GIX Implementation Based on White Box

White Box in NREN context

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RENATER Global Internet eXchange (GIX) in Paris - SFINX

- A GIX provide the physical infrastructure for traffic exchange between Autonomous System (ISP and large networks)

- RENATER GIX - SFINX
  - Created in 1995
  - 2 POPs in Paris
  - 2 Route Servers
  - 35 peers
  - PeeringDB : https://www.peeringdb.com/ix/34

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Original Architecture

- One switch at each POP
  - 3x10Gb/s LAG to connect them
- A set of VLANs
  - ID 2 for unicast traffic
  - ID 5 for multicast traffic
  - ID 98/99 for the management (only RENATER and NOC)
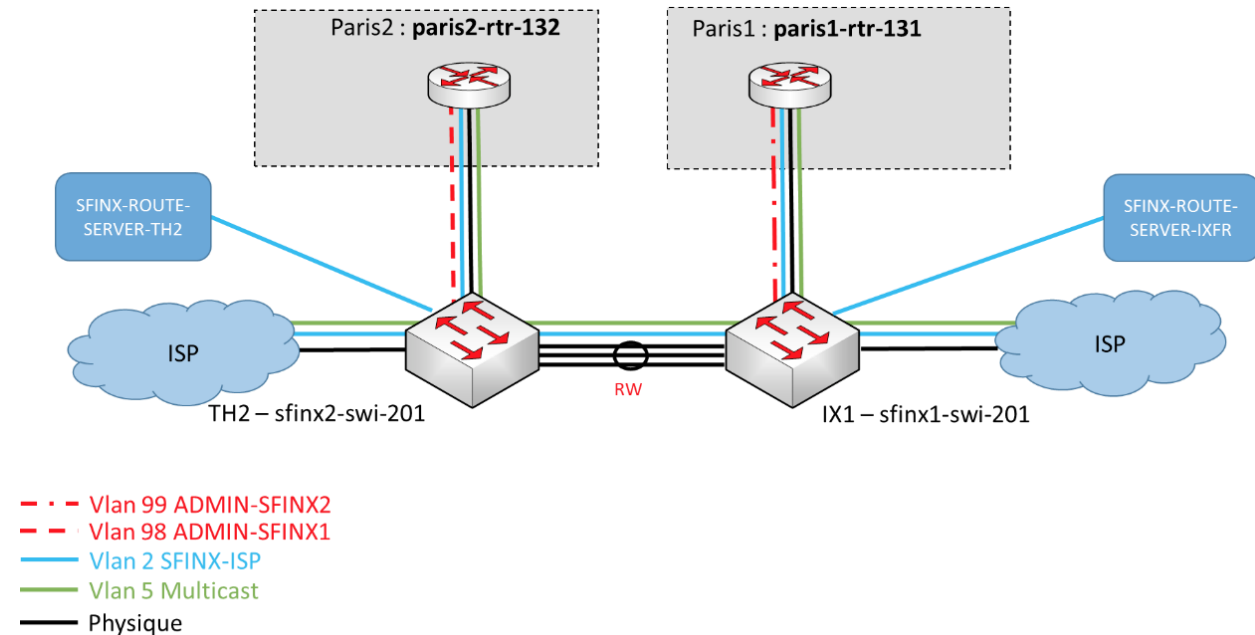
White Box: SFINX Goals

- Renew the SFINX with the same features but the TCO must not exceed the previous infrastructure

- Increasing the independence from traditional vendors

- Get ready to deploy new features after the renewal
  - EVPN
  - VXLAN
  - Etc

- Gain experience on White Box paradigm

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New GIX Requirements

Operation and Management	Security	Routing and Switching	Performance and Reliability
• OOB Access • Management access (SSH) • Authentication and Authorisation • Logging • Monitoring • Automation	• IP Layer (ACL) • MAC Layer (MAC ACL)	• VLAN • Spanning Tree Protocol (STP/RSTP/) • Core (EVPN/VXLAN)	• Switching/forwarding • Bandwidth • Reliability

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Implementation

- ## Network Operating System (NOS)
  - ### OcNOS from IPInfusion
    - Deployed in the London Internet Exchange (LINX)
    - MPLS features
    - Competitive software maintenance

