

IRIS Explorer: Collaborative Computational Steering on the Grid

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Turning numbers into pictures is usually the easiest way of finding out what they mean. The art of creating figures or scenes from numerical data is called *visualisation*, and software packages for performing data visualisation have been with us for a long time. One such package is NAG's **IRIS Explorer**, which can be used to visualise data from a variety of different sources. Users of IRIS Explorer work with applications that are created from software *modules* by selecting and connecting them together via a simple point-and-click interface which makes it easy to create and modify programs.

The need for visualisation as a means of understanding data becomes even more important as both the amount of data and computer power increases. In addition, the processes which produce data are often no longer *static*, but *dynamic* in nature. Thus, for example, whereas in the past a scientist would want to display the end result of a simulation, now there is an increasing requirement for the real-time display of intermediate results as well. This can be even more helpful if the scientist is able to control the simulation by altering its input whilst the simulation is running, since information gained from the intermediate results can be used to direct the future course of the calculation – a process commonly referred to as *computational steering*.

A real-life scenario can be used for illustration. A factory has discharged pollutant from one of its chimneys, and decisions have to be made about the evacuation of the population down-wind from the factory. Scientists can run a numerical simulation of the dispersal of the pollutant in 3D, and so can make predictions of where the pollutant will be carried to by the prevailing wind, thus providing aid to decision-makers. Changing the speed and direction of the wind results in different dispersions of the pollutant, which can aid "what-if" analyses.

To be any help, the simulation must be carried out in better than real-time, which means the use of significant computing power – such as provided by, for example, the *Grid*, a network of compute resources over which applications can be distributed. The importance of visualisation as a tool for understanding the results has already been mentioned, but our scenario illustrates how there is sometimes a requirement for visualisation to be *shared* between users – for example, the scientists and the decision-makers, or the meteorologists who would be providing details of the prevailing wind.

IRIS Explorer is currently being extended to support scenarios such as this. Using its familiar point-and-click interface, users can start their simulation application on the Grid, display its results in real time and, if desired, interactively control the simulation by setting input values. In addition, because IRIS Explorer has supported collaborative visualisation for some time now, the display of the simulation output can be shared with multiple users. The end result is an improved understanding of the simulation, its data, leading to better informed decisions.