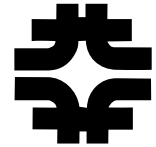


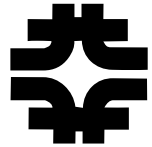
CD Overview of Resources, Manpower, Planning and Strategy

Vicky White

Fermilab

March 30, 2005

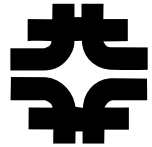
Resources - Planning for the Future



1. Computers, disks, robots, tape drives, tapes, servers, etc. required to support the program
2. Workforce with the necessary skills to design, develop and run the systems and services needed
3. Computer Facilities – space, power, cooling
4. Networking infrastructure
5. Cyber Security environment for Open Science

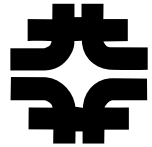
Although this review focuses on Run II, MINOS, MiniBoone our planning of course encompasses the total program – with Run II a large, but not totally driving, force in all of the above.

Resource Planning Strategies



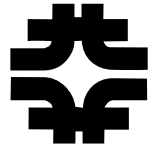
- Common approaches and services wherever possible
  - Enstore Storage System for all – with SRM grid interface
  - dcache, SAM, Oracle databases, ROOT, for most
- Grid Computing is strategic direction
  - Run II and LHC must be aligned and use worldwide computing
  - Resources must be shared internally and externally
  - Physics is not the only science
- Networks and use of the network is key
- CMS can learn from Run II (move staff)
- Soft funding should be judiciously pursued and can benefit various lab programs
- We need to invest (even) more in information systems and automated workflow so we can
  - Improve efficiency and automation
  - Understand and set metrics on how we are doing
- We must become (even) more efficient and clever so we can invest in ILC and future programs

How do we plan and get the right balance ?



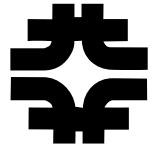
- Balance M&S and SWF
  - Slightly different balance to detectors/accelerator
- Balance Current Program Operations and future program and initiatives
- Provide (just) sufficient resources at Fermilab (people and hardware) to support the physics and provide the right “core strength” to leverage outside resources

Key Elements of Planning



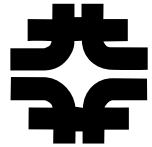
1. Understand what we are doing and why and where all the effort and money goes
   - Detailed bottoms up budget process with manpower included for each WBS
   - Detailed tracking of expenses vs budget
   - Monthly effort reporting for everyone (system supports complex cross-experiment-division efforts contributing to common projects)
2. Understand what the experiments need to succeed (and why)
   - Yearly review of Run II – detailed planning
   - MOUs (ongoing)
   - International Finance committees for CDF & D0
   - Metrics on usage of resources
   - LHC Physics Center Steering meetings

Key Elements of Planning (2)



3. Understand the staff we need to carry out our work and constantly evolve our organization to meet the needs
   - Hire for new skills (e.g. Grid, Cyber Security, Network Research, Simulation, Storage)
     - 32 new hires in past calendar year (4 recruited internally) (19 losses also)
   - Provide opportunities for growth and leadership and spread of know-how internally.
     - ~12 people have changed assignment in the past calendar year

Budget Process



FY05 BUDGET PROPOSAL - STAFFING NEEDS

Budget Requesting Dept	Budget Requesting Group	New or Modified Parent (Y)	Parent Task Number	Parent Task Name
CEPA	APS-SLD		50.02.13.01	PHY-APP-UTIL

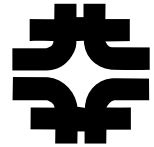
CD Category	Priority
Direct Support for Experiment or Lab program	Very Important for Lab Mission

Description
Development and support of physics application software

Opportunity Justification
Centralization of this effort provides superior quality at less total effort cost than individual experiments replicating each needed application, and also helps achieve commonality of interfaces for ease of use

Dept providing staff	Item #	Activity	# of people	Position Title	Role/Person	On Staff or New	New Task (Y)	This activity is (or to be) charged to Task Number	This activity is (or to be) charged to Task Name	Task Owning Org	# of Months	FTE Estimate	Notes
CEPA	1	PHYSICS APPLICATIONS / Physics C++ Applications	0.30	DEVELOPER	WB, JBK, MP, others	ON STAFF		50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	10.0	0.25	Likely area -- use case capture
CEPA	2	PHYSICS APPLICATIONS / Physics C++ Applications	0.10	APPLICATION PHYSICIST	JM	ON STAFF		50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	10.0	0.08	
CEPA	3	PHYSICS APPLICATIONS / Physics C++ Applications	0.10	ASSOCIATE SCIENTIST or SCIENTIST	MF	ON STAFF		50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	10.0	0.08	
CEPA	4	PHYSICS APPLICATIONS / Physics Library Support / Zoom Support	0.13	DEVELOPER	WB -- framework, Exceptions, others; DG -- CovMatrices	ON STAFF		50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	12.0	0.10	
CEPA	5	PHYSICS APPLICATIONS / Physics Library Support / Zoom Support	0.15	APPLICATION PHYSICIST	JM -- HepTuple, SpecialFunctions	ON STAFF		50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	12.0	0.15	
CEPA	6	PHYSICS APPLICATIONS / Physics Library Support / Zoom Support	0.25	ASSOCIATE SCIENTIST or SCIENTIST	MF -- ErrorLogger, PhysicsVectors, Web doc, others	ON STAFF		50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	12.0	0.25	
CEPA	7	PHYSICS APPLICATIONS / Physics Library Support / CLHEP Support	0.20	DEVELOPER	WB -- Build mechanisms	ON STAFF		50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	3.0	0.05	
CEPA	8	PHYSICS APPLICATIONS / Physics Library Support / CLHEP Support	0.30	APPLICATION PHYSICIST	LG -- STDHEP, others; JM?	ON STAFF		50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	12.0	0.30	COORDINATE -- LG on CLHEP -- Check with PSM
CEPA	9	PHYSICS APPLICATIONS / Physics Library Support / CLHEP Support	0.15	ASSOCIATE SCIENTIST or SCIENTIST	MF -- Matrix, Vector, Random, ...	ON STAFF		50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	12.0	0.15	
CEPA	10	PHYSICS APPLICATIONS / Physics Library Support / Legacy Software Libraries Support	0.15	APPLICATION PHYSICIST	JM	ON STAFF		50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	12.0	0.15	
CEPA	11	PHYSICS APPLICATIONS / Experiment Software Support & Devel / ZOOM Export & Validation	0.20	DEVELOPER	WB	ON STAFF		50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	3.0	0.05	
CEPA	12	PHYSICS APPLICATIONS / Experiment Software Support & Devel / ZOOM Export & Validation	0.20	APPLICATION PHYSICIST	JM	ON STAFF		50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	9.0	0.15	Closed-ended task
CEPA	13	PHYSICS APPLICATIONS / Experiment Software Support & Devel / ZOOM Export & Validation	0.20	ASSOCIATE SCIENTIST or SCIENTIST	MF	ON STAFF		50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	9.0	0.15	
CEPA	14	PHYSICS APPLICATIONS / Object Oriented Minimization	0.75	DEVELOPER	DG	ON STAFF		50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	9.0	0.56	
CEPA	15	PHYSICS APPLICATIONS / Object Oriented Minimization	0.10	ASSOCIATE SCIENTIST or SCIENTIST	MF	ON STAFF		50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	9.0	0.08	
CEPA	16	PHYSICS APPLICATIONS / HEP Mathematical Libraries	0.50	DEVELOPER	New CP VI with C++ expertise	NEW	Y	50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	10.0	0.42	
CEPA	17	PHYSICS APPLICATIONS / HEP Mathematical Libraries	0.10	APPLICATION PHYSICIST	JM	ON STAFF	Y	50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	10.0	0.08	
CEPA	18	PHYSICS APPLICATIONS / HEP Mathematical Libraries	0.20	DEVELOPER	MP, WB, JBK	ON STAFF	Y	50.02.13.01.01	PHY-APP-UTIL-OP	CEPA	10.0	0.17	
												3.22	

