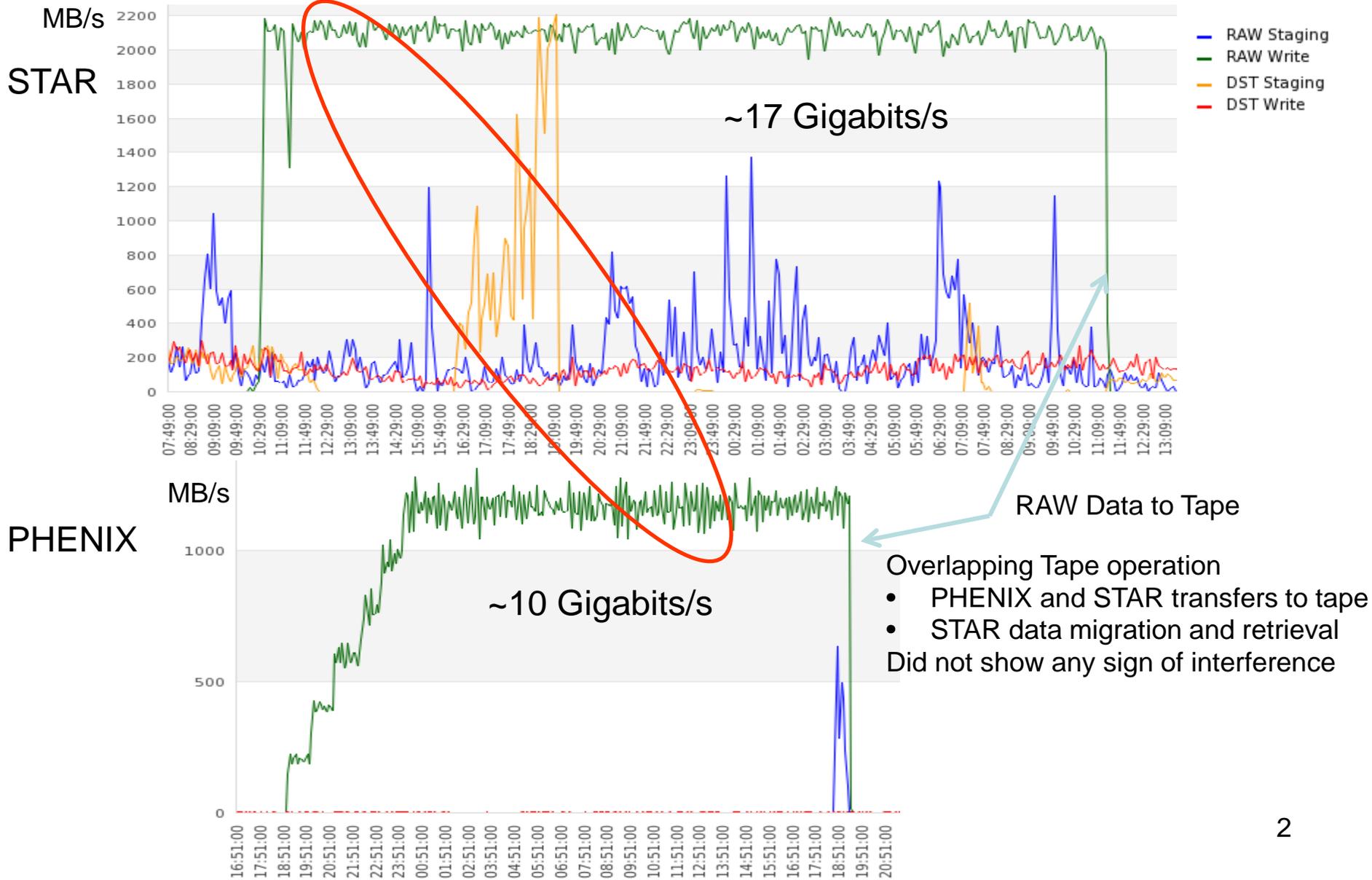


RHIC Computing Facility Status

- PHENIX and STAR Counting Houses are connected to RCF at a Network Bandwidth of 20 Gbits/sec each
 - Redundant (Bandwidth-wise and using path diversity)
- In preparation of the upcoming RHIC Run PHENIX, STAR and RCF have conducted a Mock Data Challenge Dec 29-30
 - Goal is to assess the performance and reliability of the entire chain
 - From DAQ to Data on Tape
 - Incl. Experiment Transfer Nodes, Network, RCF Storage Infrastructure
 - Random data was transferred from the STAR and PHENIX Counting Houses to the High Performance Storage System (HPSS) at RCF.
 - Using the same components as will be used during the Run
 - Significant H/W upgrade to HPSS Movers and Disk Cache in Sep - Dec
 - Have demonstrated Experiments can push >2 GBytes/s each from Counting Houses (CH) to RCF archival storage system
 - Observed up to 3.7 GBytes/s from the CHs to the RCF Storage System
 - Staging data FROM Tape while writing TO Tape
 - Overlapping writing to/reading from tape essential for PHENIX & STAR

Mock Data Challenge (MDC)



