



THE UNIVERSITY OF  
MELBOURNE

# INFO20003 Database Systems

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Tutorial 4  
2020.08.27



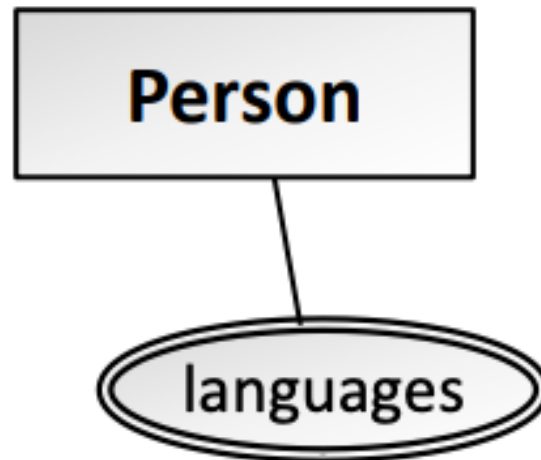
- 1. Additional concepts in ER modeling - 15 min**
- 2. Simple case study - 10 min**
- 3. Bus company case study – conceptual and logical modeling - 30min**



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**

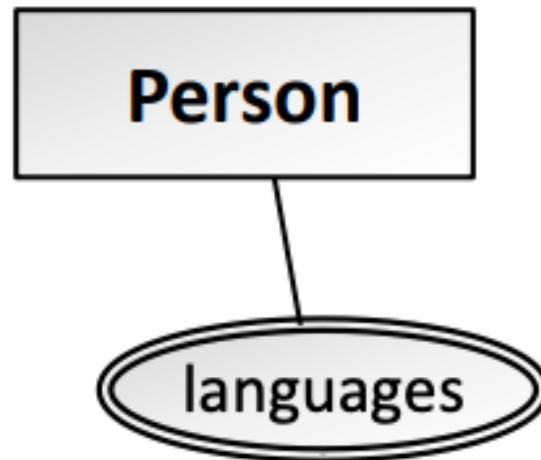


## Multivalued and composite attributes

- **Multivalued attributes in Logical Model:**

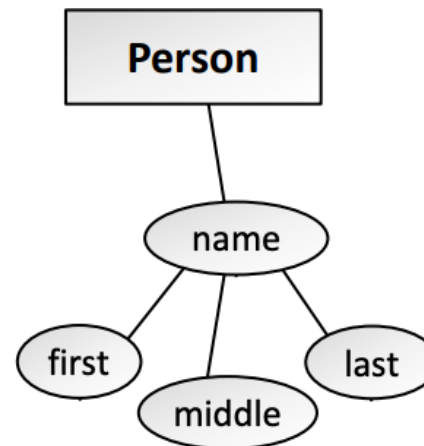
Person(PId, ... , LId (FK) )

Language(LId, 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**

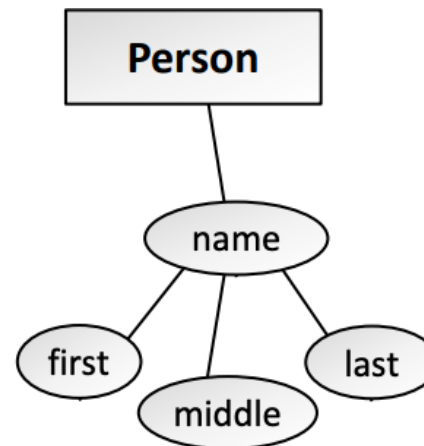


## Multivalued and composite attributes

- **Composite attributes in Logical Model:**

1. Person(PId, ... , FirstName, MiddleName, LastName)
2. Person(PId, ... , NameId (FK))

Name(NameId, FirstN, MiddleN, LastN)



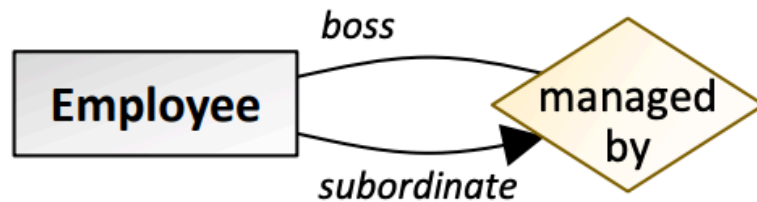


## Unary relationships

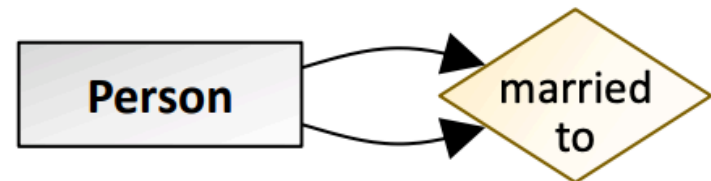
- between an entity and **itself**
- between multiple instances of the same entity
- have different cardinalities and constraints just like ordinary binary relationships
- When having different constraints, label the ends to make it clear what the constraints apply to



