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Coordination of the HPC strategy



EXDCI

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Report on first technical workshop

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Table of Contents

Project and Deliverable Information Sheet	i
Document Control Sheet.....	i
Document Status Sheet	i
Document Keywords	ii
Table of Contents	iii
References and Applicable Documents	iii
List of Acronyms and Abbreviations.....	iv
1 Introduction	2
2 Set-up of the workshop	3
2.1 Agenda of the technical workshop	3
3 Summary of the technical workshop	6
3.1 Synchronising the European HPC Community	6
3.2 HPC / Big Data interaction and convergence.....	8
3.3 EsD proposal: feedback from integrators	8
3.4 Exchanges on the “ecosystem level” recommendations	9
4 Conclusion of the meeting.....	11
5 Annexes	12
5.1 Workshop attendees	12
5.2 EsD-White paper (as of September 2016) (cf. [5] for full document)	14
5.3 Joint position paper ETP4HPC / BDVA (cf.[6] for full document)	15

References and Applicable Documents

List all external documents referenced in this document

- [1] <http://www.exdci.eu>
- [2] <http://www.prace-project.eu>
- [3] <http://www.etp4hpc.eu>
- [4] <https://exdci.eu/events/exdci-technical-meeting-2016>
- [5] <http://www.etp4hpc.eu/pujades/files/EsD%20Concept%20%20Current%20State%20%20Jul%202016%20-%204.pdf> (as of September 2016):
- [6] <http://www.etp4hpc.eu/pujades/files/BDVA%20ETP4HPC%20paper%20ETP4HPC%200final.pdf>
- [7] <https://exdci.eu/activities/questionnaire-coe-fet-hpc>
- [8] <http://exdci.irisa.fr>
- [9] <http://www.feartart.eu/>

List of Acronyms and Abbreviations

AISBL	Association Internationale Sans But Lucratif (International Non-for-Profit Association)
BDEC	Big Data and Extreme-scale Computing
BDVA	Big Data Value Association
CoE	Centres of Excellence for Computing Applications
cPPP	contractual Public-Private Partnership
CSA	Coordination and Support Action
D	Deliverable
DoW	Description of Work
EC	European Commission
EESI	European Exascale Software Initiative
EsD	Extreme scale Demonstrators
EU	European Union
FET	Future and Emerging Technologies
FEAT	Future Emerging Art and Technology
H2020	Horizon 2020 – The EC Research and Innovation Programme in Europe
HPC	High Performance Computing
R&D	Research and Development
R&I	Research and Innovation
SME	Small and Medium Enterprise
SRA	Strategic Research Agenda
TRL	Technology Readiness Level
WG	Working Group
WP	Work Package

1 Introduction

EXDCI's goal is to “coordinate the development and implementation of a common strategy for the European HPC Ecosystem in order to achieve its global competitiveness within the Horizon 2020 Programme”¹.

This requires (1) to develop a common European HPC Strategy and (2) to operate a synchronised European HPC Community.

In order to achieve goals (1) and (2), EXDCI has identified the following objectives for the European HPC communities:

- **Better research instruments:** The improvement of current research instruments, both computing resources and deployment of new technologies in order to better support applications and researcher discovery processes.
- **R&D efficiency:** Ensuring that the public and private investment in R&D is carried out in a coherent manner, maximising the impact of research.
- **Industry competitiveness:** Leveraging R&D excellence and translating its output into industry competitiveness.

In order to achieve these objectives the growing importance of Big Data issues (a.k.a. “data deluge”), which the HPC community is facing, must be taken into account.

This first EXDCI technical workshop was an opportunity for the participants to contribute to the development and the implementation of this common European strategy.

The workshop agenda has been built with the following main targets:

- Reinforcement of the collaboration with the Big Data Value Association (BDVA),
- obtaining feedback from integrators on the (Extreme-Scale Demonstrators) EsD proposal (cf. [5]),
- synchronise the European HPC Community, and
- discussion on the “ecosystem level” recommendations.

The second section of this report presents the setting and the agenda of the workshop. Section 3 summarises the workshop with respect to the main targets listed above. The conclusion of our workshop and the next steps are described in section 4.

