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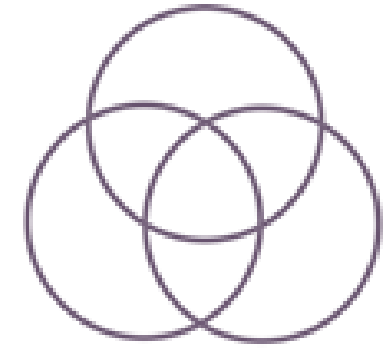
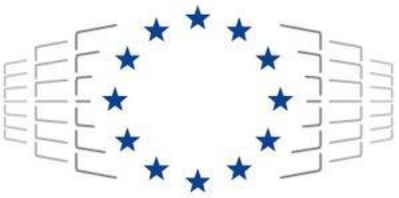


Coordination & Support
for National Competence Centres on a European Level Phase 2

Project Number: 101102047

D4.2

Intermediary Report on the Actions performed to support the NCCs and the CoEs' Interactions with Industry



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Work package:	4	NCCs, CoEs and Industry Interactions	
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2024-11-15	Marie-Françoise Gerard	Initial draft	V0.1	Detailed plan proposal to the task leaders to collect their respective inputs
2024-11-27	Marie-Françoise Gerard	Consolidated version with the feedback from Guntram Berti, Miriam Koch and Karin Schlottke, Gular Samadova (Task leaders)	V0.3	Consolidated version sent to the internal reviewers
2024-12-05	Maria-Ribera Sancho Maksym Deliyergiyev	Peer reviews done and sent back to WP4 leader	V0.3	Peer reviews

2024-12-09	Marie-Françoise Gerard	Consolidated version addressing the peer reviews	V2.0	Consolidated version for the PMT check
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2024-12-16	Marie-Françoise Gerard	Consolidated version to include the annexes in PDF in the finalized version to be submitted by the PMT	V2.2	

List of abbreviations

AI	Artificial Intelligence
CASTIEL[1-2]	Phase [1 or 2] of CASTIEL
C2ISS	EuroCC-CASTIEL Information Sharing System
CC	Competence Centre
CC-FR	French Center of Competence in HPC, HPDA, and AI[1]
CFD	Computational Fluid Dynamics
CoE	Centre of Excellence
COLA	Collaboration Agreement
CSA	Coordination and Support Action
D.X	Deliverable X
EC	European Commission
EDIH	European Digital Innovation Hub
EN	English
EOSC platform	European Open Science Cloud platform [2]
EuroCC[1-2]	Phase [1 or 2] of EuroCC
EuroCC4SEE	Complementary project to EuroCC with 5 new NCCs
GA	Grant Agreement
HPC	High Performance Computing
HPC+	HPC/HPDA/AI
HPDA	High Performance Data Analytics
IWG	Industry Working Group
JU	Joint Undertaking
M	Months
NCC	National Competence Centre
NGO	Non-Governmental Organisation
PMT	Project Management Team
PO	Project Officer
PoC	Proof of Concept
SME	Small and Medium-Sized Enterprise
TPR	Technical Progress Report
T.X	Task X
UTARTU	University of Tartu
Q	Quarter
WG	Working Group
WP	Work Package

[1] https://cc-fr.eu
[2] https://open-science-cloud.ec.europa.eu/

Executive Summary

CASTIEL2 is the Coordination and Support Action (CSA) of the EuroCC2 and EuroCC4SEE projects, which are composed of 33 National Competence Centres (NCCs), and of the 14 (as of November 2024) active Centres of Excellences (CoEs) in Europe. The Work Package 4 (WP4) of CASTIEL2 entitled "NCCs, CoEs and Industry Interactions" has the overall objective to enable effective interactions and activities of the NCCs and the CoEs to support adoption and use of HPC (and associated technologies like AI and HPDA) for a broad variety of potential users, beyond academic research. This is being performed by CASTIEL2-WP4 by working on four main axes:

- On the topics related to the improvement of the NCCs' and CoEs' skills regarding their local development and promotion around their services [this being covered by task 4.1]
- On the structuration of the NCCs' and CoEs' services and the promotion of those services, particularly (but not limited to) through the topic of the LinkHPC topic, now re-named "HPC Service Hub" (i.e. a platform being designed and developed around the WALDUR[3] solution, that will display information about the services available in the EuroCC network at the European central level and at the NCCs national level) [this being covered by task 4.4]
- On the support to the NCCs and CoEs to increase and extend engagements with established and potential industrial end-users (in particular SMEs) or other relevant target groups (ex: public administration), and to amplify the NCCs' and the CoEs' collective impact through actions like the "Code of the month" series, or through the organisation of thematic clusters and webinars.
- On ensuring the communications between the representatives of the NCCs and CoEs working on industry topics, to provide a clear exchange of knowledge, lessons learned and best practices regarding industry topics inside and outside the EuroCC2 - EuroCC4SEE -CASTIEL2 networks.

This deliverable D4.2 is the second and intermediary report on the actions performed to support the NCCs' and the CoEs' interactions with industry and other target groups by CASTIEL2-WP4 during the second year of CASTIEL2. This document presents the strategies, the methodologies, and also the main outcomes and results of the works done with regards to the industry interaction topics among the NCCs and the CoEs thanks to the coordination and support from CASTIEL2 during the second year of the project, and what this brought to the NCCs and CoEs as new skills, tools or instruments for their benefits, to support them in their interactions with industry as a whole, and other targets groups (e.g. public administration, NGOs, hospitals and others).

This deliverable reports and presents key actions and outcomes that occurred in 2024. Therefore, the elements that led to an extra-review in September 2024 and its related outcomes, along with the work performed in the new dedicated task force about the LinkHPC/HPC Service Hub platform (previously called "marketplace") are explained. Additionally, the new Task 4.4 "HPC Service Hub Implementation for the Network" is introduced along with the works performed in this new task during September-December 2024. With this new Task 4.4 and its related task force, the network is trying a new approach to set up a platform that will make the information about the EuroCC services visible for potential users at both the national and the European level.

[3] Waldur is a platform for managing private clouds, public clouds and HPC Centres. It automates OpenStack and Slurm, has billing, user self-service and support desk: https://waldur.com/. This solution is being used and adapted to the specific needs of the EuroCC2 network to display information about the services available in the network.

During this second year of CASTIEL2, WP4 provided the NCCs and the CoEs with valuable customised trainings so that they are better prepared to interact with industry (particularly SMEs), by learning how to adapt their mindsets, their ways of communication and their presentation of services.

WP4 also enhanced the sharing of existing lessons learned and experiences among the NCCs and the CoEs by launching new series of workshops such as the “Industry sector of the month” series, the “Dos & Don’ts” series, and by continuing the previous “Code of the month” series. This ensured that the NCCs and the CoEs can get inspiration on what is working well in other entities and for them to avoid trying less relevant actions, when it comes to interact with industry or with other target groups. The NCCs and CoEs were also able to identify key information about the CoEs’ codes or about some industry sectors that are often addressed by the NCCs or the CoEs.

Lastly, “Industry virtual coffee breaks” and the organisations of several webinars with other initiatives allowed the industry champions to be informed about the news and the knowledge of the network or from other external projects and initiatives (e.g. the “Security in HPC system” webinar, the POP3 webinar, etc.).

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1 Introduction

CASTIEL2 is the Coordination and Support Action (CSA) of the EuroCC2 and EuroCC4SEE projects, which are composed of 33 National Competence Centres (NCCs), and of the 14 (as of November 2024) active Centres of Excellences (CoEs) in Europe. The Work Package 4 (WP4) of CASTIEL2 entitled "NCCs, CoEs and Industry Interactions" has the overall objective to enable effective interactions and activities of the NCCs and the CoEs to support adoption and use of HPC (and associated technologies like AI and HPDA) for a broad variety of potential users, beyond academic research. This is being performed by CASTIEL2-WP4 by working on four main axes:

- On the topics related to the improvement of the NCCs' and CoEs' skills regarding their local development and promotion around their services [this being covered by task 4.1]
- On the structuration of the NCCs' and CoEs' services and the promotion of those services, particularly (but not limited to) through the topic of the LinkHPC-WALDUR platform [this being covered by task 4.4]
- On the support to the NCCs and CoEs to increase and extend engagements with established and potential industrial end-users (in particular SMEs) or other relevant target groups (ex: public administration), and to amplify the NCCs' and the CoEs' collective impact through actions like the "Code of the month" series, or through the organisation of thematic clusters and webinars.
- On ensuring the communications between the representatives of the NCCs and CoEs working on industry topics, to provide a clear exchange of knowledge, lessons learned and best practices regarding industry topics inside and outside the EuroCC-EuroCC4SEE-CASTIEL2 networks.

This deliverable D4.2 presents the strategies, the methodologies, and also the main outcomes, the results of the works done and their added value for the NCCs and CoEs, when it comes to industry interaction topics among the NCCs and the CoEs thanks to the coordination and support from CASTIEL2 during the second year of the project.

Section 2 of this deliverable provides the context by shortly reminding of the overall objectives of CASTIEL2-WP4, its management and structure.

Section 3 explains the objectives, the strategy, the performed work, the outcomes from the year 2024, and the plans for the next steps of the Task 4.1 "Contribution to the C2ISS and the evolved EuroCC ACCESS Portal Design. Contribution to the improvement of the NCCs and the CoEs skills for them to define and promote their services for various target groups". The major changes of the strategy in this task that were decided during this second year of the project are justified and explained.

Section 4 explains the objectives, the strategy, the performed work, the outcomes from the year 2024, and the plans for the next steps of the Task 4.2 "NCCs, CoEs – industry interaction support". The reasons of replacing some previous actions by different ones to take into account the challenges of the NCCs and CoEs and to support them in the most relevant way are presented there.

Section 5 explains the objectives, the strategy, the performed work, the outcomes from the year 2024, and the plans for the next steps of the Task 4.3 "NCCs – CoEs Exchange and Knowledge - Sharing on Industry Interactions". This task launched several series of workshops and webinars to enhance the exchange of information and knowledge with regards to the interaction with industry and other target groups among the NCCs and CoEs.

Section 6 explains the objectives, the strategy, the performed work, the outcomes from the year 2024, and the plans for the next steps of the Task 4.4 “HPC Service Hub implementation for the network”. This new task, added to WP4 at the end of 2024 is presented, along with its first actions and outcomes.

Section 7 presents the meetings and workshops that are transversally monitored by WP4.

Section 8 summarises the key major achievements and provides concluding remarks.

Section 9 and 10 gather the list of references and the annexes, respectively.

2 Work Package 4 of CASTIEL2: "NCCs, CoEs and Industry Interactions"

2.1 Objectives and Management of Work Package 4

Work Package 4 (WP4) of CASTIEL2 aims to establish and support effective interactions and activities of the NCCs and the CoEs to support adoption and use of HPC (and associated technologies like AI and HPDA) for a broad variety of potential users, beyond academic research. This includes the private sectors (particularly SMEs, but also larger industry), or e.g. public administrations, or public and private research institutes. The activities of WP4 consider the specific needs of the national & European HPC ecosystem, and the priority target groups of the NCCs and the CoEs.

Following the Grant Agreement (GA), Task 4.1 (T4.1) oversees the "Contribution to the C2ISS and the evolved EuroCC ACCESS Portal Design (including the marketplace)". For practical reasons, as the "marketplace" will not have an e-commerce aspect (i.e. doing business via this platform was never in scope) and to highlight the *ecosystem interaction and connection* aspect, the "marketplace" was re-named "LinkHPC platform". Therefore, until the extra review on this specific LinkHPC topic in September 2024, T4.1 was in charge of the discussions about the LinkHPC platform. Following the extra review and the decisions taken there, the WALDUR solution was adopted, and later on a new name for the platform in development was chosen: HPC Service Hub. Therefore, from now on, the terminology used is "Waldur -HPC Service Hub" instead of "LinkHPC" or "marketplace".

Additionally, as the concept of marketplace/LinkHPC platform is actually about services and offers, and about how to practically support the NCCs and CoEs to develop them, in 2024, T4.1 also organised several actions and initiatives in favour of the development and enrichment of offers and services, and the promotion of those among the NCCs and the CoEs.

Task 4.2 (T4.2) is in charge of "NCCs, CoEs – Industry Interaction Support". T4.2 supports the CoEs and the NCCs to increase and extend engagements with established and potential industrial end-users (in particular SMEs) but also other relevant target groups (ex: public administration or NGOs), and to amplify the NCCs and the CoEs' collective impact.

Task 4.3 (T4.3) is in charge of "NCCs – CoEs Exchange and Knowledge - Sharing on Industry Interactions". It manages an "industry relations" working group with NCCs and CoEs as members, which discusses and frames the challenges and requirements of establishing effective and impactful interaction with industry, by for instance ensuring that both NCCs and CoEs have access to all relevant industrial interaction information and existing solutions.

In an amendment in preparation (December 2024) by the PMT, a new Task 4.4 (T4.4) will be added to WP4, to have a dedicated task that will organise and monitor the creation and development of the new WALDUR solution among the NCCs, with local instances at the national level and with a HPC Service Hub - all based on the WALDUR solution.

3 Task 4.1 "Contribution to the C2ISS and the evolved EuroCC ACCESS Portal Design. Contribution to the improvement of the NCCs and the CoEs skills for them to define and promote their services for various target groups"

3.1 Objectives and Strategy Implementation for Task 4.1

Task 4.1 oversees the collection of the specific requirements, both from the NCCs and the CoEs, relevant and adapted to their actual and potential industrial end-users on the expectations and requirements for the evolved EuroCC ACCESS portal (including the marketplace/ HPC Service Hub Platform). The initial plan was to gather information from the NCCs and CoEs during the first year in order to be able to have a prototype by end of year 1 and to have the marketplace/ HPC Service Hub Platform prototype's first runs during year 2.

3.2 "Marketplace/ LinkHPC/ HPC Service Hub platform": Actions Undertaken During Years 1 & 2 and Results

Summary of the complete timeline regarding the topic " Marketplace/ LinkHPC/ HPC Service Hub Platform":

Outcomes and follow-up at the end of phase 1 (December 2022): At the end of phase 1 of EuroCC /CASTIEL, the results of the benchmark done during phase 1 about the potential solutions for a "marketplace" along with the results of the NCCs' votes were presented during the review in March 2023. These results being that, at the end of 2022, out of four potential solutions (i.e. the Polish EOSC platform, the French CC-FR platform, the Estonian WALDUR platform and a private Swedish solution) the NCCs had voted in favour of the Polish (EOSC platform to be adapted) and the French (CC-FR marketplace) solutions.

During the review in March 2023, follow-up questions asking for the JU's orientation and recommendations regarding these two preferred solutions (about a set-up of a potential European unique marketplace) were presented to the JU and the reviewers. There were limited received elements of answers during the review itself (a priori, the solution presented by NCC France was positively received during the review, and the reviewers highlighted the importance of having some homogeneity in the EuroCC network while working on this topic). The actual written review report was received by CASTIEL2 only on November 29th, 2023, allowing for very little time to take into account the provided feedback by end of year 1 of this phase 2 (December 31st, 2023).

Update of the working name/terminology: As the planned structure will not have an e-commerce aspect, and to better highlight the *linking the ecosystem* aspect, it was decided from April 2023 onwards to stop using the word "Marketplace" and to replace it by "LinkHPC platform".

2023

CASTIEL2-WP4 proposal to collaboratively design a common structure for the national LinkHPC platform: in agreement with the PMT, as by June 2023, there was no clear written feedback about the plans and actual expectations of the JU regarding the topic "marketplace" after the review of phase 1, it was decided to at least proceed with launching a task force to work on a common template/structure for a "marketplace". This approach led to some progress on a specific part of this topic, as it was decided to first focus on developing a template (i.e., an

architecture skeleton) that would be appropriate and validated by the interested NCCs. This template could then be deployed by the interested NCCs in their respective countries in 2024.

This template or structure would be the unique common reference for all NCCs. The plan was to have the template ready by the end of 2023; in order to allow the NCCs to work, in a second step, on actual national implementations during 2024, while CASTIEL2 would work on developing a central hub, to gather at a unique European level, the selected national data. The "national implementation" part would have to be discussed first with the PMT and the JU to see what would be the flexibility for the NCCs in terms of providers, solutions and compatibility with the central hub. For the task force to not start from scratch and to have a common object to work with, CASTIEL2-WP4 discussed with NCC France to allow some access to the structure of their CC-FR platform -through a specially developed English test version of it- and to co-organise with them the management of the task force working on the design of a future common unique structure for all NCCs.

This proposal, established by CASTIEL2-WP4 after discussions with PMT team, was shared with the industry working group and agreed upon on June 29th, 2023. During Summer 2023, the procurement was launched to NCC France for them to prepare, using their "CC-FR Marketplace", the English (EN) updated version or prototype of a test version for the national LinkHPC platform. A dedicated Task force was launched in September 2023, with 15 NCC members (details in deliverable D4.1).

On October 16th, 2023, with the EN version being online, a tutorial was held live online for the task force members, in order for NCC France to show them how to test the platform and how to provide their feedback about it through a common form. A follow-up meeting was held on November 6th, 2023, to collect the very first feedback or questions of the task force members regarding their tests of the EN platform. A "consolidation-summary" first meeting took place on November 29th, 2023 for CASTIEL2-WP4 and NCC France to present the consolidated common feedback from the task force and to discuss any debatable topic with all the task force members. Given the number of items to be discussed and agreed upon together for updates in the test version, a second meeting took place on December 11th, 2023.

The discussions in this task force during 2023 showed that there **were several major issues that prevented the task force from making substantial progress:** IP and licencing, along with databases hosting were an issue for several NCCs, given that in the case of the French solution, the IP was protected (remaining the property of the CC-FR creator). Additionally, it would be centrally hosted in a single location, whereas the NCCs generally required nationally hosted solutions due to national sovereignty considerations. They also needed access to the source code.

2024

Following the first-year review of the second phase in February 2024, two main actions were organised:

1) A Response document (to address the written questions from the JU and the reviewers following the review of February 2024) was provided to the JU in March 2024, in collaboration between PMT, WP4 and NCC France
2) A survey was conducted among the NCCs between April-June 2024 to collect the updated information about the existing national solutions that can be considered as services catalogues and to better understand the reasons of the task force blockers. The results are presented in Annex 1.

During Summer 2024, the JU requested an Extra-Review to address this topic and to find solutions to the blockers reported previously. During this Extra-Review organised by WP1, there were the following presentations:

- by the PMT-WP1: the general context and the administrative frame.
- by WP4: the whole timeline regarding this LinkHPC platform topic, a reminder of the concept behind this terminology, a reminder of the phase 1 key outcomes and a presentation of the phase 2 news and updates.
- By four NCCs (Germany, France, Estonia, Poland): the solutions existing nationally (or in development in the case of Germany).

At the end of the Extra-Review, it was decided for CASTIEL2 to work from now on with NCC Estonia on the solution developed by University of Tartu (UTARTU): Waldur.

Following this decision, at the end of 2024 the PMT worked on an amendment to add UTARTU as a new CASTIEL2 consortium member that is in charge of the new Task 4.4 :" HPC Service Hub Implementation for the Network", now specifically dedicated to the development and implementation of the Waldur solution at the national level (when no solution is already existing) and at the European central level (with a central "HPC Service Hub", i.e. new terminology to replace the "LinkHPC" previous terminology). The works performed in this new task during September-December 2024 are presented in the dedicated section 6.

Update of the working name/terminology: end of 2024, the "LinkHPC" terminology was replaced by "HPC Service Hub" to better express the targeted concept.

3.3 Other Key Topics to Support the NCCs' & CoEs' Services Development: Actions Undertaken During Year 2 and Results

"Business" Marketing/sales trainings

(1) Autumn academy set-up with NCC Austria: "Innovation and customer-users centric approached and mindset"

Following the expressed interest of the industry champions to get hands-on information and training on the topics of "how to engage with industry, particularly SMEs", how to structure their services offers, or how to set-up efficient marketing and sales methods, an Autumn academy on business development and marketing topic was developed by CASTIEL2-WP4 and NCC Austria, with support from the PMT during Spring-Summer 2023 to take place during Fall-Winter 2023-2024; with the last action of this Autumn academy to take place in early 2024. 19 representatives (from 15 NCCs and 2 CoEs) registered to participate in this Autumn academy (which included the on-site event and two follow-up online workshops). The actions performed during 2023 were already reported in the deliverable D4.1 submitted end of 2023. In 2024, there was the final online workshop on February 15th during which the participants shared their feedback of applying the learned methods in their NCCs. The participants expressed satisfaction regarding the outcomes of this Autumn academy and what they learned and experimented thanks to it.

The ideas, collected from the participants during these events, for future workshops or actions on this generic topic "Marketing & sales" were taken into account by WP4 to continue providing the NCCs and the CoEs with the most relevant skills, to address their specific challenges to interact with industry.

(2) "Gamify sales in HPC!" seminar, October 3rd - 4th., 2024

The concept for a "Gamify sales in HPC!" seminar was developed by CASTIEL2-WP4 and NCC Sweden, with support from the PMT during Winter-Spring 2024 to take place on October 2024, 3rd, and 4th in Stockholm.

29 participants (from 18 NCCs) registered to participate in this seminar for an on-site workshop in Sweden on October 3rd - 4th, 2024.

Following the end of the on-site seminar, a feedback survey was created by WP4 to collect feedback on how the seminar went and needs for the next steps. The survey was shared with the participants until October 18th, 2024, and 18 answers were collected. The main outcomes of the survey were:

- 61% of the participants found the seminar Good, 33% estimated it Excellent and the others were neutral.

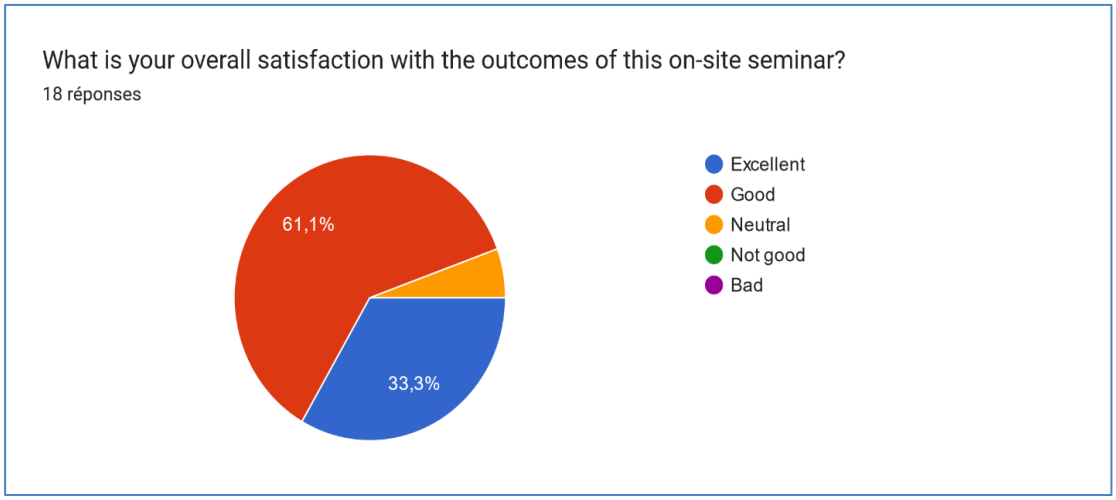


Figure 1: Satisfaction assessment following the "Gamify sales in HPC!" seminar

- Overall, this on-site seminar went well, despite the fact that the consultants had some misconception about the NCCs at the beginning (even though they actually investigated online about the NCCs to prepare for the seminar, which indicates that the visibility of the project online might be improved for a better understanding of visitors external to the projects).
- The NCCs learned, but mostly tried through useful live concepts, particularly they had to put themselves in the shoes of SMEs not already using HPC+, to understand how to provide them with the best and most relevant services.
- The participating NCCs had also, thanks to the on-site format, the opportunity to interact with other NCCs facing the same challenges, and to hear from potential solutions in other countries that could be applied in their own NCC too.

Sharing of knowledge between the CoEs: "Services development and implementation"

(3) "Services development and implementation" workshop with the CoEs

This online workshop was organised specifically only for the CoEs on September 17th, 2024. The CoEs BIOEXCEL3[4], EXCELLERAT2[5], and POP3[6] presented how they structured their service offers during their previous phases, how they implemented them or organised their processes around services, and how they promoted their services. The discussions during this workshop showed that the CoEs are still working on how to best structure and present their services. They would be interested in shaping a 1-page summary summarising their common blockers or challenges regarding the topic of services, to be able to commonly address them or to interact about them with the JU. This 1-page summary is planned to be produced in early 2025.

The presentations and the recording were shared with all the CoEs, as internal material to the CoEs: https://bscw.hlrs.de/sec/bscw.cgi/1600887.

Sharing of knowledge from the NCCs

(4) Industry sector of the month

This series of workshops was primarily organised mostly for the NCCs, but given the interest shown by the CoEs on the first selected topics, it was also open to the CoEs, and it was the opportunity for fruitful discussions that took place during the Q&A sessions between the participating CoE members (for example, particularly with BioExcel3 partners that asked several questions during the second session about "Health/Life sciences") and the presenting NCCs.

The concept is the following: it is a series of meetings for the NCCs/CoEs to present their use cases/success stories with SMEs or other target groups to show how the NCCs/CoEs supported the SMEs, and the benefits for them. It is organised according to industry sector in a format similar to the Code of the Month activity, but it is structured by industry sector: 1 volume per industry sector, the NCCs-CoEs presenting a few selected use cases during a 1-2-hour slot. The details about the two first iterations are presented in Table 1.

Table 1: "Industry sector of the month" workshops in 2024

	Industry sector of the month	Date of the workshop	Number of participants	Link to the recording
Volume 1	"Environment/Climate/ Weather", with talks by NCC Czech Republic, NCC Türkiye, CoE ESiWACE	June 12th, 2024	50 participants from 25 NCCs and 2 CoEs	https://www.eurocc-access.eu/services/video-library/

[4] BIOEXCEL3: Center of Excellence for Computational Biomolecular Research, https://bioexcel.eu/
[5] EXCELLERAT2: The European Centre of Excellence for Engineering Applications, https://www.excellerat.eu/
[6] POP3 : The Performance Optimisation and Productivity Centre of Excellence in HPC, https://pop-coe.eu/

	NCC Sweden, NCC France			
Volume 2	"Health/Life sciences" with talks by NCC Belgium, NCC Türkiye, NCC Finland, NCC Cyprus	November 12th, 2024	42 participants from 20 NCCs and 3 CoEs	

3.4 Plans for the Next Steps

The current plan – that still might evolve depending on the outcomes of the second-year review to take place in February 2024 – is that Task 4.1 would work, during 2025, on:

- "Business or Marketing or Sales" Training for the NCCs and CoEs, and support for them regarding marketing and sales, with potential new actions to be defined.
- Continuing the "Industry sector of the month" series by focusing on the priority industry topics for the NCCs and the CoEs
- For the CoEs: to organise another workshop on their services' development and implementation, to also hear from the less experienced CoEs (that are starting to implement some services in a systematic way)
- A 1-pager summarising the NCCs' & the CoEs' main blockers and challenges, respectively; for the network and the JU to have a clearer view of the priority for the next phase of EuroCC/CASTIEL

4 Task 4.2 "NCCs, CoEs – Industry Interaction Support"

4.1 Objectives and Strategy Implementation for Task 4.2

Task 4.2 is in charge of supporting the European HPC CoEs and the NCCs to increase and extend engagements with established and potential end-users from industry (in particular SMEs), but also other types of entities such as public services, and amplifying the NCCs' and the CoEs' collective impact.

During the first year of the project, it became increasingly evident that the initial plans for activities in this Task 4.2 had to be reconsidered – most importantly for CoEs but also to a degree regarding NCCs. Firstly, the current CoEs are much more focussed on technical activities, in particular porting and preparing their lighthouse codes to Exascale, leaving relatively little resources (both in terms of personnel and budget) for outreach to industry (or other relevant target groups for uptake). Moreover, the domains covered by some of the current CoEs, such as astrophysics, climate, or plasma physics, or their cutting-edge pilot cases, such as certain CFD (Computational Fluid Dynamics) use cases, do not easily lend themselves to obvious and direct uptake by industrial companies and business-oriented use cases. Therefore, a new approach had to be designed to try to leverage synergies between NCC as "horizontal projects" closer to non-academic (but not necessarily industrial) uptake of HPC and CoEs as "vertical projects" anchored in their respective specific scientific communities.

4.2 Actions Undertaken During Year 2 and Results

Sectorial industry events of interest

Organising joint visits to industrial events and fairs for specific sectors, with a shared booth co-financed by CASTIEL2 was one of the initial activities targeted by the project.

Originally intended as an activity for supporting CoEs in their industrial outreach, it became clear in Year 1 (due to reasons discussed in Section 4.1) that such events were *in principle* of interest mostly for NCCs, as a collection of NCC and CoE preferences in 2023 (see details in the deliverable D4.1 submitted in December 2023) had shown. However, during the organisation of the first of such events in March 2024 (Innovation 4 Health in Rotterdam), it turned out that the limited travel budget for the NCCs was one of the main showstoppers in this context. Another blocker, linked to the limited travel budget and the limited staff available in the NCCs, was that the NCCs prioritise the attendance to their own national events or to organise their own events with industry or other target groups. They are not available for events abroad in this frame. Therefore, despite a high level of interest initially expressed, only two NCCs (Netherlands and Belgium) took part in this first sectorial event organised by CASTIEL2. While it was quite successful for those NCCs in giving them several leads, it also became clear that this model would not provide the best return on investment, as a high attendance from the network was not to be expected, thus putting doubts on a justification of the substantial costs for booths (which have considerably increased after the COVID_19 pandemic).

Event visit to "Innovation 4 Health", 28.3.2024, Rotterdam.[7]

Innovation4Health 2024 was the 11th edition of the leading conference for key players in Health & Life Sciences. The theme for this edition was "Breaking Boundaries for a Sustainable Future in Healthcare". The event featured an exhibition with about 45 exhibitors, a program with plenary talks and parallel sessions, and a poster session.
The event was selected because many NCCs initially expressed their interest in it; however, in the end, only one representative from NCC Belgium, NCC Netherlands and CASTIEL2 WP4 each were visiting, and manned a joint booth. Nevertheless, the participation was quite successful for the participating NCCs, in particular NCC Netherlands, who contacted about 20 new leads, among them some promising startup incubators.

Figure 2: Lively discussions at the EuroCC2/CASTIEL2 booth at Innovation 4 Health 2024, Rotterdam

Thematic clusters

In light of the decision to put on hold further visits to industrial sectorial events, and of the feedback obtained during the review and in the review report regarding this topic, Task 4.2 looked for alternative routes to support both CoEs and NCCs in their objectives, and ideally

[7] https://www.hyphenprojects.nl/i4h/programme-2024

complementing their relative pre-existing strengths. One central observation is that the NCCs could potentially fill the gap between interested prospects in need of a certain solution and CoEs offering essential parts of the solution, exploiting their vast collective network to contribute to matchmaking between national prospects and suitable CoEs – as this task is not easy for the CoEs – and also to contribute to the necessary preparatory activities and assistance in case of an actual interest and feasibility of a Proof of Concept (PoC) involving one CoE's code. However, without further structuring, such collaborations would be rather ad-hoc and arbitrary. In fact, as anecdotic evidence, we often see such collaborations through leveraging institutional overlaps or pre-existing connections between partners in CoEs and NCCs, which is not bad per se but does not exploit the full potential of the network.

So, the idea of "thematic clusters" was conceived, as a space in which CoEs working on relevant and related topics, and interested NCCs would come together around a common overarching theme for leveraging commonalities in use cases, target groups of potential users, technical challenges and approaches. Such a thematic cluster could have several benefits to the participants, including increased visibility through joint outreach including possibly a common web presence, easier access to potential users for CoEs and possible support for PoCs through NCCs, access to a portfolio of thematically related solutions by NCC, and opportunities for mutual technical support.

The idea was first presented and discussed at the CASTIEL2 all-hands network meeting in April 2024, in Slovakia. As the best modus operandi for such a cluster had to be found out, it was decided to start with a pilot cluster.
As a first pilot of such a thematic cluster, Task 4.2 selected the overarching topic of "management of natural hazards by predictive HPC simulation", an umbrella theme for the applications of the CoEs HiDALGO[8], ChEESE [9]and ESiWACE[10], and also covered by a couple of use cases / success stories from NCCs. This topic is also of high and urgent societal relevance and offers a lot of potential for awareness creation among potential users, such as public administration, municipal, regional or national planning and related public institutions, but also concrete opportunities to conduct case studies, common technical challenges (like data access and management, or urgent computing infrastructure) and opportunities for collaborations between the different parties.
Task 4.2, thus started to collect interest among the relevant CoEs and NCCs, and presented first concrete ideas around the first, thematically suitable "industry sector of the month" event in June 2024. To collect the views, goals, and constraints of interested NCCs and CoEs, two meetings were held in September 2024, showing that there are common interests for both CoEs and NCCs, but also areas of interest for only one group. Following up on that, a consolidation of those discussions and identification of activities with the best potential for synergies was undertaken.
In the context of the thematic clusters, a previous cooperation between NCC Sweden (ENCCS) and CoE HiDALGO (as direct interaction between them before the thematic clusters action was set up) on a use case with the City of Stockholm served as a role model for the targeted outcomes. As one early result, a collaboration between CoE HiDALGO and NCC Austria was initiated in Q4 of 2024 on the potential uptake of their Urban Air pilot for a large Austrian player. On December 10th, 2024, an online workshop "How European projects are developing HPC-based software and services to address natural hazards" was organised by CoE ChEESE

[8] HiDALGO – HPC and Big Data Technologies for Global Systems CoE, https://hidalgo-project.eu/about-us
[9] ChEESE: Center of Excellence In Solid Earth, https://cheese-coe.eu/
[10] ESiWACE Centre of Excellence in Simulation of Weather and Climate in Europe, https://www.esiwace.eu/

and NCC Spain, supported by CASTIEL2 and featuring contributions from CoEs ChEESE, ESiWACE, HiDALGO and EoCoE[11].

"Code of the Month" series (in collaboration with WP2): 12 instances

To promote the codes of the CoEs (i) towards the industry champions of the NCCs, for the NCCs to better present them in their respective country or to their potential prospects and (ii) towards the whole European ecosystem, CASTIEL2-WP4 and WP2 set-up a "Code of the Month" series in 2023. In 2023, five volumes were organised with EXCELLERAT, RAISE[12], CoEC[13], PerMedCoE[14], MultiXScale [15](details in the deliverable D4.1). In 2024, seven volumes were organised (details in the Table 2).

For each series, there was, until the 11th volume in October 2024, an INTERNAL webinar only for industry and competence champions of the NCCs to allow informal discussions and specific questions, and there was a PUBLIC recorded webinar open to everyone. From the 12th volume onwards, it was decided to organise only one PUBLIC session, as the organising team noticed decreasing numbers in the attendance of these sessions. It was noted by WP4, but also by other WPs of CASTIEL2, and also on other projects (in which the CASTIEL2 partners are involved), that there seems to be a general trend during the second part of 2024 showing that on average every two registered people is actually attending an online event. This might be due to the lowering interest or motivation of people in general in attending the numerous possible online events now organized by every project in Europe. The details are provided in the Table 2.

Table 2: "Code of the Month" series (in collaboration with WP2): 12 volumes by end of December 2024

	Code and CoE	Date of the webinar	Number of participants	Link to the recording
Volume 6	Neko by CEEC[16]	Internal on January 24th, 2024 Public on January 31st 2024	20 participants 26 participants (2 CoEs were represented, 12 NCCs were represented, and for the external audience: 4 academic participants, 2 from large companies and 1 one from a midcap company)	https://www.eurocc-access.eu/services/video-library/

[11] EoCoE: Energy Oriented Center of Excellence: toward exascale for energy, https://www.eocoe.eu/
[12] RAISE: The European Center of Excellence in Exascale Computing "Research on AI- and Simulation-Based Engineering at Exascale", https://www.coe-raise.eu/
[13] CoEC: Center of Excellence in Combustion, https://coec-project.eu/
[14] PerMedCoE: the HPC/Exascale Centre of Excellence for Personalised Medicine, https://permedcoe.eu/
[15] MultiXScale: Center of Excellence in exascale-oriented application co-design and delivery for multiscale simulations, https://www.multixscale.eu/
[16] CEEC: Center of Excellence for Exascale CFD: https://ceec-coe.eu/

Volume 7	GROMACS by BioEXCEL	Internal event on March 6th, 2024 Public on March 13th 2024	21 participants 24 participants (at least 2 CoEs were represented, 9 NCCs were represented and for the external audience: 8 academic participants, 1 participant from an SME)	
Volume 8	FALL3D and OpenPDAC by CHEESE CoE	Internal event on April 10th, 2024 Public on May 29th 2024	26 participants 15 participants (1 CoE was represented, 7 NCCs were represented and for the external audience: 1 academic participant)	
Volume 9	Hidalgo CoE	Internal event on July 10th, 2024 Public event on July 17th 2024	31 registrations 24 participants (1 CoE was represented, 13 NCCs were represented and for the external audience: 3 academic participants, 2 from Research centres, 1 from SME, 1 other type of participant)	
Volume 10	Alya-wind by EoCoE	Internal event on September 12th, 2024 Public event on September 18th 2024	19 participants 28 participants (2 CoEs were represented, 11 NCCs were represented, and for the external	

			audience: 5 from academia, 9 from research centres, 1 from midcap, 1 from SME, 1 from public administration, 1 from other type)	
Volume 11	FLEXI / GALAEXI by CEEC	Internal event on October 16th, 2024 Public event on October 30th 2024	9 participants 11 participants (2 CoEs were represented, 5 NCCs were represented, and for the external audience: 3 participants – no details)	
Volume 12	SIESTA by MaX	Public event on December 11th 2024	25 participants (1 CoE was represented, 9 NCCs were represented, and for the external audience: 3 participants from Research centres, 6 participants from academia)	

4.3 Key Figures Regarding Interactions with Industry

- **For the NCCs**

In continuity with the phase 1 of EuroCC/CASTIEL that ended in December 2022, the project management team (PMT) collects quarterly Technical Progress Reports (TPRs) from the NCCs. Following the review in February 2024, the PMT decided to implement Digital TPRs.
To have updated fields and guidelines regarding the industry figures that will be requested in these Digital TPRs managed by PMT, CASTIEL-2-WP4 worked on several updates in the two tables about "Industry figures", that will be integrated by the PMT in the NCCs new Digital TPRs (still in preparation as of November 2024).

The questions asked in these future quarterly digital TPRs are indicated in the Table 3 and Table 4.

Table 3: Industry interaction with SMEs

	Last up-to-date figures FOR THIS QUARTER (Q8)
Number of 1st contact/appointment[17]	X first contact/appointment
Activities initiated with SMEs[18]	X activities initiated
Activities finalised with SMEs[19]	X activities finalised
Number of PoCs done for SME[20]	X PoCs done with SMEs
Sectors concerned[21]	X sectors concerned

Table 4: Industry interaction with Big Industry

	Last up-to-date figures FOR THIS QUARTER (Q8)
Number of 1st contact/appointment	X first contact/appointment
Activities initiated with Big Industry	X activities initiated
Activities finalised with Big Industry	X activities finalised
Number of PoCs done with Big Industry	X PoCs done with Big Industry
Sectors concerned	X sectors concerned

[17] This includes every "real/personalized" interaction specific to one company, so it can include a real meeting in f2f, in visio, or an individual specific email or a participation from the SME to a workshop.
Here, counted contact people are reached out with the goal to seek or to offer the NCCs assistance with a business challenge of the company. So, a mass mailing does not count, but a (positive) reply by a company with the intent to see if the NCC can help would.
In business / marketing terms, the contacts here correspond to contacted potential "leads" (source: https://en.wikipedia.org/wiki/Lead_generation)

[18] These include any initial support session/in-depth interaction that the NCC would provide to an SME that could/should have as outcome at the end a "news announcement" or "success stories" (even light). That activity being currently ongoing, the outcome is not available yet.
The PoCs are included in these activities.
Examples of such activities that clearly help the SME a step forward to HPC/HPDA/AI: specific workshops or knowledge sessions tailored to a specific SME use case; starting to advise an SME to apply for access to JU supercomputer; etc.

[19] this is when a positive result for the customer is available, which could in principle be testified by a news announcement or success stories (even light), given that the interaction is done/finished.
The PoCs are included in these activities.
Here, the intended goal of the activity for the SME has been reached.
Examples: the specific workshop or knowledge session successfully took place, or the SME got the access to the JU supercomputer, etc.

[20] The goal of a PoC is to determine the technical feasibility of an approach and to determine the next steps for an SME (next steps that would likely be outside the NCC, e.g. to apply for further funding or accelerator).
A proof of concept is usually small and may or may not be complete. According to the EIC Accelerator TRLs definitions, a PoC (Proof of Concept) includes activities towards achieving up to TRL 3 (more info about these TRL definitions in the handbook). For instance, it could involve the development of a simplified computational model, as well as initial scientific research, practical applications, applied research, or the realization or demonstration of an idea, method, or principle. A PoC is a special case of the "Activities" reported above.

[21] Aeronautics, Agriculture, Automotive, Biotechnology/Bioinformatics, Chemicals, Cosmetics, Construction /Architecture/Infrastructure, Defence sector, Earth science, Electrical and electronic engineering, Energy, Environment/climate/weather, Food and drink, Finance/Insurance, Health care / Pharmaceuticals / Medical devices, Humanities/Languages, IoT (Internet of things), IT/HPC systems services & software providers, Life sciences, Manufacturing & engineering, Maritime, Material sciences, Mechanical engineering, Public services/Civil protection, Raw materials metals minerals and forest-based, Space, Smart City, Textile, Fashion and creative, Quantum Computing.

The results for the last quarter of 2024 will be analysed in 2025, once they are made available by the PMT to WP4.

4.4 Plans for the Next Steps

During the next period, the Code of the Month activity will be continued to become a well-established event and building a library of interesting short videos on a variety of high-end software.

The approach of thematic clusters will be pursued by deepening the collaboration on the Thematic Cluster on natural hazard management and environmental simulation kicked off in 2024, as well as – guided by the experience gained through this first cluster and subject to available resources – further clusters may be initiated. The goal is to provide structures to identify the most promising areas for such collaborations, not necessarily to cover all CoEs and NCCs with this new instrument. It can be hoped that such thematic cluster structures will also live beyond the end of CASTIEL2 if they prove useful.

As argued above, the visits of sectorial industrial events will not be pursued further as separate activity, which does not exclude the organisation of individual visits, e.g. initiated by a thematic cluster.

5 Task 4.3 "NCCs – CoEs Exchange and Knowledge – Sharing on Industry Interactions"

5.1 Objectives and Strategy Implementation for Task 4.3

Task 4.3 is in charge of ensuring that both NCCs and CoEs have access to all relevant industrial interaction information and existing solutions, by organising exchange and discussions about the lessons learned, by optimising outreach and promotion activities of the NCCs towards industry and by involving other EC or EuroHPC JU funded R&I projects where advantageous (in collaboration with WP1).

5.2 Actions Undertaken During Year 2 and Results

This task implemented several activities to strengthen industry collaboration and support through knowledge sharing, success stories, and practical tools. The Dos and Don'ts workshops and corresponding best practices guides are designed to provide actionable advice for industry engagement. Monthly Industry Coffee Breaks offer a space for informal discussions, feedback collection, and idea exchanges among NCCs and CoEs. Additionally, the Industry Success Stories Booklets created in collaboration with WP5 highlights successful collaborations from the NCCs, while a continually updated Industry Use-Cases Portfolio compiles use cases across 21 industry sectors, serving for the NCCs as a practical resource for engaging potential prospects.

To complement these efforts, this task organised webinars, such as the Security Webinar on IT certifications and their role in trust-building, and the POP3 Webinar, which introduced services to NCCs for broader promotion within their networks. Furthermore, a task force led by NCC Slovenia monitored the use of a multilingual SMEs Assessment Tool to improve SME engagement across Europe. These initiatives collectively enhance NCC-industry interactions and interactions of the CoEs with various target groups, provide practical resources, and showcase successful use cases, fostering collaboration and driving growth across various sectors.

Dos and Don'ts series of workshops

Following the request of some NCCs to hear more about the other NCCs' or CoEs' experiences and lessons learned, a new workshop series "Dos & Don'ts" was launched in 2024, in collaboration between Task 4.3 and NCC Netherlands. The details about the five iterations organised in 2024 are available in Table 5. The high level of registrations which was quite stable for all the sessions, along with positive oral feedback, received by the organiser at the end of the session, indicate the level of interest for these workshops and the added value for the NCCs and CoEs.

Table 5: Dos and Don'ts workshops

Session	Topic	Date	Speakers	Number of registrations	Link to the recording and slides
1	Supercomputing days/dynamization sessions/equivalent	March 11th 2024	NCCs Croatia, Greece, Sweden, Spain,	49 registrations (from 23 NCCs and 3 CoEs), 46 participants	https://www.eurocc-access.eu/services/video-library/
2	Users days	April 29th 2024	NCCs Netherlands, Bulgaria, Latvia-	34 registrations (from 14 NCCs and 3 CoEs), 31 participants	
3	Interactions with public administration & co	May 27th 2024	NCC Slovenia, EoCoE CoE, CHEESE CoE	39 registrations (from 20 NCCs and 6 CoEs), 32 participants	
4	Outstanding/Original ways to engage with industry- Part 1	October 10th 2024	NCCs Netherlands, Slovakia	49 registrations (from 23 NCCs and 3 CoEs), 31 participants	
5	Outstanding/Original ways to engage with industry- Part 2	November 27th 2024	NCCs Cyprus, Italy	40 registrations (from 20 NCCs and 1 CoE), 31 participants	

Dos and Don'ts Best Practices Guides following the workshops:

Following each session of the "Dos and Don'ts" workshops, WP4 produced summarised Best Practices Guides, leveraging from the content presented during these workshops. These four created Best Practices Guides were shared with the network, and they are available on the EuroCC ACCESS website: https://www.eurocc-access.eu/services/document-library/.

