# INFO20003 Database Systems

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Tutorial 4
2021.03.22

1. **Additional concepts in ER modeling - 15 min**

2. **Simple case study - 10 min**

3. **Bus company case study – conceptual and logical modeling - 30min**

1. Assignment 1 has released - LMS Assessments

2. due date: **10:00 am Saturday 03 April**

3. Tips:

   - Try modeling practice first - LMS Practice on your own

   - Read case study multiple times before designing

   - Derive from case study not real world examples

   - Subjective process, many possible solutions

   - Every time make a choice, list assumptions (400 words)

   - Carefully follow the rules about transforming models

# Multivalued and composite attributes

- **Multivalued attributes**:

- more than one value at the same time.

- phone numbers, skills, languages spoken
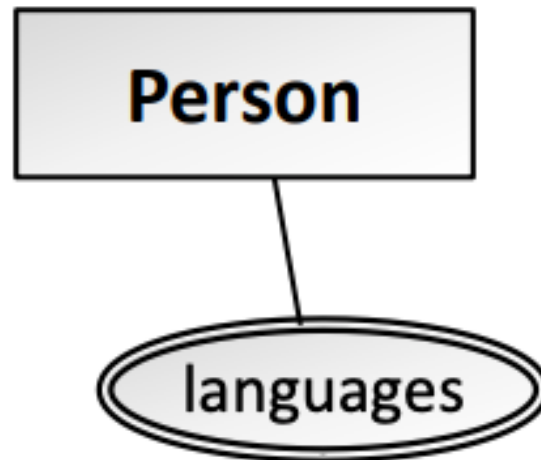
- draw using a **double outline**
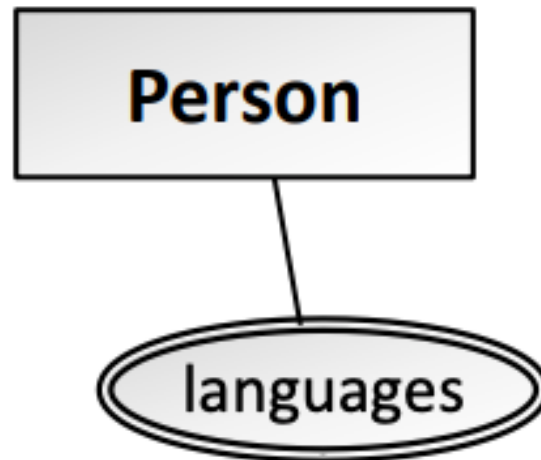
# Multivalued and composite attributes
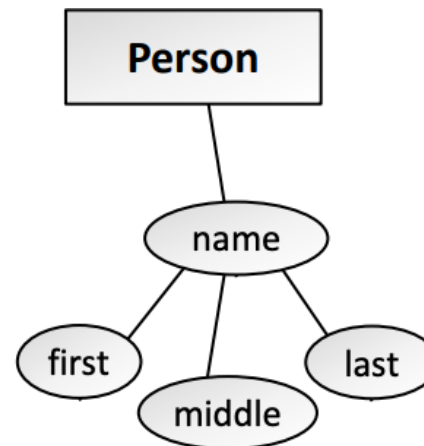
- **Multivalued attributes in Logical Model**:

Person(<u>PId</u>, … , LId (FK) )

Language(<u>LId</u>, LanguageName)

# Multivalued and composite attributes

- **Composite attributes**:

- multiple components and can be broken down into multiple attributes.

- name that can be stored as first name and last name.

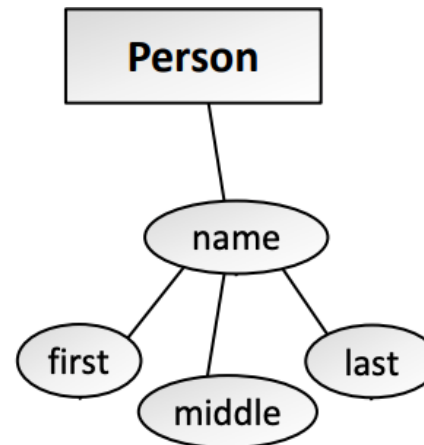- draw by **branching the sub-attributes off the composite attribute**

