# UCD

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

Project Design Document

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## 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 other cruise packages in other world locations. The company owns several large cruise liners, with each liner 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/disembark at these intermediate ports, for a 'partial cruise holiday'. Prices of cruise holidays vary, but mostly depend on the type of membership status 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.

- 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).

- Necessarily then, each package is peculiar to one route, and a route will be (logically) contained in only one package.

- Further, a ship's route or schedule will involve many ports over its journey. Passengers disembark at ports to sightsee in that city.

- 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. For example Platinum membership entitles the passenger to a wine and drinks package, dining package, gifts, spa treatments, Internet access, and passenger choice of deluxe room.

- 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.

- 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.

- Each package has a base price associated with it (e.g. Asian Adventure Summer 2014 costs $1,999) but the membership type (e.g. Gold, Silver..) chosen will constitute a percentage, rather than an add-on amount, of each package (e.g. Gold membership is 10% of the package price). These percentages-of-package-base-price will be fixed for each package. It is necessary to use percentage of package prices as an index, rather than a fixed amount, as it is not reasonable to pay $500 for Gold membership on *Asian Adventure SS2014*, which is a 30-day cruise, and also for *Moroccan Manna SS2014*, which lasts only 7 days.

## 4. Identification of Entities (and a forecast of their preliminary attributes)

- Package – <u>Package ID</u>, Package title, departure date, final arrival date, base price, *Ship number*

- Ship – <u>Ship number</u>, name, ship type, model, size, capacity, *route number*

- Route – <u>Route number</u>, route name, average passengers

- Port – <u>Port ID</u>, name, departure date, arrival date

- Reservation – <u>Reservation ID</u>, date of reservation, *package ID, membership type, customer ID*

- Customer – <u>Customer ID</u>, first name, surname, address, phone, e-mail

- Membership – <u>Membership type</u>, Add-on price (% of package's base price)

- Room – <u>Room id</u>, *Ship number, Membership type, Reservation ID*

Relationships and their cardinality (A) and optionality (B) are shown using diagrams (for space considerations):

5. Develop a prototype ERD for your project (that shows the iterative process):

The first set of relationships looks like the following:

```
┌──────────────┐  M                          ◇            1  ┌──────────────┐
│   Package    │─────────────────── is serviced by ────────│     Ship     │
└──────────────┘                             ◇               └──────────────┘
```

1.  A package is serviced by a ship. A ship, over its career on the sea, will be used to host many packages.

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

    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 new introduced to the company, may not yet be servicing any package.

```
┌──────────────┐  M                  ◇             1  ┌──────────────┐
│   Package    │─────────────────  covers  ─────────│    Route     │
└──────────────┘                     ◇                └──────────────┘
```

2.  A package is destined for a single route. A route, over time, will be travelled across to fulfill many packages.

    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.

    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 yet.
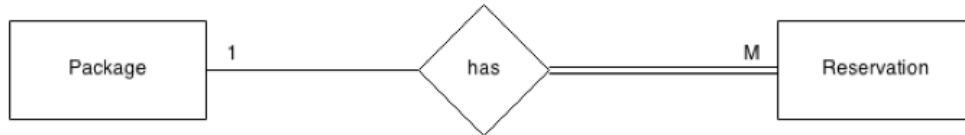
3. A package can be reserved several times (i.e. it extends to multiple customers). A reservation is made for a particular package.

   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.

   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 (an unpopular package can have no reservations but still exists) and a reservation must include the preferred package choice.



4. A package is chosen by many customers. A customer chooses one package.

   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.

   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.
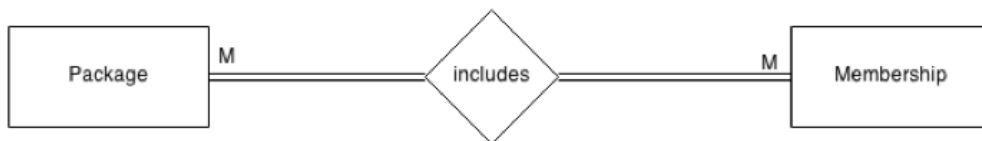


5. A package offers several membership types to its customers (e.g. Gold, Platinum, Silver, Bronze). A membership type is similarly applies to many packages.

