

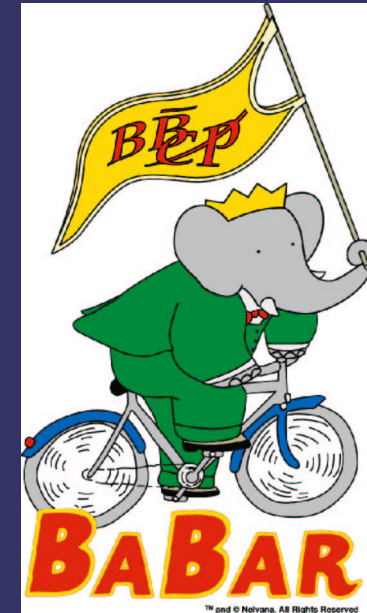
BaBar Computing

Stanford
Linear
Accelerator
Center



Stephen J. Gowdy
SLAC

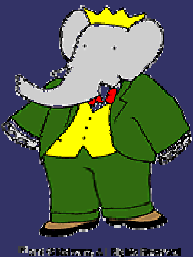
10th April 2003



SLAC Annual Programme Review

Overview

- ⇒ Progress in Past Year
- ⇒ Current Status and Plans
- ⇒ Future Plans

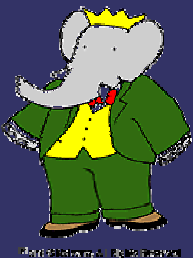
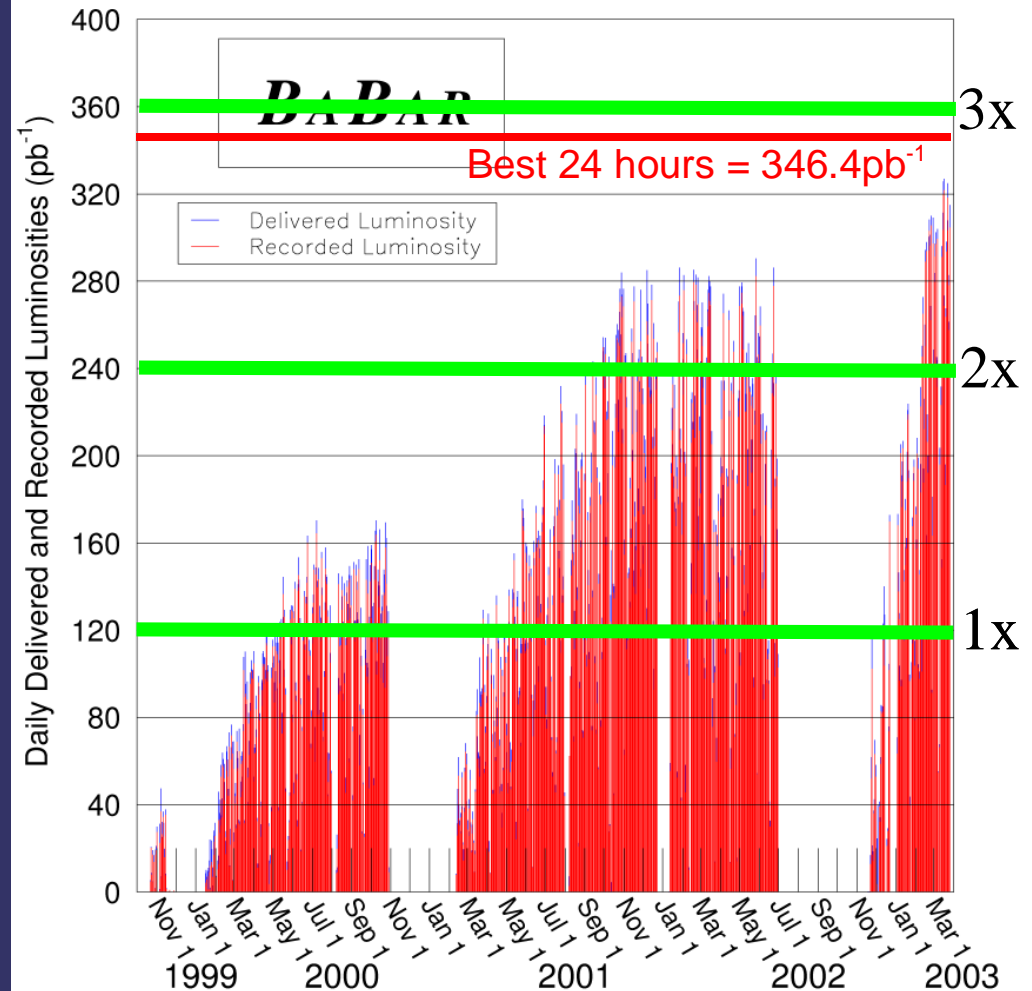


