

# Enabling the Next Generation of SDN

Brian O'Connor (ONF)

brian@opennetworking.org

P4 Workshop on June 5, 2018

*Link to slides:*

<https://goo.gl/6HFG1h>

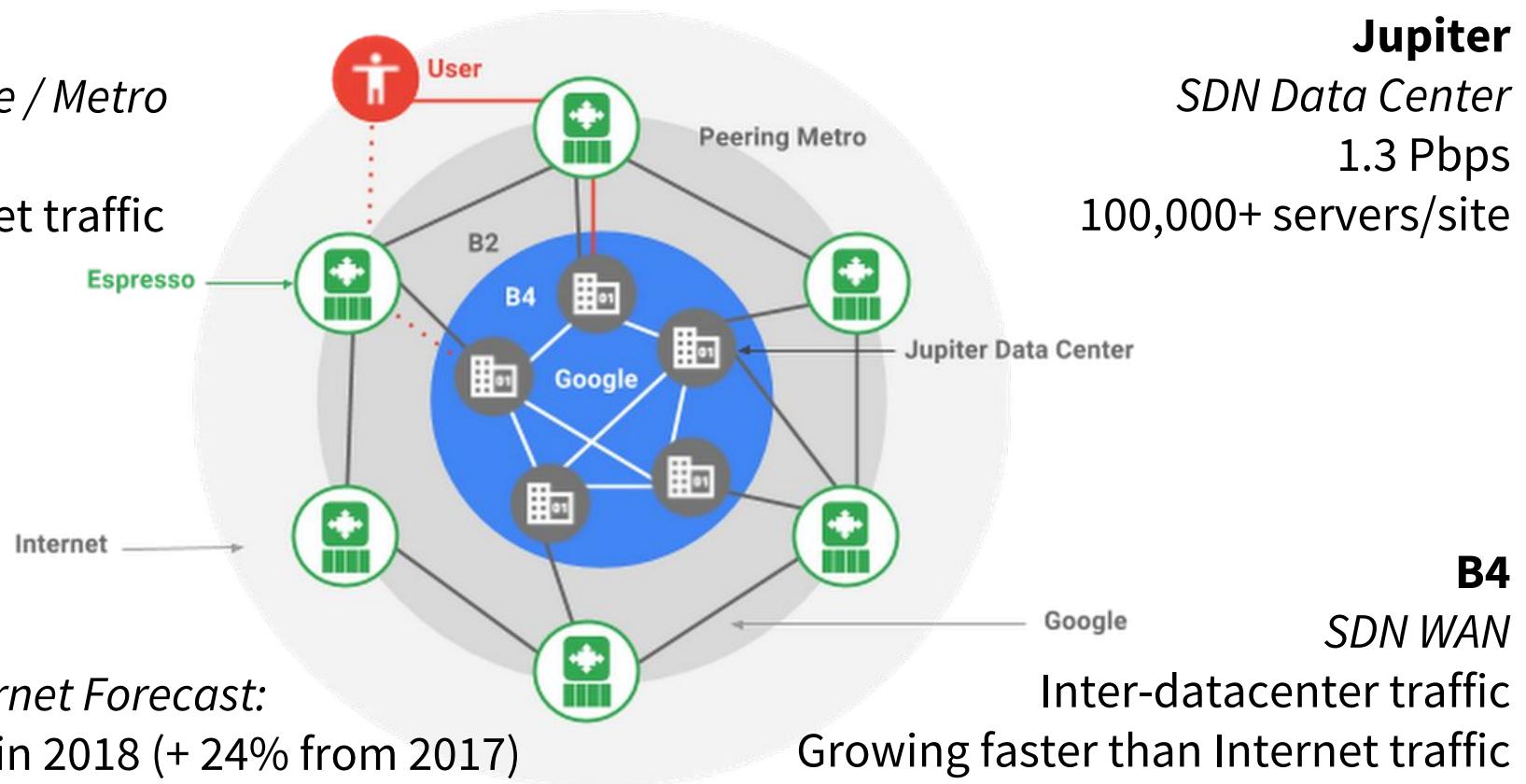


# Background

*Google runs SDN networks at scale*

## Espresso

*SDN Peering Edge / Metro*  
70 metro sites  
25% of all Internet traffic



## Jupiter

*SDN Data Center*  
1.3 Pbps  
100,000+ servers/site

## Cisco Global Internet Forecast:

~150 EB/month in 2018 (+ 24% from 2017)

