The SC22 Student Cluster Competition, and How to Participate | Weds April 13, 2022

SCC22 Committee

Agenda

Q&A session at end - please use the link above slides to ask questions

We're recording this session, the recording and these slides will be posted on the webinars page

Today:

- What is a student cluster competition?
- Meet the committee
- What's it like? Reflections of past participants
- About this year's contest(s)
- How to prepare
- Q&A

What is the Student Cluster Competition?

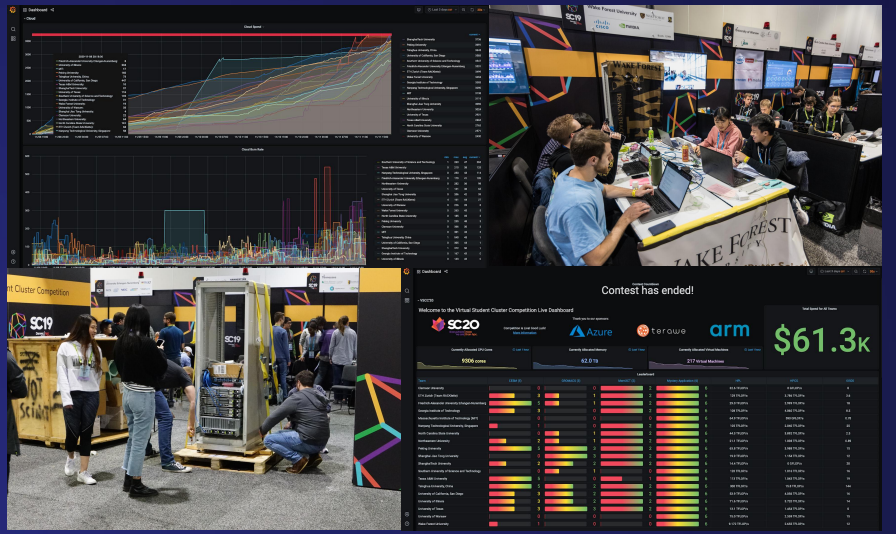
HPC is one of the **best tools in existence** for science and engineering

The SCC fosters skills development and social connections to bring new people into HPC

Screenshots from https://www.advancedclustering.com/hpc-provides-economic-return-investment-study-finds/, https://www.nextgov.com/emerging-tech/2020/12/how-supercomputing-and-advanced-x-rays-helped-government-fight-covid-19/171070/, https://www.hpcwire.com/2015/11/18/hpc-roi-invest-a-dollar-to-make-500-plus-reports-idc/ and https://www.hpcwire.com/2021/04/22/microsoft-to-provide-worlds-most-powerful-weather-climate-supercomputer-for-uks-met-office/

What is the Student Cluster Competition

A 48-hour, non-stop contest to build and run a (small) supercomputer



Teams of 6 undergraduate[1] students:

- Design and build a HPC Cluster
- Measure and tune its performance
- Run real science workloads on your cluster and the cloud
- Recover from a disaster scenario
- Report on your results

All within a power and cloud-spend budget

1. Student Team Members must:
   - Be enrolled in a university or high school
   - Be at least 18 years old by the beginning of the SCC (Monday November 14, 2022)
   - Not have received a bachelor's degree or equivalent before the beginning of the competition

SC22

Introducing the committee

Steve Leak

Kathleen Shoga

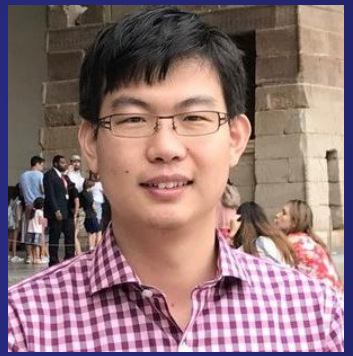
Stephanie Brink

Andy Howard

Rigo Moreno Delgado

Paul Peltz

Hai Ah Nam

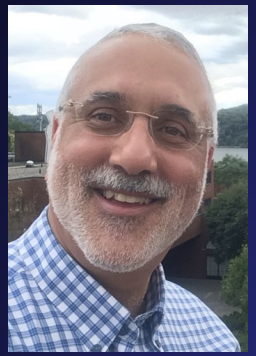


Junjie Li

Dan Ellsworth

SC22

Introducing the committee



Ramin Nosrat

Sam Coleman

George Markomanolis

Abhinav Thota

Ben Matthews

Dan Dietz

Aroua Gharbi

Ronnie Chatterjee

Also:

John Ravi
Wenyang Zhang
Ken Jansen
Stan Moore
Le Mai Weakley
Tapasya Patki
Rahul Gayatri
Jenett Tillotson

SC22

What’s it like?

