SRv6 in SONiC:
Unleashing the power of Network Programming and Disaggregation

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Cisco Systems

Agenda

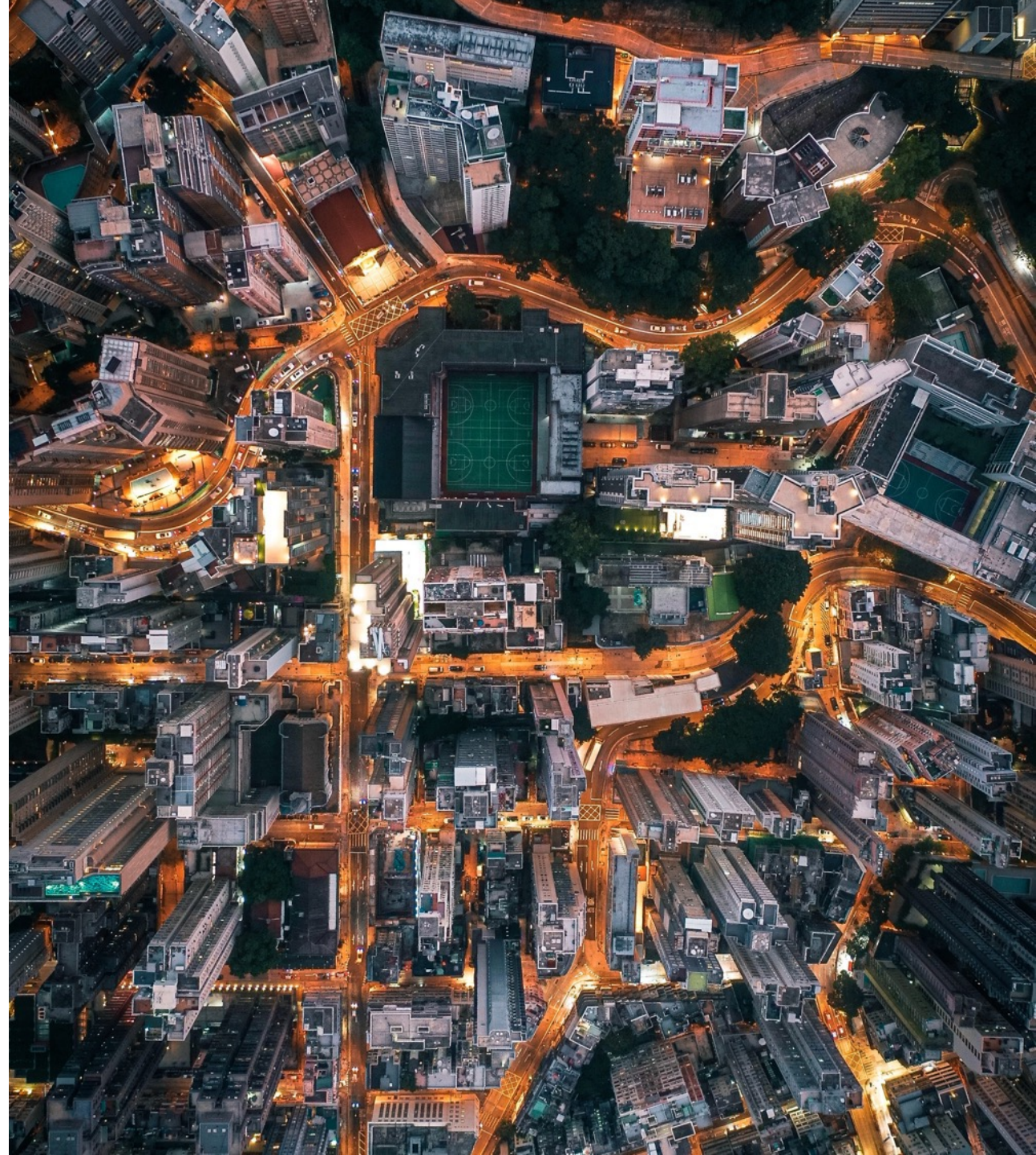Cisco Disaggregation Strategy and Domains

Cisco HW-Only Offerings (SONiC on C8K)

SRv6 in SONiC & Demonstration

Summary

Disaggregation, Definitions and Approaches

Software Delayering

SDN-enabled NOS with community tools and open-source software SW/APIs

Software Disaggregation

Software only offering on x86 (vRouter) and Integration on OCP-compliant 3rd party Hardware