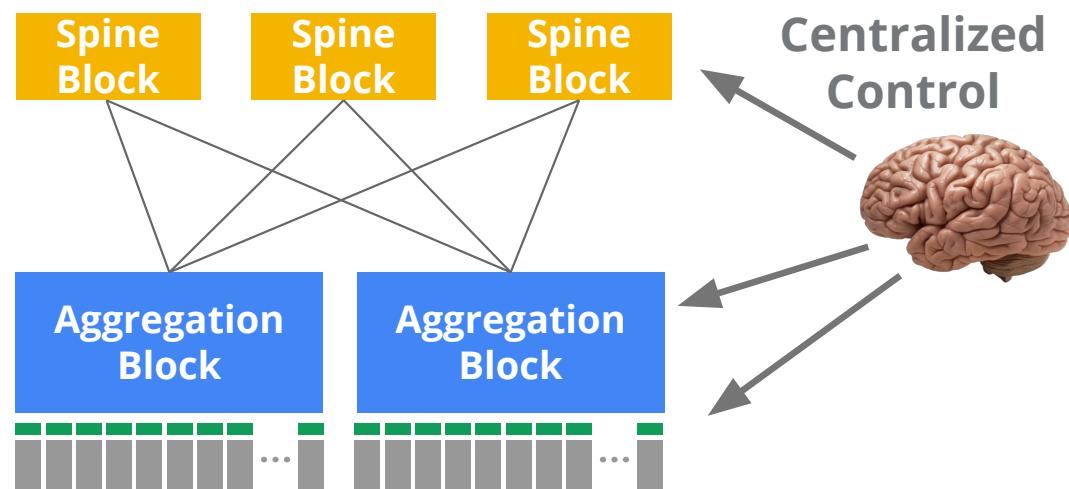
## B4

*SDN WAN*  
Inter-datacenter traffic  
Growing faster than Internet traffic

# SDN Requirements

- Highly scalable
- Highly automated
- High performance interfaces
- Custom config & management
- OpenFlow extensions / tweaks
- Needs directly drive design

Jupiter (1.3P)





# The Ugly Side of Networking

- Lack of portability
- Protocols becoming more complex
- Protocols provide limited control
- Proprietary extensions
- Proprietary management
- Locked into custom hardware
  - Can't buy and use 3rd party systems
  - Unable to leverage vendors
- Slow cycles for innovation