Let’s hear from some past participants

This year's contest

- Mostly in-person, with cloud and virtual components
  - Teams that cannot attend in-person due to COVID-related restrictions can still compete in the cloud and virtual aspects
- IndySCC: Teams not selected for SCC may be invited to join the IndySCC
  - shares the goals of the SCC but with an emphasis on education and inclusion, intended for less-experienced teams
- New participant points (details ahead)
- Dynamic Power Limit
  - During benchmarking, the traditional 3000W power limit will apply
  - During the contest, the power limit will at times be as high as 4000W, or as low as 1500W
    - Powering components off is not allowed!
- Subset of benchmarks
  - Newer benchmarks are being incorporated into the SCC
    - IO500 in recent years, another (from MLPerf) to be added this year
  - Not all benchmarks will be scored
    - Scored benchmarks will be announced when Benchmarking begins
    - Only those benchmarks need to be run and submitted

How do we get started?

- Preparation before the event:
  - Teams form partnerships with institutions and vendors
  - **Design a cluster**, **practice building and running** the applications
  - **Webinars** to help you prepare
  - Plan logistics of getting to the competition
  - SCC provides conference registration for in-person and virtual teams (6 team members plus 1 advisor)
    - Also lodging, for in-person teams
    - We encourage institution and vendor partners to budget for other expenses
  - Build and install your cluster, **make posters**, **start on reports**

What happens once we're there?

- Friday/ Saturday
  - Teams arrive
- Saturday
  - Afternoon: Safety briefings and Student Orientations
  - After the briefings: building begins!
- Monday morning:
  - Benchmarks announced and **Benchmarking** begins!
  - At the end of benchmarking, **final configuration is locked** in - no more hardware changes (including turning things off!)
- Monday evening:
  - **Mystery app, datasets announced**
  - **Main contest starts**
- Monday -> Wednesday
  - Teams run applications, gather results, present lightning talks and posters
- Wednesday **5:30pm**
  - **Competition ends!**
- Thursday
  - **Results announced!**

What’s new this year?

New participant points!

- A key goal of the SCC is to introduce students to the industry, and to HPC as a great career option
  - Especially people with different background and different perspectives to contribute
- Teams must gather at least 10 "new participant points":
  - 2 points for first-time team members (in SC SCC)
  - 1 point for second-time team members (in SC SCC)
  - 8 points for a first-time team (in any of the "majors" ie SC, ISC, ASC)
  - 3 points for a second-time team (in any of the "majors" ie SC, ISC, ASC)
- How to find more points:
  - Been here a few times? Consider stepping up from "Team member" to "Secondary Advisor", bring someone new to HPC and help your team to prepare (Tip: applying to be a Student Volunteer is another great way to participate in the conference while your team uses what you taught them in the competition!)

What's new this year?

- Dynamic power limit!
  - In the past we have had a 3000W power limit.
  - This year: it might change during the competition!
  - During Benchmarking, the power limit will be 3000W
  - At other times, it may go as high as 4000W or as low as 1500W
- So:
  - Teams will need to pay attention to power limits, and plan workloads accordingly
  - Your cluster will need to be able to at least idle within 1500W, without powering anything off
  - Power limit changes will be announced with sufficient notice to allow teams to adjust workflows

Competition components

- Benchmarks - get the highest score on the selected set of HPL, HPCG, IO500, MLPerf benchmarks
- Applications - complete tasks and report results and performance
- Posters and Lightning talks - present your team in the format of a scientific conference
- Reproducibility challenge: reproduce the results of an SC21 paper, and write your findings in a journal-quality report
- Real-world surprises - unpredictable impacts to power, budget, etc to prepare for

The Benchmarks

- HPL - Indicates the top-possible-performance of a system
  - http://top500.org/project/linpack/
- HPCG - A more challenging benchmark that measures how a system does for difficult problems
  - http://hpcg-benchmark.org/
- IO500 - The IO performance of a system
  - http://io500.org
- MLPerf: (One component, TBA)
  - Performance for modern ML-based workloads

