SHARCNET Research Support Programmes: Dedicated Programming Support

Application Guidelines

Round IV

Preface

This document describes Round IV of the **SHARC**NET Dedicated Programming Support programme and provides guidelines for applying to this programme.

SHARCNET programming specialists can provide assistance with a wide array of common HPC application development tasks, including application design, porting, optimization and parallelization. Our staff have expertise with most contemporary programming languages and methods, as well as experience with HPC software spanning research domains from the digital humanities to the physical sciences. They are well positioned to help groups best utilize SHARCNET resources to obtain significant computational results for their research.

Some of the programming projects that SHARCNET has supported in past rounds include:

- developing visualization tools for investigating linguistic relationships using VTK
- developing scripting tools to compare bacterial genomes using perl and BLAST
- porting a Matlab fluid dynamics program to Fortran and parallelizing it using SCALAPACK
- porting a forest dynamics model from Smalltalk to C and optimizing the model
- parallelizing and optimizing a Fortran climate model
- designing and developing a parallel database application in C to investigate genetic mutations

It is anticipated that up to four proposals may be supported in this competition. Please make sure that this document is the correct version. An up-to-date version of the guide is available at www.sharcnet.ca/Documents/SN_prog_application_guidelines.pdf.

Please note the following deadlines:

- Letters of Intent (LOI) for Round IV are due by **October 5, 2012**.
- Selected applications will be invited to submit a full proposal by **November 30, 2012**.

SHARCNET **Dedicated Programming Support**

1. Objectives

- To enable key research projects with the potential for exceptional and lasting impact that require significant programming support to proceed, *and*
- To facilitate optimal exploitation of **SHARC**NET's or Compute Canada's computing infrastructure for internationally leading research.

2. Summary of Programme

The programme provides support for computational projects of exceptional potential that will have lasting impact and value and that require significant support from **SHARC**NET to proceed. For Round IV, applications are encouraged that satisfy the programme objectives and priority will be given to proposals that meet one or more of the following conditions:

- Propose to make novel, effective and large-scale use of non-standard architectures especially GP-GPU.
- Propose to develop innovative visualization applications and techniques that emphasize the visualization of large datasets especially using distributed/parallel visualization/rendering techniques.
- Propose a programme of work that will enable innovative projects from disciplines that are traditionally not major users of HPC.
- Are from established HPC disciplines and that propose to develop and introduce new packages, techniques or algorithms that are substantially different than those extant in the field. Applications that propose to scale to very large numbers of processors are encouraged.

Applications from teams of faculty, especially if these are inter-disciplinary and/or inter-institutional, are especially encouraged. The key elements are described in the following points:

- The primary resource provided is application programming time and development support by one or more **SHARC**NET personnel. The intent is to enable specific, focussed projects, not to provide an envelope of incidental programmer time. Requests that do not clearly indicate a well-defined, specific outcome that represents a substantive advance in the field, will be uncompetitive.
- The programming effort is expected to occur within the setting of a collaborative team of faculty, students, postdocs etc. and the **SHARC**NET programmer is expected to become an integral member of the team for at least the duration of the project. It is anticipated that the involvement will be such that the programmer would receive co-authorship on methods and related research papers and that s/he would develop new skills as a part of this interaction. Note that the programmer may be remote from the applicant's institution but that **SHARC**NET's remote collaboration facilities will be available to facilitate interaction.
- The awarded programming time is anticipated to be from 2 to 6 months in duration spread over a period of one year. Projects requesting support over a longer period of time may be

supported. For outstanding projects in which progress has been excellent, **SHARC**NET may also entertain a renewal request if there is the prospect of further significant advances. Progress on all projects will be reviewed regularly against an agreed work plan at least every six months. Regular progress reviews will be undertaken by **SHARC**NET; renewal requests will be reviewed by the selection committee and judged alongside new proposals.

