Fermilab Data Preservation

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DPHEP Workshop

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Overview

- Introduction
- Data Preservation Strategy
- Joint SCD/CCD/CDF/D0 Project
  - Structure
  - Effort
  - Timescale
  - Infrastructure
- Conclusions

Preservation Strategy

- Tevatron Experiments collected 10 fb^{-1} of p-pbar collision data in Run 2 at 1.96 TeV center of mass energy.
- The experiments and the laboratory and the community would like to
  - maximize the physics output of these large and unique data samples
  - Enable long-term analysis of the data by the CDF and D0 collaborations
  - Takes advantage of all that has been learned by DPHEP and previous efforts
- The lab and the DOE have provided support for 2 physicists to coordinate the data preservation activities as well as the support from the two computing divisions to help to implement a project.
    - Bo Jayatilaka (CDF)
    - Ken Herner (D0)

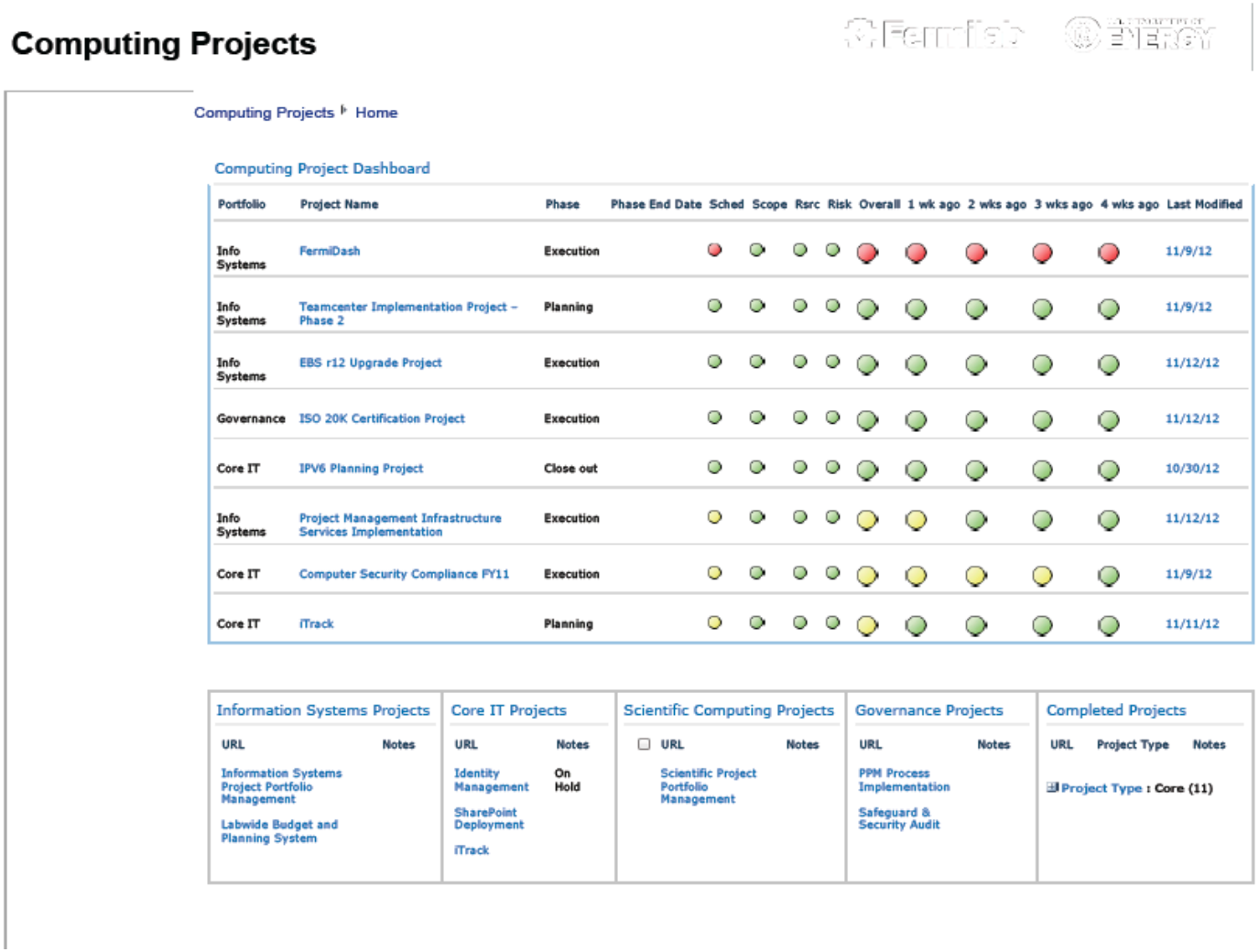
Data Preservation Project

- A Data Preservation Project has been initiated at Fermilab. It is a joint Fermilab Computing Sector(CS)/CDF/D0 effort.
  - Managed under the Computing Projects formalism in the Computing Sector.
  - Project Manager – Rob Kennedy
  - Project Technical Lead – Joe Boyd
  - Project Team:
    - Bo Jayatilaka
    - Ken Herner
    - Representatives from CDF and D0
    - Representatives from Scientific Computing Division and Core Computing Division

Data Preservation Project

- The project will have a project charter that will lay out the scope, goals, effort, deliverables and timescale for the project.
- The project sponsor is Rob Roser, head of the Scientific Computing Division.
- A steering committee will meet regularly to review progress and to help address areas of concern.
- Regular reporting (weekly), management oversight, and other project management formalisms will be followed, as in all other large projects.
- The project is expected to take approximately 2 years, during which the majority of the changes needed to provide a stable long-term analysis facility should be completed.

CS Project reporting/tracking



Computing Projects

Computing Projects ▸ Home

Computing Project Dashboard

Portfolio	Project Name	Phase	Phase End Date	Sched	Scope	Rsrc	Risk	Overall	1 wk ago	2 wks ago	3 wks ago	4 wks ago	Last Modified
Info Systems	FermiDash	Execution											11/9/12