Progress in Past Year

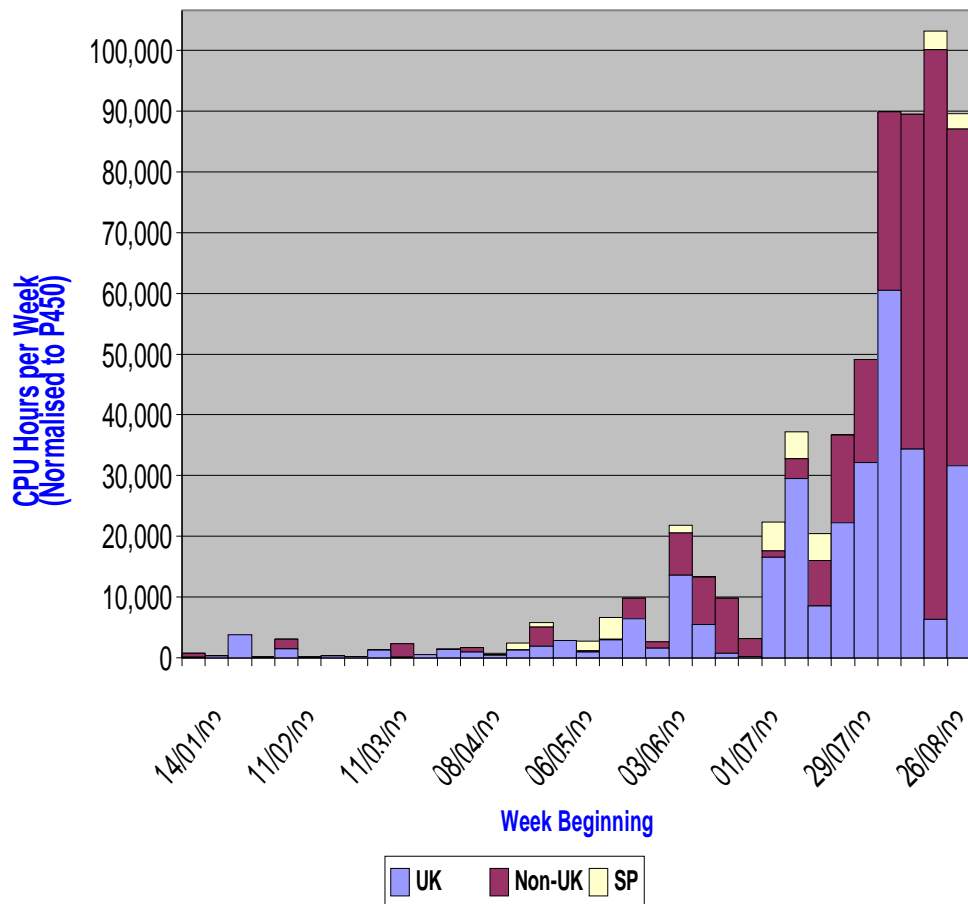
History

2003/03/27 06.48

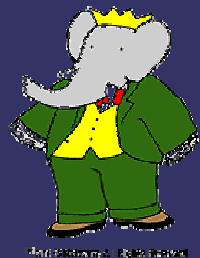
- ➔ BaBar planned on logging 120 pb^{-1} of integrated luminosity per day
- ➔ PEP-II performance enhanced
 - Must take advantage of opportunity
- ➔ Redesign of many areas in computing



Distributed Computing

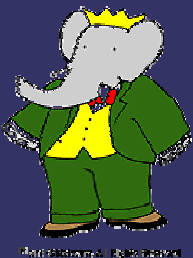


- ➔ Reaction to the need for more computing
- ➔ At end of 2001 had two “Tier-A” sites
 - SLAC: main site for processing and analysis
 - IN2P3: analysis facility
- ➔ Brought RAL Online during 2002 for “Kanga” (more info later) analysis
- ➔ Started commissioning Padova/INFN Tier-A



Prompt Reconstruction (PR)

