sesamenet
SUPERCOMPUTING EXPERTISE FOR
SMALL & MEDIUM ENTERPRISE NETWORK

Examination of an airflow around tall building and bridge structure

HPC-Competence Center

Poznan Supercomputing and Networking Centre (PSNC) is the leading research and computing centre in Poland. PSNC has increased the availability of cloud computing and HPC tools, in the form of dedicated applications, web platforms, and by offering new services for optimizing time and costs of calculations carried out remotely by various partners, including SMEs.

PSNC

Enterprise

SOFiSTiK is a software company focusing in the area of structural and mechanical engineering. SOFiSTiK offers state-of-the-art software tools for structural engineering and CFD calculations, as well as fluid-structure interaction problems and energy-related design optimizations of structures and mechanical components.

SOFiSTiK Hellas A.E.

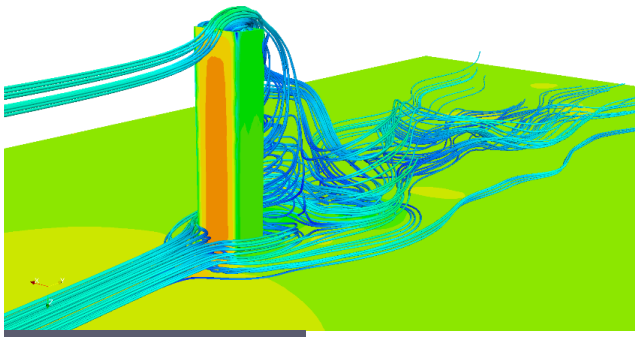
How HPC makes the difference

Numerical analysis of bridge structure stress is a complex task for engineers at the design stage. Regarding the need of analysis of structure strength, it is not enough to perform just structural analysis. It has also to be taken into account that wind is the key factor in stress applications.

From a computational point of view, the simulation of the wind load is the most demanding part of computations, as it requires the usage of a parallel solver to produce results in reasonable time.

An example of proper numerical solver dedicated to the analysis of wind loads of bridge structures is an application developed by SOFiSTIK. The example application is designed to examine wind effects on buildings structures through various weather scenarios. This solution is widely used in civil engineering with its main applications being: examination of the airflow around buildings, natural ventilation systems design and simulations of fire events in tunnels.

At PSNC, the application was used to simulate airflow around one segment of bridge structure and also an airflow around a tall building using k-ω-SST turbulence model in both analyses. All the computations were performed at PSNC Eagle and Inula clusters. Each computational domain was partitioned and around 100 and 60 CPU cores respectively were used.



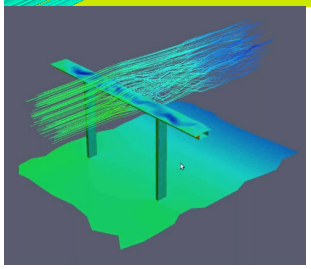


Fig 1 (above): Airflow streamlines behind tall building
Fig 2 (left): Airflow streamlines around bridge segment