Project co-funded by the European Commission within the Seventh Framework Programme

Project number: 609666

REPARA

Reengineering and Enabling
Performance and poweR
of Applications

D9.1: Initial Press Release

Document ID:	ICT-609666-D8.1
Version:	1
Work Package:	WP9 – Dissemination, exploitation and public awareness
Task:	T9.1 – Dissemination activities
Dissemination Level:	PU

Task	Person	Institution	Role	Date
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Reviewed by	J. Daniel Garcia	UC3M	Internal Reviewer	28/03/2014
Approved by	J. Daniel Garcia	UC3M	Project Coordinator	31/03/2014

Change Log

Version	Author	Contractor	Change	Date
1	Zsolt Szepessy	EVO	Initial Version	25/03/2014
2	J. Daniel García	UC3M	Revised version after internal review	31/03/2014

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Executive Summary

The **REPARA** project aims to help the transformation and deployment of new and legacy applications in parallel heterogeneous computing architectures while maintaining a balance between application performance, energy efficiency and source code maintainability.

In order to achieve its objectives, a key element is proper dissemination and generation of public awareness of the **REPARA** project covered by task **T9.1** (*Dissemination activities*) within work package **WP9** (*Dissemination, exploitation and public awareness*).

This deliverable reports activities and results of the initial press release delivery.

Deliverable context

To maximize the press release dissemination we have combined a global (internatnional delivery in English) and a local strategy (national delivery of localized press releases by beneficiaries in their countries).

Results reported in this deliverable will influence the approach for dissemination and public awareness during the life on the project which will be reported in deliverable **D9.2** (*Final press release*).

Deliverable structure

This deliverable is structured as follows:

- Chapter 1 presents an introduction to the document.
- Chapter 2 lists the contents of all the press releases.
- Chapter 3 presents information about coverage of the press releases.
- Chapter 4 draws some conclusions.

Contents

1. Introduction

In the **REPARA** project, Work package 9 covers *Dissemination, eploitation and public awareness* of the project.

One of the objectives of this work package is:

- To generate public awareness of the REPARA project.

Within this work package, task T9.1 (*Dissemination activities*) is described to *"comprise all forms of direct dissemination activities such as website creation, publication activities, workshop organisation, and press releases"*. In particular, it includes 2 press releases: one initial press release, at the beginning of the project and another press release at the end.

This deliverable reports all the activities performed to disseminate the initial press release.

Although this deliverable was initially planned for the fourth month of the project, changes in the consoritum composition made advisable to delay the delivarable until the final consortium was stabilized.

Approach for disseminating the press release

To maximize the press release dissemination we have combined a global and a local strategy.

At the global level, Evopro Innovation, as the leader of this task, delivered the press release among international media and press agencies.

Combined with this globale delivery we selected several beneficiaries to deliver localized press releases in different languages and countries:

- *Technical University of Darmstadt* in Germany.
- *Evopro Innovation* in Hungary.
- *University of Pisa* in Italy.
- *Universty Carlos III* in Spain.
- *HSR Rapperswil* in Switzerland.

Report structure

This report is structured in the following way. Chapter 2 reports the content of every press release. Chapter 3. Finally Chapter 4 concludes this report.

2. Press Releases

2.1 Global Press Release

A global press release has been distributed internationally under de coordination of *Evopro Innovation*.

2.1.1 Press Release

Headlines

A 3.6 M Euro research project could substantially reduce development costs for advanced computing

A recently granted 3.6 M Euro research project, funded by the European Commission, aims to transform new and existing computing applications for deployment to state-of-the-art heterogeneous computing systems. The resulting parallel implementations offer significant benefits in performance, energy efficiency, and product development costs for applications such as railway monitoring, industrial manufacturing, and healthcare.

Body

The 3.6 M Euro REPARA project, supported with more that 2.6M Euros by the Seventh Framework Programme (FP7) for Research and Technological Development, the EU's main instrument for funding research - will bring together expertise from academic institutions and industry specialists across five countries.

Starting in September 2013, the REPARA project will run for 3 years and will focus on deploying applications to parallel heterogeneous computing systems. The project aims to make the performance and energy efficiency benefits of such computers available to end users without the high development effort usually associated with such complex architectures. The automated tools and methodologies targeted by REPARA are designed to reduce time-to-market and development costs, leading to more competitive products.

The project involves five academic institutions: University Carlos III of Madrid in Spain, FHO HSR Rapperswil in Switzerland, Technische Universität Darmstadt in Germany, University of Szeged in Hungary, and University of Pisa in Italy. In addition, two industrial partners play key roles in the project: Evopro Innovation in Hungary and Ixion Industry and Aerospace in Spain both contribute with their practical expertise across a broad spectrum of key applications.

FP7 is the short name for the Seventh Framework Programme for Research and Technological Development. This is the EU's main instrument for funding research in Europe, running from 2007-2013. FP7 is also designed to respond to Europe's employment needs, competitiveness and quality of life. FP7 has a total budget of €50 billion.

University Carlos III of Madrid, Spain, participates through the Computer Architecture, Communications and Systems (ARCOS) research group and coordinates the REPARA project. The ARCOS team led by Prof. J. Daniel Garcia brings to the project their experience in high performance computing and embedded systems.

FHO HSR Rapperswil is a member of the University of Applied Sciences Eastern Switzerland (FHO). HSR participates with its IFS Institute for Software under the lead of Prof. Peter Sommerlad. IFS contributes its expertise in building refactoring tools for C++ in Eclipse CDT.

Technische Universität Darmstadt, in Germany, participates with its Embedded Systems and Applications Group (ESA), founded and lead by Prof. Andreas Koch. ESA contributes its specialized expertise in tools and architectures for application-specific reconfigurable computers.

University of Szeged, Hungary, participates with its Department of Software Engineering. The team participating in the REPARA project is led by Dr. Rudolf Ferenc and it contributes to the project by its expertise in static analysis, software quality assurance, energy measurement, and modelling.

University of Pisa, in Italy, participates with its Computer Science Department. They will be cooperating in the context of the REPARA project with University of Torino. The resulting team lead by Prof. Marco Danelutto, will bring to the project their experience in designing efficient structured parallel programming run-times.

