

Chapter IV

A Framework for High-Speed Networking

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ABSTRACT

This chapter describes a detailed framework configuration infrastructure design for a high performance network. The configuration is described based on the new setup and migration requirements and it indicates how the design satisfies those requirements. The chapter explains the detailed configuration of the design process of the distribution layer switches and shows how these switches can be configured in the final implementation. The chapter also discusses the modifications that occurred during the implementation/migration phase. The design of the framework incorporates resiliency into the network core in order to manage problems effectively. This will enable user access points to remain connected to the network even in the event of a failure. This incorporation aims to provide services and benefits to users without impediments.

INTRODUCTION

A computer network is simply a system of interconnected computers. This chapter emphasizes on the design and implementation of one type of computer networks, which is the local area network (LAN). It is a group of computers and associated devices that share a common communication line or wireless link and typically share the resources

of a single processor or server within a limited geographic area. Usually, the server has applications and data storage that are shared by multiple computer users to optimize network traffic.

Network traffic has increased dramatically during the last few years due to the confluence of several factors (Regnier et.al, 2004). These factors are:

- Businesses are using networks to access resources, such as enterprise storage, that were previously directly connected.
- Web services and the World Wide Web have moved increasing amounts of business activity to a networked paradigm.
- Messaging is becoming a prevalent means of sharing data and services.
- Clusters-rather than large server systems-are becoming the default means of creating large computing resources.
- The sheer volume of data has risen dramatically due to the increased use of audio and video resources, and real-time data acquisition, including, especially, radio frequency identification (RFID) tag tracking.

Major local area network technologies include Ethernet, Token Ring, and Fiber Distributed Data Interface (FDDI). Ethernet is by far the most commonly used LAN technology. A number of corporations use the Token Ring technology. FDDI is sometimes used as a backbone LAN interconnecting Ethernet or Token Ring LANs. Another LAN technology, ARCNET, was the most commonly installed LAN technology, and is still used in the automation industry.

The Framework composed of a suite of application programs, which is kept on the LAN server. Users who need an application frequently can download it once and then run it on their local hard disk. Users, in each department, can order printing and other services as needed through applications run on the LAN server. A user can share files with others at the LAN server and a LAN administrator maintains read and write access. A LAN server may also be used as a Web server.

The proposed network design has a wireless LAN that is sometimes preferable to a wired LAN because it is cheaper to install and maintain. The implementation supports a Resilient Packet Ring (RPR), which is a network topology, developed as a new standard for fibre optic rings. The Institute of

Electrical and Electronic Engineers (IEEE) began the RPR standards (IEEE 802.17) development project in December 2000 with the intention of creating a new Media Access Control layer for fibre optic rings (Ward, 2002).

In order to provide readers with more information on network models, we sketch the interfaces, which identify seven layers of communication types as in Figure 1.

Each layer depends on the services provided by the layer below it down to the physical layers, which define network hardware such as the network interface cards and the wires that connect the cards together.

The network model shown in Figure 1 can be used as a background for the layered of hardware and software that handles packet processing. When a network interface card (NIC) receives a data packet, it initiates a series of interactions with the system processor to handle the data payload and deliver it to the appropriate application as in Figure 2.

The motivation is to design and build a network infrastructure to deal with scalability issues for a network to scale for future upgrade leveraging high speed Gigabit Infrastructure with ability to grow to 10 Gigabit per second. The result is that the framework will have a network ready for future technologies such as IPv6 and MPLS. Other motivation is the manageability power added to the network with enterprise management system, which will result in better productivity

Figure 1. The OSI network mode

Application
Presentation
Session
Transport
Network
Data Link
Physical

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