STAR and PHENIX Beam Use

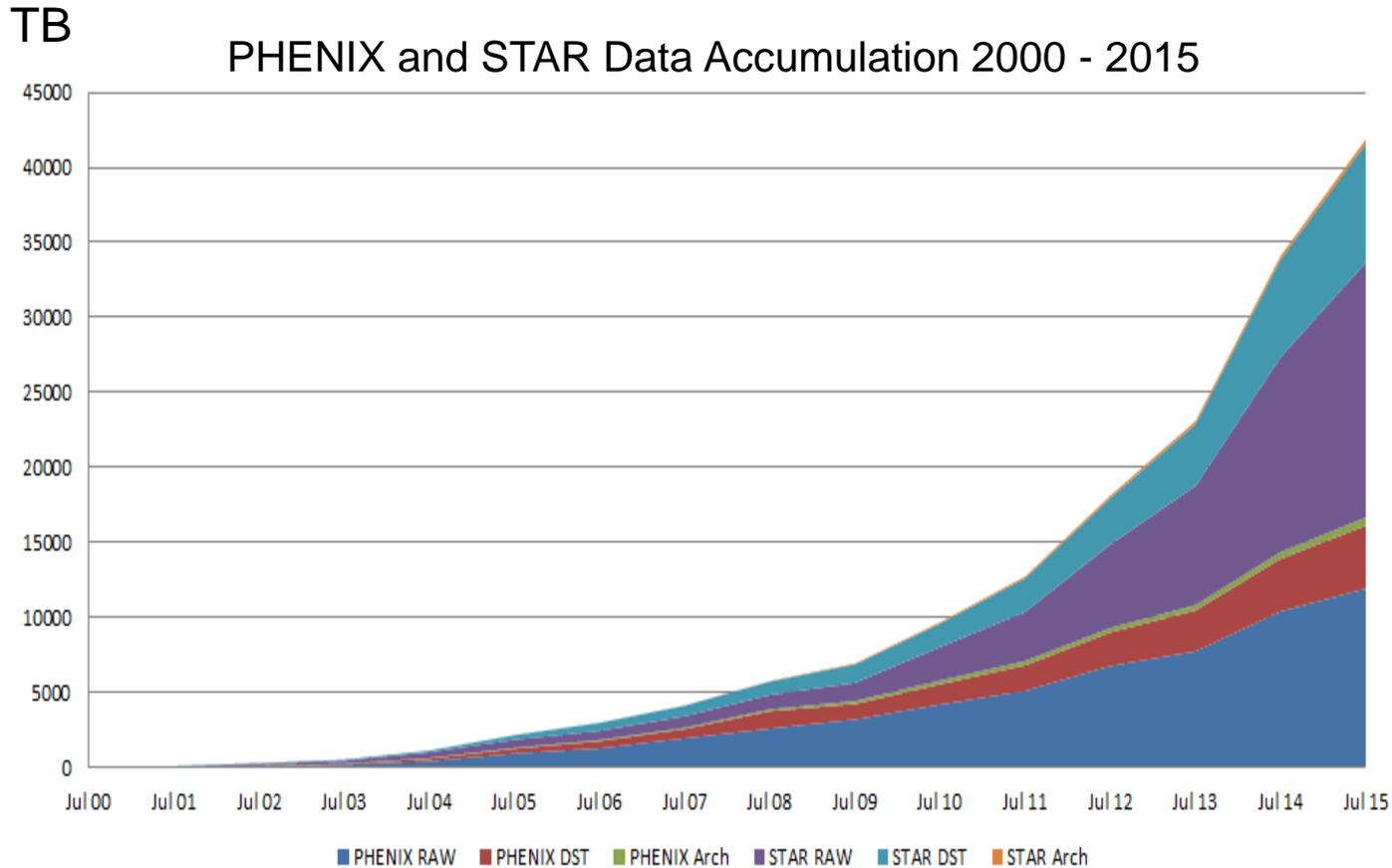
STAR

RHIC run Year	Species	Initial Number of events from the 2013 computing plan (B=Billion, M=Million)	Actual number of events or revised planning since the ESnet report
2014	Au+Au 200 GeV Au+Au 15 GeV	2 B (minbias, central) + ~ 0.78 B misc 20 M 3 PB	6.6 B events total 6 PB
2015	p+p 200 GeV p+Au 200 GeV	2.2 B (2 B minbias + trigger mix) 600 M 3 PB	~ 5 B events planned and in discussion 4 PB
2016	Au+Au 200 GeV	4.2 B (4 B minbias, ...) – large sample 6 PB	~ 6.6 B envisioned, matching the 2014 data sample in size 9 PB

PHENIX

Run	System	Energy	duration	size [TB]
Run 16	pp	62 GeV	6.5 weeks	200
Run 16	AuAu	62 GeV	9 weeks	900
Run 16	pp	510 GeV	1 week	100
<i>Run 16</i>	<i>AuAu</i>	<i>200 GeV</i>	<i>10 weeks</i>	<i>4500</i>

