Status Report and Plans for the future of CDF Italy computing

What hardware we have

How to use it

What will be next

CDF - Italy meeting
Pisa - 10 May 2002
Stefano Belforte

Summary

- What was bought
- How is used
  - Decide on usage of next chunk
- The new CAF
- Purchase plans at FNAL for 2002
- Review of overall computing plan
  - FNAL → CNAF
  - Sezioni → CNAF
- CNAF:
  - What we can have
  - Decide on who/how to use
- GRID
  - Status
  - Work to do

Introduction

- Time to do physics !
- 8 years ahead of data at knowledge frontier
  - Wise plan: invest some work now
    - ☞ Computers are an extension of the detector
    - ☞ Work hard to build
    - ☞ Relax and use it
- Keep the final goal in mind
  - Balance the work on present (poor) data with need not to endanger future higher quality years
  - Plan for 5-6 years of leisured data analysis

- Didn't we build enough already ?

The Message

- Much has been done
- Much more still has to be done

- Plentyfull computing resources
  - Always a need. Never a reality
- Competition is strong and well organised

- We need few good people : YOU !

- The group has to make clear the need and the reward
  - Support our frontline soldiers

Purchased Hardware
(2000-1-2 = 276MLit vs. 238 assigned by CSN1)

- **650GB** disk on fcdfsgi2 for MISCELLANEA 38ML
  - Symbolic links from /cdf/home/belforte/data
  - Write by Unix groups: cdfuitAd, B, C
- **1440 GB** disk on fcdfsgi2 for DATA SETS 44ML
  - In 2 weeks ?
  - Access as above
- **1440 GB** disk on fcdfsgi2 for common usage 44ML
- **8.8TB** (4 file servers) in CAF stage 1 90ML
  - By end of may ?
  - Access ? Likely by user
- **10 dual processors** (2 x 1.26GHZ) in CAF stage 1 60ML
  - Delivery to FNAL past due
  - Access ? priority queus: ilong, imed, ishort

Comments on computing budget

- All money was spent
- All money was spent on the project
- Additional money was brought on the project from Trieste
  - Tape drives financed but not bought (most)
  - Savings from other projects (little)
  - Remainings from other groups (very little)
- Excellent relationship with INFN referees and CDF offline management

- Projet financial management is working well
  - Total transparency/accountability
  - In spite of somebody's worries
- Too much enthusiasm
  - 40ML must be returned to Trieste group

Disk on fcdfsgi2

GB	Present	Managed	Used	Proposal		When	Note
100	Bottom1	Giagu	96%	SVT	Punzi ?	1.+2w	
122	Bottom2	Giagu	83%	SVT	"	1.+2w	
100	Svt_data1	Punzi	96%	SVT	"	-	
50	Svt_data2	Punzi	88%	SVT	"	-	
50	Svt_data3	Punzi	92%	SVT	"	-	
50	Svt_User	Belforte	97%	Spare/CHA/ISL	Belforte	1.+2w	
122	Top_1	Castro	91%	Spare	Belforte		
50	Spare	Belforte	1%	H→tau mu	Vataga	Now	
800	To install			Bottom	Giagu	1.	Split?
300	To install			Top	Castro	1.	
100	To install			Z→bbar + ….	Castro		
100	To install			Spare	"		Less?
144	To install			Spare	"		Split?

SVT: 200 → 422 Bottom: 222 → 800 Top: 122 → 300

Spare for: minbias, jets, …

Interactive work: a question to you

- Richard Hughes committee: Stefano Giagu for Italy
- The party line (and what most US groups will do):
  - "nothing" at FCC
  - Trailer desk= 4x1.7GHz (=1/3 old-fcdfsgi2) + 600GB
    - ☞ LCD screen 800$
    - ☞ DualAthlon, 2x160GB disk 3500$ (put 2 on each desk)
    - ☞ 8K$/desk = 10KE = 20MLit/user
- We promised (were forced) to do it in Italy (got money also)
  - each group defends his needs
    - ☞ not my problem
  - **Make it a global issue ?**
  - Big numbers require big talks, plans, reports…
    - ☞ What is the status ? What the real need ?
- More on interactive later

The new CAF

- Batch farm for analysis of:
  - 2ndary data sets (skim output)
  - Output of that (3rtiary data sets, ntuple)

- Italian contribution
  - Specification, batch configuration, batch monitor, output retrieval, betatest, money
  - Massimo Casarsa, Stefano Giagu, Igor Sfiligoi, Ombretta Pinazza, Franco Semeria, Antonio Sidoti, Paolo Mazzanti, S.B.

