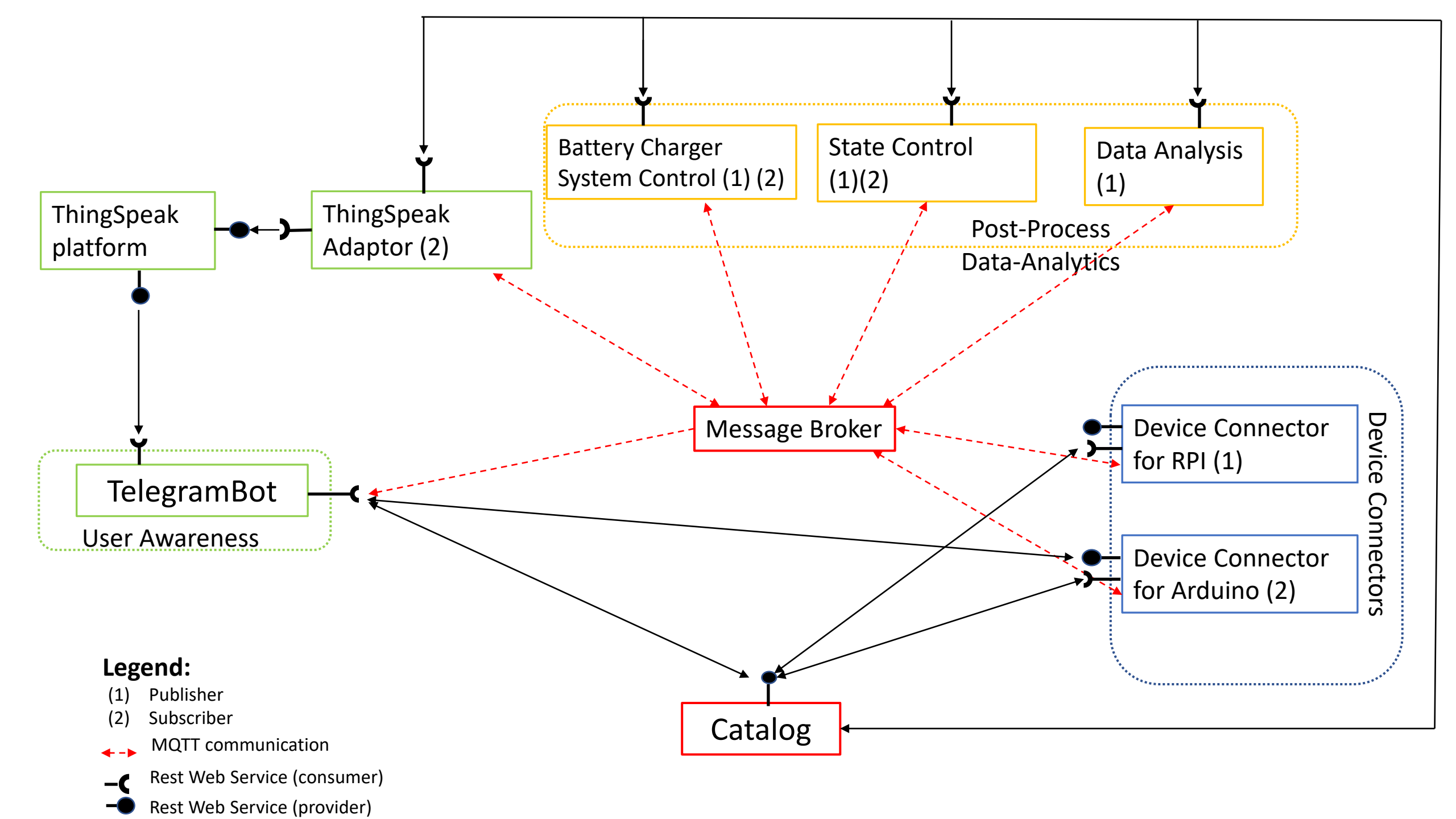
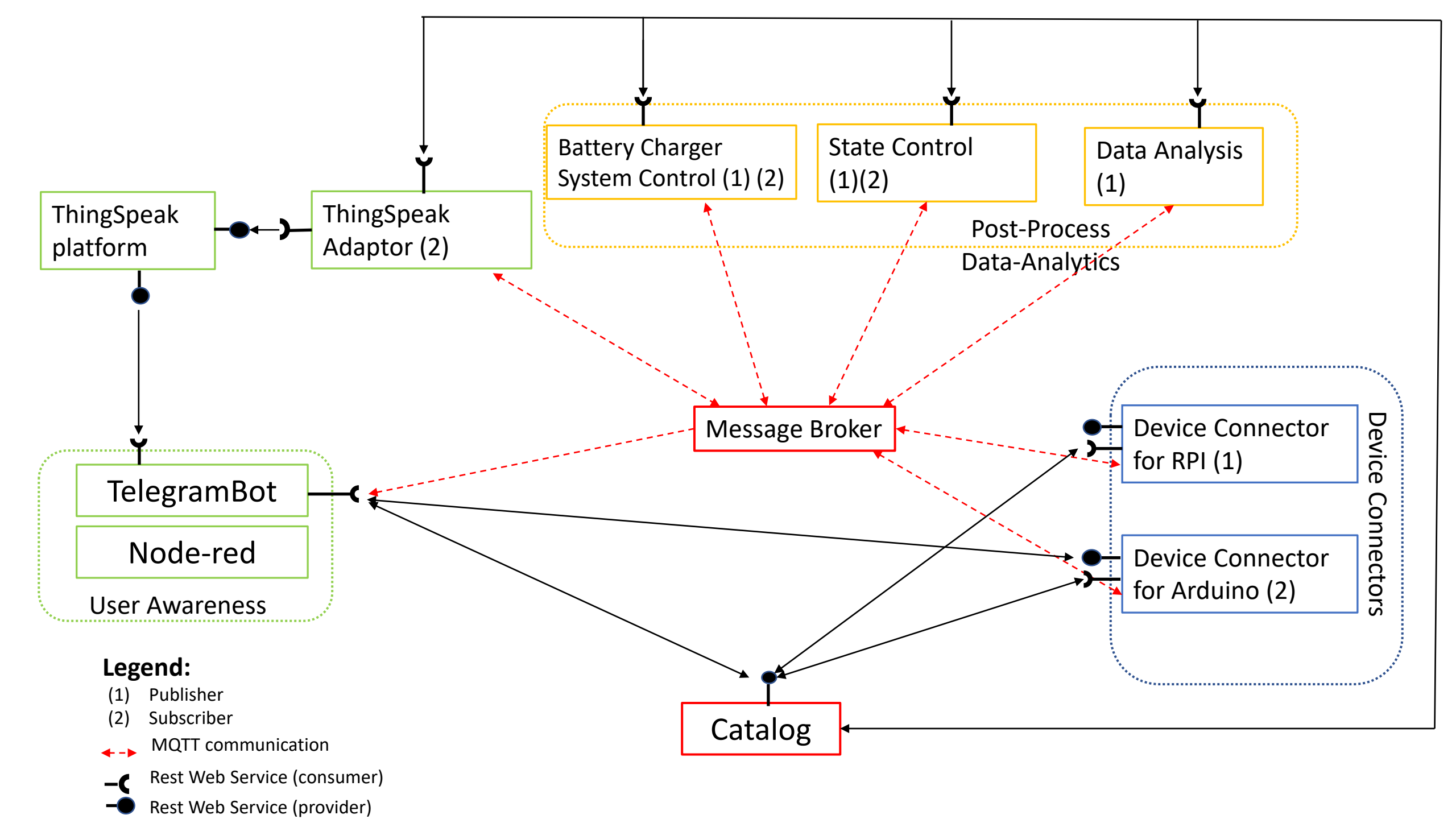
