SONiC: Enabling Fast Evolution in the Network

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Distinguished Engineer
Microsoft – Azure Networking Team
Rapid Growing SONiC Ecosystem

<table>
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<th>Application, management, tools</th>
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<td>Mellanox Technologies</td>
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<td>metaswitch</td>
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<td>ARISTA</td>
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<td>CANONICAL</td>
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<td>docker</td>
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<th>Switch Platform</th>
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Microsoft Cloud Network - 15 Billion Dollar Bet
SONiC Is Powering Microsoft Cloud At Scale

- 4 Production SKUs
- Supporting 80K servers

Tier 0 - Rack
- SONIC
- SONIC
- ... SONIC

Tier 1 - Row Leaf
- SONIC
- SONIC
- ... SONIC

Tier 2 - Spine
- T2-1-1
- T2-1-2
- ... T2-1-8
- ... T2-4-1
- T2-4-2
- ... T2-4-4

Tier 3 - Regional Spine
- T3-1
- T3-2
- T3-3
- T3-4
Feature Velocity Essential for Cloud

Cloud-scale creates the following requirements on switch firmware:

- Disaggregate firmware features
  - Minimize the baggage – switch firmware loaded with only features needed
  - Operators can select the best building blocks for the job
- Hitless upgrade so updates don’t cause customer impact
  - Fix bugs or apply security patches in hours
  - Rollout features in days
- Development environment
  - Realistic emulation environment
SONiC – Containerized

Configuration and management tools
- Ansible
- Puppet
- Chef
- 1st party
- Telemetry

Network applications
- More apps
- SNMP
- BGP
- DHCP
- IPv6 Essentials

SONiC Base
- SWSS
- Platform
- Quagga
- RedisDB
- LLDP
- SYNCD

Open Compute Project (OCP) software components
Third party software components
Bring your own custom software components
010101
101010
010101

Cookbook
SONiC Containerization

**Container Strength**
- Clean isolation
- Easy deployment
- Transactional
- Run universal

**SONiC Benefits**
- Serviceability
- Extensibility
- Development agility
- Cross-platform

What Would Containerized SONiC Enable?
SONiC Containers – Peek into Arista cEOS
SONiC-P4 Software Switch

SONiC P4 Software Switch Docker
SONiC Container Orchestration with Swarm

- Joint work with Docker
- Manage a cluster of SONiC switches with Swarm.

- Simple architecture with very few components
- Easy to use – single command to create cluster
- Declarative service model
- Powerful rolling update and rollback
Hitless BGP Upgrade Through Docker Swarm
Open Invitation

- Inviting contributions in all areas
  - SAI
  - Hardware platform
  - New features, applications and tools
  - Download it and use it!

Website: https://azure.github.io/SONiC/
Mailing list: sonicproject@googlegroups.com
Source code: https://github.com/Azure/SONiC/blob/gh-pages/sourcecode.md
Wiki: https://github.com/Azure/SONiC/wiki/
SONiC Architecture - Switch State Service (SWSS)

- **SAI DB**: persist SAI objects
- **App DB**: persist App objects
- **DB backend**: redis with object library
- **SyncD**: sync SAI objects between software and hardware
- **Orchestration Agent**: translation between apps and SAI objects, resolution of dependency and conflict

**Key Goal:**
- Evolve components independently
- Enable easy integration of containers
- Enable large scale debugging
Other Capabilities in SONiC

• Diagnose based on Switch State data
  • Steaming data out from Redis DB for monitoring
• ASIC level diagnostic capability
  • Adding TAM, critical resourcing monitoring, microburst monitoring, INT etc
  • Scenarios driven by cloud scale troubleshooting requirement
Docker Orchestration with Swarm

- Simple
  - Simple architecture. It has very few components running in manager or worker nodes.
  - Easy to use. Create cluster in single command. Almost no need to read manual for Docker users.
- Declarative service model
  - Extend Docker API to cover service, node, secret primitives.
  - Built-in raft store to persist system state.
- Secure by default
  - Built-in CA to support cryptographic node identity and key rotation.
  - Encrypted network communication.
- Powerful
  - Support service rolling update / rollback
  - Built-in routing mesh to implement load balancing
  - Flexible and platform independent. Easy to integrate into existing infrastructure.