Info Systems	Teamcenter Implementation Project – Phase 2	Planning											11/9/12
Info Systems	EBS r12 Upgrade Project	Execution											11/12/12
Governance	ISO 20K Certification Project	Execution											11/12/12
Core IT	IPV6 Planning Project	Close out											10/30/12
Info Systems	Project Management Infrastructure Services Implementation	Execution											11/12/12
Core IT	Computer Security Compliance FY11	Execution											11/9/12
Core IT	iTrack	Planning											11/11/12

Information Systems Projects

URL	Notes
Information Systems Project Portfolio Management	
Labwide Budget and Planning System	

Core IT Projects

URL	Notes
Identity Management	On Hold
SharePoint Deployment	
iTrack	

Scientific Computing Projects

URL	Notes
Scientific Project Portfolio Management	

Governance Projects

URL	Notes
PPM Process Implementation	
Safeguard & Security Audit	

Completed Projects

URL	Project Type	Notes
Project Type : Core (11)		

Project issues, partial list

Issue	D0	CDF
Login pool and home directories	Must have at least one	Must have at least one
DB Frontier		• Modified version • Running under ancient tomcat that needs to be secured
SAM	Move to SAMWeb	Move to SAMWeb
SAM Cache server	None needed long term	Possibly migrate to dcns instead of keeping dcache long term
SAM station	Must have at least one	Must have at least one
SAM database server	Needs at least one if does not go to SAMWeb	N/A
Oracle databases	• Prefer to keep Oracle • Have to migrate data to new Oracle versions over time? • CORAL needed if move to IF DB?	• Prefer to keep Oracle • Have to migrate data to new Oracle versions over time?
Mysql database	Will go	CDF Notes, and user db
Software build system (CVS, other external products used to build code)	• Expect CS to maintain CVS respository beyond 2022 • Builds on d0rel9 and 10 with chroot environment – Can this be maintained??? • SoftRelTools, Ctbuild must be maintained – do they work with SLF6??	• Moving to SLF6 • SLF5 -> SLF6 means gcc 4.1 -> gcc 4.4 • Move to SVN? How long will CVS live? • SoftRelTools
External software (what specifically does each experiment use here and can we get rid of the dependency on a special ups version? Not clear that anyone supports the individual products from fnkits that may be in use)	• Products currently served from d0fs02 and should be moved to generic nfs server • 178GB currently	• Root, Neurobayes, Legacy CERN libraries, diskcahe_i, frontier_client, fcp, encp, perl, python, event generators

