MEMORANDUM OF UNDERSTANDING No. MOU-UTB-2015036 among

UT-BATTELLE, LLC

and

SWISS FEDERAL INSTITUTE OF TECHNOLOGY, ZURICH

and

GLOBAL SCIENTIFIC INFORMATION AND COMPUTING CENTER, TOKYO INSTITUTE OF TECHNOLOGY

REGARDING DEVELOPMENT OF

AN ACCELERATED DATA ANALYTICS AND COMPUTING INSTITUTE

1. PURPOSE

The purpose of the Memorandum of Understanding (MOU) is to explore potential future collaboration among UT-Battelle, LLC (UT-Battelle), the Swiss Federal Institute of Technology, Zurich (Eidgenössische Technische Hochschule Zürich/ ETH Zurich), and Tokyo Institute of Technology (Tokyo Tech), hereinafter collectively referred to as the "Participants." Consistent with their respective missions, the Participants seek to collaborate and leverage their respective investments in application software readiness in order to expand the breadth of applications capable of running on accelerated architectures.

2. BACKGROUND

Oak Ridge National Laboratory (ORNL) is a Department of Energy (DOE) national laboratory, managed and operated by UT-Battelle, a non-profit limited liability company, organized and existing under the laws of the State of Tennessee, pursuant to DOE Contract No. DE-AC05-00OR22725. ORNL is the largest science and energy national laboratory in the DOE system, with unique scientific experts and tools often not available elsewhere. ORNL is home to DOE's leadership computing facility, the Oak Ridge Leadership Computing Facility (OLCF), and has scientific programs focus on high-performance computing as well as materials, neutron science, energy, systems biology, and national security.

ETH Zurich, located in Zurich, Switzerland, is considered one of the top universities in Europe, with academic programs in engineering, science, technology, mathematics, and management. It is home to the Swiss National Supercomputing Centre (Centro Svizzero di Calcolo Scientifico/CSCS), located in Lugano. ETH Zurich develops and provides key supercomputing capabilities required to solve important problems to science and/or society.

Page 2 of 6

Tokyo Tech, located in Tokyo, Japan, is one of the leading research universities in Japan and is the largest institution for higher education in Japan dedicated to science and technology. It is home to the Global Scientific Information and Computing Center (GSIC), which houses one of the most powerful high performance computers in the world. This system supports research as well as advanced education in computer and computational sciences at Tokyo Tech, and also is made available to select projects at outside research institutes and industries.

3. COLLABORATIVE OBJECTIVES

The intent of this MOU is to set forth the understandings and intentions of the Participants with regard to shared and complementary goals. The Participants each support leadership computing on heterogeneous architectures and provide access to these high performance computers for many of the world's most complex and time-sensitive scientific problems. It is the intent of the Participants to create an "Accelerated Data Analytics and Computing" (ADAC) institute to support collaborative projects and programs to;

- leverage development efforts to adapt important scientific and engineering applications to run successfully at scale on heterogeneous architectures, in addition to developing new applications to benefit from these accelerated node systems;
- partner with the computing industry to evaluate architectural diversity; and
- create a portal to develop and use scalable software environments to enable future collaborative scientific efforts in heterogeneous, accelerated data, and accelerated computing;
- leverage development efforts to ensure sustainability and portability of important scientific and engineering applications; and
- gather, share, and disseminate requirements, lessons learned, and best practices regarding operation, management, and procurement of ADAC resources.

Each Participant has designated key offices and points of contact to serve as channels for potential future cooperation to coordinate across the full range of complementary programs and activities.

The Participants intend to work towards establishing an ADAC institute and to collaborate in these software development activities. Upon execution of this MOU, the Participants plan to exchange examples of potential areas of cooperation, which may form the basis for written agreements to carry out program-specific tasks. All specific tasks are to be subject to separate written agreements as fully set forth herein and the availability of funding for such purpose.

Page 3 of 6

4. ROLES OF THE PARTICIPANTS

Under this MOU, the Participants plan to determine how to best achieve their collaborative objectives. Priority should be given to projects and programs that align with the research priorities, programs, and capabilities of each Participant.

Participants are encouraged to:

- provide analytical, modeling, and scientific support as appropriate for future, agreed upon scientific and educational initiatives;
- exchange scientific staff and expertise to advance their respective core scientific and educational missions; and
- convene regularly for purposes of project planning and exchange of information on the progress of their initiatives.

