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Professor Hakner PSET #2

Problem 1

a) 10001. Each data block contains 4k (4096) bytes.
b) 10015.
c) You would need a single extent descriptor. The blocks are all contiguous, and a single extent descriptor can cover 128MB of file address space. It would be placed in the 12 bytes after the header.
d) 1 additional block. Under sparse allocation, UNIX will not allocate the disk data blocks.

Problem 2

a) The inode has 2 subdirectories connected to it. The first 2 links are for '.' and '..'. The other 2 links are for connections.
b) Caching allows for faster access. Since you opened the file beforehand, a copy of it is stored in the cache, which temporarily allows for faster access. The cache is faster, but scarcer and more expensive than mass storage. Thus, the cache is only used to temporarily store files that are expected to be used/reused.
c)
    i) A new file is to be created under the directory associated with inode 100. The new file's inode is to be 9999. The new file is to have 4096 bytes of data, which is to be stored in data block 5555.
    ii) Yes, we can say what state inode #9999 is on the disk. The journal mode is set to *ordered*, meaning by the time the metadata is committed to the journal (which it has been), all data has been written back. So inode 9999 would be of size 4096 with an updated mtime.
    iii) No, there will not be any perceptible corruption of the filesystem. Both the "BEGIN" and "COMMIT" of both transactions are present. Both transactions will be replayed, meaning the metadata will be validated. As mentioned previously in

(ii), the data is guaranteed to be valid because in the *ordered* journal mode, data must be written back before metadata can be committed to the journal.

iv) Maybe; it is possible that there will be filesystem corruption. Since the mode is now set to *writeback*, there is no guarantee that the data referred to by the metadata was successfully written to memory when the metadata was committed to the journal. It is possible that at the time of power loss, the metadata was fully committed to the journal before the data itself could be written to memory. It is also possible that both were written successfully before the loss of power.

d) When you perform a mount, the inode will carry over. Therefore, the new inode at that directory will be #2.

e) B & C are on the same volume. Z is on a separate volume and potentially on an SSD. performing mv /A/B/F1 /A/C/F2 is fast, because it is merely a rename operation. In contrast, performing mv /A/C/F2 /A/Z/F3 copies F3 to F2, and then erases F3. In addition, erasure on an SSD is very slow.