Joint Project Strategy

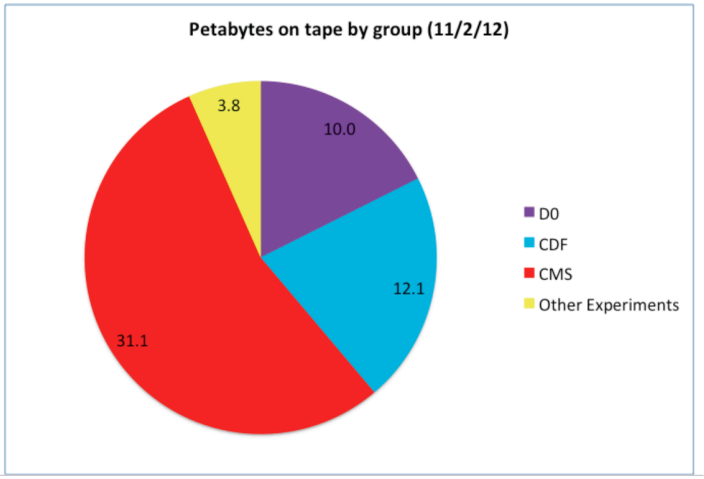
- Continue to support CDF and D0 systems for analysis in the near-term.
- Take advantage of any other developments for other programs at the laboratory and other DPHEP projects and leverage that effort whenever possible:
- Provide custom facilities only where necessary.

Fermilab Infrastructure and related activities

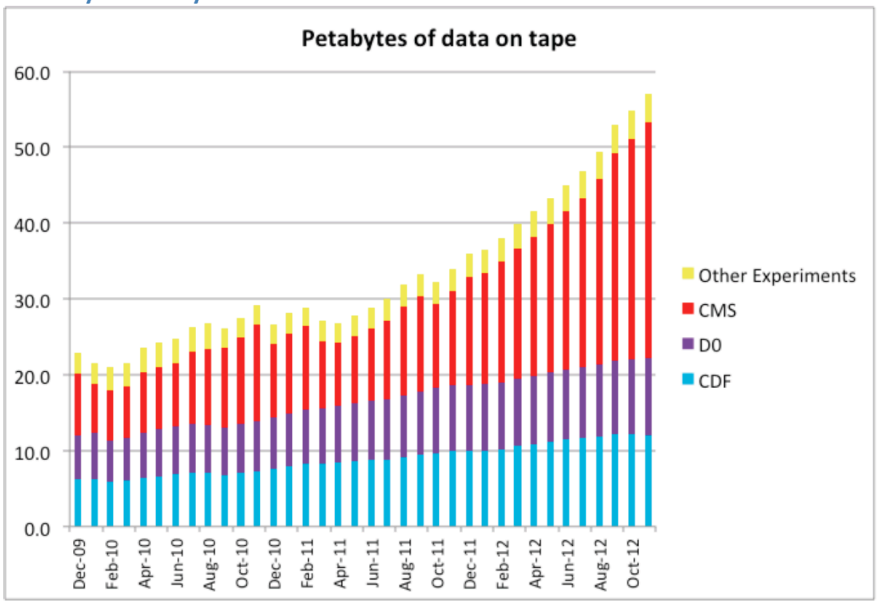
- A Shared Services Model is used for many of the computing services at Fermilab. This includes but is not limited to:
  - Storage
  - Grid Computing
  - Virtualization and Cloud Computing
  - Networking
  - Data Handling Systems
- There are many communities working at Fermilab and we can make use of ideas and technologies from many of them.
  - Intensity Frontier
  - CMS
  - Particle Astrophysics
  - Lattice QCD

Storage – migration to newer tape technology

- Fermilab has 7 SL8500 tape libraries of 10000 slots each.
- LT04 and T10KC tape technologies
- Currently migrating all data to T10K technology
- Around 17K out of 54K tapes are migrated.
- A copy of some subset of the CDF data will be copied to CNAF.

