SCF2016 WORKSHOPS PROGRAMME

Day 4 | Friday, 18 March 2016

Breakthrough Theatrette, Level 4, Matrix Building, Biopolis

SCF2016 Workshops offer attendees a variety of short courses on key topics and technologies relevant to high performance computing, programming and novel architectures. These workshops also provide the opportunity to interact with recognised leaders in the field and to learn about the latest technology trends, theory, and practical techniques.

Our workshops are open to all registered conference attendees and **pre-registration is essential** to secure your place at your desired workshop. For those of you who are only interested in attending the workshops but not the main conference from March 15 - 17, 2016, we have introduced a special workshop-only fee of **SG$150**. Please check out the details on our registration page.

W1: AUTOMATA PROCESSOR CONCEPTS AND APPLICATIONS

Time: 9:00am - 5:00pm

Venue: Level 4, Matrix Building, Biopolis

Breaks: Morning & afternoon tea breaks & lunch

Presenters:
Matt Grimm, Automata Processor Applications Engineer, Micron Technology
Indranil Roy, Automata Processor Software Development Architect, Micron Technology
Terry Leslie, Director of Automata Processor Business Development, Micron Technology
Jack Wadden, University of Virginia
Mircea Stan, University of Virginia

Abstract: This will be a full day workshop, starting in the morning with a brief discussion of concepts and foundational principles. This will incorporate live demonstrations of automata running on hardware. The foundational section will end with a demonstration of Protomata, a protein motif search application. The foundational discussion will be followed by a theoretical discussion of automata processing and mapping various problems into the AP paradigm. Specific applications and research projects will be discussed where the automata processor shows promise. There will also be a discussion of the AP cluster installation at the Center for Automata Processing at the University of Virginia.

W2: OPENPOWER WORKSHOP

Time: 9:00am - 5:00pm

Venue: Level 4, Matrix Building, Biopolis

Breaks: Morning & afternoon tea breaks & lunch

Presenters:
Norishige (Noly) Morimoto, Vice-President & Chief Technology Officer, IBM Asia Pacific
Ganesan Narayanasamy, OpenPOWER leader in Education and Research, IBM India
H. Peter Hofstee, Research Member, IBM Austin Research Laboratory

Abstract: OpenPOWER Workshop to provide latest updates on various Industry based applications.

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W3: GPU PROGRAMMING HANDS-ON: GETTING STARTED WITH GPUS FOR HPC & DEEP LEARNING

Time: 9:00am - 5:00pm

Venue: Level 4, Matrix Building, Biopolis

Breaks: Morning & afternoon tea breaks & lunch

Presenters: Pradeep Kumar Gupta, Lead HPC & Deep Learning Solutions Architect, NVIDIA, APJ
Gabriel Noaje, Senior Computational Scientist, A*STAR Computational Resource Centre

Abstract:

Learn how to program GPUs. With millions of GPU compute enabled GPUs sold to date, software developers, scientists and researchers are finding broad-ranging uses for GPU computing.

Get hands-on practice with OpenACC. OpenACC allows programmers to use simple compiler directives to identify which areas of code to accelerate, without requiring modification to the underlying code itself.

In this interactive class we will also introduce the rapidly developing technology of ***Deep Learning accelerated by GPUs***. Recent advances in Deep Learning have led to a step change in performance in a number of machine perception tasks including visual perception, speech recognition and natural language understanding after decades of slow progress in these areas. We will tour the most popular software frameworks for Deep Learning with goal of helping you decide which framework best suits your application needs as a researcher or developer.

Important Note:
Participants are required to bring their own laptops for this workshop.

W4: GPU PROGRESS AND DEVELOPMENTS FOR HPC APPLICATIONS

Time: 9:00am – 1:00pm

Venue: Level 4, Matrix Building, Biopolis

Breaks: Morning tea break and lunch

Presenters: Stan Posey, HPC Program Manager, NVIDIA USA

Abstract:

Current trends in high performance computing have advanced towards the use of graphics processing units (GPUs) to achieve accelerator speed-ups for numerical operations common among HPC applications, across a range of computational scientific and engineering domains.

In recent years, this trend has led to GPUs becoming mainstream processors for acceleration of industry-leading commercial CAE software from ISVs such as ANSYS, SIMULIA, and other vendors, and for widely used community developed software including OpenFOAM, WRF, COSMO, and several others.

