BaBar Computing

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SLAC Annual Programme Review
Overview

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

Best 24 hours = 346.4 pb\(^{-1}\)
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
Simulation Production (SP)

- 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
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-III 1.4 GHz
  - Each can process about 150 pb\(^{-1}\) per day
Increased goal for SP4 to $3\sigma$
- Now ramping down, as of 17th March
  - $276 \text{ fb}^{-1}$ ($3.4\sigma$) $B\bar{B}$
  - $75 \text{ fb}^{-1}$ ($0.92\sigma$) 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
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
Progress meetings every ~6 weeks

So far:
4th February 2003
4th March 2003
10th April 2003
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
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