Chapter XXIX
Business Grids:
Grid Computing for Business Applications

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ABSTRACT

The following short chapter discusses upcoming opportunities for using research results and developments provided by the grid computing community in a business computing context. In particular, grid-based approaches may offer various opportunities to access compute and storage power as well as expensive organizational settings of business software dynamically, as need arises and grows. The chapter starts with an introduction and motivation, followed by a systematic outline of possible application scenarios. Finally, the relevant state-of-the-art in grid computing is reviewed in the light of the goals outlined before.

BUSINESS GRIDS: MOTIVATION AND OBJECTIVES

The market for business software applications is evolving rapidly, driven by an increasing need to make processes more agile and more effective as business strategies and operating models evolve, and also to reduce the total cost of ownership (TCO) associated with these applications. In fact, the speed and cost of accommodating business level changes within an ICT landscape will increasingly become a competitive advantage for businesses, and therefore ICT concepts and technologies that support this notion of an "adaptive enterprise" will be a competitive advantage for SAP solutions.

At the same time, the complexity of software applications has grown rapidly, to the point where future applications can no longer be built as monolithic silos. In response, many enterprise application providers, including SAP, have migrated to service-oriented architectures to provide greater flexibility and adaptability. This affects at least the application layer. However, this approach also presents greater challenges on providing and managing the supporting ICT infrastructures needed

to host, allocate, and execute these new applications. In this context, an infrastructure includes general hardware (CPU, memory and storage), local and wide-area networking infrastructures, and database implementations. The traditional methods of sizing and resource planning that were suitable for very large, but fairly standard and static, application configurations do not scale well to much more flexible applications based on SOA technology. This applies both during the initial deployment of a SOA-based solution and during its operational phase, if forced to "adapt" quickly to new business strategies.

We foresee two related technologies, namely grid computing and adaptive computing, as potential solutions to these infrastructure level challenges. Grid computing is now emerging from the research labs and starting to materialize into concrete technologies and products that provide greater flexibility and adaptability for software hosting and execution environments. Nevertheless, grid computing still primarily targets scientific domains rather than business applications. The Next Generation Grid expert group has developed a European vision for grid research to accelerate the evolution from tools for solving computation and data-intensive problems towards a much more general purpose infrastructure supporting complex business processes and workflows across virtual organizations spanning multiple administrative domains (see NGG, 2006). This vision is consistent with SAP's requirements for more flexible ICT infrastructures. At the same time, hardware vendors are providing a broad range of adaptive computing solutions based on concepts such as virtualization technology. At present these are well suited for a "general purpose" ICT infrastructure but are usually based on proprietary technologies and therefore lack the independency from hardware vendors, which has always been critical for SAP.

We have adopted the term *business grid* (Franke et al., 2007) as a vision for bringing together different aspects of adaptive computing and grid computing to build more effective and more efficient general-purpose infrastructures for hosting service-oriented enterprise applications. In effect, we foresee that business grids will extend the flexibility of service-oriented architectures from the application level to the infrastructure level, delivering a number of significant benefits to SAP, including:

• Being able to more flexibly adapt ICT solutions for businesses will not only strengthen the market position of SAP customers but also the market position of SAP itself, since flexibility of SAP solutions is a core requirement of businesses.
• Flexibility from the application level to the infrastructure level will become a cornerstone for hosting future SAP solutions.
• Reduction in TCO as well as an increased return on investment (ROI) and reliability arising from more flexible and re-configurable infrastructures will help open up the multi-tenancy and SME market for SAP.
• Improving the way SAP deals with non-functional requirements, especially performance and resource consumption, will be an important step towards an industrialized development of software and operation of IT solutions.

In summary, our motivation for business grids research is that it could significantly extend the flexibility of service-oriented architectures from the application level to the infrastructure level. The remainder of this chapter explores various aspects of this vision in more detail. We first explore the concepts of business grids by considering a number of different solution perspectives. Then we present an initial gap analysis that compares the current state-of-the-art in various grid related technologies, relative to the requirements of SAP for an adaptive landscape. Finally we outline

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