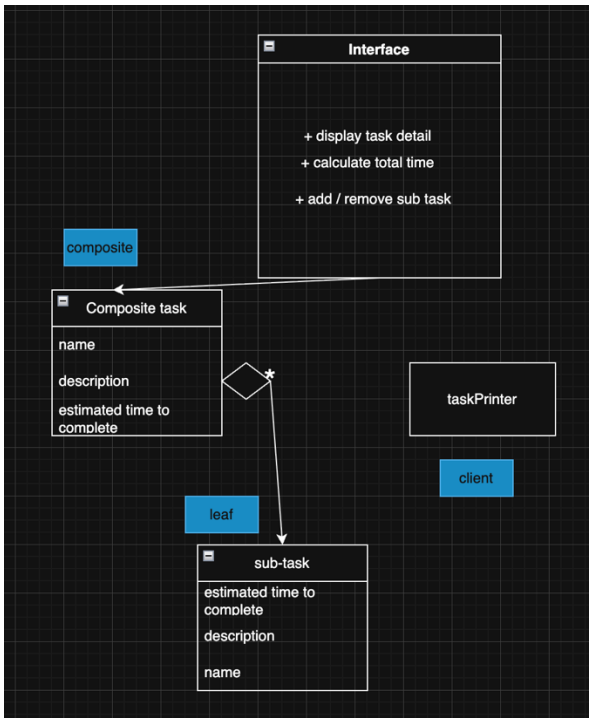
1. Identify the classes needed to represent the individual and composite tasks. What classes or objects play which participant role in the composite pattern?
2. Draw a class diagram to illustrate the relationships between these classes.



3. Give pattern-relevant code (Pseudocode/Java/C++/C#):
    1. Write pseudocode or code for the `Component` interface.

```
interface Task {
    method displayDetails()
    method calculateTotalTime()
    method addSubtask(Task task)
    method removeSubtask(Task task)
}
```

    2. Write pseudocode or code for one of the `Leaf` class.

```
class IndividualTask implements Task {
    string name
    string description
    double estimatedTime

    constructor(name, description, estimatedTime) {
        this.name = name
        …
    }
```

```
    method displayDetails() {
        print("Task: " + this.name)
        print("Description: " + this.description)
        print("Estimated Time: " + this.estimatedTime + " hours")
    }

    method calculateTotalTime() {
        return this.estimatedTime
    }
}
```

3. Write pseudocode or code for one class that acts as the `Composite` classes

```
class CompositeTask implements Task {
    string name
    string description
    list<Task> subtasks

constructor(name, description) {
    this.name = name
    …
}

method addSubtask(Task task) {
    this.subtasks.add(task)
}

method removeSubtask(Task task){
    this.subtasks.remove(task)
}

method displayDetails() {
    print("Project: " + this.name)
    print("Description: " + this.description)
    print("Sub-tasks:") for each task in
this.subtasks { task.displayDetails() }
}

method calculateTotalTime() {
    totalTime = 0 for each task in this.subtasks
{ totalTime += task.calculateTotalTime() } return
totalTime }
}
```

4. Client Code: Behavior Simulation
   Write code/pseudocode or class stubs to simulate the following scenarios:

   - Creating a composite task with sub-tasks

     ```
     projectA = new CompositeTask("Project A", "Launch of
     new product line")
     // Add sub-tasks to the composite task
     projectA.addSubtask(task1)
     projectA.addSubtask(task2)
     ```

   - A `TaskPrinter` that takes any kind of Task as input and prints its details uniformly.
   - The `TaskPrinter` calls `calculateTotalTime()` on both an individual and composite task while displaying the details.

     ```
     class TaskPrinter {
         method printTaskDetails(Task task) {
             task.displayDetails()
             totalTime = task.calculateTotalTime()
             print("Total estimated time: " + totalTime)
         }
     }

     printer = new TaskPrinter()

     printer.printTaskDetails(IndividualTask task1)
     printer.printTaskDetails(CompositeTask projectA)
     ```