Bentley College

CS640 Telecommunications Network Architectures

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Team Project #2

100 points

Description of the company

Taito Inc. is a mid-sized information systems and networking software development and consulting firm that has its headquarters in Burlington, MA, and other offices in Cambridge, MA, Arlington, VA, San Jose, CA, Austin, TX, and Chicago, IL.

In its Burlington headquarters, Taito has about 250 employees. In spite of the recent downturn in the economy, Taito is growing rapidly and will be moving to a new building, in which Taito will be renting four floors. Floor A is reserved for top management, marketing, and sales (including product demonstrations); only about 50 employees work on this floor. Floor B is used by the 75 employees of the administrative functions (finance, accounting, and HR), and Floors C and D are utilized by the consulting/software development teams. The building has been wired according to the ANSI/TIA/EIA-568-A standard so that on Floors A and B each workspace has two data ports and on Floors C and D four. In addition, the product demonstration space has 40 ports for demonstration equipment. Multimode 62.5/125 µm fiber is used as backbone cabling and UTP Cat 5e for horizontal runs. Workstations on Floors C and D and in the product demonstration space should have faster network connectivity than other users. Each floor has two telecommunications closets because otherwise the horizontal runs would be too long; in addition, Taito's new premises have on Floor D an equipment room that is next to the new main data center of the company.

Currently, Taito has separate e-mail, file/print, database, application, intranet, development, and product demonstration servers, which are all located in the data center. The database and application servers are used only by the administrative employees, and the others should not have access to them; any application that is available to all employees runs on the intranet server. The development servers are used exclusively by the consultants/software developers at the headquarters, but the intranet, file/print, and e-mail servers should be available for all company employees regardless of their physical location. Taito has outsourced its web hosting to an internationally known Tier 1 Internet service provider headquartered in the greater Boston area, and the company uses this same provider as its ISP. The headquarters is connected to the ISP using

three T-1 connections leased from the local ILEC.

The Cambridge, MA office consists of 75 employees located in a renovated factory building; all employees are on one level. This office focuses on the development of packaged software products, a new product line that the company has not released yet, and the security requirements are very strict for this office. This office has its own file/print and development servers in a small local data center; the developers and development managers in this office have the high fast network connectivity requirements as consultants and developers on Floors C and D of the headquarters have. Cabling is up-to-date also in this building.

All other offices are significantly smaller than the offices in Massachusetts, and they have between 20 and 30 consultants. These consultants are currently using the file/print, e-mail, and intranet servers in the headquarters. The Chicago and Arlington offices are located in old buildings and they are still using 10Base-2 coaxial cabling to provide network connectivity

All branch offices are currently connected to the headquarters using a Frame Relay link and get their Internet connectivity through the headquarters. The CIRs are as follows: Cambridge - HQ 1.5 Mbps, Arlington - HQ 128 Kbps, San Jose - HQ 256 Kbps, Austin - HQ 128 Kbps, Chicago - HQ 512 Kbps. Particularly the users at the Cambridge office have experienced serious performance problems recently, and all users are complaining that they do not have fast enough Internet connectivity.

Your task

You have been hired as a networking consultant to provide Taito, Inc. with a justified recommendation to address the following questions/problems:

1) Network design for the new headquarters, including the main data center.

2) Connectivity between the headquarters and the branch offices and other aspects of overall network architecture (including possible changes to the physical infrastructure at the branch offices).

3) Internet connectivity.

4) New, innovative applications that utilize networking technology and have a potential to improve the effectiveness and efficiency of Taito's operations.

Your recommendations should be as detailed and concrete as possible and include your choices for all the network devices and services that are required to make the system work. Various vendors on the Web provide detailed pricing information for a variety of networking products, and you should utilize this information in your research. Use diagrams to clarify your designs. Demonstrate the viability of your proposed solution with an OPNET simulation.

Your report should fulfill the requirements of a professional consulting report both in terms of content and its layout and language.

Assumptions regarding the traffic

When evaluating the traffic patterns, you can make the following assumptions (which, understandably, do not correspond to any specific real-world situation):

a) Each employee receives on average 100 40 KB e-mails per day and sends, on average, 20 20 KB e-mails per day. 80 of the received messages are from outside the company and 5 of the sent message leave the company.

b) Each employee retrieves, on average, 250 10 KB intranet Web pages and 400 300 KB Internet Web pages per day.

c) Each employee saves, on average, 150 times a day a 200 KB file on the file server.

d) The administrative employees communicate with the application server, on average, 500 times per day. The requests are, on average, 250 bytes long, and the responses 10 KB. Each application request generates, on average, 3 communication events with the database server, each of which has a 150 byte request and 5 KB response.

e) An average developer communicates with the development server 150 times per hour; the average size of a request is 200 bytes and a response 250 KB. This applies to developers both in Cambridge and in Burlington.

You can assume that the requests are uniformly distributed over the 8am - 8pm workday (it is, of course, totally unrealistic to think that employees would end their workdays by 8pm, but we need to make some simplifying assumptions).