Cloud Orchestration for Optimized Computing Efficiency

The Case of Wind Resource Modelling

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WINDSIDER

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WindSider Project Overview

Project at a Glance

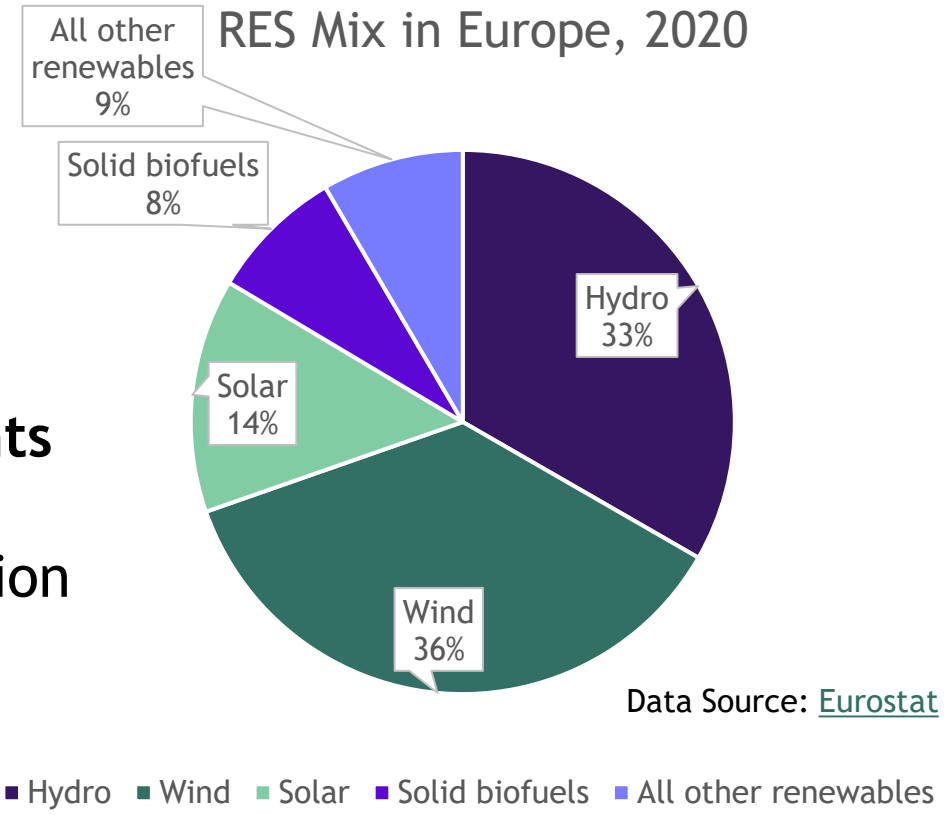
Project Title	Commercialization of a breakthrough wind resource assessment technology for automated planning of bankable wind farm
Funded under the Call	H2020-EIC-FTI-2018-2020
Duration	36 months (January 2020 - December 2022)
Partners	3E, DTU Technical University of Denmark, nazka, SingularLogic, Politécnica, Universidad Politécnica de Madrid

Motivation

Facts & Statistics

Wind energy

- One of the most used **Renewable Energy Source (RES)**
- Emerging sector attracting **huge investments** for building **new wind farm** projects
- Essential pillar of the EU's energy Union vision