Data -> information -> decisions



- All Financial reports online at

http://cd-entreport.fnal.gov/cdfinancial/default.csp

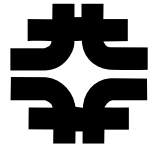
- Effort reporting

http://wwwserver2.fnal.gov/cfdocs/effort/Main/Login.cfm

- Some Metrics

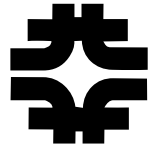
http://computing.fnal.gov/cd/metrics/

Stakeholder communications



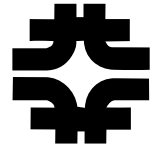
- Bi-weekly meeting slot with CDF and D0 spokespersons + Computing leaders
- As needed meetings with other expt spokespersons and/or computing leaders
- CD Head is member of CMS SW&C PMG and CMS Advisory Software & Comp. Board
- CD Head or Deputy attends various lab PMGs
- CD representative on CDF and D0 PMGs
- Stakeholders participate in briefings and status meetings – present needs, requests, etc.
- Lab Scheduling, LAM and All-Experimenters meetings
- Windows Policy committee
- Computer Security Working Group

Meetings and Communications inside CD



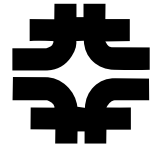
- Division Operations meeting weekly
- Facility planning meetings weekly
- Department Heads meetings weekly
- Kitchen Cabinet meeting of Division Head, Deputy and Assoc Heads weekly
- Budget Meeting ~monthly, 2 Budget retreats per year
- Briefings on issues/project proposals as needed
- Activity status reports
- Activity Coordination Meetings
  - Grid and Data Management (2 per month nominal)
  - Accelerator Division Support Projects (monthly nominal)
  - CMS Projects (monthly nominal)
- FermiGrid meetings
- Division All-hands meetings (~2 per year)
- Network and Cyber Security retreats

CD/Lab Program alignment



- CD head meets weekly with Associate Director for Research
- Occasional meetings with Director
- Division-heads meetings
- SAG meetings
- Attend PAC, HEPAP

How do we set Priorities and Balance ?



- Listen to all the input
- Look at all the data
- Talk with department heads, directorate
- Present and defend our budget
- Decide!

Computing Division ES&H Program

- Our ES&H program and record is stellar and we have broken our own and other lab records for working without a lost work time injury

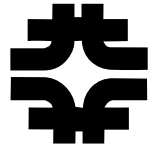
http://www-esh.fnal.gov/pls/default/lsc.html

- We received an award for the best sustained record

Risks

- Analysis of last year's risks (in Spares)
- Talked about major Risks in the plenary presentation – (details in Spares)
  - Grid
  - Facility Infrastructure
  - Tapes all in 1 building
  - Government rules
  - Weakened collaborations

