BNL Network/Storage Update

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4 March 2006
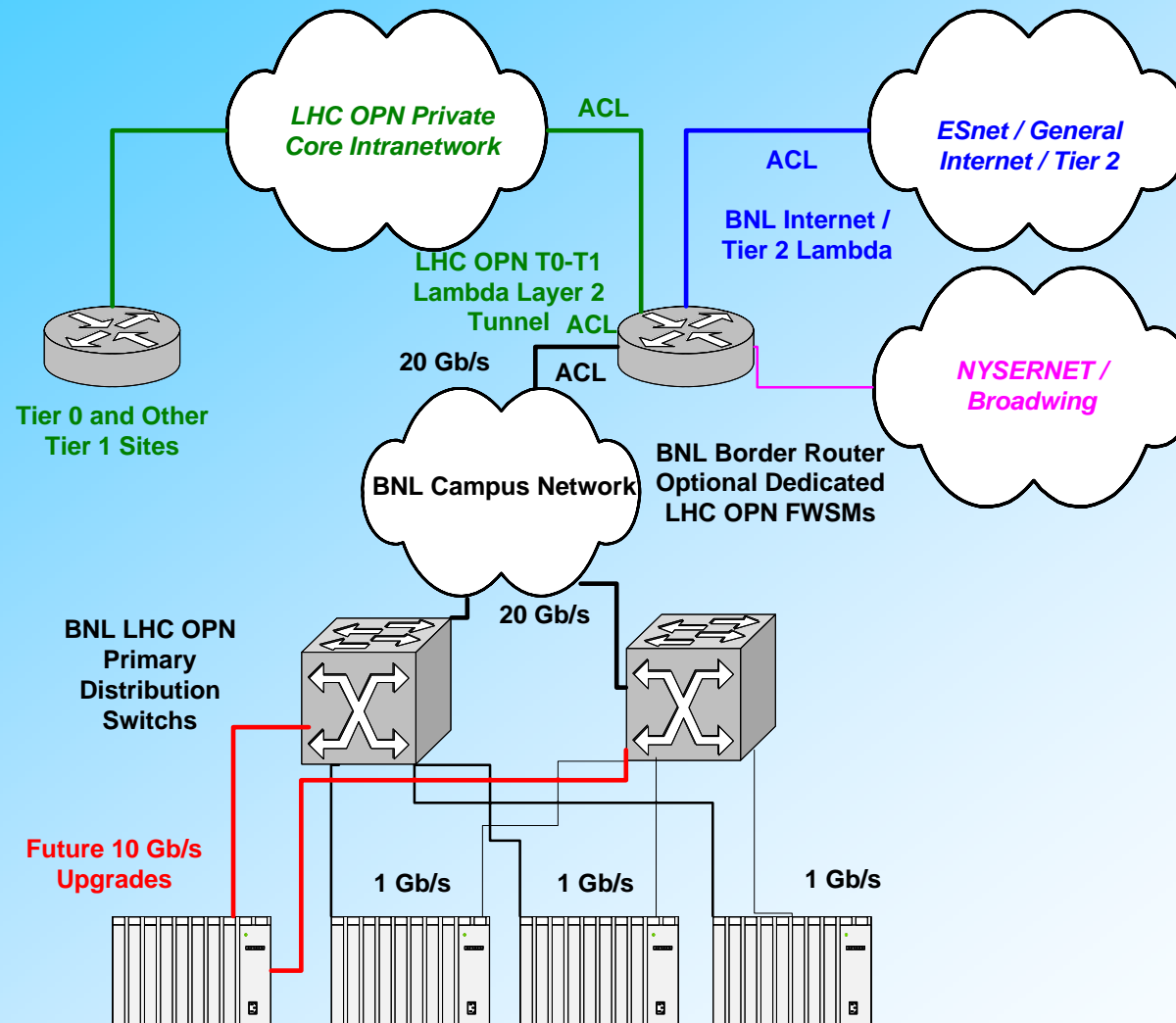
Recent BNL LAN Upgrades

- **Established dual 10 Gb/s Interfaces as 20 Gb/s EtherChannel 802.1q trunks**
  - Hashing by source & destination (address and ip port)
- **Established separate physical paths for primary and secondary VLAN traffic using spanning tree costing**
  - Different VLAN's have different primary and secondary paths to load balance the architecture
- **Established 10 Gb/s Generic Internet access via ESnet**

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BNL LHC OPN Conceptual Block Diagram

