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OCP SUMMIT

NETWORKING

SONiC Deployments Powered by Programmable Data Plane

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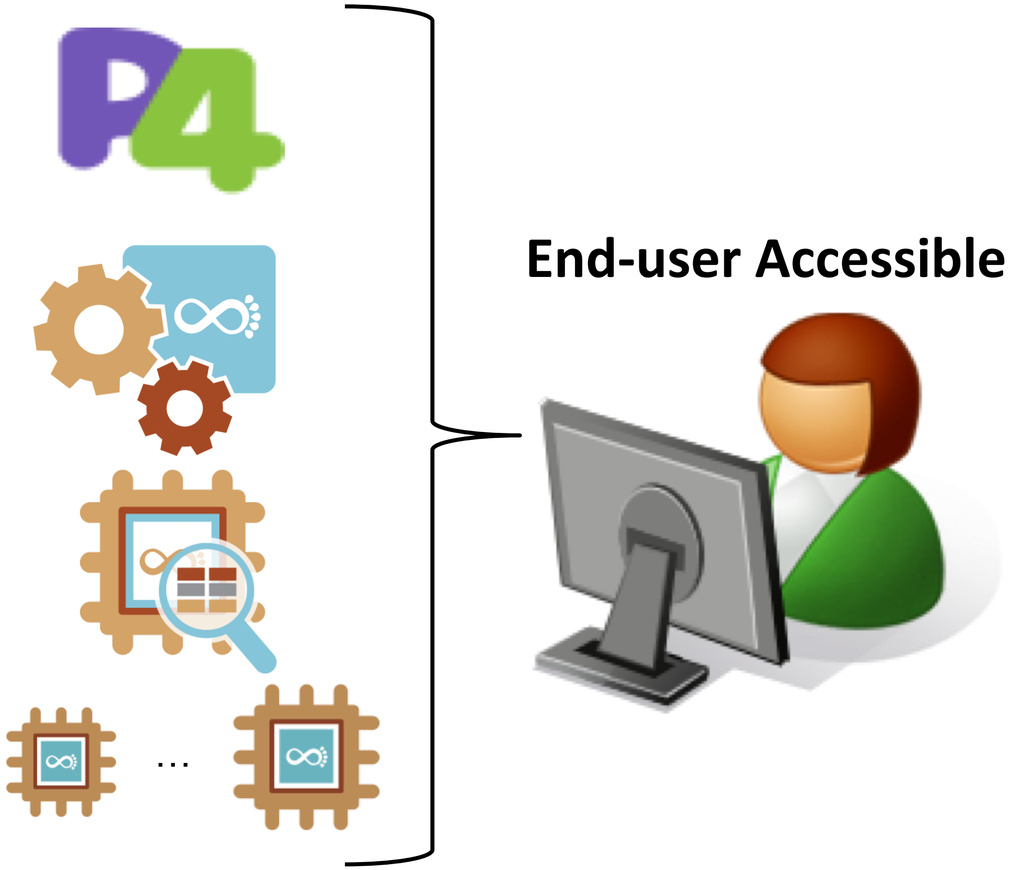
SONiC Background

- Announced @ March 2016 OCP Summit
- Growing open-source network OS project with multiple contributors (MSDC, ASIC, ODM, OEM)
- **Originally focused on fixed function switches, so how can we leverage programmable data plane?**

What makes you programmable?

