Current FRIB DAQ Network

Switch —1Gb— Core Switch Stack

Switch —1Gb— SPDAQ

Core Switch Stack —2*10Gb Bond— Switch Stack

Switch Stack —2*1Gb Bond— Current Experiments Storage /mnt/events

Core Switch Stack —2*10Gb Bond— Switch Stack

Switch Stack —2*10Gb Bond— Completed Experiments Warehouse /mnt/rawdata

Switch Stack —N*1Gb— Fishtank Computing Cluster

Switch Stack —N*1Gb— Seaside Computing Cluster
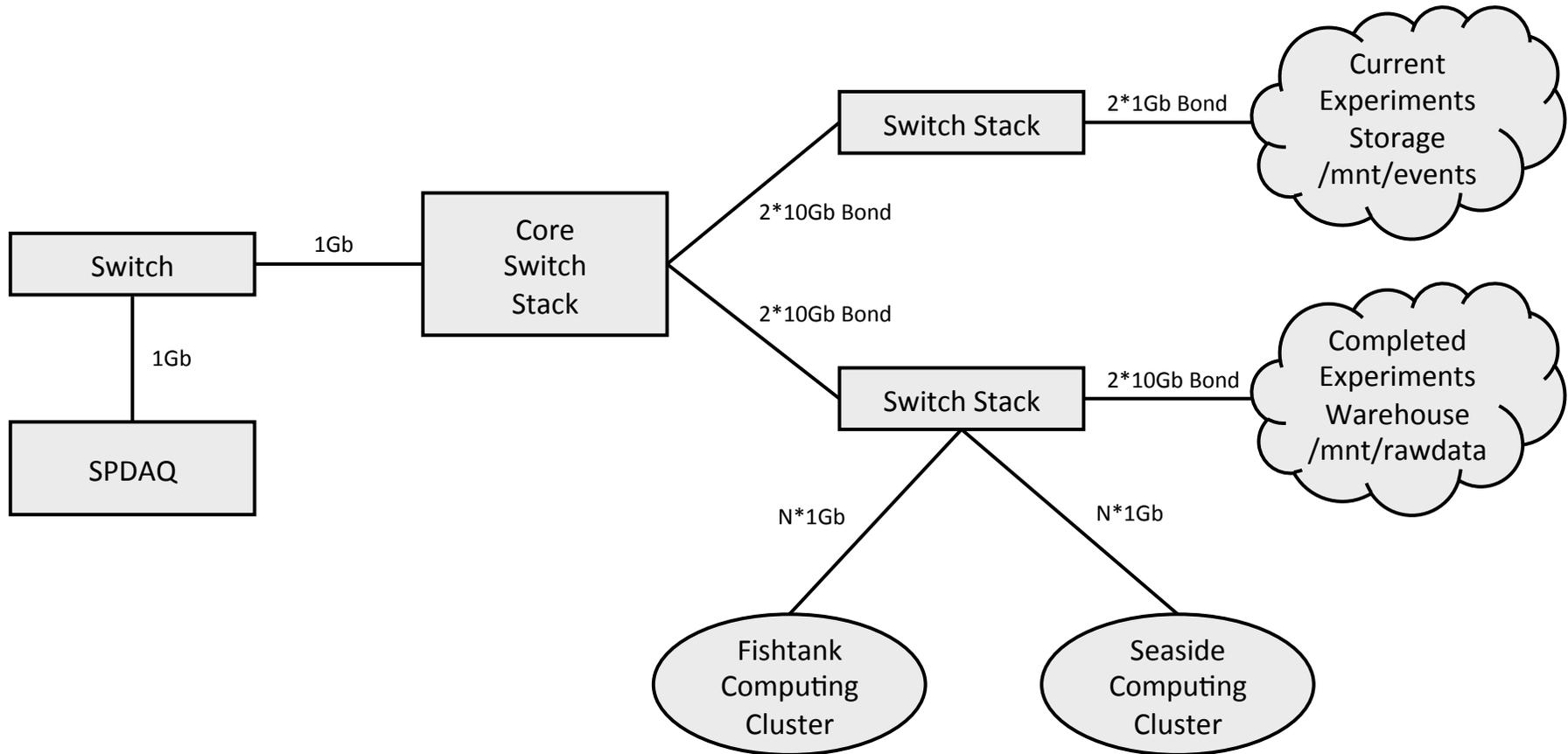
Current GRETINA DAQ Network

Switch ——— 2*10Gb Bond ——— Switch Stack ——— 2*1Gb Bond ——— GRETINA Dedicated Storage

30*1Gb

IOCs (30)

63*1Gb

2*1Gb Bond

GRETINA Computing Cluster (63)

