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D7.1 Intermediate Dissemination & Communication Activities Report

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Abstract:

This deliverable reports on the dissemination and communication activities performed in WP7 of MORE during the first 18 months of the project. It summarizes the achievements of the first half of the project and outlines the strategy, plan, and measures to communicate and disseminate the activities and results in the second half, which will focus more on the wider application of the platform and technology.

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1 Introduction

Deliverable D7.1 provides the Intermediate Dissemination & Communication Activities Report for first half of the MORE project.

It represents tasks of work package 7 of the project´s Description of Action. It summarizes the achievements of the first half of the project and outlines the strategy and measures to communicate and disseminate the activities and results in the second half, which will focus more on the wider application of the platform and technology, along with Capacity building programme and training (starting in M20) and Standardization activities (starting in M18). The industrial exploitation and innovation is performed in work package 8.

In the **first half of the project,** the communication and dissemination activities focused on creating awareness for the project and identifying and getting in touch with selected key stakeholders. The main communication channels and materials were created and set up (website, social media, templates etc.).

Events are indispensable to distribute information about MORE, as a place to initiate cooperation and collaboration activities. Besides knowledge transfer and one-way distribution of information, different kinds of interactive events are a very effective way to attract, involve and link relevant stakeholders. Given the COVID-19 pandemic, events in the first half of the project were a mix of virtual and physical events. One dedicated MORE webinar was organized, called *"IT, big data and machine learning challenges in time series data - Renewable Energy Sources (RES) sector | Management of Real-time Energy Data".* In addition, MORE partners have given 10 talks about MORE technology at scientific and industrial events. Details are listed in the Appendix at the end.

Another key channel for scientific dissemination is writing **scientific publications**. Here, the MORE partners have already published 5 papers in top scientific computer science journals and conferences such as PVLDB, SODA, ICDE, and IEEE BigData. A further 6 papers are in submission. Details are listed in the Appendix at the end.

In the **2nd half of the project**, the activities will be expanded to include wider application of the platform and technology, including a capacity building programme and training and standardization activities. For example, two rounds of hackathons hosted by the main tech partners will allow students and industrial users to try out the project's open-source components and evaluate their functionality. A PhD course on incremental machine learning will be held. A scientific workshop will be held jointly with a big data conference targeting the research community, where the scientific achievements of the project will be presented and feedback from the community will be provided. Towards the end of the project, each company partner will organize a separate roll-out event during the validation phase where they will invite their partners/customers from the RES sector to demonstrate, test and validate the MORE platform. The project will participate in relevant EU-project liaison events and exhibitions, to demonstrate its results. Capacity building activities will train potential users on the practical use of the integrated MORE platform. Standardization activities will contribute to international standards within information modeling in the renewable energy sector and interoperable approaches for big energy data applications.

2 Target Audience and Activities

MORE will maximise the impact of its activities and results by a proactive dissemination and communication. Dissemination and communication activities thus constitute an important part of the project, and all partners are aware and committed to actively communicate the project results and achievements to the targeted audiences. The goal is to ensure that the efforts supported by government funding and company investments help to reach or maintain a leading position in the relevant technologies and fields of expertise.

The consortium has established a high-level strategy to disseminate and communicate the project's findings and engage stakeholders. Our strategy is to involve, in an effective and timely fashion, a variety of relevant stakeholders from the research and academic community, the industry and the SMEs of the energy and the big data sector, policy makers and innovation managers, as well as the general public, such that they can provide their feedback to the objectives and the directions of the project. For that we will employ a variety of channels according to the type of the disseminated asset and the targeted stakeholder: e.g., knowledge dissemination will be performed via the traditional academic channels (i.e., by publishing papers and giving talks at conferences and workshops); the reach out to stakeholders from the data analytics and RES industries will be pursued via participation in fairs and conferences and by presenting our prototypes to interest groups as well as participating in knowledge exchange networks. Hackathons and roll-out events will be essential instruments for demonstrating the software outputs as well as means for performing, in a disciplined manner, validation of the platform over a wide range of users and companies. Further, we will make open-source code which anyone can use, inspect, and comment on. We will put efforts into publishing the code such that it is easy to get and we will make the code easy to use by creating manuals explaining how to use it. Social media and the Internet will also be used to raise the awareness of the project to get into contact with other potential users. By sharing our findings and prototypes early, we intend to get more feedback and experiences to base the following prototypes on.

The table below outlines how we will segment stakeholder categories, a brief description of why we want to reach certain stakeholders and our intended primary means of reaching them.

Stakeholder type	Why we want to reach these stakeholders	Primary means
• **Industry from the RES sector** • **Industry and technology companies from the data value chain** • **Industry associations**	• These stakeholders are the targeted users of the MORE framework. They will be able to **exploit advanced analytics functionalities** with much larger data amounts. This can enable preventive maintenance of RES installations and thus huge savings. • The stakeholders will be able to give valuable feedback to improve the framework incrementally • The stakeholders are essential for the MORE platform evaluation	*On a continuous basis* via Project website Social media *On a regular basis* via: Press releases Mass media initiatives Publicity campaign Knowledge exchange networks *At targeted events towards end of project (Deliverable D8.1 will concretize this)* via: Conferences Market Fairs Hackathon lab - Validation Final Event
• **SMEs** • **IT professionals** • **Young entrepreneurs**	• These groups will also be able to **benefit from an analytical platform** that can handle huge	As above + *As opportunities appear:* National and EU Innovation events

• **Incubators**	amounts of historical, streaming, and predicted data. They will also be able to contribute with feedback and ideas.	
• **Open-source communities** • **Practitioners**	• These stakeholders will **benefit from the availability of open source code** • We will make the project "open" in the sense that we share techniques, code, etc. We wish to collaborate with other interested parties to benefit from each other.	As above + *At the end of the project* MORE's core platform is made available as open source
• **Standardization organizations**	• To get a maximum impact and make the framework generally usable, the MORE should both follow relevant current standardizations (e.g., about data exchange) and **give input to new standardizations**.	*On a continuous basis in the 2nd half of the project* via Participation in WGs and consultations
• **Scientists** • **Researchers** • **Academia** • **Universities** • **Research institutes**	• To **inform the scientific community about our results and novel methods and engage them in the research problems** • To present our achievements and make them available to the academic society. • To get feedback • To exchange knowledge and ideas	*As results appear in* Journal articles Conference papers *On a continuous basis* via E-mail Project website Social media
• **EU Projects**	• **To join forces in maximizing useful results and impact, via** ○ collaboration ○ exchanging information ○ re-use of results ○ reuse of application scenarios • joint workshops	*On a continuous basis* via E-mail Webinars/online calls Workshops CORDIS Project website Social media EU events, like FIA and EDF
• **The general public**	• **To raise the awareness on the contributions of the project** and get into touch with other interested parties	*On a continuous basis* via Project website Social media *Towards the end of the project* Mass media initiatives

Table 1. MORE dissemination plan for stakeholder engagement

3 Communication Activities

3.1 Organization and coordination of communication activities

Every person in the consortium acts directly or indirectly as a communication actor, e.g., by boosting MORE's news via social media channels, producing text content to enhance the website, providing insights through targeted newsletter articles, developing liaisons with other projects, etc. The hub for all activities is the communication team coordinated by the ARC that collects, forwards, and publishes the communication content. All consortium members share their communication activities, news announcements, and additional material (event pictures, presentations, etc.) with the ARC and can get instant support. Based on this material, ARC generates communication content and updates MORE's website and social media. ARC also constructs quarterly newsletters and targeted emails for promoting MORE's events to the exploitation cluster.

However, in the unprecedented conditions of the outbreak of the COVID-19 pandemic, we faced severe obstacles concerning the physical events and meetings with stakeholders. Therefore, we focused on mainly organizing remote events and presentations to communicate the project's objectives and results. In addition, we deviated from the originally planned work package effort since ARC had to help Inaccess by further contributing to the fulfillment of the goals of the work package.

3.2 Communication Strategy and Communication Means

Communication activities cover the whole project and target multiple audiences, including media and the general public. It is essential to clearly define communication objectives in order to achieve an effective communication strategy. In the MORE project, the communication plan is driven by the goal of building a broad network of stakeholders around the MORE objectives, activities, and results. We pinpoint the following core communication objectives:

1. Increase the visibility of MORE by providing universally comprehensible information to the public about the project goals and results while engaging a wide range of stakeholders to project objectives and results.
2. Create a user community that will provide insights and detailed feedback during the project's development while communicating the project's actual results and innovation highlights.
3. Promoting and demonstrating the societal benefits generated by the MORE project to a wide range of audiences outside the core project target groups.
4. Make MORE code and documentation available as open-source, and publish the aggregated data in EU open data hubs.
5. Complement the communication activities of the MORE project.

Figure 1 shows the major communication means employed by the MORE project.

