



OPEN NETWORKING
FOUNDATION

ONF overview

SDNP BOF

IETF 82

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representing the ONF

Agenda

- Basics
- Scope
- Operation
- ONF-IETF interaction

Thanks to Dan Pitt (Executive Director ONF) as much of this was cribbed directly from him:

<http://opennetsummit.org/talks/pitt.pdf>

Basics

- ONF is an SDO and also a foundation for the advancement of SDN
 - ONF SDN == Software Defined Networks
 - Works on architectures and protocols
 - Use Case driven
- Vision is to make SDN new norm for operating and delivering services on the Internet and other networks of many types
- Mission to foster SDN community and market

Goals

- “Create the most relevant standards in record time to support a switching ecosystem based on the OpenFlow protocol”
 - OF 1.2 now specified (under review)
- Accelerate understanding of how to realize the abstractions above Open Flow
- Vendor neutral, yet enable differentiation

Legal

- 501(c)(6) incorporated 2010, launched March 22, 2011
- Funded by member dues, open to any org that pays dues, follow bylaws, and agrees to IPR policy
- IPR
 - RAND-Z: royalty free use of protocol, logo, trademark
 - Auto cross-licensing of all related IP to all other members
 - No licensing charges to members, no protection for non-members
 - ONF does not hold IP
 - Open interfaces, not open source

What is OpenFlow?

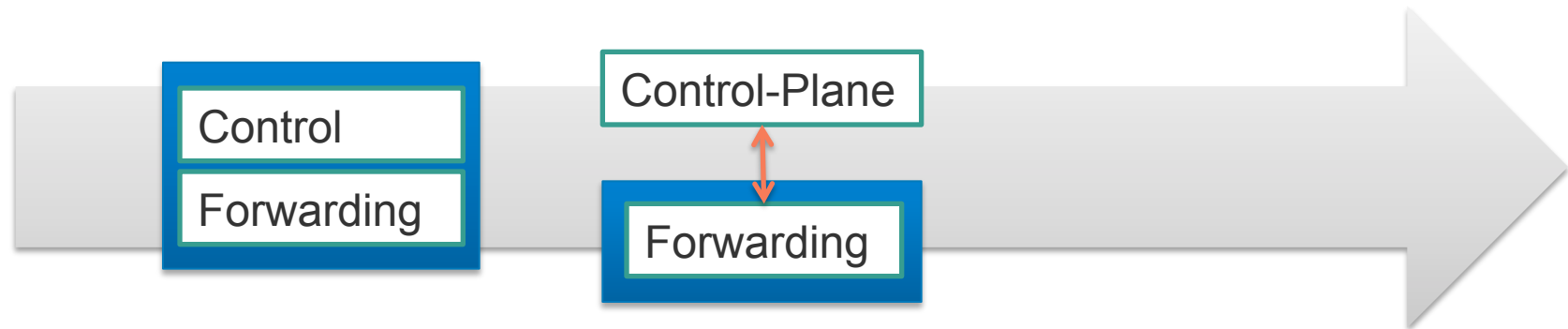
Openflow is a protocol and API, not a product or single feature

- Standardized interface between control and forwarding plane(s)
- Flow tables populated through OF used for forwarding packets
- Remote programming

OpenFlow is used to populate forwarding table

- Flow entries programmed through OF
- Switch performs lookups in flow table
- Forwarding table not stored in configuration file

OpenFlow does not configure, boot, or maintain a box



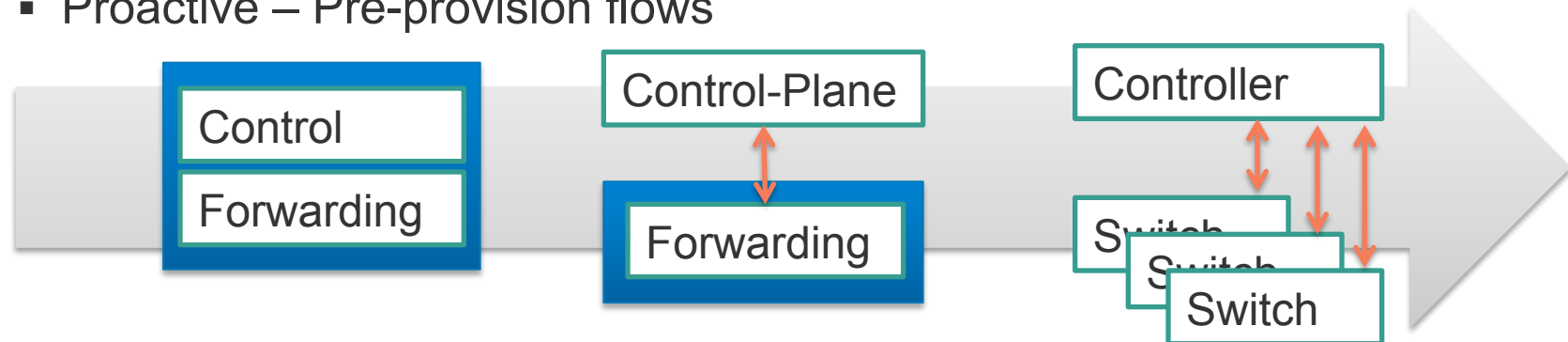
What is it (2)

