

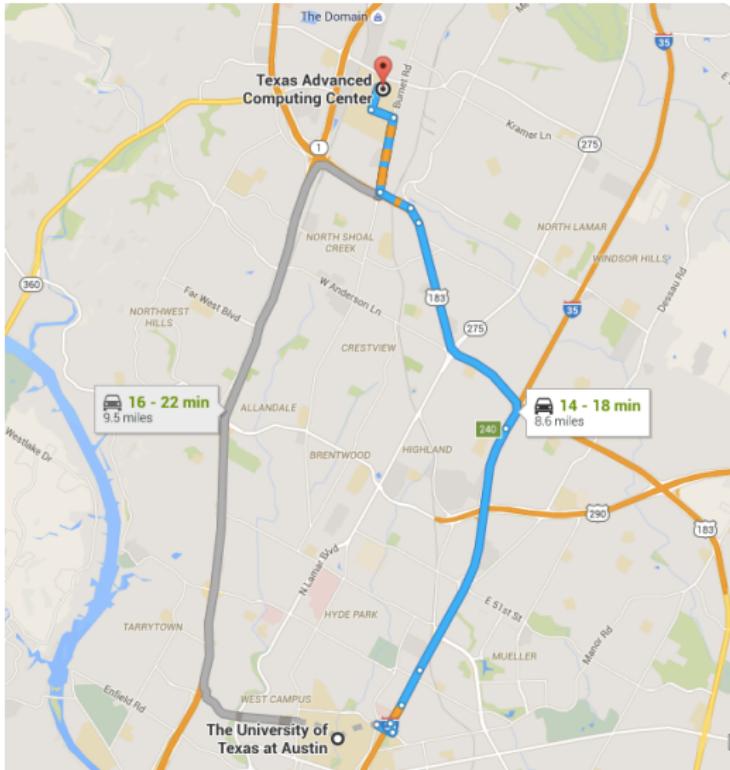
# Overview of TACC

Fall 2024

last formatted: January 13, 2025

Your instructors work at the  
Texas Advanced Computing Center

# So where is TACC?



# How do you get to TACC?



# Pickle Campus

Formerly Balcones Research Center,  
location of some of the best wildflowers in Austin.



# James Jarrell ‘Jake’ Pickle

- 1913–2005, congressman  
1963–1995
- US Navy during WW II
- important role in Civil Rights Act and Social Security reform



# TACC

- Started in 2001 with 10-ish people, now 180
- UT has had computing centers before; in 2001 TACC became independent unit: falls under VP for research.
- First major supercomputer in 2008: Ranger (top500 ranking: #7); next Stampede1: #6, Stampede2 (highest ranking #12);
- Currently: Frontera, (highest ranking #5), and largest academic computer in the world; Stampede3 unranked.

# TACC now

- 180-ish people, divided into Systems, High Performance Computing, Computational Biology, Big Data, Machine learning, Visualization, Outreach (and more) groups.
- A dozen machines-big-enough-to-have-a-name
- 1000 projects, 200 public data collections
- 30 web portals with 35k users
- new 10MWatt data center
- second new building in 10 years

# Our new building



# **Supercomputers come and go**

TACC has operated some of the leading supercomputers in the country / the world since 2008,

Want to guess how much a computer costs?

How long it stays operational?

