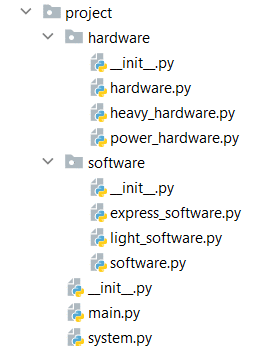
# Python OOP Exam - System Split

*You have been given the task to gather statistics about The System. The System is a network of components connected to build something which functions logically, but you don't need to know that. You need to build a program that processes statistics about The System.*

You will be provided with a **skeleton** that includes all the folders and files that you will need.

***Note: You are not allowed to change the folder and file structure and change their names!***



# Judge Upload

For the **first 2 problems**, create a **zip** file with the name **project** and upload it to the judge system

For the **last problem**, create a **zip** file with the name **tests** and upload it to the judge system

# Structure (Problem 1) and Functionality (Problem 2)

Our first task is to implement the **structure and functionality** of all the classes (properties, methods, inheritance, etc.)

***Note: Feel free to add any additional methods that might help you.***

## Class Software

In the file **software.py** implement the **Software** class:

### Structure

The class should have the following **attributes**:

* **name: str**
* **software\_type: str**
* **capacity\_consumption: int**
* **memory\_consumption: int**

### Methods

#### \_\_init\_\_(name: str, software\_type: str, capacity\_consumption: int, memory\_consumption: int)

Set the **attributes** to the provided values

## Class LightSoftware

In the file **light\_software.py** implement the **LightSoftware** class:

* The **light** software is a **type of software**, and its **type** is **"Light"**
* It has **50% more capacity consumption** than the given value. The result should be **rounded down** to the nearest integer.
* It has **50% less memory consumption** than the given value. The result should be **rounded down** to the nearest integer.

## Class ExpressSoftware

In the file **express\_software.py** implement the **ExpressSoftware** class:

* The **express** software is a **type of software**, and its **type** is **"Express"**
* It has **twice more memory consumption** than the given value

## Class Hardware

In the file **hardware.py** implement the **Hardware** class:

### Structure

The class should have the following **attributes**:

* **name: str**
* **hardware\_type: str**
* **capacity: int**
* **memory: int**
* **software\_components: list** - an **empty list** that will contain all software's components installed on that hardware

### Methods

#### \_\_init\_\_(name: str, hardware\_type: str, capacity: int, memory: int)

Set the **attributes** to the provided values

#### install(software: Software)

If there is **enough capacity** and **memory**, **add** the software object to the **software components**. Otherwise, **raise Exception** with the message **"Software cannot be installed"**

#### uninstall(software: Software)

**Remove** the software object from the **software components**

## Class HeavyHardware

In the file **heavy\_hardware.py** implement the **HeavyHardware** class:

* H**eavy** hardware is a **type of hardware**, and its **type** is **"Heavy"**
* It has **twice more capacity** than the given value
* Its **memory** is **75%** from the given value. The result should be **rounded down** to the nearest integer.

## Class PowerHardware

In the file **power\_hardware.py** implement the **PowerHardware** class:

* The **power** hardware is a **type of hardware**, and its **type** is **"Power"**
* Its capacity is **25%** of the given value. The result should be **rounded down** to the nearest integer.
* It has **75% more memory** than the given value. The result should be **rounded down** to the nearest integer.

