STRATUM

Enabling the Next Generation of SDN

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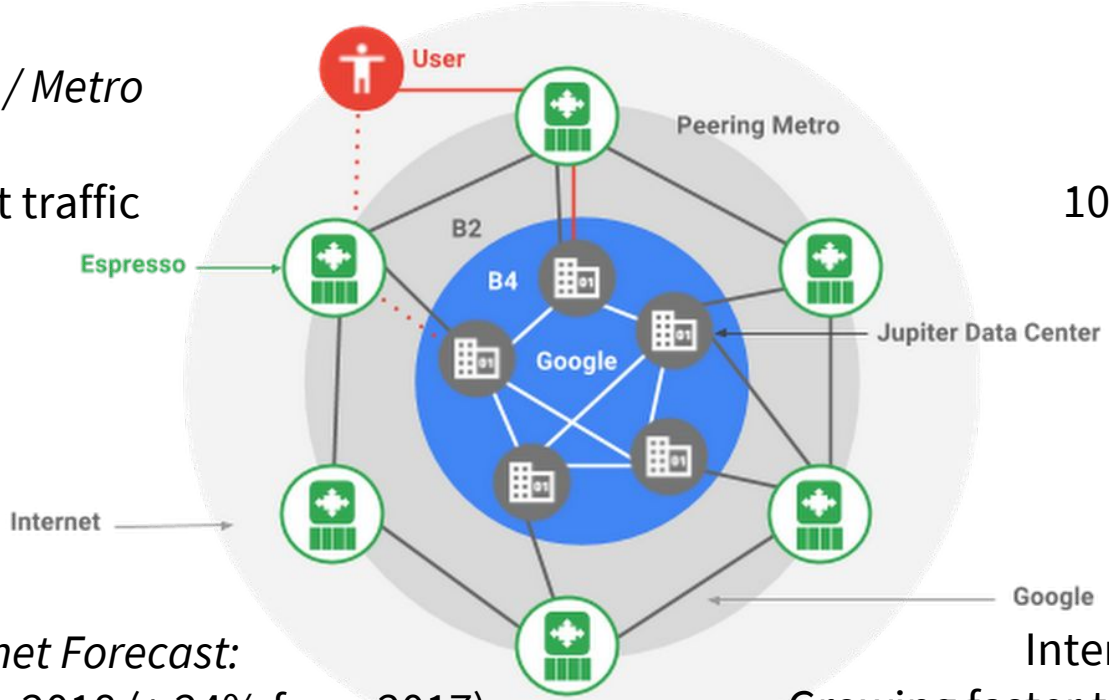
Link to slides: https://goo.gl/6HFG1h

Presenting on behalf of Google and ONF

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)

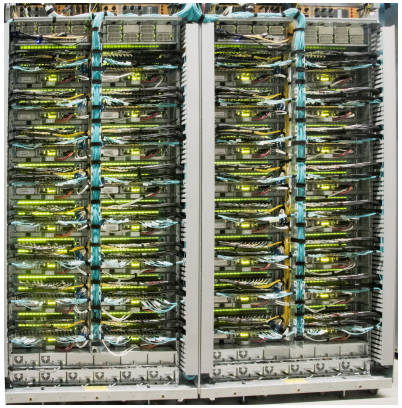
B4
SDN WAN
Inter-datacenter traffic
Growing faster than Internet traffic

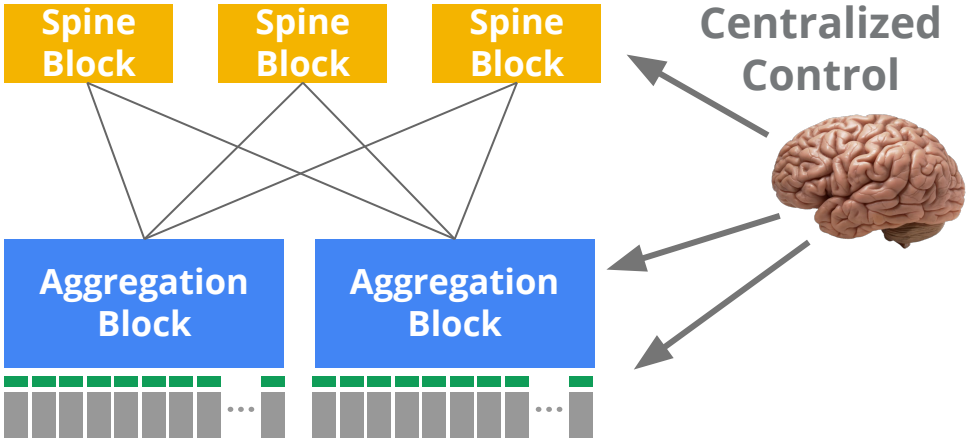
https://www.blog.google/topics/google-cloud/making-google-cloud-faster-more-available-and-cost-effective-extending-sdn-public-internet-espresso/
https://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/complete-white-paper-c11-481360.pdf

