**EuroHPC-01-2019**



**IO-SEA**


**IO - Software for Exascale Architectures**
**Grant Agreement Number: 955811**


**D6.1**

**Dissemination, Exploitation and Training Report and Future Plans**
**Year 1**


*Final*


| | |
|---|---|
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## Project and Deliverable Information Sheet

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## Document Control Sheet

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## Document Status Sheet

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| Keywords: | IO-SEA, HPC, Exascale, Software |
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## Executive Summary

The goal of this deliverable is to provide the overall strategy for Dissemination, Exploitation Collaboration and Training activities for IO-SEA and report on the progress in Year1 and discuss the plans during the course of the project. Please note that we have used the acronym D&E throughout the document that includes all these activities.

# 1 Introduction

The main objective of this work is to generate visibility for IO-SEA technologies in HPC and associated communities both in Europe and globally. This would lead to the adoption of IO-SEA components in the first Exascale deployments in Europe. This would also lead to market adoption of IO-SEA technologies by HPC and related communities.  The project intends to achieve this through the following activities:

**Dissemination**: The primary goal of dissemination is to reach wider audiences within HPC/AI communities in specific, and the computing community as a whole, impart the outcomes and provide the community an understanding of the methods, tools and techniques developed within the project. We also aim to cover communities specific to different use cases used in the project[1].

This work starts from the very beginning of the project and ramps up as the project progresses.

**Collaboration:** The primary goal of this is to identify synergies with other projects and initiatives and work with them to achieve European HPC/AI objectives.

This work starts from the beginning of the project.

**Exploitation:** The primary goal of this is to get market adoption of technologies developed in the project and gain usage for them within the HPC/AI and other related communities.

This activity is more back loaded within the project as Exploitation objectives are targeted once concrete outcomes are available.

**Training:** The primary goal of training is to educate the community on the usage of the technologies developed within the project.

We expect some of these tasks to also contribute towards de-facto standards in some areas of technology that IO-SEA is relevant to.

The purpose of this deliverable is to provide strategic objectives behind the above activities and detail the actions which are undertaken in these areas during the first year. The intended audience for this deliverable is the public/community who is interested to know more about efforts in the areas embarked upon by IO-SEA.

The following is the organisation of the rest of this document. Section 2 details the main impacts desired from the project and strategic objectives in achieving those impacts. It also highlights linkages of the project to some evolving European objectives. Section 3 details all the dissemination, exploitation and collaboration activities. Section 4 concludes the report.

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[1] 1 Astrophysics, Particle Physics, Weather Forecasting, Electron Microscopy Imaging, etc

# 2   Overall Strategy for Generating Impact

We discuss in this chapter the overall strategy for generating impact through D&E activities.

## 2.1   Expected impacts with the IO-SEA project

We re-iterate below the primary expected impacts of IO-SEA planned at the beginning of the project:

- Contribution to the realisation of the EuroHPC overall and specific objectives[2]
- Strengthening scientific leadership as well as the competitiveness and innovation potential of European industry
- Contributing to a sustainable Exascale HPC supply ecosystem in Europe and ensuring European technological autonomy in this field
- Leveraging the efforts on the European low power processing technologies (in particular the European Processor Initiative) and contributing to the realisation of future Exascale system architectures based on such technologies
- Creation and promotion of European Intellectual Property, maturity of solutions and potential for commercial exploitation in future European exascale HPC systems
- Creating impact for many scientific communities (Weather, bio-informatics, etc) by addressing these highly demanding, data intensive applications through data management tools and methods
- Delivering very valuable data management technologies to not just HPC, but also the AI, Cloud ecosystems and other related areas
- Creating market exploitation pathways for commercial partners within the project

The  D&E work aims to address these expected impacts through the focus areas:

- **Community Adoption**: Making sure that the technologies developed in the IO-SEA project will be adopted by the community
- **HPC Strategy Alignment**: Place the project technologies at the heart of the HPC European strategy
- **Industry and Research Support**: Support the European industry and research in its goal of developing an autonomous technological HPC environment
- **Applications' expertise**: Improve European competitiveness in application areas through a highly relevant data centric approach.
- **Commercial Solutions**: Introduce and promote commercial solutions built on project technologies.
- **Exascale platforms**: Increase the return on investments made in PRACE supercomputers and in EC supported efforts towards Exascale platforms.
- **Information sharing**: Spread information on the project advantages (reduction of power consumption, efficiency, ability to build a data management system for an Exascale platform) to the European public

We discuss strategies specific to Dissemination, Exploitation, Collaboration and Training to meet the above focus areas.

