MAchinE Learning for Scalable meTeoROlogy and climate

MAELSTROM

Plan for Dissemination and Communication

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www.maelstrom-eurohpc.eu

MAELSTROM

D4.1 Plan for Dissemination and Communication

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MAELSTROM

Machine Learning for Scalable Meteorology and Climate

Research and Innovation Action (RIA)
H2020-JTI-EuroHPC-2019-1: Towards Extreme Scale Technologies and Applications

Project Coordinator: Dr Peter Dueben (ECMWF)
Project Start Date: 01/04/2021
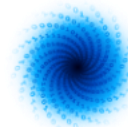**Project Duration:** 36 months

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1 Executive Summary

Dissemination and Communication activities present a crucial element in the success of the MAELSTROM project, as they ensure that results are taken up by the wider community and are sustainable beyond the initial funding period, thus providing value for money.

D4.1 provides the starting point for both dissemination and communication in the project.

The dissemination plan identifies instruments and targets. These include activities organised by MAELSTROM (including website, publications, etc.) as well as important events attended by MAELSTROM (workshops, conferences, fairs, etc.), and an overview is given in the figure below:
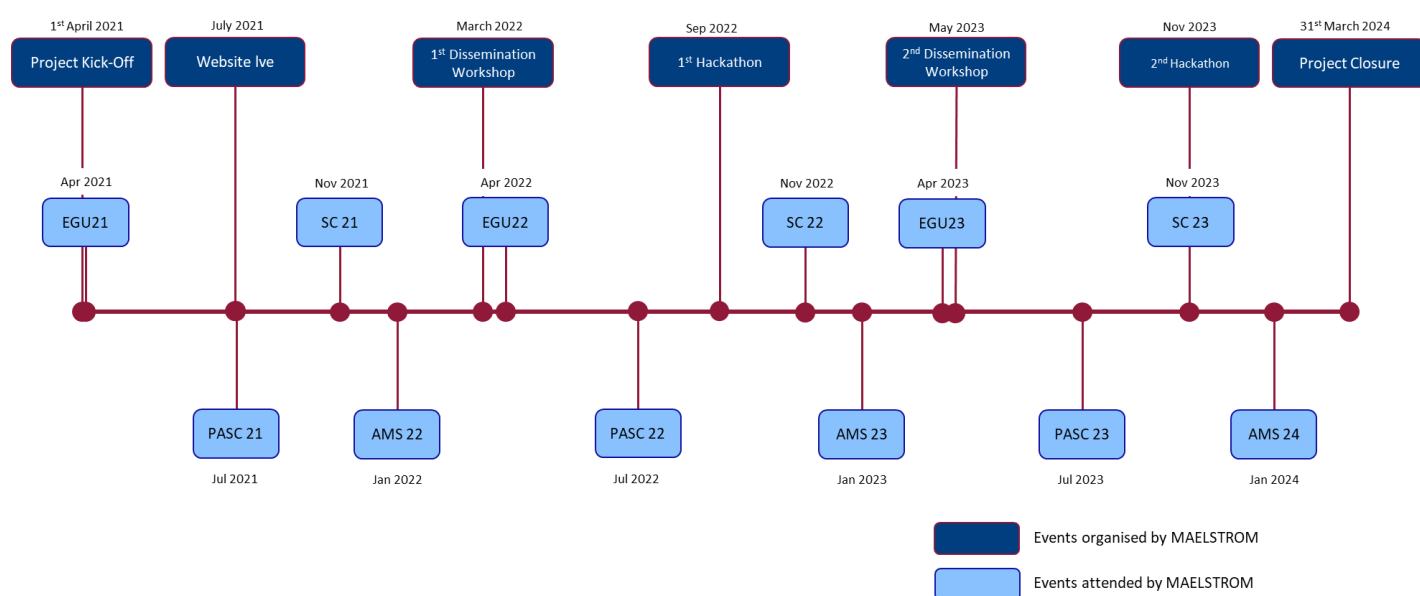
Figure 1: Dissemination milestones for MAELSTROM

Communication will comprise:

- General information on project MAELSTROM, its motivations, impacts and achievements
- Scientific and technical results
- Products that can be spun off project MAELSTROM for further use and exploitation

To ensure that such communication efforts are carried out in the most effective and resource-efficient way, the second part of this document aims to deliver guidance from the beginning to the end of the project. It contains:

- A mapping of stakeholders and audiences
- Our overall strategic communication objectives
- An overall storyline
- Our toolkit of channels and activities
- Guidelines on branding and reporting.
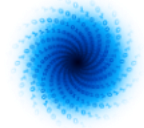
As the above needs to be acquired in a joint effort between all project partners, and as context and requirements unfold as the project progresses, this document will be subject to development throughout MAELSTROM's lifetime.
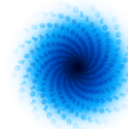
2   Introduction

2.1   About MAELSTROM

To develop Europe's computer architecture of the future, MAELSTROM will co-design bespoke compute system designs for optimal application performance and energy efficiency, a software framework to optimise usability and training efficiency for machine learning at scale, and large-scale machine learning applications for the domain of weather and climate science.

