ROADSIDE ASSISTANCE CASE: IOWA STATE UNIVERSITY TO NOAA/UCAR

Networks/Organizations Involved: Iowa State University (ISU), Great Plains Network (GPN), NOAA/UCAR network, the Engagement and Performance Operations Center (EPOC), and the Energy Sciences Network (ESnet)
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Audience: General
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PROBLEM DESCRIPTION

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 the Engagement and Performance Operations Center (EPOC) for assistance on June 21, 2019.

In order to utilize the real time streaming data, a minimum transfer rate of 80Mbps was required, with a preferred data rate of 320Mbps or greater in order to capture and process the stream. Intermittent performance issues, however, resulted in transfer rates falling as low as 32Mbps. The researcher noted that performance had degraded slowly over time, with a significant drop in performance over the past several months. At EPOC's request, the researcher installed the perfSONAR toolkit on the file transfer server in his lab in Agronomy Hall at ISU. perfSONAR bandwidth tests showed good performance from ISU to UCAR, however, from UCAR to ISU performance was poor and results showed many packet retransmits, as shown in Figure 1. Trace routes between the hosts also revealed asymmetric routing.
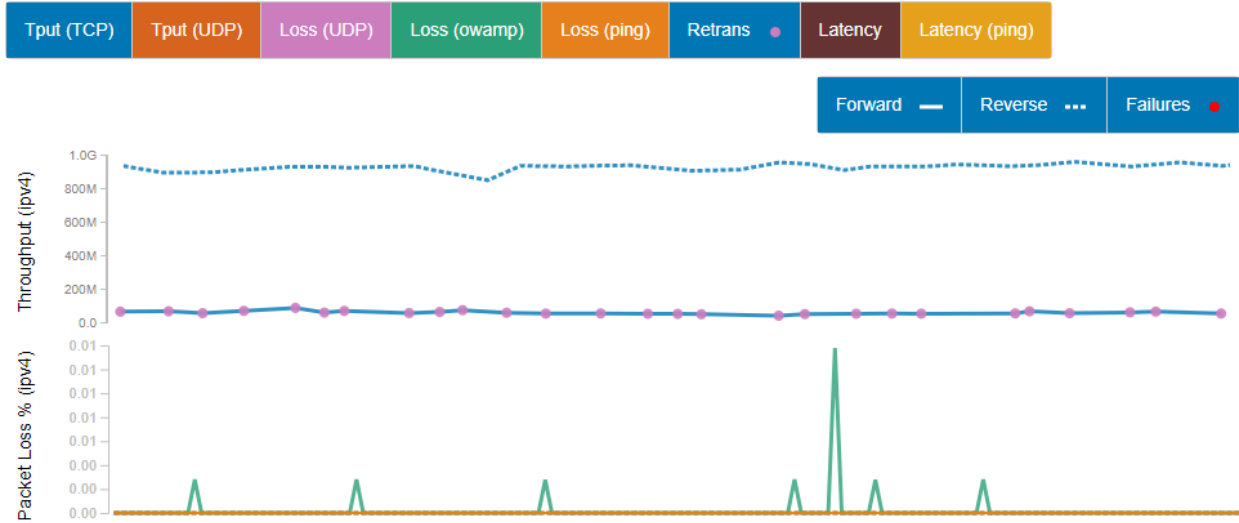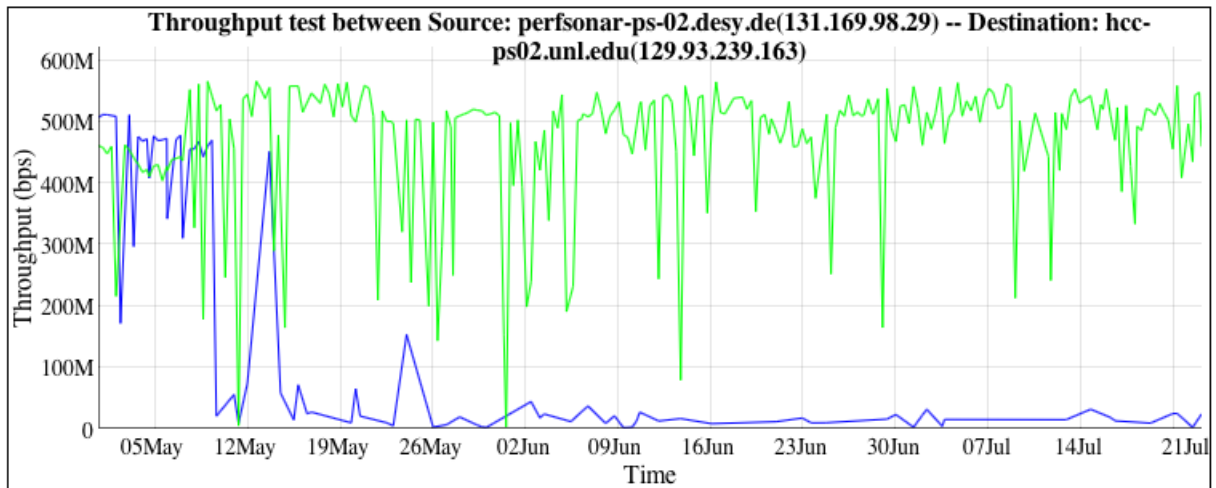
Figure 1: perfSONAR test result showing packet retransmits and poor performance from UCAR to ISU

