



COMPUTING OPERATIONS AND SUPPORT

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Fermilab

March 16, 2004

Computing Division (CD) Mission



The Computing Division's mission is to **play a full part** in the mission of the laboratory and in particular

Participate in the Science

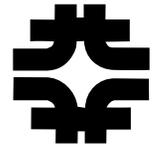
To proudly **develop, innovate, and support excellent and forefront computing solutions and services**, recognizing the essential role of cooperation and respect in all interactions between ourselves and with the people and organizations that we work with and serve.

Serve the Program and the Lab

Collaborate

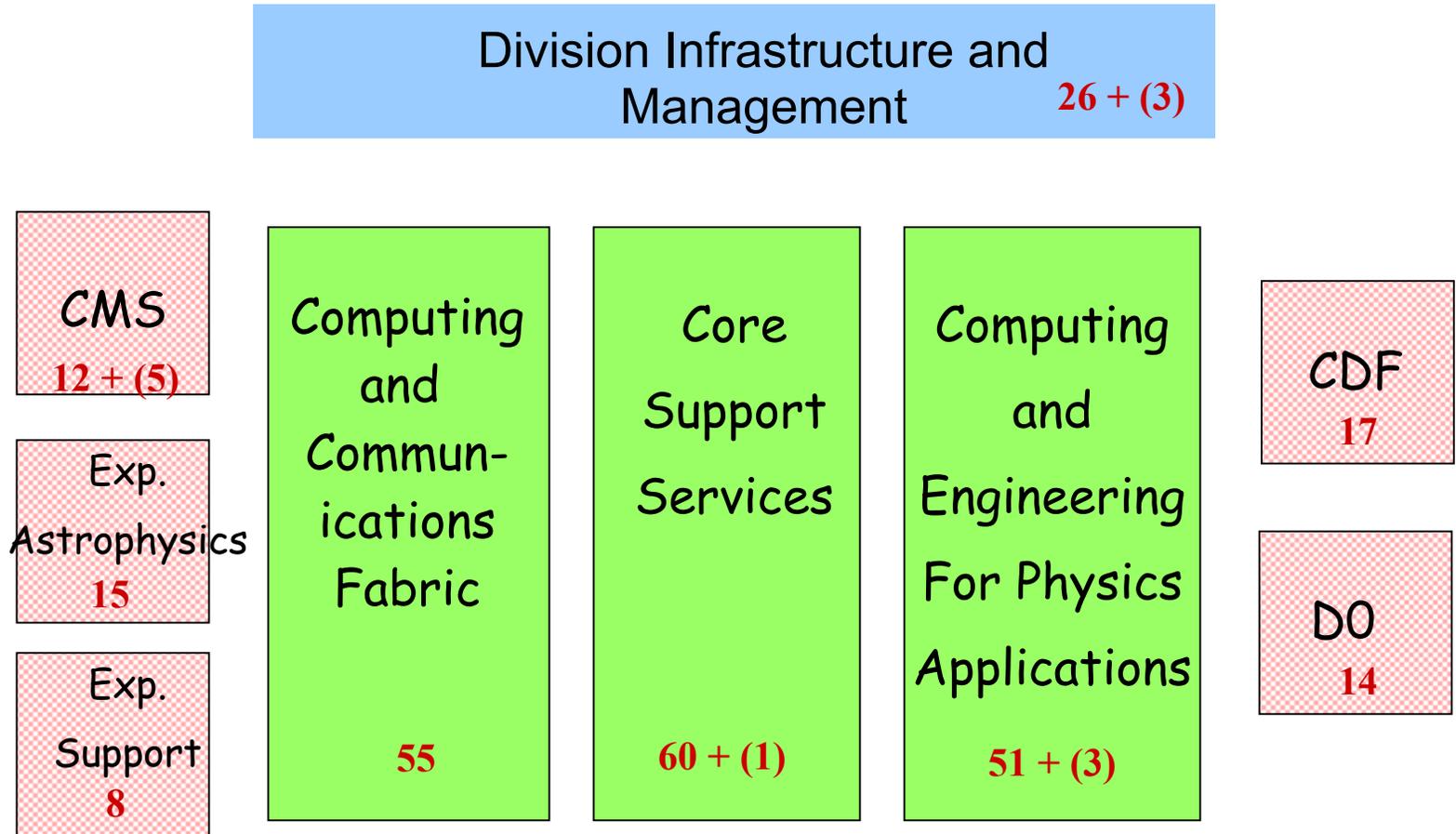
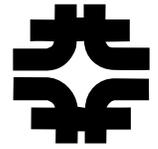
Drive the Program

