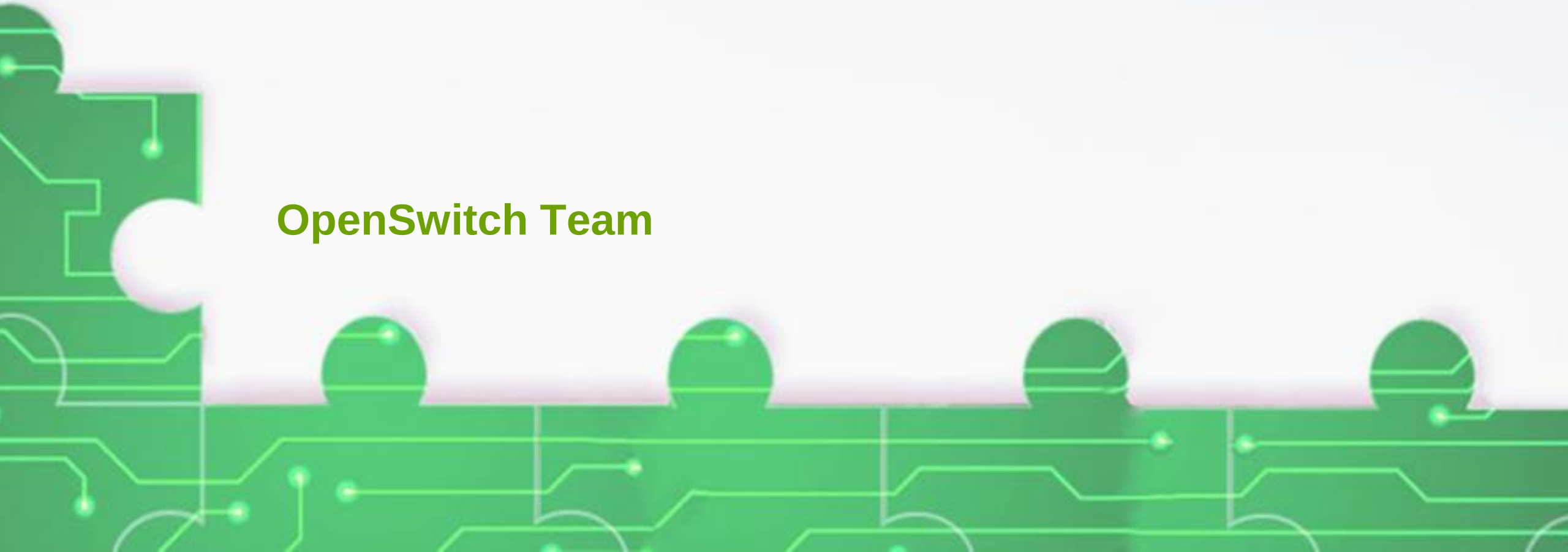
Open Networking Evolution

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 Echosystem

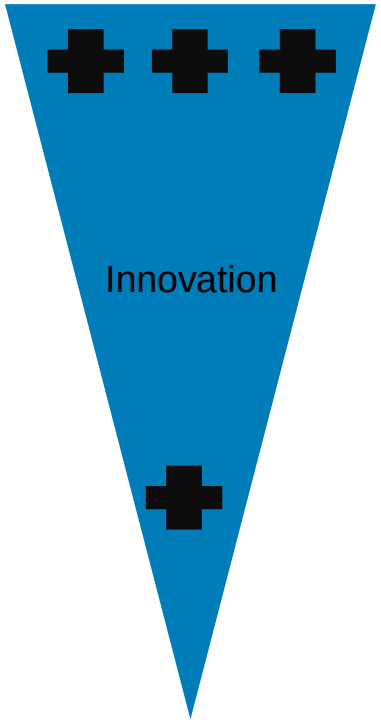
