LEVERAGING SONIC FUNCTIONALITIES IN DISAGGREGATED NETWORK SWITCHES

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International Conference on Telecommunications and Signal Processing (TSP 2020)

Submission ID: #147

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OVERVIEW

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INTRODUCTION

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TRADITIONAL NETWORK SWITCHES

- Network switches connect multiple computers in a Local Area Network (LAN) by operating on the data link layer

- Traditionally, they are closed source running a proprietary Network Operating System (NOS)

- Thus, limiting network operators and hindering the process of developing new network technologies

WHITE-BOX SWITCHES

- White-box switches are new type of forwarding devices
- Their hardware is decoupled from the software
- Network engineers can install the NOS of their own based on the infrastructure of their network
- Thus, providing the flexibility of customizing the network switch, instead of limiting it to the vendor

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MOTIVATION

- White-box switches has pushed the need for developing open source NOS to accommodate the ever-increasing network technologies

- However, open source products are usually less maintained and documented than closed source products

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CONTRIBUTION

CONTRIBUTION

- Iterating over several open source Internet Protocol (IP) routing suites and NOSs that are vendor-agnostic

- Highlighting the importance of the novel programmable data planes

- Reporting the configuration process and the prerequisites needed to deploy a working disaggregated environment

- Deploying SONiC on top of open source switches, testing the supported network protocols, and detailing the implementation

BACKGROUND
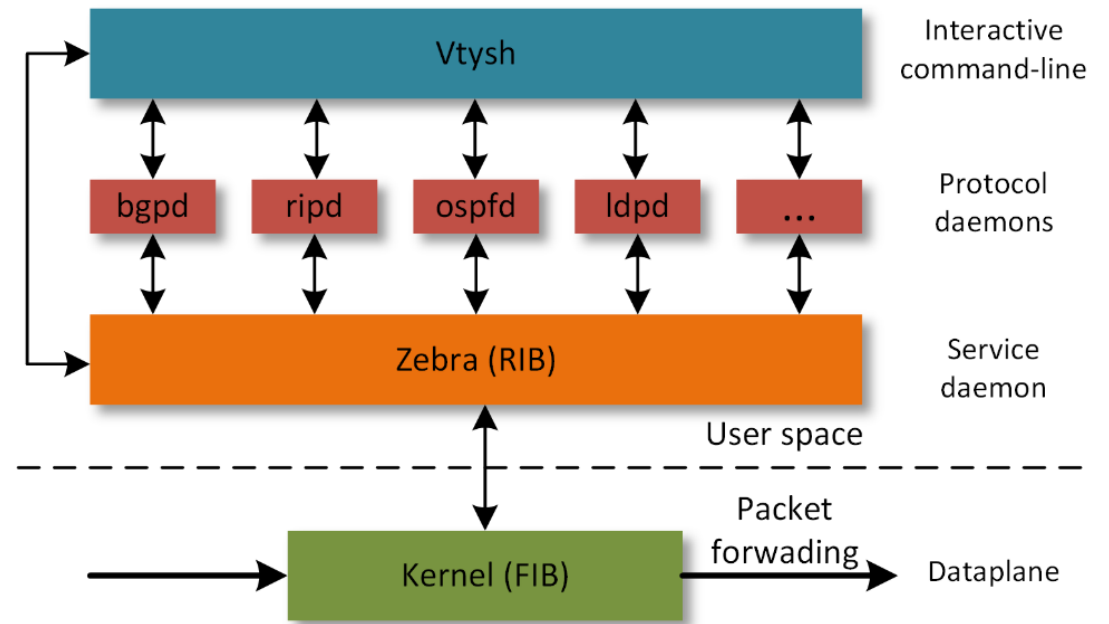
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OPEN SOURCE INTERNET ROUTING PROTOCOL SUITES

Open source IP suites provide the ability to run routing protocols, such as static routing and Border Gateway Protocol (BGP)

