H2020-INFRAEDI-2018-2020

The European Centre of Excellence for Engineering Applications

Project Number: 823691

D7.3

Dissemination, Communication, Collaboration, Community Building and Standardisation Report

The EXCELLERAT project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 823691

Workpackage:	WP7	Awareness, Impact Creation and Outreach	
Author(s):	Johanna Lucha		USTUTT
	Natalie Lewandowski		USTUTT
	Nikolai Worms		USTUTT
	Maike Gilliot		TERATEC
	Matthias Meinke		RWTH
	Antoine Dauptain		CERFACS
Approved by	Executive Centre Management		29/11/2019
Reviewer	Samir Ben Chaabane		TERATEC
Reviewer	Christian Gscheidle		FRAUNHOFER
Dissemination Level	Public		

Date	Author	Comments	Version	Status
2019-11-18	J. Lucha	Initial draft	V0.1	Draft
2019-11-21	ALL	Implementation of content from partners	V0.2	Draft
2019-11-22	J. Lucha	Document submitted to review	V1.0	Draft
2019-11-28	J. Lucha	Updates after internal review	V1.7	Draft
2019-11-29	J. Lucha	Document accepted following review	V2.0	Final

List of abbreviations

BoF	*Birds of a Feather*
CFD	*Centre Coordination Committee*
CoE	*Centre of Excellence*
EU	*European Union*
HPC	*High Performance Computing*
IG	*Interest Groups*
ISV	*Independent Software Vendor*
KPIs	*Key Performance Indicators*

Executive Summary

This meta-report will report yearly on all activities of WP7 with a subsection each for performed actions and plans in the areas of dissemination, communication, collaboration, community building and standardization. As the work package 7 tasks, concerning Community Building and Standardization, have been started and established since D7.2 “Initial Dissemination and Collaboration Plan” [1], they will be described in more detail here. There will be an overview of the status of the KPIs and a more detailed description of WP7’s tasks. Community Building and the Standardisation are developing and the results so far, are presented in this document.

Table of Contents

Table of Figures

Table of Tables

1 Introduction

The CoE for Engineering Applications EXCELLERAT aims to boost High Performance Computing (HPC) for engineering to Exascale and thus enable the engineering industry to use highly scalable codes leading to increased competitiveness. In order to help establish EXCELLERAT as a principal hub for industrial and academic players in the field of engineering with use of HPC, awareness about the services and expertise of EXCELLERAT has to be created among its stakeholders, which makes it necessary to approach communication and collaboration strategically.

In the first section of this document, the dissemination and communication strategy is addressing the questions of how information is exchanged within the project, what communication goals EXCELLERAT aims to reach, who the target group is and what message the project wants to deliver to each of them. In addition, communication and dissemination performance evaluation is outlined with the help of KPIs. This document explains the specific communication measures and tools the project uses in order to meet the strategy outlined in the prior section. The purpose of the EXCELLERAT portal specifically is only outlined very briefly, as this web-based tool will not be developed before the end of 2019.

Additionally, this deliverable provides a comprehensive summary of the activities, which can be performed in cooperation with partners beyond the EXCELLERAT CoE.

Efficient collaboration on various levels are identified, e.g., with other European CoEs or projects, with industry companies and with national projects/partners working on HPC related fields.

Finally, this document introduces community building as a tool to more efficiently support the exploitation of the EXCELLERAT services.

This document is a living document and will be updated and released as versions in M24 and M36 of the project.

2 Dissemination and Communication

The Centre will act as a single access point to technology and expertise. Academia and industry can avoid overlapping investments by making use of the knowledge pool of EXCELLERAT. This will give all parties the chance to free up their own resources to drive niche innovations specific to a particular code.

2.1 Goals and tools of dissemination

In EXCELLERAT, both dissemination and communication are managed as a combined strategy. The two are similar timing wise and one could monitor for example social media for success (with KPIs). The identified target groups also define the level of interaction that is necessary through time from awareness over understanding up to action/collaboration. Dissemination is of importance for the academic/scientific communities as well as for the industrial players. The goal is that dissemination activities will transform into collaboration and finally exploitation activities towards the end of the project.

2.2 Progress with dissemination KPIs

Table 1 below shows the current values of the communication KPIs until M12 of the project. The goal is, amongst other things, to increase the traffic on our website in way, that it is not about numbers, but that the visitors get aware of the added value of EXCELLERAT and thus enter in discussions with the consortium. The performance concerning the number released for Scientific Papers and Whitepapers as well as in the "Events" section is in an early status of the project. The consortium has decided to focus within the first year on awareness creation on the existence of the project and will now enter a phase where more and matured results lead automatically to a higher number of publications with concrete contents. The KPIs (Table 1: KPIs Overview) will further improve during M13-M36 of the project. Still despite setting the targets high, some of them are already achieved.

Tool	KPI	Status M12	Target M36
Publication	Released Scientific Papers	6	35
	Press Releases	2	4
	Released Whitepapers	0	5
Events	Project presentations conferences/events	12	25
	Significant presence at events (hosted, sponsorship and booths)	2	15
	No. of Workshops/interest group meetings | no. of workshop participants	1	4 workshops interest groups meetings
	No. of conferences | No. of attendees	1	2 | Total 150
Social Media	No. of twitter postings, Followers, Engagement and Impressions	127 tweets 148 followers Ø522 Impressions/tweet	Regular postings, 200 Follower & 500 impressions
	No. of LinkedIn postings, followers, engagement and impressions	86 followers, LinkedIn Post (7.11.19) – 891	75 Followers, 300 impressions

		organic impressions	
Reference in external media channels (on- & offline)	Press clippings	8	20
EXCELLERAT Website	Number of visits	Overall 7.544 (11/19)	7000
EXCELLERAT Portal	Number of subscribers	0	50
Newsletter	Number of subscribers	0	150

Table 1: KPIs Overview

2.2.1 Website

The EXCELLERAT website architecture and analytics have been addressed in great detail in deliverable D7.1 "Website, Corporate Design and Templates" [2]. For now, the most important statistics are the following:

- Site visits: 40/day, overall 1.190 in 30 days.
- Referring Domains: LinkedIn, Google, ec.europa.eu, hlrs.de
- Top languages: English, German.
- Search terms: codes, excellerat, hlrs, training.

