REliable Power and time-ConstraInts-aware Predictive management of heterogeneous Exascale systems



WP5 Dissemination and Exploitation

D5.3 RECIPE Dissemination Plan

http://www.recipe-project.eu



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Duration: 36 months

Coordinator: Politecnico di Milano, Italy

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RE	Restricted to a group specified by the consortium (including the Commission Ser-	
	vices)	
CO	Confidential, only for members of the consortium (including the Commission Ser-	
	vices)	







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D5.3 RECIPE Dissemination Plan

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Executive Summary

This report reports the plans to drive dissemination of the RECIPE project and the results achieved in the first reporting period.

We report the the overall results achieved by the project, individual dissemination plans and actions undertaken by each partner. Plans are reported as an update with respect to D5.2, which provides the full dissemination plan and an initial report of the first dissemination activities.

In particular, we highlight the scientific output of the project, which consisted for the first reporting period in 5 journal articles (4 published, 1 accepted) and 12 conference paper (11 published, 1 accepted), which puts RECIPE well in advance with respect to the initial plans, which foresaw a total of 5 journal articles and 15 conference paper during the entire span of the project.





1 Report and Plans on Dissemination & Communication Activities

1.1 Scientific Papers

In the early months of the project, Prof. William Fornaciari (PC, Politecnico di Milano) participated to the SAMOS conference presenting an invited paper [3], jointly written by the consortium partners.

The non-confidential results of T1.1 have been presented at Euromicro DSD2019 as a joint work involving most of the project partners [1].

Furthermore, several partners published works based on their contribution to the project, as reported in the following table.

Type of Publication	Goal	Published	Accepted	Submitted
Journal	5	4	1	2
Conference	15	11	1	2
Book	1	0	0	0

It can be seen that the RECIPE dissemination goals, reported from the Technical Annex to the Grant Agreement, have been nearly reached, hence we expect to outperform them by the end of the project.

1.2 Other Dissemination Activities

Giovanni Agosta (PTM, Politecnico di Milano) organised a Special Session on European funded projects at the SAMOS conference in 2018 and 2019.

William Fornaciari (PC, Politecnico di Milano), Giovanni Agosta (PTM, Politecnico di Milano) and Alessandro Cilardo (CeRICT) co-organized the first Italian Workshop on High Performance Computing Techologies in September 2019, which served to bring together the Italian community (primarily academic, but with a significant industrial participation), where the project activities were showcased.

Project flyers were distributed at the following events:

- Euromicro Conference on Digital Systems Design (DSD 2018, 2019);
- Italian Workshop on Embedded Systems (IWES 2018, 2019).

A short press release has been published on issue 56 of the HiPEAC Newsletter, which reaches almost 2000 computing systems researchers, industry representatives and doctoral students.

Also, POLIMI and IBTS held an initial meeting with Consorzio Muzza, which manages the water basin of the Muzza channel, covering parts of the provinces of Milan and Lodi in central Lombardy, to discuss the possibility to install IBTS devices as part of an experiment for water level data collection for Use Case 2.





Audience Overview			
All Users 100.00% Users			Oct 1, 2018 - Nov 3, 2019
Overview			
Users New Users			
40			40
20			20
. And Alle and	m. Mahan	man March South March	monoMontalla
December 20	18 February 2019	April 2019 June 2019 August	tor Returning Visitor
Users	New Users	Sessions	tor = returning visitor
1,084	1,075	1,445	11.3%
		And	
Number of Sessions per User	Pageviews	Pages / Session	
1.33	3,569	2.47	
desitter on the other one	helmonth and a state of the second second	an and the second secon	875
Avg. Session Duration	Bounce Rate		
00:01:30	61.52%		
her warmen and the second			
	1		
Country		U	sers %Users
1. Italy			162 14.69%
2. Spain			120 10.88%
3. United States			115 10.43%
4. France			100 9.07%
5. Germany			71 6.44%
6. Netherlands			71 6.44%
6. Netherlands 7. Switzerland			71 6.44% 52 4.71%
6. Netherlands 7. Switzerland 8. United Kingdom			71 6.44% 52 4.71% 48 4.35%
 Netherlands Switzerland United Kingdom Poland 			71 6.44% 52 4.71% 48 4.35% 36 3.26%

Figure 1: Website Users Analytics: geographic distribution

Finally, UPV arranged a meeting with advisory board member Dave Mayhew in Valencia, presenting him the project key features.

