Looking Beyond The Internet
Software Defined Infrastructure

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Connecting experiments and scientists traditionally has been easy: move the scientist to the experiment. Due to the Internet, this paradigm has changed. Now, scientists working on an experiment in Europe can be located nearly anywhere in the world and access the same data as if they were on site. Scientists at Fermilab in Illinois control the Large Hadron Collider (LHC) from the comfort of their own desks, receiving near-real-time data from the LHC experiments thanks to the Internet.

Experiments are growing in scale, as is their data output. The Large Synoptic Survey Telescope (LSST) will start generating data in 2020,[1] eventually creating a 6.4 GB image every 17 seconds[2] and needs to be transported to scientists and researchers in the United States with strict timing requirements. To handle these new flows, while providing new capabilities for existing networks that need to transit and receive these flows, a distributed software-defined Internet exchange point (SDX) was proposed.

The AtlanticWave-SDX project's main goal is to realize an international distributed SDX with physical locations in Atlanta, Miami, and San Paolo, Brazil. This involves creating not only the physical infrastructure including connections between the three points, the switches, and controllers, but also the software infrastructure, in particular creating controller software that allows the SDX participants to create policies at one or more locations to affect their traffic.

There are many unanswered questions related to SDXes that need to be answered in order to create the controller application for the AtlanticWave-SDX. These include:
- What should the participant interfaces look like
- What types of policies need to be implemented
- How to enforce separation between participants
- Can participants alter policy at different locations than they physically connect

All of these questions will be informed by the SDI/SDX Workshop. Many of the topics under discussion *directly* apply to these questions. Our participation will be useful due to the large overlap in topics we are considering for AtlanticWave-SDX and the SDI/SDX Workshop.

Sean Donovan is taking time off in a PhD program. His work in the past has included creating new methods for filtering network flows in software-defined networking controllers. His current work involves designing and implementing the controller software for the AtlanticWave-SDX.

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[1] http://www.lsst.org/about/timeline
[2] "AtlanticWave-SDX: An International SDX to Support Science Data Applications". Joaquín Chung, Jacob Cox, Julio Ibarra, Jerônimo Bezerra, Heidi Morgan, Russell Clark, Henry Owen. 2015

Russ Clark has a long history of SDN projects at the campus and regional level. He is the PI for the GENI@SoX regional project and leads SDX efforts for GENI and the SoX role in the AtlanticWave SDX.

Jeronimo Bezerra has extensive experience in ICT and network engineering. He is responsible for the operation and engineering of the AtlanticWave-SDX network infrastructure, including the SDN deployment between AMPATH and SouthernLight international open exchange points.

Heidi Morgan has a long history of working with the application communities on engagement and effective utilization of the cyberinfrastructure resources. She is responsible for bridging between the applications communities, development, engineering and operations.

Julio Ibarra has a very long history of ICT, telecom infrastructure management with specialization in R&E networks. He has overall responsibility for the AtlanticWave-SDX project and the network infrastructure that will support it.

We request support for travel.