2.2.2 Newsletter, Publications and Whitepapers

There has been no Newsletter set up so far, since the technical results will become available during the second year of the action. The news is currently shared via social media and the EXCELLERAT Homepage.

2.2.3 Video-Blogging/Podcasting

As EXCELLERAT still follows a multi-media approach to communication, some of the blog articles and themes can be enhanced by videos or podcasts. Used formats and formats envisioned for the future:

- Recording of presentations (webinars).

- Interviews/Discussions/Workshops.

- Explanatory videos.

2.2.4 Social Media

EXCELLERAT is using social media for promoting content and connecting with the community. Within EXCELLERAT, social media is used to:

- increase traffic to the website – over 7000 views in the first year
- create a community interested in engineering HPC
- inform about upcoming events, news and results regarding the project
- support the members, create another platform to interact & discuss topics directly

On Twitter and LinkedIn, EXCELLERAT will tag the relevant partners' handles to posts in order to encourage engagement and to connect every partner with the community. Sharing news and the participation at events are highly important in order to make F2F meetings possible, too. Being close to the community and interact via social media, the website and personal

contacts are key factors for the success of the dissemination of EXCELLERAT's results and achievements.

2.2.5 Media Relations & Events

It is one major goal to support the project's success with measures of both public relations and event presentations. EXCELLERAT will not only provide the HPC trade press with valuable content. A list of key media outlets has been identified in Table 2 and Table 3.

Magazine	Area	Language
HPCwire	HPC news	English
Primeurmagazine	Mainly HPC in Europe	English
The New Platform	HPC news	English
InsideHPC	HPC news	English
Scientific Computing World	HPC news	English
Golem	Technology news	German
Heise	Technology news	German
Eureka!	Engineering and design	English
Horizon Magazine	European funded research	English
Engineering	Technology, manufacturing, management	English
CFD online	Computational Fluid Dynamics (CFD) applications	English
INSiDE	HPC in Germany	English
Science Node	Applied HPC	English
Research & Development	Applied Science	English
Technology Review	Digital innovation	German
VDI-Nachrichten	Engineering news	German
Bild der Wissenschaft	Popular science news	German
Digital Engineering Magazin	Digital engineering applications	German
Automotive IT	IT in automotive industry	German
Data Center-Insider	Infrastructure/Hardware related news	German
Industrie 4.0 Magazin	Technology and work life	German

Table 2: Relevant magazines for press outreach

The success of the EXCELLERAT media relations will be measured in pickups by the press ("clippings"). The list below with all clippings generated so far will be updated regularly. The participation at this year's SC in Denver was a success and was the perfect occasion to network and promote EXCELLERAT.

Source	Release Date	Channel	Link
Produktdaten journal	Feb 18	Online	http://prostep.epaper.pro/journal-2018-02/de/#36
Primeurmagazine	15 Oct 2018	Online/ Video	http://primeurmagazine.com/weekly/AE-PR-11-18-85.html

GCSnews	October 2018	Online	https://www.gauss-centre.eu/fileadmin/user_upload/PR_News/2018/Publications/GCSnews20/GCSnews_20_2018_final_sm.pdf#page=2
HPC Wire	12 Dec 2018	Online	https://www.hpcwire.com/off-the-wire/EXCELLERAT-to-bring-hpc-applications-to-engineering-industry/
INSiDE	Dec 2018	Online / Print	https://www.hlrs.de/fileadmin/user_upload/InSiDE_16-2_ES_web.pdf#page=7
IDW	Dec 3, 2018	Online	https://nachrichten.idw-online.de/2018/12/03/expert-panel-on-the-future-of-hpc-in-engineering/
Innovations Report	Dec 3, 2018	Online	https://www.innovations-report.de/html/berichte/veranstaltungen/live-chat-zur-zukunft-von-supercomputing-im-engineering.html
Innovations Report	January 30, 2019	Online	https://www.innovations-report.com/html/reports/information-technology/new-analysis-methods-facilitate-the-evaluation-of-complex-engineering-data.html
InsideHPC	March 21, 2019	Online	https://insidehpc.com/2019/03/european-commission-funds-10-centers-of-excellence-for-hpc/

Table 3: List of pickups in the media

3 Collaboration Plan

3.1 Collaboration Introduction

One of the main requirements for an intensive and customer-oriented development of HPC services for Engineering is a well-planned and continuously maintained collaboration network. To efficiently use EU resources, EXCELLERAT closely cooperates with other European research activities and initiatives to identify common issues in the field of HPC and to prevent those projects from investing into redundant efforts. As part of the FocusCoE[1] platform, EXCELLERAT already intensively collaborates with FocusCoE, EoCoE[2], POP CoE[3], Max CoE[4], ChEESE CoE[5], HIDALGO CoE[6] and CompBioMed CoE[7] to synergistically define strategies for extreme scale application in the EU HPC Ecosystem.

Besides the collaboration within the FocusCoE project, EXCELLERAT features a large number of existing and newly acquired collaborations with, e.g., European and national projects, companies and dedicated research groups that have been contacted during the first year of EXCELLERAT and are summarized in Table 4. To further extend the collaboration network, further potential partners will be identified and the EXCELLERAT partners are encouraged to establish new cooperation activities. To attract potential industrial customers and collaboration partners, information about the EXCELLERAT services has been disseminated in close collaboration with Task 7.1 (Dissemination and Communication) for example at the Forum Teratec 2019 and by interest groups webinars (see Section 4). The early dissemination of the EXCELLERAT services and the cooperation with industrial end users ensures that the specific industry requirements in HPC applications are taken into account in the early development phase within EXCELLERAT.

