PHENIX Computing

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PHENIX Computing Coordinator

Points to address

- accomplishments
- status and performance using the RCF
- productivity
- priorities and prospects
- issues

People

Online/DAQ

David Winter

Brian Cole

John Haggerty
(DAQ Coordinator)

Abby Bickley

Ed Desmond

Martin Purschke
(ONCS Head)

Dave Morrison
(Computing Coordinator)

Hyon-Joo Kehayias

Tom Hemmick
(Analysis Coordinator)

Chris Pinkenburg

Irina Sourikova

Dmitri Kotchetkov

Carla Vale
(Production Manager)

Scott O'Hare

Wolf Holtzman

BNL

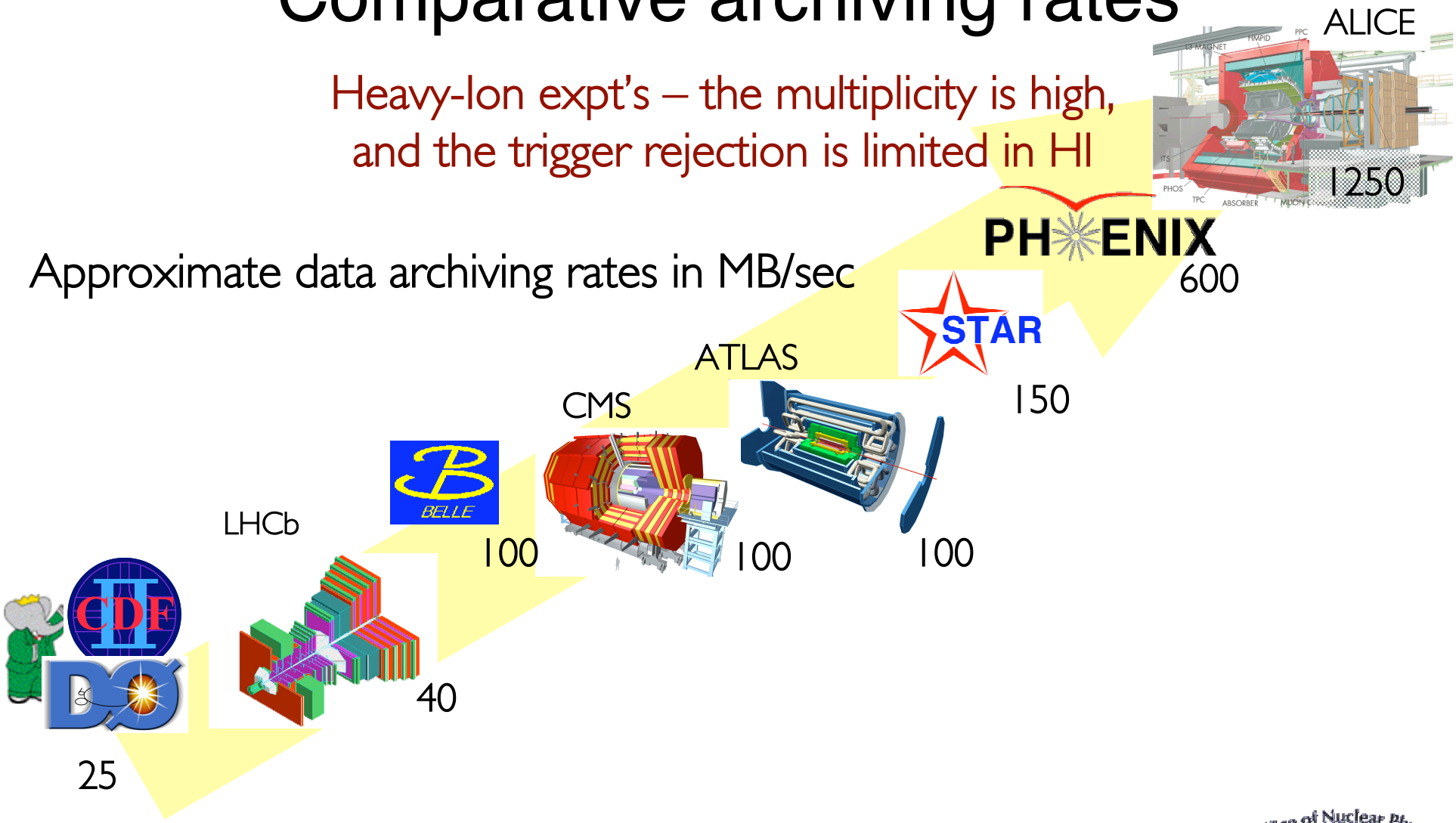
Computing Professionals

Offline

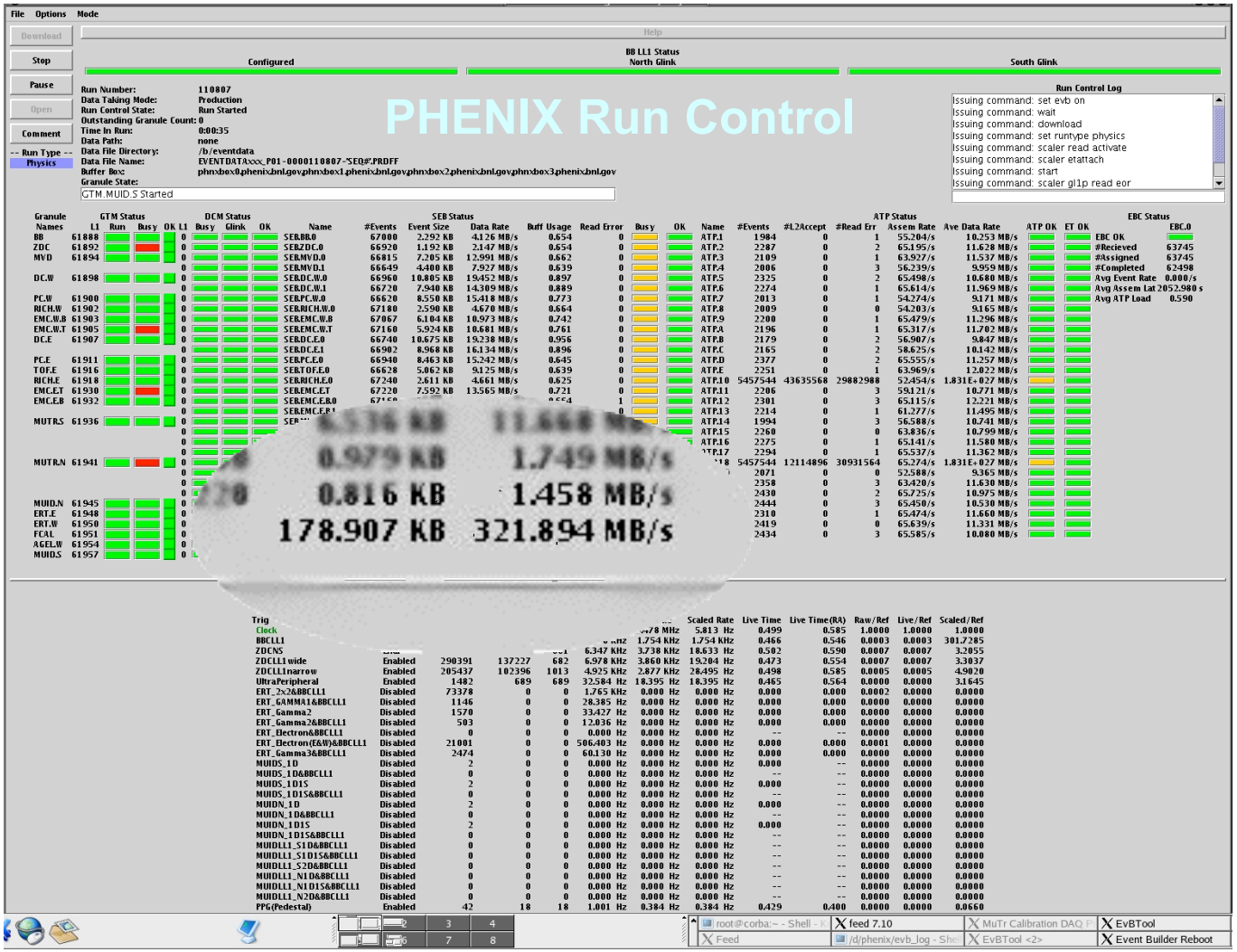
Comparative archiving rates

Heavy-Ion expt's – the multiplicity is high, and the trigger rejection is limited in HI

