

# Things to do while you are waiting

- Course slides are available at:  
[https://hprc.tamu.edu/training/aces\\_containers.html](https://hprc.tamu.edu/training/aces_containers.html)
- Log into TAMU VPN (if you're off campus)
- Get ready to launch a terminal on the FASTER cluster for interactive exercises (ask if you don't know how).

# HIGH PERFORMANCE RESEARCH COMPUTING

## Introduction to Containers Tutorial

featuring [Charliecloud](#) on the [FASTER](#) cluster

an HPRC + LANL Training Collaboration

February 14, 2023



High Performance  
Research Computing

DIVISION OF RESEARCH

**Spring 2023**



# Outline

## Morning

- Overview of Containers
- Connecting to the FASTER cluster
- Charliecloud Exercises
- Charliecloud Q&A

## Afternoon

- Charliecloud Tech Lab (separate registration)

# Course Objectives

The researcher should be able to:

- Decide whether containers are right for you
- Find container images in repositories
- Use Charliecloud at HPRC for basic container tasks

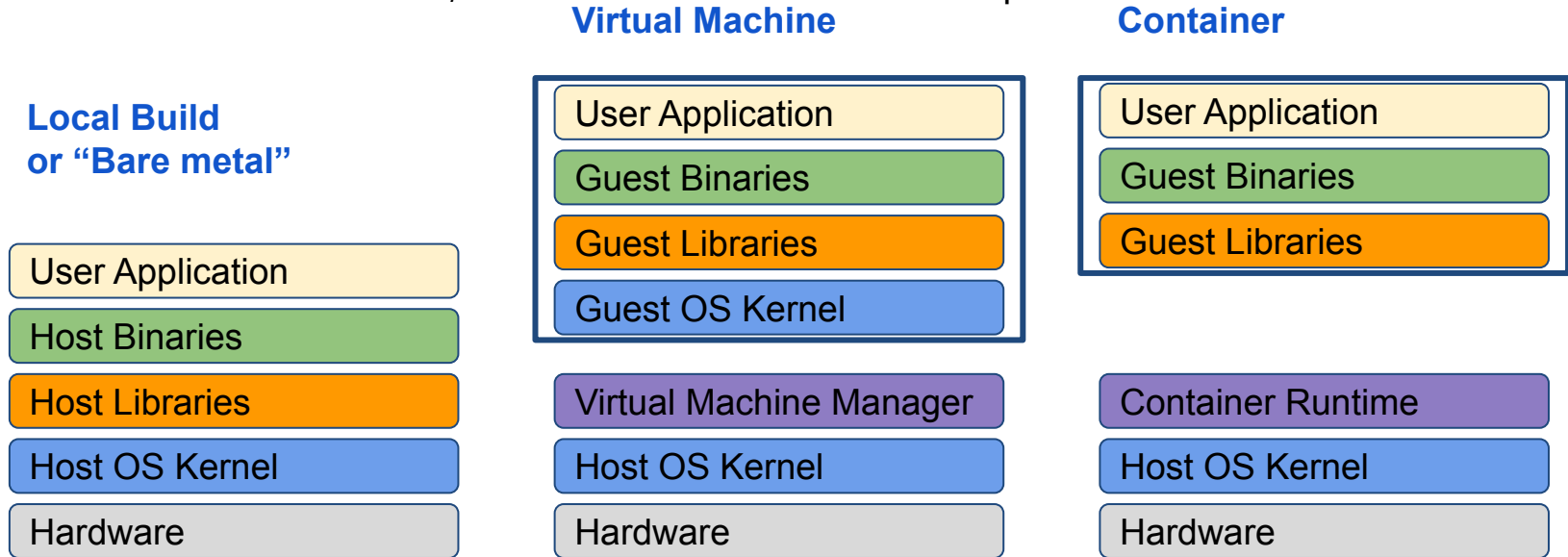
# Learning Resources

- HPRC Wiki <https://hprc.tamu.edu/wiki/SW:Charliecloud>
- HPRC on Youtube <https://www.youtube.com/c/TexasAMHPRC>
- Charliecloud Manual <https://hpc.github.io/charliecloud/>
- Docker Manual <https://docs.docker.com/>
- Other container courses:
  - NBIS <https://nbis-reproducible-research.readthedocs.io/en/latest/singularity/>
  - Arizona <https://learning.cyverse.org/projects/Container-camp-2020/>
  - TACC <https://learn.tacc.utexas.edu/mod/page/view.php?id=95>

# Overview of Containers

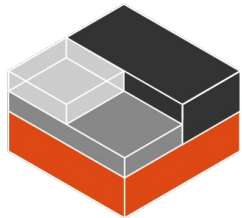
# Introduction to Containers

- Containers make Applications more portable.
- Unlike in VMs, the OS Kernel is not duplicated.

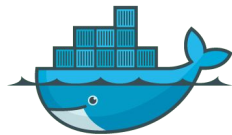


# Popular Containers

Instant deployment to users on different devices!



