



The Open Networking Foundation: Standard Bearer for SDN

Open Networking Summit

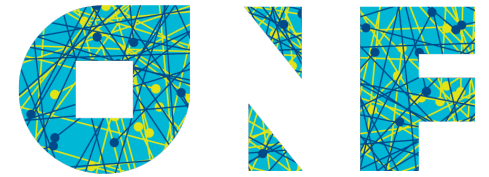
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Dan Pitt, Executive Director

Dan.Pitt@OpenNetworking.org



Points to cover



- **The Basics**
- **Why we exist**
- **Ambition, scope**
- **How we operate**
- **What we're doing**

ONF basics



ONF

- *is* a foundation for the advancement of SDN (including standardization)
- *is not* a simple SDO

Vision

- Make Software-Defined Networking the new norm for networks

Mission

- Foster a vibrant market for SDN products, services, applications, users

Goals

- Create the most relevant standards in record time to support a switching ecosystem based on the OpenFlow protocol
- Accelerate understanding of how to realize the abstractions above OpenFlow

ONF legal



A non-profit industry consortium 501(c)(6)

- Incorporated 2010, Launched March 22, 2011
- Funded by member dues
- Open to any org. that pays annual dues, agrees to bylaws, IPR policy

IPR policy

- RAND-Z: royalty-free use of protocol, OpenFlow trademark, logo
 - Automatic cross-licensing of all related IP to all other members
 - No licensing charges to members
 - No protection for non-members
- ONF itself: no IP
- Open interfaces, not open source or reference implementations (great for others)

ONF principles



Operation

- Fast, lean, efficient
- Absent politics AMAP
- A startup ourselves, iterating with customers, agile, learning

Standards creation

- Driven by users and user needs
- Developed by those close to implementation/deployment
- Standardize as little as necessary
 - Vendor differentiation without lockin, market fragmentation
 - More and more like a software community
- No names on drafts
- Relevant, implementable now; protocol-agnostic eventually
- Rapid real-world experience

ONF governance



Board of Directors

- Users, not vendors

Executive Director

- Reports to the Board
- Sole employee
- Vendor neutral

Technical Advisory Group

- Reports to the Board
- Advises on fundamental technical issues
- Makes recommendations, not decisions

