Institute of Software, Chinese Academy of Sciences

International Visiting Scholars Program

Visiting Report

Laboratory: Laboratory of Parallel Software and Computational Science
Visitor: Pavan Balaji
Inviter: Yunquan Zhang

Institute of Software, Chinese Academy of Sciences
Dr. Pavan Balaji holds a joint appointment as a Computer Scientist at the Argonne National Laboratory and as a research fellow of the Computation Institute at the University of Chicago. He had received his Ph.D. from the Computer Science and Engineering department at the Ohio State University. His research interests include high-speed interconnects, efficient protocol stacks, parallel programming models and middleware for communication and I/O, and job scheduling and resource management. He has more than 75 publications in these areas and has delivered nearly 100 talks and tutorials at various conferences and research institutes. He has received several awards for his research activities including an Outstanding Researcher award at the Ohio State University, the Director's Technical Achievement award at Los Alamos National Laboratory, and several best paper and other awards. Dr. Balaji has also served as a chairman or editor in more than 20 journals, conferences and workshops including JHPCA, ICPP, IEEE Micro, Hot Interconnects, P2S2 workshop, ICCCN, and CCGrid, and as a technical program committee member in numerous conferences and workshops. He is a member of the IEEE and ACM.
2. Arrangement in the ISCAS (e.g. date, place, schedule )


Pavan gave a talk “Is MPI Relevant at Exascale?” on Nov-29 2010 at the No. 337 meeting room of ISCAS No.5 Building. About 40 peoples from CAS and other universities attended this presentation.

Pavan gave a talk “Is Hybrid Programming the Next Step in the Evolution of HPC?” on Dec-8 2010 at ICT, CAS.

Pavan attended the IEEE ICPADS 2010 conference from Dec-8 to Dec-10 in Shanghai. He was invited to attend a panel named of “Challenges and Opportunities of HPC-based Distributed Systems” together with professor Yuanqun Zhang.

Pavan attended the HiPC 2010 conference from Dec-18 to Dec-26 in India. He attends this conference every year and is the PC member.

Pavan visited Shenzhen Institutes of Advanced Technology, CAS from Jan-5 to Jan-8 2011 to do academic communication.

Pavan gave a talk “Trends in One-sided Communication Models” on Jan-10 2011 at the 337 meeting room of ISCAS No.5 Building.

During his visiting, Pavan carried out research works on MPI communication optimization, performance analysis on NUMA architecture with Li Rao, who is a master degree candidate of Prof. Yunquan Zhang. He taught him to use the Hydra binding command to use different process-to-core mapping schemes and analyze the results of IMB benchmark.

During his visiting, Pavan also carried out research works on porting the MPI communication functions onto GPUs using CUDA programming language with Liang Yuan, who is a Ph.D candidate of Prof. Yunquan Zhang.
3. Both International and Domestic Research Situation in the Academic Field (including the situation in the ISCAS)

MPI collective communication is an important and hot research topic in parallel computing field. MPICH, which is developed and maintained by Argonne National laboratory, is the most popular MPI implementation. There are many research work and efforts on improving the performance of collective communication in the field of parallel computing performance optimization.

There are many optimization work for special network topology such as mesh, fat tree, etc; Professor Jack Dongarra from University of Tennessee and his team have done many outstanding work on auto-tuning collective communication optimization; Professor D. K. Panda from Ohio State University devotes his team to multi-core aware and topology-aware optimization; Non-blocking collective communication will be added into the standard of MPI3; One-sided communication is a new research field lead by Argonne National Laboratory and Ohio State University.

The new MPI Allgather Neighbor-exchange proposed by Parallel Software and Computational Science Laboratory exerts some influence on home and abroad research work, quoted by Jack Dongarra and IBM team, and is considered one of the 4 main Allgather algorithms gradually. We are carrying out some research work on multi-core aware and topology-aware performance optimization and Non-blocking collective communication.

Dr. Pavan invited the researcher of Parallel Software and Computational Science Laboratory to visit Argonne National Lab. to carry out collaborate work on MPI 3.0. The Argonne will fund this visiting.

The MCS director of Argonne also proposed to build a joint Lab. on Parallel Processing and Computing Techniques with ISCAS to further strengthen the collaboration relationship.
4. Gains and Experience in the Program

Dr. Pavan Balaji gave us a deep impression on his hard-working, way of thinking and easy going.

Overall thinking: Pavan thinks well of the “big map” of a certain work, for example, when guiding Li Rao for the MPI collective communication work, he listed the contents of 8 papers Li should finished before graduation. It is said Argonne laboratory train this kind of thought since post-doc and that is what we should learn.

Rigorous scholarship: When meeting difficulties from some small problems, he will analyze it and solve it, never go through any tiny problem.

Efficient problem-solving ability: we found a little bug of the MPI Hydra tool developed by his team; He reviewed the design thought 2-year ago and solved it quickly.
5. Comment and Suggestion

A reference or guide from our institute about accommodation, catering and so on will be better.

Inviter: (signature)  Yunquan Zhang