Foundations for the World Wide Grid

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The dream of using the internet to allow people to access as much computer processing and storage power as they need, when they need it, is a step closer thanks to European researchers.

Although a World Wide Grid running on top of the internet is still probably years away from being a reality, the grid, like the web before it, is starting to take shape between academic and scientific institutions.

Where the internet is a communications channel between computers, the grid goes beyond this by not just using the internet for communications but also as a means of sharing computing resources. Every computer and user can access and make use of the combined resources of the grid.

As things stand at the moment there are a series of isolated grids which allow the resources of clusters of computers, at different universities for instance, to be shared. Each of these grids is usually based on its own proprietary middleware which makes interoperability impossible. Middleware is a type of software which connects hardware resources to a grid.

There are different middlewares available, each tailored for different scientific, commercial or industrial usage.

Grid confined to experts

Another barrier to the development of the grid system is its difficulty of use, requiring as it does now knowledge of specialised computer

languages and coding skills.

It is against this background that the EU-funded g-Elipse project has been developing an easy-to-use, Windows-like graphical interface which allows access to grid resources with a few mouse clicks.

Says project coordinator Mathias Stümpert: "Entering and using a grid has been too difficult for most people, so we are developing a system which allows the ordinary student to use grid resources. Until now, these have only been available to academics and scientists able to enter complicated command lines. Instead of something that takes months to learn, we are developing a graphical user interface (GUI) which can be operated by anybody with a basic knowledge of computing."

The idea is to develop a system which is middleware independent, so a user can access any grid in exactly the same way using the same actions and commands on the GUI. The g-Eclipse system also aims to allow users to work with different grids at the same time and switch data between them.

New sort of browser

"You can think of g-Eclipse as a browser for what will become the World Wide Grid," says Stümpert. "It searches for and displays the resources that are available, and allows the user to access them. Complicated computing jobs which need more processing or storage than are available on the user's system can be sent to the grid. Data can be transferred from the local computer to the grid and workflows can be managed."

The project is making use of the Eclipse open-source ecosystem, which has thousands of developers and a very large user base and is host to numerous application development projects from around the world.

"We chose Eclipse as our medium because it allows us to create a user base and it also means anybody in the world can contribute. Eclipse projects are really transparent and open, more so even than Linux, and source code can simply be reused between Eclipse programmes."

"With support from the Eclipse Foundation we get a lot of functionality from the ecosystem and the use of a lot of infrastructure, such as software or code repositories. The project develops a life of its own which allows it to continue even after the EU funding has been spent," Stümpert says.

Middleware-independent architecture

So far, the middleware-independent g-Eclipse core architecture has been configured to work with two brands of middleware. Initially, it was assessed using the scientific gLite middleware which is used by European scientific institutions, but plug-ins have also been developed for the GRIA middleware which is in commercial and industrial use.

The system has also been configured for use with computing clouds, and specifically Amazon.com's Elastic Compute Cloud. Cloud computing allows firms which have installed computer capacity to cope with peak periods, such as Christmas, to hire the excess capacity out.

Site administrators expecting unusually heavy traffic can lease tens, hundreds or even thousands of virtual servers from firms like Amazon, for minutes, hours or days at a time as and when the extra capacity is required.

While other GUIs have been developed for this purpose, g-Eclipse is currently the only one allowing data to be transferred between the "real" world of grids and the virtual world of clouds.

Supporting other developers

"We are not just supporting the individual user, although we do already have a lot of new users sending their daily jobs to the grid, but also a framework that can be used for other developers to build their applications on." says Stümpert.

His hope is that the Eclipse community, having seen the value of the work to date, will continue to push back the boundaries with other developers plugging g-Eclipse into all the grids and clouds which connect to the internet.

"While at this early stage our users are mainly students, a few years down the road g-Eclipse could be a part of everybody's desktop. Perhaps there will be a layer in computer operating systems which allows applications to be executed on the grid rather than the local desktop."

If and when that happens, every PC user could well have access to all of the computing power and speed they could possibly require.

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Link: www.geclipse.org/

Provided by ICT Results