Five Computing Activity Areas



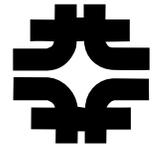
1. Provide services, tools, and components, and operate computing facilities that serve the lab and the scientific program broadly.
2. Provide dedicated help, leadership and active participation in running and approved experiments and other lab scientific programs (including support and expert help to the Accelerator Division).
3. Work on projects funded competitively outside the base budget – e.g. SciDAC & GRID projects.
4. Participate in planning and R&D for future experiments/lab activities.
5. Run a computing organization and computer center.

Computing Division Organization



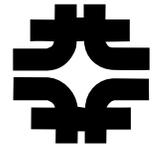
Scientists of all sorts, Engineers, Technical, Computing, Admin = 258 + (12) = 270

Organization Overview



- 3 Large Departments (166 FTE) provide common services, components, tools and expertise
 - Integrated Hardware and Software work
 - Well defined mission areas for each dept. but...
 - None of the 5 activity areas (except division infrastructure) fit entirely within any one dept.
 - Functions are NOT replicated – quite the opposite – we have consolidated efforts and eliminated competing functions
 - Must rely on each other for services and expertise

Some Common Services



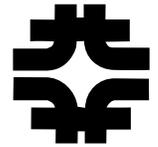
Common Service	Customer/Stakeholder	Comments
Storage and Data movement and caching	CDF, D0, CMS, MINOS, Theory, SDSS, KTeV, all	Enstore – 1.5 Petabytes data ! dCache, SRM
Databases	CDF, D0, MINOS, CMS, Accelerator, ourselves	Oracle 24x7 mySQL, Postgres
Networks, Mail, Print Servers, Helpdesk, Windows, 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

Organization Overview (2)



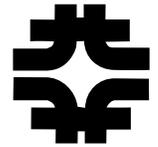
- Currently 5 Smaller Dedicated Experiment Support Departments (66 FTE)
 - Mission to build, operate and support systems and software infrastructure for a specific experiment
 - Departments for each of CDF, D0, Experimental Astrophysics, CMS, plus one for the combined smaller efforts for MINOS, MiniBoone and BTeV
 - these departments will grow and shrink or merge/split as the scientific program evolves
 - plan to merge CDF and D0 to a Run II department very soon.

Organization Overview (3)