LXC  
2008



docker

Docker  
2013



Singularity  
2015



SHIFTER

Shifter  
2016



Charliecloud

Charliecloud  
2017



Podman  
2018

★ *Last week!*

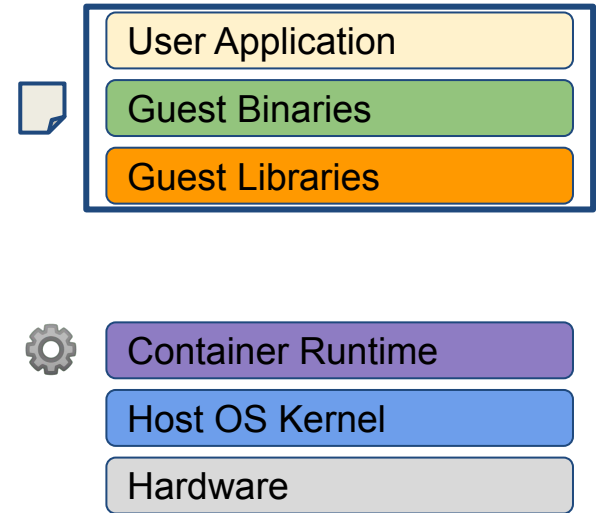
★ *Today!*



# Basics

Containers come in two parts:

- **Image:**
  - A file containing all the parts of an environment, libraries and applications
  - Generally built by experts
  - Found in online repositories
- **Runtime:**
  - Compatibility layer translates between the container environment and the host operating system
  - Runtime is installed by cluster administrators



# Why use Containers?

- **Shareability:**
  - Share your container image file by uploading to a public repository
  - Use images shared by others
- **Portability:**
  - Use images on any computer with the same architecture (x84-64)
- **Reproducibility:**
  - Container users are largely unaffected by changes to the cluster environments

# Overview of Charliecloud

Proceed to Charliecloud Tutorial Document

Exercises coming up next

# Log into FASTER via HPRC Portal

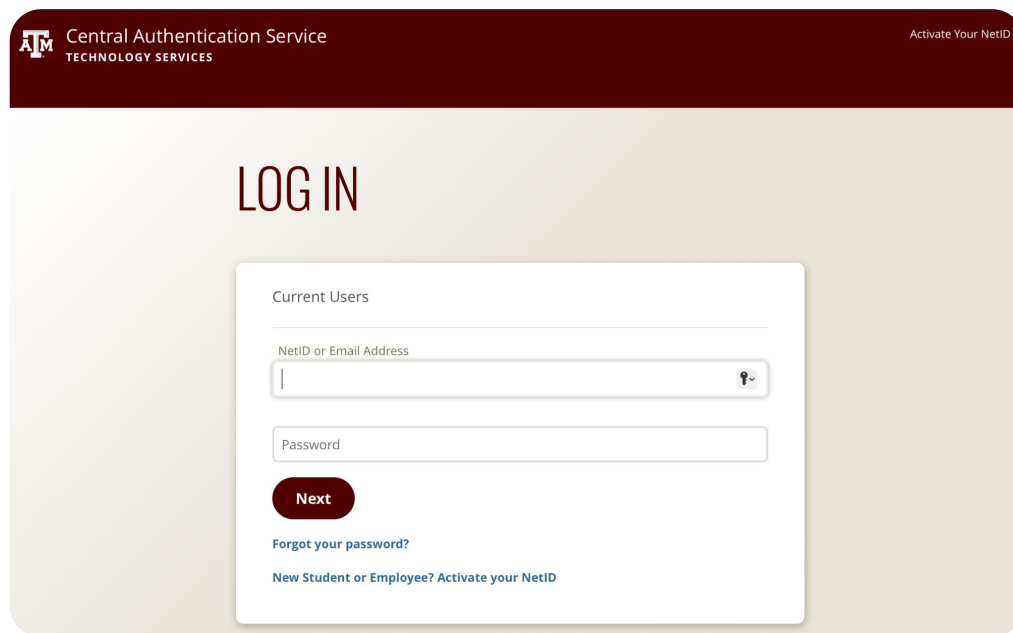
# Accessing the HPRC Portal

- HPRC webpage: [hprc.tamu.edu](http://hprc.tamu.edu), Portal dropdown menu

The screenshot displays the HPRC website header and navigation. The main navigation bar includes links for Home, User Services, Resources, Research, Policies, Events, About, and Portal. The Portal link is highlighted with a yellow box. A dropdown menu is open from the Portal link, listing Terra Portal, Grace Portal, FASTER Portal, and FASTER Portal (ACCESS). The FASTER Portal and FASTER Portal (ACCESS) items are also highlighted with yellow boxes. In the top right corner, there are social media icons for Twitter, YouTube, and LinkedIn, along with a search icon. Below the navigation bar, there is a banner image of server racks. On the left side, there is a 'Quick Links' section with a list of links: New User Information, Accounts, Apply for Accounts, Manage Accounts, User Consulting, Training, and Knowledge Base. At the bottom of the page, there is a banner for 'TEXAS A&M UNIVERSITY TO ACQUIRE A'.

# Accessing FASTER via the HPRC Portal (TAMU)

Log-in using your TAMU NetID credentials.