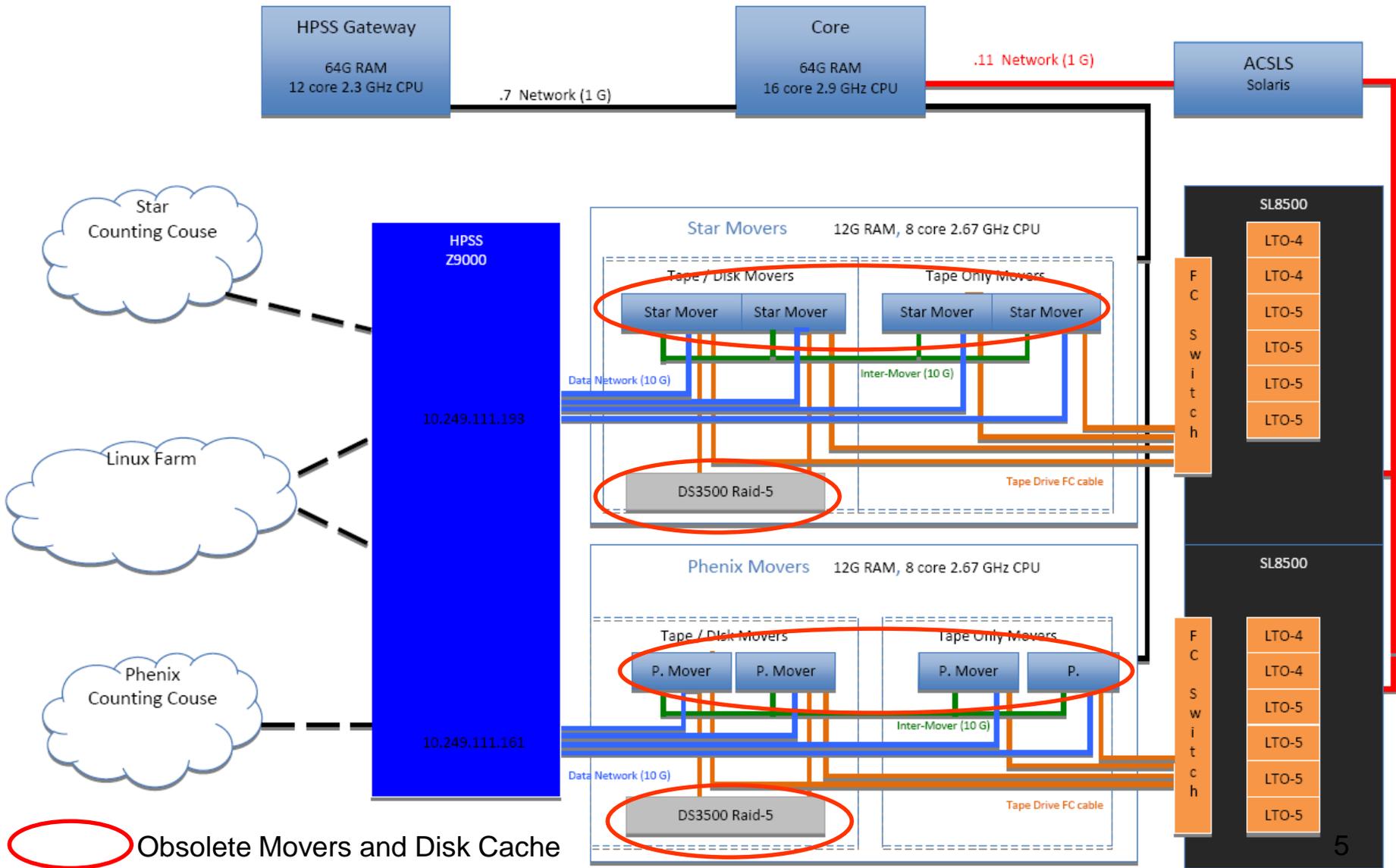
Archival Data Volume



