

# Metrics Analysis in OSG

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OSG Area Coordinators Meeting  
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# Metrics Analysis Program of Work

3.1	Metrics
3.1.1	Metrics Analysis
3.1.1.1	Metrics requirements, definition, and liaison with existing information sources
3.1.1.2	Data mining and filtering and derived metrics data management
3.1.1.3	Creation of OSG intelligence and key analytics
3.1.1.4	Communicate interpretations in various forums (reports, blog, newsletter articles)

- Focus is on analytics and communication
- Part of a larger program of work
  - 3.1.2, etc -- liaison, development and coordination of systems and services
- Distinction: monitoring (i.e. “tactical”) versus metrics (i.e. “strategic”)
- Evolve towards measures of “effectiveness” in OSG project execution, OSG as an effective enabler of Science

# Phase I - work to do

- Developing a list of metrics requirements based on core principles and objectives of OSG
- Data mining and filtering, and management of derived metrics data for analysis and presentation
- Development of key analytics, and OSG intelligence, VO response & findings

# Metrics Data Sources

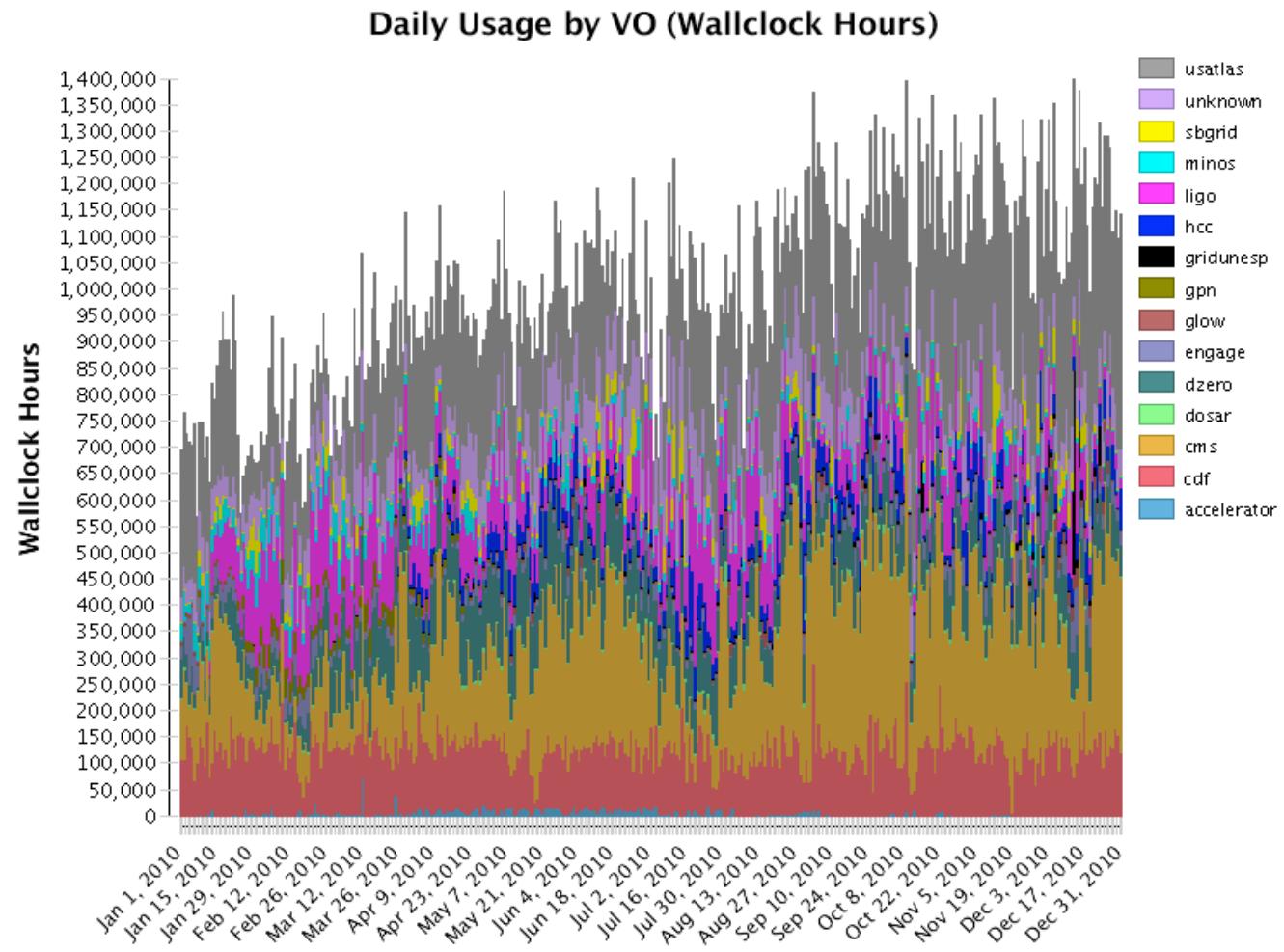
- OSG services
  - Gratia accounting, BDII, OIM
- WLCG accounting
  - Monthly reports and portal
- VO services and reports
  - Job databases and other specific resources
  - Detailed studies from within the VOs, who see facility response best
  - Detailed performance studies from sites, who see VO behavior best
- Facility services: eg. data throughput and latencies between sites
- Assessment & evaluation
  - Surveys, interviews, ‘audits’ and assessments