Open Source Integration Layer

Platform Drivers | Hardware | ASIC

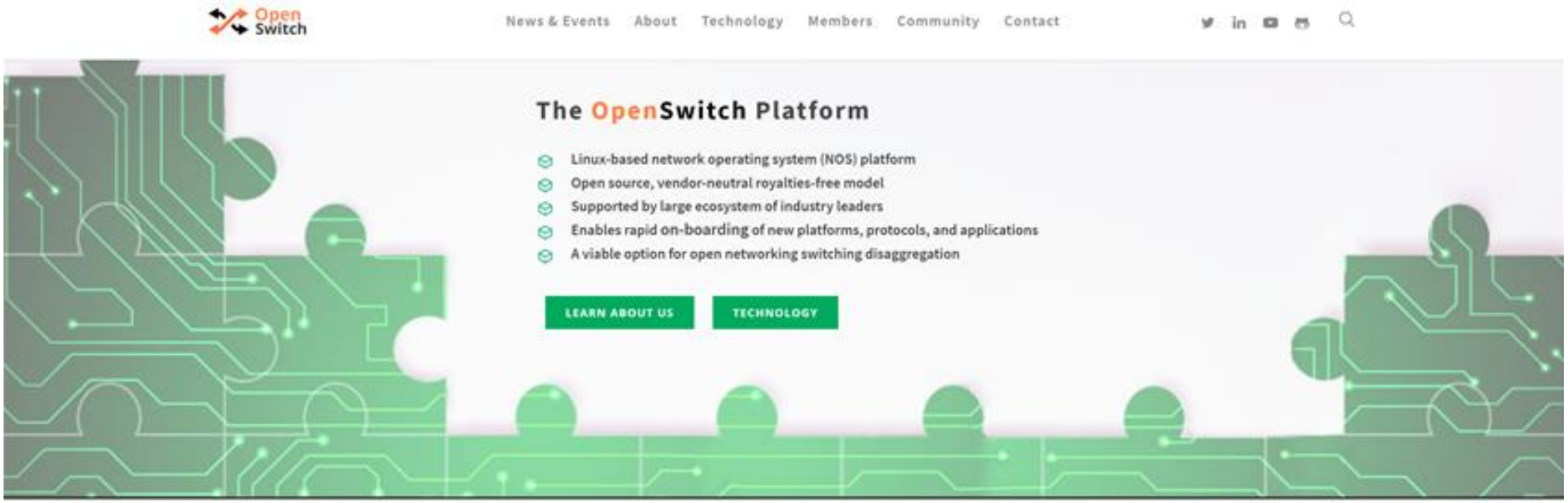
Community of applications using standard/Open Source APIs

