



HIGH PERFORMANCE AND EMBEDDED ARCHITECTURE AND COMPILATION

Project Acronym: *HiPEAC*

Project full title: High Performance and Embedded Architecture and Compilation

Grant agreement no: *ICT- 217068*

DELIVERABLE 1.1

MOBILITY REPORT

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1. Summary on Mobility

The mobility program has 4 instruments and is aimed at stimulating research cooperation between all partners and members of the network. From previous experience we know that actual collaboration requires that researchers can physically meet and spend a considerable amount of time working on a research program. Therefore we created 4 mobility instruments, each targeted at a different type of collaboration.

Internships are our industry-driven opportunities for PhD students to have a 3-month internship at one of the HiPEAC companies. The HiPEAC companies choose both the topic of the internship, as well as the internee. **Collaboration grants** are proposed together by the student and the host, which may either be a company or an academic institution.

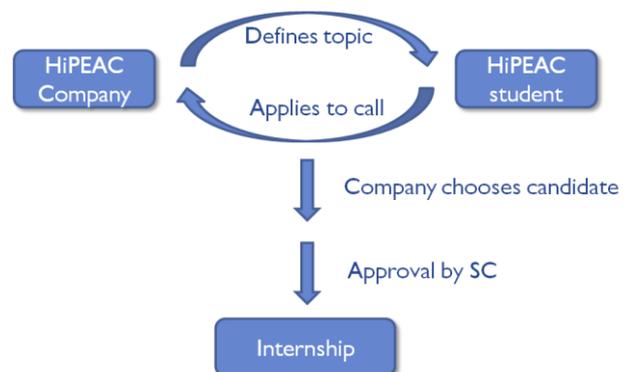
For senior researchers and professors we created the mini-sabbaticals, which are a flexible and open mechanism to stimulate short stays at HiPEAC institutions by senior members.

The fourth pillar of the mobility program are the cluster meetings, which are organized during the computing systems weeks, where all clusters can meet and discuss their research goals.

2. Task 1.1: Internships

HiPEAC yearly funds company internships in order to increase *industry-academia interaction*. Every year, the HiPEAC member companies list the research topics for which they are seeking interns. *HiPEAC students* are able to apply for the internships. The call closes mid-February, after which the companies select their candidates.

Once the companies have selected the candidates, the Steering Committee decides on the final allocation, and also on the distribution of the internship budget among the different companies. The purpose of this instrument is to have as many interns in companies as possible and to convince companies to create more self-financed internship positions for students. The goal is to have 10-15 HiPEAC financed internships per year, with a growing number of company-financed internships over the years.



2.1. Internship Period 1

In the reporting period covered by this report, 11 internships were granted. Due to the overlap, they were funded by the HiPEAC 1 budget.

The 60k€ that was reserved to fund internships was transferred to the remaining years, effectively increasing the number of internships we can grant.

2.2. Internships in HiPEAC 2

Internships in HiPEAC2 follow a similar structure.

Once the positions are gathered, the call is sent to the PhD students, who can apply for an internship.

Funding for the internships is distributed evenly among the partner companies (ARM, NXP, IBM, ST). If a company at a certain time should not require any funding, the remaining budget is distributed among the remaining companies.

Non-partner companies are in se not eligible for internship funding. However, the SC may decide to fund a particular internship request if considered valuable.

During the first reporting period, the internships were granted through HiPEAC1-funding.

2.3. Internship procedure

Calls

The internship call is opened by contacting all HiPEAC Companies (not only partner companies). They are invited to publish their internship positions at the HiPEAC website, thus in effect using the HiPEAC website as dissemination tool for their positions.

When all positions have been gathered, the HiPEAC students are invited to apply for the internships. From a students point of view, there is no distinction whether an internships is HiPEAC-financed or company-financed.

Internship assignment

The companies decide who (if any) to accept for the available internships positions. As described above, the HiPEAC partner companies receive an equal part of the funding.

