SAACC Meeting

Miami, Jan 10th 2017

AmLight: Connections/Protocols/Developments

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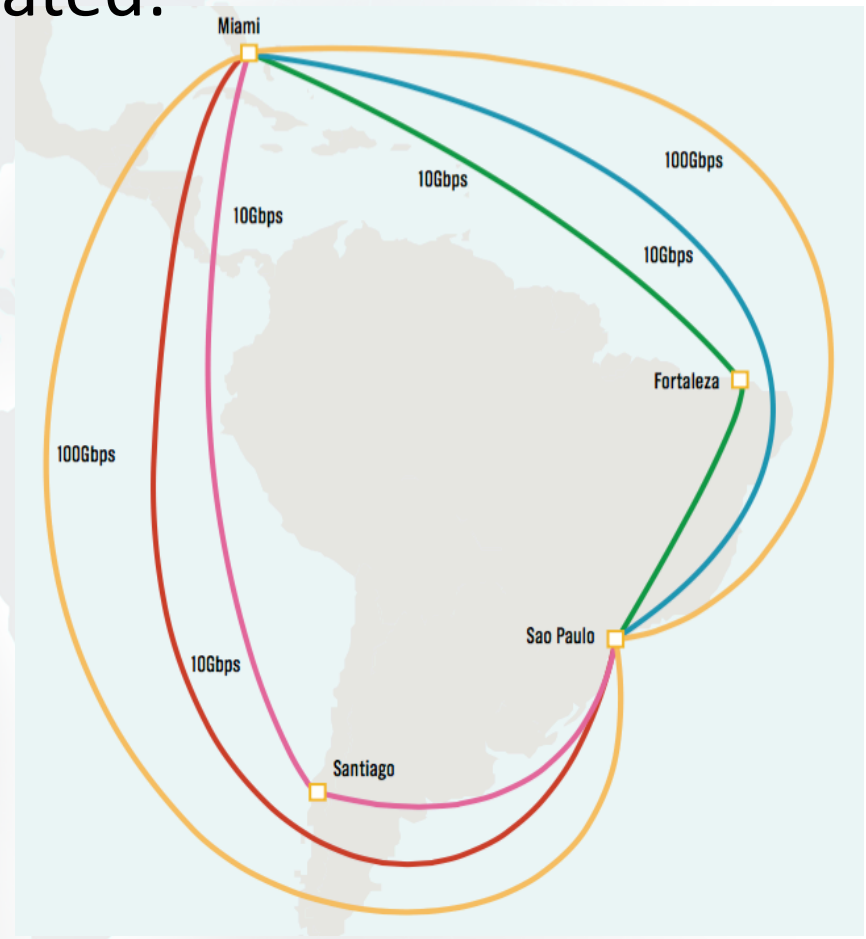
SDN @ AmLight-ExP (1/2)

- AmLight is an SDN network since 2014
- Now, *provisioning* is fully automated:

Average time to provision a new circuit		Avg. number of e-mails exchanged	
before SDN	***after SDN***	***before SDN***	***after SDN***
5 days	< 5 minutes	10	0
12 days	< 5 minutes	65	0



- Programmability was added, users can control their own traffic
  - No NOCs, phone calls or e-mails needed

SDN @ AmLight-ExP (2/2)

- Migrating to SDN was just the first step to a new AmLight
- With programmability, domain scientists can control the network to handle specific applications requirements
  - Shortest path, traffic prioritization vs. best effort, …
- Tools are being developed to handle AmLight's needs:
  - With ANSP: SDNTrace for path validation, SDN-LG for network management,…
  - With Georgia Tech: an SDX controller (next slide)
- In partnership with vendors, AmLight is testing new approaches to increase security, visibility and deeper programmability:
  - Bandwidth on demand, manage the optical layer, better traffic characterization, DDoS mitigation
- In the end, the idea is to provide a more flexible and secure network to improve *users experience* when using AmLight

SDX Motivation (1/2)