All communication means are supporting the MORE consortium to achieve the communication objectives by using the appropriate material and targeting the non-specialist general public.

Figure 1. Communication means

3.3 Project identity

The overall project material (logo, deliverable and presentation templates) design was developed in collaboration with a design agency to guarantee consistency and a high recognition value in all communication materials. The design of the project's identity materials guarantees that everything realized within MORE is recognized as part of it.

3.3.1 Logo

A unique project logo has been developed for the MORE project in accordance with the project's objectives and characteristics. Figure 2 shows MORE's logo used for external and internal communication. The logo is a vague illustration of data and energy distributions with reference to solar energy.

Figure 2. MORE's logo

3.3.2 Deliverable and presentation templates

The main principle followed throughout the project is consistency with the branding design. The colors used for the templates of documents and presentations are the ones used in the MORE logo as shown in Figures 3a and 3b that present the templates for presentations and deliverable documents.

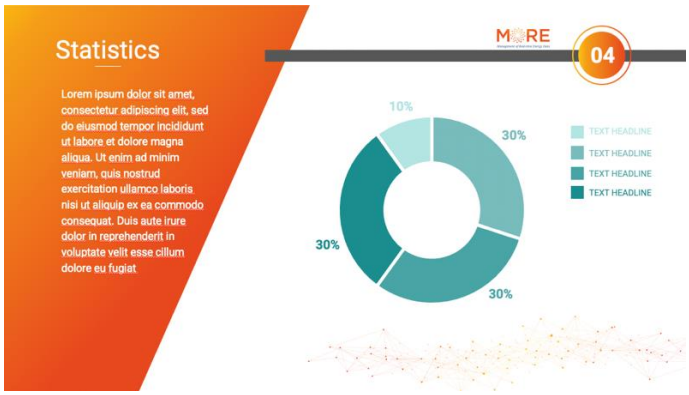


Figure 3a. MORE's presentation template

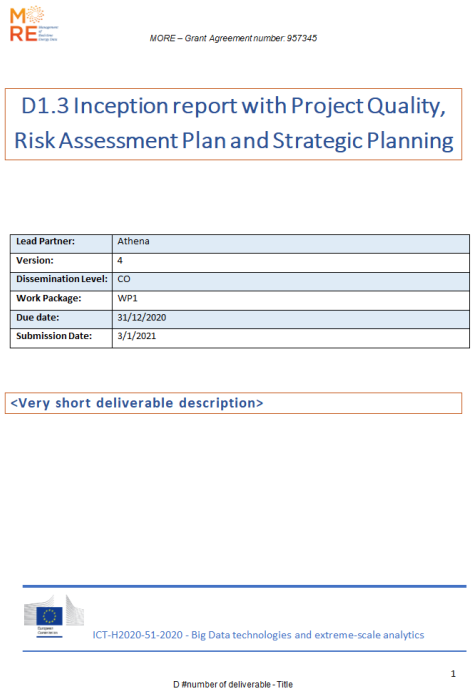


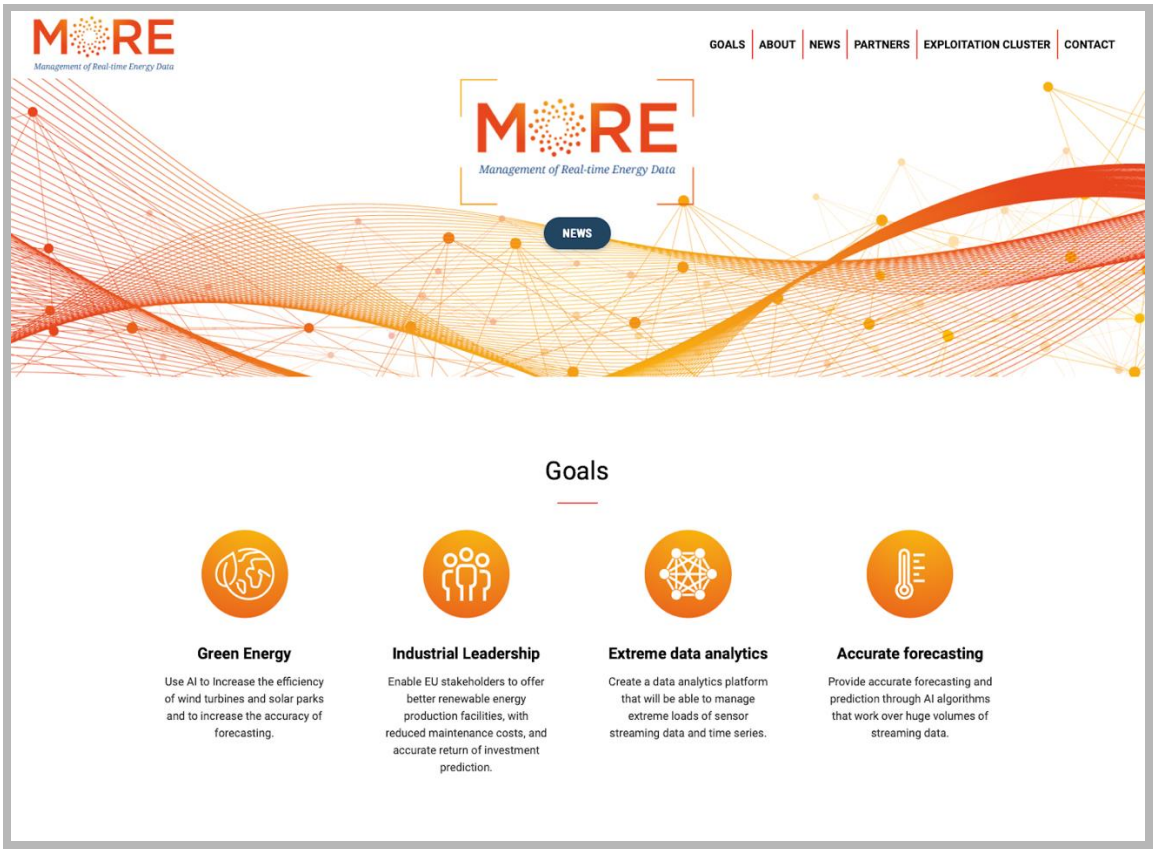
Figure 3b. MORE's deliverable template

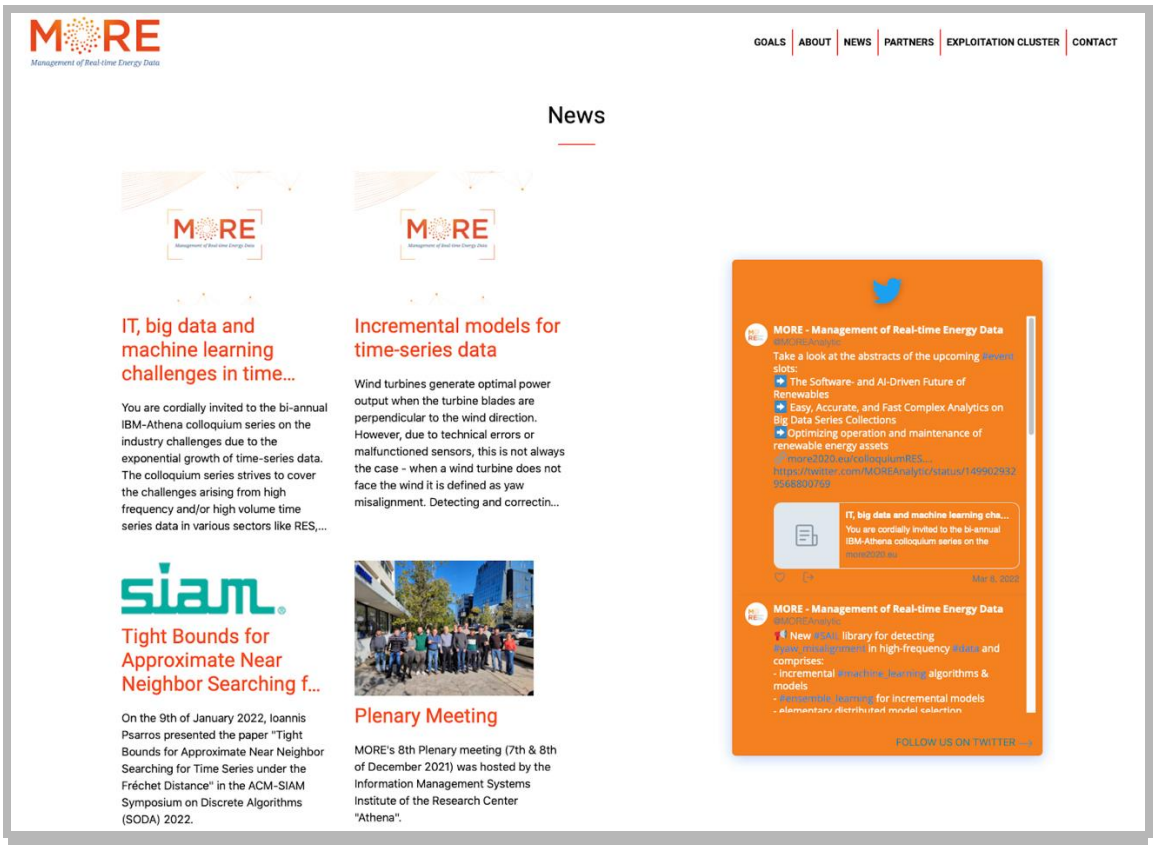
In line with the obligations regarding communication of goals, results, and achievements, these communication identity materials are used: on the project's website, Twitter account, and LinkedIn page, in the various events and presentations, on the newsletter, leaflets, and project videos.

