

STRATUM

Overview and Update

Brian O'Connor

ONF Connect (NG-SDN Track)

9/11/2019



Outline

- Stratum Basics
 - APIs and Architecture
- Open Source Launch
 - Supported platforms
 - What to expect
 - Quick tour of available resources
 - How to find more
- What's next? (project roadmap)
- Setting the stage for the rest of the sessions
- Stratum Community
 - Companies
 - Individual recognition

Agenda

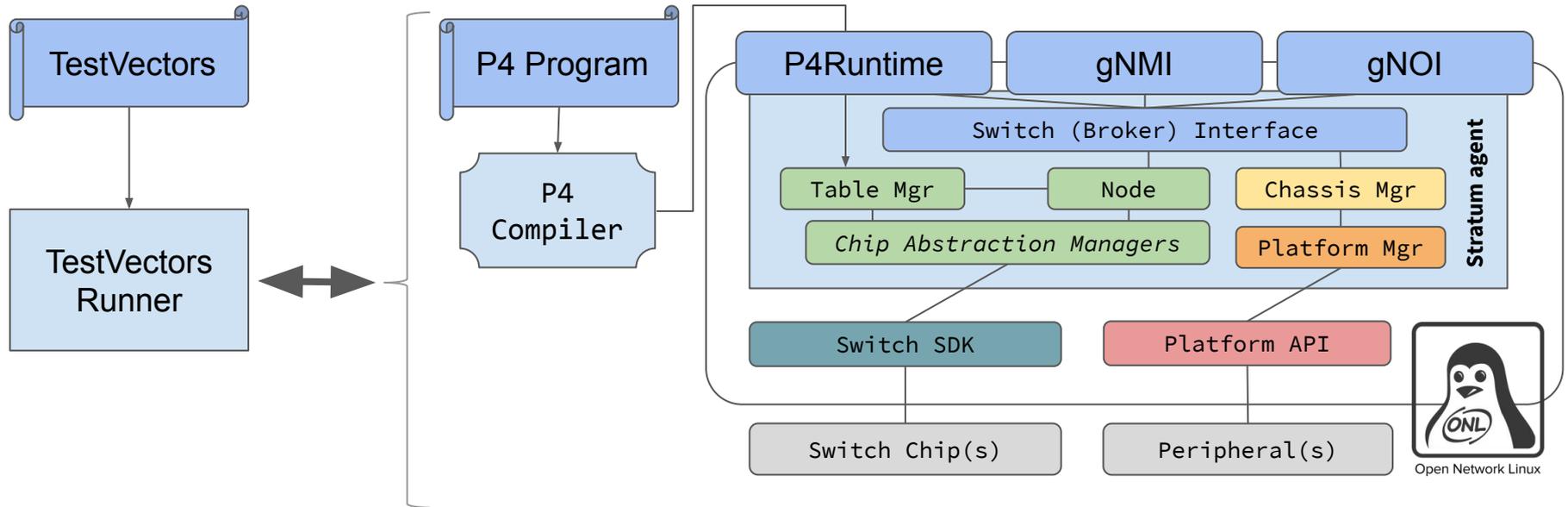


- Stratum Basics
- Open Source Launch
- What's Next?
- Preview of Stratum @ ONF Connect '19
- Stratum Community

What is Stratum?



Open source, production targeted, thin switch OS that implements NG-SDN interfaces and models



API Overview



Why Stratum?



