Dell Technologies

Sonic Enterprise Distribution by Dell Technologies

Mirko Trättner
Senior Systems Engineer
mirko.traettner@dell.com

D≪LL Technologies

Disclaimer

This presentation contains references to certain features, functionality, enhancements, or other technology that may not be currently available. This information is intended to outline our general product direction and should not be relied upon in making current purchasing decisions. These references: i) are for information purposes only, ii) may not be incorporated into any contract, and iii) do not constitute a commitment, promise or legal obligation to deliver any material, code, or functionality. The development, release and timing of any features, functionality, enhancements, or other technology described remains at the sole discretion of Dell Technologies.

DELLTechnologies

Drive digital transformation with Dell Technologies

Power up your datacenter with **PowerSwitch** and **Open Networking**

INCREASE SCALABILITY	**ENSURE AGILITY**	**BUILD IN SIMPLICITY**
LEVERAGING CLOUD-INSPIRED SOLUTIONS	**WITH DISAGGREGATED H/W & S/W CHOICES**	**BY INTEGRATING AUTOMATION**

IMPROVE CUSTOMER OUTCOMES AT THE CORE-EDGE-CLOUD WITH INNOVATIVE OPEN NETWORKING SOLUTIONS

D&LL Technologies

SCALE to meet growing demands

Leveraging real-world tested Software for Open Networking in the <u>Cloud (SONiC) OS</u> developed and hardened for hyper-scale cloud environments

Controlling complexity by moving toward a network OS that is containerized and automated using <u>standards-based APIs</u>

Actively providing better outcomes for data center networking solutions by integrating the <u>latest open-source and virtualization innovations</u>

D&LL Technologies

# AGILITY with the power of disaggregation

Choose from a selection of standards-based network operating systems and software including SmartFabric OS10, Enterprise SONiC Distribution by Dell Technologies, and select 3rd party offerings

Enable the cost-effective disaggregation of both hardware from OS software as well as components of the OS itself by choosing from multiple open networking switching and edge solutions

Have confidence with the global support and services from a proven and trusted vendor

D∕ELL Technologies
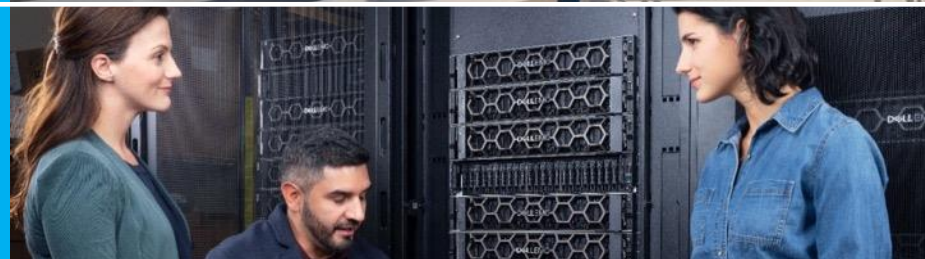
SIMPLIFY to streamline the complex

Use state-of-the-art <u>automation</u> software to simplify the design, deployment and management of your LAN and SAN network infrastructure

<u>Reduce complexity</u> and closely integrate the management of physical and virtual network infrastructures

Enable <u>zero-touch deployment</u> and centralized cloud-based management for edge locations

D&LL Technologies

What is… Dell Technologies <u>Open</u> Networking?

- With Open Networking, the user is "free" to use the operating system or software to operate his switches.

Why Open Networking ?

The demands on the network have changed drastically in recent years:

- Higher speeds
- Millions of devices and still growing (IoT)
- The amount of data explodes (and becoming more and more)
- From DataCenter to Clouds
- 24/7 availability

SDN … NOT a "one size fits all approach"

What's Our Hardware Strategy

- ❑ All DC switches are "ONIE" compliant
- ❑ "ONIE" is a OCP standard that allows to choose the OS → "Disaggregation"
- ❑ "ONIE" based Edge Switches
- ❑ uCPE for the Edge Connections
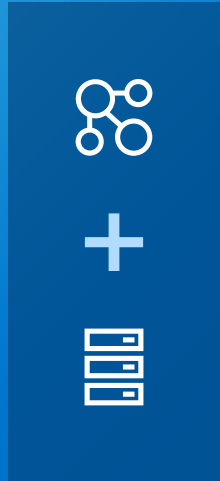
What's Our Software Strategy

- ❑ Different solution (OS) to best match customer priorities and requirements
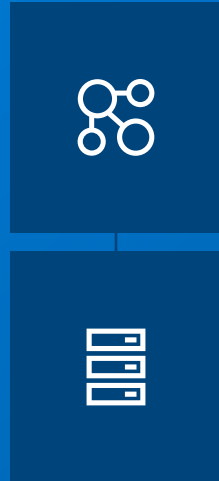- ❑ Network "disaggregation" eases implementation of innovative SDN solution

Scale

Feature

Dissaggregation

DELLTechnologies
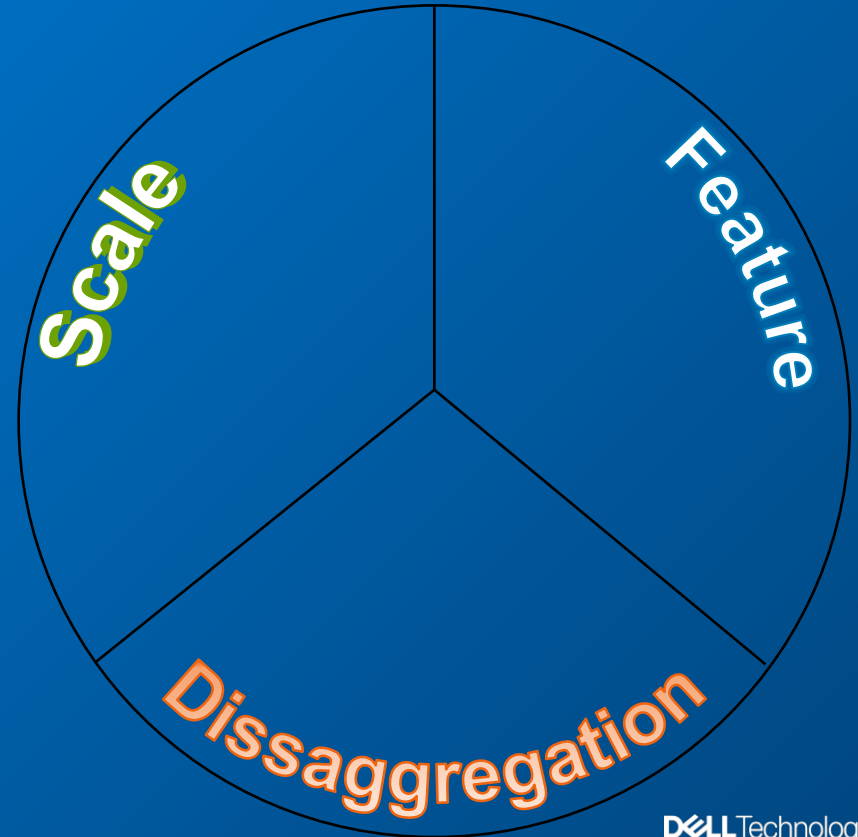
Sonic OS

D&LL Technologies

Entering the era of Open Source networking

Traditional Networking

Open Source Networking
Disaggregated HW with Open Source NOS

Containerized Apps

SONiC

HW Platforms

Before 2014

2014 to 2020
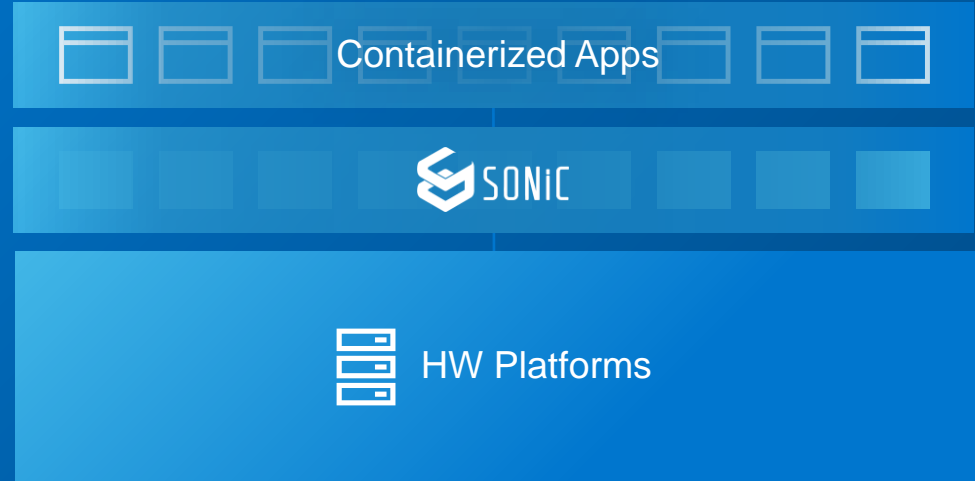
2020 Onwards

D&LL Technologies

SONiC - Software for Open Networking in the Cloud

- SONiC is a collection of software packages that are installed on Linux running on a network hardware switch which makes it a complete, functional router targeted at data center networks.

- SONiC runs on Debian Distribution

- SONiC is supported by the Community and all code is shared in Public GitHub

- Network Applications run in Linux User Space as **Docker Containers**. Include Routing Protocols, L2 protocols, Interface Manager etc.

