Getting Help

Best Practices and Common Sense for for getting help and keeping data and research secure

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https://bit.ly/COMPLECS

SDSC
SAN DIEGO SUPERCOMPUTER CENTER

UC San Diego

About COMPLECS

COMPLECS (COMPrehensive Learning for end-users to Effectively utilize CyberinfraStructure) is a SDSC training program that covers the most important non-programming concepts and skills needed to effectively use supercomputers. Topics include parallel computing concepts, Linux tools and shell scripting, code migration, data management and batch and interactive computing.

Agenda

- Motivation

- HPC Ecosystem

  - Implications on Resources Availability and Security

- Help Desk & Other Available Help Resources

- Common Issues, Solutions, Security & Best Practices

    - System Access, File Systems, Allocations, Schedulers, Applications, Performance

Motivation

- Based on experience with help desk

- Facilitate Research

  - Reduce time to solution(stress)

  - Promoting good citizenship

  - Keeping resources and research secure

  - Promote effective and efficient use resources

HPC Ecosystem

- You are not alone (HPC is a shared resource)
  - Compute resources
  - Support resources
- What all is shared
  - Login Nodes
  - File systems
  - Compute nodes
  - Licenses
  - System Administration, Security, Networking, User support
- System policies set in place to help manage

Security is a Shared Responsibility

- Resource provider is responsible to:
  - Provide Authorized Users Access to Computational Resources
  - Protect user accounts/data from unauthorized users
  - Enforce the user set permissions on data
- End user will: (review ACCESS AUP)
  - Protect personal account credentials
  - Protect personal data with appropriate permission controls
  - Use resources only for the purpose for which it has been authorized to use

What are the available Help options?

- What are the available resources
  - You
  - Project/Colleagues
  - Web (Resource providers, hardware vendors and software developers)
    - User Guide
    - Community Forums
    - Git Repositories
    - Blogs
  - Helpdesk

Help Desk: Useful Information

- Clear description of is issue

- Resource, UserID/Username, Account/Project/Allocation

- JobId
  - List of Node(s) that job ran on, Project, Start time, End time, Resources requested
  - Working directory (submit script name)
  - Location of .err and .out files

- Create new ticket for new issues

- Always be nice to the support desk! ☺

Common Issues

- Access/Logging in
  - Login issues: ssh keys, MFA, passwords
  - System unavailable: OOD portal, direct login
- File Systems
  - Sharing- chmod, chown, chgrp
  - Quotas - Usage eval - du,lfs
- Allocations/Job charging
  - Charging
- Jobs/Policies/Schedulers
  - Failed Submissions
  - Failed Jobs
- Applications/software
  - Missing software: modules, containers, compiling
- Performance and debugging
  - System tools, debuggers, profilers

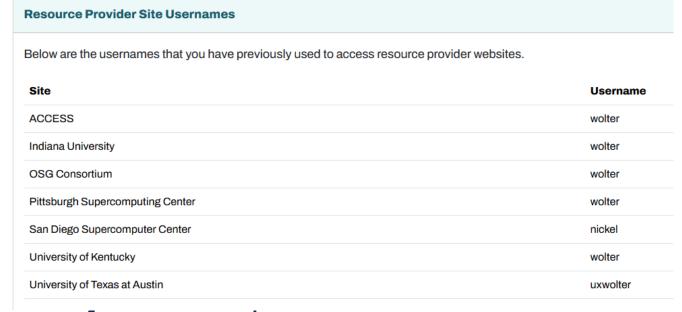# Resource Access/Logging in: Common Issues

- Login Failing
  - Problem: Incorrect credentials, incomplete setup
  - Solution: review login information, userguide
  - Passwords
    - Indicator message: Enter verification code
    - Solution: check username https://allocations.access-ci.org/profile (if username is not available for the resource then the account has not been created yet) Generally it can take 1 business day for accounts to be fully functional.
  - ssh keys
    - Indicator message: Enter password
    - Solution: resend ssh pub key, or use –i option to point to location of private key
  - MFA(2FA)
    - Indicator message: not prompted for TOTP (Not set up, new device)
    - Solution: Use SDSC Passive website (https://passive.sdsc.edu/client/) to enroll, remove and add new device