Cisco XR
Cisco XR
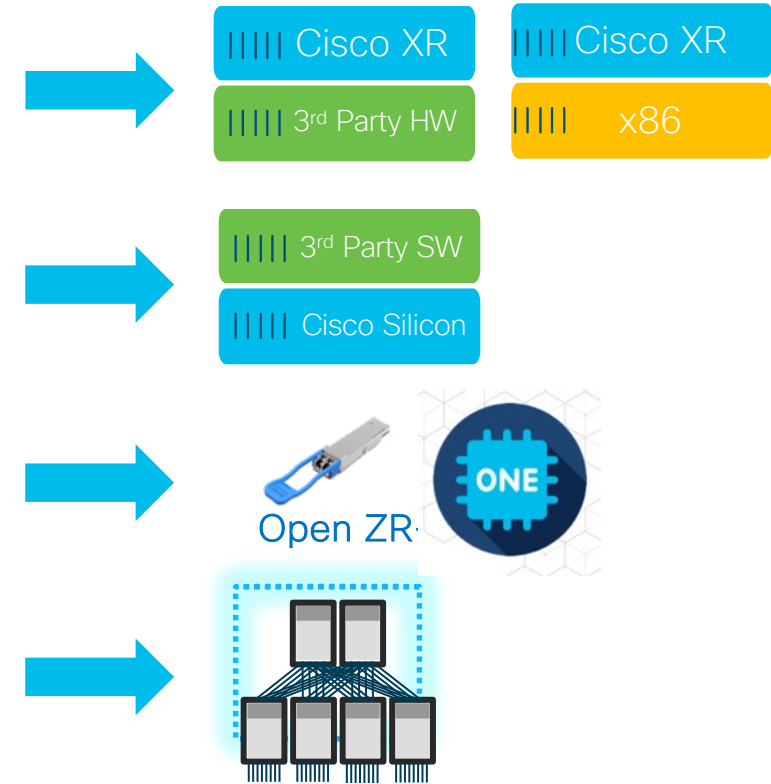3rd Party HW
x86

Hardware Disaggregation

Hardware only offering with third party Software (e.g. SONiC, etc.)

3rd Party SW
Cisco Silicon

Component Disaggregation

Deliver Optics and ASICs to 3rd party hardware as well as support 3rd party optics
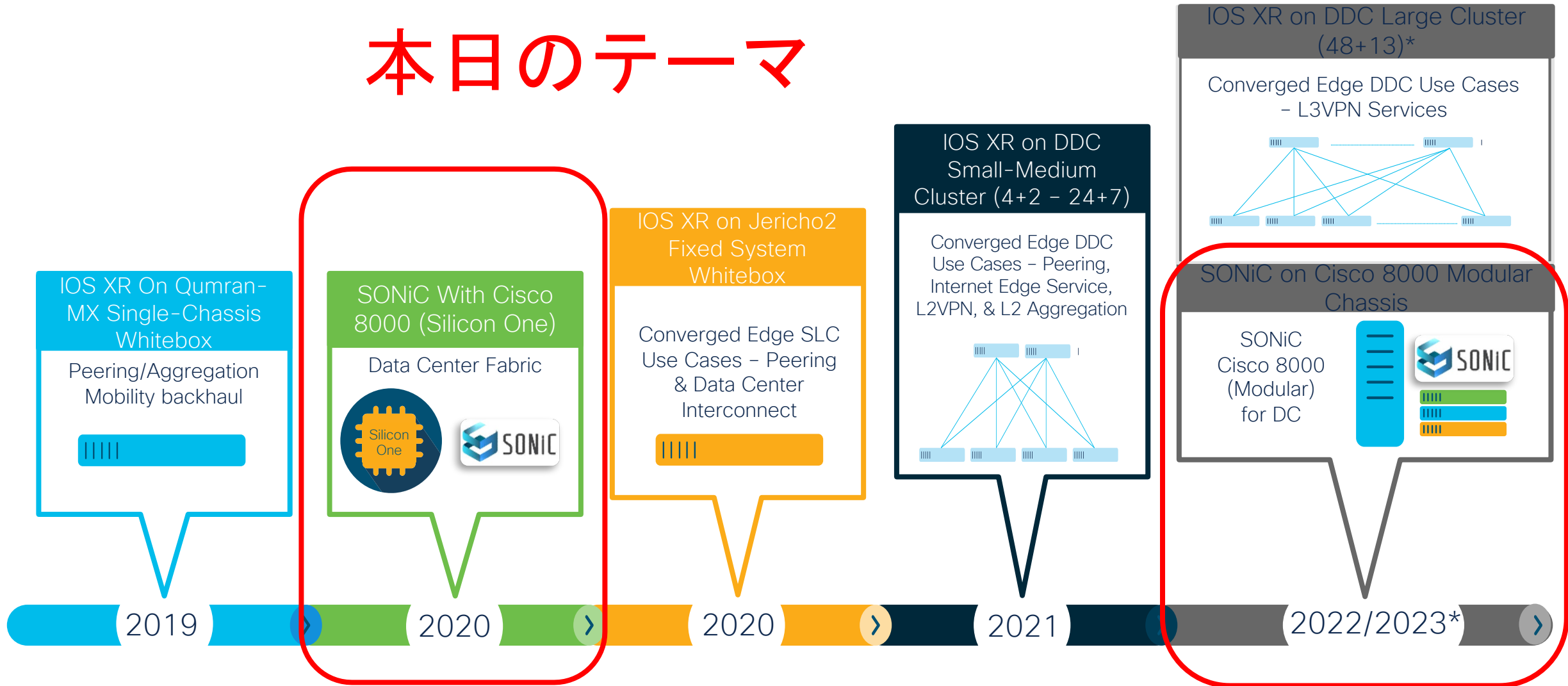
Open ZR+
ONE