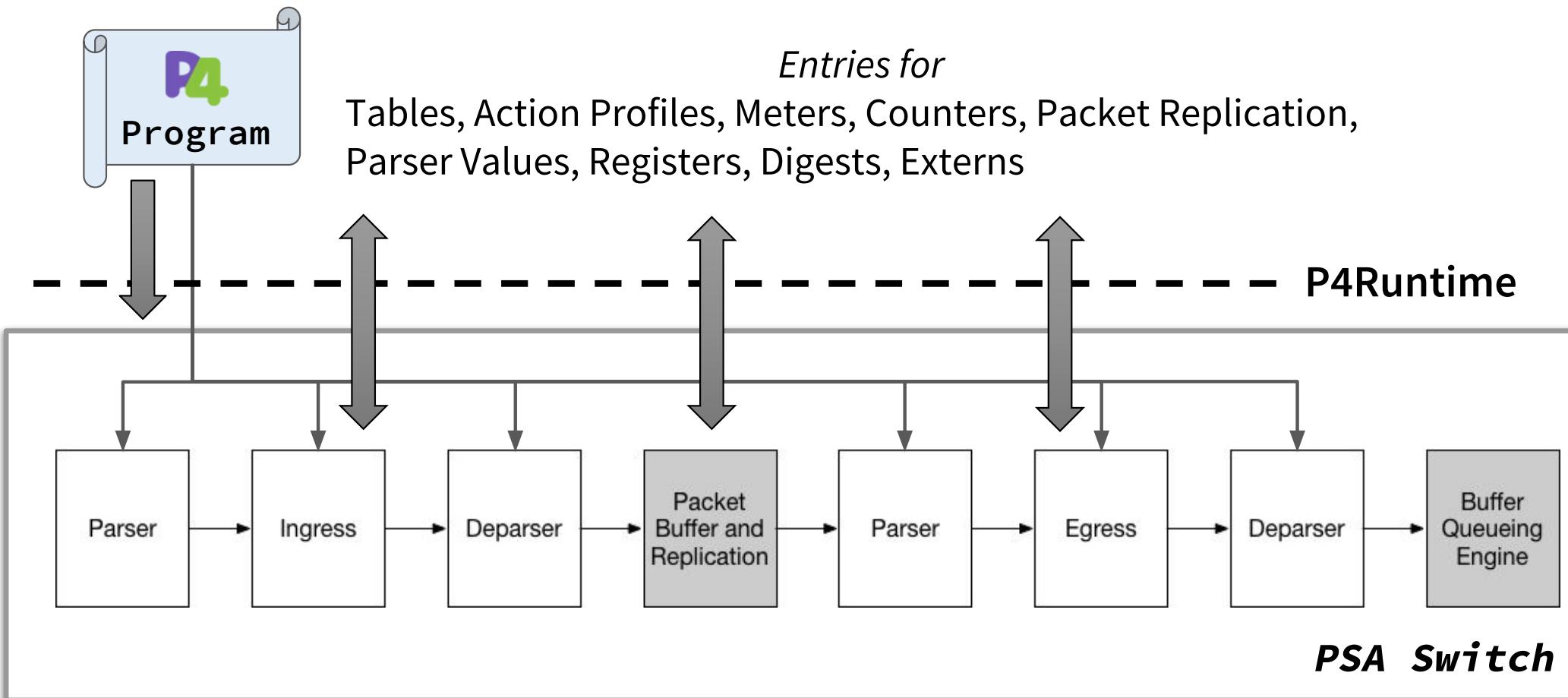
# Wanted



- New control interface with
  - Abstraction for different silicon
  - Well defined interfaces and behavior
  - Extensibility
- Common models for configuration and monitoring
- Common interfaces for operations
  - Testing, Debugging, Cert. Management, Software upgrade
- Common platform abstraction (e.g. OCP's ONLP)
- Open source switch stack



# Control Interface: P4Runtime





# P4 and P4Runtime are great, but ...

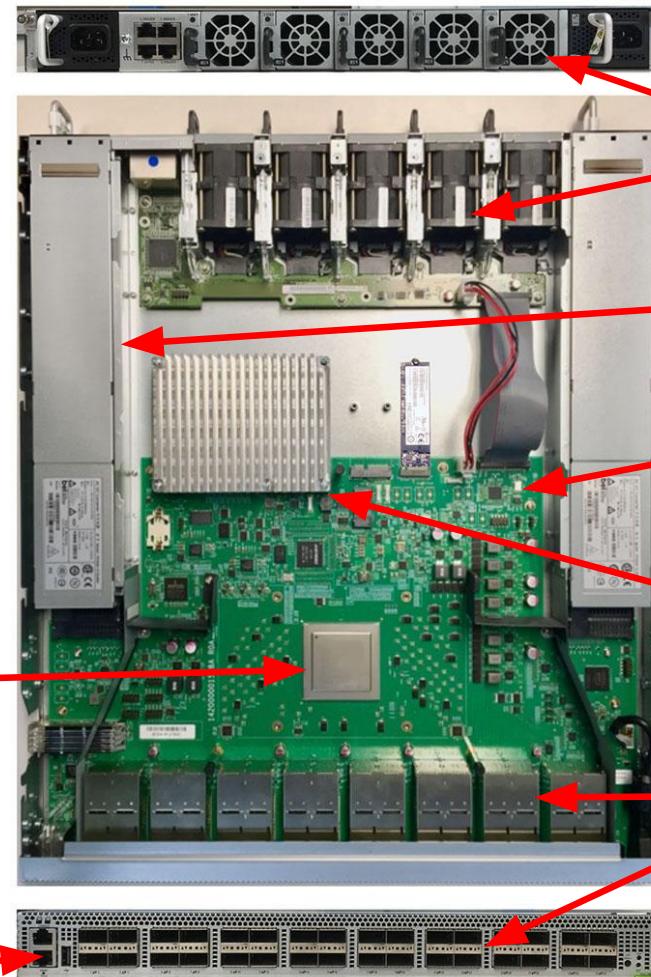
## Still Missing:

- Configuration
- Monitoring
- Operations

**OpenConfig, gNMI,**  
and **gNOI** are here to  
help!

**Switch Chip Configuration**  
QoS Queues and Scheduling  
Serialization / Deserialization  
Port Channelization

**Management Network**



**Fan Speed**

**Power supplies**

**Monitor Sensors**  
e.g. temperature

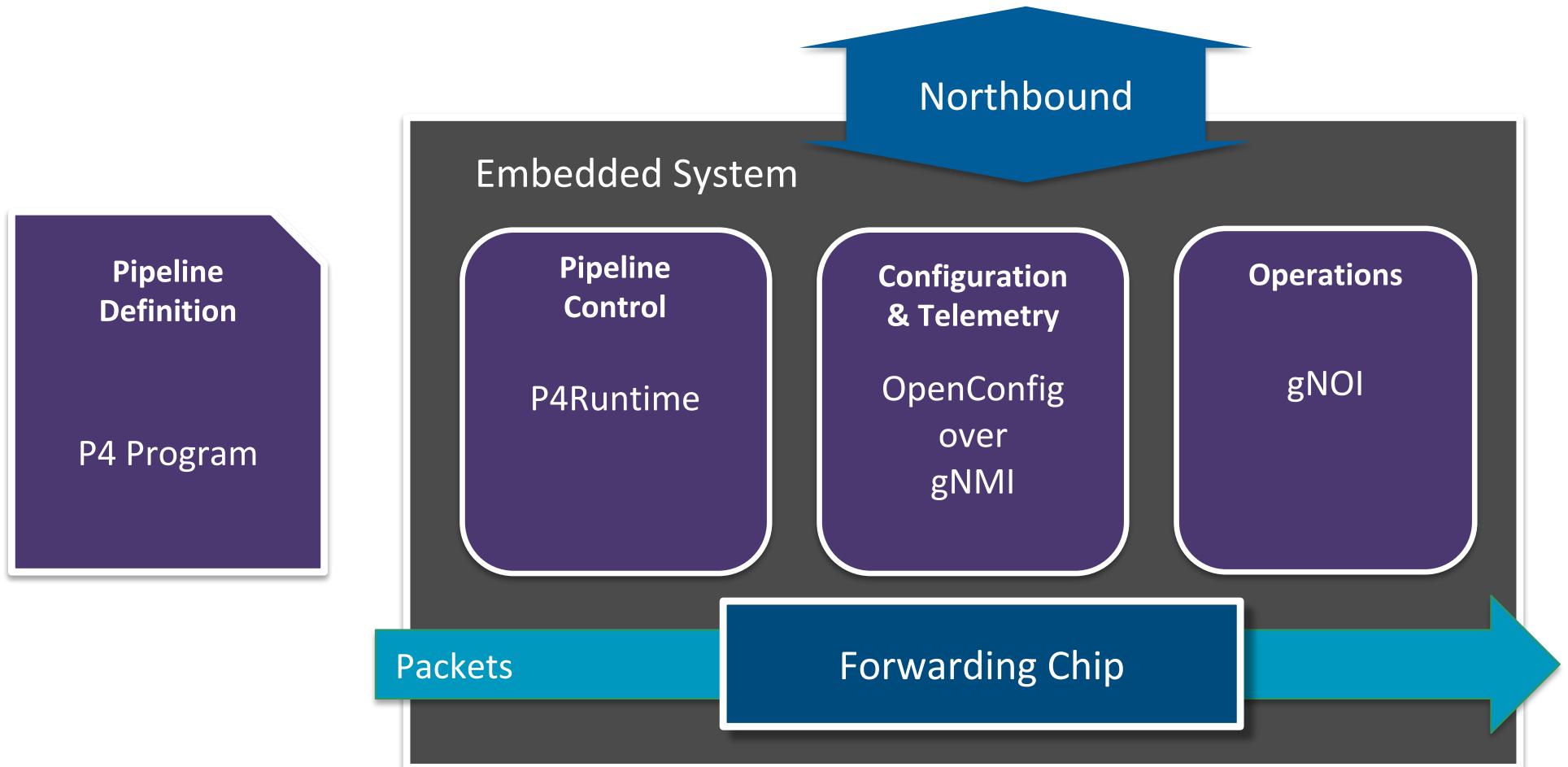
**Software Deployment and  
Upgrade**

**Port State and Mapping**  
LED Control

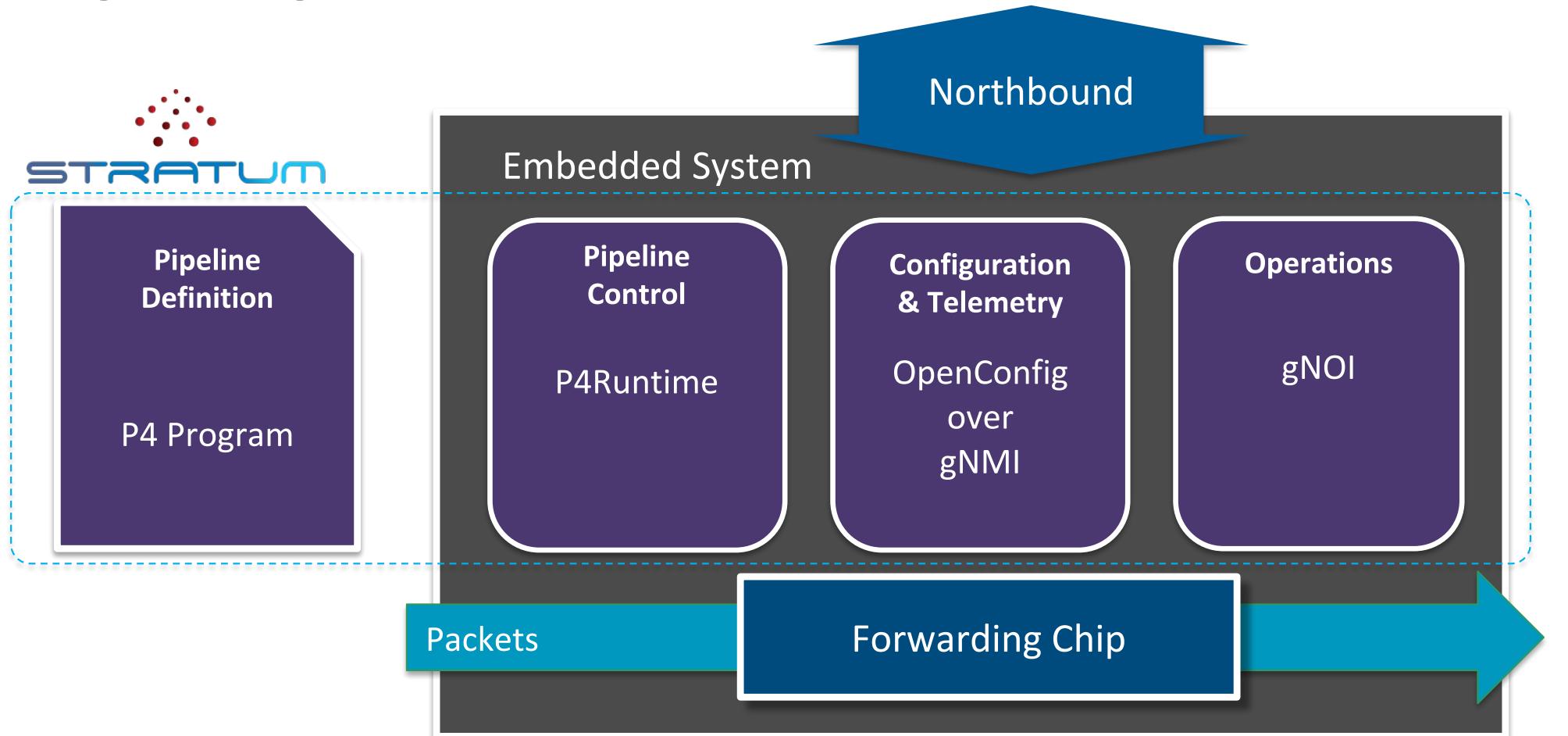
*... and the list goes on.*



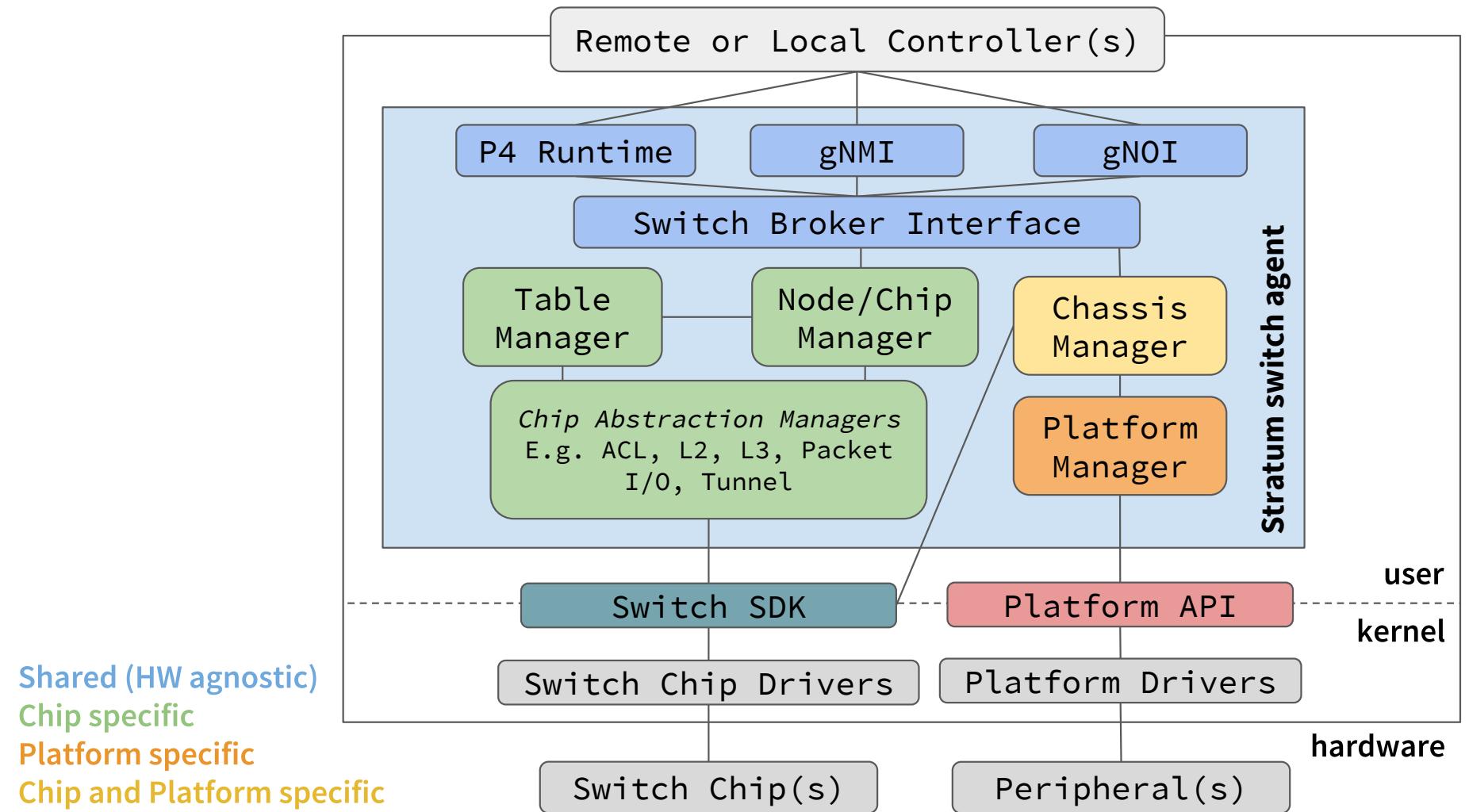
# Next Generation SDN Interfaces



# Lightweight and Production-ready