AVOIDING “PROGRAMMABILITY” WASHING…

1. Open programming language
2. Compiler & Chip Simulation Model
3. Visualization Tools
4. Fully Programmable Silicon

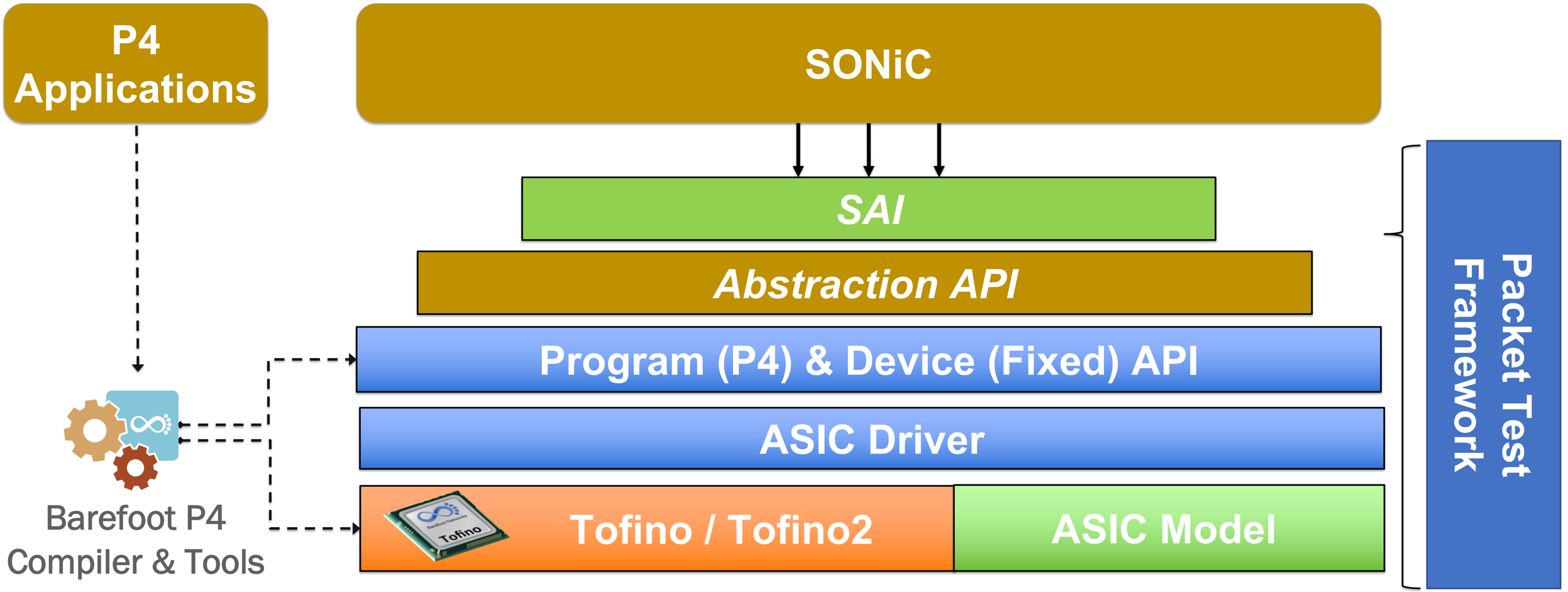


Barefoot SONiC Update

SINCE OCP U.S. SUMMIT 2018

- Continuous **upstreaming of changes** to support latest SAI / SONiC releases
- **Data plane telemetry** feature contribution and participation in SAI TAM discussions
- Expand set of **supported platforms**
- Leading platform to validate **VxLAN** support on SONiC with **cloud scale**
- Support latest SONiC **high availability** features like warm reboot with **zero service disruption**
- Enable **multiple use-cases** powered by P4 inside one SONiC image

Barefoot Software Support for SONiC



Barefoot Tofino Platform Support for SONiC

Sample Switch.P4 Features for SONiC

- **Ethernet switching**
  - **VLAN Flooding**
  - **MAC Learning & Aging**
  - STP state
  - VLAN Translation
- **IPv4 and IPv6 routing**
  - **Unicast Routing**
  - **Routed Ports & SVI**
  - **VRF**
  - Unicast RPF - Strict and Loose
  - Multicast - PIM-SM/DM & PIM-Bidir
- **QOS**
  - **QoS Classification & marking**
  - **Drop profiles/WRED -**
  - **RoCE v2 / PFC**
  - **CoPP (Control plane policing)**
  - **WRED-based ECN marking**

- **Tunneling: VxLAN (v4/v6), IP-in-IP**, GRE
- ACL
  - **Ingress MAC ACL**, **IPv4/v6 ACL, RACL**
  - **Egress MAC ACL**, **IPv4/v6 ACL, RACL**
  - QoS ACL, System ACL, PBR
  - Port Range lookups in ACLs
- Security Features
  - Storm Control,
  - IP Source Guard
- sFlow
- PTP
- Counters
  - Route Table Entry Counters
  - VLAN/Bridge Domain Counters
  - **Port/Interface Counters**
  - ACL stats
- **Barefoot Dataplane Telemetry**

