Open Networking Evolution
From perspective of OpenSwitch

OpenSwitch Team
Open Networking Evolution

- Integrated Networking Solutions
  - Delivered by one vendor (software and hardware)
  - OpenSwitch bypassed this step

- Open Networking - Hardware/Software Split
  - ONIE enabled switches
  - Choice of OSs

- Open Networking – Software Disaggregation
  - ONIE enabled switches
  - Open Linux based platform
  - Multiple software vendors supporting L2/L3 and a variety of apps/management
  - Similar to software on Linux Servers
OpenSwitch’s Open Networking Journey
What is OpenSwitch

Install standard Debian Jessie

Install the OPX packages and the routing software of your choice

Provides
Open Networking Platform Vision

Application Ecosystem

Open Source Integration Layer

Platform Drivers

Hardware

ASIC

Community of applications using standard/Open Source APIs

Developed in Open Source – Linux Integration/Adaptions

Platform Provider/Asic Provider

Innovation
Introduction to OpenSwitch

https://www.openswitch.net/
Mechanics of OpenSwitch

• Meet the team:
  – Cavium, Broadcom, Barefoot – ASIC/SAI support
  – Dell EMC – NAS/PAS/CPS
  – Cavium, Dell EMC and others – Platform porting
  – inMon, Inocybe, Metaswitch, Cavium, Broadcom, Dell EMC – Applications

• Linux Foundation Project

• Weekly TSC Calls – Thursday at 10am PST

• Communication
  – Rocket Chat – chat.openswitch.net
  – Email group – ops-tsc@lists.openswitch.net

• Website
  – https://www.openswitch.net/
  – https://github.com/open-switch/opx-docs/wiki
OpenSwitch Development Methodology

- Enable users to deploy supportable solutions
  - You should not need software engineers to support a network

- Use Standard Linux distributions without modification
  - Shift from custom Linux distribution (open platform)
  - Security, Application Updates

- Focus on enabling 3rd party software collaborations/integration
  - Develop APIs and SDKs and enable high-level and scripting languages for rapid development
  - Collaborate/adapt with open source projects in order to bring value to users
  - Integrate with Linux Networking stack – enable Linux native networking apps

- Expose differentiation of silicon features through flexible NPU integration

- Work with the community to define/provide features and functions
OpenSwitch – Overview

What is OpenSwitch
- Linux Foundation Open Source Project
- Diverse Growing Community Led by Dell EMC
- Open Source NOS for Hardware Switches
- Commercial-Grade Turnkey Solution
- Open and Premium Application Ecosystem
- Enables Rapid On-Boarding of New Platforms, Protocols and Applications

Key Features of OPX
- System
  - Linux Debian Jessie
  - Linux Stack Integration
  - 1/10/24/40/100G Platforms
- L2 Features
  - LAGs, LLDP
  - STP, PVST, VLANs, CoS
- L3 Features
  - IPv4 & IPv6 Support
  - BGPv4, OSPFv2/3, ECMP, VRFs, VRRP
  - ICMP, ARP, DNS, NTPv4, DHCPv4, IGMPv2
- Security & Instrumentation
  - ACL: 5-tuples, L2/L3, UDF
  - Monitor: (R)SPAN, sFlow
- QoS
  - DiffServ, PFC, COPP
  - Policers, Shapers, Scheduling
- Network Management
  - RADIUS, TACACS+
  - SSHv2, SCP, SNMP
- Automation
  - Control Plane Services APIs
  - Linux Utilities and Tools
  - Ansible, Chef, Puppet, Salt
  - Python, C/C++, YANG

Why OpenSwitch
- Operational Efficiency Benefits
  - Software & Hardware Disaggregation
  - Free NOS Base brings CapEx Savings
  - Open/Premium Applications Save OpEx
- Network Agility & Features Velocity
  - Custom Modifiable Open Source Code
  - Extensible to Support New Platforms
  - Provide Framework to Integrate New Applications
- Use OPX NOS with Confidence
  - Commercially Deployed Today
  - Leading Open-Networking Hardware
  - Field-Proven Control Protocol