Industry coffee breaks

The purpose of this action is to provide a space of free informal discussions, and to discuss important topics and collect direct feedback, questions or needs from the industry champions. Virtual industry coffee breaks were organised monthly, every last Thursday of the month. The virtual coffee breaks allowed industry champions to exchange ideas, to ask CASTIEL2-WP4 about needed elements, actions or clarifications.

Industry success stories booklet (in collaboration with WP5) & industry use-cases portfolio

In collaboration with WP5, CASTIEL2-WP4 produced a second industry success stories booklet[22] that includes 53 stories from 18 NCCs published online in September 2024. It is planned to be printed in early 2025 for a wider promotion.

In parallel, two success stories were collected and reviewed from two CoEs (MultiXscale and Esiwace). Several are pending from other CoEs, for CASTIEL2 to be able to provide a consistent booklet, or to include these success stories in the next EuroCC2 (NCCs) booklet, now planned for Winter-Spring 2025.

Additionally, CASTIEL2-WP4 continued to collect industry cases from the NCCs that are gathered in one common slides deck (a "portfolio") of industry use cases, ordered by sector[23] or by alphabetical order of the NCCs[24]. The "November 2024" version of this living-document/template is available in Annex 02.

14 NCCs provided 60 use cases from 21 industry sectors (out of a list of 28 industry sectors) by November 2024. This portfolio is regularly updated by CASTIEL2-WP4 when use cases are provided by the NCCs. The objective is indeed for the NCCs to be able to use it to interact with potential prospects from various industry sectors by showing them successful use cases from the relevant specific industry sector. At least, one NCC reported that this was useful in their interactions with potential prospects and various industry stakeholders.

Collaboration WP3-WP4: Webinar "Onboarding industry and SME stakeholders into NCC training programs"

In collaboration with WP3, Task 4.3 worked on a new workshops series "onboarding and securing industry prospects in the NCCs training". The first workshop took place on September 30th, 2024. The concept is to hear from both Industry Champions and Training champions from one NCC on the same day on the topic of "onboarding" in the NCCs trainings the industry/SMEs stakeholders. The goal is to assess what can interest industry in initial trainings, what works well, what could be improved, and to exchange ideas about it. The high level of registrations which was quite stable for all the sessions, along with positive oral feedback, received by the organisers in between the sessions, indicate the level of interest for these workshops and the added value for the NCCs and CoEs. The agenda and the speakers are presented in Table 6.

Table 6: Workshop series co-organised with WP3 "Onboarding industry and SMEs stakeholders into NCC training programs"

Name of the workshop	Speakers	Date of the workshop	Number of participants
"Training the Industry/SMEs Stakeholders : Listen to the NCCs´ insights" – Industry focus	NCC Italy, NCC Turkey, NCC Netherlands	Sep 30, 2024, 11:00 AM-CEST	85 registrations from 5 CoEs and 28 NCCs, 73 participants

[22] EuroCC2 booklet n°2: https://www.eurocc-access.eu/wp-content/uploads/2024/10/EUROCC2_Booklet2024_v1.0.pdf
[23] Industry portfolio, by sectors: https://www.eurocc-access.eu/wp-content/uploads/2024/10/CONSOLIDATED-Industry-use-cases-sectorial-order-ROUND3.pptx
[24] Industry portfolio, by alphabetical order of the NCCs https://www.eurocc-access.eu/wp-content/uploads/2024/10/CONSOLIDATED-Industry-use-cases-Alphabetical-ROUND3.pptx

"Training the Industry/SMEs Stakeholders : Listen to the NCCs´ insights" – Training focus	NCC Italy, NCC Bulgaria, NCC Greece	Sep 30, 2024, 02:00 PM - CEST	77 registrations from 5 CoEs and 26 NCCs, 63 participants
Webinar "Onboarding industry and SME stakeholders into NCC training programs"	NCC Austria, NCC Luxembourg	December 2nd, 2024, 3PM-CET	66 registrations from at least 1 CoE and 29 NCCs, 57 participants

Webinars with other initiatives

When relevant, CASTIEL2-WP4 organised webinars for the industry champions to receive direct information from other initiatives that could be relevant for their interactions with potential prospects or ongoing collaborations with industry. The webinars organised in 2024 were:

(1) Security webinar

This webinar on September 9th, 2024, was the opportunity for the industry champions to hear about security certifications and their value in building customer trust, a topic derived from the industry coffee breaks. The webinar was held in collaboration with SSC[25], a certification company from Stuttgart.

The webinar consisted of the following parts:

- Security in IT: Point of View from companies and SMEs, their concerns, risks and how these affect decisions.
- Simplifying decisions through certifications: What can an NCC counter to their concerns and risks? How can internationally accepted certificates help?
- Theory Block: Why standards? Which standards are there in IT and information security? Certifications, their advantages, and disadvantages? How does a certification work?

(2) POP3 webinar

On September 25th, 2024, POP3 presented to the NCCs their available services, so that the NCCs could support them by promoting these services to their own networks and contacts. In turn, the NCCs are now able to provide relevant information to their users and prospects about the services proposed by POP3.

"SMEs assessment tool" task force led and managed by ARCTUR[26]

This task force was launched in March 2023 with the lead of NCC Slovenia, in collaboration with CASTIEL2-WP2 and WP4. NCC Slovenia worked collectively with volunteer NCCs to improve their SMEs assessment tool, translate it in several languages and implement it in several NCCs. The tool is now available in 18 languages and available in 24 NCCs and 61 assessments were completed by SMEs in Europe by the end of 2024.

[25] SSC company: https://www.ssc-services.de/
[26] https://www.arctur.si/

The concept, as developed during Year 1 of EuroCC2/CASTIEL2 is summarised as a reminder in the slide of Figure 3 and in the process scheme in Figure 4.

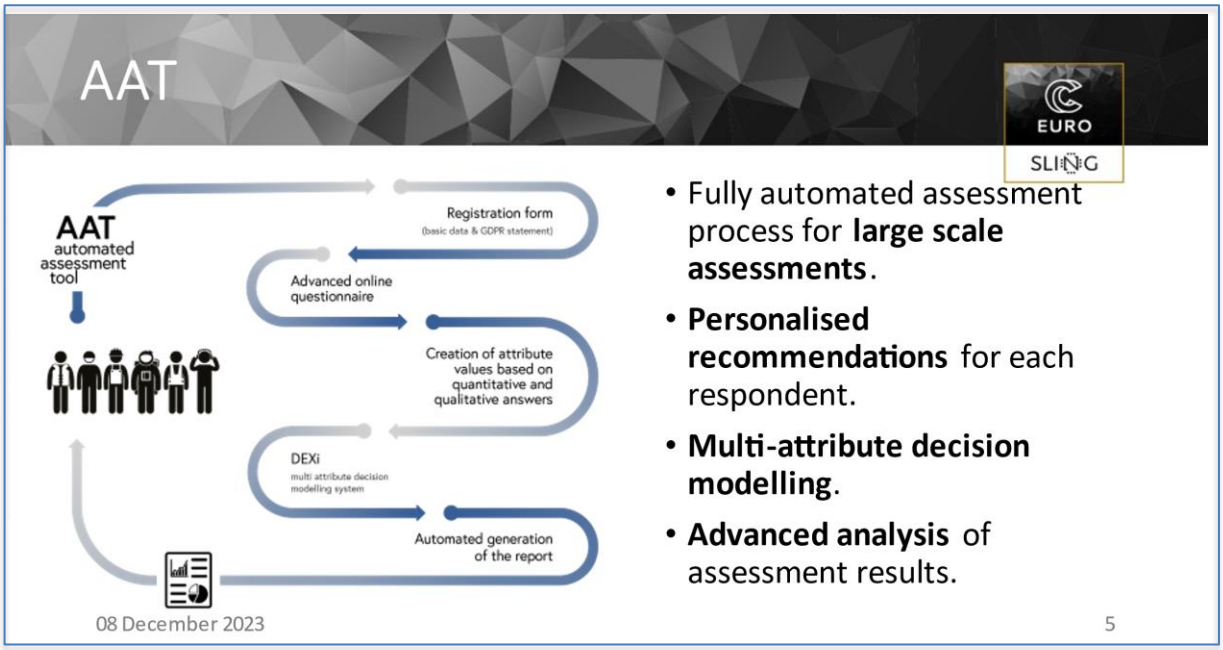


Figure 3: HPC4SMEs concept

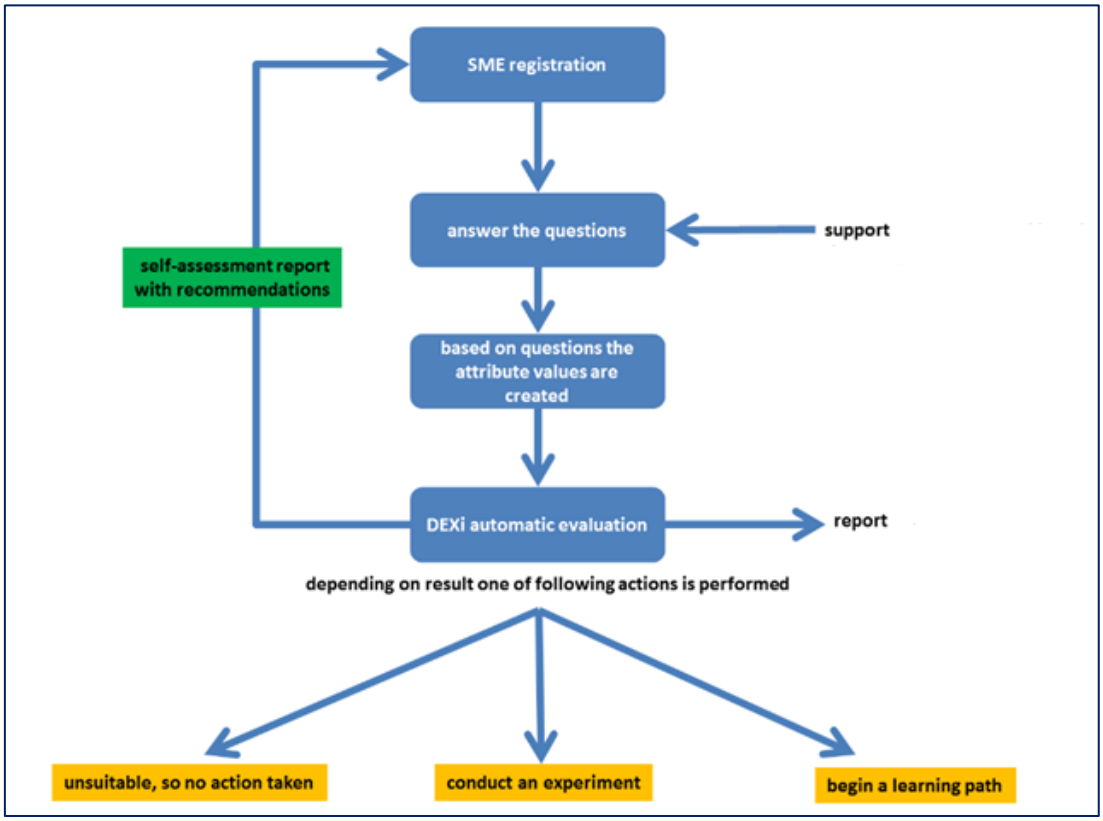


Figure 4: HPC4SMEs proposed process

A questionnaire was developed by WP4 and ARCTUR to better understand the challenges of the NCCs to use the now available tool. The questionnaire sent on November 25th, 2024, is in

Annex 03. The deadline for the NCCs to provide their answers is December 20th, 2024. Therefore, the results will be processed and analysed after December 20th, 2024.

5.3 Plans for the Next Steps

The continuous work about the industry success stories will be continued in collaboration with WP5, the NCCs and as new collaborators the CoEs too. Indeed, a third booklet is now planned for Winter-Spring 2025, and either this new volume will include industry success stories from the CoEs too, or there will be a dedicated booklet for the CoEs. Similarly, the continuous work about the industry use cases portfolio will be continued in collaboration with the NCCs, with the aim by the end of the EuroCC2 project to have collected use cases from all industry sectors and from all NCCs.

The “Dos & Don’ts” series, the industry coffee breaks, the collaboration with WP3 about the sharing of knowledge from the NCCs with regards to "Onboarding industry and SME stakeholders into NCC training programs" will continue. Furthermore, there will be more seminars covering topics that arise in the industry coffee breaks or in other discussions.

6 Task 4.4 “HPC Service Hub Implementation for the Network”

6.1 Objectives and Strategy Implementation for Task 4.4

This new task is being added to WP4 following the Extra-Review that took place in September 2024. As presented in section 3.2, following the new guidelines provided by the JU on the “LinkHPC topic” (renamed “HPC Service Hub” at the end of November 2024), UTARTU was added to the CASTIEL2 network and started the work immediately -in line with the JU’s expectations- on this topic, while an amendment to officially add them to the Consortium is under works by the PMT-WP1.

Task 4.4 is about the implementation of the HPC Service Hub across the NCCs and CoEs. Based on the EuroHPC JU’s reviewers’ recommendation, this solution will have an open-source development model and licence with a clear process for accepting contributions. Furthermore, the solution will be documented and will provide a community support model alongside the option to pay for hosting and support if desired.

6.2 Actions Undertaken During Year 2 and Results

A first meeting to present the new strategy and plans to the NCCs was held on October 11th, 2024.

The new plan for this HPC Service Hub solution is the following: WALDUR will be used by EuroCC2-CASTIEL2 to create a central HPC Service Hub that will link national instances at the NCCs that will display their service offers. This solution will also link and be linked to other platforms (namely the CoEs services portal, the JU websites and other EU platforms about services). This is summarised in Figure 5 and Figure 6.

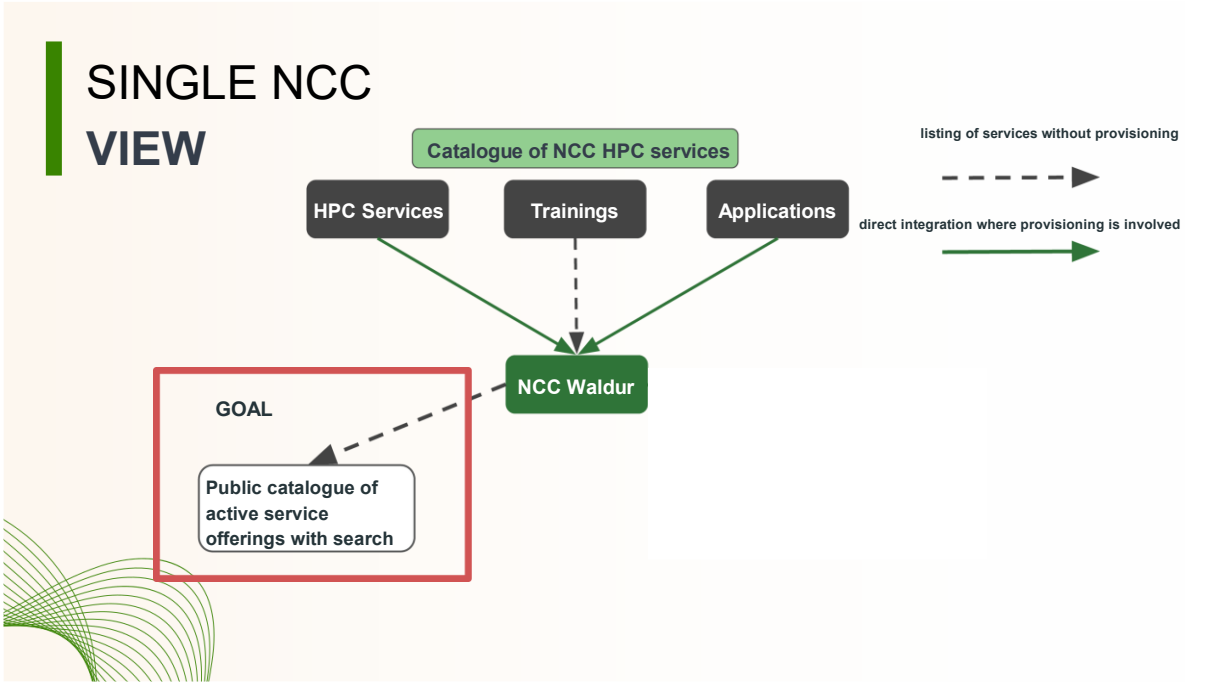


Figure 5: Concept for the NCC future local platform (national level)

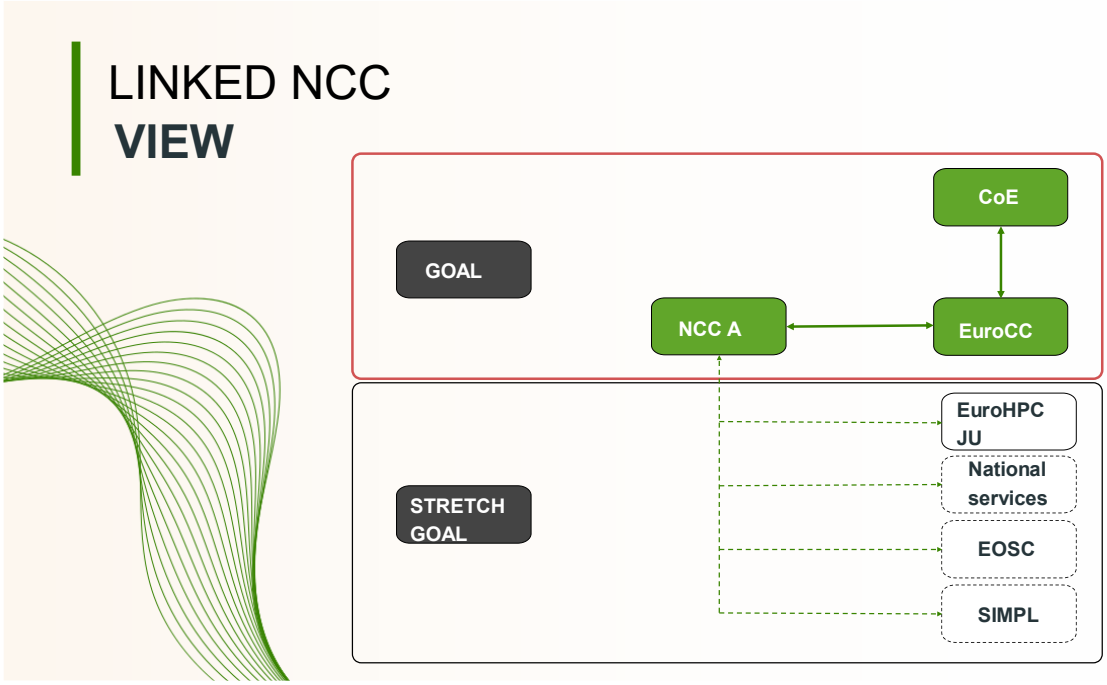


Figure 6: Concept for the whole "WALDUR-HPC Service Hub platform solutions"

Following this global presentation, a new task force (members list available in Annex 04 about the 13 NCCs members) was launched and two meetings took place:

- On November 7th, 2024, the different options for NCC platform hosting were presented (1- self hosting in the NCC, 2- hosting at UTARTU, 3- direct integration between pre-existing NCC services platform and the future central HPC Service Hub). For that, UTARTU organised several surveys to find out NCCs interests.
- On November 27th, 2024, the HPC Service Hub solution was presented; more particularly, the categories of services and their attributes were the focus: UTARTU started to collect information about the categories of services and their attributes used

in the NCCs, in order to propose a common selection, that could work as a common basis for all the interested NCCs. Also, the initial draft of the monitoring solution was shown. 20 participants attended the meeting, and several updates were shared regarding the status (with regards to the hosting options, the viewpoint on categories and the questions in the teams) in each NCC.

The main outcomes include the selection of a domain name for the central HPC Service Hub. Additionally, all task force members finalised their hosting preferences for their respective catalogues: three NCCs chose hosting at UTARTU, eight opted for self-hosting, and two decided to publish their services directly in the HPC Service Hub (among them, two NCCs were still thinking to confirm their choice). An overview of the choices of the NCCs and the status, as of November 27th 2024, is provided in Figure 7.

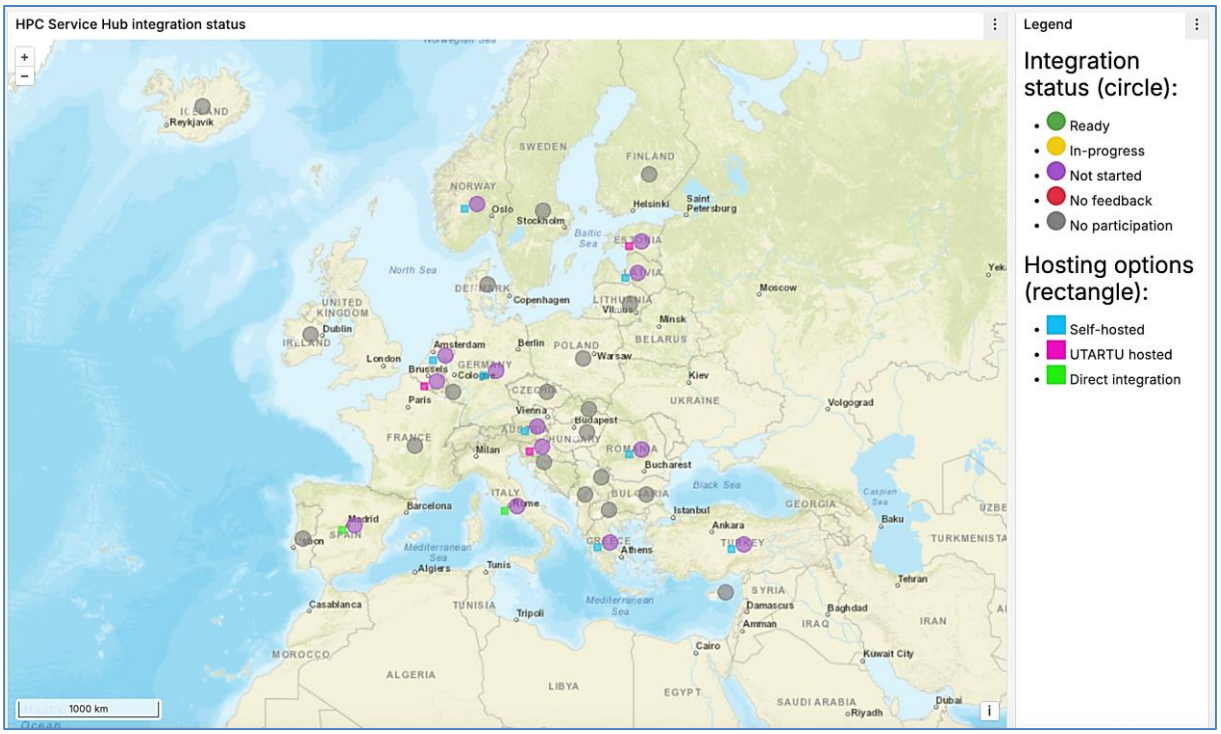


Figure 7: Overview of the choices of the NCCs in terms of hosting option and status of the planned/ongoing work - date November 27th, 2024

6.3 Plans for the Next Steps

One of the main tasks is to have an initial version of the HPC Service Hub deployment and the first national instances of the NCCs up and running by the end of January 2025. Then, the following tasks in the timeline include gathering and analysing of all stakeholders' requirements and initiating the implementation phase. These activities will ensure a smooth transition to testing and deployment, keeping the task force aligned with the overall project timeline.

7 Meetings and Workshops for the Industry Working Group

Several meetings of the industry working group were organised as transversal actions (between the three tasks of WP4), as they promoted outcomes of transversal actions or as they were meant to provide valuable inputs for phase 2 for all tasks of WP4 to work on their specific topics. These meetings are listed in the Table 7.

Table 7: Meetings organised transversally by CASTIEL2-WP4

Title	Objective	Date & Location	Content-Outcomes of the meeting
Industry working group meeting to present the updates of the "LinkHPC platform" topic	Meeting to present the update plans following the Extra-Review meeting and to collect interest from the NCCs to launch a new dedicated task force	October 11th, 2024, online	To present the updates on the "WALDUR-LinkHPC topic" & to set up a dedicated task force
Industry working group at the "NCCs-CoEs online meeting" organised by CASTIEL2-WP2	Participation to the "NCCs-CoEs online meeting" organised by CASTIEL2-WP2	November 8th, 2024, online	Organisation of an "Industry topics" session, with animation of group discussions and use of slido to collect the goals, challenges and needs of the NCCs & CoEs with regards to the industry topics during this starting period of EuroCC2-CASTIEL2
Industry working group: Digital Security Workshop with SSC	Webinar by SSC to hear about security certifications and their value in building customer trust	September 09th 2024, online	to hear about security certifications and their value in building customer trust, a topic derived from the industry coffee breaks
Industry working group: presentation of POP3 services	Webinar: POP3 presentation of their services	September 25th, 2024, online	For the NCCs to understand the services offer from POP3 and potentially leverage them in their own networks

During the industry working group session of the "NCCs-CoEs online meeting" on November 8th, CASTIEL2-WP4 organised an interactive session with a Slido to collect inputs from the participants on the major blockers and challenges of the NCCs and the CoEs. However, only 14 people participated to this afternoon session, including only two CoEs. Therefore, the results of the Slido (that included the questions):

- What is your overall satisfaction with the industry working group (the Autumn School /"gamify sales in HPC" seminar/BPG/booklets of success stories/workshops series/webinars on specific topics/etc)?
- Rank or provide new items of your main challenges in your NCC/CoE.
- What would you like from CASTIEL2-WP4 to support you in your interactions with industry/public admin/other target groups?)

are not usable for CASTIEL2-WP4, given that they are not representative of the whole network. A future proper collection of this information is planned within Task 4.1 to produce a 1-pager with the NCCs and the CoEs regarding their main challenges beginning of the year 3.

8 Major Achievements and Concluding Remarks

During the second year of the CASTIEL-2 project, WP4 performed various and numerous actions that helped the NCCs and the CoEs to structure their interaction with industry and other target groups, and to develop their services offers and the way to organise and promote them.

As presented in the section 3 which reports about Task 4.1, CASTIEL2-WP4 organised for the industry champions (and the communication or competence champions on some actions) dedicated customised trainings on the topic “marketing and sales” (see details in section 3.3), to support and train the NCCs and CoEs to be able to properly present and promote their services towards industry stakeholders. In parallel, a new strategy was adopted and developed regarding the topic “LinkHPC-Waldur HPC Service Hub” and the first works on this topic were started, in coordination with the new Task 4.4.

In the frame of Task 4.2, the “Code of the Month” series and the “Industry sector of the month” series, respectively continued and initiated by WP4, allowed the NCCs and the CoEs to hear about specific material, resources, services, codes or experiences with industry and other target groups from some experienced NCCs or CoEs. Additionally, the thematic cluster idea – while still in its infancy – has generated some interest among CoEs and NCCs. WP4 expects to learn from the initial experience with the first cluster, which is gradually being filled with live content, so that additional clusters can be initiated in year 3. It should be emphasised that such clusters have in theory the potential to endure beyond the end of the CSA, in some form (yet to be determined).

Within Task 4.3, the workshops co-organized with WP3 about “onboarding industry in the NCCs and CoEs trainings” provided a twofold viewpoints and experience sharing from industry and from training champions about how to attract and then keep industry stakeholders in their trainings. The “Dos and Don’ts” series coordinated the sharing of lessons learned and best practices among the NCCs and the CoEs on specific topics of interest for them. These workshops and the other webinars organised by WP4 enhanced the NCCs and CoEs vision of the existing materials or experiences in the network, and how they could leverage it to improve their own processes or materials.

Lastly, the new Task 4.4 focused on working on the new strategy for the (previously named LinkHPC) “Waldur HPC Service Hub”. This topic underwent major updates in the strategy and the first major works were performed in this new direction between September and December 2024 (see details in section 6).

Other major outcomes for WP4 in a writing format, including summary documents and provided information, are:

(1) Creation of four Best practices guides following the "Dos & Don'ts" series

Following the workshops co-organised with NCC Netherlands for the "Dos & Don'ts" series, four best practices guides were created. They were shared with the network, distributed through social channels by several NCCs and they are available on the EuroCC ACCESS website:

- Organising Events & Dynamisation of Sessions[27]
- Organising User Days[28]
- Interactions with public administration & Co[29]
- Outstanding/Original ways to engage with industry[30]

(2) Production of a second Industry success stories booklet & an industry portfolio

WP4 produced, in collaboration with NCC Belgium, an industry portfolio that is regularly updated to include the use cases provided by the NCCs during the whole year. It is available under:

- Sorted by industry sector: https://www.eurocc-access.eu/wp-content/uploads/2024/10/CONSOLIDATED-Industry-use-cases-sectorial-order-ROUND3.pptx
- Sorted by alphabetical name of the NCCs: https://www.eurocc-access.eu/wp-content/uploads/2024/10/CONSOLIDATED-Industry-use-cases-Alphabetical-ROUND3.pptx

Additionally, WP4, in collaboration with WP5, produced an industry success stories booklet (2nd edition) that was published online in September 2024: https://www.eurocc-access.eu/wp-content/uploads/2024/10/EuroCC2_Booklet2024_v1.0.pdf

(3) Sharing of "EU information "

Continuing what was done during EuroCC1/CASTIEL1 and in 2023, CASTIEL2-WP4 kept regularly forwarding the information received about the EU (JU/EC or even outside the Horizon Europe) about potential funding or opportunities for industry that could be of interest for the NCCs or the CoEs by email to the industry champions.

[27] Best practice guide "Organising Event & Dynamization sessions: https://www.eurocc-access.eu/wp-content/uploads/2024/09/Best-practices-guide-Session1_2907-1.pdf

[28] Best practice guide "Users days" https://www.eurocc-access.eu/wp-content/uploads/2024/09/Best-practices-guide-Session2_2608.pdf

[29] Best practice guide "Interactions with public administration & Co ":https://www.eurocc-access.eu/wp-content/uploads/2024/09/Best-practices-guide-Session3_2708.pdf

[30] Best practice guide "Outstanding/Original ways to engage with industry": to be published online during December 2024

9 References

[1] https://cc-fr.eu

[2] https://open-science-cloud.ec.europa.eu/

[3] Waldur is a platform for managing private clouds, public clouds and HPC Centres. It automates OpenStack and Slurm, has billing, user self-service and support desk: https://waldur.com/ . This solution is being used and adapted to the specific needs of the EuroCC2 network to display information about the services available in the network.

[4] BIOEXCEL3: Center of Excellence for Computational Biomolecular Research, https://bioexcel.eu/

[5] EXCELLERAT2: The European Centre of Excellence for Engineering Applications, https://www.excellerat.eu/

[6] POP3 : The Performance Optimisation and Productivity Centre of Excellence in HPC, https://pop-coe.eu/

[7] https://www.hyphenprojects.nl/i4h/programme-2024

[8] HiDALGO – HPC and Big Data Technologies for Global Systems CoE, https://hidalgo-project.eu/about-us

[9] ChEESE: Center of Excellence In Solid Earth, https://cheese-coe.eu/

[10] ESiWACE Centre of Excellence in Simulation of Weather and Climate in Europe, https://www.esiwace.eu/

[11] EoCoE: Energy Oriented Center of Excellence: toward exascale for energy, https://www.eocoe.eu/

[12] RAISE: The European Center of Excellence in Exascale Computing "Research on AI- and Simulation-Based Engineering at Exascale", https://www.coe-raise.eu/

[13] CoEC: Center of Excellence in Combustion, https://coec-project.eu/

[14] PerMedCoE: the HPC/Exascale Centre of Excellence for Personalised Medicine, https://permedcoe.eu/

[15] MultiXScale: Center of Excellence in exascale-oriented application co-design and delivery for multiscale simulations, https://www.multixscale.eu/

[16] CEEC: Center of Excellence for Exascale CFD: https://ceec-coe.eu/

[17] This includes every “real/personalized” interaction specific to one company, so it can include a real meeting in f2f, in visio, or an individual specific email or a participation from the SME to a workshop.
Here, counted contact people are reached out with the goal to seek or to offer the NCCs assistance with a business challenge of the company. So, a mass mailing does not count, but a (positive) reply by a company with the intent to see if the NCC can help would.
In business / marketing terms, the contacts here correspond to contacted potential “leads” (source: https://en.wikipedia.org/wiki/Lead_generation)

[18] These include any initial support session/in-depth interaction that the NCC would provide to an SME that could/should have as outcome at the end a "news announcement" or "success stories" (even light). That activity being currently ongoing, the outcome is not available yet.
The PoCs are included in these activities.
Examples of such activities that clearly help the SME a step forward to HPC/HPDA/AI: specific workshops or knowledge sessions tailored to a specific SME use case; starting to advise an SME to apply for access to JU supercomputer; etc.

[19] this is when a positive result for the customer is available, which could in principle be testified by a news announcement or success stories (even light), given that the interaction is done/finished.
The PoCs are included in these activities.
Here, the intended goal of the activity for the SME has been reached.
Examples: the specific workshop or knowledge session successfully took place, or the SME got the access to the JU supercomputer, etc.

[20] The goal of a PoC is to determine the technical feasibility of an approach and to determine the next steps for an SME (next steps that would likely be outside the NCC, e.g. to apply for further funding or accelerator).
A proof of concept is usually small and may or may not be complete. According to the EIC Accelerator TRLs definitions, a PoC (Proof of Concept) includes activities towards achieving up to TRL 3 (more info about these TRL definitions in the handbook). For instance, it could involve the development of a simplified computational model, as well as initial scientific research, practical applications, applied research, or the realization or demonstration of an idea, method, or principle. A PoC is a special case of the “Activities” reported above.

[21] Aeronautics, Agriculture, Automotive, Biotechnology/Bioinformatics, Chemicals, Cosmetics, Construction, /Architecture/Infrastructure, Defence sector, Earth science, Electrical and electronic engineering, Energy, Environment/climate/weather, Food and drink, Finance/Insurance, Health care / Pharmaceuticals / Medical devices, Humanities/Languages, IoT (Internet of things), IT/HPC systems services & software providers, Life sciences, Manufacturing & engineering, Maritime, Material sciences, Mechanical engineering, Public services/Civil protection, Raw materials metals minerals and forest-based, Space, Smart City, Textile, Fashion and creative, Quantum Computing.

[22] EuroCC2 booklet n°2: https://www.eurocc-access.eu/wp-content/uploads/2024/10/EUROCC2_Booklet2024_v1.0.pdf

[23] Industry portfolio, by sectors: https://www.eurocc-access.eu/wp-content/uploads/2024/10/CONSOLIDATED-Industry-use-cases-sectorial-order-ROUND3.pptx
[24] Industry portfolio, by alphabetical order of the NCCs https://www.eurocc-access.eu/wp-content/uploads/2024/10/CONSOLIDATED-Industry-use-cases-Alphabetical-ROUND3.pptx
[25] SSC company: https://www.ssc-services.de/
[26] https://www.arctur.si/
[27] Best practice guide "Organising Event & Dynamisation sessions: https://www.eurocc-access.eu/wp-content/uploads/2024/09/Best-practices-guide-Session1_2907-1.pdf
[28] Best practice guide "Users days" https://www.eurocc-access.eu/wp-content/uploads/2024/09/Best-practices-guide-Session2_2608.pdf
[29] Best practice guide "Interactions with public administration & Co ":https://www.eurocc-access.eu/wp-content/uploads/2024/09/Best-practices-guide-Session3_2708.pdf
[30] Best practice guide "Outstanding/Original ways to engage with industry": To be published online during December 2024

10 Annexes

Annex 1: Report regarding the survey conducted among the NCCs between April-June 2024 to collect the updated information about the existing national solutions that can be considered as services catalogues and to better understand the reasons of the task force blockers.
Annex 2: (Round 3) industry use cases portfolio either sorted by industry sectors or by alphabetical names of the NCCs.
Annex 3: Report regarding the questionnaire developed by WP4 and ARCTUR to understand better the challenges of the NCCs to use the now availableHPC4SME AAT tool.
Annex 4: NCCs members of the task force "Waldur -LinkHPC platform "

Annex 1: Report regarding the survey conducted among the NCCs between April-June 2024 to collect the updated information about the existing national solutions that can be considered as services catalogues and to better understand the reasons of the task force blockers

DIGITAL-EUROHPC-JU-2022-NCC-01

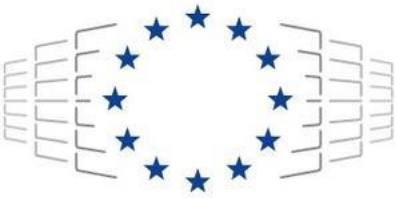
LinkHPC platform "Status" Survey

June 2024

Up-to-date information about the current running or in-development solutions, the potential needs or interests and the challenges or blockers of the NCCs for such platforms

CASTIEL2

Coordination & Support
for National Competence Centres on a European Level Phase 2
Project Number: 101102047



This project has received funding from the European High-Performance Computing Joint Undertaking (JU) under grant agreement No 101102047. The JU receives support from the Digital Europe Programme and Germany, Italy, Spain, France, Belgium, Austria.

List of abbreviations

CASTIEL2	Phase 2 of CASTIEL
EC	European Commission
EuroCC2	Phase 2 of EuroCC
EuroHPC JU	The European High Performance Computing Joint Undertaking
HPC	High-Performance Computing
JU	Short version of EuroHPC Joint Undertaking
NCC	National Competence Centre
PMT	Project Management Team
SME	Small and Medium-sized Enterprise
WP	Work Package

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1 Introduction

Following the first review in February 2024, the EuroHPC Joint Undertaking (JU) and the reviewers highlighted the importance for CASTIEL2 to monitor the status of the NCCs regarding the topic of the LINKHPC platform. The whole topic needed further clarification in terms of what the NCCs already have in-house, what they are developing, what they additionally need, whether the already existing French solution (that was the topic of discussion of a working group during 2023) is of interest, and what the blockers or requirements for the NCCs are, to potentially use it.

In order to collect elements to answer to these questions, CASTIEL2-WP4, in collaboration with the PMT of CASTIEL2 and with the support of Karim Azoum from NCC France, particularly regarding the question mentioning the offer around the French solution “CC-FR marketplace”, created a survey during February-April 2024 to be distributed among the NCCs.

This survey was sent to the industry champions of the NCCs in April 2024, with reminders sent in May 2024 for a final deadline on May 16th. The results of the answers provided by 19 NCCs were processed at end of May 2024 by CASTIEL2-WP4.

2 Survey distributed to the NCCs

Following the first-year review, the JU orally expressed (and this was repeated afterwards by writing, in the review report) the need for CASTIEL2 to understand better the overall situation and opinions of the NCCs with regards to the topic “LinkHPC platform” before moving forward on this topic.

To provide this consolidated information, CASTIEL2-WP4 created a survey, using the EU Survey tool to collect up-to-date data from the NCCs. The complete detailed (anonymized) questions and results are available in the table in Annex 1.

This survey was distributed to the NCCs a first time on April 17th, 2024, with an initial deadline for May 3rd, which was extended to May 16th after 2 reminders, including one reminder sent to individual NCCs.

2.1 Main results

2.1.1 The solutions currently used in the NCCs to manage the collected information about their ecosystem

The NCCs were asked about the tool or solution that are used in their NCC to manage all the information gathered by the NCCs (competences, experts, contacts, organisation, services) regarding the organisations (SMEs, big industry companies, research centres, public administration, etc) within their ecosystem.
The tools that are used the most are CRMs and EXCEL spreadsheets. Some other tools are also used like Airtable, e-mail and Slack, Notion , https://www.enccb.be/marketplace or some internal monitoring tool.
All the answers are detailed in Annex 1.

2.1.2 The existing or in development tool or platform in the NCCs used to manage more efficiently the gathered information about the ecosystem

The NCCs were asked whether they are developing or using an alternative/similar solution to the LinkHPC platform in their NCC. The term "LinkHPC platform" refers here to the current French solution, that was discussed in the industry working group task force. The answers are illustrated in Figure 1

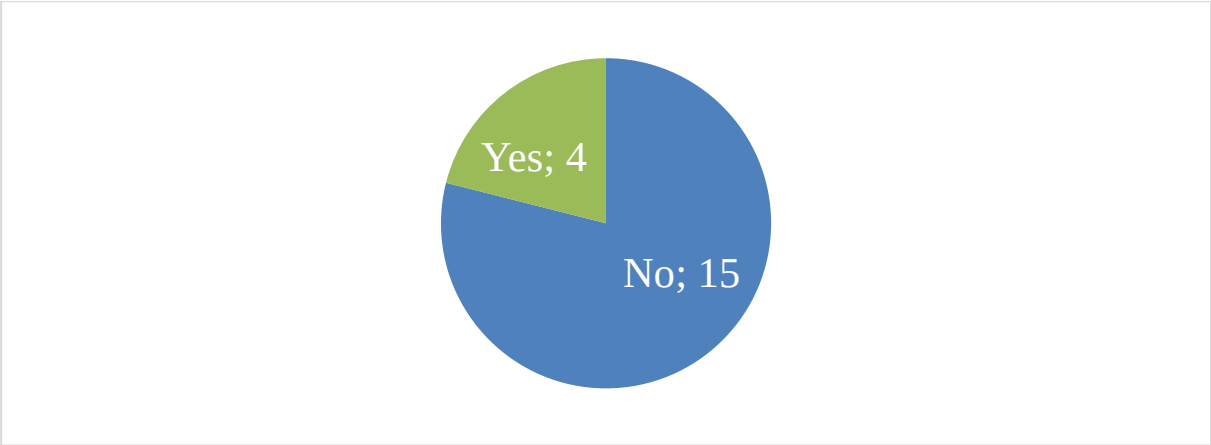


Figure 1: Answers to the question “Are you developing or using an alternative/similar solution to the LinkHPC platform in your NCC?”

4 NCCs indicated either currently having a solution, in use or in development, or they explained why they don’t need one. Details for these 4 NCCs are available as follows, and complete answers (anonymized) from all NCCs are available in Annex 1:

The a] name and the url link of the other solutions & their current b] status are:

GERMANY-

a] Development together with Gauss Alliance; is not yet publicly available

b] Former solution or existing platform that is currently being customized or updated in the NCC

ESTONIA-

a] Waldur - minu.etais.ee

b] Former solution or existing platform that could be customized or updated in the future in the NCC, if need be

POLAND-

a] No name yet, it will be on their website, but it is not deployed on the website yet.

b] New solution in current development in the NCC

AUSTRIA-

a] N/A

b] If there is in the future a final specification, they will look into how to implement a solution. As long as clarity […] on the topic is missing, […] unnecessary efforts are avoided.

2.1.3 Interest for the French solution or information about other interests

As the French solution was already discussed at the end of the phase 1 and the beginning of the phase 2 in the network, the NCCs were asked whether they were interested in testing it (at the national level), under the specific following conditions: “Teratec (represented by Dr Karim Azoum in the task force discussions) gives to NCCs the possibility to use the French marketplace and/ or the English test version- LinkHPC platform free of charge by signing a contract of test and evaluation (the source code remains the property of Teratec, and the database remains the property of the NCC users). The use of the LinkHPC platform is free of charge during the project EUROCC-2, but all deployment (like creating an NCC national webpage dedicated to the LinkHPC platform and pointers to login or creating of an account) or adaptation costs (only focusing here on the way to register Organisations by a national registration number through a dedicated API) are the responsibility of the NCC user. “

The answers are illustrated in Figure 2.

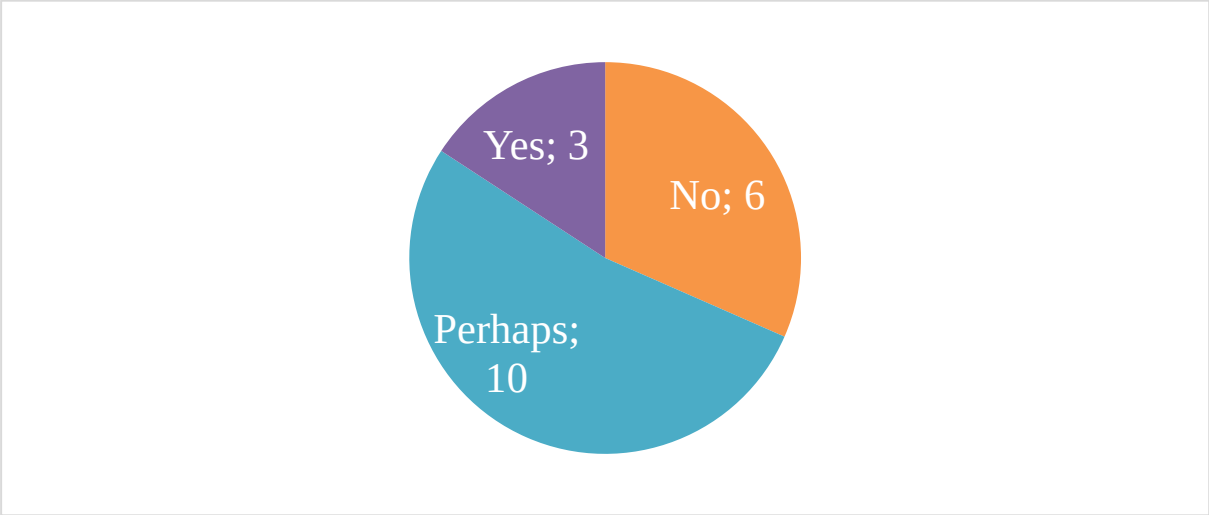


Figure 2: Answers to the question:’ Under the listed specific conditions, would you be interested in testing this solution (at the national level)?”

The reasons or specific requirements in case of yes/no/perhaps answers are detailed in Table 1 and Table 2.

Table 1: Reasons or specific needed requirements in case of Yes/Perhaps (anonymized).

In case of Yes/Perhaps, please let us know your reasons, or your potential specific requirements to do so:
We'd like to see how it looks, features and understand if it might be helpful for us.
Looks lovely, however I have concerns about not owning the source code, ease of adaptation, what happens after EuroCC and the overhead in managing the tool, compared to the number of users, as the […] ecosystem is tiny. But happy to discuss and learn more.
As stated always, we have to host this platform on an own virtual machine in […].
I think that a EuroCC-wide integrated solution would be the best. If the usage conditions are appropriate (transparent cost structure and no lock-in effect) this could be a viable solution; the more countries participate the better.
No specific requirements
To see how the platform functions in our current workflow.