Implementation



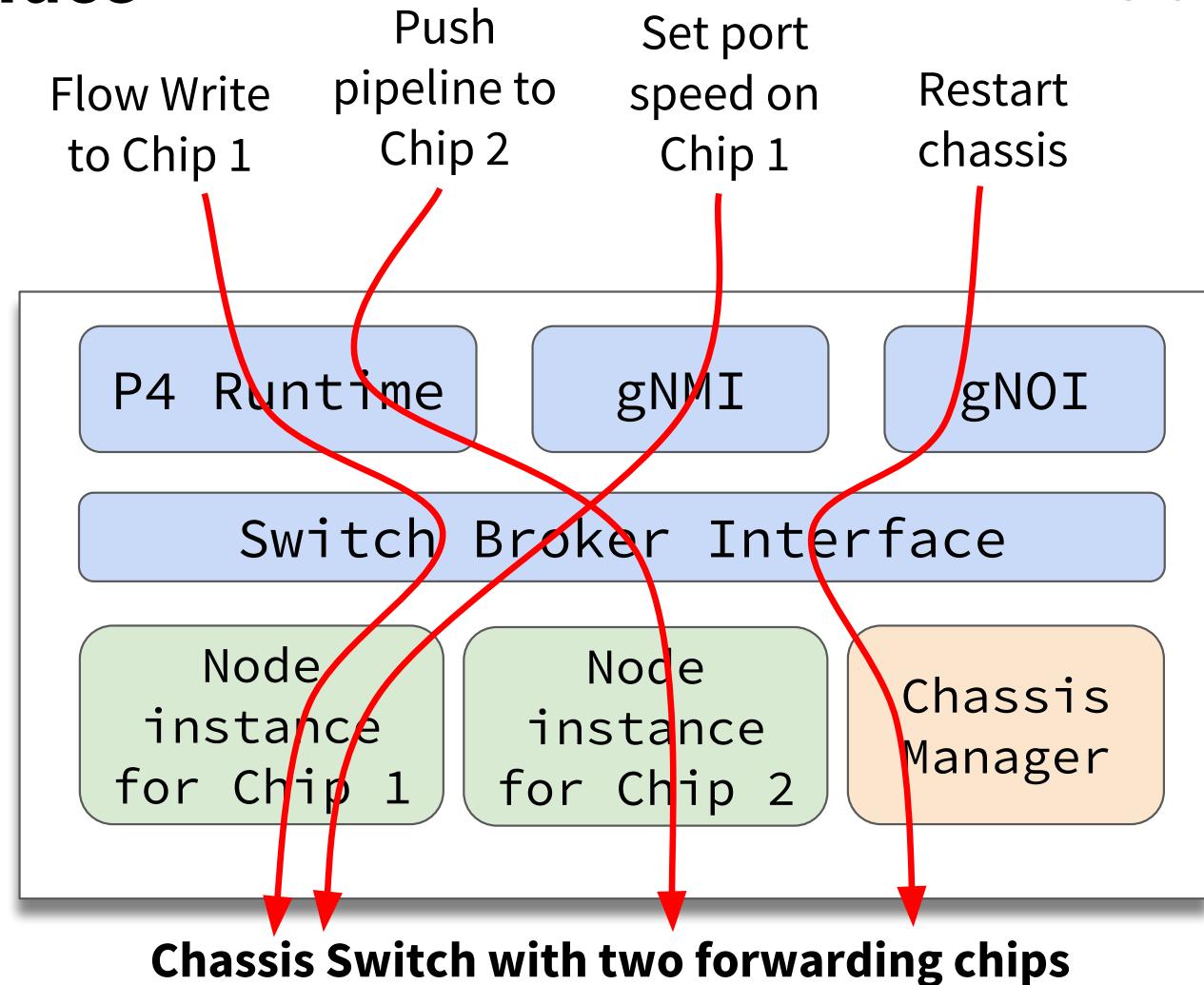
# Switch Agent Architectural Components





# Switch Broker Interface

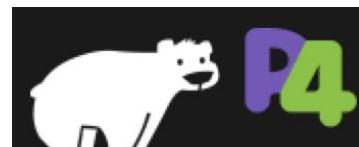
- This is NOT an abstraction like **SAI**
- Transparent broker interface between **P4Runtime / gNMI / gNOI** to vendor-specific managers





