CMPS311 Object Oriented Modeling

- Group Project -

Milestone-2: Design (10%)

This is a compulsory project. If you do not submit this, your grade will be 0 in this course.

Submission Due: ***December 13, 2012 (Thursday****) by the end of your class*

Fall 2012

Background

Mr. Ali Al-Abdullah, the owner of Central Doha Waste (CDW0, has accepted your previous submission of *Milestone-1: Requirements Analysis*. Now Mr. Al-Abdullah wants your development team to continue with the development of an information system to satisfy the requirements of Central Doha Waste (CDW). This time he looks for detail design of the system. Mr. Ali now wants that you design the system based on the use case diagram and the use case specifications provided on pages 9- 13 in this document.

This document contains the following items:

(1) Your tasks are outlined on pages 1-2;
(2) The system description on page 3-4 (same description provided in *Milestone-1*);
(3) A preliminary investigation report on page 5-8 (same as provided in *Milestone-1*).
(4) A proposed use case diagram and 6 major use case specifications are available on page 9-13 (Appendix). You must use those 6 use case specifications.

Your Tasks

Milestone 2: Design

This project concentrates on the technical aspects of the software engineering process, and hence emphasizes the modeling components developed during the process. The focus of this Milestone-2 is on the design to produce the class model, state model, and the design sequence diagram using the Unified Modeling Language (UML) and Visual Paradigm tools. The body of your Milestone 2: Design will consist of the following deliverables:

1) Propose a *domain model* of the system

2) Complete *design class diagram* with all major classes, their attributes and types, relationships with multiplicity where applicable, methods with parameters, and visibility of attributes and methods. You must use the use case specifications provided on pages 9-13.

3) *State transition diagram* of 4 state-dependent classes proposed in your design class diagram.

4) Complete *design level sequence diagrams* for all 6 major use case specifications provided in this document on pages 9-13.

Any assumptions you made regarding the system description. Assignment components will be evaluated for **accuracy**, **clarity**, **relevancy, and completeness** (especially among components and among artifacts) of your document.

Please upload your solution to Blackboard as a zip file **including both** the ***Word Document*** and the ***Visual Paradigm diagram*** (.vpp file). The Word document must have all the diagrams. **Your must call the zip file: Group?-DesignDiagrams.zip** (Group? is your Group Number) . Example: G2**DesignDiagrams**.zip.

Also you must submit a hardcopy by the end of the class on the due date.

Grading scheme for Milestone-2: Design

Criteria	**Grading %**
Domain model	10
Complete Design Class Diagram	28
Four State Transition Diagrams	16
Six Design Sequence Diagrams	42
Assumptions, and for document accuracy, clarity, relevancy, completeness	4
Total	100

Next millstone:

- Milestone-3: Contract, communication diagrams, implementation, testing/use of design patterns.

Submission requirements

Your assignment group/team MUST comply with the following submission requirements:

1. Make sure that the entire team submits only one copy of the project (hardcopy and Blackboard submissions). The cover page must contain the following items:

   [Each member of the group will be required to submit a peer group evaluation with an estimate of the contribution from each member to the project. Write the percentage contribution made by each team member so that it adds up to 100%. This evaluation *may* be used to adjust the marks awarded to each team member]

   - Group ID:_____
   - Effort distribution of the student:

     SID:___STUDENT NAME: _____Effort given_____%
     SID:___STUDENT NAME: _____Effort given_____%
     SID:___STUDENT NAME: _____Effort given_____%
     SID:___STUDENT NAME: _____Effort given_____%

   - Course number:_____
   - Submission date:_____
   - DECLARATION: *We hereby certify that no part of this project or product has been copied from any other student's work or from any other sources except where due acknowledgement is made in the project. No part of this project/product has been written/produced for us by any other persons.*

2. Be aware of
   - *Submitted work must be students' own work*
   - *You cannot copy the project from other groups.*

Submission Due: December 13, 2012 (Thursday) by the end of your class.

System Description of CDW

"The system we have at CDW at present is mostly manual. We have a computer based accounting system to manage accounts receivable, accounts payable and general accounting records. This is a standard, off-the-shelf software package called *Your Business Accounting* (YBA). CDW has three broad categories of staff:

First, there are the truck drivers who collect the waste from our customers. The trucks have hydraulic lifting forks on them that lift and empty the bins into the body of the truck.

Second, we have a driver who delivers empty bins to new customers and who collects our bins should we lose a customer.

