Editorial

Special Issue: Enterprise Networks

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Enterprise Networking is the interconnection of corporate, departmental, local, and remote computing and communications resources to create an enterprise-wide information utility. An enterprise could be organization, such as a business, government, administration, institution, etc., having business or other operating needs. The TCP/IP protocol is the internetworking protocol which glues together millions of computer and heterogeneous networks into one global Internet. It offers a number of services such as file transfer, remote login, mail and recently Web browsing. There has been a recent trend within enterprises to connect their computers using the TCP/IP protocol which will allow them to internetwork with the global Internet. The TCP/IP is a best effort datagram service. It does not provide any service guarantee and hence is not very suitable of real-time applications such as video conferencing. This special issue covers enterprise networking issues such as differentiated service for service quality guarantee in TCP/IP, access techniques that can be used to connect an enterprise to the global Internet, development of tools to monitor the performance of enterprise networks, caching techniques to reduce the access bandwidth requirements, use of ATM for connecting enterprises, and congestion control mechanisms.

The current Internet offers best effort service. It does not allow service differentiation. Consequently, real and non-real time traffic is treated equally. However, real time traffic (such as video conferencing) needs to be treated differently than non real time traffic. The Internet Engineering Task Force (IETF) has been working on the Differentiated Service for the future Internet. It will allow treating different applications with different quality of service in terms of throughput, delay, loss and reliability. Two new service classes have been defined in the Differentiated Service: the Premium and the Assured Service. The Premium service emulates a leased line, whereas the assured service emulated best effort traffic in a non-congested network. Non-compliant Assured Service packets are converted to Best Effort packets, whereas the compliant Assured Service packets travel through the network with negligible loss.

Bandwidth guarantees in the Premium Service can be implemented in the routers using scheduling disciplines. In contrast loss guarantees in the Assured service can be implemented using intelligent packet based discard strategies, such as Random Early Detection with In and Out (RIO) at the buffer. A number of enterprise networks are connected using a core network. To offer scalability, the core network looks at the aggregate traffic in each group. Since there are fewer connections (compared to the core network) in the router within an enterprise network, the enterprise network can provide quality of service to individual connections within the enterprise. The paper by Hou and Mouftah deals with performance evaluation of the Premium Service using an IP simulator developed by the authors.

Enterprises have traditionally been connected to the outside world using leased lines. However, the cost effectiveness of the ABR service of ATM makes it an attractive alternative to the leased line solution. Enterprise traffic leaving an enterprise through an ABR connection may occasionally encounter reduced bandwidth on the ABR link due to congestion in the ATM network. This may result in packet loss at the TCP/IP-ATM gateway. The paper by Hassan, Sirisena and Atiquzzaman proposes a rate control mechanism between the gateway and the host machine. The proposed mechanism reduces congestion and packet loss at the gateway. The authors have analyzed the stability of the feedback based rate control mechanism, and the mechanism has been found to be stable. The mechanism is expected to increase the performance of applications which have to communicate to hosts outside the enterprise.

Currently, a number of Intranet based enterprises are connected using Internet backbones which often employ ATM. A number of service categories have been defined for ATM. These service categories include Constant Bit Rate, Variable Bit Rate and Available Bit Rate services. The paper by Fahmy, Jain, Rabie, Goyal and Vandalore compares the ATM service categories in terms of cost, buffer requirements, and performance when carrrying Internet traffic. It has been shown that connecting enterprise networks by the Available Bit Rate virtual paths can guarantee quality of service, and minimize queuing delay at the backbone.

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Hybrid Fiber Coax based CATV networks can be used for bidirectional data communications. Such networks can be used to connect TCP based machines within enterprises to the global Internet. The paper by Chatterjee discusses the behavior of TCP over Hybrid Fiber Coax cable modem networks. The impact of a number of TCP and system parameters to optimize the performance in CATV networks has been studied.

There is a strong trend towards network based computing within enterprises. Performance of the network is crucial in the success of network based computing. This give rise to the importance of traffic monitoring and analysis tools for measuring traffic loads of individual network segments. The paper by Hong, Kwon and Kim presents the design and implementation of a portable Web based network traffic monitoring and analysis tool using a simple user interface. The tool can provide real-time and historic traffic monitoring capabilities within an enterprise. The effectiveness of the monitoring and analysis system has been demonstrated by applying it to an enterprise network environment.

The World Wide Web has become the de facto standard for disseminating information in the Internet. Caching of information (at the client) which has been fetched can improve the latency of Web browsing. The paper by Sun, Zang and Trivedi has reported on the performance improvement in a well-designed Web cache. They have shown that a well-designed cache can reduce the bandwidth requirement of the access link to almost half without compromising retrieval latency. Their results can be useful to enterprises which are planning to connect their Intranets with the Internet.

Extranet, or Extended Internet, is a private business network of several co-operating enterprises located outside the corporate firewall. Extranet services are based on the existing Internet infrastructure. An Extranet allows business partners, suppliers and customers who share common interests to form a tight business relationship and a strong communication bond. The paper by Pakstas presents results of the studies on the development of an Extranet for a high-technology science park. Experience in the development of the Extranet, security issues, and recommendations for running Extranets are presented.

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