Choice of Hardware and NPU
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<th>Features</th>
<th>OPX 2.0 Feb 2017</th>
<th>OPX 2.1 June 2017</th>
<th>OPX 2.1.2 Sept 2017</th>
<th>OPX 2.2 Dec 2017</th>
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Collaborations in 2017/2018 (Booth demos)
Metaswitch (Demo at OPX Booth)
**OUR COMPANY**

- Headquartered in London, UK and Silicon Valley
- Over 800 employees worldwide
- 1,000+ active customers worldwide
- Continuously profitable over our 35 year history
- Privately funded by Sequoia, Francisco Partners and employees
- Grown organically and strategic acquisitions

---

**Creators of the most widely deployed IP/MPLS and BGP protocol stacks**

**Invented Metaswitch µservices platform for web scale DevOps experience**

**Delivering composable control plane & cloud native VNFs for white boxes**
Introducing CNP-Base for OPX: μservices-based, Composable Networking solution

Composable Networking allows operators to consume only the software they need: best-of-breed solutions for each of hardware drivers, NOS and software applications.

- Completely separate routing and control from NOS: ISSU
- Employ DevOps continuous integration / delivery methodologies
- Mix & match protocols from different vendors

Programmatic Management API for Metaswitch Control Plane and key OPX function

Carrier-grade, Metaswitch Control Plane Microservices

IPv4/IPv6 throughout

MPLS, EVPN and Multicast packages coming shortly

Available today:
- Dell S4048-ON
- Dell S4048T-ON
- Dell S6010-ON
- Dell Z9100-ON

Coming soon:
- Dell S4200-ON
- Dell S5148-ON

Nav: Metaswitch Control Plane Microservices

Open Switch

Switch Platform and Merchant Silicon
inMon
(Demo at OPX Booth)
Linux

CPS

Merchant silicon vendor support for sFlow
standard → embedded line rate monitoring
at 10, 40, 100G

Standard performance metrics from
Linux kernel + ASIC metrics using
OpenSwitch CPS

Open source sFlow agent
http://sflow.net

Metrics pushed using standard sFlow protocol
(XDR/UDP) to external monitoring software
http://www.sflow.org

Wide selection of open source and commercial
sFlow analysis software

Graphite

sFlow

sflowtool

NTOP

WireShark

Ganglia

inMon

Standard network and host metrics
Comprehensive data center wide visibility

Embedded monitoring of all switches, all servers, all applications, all the time

Consistent measurements shared between multiple management tools

© 2018 OpenSwitch Linux Foundation Project
Embedded vs external software flow cache

- Move flow cache from ASIC to external software
  - Reduce ASIC cost / complexity
  - Fast response (data not sitting on switch)
  - Centralized, network-wide visibility
  - Increase flexibility → software defined analytics

Scale-out alternative to SNMP polling

- Reduce ASIC cost / complexity
- Fast response (data not sitting on switch)
- Centralized, network-wide visibility
- Increase flexibility → software defined analytics
Broadcom Broadview (Demo at OPX Booth)
Broadview™ Instrumentation Agent

- Platform Agnostic API For Advanced Analytics
- Open Source (Apache 2.0) Reference Implementation
- OPX Integration Ready On Multiple Platforms
- Leverages Unique Broadcom ASIC Telemetry
- BroadView Agent Specification Published on GitHub
“BroadView™ Analytics” – New Application

- Easy to Use Application for All BroadView Features
- Configuration, Reporting and Control
- Switch Level and Network Level Use Cases

Now Available On GitHub
And there are more....
**Free Range Routing** (FRRouting) – IP routing protocol suite for Linux that provides protocol daemons for BGP, OSPF, etc.

**Inocybe** – Open Networking solution using OpenDayLight as a CPS interface

**Packet Trakker™** – Cavium programmable telemetry software suite (S5148F-ON only)

**Webmin** – web-based system configuration tool on OPX

**Looking Glass** – system monitoring tool that displays platform info using information from kernel and CPS
Summary/Wrapup
• Working with the community is the way to success
• As highlighted in the keynote, the power of many is greater than the power of one

Thank you
Backup