Resource Access/Logging in
Common Issues

- Unable to access system
  - Problem: System Maintenance
  - Solution: Patience, stay informed
    - Pay attention to MOTD
    - User News (Stay Subscribed to be notified)
    - Check on User Portal -- https://support.access-ci.org/announcements
- Hanging on login
  - Problem: Users overstimulating the file system
  - Solution: Contact Support staff
    - User Data mover nodes to move data
    - Don't run compute intensive jobs on the login nodes
  - Problem: Activating Conda in your .bashrc
    - Solution: Do not initialize conda in .bashrc, but only when needed in run scripts

Resource Access/Logging in: Tips

- Different resources can have different access protocols/mechanisms, different security policies, and different usernames
  - Access Mechanism:
    - Site local passwords
    - federated login(CI-logon)
    - MFA
    - ssh keys
  - Access Protocols:
    - Portal
    - Direct Access(ssh)
- Overarching goal is to simplify ease of access and to protect research/credentials/systems

Resource Provider Site Usernames

Below are the usernames that you have previously used to access resource provider websites.

Site	Username
ACCESS	wolter
Indiana University	wolter
OSG Consortium	wolter
Pittsburgh Supercomputing Center	wolter
San Diego Supercomputer Center	nickel
University of Kentucky	wolter
University of Texas at Austin	uxwolter

Access/Logging In: Tips (Passwords/passphrases)

- Passwords
    - Don't reuse passwords
    - Longer is better
    - Don't keep digital plaintext copies of passwords
    - Don't Hard code password in files
    - Don't share passwords
- Use password-manager program
- Use SSH keys, ssh-agent
- Multi-factor Authentication(MFA)

Access/Logging In: Tips (Passwords/passphrases)

- SDSC does not use local passwords. For direct access to SDSC systems you will need to login with your SDSC local username and
  - (for ACCESS) either ssh key(& agent forewarding) or your ACCESS-CI portal password (&MFA)
  - (For non-ACCESS) either ssh key(&agent forwarding) or UCSD AD password. (&MFA)
- For the portals SDSC uses federated login(globus)
  - (for ACCESS) user ACCESS-CI portal credential
  - (for non-ACCESS) need to get UCSD AD account and invitation

File Systems: Common Issues

- Problem: File sharing
  - Solution: Use Unix commands chmod, chown, chgrp to manage file permissions
  - Review file/directory ownership and permissions(ls)
  - Find common groups for sharing (id,groups)

- Problem: System unresponsive/slow
  - Solution: Contact user support
  - Review you usage of the files system to make sure you are not the problem

- Problem: Missing, corrupted files
  - Solution: Contact User support team
  - Review file/directory ownership

File systems: Tips

- Common File systems and their utilization
  - Home – Usually limited in space
  - Scratch - Large space, limited persistence, no backup
  - Node local scratch(SSD)- good performance, only available during job
  - Persistent storage – good performance, limited persistence
  - Archival- Slow, backup
- Types of file systems
  - Lustre
  - nsf
  - gpfs
  - ceph

File systems: Tips

- Review file permissions ls –l
- Review user group
  - Groups username, id username
- Controls: Permissions granularity levels
  - (Attribute), User, Group, Other
  - Read(4), Write(2), Execute(1)
  - Default 755 (User(read, write, execute):Group(read, execute): Other(read, execute)
- Use chmod, chown commands to modify ownership and permissions

File systems: tips

- Have a backup Plan
  - Backups should be done at regular intervals that make sense with your project
    - Frequency
    - Ensure backups are made on "good" versions
    - Use Checksum on data transfers to ensure no corruption
    - User Version Control
  - Don't back up Everything
    - Clean up unnecessary files
    - Only back up files not easily reproduced or replaces
      - Source codes, scripts config files and large output files
  - Backups should be done to a different independent resource
    - Ensure credentials would not allow hackers to get onto the external resource
  - ACCESS to HPC system and file retention is usually limited. Transferring data takes time
    - Data on the system is the users responsibility
    - Plan ahead for data transfers
    - Convert many small files into a single archive file before transfer
  - Test the backup plan with the restore process

Running jobs, Allocations, Job Charging: Common Issues

- Problem: Unable to submit jobs

  - Common errors

    - sbatch: error: Project balance is not enough to run the job

    - sbatch: error: QOSMaxNodePerJobLimit

    - Sbatch: error: Invalid account or account/partition combination specified

    - Sbatch: error: Job violoates accounting/QOS policy (job submit limit, user's size and/or time limits)

