SC26 Network Research Exhibition: Demonstration Publishable Abstract

PTP enabled perfSONAR across regional RENs

Andrew Gallo, GWU & CAAREN, agallo@gwu.edu

Tom Costello, ANL & MREN, tcostello@anl.gov

Abstract

perfSONAR is widely used to measure R&E networks, with OWAMP (One-Way Active Measurement Protocol) providing per-direction latency visibility that round-trip tools like ping cannot. But accurate one-way latency depends on tightly synchronized clocks at both endpoints, and when nodes are topologically close (intra-campus, intra-metro, or within a single regional network), the real latency often falls inside the error envelope of NTP synchronization. The result is a familiar artifact: apparent negative one-way latencies and genuine path asymmetries hidden in the noise.

This NRE brings two regional networks into SCinet's Xnet precision timing infrastructure at SC26 to tackle exactly that problem. Metropolitan Research & Education Network (MREN) primarily serves universities and national labs across seven states in the upper Midwest, anchored at the StarLight exchange facility in Chicago. Capital Area Advanced Research & Education Network (CAAREN), run by George Washington University, is the DC area's on-ramp to Internet2, connecting R&E institutions across DC, Northern Virginia, and Maryland. Both networks run perfSONAR today and want to improve those measurements by giving their hosts access to better time.

Goals

1. Provision multiple perfSONAR measurement hosts at CAAREN and MREN capable of consuming precision time from upstream PTP grandmasters
2. Run OWAMP tests from a PTP-enabled perfSONAR server in the SC26 Xnet show floor footprint against the CAAREN and MREN hosts
3. Compare results between hosts with precision time with those using both unoptimized NTP to the public pool and optimized NTP from a local GPS timesource
4. (Stretch goal) Extend PTP from the SC26 Xnet White Rabbit timing provider on show floor to Starlight via SCinet WAN infrastructure & SCinet Science Connector Routers

