

Overview of TACC

Lars Koesterke

Victor Eijkhout, Susan Lindsey

Fall 2020

Your instructors

Lars Koesterke
Victor Eijkhout, Susan Lindsey

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 160
- UT has had computing centers before; in 2001 TACC became independent unit: falls under VP for research.
- First major supercomputer in 2008: Ranger.
- Currently: Frontera, #8 in the world, and largest academic computer in the world; and Stampede2, #21 in the world.

TACC now

- 160-ish people, divided into Systems, High Performance Computing, Computational Biology, Big Data, Machine learning, Visualization, Outreach (and more) groups.
- 15 platforms
- 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?

```
/poll "Cost of a supercomputer?" "Under $1M" "$1M--10M" "$10M--100M" "$100M--1B"
```

How long it stays operational?

```
/poll "Supercomputer lifetime?" "2 yrs" "5 yrs" "12 yrs"
```

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

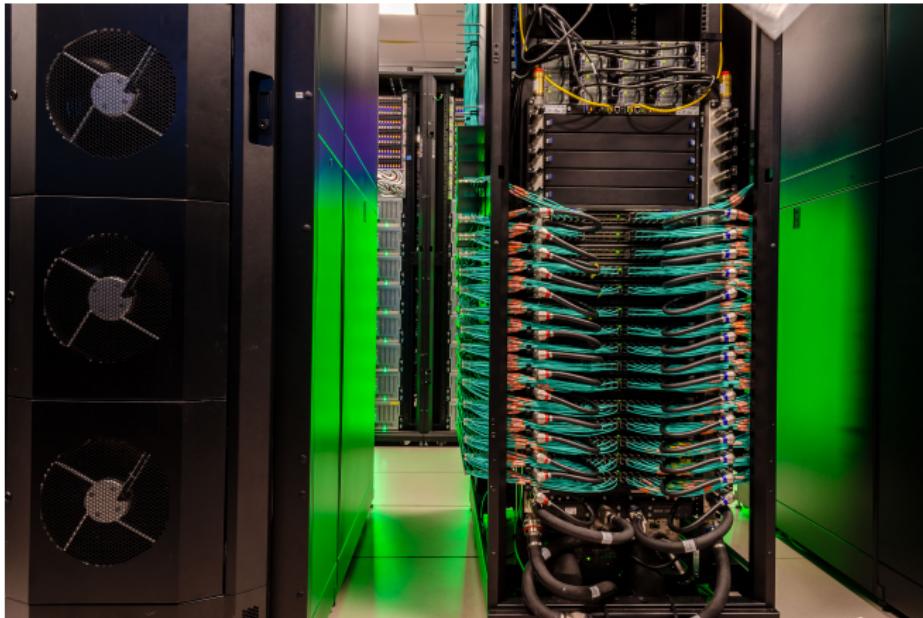
Frontera compute racks; front view



Frontera compute racks; rear view



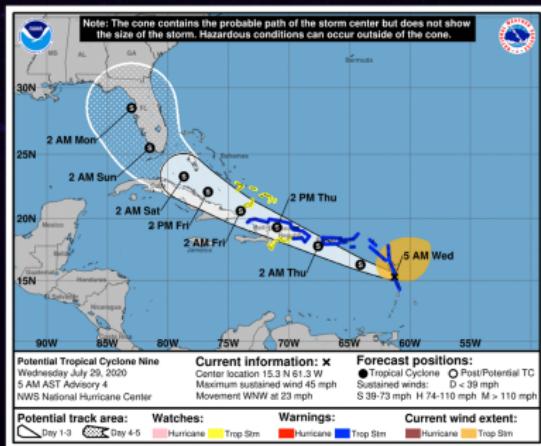
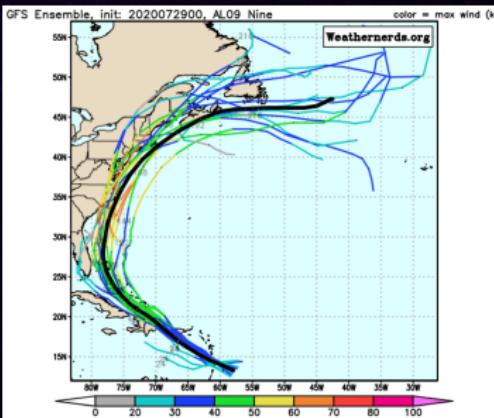
Frontera network switch



Overhead cabling

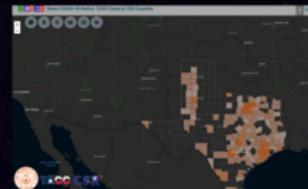


WHAT IS FRONTERA IS DOING THIS WEEK IS THIS. . .

