



ALMARVI

“Algorithms, Design Methods, and Many-Core Execution Platform for Low-Power Massive Data-Rate Video and Image Processing”

Project co-funded by the ARTEMIS Joint Undertaking under the

ASP 5: Computing Platforms for Embedded Systems

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D6.4 – Progress Efficiency Report-1

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Philips

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	PP	Restricted to other programme participants (including the JU)	
	RE	Restricted to a group specified by the consortium (including the JU)	
	CO	Confidential, only for members of the consortium (including the JU)	

DOCUMENT HISTORY

Release	Date	Reason of change	Status	Distribution
V0.1	26/08/2015	First draft	Draft	project
V0.2	03/09/2015	Second draft, added publications	Draft	project
V0.9	15/09/2015	Approved for submission to ARTEMIS JU – wait till M18 deliverables are delivered	Draft	project
V1.0	02/11/2015	Update status D18 deliverables.	Final	Artemis

Table of Contents

Executive Summary	4
1. Introduction	5
2. Management	6
2.1 Status of GA and PCA	6
2.2 Payments to partners.....	6
2.3 Issues per partner.....	6
3. Communication	7
4. Technical work	8
4.1 Deliverables.....	8
4.2 Open meetings.....	9
4.3 Publications	9
5. Conclusions	11

Executive Summary

This report summarises the major achievements of the ALMARVI project in different research, scientific, and industrial forums within the first 18 months. This is in tabular form summarising the achievements of different project partners in terms of publications, workshops, special sessions, press releases, etc.

1. Introduction

This document gives an overview of the progress of the Almarvi project. In general the project act according to plan, and there were no unrecoverable issues yet.

2. Management

2.1 Status of GA and PCA

Table 1: Contract documents

Document	Date signed by project partners	Date signed by JU
GA		March 3, 2014
PCA	September 10, 2014	
Amendment 1		July 10, 2015

2.2 Payments to partners

No issues. All payments are according to plan.

2.3 Issues per partner

Table 2: Title of Table

Partner	Date/Period	Issue	Action
Nokia	January 1, 2015	New legal name	Distribute Nokia effort over old and new entity in first Amendment
UTIA	First 9 Months	Walnut harvesting case study is a surveillance application, but the power requirements are similar to the mobile case	Keep it as a surveillance case
Turkey's partners	Complete period	Difficulties to come to project meetings because of visa issues. Several times a visa was issued on the last day before travelling.	Ask Artemis to provide statements towards Embassies in Turkey on involvement in the project.

3. Communication

Table 3: Project meetings

Date	Place	Participants
April 15-16, 2014	Eindhoven	32 people from 15 partners
September 9-10, 2014	Kuopio	41 people from 16 (all) partners
February 3-4, 2015	Prague	34 people from 15 partners
May 12-13, 2015	Tampere	30 people from 16 (all) partners
September 8-9, 2015	Turku	28 people from 15 partners

Table 4: Project MT telcos and meetings

Date	Place	Participants							
		PL	WP1	WP2	WP3	WP4	WP5	WP7	Dissemination
May 6, 2014	telco	X	X		X	X	X	X	X
June 2, 2014	telco	X	X		X		X		X
July 1, 2014	telco	X	X	X	X	X	X	X	X
August 5, 2014	telco	X		X	X	X	X	X	X
September 2, 2014	telco	X				X	X	X	X
September 10, 2014	Kuopio	X	X	X	X	X	X	X	
October 7, 2014	telco	X		X		X	X	X	X
November 11, 2014	telco	X		X	X	X	X	X	X
December 2, 2014	telco	X		X		X	X	X	X
January 6, 2015	telco	X	X	X	X	X	X	X	X
February 4, 2015	Prague	X	X	X	X	X	X	X	X
March 3, 2015	telco	X	X		X	X	X	X	X
April 7, 2015	telco	X	X	X	X	X	X		X
May 13, 2015	Tampere	X		X	X	X	X	X	X
July 7, 2015	telco	X	X		X		X	X	X
September 9, 2015	Turku	X	X	X	X	X	X	X	X