ONF governance

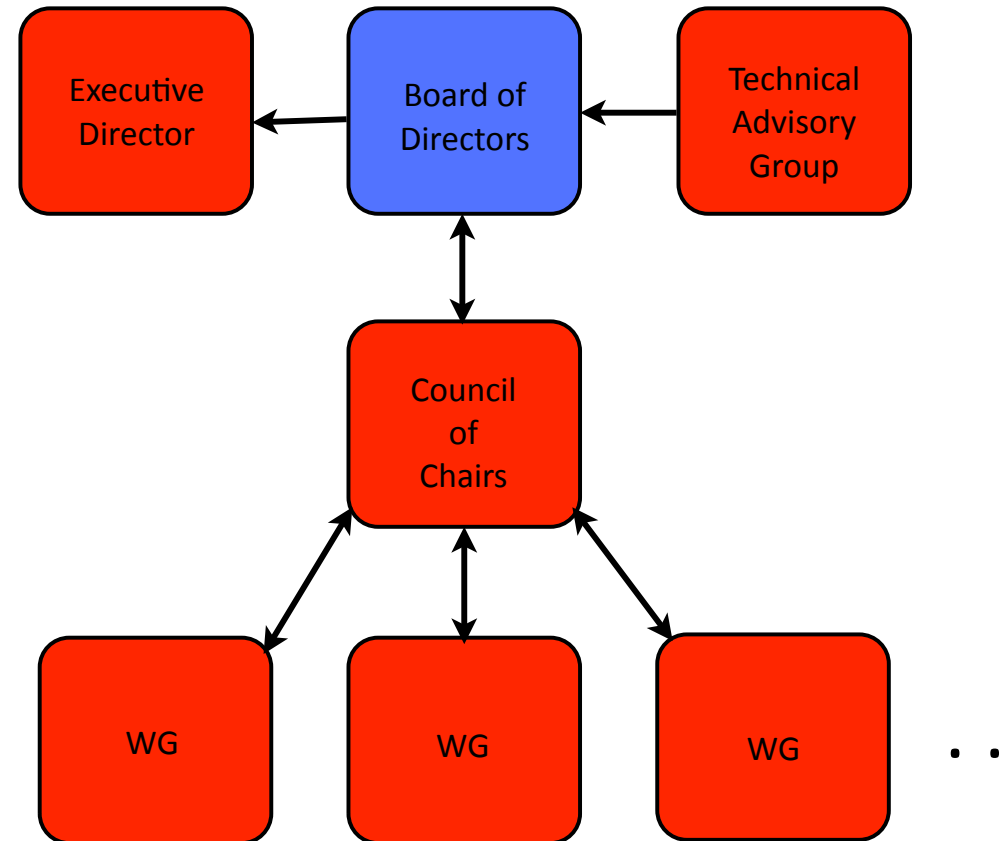


Working Groups

- Chartered by the Board
- Chaired by Board appointee
- Defined scope, deliverables, timeline
- Work/meet on own schedule

Council of Chairs

- Assures cross-WG consistency
- Forwards draft standards to Board
- Chaired by Executive Director



ONF members

8 Board members/6 “promoter” member companies

- Urs Hölzle (Sr. VP, Engineering, Google), chairman
- Najam Ahmad (Director, Network Engineering, Facebook)
- Adam Bechtel (VP, Infrastructure Group, Yahoo)
- Stuart Elby (VP, Network Architecture, Verizon)
- Bruno Orth (VP, Strategy and Architecture, Deutsche Telekom)
- Clyde Rodriguez (GM, Windows Azure Networking, Microsoft)
- Nick McKeown (Professor, EE and CS, Stanford)
- Scott Shenker (Professor, EECS, UC Berkeley and ICSI)



41 “adopter” member companies

- | | | |
|-----------------------|-----------------------|--------------------------|
| • Big Switch Networks | • HP | • Netgear |
| • Broadcom | • Huawei | • Netronome |
| • Brocade | • IBM | • Nicira Networks |
| • Ciena | • Infoblox | • Nokia Siemens Networks |
| • Cisco | • Intel | • NTT |
| • Citrix | • IP Infusion | • Plexxi Inc. |
| • Comcast | • Ixia | • Pronto Systems |
| • CompTIA | • Juniper Networks | • Riverbed Technology |
| • Dell | • LineRate Systems | • Samsung |
| • Ericsson | • Marvell | • Tencent |
| • ETRI | • Mellanox | • Vello Systems |
| • Extreme Networks | • Metaswitch Networks | • VMware |
| • Force10 Networks | • Midokura | • ZTE |
| • Fujitsu | • NEC | |

OpenFlow standards



Evolution path:

- OF 1.0 (03/2010): Most widely used version, MAC, IPv4, single table
- OF 1.1 (02/2011): MPLS tags/tunnels, multiple tables, counters
- OF 1.2 (12/2011): Wire protocol, IPv6, basic configuration, extensible expression
- OF 1.3 (04/2012): Topology discovery, test processes, test suites...
- OF 1.4 (08/2012): Capability discovery, test labs...

Goals:

- Widespread adoption, experimentation w/OF 1.2-1.4
- Accommodate current merchant silicon
- Move beyond limitations of current merchant silicon

Technical activities



Chartered Working Groups

- Extensibility (chair: Jean Tourrilhes, HP)
 - Extensible match & error messages, wire protocol, forwarding model, MAC, IPv4, IPv6
- Config-mgmt (chair: Deepak Bansal, Microsoft)
 - Protocol & schema for basic config, single logical switch to main/backup controller
- Testing-interop (chair: Michael Haugh, Ixia)
 - Conformance test suites, performance benchmarking, interoperability plug fests





Technical activities

Active mailing list discussion groups

- Match-action-table
 - Eventual home of IPv4, IPv6 field-based rules
- Hybrid forwarding plane
 - Resource sharing among conventional/OpenFlow parts of hybrid switch; shipping lanes
- Northbound API/SDN abstractions
 - Object & service models, virtualization, characterization, interaction
 - SDN abstractions above OF not very appropriate for *de jure* standardization



