The coming generation of Internet applications promises to incorporate a distinctly different view of software, one based on services.

Liang-Jie Zhang, Haifei Li, and Herman Lam

Services Computing: Grid Applications for Today

Services computing is the evolution of Internet computing toward a services-oriented architecture. By *services oriented*, we mean that businesses will purchase functionality in chunks. Rather than buying software for permanent in-house installation, companies will buy services as needed, much like they pay for an airline ticket as opposed to having a company jet on standby.

A services model removes the burden of updates and patches from the IT department, returning such work to its rightful owners: the vendors that sell the software.

To support such a scenario, an architecture must embrace a new technology suite that includes Web services and a service-oriented architecture for grid or utility computing, and autonomic computing.

BUSINESS APPLICATION GRID

You might have read about *business grids*, the application of grid computing to business enterprises. Such an application aims to accelerate business processes, improve operating efficiency and productivity, and help organizations more quickly adapt to changing requirements.

As an emerging technology, business grids remain hazily defined in terms of research and development, tending to straddle many areas. One such area is sometimes called a *business application grid (BAG)*. In a BAG, the major focus is using the existing grid computing technologies to knit together all the company's machines—desktops, workstations, and servers—to do useful work during idle time or off hours. The focus is on solving some typically well-defined business problem, such as calculating monthly financial performance averages for a mutual fund, or getting the current weather condition by giving a particular zip code.

BAGs represent the first generation of grid computing. Although the computation and storage in a BAG are geographically distributed, control is usually centralized—one machine usually does all the synchronization and coordination. Another important characteristic is that the nodes participating in a BAG are not interdependent. This is an advantage because all nodes can work based on their own schedules and preferences. It also presents some disadvantages. For example, if one node has been assigned a time-consuming task, while another node is idle, it is not easy to dynamically balance the workload.

Many applications not generally associated with a grid can work on a BAG. IBM and Charles Schwab have applied grid computing to a financial services application (http://www-1.ibm.com/grid/pdf/schwab.pdf). By maximizing processor efficiency, this application can reduce the processing time on an existing wealth management application from 4 minutes to 15 seconds. Both companies are planning to leverage grid computing in other areas.

Another example comes from the highly competitive petroleum business; these companies are under pressure to reduce IT costs. However, petroleum exploration and production consume significant computer power. To make the situa-

1520-9202/04/$20.00 © 2004 IEEE Published by the IEEE Computer Society

tion worse, the amount of data gathered during the exploration and production has grown dramatically over the past few years. So oil companies are looking into grid computing as a way to reduce cost and improve performance.

Landmark Graphics, a company specializing in software for the petroleum industry, and United Devices, a provider of grid-based software, have collaborated on petroleum data processing for many years. Their results are impressive. According to Andy Lane, president and CEO of Landmark Graphics, "The cycle time for [oil and gas] field development planning and reservoir performance prediction can be compressed from months or years, to days or weeks" (http://www.ud.com/rescenter/files/cs_oil_ gas.pdf).

In summary, individual business applications supported by grid computing can solve some business problems. However, grid computing does not work well on business processes that require a significant coordination role. For example, design collaborations among multiple companies across country boundaries may not be easily solved by using BAG.

BUSINESS GRID MIDDLEWARE

Another area of research and development in business grids focuses on the development of middleware that will provide an IT-level infrastructure to support business applications. By IT level, we mean the infrastructure provides component services to support the composition, submission, deployment, and management of business applications. However, the infrastructure does not provide component services that implement business functions, such as credit card authorization and shipping-and-handling services.

One project that's developing grid middleware is the Japanese Business Grid Consortium, a group jointly funded by its industrial members and the Japanese Ministry of Economy, Trade, and Industry (http://www.globusworld.org/program/slides/3c_1.pdf). Industrial members include Fujitsu, Hitachi, and NEC. The project's stated goal is to develop key technologies for

- generic job support for online multitier applications, traditional computational batch jobs, and legacy applications run on a business grid;
- job portability support in the form of a standard job archive format;
- automatic program and user data deployment and configuration, including the necessary middleware (such as for a relational database management system or application server);
- policy-based self-healing and self-optimization management, including disaster recovery support; and
- interoperability with existing middleware for commercial system management.

To achieve these goals, the project aims to provide standard interfaces for business application software based on the Globus Open Grid Services Architecture (http://www.globus.org/research/papers/Final_OGSI_Specification_V1.0.pdf).

In this column, we've explained two facets of where services computing is today in terms of grid computing for business applications. Today, the focus is on leveraging existing grid computing technologies to take advantage of underutilized computing capacity to solve some business problem (as in business application grids) and to provide an IT-level infrastructure to support business applications (as in business grid middleware).

However, the ultimate goal of a business grid is to apply the utility model of grid computing. Doing so will provide a virtualized infrastructure to support the transparent use and sharing of business functions on demand, in an orchestrated manner. This will permit IT professionals to build a business solution that includes multiple coherent grid services and other grid resources to achieve a specific business goal. Our next column will discuss the work in progress to make that happen. ■

Liang-Jie Zhang *is a researcher at IBM T.J. Watson Research Center and chair of the IEEE Computer Society Technical Steering Committee (technical community) for Services Computing. Contact him at zhanglj@us.ibm.com.*

Haifei Li *is an assistant professor in the Department of Computer Science at Nyack College in New York. Contact him at Haifei.Li@nyack.edu.*

Herman Lam *is an associate professor in the Department of Electrical and Computer Engineering at the University of Florida. Contact him at hlam@ufl.edu.*

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