



Roadmap to Operational SDN 2015

July 14th

SDN @ AmLight: ***One Year Later***

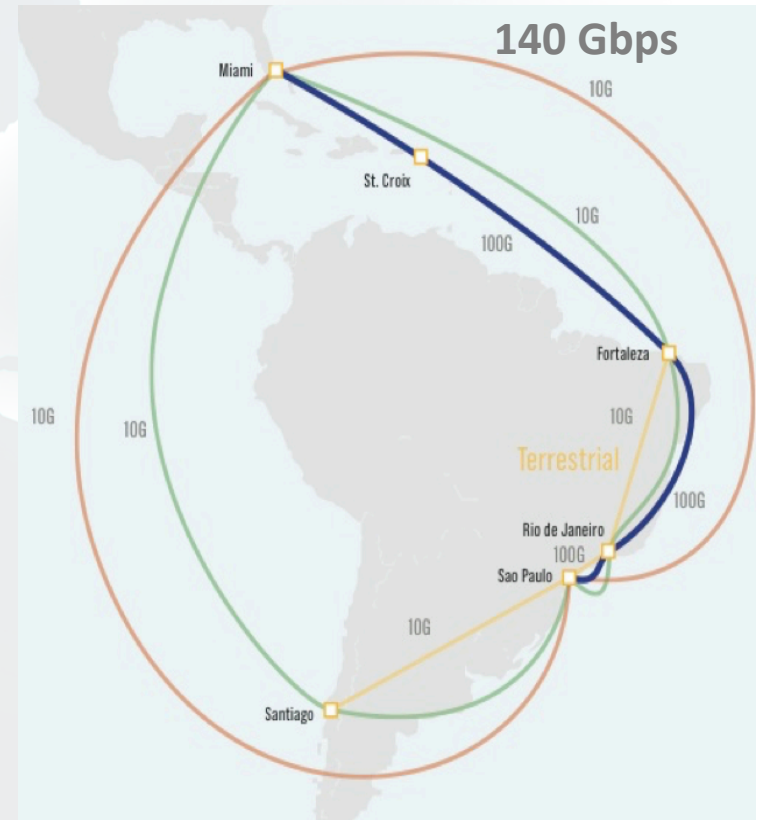
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Describing AmLight

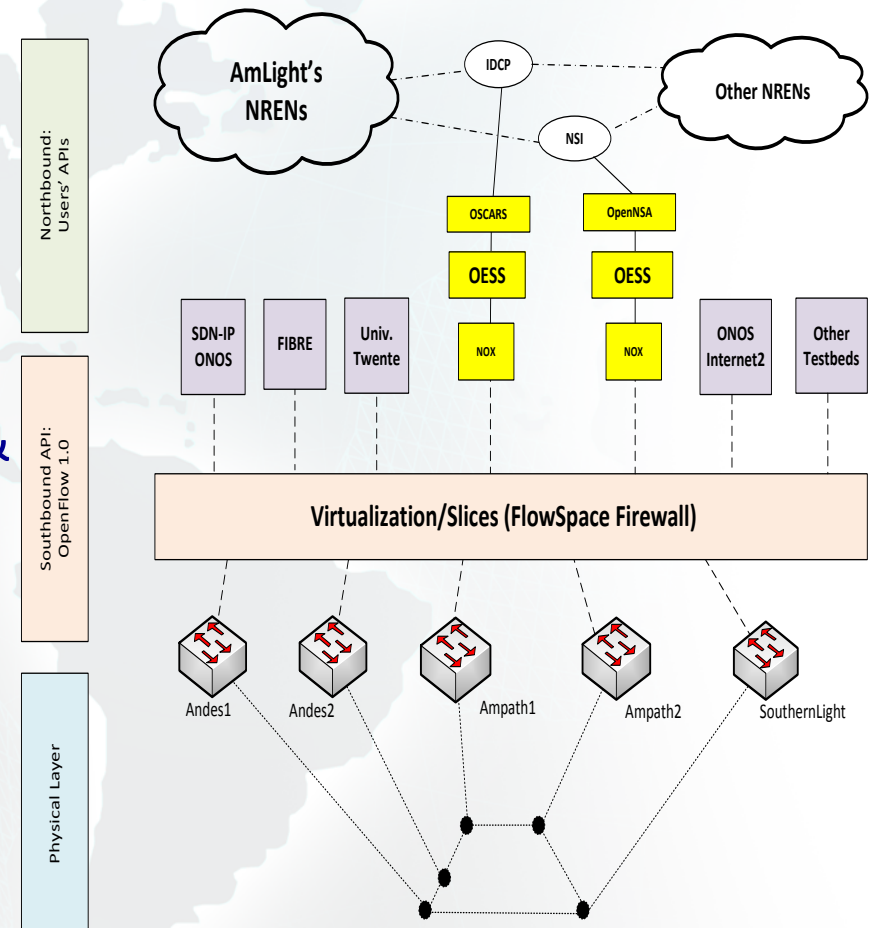
AmLight is a Distributed Academic Exchange Point