Project Partner	Collaboration Project
USTUTT	FocusCoE, HIDALGO CoE, CATALYST, CRESATA, bwWisu, bwWisu2
UEDIN	CompBioMed CoE, CompBioMed2 CoE
CINECA	MAX COE, ETP4HPC, I4MS ICT, Prace Preparatory Access, ChEESE CoE, Hi-Fi Turb, ENI s.p.a.
SICOS BW	RECOM SERVICES, OPTIMA PHARMA
KTH	EPiGRAM-HS, RIKEN, Scania, SeRC, FLOW
ARCTUR	DIH HPC5
CERFACS	MMG, AVBP, CVT, EPEEC
BSC	POP, EoCoE
FRAUNHOFER	ViPriA, VMAP, MADESI
TERATEC	POP CoE, FocusCoE
RWTH	SFB TRR40

Table 4: Overview of the EXCELLERAT collaboration projects

[1] https://www.focus-coe.eu/

[2] https://www.eocoe.eu/

[3] https://pop-coe.eu/

[4] http://www.max-centre.eu/

[5] https://cheese-coe.eu/

[6] https://hidalgo-project.eu/

[7] https://www.compbiomed.eu/

3.2 Detailed Collaboration of the EXCELLERAT Partner

In the following, an overview of the existing, newly acquired collaboration of the EXCELLERAT partners is provided (Table 5 - Table 15).

Institution	Collaboration Project	Collab. Partner	Related WP/Task	Time Frame
USTUTT	CRESTA, bwWisu, beWisu2	HLRS	WP4/T4.2	Ongoing - 2021
	Description: Development of the visualization tool Vistle (the VISualization Testing Laboratory for Exascale computing, is an extensible software environment that integrates simulations on supercomputers, post-processing and parallel interactive visualization)			
	FocusCoE	SCAPOS AG	All	Nov 2019 - Nov 2021
	Description: Representation of EXCELLERAT in the FocusCoE Activities, participation in the FocusCoE project board.			
	HIDALGO	ARH, ATOS, BUL, DIALOGIK, ECMWF, HLRS, ICCS, Know-Center, MOONSTAR, MK, PLUS, PSNC, SZE	WP3, WP4	Nov 2019 - Nov 2021
	Description: Evaluation and optimization of the HIDALGO CFD codes. Definition of optimal simulation parameters. Examination and improvement of the parallelization. Optimization of pre-processing, geometry preparation and mesh generation.			
	CATALYST	SCAPOS AG	WP4	Nov 2019 - Nov 2021
	Description: Exploration of Synergies in the area of Data Management, Data Analytics.			
	No name	ENCI, CEA, Airbus	All	Ongoing
	Description: Identify potential R&D Success stories with Airbus and Onera and work on prototypes to show the successful application of HPC to industry			

Table 5: Detailed Collaboration USTUTT

Institution	Collaboration Project	Collab. Partner	Related WP/Task	Time Frame
UEDIN	CompBioMed CoE	UEDIN, UCL, BSC, UvA, SURFsara, Uni of Oxford, Uni of Geneve, Uni of Sheffield, CBK, UPF, LifeTec Group, Acellera, Evotec UK Ltd, Bull (Atos), Janssen	All	Oct 2016 – Sep 2019

	Description: WP Leader for Sustainability and Innovation, Porting Applications and general User Support on local HPC systems, Co-author of two "HPC for Medics" courses.			
	CompBioMed2 CoE	UCL, BSC, UvA, SURFsara, Uni of Oxford, Uni of Geneve, Uni of Sheffield, CBK, UPF, Acellera, Evotec UK Ltd, Bull (Atos), Janssen, LRZ, Argonne and Rutgers	All	Oct 2019 – Sep 2023
	Description: Porting Applications and general User Support on local HPC systems, bringing in new Software Solutions, running webinar series in collaboration with VPH.			

Table 6: Detailed Collaboration UEDIN

Institution	Collaboration Project	Collab. Partner	Related WP/Task	Time Frame
CINECA	Prace Preparatory Access	/	WP3	Ongoing
	Description: HPC Performance Improvement for OpenFOAM linear solvers, creating an interface to external solver libraries such as PETSc/Hypre thus providing to the users a greater choice and flexibility when solving their cases. Increase the performances, in term of execution time, for very large test-cases (at least 50 M of cells) running on massively parallel cluster (order of thousands of cores).			
	ChEESE CoE	BSC, INGV, IMO, ETH, HLRS, CINECA, TUM, LMU, university Malaga, NGI, IPGP, CNRS, ATOS	WP3	2019 - 2022
	Description: Improve performance of linear solver algebra for simulation of solid earth. Optimization of ASHEE (Multiphase fluid dynamic model conceived for compressible mixtures composed of gaseous components and solid particle phases, based on OpenFOAM), bringing in new Software Solutions, running webinar series in collaboration with VPH.			
	Hi-Fi Turb	NUMECA, ERCOFTAC, DLR, Cenaero, CERFACS, Imperial College London, ONERA, ANSYS, DASSAULT AVIATION, UCLouvain, CINECA, UNIBG, BSC, Safran, TSAGI	WP3	2019 - 2022
	Description: Improving the capabilities of models for complex fluid flows, offers the potential of reducing energy consumption of aircraft,			

	cars, and ships, with consequent reduction in emissions and noise of combustion based engines.

