COMP 40725 Introduction to Relational Databases & SQL Programming with Dr. Scanlon

Project Design Document

Due 28.3.2014



# Project Design Document

1. Project Description

The current project idea originates in the business needs of a hypothetical cruise company, *Regal Cruises International,* that provides quality cruise holiday packages to customers. Specifically, this company requires a database to maintain its customer reservation system and cruise operations. This project idea seems highly amenable to the database requirements of the current assignment specification since a database can easily store all the information that the company needs to know about its cruise services and customer reservations. The company offers several holiday packages to its customers, based on the destination or world region (e.g. *South-East Asian Adventure*, *Alaskan Antics, Baltic Bliss*), and the time of year (e.g. *Summer 2014, Winter 2014)*. Importantly, a package is specific to the current season and year e.g. *Carribean Cruisin’ Summer 2014*, *Carribean Cruisin’ Autumn 2014*, *Asian Adventure Spring 2015,* and a package will only take place concurrently with packages/cruises in other world locations. The company owns several large cruise liners, with each liner usually alternating back and forth between a route’s initial departure port, and its final destination. Each cruise liner has many services onboard, and every cruise liner has the same passenger capacity and range of facilities. Cruises will make stops at several ports during their journey, usually a popular tourist city, but these visits are limited to day-trips and no new passenger can embark at these intermediate ports, for a ‘partial cruise holiday’. Prices of cruise holidays vary but mostly depend on the type of membership the customer chooses (as well as world region in which the cruise travels – which vary in popularity), which further determines the quantity/range of services available to the customer and the room types they can choose from.

2. Identification of Business Rules

Prior to developing a conceptual model for this database, it is necessary to explicit state the business rules of the company.

* A package will only ever have one ship associated with it.
* Conversely, a ship, over its career, will be part of many packages.
* Necessarily, each package is peculiar to one route, and a route will be (logically) contained in only one package.
* A route has many ships that service it over time, but a ship will only ever travel one route (for convenience and efficiency – travelling only back and forth from one start-point destination to an endpoint destination).
* Further, a ship’s route or schedule will involve many ports over its journey. Passengers disembark at ports to sightsee in that city, and the cruise ship may also be serviced at this port.
* One port can be included in many routes – for example, some routes will have the initial departure from the same city, and then take different trajectories. For example, several cruise package holidays depart from Southampton, UK and progress onto Norway for the Baltic cruise, to Italy for the Mediterranean Cruise and to Spain for the Canary Island Cruise.
* A package also defines the type of membership type or class that the customer will be subscribed to throughout their onboard journey. Membership types include platinum, gold, silver, and bronze and determine the various services/assets onboard that the customer will have access to.
* Platinum membership entitles the passenger to a wine and drinks package, dining package, gifts, spa treatments, Internet access, and passenger choice of deluxe room.
* Gold membership includes all of the Platinum membership features, except a limited drinks and dining plan and no customer choice of room. Silver and Bronze packages lack the drinks and dining package completely, and are differentiated by the fact that Silver membership ensures access to all cruise ship entertainment shows (e.g. comedy) free of charge, while Bronze members must pay per entry.
* One package has many membership types available, and these very membership types are applicable to all packages.
* Membership type also determines the room type allocated for a customer, such that the more lucrative the package, the more luxury afforded in terms of comfort (e.g. Gold Membership entitles the customer to a Deluxe Double Room with Balcony, etc.).
* A membership type is applicable to many rooms onboard the cruise liner, but a room only has one classification in terms of membership type (e.g. room 304 on European Express cruise is reserved for those with Platinum membership.
* A single customer can make at most one reservation at one time. In the case where a woman would like to make a reservation for a cruise package for her family, this would count as one reservation (e.g. A family would have one reservation ID; the same ID for every family member), that might include multiple rooms (e.g. twin room for children and a double room for parents).

3. Identification of Assumptions Made

Assumptions are required to explicitly account for some aspects of our database design.

* For simplicity of our database design, this cruise ship company does not offer any discounts or special offers based on customer type/status, popularity of cruise package, or any other circumstance.
* Service ports are rare as there are engineers and technical staff onboard each cruise for the duration of the journey to inspect the quality and safety of the ship. Therefore, service stations for cruises at certain ports are not included in the database design.
* This database does not need to record information about all the services and facilities onboard each cruise ship.
* Information about each employee of the cruise company and which service and ship they work on is similarly outside the purview of the current database effort.
* When dealing with returning customers (that is, customers who come back and book a holiday at a later date), a new customer ID will be generated and thus, they will be treated as new customers.