# Implementation Details

- Implements **P4Runtime**, **gNMI**, and **gNOI** services
- Controlled locally or remotely using **gRPC**
- Written in **C++11**
- Runs as a **Linux** process in user space
- Can be distributed with **ONL**
- Built using **Bazel**



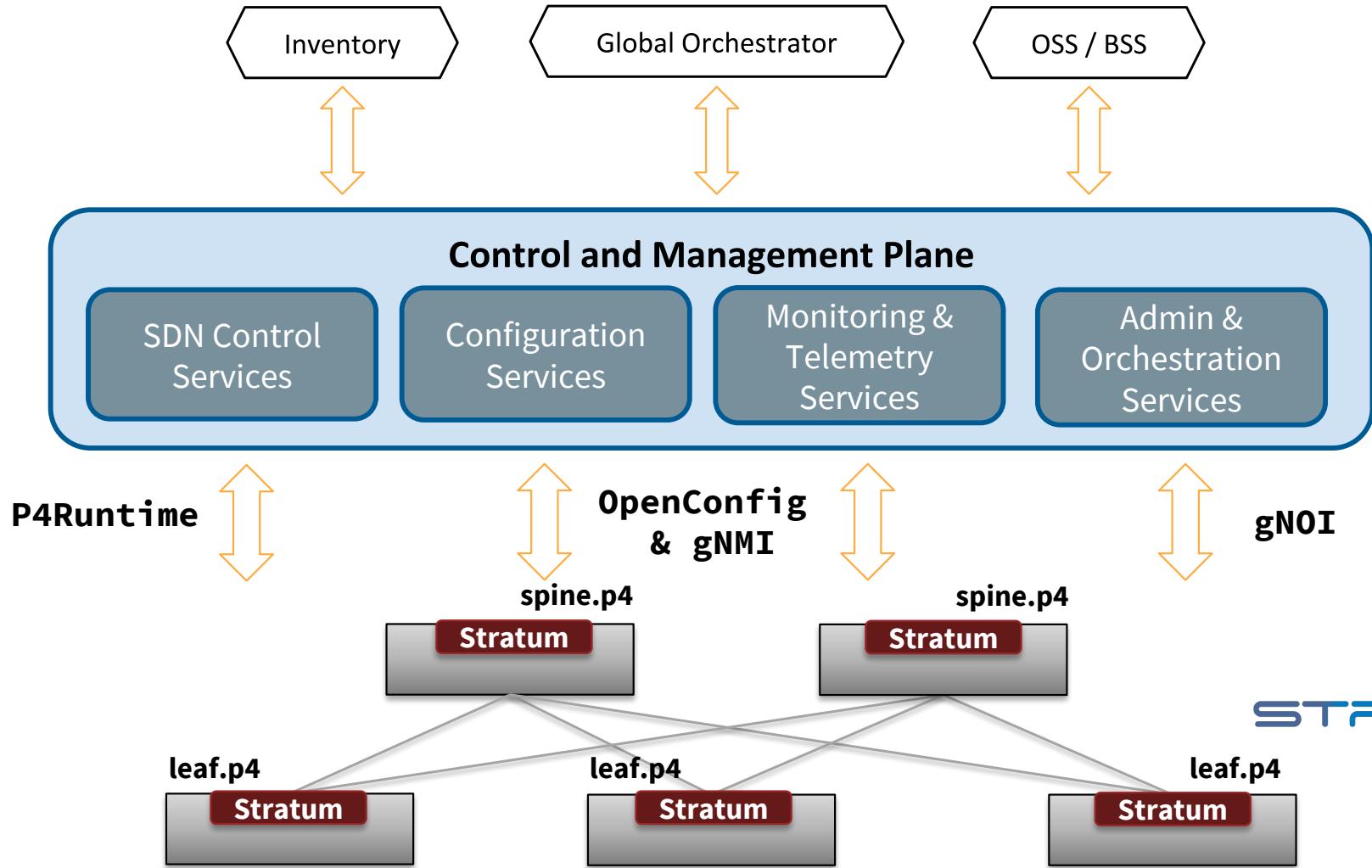
Open Network Linux



# Project Goals

1. Delivery of P4Runtime and Open Config interfaces
2. Implementation of these interfaces
  - Interfaces are defined by running open source code; this is not a standards exercise
3. Fully production ready distribution necessary to run and deploy these interfaces
4. Keep it minimal; this is perfect for some users
  - Users that need more functionality can use Stratum as a component that plugs into a larger or more complex system