Table 7: Detailed Collaboration CINECA

Institution	Collaboration Project	Collab. Partner	Related WP/Task	Time Frame
SICOS BW	RECOM SERVICES	HLRS	WP4/T4.2	2019
	Description: With the help of the 3D simulation software RECOM-AIOLOS, specially designed by RECOM for industrial furnaces, the combustion and pollutant formation processes of the plant process can be mapped in virtual reality without any effects on the running operation time, for very large test-cases (at least 50 M of cells) running on massively parallel cluster (order of thousands of cores).			
	OPTIMA PHARMA	HLRS	WP4/T4.2	2018
	Description: By using simulation and visualization technologies, OPTIMA pharma visualizes the air flows in clean room systems as an essential quality factor. The medium-sized company thus minimizes the risk of planning errors, accelerates the planning process and achieves cost savings.			

Table 8: Detailed Collaboration SICOS BW

Institution	Collaboration Project	Collab. Partner	Related WP/Task	Time Frame
KTH	EPiGRAM-HS	EPCC, ETH, FRAUNHOFER, CRAY, ECMWF	WP2, WP3	2018 - 2019
	Description: Modernization/refactoring of Nek5000, targeting heterogeneous systems.			
	RIKEN	RIKEN	T3.2, T4.2	2016 - 2021
	Description: Methods for extreme-scale industrial CFD, including in-situ techniques, dynamic load balancing methods and adaptive mesh refinement.			
	Scania	Scania	N/A	2015 - 2021
	Description: Optimization of industrial CFD use cases using ISV codes; benchmarking of various hardware options.			

Table 9: Detailed Collaboration KTH

Institution	Collaboration Project	Collab. Partner	Related WP/Task	Time Frame
ARCTUR	DIH HPC5	eXact Lab, Info.era, Sontius, Spin, Vahta, Xlab	WP6	Sep 2017 on-going
	Description: HPC5 stimulates and sustains a business growth system in technologically oriented vertical niches focusing in the Slovenia-Italy cross-border region.			

Table 10: Detailed Collaboration ARCTUR

Institution	Collaboration Project	Collab. Partner	Related WP/Task	Time Frame
CERFACS	MMG	INRIA	WP2	On-going
	Description: Use case C3U1 relies on mesh adaptation techniques developed for sequential execution by INRIA on the open source library MMG. The collaboration with INRIA dates back to 4 years as we evaluate and develop new metric methods to use MMG on complex physical cases.			
	AVBP	CORIA	WP2	2019 - 2020
	Description: CERFACS and CORIA have a long history of collaboration for CFD applications. They have worked in the past on parallel mesh adaptation techniques for incompressible flows. The current collaboration focuses on extending methods developed by CORIA to compressible flows and introducing them to AVBP.			
	CVT	GENCI	WP3	2019
	Description: CERFACS is part of the technology watch group of GENCI, the tier1 and PRACE systems manager for France. Within the CVT collaboration access and support is provided to CERFACS to port and optimize the code on new architectures. Within EXCELLERAT this concerns for now the ARM thunderx2 architecture and will be extended in 2020 to AMD Roma. This work is included in the WP3 node level and system level optimization tasks.			
	EPEEC	CERFACS	WP2, WP3	2019 - 2021
	Description: In the H2020 project, EPEEC, CERFACS developed a parallel hierarchical mesh partitioner for optimized load balancing in many core systems. Within EXCELLERAT we have extended it for load rebalancing and support for int64 required for mesh adaptation (WP2: use case C3U1). Also this partitioner is required for massively many core systems and is use in the WP3 system level optimization task.			

Table 11: Detailed Collaboration CERFACS

Institution	Collaboration Project	Collab. Partner	Related WP/Task	Time Frame
BSC	POP	/	WP3, T3.1	May 2019 - ongoing
	Description: Apply load balancing strategies for chemical reactions in detailed chemistry			
	EoCoE	BSC-INFIRA	WP2	2019
	Description: Using a better solver for the Poisson equation in replacement of GMRES and Conjugate Gradient			

Table 12: Detailed Collaboration BSC

Institution	Collaboration Project	Collab. Partner	Related WP/Task	Time Frame
FRAUNHOFER	ViPriA	SCALE, SIDACT, AUDI, Porsche, Volkswagen	WP4, T4.3	Oct 2019-Sep2022
	Description: The goal of the project ViPriA is the development of intelligent assistance systems based on artificial intelligence and machine learning approaches to support engineers in simulation-based, virtual product development.			
	VMAP	29 partners from 6 countries	WP4, T4.3	Sep 2017 – Aug 2020
	Description: The VMAP project will create new concepts for a universal material exchange interface for virtual engineering workflows. These concepts will be concretized in an open software standard.			
	MADESI	TU Darmstadt, Weidmüller Monitoring Systems, ZF Friedrichshafen	WP4, T4.3	Oct 2018 – Sep 2022
	Description: The analysis of sensor data of machines, plants or buildings makes it possible to detect anomalous states early and thus to avoid further damage. For this purpose, the monitoring data is searched for anomalies. By means of machine learning, anomaly detection can already be partially automated.			

Table 13: Detailed Collaboration FRAUNHOFER

Institution	Collaboration Project	Collab. Partner	Related WP/Task	Time Frame
RWTH	SFB TRR40	TU Braunschweig, UniBw Munich	WP4, T4.3	Jul 2019 – Jun 2020
	Description: Apply dynamic mode decomposition of experimental and numerical data provided by TU Braunschweig and UniBw Munich			

	to analyse the unsteady dynamics in the base flow field of space launchers.

