



MWT2

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US ATLAS Pre-Scrubbing

June 28, 2022



Overview of Activities

- ❖ Completed deployment of pledged capacities at each site
- ❖ Completed relocation of UC equipment to new data center
 - Moved data in phases using "swing" equipment funded by the university
 - Maintained continuous operation throughout, minimal downtimes
- ❖ Completed network infrastructure upgrades
- ❖ Completed all Facility Run3 readiness goals
- ❖ Supporting Analytics Platform (ELK)
- ❖ Supported creation of NSF Shared Tier3 / Analysis Facility
- ❖ Focus for FY23 - Stable operations for Run 3



MWT2 FTE Summary

	FY22	FY23	Comment - other activities
David Jordan	1.00	1.00	
Judith Stephen	0.33	0.50	PATH infrastructure, SPT-3G
Farnaz Golnaraghi	0.67	0.67	PATH infrastructure, SOTERIA
Ed Dambik	0.25	0.25	Also FTS developer
Jess Haney	0.67	0.00	Left project, changed ops model
Fengping Hu	0.00	0.70	
Total	2.92	3.12	

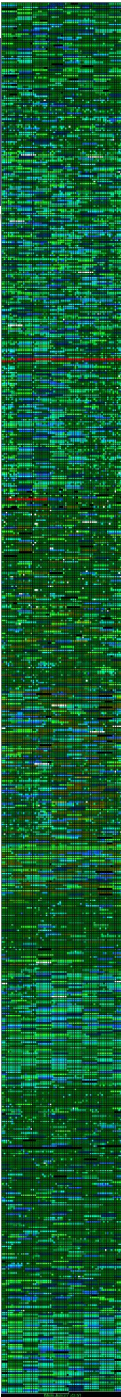
Changes reflect shared effort with PATH (OSG) project, change in operations at UIUC



MWT2 Capacity

- ❖ MWT2 (3 sites) is sized 1.5x nominal Tier 2 in funding and thus higher capacity. Current status:
 - 41,776 job slots providing 589,592 HS06 in the CE
 - 15.466 PB of storage in the SE
- ❖ In the last year MWT2 provided:
 - 33.7 Billion CPU seconds
 - Received 54 PB of from external sites with 98% efficiency
 - Sent 28 PB of data to external sites with 97% efficiency
 - Transferred 159 PB of data internally 99.5% efficiency
- ❖ The Chicago and Illinois sites have 2 x 100G external connectivity while the Indiana site should be able to upgrade from its 80G connectivity in the next year.
 - All 3 sites installed major network hardware updates in the last year.

