



COST Action IC1406

(Action start date: 8 April 2015 – Action end date: 7 April 2019)

High-Performance Modelling and Simulation for Big Data Applications - cHiPSet

PROGRESS REPORT AT MONTH 24

This report is submitted by the MC Chair on behalf of the Management Committee.

Confidentiality: This report, other than section II.D, is non-confidential. Section II.D is confidential to the Management Committee and the COST Association (including the Committee of Senior Officials, Scientific Committee and Administration).

Executive summary of the Progress Report:

Advances in high-performance computing and data analytics arguably provide new abstractions to deal with Big Data modelling and simulation by simplifying programming of scalable and parallel systems while efficiently accessing large data sets. Consequently, cHiPSet aims to form an ecosystem for the coordination and collaborations between computational science (the third paradigm of science) and data science (the fourth paradigm of science) to deliver improvements in modelling and simulation with tangible societal impacts for Europe.

During two years of the project, cHiPSet has actively nurtured research and innovation endeavours to ensure the trustworthiness of data-intensive modelling and simulation and the accessibility of computational methods and quantification approaches to enhance reproducibility and replicability of results. Through 27 short-term scientific missions and 15+ high-impact co-authored publications, this Action has shared not only the current state of best practices and standards for data-intensive modelling and simulation, but also access to new programming techniques and computational infrastructure, effectively creating knowledge by linking previously interconnected research groups, industrial data sources, and computational infrastructures across Europe.

Reflecting on the fact that scientific research has become richer in data and more computationally demanding, cHiPSet has created an innovation ecosystem in Big Data modelling and simulation where domain scientists have opportunities to further their data-science and computing skills, and computational scientists and practitioners validate their computational models via evaluation-driven research applications. A clear product of this skills ecosystem is reflected in the compilation and development of eleven interdisciplinary use case studies in distinct domains with clear societal impact such as drug discovery, cell biology, telecommunications, smart cities, social media analysis, eHealth, electromagnetics, and smart tourism.

Focused dissemination engagements have also enabled cHiPSet to reach out beyond the traditional boundaries of scientific research. cHiPSet members have given keynote talks and seminars at diverse forums such as the Big Data Value Association Summit in November 2016. Action plenary meetings have included keynote talks from major companies such as IBM and Comcast. In May 2017, cHiPSet will be organising a dedicated industry seminar to be delivered at IBEC, the Irish business confederation with 7,500 member companies from home grown to multinational, spanning every sector of the economy.

As a significant number of the 56 management committee members have ties to educational and research institutions, cHiPSet has arguably influenced curricula development at undergraduate and graduate levels. Furthermore, cHiPSet delivered formal training through a Summer School held in Bucharest in 2016, and the next edition will be in Novi Sad this Summer. These training and university engagements are actively helping to transform the broader workforce into data-enabled, computational-savvy citizens.

The cHiPSet Big Data innovation ecosystem is arguably essential to improve the lives of all Europeans by dynamically combining diverse distributed datasets and predicting the behaviour of complex systems, increasing the precision of medical treatments, understanding economic and social interactions, and enhancing energy utilisation. Moreover, the education and training of early career computational researchers and future data scientists should directly benefit European society and its economy.



COST is supported by
the EU Framework Programme
Horizon 2020

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I. Progress Report

I.A. COST Action Profile

Objective/ Aim
The main objective of the Action is to structure and co-ordinate research activity on HPC-enabled Modelling and Simulation for Big Data problems across Europe.

Details			
MoU:	103/14 (draft oc-2014-1-18820)	Start of Action:	2015-04-08
CSO approval date:	2014-11-13	End of Action:	2019-04-07

COST Member Countries and Cooperating State having accepted the MoU

	ICT		Non-ICT		Total
COST Members (countries) having accepted the MoU	Number	17	Number	15	32
	% of all ICTs	53,13%	% of all non-ICTs	46.88%	
Number of Action MC members		26		30	56

COST Member and Acceptance Date		
AT 30/07/2015	IE 11/12/2014	RO 30/01/2015
BE 30/03/2015	IL 22/12/2014	RS 27/12/2014
BA 18/07/2016	IT 30/01/2015	SK 24/06/2015
BG 23/02/2015	LV 17/02/2016	SI 12/10/2015
HR 15/06/2015	LT 16/04/2015	ES 03/12/2014
CY 24/11/2014	LU 17/12/2014	SE 02/12/2014
EE 17/12/2014	MT 10/02/2015	CH 13/07/2015
FI 21/01/2015	NL 29/02/2016	TR 08/06/2015
FR 19/12/2014	NO 23/03/2015	UK 25/11/2014
DE 01/12/2014	PL 26/11/2014	MK 24/12/2014
EL 16/12/2014	PT 04/02/2015	

Intentions to Accept the MoU

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Other participants:

Institution Name	Country
CSIRO	Australia
Chinese Academy of Sciences	China
George Mason University	USA
University of Notre Dame	USA
University of Sydney	Australia
Universidade Federal do Rio de Janeiro	Brazil
Belarusian State University	Belarus
Russian Academy of Sciences	Russian Federation

Contacts

Chair/ Vice Chair

Position	Name	Contact details	Country	Date of PhD:	Gender
Chair:	Joanna Kołodziej	Cracow University of Technology, ul. Warszawska 24, 31-155 Kraków, Poland, Tel. +48126282780, e-mail: jokolodziej@pk.edu.pl	Poland	2004	Female
Vice Chair:	Horacio González-Vélez	National College of Ireland Mayor Street, IFSC Dublin 1 Republic of Ireland, Tel. +353-1-4498529, e-mail: horacio@ncirl.ie	Ireland	2008	Male

Working Group Leaders

WG #	WG Title	WG Leader	Country	Date of PhD:	Gender	Number of participants
1	Enabling Infrastructures and Middleware for Big-Data Modelling and Simulation	Ewa Niewiadomska-Szynkiewicz	Poland	1995	Female	68
2	Parallel Programming Models for Big-Data Modelling and Simulation	Marco Aldinucci	Italy	2003	Male	40
3	HPC-enabled Modelling for Life Sciences	Andrea Bracciali	United Kingdom	2003	Male	19
4	HPC-enabled Modelling for Socio-Economical and Physical Sciences	Elisabeth Larsson	Sweden	2000	Female	31

Other positions if applicable (STSM Coordinator, WG Vice Leader, Task Force Leader...)