1.3 Website and Social Media Report

1.3.1 Website Analytics

RECIPE website is pivotal in communicating and disseminating project results to different audiences. The following pictures provide: 1) the statistics of users and the geographical information in Figure 1; 2) operating system and browser utilisation in Figure 2.

The data below show how the engagement with RECIPE project gained through the website use has increased drastically since the last report. New users, for instance, have increased in number and the analytics indicate that the majority is from Italy and Spain, which suggests that the consortium has been active in communicating and disseminating the project in its own countries. At the same time, and in line with our aims, we managed to gain more interest outside





Audience Overview				
All Users 100.00% Users				Oct 1, 2018 - Nov 3, 2019
Overview				
Users				
40				
20				1
December 201	Monda Martin Pebruary 2019	April 2019 June 20	19 August 2019	October 2019
			New Visitor	Returning Visitor
Users	New Users	Sessions		
1,004	1,075	1,445	11.3%	
Number of Sessions per User	Pageviews	Pages / Session		N
1.33	3,309	2.47		
		along-state light hill shall be the state of the state of the state		88.7%
Avg. Session Duration	Bounce Rate			
00:01:30	61.52%			
likhor and bine in commutation	t aller i Anna air a bhannaith an anna			
Browser 1. Chrome			591	% Users 54 52%
2. Firefox			193	17.80%
3. Safari			108	9.96%
4. Internet Explorer			72	6.64%
5. Edge			55	5.07%
6. 'Mozilla			16	1.48%
7. Opera			13	1.20%
8. (not set)			12	1.11%
9. Android Browser			4	0.37%
10. Mozilla Compatible Age	nt		4	0.37%

Figure 2: Website Users Analytics: browsers and OS used





the consortium's countries, and, especially, outside Europe. As Figure 1 indicates, 9,07 % of the views are from France and 6,44 % are from the Netherlands, countries we did not reach at the time of the last report, and 10,8 % are from the USA. We plan to reach an even wider audience by keeping the website updated with news even more tailored to the interests of the relevant audiences.

1.3.2 Social Media Analytics

RECIPE social media accounts allow to reach stakeholders with news and interactions. They act as outlets for the news items which also appear on the website, and provide a way to interact with and to obtain the support of other institutional accounts, such as those of the consortium partners, and those managed by the European Union entities.

RECIPE Facebook account targets a mixed audience, primarily with photographs, infographics, and news items. Only in the last month, the project's page has gained new views and new followers, with a a clear increase in readers' engagement with the posts. Figure 3 shows the important reach of some posts during salient moments of the project, such as the Cluster Meeting of FETHPC-2017 projects, organised by DG CONNECT of the EU Commission, that happened in Luxembourg at the end of October 2019, the RECIPE news about the technical meeting that took place in Milan in April 2019 and the publication of the RECIPE Press Release on the project's website in October 2018. Facebook has now 19 likes, a number that has increased with respect to last year. We plan to raise this number even more by promoting more news linked to the project and by sharing more information, photos and videos linked to the technology currently developed by the partners.

Figure 4 reports some numbers showing how, only in the last 28 days, the engagement with the page has increased.

RECIPE Twitter account targets an audience which is more technical than the Facebook one, mostly by leveraging the sharing news of major accounts followed by academics, students, and industry players.

To this end, RECIPE Twitter account has already 65 followers, a number that increased importantly from the last report. We plan on increasing such number and on improving the engagement of interested audiences with the account by getting in contact with stakeholders that we have now identified more clearly. This will increase the awareness of the project among interested parties.

Figure 5 highlights the number of impressions learned in the last 3 months, while Figure 6 indicates the number of impressions we received only in the last month (October 2019).

1.4 Individual Dissemination Plans & Reports

1.4.1 Politecnico di Milano (POLIMI)

POLIMI leads the dissemination and communication activities. As such, it has set up the website, the social media account, and the project communication and collaboration tools.

