

EXDCI workshop

Barcelona, Sept. 21st 2016

WP7

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September 21, 2016



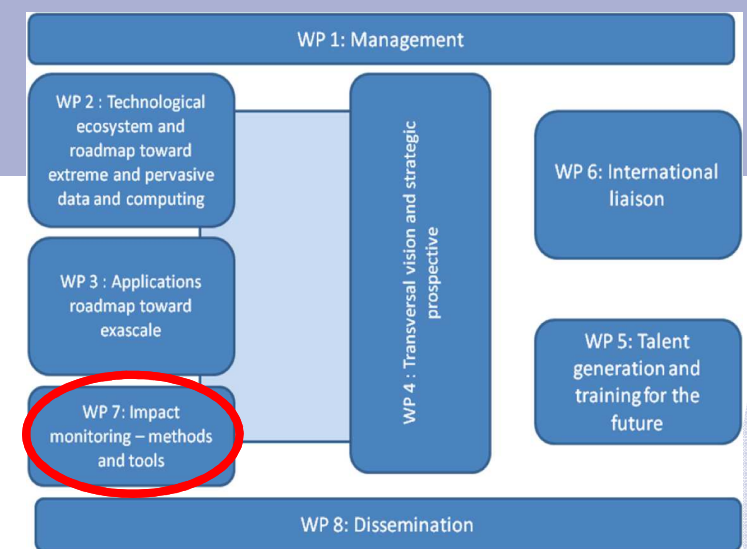
Outline

- WP7 reminder
- Methodology
 - Surveys
 - D7.1
- Surveys and cPPP report highlights
- Next steps

Outline

- **WP7 reminder**
- Methodology
 - Surveys
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WP7 - Impact Monitoring – Methods and Tools



- WP7 Objectives
 - Determine Key Performance Indicators (KPI) reflecting the progress of the Ecosystem
 - Measure the progresses
 - Building on the **HPC cPPP and PRACE KPI**
 - Indicators for Industrial Competitiveness and Socio-Economy Impact
 - Indicators for the operational aspects of the programme
 - Indicators for management aspects of the programme
 - Implementing data collection and processing
 - Delivering periodic score cards (incl. for cPPP mid-term review of 2017)

Reminder: list of HPC cPPP KPIs

A. Indicators for Industrial Competitiveness and Socio-Economy Impact

- KPI 1: Global market share of European HPC
- KPI 2: HPC additional investments
- KPI 3: Jobs
- KPI 4: Innovation Environment in HPC

B. Indicators for the operational aspects of the programme

- KPI 5: Research programme effectiveness and coverage
- KPI 6: Performance of HPC technologies developed
- KPI 7: People, education, training and skills development
- KPI 8: HPC use
- KPI 9: HPC Software ecosystem
- KPI 10: Patent, inventions and contributions to standards in HPC by H2020 funded projects

C. Indicators for management aspects of the programme

- KPI 11: Efficiency, openness and transparency of the PPP Consultation Process
- KPI 12: Dissemination and Awareness

WP7 DoA deliverables

Month	Number	Title	Comment
M12	D7.1	Initial methodology and monitoring tool-set	
M20	D7.2	First release of the HPC Ecosystem Balanced ScoreCard	employs the methodologies and tools as described in D7.1
M25	D7.3	Final methodology and monitoring tool-set	updates the approaches and tools based on experience in creating D7.2
M30	D7.4	Final release of the HPC Ecosystem Balanced ScoreCard	employs the methodologies and tools as described in D7.3

HPC cPPP progress report 2015
(sept 2015)

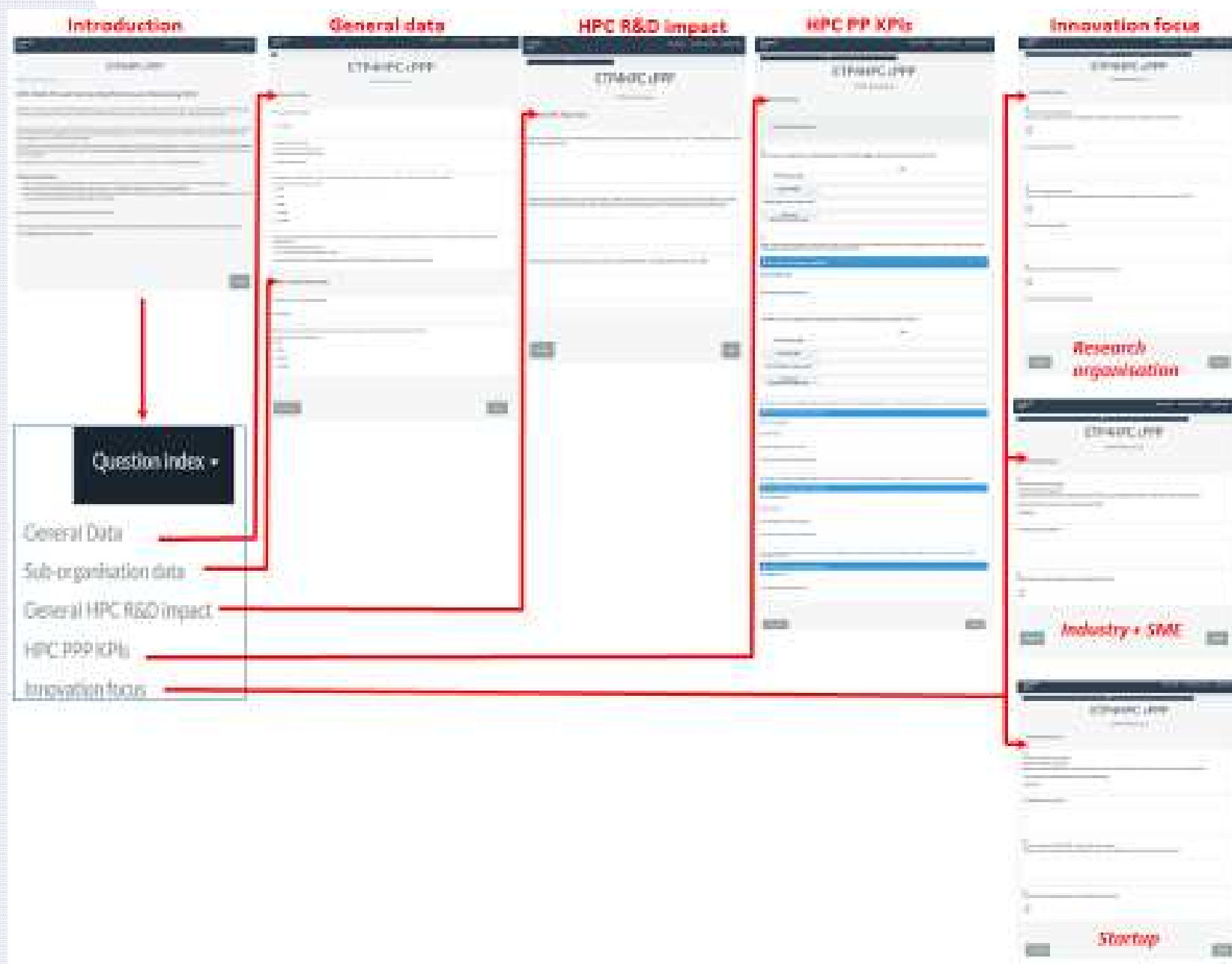
HPC cPPP progress report 2016
March 2017....
cPPs mid-term review

