

SIAG Supercomputing (SC)
Charter Renewal Application

This CHARTER RENEWAL APPLICATION applies to the SIAM Activity Group on Supercomputing. The SIAM Activity Group Supercomputing was originally formed under the aegis of SIAM on July 16, 1984 by the SIAM Council and on July 17, 1984 by the SIAM Board of Trustees. Its initial operating period began January 1, 1985 and ended December 31, 1987. Its charter has been renewed by the Council and Board thirteen times thereafter. As posted on [SIAM's SIAG/SC website](#) as of April 19, 2023, SIAG/SC had 607 members; of these, 278 were students.

According to its Rules of Procedure, the objectives of the SIAG are to provide an environment for interaction between developers of large-scale applications programs, applied mathematicians, algorithm designers, and computer architects, to foster the development of analytic methods, efficient algorithms, and applications software in context with advances in computer architecture as applied to high performance computing.

Its proposed functions are to:

- 1) Organize minisymposium at the SIAM Annual meeting in years when there is no Parallel Processing Conference.

- 2) Organize a track of at least six minisymposia at the SIAM Annual Meeting at least once every five years.

- 3) Organize a biennial SIAM Conference on Parallel Processing. The SIAG will consider dovetailing specialized workshops and conferences with the SIAM Annual meeting or other SIAG conferences. The chair of the conference organizing committee shall be either the program director or the chairperson of the SIAG or their designee. The organizing committee must be approved by the VP for Programs at least 16 months before the conference.

The SIAG complements SIAM's activities and supports its functions. The answers to the questions below indicate how this was accomplished and what the officers propose as the future directions for the SIAG.

Current SIAG/SC officers (2022-2023):

Chair, Lois Curfman McInnes
Vice Chair, Hatem Ltaief
Program Director, Michael Bader
Secretary, Rio Yokota

1. How is the field covered by the activity group doing? Is it growing, is the focus shifting? What have been the significant advances over the last two years?

The field of supercomputing is in a phase of tremendous growth; high-performance computing (HPC) now broadly underpins research and development in computational science and engineering, modeling and simulation, data analysis, machine learning, and artificial intelligence (ML/AI) throughout academia, industry, and government. In fact, the pervasiveness is so widespread that a current challenge is a tendency for community attention to focus on the newest trending application areas of high-performance computing – which currently are data science and ML/AI – rather than on the core elements of the field.

Supercomputing has finally entered the exascale area, with the first true exascale supercomputer being operational since late 2022. The necessity for computer architects, applied mathematicians, simulation software engineers, and domain scientists to collaborate toward realizing large-scale applications on these extreme-scale machines and achieving satisfactory performance is now stronger than ever.

Supercomputing architectures continue to diverge, and novel trends—mixed precision, integrating ML and simulation, data-driven computing and modeling, and digital twins, to name just a few—are pervasive, dramatically impacting the challenges of supercomputing applications. Moreover, because hybrid architectural features of extreme-scale systems also are present in moderate-scale clusters and even laptops, the trends and challenges addressed by SIAG/SC impact the broad community at all scales of computing.

2. How is the activity group doing? Is it remaining vibrant? Is the size of the SIAG stable or increasing? How is the SIAG keeping up with the changes in the field? How are the broader interests of SIAM reflected in the activities of the SIAG?

Current SIAG/Supercomputing membership (posted on [SIAM's SIAG/SC website](#) as of April 19, 2023): 607 members (with 278 student members). The size is slightly decreasing, with some long-time SIAG/SC members pivoting to engage in the newer SIAGs on data science (DS) and computational science and engineering (CSE), even though they are still very much engaged in work in high-performance computing, as applied to CSE and DS. Discussion about membership numbers with SIAM staff indicates modest declines in student membership in recent years, possibly influenced by the lack of in-person conferences during the pandemic.

A challenge over the long term is ensuring a continual inflow of new SIAG/SC members, especially students, and newcomers to the field. To help address this challenge, the 2022-2023 officers of SIAG/SC launched complementary [SIAG/SC initiatives](#) to raise awareness of the impact and opportunities in high-performance computing and help to grow the community. As summarized on the new SIAG/SC website: <https://siag-sc.org/>, the initiatives focus on the Supercomputing Spotlights webinar series, inclusivity, and outreach.

3. Please list conferences/workshops the activity group has sponsored or co-sponsored over the past three years, and give a brief (one sentence or phrase) indication of the success or problems with each.

SIAG/Supercomputing sponsored [SIAM-PP22](#), originally planned to take place in person in Seattle, Washington but ultimately pivoted to take place online. Attendance numbers were healthy (549 total participants, 109 of these being students), with an exciting program featuring advances across various aspects of algorithms, architectures, and applications, as well as community events. The conference was quite successful overall, with the caveat that attendance at some sessions was lower than would have been the case at an in-person event, given the unavoidable challenges with the time zone spread; some sessions occurred in the middle of the night for attendees around the globe.