Impacts

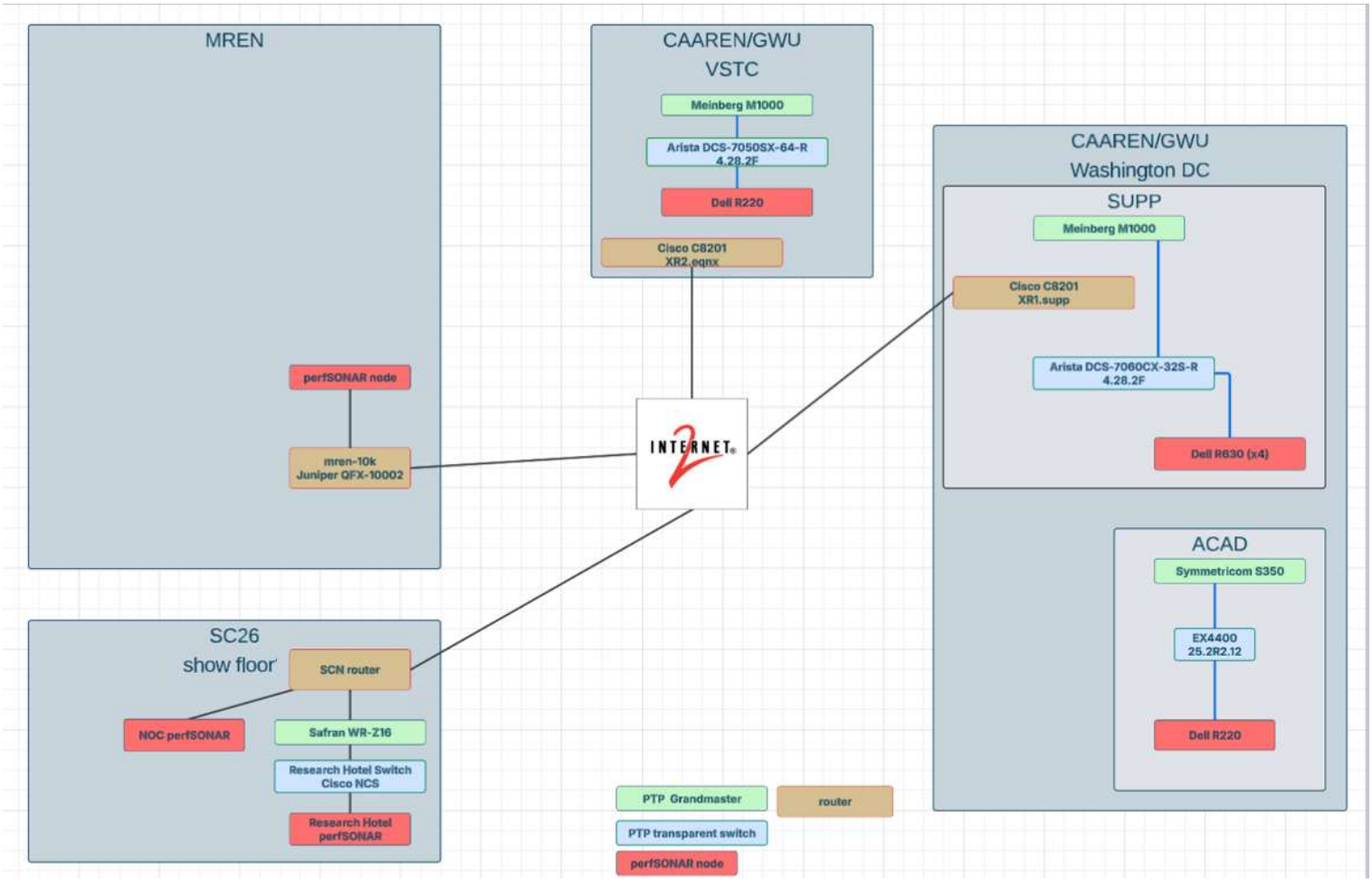
Many R&E network engineers know perfSONAR well, but far fewer have hands-on experience with PTP, and very few have ever worked with a White Rabbit time provider. This NRE closes that gap with a real-world case study: delivering PTP to perfSONAR hosts on two production regional networks, with OWAMP results compared side by side against the NTP configurations most of us run today. The outcome is practical guidance operators can act on, showing when an NTP source is good enough, when PTP is worth the effort, and what it takes to deploy it on perfSONAR hardware they already own. Configurations, measurement data & lessons learned will be shared with the R&E engineering community so others may reproduce the work at home. If the stretch goal succeeds, it also demonstrates that a REN can carry precision time to its members over existing WAN paths.

Resources

Goals #1-3 may be accomplished using existing infrastructure at the SCinet Research Hotel requested by the Xnet team. The stretch goal #4 requires extensive coordination with SCinet's WAN and Routing teams to ensure PTP is properly configured on supported hardware.

Involved Parties

- Andrew Gallo, George Washington University, CAAREN agallo@gwu.edu
- Tom Costello, Argonne National Laboratory, MREN tcostello@anl.gov
- Safran Navigation & Timing
- SCinet WAN & Routing Teams


MREN
perfSONAR node
mren-10k
Juniper QFX-10002
CAAREN/GWU
VSTC
Meinberg M1000
Arista DCS-7050SX-64-R
4.28.2F
Dell R220
Cisco C8201
XR2.eqnx
INTERNET2
CAAREN/GWU
Washington DC
SUPP
Meinberg M1000
Cisco C8201
XR1.supp
Arista DCS-7060CX-32S-R
4.28.2F
Dell R630 (x4)
ACAD
Symmetricom S350
EX4400
25.2R2.12
Dell R220
SC26
show floor
SCN router
NOC perfSONAR
Safran WR-Z16
Research Hotel Switch
Cisco NCS
Research Hotel
perfSONAR
PTP Grandmaster
router
PTP transparent switch
perfSONAR node