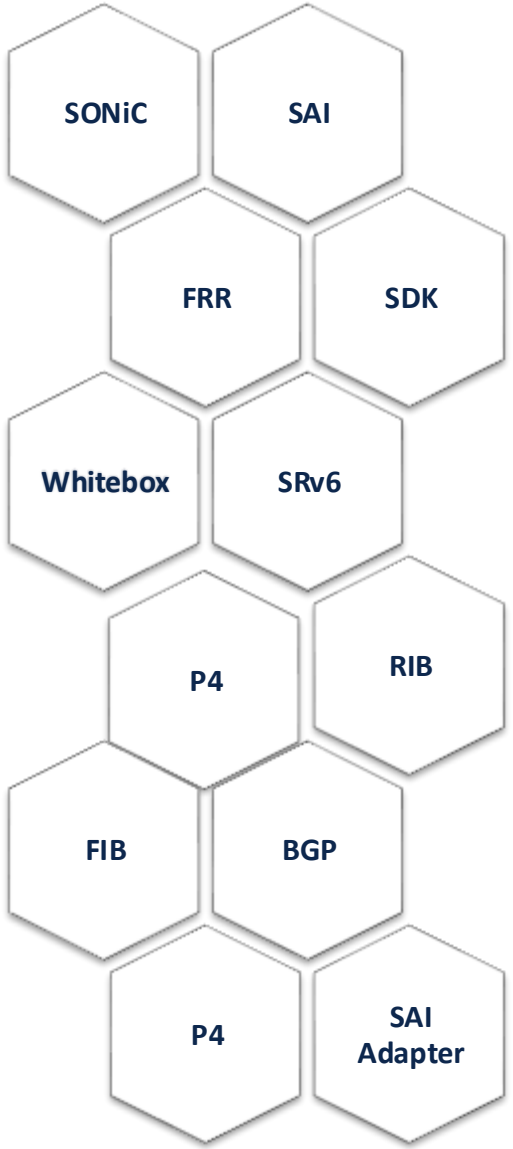
SONiC
Disaggregated, Open, Multi-Vendor Network Operating System

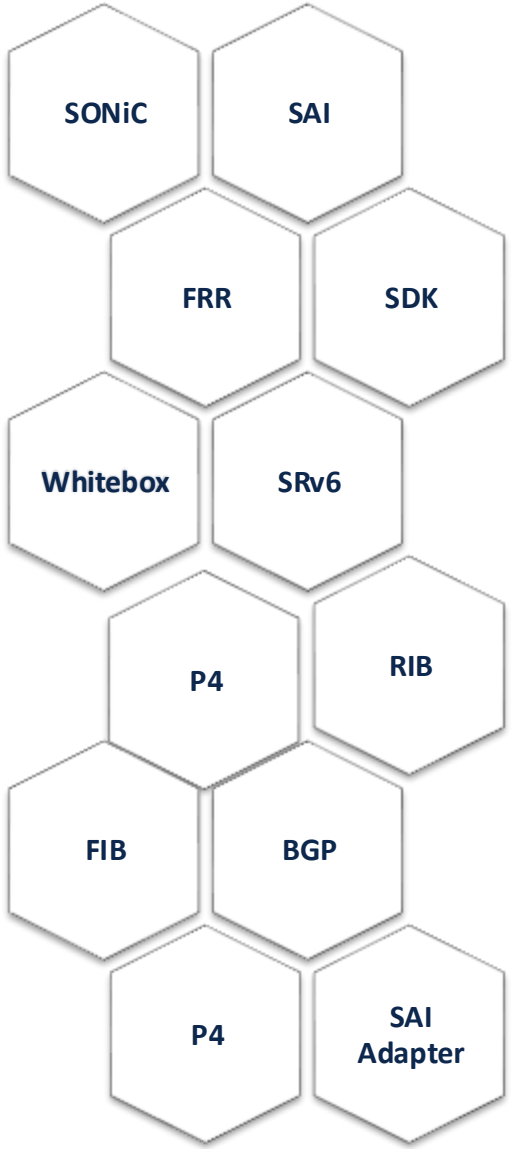
Ahmed Abdelsalam

Cisco Systems

SONiC



SONiC



What is SONiC?

https://sonicfoundation.dev

- 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
- Offers a full suite of network functionality
  - BGP, SRv6 uSID, …
- In production at some of the largest cloud providers.
- Enjoy a very large ecosystem and community.

SONiC Ecosystem

- SONiC community includes 30+ members
  - Operators & Hyperscalers
  - Major network vendors
  - Merchant silicon vendors
  - Open-source community
  - Universities and research institutes
  - https://sonicfoundation.dev/members/

Premier Members

General Members

Associate Members

What is SAI?

https://www.opencompute.org/wiki/Networking/SAI

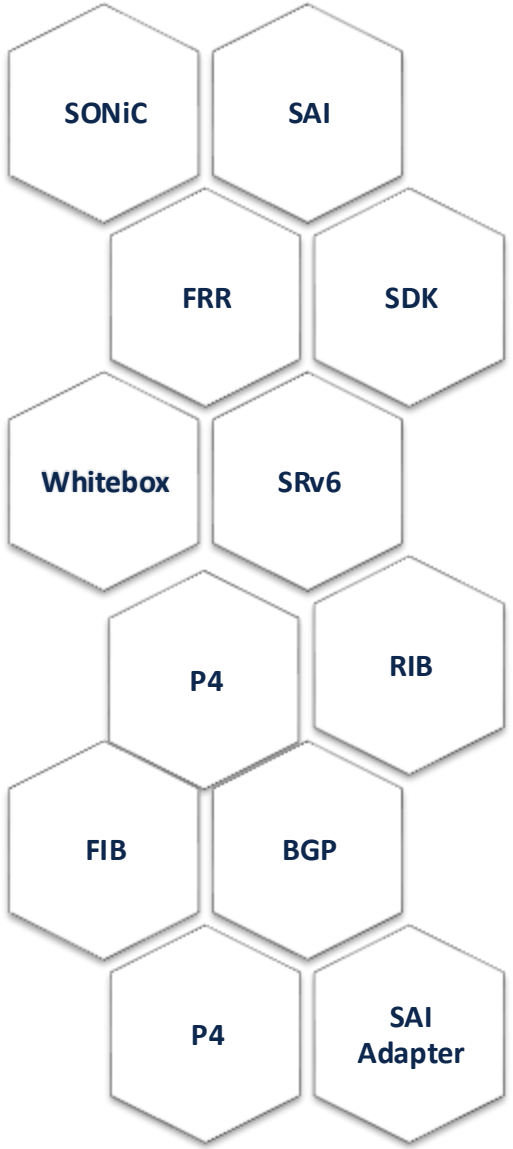
- Switch Abstraction Interface (SAI)
  - Abstraction layer to program any HW ASIC regardless of its vendor.
  - **SAI Header**: Defines a set of APIs to program the network hardware tables
- SAI Adapter
  - Every ASIC vendor provides an implementation that maps the SAI API calls into the ASIC specific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

What is FRR?