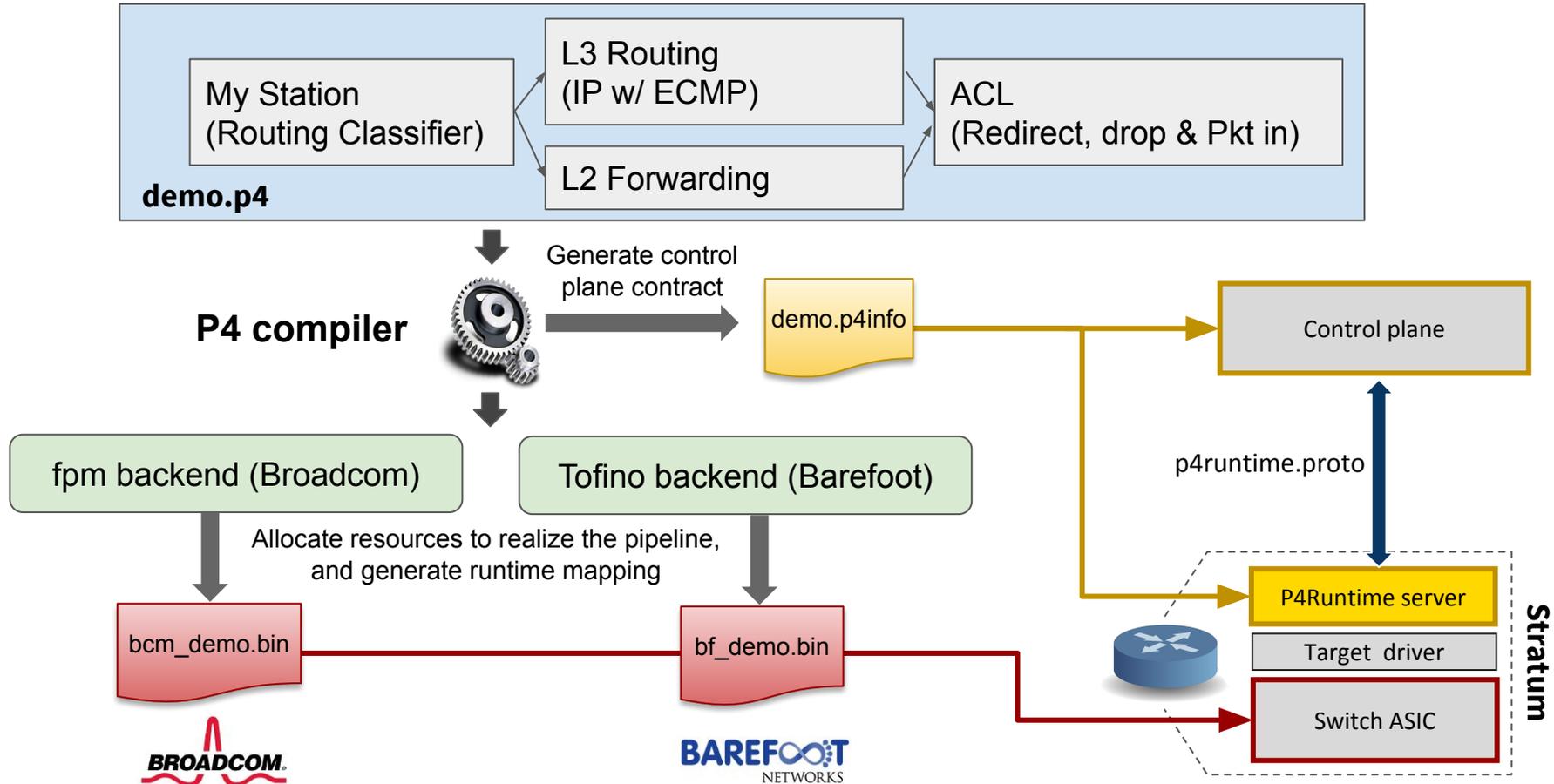
Stratum's SDN-ready Interfaces

Built from today's SDNs & Optimized for NG-SDN

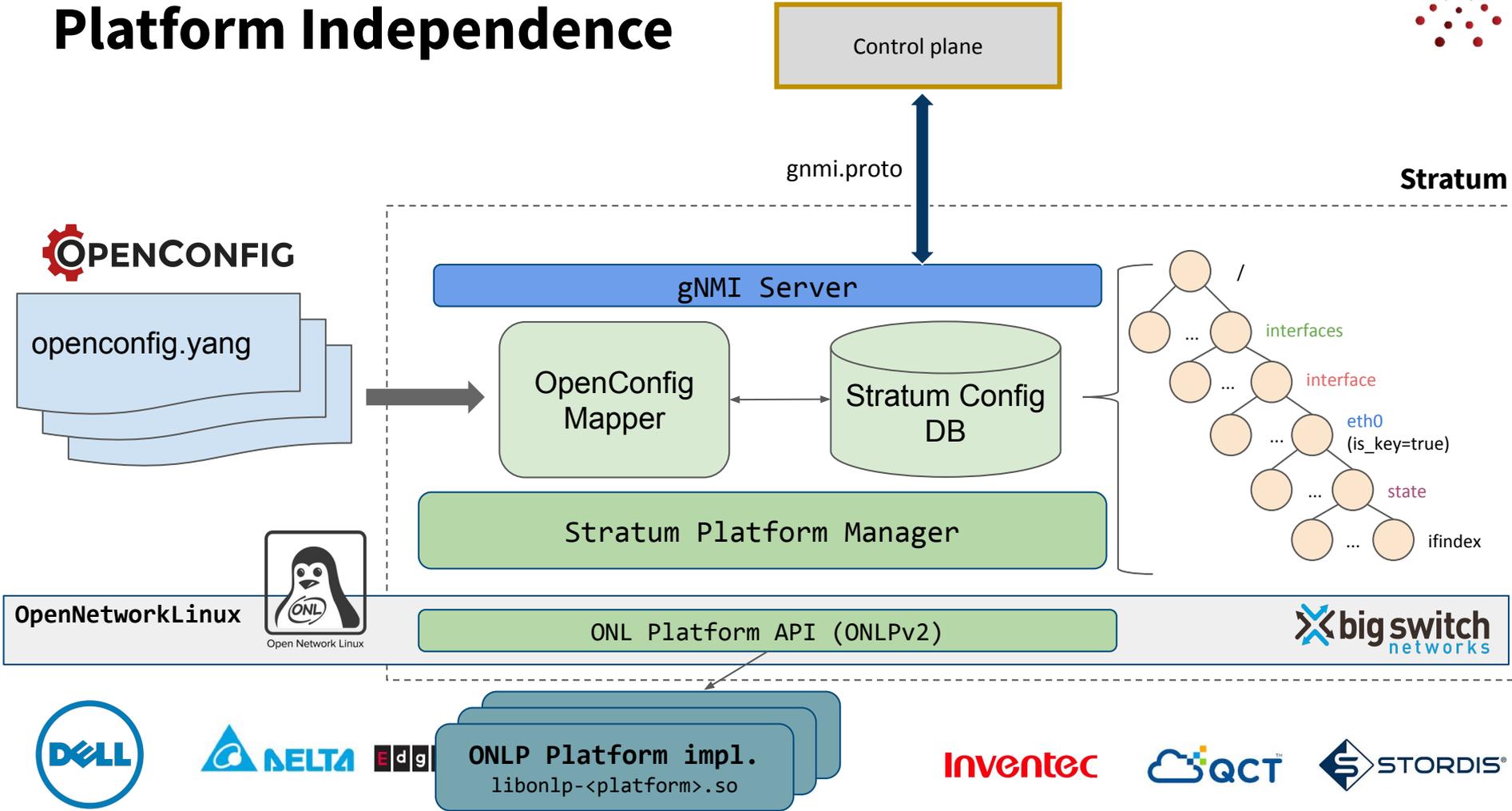
Value Proposition:

1. Hardware Independence / Vendor Optionality
2. Automated Full-Lifecycle Operation
3. Zero-Touch Provisioning
4. Data Plane Programmability and Agility

