SEVENTH FRAMEWORK PROGRAMME
Information & Communication Technologies

Coordination and Support Action

EU-India Fostering COOPeration in Computing Systems

D4.1: Brokerage Event Report

Document information

Delivery Date	30/11/2012
Confidentiality	Public
Editor	KYOS
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Quality Assurance	FORTH

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Executive Summary

A first brokerage event was organised during the European HiPEAC spring event in **Gothenburg**, Sweden on 24 April 2012. The thematic issue chosen was international collaboration. The event was well **attended by more than 30 persons**. There were **3 experts from India and 5 from Europe** that provided their visionary contributions, including a talk from the EUINCOOP project officer, providing an overview of ongoing activities in Europe and future plans in HORIZON2020 programme.

The panel discussions lead to a clear understanding of the need of collaboration with India, to complement the research activities in next generation computing system technologies. The HiPEAC coordinator suggested organizing a study/community networking delegation from Europe to visit Indian Competence Centres to develop a better understanding of possible opportunities in Computing Systems research, including the exchange of experts and students between Europe and India.

On 7-8 August 2012, a second brokerage event was held in **Bangalore**, jointly organized with the EUCLID project. A number of **key experts from both industry and academia** (15) participated in the event and exchanged different visionary challenges related to next generation computing systems and towards identifying the main challenges that could be of interest for joint EU-India research projects.

The results of these brokerage events have been captured as part of deliverable D2.2 - "Preliminary Research Roadmap" from the project.

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1 Introduction

One of the objectives of the EUINCOOP project is to stimulate cooperation between EU and India in computing technologies to support the EU's leading position in Computing Systems while ensuring mutual benefits to both EU and India.

The project aims to improve the existing cooperation and bolster future cooperation through a series of activities including identification of common priorities between the two regions. The project further endeavours to bring out a joint research roadmap to jumpstart cooperation in priority areas and to make recommendations of these findings to regional agencies in Europe and India on the key topics for sustained cooperation in computing systems development. The project has recently seen 2 major announcements from Europe and India:

- Europe Aims To Become World Leader In Supercomputing[1]: The plan would increase Europe's public HPC spend from €630 million to €1.2 billion and pump a greater share of the money into development, training, and creating "new centres of excellence".

- India Has An Approved Plan Of 1 Billion Dollars To Invest In Developing A Super Computer[2]: India is also rebooting its efforts in supercomputing with an approved plan of investing 1 billion dollars to create next generation super computers. This would be the largest ever grant for a single research programme. This initiative is to keep up with world aiming to achieve peta flop machines and exascale machines. To spearhead this mammoth initiative Indian Institute of Science has been chosen. India's defence, atomic energy, aerospace and space labs with the expertise in design and architecture of super computers will be involved to coordinate the project. This initiative offers tremendous scope for cooperation with Europe which also has similar plans of doubling its investment in exascale supercomputing technologies.

- The fastest supercomputer in the world, Sequoia, has registered a top computing speed of 16.32 petaflops, which is equivalent of computing of power from over 7.8 lakhs high-end laptops put together. The Indian government is planning to build exaflop supercomputers, that will be at least 61 times faster than Sequoia, according to recent reports[3]

EUINCOOP project is developing **preliminary roadmap document**, so as to identify key challenges in Computing Systems research to initiate joint cooperative research projects between India and Europe for mutual benefits. Towards this goal, **the project organized two workshops/brokerage events** involving experts from both regions. The first one was organized in **Gothenburg**, Sweden on 14 April 2012 (co-located with HIPEAC spring event) and the second one was organised in **Bangalore**, India on 7-8th Aug. 2012 in collaboration

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[1] http://www.hpcwire.com/hpcwire/2012-02-16/europe_aims_for_world_leadership_in_supercomputing.html

[2] http://egov.eletsonline.com/2012/01/ministry-of-science-and-technology-sanctions-5000-crore-for-supercomputer-research/

[3] Times Of India, 17 Sep. 2012: *India plans 61 times faster supercomputer by 2017* (http://bit.ly/T1iueD)

with EUCLID project to brainstorm and discuss the relevant issues from both regions. This deliverable provides an overview of these two events organized by the project.

2 Brokerage events

The project planned to have multiple interactive events involving Computing Systems experts from both regions to capture the more relevant and challenging issues in future for defining new research projects both in their regions and across the regions. In this context, EUINCOOP project chose to co-locate their first **brokerage event/workshop** with the well-known **HiPEAC Computing Systems Week**[4] in Gothenburg. The selected venue was excellent for providing the Indian delegation an **overview of the European research landscape** and personal contacts towards developing more cohesive network.

This first event was followed up with the second **brokerage event/workshop** involving invited experts from different sectors and areas of research. The workshop was held in **Bangalore** in Aug. 2012 and helped the European partners to **build insight into the Indian research methodologies** and the way they are funded. Since there are no instruments in place for industrial-academic collaboration, the main constraint for collaboration is identified is necessity of establishing "Technology platform" type of instruments in India.

