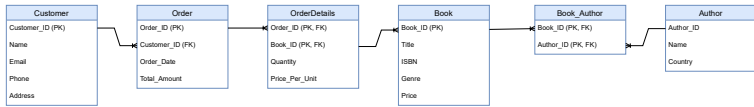


Task 1: Conceptual, Logical, and Physical Data Modeling

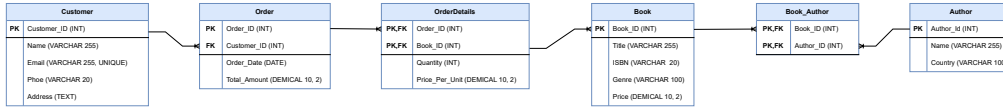
1.1. Conceptual Model: Create an ER diagram showing entities, attributes, and relationships (hint: 1:1, 1:M, M:M)



1.2. Logical Model: Convert entities into tables with primary and foreign keys



1.3. Physical Model: Assign data types to attributes



Task 2: Normalization (1NF → 2NF → 3NF)

Unnormalized table:

employee_id	name	job_code	job	state_code	home_state
E001	Alice	J01	Chef	26	Michigan
E001	Alice	J02	Waiter	26	Michigan
E002	Bob	J02	Waiter	56	Wyoming
E002	Bob	J03	Bartender	56	Wyoming
E003	Alice	J01	Chef	56	Wyoming

Issues in this table: duplicate employee_id and name; an employee can have multiple jobs (violation of 1NF); home-state is redundant for each employee_id (violation of 2NF)

1) Convert to First Normal Form (1NF)

Each columns contain indivisible values, so repeating groups should be broken down into separate rows.

employee_id	name	stat_code	home_state	job_code	job
E001	Alice	26	Michigan	J01	Chef
E001	Alice	26	Michigan	J02	Waiter
E002	Bob	56	Wyoming	J02	Waiter
E002	Bob	56	Wyoming	J03	Bartender
E003	Alice	56	Wyoming	J01	Chef

Now each value is atomic, but partial dependencies still exist

2) Convert to Second Normal Form (2NF)

All attributes must depend on the entire primary key. The issue is that name and home_state depend only on employee_id, while job depends only on job_code. The solution is to split the table into two: Employees and Jobs

Employees Table			Jobs Table		Employee_Jobs	
employee_id	name	state_code	job_code	job	employee_id	job_code
E001	Alice	26	J01	Chef	E001	J01
E002	Bob	56	J02	Waiter	E001	J02
E003	Alice	56	J03	Bartender	E002	J02
					E002	J03
					E003	J01

Now name and state_code depend only on employee_id, and job depends only on job_code

3) Convert to Third Normal Form (3NF)

Rule -> remove transitive dependencies

Issue: state-code is related to home_state, but home_state depends on state_code, not employee_id. Therefore we must move state_code to a separate States table:

States Table		Updated Employees Table		
state_code	home_state	employee_id	name	state_code
26	Michigan	E001	Alice	26
56	Wyoming	E002	Bob	56
		E003	Alice	56

No more transitive dependencies !

Finally, after 3NF Normalization:

Employees Table			Jobs Table		Employee_Jobs		States Table	
employee_id	name	state_code	job_code	job	employee_id	job_code	state_code	home_state
E001	Alice	26	J01	Chef	E001	J01	26	Michigan
E002	Bob	56	J02	Waiter	E001	J02	56	Wyoming
E003	Alice	56	J03	Bartender	E002	J02		
					E002	J03		
					E003	J01		