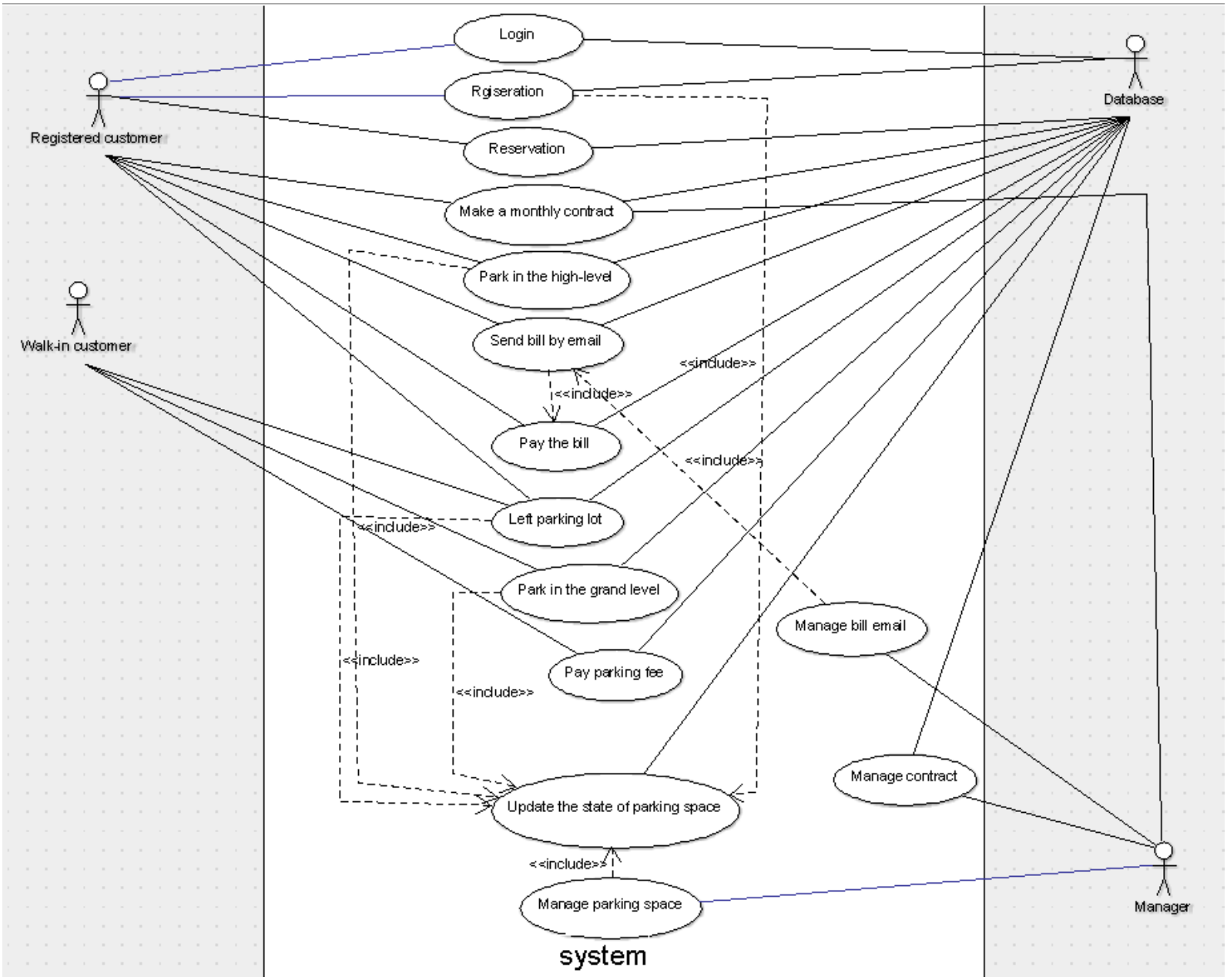
Software Quality

Deliverable 1.2

Requirement

A. Use case diagram



B. Use case elaboration

Name	Login
ID	1

Description	Register customer login the reservation system
Primary Actor	Register customer
Secondary Actor(s)	
Pre-condition	The database contains the user registration information
Post-condition	
Trigger	User wants to make a reservation