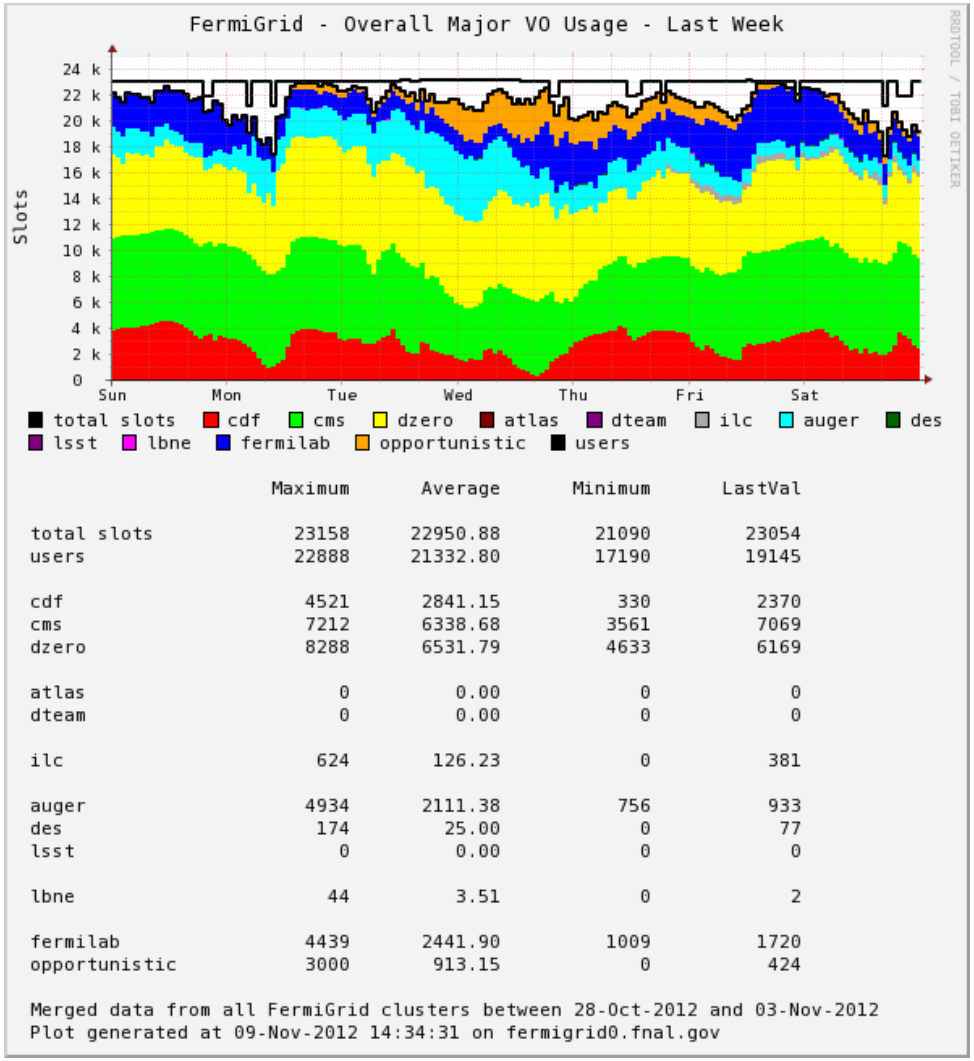


Monthly Summary



Grid Computing

- CDF and D0 already use FermiGrid. The systems will continue to exist and accept jobs from the two experiments.
- This will allow Run 2 to continue to access resources even though they are not dedicated resources.
- Long history of this sort of batch sharing at Fermilab.