# Key Analytics

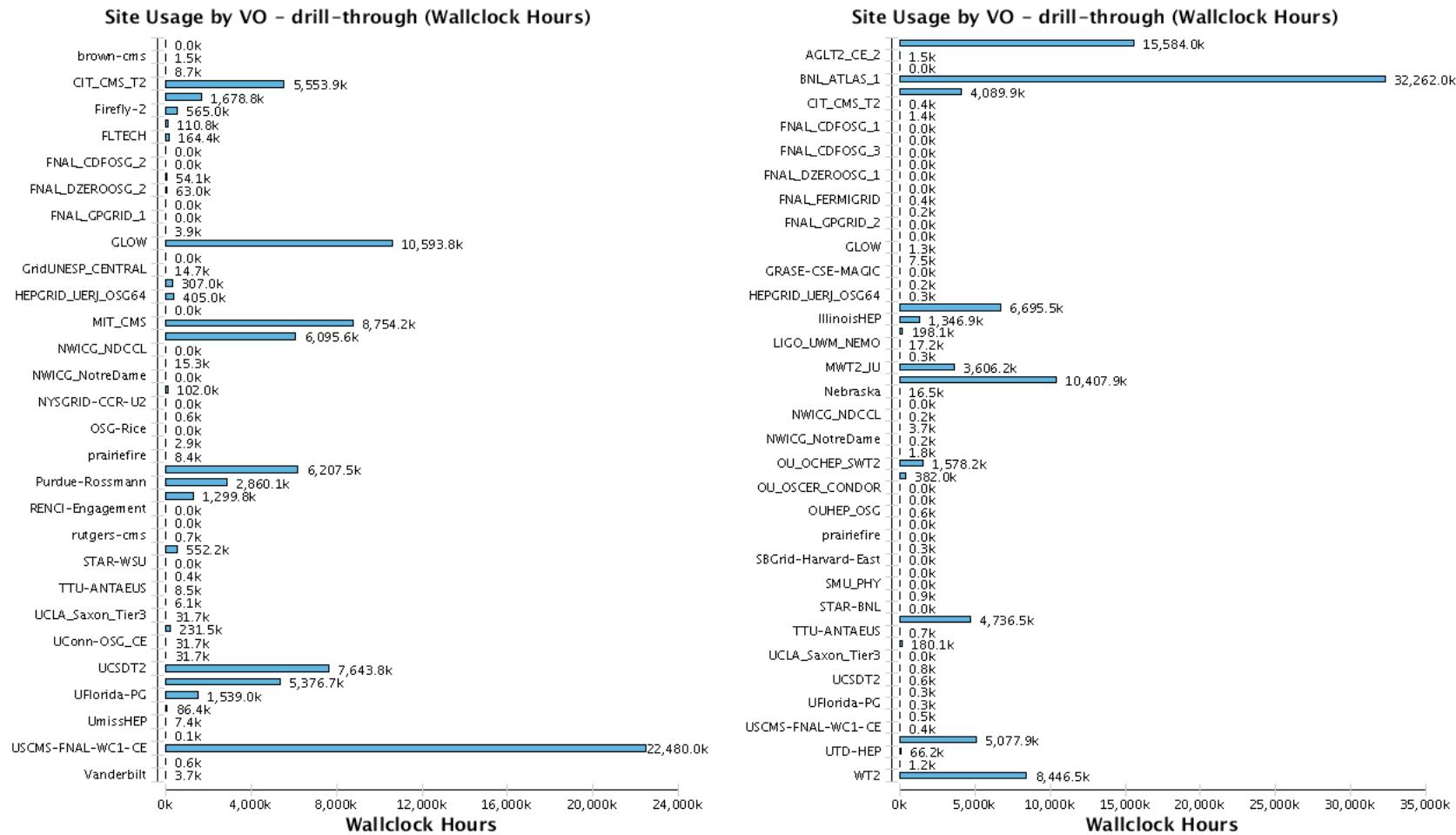
- As OSG is a distributed high throughput facility, an example key analytic would be a measure of throughput efficiency
- Yet there have been no attempts to define and then measure throughput performance (for jobs)
- No OSG-wide site throughput validation exercises - leading to better knowledge about SE technologies and endpoint performance
- No OSG-wide measures of internal IO (i.e. Amazon)
- We discuss job volumes and usage, but this might not be all that is needed to identify weak areas in terms of site and VO throughput performance

# Standard Measures

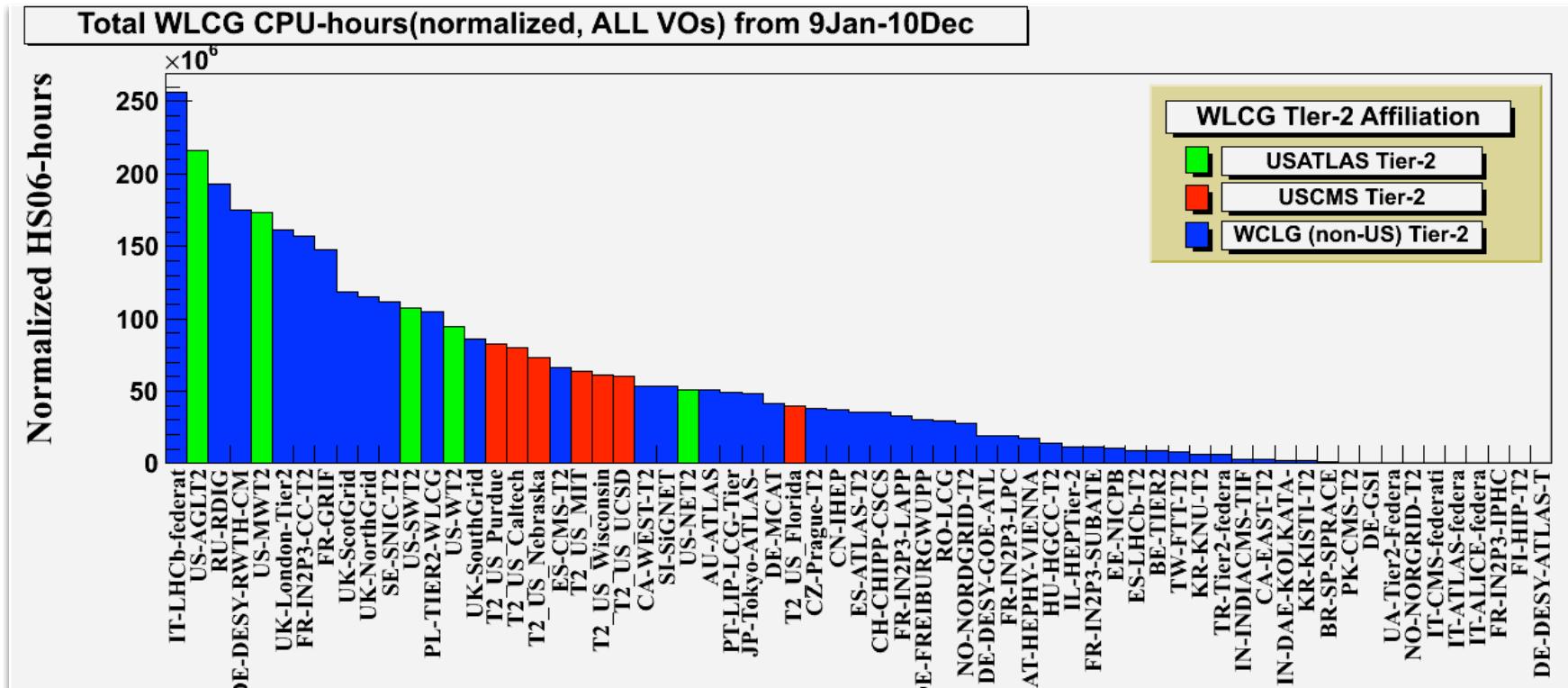
- Measure occupied job slot time
- Need delivered HS06-centric measures