4. Identification of Entities, Relationships, Cardinality and Optionality

The candidate entities for this database design are:

* Package
* Ship
* Route
* Port
* Reservation
* Customer
* Membership
* Room

Attributes of the above entity types are as follows:

* Package – Package ID, Package title, Ship number, departure date, final arrival date
* Ship – Ship number, name, ship type, model, size, capacity, route number
* Route – Route number, average passengers
* Port – Port ID, name
* Reservation – Reservation ID, package ID, membership type, date of reservation
* Customer – Customer ID, first name, surname, address, phone, reservation ID
* Membership – Membership type, price
* Room – Room id, Ship number, Membership type, Reservation ID

Relationships:

1. A package is serviced by a ship. A ship, over its career on the sea, will be used to host many packages.
2. A package is destined for a single route. A route, over time, will be travelled across to fulfill many packages.
3. A package can be reserved several times (i.e. it extends to multiple customers). A reservation is made for a particular package.
4. A package is chosen by many customers. A customer chooses one package.
5. A package offers several membership types to its customer (e.g. Gold, Platinum, Silver, Bronze). A membership type is similarly part of by many packages.
6. A ship travels one route over its career at sea. A route is travelled by many ships.
7. A ship contains many rooms of varying classification. A room is contained in a ship.
8. A route has many ports along its full course. A port may be part of several routes.
9. A reservation is made by a customer.
10. A customer is assigned a room.
11. A reservation involves a room.
12. A room is classified by membership type (for Gold/Silver/Platinum/Bronze members).

Identification of (A) Cardinality and (B) Optionality

1 A. The relationship between package and ship is necessarily a many-to-one: a package is serviced by one ship, but a ship will run many packages over time.

1 B. The package-ship relationship is mandatory : optional. A package must take place on a ship. A ship, such as a new cruise liner that is just new to the company, may not yet be servicing any package.

2 A. The cardinality between packages and route is many-to-one: a package represents one route, and a route will be represented by many packages over time.

2 B. The optionality between the package-route relationship is mandatory:optional acknowledging the fact that a package must travel along a route, but the company may introduce a new route without a package being devised to cruise along it.

3 A. The relationship between package and reservation is one-to-many: A package will have many reservations but a reservation can only detail one package.

3 B. The package-reservation relationship is optional:mandatory. A package may have a reservation associated with it, but it is not a requirement that it does, and a reservation must include the preferred package choice.

4 A. The relationship between package and customer is one-to-many: A package is chosen by many customers as their cruise holiday of choice, and a customer chooses one package at booking time.

4 B. The optionality of the package-customer relationship is optional:mandatory. A package may not yet be chosen by any customers, but a customer must choose a package if we are storing their details in a DB.

5 A. The relationship between package and membership type is many-to-many. A package has several membership types available to customers, and membership type is a facet of many packages.

5 B. The optionality of package-membership type is mandatory:mandatory as a package must offer several membership types to customers and a membership type must be present in all packages.

6 A. The relationship between ship and route is many-to-one: a ship will only travel one route, and a route will have many ships covering it over time.

6 B. The optionality between ship and route is optional:optional. A ship may be newly introduced to the company’s fleet and thus not be assigned a route. Equally, a route may be newly conceived of in the company’s itineraries and not have any ships travelling it yet.

7 A. The relationship between Ship and Room is one-to-many: a ship has many rooms but a room is part of a ship.

7 B. This relationship also expresses a mandatory:mandatory optionality. A ship must contain a room, and a room must be housed in a ship.

8 A. The relationship between Route and Port is many-to-many: A route consists of many ports on its journey, and a port can be part of many routes (see Assumptions).

8 B. The optionality of the Route-Port relationship is characterized as mandatory:mandatory. A route must contain at least one port, and a port must be included as part of a route.

9 A. The cardinality between Reservation and Customer can be best described as a one-to-one. A reservation can be made by a customer, and a customer makes one reservation.

