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

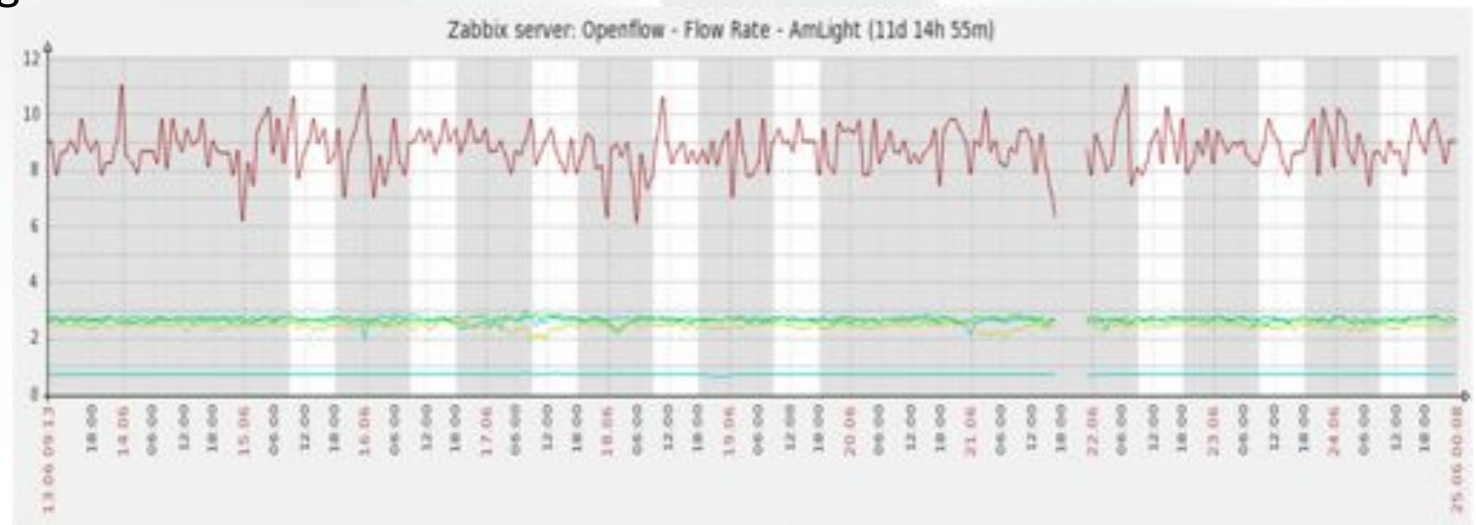- Currently 5 slices for experimentation
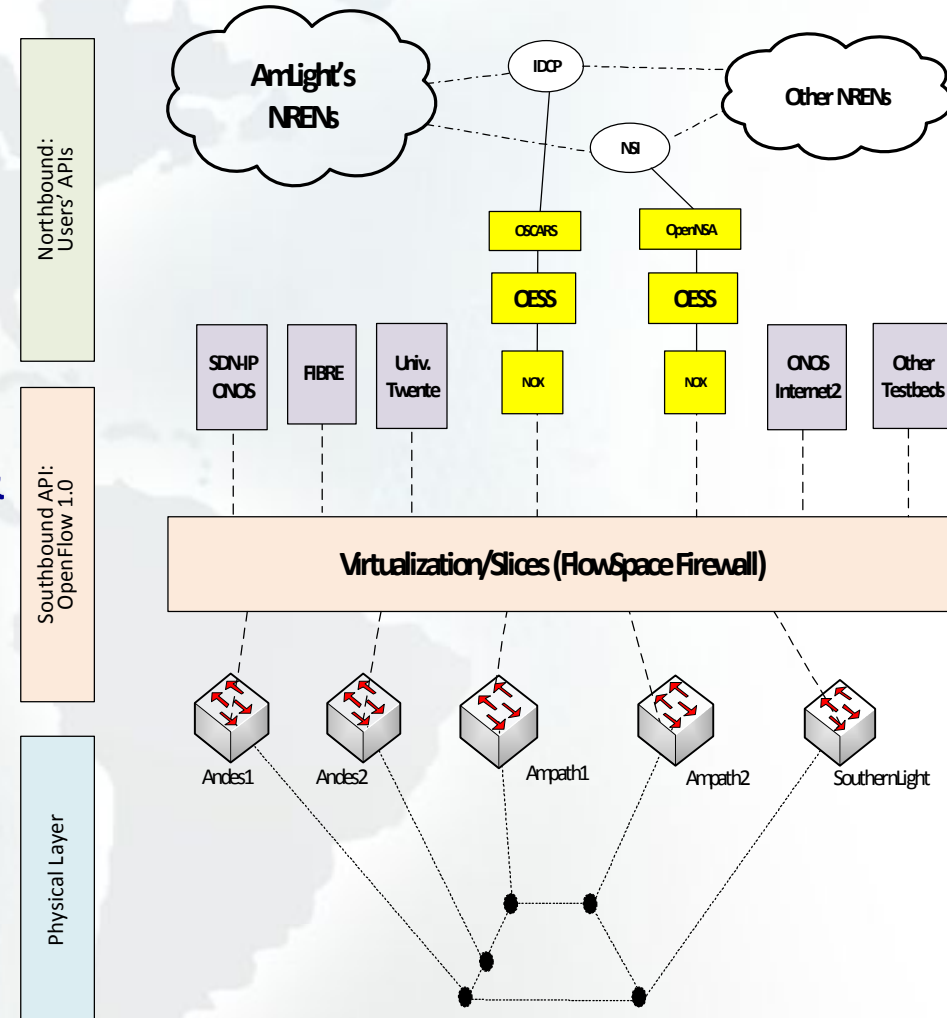
AmLight SDN: Numbers (1/2)