Position	Name	Country	Date of PhD:	Gender
Scientific Coordinator	Clemens Grellck	Netherlands	2001	Male
WG1 Vice Leader	Ioan Salomie	Romania	1994	Male
WG2 Vice Leader	Christoph Kessler	Sweden	1994	Male
WG2 Vice Leader	Peter Kilpatrick	United Kingdom	1985	Male
WG3 Vice Leader	Salvatore Vitabile	Italy	1999	Male
WG4 Vice Leader	Otthein Herzog	Germany	1976	Male
WG4 Vice Leader	Esko Turunen	Finland	1994	Male
STSM Coordinator	Juan C. Burguillo-Rial	Spain	2001	Male
STSM Vice Coordinator	Edgars Celms	Latvia	2007	Male
STSM Vice Coordinator	Karol Mikula	Slovakia	1993	Male
Training School Coordinator	Ciprian Dobre	Romania	2008	Male
Training School Vice Coordinator	Sanja Brdar	Serbia	2016	Female
Training School Vice Coordinator	Dzmitry Kliazovich	Luxembourg	2006	Male
Dissemination Coordinator	Peter Kilpatrick	United Kingdom	1985	Male
Dissemination Vice Coordinator	Clemens Grellck	Netherlands	2001	Male
Dissemination Vice Coordinator	Siegfried Benkner	Austria	1994	Male

Industry Collaboration Coordinator	Dave Feenan	Ireland	N/A	Male
Industry Collaboration Vice Coordinator	Michał Marks	Poland	2015	Male
Industry Collaboration Vice Coordinator	Salvatore Vitabile	Italy	1999	Male
Communication Representative	Horacio González-Vélez	Ireland	2008	Male

Action website:	http://chipset-cost.eu
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I.B. Progress with MoU objectives and deliverables and additional outputs

cHiPSet MoU: <http://chipset-cost.eu/wp-content/uploads/2017/05/IC1406-e.pdf>

Objectives and goals: <http://chipset-cost.eu/index.php/action-objectives-grant-periods-goals/>

MoU objectives

MoU objective	Achieved Yes/ Partially/ No	Evidence of (partial) achievement including hyperlink to enable assessment of the achievement ¹ . Justification if full achievement is not foreseen
The main objective of the Action is to structure and coordinate research activity on HPC-enabled Modelling and Simulation for Big Data problems across Europe.	Partially	Reflecting on the fact that scientific research has become richer in data and more computationally demanding, cHiPSet has created an innovation ecosystem in Big Data modelling and simulation where domain scientists have opportunities to further their data-science and computing skills, and computational scientists and practitioners validate their computational models via evaluation-driven research applications. A clear product of this skills ecosystem is reflected in the compilation and development of eleven interdisciplinary use case studies in distinct domains with clear societal impact such as drug discovery, cell biology, telecommunications, smart cities, social media analysis, eHealth, electromagnetics, and smart tourism.
To build an effective, durable and active working community of European researchers in the area, with a span of about 60 research institutions and companies, more than 15 COST Countries	Yes	After two years of the project, cHiPSet has 32 COST countries as members and 56 members of the Management Committee representing different institutions. In the whole consortium, we have 143 people from 97 institutions. The Action membership significantly increased during the first year from 14 COST countries in 2014 to 29 COST countries by the end of 2015 . In 2016 , another three COST countries joined to make cHiPSet a 32 - COST Country Action plus another 6 international country participating. The list of the participant countries can be found at the following webpage: http://www.cost.eu/COST_Actions/ict/IC1406?management The list of Action consortium can be analysed based on the WG members lists: http://chipset-cost.eu/index.php/wg1/ http://chipset-cost.eu/index.php/wg2/ http://chipset-cost.eu/index.php/wg3/ http://chipset-cost.eu/index.php/wg4/
Constantly strive to expand the Action's activities to other participants, increasing both the number of research institutions and companies, and that of COST Countries	Partially	

¹ The links to the outputs and deliverables will be used by the Action Rapporteur in assessing the progress.

		<p>The number of the industrial partners should be increased, which is one of the goals in the 3GP (http://chipset-cost.eu/index.php/action-objectives-grant-periods-goals/)</p>
<p>To foster the formation of new multi-disciplinary expertise of competent researchers exploiting HPC-enabled MS, and contribute, in particular, to the formation of the new generations of such researchers</p>	<p>Partially</p>	<p>This is an evolving objective as we continue to nurture expertise in HPC and data-intensive applications in distinct domains.</p> <p>The expertise database of cHiPSet members is already created. The experts working in the specified domains who are involved in the Action, can be extracted from the whole consortium by using the online search application available at http://chipset-cost.eu/index.php/chipset-expertise-database/ . We will continue our work in GP3 and GP4 on the improvement of the database and presentation of the areas of expertise of our members.</p> <p>55 Early Career Investigators (ECIs) are currently involved in cHiPSet, which is 38% of the whole consortium . Most of them are PhD students and young Post Docs (no more than 4 years after PhD)</p> <p>We have sponsored 27 Short Term Scientific Mission (STSM) grants, which allowed ECIs to visit different centres of expertise and add cHiPSet-related skills to their accomplishments (http://chipset-cost.eu/index.php/awarded-stsm-grants/).</p> <p>ECIs were also involved in the work on state-of-the-art in infrastructures and middleware for Big Data modelling and simulation (http://chipset-cost.eu/wp-content/uploads/2017/05/report-1.pdf). They manage 4 teams working on the case studies (http://chipset-cost.eu/index.php/case-studies/) – most of the work on that is planned for GP3 and GP4.</p>
<p>To disseminate obtained research results, identify best practices, and develop prototypes and supporting tools</p>	<p>Partially</p>	<p>We continue to actively work on this objective. During the second grant period, Action members managed to publish 15+ co-authored papers completely emanated from the COST Action collaborative efforts. The dissemination activities are presented in I.E section of this report.</p>
<p>Strengthen the collaboration with European companies in order to establish efficient technological transfer of the latest HPC-enabled MS techniques, methods, and tools, encouraging their industrial adoption</p>	<p>Partially</p>	<p>This work is coordinated by Industry Collaboration Team lead by Dave Feenan (MC Member, Ireland). He has integrated IBEC, the confederation of Irish companies, which brings the direct access to 1000+ companies.</p> <p>Additionally, cHiPSet has already 5 very active industrial members (http://chipset-cost.eu/index.php/collaboration-with-industry/). However, the extension of that group will be one of the main goals in 3GP and 4GP.</p> <p>Some companies, such as Comarch and Nask are already involved in the preparation of the case studies (http://chipset-cost.eu/index.php/case-studies/ - CS 6 and CS 9) - http://chipset-cost.eu/index.php/gp2-material/ (restricted access- password: chipset_GP2). We wish to improve the industrial involvement in this work in order to define the background to the new potential standards in HPC-enabled solutions for Big Data systems.</p>
<p>To establish the Action itself as a reference point of competence that can provide</p>	<p>Partially</p>	<p>In GP1 and GP2, the preliminary work on making the Action as the reference point and complementary network to EU industrial societies and organisations has been</p>

