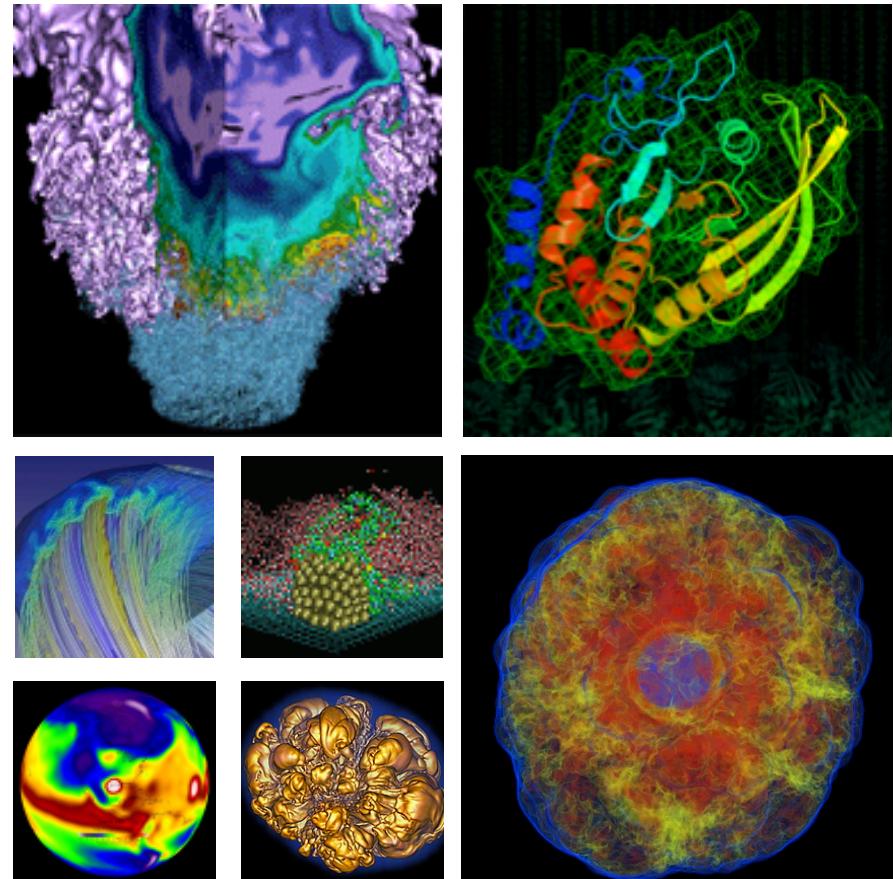


# Containers and Science



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# Focus on Science



- NERSC supports the broad mission needs of the six DOE Office of Science program offices
- 6,000 users and 750 projects
- 2,078 referred publications in 2015
- 2015 Nobel prize in physics supported by NERSC systems and archive



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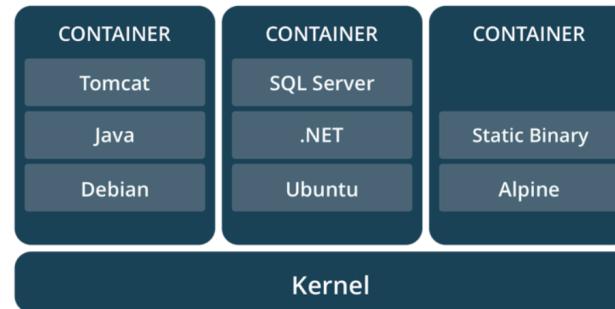
<https://github.com/NERSC/Shifter-Tutorial>



# Why Containers?



- **Light weight, executable piece of software that contains everything you need to run it**
  - Code, system libraries and tools, environment, settings
- **All software and processes are isolated from their surroundings**
- **Portable**
- **Typically used for single instance programs**