- ⇒ System tasked with processing real data
 - Needs to keep up with data taking at IR2
- ⇒ Through Run1 and Run2 continuously fought scaling issues
- ⇒ New method implemented during 2002 to remove main bottleneck
 - Calibrations previously performed during reconstruction, now two pass system
 - Preprocess subset of data to provide calibrations before reconstruction
 - A side effect is that this improves the data quality



conditions transfer

Conditions

calibrations only

PromptCalib Farm

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oprserv

readonly conditions

Processing Farm 1

CHS

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readonly conditions

Processing Farm 2

CHS

Datamover

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oprserv

readonly conditions

Processing Farm N

CHS

Datamover

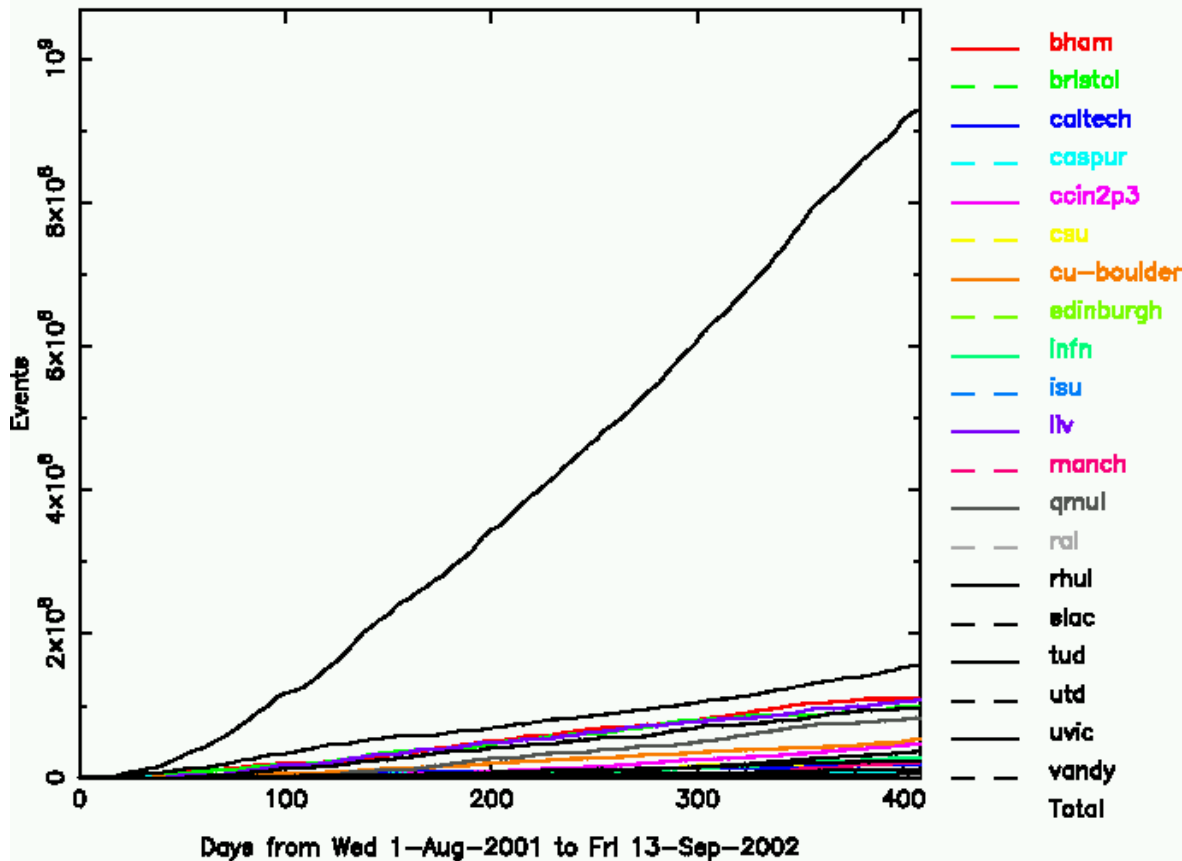
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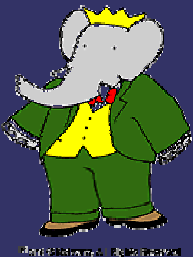
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Simulation Production (SP)