  - Solution: User tools to evaluate allocations and scheduler policies

  - Solution: Request more time

- Problem: Understanding Charging

  - Charging

Accounting/Charging: Tips

- Different resources use different home grown tools to help users evaluate their usage.
  - expanse-client tool(SDSC)
  - TSCC_client tool (TSCC)
  - projects (PSC)
  - taccinfo (TACC)
- Expanse uses expanse-client tool
  - Per User
  - Per Project
  - Per Resource
- ACCESS Portal accounting updated at various intervals
- Slurm tools : sacct

```
login01 ~]$ expanse-client user train112 -p

 Resource  expanse


 NAME     STATE  PROJECT  TG PROJECT    USED
AVAILABLE  USED BY PROJECT
-----------------------------------------------------------
---------
 train112  allow  gue998  TG-CIE960001S  337
200000       114621
```

Jobs/Policies/Schedulers: tips (charging)

- All systems charge differently
  - Each resource has a unique definition of an SU
  - Some are in core hours, some are in node hours, etc
  - Some charge for other components such as memory
- Visit the user guide for specifics
  - Check for opportunities to save
- Allocations are shared
- Charging is generally based on what is requested, not how resources are used
- Do test jobs to evaluate
  - Slurm commands to collect information
    - sacct –u $USER
    - sacct –j $JOBID

Jobs/Policies/Schedulers: Common Issues

- Problem: Unable to submit jobs
  - Solution: Review errors
    - Common Sbatch errors:
      - Invalid account or account/partition
      - Job violates accounting/QOS policy (job submit limit, user's size and/or time limits)
      - Project balance is not enough
      - QOS Max NodePerJobLimit

- Problem: Jobs not running
  - Solution: Use squeue to identify "reasons" for pending jobs
  - Solution: Check user notifications for pending or active System Maintenance
    - https://support.access-ci.org/outages

Running Jobs: Tips Jobs/Policies/Schedulers(Slurm)

- Slurm tools to help monitor and manage jobs
  - squeue: view running or queued job and job step information
  - sacctmgr: view or modify Slurm account information
  - scontrol: view or modify Slurm configuration including jobs, job steps, nodes, partitions, reservations, and overall system configuration.
  - sacct: displays job accounting data
  - sinfo: view partition and node information
  - User Guide

Jobs/Policies/Schedulers : tools (squeue: Job Status)

- squeue [OPTIONS…] (PBS,MAUI: qstat,showq)
  - View information about queued or running jobs

```
[nickel@login01 ~]$ squeue | more
       JOBID PARTITION     NAME     USER ST       TIME  NODES NODELIST(REASON)
    13574113   compute 80dgree_   yweng3 PD       0:00      2 (MaxMemPerLimit)
    12668967   compute 0-xtensi  kavousi PD       0:00      1 (MaxMemPerLimit)
    14756880   compute job001_p  amytsai PD       0:00     10 (Reservation)
    14800161   compute namd-com sasadian PD       0:00      6 (QOSMaxCpuPerUserLimit)
    14800218   compute namd-com sasadian PD       0:00      6 (QOSMaxCpuPerUserLimit)
    14789098   compute bl_8JHNp    uscms PD       0:00      1 (MaxJobsPerAccount)
```

- Running jobs

```
14813206    compute post0110 lpegolot  R   16:30:28    1 exp-9-35
14800090    compute namd-com sasadian  R   16:13:01    6 exp-2-29,exp-3-23,exp-4-33,exp-7-20,exp-9-[03,26]
14764467    compute V1WTReRU  aminkvh  R   16:08:56    1 exp-2-54
14773832    compute V4R1639Q  aminkvh  R   15:55:58    1 exp-8-14
14800092    compute namd-com sasadian  R   15:29:28    6 exp-4-29,exp-7-[07,39-40],exp-9-[28,41]
14812166    compute  scratch mlaskow2  R   15:53:59    1 exp-10-20
14812167    compute  scratch mlaskow2  R   15:39:34    1 exp-8-48
14800158    compute namd-com sasadian  R   15:17:18    6 exp-2-[26,50],exp-4-[52-53],exp-7-[42-43]
14812168    compute  scratch mlaskow2  R   15:20:01    1 exp-10-37
```

Jobs/Policies/Schedulers : tools
(squeue: Job Status)

- Queue states
  - PD –PENDING, R – RUNNING, S – SUSPENDED, CA – Canceled, CG – COMPLETING, CD – COMPLETED

- squeue – Common "reasons" for pending jobs
  - MaxMemPerLimit
  - QOSMaxNodePerUserLimit
  - Priority
  - ReqNodeNotAvail, Unavailable nodes: exp-x-xx
  - ReqNodeNotAvail, Reserved for maintenance
  - Licenses
  - Dependency (file system, license, another job)
  - Priority