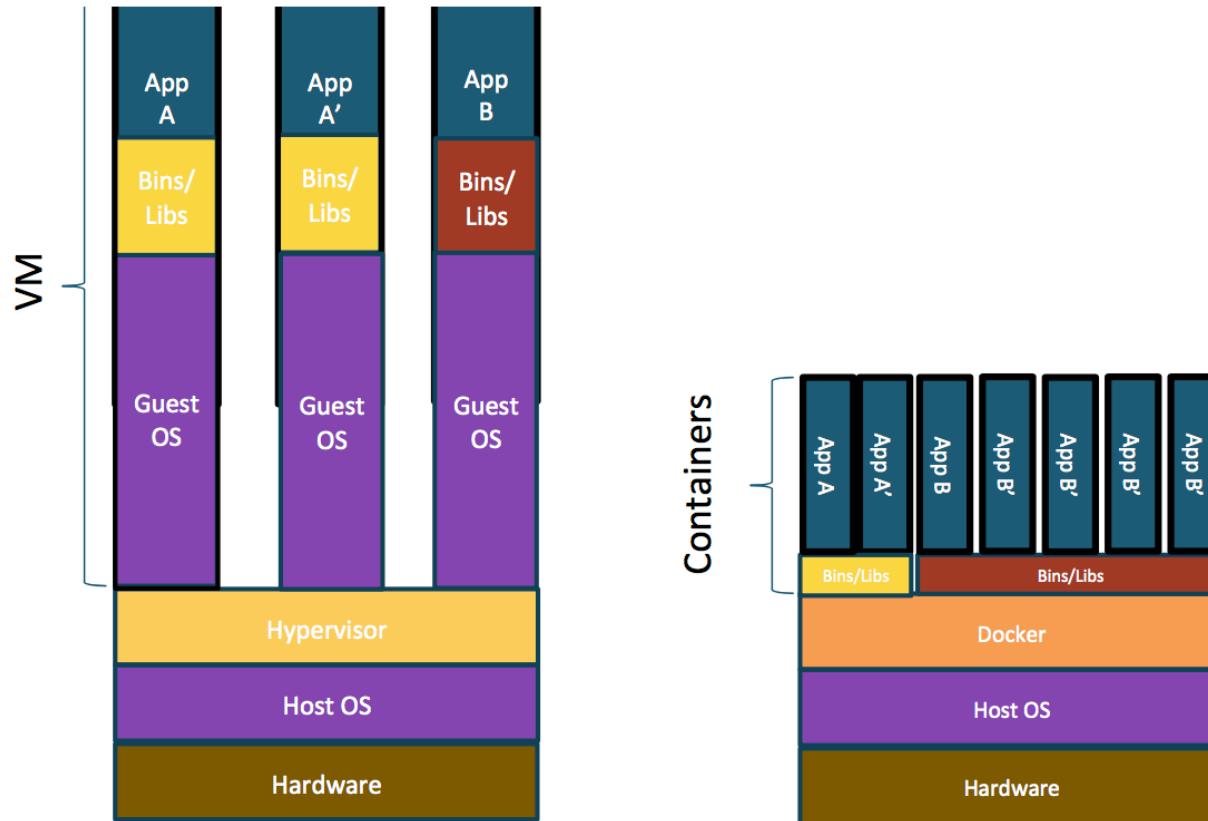


# Containers and Science



- **Reproducibility**
  - Everything you need to redo a scientific analysis
  - Image manifest contains all information about environment
    - Scripts, portable input files can be managed with version controller for greater control
- **Portability**
  - Runs on every system
- **Reduction of Effort**
  - Compile takes 10 hours? Just do it once and share it with everyone
  - System doesn't have the right library version? Yum install it yourself in the container

# Containers and System Administration



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<https://github.com/NERSC/Shifter-Tutorial>



# Docker: Modern Containers

- Started in 2013
- Complete toolset
  - Create, run, and share images

Dockerfile: Standardized set of instructions for building your image

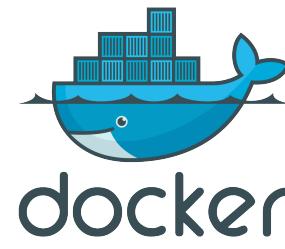
```
# Basic Docker deployment of Ubuntu container running Apache2
#
# Choose the Ubuntu image
#
FROM ubuntu

# Run the commands we need to create our environment
#
# Update the Ubuntu image and install Apache and Curl
#
RUN apt-get update && apt-get install -y apache2 curl

# Create the basic landing page file
#
RUN echo "Hello Docker World" > /var/www/html/index.html

# Expose the HTTP server to the outside world
#
EXPOSE 80

# Run the Apache server
#
RUN echo /usr/sbin/apachectl start >> /etc/bash.bashrc
```



Docker Hub: Central portal for sharing your images

A screenshot of the Docker Hub website's "Explore Official Repositories" section. The interface has a dark header with a search bar and navigation links for "Explore", "Help", "Sign up", and "Sign in". Below the header is a grid of repository cards. Each card contains the repository name, icon, maintainer, star count, pull count, and a "DETAILS" button.

Repository	Maintainer	Stars	Pulls	Details
nginx	nginx	5.9K	10M+	<a href="#">DETAILS</a>
redis	redis	3.7K	10M+	<a href="#">DETAILS</a>
busybox	busybox	995	10M+	<a href="#">DETAILS</a>
ubuntu	ubuntu	5.9K	10M+	<a href="#">DETAILS</a>
registry	docker	1.5K	10M+	<a href="#">DETAILS</a>
alpine	alpine	2.1K	10M+	<a href="#">DETAILS</a>



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