- Switch Abstraction Interface (SAI) API for control plane integration

- Built by Microsoft and the networking community and is now adopted by Open Compute Platform (OCP) community

D∅LL Technologies
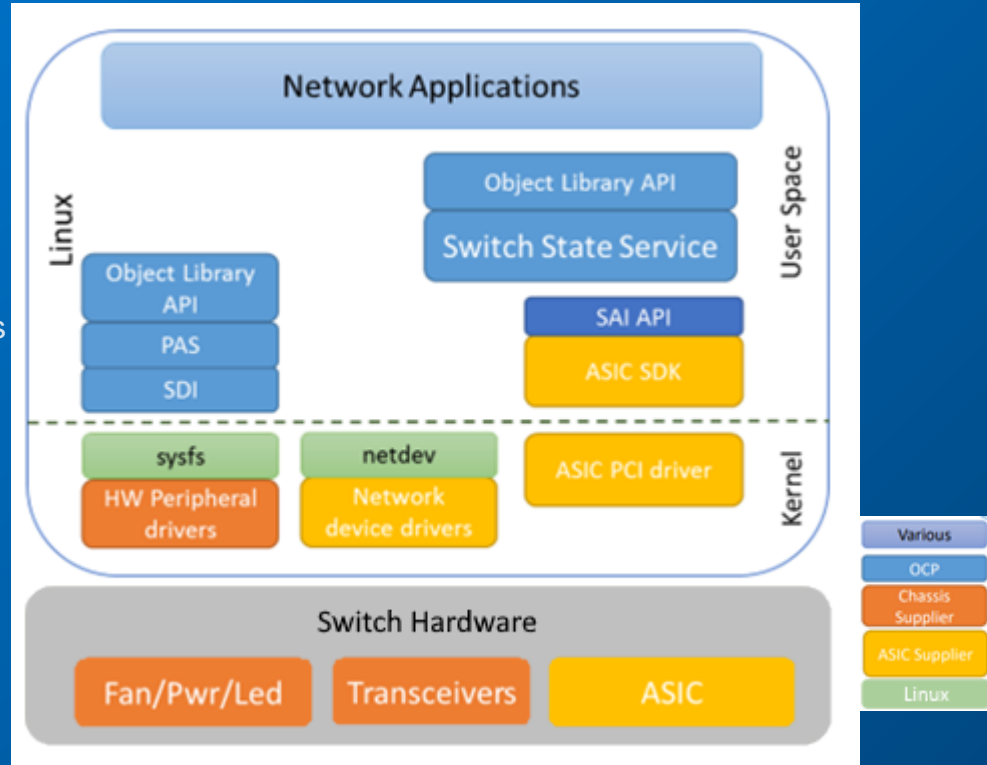
Switch Abstraction Interface

Network Applications

Hello

Switch Abstraction Interface

مرحبا · 你好 · नमस्ते · Bonjour · Hola · Aloha

BAREFOOT NETWORKS · BROADCOM · centec networks · CAVIUM · Mellanox TECHNOLOGIES · MARVELL
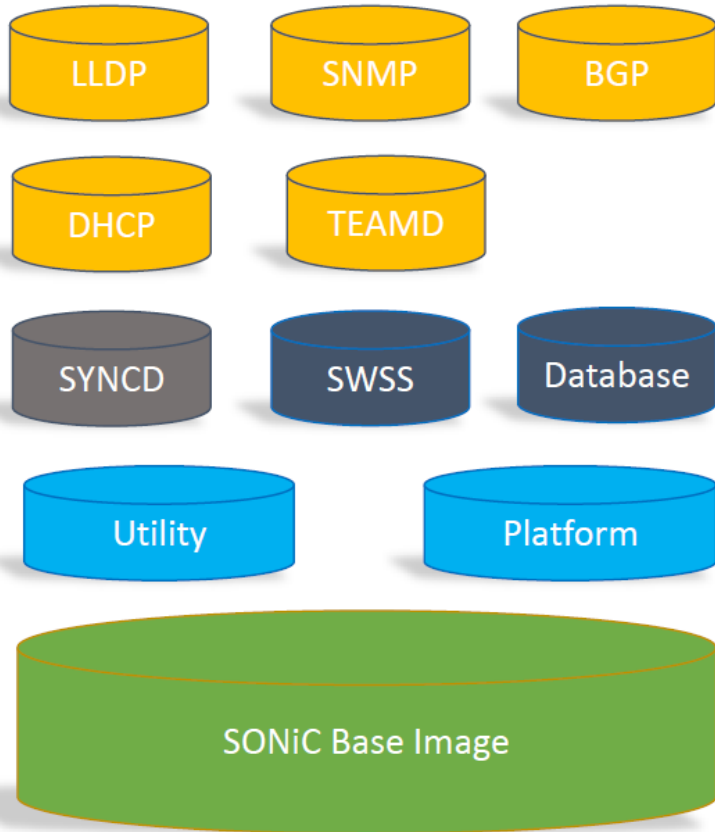
Simple, consistent, and stable network application stack

Helps consume the underlying complex, heterogeneous hardware easily and faster

DELLTechnologies

SONiC Containerization

- [TEAMD](#)
- [LLDP](#)
- BGP: Quagga or FRR
- SNMP: Net-SNMP + SNMP subagent
- DHCP Relay: isc dhcp
- Platform: sensors
- SWSS: switch state service
- DB: Redis
- Syncd: sairedis + syncd agent

DELLTechnologies

Benefits of Container Architecture – Modular Design

- Sandboxing - the apps are developed independent of the platform specific details required to interact with lower-layer abstractions

- Improved Security

- Increased Portability

- Ease of Troubleshooting

- Granular Resource Management for applications

- Simple and Fast Deployment

- Improved Scalability

D❤LL Technologies
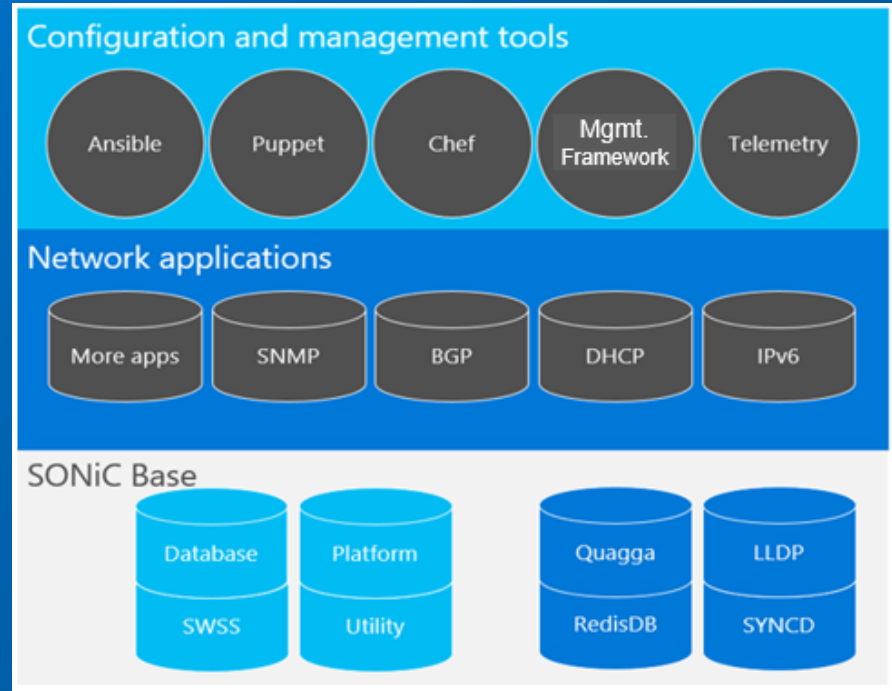
Software for Open Networking in the Cloud (SONiC)

- An open source software project under OCP

- SONiC is a Network Operating System with the seed code provided by MSFT

- Currently SONiC is running on 40,000+ Azure switches

- SONiC allows the operator to control the complexity of the data center fabric by moving towards an automated, intent-based, API-centric, and purpose-built containerized network