   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.

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.
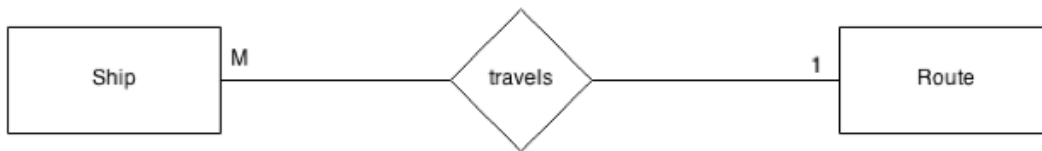


6. A ship travels one route over its career at sea. A route is travelled by many ships.

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.

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 ship contains many rooms of varying classification. A room is contained in a ship.

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

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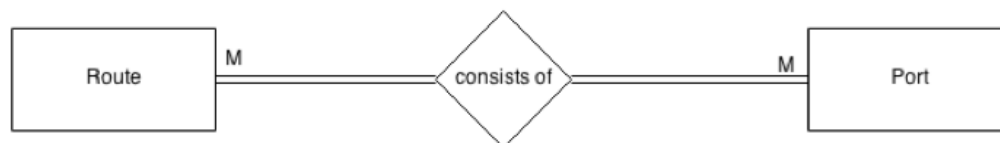


8. A route has many ports along its full course. A port may be part of several routes.

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).

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 part of a route.
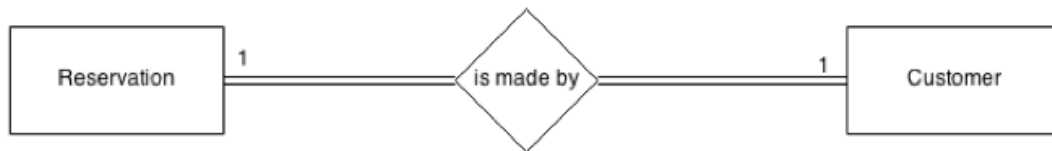


9. A reservation is made by a customer.

9 A. The cardinality between Reservation and Customer can be best described as a one-to-one. A reservation (transaction) is made by a customer, and a customer makes one reservation.
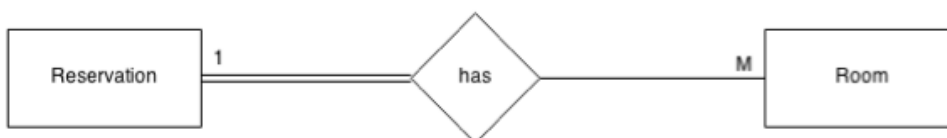
9 B. The optionality between Reservation and Customer is mandatory:mandatory. A reservation must be made by a customer, and a customer (to be included in the Customer table) must have a reservation.



10. A customer is assigned a room.

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.

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 reservation involves a room.

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.

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, i.e. be reserved.