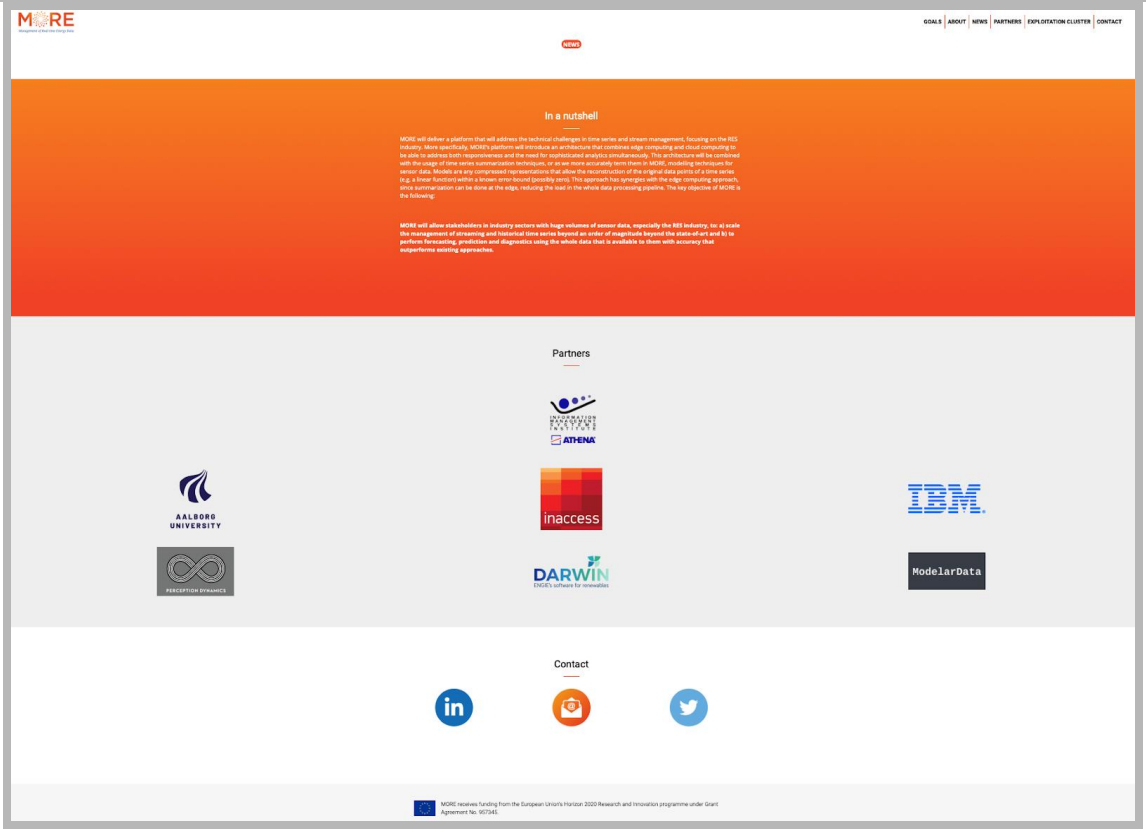
3.4 Website

MORE's website comprises the goals, achievements, and the latest project news. We aim for the website to be the central communication means, reflecting the project's progress as it matures. In addition, the website is growing into a channel to other means of communication such as social media accounts, deliverables, open data repositories, newsletter, etc.

Moreover, the consortium's short and extended articles provide useful project overviews and highlights and increase user engagement to MORE's results and achievements. By comprising a news section enriched with MORE's latest tweets, the website provides up-to-date information on intermediate and final project results. Furthermore, the website holds a separate page for demonstrating the exploitation cluster to promote the organizations already participating and encourage more to become parts of the cluster. Since January 2022, MORE's website has had 256 unique user visits, and Figure 4 shows the website's main pages.




MORE
Management of Real-time Energy Data
GOALS | ABOUT | NEWS | PARTNERS | EXPLOITATION CLUSTER | CONTACT
News
IT, big data and machine learning challenges in time...
You are cordially invited to the bi-annual IBM-Athena colloquium series on the industry challenges due to the exponential growth of time-series data. The colloquium series strives to cover the challenges arising from high frequency and/or high volume time series data in various sectors like RES,...
Incremental models for time-series data
Wind turbines generate optimal power output when the turbine blades are perpendicular to the wind direction. However, due to technical errors or malfunctioned sensors, this is not always the case - when a wind turbine does not face the wind it is defined as yaw misalignment. Detecting and correctin...
siam
Tight Bounds for Approximate Near Neighbor Searching f...
On the 9th of January 2022, Ioannis Psarros presented the paper "Tight Bounds for Approximate Near Neighbor Searching for Time Series under the Fréchet Distance" in the ACM-SIAM Symposium on Discrete Algorithms (SODA) 2022.
Plenary Meeting
MORE's 8th Plenary meeting (7th & 8th of December 2021) was hosted by the Information Management Systems Institute of the Research Center "Athena".
MORE - Management of Real-time Energy Data
Take a look at the abstracts of the upcoming #event slots:
The Software- and AI-Driven Future of Renewables
Easy, Accurate, and Fast Complex Analytics on Big Data Series Collections
Optimizing operation and maintenance of renewable energy assets
more2020.eu/colloquiumRES...
https://twitter.com/MOREAnalytic/status/1499029329568800769
IT, big data and machine learning cha...
You are cordially invited to the bi-annual IBM-Athena colloquium series on the
more2020.eu
Mar 8, 2022
MORE - Management of Real-time Energy Data
New #SAIL library for detecting #yaw_misalignment in high-frequency #data and comprises:
- incremental #machine_learning algorithms & models
- #ensemble_learning for incremental models
FOLLOW US ON TWITTER


MORE
GOALS | ABOUT | NEWS | PARTNERS | EXPLOITATION CLUSTER | CONTACT
NEWS
In a nutshell
MORE will deliver a platform that will address the technical challenges in time series and stream management, focusing on the RES industry. More specifically, MORE's platform will introduce an architecture that combines edge computing and cloud computing to be able to address both responsiveness and the need for sophisticated analytics simultaneously. This architecture will be combined with the usage of time series summarization techniques, or as we more accurately term them in MORE, modelling techniques for sensor data. Models are any compressed representations that allow the reconstruction of the original data points of a time series (e.g. a linear function) within a known error-bound (possibly zero). This approach has synergies with the edge computing approach, since summarization can be done at the edge, reducing the load in the whole data processing pipeline. The key objective of MORE is the following:
MORE will allow stakeholders in industry sectors with huge volumes of sensor data, especially the RES industry, to: a) scale the management of streaming and historical time series beyond an order of magnitude beyond the state-of-art and b) to perform forecasting, prediction and diagnostics using the whole data that is available to them with accuracy that outperforms existing approaches.
Partners
ATHENA
AALBORG UNIVERSITY
inaccess
IBM
PERCEPTION DYNAMICS
DARWIN
ENGIE's software for renewables
ModelarData
Contact
MORE receives funding from the European Union's Horizon 2020 Research and Innovation programme under Grant Agreement No. 957345.