SDN Requirements

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

Jupiter (1.3P)





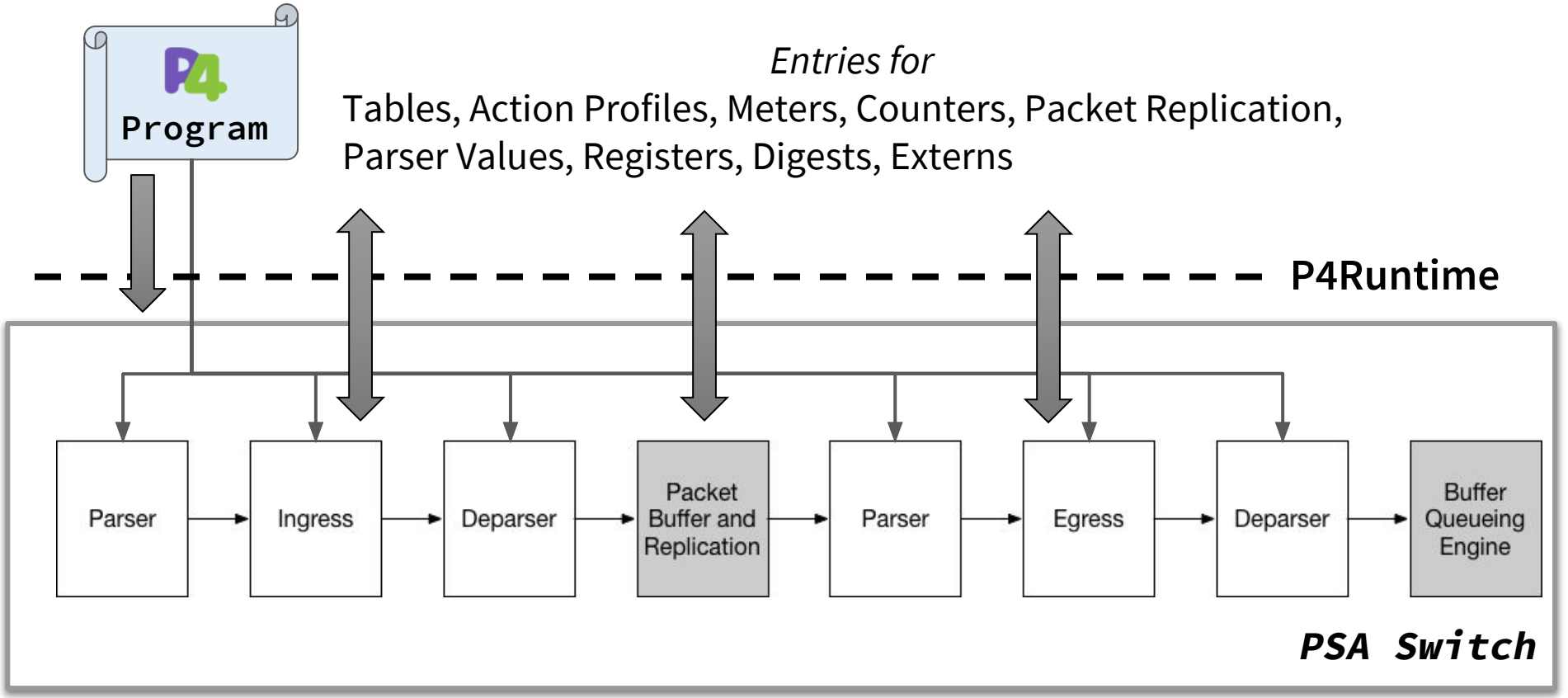
The Ugly Side of Networking

- 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

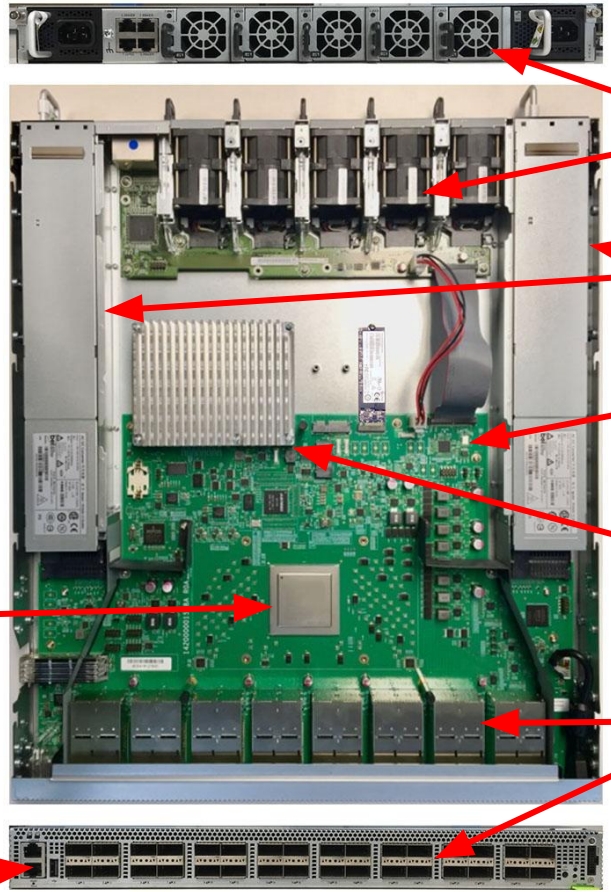


P4 and P4Runtime are great, but ...