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- Dual approach (limiting surveys / pooling efforts!)
 - EXDCI general survey => FETHPC projects and CoEs
very general spectrum
WP7 focussing more on KPI aspects, SMEs&innovation (2 sections on the survey) – contribution to the collective effort
 - ETP4HPC extra survey => ETP4HPC members
Strong focus on « Private side » R&D investments
- Both done Q1/Q2 2016
 - EXDCI excellent answer rate (using some direct interviews)
 - ETP4HPC more contrasted

ETP4HPC survey (LimeSurvey)



EXDCI survey (ETP4HPC contrib & focus)

2. Training and talent generation

One of the acknowledged barriers to increasing the uptake of HPC in academia and industry is the shortage of skilled personnel. EXDCI aims to identify gaps in training provision, and then produce a synthesized Training Roadmap to address how to bridge these gaps and make training more accessible. EXDCI will co-ordinate European efforts in HPC training and education by establishing a community of training providers.

Do you plan to use existing training material for your project or CoE?

☐ Yes ☐ No

Do you plan to produce new training material for your project or CoE?

☐ Yes ☐ No

Please give further details (e.g. availability, cost, target).

Is the training given or being developed by your project / CoE potentially of benefit to other FETHPC projects / CoEs?

☐ Yes ☐ No

Please give further details.

Which are the main areas in which you think your project / CoE could benefit from training provided by external organisations?

Are you aware of any suitable training already provided by another organisation in any of these areas?

☐ Yes ☐ No

Comment:

4. Impact assessment – innovation, technology transfer

Another mission of EXDCI is to foster innovation in HPC, in particular by supporting start-ups and SMEs in their development. The questions of this section are formulated with the intention to get insights into: (1) the new technologies developed in your project suitable for innovation and (2) the needs of SMEs regarding innovation and development.

What KPI (Key Performance Indicators) would measure best the influence of your project in the ecosystem?

Have you already detected technologies from your project with potential for technology transfer (either via licensing, patent filing or via the creation of start-ups)?

☐ Yes ☐ No

Which actions are planned in your project in order to support the emerging technologies of your project? Examples could be: familiarize with entrepreneurship, events/links towards the local innovation ecosystem, support and advice for start-up projects, ... Please list below

Type of action	Short description	Contact person
<input type="text"/>	<input type="text"/>	<input type="text"/>

Add a row

Example:

Type of action: promotion and networking for future entrepreneurs.

Short description: Booth to promote those technologies on the business convention XX

Contact person: Paul Smith (+ email)

In your opinion, what could be done to support those emerging technologies?

On which support provided by the participant's institutions for technology transfer, licensing and entrepreneurship does your project rely? Please list below:

Type of action	Short description	Contact person (within the project)
<input type="text"/>	<input type="text"/>	<input type="text"/>

Example:

Type of action: 2-day course on entrepreneurship of XX open to all project participants.

Short description: To get acquainted with the fundamental notions of a business plan, fund raising, development of a product based on role plays.

Contact person (within the project): Paul Smith (+ email)

Are actions planned in your project (or with partners) in order to emphasize/ promote the SMEs of your project? Examples could be: (Co-) financing of a common booth at a business convention; specific sub-events focusing on the SMEs, ... Please list below:

Type of action	Description	Action carrier (project, participants institution, ...)	Contact person
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

Add a row

Example:

Type of action: Business development and promotion

Description: Booth to promote at business convention XX

Action carrier (project, participants institution, ...): Chamber of Commerce Paris OR: Event organized by our project partner XX

Contact person: Paul Smith (+ email)

In your opinion, what should be done to highlight your project's SMEs?

Which SMEs of your project would accept to be interviewed (approx. 45 min) on their needs regarding their development and potential support actions?

5. Monitoring European Key Performance Indicators

A key performance indicator is a business metric used to evaluate factors that are crucial for the success of an organization. In our case the EC has set up a number of KPIs which we collect within EXDCI to allow the EC to see our progress and highlight our successes. It is in the interest of the projects and CoEs to provide this information (although we understand that this put an additional load on the projects). However it gives us a chance to get an overview over the work program and a handle to see it and where we can see challenges.

Do you have plans to make new European HPC middleware or application software available during the project lifetime and if so what is the status?

Name of the software	Description	Status / Time to availability	Contact person
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

[Add a row](#)

Example:

Name of the software: GASPI/GPI

Description: Communication API

Status / Time to availability: Installed at Archer

Contact person: Paul Smith (+ email)

Do you plan to use HPC resources (Tier-0, Tier-1, Tier-2... levels) during the project?

Resource and purpose	Description	Status / Plan	Contact person
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

[Add a row](#)

Example:

Resource and purpose: run NERSC code on Archer

Description: (-)

Status / Plan: Planned for 2017

Contact person: Paul Smith (+ email)

Do you plan to organize / have already organized multi-disciplinary or cross-disciplinary activities (e.g. workshops)?

