

# **Run II Needs and Challenges for the Future Related to Infrastructure**

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# Future Run II Needs and Challenges

- I/O (including storage, networking, data access)
  - disk capacity is increasing nicely, I/O rates of RAID arrays are above network rates
    - ==> bound Gb/s interfaces just fine
  - tape capacity is increasing slowly and with library/drive/maintenance puts significant stress on the Run II budget
    - ==> no single library vendor with incremental procurement
    - ==> no N to N+1 media migration
  - tape I/O rate is above network rates and limited by small file sizes
    - ==> need a tape subsystem that can properly handle small files (internally combining them into fewer large files, hidden from/unknown to the user, i.e. transparently also during restore). "long overdue"
    - ==> need a tape subsystem that decouples reading from/writing to tape from sending data to the clients (i.e. asynchronous restores, parallel transfers) to accommodate slower clients. "very soon"
  - Fermilab is moving from experiment oriented to facility oriented network, i.e. network of CDF and DØ in FCC, GCC will be shared and with other experiments, groups, activities
    - ==> more sophisticated monitoring, since traffic much less understood
    - ==> trouble shooting moves more from experiment to networking group

# Future Run II Needs and Challenges

- I/O (including storage, networking, data access)
    - experiment applications are written for on-site use and generally un-prepared for the larger latency of WANs and firewall issues when extended to include off-site resources  
==> firewall discovery tool for the multi-layer firewalls (host, VLAN, site, ...)
    - data handling/access are multi-component systems. The total failure rate is the product of all the individual component failure rates.  
==> robust components and component level testing/integration
    - two distinct data access types:
      - on demand data access of analysis
      - scheduled data transfer and predictable access of processing
- ==> current Run II approaches satisfy experiment needs



# Future Run II Needs and Challenges

- Fault Tolerance, Power, Resource Management, Programming
  - robust infrastructure more important than full fault tolerance  
==> many Run II services not designed for fault tolerance, expensive to retro-fit to make use of VMs/HA clusters
  - power is not much a concern, power efficiency is increasing and CDF/DØ are past their expanding phase  
==> advanced planning, planning, planning !!!
  - DØ has better integrated job data flow management than CDF  
==> current resource management satisfies experiment needs
  - C++ is the standard for compiled programs, PERL/python for scripts  
==> debugging is sub-optimal but was accepted by the experiments
  - kerberos support seems to be dwindling in Fermilab: examples cryptocard support, kcron, ...  
==> integrated account, kerberos principles (primary and all special instance ones) and certificate management (including expiration and closed account notification) "overdue"
  - SL security updates can be rather disruptive  
==> finer classification would be much appreciated !