ID: 674
ONIE-Machine: dell_s6000_s1220
ONIE-Machine-Rev: 0
ONIE-Arch: x86_64
ONIE-Security-Key:
ONIE-Operation: os-install
ONIE-Version: 2015.08
Resources

ONIE Websites

- Home Page: www.onie.org
- Source Code: github.com/opencomputeproject/onie
- Documentation: github.com/opencomputeproject/onie/wiki
- Mailing List: lists.opencompute.org/mailman/listinfo/opencompute-onie
- OCP Wiki: www.opencompute.org/wiki/Networking/ONIE
- Blogs: cumulusnetworks.com/blog
- Twitter: @ProjectONIE   @curtbrune
Thank You!