Evopro Innovation Kft is an Hungarian professional services company in the Central-European region providing innovative R&D services in transportation technology, embedded systems, dedicated computing and mobile computing. Evopro Innovation team lead by Dr. Zsolt Szepessy provides a large experience in real industrial applications and specific expertise in embedded DSP solutions.

Ixion Industry and Aerospace is Spanish company created with the objective of attending the necessity of automation in Society, reaching the highest efficiency in the processes by state-of-the-art technological solutions. Ixion team lead by Dr. Jorge Villagrá provides experience with a range of industrial applications in robotics and industrial maintenance.

For more information:

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2.2 Local press releases

2.2.1 Germany

A press release localized to the German public was delivered by TUD.

Headlines

EU-Projekt REPARA unterstützt Programmierer bei Software-Modernisierung
Wie lassen sich ältere Computerprogramme hocheffizient auf modernsten Rechnern ausführen, für die sie nicht geschrieben sind? Mit dieser Frage befasst sich das EU-Projekt REPARA. Ein wesentlicher Beitrag zur Antwort kommt von Wissenschaftlern des Fachbereichs Informatik der TU Darmstadt. Ende März treffen die Projektbeteiligten aus ganz Europa in Darmstadt zusammen.

Body

Das 3,6 Millionen Euro umfassende Projekt REPARA, das im September startete, läuft über drei Jahre und wird von der EU mit 2,6 Millionen Euro unterstützt. Forscherinnen und Forscher der Universität Carlos III in Madrid (Spanien), der Hochschule für Technik Rapperswil (Schweiz), der Universität der Wissenschaften Szeged (Ungarn), der Universität Pisa (Italien) und der TU Darmstadt arbeiten gemeinsam mit zwei Industriepartnern zusammen.

Ziel ist es, durch automatisierte Computerwerkzeuge den Entwicklern zu ermöglichen, bestehende Programme auf heterogenen Parallelrechnern auszuführen. Für Endanwender werden damit an individuelle Anwendungen angepasste Programme schneller und kostengünstiger verfügbar.

"Früher arbeitete man mit Prozessoren, die von Generation zu Generation deutlich schneller wurden. Aber die Entwicklung von immer schnelleren Einzelprozessoren ist am Ende. Man führt heute daten- und rechenintensive Anwendungen mit mehreren Prozessoren oder auf heterogen aufgebauten Systemen, die verschiedene Arten von Recheneinheiten kombinieren, parallel aus", sagt Professor Andreas Koch, Leiter des Fachgebiets Eingebettete Systeme und ihre Anwendungen, der am Fachbereich Informatik der TU Darmstadt an REPARA mitwirkt. *"Ältere Software ist dafür aber nicht geschrieben, und es wäre äußerst aufwendig, hochspezialisierte Anwendungen für jede mögliche Systemarchitektur neu zu programmieren."*

Bei der schrittweisen Anpassung von Software-Codes, der *"Refaktorierung"*, sollen die Ergebnisse von REPARA Programmierer künftig halbautomatisch unterstützen. Die so transformierten Anwendungen können auf modernen Rechnern dann nicht nur schneller, sondern oftmals auch energieeffizienter ausgeführt werden.

Das Fachgebiet Eingebettete Systeme und ihre Anwendungen der TU Darmstadt ist spezialisiert auf die Hardware-Komponenten, die im Rahmen von REPARA zum Einsatz kommen werden. Die Darmstädter Wissenschaftler entwerfen dabei anwendungsspezifische Recheneinheiten, bei denen die Hardware unmittelbar die Daten verarbeitet – anders als etwa bei häuslichen Computern, bei denen unter anderem noch Betriebssysteme und Software-Programme zwischengeschaltet sind.

Solch spezialisierte Hardware wird eine wichtige Rolle im REPARA-Projekt spielen. Der refaktorierte Code älterer Programme läuft durch die Compiler der Darmstädter Forscher und wird dabei so übersetzt, dass rechenintensive Teile direkt in die Spezial-Hardware heterogener Parallelrechner abgebildet werden.

"Wir erzeugen eine Beschreibung für einen Chip, einen Plan für eine digitale Schaltung, die passgenau auf die präzisen Anforderungen der aktuellen Anwendung ausgelegt werden kann", sagt Andreas Koch. Weil die Herstellung von Chip-Unikaten allerdings extrem teuer ist, setzen die TU-Wissenschaftler universell verwendbare Halbleiterbausteine ein, die schnell mit der Funktion der aktuell benötigten Schaltung konfiguriert werden können. *"Wir füllen leere Chips mit Leben"*, sagt Koch.

Die Verbesserung von Rechenleistung und Energieeffizienz wird im Rahmen von REPARA an mehreren Modell-Anwendungen konkret getestet. Dafür wählten Forscher und Industriepartner bereits Anwendungen zur Entwicklung von neuen Medikamenten, zur Überwachung von

Schienennetzen, zum dreidimensionalen Sehen und der Navigation von Robotern sowie zur Qualitätskontrolle in der industriellen Fertigung aus.

Das Fachgebiet Eingebettete Systeme und ihre Anwendungen ist in alle Modell-Anwendungen involviert. *"Wir werden zum Beispiel die Technik beisteuern, um Raten von 30 Bildern pro Sekunde verarbeiten zu können, wo derzeit viele Sekunden an einem einzelnen Bild gerechnet wird, ohne dabei mehr Energie zu verbrauchen"*, sagt Andreas Koch.

2.2.2 Hungary

A press release localized for the Hungarian public was delivered by *Evopro Innovation*.

Headlines

Közös kutatási programot indítottak európai cégek és egyetemek
A 3,6 millió eurós projekt jelentősen csökkentheti a fejlesztési költségeket

Budapest, 2014. február 25. – Egyetemek és high-tech cégek közös informatikai fejlesztését támogatja az Európai Bizottság. A három évig tartó, 2,6 millió euróval támogatott kutatás-fejlesztés eredményként jelentős teljesítmény-, energiahatékonyság- és termékfejlesztési költségbeli előnyök érhetők el egyebek mellett a vasúti ellenőrzés, az ipari termelés és az egészségügy terén. A programban a Szegedi Tudományegyetem és a magyar evopro Innovation Kft. vesz részt.

