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## IRNC: RXP: AtlanticWave-Software Defined Exchange: A Distributed Intercontinental Experimental Software Defined Exchange (SDX)

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## **AtlanticWave-SDX Project**

AtlanticWave-SDX is building a distributed intercontinental experimental SDX in response to a growing demand to:

- Support end-to-end services
  - Capable of spanning multiple IXPs and SDN domains
  - Dynamic provisioning of end-to-end circuits
  - Network programmability
- Provide more intelligent network services to
  - Foster innovation
  - Increase network efficiency

Collaboration between Florida International University (FIU) and Georgia Institute of Technology (GT)

# **Conceptual Design**

AtlanticWave-SDX conceptual design is comprised of two components:

- A Network Infrastructure Development Component
  - Connects AMPATH-IXP to AmLight-EXP spectrum delivered in Boca Raton
- An Innovation Component
  - Builds a multi-domain SDX between the U.S. and South America
  - Leverages open exchange point resources at SoX (Atlanta), AMPATH (Miami), and Southern Light (Sao Paulo, Brazil)

### **Network Infrastructure Development Component**

- 1. Create an optical network between Boca Raton and Miami
- 2. Upgrade the switching capacity at AMPATH to receive multiple 100G links from AmLight ExP
- 3. Extend upstream capacity to Internet2 AL2S over the FLR network
  - two sets of 250GHz channels, provisioned over two paths



## **Innovation Component**

#### Multi-Domain SDX Controller

- Connected to intermediate slice managers
  - "Isolated" from local applications
- Using OF 1.3

#### Policy API will support:

• Application Specific Peerings if (dstport == 80) forward to B else if (dstport == 4321 || dstport == 4322) forward to C



if (current\_bw > SLA\_bw) secondary = findSecondaryPath()
 while (current\_bw > SLA\_bw) LoadBalance(primary, secondary)

# Bandwidth Calendaring scheduled\_time = 21:00:00 GMT -5 if (current\_time == scheduled\_time) { BW = 90 t = 60 OnDemandVC(BW, t) }



## **AtlanticWave-SDX Challenges**

- Create a multi-domain high-capacity distributed exchange point interconnecting AtlanticWave RXPs:
  - MANLAN, MAX GigaPoP, WIX, SoX, AMPATH, Southern Light
  - A dedicated slice on AL2S and AmLight
- Create an environment for researchers and practitioners to collaborate at-scale
  - Retaining graduate students for development of SDX apps
  - Prototyping for SDN applications and services
  - Scientific instruments on demand
  - Application specific infrastructure on demand
- SDNWorkshop-SC15 Paper: AtlanticWave-SDX: An International SDX to Support Science Data Applications

## **Science Drivers**

- Large Synoptic Survey Telescope (LSST)
  - Image transfer south-to-north for transient alert processing
  - Data Release Catalog
  - Control Information
  - Calibration Information
  - User access of scientific data in the Data Access Centers
- Atacama Large Millimeter Array (ALMA)
- U.S. Astronomy Observatories in Chile
  - CTIO, Gemini-South, SOAR, others
  - Dark Energy Camera (DECam)
- LHC Open Network Environment (LHCONE)
  - HEP experiments are moving towards more dynamic workflows and data management,
  - Significant increases in utilization of network resources in an active way
- Ultra-High Definition (UHD) Video
  - 4K UHD (8.3M pixels) and 8K UHD (33.2 Mpixels)
  - Minimum bandwidth requirement of 300Mbps with low packet loss  $_{\rm 7}$  and low jitter rates

## **Current Status**

- Network Infrastructure Component:
  - Establishing partnerships/contracts to create the optical infrastructure Boca Raton – Miami
    - Fiber, Hosting
- Innovation Component:
  - Hiring a DevOps engineer
  - Discussing implementation details
- Next target:
  - Have a prototype for SC16