# Multivalued and composite attributes

- **Composite attributes in Logical Model**:

1. Person(<u>PId</u>, … , FirstName, MiddleName, LastName)

2. Person(<u>PId</u>, … , NameId (FK))

   Name(<u>NameId</u>, FirstN, MiddleN, LastN)

# Unary relationships

- between an entity and **itself**

- between multiple instances of the same entity

- have different cardinalities and constraints just like ordinary binary relationships

- When having different constraints, label the ends to make it clear what the constraints apply to

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# Unary relationships
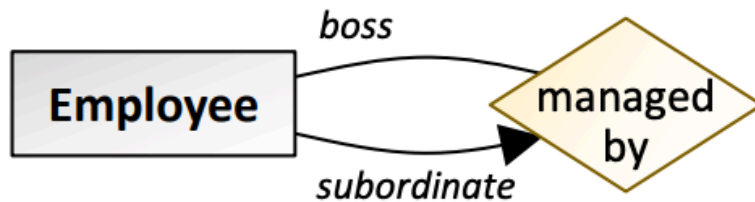


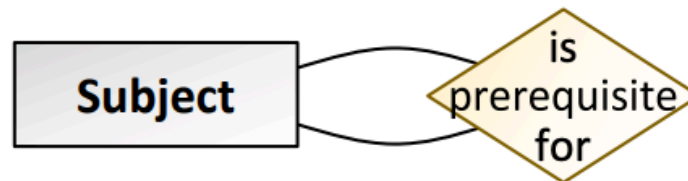One-to-many unary relationship
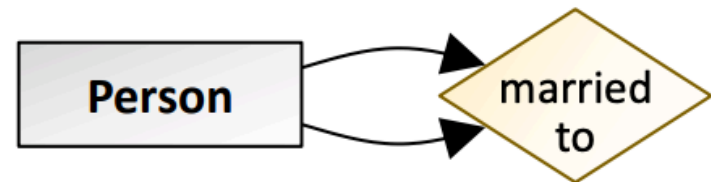
One-to-one unary relationship

Many-to-many unary relationship

# Resolve relationships in logical model

One to one:



1: A (<u>AId</u>, … , BId (FK) )
    B (<u>BId</u>, …)

2: A (<u>AId</u>, …)
    B (<u>BId</u>, … , AId (FK))

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# Resolve relationships in logical model

One to Many:



      A (<u>AId</u>, … )
      B (<u>BId</u>, … , AId (FK) )
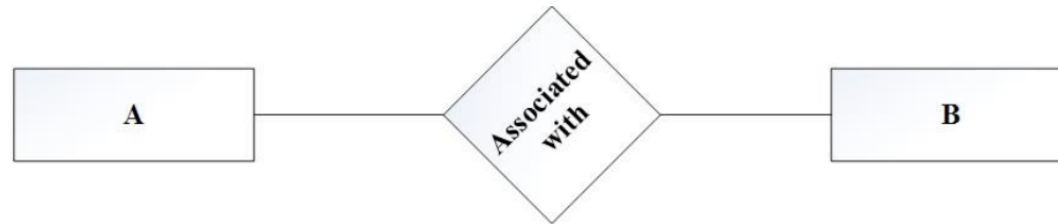
# Resolve relationships in logical model

Many to many:



A (<u>AId</u>, …)
RAB (AId (<span style="color:red">P</span>FK), BId (<span style="color:red">P</span>FK), …)
B (<u>BId</u>, …)

# Any questions?

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Australia's corporate regulator, ASIC, stores a range of information about every Australian company, including the name, the nine-digit ACN (Australian Company Number), the date of registration and de-registration, and the names of the company's directors. Every company has a registered address, made up of the street address, suburb, state and postcode. A company may be owned by another company; in this situation ASIC keeps track of the company's parent company.