Name of activity	Description with number of participants	Status / Plan	Contact person
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

[Add a row](#)

Example:

Name of activity: cross-disciplinary application workshop

Description with number of participants: Lyon, March 2016, 20 participants, URL

Status / Plan: Planned for 2017

Contact person: Paul Smith (+ email)

What are your plans to develop next-generation software codes, libraries and algorithms?

Name of software	Description	Status / Plan / Adaptation to next generation machines	Contact person
<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

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H2020-FETHPC-2014

Coordination of the HPC strategy



EXDCI

European eXtreme Data and Computing Initiative

Grant Agreement Number: FETHPC-671558

D7.1

Initial methodology and monitoring tool-set

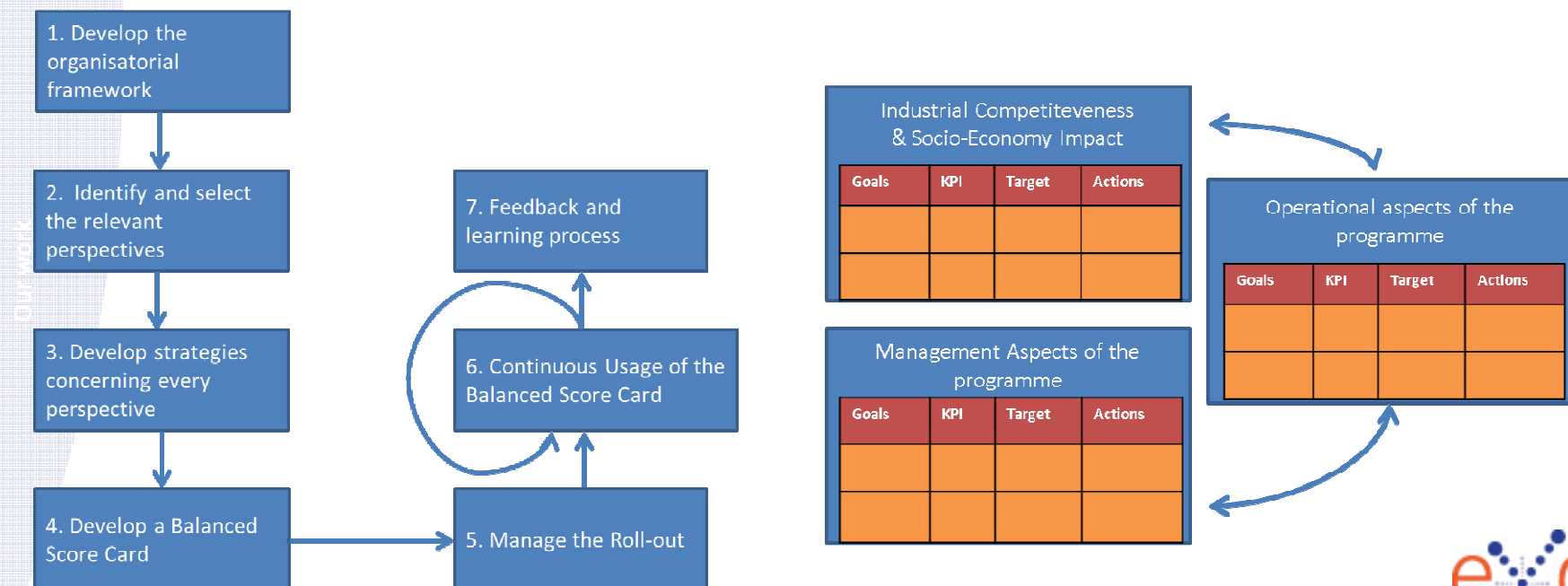
Final

Version: 1.1
Editor: Guy Lonsdale
Date: 12.08.2016



D7.1 methodology

- Scope a bit wider than mere cPPP progress report
- Balanced Score Card = link KPIs to strategy and possibility to suggest strategic and management orientations
- Of course the bulk/initial KPI set is the HPC cPPP one (actually a derivation of the general all-cPPP KPIs...)



Perspective	Goal
Industrial Competitiveness and Socio-Economy Impact	<ul style="list-style-type: none"> • Increase market share • Create innovation environment in HPC (exploited patents and standards) • Increase employment • Support growth of SMEs
Operational aspects of the programme	<ul style="list-style-type: none"> • Effective research programme and coverage • Develop performance of HPC technologies • Provide education, training, skills development • Increase use of HPC • Develop a HPC software ecosystem • Generate patent, inventions and contributions to standards
Management aspects of the programme	<ul style="list-style-type: none"> • Dissemination and Awareness • Effective execution

Data Sources

	KPI	Key Performance Indicator (KPI)	EXDCI survey	ETPHPC survey	PRACE KPIs	EC H2020 stats	Analysts' reports	Public sources Web etc.
Industrial Competitiveness and Socio-Economy Impact	1	Global market share of European HPC					***	*
	2	HPC additional investments		***				
	3	Jobs		***			*	
	4	Innovation Environment in HPC: start-ups...	**	***				*
Operational aspects of the programme	5	Research programme effectiveness and coverage: H2020 calls....				***		
	6	Performance of HPC technologies developed	*		*			***
	7	People, education, training and skills development			***			
	8	HPC use	**		**			
	9	HPC Software ecosystem	**		**			
	10	Patent, inventions and contributions to standards in HPC by H2020 funded project	*	***				
Management aspects of the programme	11	Efficiency, openness and transparency of the PPP Consultation Process				***		
	12	Dissemination and Awareness	**	**	**			

	Not a data source
*	Complementary source
**	Important source
***	Main source

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PROGRESS MONITORING REPORT 2015