- BIRD:
  - implements multiple routing protocols, such as OSPF and BGP (Linux)
- OpenBGPD:
  - implements BGP (Linux)
- eXtensible Open Router Platform (XORP):
  - implements multiple routing protocols (Mac OS, Linux, and Windows)
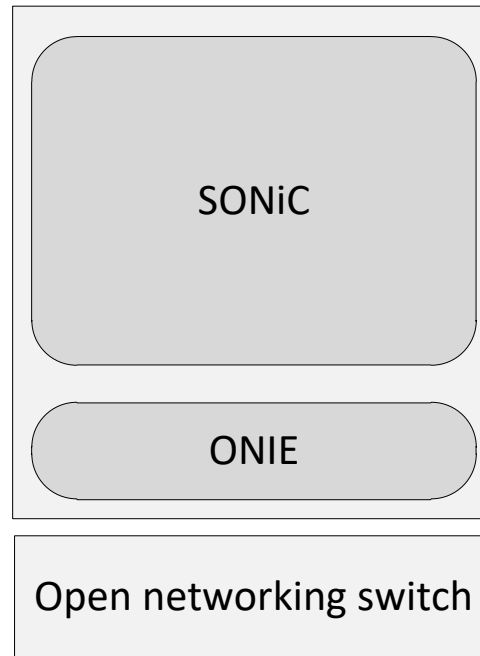- FRR

FRR

- FRR is an IP routing protocol suite for Linux and Unix platforms
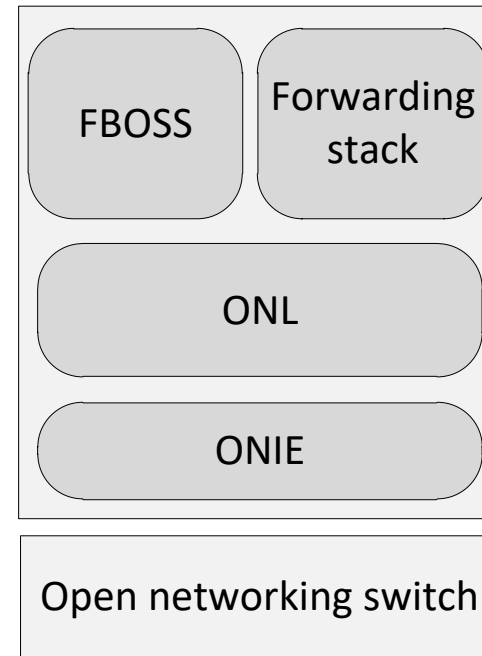- Implements static routing, BGP, OSPF, and variety of other layer 2 and layer 3 protocols
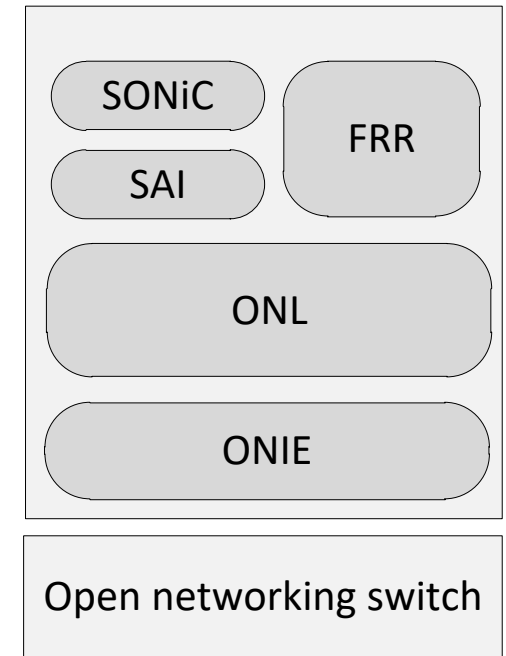
OPEN SOURCE NOS
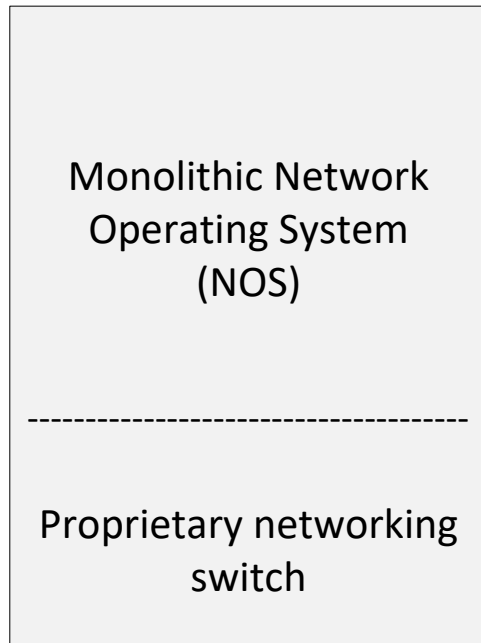
Legacy switch