SONiC with Programmable Silicon

- P4 program defines a **use-case** (ToR, Spine, Gateway):
  - **Features** enabled / disabled (L2, L3, MPLS, VxLAN, Telemetry etc.)
  - **Scale** for each table (MACs, routes, ACLs etc.)
- Delivering different data planes with operating system:
  - Option 1: Compile different images
  - **Option 2: Single image includes multiple P4 programs**

Switching Between Different Data Planes

AVAILABLE FROM 201807 SONIC RELEASE IN A SINGLE BAREFOOT DEBIAN PACKAGE

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 the switch for the new data plane to take effect

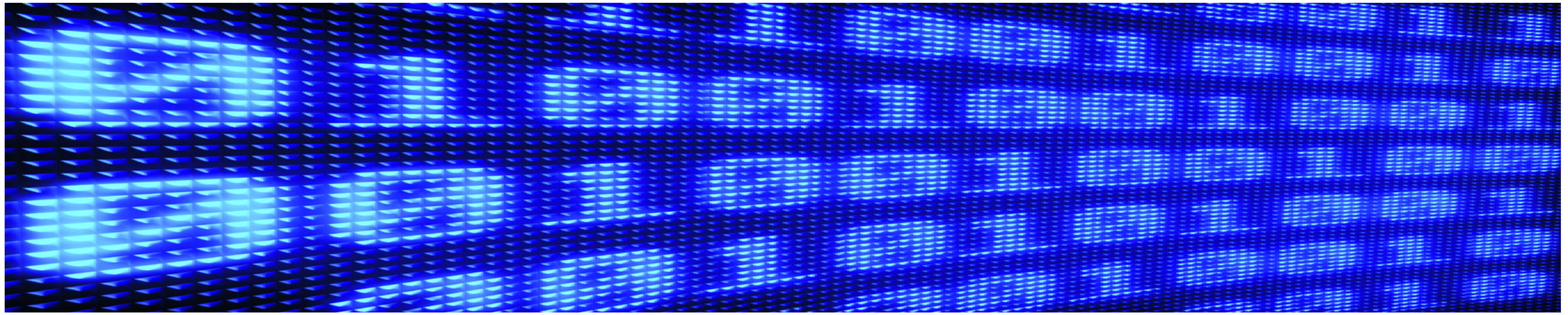
Embedded P4 programs:

- **MSDC_PROFILE**
  - Default for baseline SONiC features
- **MSDC_IPV4_PROFILE**
  - **Focused on high scale tunneling**
- **MSDC_LEAF_DTEL_INT_PROFILE**
  - Dataplane telemetry leaf
- **MSDC_SPINE_DTEL_INT_PROFILE**
  - Dataplane telemetry spine

SONiC Delivery

HOW TO GET STARTED

Option	Scenario
Binary file on SONiC community page	**Quick start with SONiC supported features**
Binary files provided by Barefoot support	Quick start with features not upstreamed
Compile from P4 Studio SDE	Data plane / SAI implementation change



Use-case 1: SONiC and Table Scale

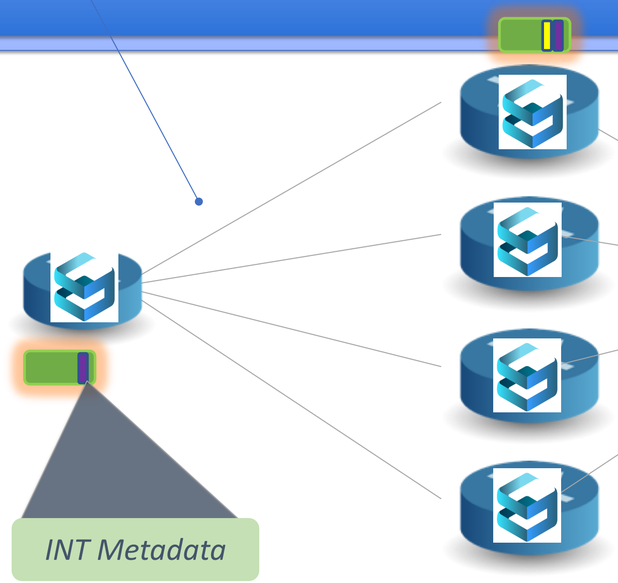
- Different table sizes for leaf and spine
- Different table sizes for different deployments
- Example: IPv4 vs IPv6 heavy fabric