***High Performance Computing
Contractual Public Private Partnership***



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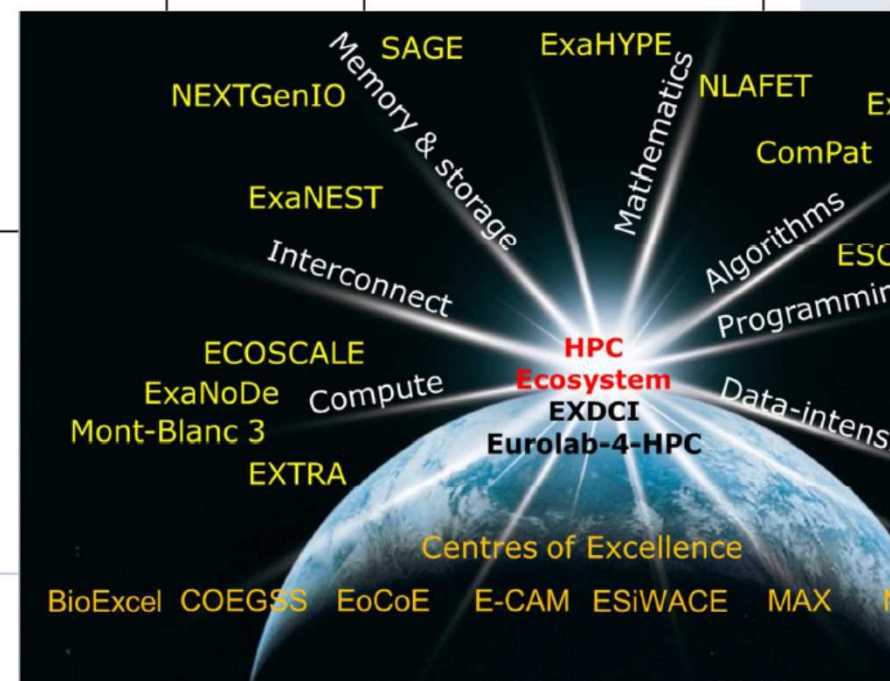
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Last year, the European Commission set up a Public-Private Partnership with the European Technology Platform on High Performance Computing to develop technologies and applications with the aim of exploiting the huge opportunities offered by High Performance Computing to give a world-wide competitive edge and faster access of innovation results to markets. The EU committed €700 million from the Horizon 2020 programme, with the private sector providing matching funds. In 2015, the first investments have so far resulted in the launch of 19 Exascale technology projects, 8 Centres of Excellence in applications and 2 Coordination and Support Actions.

In the case of Exascale technology projects, the progress made through industry in this initiative is visible, by comparing industry participation in projects funded under two calls, one which was organised previous to the establishment of the cPPP, and one thereafter. During the short timeframe of about 2 years, overall industry and SME participation in Exascale projects increased by more than 60%. and SME participation increased by a factor of 4. The ETP4HPC platform was also successful in attracting 11 new members in 2015 - reaching a total of 70 at the end of the year - with more than half of these new members having industrial or SME profiles (close to 60% of members are private companies, out of which SMEs represent 35% of the total number of members). Although it is still too early to quantify the leveraging factor for industry investment, the first identified trends show a vibrant private side R&D investment, which if combined with the increasing industry participation in the HPC calls, should pave the way to a sustainable stimulation of HPC systems and services delivery by H2020 –funded R&D.

These initial results are encouraging and have been confirmed by a study published by the European Commission in 2015. It shows that, in Europe, there has been an improvement in HPC capabilities during recent years in terms of narrowing the gap which separates the most

Topic	Type of actions	Funding	Opening Date Closing Date
<p>FETHPC-01-2016: Co-design of HPC systems and applications¹³</p> <p><i>The Commission considers that proposals requesting a contribution between EUR 10 and 20 million would allow this specific challenge to be addressed appropriately.</i></p>	RIA	€41 M	14 April 2016 26 September 2016
<p>FETHPC-02-2017: Transition to Exascale Computing¹⁴</p> <p><i>The Commission considers that proposals requesting a contribution from the EU between EUR 2 and 4 million would allow this specific challenge to be addressed appropriately.</i></p>	RIA	€40 M	12 April 2017 26 September 2017
<p>FETHPC-03-2017: Exascale HPC ecosystem development¹⁵</p> <p>The Commission considers that proposals requesting a contribution between EUR 1 and 2 million would allow this specific challenge to be addressed appropriately. Nonetheless, this does not preclude submission and selection of proposals requesting other amounts.</p>	CSA	€4 M	12 April 2017 26 September 2017



The FETHPC call closed on November 25th, 2014. Eighty-one (81) eligible proposals were submitted, out of which 79 were for FETHPC-1:

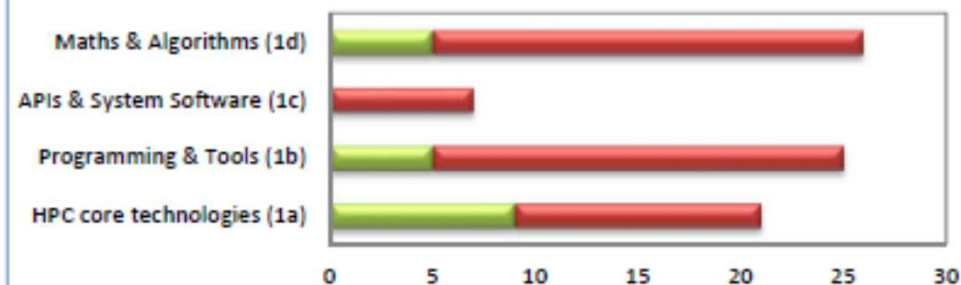
#eligible proposals	79
#retained proposals	19
#participants in eligible proposals	652
#participants in retained proposals	178
Budget requested by the eligible proposals	€340,000,000
Indicative budget for the call	€93,400,000
Actual funding	€94,549,793

There were 2 proposals for FETHPC-2-2014 (CSAs), 1 submitted proposal for each sub topic – both were selected for the amount of €4,041,856 in funding (indicative budget was €4M). Total amount of EU funding for FETHPC is €98.6 M.