live core
efficiency



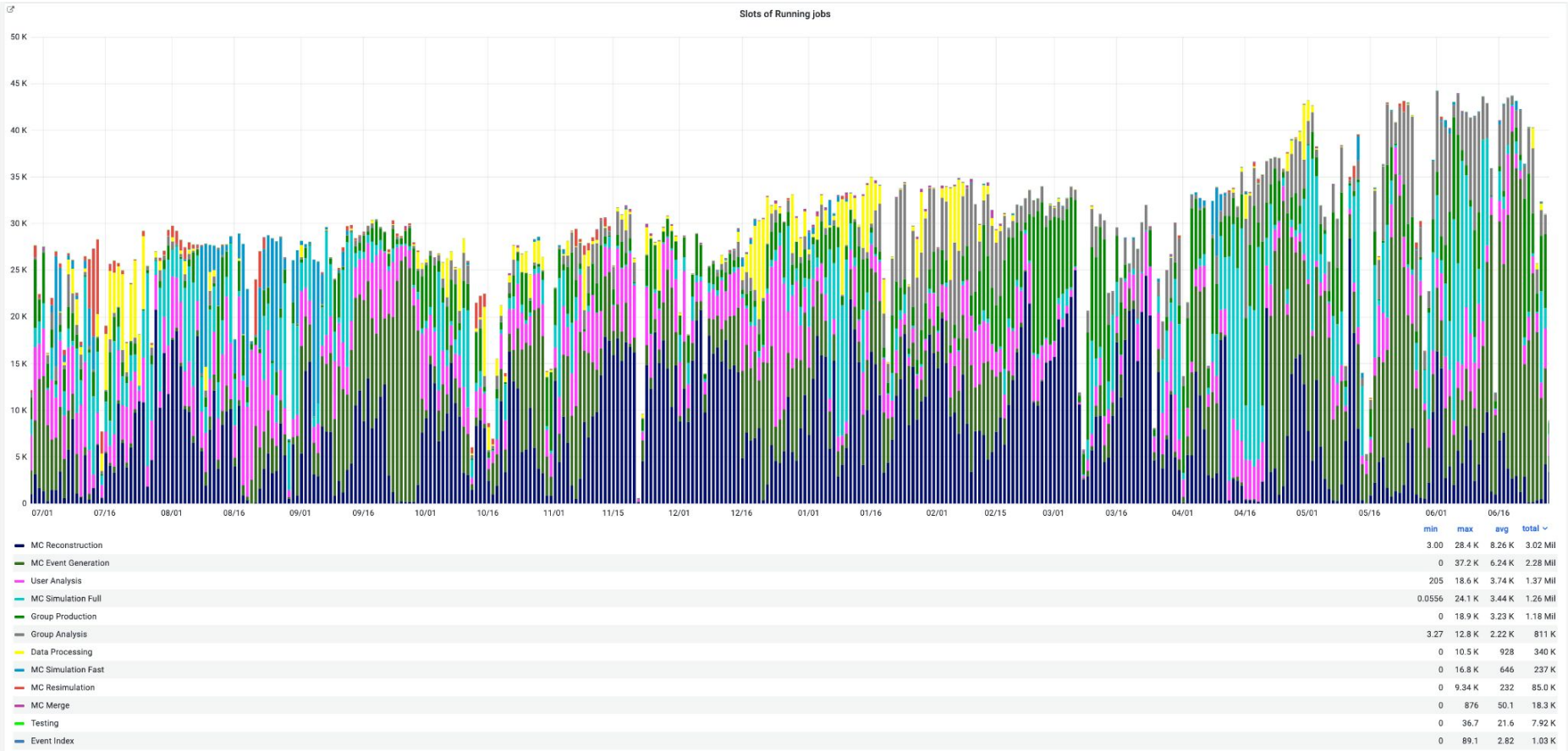


MWT2 Equipment Purchases

- ❖ Recall IU and UIUC are compute only, storage and compute at UC
- ❖ In FY21 all 3 sites bought compute servers and used their infrastructure funding to update their networks.
 - This added 9216 job slots and 132,505 HS06
- ❖ In FY22 Illinois and Indiana bought / will buy compute servers while Chicago bought / will buy storage servers
 - This added 4320 slots and 73,842 HS06
 - We plan to add 5796 slots & 87,589 HS06 with our remaining FY22 \$
 - We added 5.441 PB (usable) of storage
 - We plan to add 1.280 PB of storage with our remaining FY22 \$
- ❖ In FY23 MWT2 expects the same split of between compute and storage to be heavier in compute and lighter in storage.
 - Since FY23 has a lower nominal funding level, the total amount of equipment will be reduced.