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2 https://eurohpc-ju.europa.eu/discover-eurohpc-ju

## 2.2 Strategy and Plans

### 2.2.1 Dissemination

| Focus Areas | Plan |
|---|---|
| Community Adoption | The plan is to increase participation in trade shows, conferences and major venues for presenting IO-SEA Technologies. This will be a fore runner for new Collaborations, Training and eventually community adoption and participation in growing the community around IO-SEA Technologies. The project will open source almost all of the work and this will be a critical central piece. We will also come up with metrics to track the community adoption on a periodic basis for foundational platform components such as CORTX Motr[3]. The website and social media efforts will also be geared towards this. |
| HPC Strategy Alignment | This will be achieved by hosting joint workshops with other EuroHPC projects and of course the other SEA projects. This type of dissemination in international venues such as SC (Super Computing) will also increase outreach for European HPC technologies as a whole. |
| Industry and Research Support | Industry and Research organisations will disseminate IO-SEA to their respective communities & users and bolster support for IO-SEA work done by them. |
| Applications' Expertise | There will be heavily focus on applications discussing their experiences as part of the dissemination – and joint workshops between EuroHPC and SEA projects will focus on cross co-design. |
| Commercial Solutions | - Please see Exploitation - |
| Exascale Platforms | The project will continue to look at the possibility of including IO-SEA components as part of the Modular Supercomputing Architecture (MSA)[4] developed at Juelich, and also as part of the EUPEX pilot.<br><br>The previously used SAGE prototype coming out of the SAGE project[5] will be repurposed to work with MSA further bolstering the collaboration there. This part is being finalised. |
| Information Sharing | To summarize, this will be achieved through a combination of :<br>1. Project Website<br>2. Social Media (Twitter & Linkedin)<br>3. Dissemination materials<br>4. Participation in Exhibitions<br>5. Publication of Papers |

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3 https://github.com/Seagate/cortx-motr
4 https://juser.fz-juelich.de/record/862856
5 https://sagestorage.eu/

| | |
|---|---|
| | 6. Press Releases<br>7. Social Media |

Table 1 Dissemination Strategy

## 2.2.2 Collaborations

| Focus Areas | Plan |
|---|---|
| Community Adoption | Collaboration with SEA projects to start with, and then further collaboration with other EuroHPC projects will aim at spearheading community building and adoption for IO-SEA |
| HPC Strategy Alignment | Joint workshops, Birds of a Feather (BoF) events, etc with other EuroHPC projects & SEA projects will be a collaborative endeavour – which will hopefully also catalyse deeper technical engagements. |
| Industry and Research Support | Collaborations will be sought with European Processor Initiative (EPI) and associated projects such as EUPEX. A partnership agreement that is now ready between the 10 EuroHPC projects provides a great framework for building an ecosystem of indigenous European technologies supported by European Industry and Research. |
| Applications' Expertise | Collaborations between the EuroHPC and SEA projects will focus on cross co-design between the applications and the other (Non IO-SEA) platforms further bolstering the application portfolios and exposing them to new challenges. |
| Commercial Solutions | -    Please see Exploitation - |
| Exascale Platforms | The project will disseminate into organisations hosting pre-Exascale and upcoming Exascale machines. The project will also very actively work and disseminate into EuroHPC projects working on Exascale Pilots and the European Processor (eg: the EUPEX project) |
| Information Sharing | -    Please see dissemination - |

Table 2 Collaboration Strategy

## 2.2.3 Exploitation

| Focus Areas | Plan |
|---|---|
| Community Adoption | Community adoption through dissemination and collaboration will eventually lead to new Exploitation pathways for IO-SEA technologies by helping to build and design entirely new solutions in the market place supported by the community. |
| HPC Strategy Alignment | -    Please see Dissemination and Collaboration - |

| | |
|---|---|
| Industry and Research Support | IO-SEA will help European Industry and Research participants (supported by SEA and EuroHPC project collaborations) in these projects to build new liaisons and explore new exploitation pathways |
| Applications' Expertise | - Please see Dissemination and Collaboration - |
| Commercial Solutions | IO-SEA commercial partners (ATOS, ParTec and SEAGATE) have a solid exploitation plan to build commercial solutions based on their contributions. This will be detailed in the Exploitation plan discussed later in the project. |
| Exascale Platforms | Usage in working Exascale platforms is also a longer term exploitation pathway for IO-SEA technologies. This is supported by collaboration activities that are initiated. |
| Information Sharing | - Please see dissemination - |

Table 3 Exploitation Strategy

## 2.2.4 Training

| Focus Areas | Plan |
|---|---|
| Community Adoption | A solid training plan is now available that will propel community adoption. The training plan will be "backloaded" time-wise so that training activities start in earnest once early implementations start to become available. The training plan will be discussed later in the report. |
| HPC Strategy Alignment | - Please see Dissemination and Collaboration - |
| Industry and Research Support | IO-SEA will help European Industry and Research participants will work towards training their respective communities – helping future exploitation and usage. |
| Applications' Expertise | - Please see Dissemination and Collaboration - |
| Commercial Solutions | Training (especially of all open source outcomes) is a pre-cursor to community building and later exploitation. |
| Exascale Platforms | Training activities will focus on trying to impart the usage of IO-SEA technologies in very new environments and deployments targeting Exascale – investigated by other projects such as EUPEX. |
| Information Sharing | - Please see dissemination - |

Table 4 Training Strategy

## 2.3 Alignment with Evolving European Objectives

The EuroHPC JU[6] was created in 2018 to develop, deploy, extend, and maintain a world-leading supercomputing and data infrastructure in Europe. One of the main objective of the JU is to reach Exascale capabilities by 2022/24 timeframe. The 2021-27 EuroHPC Phase 2 has a budget of ~€7B. The IO-SEA project, which is a Research and Innovation activity, started as a backdrop to this, and has fully aligned itself to EuroHPC goals and objectives.

