SDE 2 : Smart Home System

Description

To build an IoT based Home Automation System

Device Features

1. An **Interface** device
    a. Google Home
    b. Alexa
    c. More can be added
2. **SmartHome** Device
    a. Generic Electrical Devices
        i. Can be turned on and off
    b. Lights
        i. Can be turned on and off
        ii. Brightness can be changed between a level of 1 to 10
    c. Fans
        i. Can be turned on and off
        ii. Speed can be controlled between a level of 1 to 5
3. A home can have 0 or more Interface device of each kind
4. A home can have 1 or more SmartHome devices
5. All SmartHome devices are connected to 1 interface device

Bonus Feature:

1. **Create custom user modes**: A mode is a set of configurations for all the connected smart home devices. A user can create multiple modes for activating all the devices at once as per his configurations. Refer to the input/output for details

Requirement

1. Add 1 or more Interface Devices
2. Add 1 or more SmartHome Devices with an Interface Device they are connected to
3. User should be able to send a command to any SmartHome device via a connected Interface device
4. SmartHome device can respond to the command as follows:
    a. Can only accept a valid command (described above) and change its internal state and notify the user
    b. Can reject an invalid command with appropriate message to the interface device
5. At any given time, system should maintain and be able to print the following state
    a. List of SmartHome devices per Interface device
    b. Current State of each SmartHome device
    c. Aggregated Usage Statistics of each connected SmartHome device

Other Notes:

1. Do not use any database or NoSQL store, use in-memory data-structure for now.
2. Do not create any UI for the application.
3. You can take input via STDIN, File or within the driver program.
4. Please prioritize code compilation, execution and completion.
5. Work on the expected output first and then add good-to-have features of your own.
6. The given strings in test-cases are for indicative purposes. Please take appropriate parameters in input.

Expectations:

1. Make sure that you have working and demonstrable code.
2. Make sure that code is functionally correct.
3. Code should be modular and readable.
4. Separation of concern should be addressed.
5. Code should easily accommodate new requirements with minimal changes.
6. Code should be easily testable.

Test Cases

The strings in the test cases are indicative. Feel free to take exact values in your driver methods.

1. add_interface_device(“Google Home”, “Activated by ‘OK,Google’”)
2. add_interface_device(“Alexa”, “Activated by ‘Alexa’”)
3. add_smarthome_device(“Drawing Room Light”,“Alexa”)
4. add_smarthome_device(“Living Room Fan”,”Google Home”)
5. add_smarthome_device(“Smart Charger”,”Alexa”)
6. give_command(“Alexa”Drawing Room Light”,”ON”) -> OK, Drawing Room Light Turned On
7. give_command(“OK Google”,”Living Room Fan”,”ON”) -> OK, Living Room Fan turned on
8. give_command(“OK Google”, “Living Room Fan”,”Speed”,“5”) -> OK, Living Room Fan speed set to 5
9. give_command(“OK Google”,”Living Room Fan”,“Speed”, “7”) -> Sorry, Cannot set Living Room Fan speed to 7 (outside the predefined range of 1 - 5)
10. give_command(“Alexa”, set Drawing Room Light Brightness to 8”) -> OK, Drawing Room Light Brightness set to 8
11. give_command(“Alexa”,”Smart Charger”,”ON”) -> OK, Smart Charger turned on
12. give_command(“Alexa”,”Smart Charger”,”OFF”) -> OK, Smart Charger turned off
13. give_command(“OK Google”,”Living Room Fan”, “OFF”) -> OK, Living Room Fan turned off
14. give_command(“OK Google”,”Living Room Fan”,”Speed”,”3”) -> Sorry, Living Room Fan is not turned on
15. print_connected_device(“Google Home”)

#	Category	Name	State
1	Fan	Living Room Fan	On [Speed=5]

16. print_connected_device(“Alexa”)

#	Category	Name	State
1	Light	Drawing Room Light	on[Brightness=8]
2	Generic	Smart Charger	off

17. print_usage() // Capture/print total usage in seconds for simplicity

#	Name	Utilization
1	Drawing Room Light	150 seconds
2	Living Room Fan	30 seconds
3	Smart Charger	10 seconds

18. add_mode(“Alexa”,”Sleep Mode”)

    a. “Drawing Room Light”,OFF
    b. “Smart Charger”,ON
19. add_mode(“OK Google”, “Sleep Mode”)
    a. “Living Room Fan”,”ON”,”3”
20. activate_mode(“Alexa”,”Sleep Mode”)
21. activate_mode(“OK Google”,”Sleep Mode”)
22. print_connected_device(“Alexa”)

#	Category	Name	State
1	Light	Drawing Room Light	off
2	Generic	Smart Charger	on

23. print_connected_device(“Google Home”)

#	Category	Name	State
1	Fan	Living Room Fan	On [Speed=3]