

Project 01: ER Diagram **Group #50**

Bryan Castorius Halim	Identify data constraints
Jason Lienardi	Drew rough sketch of ER diagram
Jayson Ng	Discuss, update and finalise ER diagram as well as application schema
Ng Yan Jie	Identify relations constraints

Application Constraints

Data

✕ - Inferred as optional, if there's no data on the attribute, nothing happens (can be null), as the current ER diagram provided cannot capture whether the attribute is enforced or not

Customers		
✓	email address (email)	Key attributes
✓	phone number (phoneNumber) first name (firstName) last name (lastName) credit card number (ccNum)	Attributes
✓	full name (fullName)	Attributes Composed of first name (firstName) and last name (lastName)
✕	date of birth (dob) driver's license (driverLicense) unit address (unit) street address (street) block address (block) zip address (zip)	Optional attributes
✕	home address (homeAddress)	Optional attributes Composed of unit address (unit), street address (street), block address (block), and zip address (zip)
✕	age (age)	Optional attribute Derived from <u>date of birth</u>

Employees		
✓	employee id (eId)	Key attributes
✓	phone number (phoneNumber) first name (firstName) last name (lastName)	Attributes
✓	full name (fullName)	Attribute Composed of first name (firstName) and last name (lastName)

Drivers (subclass of Employees)		
✓	All of the designated employees attributes	
✓	private hire car driver's vocational licence (PDVL)	Attributes

✓	driver fee rate (rate)	Attributes Constant amount (should be the same across all drivers)
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Bookings		
✓	booking id (bId)	Key attributes
✓	booking date (bDate) start date (sDate) number of days (days) is booking cancelled (isCancelled)	Attributes
✓	end date (eDate)	Attributes Derived from (<u>start date + number of days</u>)
✓	Final bill (bill)	Attribute Derived from Car Models' <i>Deposit amount</i> - (<i>number of days</i> * Car Models' <i>daily rent price</i>) - Drivers <i>number of driver's rent days</i> * Driver's <i>driver fee</i> (if any) REFERENCES Customers if final bill is positive, customer will receive the cash from the employee that receives the car keys if final bill is negative, Customer's credit card will be charged in the amount of final bill if final bill is 0, nothing happens

Offices		
✓	office zipcode (zip)	Key attributes
✓	name or location of the office (name)	Attributes name is unique

CarModels (weak entity)		
✓	car brand (brand) car model (model)	Partial key attributes
✓	daily rent price (rentRate) deposit amount (depoRate) maximum passenger (maxCap)	Attributes Dependent on the partial keys maxCap would be a multivalued attribute as one car brand with a certain model, might have different max capacities

Cars		
✓	licence plate (plate)	Key attributes

✓	colour of the car (color) car production year (prodYear) the status of the car (isDamaged) the rent status of the car (isRented) the date of return (returnDate)	Attributes isDamaged is default to false isRented is derived from the current date - return date of the Bookings table, if there is no overlap between booking dates the car is indicated as available. If negative it's still rented (True)
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Relations

Initiates	
✓	Binary relationship involving Customers and Bookings
✓	<i>No additional attributes</i>
✓	A customer may not have any bookings (0) or a customer may initiate more than 1 booking
✓	A booking must be initiated by at least 1 customer
✓	A booking may be initiated by at most 1 customer (<i>i.e., for the same booking id</i>)
✗	A booking initiated by a customer may be cancelled if no car is available after 2 days <i>[Not enforced because this is an automatic action]</i>

Hires	
✓	Binary relationship involving Bookings and Drivers
✓	<i>Hiring start date, days hired, and hiring end date (derived from start + daysHired)</i> driverStartDate Constraints -> Must be from the Booking <u>start date</u> and before the Booking <u>end date</u> or after the Booking <u>start date</u> and before the Booking <u>end date</u> driverEndDate Derived from <u>start date + days hired</u> Constraint -> Must be after the <u>driver start date</u> and before or during the Booking <u>end date</u> .
✓	A booking may include 0 drivers
✓	A booking may hire at most 1 driver (<i>i.e., for the same booking id</i>)
✓	A driver may be hired in 0 bookings
✓	A driver may be hired in more than 1 bookings
✗	The driver cannot be hired before the start date nor after the end date <i>[Not enforced because this is an automatic action]</i>
✗	The driver can only be hired for consecutive days <i>[Not enforced because this is an automatic action]</i>
✗	The driver can only be hired if a car is assigned to the booking (do we make this a ternary relation between bookings, drivers and car models?) <i>[Not enforced because this is an automatic action]</i>
✗	If driver is not hired, then the customer must have a driver licence

	<i>[Not enforced because this is an automatic action]</i>
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Involves	
✓	Ternary relationship involving Bookings, Employees (keyReceiver) and Employees (keyGiver)
✓	<i>No additional attributes</i>
✓	A booking may involve 0 employees
✓	A booking may involve 1 employees
✓	An employee may be involved in 0 bookings
✓	An employee may be involved in more than 1 bookings
✓	A booking must have both of the keyGiver and keyReceiver, or neither of them (if booking is cancelled) <i>[Enforced because there cannot be NULL values]</i>

Rents	
✓	Binary relationship involving Bookings and CarModels
✓	Return date Constraints -> Must be the same or after the start date of the booking <i>[No additional attributes]</i>
✓	A booking may rent 0 car models
✓	A booking may rent at most 1 car models
✓	A car model may be rented by 0 bookings
✓	A car model may be rented by more than 1 bookings
✗	Car may be returned early <i>[Not enforced because this is an automatic action]</i>
✗	Car will not be returned late <i>[Not enforced because this is an automatic action]</i>
✗	Car is available if it belongs to its own location, and is not damaged nor being rented <i>[Not enforced because this is an automatic action]</i>

Has	
✓	Binary relationship involving Cars and CarModels
✓	<i>No additional attributes</i>
✓	A car may have 1 car models
✓	A booking may have at most 1 car models
✓	A car model may be in 0 bookings
✓	A car model may be in more than 1 bookings
✓	A car model must be part of a car, i.e. its existence is dependent on car <i>[Enforced because car model is a weak entity and car is the owning entity]</i>
✓	A car model cannot uniquely identify an entity; there may be multiple cars with the same car model <i>[Enforced because the car model is a weak entity with partial keys. Car, the owning entity, contains the primary key]</i>

Parks	
✓	Binary relationship involving Offices and Cars
✓	<i>No additional attributes</i>
✓	An office may park 0 cars
✓	An office may park more than 1 cars
✓	A car must be parked in at least 1 offices
✓	A car must be parked in at most 1 offices

WorksIn	
✓	Binary relationship involving Employees and Offices
✓	<i>No additional attributes</i>
✓	An employee must work in at least 1 offices
✓	An employee must work in at most 1 offices
✓	An office must have at least 1 employees working in
✓	An office may have more than 1 employees working in

PicksUpAt	
✓	Binary relationship involving Bookings and Offices
✓	<i>No additional attributes</i>
✓	A booking may pick up at 0 offices
✓	A booking must pick up at at most 1 offices
✓	An office may be picked up at by 0 bookings
✓	An office may be picked up at by more than 1 bookings

ISA	
✓	Extended relationship between Employees and Drivers
✓	An employee may not be a driver
✓	An employee may be a driver (cannot belong to multiple specialised entity sets as there is only one to begin with)
✓	(Rationale) A driver is a special type of employee

ER Diagram