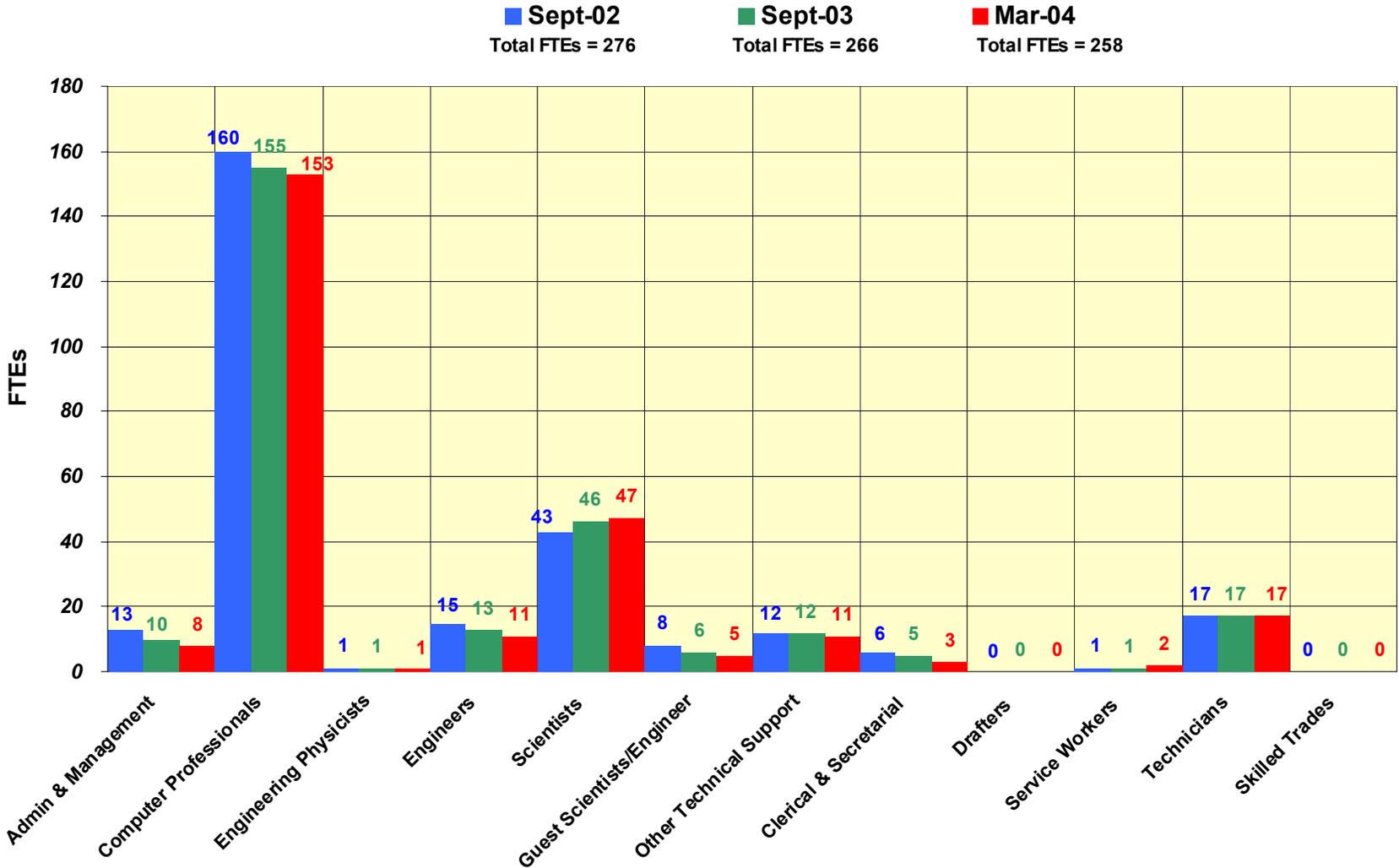
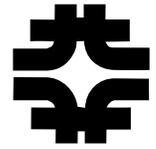
- The 5 Dedicated Experiment departments have the role of
 - Liaison between experiment and CD at large
 - Development and support that Fermilab CD agreed to take on (under an MOU)
 - Facilitating getting services and expertise from the core departments
 - Preparing and presenting the requirements of the experiment and usually participating in management of the experiment Software and Computing organization.

Division Office (26 FTE) contains



- Division Direction via 3 Associate Heads + Assistants, Head and Deputy
 - Cross cutting responsibilities in Planning, Operations, Projects and outreach + Science
- Facility Management
- Safety Officer
- Budget, Financials and Personnel
- Capital Asset reporting for the lab
- Computer Security leadership for the lab
- Administrative Support
- Education Office support and Outreach
- Web Pages for Division