Internships Grant report

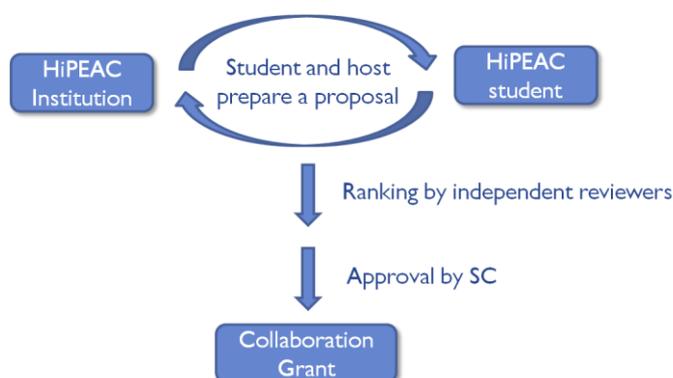
After the internship period, every applicant is requested to write a brief activity report.

This report contains the following items:

- An overview of the activities performed at the host's site
- Research results, publications, project proposals, ...
- Future plans for collaboration with the host

3. Task 1.2: Collaboration Grants

HiPEAC yearly funds several collaboration grants for *HiPEAC students* wanting to visit another *HiPEAC institution* (either an academic institution or a company). The students and their host prepare a small research project for the stay (hence the topic is defined by the students and their hosts). The Steering Committee decides on the final allocation of the collaboration grants – based on the quality of the proposals. Although targeted at PhD students, postdocs are also eligible for this program.



The objective of the collaboration grants is to stimulate real collaboration

between HiPEAC members. The initial goal is to fund 20 collaboration grants per year. We hope to get many more applications for collaboration grants, and that the non-granted applications will be funded anyhow by the institutions involved. For some students, this instrument might be a step towards a European PhD.

3.1. Collaboration grant procedure

Calls

In the first reporting period, two calls for collaboration grants were launched:

1. Call during the Computing Systems Week, June 2008, Barcelona. This call was also announced in the HiPEAC Newsletter.
2. Call announced at the Summer School, July 2008.

Collaboration Grant Ranking

The collaboration grant proposals are ranked and the best proposals are granted.

The criteria used for ranking are:

- Scientific quality of the proposal
- Track record of the applicant
- Current linkage of the applicant to the host research group
- History of grants
- Independence of applicant
- Possibility for a new linkage between research groups

The ranking is done by independent reviewers. The reviewers for this year's collaboration grant were:

- Michael O'Boyle, University of Edinburgh (coordinator)
- Andre Seznec, INRIA/IRISA
- Stefanos Kaxiras, University of Patras
- José Duato, Universidad Politecnica de Valencia

The Steering Committee then makes the final decision on the grants.

Administrative aspects

Once the collaboration grant is approved, the applicant can enter his or her details on the website. A grant agreement will be generated, and has to be signed by the applicant, his advisor, the host and the coordinator.

After receiving the agreement, the applicant receives the grant in two instalments, one prior to the stay, and one during the stay.

Collaboration Grant Report

After the collaboration grant period, every applicant is requested to write a brief activity report.

This report contains the following items:

- An overview of the activities performed at the host's site
- Research results, publications, project proposals, ...
- Future plans for collaboration with the host

3.2. Call 1: June 2008 (announced at CSW, Barcelona)

The first call was announced during the Computing Systems Week, in Barcelona.

The call was also published in the July 2008 newsletter (HiPEAC Newsletter 15).

22 proposals were submitted. 6 of those were granted.

The granted proposals are:

Name of applicant	Applicant's Institution	Host	Title of collaboration grant
Alberto Ros	University of Murcia	Marcelo Cintra, University of Edinburgh	Impact of fine-grained interleaving cache organizations and block migration in cache coherence protocols for tiled CMPs
Ricardo Chaves	INESC-ID	Jorge Guajardo Merchan, Philips	DPA/DEMA countermeasures on embedded secure devices
Ricardo Quisilant del Barrio	University of Malaga	Per Stenström, Chalmers	Optimization of data conflict detection for hardware transactional memory systems
Pablo Abad	University of Cantabria	Giorgos Dimitrakopoulos, Forth	Analysis of buffer organization and flow control impact on scalable CMPs performance implemented in deep submicron technologies
Francesco Regazzoni	AlaRI	Paolo Ienne, EPFL Lausanne	Methodologies and tools for side channel resistant design flow
Marcela Zuluaga	Edinburgh University	Paolo Ienne, EPFL Lausanne	Amortizing the Cost of ASIP Design Across Multiple Application Domains

3.3. Call 2: July 2008 (Summer School)

The second call was announced during the Summer School in July 2008. 13 proposals were submitted.

