

INDUSTRY COLLABORATIONS @ TACC

HPC User Forum

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TACC AT A GLANCE



Personnel

160 Staff (~70 PhD)

Facilities

12 MW Data center capacity
Two office buildings, Three
Datacenters, two visualization
facilities, and a chilling plant.

Systems and Services

A Billion compute hours per year
5 Billion files, 50 Petabytes of Data,
Hundreds of Public Datasets

Capacity & Services

HPC, HTC, Visualization, Large scale data
storage, Cloud computing
Consulting, Curation and analysis, Code
optimization, Portals and Gateways, Web
service APIs, Training and Outreach



EXTREME SCALE SUPERCOMPUTING



Stampede

- #17 HPC system in the world for computation 500k CPU core 9.7 PF

Lonestar 5

- Texas-focused Cray XC40
30,000 Intel Haswell cores 1.25 PF

Wrangler

- 0.6 PB usable DSSD flash storage
w/1 TB/s read rate + 10 PB Lustre

Maverick

- 132 Fat nodes w dual 10 core Ivy
Bridge + NVIDIA Kepler K40 GPGPU

Chameleon & Jetstream Cloud

- 1400 nodes OpenStack

Disk and Tape Storage

- 100+ PB storage in HIPAA-aligned
data center



Hikari

- 380V DC Green computing
system partnership with NEDO
and NTT. 10k Haswell cores.
HVDC and Solar (partial)
- Support for container
ecosystem

STAMPEDE-2

- ▶ A renewal of the Stampede project award for 2017-2021.
- ▶ Will be deployed in phases in 2017 and 2018 in partnership with Dell, Intel, and Seagate.
- ▶ Supported by a University team including UT-Austin, Ohio State, Indiana, Cornell, Clemson, and Colorado.

- ▶ Specs:
 - ▶ Phase 1: 4,204 Intel Xeon Phi (Knights Landing) nodes, Intel Omnipath interconnect, Seagate Lustre Filesystem (Spring of 2017 – deployment underway!)
 - ▶ Phase 2: 1,736 Next Generation Intel Xeon nodes (Fall of 2017)
 - ▶ Phase 3: A few nodes 3D Xpoint Non-Volatile Memory DIMMS (2018)

TACC provides the software, hardware, services, and team for end to end computational science



SCIENCE & TECHNOLOGY AFFILIATES FOR RESEARCH (STAR) PROGRAM

- ▶ 10th Anniversary year!
- ▶ UT-defined “Industrial Affiliate” - standard agreement
- ▶ Base level membership: all receive the same benefits
 - ▶ Annual meeting
 - ▶ Monthly newsletter
 - ▶ Quarterly “Working Sessions”
 - ▶ Access to staff for questions
 - ▶ Access to students for internships/jobs
 - ▶ “Testing” access to TACC’s HPC Systems

ADDITIONAL COLLABORATIONS

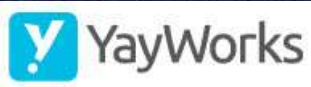
- ▶ Research projects require an additional contract – customized to Affiliate needs – “Sponsored Research Agreement”
- ▶ TACC staff PI depends on the project

- ▶ Access to HPC systems, expertise and resources
 - ▶ Advanced Computing and Visualization
 - ▶ Data Mining and Large-scale storage
 - ▶ Software Development
 - ▶ Technology consulting

TIERED MEMBERSHIP STRUCTURE

- ▶ Higher tiers include:
 - ▶ Additional Consulting Hours and Small Projects
 - ▶ Additional Compute, Visualization, and Storage Hours
 - ▶ Specific/tailored Training Courses On-site
 - ▶ Additional Registrations at TACC Institutes

CURRENT STAR PARTNERS



WORKING SESSIONS

- ▶ Quarterly webcast sessions to discuss new technologies, ask questions, share experiences. Past topics included:
 - ▶ Lonestar5 Modifications (to create a module system on Cray)
 - ▶ Software-defined Visualization
 - ▶ System monitoring and user support
 - ▶ Stampede overview
 - ▶ Advanced Computing Evaluation – new technologies (ACElab)
 - ▶ Green data centers
 - ▶ Infiniband vs. Ethernet

BUILDING THE PIPELINE

- ▶ Chevron sponsored developing TACC's scientific computing curriculum for distribution (\$250K)
 - ▶ STAR Partners visit classroom as guest lecturers
- ▶ Raytheon & BP have supported TACC's Student Cluster Challenge teams since SC'13
- ▶ Shell, Chevron, BP and others have sponsored "STAR Scholars" – Fall/Spring interns
 - ▶ Chosen by TACC staff for specific projects
 - ▶ We send resumes to partners who fund internships

