SONiC Powered by Programmable Data Planes

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Data Plane Programmability Building Blocks

1. Open programming language & Community
2. Compiler & Chip Simulation Model
3. Visualization Tools
4. Flexible / Auto-generated APIs
5. Fully Programmable ASIC

End-user Accessible
P4 Community and Ecosystem

- Strong community
- 3000+ developers
- 5 active working groups
- 100+ member organizations
Barefoot Intel Progress with SONiC in 2019

- Expand set of **supported platforms**
  - Tofino2 White box
  - Stordis OCP Accepted Switches
- **Testing & Hardening**
  - Multiple testbeds enabling CI/CD with SONiC and P4 data plane
  - Passing SONiC community test suite
  - Daily SONiC testing
- Continuous upstreaming of changes to **support latest SAI / SONiC releases** and **features**
  - SAI 1.5.1 support
  - High-scale VXLAN tunneling
  - Warm reboot
P4-Programmable OCP Switches

BF6064X-T
64x100G Switch

BF2556X-1T
48x10/25+8x100G Switch

Advanced Programmable Switches with Built-in Time Synchronization
AS9516-32D – Tofino™ 2 Whitebox

- Now supports SONiC!
- Same SDE / SAI as Tofino
- P4 program with higher table scale

- System specifications
  - 1 RU
  - 32x400GE QSFP-DD ports (2x1 stacked QSFP-DD cages)
  - Intel® Xeon-D COM-Express CPU module
Barefoot Intel Software Support for SONiC

- Barefoot P4 Compiler & Tools
  - Tofino / Tofino2
  - ASIC Model
  - Program (P4) & Device (Fixed) API
  - Abstraction API
  - SAI
  - Packet Test Framework
# Barefoot Intel SONiC Delivery

<table>
<thead>
<tr>
<th>Option</th>
<th>Scenario</th>
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<tr>
<td>Binary file on SONiC community page</td>
<td>Quick start with SONiC supported features</td>
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<tr>
<td>Binary files provided by Barefoot support</td>
<td>Quick start with features not upstreamed</td>
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<tr>
<td>Compile from P4 Studio SDE</td>
<td>Data plane / SAI implementation change</td>
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</table>
Barefoot Intel SONiC Strategy

1. Validation of SONIC master (specific ref point) with each GA release of P4 Studio SDE
2. Pass community tests with all P4 Studio SDE releases and coupled SONiC release / ref point
3. Maintain a SDE + SONiC combination for community test baseline
Intel & Keysight Partnership

**Intel SONiC Hardening**

- Double # of testbeds
- 100% of tests passed
- Daily SONiC validation
- Latest SAI / SONiC with every SDE release
- 70+ PRs submitted in 2019

**Keysight SONiC Validation**

- Contribute test methodologies
- UHD100T32 test platform
- Scalable, cost-effective & dev-ops friendly
- Keysight test leadership + Barefoot programmability

**Powered by Barefoot Tofino**

NEW
Switching Between Different P4 Data Planes

1. In SONiC, edit /etc/sonic/config_db.json to include the p4_profile attribute:

```
... "DEVICE_METADATA": { "localhost": { ...
  "p4_profile": "<P4 program name"}
```

2. Load the updated config_db.json:

```
sudo config load -y
```

3. Reboot for the new data plane to take effect

Embedded P4 programs:

- **A_PROFILE**
  - Tofino Foundational Features + **Dataplane telemetry**

- **B_PROFILE**
  - Tofino Foundational Features + **High Scale tunneling**

- **C_PROFILE**
  - Tofino2 Foundational Features
Custom Data Plane Integration Options with SONiC

OPTION 1 – DIRECT ACCESS TO P4

SONiC

Baseline Features

SAI

Abstraction API

Program (P4) & Device (Fixed) API

New Feature

sai.p4

OPTION 2 – CONTROL EVERYTHING VIA SAI

SONiC

Baseline Features

SAI

Abstraction API

Program (P4) & Device (Fixed) API

New Feature

sai.p4

SAI Flex / Extension / new attributes
Use-case: SONiC and Table Scale

- Different table sizes for leaf and spine
- Different table sizes for different deployments
- Example: IPv4 vs IPv6 heavy fabric

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Scenario 1</th>
<th>Scenario 2</th>
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<tbody>
<tr>
<td>IPv4 Host Local</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>IPv4 LPM</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>IPv6 Host</td>
<td>Low</td>
<td>High</td>
</tr>
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<td>Medium</td>
</tr>
</tbody>
</table>
Use-case: SONiC & Data-Plane Telemetry

Barefoot Data-Plane Telemetry

- In-Band Network Telemetry (INT)
- Intelligent Deduplication and Triggers
- Path & Latency Change Detection
- Microburst detection
- Report on Drop

3rd Party Network Management Solutions

Open Telemetry Report Format defined by the P4.org Applications Working Group

Deep Insight
Open Northbound APIs

INT Metadata
Addressing SONIC Growing Pains Together

- Same level of PR validation for all platforms
- Stable released branch / image vs master
- Community tests to become more flexible
  - Not tied to specific fan-out switch
  - Increase use-case coverage