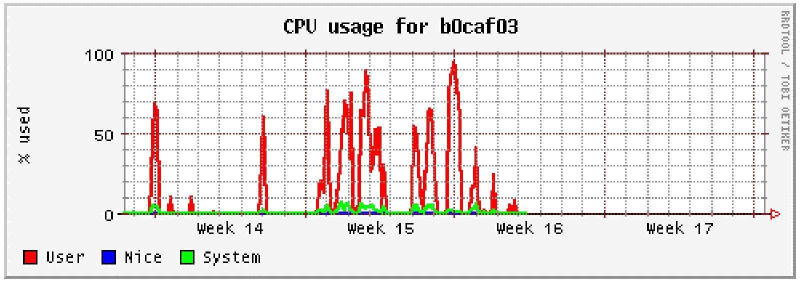
- Works ! Use it !

Interactive work on CAF

- Some/most large Root jobs can run on CAF
- CAF output on scratch/user disk accessible from trailers desktop for interactive Root
- Each user can expect O(10GB) for private use on CAF output nodes
- TB's available on CAF disk servers
- My opinion:
  - Much talk, no clear need
  - Biggest problem will be managing of large disk areas
  - Try to do it in Italy first

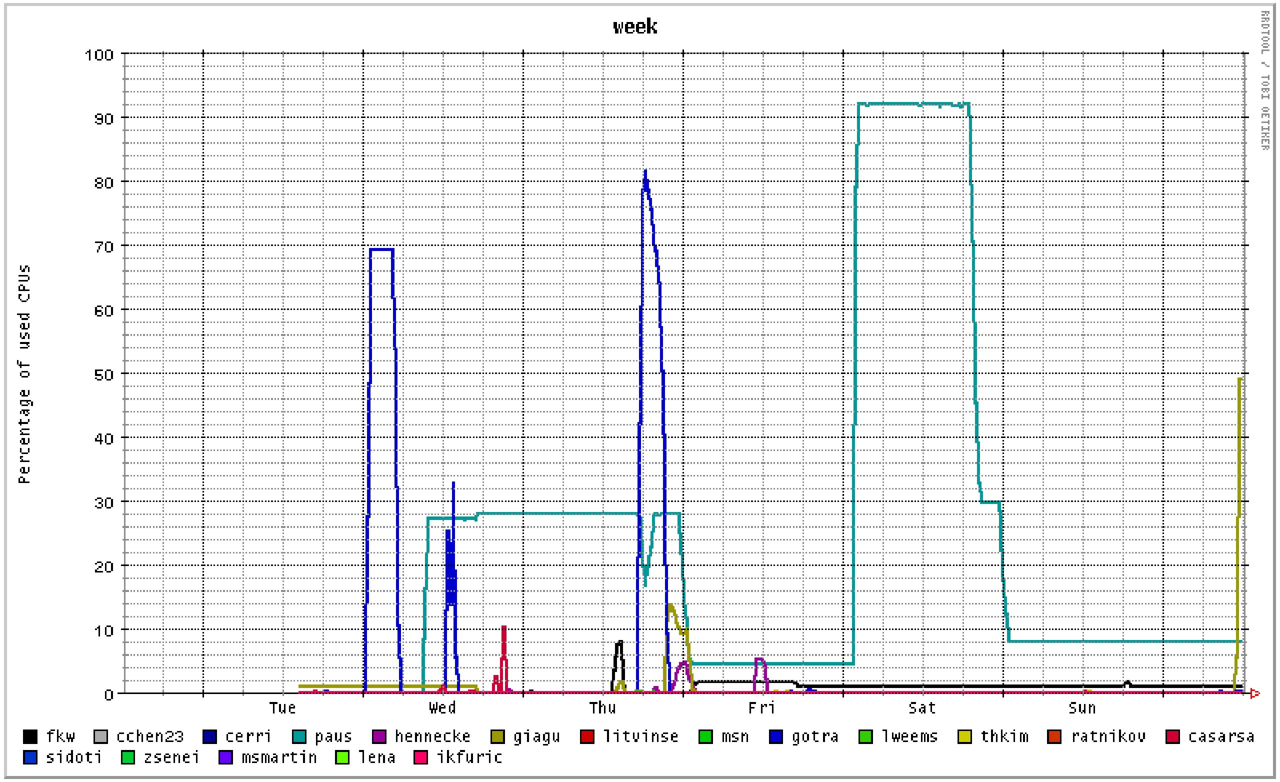
CAF prototype very little used !