"By 2025, 40% of organizations that operate large data center networks (more than 200 switches) will run SONiC in production environments"
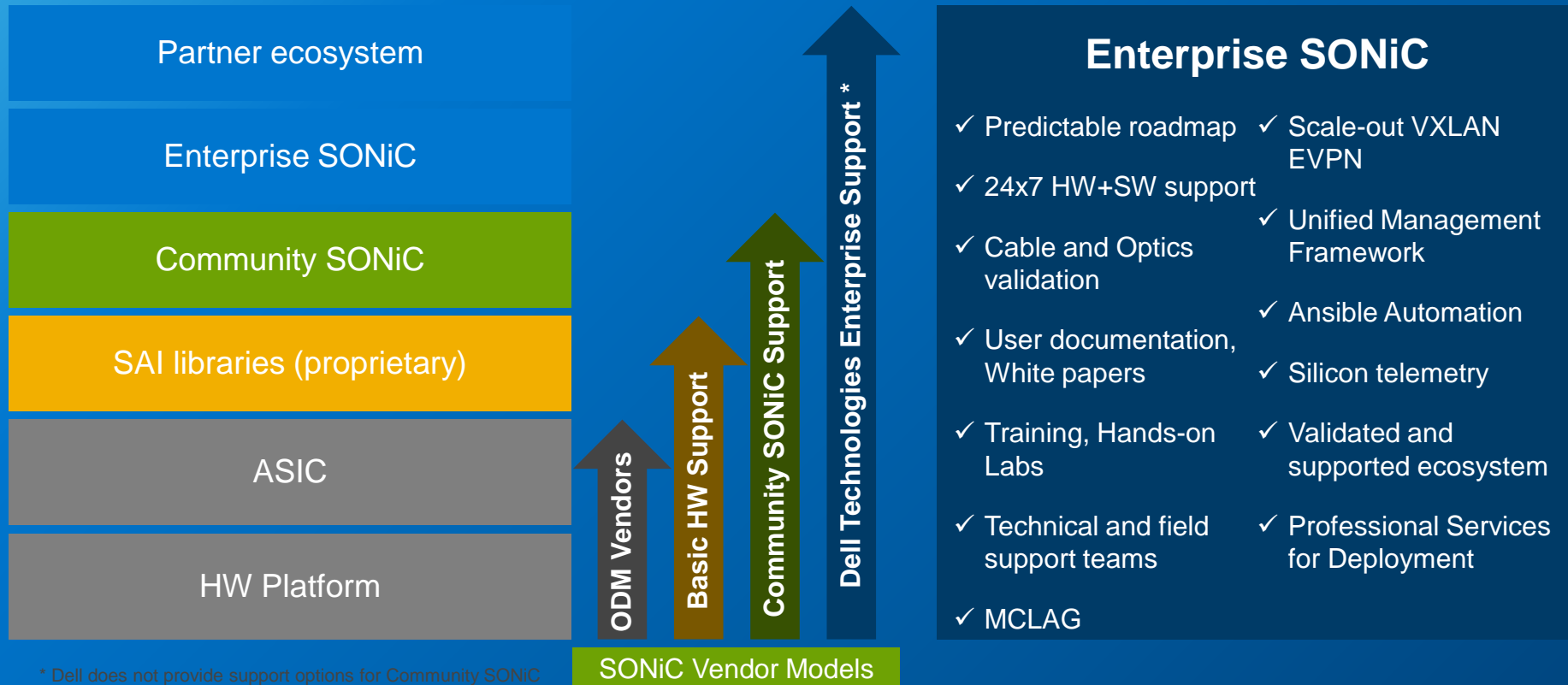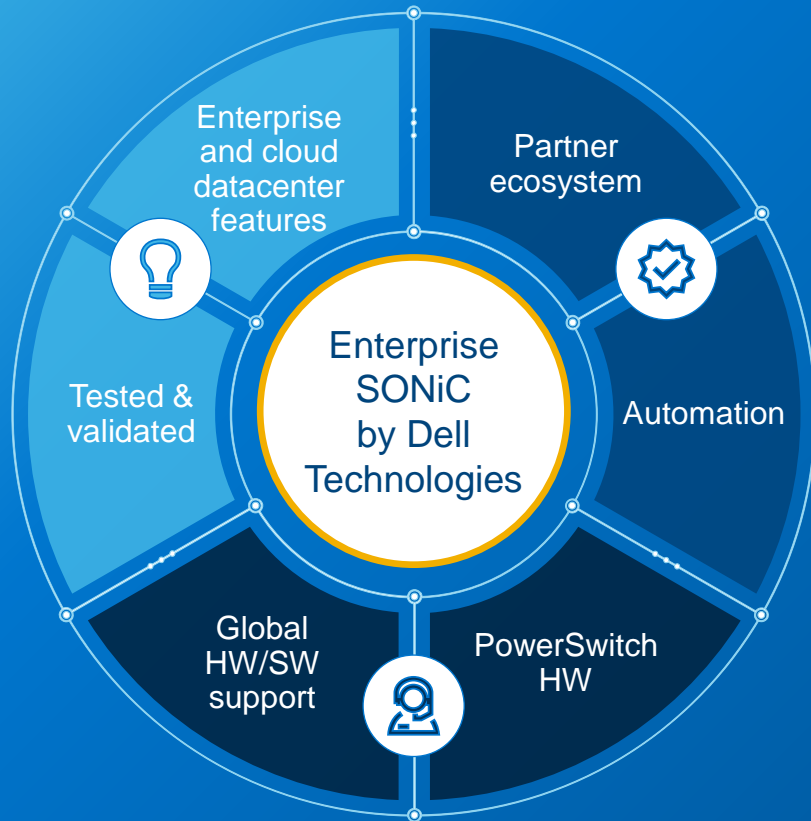
Gartner

D∕LL Technologies

SONiC

SONiC Support Models in the Industry

Partner ecosystem

Enterprise SONiC

Community SONiC

SAI libraries (proprietary)

ASIC

HW Platform

ODM Vendors

Basic HW Support

Community SONiC Support

Dell Technologies Enterprise Support *

SONiC Vendor Models

* Dell does not provide support options for Community SONiC

Enterprise SONiC

- ✓ Predictable roadmap
- ✓ 24x7 HW+SW support
- ✓ Cable and Optics validation
- ✓ User documentation, White papers
- ✓ Training, Hands-on Labs
- ✓ Technical and field support teams
- ✓ MCLAG

- ✓ Scale-out VXLAN EVPN
- ✓ Unified Management Framework
- ✓ Ansible Automation
- ✓ Silicon telemetry
- ✓ Validated and supported ecosystem
- ✓ Professional Services for Deployment

DELLTechnologies

Enterprise SONiC Distribution by Dell Technologies

Enterprise and cloud datacenter features

Partner ecosystem

Tested & validated

Enterprise SONiC by Dell Technologies

Automation

Global HW/SW support

PowerSwitch HW

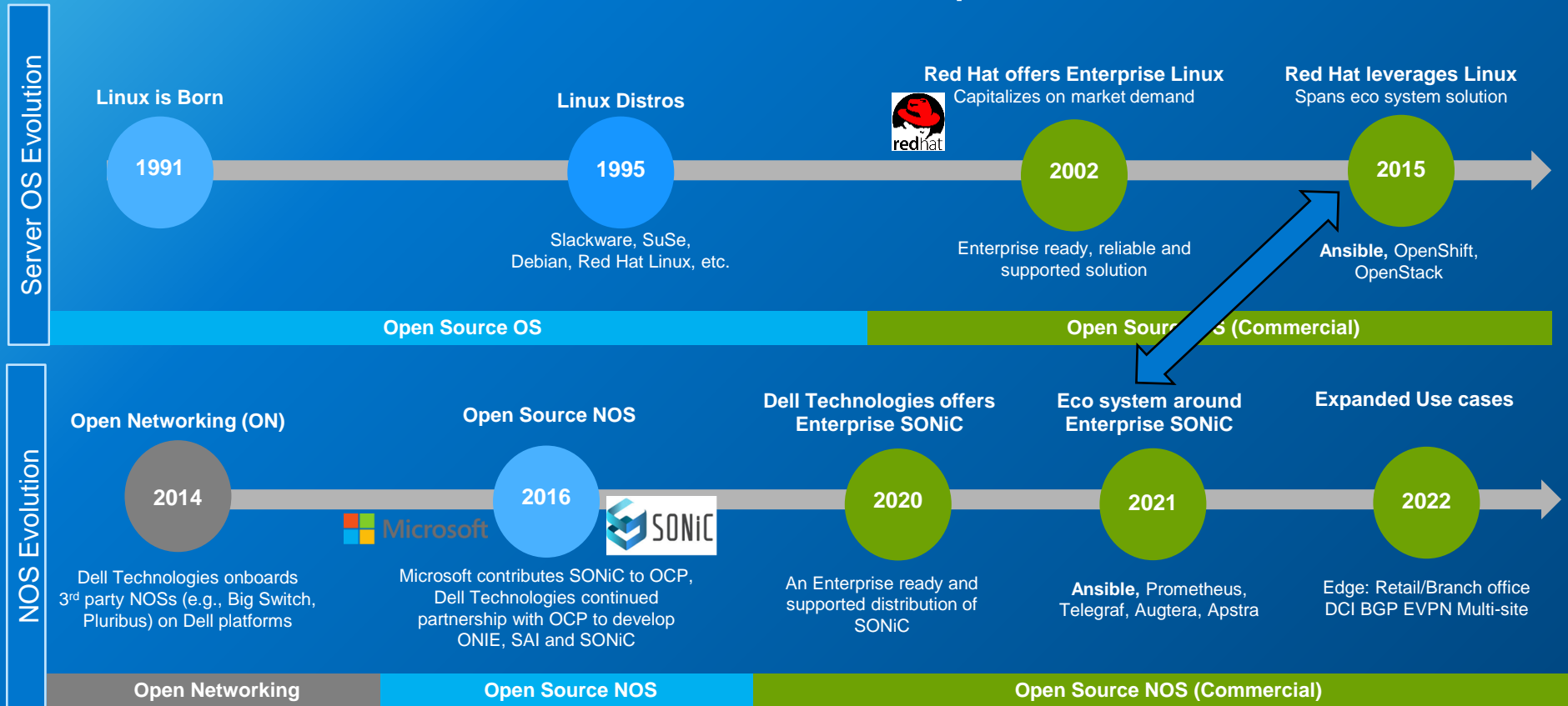|		
Enterprise Ready	• Enterprise grade features and hardening • Feature visibility	
Support Services	• Global 24x7 ProSupport and ProDeploy	
Community Contribution	• 1M+ lines of code | 5K+ defect/bug fixes • Ansible modules | User groups • User documentation	
Use case driven	• Cloud use case • Enterprise use case • Edge use case	
Integrations	• **Ecosystem partners:** Augtera, Apstra, Dorado • **Open-source solutions:** Ansible Collection certified by RedHat, Telegraf, Prometheus, OpenStack	
Automation and Visibility	• Open source, open interfaces • Telemetry and Deep analytics	• Automation ready • Container-based architecture
Tools and Utilities	• 3rd-party container management	
Education	• Virtual demos, Hands-on Labs, Fabric Design Center, Technical papers, User documentation	