Distributed Software

Single NOS for multiple hardware devices forming a virtual cluster = Fabric Router (DDC)

Cisco's Disaggregation Journey

本日のテーマ

IOS XR On Qumran-MX Single-Chassis Whitebox
Peering/Aggregation Mobility backhaul

SONiC With Cisco 8000 (Silicon One)
Data Center Fabric

IOS XR on Jericho2 Fixed System Whitebox
Converged Edge SLC Use Cases – Peering & Data Center Interconnect

IOS XR on DDC Small-Medium Cluster (4+2 – 24+7)
Converged Edge DDC Use Cases – Peering, Internet Edge Service, L2VPN, & L2 Aggregation

IOS XR on DDC Large Cluster (48+13)*
Converged Edge DDC Use Cases – L3VPN Services

SONiC on Cisco 8000 Modular Chassis
SONiC Cisco 8000 (Modular) for DC

2019   2020   2020   2021   2022/2023*

Cisco HW-Only Offerings (SONiC on C8K)

Why SONiC?

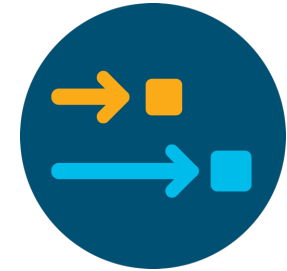## Decouples Hardware & Software

SONiC is built on Switch Abstraction Interface that helps in accelerating hardware innovation

Accelerates Software Evolution

First solution to break monolithic switch software into multiple containerized components that accelerates software evolution
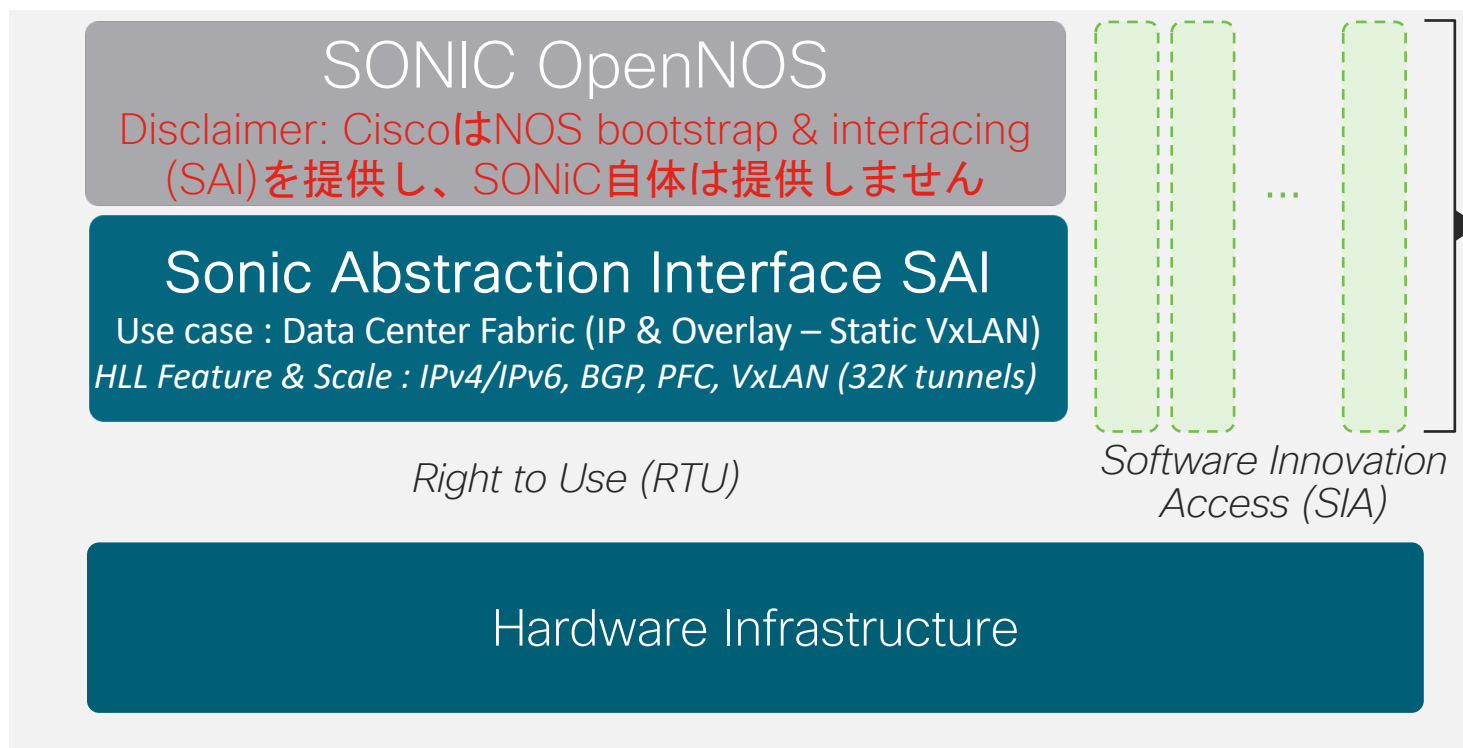
Rapidly Growing Ecosystem