The call for advanced pilots towards European Exascale Supercomputers was launched in mid 2020. As part of this, projects were funded that proposed to build the pilots based on (1) European Processor (2) General Purpose Processors. These projects have now started and IO-SEA is closely aligning with the EUPEX pilot looking at building an European Processor[7] oriented pilot.

Collaboration activities will also try to disseminate into, and get valuable insights and learnings from the seven pre-exascale machines deployed in Europe[8] especially in the area of storage and I/O in an actual working environment.

It is also worth mentioning that a major cloud project in Europe has started with GAIA-X[9], which is a Franco-German initiative to build a federated cloud infrastructure in Europe, with data that will reside in European servers, with data sharing abiding by the European data sharing rules. HPC is also one of the blocks of the GAIA-X infrastructure. The IO-SEA project is cognizant of these developments and is developing tools and methods that are also applicable for HPC in the cloud in such a scenario.

Further IO-SEA has very strong linkages to the above communities. IO-SEA partners ATOS, CEA, Juelich and Seagate are on the steering board of the ETP4HPC[10] organisation that is part of the RIAG, or, Research and Innovation Advisory Group of EuroHPC. The above partners and the University of Mainz are also active contributors of the ETP4HPC Strategic Research Agenda (SRA) which is one of the key documents in the European HPC ecosystem describing the roadmap for HPC. Seagate and University of Mainz lead the storage and I/O work group for the ETP4HPC SRA.

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6 https://eurohpc-ju.europa.eu/

7 https://www.european-processor-initiative.eu/

8 https://eurohpc-ju.europa.eu/discover-eurohpc-ju#ecl-inpage-211

9 www.gaia-x.eu

10 www.etp4hpc.eu

# 3 Dissemination, Exploitation and Collaboration Activities

We discuss the on-going Dissemination, Collaboration and Exploitation activities that have been pursued.

## 3.1 Dissemination, Exploitation and Collaboration Activities

We continue to stress heavily on dissemination at this time of the project as it is a precursor to future exploitations. As seen from the dissemination activities, the target audience types have primarily been:

- Existing and future customers for our partners, products and services
- Key influencers of the HPC and Exascale European strategy (e.g. ETP4HPC)
- The HPC community in Europe and throughout the world.
- AI/Big data communities in general
- Scientific research communities of the Centres of Excellence and those of our applications areas
- Early career scientists who will form the future workforce in HPC.
- EuroHPC projects as part of "Transition to Exascale" calls (10 projects including the SEA projects) in "Advanced Exascale Pilots" calls in 2020
- Wider European public
- Weather and Climatology communities (Through ECMWF and ESiWACE)
- AI and DL communities using more and more HPC resources

In terms of the audiences we have reached out to, we can break it down into:

- Website audience (thousands of unique visitors, as we can see from the website activity) accessing our website: www.sagestorage.eu
- Twitter audience (~150 followers, which includes very large organisations in the US and the EU, including other research programs) through our twitter handle @io-sea.
- Audience from workshops, conference talks, etc. and we aim to obtain rough record estimates of the audience for each event.
- Targeted audience captured from publications, blogs etc is much harder to estimate, but is directly linked to the readership. We provide some estimates here.
- Audience from booth activity– primarily from Supercomputing and International Supercomputing Conference.

We next list all the dissemination activities undertaken by the IO-SEA project.

### 3.1.1 Dissemination Activities

The following is a list of dissemination activities held during the first year. The focus has been in introducing the technologies and the overall picture of the IO-SEA project.

| Date | Event Name | Title or Content | Venue | Lead | Audience type (& Number if Known) |
|---|---|---|---|---|---|
| 8/6/2021 | Teratec Forum | Extreme Data Challenges in Numerical Weather Prediction | Virtual | ECMWF | HPC/HPDA |
| 22-24/6/2021 | Teratec Forum 2021 | Presentation of the IO-SEA project (logo, website) at the booth of the LEXIS project | virtual | IT4I | N/A |
| 24/6/2021 | Forum Teratec (storage worksop) | Stockage HPC : de nouveaux paradigmes pour s'attaquer aux défis des architectures Exascale | online | CEA | around 50 participants (online) |
| 25/6/2021 | The 30th International Symposium on High-Performance Parallel and Distributed Computing: EMERGING OPEN STORAGE SYSTEMS AND SOLUTIONS (EMOSS'21) FOR DATA INTENSIVE COMPUTING 2021 (EMOSS'21) | CORTX: AN OBJECT STORAGE PLATFORM FOR THE DATA INTENSIVE ERA | Stockholm (Remote) | Seagate | Remote, about 20 (Storage experts, research institutions, Industry) |
| 25/6/2021 | The 30th International Symposium on High-Performance Parallel and Distributed Computing: EMERGING OPEN STORAGE SYSTEMS AND SOLUTIONS (EMOSS'21) FOR DATA INTENSIVE COMPUTING 2021 (EMOSS'21) | GLOBAL MEMORY ABSTRACTION SOLUTIONS FOR EMERGING STORAGE SYSTEMS | Stockholm (Remote) | ATOS/Seagate | Remote, about 20 (Storage experts, research institutions) |