¹ as defined in EXDCI's DoA

2 Set-up of the workshop

The workshop took place on the premises of BSC in the “Rectorat Building” on Wednesday the 21st and Thursday the 22nd of September 2016. The participants were hosted at the Senator Barcelona Spa Hotel.

Each WP leader invited the main contributors of his/her work package to this internal meeting. The following invited guest completed the list of attendees:

- SRA experts,
- system integrators (representatives of Atos-Bull, Cray, E4, Eurotech, Fujitsu, Huawei, Lenovo, and Megware),
- Jim Kenneally, representing BDVA,
- Theo Ungerer and Paul Carpenter representing the CSA EuroLab4HPC.

In total, 52 participants took part in the workshop, of which eight were women. The annex lists the participants’ names and affiliations.

2.1 Agenda of the technical workshop

As described earlier, the workshop focused on four aspects:

Synchronising the European HPC Community: The EXDCI work packages reported on the status of their work and EuroLab4HPC presented its roadmap. Moreover, HPC users reported on their applications with a goal to identify jointly key use cases for the upcoming SRA (cf. section 3.1).

Reinforcing the collaboration with the Big Data Community: Whereas the economic and social impact of “Big Data” is unquestionable, the upcoming computing needs for data analytics applications are yet not well understood. The BDVA keynote by Jim Kenneally and the presentation of the different Big Data use cases were the basis for a discussion on convergence and collaboration (cf. section 3.2).



Introduction by François Bodin

Integrators' view on the EsD: The EsDs are pre-commercial systems including innovative R&D outcomes from the current FETHPC/CoE projects. This concept has been developed by ETP4HPC in order to promote innovative technologies by improving their maturity. Moreover, the EsDs bring these technologies closer to the market by showing their scalability as part of a real system. As such, they are an important part in the implementation of the HPC strategy. A half-day session was devoted to this topic, focussing on the system integrators' point of view (cf. section 3.3).

Ecosystem level recommendations: The first version of the EXDCI global recommendations (D 4.3) has been prepared within WP4. The WP leader presented the elaboration process and the recommendations (cf. section 3.4).

The above resulted in the following workshop agenda:

Wednesday the 21st of September 2016		
10:00 – 11:00	Welcome Coffee and Registration	
11:00 – 11:15	Sala de Junes Introduction François Bodin	
11:15 – 12:15	Sala de Junes Keynote: BDVA Presentation Jim Kenneally	
12:15 – 12:45	Sala de Junes FEAT Presentation Špela Petrič, Miha Turšič	
12:45 – 13:45	MareNostrum Lunch	
13:45 – 14:15	Sala de Junes WP2 Presentation Michael Malms	Sala del Llac WP5 Presentation Janez Povh
14:15 – 14:45	Sala de Junes WP4 Presentation Thierry Bidot	Sala del Llac WP6 Presentation Mark Asch
14:45 – 15:15	Sala de Junes WP3 Presentation Stéphane Requena	Sala del Llac WP7 Presentation Jean-Philippe Nominé
15:15 – 15:45	Coffee Break	

15:45 – 17:30	Sala de Junes Review and Analysis of Big Data related use cases provided by BDVA Jim Kenneally, Michael Malms
17:30 – 17:45	Coffee Break
17:45 – 19:30	Sala de Junes WP2 – WP3 Interlock Session Michael Malms, Stéphane Requena
20:30	Restaurant Barceloneta Dinner Moll dels Pescador, Port Vell, Carrer de l'Escar, 22, 08039 Barcelona

Thursday the 22nd of September 2016	
09:00 – 10:00	Sala de Junes EuroLab4HPC Roadmap Theo Ungerer, Paul Carpenter
10:00 – 11:30	Sala de Junes EsD Workshop I Thomas Eickermann, Michael Malms, Marcin Ostasz
11:30 – 12:00	Coffee Break
12:00 – 13:30	Sala de Junes EsD Workshop II Thomas Eickermann, Michael Malms, Marcin Ostasz
13:30 – 14:30	MareNostrum Lunch and MareNostrum Visit
14:30 – 15:30	Sala de Junes Global Vision Consolidation François Bodin
15:30 – 16:00	Coffee Break

16:00 – 16:15	Sala de Juntas Conclusion Sergi Girona, François Bodin
16:15 – 18:00	PMO, TB and Scribes only Sala de Juntas <ul style="list-style-type: none"> · Writing and consolidation of Technical Workshop Report · Review preparation · Year 2 Planning Chair: François Bodin

All the workshop presentations are published on the EXDCI website (cf.[4]).