Top-Down Data Plane Programmability



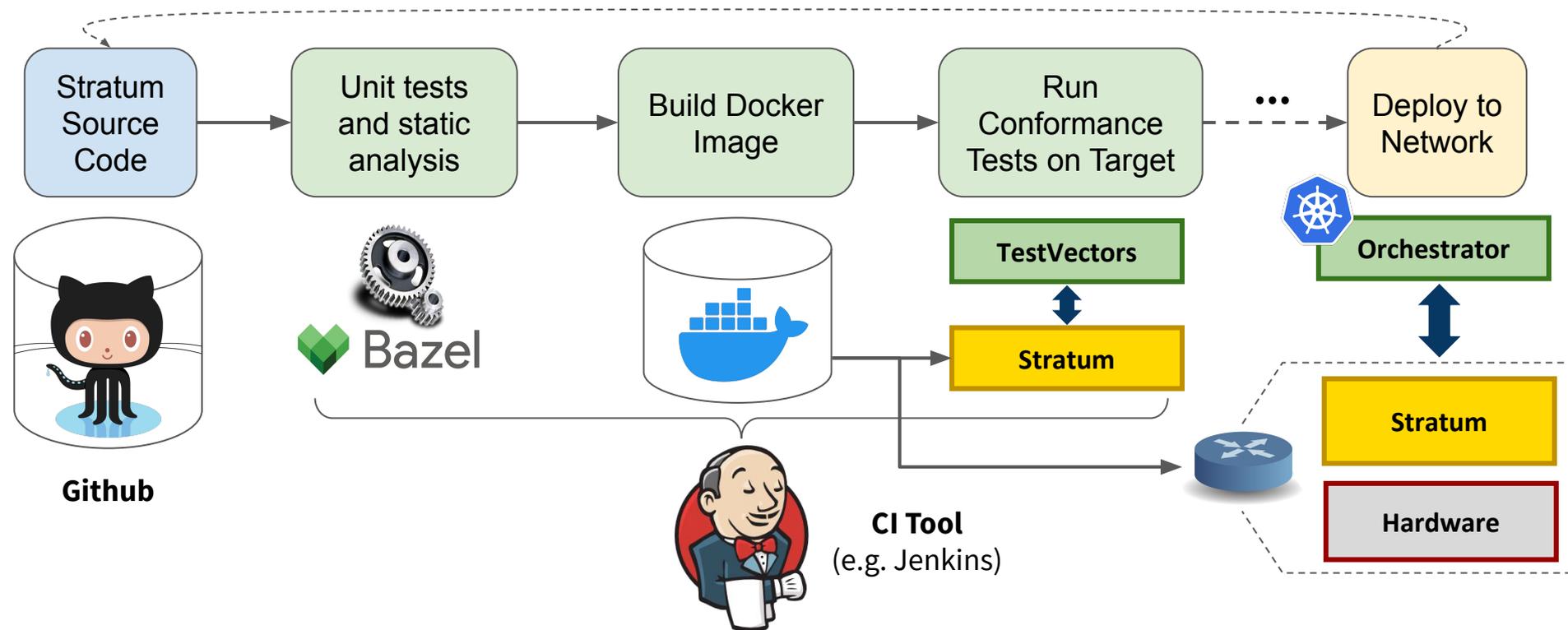
Platform Independence



Supporting Cloud-Style Agility



- Stratum deployment and testing framework enable best practices in CI/CD
- Telemetry and end-to-end verification allow for failure detection and rollback