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

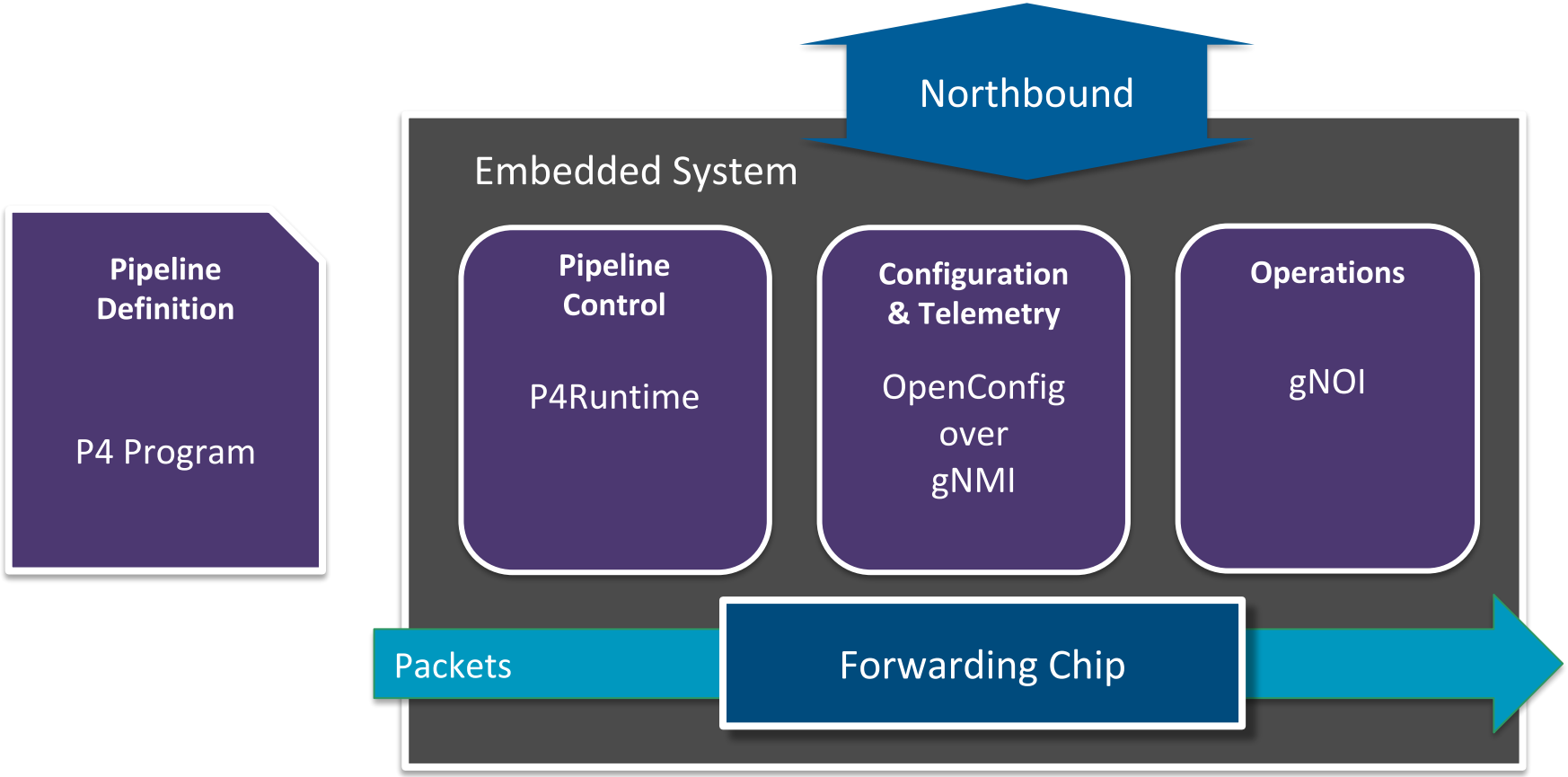
Monitor Sensors
e.g. temperature