Some other potential risks

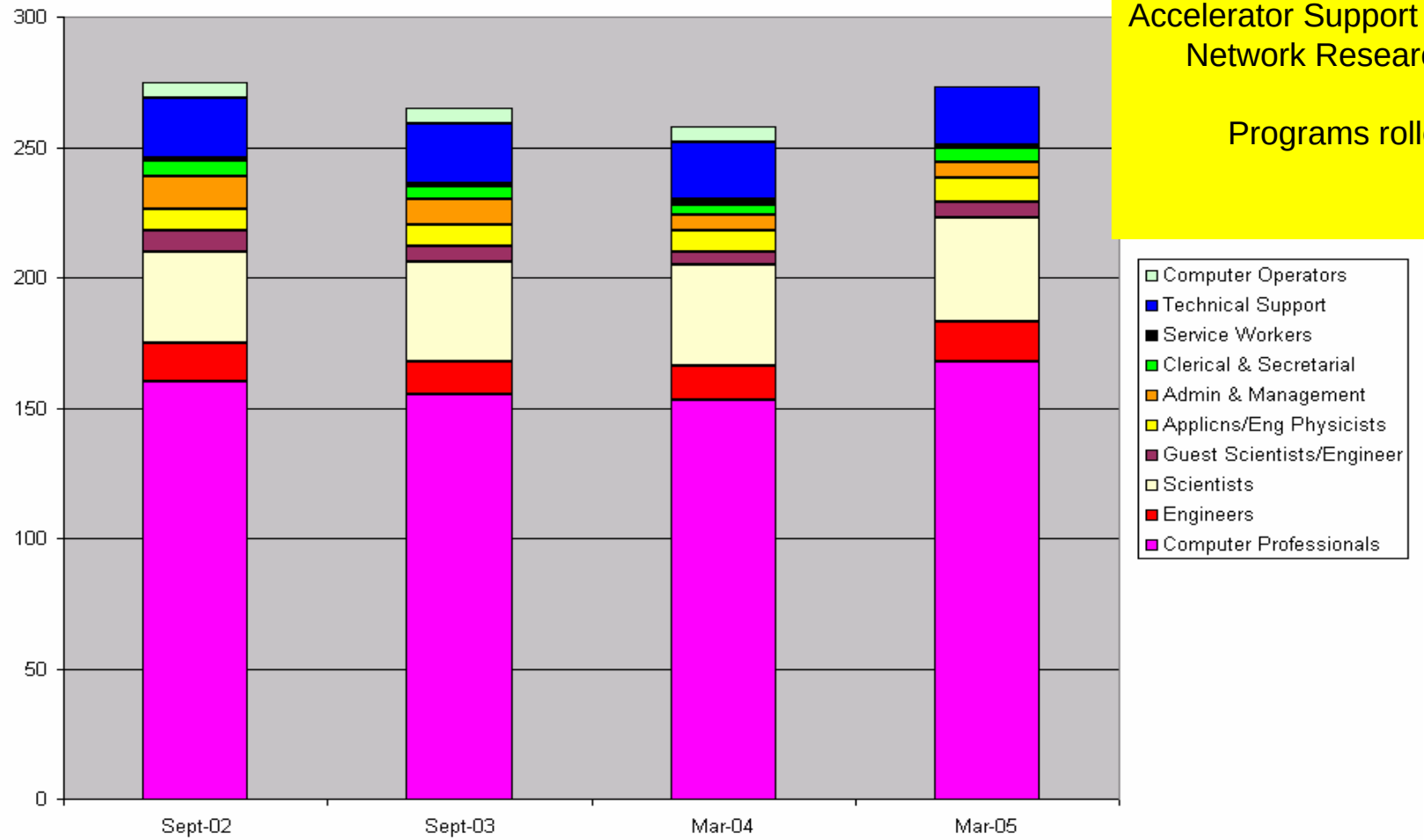


- Can't get or keep people with the skills we need
  - I hope not. We have challenging computing problems and an exciting physics program
- Can't gain much in further efficiencies – just more work to do with fewer people
  - We certainly are doing more with the same number of people and also have many things automated
  - But it is getting harder
- Experiment or TeV planning is wrong and computing needs are much greater than planned and can't be met with offsite resources
  - ?

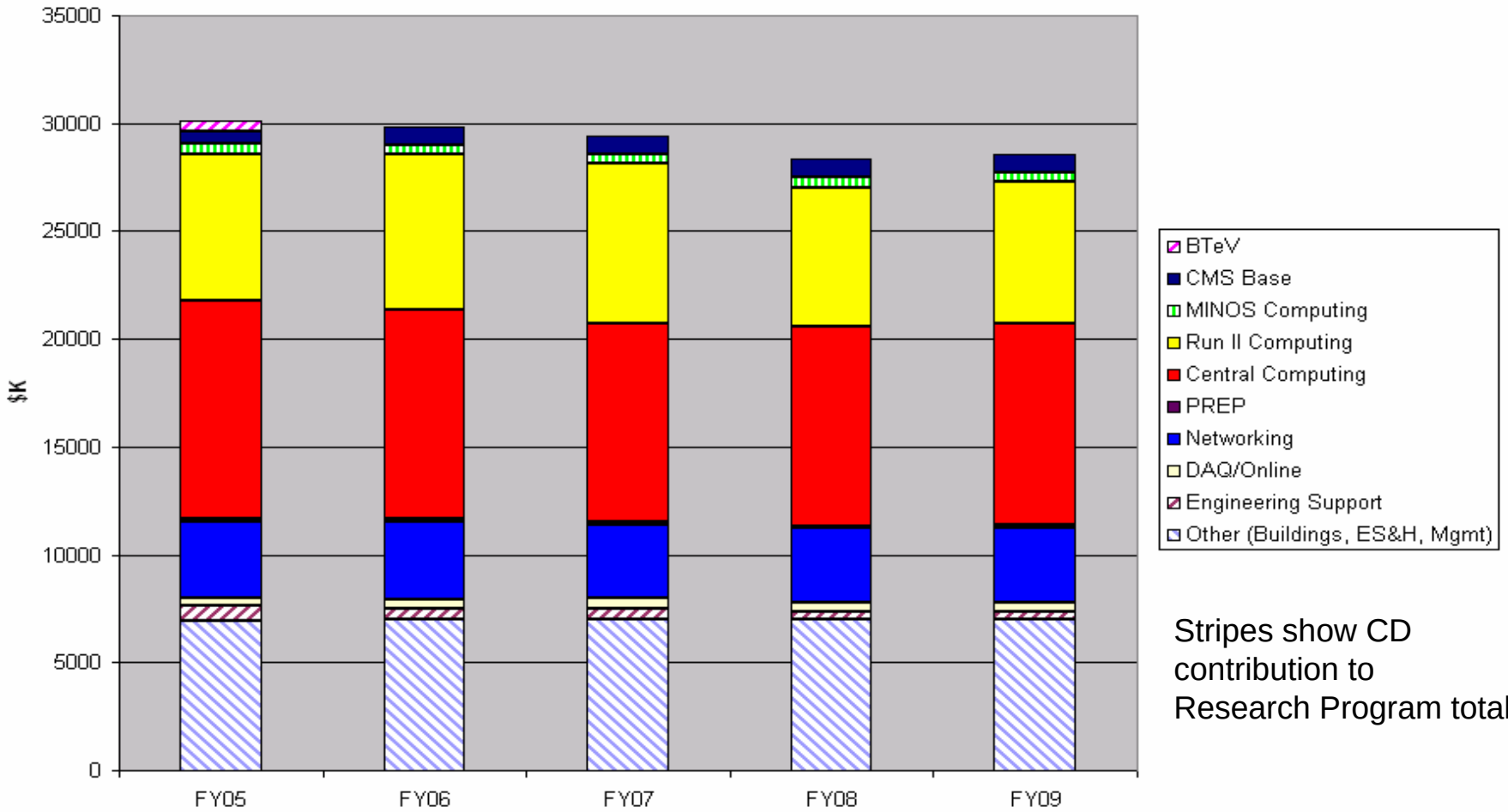
Job Categories 2002-present

Programs added
CMS(+12)
Accelerator Support (~12)
Network Research (2)

Programs rolled off
?

