



SRv6 uSID in SONiC

Ahmed Abdelsalam, Carmine Scarpitta

Cisco Systems

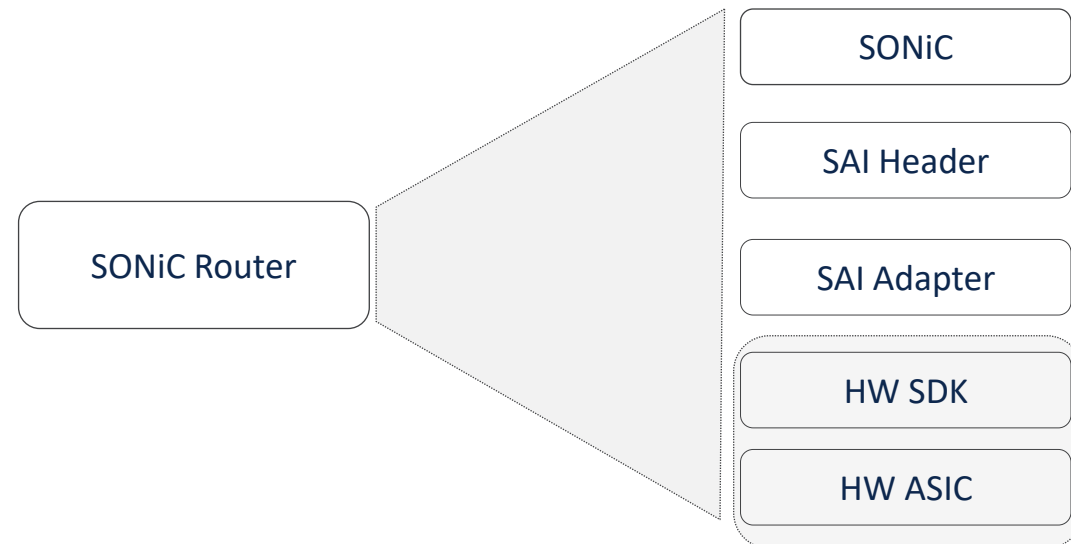
What is SONiC?



- Software for Open Networking in the Cloud (SONiC)
 - Originated and open sourced by Microsoft
 - Goal to power their Azure cloud infrastructure connectivity
- NOS that runs on systems and ASICs from multiple vendors and ASICs
 - e.g., Cisco C8000, Cisco Silicon One ASIC.
- Offers a full suite of network functionality
 - BGP, SRv6, ...
- In production at some of the largest cloud providers.
- Enjoy a very large ecosystem and community.

What is SAI?

- Switch Abstraction Interface (SAI)
 - Abstraction layer to program any HW ASIC regardless of its vendor.
 - **SAI Header**: Defines a set of APIs to program the network hardware tables
- SAI Adapter
 - Every ASIC vendor provides an implementation that maps the SAI API calls into the ASIC specific API

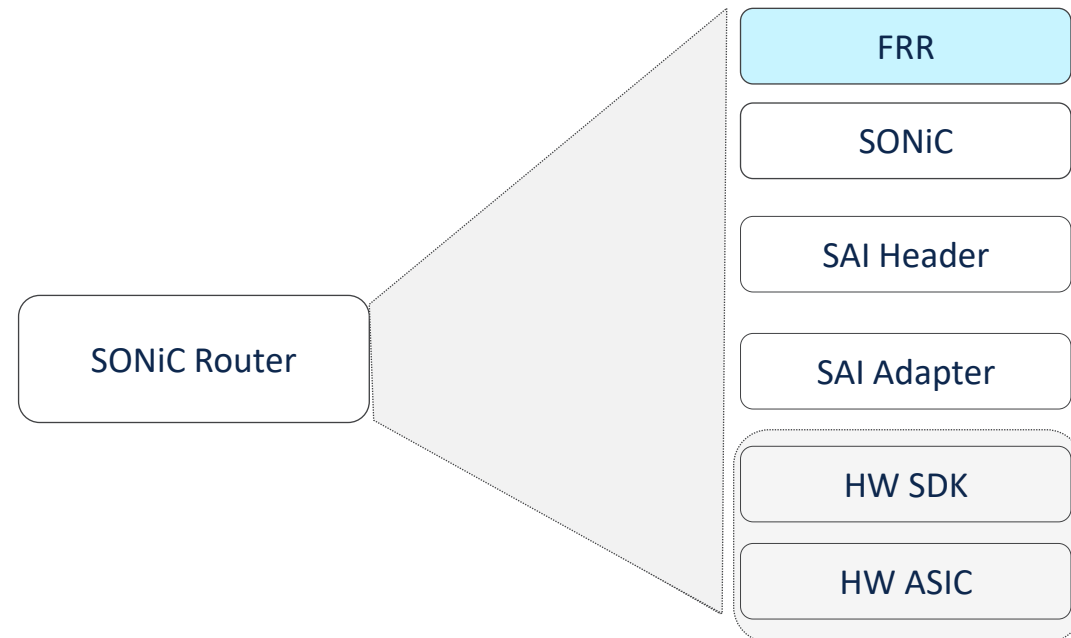


What is FRR?