GRETINA Node 0
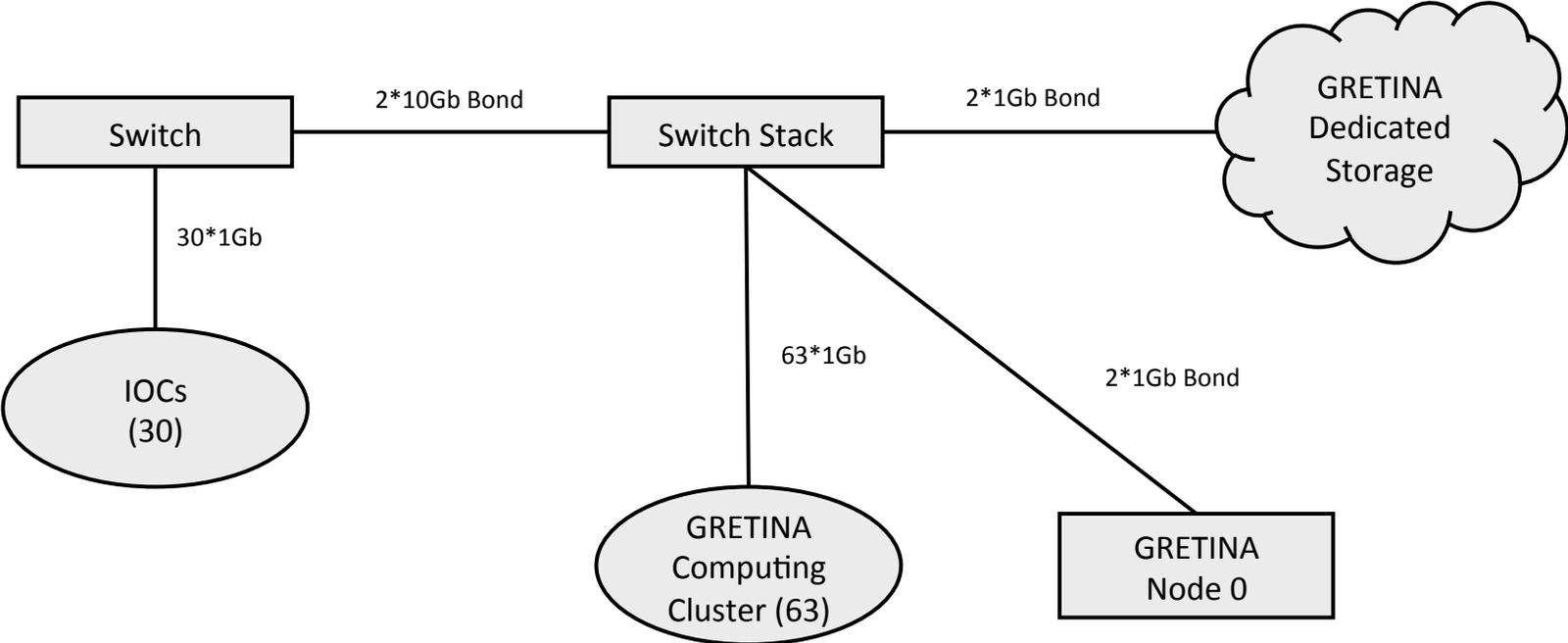
Current Activities

- Increasing network reliability at FRIB
  - Using bonded pairs of physical connections where reliability is needed (e.g., storage, cryo) to prevent single points of failure
  - Actively phasing out older (>5 years) gear
  - Replacing unmanaged network equipment with managed

Short Term Opportunities

- Upgrade of storage server for current experiments would allow 2*10Gb connectivity
- Upgrade of individual edge switches and SPDAQs would allow 10Gb connectivity for specific purposes
  - Not useful unless storage is capable of same speed

Emerging/Future Network Trends

- 10Gb
  - Can reach 300 meters over one pair of OM3 multimode fiber (this is what is installed throughout the lab)
  - Network equipment Is readily available, although still a little expensive
  - Is already in use in the lab within the computer room (mainly between core switches and storage)
  - Would require some equipment upgrades to use outside the computer room
- 40Gb/100Gb
  - There are official IEEE standards
  - Can reach 150 meters over OM4 multimode fiber
  - Because it utilizes parallel physical circuits, requires 4 (40Gb) or 10 (100Gb) fiber pairs
  - All major enterprise brands have equipment, but it is very expensive
  - May be available within the lab's computer room within a year
  - Would require major upgrade of lab's fiber infrastructure to use outside the computer room
- 400Gb
  - IEEE working groups have been established
  - A standard is expected to be finalized in 2017

Observations and Future

- The capability of future network technology (speed) need not constrain Data Acquisition planning—it will be there
- Future detectors (e.g., GRETA) will undoubtedly require this technology
- In cases where one "pipe" is insufficient, multiple physical circuits can be combined to create an even fatter pipe (but not a faster one)

- The lab's network infrastructure should be able to support 10Gb data rates anywhere (not everywhere) within a year (given a little advance notice)
- Within 5 years, 10Gb connectivity will be ubiquitous

- The lab's current fiber infrastructure cannot support 40Gb/100Gb and beyond
- Fiber infrastructure is expected to last 25-30 years!
- Fiber installations planned by other groups do not envision a 40Gb/100Gb/400Gb requirement and may be insufficient for DAQ
- Ad-hoc fiber installations are expensive
- If the fiber infrastructure has proper coverage, equipment can be easily added if/when it is needed

- The more we know about your network needs beforehand, the better we can meet them!