A Framework for the Provision of Network Quality of Service for Enterprise Resource Planning Systems

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ABSTRACT

This paper presents research into the use of network Quality of Service (QoS) technologies to improve the performance of Enterprise Resource Planning (ERP) systems. The paper explores state-of-the-art QoS technologies and implementations and provides a framework for the provision of QoS for ERP systems that utilize Internet Protocol (IP) networks. Four individual case studies, including both leading ERP vendors and network technology vendors, were conducted. Cross-case analysis confirmed that the traditional approaches for ensuring the performance of ERP systems on IP networks do not address network congestion and latency effectively, nor do they offer guaranteed network service quality for ERP systems. Moreover, cross-case comparative data analysis also reviewed existing QoS implementations and suggested that while QoS is being acknowledged increasingly by enterprises as an important issue, its deployment remains limited. The proposed framework focuses on providing a structured approach to implement end-to-end IP QoS that accommodates both ERP systems and their Web-enabled versions, based on traffic classification mechanisms.

Keywords: enterprise resource planning (ERP) systems; IP-based networks; network quality of service (QoS) technologies

INTRODUCTION

According to Kumar and Hillegerberg (2000), ERP systems are configurable information systems packages that integrate information and information-based processes within and across functional areas in an organization. Other definitions may differ in their wording, but a common theme surfaces upon closer inspection: the integration of enterprise information.

Traditionally ERP systems have targeted the large, complex business organization, facilitating the integration and the
flow of information between functions within an enterprise in a consistently visible manner. Even with the current movement of repackaging the ERP systems for small to medium enterprises (SMEs) by ERP vendors, the governing concept remains: how can ERP systems support the integration of enterprise information across functional boundaries in an enterprise across geographical boundaries for multi-site enterprises, or even across organizational boundaries in order to reach external entities, such as suppliers and customers. It has been suggested that IS academics have been asleep at the wheel of the ERP phenomenon, and most of the early research has not examined the implications and complexities of enterprise-wide information integration (Kumar & Hillegerberg, 2000).

To support enterprise-wide information integration, the enterprise network infrastructure should be considered a critical component of the overall IT strategy and ERP system deployments. This is due largely to the fact that modern ERP systems have evolved from the centralized mainframe systems to the more scalable client-server architecture. The client-server ERP systems are distributed inherently and, therefore, are capable of supporting large, multi-site enterprises. However, the ERP client and the server communicate with each other mainly through network connections, and the quality of the network connections, therefore, has a very strong influence on the stability and performance of the entire ERP system.

The quality of the network traditionally has been measured mainly in terms of bandwidth. According to Delcroix and Green-Armytage (2002), between 1998 and 2003, Wide Area Network (WAN) bandwidth use in multi-national companies was driven by Internet applications and database applications, such as ERP. In the 2002-2003 period, bandwidth requirements were being driven by increased used of these applications and by the natural growth of computer applications and graphical screen presentations.

Bandwidth, in general, is expected to become more of a commodity in the long term. In fact, enterprises already are enjoying the benefits of high-capacity Local Area Networks (LAN) at prices lower than ever before (Hiller, 2002). In the meantime, however, the WAN bandwidth price and the availability vary significantly from one location to another. Delcroix and Green-Armytage (2002) suggested that the long-distance markets offer sufficient bandwidth at acceptable prices in the United States and Western Europe. However, in less deregulated countries, bandwidth tends to be less available and hence more expensive. Enterprises constrained with IT budgets and local bandwidth availability will have to manage their network traffic effectively or face congestion on the enterprise networks. Globally, it has been predicted that some form of bandwidth management will be necessary during at least the next five-year period in order to bring bandwidth use in line with the acceptable cost for enterprises in various locations (Delcroix & Green-Armytage, 2002).

Furthermore, enterprises are experiencing heavy increases in bandwidth demand. A significant issue that leads enterprise network managers to doubt that the current enterprise networks will meet business requirements over the next two years is the continuing growth in volume of traffic. A study conducted by Ashton, Metzler & Associates and Sage Research (2001) showed that the vast majority of enterprises surveyed in the study has data traffic growing by 11% or more on an annual basis, and about a quarter of surveyed enterprises have data traffic growing by 51% on an
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