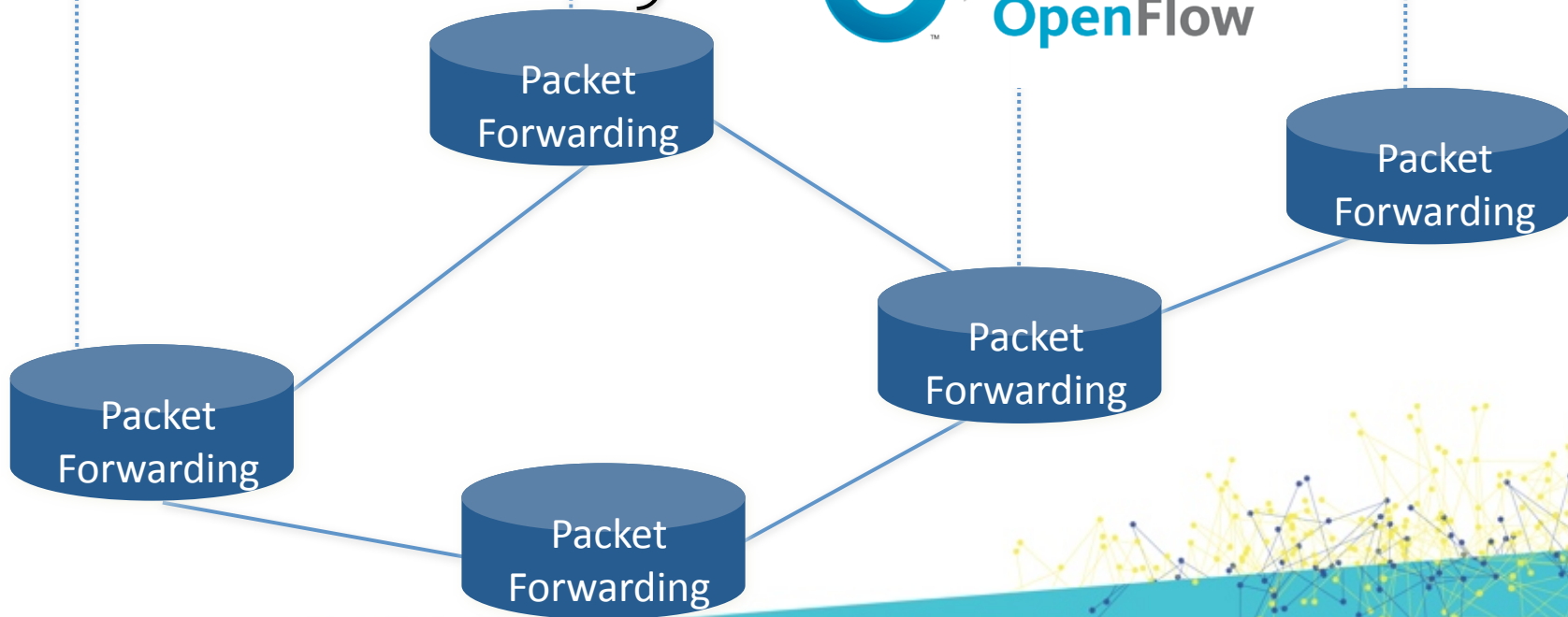
3. Consistent, well-defined global view

Feature Ctl. Program

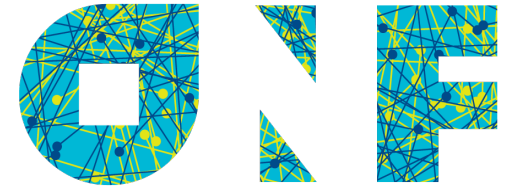
2. At least one Network OS probably many Open- and closed-source