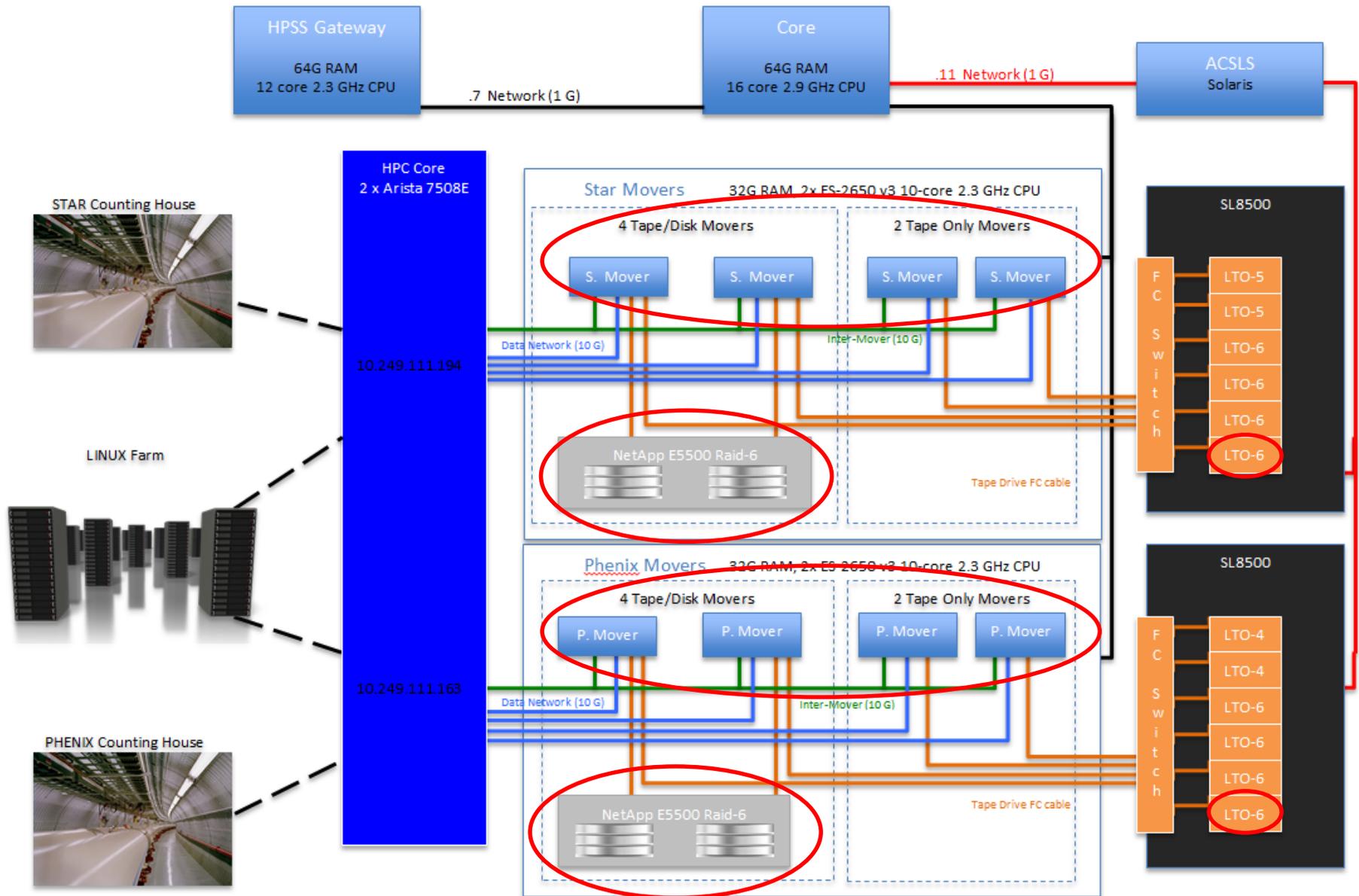
Data volume collected in Run10-Run15 increased progressively