This session will examine:

- Performance characteristics and requirements of HPC algorithms common to application software in the domains of computational mechanics and atmospheric modelling.
- Current state of GPU parallel solvers in production-use from commercial CAE vendors and considerations for optimal applied-use based on modeling and simulation objectives.
- Developments of GPU parallel atmospheric models and a review of the programming strategies deployed including the use of GPU-based libraries developed by NVIDIA and OpenACC – a directives-based programming model that preserves software portability.
- Select case studies will be reviewed that include deployment of GPUs for practice-level HPC and the application benefits they provide – in some cases transforming current modeling and simulation procedures.
- Review and discussion on NVIDIA directions of GPU hardware, application software development environment, and available programming models. on current and future Intel® Xeon and Xeon Phi processors (including Broadwell and Knights Landing).

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W5: EASILY DEPLOY DOCKER AND OPENSTACK WITH BRIGHT CLUSTER MANAGER AND BRIGHT OPENSTACK

Time: 9:00am - 5:00pm

Venue: Level 4, Matrix Building, Biopolis

Breaks: Morning & afternoon tea breaks & lunch

Presenters: Robert Stober, Director of Systems Solution Architects, Bright Computing

Abstract: Containerisation and private clouds are gaining popularity in HPC environments. Through this workshop, participants will have the opportunity to learn first hand how to deploy, manage and monitor Docker containers using Bright Cluster Manager. In addition, participants will have hands on experience to deploy an Openstack private cloud "from scratch" using Bright Openstack.

Important Notes:
(a) This workshop is limited to 20 participants only.
(b) Participants are required to bring their own laptop.
(c) Prior to the workshop participants should install the Bright Cluster Manager front end client CMGUI for Bright Cluster Manager 7.2. Please refer to SCF2016 website for detailed instructions.

W6: PERFORMANCE TUNING ON INTEL MULTI AND MANY-CORE ARCHITECTURES

Time: 9:00am – 5:00pm

Venue: Level 4, Matrix Building, Biopolis

Breaks: Morning & afternoon tea breaks and lunch

Presenters: Mukesh Gangadhar, Senior Application Engineer, Intel

Abstract: Hardware technologies in High Performance Computing are continuously undergoing major changes and rapidly increasing performance capabilities, but the software and the underlying code legacy is often left unchanged or even neglected. This leads to performance gaps and underutilized hardware assets.

In this workshop, gain insights into cutting-edge programming techniques and tools required to achieve the highest performance on Intel® Architecture using C/C++ or Fortran. Also, learn how to write code in order to maximize software performance on current and future Intel® Xeon and Xeon Phi processors (including Broadwell and Knights Landing).

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W7: BREAKTHROUGH ENGINEERING USING HPC ON CLOUD

Time: 9:00am – 1:00pm

Venue: Level 4, Matrix Building, Biopolis

Breaks: Morning tea break and lunch

Presenters: Rajesh Chhabra, Vice President APAC – Enterprise Computing, Altair
Srirangam Srirangarajan, Managing Director – Altair Engineering Sdn Bhd.

Abstract: Engineering is one of the most dynamic sector today. Rapidly changing demands – both in manpower and computing resources – make it also one of the most suitable for leveraging the Cloud. The need to collaborate across the globe with multi-disciplinary experts leveraging the best of the breed engineering applications is an absolute necessity.

These computation intensive engineering applications inturn depend on High Performance Computing (HPC) for quicker turnaround times. Faster turnarounds lead to faster collaboration which in turn would mean faster decision making.

Cloud computing's unique ability to allow multiple collaborators to work on the same data models improves technical efficiency, data security and reduces potential errors due to miscommunication which in-turn reduces costs and improves overall efficiency.

This workshop is designed for Engineering R&D Heads, Engineering Leads, Product Design specialists and HPC infrastructure providers (technical + management). The workshop will showcase the Cloud solutions for organisations wanting to provide any software as a service and key engineering applications from Altair to enable breakthrough engineering for the modern era using HPC on Cloud.