SONiC has gained wide industry support over the last years that includes major network chip vendors

SONiC on Cisco 8000

Ciscoからは Hardware 及び SAIまでを提供
SONiC自体はCCOからダウンロードできますが、コミュニティ版を提供しています

SONIC OpenNOS
Disclaimer: CiscoはNOS bootstrap & interfacing (SAI)を提供し、SONiC自体は提供しません

Sonic Abstraction Interface SAI
Use case : Data Center Fabric (IP & Overlay – Static VxLAN)
HLL Feature & Scale : IPv4/IPv6, BGP, PFC, VxLAN (32K tunnels)

Right to Use (RTU)

Software Innovation Access (SIA)

Hardware Infrastructure

SONiC Control Plane and Userspace Libraries

CPU
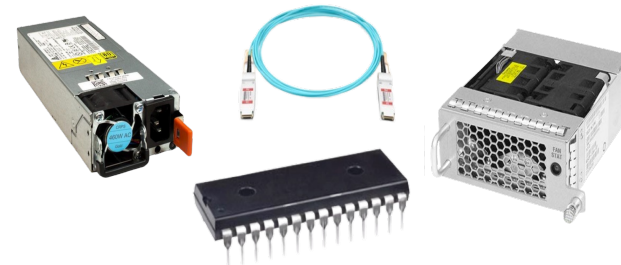
sai

Platform Plugins

ASIC SDK
(Cisco Silicon One)