Number of OF Flows in the "production" slice:
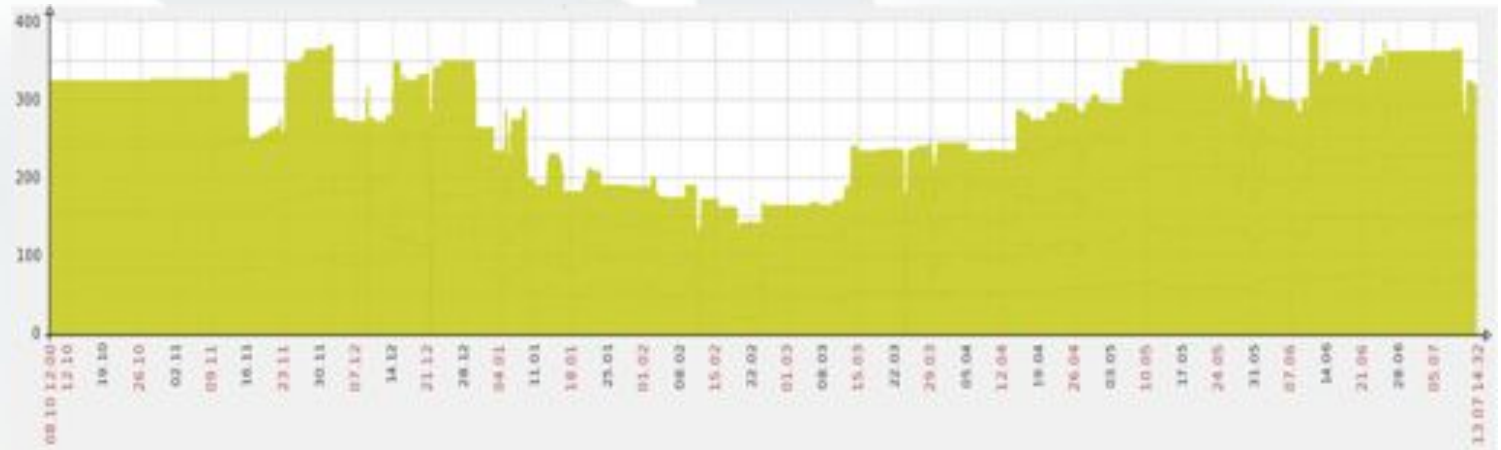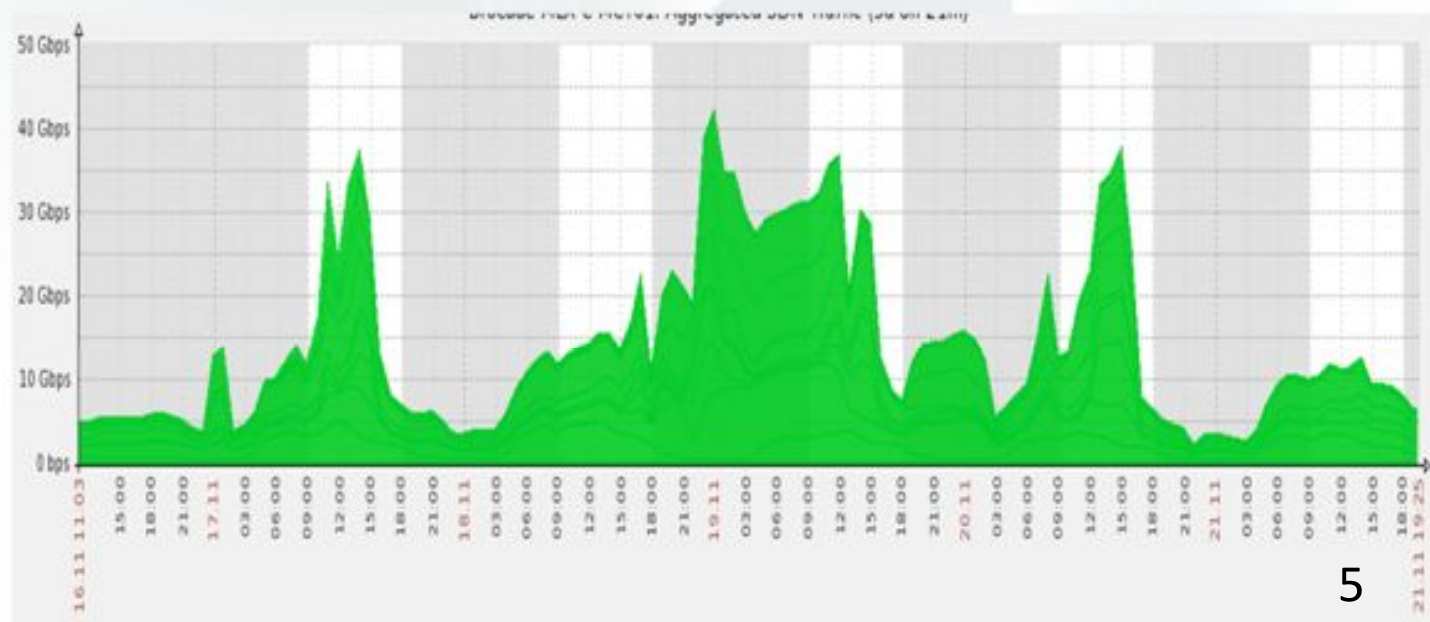

Number of OF messages sent to OF devices:

Results of the integration between OESS + Zabbix + FSFW   4

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!
www.sdn.amlight.net

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