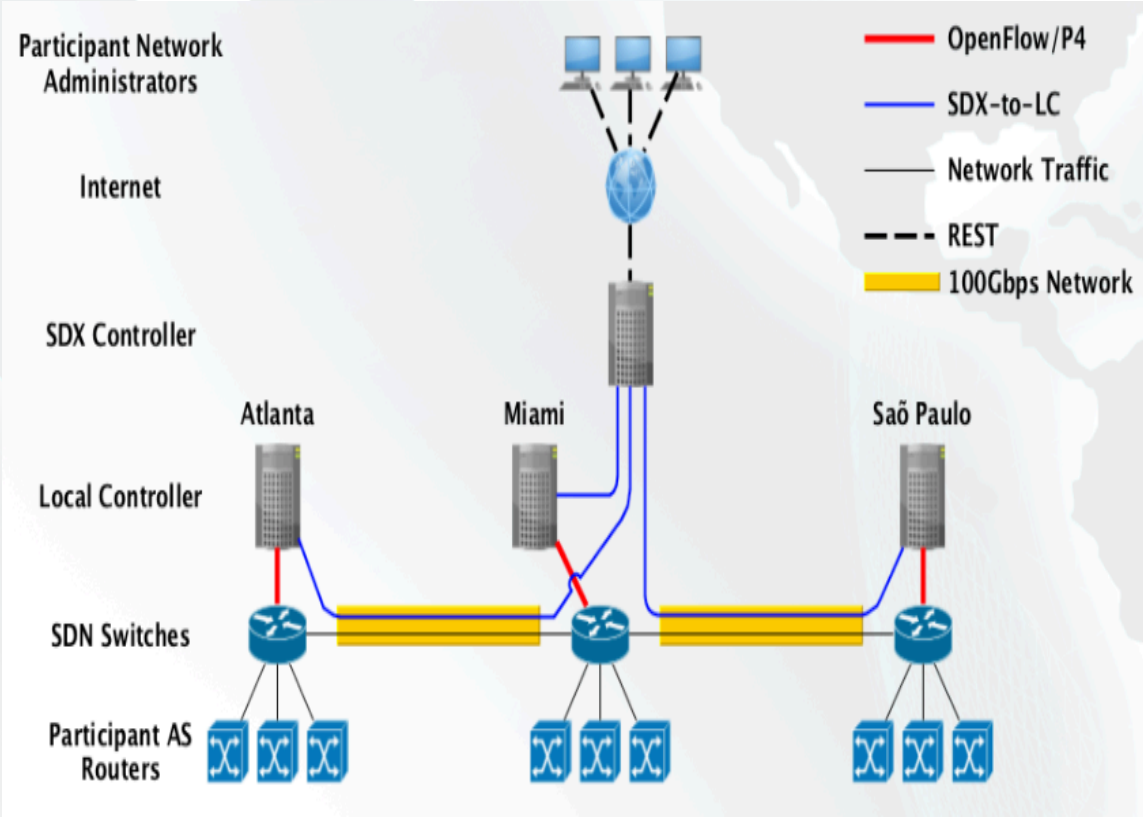
- Two interfaces available for network programmability:
  - Low-level API using the OpenFlow protocol
  - Mid-level API using the Network Service Interface - NSI
- Sometimes, domain scientists do not want to go into all networking details
  - Rewriting application takes time
- A simpler approach is being proposed to help domain scientists with a high-level API:
  - SDX – *Software Defined Exchanges*

SDX Motivation (2/2)

- A Software Defined eXchange (SDX) seeks to introduce Software Defined Networking (SDN) technologies into Academic Exchange Points to optimize resource sharing and allocation
  - Inter-domain R&E network *programmability*
  - End-to-End QoS *coordination* and *enforcement*
- SDX aims to provide user-friendly APIs to facility policy description

AtlanticWave-SDX Project (1/2)

- NSF project to create a distributed inter-domain SDX controller
- Initially, three Academic Exchange Points will be managed by a single SDX controller:
  - Atlanta
  - Miami
  - Sao Paulo
- The SDX controller will provide two different user interfaces:
  - High-level abstraction for domain scientists
  - Low-level abstractions for network engineers



AtlanticWave-SDX Project (2/2)

- Some applications:
  - *Bandwidth calendaring:*
    - *"SDX, please, set a network profile to help me move data every night from 2am to 3am at 10Gbps"*
  - *Resource allocation*
    - *"SDX, I have 7TB of data to send from LSST to NCSA in 1 hour starting in 5 minutes. Please set a network profile!"*
  - *Incoming traffic engineering*
    - *"SDX, help me control of the way I receive traffic from multiple interfaces and sources!!"*
  - *Bandwidth on demand*
    - *"SDX, the network is too slow today. Find another path for me that could guarantee 10Gbps from LHC to here."*