Table 14: Detailed Collaboration RWTH

Institution	Collaboration Project	Collab. Partner	Related WP/Task	Time Frame
TERATEC	FocusCoE,	CEA, KTH, HLRS, BSC, UCL, ENEA, PRACE, ICHEC,	WP3, WP5	Dec 2019 – Nov. 2021
	Description: coordination and implementation of activities supporting the CoEs in connecting to the industrial ecosystem in helping in promoting their services to potential clients			
	POP	BSC, USTUTT, IT4I, FZ Juelich, NAG, RWTH, UVSQ	WP2, WP3	Dec 2019 – Nov. 2021
	Description: Business Development and Sustainability, assessment of the experiments and customer advocacy			

Table 15: Detailed Collaboration TERATEC

4 Community Building

4.1 Approach

The goal on this activity is twofold: First, to ensure that EXCELLERAT is recognised by developers and users of engineering applications codes as a new key player in their ecosystem for Exascale codes in engineering, and second to link EXCELLERAT and its activities to the communities of academics and industrial users and developers, who are potential customers of EXCELLERAT's services.

The approach in EXCELLERAT (as described in D7.2 "Initial Dissemination and Collaboration Plan" [1]), is the following: to connect to already established communities instead of building "new" communities and to connect EXCELLERAT and its activities and services to these already existing communities. By doing so, EXCELLERAT gains awareness amongst potential clients and among the ecosystem of HPC engineering applications in general. To this end, we collected information from all EXCELLERAT members on national (or regional) communities and events, which are relevant to EXCELLERAT (cf. Annex).

The second pillar of EXCELLERAT's approach are the Interest Groups. A key challenge for EXCELLERAT is the integration of external stakeholders to its value network in the project's evolution process. This interaction with entities external to the consortium will enhance the success and sustainability potential of the Centre, as well as ensuring a multiplication of the available knowledge. The goal is to widen the awareness and encouraging further use of HPC in Europe.

4.2 Implementation

In order to agree on some common community related actions this input was discussed and amended with the EXCELLERAT partners during the All-hands meeting in Bologna (November 2019). Currently, we will mainly concentrate the efforts on the HPC developer and researcher communities, as the service portfolio and the business model of EXCELLERAT needs to be more advanced to engage discussion with potential clients in industrial clients (and academia). Table 16 below gives an overview of the foreseen activities in this domain for the next months.

Objective	Community activities
Establish EXCELLERAT as key player for researchers, developers, and HPC specialists for engineering applications	Apply for a Minisymposium at PASC 2020 [8]
	Workshop: "Optimised use of FPGA in ARM architectures"
	Birds of a Feather (BoF) or similar event at ISC20 or SC20 on "Data Analytics for HPC engineering applications"
	BoF or similar event at ISC20 or SC20 on "Co-design"

Table 16: Implementation

The activities reaching out to potential clients, especially in industry, have already started and will be pursued. They will gain more importance in the second half of the project, once the service portfolio and the service offerings are well defined. Currently, the following actions are planned:

[8] https://pasc20.pasc-conference.org/

- Involvement in the NAFEMS Iberia Conference, which is taking place in Barcelona in May 2020.
- Apply for a Workshop ("Collateral Event" or "Exhibitor Initiatives") at the CAE Conference[9] in 2020 or 2021.
- With support of FocusCoE, EXCELLERAT will attend more industrial sectorial events: Forum Teratec (June 2020); Digital Factory (as part of the Hannover Fair), April 2020.

4.3 Work Involvement of the Interest Groups

EXCELLERAT has decided to establish the so-called Interest Groups, with their main goal being the communication, monitoring and validation of the project's overall goal and the industrial, as well as technological relevance for the user communities. The Interest Groups are structured in such a way that allows providing the viewpoints of the different actors of the Centre´s value chain: Code Developers/ISVs, Industrial End Users, Scientific Experts and Technology Providers.

The first webinar for the Interest Groups was done and recorded at the beginning of November 2019. The agenda for this webinar is presented in Table 17 below.

Topic
Introduction
Role of the Interest Groups in EXCELLERAT
Presentation of the Project (Overview of EXCELLERAT)
Presenting our new HPC data exchange platform
Video + Work plan for Vistle (Visualisation)
Presentation of the BigWhoop compression library
First Preview of the Service Portal
Questions and Advice
Summary

Table 17: IG Webinar Agenda

The purpose of this webinar was to give the IG an overview about the recent results of EXCELLERAT and the project as well as integrating them into the process. Different Interest Groups including the following:

- ISVs (offering software and service in the domain of civil engineering)
- Software developers (in academia and in industry), who contribute to the development of the EXCELLERAT application codes (or similar applications)
- Users (from academia and industry), who are interested in making sure that the future applications development's take their requirements into account
- Trade unions, who may act as interface between the application developers and the end users, as for example.

Thanks to the IG Webinar, it is easier to communicate with the IG members, since they now understand the purpose and the use of EXCELLERAT even better. The members will be notified, if events within the project would be interesting for them. That might provide the ability to even meet in person, discuss the further steps and get some feedback.

[9] https://www.caeconference.com/

As a result of the IG, EXCELLERAT will be able to grow and adapt according to the important counselling from the Groups. Furthermore, all of the EXCELLERAT members are able to collect more helpful information to provide the best possible services in the end.

5 Standardisation

5.1 Identification

The identification of useful new standards for HPC community is always tricky. Indeed, the community is extremely small, and even limited to the CFD community, but the diversity of problems has proven to be large. This situation makes difficult the spontaneous emergence of HPC standards.

Therefore, our identification process started the supposed end of the story, which is far from the present situation of HPC players:

This point of view was made possible because of the ten year of HPC production runs done by Safran Group, for engineering purposes, using AVBP, on a Tier-1 machine. To collect objective information, we used a joint "KAIZEN" meeting on the industrialization aspect between three Safran Group engineers and four CERFACS representatives. The outcome of the 2-day meeting is confidential, but many ideas can be reformulated in a more global way.