Q: Use this information to model a "company" entity using Chen's notation
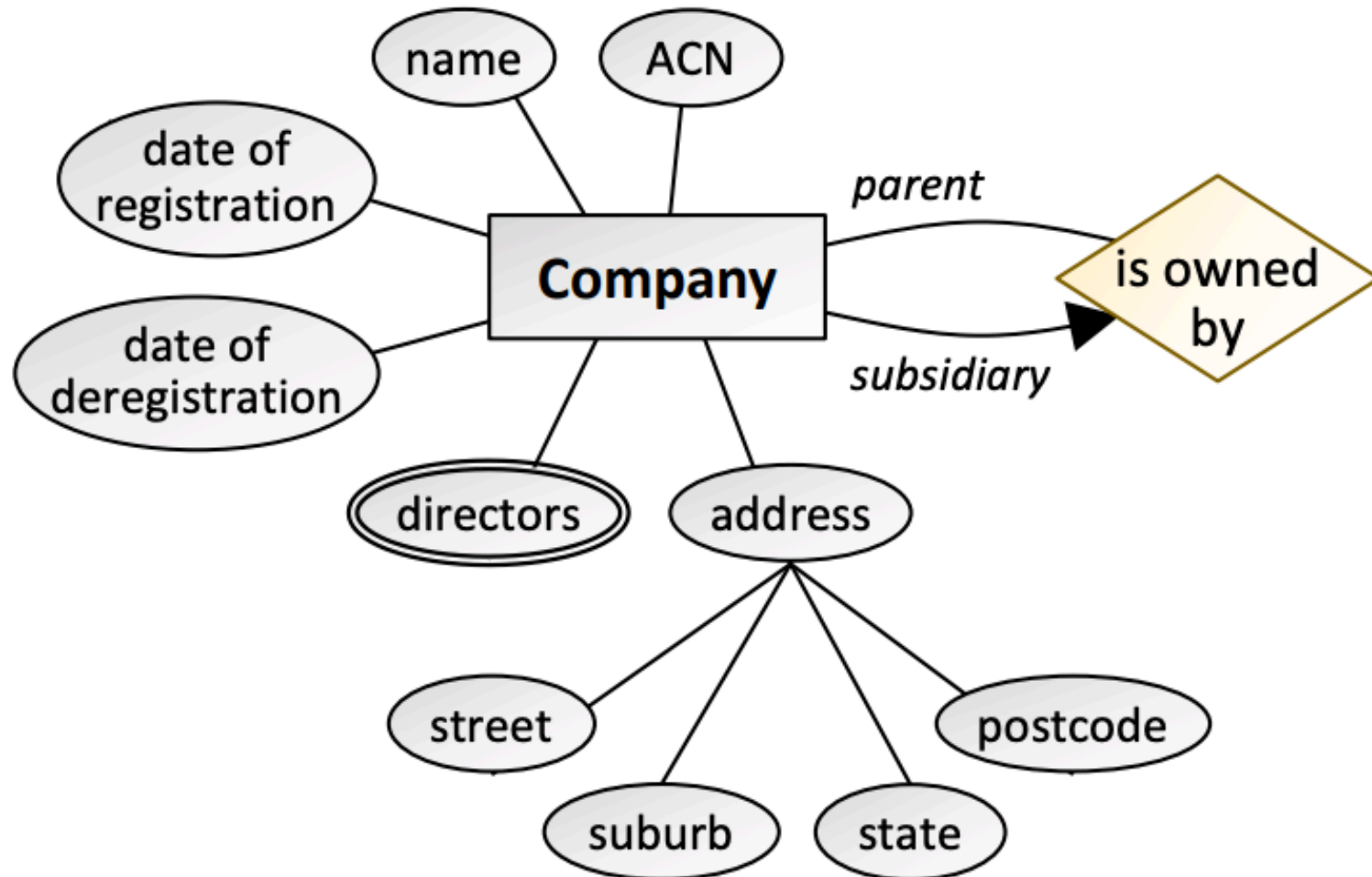
# Group/Individual case study

1. **Already have a study group and they are all in this tut?**

   - **Message me the name of all group members**

2. **No group yet but happy to join some groups.**

   - **No need to do anything**

   - **I'll randomly allocate you to some groups**

3. **Don't want be in a group for now?**

   - **Totally fine, please message me about this**

A bus company owns a number of buses. Each bus is allocated to a particular route, although some routes may have several buses. Each route passes through a number of towns. One or more drivers are allocated to each stage of a route, which corresponds to a journey through some or all of the towns on a route. Some of the towns have a depot where buses are kept – each bus always returns to its allocated depot at the end of the day.