3 Summary of the technical workshop

This section gives a summary of the key aspects of the workshop: Section 3.1 summarises the FEAT-session, the exchange with EuroLab4HPC, and the ongoing work on hurdles for start-ups and SMEs. Furthermore, it presents the outcome of the EXDCI survey. Section 3.2 refers to the big data use cases and the discussions with Jim Kenneally from the BDVA. The main conclusions of the EsD discussion with the system integrators is given in section 3.3, followed by a brief recapitulation of the “Ecosystem level” recommendations and their implementations in section 3.4.

3.1 Synchronising the European HPC Community

Operating a synchronised European HPC Community is a key objective of EXDCI. To reach this goal, EXDCI has built an effective network of stakeholders, both external and internal to the project, delivering concrete actions and communication channels.

During this first year of EXDCI, multiple meetings have facilitated interactions, such as the Rome workshop (September 29-30, 2016), the BoF at SC15, the HPC Summit Week (Prague, May 9–12, 2015), the joint European BDEC workshops (Frankfurt, June 16-17, 2016 and on June 23, 2016), as well as the EXDCI booths at ISC16 (Frankfurt, June 20-22, 2016) and at the Teratec forum 2016 (Saclay, June 28-29, 2016).

During the first technical workshop, the discussion focused on the following main topics:

FET HPC projects and CoEs: The FET HPC projects and CoEs had been requested to fill in a questionnaire [7]. The objective was to analyse the priorities of the project tasks and identify the appropriate contacts to deliver the milestones. This survey has provided many valuable inputs relative to KPIs, data on the technologies mature for a start-up, and some SRA topics covered by the projects. Furthermore, it had initialised the exchange of outcomes between FETHPC/CoE in order to promote synergies between these projects. The first elements have been made available online [8].

Start-up and SMEs: A particular action focused on potentially upcoming HPC start-up projects and the HPC intrinsic difficulties start-ups and SMEs in HPC face, with a special focus on how this situation is perceived by the SMEs. This is based on 14 interviews with start-ups and SME in HPC and the EXDCI survey.

Crossing technological developments and applicative needs: The status and trends of five application domains were presented: CFD applications, Combustion & Multiphase, Weather and Climate simulations, Fundamental Sciences, and Life Science & Health. It turns out that computation size continues to grow at a very high rate in many areas. For example, CFD meshes are presently in the order of 100 billion cells. Physics complexity is continually increasing as well. This implies that there is a joint use of different coupled numerical methods and codes such as hybrid fluids-particles codes. Time and space discretisations of the methods are quite different, leading to great difficulty in implementing parallelism. In addition, the data generated is also still growing at an impressive rate. In situ data analysis is increasingly applied and is gaining momentum. However, in many cases, data needs to be saved and provided to the community. In climate modelling an order of 21 TB/day is being generated today for IPCC/CMIP campaigns, but up to 128 TB/day are expected in the future.

A lot of currently used codes have been developed for many years/decades by e.g. gluing new models and thus containing old parts. Moving these legacy codes is difficult, takes years, and requires a lot of effort (“HW changes faster than SW”). Application developers need to anticipate important changes to come, such as new programming models for parallelism. They ask for explicit demonstrations that it is worth changing the codes and, in particular that the new programming models will be durable. Large companies are aware of such tendencies, but seem hesitating to share this knowledge for commercial reasons.

EuroLab4HPC: The road-mapping effort performed by both projects is organised in a complementary manner (EXDCI roadmap focuses on mid-term technology and applications, and EuroLab4HPC roadmap on the long-term research issues).

The present EuroLab4HPC roadmap led to discussions on how to extrapolate from the present situation on what may be a long-term situation. A proposal was made to reverse the approach, i.e. to define a set of arbitrary future configurations and then seek feedback from users and technological people on these possible future configurations.