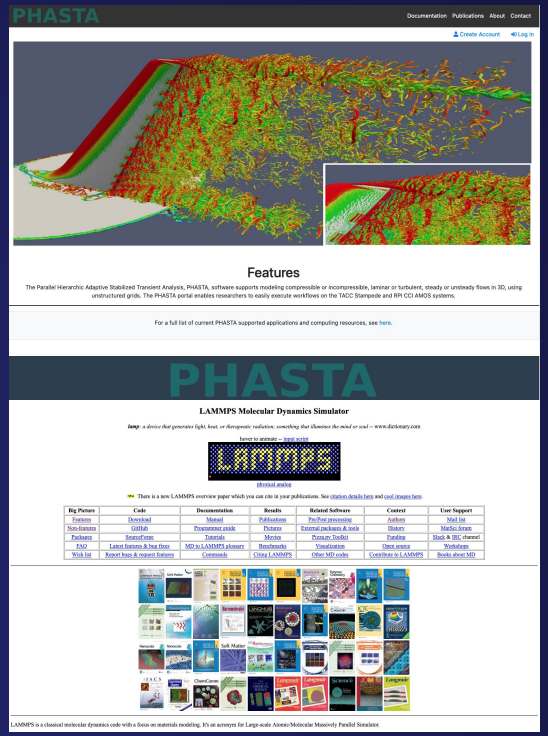
Not all benchmarks will be scored!

We will announce at the start of benchmarking, which ones will be used.

The full set is here to help give you parameters to consider in your system design

The applications

- PHASTA
  - Parallel Hierarchic Adaptive Stabilized Transient Analysis of compressible and incompressible Navier Stokes equations
- LAMMPS
  - Large-scale Atomic/Molecular Massively Parallel Simulator
- Reproducibility Challenge
  - Announcement coming soon
- Mystery App
  - Revealed at competition start



IndySCC

- What is IndySCC?
  - IndySCC shares the goals of SCC but is intended for less experienced teams
  - Resources are provided for teams to compete on
    - Will be using Chameleon Cloud to provision, hardware TBA
  - Competition is completely virtual
  - Competition starts in July with educational components throughout the fall
  - Final 48-hour competition similar to SCC held Nov 4-6th (weekend prior to SCC)
  - Some activities at the conference such as posters, lightning talks, “meet the teams”...

- How do we get into IndySCC?
  - Teams can indicate preference for IndySCC vs SCC in the CFP, however, this is not a guarantee of invitation into either competition
  - Teams that apply for SCC but do not get accepted may be invited to IndySCC, and are given priority
  - Our goal is keep all teams engaged and strengthen teams to come back the following year

Posters and Lightning Talks

Each team will present a poster and a lightning talk about their team and the design to conference attendees

- Introduction to your team and school
- Description of your hardware architecture and cloud strategy with discussion on why you choose it
- Discussion of your deployment and management strategy of cloud resources / hardware and software resources
- Discussion of how you prepared for the competition
- Discussion of your general strategies for running and optimizing the applications
- Why your team will win!

Exact specifications for the poster and lightning talk will be posted soon

Communications

To make sure you hear announcements between now and when teams are selected:

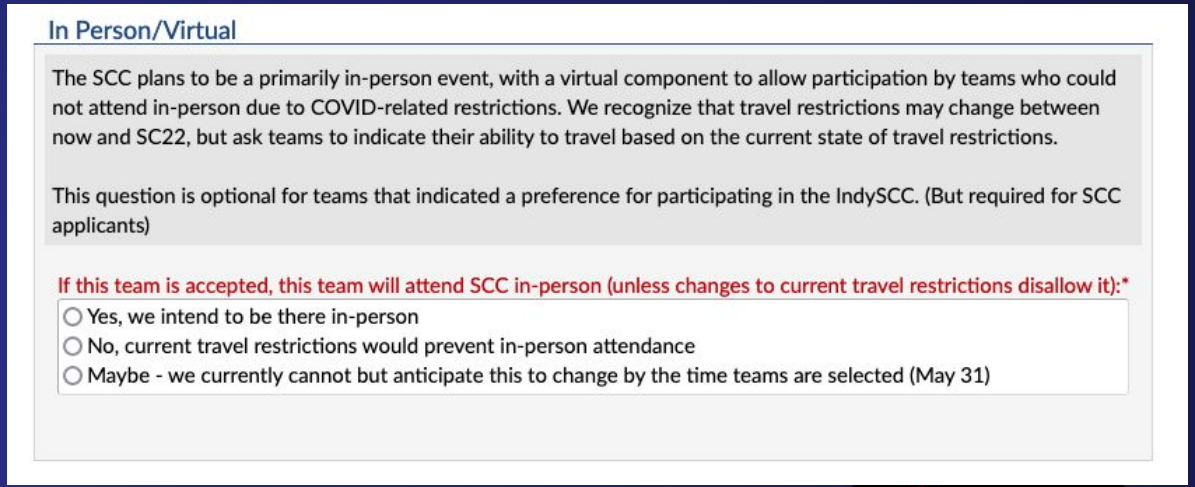
- Start a draft submission, with at least your contact details!
- We will make sure to include those email addresses when sending announcements

There will be an SCC Slack again this year - team members will get an invite to join the Slack workspace

We will have either a Google Group or Q&A/Stack-overflow-type site for teams to ask (and answer!) questions during the preparation and competition

What about Travel Restrictions?

- Planning for primarily in-person
- BUT we recognise that some teams - especially international ones - may face travel restrictions
- SO the SCC will have a virtual/cloud component
  - Teams that cannot travel will still be able to join the SCC, via the virtual component
  - Some components of the event may not be possible for virtual-only teams to participate in
- Application form has a question about in-person vs virtual:
  - The goal is to help with planning in the face of uncertainty
  - We understand that things outside of your control might change before November, and will be doing our best to give teams the best opportunities we can, and run a great and fair SCC for everyone


In Person/Virtual

The SCC plans to be a primarily in-person event, with a virtual component to allow participation by teams who could not attend in-person due to COVID-related restrictions. We recognize that travel restrictions may change between now and SC22, but ask teams to indicate their ability to travel based on the current state of travel restrictions.

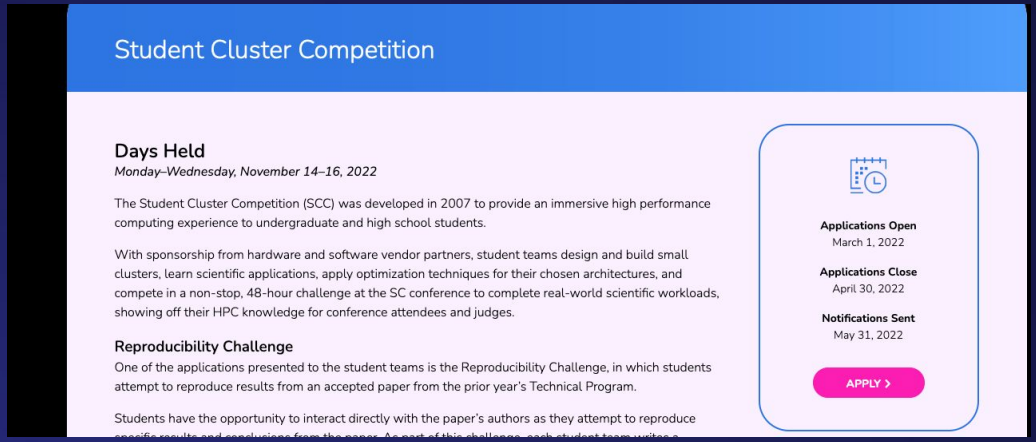
This question is optional for teams that indicated a preference for participating in the IndySCC. (But required for SCC applicants)

If this team is accepted, this team will attend SCC in-person (unless changes to current travel restrictions disallow it):*

- ○ Yes, we intend to be there in-person
- ○ No, current travel restrictions would prevent in-person attendance
- ○ Maybe - we currently cannot but anticipate this to change by the time teams are selected (May 31)

Tips for the application

- Be sure to address **all** of the questions!
  - Strength of Team
  - Strength of Hardware and Software Approach
  - Strength of Approach for Software and Cloud Administration
  - Strength of Vendor/Institution Relationship
  - Strength of Diversity
  - Team Preparation
  - Team Educational Goals

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hpc accelerates.
Q&A