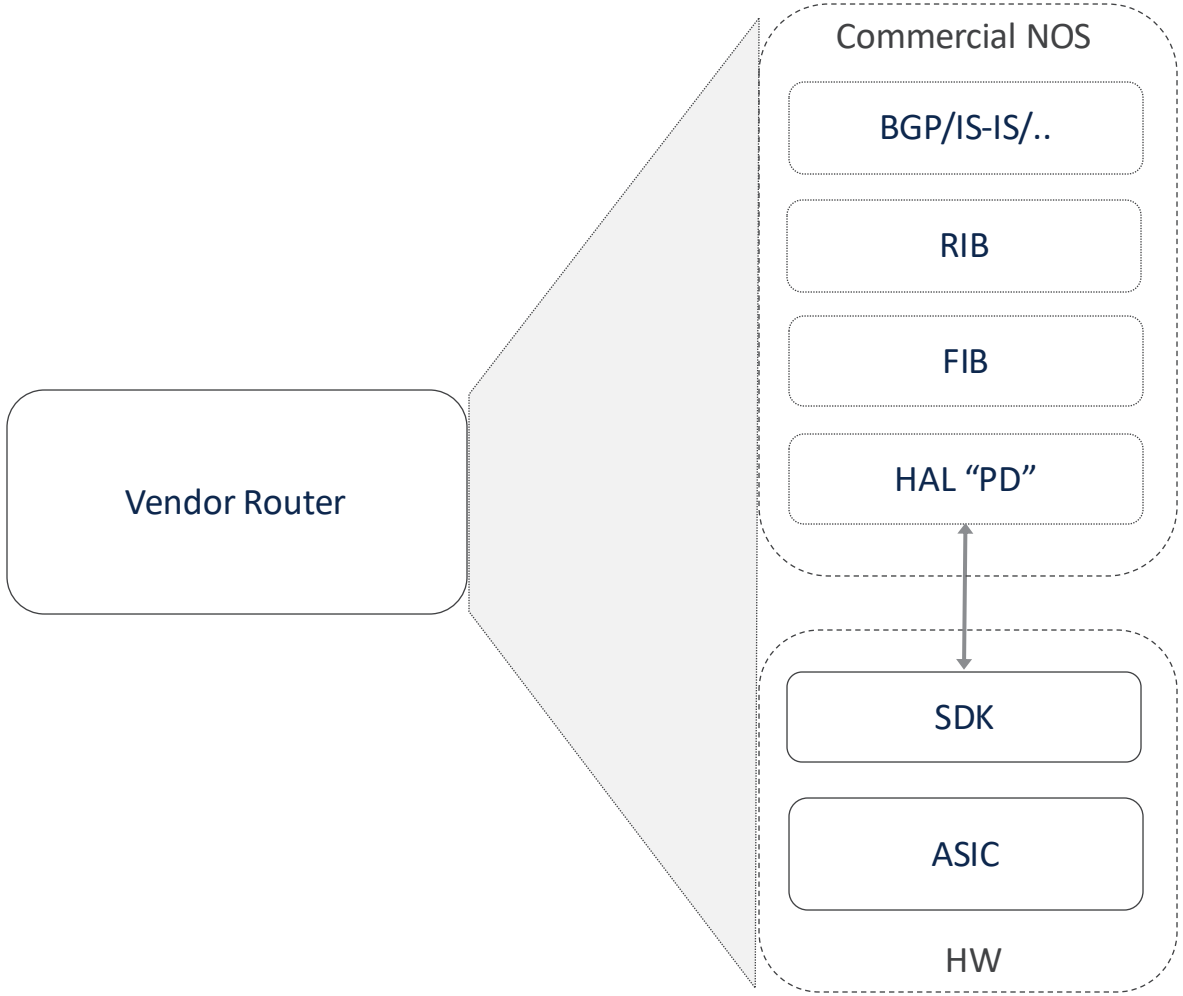
https://frrouting.org/

- 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

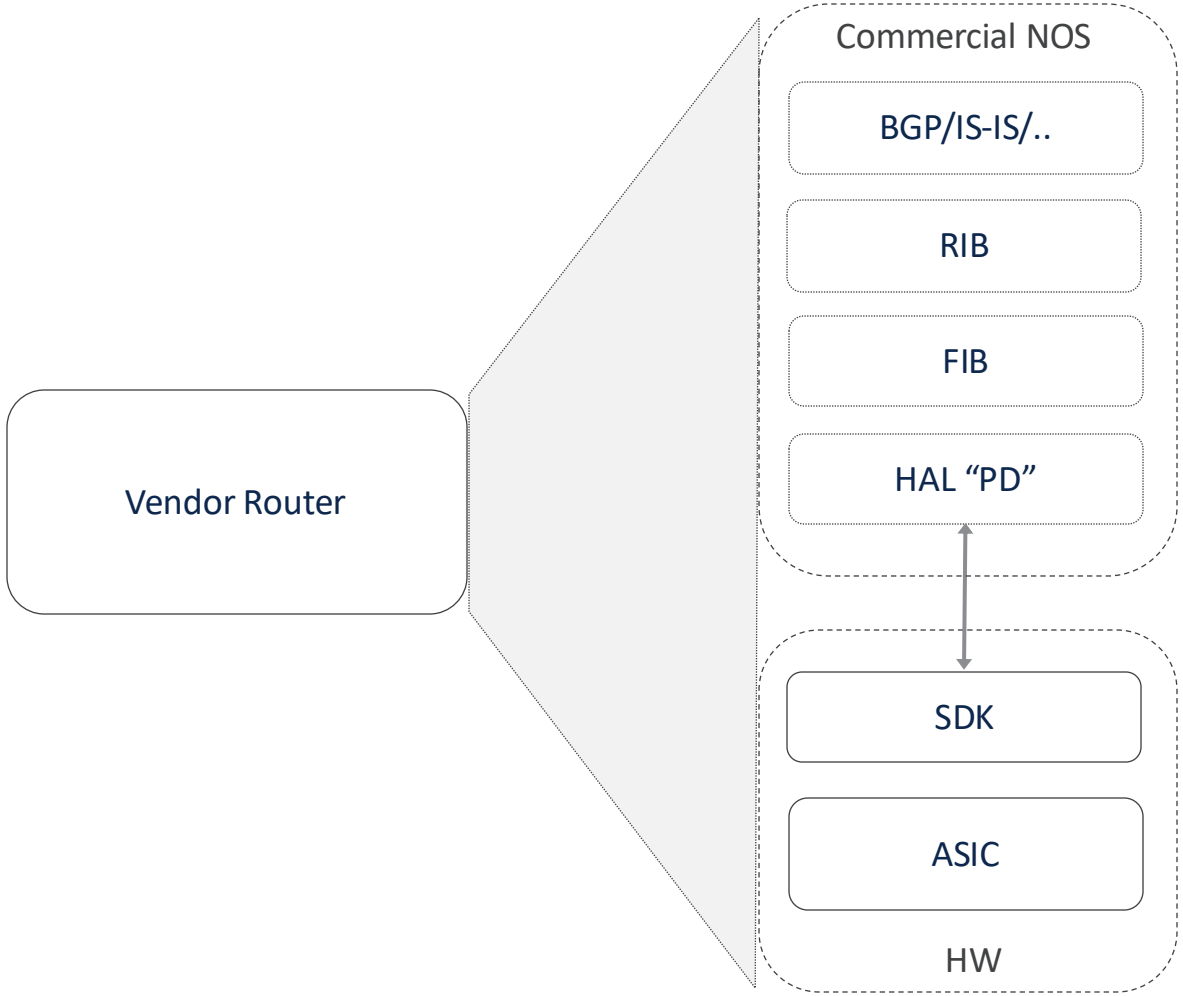
SONiC