We would need to understand better the advantages of LinkHPC and also find someone to perform the testing.
Depending on the demand scope and available resources
Two key issues: 1. The solution is free-of-charge during the project, however, what happens afterwards? The NCCs are fundamentally either committing to paying (if that is the route Teratec choses), or are forced to create their own solution from scratch (in a short period of time)? If LinkHPC is merely scraping/compiling data from national web pages (that we are supposed to have anyways), why even have it? If LinkHPC is a platform where NCCs are directly filling in data and there is no need to have a national platform/page - we are back at the first question. 2. The issue of data/privacy is an important issue, especially in the context of the first point. This should be discussed after basics in point 1. are resolved.
It could be beneficial in order to share professional matters and contacts. Our main reason is curiosity. We don't have any specific requirements,
If no one uses it, then usefulness is questionable. Not sure if time investment in platform will result in necessary value added.
We already use it.
It's a ready-made tool that looks very interesting and has been available since long time ago (first EuroCC phase). The conditions are reasonable for the sake of maintenance and usability.

Table 2: Reasons in case of No (anonymized)

In case of No, please let us know your reasons:
• Concerns about the fact that the database, the IP of the tool, the code source are managed by/in another country; concerns about national specific limitations or constraints (regarding development or management of this kind of solution in a foreign country); • Interest for other solutions or providers; • Others, please specify: There are number of concerns related to using a tool that is free of charge for the next 18 months, what happens after that, if we spend resources adding information or have our customers do it, will it have a value after the project? Also, the hosting entity of the NCC are in the process of acquiring a CRM tool anyway, so spending resources on a tool in parallel would work against these efforts, assuming the NCC will be part of the hosting entity in the long run. Do not think companies would spend time registering in a database unless they take time to meet with us, and if they do, we have already established the relationship. We are in current collaboration to establish a CRM that will be used in our FitSM process that will benefit us more
Others, please specify: The central management can manage the system, not specific NCC.
Others, please specify: Our company is closing or restructuring, so I cannot make a decision.
No need or interest for this kind of solution in our country
Others, please specify: We have already adopted Waldur, and it perfectly meets our requirements.

Others, please specify: We are trying to avoid closed source solution, particularly within EU funded projects, and if open-source alternatives are available.

3 Conclusions

This survey provided the current information about the up-to-date status of the NCCs regarding the topic LinkHPC platform.

In a nutshell, 6 NCCs are not interested in the solution proposed by the French NCC, because of national constraints or concerns about IPR and access after the project end, or because they already have their own national solution (in preparation or already in place), 3 NCCs are definitely interested in the solution proposed by the French NCC (1 actually already using it in their NCC); 10 NCCs are potentially interested with some specific requirements or with questions (particularly regarding the IP or the use during and after the project) to be answered at a higher level before using it.

It should be noted that 3 NCCs have their own national solutions either already in place or in development, different from the French solution.

Recurring questions or issues are the lack of a final decision on the requirements/expectations on this topic by the JU (and what are therefore the available or usable resources for this topic), the uncertainty about what happens after the end of the project, the impossibility to own/have access to the source code, and to have the database hosted in their country.

These results were shared with the PMT of CASTIEL2 & EuroCC2 to determine what the next steps on this topic between the NCCs and CASTIEL2 should be.

Annex 1: complete results

Part 1/2 (anonymized)

Which tool or solution is used in your NCC to manage all the information gathered by your NCC (competences, experts, contacts, organisation, services) regarding the organisations (SMEs, big industry companies, research centers, public administration, etc) within your ecosystem:	**Specify your other tool or solution, or indicate if you already have an existing platform similar to the LinkHPC platform (please indicate the name and the url link)**	**Are you developing or using an alternative/similar solution to the LinkHPC platform in your NCC? This term "LinkHPC platform" refers here to the current French solution, that was discussed in the industry working group task force (for information, this "LinkHPC platform" was previously called: marketplace).**	**Please provide the name and the url link of this solution:**	**Please indicate the stage of this solution:**	**Please specify the other stage of your solution**
Excel spreadsheets		No			
Excel spreadsheets; CRM		No			
Other, please specify:	we have a own tool that is mainly used for reporting, it can also hold information about the entities	Yes	n/a	Other, please specify	If we have a final specification, we will look into how to implement a solution. As long as the discussion in the task force are going on and clarity from JU is missing we will save work force to avoid unnecessary efforts
Other, please specify:	CRM tool are being implemented for the organisation hosting the NCC (Hedgedoc)	No			
Excel spreadsheets		Yes	Development togehter with Gauss Alliance; is not yet publicly available	Former solution or existing platform that is currently being customized	

				or updated in your NCC	
Excel spreadsheets		No			
Excel spreadsheets; Other, please specify:	Airtable	No			
Excel spreadsheets		No			
Excel spreadsheets		No			
Excel spreadsheets		No			
CRM		No			
Excel spreadsheets		Yes	Waldur - minu.etais.ee	Former solution or existing platform that could be customized or updated in the future in your NCC, if need be	
Excel spreadsheets		No			
Excel spreadsheets		Yes	No name yet, it will be on our website but it is not deployed on our website yet.	New solution in current development in your NCC	
Excel spreadsheets		No			
Excel spreadsheets		No			
Excel spreadsheets; Other, please specify:	Airtable, e-mail and Slack for international cooperation search and information exchange (e.g. expert search)	No			
Excel spreadsheets; CRM; Other, please specify:	https://www.enccb.be/marketplace	No			
Other, please specify:	Notion	No			

Part 2/2 (anonymized)

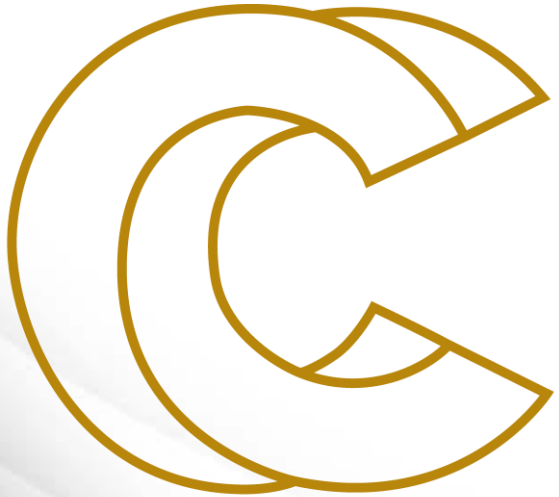
Teratec (represented by Dr Karim Azoum in the task force discussions) gives the possibility to NCCs to use free of charge the French marketplace and/ or the English test version- LinkHPC platform by signing a contract of test and evaluation (the source code remains the property of Teratec, and the database remains the property of the NCC users). The use of the LinkHPC platform is free of charge during the project EUROCC-2, but all deployment (like creating an NCC national web page dedicated to the LinkHPC platform and pointers to login or create an account) or adaptation costs (only focusing here on the way to register Organisations by immatriculation number through a dedicated API) are the responsibility of the NCC user. Under these conditions, would you be interested in testing this solution (at the national level) ?	**In case of No, please let us know your reasons:**	**Please specify your other reason(s)**	**In case of Yes/Perhaps, please let us know your reasons, or your potential specific requirements to do so:**
Perhaps			We'd like to see how it looks, features and understand if it might be helpful for us.
Perhaps			Looks lovely, however i have concerns about: not owning the source code, ease of adaptation, what happens after eurocc and the overhead in managing the tool,l compared to the number of users, as the […] ecosystem is tiny. But happy to discuss and learn more.
Perhaps			As stated always, we have to host this platform on a own virtual machine in […]

No	concerns about the fact that the database, the IP of the tool, the code source are managed by/in another country; concerns about national specific limitations or constraints (regarding development or management of this kind of solution in a foreign country); Interest for other solutions or providers; Interest for other solutions or providers; Others, please specify	There are number of concerns related to using a tool that is free of charge for the next 18 months, what happens after that, if we spend resources adding information or have our customers do it, will it have a value after the project? also, the hosting entity of the NCC are in the process of acquiring a CRM tool anyway, so spending resources on a tool in parallel would work against these efforts, assuming the NCC will be part of the hosting entity in the long run. Do not think companies would spend time registering in a database unless they take take to meet with us, and if they do, we have already established the relationship. We are in current collaboration to establish a CRM that will be used in our FitSM process that will benefit us more	
Perhaps			I think that a EuroCC-wide integrated solution would be the best. If the usage conditions are appropriate (transparent cost structure and no lock-in effect) this could be a viable solution; the more countries participate the better
Perhaps			No specific requirements
Perhaps			To see how the platform functions in our current workflow.
No	Others, please specify	The central management can manage the system, not specific NCC.	
Perhaps			We would need to understand better the advantages of LinkHPC and also find someone to perform the testing

No	Others, please specify	Our company is closing or restructuring, so I cannot make a decision.	
No	No need or interest for this kind of solution in our country		
No	Others, please specify	We have already adopted Waldur, and it perfectly meets our requirements.	
Perhaps			Depending on the demand scope and available resources
No	Others, please specify	We are trying do avoid closed source solution, particularly within EU funded projects, and if open-source alternatives are available.	
Perhaps			Two key issues: 1. The solution is free-of-charge during the project, however, what happens afterwards? The NCCs are fundamentally either committing to paying (if that is the rout Teratec choses), or are forced to create their own solution from scratch (in a short period of time)? If LinkHPC is merely scraping/compiling data from national web pages (that we are supposed to have anyways), why even have it? If LinkHPC is a platform where NCCs are directly filling in data and there is no need to have a national platform/page - we are back at the first question. 2. The issue of data/privacy is an important issue, especially in the context of the first point. This should be discussed after basics in point 1. are resolved.
Yes			It could be benefitial in order to share professional matters and contacts
Perhaps			If noone uses it, then usefuleness is questionable. Not sure if time investment in

			platform will result in necessary value added.
Yes			We already use it
Yes			It's a ready-made tool that looks very interesting and has been available since long time ago (first EuroCC phase). The conditions are reasonable for the sake of maintenance and usability.

Annex 2: (Round 3) industry use cases portfolio either sorted by industry sectors or by alphabetical names of the NCCs



EURO^2

Industry use-cases

EuroCC-1 & -2 portfolio

Content

NCC Name	Number of use cases reported
Austria	2
Belgium	4
Bulgaria	2
Croatia	3
Czechia	13
Estonia	4
France	8
Hungary	2
Latvia	3
Portugal	4
Slovakia	2
Spain	1
Sweden	3
Türkiye	6
TOTAL	**57**

Austria

Energy

HAKOM TIME SERIES

EURO²

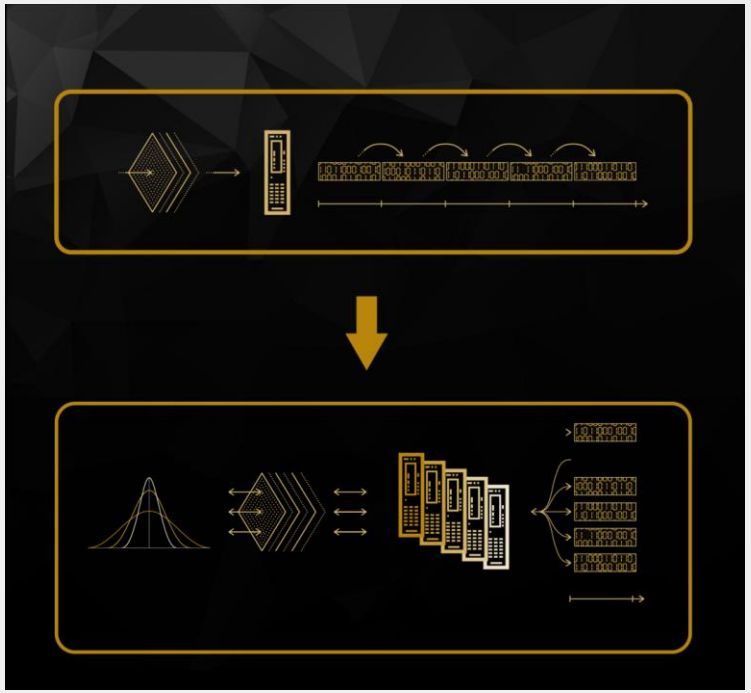
Time Series in the Energy Sector

Company

HAKOM is the technology leader for time series management in the energy industry. Its PowerTSM® Technology enables and accelerates innovation.

Challenges & Solution

The energy sector generates more data than ever before - most of it is time series data. In order to add more advanced big data analytics capabilities, the company tested its technology on a supercomputer. EuroCC Austria referred HAKOM to the experts of the Little Big Data (LBD) cluster, an HPC system at TU Wien. The successful integration of time series management (TSM) software on a highly parallel cluster enables HAKOM now to further develop the tools for analysis of very large data sets directly through its TSM system.



Benefits

- more advanced big data analytics capabilities available
- enables development of tools for analysis of very large data sets directly through its TSM system

"With the guidance of the EuroCC team we decided to export our time series data to parquet files ... With all the data residing in the distributed network file system reading subsets of data – roughly 10 GB – into a Spark distributed data frame became both doable and reasonably fast."

Gregor Beyerle, Data Scientist @HAKOM

Full story:

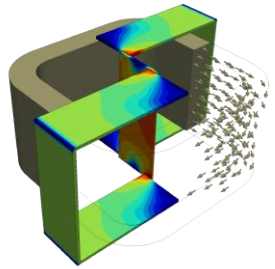
EURO AUSTRIA

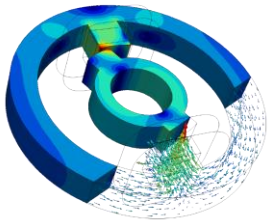
whole story

Simeon Harrison, EuroCC Austria, info@eurocc-austria.at

Electrical and electronic engineering

TAILSIT





EURO²

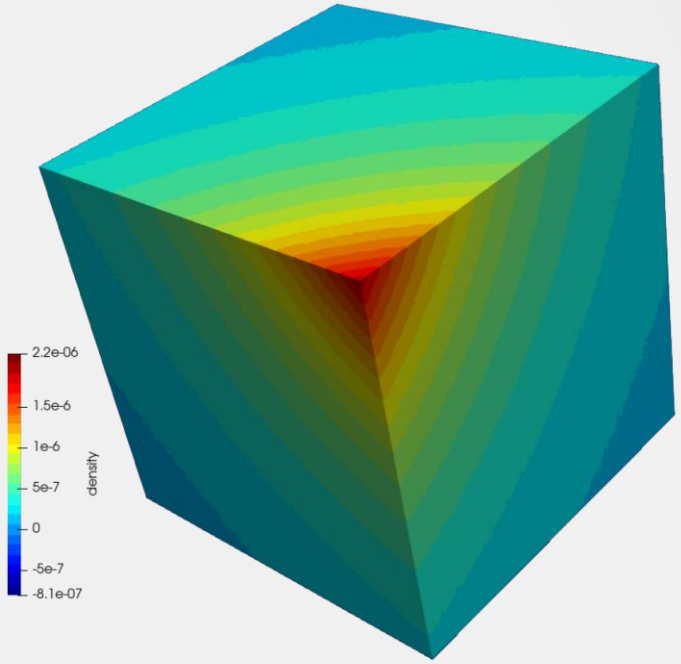
Electromagnetic Simulations

Company

TAILSIT, a company from Graz, Austria produces custom-fit simulation software tools for computational electromagnetics and structural analysis.

Challenges & Solution

TAILSIT's distinctive software library employs a coupled Finite/Boundary Element Method (FEM/BEM) for electromagnetic analysis. BEM, with quadratic complexity, becomes nearly linear through Fast Multipole Method (FMM) integration. Challenges arose in limited desktop capacity. With support from the Vienna Scientific Cluster (VSC) at TU Wien the software was adapted for HPC machines, yielding significant runtime enhancements and the ability to handle problems with up to $50 \cdot 10^9$ degrees of freedom, a major leap from its previous capacity of 10^6.



Unit cube and its calculated potential caused by a given fundamental solution

Benefits

- ⩥ significant run-time improvements
- ⩥ good overall scaling for up to a few thousand CPUs
- ⩥ achievement of significant upscaling of degrees of freedom

"Based on the results and the knowledge acquired from this project, we were able to further develop our method such that the first industrial applications have been simulated. In order to harden the algorithms and thus to achieve a sustainable implementation, we will again seek cooperation with the VSC team."

Dr. Jürgen Zechner, CEO @TailSiT

Full story:

EURO AUSTRIA

⩥ publication

Dr. Soner Steiner, EuroCC Austria, info@eurocc-austria.at

Belgium

Manufacturing & Engineering

Understanding physics at the microscale in filter media

Company

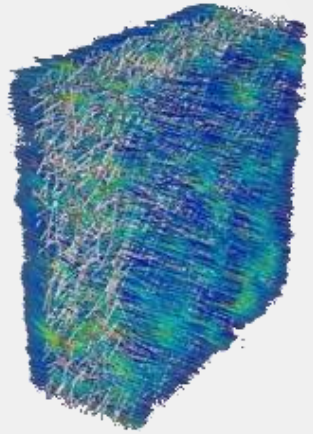
Atlas Copco is specialized in the design, development and manufacturing of industrial compressors and expanders, vacuum solutions and air and gas treatment equipment.

Challenges & Solution

The flow geometry and physics at the microscale in filter media are complex and require state-of-the-art computational fluid dynamics techniques to resolve. The required computational resources are extensive and need world-class high-performance computing.

Simulations were first performed to build the necessary experience in efficiently running large-scale calculations and exploring the computational limits. Using VSC infrastructure gave Atlas Copco access to new simulation techniques to investigate the microscale behavior of oil aerosol filter media.

Virtual filter medium microstructure



Streamlines flow through a filter medium coloured by velocity magnitude

Benefits

✓ Accelerate the development of new and better designs

✓ Simulation of more physics and larger problems that were infeasible before

☞ **Cleaner air delivered at a lower energy cost to our customers**

"Atlas Copco wanted to have a better understanding of microscale air and oil flow behaviour in oil aerosol filter media. If we better understand the physics at this scale, we can design filters with higher filtration efficiency at a lower pressure drop. This, in the end, results in cleaner air delivered at a lower energy cost to our customers" **Tom Saenen, Technology developer @Atlas Copco**

Full story:

Carl MENSCH, Industry EuroCC BE, carl.mensch@uantwerpen.be

Biotechnology / Bioinformatics

PUXANO

EURO²

Matchmaking, mapping industry challenges to research

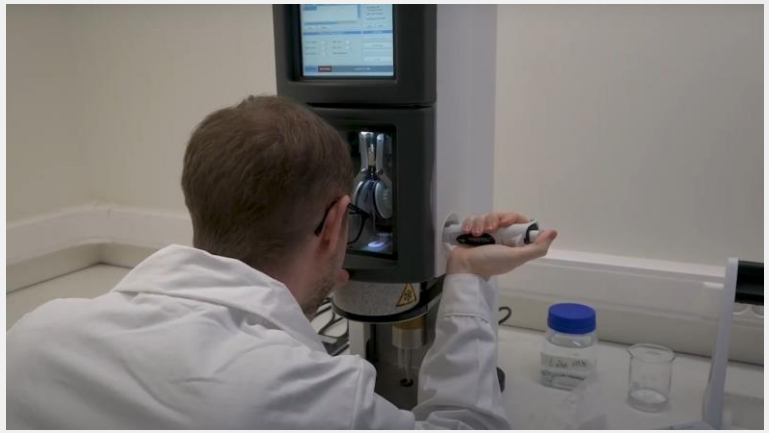
Company

PUXANO is a biotech company offering structure-based protein research services to pharma and biotech companies. The company differentiates from others by developing its own technologies to accelerate the process of obtaining protein structures.

Challenges & Solution

The procondor platform helps to optimize the protein sequence in a semi-automated manner. Puxano initially used the platform internally but wanted to automate it further and make it available for others to use.

To meet this computational demand, Puxano has employed the HPC services of VSC. Furthermore, VSC introduced Puxano to the Data Science Institute of UHasselt (DSI). DSI helped Puxano design a suitable database structure. The developed database is being incorporated into the Puxano analysis pipelines and serves as the core source of information for the Puxano (web-based) service platform.



Benefits

- ✓ VSC as match-maker between Puxano and DSI
- ✓ DSI gave new insights to design a suitable database structure

☞ **The developed database serves as the core source of information for the Puxano (web-based) service platform.**

"Our key objective was to rethink our script for protein construct design into a software platform. The idea was to find out which type of database structure served best to integrate protein information in different formats, have efficient data storage, easily updatable and searchable. Our collaboration with academia was very valuable for the success of the project" **Wouter Van Putte, Director & co-Founder @Puxano**

Full story:

EURO BELGIUM

Carl MENSCH, Industry EuroCC BE, carl.mensch@uantwerpen.be

Energy

The Role of HPC in Ensuring Nuclear Reactor Safety

Company

Founded in Belgium 150 years ago, Tractebel is today one of the world's leading engineering companies for energy, water and infrastructure projects.

Challenges & Solution

In 2012, the federal agency of nuclear control of Belgium reported defects in the vessels of the nuclear reactor Doel 3 and Tihange 2. Among a lot of analyses, numerical simulation has been chosen to assess the risk level.

These simulations were highly computationally demanding. A single computation required a high quantity of memory (up to 128Gb for the first computations – feasibility proved up to 768Gb). Due to the high number of configurations to compute (some hundreds), combined with the memory needs, the use of HPC infrastructure was a requirement.

Benefits

- ✓ HPC helped in the assessment of structural integrity
- ✓ Safe restart of the reactors (combined with inspections)

☞ **Tractebel acquired unique expertise and now conducts its own analyses on various parts of nuclear power plants internally but also for its partners.**

"Multiple crack configurations required much caution to perform the computation within the available hardware resources while satisfying high-quality standards in the results. Cenaero developed methodologies to face the challenges (number of configurations, memory and restitution time limitations, post-processing). " **Valéry Lacroix, Technical manager of seism & structural integrity group @Tractebel**

Full story:

Frédérique Jacobs, Industry EuroCC BE, frederique.jacobs@cenaero.be

IT/HPC systems, services & software

MPACTS

EURO²

Leveraging expertise

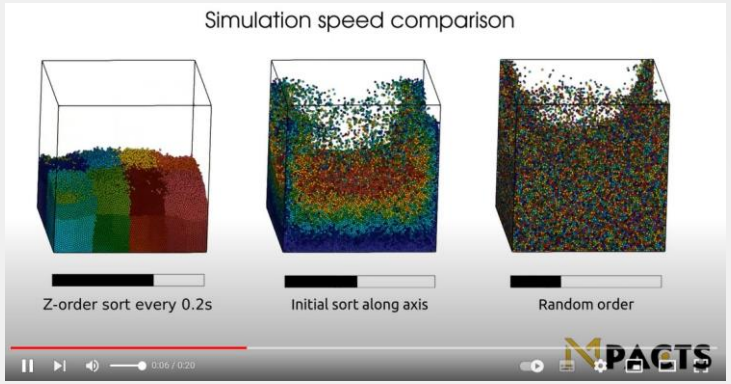
Company

Founded in 2018, Mpacts is a SME dedicated to te development of Mpacts simulation software. It is designed to simulate the behaviour of granular materials, assemblies of large numbers of particles in industrial processes.

Challenges & Solution

While granular dynamics is conceptually very similar to molecular dynamics, it is also much more complex since particles have shape and complex interactions, which complicates contact detection. Develop computationally efficient simulation software for granular processes is critical.

The Flemish Supercomputing Center (VSC) recommended sorting the particles so that particles close in (simulated) space are also close together in computer memory. VSC also built a tool that automates the compilation of Python modules from C++/C/Fortran. These programming techniques made the software more efficient and, thus, faster.



Benefits

- ✓ Sorting the particles in memory translates into faster computation times by factor 2 with existing hardware.
- ✓ Performance increases by a factor of five with GPUs

☞ **This improvement has a high impact on the responsiveness in solving engineering problems.**

"The ability to work with the highly skilled experts in the field of HPC at VSC was a very interesting and rewarding experience. I would recommend anyone involved in supercomputing to contact the VSC and benefit from their available expertise to improve your calculations." **Simon Vanmaercke, Co-Founder @Mpacts**

Full story:

EURO BELGIUM

Carl MENSCH, Industry EuroCC BE, carl.mensch@uantwerpen.be

Bulgaria

Health care / Pharmaceuticals / Medical devices

AMET
allgemeine medizin - elektronik - technologie

EURO

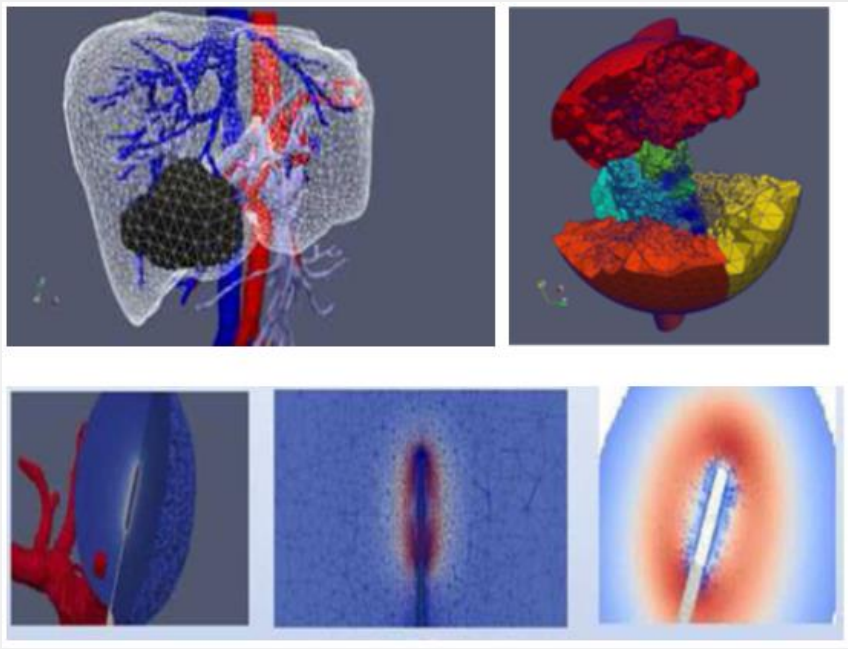
Supercomputer application in biomedical engineering

Company

AMET Ltd. is a company dedicated to development, modern manufacturing and distribution of electronic medical equipment and modules. It is a reliable and desired partner in Bulgarian and foreign market.

Challenges & Solution

The processes are substantially three-dimensional and time-dependent. The developed software tools for supercomputer simulation of coupled physical processes of radiofrequency electro surgery manipulations are beyond the scope of available commercial packages. Measurable indicators are applied to assess the reliability of the obtained results, thus providing proven criteria for minimizing subjective inaccuracies. The impact of using large-scale HPC models reached more than two times improved precision of evaluating the volume of effectively ablated tissue.



Benefits

- ✓ Fully realistic computer simulation of strongly coupled processes of radiofrequency electrosurgical technologies.
- ✓ Time/cost saving of parameter optimization of high tech low-invasive procedures.
- ✓ Assessment and optimization of hard to measure complex processes.

"The use of state-of-the-art modeling, simulation and high performance technologies is very important to our company. The business impact from our collaboration with IICT-BAS includes improving the technology characteristics of existing products and development of new products."

Janet Popova, Managing DIrector @Amet Ltd.

Full story:

EURO² Bulgaria

Contact person at the NCC Bulgaria: Stanislav Harizanov, sharizanov@parallel.bas.bg

Manufacturing & Engineering

PLYGEAR

EURO²

Improving the furniture precision

Company

PLYGear is specialized in the design, computer modelling and manufacturing of furniture born in timely recorded digital dreams supported by the plywood unique properties.

Challenges & Solution

The models designed and implemented in virtual environment are complex and require state-of-the-art computational techniques to resolve. The required computational resources are extensive and need high-performance computing as all Plygear items need the precision of the modern processing methods.

Simulations were performed to acquire knowledge in running effectively new design methods. The impact of using large-scale HPC models improved both the precision and the production rate.

Benefits

Accelerate the development of new designs via simulations

Each model is designed and implemented in virtual environment

☞ **a functional minimalist design offered to our customers**

Full story:

"PLYGear wanted to have a better approach to furniture design for a complex environment by mixing ideas with passion and engineering precision. The most characteristic of all PLYGear items is that thanks to the precision of the modern processing methods the assemblies are made extremely reliable and impeccable. " *Borislav Georgiev*, **MS in Engineering, Technology Developer @PLYGear**

EURO² Bulgaria

Contact person at the NCC BG: Ana Proykova, anap@phys.uni-sofia.bg

Croatia

Manufacturing & engineering

Mikrotvornica

EURO

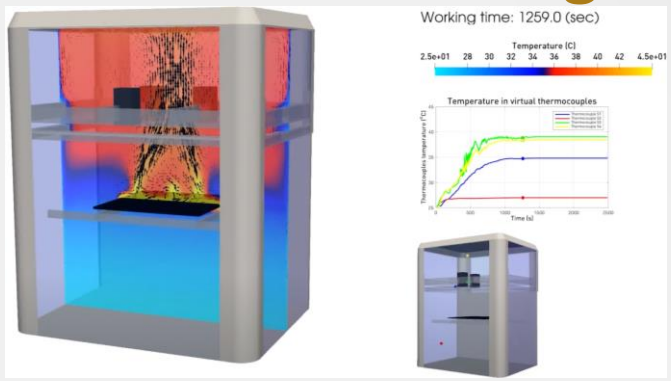
HPC-based Stabilization for Additive Manufacturing

Company

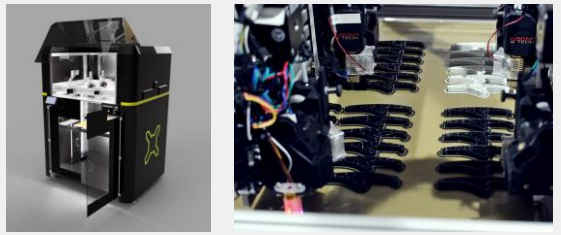
Mikrotvornica d.o.o. specializes in high-quality prototype and product production using advanced technologies, with a strong focus on additive and digital manufacturing.

Challenges & Solution

The aim of the project is to reduce heat-induced deformations in 3D-printed objects. These deformations can significantly affect the quality and functionality of the final product. Based on computational fluid dynamics simulations performed using the HPC infrastructure, through an iterative processes and fine-tuning, an improved 3D printer assembly was created. In addition, the additive manufacturing process was improved by outlining and providing complete control over the parameters that affect the dimensional stability of 3D printed products.



CFD-based tuning process.



Modified 3D printer and object printing.

Benefits

- ✓ Shorter delivery times by up to 50%.
- ✓ Reduction of up to 30% in production costs.
- ✓ Savings of €150.000,00 over a period of three years.
- ✓ Increase in sales by up to 30%.

"In cooperation with the members of NCC Croatia (RBI), we were provided with professional support and extensive experience with regards to the application of high-performance computing in order to improve 3D printing characteristics and capacities."

Nikola Blažević, CEO @Mikrotvornica

Full story:

HRVATSKI CENTAR KOMPETENCIJA ZA HPC

Lado Kranjčević, NCC Croatia, lado.kranjcevic@riteh.hr

Mechanical engineering

AITAC

EURO²

Dynamic Fluid-Object Interactions During Motion

Company

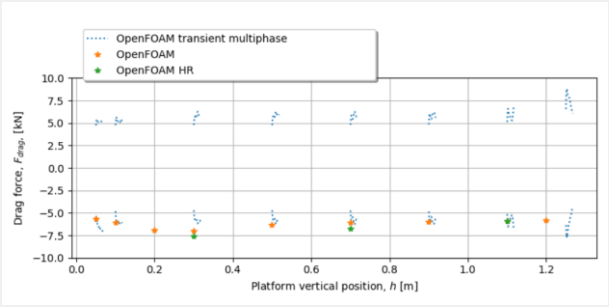
AITAC d.o.o. is a local subsidiary providing yacht, naval, cruise ship, marine & offshore engineering and PLM services in shipbuilding and offshore industry.

Challenges & Solution

Simulating the movement of submerged objects in a fluid-filled tank can be a challenging task. The dynamic interaction introduces a variety of problems e.g. sloshing and potential spillage, all of which must be accurately characterized and effectively mitigated. The use of high performance computing is indispensable for the successful execution of these computational fluid dynamics simulations.

A carefully crafted plan for the optimal motion of objects is proposed. This plan represents a delicate equilibrium between the minimization of waiting times and the prevention of water spillage, and as such improves the overall system performance.

Simplified / representative problem concept.



Forces at relevant locations.

Benefits

- ✓ Optimized system performance by minimizing waiting times
- ✓ Facilitated the rapid exploration of novel design possibilities
- ✓ Optimal movement plan contributes to safer and more reliable system

"We were interested in the displacement of the water during the movement and were unsure of the bottom's impact on the flow and the force due to the negative pressure. Given that this is a component of a larger system, we needed a solution that would ensure uninterrupted and optimal operation."
Domagoj Borucinsky, Engineer @AITAC

Full story:

HRVATSKI CENTAR KOMPETENCIJA ZA HPC

Lado Kranjčević, NCC Croatia, lado.kranjcevic@riteh.hr

Manufacturing & engineering

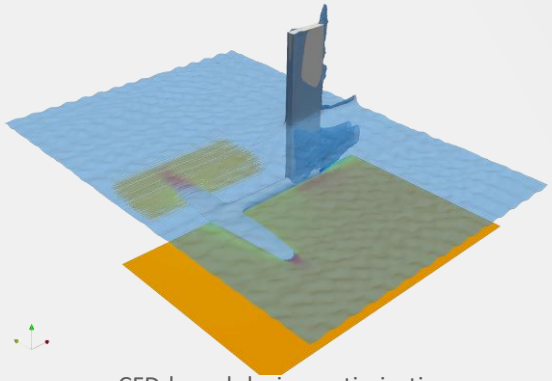
Digital Twin Framework for Hydrofoil Optimization

Company

Marotti Windsurfing d.o.o. is a company founded by the two-time windsurfing champion. MWSC is dedicated to the development and production of windsurfing equipment.

Challenges & Solution

In close cooperation with IIT d.o.o., specialized equipment and software were developed to ensure precise measurements of fluid data. A methodology based on reverse engineering and digital twin technology was developed to design an optimized hydrofoil. The mold creation process saw collaboration with members from the Academia and Bex d.o.o., resulting in a robust approach to aluminium mould production. State-of-the-art techniques were employed to produce and thoroughly test new hydrofoil prototypes.



CFD-based design optimisation

Hydrofoil mold used to create a prototype design.

Benefits

- ✓ Enhanced hydrofoil windsurfing performance.
- ✓ Competitive and industrial advantage (improved products).
- ✓ Industry/company growth.
- ✓ International recognition.
- ✓ Futureproofing.

"I am grateful for the accessibility, willingness, and enthusiasm in order to jointly achieve success. Our goal is to create a so-called 'speed foil' hydrofoil with which we will attempt to break the speed world record. I am confident, based on current results, that we will achieve this."
Enrico Marotti, CEO @Marotti Windsurfing

Full story:

HRVATSKI CENTAR KOMPETENCIJA ZA HPC

Lado Kranjčević, NCC Croatia, lado.kranjcevic@riteh.hr

Czechia

Security

Tool to fight criminality more effectively

Company

The Police of the Czech Republic are an armed security force established by the National Council Act of 21 June 1991. The Police of the Czech Republic serves the public.

Challenges & Solution

The practical part of the Maps of the Future II project aimed to use crime data to develop and test new procedures and tools for more effective crime fighting and more targeted, efficient, and thus cheaper use of resources (personnel, financial, and material).

Models designed to predict crime and socio-pathogenic phenomena throughout the Czech Republic were successfully developer and tested. The possibility of running memory and computationally demanding tasks in parallel using dedicated graphics cards proved crucial, allowing individual experiments to be reduced from days to hours.

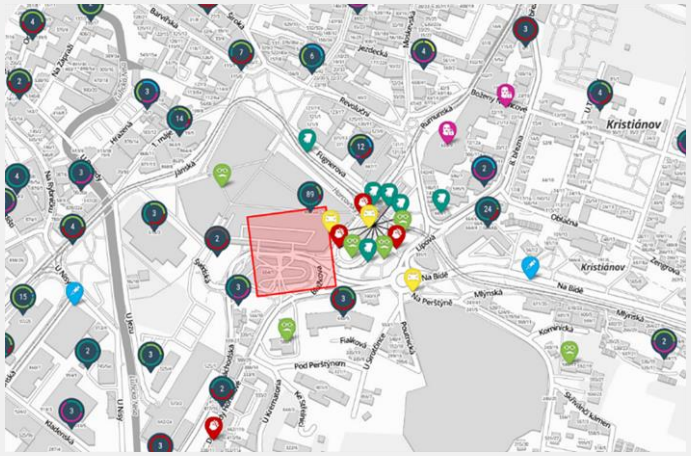


Photo provided by the Police of the Czech Republic.

Benefits

- ✓ The criminality prediction model training time was reduced several fold
- ✓ The training done on the GPU nodes of the Karolina cluster was shown to be effective
- ✓ The solution will help the Police of the Czech Republic increase the efficiency of their patrol planning.

"I am very pleased that the employees of the Police of the Czech Republic are actively involved in the search for innovations and solutions to one of the current topics in the internal security of the Czech Republic, which is the effective use of available resources (both human and material)." **genmjr. Martin Vondrasek, Police President**

Full story:

EURO CZECHIA

Contact person at the NCC: Tomas Karasek, tomas.karasek@vsb.cz

Manufacturing & Engineering

Use of Bulk Simulation in the Development of a Rail Freight Wagon

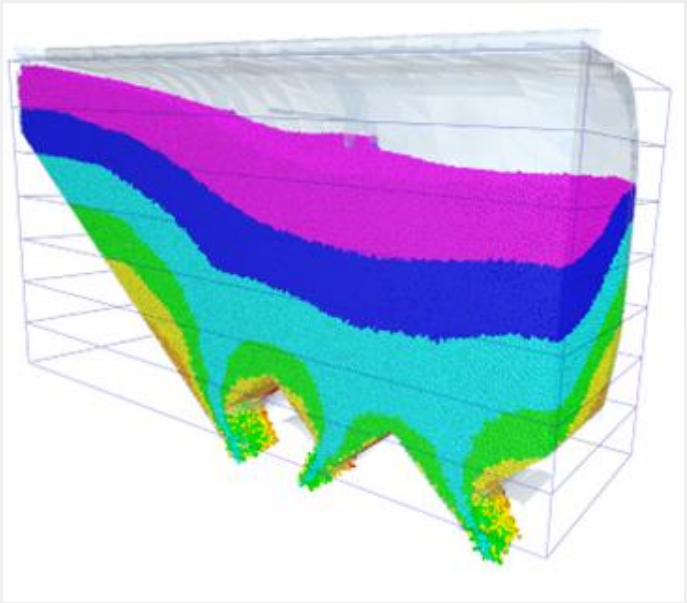
Company

Advanced Engineering is a company that focuses on computer simulations, structural analysis and optimisation of structures, and multi-physics modelling and simulation.

Challenges & Solution

End customers and users asked for a guarantee for the time required to unload each wagon during unloading, and the development team needed to make sure that the geometry of the hoppers and funnels would ensure the complete discharge of bulk material without it being stuck to the walls.

The solution can simulate the interaction of the bulk material with the structure, the ability to compare multiple design options, and the ease of analysing the behaviour of different grain types under various external conditions such as temperature and humidity.



Ongoing simulation of emptying a freight wagon box – one-quarter simulation model.

Benefits

✓ Time and costs savings through numerical modelling and simulations

✓ The ability to simulate the interaction of the bulk material with the structure

✓ The ability to compare multiple design options

"The advantage of computer simulations of bulk material movement for this problem over physical testing is that the cost of hiring grain silos and grain costs are eliminated." **Tomas Curda, Business Development Manager, Advanced Engineering, s.r.o.**

Full story:

EURO CZECHIA

Contact person at the NCC: Tomas Karasek, tomas.karasek@vsb.cz

Healthcare

Medical Image Processing

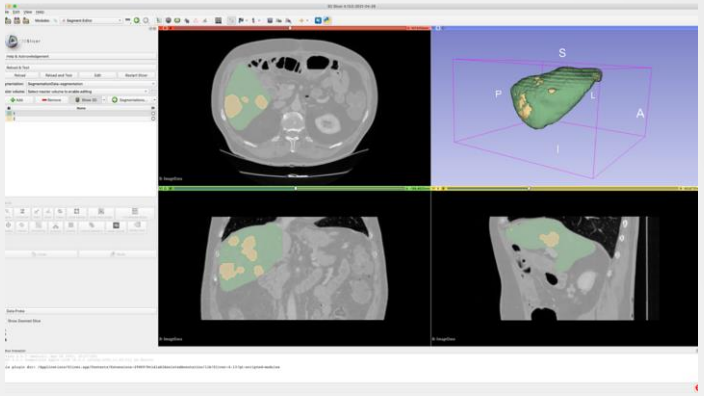
Company

University Hospital Ostrava is a state-funded organisation established by the Ministry of Health of the Czech Republic. The primary purpose of this organisation is to provide health services.

Challenges & Solution

The main goal of the cooperation was to deploy and test a tool providing remote automatic tissue segmentation from patient image data obtained from computed tomography (CT) or magnetic resonance imaging (MRI) on supercomputers at IT4Innovations National Supercomputing Center.

The automated segmentation process can be applied to specific tissues of real interest to the physician, and the resulting model can be further used to plan healthcare tailored to the individual patient.



3D Slicer working environment with possible output obtained by automatic segmentation on HPC cluster.

Benefits

- ✓ The time of the segmentation process is reduced by automation
- ✓ Spared time can be used for the physician´s benefit
- ✓ The automated segmentation process can be applied to specific tissues of interest to the physician

"Using this toolkit is beneficial for both patients and physicians, as automation allows us to achieve high-quality image reconstructions in a fraction of the time and with minimal effort." **Jan Roman, MD, University Hospital Ostrava**

Full story:

EURO CZECHIA

Contact person at the NCC: Tomas Karasek, tomas.karasek@vsb.cz

Healthcare

Launch of the Vaccination Centre

Company

This case has been handled together with the University Hospital Ostrava, Moravian-Silesian Region, Statutory City of Ostrava and Faculty of Medicine of the University of Ostrava.

Challenges & Solution

In March 2021, IT4T and the NCC in HPC collaborated on a joint project to build a large-scale vaccination centre in Ostrava, which was commissioned at the Černá louka site.

Our team created a simulation of the vaccination center's hall. This simulation detects critical vaccination centre points at times of high workload. Several bottlenecks in the original design, such as the waiting room after vaccination and the exit confirmation printing.

A consultation before the vaccination process.

Benefits

- ✓ The vaccination center can be designed efficiently in short period of time. Accurate detection of critical points and it´s redesign.
- ✓ The required number of operator and staff positions for each station were identified.
- ✓ The simulation also determines how many patients can be in the vaccination centre at any one time, at different stages.

”I appreciate the efforts of all the partners who have been and continue to be involved in constructing the vaccination centre. It is good to note that an important element in the design of such a centre was the supporting simulation, which was developed by scientists at IT4I and without which the testing of the capacity of the centre would have taken many times longer.“

Ivo Vondrak, Governor of the Moravian-Silesian Region

Full story:

EURO CZECHIA

Tomas Karasek, tomas.karasek@vsb.cz

Energy

Computational Simulations for Emission Reduction in Combustion Plants

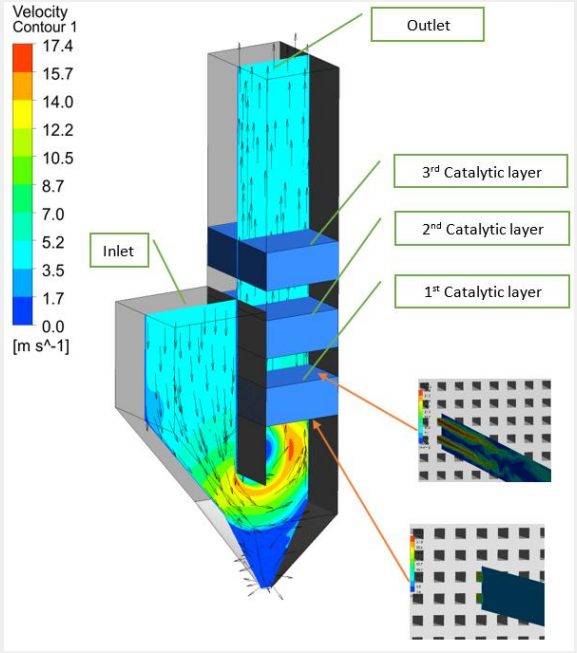
Company

The ORGREZ company provides services and supplies in several specific fields of power engineering, thermal engineering and ecology, generally in the processes of fuel energy conversion and electricity production and distribution.

Challenges & Solution

The main objective was to determine whether Computational Fluid Dynamics simulations could be used for the fast and efficient description of the selective catalytic reduction technology (SCR) catalysis process and, therefore, as a tool to mediate the design of a computational application for the design of this technology.

The use of numerical modelling and simulations will make the process more efficient, and faster and, most importantly, extend the application possibilities of this process, which will enable subsequent optimization of the designed solution and, thanks to high-performance computing, it will be possible to complete these simulations in a relatively short time.



CFD simulation of SCR process.

Benefits

- ✓ Confirmation of the applicability of CFD for SCR design and optimization
- ✓ Time and costs saving due to speed up of SCR design process
- ✓ Environmental impact due to optimised SCR design leading to increase of NOx emission reduction

"By speeding up the design process of the SCR technology, time and cost savings are achieved and, in addition, the optimised SCR technology design leads to more effective NOX emission reduction and extended technology lifetime, which has a positive impact on the environment."