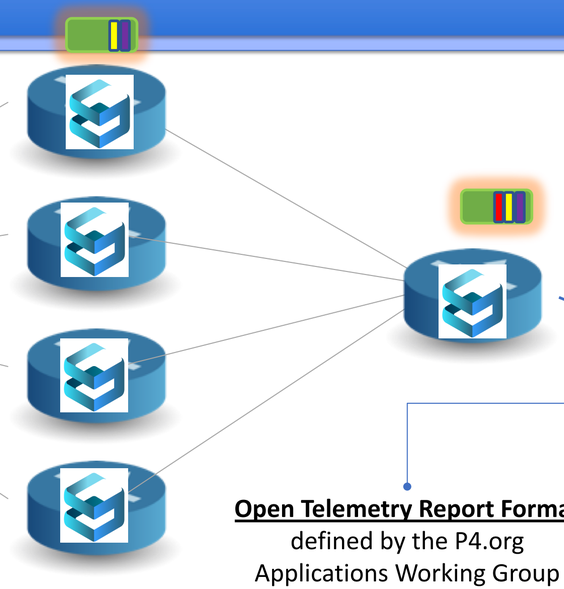
Parameter	Scenario 1	Scenario 2
IPv4 Host Local	128K	32K
IPv4 LPM	16K	4K
IPv6 Host	4K	4K
IPv6 LPM	10K	60K