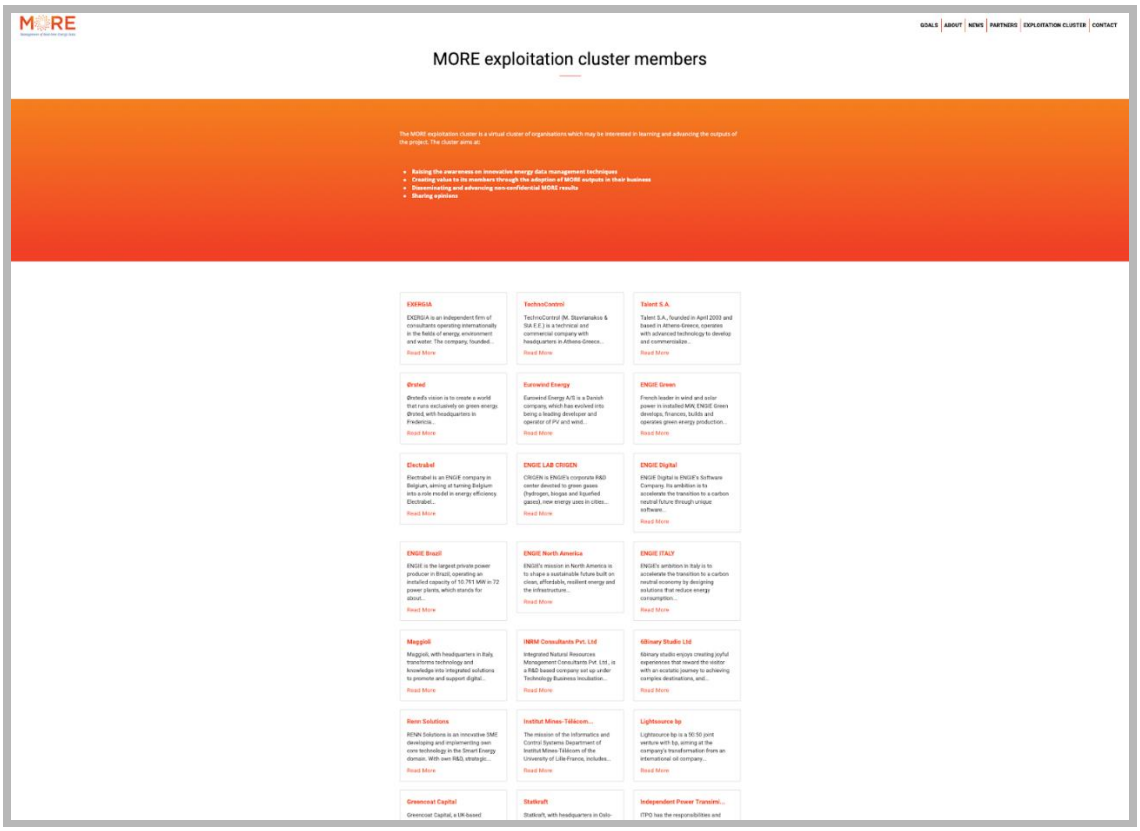


Figure 4. MORE's website (home page, goals & links, news and articles)

Following the development of the project, the website will include a separate section containing public reports and publications upon their review. Finally, the website will be enriched with publicly available video content from webinars and demos to better demonstrate and showcase the project outcomes.

The web design is responsive and includes all elements for search engine optimization, while the URL (www.more2020.eu) includes the project acronym and refers to Horizon 2020.

To sustain a holistic online presence for MORE, the project's website is regularly updated, including the project's results and specific news/events related to the project. Due to the evolving nature of the MORE project, the website's structure is clear, and the information is constantly updated following the developments of the project. In March 2022, and as the project started to produce more results, we opted to upgrade the website's news section by raising it to the top and adding a tweet crawler.

3.5 Social Media

Communication means for the MORE project comprise a consistent presence in social networks. Specifically, we have created a Twitter account and a LinkedIn small-company page.

3.5.1 Twitter account

MORE's tweets are short posts consisting of short textual updates and links to MORE-related events or website articles.

The @MOREAnalytic account (Figure 5) is used as a preeminent communication means, given its efficiency in terms of visibility and engagement of users. Moreover, MORE's tweets contain various project-related hashtags (e.g., #RES, #bigdata, #machine_learning, #time_series, etc.) to expand our reach and get more impressions.

The account is mainly dedicated to short textual content to swiftly spread the message and the news of the MORE project. The Twitter account is used as a channel for constant updates on every project development and result and as a reminder for all the project-related activities and events.

3.5.2 LinkedIn Page

The second social media channel of the MORE project is a LinkedIn page that will allow MORE to communicate through the most popular professional networking platform. LinkedIn can be a very effective tool for the project's exploitation strategy that can promote MORE as a disruptive idea on the market, triggering potentially interested companies and end-users. As a networking site for professionals, it can be used to reach other groups or professionals (experts and possible stakeholders) interested in posting information about the project's vision, objectives, results, and achievements.

We opted to create a small company page rather than a profile to support content reposting, available to everyone interested, and facilitate users to invite more connections to follow/like MORE's page. Since January 2022, MORE's LinkedIn page has had 225 page views from 108 unique users and has 103 followers.

3.6 Newsletter

Information about the project's progress, news, and events will be shared among the interested stakeholders using newsletters. MORE's newsletter will comprise short articles written by each partner regarding the development, highlights, use cases, and results achieved through MORE. These articles are short texts (~600 words) that ensure that MORE's community and cluster are well informed of the project's progress.

MORE's newsletter is published every six months (April and October) based on the text material composed by the partners. Currently, we are gathering material and preparing the first newsletter for April 2022. The first newsletter will include general information about the project and the project's use cases. Moreover, it will comprise details about the SAIL library and the project's latest news. The newsletter's format and layout will be aligned with the general project layout and theme.