| | | | | | |
|---|---|---|---|---|---|
| 24/6 - 2/7/2021 | ISC High Performance 2021 | Presentation of the IO-SEA project (logo, website) at the booths of the LEXIS project and IT4I | virtual | IT4I | N/A |
| 2/7/2021 | The International Supercomputing Conference 2021: Workshop on the In Situ Co-Execution of High-Performance Computing & Data Analysis | Advancing Object storage architectures for Extreme scale | Remote | Seagate | Remote, about 20 (Storage experts, research institutions, Industry) |
| 24/8/2021 | Summer school on Effective HPC for Weather & Climate | Modern Storage | Remote | Seagate | Remote, around 50 (Students in HPC storage and I/O, Industry and Academia) |
| 24/6 - 2/7/2021 | ISC High Performance 2021 | Presentation of the IO-SEA project (logo, website) at the booths of the LEXIS project and IT4I | virtual | IT4I | N/A |
| 21/11/2021 | SC'21 | Object Storage BoF | Hybrid | CEA/ Seagate | Remote, around 50 (Students in HPC storage and I/O, Industry and Academia) |
| 5/11/2021 | Motr Interfaces Workshop | Motr Interfaces | Remote | Seagate | Remote, around 50 - HPC EU Projects |
| 15-18/11/2021 | Supercomputing Conference 2021 | Presentation of the IO-SEA project (logo, printed leaflet, presentation) at the booth of IT4I | America's Center Convention Complex, St. Louis | IT4I | > 200 attendees of the booth |
| 16/112021 | BoF SC21: online session | Object Stores for HPC: a Devonian Explosion or an Extinction Event? | online | CEA/Seagate/ECMWF | around 60 participants (online) |
| 3/3/2022 | CORTX Meet An Architect community event | IO-SEA Ephemeral Services | Remote | Seagate | Remote, about 20 (Storage experts, research institutions, Industry) |
| 5/2022 | Joint SEA-BoF at ISC22 - accepted | Smart resource management beyond compute nodes | ISC 2022, Hamburg | CEA/ Seagate | TBD |

| 1/6/2022 | The 31st International Symposium on High-Performance Parallel and Distributed Computing: EMERGING OPEN STORAGE SYSTEMS AND SOLUTIONS (EMOSS'22) FOR DATA INTENSIVE COMPUTING 2022 (EMOSS'22)" | IO-SEA Talks - TBD | HPDC'22 Stockholm | Seagate | TBD |
|---|---|---|---|---|---|

Table 5 Dissemination Activities

### 3.1.2 Publications/Newsletters

We do not have technical publications in the first year as its still too early for project results. The focus has been mainly on Newsletters primarily led by IO-SEA partner IT4I.

| Date Submitted | Name of Publication/News Letter | Lead | IO-SEA Authors | Journal/Conference | Status |
|---|---|---|---|---|---|
| 9/4/2021 | Record number of H2020 projects in IT4I | IT4I | Markéta Dobiašová/IT4I | Internal newsletter IT4Innovations 14/2021 | http://mailchi.mp/205401830f78/intern-zpravodaj-8113642 |
| 23/4/2021 | IT4I is collaborating on a new H2020 project | IT4I | Markéta Dobiašová/IT4I | Internal newsletter IT4Innovations 16/2021 | http://mailchi.mp/b55d31ea16b2/intern-zpravodaj-8113654 |
| 4/5/2021 | Storage facilities for the most powerful supercomputers in Europe will be developed in Ostrava | IT4I | Markéta Dobiašová/IT4I | Lupa.cz | https://www.lupa.cz/aktuality/v-ostrave-a-brne-budou-vyvijet-uloziste-pro-nejvykonnejsi-superpocitace-v-evrope/?utm_source=FB&utm_medium=post&utm_campaign=Lupa&fbclid=IwAR0-OpLhu2ohn4anwcNxNWzhmj3t3_Cl4lCj9-aPtf19pYINJ-KDO0-yhm0 |

| 7/5/2021 | Lupa.cz informs about the IO-SEA project | IT4I | Markéta Dobiašová/IT4I | Internal newsletter IT4Innovations 18/2021 | http://mailchi.mp/a05490b6dfe6/intern-zpravodaj-8113666 |
|---|---|---|---|---|---|
| 4/6/2021 | IT4Innovations participates in implementing the ACROSS and IO-SEA projects (CZ version) | IT4I | Markéta Dobiašová/IT4I | Newsletter IT4Innovations 1/2021 | https://mailchi.mp/e269a1ac7050/it4innovations-newsletter-12021 |
| 4/6/2021 | IT4Innovations participates in implementing the ACROSS and IO-SEA projects (EN version) | IT4I | Markéta Dobiašová/IT4I | Newsletter IT4Innovations 1/2021 | https://mailchi.mp/955ea0aaa113/it4innovations-newsletter-8120109 |
| 15/7/2021 | Storage facilities for the most powerful supercomputers in Europe will be developed in Ostrava (CZ version) | IT4I | Markéta Dobiašová/IT4I | Newsletter IT4Innovations 2/2021 | https://mailchi.mp/36035502eb36/it4innovations-newsletter-8122029?e=af22d43958 |
| 16/7/2021 | Storage facilities for the most powerful supercomputers in Europe will be developed in Ostrava (EN version) | IT4I | Markéta Dobiašová/IT4I | Newsletter IT4Innovations 2/2021 | https://mailchi.mp/83846adaa318/it4innovations-newsletter-8124029?e=af22d43958 |