D&LL Technologies

Key SONiC Community Contributions

PRs Merged
PRs in Review
PRs coming soon

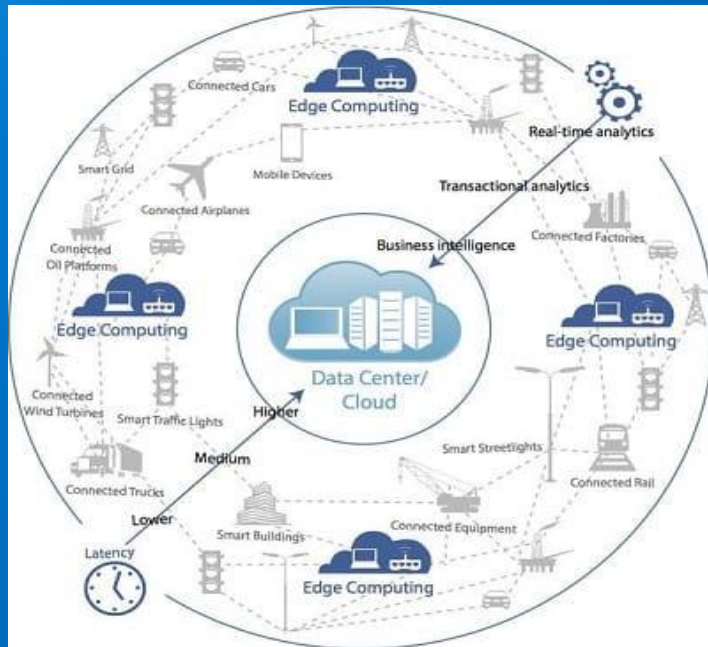| INFRASTRUCTURE	L3	L2	OTHERS
SONiC Unified Management Framework (incl. AAA/RBAC, FRR)	L3 Perf/Scale	L2 Perf/Scale	ACL enhancements (Policing, DHCP/PCP remark, L2)
Platform Development Kit (PDK) - PDE/PDDF V2.0	Bidirectional Forwarding (BFD)	PVST/STP features	Egress shaping (port, queue)
Build Improvements	VRF-Lite (co-dev)	IGMP Snooping	sFlow (co-dev)
Error Handling	EVPN/VXLAN	MCLAG (L2)	TAM - Threshold
Zero Touch Provisioning (ZTP)	Static Anycast Gateway	STP / PVST	SPytest Automation Framework (integrated with PTF)
Debug Framework	BGP Unnumbered	Port Mirror	RADIUS
Core File Management	OSPFv2	Storm Control	
Gearbox (Ext. PHY)	DHCP Relay Enhancements	UDLD	
KDUMP	IP Helper		
Dynamic Port Breakout	NAT		

DELLTechnologies

Networking following the footsteps of Compute evolution
We have a model so the time-line compresses

Server OS Evolution

Linux is Born

1991

Linux Distros

1995

Slackware, SuSe,
Debian, Red Hat Linux, etc.

Red Hat offers Enterprise Linux
Capitalizes on market demand

2002

Enterprise ready, reliable and
supported solution

Red Hat leverages Linux
Spans eco system solution

2015

Ansible, OpenShift,
OpenStack

Open Source OS

Open Source OS (Commercial)

NOS Evolution

Open Networking (ON)

2014

Dell Technologies onboards
3rd party NOSs (e.g., Big Switch,
Pluribus) on Dell platforms

Open Source NOS

2016

Microsoft contributes SONiC to OCP,
Dell Technologies continued
partnership with OCP to develop
ONIE, SAI and SONiC

**Dell Technologies offers
Enterprise SONiC**

2020

An Enterprise ready and
supported distribution of
SONiC

**Eco system around
Enterprise SONiC**

2021

Ansible, Prometheus,
Telegraf, Augtera, Apstra

Expanded Use cases

2022

Edge: Retail/Branch office
DCI BGP EVPN Multi-site

Open Networking

Open Source NOS

Open Source NOS (Commercial)

D\<LL Technologies

Living on the Edge

Trends at the Edge

- AI/ML
- Block Chain
- Virtual Reality
- IoT
- 5G Networking
- Robotic Process Automation
- Quantum Computing
- Cyber Security

Edge Computing
Real-time analytics
Connected Cars
Smart Grid
Mobile Devices
Transactional analytics
Connected Airplanes
Connected Factories
Connected Oil Platforms
Business intelligence
Edge Computing
Edge Computing
Data Center/Cloud
Connected Wind Turbines
Smart Traffic Lights
Higher
Smart Streetlights
Connected Rail
Medium
Connected Trucks
Lower
Smart Buildings
Connected Equipment
Latency
Edge Computing

Challenges at the Edge

TEAMWORK   BUSINESS

- Bandwidth
- Latency
- Connectivity
- Complex Infrastructure
- Management
- Security

$

Manufacturing
Finance
Health Care
Oil & Gas
Retail Stores

DELLTechnologies

Introducing Dell Enterprise SONiC 4.0

- **Extend SONiC Capabilities to the Network Edge**
  - Streamline management of the Datacenter and the Edge, as a single fabric
  - Automate Edge deployment and configuration tasks with open design APIs

- **Data Center Interconnect with BGP EVPN Multi-site**
  - Manage multiple SONiC sites as a single network fabric
  - Expanded business continuity & disaster recovery capabilities

2 | **Data center interconnect**

1 | **Data center networking**

Service provider data center

Interconnecting core infrastructure

Enterprise IP/MPLS WAN

Enterprise data center

Internet/cloud access

Edge

3 | **Edge Networking**

DELLTechnologies

Dell Edge Switching Platforms

- N3248PXE – 48x 10G Base-T with POE
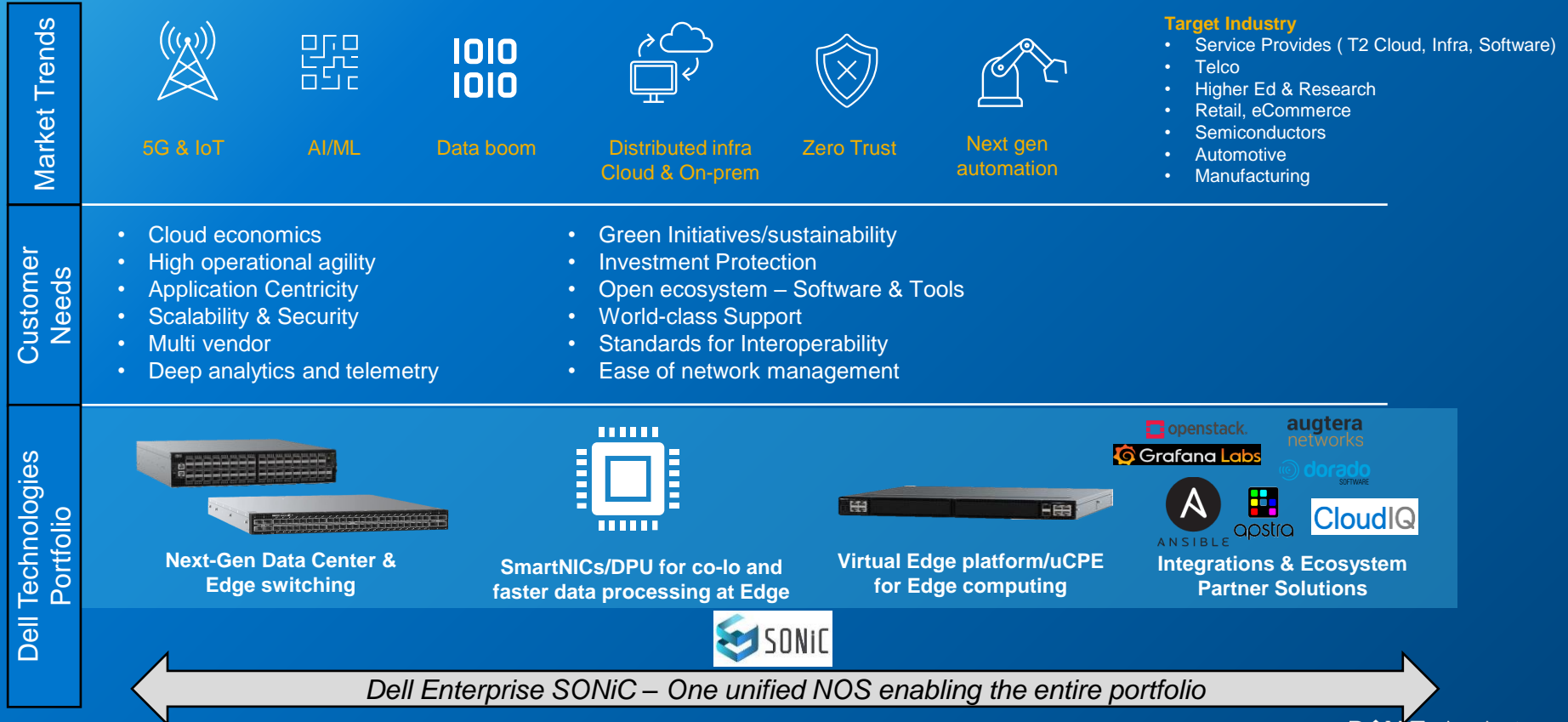- N3248P – 48x 1G Base-T
- N3248TE – 48x 1G Base-T
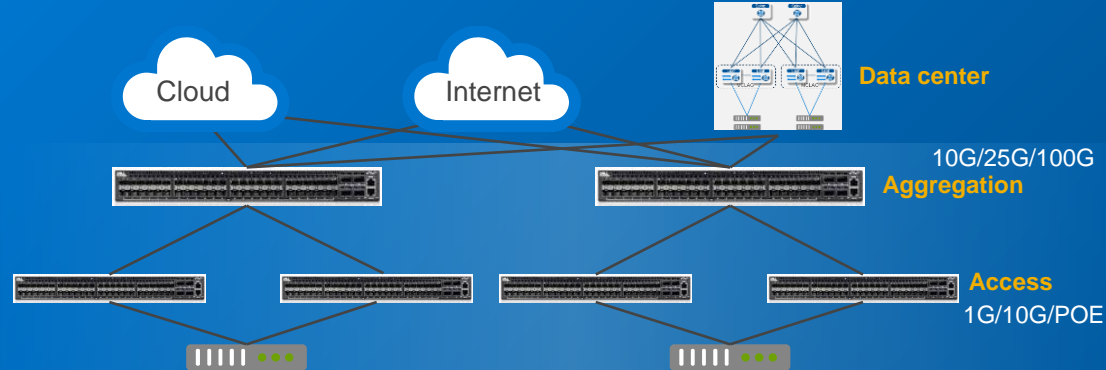
Enterprise SONiC Edge bundle features

- L2 Capabilities
- Data center L3 (BGP, ECMP, etc)
- Private VLANs
- Voice VLANs
- VXLAN EVPN
- MCLAG
- Multicast
- NAT
- ACLs
- POE/POE+
- Port Security (802.1X)
- AAA (Radius, TACACS)
- User containers