AtlanticWave-SDX: User Interfaces

Network Engineers

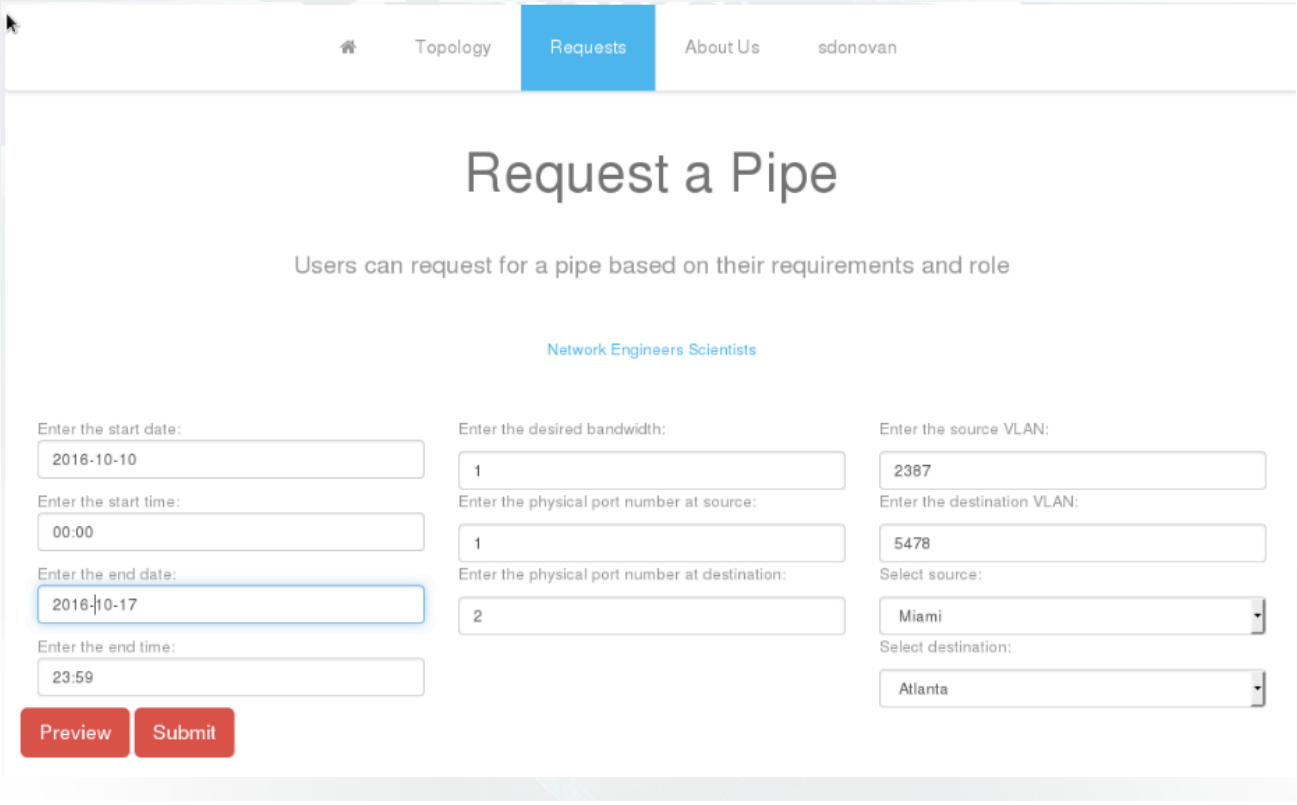
```
{
  "l2tunnel": {
    "starttime":"2017-02-10T23:20:50",
    "endtime":"2017-02-11T23:20:50",
    "srcswitch":"lsst-switch",
    "dstswitch":"ncsa-switch",
    "srcport":1,
    "dstport": 2,
    "srcvlan": 1000,
    "dstvlan" 1001,
    "bandwidth": "1G"
  }
}
```

Domain Scientists

```
{
  "dtntunnel": {
    "starttime":"ANYT01:00:00",
    "endtime":"ANYT05:00:00",
    "srcdtn":"lsst-dtn",
    "dstdtn":"ncsa-dtn",
    "datasetsize": "100GB"
  }
}
```

Current Status

- Prototype demonstrated at the GLIF and Super Computing 2016
  - https://github.com/atlanticwave-sdx/atlanticwave-proto
- Support for NSI being added
- Integration with Shibboleth for easy authentication almost ready
- Later this year, domain scientists will have a functional SDX available for tests
- Web interface:



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Thanks!

Questions?

www.atlanticwave-sdx.net