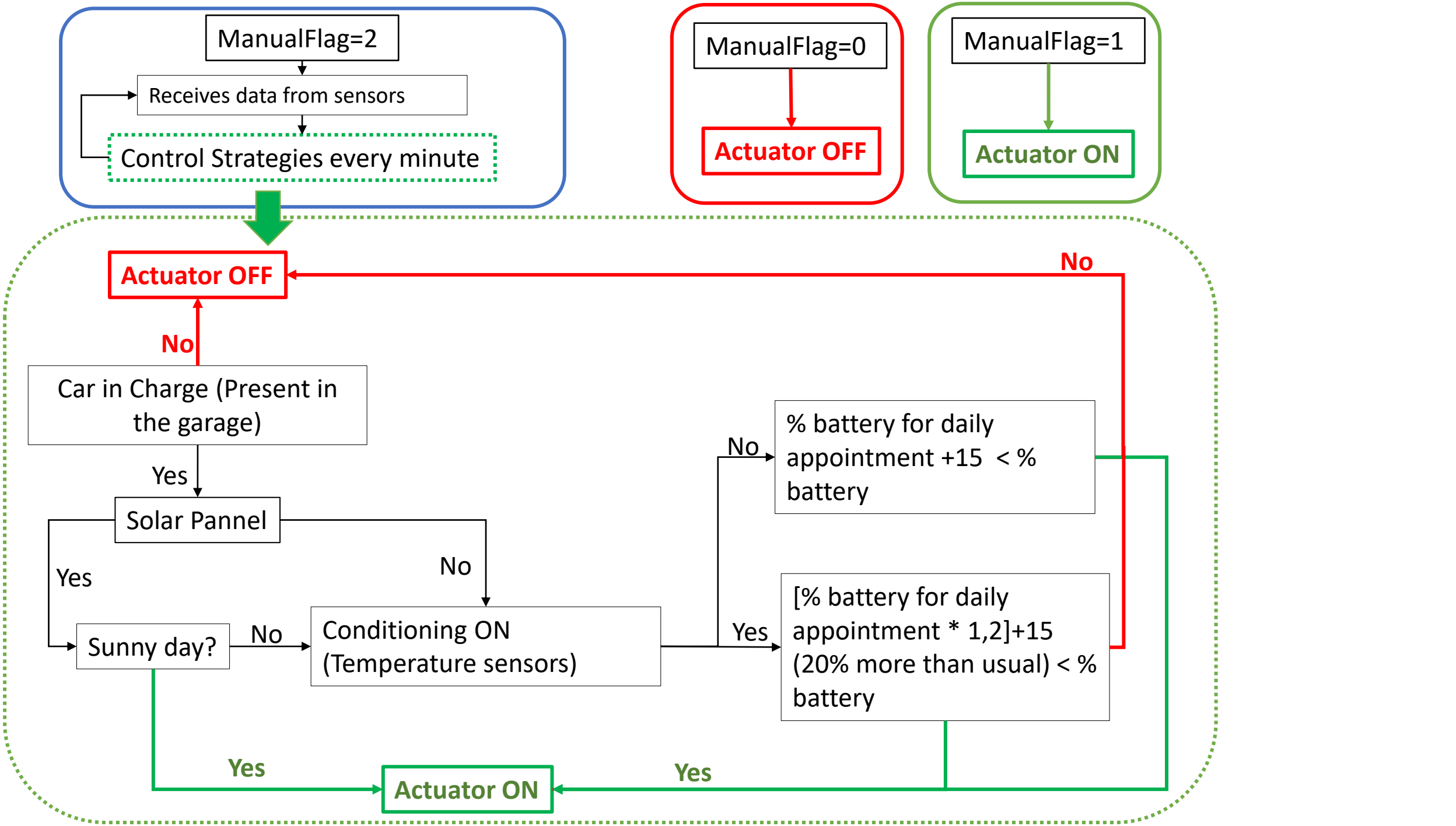