# Frontera

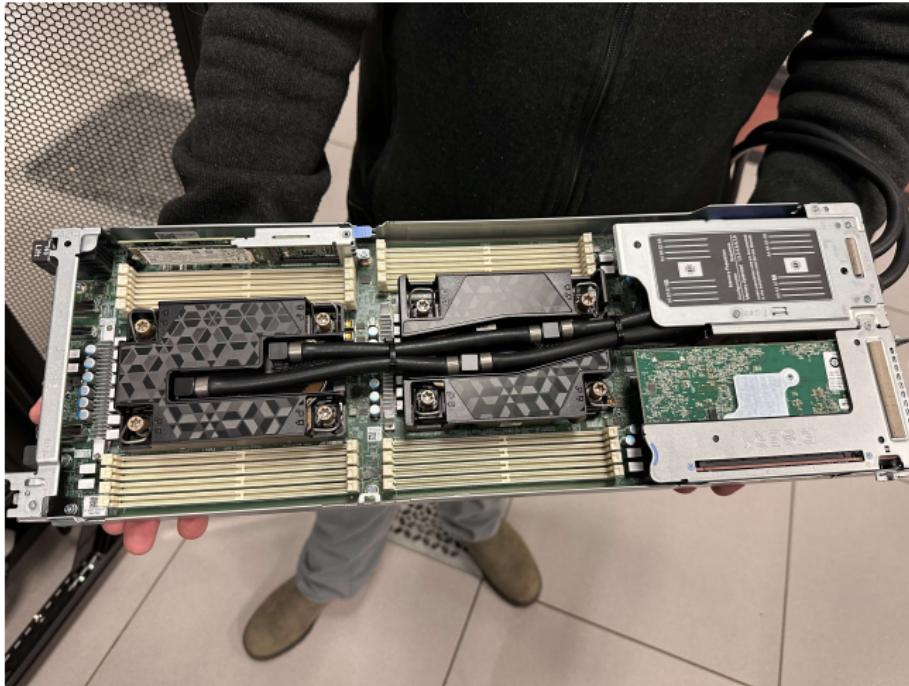
- Our currently most powerful machine, operational as of Right Now.
- Rough cost: \$60M for hardware, and similar for personnel.
- 91 racks with 8008 nodes; each node two 28-core Intel Cascade Lake processors.
- 60Pbyte of storage, of which 3Pbyte flash.
- Two GPU subclusters

# Frontera compute racks; front view



rightmost rack is open: note the water cooling cables

# Water-cooled node



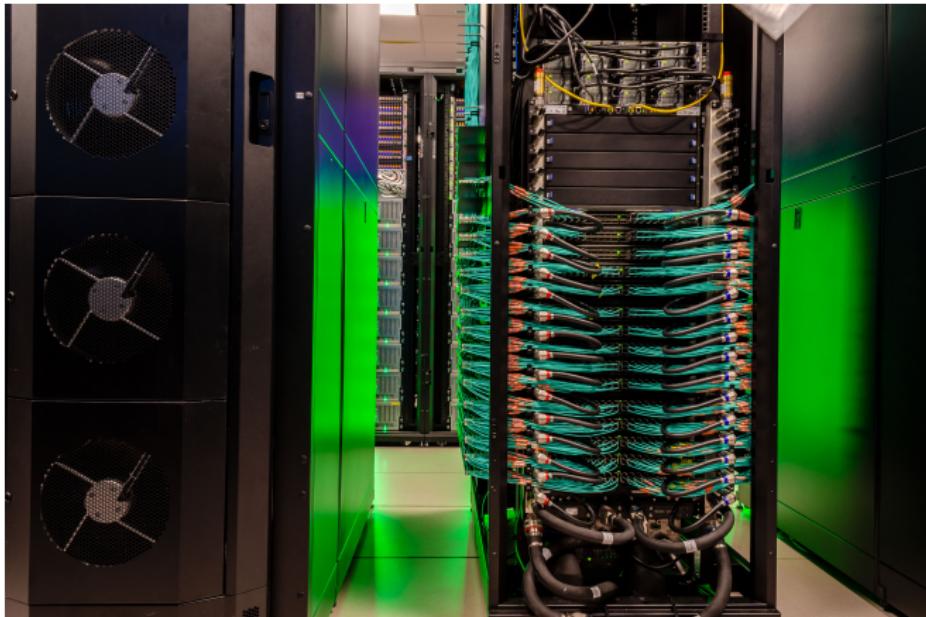
(actually a Sapphire Rapids node)