The MAELSTROM compute system designs will benchmark the applications across a range of computing systems regarding energy consumption, time-to-solution, numerical precision and solution accuracy. Customised compute systems will be designed that are optimised for application needs to strengthen Europe's high-performance computing portfolio and to pull recent hardware developments, driven by general machine learning applications, toward needs of weather and climate applications.

The MAELSTROM software framework will enable scientists to apply and compare machine learning tools and libraries efficiently across a wide range of computer systems. A user interface will link application developers with compute system designers, and automated benchmarking and error detection of machine learning solutions will be performed during the development phase. Tools will be published as open source.

The MAELSTROM machine learning applications will cover all important components of the workflow of weather and climate predictions including the processing of observations, the assimilation of observations to generate initial and reference conditions, model simulations, as well as post-processing of model data and the development of forecast products. For each application, benchmark datasets with up to 10 terabytes of data will be published online for training and machine learning tool-developments at the scale of the fastest supercomputers in the world. MAELSTROM machine learning solutions will serve as blueprint for a wide range of machine learning applications on supercomputers in the future.

2.2   Scope of this deliverable

2.2.1   Objectives of this deliverable

This document defines the dissemination and communication plan for the MAELSTROM project, and is to be seen as a living document.

2.2.2   Work performed in this deliverable

The work to create the plans included a collection of feedback from the partners in form of questionnaires and the identification of the relevant aspects pertaining to both dissemination and communication.

2.2.3   Deviations and counter measures

No deviations have been encountered.
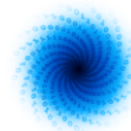
3   Dissemination Plan

Dissemination activities are designed around providing/ disseminating information to the scientific communities and relevant stakeholders in three areas:

1. Scientific and technical results through
    a. Scientific Publications
    b. Conference Talks
    c. Organised Workshops, providing updates on the project results
    d. Hackathons
    e. Reports to and feedback from Committees and Boards
2. Products through dissemination of
    a. Datasets and accompanying material (e.g. descriptions, meta data)
    b. Algorithms
    c. Graphics and animations
3. Progress information through provision of
    a. Newsletters (digital and print)
    b. Public Deliverables
    c. Dissemination Materials (brochures, posters, flyers)

The following table provides information on the MAELSTROM Dissemination (as well as Communication and Exploitation) Targets.

Table 1: Overview of plans for dissemination, exploitation, communication and software/data management

	Plan for Dissemination and Communication	Project Portal and Software Collaboration Platform	Exploitation Plan
Objective	Enable and facilitate implementation of MAELSTROM outputs for European weather and climate (W&C) prediction community	Provide metrics, data and software to facilitate numerical experimentation inside/outside MAELSTROM	Enable long-term sustainability and uptake of MAELSTROM results
Target audiences	**Dissemination:** - MAELSTROM project partners - W&C prediction centres - Scientific Community - EC (as a multiplier) **Communication:** - General public - Scientific community - HPC industry - European Processor Initiative	- MAELSTROM project partners - EC (as a multiplier)	- MAELSTROM project partners - W&C prediction centres - Scientific Community - HPC industry - European Processor Initiative - ETP4HPC - WMO programmes - EC (as a multiplier)

	- ETP4HPC - WMO programmes - EC (as a multiplier)		
Instruments	- MAELSTROM website + partners websites - MAELSTROM reports - MAELSTROM Wiki - MAELSTROM workshops - MAELSTROM hackathons - Scientific publications - Press releases, marketing documents and cooperate presentations - Public webinars	- MAELSTROM website - MAELSTROM software collaboration platform - MAELSTROM suites, data	- MAELSTROM website - MAELSTROM software collaboration platform
Access	Public	2-tier (project, public)	2-tier (project, public)
Responsibility	WP4	WP4	WP5

3.1   Dissemination instruments

3.1.1   MAELSTROM Website

The forthcoming MAELSTROM website (www.maelstrom-eurohpc.eu - to be available by July 2021) serves as the main dissemination instrument for the project. It contains various sections both for the general public as well as specifically targeted towards stakeholders including the scientific community.

Resources including deliverables, publications as well as links to data sets will be published on the website together with regular news updates. Further details are provided in the MAELSTROM deliverable D4.4 Web Portal including Software Collaboration Platform.

3.1.2   Journals, Conferences and Workshops

Strong engagement with the academic sector will promote the work performed in MAELSTROM and at the same time follow the scientific developments taking place outside the consortium. This exchange of information and knowledge will be realised through attendance of scientific conferences, organisation of sessions devoted to MAELSTROM and related topics at the annual meeting of the European Geophysical Union, and by the general process of MAELSTROM scientists attending and presenting seminars and engaging in discussion at universities and research institutes.

Conferences and Workshops of interest for MAELSTROM include:

- European Geosciences Union
- American Meteorological Society annual meeting
- HPC Status Conference
- ISC High Performance
- SC (Supercomputing)
- Platform for Advanced Scientific Computing (PASC) Conference

Publication in scientific journals will play a major role as this allows a rigorous peer-review to take place, ensuring that MAELSTROM results are relevant to the community. Relevant Journals include:
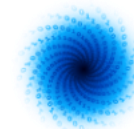
- Physical Review E
- Physical Review Letters
- Journal of Open Research Software (JORS)
- Journal of Open Source Software (JOSS)
- Environ. Res. Lett.
- Journal of Advances in Modeling Earth Systems

It is envisaged that over the course of the project plus one year at least six peer-reviewed, co-authored (journal) publications will be produced covering the topics of the scientific-technical work packages of the MAELSTROM project (WPs 1 to 3). In addition, regular conference and workshop publications and attendance with talks on topics from MAELSTROM will complement these publications.

