Scan Resource Allocation - Question

Description

Intro

One of the primary things we do at Cyera is scanning data inside Cloud Assets 🙂

In this exercise, we will aim to allocate the scan compute units that Cyera operated against Cloud Providers, for a specific customer.
Scan compute units are resources dedicated to scanning operations in cloud environments. Allocating more units to a task can accelerate the scanning process, allowing for quicker data retrieval and analysis.

Confronted with a limited supply of scan compute units, our challenge is to distribute this resource wisely among all our customers, enhancing scan efficiency and effectiveness. To accomplish this, you need to implement the
`allocate` method. This method aims to align scan resource allocation with the unique requirements of each customer and the collective demand on our systems.

Each customer license includes three non-negative key parameters that influence the allocation of scan compute units:

- Base - The base compute units that are expected to be allocated.

- Grow - The relative ratio in which the allocation will increase in the case of compute units excess.

- Shrink - The proportion by which the allocation of compute units will be reduced in the case of shortage.

Definitions

- **Excess** - Occurs when the total available compute units surpass the aggregate of base allocations for all customers.

- **Shortage** - This happens when the combined base allocations of all customers exceed the total available compute units.

Notes

1. Fraction compute unit allocations are allowed. For example 1.5, 7.2.

2. Negative compute unit allocations are **NOT** allowed. For example -2, -5.3.

    a. In case a customer would have been allocated a negative amount:

        i. It should instead be allocated 0.

        ii. The difference should be decreased from the remaining customers based on the ratio of their "shrink" property.

Final Notes

- When implementing your solution, focus on correctness, readability, and efficiency.

- Early submissions are encouraged, but not at the expense of the above.

Examples

- Below are examples of inputs and the expected result.
- Each customer is defined by the properties base, grow & shrink accordingly
- The result is the number of scan compute units assigned to each customer, in order.

Example 1

Customer 1: [10, 1, 1]

Customer 2: [10, 1, 1]

Available compute units: 20

Result: [10, 10]

Example 2

Customer 1: [10, 1, 1]

Customer 2: [10, 1, 1]

Available compute units: 23

Result: [11.5, 11.5]

Example 3

Customer 1: [10, 4, 1]

Customer 2: [10, 1, 1]

Available compute units: 30

Result: [18, 12]

Explanation: the growth ratio was 4:1 so the extra 10 scan compute units were divided 8:2

Example 4

Customer 1: [10, 2, 3]

Customer 2: [10, 1, 2]

Available compute units: 10

Results: [4, 6]

Explanation: the shrink ratio was 3:2 so the shortage of 10 scan compute units was divided 6:4

Example 5

Customer 1: [20, 1, 1]

Customer 2: [5, 1, 1]

Customer 3: [15, 1, 1]

Available compute units: 10

Results: [7.5, 0, 2.5]

Example 6

Customer 1: [19, 1, 1]

Customer 2: [5, 1, 1]

Customer 3: [11, 1, 1]

Customer 4: [15, 1, 1]

Available compute units: 10

Results: [7, 0, 0, 3]