The granted proposals are:

Name of applicant	Applicant's Institution	Host	Title of collaboration grant
Francisco Gilabert Villamon	University Politecnica de Valencia	Davide Bertozzi, University of Ferrara	Expanding switch architectures for On-Chip Interconnects
Jaume Joven Murillo	University Autonoma de Barcelona	Federico Angiolini, iNOCS,	Quality of Service Provisioning through Hardware and Middleware Design for Application-Specific NoC-Based MPSoCs
Mounira Bachir	INRIA	David Gregg, University of Dublin	Minimizing code size in embedded loops
Sebastian Lopez	University of Las Palmas G.C.	Wayne Luk, Imperial College	Design space exploration of reconfigurable architectures for video processing applications

Vincenzo Rana	Politecnico di Milano	David Atienza, EPFL Lausanne	A novel design flow for FPGA-based systems based on 2D reconfigurable Networks-on-Chip
Ricardo Velasquez	AlaRI – Advanced Learning and Research Institute	Rainer Leupers, RWTH Aachen	MPSoCs – Programming Models and Operating Systems
Fabian Nowak	University of Karlsruhe	Stephan Wong, TU Delft	Universal Platform for Research on Reconfigurable Systems

4. Task 1.3: Mini-sabbaticals

HiPEAC is stimulating short sabbatical leaves for *senior researchers and professors*. Mini-sabbaticals are typically stays for one month or longer at a member company (or another institution). The goal of the mini-sabbaticals is to stimulate collaboration with the aim of coordinating or refocusing the research portfolio of the two institutions involved. The goal is to have between 5 and 10 mini-sabbaticals per year.



4.1. Mini-sabbatical procedure

Mini-sabbatical application calls are open all year long. The HiPEAC Steering Committee periodically evaluates mini-sabbatical applications, introduced by the mini-sabbatical coordinator.

The applicant submits a proposal, in which he states the work to be done, a time frame and a budget. The Steering Committee then decides on the allocation of the budget (in the order of a 100€ per day + travel expenses, no salaries).

The applicant is a senior researcher or professor, active full Member of HiPEAC, and the destination institution can be a HiPEAC institution, or even a non-HiPEAC institution that is looking to join or collaborate with HiPEAC.

4.2. Period 1

The first period of HiPEAC was used to set a procedure and agreement for the mini-sabbaticals. Although no specific call or announcement was launched, we granted two mini-sabbaticals:

Name of applicant	Affiliation	Host institution
Enrique Torres	University of Zaragoza	International Computer Science Institute
Rainer Leupers	RWTH Aachen	ACE, Amsterdam

Enrique Torres has finished his mini-sabbatical. A report on this mini-sabbatical was published in HiPEAC Info 18.

Rainer Leupers' mini-sabbatical is ongoing.

4.3. Future work

The mini-sabbatical procedure will be announced in issue 19 of the HiPEAC Newsletter 19. We hope to have the foreseen 5 tot 10 mini-sabbaticals in the next period.

5. Task 1.4 Cluster Meetings

The general cluster meetings are the occasions on which the *HiPEAC community* gathers, discusses ongoing research, and makes plans for the future. The primary goal of the general cluster meetings is to bring together in one location a major part of the HiPEAC community during 2-3 days. During general cluster meetings, all clusters and task forces have their meeting, chaired by the cluster coordinator. During the general cluster meetings, there are also break-out sessions where individual members can meet to have detailed discussions about their common plans. At least once a year a general cluster meeting also hosts a general assembly meeting (Task 4.2) and twice a year it hosts an industrial workshop (Task 3.9).

