Publishable summary

The HiPEAC network of excellence works in the context of the radical paradigm shift towards multicore computing and the convergence of the commodity market, the supercomputing market, and the embedded market, making the (heterogeneous) multicore chip the universal computing device of this era. The network wants:

(i) **To stimulate pan-European collaboration and networking** between the members of the network and beyond. This involves stimulating joint research in various ways, e.g. between member institutions across the different disciplines - computer architects, design tool builders, compiler builders, and system designers; between researchers from academia and industry; and between European and non-European institutions. This collaboration between best-of-breed leads to more European excellence in the HiPEAC domain.

(ii) **To coordinate European research in the HiPEAC domain**. Research coordination in HiPEAC is done in seven thematic clusters, each of which deals with a specific part of the HiPEAC research agenda. Clusters are formed by researchers from industry and academia interested in the cluster topic. Clusters continuously update their research agenda and steer European research by deciding on which challenges to tackle, and by coordinating the research efforts of the cluster members.

(iii) **To stimulate exploitation of research results**. The network stimulates highly visible publications and the commercialisation of research results by existing or newly created companies. The goal is to further increase Europe's worldwide visibility in the HiPEAC domain and to help companies achieve world-leading positions in computing systems and computing products.

The HiPEAC partners are Universiteit Gent (Belgium), RWTH Aachen (Germany), Barcelona Supercomputing Center (Spain), Chalmers University of Technology (Sweden), TU Delft (The Netherlands), University of Edinburgh (UK), FORTH (Greece), INRIA (France), ARM Ltd (UK), IBM (Israel), Thales (France), STMicroelectronics (France).

The HiPEAC network is very ambitious in its goals and wants to extend its operation beyond the partners of the network. Every excellent researcher from academia or industry can join the HiPEAC network as a HiPEAC member. A HiPEAC member has both entitlements and responsibilities. He or she can participate in all public HiPEAC activities and can have access to the resources of the network (collaboration grants, internships, summer school, conference, journal, newsletter, …). We expect from the members that they start collaboration with other members in the network and that they promote the network. Non-active members automatically lose their membership status. HiPEAC members can link their students, colleagues and collaborators, making them HiPEAC PhD student or HiPEAC affiliated member. HiPEAC extends its links outside Europe too. Non-European researchers can become associated members. Associate members have all the rights of the regular HiPEAC members, but as non-Europeans, they cannot access the financial resources.

The HiPEAC objectives are translated into a joint program of activities consisting of three programs, supplemented by appropriate management processes. The three programs are heavily interdependent and are the basic mechanisms for achieving the main objectives of the network.

Joint program of activities

WP1: Mobility program

Real collaboration is only possible if people spend a considerable time together working on a common problem. The mobility program supports two different types of mobility:

MOBILITY **SPREADING EXCELLENCE**

RESEARCH

Large networking events

HiPEAC has four large networking events: the ACACES Summer School, the HiPEAC conference, and two Computing Systems Weeks - one in spring and one in autumn. These computing systems weeks consist of cluster meetings and an industrial workshop. The primary goal of the large networking events is to bring the HiPEAC community together under one roof on a regular basis, and thereby create an opportunity to meet and make collaboration plans. Since February 2010 we had 2 computing systems weeks meetings. The spring computing systems week was held at the University of Edinburgh's School of Informatics in Edinburgh in May, 2010. 115 people attended the meeting. The autumn computing systems week was held at the UPC Campus in Barcelona, Spain, and attracted 173 people.

Exchanges

Examples are internships, collaboration grants, and mini-sabbaticals. These exchanges last between a couple of weeks and three months, and result in some concrete research result (joint paper, report, prototype, etc.)

Two internship calls were made in 2010 accounting for a total of 20 internship positions. The second call extended the internship program from HiPEAC industrial partners to all HiPEAC industrial members, resulting in 6 additional internships.

The collaboration grant call received 38 proposals. The review board ranked these proposals and 27 were granted.

The mini-sabbatical calls attracted 6 applications.