Furthermore, POLIMI edited and presented an invited paper to the SAMOS 2018 [3] conference, and organised the SAMOS Special Session on European Projects. POLIMI also contributed to





Published	Post	Туре	Targeting	Reach		Engage	ement	Promote
25/10/2019 16:32	RECIPE delegates before, during and after the review meeting at the		Ø	97		22 9		Boost Post
24/10/2019 11:08	Today RECIPE's delegates, including the Coordinators from Politecnico di	6	0	247		13 14		Boost Post
23/10/2019 10:13	Midterm Review in Luxembourg The rehearsal is starting right now and	6	0	100		36 11		Boost Post
15/04/2019 14:23	Recipe eu-H2020	6	0	25	I.	8 2		Boost Post
15/04/2019 10:48	Now live from Politecnico di Milano to discuss the developments of our	6	0	210		32 15		Boost Post
0 6/02/2019 14:37	What is PREDICTIVE RELIABILITY? What is its role in future HPC systems? Find out	8	0	48	I.	3 5		Boost Post
30/01/2019 17:34	Check it out! Recipe project short description is now out in the latest	6	۲	57	L	0 5		Boost Post
24/01/2019 10:28	RECIPE Meeting yesterday in Valencia (within HiPEC 2019) sharing		۲	22	1	3 1		Boost Post
22/10/2018 17:27	RECIPE in a nutshell? Here is our press release for you to have a look	6	0	349		5 8		Boost Post
20/07/2018 10:17	First meeting with the EAB members Dave Mayhew, from The University of	6	0	76		4 7		Boost Post
18/07/2018 10:11	The project coordinator Prof. William Fornaciari is now presenting the	6	۲	474		77 16		Boost Post
18/07/2018 09:57	The External Advisory Board (EAB) list of people has been finalized	6	0	44	I.	3 6		Boost Post
15/06/2018 11:47	Kick-off meeting at Politecnico di Milano on May 2018. #H2020	6	0	272		54 18		Boost Post

Figure 3: Facebook views







Figure 4: Facebook engagement

a paper on the outcomes of Task 1.1, which has been published at Euromicro DSD2019 [1].

In addition to these joint publications with other partners, POLIMI published several papers, including 3 journals [17, 15, 12] (plus 1 accepted for publication [10]) and 4 conference papers [13, 16, 14, 7] (plus 1 accepted for publication [9]).

POLIMI further disseminated information about RECIPE through the flyers, at the HiPEAC conference (HiPEAC 2019), Euromicro Digital Systems Design (DSD 2018, DSD 2019) conference, at the SAMOS 2019 conference, and at the Italian Workshop on Embedded Systems (IWES 2018, IWES 2018).

POLIMI co-organized the first Italian Workshop on High Performance Computing Technologies, where we introduced our team and the work done in RECIPE.

POLIMI plans to further disseminate project awareness through several channels, including a tutorial on the resource management infrastructure at HiPEAC 2020.

POLIMI is also preparing a journal submission on its open source software toolchain, which is developed as part of both the RECIPE and MANGO projects.

1.4.2 Universitat Politécnica de Valencia (UPV)

With regards to dissemination is referred to, UPV has helped on building the Advisory Board and arranged a meeting with Dave Mayhew in Valencia (AB member). We have also got all feedback reported by the AB members and we have created a document for internal discussion by the consortium partners. In addition, UPV has disseminated the RECIPE project in the

















context of DeepHEALTH reaching international universities and companies, such as Università degli Studi di Torino, Barcelona Supercomputing Center (BSC), CEA List and PRO DESIGN Electronic GmbH. Additionally, we have initiated the contact for filming a short TV interview, but the recording is going to be postponed until 2020 most probably.

As far as communication is referred to, UPV attended HiPEAC and DAC Conferences in 2019. In HiPEAC 2019, we attended the Workshop on Reconfigurable Computing (WRC 2019), while we edited and presented a paper in the main track session at DAC 2019 [8]. UPV has also contributed to a joint publication with other partners on the outcomes of Task 3.1, which has already been submitted to ACM Computer Surveys journal.

In the future, UPV plans on attending the HiPEAC, ISCA, DATE and DSN Conferences at 2020. For DATE 2020, we have already submitted a paper to DATE 2020, which is currently under revision process.