Vendor Router - Running Commercial NOS



Vendor Router vs SONiC Router



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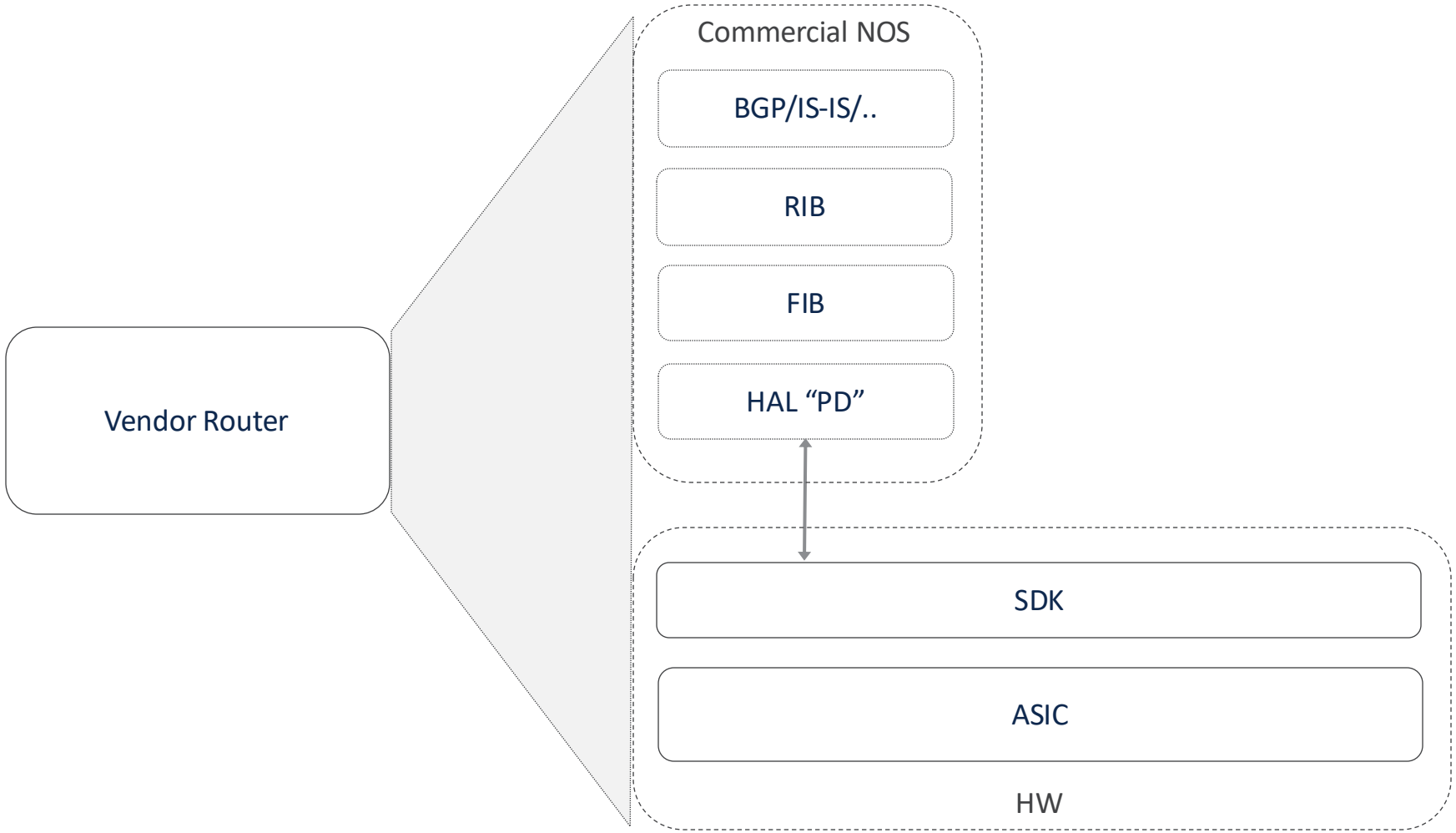