<p>advisory support to industries and can offer informed expertise to policy makers in the strategic field of HPC-enabled MS</p>	<p>done. We initialized the collaboration with BDVA (http://chipset-cost.eu/index.php/2017/05/04/collaboration-chipset-bdva/) and ETP4HPC (http://chipset-cost.eu/index.php/2017/05/04/chipset-promoted-etp4hpc/).</p> <p>chIPSet is invited and promoted by HiPEAC at the most important ICT events – we have been approved to present the Action at HiPEAC booth at ISC 17 HPC event in June 2017 in Frankfurt (Germany) (http://chipset-cost.eu/index.php/2017/05/04/chipset-isc-17-event/).</p> <p>We also prepared the networking event targeted at industry, which will be held in Dublin on 18/May, at the beginning of GP3: http://www.isin.ie/go/news_events/events/innovation-forum-high-performance-modelling-and-simulation-for-big-data-applications</p> <p>The work in this domain will be continued in GP3 and GP4 and will be managed by the Industry Collaboration Team. The results will be published at http://chipset-cost.eu/index.php/collaboration-with-industry/.</p>
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MoU deliverables

MoU deliverable	Level of progress ¹	Evidence of (partial) delivery achievement including hyperlink to enable assessment of the delivery ¹ . Justification if full achievement is not foreseen
<p>Outreach publications - special issues in well cited journals- publication #1</p>	<p>Finished</p>	<p>The following Special Issues and Special sections have been published:</p> <ul style="list-style-type: none"> • Florin Pop, Mauro Iacono, Marco Gribaudo, Joanna Kolodziej: "Advances in modelling and simulation for big-data applications (AMSBA)", Concurrency and Computation: Practice and Experience 28(2): 291-293 (2016) (IF: 0942), http://onlinelibrary.wiley.com/doi/10.1002/cpe.3750/full • Mauro Iacono, Joanna Kołodziej: "Complex Problems in High-Performance Computing Systems", AMCS, Volume 25 / Number 4, 2015 (IF: 1.3), https://www.amcs.uz.zgora.pl/?action=papers&issue=63 <p>The cHiPSet members published also in vol. 2/2016 of the JTIT Journal (http://www.itl.waw.pl/archiwum-jtit?view=kwartalrok&rok=2016&kwartal=2). This journal is indexed in Scopus (http://www.itl.waw.pl/jtit-indexation) and most of the cHiPSet publications are the results of STSM scholarships. The editors of this regular issue were Ewa Niewiadomska-Szynkiewicz and Ioan Salomie.</p> <p>The list of cHiPSet publications is available at: http://chipset-cost.eu/index.php/publications/</p>
<p>Scientific Working Groups report for GP1</p>	<p>Finished</p>	<p>The report is available at the following webpage http://chipset-cost.eu/wp-content/uploads/2017/05/GP1-WGs-summary-reports.pdf</p>
<p>Annual Action scientific report #1</p>	<p>Finished</p>	<p>The annual Action report, STSM, and dissemination reports are available at the following webpage http://chipset-cost.eu/index.php/reports/</p>

		<p>At the same page the Research Work Results for GP1 can be found.</p> <p>http://chipset-cost.eu/wp-content/uploads/2017/05/report-1.pdf</p> <p>The selected chapters have been published in "Resource Management for Big Data Platforms: Algorithms, Modelling, and High-Performance Computing Techniques" Springer book</p> <p>http://www.springer.com/gp/book/9783319448800</p>
Lecture notes from training school #1	In progress	<p>The post TS book is prepared as publication in the Springer's "Briefs in Computational Intelligence" series.</p> <p>http://chipset-cost.eu/index.php/2016/12/06/post-tr-publication/</p> <p>The chapters and all materials have been delivered to Springer. The publication process is in progress and the expected publishing date is September 2017. The Table of Contents and drafts of the chapters can be found at the following webpage:</p> <p>http://chipset-cost.eu/index.php/ts_2016-lecture-notes/ (restricted access – password: TS_2016)</p>
Outreach publications - special issues in well cited journals- publication #2	Finalized and In progress	<p>A special issue in Elsevier's Simulation Modelling Practice and Theory (JCR, IF 1.3) will be published as vol. 76 this Summer. Full information about it is available at:</p> <p>http://chipset-cost.eu/index.php/2017/05/04/simpat-si-finished/</p> <p>The cHiPSet members published also in vol. 1/2017 of the JTIT Journal (http://www.itl.waw.pl/archiwum-jtit?view=kwartalrok&rok=2017&kwartal=1). This journal is indexed in Scopus (http://www.itl.waw.pl/jtit-indexation) and most of the cHiPSet publications are the results of STSM scholarships.</p> <p>The list of the cHiPSet publications is available at:</p> <p>http://chipset-cost.eu/index.php/publications/</p>
Scientific Working Groups report for GP2	Finished	<p>The report is available at the following webpage http://chipset-cost.eu/wp-content/uploads/2017/05/GP2-WGs-summary-reports.pdf</p>
Annual Action scientific report #2	Finished	<p>The annual Action report, STSM, and dissemination reports are available at the following webpage http://chipset-cost.eu/index.php/reports/</p> <p>The rest of the supplementary material (personal data, unpublished draft material) has restricted access at the following webpage:</p> <p>http://chipset-cost.eu/index.php/gp2-material/ (password: chipset_GP2)</p>
Lecture notes from training school #2	Planned	<p>Planned for February 2018</p>
Outreach publications - special issues in well cited journals- publication #3	In progress	<p>The preparation of the Special Issue in Springer Data Science and Engineering journal is in progress, the information about it can be found at the following page:</p> <p>http://chipset-cost.eu/index.php/2017/05/04/si-data-science-engineering-journal/</p>

Co-authored publications and FP7/ H2020 proposals



The co-authored publications and FP7/ H2020 proposals/ projects resulting from the Action are listed on the page following the “Additional outputs and achievements” section

Additional outputs and achievements

Please describe any other outputs and achievements that have resulted or are in progress, focusing in particular on those that contribute to the COST mission of “COST enables break-through scientific developments leading to new concepts and products and thereby contributes to strengthen Europe’s research and innovation capacities.”