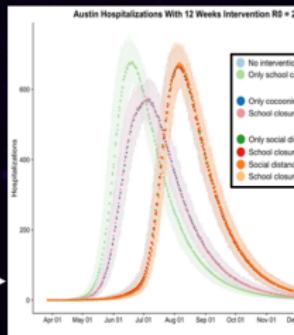
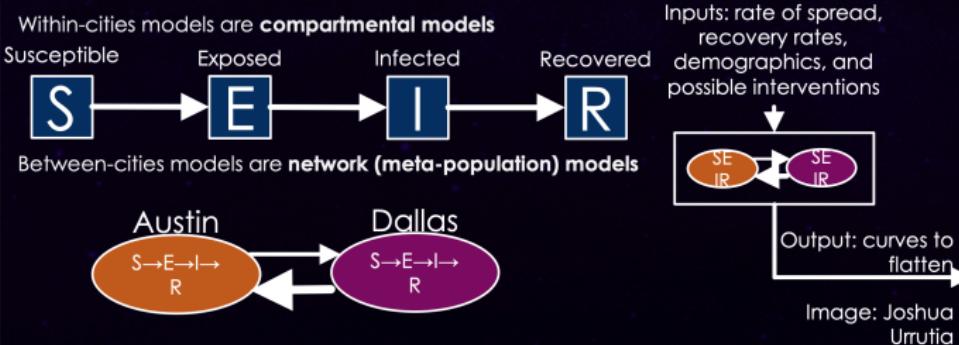


COVID - EPIDEMIOLOGY

- ▶ 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 5th.



Emergency Responder
courtesy Gordon W



FIELDS OF SCIENCE

- ▶ From last allocation request

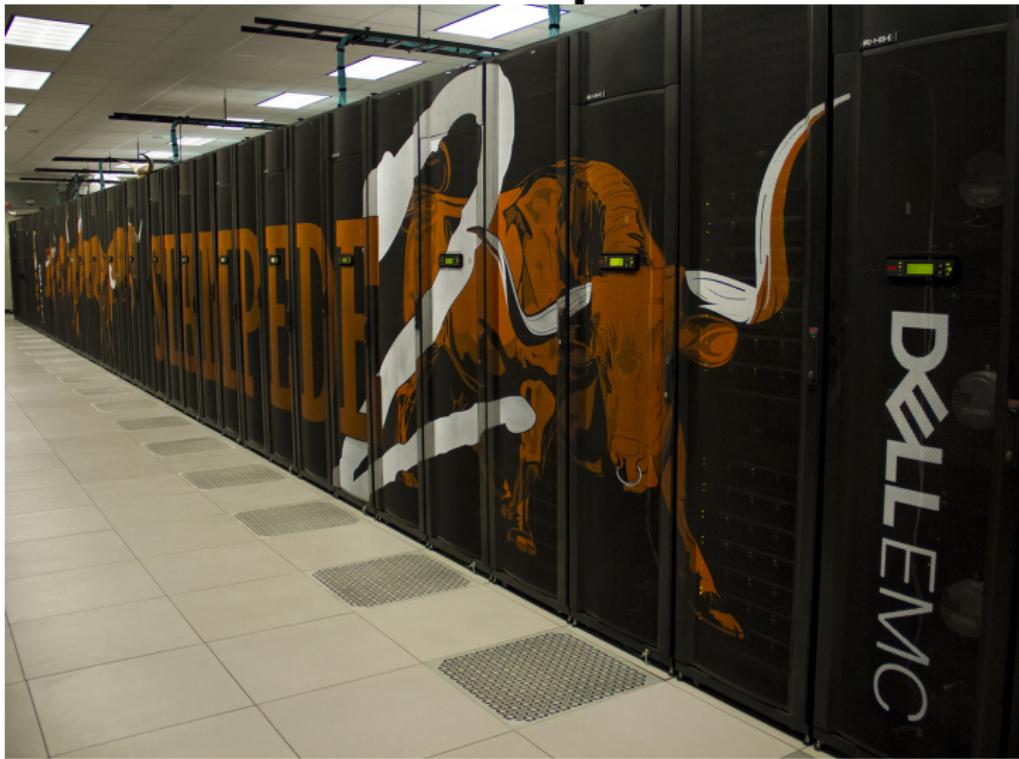
Extragalactic Astronomy and Cosmology	Materials Research	Nuclear Physics	Gravitational Physics	Astronomy and Science
Fluid, Particulate, and Hydraulic Systems	Biophysics	Chemistry	Molecular Biosciences	Condensed Matter Physics
		Physics	Solar Terrestrial Research	Stellar Astronomy and... Atmospheric Chemistry
		Elementary Particle Physics	Geophysics	Mathematical... Applied Mathematics Atmospheric... Physical...
				Computational... Interfacial... Physical...