Vojtech Vavricka, Managing Director of the ORGREZ Division for Ecology Systems

Full story:

EURO CZECHIA

Contact person at the NCC: Tomas Karasek, tomas.karasek@vsb.cz

Mechanical Engineering

Numerical simulation of Butterfly Valve closing

Company

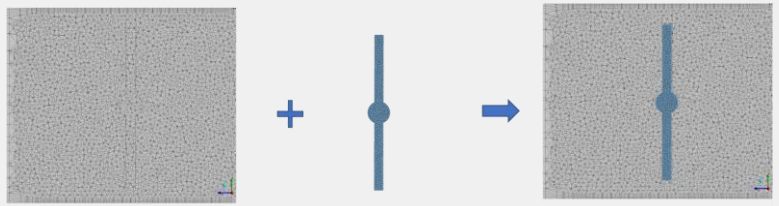
The Armatury Group specialises mainly in the production of valves, technological units, and related services. The main advantages of their production are their wide range of goods, quality of production and adaptation to customer requirements.

Challenges & Solution

In this collaboration, the primary focus was creating a proof-of-concept, by comparing available Computational Fluid Dynamics Simulation (CFD) approaches to moving objects in fluids.

A comparison of four CFD methods was successfully conducted, providing an overview of the requirements and limitations of each method, as well as the accuracy of the results. The simulations were carried out on a "simplified" flap valve, designed not to limit the use of any of the above-mentioned methods.

Overset mesh method.



Immersed body method.

Benefits

- ✓ Future computation models will be built with higher accuracy results.
- ✓ The simulations will be completed faster, resulting in cost savings.
- ✓ When many simulations are required, a supercomputer is an advantageous tool.

Full story:

"The use of HPC infrastructure will not only allow computational models to be built with higher accuracy results but also help to complete these simulations in a reasonable time, leading to cost savings. In addition, using supercomputers is advantageous for design optimization when many simulations need to be performed."

Lukas Kusnir, Research and Development Director of Armatury group

Tomas Karasek, tomas.karasek@vsb.cz

Realistic architectural visualisations using supercomputers

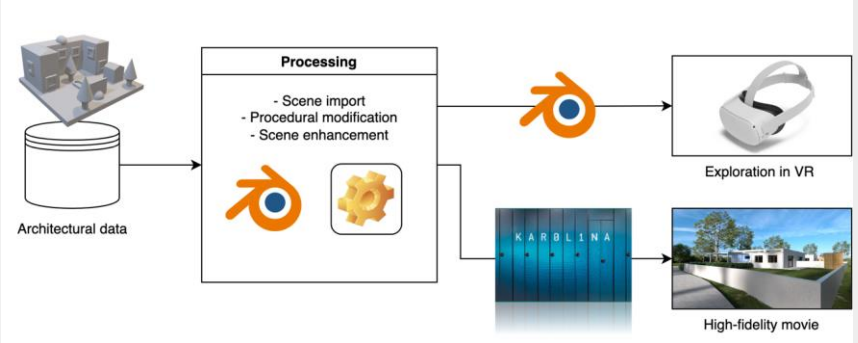
Company

INFER WAY focuses primarily on designing buildings, public spaces, preparing architectural and urban studies, and designing interiors. In addition to civil and residential buildings, the company also creates single-family houses and various interiors.

Challenges & Solution

The company wanted to develop and verify suitable procedures for processing input architectural data that would enable the generation of visually attractive outputs.

Creating procedures to appropriately modify and augment the 3D scene was necessary to generate photorealistic quality video footage. Furthermore , the scene was modified to allow interactive exportation in VR. In both cases, a path trace rendering was used. A supercomputer was used to achieve fast and accurate rendering outputs.



Processing workflow applied to architectural data.

Benefits

- ✓ Visualisations of the building design can be highly immersive.
- ✓ Improvement of the design ideas explanation between the designer and the customer.
- ✓ Time and cost savings.

Full story:

EURO CZECHIA

“Thanks to HPC, it is possible to achieve high visual quality in a fraction of the time compared to rendering on a standard workstation or a set of several workstations. Ideas can be better communicated with the customers, and due to the integration of VR technology in the process, resulting visualisations can be highly immersive.“

Martina Perinkova, CEO of INFER WAY s.r.o.

Tomas Karasek, tomas.karasek@vsb.cz

Healthcare

misterine

EURO²

Using supercomputers to create 3D tissue models for visualization

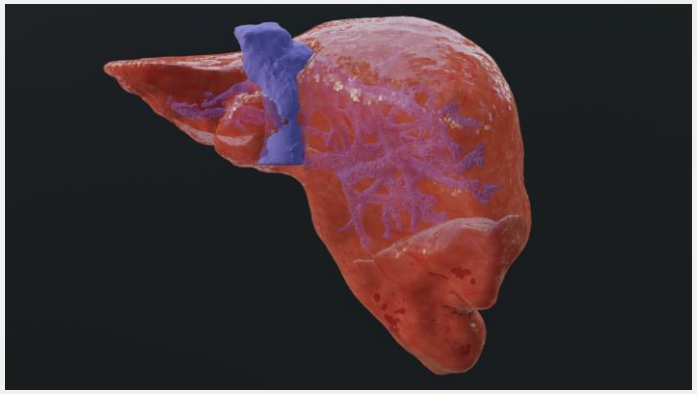
Company

Misterine's innovative AR and VR solutions enable better visualisation and education through immersive 3D experiences. Their Studio & App help users to effortlessly create, edit, and play AR manuals for a better understanding of complicated manual procedures.

Challenges & Solution

Misterine wanted to create 3D tissue models for visualisation using the supercomputer. Incorporating the new features into Misterine's existing workflow and ensuring seamless integration with NCC's workflow while maintaining data integrity presented a significant challenge.

NCC has offered methods to enhance Misterine Studio's software capabilities to showcase medical tissues in AR and enable workflow execution from the command line.



A 3D liver model that may be viewed in AR/VR.

Benefits

- ✓ For example, tissue models can be used for AR training from medical image data.
- ✓ Medical professionals and researchers can study and analyse the tissue more precisely.
- ✓ The solution will help optimise workflows, reduce complexity, and render realistic images using AR and VR devices.

"Thanks to using supercomputers, it has been possible to reduce the time of AI model training from computed tomography (CT) datasets. This will help Misterine with advanced data processing capabilities with deep learning."

Martin Klima, CTO of Misterine s.r.o.

Full story:

EURO CZECHIA

Tomas Karasek, tomas.karasek@vsb.cz

Manufacturing & Engineering

Neural networks in the steel industry

Company

ITA technology & software company supplies know-how and software solutions to leading major producers of rolling equipment, technologies, and control systems. Many of their software solutions have been successfully installed in rolling mills worldwide.

Challenges & Solution

Among the objectives of the collaboration was to investigate the possibility of using machine learning and neural networks to predict the accurate cooling parameters in steel rolling manufacturers' processes.

Having the correct parameters is essential for ensuring the final product's quality. The aim is to replace the need for manual correction with automatic correction based on AI methods.

The solution was analyzed and verified if the predictions generated by the ML models can enhance the methods currently used by ITA.

Ilustration of the steel sheet cooling process.

Benefits

- ✓ Artificial intelligence allows more accurate temperature calculations.
- ✓ An automated correction based on AI can calculate the estimated belt temperature after cooling more accurately and make the entire cooling process more efficient.
- ✓ Time and, therefore costs can be saved.

Full story:

“The collaboration with IT4Innovations and the use of machine learning methods have been very beneficial for us, as the deployment of artificial intelligence allows for more accurate temperature calculations. Among the time and cost savings, I would also like to highlight the positive environmental impact thanks to the optimized cooling process.”

Daniel Hajduk, ITA, spol. s r.o. Executive Manager

Contact person at the NCC: Tomas Karasek, tomas.karasek@vsb.cz

Biotechnology

Healthcare

Estimation of product defects using supercomputers

Company

The ING Corporation develops, designs, and manufactures medical devices using modern technologies such as 3D printing, CNC machines, and advanced materials. It is one of the leading companies on the Czech market in prosthetics.

Challenges & Solution

The main goal was to develop and verify effective procedures for analysing the shape of manufactured products, especially focusing on identifying possible inaccuracies. Implementing machine vision instead of manual check by an expert can offer a significantly more efficient and accurate approach.

Using descriptive points and relevant information that describe the product, the solution algorithm calculates the manufacturing error rate.

The first column shows two different types of product deformation. As you can see, the shape of the product is damaged. The next column shows the final product that meets the quality standards.

Benefits

- ✓ Algorithm calculates the manufacturing error rate by comparing the final product to its proposed construction.
- ✓ Verification of the product's shape if it meets the standards.
- ✓ Proposed solution can make production more efficient thanks to the possibility of detecting non-conforming products.

Full story:

"The proposed solution can make production more efficient thanks to the possibility of detecting non-conforming products. In the next phase, it would be possible to use the results to identify problematic parts of the product design itself. It would further improve the efficiency of the entire design-manufacturing process."

Jiri Rosicky, CEO of ING corporation

Tomas Karasek, tomas.karasek@vsb.cz

System for intelligent identification of air pollution sources

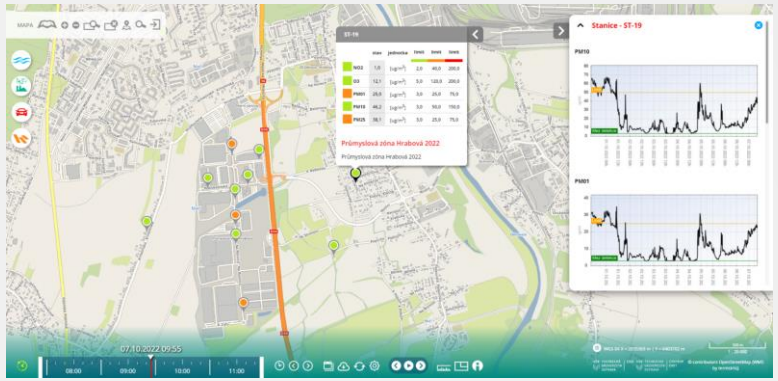
Company

ENVItech Bohemia focuses on offering comprehensive services in the field of environmental monitoring, especially of air - the company's main focus is the measurement of concentrations of pollutants. They supply a comprehensive assortment of means for monitoring air quality, including management systems.

Challenges & Solution

The aim of the cooperation between ENVItech and the VSB – Technical University of Ostrava institutes CEET and IT4Innovations was the implementation of the "Intelligent Air Pollution Source Identification System" (IIS) based on the principle of an online model of short-term values of concentrations of selected, health-relevant substances.

A comprehensive system for monitoring emission loads and software for evaluating and interpreting air pollution was acquired, emphasizing effective use for strategic decision-making in state administration, self-administration, and industrial resource management.



View of the software evaluating and interpreting air pollution.

Benefits

- ✓ Moravian-Silesian Region and the Ministry of the Environment have obtained a tool for fast, large-scale and cheap measurements of air pollution changes.
- ✓ Easy-to-use graphical interface for an average users integrating data from different thematic areas.
- ✓ Plug&Play system architecture enabling the simple integration of new sensors and automatic data processing and visualisation.

Full story:

"In order to evaluate the effectiveness of the decarbonization of the region and the impact of low-carbon technologies on the environment and society, it is necessary to assess the state of air quality before and after their implementation. Therefore, the creation of an intelligent identification system of air pollution sources was absolutely necessary."

Stanislav Misak, Director of the CEET at VSB – Technical University of Ostrava

Tomas Karasek, tomas.karasek@vsb.cz

Healthcare

POLITECNICO MILANO 1863

EURO²

Easy and secure access to HPC infrastructure for scientists through HEAppE

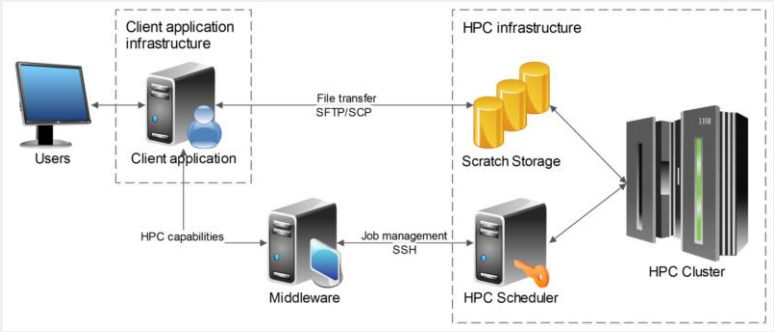
Company

Politecnico di Milano is a public scientific-technological university that trains engineers, architects, and industrial designers.

Challenges & Solution

During the COVID-19 pandemic, the university wanted its scientists and researchers to access HPC infrastructure easily without installing additional software. The solution should allow them to continue their research on possible cures for COVID-19.

The collaboration led to developing a client environment application based on the web-based interactive computing platform Jupiter Notebook. It allows for the creation and management of HPC executions using HEAppE Middleware. Additionally, the client environment offers the choice of a language (C# or Python), depending on the research activity.



Visualisation of the connection between the user and HPC Cluster through the client environment.

Benefits

- ✓ The solution enables to continue research using HPC infrastructure remotely even during isolation.
- ✓ Can help further accelerate the computational process in case of future pandemics.
- ✓ Installation of additional software is not necessary.
- ✓ Choice of a language is possible.

Full story:

"Within the project Exscalate4COV, we virtually screened more than 70 billion molecules as possible drugs against Sars-CoV-2. This is where supercomputers make all the difference, facilitating the rapid selection of only the most promising molecules for subsequent phases of the drug discovery pipeline." Gianluca Palermo, Professor at Politecnico di Milano

EURO CZECHIA

Tomas Karasek, tomas.karasek@vsb.cz

Ullmanna
AI agriculture

EURO²

Weed detection – weeding machine

Company

Family-run tech startup Ullmanna develops an agricultural weeding machine that recognizes the target crop using machine learning and enables in-line weed control.

Challenges & Solution

The main challenge was identifying crops automatically, in this case sugar beets, from weeds. By recognizing the crops, the weeding machine will be able to remove the weeds without damaging them.

Direct deployment on the weeding machine places additional demands on the technology regarding HW and recognition speed.

By using machine learning, we were able to solve this challenge. To accomplish this goal, a neural network was created and trained.

Agricultural weeding machine device for recognition of the target crop from weed.

Benefits

- ✓ The weeds can be removed while not damaging the crop grown.
- ✓ Farming activities without the use of chemical sprays.
- ✓ Positive impact on the environment and society.
- ✓ Enables an increase in food production without the usage of pesticides.

Full story:

EURO CZECHIA

"Our intended product has a significant positive impact on the environment and society – it enables an increase in food production without the use of pesticides that negatively affect both the environment and human health."

Martin Ullmann, Chief Executive Officer, Co-founder, Ullmanna

Tomas Karasek, tomas.karasek@vsb.cz

Estonia

Agriculture

KAPPAZETA

EURO²

An accurate AI-based Cloud Mask Processor for Sentinel-2

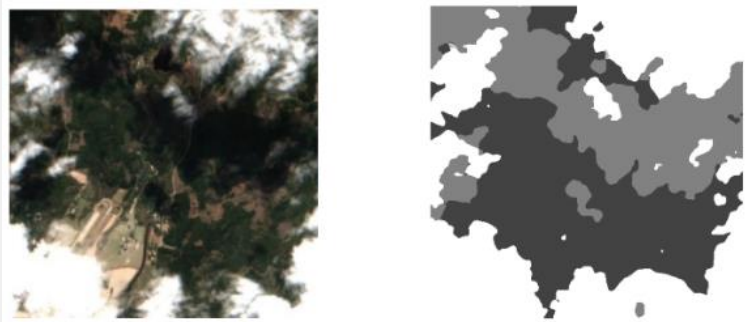
Company

KappaZeta is a remote sensing company with expertise in using radar satellite data, incorporating it with optical satellite data and providing some of the most accurate AI models on the market.

Challenges & Solution

Cloud masking is an essential step for the pre-processing of optical satellite imagery. KappaZeta addresses the problem by introducing KappaMask, an AI-based cloud and cloud shadow masking processor that uses a large convolutional segmentation model. Faster model convergence during training can be achieved by using larger batch sizes of the training data, which means more GPU memory is needed.

KappaMask was trained on an open-source dataset and fine-tuned on a Northern European terrestrial dataset which was labelled manually using the active learning methodology.



(a) Original image (b) KappaMask

Comparison of L2A prediction output for a 512 × 512 pixels sub-tile in the test dataset.

(a) Original Sentinel-2 L2A True-Colour Image; (b) KappaMask classification map.

Benefits

- ✓ Reliable cloud mask processor for Northern Europe region, which is compatible with ESA Sentinel-2 L2 processing chain
- ✓ Creation of high quality reference dataset for future developments
- ✓ Innovative application of deep learning techniques in cloud masking

"We compared KappaMask v2 with other cloud masking processors including Sen2Cor, Fmask, MAJA, IdePix and S2Cloudless on the challenging and diverse test set. KappaMask v2 demonstrated exceptional performance reaching the highest accuracy and outperforming all the above-mentioned methods." **Tetiana Shtym, machine learning engineer @ KappaZeta**

Full story:

EURO ESTONIA

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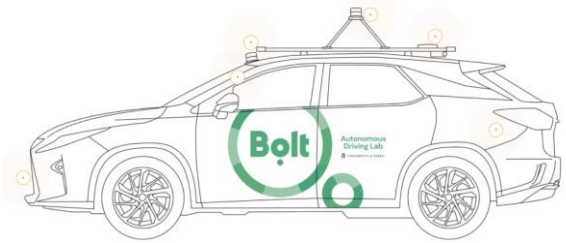
Autonomous Vehicles



Self-driving Technology Research in partnership with the University of Tartu

Company

Bolt is an Estonian mobility company that offers vehicle for hire, micro mobility, car-sharing, and food delivery services headquartered in Tallinn and operating in over 400 cities in over 45 countries. In partnership with the University of Tartu, the company develops self-driving technology for a Level 4 autonomous car.

Challenges & Solution

Autonomous cars acquire up to 357 GB/hour of data during test drives. Autonomous car engineers needed a system to store and easily access those test logs.

Acquired test logs are copied to HPC storage, into appropriately guarded directory. Regularly cron job processes those log files into metadata stored in MongoDB database. Processing is distributed over cluster and happens in parallel. Longest logs can take up to 24 hours to process, so processing them sequentially would be very time-consuming. On top of MongoDB sits custom-made application that allows filtering of test sessions and browsing them using Webviz visualization tool. Visualization tool accesses the raw sensor data from HPC storage.

Lexus RX450h equipped with the sensors that are a prerequisite for basic autonomy.

Benefits

- ✓ Custom database application and visualization tool enables easy analysis of the logs
- ✓ Thanks to distributed processing in the cluster the metadata about the drives usually shows up already next morning
- ✓ Thanks to petabytes of storage at the HPC Centre, the company can keep all the data they need

Full story:

"Thanks to custom database application and visualization tool the team members can easily analyze the logs and share their findings with each other" **Tambet Matiisen, Operations coordinator @Bolt**

Ülar Allas, EuroCC EE, ylar.allas@ut.ee

Humanities/ Languages technology

LUISA TRANSLATION AGENCY

EURO²

Machine Translation Post-Editing

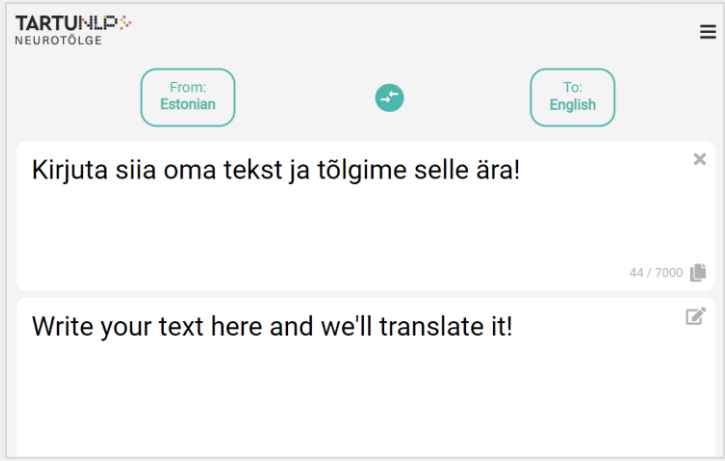
Company

Luisa Tõlkebüroo OÜ is the biggest translation agency in Estonia. The company offers more than 50 services – including sworn translation, simultaneous and consecutive interpretation, layout work, machine translation and post-editing, subtitling and localisation.

Challenges & Solution

The company needed a custom-made machine translation system to reduce the time of translations. As the company had no previous experience neither in natural language processing nor in machine learning, they collaborated with the TartuNLP team. Training of the machine translation model was conducted by using University of Tartu HPC centre's Rocket cluster.

Once the models were trained, the company considered different options for deployment. Their initial plan was to invest in their own infrastructure but soon they realized that it would not be justified for their use case and the TartuNLP group deployed the models alongside other services in the cloud.



Screenshot of the translation engine developed by TartuNLP.

Benefits

- ✓ Neural machine translation systems were built for 4 language pairs and several text domains
- ✓ The company enjoyed lower deployment costs and did not have to worry about maintaining their own hardware
- ✓ The innovative translation tool helps to save valuable time and human resources

Full story:

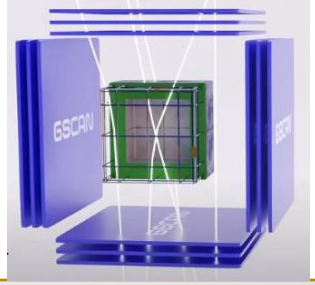
"Thanks to rapid advances in the technology and our extensive translation memory, we are able to offer our clients machine translations with post-editing in a range of language combinations and on a range of topics." **Anna Räbokon, Customer Relations Manager @Luisa Tõlkebüroo OÜ**

EURO ESTONIA

Ülar Allas, EuroCC EE, ylar.allas@ut.ee

Construction (3D Scanning)

GSCAN



EURO²

Cosmic Ray-based Solutions for 3D Imaging

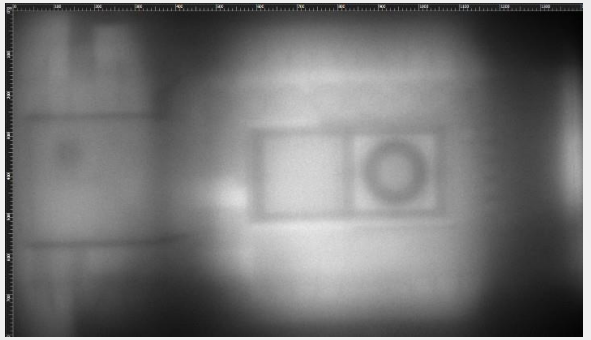
Company

GScan was founded in 2018 to revolutionize inspection, security and medical scanning markets using Muon Flux Technology (MFT). GScan, as the pioneer of MFT having unique IP, tech & sales know-how in the field, is developing a new generation of Non-Destructive Testing (NDT) scanners and tomography systems for infrastructure management applications.

Challenges & Solution

To keep the surrounding environment safe and ensure their longevity, careful assessment, maintenance and investment plan is required. However, currently there is no efficient way of obtaining the information required for more efficient use of assets and reducing risks for critical infrastructure.

Using cosmic ray tomography, the technology monitors particle trajectory changes, extracting vital statistics about material and shape. This data is transformed into 2D and 3D visualizations, including internal and external geometries and chemical composition. The comprehensive delivered output provides in-depth insights into the objects and materials under scrutiny. HPC plays an important role in translating the collected data into visualizations.



A reconstructed model of a temporarily decommissioned nuclear submarine. The horizontal plane slice covers 15x9 m area, which in total consists of 135 0000 points of interest (pixels), and is one out of 900 slices that were processed during the post-processing of measurement

Benefits

- ✓ Acceleration of data processing and reconstructions.
- ✓ Application of a broader range of algorithms during the post-processing.
- ✓ Provision of more reliable data about critical infrastructure for a safer world.

Full story:

«With time and space related digital data in terabytes, the detailed process of reconstruction enables us to see inside of structures what was not possible before. » Sander SEIN, PROJECT MANAGER GSCAN

Sander SEIN, PROJECT MANAGER GSCAN

EURO ESTONIA

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France

Finance

advestis
part of mazars

EURO²

Data science & Machine Learning Development of prediction and investment rules

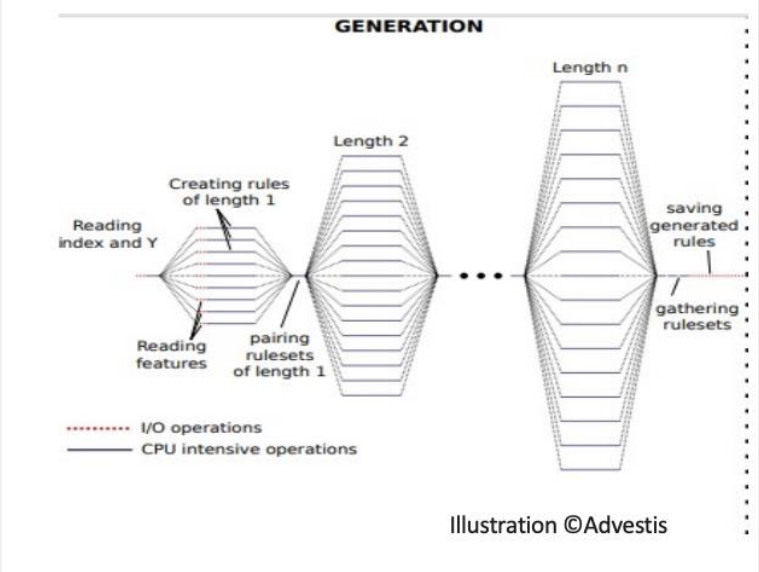
Company

Since its creation in 2011 in Paris, Advestis part of Mazars offers services of applied research in data science and put into production some machine learning systems.

Challenges & Solution

Advestis has developed an artificial intelligence algorithm capable of generating interpretable investment rules, based on data from financial results. Even filtered, the number of generated rules remains significant and the restitution time of the algorithm was too high.

Criann's HPC engineer accompanied the R&D team of Advestis in the optimization and execution of the algorithm, coded in Python, and using the package mpi4py for parallelization.



Generation of rules, illustration © Advestis

Benefits

- ✓ Restitution times have been divided by 20, which results in a very clear reduction in the costs of calculation.
- ✓ Improved prediction quality and increased financial performance.

Full story:

"The assistance from CRIANN, both for handling the calculation nodes and for advice on optimizing the code, was of very good quality and allowed us to progress very quickly. »

***Philippe COTTE,* LEAD PYTHON ENGINEER, Advestis part of Mazars**

CCFR CENTRE DE COMPÉTENCE HPC.HPDA.IA

Marie-Sophie CABOT, Industry Euro CC FR, Marie-Sophie.Cabot@criann.fr

Finance

HORAE TECHNOLOGY

EURO²

Independent portfolio management company part of the Ecole Polytechnique incubator nursery

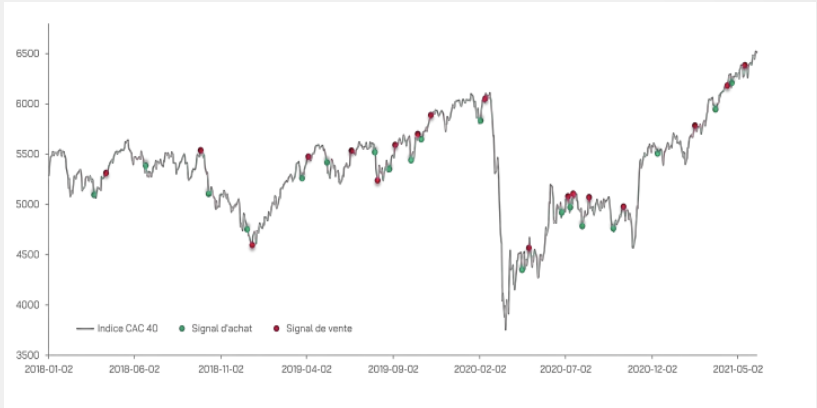
Company

Created in 2021, Horae Technology offers investment solutions for individuals and institutions.

Challenges & Solution

Horae Technology is developing an innovative decision support tool combining artificial intelligence and behavioral finance. In September 2021, Horae Technology joined the Euro-CC program, in order to benefit from high-level support in intensive computing.

This computing power has notably enabled the company to accelerate the performance of its tool via the parallelization of its code and the possibility of analyzing thus thousands of financial securities simultaneously.



Retroactive evaluation of buy and sell signals on the CAC 40 index

Benefits

- ✓ Improve the calculation time of training algorithms
- ✓ Significantly increase the power and robustness of the AI models.

Full story:

Individual and personalized support allowed the company to quickly become autonomous in the use of the supercomputer.

CCFR CENTRE DE COMPÉTENCE HPC.HPDA.IA

Marie-Sophie CABOT, Industry Euro CC FR, Marie-Sophie.Cabot@criann.fr

Environmental risks & Insurance

How to provide a statistically significant set of data of extreme weather events

Company

RiskWeatherTech supports its institutional and private customers in the risk management and the study of the vulnerability of territories and businesses.

Challenges & Solution

Faced with the recurrence of intense weather disturbances in France, Risk Weather Tech has developed, thanks to Myria supercomputer at Criann, a vast catalog of storms physically and statistically plausible. Main objectives: anticipate potential damage on infrastructure and map more precisely the risks of insurance claims.

Proof of concept that were achieved

- Building a database of climate events

- Accurate mapping of claims risks

Exemple of an extreme weather event

Benefits

- ✓ Simulation of 10,000 realistic storms that could occur in France
- ✓ More than 870,000 CPU hours was needed

The catalogue of 10,000 storms is a tool for the insurance industry to analyse the risks associated with storms in France

Full story:

Marie-Sophie CABOT, Industry Euro CC FR, Marie-Sophie.Cabot@criann.fr

Environment water quality

PROLOG INGENIERIE

EURO²

Opening of public bathing sites in the natural environment

Company

The PROLOG INGÉNIERIE group, an independent consultancy engineering firm, in the field of water and associated remotely managed systems, works to improve water quality.

Challenges & Solution

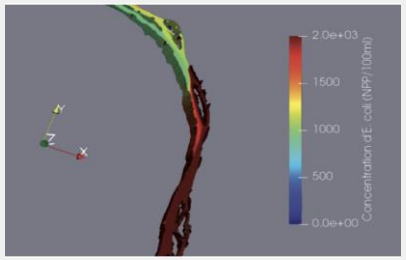
How to succeed in opening swimming sites in Marne after the Paris 2024 Olympic Games? To support the management plans put in place by public authorities in these highly urbanized areas, Prolog engineering has developed a model coupling hydrodynamics and water quality on the Criann supercomputer.

Proof of concept that were achieved :

- 3D hydrodynamic simulation of a section of the river Marne with consideration of pollution sources

- Deployment on HPC architecture

- Getting started with the HPC environment



Fine modeling of the dispersion of bacteriological strains from their point of emission

Benefits

- ✓ Speed of calculation time
- ✓ Fine representation of pollution dispersion
- ✓ More than 120,000 CPU hours was needed

Numerical simulation and HPC in support to public authorities for management plans

Full story:

CCFR CENTRE DE COMPÉTENCE HPC.HPDA.IA

Marie-Sophie CABOT, Industry Euro CC FR, Marie-Sophie.Cabot@criann.fr

Healthcare

braintale

EURO²

AI medical device software to quantify brain damage and clinical prognosis

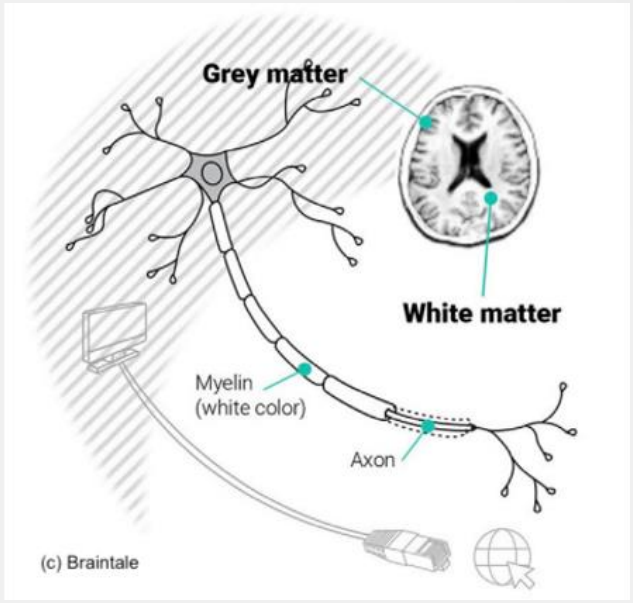
Company

Braintale is an innovative company dedicated to deciphering the white substance to allow better treatment in neurology and intensive care with prognostic solutions clinically validated.

Challenges & Solution

Braintale has joined the Euro-CC program, in order to benefit from high-level support in supercomputing

This computing power has notably enabled the company to analyze in efficient conditions the data of more than 500 patients in order to develop its research tools to optimize the intake in charge of brain diseases



Measurements of brain white-matter microstructure alterations

Benefits

- ✓ Optimization of retrospective analysis of large research cohorts
- ✓ Intensive processing of very large volumes of data

HPC for the development of an innovative medical device that will benefit to patients, medical professionals and researchers

Full story:

CCFR CENTRE DE COMPÉTENCE HPC.HPDA.IA

Marie-Sophie CABOT, Industry Euro CC FR, Marie-Sophie.Cabot@criann.fr

Engineering

Multi-scale and multiphysics simulation of a dam on HPC architecture

Company

CEVAA, part of the 6NAPSE Group, is an engineering office specialized in acoustics and mechanics, with a range of expertise and testing facilities for Industry.

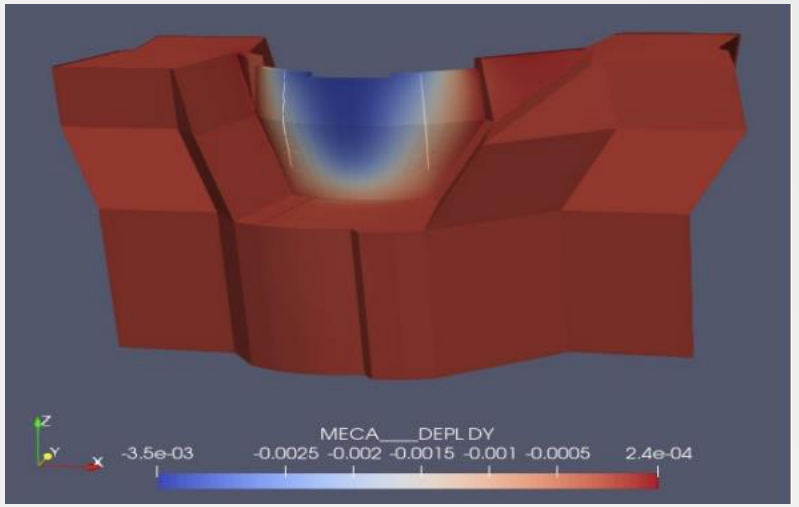
Challenges & Solution

CEVAA was requested to study the mechanical performance of a dam. With length scales ranging from centimeter to several tens of meters, consideration of multiphysics loadings (temperature, pressure, efforts), the internal calculation resources of the company were clearly insufficient to conduct the study.

The study was carried out on the Myria supercomputer of CRIANN with Code_Aster software for calculations and Salome-Meca for meshing and post-processing.

- installing the latest versions sequential and parallel of Code_Aster

- help with creating scripts launch of calculations.



Results of mode shapes on a dam

Benefits

- ✓ HPC expertise
- ✓ Solve client projects with a significant productivity gain

For CEVAA project, the support consisted in installing the latest sequential and parallel versions of Code_Aster, and providing scripts for calculation launches.

Full story:

Marie-Sophie CABOT, Industry Euro CC FR, Marie-Sophie.Cabot@criann.fr

Electrical and Electronic Engineering

INFINERGIES

GROUPE 6NAPSE

EURO²

Development of an on-board battery charger

Company

Infinergies – Part of Groupe 6Npase is a Power electronics design office. Its expertise and capacity for innovation place it at the heart of the development of innovative solutions in various industries.

Challenges & Solution

Involved in the development of an on-board battery charger for electric vehicles, Infinergie was faced with the problem of the cumulative duration of the simulations to be implemented.

The product must be able to charge the battery, but also to supply electricity to the grid, or power electrical outlets in the vehicle, whatever the battery's state of charge.

This requires a large number of simulations to test these numerous operating cases.

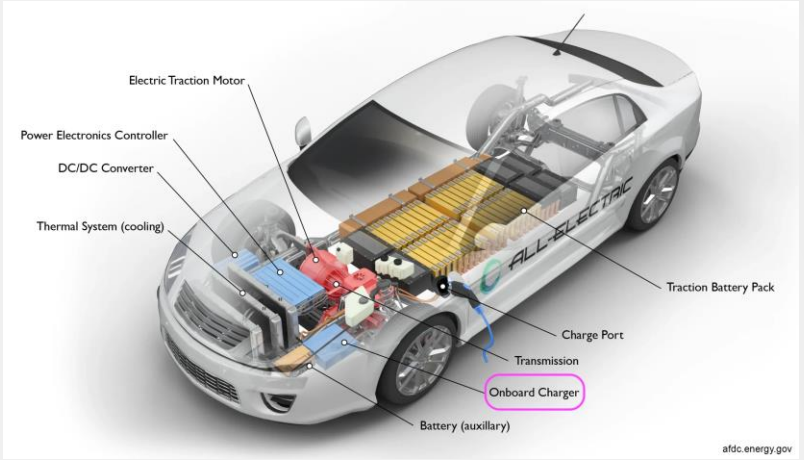


Image source: https://afdc.energy.gov/vehicles/how-do-all-electric-cars-work

Benefits

Simulation of a large number of operating points.

Compliance with the end customer's specifications in a tight timeframe.

Full story:

"Our schedule was very tight. The help we received in setting up our simulations on the supercomputer was extremely effective, and then access to the computing power enabled us to solve our industrial problem within the deadline."

Adrien Thurin, COO @Infinergies – Groupe 6NAPSE

CCFR CENTRE DE COMPÉTENCE HPC.HPDA.IA

Contact person at the NCC: marie-sophie.cabot@criann.fr

Defense & Space Engineering Software

ABSTRAO

EURO²

Development of explicit non-linear reference software for defense and space applications.

Company

Abstrao – this company is specialized in integrating numerical modelling into the analysis and optimization of systems subjected to extreme loading.

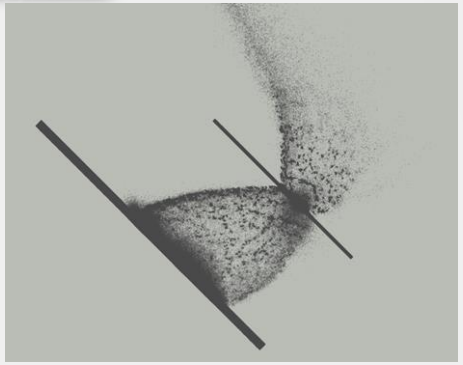
Challenges & Solution

First evaluation of the scalability of a multi-GPU HPC version of the code.

Technological demonstrations through applications linked to hypervelocity impacts of space debris on satellite protective structures.

→ Hypervelocity impact test result at 7.2km/s https://www.esa.int/ESA_Multimedia/Images/2013/04/Hypervelocity_Impacts EMI test 3915

→ ABSTRAO Solver result



Benefits

Very good weak and strong scalability (90%) on 30xA100 on *Turpan* - MESONET ARM machine

Significant progress in code maturity

Full story:

"The collaboration between CALMIP and ABSTRAO has been instrumental in the first evaluation of the ABSTRAO HPC Solver performances. This partnership has leveraged CALMIP's infrastructure and technical expertise, enabling a comprehensive and rigorous assessment of the solver's capabilities."

Jérôme Limido, CEO ABSTRAO

CCFR CENTRE DE COMPÉTENCE HPC.HPDA.IA

Contact person → at the NCC : Marie-Sophie Cabot - marie-sophie.cabot@criann.fr and at Calmip : Nadine Marouzé - nadine.marouze@toulouse-inp.fr

Hungary

Fashion and creative

Tengr.ai



EURO²

Tengr.ai revolutionizes the creative industry using Komondor

Company

Tengrai Artificial Intelligence kft. was founded in 2023 with the goal of creating a European image-generation startup. It has already released a free-to-use image generation to the public, while video- and web generation is in the proof-of-concept stage.

Challenges & Solution

The biggest challenge was to create a solution that creates images at least as good as the American competitors while following the privacy-by-design philosophy that does not have gender or racial bias. It needs to easily "forget" styles if there are copyright claims for parts of the training dataset. Moreover, the founders were living during communist regimes, so they are against censorship while also forbidding illegal content generation.

Benefits

- ✓ Enable everyone to express their creative freedom
- ✓ Replace overused and boring stock photos
- ✓ Easy-to-use and accessible image generation
- ✓ Multilingual and multicultural, without racial or gender bias
- ✓ Video and website generation

"KIFÜ enabled this project through Komondor HPC; without their help and support, the Tengr.ai project would not stand a chance in this highly competitive and fast-paced environment."

Peter W. Szabo, Founder and researcher @Tengrai Artificial Intelligence kft.

Full story:

EURO²

Erzsébet Horváth Governmental Agency for IT Development-KIFÜ, horvath.erzsebet@kifu.gov.hu

Smart City

INTERMAP©

EURO²

Machine learning aided geospatial data acquisition

Company

InterMap has 24 years of experience developing hardware and software solutions for collecting, managing and sharing geospatial data, employing most recent advances in the mapping and IT fields, assisting the job of surveyors, municipalities and infrastructure planners.

Challenges & Solution

To acquire accurate and useful data with the least possible manual labour, efficient machine learning models must be trained. These training sessions require vast amount of computer resources.

By employing HPC resources, the training time can be significantly reduced, thus more experimental solutions can be examined. Furthermore, with more processing capability, more complex models can be trained, which opens up new data acquisition methods.

Image processing results on ground survey images, from which spatial data can be generated.

Benefits

- Faster training of experimental models
- Scalable resource allocation to match model complexity
- Parallel processing results in more generic models

Full story:

EURO²

"We were able to deploy our training pipeline to the Komondor HPC, provided by the KIFÜ and the results are the expected: more complex image processing models can be trained in much less time, which would not be possible on consumer-grade hardware."

Gergő Tóth, Technology developer @InterMap

Katalin Kelemen Governmental Agency for IT Development-KIFÜ kelemen.katalin@kifu.gov.hu

Latvia

Health care / Pharmaceuticals / Medical devices

castprint

EURO

Topological optimization using HPC for medical devices

Company

CastPrint is a Latvian SME that provides clinics with custom-made 3D printed casts for wrist, finger, leg fractures. The casts are lighter and more breathable than the traditional gypsum fixtures.

Challenges & Solution

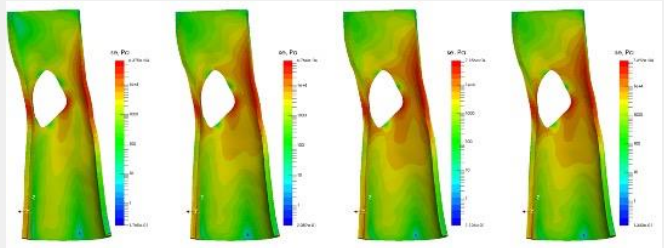
The Challenge

Creation of a 3D printed cast is a time-consuming and resource intensive process. Since the 3D scans used for production contain huge numbers of surface elements, processing the data on typical office computers is both slow and often unreliable, with software crashes resulting in data loss and delayed delivery to patients.

The Solution

Integrating parametric model optimization into the design process of the medical device. This involves using simulations to determine the most efficient shape for the cast, which in turn reduces the amount of material required and shortens printing times.

The use of HPC enables faster and more effective simulations, automating certain aspects of the design process and ultimately reducing the time spent on it.



Benefits

- 20% reduction in labor hours for cast design, which also reduces the risk of human error.
- Approximately 25% reduction in production material use through topological optimization.
- 25% reduction in production time through material optimization and shorter printing durations.
- Up to 15% reduction in production costs.
- Up to 25% enhanced production capacity at CastPrint.

Full story:

EURO SuperS

"There are many challenges in the production of fixators. The most important ones – how to shorten production time? how to reduce manual steps? how to save 3D printing times? These challenges also had a solution: parametric model optimization and HPC technology."

***Janis Olins*, CEO @CastPrint**

Contact person at the NCC: Karlis Muiznieks, karlis.muiznieks@lu.lv

Health care / Pharmaceuticals / Medical devices

SEMANTIC INTELLIGENCE

EURO²

AI algorithm for molecule recognition

Company

Semantic Intelligence has developed an AI-driven IP Intelligence Engine enables scientists & IP experts to search, analyze and extract complex knowledge on chemical-biological interactions

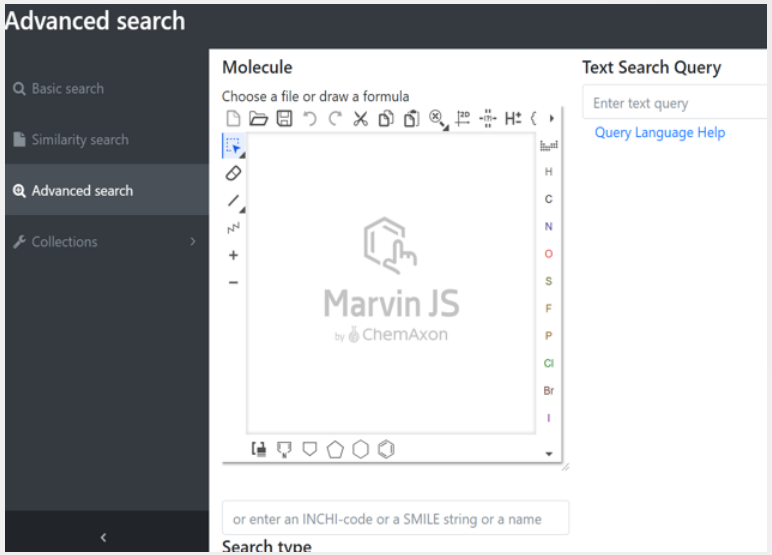
Challenges & Solution

Challenge

How to index molecular images quickly & efficiently to provide users with the fastest possible access to current, published patents? The data base is one of the largest patent databases: USPTO (United States Patent and Trademark Office) with 5 million patent documents, more than 50 million molecules.

