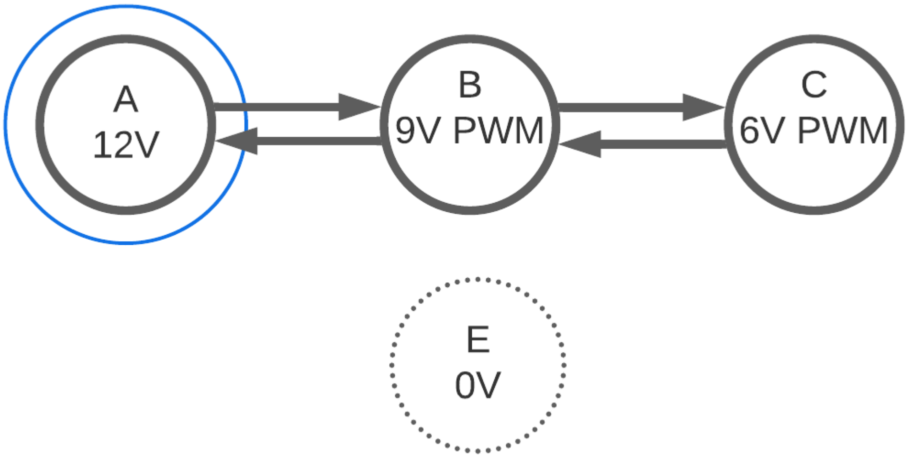
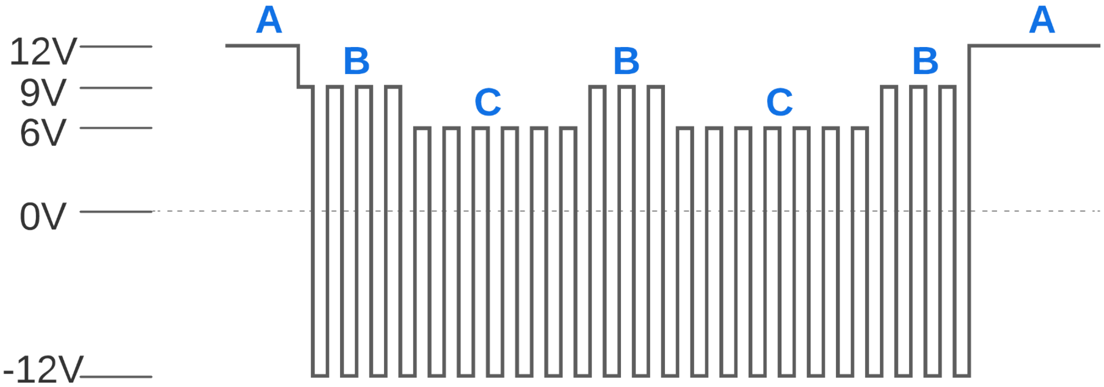
Technical test Test Automation Engineer

Task 1: Simplified electric vehicle charging scenario

(Note: This is simplified version of the IEC61851 standard)

Charging state diagram





A Control Pilot signal (CP) is used to communicate states between the electric charging equipment (EVSE, Electric Vehicle Supply Equipment) and the electric car (EV, Electronic Vehicle). The EVSE sends out a 12V constant voltage when it is available (state A), or a 12V/-12V PWM signal with a frequency of 1kHz to indicate the EVSE is ready to start charging, or is currently charging (state B or C). The signal is passed through the charging circuitry in the EV and read back by the EVSE.

Before the signal is read back by the EVSE, the EV can manipulate the signal by applying different resistance values. This changes the voltage that is read by the EVSE and thus offers a way for the EV to communicate its state to the EVSE. The diagram above shows the signal after the EV has applied the resistance.

Following table explains the individual states and state transitions:

State	Explanation	Transitions
A	Available	**A → B:** User connects the charging cable. **B → A:** User disconnects the charging cable
B	Standby, ready to charge (i.e. cable plugged in)	**B → C:** EV manipulates CP voltage to indicate charging can start **C → B:** EV manipulates CP voltage to indicate charging should stop
C	Charging	
E	Error	Error state can happen at any point in time. Triggers might be, for example, one of the safety features of the EVSE being triggered. EVSE will signal error state by setting the CP voltage to 0V.

Note that there is no way to go from A directly to C, or vice versa.

To answer the questions below, you can assume that the following functions are implemented and available to use.
The predefined function below allows the EVSE to read the voltage on the CP line:

```
def evse_get_cp() -> float:
      ...
      return voltage
```

The following predefined functions allow you to control the EV’s CP line, and to check if the EV is charging:

```
class ChargingState(Enum):
    A = 1
    B = 2
    C = 3

def ev_set_state(state: ChargingState) -> None:
      …
```

```python
def ev_charging() -> bool:
    ...
    return charging
```

Questions:

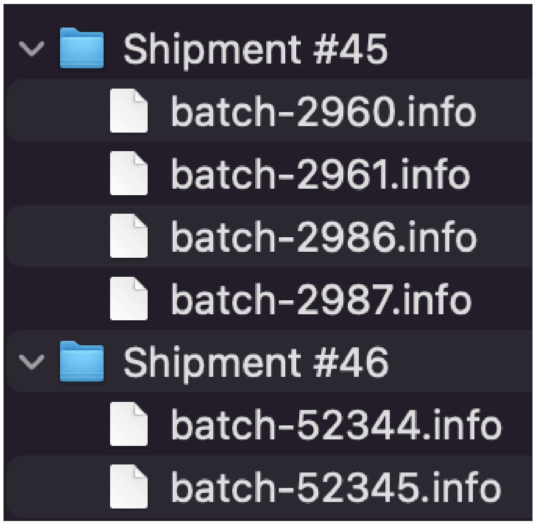
1. Provide a list of test cases that you would use to test the state transitions.
2. Write python code to test the majority of your functional test cases. You can add additional `evse_xxx()` functions for generating error states.

Task 2: Python

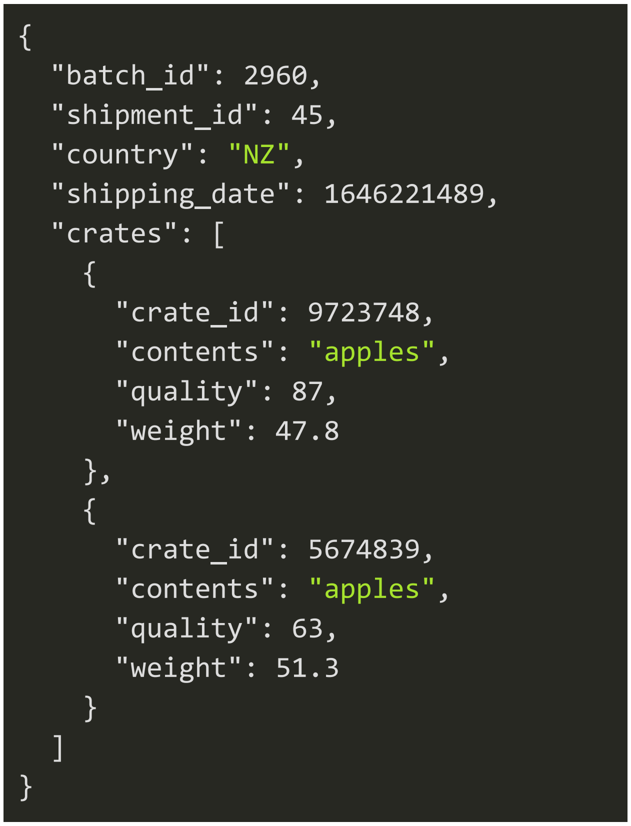
An international food distributor for apples receives large shipments and needs to decide how it will further distribute and sell the incoming shipments of apples. Each shipment consists of multiple batches of crates.

Every shipment that the company receives comes with information about each batch of crates in the shipment, and information about every crate in each batch. An employee then transfers the shipment information on a computer.

In the 2 pictures below you can see how the employee organizes the shipment information, and what each document containing shipping information looks like.



```
Shipment #45
    batch-2960.info
    batch-2961.info
    batch-2986.info
    batch-2987.info
Shipment #46
    batch-52344.info
    batch-52345.info
```



```
{
  "batch_id": 2960,
  "shipment_id": 45,
  "country": "NZ",
  "shipping_date": 1646221489,
  "crates": [
    {
      "crate_id": 9723748,
      "contents": "apples",
      "quality": 87,
      "weight": 47.8
    },
    {
      "crate_id": 5674839,
      "contents": "apples",
      "quality": 63,
      "weight": 51.3
    }
  ]
}
```

Employees spend a great deal of time processing the shipment information and you are hired to write a Python program that can help with processing the information.

Questions:

1. Write a Python program that takes as input a folder name, percentage and quality. The program will process each shipment folder in the provided folder name. The goal of the program will be to compose a list of shipments and batches where the percentage of crates that has a quality higher than the provided quality is higher than or equal to the provided percentage. The output should be a file where each line is of the format “<shipment id>; <batch id>”.
2. Describe how you would test your solution.

Task 3: Computer vision

For our automated test setups we mount our charging stations (EVSE) on a wall. The wall will fit 2 rows of 4 charging stations, and we have more than one wall at our disposal.
All charging stations have LED indicators on the front that show the status of the charging station. There are 3 LED indicators on every charging station, each of which can be turned on or off, and each LED indicator can have different colors depending on the state that needs to be displayed.

A camera will be pointed at each wall, with all 8 charging stations in view of the camera. However, the only guarantee we have is that all 8 charging stations will be visible on the camera. Other than that, the camera setup for each wall might be slightly different, e.g. the distance between the camera and the wall might be different, or the angle of the camera might be different.

The automated setups will run functional test scenarios, where the state of the LED indicators is tested as well. Additionally, stress testing will be done for the LED indicators, where the LED indicators are kept in a certain state for long periods of time and we test for any unwanted behavior such as flickering.

Please answer the following questions:

1. What challenges and risks do you see with building the setup as described above?
2. How would you handle/mitigate those challenges and risks?
3. What would be your approach for building the whole system?
4. Which tools and techniques would you use?