TEXAS A&M UNIVERSITY TO UNIVERSITY OF NEBRASKA-LINCOLN PERFORMANCE ISSUE

Organizations Involved: Engagement and Performance Operations Center (EPOC), Lonestar Education and Research Network (LEARN), Texas A&M University (TAMU), University of Nebraska-Lincoln (UNL), and Internet2

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Audience: Many institutions connect to a combination of regional networks, commercial networks, and national networks. Without careful planning and intentional routing, traffic best suited for regional research and education (R&E) networks often gets routed over commercial networks that aren't tuned for high volume data transfers. The friction between normal internet use cases and large data transfer use cases can have a severe impact on users.

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PROBLEM DESCRIPTION

While researching a network performance problem, engineers found that traffic between TAMU and UNL was routed asymmetrically and was using a commercial network in one direction and a R&E network in the other. The performance issue was discovered as part of the set up for regular performance monitoring using the perfSONAR tool. Figure 1 shows perfSONAR test results which indicate expected performance from UNL to TAMU but very poor performance in the opposite direction. Using these perfSONAR performance results, traceroutes, and information from routing tables at both institutions, engineers were able to confirm the traffic asymmetry and performance problems.
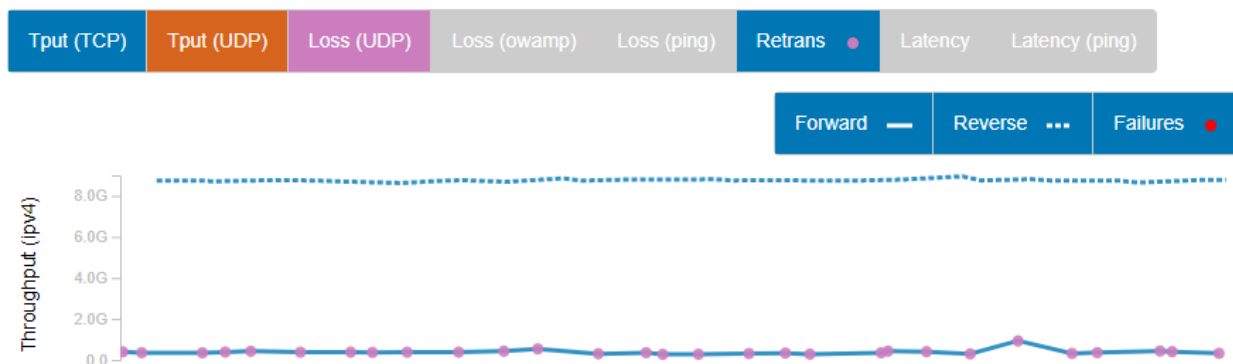

Figure 1: perfSONAR test showing drastically different inbound and outbound performance.

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PROBLEM RESOLUTION

Having determined the routes in both directions, the next step was to pull in engineers from different domains along the path to help determine appropriate steps to resolve the issue. Engineers from EPOC, LEARN, TAMU, and Internet2 worked together and found a configuration setting on a TAMU router that directed research traffic to prefer a commercial route instead of the available R&E routes. TAMU engineers made changes to the Border Gateway Protocol (BGP) configuration on their router to prefer R&E routes, if available, over commercial routes so that the paths would be symmetric and over circuits tuned for research traffic.

After these changes, perfSONAR tests showed greatly increased performance from TAMU to UNL, as shown in Figure 2. This change improved the performance of transfers to UNL and potentially to a large number of other destinations, speeding up a variety of existing campus use cases, many of whom were not yet aware that performance was impacted.
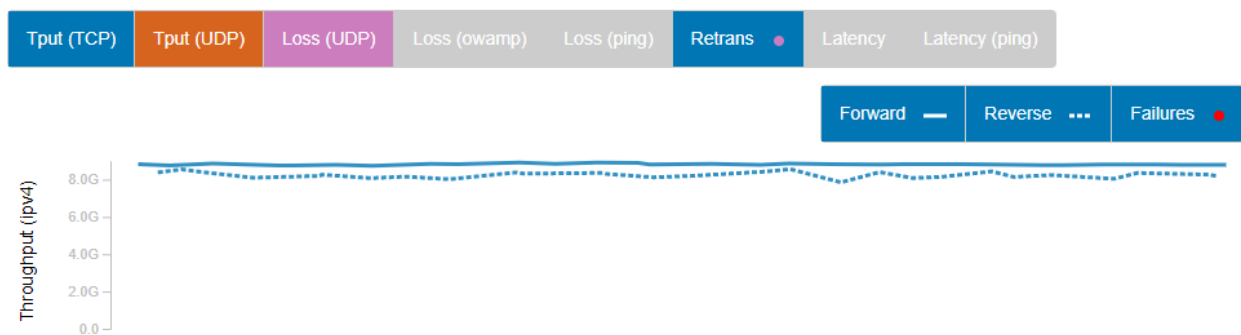

Figure 2: perfSONAR tests showing improved performance and similar results in each direction

For more information about problems like this one, please see:
- https://www.perfsonar.net/
- https://fasterdata.es.net/
- Normalization of Research and Education routing: https://epoc.global/wp-content/uploads/2020/09/20200505-UofSC-Virtual-Workshop-BGP-Architectures-and-Best-Practices.pdf