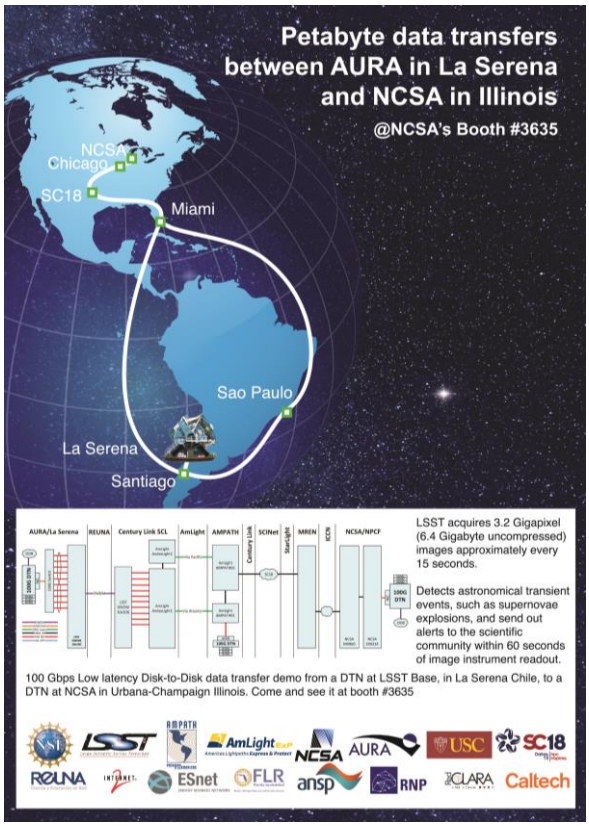
SC18 Network Research Exhibition: Large Synoptic Survey Telescope (LSST) Real Time Low Latency Transfers for Scientific Processing Demonstrations

Global Petascale to Exascale Science Workflows Accelerated by Next Generation SDN Architectures and Applications

At SC18 in Dallas, Texas we plan to experiment with data transfer rates, using 100Gig FIONA Data Transfer Nodes (a.k.a. DTNs) in Chile and Illinois. The demos aim to achieve three goals: First, we will demonstrate real time low latency transfers for scientific processing of multi-Gigabyte images from the LSST base station site in La Serena, Chile[1], flowing over the REUNA Chilean National Research & Education Network (NREN), as well as ANSP and RNP Brazilian national circuits and the AmLight-ExP Atlantic and Pacific Ring through AMPATH[2] to Starlight and NCSA. Second, we will simulate operational and data quality traffic to SLAC, Tucson and other sites including the Dallas show floor. Third, we will stress test the AmLight ExP network to simulate the LSST annual multi-petabyte Data Release from NCSA to La Serena at rates consistent with those required for LSST operations[3].



Group Leads and Participants, by Team

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[1] LSST is operated by The Association of Universities for Research in Astronomy (AURA) for the National Science Foundation

[2] AMPATH is the International Exchange Point for Research and Education in Miami operated by Florida International University's Center for Internet Augmented Research and Assessment (a.k.a. CIARA)

[3] Dependent on time and resources available, it may occur after SC18

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Additional Information:

(1) LSST (J. Kantor):

LSST Science Use Case 1: Prompt processing

LSST acquires 3.2 Gigapixel (6.4 GB uncompressed) images approximately every 15 seconds and must transfer those images from AURA in La Serena, Chile to NCSA in Urbana-Champaign, Illinois in 5 seconds. This is in order to perform "prompt processing" to detect astronomical transient events, such as supernovae explosions, and send out alerts to the scientific community within 60 seconds of image readout from the instrument. Approximately2000full focal plane images per night are generated (in pairs of exposures over a single telescope pointing called a "visit"). Each image is composed of 21 files, with each file containing the image data from 1 LSST Camera Raft (an array of 3 x 3 CCDs, each 4k x 4k pixels). At SC 2018, we will demonstrate low latency transfers simulated or pre-cursor images from AURA in La Serena Chile to the Chicago Starlight point, and from there to NCSA and/or to the SC venue.

LSST Science Use Case 2: Data Release

At NCSA in Illinois and a satellite processing center at CC-IN2P3 in Lyon, France, LSST reprocesses all of the accumulated survey images every year, to produce deep, co-added images and astronomical object catalogs with extremely precise measurements of very faint objects up to 13B light years distance from Earth. The output of this annual processing is a Data Release, and the size of each Data Release increases each year, from approximately 6 PB in year 1 up to 60 PB in year 10. On completion and quality assessment, the entire Data Release is transferred to our Data Access Centers located at NCSA and at AURA in La Serena, Chile. The transfer from NCSA to La Serena is accomplished over the network, over a period of months. At SC 2018, we will demonstrate PB data transfers from NCSA to AURA in La Serena, Chile at rates consistent with those required for LSST operations.

(2) The AmLight Express and Protect (AmLight-ExP) Project (J. Ibarra): AmLight-Exp plans to support high-throughput, low latency experiments using optical spectrum on the new Monet submarine cable, and its 100G ring network that interconnects the research and education communities in the U.S. and South America, including Chile and Brazil. Use cases for LSST, requiring high throughput image transfers, low latency, and rapid recovery from network events will be tested.