Enterprise SONiC Edge Bundle Use Cases

- Edge Bundle extends Data Center fabric to remote locations using the same NOS and tool used in the Data Center
- Can use VXLAN to stretch fabrics
- BGP EVPN Control Plane for L3 Routing
- POE/POE+ for VoIP, IP Cameras, Medical and Security Devices
- Port Security (802.1x)
- Automation and Management tools used in Data Center can be leveraged for Edge Switches
- User Container support for 3rd Party Applications

D≪LL Technologies

Dell offers a portfolio of Emerging Networking Products aligned per market trends, technology evolution, and best practices from the hyperscalers

Market Trends

5G & IoT

AI/ML

Data boom

Distributed infra Cloud & On-prem

Zero Trust

Next gen automation

Target Industry
- Service Provides (T2 Cloud, Infra, Software)
- Telco
- Higher Ed & Research
- Retail, eCommerce
- Semiconductors
- Automotive
- Manufacturing

Customer Needs

- Cloud economics
- High operational agility
- Application Centricity
- Scalability & Security
- Multi vendor
- Deep analytics and telemetry

- Green Initiatives/sustainability
- Investment Protection
- Open ecosystem – Software & Tools
- World-class Support
- Standards for Interoperability
- Ease of network management

Dell Technologies Portfolio

Next-Gen Data Center & Edge switching

SmartNICs/DPU for co-lo and faster data processing at Edge

Virtual Edge platform/uCPE for Edge computing

openstack.
Grafana Labs
augtera networks
dorado SOFTWARE
ANSIBLE
apstra
CloudIQ

Integrations & Ecosystem Partner Solutions

SONiC

Dell Enterprise SONiC – One unified NOS enabling the entire portfolio

DELLTechnologies

Sonic Support

DELLTechnologies

Hardware and software support model

Proven and trusted leader

#1 in Open Networking for the last 5 years and moving to Open Source Networking

Configuration and management tools

Containerized applications

Open source applications

Cloud version

Enterprise version

Edge version

Software license and support

Enterprise SONiC Distribution by Dell Technologies

DELL EMC PowerSwitch

Hardware ProSupport

Global Support & Services

1 year

3 year

5 year

BROADCOM® Merchant silicon

SONiC for Enterprises

Extensive testing and validation, enterprise hardened NOS brings Cloud network operating system to enterprises

Dell Technologies ProSupport

- Global coverage
- Mission critical and all the supported SKUs for hardware
- Dell EMC qualified optics
- POS – the hardware and SONiC support are tied for the same term

Global support

24/7 fast response time in 165 countries with 60,000+ professionals

Training resources

- Comprehensive documentation
- Virtual lab
- Reference architectures and white papers

DELLTechnologies

Enterprise SONiC lifecycle management

Day 0 | Day 1 | Day 2 | Day 3 and beyond

Design

Design planning
Fabric Design Center
- Bill of Materials
  - Switches
  - Cables and optics
  - Servers & Storage
- CLI Startup config
- Ansible Playbooks

Fabric Design Center

Deploy

Hardware installation
Cabling
Software installation
ONIE install
- HTTP, TFTP, FTP
- USB
Zero Touch Provision
Ansible automation

ONIE

Configure

Ansible
MF-CLI
REST API
gNMI

ANSIBLE | apstra
dorado SOFTWARE

Operate

Linux shell
Syslog
RBAC
RADIUS/TACACS+
SNMP
OS upgrades

ANSIBLE | apstra
dorado SOFTWARE

Monitor/Diagnose

sFlow
Mirroring, Everflow
Telemetry
- gNMI
- Dial-in / Dial-out
Advanced Telemetry
- Buffer Statistics Tracking
- Mirror on Drop (MoD)
- Inband Flow Analyzer

augtera networks
Grafana Labs
ca technologies | dorado SOFTWARE

DELLTechnologies

Enterprise SONiC with Ansible Collection

Open-source project to support Dell EMC NOS's with Ansible

- Ansible playbooks for deployment
- Management Framework CLI and REST
- Ansible Network Resources
- Ansible Collection
- RedHat Certified

DELL EMC

enterprise_sonic

dellemc

Ansible Network Collection for Enterprise SONiC Distribution by Dell Technologies

⬇70 Downloads   Login to Follow   Issue Tracker   Repo

Details   Read Me   **Content**

Filter content...   Show: ☐ Roles ☑ Modules ☐ Playbooks ☐ Plugins

sonic_bgp `Module` Configures global BGP protocol settings on devices running Enterprise SONiC.	**sonic_bgp_af** `Module` Configures global BGP_AF protocol settings on devices running Enterprise SONiC.	**sonic_bgp_neighbors_af** `Module` Configures BGP neighbors address-family configuration on devices running Enterprise SONiC.	**sonic_l3_interfaces** `Module` Configures Layer 3 interface settings on devices running Enterprise SONiC.
sonic_vlans `Module` Configures VLANs protocol settings on devices running Enterprise SONiC.	**sonic_l2_interfaces** `Module` Manages Layer 2 interface attributes on devices running Enterprise SONiC.	**sonic_vxlans** `Module` Manages interface attributes on devices running Enterprise SONiC.	**sonic_lag_interfaces** `Module` Manages link aggregation group (LAG) interfaces on devices running Enterprise SONiC.
sonic_config `Module` Manages configuration sections on devices running Enterprise SONiC.	**sonic_bgp_as_paths** `Module` Configures 'as path list' settings for BGP on devices running Enterprise SONiC.	**sonic_command** `Module` Runs commands on devices running Enterprise SONiC.	**sonic_bgp_neighbors** `Module` Configures BGP neighbors on devices running Enterprise SONiC.
sonic_bgp_communities `Module` Configures 'community' settings for BGP on devices running Enterprise SONiC.	**sonic_interfaces** `Module` Manages interface attributes on devices running Enterprise SONiC.	**sonic_mclag** `Module` Manages multi chassis link aggregation groups of Enterprise SONiC domain.	**sonic_bgp_ext_communities** `Module` Configures the 'extended community-list' settings for BGP on devices running Enterprise SONiC.
sonic_facts `Module` Collects facts on devices running Enterprise SONiC.	**sonic_vrfs** `Module` Manages VRF and VRF interface attributes on devices running Enterprise SONiC.	**sonic_api** `Module` Manages REST operations on devices running Enterprise SONiC.	

https://galaxy.ansible.com/dellemc/enterprise_sonic

DELLTechnologies

Datacenter Hardware

D&LL Technologies

Datacenters optimized Switches

❑ Dedicated administration port called out of band (OOB)

❑ Hot swappable redundant power supply and fans

| Power Supply 0 | Fan 0 | Fan 1 | Power Supply 1 |
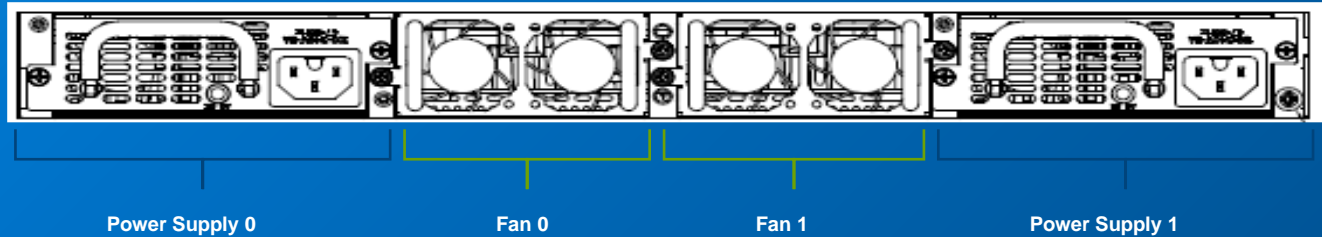
❑ Selectable Air flow « IO to PSU » or « PSU to IO »

Air out (Hot side)

Normal Airflow

IO to PSU

Air In (Cool side)

Air In (Cool side)

Reverse Airflow

PSU to IO

Air out (Hot side)

DELLTechnologies

Z9432F-ON 400GbE super spine switch

Powering up the next-generation IP fabric with 400GbE open networking

- State-of-the-art, high density 100/400GbE switch for demanding environments with 4X the throughput, 2X the price/performance and double the power efficiency of 100GbE platforms
  - **1RU Z9432F-ON**:
    - 32 ports x 400GbE
    - 64 ports x 200GbE (via breakout)
    - 128 ports x 10/50/100GbE ports (via breakout)
  - 25.6Tbps switching capacity in 1RU (full duplex)

Purpose-built for

- Web 2.0, enterprise, and Tier1/Tier2 cloud service provider data center networks with intensive compute and storage traffic, cloud IoT, AI and streaming video requirements

Dell Technologies innovation

- Supports Open Networking (ONIE) and select 3rd party OS
- Flexible & multi-rate (10/25/40/50/100/200/400GbE) for cost-effective 100GbE connectivity and to help simplify migration to 100/200/400GbE
- Running Dell EMC SmartFabric OS10
- QSFP56-DD 400G form factor with low power, cost & space

Enterprise SONiC Distribution by Dell Technologies

OS10

Dell EMC PowerSwitch Z9432F-ON

4X
Switching throughput in 1RU form factor*

2X
Density of 100GbE switching ports**

* As compared to existing 100GbE switching platforms

** As compared to existing 64 port 100GbE switch

D&LL Technologies

S5448F-ON 100/400GbE ToR switch

Multi-rate 1RU ToR switch for 15G Servers

- Fixed switch with 48x25/50/100GbE + 8x400GbE in 1RU
- Max 50/100GbE density: 72x50/100GbE (with breakout)
- SFP56-DD is backwards compatible to SFP+/SFP28 and supports 10/25/50/100G without breakouts
- 16Tbps of switching capacity (full-duplex)
- Based on Broadcom Trident4 chipset
- Full multi-rate capabilities from 10-400GbE
- Optical breakouts with single-mode and multi-mode fiber
- TAA models support TPM based Secureboot
- Supports PTPv2 (1588) and SyncE
- ON platform with OS10 and optional 3rd party OS support

Purpose-built for 400G fabrics

- Multiple ToR use cases:
  - 10/25G (NRZ) ToR to 100G/400G fabrics
  - 50/100G (PAM4) ToR to 400G fabrics
- 1.5:1 oversubscribed ToR with 8x400GbE uplinks

Dell Technologies innovation

- Supports **Open Networking** (ONIE) and select 3rd party OS
- Multi-Rate platform (10, 25, 40, 50, 100, 200, 400GbE)

NEW!