9 B. The optionality between Reservation and Customer is mandatory:mandatory. A reservation must be made by a customer, and a customer (to be included in the Customer table) must have a reservation.

10 A. The relationship between Customer and Room is one-to-many. A customer sleeps in one bedroom throughout their stay, and a room accommodates many customers over time.

10 B. The optionality between Customer and Room is mandatory: optional. A customer must have a room while aboard the cruise liner, but a room need not necessarily be occupied.

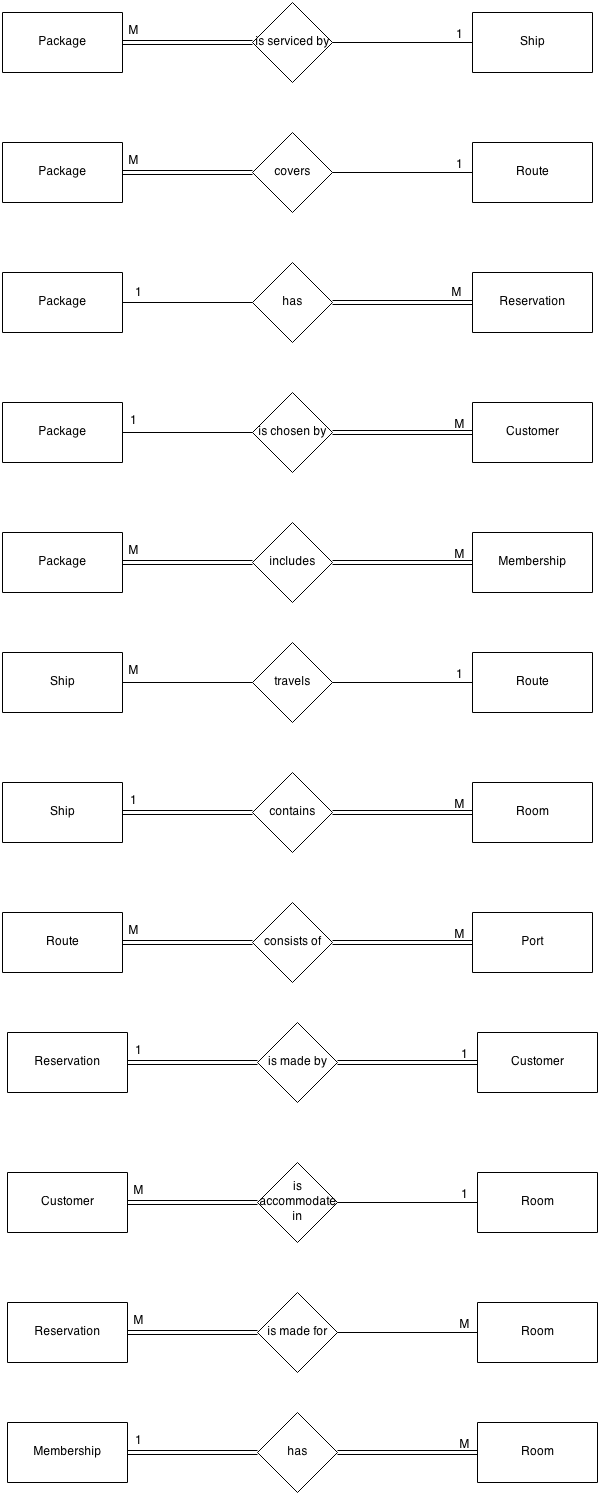
11 A. The relationship between Reservation and Room is one-to-many: A reservation can involve multiple rooms and a room is involved in one reservation.

11 B. The optionality of the Reservation-Room relationship is mandatory: optional – a reservation must involve a room, but a room does not always have to be occupied by passengers.