Cumulative Events by Location

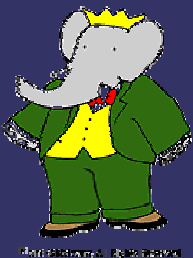


- ➔ Prior to last year produced $0.5\sigma_{\text{hadronic}}$
- ➔ SP4 targeted $1.5\sigma_{\text{hadronic}}$
- Also adjusted
—BB:udsc: τ ratio from 1:3:1 to 2:3:1 in spring 2002
- ➔ Number of sites grew from 7 to 20



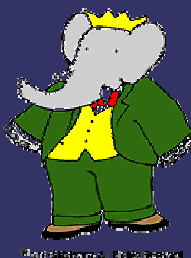
Online System

- ⇒ Initial Online Event Processing (OEP) system consisted of 32 Sun Solaris 333 MHz machines
- ⇒ Dataflow uses 156 300 MHz Motorola SBCs
- ⇒ Last summer upgraded OEP farm to 50 Dell 1650 (dual P-III 1.4 GHz)
 - Overall gain is 5 times in CPU power
 - Required work already done prior year to support Linux (different byte ordering)
 - L1 sustainable rate up from 2 kHz to 5.5 kHz
 - Will allow future enhancement of Level 3 Trigger algorithms, important to reduce backgrounds



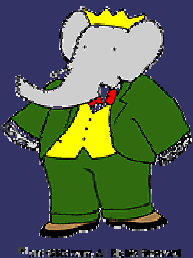
Data Format

- ⇒ Online system writes flat files (XTC)
 - Used as input to PR
 - Average size is 30 kB/ev
- ⇒ During 2002 transitioned from writing RAW & REC formats to new miniDST format
 - RAW/REC size was 250 kB/ev
 - MiniDST now 10 kB/ev
- ⇒ Write to Objectivity/DB from production
 - Later convert only analysis level data to ROOT based store, Kanga (Kind ANd Gentle Analysis)
 - Was created due to early problems with data access



Computing Model Working Group 2

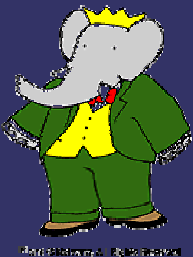
- ⇒ Review of April 2002 recommended updating Computing Model
- ⇒ Formed CMWG2 in July, asked to look in particular at
 - the plans now underway for scaling of the Online and Prompt Reconstruction systems to much higher data rates
 - the long-term data storage strategy for the experiment, taking into account that disruption and manpower costs must be kept to a minimum
 - the anticipation of future analysis methodology and its accommodation within the Model
 - the Monte-Carlo requirements to match the future analysis needs of BaBar, and to recommend a plan and methods for producing them
 - all other aspects of BaBar computing having an impact on the Computing Model, including but not limited to GRID development/deployment, data distribution and code development.



Current Status and Plans

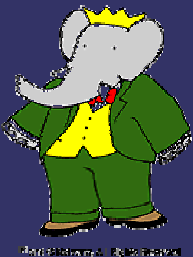
Prompt Reconstruction

- ⇒ Can keep up with data
 - Currently using 1 Prompt Calibration (PC) and 2 Event Reconstruction (ER) farms at SLAC
- ⇒ Reprocessing finishing now
 - Used 2 PC farms and ~3 ER (43 fb^{-1}) farms at SLAC plus 4 ER (50 fb^{-1}) farms in Padova Tier-A
 - Problems with database corruption prevented finishing in March
- ⇒ PC farms use 16 Dual P-IIIs 1.4 GHz
 - Each can process about 600 pb^{-1} per day
- ⇒ ER farms use ~32 Dual P-IIIs 1.4 GHz
 - Each can process about 150 pb^{-1} per day