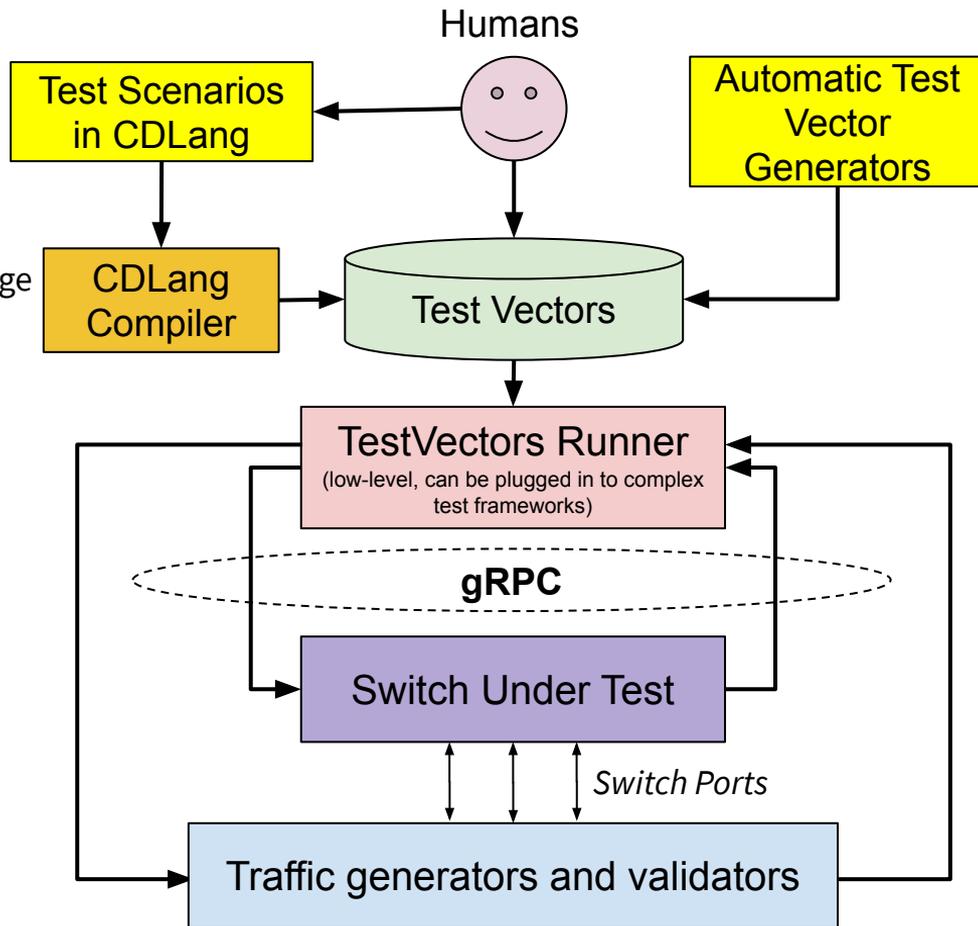
Testing Stratum Devices



Test Vectors serve as **compliance tests** for Stratum-based devices

They can be written **manually** or **generated automatically**

- Stratum comes with a Contract Definition language (cdlang) for generating test vectors



Test Vector

Test Case

Stimulus 1	➔	Expectation 1
Stimulus 2		Expectation 2
...		...

TestVectors Runner is a data-driven framework that enables users to execute TestVectors

- Reference impl. in **golang**; supports **P4RT/gNMI**



Stratum Open Source Launch

Stratum Approved for Open Source



<https://github.com/stratum/stratum>

Why GitHub? Enterprise Explore Marketplace Pricing Search Sign in Sign up

stratum / stratum Watch 1 Star 0 Fork 0

Code Issues 0 Pull requests 0 Projects 0 Security Insights

Branch: master stratum / README.md Find file Copy path

bocon13 Adding Stratum logo to README 01b30ff 1 minute ago

1 contributor

13 lines (7 sloc) 850 Bytes Raw Blame History


STRATUM

Stratum - Enabling the era of next-generation SDN

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Stratum is an open source silicon-independent switch operating system for software defined networks. It is building an open, minimal production-ready distribution for white box switches. Stratum exposes a set of next-generation SDN interfaces including P4Runtime and OpenConfig, enabling interchangeability of forwarding devices and programmability of forwarding behaviors. Current support includes Barefoot Tofino and Broadcom Tomahawk devices, as well as the bmv2 software switch.

Getting Started in 30 Seconds



```
bocon — docker run --privileged --rm -it -p 50001:50001 opennetworking/mn-stratum — 82x25
$ docker run --privileged --rm -it -p 50001:50001 opennetworking/mn-stratum
Unable to find image 'opennetworking/mn-stratum:latest' locally
latest: Pulling from opennetworking/mn-stratum
ebdf14d578b0: Downloading  19.81MB/22.09MB
59da2e604484: Downloading  17.97MB/18.6MB
cc14e4385158: Download complete
e7ad9e1c80e0: Download complete
376b9b1017b2: Download complete
c668bd238665: Download complete
```

Getting Started in 30 Seconds



```
bocon — docker run --privileged --rm -it -p 50001:50001 opennetworking/mn-stratum — 82x25
59da2e604484: Pull complete
cc14e4385158: Pull complete
e7ad9e1c80e0: Pull complete
376b9b1017b2: Pull complete
c668bd238665: Pull complete
Digest: sha256:22d3a45b8da176c1d1eab80c6917d31703763bbe7695d85a242e53e97ffe50d5
Status: Downloaded newer image for opennetworking/mn-stratum:latest
*** Error setting resource limits. Mininet's performance may be affected.
*** Creating network
*** Adding controller
*** Adding hosts:
h1 h2
*** Adding switches:
s1
*** Adding links:
(h1, s1) (h2, s1)
*** Configuring hosts
h1 h2
*** Starting controller
*** Starting 1 switches
s1 ⚡ stratum_bmv2 @ 50001
*** Starting CLI:
mininet> █
```



For a basic tutorial, visit <https://github.com/stratum/tutorial>

Works on hardware switches, too!

- Canonical port for NG-SDN gRPC interfaces is 28000
- Need to mount /dev, /sys, and ONLP libraries into the container



What to Expect

Open Source Launch is an Alpha Release

- Software Architecture is in place
- Support for fixed-function and programmable targets
- Some features not yet implemented

What can I do with Stratum today?

