

Chapter VIII

Designing a Resilient and High Performance Network

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ABSTRACT

This article describes the detailed configuration and LAN infrastructure design at the University of Bahrain (UOB). The article describes the configuration based on the new setup and migration requirements and indicates how the design satisfies those requirements. The article 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 article also discusses the modifications that occurred during the implementation/migration phase. The design of the network at UOB campuses 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. The article emphasizes the design and implementation of one type of computer network—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.

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.

At UOB, a suite of application programs is kept on the LAN server. Users who need an application frequently can download it once and then run it on their local hard drives. 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 also may 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 to maintain. The implementation supports a Resilient Packet Ring (RPR), a network topology developed as a new standard for fiber 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 fiber optic rings (IEEE, 2000).

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.

Figure 1. The OSI network model

Application
Presentation
Session
Transport
Network
Data Link
Physical

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.

The motivation is to design and build a network infrastructure to solve scalability issues for a network to scale for future upgrade leveraging high-speed gigabit infrastructure with the ability to grow to 10 gigabits per second. The result is that UOB has a network ready for future technologies such as IPv6 and MPLS. Another motivation is the manageability power added to the network with an enterprise management system, which will result in better productivity of the IT staff, faster fault isolation and response, as well as proactive management planning for future applications.

The rest of the article is organized as follows. The second section provides background details on the UOB network organization; related work to high performance and resiliency has been discussed in the third section. The fourth section discusses the physical connectivity and topology of the network at UOB; the fifth section provides discussion details of WAN connectivity. The IP addressing and VLANs—layer 3 design—is outlined in the sixth section. The seventh section discusses network management issues at UOB; and the eighth section gives a brief conclusion with some discussion of future research directions in this area.

BACKGROUND

The Internet is a network of networks, and it is not a network of hosts. For example, the UOB network is connected to one of the Batelco networks, which has a backbone that is connected to other networks. This concept is outlined in Figure 2.

This research study describes a project that aims to design and implement a LAN infrastructure for the UOB upgrading from the legacy ATM network to a state-of-the-art gigabit and

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