Developed in Open Source – Linux Integration/ Adatptions

Platform Provider/Asic Provider



Introduction to OpenSwitch



https://www.openswitch.net/

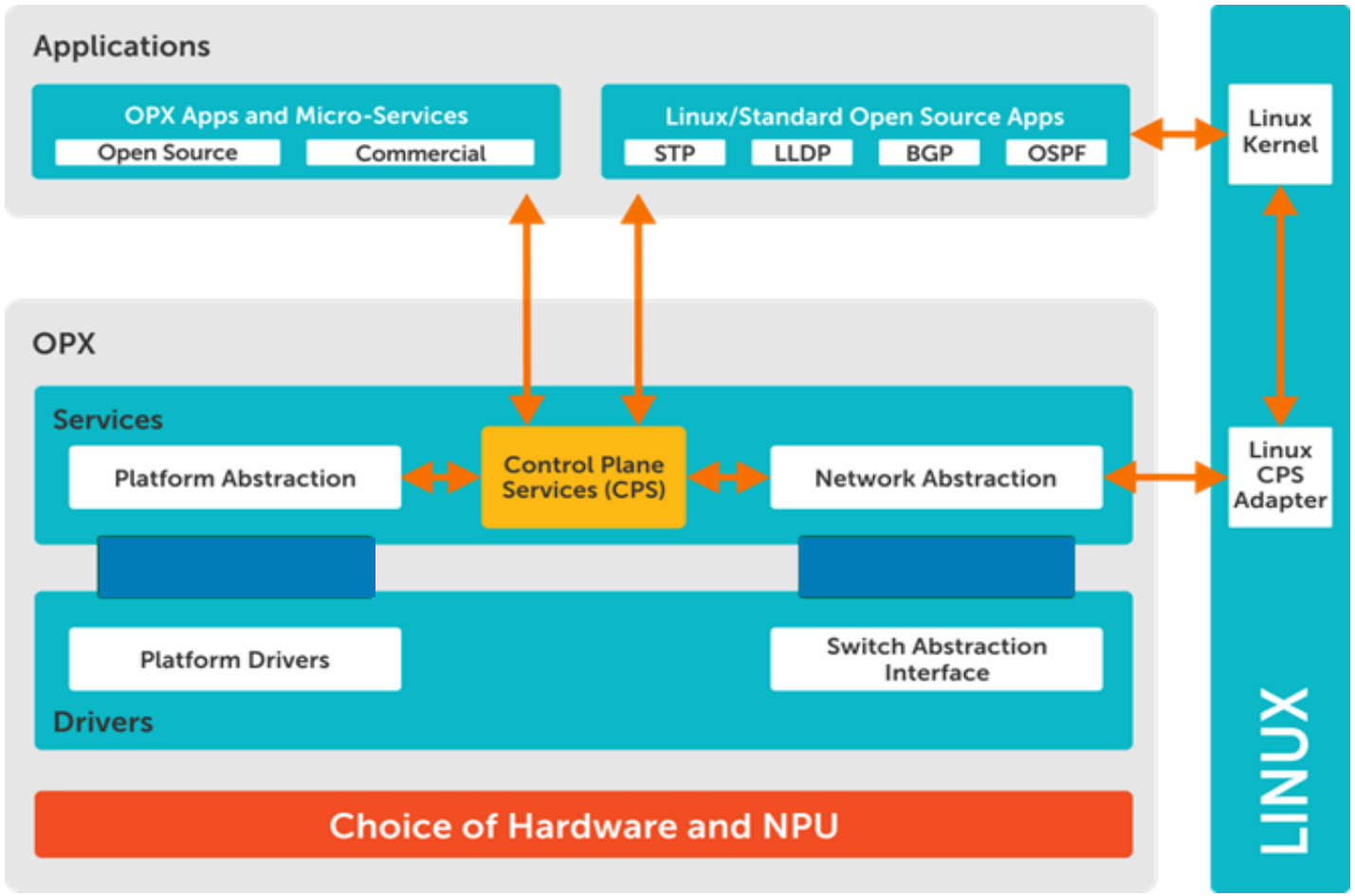
Mechanics of OpenSwitch

- 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 – Applcations
- 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 Methedology

- 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/integation
  - 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

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

Key Features of OPX

System

- Linux Debian Jessie
- Linux Stack Integration
- 1/10/25/40/100G Platforms

L2 Features

- LAGs, LLDP
- STP, PVST, VLANs, CoS

L3 Features

- IPv4 & IPv6 Support
- BGPv4+, OSPFv2/3, ECMP, VRFs, VRRP
- ICMP, ARP, DNS, NTPv4, DHCP, 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