- System Maintenance
  - https://support.access-ci.org/outages

Jobs/Policies/Schedulers: tools (scontrol)

- scontrol [OPTIONS...] [COMMAND...]
  - scontrol show job <<local_jobid>>
  - view or modify Slurm configurations and state on currently queued or running jobs

```
login01]$ scontrol show job 32658556
JobId=32658556 JobName=NGBW-JOB-BEAST2_XSEDE-43842C4A2D8C4B5085E71285ADC4D5DB
   UserId=testuser(505687) GroupId=use300(6099) MCS_label=N/A
   Priority=4509 Nice=0 Account=sds121 QOS=shared
   JobState=RUNNING Reason=None Dependency=(null)
   Requeue=1 Restarts=0 BatchFlag=1 Reboot=0 ExitCode=0:0
   RunTime=00:46:22 TimeLimit=03:00:00 TimeMin=N/A
   SubmitTime=2024-07-30T12:22:15 EligibleTime=2024-07-30T12:22:15
   AccrueTime=2024-07-30T12:22:15
   StartTime=2024-07-30T12:22:16 EndTime=2024-07-30T15:22:16 Deadline=N/A
   SuspendTime=None SecsPreSuspend=0 LastSchedEval=2024-07-30T12:22:16
Scheduler=Main
   Partition=shared AllocNode:Sid=login01:2295441
   ReqNodeList=(null) ExcNodeList=(null)
   NodeList=exp-16-53
   BatchHost=exp-16-53
   NumNodes=1 NumCPUs=1 NumTasks=1 CPUs/Task=1 ReqB:S:C:T=0:0:*:*
   ReqTRES=cpu=1,mem=1G,node=1,billing=3600
   AllocTRES=cpu=1,mem=1G,node=1,billing=3600
   Socks/Node=* NtasksPerN:B:S:C=1:0:*:* CoreSpec=*
   MinCPUsNode=1 MinMemoryNode=1G MinTmpDiskNode=0
   Features=(null) DelayBoot=00:00:00
   Reservation=cipres-shortjobs
   OverSubscribe=OK Contiguous=0 Licenses=cipres:1 Network=(null)
   Command=./_batch_command.run
   WorkDir=/expanse/projects//NGBW-JOB-BEAST2_XSEDE-
43842C4A2D8C4B5085E71285ADC4D5DB
   StdErr=/expanse/projects//NGBW-JOB-BEAST2_XSEDE-
43842C4A2D8C4B5085E71285ADC4D5DB/_scheduler_stderr.txt
   StdIn=/dev/null
   StdOut=/expanse/projects//NGBW-JOB-BEAST2_XSEDE-
43842C4A2D8C4B5085E71285ADC4D5DB/_scheduler_stdout.txt
   Power=
   MailUser=user@sdsc.edu
MailType=INVALID_DEPEND,BEGIN,END,FAIL,REQUEUE,STAGE_OUT
```

Jobs/Policies/Schedulers: tools (sacct)

- ## sacct [OPTIONS...]
  - ### View accounting data for completed jobs and job steps

```
l@login01 user_support]$ sacct -j 32659299 -l
JobID         JobIDRaw        JobName    Partition  MaxVMSize  MaxVMSizeNode  MaxVMSizeTask  AveVMSize      MaxRSS MaxRSSNode MaxRSSTask    Ave
RSS MaxPages MaxPagesNode   MaxPagesTask   AvePages      MinCPU MinCPUNode MinCPUTask     AveCPU    NTasks  AllocCPUS   Elapsed       State Ex
itCode AveCPUFreq ReqCPUFreqMin ReqCPUFreqMax ReqCPUFreqGov     ReqMem ConsumedEnergy  MaxDiskRead MaxDiskReadNode MaxDiskReadTask    AveDis
kRead MaxDiskWrite MaxDiskWriteNode MaxDiskWriteTask    AveDiskWrite     ReqTRES  AllocTRES TRESUsageInAve TRESUsageInMax TRESUsageInMaxNode T
RESUsageInMaxTask TRESUsageInMin TRESUsageInMinNode TRESUsageInMinTask TRESUsageInTot TRESUsageOutMax TRESUsageOutMaxNode TRESUsageOutMaxTas
k TRESUsageOutAve TRESUsageOutTot
```