The breakdown of the number of FETHPC1 submitted and retained projects, by sub topic, is the following:

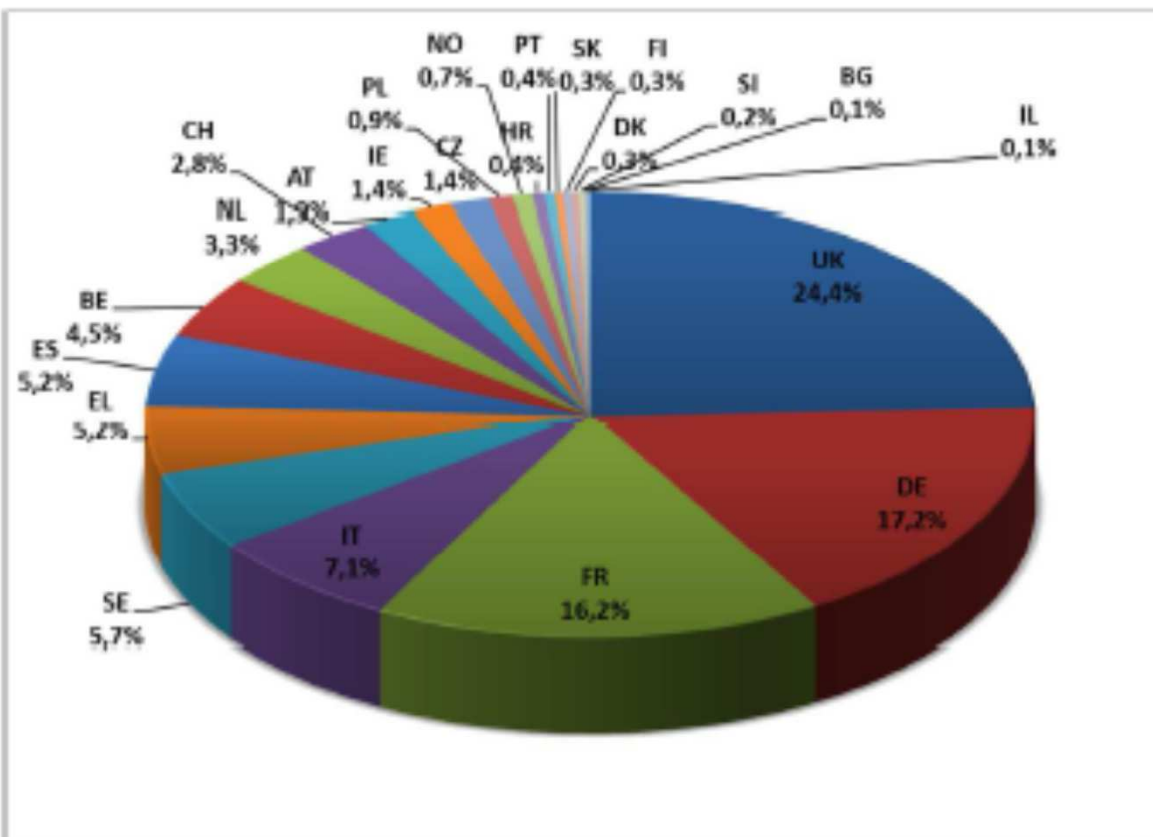
Sub topic	#submitted	% submitted	#retained	%retained
HPC core technologies (1a)	21	26,6%	9	47,4%
Programming & Tools (1b)	25	31,6%	5	26,3%
APIs & System Software (1c)	7	8,9%	0	0,0%
Maths & Algorithms (1d)	26	32,9%	5	26,3%
Total FETHPC 1	79	100,0%	19	100,0%

FETHPC1: submitted & retained prop. per subtopic



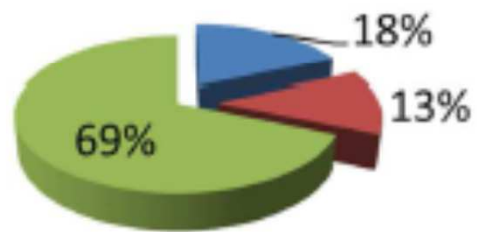
The lack of selected projects in subtopic 1c) APIs & System Software was pinpointed by ETP4HPC as soon as the results were known. The low number of related proposals can explain this result. ETP4HPC insisted that by failing to cover this important SRA topic could lead to jeopardising extreme scale objectives.

Czech Republic	1,4	CZ	1,41%
Poland	0,9	PL	0,87%
Norway	0,7	NO	0,72%
Croatia	0,4	HR	0,44%
Portugal	0,4	PT	0,39%
Slovakia	0,3	SK	0,30%
Finland	0,3	FI	0,29%
Denmark	0,3	DK	0,28%
Slovenia	0,2	SI	0,20%
Bulgaria	0,1	BG	0,12%
Israel	0,1	IL	0,08%