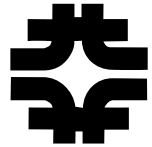


Computing M&S + SWF

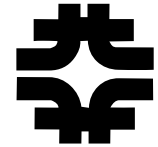


Stripes show CD contribution to Research Program total

Conclusions

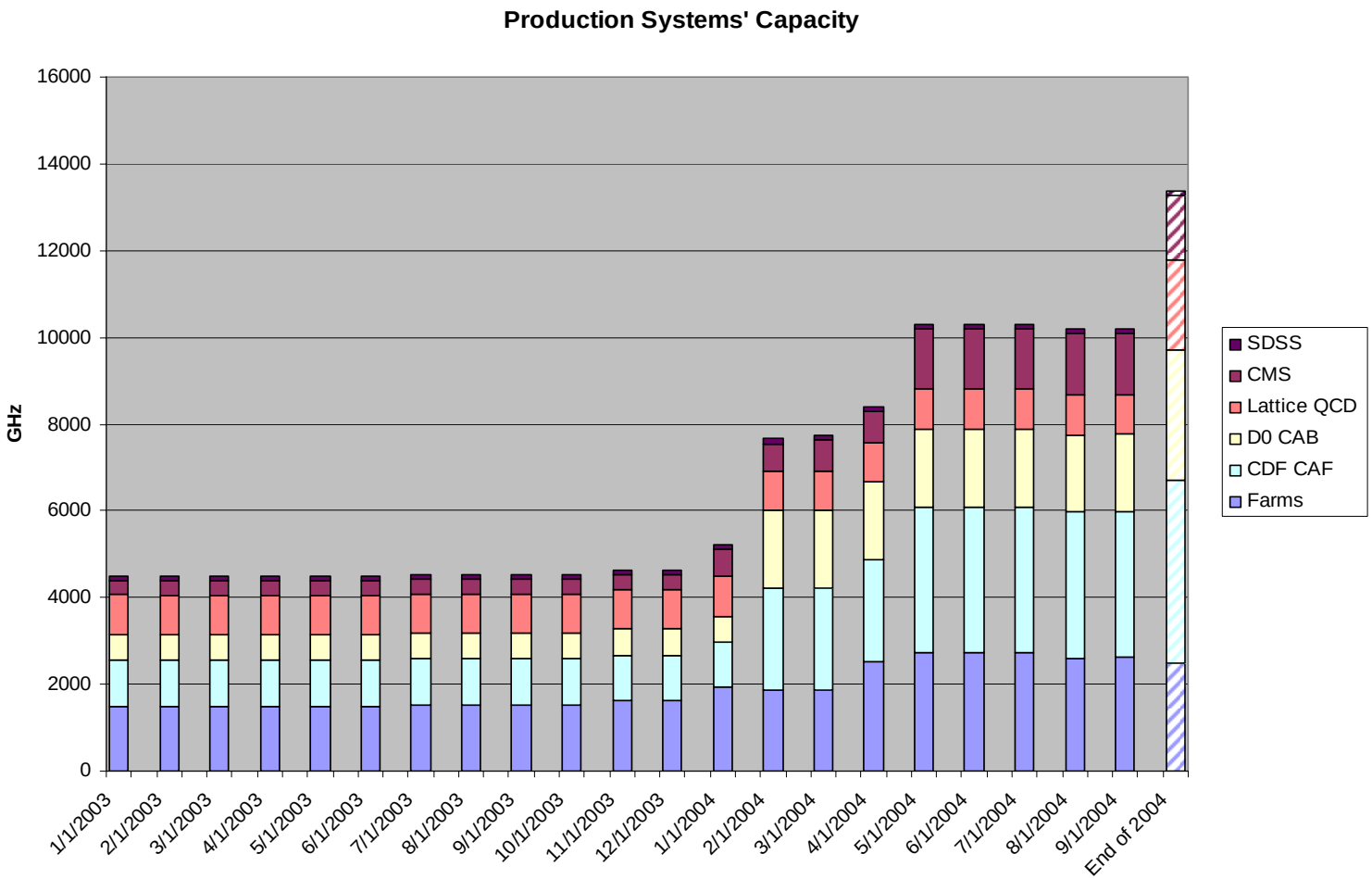


- Managing our resources in a declining budget scenario is not an easy task and the plan may need adjustments
  - Depends on which risks turn out to be real
- However, we believe that we have a plan that does the best we can to ensure appropriate support for “Tevatron Operations at FNAL” while
  - Reducing staff
  - Putting additional effort into CMS, Lattice QCD and future programs
  - Dealing with increased regulatory pressures on IT and Computer Security
  - Dealing with workforce evolution and morale
- I believe we will succeed – but we will have to work very hard at it