W8: SPEEDING UP CFD SIMULATIONS FOR VARIOUS INDUSTRIAL APPLICATIONS

Time: 9:00am – 5:00pm

Venue: Level 4, Matrix Building, Biopolis

Breaks: Morning & afternoon tea breaks and lunch

Presenters: Dr. Vincent Chai, Technical Sales Consultant, CAD-IT Consultants

Abstract: In this workshop, participants will be able to experience the power and scalability of ANSYS computational fluid dynamics (CFD) solutions when paired with ANSYS HPC tools for various industry problems. In the recent release, ANSYS CFD with HPC was shown to scale from 768 cores to over 129,000 cores at 90% efficiency when solving complex fluid dynamic problems.

This workshop will go through different case studies with various applications for different industrial applications such as data centre cooling, multiphase analysis, turbomachinery studies and more.

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W9: OPTIMIZING WITH HPC FOR ADVANCED MECHANICAL SIMULATION

Time: 9:00am – 1:00pm

Venue: Level 4, Matrix Building, Biopolis

Breaks: Morning tea break and lunch

Presenters: Hari Hara, Application Engineer, CAD-IT Consultants

Abstract: In this workshop, participants will be able to experience the power of ANSYS HPC, parametric analysis and optimisation tools for mechanical design and simulation.

With ANSYS finite element analysis (FEA) tools, you can simulate real world behaviour of components and sub-systems. The ability to customize, automate and parameterize your simulations to analyse multiple design scenarios, allows you to test different design variations quickly and accurately. High-performance computing (HPC) adds tremendous value to engineering simulation by enabling the creation of large, high-fidelity models that yield accurate and detailed insight into the performance of a proposed design, predicting the actual performance of the product under real-world conditions.

W10: OVERCOMING ELECTROMAGNETICS CHALLENGES IN LARGE & COMPLEX SYSTEMS WITH HPC

Time: 2:00pm – 6:00pm

Venue: Level 4, Matrix Building, Biopolis

Breaks: Afternoon tea break

Presenters: Dr. Boyu Zheng, Technical Manager, CAD-IT Consultants

Abstract: Modern electronics industry requires innovative approaches to design higher-speed, higher-throughput, better power efficiency and smaller form-factor electronics systems. As we are entering the era of Internet of Things (IoT), wireless communication and networking becomes equally important with the focus on wireless connectivity, antenna design, and electromagnetic interference and compatibility (EMI/EMC) issues. These systems are usually large and complex, therefore a lot of challenges are encountered during the stages of design and optimization.

ANSYS high-fidelity electromagnetic simulation software is ideal for identifying electromagnetic issues early in the design cycle. For example, the software enables engineers to do design space exploration to quickly identify the ideal solution for antenna design and placement. With HPC and ANSYS electromagnetics solution, engineers can effectively increase system performance and product reliability while reducing field failures.

In this workshop, participants will have the opportunity to understand the workflow of applying ANSYS electromagnetics solution to tackle real-world challenges in large and complex systems. There will also be hands-on sessions for participants to test out ANSYS and feel the solving capability with HPC.

W11: HIGH PERFORMANCE COMPUTING WITH JULIA

Time: 9:00am – 5:00pm

Venue: Level 4, Matrix Building, Biopolis

Breaks: Morning & afternoon tea breaks and lunch

Presenters: Viral Shah, Co-inventor of Julia, Co-founder of Julia Computing

Abstract: Julia is a high-level, high-performance, open source programming language for technical computing. It provides a sophisticated compiler, distributed parallel execution, numerical accuracy, and an extensive mathematical function library. Julia's Base library, largely written in Julia itself, also integrates mature, best-of-breed open source C and Fortran libraries for linear algebra, random number generation, signal processing, and string processing. In addition, the Julia developer community is contributing a number of external packages through Julia's built-in package manager at a rapid pace. IJulia, a collaboration between the Jupyter and Julia communities, provides a powerful browser-based graphical notebook interface to Julia.

This workshop will start with a basic introduction to Julia. It will then cover topics related to key scientific libraries (array manipulation, linear algebra, sparse matrices, FFTs, etc.). The participants will also learn how to write high performance Julia code, and what makes Julia so fast. Towards the end, we will discuss parallelism, multi-threading, and Julia on GPUs. In the second half, participants may translate their existing programs to Julia or work on an exercise to practise their julia skills.

See: http://www.julialang.org/

Important Note:
Participants are required to bring their own laptops for this workshop.