1. Action members and partners expertise database– an IT tools for dissemination of the skills and expertise information of the Action members (<http://chipset-cost.eu/index.php/chipset-expertise-database/>)
2. Comprehensive state-of-the-art analysis of the recent developments on infrastructures and middleware for Big Data modelling and simulation – publication of the Springer book and online survey
3. Publication of educational material from the training schools – reference books for young researchers, practitioners, students and anyone who would like to improve his/her knowledge in HPC-related models, middleware, systems (one volume delivered to the publisher, two others planned for 3GP and 4GP)
4. Preliminary work in cross-WG international teams with the involvement of the industrial partners in the case studies in order to address practical challenging Big Data problems in medical, telecommunication, biological, socio-economical, physical applications, and work on the new standards and technologies– this work will be continued in GP3 and GP4.

Co-authored publications and FP7/ H2020 proposals

Co-authored publications

Enter in the table below only publications on the topic of the Action, co-authored by at least two Action participants from two different countries participating in the Action and for which the Action networking added value. A maximum of ten publications may be entered. If the Action has more than ten such publications the Core Group should select the ten most significant ones to include in the table below.

NO.	Bibliographic data (including: Title, Authors, Title of the periodical or the series, Issue number or volume, Publisher, Year of publication, Relevant pages)	Main author	Number of authors (editors)	Action participants listed among the authors (Name, country and role ²)	WGs involved in publication	Date of submission (must be after Action start date)	Expected date of publication (if not already published)	Persistent link to publicly available version of the paper (if available) or the abstract	Is/Will open access ³ provided to this publication?	Is/ will COST be cited/ acknowledged in the publication?	Are/ will COST funds (be) implicated in this publication	Relevance to H2020 Societal Challenges ⁴ ?	Is it peer-reviewed?	Was the added value of the Action Networking necessary for the publication	Impact Factor (if applicable)
1	Florin Pop, Joanna Kołodziej, Beniamino Di Martino(eds) : "Resource Management for Big Data Platforms: Algorithms, Modelling, and High-Performance Computing Techniques", Computer Communications and Networks Series, Springer, 2016.	Florin Pop	3	F. Pop (RO, WG Member), J. Kołodziej (PL, Chair)	WG1	2016	N/A	http://www.springer.com/gp/book/9783319448800	NO	YES	NO	YES	YES	YES	N/A
2	Joanna Kolodziej, Luis Correia, Jose Manuel Molina (eds): "Intelligent Agents in Data-Intensive Computing", Studies in Big Data Series, vol. 14, Springer 2016.	Joanna Kolodziej	3	J. Kolodziej (PL, Chair), L. Correia (PT, MC), J. Molina (ES, MC)	WG1, WG2, WG4	2016	N/A	http://www.springer.com/us/book/9783319237411	NO	YES	NO	YES	YES	YES	N/A
3	Florin Pop, Ciprian Dobre, Dragos-George Comaneci, Joanna Kolodziej: "Adaptive scheduling algorithm for media-optimized traffic management in software defined networks", Computing 98(1-2): 147-168 (2016)	Florin Pop	4	F. Pop (RO, WG), C. Dobre (RO, MC), J. Kolodziej (PL, Chair)	WG1	2016	N/A	https://link.springer.com/article/10.1007/s00607-014-0406-9	NO	YES	NO	YES	YES	YES	0.872
4	Fátima Leal, Joana Matos Dias, Benedita Malheiro, and Juan Carlos Burguillo. Analysis and Visualisation of Crowd-sourced Tourism Data. In Proceedings of the Ninth International C* Conference on Computer Science & Software Engineering (C3S2E '16), Evan Desai (Ed.). ACM, New York, NY, USA, 98-101. 2016.	Fátima Leal	4	(J. Matos, PT, MC Substitute) (J.C. Burguillo, ES, MC)	WG4	2016	N/A	DOI: http://dx.doi.org/10.1145/2948992.2949008	NO	YES	YES	YES	YES	YES	N/A
5	Fátima Leal, Horacio González-Vélez, Benedita Malheiro, and Juan Carlos Burguillo. Profiling and rating prediction from multi-criteria crowd-sourced hotel rating. In 31th European Conference on Modelling and Simulation, ECMS 2017, Budapest, Hungary, May 23 - 26 May, 2017, Proceedings., 2017. (Accepted for publication)	Fátima Leal	4	(H. González-Vélez, IE, Vice-Chair) (J.C. Burguillo, ES, MC)	WG1 & WG4	2017	2017		NO	YES	YES	YES	YES	YES	N/A
6	Fátima Leal, Horacio González-Vélez, Benedita Malheiro, and Juan Carlos Burguillo. Semantic Profiling and Destination Recommendation based on Crowd-sourced Tourist Reviews. In Sigeru Omatu, Sara	Fátima Leal	4	(H. González-Vélez, IE, Vice-Chair) (J.C.	WG1 & WG4	2017	2017		NO	YES	YES	YES	YES	YES	N/A

² MC Member/ MC Substitute/ MC Observer/ WG Member/ Training School Trainee/ STSM Recipient/ Other Action Participant

³ Open Access is defined as free of charge access for anyone via Internet. Please answer "yes" if the open access to the publication is already established and also if the embargo period for open access is not yet over but you intend to establish open access afterwards.