3.1.3   Scientific Committees

The representation of ECMWF and project partners in international committees will be used as a channel for disseminating MAELSTROM results and output in the W&C prediction communities (mostly through WMO programmes WWRP and WCRP). ECMWF and its partners are strongly represented in these communities. ECMWF is the only forecasting centre that has assumed full membership status of the ETP4HPC and both E4 and FZJ are part of the ETP4HPC steering board. E4, ETH and FZJ are also part of the European Processor Initiative consortium. This ensures an efficient push-through of the MAELSTROM outcome to the relevant target groups. The HiPEAC (www.hipeac.net), CLAIRE (https://claire-ai.org) and ELLIS (https://ellis.eu/en) networks will also be used as dissemination platforms.

3.1.4   Other Instruments

Other instruments used by the MAELSTROM project to disseminate its results include:

- Tradeshows

- Exhibitions

- Web / wiki pages

- Press releases, Dissemination of information through print, TV and radio media,

- Overview of project results in partners' newsletter.

- Open house day and other Company dissemination tools

Other instruments also include ad-hoc and planned interactions and liaison with relevant international research activities as well as related EuroHPC projects.

3.2   Dissemination Milestones

The dissemination milestones are provided in

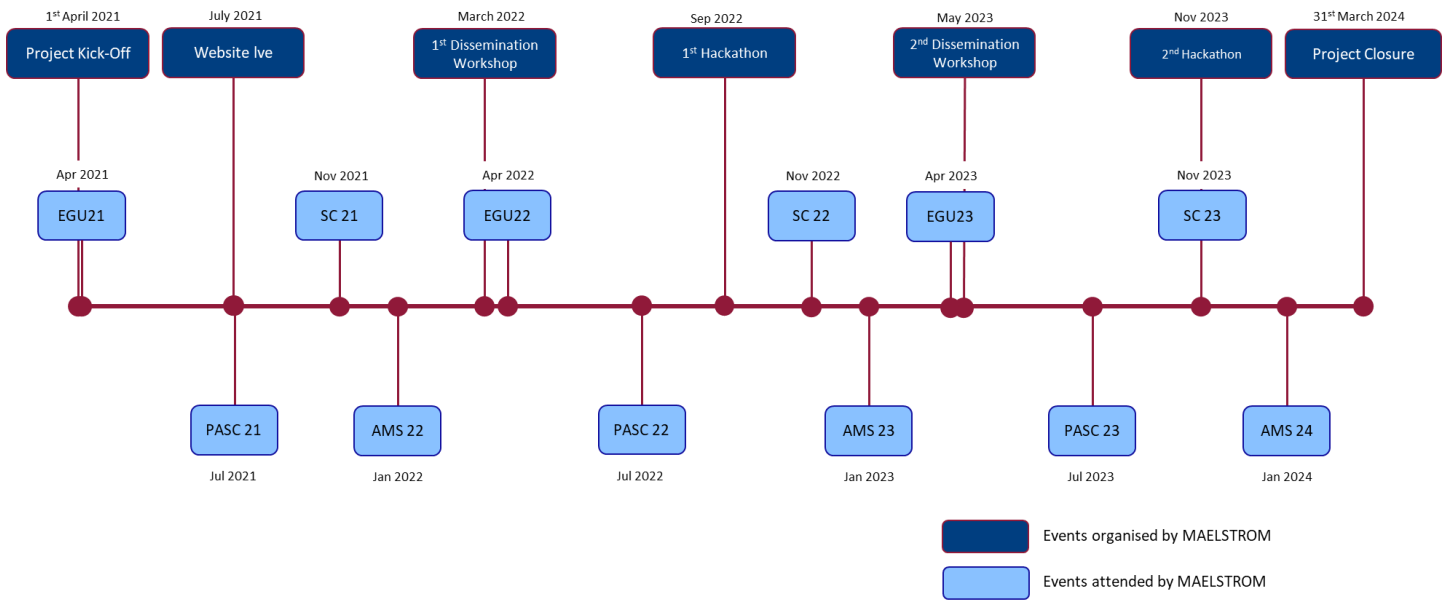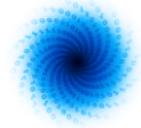*Figure 2: MAELSTROM Dissemination Milestones*
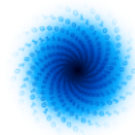
3.3 Planned Dissemination Activities

Table 2 presents the currently planned dissemination activities by the project partners. These will evolve over the duration of the project.

