Project N°: 610456

D1.3 First Public Activity Report

July 10, 2015

Abstract:

This deliverable includes a summary of the EUROSERVER project objectives and progress.

Document Manager	
Yves Durand, Isabelle Dor	CEA
Reviewers	
Per Stenström	CHAL
John Thomson	ONAPP

Document Id N°:		**Version:**	2.0	**Date:**	July 10, 2015

Filename:	D1 3-first_public_activity_report_v2.0.docx

The EUROSERVER Consortium consists of the following partners:

Participant no.	Participant names	short name	Country
1	Commissariat à l'énergie atomique et aux 2nergies alternatives	CEA	France
2	STMicroelectronics Grenoble 2 SAS	STGNB 2 SAS	France
3	STMicroelectronics Crolles 2 SAS	STM CROLLES	France
4	STMicroelectronics S.A	STMICROELECTRONICS	France
5	ARM Limited	ARM	United Kingdom
6	Eurotech SPA	EUROTECH	Italy
7	Technische Universitaet Dresden	TUD	Germany
8	Barcelona Supercomputing Center	BSC	Spain
9	Foundation for Research and Technology Hellas	FORTH	Greece
10	Chalmers Tekniska Hoegskola AB	CHALMERS	Sweden
11	ONAPP Limited	ONAPP LiMITED	Gibraltar

Revision history

Version	Author	Notes
0.1	Yves Durand	Creation
0.2	Per Stenström	Review
0.3	John Thomson	Review
0.4	Yves Durand *et al.*	consolidation
0.5	John Thomson	Collaboration program added
0.6	Isabelle Dor *et al.*	Final review
1.0	I. Dor	Finalized version
2.0	I. Dor, Y. Durand	Amended version and references added.

Content

Publishable summary

EUROSERVER develops a micro-server solution for today's cloud infrastructure that is tailored for their workloads (see [1]). The EUROSERVER platform combines several architectural key features, such as: highly efficient ARMv8 processors, an innovative scalable memory scheme called UniMEM and the use of Hybrid Memory Cubes to maximize density and bandwidth of external memory. It takes advantage of the most recent integration technologies including FD-SOI and organic System-in- Package for energy efficiency. It uses advanced software features to optimize resource sharing and communication within the system (see [2]).
Its architecture is actually designed for scalability. Therefore, its basic building block, i.e. a microserver board, is also suitable for use in smaller packaging for embedded applications such as transportation, or telecom infrastructure.
This holistic approach puts EUROSERVER in a leadership position in several technical areas. Thus, the members of the consortium contribute actively in both software and hardware scientific communities in computer architecture, system software, integration technology, software virtualization and network infrastructure.

EUROSERVER has started in September 2013. Since then, the consortium has reached important achievements:

- A systematic requirement analysis was conducted and used to refine the system specifications for a set of three distinct scenarios (Cloud/Enterprise, Embedded and Communications).
- A first prototype was developed, based on discrete components and programmable devices. Memory sharing was demonstrated using this platform, as well as particular Linux kernel modules and hypervisor extensions.

Several strategic choices have consolidated EUROSERVER architecture. An innovative structure based on interconnected compute "coherent island" was adopted for an optimal balance between data locality and transfer efficiency. The compute SoC internal structure was organized around several independent "chiplets" implementing the islands. The coupling between these chiplets was realized by high speed serial links. Physically, the system is integrated onto a cost effective organic interposer solution. Besides, the consortium has selected the Hybrid Memory Cubes (HMC) technology for its central memory: this technology increases the density by stacking DDRAM modules in order to offer better bandwidth and memory storage density that are directly connected to the cores.
These hardware innovations would not be exploitable without software support. Software developments have been carried out in specific areas demonstrating that hardware agnostic improvements can be made for micro-servers in general. To differentiate EUROSERVER from micro-server and typical server designs the key software technologies being worked on are:

- Shared memory model where all cores can access RAM from remote units through a controlled interface.
- More highly efficient Hypervisor platforms that are investigated and developed with a focus on reducing the virtualisation overhead.
- Moving higher up the stack, improvements on common workloads such as creating an accelerated LAMP stack, a scalable M2M messaging service and a dataflow based task parallel runtime environment to support RAN functionality are elaborated and performed.

The emerging key differentiator for EUROSERVER is improved resource utilisation (see [2]). Just as Cloud computing and virtualisation enables companies to converge workloads from many distributed and under-utilised hardware platforms into smaller numbers of servers, EUROSERVER proposes to more efficiently exploit micro-server and low power hardware in order to pave the way towards the next generation of more power efficient servers.

EUROSERVER being technically challenging offers a great opportunity for junior engineers and PhD students to contribute to the project while working on highly specific subjects directly connected to EUROSERVER (see [3]). There are presently 14 PhD thesis and masters in progress among the academic EUROSERVER partners on different challenging topics such as HMC, virtualization, etc. It actively participates to EUROSERVER findings dissemination together with the consortium partners' involvement in scientific conferences in the field of computer architecture, information technology, embedded computing, etc., presenting the most recent technological developments. Since the beginning of the project, EUROSERVER findings have been presented in 34 conferences and workshops.

Finally, EUROSERVER provides a European foundation and ecosystem for scalable, low-power and low-cost approach for computing. Several forthcoming H2020 projects in the area of "HPC Core Technologies" - e.g. GREETINGS16 (CATRENE), 2.5D Integration with an Active Interposer (including I/O) ExaNoDe, Virtualisation + runtime Apps ExaNeSt, Intereconnects + Storage ExaNeSt, GPU accelerator + advanced processing ExaNoDe and FPGA Accelerators in the ECOSCALE project, Mont Blanc-3 - are aligned with EUROSERVER approach and could benefit from EUROSERVER technology.

References:

[1] EEtimes article, "*Microservers Brew in Europe's Labs*", C. Kachris, October 16, 2014 - http://www.eetimes.com/author.asp?section_id=36&doc_id=1324294

[2] EEtimes article, "*European server project promotes ARM on FDSOI*", P. Clarke, January 02, 2015 - http://www.electronics-eetimes.com/en/european-server-project-promotes-arm-on-fdsoi.html?cmp_id=7&news_id=222923411&page=0

[3] Y. Durand and al, "*EUROSEVER: Energy Efficient Node for European Micro-servers*", DSD 2014 proceedings, August 2014, Verona, Italy.