⁴ H2020 Societal Challenges are "Health, demographic change and wellbeing"; "Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the Bioeconomy"; "Secure, clean and efficient energy"; "Smart, green and integrated transport"; "Climate action, environment, resource efficiency and raw materials"; "Europe in a changing world - inclusive, innovative and reflective societies"; "Secure societies - protecting freedom and security of Europe and its citizens"

	Rodríguez, Gabriel Villarrubia, Pedro Faria, Paweł Sitek and Isabel Praça editors, Distributed Computing and Artificial Intelligence, 14th International Conference, 2017. (Accepted for publication)			Burguillo, ES, MC)											
7	Jakóbk, Agnieszka; Grzonka, Daniel; Palmieri, Francesco: "Non-deterministic security driven meta scheduler for distributed cloud organizations", Simulation Modelling Practice and Theory, 2016, Elsevier	Agnieszka Jakóbk	3	(A. Jakóbk, PL, WG), (D. Grzonka Daniel, PL, WG)	WG1	2016	2017	https://doi.org/10.1016/j.simpat.2016.10.011	NO	YES	NO	YES	YES	YES	1.482
8	Suejb Memeti, Sabri Pllana, Joanna Kołodziej. Optimal Worksharing of DNA Sequence Analysis on Accelerated Platforms. Chapter in book: Resource Management for Big Data Platforms: Algorithms, Modelling, and High-Performance Computing Techniques, Springer, 2016, 279-309.	Suejb Memeti	3	S. Pllana (SE, MC Subs) , J. Kołodziej (PL, Chair)	WG1 & WG2	2016	N/A	http://link.springer.com/chapter/10.1007/978-3-319-44881-7_14	NO	YES	NO	YES	YES	YES	N/A
9	Mauro Iacono, Joanna Kołodziej (eds): "Complex Problems in High-Performance Computing Systems", AMCS, Volume 25 / Number 4, 2015,	Mauro Iacono	2	M. Iacono (IT, WG), J. Kołodziej (PL, Chair)	WG1	2015	N/A	https://www.amcs.uz.zgora.pl/?action=papers&issue=63	YES	YES	NO	YES	YES	YES	1.3
10	Jakóbk, Agnieszka; Grzonka, Daniel; Kołodziej, Joanna; Chis, Adriana E; González-Vélez, Horacio; "Energy Efficient Scheduling Methods for Computational Grids and Clouds", Journal of Telecommunications and Information Technology, vol. 1, pp. 56-64, 2017	Agnieszka Jakóbk	5	(A. Jakóbk, PL, WG), (D. Grzonka Daniel, PL, WG), J. Kołodziej (PL, Chair), (A.E. Chis, IE, WG), (H. González-Vélez, IE Vice-Chair)	WG1	2017	N/A	https://www.itl.waw.pl/czasopisma/JTIT/2017/1/56.pdf	YES	YES	YES	YES	YES	YES	N/A

FP7/ H2020 Proposals and projects

This table contains FP7/ H2020 proposals/ projects spinning off from Action activities and including in the proposing consortium at least three Action participants from at least three different countries participating in the Action.

NO.	Title	Name and country of main proposer	Number of proposers	Action participants listed among the proposers (Name, country, role ³ in the Action)	Funding agency submitted to	Date submitted	Date results expected	Result	Call identifier	Relevance to H2020 Societal Challenges ⁴ ?	Was the added value of the Action Networking necessary for the proposal / project?
Proposals											
List FP7/ H2020 proposals submitted as a result of the Action in this section of the table											
1	RIBELINO : Research in IoT: Brazil–Europe for Life Improvement & Nourishment of Older Adults	Horacio Gonzalez-Velez (IE)	10	Ciprian Dobre, RO, Training School Coordinator Carla Delgado, BR, MC Member (International)	EU H2020	14/Mar/2017	Summer	---	EUB-02-2017 RIA	Yes	Yes
2	Pangaea: An evolutionary computational concept to unveil the intricacies of complex systems - pilot study in ecology	Luis Correia (Portugal)	5	Joanna Kolodziej (Poland, Chair) Anna Esparcia (Spain, WG member)	EU H2020	17 January 2017	Summer	-	H2020-FETOPEN-2016-2017	Yes	Yes