Also successful was the publication of the **SIAM-PP22 Conference Proceedings** (<https://doi.org/10.1137/1.9781611977141>), providing a publication opportunity for conference participants. The paper conference proceedings are unique in emphasizing the intersection between high-performance scientific computing and scalable algorithms, architectures, and software. These proceedings were the second of the SIAM PP conference series after the restart of SIAM PP20. An initiative of the 2020-2021 SIAG/SC officers, the SIAM PP proceedings are creating a forum for the distinct work happening within the SIAG/SC and helping to maintain the overall health of SIAG/SC, particularly with respect to its prizes.

SIAG/Supercomputing initiated the organization of a BOF at ISC23 (Hamburg, Germany, May 24, 2023) entitled ***Supercomputing with the Societies***, recruiting as collaborators the complementary groups ACM SigHPC and IEEE Computer Society Technical Community on Parallel Processing. The event promoted outreach and productive community discussion, as summarized in the following abstract.

Abstract: Come and learn from the leaders of the professional societies focused on HPC from ACM, IEEE, and SIAM! Speakers will discuss the structures, activities, and opportunities within each of the groups. Professional societies play a valuable role in technical communities by sponsoring conferences, awarding achievements, bringing new members into the field, and connecting people in a variety of other ways. This first cross-society meeting of its kind aims at identifying joint efforts for possible collaborations, discussing the status of HPC as a community, and engaging the audience to address common challenges. With AI workloads becoming ubiquitous, how should HPC further support this trend? How can professional societies help prepare the needed workforce to aspire to new heights in scientific discovery powered by AI? Can HPC guide AI in continuing to expand with ethics, diversity, and inclusivity brought to the forefront? Located at the waist of an hourglass that bridges hardware and scientific applications, HPC is actually at the confluence of many other technological trends. Should professional societies together chart the HPC evolution and strive to influence governmental and private sectors for education, training, and funding opportunities? Our current activities can be further leveraged to create synergism across professional societies. We will define action items for community members and leaders related to fostering the next generation of HPC experts, supporting diversity and inclusivity in our community, handling reproducibility across societies, maintaining an online repository listing all conferences/journals around HPC, co-hosting webinars, creating a unique template for research papers, and more!

4. Please indicate the number of minisymposia directly organized by the activity group at the last two SIAM annual meetings. When did the SIAG last organize a track at an annual meeting or meet jointly with the SIAM Annual Meeting?

The SIAG last organized a track at SIAM AN17. In accordance with SIAM guidelines, we anticipate that SIAG/SC will organize a track at the 2024 or 2025 conference (considering that there will be no SIAM Annual Meeting in 2023).

5. Please indicate other activities sponsored by the activity group, to include newsletters, prizes and web sites. Have each of these been active and successful?

In 2022 the SIAG/SC officers launched complementary [SIAG/SC initiatives](#) to raise awareness of the impact and opportunities in high-performance computing and help to grow the community. As summarized on the new SIAG/SC website: <https://siag-sc.org/> (which itself is part of these initiatives), the initiatives focus on the [Supercomputing Spotlights](#) webinar series, inclusivity, and outreach via the website and social media (with new official SIAG/SC accounts on [Twitter](#), [FaceBook](#), [LinkedIn](#), and [YouTube](#)).

Prior to launching the initiatives, we pursued broad outreach (including multiple online sessions in different time zones) to invite the SIAG/SC community (and beyond) to engage with us to help shape the initiatives and participate in them. As an incentive for participation in these outreach sessions, we created SIAG/SC t-shirts and provided these to raffle winners at the various online sessions. Following this outreach, we established a SIAG/SC committee (approved by SIAM), which collaborates with us on SIAG work, including brainstorming on potential topics and speakers for Supercomputing Spotlights webinars and forming a canvassing committee for SIAG/SC awards.

Thus far, we have hosted four Supercomputing Spotlights sessions, which aim to introduce topics in a broadly understandable way to students and newcomers to the field; all sessions have been well attended, with registrations typically ranging from 200-400 people, live attendance well over 100 people per session, and many additional viewers of slides and YouTube videos over the longer term. We sincerely thank SIAM (and especially Maggie Hohenadel) for SIAM Zoom support for these webinars.

The new SIAG/Supercomputing website (<https://siag-sc.org>) is a hub for community outreach and communicating about SIAG activities and initiatives.