- Demos (ONF has done several over the past year)
- User Experimentation; Porting to New Platforms

Stratum can now be incorporated into vendors' products

Stratum Switch Support Today



Switch Vendor						
Switching ASIC						
 Tofino Up to 6.5 Tbps		AG9064v1 64 x 100 Gbps	Wedge100BF-32X 32 x 100 Gbps Wedge100BF-65X 65 x 100 Gbps	D5054 6 x 100 Gbps + 48 x 25 Gbps		BF6064X 64 x 100 Gbps
 Tomahawk Up to 3.2 Tbps	Z9100 32 x 100 Gbps		AS7712 32 x 100 Gbps	D7032 32 x 100 Gbps	T7032-IX1 32 x 100 Gbps	

+ 2 software switches: **bmw2** (functional software switch) & **dummy switch** (used for API testing)

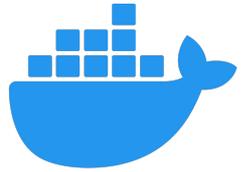
Near-term future platforms:

- Additional platforms for existing targets
 - Existing vendors + Asterfusion, ...
- Mellanox SN2700 (Spectrum)
- Datacom platforms (PowerPC-based)



DATACOM

Downloading Stratum



Stratum bmv2 switch + Mininet Docker Image:

```
docker pull opennetworking/mn-stratum
```

<https://cloud.docker.com/u/opennetworking/repository/docker/opennetworking/mn-stratum>

Barefoot Tofino Docker Image:

```
stratumproject/stratum-bf:8.9.1-4.14.49-OpenNetworkLinux
```

<https://cloud.docker.com/u/opennetworking/repository/docker/opennetworking/mn-stratum>

or

Broadcom Tomahawk Docker Image: *coming soon*



ONL OS Image: *pre-built, ONIE installable image coming soon*

Source code: <https://github.com/opennetworkinglab/OpenNetworkLinux>

Based on ONLPv2



Open Network Linux



How to Contribute

- Get started with the basic tutorial
<https://github.com/stratum/tutorial>
- Stratum uses Github for source management, issue tracking and pull requests
 - *File bugs, request features, and submit patches on Github*
- Join the Stratum Announcement mailing list
<https://lists.stratumproject.org/listinfo/stratum-announce>
(We will provide more details on joining developer lists and Slack soon)
- Attend a Stratum Technical Steering Team call
(Currently, alternating between Wednesday 4:30pm & Thursday 10am Pacific)



What's Next for Stratum?

Stratum Roadmap



1. Pushing Stratum towards production
 - Work towards feature parity with ONF's Trellis and SEBA
 - Additional core features for Telco stacks
(support for MPLS, VLAN, security, QoS, etc.)
2. Additional switch chip & platform support
3. Formalizing and publishing a compliance test framework
 - Work to gain broader consensus on TestVectors approach
 - Increase repo of test cases; build tools to make test generation easier
4. Beyond packet switches
 - Stratum for Packet Transponders (*see Leonid's talk at 5pm today*)
 - Stratum for Smart NICs
 - Stratum on a production-quality software switch

Stratum Roadmap



1. Pushing Stratum towards production

- Work towards feature parity with ONF's Trellis and SEBA

-

The roadmap is defined by the community!

If you have ideas or want to push Stratum in a new direction, give a presentation at one of the Stratum Technical Steering calls.

2. Ac

3. Fo

-

-

4. Beyond packet switches

- Stratum for Packet Transponders (*see Leonid's talk at 5pm today*)
- Stratum for Smart NICs
- Stratum on a production quality software switch