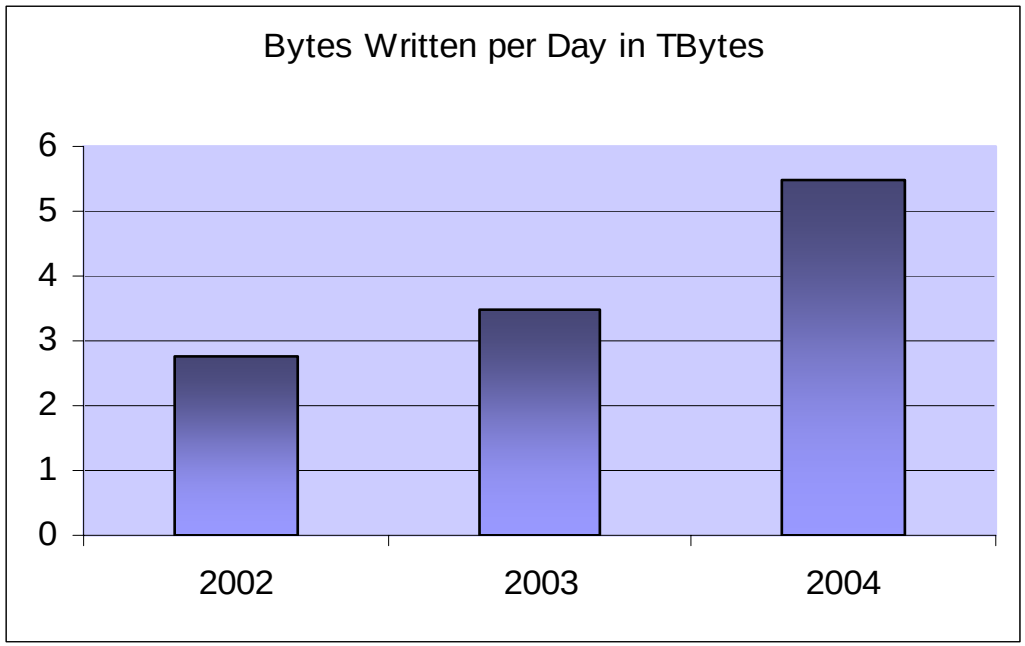


Spare Slides

Systems Capacity

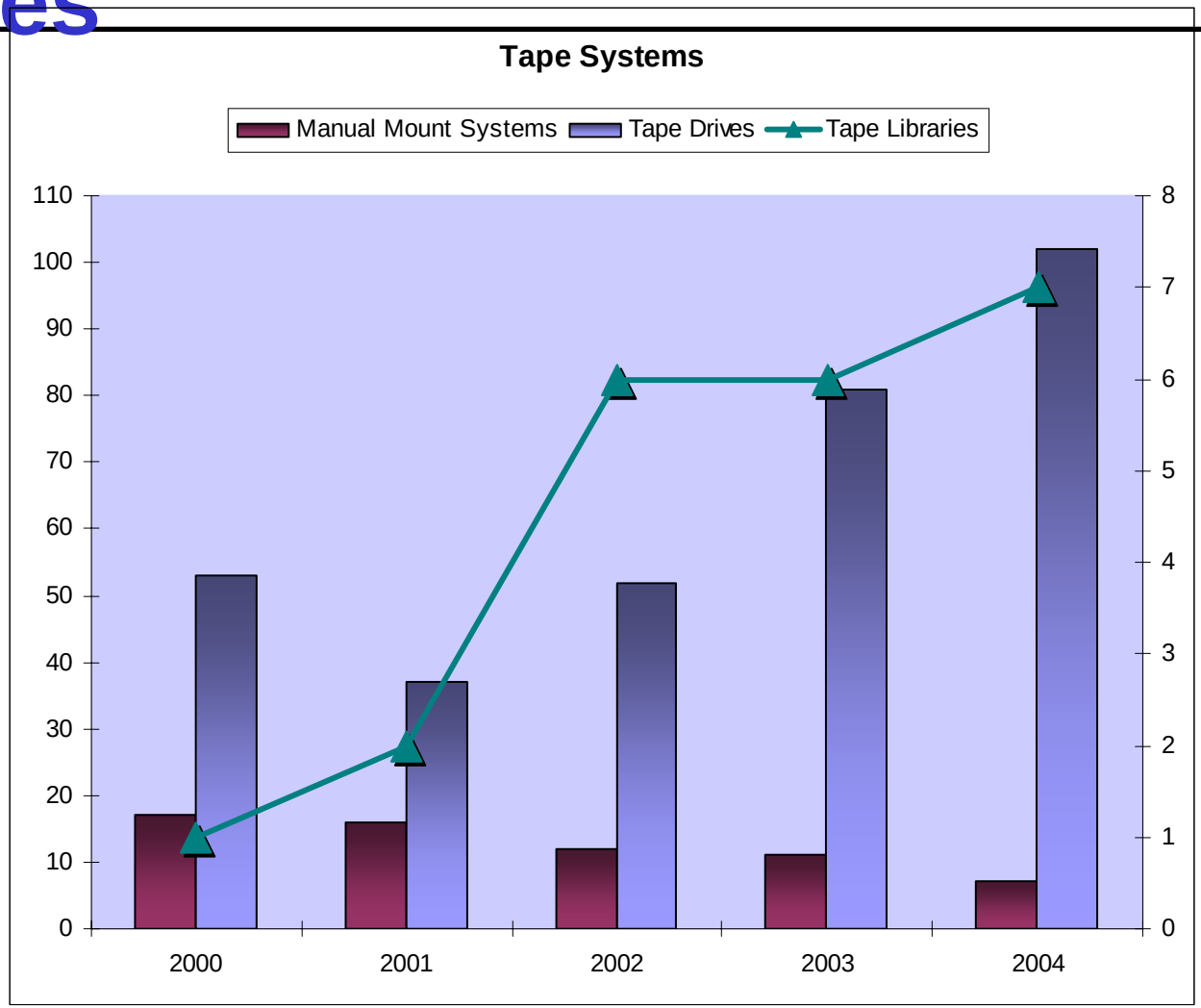


Data Written per Day

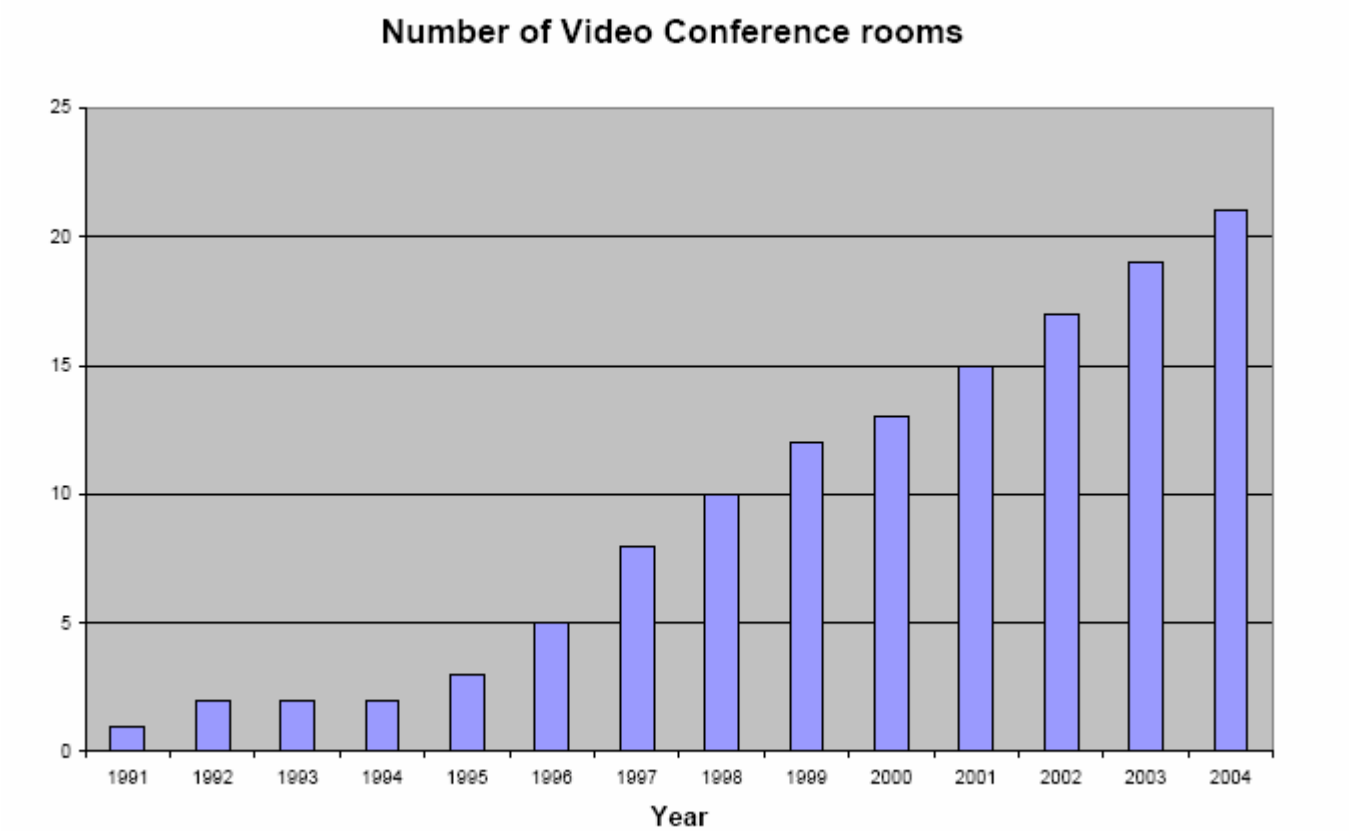


> 2.2 Petabytes of Data in the robots

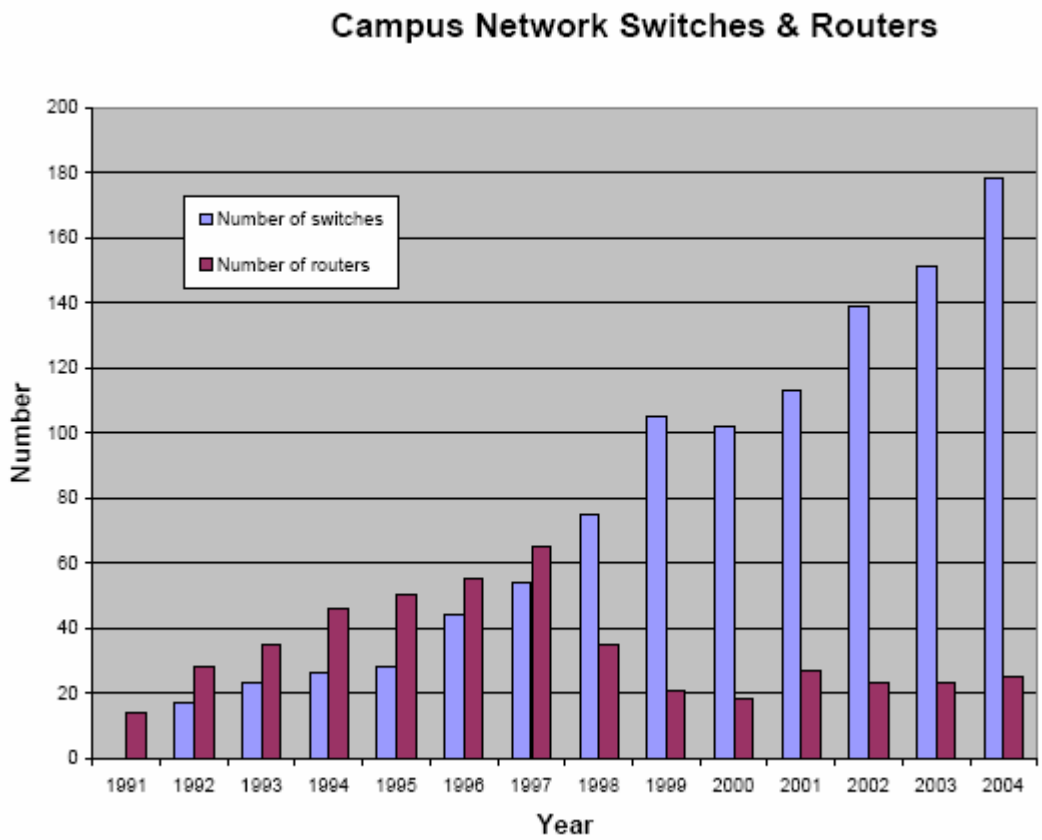
Storage Systems and Tape Drives



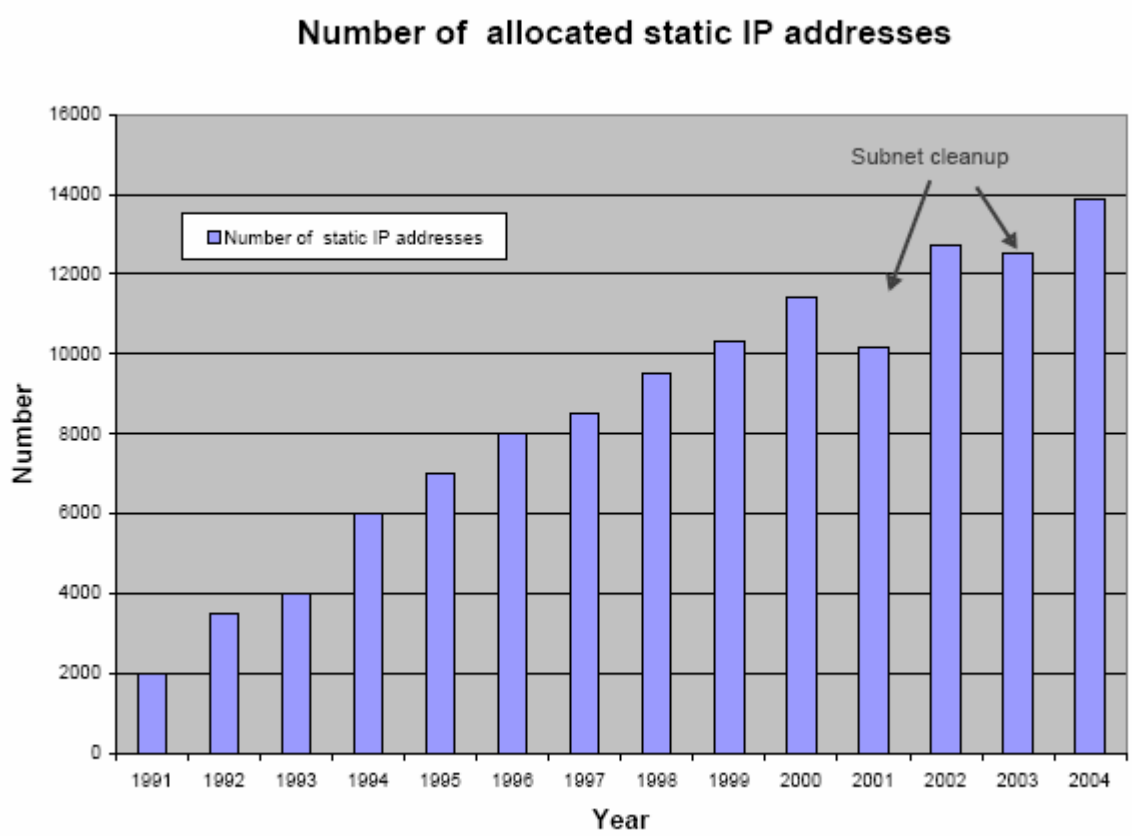
Videoconferencing



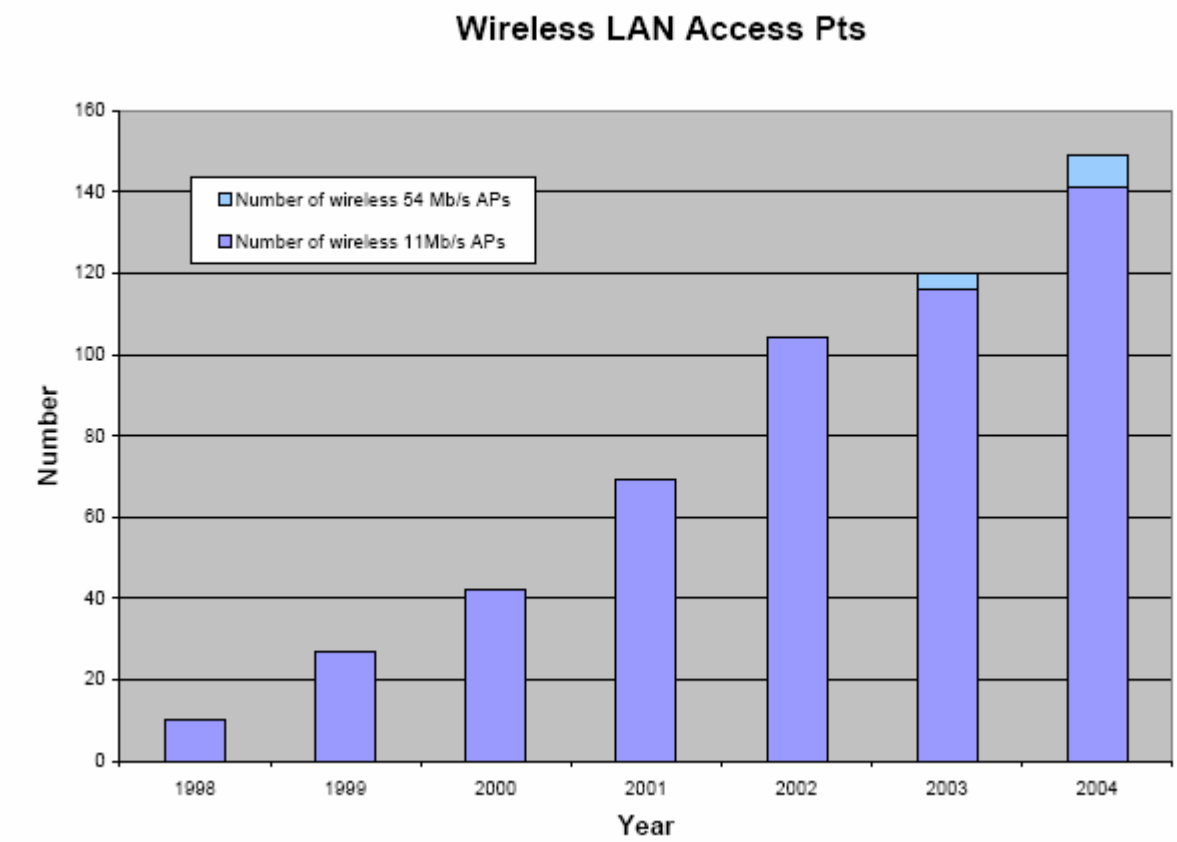
Network Switches and Routers



Network – Static IP addresses



Wireless Access Points on Network



Some Common Services

Common Service	Customer/Stakeholder	Comments
Storage and Data movement and caching	CDF, D0, CMS, MINOS, Theory, SDSS, KTeV, all	Enstore – 1.5 Petabytes data ! dCache, SRM
Databases	CDF, D0, MINOS, CMS, Accelerator, ourselves	Oracle 24x7 mySQL,Postgres
Networks, Mail, Print Servers, Helpdesk, Windows, Linux, etc.	Everyone !	First class, many 24X7, services + lead Cyb.Security
SAM-GRID	CDF, D0, MINOS	Aligning with LHC
Simulation, MC and Analysis Tools	CDF, D0, CMS, MINOS, Fixed Target, Accel. Div.	Growing needs
Farms	All experiments	Moving to GRID
Engineering Support and R&D	CDF, D0, BTeV, JDEM, Accel. Div. Projects	Q outside our door

Risks from 2004 review

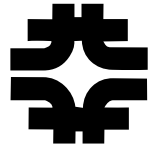
Risk	Type of Risk	Plan/mitigation
Provision of computer center building infrastructure fails to keep up with programmatic demands for power and cooling for computing power	Infrastructure	Multi-year plan to re-use existing buildings – separate plan each year to build to match characteristics of systems given changing technologies
Processing time for CDF or D0 events and/or need to reprocess pushes computing needs outside planning envelope.	Programmatic	Establish Grid model for provision of computing resources in a seamless way. (Already close to established). Execute plan at Fermilab to make all computing generic Grid computing to meet peak demands by load sharing.