- 2/3 or ~32 PB were created and archived in 6 years (2010-2015)
- Entire archived volume is “active” data – Analyses today going back to data from early Runs

HPSS Mass Storage System Overview in Run15



HPSS Mass Storage Overview (Run16)

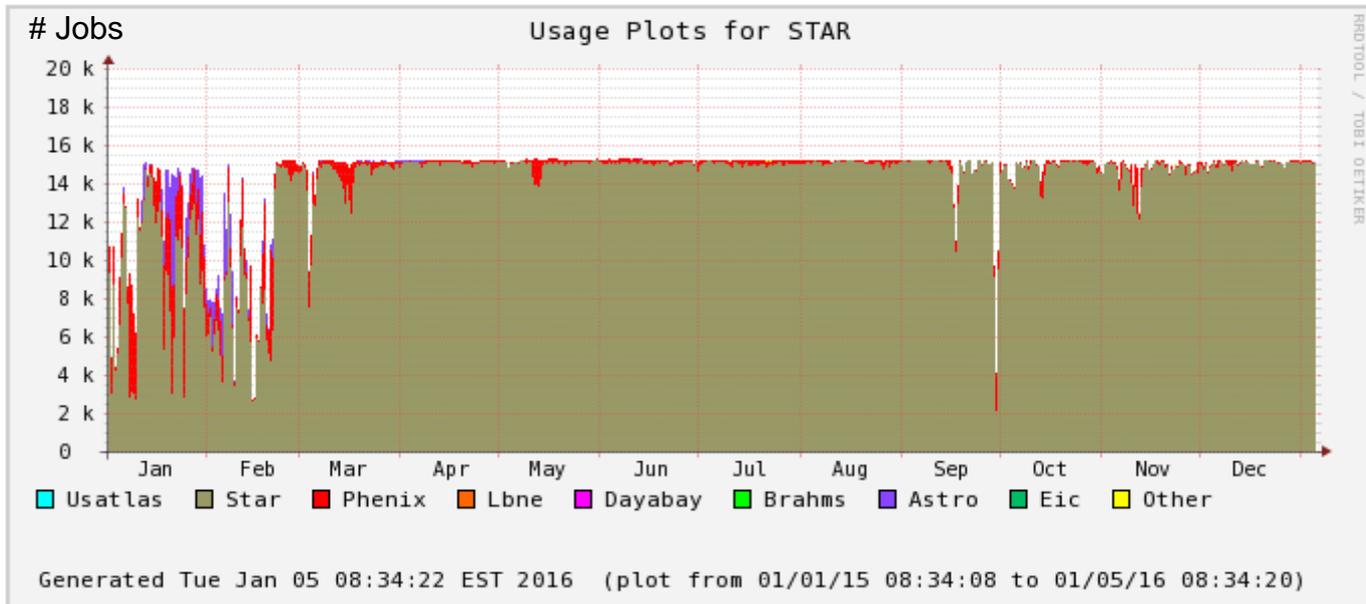
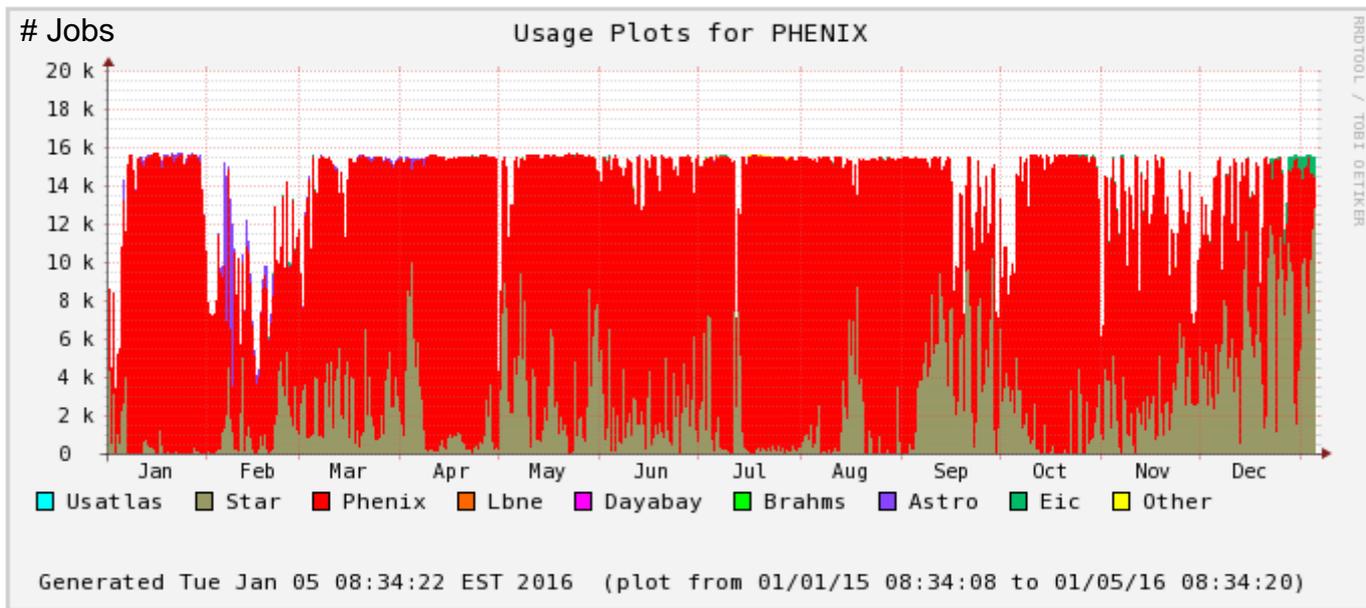


