Problem 636: Exclusive Time of Functions

Problem Information

Difficulty: Medium
Acceptance Rate: 0.00%
Paid Only: No

Problem Description

On a

single-threaded

CPU, we execute a program containing

n

functions. Each function has a unique ID between

0

and

n-1

.

Function calls are

stored in a

call stack

: when a function call starts, its ID is pushed onto the stack, and when a function call ends, its ID is popped off the stack. The function whose ID is at the top of the stack is the current function being executed

. Each time a function starts or ends, we write a log with the ID, whether it started or ended, and the timestamp.

You are given a list

logs

, where

logs[i]

represents the

i

th

log message formatted as a string

"{function_id}:{"start" | "end"}:{timestamp}"

. For example,

"0:start:3"

means a function call with function ID

0

started at the beginning

of timestamp

3

, and

"1:end:2"

means a function call with function ID

1

ended at the end

of timestamp

2

. Note that a function can be called

multiple times, possibly recursively

.

A function's

exclusive time

is the sum of execution times for all function calls in the program. For example, if a function is called twice, one call executing for

2

time units and another call executing for

1

time unit, the

exclusive time

is

2 + 1 = 3

.

Return

the

exclusive time

of each function in an array, where the value at the

i

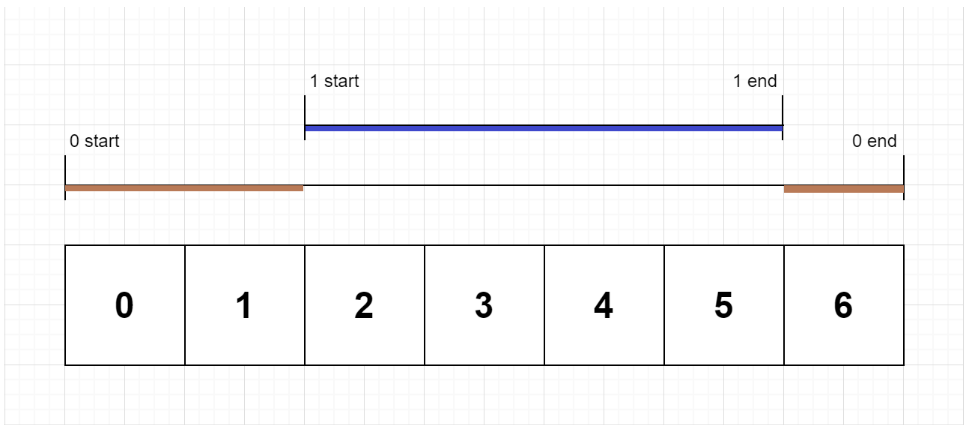
th

index represents the exclusive time for the function with ID

i

.

Example 1:



Input:

n = 2, logs = ["0:start:0","1:start:2","1:end:5","0:end:6"]

Output:

[3,4]

Explanation:

Function 0 starts at the beginning of time 0, then it executes 2 for units of time and reaches the end of time 1. Function 1 starts at the beginning of time 2, executes for 4 units of time, and ends at the end of time 5. Function 0 resumes execution at the beginning of time 6 and executes for 1 unit of time. So function 0 spends 2 + 1 = 3 units of total time executing, and function 1 spends 4 units of total time executing.

Example 2:

Input:

n = 1, logs = ["0:start:0","0:start:2","0:end:5","0:start:6","0:end:6","0:end:7"]

Output:

[8]

Explanation:

Function 0 starts at the beginning of time 0, executes for 2 units of time, and recursively calls itself. Function 0 (recursive call) starts at the beginning of time 2 and executes for 4 units of time. Function 0 (initial call) resumes execution then immediately calls itself again. Function 0 (2nd recursive call) starts at the beginning of time 6 and executes for 1 unit of time. Function 0 (initial call) resumes execution at the beginning of time 7 and executes for 1 unit of time. So function 0 spends 2 + 4 + 1 + 1 = 8 units of total time executing.

