

1DV503/1DT903 Database Technology and Modeling

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Task 1. The Hospital database

1.1 Identify all entities and their attributes from the description of database requirements using the following Table template:

Entity	Attribute	Attribute Type	Key Attribute	Value sets of attribute (type, min, max, value, NULL/NOT NULL)
DEPARTMENT	Unique ID	Simple / Composite	True	Not null - Number or Number + Letters
	Name	Simple	True	Not null - Characters(256)
	Head of the department (ID)	Simple / Composite (First name - Last name)	True	Not null - Characters or mix Letters and numbers
PHYSICIAN	Unique ID	Simple / Composite	True	Not null - Mix letter and numbers
	Name (First name, last name)	Composite (First name + last name)	False	Not Null - Character (256) and Character (256)
	Address	Composite (Address, postal code, city)	False	Not null - Character (256) or (Character (256) - Numeric (5) - Character (100))

PATIENT	Unique ID	Simple / Composite	True	Not null - Number of numbers + letters
	First name	Simple	False	Not null - Character (256)
	Last name	Simple	False	Not null - Character (256)
	Adress	Composite (Address, postal code, city)	False	Not null - Character (256) or (Character (256) - Numeric (5) - Character (100))
	Phone	Simple / Composite	False	Numeric (10) or Country code - Numerical (10)
	Insurance ID	Simple / Composite	True / False (Kids can have insurance ID of their parents)	Not null - Characters (100)
NURSE	Unique ID	Simple / Composite	True	Not null - Number or mix number + letter
	Name (first name, last name)	Simple / Composite (simple, simple)	False	Not null - Character (256) or Character (256) and Character (256)
	Position	Simple	False	Not null - Character (100)
APPOINTEMENT	Appointment ID	Simple / Composite	True	Not null - Number or numbers + letters
	Patient ID	Simple / Composite	False	Not null - Number of numbers + letters
	Nurse ID	Simple /	False	Not null -

		Composite		Number or mix number + letter
	Physician ID	Simple / Composite	False	Not null - Mix letter and numbers
	Start date	Simple	False	Not null - Datatype
	End date	Simple	False	Not null - Datatype
	Room ID	Simple / Composite	True	Not null - Numbers or mix numbers + letters
PROCEDURE	Unique code	Simple / Composite	True	Not null - Numbers or mix numbers + letters
	Name	Simple	False	Not null - Characters (256)
	Cost	Simple	False	Not null - Numerical (9) - From 0 to 100 000 000
	Date	Simple	False	Not null - Datatype
MEDICATION	Unique code	Simple / Composite	True	Not null - Numbers or numbers + letters
	Code	Simple / Composite	False	Not null - Numbers or numbers + letters
	Name	Simple	False	Not null - Characters (256)
	Brand	Simple	False	Null - Characters

				(256)
	Description	Simple	False	Null - Characters (1024)
ROOM	Unique number	Simple / Composite	True	Not null - Numerical or Numerical + letters
	Type	Simple	False	Null - Characters (256)
	Availability	Simple	False	Boolean (available or not available) (0,1)