Archival System Resources and Performance

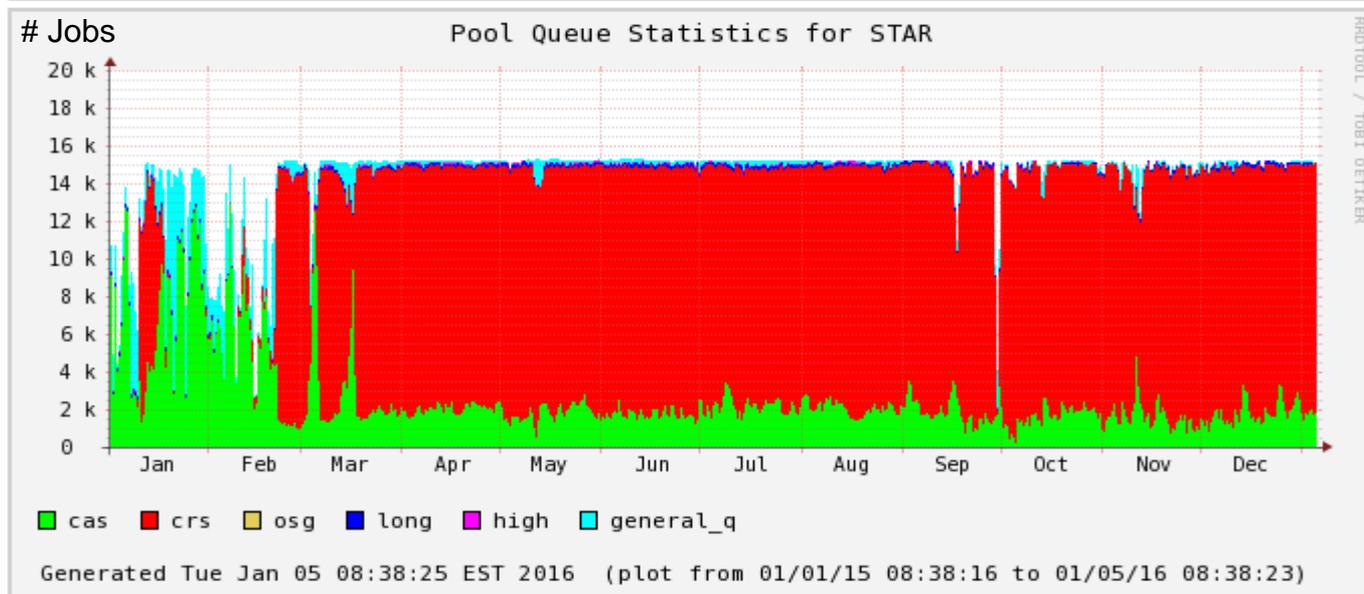
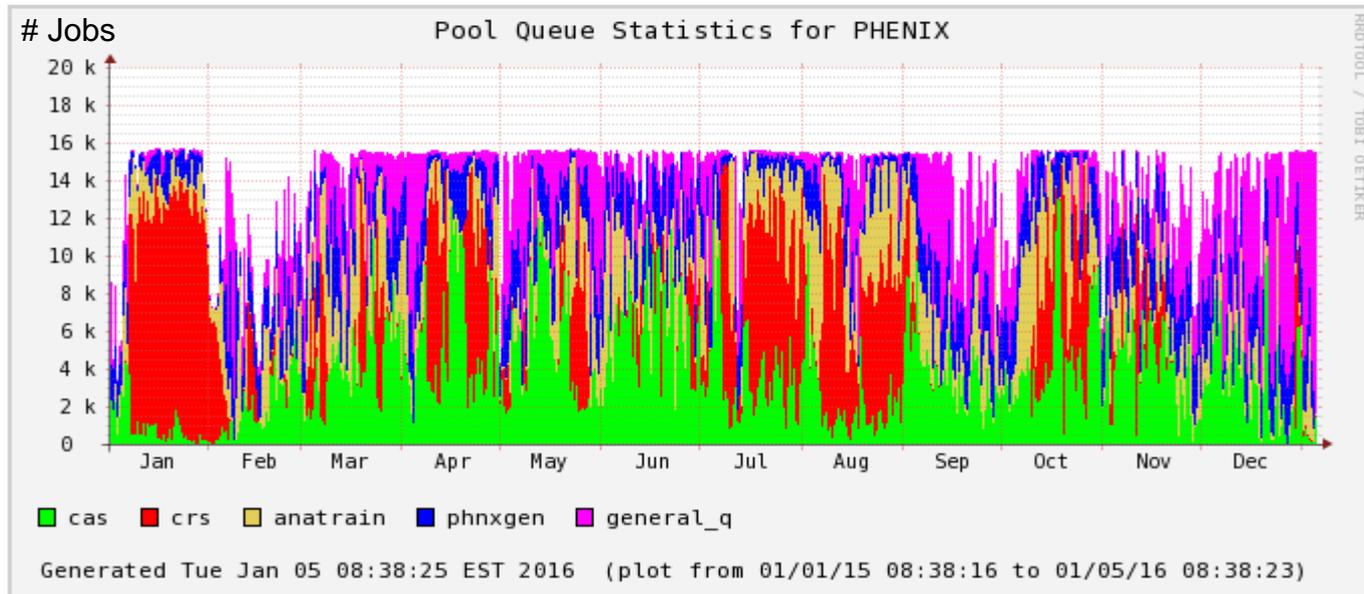
Experiment		
PHENIX		
	Number of Tape Drives	15
	Max B/W per Tape Drive [MB/s]	140
	HPSS Cache Size [TB]	272
	Cache B/W [GB/s]	5
	Aggregate B/W to Tape [MB/s]	2100
	B/W to Tape req. in Run16 [MB/s](avg.)	740
	Aggregate B/W from Tape [MB/s]	1850
	B/W from Tape during Run16 [MB/s]	1500
STAR		
	Number of Tape Drives	15
	Max B/W per Tape Drive [MB/s]	140
	HPSS Cache Size [TB]	272
	Cache B/W [GB/s]	5
	Aggregate B/W to Tape [MB/s]	2100
	B/W to Tape in Run16 [MB/s] (avg.)	1490
	Aggregate B/W to Tape [MB/s]	1850
	B/W from Tape during Run16 [MB/s]	1500
	Available Archive Capacity [TB] as of Dec 31, 2015	26068

- More space will become available as media migration from LTO4/5 to LTO6 progresses

PHENIX and STAR Processor Farm Utilization in 2015



PHENIX and STAR Processor Farm Utilization in 2015



Conclusion

- RCF is prepared for data taking at PHENIX and STAR at the required level of performance and storage capacity
- The RCF architecture and performance allows to support overlapping Data Taking, Production and Analysis in a sustainable manner