SONiC

FBOSS

Big Switch

EXPERIMENTATION
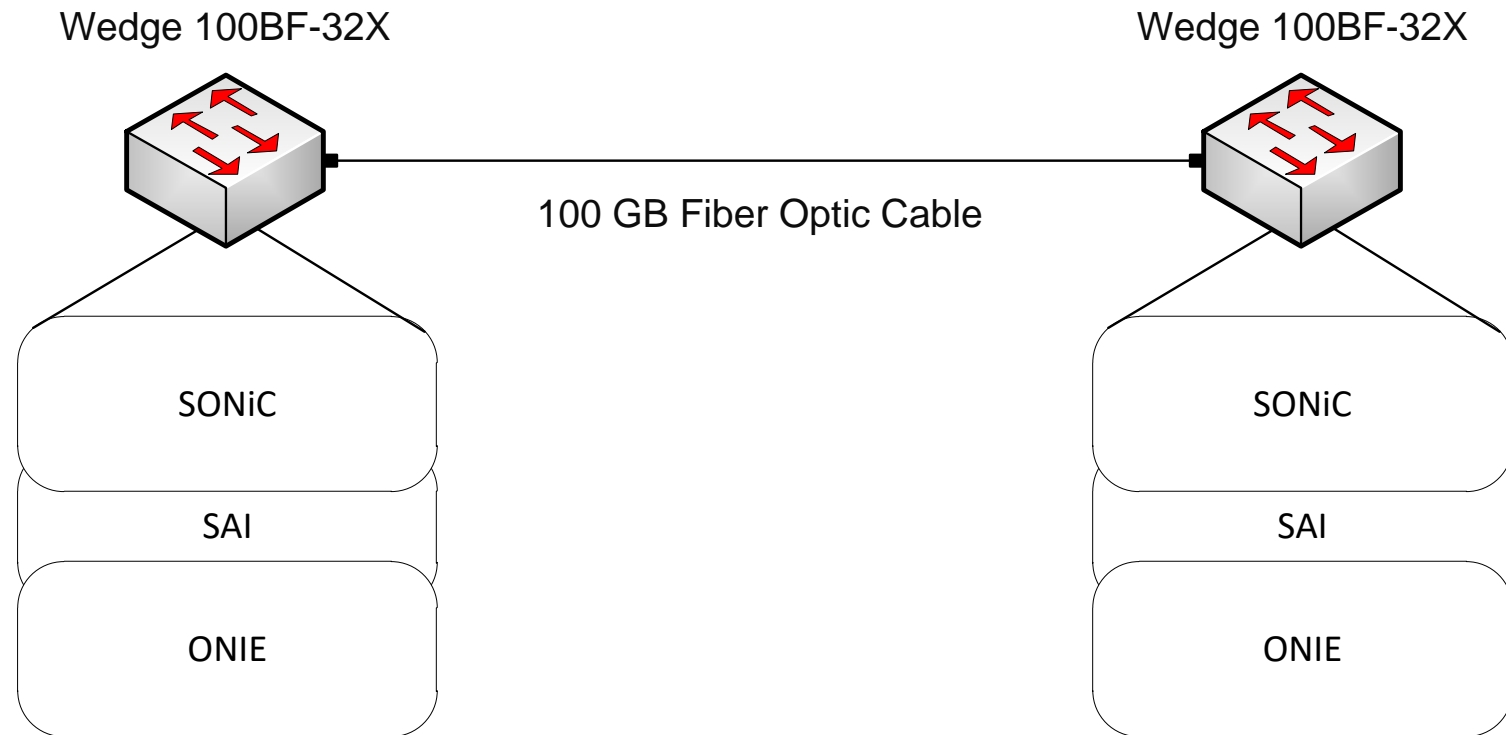
PREPARATORY PHASE

We used Edgecore switches that use programmable switching silicon (Tofino) manufactured by Barefoot Networks, an Intel company