# Where they compute

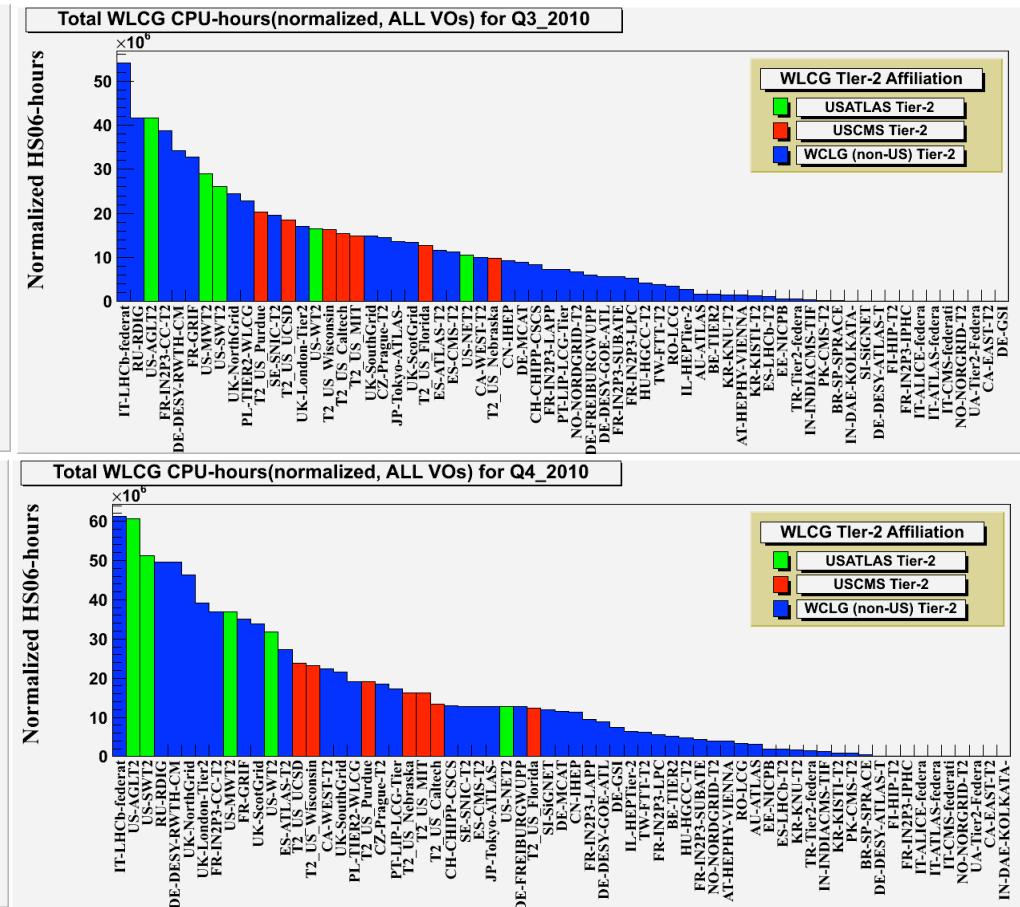
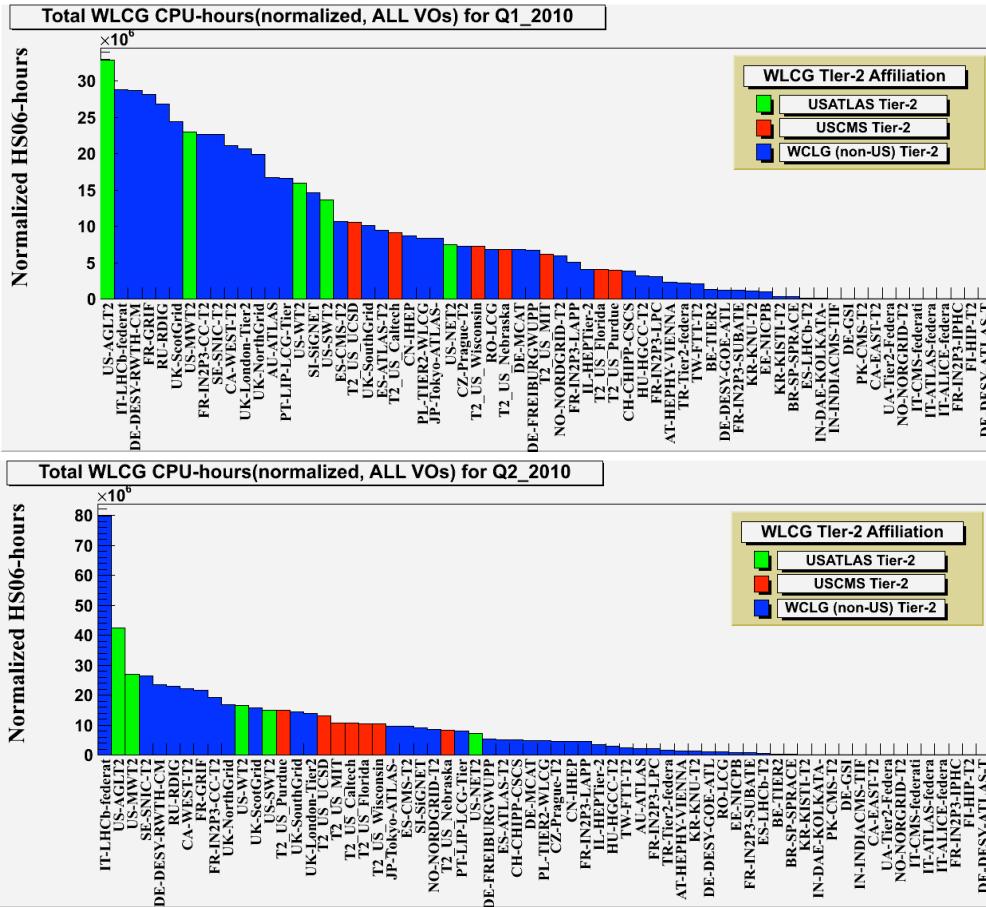