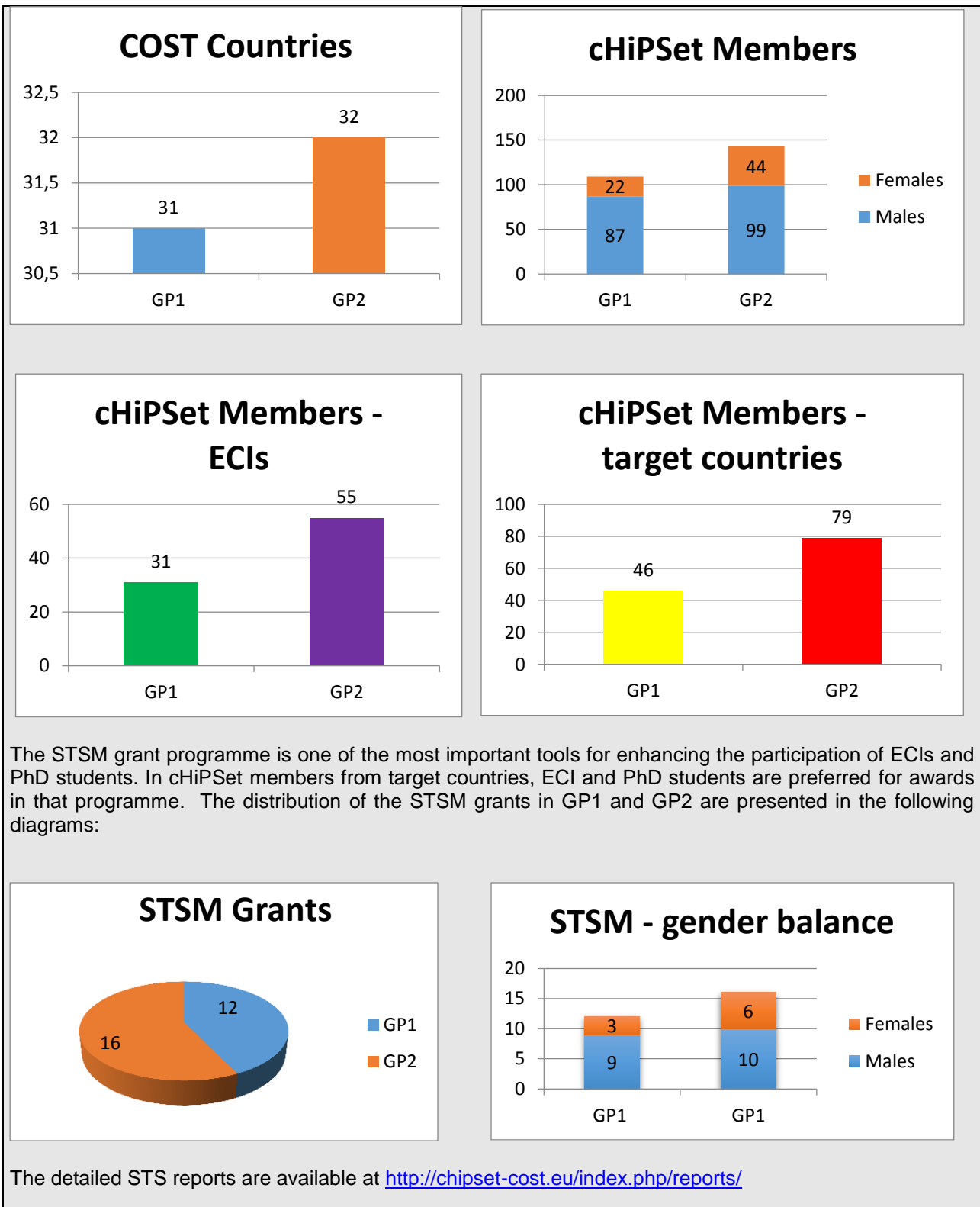
I.C. Networking

Added value of the Networking

- Integration of MS and HPC Communities into one collaborating consortium.**
 Usually those groups work separately and have just occasional short meetings at the conferences: most of the Action members have never met nor worked together before. The Action has resulted in the new research and collaboration Activities (15+ new publication in the new research teams - <http://chipset-cost.eu/index.php/publications/>). Our members can meet face-to-face and share their experience and ideas in many virtual meetings organized in the consortium (<http://chipset-cost.eu/index.php/meetings-calendar/>).
- Promotion of the research of the Action members in the wider audience**
 The research results of the Action are presented at the frequently viewed Action webpage (<http://chipset-cost.eu/index.php/publications/>). In 3GP, It is planned to create the Research Groups database and advertise them at the webpage.
- Promotion of the skills of the Action members– expertise database.**
 The expertise database has been created (<http://chipset-cost.eu/index.php/chipset-expertise-database/>) for better promotion of the scientific-technological potential of the integrated MS + HPC communities. This database will be extended in GP3 and GP4 by including the newly-hired Action members.
- New experiences in the project management.**
 The project management team had never worked before the Action in such a large and distributed consortium. The management of the large COST Action is a challenge. However we could already successfully share our experience at the info days (<http://chipset-cost.eu/index.php/2015/10/28/chipset-presented-at-ict-2015-event-in-lisbon/>) and COST events (<http://chipset-cost.eu/index.php/2016/02/11/cost-information-session-in-poland/>) being a first-contact reference point to other project management teams and candidates.
- Fast progress in the careers of Early Career Investigators (ECIs)/ Young Researchers, especially from the developing target countries in Europe.**
 Young researchers are forced to be active in the research work in the WGs. The STSM grant programme allowed them to work in new research teams and learn from the experts in the domains. Four new PhD degrees and two habilitations in computer science are expected to be finalised by the end of the 3GP. Both Training Schools – one realised and one planned – are located in the target countries, where local PhD students and young researches have free access to the lectures and practical lab classes.

Extent of the networking

The cHiPSet consortium expanded during the last 2 years. We started with **12** COST countries involved in the preparation of the project proposal and reached **32** by the end of the GP2. ECIs and student members from the target countries represent very active groups in the Action consortium (**29%** of the whole consortium in **GP1**, **38%** - in **GP2**). Half of the face-to-face events have been organized in the target countries (<http://chipset-cost.eu/index.php/meetings-calendar/>). The two training schools have been located in target countries (Romania and Serbia). To achieve fair gender balance in ICT sector is not an easy task (**20%-GP1**, **31%-GP2**). However, in the case of cHiPSet, the Chair of the Action and 2 WG leaders are women. The comparison of the statistical membership data in GP1 and GP2 are presented in the following diagrams:



I.D. Impacts

The impacts that have resulted, or might result from the Action are described in the following table.

Description of the impact	Type of impact ⁵	Timing of impact ⁶
Improved understanding of data-intensive modelling and simulation, particularly in European academic circles (justified via 2 books, 3 special issues and publications)	Scientific	Achieved
Substantial improvement of quality of life for the citizens in Europe via better designed telecommunications, enhanced drug treatments, remote health monitoring, smarter cities and tourism (justified via 11 use case compilation)	Societal	Foreseen 2-5 years
Integration of the experts in HPC programming and data intensive tools developers for mutual training and development with the public outreach	Scientific	Achieved
Development of the new standards in Big Data analytics (background work -11 case studies with the involvement of the industrial partners)	Scientific/Technological	Foreseen 2-5 years
Significant progress in the ECIs' careers (justified by the distribution of the STSM for the young researchers)	Scientific	Foreseen within 2 years

I.E Dissemination and exploitation of Action results

Item/ activity	Target audience	Result	Hyperlink
Action Webpage	Scientific communities, industry stakeholders, general public	100K+ views during the last 2 years, the link appeared at ECMS, NESUS and MPM4CPS webpages	http://chipset-cost.eu/
Action brochures, roll-up, poster	Scientific communities, industry stakeholders, general public (ICT Community, Industrial Partners, experts in biological, physical and economical sciences,)	Extension of the Action consortium	http://chipset-cost.eu/index.php/dissemination-materials/
Social Media	General Public	Extension of the Action consortium	https://www.facebook.com/cHiPSet.COST https://twitter.com/cHiPSet_COST https://www.linkedin.com/groups/8415036
Action Newsletters	General Public	Extension of the Action consortium	http://chipset-cost.eu/index.php/newsletter/
Participation in the dissemination events (2 realised, 2 already planned for 3GP)	Scientific communities, industry stakeholders, (Pan-European ICT, HPC, MS Communities ,	Collaboration with ECMS and extension of the consortium Collaboration with BDVA	http://chipset-cost.eu/index.php/meetings-calendar/ and Sec. IIB1 of this report (below)

⁵ Scientific/ technological, Economic, Societal

⁶ Achieved/ Foreseen within 2 years/ Foreseen 2-5 years/ Foreseen 5-10 years/ Foreseen 10+ years