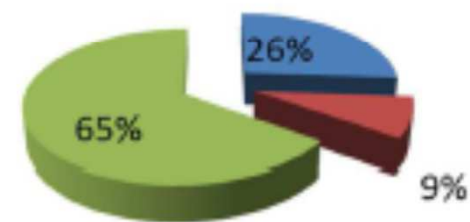
FETHPC participants

■ Industry (no SME) ■ SME ■ Other

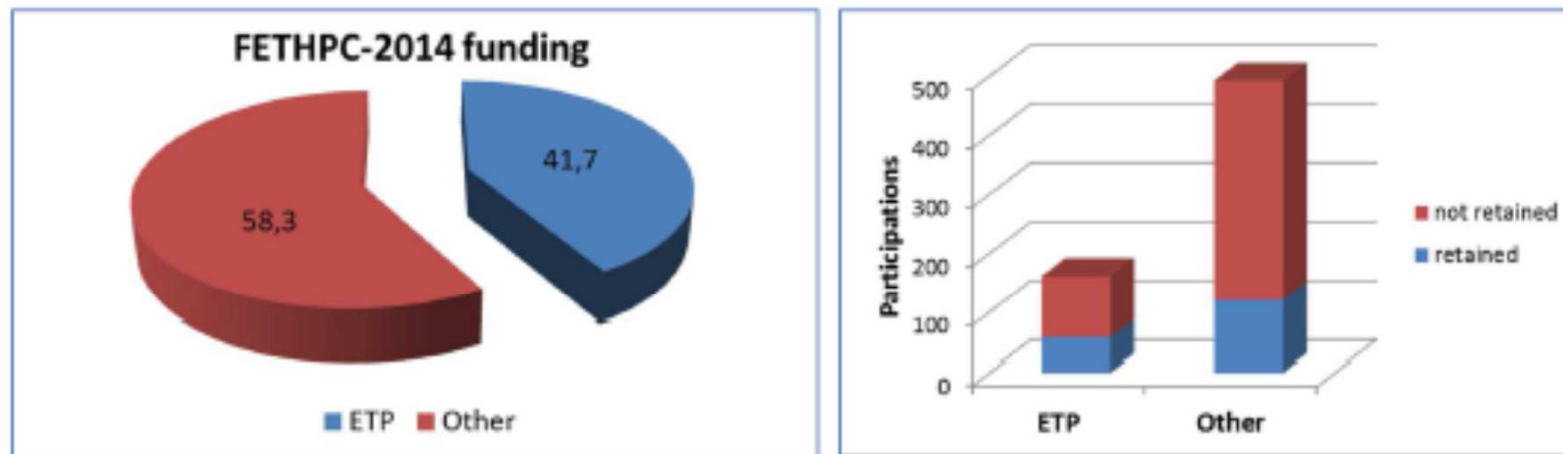


FETHPC funding

■ Industry (no SME) ■ SME ■ Other



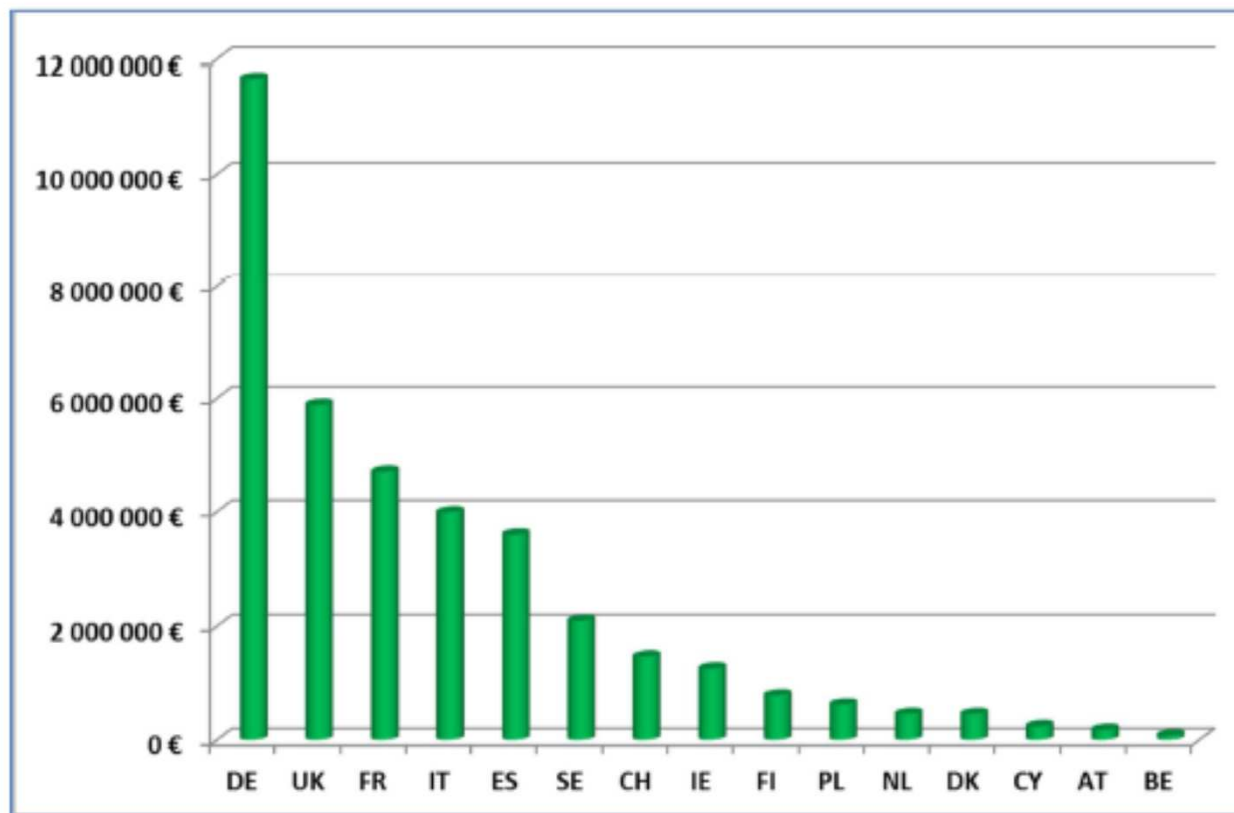
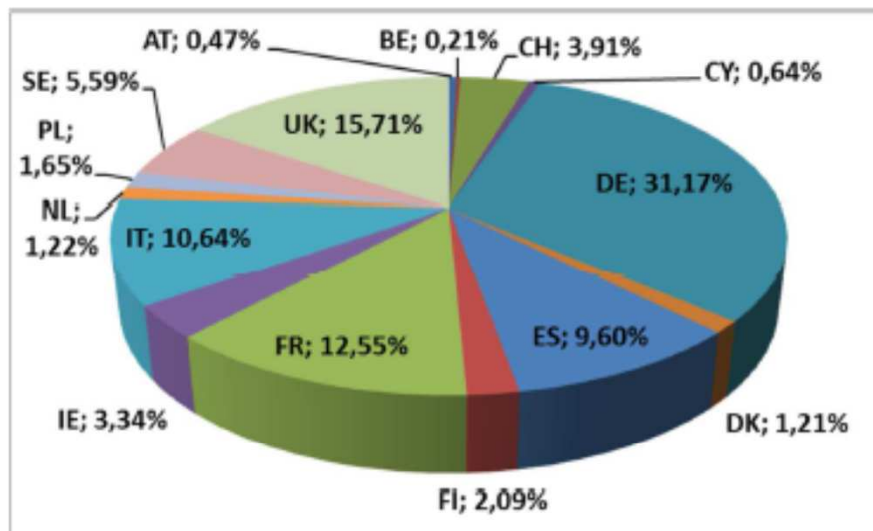
<i>FETHPC 14-15</i>	Participants	Funding (€M)	% participants	% funding
Industry (non-SME)	51	32,8	18,4%	26,2%
SME	21	8,1	12,9%	8,5%
Other	163	94,5	68,7%	65,3%



Fraction of FETHPC awarded o ETP4HPC members or non-members
(Left: funding – Right: number of participants, also including consortia which were not retained)