Software Deployment and Upgrade

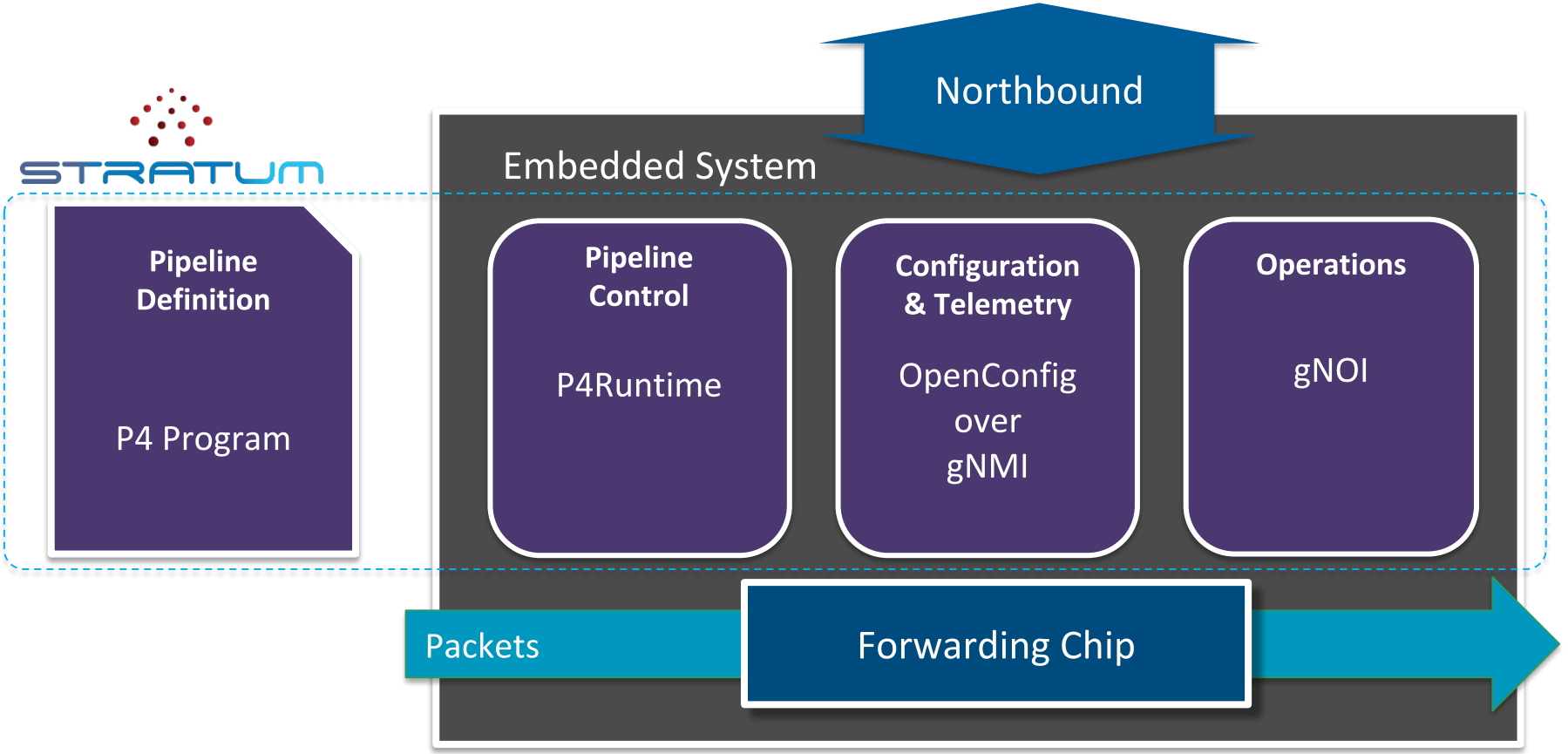
Port State and Mapping
LED Control

… and the list goes on.