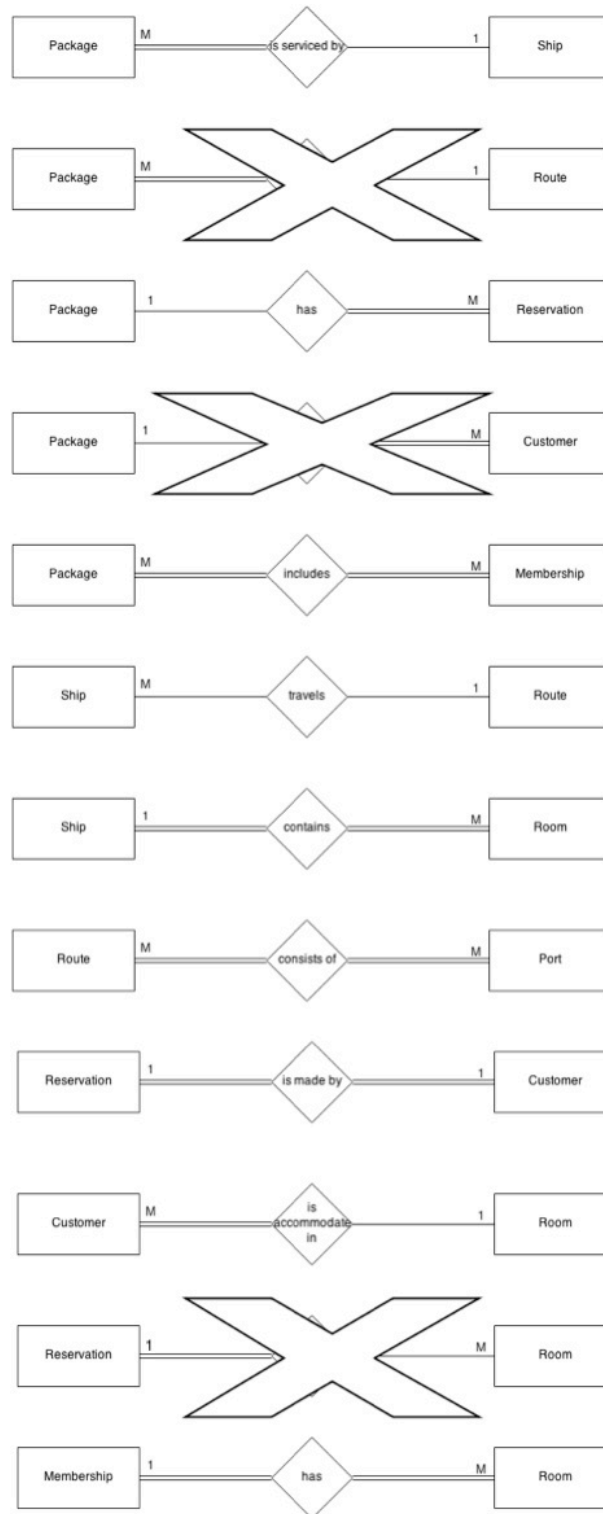12. A room is classified by membership type (for Gold/Silver/Platinum/Bronze members).

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.

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.

Evidence of the Iterative Process:

*Removing Redundant Relationships*: Relationship between Package and Route is unnecessary as a package is serviced by one ship, which will only ever be designated one route during its entire career. Therefore, this information can be derived. The relationship between Package and Customer is further eliminated as the package that a customer reserves will be stored in the Reservation entity. Reservation and Room is thought to be unnecessary, as this method would not capture all details about the customers occupying a room. It would be better encapsulated by a relationship between Customer and Room.

| Package | M | is serviced by | 1 | Ship |
|---|---|---|---|---|

| Package | M | | 1 | Route |
|---|---|---|---|---|

| Package | 1 | has | M | Reservation |
|---|---|---|---|---|

| Package | 1 | | M | Customer |
|---|---|---|---|---|

| Package | M | includes | M | Membership |
|---|---|---|---|---|

| Ship | M | travels | 1 | Route |
|---|---|---|---|---|

| Ship | 1 | contains | M | Room |
|---|---|---|---|---|

| Route | M | consists of | M | Port |
|---|---|---|---|---|

| Reservation | 1 | is made by | 1 | Customer |
|---|---|---|---|---|

| Customer | M | is accommodate in | 1 | Room |
|---|---|---|---|---|

| Reservation | 1 | | M | Room |
|---|---|---|---|---|

| Membership | 1 | has | M | Room |
|---|---|---|---|---|

Draft 2 with removed relationships:

| Package | M | is serviced by | 1 | Ship |
|---|---|---|---|---|

| Package | 1 | has | M | Reservation |
|---|---|---|---|---|

| Package | M | includes | M | Membership |
|---|---|---|---|---|

| Ship | M | travels | 1 | Route |
|---|---|---|---|---|

| Ship | 1 | contains | M | Room |
|---|---|---|---|---|

| Route | M | consists of | M | Port |
|---|---|---|---|---|

| Reservation | 1 | is made by | 1 | Customer |
|---|---|---|---|---|

| Customer | M | is accommodate in | 1 | Room |
|---|---|---|---|---|

| Membership | 1 | has | M | Room |
|---|---|---|---|---|
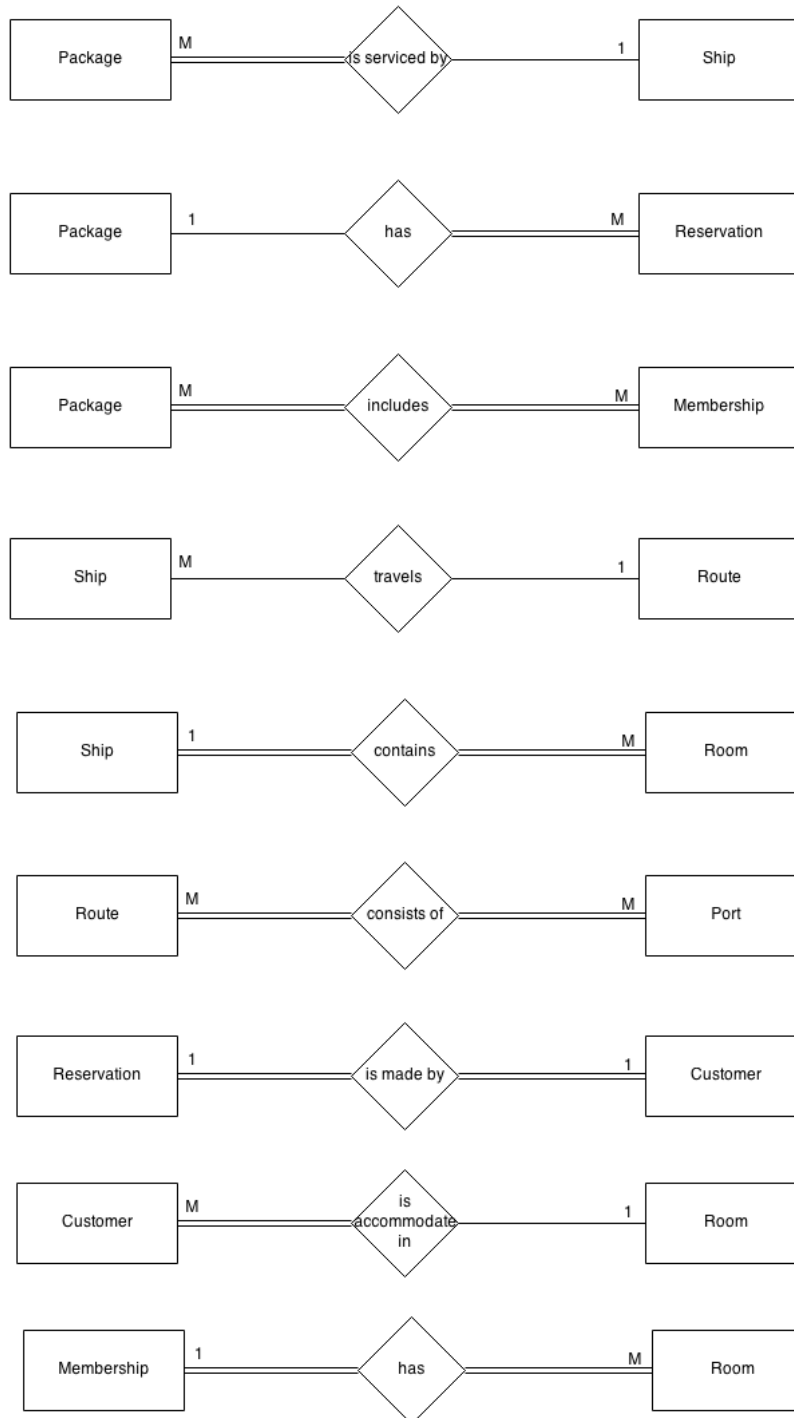
ERD Draft 1: This ERD predates the changes made between the reinstated relationship between Reservation and Room, and the