UserSpace

Kernel

Platform Drivers

NPU
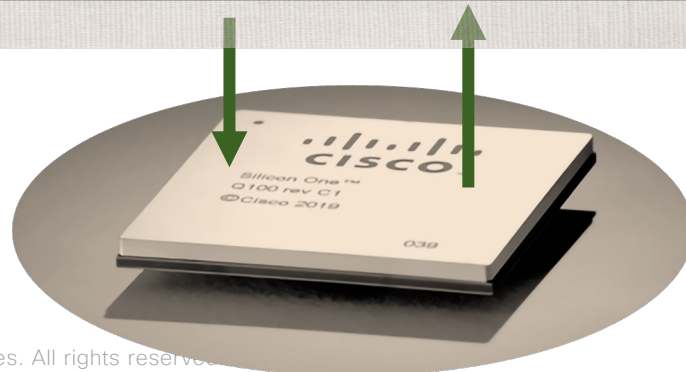
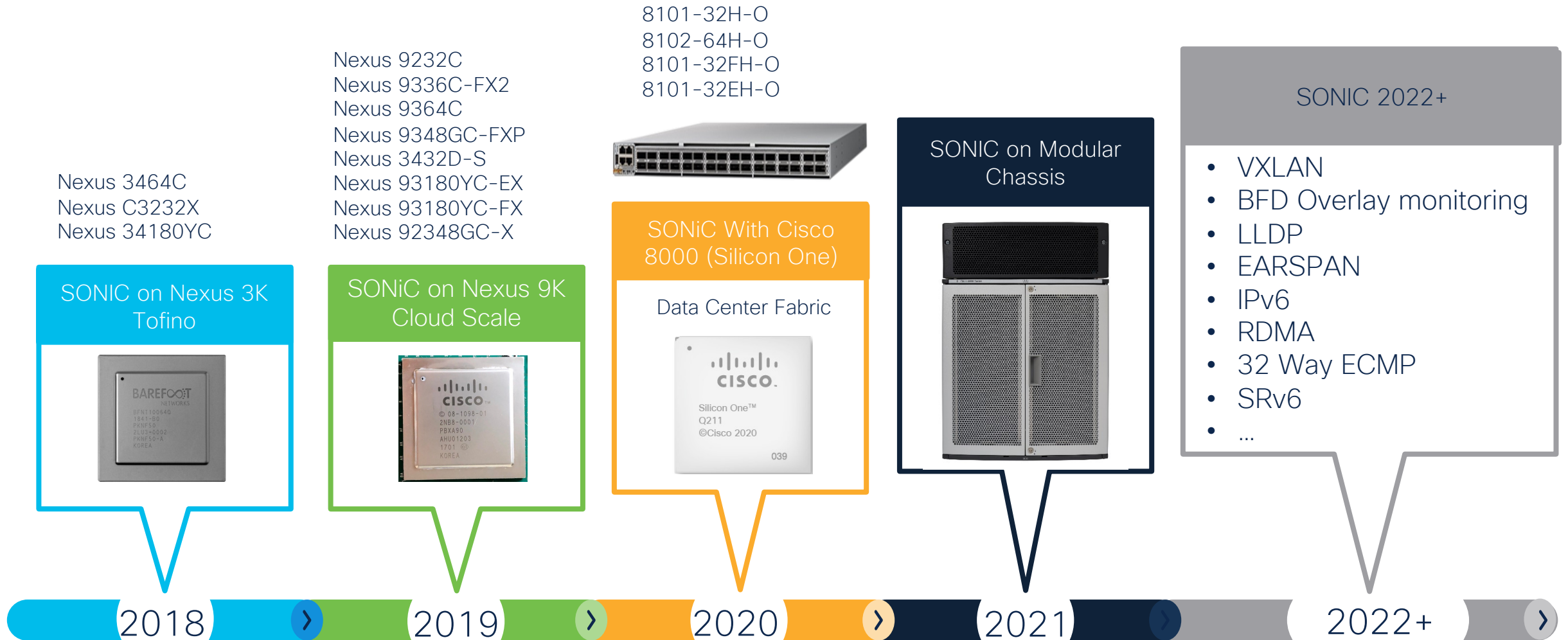Peripheral HW

Cisco's Sonic Journey

8101-32H-O
8102-64H-O
8101-32FH-O
8101-32EH-O

Nexus 9232C
Nexus 9336C-FX2
Nexus 9364C
Nexus 9348GC-FXP
Nexus 3432D-S
Nexus 93180YC-EX
Nexus 93180YC-FX
Nexus 92348GC-X

Nexus 3464C
Nexus C3232X
Nexus 34180YC

SONIC 2022+

SONIC on Modular
Chassis

SONiC With Cisco
8000 (Silicon One)

SONIC on Nexus 3K
Tofino

SONiC on Nexus 9K
Cloud Scale

Data Center Fabric

- VXLAN
- BFD Overlay monitoring
- LLDP
- EARSPAN
- IPv6
- RDMA
- 32 Way ECMP
- SRv6
- ...