RESOLUTION

The ISU WAN engineer confirmed that changes to the Great Plains Network (GPN) and Internet2 WAN connections had recently taken place. The timing of these changes coincided with the major performance drop. There was also evidence of MTU configuration issues along the path with jumbo frame packets being dropped or fragmented.

Figure 2: Example of failing performance as seen in perfSONAR after a change in network topology.

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 ISU campus network. Based on these findings, ISU engineers upgraded the operating systems running on several pieces of network hardware, adjusted system configurations on hardware along the path, and rebooted the Agronomy Hall switches.

During the last week of September 2019, the Network Engineering team at ISU also made a number of larger changes to the network configuration for the ISU campus:
- Along with engineers from GPN, their regional provider, they identified that the 10Gbps link to Internet2 was congested. As a result, engineers changed the primary campus peerings to directly connect to Internet2 via a newer 100Gbps path provided by GPN.
- They replaced the entire switching infrastructure in Agronomy Hall with newer hardware.
- They 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 rate, averaging 624Mbps 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 networks to monitor network performance.
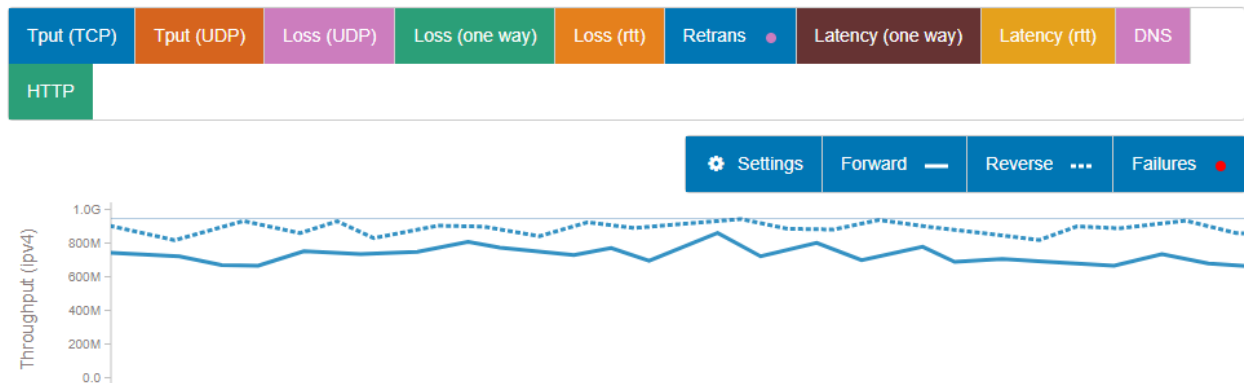

Figure 4: perfSONAR test showing improved, consistent performance