- Loaded with P4 program to handle all supported protocols
- Can add additional protocols by modifying the P4 program
- Allows for more visibility over the network
- Allows the installation of several open source NOSs
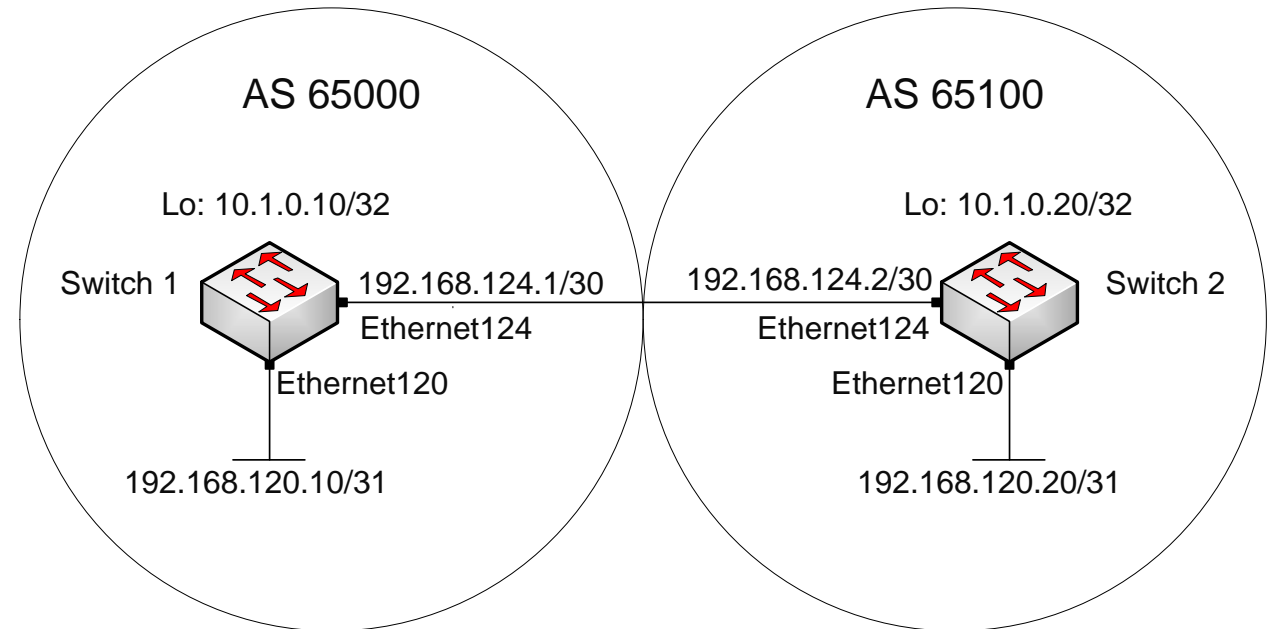
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ENVIRONMENTAL SETUP

Wedge 100BF-32X   Wedge 100BF-32X

100 GB Fiber Optic Cable

SONiC   SONiC

SAI   SAI

ONIE   ONIE

SONIC SUPPORTED ROUTING PROTOCOLS

- Static routing protocol
  - Configure the file /etc/sonic/config_db.json to change the IP addresses of the interfaces
  - Load the configuration to take effect using *sudo config load –y*
  - Configure static routes using the vtysh session

- BGP
  - Configure the file /etc/sonic/config_db.json to change the IP addresses of the interfaces and the router ID (loopback)
  - Load the configuration
  - Configure BGP using the vtysh session

AS 65000

Lo: 10.1.0.10/32

Switch 1   192.168.124.1/30
            Ethernet124

            Ethernet120

192.168.120.10/31

AS 65100

Lo: 10.1.0.20/32

192.168.124.2/30   Switch 2
Ethernet124

            Ethernet120

192.168.120.20/31

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DISCUSSION

DISCUSSION

- Open source NOSs are mainly targeted to data centers, however, they can be ported to campus networks

- The integration of open source NOSs in white-box switches allows for leveraging the switches capabilities

- With P4 switches, various applications can be done, such as DDoS detection, In-band Network Telemtry (INT), load balancing

CONCLUSION AND FUTURE WORK

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CONCLUSION AND FUTURE WORK

- Surveying a number of open source networking software systems

- Highlighting the importance of P4 switches in reshaping the network

- Deploying SONiC NOS on P4 switch and exploring the supported routing protocols, while detailing the implementation

- We plan to deploy SONiC on our programmable switches in our campus network and report their effect

THANKS!