Blue Waters Allocation Process for UIUC

Overview
Blue Waters is one of the world's fastest computing systems. Each year that Blue Waters is in operation, about 3-4 million node-hours will be allocated to projects from the University of Illinois at Urbana-Champaign. As each node has many powerful cores, this is significantly more computing power than most universities have available for their use, and this resource provides University faculty and staff with a unique opportunity to perform groundbreaking work in computational science. This document describes how University faculty and staff may request access to this resource. In the rest of this document, “Illinois” refers to the University of Illinois at Urbana-Champaign.

Uniqueness of Blue Waters
Blue Waters is a uniquely powerful resource for computational science. Blue Waters is a Cray system with a combination of XE6 nodes (two AMD Interlagos CPU modules – four processor chips) and XK7 nodes (one AMD Interlagos CPU module and 1 NVIDIA Kepler K20X GPU), connected with Cray's Gemini interconnect, a high performance network. A high-performance, high-capacity file system is also part of the system. A summary of the key capabilities is below; more information is available at https://bluewaters.ncsa.illinois.edu.

- Over 1.3 PetaFLOPS ($10^{15}$ floating-point operations per second) sustained performance (over 11PetaFLOPS peak)
- 1.5 PetaBytes (PB) memory, 25PB Disk, 300PB Tape
- Over 4 PetaFLOPS peak GPU performance (typically $\frac{1}{4}$ PF sustained)
- Over 1 TeraBytes/sec ($10^{12}$ bytes/second) sustained disk bandwidth
- Extreme Scale (22,640 XE6 nodes with over 360,000 core modules or 720,000 integer cores)
- Large GPU system (>3,072 XK7 nodes)

The Blue Waters system is intended for problems that are too demanding for any other system. Projects should make use of the unique capabilities of Blue Waters at large scale, which need not be just floating-point speed; it could be total memory, data size or data bandwidth, or even computational scale. Project proposals are expected to demonstrate that no other resource would be suitable for a given problem, as Blue Waters is not merely a large source of compute cycles (a partial list of alternative resources of compute cycles is included at the end of this document).

Status of Blue Waters
The Blue Waters system is currently completing its deployment and testing. NCSA expects Blue Waters to become available for full service production by March 2013 after an NSF Panel Review. Once Blue Waters enters full service, compute time and
storage will become available to Illinois researchers through the process described in this document.

**Requests for time on Blue Waters by Illinois faculty**

Illinois faculty may request time on Blue Waters. There are two types of allocations: **startup**, intended to prepare a code for Blue Waters, and **general**, intended for large-scale research and/or education projects. Allocations will be announced three times a year (roughly corresponding with the academic calendar) on January 15th, May 15th, and September 15th.

Requests for time should meet the goals of the Blue Waters Allocation Policy, quoted below:

“2% of the available time will be allocated to university projects: (i) faculty whose research and/or education programs would be greatly enhanced by access to Blue Waters and (ii) research and/or education proposals where a commitment of Blue Waters resources will significantly increase the competitiveness of the proposals. The Blue Waters Allocation Committee will directly handle these requests for time.”

The full Blue Waters Allocation Policy is available at [http://www.ncsa.illinois.edu/BlueWaters/pdfs/AllocationsPolicy.pdf](http://www.ncsa.illinois.edu/BlueWaters/pdfs/AllocationsPolicy.pdf).

**Startup Projects**

Startup projects should be used to evaluate and tune code for Blue Waters and/or demonstrate the readiness of applications or techniques for use in a proposal submission. Startup projects are nonrenewable and are for periods of 6-18 months. A limited number of startup projects can be supported at any time, in part due to limited availability of support infrastructure.

A startup project proposal should contain:

1. Name(s) of Illinois PI and Co-PIs
2. Name(s) of collaborators and their institutions and nationalities
3. Detailed description of the problem and the value of its solution
4. Brief description of the computational methods and codes
5. Estimated computational and storage needs (in node hours (for XE and/or XK) and both on-line disk and near-line (tape) storage)
6. Amount and type of required support from NCSA staff (see note below)
7. Period of Project
8. Justification of resources requested (Why Blue Waters and not some other system?)
9. Explanation of why this is a startup project and what might be the outcome and next step if the startup work succeeds

A typical startup proposal will be a few pages long. A typical startup project might request 20,000-50,000 node hours, which will permit a few short tests at full machine scale as well as time for testing at smaller scale. Projects requiring smaller
amounts of time should consider applying for one of the XSEDE startup accounts (See Alternate Sources of Compute Cycles for XSEDE) or other resources.

**General Projects**
For significant research and/or education projects, a general project allocation should be used. Only a few such projects can be supported in each year.