Solution

AI algorithm training in molecule recognition & integration into existing data processing workflow.



Benefits

- Successfully completed algorithm training on the database
- Confidence in the effectiveness of the HPC center infrastructure and process
- Expected time & cost saving benefits (~20-30%)

"Use of HPC allows us to perform a completely new approach to rapid analysis of big data in biopharmaceuticals, combining both structured and unstructured data to provide a data-driven, critical decision-making process to our clients."

Vita Sture, CEO @Semantic Intelligence

Full story:

EURO SuperS

Contact person at the NCC: Karlis Muiznieks, karlis.muiznieks@lu.lv

IT/HPC systems, services & software providers

Pitch Patterns

asya

EURO²

Classifying emotions from tone of voice for call-centres

Company

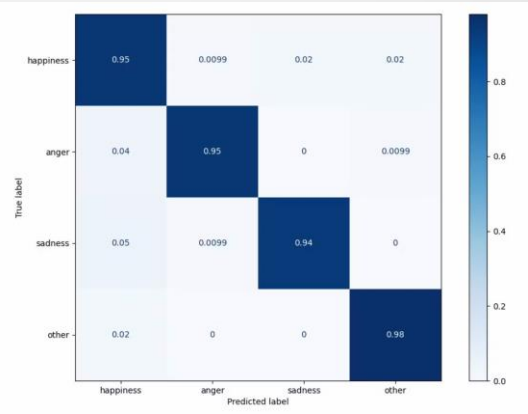
Asya.ai is producing pitchpatterns.com which is the best call-centre analytics and automation software

Challenges & Solution

Emotion classification from tone of voice is complicated, because lack of public datasets and lack of open-source models. It is also necessary to have significant hardware resources to do hyper-parameter search in order to train your own model.

With collaboration with RTU HPC we managed to train our own emotion classification model to detect Happiness, Anger, Sadness and Neutral emotions in tone of voice. It achieved 95% accuracy.

Emotion classification from tone of voice before HPC project: 52% accuracy



Emotion classification from tone of voice after HPC project: 95% accuracy

Benefits

✓ Training Deep Learning models

☞ **New feature and unique selling point for the product**

"Call-centres use tone of voice emotion classification to improve quality of the service. This feature is unique selling point for pitchptatterns.com software" **Evalds Urtans, CEO, asya.ai**

Full story:

EURO SuperS

Evalds Urtans, SIA ASYA, evalds.urtans@asya.ai

Portugal

Textile & Fashion

Innovating Portugal's Footwear Industry

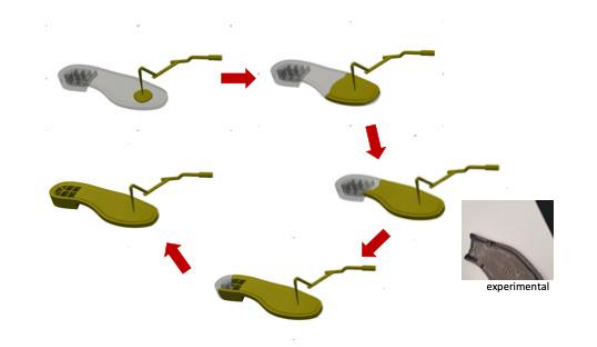
Company

Atlanta, founded in 1995, excels in innovative sole production for the footwear industry. With advanced facilities, they craft 20,000 pairs daily, blending design, quality, and technical expertise.

Challenges & Solution

Portugal's footwear industry faces challenges in optimizing sole design due to reliance on trial-and-error methods, which are time-consuming and resource-intensive. The introduction of computing in this process offered a solution by enabling simulation before physical testing, which optimized mold design and reduced iterations.

A collaboration between the University of Minho and Atlanta, within the GreenShoes 4.0 project, leveraged computational modeling to enhance product quality and streamline production, driving the sector's digital transformation.



Benefits

- Optimized mold design for better precision
- Reduced time and material costs
- Enhanced product quality by avoiding weak regions
- Improved process efficiency and faster production cycles
- Informed decision-making with detailed simulation data
- Support for innovation in manufacturing techniques
- Contribution to the digital transformation of the footwear industry

"The (injection) machine had occupancy rates of 65% when we did manual planning. This planning took up dozens of hours a week and now, with these solutions, it takes us between 3 and 4 hours a week. It was an abysmal difference both for the planning team and for the occupancy rate of the machines. Now the occupancy rate has risen by around 20% to around 85%."
André Santos, IT Director @ AMF

Full story:

EURO² PORTUGAL

Lígia Breda Melo, NCC Portugal, eurocc-portugal@lip.pt

Manufacturing

Logoplaste

EURO²

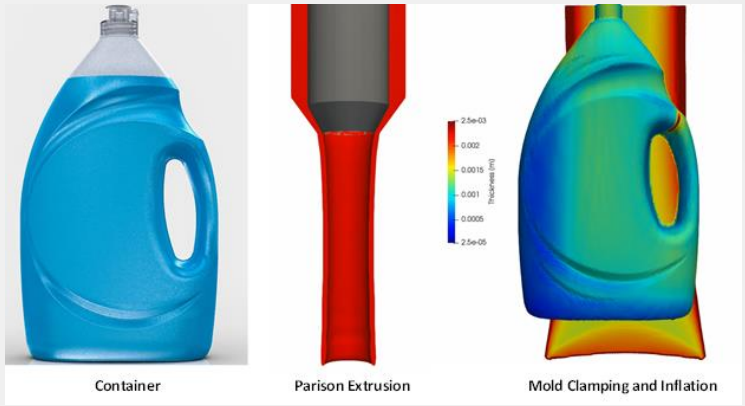
Extrusion Blow Molding Simulator

• Company

Logoplaste, founded in 1976, pioneers in-house rigid plastic packaging, delivering innovative, eco-friendly solutions that reduce CO2 emissions and support a circular economy.

• Challenges & Solution

The extrusion blow molding (EBM) process for creating hollow containers involves complex materials and multiple parameters that traditionally rely on trial-and-error methods, which are resource-intensive and time-consuming. To address these challenges, the University of Minho and Logoplaste Innovation Lab developed advanced numerical codes to simulate the entire EBM process. By porting these simulations to HPC systems and integrating optimization tools, they achieved more accurate, efficient, and scalable solutions, significantly reducing time-to-market.



Container | Parison Extrusion | Mold Clamping and Inflation

Benefits

- Optimized process parameters, reducing trial-and-error
- Shorter time-to-market for products
- Enhanced accuracy in design and material predictions
- Increased resource and cost efficiency
- Scalable simulations using HPC
- Continuous improvement through ongoing tool development
- Data-driven decisions via optimization tools

Full story:

Computational modeling through HPC helps set optimal process parameters, reducing reliance on trial-and-error methods.

EURO² PORTUGAL

Lígia Breda Melo, NCC Portugal, eurocc-portugal@lip.pt

Health & Pharmaceuticals

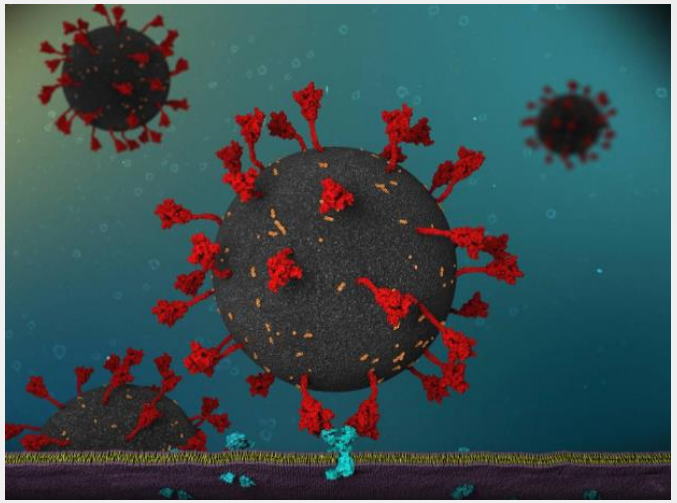
Developing Optimized Drugs Against COVID-19

Company

BioSIM bridges theory and experiment using advanced computational tools for Enzymatic Catalysis and Drug Discovery, while Crowdfight fosters scientific collaborations by connecting experts.

Challenges & Solution

The challenges included rapidly identifying effective drugs to combat COVID-19, understanding the virus's Spike protein interactions, and managing a vast number of potential molecules. Traditional methods would have been too slow and resource-intensive. The solution was leveraging computational resources to create detailed 3D models, screen 200,000 molecules, and rank them by potential efficacy. This approach enabled efficient identification and optimization of promising drug candidates, ensuring their effectiveness against evolving variants.



The interaction between SARS-CoV-2 Spike – Human ACE2

Benefits

- Accelerated drug discovery
- Optimized molecule selection
- Enabled 3D modeling of virus-protein interactions
- Facilitated collaboration
- Ensured drug effectiveness against new variants

"These computational resources allowed us to make a sort of ranking of molecules, from the least to the most promising. If we didn't have access to them, we would have tested a much smaller number of these molecules and it would mean much less chance of success".

Sérgio Sousa, Researcher @ BioSIM

Full story:

EURO² PORTUGAL

Lígia Breda Melo, NCC Portugal, eurocc-portugal@lip.pt

Manufacturing

HPC For Profile Extrusion

Company

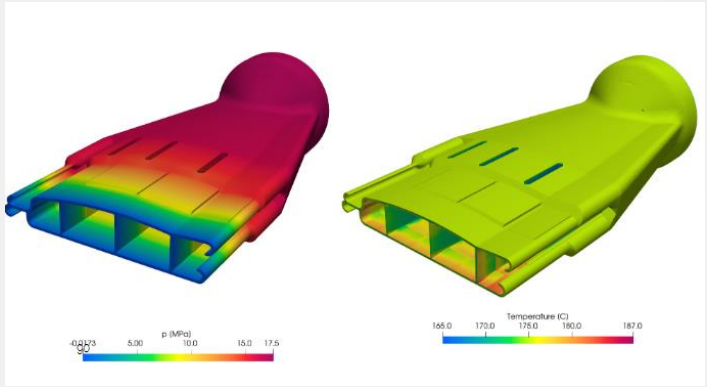
Soprefa is a Portuguese SME specialized in the production and distribution of plastic profiles for a large variety of applications.

Wolf Dynamics is an Italian SME specialized in consulting services in computer-aided engineering, multi-physics simulations, numerical optimization, data analytics, and interactive data visualization.

Challenges & Solution

Plastic profiles, crucial in sectors like healthcare and aeronautics, require precise design for specific applications. Traditional trial-and-error methods are time-consuming, costly, and heavily reliant on designer experience, particularly for complex geometries. This inefficiency hampers Soprefa's ability to develop new profiles and expand its business.

As a solution, Soprefa adopted computational tools using open-source libraries, integrating OpenFOAM and Dakota for HPC-based simulation and optimization. This streamlined the extrusion die design process, cutting down costs and time while improving product quality.



Profile extrusion is the technique employed to manufacture constant cross-section thermoplastic profiles, which has a vast range of major applications.

Benefits

- Improved profile extrusion die design using simulation, optimization, and HPC systems.
- 30-40% faster product time to market (3 to 2 months).
- 40% reduction in raw materials (1 Ton to 600 kg).
- 23% cost reduction (€18,000 to €14,000 per tool).
- Greater independence in extrusion die design, protecting Soprefa's know-how.

Full story:

"The project teamed up with three entities with experience in this field to illustrate the benefits of HPC, especially when it comes to solving complex problems in the industrial sector, such as the design of profile extrusion dies.".

Miguel Nóbrega, Researcher @ University of Minho

Lígia Breda Melo, NCC Portugal, eurocc-portugal@lip.pt

Slovakia

Aeronautics

SHARK.AERO

EURO²

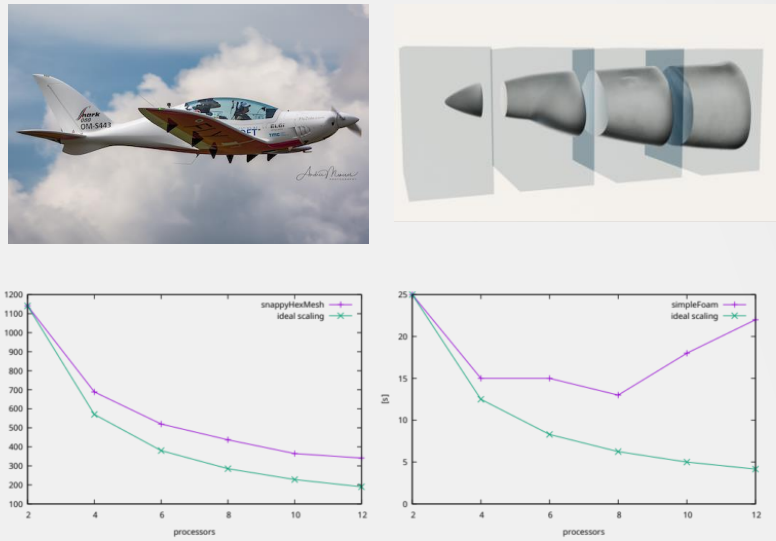
Transfer and optimization of CFD calculations workflow in HPC environment

Company

Shark Aero company designs and manufactures ultralight sport aircrafts with two-seat tandem cockpit. For design development they use popular open-source software package OpenFOAM.

Challenges & Solution

- The CFD (Computational Fluid Dynamics) simulations use the Finite Elements Method (FEM). Model created in Computer-Aided Design (CAD) software is divided into discrete cells, so called "mesh". Computational requirements scale with the 3rd power of the mesh density
- Workflow consist of enclosing mesh creation, mesh segmentation, model inclusion and CFD simulation itself. Model inclusion (using snappyHexMesh program) is the time-limiting step.
- Efficient parallelization (using Message Passing Interface) requires thorough design of the mesh division into domains, in order to minimized data transfer necessary for resolving boundary conditions.



From reality to model (top); parallel scaling of selected workflow steps (bottom)

Benefits

- ✓ 8x speed-up was achieved by migration to HPC. Aircraft parts design requires simulations of a relatively small models, but numerous times during the optimization.
- ✓ Higher speed-up is expected with increasing the problem size.

"Thanks to HPC we were not only able to run multiple simulations simultaneously, but we could also use much more refined mesh, which was not possible before due to memory limitations of our local computers."
Petr Sterba, Chief Engineer@SHARK.AERO, ltd.

Full story:

EURO SLOVAKIA

Lucia Demovičová, WPL EuroCC Slovakia, lucia.demovicova@nscc.sk

Finance & IT systems

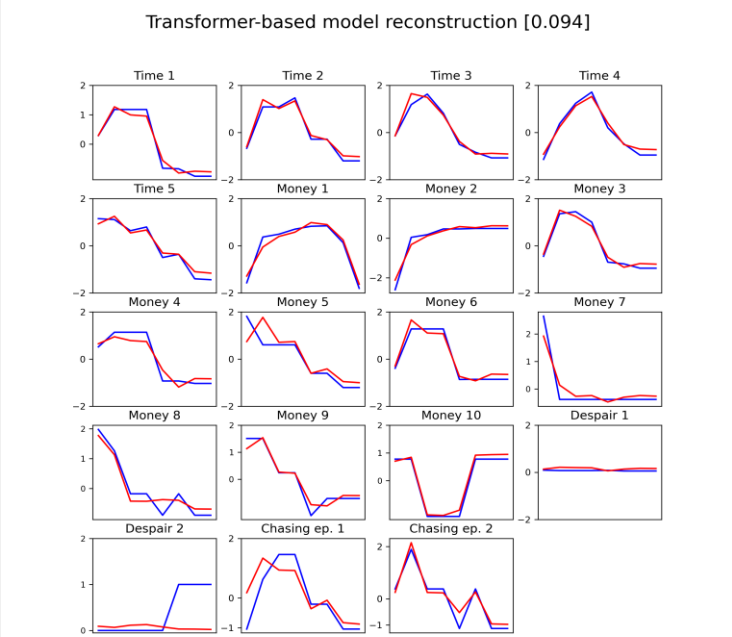
Anomaly Detection in Time Series: Gambling prevention using Deep Learning

Company

DOXXbet, ltd. – betting and online casino; Codium, ltd. – software developer of betting and iGaming platform, focused on enhancing customer service and players' engagement via identification and prevention of gambling behavior.

Challenges & Solution

- Unsupervised Transformer-based autoencoder (AE) model was used to detect anomalies in the dataset generated by online casino players.
- Data consists of time series of 19 derived features reflecting players' behavior, such as net loss / gain, cash deposits / withdrawals in a sliding time window, login frequency, etc.
- Alignment of AE's reconstruction error and the so called proxy indicators (selected manufactured descriptors, such as "chasing loss") enabled us to distinguish between data anomalies and potential problem gambling of players, thus decreasing the false positive rate.
- Training model with more than 100k trainable parameters and gigabytes of data greatly benefited from utilizing GPU-accelerated HPC facility.



Expected (blue) vs. predicted (red) values for each descriptor: single time window of a random player

Benefits

- ✓ Help betting and online casino providers mitigate negative consequences for players, which is in line with European trends in risk management.
- ✓ Real-time problem gambling detection using AI and Big Data thanks to HPC.

Full story:

"The accelerated module of the HPC system Devana allowed us to test several approaches to prevention of pathological online gambling. Powerful GPU accelerators were of great value in training and fine-tuning of sophisticated AI models."
Martin Varmus, CEO@Codium, ltd.

Lucia Demovičová, WPL EuroCC Slovakia, lucia.demovicova@nscc.sk

Spain

Earth science

Use of AI for satellite-based surface wind correction

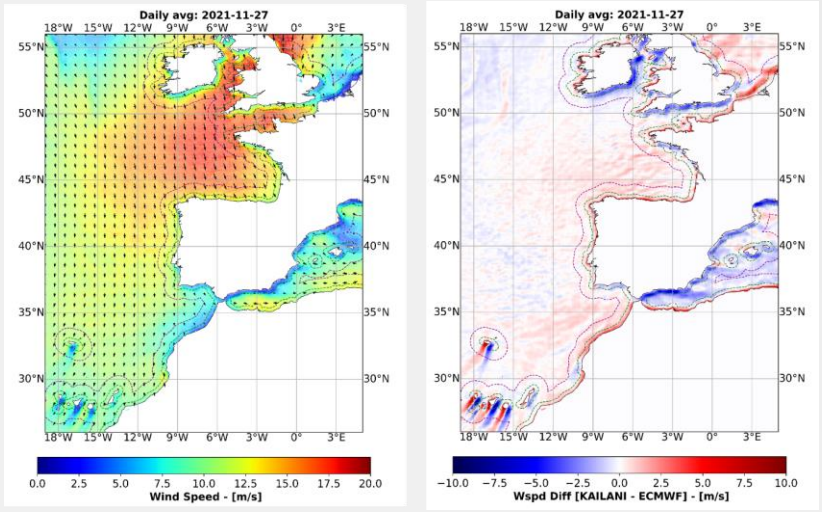
Company

Nologin Oceanic Weather Systems (NOW Systems) is an EC Copernicus Marine Service provider for the European Atlantic façade. Since 2018 they co-lead the IBI-MFC (Iberia-Biscay-Ireland Monitoring & Forecasting Centre) with Mercator Ocean International, delivering regional forecasts in collaboration with Meteo-France and CESGA.

Challenges & Solution

The main objective of this experiment is the feasibility analysis of the use of Artificial Intelligence techniques for the improvement of resolution and correction of winds generated by regional atmospheric models using satellite SAR remote observation data, using the European Copernicus service.

A neural network has been developed and trained that is capable of generating a wind field at a higher resolution than the original model, including the patterns seen in the SAR and it can be generalized to any area of the planet.



Performance of artificial intelligence in extreme events.
(left) Daily mean wind speed in the storm of 27 November 2021, preceded with Artificial Intelligence.
(right) Differences between Artificial Intelligence prediction and ECMWF dynamic model.

Benefits

- High availability of nodes allows to optimize the time spent on neural network development, ensuring that several experiments can be queued.
- Faster training thanks to GPU-enabled nodes, which allows optimizing the architecture and obtaining more accurate results that improve coastal circulation and wave models.
- The use of HPC in all phases of the process reduces execution times and therefore optimizes R&D development costs.

Full story:

"Significant time reduction by an order of magnitude. The capacity of the GPU nodes allows training of large batches, minimizing errors during AI training. The processing speed of the GPU considerably reduces the training time of the different tests until the optimal architecture is found."

Jose Maria Garcia-Valdecasas, Coastal Services Manager @NOW Systems

Contact person at the NCC: Laura Martínez, eurocc@res.es

Sweden

Environment/
climate/weather

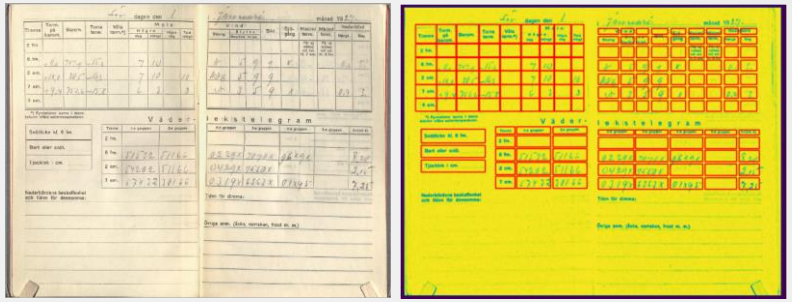
Sweden's Meteorology & Hydrology Institute digitizes archival tabular data using LUMI

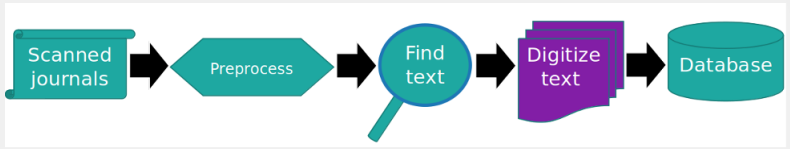
Company

The Swedish Meteorological and Hydrological Institute (SMHI) is an expert authority with a global perspective and a vital task of predicting changes in weather, water and climate.

Challenges & Solution

SMHI, possesses troves of archival data of observations spanning decades in paper format. The ambition of the project is to optimize and train a sufficiently accurate machine learning model which can handle different forms of tabular data, convert handwritten-text and produce machine-readable. SMHI aims to use a combination of image processing and machine learning to achieve this. The digitization pipeline is implemented in Python, using well-known open-source scientific libraries such as scikit-image and TensorFlow.





Benefits

This project aids and accelerates the digitization work from the paper archives into data, which is done manually as of now. As a result of the project, SMHI aims at digitizing numerous historical weather observations that will help a better understanding of climate, especially of the occurrence of extreme weather events.

"A HPC allocation enables us to rapidly test and develop the product. (…) GPUs allow faster tuning hyperparameters of this model. On CPUs the neural network training takes 11 hours. On GPUs the whole training takes only 1 hour."

Ashwin Mohanan, Scientific programmer at SMHI

Full story:

Contact person at the NCC: Apostolos Vasileiadis, apostolos.Vasileiadis@ri.se

Public services/
Civil protection

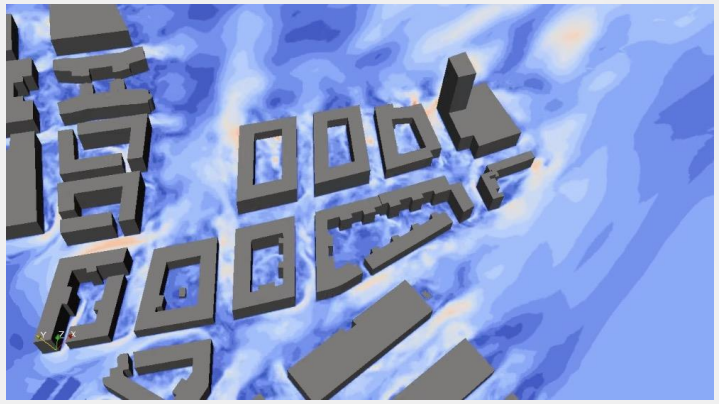
SLB-analys Analyse Air Pollution Flow Using MeluXina Supercomputer

Company

Stockholms luft- och bulleranalys (SLB-analys) is a unit at the Environment and Health Administration of the City of Stockholm. The unit is responsible for monitoring outdoor air quality in the city.

Challenges & Solution

The dispersion of aerosol particles in urban environments heavily depends on meteorological parameters, in particular air flows. SLB-analysis run scaling tests on EuroHPC JU resources to push the boundaries of CFD simulations using OpenFOAM to larger spatial domains and higher complexity.



Benefits

- Simulating larger urban area becomes possible
- Time-to-solution is greatly reduced
- Better results used for air quality assessment

"By using more complex turbulence models, the accuracy of the results will be improved so that there can be an investigation whether new developments will meet air quality limits and propose measures to improve air quality in sensitive areas."

Qiang Li, Research software engineer, ENCCS

Full story:

Contact person at the NCC: Apostolos Vasileiadis, apostolos.Vasileiadis@ri.se

Manufacturing & engineering

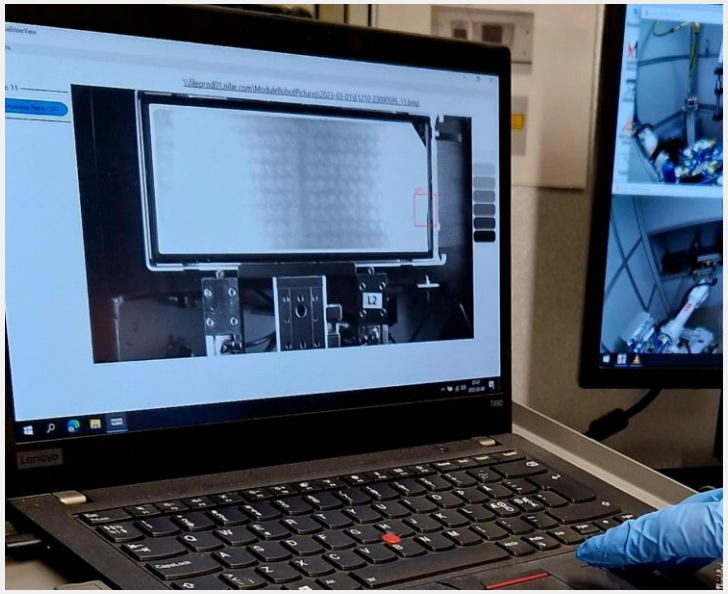
Nilar automates battery inspection using AI vision on Vega

Company

Nilar AB develops and manufactures batteries that are safe and re-usable, which is crucial for a climate transition that works, i.e. that electricity is actually there when it is needed and not just when it is generated.

Challenges & Solution

Quality inspection is an essential part of the battery manufacturing process, since quality determines battery performance, lifespan, and safety. Inspection should ideally be done for every part of every battery, but the high production rate makes this very difficult to achieve without automation. ENCCS and Nilar AB have leveraged the computational resources that the EuroHPC JU Vega cluster provides and the large image datasets Nilar has collected from their assembly lines to develop an AI-based computer vision solution as a first step towards complete automation of Nilar's quality inspection process.



Benefits

- Spot negative trends earlier
- Faster manufacturing adjustment
- Reduce scrap rate

"From the supercomputing access, Nilar is already seeing benefits from the solution, such as being able to spot negative trends in quality earlier, which enables faster adjustment of process parameters to reverse these trends. This has helped reduce scrap rate, which in turn has led to a positive impact on their business."

Andreas Thore, Researcher at ENCCS/RISE

Full story:

Contact person at the NCC: Apostolos Vasileiadis, apostolos.Vasileiadis@ri.se

Türkiye

IT/HPC systems, services & software providers

machinetutors

EURO

Large Scale Real-Time Image Content Moderation

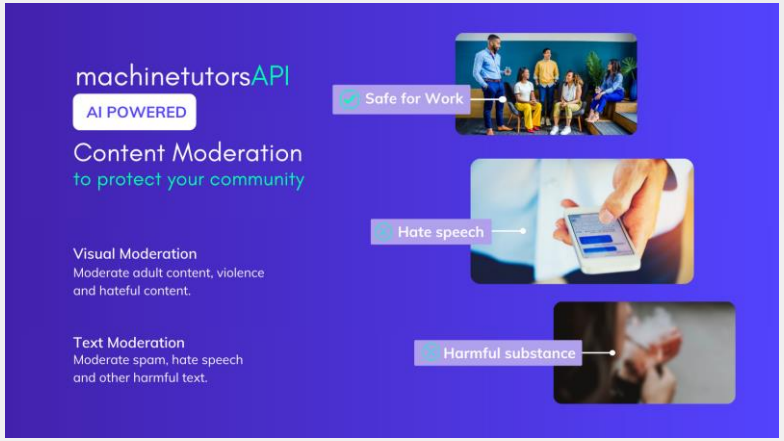
Company

Founded in 2010, Machinetutors provides machine learning consultancy and customized AI software development services. Machinetutors empowers businesses all over the world by solving real-world problems.

Challenges & Solution

This project addresses the problem of large-scale real-time image-based content moderation. The system is deployed to a production environment where tens of thousands of users browse the internet daily. The system must be both accurate and run in real-time to meet the business requirements. Moreover, the model size must be small so that multiple copies of the model can be run simultaneously on a GPU to reduce server costs. A major challenge has been making several models work efficiently together.

In order to solve the problem defined, we develop three main models. In the first model, we propose a multi-label NSFW classifier that can detect the NSFW levels (light, medium, hard) and predict other labels, such as the real person and clothing characteristics. The second model is a one-stage body -based age & gender detection model. Current age & gender methods are both face based i.e. they use face bounding boxes and are two-stage processes, they first run a face detector and then run the model on these boxes. When multiple faces are present in an image, this approach fails to meet the real-time requirement. The third one is a segmentation model. These three models run in a pipeline via which we can run various scenarios.



Benefits

- ✓ Run many experiments in parallel
- ✓ Run larger batch size trainings on newer GPUs
- ✓ Access many GPUs for hyperparameter tuning
- ✓ Gain a considerable competitive advantage in the global AI ecosystem considering the speed and the cost-efficiency

Full story:

"EuroCC project made it possible for our company to play a major role in the transformation of a content safety technology start-up into a leading organization in Europe. The state of the art artificial intelligence models our team trained would not have been achievable without the computation resources they provided." **Eray Berger, CEO @Machinetutors**

EURO

TRUBA Turkish Science e-Infrastructure

Contact person at the NCC: Sevil Sarıkurt, NCC Türkiye, ncc@ulakbim.gov.tr

Environment/
Climate/ Weather

ErikTronik

EURO

The multiphysics experiments of the Weather Research and Forecasting Model (WRF) on precipitation patterns of Turkey

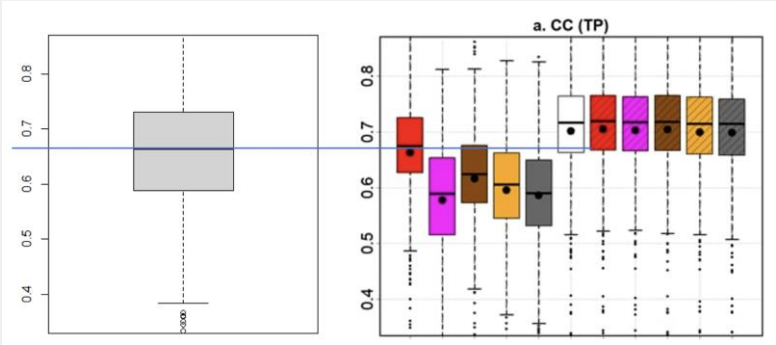
Company

ErikTronik Engineering is a corporation that operates in several domains including aviation, energy, meteorology, and defence. They offer solutions in aviation and navigation for both military and civilian airports, design algorithms and provide energy forecasts, transform data into decision-making tools in meteorology-dependent areas, and supply spare parts to defence agencies with certifications. Additionally, ErikTronik supports projects in Turkey and the EMEA region offering consultancy, engineering, sales and after-sales services, while also addressing challenges like climate change, food, and business intelligence through engineering solutions.

Challenges & Solution

WRF model may provide accurate representation of the atmosphere and the surface conditions. However, such WRF model requires major parametrizations (e.g., cloud, planetary boundary layer, other physics options) to be optimized. On the other hand, simulations of WRF model require high computational resources to accomplish such optimization studies.

The project's sensitivity tests were completed over the Turkey domain for 2020, with a 60-combination of model physics in 4-km resolution. The combination number, resolution, and simulation time are rather comprehensive for such sensitivity tests. We have valuable information now about which multiphysics ensemble responds favorably to the Turkey precipitation characteristics.



Previously available model performances (solid gray box on the right with a median 0.58) are improved to the level of European state of the art model accuracy levels (left gray box with median 0.66). These are very encouraging results compared with existing state of the art models.

Benefits

- ✓ Gained experience for the first time in the HPC domain.
- ✓ Encouraged to apply to the EuroHPC projects in the seasonal forecast and climate prediction areas through gained experience with this project.
- ✓ Improved their insight into driving mechanisms of precipitation over Turkey.

Full story:

"ErikTronik's enhanced forecasting in Türkiye benefits climate-dependent domains by improving resource prediction, hydrometeorological forecasting, and climate change mitigation. This capacity aids in better water management and response to climatic adversities, supporting particularly the renewable energy and agriculture sectors in risk and operational handling." **Erdem Erikçi, CTO @Eriktronik**

EURO

TRUBA Turkish Science e-Infrastructure

Contact person at the NCC: Sevil Sarıkurt, NCC Türkiye, ncc@ulakbim.gov.tr

IoT, IT/HPC systems, services & software

ERSTE

EURO²

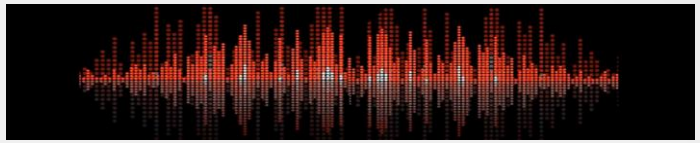
Fine-tuning speech-to-text models on HPC clusters

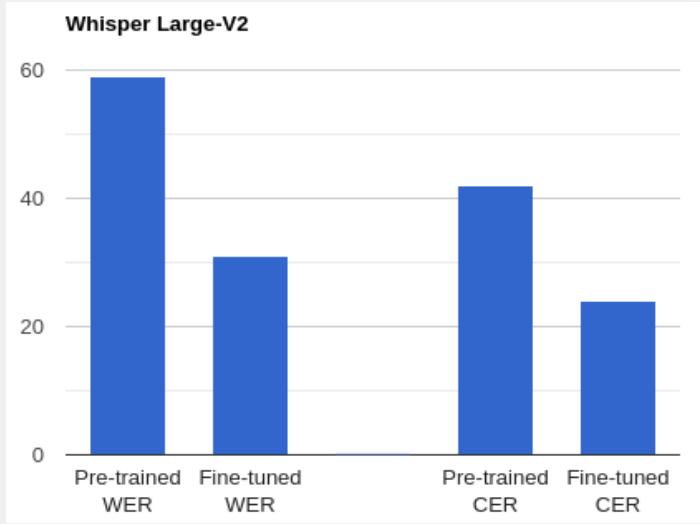
Company

Erste Software (2017), located in Türkiye, is an SME focused on IoT, mobile device management, and using ML/AI techniques in practice.

Challenges & Solution

The sales/quotation preparation process in manufacturing is a tedious task with back-and-forth messages in between the customer and manufacturer, since production requires high-precision under strict time-to-deliver constraints. A major part of the process is daily meetings between the engineering and sales teams. Recording this crucial know-how, transcribe it to enable semantic search for the current and future quotations is important. To address this problem, Erste's decision was to fine-tune a pre-trained model, Whisper, for Turkish. Yet an accurate fine-tuning requires significant computational power. Although Erste had experience in traditional ML training, they lack access and expertise on using multiple GPUs for this purpose. In this use-case, they leverage the expertise in the NCC Türkiye and computational resources to fine-tune a large-scale model.





Benefits

- ✓ Gained experience in utilizing TRUBA HPC resources and training large-scale models with large-scale datasets.
- ✓ Enhance the efficiency and quality of customer's manufacturing endeavours in the long run.
- ✓ Significantly improved the accuracy of Whisper, a speech-to-text model for Turkish.

Full story:

"Thanks to this opportunity, Erste Software had a rewarding experience on working with academicians and HPC experts in the EuroCC team. In addition to increasing the accuracy and cost-efficiency of our solution, for our future projects, we gained valuable experience on using HPC resources and working with large-scale datasets and models." ***Özer Aydemir*, Co-founder and CEO @Erste**

EURO² TRUBA Turkish Science e-Infrastructure

Contact person at the NCC: Sevil Sarıkurt, NCC Türkiye, ncc@ulakbim.gov.tr

IoT, IT/HPC systems, services & software

VLMedia

EURO²

AI-Driven Style Transfer for Virtual Environments

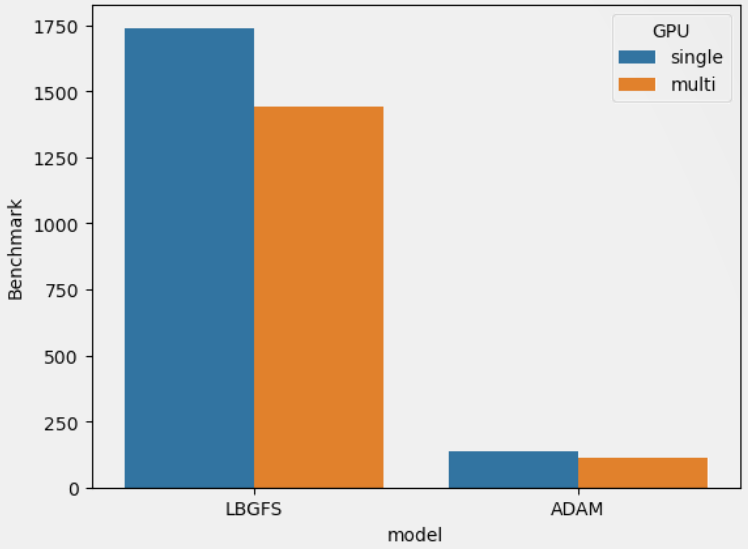
Company

Founded in 2014, VL Media is a software company focussed on designing and creating user-friendly social apps and games.

Challenges & Solution

One of the projects carried out by the company is to customize the scene in the virtual environment and the audio-visual objects within the scene by the content producers. In order to make more original designs, different studies, and experiments will be carried out using the style transfer of these images determined by the content producer by using artificial intelligence. Style transfer is frequently used today thanks to the advancement of GPU technology. Since all the methods used by the company to realize such designs require GPU processing power.

The customized multi-GPU strategy adopted in the project is favoured for its alignment with the model's characteristics and workload requirements. DataParallel serves the purpose of providing more general and straightforward multi-GPU support, combining multi-GPU processing and multi-scale production to achieve high-quality, high-resolution results.



Benchmark Results

Benefits

- ✓ Enhanced Customization in Virtual Environments
- ✓ Hybrid Style Transfer Technique
- ✓ Balanced Content and Style Preservation
- ✓ Customized Multi-GPU Strategy

Full story:

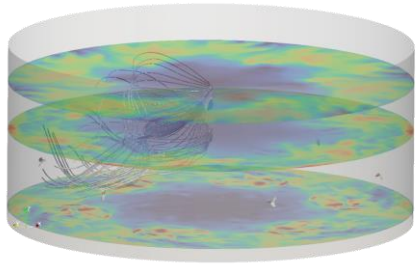
"I'm thrilled to collaborate with TRUBA's experts in the realm of style transfer. Together, the fusion of our creative ideas and high-performance computing, in the exciting domain of style transfer, is crafting a new visual language that will redefine what's possible."

Eda Yüksel, CRO @VLMedia

EURO² TRUBA Turkish Science e-Infrastructure

Contact person at the NCC: Sevil Sarıkurt, NCC Türkiye, ncc@ulakbim.gov.tr

Agriculture, Environment/ climate/weather



Efficiency of Mechanical Mixers in Biogas Digesters

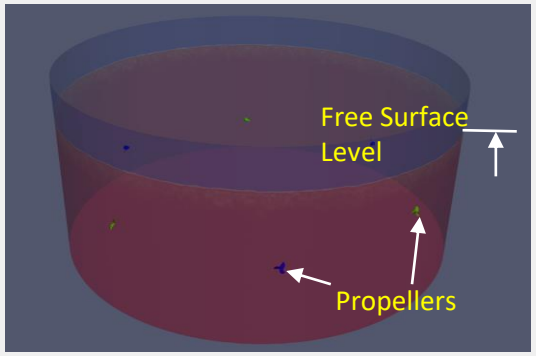
Company

EYS Endüstri Makina is a company focused on practical solutions to organics recycling problems by putting to use their knowledge and experience in manure management, dewatering, and composting solutions. The company offers innovative and quality products to shape the future of the environmental and agricultural sectors.

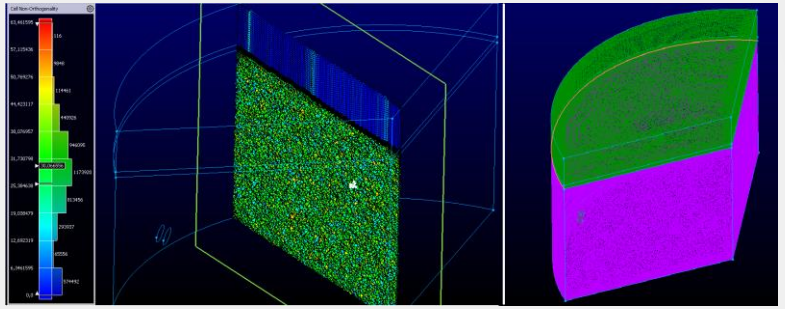
Challenges & Solution

Mixers or agitators are essential components of biogas digesters that are responsible for ensuring a homogenous mixture of organic material and maintaining optimal conditions for the growth of microorganisms that produce biogas. In terms of energy efficiency, the power consumption of mixers or agitators depends on several factors, such as the type of mixer, the size of the digester, and the characteristics of the feedstock. In this PoC, the company wanted to conduct unsteady, high fidelity CFD analyses of various biogas digesters (variable diameter and depth) with different mixer configurations (number of mixers and positioning). They are using open-source finite volume tools to assess the mixing performance and energy consumption of mechanical mixers.

The optimal number of processors for the open-source CFD solver OpenFOAM was determined by running benchmark cases. The production runs were conducted efficiently using the load-balancing data gathered from the aforementioned benchmark runs. A number of different mixer configurations were simulated. Then the results of these cases were postprocessed, and the dead zones inside the reactor, which inhibit biogas production, were investigated. Shorter run times were achieved thanks to parallelized runs with a number of cores up to 1024, compared to our local compute servers.



The full model of the digester



Mesh of periodic digester

Benefits

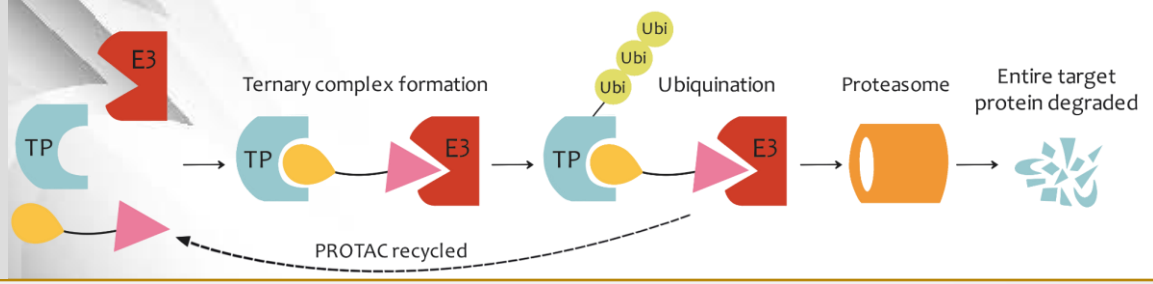
- ✓ Closely monitor scalability and parallel performance metrics.
- ✓ Try to increase utilization of automated operations, such as on-the-fly data analysis, file transfer processes, or using certain software applications remotely on HPC servers, etc.
- ✓ Try to streamline steps in their flow chart, aiming to minimize human intervention in the process. (e.g., geometry generation, mesh generation, solver setup, etc.)

"We have examined mixer positioning and mixing performance in high-capacity (i.e., volumetric capacities at the order of 10.000 m^3) biogas digesters. We needed high-performance computing resources due to the large size of the digesters and time-resolved simulations with LES approach (i.e., the total number of computational cells O(10^7)). At that point, the computational resources provided by the EuroCC program, were a big help for us in shortening the time needed for our iterative design process. Due to the time constraints and competitiveness of industrial scale engineering projects, we believe that the need for remote HPC systems will be a constant requirement for companies like us." **E. Orçun Kozaka, R&D Manager @EYS Endüstri Makina**

Full story:

Sevil Sarıkurt, NCC Türkiye, ncc@ulakbim.gov.tr

Biotechnology/ Bioinformatics, Chemicals



PeptiSyn

EURO²

Designing PROTACS for HIV-TAT using deep learning and molecular modeling methods

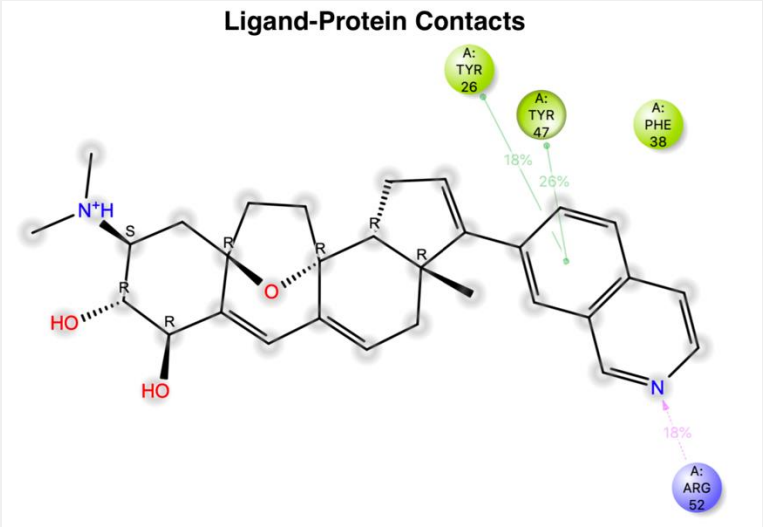
Company

PeptiSyn is a company focussed on the production of peptides, both on a large and small scale, which are widely used in biomedical, medical, chemical, cosmetic, and other related areas.