Job Categories – March 2004

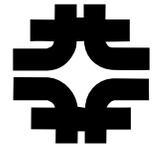


Computing Division FY04 Budget



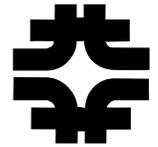
DS - COMPUTING DIVISION	Labor	M&S	total
Run 2			
Accelerator Operation	0.0	0.0	0.0
Accelerator Improvement	1,528.2	12.3	1,540.5
Detector Operation	5,771.2	4,195.5	9,966.7
Detector Improvement	0.0	0.0	0.0
Non-Run 2			
Accelerator Operation	0.0	0.0	0.0
Accelerator Improvement	0.0	0.0	0.0
Detector Operation	834.9	143.5	978.4
Detector Improvement	0.0	36.8	36.8
Others			
Direct	12,840.7	6,086.2	18,926.8
Indirect	996.2	0.0	996.2
Total	27,217.9	13,240.4	40,458.3

FTE Staffing for Major Projects



- Staffing for the major projects (including Run II) comes from a combination of :
 - Directly assigned staff, e.g. CD-CDF Department
 - Shared services and developments e.g.
 - Mass storage, databases, networks, engineering
 - Use of more general services and staff e.g.
 - Helpdesk, email, repairs, desktops, etc.
- The **staffing table** shows the assigned staff plus part of the shared services that can clearly be identified as working on services/ technologies targeted at the Project's needs.

FTE Staffing for Major Projects



FY04	Scientists	Computer Professionals		Engineers	Techs	TOTAL
		Dedicated	Shared services			
						127.1
CDF	11	9.2	11.2	0.5		31.9
D0	8	5	11.2	0.5		24.7
MINOS	2	2.6	3			7.6
MiniBooNE	0.5	0.1				0.6
CMS	4	14.3+5	2			25.3
BTeV	0.5	1.0		1.8		3.3
Future Kaons	0.5					0.5
SDSS	8	2.8				10.8
CDMS		0.2				0.2
Fixed Target		2				2
Theory/Lattice	1	4.2				5.2
Accelerator	4	8		2	1	15

Risks and Challenges (1)



- Grid Computing
 - Mitigates risk of sole reliance on Fermilab computing resources in case of changes in event processing time (e.g. due to degradation of detector)
 - Provides opportunities and challenges
 - Leadership in Grid Computing (Open Science Grid in the US (peering with EGEE in Europe) in support of the LHC and more
 - Bridge between the Run II era and the LHC era
 - Aim for having all of our computing on the Grid

Risks and Challenges (2)



- Successful central data storage and movement systems (Enstore and dCache) used by all expts and theorists
- 1.5 Petabytes of data on tape in robots
- Routinely ingest 2+ TB of data per day
- Routinely serve up 40 TB of data via dCache on CDF analysis servers
- **Plan in FY05/FY06 to**
 - Aggregate robotic storage – one logical system
 - Disperse robots to mitigate risk of disaster

Risks and Challenges (3)



- Feynman Computing Center is out of
 - Power, cooling and space (almost)
- Already taken over part of the New Muon Lab as a satellite facility for Lattice Gauge Computing
- Lab is aggressively working to re-use another experimental service building at Wide Band as a High Density Computing Facility
 - Refurbish in stages to match rapidly changing technology characteristics
 - Need the first stage of this by late summer 04
 - Risk to Run II physics program if can't add Farm and analysis computing to keep up with the data

Risks and Challenges (4)



- Successful ongoing work with Accelerator Division colliding with need to ramp up work on BTeV in 05 and 06

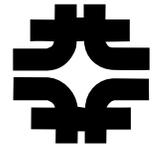
Approx FTEs for	FY04	FY05	FY06
BTEV R&D (base)	3.3	6.5	1
BTEV Project work		5	26
Accel. BPM project (s)	11	7	0
Accel. support projects	4	1	0
Totals	18.3	19.5	27

Workforce Evolution



- Need more skilled people in
 - Networks (WAN futures) - link to Starlight
 - Software Engineering, Data Management, GRID, Databases
 - Accelerator modeling
 - Postdocs – for CMS in particular
 - Trigger, DAQ and online for BTeV
- LHC ramp-up gives opportunity to hire (12 people)
- Emphasize mobility and opportunities to retrain
- Will be going to lights out operations
- Outsource more PC repair, network physical layer
- Have downsized – stressful – no less work!