A general project proposal should contain:
1. Name(s) of Illinois PI and Co-PIs
2. Name(s) of collaborators and their institutions and nationalities
3. Detailed description of the problem and the value of its solution
4. Brief description of the computational methods and codes
5. Evidence of suitability for running on Blue Waters (including evidence of the efficiency of the node code; analysis and/or demonstration of scalability)
6. Estimated computational and storage needs (in node hours (for XE and/or XK) and both disk and tape storage)
7. Amount and type of required support from NCSA staff (see note below)
8. Period of Project
9. Justification of resources requested (Why Blue Waters and not some other system?)

A typical general proposal will be 5-8 pages and will provide more details than a startup proposal. A typical general proposal will request 100,000 to 1 million node hours, which will permit 2-10 projects at any time. Projects requiring more time are encouraged to apply for time through NSF’s PRAC program [http://www.nsf.gov/pubs/2008/nsf08529/nsf08529.htm](http://www.nsf.gov/pubs/2008/nsf08529/nsf08529.htm). When submitting for either a general allocation under this program or for an NSF PRAC award, a startup allocation is recommended in order to demonstrate readiness to make efficient use of Blue Waters.

**Review Criteria**
Projects will be judged on their scientific and/or educational merit, their suitability for Blue Waters, and their demonstrated need for the unique capabilities of Blue Waters.

**Principal Investigators**
The principal investigator must be an University of Illinois at Urbana-Champaign faculty member. A Co-PI may be a student or staff member. Young investigators are encouraged to apply.

**Review Cycle**
Once Blue Waters is in production and there are sufficient users of the system, general proposals will be reviewed three times a year, with proposals due December 15th, April 15th, and August 15th. Startup proposals can be submitted at any time and will be reviewed within a month.
To speed the access of Illinois researchers to the Blue Waters system, the initial call for proposals has a due date of February 15th, 2013, with decisions expected before the system becomes available for general use (expected in March 2013). In addition, general proposals can be submitted after February 15th and will be considered within a month, until April 15th, when the regular review cycle described above will begin.

NCSA Staff Assistance
Blue Waters information is available to guide potential proposals. Much system and programming environment information is available at the Blue Waters web site (http://www.ncsa.illinois.edu/BlueWaters). Training material from past workshops as well as complete documentation about using Blue Waters is available at the Blue Waters portal as well (https://bluewaters.ncsa.illinois.edu, see the “Documentation” link). Blue Waters support staff are available during the workday to provide limited assistance for proposal writers such as answering specific questions, discussing algorithms and method approaches, scoping problems, providing general performance metrics, etc. Contacting the Blue Waters Support by submitting a service request via email to help+bw@ncsa.illinois.edu or calling 217-244-6689 between 9AM and 5PM Monday through Friday.

Submission Instructions
Proposals for time on Blue Waters should be submitted through “Easychair,” a conference management system that supports peer review and notification.

- Startup request:
  https://www.easychair.org/conferences/?conf=uiucbwstartupallocat
- General request:
  https://www.easychair.org/conferences/?conf=uiucbwgeneralallocat

Reporting Requirements
Reports are required with any award of time under this program. The report should include accomplishments achieved with the research conducted on Blue Waters — including publications, grants submitted, grants obtained, and talks presented, as well as details of any issues or problems encountered with the use of Blue Waters. Allocations are required to provide a report annually as well as a final report when the allocation ends. Projects are encouraged to contact Blue Waters support about issues or problems as they occur rather than using these reports to bring issues to the attention of the Blue Waters project.

Credit Line
The following text or something similar must be included in publications of all kinds that report on work performed with an allocation of time on Blue Waters made under this program:

This research is part of the Blue Waters sustained-petascale computing project, which is supported by the National Science Foundation (award
number OCI 07-25070) and the state of Illinois. Blue Waters is a joint effort of the University of Illinois at Urbana-Champaign and its National Center for Supercomputing Applications.

Alternate Sources of Compute Cycles
There are a number of sources of compute cycles available to researchers. These include both national and campus resources, and should be considered for projects that do not require the full power of Blue Waters. A partial list follows:

- NSF provides access to a number of high-end systems through the Extreme Science and Engineering Discovery Environment (XSEDE) project, including both startup and large-scale allocations. For more information, see https://www.xsede.org/
- DOE offers time on high-end systems operated by the Office of Science through the INCITE program: http://www.doeleadershipcomputing.org/
- A resource that researchers and/or their units may buy into is the Campus Cluster, for details, see https://campuscluster.illinois.edu/
- NSF’s PRAC program provides access to Blue Waters (NSF controls roughly 80% of the available time on Blue Waters). Information on this program (which is annual) is available at http://www.nsf.gov/pubs/2008/nsf08529/nsf08529.htm.