Use-case 2: 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



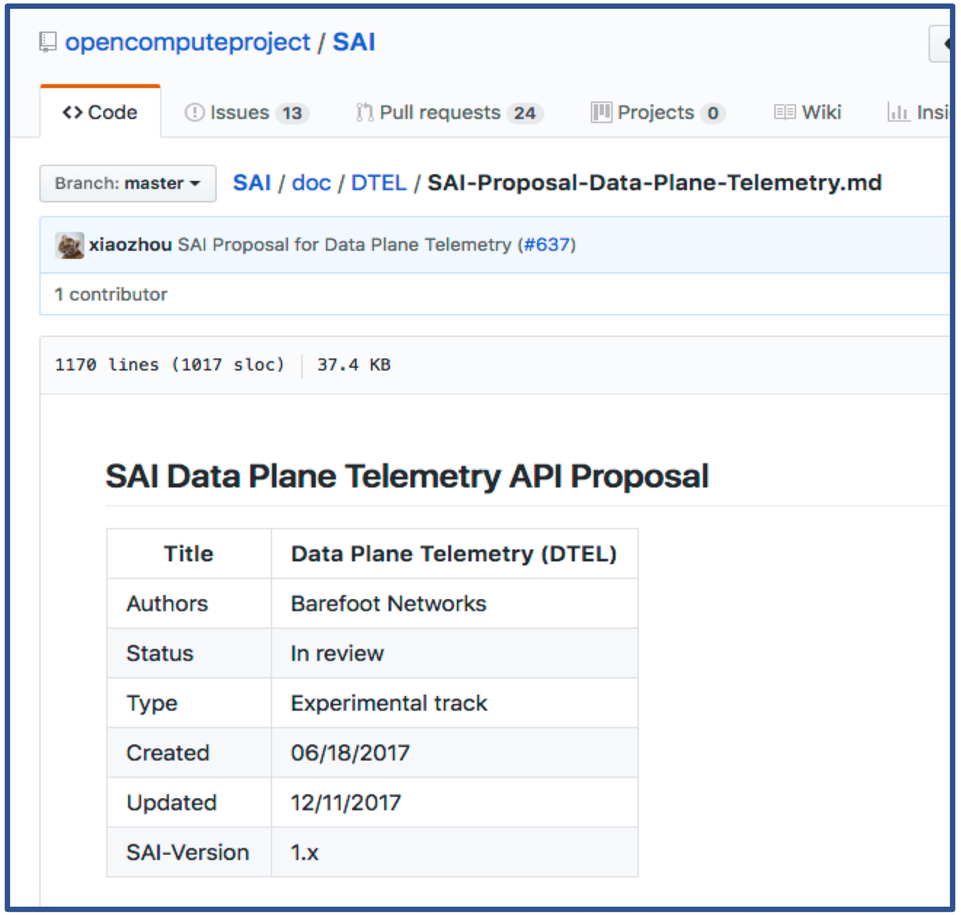


Open Telemetry Report Format
defined by the P4.org
Applications Working Group

3rd Party Network Management Solutions

Deep Insight
Open Northbound APIs

SAI Data Plane Telemetry APIs



opencomputeproject / SAI

Code | Issues 13 | Pull requests 24 | Projects 0 | Wiki | Insi

Branch: master ▾ SAI / doc / DTEL / SAI-Proposal-Data-Plane-Telemetry.md

xiaozhou SAI Proposal for Data Plane Telemetry (#637)

1 contributor

1170 lines (1017 sloc) | 37.4 KB

SAI Data Plane Telemetry API Proposal

Title	Data Plane Telemetry (DTEL)
Authors	Barefoot Networks
Status	In review
Type	Experimental track
Created	06/18/2017
Updated	12/11/2017
SAI-Version	1.x

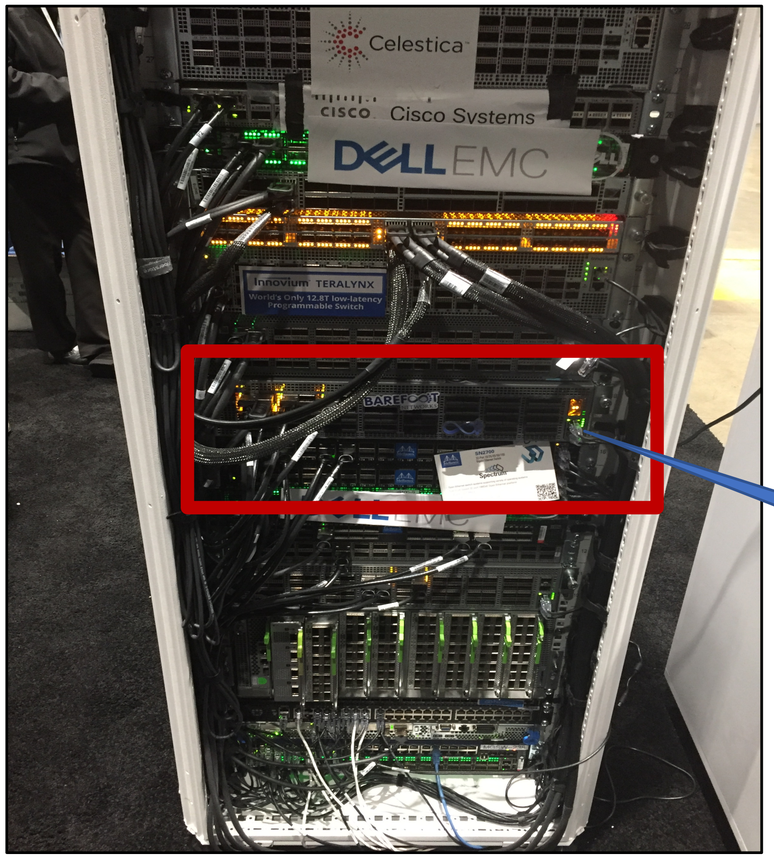
- Part of SAI 1.3
- Defines entire spectrum of data plane telemetry configuration
  - Flow watchlists
  - Switch ID
  - Report destination