Each of the buses is identified by its registration number and can carry different numbers of passengers, since the vehicles vary in size and can be single or double-decked. Each route is identified by a route number and information is available on the average number of passengers carried per day for each route. Drivers have an employee number, name, address, and sometimes a telephone number, and the names of the training courses they have completed need to be stored.

a. Identify the **entities**.

- Bus

- Route

- Stage

- Town

- Depot

- Driver

b. Identify the relationships (use business rules to identify relationships). State all the key constraints and participation constraints.

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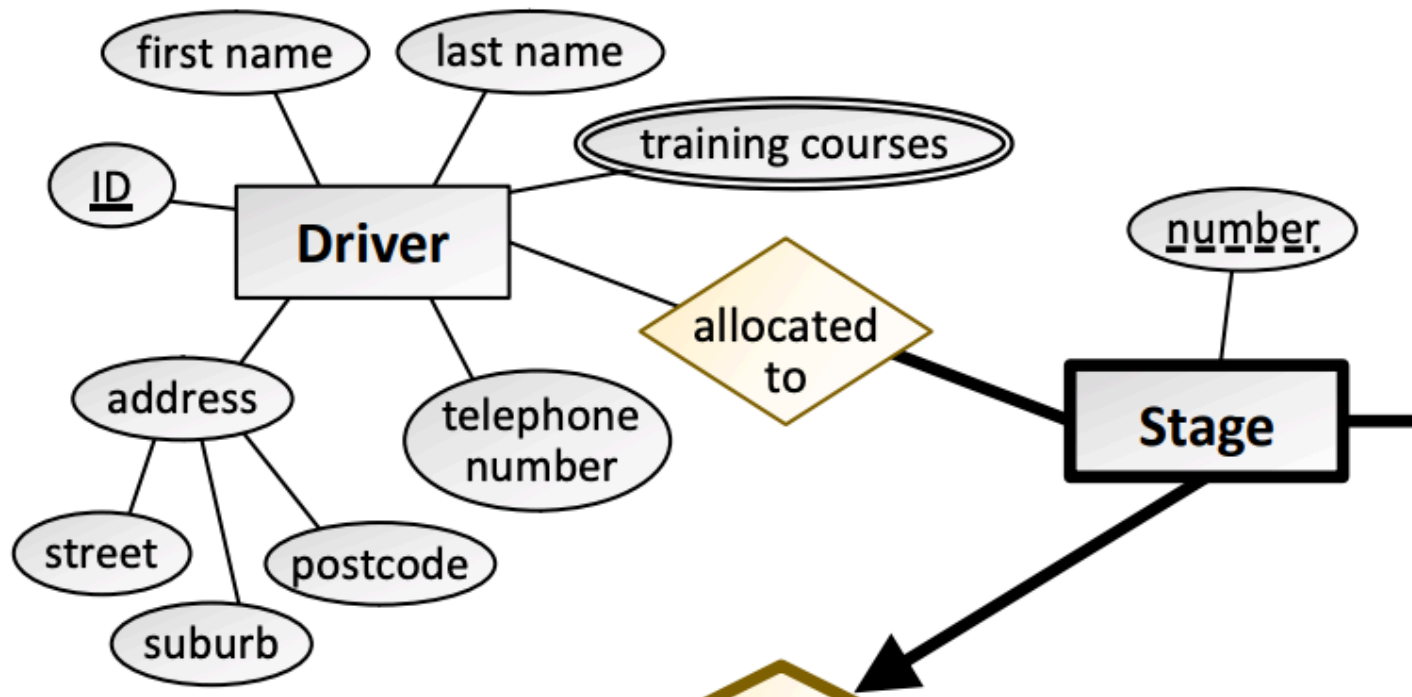
c. Draw a **conceptual model** and populate entities with appropriate attributes (use Chen's notation).
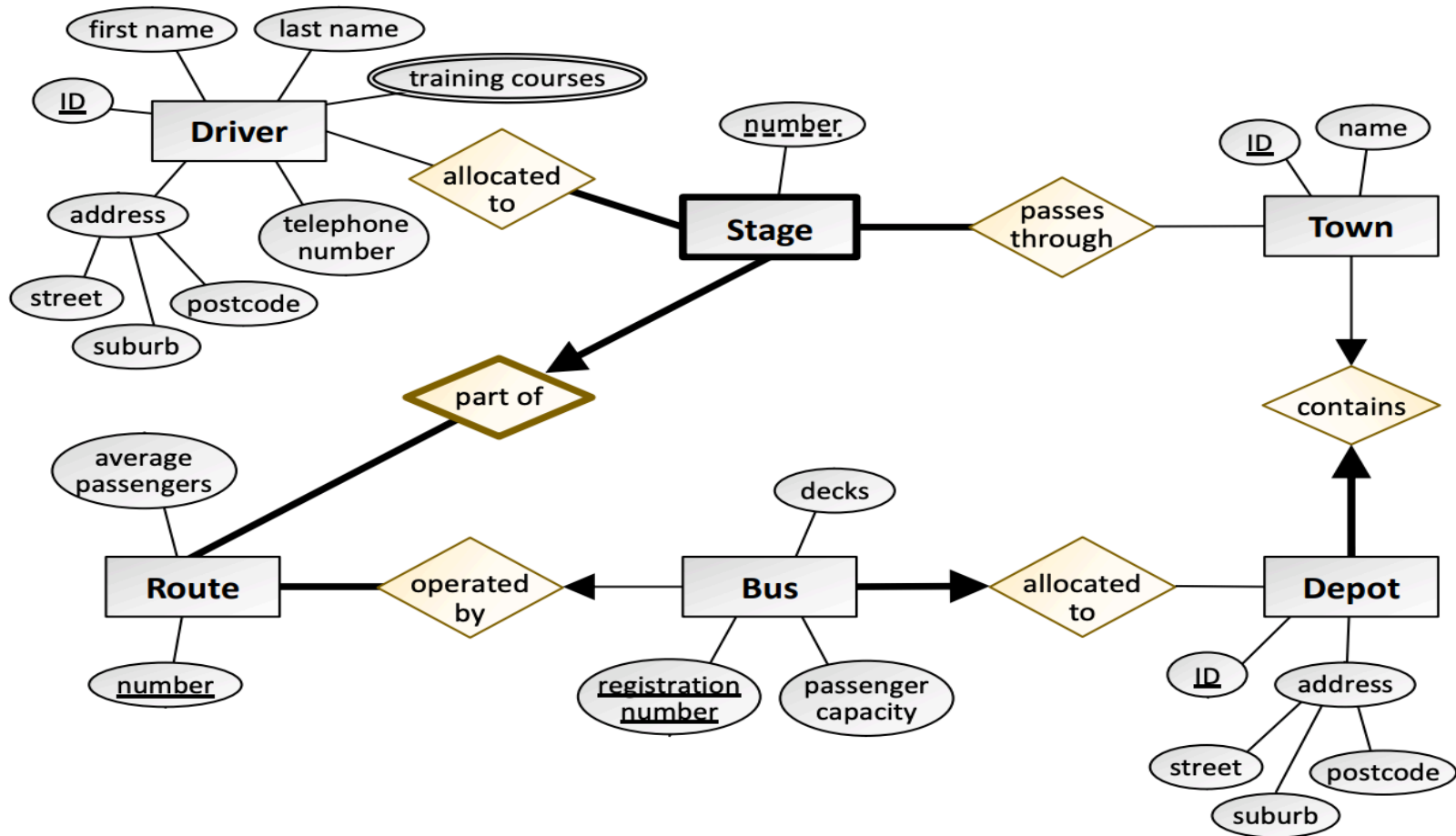
d. Discuss the **logical modeling** of the Driver entity.