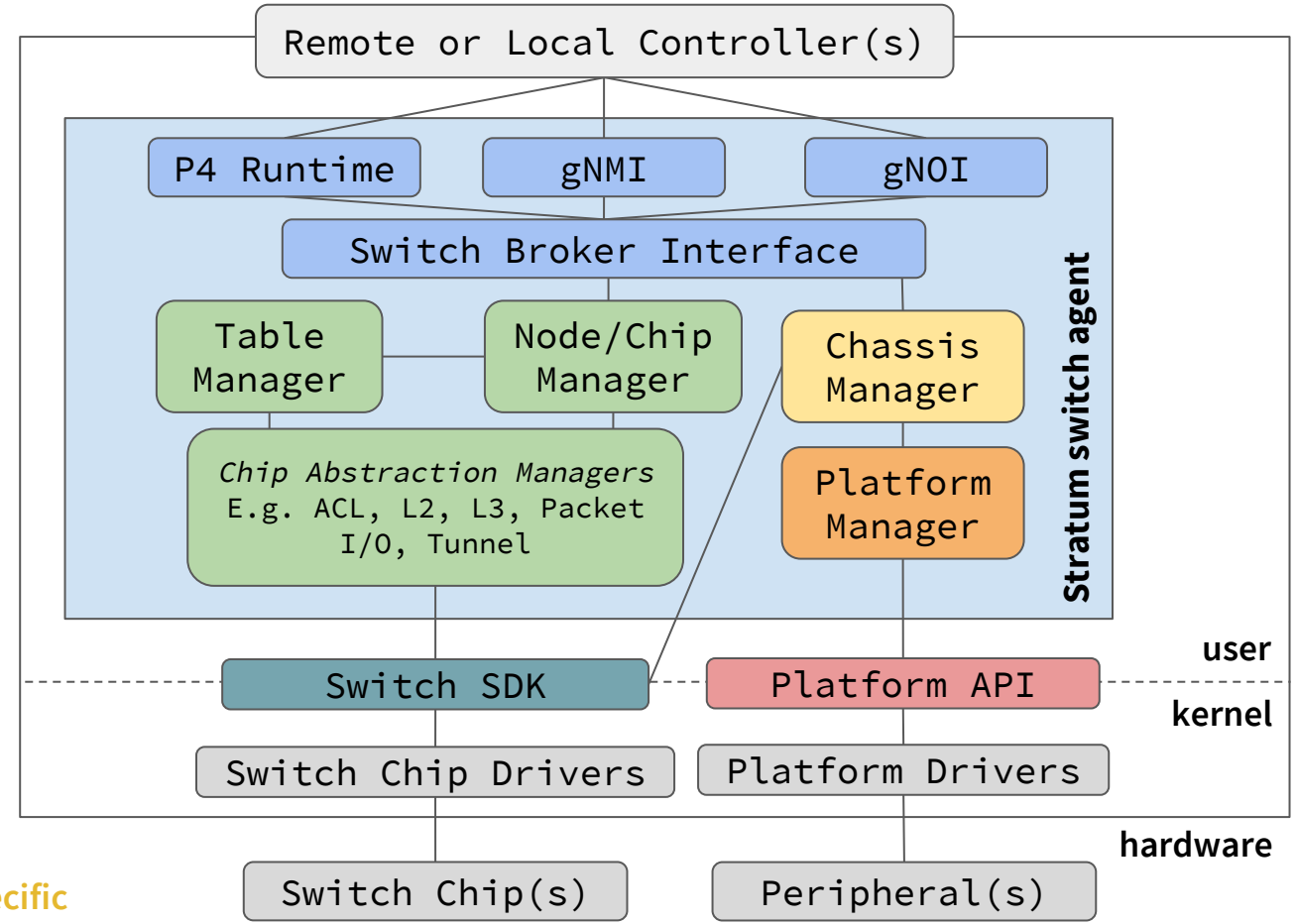
Next Generation SDN Interfaces



Lightweight and Production-ready Implementation



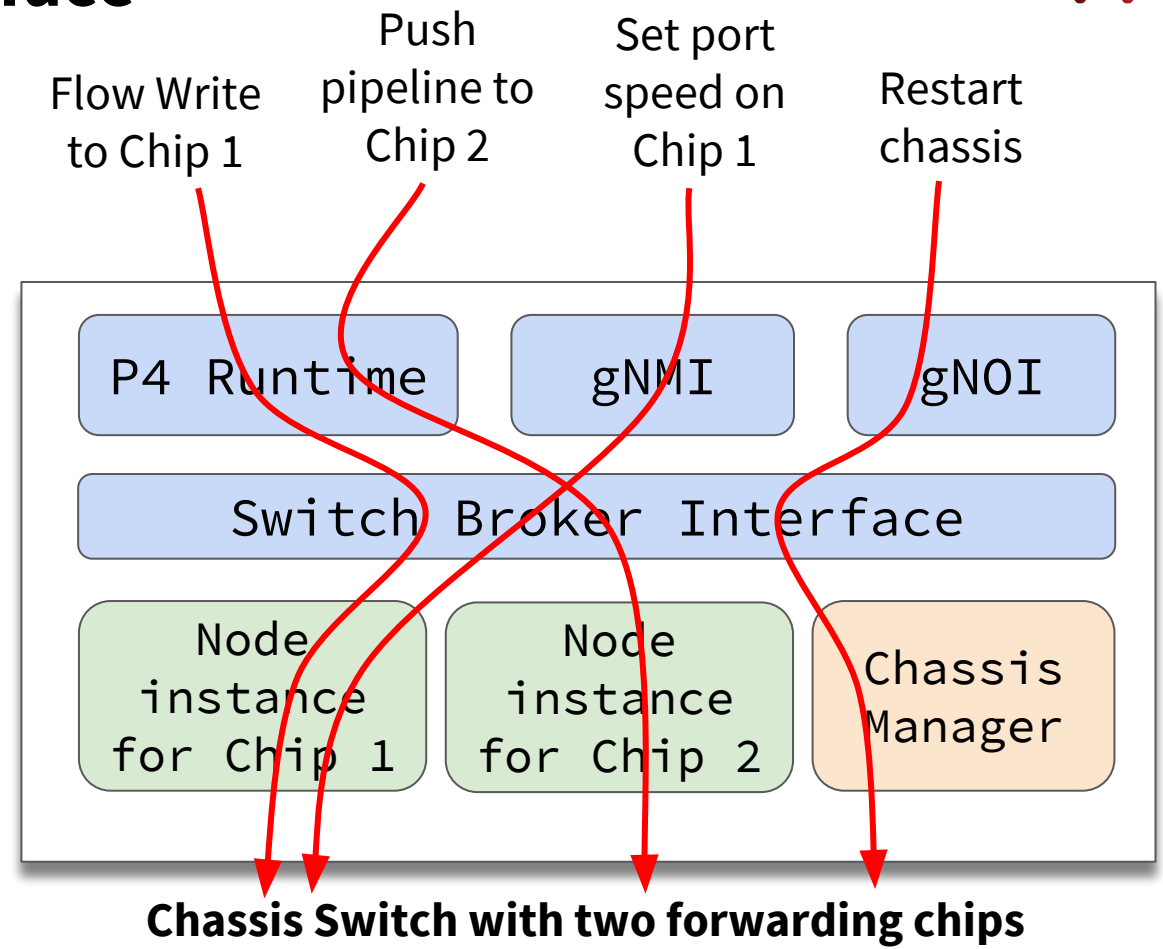
Switch Agent Architectural Components



Shared (HW agnostic)
Chip specific
Platform specific
Chip and Platform specific

