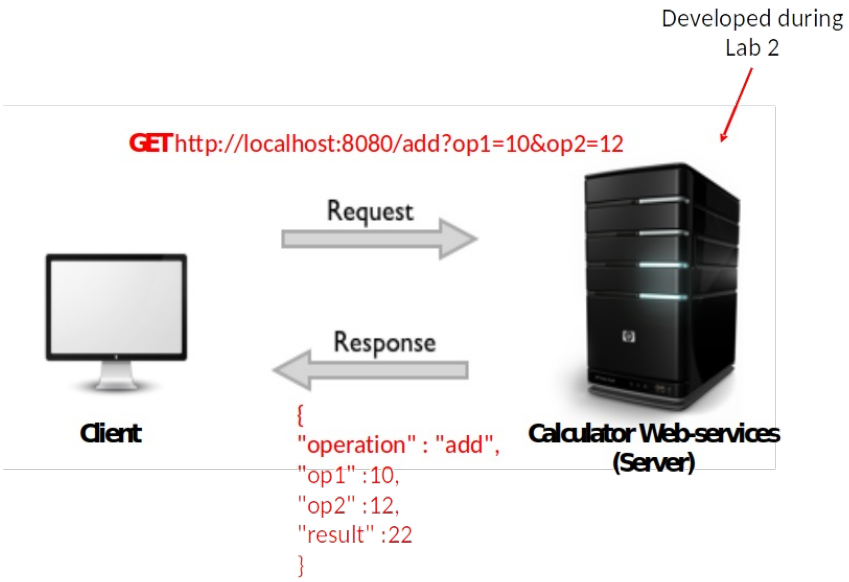
# Programming for IoT Applications

*Lab 3*

## Exercise 1

Develop a client python application for invoking the RESTful calculator developed in Exercise_1 during the Lab 2 that:

- asks to end-users the operation to be performed and two operands
- invokes the web services published by the RESTful
- shows the results to end-users in a friendly way (NOT the full JSON)




## Exercise 2

Extend Exercise_3 proposed during the Lab 1, for designing a RESTful-style catalog manager. Identify what are the proper HTTP methods (among GET, POST, PUT and DELETE) and develop the web services to:

- **searchByName**: print all the information about the devices for the given
- **searchByID** : print all the information about the devices for the given
- **searchByService** : print all the information about the devices that provides the given
- **searchByMeasureType** : print all the information about the device that provides such measure
- **insertDevice**: insert a new device it that is not already present on the list (the ID is checked). Otherwise ask the end-user to update the information about the existing device with the new parameters. Every time that this operation is performed the “last_update” field needs to be updated with the current date and time in the format “yyyy-mm-dd hh:mm”. The structure of the parameters of the file must follow the one of the ones that are already present
- **printAll** : print the full catalog
- **exit**: save the catalog (if changed) in the same JSON file provided as input.

## Exercise 3

Develop your REST web services for getting information from third-party web services for the real bike sharing in Barcelona (Spain). Choose the most suitable HTTP method among GET/POST/PUT/DELETE and the data-format.

Example of bike sharing JSON:


```
{
  "url_icon": "\/icons\/ubicacio.png",
```

```
  "url_icon2": "\/icons\/ubicacio2.png",
  "url_icon3": "\/icons\/ubicacio3.png",
  "url_icon4": "\/icons\/ubicacio4.png",
  "url_icon5": "\/icons\/ubicacio5.png",
  "estacions_icon": "\/icons\/estacions.png",
  "parametros_filtro": [],
  "stations": [{
    "id": "496",
    "type": "BIKE",
    "latitude": 41.404839,
    "longitude": 2.17482,
    "streetName": "C\/ PROVEN\u00c7A, 445",
    "streetNumber": "",
    "slots": 4,
    "bikes": 9,
    "type_bicing": 2,
    "electrical_bikes": 0,
    "mechanical_bikes": 4,
    "status": 1,
    "disponibilidad": 0,
    "icon":"\/icons\/ubicacio-0.png",
    "transition_start": "",
    "transition_end": ""
  },    {
    "id": "424",
    "type": "BIKE",
    "latitude": 41.379632,
    "longitude": 2.192662,
    "streetName": "PG. MAR\u00cdTIM DE LA BARCELONETA",
    "streetNumber": "",
    "slots": 7,
    "bikes": 20,
    "type_bicing": 2,
    "electrical_bikes": 1,
    "mechanical_bikes": 19,
    "status": 1,
    "disponibilidad": 75,
    "icon":"\/icons\/ubicacio-0.png",
    "transition_start": "",
    "transition_end": ""
  }
]
}
```


In detail, the application needs to get in real-time the information from https://www.bicing.barcelona/en/get-stations and provide web services to:

1. **Order the bike-stations by available “slots” and display first N stations.**

   The user can also choose to have the results in ascending or descending order (by default descending). The parameters for this web service are: - N: number of stations to display. It is optional and by default N=10. - order: It is optional and the default value is descending

2. **Order the bike-stations by available “bikes” and display first N stations.**

   The user can also choose to have the results in ascending or descending order (by default descending).

The parameters for this web service are: - N: number of stations to display. It is optional and by default N=10. - order: It is optional and the default value is descending

3. **Get all the bike-stations with more than N available “electrical_bikes” and more than M free “slots”**

   The parameter for this web service is: - N: number of available bikes. It is optional and by default N=10. - M: number of free slots. It is optional and by default M=5.

4. **Count all the available “bikes” and all the free “slots” in the city.**

Each web service must verify if the parameters are correct otherwise rise an HTTP error with the right HTTP status code.