4. Technical work

4.1 Deliverables

Table 5: Deliverables

Del. No.	Deliverable Name	Dissemination Level	Delivery Date	Actual delivery	Milestone reached
D6.1	<i>ALMARVI Project Handbook</i>	CO	M03	M03	
D6.2	<i>Project Management Plan</i>	CO	M03	M03	
D7.1	<i>Project Website and Initial Project Presentation</i>	PU	M03	M03	
D7.2	<i>Project Repository and Partners' Communication Setup</i>	CO	M03	M05	
D6.3	<i>Integration and Quality Assurance Plan</i>	CO	M06	M06	
D1.1	<i>Requirements and System Specifications</i>	CO	M08	M12	
D7.3	<i>Dissemination Plan and Strategies</i>	PU	M08	M09	MS1
D6.6	<i>Annual Progress Report-1</i>	CO	M12	M14	
D1.2	<i>ALMARVI System Architecture</i>	CO	M14	M15	MS2
D1.3	<i>Cross-Layer Models for estimating System Properties/Parameters</i>	PU	M14	M14	
D1.4	<i>ALMARVI V&V requirements and strategy</i>	CO	M14	M14	
D2.2	<i>Scalable and Low-power Video Processing Control and Transmission (Design Document)</i>	CO	M18	M19	
D2.4	<i>Parallel and Power-Aware Image Segmentation Algorithms (Architecture and Design)</i>	PU	M18	M19	
D2.5	<i>Parallel Object Recognition and Tracking, Motion Analysis Algorithms (Architecture and Design)</i>	PU	M18	M18	
D2.7	<i>Parallel Image Enhancement, Restoration, and Fusion Algorithms (Architecture and Design)</i>	PU	M18	M19	
D3.1	<i>Execution platform configuration</i>	CO	M18	M19	
D3.3	<i>Abstracting heterogeneous hardware architectures</i>	PU	M18	M19	
D5.1	<i>Medical Healthcare Demonstrator Early Prototype</i>	CO	M18	M20	MS3
D5.3	<i>Security/Surveillance and Monitoring Demonstrator Early Prototype</i>	CO	M18	M20	MS3
D5.5	<i>Mobile Handset Demonstrator Early Prototype</i>	CO	M18	M19	
D6.4	<i>Progress Efficiency Report-1</i>	PU	M18	M19	
D7.4	<i>Exploitation Report (Intermediate)</i>	CO	M18	M20	MS3
D7.6	<i>Dissemination Report (Intermediate)</i>	PU	M18	M18	

Although the early prototype demonstrators are available, the corresponding deliverables are not all finished, but they are expected in very soon. The intermediate exploitation report, still needs few additions. It is expected that Milestone MS3 can be passed in M20.

4.2 Open meetings

Table 6: Project meetings

Venue	Date	Place	Participants
SAMOS conference/Almarvi track	July 13-23, 2015	Samos, Gr	International audience, 30 people
WEEE	September 10-12, 2015	Espoo, Fin	International audience, 50 people
ES week/ tutorial on mixed criticality	October 9-14, 2015	Amsterdam, NL	Forthcoming – expected: at least 25