Example 3:

Input:

n = 2, logs = ["0:start:0","0:start:2","0:end:5","1:start:6","1:end:6","0:end:7"]

Output:

[7,1]

Explanation:

Function 0 starts at the beginning of time 0, executes for 2 units of time, and recursively calls itself. Function 0 (recursive call) starts at the beginning of time 2 and executes for 4 units of time. Function 0 (initial call) resumes execution then immediately calls function 1. Function 1 starts at the beginning of time 6, executes 1 unit of time, and ends at the end of time 6. Function 0 resumes execution at the beginning of time 6 and executes for 2 units of time. So function 0 spends 2 + 4 + 1 = 7 units of total time executing, and function 1 spends 1 unit of total time executing.

Constraints:

1 <= n <= 100

2 <= logs.length <= 500

0 <= function_id < n

0 <= timestamp <= 10

9

No two start events will happen at the same timestamp.

No two end events will happen at the same timestamp.

Each function has an

"end"

log for each

"start"

log.

Code Snippets

C++:

```
class Solution {
public:
vector<int> exclusiveTime(int n, vector<string>& logs) {

}
};
```

Java:

```
class Solution {
public int[] exclusiveTime(int n, List<String> logs) {

}
}
```

Python3:

```
class Solution:
def exclusiveTime(self, n: int, logs: List[str]) -> List[int]:
```

Python:

```
class Solution(object):
def exclusiveTime(self, n, logs):
"""
:type n: int
:type logs: List[str]
:rtype: List[int]
"""
```

JavaScript:

```
/**
* @param {number} n
* @param {string[]} logs
* @return {number[]}
*/
var exclusiveTime = function(n, logs) {

};
```

TypeScript:

```
function exclusiveTime(n: number, logs: string[]): number[] {

};
```

C#:

```
public class Solution {
public int[] ExclusiveTime(int n, IList<string> logs) {

}
}
```

C:

```
/**
* Note: The returned array must be malloced, assume caller calls free().
*/
int* exclusiveTime(int n, char** logs, int logsSize, int* returnSize) {

}
```

Go:

```
func exclusiveTime(n int, logs []string) []int {

}
```

Kotlin:

```
class Solution {
fun exclusiveTime(n: Int, logs: List<String>): IntArray {

}
}
```

Swift:

```
class Solution {
func exclusiveTime(_ n: Int, _ logs: [String]) -> [Int] {

}
}
```

Rust:

```
impl Solution {
pub fn exclusive_time(n: i32, logs: Vec<String>) -> Vec<i32> {

}
}
```

Ruby:

```
# @param {Integer} n
# @param {String[]} logs
# @return {Integer[]}
def exclusive_time(n, logs)

end
```

PHP:

```
class Solution {

/**
* @param Integer $n
* @param String[] $logs
* @return Integer[]
*/
function exclusiveTime($n, $logs) {

}
}
```

Dart:

```
class Solution {
List<int> exclusiveTime(int n, List<String> logs) {

}
}
```

Scala:

```
object Solution {
def exclusiveTime(n: Int, logs: List[String]): Array[Int] = {
}
}
```

Elixir:

```
defmodule Solution do
@spec exclusive_time(n :: integer, logs :: [String.t]) :: [integer]
def exclusive_time(n, logs) do

end
end
```

Erlang:

```
-spec exclusive_time(N :: integer(), Logs :: [unicode:unicode_binary()]) ->
[integer()].
exclusive_time(N, Logs) ->
.
```

Racket:

```
(define/contract (exclusive-time n logs)
(-> exact-integer? (listof string?) (listof exact-integer?))
)
```

Solutions

C++ Solution:

```
/*
* Problem: Exclusive Time of Functions
* Difficulty: Medium
* Tags: array, string, stack
*
* Approach: Use two pointers or sliding window technique
* Time Complexity: O(n) or O(n log n)
* Space Complexity: O(1) to O(n) depending on approach
*/
```

```
class Solution {
public:
vector<int> exclusiveTime(int n, vector<string>& logs) {

}
};
```