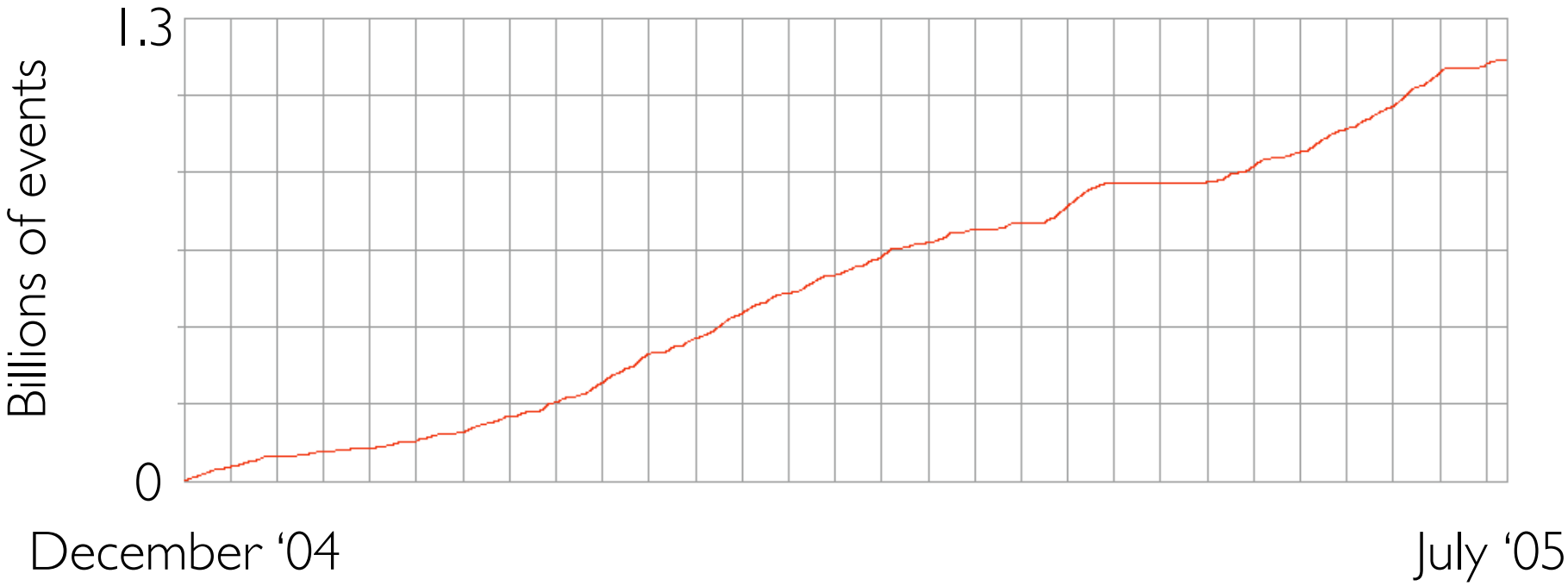
Approximate data archiving rates in MB/sec



PHENIX Run Control



Run–4 200 GeV Au+Au
Central Arm Reconstruction



Many simultaneous activities

Run 4 200 GeV Au+Au
central arm production

Run 4 200 GeV Au+Au
"analysis train"