Art and HPC: EXDCI has established a link with the FEAT project to work on the connection between art and HPC. The goal of FEAT is to develop innovative artwork through deep engagements with FET projects by rethinking emerging technology whilst exposing it to methodological subjectivity, thereby, configuring its position in the context of humanities and also in its artistic relevance.



Presentation of EuroLab4HPC's Roadmap

3.2 HPC / Big Data interaction and convergence

The Big Data Value Association (BDVA) sessions were an opportunity to strengthen the link between EXDCI and the association. BDVA is the industry-led contractual private partner to the European Commission for the implementation of the Big Data Value cPPP. As of December 2015, BDVA has over 120 members, which includes large companies and SMEs, and industry, together with research institutions and academia.

The core of this collaboration is the convergence of HPC and HPDA system designs to cope with scientific computing and high performance data analytics in future supercomputers, thus, enabling an extended use of HPC systems in the future. This strategic and important move complements the work already performed in the context of BDEC (Big Data and Extreme Computing). The focus of the BDVA presentations was on a review of typical Big Data use cases, which may drive the design of future systems. The applications presented were the following:

- “Autonomous car” proposed by Jim Kenneally, Victor Bayon-Molino, Intel Labs, Intel Corp.,
- “Uncovering the mechanisms of cardiac arrhythmias” proposed by Xing Cai (Simula Research Lab, Norway),
- “Early Warning Systems”, proposed by Enza Giangreco, Davide Storelli, Marco Matera, R&D Laboratory – Engineering Ingegneria Informatica S.p.A.,
- “Forestry, Fishery and Agriculture – The DataBio Lighthouse” Proposed by Caj Södergård, VTT, Finland,
- “High quality dynamically adaptable Machine Translation”, Jan Hajič, Andrejs Vasiljevs, Charles University in Prague.

A white paper entitled “ETP4HPC – BDVA Position Paper” was made available to the workshop attendees (cf. [6]).

3.3 EsD proposal: feedback from integrators

The idea of the EsDs was first proposed by ETP4HPC about two years ago. EsDs are vehicles to optimise and synergise the European R&D effort by integrating isolated R&D outcomes of H2020 HPC projects into several fully integrated HPC system prototypes. By doing so, these

EsDs validated and prove the advancement in R&D across projects at high TRL and facilitate a pathway to commercial exploitation.

Thus, EsDs would establish proof-points for the readiness, usability and scalability of R&D outcomes by integrating them, paired with open market state-of-the art technologies, into usable systems. The EsDs are not meant as a research infrastructure, but as a pre-commercial version of a next generation HPC system.

Multiple workshops, e.g. in Prague during the European HPC Summit Week and at ISC16, have been organised in order to shape this idea. Issues such as technical goals, uses cases, budget aspects, composition of consortia, and acquisition/procurement options have been jointly discussed with the community.

The EXDCI technical workshop has been a good opportunity to gather the community again on this topic, with focus this time on HPC system integrators. Eight system integrators presented their vision of a successful EsD project and the role that they would like to play in these projects.

An element for success of the EsDs is their capacity to integrate various mature R&D outcomes into a single coherent system prototype. This in turn depends on the system integrators' capability to identify valuable R&D results as candidates for collaboration. The integrators raised the question whether some kind of "evaluation process" is necessary to assess R&D outcomes. The integrators pointed out these previous projects may provide valuable insight on best practise and guidelines for such set-ups.

Moreover, the integrators agreed that a conceptual phase of approximately 6 months prior to the start of a call would be necessary to identify promising technology components. According to some system integrators, financial support should be provided for this phase.

In terms of the EsD system procurement, the contractual role of system integrators in an EsD consortium was also discussed, in particular how to implement the funding for the integrators. One idea would be to implement the procurement in a subcontractor position to the consortium rather than on a member level of the consortium itself.

The system integrators also pointed out that the EsDs only make sense from a business perspective if these are pre-commercial versions of future, marketable systems. Thus, intellectual property is a major concern.

