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OPEN
Compute Summit
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Open Network Linux
A Common Linux Platform for OCP Switches

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Outline

- Proposed in November OCP workshop
  - Goal: Common community target → faster adoption
  - Status: Open sourced on github yesterday: 1/27 (!!)

- Technical details
  - Multi-platform support: x86, PPC, and x86 VM
  - Full “Server-like” experience on network hardware
  - Network booting and image management

- Demo and “Hello World” L3 forwarding app
# November Proposal: Tower of Babel is Bad

<table>
<thead>
<tr>
<th>Stack #1</th>
<th>Stack #2</th>
<th>Stack #3</th>
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</thead>
<tbody>
<tr>
<td><strong>STP + MLAG</strong>&lt;br&gt;Fedora Linux Kernel&lt;br&gt;Device Tree #1 Initrd #1</td>
<td><strong>OpenFlow daemon</strong>&lt;br&gt;Std. Debian Linux Kernel&lt;br&gt;Device Tree #2 Initrd #2</td>
<td><strong>Quagga + hooks</strong>&lt;br&gt;BusyBox Linux Kernel&lt;br&gt;Device Tree #3 Initrd #3</td>
</tr>
<tr>
<td>OCP Platform V1</td>
<td>OCP Platform V2</td>
<td>White box vendor</td>
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</tbody>
</table>

Switch Agent(s)

Platform Independent

Platform Dependent

Hardware Layer
November Proposal: Common Linux Platform

- STP + MLAG
- OpenFlow daemon
- Quagga + hooks

- Standard packages, tools, etc.
  Stock Linux Kernel + any patches
- Unified Device Tree Repository
  Unified Driver Repository

- OCP Platform V1
- OCP Platform V2
- White box vendor

Keep differentiation in switch agents
Come together around the common bits
Maximize hardware abstraction
Open Network Linux: **Goals**

- Accelerate adoption of OCP switch hardware
  - Users: download image, install via ONIE
  - Vendors: common Linux platform for new drivers, testing
- Create an open community
  - Target: Linux portable to all networking devices
- **License:** Eclipse Public License and GPL for Kernel
- “What’s in it for me?”
  - Engineering efficiencies
  - Better development and deployment experience
Open Network Linux: Status

- Lots of support from community – thanks!
- Github went live yesterday: 1/27/2014
  - Main repository: github.com/opennetworklinux/ONL
- Builds ONIE-compatible images for:
  - Generic x86 platforms: Interface Masters not yet tested
  - Many PPC platforms: Quanta LY2, LB9, LB8D, Accton 5652
  - x86 VM build: for testing – qcow2 (vmdk via convert)
- Stability level: “works for us”
- Feedback welcome
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Technical Overview

- Code builds two main artifacts:
  - ONL installer/loader: like grub, but multi-platform with netboot
  - ONL SWI file: zip’d Switch Image with root fs, kernel, initrd

- Code is divided into multiple sub-modules
  - ONL: main repository – auto pulls in other repos
  - linux-3.9.6: extracted kernel code
  - loader: scripts and code for boot loader process
  - infra and common: libraries, shared routines, faultd
Deployment Overview

- Full documentation in README in ONL repository
  1. Get code from github.com/opennetworklinux/ONL
  2. (only for ppc) Build a cross-compilation workspace
  3. Build ONL installer/loader image
  4. Put ONL installer/loader image on ONIE server
  5. Boot switch and install ONL via ONIE
  6. Build one or more ONL SWI’s
  7. Netboot from scp/nfs/http/ftp/etc. to install ONL SWI
ONL is Multi-Platform

- Support many boxes from the same code-base

Open Network Linux:
- Kernel
- Drivers
- Loader
- Work flow
- Build scripts
- Management Model

X86 Arch
- Interface Master's
- x86 VM
- others?

PPC
- Quanta LB9, LY2, LY5
- Accton 5652
- Delta, Alpha, etc.

ARM?
- ???
Tricks to Use Switches Like Servers

- Switches have flash, not hard drives
  - Problem 1: Maximum flash cycle time limit disk writes
  - Problem 2: Flash and ram more limited than typical servers
  - Fix: Use overlayfs to overlay copy-on-write ram disk over flash

- ONL uses full-featured binaries
  - For size, most switch OS’s use stripped binaries, e.g., busybox
  - Bigger binaries uses additional space, but ok with overlayfs
  - Install/use proper Debian binaries using apt-get
  - Useful for development or operations, e.g., gcc or Chef/Puppet
ONL Supports Net Booting Natively

- Boot SWIs over the network once ONL Loader installed
  - SWIs are cached locally for performance, resilience
  - Simplifies operational management, upgrades
  - Supports http, ftp, tftp, nfs, ssh/scp, or ZTN

- Zero-touch Networking (ZTN): auto-discover SWIs
  - Like PXE for your switches
  - Query all http servers in local subnet, use SWI of first hit
  - Just like ONIE

- Netboot makes managing your network much easier
Install Using ONIE then Boot ONL

Boot Logic:

1. uBoot POSTs
2. $nos_boot_cmd is read from ENVs
3. run $nos_boot_cmd
   • If $nos_boot_cmd returns, run ONIE
   • On install, ONIE sets $nos_boot_cmd to load ONL loader
4. Loader downloads specified SWI URL if not cached
5. Loader mounts rootfs as ramdisk with overlayfs
6. ONL loader kexec’s SWI kernel

~64MB
- uBoot
- ENVs
- ONIE
- Free Space

~2GB
- ONL Loader
- ONL SWI #1 (cached)
- ONL SWI #2 (cached)

Mass Storage
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Demo and Forwarding Agents

- **Demo:**
  - Netbooting
  - Quick file system walk through

- **Available Forward agents**
  - Download BSN’s Switch Light OpenFlow daemon binary
  - “Hello World” L3 agent
    - Monitor Linux software route via rtnetlink
    - Copy routes/neighbor/interfaces into ASIC with binary driver
    - Enables box for Quagga, Xorp, etc.
  - *Work in progress*
Conclusion

- **Open Network Linux is available now**
  - Goal: support all bare metal switches: OCP and non-OCP
  - [github.com/opennetworklinux/ONL](https://github.com/opennetworklinux/ONL)

- **Technical benefits:**
  - Multi-platform, switch like server, netbooting

- **Contributions Encouraged!**
  - New platforms
  - Additional features/drivers
  - Better documentation
This is an interstitial slide