Simulations in support of analyses

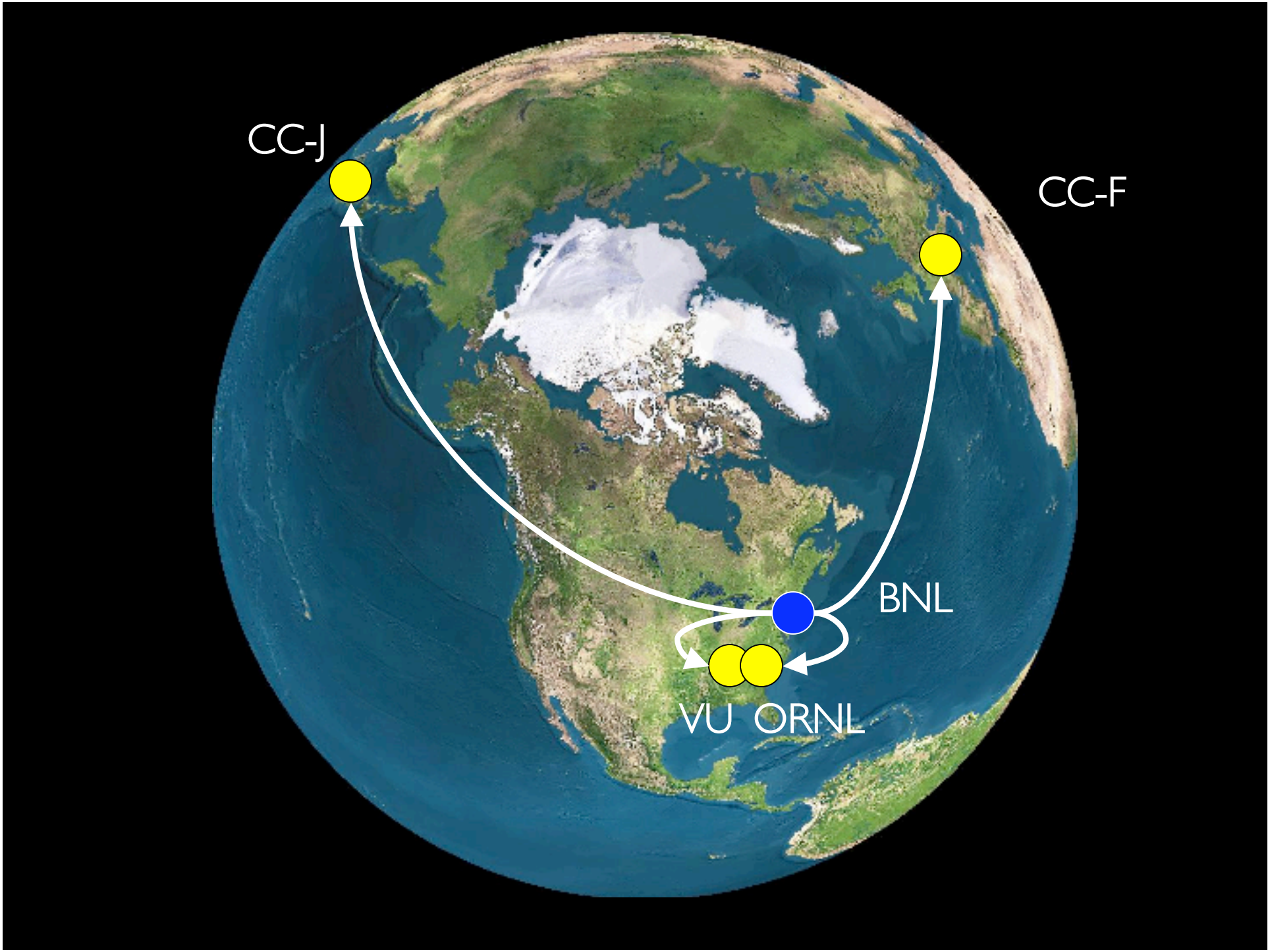
Run 5 200 GeV Cu+Cu
filtered dilepton production

