# 1487. Making File Names Unique

String

Hash Table

<u>Array</u>

## **Problem Description**

Medium

it should have a unique name. If a name has been used before, a suffix in the format of (k) must be appended, where k is the smallest positive integer that makes the name unique again. The task is to simulate this process and return the final list of names used for the folders. For instance, if names is ["doc", "doc", "image", "doc(1)", "doc"], the output should be ["doc", "doc(1)", "image", "doc(1)(1)",

The problem requires creating a file system with folders named according to the input array names. Whenever a folder is created,

"doc(2)"]. This array represents the names of the folders after every minute following the naming rules defined by the problem. Intuition

The intuition behind the solution involves tracking each folder name and the suffixes applied to resolve the name conflicts. We use a dictionary (hashmap) to keep track of the names and their corresponding suffixes to achieve this efficiently. We iterate over the input list of names. For each name, we perform the following steps:

Check if the name already exists: If the name exists in the dictionary, it means we've encountered a conflict and we need to find the next suitable suffix to make the name unique.

- Resolve the conflict: Increase the numeral suffix starting from the one recorded in the dictionary until we find a name that is not already used.
- Update the name with the suffix: Once a unique name is constructed, we update the current name in the list of names with the newly formed unique name.

Update the dictionary: Store the changed name with a suffix of 1 if it's a new name. If the name was altered and had a suffix

added, update the original conflicting name's suffix for future conflict resolution. The logic behind incrementing the suffix numeral ensures that we will always find the smallest possible integer k to append while

maintaining uniqueness. The defaultdict from the collections module provides convenience for this process since it will

The implementation of the provided solution uses a combination of a loop and a dictionary (hashmap) to achieve its objectives.

Data Structure: We use a defaultdict from the collections module with integer values that defaults to 0. This helps in

automatically assume the default integer value of 0 when accessing a new name not yet in the dictionary. **Solution Approach** 

#### easily tracking the next available integer suffix that should be used for each unique base name. Iterate Through Names: We iterate over the input list of names with the help of a for loop. Each name encountered is

conflicting name.

end of the function.

added to our final names list).

this, resulting in "file(1)".

Updated names list: ["file"] Dictionary: {"file": 1}

Updated names list: ["file", "file(1)", "file(2)"] Dictionary: {"file": 3}

The iteration ends as there are no more names in the names array.

def getFolderNames(self, names: List[str]) -> List[str]:

# Iterate over all the names in the input list.

name\_counts = defaultdict(int)

if name in name counts:

count += 1

for index, name in enumerate(names):

count = name counts[name]

name counts[name] = count + 1

names[index] = f'{name}({count})'

# Create a dictionary to store the counts of each folder name.

# Check if the name already exists in the dictionary.

# Start with the current count for this name.

while f'{name}({count})' in name\_counts:

# Check if the name with the appended count exists.

# Update the count for this name in the dictionary.

# Modify the current name to include the count in the format "name(count)".

# If it does, increment the count and check again.

name.

dictionary for potential future conflicts.

Here's a step-by-step explanation of how the code works:

evaluated to determine if it's unique or if a suffix is needed. **Check and Resolve Name Conflicts:** 

- ∘ If the current name is present in the dictionary, it indicates a conflict. We then initiate a while loop to find a unique name by incrementing the integer suffix. ∘ Inside the loop (while f'{name}({k})' in d), we keep appending a suffix (k) to the original name and increment k to find a non-
- update the dictionary with the new suffix (d[name] = k + 1) to indicate the next available suffix for this base name. Final Names Update and Dictionary Maintenance:

If the name was modified by adding a suffix, we've already updated the entry in the dictionary with the next suffix to be used.

∘ If the current name isn't in the dictionary, it's already unique, and we simply store it with a suffix of 1 (which means d[names[i]] = 1) in the

Return the Modified List: The names list, which now contains all the unique names assigned by the system, is returned at the

• Once a unique name is found, we assign this new name to the correct position in the names list (using names[i] = f'{name}({k})') and

- End of Loop: Each iteration of the loop either adds a unique name directly to the dictionary or resolves a conflict by appending the appropriate suffix. By the end of the loop, all conflicts are resolved.
- This solution's complexity lies in the loop and the operations within it. The average case time complexity is O(n\*k), where n is the length of the names list and k represents the time taken to find a unique name through the incremental suffix process. However,

the worst-case time complexity can increase if there is a large number of conflicts that result in longer searches for a unique

**Example Walkthrough** Let's use a small example to illustrate the solution approach. Consider the input array names as ["file", "file", "file",

"file"]. The aim is to create a list where all folder names are unique following the rules described in the problem statement.

Start with an empty defaultdict and iterate through the names list. First, encounter "file". "file" is not in the dictionary, so we add "file" to the dictionary with a value of 1 (meanwhile it's also

Next, see another "file". Since "file" is in the dictionary (with a value 1), there's a conflict. We append (1) to "file" to resolve

Updated names list: ["file", "file(1)"] Dictionary before incrementing: {"file": 1} Increment the suffix in the

### dictionary: {"file": 2} (for potential future conflicts)

**Python** 

We see "file" again. Repeat the check and update steps, the suffix this time is (3). Final names list: ["file", "file(1)", "file(2)", "file(3)"] Final dictionary: {"file": 4}

Our final list is ["file", "file(1)", "file(2)", "file(3)"], where each "file" is unique. This shows how the aforementioned

algorithm successfully solves the file naming problem by systematically ensuring each new folder name has not been used

Encounter another "file". Check the dictionary. Since "file" is there with the value 2, append (2) and increment the suffix.

before, appending the smallest possible unique suffix when necessary. Solution Implementation

from collections import defaultdict class Solution:

#### # Add or update the name in the dictionary with a count of 1, # indicating this modified name is now used once. name\_counts[names[index]] = 1 # Return the list with unique folder names.

return names

```
public String[] getFolderNames(String[] names) {
    // Create a map to store the highest integer k used for each original name.
    Map<String, Integer> nameMap = new HashMap<>();
```

class Solution {

#include <unordered map>

vector<string> getFolderNames(vector<string>& names) {

int count = nameCountMap[name];

// Check if 'name' already appeared and get its count

newName = name + "(" + to string(count) + ")";

count++; // Increment the count

return names; // Return the vector with unique folder names

// Initialize a map to keep track of the counts of each folder name

// Check if the current name already exists in the map

let count: number = nameCounts.get(names[i]) || 0;

# indicating this modified name is now used once.

name\_counts[names[index]] = 1

# Return the list with unique folder names.

there are names with the same base, let's call this number m.

The space complexity of the algorithm can be broken down as:

for (auto& name : names) {

**if** (count > 0) {

do {

string newName;

nameCountMap[name] = 1;

function getFolderNames(names: string[]): string[] {

// Iterate over the list of names

for (let i = 0; i < names.length; ++i) {</pre>

if (nameCounts.has(names[i])) {

const nameCounts: Map<string, number> = new Map();

unordered\_map<string, int> nameCountMap; // Map to keep a count of folder names

nameCountMap[name] = count; // Update count for the original name

name = newName; // Use the newName for the current iteration

// If name is original or new unique name is found, set its count to 1

// Retrieve the count for the current name, defaulting to 0 if it's not found

// Create a unique folder name by appending count in parentheses

// If name exists, find a unique name by appending the count in parentheses

} while (nameCountMap[newName] > 0); // Check if the newName is also taken, continue if yes

using namespace std;

class Solution {

public:

Java

```
// Iterate through each name in the input array.
        for (int i = 0; i < names.length; ++i) {
            // If the current name has already been encountered,
            // append a unique identifier to make it distinct.
            if (nameMap.containsKev(names[i])) {
                // Get the current highest value of k used for this name.
                int k = nameMap.get(names[i]);
                // Check if the name with the appended "(k)" already exists.
                // If it does, increment k until a unique name is found.
                while (nameMap.containsKey(names[i] + "(" + k + ")")) {
                    ++k;
                // Update the map with the new highest value of k for this name.
                nameMap.put(names[i], k);
                // Modify the current name by appending "(k)" to make it unique.
                names[i] += "(" + k + ")";
            // Insert or update the current name in the map, setting its value to 1.
            // If the name is new, this records it as seen for the first time.
            // If the name has been modified, this ensures it's treated as new.
            nameMap.put(names[i], 1);
        // Return the modified array of names, with each name now unique.
        return names;
C++
#include <vector>
#include <string>
```

### **}**; **TypeScript**

```
// Keep incrementing count until a unique name is found
            while (nameCounts.has(`${names[i]}(${count})`)) {
                ++count;
            // Update the count for the current name in the map
            nameCounts.set(names[i], count);
            // Append the count to the current folder name to make it unique
            names[i] += `(${count})`;
       // Set the count for this unique folder name in the map, or update it to 1
       nameCounts.set(names[i], 1);
   // Return the transformed list of names with all unique folders
   return names;
from collections import defaultdict
class Solution:
   def getFolderNames(self, names: List[str]) -> List[str]:
       # Create a dictionary to store the counts of each folder name.
       name_counts = defaultdict(int)
       # Iterate over all the names in the input list.
        for index. name in enumerate(names):
           # Check if the name already exists in the dictionary.
           if name in name counts:
                # Start with the current count for this name.
                count = name counts[name]
                # Check if the name with the appended count exists.
                # If it does, increment the count and check again.
                while f'{name}({count})' in name_counts:
                    count += 1
                # Update the count for this name in the dictionary.
                name counts[name] = count + 1
                # Modify the current name to include the count in the format "name(count)".
                names[index] = f'{name}({count})'
           # Add or update the name in the dictionary with a count of 1,
```

The provided code snippet maintains a dictionary to keep track of the number of times a particular folder name has appeared. It

then generates unique names by appending a number in parentheses if necessary. Let's analyze the time and space complexity:

#### 1. The for loop iterates through each name in the input list, so it gives us an O(n) term, where n is the number of names in the list. 2. Inside the loop, the code checks if name exists in the dictionary with if name in d, which is an O(1) operation due to hashing. 3. If there is a conflict for a name, the code enters into a while loop to find the correct suffix k. In the worst case, it may run as many times as

**Time Complexity** 

return names

Time and Space Complexity

The while loop could contribute significantly to the time complexity if there are many names with the same base. If m is the maximum number of duplicates for any name, the worst-case time complexity for while loop iterations across the entire input is

1. The dictionary d, which stores each unique folder name. In the worst case (all folder names are unique, and for each original name, there's a

4. Each iteration of the while loop involves a string concatenation and a dictionary lookup, both of which are 0(1) operations.

# **Space Complexity**

Therefore, the overall worst-case time complexity is 0(n + m\*n) which simplifies to 0(m\*n).

O(m\*n) because each unique name will go through the loop at most m times.

different number of folders), this dictionary could potentially store 2 entries per name (the original and the latest modified version). So, in the worst case, it could hold up to 2n entries, contributing 0(n) to the space complexity. 2. Temporary storage for constructing new folder names during the while loop does not significantly add to the space complexity because it only

Therefore, the overall space complexity is O(n).

holds a single name at a time.

- To summarize:
- Time Complexity: 0(m\*n) Space Complexity: 0(n)