3.4 Exchanges on the "ecosystem level" recommendations

This session of the workshop aimed at sharing with the participants the transversal recommendations that had been elaborated during the first year of EXDCI. They are complementary to the technical recommendations that are provided in the PRACE Scientific Case, the SRA and other EXDCI deliverables. These recommendations focus on three aspects of the European ecosystem, forming a continuum from fundamental research to exploitation:

1. **Better research instruments:** The improvement of current research instruments, both computing resources and deployment of new technologies in order to better support applications and researcher discovery processes.
2. **R&D efficiency:** Ensuring that the public and private investment in R&D is carried out in a coherent manner, maximising the impact of research.
3. **Industry competitiveness:** Leveraging R&D excellence and translating its output into industry competitiveness.

The recommendations are summarised in the following table:

Recommandations	Expected impact
Encouraging commercial relationships between SMEs and industry via European projects	Industry competitiveness
Concerted approach to HPC training in Europe	
Incentives to increase EU stakeholders' implications in standard initiatives	
IPCEI for advanced research and innovation	R&D efficiency
Paving the way from EsD development towards applications	
Improving FETHPC and CoE result capitalisation	
Operation policies and federations towards convergence	Better research instruments
Big Data and extreme scale international initiatives	
Access to advanced technologies	

Table 1: Global recommendations

An intentionally short list of recommendations has been proposed by all EXDCI work packages as priorities, after multiple exchanges with the ecosystem. They are described in detail in deliverable D4.3.

The next step is to present them to the FETHPC projects and CoEs for comments. Moreover, a survey is planned to be launch after the workshop.

4 Conclusion of the meeting

The goal of EXDCI is to develop, in close collaboration with the ecosystem, a strategy and its implementation in line with Europe's HPC ambitions.

This first EXDCI technical workshop was an opportunity to gather experts, from EXDCI and beyond, to contribute to the development and implementation of this common European strategy.

The workshop fuelled reflexions and triggered the next steps for the coming year of EXDCI. As of today, the following actions to implement the global recommendations are already underway:

- The integrators' contribution was another step in the construction of the EsD proposal, which will be part of ETP4HPC's suggestion for the 2018-2020 work plan of H2020 (to be delivered to the EC by the end of 2018).
- Regarding the convergence of HPC and Big Data, a common white paper is being prepared with the BDEC community. It will be presented at SC16.
- Regarding access to market for SMEs and Start-ups: a one-day-workshop with all stakeholders is being prepared. The goal is to release two recommendations or best practices, which will be put into practice in the upcoming calls (e.g., the EsD call).

The second year of EXDCI will focus on the implementation of the global recommendations and seek to maintain and to strengthen the collaboration within the European ecosystem.

5 Annexes

5.1 Workshop attendees

Surname	Name	Affiliation
Alioto	Gina	BSC
Andre	Jean-Claude	JCA Consultance & Analyse
Apostolov	Rossen	KTH
Asch	Mark	Université de Picardie Jules Verne
Aumeter	Axel	Megware
Bartsch	Valeria	Fraunhofer
Bidot	Thierry	Neovia Innovation
Bode	Mathis	RWTH
Bodin	François	IRISA
Bricard	Philippe	Nice Software
Brochard	Luigi	Lenovo
Brun	Sacha	CEA
Carpenter	Paul	BSC
Cavazzoni	Carlo	CINECA
Colin de Verdière	Guillaume	CEA
Dollfus	Marc	INTEL
Eickermann	Thomas	Jülich
Erbacci	Giovanni	CINECA
Espasa	Roger	BSC
Fournier	Yvan	EDF
Gilliot	Maike	Teratec / ETP4HPC
Giménez	Renata	BSC
Girona	Sergi	BSC
Gleeson	Catherine	BSC / ETP4HPC
Goodenough	John	ARM
Hoppe	Hans-Christian	INTEL