- In **exceptional circumstances**, **SHARC**NET may consider requests for additional resources if these are necessary to ensure that the proposed development succeeds. Such resources may include those under the Fellowships, and Dedicated Resources programme or, potentially, new hardware or software. There is no guarantee that any of these additional resources will be available during a particular application round. Any additional equipment or infrastructure purchased to support a specific project would become a part of the standard **SHARC**NET inventory and would be allocated under **SHARC**NET oversight.
- **SHARC**NET programming personnel are experts in the development and programming of large-scale HPC applications, however **SHARC**NET makes no guarantees as to the fitness or suitability of any software or application, or of the correctness or validity of research output, resulting from involvement in this programme.
- All work resulting from support through this programme must properly acknowledge **SHARC**NET.
- It is anticipated that up to four projects will be awarded support in this round.

Prospective applicants should refer to the following sections for detailed information about the application process.

3. How to Apply

Eligibility

The programme is open to all faculty holding a valid **SHARC**NET account; preference will be given to faculty from **SHARC**NET partner institutions in the event of close ranking of proposals. Direct funding, if any, can only be allocated to projects led by faculty at **SHARC**NET institutions.[1]

Applications

There is a two stage application process:

1. **Letter of Intent**: A letter of intent (LOI) to apply must be submitted by the deadline indicated in the preface to these guidelines. Results of the LOI stage will be announced within approximately 3 weeks of the submission deadline.
2. **Full Application:** A number (anticipated to be 6 to 8) of applicants from amongst those submitting an LOI will be invited to submit a full proposal.

[1] The **SHARC**NET partners are: Brock University, Lakehead University, Laurentian University, McMaster University, Nipissing University, Ontario College of Art & Design, The University of Western Ontario, Trent University, University of Guelph, University of Ontario Institute of Technology, University of Waterloo, University of Windsor, Wilfrid Laurier University, York University, Fanshawe College, Sheridan College and Perimeter Institute.

Applicants must submit all materials for both stages (including CV's and any additional materials) using the web forms to be found at www.sharcnet.ca/my/research/programming. If you have difficulty with the electronic submission, please contact the **SHARC**NET office. All application materials will be treated confidentially. When the online forms have been completed, you will be able to print a formatted hardcopy from your web browser. ******Note that users must have a SHARCNET web portal account in order to access the application form.******

Any application requesting direct funding requires sign-off by the appropriate Research Office as for the Fellowships programme (see www.sharcnet.ca/my/research/fellowships). Institutional signoff is required only at the time of submission of the full application and ONLY if funding is requested.

The following guidelines refer, primarily, to the LOI. **SHARC**NET will work with applicants with accepted LOIs to ensure that all required elements are present in the full proposal. In preparing the LOI it is worth bearing in mind that the full application will require, in addition to a complete description of the expected outcomes and methodology to be employed, a detailed work plan including timelines and deliverables as well as a clear indication of the personnel resources to be committed by the applicant(s) and team(s).

Questions regarding the application process or form may be directed to the **SHARC**NET office at (519) 661-4000 or by e-mail to research-support@sharcnet.ca.

Project Description

Note the word count restrictions on the application form. Any submitted material in excess of the stated maxima will be ignored.

The overarching criterion for consideration of applications is their potential to enable substantively new uses of HPC and of **SHARC**NET resources that will lead to high-impact, internationally-leading research results. The intention is to enable a "step change" in the supported discipline(s). Consider the following when preparing your project description:

- Applicants should clearly explain how the project is novel and that it is not simply a reimplementation of work done or available elsewhere.
- The ability to leverage expertise from one discipline in enabling leading research in another is especially valuable.
- Proposals should clearly explain how an integrated team will be constructed – including the **SHARC**NET staff member(s) – that will lead to a successful conclusion. This explanation should also describe any expertise in project management that the team brings to the project.
- Applicants should make realistic estimates of the resources, including programmer time, necessary to complete the project. It is understood that it is difficult to make precise estimates: a detailed work plan will be developed in conjunction with **SHARC**NET if the LOI is accepted.
- Applicants should specify the anticipated outcomes in concrete terms. For example, compare what is proposed with the state-of-the-art; give the names of journals in which you anticipate publishing results; explain how the product can help other researchers.