Demands for serving up Run II data both on-site and off-site, escalate to a point where the central storage and caching systems fail to scale	Programmatic	Much work has been done to assure scalability of the central storage system. We have many robots and can add tape drives to robots in a scalable way.
Tape technologies do not continue to follow the cost/GB curve we plan for or tape technologies become obsolete	Programmatic	We have two different types of robots including two large ADIC flexible media robots that can take a broad range of media types. If STK silos become obsolete and STK makes no new media we can expect LTO drives or their descendents to continue for several years. Our caching strategy allows us to transparently go to an all disk solution, and to replicate data on disk, should this become cost effective.

Risks from 2004 review

Rely on Grid Computing to solve many problems If the Grid has been oversold, or oversubscribed and Run II experiments have increasing difficulty getting resources as we approach LHC turnon this could limit the physics from Run II.	Programmatic	We plan to maintain a solid base of processing capability at Fermilab. Experiments will have to make hard choices that could limit the physics.
Success with Accelerator Division joint projects means we are likely to be asked to be engaged in this work longer. Already this is happening. Applying resources to BTeV has to be balanced with these needs.	Programmatic	Plan carefully what we take on.
For the Grid to work the Network infrastructure must be highly performant to all locations	Programmatic	1) Fermilab procuring fiber connection to starlight 2) Fermilab worked on ESnet roadmap report in office of science and now working with ESnet to use the fiber for a Metropolitan Area Network, with ANL. 3) R&D proposals and continual push on improved networking capabilities worldwide (ICFA SCIC), Internet working group, etc.

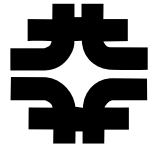
Risk	Type of Risk	Plan/mitigation
All data tapes in FCC. All data tapes for one experiment in one or at most two tape silos. Risk of catastrophic data loss low, but non zero.	Programmatic and Infrastructure	Working on a)Physical Infrastructure to house silo(s) b)Combining all silos into one logical system c)Dispersal of data to multiple physical locations
Satellite computer center buildings will not have Generator backup, only UPS to allow for orderly shutdown of systems on power failure	Programmatic	Need 10% more processors to mitigate effects of power outages – which leave many dead systems in their wake. Have adopted a policy on use of buildings to minimize effects of downtime of worker nodes, keeping file servers, machines with state in FCC.
Satellite computer centers need money to run them. FCC costs us a lot to run. FESS do not provide all of the services. We have to pay for many contracts ourselves. Each additional building will need maintainance, up to high standards, if millions of dollars of computing are to be within and monitored.	Infrastructure	We still need to squeeze these costs out of the budget. If necessary will have to “tax” purchasers of computing.
Plan for lights out computing center could get derailed. Two legacy tape systems are being migrated to robotic storage. Building monitoring systems need improvement.	Programmatic	Finish executing plan to put all active data into a robot. Work with FESS on enhanced and secure access to building monitoring information is ongoing.