- ## Hardware

  - ### DELL S4048-ON
    - Support several NOS
    - ONIE
    - Broadcom Trident 2 chipset
    - 48x10Gb/s interfaces and 6x40Gb/s uplink ports
    - 720Gb/s forwarding performance

Feature Implementation (NOS)

- Out of Band (OOB) Access
  - Take control over the OOB Network
  - Reinstall/install the NOS if required
    - From network (management interface)
    - From USB stick

- Management Access
  - Cannot be restricted easily (in-band ports)
  - VLAN interface and IP address
  - SSH ACL

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Feature Implementation (NOS)

- Authentication and Authorisation
  - Prerequisites : should be done using the RENATER Backbone TACACS system
  - OcNOS supports TACACS but does not use the same autorisation system
    - It requires its own TACACS server
  - Trade-off: It uses the RENATER TACACS but with sub-optimal authorisation

- Logging
  - Implemented without any problems
  - The configured logs are sent to a log server

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Feature Implementation (NOS)

- Monitoring
  - SNMP implemented without any problems
  - The WB are polled by SNMP collectors

- Automation
  - Automation with Ansible was tested successfully
  - Ansible module provided

- Security
  - IP layer with ACL
  - MAC layer with ACL and Broadcast Storm control

Feature Implementation (NOS)

- Routing and Switching
  - VLANs
  - RSTP per VLAN
    - Not compatible with old SFINX switches (interoperability)
    - Remove of RSTP
    - Loop free layer 1 architecture
  - Possibility to change the core architecture by replacing the layer 2 with an EVPN over IP
  - Bug discovered during the tests that slowed down the device
    - Due to the BIOS of the DELL switch
    - NOS supplier provided a patch