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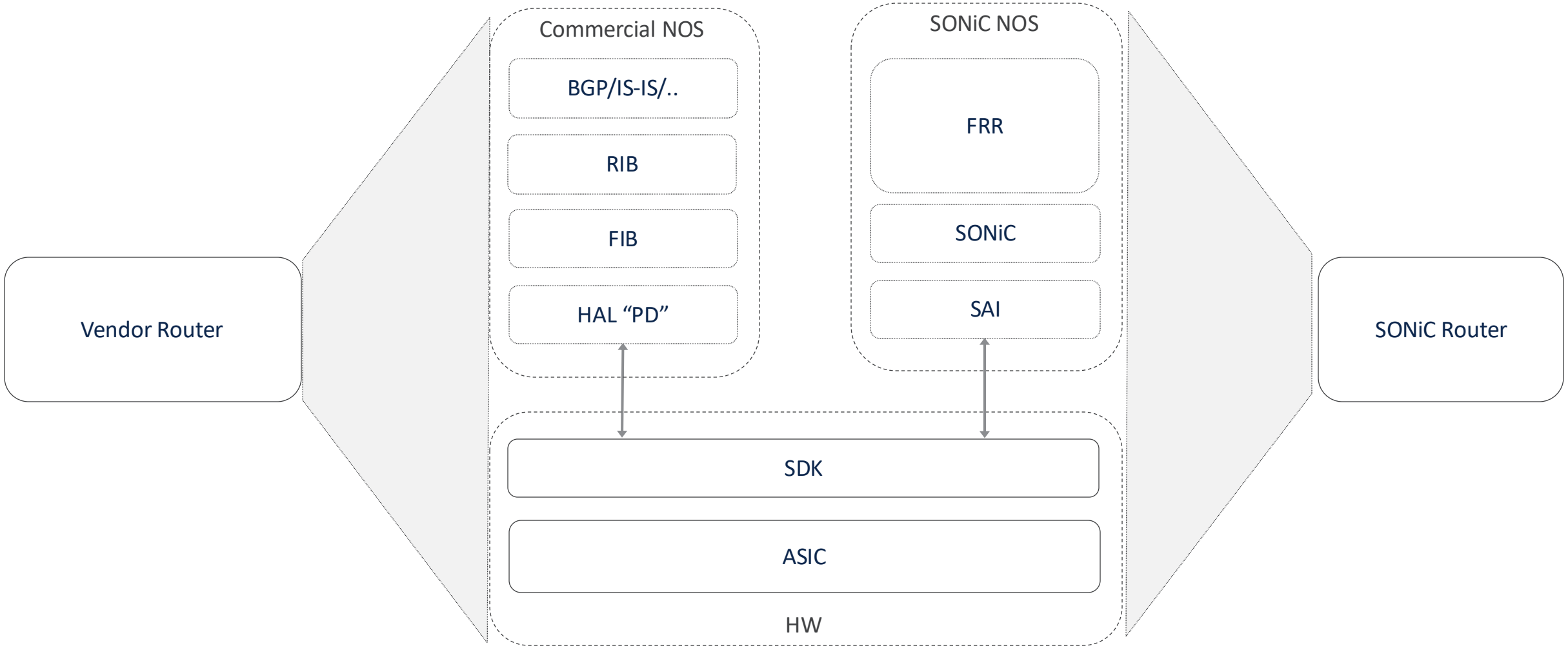
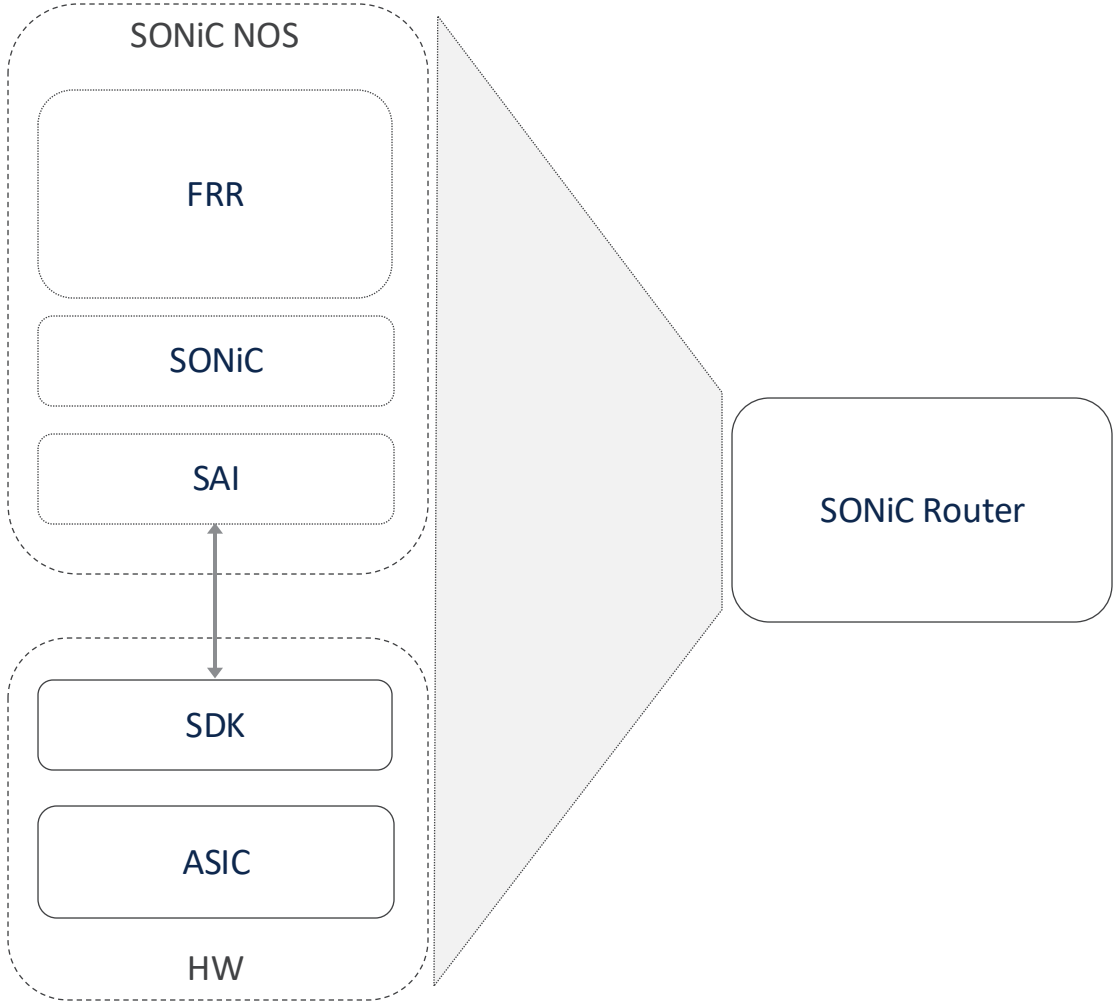