Run 5 200 GeV p+p
data transfer to CC-J

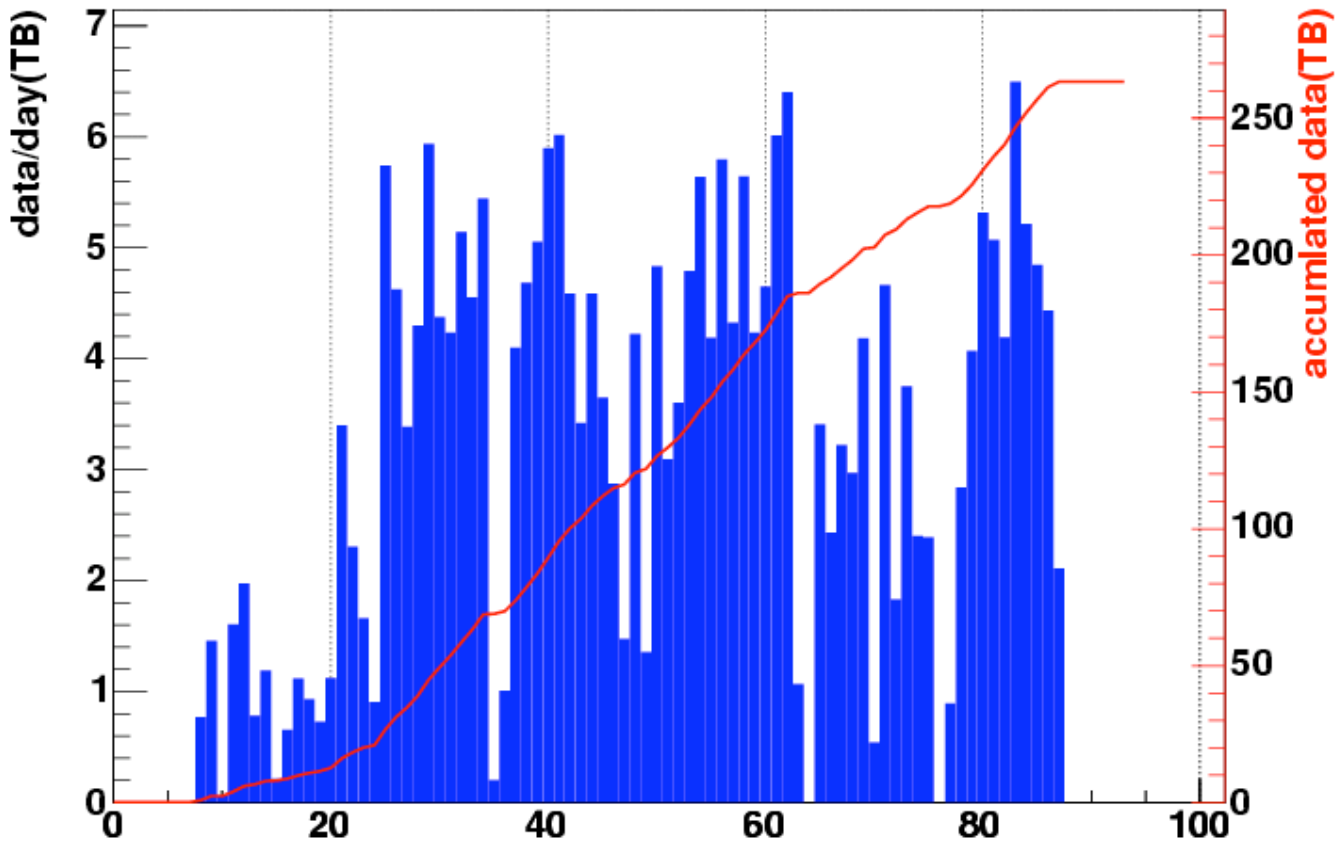
Run 4 200 GeV Au+Au
single muon test production

Run 5 200 GeV Cu+Cu
central arm production

Run 5 62.4 GeV Cu+Cu
filtered dilepton production


CC-J
CC-F
BNL
VU
ORNL

Run-5 p+p data sent to CC-J



sustained ~50 MB/sec with demonstrated throughput ~100 MB/sec done using GridFTP

PHENIX software

- main code base consists of over 8,000 files organized into 200 libraries
- automated nightly build helps us keep code close to working state at all times
- variety of tools have been used to “profile” code to improve performance, and to hunt down and fix memory leaks
- only “tagged” versions of software are used for production