2018   2019   2020   2021   2022+

https://www.cisco.com/c/en/us/td/docs/iosxr/cisco8000/sonic/b-release-notes-sonic-202205.html
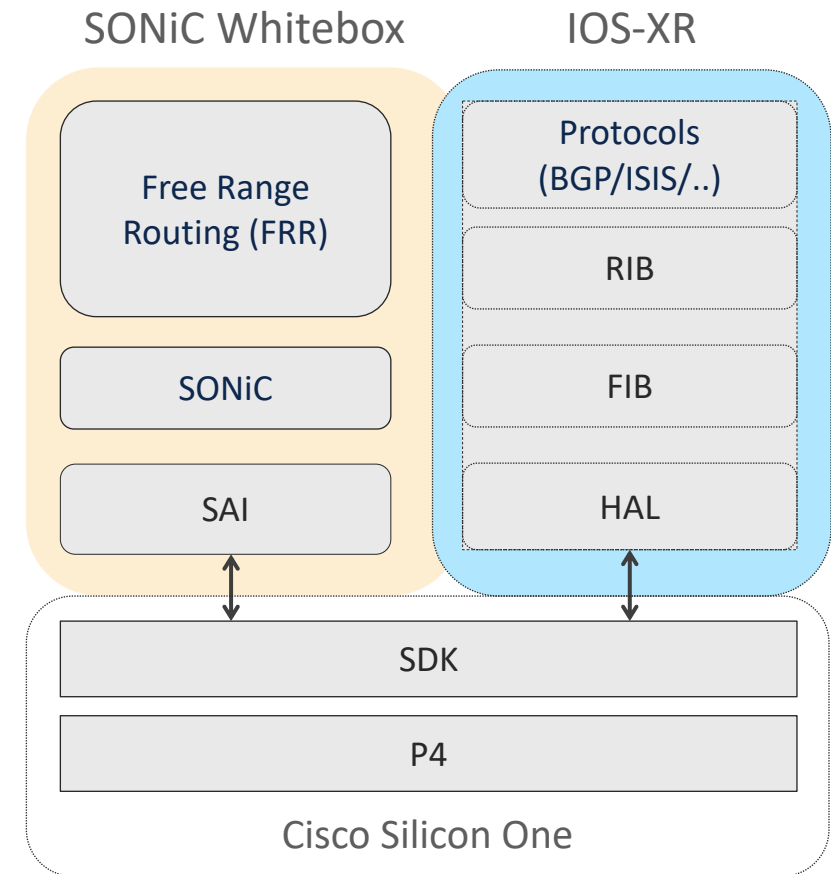
SRv6 in SONiC

SRv6 uSID

- End-to-End Service Creation
  - Across Access/Metro/Core/DC/NFV
  - Any kind of service: VPN, TE, NFV, …

- End-to-End Measurement Analytics
  - Liveness/Loss/Latency/ECMP

- End-to-End across Commercial and Whitebox routers
  - Commercial IOS-XR
 - Whitebox SONiC

SRv6 uSID: End-to-End across Commercial and Whitebox routers

- Cisco Silicon One
  - P4/SDK

- Commercial router
  - Cisco IOS-XR
  - Native SDK API

- Whitebox enablement
  - SAI header/SAI Adaptor
  - SONiC/FRR (and Linux kernel)

- Richer support than MPLS after 20 years

SONiC Whitebox

IOS-XR

Free Range Routing (FRR)

SONiC

SAI

Protocols (BGP/ISIS/..)