LHC OPN Private Core Intranetwork

ACL

ESnet / General Internet / Tier 2

ACL

BNL Internet / Tier 2 Lambda

LHC OPN T0-T1 Lambda Layer 2 Tunnel

ACL

20 Gb/s

ACL

NYSERNET / Broadwing

Tier 0 and Other Tier 1 Sites

BNL Campus Network

BNL Border Router Optional Dedicated LHC OPN FWSMs

BNL LHC OPN Primary Distribution Switchs

20 Gb/s

Future 10 Gb/s Upgrades

1 Gb/s

1 Gb/s

1 Gb/s

Storage servers multi-homed to bridge LHC OPN to US ATLAS Tier 1 network
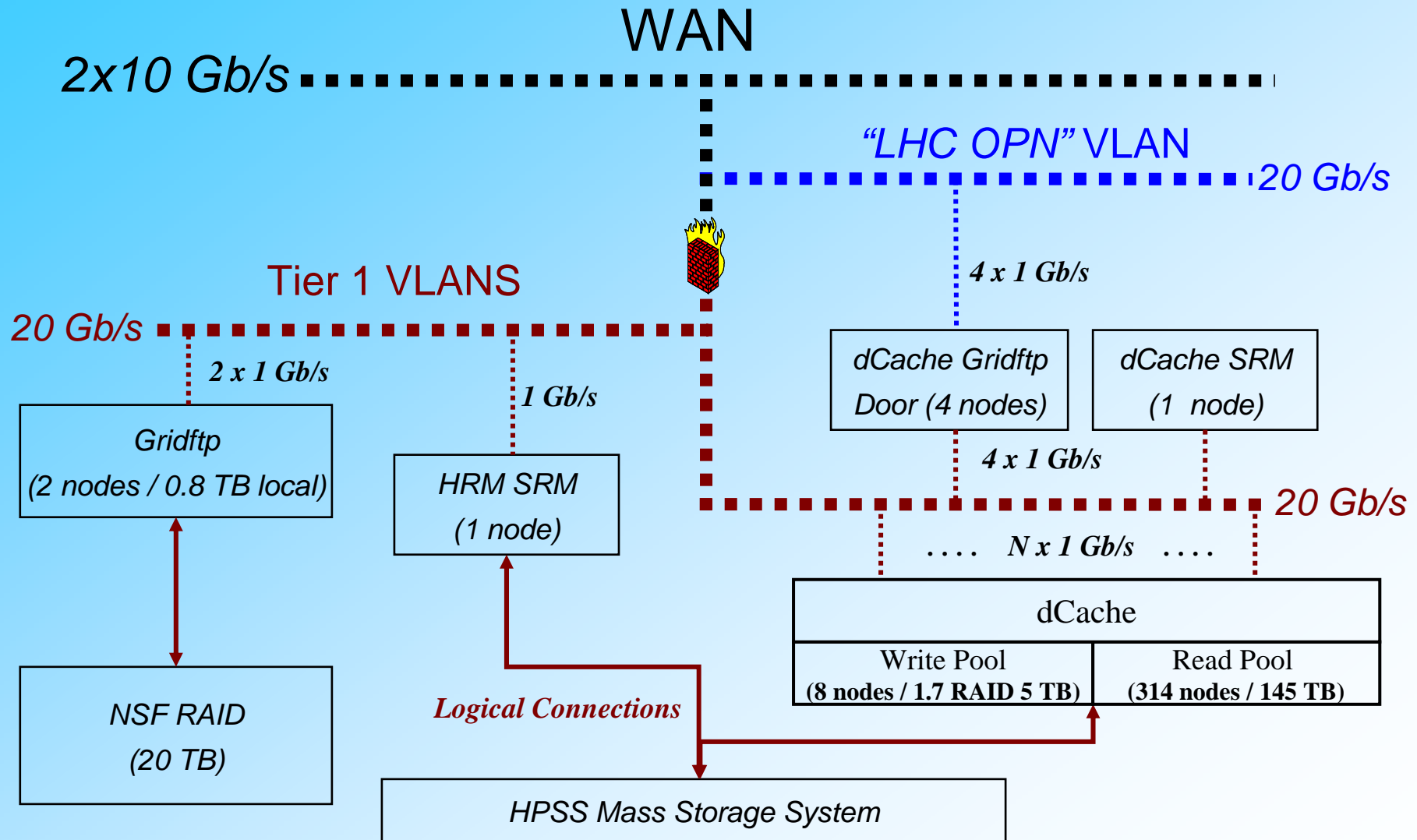
Current
BNL 20 Gig-E Architecture
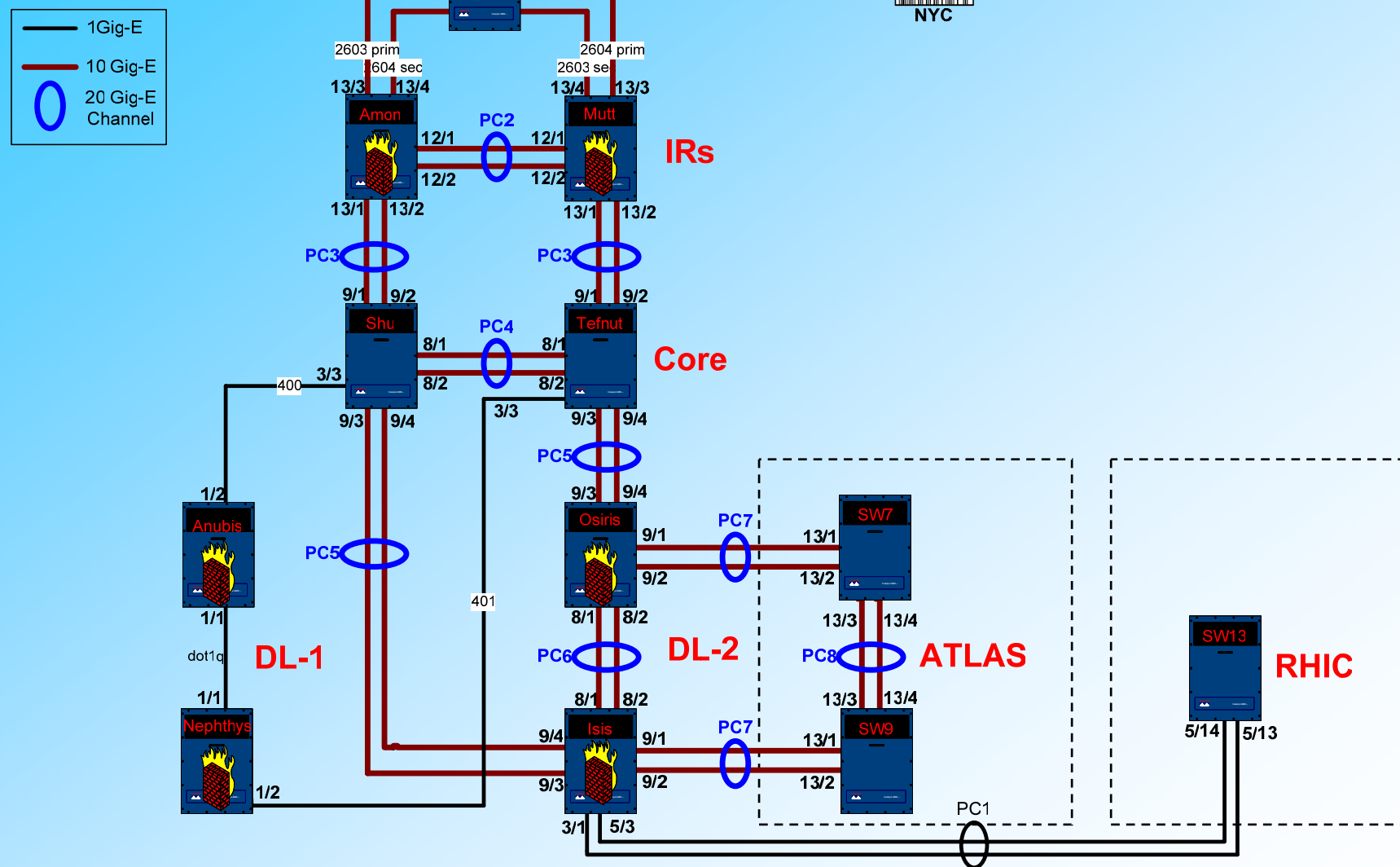
BNL Tier 1 dCache / Linux Farm