# OSG Tier-2 Centers in WLCG (2009-2010)



Source: WLCG accounting portal. Macro by S. McKee

# OSG Tier-2 Centers in WLCG (2010)

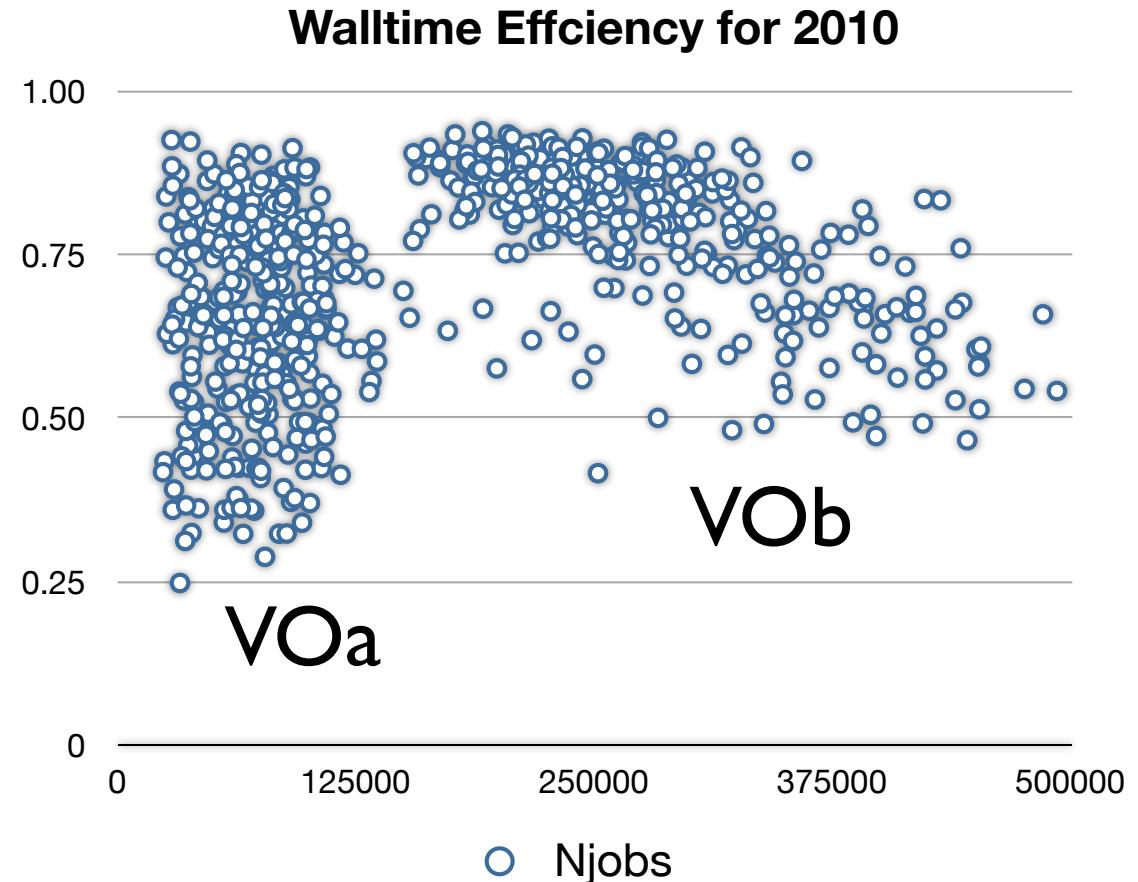


# Needed Upgrades

- Normalized CPU in Gratia portal
- Time dependent installed capacity
- CPU delivery versus promised (site-VO)
- Internal IO metrics: data consumption by jobs