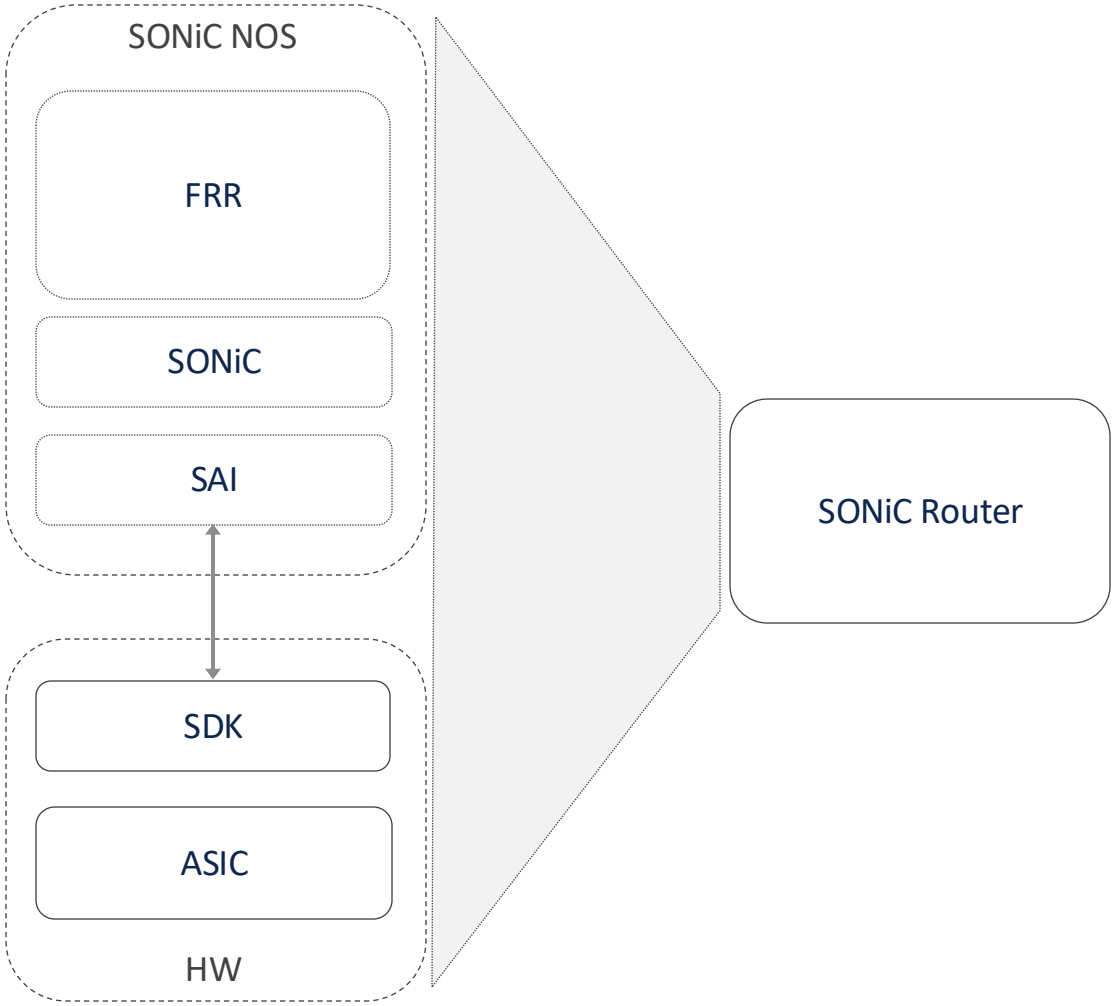
Whitebox SONiC vs Vendor SONiC

- Whitebox SONiC
  - ASIC [SDK + SAI]
  - OEM: build the system
  - Testing, support, upgrades [DIY/3rd Party]
- Vendor SONiC
  - Vendor router running SONiC
  - Test, support, upgrade by network vendor