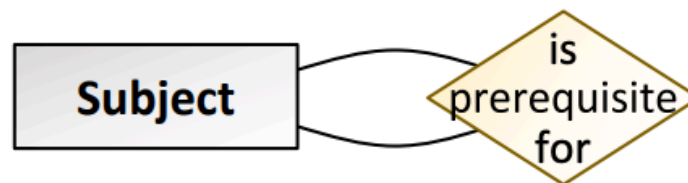
## Unary relationships



*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 (AId, ... , BId (FK) )  
B (BId, ...)

2: A (AId, ...)  
B (BId, ... , AId (FK))

## Resolve relationships in logical model

One to Many:



A (AId, ...)

B (BId, ... , AId (FK) )

## Resolve relationships in logical model

Many to many:



A (AId, ...)

RAB (AId (**P**FK), BId (**P**FK), ...)

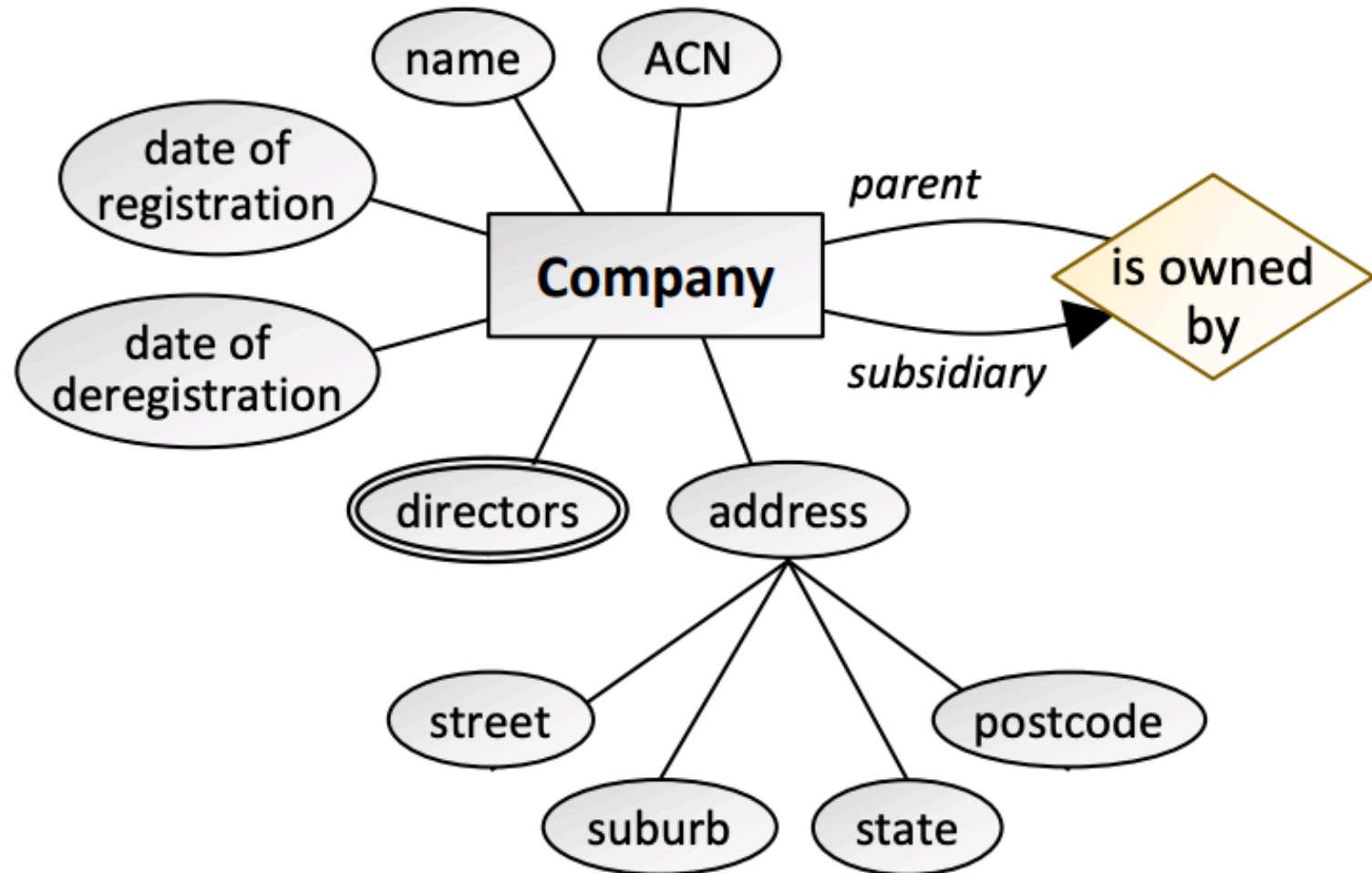
B (BId, ...)