Stampede2

- Second biggest machine: cost \$30M
- 4000 nodes with Intel ‘Knights Landing’ Xeon phi;
1700 nodes with two Skylake server processors.
- 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



Cabling coming down

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



Lonestar5

Our Cray



Longhorn

IBM Power9 plus V100 GPUs.



Frontera-rtx

Single precision GPUs.



Maverick2

GPU machine



Btw, this picture is not sideways:
the machine hangs in a bath of HEB-\$1/bottle-mineral oil
(ok, slightly better than that)

Hikari



Hikari water cooling



Big data

- Wrangler: big data machine with lots of SSDs
- Rustler: hadoop cluster
- Stockyard: 20Pbyte spinning disc (shared between all clusters)
- Ranch: 50Pbyte of tape

Wrangler



Clouds

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

Catapult

Microsoft FPGA machine learning platform



Stockyard

Mass storage

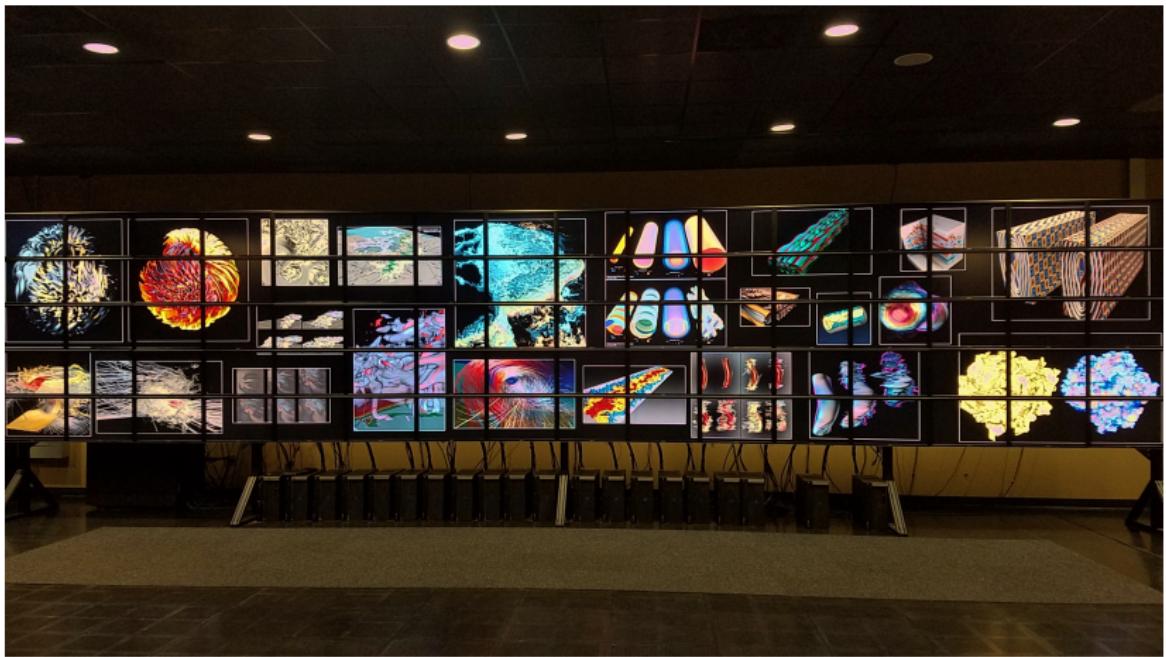


Visualization lab (POB)



A picture is worth a thousand. . .

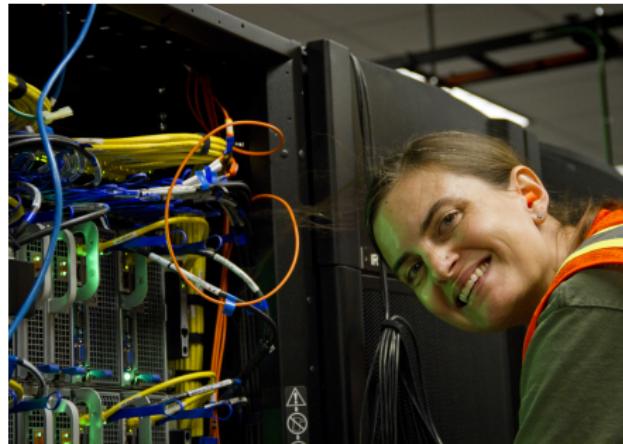
Our graphics people can help you understand your results (and sell your research) through high quality visualization.