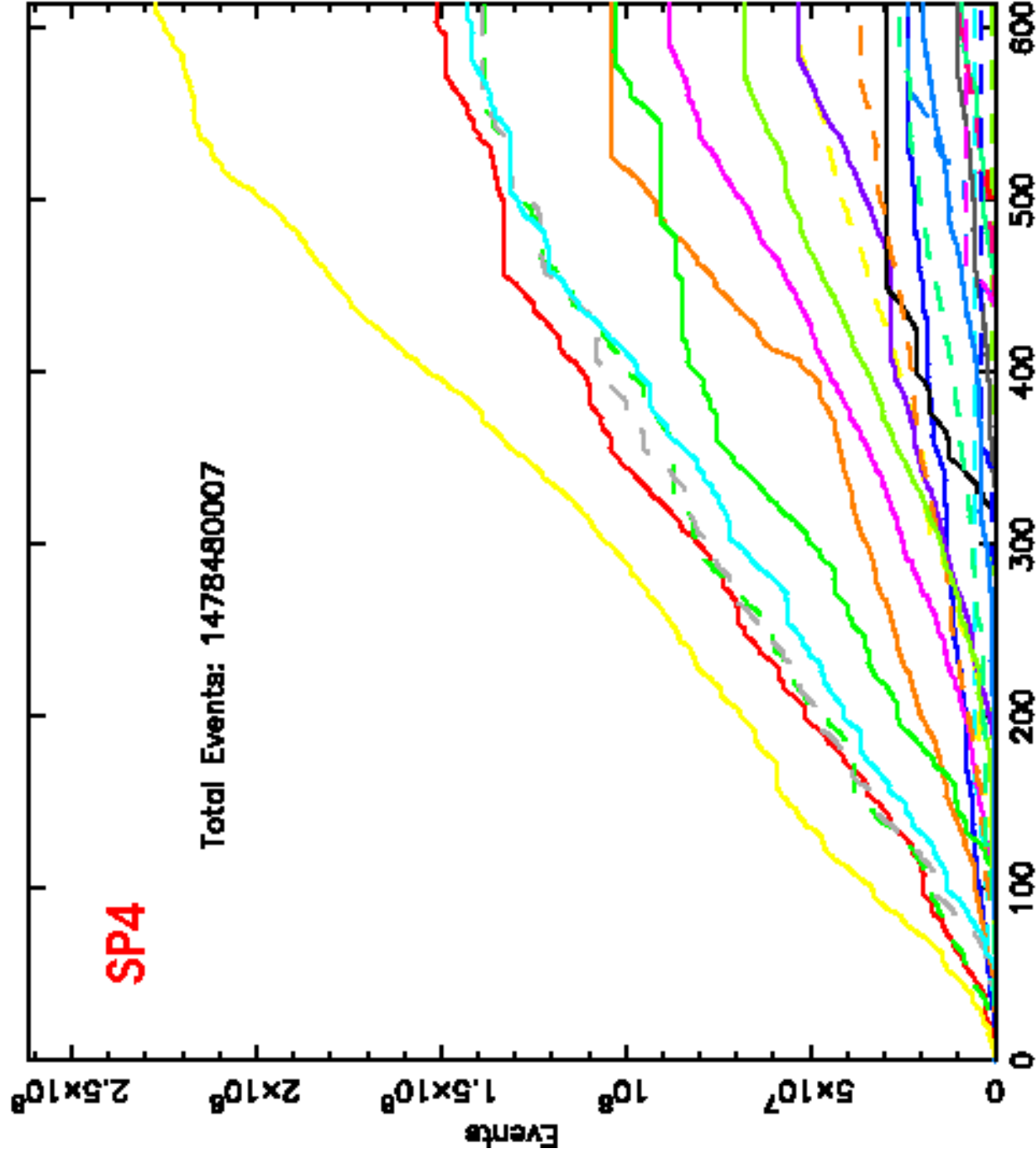


Simulation Production (SP)

- ⇒ Increased goal for SP4 to 3σ
 - Now ramping down, as of 17th March
 - 276 fb⁻¹ (3.4σ) $\overline{B\overline{B}}$
 - 75 fb⁻¹ (0.92σ) continuum
- ⇒ Started SP5 in January
 - This will match new data (re)processing
 - Sites are transitioning from SP4
 - Should do between 1 and 2 times data depending on cut off for summer