MWT2 workloads





Efficiency by workload

data.adcactivity

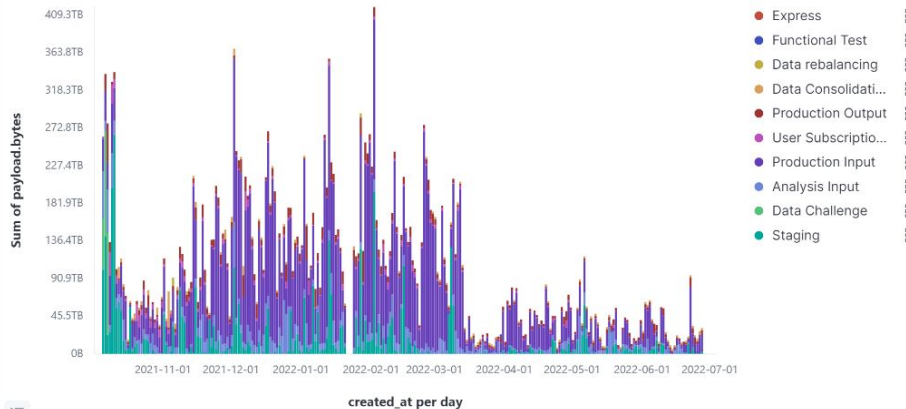
CPU Efficiency of good jobs

	CPU consumption	Walltime	CPU Efficiency
MC Reconstruction	213.78 Bil	259.01 Bil	0.83
MC Event Generation	182.10 Bil	195.97 Bil	0.93
User Analysis	108.12 Bil	117.29 Bil	0.92
MC Simulation Full	104.11 Bil	108.58 Bil	0.96
Group Production	94.38 Bil	101.49 Bil	0.93
Group Analysis	54.38 Bil	70.01 Bil	0.78
Data Processing	23.64 Bil	29.42 Bil	0.80
MC Simulation Fast	19.26 Bil	20.44 Bil	0.94
MC Resimulation	6.93 Bil	7.36 Bil	0.94
MC Merge	1.48 Bil	1.60 Bil	0.92
Testing	343.04 Mil	686.23 Mil	0.50
Event Index	80.41 Mil	89.71 Mil	0.90

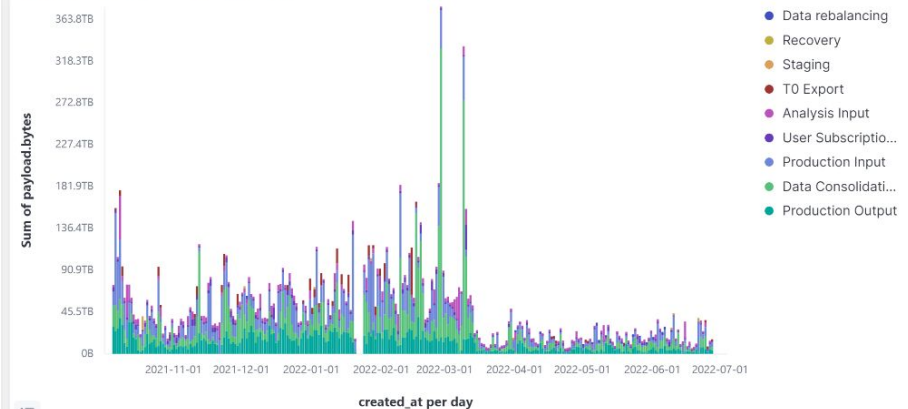


DDM transfers

MWT2 as FTS destination - activities throughput



MWT2 as FTS source - activities throughput



MWT2 as destination: filters

payload.activity: Desc...	Count	Sum of payload.bytes
Production Input	8,094,097	16.8PB
User Subscriptions	3,515,687	877.6TB
Production Output	2,804,407	1.8PB
Staging	1,911,238	4.6PB
Analysis Input	1,437,134	3.2PB
Functional Test	1,101,704	1.1TB
Total	19,937,933	28.2PB

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MWT2 as source: filters

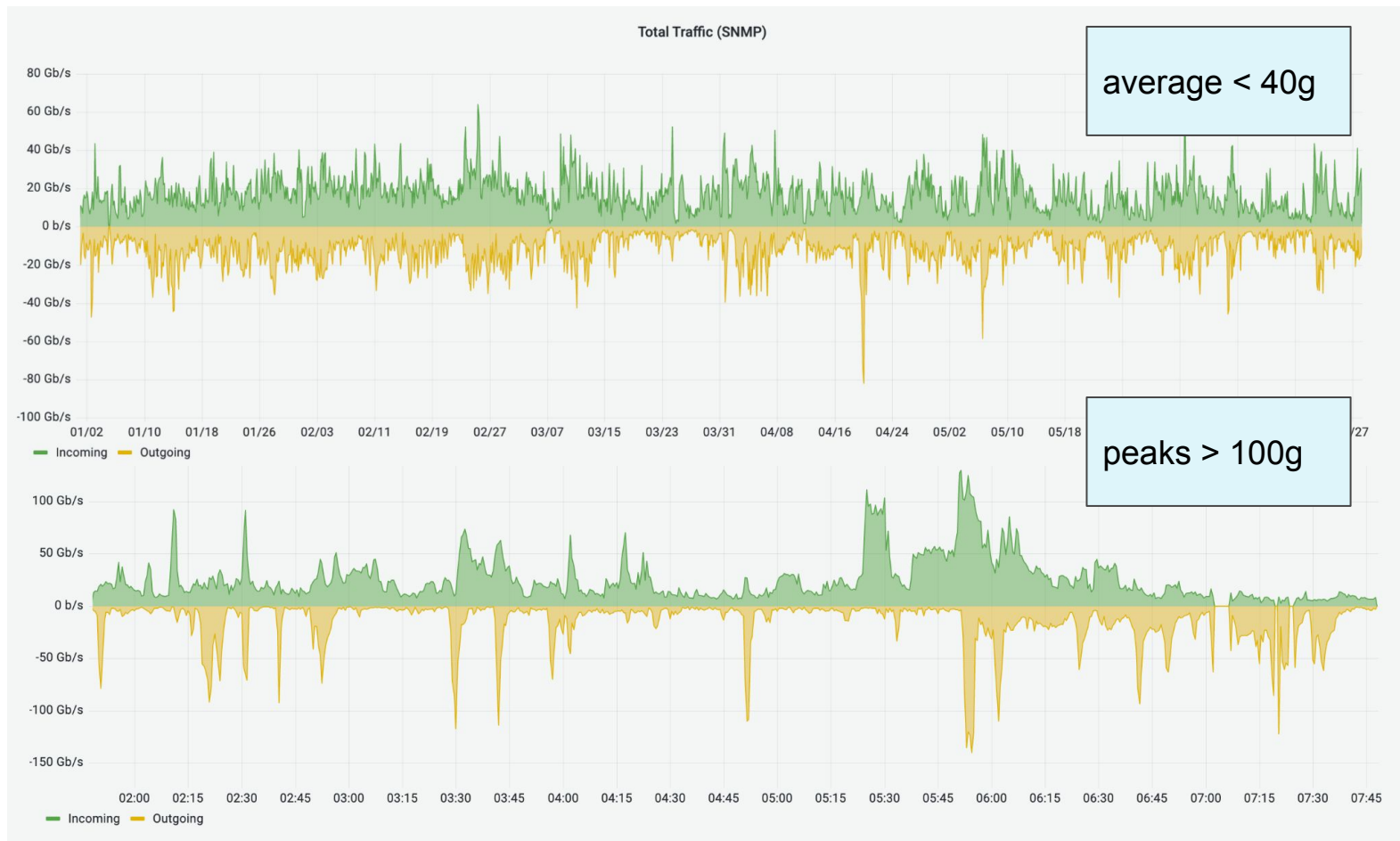
payload.activity: Desc...	Count	Sum of payload.bytes
Production Output	5,513,700	3.5PB
User Subscriptions	4,224,115	777.6TB
Data Consolidation	2,975,743	4.6PB
Production Input	2,133,073	4PB
Analysis Input	639,579	1.4PB
TO Export	144,206	356.2TB
Total	15,737,486	14.7PB

- MWT2 from FTS we had approx 20PB ingress in 10 months (so 2PB/month)
- In March noticed significant reduction



Network

- ❖ WAN from UC is critical for both DDM transfers and internal data access (dCache at UC)





Run 3 Readiness

All Facility organized milestones for Run 3 have been met at MWT2 - we are ready!

- ❖ OSG 3.6 (CE is token only)
- ❖ HTCondor 9.0.10 (9.0.13 by end of week)
- ❖ HTCondor-CE 5.1.3
- ❖ dCache 7.3.15
- ❖ HTTP-TPC primary protocol, XRootD allowed
- ❖ Removed GridFTP and SRM support
- ❖ IPV6 available on all outward facing servers



FY22 Milestone Status

- ❖ MS 113 Deployment of pledged resources
 - This was completed on time (April 2022)
- ❖ MS 118 Deployment of pledge resources
 - Remaining FY22 equipment procurement
 - Move up FY23 as soon as possible
 - The major risk is 6+ month delays over normal delivery times, and increased costs from innflation and supply chain
 - Lower capacity delivered later
 - Begin procurement process sooner

Refer to [*milestones spreadsheet*](#)

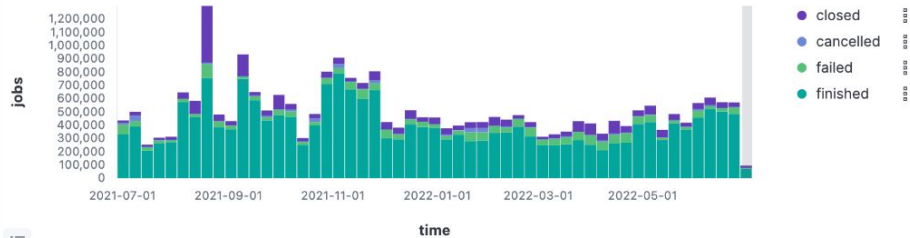


Extra slides

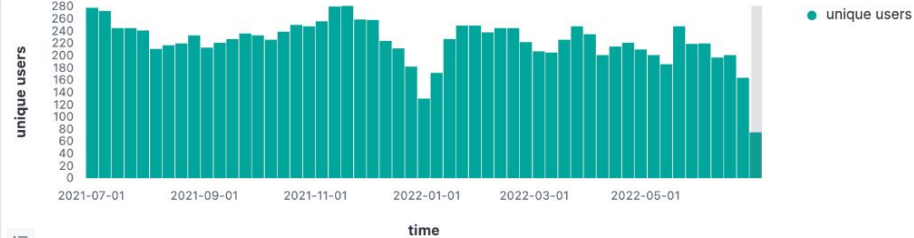


MWT2 metrics (1 year)

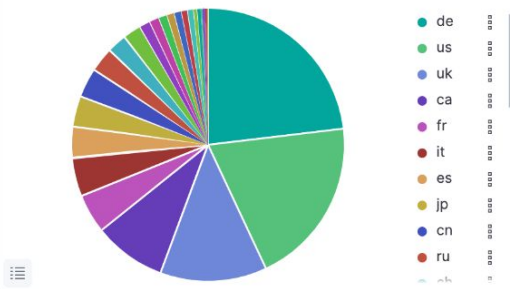
MWT2 jobs status



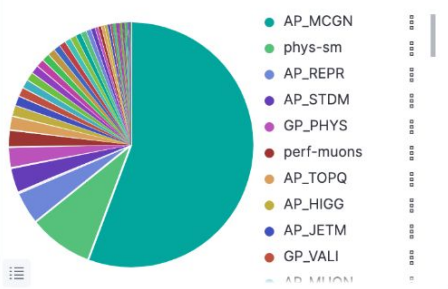
MWT2 unique users



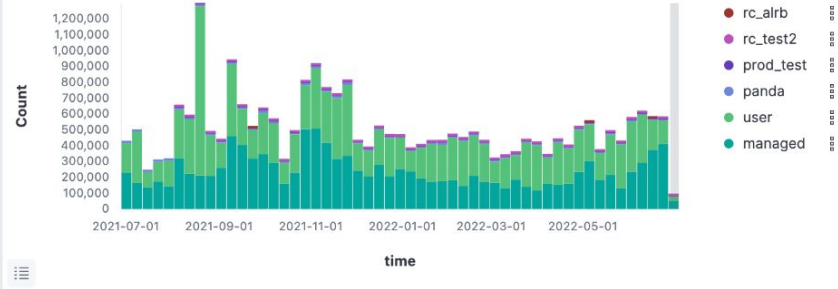
MWT2 users origin



MWT2 jobs per working group



MWT2 - production and user jobs



MWT2 IO sums

125,141,047 input files **176.38PB** input data size **34,936,736** output files **12.02PB** output data size

MWT2 jobs and times

26,668,554 jobs **1,246** unique users **33765 years** wall time **30166 years** cpu time