Challenges & Solution

The company carry out a project aimed to develop PROTAC molecule for TAT which is a pivotal protein in the life cycle of the HIV virus and drastically enhances the efficiency of viral infection. The artificial intelligence library that will be used in this project is designed for small molecules. Yet, it has not been tested on TAT protein, which is an intrinsically disordered protein. Thus, this will be the first challenge to apply this methodology. Using the ROSETTA program to model three-dimensional complex structure of PROTACs will be a challenge as the company does not have experience in this program.

Using deep learning methods the company created 5000 possible linkers for PROTACS. These linker molecules were filtered by their efficiencies to be used as PROTACS using molecular modeling, MD simulations and free energy calculations. Optimal linkers for experiments were identified.



HIV-TAT dCA molecule interaction diagram

Benefits

✓Reducing effort and money spent on experiments

✓Selecting more potent molecules

✓ Searching a large chemical space efficiently

"I am thankful to be given the chance to carry out our calculations on TRUBA systems and the support given by the technical teams. Designing PROTACs is not an easy task, using AI and other molecular modelling approaches we could significantly saved time and reduced experimental costs"

Onur Alptürk, Director & co-Founder @PeptiSyn

Full story:

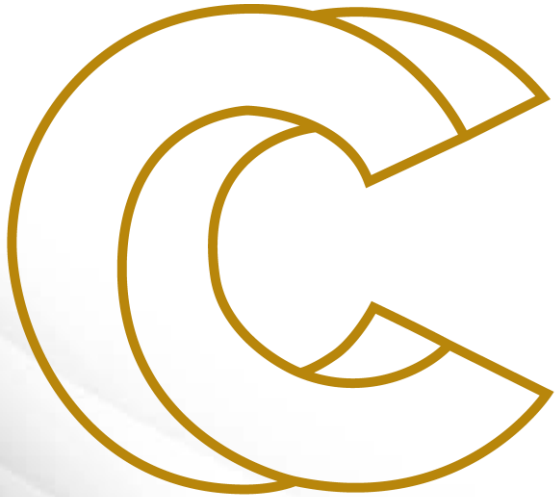
EURO² TRUBA Turkish Science e-Infrastructure

Sevil Sarıkurt, NCC Türkiye, ncc@ulakbim.gov.tr

EuroCC: Use cases portfolio

coordinated by CASTIEL2-WP4

This project has received funding from the European High-Performance Computing Joint Undertaking (JU) under grant agreement No 951732. The JU receives support from the European Union's Horizon 2020 research and innovation programme and Germany, Bulgaria, Austria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Greece, Hungary, Ireland, Italy, Lithuania, Latvia, Poland, Portugal, Romania, Slovenia, Spain, Sweden, United Kingdom, France, Netherlands, Belgium, Luxembourg, Slovakia, Norway, Switzerland, Turkey, Republic of North Macedonia, Iceland, Montenegro



EURO^2

Industry use-cases
EuroCC-1 & -2 portfolio
Sorted by industry sectors

Content

Industry sector	Number of use cases reported
Aeronautics	**1**
Agriculture	**3**
Automotive	**1**
Biotechnology/Bioinformatics	**2**
Chemicals	**1**
Cosmetics	0
Construction /Architecture/Infrastructure	**2**
Defence sector	**1**
Earth science	**1**
Electrical and electronic engineering	**2**
Energy	**3**
Environment/climate/weather	**5**
Food and drink	0
Finance/Insurance	**3**
Health care / Pharmaceuticals / Medical devices	**9**
Humanities/Languages	**1**
IoT (Internet of things)	0
IT/HPC systems services & software providers	**5**
Life sciences	0
Manufacturing & engineering	**10**
Maritime	**0**
Material sciences	0
Mechanical engineering	**2**
Public services/Civil protection	**2**
Raw materials metals minerals and forest-based	0
Space	0
Smart City	**1**
Textile	1
Fashion and creative	**1**
Total	**57**

Aeronautics

1

Aeronautics

SHARK.AERO

EURO²

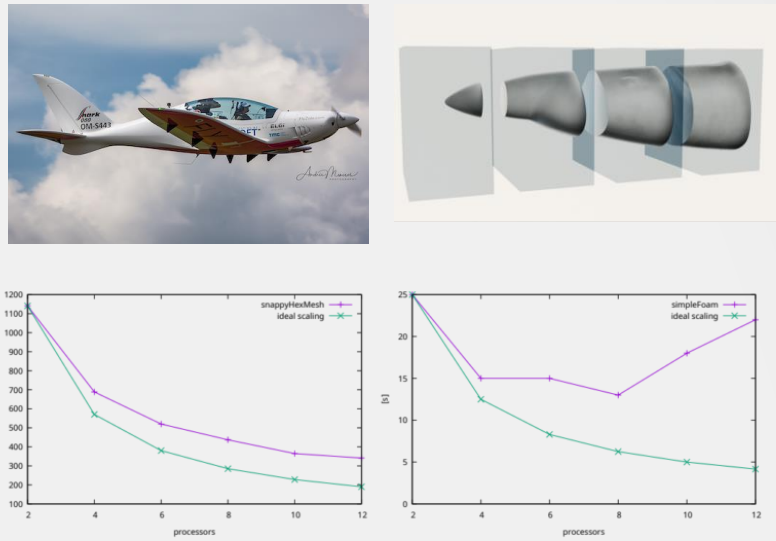
Transfer and optimization of CFD calculations workflow in HPC environment

Company

Shark Aero company designs and manufactures ultralight sport aircrafts with two-seat tandem cockpit. For design development they use popular open-source software package OpenFOAM.

Challenges & Solution

- The CFD (Computational Fluid Dynamics) simulations use the Finite Elements Method (FEM). Model created in Computer-Aided Design (CAD) software is divided into discrete cells, so called "mesh". Computational requirements scale with the 3rd power of the mesh density
- Workflow consist of enclosing mesh creation, mesh segmentation, model inclusion and CFD simulation itself. Model inclusion (using snappyHexMesh program) is the time-limiting step.
- Efficient parallelization (using Message Passing Interface) requires thorough design of the mesh division into domains, in order to minimized data transfer necessary for resolving boundary conditions.



From reality to model (top); parallel scaling of selected workflow steps (bottom)

Benefits

- ✓ 8x speed-up was achieved by migration to HPC. Aircraft parts design requires simulations of a relatively small models, but numerous times during the optimization.
- ✓ Higher speed-up is expected with increasing the problem size.

"Thanks to HPC we were not only able to run multiple simulations simultaneously, but we could also use much more refined mesh, which was not possible before due to memory limitations of our local computers."
Petr Sterba, Chief Engineer@SHARK.AERO, ltd.

Full story:

EURO SLOVAKIA

Lucia Demovičová, WPL EuroCC Slovakia, lucia.demovicova@nscc.sk

Agriculture

3

Agriculture

KAPPAZETA

EURO²

An accurate AI-based Cloud Mask Processor for Sentinel-2

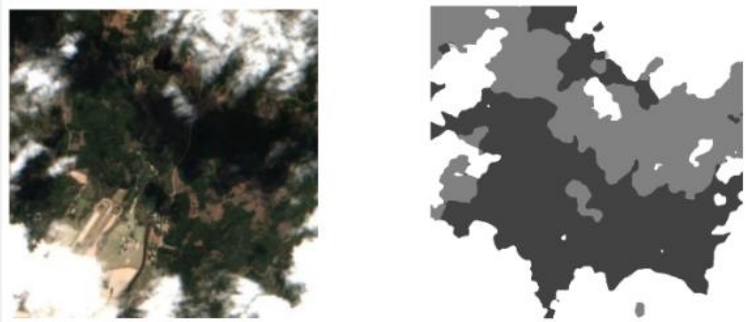
Company

KappaZeta is a remote sensing company with expertise in using radar satellite data, incorporating it with optical satellite data and providing some of the most accurate AI models on the market.

Challenges & Solution

Cloud masking is an essential step for the pre-processing of optical satellite imagery. KappaZeta addresses the problem by introducing KappaMask, an AI-based cloud and cloud shadow masking processor that uses a large convolutional segmentation model. Faster model convergence during training can be achieved by using larger batch sizes of the training data, which means more GPU memory is needed.

KappaMask was trained on an open-source dataset and fine-tuned on a Northern European terrestrial dataset which was labelled manually using the active learning methodology.



(a) Original image (b) KappaMask

Comparison of L2A prediction output for a 512 × 512 pixels sub-tile in the test dataset.

(a) Original Sentinel-2 L2A True-Colour Image; (b) KappaMask classification map.

Benefits

- ✓ Reliable cloud mask processor for Northern Europe region, which is compatible with ESA Sentinel-2 L2 processing chain
- ✓ Creation of high quality reference dataset for future developments
- ✓ Innovative application of deep learning techniques in cloud masking

"We compared KappaMask v2 with other cloud masking processors including Sen2Cor, Fmask, MAJA, IdePix and S2Cloudless on the challenging and diverse test set. KappaMask v2 demonstrated exceptional performance reaching the highest accuracy and outperforming all the above-mentioned methods." **Tetiana Shtym, machine learning engineer @ KappaZeta**

Full story:

EURO ESTONIA

Ülar Allas, EuroCC EE, ylar.allas@ut.ee

Ullmanna
AI agriculture

EURO²

Weed detection – weeding machine

Company

Family-run tech startup Ullmanna develops an agricultural weeding machine that recognizes the target crop using machine learning and enables in-line weed control.

Challenges & Solution

The main challenge was identifying crops automatically, in this case sugar beets, from weeds. By recognizing the crops, the weeding machine will be able to remove the weeds without damaging them.

Direct deployment on the weeding machine places additional demands on the technology regarding HW and recognition speed.

By using machine learning, we were able to solve this challenge. To accomplish this goal, a neural network was created and trained.

Agricultural weeding machine device for recognition of the target crop from weed.

Benefits

- ✓ The weeds can be removed while not damaging the crop grown.
- ✓ Farming activities without the use of chemical sprays.
- ✓ Positive impact on the environment and society.
- ✓ Enables an increase in food production without the usage of pesticides.

Full story:

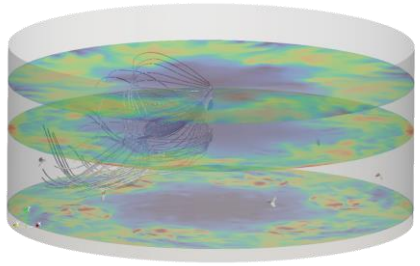
EURO CZECHIA

"Our intended product has a significant positive impact on the environment and society – it enables an increase in food production without the use of pesticides that negatively affect both the environment and human health."

Martin Ullmann, Chief Executive Officer, Co-founder, Ullmanna

Tomas Karasek, tomas.karasek@vsb.cz

Agriculture, Environment/ climate/weather



Efficiency of Mechanical Mixers in Biogas Digesters

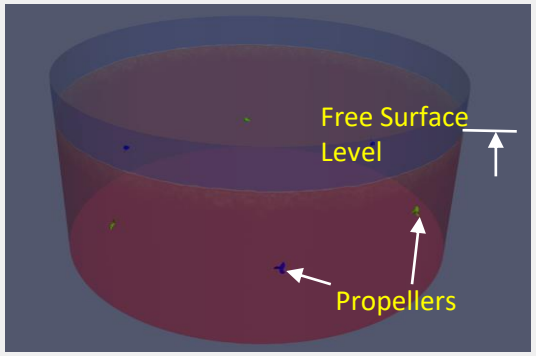
Company

EYS Endüstri Makina is a company focused on practical solutions to organics recycling problems by putting to use their knowledge and experience in manure management, dewatering, and composting solutions. The company offers innovative and quality products to shape the future of the environmental and agricultural sectors.

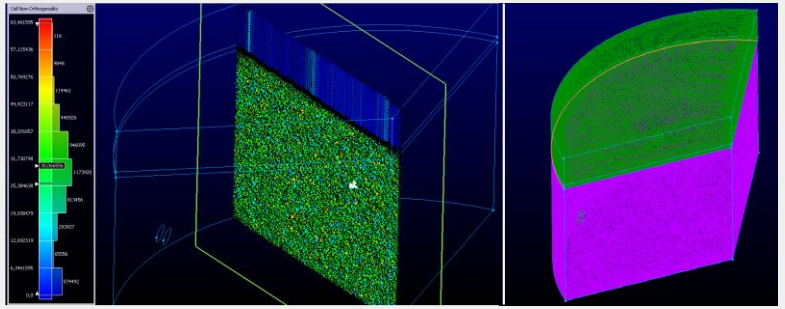
Challenges & Solution

Mixers or agitators are essential components of biogas digesters that are responsible for ensuring a homogenous mixture of organic material and maintaining optimal conditions for the growth of microorganisms that produce biogas. In terms of energy efficiency, the power consumption of mixers or agitators depends on several factors, such as the type of mixer, the size of the digester, and the characteristics of the feedstock. In this PoC, the company wanted to conduct unsteady, high fidelity CFD analyses of various biogas digesters (variable diameter and depth) with different mixer configurations (number of mixers and positioning). They are using open-source finite volume tools to assess the mixing performance and energy consumption of mechanical mixers.

The optimal number of processors for the open-source CFD solver OpenFOAM was determined by running benchmark cases. The production runs were conducted efficiently using the load-balancing data gathered from the aforementioned benchmark runs. A number of different mixer configurations were simulated. Then the results of these cases were postprocessed, and the dead zones inside the reactor, which inhibit biogas production, were investigated. Shorter run times were achieved thanks to parallelized runs with a number of cores up to 1024, compared to our local compute servers.



The full model of the digester



Mesh of periodic digester

Benefits

- ✓ Closely monitor scalability and parallel performance metrics.
- ✓ Try to increase utilization of automated operations, such as on-the-fly data analysis, file transfer processes, or using certain software applications remotely on HPC servers, etc.
- ✓ Try to streamline steps in their flow chart, aiming to minimize human intervention in the process. (e.g., geometry generation, mesh generation, solver setup, etc.)

"We have examined mixer positioning and mixing performance in high-capacity (i.e., volumetric capacities at the order of 10.000 m^3) biogas digesters. We needed high-performance computing resources due to the large size of the digesters and time-resolved simulations with LES approach (i.e., the total number of computational cells O(10^7)). At that point, the computational resources provided by the EuroCC program, were a big help for us in shortening the time needed for our iterative design process. Due to the time constraints and competitiveness of industrial scale engineering projects, we believe that the need for remote HPC systems will be a constant requirement for companies like us." **E. Orçun Kozaka, R&D Manager @EYS Endüstri Makina**

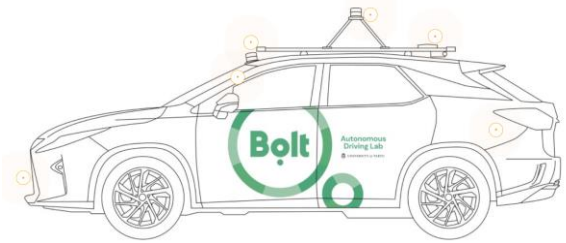
Full story:

Sevil Sarıkurt, NCC Türkiye, ncc@ulakbim.gov.tr

Automotive

1

Autonomous Vehicles



Self-driving Technology Research in partnership with the University of Tartu

Company

Bolt is an Estonian mobility company that offers vehicle for hire, micro mobility, car-sharing, and food delivery services headquartered in Tallinn and operating in over 400 cities in over 45 countries. In partnership with the University of Tartu, the company develops self-driving technology for a Level 4 autonomous car.

Challenges & Solution

Autonomous cars acquire up to 357 GB/hour of data during test drives. Autonomous car engineers needed a system to store and easily access those test logs.

Acquired test logs are copied to HPC storage, into appropriately guarded directory. Regularly cron job processes those log files into metadata stored in MongoDB database. Processing is distributed over cluster and happens in parallel. Longest logs can take up to 24 hours to process, so processing them sequentially would be very time-consuming. On top of MongoDB sits custom-made application that allows filtering of test sessions and browsing them using Webviz visualization tool. Visualization tool accesses the raw sensor data from HPC storage.

Lexus RX450h equipped with the sensors that are a prerequisite for basic autonomy.

Benefits

- ✓ Custom database application and visualization tool enables easy analysis of the logs
- ✓ Thanks to distributed processing in the cluster the metadata about the drives usually shows up already next morning
- ✓ Thanks to petabytes of storage at the HPC Centre, the company can keep all the data they need

Full story:

"Thanks to custom database application and visualization tool the team members can easily analyze the logs and share their findings with each other" **Tambet Matiisen, Operations coordinator @Bolt**

Ülar Allas, EuroCC EE, ylar.allas@ut.ee

Biotechnology/Bioinformatics

2

Biotechnology / Bioinformatics

PUXANO

EURO²

Matchmaking, mapping industry challenges to research

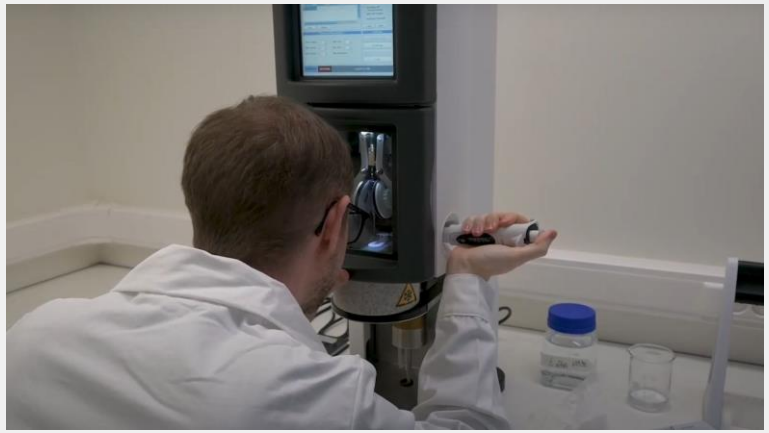
Company

PUXANO is a biotech company offering structure-based protein research services to pharma and biotech companies. The company differentiates from others by developing its own technologies to accelerate the process of obtaining protein structures.

Challenges & Solution

The procondor platform helps to optimize the protein sequence in a semi-automated manner. Puxano initially used the platform internally but wanted to automate it further and make it available for others to use.

To meet this computational demand, Puxano has employed the HPC services of VSC. Furthermore, VSC introduced Puxano to the Data Science Institute of UHasselt (DSI). DSI helped Puxano design a suitable database structure. The developed database is being incorporated into the Puxano analysis pipelines and serves as the core source of information for the Puxano (web-based) service platform.



Benefits

- ✓ VSC as match-maker between Puxano and DSI
- ✓ DSI gave new insights to design a suitable database structure

☞ **The developed database serves as the core source of information for the Puxano (web-based) service platform.**

"Our key objective was to rethink our script for protein construct design into a software platform. The idea was to find out which type of database structure served best to integrate protein information in different formats, have efficient data storage, easily updatable and searchable. Our collaboration with academia was very valuable for the success of the project" **Wouter Van Putte, Director & co-Founder @Puxano**

Full story:

EURO BELGIUM

Carl MENSCH, Industry EuroCC BE, carl.mensch@uantwerpen.be

Biotechnology

Healthcare

Estimation of product defects using supercomputers

Company

The ING Corporation develops, designs, and manufactures medical devices using modern technologies such as 3D printing, CNC machines, and advanced materials. It is one of the leading companies on the Czech market in prosthetics.

Challenges & Solution

The main goal was to develop and verify effective procedures for analysing the shape of manufactured products, especially focusing on identifying possible inaccuracies. Implementing machine vision instead of manual check by an expert can offer a significantly more efficient and accurate approach.

Using descriptive points and relevant information that describe the product, the solution algorithm calculates the manufacturing error rate.

The first column shows two different types of product deformation. As you can see, the shape of the product is damaged. The next column shows the final product that meets the quality standards.

Benefits

- ✓ Algorithm calculates the manufacturing error rate by comparing the final product to its proposed construction.
- ✓ Verification of the product's shape if it meets the standards.
- ✓ Proposed solution can make production more efficient thanks to the possibility of detecting non-conforming products.

Full story:

"The proposed solution can make production more efficient thanks to the possibility of detecting non-conforming products. In the next phase, it would be possible to use the results to identify problematic parts of the product design itself. It would further improve the efficiency of the entire design-manufacturing process."

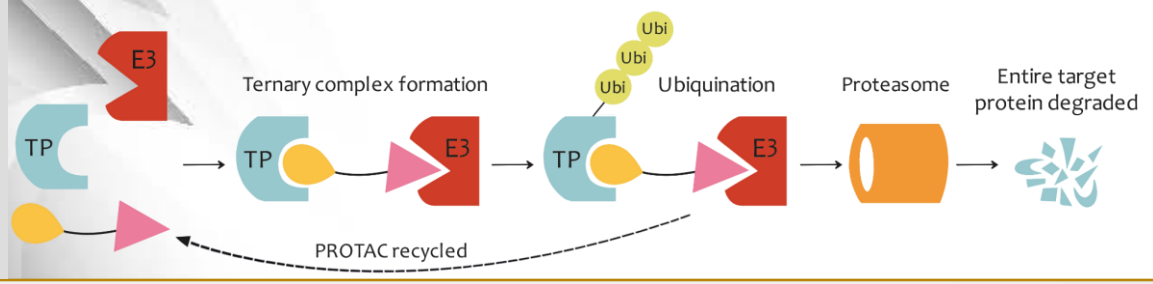
Jiri Rosicky, CEO of ING corporation

Tomas Karasek, tomas.karasek@vsb.cz

Chemicals

1

Biotechnology/ Bioinformatics, Chemicals



PeptiSyn

EURO²

Designing PROTACS for HIV-TAT using deep learning and molecular modeling methods

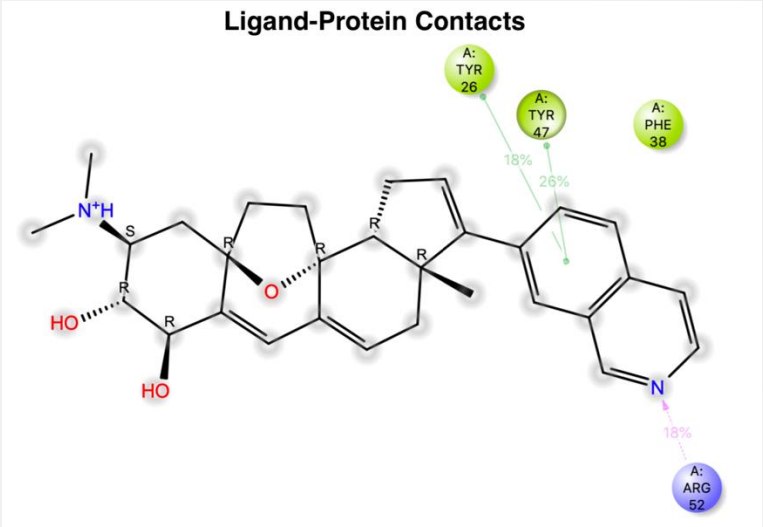
Company

PeptiSyn is a company focussed on the production of peptides, both on a large and small scale, which are widely used in biomedical, medical, chemical, cosmetic, and other related areas.

Challenges & Solution

The company carry out a project aimed to develop PROTAC molecule for TAT which is a pivotal protein in the life cycle of the HIV virus and drastically enhances the efficiency of viral infection. The artificial intelligence library that will be used in this project is designed for small molecules. Yet, it has not been tested on TAT protein, which is an intrinsically disordered protein. Thus, this will be the first challenge to apply this methodology. Using the ROSETTA program to model three-dimensional complex structure of PROTACs will be a challenge as the company does not have experience in this program.

Using deep learning methods the company created 5000 possible linkers for PROTACS. These linker molecules were filtered by their efficiencies to be used as PROTACS using molecular modeling, MD simulations and free energy calculations. Optimal linkers for experiments were identified.



HIV-TAT dCA molecule interaction diagram

Benefits

✓Reducing effort and money spent on experiments

✓Selecting more potent molecules

✓ Searching a large chemical space efficiently

"I am thankful to be given the chance to carry out our calculations on TRUBA systems and the support given by the technical teams. Designing PROTACs is not an easy task, using AI and other molecular modelling approaches we could significantly saved time and reduced experimental costs"

Onur Alptürk, Director & co-Founder @PeptiSyn

Full story:

EURO² TRUBA Turkish Science e-Infrastructure

Sevil Sarıkurt, NCC Türkiye, ncc@ulakbim.gov.tr

Cosmetics

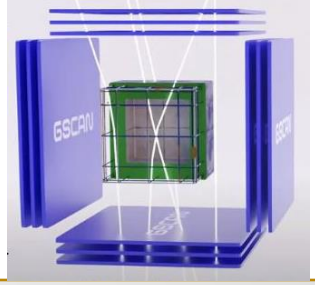
0

Construction /Architecture/Infrastructure

2

Construction (3D Scanning)

GSCAN



EURO²

Cosmic Ray-based Solutions for 3D Imaging

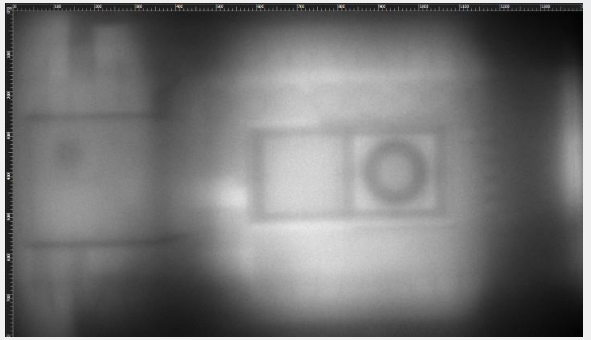
Company

GScan was founded in 2018 to revolutionize inspection, security and medical scanning markets using Muon Flux Technology (MFT). GScan, as the pioneer of MFT having unique IP, tech & sales know-how in the field, is developing a new generation of Non-Destructive Testing (NDT) scanners and tomography systems for infrastructure management applications.

Challenges & Solution

To keep the surrounding environment safe and ensure their longevity, careful assessment, maintenance and investment plan is required. However, currently there is no efficient way of obtaining the information required for more efficient use of assets and reducing risks for critical infrastructure.

Using cosmic ray tomography, the technology monitors particle trajectory changes, extracting vital statistics about material and shape. This data is transformed into 2D and 3D visualizations, including internal and external geometries and chemical composition. The comprehensive delivered output provides in-depth insights into the objects and materials under scrutiny. HPC plays an important role in translating the collected data into visualizations.



A reconstructed model of a temporarily decommissioned nuclear submarine. The horizontal plane slice covers 15x9 m area, which in total consists of 135 0000 points of interest (pixels), and is one out of 900 slices that were processed during the post-processing of measurement

Benefits

- ✓ Acceleration of data processing and reconstructions.
- ✓ Application of a broader range of algorithms during the post-processing.
- ✓ Provision of more reliable data about critical infrastructure for a safer world.

Full story:

«With time and space related digital data in terabytes, the detailed process of reconstruction enables us to see inside of structures what was not possible before. » Sander SEIN, PROJECT MANAGER GSCAN

Sander SEIN, PROJECT MANAGER GSCAN

EURO ESTONIA

Ülar Allas, EuroCC EE, ylar.allas@ut.ee

Realistic architectural visualisations using supercomputers

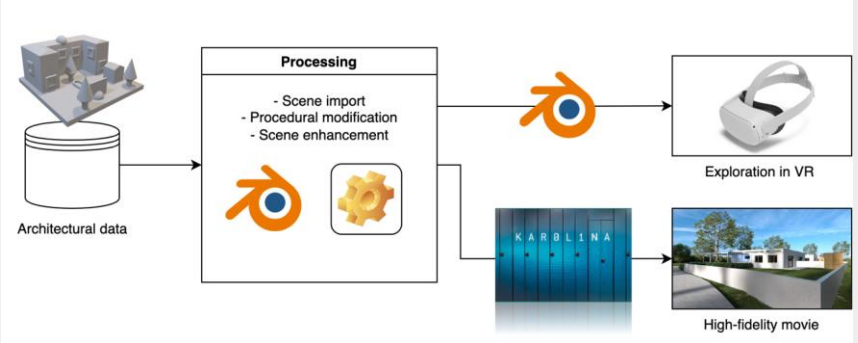
Company

INFER WAY focuses primarily on designing buildings, public spaces, preparing architectural and urban studies, and designing interiors. In addition to civil and residential buildings, the company also creates single-family houses and various interiors.

Challenges & Solution

The company wanted to develop and verify suitable procedures for processing input architectural data that would enable the generation of visually attractive outputs.

Creating procedures to appropriately modify and augment the 3D scene was necessary to generate photorealistic quality video footage. Furthermore , the scene was modified to allow interactive exportation in VR. In both cases, a path trace rendering was used. A supercomputer was used to achieve fast and accurate rendering outputs.



Processing workflow applied to architectural data.

Benefits

- ✓ Visualisations of the building design can be highly immersive.
- ✓ Improvement of the design ideas explanation between the designer and the customer.
- ✓ Time and cost savings.

Full story:

EURO CZECHIA

“Thanks to HPC, it is possible to achieve high visual quality in a fraction of the time compared to rendering on a standard workstation or a set of several workstations. Ideas can be better communicated with the customers, and due to the integration of VR technology in the process, resulting visualisations can be highly immersive.“

Martina Perinkova, CEO of INFER WAY s.r.o.

Tomas Karasek, tomas.karasek@vsb.cz

Defence sector

1

Defense & Space Engineering Software

ABSTRAO

EURO²

Development of explicit non-linear reference software for defense and space applications.

Company

Abstrao – this company is specialized in integrating numerical modelling into the analysis and optimization of systems subjected to extreme loading.

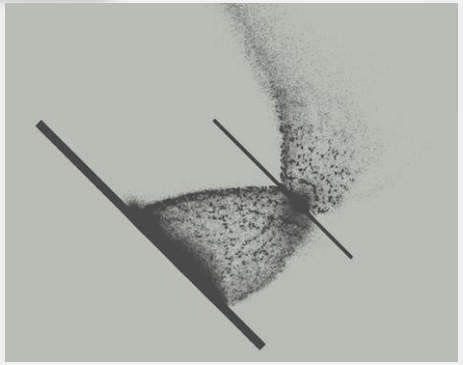
Challenges & Solution

First evaluation of the scalability of a multi-GPU HPC version of the code.

Technological demonstrations through applications linked to hypervelocity impacts of space debris on satellite protective structures.

→ Hypervelocity impact test result at 7.2km/s https://www.esa.int/ESA_Multimedia/Images/2013/04/Hypervelocity_Impacts EMI test 3915

→ ABSTRAO Solver result



Benefits

Very good weak and strong scalability (90%) on 30xA100 on *Turpan* - MESONET ARM machine

Significant progress in code maturity

Full story:

"The collaboration between CALMIP and ABSTRAO has been instrumental in the first evaluation of the ABSTRAO HPC Solver performances. This partnership has leveraged CALMIP's infrastructure and technical expertise, enabling a comprehensive and rigorous assessment of the solver's capabilities."

Jérôme Limido, CEO ABSTRAO

CCFR CENTRE DE COMPÉTENCE HPC.HPDA.IA

Contact person → at the NCC : Marie-Sophie Cabot - marie-sophie.cabot@criann.fr and at Calmip : Nadine Marouzé - nadine.marouze@toulouse-inp.fr

Earth science

0

Earth science

Use of AI for satellite-based surface wind correction

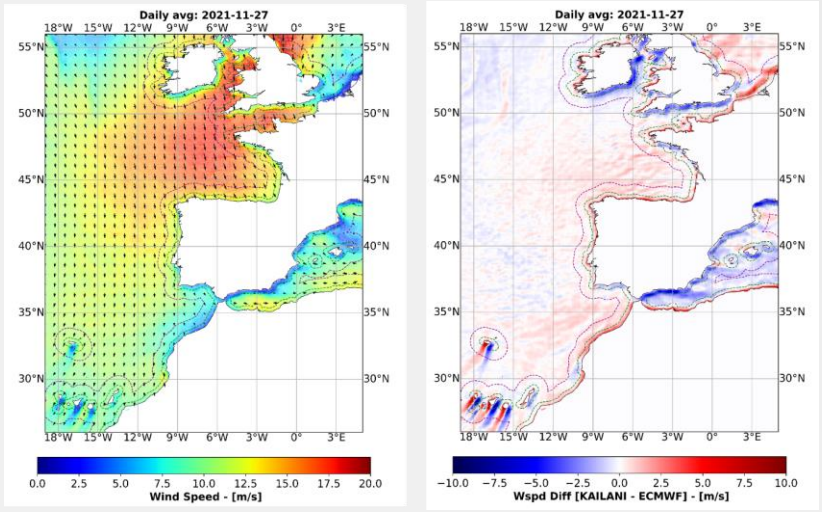
Company

Nologin Oceanic Weather Systems (NOW Systems) is an EC Copernicus Marine Service provider for the European Atlantic façade. Since 2018 they co-lead the IBI-MFC (Iberia-Biscay-Ireland Monitoring & Forecasting Centre) with Mercator Ocean International, delivering regional forecasts in collaboration with Meteo-France and CESGA.

Challenges & Solution

The main objective of this experiment is the feasibility analysis of the use of Artificial Intelligence techniques for the improvement of resolution and correction of winds generated by regional atmospheric models using satellite SAR remote observation data, using the European Copernicus service.

A neural network has been developed and trained that is capable of generating a wind field at a higher resolution than the original model, including the patterns seen in the SAR and it can be generalized to any area of the planet.



Performance of artificial intelligence in extreme events.
(left) Daily mean wind speed in the storm of 27 November 2021, preceded with Artificial Intelligence.
(right) Differences between Artificial Intelligence prediction and ECMWF dynamic model.

Benefits

- High availability of nodes allows to optimize the time spent on neural network development, ensuring that several experiments can be queued.
- Faster training thanks to GPU-enabled nodes, which allows optimizing the architecture and obtaining more accurate results that improve coastal circulation and wave models.
- The use of HPC in all phases of the process reduces execution times and therefore optimizes R&D development costs.

Full story:

"Significant time reduction by an order of magnitude. The capacity of the GPU nodes allows training of large batches, minimizing errors during AI training. The processing speed of the GPU considerably reduces the training time of the different tests until the optimal architecture is found."

Jose Maria Garcia-Valdecasas, Coastal Services Manager @NOW Systems

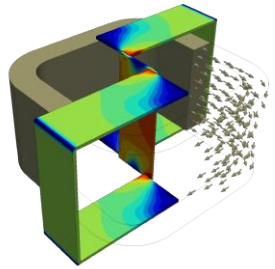
Contact person at the NCC: Laura Martínez, eurocc@res.es

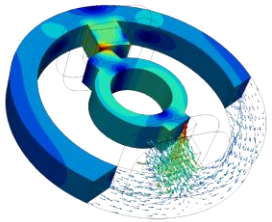
Electrical and electronic engineering

1

Electrical and electronic engineering

TAILSIT





EURO²

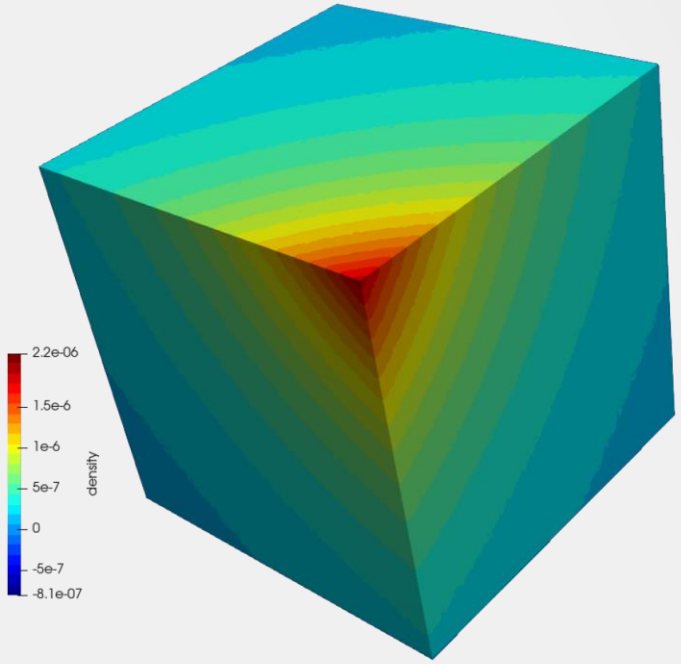
Electromagnetic Simulations

Company

TAILSIT, a company from Graz, Austria produces custom-fit simulation software tools for computational electromagnetics and structural analysis.

Challenges & Solution

TAILSIT's distinctive software library employs a coupled Finite/Boundary Element Method (FEM/BEM) for electromagnetic analysis. BEM, with quadratic complexity, becomes nearly linear through Fast Multipole Method (FMM) integration. Challenges arose in limited desktop capacity. With support from the Vienna Scientific Cluster (VSC) at TU Wien the software was adapted for HPC machines, yielding significant runtime enhancements and the ability to handle problems with up to $50 \cdot 10^9$ degrees of freedom, a major leap from its previous capacity of 10^6.



Unit cube and its calculated potential caused by a given fundamental solution

Benefits

- ⩥ significant run-time improvements
- ⩥ good overall scaling for up to a few thousand CPUs
- ⩥ achievement of significant upscaling of degrees of freedom

"Based on the results and the knowledge acquired from this project, we were able to further develop our method such that the first industrial applications have been simulated. In order to harden the algorithms and thus to achieve a sustainable implementation, we will again seek cooperation with the VSC team."

Dr. Jürgen Zechner, CEO @TailSiT

Full story:

EURO AUSTRIA

⩥ publication

Dr. Soner Steiner, EuroCC Austria, info@eurocc-austria.at

Electrical and Electronic Engineering

INFINERGIES

GROUPE 6NAPSE

EURO²

Development of an on-board battery charger

Company

Infinergies – Part of Groupe 6Npase is a Power electronics design office. Its expertise and capacity for innovation place it at the heart of the development of innovative solutions in various industries.

Challenges & Solution

Involved in the development of an on-board battery charger for electric vehicles, Infinergie was faced with the problem of the cumulative duration of the simulations to be implemented.

The product must be able to charge the battery, but also to supply electricity to the grid, or power electrical outlets in the vehicle, whatever the battery's state of charge.

This requires a large number of simulations to test these numerous operating cases.

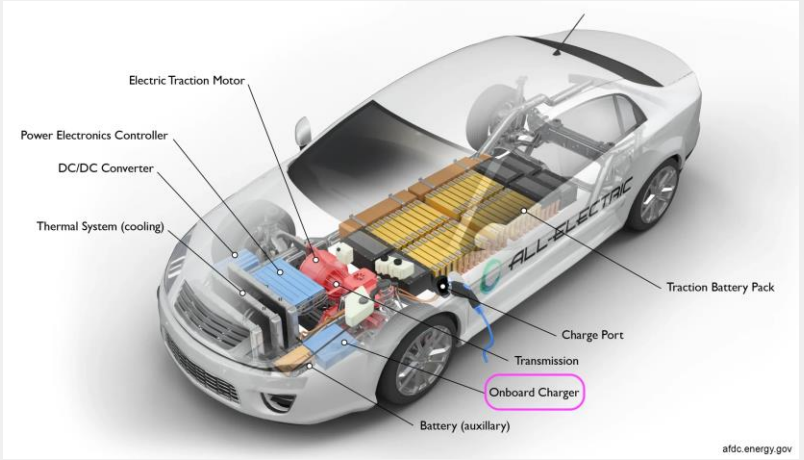


Image source: https://afdc.energy.gov/vehicles/how-do-all-electric-cars-work

Benefits

Simulation of a large number of operating points.

Compliance with the end customer's specifications in a tight timeframe.

Full story:

"Our schedule was very tight. The help we received in setting up our simulations on the supercomputer was extremely effective, and then access to the computing power enabled us to solve our industrial problem within the deadline."

Adrien Thurin, COO @Infinergies – Groupe 6NAPSE

CCFR CENTRE DE COMPÉTENCE HPC.HPDA.IA

Contact person at the NCC: marie-sophie.cabot@criann.fr

Energy

3

Energy

HAKOM TIME SERIES

EURO²

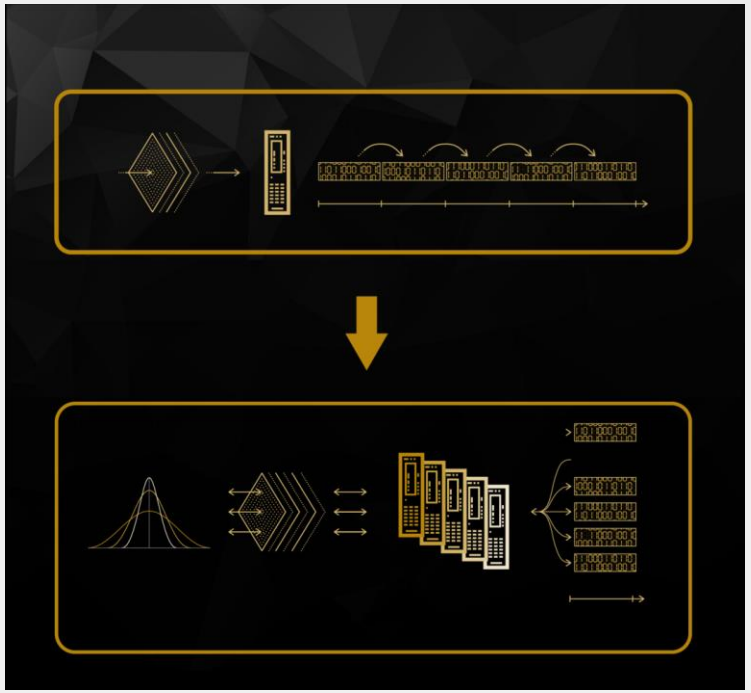
Time Series in the Energy Sector

Company

HAKOM is the technology leader for time series management in the energy industry. Its PowerTSM® Technology enables and accelerates innovation.

Challenges & Solution

The energy sector generates more data than ever before - most of it is time series data. In order to add more advanced big data analytics capabilities, the company tested its technology on a supercomputer. EuroCC Austria referred HAKOM to the experts of the Little Big Data (LBD) cluster, an HPC system at TU Wien. The successful integration of time series management (TSM) software on a highly parallel cluster enables HAKOM now to further develop the tools for analysis of very large data sets directly through its TSM system.



Benefits

- more advanced big data analytics capabilities available
- enables development of tools for analysis of very large data sets directly through its TSM system

"With the guidance of the EuroCC team we decided to export our time series data to parquet files ... With all the data residing in the distributed network file system reading subsets of data – roughly 10 GB – into a Spark distributed data frame became both doable and reasonably fast."

Gregor Beyerle, Data Scientist @HAKOM

Full story:

EURO AUSTRIA

whole story

Simeon Harrison, EuroCC Austria, info@eurocc-austria.at

Energy

The Role of HPC in Ensuring Nuclear Reactor Safety

Company

Founded in Belgium 150 years ago, Tractebel is today one of the world's leading engineering companies for energy, water and infrastructure projects.

Challenges & Solution

In 2012, the federal agency of nuclear control of Belgium reported defects in the vessels of the nuclear reactor Doel 3 and Tihange 2. Among a lot of analyses, numerical simulation has been chosen to assess the risk level.

These simulations were highly computationally demanding. A single computation required a high quantity of memory (up to 128Gb for the first computations – feasibility proved up to 768Gb). Due to the high number of configurations to compute (some hundreds), combined with the memory needs, the use of HPC infrastructure was a requirement.

Benefits

- ✓ HPC helped in the assessment of structural integrity
- ✓ Safe restart of the reactors (combined with inspections)

☞ **Tractebel acquired unique expertise and now conducts its own analyses on various parts of nuclear power plants internally but also for its partners.**

"Multiple crack configurations required much caution to perform the computation within the available hardware resources while satisfying high-quality standards in the results. Cenaero developed methodologies to face the challenges (number of configurations, memory and restitution time limitations, post-processing). " **Valéry Lacroix, Technical manager of seism & structural integrity group @Tractebel**

Full story:

Frédérique Jacobs, Industry EuroCC BE, frederique.jacobs@cenaero.be

Energy

Computational Simulations for Emission Reduction in Combustion Plants

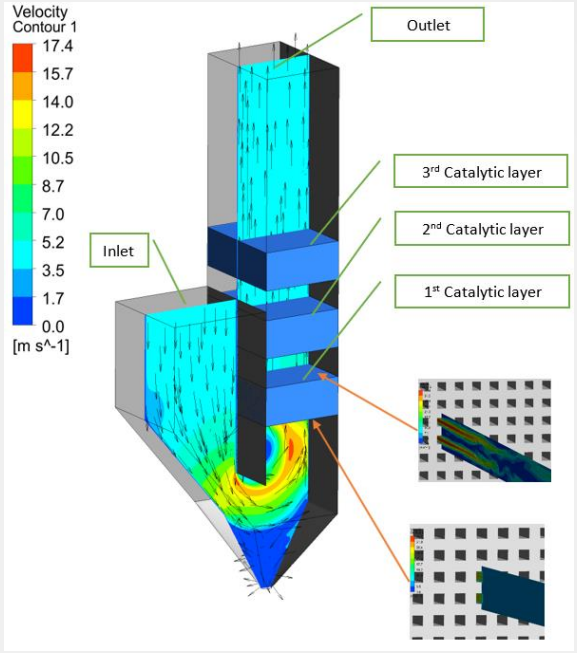
Company

The ORGREZ company provides services and supplies in several specific fields of power engineering, thermal engineering and ecology, generally in the processes of fuel energy conversion and electricity production and distribution.

Challenges & Solution

The main objective was to determine whether Computational Fluid Dynamics simulations could be used for the fast and efficient description of the selective catalytic reduction technology (SCR) catalysis process and, therefore, as a tool to mediate the design of a computational application for the design of this technology.