- ## For formatted output

```
@login01 user_support]$ sacct -j 28582088 --format=JobID%20,Partition,CPUTime,MaxRSS,MaxDiskRead,MaxDiskWrite,NCPUs,ReqNodes,NNodes,ReqMem
            JobID  Partition     CPUTime     MaxRSS  MaxDiskRead MaxDiskWrite     NCPUS ReqNodes   NNodes     ReqMem
-------------------- ---------- ---------- ---------- ------------ ------------ ---------- -------- -------- ----------
         28582088     shared 16-00:27:44                                            64        1        1    112.50G
      28582088.batch         16-00:27:44  12143272K      232.05M      120.89M        64        1        1
     28582088.extern         16-00:27:44       1856K        0.01M        0.00M        64        1        1
```

Jobs/Policies/Schedulers: Tools (acctmrg, sinfo)

- Tools for reviewing system policies,, partition activity and setup
  - sacctmrg – used to view and modify slurm account information
  - sinfo –used to view information about nodes and partitions
- User Guide

Partition Name	Max Walltime	Max Nodes/Job	Max Running Jobs	Max Running + Queued Jobs	Charge Factor	Notes
compute	48 hrs	32	32	64	1	Exclusive access to regular compute nodes; *limit applies per group*
ind-compute	48 hrs	32	32	64	1	Exclusive access to Industry compute nodes; *limit applies per group*
shared	48 hrs	1	4096	4096	1	Single-node jobs using fewer than 128 cores
ind-shared	48 hrs	1	32	64	1	Single-node Industry jobs using fewer than 128 cores

```
[nickel@login01 ~]$ sinfo
PARTITION       AVAIL  TIMELIMIT   NODES   STATE NODELIST
compute            up 2-00:00:00       3 drain$ exp-14-30,exp-16-[53-54]
compute            up 2-00:00:00       1  maint exp-9-23
compute            up 2-00:00:00       2  down* exp-12-12,exp-14-53
compute            up 2-00:00:00       3   comp exp-8-29,exp-9-25,exp-13-19
compute            up 2-00:00:00       1   drng exp-8-26
compute            up 2-00:00:00       2  drain exp-9-30,exp-14-50
compute            up 2-00:00:00       8   resv exp-13-[55-56],exp-16-[55-56],exp-17-[53-
compute            up 2-00:00:00     185    mix exp-1-[22,25-26,48-49,51-55],exp-2-[01-02
30,39-40,42,44,46-47],exp-13-[01-07,12,16,20,22,27,42,46,48,50,52,54],exp-14-[01-02,04,
compute            up 2-00:00:00     375  alloc exp-1-[01-21,23-24,27-47,50,56],exp-2-[03
-[21-28,34,38-54],exp-12-[01-11,13-16,29,31-38,41,43,45,48-56],exp-13-[08-11,13-15,17-1
compute            up 2-00:00:00     154   idle exp-4-[15-56],exp-5-[01-56],exp-6-[01-56]
```

```
[nickel@login01 ~]$ sacctmgr show qos format=name%20,MaxWall,MaxTRESPU%20,MaxJobsPU,MaxSubmitPU,MaxTRESPA%20,MaxJobsPA,MaxSubmitP
                Name     MaxWall             MaxTRESPU MaxJobsPU MaxSubmitPU              MaxTRESPA MaxJobsPA MaxSubmitPA
-------------------- ----------- --------------------- --------- ----------- --------------------- --------- -----------
              normal  2-00:00:00       cpu=8192,node=64        32          64      cpu=16384,node=128        32          64
       shared-normal  2-00:00:00       cpu=8192,node=64      4096        4096      cpu=16384,node=128      4096        4096
 large-shared-normal  2-00:00:00                                2           4                                  4           4
      preempt-normal  7-00:00:00                              128           cpu=4096,node=32                            128
          gpu-normal  2-00:00:00   cpu=160,gres/gpu=16+         4           8         gres/gpu=32,node=8         8          16
   gpu-shared-normal  2-00:00:00   cpu=240,gres/gpu=24+        24          24   cpu=320,gres/gpu=32+        24          24
  gpu-preempt-normal  7-00:00:00     gres/gpu=24,node=6        12          16     gres/gpu=48,node=12        16          20
```

Application Software: Common Issues

- Problem: Missing software
  - Solution: User Module commands to id if software is available
  - Solution: Compile own software in personal directory space
- Problem: Missing software version
  - Solution: Use containers
- Problem: Unable to load software
  - Solution: User module spider command to see all dependencies to load
- Problem: Need Licensed Software (Gaussian, VASP)
  - Solution: Contact help desk