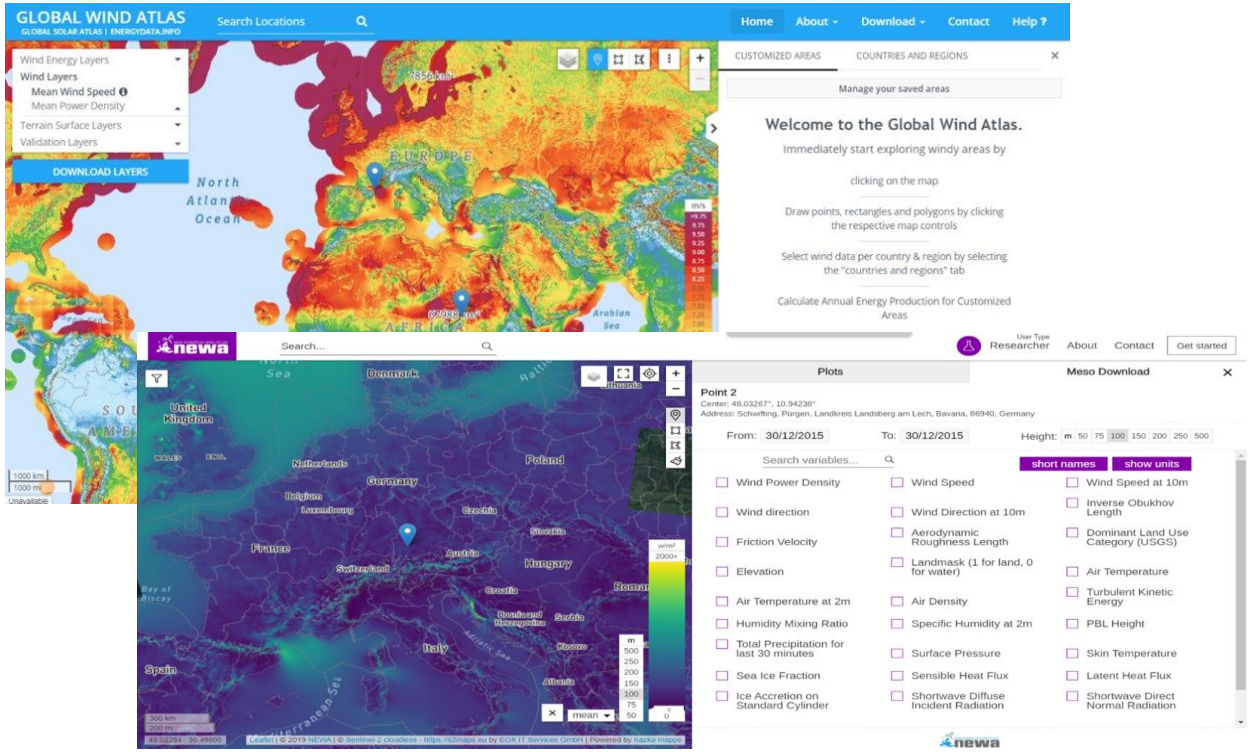
Data Source: Eurostat

Background & Challenges

Need for high accuracy maps

Existing Open Solutions

- Global Wind Atlas (GWA)
- New European Wind Atlas (NEWA)



Challenges in site identification

- Improve energy estimations
- Reduce time and costs

Project Goal

AI-Powered Wind Data Platform

WindSider provides an **automated** and **cost-effective** solution to generate **reliable** wind resource data and analytics to accelerate decision-making and **lower the risk** of building new wind farms.

Key Innovations

- Reduce processing **time** and **cost**
- Ensure **bankable precision**

Overall Approach

Built on three key pillars

Data Hub

On-the-fly land cover & roughness maps at **very high resolution**

Combining **Numerical Modelling** and **AI** in the **Cloud**

Smart Analytics

Extra **diagnostics**
Custom roughness maps
Wind index
Constraints mapping
Yield Calculations

Web Interface

Built upon **GWA & NEWA**
User **Personal space** & Dashboard
Embedded GIS capabilities
Smart **Analytics** modules

WindSider Cloud Orchestration

Containerized Architecture

Main design & evaluation principles:

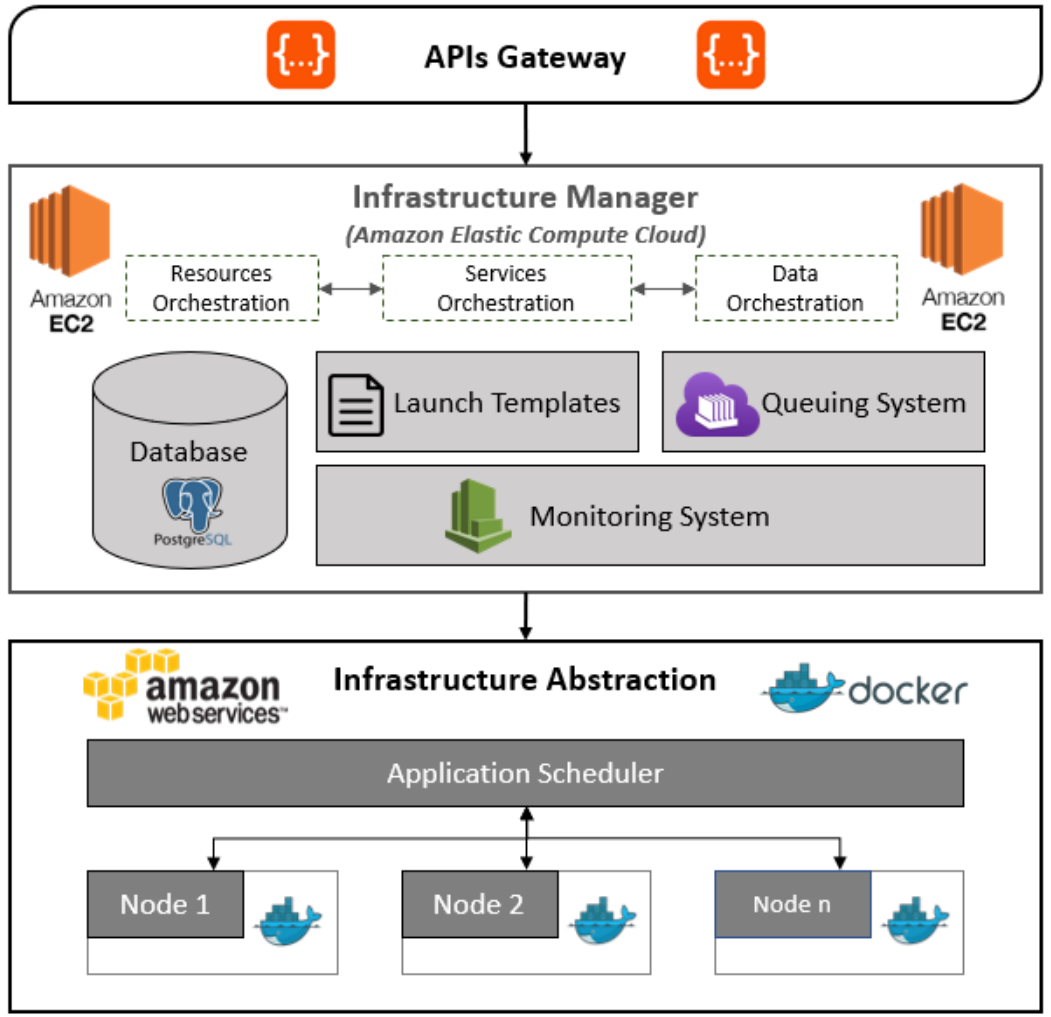
- Enable the dynamic, flexible cloud deployment of **containerized wind resource model chains** and Weather Research and Forecasting (**WRF**) jobs
- Interconnect appropriate **monitoring tools**, by enabling the processing of monitoring data, extracted from the cloud instances
- Define a set of specific, measurable, achievable and relevant **key performance indicators (KPIs)** to test and evaluate the proposed architecture

Cloud Orchestrator Overview

High Level Architecture

Cloud Orchestrator's responsibilities

- Handle deployment requests for WRF jobs
- Support multiple WRFJobs submissions through a queuing system
- Manage the lifecycle of a running job (Stop, Delete, Restart
- Manage the functional requirements of the jobs (total cost, total execution time etc.)