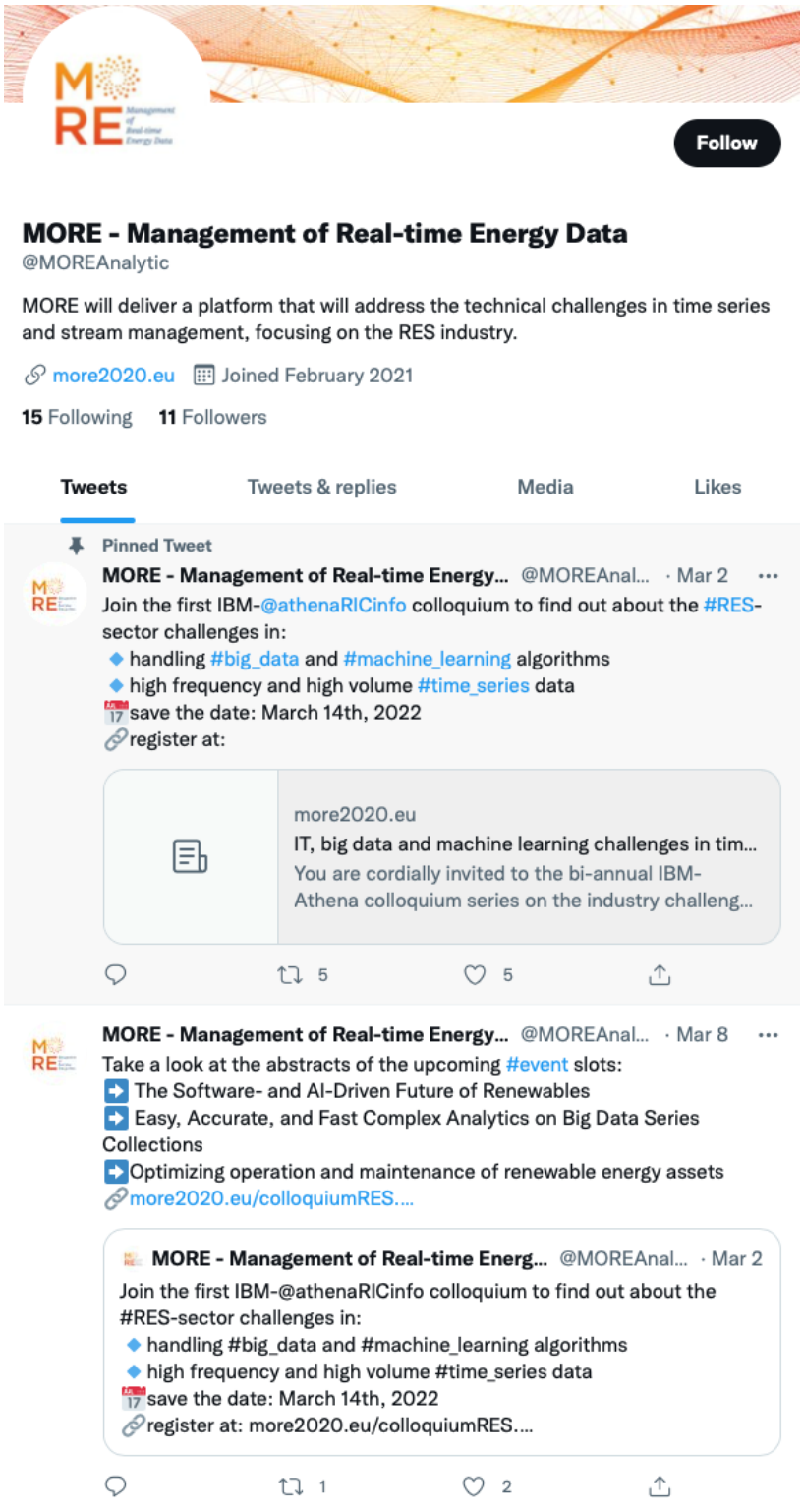


Figure 5. MORE Twitter account

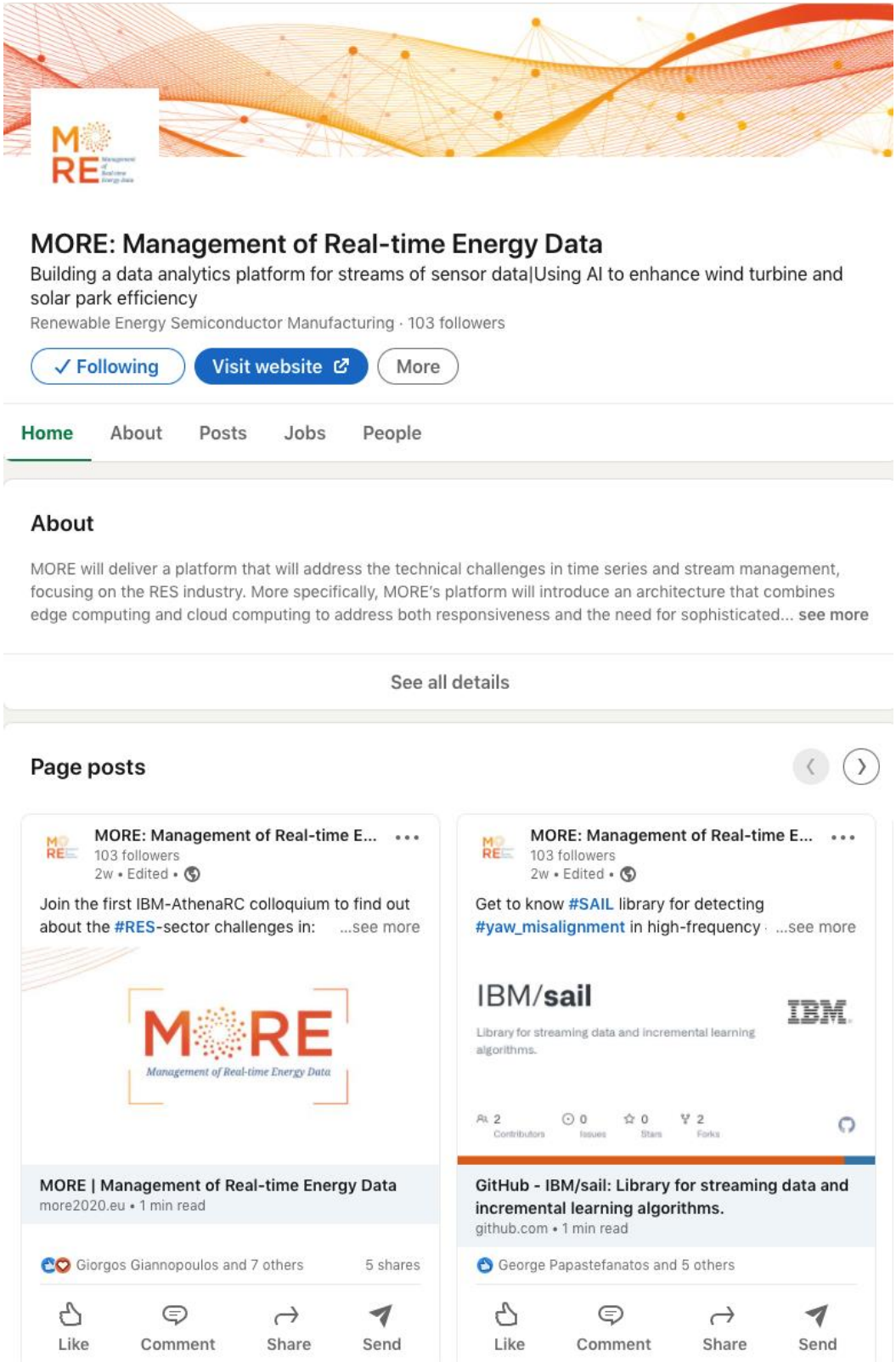


Figure 6. MORE's LinkedIn page

3.7 Event videos

Several dissemination events will be organized with the generation of the first MORE results. Hence, videos from webinars, demos, and presentations will be made available to the public to describe better and communicate the general context of the technologies developed in MORE. The videos will be available on the MORE website and further disseminated through social media announcements and cluster emails. The first video concerning the IBM-Athena colloquium will be available in April 2022.

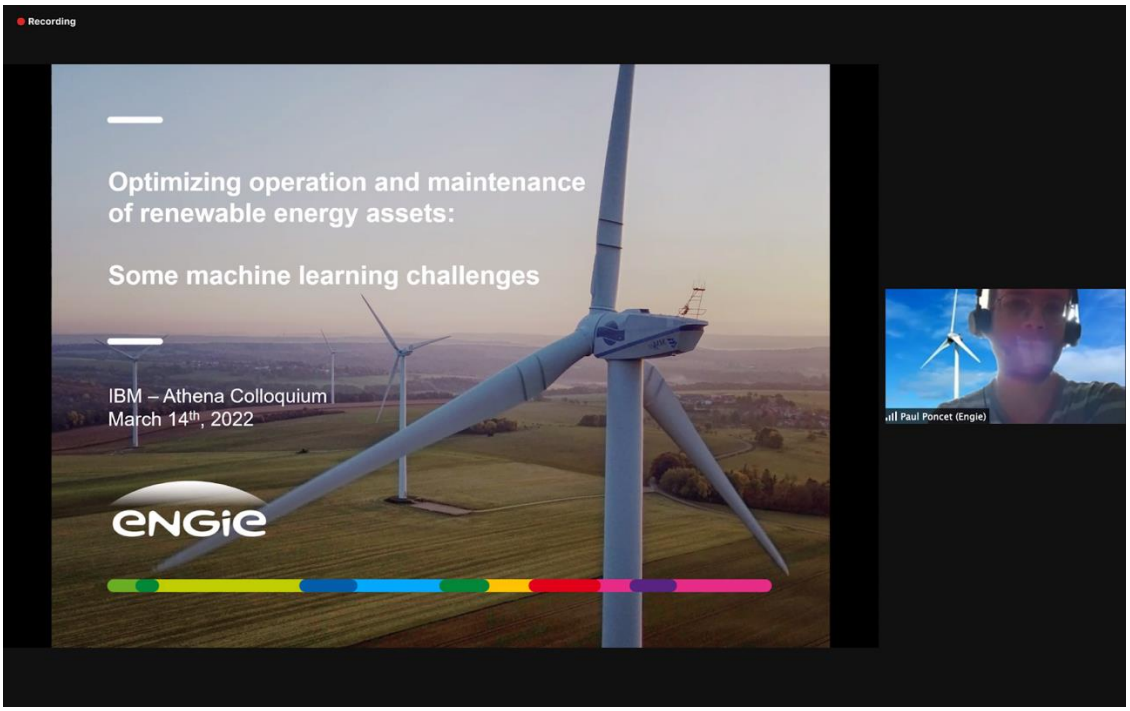


Figure 7. Athena-IBM colloquium video

3.8 Leaflet

MORE's leaflet will present the project's objectives, implementation infographics, progress, and results. The leaflet will be developed at a mature point in the project's duration, showcasing the project's significant achievements, and will facilitate the project's visibility in physical events and conferences. However, the COVID-19 pandemic and the conversion of physical to online events prevented us from publishing such material so far. The production of printed promotional material will follow the scope of specific targeted messages for each target group.

3.9 Open Access

We plan to make all code and documentation developed in the context of MORE available as open-source using existing open-access platforms such as GitHub (https://github.com/). Moreover, we aim to make aggregated data from the project available as Open data and publish them in EU open data hubs such as Zenodo (https://zenodo.org/). So far, we have published the SAIL library (https://github.com/IBM/sail) that leverages the existing machine learning libraries and creates a common set of APIs to run these models in the backend. As the project matures and generates more code and data, more resources will be made available as open.

3.10 Communication Plan

All the communication means and activities mentioned above have been unified in the communication plan, spreading throughout the project. This plan considers the project's growth; therefore, the available results and the respective communication needs define the specific communication activities in each

project phase. In Figure 8, we present the communication plan that entails each project period's selected communication means and actions.