In the following section, we provide details about the organisation and outcome of these two events.

2.1 Workshop on Challenges in computing systems Research-International collaboration (24 Apr.2012, Gothenburg, Sweden)

The first brokerage event was organised during the European HiPEAC spring event in Gothenburg, Sweden on 24 April 2012. The thematic issue chosen was international collaboration. The event was well attended with more than 30 persons. There were 3 Experts from India and 5 from Europe provided their visionary contributions, including a talk from the EUINCOOP project officer, providing an overview of on-going activities in Europe and future plans in HORIZON2020 programme. The presentations from this event can be downloaded from the project website.

2.1.1 Agenda

14.30 – 14.35   **Welcome and Introduction**

Dr. Sotiris Ioannidis, EUINCOOP project coordinator, FORTH, Greece

14.35 – 14.50   **European Research in Computing Systems**

Panagiotis Tsarchopoulos, European commission, Brussels

14.50 – 15.10   **Future Computing Systems: Overview of Key Challenges for the future Research**

Dr. Sathya Rao, KYOS, Switzerland

15.10 – 15-30   **Challenges and Opportunities in Heterogeneous Multicore Computing Era**

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[4] http://www.hipeac.net/content/goeteborg-hipeac-computing-systems-week-april-2012

Prof. R. Govindarajan, Supercomputer Education and Research Centre, India

15.30 – 15.50	**Reconfigurable technology and tools: the FASTER approach and future Opportunities**
	Prof. Dionisios N. Pnevmatikatos, FORTH, Greece

15.50 – 16.10	**TERAFLUX: Computer Architecture and Software Platform for Teradevice Computing**
	Dr. Albert Cohen, INRIA, France

16.10 – 16.30	**Coffee Break**

16.30 – 16.50	**System-on-chip Fault-Tolerance, the DeSyRe approach**
	Prof. Ioannis Soudris, Chalmers University, Sweden

16.50 – 17.10	**Parallel Programming Environments: HPC, Grid, Cloud and Hybrid Computing**
	Dr. Prahlada Rao, CDAC, India

17.10 – 17.30	**Ongoing Research in Indian Institute of Science**
	Prof. Jamadagni, IISc, India

17.30 – 17.40	**Planet HPC**
	Mark Sawyer, Supercomputing center, University of Edinburg, U.K.

17.40 – 18.00	**Panel discussion: HORIZON2020 Perspectives**
	EURO-INDIA JOINT RESEARCH ACTIVITIES

2.1.2 Summary of discussions

The presentations and discussions resulted in the following observations:

- **The EU has a greater number of projects addressing research into multicore technologies than India.** This is likely related to the emphasis placed in India on applying advanced technologies like multicore, while the EU is investing in the design and development of advanced multicore platforms.

- **EU and India have similar levels of interest in the use of virtualisation technologies.**

- **EU and India have similar levels of interest in technologies for improving parallelisation of systems**. India has a few more projects, though some of these are more about applying advanced parallelisation techniques for specific application domains rather than researching new parallelisation techniques.

- **The EU has a greater number of projects addressing the platform and lower level system technologies than India.** The motivation behind this is likely to be the same as the EU's greater emphasis on multicore research.

- **India has a larger number of projects that are focused on performance analysis and optimisation**, though as in the case with parallelisation some of these are more about applying performance analysis techniques to address specific application domains needs rather than developing new techniques.

- **Reconfigurability plays a larger role in EU funded projects than in India research.** The area for India projects where research into reconfigurability is most prevalent are related to Ubiquitous Computing.

The panel discussions also lead to clear understanding of the need of collaboration with India, to complement the research activities in next generation computing system technologies. The HiPEAC coordinator suggested organize the study/community networking delegation from Europe to visit Indian Competence Centers, so as to develop better understanding of possible opportunities in Computing systems research, including the exchange of experts and students across Europe and India.

2.1.3 Pictures from the event

2.2 Workshop on Embedded systems and future computing systems

As a follow-up to the Gothenburg event, EUINCOOP jointly organized with the EUCLID project[5] a second event, in order to further realize the objective of identifying common research priorities between EU and India and drawing up a joint research roadmap. The event was held on 7-8 Aug. 2012, in Bangalore. The necessary logistics for the event were provided by the Indian Institute of Science (IISc). IISc are also partners in EUINCOOP and host "the Supercomputer Education and Research Center (SERC)" in their campus.