The use of numerical modelling and simulations will make the process more efficient, and faster and, most importantly, extend the application possibilities of this process, which will enable subsequent optimization of the designed solution and, thanks to high-performance computing, it will be possible to complete these simulations in a relatively short time.



CFD simulation of SCR process.

Benefits

- ✓ Confirmation of the applicability of CFD for SCR design and optimization
- ✓ Time and costs saving due to speed up of SCR design process
- ✓ Environmental impact due to optimised SCR design leading to increase of NOx emission reduction

"By speeding up the design process of the SCR technology, time and cost savings are achieved and, in addition, the optimised SCR technology design leads to more effective NOX emission reduction and extended technology lifetime, which has a positive impact on the environment."

Vojtech Vavricka, Managing Director of the ORGREZ Division for Ecology Systems

Full story:

EURO CZECHIA

Contact person at the NCC: Tomas Karasek, tomas.karasek@vsb.cz

Environment/climate/ weather

5

Environment/
climate/weather

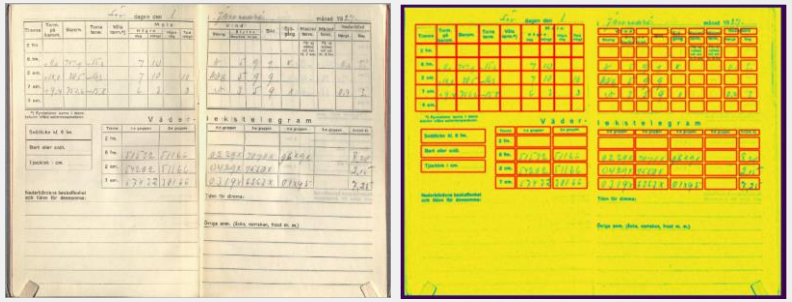
Sweden's Meteorology & Hydrology Institute digitizes archival tabular data using LUMI

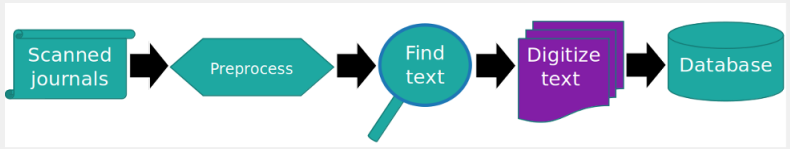
Company

The Swedish Meteorological and Hydrological Institute (SMHI) is an expert authority with a global perspective and a vital task of predicting changes in weather, water and climate.

Challenges & Solution

SMHI, possesses troves of archival data of observations spanning decades in paper format. The ambition of the project is to optimize and train a sufficiently accurate machine learning model which can handle different forms of tabular data, convert handwritten-text and produce machine-readable. SMHI aims to use a combination of image processing and machine learning to achieve this. The digitization pipeline is implemented in Python, using well-known open-source scientific libraries such as scikit-image and TensorFlow.





Benefits

This project aids and accelerates the digitization work from the paper archives into data, which is done manually as of now. As a result of the project, SMHI aims at digitizing numerous historical weather observations that will help a better understanding of climate, especially of the occurrence of extreme weather events.

"A HPC allocation enables us to rapidly test and develop the product. (…) GPUs allow faster tuning hyperparameters of this model. On CPUs the neural network training takes 11 hours. On GPUs the whole training takes only 1 hour."

Ashwin Mohanan, Scientific programmer at SMHI

Full story:

Contact person at the NCC: Apostolos Vasileiadis, apostolos.Vasileiadis@ri.se

Environment/
Climate/ Weather

ErikTronik

EURO

The multiphysics experiments of the Weather Research and Forecasting Model (WRF) on precipitation patterns of Turkey

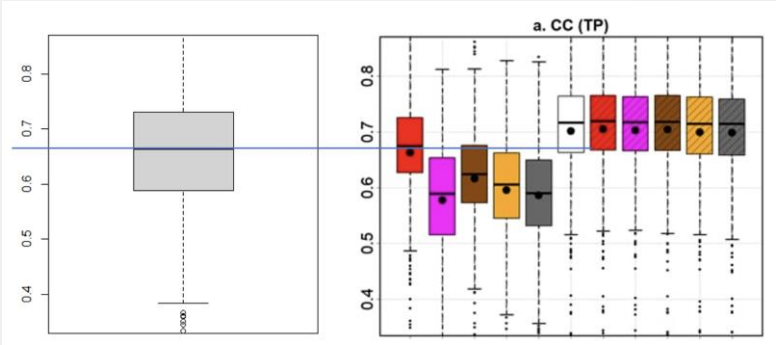
Company

ErikTronik Engineering is a corporation that operates in several domains including aviation, energy, meteorology, and defence. They offer solutions in aviation and navigation for both military and civilian airports, design algorithms and provide energy forecasts, transform data into decision-making tools in meteorology-dependent areas, and supply spare parts to defence agencies with certifications. Additionally, ErikTronik supports projects in Turkey and the EMEA region offering consultancy, engineering, sales and after-sales services, while also addressing challenges like climate change, food, and business intelligence through engineering solutions.

Challenges & Solution

WRF model may provide accurate representation of the atmosphere and the surface conditions. However, such WRF model requires major parametrizations (e.g., cloud, planetary boundary layer, other physics options) to be optimized. On the other hand, simulations of WRF model require high computational resources to accomplish such optimization studies.

The project's sensitivity tests were completed over the Turkey domain for 2020, with a 60-combination of model physics in 4-km resolution. The combination number, resolution, and simulation time are rather comprehensive for such sensitivity tests. We have valuable information now about which multiphysics ensemble responds favorably to the Turkey precipitation characteristics.



Previously available model performances (solid gray box on the right with a median 0.58) are improved to the level of European state of the art model accuracy levels (left gray box with median 0.66). These are very encouraging results compared with existing state of the art models.

Benefits

- ✓ Gained experience for the first time in the HPC domain.
- ✓ Encouraged to apply to the EuroHPC projects in the seasonal forecast and climate prediction areas through gained experience with this project.
- ✓ Improved their insight into driving mechanisms of precipitation over Turkey.

Full story:

"ErikTronik's enhanced forecasting in Türkiye benefits climate-dependent domains by improving resource prediction, hydrometeorological forecasting, and climate change mitigation. This capacity aids in better water management and response to climatic adversities, supporting particularly the renewable energy and agriculture sectors in risk and operational handling." **Erdem Erikçi, CTO @Eriktronik**

EURO

TRUBA Turkish Science e-Infrastructure

Contact person at the NCC: Sevil Sarıkurt, NCC Türkiye, ncc@ulakbim.gov.tr

System for intelligent identification of air pollution sources

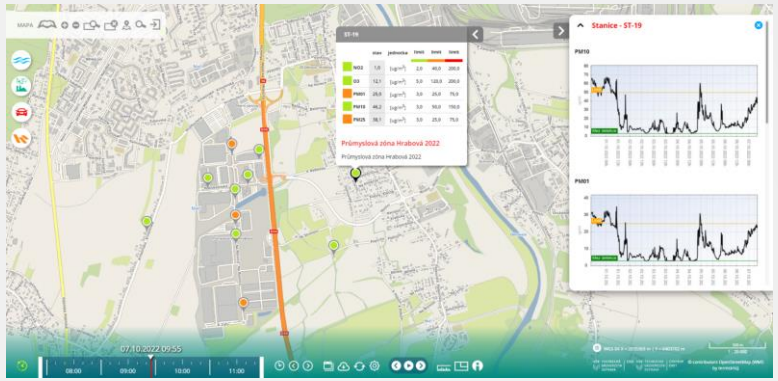
Company

ENVItech Bohemia focuses on offering comprehensive services in the field of environmental monitoring, especially of air - the company's main focus is the measurement of concentrations of pollutants. They supply a comprehensive assortment of means for monitoring air quality, including management systems.

Challenges & Solution

The aim of the cooperation between ENVItech and the VSB – Technical University of Ostrava institutes CEET and IT4Innovations was the implementation of the "Intelligent Air Pollution Source Identification System" (IIS) based on the principle of an online model of short-term values of concentrations of selected, health-relevant substances.

A comprehensive system for monitoring emission loads and software for evaluating and interpreting air pollution was acquired, emphasizing effective use for strategic decision-making in state administration, self-administration, and industrial resource management.



View of the software evaluating and interpreting air pollution.

Benefits

- ✓ Moravian-Silesian Region and the Ministry of the Environment have obtained a tool for fast, large-scale and cheap measurements of air pollution changes.
- ✓ Easy-to-use graphical interface for an average users integrating data from different thematic areas.
- ✓ Plug&Play system architecture enabling the simple integration of new sensors and automatic data processing and visualisation.

Full story:

"In order to evaluate the effectiveness of the decarbonization of the region and the impact of low-carbon technologies on the environment and society, it is necessary to assess the state of air quality before and after their implementation. Therefore, the creation of an intelligent identification system of air pollution sources was absolutely necessary."

Stanislav Misak, Director of the CEET at VSB – Technical University of Ostrava

Tomas Karasek, tomas.karasek@vsb.cz

Environmental risks & Insurance

How to provide a statistically significant set of data of extreme weather events

Company

RiskWeatherTech supports its institutional and private customers in the risk management and the study of the vulnerability of territories and businesses.

Challenges & Solution

Faced with the recurrence of intense weather disturbances in France, Risk Weather Tech has developed, thanks to Myria supercomputer at Criann, a vast catalog of storms physically and statistically plausible. Main objectives: anticipate potential damage on infrastructure and map more precisely the risks of insurance claims.

Proof of concept that were achieved

- Building a database of climate events

- Accurate mapping of claims risks

Exemple of an extreme weather event

Benefits

- ✓ Simulation of 10,000 realistic storms that could occur in France
- ✓ More than 870,000 CPU hours was needed

The catalogue of 10,000 storms is a tool for the insurance industry to analyse the risks associated with storms in France

Full story:

Marie-Sophie CABOT, Industry Euro CC FR, Marie-Sophie.Cabot@criann.fr

Environment water quality

PROLOG INGENIERIE

EURO²

Opening of public bathing sites in the natural environment

Company

The PROLOG INGÉNIERIE group, an independent consultancy engineering firm, in the field of water and associated remotely managed systems, works to improve water quality.

Challenges & Solution

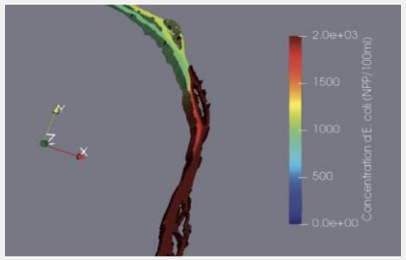
How to succeed in opening swimming sites in Marne after the Paris 2024 Olympic Games? To support the management plans put in place by public authorities in these highly urbanized areas, Prolog engineering has developed a model coupling hydrodynamics and water quality on the Criann supercomputer.

Proof of concept that were achieved :

- 3D hydrodynamic simulation of a section of the river Marne with consideration of pollution sources

- Deployment on HPC architecture

- Getting started with the HPC environment



Fine modeling of the dispersion of bacteriological strains from their point of emission

Benefits

- ✓ Speed of calculation time
- ✓ Fine representation of pollution dispersion
- ✓ More than 120,000 CPU hours was needed

Numerical simulation and HPC in support to public authorities for management plans

Full story:

CCFR CENTRE DE COMPÉTENCE HPC.HPDA.IA

Marie-Sophie CABOT, Industry Euro CC FR, Marie-Sophie.Cabot@criann.fr

Food and drink

0

Finance/Insurance

3

Finance & IT systems

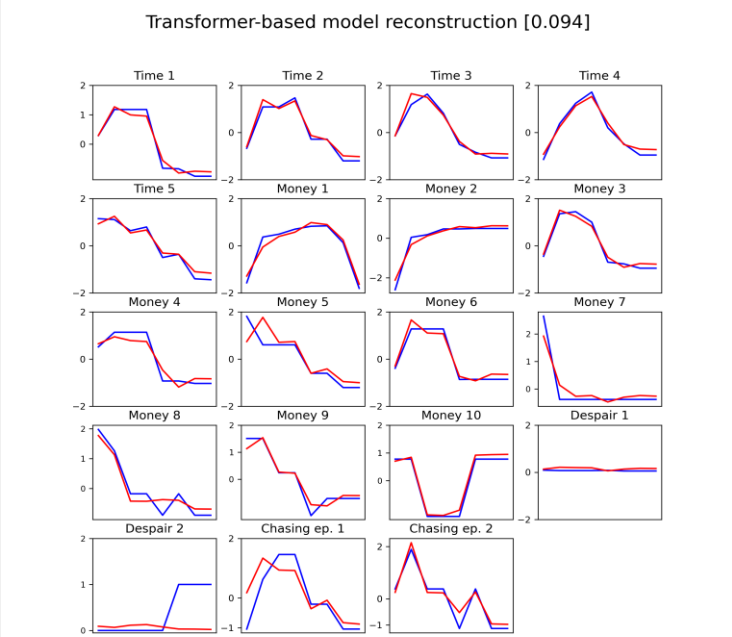
Anomaly Detection in Time Series: Gambling prevention using Deep Learning

Company

DOXXbet, ltd. – betting and online casino; Codium, ltd. – software developer of betting and iGaming platform, focused on enhancing customer service and players' engagement via identification and prevention of gambling behavior.

Challenges & Solution

- Unsupervised Transformer-based autoencoder (AE) model was used to detect anomalies in the dataset generated by online casino players.
- Data consists of time series of 19 derived features reflecting players' behavior, such as net loss / gain, cash deposits / withdrawals in a sliding time window, login frequency, etc.
- Alignment of AE's reconstruction error and the so called proxy indicators (selected manufactured descriptors, such as "chasing loss") enabled us to distinguish between data anomalies and potential problem gambling of players, thus decreasing the false positive rate.
- Training model with more than 100k trainable parameters and gigabytes of data greatly benefited from utilizing GPU-accelerated HPC facility.



Expected (blue) vs. predicted (red) values for each descriptor: single time window of a random player

Benefits

- ✓ Help betting and online casino providers mitigate negative consequences for players, which is in line with European trends in risk management.
- ✓ Real-time problem gambling detection using AI and Big Data thanks to HPC.

Full story:

"The accelerated module of the HPC system Devana allowed us to test several approaches to prevention of pathological online gambling. Powerful GPU accelerators were of great value in training and fine-tuning of sophisticated AI models."
Martin Varmus, CEO@Codium, ltd.

Lucia Demovičová, WPL EuroCC Slovakia, lucia.demovicova@nscc.sk

Finance

advestis
part of mazars

EURO²

Data science & Machine Learning Development of prediction and investment rules

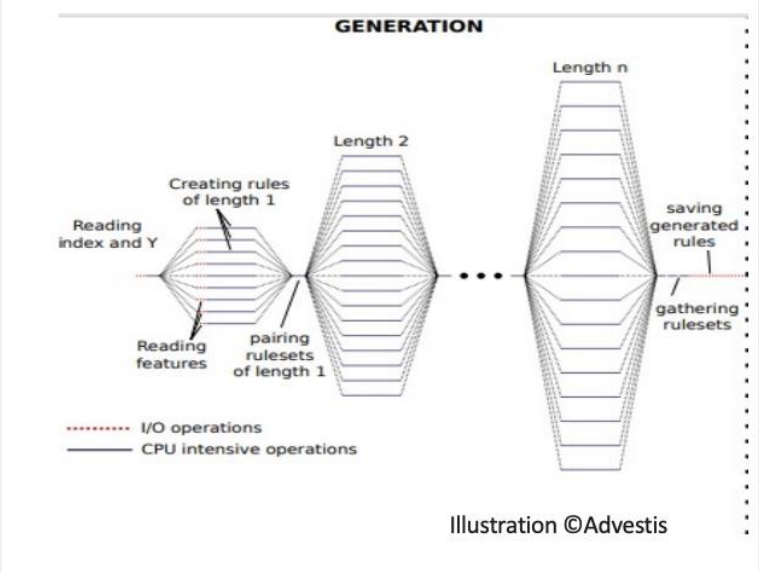
Company

Since its creation in 2011 in Paris, Advestis part of Mazars offers services of applied research in data science and put into production some machine learning systems.

Challenges & Solution

Advestis has developed an artificial intelligence algorithm capable of generating interpretable investment rules, based on data from financial results. Even filtered, the number of generated rules remains significant and the restitution time of the algorithm was too high.

Criann's HPC engineer accompanied the R&D team of Advestis in the optimization and execution of the algorithm, coded in Python, and using the package mpi4py for parallelization.



Generation of rules, illustration © Advestis

Benefits

- ✓ Restitution times have been divided by 20, which results in a very clear reduction in the costs of calculation.
- ✓ Improved prediction quality and increased financial performance.

Full story:

"The assistance from CRIANN, both for handling the calculation nodes and for advice on optimizing the code, was of very good quality and allowed us to progress very quickly. »

***Philippe COTTE,* LEAD PYTHON ENGINEER, Advestis part of Mazars**

CCFR CENTRE DE COMPÉTENCE HPC.HPDA.IA

Marie-Sophie CABOT, Industry Euro CC FR, Marie-Sophie.Cabot@criann.fr

Finance

HORAE TECHNOLOGY

EURO²

Independent portfolio management company part of the Ecole Polytechnique incubator nursery

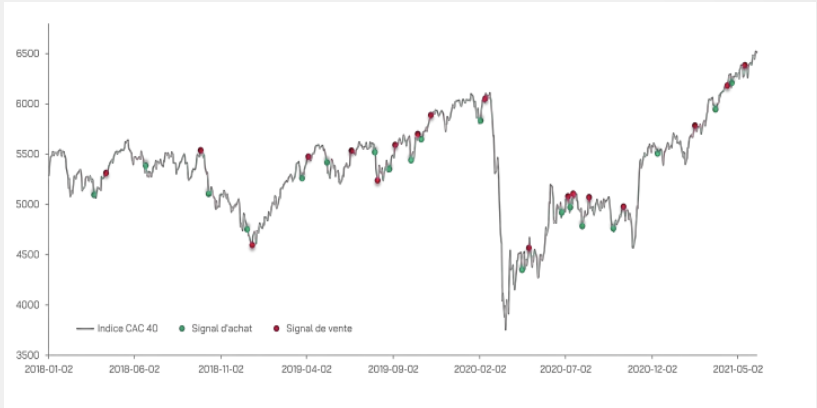
Company

Created in 2021, Horae Technology offers investment solutions for individuals and institutions.

Challenges & Solution

Horae Technology is developing an innovative decision support tool combining artificial intelligence and behavioral finance. In September 2021, Horae Technology joined the Euro-CC program, in order to benefit from high-level support in intensive computing.

This computing power has notably enabled the company to accelerate the performance of its tool via the parallelization of its code and the possibility of analyzing thus thousands of financial securities simultaneously.



Retroactive evaluation of buy and sell signals on the CAC 40 index

Benefits

- ✓ Improve the calculation time of training algorithms
- ✓ Significantly increase the power and robustness of the AI models.

Full story:

Individual and personalized support allowed the company to quickly become autonomous in the use of the supercomputer.

CCFR CENTRE DE COMPÉTENCE HPC.HPDA.IA

Marie-Sophie CABOT, Industry Euro CC FR, Marie-Sophie.Cabot@criann.fr

Health care / Pharmaceuticals / Medical devices

Health care / Pharmaceuticals / Medical devices

AMET
allgemeine medizin - elektronik - technologie

EURO

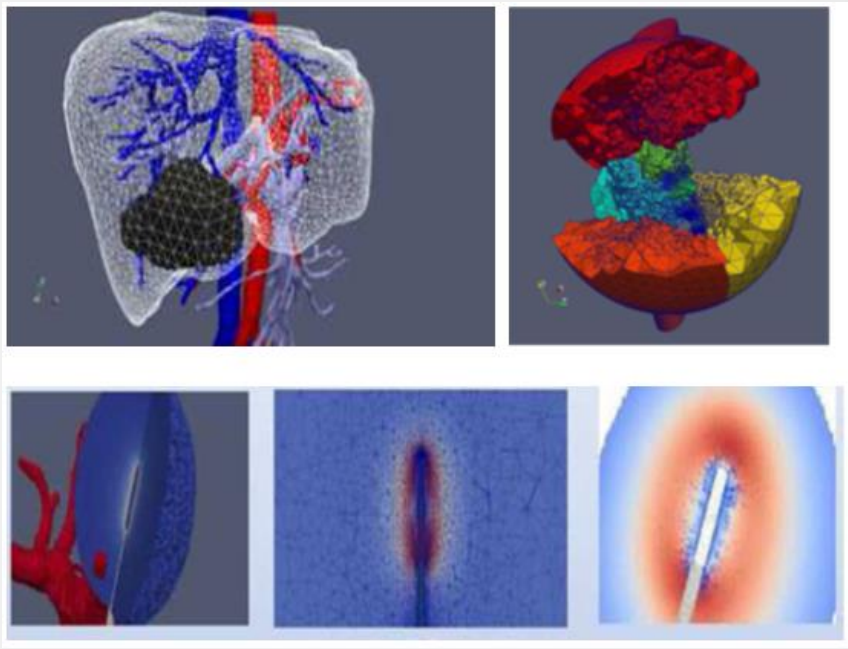
Supercomputer application in biomedical engineering

Company

AMET Ltd. is a company dedicated to development, modern manufacturing and distribution of electronic medical equipment and modules. It is a reliable and desired partner in Bulgarian and foreign market.

Challenges & Solution

The processes are substantially three-dimensional and time-dependent. The developed software tools for supercomputer simulation of coupled physical processes of radiofrequency electro surgery manipulations are beyond the scope of available commercial packages. Measurable indicators are applied to assess the reliability of the obtained results, thus providing proven criteria for minimizing subjective inaccuracies. The impact of using large-scale HPC models reached more than two times improved precision of evaluating the volume of effectively ablated tissue.



Benefits

- ✓ Fully realistic computer simulation of strongly coupled processes of radiofrequency electrosurgical technologies.
- ✓ Time/cost saving of parameter optimization of high tech low-invasive procedures.
- ✓ Assessment and optimization of hard to measure complex processes.

"The use of state-of-the-art modeling, simulation and high performance technologies is very important to our company. The business impact from our collaboration with IICT-BAS includes improving the technology characteristics of existing products and development of new products."

Janet Popova, Managing DIrector @Amet Ltd.

Full story:

EURO² Bulgaria

Contact person at the NCC Bulgaria: Stanislav Harizanov, sharizanov@parallel.bas.bg

Healthcare

Medical Image Processing

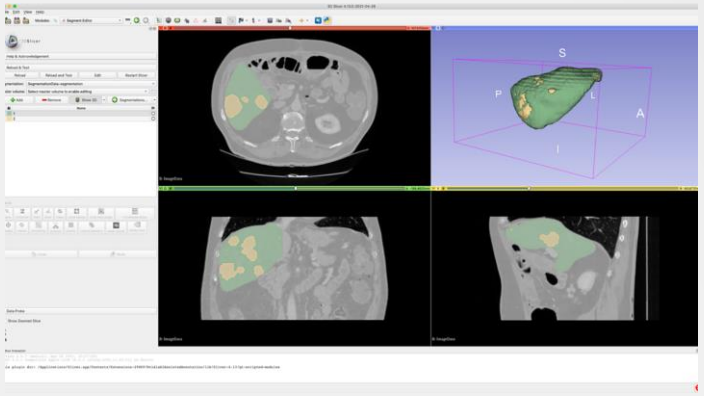
Company

University Hospital Ostrava is a state-funded organisation established by the Ministry of Health of the Czech Republic. The primary purpose of this organisation is to provide health services.

Challenges & Solution

The main goal of the cooperation was to deploy and test a tool providing remote automatic tissue segmentation from patient image data obtained from computed tomography (CT) or magnetic resonance imaging (MRI) on supercomputers at IT4Innovations National Supercomputing Center.

The automated segmentation process can be applied to specific tissues of real interest to the physician, and the resulting model can be further used to plan healthcare tailored to the individual patient.



3D Slicer working environment with possible output obtained by automatic segmentation on HPC cluster.

Benefits

- ✓ The time of the segmentation process is reduced by automation
- ✓ Spared time can be used for the physician´s benefit
- ✓ The automated segmentation process can be applied to specific tissues of interest to the physician

"Using this toolkit is beneficial for both patients and physicians, as automation allows us to achieve high-quality image reconstructions in a fraction of the time and with minimal effort." **Jan Roman, MD, University Hospital Ostrava**

Full story:

EURO CZECHIA

Contact person at the NCC: Tomas Karasek, tomas.karasek@vsb.cz

Health care / Pharmaceuticals / Medical devices

castprint

EURO

Topological optimization using HPC for medical devices

Company

CastPrint is a Latvian SME that provides clinics with custom-made 3D printed casts for wrist, finger, leg fractures. The casts are lighter and more breathable than the traditional gypsum fixtures.

Challenges & Solution

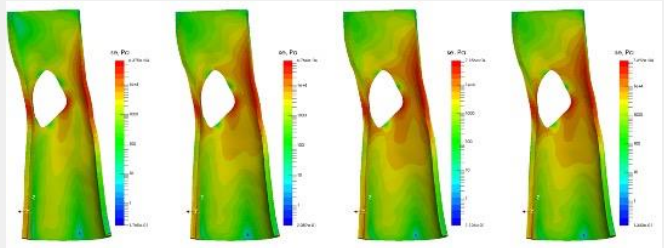
The Challenge

Creation of a 3D printed cast is a time-consuming and resource intensive process. Since the 3D scans used for production contain huge numbers of surface elements, processing the data on typical office computers is both slow and often unreliable, with software crashes resulting in data loss and delayed delivery to patients.

The Solution

Integrating parametric model optimization into the design process of the medical device. This involves using simulations to determine the most efficient shape for the cast, which in turn reduces the amount of material required and shortens printing times.

The use of HPC enables faster and more effective simulations, automating certain aspects of the design process and ultimately reducing the time spent on it.



Benefits

- 20% reduction in labor hours for cast design, which also reduces the risk of human error.
- Approximately 25% reduction in production material use through topological optimization.
- 25% reduction in production time through material optimization and shorter printing durations.
- Up to 15% reduction in production costs.
- Up to 25% enhanced production capacity at CastPrint.

Full story:

EURO SuperS

"There are many challenges in the production of fixators. The most important ones – how to shorten production time? how to reduce manual steps? how to save 3D printing times? These challenges also had a solution: parametric model optimization and HPC technology."

***Janis Olins*, CEO @CastPrint**

Contact person at the NCC: Karlis Muiznieks, karlis.muiznieks@lu.lv

Health care / Pharmaceuticals / Medical devices

SEMANTIC INTELLIGENCE

EURO²

AI algorithm for molecule recognition

Company

Semantic Intelligence has developed an AI-driven IP Intelligence Engine enables scientists & IP experts to search, analyze and extract complex knowledge on chemical-biological interactions

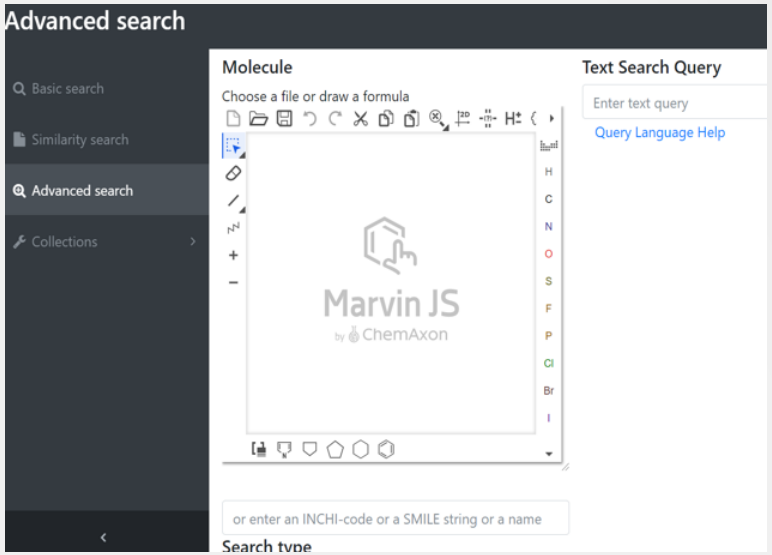
Challenges & Solution

Challenge

How to index molecular images quickly & efficiently to provide users with the fastest possible access to current, published patents? The data base is one of the largest patent databases: USPTO (United States Patent and Trademark Office) with 5 million patent documents, more than 50 million molecules.

Solution

AI algorithm training in molecule recognition & integration into existing data processing workflow.



Benefits

- Successfully completed algorithm training on the database
- Confidence in the effectiveness of the HPC center infrastructure and process
- Expected time & cost saving benefits (~20-30%)

"Use of HPC allows us to perform a completely new approach to rapid analysis of big data in biopharmaceuticals, combining both structured and unstructured data to provide a data-driven, critical decision-making process to our clients."

Vita Sture, CEO @Semantic Intelligence

Full story:

EURO SuperS

Contact person at the NCC: Karlis Muiznieks, karlis.muiznieks@lu.lv

Healthcare

Launch of the Vaccination Centre

Company

This case has been handled together with the University Hospital Ostrava, Moravian-Silesian Region, Statutory City of Ostrava and Faculty of Medicine of the University of Ostrava.

Challenges & Solution

In March 2021, IT4T and the NCC in HPC collaborated on a joint project to build a large-scale vaccination centre in Ostrava, which was commissioned at the Černá louka site.

Our team created a simulation of the vaccination center's hall. This simulation detects critical vaccination centre points at times of high workload. Several bottlenecks in the original design, such as the waiting room after vaccination and the exit confirmation printing.

A consultation before the vaccination process.

Benefits

- ✓ The vaccination center can be designed efficiently in short period of time. Accurate detection of critical points and it´s redesign.
- ✓ The required number of operator and staff positions for each station were identified.
- ✓ The simulation also determines how many patients can be in the vaccination centre at any one time, at different stages.

”I appreciate the efforts of all the partners who have been and continue to be involved in constructing the vaccination centre. It is good to note that an important element in the design of such a centre was the supporting simulation, which was developed by scientists at IT4I and without which the testing of the capacity of the centre would have taken many times longer.“

Ivo Vondrak, Governor of the Moravian-Silesian Region

Full story:

EURO CZECHIA

Tomas Karasek, tomas.karasek@vsb.cz

Healthcare

misterine

EURO²

Using supercomputers to create 3D tissue models for visualization

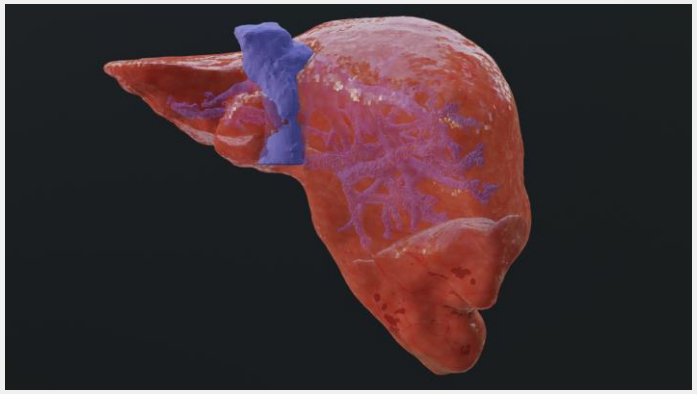
Company

Misterine's innovative AR and VR solutions enable better visualisation and education through immersive 3D experiences. Their Studio & App help users to effortlessly create, edit, and play AR manuals for a better understanding of complicated manual procedures.

Challenges & Solution

Misterine wanted to create 3D tissue models for visualisation using the supercomputer. Incorporating the new features into Misterine's existing workflow and ensuring seamless integration with NCC's workflow while maintaining data integrity presented a significant challenge.

NCC has offered methods to enhance Misterine Studio's software capabilities to showcase medical tissues in AR and enable workflow execution from the command line.



A 3D liver model that may be viewed in AR/VR.

Benefits

- ✓ For example, tissue models can be used for AR training from medical image data.
- ✓ Medical professionals and researchers can study and analyse the tissue more precisely.
- ✓ The solution will help optimise workflows, reduce complexity, and render realistic images using AR and VR devices.

"Thanks to using supercomputers, it has been possible to reduce the time of AI model training from computed tomography (CT) datasets. This will help Misterine with advanced data processing capabilities with deep learning."

Martin Klima, CTO of Misterine s.r.o.

Full story:

EURO CZECHIA

Tomas Karasek, tomas.karasek@vsb.cz

Healthcare

POLITECNICO MILANO 1863

EURO²

Easy and secure access to HPC infrastructure for scientists through HEAppE

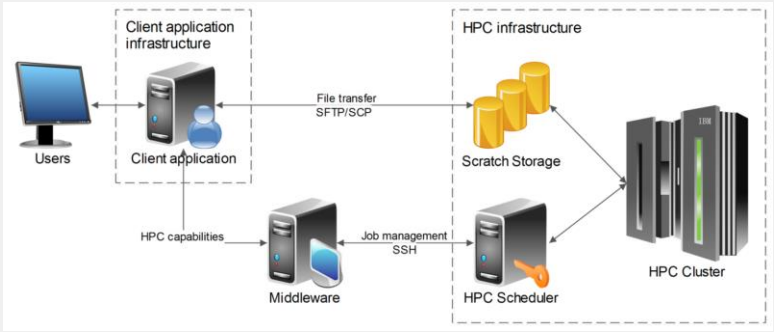
Company

Politecnico di Milano is a public scientific-technological university that trains engineers, architects, and industrial designers.

Challenges & Solution

During the COVID-19 pandemic, the university wanted its scientists and researchers to access HPC infrastructure easily without installing additional software. The solution should allow them to continue their research on possible cures for COVID-19.

The collaboration led to developing a client environment application based on the web-based interactive computing platform Jupiter Notebook. It allows for the creation and management of HPC executions using HEAppE Middleware. Additionally, the client environment offers the choice of a language (C# or Python), depending on the research activity.



Visualisation of the connection between the user and HPC Cluster through the client environment.

Benefits

- ✓ The solution enables to continue research using HPC infrastructure remotely even during isolation.
- ✓ Can help further accelerate the computational process in case of future pandemics.
- ✓ Installation of additional software is not necessary.
- ✓ Choice of a language is possible.

Full story:

"Within the project Exscalate4COV, we virtually screened more than 70 billion molecules as possible drugs against Sars-CoV-2. This is where supercomputers make all the difference, facilitating the rapid selection of only the most promising molecules for subsequent phases of the drug discovery pipeline." Gianluca Palermo, Professor at Politecnico di Milano

EURO CZECHIA

Tomas Karasek, tomas.karasek@vsb.cz

Healthcare

braintale

EURO²

AI medical device software to quantify brain damage and clinical prognosis

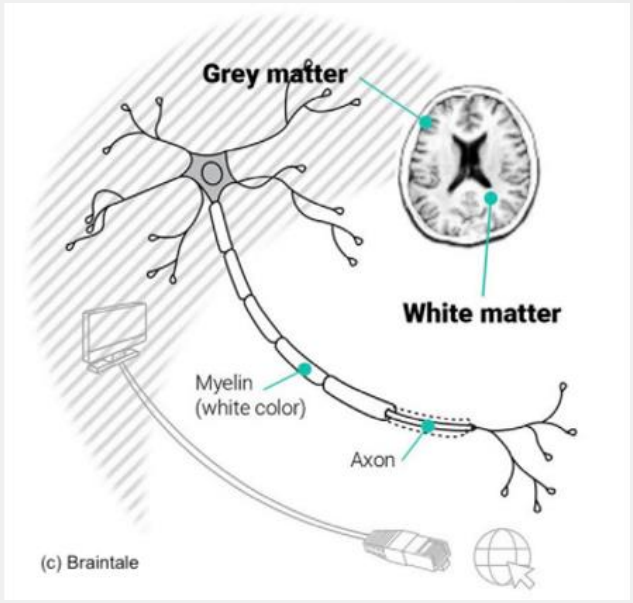
Company

Braintale is an innovative company dedicated to deciphering the white substance to allow better treatment in neurology and intensive care with prognostic solutions clinically validated.

Challenges & Solution

Braintale has joined the Euro-CC program, in order to benefit from high-level support in supercomputing

This computing power has notably enabled the company to analyze in efficient conditions the data of more than 500 patients in order to develop its research tools to optimize the intake in charge of brain diseases



Measurements of brain white-matter microstructure alterations

Benefits

- ✓ Optimization of retrospective analysis of large research cohorts
- ✓ Intensive processing of very large volumes of data

HPC for the development of an innovative medical device that will benefit to patients, medical professionals and researchers

Full story:

CCFR CENTRE DE COMPÉTENCE HPC.HPDA.IA

Marie-Sophie CABOT, Industry Euro CC FR, Marie-Sophie.Cabot@criann.fr

Health & Pharmaceuticals

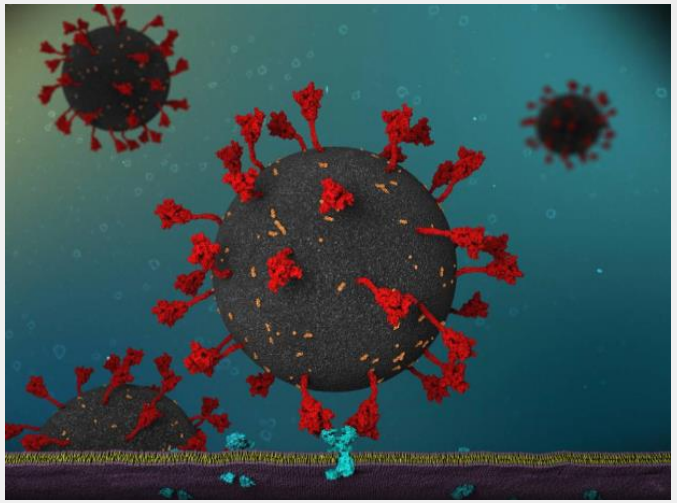
Developing Optimized Drugs Against COVID-19

Company

BioSIM bridges theory and experiment using advanced computational tools for Enzymatic Catalysis and Drug Discovery, while Crowdfight fosters scientific collaborations by connecting experts.

Challenges & Solution

The challenges included rapidly identifying effective drugs to combat COVID-19, understanding the virus's Spike protein interactions, and managing a vast number of potential molecules. Traditional methods would have been too slow and resource-intensive. The solution was leveraging computational resources to create detailed 3D models, screen 200,000 molecules, and rank them by potential efficacy. This approach enabled efficient identification and optimization of promising drug candidates, ensuring their effectiveness against evolving variants.



The interaction between SARS-CoV-2 Spike – Human ACE2

Benefits

- Accelerated drug discovery
- Optimized molecule selection
- Enabled 3D modeling of virus-protein interactions
- Facilitated collaboration
- Ensured drug effectiveness against new variants

"These computational resources allowed us to make a sort of ranking of molecules, from the least to the most promising. If we didn't have access to them, we would have tested a much smaller number of these molecules and it would mean much less chance of success".

Sérgio Sousa, Researcher @ BioSIM

Full story:

EURO² PORTUGAL

Lígia Breda Melo, NCC Portugal, eurocc-portugal@lip.pt

Humanities / Languages

Humanities/ Languages technology

LUISA TRANSLATION AGENCY

EURO²

Machine Translation Post-Editing

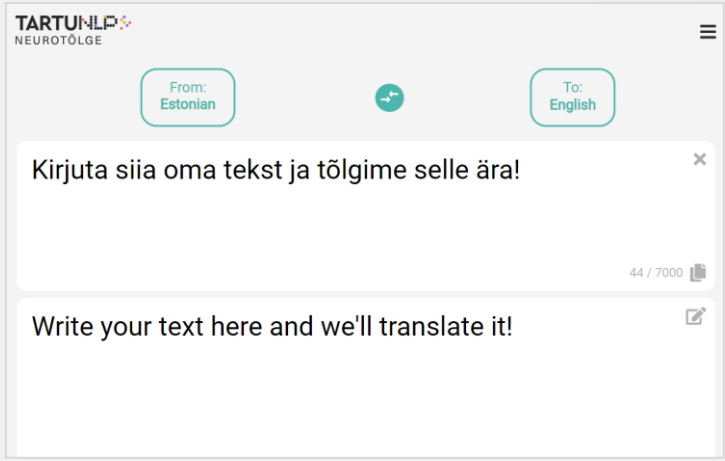
Company

Luisa Tõlkebüroo OÜ is the biggest translation agency in Estonia. The company offers more than 50 services – including sworn translation, simultaneous and consecutive interpretation, layout work, machine translation and post-editing, subtitling and localisation.

Challenges & Solution

The company needed a custom-made machine translation system to reduce the time of translations. As the company had no previous experience neither in natural language processing nor in machine learning, they collaborated with the TartuNLP team. Training of the machine translation model was conducted by using University of Tartu HPC centre's Rocket cluster.

Once the models were trained, the company considered different options for deployment. Their initial plan was to invest in their own infrastructure but soon they realized that it would not be justified for their use case and the TartuNLP group deployed the models alongside other services in the cloud.



Screenshot of the translation engine developed by TartuNLP.

Benefits

- ✓ Neural machine translation systems were built for 4 language pairs and several text domains
- ✓ The company enjoyed lower deployment costs and did not have to worry about maintaining their own hardware
- ✓ The innovative translation tool helps to save valuable time and human resources

Full story:

"Thanks to rapid advances in the technology and our extensive translation memory, we are able to offer our clients machine translations with post-editing in a range of language combinations and on a range of topics." **Anna Räbokon, Customer Relations Manager @Luisa Tõlkebüroo OÜ**

EURO ESTONIA

Ülar Allas, EuroCC EE, ylar.allas@ut.ee

IoT (Internet of things)

IT/HPC systems, services & software providers

4

IT/HPC systems, services & software

MPACTS

EURO²

Leveraging expertise

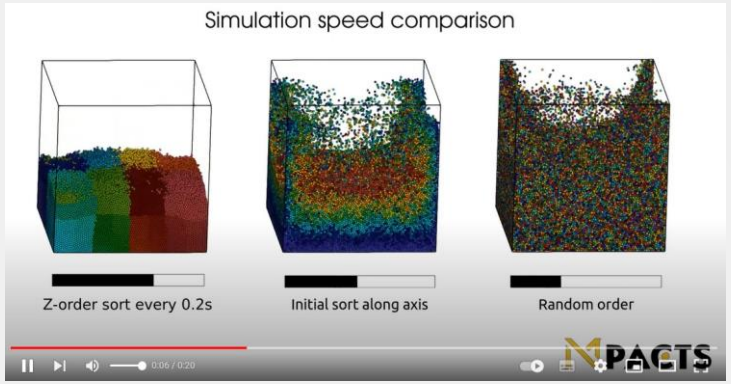
Company

Founded in 2018, Mpacts is a SME dedicated to te development of Mpacts simulation software. It is designed to simulate the behaviour of granular materials, assemblies of large numbers of particles in industrial processes.

Challenges & Solution

While granular dynamics is conceptually very similar to molecular dynamics, it is also much more complex since particles have shape and complex interactions, which complicates contact detection. Develop computationally efficient simulation software for granular processes is critical.

The Flemish Supercomputing Center (VSC) recommended sorting the particles so that particles close in (simulated) space are also close together in computer memory. VSC also built a tool that automates the compilation of Python modules from C++/C/Fortran. These programming techniques made the software more efficient and, thus, faster.



Benefits

- ✓ Sorting the particles in memory translates into faster computation times by factor 2 with existing hardware.
- ✓ Performance increases by a factor of five with GPUs

☞ **This improvement has a high impact on the responsiveness in solving engineering problems.**

"The ability to work with the highly skilled experts in the field of HPC at VSC was a very interesting and rewarding experience. I would recommend anyone involved in supercomputing to contact the VSC and benefit from their available expertise to improve your calculations." **Simon Vanmaercke, Co-Founder @Mpacts**

Full story:

EURO BELGIUM

Carl MENSCH, Industry EuroCC BE, carl.mensch@uantwerpen.be

IT/HPC systems, services & software providers

machinetutors

EURO

Large Scale Real-Time Image Content Moderation

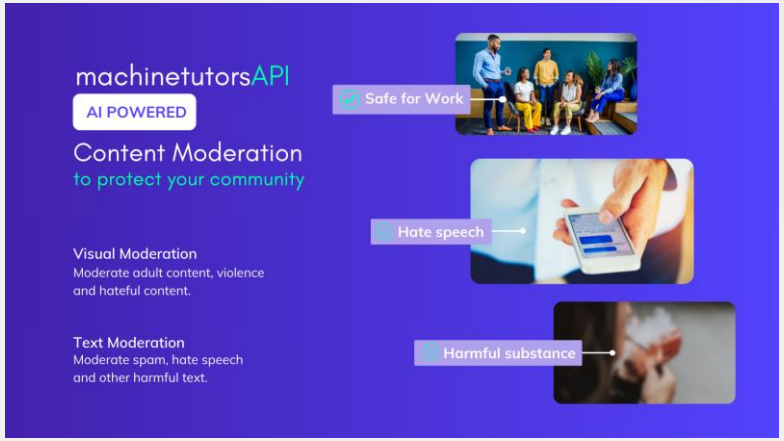
Company

Founded in 2010, Machinetutors provides machine learning consultancy and customized AI software development services. Machinetutors empowers businesses all over the world by solving real-world problems.

Challenges & Solution

This project addresses the problem of large-scale real-time image-based content moderation. The system is deployed to a production environment where tens of thousands of users browse the internet daily. The system must be both accurate and run in real-time to meet the business requirements. Moreover, the model size must be small so that multiple copies of the model can be run simultaneously on a GPU to reduce server costs. A major challenge has been making several models work efficiently together.

In order to solve the problem defined, we develop three main models. In the first model, we propose a multi-label NSFW classifier that can detect the NSFW levels (light, medium, hard) and predict other labels, such as the real person and clothing characteristics. The second model is a one-stage body -based age & gender detection model. Current age & gender methods are both face based i.e. they use face bounding boxes and are two-stage processes, they first run a face detector and then run the model on these boxes. When multiple faces are present in an image, this approach fails to meet the real-time requirement. The third one is a segmentation model. These three models run in a pipeline via which we can run various scenarios.