TRAINING - TACC INSTITUTE SERIES

- ▶ Series of week long training events with hands-on activities
 - ▶ Designing and Administering Large-scale Systems – This week! (repeat in the fall)
 - ▶ Computational Techniques for Life Sciences – June 5-9
 - ▶ Data and Information Analytics – June 19-23
 - ▶ Visualizing and Interacting with Data – June 19-23
 - ▶ Computational Science in the Cloud – July 24-28
 - ▶ Parallel Programming Foundations – July 31-Aug 4
 - ▶ HPC Concepts for Managers – September 11-15
- ▶ Reduced registration fee for STAR Partners

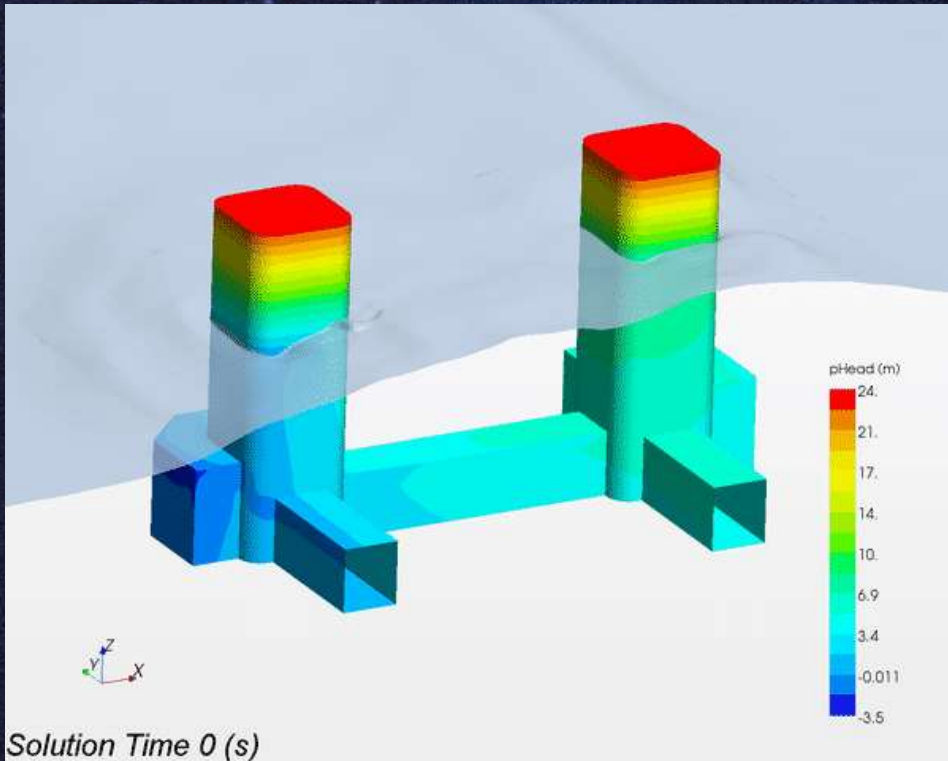
STAR FOR SMALL COMPANIES

- ▶ Special membership category for startups, small businesses and emerging technology companies
 - ▶ Small allocation of computing cycles, and support to test software, learn how to write/optimize code
- ▶ TACC partners with small companies on proposals like the Texas Emerging Technology Fund
- ▶ Support Workforce and Economic Development in Texas



PARTNER PROJECTS

OFFSHORE OIL PLATFORMS



- ▶ Technip joined STAR in 2013
- ▶ Used more than 6 million compute hours on *Stampede* in 2014 – one of the largest users
- ▶ Simulating waves to improve accuracy, security and environmental quality of their platforms

"Technip is using TACC's Stampede system to make our platforms more efficient, safer, and better for the environment. ... Stampede has allowed us to run simulations in one day or even overnight. "



Firefly Space Systems



Firefly, a TACC industrial partner, will begin engine tests shortly on rocket engines designed using Stampede.