- US ATLAS Tier 1 at BNL uses its Linux farm
  - ... as its primary compute resource and
  - … as its primary online storage resource via dCache
  - 100% overlap between standard worker nodes and dCache read pool servers
- Special function servers such as gridftp doors, write pool servers, etc., are single function and not used as worker nodes
- ATLAS Linux farm contains 300+ nodes with ~200 TB of local disk, most of which is part of the production dCache system
- The dCache system is backended by a Mass Storage System managed by the HPSS HSM
  - "Permanent" ATLAS storage is realized by migration through and staging back through the dCache system

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BNL Tier 1 WAN Storage Interfaces

WAN

2x10 Gb/s

"LHC OPN" VLAN

20 Gb/s

Tier 1 VLANS

20 Gb/s

2 x 1 Gb/s

4 x 1 Gb/s

1 Gb/s

dCache Gridftp Door (4 nodes)	dCache SRM (1 node)

Gridftp (2 nodes / 0.8 TB local)

4 x 1 Gb/s

HRM SRM (1 node)

20 Gb/s

.... *N x 1 Gb/s* ....

dCache	
Write Pool **(8 nodes / 1.7 RAID 5 TB)**	Read Pool **(314 nodes / 145 TB)**

NSF RAID (20 TB)

Logical Connections

HPSS Mass Storage System

Upgraded BNL Tier 1 Mass Storage System

- HSM – HPSS Version 5.1.1

- Robotics – StorageTek/Sun SL8500

  - Physical capacity: ~ 6500 cartridges (2.6 PB for LTO Gen 3)

  - Current licensed capacity: 1448 cartridges

- Tape Drives – 10 x LTO Gen 3

  - 400 GB/cartridge uncompressed

  - 80 MB/sec streaming transfer rate

- Mover/Servers – (5 Tape + 4 Disk) x Dual Processor Linux Nodes

  - 4 x 1 Gb/sec EtherChannel connection per server

- Disk Cache – 9 TB Data Direct RAID 3

  - 4 port x dual channel controller connects to 4 mover/servers via FibreChannel

  - Theoretic bandwidth 1600 MB/sec

- Projected actual maximum ingest rate to tape ≤ 400 MB/sec

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