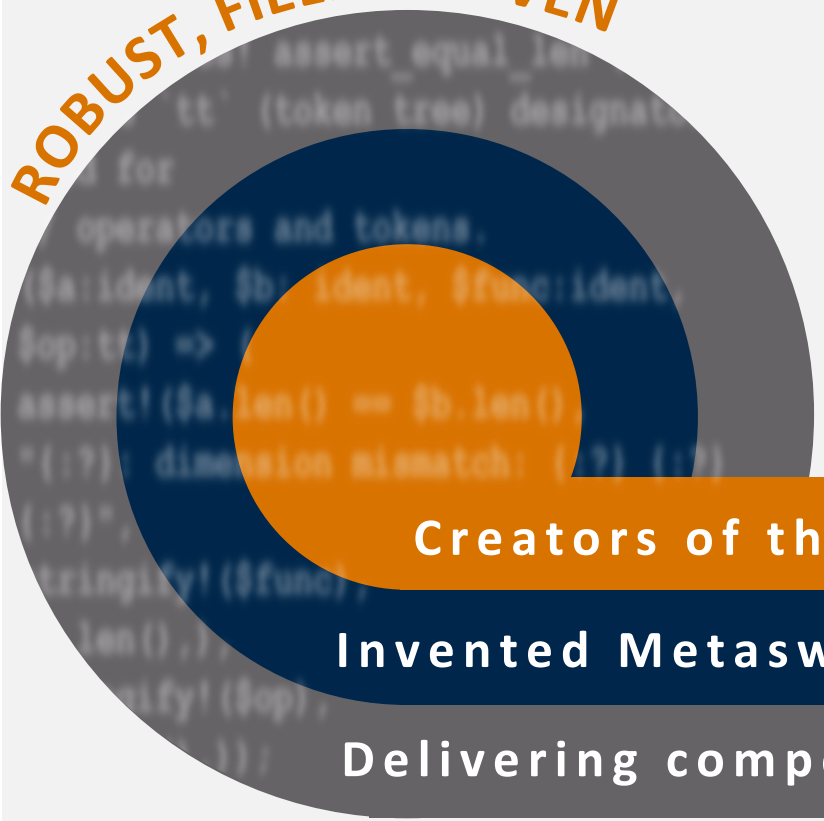
A Year (or Just Over) in Review

Release / Category	OPX 2.0 Feb 2017	OPX 2.1 June 2017	OPX 2.1.2 Sept 2017	OPX 2.2 Dec 2017	OPX 2.3 Mar 2018
Features	Standard L2/L3 Rich ACL/QoS Bug fixes Routing Stack: Quagga	Ansible CI/CD enhancements Testing Framework Bug fixes Addition of platforms: 1G/10G/40G	ACL Persistency Yang 1.1 Bug fixes Platforms: 100G Routing Stack: Quagga FRR	hsFlow 25G Multicast Snooping Bug fixes Platforms: Cavium	SNMP Management VRF Bug fixes Platform: 25G Routing Stack: Metaswitch Quagga
Platforms added	DellEMC S6000	DellEMC S3048 DellEMC S4048 DellEMC S6010	DellEMC Z9100	Edgecore 7512	DellEMC S5148
NPU Support added	Broadcom (SAI 0.96)	Broadcom (SAI 0.96)	Broadcom Cavium (SAI 1.0 + 0.96)	Broadcom Cavium (SAI 1.2 + 0.96)	Broadcom Cavium (SAI 1.2 + 0.96)

Collaborations in 2017/2018 (Booth demos)

Metaswitch
(Demo at OPX Booth)

Metaswitch: Building on a Strong Networking Software Heritage



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

metaswitch

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

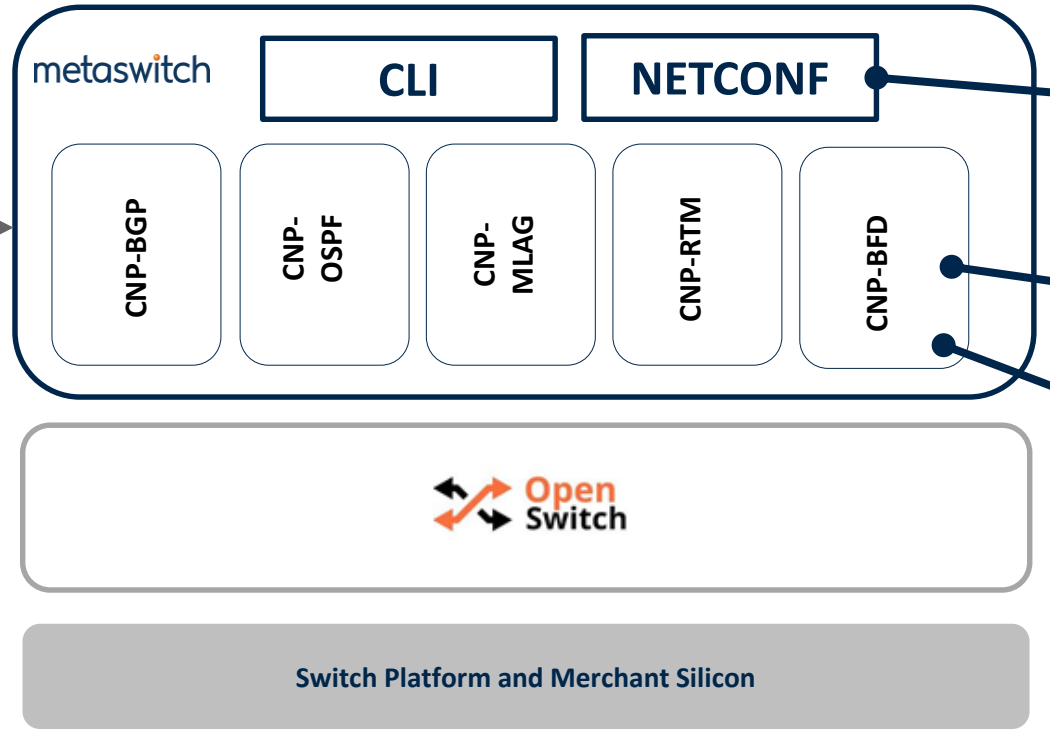
Completely separate routing and control from NOS: ISSU

