



Brookhaven™  
National Laboratory



ATLAS  
EXPERIMENT

## SDCC STAKEHOLDER FEEDBACK - ATLAS

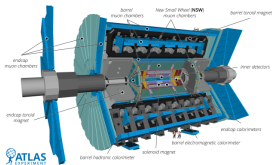
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Johannes Elmsheuser (BNL)

06 September 2024, BNL SDCC TAB meeting #10

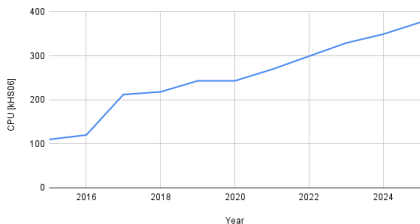
# BNL SDCC'S ROLE IN ATLAS

- ATLAS experiment at the CERN LHC is using BNL SDCC:
  - WLCG Tier1 site mainly used automated through ATLAS workflow management system PanDA and data management system Rucio
  - Interactive access by individual (US)ATLAS users as Analysis Facility
- WLCG context:
  - Tier1 computing site in WLCG (World wide LHC Computing Grid)
  - $\approx 150$  Tier0/1/2/3 sites worldwide classified by their capabilities
  - BNL providing  $\approx 23\%$  of all ATLAS Tier1 resources (10 ATLAS Tier1s)
  - Tier1 defines high availability and support and esp. TAPE storage
  - BNL hosts according to its share 23% of second RAW data copy (1 copy at CERN and 1 copy distributed across Tier1 world-wide)
- Interactive Analysis facility ([US AF documentation](#))
  - In the past several years USATLAS has setup AF at BNL (and UChicago and SLAC)
  - Interactive access for ATLAS analysis users and local BNL ATLAS persons



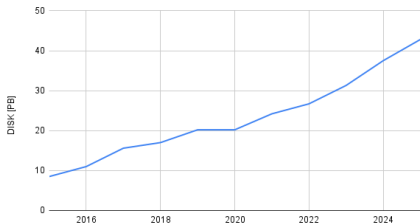
# BNL WLCG ATLAS TIER1 RESOURCE PLEDGES OVER IN THE PAST YEARS

CPU vs. Year

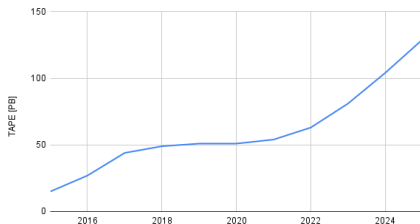


- 10-14 HS06 (or HS23) correspond to roughly one modern CPU core
- $\approx 8-10\%$  of CPU and DISK of worldwide ATLAS resource pledge

DISK vs. Year

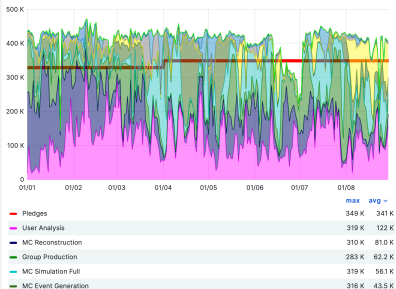


TAPE vs. Year

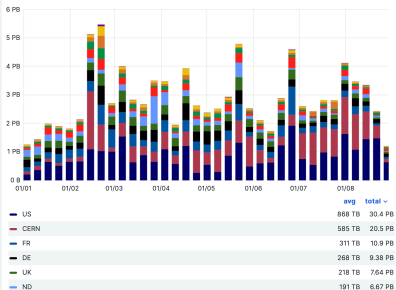


# BNL ATLAS RESOURCE USAGE

Slots of Running jobs (HS23) by ADC activity

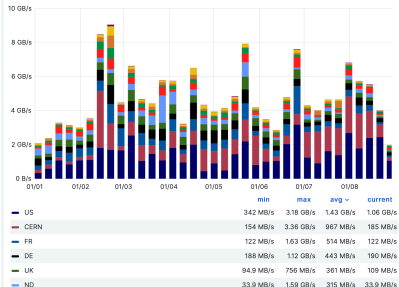


Transfer Volume

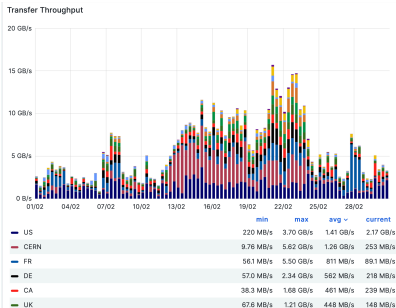
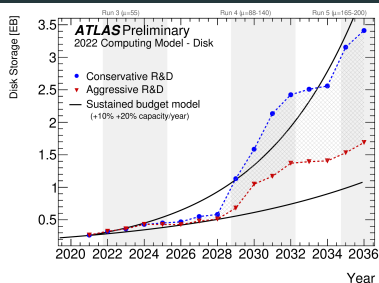
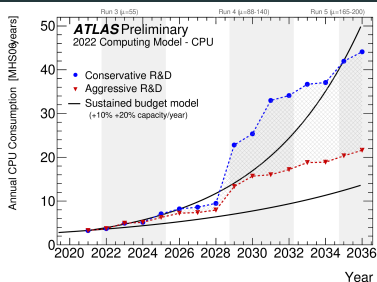


- 33-35k concurrently running CPU batch slots
- Transfer rates to BNL dCache storage 2.5-5 GB/s, Volume: 2-4 PB/week

Transfer Throughput



# ATLAS RESOURCE PROJECTIONS FOR THE NEXT YEARS



- Top: HL-LHC resource projections for CPU and DISK - large R&D program in ATLAS on-going to meet expected sustained resource increase
- Lower left: BNL data transfer rate in Feb 24, increase due to Data Challenge 24 with worldwide injected transfers at 25% HL-LHC rates
- HL-LHC will bring significant resource requests (not only) to SDCC

# LIST OF SERVICES (I)

- Production
  - (AlmaLinux 9) batch worker nodes, use with singularity containers, ATLAS and grid software launched from CVMFS
  - HTCondor compute element and batch system as entry point for production jobs of PanDA workflow management system
  - dCache mass storage with disk and tape managed by Rucio data management system
  - FTS instance for work-wide bulk file transfers through Rucio data management system - requires excellent inbound/outbound network connectivity through ESNet
  - xcache instance for local file caching and remote file access (size and efficiency to be assessed)
  - Tape library with efficient disk front end

## LIST OF SERVICES (II)

- Interactive users
  - jupyterhub, ssh login to shared nodes, scratch disk space for code development/tests
  - Seamless access to experiment software with CVMFS and singularity containers
  - Access to GPUs for ML or try out new(er) technologies like ARM
  - Documentation webpages for analysis users ([SDCC documentation](#), [US AF documentation](#))
  - Troubleshooting through efficient ticketing system

## SOME DISCUSSION POINTS

- Account registration for USATLAS collaborators can be lengthy
- Interactive access to resources for (US)ATLAS users with sufficient quality of service ?
- GPU access through PanDA/grid
- Facilities R&D: status of GPU or ARM CPUs or FPGA ? Testbeds for other "technologies" ? Use Cloud ?