Dell EMC PowerSwitch S5448F-ON

Multi-Rate Without Breakout

2X Packet Buffers & Routes

D&LL Technologies

S5200-ON 25GbE &100GbE in-rack switches

Latest generation 25GbE & 100GbE open networking switches

- Low-cost fixed form factor top-of-rack switches offering multiple options of 25GbE SFP28 ports for in-rack server and storage connections and 100GbE QSFP28 & QFSPDD-28 ports for uplink and clustering

- Based on Broadcom Trident3 chipset

- Enhanced buffering, higher forwarding tables and data plane support for VXLAN Routing (RIOT: Routing In and Out of Tunnels)

  - S5212F-ON – 1RU, half-width,12 x 25GbE ports and 3 x 100GbE ports. 2.5X the throughput at ½ the size

  - S5224F-ON - 1RU, 24 x 25GbE ports and 4 x 100GbE ports

  - S5248F-ON – 1RU, 48 x 25GbE ports and 8 x 100GbE ports (4xQSFP28 100GbE and 2xQSFPDD-28 2x100GbE ports)

  - S5296F-ON – 2RU, 96 x 25GbE ports and 8 x 100GbE ports
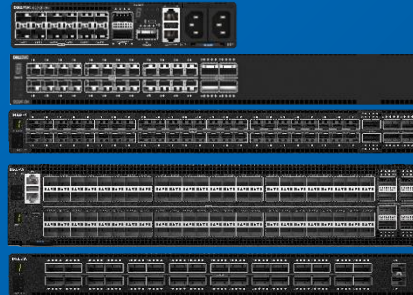
  - S5232F-ON – 1RU, 32 x 100GbE ports

Purpose-built for

- Optimized for combinations of 25GbE connections in-rack with 100G to fabric and highly scalable and cost-effective 100GbE leaf/spine fabric between data center racks

- Ideal for Web 2.0, Enterprise, mid-market and Cloud Service Provider data center networks

Dell Technologies innovation

- High Density (96-port) for ToR/MoR/EoR

- QSFPDD-28 ports for higher density 100GbE uplink (S5248F)

- Open Networking running OS10 & ONIE or Enterprise SONiC Distribution (S5232F-ON, S5248F-ON, S5296F-ON)

- Fully tested and validated with 3rd party operating systems

Enterprise SONiC Distribution by Dell Technologies

OS10

S5212F-ON

S5224F-ON

S5248F-ON

S5296F-ON

S5232F-ON

Dell EMC PowerSwitch S5200-ON

2.5X
Throughput of traffic

32
100GbE ports in 1RU

* Ports: Comparing S5296F (96) with S5048F (48) 25GbE;

DELLTechnologies

S4100-ON 10/100GbE in-rack switches

Latest multi-functional, multi-protocol 10/100GbE in-rack switches

- **S4112F-ON** – ½ RU,12 x 10GbE + 3 x 100GbE ports
- **S4112T-ON** – 1/2RU, 12 x 10GBase-T + 3 x 100GbE ports
- **S4128F-ON** - 28 x 10G SFP+ and 2 x 100G QFSP28 ports
- **S4128T-ON** - 28 x 10GBaseT ports and 2 x 100G QFSP28 ports
- **S4148F-ON** - 48 x 10G SFP+, 2 x 40G QSFP+ ports and 4 x 100G QSFP28 ports
- **S4148T-ON** - 48 x 10GBaseT ports, 2 x 40G QSFP+ ports and 4 x 100G QSFP28 ports

Applications

- 10/100GbE in-rack connectivity for servers and SDS environments

Dell Technologies innovation

- Open Networking with support for OS10 & ONIE
- Fully tested and validated with 3rd party operating systems

ONIE   OS10

Dell EMC PowerSwitch S4100-ON

10/100 GbE
in-rack connectivity

OS10 software environment
Programmable Linux OS

DELLTechnologies

S3048-ON 1/10GbE in-rack switch

Latest 1/10GbE 1RU in-rack switch
- 48 x 1GBase-T & 4 x 10GbE SFP+ ports
- Built for superior efficiency & performance
- Next-generation 1G silicon for OS9.x & ON support

Purpose-built for server and storage connectivity
- Ideal for enterprise and mid-market environments with existing 1GbE installed base
- Complete OS9 feature set including SDN, Open Automation, and virtualization features

Dell Technologies innovation
- Open Networking (ONIE)
- Fully tested and validated with 3rd party operating systems
- User Port stacking support

ONIE

OS9

Dell EMC PowerSwitch S3048-ON

1/2	1/2
Latency vs. current generation 1G ToR*	Power consumption vs. current generation*

* Source: Competitive Data Sheets

DELLTechnologies
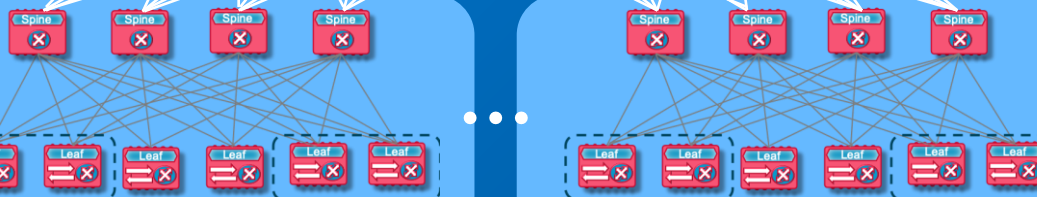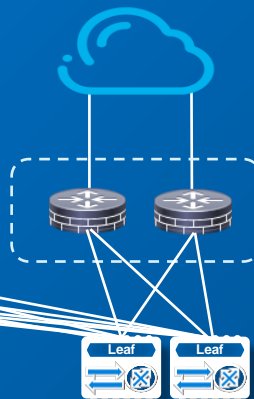
Use Cases

DELLTechnologies

Scalable L3 Fabric Underlay for Data Center

Target Deployments : Webscale DC, SP/Ent DC for workloads like Hadoop

Service Provider, Retail, Educational Institutes

Provisioning/Automation
apstra | dorado SOFTWARE | ANSIBLE

Monitoring/Analytics
augtera networks | vRealize Log Insight

- CLI/SNMP (or)
- gNMI (or)
- REST APIs -OC YANG

Sup Spine
Sup Spine
Sup Spine
Sup Spine

Leaf Leaf

Spine Spine Spine Spine   Spine Spine Spine Spine

Leaf Leaf Leaf Leaf Leaf Leaf   • • •   Leaf Leaf Leaf Leaf Leaf Leaf

DC POD 1   DC POD N

Simple
- BGP based scaleout architecture
- Simple repeatable configs with VLAN, BGP Unnumbered, ACL, QoS, VRRP

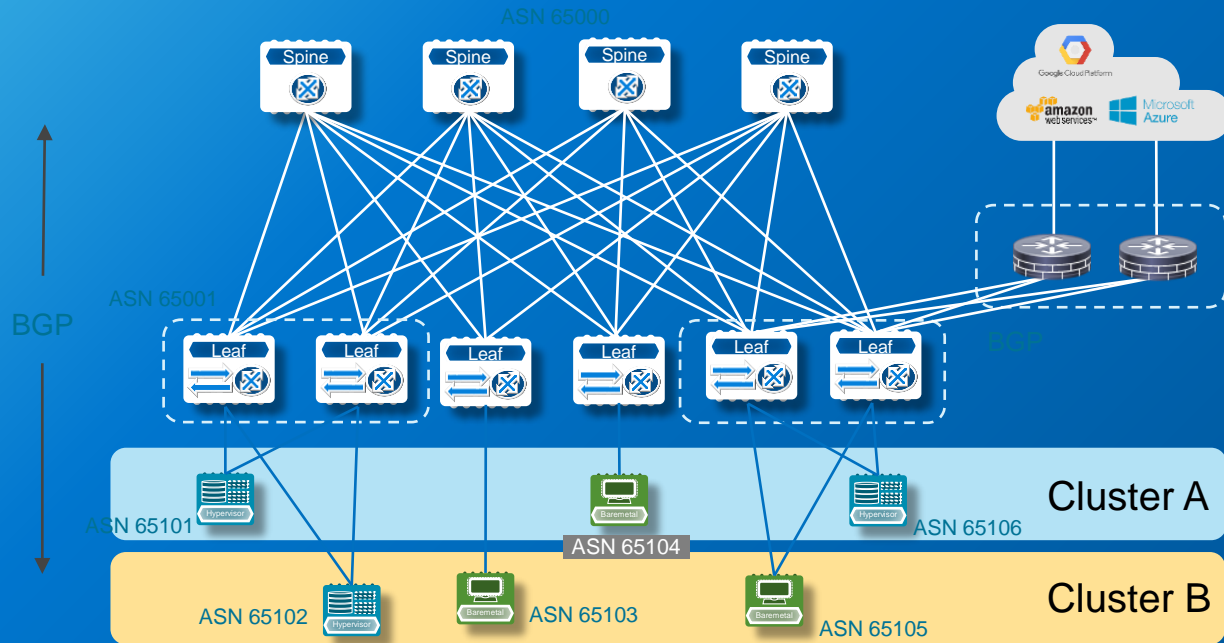## Agile
- DevOps, CI/CD
- Telemetry/Flow Analytics to gain deep visibility into network

Cost-Effective
- Merchant Silicon
- Dell Hardware

DELLTechnologies

Routing on the Host

ASN 65000

Spine Spine Spine Spine

ASN 65001

Leaf Leaf Leaf Leaf Leaf Leaf

BGP

BGP

Cluster A

ASN 65101 ASN 65106

ASN 65104

Cluster B

ASN 65102 ASN 65103 ASN 65105

Kubernetes FRR PROJECT CALICO

Simplicity
- Each Host known by it's router ID address(/32)
- Eliminates VLANs, MLAG, STP, and Port Channels on leafs
- BGP unnumbered simplifies host-leaf pt-pt addressing
- Hosts advertise their own networks dynamically

Agile
- Micro-services / cloud native
- Decouples hosts from racks

Cost-Effective
- Eliminates leaf ICL links

Resilient
- L3 time to live (TTL) prevents loops.
- Enhances troubleshooting with traceroute and as-paths

DELLTechnologies

38 © Copyright 2021 Dell Inc.