**Any questions?**

**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

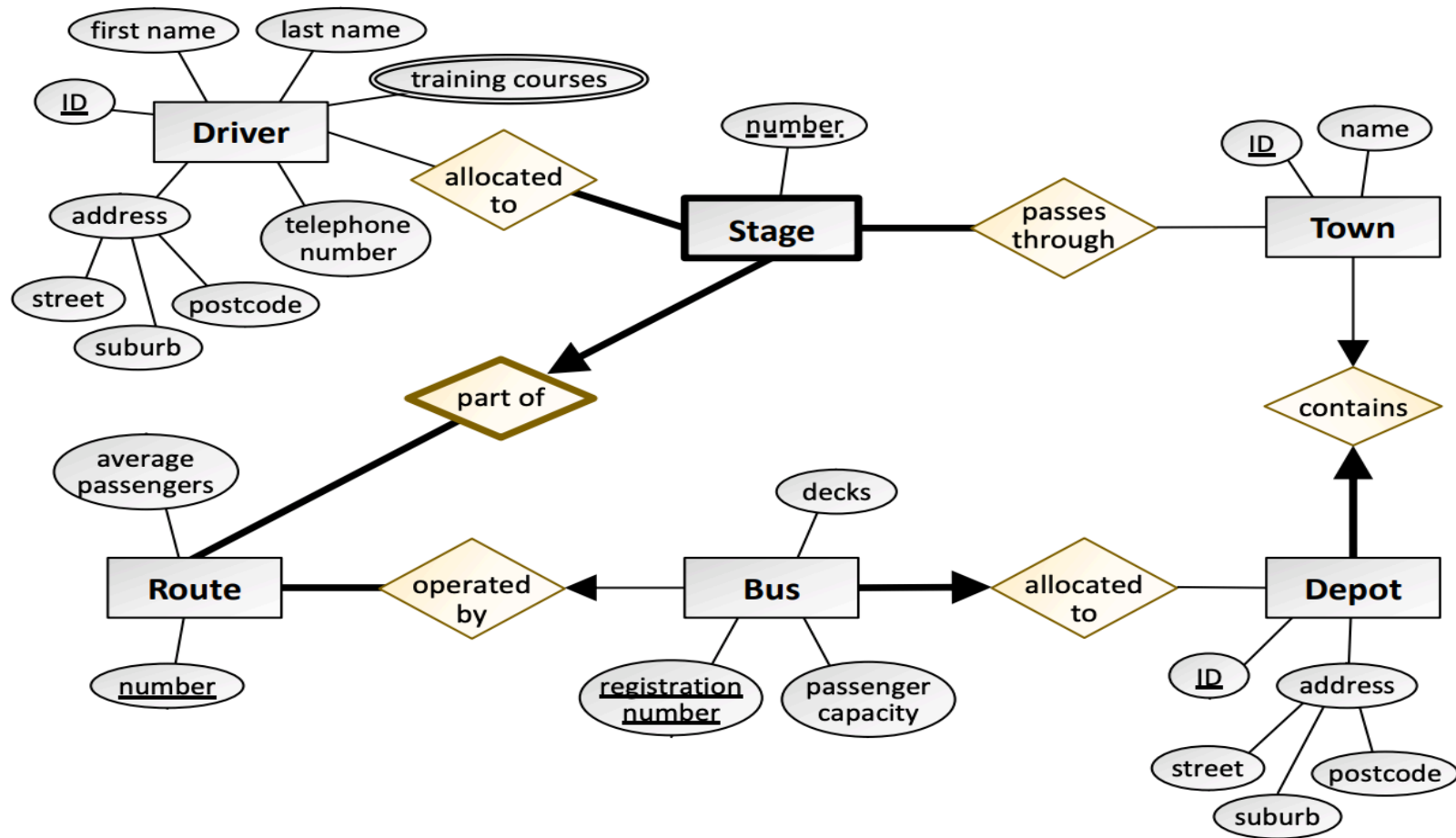
b. Identify the relationships (use business rules to identify relationships). State all the key constraints and participation constraints.