Table 2: MAELSTROM planned dissemination activities

Partner(s)	Activity Type*	Description	Where	When	Resources/Links/Abstracts	Target Audience	Countries addressed	Audience Size
Key MAELSTROM Events								
All	Dissemination Workshop 1	Organisation of 1st Dissemination Workshop	TBD	March 2022	TBD	ML and W&C scientists	Europe	50
All	Hackathon	Organisation of MAELSTROM Hackathon	TBD	September 2022	TBD	ML and W&C scientists	Europe	20
All	Hackathon	Organisation of MAELSTROM Hackathon	TBD	November 2023	TBD	ML and W&C scientists	Europe	20
All	Dissemination Workshop 2	Organisation of 2nd Dissemination Workshop	TBD	May 2023	TBD	ML and W&C scientists	Europe	50
Workshops and Conferences								
ECMWF	Talk	Seminar talk by Peter Dueben at ATOS Expert Community on "Machine learning for global weather predictions"	Virtual	28 April 2021	TBD	Industry and higher education	International	60
ECMWF	Talk	Presentation by Matthew Chantry at EGU2021 on "Machine learning emulation of gravity wave drag in numerical weather forecasting "	Virtual	30 April 2021	https://meetingorganizer.copernicus.org/EGU21/session/40110	Students and Scientists	International	100
ECMWF	Session chairing	Peter Dueben acted as Convener for a session at EGU2021 on "Machine learning for Earth system modelling"	Virtual	30 April 2021	https://meetingorganizer.copernicus.org/EGU21/session/40110	Students and Scientists	International	100
ECMWF	Talk or Poster	Submission planned for 3rd NOAA Workshop on leveraging AI in Environmental Sciences	Boulder, USA	13-17 September 2021	TBD	Science	International	100
ECMWF	Session chairing	Peter Dueben will act as Convener for a session on "Evolving data services: are we ready for	Virtual	20-24 September 2021	https://www.eumetsat.int/eumetsat-meteorological-satellite-conference-2021	Industry and higher education	International	100

		Artificial Intelligence and Machine Learning applications"						
ECMWF	Conference	ESA and ECMWF will organise a workshop on machine learning for Earth System Observation and Prediction	Virtual	Autumn 2021	TBD	Students and science	International	300
ECMWF	Talk or Poster	Submission planned for AMS2022	Texas, USA	23-27 January 2022	https://annual.ametsoc.org/index.cfm/2022/	Science	International	100
JSC	Conference	EGU Conference	Austria	May 2022	TBD	Weather and climate scientists	Austria	medium
JSC	Conference	ParCo	TBD	September 2022	https://www.parco.org/	HPC	Europe	medium
MET Norway	Conference	American Meteorological Society annual meeting	Houston, USA	2022	TBD	Research community	Global	50-100
MET Norway	Conference	To be determined	TBD	2022	TBD	Research community	Global	50-100
4cast	Conference	HPC Status Conference	Germany	2022	https://gauss-allianz.de/de/hpc-statuskonferenz-2021	HPC scientists	Germany	medium
4cast	Conference	EGU Conference	Austria	May 2023	https://www.egu.eu/	W&C scientists	Europe	medium
JSC	Conference	EGU Conference	Austria	May 2023	TBD	W&C scientists	Austria	medium
4cast	Conference	ISC High Performance	Frankfurt, Germany	June 2023	https://www.isc-hpc.com/	HPC scientists	World/Europe	large
JSC	Conference	SC (Supercomputing)	USA	November 2023	https://www.supercomputing.org	HPC	World-Wide	large
JSC	Conference	Submit a paper to NeurIPS conference 2023 and give presentation	TBD	December 2023	https://nips.cc/Conferences/FutureMeetings	ML scientists	World-wide	medium
MET Norway	Conference	American Meteorological Society annual meeting	Denver, USA	2023	TBD	Research community	Global	50-100
MET Norway	Conference	To be determined	TBD	2023	TBD	Research community	Global	50-100
E4	Conference	TBD	TBD	2022/2023	TBD	HPC scientists	International	medium
ECMWF	Talk or Poster	Submission planned for EGU2022	Europe	TBD	TBD	Science	International	100
ECMWF	Talk or Poster	Submission planned for PASC2022	Switzerland	TBD	TBD	Science	International	100

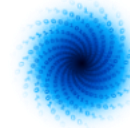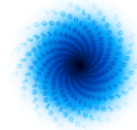|								
ECMWF	Talk or Poster	Submission planned for ECMWF ML conference	TBD	TBD	TBD	Science	International	150
ECMWF	Session chairing	Machine learning session planned for EGU2022	Europe	TBD	TBD	Science	International	100
ECMWF	Session chairing	Machine learning mini-sumposium planned for PASC2022	Switzerland	TBD	TBD	Science	International	100
ECMWF	Talk or Poster	Submission planned for 4rd NOAA Workshop on leveraging AI in Environmental Sciences	USA	TBD	TBD	Science	International	100
ECMWF	Talk or Poster	Submission planned for AMS2023	Texas, USA	TBD	TBD	Science	International	100
ECMWF	Talk or Poster	Submission planned for EGU2023	Europe	TBD	TBD	Science	International	100
ECMWF	Talk or Poster	Submission planned for ISC2023	Europe	TBD	TBD	Science	International	100
ECMWF	Talk or Poster	Submission planned for ECMWF HPC conference	Europe	TBD	TBD	Science	International	150
ECMWF	Session chairing	Machine learning session planned for EGU2023	Europe	TBD	TBD	Science	International	100
ECMWF	Session chairing	Machine learning birds-of-the-feather meeting planned for ISC2023	Switzerland	TBD	TBD	Science	International	100
ETH Zurich	Talk	Advertising the project in invited talks	Workshops, external laboratory group meetings	TBD	TBD	Researchers in Machine Learning and High-Performance Computing	N/A	10-30
Publications								
SnT-UL	Publication	Benchmark workload characterisation	IISWC 2022	Jan 2022		Research community	Global	?
JSC	Publication	Datasets publication to ESSD	TBD	December 2022	https://gmd.copernicus.org/articles/special_issue386_1147.html	Weather and climate scientists	World-wide	Large
4cast	Publication	Publication of intermediate results concerning the workflow tools	SoftwareX	2022	https://www.journals.elsevier.com/softwarex/	Software developers	World	medium
MET Norway	Publication	Scientific publication on the dataset	To be determined	2022		Research community	Global	