Third, we have our administration staff. They prepare the daily work schedules for both the drivers who deliver or collect empty bins, and those who collect waste.

In addition, there are sales staff to obtain new customers and new waste collection business, but their role is not relevant in a discussion of the day-to-day waste collection activities of the company. Finally, the company has several supervisors who look after daily activities such as managing trucks and drivers. In case of emergency such as illness of drivers, or increased collection requirements, supervisors call casual drivers. The company maintains a database for such casual drivers. The payment to the casual drivers is made on daily rate basis.

We have two sizes of bins that we supply to customers. One is *two cubic meters (Small bin)*, the other is *four cubic meters (Big bin)*. When a customer takes a waste collection service with us, the agreement can be for a "regular" or "on request" service. "Regular collections" are made every specified day of the week. "On request" customers, as the name suggests, have their waste collected whenever they call and request collection. Customers can call one or two days before the collection is required.

Each day we prepare work a schedule for each collection driver. The work sheet has listed on it the names and addresses of each customer the driver must visit that day to empty their customer's bin. The customers listed are all those who have a scheduled service for the day as well as the "on request" customers who have requested a service. The company also serves corporate clients such as industries and factories. Some special trucks are used to collect the industry wastes every day. The billing to these corporate clients is calculated on yearly basis. The rates are also different for the corporate clients.

When the driver collects the waste at the customer site, he marks the work schedule to indicate that the collection has been made. Very occasionally, the customer may have excess waste in the collection (the bin is overloaded). In such cases the driver marks the work schedule accordingly, and the customer is charged an excess waste fee for that service.

Charges to our all clients for waste collection services are calculated as follows. Each bin has a monthly rental charge. In addition, there is a collection charge each time the bin is emptied. As noted above, there may also be an excess waste fee associated with the collection service. When the driver returns his work schedule, the services that have been performed are recorded. At the end of each month, the details of each service (including excess waste fee if applicable) and bin rental fees are entered into YBA where an invoice is prepared for each customer for the month's fees. The invoice shows the bin rental for the month and each waste collection service performed.

As far as the delivery and collection of bins is concerned, each day we prepare a work schedule of bins to be delivered to customers and bins to be returned from customers. The driver has the responsibility for deciding whether bins are taken from our yard, or whether the bin may be removed from one customer and delivered to the next. When the driver delivers or

collects a bin, he marks the work schedule accordingly. The rental charges for these customers are charged on a pro-rata basis for the month of installation or removal. For example, if a bin was delivered halfway through the month, then the rental for the month would be half.

Finally we have two separate trucks that are used for waste collection and we divide the work done into two zones: " Doha North " and " Doha South ". Customers in the north of Doha are listed on the *north work schedule*, and serviced by the *Doha North* truck. Customers in the south of Doha are listed on the *south work schedule* and serviced by the *Doha South* truck. We only have one bin delivery truck for each of these two zones. Of course, we expect that our business will grow and the number of collection tracks will increase.

We want a system that will manage the scheduling of trucks, managing drivers, payrolls for the drivers, customers, bins delivery, bins collection. It will also take care of invoice preparation and forwarding it to YBA. All financial matters such as payment made by customers and salary of employees will be managed by YBA."

For this milestone, your client is still Dr. Khaled Khan. You can ask any question directly to him. Send him email k.khan@qu.edu.qa or see him during his office hours. In most cases, you need to make assumptions. Note, the above requirements description may be confusing or incomplete. You should also imagine how a system like this works. You MUST attach your justifications for any assumptions that you made in your project.

Silver Systems Solutions Limited

123 Goodness Street
Doha

October 1, 2012

To
Mr. Ali Al-Abdullah
Managing Director
Central Doha Waste
Doha
State of Qatar

Preliminary System Report

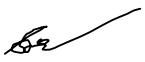
Dear Mr. Al-Abdullah,

We have pleasure in presenting our report for your use. We have investigated the business requirements in your waste service business and recommend that you retain Your Business Accounting (YBA) as the accounting package in your business. It is meeting your current requirements and until such time as you need to expand to a multi-user accounting environment, you should continue to do so.

However, improvement can be made in the information systems of your business through development of computer based processing of the records of services provided to your customers through your industrial waste service. As there are no off-the-shelf solutions available to meet these needs we suggest that a software development team be engaged to undertake the design of the information system required. We believe that the recent graduates from Qatar University who have completed software engineering course could design this system. The system developed should provide an interface to YBA for the invoicing of customers and management of accounts.