# The Next Generation SDN picture



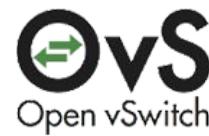


# Realizing Stratum's Vision

- Community
  - Deliver Stratum agent
  - Deliver a reference open source control plane
  - Deliver a tool chain (e.g. conformance test suite, debugging)
- Vendors
  - Add support for multiple switching chips and platforms
  - Develop network solutions that incorporate Stratum
- Service Providers
  - Use Stratum-based white boxes and API-compliant black boxes when available
  - Share P4 programs for relevant use cases
  - Define compliance test cases and qualification criteria

# Stratum Community

Google Tencent 腾讯



# Stratum Development Timeline



Q1 2018

Q2 2018

Q3 2018

Q4 2018

2019

**Stratum Community Launch**  
with 22 partners

**Seed code from Google**  
available to pioneering members



**Field Trials, Production Deployments**  
on cloud and telco networks

**Open Source Launch**  
with forwarding chip and  
platform support for every  
vendor member

## Pioneer work days

- Reference Platform Support (HW & SW)
- Development Infrastructure (Build, CI, etc.)

## Community Development

## Codebase GA for Stratum Members

- Expanded platform support
- Feature development
- Hackathons



# Getting Involved

## ***Contribute to the Interfaces***

P4Runtime, gNMI, gNOI, and the OpenConfig models are already open source

## ***Become a Stratum Member***

1. Have a contribution plan
2. Sign the required documents

*We are still accepting hardware vendors and users!*

## ***Join the Public Mailing List***

We will provide periodic updates on Stratum's progress.

## ***For more details:***

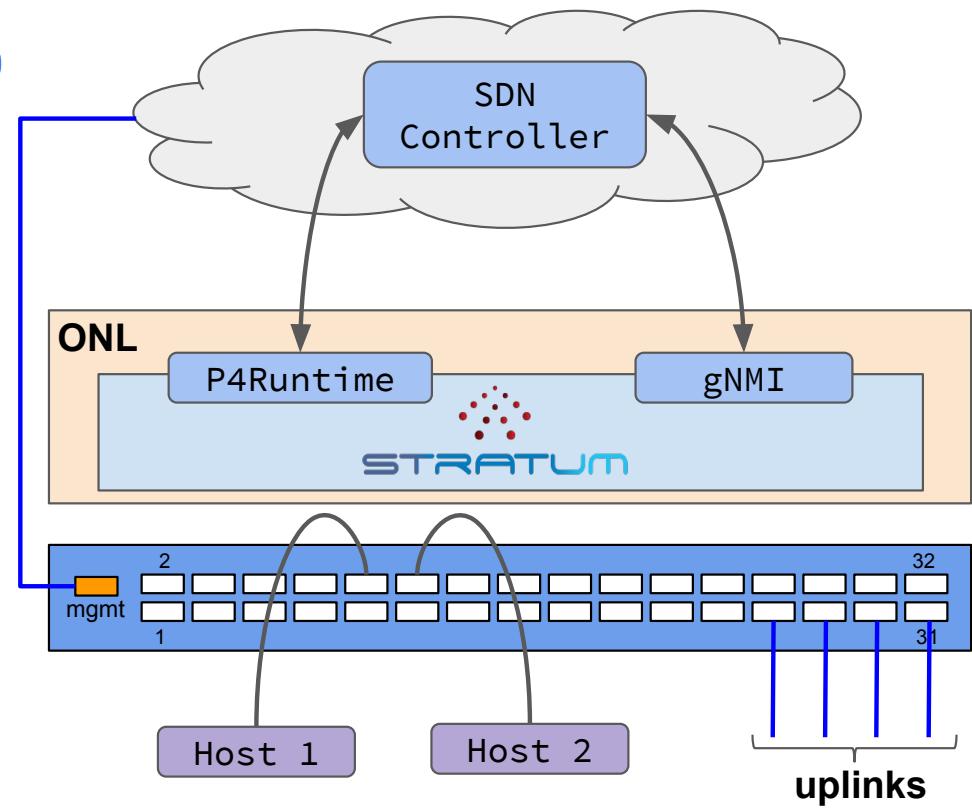
<https://wiki.opennetworking.org/display/COM/Stratum+Wiki+Home+Page>

<https://stratumproject.org/>

To see Stratum in action, visit our demo!

## Stratum Switch Stack Demo

- A simple **ToR** demo to showcase open source **ONF Stratum switch stack** running on a **whitebox** switch
- **P4Runtime** for programming forwarding entries
- **gNMI** for configuration and telemetry
- Simple SDN controller (**gRPC client**) to push config and forwarding entries
- **ONL** for platform OS



Google GRPC

OPENCONFIG