Kenneally	Jim	INTEL / BDVA
Laure	Erwin	CoE (BioExcel)
Lavignon	Jean-Francois	ATOS-BULL / ETP4HPC
Lonsdale	Guy	Scapos
Magugliani	Fabrizio	E4
Malms	Michael	IBM / ETP4HPC
Malossi	Cristiano	IBM
Muggeridge	Malcolm	Seagate
Nominé	Jean-Philippe	CEA / ETP4HPC
Ostasz	Marcin	BSC / ETP4HPC
Panziera	Jean-Pierre	ATOS-BULL
Papiah	David	Fujitsu
Petric	Spela	FEAT
Pitsch	Heinz	RWTH
Pleiter	Dirk	Jülich
Povh	Janez	Univ. Ljubljana
Requena	Stéphane	GENCI
Ribera Sancho	Maria	BSC
Rosse-Laurent	Pascale	ATOS-BULL
Schick	Heiko	Huawei
Tursic	Miha	FEAT
Ulmer	Dominik	Cray
Ungerer	Theo	Univ. Augsburg
Wittmann	Ingolf	IBM
Yenes	Inigo	PRACE aisbl
Zacharov	Igor	Eurotech

5.2 EsD-White paper (as of September 2016)
(cf. [5] for full document)

ETP4HPC • Extreme-Scale Demonstrators • Current State of Definition • 14 October 2016

The Extreme-Scale Demonstrators concept: Current State of Definition

Follow this discussion at: <http://www.etp4hpc.eu/en/esds.html>

1	Preface	2
2	Extreme-Scale Demonstrators (overview included in SRA 2)	2
3	Meta-Level Workload Requirements & System Characteristics (Hans-Christian Hoppe)	7
4	Use case analysis: ISC workshop outcome (Erwin Laure)	9
5	EsD project budgets: Maximising the Value of ESDs (Malcolm Muggeridge).....	11
6	EsDs: Options for acquisition (Dirk Pleiter).....	13
7	EsD Consortium – a more detailed view (Thomas Eickermann).....	17

1

5.3 Joint position paper ETP4HPC / BDVA (cf.[6] for full document)

ETP4HPC – BDVA cPPPs positioning

1 The context: development of the data economy

It is widely accepted that we are at the beginning of a new industrial revolution. This new revolution has many names: some call it the digitisation of industry, others the 'Internet of Everything', or 'the Sensor Economy'. All these refer to the use of sensors to collect data, and the use of computing power to analyze the data and make useful judgments from it.

The data economy, drawing on data provided by the Internet of Things, and other sources, will transform many aspects of our lives and businesses. Gartner forecasts that by 2020, 25 billion "things" will be connected, with each producing data for analysis in various ways. This will include data from infrastructures, data from cities, health data, logistics data, performance data, and agricultural data and so on. This new economy will have the potential to improve the way we use resources, and deliver services. Consumers, citizens, businesses and governments will all benefit.

One of Europe's main challenges in the coming years will be to seize all the opportunities of the digital economy. This will be essential for the competitiveness of its economy, for maintaining its position in the world and for the well-being of its citizens. One dimension of this challenge is a significant increase of the IT deployment by the European industry. Without a strong action towards the digitalisation of the industry, existing (and future!) industries could become less competitiveness and be leapfrogged by new industrial regions, even within the domestic European markets. The second dimension is related to the development of the new data economy. Europe must be at the forefront of the creation of the data economy that will generate new areas of activities and will also support the digitalised industry.

In order to meet both dimensions of the above challenge, Europe must identify the strategic assets to develop and the levels of the value chain that need to be controlled in order for the continent to be in the driving seat. Looking at these priorities, it appears that having cutting edge IT infrastructures in Europe and the ability to deal with big data are of the utmost importance. Without excellent computing infrastructures located in Europe and the right skills to extract value from data, we will be unable to successfully develop the new digitalised industry and the data economy that go with it. The data will flow to and be stored where the best computing infrastructures and skills are located. So without excellent, secure infrastructures and the ability to extract value from the data, European data will be exploited elsewhere and will thus generate value outside Europe. The successful development of this new industry also requires the use of simulation and the processing of large amounts of data. The existence of high-performance computing (HPC) infrastructures and expertise in big data are of essential importance to the modernisation and the continued competitiveness of industry.

In this context, the BDVA (Big Data Value Association) and the ETP4HPC (European Technology Platform for High-Performance Computing) will work together in order to strengthen Europe's position in these two domains and will interact to exploit all the synergies between them. In line with the EC priority of a connected Digital Single Market, they will develop Europe's capacity to seize the opportunities offered by the data economy. This paper briefly presents the way the two organisations plan to cooperate.