2.2.1 Agenda

Day 1 – August 7, 2012

10.00 – 11.00   **Introduction and Ongoing research activities in India**
Prof. Jamadagni, IISc, India

11.00 – 12.00   **New opportunities for complex systems applied to energy systems**
Prof. S.S. Murthy, IIT-Delhi

12.00 – 13.00   **Key challenges faced by Industry deploying complex systems**
Dr. Andra Venkateswarulu, GE Global Research

13.00 – 14-00   **Lunch**

14.00 – 15.00   **New opportunities for emerging markets: Indian scenario – present and future directions**
Dr. Chinmaya Kar, Control group, HTSL

15.00 – 16.00   **Current work/projects and trends in TCS using complex systems**
Mr. P Balamurulidhar, TCS innovation Labs

16.00 – 17.00   **Discussions and conclusions**

Day 2 - August 8, 2012

9.30 – 9.40   **Introduction and framework of the workshop**
Prof. *Jamadagni*, IISc

9.40 – 10.20   **Machine learning as a major thrust for future computing: recent trends in computing systems**
Prof. Chiranjib, Machine to Machine learning lab, IISc,

10.20 – 11.00   **Key computing challenges of India in comparison with Europe and other developed nations**
Mr. *Suraj* Mukundarajan, Infineon Technologies

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[5] http://www.euclid-india.eu/

11.00 – 11.20	**Coffee**
11.20 -12.00	**Next Generation Smart Grids- Technology challenges, needs and steps taken**
	Dr. Bindu Madhav, CDAC
	Hybrid computing
	Dr. *Prahlad* Rao, CDAC
12.00 -12.40	**Realistic Interventions in Health care through computing systems and technology challenges**
	Mr. Sham Banerji, i2i solutions
12.40 – 13.20	**Lunch**
13.20 – 14.00	**Emerging opportunities and technology innovation for healthcare monitoring and screening**
	Mr. *Shyam* Vasudev Rao
14.00 – 14.40	**SWOT Analysis of computing system research technologies, Application pull of computing, - Immediate technology needs of India**
	Prof. *Govindarajan*, Supercomputing Research Center
14.40 – 15.20	**Perspective of collaborative research in future computing systems between Europe and India**
	Dr. *Sathya* Rao, KYOS
15.20 – 16.00	**Coffee Break and Networking**
16.00 – 16.30	**Computing 2020: Next Generation Innovations**
	Mr. *Manar* Subodh, Intel
16.30 – 17.30	**Panel discussion: "Key research challenges to be addressed for joint research projects"**

2.2.2 Summary of Discussions

The first day of the workshop was devoted for the supportive discussion to enhance **cooperation in complex systems engineering** earlier known as networked monitoring and control systems. Noted Industry and Academic experts from the field delivered talks relating to the current work and level of research in complex systems engineering. Indian Institute of Technology - Delhi, Indian Institute of Science (IISc) - Bangalore, GE - India Global Research - Bangalore, Honeywell Technology Solutions - Bangalore and Tata Innovation labs, Kyos Technologies - Switzerland and Intel India were among the key speakers for the day who expressed keen interest in collaborating with Europe to come up with innovative solutions for the very important Societal challenges common to both the regions.

The second day of the workshop concentrated on discussion of the **topics that the Indian industry and academia view as priorities** for the future of computing systems and are keen

on advancing. It was a very fruitful discussion in terms of convergence of immediate research priorities, research needs and expression of interests to collaborate. The highlight of the workshop was the **five keynote talks, which communicated the perspectives of Industry and Academia**. Infineon technologies India, Forus Health care India Limited-Bangalore, Centre for Advanced Computing- Bangalore, Indian Institute of Science-Bangalore participated and discussed collaborative opportunities.

Two EUINCOOP Partners, Professor Jamadagni (IISc) and Dr. Sathya Rao (Kyos Technologies) gave elaborate talks on the FP7 projects in computing systems and the many opportunities offered by FP7 to countries like India that can participate and benefit from cooperation in the field. Dr. Rao further briefed the audience on the different roadmaps and the results of the first EUINCOOP brokerage event in Gothenburg and the results available from deliverables D2.1 and D3.2 of the project. Copies of these deliverables were also distributed for easy reading. He also informed about upcoming calls and encouraged Indian partners to take an active role. The response was very encouraging with all the participants keen on participating in the upcoming calls. EUINCOOP will take every opportunity to encourage participation and is ideating to bring a joint EU-India tech forum in computing systems as a united form with participation from Industry and academia, consumers, vendors and all other stakeholders to strengthen the computing systems community to jointly drive the research priorities and build capabilities.

The results from the presentations from the experts have been elaborated in deliverable D2.2: Preliminary roadmap document.

2.2.3 Pictures from the workshop

Project Team

3 Conclusions

The two brokerage events provided ample information to develop preliminary roadmap for computing system research with cooperation across two regions. The roadmap is being circulated across HiPEAC community and the key experts for their feedback, which will be used for further enhancing the roadmap document. The improved will be presented to the experts of advisory group and additional brokerage events planned in the project for creating the key challenges to be addressed in both India and Europe with mutual cooperation.

Participants in the events cleared showed major interest to cooperate in joint projects during the upcoming calls and during HORIZON2020 framework. The networking across researchers of both regions will help in defining joint projects.