5. IMPLEMENTATION

To implement this MOU, the Associate Laboratory Director for Computing and Computational Sciences at ORNL, the Director of CSCS at ETH Zurich, and the Professor of the GSIC at Tokyo Tech are to serve in a coordinating role. The designated key offices for implementation of this MOU are:

UT-BATTELLE, LLC: Computing and Computational Sciences

ETH ZURICH: Swiss National Supercomputing Centre (CSCS)

TOKYO INSTITUTE OF TECHNOLOGY: Global Scientific Information and Computing Center (GSIC)

These offices are to have overall responsibility for carrying out the objectives of this MOU, including the development of the joint tasks that are deemed necessary or appropriate to the successful implementation of specific projects and activities, including convening workshops.

For purposes of implementation, mutually agreed upon program-specific tasks should include a statement of:

- a. Overall goals and objectives;
- b. Work requirements of each party;
- c. Time constraints and completion dates:
- d. Cost/funding requirements by each party and means of making funds available; and
- e. Other pertinent information, such as logistics.

Page 4 of 6

6. FUNDING AND RESOURCE COMMITMENTS

This MOU does not create any legally binding obligations among the Participants. Separate agreements among UT-Battelle, ETH Zurich, and Tokyo Tech should be developed to carry out program-specific tasks. Specific tasks that require transfer of funds, services, or property are to be contingent on the availability of funds for such purpose.

This MOU is neither a fiscal nor funds obligation document. Any endeavor involving reimbursement or contribution of funds among the Participants to this MOU is expected to be handled in accordance with applicable laws, regulations, and procedures of all Participants and is expected to be subject to a separate written agreement to be entered into by all Participants.

The Participants are signing this MOU while wishing to maintain their own separate and unique missions and mandates and their own accountabilities. Nothing in this MOU should be construed as superseding or interfering in any way with other agreements or contracts entered into between or among the Participants, either prior to or subsequent to the signing of the MOU, unless otherwise expressly provided in such agreements or contracts.

7. DURATION, MODIFICATION, AND DISCONTINUATION

Cooperation under this MOU may commence upon signature and may continue for a period of five years, unless otherwise modified by the Participants or discontinued as set forth below.

This MOU may be modified by mutual written consent of the Participants. The Participants may discontinue this MOU at any time by mutual written consent. Alternatively, a Participant that wishes to discontinue its participation in this MOU should endeavor to provide at least 60 days advance written notice to the other Participants.

8. USE OF NAMES

No Participant may use the names, trademarks, or logos, of another Participant without prior written approval of such Participant.

9. APPLICABLE LAWS, REGULATIONS AND AGREEMENTS

Each Participant should conduct the activities under this MOU in accordance with the laws and regulations to which it is subject, and applicable international agreements to which its Government is party.

Page 5 of 6

10. POINTS OF CONTACT

The designated Points-of-Contact for implementation of this MOU are:

UT-BATTELLE, LLCName:Jeffrey A. NicholsTitle:Associate Laboratory DirectorPhone:+1-865-574-6224

SWISS FEDERAL INSTITUTE OF TECHNOLOGY, ZURICH

Name:Thomas SchulthessTitle:Director CSCSPhone:+41-79-758-24-15

GLOBAL SCIENTIFIC INFORMATION AND COMPUTING CENTER, TOKYO INSTITUTE OF TECHNOLOGY

Name: Satoshi Matsuoka Title: Professor Phone: +81-3-5734-3876

Page 6 of 6

Signed in duplicate. FOR UT-BATTELLE, LLC:

By:

Name: Jeffrey A. Nichols

Title: Associate Laboratory Director Computing and Computational Sciences Oak Ridge National Laboratory

16

31 Date:

Place:

ORNL

FOR SWISS FEDERAL INSTITUTE OF TECHNOLOGY, ZURICH:

By:

Name: Prof. Dr. Thomas Schulthess

Title: **Director Swiss National Supercomputing** Centre

Date: 3/23/2016 .S.S.S. -i-(01 Place: By:

Name: Prof. Dr. Detlef Günther

Title: VP for Research and Corporate Relations

Date: 11. 4. 16 Place: 2-1

FOR GLOBAL SCIENTIFIC INFORMATION AND COMPUTING CENTER. TOKYO INSTITUTE OF TECHNOLOGY:

By:

3/16/16

Name: Isao Yamada

Title: Director of Global Scientific Information And Computing Center, Tokyo Institute of Technology

Date:

Place: GSIC Tokyo Institute of Technology