In order to limit the amount of travelling, cluster meetings are often co-located with other major events like the HiPEAC Conference. For the same reason, the HiPEAC general cluster meetings are also a good opportunity to schedule meetings of other European projects before or after. As a result, these general cluster meetings have become major networking events for the European HiPEAC community.

5.1. 1st Cluster Meeting, Goteborg

The first cluster meeting took place on January 30-31, in Goteborg.

It was organised just after the HiPEAC 2008 Conference.

Attendance

The cluster meeting in Goteborg attracted 142 people.

72 Attendants were current members, and 27 of the 142 were affiliated PhD students. 34 affiliated colleagues contributed to one or more of the cluster meetings.

That means that 133 people who attended the event are now a member or affiliated to a member.

Program

Wednesday, January 30, 2008				
Time slot	room a	room b	room c	room e
09:00-12:00	Kick Off Meeting			
13:30-15:00	Multi-core architectures			
15:30-17:00	Reconfigurable Computing	Programming models and operating systems	<i>NoC Characterization Cluster (Pisa)</i>	<i>Video Codec Parallelization</i>
17:30-19:00	Adaptive Compilation Cluster	Interconnects Cluster	<i>Performance Implications of Hard-Faults in non-architectural resources</i>	<i>Video Codec Parallelization</i>
Thursday, January 31, 2008				
Time slot	room b	room c	room d	room e
08:30-10:00	<i>Interconnects and IPC</i>	<i>SARC WP3</i>	<i>SARC WP2</i>	Virtualization & Binary Translation
10:30-12:00	Design Methodology and Tools	<i>SARC WP3</i>	<i>SARC WP1</i>	Virtualization & Binary Translation
13:30-15:00	Simulation & Modeling cluster	<i>SARC WP2</i>		
15:30-17:00	Compilation platform	<i>SARC WP2</i>		
17:30-19:00	<i>SARC WP7</i>			

Other Projects' Meetings

During the Cluster Meetings, HiPEAC also hosted meetings for the following projects (in italics):

- SARC
- HiPEAC1 clusters

Meeting report

The specific meeting reports by the clusters can be found in the Research Report.

5.2. 2nd Cluster Meeting, Barcelona

The second cluster meeting was organised during the Computing Systems Week at UPC, in Barcelona, from June 2-3, 2008.

During the Computing Systems Week, the 5th HiPEAC Industrial Workshop took place on the premises of HP Labs Barcelona. A two-day multi-core workshop was organised after the cluster meetings, on June 5-6.

Detailed reports on the industrial workshop, cluster meeting and multi-core workshop can be found in the Spreading Excellence report and Research Report.

Attendance

The Barcelona Computing Systems Week attracted a record number of 200 attendees.

66 of the attendants were current members. 66 affiliated PhD students and 42 affiliated colleagues joined in. 20 people from industry also attended the meetings, coming from companies such as:

Transitive	NXP
SUSE Linux	Ericsson
IBM	Infineon
HP	Alcatel-Lucent
Thales	

Program

Monday, June 2, 2008				
Time slot	Vertex	Room 1	Room 2	Room 3
08:30-10:00		<i>ACOTES</i>		
10:30-12:00		<i>ACOTES</i>		
13:30-15:00	Multi-core	<i>ACOTES</i>	<i>Milepost</i>	
15:30-17:00	Reconfigurable Computing	Compilation platform	<i>Milepost</i>	Multi-core
17:30-19:00		Binary Translation and Virtualization	Task Force on Low Power	
Tuesday, June 3, 2008				
Time slot	Room 1	Room 2	Room 3	Room 4
08:30-10:00	Adaptive Compilation	Interconnects		
10:30-12:00	Design Methodology and Tools	Programming models and operating systems	<i>ACSEES</i>	<i>SARC-WP2</i>
13:30-15:00	Simulation Platform	Reliability Task Force	Task Force on Education and Training	<i>SARC WP3</i>
15:30-17:00	<i>Developing High-performance Techniques for Real-time</i>	<i>Performance evaluation tools for heterogeneous multi-core environments</i>	<i>SARC</i>	
17:30-19:00			<i>SARC</i>	HiPEAC SC

Other Projects' Meetings

The Computing Systems Week also hosted meetings for other projects (in italics):

- *ACOTES*
- *SARC*
- *MILEPOST*
- *HiPEAC1 clusters*

Participants' Feedback

The participants of the Computing Systems Week were asked to give a feedback on their experience in Barcelona.