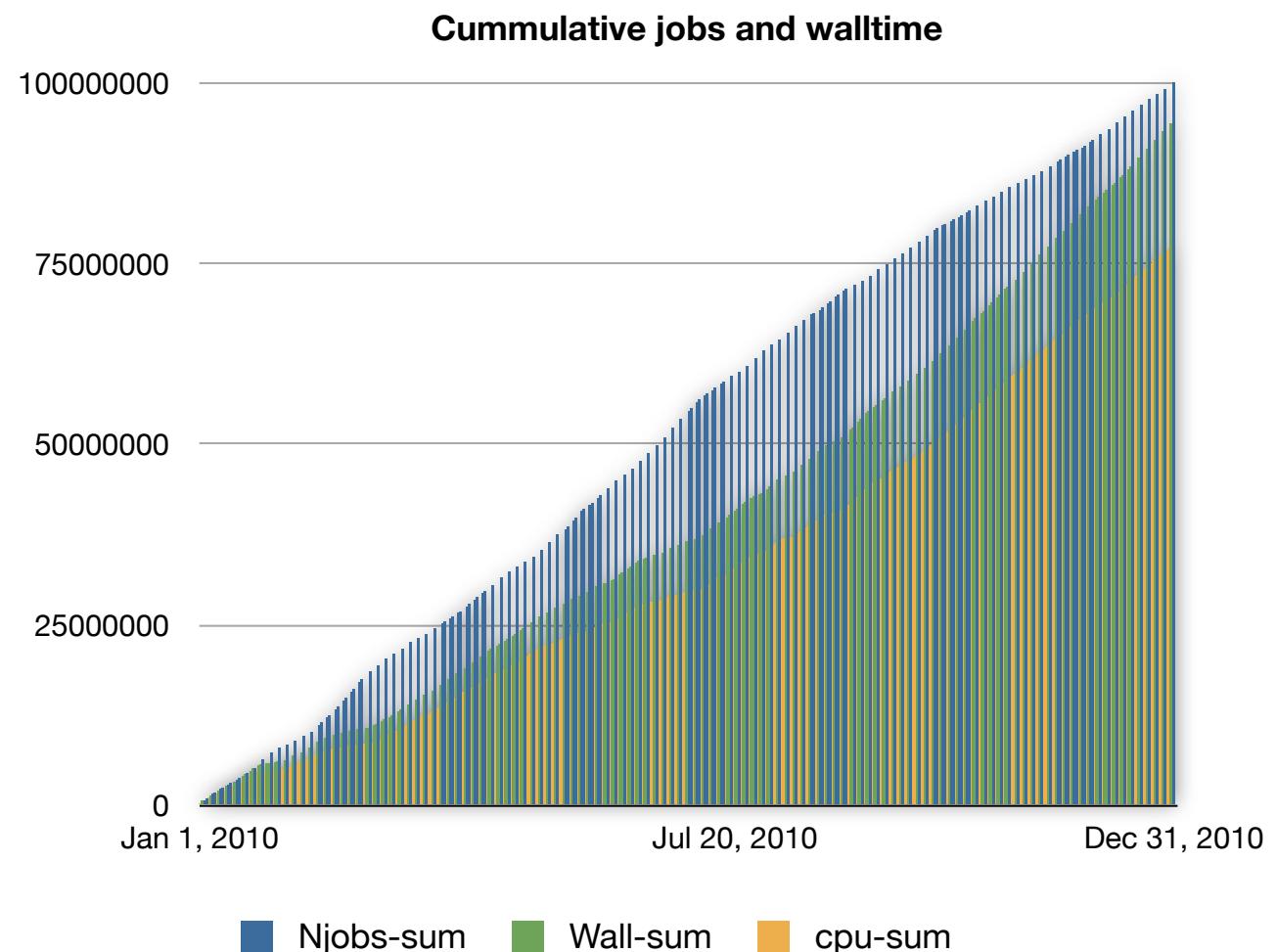
# Throughput Efficiency Measures

- Walltime efficiency for two OSG VO<sub>s</sub>
- VO<sub>a</sub> - efficiency indep. of #jobs
- VO<sub>b</sub> - some eff. dep., but more efficient per job, & more throughput overall
- Fooled by empty payloads