Body

Öt ország oktatási intézményei és ipari szakemberei dolgoznak együtt a REPARA projektben. A 3,6 millió euró összköltségvetésű program – amelyet az EU fő kutatásfinanszírozási eszközeként működő 7. Kutatási és technológiafejlesztési keretprogramja 2,6 millió euróval támogat – 2013 szeptemberében indult.

A 3 éven át zajló REPARA projekt az alkalmazások párhuzamos heterogén számítástechnikai rendszerekre történő telepítésére összpontosít. A program célja, hogy a végfelhasználók számára is elérhetővé tegye ezeknek a számítógépeknek a teljesítményben és energiahatékonyságban megmutatkozó előnyeit anélkül, hogy el kellene végezniük az ilyen összetett architektúrák esetében szokásos jelentős fejlesztéseket. A REPARA célterületeinek számító automatizált eszközök és munkafolyamatok révén lerövidül a piacra jutáshoz szükséges idő, csökkennek a fejlesztési költségek, ezáltal fokozódik a termékek versenyképessége.

A projektben öt oktatási intézmény vesz részt: a Madridi III. Károly Egyetem, a svájci Rapperswili Műszaki Egyetem, a Darmstadti Műszaki Egyetem, a Szegedi Tudományegyetem és a Pisai Egyetem. A programban kulcsszerepet játszik továbbá két ipari partner: a magyar evopro Innovation és a spanyol Ixion Industry and Aerospace. Mindkét vállalat az alkalmazások széles spektrumán szerzett gyakorlati szakértelmével járul hozzá a kutatás sikeréhez.

Az FP7 a 7. Kutatási és technológiafejlesztési keretprogram rövidített elnevezése. Ez az EU fő eszköze az Európában zajló kutatások finanszírozására a 2007-2013 közötti időszakban. Az FP7 célja továbbá, hogy válaszoljon a foglalkoztatási igények, a versenyképesség és az életminőség kérdéseire. A program teljes költségvetése mintegy 50 milliárd euró.

A Madridi III. Károly Egyetem az ARCOS (számítógép-architektúrákkal, kommunikációval és rendszerekkel foglalkozó) kutatócsoporttal képviselteti magát, egyben ez az intézmény koordinálja a projektet. A Prof. J. Daniel Garcia által vezetett ARCOS csoport a nagyteljesítményű számítógépek és beágyazott rendszerek terén szerzett tapasztalatait szolgáltatja a kutatáshoz.

A Rapperswili Műszaki Egyetem (HSR) az Alkalmazott Tudományok Kelet-Svájci Egyetemének (FHO) tagja. A HSR a Prof. Peter Sommerlad vezette IFS (Institute for Software) révén vesz

részt a projektben. Az IFS jelentős tapasztalattal bír a C++ alkalmazások refaktorizálását támogató Eclipse rendszerekben.

A Darmstadti Műszaki Egyetemet a beágyazott rendszerekkel és alkalmazásokkal foglalkozó ESA csoport képviseli, amelyet Prof. Andreas Koch vezet. Az ESA tapasztalatait az alkalmazás-specifikus újrakonfigurálható számítógépek számára készülő eszközök és architektúrák terén hasznosítják majd.

A Szegedi Tudományegyetem Szoftverfejlesztés Tanszéke a Dr. Ferenc Rudolf vezette csoporttal vesz részt a REPARA projektben. A közös munkához főként a statikus elemzés, a szoftverminőség-biztosítás, az energiamérés és a modellezés terén felhalmozott szakértelmükkel járulnak hozzá.

A Pisai Egyetem Számítástechnikai Tanszékének munkatársait delegálja, akik a REPARA projekt során a Torinói Egyetemmel működnek együtt. Prof. Marco Danelutto vezeti az így felállt csoportot, amely a párhuzamos rendszerek hatékony futtatókörnyezete terén szerzett tapasztalatait adja a kutatáshoz.

Az evopro Innovation Kft. egy professzionális magyar mérnöki szolgáltató vállalat, amely innovatív kutatás-fejlesztési tevékenységet végez a közlekedéstechnológia, a beágyazott rendszerek, valamint a dedikált és mobil számítástechnika terén. Az evopro Innovation Dr. Szepessy Zsolt vezette csapata jelentős szakmai tapasztalattal bír a valós ipari alkalmazások, valamint specifikus szakértelemmel rendelkezik a beágyazott DSP (digitális jelfeldolgozási) megoldások terén.

A spanyol Ixion Industry and Aerospace vállalatot azzal a céllal hozták létre, hogy kielégítse a társadalom automatizálás iránti igényét, korszerű technológiai megoldásokkal érve el a lehető legnagyobb folyamathatékonyságot. Az Ixion Dr. Jorge Villagrá vezette csapatának tapasztalatai egy sor ipari alkalmazásra terjednek ki a robotika és az ipari karbantartás terén.

További információ:

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2.2.3 Italy

A press release localized to Italian public was released by University of Pisa.

Headlines

3,6 milioni di euro per il progetto europeo Repara

L'obiettivo è di creare sistemi informatici più veloci con un risparmio energetico del 50%.

Body

La Commissione Europea ha approvato il progetto di ricerca REPARA finanziandolo con 2.6 milioni di euro su un costo totale di 3.6 milioni. Il progetto, a cui partecipa anche anche l'Università di Pisa, avrà 3 anni per raggiungere un obiettivo molto ambizioso: fornire strumenti e metodologie per lo sviluppo di nuove applicazioni capaci di sfruttare al meglio le enormi potenzialità di calcolo dei sistemi che includono processori multi-core, coprocessori grafici paralleli ed acceleratori hardware.