Switch Broker Interface

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



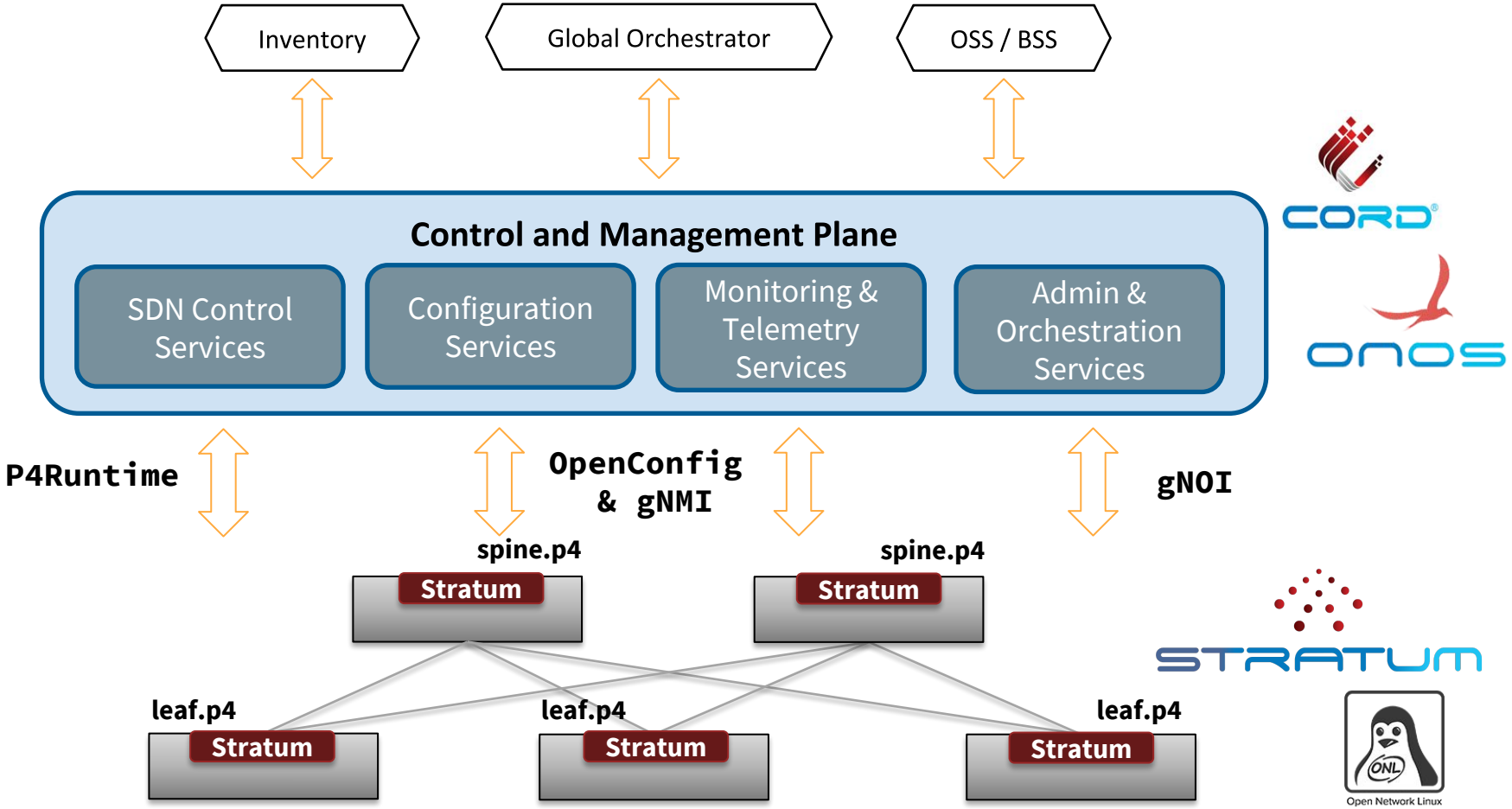
Implementation Details

- 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**

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

China unicom 中国联通

NTT

Türk Telekom

ONF