- Connects **AMPATH** and **SouthernLight** GLIF GOLES
- 4 x 10G links and two topologies
 - By Sep 1st: + 100Gbps between Miami and Brazil
- **SDN ring**: Miami-Brazil-Chile-Miami
 - Full Openflow 1.0
 - Supports Network Virtualization
 - NSI and OSCARS enabled
- **MPLS ring**: Miami-Brazil-Miami



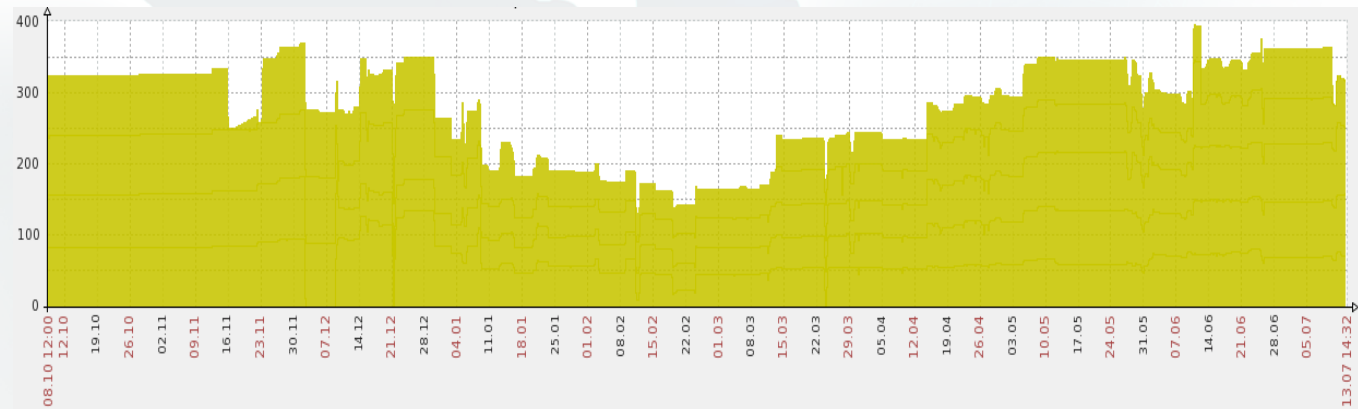
Describing AmLight SDN

- Production SDN Infrastructure
- Carries Academic and Non-Academic traffic
 - L2VPN, IPv4, IPv6, Multicast
- 5x Brocade switches, 2x Hybrid Ports & 10+ Native OpenFlow ports
- Flow Space Firewall for Network Virtualization/Slicing
- OESS for L2VPNs
- Currently 5 slices for experimentation