Name	Registeration
ID	2
Description	Customer register as user in the system
Primary Actor	Register customer
Secondary Actor(s)	
Pre-condition	User does not exist
Post-condition	User's information saves in the database
Trigger	Customer wants to access to the reservation system

Name	Reservation
ID	3
Description	Register customer can make parking reservation in the system.
Primary Actor	Register customer
Secondary Actor(s)	
Pre-condition	1. 1. There is empty parking space in the parking lot 2. Register customer need provide parking plan and plate number
Post-condition	1. Parking plan and plate number save in the database 2. The state of parking space has been updated to "reserved"
Trigger	Register customer have a plan to park in the parking lot

Name	Park in the high-level
ID	4
Description	Register customer can park in the high-level of the parking lot.
Primary Actor	Register customer
Secondary Actor(s)	
Pre-condition	1. Customer must be register customer 2. Register customer has made a reservation

	3. Register customer provide parking plan and plate number at the entrance of the parking lot. 4. There is empty parking space in the high-level of parking lot.
Post-condition	1. Parking plan and plate number save in the database 2. The state of parking space has been updated to “used”
Trigger	The sensor at the entrance detects the register customer

Name	Send bill by email
ID	5
Description	The system sends bill to register customer every month.
Primary Actor	Database
Secondary Actor(s)	
Pre-condition	1. Mail recipient must be register customer 2. Monthly fixed date
Post-condition	Register customer accepts the bill email
Trigger	The system sends email automatically by the fixed date of each month

Name	Pay the bill
ID	6
Description	Register customer can read and pay the bill by clicking the link in the email.
Primary Actor	Register customer
Secondary Actor(s)	
Pre-condition	Register customer accepts the bill email.
Post-condition	
Trigger	Register customer clicks the link in the email

Name	Left parking lot
ID	7
Description	Customer left the parking lot via exit
Primary Actor	1. Register customer 2. Walk-in customer
Secondary Actor(s)	
Pre-condition	1. Customer is register customer 2. Walk-in customer has paid the parking fee
Post-condition	1. The state of parking space has been updated to “empty” 2. The parking fee charged to bill

Trigger	The sensor at the exit detects the leaving customer

Name	Park in the grand level
ID	8
Description	Walk-in customer can only park in the grand level of the parking lot
Primary Actor	Walk-in customer
Secondary Actor(s)	
Pre-condition	There is empty state parking space in the grand level of parking lot
Post-condition	The state of parking space has been updated to “used”
Trigger	The sensor at the entrance detects arrived customer

Name	Pay parking fee
ID	9
Description	Walk-in customer should pay parking fee before they leaving the parking lot
Primary Actor	Walk-in customer
Secondary Actor(s)	
Pre-condition	Walk-in customer stays at the exit of parking lot
Post-condition	
Trigger	The sensor at the exit detects the leaving customer

Name	Update the state of parking space
ID	10
Description	1. The state of parking space will be change if the customer left the parking space 2. Manager can update the state of parking space in real time
Primary Actor	1. Register customer 2. Walk-in customer
Secondary Actor(s)	Manager
Pre-condition	1. Customer make reservation, park or leave 2. Manager update the state manually
Post-condition	The state of parking space has been updated
Trigger	Reservation, parking or leaving

Name	Manage parking space
ID	11
Description	Manager can read and search the state of parking space

Primary Actor	Manager
Secondary Actor(s)	
Pre-condition	
Post-condition	
Trigger	Manager stays in the page of managing parking space

