protoDUNE/SP Disk Buffer as Neut sub-cluster

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Abstract

This note describes the numbers and plan for using a portion of the `neut` computer cluster for development, testing and potential implementation of the single-phase protoDUNE disk buffer.

1 Numbers

The current "data scenario" estimates[1] bracket an expected range of data rate and data volume coming from in-spill beam triggers and out-of-spill cosmic ray muon triggers. The scenarios at the ends of this range are named "Central" and "High rate". Two driving assumptions are the beam trigger rate and that one cosmic-ray muon trigger is acquired out-of-spill for every in-spill beam trigger.

trigger 25 – 50 Hz

peak 1.5 – 3.0 GByte/sec (instantaneous during spill)

daily 25 – 50TB/day (just beam, $\times 2$ with cosmics)

3-day 150 – 300TB (total beam + cosmics)

2 Concept

The `neut` cluster is now being formed using some 300 nodes in total reclaimed from ATLAS. We will dedicate about 50 nodes in support of developing the disk buffer system for the single-phase protoDUNE detector adequately scaled for storing three days worth of expected data. To label this sub-cluster we say "`neut-spbuf`". Initially `neut-spbuf` will be for developing and testing the buffer system design. Meanwhile, we will explore what is needed to migrate `neut-spbuf` into actual operation.

3 Disk

The current `neut` nodes have very limited disk storage. The `neut-spbuf` nodes must be upgraded to provide storage to meet the 3-day buffer requirement. To meet the "High rate" requirement we will install 2×3TB SATA disks in each of the 50 `neut-spbuf` nodes.

[1] DocDB 1086-v7

4 Networking

The "High rate" scenario requires sinking a peak of 3.0 GByte/sec (24 Gbps) throughput during the beam spill. Between spills, when cosmic muon triggers are acquired, the throughput is somewhat reduced but we take 3.0 GByte/sec as our requirement. Spread across the 50 `neut-spbuf` nodes these streams this will approximately fill 50% of the existing 1Gbps NICs. We expect similar multiplicity at the data production end (the Event Builder layer of the pD/SP DAQ).

During initial testing we will request a 20 Gbps link between the current location of `neut`[2] and central CERN computing including EOS and the pD/SP detector site[3].

To supply this connectivity we require 50 switch ports at 1Gbps and (effectively) one switch port at 20Gbps. Based on our current design it is possible to segment the network streams so that the total bandwidth is spread over multiple switches, for example two switches each with 25 ports at 1Gbps and 1 port with 10 Gbps. One example switch is the Cisco SG500X-48P which can provide 48 1Gbps ports and ample ports on the high-bandwidth side. One such switch is needed on the DAQ end of the 20Gbps link and one on the `neut-spbuf` end.

[2]CERN building 185
[3]CERN building EHN1