JSC	Publication	ACM Transactions on Parallel Computing	TBD	February 2023	https://dl.acm.org/journal/topc	HPC	World-wide	large
JSC	Publication	ISC High Performance	Germany	June 2023	https://www.isc-hpc.com/	HPC	World-Wide/Europe	large
JSC	Publication	Publish ML solution publication on GMD	TBD	June 2023	https://www.geoscientific-model-development.net/	Weather and climate scientists	World-wide	large
MET Norway	Publication	Scientific publication on methods / results	To be determined	2023		Research community	Global	
4cast	Publication	Publication of (intermediate) results concerning the applications	e.g. Physical Review E; Physical Review Letters	2023	https://journals.aps.org/pre/ https://journals.aps.org/prl/	Physicists, ML scientists	World	medium
4cast	Publication	Publication of results concerning the workflow tools	e.g. Journal of Open Research Software (JORS); Journal of Open Source Software (JOSS)	2023/2024	https://openresearchsoftware.metajnl.com/ https://joss.theoj.org/	Software developers	World	medium
ECMWF	Publication	M. Chantry et al. "Machine learning emulation of gravity wave drag in numerical weather forecasting" submitted to JAMES	JAMES	TBD	TBD	Science	International	medium
ECMWF	Publication	S. Hatfield et al. "Building tangent-linear and adjoint models for data assimilation with neural networks" submitted to JAMES	JAMES	TBD	TBD	Science	International	medium
ECMWF	Publication	M. Sonnewald et al. "Bridging observations, theory and numerical simulation of the ocean using Machine Learning" submitted to Environ. Res. Lett.	Environ. Res. Lett.	TBD	TBD	Science	International	medium
ECMWF	Publication	Planned submission of paper on the emulation of radiation using deep learning in IFS in 2022	TBD	TBD	TBD	Science	International	medium
ECMWF	Publication	Planned submission of paper on the emulation of cloud physics using deep learning in IFS in 2023	TBD	TBD	TBD	Science	International	medium
ETH Zurich	Publication	Scientific publications on novel research produced in WP1 and WP2	Top-class conferences and journals:	TBD	TBD	Researchers and conference attendees	N/A	30-300

			IEEE Journals, NeurIPS, ICML, Supercomputing, IPDPS					
Other Dissemination Activities								
ECMWF	Science Blog	Peter Dueben has written a science blog for the ECMWF webpage	Webpage	12 April 2021	https://www.ecmwf.int/en/about/media-centre/science-blog/2021/large-scale-machine-learning-applications-weather-and	General public	International	100
4cast	Website	Announcement of participation at MAELSTROM	4cast-Website	April 2021	https://4-cast.de	Wind/solar park operators, traders, power producers	Germany	small
JSC	Website	JSC website	JSC	May 2021	https://www.fz-juelich.de/ias/jsc/EN/Research/Projects/projects_node.html	TBD	Germany	large
SnT-UL	Press release	Showcasing UL-SnT's participation in MAELSTROM from Luxembourgish perspective.	TBD	June 2021	TBD	TBD	TBD	TBD
MET Norway	Press release	Press release aimed Norwegian media regarding use of MAELSTROM results on yr.no	TBD	2022	TBD	General public	Norway	TBD
JSC	Press Release	Press Release about HPC Utilization at JSC	Germany	December 2023	TBD	The Public	Germany	large
4cast	Press Release	Announcement of finalization of workflow tools	IHK Potsdam	2024	https://www.ihk-potsdam.de/servicemarken/presse	Public from the Potsdam area	Germany	small
ETH Zurich	Dataset	Online publication of datasets used in WP1, Application 4.	Online (hosted both on ECMWF and ETH Zurich)	TBD	TBD	Researchers in Machine Learning and Meteorology	N/A	>10
ETH Zurich	Code	Open source code of machine learning training scripts in WP1, and infrastructure in WP2.	Online (GitHub)	TBD	TBD	Researchers in Machine Learning, Meteorology, and High-	N/A	>10

