1. A large financial news organization wishes to build distributed middleware system specifically to allow the construction of financial applications operating over the Internet. End users may be consumers, businesses, employees, or anyone else connected to the institution via the public Internet, an intranet, or an extranet. The platform must support services such as streaming market data, static/snapshot market data, transactions, and custom publish/subscribe applications. Taking the components individually:

- *Streaming Data System*
  This is intended to allow end users to receive standard streams of data on prices or events of interest. Updates are 'pushed' to the end user, using multicast where appropriate.

- *Static Data System*
  This is intended to allow data to be delivered to users via a 'pull' model (i.e. request/response).

- *Publish/Subscribe System*
  This is where information or events are pushed to a client, but the information is filtered according to criteria they have specified in advance.

The intended users of this system will be connected via links of widely varying quality of service. Thus, the system should allow event-driven or scheduled information updates to be delivered to end users via pagers, cellular phones, personal digital assistants (PDAs), or email, as well as over higher bandwidth Internet connections. Furthermore, the system should scale to hundreds of thousands of simultaneous users spread across the globe.

a) 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:

  o Network infrastructure and protocols
  o Network management
  o Wireless systems issues including, but not limited to, support for disconnection and power saving
  o Scalability
  o Availability
  o User management including support for authentication, encryption and billing
  o Managing user expectations and user support. [30]

b) 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 likely market, usability and cost at each stage. [30]

2. Your friend Alice believes that a particular piece of software used on many Web sites is insecure. The software allows access not only to the Web page, but also to other parts of the site's computer systems. Alice has written a program that would probe Web sites to check if they are vulnerable to fairly simple hacker attacks.

Alice is thinking of running her program on a large number of Web sites and publishing a summary of the results (without mentioning sites by name) to alert the public and the business world to the problems. She asks you for advice.

a) What are the relevant risks, responsibilities and obligations? [10]

b) Give at least one argument for each of the three positions: that Alice's plan is professionally and ethically obligatory, that it is acceptable, or that it is ethically prohibited. [10]

c) Finally, compose a reasoned letter to Alice that outlines the category into which you think her proposed action falls. [20]

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