Why SONiC

- Same NOS & Northbound API
- Diverse ASIC & Vendor



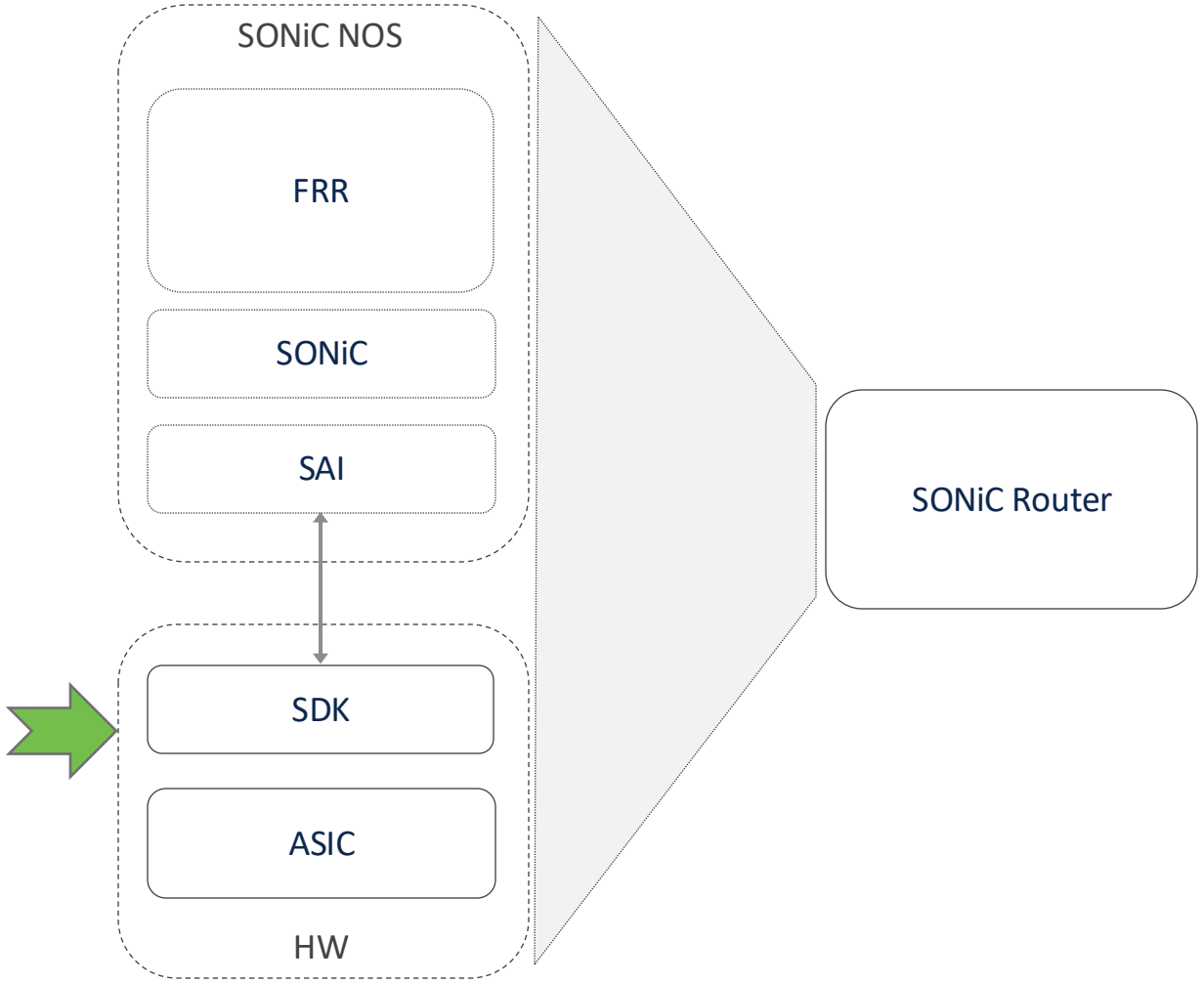
SRv6 uSID in SONiC

SRv6 uSID in SONiC (Mature, Deployed, Rich Ecosystem)

- Mature:
  - AI Backend: Static uSID Fabric - SDN controller
  - L3VPN: IPv4/IPv6 - Static & BGP (RFC9252)
  - SRv6 GRT: IPv4/IPv6 - Static & BGP (RFC9252)
  - Underlay Traffic Engineering: Static & IS-IS (RFC9352)
  - Static steering of IPv4/IPv6 traffic over SRv6 uSID
  - SRv6 SID Manager - F3216/GIB/LIB/WLIB
  - Mainline: 350+ PR and 1600+ commits across SAI/SONiC/FRR.
- Deployed:
  - Alibaba eCore – In production across all China
  - Microsoft – AI backend
- Rich Ecosystem:
  - Contributors: Cisco, Microsoft, Alibaba, Broadcom, Nvidia

