Phase 1: in this phase the main functionality for the system was implemented.

Reservation Free Parking Module (available for VIP users and Normal users)

Check Availability:

* Description: it gives the ability for both users to view the current parking area status by displaying the parking area map with a status shown for each parking spot. It required a hardware and software implementation.
* Logic: the installed sensor in each spot will keep listen if any user entering or leaving the spot and then the value will be sent to the NodeMCU which is in term updating the Firebase Database. On the other hand, the application or website will keep listen to any change in the spot status in the Firebase Database and reflect any changes directly to the map without needing to refresh the page.

Reserved Parking Module (available for VIP users only)

Reserve a parking:

* Description: it gives the ability for VIP user to reserves a parking spot for several hours. VIP user can reserve starting from one day before the reserving time and they can reserve up to 6 hours per day. Also, the VIP user will be charged 5 QR per hour and if they exceed the reserved time, triple price penalty will be applied.
* Logic: In order to reserve, VIP user should select the date, start time and the duration. Whenever the date is selected the status for each hour will be changed based on the number of reservations in each hour. The application displays the status of each hour through colors. Blue for “available” and red for “not available”. Hardware part

Extend reservation:

* Description: it gives the ability for VIP user to extends a reservation and the extension time is by default one hour. VIP user will be charged 5 QR per extension.
* Logic:

Phase 2: to improve the system additional functionality was implemented.

Reservation Free Parking Module (available for VIP users and Normal users)

Get Directions:

* Description: this feature was added to the check availability service to give the user the ability to get directions for specific spot. It required a software implementation only.
* Logic: Each spot is associated with specific (latitude, longitude) coordinate. By using google map we were able to get the location and the directions from current location of the user (device location) to the spot location.

Reserved Parking Module (available for VIP users only)

Reserve a parking:

* Description: this service is already implemented in the phase-1. Additional feature was added which is knowing how many spots left in each hour.
* Logic: The application displays the status of each hour through colors. Green if >75% left*,* orange if 50% left, red if 25% left and gray if 0% left. For knowing the left percentage, for each hour the code will loop through all the reservation that are not cancelled and count how many reservations in this hour. Now the left percentage is computed by (number of reservation in specified hour/ total allowable reservation per hour) \* 100.