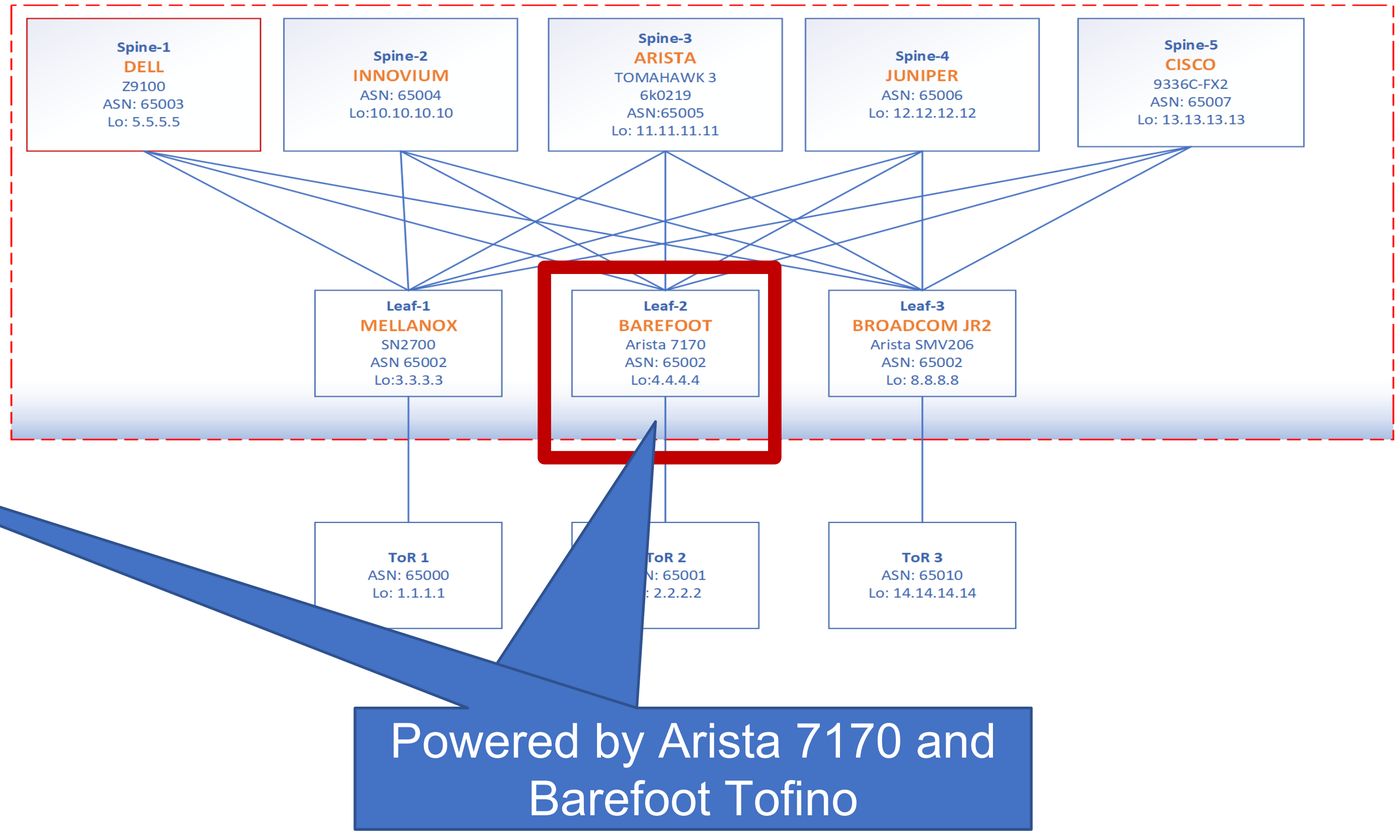
SONiC and Data Plane Telemetry

- SONiC Telemetry Feature
  - New tables in several SONiC databases
  - Configuration script
- Released in SONiC 201807 release!

```
# Instantiate a switch:
my_switch = sonic_switch.SONiCSwitch(dtel_switch_id='123',
                                     management_ip='10.10.10.10',
                                     dtel_monitoring_type='int_endpoint')

# Create a report session:
rs = my_switch.create_dtel_report_session('192.168.0.1')

# Create a watchlist:
wl = my_switch.create_dtel_watchlist('flow')

# Add entries to the watchlist:
wl.create_entry(priority=10,
                src_ip='10.131.0.0',
                src_ip_mask=11,
                dst_ip='10.131.0.0',
                dst_ip_mask=11,
                dtel_sample_percent=100,
                dtel_report_all=True)
```