Open Networking Foundation

big switch networks

Ruijie NETWORKS

vmware

BAREFOOT NETWORKS

BROADCOM

CAVIUM

Mellanox TECHNOLOGIES

XILINX

DELTA

Edge-corE NETWORKS

QCT

Inventec

CORD

ONL
Open Network Linux

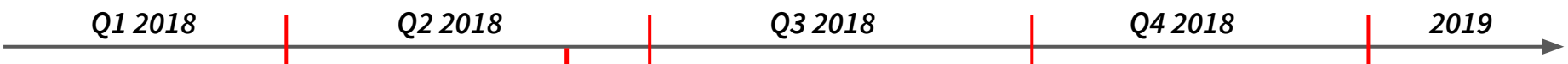
ONOS

OvS
Open vSwitch

P4

SDKLT

Stratum Development Timeline



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:

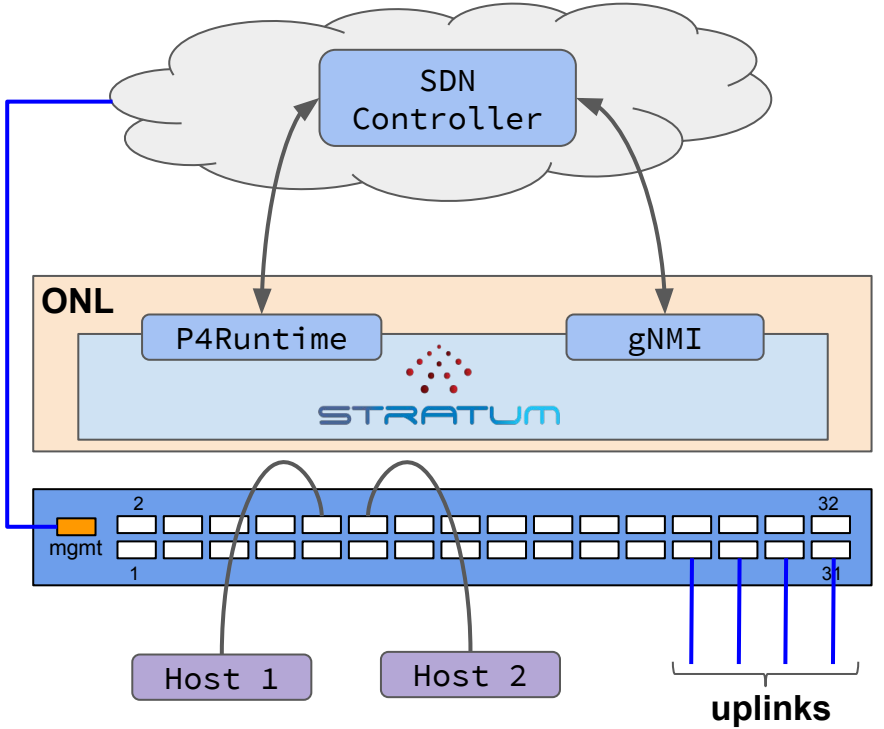
https://wiki.opennetworking.org/display/COM/Stratum+Wiki+Home+Page

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 P4 Open Network Linux ONF Open Networking Foundation