

Iowa State Streaming Data Movement Executive Summary
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A climate researcher at Iowa State University (ISU) experienced poor performance streaming National Oceanic and Atmospheric Administration (NOAA) real time earth observation data from the University Corporation for Atmospheric Research (UCAR) in Boulder, Colorado. ISU's Wide Area Network (WAN) Engineer contacted EPOC for assistance on June 21, 2019 after attending an EPOC presentation at the Great Plains Networks (GPN) annual meeting.

A sustained data rate of 80Mb/s was required to keep up with the real time stream of data, and a data rate of 320Mb/s or greater was preferred by the researcher in order to capture and process the stream. However, the researcher was seeing intermittent transfer rates that fell as low as 32Mb/s. Performance had degraded slowly over time, with a significant drop in performance over the past few months. The researcher processes and stores the data on a host in the Agronomy Hall on the ISU campus.

After consulting with EPOC engineers, the researcher installed the perfSONAR toolkit on the file transfer server in his lab in Agronomy Hall at ISU. PerfSONAR bandwidth tests to a UCAR perfSONAR host showed good performance from ISU to UCAR, however, from UCAR to ISU performance dropped and results showed many packet retransmits. Trace routes between the hosts showed data took an asymmetric path.

The ISU WAN network engineer confirmed that changes to their Wide Area Network connections to GPN and Internet2 had recently taken place. The timing of these changes coincided with the major performance drop. There was also evidence of packet fragmentation along the path with some jumbo frame packets being dropped or possibly fragmented.

The ISU WAN engineer and researcher proceeded to install several perfSONAR hosts in various locations along the network path. The tests showed that the network issue appeared to be confined to the local ISU network. After this finding, ISU engineers upgraded the operating systems running on several pieces of network hardware, adjusted several system configurations on hardware along the path, and rebooted Agronomy Hall switches.

During the last week of September, the Network Engineering team at ISU also made a number of larger changes to the network configuration for the ISU campus:

- Along with GPN, their regional provider, they identified that the 10Gb/s link to Internet2 was congested.
- They changed the primary campus peerings to directly connect to Internet2 via a newer 100G path provided by GPN
- Replaced the entire switching infrastructure in Agronomy Hall with newer hardware.
- Normalized the network path between Agronomy Hall and the campus core network to remove the routing asymmetry.

These improvements have resulted in a more consistent transfer time averaging 624Mb/s to and from the UCAR perfSONAR node. The researcher is again able to process earth observation data in real time, and the perfSONAR infrastructure that was set up as part of this process will continue to be used in the ISU campus core and Agronomy Hall to monitor network performance.

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