new relationship between Reservation and Membership. At this stage, I associated Customer and Room together, to wrongly capture what customer what tied to what room. These changes are corrected in the final ERD that follows on the next few pages.
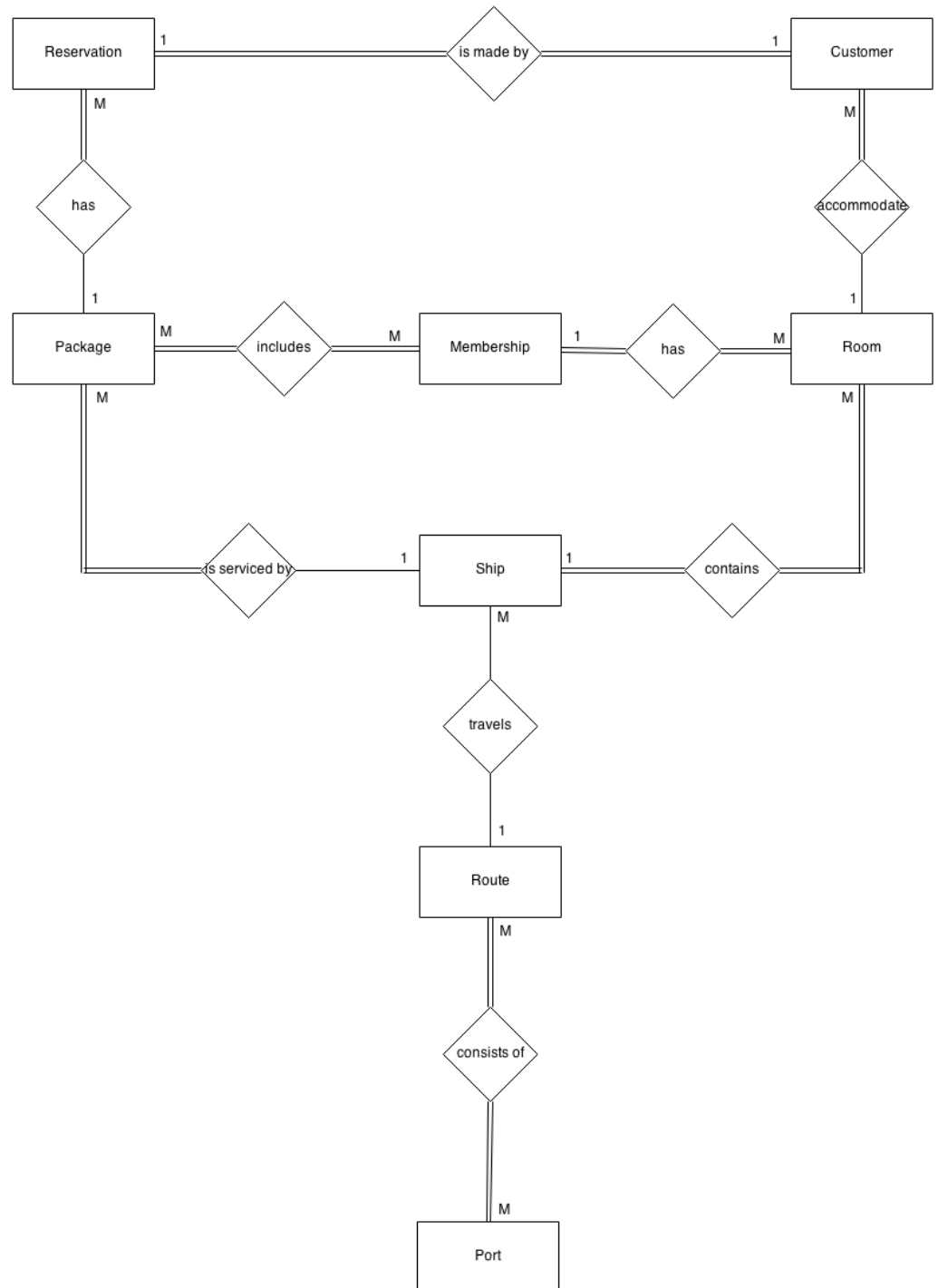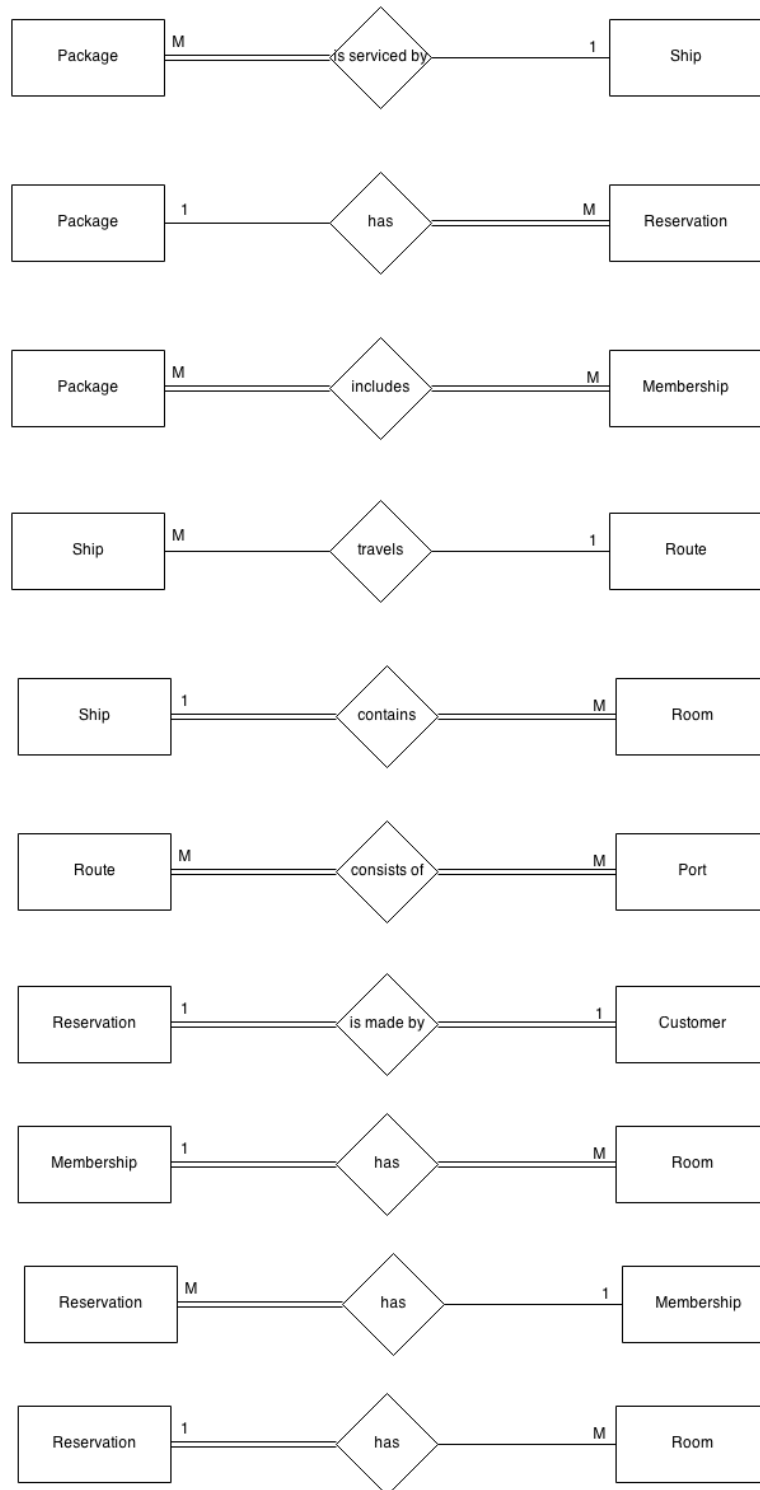
Draft 3: Changes – Relationship between