- Up and running for more then a month
- 1TB disk: J/PSI and hadronic B data
- 8 dual node available there to whoever asked
- 8 with poor connection to disks used mostly for MC (C.Pauss)



- Other 7 nodes have identical profile
- Average <<50%
- Almost all work by Stefano Giagu (StreamH) and Yuri Gotra (J/Psi) in a few 3-4 few hour shots

CAF Stage 1 not better



- First week with 40 nodes
- Only Pauss is really loading it + spikes of Gotra and Giagu
- There was no hungry user waiting behind the corner

Next Purchase

- CSN1: June 24
- Letter to referees: May 30
- CAF upgrade: grow to 7 "farmlets" 240KEuro
  - +3 file servers → 7 x 2.2 = 15 TB
  - +65 dual nodes → 75 (Belforte's rule: 1 CPU / 100GB)
    - ☞ original rule was 1GHz, 50 x 1.26GHz enouh
  - File servers 11K$ each: 33 K$ = 40KEuro
  - Duals 2500K$ each : 162.5K$ = 200KEuro
- Avaibility 120KEuro s.j., needs 120 more
  - Assigned in Jan: 80KEuro
  - total request 2002 = 320KEuro
  - request September 2001: 300 KEuro
- As much disk+cpu as asked "in the plan" for all Run2a !!
  - 1999 plan was 15TB + ½ fcdfsgi2 (or 3 8-ways = 12 duals)

Following Purchase

- CSN1 September 20
- Could ask advance assignement of 2003 money
- Other O(100) Keuro possible
- What for ?

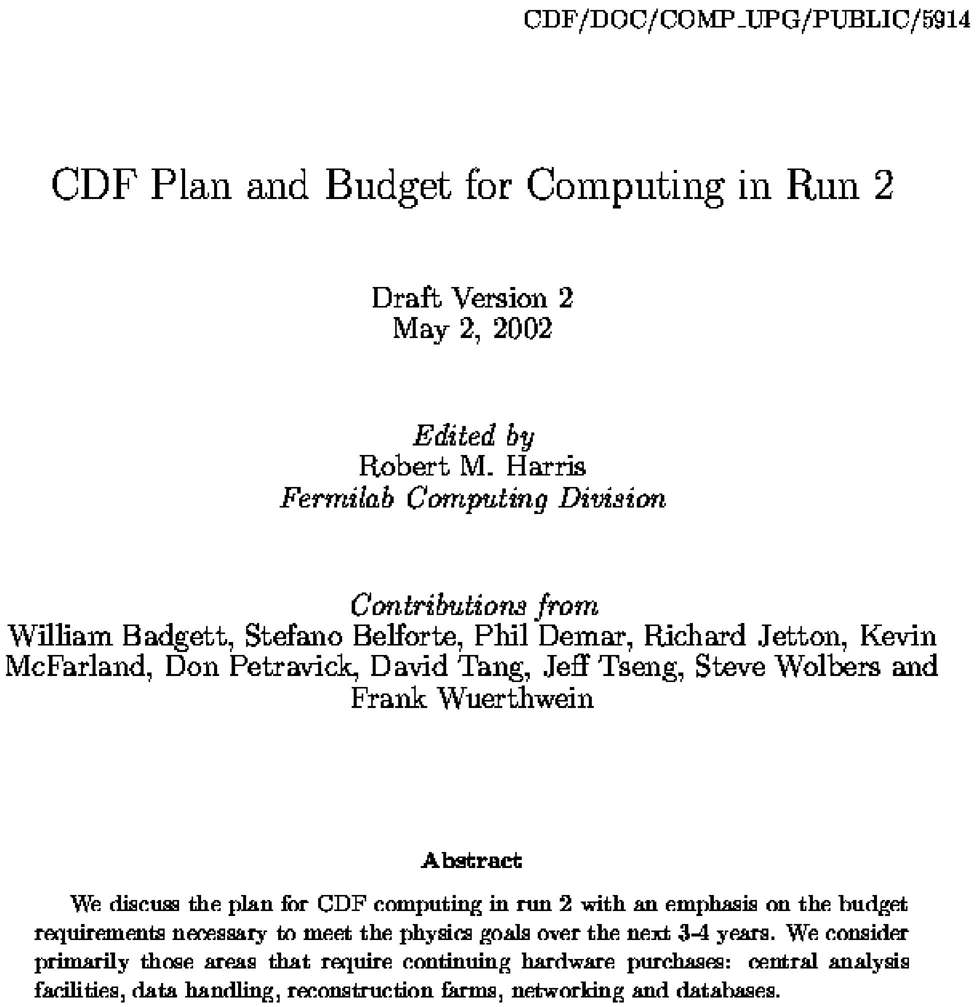
- Need
  - luminosity expectation
  - demonstration that hardware bought in 2002 is not enough to cover all of 2003 needs
  - demonstration that we can really saturate the hardware

