

CPRE 416: Software Evolution and Maintenance Project 2 (100 points)

Assigned: November 16, 2005

Due: December 2, 2005 at the beginning of the class

Name: Fill in on your answer sheet

The objective of this project is:

- a. Gain an overall understanding of various subsystems in the given Xinu operating system code.
- b. Gain an in-depth understanding of the Xinu file system.

Use the XinuVax code for this project.

You will submit a report that documents your understanding. You should follow the given guidelines, which provide specific directions for you to work on this project.

Guidelines for Part a (overall understanding):

As discussed in class, identify the key routines (which appear as the roots of the reverse call order tree) for each subsystem. Generate reverse call order trees for memory allocation and deallocation and synchronization routines as these are expected to be aspects common to all subsystems. Along with this technique of using reverse call order trees, you should use other clues such as function names and include files to support your identification of subsystems.

Your report for this part should enumerate all the subsystems you have identified and for each subsystem include the following:

- A short description of the purpose of the subsystem.
- A list of the key routines for each subsystem and the purpose of each key routine.
- A list of the header files that are specific to each subsystem.
- A list of the key data structures for each subsystem and the purpose of each key data structure.

Guidelines for Part b (in-depth understanding):

This part will include more information about the Xinu file subsystem in addition to what you have done for overall understanding in Part a. Your report should include:

- Identify routines corresponding to various file operations such as open, close etc.
- Describe your understanding of the synchronization used in the file subsystem. For example, list the shared data structures and for each shared data structure identify the semaphore used to control accesses and the routines where the synchronization calls are made.
- A file needs *index* blocks and *data* blocks. Identify the code where these blocks are allocated.
- In Xinu, only one data block of the file is kept in the memory. While reading a file, if the cursor goes beyond the current datablock (the one which is in memory) the next data block must be fetched from the disk. Identify the code where the fetching is done. What is the specific data structure (and the specific field if applicable) where the current data block resides?
- While writing a file, if the cursor goes beyond the current datablock (the one which is in memory) a new datablock may have to be allocated and the current data block must be written back to the disk if it is modified. Identify the code where the allocation of new data block is done. Identify the code where the current data block gets written back.
- Multiple processes that are executing concurrently may need allocation of new datablocks at the same time. Explain how Xinu ensures that the same data block is not allocated to multiple files.
- What is the limit on the number of files that can be open concurrently? Explain the logic you have used to answer this question.

This assignment requires a combination of good strategies to decide what to extract and a tool to actually extract the information from you. We have discussed some strategies in the class and shown how to use the tool available to you in the Software Engineering Lab on the second floor of Coover.

A part of the credit (about 15%) will be to show that you can do interesting things on your own without requiring detailed instructions on what to do. Here are some examples of the type of work that will be considered such as your thoughts on:

- Program comprehension strategies beyond what has been discussed in class. Be specific and illustrate your strategy and its usefulness through an example.
- New tool feature(s). Describe the new feature and why it is useful.
- Impact of using the tool – your thoughts on how the specific tool has been beneficial.
- Your learning experience through this project.

You will be working individually on this project. You can discuss strategies and help each other in the mechanics of using the tool, but you should make all your observations with the tool, reasoning, and writing individually; do not share that part of the work with anyone else.

Submit a report that is well written and well formatted using appropriate sections and section headings. Write it like a technical paper. You may want to take a look at some technical papers and follow a pattern you like.

Have fun and show your creativity and passion for learning. My grading is usually partly relative and I try to reward students who have done something that shows the motivation to do hard work and learn.