We have attached a copy of our Preliminary Systems Report on the work that we have undertaken on this project.

Yours faithfully,



(Ahmed Ibrahim)
Project Manager

Silver System Solutions Limited
123 Goodness Street
Doha

CENTRAL DOHA WASTE : PRELIMINARY INVESTIGATION REPORT

Our requirements elicitation process for the industrial waste collection functions at CDW has provided the following requirements specification.

Overview Statement

The purpose of the development project for CDW is to create a computer based information system to be used in the management and control of the industrial waste collection functions in the company.

Customers

The client (and sponsor) for this project is Central Doha Waste.

Goals

In general terms, the goals of the system are to provide automated record keeping and reporting for the industrial waste collection service of CDW. In so doing the system will provide enhanced functionality in work schedule management and analysis reporting. More specifically the goals include:

- Automation of the creation of work schedules (service and bin installation/removal)
- Preparation of regular workload analysis
- Preparation of regular installation/removal analysis reporting
- Generation of billing data for YBA

Some Identified Use Cases:

(This section is not complete. It will require further development in the next stage of the development)

Use case:	Prepare daily work schedule
Actors:	Administrator
Type:	Primary
Description:	The administrator initiates this use case each day. Each customer record is examined to determine whether or not a waste removal service is scheduled for the customer for today. Scheduled services are collected and formed into a service work schedule. Ad hoc service requests for the day are added. The use case ends when the service work schedule is complete.

Use case:	Prepare on-request service schedule
Actors:	Customer, administrator
Type:	Primary
Description:	This use case begins when a customer calls to request an ad hoc waste collection service. The customer advises the day on which the service should occur. The use case ends when the service request has been recorded.

Use case:	Prepare install/removal schedule
Actors:	Administrator
Type:	Primary
Description:	The administrator initiates this use case each day. The records of new customer services and terminating customer services are examined and installation and removal of bins for the day are identified. (Note: the creation and maintenance of the records of new customer services and terminating customer services is outside the boundary of this project). The installation/removal services are collected and formed into an installation/removal work schedule. The use case ends when the schedule is complete.

Use case:	Maintain customer record
Actors:	Administrator
Type:	Secondary
Description:	This use case begins when the administrator is advised of a customer change. The change may be a new customer, alteration to an existing customer's data, or a customer terminating its association with CDW. The use case ends when the customer's record is up to date.

Use case:	Maintain customer waste service record
Actors:	Administrator
Type:	Secondary
Description:	This use case begins when the administrator is advised of a change to a customer's waste collection service. The change may be the addition of a new customer service, alteration to an existing service, or a termination of a service. The maintenance will refer to quantity and size of bin, or service day and frequency, or both. The use case ends when the customer's service record is up to date.

Use case:	Prepare customer service summary
Actors:	Administrator
Type:	Secondary
Description:	This use case begins at month end. The customer service records for services performed are accessed. Statistics are produced for each customer of the services provided. The use case ends when the service summary report is complete.

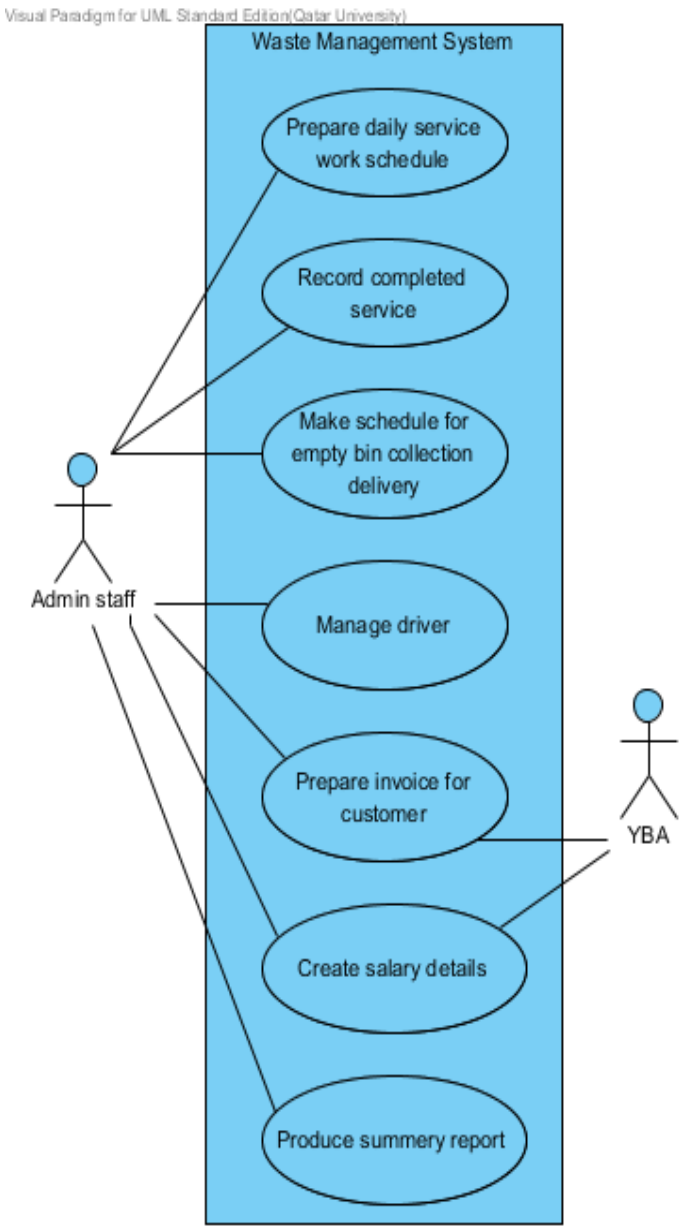
Use case:	Prepare installation/removal summary
Actors:	Administrator
Type:	Secondary
Description:	This use case begins at month end. The bin installation and removal records are accessed. Statistics are produced for each bin size of the bin movements. The use case ends when the installation/removal summary