- In 2002 INFN will already own 10% of full CAF specification for all of Run2a

Exercise for 2003

- Buy all that is needed till end of Run2a (2004+) 2.5fb-1
  - Cfr. CDF-5914 (our plan now !)
- Assume Moore's scaling: x2 every 1.5 year
  - May mean delaying purchases to end of 2003
- Add 24TB (total 38) = 7 file servers x 3.5 TB each
- Add 50 dual at 2.5GHz/CPU (total 400GHz)
- Total cost: 300KEuro
- That means buying a bit more of 10% of CDF5914 estimate for all of CDF, I.e. satisfying 20 instead of 200 users.
- This is what I want to put in 2003 requestsn
- Possibly want most of this assigned already in 2002
  - Maybe include requests to cover also 2004 needs
- To defend these numbers will need more then words

CDF 5914



CDF/DOC/COMP_UPG/PUBLIC/5914

CDF Plan and Budget for Computing in Run 2

Draft Version 2
May 2, 2002

Edited by
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Abstract

We discuss the plan for CDF computing in run 2 with an emphasis on the budget requirements necessary to meet the physics goals over the next 3-4 years. We consider primarily those areas that require continuing hardware purchases: central analysis facilities, data handling, reconstruction farms, networking and databases.

Round Numbers

- Disco + CPU batch + 10% CPU per “interattivo”

- 2003 = 100 Keuro (1.2 fb-1)
- 2003+2004 = 300 Keuro (2.5 fb-1)
- 2003+2004+2005(1/2) = 500 Keuro (3.3 fb-1)

- Cosa metto nei moduli ?

	Ndual	GHz	tot	integ	**N-fcdfsgi2**	Nfile	TB	tot	**integ**
			GHz	cpu	**equivalent**	srver	each	disk	**TB**
2002-1	10	1.2	24	24	**1.1**	4	2.2	9	**9**
2002-2	65	1.2	156	180	**8.4**	3	2.2	7	**16**
2003/4	55	2.5	275	455	**21.3**	8	3.5	28	**44**
2005-1	45	2.5	225	680	**31.9**	7	3.5	25	**69**