easier



Stratum @ ONF Connect '19

NG-SDN Track Preview



Stratum Ecosystem and Use Cases
Wednesday & Thursday,
4:30pm - 6pm

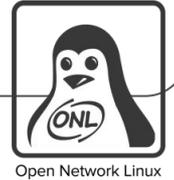
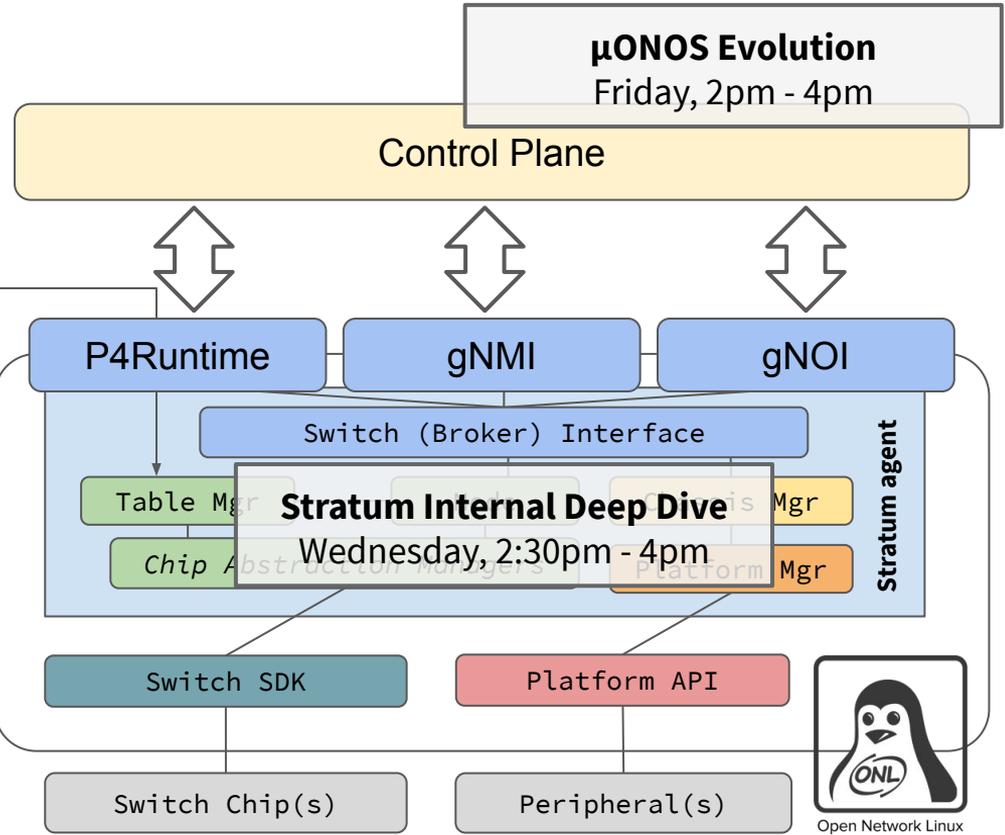
TestVectors

Testing and Qualifying Stratum Devices
Thursday, 2pm - 4pm

TestVectors Runner

P4 Program

P4 Compiler



Open Network Linux

Demos @ ONF Connect '19



1. Stratum Interoperability

- Community Launch Demo with multiple ASIC and platform vendors
- **8 Stratum switches** in an IP routed, leaf-spine fabric
- Highlighting **hardware independence** and **automatic full-lifecycle operation**

2. μONOS

- **3 Stratum switches**
- Highlighting **zero-touch provisioning** and device configuration

3. SEBA

- **1 Stratum switch**
- Highlighting **top-down data plane programmability** (offloading the BNG)