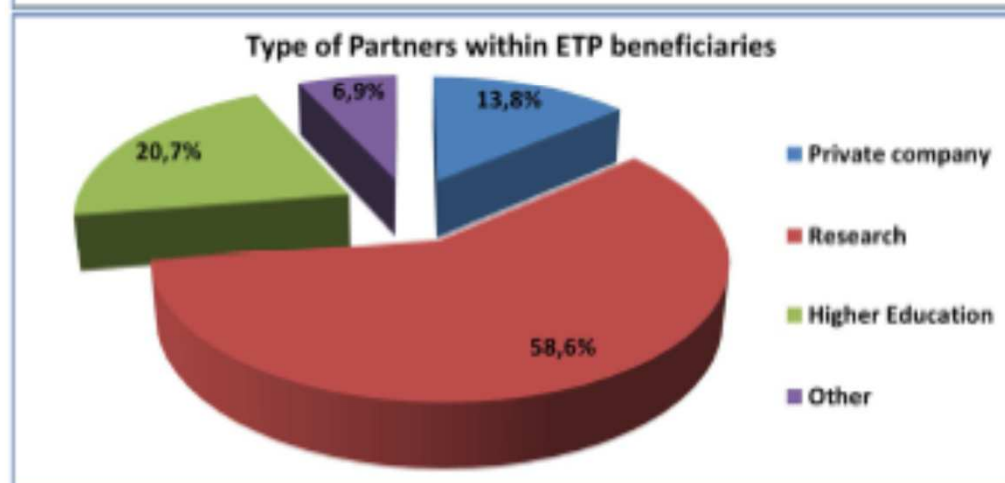
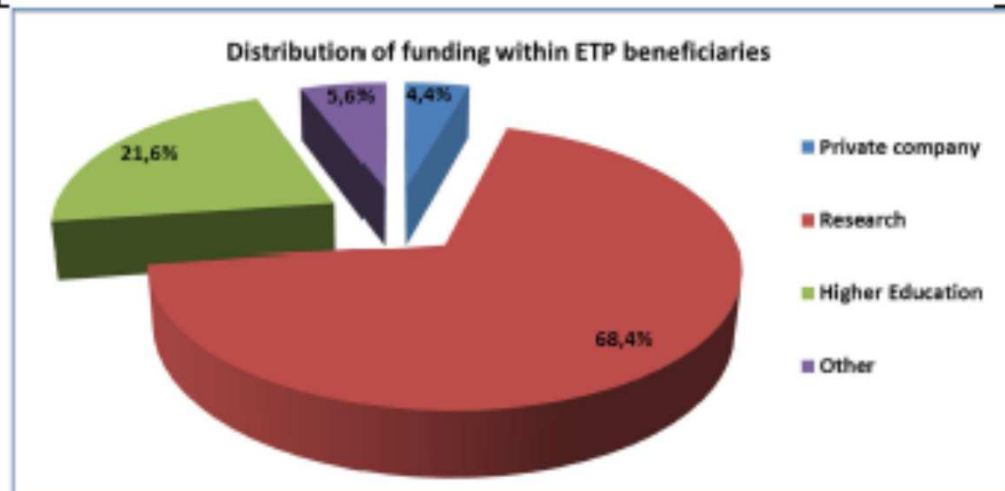
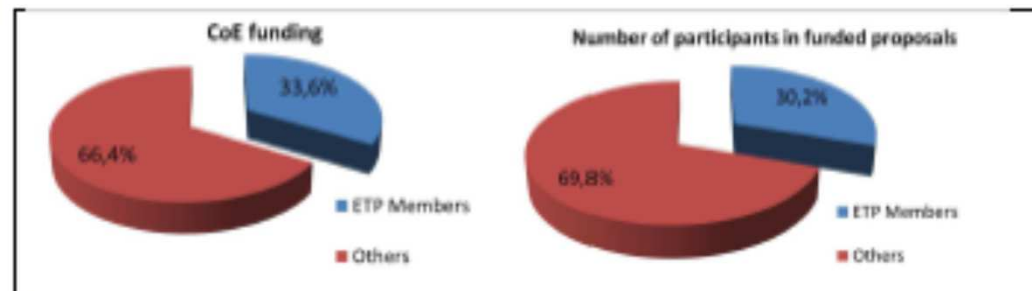
Distribution of CoE EU funding and participants by country

AT	0,47%
BE	0,21%
CH	3,91%
CY	0,64%
DE	31,17%
DK	1,21%
ES	9,60%
FI	2,09%
FR	12,55%
IE	3,34%
IT	10,64%
NL	1,22%
PL	1,65%
SE	5,59%
UK	15,71%



CoE EU funding distribution by country

Statistics of the CoE call eventually revealed that participants outside the ETP4HPC platform have received a majority of the funding, such as for FETHPC projects, confirming the openness of the cPPP.



2.4 Additional private investments and outputs

ETP4HPC association performed a survey of its members to estimate the trend of the current level of private investments in HPC R&D in Europe. The survey is similar to that of last year²². The bulk of the survey consisted of questions on "private side" effort. The reference period chosen for the survey is 2015. Some qualitative questions were also included in the survey (such as related to patents, standards, SMEs).

In the survey's questions, R&D was understood as activities carried out within Europe, and broken down into three categories:

- "HPC Technology R&D": R&D for technologies covered by the technical research priorities of the ETP4HPC SRA or related and comparable technologies.
- "Other HPC R&D": Other R&D activities relating to the use of HPC and HPC Technologies, e.g. HPC applications development.
- "Other research - indirect HPC R&D - with an impact on HPC": other R&D activities in areas other than HPC that have an impact on HPC and/or the results of which might be used in HPC (such as more general micro-electronics development) – this latter category is not commented here since the observed collected results are not considered a sufficient sampling.

A total of 35 out of 70 ETP4HPC²³ organisations participated in the survey but not all of them provided all requested figures and amounts. In general, the participation in this year's survey is not higher than that of last year's, even if the number of ETP4HPC members has slightly increased from 64 members at the end of 2014 to 69 in March 2015.

In order to render the answers representative of the whole ETP4HPC technology platform, corrective factors have been applied to rebalance categories²⁴ and extrapolate. The distribution of the answers, without using extra public sources, shows that we have an above-average participation of research institutes in this survey. A possible interpretation could be that much of data collected in the survey could be considered public from research organisations.