1. resolve multivalued and composite attributes

2. Resolve relationships

Driver (<u>DriverID</u>, FirstName, LastName, AddressStreet, AddressSuburb, AddressPostcode, PhoneNumber)

FK

DriverTrainingCourses (<u>DriverID</u>, <u>TrainingCourseName</u>)

DriverAllocatedToStage (DriverID [FK], RouteNumber [FK], StageNumber [FK])

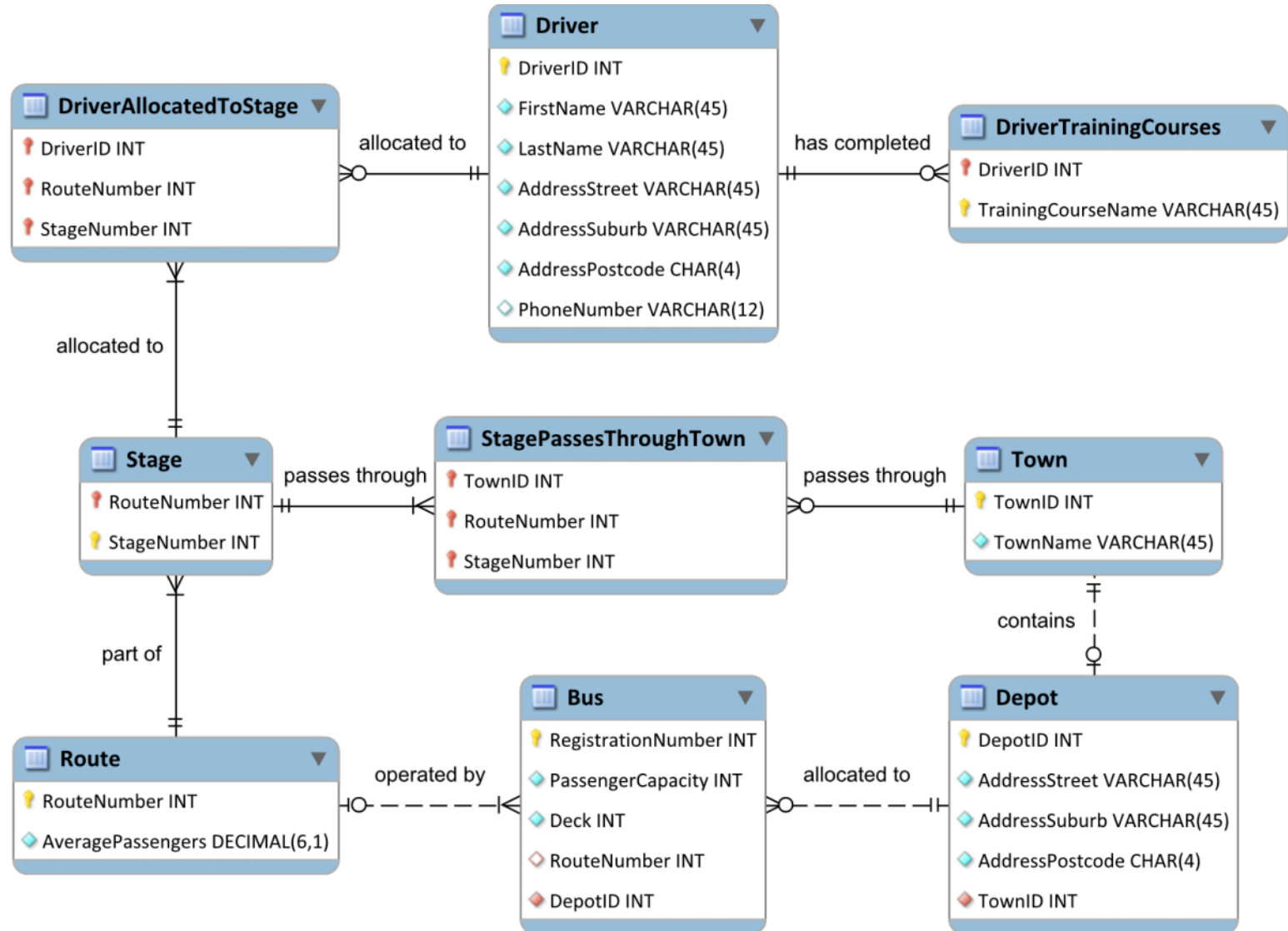Stage (RouteNumber [FK], StageNumber)

Town (TownID, TownName)

StagePassesThroughTown (TownID [FK], RouteNumber [FK], StageNumber [FK])

Route (RouteNumber, AveragePassengers)

Bus (RegistrationNumber, PassengerCapacity, Make, Deck, RouteNumber [FK], DepotID [FK])

Depot (DepotID, AddressStreet, AddressSuburb, AddressPostcode, TownID [FK])

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# Any questions?

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