Stratum Interoperability Demo

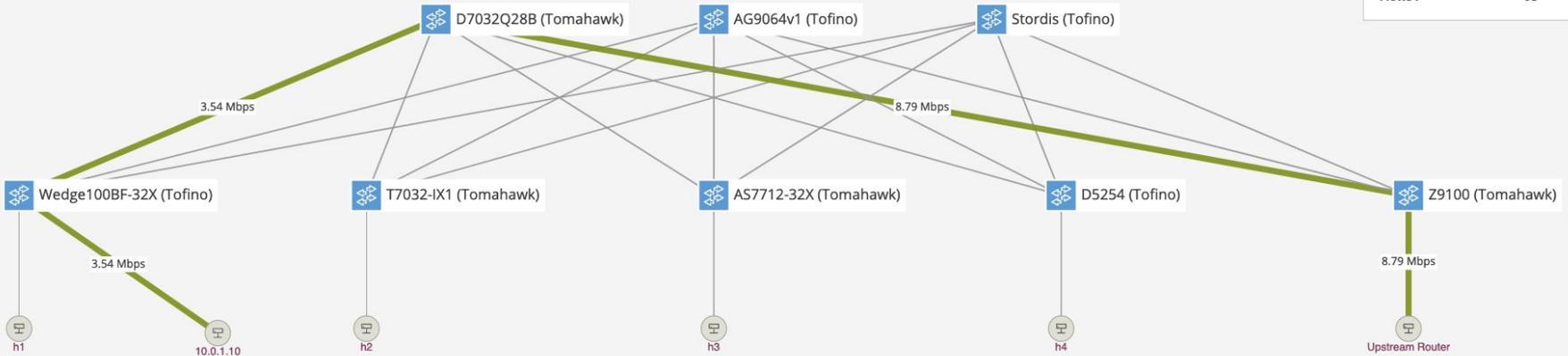


127.0.0.1
127.0.0.1
Devices: 8

IPv4 Leaf-Spine Fabric with ECMP L2 Bridging on the host Connectivity to upstream router

ONOS Summary

Version :	2.2.0
Devices :	8
Links :	30
Hosts :	6
Topology SCCs :	1
Intents :	0
Flows :	95



Stratum @ ONF Connect '19



Tutorial: <https://github.com/opennetworkinglab/ngsdn-tutorial>

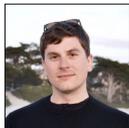
Next-Gen SDN Keynote on Thursday @ 11am



ONF Connect 2019
Next-Gen SDN Tutorial



Brian O'Connor
ONF



Carmelo Cascone
ONF

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Overview: Next-Gen SDN Stack



Nate Foster
Associate Professor
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Cornell University



Timon Sloane
VP, Marketing &
Ecosystem, ONF



Brian O'Connor
MTS, ONF



Thomas Vachuska
Chief ONOS Architect, ONF



Stratum Community

Stratum Community



Pioneer Phase
Mar. '18

Member Preview Phase
Mar. '19

Sept. '19

Logos of members in the Pioneer Phase (Mar. '18) and Member Preview Phase (Mar. '19):

- Pioneer Phase (Mar. '18):** Dell, KPN, Noviflow, OSI (One Source Integrations), PLVISION (Connectivity of Tomorrow), Juniper Networks, Ciena, Inventec, BISDN, Extreme (Connect Beyond the Network), Datacom, Cisco.
- Member Preview Phase (Mar. '19):** Stordis, Asterfusion, Intel.

Launch Members (March 2018)

Logos of Launch Members (March 2018):

- Barefoot Networks, Big Switch Networks, Broadcom, Cavium, China Unicom (中国联通), Delta
- Edge-Core Networks, Google, Mellanox Technologies, NTT, ONF (Open Networking Foundation), Open vSwitch
- QCT, Ruijie Networks, Tencent (腾讯), Türk Telekom, VMware, Xilinx

Open Source

Stratum Contributors



Thanks to everyone who has contributed code to the project!

Alex Yashchuk, PLVision
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Brian O'Connor, ONF
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Rajesh Pandey, Cisco
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Tom Everman, Google
Tomek Madejski, Google
Uyen Chau, ONF
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Yi Tseng, ONF
Zubin Shah, Cavium

... as well as Anonymous Contributors from Google and commit co-authors

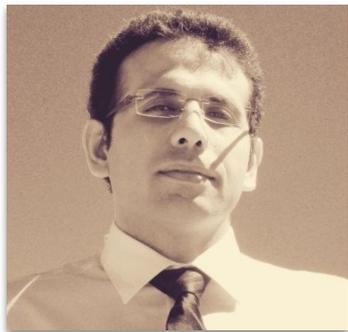
ONF's 2019 Contributor Award



Designed to recognize top ONF Community members who are:

- Top Code Contributors (or Code Removers)
- Top Reviewers and Mentors
- Top Ambassadors or Advocates
- Contributors of Significant Components of a system
- Consistently "chopping wood and carrying water" (helping everyone be more productive)

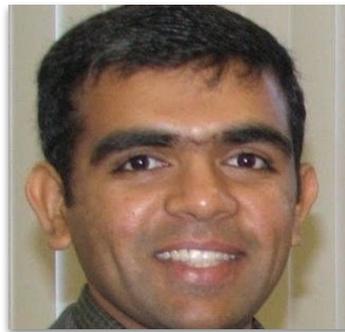
For outstanding contributions to Stratum



Alireza Ghaffarkhah
Google



Antonin Bas
Barefoot Networks



Devjit Gopalpur
Google



Yi Tseng
ONF