Supercomputing Spotlights speakers:

- June 27, 2022: **Satoshi Matsuoka**, Director of the RIKEN Center for Computational Science, Japan, [*Supercomputing for Everyone*](#)
- Nov 2, 2022: **David Keyes**, Director of the Extreme Computing Research Center, King Abdullah University of Science and Technology, Saudi Arabia [*Efficient Computation through Tuned Approximation*](#)
- Feb 15, 2023: **Didem Unat**, Director of the Parallel and Multicore Computing Laboratory, Koç University, Turkey, [*Supercomputing Software for Moore and Beyond*](#)
- April 19, 2023: **Karen Willcox**, Director of the Oden Institute for Computational Engineering and Sciences, Univ of Texas at Austin, [*Digital Twins: How High-Performance Computing is Personalizing the Future for Complex Systems*](#)
- [next session] June 14, 2023: **Eng Lim Goh**, Senior Vice President, Data & AI, Hewlett Packard Enterprise, [*Generative AI: Disruptions and Implications for Institutions, Enterprises and Society*](#)

We encourage attendees to provide feedback (via an anonymous survey) for each webinar, including suggestions for topics/speakers to consider for future sessions. Feedback has been overwhelmingly positive. The following are a few sample responses (regarding the four Supercomputing Spotlights sessions thus far) to the question, “What did you like most about this webinar?”

- *Broadly accessible and put a focus on the impact of HPC in many application domains*
- *Explanation of trends and future directions*
- *Inspirational speaker, great Q/A with the audience*
- *Friendly atmosphere*
- *Good overview of current research directions and associated challenges*
- *Good explanations of the basic concepts, which helped me understand the research better (I do not have an HPC background)*
- *Clear and jargon-free presentation of a new supercomputing paradigm*
- *The comprehensive yet accessible nature of the presentation was excellent.*
- *The question and answer section was exciting, eye-opening, and potentially could pull up ideas not unraveled in the talk, as well as stimulating the speaker to reveal open questions related to the topic presented.*

We plan to continue the Supercomputing Spotlights webinar series at a pace of about four sessions annually, aiming for balanced representation across topics, geography, type of employer (academia, industry, research laboratories), and other aspects of diversity.

[SIAG/SC sponsors three prizes](#): Early Career, Career, and Best Paper. While there have been plenty of nominees for the Career and Best Paper prizes over the years, the Early Career prize did not have enough nominees in 2022. Consequently, we are working through a canvassing committee to ensure a robust set of nominees for the 2024 award (where nominations are open during March - July 2023).

6. What activities are planned and proposed for the next period of the charter? Please describe scheduled and suggested future activities in detail.

Planning is well underway for [SIAM PP24](#), which will take place in March 2024 in Baltimore, MD. The call for papers and call for other conference contributions are being widely publicized, and we expect a strong community response – enthusiasm to gather in person. We would like to work with the future incoming team of SIAG/SC officers (for 2024-2025) to continue and expand the current initiatives, with a goal of showcasing the impact and opportunities of work in high-performance computing and drawing in newcomers to the field.

7. How can SIAM help the activity group achieve its goals?

- Help with publicity for SIAG/SC events
- Make it easier for people to learn about the existence of SIAG/SC; it is not easy to find this activity group when navigating the SIAM website
- Consider a change to SIAG membership costs (given recent trends) – how to encourage membership in multiple complementary SIAGs, while still keeping costs manageable for the community?

We propose to revise the SIAG/Supercomputing description on SIAM’s website to reflect the group’s focus more accurately.

Proposed new version: This activity group provides a forum to exchange ideas on algorithms, software, and architectures needed for solving large-scale problems on high-performance computer systems. We particularly focus on the interplay of numerical methods and analysis, performant implementation, and novel approaches in modeling, together with their realization in simulation software and efficient use of supercomputing infrastructure.

Current version (<https://www.siam.org/membership/activity-groups/detail/supercomputing>): This activity group provides a forum for computational mathematicians, computer scientists, computer architects, and computational scientists to exchange ideas on mathematical algorithms and computer architecture needed for high-performance computer systems. We promote the exchange of ideas by focusing on the interplay of analytical methods, numerical analysis, and efficient computation.

8. How can the activity group help SIAM in its general role of promoting applied mathematics and computational science?

- Outreach, raising awareness of SIAM’s presence in high-performance computing and related topics in computational mathematics
- Act as an entryway to SIAM for researchers from computer science and software engineering, who focus on applied-math applications and mathematical software
- Help to build connections with existing student chapters located in worldwide universities

This SIAG requests that the SIAM Council and Board of Trustees renew its charter for a two-year operating period beginning January 1, 2024.

Signed

Lois Curfman McInnes, Chair of the SIAG on Supercomputing

May 25, 2023