NWEN301 Homework Assignment 4. David Burrell:300209541

1. What are the implications of supprting UNIX consistnecy semantics for shared access of those files that are stored on remote file systems?

   Requires updates to a file to be immediately available to other processes. This can cause some ineffciencies such as more communication between server and clients, and not batching updates because the client has to report updates immediately.

2. Consider a file currently consisting of 20 blocks. Assume that the file control block (and the index block, in the case of indexed allocation) is already in memory. Calculate how many disk I/O operations are required for contiguous, linked, and indexed (single-level) allocation strategies, if, for one block, the following conditions hold. In the contiguous-allocation case, assume that there is no room to grow in the beginning, but there is room to grow in the end. Assume that the block information to be added is already stored in memory.

   a. The block is added at the beginning.

      Contiguous: 41

      Linked: 2

      Indexed(single-level): 2

   b. The block is added at the end.

      Contiguous: 1

      Linked: 4

      Indexed(single-level): 2

   c. The block is removed from the beginning.

      Contiguous: 2

      Linked: 2

      Indexed(single-level): 1

   d. The block is removed from the end.

      Contiguous: 1

      Linked: 21

      Indexed(single-level): 1

3. Propose a change to the system-wide open file table in order to support the option for multiple processes to jointly share the same location pointer while reading information from the same file.

   each entry in the table could contain a list of processes reading the file.

4. Consider a file system that uses inodes to represent files. Disk blocks are 16-KB in size and each pointer/link to a disk block requires 8 bytes. A file in this file system has 12 direct disk blocks, plus one single and one double indirect disk blocks. What is the maximum size of a file that can be stored in this file system?

   (12 * 16KB) + (1024 * 16KB) + (1024 * 1024 * 16KB) = 16GB

5. The beginning of a free-space bitmap looks like this after the disk partition is first formatted: 1000 0000 0000 0000 (the first block is used by the root directory). The system always searches for free blocks starting at the lowest-numbered block, so after writing file A, which uses six blocks, the bitmap looks like this: 1111 1110 0000 0000. Show the bitmap after each of the following additional actions:

   (a) File B is written, using five blocks.

   1111 1111 1111 0000

   (b) File A is deleted.

   1000 0001 1111 0000

   (c) File C is written, Using eight blocks.

   1111 1111 1111 1100

   (d) File B is deleted.

   1111 1110 0000 1100

6. A RAID can fail if two or more of its drives crash within a short time interval. Suppose that the probability of one drive crashing in a given hour is p. What is the probability of a k-drive RAID failing in a given hour?

   P(0 fail) = (1-p)^k

   P(1 fail) = kC1 * p^1 * (1-p)^(k-1)

   P(k fail in hour) = 1 - P(0 fail) - P(1 fail)

   = 1 - ((1-p)^k) - (kC1 * p^1 * ((1-p)^(k-1)))