Benefits

- ✓ Run many experiments in parallel
- ✓ Run larger batch size trainings on newer GPUs
- ✓ Access many GPUs for hyperparameter tuning
- ✓ Gain a considerable competitive advantage in the global AI ecosystem considering the speed and the cost-efficiency

Full story:

"EuroCC project made it possible for our company to play a major role in the transformation of a content safety technology start-up into a leading organization in Europe. The state of the art artificial intelligence models our team trained would not have been achievable without the computation resources they provided." **Eray Berger, CEO @Machinetutors**

EURO

TRUBA Turkish Science e-Infrastructure

Contact person at the NCC: Sevil Sarıkurt, NCC Türkiye, ncc@ulakbim.gov.tr

IoT, IT/HPC systems, services & software

ERSTE

EURO²

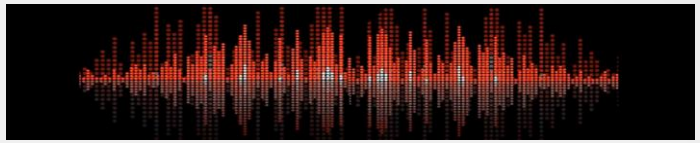
Fine-tuning speech-to-text models on HPC clusters

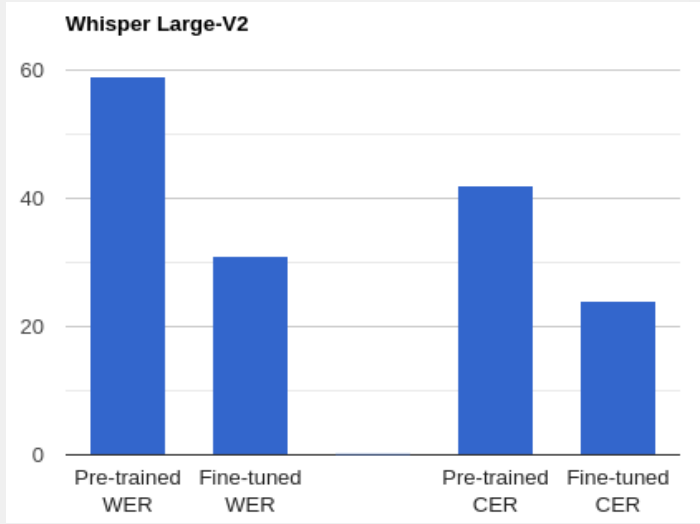
Company

Erste Software (2017), located in Türkiye, is an SME focused on IoT, mobile device management, and using ML/AI techniques in practice.

Challenges & Solution

The sales/quotation preparation process in manufacturing is a tedious task with back-and-forth messages in between the customer and manufacturer, since production requires high-precision under strict time-to-deliver constraints. A major part of the process is daily meetings between the engineering and sales teams. Recording this crucial know-how, transcribe it to enable semantic search for the current and future quotations is important. To address this problem, Erste's decision was to fine-tune a pre-trained model, Whisper, for Turkish. Yet an accurate fine-tuning requires significant computational power. Although Erste had experience in traditional ML training, they lack access and expertise on using multiple GPUs for this purpose. In this use-case, they leverage the expertise in the NCC Türkiye and computational resources to fine-tune a large-scale model.





Benefits

- ✓ Gained experience in utilizing TRUBA HPC resources and training large-scale models with large-scale datasets.
- ✓ Enhance the efficiency and quality of customer's manufacturing endeavours in the long run.
- ✓ Significantly improved the accuracy of Whisper, a speech-to-text model for Turkish.

Full story:

"Thanks to this opportunity, Erste Software had a rewarding experience on working with academicians and HPC experts in the EuroCC team. In addition to increasing the accuracy and cost-efficiency of our solution, for our future projects, we gained valuable experience on using HPC resources and working with large-scale datasets and models." ***Özer Aydemir*, Co-founder and CEO @Erste**

EURO² TRUBA Turkish Science e-Infrastructure

Contact person at the NCC: Sevil Sarıkurt, NCC Türkiye, ncc@ulakbim.gov.tr

IoT, IT/HPC systems, services & software

VLMedia

EURO²

AI-Driven Style Transfer for Virtual Environments

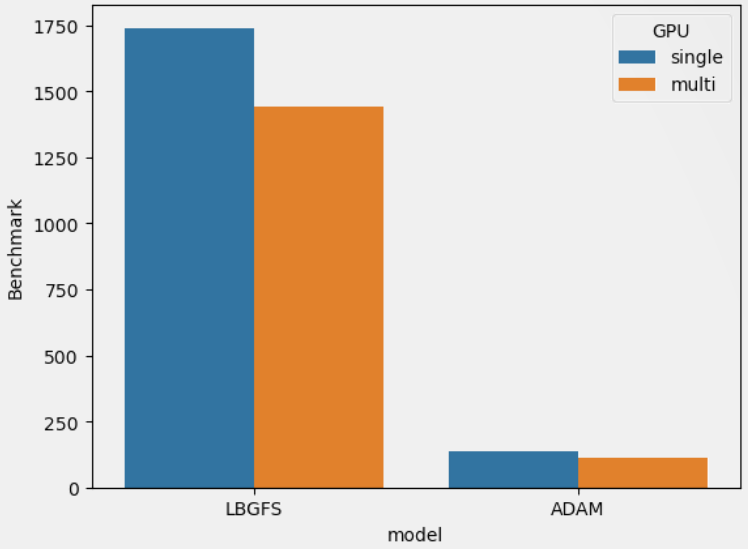
Company

Founded in 2014, VL Media is a software company focussed on designing and creating user-friendly social apps and games.

Challenges & Solution

One of the projects carried out by the company is to customize the scene in the virtual environment and the audio-visual objects within the scene by the content producers. In order to make more original designs, different studies, and experiments will be carried out using the style transfer of these images determined by the content producer by using artificial intelligence. Style transfer is frequently used today thanks to the advancement of GPU technology. Since all the methods used by the company to realize such designs require GPU processing power.

The customized multi-GPU strategy adopted in the project is favoured for its alignment with the model's characteristics and workload requirements. DataParallel serves the purpose of providing more general and straightforward multi-GPU support, combining multi-GPU processing and multi-scale production to achieve high-quality, high-resolution results.



Benchmark Results

Benefits

- ✓ Enhanced Customization in Virtual Environments
- ✓ Hybrid Style Transfer Technique
- ✓ Balanced Content and Style Preservation
- ✓ Customized Multi-GPU Strategy

Full story:

"I'm thrilled to collaborate with TRUBA's experts in the realm of style transfer. Together, the fusion of our creative ideas and high-performance computing, in the exciting domain of style transfer, is crafting a new visual language that will redefine what's possible."

Eda Yüksel, CRO @VLMedia

EURO² TRUBA Turkish Science e-Infrastructure

Contact person at the NCC: Sevil Sarıkurt, NCC Türkiye, ncc@ulakbim.gov.tr

IT/HPC systems, services & software providers

Pitch Patterns

asya

EURO²

Classifying emotions from tone of voice for call-centres

Company

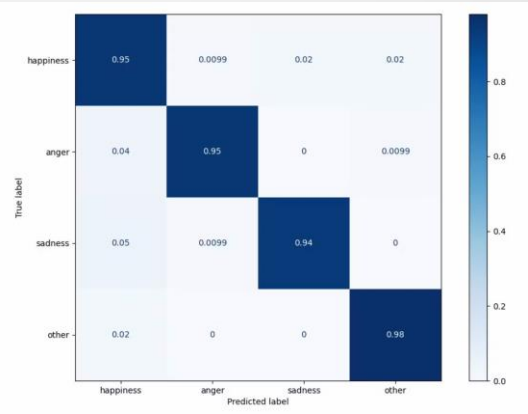
Asya.ai is producing pitchpatterns.com which is the best call-centre analytics and automation software

Challenges & Solution

Emotion classification from tone of voice is complicated, because lack of public datasets and lack of open-source models. It is also necessary to have significant hardware resources to do hyper-parameter search in order to train your own model.

With collaboration with RTU HPC we managed to train our own emotion classification model to detect Happiness, Anger, Sadness and Neutral emotions in tone of voice. It achieved 95% accuracy.

Emotion classification from tone of voice before HPC project: 52% accuracy



Emotion classification from tone of voice after HPC project: 95% accuracy

Benefits

✓ Training Deep Learning models

☞ **New feature and unique selling point for the product**

"Call-centres use tone of voice emotion classification to improve quality of the service. This feature is unique selling point for pitchptatterns.com software" **Evalds Urtans, CEO, asya.ai**

Full story:

EURO SuperS

Evalds Urtans, SIA ASYA, evalds.urtans@asya.ai

Life sciences

Manufacturing & engineering

7

Manufacturing & Engineering

Understanding physics at the microscale in filter media

Company

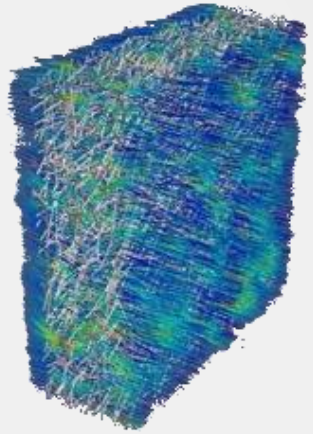
Atlas Copco is specialized in the design, development and manufacturing of industrial compressors and expanders, vacuum solutions and air and gas treatment equipment.

Challenges & Solution

The flow geometry and physics at the microscale in filter media are complex and require state-of-the-art computational fluid dynamics techniques to resolve. The required computational resources are extensive and need world-class high-performance computing.

Simulations were first performed to build the necessary experience in efficiently running large-scale calculations and exploring the computational limits. Using VSC infrastructure gave Atlas Copco access to new simulation techniques to investigate the microscale behavior of oil aerosol filter media.

Virtual filter medium microstructure



Streamlines flow through a filter medium coloured by velocity magnitude

Benefits

✓ Accelerate the development of new and better designs

✓ Simulation of more physics and larger problems that were infeasible before

☞ **Cleaner air delivered at a lower energy cost to our customers**

"Atlas Copco wanted to have a better understanding of microscale air and oil flow behaviour in oil aerosol filter media. If we better understand the physics at this scale, we can design filters with higher filtration efficiency at a lower pressure drop. This, in the end, results in cleaner air delivered at a lower energy cost to our customers" **Tom Saenen, Technology developer @Atlas Copco**

Full story:

Carl MENSCH, Industry EuroCC BE, carl.mensch@uantwerpen.be

Manufacturing & Engineering

PLYGEAR

EURO²

Improving the furniture precision

Company

PLYGear is specialized in the design, computer modelling and manufacturing of furniture born in timely recorded digital dreams supported by the plywood unique properties.

Challenges & Solution

The models designed and implemented in virtual environment are complex and require state-of-the-art computational techniques to resolve. The required computational resources are extensive and need high-performance computing as all Plygear items need the precision of the modern processing methods.

Simulations were performed to acquire knowledge in running effectively new design methods. The impact of using large-scale HPC models improved both the precision and the production rate.

Benefits

Accelerate the development of new designs via simulations

Each model is designed and implemented in virtual environment

☞ **a functional minimalist design offered to our customers**

Full story:

"PLYGear wanted to have a better approach to furniture design for a complex environment by mixing ideas with passion and engineering precision. The most characteristic of all PLYGear items is that thanks to the precision of the modern processing methods the assemblies are made extremely reliable and impeccable. " *Borislav Georgiev*, **MS in Engineering, Technology Developer @PLYGear**

EURO² Bulgaria

Contact person at the NCC BG: Ana Proykova, anap@phys.uni-sofia.bg

Manufacturing & engineering

Mikrotvornica

EURO

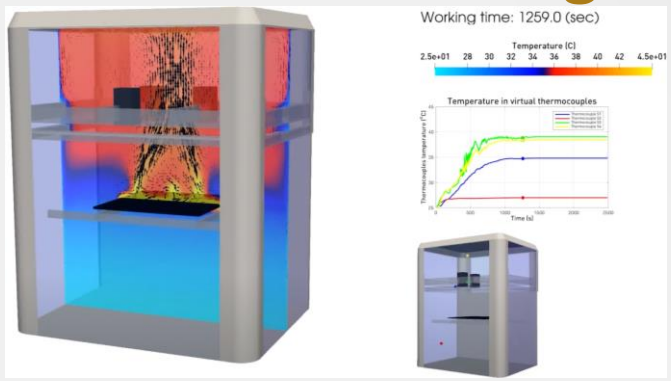
HPC-based Stabilization for Additive Manufacturing

Company

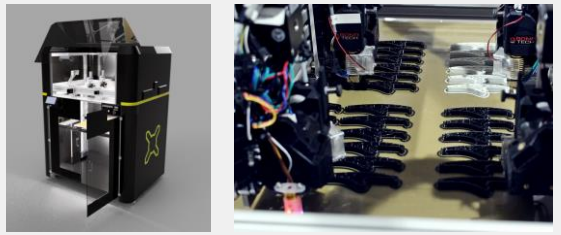
Mikrotvornica d.o.o. specializes in high-quality prototype and product production using advanced technologies, with a strong focus on additive and digital manufacturing.

Challenges & Solution

The aim of the project is to reduce heat-induced deformations in 3D-printed objects. These deformations can significantly affect the quality and functionality of the final product. Based on computational fluid dynamics simulations performed using the HPC infrastructure, through an iterative processes and fine-tuning, an improved 3D printer assembly was created. In addition, the additive manufacturing process was improved by outlining and providing complete control over the parameters that affect the dimensional stability of 3D printed products.



CFD-based tuning process.



Modified 3D printer and object printing.

Benefits

- ✓ Shorter delivery times by up to 50%.
- ✓ Reduction of up to 30% in production costs.
- ✓ Savings of €150.000,00 over a period of three years.
- ✓ Increase in sales by up to 30%.

"In cooperation with the members of NCC Croatia (RBI), we were provided with professional support and extensive experience with regards to the application of high-performance computing in order to improve 3D printing characteristics and capacities."

Nikola Blažević, CEO @Mikrotvornica

Full story:

HRVATSKI CENTAR KOMPETENCIJA ZA HPC

Lado Kranjčević, NCC Croatia, lado.kranjcevic@riteh.hr

Manufacturing & engineering

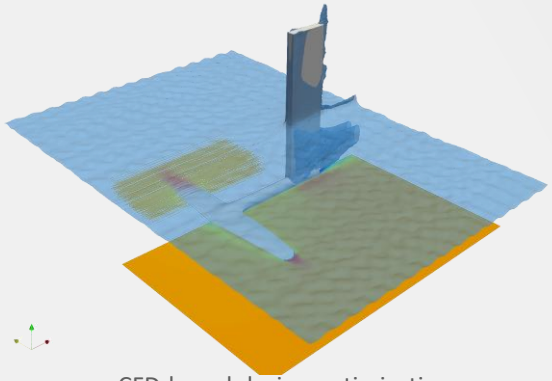
Digital Twin Framework for Hydrofoil Optimization

Company

Marotti Windsurfing d.o.o. is a company founded by the two-time windsurfing champion. MWSC is dedicated to the development and production of windsurfing equipment.

Challenges & Solution

In close cooperation with IIT d.o.o., specialized equipment and software were developed to ensure precise measurements of fluid data. A methodology based on reverse engineering and digital twin technology was developed to design an optimized hydrofoil. The mold creation process saw collaboration with members from the Academia and Bex d.o.o., resulting in a robust approach to aluminium mould production. State-of-the-art techniques were employed to produce and thoroughly test new hydrofoil prototypes.



CFD-based design optimisation

Hydrofoil mold used to create a prototype design.

Benefits

- ✓ Enhanced hydrofoil windsurfing performance.
- ✓ Competitive and industrial advantage (improved products).
- ✓ Industry/company growth.
- ✓ International recognition.
- ✓ Futureproofing.

"I am grateful for the accessibility, willingness, and enthusiasm in order to jointly achieve success. Our goal is to create a so-called 'speed foil' hydrofoil with which we will attempt to break the speed world record. I am confident, based on current results, that we will achieve this."
Enrico Marotti, CEO @Marotti Windsurfing

Full story:

HRVATSKI CENTAR KOMPETENCIJA ZA HPC

Lado Kranjčević, NCC Croatia, lado.kranjcevic@riteh.hr

Manufacturing & Engineering

Use of Bulk Simulation in the Development of a Rail Freight Wagon

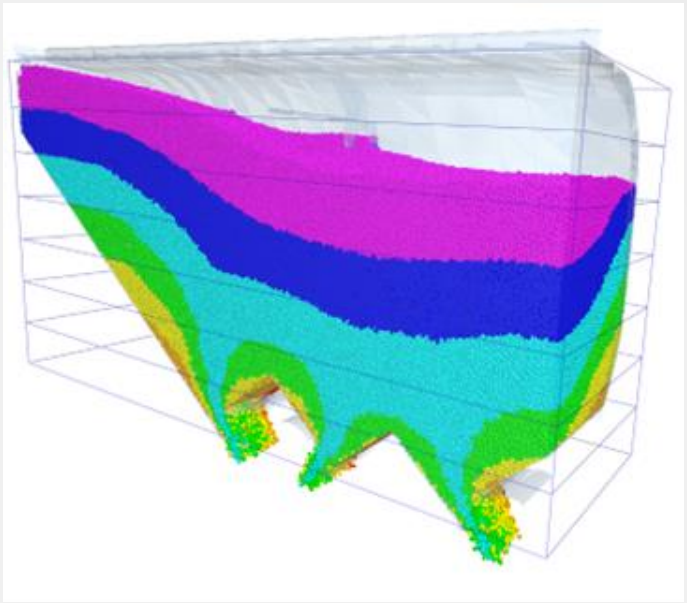
Company

Advanced Engineering is a company that focuses on computer simulations, structural analysis and optimisation of structures, and multi-physics modelling and simulation.

Challenges & Solution

End customers and users asked for a guarantee for the time required to unload each wagon during unloading, and the development team needed to make sure that the geometry of the hoppers and funnels would ensure the complete discharge of bulk material without it being stuck to the walls.

The solution can simulate the interaction of the bulk material with the structure, the ability to compare multiple design options, and the ease of analysing the behaviour of different grain types under various external conditions such as temperature and humidity.



Ongoing simulation of emptying a freight wagon box – one-quarter simulation model.

Benefits

✓ Time and costs savings through numerical modelling and simulations

✓ The ability to simulate the interaction of the bulk material with the structure

✓ The ability to compare multiple design options

"The advantage of computer simulations of bulk material movement for this problem over physical testing is that the cost of hiring grain silos and grain costs are eliminated." **Tomas Curda, Business Development Manager, Advanced Engineering, s.r.o.**

Full story:

EURO CZECHIA

Contact person at the NCC: Tomas Karasek, tomas.karasek@vsb.cz

Manufacturing & engineering

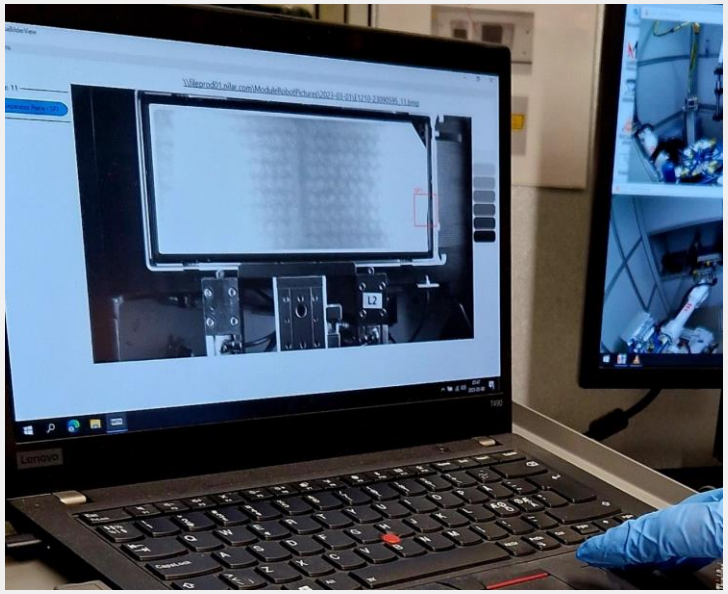
Nilar automates battery inspection using AI vision on Vega

Company

Nilar AB develops and manufactures batteries that are safe and re-usable, which is crucial for a climate transition that works, i.e. that electricity is actually there when it is needed and not just when it is generated.

Challenges & Solution

Quality inspection is an essential part of the battery manufacturing process, since quality determines battery performance, lifespan, and safety. Inspection should ideally be done for every part of every battery, but the high production rate makes this very difficult to achieve without automation. ENCCS and Nilar AB have leveraged the computational resources that the EuroHPC JU Vega cluster provides and the large image datasets Nilar has collected from their assembly lines to develop an AI-based computer vision solution as a first step towards complete automation of Nilar's quality inspection process.



Benefits

- Spot negative trends earlier
- Faster manufacturing adjustment
- Reduce scrap rate

"From the supercomputing access, Nilar is already seeing benefits from the solution, such as being able to spot negative trends in quality earlier, which enables faster adjustment of process parameters to reverse these trends. This has helped reduce scrap rate, which in turn has led to a positive impact on their business."

Andreas Thore, Researcher at ENCCS/RISE

Full story:

Contact person at the NCC: Apostolos Vasileiadis, apostolos.Vasileiadis@ri.se

Manufacturing & Engineering

Neural networks in the steel industry

Company

ITA technology & software company supplies know-how and software solutions to leading major producers of rolling equipment, technologies, and control systems. Many of their software solutions have been successfully installed in rolling mills worldwide.

Challenges & Solution

Among the objectives of the collaboration was to investigate the possibility of using machine learning and neural networks to predict the accurate cooling parameters in steel rolling manufacturers' processes.

Having the correct parameters is essential for ensuring the final product's quality. The aim is to replace the need for manual correction with automatic correction based on AI methods.

The solution was analyzed and verified if the predictions generated by the ML models can enhance the methods currently used by ITA.

Ilustration of the steel sheet cooling process.

Benefits

- ✓ Artificial intelligence allows more accurate temperature calculations.
- ✓ An automated correction based on AI can calculate the estimated belt temperature after cooling more accurately and make the entire cooling process more efficient.
- ✓ Time and, therefore costs can be saved.

Full story:

“The collaboration with IT4Innovations and the use of machine learning methods have been very beneficial for us, as the deployment of artificial intelligence allows for more accurate temperature calculations. Among the time and cost savings, I would also like to highlight the positive environmental impact thanks to the optimized cooling process.”

Daniel Hajduk, ITA, spol. s r.o. Executive Manager

Contact person at the NCC: Tomas Karasek, tomas.karasek@vsb.cz

Engineering

Multi-scale and multiphysics simulation of a dam on HPC architecture

Company

CEVAA, part of the 6NAPSE Group, is an engineering office specialized in acoustics and mechanics, with a range of expertise and testing facilities for Industry.

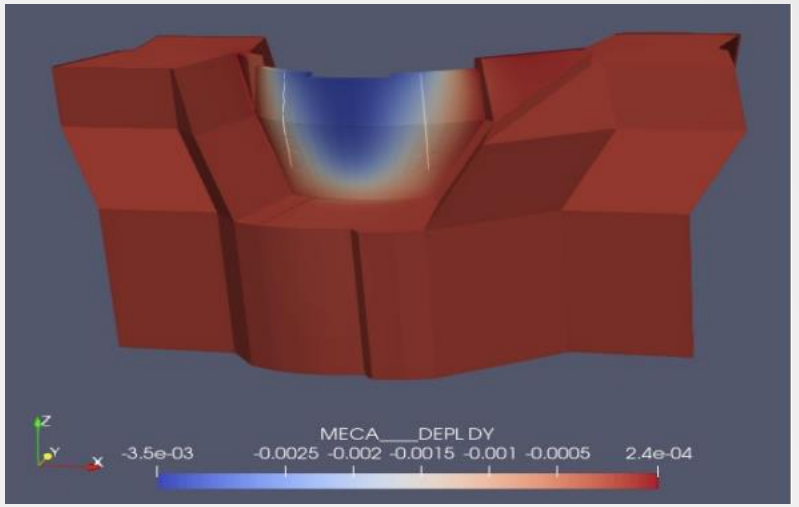
Challenges & Solution

CEVAA was requested to study the mechanical performance of a dam. With length scales ranging from centimeter to several tens of meters, consideration of multiphysics loadings (temperature, pressure, efforts), the internal calculation resources of the company were clearly insufficient to conduct the study.

The study was carried out on the Myria supercomputer of CRIANN with Code_Aster software for calculations and Salome-Meca for meshing and post-processing.

- installing the latest versions sequential and parallel of Code_Aster

- help with creating scripts launch of calculations.



Results of mode shapes on a dam

Benefits

- ✓ HPC expertise
- ✓ Solve client projects with a significant productivity gain

For CEVAA project, the support consisted in installing the latest sequential and parallel versions of Code_Aster, and providing scripts for calculation launches.

Full story:

Marie-Sophie CABOT, Industry Euro CC FR, Marie-Sophie.Cabot@criann.fr

Manufacturing

Logoplaste

EURO²

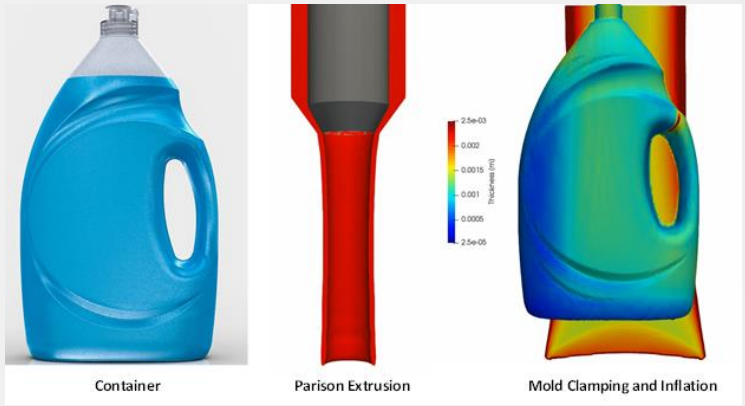
Extrusion Blow Molding Simulator

• Company

Logoplaste, founded in 1976, pioneers in-house rigid plastic packaging, delivering innovative, eco-friendly solutions that reduce CO2 emissions and support a circular economy.

• Challenges & Solution

The extrusion blow molding (EBM) process for creating hollow containers involves complex materials and multiple parameters that traditionally rely on trial-and-error methods, which are resource-intensive and time-consuming. To address these challenges, the University of Minho and Logoplaste Innovation Lab developed advanced numerical codes to simulate the entire EBM process. By porting these simulations to HPC systems and integrating optimization tools, they achieved more accurate, efficient, and scalable solutions, significantly reducing time-to-market.



Container | Parison Extrusion | Mold Clamping and Inflation

Benefits

- Optimized process parameters, reducing trial-and-error
- Shorter time-to-market for products
- Enhanced accuracy in design and material predictions
- Increased resource and cost efficiency
- Scalable simulations using HPC
- Continuous improvement through ongoing tool development
- Data-driven decisions via optimization tools

Full story:

Computational modeling through HPC helps set optimal process parameters, reducing reliance on trial-and-error methods.

EURO² PORTUGAL

Lígia Breda Melo, NCC Portugal, eurocc-portugal@lip.pt

Manufacturing

HPC For Profile Extrusion

Company

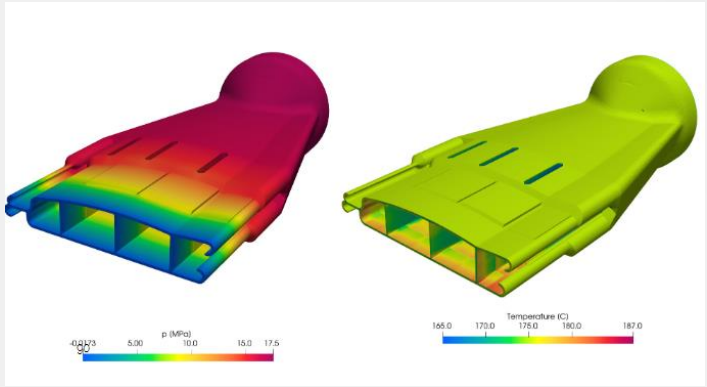
Soprefa is a Portuguese SME specialized in the production and distribution of plastic profiles for a large variety of applications.

Wolf Dynamics is an Italian SME specialized in consulting services in computer-aided engineering, multi-physics simulations, numerical optimization, data analytics, and interactive data visualization.

Challenges & Solution

Plastic profiles, crucial in sectors like healthcare and aeronautics, require precise design for specific applications. Traditional trial-and-error methods are time-consuming, costly, and heavily reliant on designer experience, particularly for complex geometries. This inefficiency hampers Soprefa's ability to develop new profiles and expand its business.

As a solution, Soprefa adopted computational tools using open-source libraries, integrating OpenFOAM and Dakota for HPC-based simulation and optimization. This streamlined the extrusion die design process, cutting down costs and time while improving product quality.



Profile extrusion is the technique employed to manufacture constant cross-section thermoplastic profiles, which has a vast range of major applications.

Benefits

- Improved profile extrusion die design using simulation, optimization, and HPC systems.
- 30-40% faster product time to market (3 to 2 months).
- 40% reduction in raw materials (1 Ton to 600 kg).
- 23% cost reduction (€18,000 to €14,000 per tool).
- Greater independence in extrusion die design, protecting Soprefa's know-how.

Full story:

"The project teamed up with three entities with experience in this field to illustrate the benefits of HPC, especially when it comes to solving complex problems in the industrial sector, such as the design of profile extrusion dies.".

Miguel Nóbrega, Researcher @ University of Minho

Lígia Breda Melo, NCC Portugal, eurocc-portugal@lip.pt

Maritime

0

Material sciences

0

Mechanical engineering

2

Mechanical engineering

AITAC

EURO²

Dynamic Fluid-Object Interactions During Motion

Company

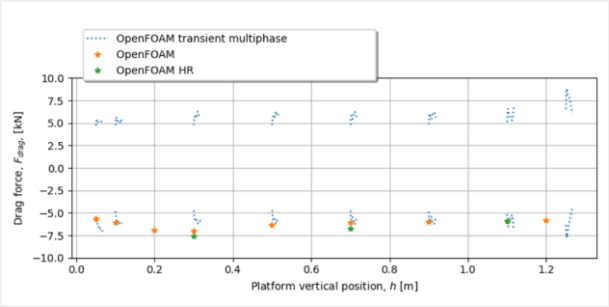
AITAC d.o.o. is a local subsidiary providing yacht, naval, cruise ship, marine & offshore engineering and PLM services in shipbuilding and offshore industry.

Challenges & Solution

Simulating the movement of submerged objects in a fluid-filled tank can be a challenging task. The dynamic interaction introduces a variety of problems e.g. sloshing and potential spillage, all of which must be accurately characterized and effectively mitigated. The use of high performance computing is indispensable for the successful execution of these computational fluid dynamics simulations.

A carefully crafted plan for the optimal motion of objects is proposed. This plan represents a delicate equilibrium between the minimization of waiting times and the prevention of water spillage, and as such improves the overall system performance.

Simplified / representative problem concept.



Forces at relevant locations.

Benefits

- ✓ Optimized system performance by minimizing waiting times
- ✓ Facilitated the rapid exploration of novel design possibilities
- ✓ Optimal movement plan contributes to safer and more reliable system

"We were interested in the displacement of the water during the movement and were unsure of the bottom's impact on the flow and the force due to the negative pressure. Given that this is a component of a larger system, we needed a solution that would ensure uninterrupted and optimal operation."
Domagoj Borucinsky, Engineer @AITAC

Full story:

HRVATSKI CENTAR KOMPETENCIJA ZA HPC

Lado Kranjčević, NCC Croatia, lado.kranjcevic@riteh.hr

Mechanical Engineering

Numerical simulation of Butterfly Valve closing

Company

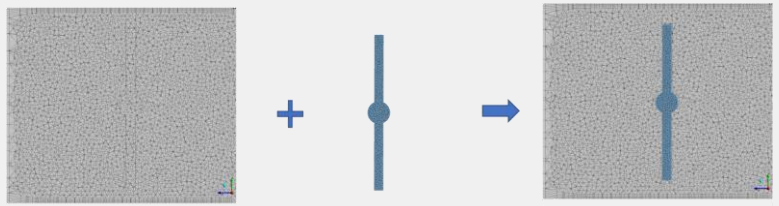
The Armatury Group specialises mainly in the production of valves, technological units, and related services. The main advantages of their production are their wide range of goods, quality of production and adaptation to customer requirements.

Challenges & Solution

In this collaboration, the primary focus was creating a proof-of-concept, by comparing available Computational Fluid Dynamics Simulation (CFD) approaches to moving objects in fluids.

A comparison of four CFD methods was successfully conducted, providing an overview of the requirements and limitations of each method, as well as the accuracy of the results. The simulations were carried out on a "simplified" flap valve, designed not to limit the use of any of the above-mentioned methods.

Overset mesh method.



Immersed body method.

Benefits

- ✓ Future computation models will be built with higher accuracy results.
- ✓ The simulations will be completed faster, resulting in cost savings.
- ✓ When many simulations are required, a supercomputer is an advantageous tool.

Full story:

"The use of HPC infrastructure will not only allow computational models to be built with higher accuracy results but also help to complete these simulations in a reasonable time, leading to cost savings. In addition, using supercomputers is advantageous for design optimization when many simulations need to be performed."

Lukas Kusnir, Research and Development Director of Armatury group

Tomas Karasek, tomas.karasek@vsb.cz

Public services/Civil protection

2

Security

Tool to fight criminality more effectively

Company

The Police of the Czech Republic are an armed security force established by the National Council Act of 21 June 1991. The Police of the Czech Republic serves the public.

Challenges & Solution

The practical part of the Maps of the Future II project aimed to use crime data to develop and test new procedures and tools for more effective crime fighting and more targeted, efficient, and thus cheaper use of resources (personnel, financial, and material).

Models designed to predict crime and socio-pathogenic phenomena throughout the Czech Republic were successfully developer and tested. The possibility of running memory and computationally demanding tasks in parallel using dedicated graphics cards proved crucial, allowing individual experiments to be reduced from days to hours.

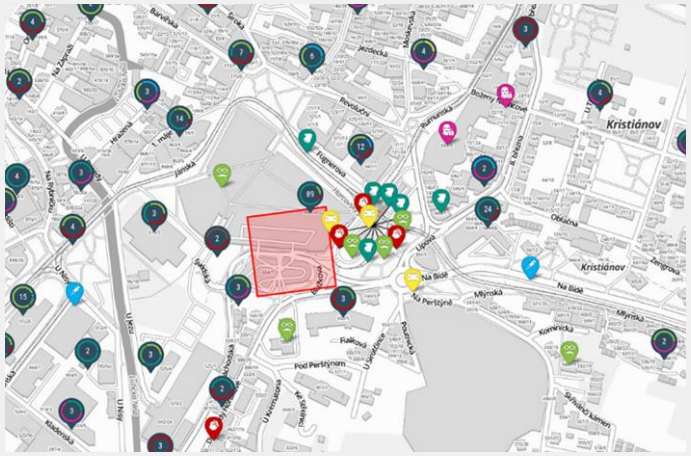


Photo provided by the Police of the Czech Republic.

Benefits

- ✓ The criminality prediction model training time was reduced several fold
- ✓ The training done on the GPU nodes of the Karolina cluster was shown to be effective
- ✓ The solution will help the Police of the Czech Republic increase the efficiency of their patrol planning.

"I am very pleased that the employees of the Police of the Czech Republic are actively involved in the search for innovations and solutions to one of the current topics in the internal security of the Czech Republic, which is the effective use of available resources (both human and material)." **genmjr. Martin Vondrasek, Police President**

Full story:

EURO CZECHIA

Contact person at the NCC: Tomas Karasek, tomas.karasek@vsb.cz

Public services/
Civil protection

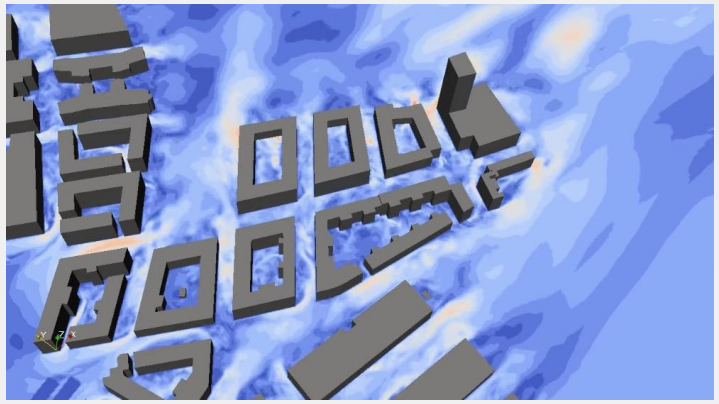
SLB-analys Analyse Air Pollution Flow Using MeluXina Supercomputer

Company

Stockholms luft- och bulleranalys (SLB-analys) is a unit at the Environment and Health Administration of the City of Stockholm. The unit is responsible for monitoring outdoor air quality in the city.

Challenges & Solution

The dispersion of aerosol particles in urban environments heavily depends on meteorological parameters, in particular air flows. SLB-analysis run scaling tests on EuroHPC JU resources to push the boundaries of CFD simulations using OpenFOAM to larger spatial domains and higher complexity.



Benefits

- Simulating larger urban area becomes possible
- Time-to-solution is greatly reduced
- Better results used for air quality assessment

"By using more complex turbulence models, the accuracy of the results will be improved so that there can be an investigation whether new developments will meet air quality limits and propose measures to improve air quality in sensitive areas."

Qiang Li, Research software engineer, ENCCS

Full story:

Contact person at the NCC: Apostolos Vasileiadis, apostolos.Vasileiadis@ri.se

Raw materials, metals, minerals and forest-based

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Space

0

Smart City

0

Smart City

INTERMAP©

EURO²

Machine learning aided geospatial data acquisition

Company

InterMap has 24 years of experience developing hardware and software solutions for collecting, managing and sharing geospatial data, employing most recent advances in the mapping and IT fields, assisting the job of surveyors, municipalities and infrastructure planners.

Challenges & Solution

To acquire accurate and useful data with the least possible manual labour, efficient machine learning models must be trained. These training sessions require vast amount of computer resources.

By employing HPC resources, the training time can be significantly reduced, thus more experimental solutions can be examined. Furthermore, with more processing capability, more complex models can be trained, which opens up new data acquisition methods.

Image processing results on ground survey images, from which spatial data can be generated.

Benefits

- Faster training of experimental models
- Scalable resource allocation to match model complexity
- Parallel processing results in more generic models

Full story:

EURO²

"We were able to deploy our training pipeline to the Komondor HPC, provided by the KIFÜ and the results are the expected: more complex image processing models can be trained in much less time, which would not be possible on consumer-grade hardware."

Gergő Tóth, Technology developer @InterMap

Katalin Kelemen Governmental Agency for IT Development-KIFÜ kelemen.katalin@kifu.gov.hu

Textile

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Textile & Fashion

Innovating Portugal's Footwear Industry

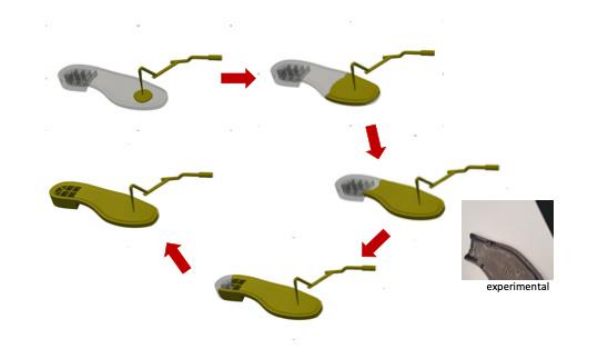
Company

Atlanta, founded in 1995, excels in innovative sole production for the footwear industry. With advanced facilities, they craft 20,000 pairs daily, blending design, quality, and technical expertise.

Challenges & Solution

Portugal's footwear industry faces challenges in optimizing sole design due to reliance on trial-and-error methods, which are time-consuming and resource-intensive. The introduction of computing in this process offered a solution by enabling simulation before physical testing, which optimized mold design and reduced iterations.

A collaboration between the University of Minho and Atlanta, within the GreenShoes 4.0 project, leveraged computational modeling to enhance product quality and streamline production, driving the sector's digital transformation.



Benefits

- Optimized mold design for better precision
- Reduced time and material costs
- Enhanced product quality by avoiding weak regions
- Improved process efficiency and faster production cycles
- Informed decision-making with detailed simulation data
- Support for innovation in manufacturing techniques
- Contribution to the digital transformation of the footwear industry

"The (injection) machine had occupancy rates of 65% when we did manual planning. This planning took up dozens of hours a week and now, with these solutions, it takes us between 3 and 4 hours a week. It was an abysmal difference both for the planning team and for the occupancy rate of the machines. Now the occupancy rate has risen by around 20% to around 85%."
André Santos, IT Director @ AMF

Full story:

EURO² PORTUGAL

Lígia Breda Melo, NCC Portugal, eurocc-portugal@lip.pt

Fashion and creative

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Fashion and creative

Tengr.ai



EURO²

Tengr.ai revolutionizes the creative industry using Komondor

Company

Tengrai Artificial Intelligence kft. was founded in 2023 with the goal of creating a European image-generation startup. It has already released a free-to-use image generation to the public, while video- and web generation is in the proof-of-concept stage.

Challenges & Solution

The biggest challenge was to create a solution that creates images at least as good as the American competitors while following the privacy-by-design philosophy that does not have gender or racial bias. It needs to easily "forget" styles if there are copyright claims for parts of the training dataset. Moreover, the founders were living during communist regimes, so they are against censorship while also forbidding illegal content generation.

Benefits

- ✓ Enable everyone to express their creative freedom
- ✓ Replace overused and boring stock photos
- ✓ Easy-to-use and accessible image generation
- ✓ Multilingual and multicultural, without racial or gender bias
- ✓ Video and website generation

"KIFÜ enabled this project through Komondor HPC; without their help and support, the Tengr.ai project would not stand a chance in this highly competitive and fast-paced environment."

Peter W. Szabo, Founder and researcher @Tengrai Artificial Intelligence kft.

Full story:

EURO²

Erzsébet Horváth Governmental Agency for IT Development-KIFÜ, horvath.erzsebet@kifu.gov.hu

EuroCC: Use cases portfolio

coordinated by CASTIEL2-WP4

This project has received funding from the European High-Performance Computing Joint Undertaking (JU) under grant agreement No 951732. The JU receives support from the European Union's Horizon 2020 research and innovation programme and Germany, Bulgaria, Austria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Greece, Hungary, Ireland, Italy, Lithuania, Latvia, Poland, Portugal, Romania, Slovenia, Spain, Sweden, United Kingdom, France, Netherlands, Belgium, Luxembourg, Slovakia, Norway, Switzerland, Turkey, Republic of North Macedonia, Iceland, Montenegro

Annex 3: Questionnaire developed by WP4 and ARCTUR to understand better the challenges of the NCCs to use the now available HPC4SME AAT tool

HPC4SME follow-up & news

CASTIEL2 needs to collect information about the
HPC4SME take-up among the NCCs.
Thanks a lot in advance for taking the time to fill in this short questionnaire!

* Indique une question obligatoire

1. Adresse e-mail *

_____

2. Name of your NCC (ex: NCC Slovenia) *

_____

3. Are you part of the "HPC4SME tool" task force or using the "HPC4SME tool"? *

Une seule réponse possible.

- ◯ Yes
- ◯ No
- ◯ Autre : _____

If you are using the HPC4SME tool, here are just a few questions:

4. 1) During 2024, how many SMEs shared their report with your NCC? *

(please provide a number here)

_____

5. 2) Regarding the SMEs that shared their report with you, how many of them did your NCC support (for example, this refers to activity/interaction/support like connecting with other partners, or access to HPC trial or PoC or offer a training, etc.) ? *

(please provide the number of SMEs that you supported in some way, after using the HPC4SME tool)

6. 3) Regarding the SMEs that shared their report with you, which type of interactions did you have for how many SMEs? *

(No names needed there. For example, simply indicate: " We helped 15 SMEs in total. Through the following activities: 10 SMEs access to HPC, 15 SMEs consulting, 3 SMEs PoC, 4 SMEs support for FFplus Open Call proposal ")

7. 4) Please provide the effort used by your NCC on this action during 2024 *

(Please provide PMs estimations in the respective/concerned tasks, a priori it would be in task X.3 or task X.7)

8. 5) For the translation of the tool, how did you cover the translation activity: *

Une seule réponse possible.

- ◯ You translated it internally = you used personal costs (i.e. translated it within the NCC partners):
- ◯ You used a services provider (i.e. using your "Other costs" budget)
- ◯ You didn't perform a translation of the tool; you use the English version
- ◯ Autre : _____

9. 6) What were the main reasons that prevented you from using the HPC4SME AAT tool? *
(Select all that apply, and feel free to add comments)

Une seule réponse possible.

- ◯ We have no challenges using HPC4SME AAT
- ◯ We lack the manpower to execute the activities
- ◯ We are not interested in using this tool
- ◯ We don't have specific services to offer to the industry
- ◯ We rarely engage with industry
- ◯ We don't see any added value in using this tool
- ◯ We didn't understand how to use this tool
- ◯ Autre : _____

10. 7) How did you communicate information about the HPC4SME AAT Task Force and its activities within your NCC? *

Une seule réponse possible.

- ◯ Through mailing lists
- ◯ During monthly meetings
- ◯ We did not share the information
- ◯ Autre : _____

11. 8) If you have any remarks about the use of HPC4SME AAT or HPC4SME Task Force, please share it here

Annex 4: NCCs members of the task force "Waldur -LinkHPC platform "

NCCs members of the task force “Waldur -LinkHPC platform "
CASTIEL2-WP4
NCC Estonia
CASTIEL2-PMT
NCC Belgium
NCC Greece
NCC Netherlands
NCC Slovenia
NCC Austria
NCC Norway
NCC Italy
NCC Türkiye
NCC Spain
NCC Germany
NCC Romania
NCC Latvia

Table 8: NCCs members of the task force Waldur -LinkHPC platform "