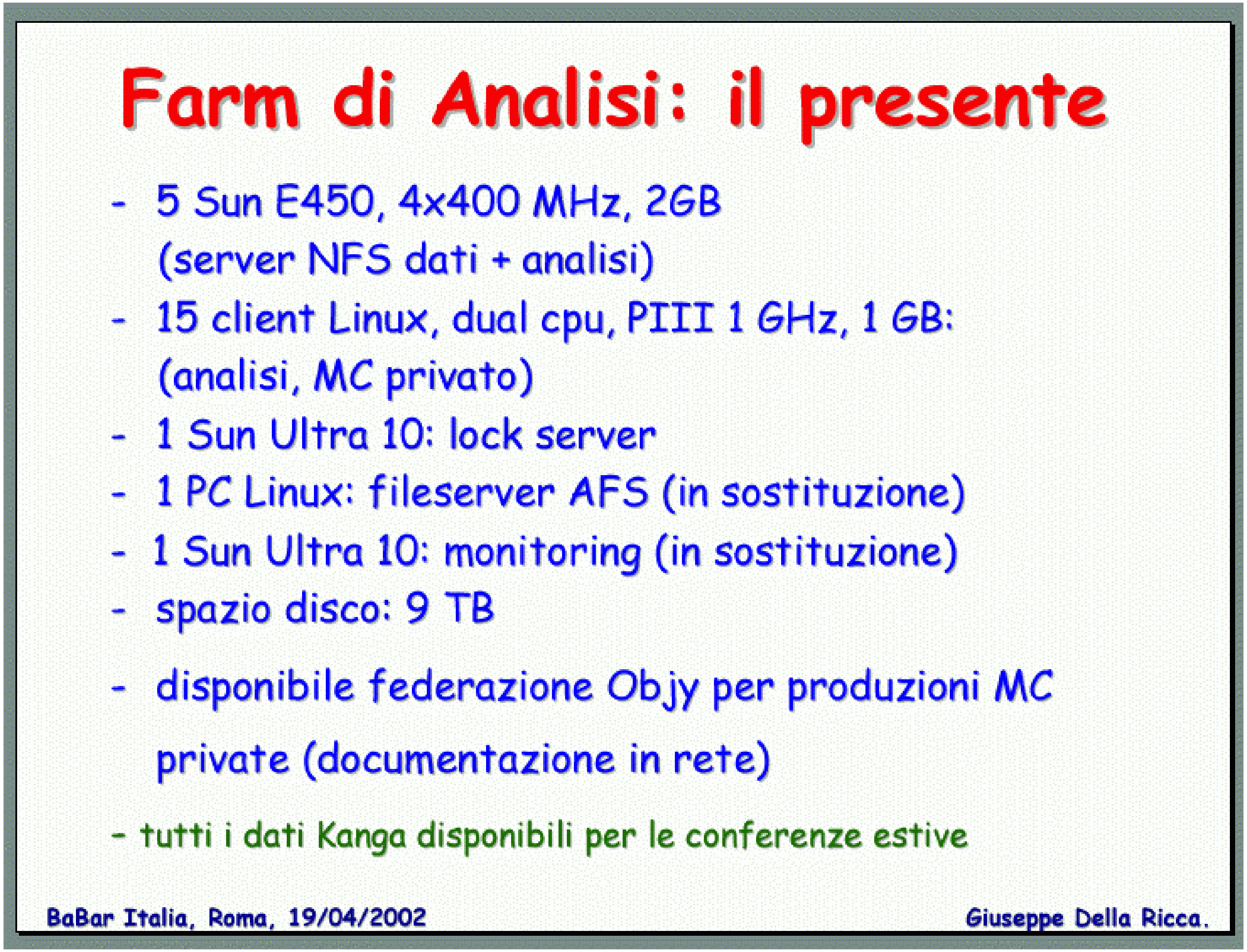
The BIG PROBLEM

- Computing for analysis is a big success
- More then enough hardware already in place
  - Luck: bad news do not come alone
    - hardware troubles : little disk so far
    - Tevatron troubles : little data so far
  - Linux saved us from C++ disaster
- Know what to buy
- System is working
- CSN1 willing to pay
- Need a case !!
  - Usage ! Usage ! ! Usage ! ! !
- Problem is not lack of computers
  is lack of people using them

One Solution

- More coordinated effort
  - Less topics, with more manpower
  - Written plans/reports: Needs, Usage, Goals, milestones
  - Demonstrations/justification of where money goes
- **IF : we build a running machine with**
  - clear direction
  - important goal
  - demonstrable progresses
- **THEN: it will be an unstoppable train**
- Learn from BaBar e.g.
- Not something I can do alone