Working with stakeholders



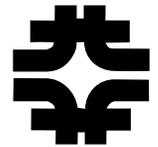
- Liaison's within CD experiment depts
- Budget process – bottoms up w. manpower
- Run II Computing Reviews yearly
- SDSS Reviews
- CMS Project Management Group (PMG) for Computing and Software
- Somewhat formal “Project” structure with briefings to initiate, get status and closeout
- Demand metrics on performance of systems

Projects in Computing Division



- Strong “project” culture where problem-solving or development of some hardware or software will involve a team of people, likely from more than one department + experiment stakeholders
- <http://computing.fnal.gov/projects>

Computing Division Projects



 Fermi National Accelerator Laboratory

Computing Division

CD Home	Search	Departments	Index	Help Desk	At Work
System Status	Projects	Security	Policy	Organization	CD Internal

Projects by Category

Current	Meetings	Reports	Closeout	Update/Input
Search	By Category	By Leader	By OU	FNAL WBS #s

Accelerator Support

[Accelerator Support](#)
[Booster Monitoring](#)
[Controls](#)
[Emittance Class](#)
[Main Injector](#)
[Recycler BPM](#)
[Tevatron BPM Upgrade](#)
[Vax Migration](#)

Astro

[Astro](#)
[CDMS Computing](#)
[SDSS](#)
[SNAP](#)

BTeV

[BTeV](#)

Building

[Aperture Enhanced Data Center](#)
[Building Automation Aperture](#)
[Make Building Control System More](#)

[Accessible to CD](#)

CDF RUN2

[Calibration Task List](#)
[CDF CAF](#)

Databases

[BLAST](#)
[Databases](#)
[froTier](#)
[MINOS Oracle Integration](#)

Distributed Computing

[iVDGL](#)
[PPDG](#)
[Shahkar](#)
[VO Management](#)

Division Infrastructure

[CD DocDB](#)
[CD Web Upgrade](#)
[Computing Division Exhibit Area](#)
[Data Center Automation](#)
[Maintain Computing Division Exhibit](#)

Area

[Maintain Computing Division Exhibit](#)

Area

[Metrics](#)
[MISCOMP](#)
[Project Accounting](#)
[Project Tracking and Effort Reporting](#)
[Search Upgrade](#)
[Video Room Development](#)

Physics Applications

[Physics Applications](#)

Projects

[Project Definition Reviews](#)

Research and Development

[BTeV DAQ](#)
[Research and Development](#)
[SNAP Electronics R&D](#)

RTES

[RTES](#)

Run II Database

Administration

[CDF Offline Hardware Replacement](#)
[CDF online standby database](#)
[CDF Silicon Upgrade](#)
[D0 Hardware Replacement](#)
[Database Server Implementation and](#)
[Maintenance](#)
[Oracle Advanced Security Option](#)
[Oracle Streams](#)

SAM - Data Management

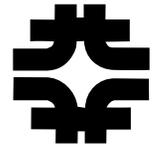
[JIM](#)
[MCRUnJob](#)
[Runin](#)

Metrics on Performance of Systems



- Some of the highest level metrics we look at each week at our operations meeting have been gathered at http://www-csd.fnal.gov/metrics/CD_metrics_digest.htm
- Many detailed performance metrics for services and problems such as Network, Email, Security incidents, Helpdesk tickets, Data movement and storage, SAM data handling and more... (see breakout session)

Self Assessment



- We look at how we are doing, what went wrong and why all the time
- We plan in our budget process and have held 2 budget retreats in the past year
- The formal self-assessment program is but one part of the continuous process.
 - More in breakout session



CD reached 1M hours worked without a lost work time injury – had celebration & trophy

- Discuss each week at Operations meeting
- Discuss at All-hands CD meetings
- Lively and effective Safety Officer
- Strong facility management team
- Keep reminding people and doing walkthroughs
- Employees are alert – e.g. repairs/radiation
- OSHA inspection of all CD areas found just 3 CD violations – 2 corrected same day