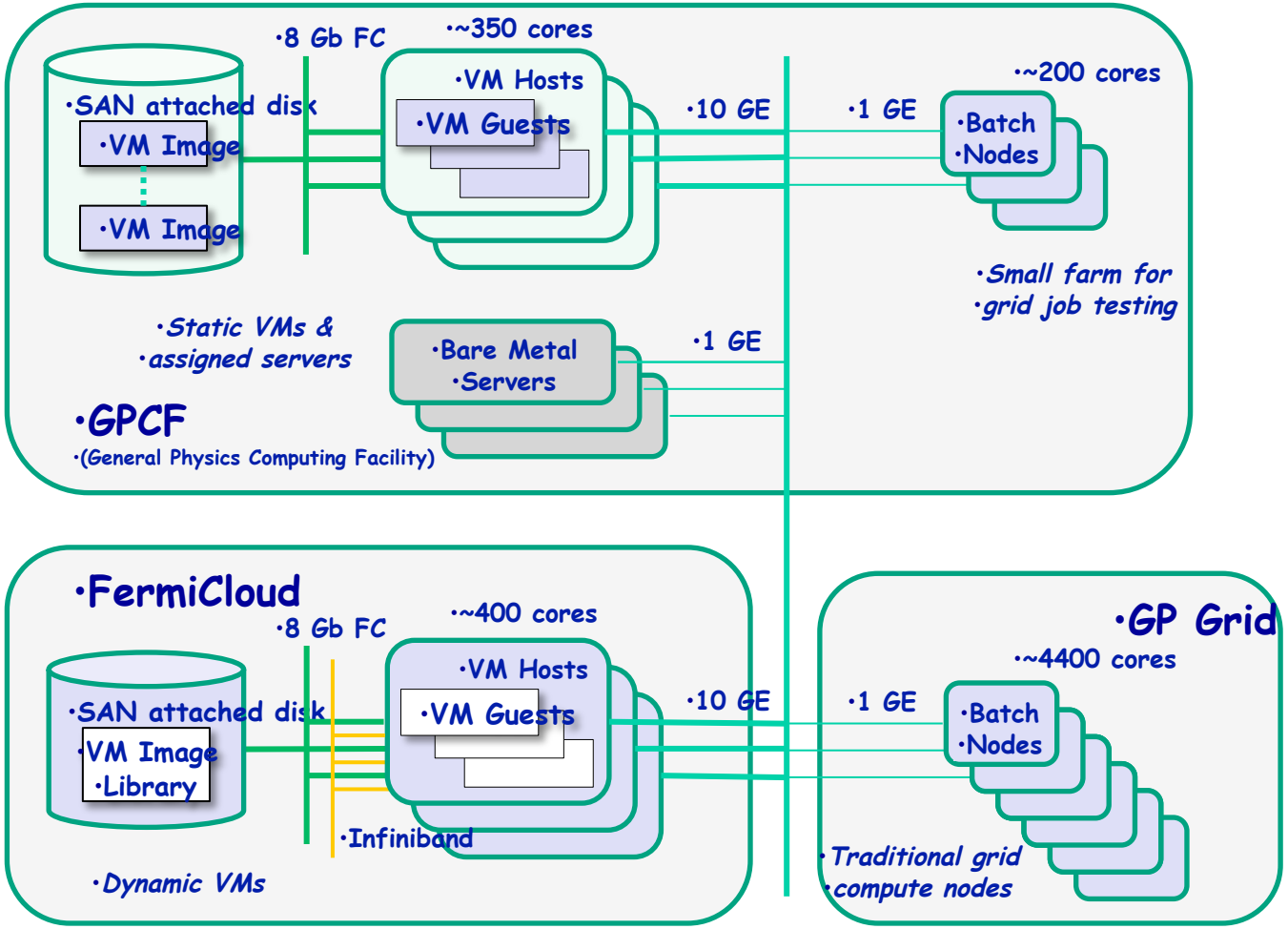
	Maximum	Average	Minimum	LastVal
total slots	23158	22950.88	21090	23054
users	22888	21332.80	17190	19145
cdf	4521	2841.15	330	2370
cms	7212	6338.68	3561	7069
dzero	8288	6531.79	4633	6169
atlas	0	0.00	0	0
dteam	0	0.00	0	0
ilc	624	126.23	0	381
auger	4934	2111.38	756	933
des	174	25.00	0	77
lsst	0	0.00	0	0
lbne	44	3.51	0	2
fermilab	4439	2441.90	1009	1720
opportunistic	3000	913.15	0	424

Merged data from all FermiGrid clusters between 28-Oct-2012 and 03-Nov-2012
Plot generated at 09-Nov-2012 14:34:31 on fermigrid0.fnal.gov