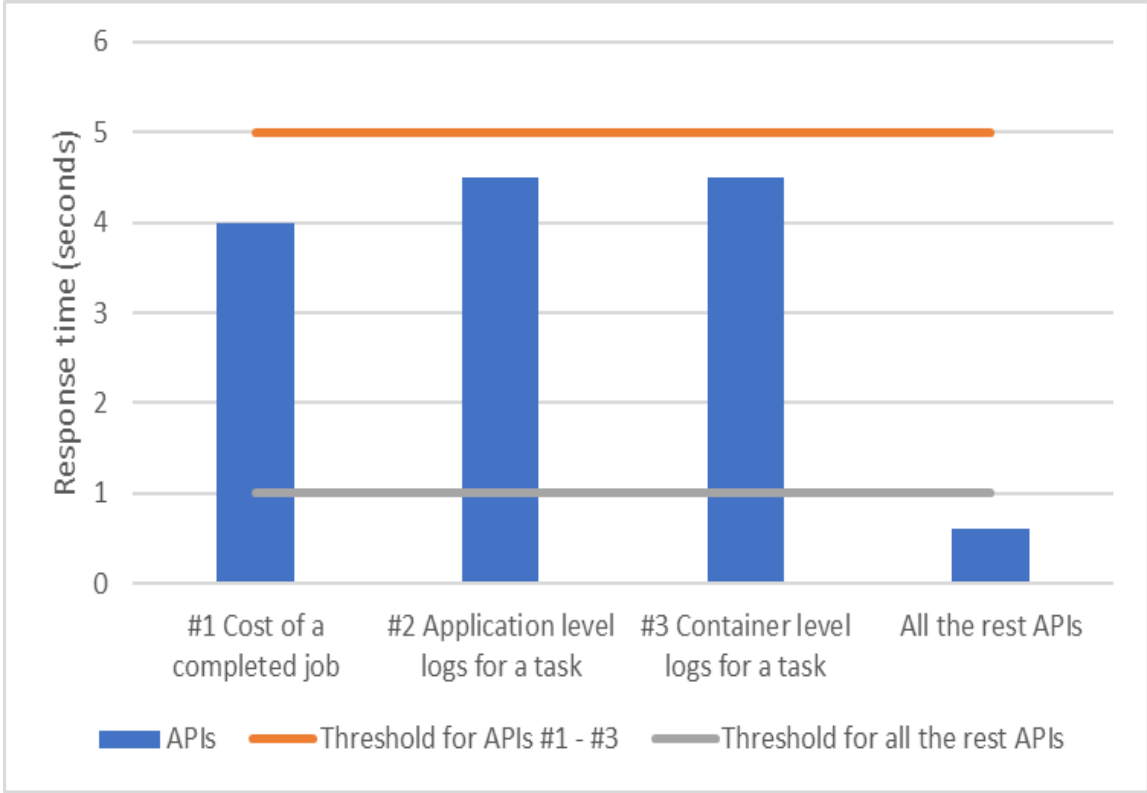


Evaluation Results

Performance Criteria

Full run of a **real WRF job**, 122 tasks have been deployed on AWS

KPI	Description	Goal
Latency	API to return the cost spent of a completed job	<=5s response time
	APIs to return the application and container level logs of a specific task	<=5s response time
	All the rest available APIs	<=1s response time
Completion time	Completion time is defined as the time a WRF job needs to be completed with exit code '0'	<=24h competition time
Deployment time	Deployment time is defined as the time an on-spot instance needs to be ready for a job deployment	<=5m deployment time



Next Steps & Outlook

Evaluation

Next Steps until the end of the project

- A **beta version** of the complete WindSider solution will be tested in close collaboration with **key industry partners**
- Perform **technical** and **business** evaluation

WINDSIDER

www.windsider.io

Thank you

3E

DTU Technical University of Denmark

nazka

SingularLogic

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