

Homework 10
1.264, Fall 2006
Communications, and software process
Due: Thursday, December 7

A. Communications

Your chemical manufacturing Web ordering system is planned for implementation in 9 months, after three more spirals with a larger team. You've been asked to design the communications network to support the system.

The staff that will be placing orders is:

- 25 users in Houston, TX
- 20 users in Newark, New Jersey
- 10 users in Detroit, MI
- 10 users in Los Angeles, CA
- The users above are employees of a chemical broker who acts as an intermediary and consolidator; the employees work from offices at these sites. Mobile and offsite use is minimal.
- All the offices above are within 3 miles of a telephone central office. They are all served by LEC and CATV carriers offering point to point T1, DSL, MAN Ethernet, cable modem and frame relay services
- Customers place about 3,000 orders per day
 - 10% of the orders are entered directly through the Web site
 - 90% are entered by brokers; the customer has phoned, faxed or emailed information to the broker, who consolidate orders, arrange shipping and insurance, negotiate freight rates, and "guarantee" lowest delivered prices

The servers will be located in the New Orleans, LA headquarters of your company, which has a connection to the Internet to handle orders entered directly through the Web site.

You must configure the network connecting the offices in Houston, Newark, Detroit, Los Angeles and Boston.

- a) Estimate the traffic from each site. Assume each broker handles roughly the same number of daily transactions and queries. All Web queries go to the New Orleans server directly; estimate its Web volume separately.
- b) Select the wide area network (WAN) technology and protocol that has appropriate bandwidth and security for each of the links between remote offices and the New Orleans HQ
- c) Select the access technology from the office to the WAN point of presence. (This may be the same as the WAN technology or not.) The New Orleans HQ also needs an Internet access link; choose its technology. Again, consider bandwidth and security.
- d) Select the local area network (LAN) technology and bandwidth for each office.
 - While costs are not part of the homework explicitly, choose the lowest-bandwidth, most efficient solution that you can find for the WAN. The LAN

- can be oversized at little cost, so the actual choice would probably be a higher bandwidth option, but compute the minimum bandwidth required.
- For New Orleans, decide if one LAN is used for the office and the servers, or whether two are used, from both bandwidth and security perspectives.
- e) Recommend a strategy for providing network redundancy in case of link failure. You may recommend a public network, or a redundant topology for a private network, or a hybrid strategy.
 - Make a recommendation for redundancy for the New Orleans Internet link as well.
 - f) Discuss and recommend an option for a remote, mobile (laptop or Palm PC) user with intermittent connectivity to the network, to be used by mobile employees, as a future plan. Consider wireless data, dialup or satellite options.
 - g) Draw a network diagram; label the technology, protocol and bandwidth of all links. Define all nodes (routers, firewalls, load balancer, switches, etc.). Show the servers and clients at each site. Use Visual Paradigm; choose a convenient diagram type.

Analysis assumptions:

- h) You do not need to consider your voice traffic, only your data traffic. Assume an 8 hour workday during which all broker traffic occurs, with a peak data rate 10 times the average data rate. This is a very sharp peak, but often occurs at the start of the day, immediately before and after lunch, and at the end of the day.
- i) Assume that orders are 43% of all traffic and that other data is 57% of traffic, consistent with TPC-C benchmarks for order entry applications. These other transactions include status queries, reports, shipment notices, etc.
- j) Assume that an order is 4000 bytes (4kB) of data as a worst case. This is a long order, with long product names, and associated headers, XML tags, etc.
- k) Ignore email traffic, Web surfing by employees, etc. in this analysis (though you have to consider them in real life).

You'll find the core bandwidth requirements to be modest.

B. Review of Development Cycle 1

Take out your homework 2 solutions and revise them to reflect the knowledge gained from doing the first cycle of development. Don't rewrite the document; just make changes, additions or deletions to reflect what you've learned. They can be brief; they can refer to homework sets 3-9 as needed.

Please put in revised screen shots from your Dreamweaver Web site to replace the initial Web pages in your homework 2 solution. Also, revise your estimate of the number and complexity of Web pages to implement your requirements.

Hand in the revised requirements narrative document. Keep it the same length and organization as your original document. Update the user interface, process descriptions,

resource estimates, etc. Change the error bounds on the resource estimates to reflect the later stage of development.

While you would normally include the UML models, data model, sample database and prototype Web application in the revised requirements (and/or design documents), assume that they are available and will be delivered to the management as separate documents, to which you may refer. Thus, you should assume that homework sets 3-9 are being handed in to the management as well, and that they have been appropriately edited. Again, revise only homework 2.

Add two pages of comments at the beginning of your revised requirements, addressing the following questions:

- What do you believe the outcomes of development efforts would be in the following two cases:
 - Contracting development of your system to a vendor based on your original homework 2
 - Contracting development of your system to a vendor based on a package containing your homework sets 3-9 and revised homework 2
- Do you feel that the error bounds on the resources for the next cycle are reasonable? Do they reflect the uncertainty that has been removed by the first cycle of the spiral model?
- Do you feel the current requirements can be translated into a design and system with low risk, or are there still substantial elements of uncertainty? If so, identify the substantial elements of uncertainty.

Hand in the revised requirements document as a Word document to the Stellar Web site.