RIB

FIB

HAL

SDK

P4

Cisco Silicon One

SRv6 uSID in SONiC/SAI

- Collaboration with Alibaba to enable SRv6 uSID whitebox running SONiC

- Full-stack solution: SAI Adaptor + SONiC + FRR
  - SAI: Industry collaboration (CSCO, BCOM, Intel) to define the SRv6 SAI header
    - > SAI has full SRv6 uSID support + Path Tracing midpoint
  - SONiC/FRR: Today we support an SRv6 fabric with BGP services + ISIS-SRv6
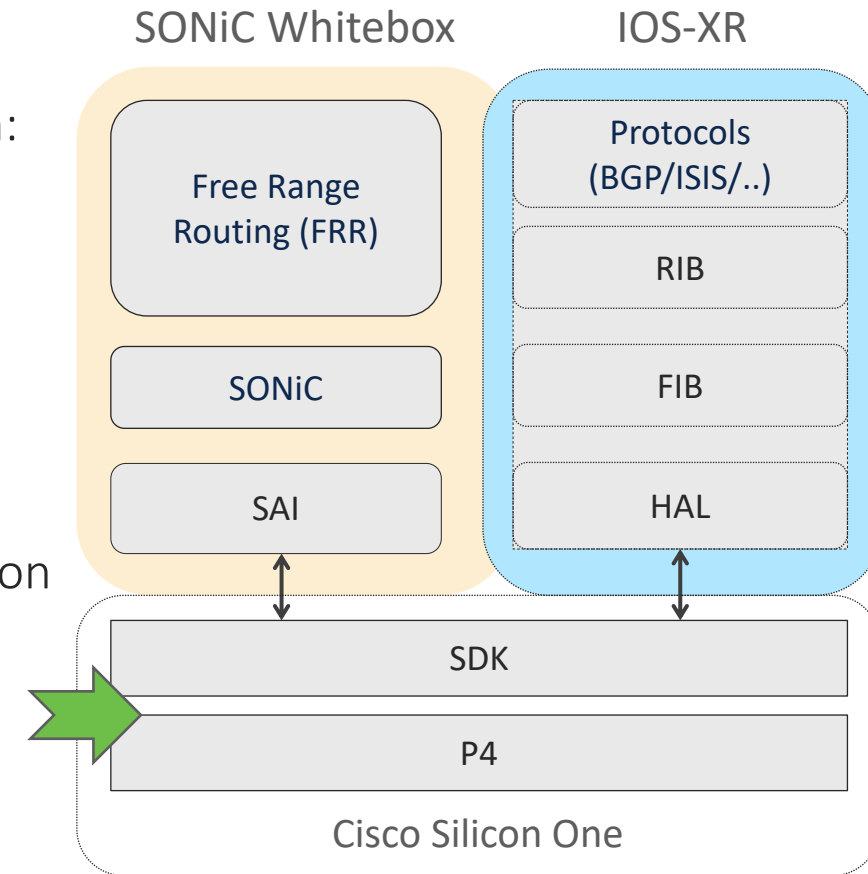   - > Work in progress to include all the measurements!
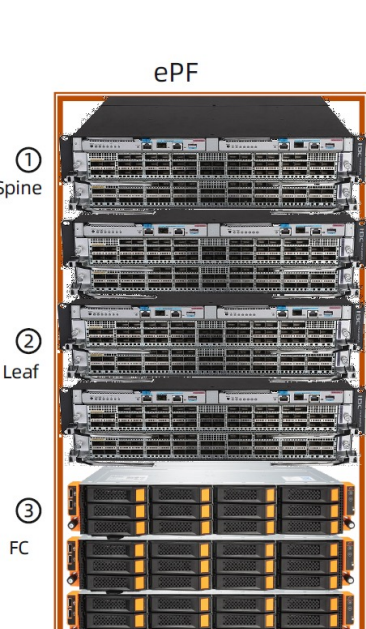
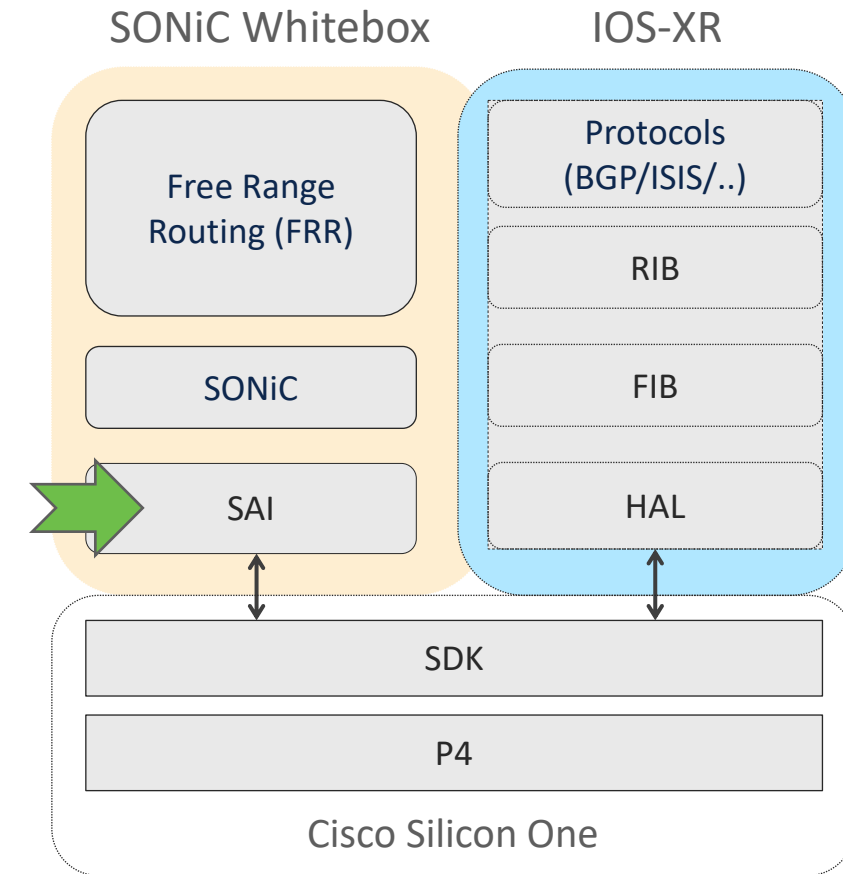# SRv6 uSID on Cisco Silicon One
SONiC and Cisco Commercial NOS

▶ SRv6 is fully enabled on Q200 using P4 programmable NPU

▶ Common SDK exposes SRv6 functions and attributes to integrate with:

    SONiC using SAI adaptor

    Commercial NOS (Cisco IOS-XR, ..) using native APIs

▶ Implementation includes full SRv6 support with:

    L3VPN and Policy

    Overlay and Underlay ECMP support

    Determine underlay NH automatically or through NOS specification

▶ Path Tracing

▶ Future Cisco Silicon One devices are also SRv6-enabled
(single SDK/P4 across all chipsets)