							Performance Computing		
SnT-UL	Website articles	Web story featuring important news or milestones in the project, with a storytelling approach.	SnT website	Project beginning, Project halfway and/or end	TBD		Lay audience	International (language: English)	6500 visitors per month
SnT-UL	Social media posts	Short written text linking to a web story or achievement	SnT twitter, SnT Linkedin	Whenever an article is published, ad-hoc throughout the year	TBD		Lay audience	International (language: English)	Twitter: >1200 Linkedin: >2800
SnT-UL	Press release or media pitch	Media brief written specifically for journalists depicting the achievement.	Local media	Once or ad-hoc there is an achievement relevant for the media landscape	TBD		Journalists	Luxembourg	University contact list has 100+ contacts
SnT-UL	Speaker at business event	Giving a speaker slot to a researcher active in the project who can talk about the work to a lay audience	Local business or outreach events	Ad-hoc	TBD		Lay audience	Luxembourg	N/A
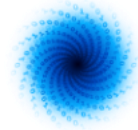
4 Media and Communication Plan

4.1 Context

4.1.1 Weather and Climate Forecasting

Weather and climate have a huge impact on human activities such as safety, health, economy, and peace. This applies to short-term weather effects, causing serious hazard, and for medium to long term effects of climate change. The latter have become one of the most omnipresent and alarming concerns in people's perception, likely to overthrow economic, social, and political power structures.

Effects of both weather and climate could be mitigated and managed better, if better forecasts were available. Yet even the most advanced weather prediction models are unable to provide reliable predictions of extreme weather events with more than a week forecast lead time. Even the most advanced climate prediction systems fail to provide reliable predictions for changes in local weather patterns due to climate change.

4.1.2 Machine Learning

Machine leaning (headlined to the public often as "artificial intelligence") applications provide powerful opportunities to learn the behavior of complex systems from data. The number of machine learning (ML) applications is long and steadily growing (e. g. in image and speech recognition, healthcare, gaming, or finance). ML tools have shown an outstanding capability to finish difficult tasks much quicker or better than humans.

4.1.3 High Performance Computing

Developments for computer hardware are moving at a breath-taking pace. Recent machines are about to cross the threshold to exascale computing. EuroHPC JU, the funder of MAELSTROM, has committed itself to developing a world class supercomputing ecosystem in Europe.

4.1.4 MAELSTROM at the intersection

It could be assumed that those topics are natural symbionts: forecasts requiring to deal with the greatest possible level of non-linear complexity (the entire earth) at very high resolution; a programming paradigm suited to deal with this complexity; and a new class of hardware to furnish the required computing power.

And when we look at the state of the art, though, we see that the use of ML for weather and climate prediction is still young, and that productive approaches harnessing both, ML and HPC in combination, for weather and climate (W&C) are in their absolute infancy. A big barrier to date is the lack of comprehensive workflow tools that would allow to efficiently develop and benchmark scalable applications.

This is where MAELSTROM comes into play and promises to deliver against three main objectives:

Objective 1

To open weather and climate predictions as a new usage domain for machine learning applications that can exploit exaflop performance.

Objective 2
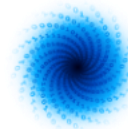
To develop the optimal software environment to develop exascale-ready machine learning tools that can be used across the workflow of weather and climate predictions.

Objective 3

To optimise compute system designs for machine learning applications for weather and climate predictions at the node and system level and to transfer this knowledge to other machine learning applications that will use future EuroHPC systems.

4.2 Stakeholders and Audiences

Before messages for communication can be defined, or communication activities tailored and scheduled, it is necessary to gain a structured view on stakeholders and possible audiences of project MAELSTROM, their motivations, level of knowledge, and degree of attention.

4.2.1 The Funder

Project MAELSTROM is funded by [EuroHPC JU](#), a public-private partnership, whose members are the EU, all its countries (but Malta), a few other associated countries and two private partners. The EuroHPC JU has the objectives of

- developing a pan-European supercomputing infrastructure
- supporting research and innovation activities.

EU and member countries have funded EuroHPC with €500 Mio each and must justify the good reason for such invest to their voters and taxpayers.

4.2.2 The Project Partners

ECMWF, 4cast, E4, ETH Zürich, Jülich SC, Meteorologisk Institutt and Université du Luxembourg are not the partners of project MAELSTROM to for the sake of it, but to gain visibility and scientific and economic weight.

4.2.3 The People Behind the Project Partners

Consortia, organizations, businesses are all run by people who have personal motivations beyond their paycheck: curiosity, esteem, leaving a footprint, and so on. A quick exercise during the project kick-off, in which participants were to name real people they want to address as their audience, revealed the desire to have MAELSTROM noticed by leaders, economy and science figureheads and patrons.

The people behind MAELSTROM are in the same time receivers and senders of project communication. Ideally, communication is not only carried by one or few "communication guys", but every single person working on the project has enough understanding of our core messages and communication strategy that she or he can act as a MAELSTROM ambassador.

4.2.4 Scientific community

Members of the scientific community, be it in research organizations, universities, or commercial R&D departments, are the audience with the highest level of both knowledge and attentiveness. Of all audiences, they will be able to profit most directly from scientific or technological advancements presented by MAELSTROM. Yet, any MAELSTROM messages will need to cut through a dense clutter of output from other sources to stand out.
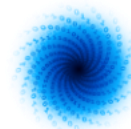
Scientific community core

Is actually involved in weather & climate prediction.