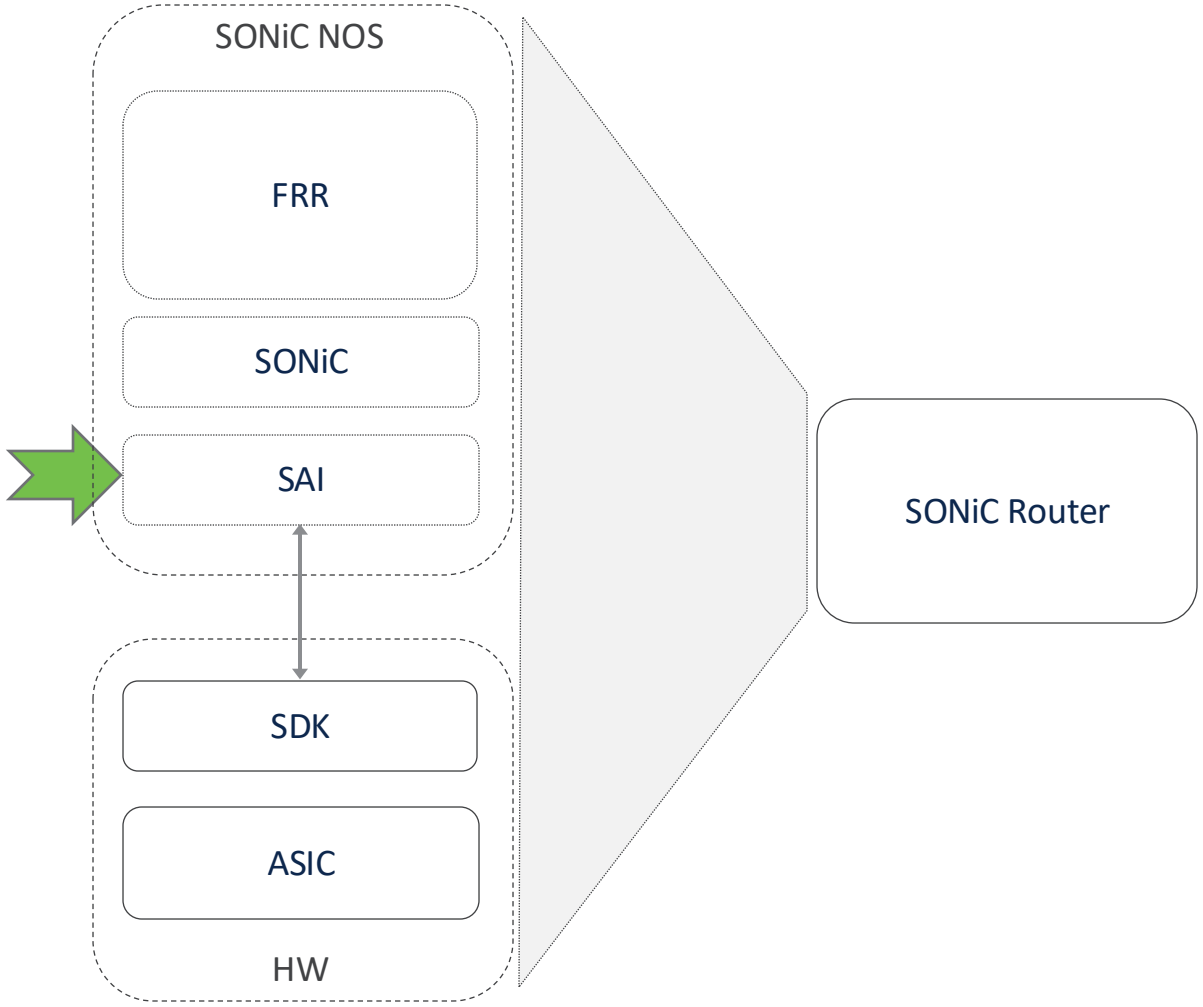
SRv6 uSID in SONiC

- ASIC and SDK
  - Full SRv6 uSID support across merchant silicon vendors



SRv6 uSID in SONiC

- SAI Header
  - SRv6 Endpoint behaviors for Underlay and Overlay (uN, uA, uDT4, uDT6, uDT46, uDX4, uDX6 ….)
  - SRv6 Endpoint flavors (PSP, USP, USD)
  - SRv6 Headend/Encapsulation behaviors (H.Insert, H.Insert.Red, H.Encaps, H.Encaps.Red)
  - Traffic Steering over SRv6 Encapsulation “ SID List”



SRv6 uSID in SONiC

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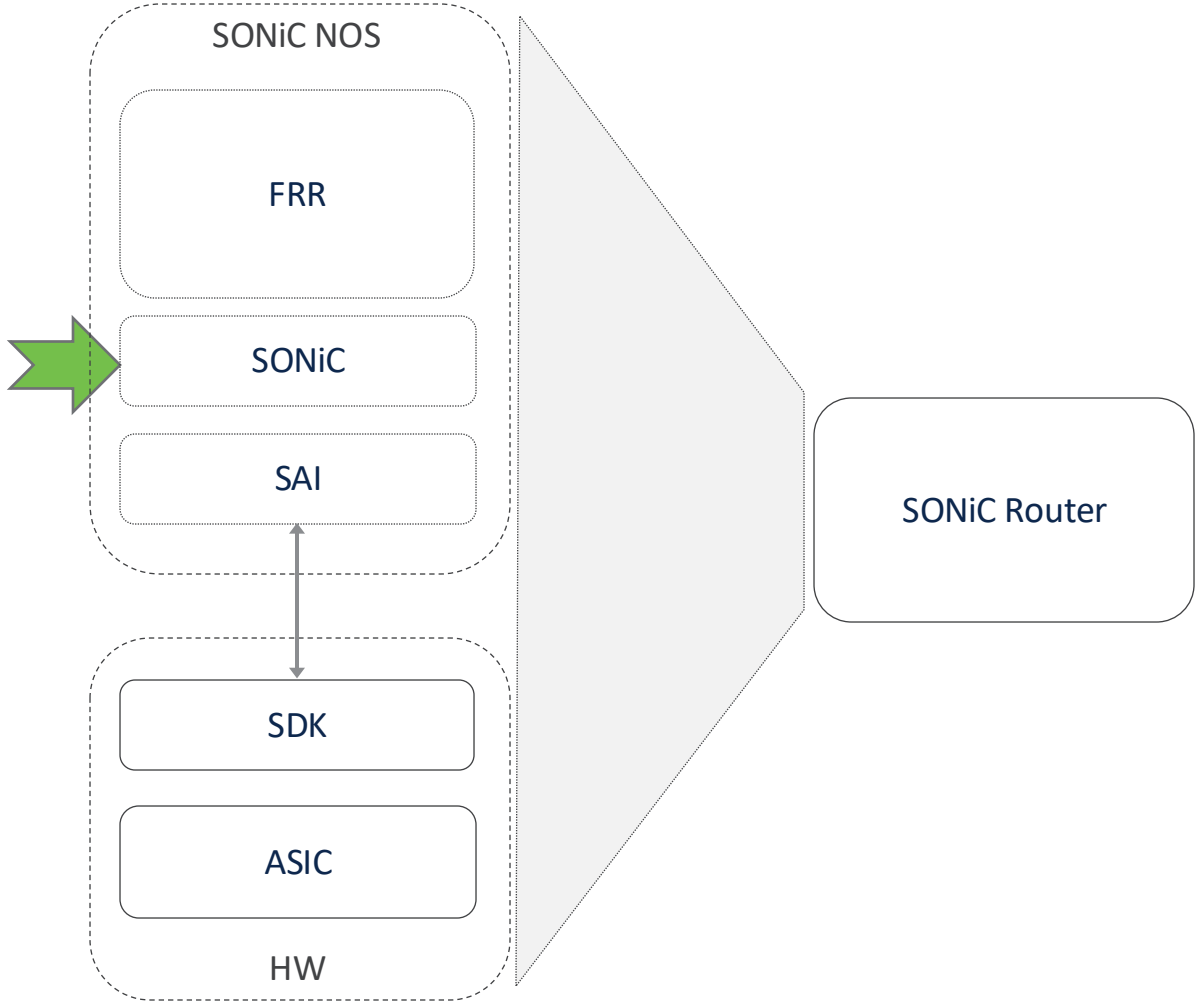

