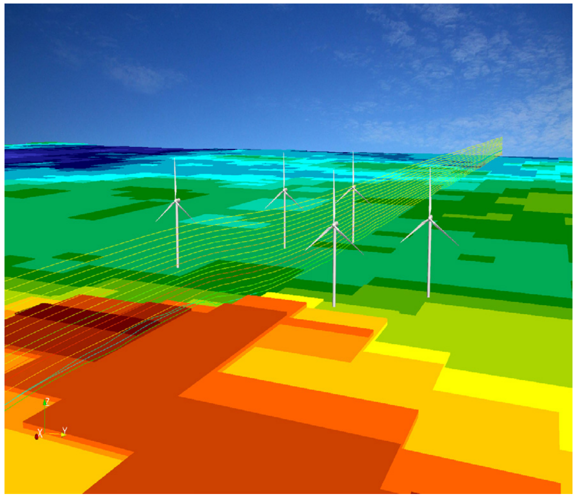
EULAG

Poznan Supercomputing and Networking Center (PSNC) applies HPC to predict the energy produced by renewable energy sources. For the existing wind turbines, the simulation provides a more detailed weather forecast to maximize the outcome of the power plant. It can also help in finding the most optimal localization of the wind turbines to maximize benefit from local topography and weather conditions.

PSNC simulations software uses HPC simulations to predict and forecast air quality in urban areas, modelling NOx, SOx, PM2.5 and PM10 concentrations in particular. The EULAG model allows different scales to be modeled, taking into account:

- Weather conditions, including forecasts;
- Different emission types: point, line, area, including vehicle types, emission based on land cover;
- Complex urban topography;
- Season differentiation

PSNC main goal is to ensure reliable, in-time and efficient air quality modeling and execution of energy production prediction in order to allow fine-grained optimization in future smart grids.



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http://www.recipe-project.eu/

RECIPE

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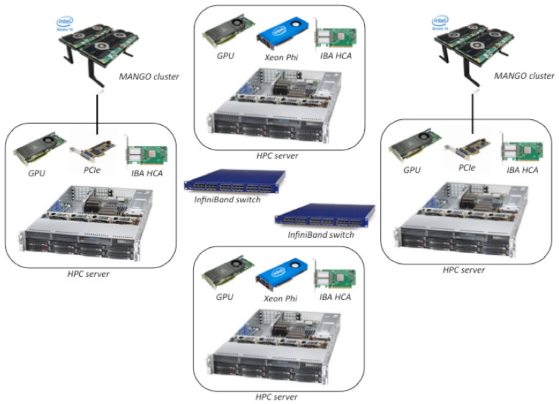


OBJECTIVES

RECIPE (REliable power and time-ConstraIn-ts-aware Predictive management of heterogene-ous Exascale systems) provides the tools needed to make the heterogeneous resources in future High Performance Computing (HPC) systems more robust and reliable.
The main goals are:

- 25% increase in energy efficiency
- 15% increase in mean to time failure
- Up to 25% improvement in energy-delay pro-duct
- Occurrence of fault executions reduced by 20% with recovery times compatible with re-al-time performance

PROBLEM and METHODOLOGY

RECIPE provides a hierarchical runtime resource management infrastructure to optimise energy efficiency and minimise the occurrence of thermal hotspots. This preserves the time constraints im-posed by the applications, and ensures reliability for both time-critical and throughput-oriented computation.
More powerful and less energy-hungry supercom-puters are needed.

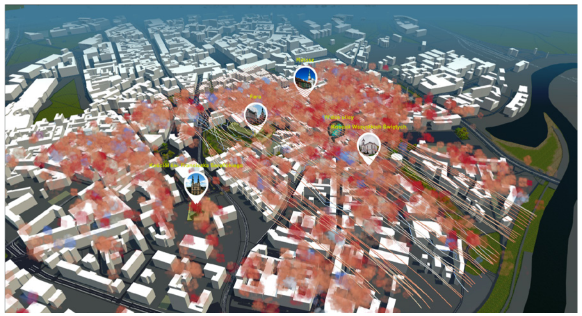
However, the supply needed to keep HPC centres running is about to exceed the capabilities of the power grid. We therefore need to exploit resour-ce heterogeneity. RECIPE provides the tools to manage these heterogeneous resources in future HPC systems.

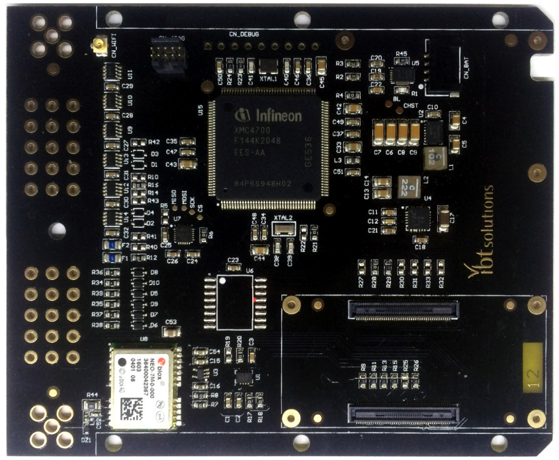
ENVIRONMENTAL MONITORING

Flood events are the most frequent and expensive manifestations of hydro-geological instability. Be-cause of climate change, by 2050 the number of flood events is expected to double, with devasta-ting effects on our ability to intervene and on our economy. Environmental monitoring is often ex-tended with numerical weather prediction (NWP) models, which can be used to predict the occur-rence and the range of the floods, and to optimize the behavior of power plants exploiting renewable energy sources (RES) such as wind turbines.

RECIPE aims at:

- Demonstrating the applicability of weather forecast in two application domain, i.e. water level prediction and RES;
- Showing that run-time resource management is of paramount importance to achieve relia-bilty and to satisfy timing-related performan-ce in a cost-effective manner.





H2Observer

IBTS designs a set of in-field deployable platfor-ms and a dashboard application to keep the sta-tus of water basins under control. The long-term goal is not only to monitor the status of rivers and canals, but also to :

- Improve the reaction speed to critical condi-tions such as floods by exploiting weather fo-recasts;
- Make the application running on the server more reliable;
- Create a repository with historical data for analysis and forecast collected through a flexible, easily deployable and low-cost sensor station;
- Create a control dashboard for different end-users

Interestingly, weather predictions are not merely used to enhance water level predictions, hence flooding. The data coming from the on-field sen-sors (water level, humidity, speed and direction of wind, etc.) can also be used to enhance the preci-sion of weather predictions themselves, thus crea-ting a very useful synergy.