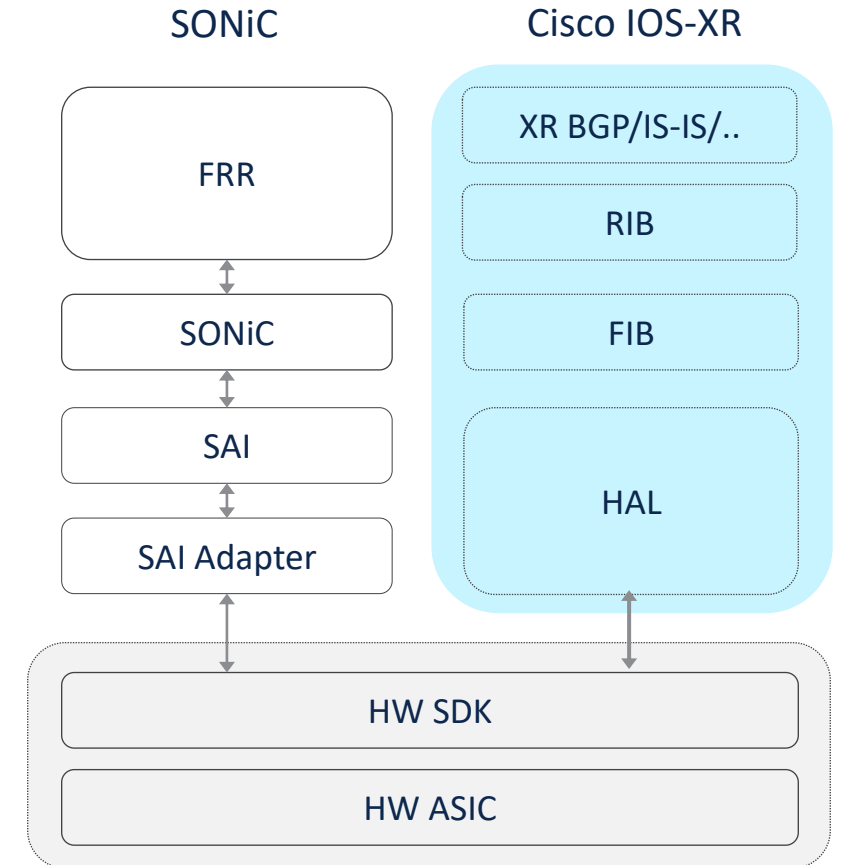
<https://frrouting.org/>

- FRRouting (FRR) is open-source Internet routing protocol suite.
 - BGP, IS-IS, ...
 - Full SRv6 uSID supports
 - Full SRv6 interoperability with IOS-XR (Alibaba SRv6 Deployment)
- FRR is the routing stack used by SONiC



SONiC architecture

- ASIC
 - Programmable HW ASIC “P4”
 - SDK Native API
- Vendor NOS (Cisco IOS-XR Router)
 - Vertically Integrated
 - Native SDK API
- SONiC
 - Disaggregated FRR/SONiC/SAI
 - SAI Adapter



SRv6 uSID in SONiC

SRv6 uSID in SONiC – Alibaba Deployment

- 2021: [SRv6 uSID in SONiC collaboration started](#)
 - Very rich ecosystem (Alibaba, Cisco, Broadcom, Intel, others)
 - SRv6 uSID support in [SAI \(1.19\)](#) and [SONiC \(202111\)](#)
- 2022: [Alibaba Routing Platform](#)
 - SONiC based and SRv6 uSID enabled
 - SRv6 uSID VPN support in [SONiC \(202211\)](#)
- 2023: [Alibaba SRv6 uSID deployment \(SONiC & IOS-XR\)](#)
 - Across all of China
 - SRv6 uSID VPN enhancement in [SAI \(1.12\)](#) and [SONiC \(202305\)](#)
 - SONiC Routing WG ([Link](#)) and Alibaba & Cisco Blog ([Link](#))
- 2024: [SONiC PhoenixWing Initiative](#)
 - Endorsed by Alibaba, Cisco, Microsoft, Broadcom, Linux Foundation ([Link](#))
 - Enrich mainline SONiC with more SRv6 uSID features and testing ([SONiC 202411](#))