A major change, transparently

- Objectivity proprietary object-oriented database
  - basis for conditions DB
  - technically constraining
  - licensing disputes
- replaced with freely available PostgreSQL relational database
  - no user code changes
  - eased inter-site replication
  - no license fees (~$16k)

Interaction with the RCF

- very good working relationship, very good support
  - long-standing weekly liaison meeting
  - respond quickly to “trouble tickets”
  - quite serious about production facility
- Condor batch system ran 160,000 user jobs during June
- inter-facility networking (e.g., BNL to CC-J)
  - several-fold improvement
- very large farm just “works”
- software development
  - farm software
  - infrastructure for optimized data retrieval

HPSS and data archiving in run-5

- 2 GbE fibers to RCF
- ~9 tape drives × 30 MB/sec
  - still, struggled to get 50 MB/sec at times
- variety of configuration changes and solved problems raised rate
  - new network, new data mover, larger files, “phantom” tape, better monitoring, buffering, throttling
- good interaction with RCF to try and address troubles

Productivity

- one measure might be fraction of CPU cycles consumed
  - perhaps not so flattering to PHENIX
- PHENIX has always had bursty needs
  - e.g., network to CC-J
- this is changing with advent of enormously larger data sets

- another measure might be physics output per person working on “core” computing issues
  - 2.5 FTEs Ops
  - 1 FTE NSF
  - fractions integrated across many people
  - students, post-docs

Decadal plan will keep computing busy

- succession of unique runs
- installation and integration of new detectors

Run	Species	$\sqrt{s_{NN}}$ (GeV)	Phys. wks.	$\int \mathcal{L}dt$ (rec.)	J/ψ N.Arm	π^0 p_T^{max} (GeV/c)	γ p_T^{max} (GeV/c)	γ x_T^{max}
4	Au+Au	200	19	203 μb^{-1}	2700	19.0	14.8	0.15
	p+p	200	5	0.5 pb^{-1}	750	13.5	10.5	0.11
5	Si+Si	200	14	4.7 nb^{-1}	3460	17.3	13.4	0.13
	p+p	200	10	3.8 pb^{-1}	6030	17.3	13.4	0.13
6	Au+Au	62.4	19	45 μb^{-1}	120	10.4	8.1	0.26
	p+p	500	2	2.1 pb^{-1}	9,400	22.4	17.4	0.07
7	p+p	200	22	76 pb^{-1}	122,000	24.9	19.4	0.19
		62.4	5	2.7 pb^{-1}	880	11.0	8.6	0.27
8	Au+Au	200	19	1503μb^{-1}	20,000	24.1	18.7	0.18
9	p+p	500	29	377pb^{-1}	1.7M	41.9	32.7	0.13
10	d+Au	62.4	29	2.3nb^{-1}	182	9.6	7.5	0.24
aa	p+p	62.4	29	15.7 pb^{-1}		13.3	10.4	0.33
bb	p+Au	200	29	100/A pb^{-1}		25.7	20.0	0.20
cc	p+Si	200	29	100/A pb^{-1}		25.7	20.0	0.20
dd	p+Au 250 100	316	29					low

Priorities

- effective archiving of physics data
  - read: HPSS
- steady and timely production process
  - very long compared to expected tenure of typical post-doc production manager
- better management and allocation of resources in support of analysis
  - dCache, GRID
- software integration of upgrade detectors

Prospects

- don't expect great increases in data volume per run over run-5
- very impressive contributions to production effort coming from off-site
  - has always been true for simulation
  - increasingly so for real data
- more accessible computing resources
  - reco/analysis farm, CH farm, off-site
- very lean manpower prospects

Issues and Concerns

- HPSS performance
  - tough situation during run-5
  - new version, new silo, new drives for run-6
- long, complex production handled by "volunteer" labor
- intra- and inter-facility resource management