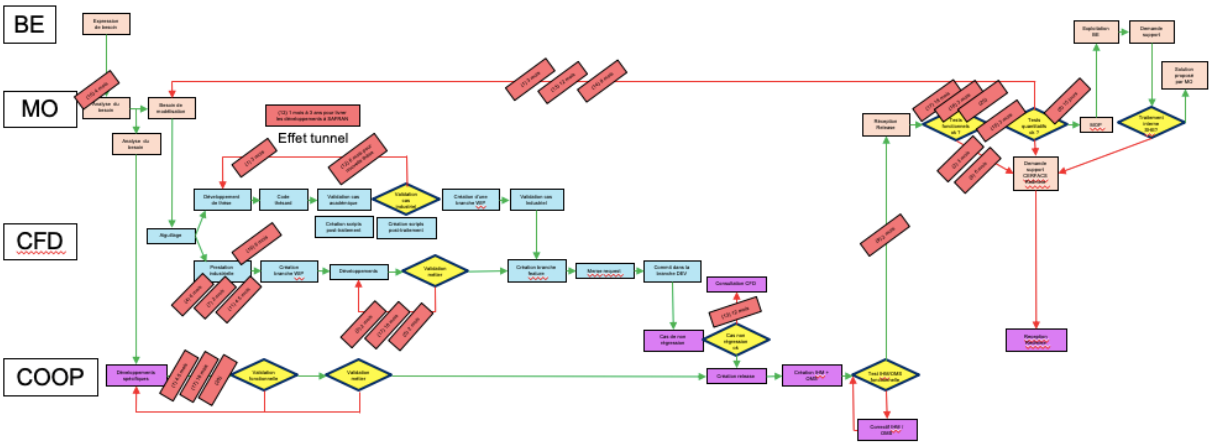

Figure 1: Breakdown of the Industrialization process of AVBP

As shown in Figure 1, an HPC solver, between Safran Group and CERFACS. Taken from the KAIZEN workshop at CERFACS (blurred for confidentiality.)

To help this reformulation, let us use the following user story: A Tier-0 HPC centre manager performs a survey on the past year production. The survey must prove that the power consumption was efficiently converted into mainly engineering answers. This user-story helps to imagine the future bottlenecks we will face, not while developing HPC for engineers, but while using HPC for engineers on a large scale. We divided these bottlenecks into three large categories:

1. Crashes,
2. Performances,
3. Sustainability.

The remaining section detail the ideas that are under investigations in this Standardization work.

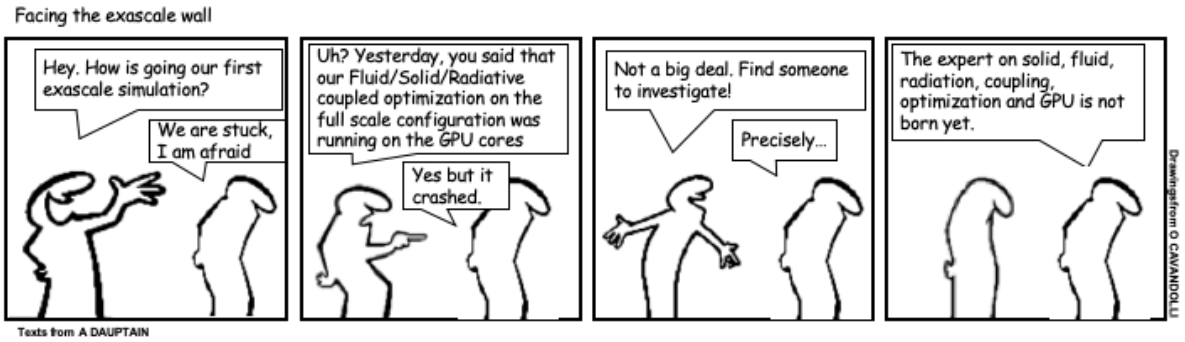

Figure 2: Comic Strip #1 from the future HPC blog on the website (www.excellerat.eu [3])

Crashes

HPC runs crash for many reasons. A very interesting action would be to extract value from these crashes.

A first idea is a "Standard Error Code" collected in the scheduling log. This would give figures on the crash origins: setup mistakes stopped by the parser, unphysical solution stopped by the modelling step, unacceptable iterative process stopped by the numeric, unacceptable configuration stopped by the data structure. Such figures would be really helpful to set priorities for code developers.

A fair amount of jobs stops comes from the reading of inputs files. We found two promising approaches to limit drastically these crashes on two levels: "parsing", then "validating".

Digging deeper, many errors are simply linked to the use of the wrong version. For example, the user asks from the solver a functionality not implemented in the version installed. Using a homogeneous versioning strategy would greatly reduce support and frustration of the players form this aspect.

Finally, the crashes that created the longest supports were the cross-competency bugs, i.e. when a bug arises from the unexpected clash of many fields: numeric, physics, data structure, compiler, optimization process, post processing. This suggests several threads to follow such as "dependency inversion" or "competencies splitting", but these ideas are not mature enough in this specific field to be prioritized yet.

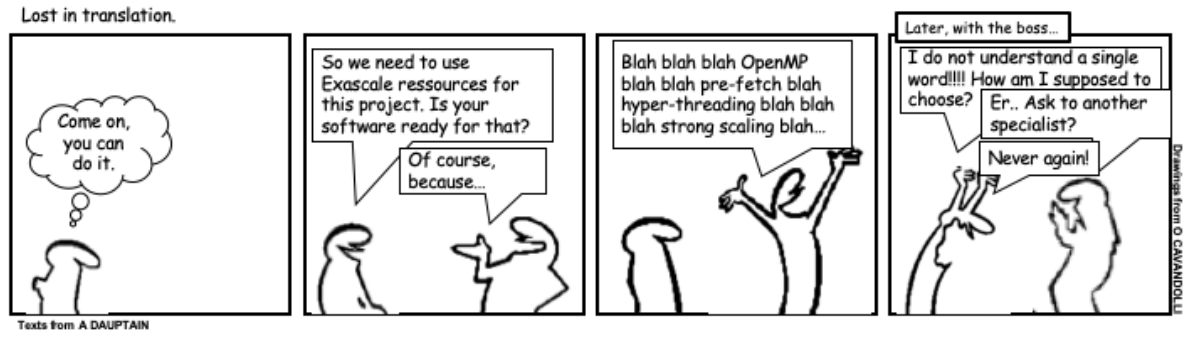

Figure 3: Comic Strip #2 from the future HPC blog on the website (www.excellerat.eu [3])

Performances

Understanding HPC performances and comparing them fairly is always extremely difficult. One obvious idea is to create a unified "score card" for performances, if not on a global scale, at least on each machine. However, as EXCELLERAT core target is "Exascale for engineering", this topic must be more focused on "performance with respect to one engineering problem". This point of view is however seldom addressed, and probably requires the development of a specific HPC performances training.