SRv6 uSID in SONiC

- FRR
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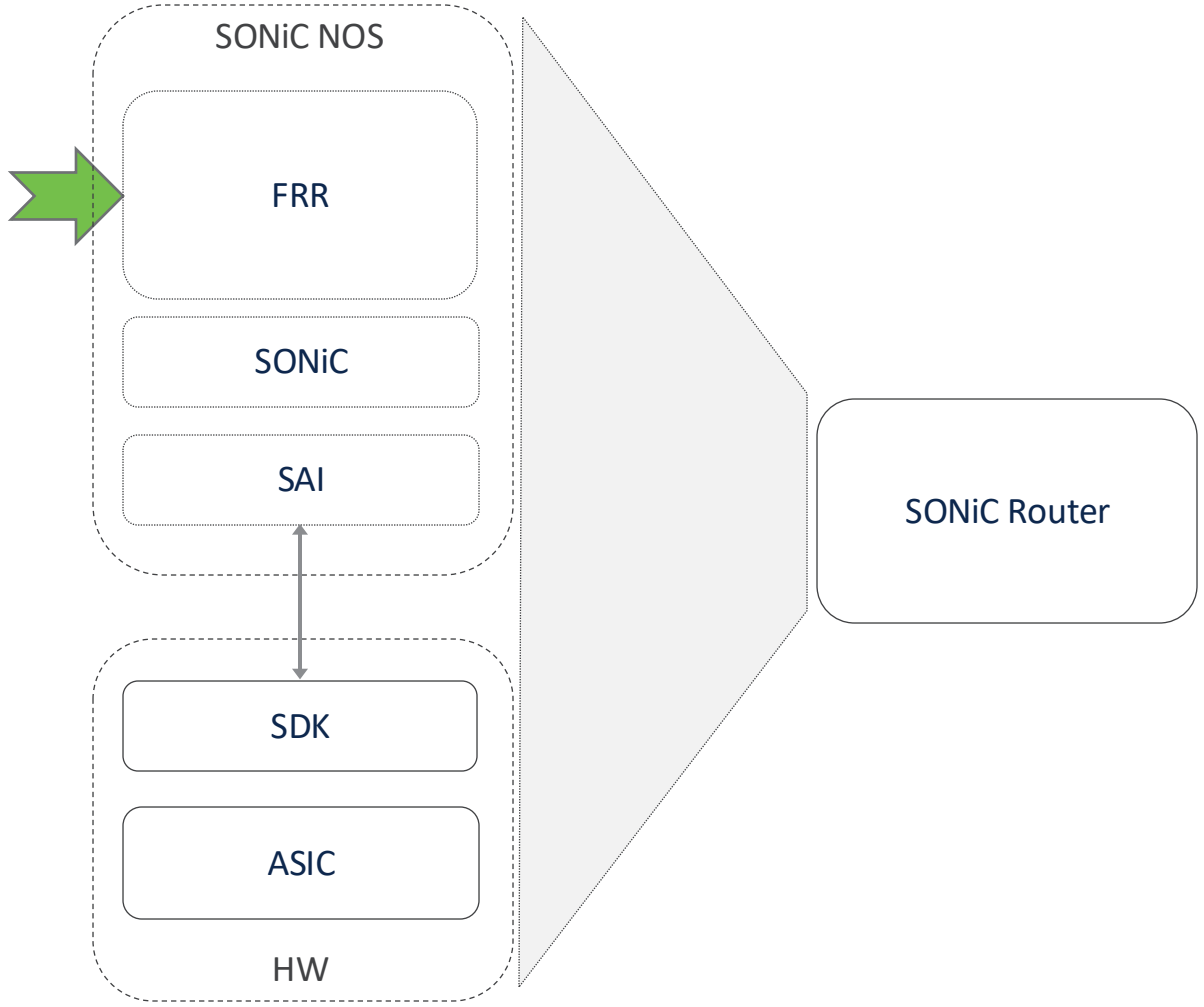
  - SRv6 SID Manager - F3216/GIB/LIB/WLIB



SONiC for Everyone ?

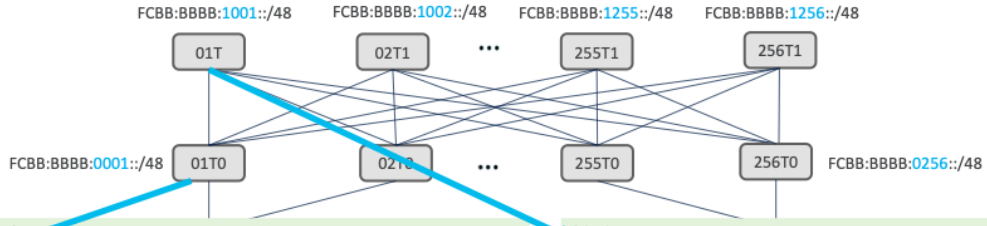
It depends

- Scale
  - Hyperscalers vs Enterprise vs Research department
- Deployment model:
  - Whitebox SONiC vs Vendor SONiC
- Use-case:
  - DC vs WAN/Routing

Get Started

- https://www.segment-routing.net/demos/2025-08-26-oss-eu-2025-sonic-srv6-demo/

Demo: SRv6 uSID – AI Backend use-case



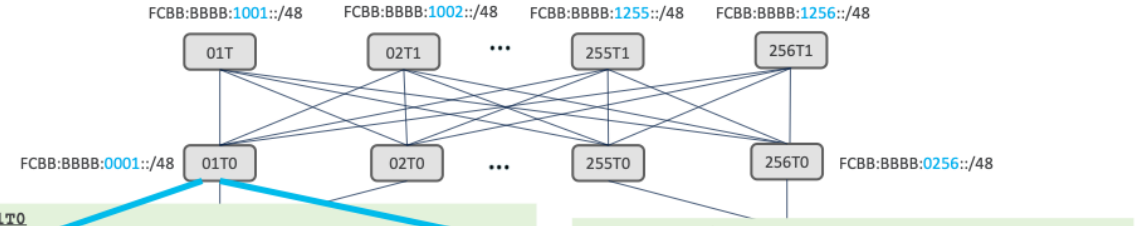
01T0

```
…
ipv6 route fcbb:bbbb:1001::/48 Ethernet01
ipv6 route fcbb:bbbb:1002::/48 Ethernet02
…
segment-routing
 srv6
  locators
   locator MAIN
    prefix fcbb:bbbb:0001::/48
    format usid-f3216
  static
   sid fcbb:bbbb:0011::/48 locator MAIN behavior uN
…
```

01T1

```
…
ipv6 route fcbb:bbbb:0001::/48 Ethernet01
ipv6 route fcbb:bbbb:0002::/48 Ethernet02
…
segment-routing
 srv6
  locators
   locator MAIN
    prefix fcbb:bbbb:1001::/48
    format usid-f3216
  static
   sid fcbb:bbbb:1001::/48 locator MAIN behavior uN
…
```

Demo: SRv6 uSID – BGP L3VPN use-case



01T0

```
…
router bgp 65001
 bgp router-id 1.1.1.1
 neighbor 2001:db8:1:1001::1001 remote-as 65011

 address-family ipv6 unicast
  network fcbb:bbbb:1::/48
  network fcbb:bbbb:1::1/128

 address-family ipv6 vpn
   segment-routing srv6
     locator MAIN
     encap-behavior H_Encaps_Red
```

```
segment-routing
 srv6
  locators
   locator MAIN
    prefix fcbb:bbbb:1::/48
    format usid-f3216
  encapsulation
   source-address fcbb:bbbb:1::1
```


CISCO