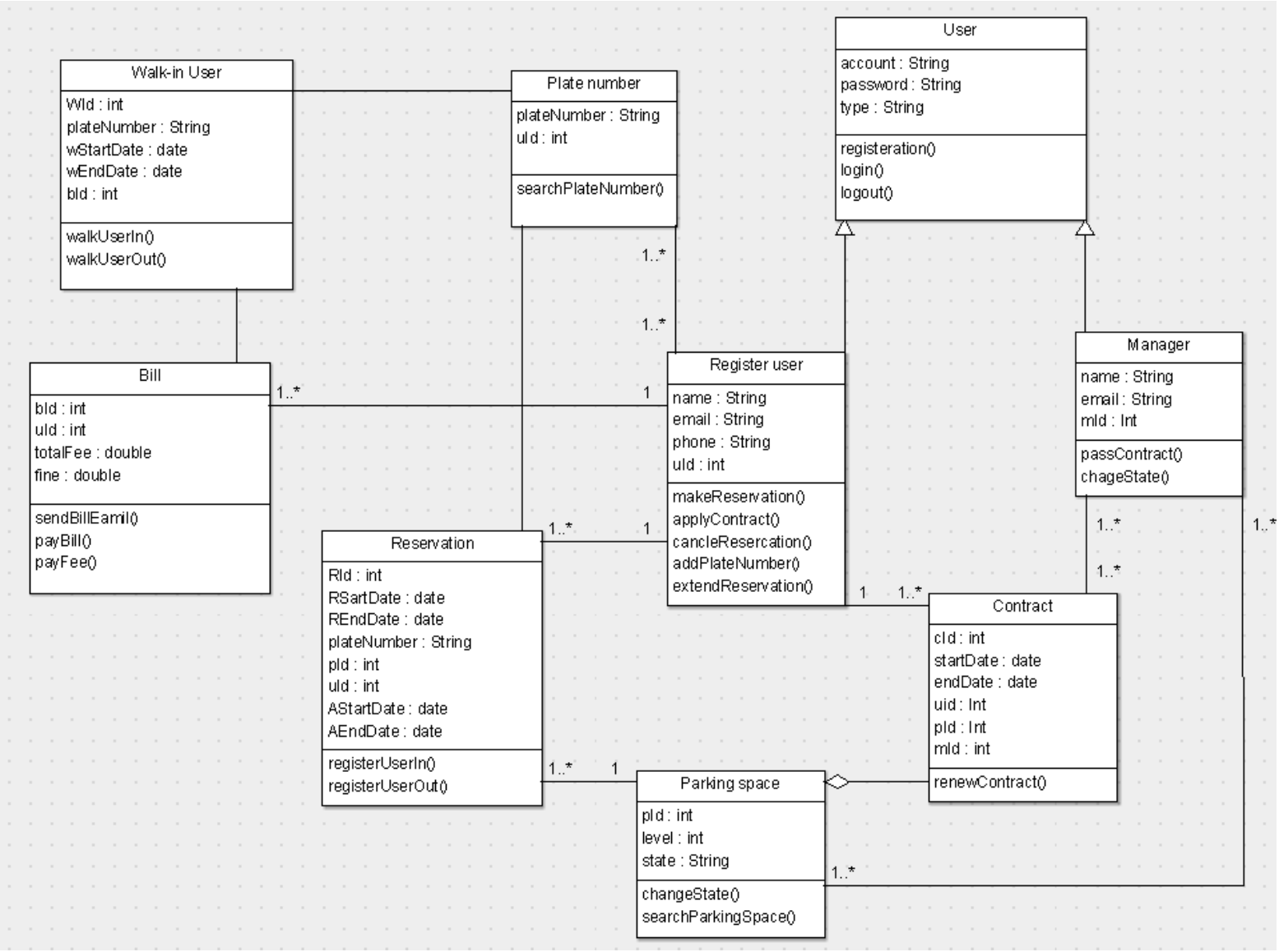
Name	Manage bill email
ID	12
Description	Manager sets the temple of the bill email and which date of every month to send the bill email
Primary Actor	Manager
Secondary Actor(s)	
Pre-condition	
Post-condition	The temple of email and date have been saved in the database
Trigger	Manager stays in the page of managing bill email.