# Frontera compute racks; rear view



racks are approx 9ft tall; note blue network cables

# Frontera network switch

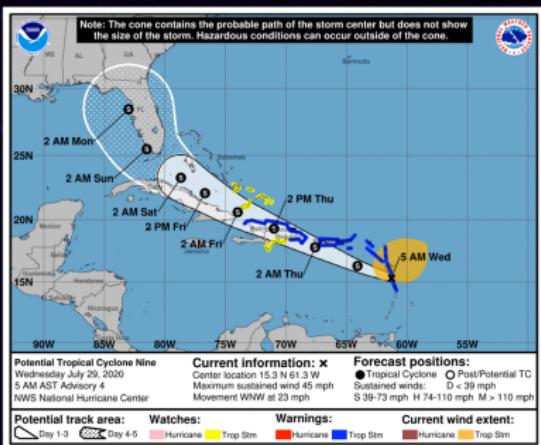
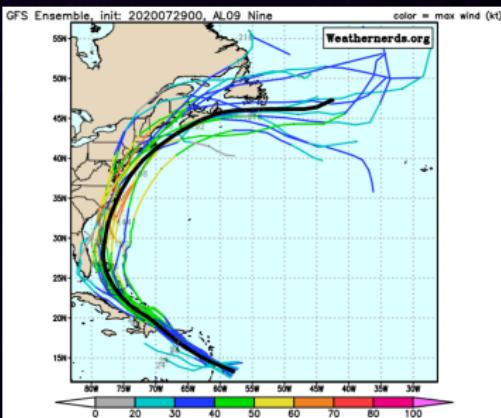


multiple network switches

# Overhead cabling



# WHAT IS FRONTERA IS DOING THIS WEEK IS THIS. . .

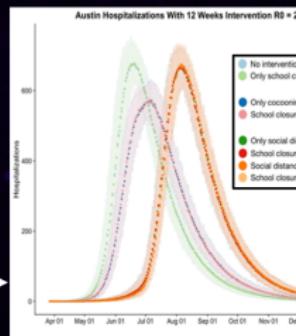
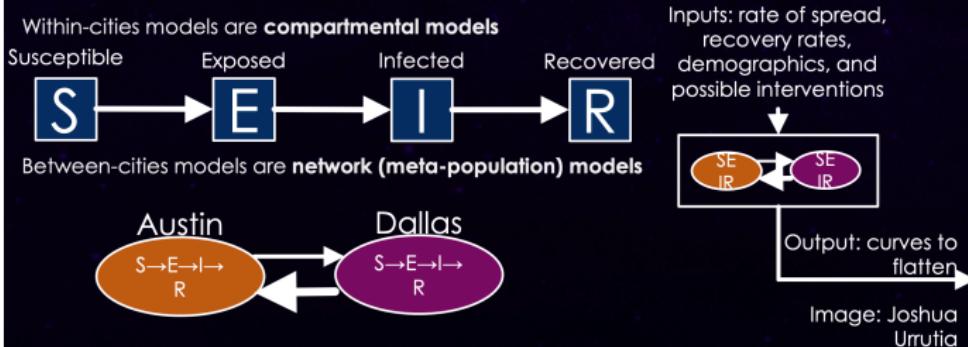


# COVID - EPIDEMIOLOGY

- ▶ Dr. Lauren Meyers, UT-Austin -- Epidemiology guiding Austin and Texas shelter-in-place orders
- ▶ County-by-county outbreak predictions covered on front page of New York Times, April 5<sup>th</sup>.