Multi-Tenancy with VXLAN EVPN

Large Enterprises, Financial Services
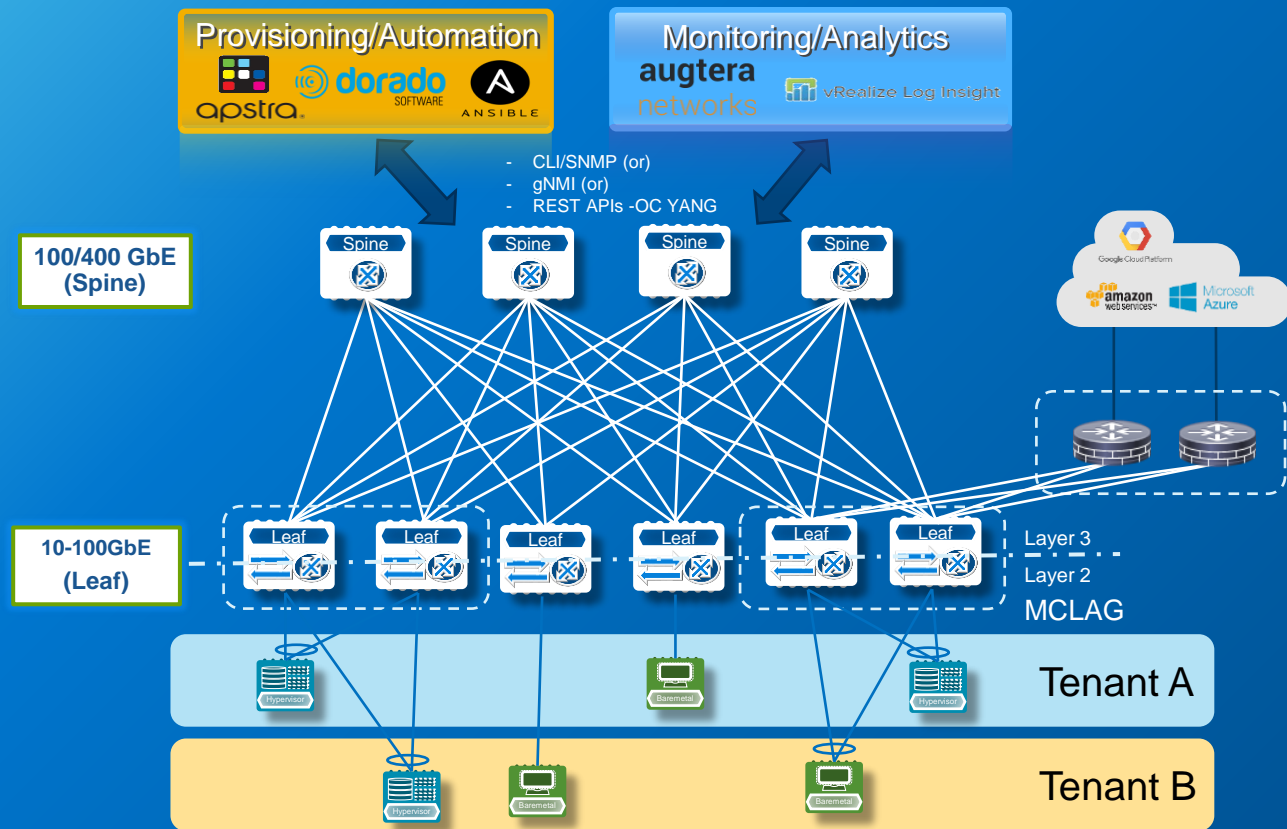
Scalable
- Large namespace compared to VLANs
- Future proof Scale-out Architecture
- BGP EVPN control plane automates VM discovery and reachability
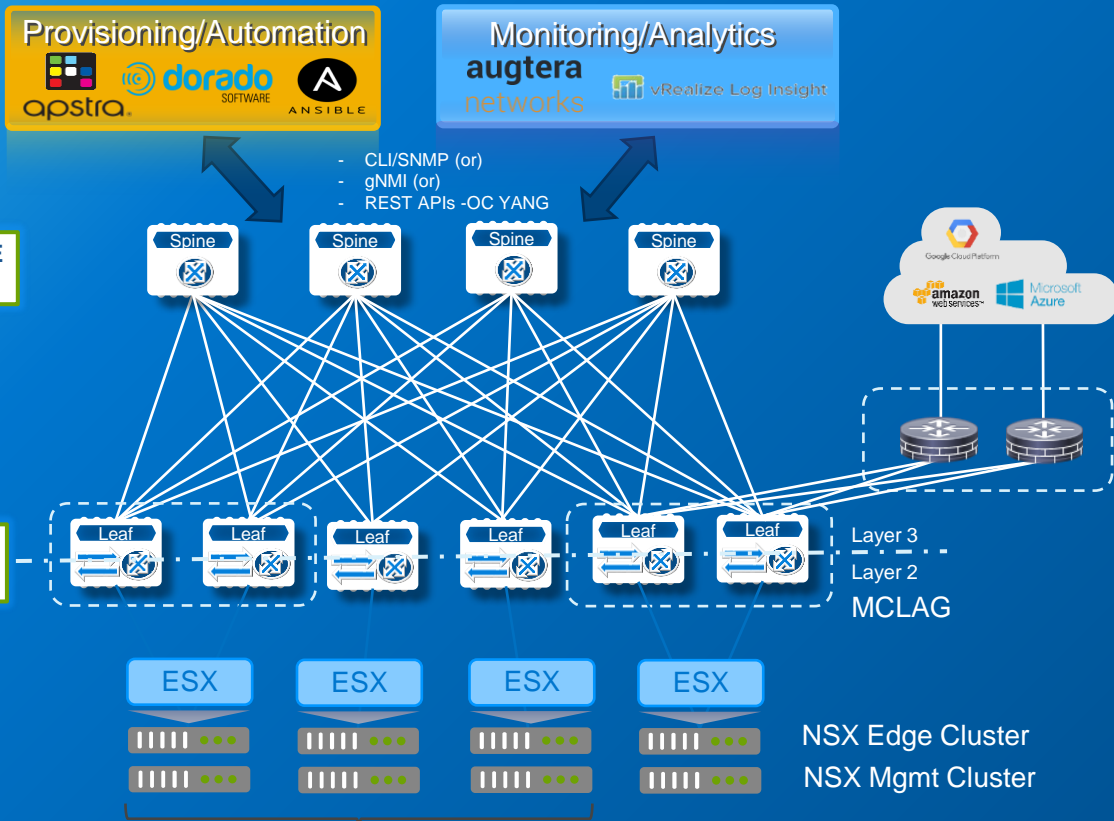
Flexible
- L2 Extension over an L3 underlay allows host mobility
- Multi-tenancy enabled by VXLAN segmentation
- L3 ECMP provides load sharing and redundancy
- ARP suppression to limit broadcast flooding

Open
- Standards based solution allows interoperability between vendors

Provisioning/Automation
apstra · dorado SOFTWARE · ANSIBLE

Monitoring/Analytics
augtera networks · vRealize Log Insight

- CLI/SNMP (or)
- gNMI (or)
- REST APIs -OC YANG

100/400 GbE (Spine)
Spine Spine Spine Spine

10-100GbE (Leaf)
Leaf Leaf Leaf Leaf Leaf Leaf

Layer 3
Layer 2
MCLAG

Tenant A
Tenant B

Google Cloud Platform · amazon web services · Microsoft Azure

DELLTechnologies

Network Fabric Underlay for SDN Deployments
(E.g., vCenter, ESX, vSAN, NSX)

Provisioning/Automation
apstra   dorado SOFTWARE   ANSIBLE

Monitoring/Analytics
augtera networks   vRealize Log Insight

- CLI/SNMP (or)
- gNMI (or)
- REST APIs -OC YANG

100/400 GbE (Spine)

Spine   Spine   Spine   Spine

Google Cloud Platform
amazon web services   Microsoft Azure

10-100GbE (Leaf)

Leaf   Leaf   Leaf   Leaf   Leaf   Leaf

Layer 3
Layer 2
MCLAG

ESX   ESX   ESX   ESX

NSX Edge Cluster
NSX Mgmt Cluster

ESX/NSX Compute Clusters

Scalable
- BGP based scaleout architecture
- Simple repeatable configs with VLAN, BGP, ACL, QoS, VRRP
- VMware NSX based Multi-Tenant Cloud with VXLAN gateways on server

Flexible
- DevOps/CI/CD, Fast Reboot
- Programmatic Interfaces
- Telemetry/Flow Analytics to gain deep visibility into network

Open
- Standards based solution allows interoperability between vendors

DELLTechnologies

Bringing all together

DELLTechnologies

Enterprise SONiC 4.0 Feature Overview

Protocols

- Traffic forwarding Scalability (S5200)
- BGPv4/v6, ECMP, BFD, VRRPv4/v6
- Routed sub-interfaces (S5200)
- Static routing
- Policy Based Routing
- VRF-lite, Management VRF
- OSPFv2
- LAG, LLDP, LLDP-MED
- NTP, DHCP Relay, DHCP Opt 82
- 802.1x (PAC)

- QOS, WRED
- PFC, ECN
- L2 & L3 VXLAN, A & Symm IRB
- DCI Multi-Site
- BGP EVPN
- BGP Unnumbered
- Anycast Gateway
- MCLAG, LACP Fallback
- PVST, RPVST+, MSTP
- L2 & L3 Multicast, IGMP, PIM-SSM, IGMP Snooping
- COPP, Storm Control
- UDLD
- IP SLA