BaBar's Analysis Farm at Caspur: 30 CPU



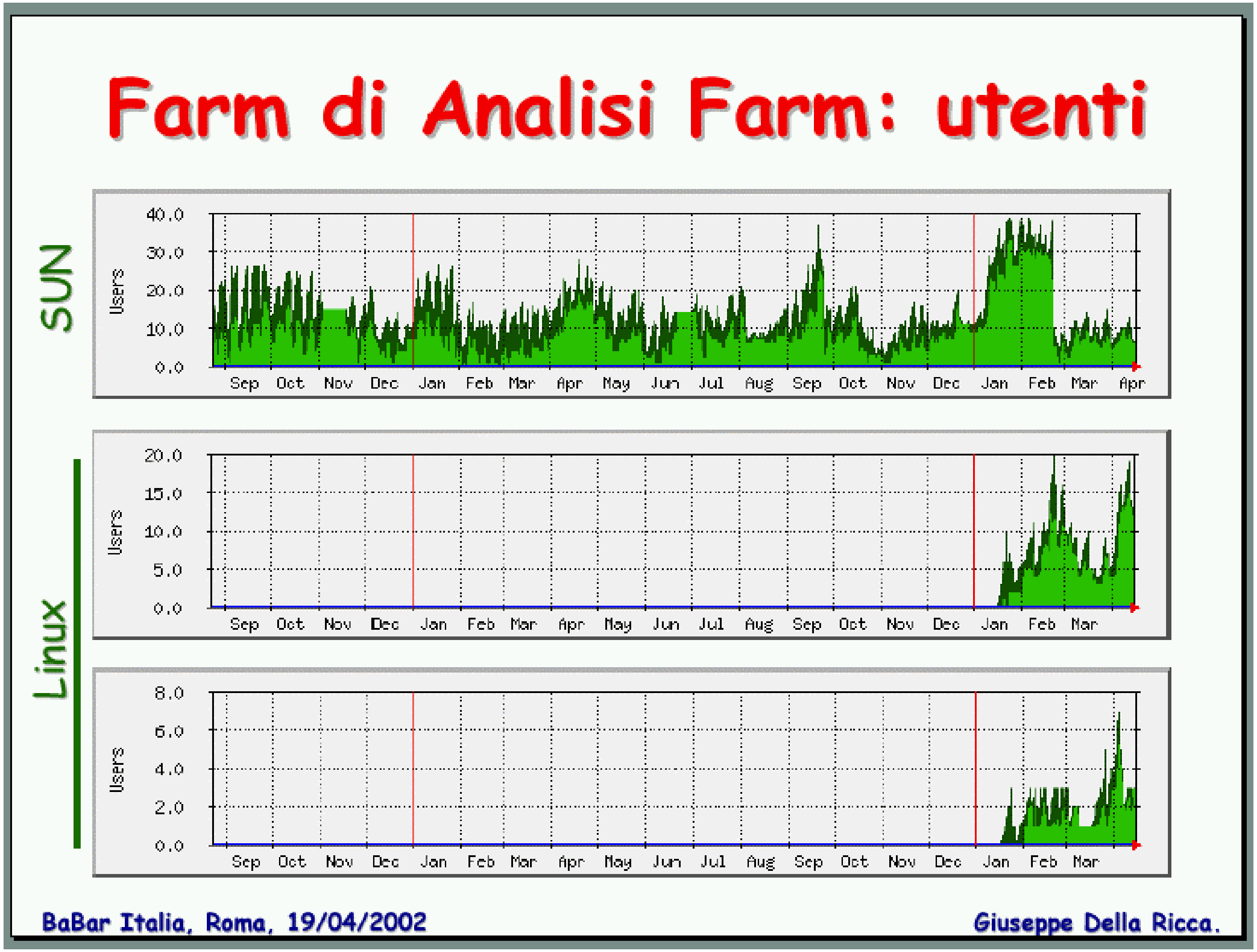
Farm di Analisi: il presente

- 5 Sun E450, 4x400 MHz, 2GB (server NFS dati + analisi)
- 15 client Linux, dual cpu, PIII 1 GHz, 1 GB: (analisi, MC privato)
- 1 Sun Ultra 10: lock server
- 1 PC Linux: fileserver AFS (in sostituzione)
- 1 Sun Ultra 10: monitoring (in sostituzione)
- spazio disco: 9 TB
- disponibile federazione Objy per produzioni MC private (documentazione in rete)
- tutti i dati Kanga disponibili per le conferenze estive

BaBar Italia, Roma, 19/04/2002

Giuseppe Della Ricca.

