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Migration to SONiC from Three-tiered Legacy Network - EPFL Cast Study
Migration to SONiC from 3-tiered Legacy Network – EPFL Case Study

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Network

Campus

11,449 students, of whom 2,199 PhD students
344 faculty
6,134 staff (incl. PhD)

Structure

5 Schools (13 study prog. leading to an MSc)
2 Colleges
20 Institutes
44 research centers
371 laboratories
EPFL’s three missions according to the Federal Act

- **Education**
- **Research**
- **Innovation**
Current Network Architecture
Goals for the Data Center Network

▪ No more blocking links for redundancy
  • No spanning tree
▪ Place a server everywhere within a POD
  • Optimize placement without compromising bandwidth or latency
▪ Ease to add links, hence bandwidth
▪ Flexibility for host connectivity
  • From 10Gb to 100Gb
▪ Provide HaaS capabilities with dynamic network and security assignments through automation
Why SONiC

- The same NOS, thus functionalities and reliability, across different Hardware Vendors to avoid locking and the freedom to choose the best hardware that suits our needs
- Being able to separate the hardware and the software
- Advanced telemetry. Deep visibility leads to rapid troubleshooting
- A modern NOS able to answer our needs in dissimilar workloads and capable to evolve accordingly with the best standards
New Fabric Architecture
DC 2020

SUPER SPINE

POD 1

16 x Racks – 32 Leaf Switches

POD 2

16 x Racks – 32 Leaf Switches

400G

100G

LEGACY

ESXi

SWITCH SILICON

Sup Spine: TD4
Spine: TD4
Leaf: TD3
Migration Strategy

- Legacy
- L3
- L2

DG Migration

VLAN Extension

SONiC Fabric

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Migration Strategy

- Extend VLAN to SONiC Fabric
- vMotion VMs to New Fabric
  - DG is still in Legacy Network
  - Tromboning traffic
- Once 50% or more workloads are migrated, it's time to migrate DG

  - a. Configure the Default Gateway address of the VLAN as anycast gateway in the Fabric.
  - b. Shutdown sub-interface of the corresponding VLAN on Legacy L3 Switch. This will also stop BGP advertisement from N7700-L3 for this subnet (VLAN).
  - c. Advertise the subnet (VLAN) from Border Leaf to Legacy L3 Switch.
How to Scale!

- Initial Validation was done with CLI
- Default gateway migration is an intrusive step:
  - 6 sec outage was observed for hosts in legacy network
  - 1 sec outage was observed for hosts in new SONiC Fabric

Scale Requirements
- Migration of 1000s of VLANs requires automation
- EPFL expectations from Automation Tool:
  - Ability to stage all changes before the change window
  - Feedback Loop after committing the changes
  - Ability to Roll-back changes from 100s of devices with one push
Approach to automating network operations

- “Apstra IBN” is about three distinct automation aspects:
  - Validation of intent correctness — eliminates operator error
  - Configuration generation — stateless automation focuses only on this
  - Operational expectations validation — most important aspect of automation.

- The first two are prerequisites, but the end goal is the correct outcome.
Step 1) Preprovision all EVPN Tenants and VLANs

Create Routing Zone

- VRF Name
- VLAN ID
- VNI
- Routing Policies

Create Virtual Network

- Name
- Routing Zone
- VLAN ID

<table>
<thead>
<tr>
<th>VRF Name</th>
<th>Type</th>
<th>VLAN ID</th>
<th>Route Target</th>
<th>VNI</th>
</tr>
</thead>
<tbody>
<tr>
<td>default</td>
<td>L3 fabric</td>
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<td>N/A</td>
<td>N/A</td>
</tr>
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<td>tenant_1</td>
<td>EVPN</td>
<td>2</td>
<td>10000:1</td>
<td>10000</td>
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<tr>
<td>tenant_2</td>
<td>EVPN</td>
<td>3</td>
<td>10000:1</td>
<td>10001</td>
</tr>
</tbody>
</table>

Create Virtual Switch

- Name
- Routing Zone
- Type
- VID
- Assigned to
- IPv4 Connectivity

- VMD_Students
- VMD_Pub
- VMD_Research
Step 2) Migrate VLANs

- Use server labeling (unique names) or tags (meta-data) for batch assignment of interfaces
- Example: VLAN stretched over two compute racks, 10 servers per rack
Step 2) Validate network state

Validate EVPN control plane:
- Look at BGP routing table (RIB) for EVPN routes, check EVPN Route-Type 3 generated routes on a per device and VN basis and validates them against routes expectations derived from intent.

Validate EVPN data plane:
- Check device’s forwarding plane (FIB) and validates them against Flood List expectation derived from intent.
Step2) Validate network state (cont’d)
Step 3) Move L3 GW to EVPN domain, and validate

- Augment VNs with L3 intent.

**Incremental configuration** (SONiC API)

**State validation (EVPN Route-Type 5)**
In case of issues, rollback to previous fabric state

- Store system-wide definitions of your intent, to roll-back to.
- Storing individual switch configurations is not scalable.
- The automation tool must render device’s configurations at run time by selecting a blueprint revision.
Call to Action

• SONiC is ready for Enterprise Deployment.
• There is no suitable Enterprise grade Orchestration option in Open Source community
• Apstra integration with SONiC provides a turnkey Day 0- Day 2 operations solution
• Trial of SONiC + Apstra
Thank you!