Two roles

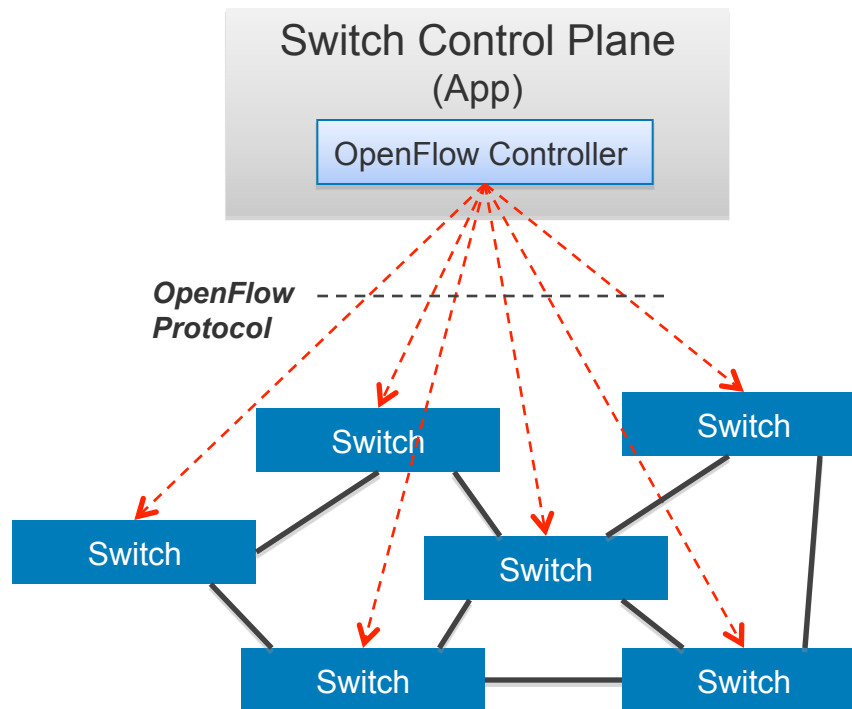
- OpenFlow controller
 - Controls one or more switches
 - Computes paths, maintains state, formulates flows, and pushes to OF Switch(es)
- OpenFlow Switch
 - Takes commands (flows) from OF controller; sends stats to it
 - Holds the FIB in volatile memory (not configured)

Two modes of operation

- Reactive - Data plane driven (“Packet-in”)
- Proactive – Pre-provision flows



OpenFlow Switch/Network Design



Switch Control Plane:

- Logically centralized
- Physically distributed in one or more server clusters
- Embedded OF Controller
- This is where the intelligence / complexity resides
- Killer app – network virtualization

- Arbitrary topology of switches
- **Multi-vendor**
- OpenFlow packets can be of any format, incl. non-IP

Vendor-agnostic interfaces
for non-abstracted silicon
primitives...

Source: OpenFlow.org

Architectural Assumptions/ Cornerstones

- Controller has pt2pt with switch
 - Can control multiple clients
- No defined interaction between clients
 - No “path transaction”
- No inband communication between clients
 - All communication from client <-> controller
- Single producer model per “virtual port”
 - Single controller produces forwarding state on a virtual port

Standardization

Standards creation

- Driven by users and user needs
- Developed by those close to implementation/
deployment
- Rapid real-world experience – plan to iterate specs
via implementation experience
- Standardize as little as necessary, more and more like
a software community
- No names on drafts
- WG chair (single) determines functionality defined
(scope), progression of doc (1.x, 1.y), review by
group, adoption of council of chairs, ratified by board

Governance

Board of Directors

Users, not vendors

Executive Director

Reports to the Board

ONF employee

Vendor neutral

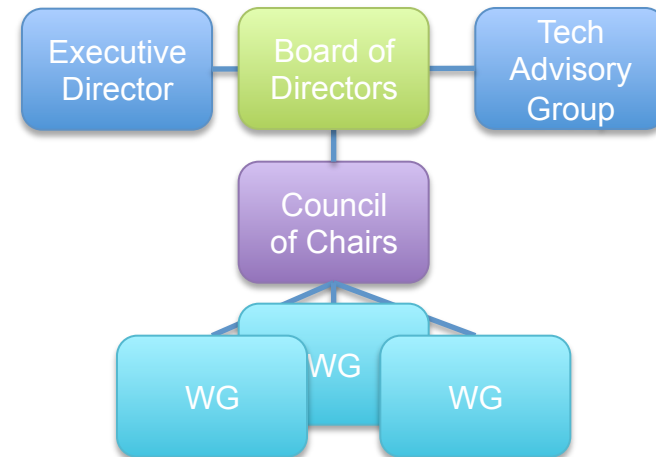
Technical Advisory Group

Reports to the Board

Advises on fundamental technical issues

Makes recommendations, not decisions

“CTO – like” function at the whim of the board



Governance.2

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

Standardization progression for OpenFlow protocol

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...

Chartered WGs

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

PROPOSED (soon, call for Chair volunteers): **Hybrid Programmable Forwarding Plane** (2011.12)

Open Discussions

Hybrid Programmable Forwarding Plane

- Resource sharing among conventional/OpenFlow parts of hybrid switch; shipping lanes

Match-Action-Table

- Eventual home of IPv4, IPv6 field-based rules
- Modularization of protocol, Forwarding Description Language

Northbound API/SDN abstractions

Object & service models, virtualization, characterization, interaction

SDN abstractions above OF not very appropriate for *de jure* standardization

Use-Case discussion

Applicable deployment examples, functional descriptions, network/operational architectures of SDN

Industry Education/Marketing

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

- Industry common Use-cases

How SDOs can interact

- Cross publish use-cases
- Refrain from prematurely staking turf
- Point of interaction appears to be at definition of OF and HPFP
 - Cross post written into charter
- Common naming/nomenclature/TLAs
- Common goal of reusing technology where possible
- Cross posting email lists

ONF Conclusion

ONF now the home of OpenFlow

Take OpenFlow 1.2 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