Network OS

1. Open interface to packet forwarding



Rich environment above OpenFlow



Apps

Control Program A

Control Program B

Tools

Abstract Network View

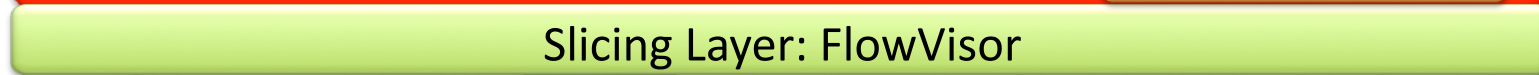


Global Network View

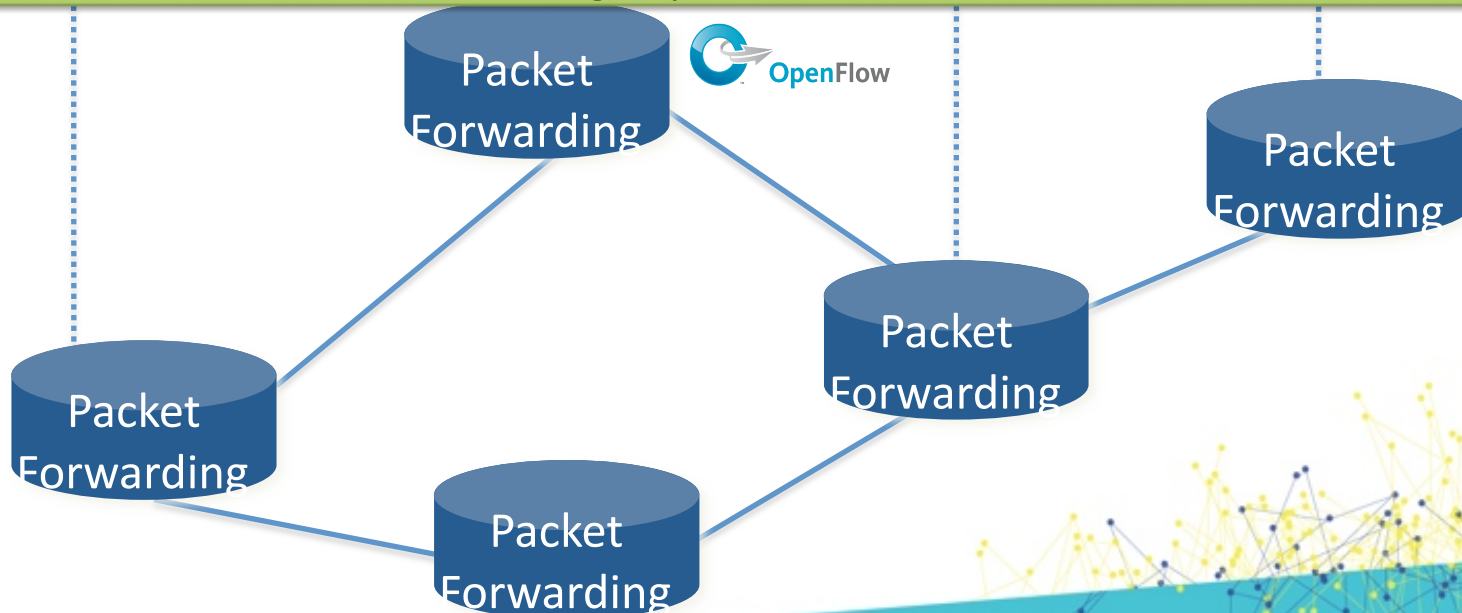


Network OS(s)

Control Program C



Slicing Layer: FlowVisor



Market education



Objectives

- Position SDN/OF as the future of networking
- Educate members/non-members; vendors/operators
- Foster a vibrant market through market education in partnership w/members
- Raise awareness, support adoption, help members succeed

Ideas

- Common vocabulary
- Consistent messaging
- Shared collateral
- Collaborative appearances

Just getting started: talk to me

Conclusions



ONF now the home of OpenFlow

- Take OpenFlow 1.1 to commercial strength – Job One
 - Family of standards: foundation, building blocks, choices
 - Protocols; configuration and management; compliance and interoperability
 - Development, deployment, experience, feedback

SDN beyond OpenFlow

- SDN abstractions, object models, interactions
- Ecosystem for new features, new players, new business models

Technical standards + market education

- Market pull to drive the ecosystem

www.OpenNetworking.org

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