"Il nostro mondo è sempre più gestito da sistemi informatici complessi che svolgono per noi i compiti più diversi: dal controllo e alla sicurezza, all'ambito produzione e dell'industria – ha spiegato il professor **Marco Danelutto del Dipartimento di Informatica che coordina il gruppo di ricerca dell'Ateneo pisano impegnato in REPARA** - Questi sistemi richiedono tipicamente un grosso sforzo di programmazione per raggiungere le elevate prestazioni di cui sono capaci. L'obiettivo del progetto è lo sviluppo di strumenti di programmazione che permettano la realizzazione di applicazioni che, rispetto alle attuali, risultino fino a due volte più veloci e con un consumo energetico ridotto della metà."

Oltre all'Ateneo pisano REPARA coinvolge altre quattro istituzioni accademiche (l'Università Carlos III di Madrid in Spagna, FHO HSR Rapperswil in Svizzera, Technische Universitad di Darmstadt in Germania, l'Università di Szeged in Ungheria) e due industrie (Evopro Innovation in Ungeria ed Ixion Industry and Aerospace in Spagna).

"Il nostro principale contributo al progetto – ha concluso Marco Danelutto – è costituito dall'ambiente per la programmazione parallela FastFlow, sviluppato in collaborazione con l'università di Torino e disponibile sotto licenza open source. FastFlow permette infatti di ottenere ottime prestazioni, paragonabili o, in certi casi, migliori a quelle che si hanno utilizzando ambienti di programmazione allo stato dell'arte".

Nell'ambito del progetto REPARA, l'Università di Pisa si avvarrà della collaborazione del gruppo di ricerca diretto da Marco Aldinucci al Dipartimento di Informatica dell'Università di Torino, Dipartimento con cui l'Ateneo ha una convenzione per la collaborazione in progetti di ricerca fin dal 2009.

2.2.4 Spain

A press release localized to the Spanish public was delivered by UC3M both in Spanish and English.

Headlines (in Spanish)

En busca de una computación paralela más rápida, eficiente y sostenible

Un proyecto de investigación europeo, denominado REPARA y coordinado por la Universidad Carlos III de Madrid (UC3M), estudia cómo mejorar las aplicaciones informáticas de computación en paralelo para aumentar su rendimiento, eficiencia energética y facilitar la programación y mantenimiento del código fuente.

Body (in Spanish)

La computación heterogénea en paralelo combina varios elementos de procesamiento de distintas características que comparten un único sistema de memoria. Normalmente se emplean

procesadores de múltiples núcleos (como los 'multicore' de algunos smartphones u ordenadores personales) combinados con tarjetas gráficas y otros componentes para realizar procesamiento de grandes cantidades de datos. Estos trabajos de cálculo encuentran aplicaciones en diversos sectores, como el sanitario (predicción del acoplamiento de proteínas), el transporte (monitorización de sistemas ferroviarios), la robótica (visión estereoscópica y navegación) o el industrial (análisis de defectos en la fabricación de piezas).

El objetivo del proyecto REPARA es poner a disposición de los usuarios los beneficios energéticos y de rendimiento de estos sistemas informáticos, sin el enorme esfuerzo de desarrollo que conllevan este tipo de arquitecturas complejas. Y la clave para conseguirlo radica, entre otras cosas, en la "refactorización" de código fuente, una técnica usada en ingeniería de software para mejorar la estructura interna de un programa sin alterar su comportamiento observable. Algo así como cambiar la distribución de las tuberías y bombas de presión de un edificio para que salga el agua de manera más rápida, limpia y ecológica.

En el caso de REPARA, cuya denominación puede interpretarse como "Refactoring for Parallelism" en alusión a la utilización de técnicas de refactorización en la computación en paralelo, los científicos tratan de mejorar tres propiedades fundamentales: el rendimiento de las aplicaciones (ayudando a incrementar su velocidad de ejecución), la eficiencia energética (reduciendo su consumo energético) y la facilidad de mantenimiento y modificación del código fuente. "Las herramientas y tecnologías que REPARA pretende producir están pensadas para reducir los costes de desarrollo y el tiempo de llegada al mercado, lo que redundará en productos más competitivos", apunta el coordinador del proyecto, José Daniel García, del grupo de investigación de Arquitectura de Computadores, Comunicaciones y Sistemas (ARCOS) de la UC3M.

Primer prototipo en 2015 Los investigadores esperan tener prototipos de las nuevas herramientas hacia febrero de 2015 y probarlos después en una fase de evaluación con los socios industriales. "Esperamos conseguir mejoras importantes, tanto en la velocidad de ejecución como en la eficiencia energética de los computadores", adelanta el profesor José Daniel García. "Y también podemos reducir el tiempo que necesitan los ingenieros para poner a punto un producto software en un entorno paralelo, lo que rebajaría notablemente los costes de desarrollo y favorecería la competitividad de la industria de desarrollo de software", resalta.

En un trabajo de investigación publicado recientemente en la revista New Generation Computing, los investigadores han analizado cómo afecta el modelo de programación al rendimiento y la eficiencia energética en el caso de arquitecturas de procesadores de varios núcleos. A partir de aquí precisamente surgió la idea de ahondar en esta línea, porque "se hace necesario ayudar a los desarrolladores en la transición a distintos modelos de programación, así como en la selección del modelo de programación más adecuado dependiendo de las características concretas de su aplicación", explica el profesor José Daniel García.

El proyecto REPARA (Reengineering and Enabling Performance and poweR of Applications), que arrancó en septiembre de 2013 con una duración prevista de tres años, reúne a expertos en sistemas informáticos paralelos y heterogéneos del ámbito académico e industrial de cinco países europeos. Cuenta con presupuesto que supera los 3,6 millones de euros, de los cuales más de 2,6 millones provienen del Séptimo Programa Marco (7PM) para la Investigación y el Desarrollo Tecnológico, el principal instrumento de la Unión Europea para financiar la investigación. En total, participan cinco instituciones académicas: la FHO HSR Rapperswil (Suiza), la Technische Universität Darmstadt (Alemania), la Universidad Carlos III de Madrid (España), la Universidad de Szeged (Hungría) y la Universidad de Pisa (Italia). Además, el proyecto cuenta con dos socios en el sector industrial: Ixion Industry & Aerospace en España y Evopro Innovation en Hungría. La UC3M es la institución coordinadora del proyecto REPARA y participa a través del grupo de investigación ARCOS, que aporta al proyecto su

dilatada experiencia en computación de alto rendimiento y sistemas empotrados.