Table 6 Publications/Newsletters

### 3.1.3 Press Releases

We have had 3 press releases around IO-SEA.

| Date Submitted | Press Release | Lead | IO-SEA Authors | Pubished in | Status |
|---|---|---|---|---|---|
| 8/4/2021 | *IT4Innovations excels in the Horizont 2020 projects (CZ version)* | *IT4I* | *Markéta Dobiašová* | *Press release, www.it4i.cz* | *https://www.it4i.cz/o-it4i/infoservis/tiskove-zpravy/it4innovations-soucasti-16-projektu-horizont-2020-a-jednim-z-klicovych-inovatoru* |
| 8/4/2021 | *IT4Innovations excels in the Horizont 2020 projects (EN version)* | *IT4I* | *Markéta Dobiašová* | *Press release, www.it4i.cz* | *https://www.it4i.cz/en/about/infoservice/press-releases/it4innovations-part-of-16-horizon-2020-projects-and-one-of-the-key-innovators* |
| 23/8/2021 | *Pan-European project IO-SEA for Exascale Data and Storage Technologies* | *ICHEC* | *Venkatesh Kannan* | *Press release, www.ichec.ie* | https://www.ichec.ie/news/pan-european-project-io-sea-exascale-data-and-storage-technologies |

Table 7 IO-SEA Press Releases

IO-SEA press releases have been picked up by very important venues such as HPCWire.[11]

### 3.1.4 Website Update

The IO-SEA Website is at: https://iosea-project.eu/.  The website introduces the key concepts of the project and is a resource for including project materials, publications, public deliverables, blogs, event coverage etc and continues to be updated. The website is also linked from the joint SEA projects site which shows the linkage between the three "SEA" projects. The website is developed using the popular Content Management System (CMS),  Wordpress[12].  We have gathered some website usage statistics during the first year of the project. The usage is expected to ramp up significantly in the second year.  These are indicated below:

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[11] https://www.hpcwire.com/off-the-wire/pan-european-project-io-sea-for-exascale-data-and-storage-technologies-kicks-off/

[12] https://wordpress.com/

Figure 1  Website Statistics (Year 1)

Figure 2 below indicates where the traffic is primarily originating from.



Figure 2  Most number of website sessions

### *3.1.5 Social Media Update*

IO-SEA uses two channels for its Social Media strategy, Twitter and Linkedin. Twitter is used to engage audiences on important project highlights and the focus is on content. Linkedin is used as a mechanism to link with communities and the focus is on people that can connect to the project.

**<u>Twitter</u>**

We have used Twitter since the beginning of the project. On an average, we have had about one tweet a week. The 151 followers include major EU projects such as EUPEX, EuroCC, EsiWACE, etc and key influencers within the HPC community in Europe.
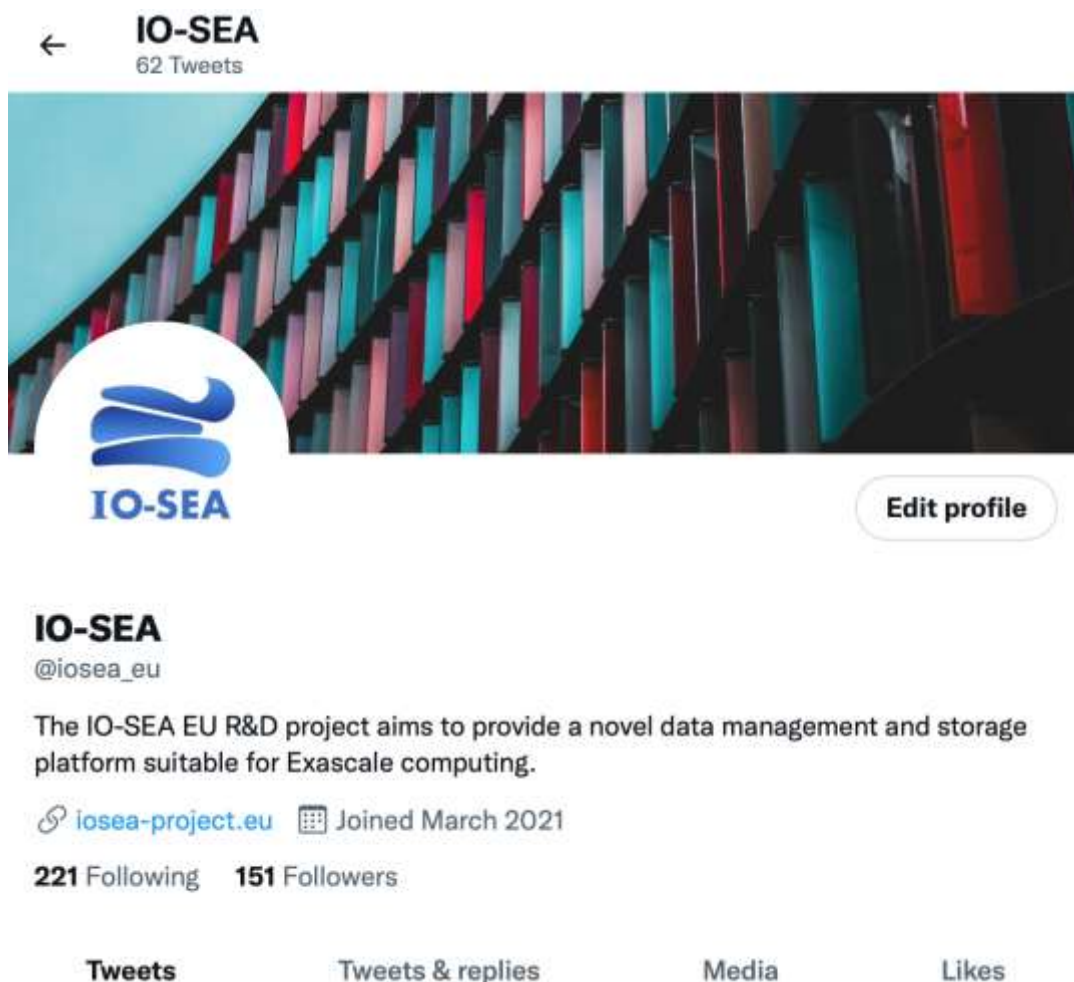


