Stratum Techinar
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Outline

• Recent Stratum Enhancements and Releases
• Extending Stratum Support to the Server
• Stratum Roadmap
Stratum Releases

✓ 20.06
✓ 20.09
✓ 20.12
✓ 21.03
✓ 21.06
✓ 21.10
✓ 21.12
✓ 22.03
✓ 22.06 (latest)
➢ 22.09 (planned)

- Stratum is 9 releases old
- Quarterly release cadence
- “Live at Head”
- Status by Target
  - Intel® Tofino™ programmable Ethernet switch ASIC – stable, active development
  - Broadcom StrataXGS switch series – stable, some maintenance
  - BMv2 – stable, some maintenance
  - np4intel – PoC quality, no active development
  - TDI (DPDK, IPU) – incubating
Stratum Fixes and Enhancements

Improved support for Intel® Tofino™ programmable Ethernet switch ASIC

• Removed Stratum-bf
  • Was based on unmaintained, inflexible PI node backend

• Stratum-bfrt for Intel Tofino has reached maturity / production hardened
  • Used by SD-Fabric, Aether, and Pronto (as well as some other vendors/users)

• Support for Intel P4Studio 9.7.x, 9.8.0 and 9.9.0

• Experimental support for table entry idle timeout notifications on Intel Tofino
Stratum Fixes and Enhancements

P4Runtime Enhancements

• Stratum now uses **P4Runtime canonical byte strings** by default
  • The old behavior can be enabled with the **enable_bfrrt_legacanonical byte stringsy_legacy_bytestring_responses** flag

• Spec compliant P4Runtime mastership arbitration (v1.4.0-rc.1)

• **P4Runtime metadata translation** is now **experimentally supported** for stratum_bfrrt and is enabled with the **experimental_enable_p4runtime_translation** flag

• New OpenConfig path (`/interfaces/interface[name=*]/state/id`) that can be used for P4Runtime port translation

• Minor fixes: P4 MeterConfig resets, port ID values in the OpenConfig tree
Stratum’s Use in SD-Fabric

- Stratum runs on the switching infrastructure
- Stratum provides:
  - Precise forwarding control on a P4 defined pipeline
  - Increased visibility via INT
  - Network function offloading
  - P4RT / gNMI as SDN interfaces
- What about on the server?
Extending the Control Domain

- Shift boundary for network control domain into the server
- Provide better isolation on the server
- Extend P4 programmability and visibility into the server
What is an IPU or DPU?

• **Infrastructure Processing Unit or Data Processing Unit**

• Can be deployed on a PCI card:
  • High speed Ethernet ports
  • Embedded micro-server
  • Programmable network pipeline
  • RDMA, NVMe, DPDK, IPDK, etc.
  • Offload functions (e.g. crypto)

• Standalone operation and management

• Physically isolated from main CPU
Programming the IPU using TDI

- TDI (Table Driven Interface) provides a common interface for different targets
- TDI is independent of P4 program, architecture, and backend target
- Entry schema (tdi.json) is driven by the P4 program and target-specific fixed functions (e.g. traffic manager)
Stratum Roadmap: Stratum_TDI

• TDI is already open sourced: https://github.com/p4lang/tdi
• Internal version of P4-OvS (*infrap4d*) is built on TDI
  • Based on *stratum_bfrt*
  • BfRt-based code refactored to use TDI
• Later in 2022, plan to upstream new *stratum_tdi* target that will support:
  • P4-DPDK, Intel® Mount Evans IPU, Intel® Tofino™ switch ASIC
  • FPGA, additional switch ASICS (future)
• Upstreaming brings many benefits
  • Provide a high(er) performance Stratum software switch target, based on DPDK
  • Allow P4-OvS to more easily consume Stratum fixes and enhancements
  • Path for unified software stack for different P4-enabled targets
Adapting Stratum for P4-OvS

**stratum_bfrt**
- P4Runtime
- gNMI
- Stratum Switch Interface
- P4RT to BfRt Managers
- OpenConfig to BfRt Mappings
- BfRt

**Intel® P4 Studio SDE**

**Intel® Tofino™ programmable Ethernet switch ASIC**

**stratum_tdi**
- P4Runtime
- gNMI
- Stratum Switch Interface
- P4RT to TDI Managers
- OpenConfig to TDI Mappings
- TDI
- P4-enabled Target SDK

**Similar interface to BfRt**

**CPU (DPDK)**

**FPGA / NIC / IPU**

Originally developed as infrap4d for P4-OvS

Mappings require simple refactoring from BfRt to TDI
Stratum Roadmap: Base OS Background

- Stratum runs on Linux
  - Not tied to any particular distro, but it’s helpful to provide a default
  - Users have a lot of flexibility

- Open Network Linux (ONL) has been the default base OS for many years
  - ONLPv2 branch and platform API
  - Very few commits over past 2 years
  - Based on older distro and kernel
  - Lack of new platform support, bugs, performance issues

- SONiC is a better choice for the Stratum’s base OS for switches
  - Also based on Debian
  - Actively maintained by a diverse community
  - Regular releases (twice a year) and updates/fixes
Stratum Roadmap: Base OS Plan

• ONL is the default base OS for Stratum 22.06
  • Users can continue to use ONL (or another distro) if they prefer

• Moving forward, SONiC will be the default base OS
  • Note: the SONiC control plane is disabled
  • We just use the Linux distro, kernel, and platform API

• Stratum releases starting with 22.09 will:
  • Point to a specific SONiC image
  • Contain kernel modules for recently supported SONiC images (and ONL, too)
  • Be tested on the SONiC base OS

• Longer term opportunities
  • Create a Stratum PHAL adapter for SONiC’s platform API
  • Plug Stratum into SONiC’s CLI (e.g. allow users to configure and monitor ports)
Summary

• Stratum 22.06 recently released in June
  • Stratum_BfRt fully replaces Stratum_Bf

• Stratum is venturing into server via the IPU / DPU

• Stratum 22.09 planned for September
  • Initial version of Stratum_TDI
  • SONiC as the default base operating system
Getting Involved

How do I get involved with Stratum?

• Send an email to stratum-dev or a Slack message to #stratum-dev
• Join the bi-weekly technical steering team (TST) meeting
• Send a pull request with your changes to the Stratum Github repo
• Try the NG-SDN tutorial
• Help review and test Stratum on P4-DPDK
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Follow Up Links:
https://opennetworking.org/stratum/
https://github.com/stratum/stratum