## Class System

The System class is where **all the logic** of the task will be implemented

The class should have the following **attributes**:

* **\_hardware** - an **empty** **list** that will bestoring all the **hardware components**
* **\_software** - an **empty** **list** that will be storing all the **software components**

### Methods

**All** described **methods** below should be **static**!

#### register\_power\_hardware(name: str, capacity: int, memory: int)

Create a **PowerHardware** instance and **add it** to the **hardware list**

#### register\_heavy\_hardware(name: str, capacity: int, memory: int)

Create a **HeavyHardware** instance and **add it** to the **hardware list**

#### register\_express\_software(hardware\_name: str, name: str, capacity\_consumption: int, memory\_consumption: int)

* If the **hardware** with the given name **does NOT exist**, return the message **"Hardware does not exist"**
* Otherwise, create an **express software**, **install it** on the hardware, and **add it** to the **software list**
* If the installation is **not possible,** **raise Exception** with the message **"Software cannot be installed"**

#### register\_light\_software(hardware\_name: str, name: str, capacity\_consumption: int, memory\_consumption: int)

* If the **hardware** with the given name **does NOT exist**, return a message **"Hardware does not exist"**
* Otherwise, create a **light software** instance, **install it** on the hardware, and **add it** to the **software list**
* If the installation is **not possible,** **raise Exception** with the message **"Software cannot be installed"**

#### release\_software\_component(hardware\_name: str, software\_name: str)

* If **both components exist** on the system, **uninstall** the **software** from the given **hardware**, and **remove it** from the **software list**
* Otherwise, **return** a message **"Some of the components do not exist"**

#### analyze()

**Return** the following **information** (as a string) for the **total memory** and **capacity** used (calculated for **all hardware components** in the system):

**"System Analysis  
Hardware Components: {number\_of\_hardware\_components}  
Software Components: {number\_of\_software\_components}  
Total Operational Memory: {total memory consumption for all registered software components} / {total memory for all registered hardware components}  
Total Capacity Taken: {total capacity consumption for all registered software components} / {total capacity of all registered hardware components}"**

#### system\_split()

**Return** the following **information** (as a string) for **each** hardware component:

**"Hardware Component - {component name}  
Express Software Components: {number of the installed express software components}  
Light Software Components: {number of the installed light software components}  
Memory Usage: {total memory used of all installed software components} / {total memory of the hardware}  
Capacity Usage: {total capacity used of all installed software components } / {total capacity of the hardware}  
Type: {hardware\_type}  
Software Components: {names of all software components separated by ', '} (or 'None' if no software components)"**

# Examples

In the **main.py** file we have created a **zero test**, so you can test your code

|  |  |
| --- | --- |
| **Test Code** | **Output** |
| System.register\_power\_hardware("HDD", 200, 200)  System.register\_heavy\_hardware("SSD", 400, 400)  print(System.analyze())  System.register\_light\_software("HDD", "Test", 0, 10)  print(System.register\_express\_software("HDD", "Test2", 100, 100))  System.register\_express\_software("HDD", "Test3", 50, 100)  System.register\_light\_software("SSD", "Windows", 20, 50)  System.register\_express\_software("SSD", "Linux", 50, 100)  System.register\_light\_software("SSD", "Unix", 20, 50)  print(System.analyze())  System.release\_software\_component("SSD", "Linux")  print(System.system\_split()) | System Analysis  Hardware Components: 2  Software Components: 0  Total Operational Memory: 0 / 650  Total Capacity Taken: 0 / 850  Software cannot be installed  System Analysis  Hardware Components: 2  Software Components: 5  Total Operational Memory: 455 / 650  Total Capacity Taken: 160 / 850  Hardware Component - HDD  Express Software Components: 1  Light Software Components: 1  Memory Usage: 205 / 350  Capacity Usage: 50 / 50  Type: Power  Software Components: Test, Test3  HardwareComponent - SSD  Express Software Components: 0  Light Software Components: 2  Memory Usage: 50 / 300  Capacity Usage: 60 / 800  Type: Heavy  Software Components: Windows, Unix |

# Unit Testing (Problem 3)

You will **be provided with another skeleton** for this problem. You should **write tests** for the **PaintFactory** class. It will have some **properties**, **methods**, and a **constructor**, all of them **working properly**. You are **NOT ALLOWED** to change the class. Cover the whole class with unit tests to make sure that the class is working as intended. Submit **only the test** folder.