Employ DevOps continuous integration / delivery methodologies

Mix & match protocols from different vendors

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

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



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

metaswitch

inMon
(Demo at OPX Booth)

Standard network and host metrics

Wide selection of open source and commercial sFlow analysis software

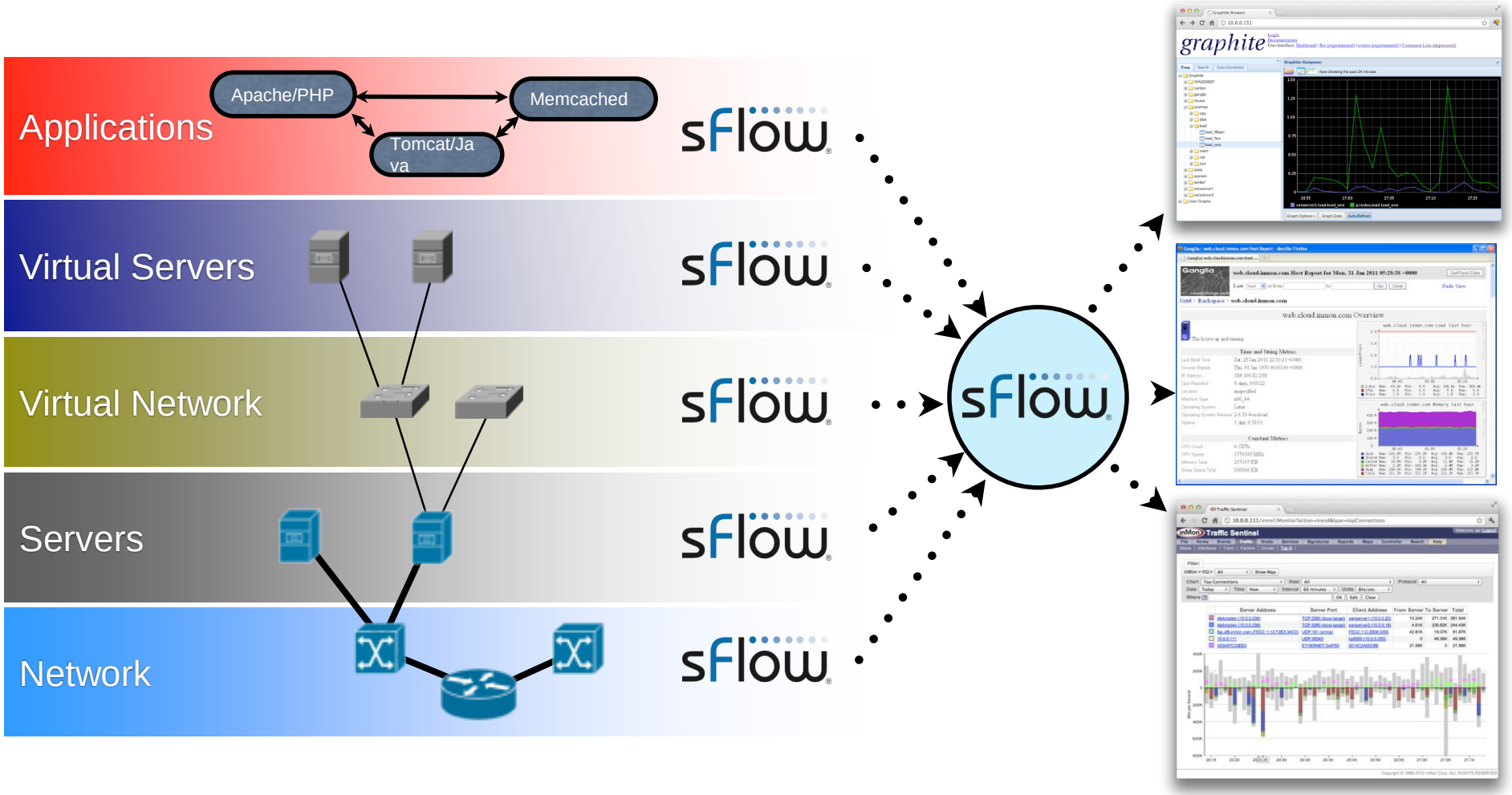
Metrics pushed using standard sFlow protocol (XDR/UDP) to external monitoring software
http://www.sflow.org