Name	Make a monthly contract
ID	13
Description	Register customer can apply for a monthly contract with manager. Manager need to review the contract and pass the application. If register customer makes a contract, the fixed parking space will be reserved for him permanently
Primary Actor	Register customer
Secondary Actor(s)	Manager
Pre-condition	1. Customer must be register customer 2. Manager passes the application
Post-condition	1. The information of contract has been saved in the database 2. The parking space relates to the register customer
Trigger	Register customer apply for a contract

Name	Manage contract
ID	14
Description	Manager can read and search contract.
Primary Actor	Manager
Secondary Actor(s)	
Pre-condition	
Post-condition	

Trigger	Manager stays in the page of managing contract

C. UML Class Diagram



Quality Plan

A. Quality goals and metrics [1]:

B. Product Quality	Quality Goals	Quality Metrics	Strategy
Product Operation			
Correctness	The system shall meet the specifications	The functionality issue reports should less than 5 in the whole lifecycle	Provide beta version to allow customers to

			experience and provide feedback
Reliability	The system shall work accuratly all of the time	The crashing frequency should be less than 3 per year	Stress testing
Usability	The system should be easy to learn and operate	A new user should be able to start using it with less than a day's training	Provide beta version to allow customers to experience and provide feedback
Integrity	They system should not be tampered	The data leakage should be less than 1 in 3 years	Unit test on normal cases and boundary cases
Efficiency	The system should quickly solve the intended problems	The system should finish all the data query and manipulation in less than one second	Unit test on normal cases and boundary cases
Product Revision			
Maintainability	The bugs and errors can be easily fixed	The source code should be readable, easily traced back to documents.	Code Review
Flexibility	The system can be easily changed	The changing in some parts should not affact the whole running.	Objected Oriented Design
Testability	The system should be testable	Every class must available for white and black box testing.	Mutation and Unit testing tools
Product Transition			
Reusability	Parts of the system should be able to be reused in another system	Modules in the system can be used in another system in less than 1 week configuring	Standard interface design and Objected Oriented Design
Portability	The system should be easily moved to a new platform	The system should work correctly on different models of devices	Standard interface design
Interoperability	The system should be able to interaction with other systems	The system should be able to work with other data management systems	Standard interface design

Priority of quality goals: (high->low)

1. Correctness
2. Maintainability, Testability
3. Usability, Efficiency, Reliability
4. Flexibility, Portability
5. Integrity
6. Reusability, Interoperability

Additional notes: To finish the project in a short time, our team weighed the priority of quality goals as such a way: Our main goal of this project is to finish a functional and usable product that satisfies the project specification. Thus **Correctness** is the most important metric in our project. If we cannot provide a usable software, the project is meaningless. Then, we have to make sure we can finish the project efficiently. Thus **Maintainability** and **Testability** is of secondary importance. Then, we have to make sure the user experience not too bad. Thus **Usability**, **Efficiency**, **Reliability** must be concerned. **Flexibility** and **Portability** also affect the efficiency and quality of our project. **Integrity** is not a big concern in our project. As we do not have the requirements for reusing and interoperating with other systems, Reusability and Interoperability take a back seat for this project.

C. Costs of quality

Task Name	Estimated Effort(hrs)	Implementation	Evaluation	Prevention
Project Planning	30	25	0	0
Simulation Environment Construction	10	8	2	0
User Interface Design	30	20	5	5
Database Settings	20	15	2	3
Garage Access Control	30	20	4	6
Monitoring of Occupancy and Space Reassignment	40	30	5	5
Simulation of Arrivals and Departures	40	30	5	5
Data Collection	20	15	5	0
System Administration	25	20	2	3
System Testing	29	15	4	10
Software Bug Correction	28	5	3	20
Total	302	203	37	57

[1] McCall, J. A., Rihcards, P. K., Walters, G. F. Factors in Software Quality, Volumes I, II, and III. US Rome Air Development Center Reports, US Department of Commerce, USA, 1977.