D56 General Paper

Time Allowed: 2.5 hours

Answer All Questions

Answer all parts of the question

A large UK metropolitan university is currently carrying out a major upgrade to its IT infrastructure.

Historically its activities have been grouped around a central area where most departments are located (central precinct). Over the past 10 years there has been rapid growth outside of this area, and the administrative functions are carried out in a building 100m away, some academic departments are outside this area too. Altogether some 50 buildings within a radius of 400m of the central precinct are used for teaching, administration and research. A new medical block is being built within 200m of the precinct and this will house 500 staff and teaching facilities. There are two facilities that are about 60km away to the north and south. Departments range in size from 10 staff (teaching, research and administration) to 100-150 in larger departments. Overall, there are about 13,000 taught students, 800 research students, 2,000 academics, and 6,500 staff in all (including technical and administrative support staff and research staff).

At present the university's network infrastructure is based on a single FDDI network in the central precinct connected to routers acting as firewalls to departmental networks. The closer buildings in the vicinity are connected to the routers via ducts owned by the University; the more distant buildings use commercially provided links. Departmental networks use 10baseT, 100baseT technology into local hubs as well as coaxial distribution in some cases.

Student computing is provided in a number of cluster rooms containing 30-40 machines running Windows 3.1 with applications and user data being provided from networked file servers. This same service is provided to 1200 staff although for staff the servers are located in the computer centre. Some of the larger departments run their own services and cluster rooms for teaching, and many research groups run their own computing facilities, typically 5-20 workstations based around a server. These departmental and research group services are independent of the central service, except that they need to use network services for e-mail and access to external resources. Departmental facilities may be running any of a number of operating systems: Unix variants, Novell, Windows 3.11, Windows NT, etc.

The university's objective in developing its facilities include:

- Providing network capacity to keep pace with increasing demand over the next 10 years
- Providing a network infrastructure capable of managing security
- Providing a flexible and easily manageable network infrastructure
- Providing robustness against common failures including electricity supply, air conditioning, flood and theft.
- A phased upgrade of centrally provided computing services from 16-bit Windows 3.1 to Windows NT, initially based on a number of "Windows Terminal Servers" to run the applications. This approach is expected to reduce the immediate capital expenditure since many of the PCs are less than two years old.
- Integration of computer registration across all systems to ease the problems of sharing files and other services.

- Extend services so that authenticated and encrypted materials may be communicated between staff.

TURN OVER

1. What are the technical and managerial challenges that a system designer would face if the above objectives were to be accomplished by 2005? You might like to consider at least the following areas:
   - Network infrastructure, including that in machine rooms, the backbone and distribution to user machines
   - Network management. (Wireless communication should be discussed in dealing with these two points.)
   - Delivery of digital audio visual material for personal and class-based teaching and learning
   - User management including support for authentication and encryption
   - Access to shared resources in different administrations, e.g. files, printers, WTS sessions, Unix sessions etc.
   - Any experiments, data or feasibility studies you would recommend before design decisions are finally made
   - Managing user expectations and user support.

   [50 marks]

2. Given the challenges that you identified above, propose appropriate solutions (specify protocols where necessary) and how they should be rolled out bearing in mind the existing infrastructure base, usability and cost at each stage. [50 marks]

All answers should be justified. State any assumptions that you make, and in cases where you do not believe you have sufficient information you should state this and indicate how you might obtain it.

END OF PAPER

D56 Outline Answer

The aim here is to get the students to think about the complexities of modern networked computing where a large variety of needs exist, the technology and standards are very fluid and yet wrong decisions can be very expensive mistakes. Also corporate systems require integration of disparate administrations without seriously inconveniencing users or making the systems management too unwieldy. A thoughtful essay exploring these issues is required, based on the prompts given in the question.