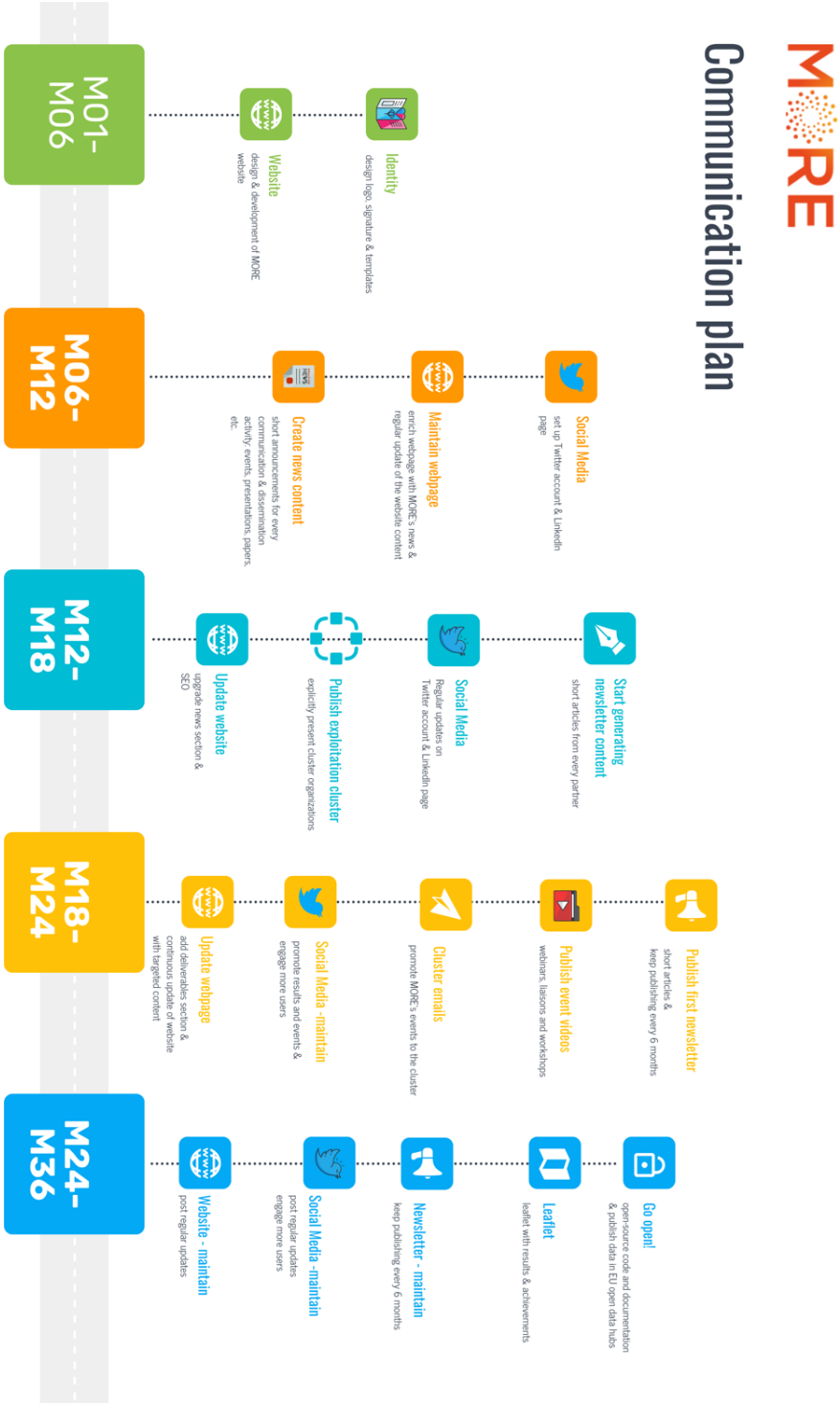

MORE
Communication plan
M01-M06
Identity
design logo, signature & templates
Website
design & development of MORE website
M06-M12
Social Media
set up Twitter account & LinkedIn page
Maintain webpage
enrich webpage with MORE's news & regular update of the website content
Create news content
short announcements for every communication & dissemination activity events, presentations, papers, etc.
M12-M18
Start generating newsletter content
short articles from every partner
Social Media
Regular updates on Twitter account & LinkedIn page
Publish exploitation cluster
explicitly present cluster organizations
Update website
upgrade news section & SEO
M18-M24
Publish first newsletter
short articles & keep publishing every 6 months
Publish event videos
webinars, liaisons and workshops
Cluster emails
promote MORE's events to the cluster
Social Media -maintain
promote results and events & engage more users
Update webpage
add deliverables section & continuous update of website with targeted content
M24-M36
Go open!
open-source code and documentation & publish data in EU open data hubs
Leaflet
leaflet with results & achievements
Newsletter - maintain
keep publishing every 6 months
Social Media -maintain
post regular updates engage more users
Website - maintain
post regular updates

Figure 8. MORE's communication plan

4 Dissemination activities, materials, and tools

The active engagement of different stakeholders in various phases of the project is a major goal of the dissemination activities.

The dissemination spans a wide range of activities and channels. Below, we describe already *completed activities and results as well as future plans* for each type of activity. They are listed in the approximate relative order in which they start within the project.

4.1 Scientific Publications

Scientific publications are a cornerstone of the dissemination of any research project. Here, the detailed description of new ideas, concepts, methods, algorithms, tools and their experimental evaluation are disseminated in concise papers to carefully selected and focused scientific communities. For example, the main target community of the technical aspects of the MORE platform is the data management research community, while the main target application research community is the energy research community. The partners in the MORE project have already published 5 papers in top scientific computer science journals and conferences such as PVLDB, SODA, ICDE, and IEEE BigData. Titles include:

1. "Tight Bounds for Approximate Near Neighbor Searching for Time Series under the Fréchet Distance", ACM-SIAM Symposium on Discrete Algorithms (SODA) 2022
2. "A Two-layer Partitioning for Non-point Spatial Data", IEEE 37th International Conference on Data Engineering (ICDE). IEEE, 2021
3. "Efficient Temporal Pattern Mining in Big Time Series Using Mutual Information", PVLDB 15(3), 2021
4. "Efficient and Distributed Temporal Pattern Mining", IEEE BigData, 2021
5. "Extreme-Scale Model-Based Time Series Management with ModelarDB". 28th International Symposium on Temporal Representation and Reasoning (TIME), 2021.

A further 6 papers are in submission. Titles include

1. "Data-driven soiling detection in PV modules", submitted to the 13th ACM International Conference on Future Energy Systems (ACM e-Energy) 2022
2. "Time Series Management Systems: A 2022 Survey", to be submitted to ACM Books
3. "A Unified Approach for Multi-scale Synchronous Correlation Search in Big Time Series", submitted to IEEE TKDE 2022
4. "Inferring Causal Relations between Temporal Events", submitted to ACM SIGKDD 2022.
5. Approximating Length-Restricted Means under Dynamic Time Warping. Under submission at the 49th EATCS International Colloquium on Automata, Languages, and Programming (ICALP).
6. "Management of Real-time Energy Data". ACM e-Energy 2022

We are very happy with such good numbers already halfway in the project. More details are listed in the Appendix at the end.

4.2 Events and talks

Events are indispensable to distribute information about scientific projects, as a place to initiate cooperation and collaboration activities. Interactive events are a very effective way to attract, involve and link relevant stakeholders. Some events are aimed at a scientific audience, like publications, while others are aimed at a broader industrial audience. Given the COVID-19 pandemic, events in the first half of the project were a mix of virtual and physical events.

Thessaloniki International Fair 2021

MORE participated in the 85th Thessaloniki International Fair, with a physical presence at the Thessaloniki International Exhibition Center. MORE was hosted at the stand of the General Secretariat for Research and Innovation (HALL 7, STAND 3) from 11 to 19 September. This year's event was dedicated to Greece, aiming to contribute to the redefinition of Greek society's needs, stimulate its historical memory, and bring closer the citizen with the new digital services and technologies, the innovations, and the Greek production.

Figure 9. MORE was part of Athena Research Center stand in TIF2021

Dedicated MORE Webinar

A dedicated MORE webinar was organized on March 14, 2022, called “IT, big data and machine learning challenges in time series data - Renewable Energy Sources (RES) sector | Management of Real-time Energy Data”. The abstract of this event was “The bi-annual IBM-Athena colloquium series addresses the industry challenges due to the exponential growth of time-series data. The colloquium series strives to cover the challenges arising from high frequency and/or high-volume time series data in various sectors like RES, water, inventory management etc. The first colloquium aims to understand the challenges in handling big data and machine learning algorithms in renewable energy sources sector. Traditionally, data in RES has been aggregated over 5–10-minute intervals and business use cases were built on this aggregated data for the RES sector. However, with lowering cost of sensors and communications, and increasing demand for high frequency updates and use cases, there is an exponential growth in the data generated by the devices. There are natural challenges of persistence and analytics on this data. Privacy and security add

an additional layer of complexity. The colloquium will cover the use cases that arise from high frequency data and the technical challenges to handle this data and provide analytics on top. The online event takes took place between 1 PM - 3:30 PM GMT on March 14, 2022. Speakers and panelists are international industry and academic experts that would provide a holistic viewpoint on the future of computing in the RES sector.”. The list of talks included:

- The Software- and AI-Driven Future of Renewables (Shivkumar Kalyanaraman)
- Easy, Accurate, and Fast Complex Analytics on Big Data Series Collections: Renewable Energy Sources and Beyond (Themis Palpanas)
- Optimizing operation and maintenance of renewable energy assets: some machine learning challenges (Paul Poncet)

The webinar had 34 attendees from research institutions and SMEs. In the context of the webinar, participants thoroughly discussed after every session and posed substantive questions regarding the colloquium's topics, giving impetus for further collaborations on this basis.