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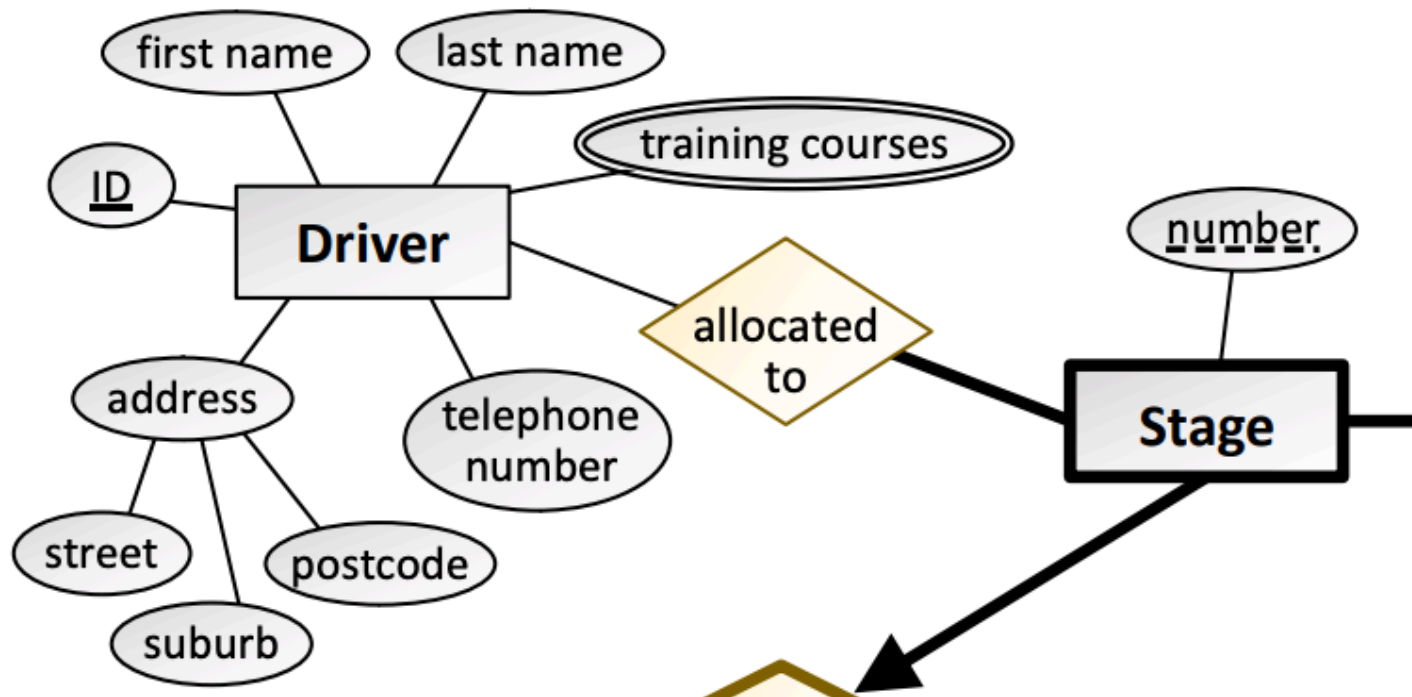
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c. Draw a **conceptual model** and populate entities with appropriate attributes (use Chen's notation).



d. Discuss the **logical modeling** of the Driver entity.