Más información :

- Web del proyecto REPARA: http://www.repara-project.eu
- **A Comparative Study and Evaluation of Parallel Programming Models for Shared-Memory Parallel Architectures**. Luis Miguel Sánchez, Rafael Sotomayor, J. Daniel García, Javier Fernández, Soledad Escolar. New Generation Computing, 31(3):139–161. Julio 2013. Springer, Japón. ISSN: 0288-3635. DOI: 10.1007/s00354-013-0301-5.
- Web del grupo de investigación ARCOS: http://www.arcos.inf.uc3m.es/

Headlines (in English)

Searching for faster, more efficient and sustainable parallel computing

An European research project, named REPARA and coordinated by Universidad Carlos III de Madrid (UC3M), is studying how to improve parallel computing applications to increase their performance and energy efficiency, as well as easing programming and source code maintenance.

Body (in English)

Parallel heterogeneous computing combines several processing elements with distinct characteristics that share a single memory system. Normally, multicore processors are used (such as those in some smartphones or personal computers), combined with graphic cards and other components to process large amounts of data. These computation tasks have applications in several domains, such as healthcare (protein docking), transportation (monitoring of railway systems), robotics (stereoscopic vision and navigation), and industry (defects detection in manufactured parts).

Parallel heterogeneous architectures may provide important benefits in terms of both energy efficiency and performance. The REPARA project main objective is to make available these benefits to users without the enormous development efforts that these complex architectures entail. And the key to achieve this goal lies, among other things, in “source code refactoring”, a technique used in software engineering to improve the internal structure of a program without altering its observable behavior. This is something akin to changing the distribution of the pipes and pumps in a building so that the water will come out of the faucet in a faster, cleaner and more ecological manner.

Within REPARA project, whose name can be interpreted as "Refactoring for Parallelism" in allusion to the usage of source code refactoring performed for parallel computing, scientists are attempting to improve three basic properties: the applications’ performance (increasing execution speed), energy efficiency (reducing energy consumption) and the ease of source code maintenance and modification. “The tools an technologies that REPARA is intended to produce are expected to reduce development costs and the products time to market, which will in turn make the products more competitive,” points out the project coordinator, José Daniel García, from the ARCOS (Computer Architecture, Communications and Systems) research group at UC3M.

First prototype in 2015 Researchers expect to have prototypes of these new tools by February 2015, and test them in an evaluation phase together with their industrial partners. “We hope to obtain substantial improvements, in both execution speed and energy efficiency,” states Professor José Daniel García. “We can also reduce the time that the engineers need to fine tune

a software product in a parallel heterogeneous environment, which will significantly reduce development costs and increase software development industry competitiveness", he highlights.

In a research paper recently published in the New Generation Computing journal, these researchers analyzed how programming models affect productivity and energy efficiency in the case of multicore processor architectures. This work was the base for the project idea, because it's necessary to help developers in the transition to different programming models, as well as in the selection of the best programming model depending on the concrete characteristics of their application," explains Professor García.

The REPARA (Reengineering and Enabling Performance and Power of Applications) project, which began in September 2013 and is expected to continue for three years, joins experts in heterogeneous parallel systems, from academia as well as from the industry, from five European countries. Its budget is over 3.6 million Euros, of which over 2.6 million Euros are provided by the Seventh European Framework Program (7PM) for Research and Technological Development, the main European Union instrument for funding research. In all, five academic institutions are participating: FHO HSR Rapperswil (Switzerland), the Technische Universität Darmstadt (Germany), the Universidad Carlos III of Madrid (Spain), the University of Szeged (Hungary) and the University of Pisa (Italy). In addition, the project has two partners in the industrial sector: Ixion Industry & Aerospace in Spain and Evopro Innovation in Hungary. UC3M is the coordinating institution for the REPARA project and it is participating through the ARCOS research group, which brings its extensive experience in high performance computing and embedded systems.

Further information :

- Project website: http://www.repara-project.eu
- **A Comparative Study and Evaluation of Parallel Programming Models for Shared-Memory Parallel Architectures**. Luis Miguel Sánchez, Rafael Sotomayor, J. Daniel García, Javier Fernández, Soledad Escolar. New Generation Computing, 31(3):139–161. July 2013. Springer, Japan. ISSN: 0288-3635. DOI: 10.1007/s00354-013-0301-5.
- ARCOS Research group website: http://www.arcos.inf.uc3m.es/

2.2.5 Switzerland

A press release localized to swiss public was delivered by *HSR*.

Headlines

IFS verbessert Programmcode

Die HSR partizipiert am 3.6 Millionen Euro dotierten EU-Forschungsprojekt REPARA.

Body

Die HSR Hochschule für Technik Rapperswil beteiligt sich mit dem IFS Institut für Software am Forschungsprojekt "Reengineering and Enabling Performance and poweR of Applications", kurz: REPARA. Dieses europäische Forschungsprojekt startete innerhalb des siebten Rahmenprogramms im September 2013 und soll die Entwicklungskosten für Advanced Computing erheblich reduzieren.

Moderne Computersysteme vereinen heute nebst dem eigentlichen Prozessor verschiedene Arten von zusätzlichen Grafik- oder Signalprozessoren, um die Rechenleistung zu steigern. So

können physikalische Begrenzungen wie beispielsweise der übermässig steigende Energieverbrauch und die damit notwendige Kühlung umgangen werden.

Die bestehenden Programmiermodelle stammen jedoch oft aus einer Zeit, in dem ein Prozessor in einem homogenen System alle Funktionen übernahm. Im Projekt REPARA erforschen die Beteiligen Projektpartner automatisierte Werkzeuge und Methoden, um diese neuen heterogenen Architekturen mit unterschiedlichen Prozessoren besser zu adressieren. Das Ziel ist, Endbenutzern die Performance- und Energieeffizienzvorteile dieser heterogenen Systeme verfügbar zu machen und gleichzeitig den hohen Entwicklungsaufwand solcher komplexer Architekturen zu vereinfachen. Dies verkürzt die Produkteeinführungszeit und reduziert die Entwicklungskosten von Anwendungen wie beispielsweise in der Bahnverkehrsüberwachung, in der industriellen Fertigung oder im Gesundheitswesen.