Sustainability

Even if simulations are usually cheaper than experiments, the risk of not getting the needed design at the needed time is relatively high: errors in the setup, wrong modelling choices, high sensibility to a purely numerical parameter. The communication on simulation results on HPC needs special care.

If the production spans over several years, the same results must be obtained regardless of the solver versions, the queuing strategy (i.e. nb. of cores), or the machines. This is called Repeatability. However, some small differences can appear and propagates through these highly non-linear simulations. As a consequence, there is a strong need for a clear approach to define is the difference between two runs of the same simulation is acceptable or not, in other words an acceptable repeatability, for a specific engineering problem.

The drawback of having a production version is the continuous efforts required to keep it running: porting, training, debugging, testing. Such activities are not very compatible with the usual work of the academically team which developed the software. Finding a sustainable human network to back the production is a real challenge. On the technical side, a code able to evolve with a sustainable support, imply established coding standards and some software engineering best practices adapted to HPC.

Finally, an engineering problem can reasonably be solved on the future tier-0 machines only if the energetic footprint of the computation is affordable and decreasing.

5.2 Elaboration

In the first year, we started with the "crashes" topic. The parsing was investigated and gave two outcomes. As HPC solvers usually rely on low-level languages like C, C++ of Fortran, writing an in-house parser is common practice. However, the input files should always use a mainstream serialized input format adapted to human edition, such as YAML, TOML. In the case of Fortran, the Fortran Name lists is a built-in parser already on the shelf. It is limited, but often more complete than any other in-house Fortran-written parser. Furthermore, python packages (f90nml, name list) handles the reading/writing from a higher level.

By doing so, the parsing can be done using a mature and thoroughly-tested parser. At CERFACS, we created a setup wizard for AVBP using YAML input files (available upon request), and moved the input file of AVTP- a fork from AVBP- dedicated to thermal problem, to Fortran Name lists. These two actions allowed us to test the limits of these input formats.

The validation step was studied as we tried a tiny HPC-as-microservice experiment. On the web, queries are validated using the extremely mature Json-SCHEMA standard[10]. It was straightforward to consider the input files as "queries" and perform complex validation operations by using pre-existing tools such as jsonschema in Python3. We now recommend the use of SCHEMA instead of the numerous ifs tests that usually check the inputs of an HPC

[10] https://json-schema.org/

solver. Indeed, this part is often the source of the highest cyclomatic complexity (i.e. bugs are hiding there) and should not be manually rewritten.

Only one versioning strategy really appeared as a standard. It is the semantic versioning[11] already in use for python packages for example. This will become a must-have for production, since probably most of the higher-level environments will already follow this rule.

Finally, the standard error code is still under investigation. We plan to test it in the next months within the solver AVBP. The biggest question is how to effectively log the error codes in the job scheduler database, or a separate database in open format. Once this done, a 6-month trial on the internal CERFACS production will tell if this idea gives a valuable insight.

In the next years, we will focus on "sustainability" and "performances" topics.

5.3 Diffusion

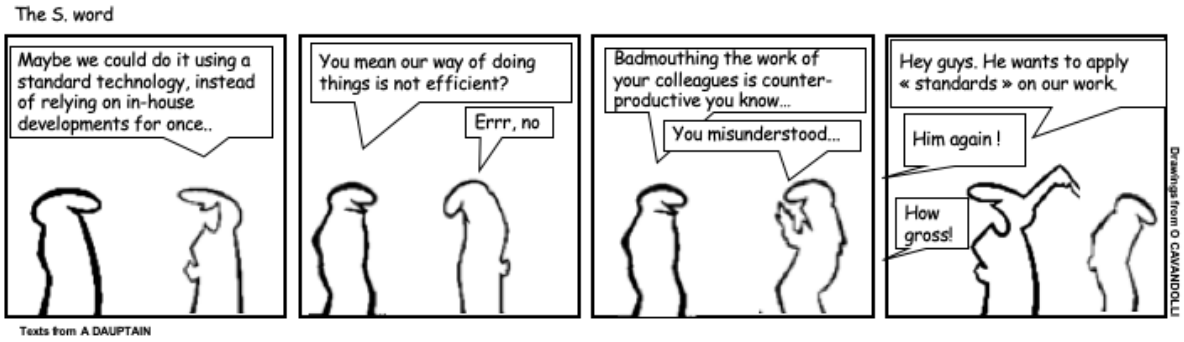

Figure 4: Comic strip #3 from the future HPC blog on the website (www.excellerat.eu [3])

Standardization is not an appealing topic for HPC software developers. For the time being, the diffusion will rely mostly on online training (using jupyter notebooks for example) and example software. Some resources are already online[12], and will be transferred to the EXCELLERAT portal.

The code quality is more easily accepted if a tool can automatically check the quality versus the standard, and give a score. These tools are often called "linters". As many CFD HPC solver are in Fortran, and Fortran linters are part of commercial packages, we created a small, free and open source Fortran linter[13], with a customizable standard merging some PEP008 ideas and the existing Fortran90/95 convention[14]. We will see if this tool can reach its audience.