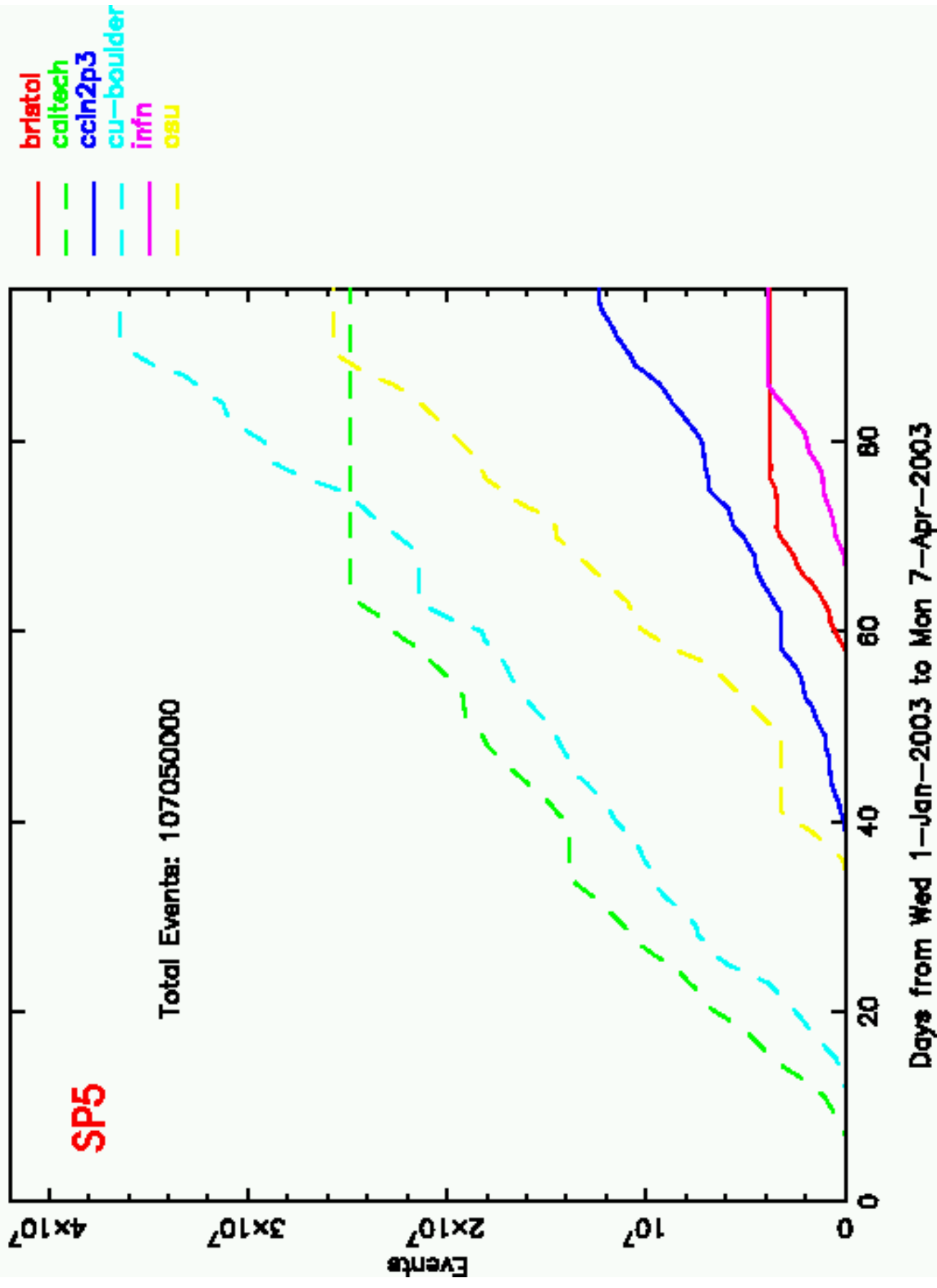


Cumulative Events by Location



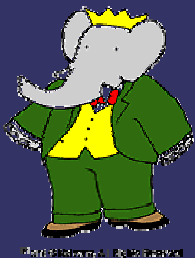
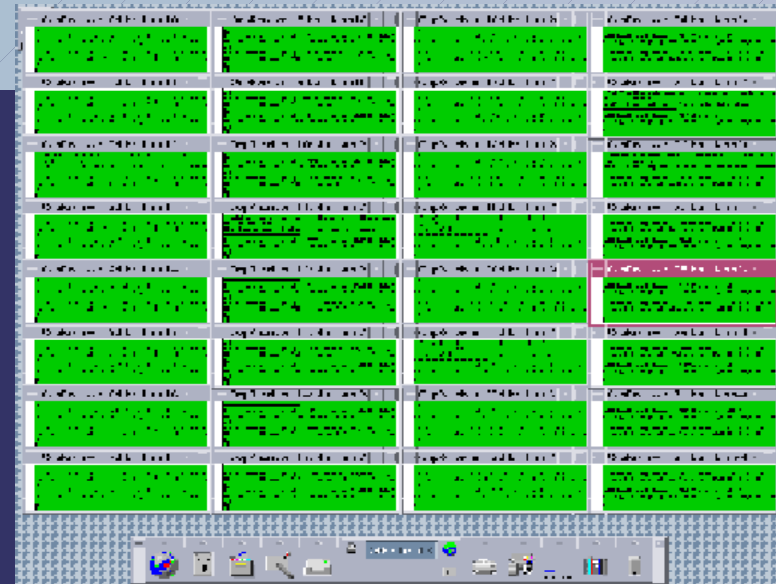
Days from Wed 1-Aug-2001 to Mon 7-Apr-2003