Das Europäische Forschungsprojekt vereinigt die Expertise von Hochschulen und Spezialisten der Industrie aus fünf Ländern. Alle Projektpartner haben sich an der HSR getroffen. Die HSR partizipiert mit dem IFS Institut für Software unter der Leitung von Prof. Peter Sommerlad. Das IFS trägt seine Expertise in der Entwicklung von Refaktorisierungswerkzeugen für C++ und Eclipse Anwendungen bei. Refaktorierung bezeichnet die Strukturverbesserung von Programmcode, um diesen zu verbessern und zu vereinfachen - bei gleichbleibender Funktion.

Für weitere Informationen:

- Web: http://www.repara-project.eu
- LinkedIn: http://www.linkedin.com/groups/REPARA-Project-5183908
- Twitter: http://twitter.com/reparaproject

Kontakt:

Prof. Peter Sommerlad REPARA Teamleiter HSR IFS Institut für Software

HSR Hochschule für Technik Rapperswil Oberseestrasse 10 8640 Rapperswil, Schweiz Tel: +41 55 222 4630 Fax: +41 55 222 4629 e-mail: peter.sommerlad@hsr.ch

3. Media coverage

3.1 International coverage

The global press release has been distributed to the following agencies:

- Bloomberg New Energy Finance
- Bloomberg
- Dow Jones / The Wall Street Journal Europe
- Thomson Reuters
- Financial Times
- European News Agency
- Agence Telegraphique Suisse - Schweizerische Depeschenagentur
- dpa Deutsche Presse-Agentur
- ANSA (Italy)
- Central European News (CEN)

3.2 Local coverage

3.2.1 Germany

In Germany, the press release has been delivered by the following means.

The localized press release has been published in the Technical University of Darmstadt website.

- Web version: http://www.tu-darmstadt.de/vorbeischauen/aktuell/einzelansicht_91584.de.jsp.
- PDF version: http://www.tu-darmstadt.de/media/illustrationen/referat_kommunikation/pressemeldungen/2014_3/23-2014-REPARA.pdf

Besides the following has been published

- juraforum.de (24/03/2014): EU-Projekt REPARA unterstützt Programmierer bei Software-Modernisierung
  - http://www.juraforum.de/wissenschaft/eu-projekt-repara-unterstuetzt-programmier bei-software-modernisierung-473844.
- Elektronikpraxis.de (25/03/2014): Wie man veraltete Software automatisch auf Vordermannn bringt
  - http://www.elektronikpraxis.vogel.de/softwareengineering/programmiersprachen/articles/439332/

3.2.2 Hungary

In Hungary, the press release has been delivered by several means.

The press release has been sent out to the following agencies:

- HavariaPress
- MTI
- MTI-Eco
- Objektív Hírügynökség
- Orientpress
- TelePress

Additionally the press release has also been sent out to the following media:

- Délmagyarország/Délvilág
- Magyar Hírlap
- Magyar Nemzet
- Metropol
- Napi Gazdaság
- Népszabadság
- Népszava
- Világgazdaság

The press release has been also sent out to the following press:

- Budapest Business Journal
- Figyelő
- Haszon
- Heti Válasz
- HVG
- Pannon Lapok Társasága
- PC World
- Piac és Profit
- Tranzit

It has also been sent to the following internet based media:

- Bitport.hu

- Computerworld.hu
- Delmagyar.hu
- Echotv.hu
- euroastra.hu
- Figyelo.hu
- Gyartastrend.hu
- Hetivalasz.hu
- Hir24.hu
- Hirado.hu
- Hirextra.hu
- Hirtv.hu
- Hvg.hu
- Hwsw.hu
- Index.hu
- Inforadio.hu
- Infovilag.hu
- Innoportal.hu
- Itbusiness.hu
- Itcafe.hu
- Itextreme.hu
- Ma.hu
- Metropol.hu
- Mfor.hu
- Mno.hu
- Napi.hu
- Napigazdasag.hu
- Nepszava.hu
- News4business.hu
- Nol.hu
- Origo.hu

- Pcworld.hu
- Penzcentrum.hu
- Piacesprofit.hu
- Portfolio.hu
- Privatbankar.hu
- Profitline.hu
- Sg.hu
- Sikerado.hu
- Stop.hu
- Technet.hu
- tozsdeforum.hu
- tranzitonline.eu
- Vg.hu
- Wikitech.hu
- Zoldtech.hu

Finally, it has been sent to the following radio and television media:

- ATV
- Echo TV
- Gazdasági Rádió
- Hír TV
- Hir24
- InfoRádió
- Klubrádió
- M1
- MR1-Kossuth
- RTL Klub
- TV2

News have been recorded in the following media:

- profitline.hu (24/02/2014): 3,6 millió eurós kutatási projekt magyar résztvevőkkel

- tranzitonline.eu (25/02/2014): Közös kutatási programot indítottak európai cégek és egyetemek
- sikerado.hu (25/02/2014): Közös kutatási programot indítottak európai cégek és egyetemek
- news4business.hu (25/02/2014): Evopro Kft.: Közös kutatási programot indítottak európai cégek és egyetemek
- infovilag.hu (25/02/2014): A szegedi egyetem és az evopro is részt vesz az EU kutatási programjában
- orientpress.hu (25/02/2014): Közös kutatási programot indítottak európai cégek és egyetemek
- itcafe (25/02/2014): Magyar informatikusok egy európai projektben
- Napi Garzdaság (25/02/2014): K+F vasúti, ipari és egészségügyi szoftverfejlesztés
- itextreme.hu (27/02/2014): Közös kutatási programot indítottak európai cégek és egyetemek
- Délmagyarország (01/03/2014): Összefogás a fejlesztési költségek lefaragásáért
- delmagyar.hu (01/0372014): Az egyetem is részt vesz a kutatásban

3.2.3 Italy

In Italy, the press release has been delivered by the following means:

First the press release has been published in the University of Pisa Website. It is availabe at http://www.unipi.it/index.php/tutte-le-news/item/ 3680-36-milioni-di-euro-per-il-progetto-europeo-repara.

Additionally, news have been published in the following media:

- Tirreno.it: *3,6 milioni di euro per il progetto europeo Repara*
  - http://iltirreno.gelocal.it/pisa/cronaca/2014/02/25/news/3-6-milioni-di-euro-per-il-progetto-europeo-repara-1.8737774.
- Nazione Pisa: *Sistemi Informatici Veloci L'Europa scommette sull Università di Pisa.*
  - http://rassegnastampa.unipi.it/rassegna/archivio/2014/02/26SI13006.PDF
- InToscana.it: *INTERNET SUPERVELOCE: L'EUROPA SCOMMETTE SULL'UNIVERSITÀ DI PISA*
  - http://www.intoscana.it/site/it/tecnologia/articolo/Internet-superveloce-lEuropa-scommette-sullUniversita-di-Pisa/
- PisaInformaFlash: *3,6 milioni di euro per il progetto europeo Repara*
  - http://www.pisainformaflash.it/comunicati-stampa/dettaglio.html?cId=47&iId=7495
- StampToscana.it: *Progetto europeo REPARA: partecipa anche l'Università di Pisa*

  - http://stamptoscana.it/articolo/innovazione/progetto-europeo-repara-partecipa-anche-luniversita-di-pisa

- GoNews.it: *L'ateneo parte del progetto della Commissione Europea per realizzare applicazioni informatiche più veloci ed energetiche*

  - http://www.gonews.it/2014/lateneo-parte-del-progetto-della-commissione-europea-per-realizzare-applicazioni-informatiche-piu-veloci-ed-energetiche/#.Uw2vaM7wo0w

- Controcampus.it: *http://www.controcampus.it/2014/02/unipi-repara-sistemi-informatici-veloci-e-con-risparmio-energetico/*

  - http://www.controcampus.it/2014/02/unipi-repara-sistemi-informatici-veloci-e-con-risparmio-energetico/

- NovedaFirenze.it: *A Pisa 3,6 milioni di euro per il progetto europeo Repara*

  - http://www.nove.firenze.it/vediarticolo.asp?id=b4.02.25.19.04

- researchitaly.it: *Faster and more efficient computers with REPARA*

  - https://www.researchitaly.it/en/researching/press-media-4/news/faster-and-more-efficient-computers-with-repara/

3.2.4 Spain

Press release coverage

In Spain, the press release has been delivered by several means.

University Carlos III delivery First, the press release has been published in University Carlos III website in Spanish, English and Chinese.

- Spanish version: http://portal.uc3m.es/portal/page/portal/actualidad_cientifica/noticias/proyecto_repara.

- English version: http://portal.uc3m.es/portal/page/portal/actualidad_cientifica/noticias/repara_project.

- Chinese version: http://portal.uc3m.es/portal/page/portal/actualidad_cientifica/noticias/proyecto_repara/Noti_chino_proyecto_REPARA_UC3M.pdf

Besides, the press release was delivered internally by the following means:

- During one week the press release was present in the university website homepage (both in the Spanish and English version).

- Internal weekly news bulletin: http://hosting01.uc3m.es/semanal3/243weekly_semanal3_del10al16demarzo.html.

Scientific news media

- Madri+d: http://www.madrimasd.org/informacionidi/noticias/noticia.asp?id=59714&origen=notiweb_suplemento&dia_suplemento=lunes&seccion=noticiaslunes
- DiCYT (Iberoamerican Agency for Broadcasting of Science and Technology): http://www.dicyt.com/noticias/en-busca-de-una-computacion-paralela-mas-rapida-eficiente-y-sostenible.
- SINC Agency (Scientific News and Information Service): http://www.agenciasinc.es/Noticias/Avances-hacia-una-computacion-paralela-mas-rapida-eficiente-y-sostenible
- AlphaGalileo: http://www.alphagalileo.org/ViewItem.aspx?ItemId=139761&CultureCode=es

Spanish Media

- El Economista.es (10/03/2014): La universidad carlos III de madrid investiga una computación paralela más rápida, eficiente y sostenible.
  - http://ecodiario.eleconomista.es/sociedad/noticias/5607217/03/14/La-universidad-carlos-iii-de-madrid-investiga-una-computacion-paralela-mas-rapida-eficiente-y-sostenible.html.
- Salamanca24horas.com (10/03/2014): En busca de una computación paralela más rápida, eficiente y sostenible
  - http://www.salamanca24horas.com/local/106087-en-busca-de-una-computacion-paralela-mas-rapida-eficiente-y-sostenible.
- Servimedia.es (10/03/2014): La Universidad Carlos III de Madrid investiga una computación paralela más rápida, eficiente y sostenible
  - http://www.servimedia.es/Noticias/DetalleNoticia.aspx?seccion=23&id=354039.
- presspeople (10/03/2014): Avances hacia una computación paralela más rápida, eficiente y sostenible
  - http://www.presspeople.com/nota/avances-hacia-computacion-paralela-rapida-eficiente.
- El Mundo Financiero (10/03/2014): La Universidad Carlos III de Madrid investiga una computación paralela más rápida, eficiente y sostenible
  - http://www.elmundofinanciero.com/noticia/26265/Tendencias/La-Universidad-Carlos-III-de-Madrid-investiga-una-computacion-paralela-mas-rapida-eficiente-y-sostenible.html.
- Tendencias 21 (10/03/2014): Avances hacia una computación paralela más rápida, eficiente y sostenible
  - http://www.tendencias21.net/Avances-hacia-una-computacion-paralela-mas-rapida-eficiente-y-sostenible_a31805.html.
- newsesp (10/03/2014):

  - http://www.newsesp.com/noticias/la-universidad-carlos-iii-madrid-investiga-una-computacion-paralela-rapida-eficiente-y-sostenible.

