FUSION: AUTOMATIC BETWEEN-PULSE ANALYSIS OF DIII-D EXPERIMENTAL DATA

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NEAR REAL-TIME PROCESSING OF LIGHT-SOURCE WORKLOADS AT **ALCF**

Results **Experiment**

- 1.Transfer 40GB[†] input dataset from APS, ALS,
- and NSLS-II
- 2.Process data with real-time queue

Tasks C

12

3. Transfer results to

125

75

50

25

† 40GB dataset was the largest of the

Count 100

- Scientists set A pulse is a Scientists co Tasks S
- Experimenta
- DIII-D pulses
- ALCF comput results for a n

- and simultaneously
- Continuously executed for 48+ hours
- Transferred 23TB input data from APS/ALS/NSLS-II to ALCF

APS+ALS

IRI

Integrated

Research

Infrastructure

Toward Real-time Analysis of Experimental Science Workloads on Geographically Distributed Supercomputers

ALS

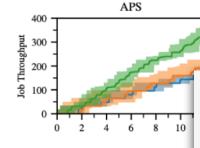
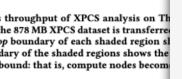
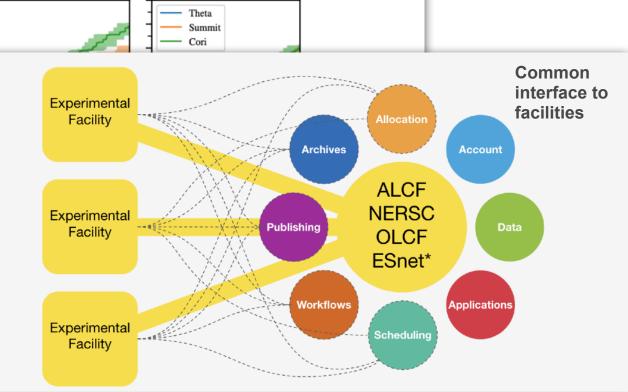


Figure 9: Simultaneous throughput of XPCS analysis on Th experiments in which the 878 MB XPCS dataset is transferred the Balsam API. The top boundary of each shaded region sl runs. The bottom boundary of the shaded regions shows the system is network I/O-bound: that is, compute nodes become



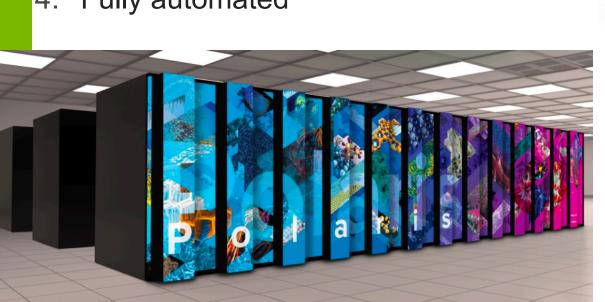
ENERGY U.S. Department of Energy laboratory managed by UChicago Amenica. LLC





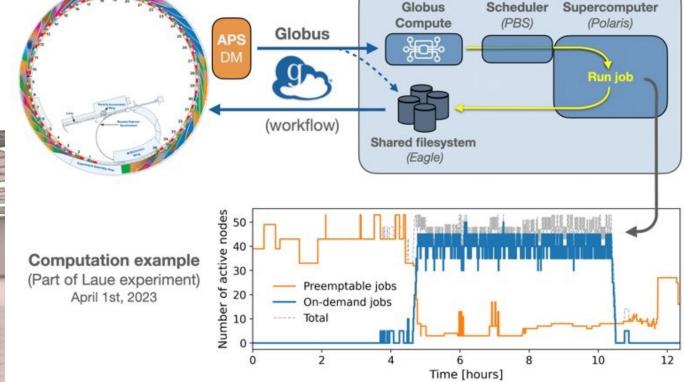
Nexus@ALCF

- 1. Instrument accounts to provide identities
- Demand and preemptable queues enable on-demand access
- Allocations and suballocations empower facilities to manage resources
- 4. Fully automated

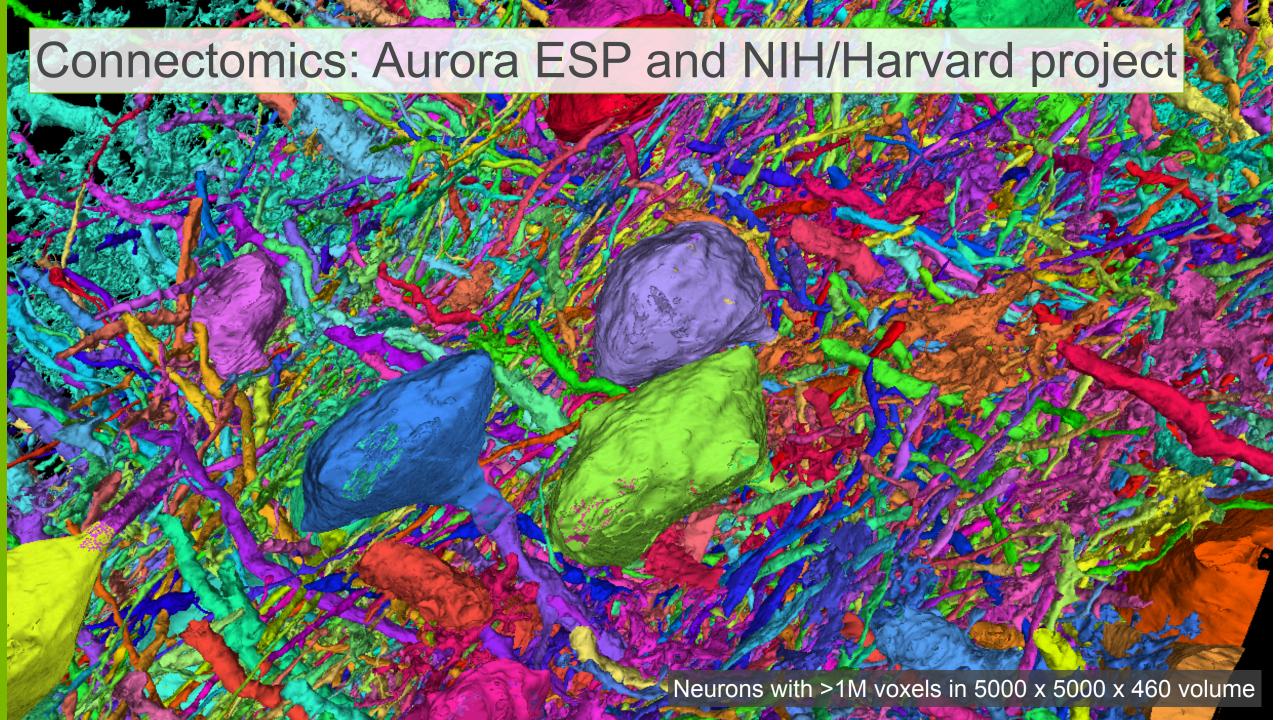


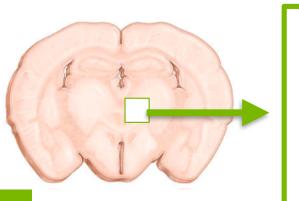
One-time configuration at ALCF **APS** experiments Using a service account per beam line No human involved in the workflows ALCF creates APS admin user setups APS requests APS users log into DM system starts Globus flows involving service account a shared environment DM system using service account at ALCF and funcX endpoint shared Globus identity shared funcX endpoint Service account APS user func 1 Globus (sudo) APS user beam line APS user APS admin User account APS admin

APS (data acquisition)



ALCF (on-demand data analysis)

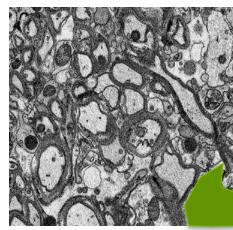




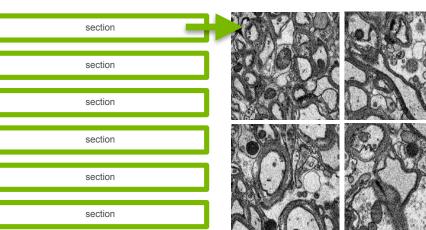
Mouse brain: 70M neurons ~1cm^3

sample

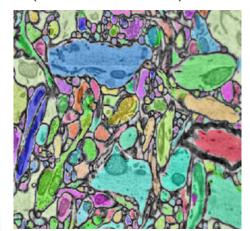
~1mm^3



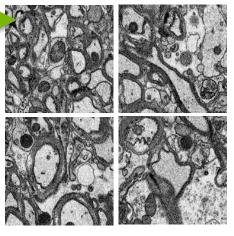
Mask out non-target objects



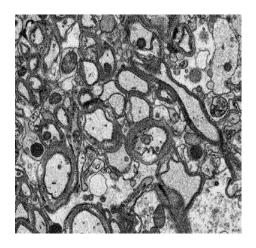
25000 40nm sections 1mm x 1mm (4nm resolution)



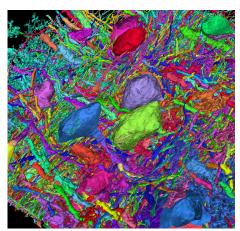
Segment target objects



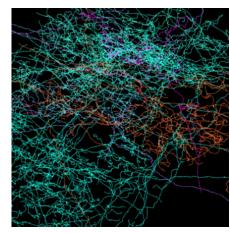
Each section imaged with EM as N tiles (8 bit)



Sections stitched together (CV-based)

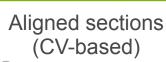


Reconstructed 3D neurons with >1M voxels (NN-based)



Skeletonize to produce connectivity graph for analysis





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