report is complete.

Use case:	Forward billing data to YBA
Actors:	Administrator
Type:	Primary
Description:	This use case is initiated by the administrator. Customer installed bin records (for rental charges) and customer service records (for service charges) are accessed and billing records created. The use case ends when the billing records have been sent to the YBA system.

Note: The use cases and systems functions that were prepared by Silver System Solutions Pty Ltd might have some flaws or incomplete. It is required that the project development team corrects those problems, if there is any.

Appendix



Use Case Diagram of the Waste Management System.

Use Case Specifications

Use case Name:	**Prepare daily service work schedule**
Brief Description:	The admin staff initiates this use case each day. Each customer record is examined to determine whether or not a waste removal service is scheduled for the customer for today. A service work schedule is prepared based on the services requested by customers.. On request service requests for the day are also added. The use case ends when the service work schedule is complete.
Primary actors:	Admin staff

Trigger: Admin staff decides to create a daily service work schedule

Preconditions:

1. Customer service requests exist for the day

Post-conditions:

1. A work schedule has been created for the services requested for the day.

Main Success Scenario: A work schedule is created.

Actor Action	System Response
1 This use case begins when the Admin staff decides to create a daily work schedule.	
2 The Admin staff requests the "create work schedule" function.	3 Displays a form for entry of day of the week and service zone.
4 The Admin staff provides the day of the week and the zone (North Doha or South Doha)	5 Records the day, zone in storage
	6. Retrieves the service request and address of each customer
	7 Compares the customer's request with the stored day of the week and zone.
	8 Adds the customer name, address, bin size and bin quantity to the work schedule
	9 Stores the work schedule for this day of the week and zone
	10 Prints the work schedule for this day of the week and zone

Alternative flows (if any):

5a. If the day of the week or the zone is invalid, display error message and return to step 4.

6a. If a customer has no scheduled service for this day, or is in another zone, the system accesses the next customer record and returns to step 6.

Use case Name:	**Record completed service**
Brief Description:	This use case begins when the admin staff selects to record the waste collection services that have been performed by a driver in a particular zone for a particular day. The Admin staff uses the annotated work schedule returned by the driver. The use case ends when all services noted on the work schedule have been recorded.
Primary actors:	Admin staff

Trigger: The admin staff decides to enter the performed services

Preconditions:

1. A schedule must exist

Post-conditions:

2. Performed services are recorded.

Main Success Scenario: All completed services are stored.

Actor Action	System Response
1. This use case begins when the admin staff decides to enter performed services from a daily work schedule.	
2. The admin staff requests the "enter services performed" function.	3 Requests the day of the week and zone.

4.The Admin staff provides the day of the week and the zone (North city or South city)	5. Locates the stored work schedule and displays it
6. For each entry in the work schedule, (a) the Admin staff enters whether the service was done (b) the Admin staff indicates if there was an overload situation	7 Retrieves one-by-one all customers' bin record to access the service requests
	8 Stores the service data whether a serviced is performed or not, including overload waste

Alternative flows (if any):

6a. The work schedule for the day of the week and zone does not exist. Display message of this fact and proceed to step 10.