- Discapnet.es (10/3/2014): La universidad carlos iii de madrid investiga una computación paralela más rápida, eficiente y sostenible

  - http://www.discapnet.es/Castellano/Actualidad/Linea_Social/la-universidad-carlos-iii-de-madrid-investiga-una-computacion-paralela-mas-rapida-eficiente-y-sostenible.aspx.

- Teinteresa.es (10/03/2014): La universidad carlos iii de madrid investiga una computación paralela más rápida, eficiente y sostenible

  - http://www.teinteresa.es/espana/UNIVERSIDAD-INVESTIGA-COMPUTACION-EFICIENTE-SOSTENIBLE_0_1099090763.html.

- LaQuincena.es: *En busca de una computación paralela más rápida, eficiente y sostenible*

  - http://www.laquincena.es/noticias/saludcienciauniv/2014031047717/busca-computacion-paralela-rapida-eficiente-sostenible-video.

Other media

- CONVERtronic.net: Proyecto REPARA, computación paralela más rápida, eficiente y sostenible.

  - http://www.convertronic.net/Tecnologia/proyecto-repara-computacion-paralela-mas-rapida-eficiente-sostenible.html.

English impacts derived from Spain

The spanish press release had also impact in English.

Scientific new media

- DiCYT (Iberoamerican Agency for Broadcasting of Science and Technology): http://www.dicyt.com/news/searching-for-faster-more-efficient-and-sustainable-parallel-computing

- SINC Agency (Scientific News and Information Service): http://www.agenciasinc.es/en/News/Searching-for-faster-more-efficient-and-sustainable-parallel-computing

- AlphaGalileo: http://www.alphagalileo.org/ViewItem.aspx?ItemId=139761&CultureCode=en

- EurekAlert Chinese (Scientific News Service from the American Association for Science Advancement): http://chinese.eurekalert.org/en/pub_releases/2014-03/ciuo-sff031014.php

Other media

- Physorg:
  - http://phys.org/news/2014-03-faster-efficient-sustainable-parallel.html.
- 15Minute News:
  - http://www.15minutenews.com/article/27353711/searching-for-faster-more-efficient-and-sustainable-parallel-computing/.
- Unfox News:
  - http://unfoxnews.com/news/searching-for-faster-more-efficient-and-sustainable-parallel-computing.
- Bruch News:
  - http://www.brunchnews.com/phys/technology/searching-for-faster-more-efficient-and-sustainable-parallel-computing-798072.
- eScience News:
  - http://esciencenews.com/sources/physorg/2014/03/11/searching.faster.more.efficient.and.sustainable.parallel.computing.
- News.Nom:
  - http://www.news.nom.co/searching-for-faster-more-efficient-and-8315737-news/.
- Bartle Doo Articles:
  - http://bd.summit.net/articles/2014/03/11/searching-for-faster-more-efficient-and-sustainable-parallel-computing/#gsc.tab=0
- Best of the web:
  - http://llikdaor123.wordpress.com/2014/03/11/searching-for-faster-more-efficient-and-sustainable-parallel-computing/
- MyLiye:
  - http://www.myliye.com/news/searching-for-faster-more-efficient-and-sustainable-parallel-computing/
- Tech News Indexer:
  - http://w8.ms/searching-for-faster-more-efficient-and-sustainable-parallel-computing/
- Veooz:
  - http://www.veooz.com/news/jGy_VAa.html
- Nets247:
  - http://www.nets247.com/news/searching-for-faster-more-efficient-and-sustainable-parallel-computing

Chinese impacts derived from Spain

The spanish press release had also impact in Chinese.

Scientific news media

- EurekAlert Chinese (Scientific News Service from the American Association for Science Advancement): http://chinese.eurekalert.org/zh/pub_releases/2014-03/ciuo-sff031014.php

Video coverage

A video interview with J. Daniel Garcia was posted in *YouTube* (http://youtu.be/vNbiU53LvFQ)
The video interview was covered in the following media:

- Madrid+d: http://www.madrimasd.org/cienciaysociedad/mediateca/default.asp?videoID=2457
- SINC Agency (Scientific News and Information Service): http://www.agenciasinc.es/Multimedia/Videos/En-busca-de-una-computacion-paralela-mas-rapida-eficiente-y-sostenible

Twitter coverage

The accounts @uc3m and @ciencia_uc3m both posted links to the news in Spanish and English.

Spanish tweets

- @ciencia_uc3m: En busca de computación paralela más rápida, eficiente y sostenible http://bit.ly/1ekhMTk la @uc3m en el @reparaproject.
- @uc3m: Computación paralela más rápida, eficiente y sostenible http://bit.ly/1ekhMTk Eso busca la #uc3m en el @reparaproject vía @ciencia_uc3m.

English tweets

- @ciencia_uc3m:Searching for faster, more efficient and sustainable parallel computing http://bit.ly/1h6Eb8z @uc3m in @reparaproject.
- @uc3m:Searching for faster, more efficient and sustainable parallel computing http://bit.ly/1h6Eb8z #uc3m in @reparaproject via @ciencia_uc3m.

3.2.5 Switzerland

In Switzerland, the press release has been published on HSR's website http://www.hsr.ch/News-Detail.2355.0.html?tx_ttnews[tt_news]=1543.
In addition, it has been distributed locally and was printed in the following media:

- Zürichsee-Zeitung, 15/03/2014
- St. Galler Tagblatt, 17/03/2014
- March-Anzeiger, 17/03/2014

- wn.com (17/03/2014): IFS verbessert Programmcode (HSR Hochschule für Technik Rapperswil)
  - http://article.wn.com/view/2014/03/17/IFS_verbessert_Programmcode_HSR_Hochschule_fur_Technik_Rappe/

4. Conclusions

The delivery of the initial press release has been completed successfully. The **REPARA** consortium has delivered:

- A global press release in English.
- A localized press release in Germany.
- A localized press release in Hungary.
- A localized press release in Spain. Versions of this press release were also released internationally in English and Chinese.
- A localized press release in Italy.
- A localized press release in Switzerland.