BaBar's Analysis Farm at Caspur: users

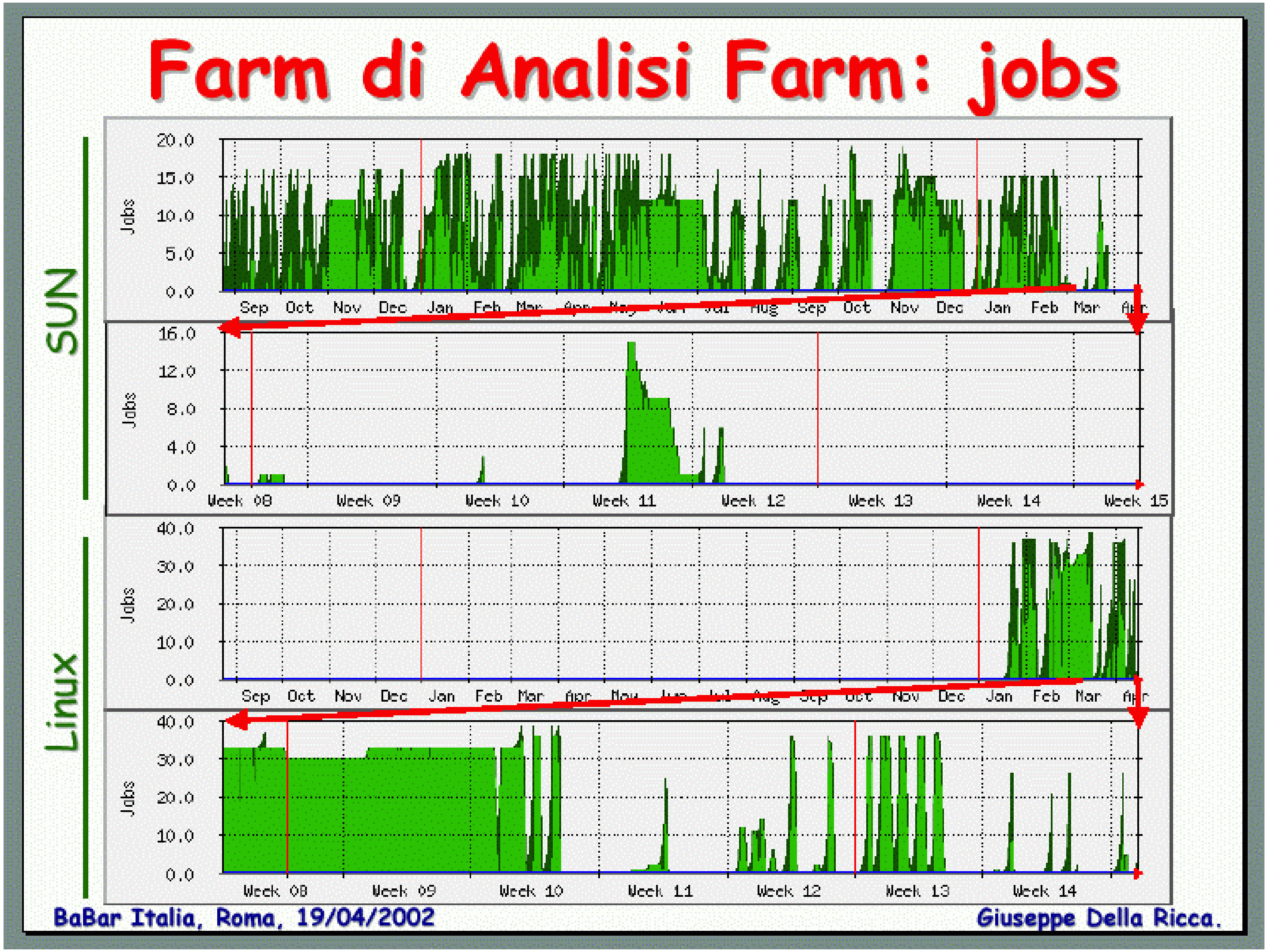


Farm di Analisi Farm: utenti

BaBar Italia, Roma, 19/04/2002

Giuseppe Della Ricca.

BaBar's Analysis Farm at Caspur: jobs



Farm di Analisi Farm: jobs

BaBar Italia, Roma, 19/04/2002

Giuseppe Della Ricca.

Another Solution

- Work on “somebody’s else hardware”:
  - CNAF Regional Center
  - GRID
- There is nothing like “idle machines waiting for us”, but in this case it “might” be easier to get resources
- Will get resources, not money
  - If we do not use them, someone else will
  - Not a bad thing
- Work on this already started and moving fast

“Move” CAF farmlets (our TierB/1) to CNAF

- Regional Center @ CNAF = INFN pet project
  - New computer room ready early 2003
  - Plans for O(1k) nodes, O(100) TB disk, big tape robot
- CSN1, CDF referees, CNAF director
  - happy to see CDF doing there most work
- Plan to build equivalent of 10~20 CAF farmlets:
  - 100~200 duals + 10~20 TB
  - Presente to CNAF group on February 5
  - Presented to Regional Center Committee on May 3
  - Received as reasonable
- Method of financing C.R. still under debate. In any case CSN1 will have to approve the requirements
- For more about CAF and CNAF:

http://www.ts.infn.it/~belforte/offline/caf/index_caf.html

Overall Hardware Needs

- Data Storage (2003 + …)
  - 10TB + 10TB/year for 2ndary/3rtiary
  - 3TB + 1TB/year for interactive
- Analysis CPU
  - 10 “1GHz” CPU / TB of data (from 2001 benchmark)
- Interactive CPU/Disk
  - 2 “up-to-date” CPU / user x 40 users
  - 300GB / user x 40 users (growing with technology)
    - ☞ size this from comparison to resources available to US students at Fermilab (typical University owned PC’s in offices: 5~7K$ per desk every 3 years)
- MonteCarlo CPU (Gen+Sim)
  - ~40 “up-to-date” CPU’s (possible underestimate)

Move interactive work to CNAF

- Reduce to mininum hardware at home
  - Last years: lot of work, little gain
  - No way to share tools/data in sight
- Common area with quotas
  - Common CPU pool
  - Easier to add new users
  - Avoid resource waste
  - Easy share of scripts/kumacs/…
- Proposed in mail to everybody one month ago
  - One enthusiastic yes

Decision time

- We will not ask money for hardware at FNAL beyond 2003
- We will ask ~20 "farmlets" at CNAF
  - Yes or No ?
- We will move interactive work at CNAF
- We will not ask for hardware in Bologna/Padova/Pisa/Roma/LNF/Pavia/Udine/Trieste/… besides simple desktops
  - Yes or No ?
- For the time being these are reversible decisions

The new plan

- 2002-2003: work at FNAL
- 2002: tests at CNAF
- 2003: try serious work at CNAF
- 2004: work symmetrically and efficiently in both places
- If no good → go back to FNAL
- Risks
  - Hardware delay
    - computing room
    - procurement
    - installation
  - Operational instabilities and/or inadequacies
    - long way from a pile of PC's to a smootly running computing centers with happy users
  - Need to define clearly what will make us say the final yes

The road to Bologna

- CDF start as "test" in June 2002
  - 5 dual nodes + 1 TB disk
  - CNAF director's gift, no review, no approval
  - Used by logging in explicitely
  - Access restricted to few users
  - PBS ?
- Share of GRID test machines at CNAF for MC possible
- Plan for resources for next year: May 30 → CSN1: June 24
- More test hardare after september (maybe)
- Need to understand:
  - Access (ssh ? Certificates ? Kerberos ?)
  - Batch (PBS ?? Not trivial problem, see CAF)
  - Performance (CPU ←→ disk, see CAF)
  - DataBase access/replica/export (MSQL?)