Java Solution:

```
/**
* Problem: Exclusive Time of Functions
* Difficulty: Medium
* Tags: array, string, stack
*
* Approach: Use two pointers or sliding window technique
* Time Complexity: O(n) or O(n log n)
* Space Complexity: O(1) to O(n) depending on approach
*/

class Solution {
public int[] exclusiveTime(int n, List<String> logs) {

}
}
```

Python3 Solution:

```
"""
Problem: Exclusive Time of Functions
Difficulty: Medium
Tags: array, string, stack

Approach: Use two pointers or sliding window technique
Time Complexity: O(n) or O(n log n)
Space Complexity: O(1) to O(n) depending on approach
"""

class Solution:
def exclusiveTime(self, n: int, logs: List[str]) -> List[int]:
# TODO: Implement optimized solution
pass
```

Python Solution:

```
class Solution(object):
def exclusiveTime(self, n, logs):
"""
:type n: int
:type logs: List[str]
:rtype: List[int]
"""
```

JavaScript Solution:

```
/**
* Problem: Exclusive Time of Functions
* Difficulty: Medium
* Tags: array, string, stack
*
* Approach: Use two pointers or sliding window technique
* Time Complexity: O(n) or O(n log n)
* Space Complexity: O(1) to O(n) depending on approach
*/

/**
* @param {number} n
* @param {string[]} logs
* @return {number[]}
*/
var exclusiveTime = function(n, logs) {

};
```

TypeScript Solution:

```
/**
* Problem: Exclusive Time of Functions
* Difficulty: Medium
* Tags: array, string, stack
*
* Approach: Use two pointers or sliding window technique
* Time Complexity: O(n) or O(n log n)
* Space Complexity: O(1) to O(n) depending on approach
*/
```

```
function exclusiveTime(n: number, logs: string[]): number[] {

};
```

C# Solution:

```
/*
* Problem: Exclusive Time of Functions
* Difficulty: Medium
* Tags: array, string, stack
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* Approach: Use two pointers or sliding window technique
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public class Solution {
public int[] ExclusiveTime(int n, IList<string> logs) {

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* Difficulty: Medium
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*/

/**
* Note: The returned array must be malloced, assume caller calls free().
*/
int* exclusiveTime(int n, char** logs, int logsSize, int* returnSize) {

}
```

Go Solution:

```go
// Problem: Exclusive Time of Functions
// Difficulty: Medium
// Tags: array, string, stack
//
// Approach: Use two pointers or sliding window technique
// Time Complexity: O(n) or O(n log n)
// Space Complexity: O(1) to O(n) depending on approach

func exclusiveTime(n int, logs []string) []int {

}
```

Kotlin Solution:

```kotlin
class Solution {
fun exclusiveTime(n: Int, logs: List<String>): IntArray {

}
}
```

Swift Solution:

```swift
class Solution {
func exclusiveTime(_ n: Int, _ logs: [String]) -> [Int] {

}
}
```

Rust Solution:

```rust
// Problem: Exclusive Time of Functions
// Difficulty: Medium
// Tags: array, string, stack
//
// Approach: Use two pointers or sliding window technique
// Time Complexity: O(n) or O(n log n)
// Space Complexity: O(1) to O(n) depending on approach

impl Solution {
pub fn exclusive_time(n: i32, logs: Vec<String>) -> Vec<i32> {
}
}
```

Ruby Solution:

```
# @param {Integer} n
# @param {String[]} logs
# @return {Integer[]}
def exclusive_time(n, logs)

end
```

PHP Solution:

```
class Solution {

/**
* @param Integer $n
* @param String[] $logs
* @return Integer[]
*/
function exclusiveTime($n, $logs) {

}
}
```

Dart Solution:

```
class Solution {
List<int> exclusiveTime(int n, List<String> logs) {

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