WP2: Research program

The program is aimed at coordinating and carrying out joint research between the different partner and member institutions. Based on the HiPEAC strategic research agenda, seven thematic clusters have been formed, each of them dealing with a substantial part of the HiPEAC research agenda. The academic partners in HiPEAC coordinate the clusters, and the cluster operation is supported by a dedicated experienced researcher who takes care of the day-to-day (scientific and administrative) management of the cluster. The seven clusters are:

1. Multicore Architecture (Per Stenström, Chalmers)
2. Programming models and operating systems (Eduard Ayguadé, BSC)

3. Compilation (Michael O'Boyle, University of Edinburgh)

4. Interconnects (Manolis Katevenis, FORTH)

5. Reconfigurable Computing (Georgi Gaydadjiev, TU Delft)

6. Design and simulation (Rainer Leupers, RWTH)

7. Virtualization (Koen De Bosschere, UGENT)

Next to the cluster, there are also four task forces, working on cross-cutting challenges:

1. A task force on education and training (Manolis Katevenis, FORTH)

2. A task force on low power (Stefanos Kaxiras, University of Uppsala)

3. A task force on reliability and availability (Yiannakis Sazeides, University of Cyprus)

4. A task force on applications (Nacho Navarro, BSC)

Task forces have a similar organization, but they do not have an associated cluster researcher.

These 11 thematic working groups are where the actual HiPEAC research coordination takes place. They also help in updating the HiPEAC strategic research agenda.

All research clusters have met twice in 2010. In 2010, the clusters have been instrumental in the formation of several consortia for FP7 project proposals. In terms of activities, the clusters have focused in 2010 on interaction with the FP7 projects in computing systems. In Edinburgh, the then recently approved FP7 projects gave high-level presentations. In Barcelona, they gave in depth technical presentations for the cluster audiences. All clusters have been involved in the organization of international events (workshop, tutorial, and seminar) that are directly linked to the cluster activity.

WP3: Spreading excellence program

This program manages all the public communication and integration activities of the network. The most visible activities are the HiPEAC website, the yearly HiPEAC conference, the HiPEAC journal, the quarterly HiPEAC info newsletter, the biannual industrial workshops, the HiPEAC roadmap, detailing the HiPEAC strategic research agenda, and the yearly International Summer School on Advanced Computer Architecture and Compilation for High-Performance and Embedded Systems (ACACES). Just as important are the activities targeted at the HiPEAC start-ups, the web seminars, and the award program to stimulate dissemination of research results in top conferences.

The conference in Heraklion attracted 85 submissions, of which 20 were accepted. In conjunction with the conference, 7 workshops and 2 tutorials were organized.

The ACACES 2010 Summer School was held from July 11 to July 17, 2010. With 303 applications, the summer school continues to be a very attractive event. Due to the capacity limits, we limited the attendance to 193 students. 56 PhD students received a HiPEAC grant. 22 people from industry, representing 11 different companies, attended.

The journal received 17 submissions, and eventually accepted 12.

The roadmap was published in January 2010, and a short movie was created by September 2010. See www.hipeac.net/roadmap.

Four issues of HiPEAC-info, the quarterly HiPEAC newsletter have been produced. They were sent to respectively 868, 1038, 845 and 1252 subscribers.

A database with publications by HiPEAC members has been set up and is available on the website. The database currently holds 5013 publications, starting from 2006.

The HiPEAC website www.hipeac.net has been reorganized and redesigned to improve the attractiveness and usability. The cluster coordinators continue improving their cluster specific website.

Two industrial workshops have been organized. In May, the University of Edinburgh hosted the Edinburgh innovation event. In October, BSC hosted the Barcelona multicore workshop.

In order to promote HiPEAC start-ups, Per Stenström and Andrzej Brud from Chalmers have been teaching a course on "How to transform research results into a business" at the ACACES 2010 summer school. Also, the innovation event at Edinburgh was targeted at start-up companies and SMEs. In 2010 we welcomed 4 new HiPEAC start-ups.

The award program was successful in 2010. 28 papers received a HiPEAC Paper Award. 14 of those were eligible for a financial award. This means we currently have awarded 67 papers in total, of which 40 with a financial award.

WP4: Management

The HiPEAC steering committee meets monthly, either physically or virtually via a conference call. Meeting minutes are available at the HiPEAC website (only for the steering committee).

In 2010, the HiPEAC project manager Wouter De Raeve left the network and he was replaced by Jeroen Ongenae.

The reimbursement service proves to be lightweight and efficient. In 2010 137 reimbursement requests were submitted, 112 of those were accepted, and 25 rejected.

In 2010, The HiPEAC community welcomed 41 new members, of which 16 from industry. The community has been steadily growing. Currently, HiPEAC has 12 partners, 246 members, and 47 associate members. Of the 246 members, 72 are members from companies. Furthermore, we have 470 HiPEAC PhD students and 236 affiliate members. The current list of members is at http://www.hipeac.net/dmemberslist.

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