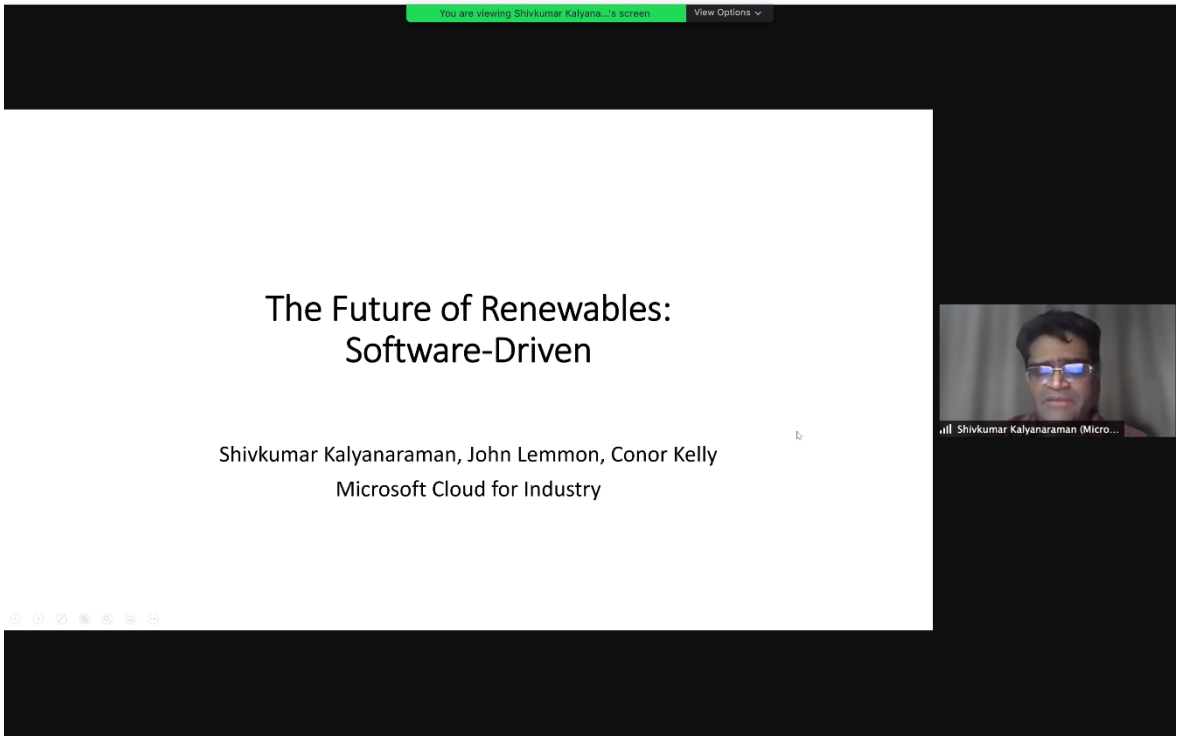


Figure 10. IBM-Athena colloquium webinar

In addition, MORE partners have given 10 talks about MORE technology at scientific and industrial events.

Danish Digital Tech Summit

Most prominently, the MORE project arranged a dedicated session at the major Danish Digital Tech Summit held November 30-December 1 in Copenhagen which with more than 5000 attendees (decision makers, engineers, companies, academia, startups, investors, and students) is the largest academic based

technology and business event in the Nordic countries. The session was called “Managing and analyzing very large time series from IoT and sensors”. It had the following abstract: “Massive amounts of data is collected, for example from different types of sensors devices connected using Internet-of-things (IoT) technology or from monitoring of large-scale Internet services. Due to the massive amounts of data, much of it is unfortunately thrown away and not exploited today. The data needs to be collected, stored, queried, and analyzed on both edge and cloud platforms to solve important problems in many industrial domains, e.g., management of solar parks and wind parks to detect small variations or problems early.”

The talks given by MORE partners at this session included:

1. "Model-Based Storage and Management of Massive Sensor Time Series" by Christian Thomsen, AAU
2. "What ModelarDB can do for your sensor data" by Christian Nygaard, ModelarData
3. "Communication and computation challenges from RES data" by George Konstantoulakis (InAccess)
4. "Finding Correlations in Massive Time Series" by Nguyen Ho, AAU

The session gathered an audience of 50 from academia and industry, there was a lot of interest and questions, and some new connections were made.

Academic Keynote talks

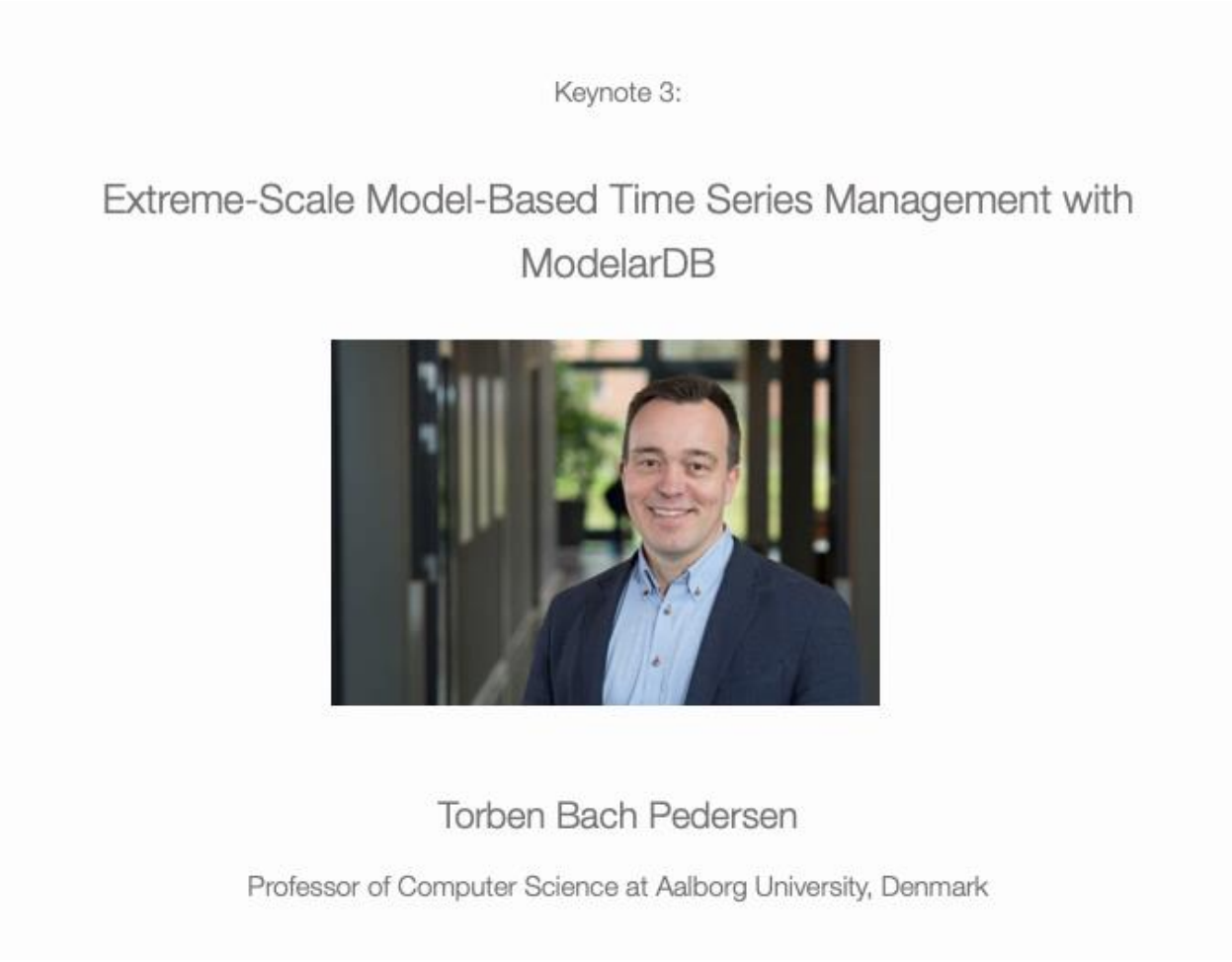
Professor Torben Bach Pedersen was invited to give no less than three keynote talks at academic conferences about ModelarDB which is a cornerstone in the MORE platform:

- "Extreme-Scale Model-Based Time Series Management with ModelarDB (Invited Talk)", 10th International Conference on Model and Data Engineering, June 2021
- "Extreme-Scale Model-Based Time Series Management with ModelarDB (Invited Keynote)", 28th International Symposium on Temporal Representation and Reasoning (TIME), September 2021
- "Extreme-Scale Model-Based Time Series Management with ModelarDB (Invited Keynote)", 32nd DEXA Conferences and Workshops

As an example, the abstract of the last keynote was "To monitor critical industrial devices such as wind turbines, high quality sensors sampled at a high frequency are increasingly used. Current technology does not handle these extreme-scale time series well, so only simple aggregates are traditionally stored,

removing outliers and fluctuations that could indicate problems. As a remedy, we present a model-based approach for managing extreme-scale time series that approximates the time series values using mathematical functions (models) and stores only model coefficients rather than data values. Compression is done both for individual time series and for correlated groups of time series. The keynote will present concepts, techniques, and algorithms from model-based time series management and our implementation of these in the open-source Time Series Management System (TSMS) ModelarDB. Furthermore, it will present our experimental evaluation of ModelarDB on extreme-scale real-world time series, which shows that that compared to widely used Big Data formats, ModelarDB provides up to 14x faster ingestion due to high compression, 113x better compression due to its adaptability, 573x faster aggregation by using models, and close to linear scale-out scalability."

The talks were well attended, e.g., more than 150 researchers for the last one, and yielded many relevant questions.



Scientific Workshop
A scientific workshop will be organized jointly with a big data conference, like SIGMOD, VLDB, ICDE, EDBT in the 3rd year of the project. This will target the data management research community, and present the scientific achievements of the project and get feedback from the community.

Details about events and talks are listed in the Appendix at the end.

4.3 PhD courses

A PhD course on Incremental Machine Learning Algorithms for Time-series Data will be held by MORE member Research Scientist Seshu Tirupathi from IBM Ireland in the Computer Science PhD program at Aalborg University on May 9-12, 2022. The description is "The course provides an introduction to incremental machine learning algorithms (IMLA) with an emphasis on models and applications for time-series problems. The initial lectures motivate the need for IMLA along with an overview of the various categories of IMLA like continual learning, online learning etc. Following that, incremental variants of the standard machine learning algorithms like linear regression, SVM and random forest algorithms will be studied in detail. Other topics that would be covered in the course include IMLA for neural networks, pre-processing and post-processing tools for incremental models, concept drift, and catastrophic forgetting. The course will have an emphasis on time-series applications."

The course will teach 15 computer science PhD students from AAU and other Danish universities about the advanced incremental ML techniques and associated tools developed in MORE so they can use them in their own projects and thus help spread the results.

There are no specific plans for more PhD courses but another course is expected in 2023.

4.4 Hackathons

The project will arrange two rounds of hackathons, the first (smaller) in 2022, and the second (larger) towards the end of the project in 2023. These will be hosted by the main academic/tech partners and allow students, industrial users, and members of the open-source community to try out the project's open-source components and evaluate their functionality. The plans for the 2022 round are:

- **AAU:** late August or September 2022, targeted at computer science and software engineering students at AAU, mainly from the last semester of the bachelor educations and the master educations
- **Athena:** end of 2022, targeted at computer science and software engineering students from associated universities in Athen like NTUA and UoA.

The larger 2023 round of hackathons will be held at the same sites, perhaps complemented with online attendance or a hackathon at an industrial partner.

4.5 Roll-out events

Each of the company partners will organize a separate roll-out event during the validation phase towards the end of the project. Here, they will invite their partners and customers from the RES sector so they can together demonstrate, test and validate the MORE platform and provide feedback to the project and the further exploitation efforts.

4.6 EU-liaison

Finally, the MORE consortium members actively participate in EU-projects liaison events, meetings and exhibitions. Here the results of the project are demonstrated and presented and feedback is collected.

In the first half of the project, liaison meetings were held with other EU projects hosted by the same partners, specifically Musketeer (IBM) and XPM - Explainable Predictive Maintenance (ENGIE).

In the second half of the project, more such meetings as well as participation in dedicated EU-projects liaison events and exhibitions are expected, but there are no concrete plans yet.

ANNEX

MORE's Presentations

Title	Date	Presenter	Event	Audience size	Audience type
Tight Bounds for Approximate Near Neighbor Searching for Time Series under the Fréchet Distance	09/01/2022	Ioannis Psarros (ARC)	SODA 2022	~50	scientific conference
A Two-layer Partitioning for Non-point Spatial Data	22/04/2021	Dimitrios Tsitsigkos	ICDE 2021	~50	scientific conference
Scalable Model-Based Management of Correlated Dimensional Time Series in ModelarDB+	22/04/2021	Søren Kejser Jensen (AAU)	ICDE 2021	~50	scientific conference
Model-Based Storage and Management of Massive Sensor Timeseries	01/12/2021	Christian Thomsen (AAU)	Danish Digital Tech Summit	50	Industry, researchers
What ModelarDB can do for your sensor data	01/12/2021	Christian Nygaard (ModelarDB)	Danish Digital Tech Summit	50	Industry, researchers
Communication and computation challenges from RES data	01/12/2021	George Konstantoulakis (InAccess)	Danish Digital Tech Summit	50	Industry, researchers
Finding Correlations in Massive Time Series	01/12/2021	Nguyen Ho (AAU)	Danish Digital Tech Summit	50	Industry, researchers
Extreme-Scale Model-Based Time Series Management with ModelarDB (Invited Talk)	28/9/2021	Torben Bach Pedersen (AAU)	28th International Symposium on Temporal Representation and Reasoning (TIME), 2021.	50	Researchers
Extreme-Scale Model-Based Time Series Management with ModelarDB (Invited Keynote)	30/9/2021	Torben Bach Pedersen (AAU)	32nd DEXA Conferences and Workshops	150	Researchers
Extreme-Scale Model-Based Time Series Management with ModelarDB (Invited Keynote)	21/06/2021	Torben Bach Pedersen (AAU)	10th International Conference on Model and Data Engineering	60	Researchers

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MORE's Publications

Publication Title	Journal / Proceedings	Link
Tight Bounds for Approximate Near Neighbor Searching for Time Series under the Fréchet Distance	ACM-SIAM Symposium on Discrete Algorithms (SODA) 2022	https://epubs.siam.org/doi/10.1137/1.9781611977073.25
A Two-layer Partitioning for Non-point Spatial Data	IEEE 37th International Conference on Data Engineering (ICDE) 2021	https://www.cs.uoi.gr/~nikos/2layerICDE21.pdf
Efficient Temporal Pattern Mining in Big Time Series Using Mutual Information	PVLDB 15(3) 2021	https://dl.acm.org/doi/10.14778/3494124.3494147
Efficient and Distributed Temporal Pattern Mining	IEEE BigData 2021	https://ieeexplore.ieee.org/document/9671753
Extreme-Scale Model-Based Time Series Management with ModelarDB	28th International Symposium on Temporal Representation and Reasoning (TIME) 2021 (Invited Talk)	https://vbn.aau.dk/en/publications/extreme-scale-model-based-time-series-management-with-modelardb-i

M01-M18 Publications

MORE's Events

Event Title	Date	Venue	Event type	Audience size	Audience composition
IT, big data and machine learning challenges in time series data - Renewable Energy Sources (RES) sector | Management of Real-time Energy Data	14/03/2022	Online	Colloquium webinar	34	researchers, SMEs
Managing and analyzing very large time series from IoT and sensors	01/12/2021	Digital Tech Summit, Copenhagen	Session at conference	50	Industry, researchers

M01-M18 Events

MORE's Liaisons

Liaisons with project	Partner	Type	Link	Audience size	Audience composition
Musketeer	IBM	Meetings	https://musketeer.eu/	34	Researchers, SMEs
XPM: Explainable Predictive Maintenance	ENGIE	Meetings	https://www.chistera.eu/	50	Industry, Researchers

M01-M18 Liaisons

MORE's Submitted Papers

Publication Title	Journal / Proceedings
Data-driven soiling detection in PV modules	13th ACM International Conference on Future Energy Systems (ACM e-Energy) 2022
Time Series Management Systems: A 2022 Survey	ACM Books
A Unified Approach for Multi-scale Synchronous Correlation Search in Big Time Series	IEEE TKDE 2022
Inferring Causal Relations between Temporal Events	ACM SIGKDD 2022
Approximating Length-Restricted Means under Dynamic Time Warping	49th EATCS International Colloquium on Automata, Languages, and Programming (ICALP)
Management of Real-time Energy Data	ACM e-Energy 2022

M01-M18 Submitted Papers