Risks, Challenges, Mitigations (1)



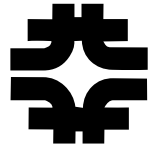
- Reliance on Offsite resources/Grid Computing
  - Going well – but overall lack of funding from DOE and NSF for Grid Infrastructure and Network Infrastructure is a big risk
    - Need support for Middleware (Globus, Condor,VDT, iGOC, SRM), Grid Project continuations (PPDG, GriPhyN, iVDGL) and Open Science Grid development & operations
    - Must get ESnet upgrades (and LHCnet) !!
  - Mitigation: Funding agencies please work together on support building “cyber infrastructure” for global science - and build on the huge successes in Grid Computing so far

Risks, Challenges, Mitigations (2)



- Computing Facility Infrastructure
  - planned, but may be a bit late
- Distribution of data across 2 buildings to mitigate risk of catastrophe and also provide more reliable access to data
  - Ongoing –achieve partially in FY06
- Government (President/OMB/DOE) directives on managing Information Technology, Personal Identification, Foreign Visitors, Cyber Security, Asset management, and more…
  - Only mitigations are to work via SLCCC, Lab Directors, Ray Orbach, and Congress and to learn how to “get to green” in a way that does not compromise the science

Risks, Challenges, Mitigations (3)



- Collaborations possibly becoming too weak to run detectors and experiment parts of computing.
  - Need the MOUs
  - Need to build a solid operational model that will work with fewer people.
  - LHC Physics Center at Fermilab should help to encourage continued participation in Run II experiments during the transition to the LHC era