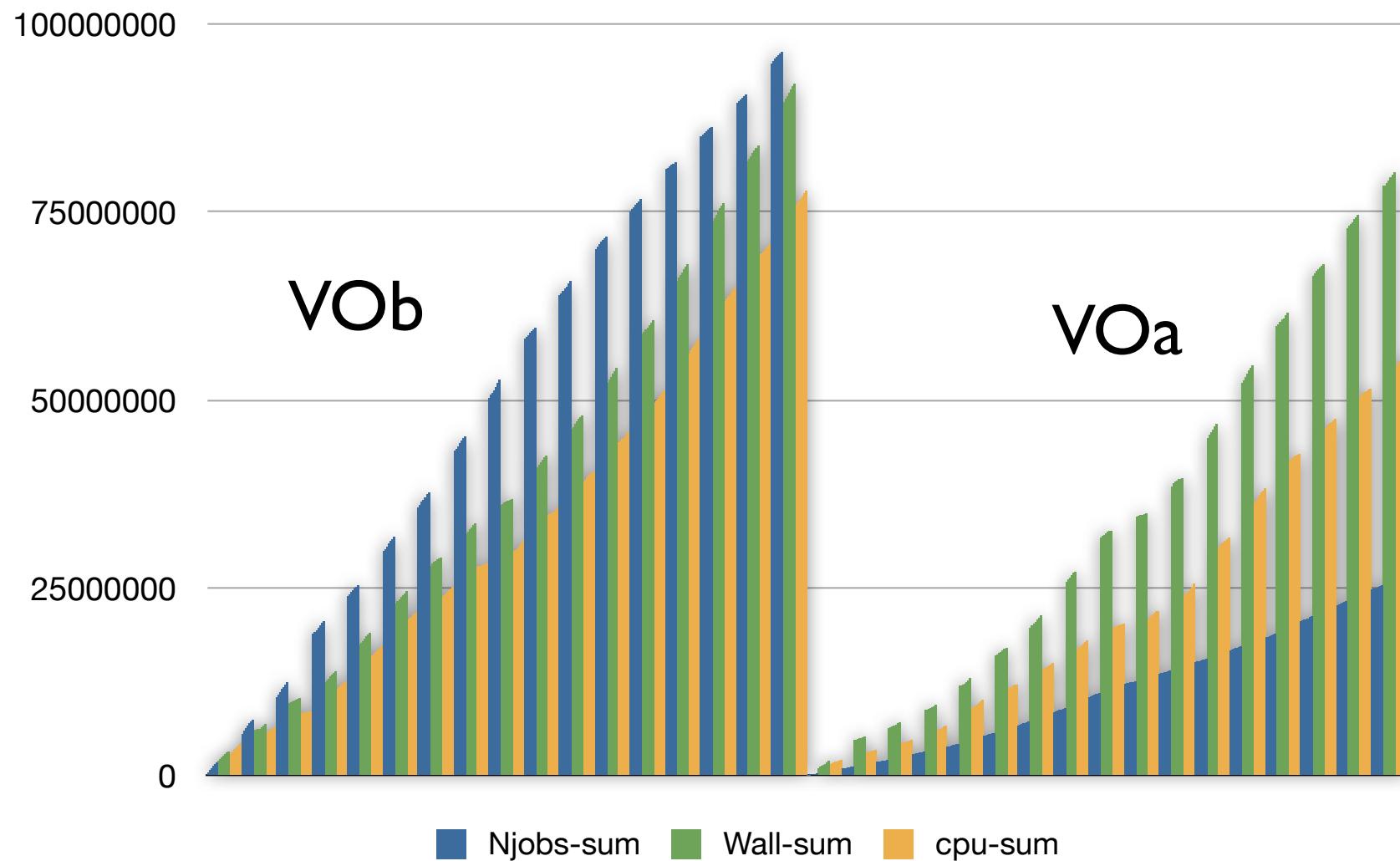


# Annual VOb efficiency

- 100M jobs
- Overall about 75% efficient in 2010

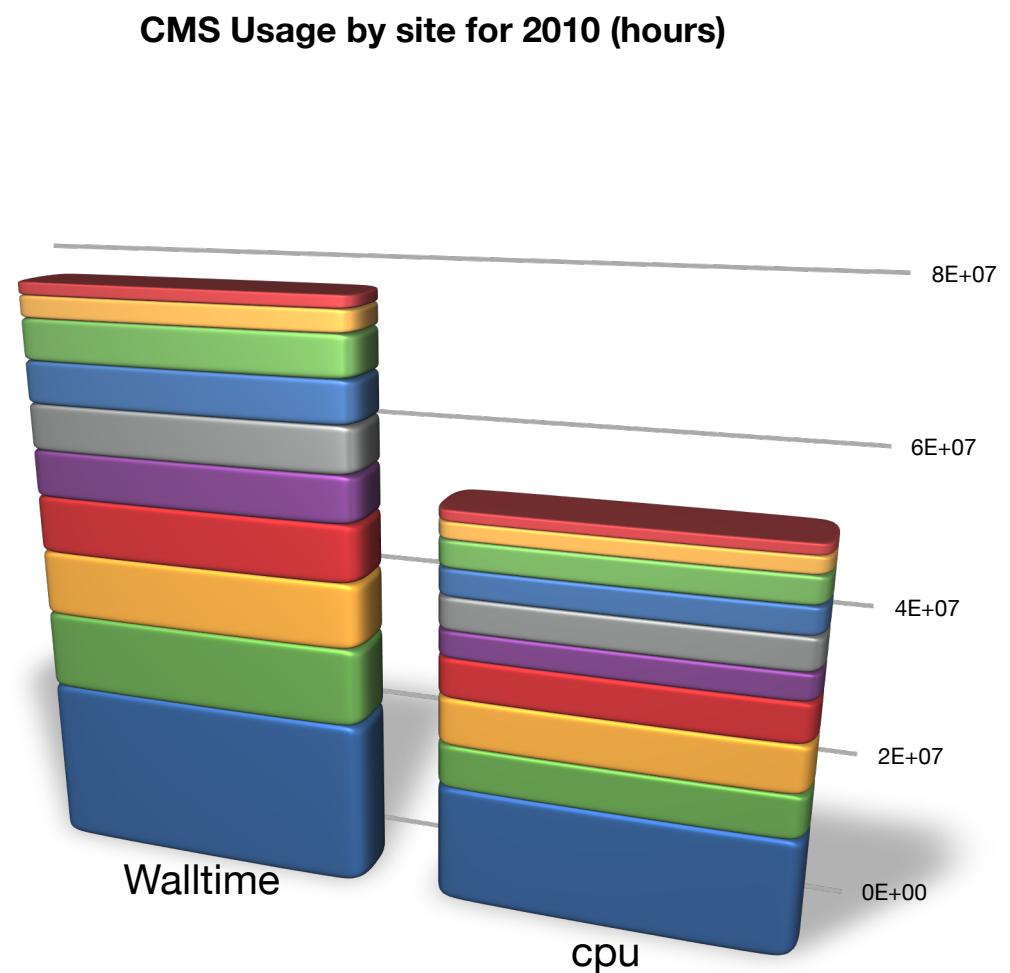


# 2 VOs in 2010



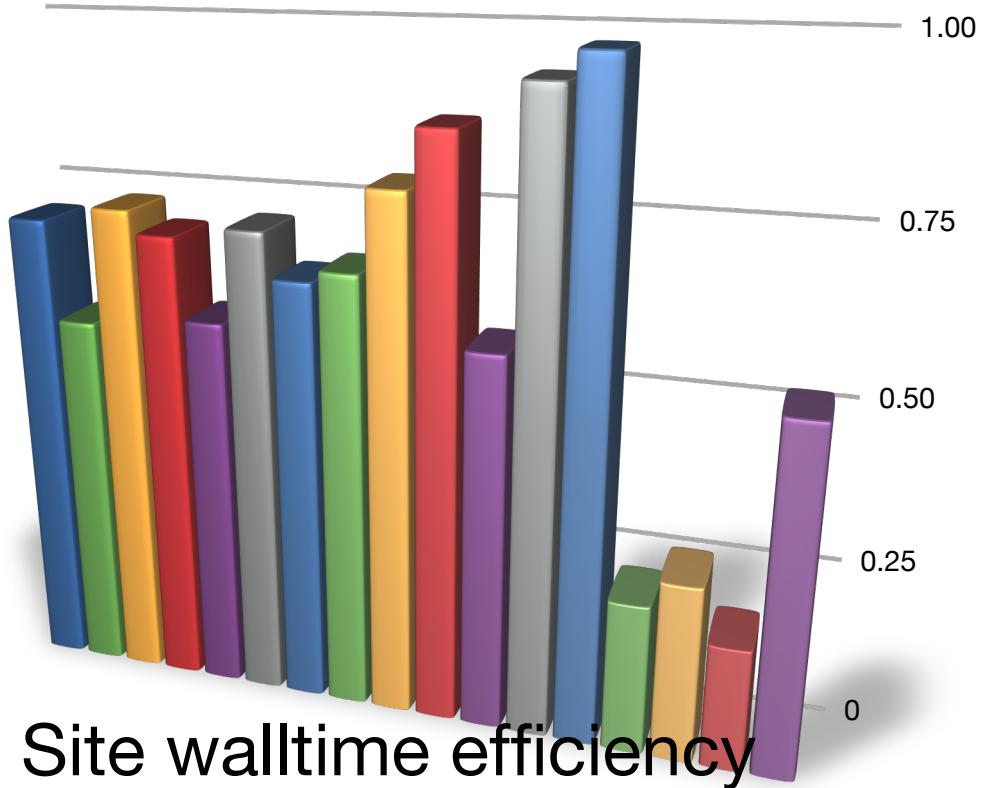
# VO usage over OSG

- █ Firefly
- █ Purdue-Rossmann
- █ UFlorida-HPC
- █ CIT\_CMS\_T2
- █ Nebraska
- █ Purdue-RCAC
- █ UCSDT2
- █ MIT\_CMS
- █ GLOW
- █ USCMS-FNAL-WC1-CE



# Efficiency of top CMS producers in 2010

- USCMS-FNAL-WC1-CE
- GLOW
- MIT\_CMS
- UCSDT2
- Purdue-RCAC
- Nebraska
- CIT\_CMS\_T2
- UFlorida-HPC
- Purdue-Rossmann
- Firefly
- UFlorida-PG
- Purdue-Steele
- Firefly-2
- SPRACE
- HEPGRID\_UERJ\_OSG64
- HEPGRID\_UERJ
- UCOLORADO\_HEP



# Reaching out to the VOs

- As is our custom in OSG, we need to work with VOs and sites as:
  - users
  - resource providers
  - technology & techniques
  - sources of computing intelligence
- Adopt data and knowledge to benefit the wider OSG community
- In particular, metrics associated with file access
- Examples are from infrastructure and detailed application performance