Wider scientific community

Is involved in ML but not necessarily in weather & climate.

4.2.5   Political leaders and lawmakers

Politicians are above all generalists, who are beholden to many sides from voters to party leaders to lobbyists. Their expertise can be expected medium to low, and so is usually their attention span. Messages can be digested best if they are concise and simple.

4.2.6   Weather & climate predictors

These may be commercial businesses or other institutions. These also include ECMWF member states and their Meteorological Centres, as well as climate modelling centres like the Coupled Model Intercomparison Project (CMIP), and, the World Meteorological Organisation.

They are vital as input providers; a close contact to them will ensure that MAELSTROM's work is strictly geared towards practical needs.

They are also vital output takers, who will closely watch the project and adapt developments for their own predictions and workflows.

4.2.7   HPC Industry

We expect the HPC industry to look closely if MAELSTROM manages to generate new use cases for their offering and for findings of the MAELSTROM co-design cycle that may have an impact on their product development in the future.

4.2.8   Traditional Press and Media

Media are generally interested in whatever their audience is interested in. The right degree of detail and a catchy plot increase the chances of them picking up messages.

## 4.2.9   Scientific journalists & social media activists

Traditional journalists, bloggers and youtubers like Cedric Engels or Mai Thi Nguyen-Kim have gained importance over the past decade as multipliers. They translate scientific content into non-scientific language, serve other channels than traditional media and can reach audience not covered otherwise.

4.2.10 The General Public

The general public has a smattering of machine learning (or "artificial intelligence"), has however developed a keen interest in the topic of climate change and may be open to learn about the welfare of the European economy. Being "pro" or "contra" the European Union, or even the European idea, has become an important parameter in people's political views.

4.3   Message and overall Storyline

MAELSTROM provides a rich choice of messages that may be of interest and value for single, several or all audiences. As a starting point (as of May, shortly after project start), this document presents a
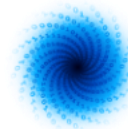
selection without claiming completeness, which needs to be elaborated, prioritized and directed to the appropriate audience in a subsequent effort.

4.3.1 Better predictions and inherent benefits

Weather and climate predictions that are substantially improved in terms of reliability and local resolution will allow to preempt or mitigate hazard and to give political, economic, and social opinion formation and decision making a more informed basis, thus act for the good of everybody on this planet.

Improved forecasts contribute to efficient production of renewable energies, thus are part of accomplishing the energy transition and paving the way into a sustainable future.

4.3.2 Improved weather & climate toolbox

MAELSTROM is committed to achieving three overall and four specific objectives, as defined in the research proposal. This is what we get funding for. The objectives as such are a message. The steps on the way to the goal are messages. The successful completion of each of the objectives is a message.

Overall objectives

O1: MAELSTROM will open W&C predictions as a new usage domain for ML applications that can exploit exaflop performance.

O2: MAELSTROM will develop the optimal software environment to develop exascale-ready ML tools that can be used across the workflow of W&C predictions.

O3: MAELSTROM will optimize compute system designs for ML applications for W&C predictions at the node and system level and to transfer this knowledge to other ML applications that will use future EuroHPC systems.

Specific objectives

SO1: MAELSTROM will develop benchmark datasets for six selected ML applications that cover the entire workflow of W&C predictions.

SO2: MAELSTROM will develop production-ready ML solutions that are optimised for efficiency, scalability, and quality for six selected ML applications across the W&C workflow.

SO3: MAELSTROM will develop bespoke ML workflow tools for W&C applications that optimize collaborations between W&C, ML and HPC experts and allow for a prompt uptake and operational implementation of ML within W&C models as well as the performance benchmarking of ML solutions based on Deep500.

SO4: MAELSTROM will develop bespoke system-level architecture blueprints for ML in W&C predictions.

4.3.3 Use Beyond Weather & Climate

Technology transfer into other domains
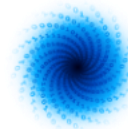
MAELSTROM findings and products, first and foremost ML/HPC workflow and hardware benchmarking tools, will also be applicable in other domains, like engineering, computational fluid dynamics, physics, chemistry, biology, and medicine.

Physics-informed ML

Most ML applications act as black boxes and don't allow to understand underlying physical effects. The W&C community has a strong background in classical statistics physical system modelling, can therefore help progress a "physics-informed ML". Lessons learned in MAELSTROM regarding physics-informed ML for the W&C domain will find applications in other domains such as engineering or general computational fluid dynamics.

4.3.4   Commercial exploitation

MAELSTROM's achievements are not only of scientific but also of commercial value. With the open-source character of MAELSTROM's toolkit allowing for a wide uptake in the weather and climate prediction market, MAELSTROM's products offer good potential for monetarization.

4.3.5   Strengthening Europe

European digital sovereignty and competitiveness

Europe is still catching up with developments in the US or Asia in the domain of ML. A multi-purpose ML framework will free European scientists from being locked into solutions that are largely developed overseas and significantly improve Europe's competitiveness and innovation potential. Creation and promotion of European intellectual property will rise the attractiveness of Europe as a science hub and homebase.

European pride and patriotism

European-born (and European-funded) scientific and technological achievements will strengthen the sense of European community and the trust in European institutions.

