STATUS OF COMPUTER NETWORK UPGRADE AT THE NSCL

Kevin Behrooz, Ron Fox, Barbara Pollack

Introduction

In this paper we will discuss the status of high-speed computer network backbone in the lab. NSCL has employed a dual ring FDDI as its internal backbone. At various concentration areas Ethernet switches were put in place to provide segment switching and connectivity to various segments and repeaters. While the FDDI backbone has worked very well in our lab for many years, it is becoming obsolete because of its limited bandwidth. New applications demand high-speed connections to the servers and desktop computers, which in turn make the backbone congested. A new scalable computer network backbone needed to be created to deal with the bandwidth problem.

Comparison of Available Technologies

Four alternative backbone technologies were considered.

1- Switched FDDI: This solution was costly; it did not scale well and functional workgroups were required to be in the same physical area.

2- Full duplex fast Ethernet: While this was the least expensive option, it did not provide the necessary bandwidth and scalability.

3-Gigabit Ethernet: At the time of writing this paper gigabit Ethernet standards do not cover the needed distance and the media. Furthermore, many vendors do not offer switches with gigabit Ethernet uplink ports at this time. Finally, gigabit Ethernet is not scalable to higher bandwidth.

4-ATM: While ATM has been around for many years in Wide Area Networks, its emergence as a high speed LAN solution is something very new. However, because of its excellent scalability, high speed, and the possibility of using Quality of Service (QoS), it was seriously considered and chosen as the future computer backbone at NSCL.

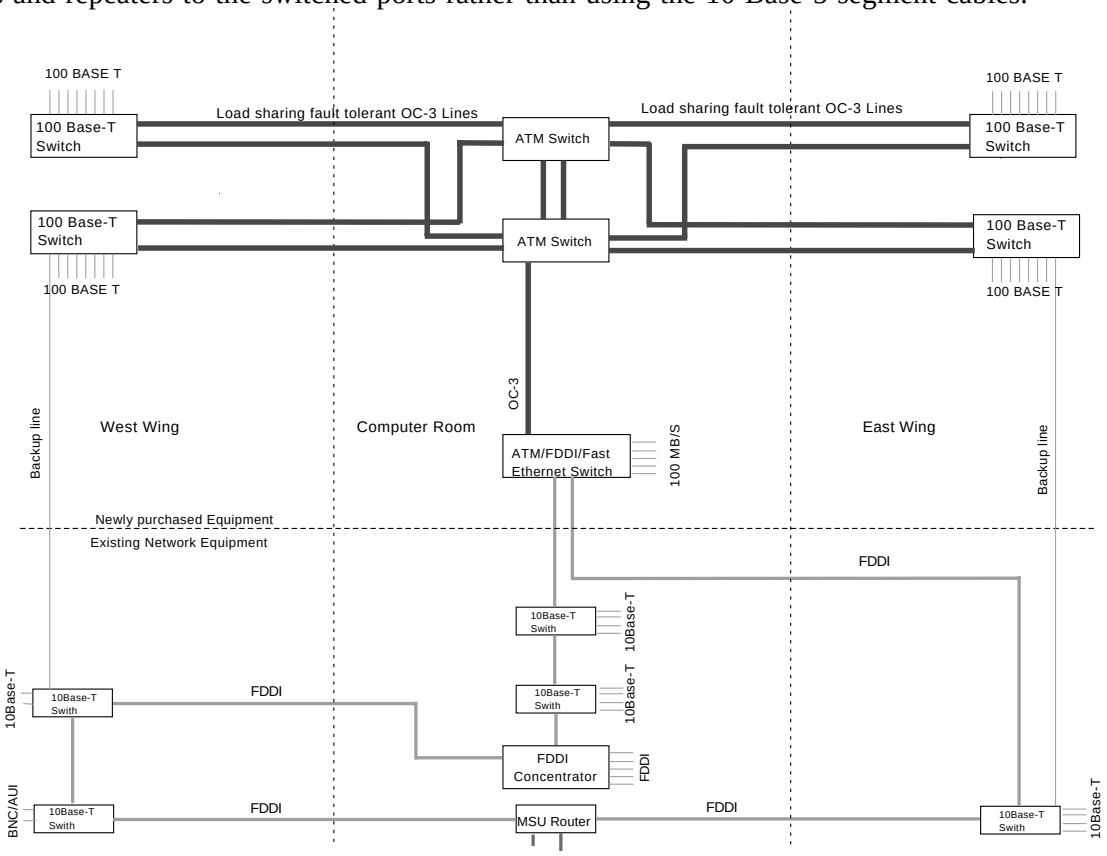
Implementation

Using matching funds from Michigan State University, we purchased a few ATM and Fast Ethernet switches with dual, load sharing, fault-tolerant ATM uplink ports. The new backbone runs in parallel with the older FDDI ring. A high-speed switch provides FDDI to ATM switching to maintain the connectivity between the old and the new backbones. Since ATM is essentially a point-to-point protocol, we have implemented distributed LAN Emulation (LANE) to provide for broadcasts, multicasts, and other connectionless requirements of traditional LANs. The following figure shows the configuration of FDDI and ATM backbones at NSCL.

At this time our new ATM backbone provides 310Mb/s bandwidth using two OC-3 lines. This set up is easily scalable to a pair of OC-12 lines to provide 1.24 GB/s if needed. At the time of this writing OC-48 ATM switches are commercially available; therefore, it seems scalability of our backbone will not be a major issue in the next few years.

Other improvements

While upgrading the backbone was necessary, other improvements needed to be done in order to utilize the newly available bandwidth. Many offices are being re-wired with CAT-5 grade 7 cables. This will provide high-speed network connections to the desktop computers. Furthermore, some of the old 10 base-5 segments need to be converted into collapsed micro segments. This will be done by connecting the nodes and repeaters to the switched ports rather than using the 10 Base-5 segment cables.



Conclusion

In this paper we discussed the implementation and deployment of ATM as the next generation of computer network backbone at NSCL. ATM was chosen over the other alternatives because of its high speed and scalability. While ATM standards for Quality of Service has existed for some time, the number of desktop applications utilizing QoS has been minimal. It remains to be seen whether we can use any of the QoS features of our ATM backbone.