Open source sFlow agent
http://sflow.net

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

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

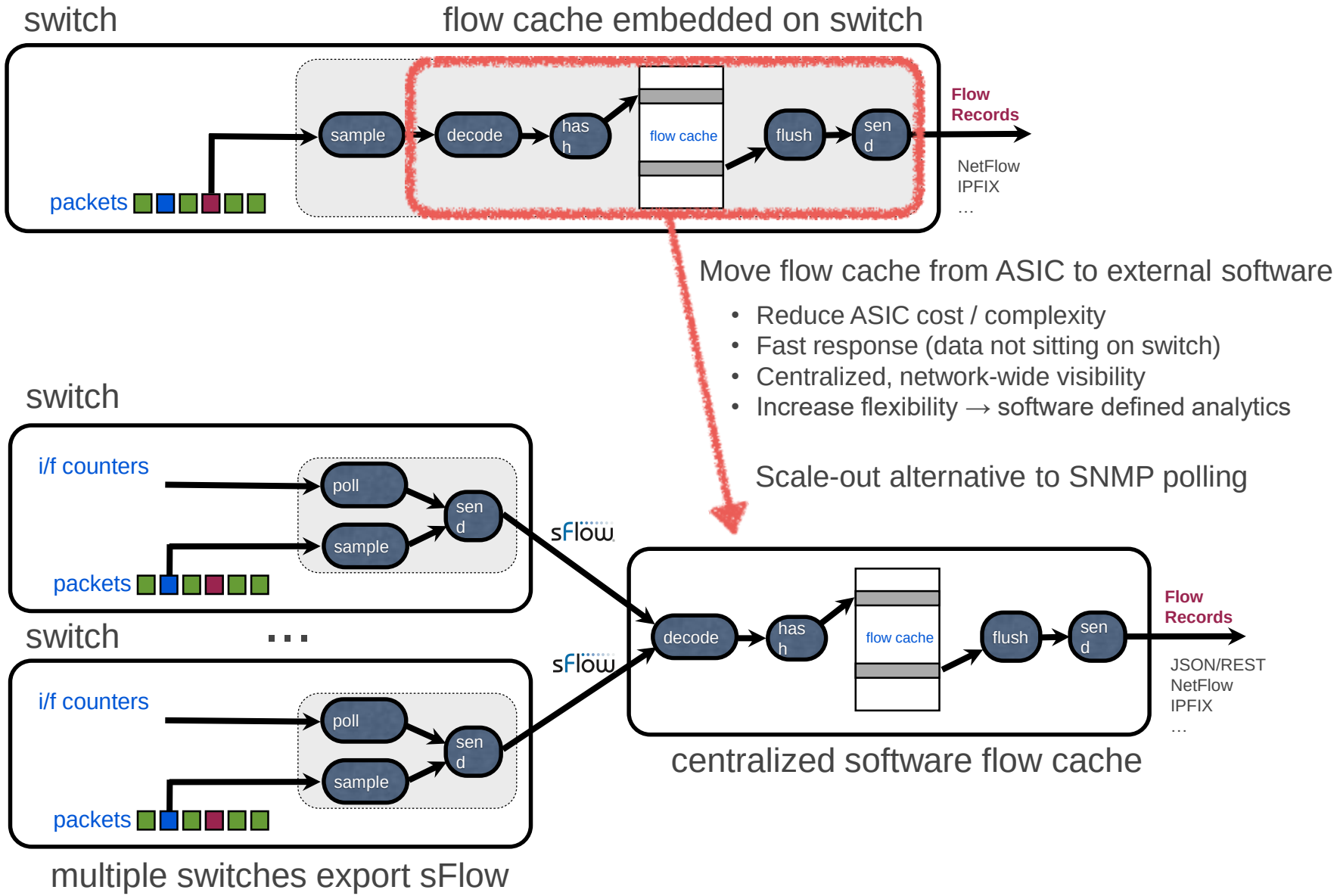
Comprehensive data center wide visibility