Battery Charger
System Control (1) (2)
State Control
(1)(2)
Data Analysis
(1)
Post-Process
Data-Analytics
ThingSpeak
platform
ThingSpeak
Adaptor (2)
Message Broker
Device Connector
for RPI (1)
Device Connector
for Arduino (2)
Device Connectors
TelegramBot
User Awareness
Catalog
Legend:
(1) Publisher
(2) Subscriber
MQTT communication
Rest Web Service (consumer)
Rest Web Service (provider)


Battery Charger
System Control (1) (2)
State Control
(1)(2)
Data Analysis
(1)
Post-Process
Data-Analytics
ThingSpeak
platform
ThingSpeak
Adaptor (2)
Message Broker
TelegramBot
Node-red
User Awareness
Device Connector
for RPI (1)
Device Connector
for Arduino (2)
Device Connectors
Catalog
Legend:
(1) Publisher
(2) Subscriber
MQTT communication
Rest Web Service (consumer)
Rest Web Service (provider)


ManualFlag=2
Receives data from sensors
Control Strategies every minute
ManualFlag=0
Actuator OFF
ManualFlag=1
Actuator ON
Actuator OFF
No
No
Car in Charge (Present in the garage)
Yes
Solar Pannel
Yes
No
Sunny day?
No
Conditioning ON (Temperature sensors)
No
% battery for daily appointment +15 < % battery
Yes
[% battery for daily appointment * 1,2]+15 (20% more than usual) < % battery
Yes
Actuator ON
Yes

Battery Capacity (KWh)

Battery Consumption (km/KWh)

Autonomy of the electric vehicle with 100 % of battery (km)

Km necessary to cover all the daily appointment > max autonomy in km of the user's battery?