7a. For services that have not been performed due to various reasons and that require rescheduling, the Admin staff will enter the rescheduled services via the *Schedule* o*n request service* use case later.

Use case Name:	**Make schedule for empty bin collection and delivery**
Brief Description:	The Admin staff initiates this use case every day. The system finds the details of all new customers, the additional service request of existing customers, and the customers who do not want any service. A service work schedule is prepared based on these. The use case ends when the service work schedule for the delivery and collection of bins is complete.
Primary actors:	Admin staff

Trigger: Admin staff decides to create a bin delivery and collection schedule

Preconditions:

2. At least one new customer, an additional service request, or an outgoing customer exists

Post-conditions:

3. A work schedule has been created for the bin delivery and collection.

Main Success Scenario:

Actor Action	System Response
1 This use case begins when the Admin staff decides to create a schedule for bin delivery and collection.	
2 The Admin staff requests the "create work schedule" function.	3 Displays a form for entry of day of the week and service zone.
4 The Admin staff provides the day of the week and the zone (North Doha or South Doha)	5 Records the day, zone in storage
	6. Retrieves the new service request, additional service request, or terminated services
	7 Find the customer details
	8 Allocate the correct bin size to the customer according to the request for the bin delivery
	9. Make schedule for bin delivery for new requests and collection for terminated services

	9	Store the work schedule
	10	Print the work schedule

Alternative flows (if any):

5a. If the day of the week or the zone are invalid, display error message and return to step 4.

6a. If a customer has no scheduled service for this day, or is in another zone, the system accesses the next customer record and returns to step 6.

Use case Name:	**Manage drivers**
Brief Description:	This use case begins when the admin staff wants to assign task to drivers. The system finds daily schedule, and empty bin delivery and collection schedule (if there is any). The use case ends when all schedules are assigned to available drivers.
Primary actors:	Admin staff

Trigger: The admin staff starts assigning schedule to drivers.

Preconditions:

1. A daily service work schedule or an empty bin delivery and collection schedule must exist.

Post-conditions:

1. The daily service work schedule is assigned to drivers.
2. The empty bin delivery and collection schedule, if any exists, is assigned to drivers.

Main Success Scenario:

Actor Action	System Response
1. The admin staff requests for assigning drivers to schedules	2. Retrieves the daily service work schedule and empty bin delivery schedule if there is any
	3. Gets available driver for the schedules
	4. Assigns the available drivers to schedules
	5. Displays and stores the schedules with assigned driver's names

Alternative flows (if any):

3a. If no drivers are available, find casual drivers for the schedule.

Use case Name:	**Prepare invoice for customer**
Brief Description:	This use case begins when the admin staff selects to prepare bills (invoices) for all services performed for customers. The system prepares invoices based on services already completed. The use case ends when all invoices are sent to YBA.
Primary actors:	Admin staff

Trigger: The admin staff decides to prepare invoices

Preconditions:

1. Completed service must exist.	
Post-conditions: 2. Invoices are prepared and sent to YBA.	
Main Success Scenario:	
Actor Action	**System Response**
1. The admin staff requests for the preparation of invoices	2. Retrieves the list of services performed for each customer
	3. Finds the bin size of each service and the service fee
	4 Calculates the cost and prepare the invoice
	5 Displays and stores the invoice
	6 Sends a copy of the invoice to YBA
Alternative flows (if any):	
3a. If the service includes overload waste, or additional on-request services of a customer, the system finds the related fees, and includes the cost in the invoice	

Use case Name:	**Create salary details**
Brief Description:	This use case begins when the admin staff wants to make drivers' salary information for YBA
Primary actors:	Admin staff
Trigger: The admin staff starts preparing salary data for drivers.	
Preconditions: 1. Driver is assigned to a schedule. 2. Driver must exist	
Post-conditions: 1. A salary slip is created for all drivers who have been assigned to schedules.	
Main Success Scenario:	
Actor Action	**System Response**
1.The admin staff requests to prepare salary information for drivers	2. Retrieves the daily service work schedule and empty bin delivery schedule (if there is any)
	3. Gets the driver details assigned to schedules
	4. Finds the salary scale of drivers
	5. Prepares salary information and stores.
	6. Displays salary data and send a copy to YBA
Alternative flows (if any):	
4a. If the drivers are casual, find the hourly rate of casual	

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