SONiC Whitebox

- Free Range Routing (FRR)
- SONiC
- SAI

IOS-XR

- Protocols (BGP/ISIS/..)
- RIB
- FIB
- HAL

Cisco Silicon One

- SDK
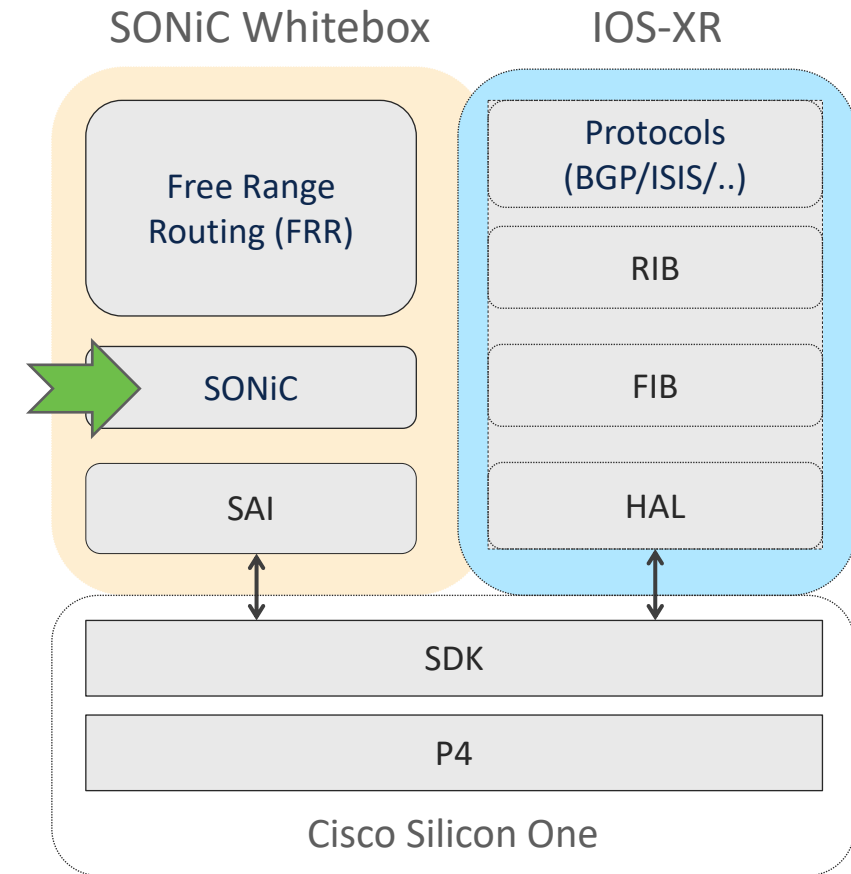- P4

SRv6 uSID on Cisco Silicon One
SAI Header and S1 SAI Adapter

▶ SAI Header

> SAI 1.9 (June 2021): SRv6 uSID full support
>
> Hardware abstraction layer across merchant silicon providers
>
> Collaboration among Cisco, Alibaba, Broadcom and Intel Barefoot
>
> SAI 1.12: SRv6 uSID VPN Hyperscale enhancement

▶ S1 SAI Adapter

> Cisco Silicon One has full implementation of SRv6 uSID SAI Header

SONiC Whitebox | IOS-XR

Free Range Routing (FRR)	Protocols (BGP/ISIS/..)
SONiC	RIB
	FIB
SAI	HAL

SDK

P4

Cisco Silicon One

SRv6 uSID is fully supported in SONIC

- SONIC 202211
  - uN/uA/uDT4/uDT6/uDT46
  - H.Encaps/H.Ecanps.Red

- Across all SONiC components
  - ConfigDB/App DB/Orchestration Agent
  - Fpmsyncd (for the integration with FRR)

- Path Tracing in SAI/SONiC
  - https://github.com/opencomputeproject/SAI/pull/1841
  - https://github.com/sonic-net/SONiC/pull/1456

SONiC Whitebox | IOS-XR

Free Range Routing (FRR)

Protocols (BGP/ISIS/..)

RIB

SONiC

FIB

SAI

HAL

SDK

P4

Cisco Silicon One

Demo

Conclusion

- SRv6 uSID: End-to-End Solution
  - End-to-End Policy Creation
  - End-to-End Measurement Analytics
  - End-to-End across Commercial and Whitebox routers

- SRv6 uSID is fully supported in SONiC based Whitebox

- Richer SRv6 support than MPLS after 20 Years.

- CY23: Path Tracing support.
  - Complete trajectory of the packet at linerate with 60usec (WAN)/200nsec (DC).

- We appreciate the contribution from our ecosystem partners