4.3.6   Stimulus for the Scientific Community

Research role model

MAELSTROM's co-design cycle is a living example for the fertility of cross-disciplinary research formats (hardware + software + data science). MAELSTROM's diverse team structure promotes the benefits of gender equality in science. MAELSTROM will seed interdisciplinary and international research projects across the European countries.

Community building

MAELSTROM will develop an interdisciplinary community for ML in weather & climate science in Europe.

Talent Development

MAELSTROM will train the next generation of data scientists and provide them with the tools they need to thrive in scientific research area that is growing in a neck-breaking pace.
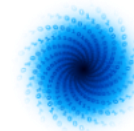
4.4 Channels

4.4.1 Channel glossary

Channels at our disposals are:

MAELSTROM website

A top-level public website solely for project MAELSTROM.

Partner websites

Existing websites of MAELSTROM's partners; can't be expected to change structurally for the sake of MAELSTROM, but content can be added.

MAELSTROM community portal

A dedicated portal with public and non-public areas to share code and provide access to the MAELSTROM datasets. Likely Git-based.

Project reports

"Official" reports as required by the funder. Not public.

Workshops

Two workshops hosted by ECMWF

Hackathons

Possible hosting locations: Jülich SC and ECMWF

Scientific publications

Documents meeting all the requirements towards, well, scientific publications.

Press releases

Electronic publications in PR style, distributed on the website or directly to the media, upon inquiry or by initiative.

Marketing documents

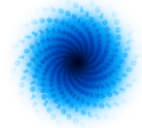PDF publications that are meant to travel unaccompanied, i.e. are self-explanatory.

Corporate presentations

PDF or PPT documents that are meant to be presented and explained. Not travelling alone.

Public webinars

Like an interactive seminar or the public plenary presentation of the kick-off meeting, just online.

Committees

International committees, ideally in which MAELSTROM partners are already active, such as: World Meteorological Organization (WMO), European Technology Platform for High Performance Computing (ETP4HPC), European Processor Initiative (EPI), HiPEAC, CLAIRE, ELLIS.

4.4.2   Project Partners as the "Super Channel"

Most of the mentioned channels do not have a "built-in" reach of audience. E. g.: How shall a press release find its way to a journalist? How do people become aware of a hackathon? What's the worth of a Twitter account with no followers?

The success of MAELSTROM's communication efforts relies thus heavily on each single project partner, and within each project partner, on each single team member. We need every one of us to act as an evangelist and multiplier. Professional and personal contacts, individual social media accounts – we need all of them activated for MAELSTROM.
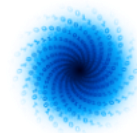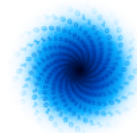
4.5   Targeting and Channelling

The following overview is a rough draft of how to direct messages to audiences and using the right channel. Once we have audited and evolved our set of audiences and messages, we can elaborate it.

Table 3: Communication Targets and Channels

Message	Funder	Project partners	Project people	Scientific community core	Wider scientific community	Political leaders	W&C predictors	HPC industry	Press & media	Social media	General public	MAELSTROM website	MAELSTROM comm. portal	Partner websites	Project reports	Workshops	Hackathons	Public webinars	Scientific Publications	Press releases	Marketing documents	Corporate presentations
Better predictions and inherent benefits	X		XX			XX	XX		X	X	XXX	X		X							XX	
Improved weather & climate toolbox	X	X	X	XXX		X	XXX					X	X	X	X				X			
Technology transfer into other domains	X	X		X	XX	X		XXX				X	X	X		X	X	X	X			
Physics-informed ML				X	X		X	X				X	X	X		X	X	X	X			
Commercial exploitation		XXX	XX			X							X	X							X	X
European digital sovereignty and competitiveness	XXX	X	X			XXX		X	X	X	X	X									X	
European pride and patriotism	X	X	X	X	X	XX			X		XX	X									X	
Research role model	X	X	X	X	X	X			X			X				X	X				X	

Community building	X	X	X	XX	XX	X							X			X	X	X		
Talent Development	X	X		X	X	X							X			X	X			
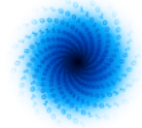
5 Conclusion

This document, D4.1 Plan for Dissemination and Communication, outlines the planned dissemination activities for the MAELSTROM partners, and provides the communication plan together with the necessary tools and information to ensure that the message of the project is clearly communicated. This document is to be seen as a living document and will be regularly revisited throughout the live time of the project.
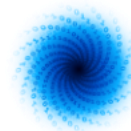
Document History

Version	Author(s)	Date	Changes
0.1	Jan Mirus (for 4cast), Daniel Thiemert (ECMWF)	13/05/2021	Initial version
0.2	Jan Mirus (for 4cast), Daniel Thiemert (ECMWF), Peter Dueben (ECMWF)	14/05/2021	further improvements
1.0	Jan Mirus (for 4cast), Daniel Thiemert (ECMWF)	28/05/2021	Final version for submission

Internal Review History

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Daniele Gregori (E4)	26/05/2021	Approved with comments
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Estimated Effort Contribution per Partner

Partner	Effort
4cast	0.1
ECMWF	0.25
Total	0.35