We also developed a small-scale CFD code[15] (not HPC) to illustrate and train on the core ideas of software engineering that seem to be applicable to HPC.

Finally, a blog illustrating with comic strips (please see Figure 2, Figure 3 and Figure 4) the concepts arising during this task of standardization will probably be added/mirrored on the EXCELLERAT official portal. Some of the strips were used in this section.

[11] https://semver.org/spec/v2.0.0-rc.2.html

[12] http://cerfacs.fr/coop/

[13] https://pypi.org/project/flinter/

[14] https://alm.engr.colostate.edu/cb/wiki/16983

[15] https://pypi.org/project/barbatruc/

6 Conclusion

Deliverable 7.3 summarizes the results so far regarding, amongst other things, Communication and Collaboration. These will be the driving force in EXCELLERAT, even more in the upcoming future. It is also important for the development of getting the needed expertise and consulting. Overall for EXCELLERAT there is a clear need for community building, which is in works and already growing thanks to the Interest Groups. The clear benefit for EXCELLERAT is that the CoE will be more visible and understandable.

This deliverable outlined the project's work and next steps for WP7 to assist and to support EXCELLERAT overall. The selection of these concrete approaches is based on present requirements as well as the constraints of the project. If some requirements change, it will be adapted accordingly. Further steps and details will be presented in the next Deliverable for WP7.

The project is still in progress therefore the data from this document will be changed and updated for the next report. In the next phase of WP7, there will be a great focus on collaboration, especially with the Interest Group members. The approach towards community building will be continued as planned, which will be described in more detail in deliverable D7.4 "Updated Dissemination, Communication, Collaboration, Community Building and Standardization Report" (Table 18).

Number	Title	Due	Status
D7.1	Website, Corporate Design and Template	PM 2	Submitted
D7.2	Initial Dissemination and Collaboration Plan	PM 3	Submitted
D7.3	Dissemination, Communication, Collaboration, Community Building and Standardization Report	PM 12	Submitted
D7.4	Updated Dissemination, Communication, Collaboration, Community Building and Standardization Report	PM 24	To be submitted
D7.5	Final Updated Dissemination, Communication, Collaboration, Community Building and Standardization Report	PM 36	To be submitted

Table 18: Deliverables

The first milestone (Table 19) to be reached in EXCELLERAT with the help of Work Package 7 was the project kick off. This work package has supported this. The second milestone: MS6 will not be due until the project closes.

Number	Title	Due	Status
MS1	Project Kick Off	PM 1	Done
MS6	Final Reports of all project outcomes and project close	PM 36	To be done

Table 19: Milestones

7 References

[1] EXCELLERAT project, D7.2 “Initial Dissemination and Collaboration Plan”
[2] EXCELLERAT project, D7.1 “Website, Corporate Design and Templates”
[3] EXCELLERAT project, https://www.excellerat.eu

Annex: Input from the EXCELLERAT Partners on Community

Topics for Workshops/BoFs or similar events

- Machine Learning for CFD.
- Performance analysis and optimization of our code.
- Good practices in HPC and physical modelling code development.
- Future of computational engineering.
- The challenges of Exascaling engineering codes.
- HPC and Scientific Programming in Fortran (highlight the advantages of this language, which is often perceived as old-fashioned).
- Envisaged critical bottlenecks on incoming (pre) Exascale machines. Are our codes ready?

National / regional communities, events and communities relevant to EXCELLERAT's topics

Country	Events/communities/associatioms
Italy	Events https://corsi.cineca.it/en/hpc/school-numerical-methods-parallel-cfd/roma-20191202 https://www.caeconference.com/
Spain	NAFEMS Iberia https://www.nafems.org/about/regional/iberia/ Digital Innovation Hubs Spanish Digital Innovation Hub for HPC https://s3platform.jrc.ec.europa.eu/digital-innovation-hubs-tool/-/dih/1168/view • Clusters (regional) • Cluster Automotive Sector in La Rioja http://www.aeiriojaautomocion.es/en/homee/ • Cluster Automotive Sector in Valencia https://avia.com.es/?lang=en • Cluster Automotive Sector in Aragon https://www.caaragon.com/ • Cluster Automotive Sector in Castilla y Leon https://www.facyl.es/en/ • Cluster Automotive Sector in Galicia http://www.ceaga.com/index.asp • Cluster Automotive Sector in Madrid http://www.mcautomocion.es/ • Cluster Automotive Sector in Catalonia https://ciac.cat/en/welcome • Cluster Aeronautic Sector in Aragon http://aeronauticaragon.com/ • Cluster Aerospace Sector in Basc Contry http://www.hegan.com/ • Cluster Aerospace Sector in Madrid https://www.madridaerospace.es/en/

	• Cluster Aerospace Sector in Andalucia http://www.helicecluster.com/
Germany	- Industrie und Handelskammer IHK (Chamber of Commerce and Industry), Stuttgart - RKW Baden-Württemberg Rationalisierungs- und Innovationszentrum der Deutschen Wirtschaft Stuttgart - Leichtbau BW GmbH Landesagentur für Leichtbau Baden-Württemberg, Stuttgart - Landesverband der Baden-Württembergischen Industrie e. V.
France	Events Forum Teratec Vivatechnology (https://vivatechnology.com/) NAFEMS events Smaller events, such as IFPEN seminar, etc. ISV events, such as ESI Group (OpenFOAM), Ansys) Clusters and other associations (national) Boost aerospace (aeronautique industry + suppliers) http://www.boostaerospace.com/ AFNET http://afnet.fr/ Competence Cluster Aerospace Valley https://www.aerospace-valley.com GIFAS https://www.gifas.asso.fr/ PFA (plateforme filière automobile: grand groups + PME autour de l'automobile) https://pfa-auto.fr/ VEDECOM (http://www.vedecom.fr/) Moveo: Competence Cluster https://pole-moveo.org/

Table 20: National/Regional communities and events