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

Consistent measurements shared between multiple management tools

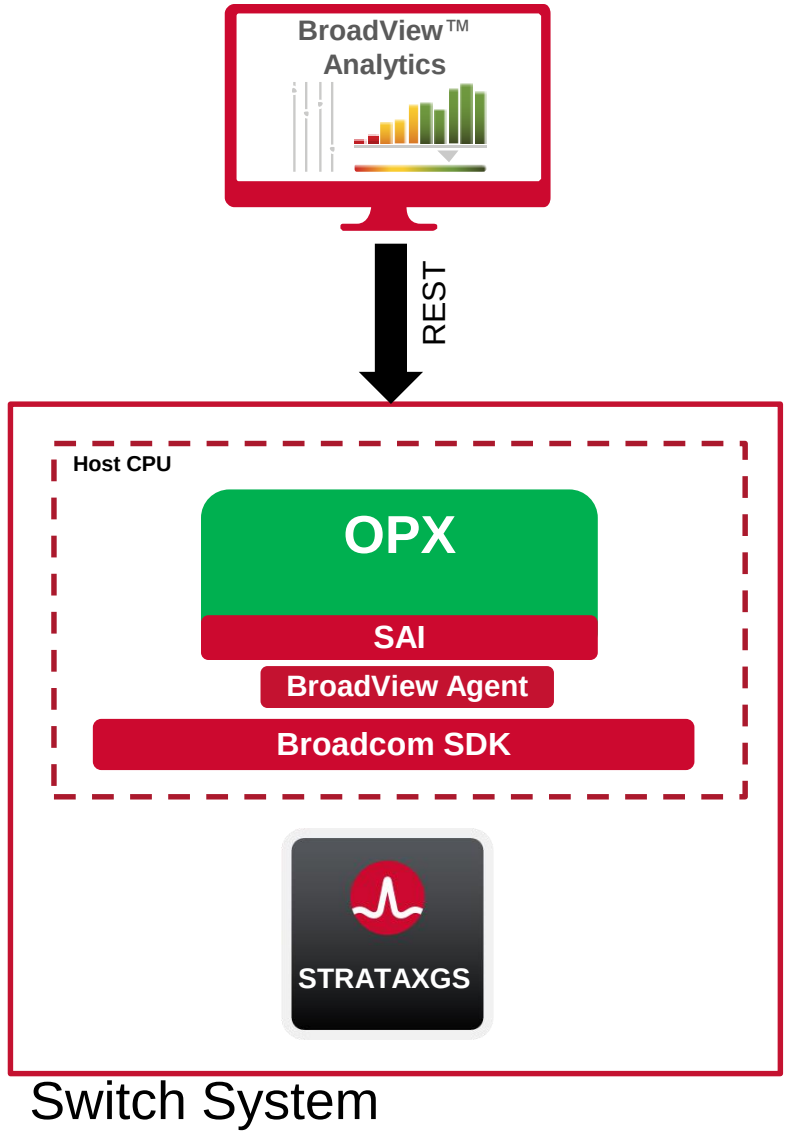
Embedded vs external software flow cache