The first decision

- Usage of the CDF test setup at CNAF
- Proposal:
  - B-tagged multijet stream
    - top→6j H→4j
    - Bologna/Padova
- Because
  - Antonio has done/is doing a lot of work
  - The data size fits the available disk
  - The number of users (4~5) fits the requirements
  - Is all italian, no pressing need to share data with US collegues
  - Is not as pressing/fireline as Stream H

The second decision

- Want to start stealing idle cycles from GRID/LHC test beds
  - Verbal agreement with L.Perini (Atlas)
  - Some machine at CNAF allocated as "grid test bed" and not assigned to specific experiments
  - LHC work concentrated in short periods (MDCs)
- O(10) CPU for O(days) / month no local permant storage
- Proposal
  - Higgs → tau mu
- Because
  - Elena will test GRID tools
  - Can do by saving only final Ntuple (Elena dixit)
  - Size fits
  - Biggest MC production project in Italy

Long Term Future (beyond 2003-4)

- Computing at CNAF will grow with Luminosity until 2010
- CDF needs will always need to go through CSN1
- Share hardware with UK, Spain, Germany
  - Much, much better network then US
  - Can build large disk resident data sets buy avoiding overlap, x2 is already a log in some case (Stream H)
- Need tools
  - GRID
- Need agreement
  - Boring talks
  - Have to find out how "monetize" it, esp. as contribution to CDF
  - N.B. for BaBar money spent in Italian farm counts as contribution to running cost (MOF)

GRID

- GRIDs are there to stay
- It is mostly a matter of names
- CDF already has developed his own distributed job submission tool: CAF_GUI
  - Is a naïve replica of GRID tool
  - It lacks functionalities and especially design
  - It is much prettier and handier
  - It is tailored to CDF needs
  - It will not work for submission to a place other then Fnal
- Wouldn't it be nice to use the same "script" to launch a job at FNAL or CNAF ?
  - Is not simply "a script", packaging one job to run on a remote node is a full environment that has to be learnt

CDF_GRID

- CDF_GRID launched on March 13 (Italy+UK + others)
- UK active on it since > 1 year with O(10) people
- Our strength
  - Flavia
  - INFN-GRID developers have leading role in EuropeanDataGRID (EDG) and are hungry for customers
  - Good connection with management (Ghiselli, Perini …) build over the years
  - Test bed hardware already there (BO+TS)
- Our weakness
  - Very few people
  - Sluggish enthusiasm: besides Antonio
  - No full time professional
  - Test bed installation already a problem

Work on GRID so far

- CDF is officially part of DataTAG initiative
  - Contact persons: Flavia Donna , Antonio Sidoti
- CDF entity described in DataTAG databases (VO)
- 3 CDF users have got Globus Certificates (GRID passwords), Antonio, Elena Vataga, S.B.
- DataTAG test bed machines being installed at Trieste (3) and Bologna (4)
- DataTAG UI installed at FNAL on Trieste's ncdf29
- Flavia+Stefano with big help from Alex Cerri managed to
  - Run one CDF MC example on the GRID:
    - ☞ submit from FNAL, Torino
    - ☞ executes at CNAF
    - ☞ retrieve otput to Torino, CNAF
    - ☞ same result as running on fcdflnx1

CDF_GRID plan

- Data Handling (copies, replicas, staging…)
  - UK investigating SAM for remote data replica
  - CDF adopting SAM for local DH
  - Flavia + DataTAG + US (iVGDL) to integrate SAM+EDG
  - SAM station will be setup in TS (S.B.)
- Remote job submission
  - Italy will investigate EDG tools
  - Antonio/Elena on it
  - Is wat will really glue toghether European CDFers
- Authentication/Authorisation
  - Globus vs. Kerberos. Igor Sfiligoi interested
  - Distributed/Heirarchical VO: Lamberto Luminari intersted
- Details, status, docs, log of tests, hints and tricks:

http://www.ts.infn.it/~belforte/offline/grid/index_grid.html

GRID works ahead

- Push for the test bed (help?)
- Learn to use it with AFS (sysman problem)
- Learn to use it without AFS = w/o CDF offline
  - Opens the way to "running everywhere"
- Learn to use SAM "standalone"
  - May be main mode of operating CNAF for a while
  - Hardware assigned to it in Trieste
- Experiment with SAM integrated in EDG
  - DataTAG responsibility
  - CDF must provide test and feedback

Conclusion

- Remember the message:
  - This is the most important thing we are doing now
  - Need to turn analysis into a running train
  - Much much more work was done then my e-mails say, visit my web page and explore the links
- HW at FNAL under control
  - Have agreed on some resource assignement and plans
  - New CAF is also our project, make sure delivers promise
- Moving to CNAF : Requires one person to drive the work to
  - explore, comunicate, test, define, report, request
- Integrating in GRID : Require one person to drive the work
  - explore, communicate, test, define, report, request
- Important, visible, usefull, responsibilities
- Group management kindly encouraged to focus on this