1.4.3 Centro Regionale Information Communication Technology scrl (CeRICT)

In line with the initial plan (aiming to present at least one contribution per year in the form of a technical paper, presentation, session chairing, or invited talk) CeRICT has participated in the *Italian Workshop on Parallel and High Performance Computing Technologies* and presented an article for the 3PGCIC-2019 conference. CeRICT has also taken part in the *High Performance and Embedded Architecture and Compilation* (HiPEAC) conference (Valencia, January 21-23, 2019) and the *Design Automation and Test in Europe* (DATE) conference (Firenze, March 25-29, 2019), although travelling costs will not be reported in RECIPE. The targeted audience mostly included research groups from academia as well as representatives of the relevant industry sectors (computing technologies, digital electronics, programming tools). Also in line with the activities listed in the initial dissemination plan, CeRICT performed the following actions:

- setting up a dedicated website for advertising the compute platform and programming toolchain developed during the project (http://www.NaplesPU.org);
- using the organisational website as well as social media for focused communication activities;
- advertising the architectural exploration activity carried out by CeRICT during the Advanced Computer Architecture and GPU Programming course at the University of Naples Federico II, a member of the CeRICT consortium, adopting the compute platform currently under development in RECIPE as a case study of a many-core architecture.

1.4.4 École Polytechnique Fédèrale de Lausanne (EPFL)

EPFL has disseminated the project results via the publication of papers in conferences and journals and the presentation of the project results at several events:

Accepted publications:

• Iranfar, A., Terraneo, F., Csordas, G., Zapater, M., Fornaciari, G., Atienza, D. "Dynamic Thermal Management with Proactive Fan Speed Control Through Reinforcement Learning", Submitted to Design Automation and Test in Europe Conference (DATE), 2020 [6]





- Qureshi, Y., Simon, W.A., Zapater, M., Atienza, D., "Gem5-X: A gem5-based System Level Simulation Framework to Optimize Many-Core Platforms", Proceedings of the 27th High Performance Computing Symposium (HPC 2019), 2019. Best Runner-Up Paper Award [11]
- Iranfar, A., Silva de Souza, W., Zapater, M., Olcoz, K., Xavier-de-Souza, S., Atienza, D., "A Machine Learning-Based Framework for Throughput Estimation of Time-Varying Applications in Multi-Core Servers", IEEE Int. Conf. on Very Large Scale Integration (VLSI-SoC), 2019 [5]
- Iranfar, A., Pahlevan, A., Zapater, M., Atienza, D., "Enhancing Two-Phase Cooling Efficiency through Thermal-Aware Workload Mapping for Power-Hungry Servers", Design, Automation, and Test in Europe Conference and Exhibition (DATE), 2019 [4]
- Costero, L., Iranfar, A., Zapater, M., Igual, F., Olcoz, K., Atienza, D., "Multi-Agent Reinforcement Learning for Efficient Real-Time Multi-User Video Transcoding". Design, Automation, and Test in Europe Conference and Exhibition (DATE), 2019. [2]

Dissemination plan for next months In the following months, we envision the dissemination of the work in the following venues:

- Invited presentation in the International Conference on VLSI Design, (VLSID 2020 Conference), "Enhancing the thermal reliability of multi-processor systems-on-chip using approximate computing techniques", Bengaluru, India, January 2020 (appointed)
- Invited presentation by Huawei in "Power, performance and thermal aware multi-objective design and management of 2D/3D many-core servers" at the International Electronics Cooling Technology workshop (CWT), China, November 2019 (appointed).
- Submission of a joint paper with other consortium partners to SAMOS 2020
- Submission of the work resulting from WP3 to an IEEE Trans. journal.

Furthermore, EPFL is regularly attending the following conferences and communication events:

- Design Automation and Test in Europe (DATE) academic audience mainly Scope: various aspects of embedded engineering and electronic design automation
- Design Automation Conference (DAC) academic & industry audience Scope: conference for design and automation of electronic systems
- IEEE International Parallel & Distributed Processing Symposium (IPDPS) academic audience mainly Scope: parallel and distributed architectures, applications, software
- Embedded Systems Week (ESWEEK) academic audience mainly Scope: All aspects of embedded systems and software

We also plan the submission of publications to the following journals:

- IEEE Transactions on Computers monthly frequency, scope: computer organisation and architectures, digital devices and operating systems
- IEEE Micro bi-monthly journal, scope: all aspects of computer science





- IEEE Trans. on Computer-Aided Design: monthly design, analysis and use of computeraided design of integrated circuits and systems
- IEEE Trans. on Circuits and Systems I monthly theory, analysis, CAD, and practical implementation of circuits.
- IEEE Computer monthly all aspects of computer science

EPFL disseminates the project results and any other achievement via the webpage of its laboratory¹. We also use the webpage and social accounts of the RECIPE project.

The research undertaken during the RECIPE project will be part of the PhD thesis of the students hired by the project.

1.4.5 Barcelona Supercomputing Center (BSC)

BSC has disseminated RECIPE's work through informal meetings with other researchers within BSC itself. In particular, the group has discussed the scope and objectives of RECIPE with BSC researchers leading the H2020 LEGATO and Montblanc 2020 projects.

BSC is regularly attending and communicating the project's results to the following conferences:

- HIPEAC Conference
- DATE Conference
- DAC Conference, whose audience is a mix of academics and industrial people

BSC plans to upload on its website a publication concerning the innovative use of statistical tools to derive the worst-case execution of HPC applications that will be carried out in the context of RECIPE. BSC will then publicise such publication on Facebook, Twitter and LinkedIn to increase its visibility and impact.

On the academic side, BSC expects that the RECIPE's work will be part of two PhD theses from BSC/UPC. It also intends to use its connection with UPC to disseminate the outputs of RECIPE to master students.

Progress report:

- Accepted publications with other H2020 projects
 - Towards Resilient EU HPC Systems: A Blueprint, HIPEAC 2020 (tentative), a joint collaboration between the following projects: MB2020 , EXA2PRO , SDK4ED , EVOLVE , EXDCI , RECIPE , ECOSCALE , ExaNoDe , ExaNest ,Eurolab4HPC.
- Publications under review:
 - Predictive Reliability and Fault Management in Exascale Systems: State of the Art and Future Perspectives, ACM Computing Surveys.
 - On the Use of Probabilistic Worst Case Execution Time Estimation for Parallel Applications in High Performance Systems, 26 th IEEE Real Time and Embedded Technology and Applications Symposium (RTAS), 2020.

¹http://esl.epfl.ch





- Organization of Special Issue:
 - Special Issue on *Supercomputing and Mathematics* in the open access journal Mathematics (ISSN 2227-7390, IF: 1.105, rank Q1).
- Organization of Tutorial (under evaluation):
 - Tutorial on Early System Reliability Analysis for Cross-layer Soft Errors Resilience in Microprocessor Systems at DATE 2020.

1.4.6 Poznan Supercomputing and Networking Center (PSNC)

PSNC disseminates project's results by publishing relevant content on its organisation website, thus sharing major RECIPE-related news with the community and stakeholders.

Further dissemination activities are carried out by participating to workshops and conferences, e.g. the already held HiPEAC 2019 Conference, and the upcoming Supercomputing Conference (17-22/11/2019), where PSNC will have its booth and will present RECIPE through flyers and individual talks.

PSNC gave a talk on its thermal models for heterogeneous systems at the Conference on Parallel Processing and Applied Mathematics (Bialystok, Poland, 9/9/2019) - Thermal and power-aware fans management of heterogeneous server system.

Additionally, PSNC liaised with H2020 VECMA project² for further dissemination. Applications, which are included in UC2 development, are used as externals, to be enhanced with uncertainty quantification, verification and validation features.

1.4.7 IBT Solutions S.r.l. (IBTS)

IBTS focus is to improve the awareness on IBTS design capabilities among the partners and towards perspective customers.

IBTS plans to create a specific section of its Web portal to advertise on this new product under development and its relation with the RECIPE project. Moreover, IBTS will cooperate with the rest of the partners to write joint papers to be presented at conferences and workshops. The plan for the future is to keep on using the website as the main vehicle for external public dissemination, while cooperating with the partners of the use case where IBTS is involved to write papers for conferences and magazines.

For the sake of moving from the creation of awareness in the direction to create a real business, we are planning to design a commercial brief showing in a more detailed manner the full range of opportunities offered by the system we are developing, and to perform an initial study on the possible stakeholders in the Lombardy Region. We plan to identify a location capable to host a real setup and to create a "story" around it to be presented directly to a set of 2-4 possible customers, within the project timeframe. Such experience and the feedback we plan to collect will constitute the cornerstone to refine the dissemination material that will be adopted for the commercial exploitation of the project output after the project timeframe. We will also analyse the possibility to present such material in specific fairs and exhibitions organised in Italy and/or in locations suggested by the RECIPE partners.

 $^{^{2}}$ https://www.vecma.eu





The presence during public events will be taken into account when the platform under development will be mature enough. The creation of product flyers is also foreseen at the end of the first year, and specific contacts are already in progress with a local water management public body to join an info-day (within the project timeframe) where the benefits of the infrastructure under development are explained to a wide not-purely technical audience.

During month 18, the system has been presented to Consorzio Muzza, a public body in charge of the management of a water basin in south-eastern Lombardy. The system has also been presented to a wider audience during the 2019 Italian Workshop on Embedded Systems, held in Naples in September 2019. Work is in progress to present the system to a river reserve in the Emilia Romagna region.

1.4.8 Centre Hospitalier Universitaire Vaudois

In September 2019, in the Second International Congress on Mobile Devices and Seizure Detection in Epilepsy event, Prof. Ryvlin presented the ongoing projects related to epilepsy, including the RECIPE project. At this conference, he introduced the work CHUV is doing with respect to Use Case 3. In December 2019, Prof. Ryvlin plans to introduce the ongoing work on the RECIPE Use Case 3 at the annual meeting of the American Epilepsy Society 2019 in Baltimore. Professor Ryvlin, as an academic professor, disseminates the project's results also during courses for future clinicians. The Use Case 3 flyer will be placed in the waiting room of epilepsy consultations, as epileptic patients as well as their relatives are interested in knowing more about the technological progress in this area of research.

2 Data Management Plan

Data Management Plans (DMPs) are introduced in the Horizon 2020 Work Programmes:

"A further new element in Horizon 2020 is the use of Data Management Plans (DMPs) detailing what data the project will generate, whether and how it will be exploited or made accessible for verification and re-use, and how it will be curated and preserved. The use of a Data Management Plan is required for projects participating in the Open Research Data Pilot. Other projects are invited to submit a Data Management Plan if relevant for their planned research."

The purpose of the Data Management Plan (DMP) is to provide an analysis of the main elements of the data management policy that will be used by the applicants with regard to all the datasets that will be generated by the project. The DMP is not a fixed document, but evolves during the lifespan of the project.

In the case of RECIPE, specific care needs to be put to ensure correct management of data within Use Case 3, which employs personal data from patients to drive its machine learning application.





2.1 Private Data Management Policies

The Project Coordinator is the physical person responsible for the RECIPE project and for approving other users access to the project.

Users are physical persons participating in the project. Membership of users to RECIPE project is authorised by Project Coordinator and the entire consortium is aware of that list, since any modification is discussed during the weekly telcos.

2.1.1 Project Data Sharing Platforms

Phabricator is a suite of web-based collaboration tools. The instance of Phabricator used for RECIPE is self-hosted at POLIMI, the coordinating entity, and connected to file storage and versioning solutions, also self-hosted on the same physical machine (which is not virtualised). In particular, we employ ownCloud, a self-hosted Dropbox-like solution for private file storage. It is used in the project as a repository to store files related to the project (e.g., reports, publications, dissemination materials). We use a free version of ownCloud as the repository server. It is an open platform which can be accessed through a web interface or a sync client (available for desktop and mobile platforms). Members of the RECIPE Consortium can access the repository files using accounts, previously created by a system administrator. Furthermore, we employ Git, a version-control system supporting collaboration on both the RECIPE software and shared documents provided in (primarily) plain text or markup formats. Access to the three platforms is granted by the coordinator, and is technically managed via username/password authentication, or via public key authentication.

The project website is hosted on a different (virtualised) machine, since it holds only public documents. All the machines are placed in a server room secured by electromechanical locks controlled by access cards. Only POLIMI system administrators have access to this room.

2.1.2 Storage and Access Policies

Data generated or used by the project are held in facilities under the control of individual partners, and are shared (when such sharing is authorised by the Project Coordinator based on the policies set in the Consortium Agreement) with other partners only through the project OwnCloud and Git platforms.

In particular, data employed for Use Case 3 are kept at CHUV facilities in Switzerland, and will not be stored in the project facilities nor otherwise moved outside Switzerland. A synthetic data set with compatible statistical properties will be generated for the purpose of testing the scale-up of the Use Case 3 application on the RECIPE hardware infrastructure, which will be installed at UPV and CERICT facilities.

Such hardware infrastructure is dedicated to the project, and will be accessible to other consortium partners (only) through public key authentication and/or password based SSH/SFTP access.

RECIPE will also leverage a hardware prototype developed within the context of the MANGO H2020 FET-HPC project, which will be also installed at UPV and CERICT after the end of the MANGO project itself. Since the MANGO prototype will be accessible also to partners of





the MANGO consortium which are not partners of RECIPE, only non-confidential data will be transferred to and elaborated on the MANGO prototype.

Any transfer of data between RECIPE storage facilities will take place through encrypted and authenticated channels (SFTP/SCP) only.

2.2 Data Management Plan Template

For each generated dataset, the following metadata will be produced. Open datasets will be listed on appropriate resources, such as OpenAIRE.

Number	Item	Description
1	Dataset reference and name	Identifier for the dataset to be produced (DOI)
2	Dataset description	Description of the data that will be generated or col- lected, its origin (in case it is collected), nature and scale and to whom it could be useful, and whether it underpins a scientific publication. Information on the existence (or not) of similar data and the possibilities for integration and reuse.
3	Standards and meta- data	Reference to existing suitable standards of the discipline. If these do not exist, an outline on how and what meta- data will be created.
4	Data sharing	Description of how data will be shared, including access procedures, embargo periods (if any), outlines of tech- nical mechanisms for dissemination and necessary soft- ware and other tools for enabling reuse, and definition of whether access will be widely open or restricted to spe- cific groups. Identification of the repository where data will be stored, if already existing and identified, indi- cating in particular the type of repository (institutional, standard repository for the discipline, etc.). In case the dataset cannot be shared, the reasons for this should be mentioned (e.g. ethical, rules of personal data, in- tellectual property, commercial, privacy-related, security- related).
5	Archiving and preserva- tion (including storage and backup)	Description of the procedures that will be put in place for long-term preservation of the data. Indication of how long the data should be preserved, what is its approximated end volume, what the associated costs are and how these are planned to be covered.

A Updated Dissemination Materials





A.1 Flyers

This flyer provides a focused overview of the RECIPE activities concerning each Use Case. The goal of these flyers is to allow Use Case developers to showcase the benefits their application receives from the project.













OBJECTIVES RECIPE (REliable power and time-Constraints-aware Predictive ma-nagement of heterogeneous Exascale systems) provides the tools needed to make the heterogeneous resources in future High Performance Computing (HPC) systems more robust and reliable. The main goals are:

- 25% increase in energy efficiency 15% increase in mean to time failu-Up to 25% improvement in ener-
- gy-delay product Occurrence of fault executions re-
- duced by 20% with recovery times compatible with real-time performance



GEOPHYSICAL EXPLORATION The most promising geophysical imaging tool nowadays is Full Waveform Inversion or FWI. Potentially, FWI can retrieve physical parameters for a who-le 3D subsurface volume directly from the seismic data. However, the tool has its limitations, as are the necessity of specially acquired data (low-frequen-cy, long-offset), good initial models and huge computational demands. In our tool, the FWI tool has inherited the efficient implementation of the algorithmi-cally similar RTM and boosted its capabilities in order to turn this very costly imaging algorithm into a commodity.

PROBLEM and METHODOLOGY RECIPE provides a hierarchical run-time resource management infra-structure to optimise energy efficiency and minimise the occurrence of ther-mal hotspots. This preserves the time constraints imposed by the applica-tions, and ensures reliability for both time-critical and throughput-oriented computation.

More powerful and less energy-hungry supercomputers are needed. However, the supply needed to keep HPC centres running is about to exceed the capabilities of the power grid. We therefore need to exploit resource heterogeneity. RECIPE provides the tools to manage these heterogeneous resources in future HPC systems.



MORE THAN A RECIPE... Our FWI tool incorporates novel preconditioning, data compression and workflow control ideas that make its approach unique and result in very high-resolution 3D subsurface models.

The resulting models are of very high quality even at deep sections, while the computing costs are not too different from those required for other hi-gh-end imaging applications (e.g. RTM). Together with accelerated kernels running on advanced HPC platforms, our tool is mature and ready to reduce uncertainty in seismic exploration surveys today.







EULAG

EULAG Poznan Supercomputing and Networking Cen-ter (PSNC) applies HPC to predict the energy produced by renewable energy sources. For the existing wind turbines, the simulation provides a more detailed weather forecast to maximize the outcome of the power plant. It can also help in fin-ding the most optimal localization of the wind tur-bines to maximize henefit from local tonorraphy bines to maximize benefit from local topography and weather conditions.

PSNC simulations software uses HPC simulations to predict and forecast air quality in urban areas, modelling NOx, SOx, PM2.5 and PM10 concentra-tions in particular. The EULAG model allows diffe-rent scales to be modeled, taking into account:

- Weather conditions, including forecasts; Different emission types: point, line, area, in-cluding vehicle types, emission based on land cover:
- Complex urban topography; Season differentiation

PSNC main goal is to ensure reliable, in-time and efficient air quality modeling and execution of energy production prediction in order to allow fine-grained optimization in future smart grids.











OBJECTIVES

RECIPE (REliable power and time-Constraln-ts-aware Predictive management of heterogeneto make the heterogeneous resources in future High Performance Computing (HPC) systems more robust and reliable.

- The main goals are:
 25% increase in energy efficiency
 15% increase in mean to time failure
- Up to 25% improvement in energy-delay product
- Occurrence of fault executions reduced by 20% with recovery times compatible with real-time performance

PROBLEM and METHODOLOGY

RECIPE provides a hierarchical runtime resource management infrastructure to optimise energy efficiency and minimise the occurrence of thermal hotspots. This preserves the time constraints im-posed by the applications, and ensures reliability for both time-critical and throughput-oriented computation. More powerful and less energy-hungry supercom-

puters are needed

However, the supply needed to keep HPC centres running is about to exceed the capabilities of the power grid. We therefore need to exploit resour-ce heterogeneity. RECIPE provides the tools to manage these heterogeneous resources in future HPC systems.

ENVIRONMENTAL MONITORING

Flood events are the most frequent and expensive manifestations of hydro-geological instability. Be-cause of climate change, by 2050 the number of flood events is expected to double, with devastating effects on our ability to intervene and on our economy. Environmental monitoring is often ex-tended with numerical weather prediction (NWP) models, which can be used to predict the occurrence and the range of the floods, and to optimize the behavior of power plants exploiting renewable energy sources (RES) such as wind turbines.

RECIPE aims at:

- Demonstrating the applicability of weather forecast in two application domain, i.e. water level prediction and RES;
- Showing that run-time resource management is of paramount importance to achieve relia-bilty and to satisfy timing-related performan-ce in a cost-effective manner.





H2Observer

IBTS designs a set of in-field deployable platforms and a dashboard application to keep the sta-tus of water basins under control. The long-term goal is not only to monitor the status of rivers and canals, but also to :

- Improve the reaction speed to critical condi-tions such as floods by exploiting weather fo-
- recasts;
- recasts; Make the application running on the server more reliable; Create a repository with historical data for analysis and forecast collected through a flexible, easily deployable and low-cost sensor .
- station; Create a control dashboard for different end-users

Interestingly, weather predictions are not merely used to enhance water level predictions, hence flooding. The data coming from the on-field sen-sors (water level, humidity, speed and direction of wind, etc.) can also be used to enhance the precision of weather predictions themselves, thus creating a very useful synergy.





RECIPE (REliable power and time-ConstraInts-aware Predictive management of heterogeneous Exascale systems) provides the tools needed to make the heterogeneous resources in future High

Performance Computing (HPC) systems more robust and reliable.

Goals

- 25% increase in energy efficiency
- 15% increase in mean to time failure
- Up to 25% improvement in energy-delay product
- Occurrence of fault executions reduced by 20% with recovery times compatible with real-time performance
- Full exploitation of available resources under non-satura-ted conditions





Methodology

RECIPE provides a hierarchical runtime resource management infrastructure to optimise energy efficiency and minimise the occurrence of thermal hotspots. This preserves the time constraints imposed by the applications, and ensures reliability for both time-critical and throughput-oriented computation.

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Epilepsy and MHealth

Epileptic seizures induce a number of autonomic system changes that can be monitored via wearable electronics. However, the huge variation in seizures from one patient to another makes their detection very challenging and militates for individually setting algorithm.



Once stabilized, patients' wearable devices should access their own specific algorithm in due time to offer real-time seizure detection. To do so, biomedical traces obtained via a monitoring system are labelled as potential seizures, and are sent to computing infrastructures with enough computational power to execute the required machine-learning and deep learning algorithms needed to detect whether the biomedical traces seem to correspond to an upcoming epileptic seizure.

The main goal in this project is to develop the required software infrastructure to enable the deployment of the seizure detection algorithms in a prototype platform able to manage a large-scale population while meeting the real-time requirements of the application.







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