Applications/software: tips

- Software is made available
  - Modules
  - Compile
  - Containers
    - Ask help desk
- Most HPC system use module to manage their software stacks
  - Check for available software with the module commands
    - module [options] sub-command [args ...]
- Login nodes, compute nodes are different
  - Compiling codes need to happen on the nodes on which they will run
  - Modules need to be loaded on the nodes on which applications will run
- Software managed by the resource provider has usually been tested and fine tuned for the specific resources

Software: Navigating with Modules

Command	Description
`module list`	Currently Loaded Modules
module avail	List of available software modules based on your current module path
module spider	List all available software and versions on the system
module spider <application name>	List available application specific modules and module details, including versions and dependencies
module load [module file]	Load module(s) or specify unresolved dependencies
module show [module file]	Display information about loaded modules including changes, dependencies, versions and paths
module unload [module file]	Unloads a specified module form the environment
module purge	Unloads all the loaded modules
module reset	Reset modules to default settings

System Performance: Common Issues

- Login Nodes

- Compute nodes

  - GPU

  - CPU

- Filesystems

  - Lustre (project storage, scratch)

  - NSF (home)

System Performance : Monitoring Resource Utilization

- System evaluation Tools
  - top, htop, atop : display Linux processes
  - mpstat : display processors related statistic
  - sar : display system activity report
  - free: display memory statics
  - ps: display active processes
  - nvidia-smi: display gpu activity and statistic
- Job evaluation tools
  - seff(slurm efficiency) after job is complete
  - Slurm tools: sacct, sacctmgr
- Profiling tools
  - gprof
- Debuggers
  - Totalview, dbx

Best Practices: Getting help

- Understand your problem

- Engage with appropriate support tools

- Help Desk

  - While help desk staff are exceptional, they should be considered general practitioners

  - Provide relevant and adequate information for helpdesk to reduce iterations

    - Username, Account, System, Jobid, specific error message if available, etc.
    - The user with the problem should submit the help ticket

- Always be nice to the support desk! ☺

Best Practices: Risk Management

- Manage/secure your credentials
- Manage/secure you personal devices
- Manage directory and file access
  - Use least privileges
  - Use chmod, chown commands to modify ownership and permissions
- Data Resiliency
  - Clean up unnecessary files
  - Back up Data
  - Use integrity checking
    - Data transfers, bad hardware
- Have a contingency plan(Data recovery plan)
  - Off site backup

Best Practices: jobs and job charging

- Check user guide for accounting policies
- Use system tools for most up to date accounting information
  - Slurm for individual job details
    - sacctmgr
    - sacct
    - squeue
    - scontrol
    - sinfo
  - Home grown tools for accounting information
    - Expanse-client

Best Practices: Software

- Review user guide for tools available
- Use system installed applications when available
- Use containers to manage out of date software

In Conclusion

- Manage your risks by securing your accounts, research and data

- Be a good citizen

- There is help available if you know where to look

Allocation Opportunities

- Trial Accounts: consult@sdsc.edu
  - Eligibility: U.S-based researcher or educator, at the graduate-student level or higher.
  - ACCESS-CI portal account
  - 1K Expanse Compute &/ 100 GPU hours
- ACCESS-CI Allocations: https://allocations.access-ci.org/
  - Eligibility: U.S-based researcher or educator, at the graduate-student level or higher.
  - Explore(< 400K), Discover (<1.5M), Accelerate(<3M), Maximize (>3M)
  - Getting started Guide: https://allocations.access-ci.org/get-your-first-project
  - ACCESS Help Desk: https://support.access-ci.org/?check_logged_in=1
- HPC@UC Allocations: consult@sdsc.edu (<500K Sus)
  - Eligible for UC researchers, , at the graduate-student level or higher.

Review and helpful links

- ACCESS AUP
  - https://identity.access-ci.org/aup.html
- SSH Key setup
  - https://github.com/sdsc-hpc-training-org/hpc-security
- Comet Webinar- Indispensable Security: Tips to Use SDSC's HPC Resources Securely
  - *https://www.sdsc.edu/event_items/202007_CometWebinar.html*
- Expanse Webinar: Enduring Security: The Journey Continues
  - *https://education.sdsc.edu/training/interactive/202204_expanse_enduring_security/index.html*
- Access Allocations:
  - https://allocations.access-ci.org/
- Training Catalog
  - *https://www.sdsc.edu/education_and_training/training_hpc.html#catalog*

Questions

- ## [How to Reach Support](#)

  - consult@sdsc.edu

  - https://support.access-ci.org/