Walkthrough of Code: An active directory either appends a new user to a group or searches whether a user is in a specified group. A group can be composed of either users or groups. A user and a group are a similar notion to a leaf node and a root node in a tree. Appending a user or a group node doesn't require traversing the directory as the directory is not limited to a binary format, though to search for a user, it would require traversing a directory as it would all trees.

Time Complexity: O(n)
An active directory is constructed as a tree, with nodes of its object type within itself. There is now way to single out a certain path and the end condition is it either has found the user in the group or has traversed the whole directory without the user in it. The time complexity varies on the tree size with no other clear algorithm to traverse each node efficiently.

Space Complexity: O(n)
An active directory space complexity is that of directories and their files. The active directory complexity varies linearly with every new directory.