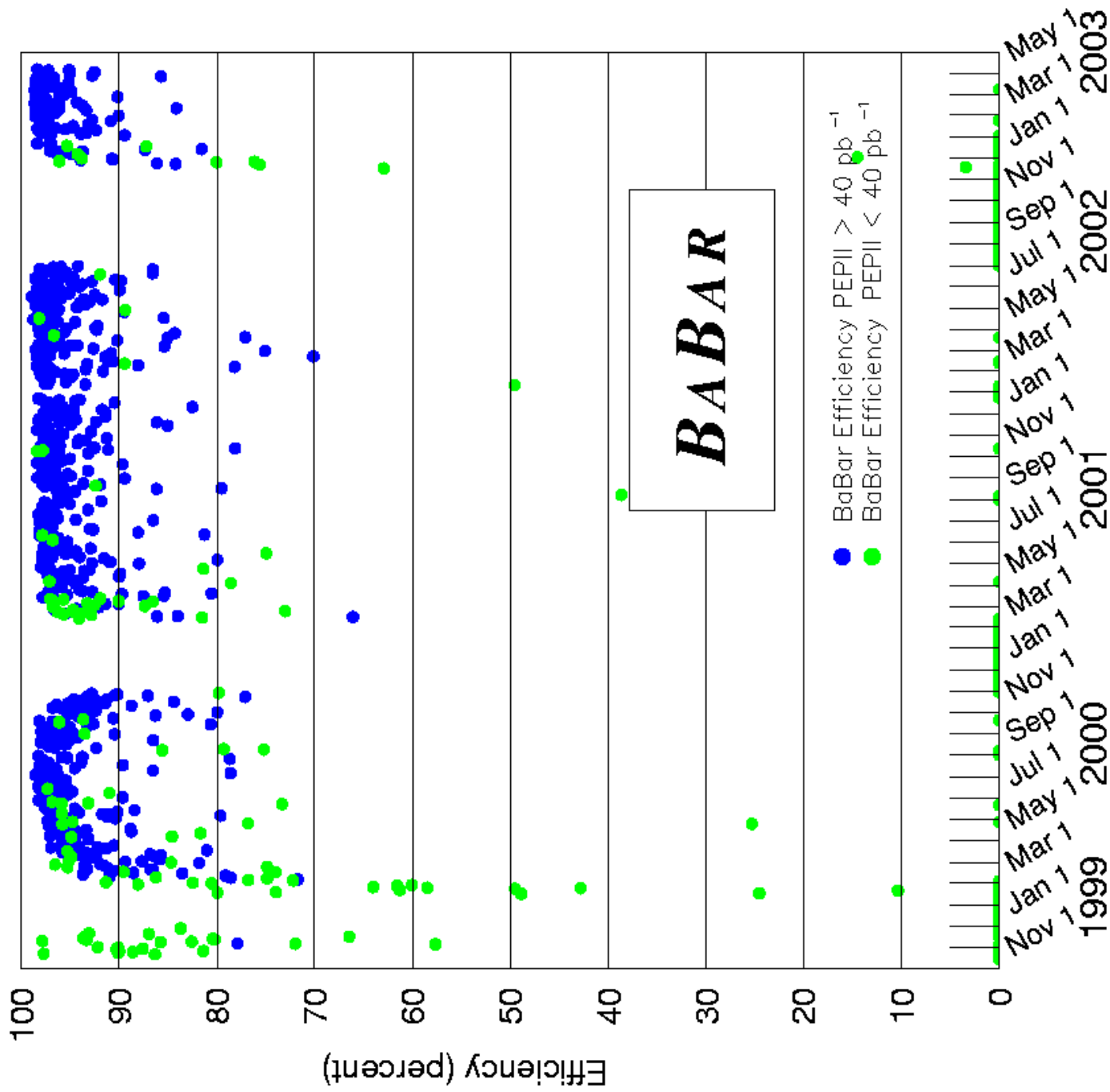
Cumulative Events by Location



Online System

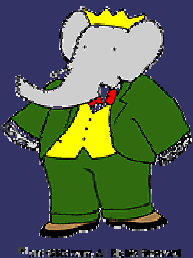
- ➔ Restarted data taking with new OEP farm
- Flawless due to extensive prior testing
- ➔ Many enhancements to run control
 - Automatic end and start of runs
 - OEP Node interface simplified