Total Cost of Ownership Assessment

- Use of white paper "White Box Total Cost of Ownership" and "TCO Calculator"
  - White Paper: White Box Total Cost of Ownership
  - TCO Calculator
- From our cost assessment, the new version of the SFINX is significantly cheaper than the previous version
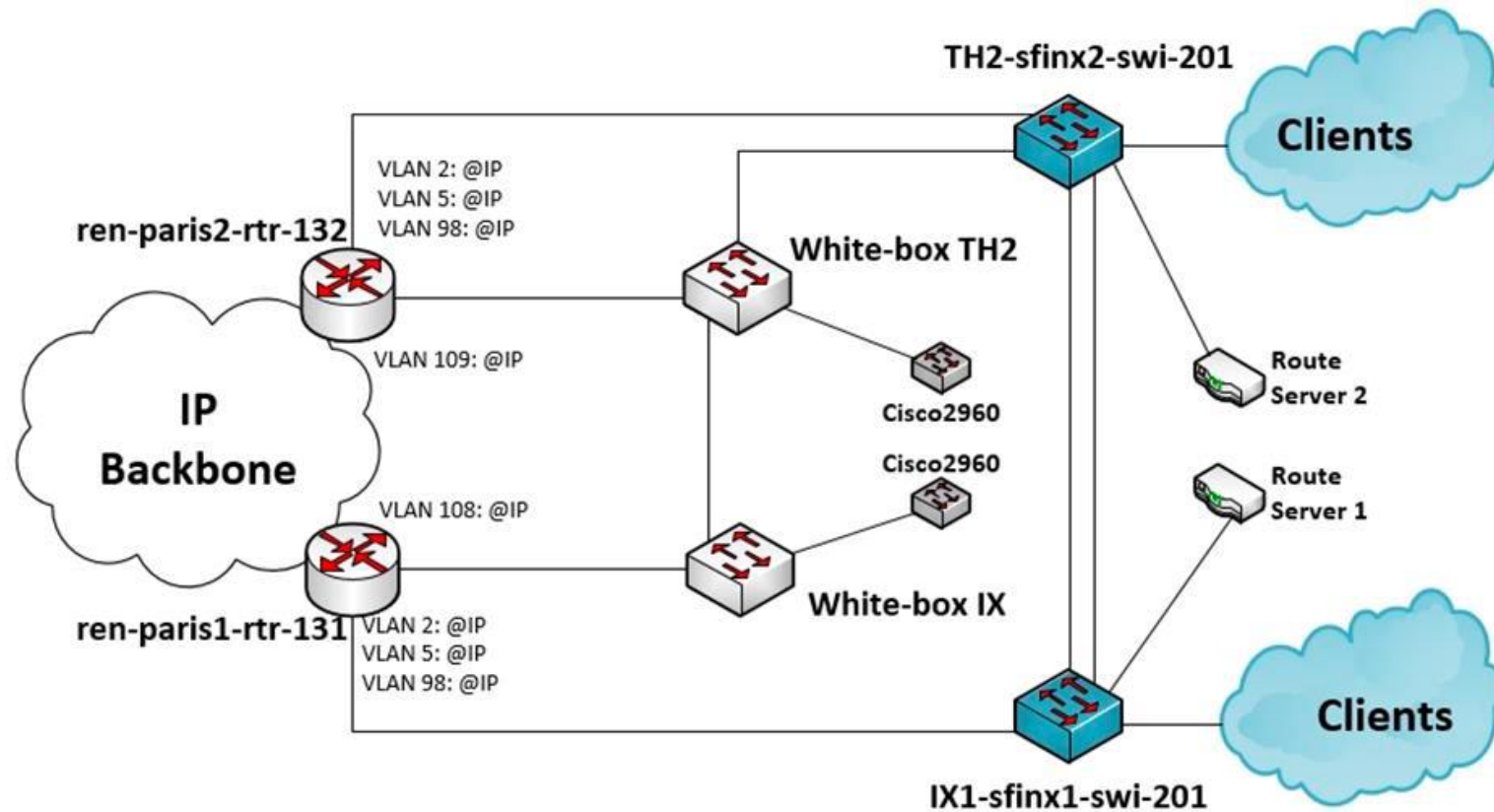
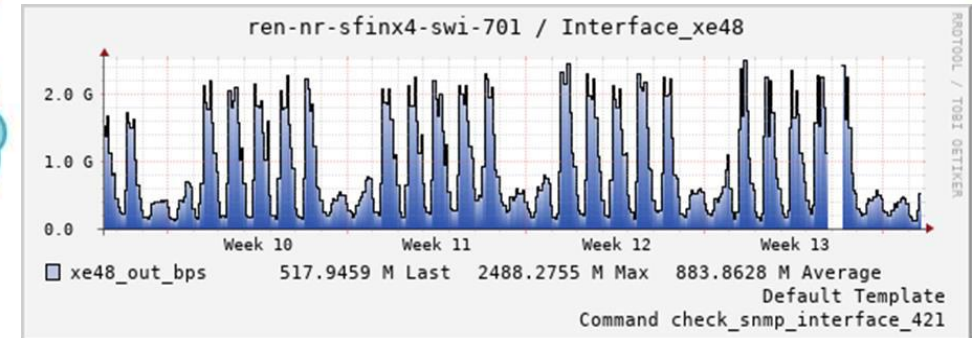# Migration plan