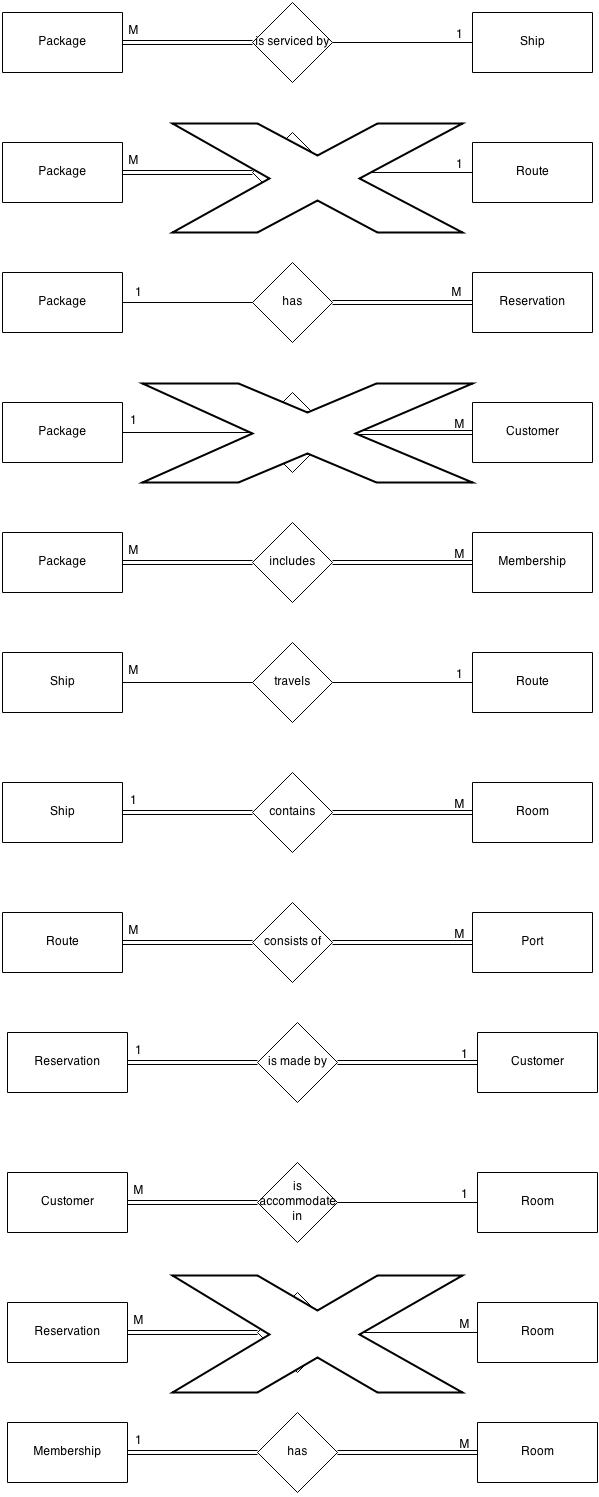
12 A. The relationship between Membership and Room is one-to-many. A membership has many rooms classified according to that type, and a room can be deemed suitable for one membership type.

12 B. The relationship between Membership and Room is further distinguished by mandatory:mandatory. A membership type must have certain rooms dedicated to its policy; a room must be categorized under one membership type.

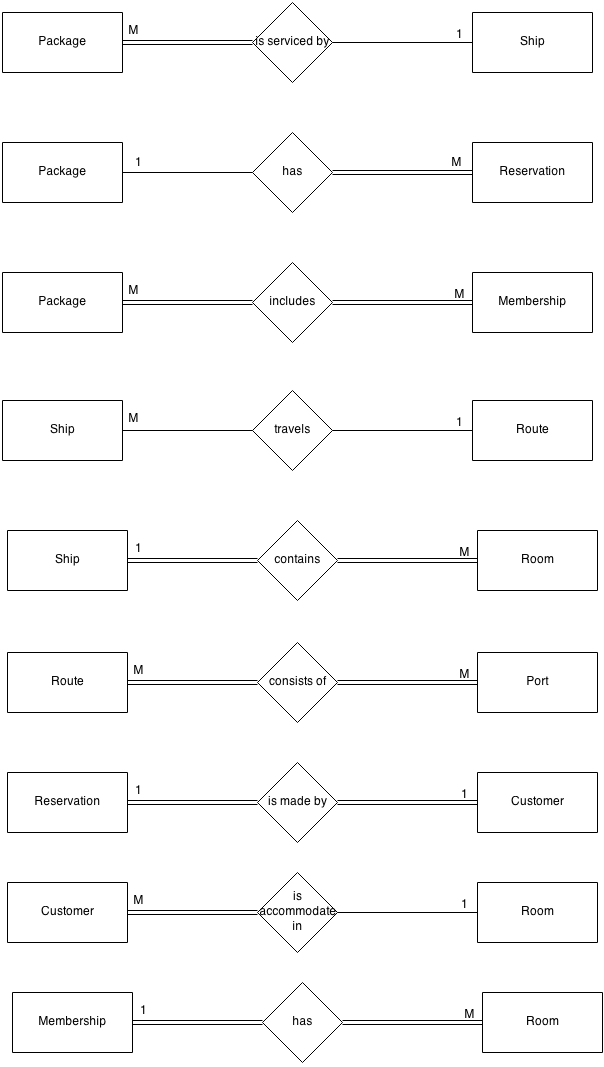
5. Develop a prototype ERD for your project:



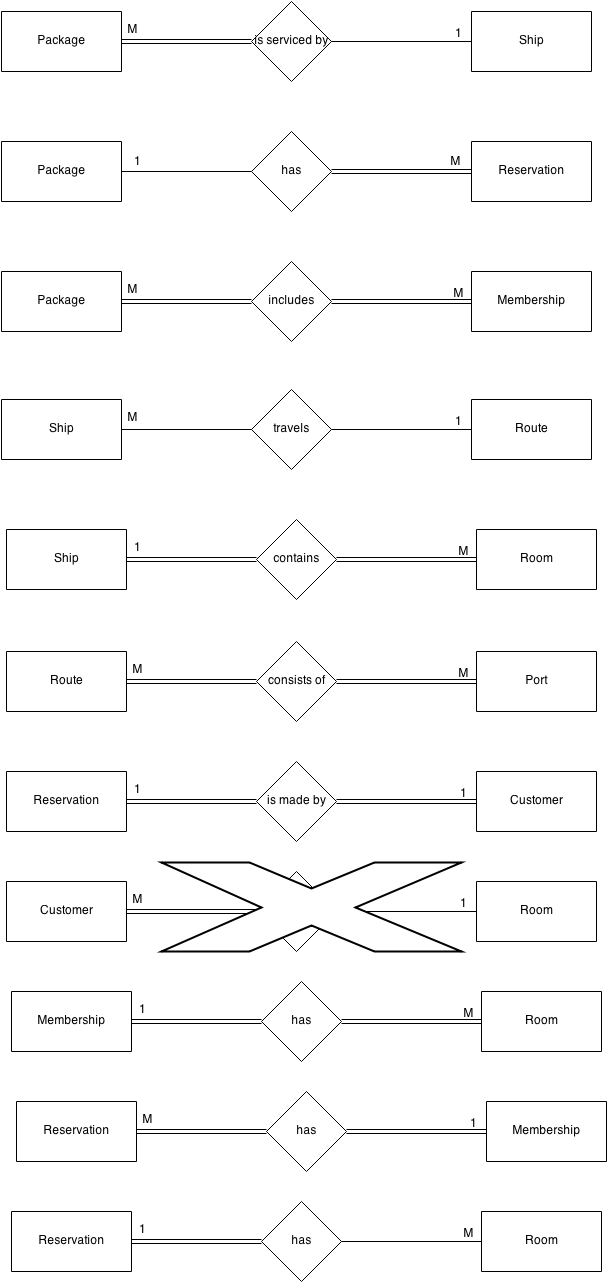
Removing Redundant Relationships



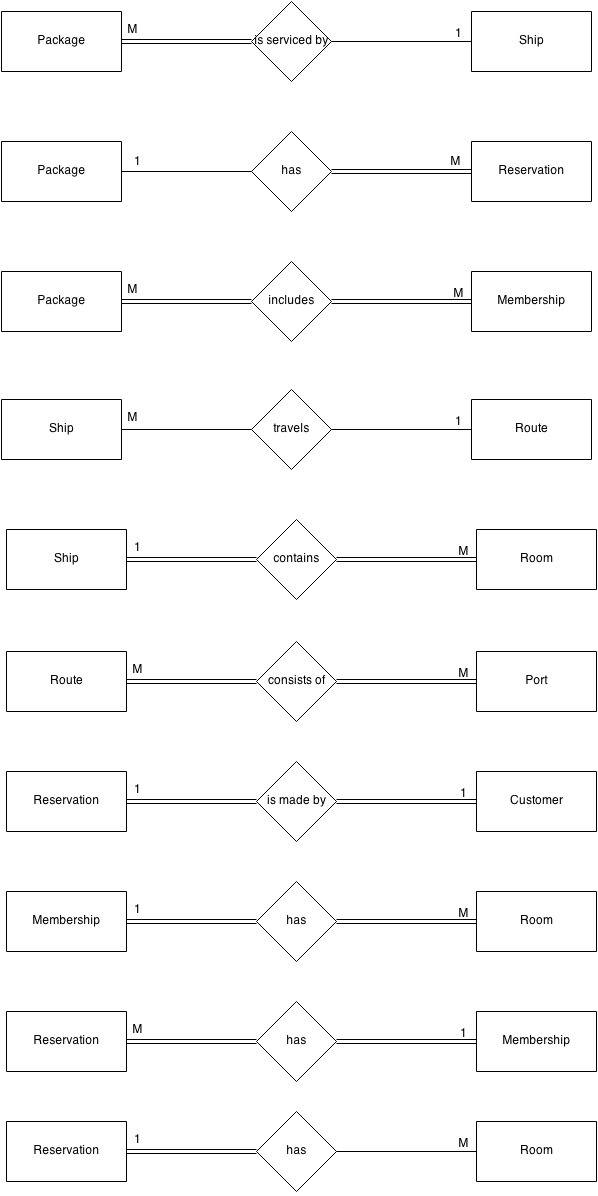
Draft 2:

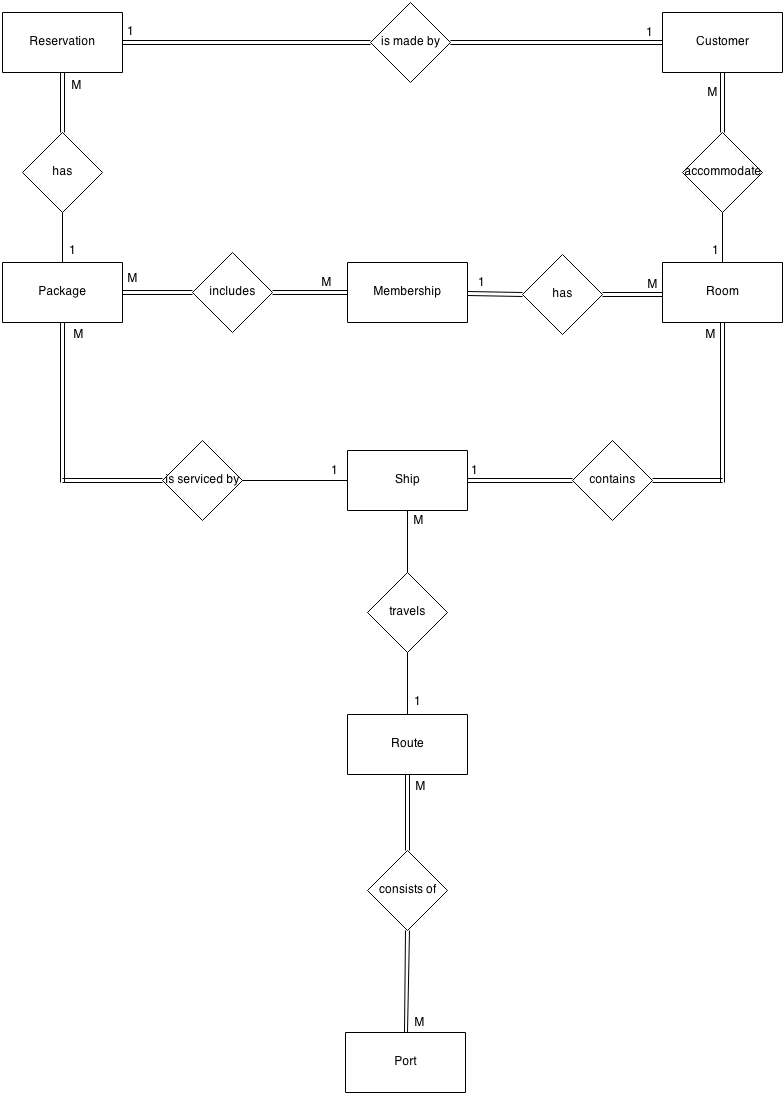


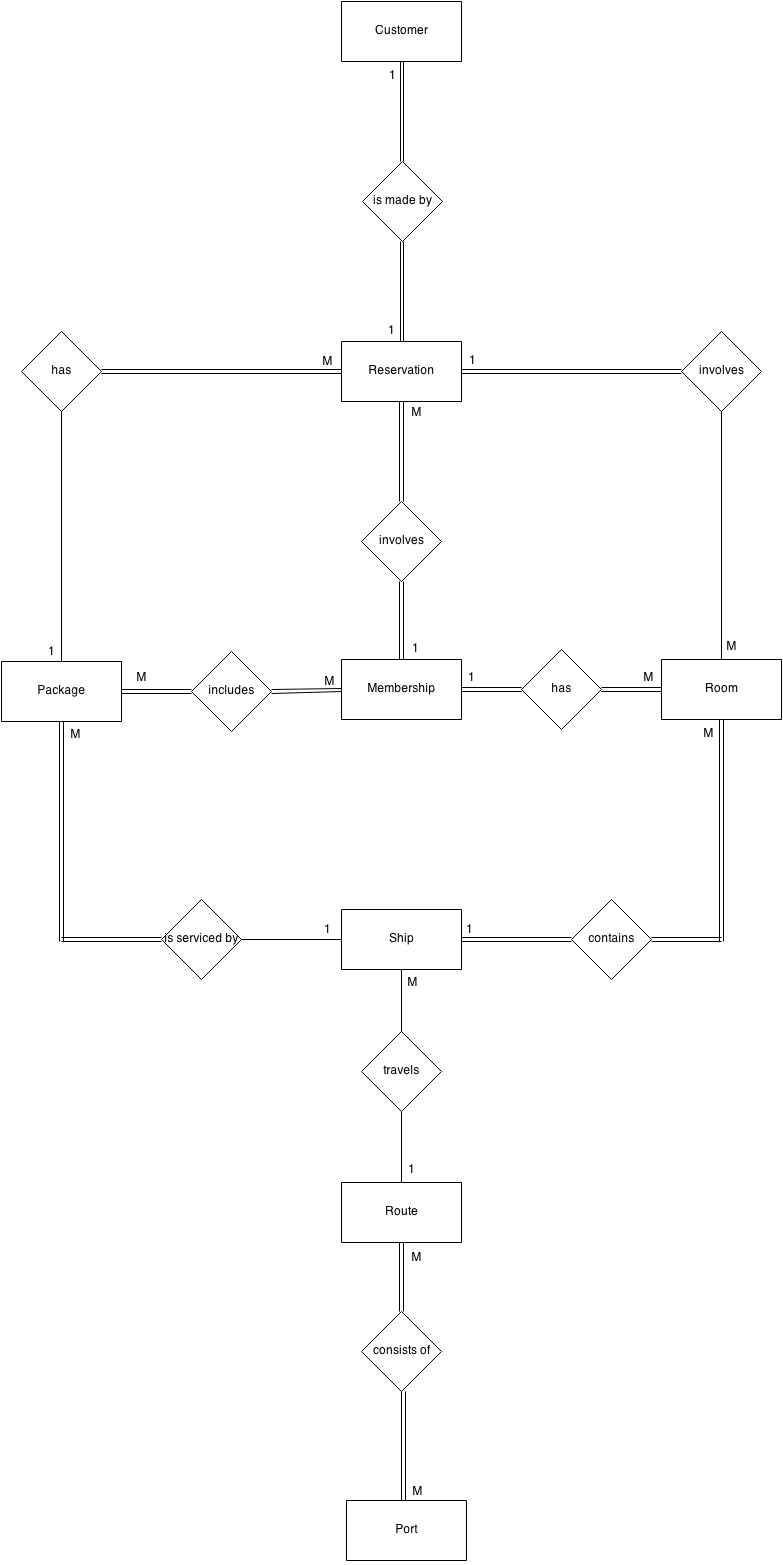
Draft 3: Changes – Relationship between Customer and Room is extinguished as room number should be associated with a particular reservation (even if that spans multiple rooms). New relationships between Reservation and Membership (to identify what membership type was chosen) and also between Reservation and Room.



So, the final relationship resemble the following:



ERD Draft 1:

ERD Draft 2: