NOIRLab - ITOps

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Agenda

- NOIRLab General Overview
- NOIRLab IT Operations (ITOps)
- Backbone Networks Activities
- Program Integration
- Network Upgrade Project
NOIRLab General Overview

Mission:
Enable breakthrough discoveries in astrophysics developing and operating state-of-the-art ground-based observatories and providing data products and services for a diverse and inclusive community*

NOIRLab Programs
- MSO (Mid-Scale Observatories)
- CSDC (Community Science and Data Center)
- GEMINI Observatory
- KPNO (Kitt Peak National Observatory)
- Vera C. Rubin Observatory (Construction)

Tenant Services
NOIRLab provides several services, such as summit-base connectivity, and access to research and commodity internet, to several Tenants through special agreements.

AURA operates these facilities and NSF’s NOIRLab under a cooperative agreement with NSF

* Source: https://noirlab.edu/
NOIRLab IT Operations (ITOps)

Overview

ITOps infrastructure and operations support standardizes system deployment and management as well as IT support requirements reaching all levels of NOIRLab. This includes Astronomy IT Operations, Business IT Operations, NOIRLab business and service areas.

Astronomy IT Operations
Delivers and supports enterprise computing services dedicated to supporting science.

Business IT Operations
Delivers and supports integrated IT services across all NOIRLab sites. Provides the IT services necessary to run the business of a globally distributed organization.

The Team
24 staff distributed across all NOIRLab sites in Chile, Hawaii and Tucson
Backbone Network activities

- Chile to USA links
- La Serena to Santiago
- Cerro Pachon <> La Serena
- DWDM improvements
- LCO improvements
Chile to USA

- 10Gbps burstable to 40Gbps on both links
- REUNA backup 10Gbps shared link
La Serena to Santiago

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Cerro Pachón to La Serena

La Serena  $\quad$  Cerro Tololo  $\quad$  Cerro Pachon

Primary

1st backup

2nd backup

Backup

20 x 10Gbps DWDM

400Mbps

300Mbps

300Mbps

300Mbps

Exclusive use Gemini

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DWDM Improvements

Base Data Center
La Serena

Internet

NOIRLab

Vera Rubin Obs.

Caseta Comunicaciones
Cerro Pachon

NOIRLab

Rubin Data Center
Cerro Pachon

Vera Rubin Obs.
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DWDM Improvements

Base Data Center
La Serena

Internet

NOIRLab

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NOIRLab

Rubin Data Center
Cerro Pachon

Vera Rubin Obs.
LCO Improvements

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Program Integration

- Gemini & MSO Integration
- ITOps Improvements 2021
- NOIRLab Network Upgrade Project
Gemini & MSO Integration

Activities During 2021

- In Layer 2 & L3: Sharing strategic VLANs and routes between both Programs

- Developing the “NOIRLab Network Upgrade Project”
  - Wired: Defining new Core/Spine and Access/Leaf Topology
  - WiFi: Defining new equipment to integrate both NOIRLab Programs

- Firewall Upgrade: Completed NGFW migration on CTIO
  - SSL VPN: To provide encrypted connection to Authentication Servers

- VoIP: Modifying Dial-Peers to communicate between both VoIP Systems
Integration Gemini - MSO in La Serena Base Facilities

- Gemini La Serena BASE Facilities
- Intrusion Prevention
- AntiMalware
- URL Filtering
- VPN Server
- Monitoring
- Multi-Tier Collapsed Core
- Access Layer
- FlexStack1
- CME
- WLC
- Storage
- VMWare
- FlexStack2
- Logs
- End user devices

- Base Data Center
- MEC
- OUT
- DMZ1
- Failover Link
- Firepower Thread Detection
- VSS
- IN

- New Next-Generation Firewalls - MSO La Serena
- Old ASA Legacy Firewalls

- MSO Building
- Access Switches MSO La Serena
- Cisco 6500

- Border Router
- VPN Remote User
- INTERNET

- Vera Rubin Networks Base
- Vera Rubin Networks Summit
- SOC
- CTO Tokyo

VSS: Virtual Switching System
MEC: Multi-Ether Chassis
WLC: Wireless LAN Controller
CME: Call Manager Express
ISE: Identity Service Engine
FMC: Firepower Management Center
MS-AD: Microsoft Active Directory
NTP: Network Time Protocol
DNS: Domain Name Service

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ITOps Improvements 2021

Next Generation Firewalls
- Increased number of Tunnel Profiles to Provide access to Remote users (GS, CTIO, GN)
- ResearchSOC Initiative (https://researchsoc.iu.edu/)
- CTIO Traffic Control moved to NGFW in SBF, legacy ASA Firewall VPN Server
- Implementation IPS, URL Filtering, Pre-Filtering

Software Upgrade on NX-OS Backbone devices
- NX-OS Upgrade on all Nexus devices that provide the connectivity to NOIRLab Backbone
  - AURA /NOIRLab Border Router
  - Head Border devices between SBF, Pachon Summit and Tololo Summit

Network Services & Collaborative Tools
- Authentication & Authorization :
  - Improvement ISE Nodes deployment, Licensing, Many new Policy Set Statements
- Centralized Service Desk (CSD)
- Unified productivity suite deployed to all NOIRLab Staff

Collaboration and Integration with Vera C. Rubin Observatory
NOIRLab Networking Upgrade Project

- LAN Design in all Locations: still in progress
  - (La Serena, Cerro Pachón, Cerro Tololo, Hilo, Mauna Kea, Tucson, Kitt Peak)
- WiFi Upgrade
- WAN Design

Based on standard technologies the options available (Design phase) are:

- Traditional Multi-Tier design
  - Core - Distribution - Access Topologies
  - Stacking Topologies
- Fabric L2 Leaf-Spine (Using Multi-Link Aggregation - MLAG)

Requires studying vendor capabilities

- Such as: Cisco - Arista - Aruba

~3 years to cover all locations

Will involve important NOIRLab stakeholders
Preliminary LAN Design using Multi-Tier topology in SBF

C9600X-SUP-2 only supports speeds of 10GE or higher (no 1GE support).

- 40 Gb
- 100 Gb
- 10 Gb

Gemini Data Center

NGFW

C9606R Sup 1

432 Access Ports (Stack 1M) SW 48

96 Access Ports (Stack 1M) SW 48 DR

NGFW

C9606R Sup 1

4xToR

192 Access Ports (Stack 1M) SW 48 DR 1

192 Access Ports (Stack 1M) SW 48 DR 2

Base Data Center

C9606R Sup 1/Sup2

3xToR
Preliminary LAN Design using L2LS (Arista Model)