	Industrial partners)		
15+ scientific publications	Scientific communities (ICT, HPC, MS Communities around world)	50+ citations in the last year	http://chipset-cost.eu/index.php/publications/
Participation in ICT Info Days (2015 and 2016) – promoting the action and Cost Programme together with the COST officers	Scientific communities, industry stakeholders, general public +ICT community (7000+ participants), policy makers	Promotion through the official COST channels, sharing the experiences in the action management with the new cost action chairs	http://chipset-cost.eu/index.php/2015/10/28/chipset-presented-at-ict-2015-event-in-lisbon/
Hosting the COST promotional events	Scientific communities, industry stakeholders, general public (Potential COST applicants), policy makers	Promotion through the official COST channels, new contacts with the potential partners and partner COST Actions	http://chipset-cost.eu/index.php/2016/02/11/cost-information-session-in-poland/
Collaboration with European Council on Modelling and Simulation – participation at ECMS events	Scientific communities, industry stakeholders(US and European MS Community)	Publication of the cHiPSet logo at the ECMS webpage, publication of the cHiPSet research paper in ECMS proceedings (Web of Sciences indexation) – best paper award for cHiPSet members in 2016	http://www.scs-europe.net/ http://chipset-cost.eu/index.php/2016/06/20/collaboration-with-ecms/ http://chipset-cost.eu/index.php/2016/06/12/best-paper-award-at-ecms2016-conference/
Presentation of the action at CloudCom 2016 Conference	Scientific communities, industry stakeholders (Cloud Computing world-wide community)	Extension of the cHiPSet consortium (2 new partners), many new international contacts	http://chipset-cost.eu/index.php/2017/03/03/chipset-presented-cloudcom-2016/
Presentation of the action at industry 4.0 for Big Data workshop in Brussels (March	Industry stakeholders(, Industry 4.0 community), policy makers (EC representatives – Big Data panels),	Participation in the discussion panel, presentation of the Action to potential industrial partners	http://chipset-cost.eu/index.php/2017/05/04/chipset-presented-brussels/

I.F. Action success(es)

COST regularly communicates the successes of Actions. At this point in time what aspect(s) (outcomes and/ or impacts, rather than activities) of this Action is/ are the most suitable for communication?

Description of the success story	Dimension of the success
<p>chIPSet COST Action as an active collaborator of industrial clusters and societies in the work on the specification of the new trends and standards in the research, engineering and ICT and digitizing industry.</p> <p>chIPSet is successfully promoted by BDVA, ETP4HPC and HiPEAC. We started such collaboration in GP2; however, the most important results of such collaboration are expected in GP3 and GP4 (plans for face-to-face meetings and participation in the preparation of the BDVA publications supported by EC).</p>	Breakthrough: scientific and technological

II. Management Report

II.A. Overview of expenditure

	Grant Period 1	Grant Period 2	Total
GP start and end dates	01/06/2015 - 30/04/2016	01/05/2016-30/04/2017	
Grant Holder Institution	Cracow University of Technology (CUT) PL	Cracow University of Technology (CUT) PL	
Meetings	70474,21	64278,24	134752,45
Training Schools	0,00	20899,17	20899,17
STSMs	22500,00	22267,00	44767,00
Dissemination	2803,91	1868,22	4672,13
OERSA¹	0,00	0,00	0,00
Total scientific expenditure	95778,12	109312,63	205090,75
FSAC²	14366,72	16396,89	30763,61
TOTAL	110144,84	125709,52	235854,36

¹ OERSA = Other Expenses Related to Scientific Expenditure (e.g. bank charges)

² FSAC = Amount received by Grant Holder for Financial Scientific and Administrative Coordination

II.B. Budget and Participation management

II.B.1 Budget spent in relation to individuals/ institutions outside participating COST countries					
<i>STSMs from or to institutions from countries other than Participating COST countries</i>					
The table below describes the added value STSMs to approved institutions in IPC or NNC or Specific Organisations and any STSMs from an approved institution in an NNC to a participating COST country.					
Grantee		Host		Date	Topic and value added to the Action
Institution	Country	Institution	Country		
Russian Academy of Sciences, Moscow, Russia		Cracow University of Technology, Poland		03/07/2016-03/14/2016	<p>Topic: “Queueing theory formalism for performance evaluation of Big data systems”</p> <ul style="list-style-type: none"> • The research cooperation with CUT and RAS – research results as a part of the WG1 report. Two regular seminars of the Computer science department of CUT were devoted to the exchange of ideas and experience on the common aspects of the scientific research. • Introduction of the NNC member to the main research activities of the Action working groups and to the general purposes and aim of the COST Action. • The organization issues of the 2016 conference track “high performance modelling and simulation” under the umbrella of the ECMS were also discussed. Special attention was given to the question of how to make it and its future editions more visible for the COST Action participants.
Russian Academy of Sciences, Moscow, Russia		Cracow University of Technology, Poland		04/02/2017 - 11/02/2017	<p>Topic: “Mathematical modelling of the Big Data world.”</p> <ul style="list-style-type: none"> • Continuation of the workplan defined for RAS. • Scheduling aspects of Big Data, the analysis allows discovery of general patterns and better understanding of the system behaviour. The results aim to tune-up novel mathematical models for scheduling in cloud and grids, minimizing the makespan, while taking into account data transfer times and task deadlines – part of the research realized in WG1
University of Luxembourg, Luxembourg		Belarussian State University, Belarus		11/23/2015-11/29/2015	<p>Topic: “Resource allocation in cloud computing and big data systems”</p> <p>This Short Term Scientific Mission (STSM) has been accomplished in full. It allowed bringing together and enabled collaboration and exchange of the core scientific expertise of the Parallel Computing and Optimization</p>

			<p>group from the University of Luxembourg (UL), represented by Dr. Dzmitry Kliazovich- the active member of WG1 of the Action, and the Research Laboratory of Applied Probabilistic Analysis from the Belarussian State University (BSU), headed by Prof. Alexander N. Dudin. Then following goals and activities have been accomplished:</p> <ul style="list-style-type: none"> • Building a formal model of cloud computing and big data systems – collecting material for a part of the WG1 scientific report and work result • Meeting with the team and presentations of research areas and Action research plan • Developing idea for a joint Horizon 2020 proposal
University of Luxembourg, Luxembourg	Belarussian State University, Belarus	19/12/2016 – 30/12/2016	<p>Topic: “Communication Network Integrated Cloud Computing and Big Data Systems.”</p> <ul style="list-style-type: none"> • Continuation of the STSM visit in December 2015 • Preparation of the proposal for Horizon 2020. • A joint publication – preparation of the draft
Cracow University of Technology, Poland	George Mason University, USA	03/10/2016-03/20/2016	<p>Topic: “Data and tasks scheduling in distributed computing environments”</p> <ul style="list-style-type: none"> • Active research collaboration with IPC partner of the Action - establish collaboration and lay foundation of the joint research with the Health Informatics Center at George Mason University. • The research’s topics development of the COST Action IC1406 WG1. • Establishment of tight scientific cooperation between scientists working in an advanced country and those in a developing country – access to knowledge, expertise and scientific facilities not available locally. • Gained significant medical benchmarks for testing the developed model of the Data-aware Scheduler in Heterogeneous Computing Environments