Virtualization and Cloud Computing

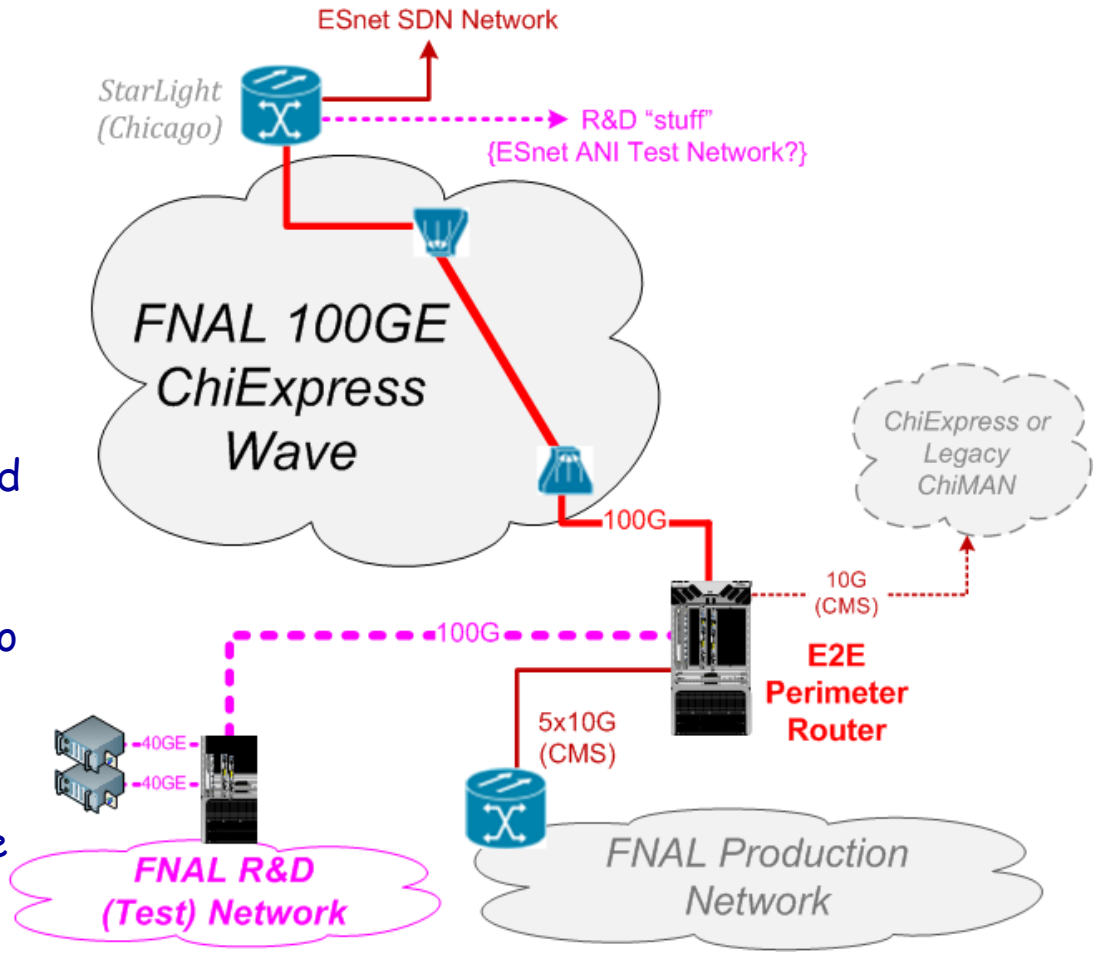
- Multiple efforts at Fermilab, including:
  - GPCF, primarily static virtualization for Intensity Frontier experiments
  - FermiCloud, dynamic virtualization
  - Central virtualization for Windows applications
- It is expected that virtualization techniques can be used as a part of a data preservation plan for Run 2 if so desired.
- Also working to understand how one would use EC2 and AZURE in a test and production environment.
- Computer security issues are critical and will be part of any evaluation and implementation of virtualized and cloud systems.