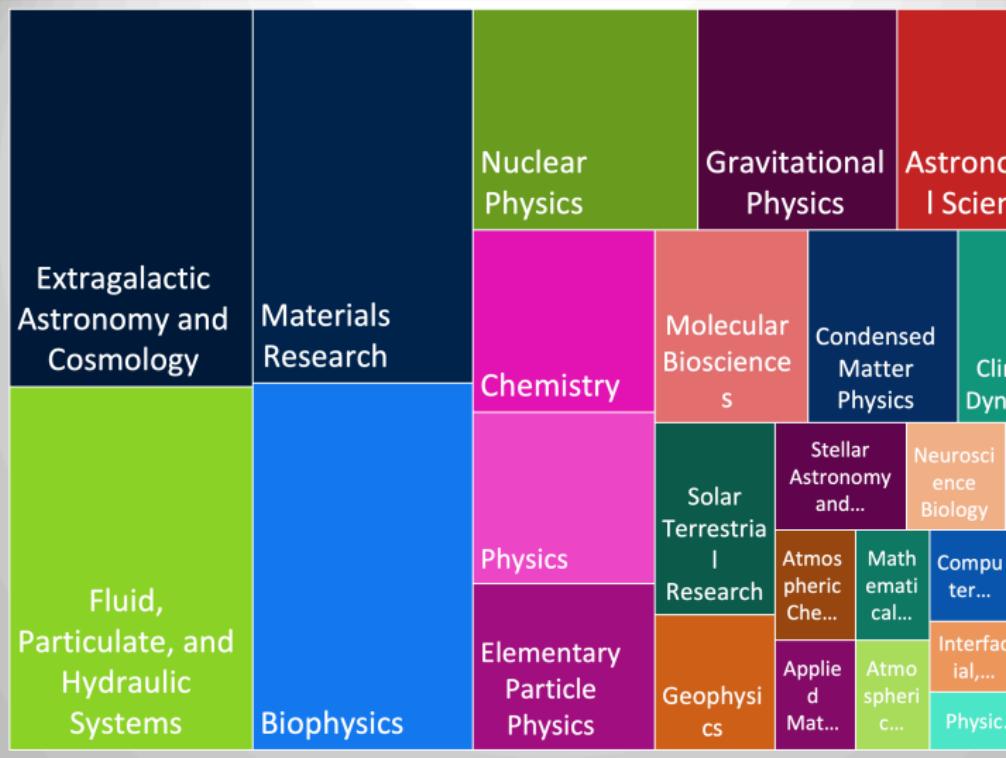


Emergency Responder  
courtesy Gordon W



# FIELDS OF SCIENCE

- ▶ From last allocation request



# Vista

Our first NVidia machine

\$10M from NSF, \$10M from UT for AI research

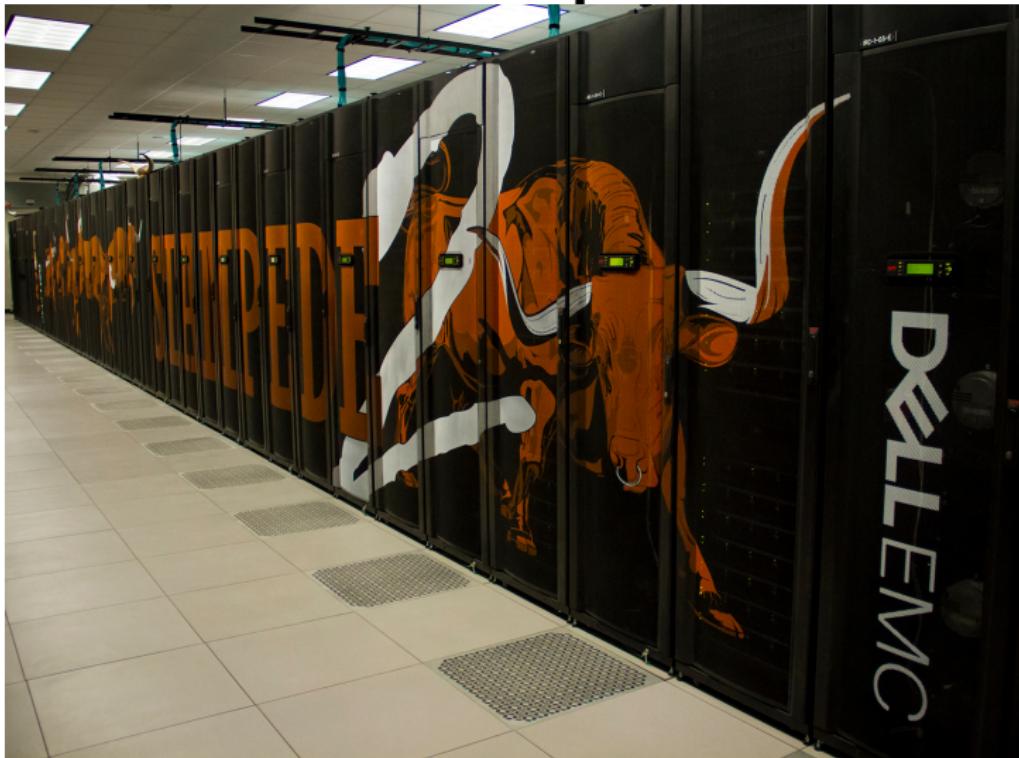
256 Grace CPU nodes, 600 Grace Hopper GPU nodes.