Customer and Room is extinguished as room number should *actually* be associated with a particular reservation (even if that spans multiple rooms – See Assumptions). The old relationship between Reservation and Room is thus restored (1:M) and also a new relationship between Reservation and Membership (M:1) is established (to identify

what membership type

was chosen by the customer).
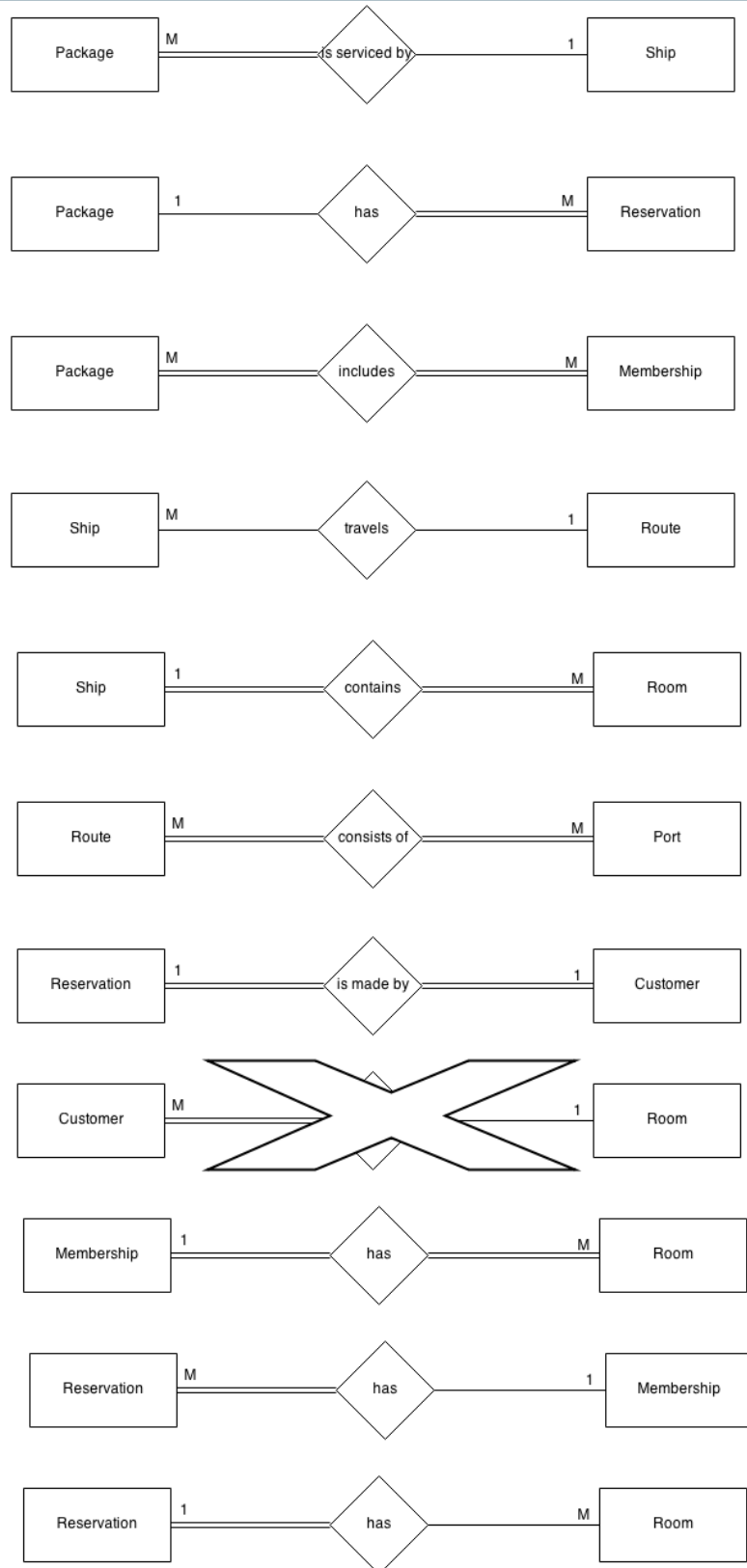
So, the final set of relationships resemble the following:

ERD Draft 2: This is my final ERD for this assignment.

It has corrected my misinterpretation of the

relationship between Customer and Room, and

now depicts the relationship between Reservation

and Room, and also Reservation and Membership chosen.