- Applicants should describe the technical outcomes in sufficiently concrete terms that a technical evaluation can be made of the feasibility and value of what is proposed. The proposal should also describe the expected lifetime of the application or code that will be developed and, if it is to have longevity, how it will be maintained. Putting a resulting code or package in the public domain is encouraged unless specific reasons for doing otherwise are justified.
- If appropriate, describe the potential for development of intellectual property, or new relationships with private sector firms.
- Applications requesting renewal of an existing award must make a compelling case that additional resources will lead to important new advances and results. It should be noted that such requests will be held to a very high standard. (**N.B**. any renewal request should append the word "RENEWAL" to the title in the online form.)

It is understood that applicants from non-traditional HPC disciplines may be less well versed in completely describing the technical requirements and scope of their proposal. The selection committee will take this into account in judging applications at the LOI stage and **SHARC**NET will work with applicants invited to submit a full proposal to fully describe all required technical details.

Applicants should bear in mind that their principal audience is a group of scientists and technical experts knowledgeable in the uses of high-performance computing but not necessarily expert in the research area of the applicant. ***Therefore, project descriptions in the LOI should not use highly specialized language, and should clearly state the motivation, methods, and objectives of the proposal.***

Requests for Additional Resources

Any additional resources required to undertake and successfully complete the project should be carefully described and justified. Any funding awarded as part of this programme will be governed by the same guidelines as Fellowship funding.
N.B. It is not anticipated that most applications will request resources beyond the primary programming time: nevertheless, applicants should ask for what they need.

Supporting Information

Applicants should provide additional information that supports their expertise and track record in completing large projects of this kind. This may include:

- Brief descriptions of previous large-scale and/or long-term projects or developments and their outcomes.
- Up to three key papers that demonstrate research impacts in the field of the application (or in a closely related field). A brief description of the papers' impact may be provided; complete bibliographic details must be provided.
- Outcomes from previous awards of **SHARC**NET Fellowship funding or Dedicated Resources. Be specific about the outcomes of such awards: people, papers, significance, recognition etc.
- Applicants must describe the relationship to this proposal of any other funding held or applied for by any of the team members. Need for the programmer time and the promise that this time

will lead to a significant new capability in the applicant(s)' research will be necessary criteria for success.

Suggested Reviewers

Applications will be reviewed from both a scientific and technical perspective. Applications will be reviewed internally to **SHARC**NET and may also be sent out for external review. Applicants should list on the form three suggested reviewers who can give an informed opinion of the proposal if requested. The suggested reviewers should be "arms-length" in that the reviewer should not:

- be from the same university (or associated institution) as the applicant
- have a personal relationship with the applicant (close friend, relative)
- have been a research supervisor or graduate student of the applicant within the last 6 years
- have been the applicant's Ph.D. (or equivalent) supervisor
- have collaborated with the applicant in the last six years or have plans to collaborate in the near future
- be in a position to gain financially from the application

The selection committee will endeavour to use at least one of the suggested reviewers if an external review is sought, but may select additional or alternate reviewers as it feels appropriate.

Curriculum Vitae

No specific format is required for your submitted CV but an NSERC Form 100, Parts I and II or any reasonably analogous document with equivalent information is acceptable. The CV may be uploaded to your online profile via the application form or via the web portal at "My Account > Settings > Details".

Multiple Applications

An individual faculty member may be the lead on only one application (LOI and full application) and may not be leading a current Dedicated Programming Support award. (The sole exception to the latter constraint is if the application is for renewal of an existing award.) The faculty member may be a co-investigator on other applications to this programme. Applicants should take note that one measure used to judge the suitability of an application for an award will be the extent to which the principal investigator will be closely engaged in, and able to lead, the project.

4. After Review of the Letters of Intent

Announcement

Applicants will be notified by email whether or not they have been successful at the LOI stage.