<i>Additional private investments</i>	HPC technology R&D	Other HPC R&D
2015 survey	215 Mio Euro	200 Mio Euro
2012-2014 survey / average per annum	165 Mio Euro	225 Mio Euro

It can be observed that:

- R&D budget amount in HPC technology is consistent with the amount which ETP4HPC had previously used in its Vision Paper of 2012 and SRA of 2013
- The fraction of EU funding in R&D HPC technology is consistent with the known level of FP7 HPC related efforts (see section 3.1)
- Within Europe, there are important private sector investments in HPC R&D (both in HPC technology and use of HPC)

Q49: Do you have plans to make new European HPC middleware or application software available during the project lifetime and if so what is the status?

Project	Name of Software	Description	Status/Time to availability
AllScale	AllScale compiler AllScale runtime system	parallelizing source to source compiler for C++ - runtime system for extreme scale parallel architectures	Oct. 2018 - Oct 2018 -
NUMEXAS	Kratos	Multi Physics framework	Available (BSD licensed) -
ExaHyPE	ExaHyPE	Exascale Hyperbolic PDE engine	prototype will be released towards end of 2016 -
READEX	READEX Tool-suite -	The full tool-suite that will be developed during the project.	To be developed, ETA 2.5 years (end of project). First Beta release planned for Spring 2017.
ESCAPE	Weather and climate dwarfs	Key model components that drive cost and offer largest potential for obtaining efficiency gains	End of project
SAGE	<ul style="list-style-type: none"> • Clovis API • MPI-IO for Objects • pNFS • Flink for SAGE • PGAS 	<ul style="list-style-type: none"> • Open API for access to extreme scale Objects suitable for massive data ingest and HPC I/O. Availability in Year 3. (Malcolm Muggeridge, Seagate) • MPI-IO adaptation to work on top of Objects • pNFS adaptation to work on top of Objects • Data analytics & workflows for data centric HPC • Exploitation of NVRAM in the storage hierarchy for PGAS 	Year 3

Project	Name of Software	Description	Status/Time to availability
ESIWACE	ESD -	Earth-System/O Middleware	Development started in March 2016, End of 2016 first prototype
Project (ExCAPE)	(Unknown)	Implementation of scalable machine learning algorithms on HPC clusters - single task machine learning methods	(Unknown, towards end of project) - code release envisaged after paper publication, which is in preparation
MAX	Quantum-ESPRESSO SIESTA FLEUR AiIDA Yambo	http://www.quantum-espresso.org/ - http://departments.icmab.es/leem/siesta/ - http://www.flapw.de/pm/index.php - http://www.aiida.net/ - http://www.yambo-code.org/ -	available
EXA2CT	GASPI - Piplined PETSC	PGAS Library - Solver library	Installed on many HPC machines - In next PETSC release -
INTERTWinE	GASPI OmpSs StarPU	Distributed PGAS runtime Task-based parallel runtime Task-based parallel runtime	In production

More from surveys
=> will feed 2.4 final
section of the progress
report

Q61: What are your plans to develop next-generation software codes, libraries and algorithms?

Project	Name of software	Description	Status/Plan/Adaptation to next generation machines
NUMEXAS	Kratos	improving the software	Available
ESCAPE	IFS, ARPEGE, HARMOMIE	Global and regional NWP models	Adaptation to GPU and accelerators, and optical processors
SAGE	iPIC3D, Jurassic, IMAS, Savi, RAY and NEST	SAGE Use cases for in-storage compute	Adapted to SAGE
ESiWACE	ESD	Earth-System/O Middleware	Development started in March 2016, End of 2016 first prototype
Project (ExCAPE)		<p>New algorithms for deep learning for chemogenomics</p> <p>New algorithms for matrix factorization for chemogenomics</p> <p>New algorithms for conformal prediction for chemogenomics</p> <p>Framework for executing machine learning algorithms targeted at chemogenomics on HPC hardware -</p>	Will be developed and run on Salomon@IT4I
MAX	Quantum-ESPRESSO SIESTA FLEUR AiiDA Yambo	http://www.quantum-espresso.org - http://departments.icmab.es/leem/siesta/ http://www.flapw.de/pm/index.php http://www.aiida.net/ http://www.yambo-code.org/	<p>porting to Intel KNL, OpenPower+GPU and ARM+GPU, work in progress</p> <p>multi-threads parallelization and porting to KNL, work in progress</p> <p>multi-threads parallelization and porting to KNL, work in progress</p> <p>integration with "big data" DB technologies like spark, work in progress</p> <p>multi-threads parallelization and porting to KNL, work in progress</p>

Q61: What are your plans to develop next-generation software codes, libraries and algorithms?

Project	Name of software	Description	Status/Plan/Adaptation to next generation machines
EXA2CT	Many proto-apps	based on HPC codes	See www.exa2ct.eu
INTERTWinE	Ludwig iPIC3D Tau PLASMA and DPLASMA BSC Application Repository ComBLAS	material science (Lattice Boltzmann) appl. plasma physics appl. fluid-dynamics appl. dense linear algebra library benchmark suite graph/ sparse linear algebra library	demonstrators for project interoperability experiments
NLAFET	NLAFET library	Prototype implementations of novel algorithms for fundamental numerical linear algebra operations	Available at the end of the project, in 30 months
BioExcel CoE	GROMACS	MD simulations code	Being ported to various accelerators such as latest generations GPUs and Xeon PHIs
NUMEXAS	Kratos -	improving the software	Available

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- Methodology
 - Surveys
 - D7.1
- Surveys and cPPP report highlights
- **Next steps**

Next steps

- Finalise 2015 cPPP Progress Report : September...
Exploiting the rest of surveys outcomes
- Mid-term review of the cPPPs in 2017
- cPPP report expected March 2017
 - ETP4HPC and cPPP activities tracking - continuous process – under control
 - EC stats on FETHPC CoEs etc. – we will have updates (incl. FETHPC-2016 submission and possibly selection results)
 - PRACE recurring KPIs
 - ETP4HPC survey & R&D investments (possible outsourced extra expertise?)
 - EXDCI (new) survey
 - Outsourced: quantitative socio-economic KPIs



THANK YOU!

For more information visit

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Backup

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