An online survey was carried out. The survey asked the attendants for their appreciation of the different events (Cluster Meetings, Industrial Workshop, Multi-core Workshop).

They were also asked to voice their opinions on what they thought was most/least valuable during the computing systems week.

Feedback Results

67 attendants (33%) completed the survey.

69 % of those attended a Computing Systems Week for the first time. The majority of the people who completed the survey were academics (90%). Half of them were PhD Students, the rest were senior researchers.

We then asked for their expectations for the Computing Systems Week.

The answers that were most significant:

- Meet other researchers and seek opportunities for collaboration
- Exchange ideas and opinions, gain new perspectives
- Understand long term industry trends and roadmaps
- They expect respectable presenters, a varied program, containing presentations, workshops, tutorials and break-out sessions

When asked to give their appreciation for a specific event (3-point scale), these were the results:

Answer Options	Low	Neutral	High	Rating Average
Design methodology and tools	13%	43%	43%	2.30
Multi-core architecture	6%	37%	57%	2.51
Programming models and operating systems	10%	41%	49%	2.39
Adaptive compilation	11%	52%	37%	2.26
Interconnects	10%	52%	38%	2.29
Reconfigurable computing	21%	38%	42%	2.21
Binary translation and virtualization	17%	43%	39%	2.22
Simulation platform	12%	62%	26%	2.15
Compilation platform	6%	50%	44%	2.39
Task force on Low Power	24%	44%	32%	2.08
Task force on Reliability and Availability	6%	44%	50%	2.44
Task force on Education and Training	23%	54%	23%	2.00

The appreciation was very event-specific. The event on multi-cores was highly appreciated, while the events on the Task Force on Low Power and Education and Training received a lower rating. Rating averages (on a scale of 1-3) are good.

The workshops on multi-cores and the industrial workshop received the following ratings:

Answer Options	Low	Neutral	High	N/A	Rating Average
Industrial Workshop at HP Labs	0	21	19	23	2.48
Barcelona Multi-Core Workshop	0	6	46	14	2.88

The ratings are very high for these events, especially for the Multi-Core workshop.

The following aspects were mentioned most often when asked what was most appreciated:

- Large presence of researchers, both from academia as from industry
- Good presentations and speakers
- Possibility to do extensive networking
- Diversity of events

The following aspects were appreciated less:

- Meetings were too short, too many presentations in one meeting
- Too full, too much information within short time spans
- Industrial Workshop not focused enough on industry
- No possibility for real debate during the cluster meetings

40 attendants stated that after the cluster meetings, they saw real opportunities in new collaborations, through internships, joint project proposals, ...

The following activities were suggested to be organized at future cluster meetings:

- Poster session
- Tutorial
- Presentations on current FP7 projects

In **response** to these suggestions, the poster session at the Summer School was extended with presentations of related European projects. The Conference in Cyprus organised a specific tutorial and poster session.

40% of the surveyed stated they would attend the Paris Cluster Meetings. 55% was undecided (due to budget restrictions, authorisation, programme, speakers,...). Only 4.5% stated explicitly they would not attend the cluster meeting in Paris.

Feedback conclusion

While the cluster meetings received good feedback, the feedback has also given us the opportunity to further improve the meetings. The cluster meetings are considered to be a way to get a quality overview of the current research and to gain new insights, but also as a networking event, where one can meet many researchers and talk about new collaborations.

In future cluster meetings, we will consider these aspects. One item to improve is the schedule of the meetings. More time should be made available for in-depth presentations and discussions.