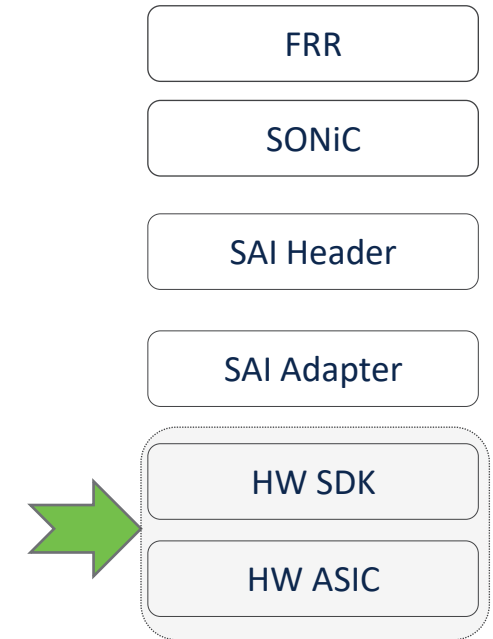
SRv6 uSID in SONiC – MSFT Use-case

- SONiC 202505: [Static SRv6 programmed from the SDN controller](#)
 - https://github.com/sonic-net/SONiC/blob/master/doc/srv6/srv6_static_config_hld.md
 - Collaboration between Cisco, Alibaba, Microsoft, and Nvidia.
 - More than 30 PRs to SAI/SONiC/FRR including new features/bug fixes/testing.
 - Upgrade to FRR 10.3 <https://github.com/sonic-net/SONiC/issues/1895>
- OCP EMEA: [Demo of SRv6 uSID in SONiC](#)
 - Cisco & MSFT (<https://sonicdemosocpemea25.sched.com/>)

Deep dive

HW ASIC & HW SDK

- SRv6 uSID is supported natively across many Merchant Silicon ASIC/SDK.
 - E.g., Cisco Silicon One (P4 programmable NPU)
- SDK exposes functions and attributes to integrate with:
 - SONiC using SAI adaptor
 - Vendor NOS (Cisco IOS-XR, ..) using native APIs



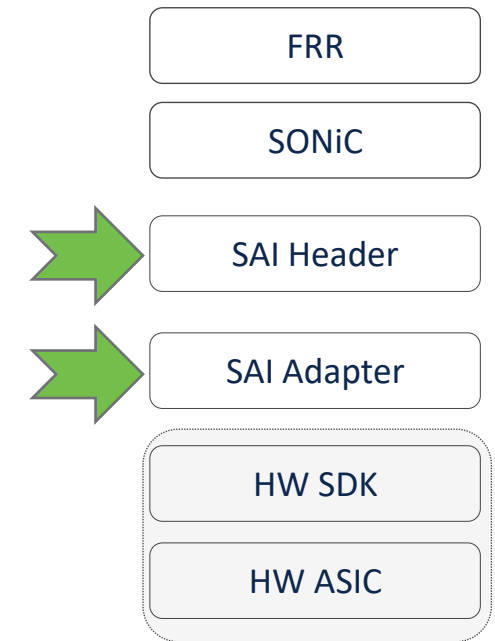
SAI

- SRv6 SAI Header

- SRv6 Headend/Encapsulation behaviors (*H.Insert, H.Insert.Red, H.Encaps, H.Encaps.Red*)
- SRv6 Underlay/Overlay behaviors (*End, End.X, End.T, End.DX4, End.DX6, End.DT4, End.DT6, End.DT46, uN, uA, End.B6.Encaps, End.B6. Encaps.Red, End.B6.Insert, End.B6.Insert.Red*)
- SRv6 Traffic Engineering behaviors (*SR Policy, Candidate Path, SID List*)
- **Mainline in community SAI**

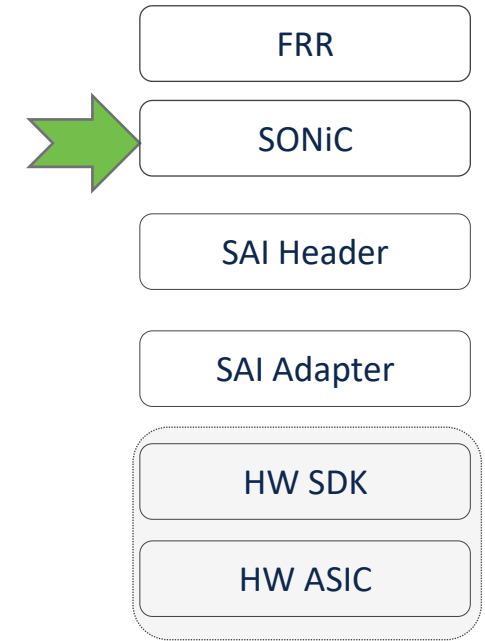
- SAI Adapter

- SRv6 uSID is supported natively in the SAI adapter implementation of many Merchant Silicon.
- Cisco Silicon One has full implementation of SRv6 uSID SAI Header