Yes

No

Send an alert to communicate to the USER that the number of total km is too high so may be necessary to recharge the car between 2 appointment.

Send to the actuator control strategy the value of the battery's percentage necessary for the following day.

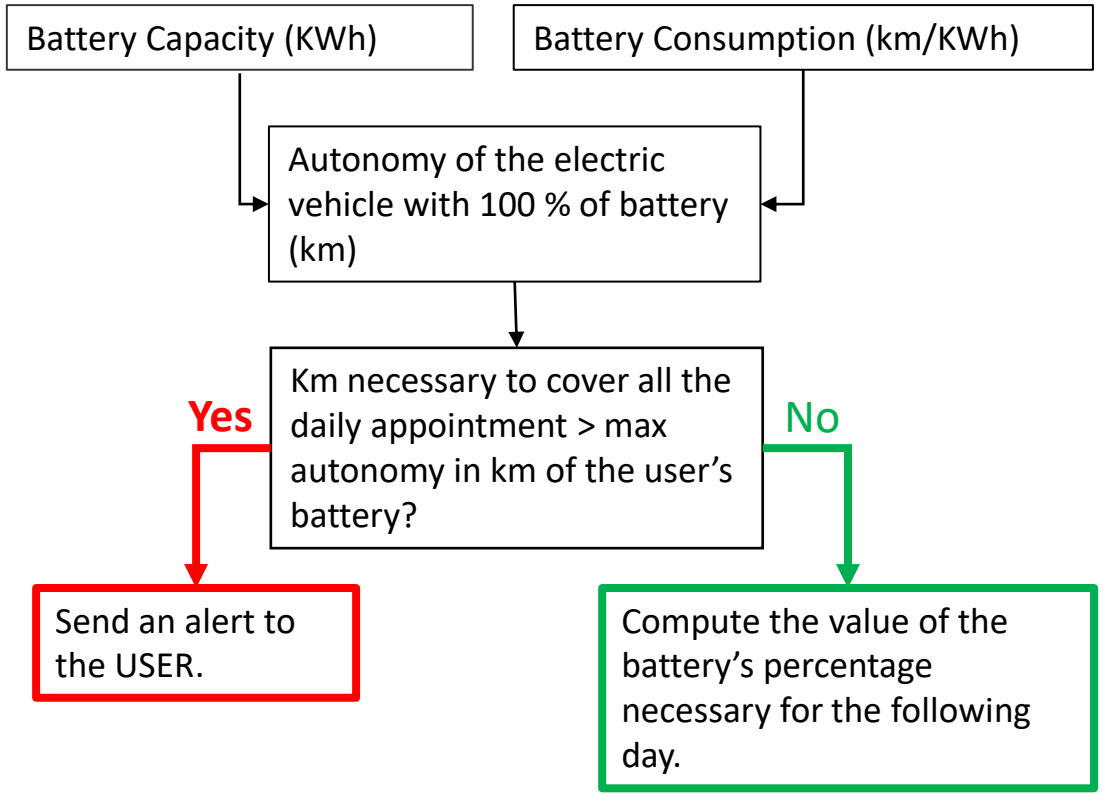

```
{
  "UserID": "1",
  "UserName": "Mario",
  "UserSurname": "Rossi",
  "CapacityBattery": 50,
  "Consumption_km/kwh": 6,
  "ChatID": "740346462",
  "ThingSpeakKey": "2141952",
  "ConnectedDevices": [
```



```
"Agenda": {
  "Monday": [
    {
      "Type": "work",
      "StartTimeSlot": 8,
      "NumberOfTotalKilometers": 50
    },
    {
      "Type": "sport",
      "StartTimeSlot": 19,
      "NumberOfTotalKilometers": 18
    }
  ],
  "Tuesday": [
    {
      "Type": "work",
      "StartTimeSlot": 8,
      "NumberOfTotalKilometers": 50
    }
  ],
  "Wednesday": [
```


$$\text{EnergyNecessary} = \frac{NumberKmPerDay}{Battery\ Consumption}\text{[KWh]}$$

$$\text{Battery} = \frac{EnergyNecessary*100}{Battery\ Capacity}\text{ [\%]}$$



$$\text{EnergyNecessary} = \frac{NumberKmPerDay}{Battery\ Consumption}[\text{KWh}]$$

$$\text{Battery} = \frac{EnergyNecessary*100}{Battery\ Capacity}\ [\%]$$