# Personar Throughput & Latency Matrices: insight into...

Status of perfSONAR Latency Matrix

-	0	1	2	3	4	5	6	7	8
0:atlas-npt1.bu.edu	-	CRITICAL							

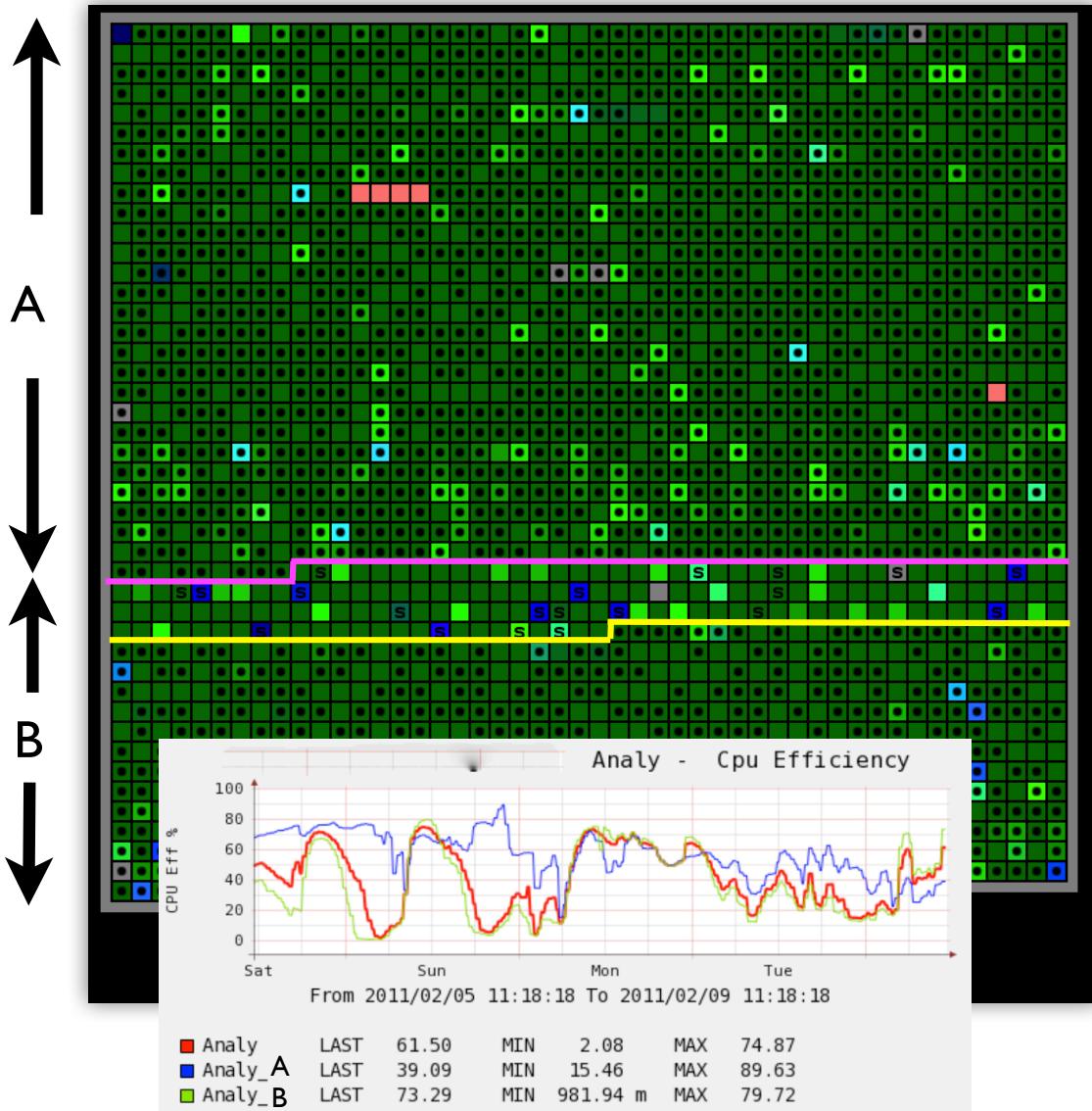
Status of perfSONAR Throughput Matrix

-	0	1	2	3	4	5	6	7	8
0:atlas-npt2.bu.edu	-	OK OK	OK UNKNOWN	OK OK	OK OK	UNKNOWN UNKNOWN	UNKNOWN UNKNOWN	UNKNOWN UNKNOWN	OK OK
1:lhcmon.bnl.gov	OK OK	-	OK OK	OK OK	OK OK	UNKNOWN UNKNOWN	OK UNKNOWN	UNKNOWN UNKNOWN	OK OK
2:ps2.ochep.ou.edu	UNKNOWN OK	OK OK	-	CRITICAL UNKNOWN	UNKNOWN OK	UNKNOWN UNKNOWN	OK UNKNOWN	UNKNOWN UNKNOWN	OK OK
3:psmsu02.aglt2.org	OK OK	OK OK	OK OK	-	OK OK	UNKNOWN UNKNOWN	UNKNOWN UNKNOWN	UNKNOWN UNKNOWN	OK OK
4:netmon2.atlas-swt2.org	OK OK	OK OK	OK UNKNOWN	OK OK	-	UNKNOWN UNKNOWN	OK UNKNOWN	UNKNOWN UNKNOWN	OK OK
5:iut2-net2.iu.edu	OK OK	OK OK	OK OK	OK OK	OK OK	-	OK UNKNOWN	UNKNOWN UNKNOWN	OK OK
6:psnr-bw01.slac.stanford.edu	UNKNOWN UNKNOWN	UNKNOWN OK	UNKNOWN OK	UNKNOWN UNKNOWN	UNKNOWN UNKNOWN	UNKNOWN UNKNOWN	-	UNKNOWN UNKNOWN	UNKNOWN UNKNOWN
7:uct2-net2.uchicago.edu	OK OK	OK OK	OK OK	OK OK	OK OK	OK OK	OK UNKNOWN	-	OK OK
8:psum02.aglt2.org	OK UNKNOWN	OK OK	OK UNKNOWN	OK OK	OK OK	UNKNOWN UNKNOWN	UNKNOWN UNKNOWN	UNKNOWN UNKNOWN	-

# ... expected data throughput ceilings and direct access protocol performance between OSG endpoints

- Distributed high throughput computing is about placing jobs where there is opportunity and a good fit
- But also about preparing or tending the needed environment which nearly always requires data
- VO profiles - how organizations access data
- Technology directions - caching versus manage placement
- These are components that need to be recognized for OSG to remain effective

# Wide Area Efficiency Example



Site A & Site B  
are federated with  
10 Gbps networks and  
OSG services

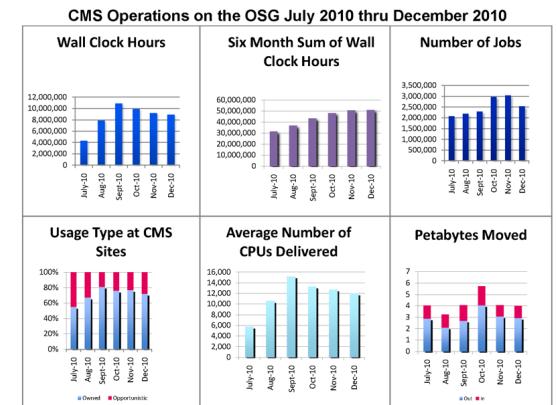
#### Efficiency Monitor:

each square a core  
dot = direct access (dcap)  
solid = stage-in to scratch  
(dccb, lcg-cp)

greener = more efficient  
bluer = slower ("cold")  
pink = offline  
red = down

# Others to develop and understand

- Installed CPU & storage capacity v. time v. site
- Used CPU & storage capacity v. time v. site v. VO
- Profile of storage access by jobs by site, and performance
- Measures of “opportunity”
  - by site (resource providing)
  - by VO (resource consuming)



# Conclusions

- A start on key analytics for distributed high throughput computing
- Lots of work ahead:
  - continued requirements definition, & liaise with providers
  - investigation of site-internal IO and efficiency
  - measure of wide-area IO efficiency and performance
  - better visualisation as appropriate
  - interpretive reports and dissemination
  - assessment metrics