Feedback on Applications

Applicants will receive brief comments on their applications that will summarise the reasons for the recommendation and may include any external reviewers' reports and specific comments from the

internal reviewers. Successful applicants will receive detailed instructions on how to submit a full application.

5. How Decisions Are Made

Applications will be reviewed by a committee comprised of researchers from **SHARC**NET institutions and **SHARC**NET technical programming staff. In making recommendations, the committee will take into account how well the application satisfies the selection criteria detailed earlier as well as comments from any external reviewers.

The committee consists of at least one full-time faculty member from each of at least six partner institutions and is chaired by the Scientific Director. The committee will be constituted to ensure that its members have a broad appreciation of the impact and potential of HPC in a variety of disciplines. Membership is posted at: www.sharcnet.ca/my/about/committees.

The committee ranks the applications. This ranking, together with resource constraints is used to make a recommendation to the Scientific Director of which applicants to invite to submit a full proposal. The same committee will rank the full proposals with a final recommendation being forwarded to the Board for approval. **SHARC**NET then notifies applicants of the results.

Ranking Criteria

Proposals will be judged on the degree to which they meet the programme objectives described in sections 1 and 2, and in the subsections “Project Description” and “Supporting Information” of section 3.

Dedicated Programming Support Application (Round IV)
SAMPLE Letter of Intent Form

(the actual application must be made online and could differ slightly from the format below)

1. Applicant Information	
Lead investigator:	
Last Name:	First Name:
Institution:	Department:
Telephone:	FAX:
E-mail Address:	
Co-Investigators:	
1) Last Name:	First Name:
Institution:	Department:
2) Last Name:	First Name:
Institution:	Department:
3) …	

2. Requested Programmer Time	**Additional Resource Requests**
Total estimated project duration:	Dedicated CPU or storage allocation (system & amount):
Total estimated programmer time:	Fellowship support (type & amount)
Expected start date:	Hardware/software purchase (details & estimated cost):
	Other:

3. Title of Research Project (for renewals, the word "RENEWAL" should be appended to the title)

4a. Description of Research Project: Describe the research objectives of the project, justifying its significance and potential impact. Describe how successful completion of the project will lead to a "step change" in your discipline(s). Evaluate the significance of the project in the long term.
The online form will permit a maximum of 1000 words.

4b. Methodology: Describe the technical problem that is to be solved by undertaking this development. Describe the state-of-the-art in the field and justify that this contribution is novel and will have high impact. Describe the specific approach being proposed and support the time estimates that you have given in Section 2. Evaluate the longevity of the application that will be developed and describe how the programming investment will be safeguarded over the long term. If applicable, describe how other SHARCNET researchers might benefit from the development and use of the techniques that will be developed and implemented. Will the code be put in the public domain or licenced?
The online form will permit a maximum of 1000 words.

5. Additional Resources Requested: Use this section to request and justify any additional resources. Make clear why these are critical to the success of the project described in Section 4. Describe the relationship of this proposal to any other funding pending or held by the applicants.
The online form will permit a maximum of 250 words.

6. Supporting Information: Applicants may provide information to support the assertion that the team is capable of accomplishing the goals described. This might include previous experience managing large projects; outcomes from previous **SHARC**NET awards; key papers and their significance etc.
The online form will permit a maximum of 500 words.

7. Suggested reviewers: Please list the names, email addresses and telephone numbers of 3 arms-length reviewers who can assess your application. *The definition of arms-length is given in the guidelines.*

	Name, Title & Position	Email	Telephone
1			
2			
3			

Additional Form Information:

- CV of applicant(s) (e.g. NSERC Form 100, Parts I and II; CFI CV; or equivalent)

Submit To:

Applications should be submitted electronically via the web form available at www.sharcnet.ca/my/resource_applications . If you have any questions regarding the process, please contact the **SHARC**NET office at (519) 661-4000 or email research-support@sharcnet.ca.