We're very hands-on



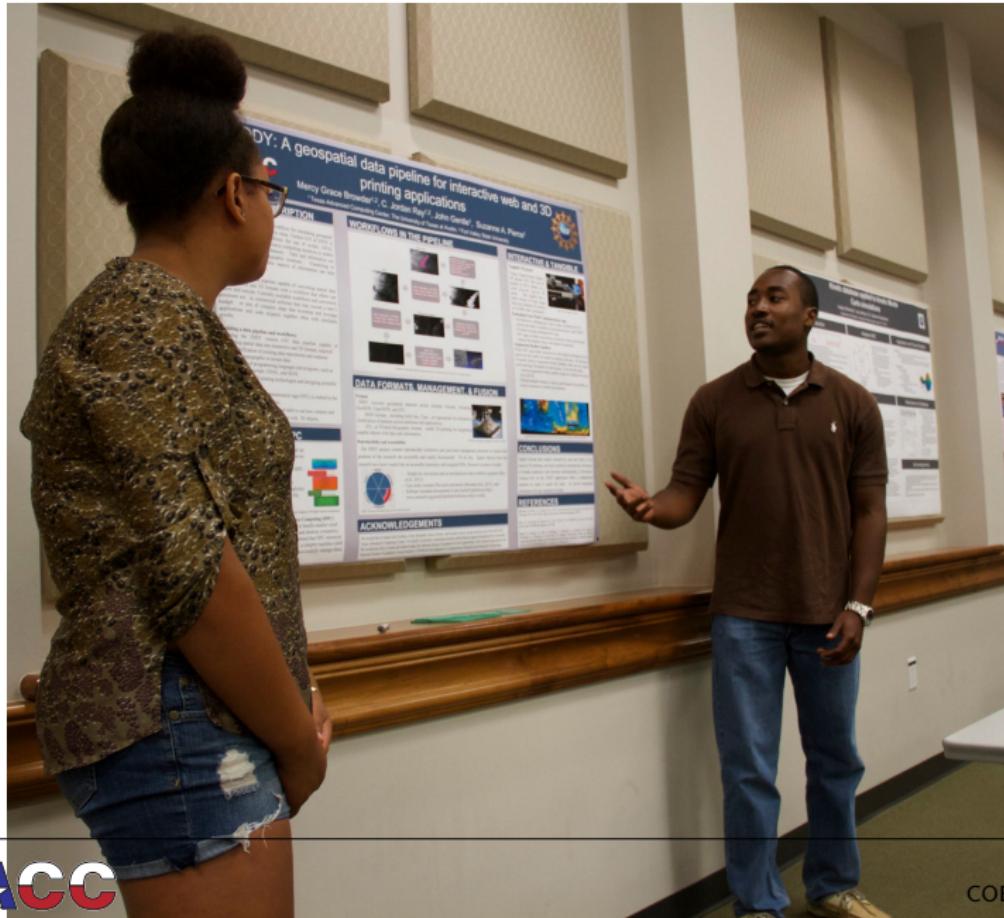
We're very hands-on



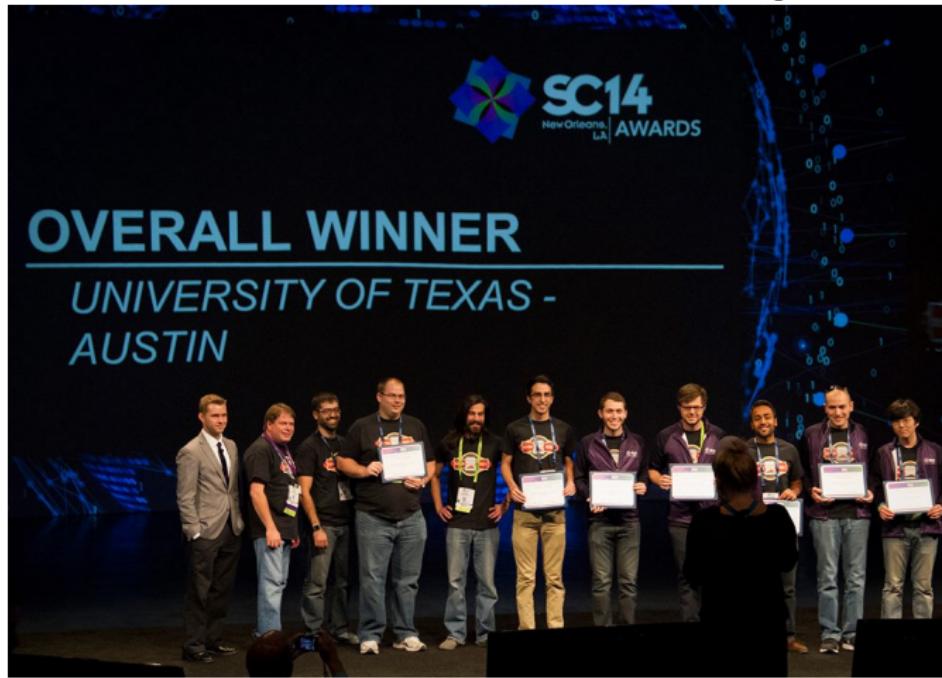
We're very hands-on



Student activities: REU



Student cluster competition



Outreach: Code at TACC



We share



We keep growing