# Stampede2

- Second biggest machine: cost \$30M
- 4000 nodes with Intel 'Knights Landing' Xeon phi; 1700 nodes with two Intel Skylake server processors; 200 nodes Intel Icelake
- 75 miles of cabling, up to 4.5Mwatt power
- TACC's machines are popular and reliable:  
Stampede1 was used by 5000 users, up 98% of the time,  
8 million jobs over its lifetime.

# Stampede2



# Stampede3



Stampede 2 is turned off, Stampede 3 is now running, reusing cabinets from Stampede2

# Cabling coming down

Cables go from each, over the racks,  
coming down to the switches



# Lonestar 6

Our first AMD in a long time  
liquid-immersion cooled



('space coffin': before we wrapped it)

# Lonestar 6

With beautiful artwork:



# Lonestar 6

560 compute nodes

partly immersed, partly air-cooled

16 GPU nodes with  $2 \times$  A100 each.

# Frontera-rtx

Single precision GPUs.



Note: the machine hangs in a bath of HEB-\$1/bottle-mineral oil  
(ok, slightly better than that)

# Oil



# Hikari

Solar powered



No longer with us, but: ...

# Solar panels

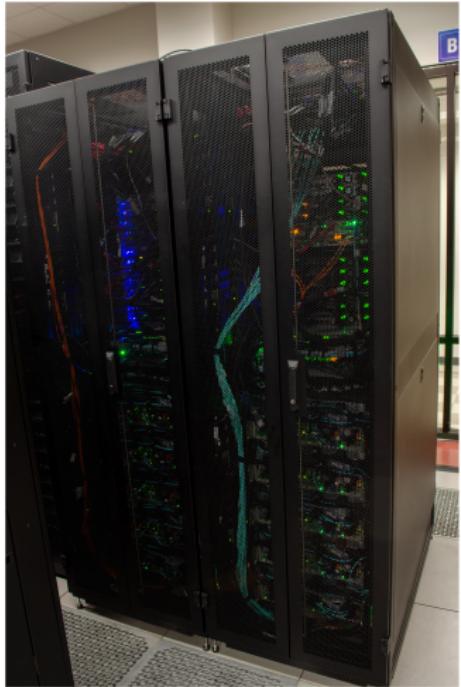


# Big data

- Stockyard: 7Pbyte spinning disc (shared between all clusters)
- Ranch: 100Pbyte of tape
- Corral3: 40Pbyte
- Rustler: hadoop cluster (up for refresh)

# Stockyard

Mass storage



# Corral

Large spinning disc



# Clouds

- Rodeo: mostly internal use
- Chameleon: cloud research
- Jetstream: for educational use

# Visualization lab (POB)

Our graphics people can help you understand your results (and sell your research) through high quality visualization.