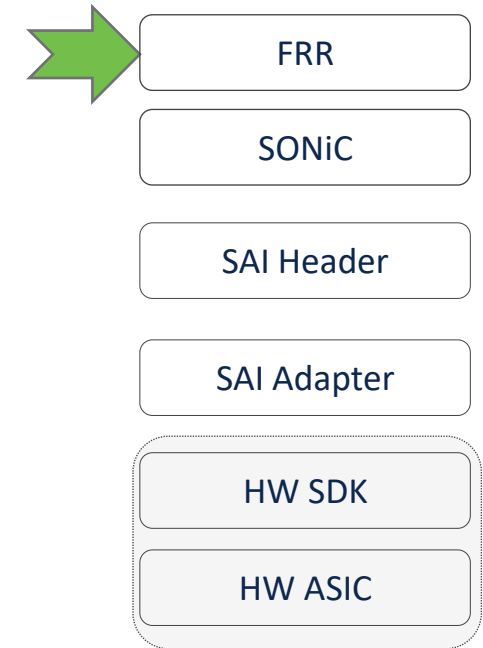
SONiC

- SRv6 uSID
 - Headend/Encapsulation behaviors
 - Underlay/Overlay behaviors
 - Traffic Engineering behaviors (Phoenix Wing)
- Across all SONiC components
 - ConfigDB/App DB/Orchestration Agent/Fpmsyncd



FRR

- BGP L3VPN Services (RFC 9252)
 - VPNv4: IPv4 address family
 - VPNv6: IPv6 address family
 - VPNv46: IPv4 and IPv6 using a single SID uDT46
- IS-IS Underlay (RFC 9352)
- Static SID allocation
- Static Traffic Steering into SRv6 SID List
- SID Manager
 - SRv6 uSID deployment blueprint
 - Interoperability between FRR, Cisco IOS-XR, and other vendors



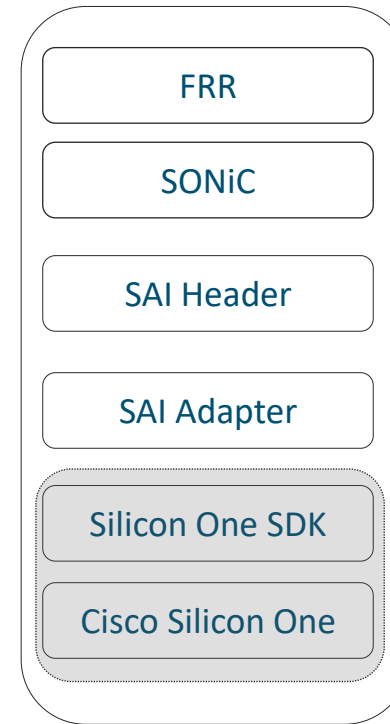
Conclusion

- SRv6 uSID – Fully supported in SONiC
 - Cisco Silicon One
 - SAI Header & SAI Adapter
 - SONiC Stack
 - FRR
- Deployed at Alibaba
 - Cisco IOS-XR & SONiC
- Very Rich Ecosystem
 - PhoenixWing: Alibaba, Cisco, Microsoft, Broadcom, Linux Foundation
 - SRv6 SDN use-case: Alibaba, Cisco, Microsoft, Nvidia

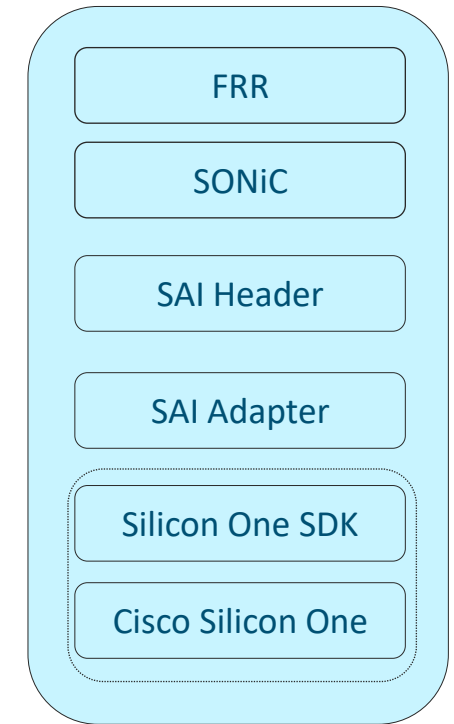


Whitebox SONiC vs Cisco SONiC

- Whitebox SONiC
 - ASIC [SDK + SAI]: E.g., Cisco Silicon One
 - OEM: build the system
 - Testing, support, upgrades [Operator/3rd Party]
- Cisco SONiC
 - Cisco C8000 device running SONiC
 - ASIC: Cisco Silicon One
 - Test, support, upgrade by Cisco



Whitebox SONiC



Cisco SONiC