Shared Computing Infrastructure



100 GE

- E2E Perimeter Router
  - Replace current circuit router
  - Will have 100G and 10G cards
- FNAL R&D Switch
  - Nexus 7009 that is being purchased this FY
  - Will have 40G and 100G card from E2E
- Overview
  - ~50%BW will be allocated to migrate existing E2E circuits
  - ~50% BW for R&D
  - The FNAL R&D switch to be connected to production E2E router
  - It will have 40G ports for servers



Frameworks, Data Handling, Linux, etc

- The overall scientific program at Fermilab provides advances and research into many areas that in turn can be leveraged for Run 2 data preservation.
  - Frameworks
  - Data Handling systems
  - GEANT4, ROOT
  - Scientific Linux
  - Multicore, GPU, Phi architecture, etc.
- Wherever possible, the Run 2 systems can take advantage of developments in these areas.
- We also coordinate with and have some interactions with other Data Preservation projects
  - SDSS, DES, CMS
  - OSG, NSF, other agencies
  - DASPOS

Summary

- The Fermilab Computing Sector is committed to successful Data Preservation for Run 2 experiments.
- From Rob Roser's budget presentation to the laboratory:

Tevatron Data (knowledge) Preservation

› High Profile Project in DOE

› Job much larger than simply archiving – preserving ability to do analysis and validate

› We need to move away from these current custom systems to being able to run on generic future platforms

› Hiring 2 domain experts for 2 2-year term positions with new funds

› Budgeted additional 2.1 FTE of effort from SCD (mostly REX) to help

› A cooperative effort between SCD and Expts

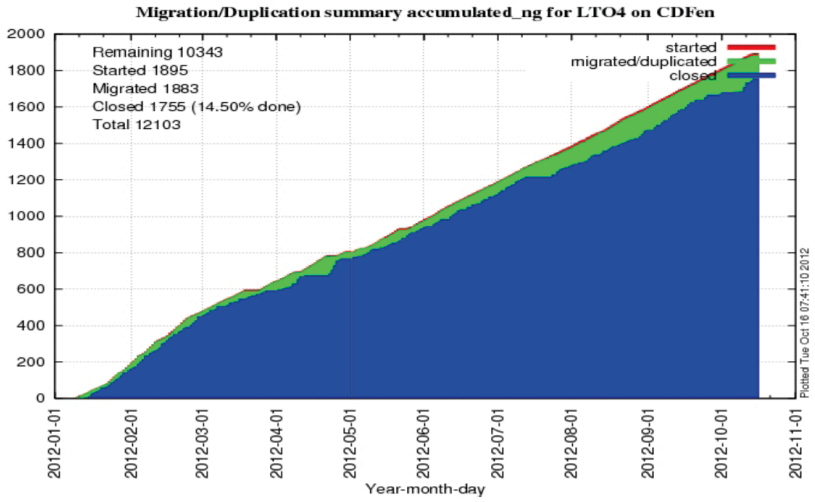
› Detailed plan does not yet exist – scope needs to fit within a 2-year window with reasonable levels of effort…

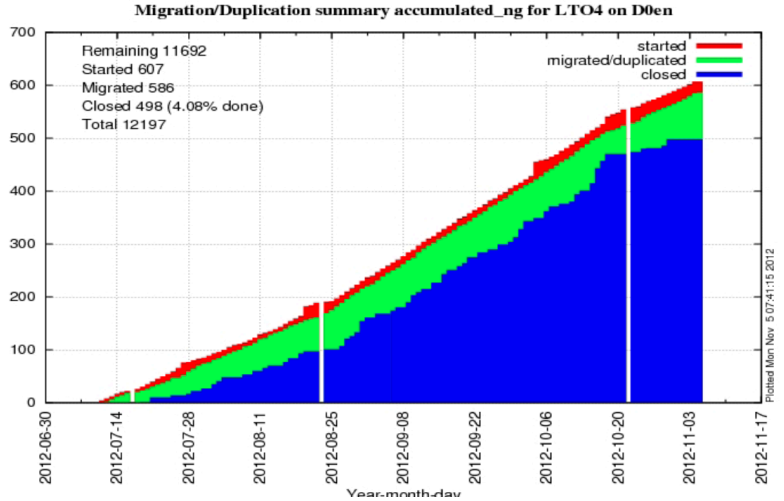
Detailed plan will be first job of these new hires!!!