The screenshot shows the login interface for the Central Authentication Service. At the top, there is a dark red header with the TAMU logo, the text "Central Authentication Service TECHNOLOGY SERVICES", and a link "Activate Your NetID". Below the header, the word "LOG IN" is displayed in large, dark letters. The main content area is a light beige color. In the center, there is a white login form with a dark red border. The form has a title "Current Users" and a subtitle "NetID or Email Address". It contains two input fields: "NetID or Email Address" and "Password". Below the "Password" field is a dark red "Next" button. At the bottom of the form, there are two links: "Forgot your password?" and "New Student or Employee? Activate your NetID".

Central Authentication Service  
TECHNOLOGY SERVICES

Activate Your NetID

## LOG IN

Current Users

NetID or Email Address

Password

Next

[Forgot your password?](#)

[New Student or Employee? Activate your NetID](#)

# Accessing FASTER via the HPRC Portal (ACCESS)

Log-in using your ACCESS credentials.

The screenshot shows the ACCESS portal interface. At the top left is the ACCESS logo, and at the top right is the text "Powered By CILogon" with the CILogon logo. Below the header is a "Consent to Attribute Release" section with a dropdown arrow. The consent text reads: "TAMU FASTER ACCESS\_OOD requests access to the following information. If you do not approve this request, do not proceed." followed by a list of requested attributes: "Your CILogon user identifier", "Your name", "Your email address", and "Your username and affiliation from your identity provider". Below the consent section is a "Select an Identity Provider" section. It features a dropdown menu with "ACCESS CI (XSEDE)" selected. Below the dropdown is a "Remember this selection" checkbox and a "Log On" button. At the bottom of this section, it says "By selecting 'Log On', you agree to the [privacy policy](#)". At the very bottom of the page, there is a footer with links for "FAQs" and "help@cilogon.org".

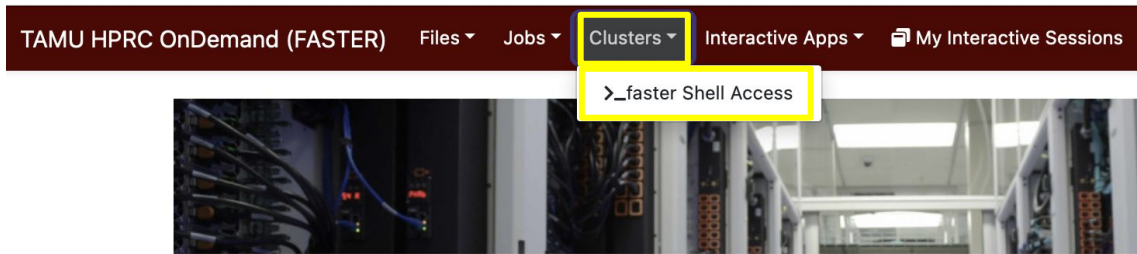
The screenshot shows the ACCESS portal login screen. At the top left is the ACCESS logo, and at the top right is the CILogon logo. The main heading is "Login to CILogon". Below this are two input fields: "ACCESS Username" and "ACCESS Password". There is a "Don't Remember Login" checkbox and a "Login" button. To the right of the login fields is the CILogon logo and the text "CILogon facilitates secure access to CyberInfrastructure (CI)". Below this, there are several links: "If you had an XSEDE account, please enter your XSEDE username and password for ACCESS login", "Register for an ACCESS Account", "Forgot your password?", and "Need Help?". At the bottom of the page, there is a link that says "Click Here for Assistance".

This is a close-up of the "Select an Identity Provider" dropdown menu. The dropdown is open, showing the selected option "ACCESS CI (XSEDE)" with a small question mark icon to its right.

Select the Identity Provider appropriate for your account.

# Shell access via the HPRC Portal

Access through (most) web browsers  
-Top Banner Menu “Clusters” -> “Shell Access”



OnDemand provides an integrated, single access point for all of your HPC resources.

## Message of the Day

### IMPORTANT POLICY INFORMATION

- Unauthorized use of HPRC resources is prohibited and subject to criminal prosecution.
- Use of HPRC resources in violation of United States export control laws and regulations is prohibited for non-citizens and legal residents.
- Sharing HPRC account and password information is in violation of State Law. Any shared accounts w
- Authorized users must also adhere to ALL policies at: <https://hprc.tamu.edu/policies>



# Charliecloud Tutorial

with exercises

# Tutorial Complete

# Conclusion

- Run Containers on clusters! It's easy.
- HPRC supports Charliecloud
- Convert Docker to Charliecloud!
- Ask for help!

# Questions



Join Us for  
**Charliecloud Tech Lab**  
this afternoon!

register at

[hprc.tamu.edu/training/aces\\_containers\\_techlab.html](https://hprc.tamu.edu/training/aces_containers_techlab.html)

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  - NBIS <https://nbis-reproducible-research.readthedocs.io/en/latest/singularity/>
  - Arizona <https://learning.cyverse.org/projects/Container-camp-2020/>
  - TACC <https://learn.tacc.utexas.edu/mod/page/view.php?id=95>

# Thank you

Contact: [help@hprc.tamu.edu](mailto:help@hprc.tamu.edu)