ACCESS and Major Facilities

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Content Warning

These are my opinions, based on my experience and observations with ACCESS and its resource providers.
Context

• ACCESS - Advanced Cyberinfrastructure Coordination Ecosystem: Services & Support
  • Allocation, common user support, monitoring, etc. for NSF-funded HPC resources
    • PSC Bridges-2, SDSC’s Expanse, NCSA’s Delta, TACC’s Stampede, Purdue’s Anvil
    • Except for leadership class facility – Frontera, Vista, Horizon
  • No control of CI resources beyond allocating time – By design
  • Replaced XSEDE in 2022
  • INCITE is the DOE equivalent

• Major Facilities
  • Large scale (>$100M) NSF-funded research facilities
  • Multi-user, multi-science facilities
Context - MFs and Computing

• MFs require a certain level of “dedicated” CI resources to complete their mission
  • Who provides that CI depends a lot on the MF
  • “Normal” ACCESS model with an allocation and shared resources doesn’t fit
• There are many different MFs with different missions and operating principles
  • From “vertically integrated” (experiment to final result/paper) to a resource/data provider
• Question of mission: LHC vs. LSST
  • LHC has a science mission and is closed community
    • Vertically integrated from experiment to final result/paper
    • LHC experiments need to provide resources to create data products and perform data analysis
  • LSST is a science/discipline community MF
    • LSST is a resource like an ACCESS resource – Astronomers request time, request data products, etc.
    • LSST computing needs are focused on providing data products and alerts
    • ACCESS will support individual scientists using LSST data, not necessarily the “LSST collaboration”
What will we cover?

• Experience of MFs with ACCESS
• How could ACCESS and MFs work together
• What is missing in the ACCESS portfolio from a MF perspective
MFs & ACCESS – Computing Paradigms

• MFs are not “classical” HPC
  • Limited to no tightly coupled workloads that require >1 node
  • Ingeniously/pleasingly/embarrassingly parallel workloads
  • AI (and distributed AI training) is a recent development

• MFs are data-intensive and (mostly) distributed
  • MF workloads can be organized chaos – Flying the plane while replacing the engines
  • Big data in, big data out – MFs move data in and out for every workload
  • ACCESS orients data movement around “do computation locally and move output data once you are done”
MFs & ACCESS

• Non-standard user conundrum
  • Large userbase hidden behind MF, see LHC, IceCube, LIGO
  • MFs are odd balls in the NSF portfolio – Not your standard single-few-several PI projects
  • Using > 1 ACCESS resource needs to be well motivated

• Non-homogeneity of MF application
  • MF application behavior changes significantly between workloads
  • Containers, containers, and more containers

• Non-homogeneity of ACCESS resources
  • Every ACCESS resource is slightly different – Login (MFA), software stack, available resources, policies, etc.
  • Large complex software stacks and need to be moved around and are centrally managed
  • Takes MFs effort to integrate, is the effort worth it?
Working Together

Lots of Opportunity!
ACCESS resource providers have all resources to build CI for an MF
Working Together

Need a virtualization environment? - JetStream2, (CyVerse, Chamelon)
Need storage? - Open Storage Network, etc.
Need GPUs? – Delta, Expanse, Bridges-2, etc.
Need CPUs? – “All”
Working Together

• What is the hold up?
  • Mission
    • ACCESS are **multi-user HPC** facilities
    • Computing Paradigms
    • Funded through CISE/OAC and not MF directorates
    • NSF internal question of funding and funding cycles – MFs are multi-decade instruments vs. 5-10 years for ACCESS resources
  • “Another user”
    • MF comes in as a “user” – Multi-user facilities
    • MFs are 24/7/365 in terms of science operations – IceCube uptime is > 99% (over the 12 years)
    • Are MFs different then other NSF PIs? – Not to ACCESS
  • Question of support
    • MF researchers expect dedicated support that is more than what ACCESS providers are used to or can provide without additional resources
Working Together

• Better cross-resource support and homogeneity – Low Hanging Fruit
  • Why can I use apptainer/cvmfs on resource A and not B?
  • MFA policies more suited towards remote submission
    • Collaboration with ACCESS, PATh, and MFs

• AI Resources
  • Most MFs can’t afford/have access to/justify large scale AI hardware, i.e. more than single 8x A/H100 machine

• Hosting CI
  • ACCESS resource providers could be be hosts of MF CI
    • Example OSDF caches at SDSC, Internet2 backbone, used by LIGO, LHC, etc.
    • MF buys extra server(s) and hosted/adminged to ACCESS resource
  • Economies of scale
  • Requires dedicated support
What is missing in the ACCESS portfolio

• Archival
  • Economies of Scale
  • NERSC in DOE – One big tape archive is easier than 10 smaller ones
• Easier support for “distributed” workloads
  • Solutions for IceCube, LHC, and LIGO are there just not the personpower to implement them
• Common policies/setups across ACCESS sites
Thank you!

Questions?