

Design Proposal {January 18, 2013}

42 Points

Due: Tuesday, January 29, 2013 at 10 a.m.

Program 1 involves the implementation of a primitive application layer on top of an emulated three-layer protocol stack. This related assignment is to submit a design proposal in a technically professional style. The paper must be typed and is not to exceed 25 pages (not counting diagrams and figures).

[Required Team Design Meeting Deadline: **Thursday, January 24**]

Your first task, once teams have been assigned, is to schedule one **required design meeting** with Professor Kinicki to ask questions about the details of the project. The four key points to focus on in your design report are: a **detailed** specification of your proposed application layer protocol; a thorough explanation of the data structures and **communication mechanisms** you propose to use at the layer interfaces (e.g., processes or threads, shared buffers between layers, signals, semaphores); a **preliminary plan** for the implementation of your database; and a **clear**, preliminary discussion of the implementation of data link layer sliding window mechanism.

The Application Layer

Generically, your application layer implements an interactive request/response protocol, and you must support at least **two concurrent clients**. The client abstraction implies reading commands from standard input, handling any auxiliary inputs (e.g., reading in photo files), preparing the appropriate server requests, sending the request as an application message to the server, and handling the various responses returned by the server. Most server responses can be directed to standard output (namely, the screen), but special consideration must be given to saving a downloaded photo to a file prior to displaying it on the screen.

The project team **MUST** propose, design and implement their application layer. Your proposal includes an explanation of the primitive functionality of both the client and the server that you will support and the detailed **specification** of your application protocol. You must specify valid commands that the client accepts as input, the meaning of the command request to the server, and the server responses. Your protocol must support at least **six** distinct commands, although more than six are likely. Your commands should include at least one large transfer in both directions (i.e., transfer of a photo file).

You are free to design your application layer in terms of the ‘messages’ sent to the network layer. However your design must be able to handle sending a photo as part of a message in both directions.

If the server encounters an application level error while processing a request, it returns an appropriate error message. Given the limited time to complete this project, you can make

‘reasonable’ assumptions about what input errors your application interface will handle and those errors it will assume cannot happen. Clearly state these assumptions in your proposal.

The Network, Data Link and Physical Layers

Many (but NOT all) details for these three layers have been specified in the Program 1 assignment. Your design report needs to specify the missing details that will be in your design.

The **key design decisions** for this project involve your design choices for communication that will dictate the specifics of the interfaces between the layers and the concurrency control mechanisms that you employ (e.g., semaphores, shared memory, pipes, processes and/or threads). Your design proposal must identify your choices. **Warning: do not get too fancy by using techniques that are overkill or mechanisms you have not used previously.**

Test Data and Live Demo

Since each proposal will be unique, it is each team’s responsibility to provide interesting and meaningful test data to demonstrate that your project works. Each project will require a one hour demonstration to show how much of your project works. If the final project turned in does not work completely, then you must provide mechanisms and test data that show which modules work properly. At the live demo, you must include a file with your documented source code, your **original** graded design proposal, and an updated addendum that identifies changes in your final design and a README file **clearly states** the functionality that works, works partially or does not work at all.

Output

It is a good idea to implement your project with a debug (or verbose) mode that outputs a very detailed trail of exactly where your clients and server are during execution. However, you want to be able to turn this off for the final demonstration. In conjunction with your debugging, you also need to provide statistics gathering functionality for your concurrent server and all executing clients. These statistic gathering components may or may not be separate processes, but it is quite useful for the demo that these monitoring functions output **ongoing information** into separate windows. The following are a list of “suggested” monitoring statistics that your programs should provide. You may want to add additional monitoring information that is specific to your proposal:

1. the total number of data frames transmitted successfully
2. the total number of data frames received successfully
3. the total number of data frames received with errors
4. the total number of ACK’s transmitted successfully

5. the total number of ACK's received successfully
6. the total number of ACK's received with errors
7. the total number of duplicate frames received.

You **must provide** the server response time for each message issued by a running client.

Grading of the Design Proposal

Each design proposal will be graded based on basic technical writing standards including: organization and structure, proper grammar, formal presentation style, typos and misspellings, clarity and completeness of the design proposal and clarity of the writing style.

Your report must include: the specification of the application protocol that includes command syntax and parameters, a complete discussion of the concurrency and the layer interface issues, an outline of the organization of your database, a preliminary discussion of your data link layer sliding window mechanism, a diagram illustrating the components and interfaces of your design, a table that clearly allocates the work among the three team members, a tentative milestone schedule and a list of references or bibliography.

It is critical that a **hardcopy** of your design report is turned in as soon as possible.