Broadcom Broadview (Demo at OPX Booth)

Broadview™ Instrumentation Agent

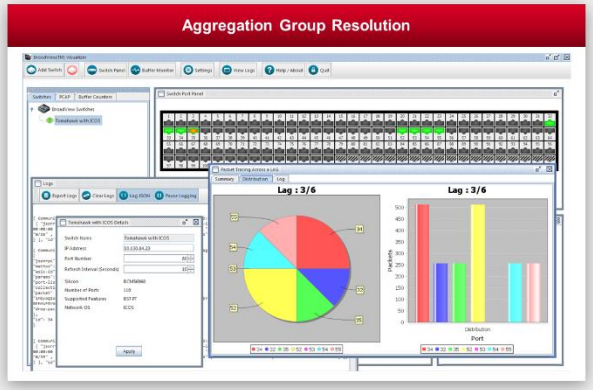
- Platform Agnostic API For Advanced Analytics
- Open Source (Apache 2.0) Reference Implementation
- OPX Integration Ready On Multiple Platforms
- Leverages Unique Broadcom ASIC Telemetry
- BroadView Agent Specification Published on GitHub

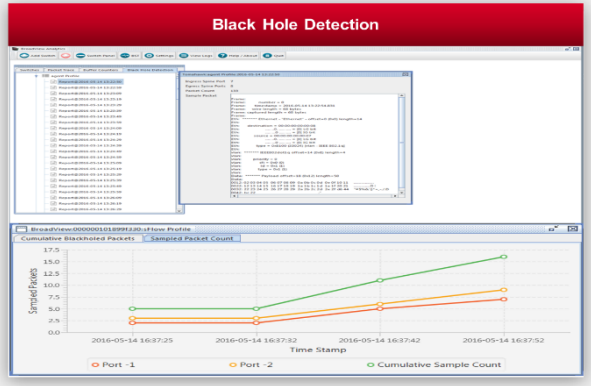


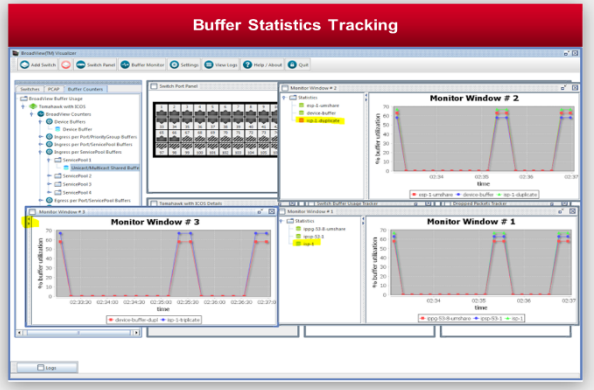
BROADCOM

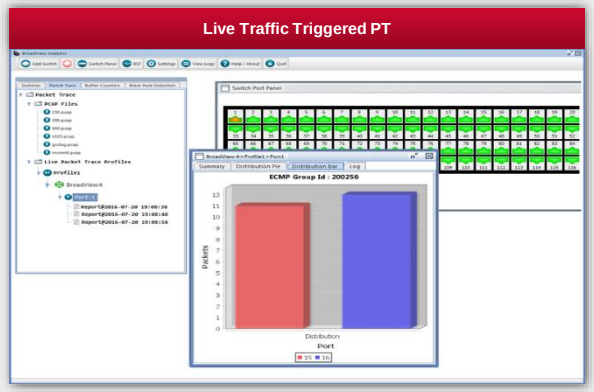
“BroadView™ Analytics” – New Application

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









Now Available On GitHub

BROADCOM

And there are more….

Free Range Routing (FRRouting) – IP routing protocol suite for Linux that provides protocol daemons for BGP, OSPF, etc.

Webmin – web-based system configuration tool on OPX

Inocybe – Open Networking solution using OpenDayLight as a CPS interface

Looking Glass – system monitoring tool that displays platform info using information from kernel *and* CPS

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

Summary/Wrapup

OpenSwitch/Open Networking 2.0

- Working with the community is the way to success
- As highlighted in the keynote, the power of many is greater then the power of one

Thank you

Backup