Figure 3  IO-SEA Twitter Page

We have had a total of about ~20K impressions in the first three quarters of the project. We exemplify below the impressions we have had in the first quarter of the project.
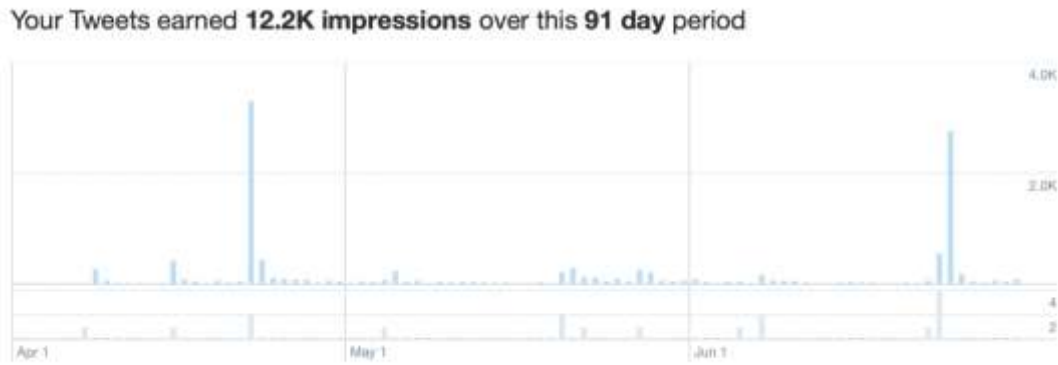
Your Tweets earned **12.2K impressions** over this **91 day** period



Figure 4  Twitter impressions (first quarter of the project)

| Project Quarter | Impressions |
|---|---|
| Q1 (Apr'21 - June'21) | 12.2K |
| Q2 (July'21 - Sept'21) | 5.7K |
| Q3 (Oct'21 - Dec'21) | 3.2K |

Table 8 Twitter impressions by Quarter

We plan to increase twitter activity as we have more outcomes that can be disseminated into the community in Year 2 and Year 3.

**Linkedin**

Linkedin was set up to connect the project with relevant people in the community. Linkedin was a new initiative that started in the third quarter. We will continue to disseminate through Linkedin more widely during the second and third years of the project.
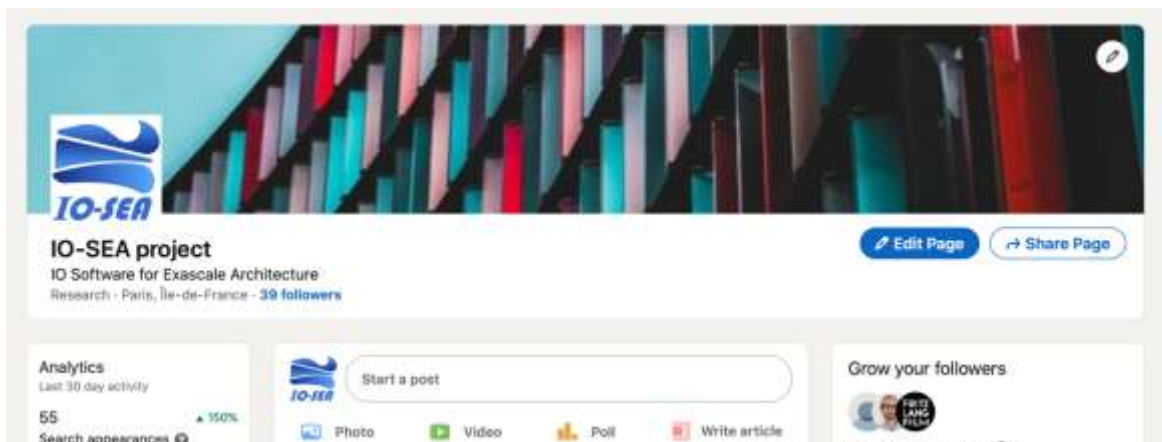