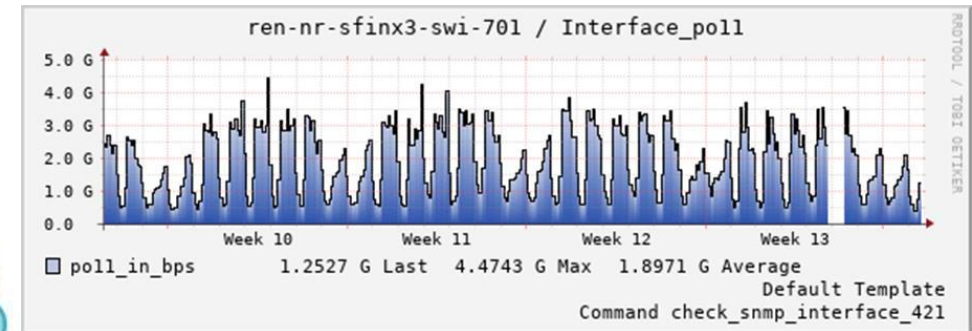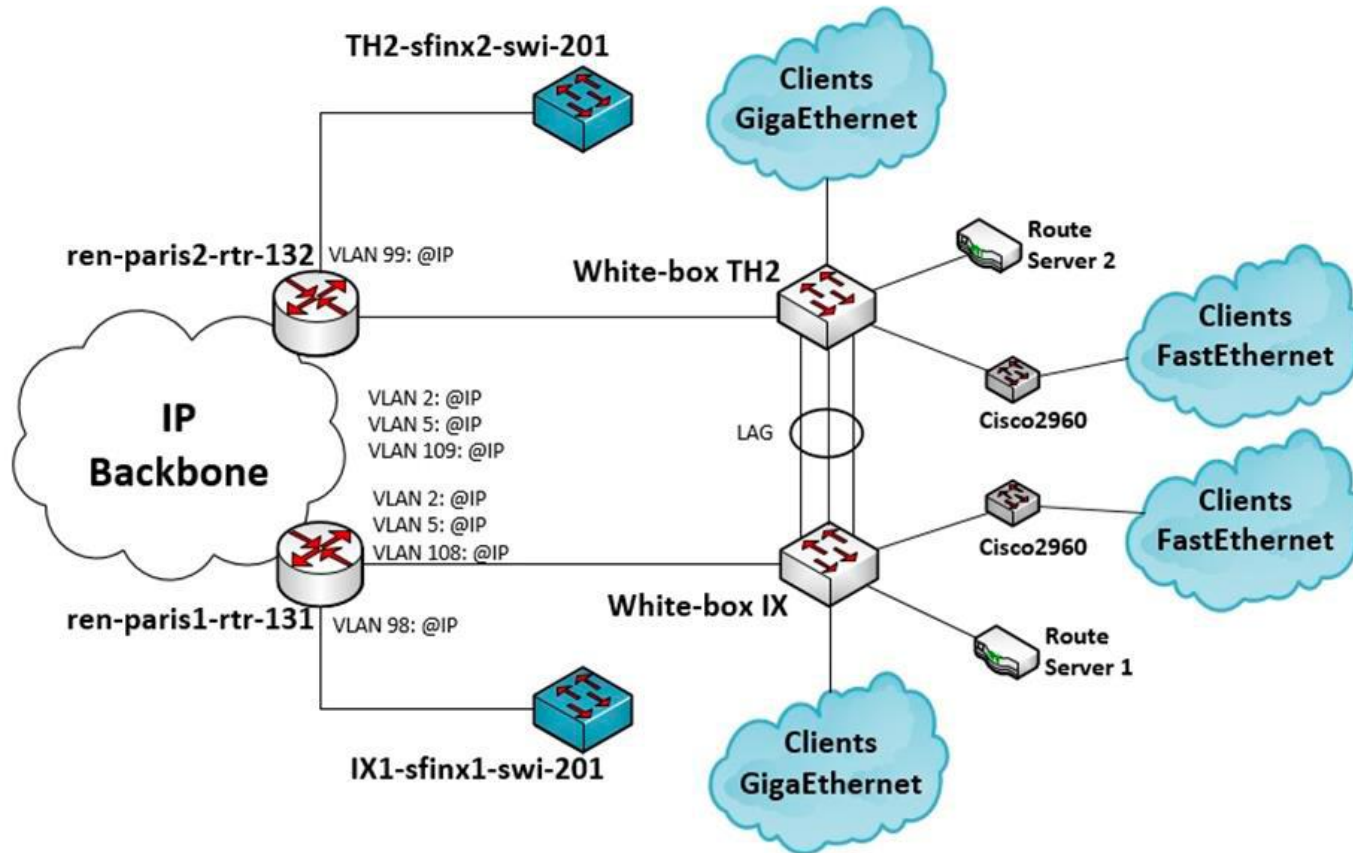- Ensure a smooth and stable transition
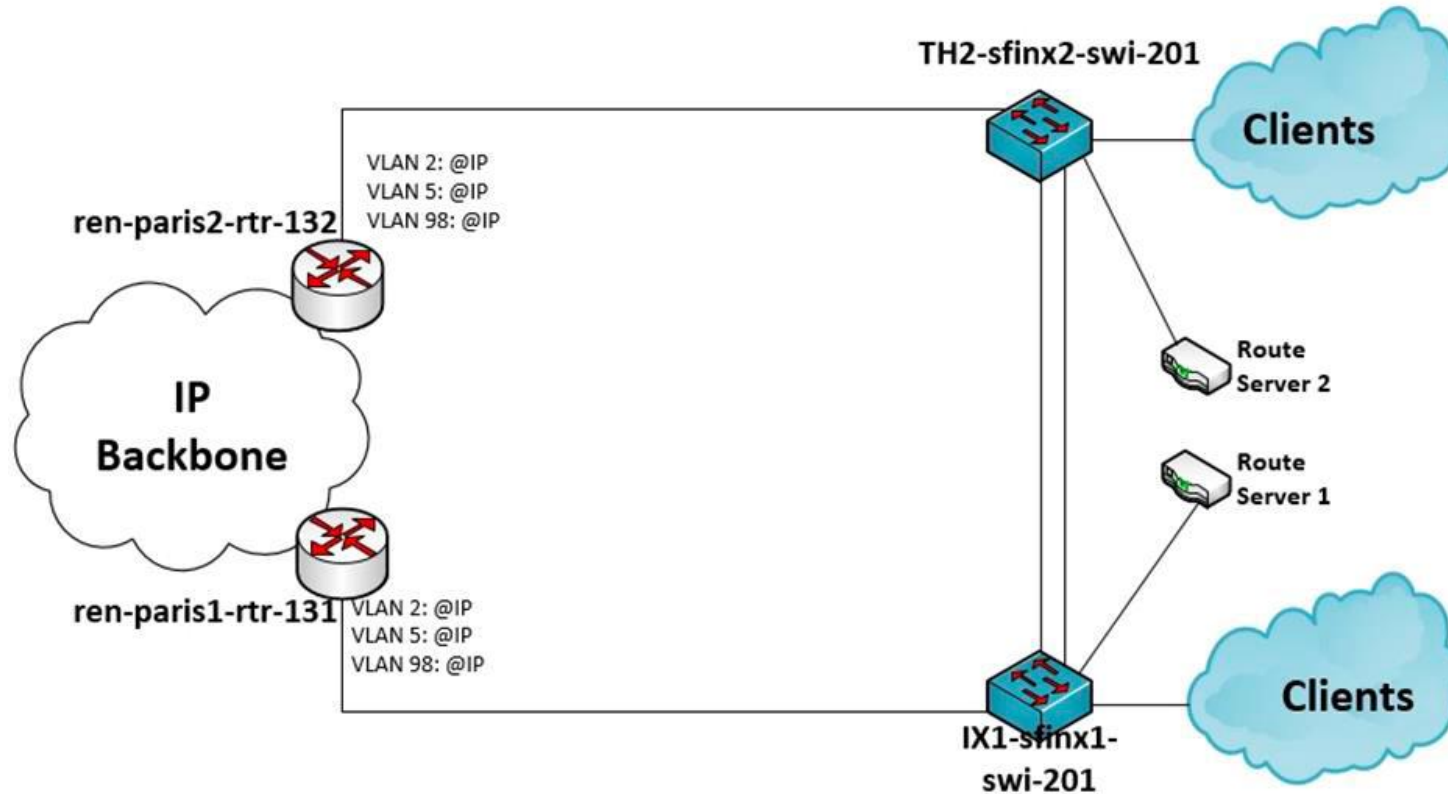
Migration plan

- Introduction of the White Boxes in the topology
- Incompatibility of the RSTP between olds devices and the White Boxes
  - Avoiding physical loops

Migration plan

- Last step

Conslusions

- Main goals achieved
  - SFINX was renewed with similar set of features
  - Lower cost
  - More independance from traditional vendors
  - Run in production for several months without any problems
- Some features are not compatible with traditional vendors application
- Getting started with the new NOS, OcNOS (Cisco like)
  - Easy to learn and use for engineers accustomed with Cisco
- RENATER acquired experience in White Box deployment and management

Thank you

Any questions?

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