Platforms

- **Z9432F-ON**
  Trident4.x11, 32x400G + 2x10G
- **Z9332F-ON**
  Tomahawk3, 32x400G + 2x10G
- **Z9264F-ON**
  Tomahawk2, 64x100G + 2x10G
- **S5232F-ON**
  Trident3.x7, 32x100G + 2x10G
- **S5448F-ON**

- **S5296F-ON**
  Trident3.x7, 96x25G + 8x100G
- **S5248F-ON**
  Trident3.x7, 48x25G + 4x100G + 2x(2x100G)
- **S5224F-ON**
  Trident3.x5, 24x25G + 4x100G
- **S5212F-ON**
  Trident3.x5, 12x25G + 3x100G
- **N3248TE-ON** (OOB Mgmt use case)
  Trident3.x3, 48x1G + 4x10G + 2x100G
- **N3248X-ON** Trident3.x5, 48x10G
- **N3248PXE-ON** Trident3.x5, 48x10G POE

Community

- Community version 202012
- SAI version 3.8.2
- Debian 10 (Buster)
- Linux kernel 4.19
- FRR 7.2

Infrastructure

- L2 & L3 ACL
- TACACS, RADIUS, RBAC
- Dynamic port breakout
- Standard interface naming
- SNMPv2/v3
- Syslog
- NAT
- NTP
- PoE, PoE+, UPoE

Management and Monitoring

- ZTP
- gNMI, REST, MF-CLI, OpenConfig models
- Silicon telemetry (IFA, MOD)
- Silicon Analytics: In-band Flow Analyzer 2.0, Drop Monitor, Tail-stamping
- sFlow
- RSPAN, ERSPAN/Everflow

Ecosystem

- Ansible collection
- Apstra
- Augtera
- Fabric Design Center
- Telegraf
- CLoudIQ

D&LL Technologies

Bringing the Cloud Networking to Enterprise

➢ **Open Source Technology**
- ✓ Active and Growing Community
- ✓ Access to source code and multiple vendors

➢ **Scale**
- ✓ 1000's to 10000's switches
- ✓ L3 Fabric
- ✓ VxLAN EVPN Fabric

➢ **Micro-services Architecture**
- ✓ Serviceability
- ✓ Fast and Warm Reboot

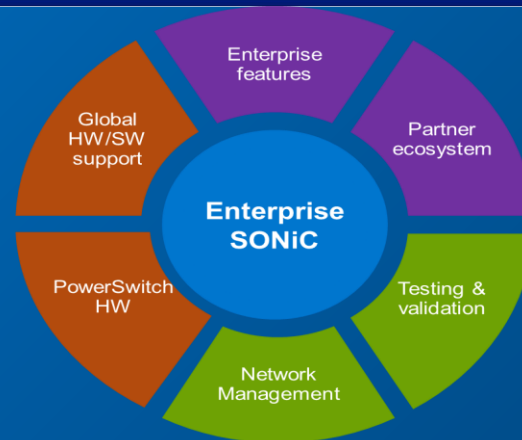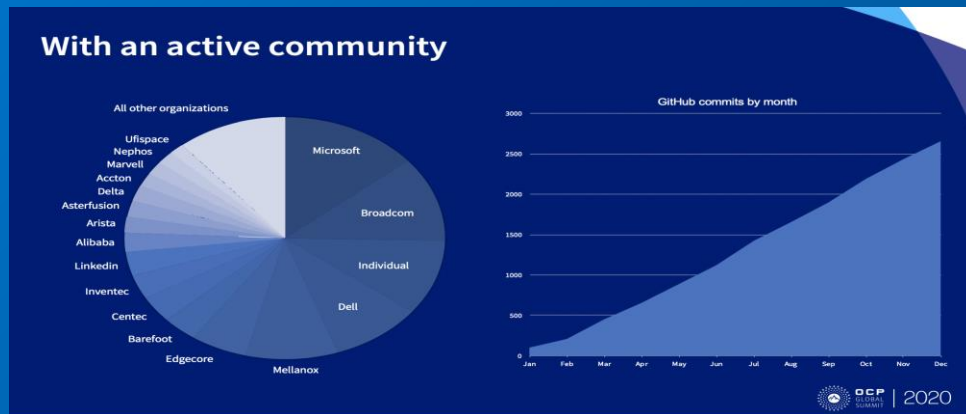➢ **New technologies – Evolution of the Networks**
- ✓ Open Standard
- ✓ ZTP (ONIE + SONiC)
- ✓ Streaming Telemetry REST, gNMI, gNOI
- ✓ Automation
- ✓ **Everflow**, sFlow, SPAN
- ✓ **Silicon advanced analytics: IFA, MoD, BST**
- ✓ Containerized Apps

➢ **Telemetry, Monitoring, and Fault Prediction**
- ✓ Augtera AI Network Pulse

➢ **Intent-based Networking**
- ✓ Apstra AOS

With an active community

Open source networking made real

D∈LL Technologies

Our Vision & Strategy

VISION

- **Cloud-inspired NOS** to provide Enterprises with reliability, flexibility and disaggregation
- Be the **Linux of Networking**
- Flexible standards based **Open interfaces**

STRATEGY

- Offer **commercial distribution of SONiC**
- **Enable one unified NOS** across the product portfolio
- **Enterprise enablement –** Extending SONiC from DC to Edge, Telco & VLE DC features
- **Value proposition :**
  - E2E Support – SW, HW, Ecosystem technologies
  - Global supply chain
  - Predictable Roadmap
  - Ecosystem partner technologies
  - Documentation and Training

Delivering customers full control and choice of the technology stack –
HW, SW, and ecosystem tools, at optimal cost and no vendor lock-in

Technology Support

- Ecosystem & Apps
- Open Interfaces
- NOS Standardization
- Choice of HW

DELLTechnologies

When to recommend OS10 vs. Enterprise SONiC

	SmartFabric OS10	Enterprise SONiC Distribution by Dell Technologies
Description	Linux-based, multi-purpose OS featuring an industry-hardened networking stack with standard L2 and L3 protocols over a standard CLI interface	Highly scalable and flexible open source-based OS featuring a scalable and flexible architecture based on containers and including L2 and L3 protocol support with an enterprise-class centralized management infrastructure
Targeted use cases	- SMB and Commercial - 10s of nodes in fabric - Server attachment - Integrated solutions - Traditional SNMP monitoring	- Large enterprise, cloud-level hyper-scale environments - 100s of nodes in fabric - DevOps mentality - Advanced telemetry and analytics

D≪LL Technologies

Resource links

Dell Technologies resources
Enterprise SONiC Distribution by Dell Technologies Sales Portal.
Reach out to the team for questions.

SONiC Community resources
Community SONiC portal: Azure.github.io/SONiC
Community SONiC wiki: Github.com/Azure/SONiC/wiki
Community binaries – find the platform and appropriate binary:
Github.com/Azure/SONiC/wiki/Supported-Devices-and-Platforms

APPS

SONiC

**DELL EMC
PowerSwitch**

Hands-on resources

SONiC lab on DemoCenter.dell.com

- Introduction to SONiC OS

- FRRouting with SONiC

- BGP Communities

New DemoCenter

D∕LL Technologies

Networking labs @ New Dell Demo Center

Employee and Partners: https://democenter.delltechnologies.com

Customers: https://www.delltechnologies.com

Invite customers to Networking labs @ Demo Center

Sales can create a Lab and invite customers on demand

Option to extend the Lab up to 7 days

DELLTechnologies

Dell Networking – Key Use Cases & Value Propositions

Key deliverables are Simplicity, Flexibility and Interoperability

OS10 / SONiC	SFS	CloudIQ	SFSS	Edge – Connect & Secure

KEY USE CASES – INTEGRATED			**KEY USE CASES – EMERGING**	

Storage / Compute Attach	NVMe / TCP with Automation	Ready Insights	Scalable DC Networking	Edge Networking	Cloud Managed Networking

SmartFabric Services	**SmartFabric Storage Software**	**CloudIQ**	**Dell Enterprise SONiC**	**SONiC EDGE BUNDLE**	**SDWAN with Security**
▪ Plug-and-play fabric deployment ▪ Simplified management and orchestration ▪ Automatic onboarding of workload devices ▪ Integrated lifecycle Integration with VMware vCenter and NSX-T ▪ Built-in monitoring ▪ Available at "No Extra Cost"	▪ "FC like" services for NVMe over TCP storage hosts ▪ Automation of complex storage and networking tasks ▪ Single Pane of Management with vCenter ▪ Single Pane of Management for SFS & SFSS with Dell Switches	▪ Cloud based Monitoring ▪ Single pane of glass for compute, storage and switch telemetry ▪ Reduces Risk, Helps Plan Ahead, Improves Productivity ▪ "Out of the box" Analytics ▪ Available at "No Extra Cost"	▪ Built for "Cloud Era" Networking ▪ Built for simplicity and scale ▪ Open Source – deployed by Top Hyperscalers and Telcos ▪ Dell brings the experience to Enterprise customers – "Redhat Style " ▪ Standards based automation ▪ Multi-Vendor Support	▪ Edge use case extends data center fabric to remote locations using the same NOS and tools ▪ Power IP Cameras, Medical and Security Devices ▪ Network OS for SmartNIC/DPU for colo and faster data processing at Edge (Upcoming) ▪ Retail Use case released	▪ Dell Virtual Edge Platform - Universal CPE with flexible capabilities ▪ Cloud and On-premise management options ▪ Easy connectivity to Cloud apps from anywhere ▪ Securing the end clients, backbone connectivity and web connections

▪ **RELIABLE 24/7 GLOBAL SUPPORT & SERVICES**   ▪ **FAR BETTER LEAD TIMES THAN COMPETITION**

DELLTechnologies

Learn more at
delltechnologies.com/networking

D&LL Technologies