We will focus on our strong points, such as offering the possibility to meet highly appreciated senior researchers in the domain, and to attend a wide range of activities, including workshops, tutorials and poster sessions.

5.3. 3rd Cluster Meeting, Paris

The third cluster meeting was held in conjunction with the 6th HiPEAC Industrial Workshop at the buildings of Thales Research & Technology, Paris, from November 24-28, 2008.

Attendance

The meetings were attended by 158 people, of which 62 HiPEAC members, 22 affiliated PhD students and 25 affiliated colleagues. 34 people from industry joined the meetings, coming from the following companies:

NXP	Alcatel-Lucent
ST Microelectronics	Ateji
IBM	Silicon Hive
Microsoft	Honeywell Aerospace
Intel	Infineon
Transitive	HP

Although the number of attendants was lower (158 versus 200), we managed to attract more industry participants (34 versus 20).

Program

Thursday, November 27, 2008			
Time slot	Auditorium	1C	2C
08:30-10:00	Multi-core		
10:30-12:00	Interconnects	Adaptive Compilation	
13:30-15:00	Reconfigurable Computing	Virtualization	
15:30-17:00	Programming Models	Task Force on Reliability	<i>Multi-threaded Real-Time</i>
17:30-19:00	Simulation Platform	Task Force on Education and Training	<i>Multi-threaded Real-Time</i>
SOCIAL EVENT			
Friday, November 28, 2008			
Time slot	Room 1	Room 2	Room 3
08:30-10:00	Design Methodology and Tools	Task Force on Applications	<i>Multi-threaded Real-Time</i>
10:30-12:00	Compilation Platform	Task Force on Low Power	<i>Multi-threaded Real-Time</i>
13:30-15:00		<i>Milepost</i>	<i>Multi-threaded Real-Time</i>
15:30-17:00		<i>Milepost</i>	<i>Multi-threaded Real-Time</i>
17:30-19:00		<i>Milepost</i>	<i>Multi-threaded Real-Time</i>

Thales generously offered a nice social event to the HiPEAC community. 103 people attended the event, which was highly appreciated.

Other Projects' Meetings

The Computing Systems Week provided opportunities for the following projects to meet:

- ACOTES
- MILEPOST
- SARC
- HiPEAC1 cluster meetings

Meeting Reports

The cluster meeting reports can be found in the Research Report.

5.4. 4rd Cluster Meeting, Paphos, Cyprus

The fourth cluster meeting was held after the HiPEAC 2009 Conference in Cyprus, in the Amathus Hotel.

Attendance

The cluster meetings were attended by 82 people according to our database, of which 40 members, 12 affiliated PhD students and 17 affiliated colleagues. 10 people from industry attended, coming from IBM, ST and Thales Research & Technology. The reason for the lower attendance of this cluster meeting is that it was only a one-day event at the end of a 4-day conference. Many people decided to go back earlier, having done their networking during the conference. A second reason was that several clusters organised a workshop on the Sunday before the conference, which actually replaced the cluster meeting in several cases. Another factor was that the January cluster meeting was too close to the November meeting to be really useful as a networking event.

As a result, the Steering Committee decided to change the organisation of the cluster meetings at the conference into workshops and tutorials from next year on. The conference however turned out to be an excellent place to network for the upcoming FP7 call.

Program

Thursday, January 30, 2009				
Time slot	Room A	Room B	Room C	Room D
08:30-9:15	General Assembly Meeting			
09:30-11:00	Compilation Platform			
11:30-13:00	Interconnects	Adaptive Compilation	Task Force on Reliability	
14:30-16:00	Reconfigurable Computing	Virtualization	Task Force on Low Power	<i>Milepost</i>
16:15-17:45	Multi-core architecture			<i>Milepost</i>
18:00-19:30	Programming Models	Task Force on Applications		Task Force on Education

Other projects' Meetings

Only MILEPOST used the opportunity to meet (in italics).

6. Conclusion

All mobility instruments have been launched successfully, and show a healthy level of activity. The consortium is searching for ways to (i) extend the internship program beyond the sponsored internships, and (ii) to increase the number of mini-sabbaticals.