Invited Speakers				
The table below highlights the added value of Invited Speakers from COST countries that have not accepted the MoU and/ or non-participating NNC, IPC or Specific Organisations whose participation at a meeting or Training School was reimbursed by the Action.				
Participant name	Institution	Country	Event date	Topic and added value to the Action
Grzegorz Sowa	Comarch S.A.	Poland	11/09/2015	<p>“Brilliant solutions. Innovative technology. Strongly-modern design. Comarch products in the service of pan-European projects” (abstract and slides: http://chipset-cost.eu/index.php/mcwg-meeting-special-session/)</p> <ul style="list-style-type: none"> • Presentation of the potential industrial partner for Horizon 2020 consortia of the Action institutions, • Comarch as a potential new industrial member of the Action
Jesus Carretero	NESUS COST Action	Spain	11/09/2015	<p>“COST Action IC1305. Network for Sustainability in Ultrascale Computing Systems (NESUS)” (abstract and slides: http://chipset-cost.eu/index.php/mcwg-meeting-special-session/)</p> <ul style="list-style-type: none"> • Establishing a collaboration with NESUS Action – new dissemination channel for Action outputs and research results of the cHiPSet members • Discussion of the organization of joint research activities, meeting and events
Dominik Skokowski	Kosciuszko Institute	Poland	11/09/2015	<p>“Strategic Approach to Cybersecurity” (abstract and slides: http://chipset-cost.eu/index.php/mcwg-meeting-special-session/)</p> <ul style="list-style-type: none"> • New perspectives and problems related to Cybersecurity – direct contact of the Action members with the organization responsible for preparation of the NATO summits and active in the cybersecurity forum
Dr Simon Wong	Ireland's High-Performance Computing Centre (ICHEC)	Ireland	25/04/2016	Modelling and simulation in the physical sciences
Dr. Kostas Katrinis	IBM Research	Ireland	25/04/2016	Emerging trends in Exascale computing

Dissemination meetings					
The table below highlights the added value of Dissemination Meetings financed from Action funds.					
Participant name	Role	Country	Date	Location	Topic and added value to the Action
Joanna Kolodziej	Action Chair	Poland	June 1, 2016	Regensburg/ Germany	<p>“High-Performance Modelling and Simulation for Big Data Applications” – the oral presentation of the action aims and achievements provided by the Action Chair at ECMS 2016 conference. The benefits for cHiPSet include:</p> <ul style="list-style-type: none"> • ECMS (http://www.scs-europe.net/) as a new channel of dissemination of the Action Activities at the wider Simulation and Modelling European Community • Start of the collaboration of the Action with ECMS as strategic partner – dissemination of both Action and Council achievements – ECMS annual conferences as an opportunity of publication of the research of the Action members.(the logos of the Council and Action are published at the webpages of both partners).
Horacio Gonzalez-Velez	Action Vice-Chair	Ireland	December 1, 2016	Valencia/ Spain	<p>“High-Performance Modelling and Simulation for Big Data Applications” – the oral presentation of the action activities provided by the Action Vice-Chair at BDVA summit. The cHiPSET presentation was included as part of the "<i>High Performance Data Analytics: Big Compute and Big Data Working Together For European Success</i>" session hosted by Intel on 1/Dec. The session included two additional presentation from ETP4HPC, the European Technology Platform for High-Performance Computing, and the IPCEI-HPC-BDA, Important Project of Common European Interest on HPC and Big Data Enabled Applications.</p> <p>The added value to the Action:</p> <ul style="list-style-type: none"> • To increase the outreach of the Action, • To allow cHiPSet members enhance their collaborative links with other HPC and Bid Data endeavours in Europe.

II.C. Participants

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II.D. Specific matters

This section is confidential to the Management Committee, and the COST Association (Administration, Scientific Committee and Committee of Senior Officials); and is not included in the version of the report that is made publicly available.

Annex 1

Definitions:

COST Action Challenge (main aim)	“The research question addressed by the COST Action targeting scientific, technological, and / or socioeconomic problems”
COST Action Innovation	“The creation and / or development of new or improved concepts, products, processes, services, and / or technologies that are made available to markets, governments and society”
COST Action objectives	“COST Action objectives are the results that an Action needs to achieve in order to respond to meet its challenge. These are SMART (Specific, Measurable, Achievable, Relevant, Timely) and twofold: research coordination objectives and capacity building objectives.”
COST Action research coordination objectives	“Achieving these objectives turns COST Actions from initially scattered teams into one transnational team and leverages the existing funded research. These objectives entail the distribution of tasks, sharing of knowledge and know-how, and the creation of synergies among Action participants to achieve specific outputs.”
COST Action capacity building objectives	“Achieving these objectives entail building critical mass to drive scientific progress, thereby strengthening the European Research Area. They can be achieved by the delivery of specific outputs and / or through network features or types and levels of participation.”
COST Action networking activities	“any activities organised by the COST Action (whether or not directly funded by COST) in order to achieve research coordination and capacity building objectives.”
COST Action networking tools	“instruments through which eligible activities can be funded”
COST Action outputs	“direct results from the COST Action activities. These can be codified knowledge, tacit knowledge, technology, and societal applications.”
COST Action impact	“the short- to long-term scientific, technological, and / or socioeconomic changes produced by a COST Action, directly or indirectly, intended or unintended.”
COST Action deliverable	“a distinct, expected and tangible output of the Action, meaningful in terms of the Action’s overall objectives such as a report, a document, a technical diagram, a software etc. Action deliverables are used to measure its progress and success.”
COST Action milestones	“Control points in the Action that help to chart progress. They are also needed at intermediary points so that, if problems have arisen, corrective measures can be taken. A milestone may be a critical decision point in the Action where, for example, the MC must decide which of several technologies to adopt for further development (e.g. core group and MC meetings, mid-term reviews)”
Inclusiveness Target Country (ITC):	Current COST Member Countries targeted by the COST inclusiveness Policy (“Inclusiveness Target Countries” (ITC)): EU 13 (Bulgaria, Cyprus, Czech Republic, Estonia, Croatia, Hungary, Lithuania, Latvia, Malta, Poland, Romania, Slovenia, Slovakia), EU candidate countries (the former Yugoslav Republic of Macedonia, Montenegro, Republic of Serbia, Turkey) and potential EU candidate countries (Bosnia and Herzegovina). In addition, to comply with the EC criteria for ‘Spreading Excellence and Widening Participation’, Portugal and Luxemburg are included.