1. resolve multivalued and composite attributes
2. Resolve relationships

Driver (DriverID, FirstName, LastName, AddressStreet, AddressSuburb,  
AddressPostcode, PhoneNumber)

DriverTrainingCourses (<sup>FK</sup>DriverID, TrainingCourseName)



DriverAllocatedToStage (<sup>FK</sup>DriverID, <sup>FK</sup>RouteNumber, <sup>FK</sup>StageNumber)

Stage (<sup>FK</sup>RouteNumber, StageNumber)

Town (TownID, TownName)

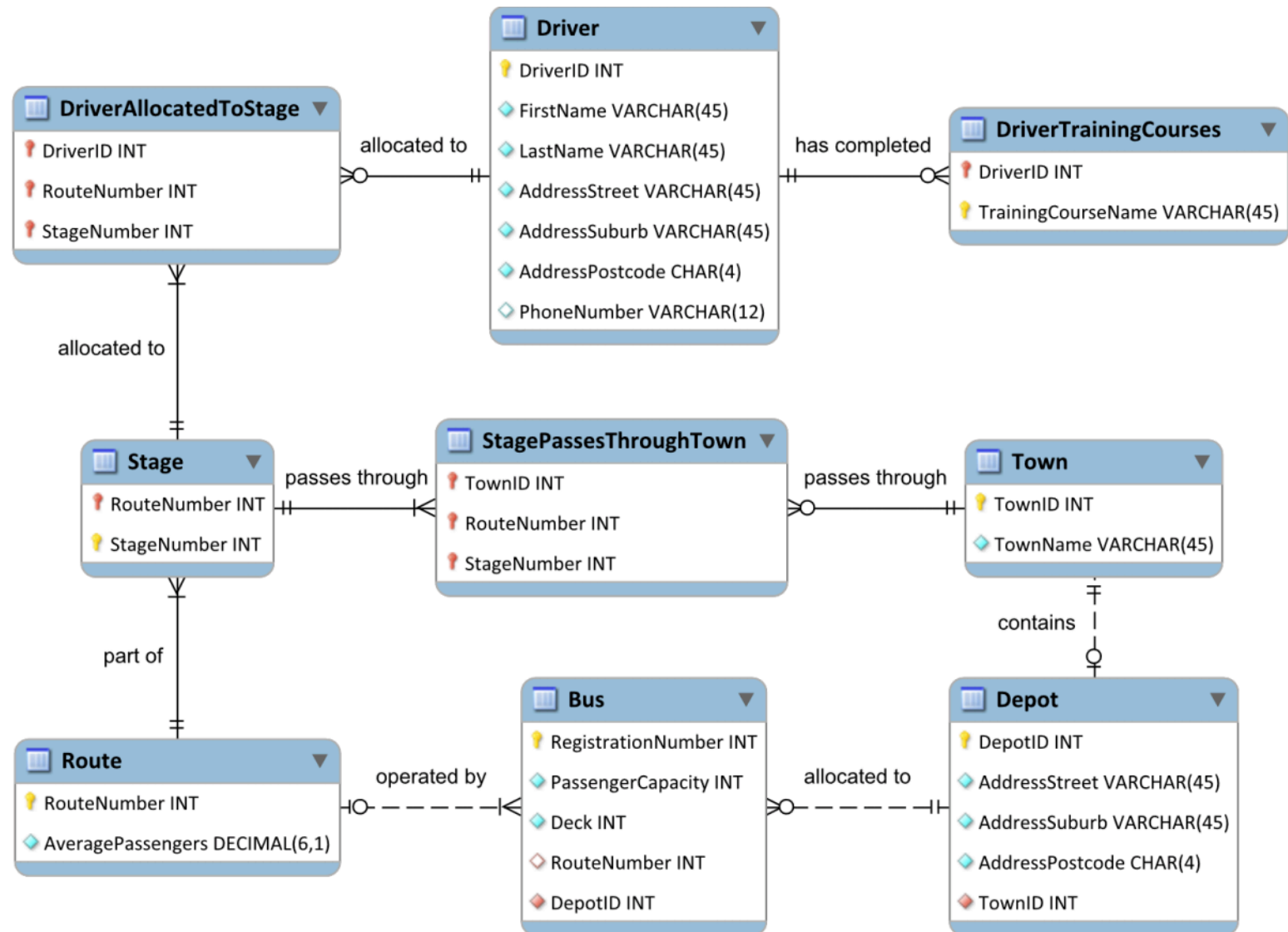
StagePassesThroughTown (<sup>FK</sup>TownID, <sup>FK</sup>RouteNumber, <sup>FK</sup>StageNumber)

Route (RouteNumber, AveragePassengers)

Bus (RegistrationNumber, PassengerCapacity, Make, Deck, <sup>FK</sup>RouteNumber, <sup>FK</sup>DepotID)

Depot (DepotID, AddressStreet, AddressSuburb, AddressPostcode, <sup>FK</sup>TownID)







**Any questions?**