Computing Model

- ⇒ CMWG2 finalised reports in December
 - Recommended BaBar adopt ROOT Eventstore
 - Coupled with new analysis methodology
 - Recognised as highest priority
- ⇒ Internal Review also in December
 - Welcomed and reinforced recommendations
 - Recommended BaBar should consider complete phaseout of Objectivity
- ⇒ Planning and early developments underway
 - Utilising an Oversight Committee to track progress and problems



Project Lead

P. Elmer

**Anal. Consultant
D. Lange**

**New Micro
D. Brown**

**Bookkeeping
A. Forti**

**Kanga Data Dist
F. Salvatore**

**Skim Production
N. Chevalier**

**Sim. Production
D. Smith/C. Bozzi**

**Prompt Reco
T. Pulliam**

Frequent Meetings

Kicked off by Workshop at RAL on 13th/14th Jan

Oversight

BaBar Management

M. Giorgi
W. Wisniewski
S. Gowdy
R. Bartoldus
L. Lanceri
S. Smith

G. Hamel de Monchenault
A. Roodman
J. Smith

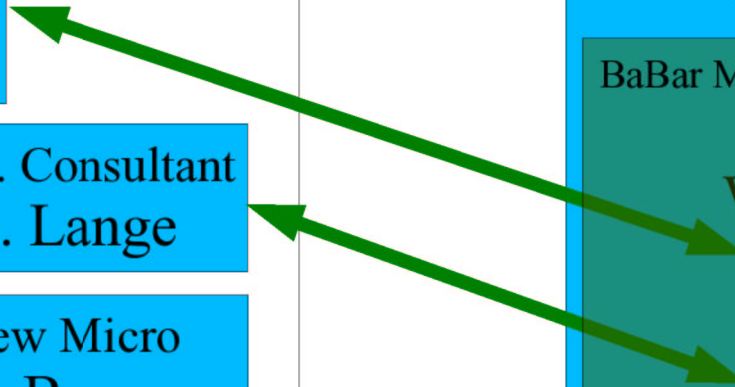
Progress meetings every ~6 weeks

So far:

4th February 2003

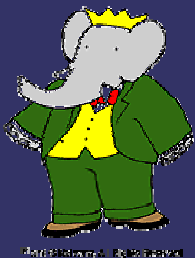
4th March 2003

10th April 2003



Computing Model (Cont.)

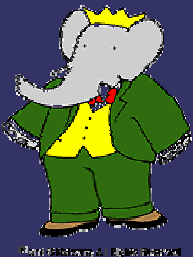
- ⇒ First step with analysis model this month
 - Will produce prototype format to be used by few physics groups as test
 - Start production scale tests during June/July
- ⇒ Data & Monte Carlo Production System tests through summer
 - Overlap with existing work done on Grid development and Objectivity Contingency Planning last year



Future Plans

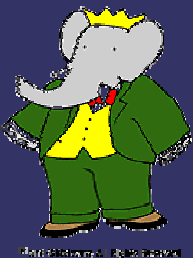
BaBar GRID

- ⇒ Aimed to facilitate transparent access to distributed computing resources
- ⇒ GridKa intended to be exploited using Grid technology by end of year
 - New Tier-A in Karlsruhe, Germany
- ⇒ Developing Simulation Production to work on any Grid site also without special BaBar setup
 - Potential to reduce manpower needed to keep ~25 current SP sites going



Computing Model

- ⇒ Bookkeeping and Job Management
 - New system will be developed to aid user in controlling the very large number of jobs run as part of a typical analysis
 - Helps track status and (optional) merging of output (like histograms)
 - Will use the concept of datasets
 - Defined by Run Quality Manager
 - User should be able to request updated results to follow any changes since initial query
 - Intend to be Grid-aware
 - Actual dependence will be decided nearer deployment
- ⇒ Production systems writing new format
 - Requires complete analysis chain testing



Conclusions

- ⇒ BaBar Computing has met needs of experiment over the first four years
 - Demanded significant upgrades along the way
- ⇒ Plans underway to continue to meet these challenges into the future
- ⇒ In an important transition period with updated Computing Model