Figure 5  IO-SEA Linkedin page

### 3.1.6 Snapshots

As seen in the dissemination log, IO-SEA has had participation in major events such as Supercomputing Conference (SC) in the United States, International Supercomputing Conference (ISC) in Europe and also major conferences such as HPDC. There have also been tweets by Irish embassy in Germany and also coverage from major venues such as HPC Wire. We provide some snapshots below:



Figure 6  IO-SEA Dissemination Snapshots

### 3.1.7 Dissemination Materials

The dissemination materials included Flyers and Introductory Presentation deck. We used them primarily during remote events and conferences. In the upcoming events we will also provide gifts ( as and when events start taking place face2face).

Figure 7  IO-SEA Flyer

## 3.2  Collaborations

The strategic objective with collaboration has been to identify complimentary value propositions for IO-SEA and jointly develop pieces of the Exascale HPC  for the wider community going forward – primarily focussing on collaborations with the 10 EuroHPC projects and the SEA projects.

We continue to have regular sync ups and joint dissemination activities with the SEA projects. For example, we have a joint booth at ISC'21 with the three SEA projects. We also continue to discuss synergies and usage of each others' outcomes. For example we are discussing the usage of the SAGE prototype at Juelich for IO-SEA and its usage as a storage platform for the other SEA projects. There are also technical synergies discussed in the other areas, for example instrumentation and telemetry. Specific technical collaborations are also being discussed with the ADMIRE[13] EuroHPC project.

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13 https://www.admire-eurohpc.eu/

The IO-SEA project along with the two other SEA projects is also spearheading the development of a collaboration agreement with the 10 EuroHPC projects. The ambitious collaboration agreement between 60 different organisations almost close to completion and will be a major milestone thanks to the IO-SEA ( & the SEA) projects.

# 4 Exploitation

The consortium is building a brand new I/O environment for Exascale class supercomputers, based upon many existing products and components that will be extended, and a few new components that will be created on purpose. There are strong exploitation pathways mainly for the industrial partners ATOS, Seagate and the Small and Medium Enterprise (SME) Partec, and also for the open source technology components used within the project.

The extended existing products will benefit from the IO-SEA efforts mainly by proposing new features that are mandatory with the IO-SEA stack but are also useful in more conventional environments. A survey to gather the licences of the existing assets has been done and is presented in table 9. These technologies will be further expected to be exploited within IO-SEA.

| Partner | Application Name | License Name | Ver (if applicable) | Terms and Conditons | Download Links |
|---|---|---|---|---|---|
| **BULL** | **Smart Data Management Suite** | Proprietary | 2.9 | | N/A |
| **CEA** | **NFS-Ganesha** | LGPLv3 | 3.X | https://www.gnu.org/licenses/lgpl-3.0.txt | https://github.com/nfs-ganesha/nfs-ganesha/ |
| **CEA** | **libkvsns** | LGPLv3 | 3 | https://www.gnu.org/licenses/lgpl-3.0.txt | https://github.com/phdeniel/kvsns |
| **CEA** | **Phobos** | LGPL | 2.1 | https://www.gnu.org/licenses/old-licenses/lgpl-2.1.html | https://github.com/cea-hpc/phobos |
| **CEA** | **RAMSES** | CeCILL-C | - | https://bitbucket.org/rteyssie/ramses/src/master/doc/license.txt | https://bitbucket.org/rteyssie/ramses/src/master/ |

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|---|---|---|---|---|---|
| **CEA** | **Robinhood** | CeCILL-C | 3 | http://www.cecill.info/index.en.html | https://github.com/cea-hpc/robinhood |
| **ECMWF** | **FDB** | APACHE | 2 | http://www.apache.org/licenses/LICENSE-2.0 | https://github.com/ecmwf/fdb |
| **ICHEC** | **Estuary** | GNU General Public | 2,0 | https://git.ichec.ie/performance/storage/estuary/-/blob/master/LICENSE | https://git.ichec.ie/performance/storage/estuary |
| **ICHEC** | **Diemos** | MIT License | | https://git.ichec.ie/performance/storage/deimos/-/blob/master/LICENSE | https://git.ichec.ie/performance/storage/deimos |
| **KTH** | **NoaSCI** | BSD 2-Clause | 1.0 | https://opensource.org/licenses/BSD-2-Clause | https://github.com/KTH-HPC/noasci |
| **SEAGATE** | **MOTR / CORTX** | APACHE | 2.0 | https://www.apache.org/licenses/LICENSE-2.0.html | https://github.com/Seagate/cortx |
| **PARTEC** | **ParaStation Modulo Software Suite** | partly QPL/partly proprietary | 1.0 | https://opensource.org/licenses/QPL-1.0 | https://github.com/parastation |
| **VSB** | **High-End Application Execution Middleware former HPC as a Service Middleware (HEAppE)** | GPL | 3.0 | https://github.com/lt4innovations/HEAppE/blob/master/LICENSE | https://github.com/lt4innovations/HEAppE |

Table 9 Existing open source technology assets within IO-SEA (For Further Exploitation)

The same survey will be conducted at the end of the project to disseminate the new assets produced in IO-SEA.