# Small display in the TACC building



# We're very hands-on



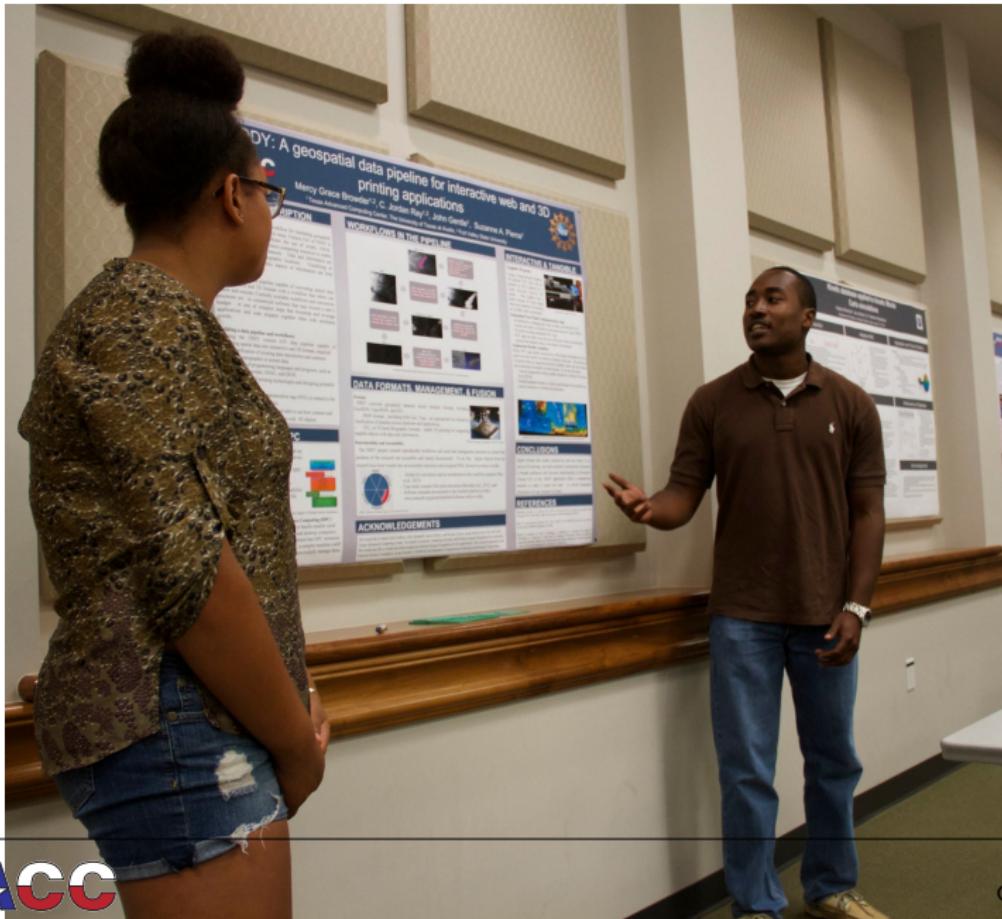
# We're very hands-on



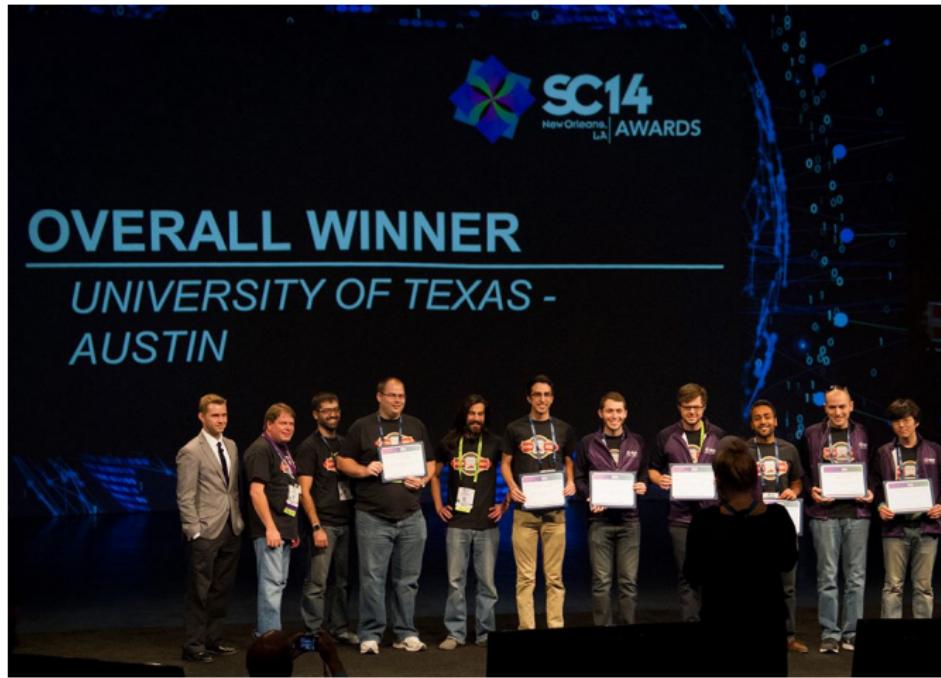
# We're very hands-on



# Student activities: REU



# Student cluster competition



# Outreach: Code at TACC



# We share



# We keep growing

Horizon in, we hope, FY26:

PICTURE MISSING

# Bridging Frontera and Horizon: Vista



# Credits

Most pictures: Jorge Salazar, TACC media group