BACKUP

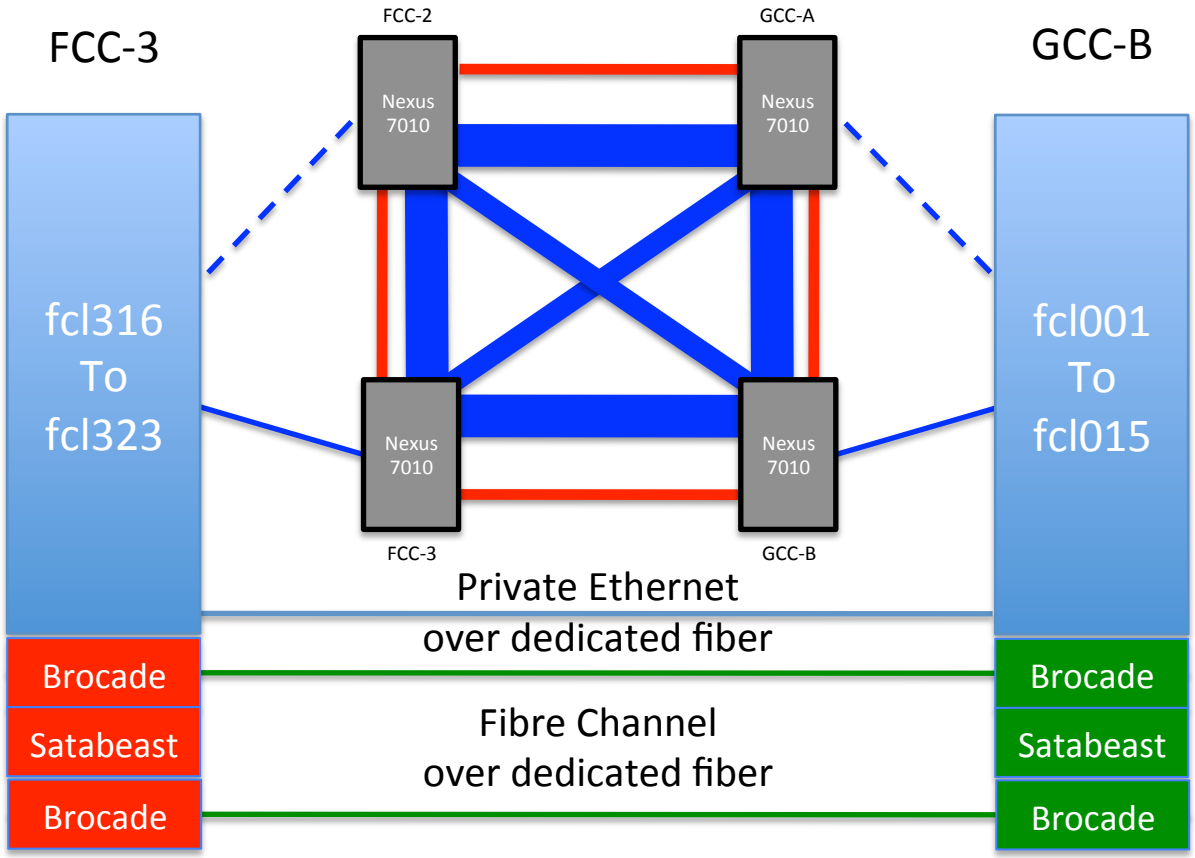
Tape migration – LTO4 to T10K

Media	Total to Migrate	Migrated	Closed (scanned)	Validated	Removed From Library	% Done
CDF LTO3	4071	4071	4071	4071	4071	100.00
CDF RAW LTO4	2980	2062	1924	1897	0	63.66
CDF non-RAW LTO4	9116	0	0	0	0	0.00
D0 RAW LTO4	3052	587	470	470	0	15.40
D0 non-RAW LTO4	9072	0	0	0	0	0.00
Public	5223	0	0	0	0	0.00
Total	33514	6720	6465	6438	4071	19.21





FermiCloud – Network & SAN "Today"



FY2011 / FY2012

Networks

- The requirements of the program already push the networks to multiple high capacity redundant links within and outside the laboratory.
  - CMS T1, Run 2, IF, Astrophysics, Lattice QCD, etc.
- R&D activities and participation in 100 GE networking will lead to sufficient capacity for future networking.