4.3 Publications

- I. Pöllänen, B. Braithwaite, T. Ikonen, H. Niska, K. Haataja, P. Toivanen, and T. Tolonen, “Computer-Aided Breast Cancer Histopathological Diagnosis – Comparative Analysis of three DTOCS-based Features: SWDTOCS, SW-WDTOCS, and SW-3-4-DTOCS”, *4th International Conference on Image Processing Theory, Tools, and Applications (IPTA 2014)*, Paris, France, October 14–17, 2014
- D. Goswami, D. Müller-Gritschneider, T. Basten, U. Schlichtmann, S. Chakraborty “*Fault-tolerant Embedded Control Systems for Unreliable Hardware*,” International Symposium on Integrated Circuits (ISIC), Singapore, 2014 (December)
- T. Ikonen, H. Niska, B. Braithwaite, I. Pöllänen, K. Haataja, P. Toivanen, J. Isola, and T. Tolonen, “*Computer-Assisted Image Analysis of Histopathological Breast Cancer Images Using Step-DTOCS*”, *14th International Conference on Hybrid Intelligent Systems (HIS 2014)*, Kuwait, December 14-16, 2014
- B. Braithwaite, H. Niska, I. Pöllänen, T. Ikonen, K. Haataja, P. Toivanen, and T. Tolonen, “*Optimized Curve Design for Image Analysis Using Localized Geodesic Distance Transformations*”, *IS&T SPIE Electronic Imaging*, San Francisco, California, USA, February 8–12, 2015
- I.Szentandrás, M. Zachariáš, J. Tinka, M. Dubská, J. Sochor, A. Herout, “*INCAST*”, International Symposium on Mixed and Augmented Reality ISMAR 2015, Fukuoka, Japan, October 2015
- Article in the ARTEMIS-IA news, March 17, 2015: artemis-ia.eu/news/almarvi.html
- H. Kultala, T. Viitanen, P. Jääskeläinen, J. Helkala, and J. Takala, “*Compiler Optimizations for Code Density of Variable Length Instructions*,” in Proc. IEEE International Workshop Signal Process. System, Belfast, UK, Oct. 20-22 2014, pp. 127 – 132.
- T. Viitanen, H. Kultala, P. Jääskeläinen, and J. Takala, “*Heuristics for Greedy Transport Triggered Architecture Interconnect Exploration*,” in Proc. International Conference Compilers Architecture Synthesis Embedded System, New Delhi, India, Oct. 12-17 2014.
- Zliobaite, I.; Hollmén, J.; Teittinen, J.; Koskinen L.; “*Towards hardware-driven design of low-energy algorithms for data analysis*” ACM SIGMOD Record archive, Volume 43 Issue 4, December 2014, Pages 15-20.
- Turnquist, M.J.; Hienkari, M. ; Makipaa, J. ; Koskinen, L. ; “*A Fully Integrated Self-Oscillating Switched-Capacitor DC-DC Converter for Near-Threshold Loads*” Accepted to The IEEE A-SSCC 2015 (Asian Solid-State Circuits Conference).
- M. Hradiš, J. Kotera, P. Zemčík and F. Šroubek, “*Convolutional Neural Networks for Direct Text Deblurring*”, Proceedings of The British Machine Vision Association and Society for Pattern Recognition BMVC 2015, Swansea, UK, 2015, pp. 1-13.
- **SAMOS XV, 2015 Special session on “Mid-Term Results of the ALMARVI ARTEMIS project”** organized by J. Takala and Z. Al-Ars includes the following publications:
 - “*Multi-Constraint Multi-Processor Resource Allocation*” by A. R. B. Behrouzian, D. Goswami, T. Basten, M. Geilen, H. Alizadeh Ara (**TUE**)

- “GPU Implementation of an Anisotropic Huber-L1 Dense Optical Flow Algorithm Using OpenCL” by D. Buyukaydin and T. Akgun (**ASEL**)
- “Using VLIW Softcore Processors for Image Processing Applications” by J. Hoozemans, S. Wong and Z. Al-Ars (**TUD**)
- “Power Optimizations for Transport Triggered SIMD Processors” by J. Multanen, T. Viitanen, H. Linjamäki, H. Kultala, P. Jääskeläinen, J. Takala, L. Koskinen, J. Simonsson, H. Berg, K. Raiskila and T. Zetterman (**Multi-partner collaboration: TUT, UTU, NOK**)
- “Current Analysis Approaches and Performance Needs for Whole Slide Image Processing in Breast Cancer Diagnostics” by I. Pöllänen, B. Braithwaite, K. Haataja, T. Ikonen and P. Toivanen (**UEF**)
- “Performance evaluation of image noise reduction computing on a mobile platform” by J. Hannuksela, M. Niskanen and M. Turtinen (**VIS**)
- “Video Chain Demonstrator on Xilinx Kintex7 FPGA with EdkDSP Floating Point Accelerators” by J. Kadlec (**UTIA**)

5. Conclusions

The project progresses according to plan. At this moment a large amount of deliverable are due, and these are relevant for the milestone MS3. This is a solid basis for further work in the project.