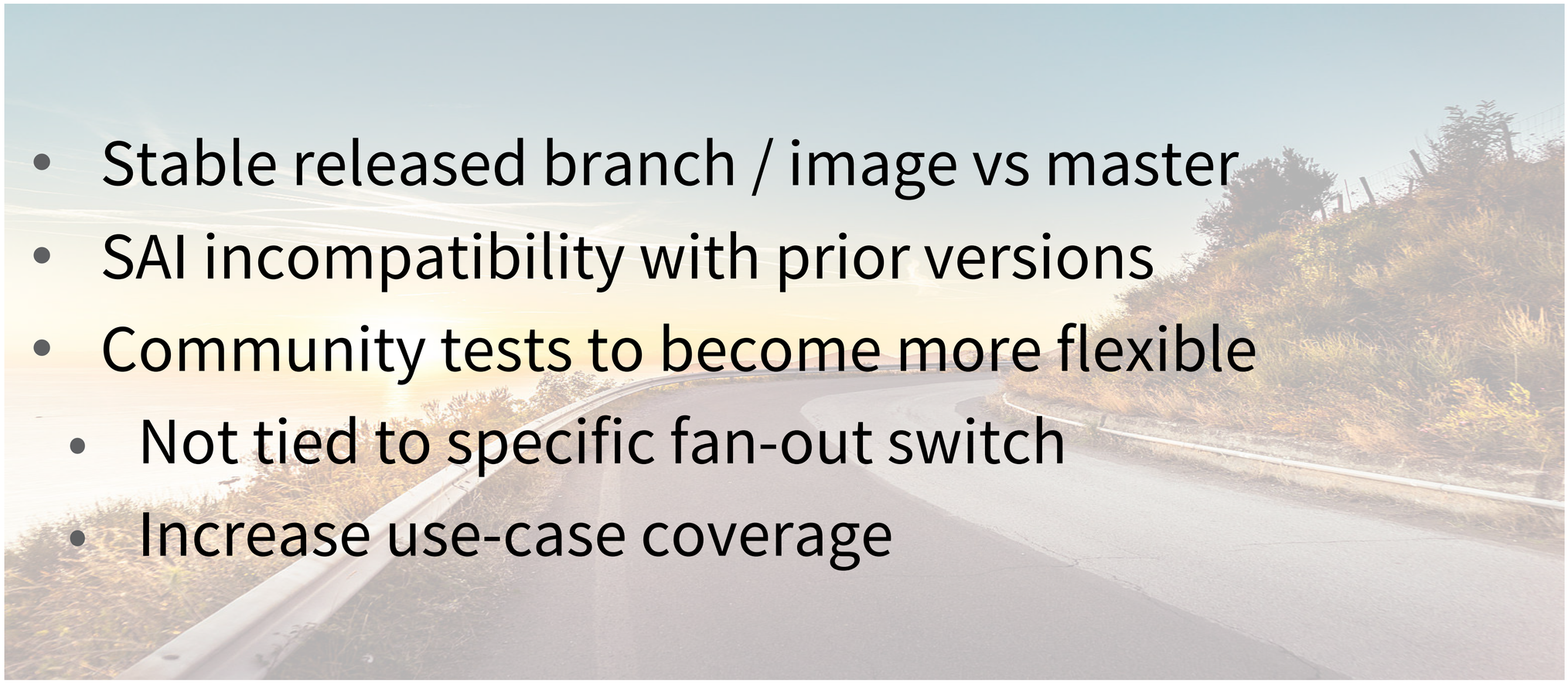
Baremetal Server Hosting / Disaggregated Chassis





SONiC Deployment Challenges

IMPROVEMENT OPPORTUNITIES TO DRIVE BROADER SONIC ACCEPTANCE



- Stable released branch / image vs master
- SAI incompatibility with prior versions
- Community tests to become more flexible
  - Not tied to specific fan-out switch
  - Increase use-case coverage

Call to Action

- See Barefoot related presentations and demos: https://www.barefootnetworks.com/blog/bringing-ocp-vision-reality-programmable-dataplanes-progress-report/
- Use latest SONiC binary for Barefoot to try out some of the use-cases https://github.com/Azure/SONiC/wiki/Supported-Devices-and-Platforms
- Use Barefoot P4 Studio and P4 to modify data plane to address new use cases

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