Firefly aims to provide low-cost space launch capabilities for the small satellite market

WEATHER OVER CHICAGO

- ▶ WRF Project, funded by Raytheon:
- ▶ Simulation around the O'Hare International Airport, Chicago, Illinois, approximately 224km in diameter, height 21km, resolution about 167m in the horizontal direction and 90m vertically. Timesteps were 3 seconds apart.
- ▶ Used 1024 CPUs on 128 compute nodes

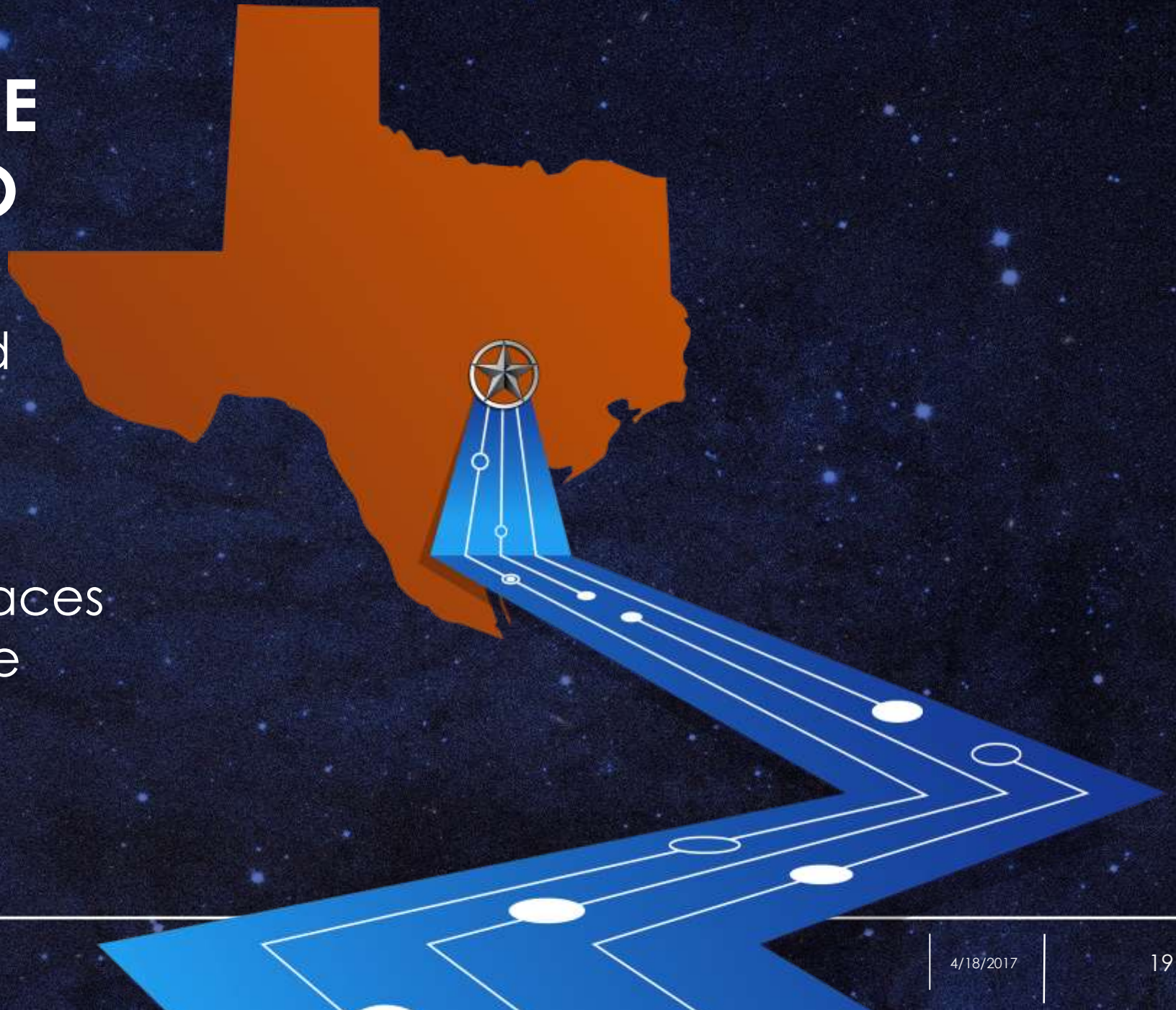


FUTURE PLANS

- ▶ Additional programs for partner contact with HPC-capable students
- ▶ Early User program for Stampede2, and lots of KNL training
- ▶ Consulting:
 - ▶ Provide guidance and testing for future systems
 - ▶ Personnel development (training) and sounding-board for development

AT TACC WE ARE ON THE PATH TO TEXASCALE

- ✓ Bigger, faster, and more efficient computing
- ✓ Powerful user and application interfaces
- ✓ Support for diverse communities



THANK YOU!

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<https://www.tacc.utexas.edu/partnerships/industry>