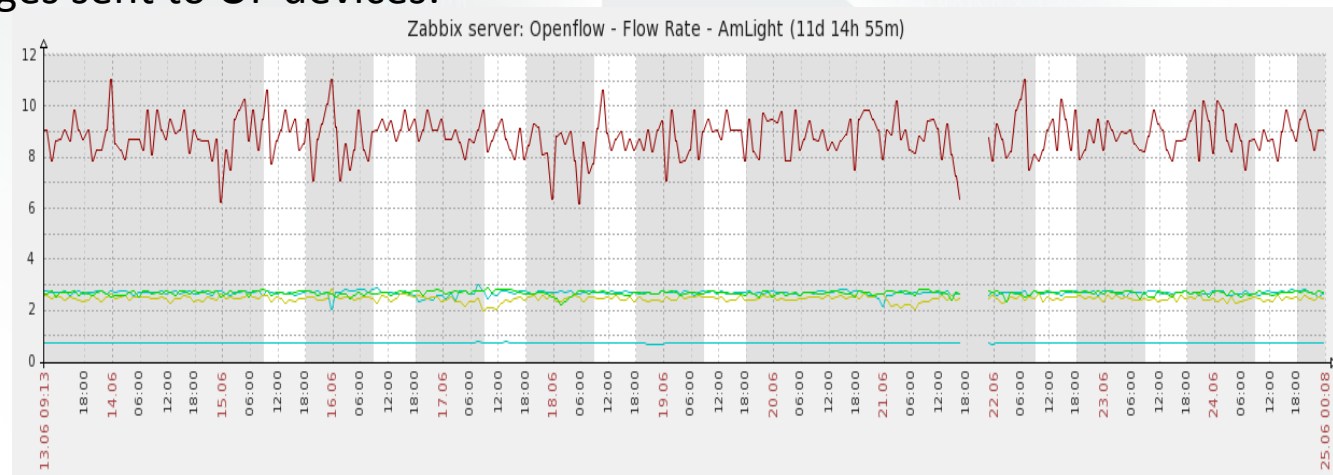


AmLight SDN: Numbers (1/2)

Number of OF Flows in the “production” slice:



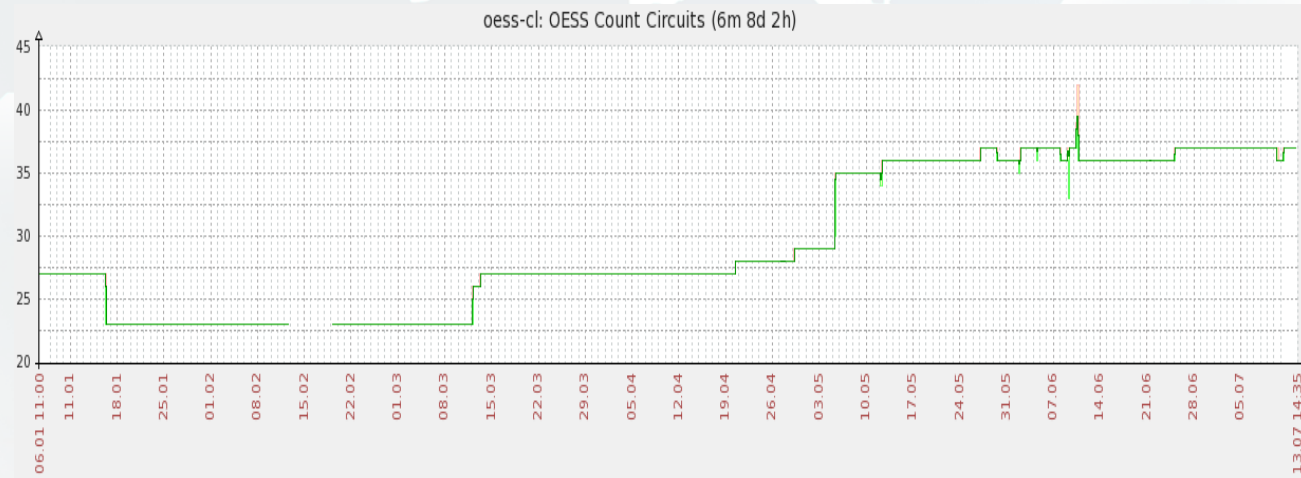
Number of OF messages sent to OF devices:



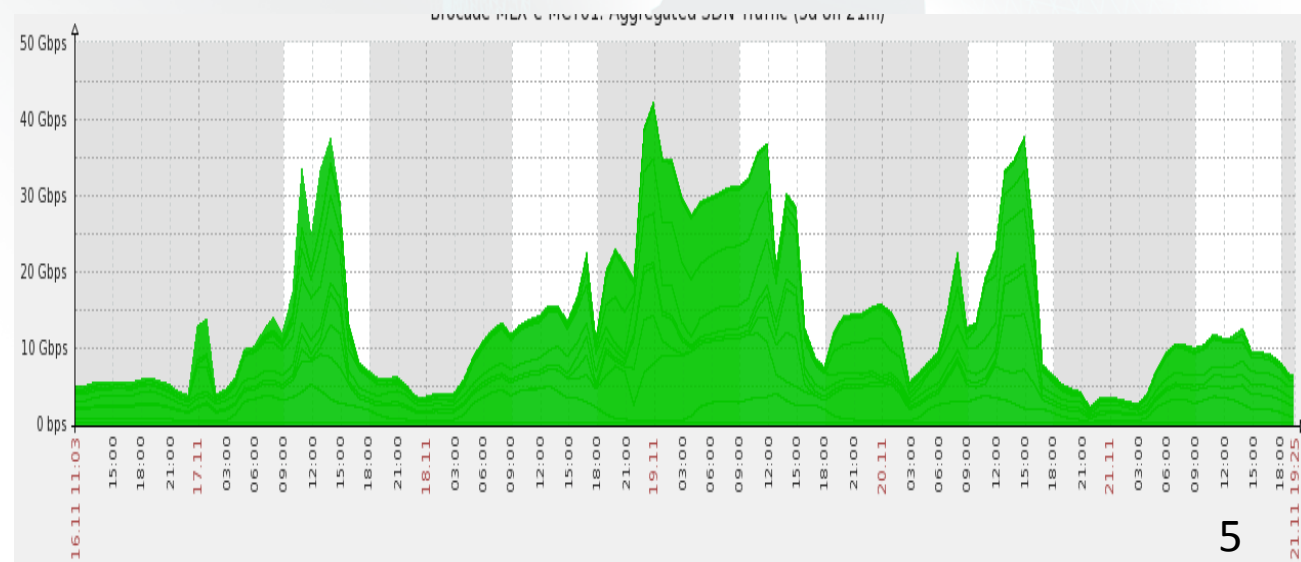
Results of the integration between OESS + Zabbix + FSFW

AmLight SDN: Numbers (2/2)

Number of OF circuits in the “production” slice:



Amount of traffic of all OF ports:



Experiences after a year (1/3)

Reasons to believe!! 😊

1) SDN to improve network operations:

- It works! Easy to see results, easy to test new applications, easy to add new features!
- Provisioning time decreased from days to seconds

2) SDN as a platform for innovation/network virtualization:

- Fantastic! Multiple testbeds in parallel allowed
- Users have a real playground to test new protocols, algorithms and ideas

Experiences after a year(2/3)

But, SDN/Openflow also brought problems...

- **Troubleshooting:**

“Why is it not working?” / “What has just happened?”

“Why my flows were removed/were not installed?”

“Why has switch reloaded?” / “Why my flows are duplicated?”

- **Lack of features:**

“Why don’t your switch support MAC rewrite?”

“Why is my application limited to 2k flows?”

“Why can’t I use OF 1.0 and OF1.3 in parallel?”

- **Users that want to change the network:**

“Why can’t you change your switch to be reactive?”

“Could my app connect directly to the switches (bypass FSFW)?

- **Lack of support from some partners (friendly fire):**

“I can get the same results with VLAN+STP or MPLS”

“This was not happening before SDN be deployed”

Experiences after a year (3/3)

Reasons to make you reconsider the *timing*!! ☹️

1) SDN to improve network operations:

- Troubleshooting is still a challenge
- Lack of skills to troubleshoot and improve the network
- Some vendors/devices don't provide enough information
- *How to validate an Openflow device?*

2) SDN as a platform for innovation:

- Users forget this is production network
- *How to migrate all testbeds to OF1.3 at the same time?*
- *How to support multiples testbeds in parallel?*
 - Each *testbed* requires a huge engagement from the engineering team

Tools that would help us

- Traceroute for users
 - Users should be able to start the troubleshooting before contacting NOC
 - Is it possible to be multi-domain?
- Openflow consistency between devices and applications
 - How to validate that all flow databases are synchronized?
- OpenFlow Sanitizer
 - How to control what OF messages applications can send to the OF devices?
- Flow recorder
 - How to track all OF messages sent by apps to OF devices?
 - How to use this info to help vendors with troubleshooting?
- Hybrid Port (legacy and OpenFlow in the same port)
 - Is it possible to “standardize” it?

Future

1) AtlanticWaveSDX:

- NSF Grant to build a distributed international SDX involving AmLight and AtlanticWave (SouthernLight, AMPATH, SOX, MAX and MANLAN)
- Partnership with Georgia Tech
- Started officially on June 2015

2) OpenFlow Sanitizer

- OpenFlow proxy being developed to filter and log specific OF messages

3) SDN Traceroute

- A multi-slice SDN traceroute with a web interface



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Thank you!
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