For the industrial partner, ATOS, the Atos Smart Data Management Suite will be extended with features such as workflows support, ephemeral services instrumentation and enhanced optimization algorithms. Those features will be included in the official product as soon as they are developed.

Seagate will develop new products based on CORTX, based on innovations within the project. The innovations will be extended to provide for a wide ecosystem of customers including those from the Cloud. Edge, Rack and Cloud products will be developed and enhanced. CORTX Motr will be positioned for use in future Exascale prototypes and installations, as the European object store of choice.

IO-SEA will provide a strong exploitation pathway for the European SME exemplified by ParTec. Further developments of ParaStation HealthChecker and ParaStation Management within the IO-SEA project will be integrated directly in ParTec's product portfolio. These advanced software packages should be published in production maturity and ready for use in the European (and German) Exascale computers that are expected soon. The new functionality regarding data management and storage will also enable better I/O support on heterogeneous modular supercomputer architectures and simplify their use for application developers.

The IO-SEA project enables ParTec to continue the development of ParaStation Modulo. For this purpose, ParaStation Management is expanded to include the ability to dynamically assign data nodes in heterogeneous modular supercomputers. Additionally, ParaStation HealthChecker will be further developed to take this into account in node monitoring.

The new functionalities implemented in IO-SEA will advance ParaStation Modulo and strengthen ParTec's position as an HPC service and software provider.

# 5  Training

During the first six months of the project, potential topics for training workshops and webinars were identified and preliminary training plan was set up. The training will focus on the use of the IO-SEA on-demand runtime environment by data intensive applications outside of the project and the individual usage of the tools and techniques developed within the project for the purposes of applications outside the project.

The training activities will be held towards the end of the project when the technologies start to be implemented. More precisely, it is expected that the training events will be organised in the second half of the project starting from M18. A preliminary list of topics for development of training materials including responsible partners for each topic and expected month of delivery is shown in the following table.

| Topic no. | Description | Responsible partner | Preliminary Deadline |
|---|---|---|---|
| 1 | IO-SEA Overall, top level view - sales pitch with demonstration, success stories | ATOS, FZJ | M18 |
| 2 | Cortx, motr & object store related | Seagate | M18 |
| 3 | Phobos & tape storage related | CEA, ICHEC | M18 |
| 4 | Infrastructure monitoring tools | ParTec | M18 |
| 5 | Long term data storage in IO-SEA and Object storage in HPC applications | CEA, ICHEC, Atos | M24 |

| 6 | General technical session - IO-SEA interface, usage, features from all WPs | CEA | M30 |
|---|---|---|---|
| 7 | JUBE Benchmarking Use Cases + Synthetics | FZJ | M30 |
| 8 | Scientific data curation and DASI | ECMWF | M30 |
| 9 | EM - success story | CEITEC, IT4I | M30 |
| 10 | RAMSES - success story | CEA | M30 |
| 11 | ECMWF - success story | ECMWF | M30 |
| 12 | TSMP - success story | FZJ | M30 |
| 13 | LQCD - success story | FZJ | M30 |

Table 10 Planned training activities

The training materials will be used in training events organised as hands-on training workshops or webinars. Both personal and hybrid mode is possible according to the covid pandemic situation. The events will be organised as a co-located events with some of the thematic conferences like Supercomputing (SC), ISC High Performance (ISC), European Big Data Value Forum (EBDVF) or HiPEAC if accepted by the organisers, or organised as stand-alone events organised by the EVEREST consortium.

The events will be promoted to the wider community through the networks like PRACE, EuroCC, or BDVA/DAIRO.

# 6  Conclusion

This deliverable summarized the overall strategy for Dissemination, Exploitation, Collaboration and Training and activities accomplished during the first year.

In Year 2, we will:

(1) Focus on collaboration events and workshops
(2) Work on Joint participation in events with the other SEA and EuroHPC projects
(3) Start scientific publications as we begin to have outcomes
(4) Continue to expand and pull more traffic to the website as we start to produce public deliverables and outcomes
(5) Work on de-facto standardization of some of the technologies and APIs used in the project. We will provide more details in the upcoming deliverables
(6) Continue to expand the social media footprint as we head into Year 2 of the project
(7) Work on more focussed exploitation plans, especially from Industrial partners
(8) Monitor the European Ecosystem around HPC, AI & Cloud and take steps to engage with other communities and look at how we can help them meet the new challenges.

## 7   List of Acronyms and Abbreviations

AI – Artificial Intelligence

BDVA – Big Data Value Association

BSD – Berkley Software Distribution

ETP4HPC – European Technology Platform for HPC

EUPEX – European Pilot for Exascale

DL – Deep Learning

GPL – General Public License

HiPEAC - High Performance and Embedded Architecture and Compilation

SME – Small and Medium Enterprise