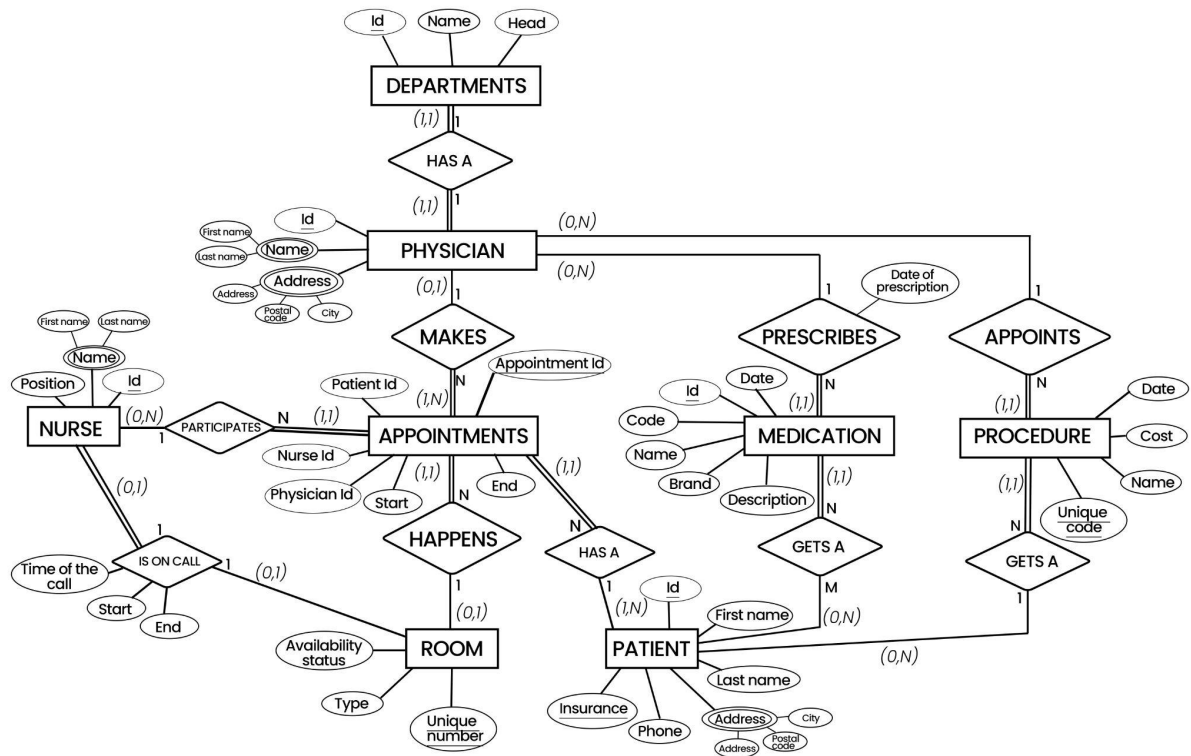
1.2 Identifying the relationship between entity sets using the following table template:

Entity A	Relationship name	Entity B	Cardinality Ratio n (1:1,1:N,N:1,M:N)	Attribute of Relationship Types	Justify your decision
Department	HAS A	Physician	1:1	/	A department can have only one physician at his head, and the physician belongs to only one department
Physician	MAKES	Appointment	1:N	/	A physician makes several appointments but an appointment can be made only by one physician
Nurse	PARTICIPATES	Appointment	1:N	/	A nurse participates to several appointment but an appointment has

					only one nurse
Nurse	IS ON CALL	Room	1:1	Time of the call (Time) Start (Datatype) End (Datatype)	A nurse can be on call to only one room and a room can have only one nurse
Appointment	HAPPENS	Room	1:1		An appointment can happen in only one room but a room can have several appointment
Patient	HAS AN	Appointment	1:1		The patient can have only one appointment and the appointment can have only one patient
Patient	GETS A	Procedure	1:N		The patient can have several procedure but a procedure can have only one patient
Patient	GET A	Medication	M:N		The patient can have several medications and the medication can be administered to several patients
Physician	PRESCRIBE S	Medication	1:N	Date of prescription	The medication can be prescribed by only one physician but the physician can prescribe
Physician	Appoints	Procedure	1:N		The physician can appoint several procedures but a procedure is always appointed by one physician

1.3 Design an ER schema for hospital database based on information provided in task 1, and entities defined in 1.2 with relationships defined in 1.3.

The ER schema should contain entities with their corresponding attributes, key attributes of each entity, relationship types, and their corresponding cardinality ration.



Task 2 Conference Review Database (25 points)

2.1 Identify all entities and their attributes from the description of Conference review database requirements using the following Table template:

Entity	Attribute	Attribute	Key	Value sets of attribute
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		Type	Attribute	(type, min, max, value, NULL/NOT NULL)
AUTHOR	Author_id*	Composite (Email, First Name, Last Name, Affiliation, Country)	True	Not null - Characters, formatted with email ending
	Email	simple / composite	False	Not null - Characters, formatted with email ending
	First Name	Simple	True	Not null - Characters (256)
	Last Name	Simple	True	Not null - Characters (256)
	Affiliation	Simple	True	Not null - Characters (256)
	Country	Simple	True	Not null - Characters (256)
PAPER	Unique identifier	Simple / Composite	True	Not null - Numerical or Numerical + letters
	Title	Simple	False	Not null - Character (1024)
	Abstract	Simple	False	Not null - Characters
	Keywords	Simple / Derived	False	Not null - Characters
	Years	Simple	False	Not null - Numerical (4)
	Name of electronic file	Simple	False	Not null - Mix characters (5) and numerical value (3 or +)
	Authors	Multivalued	False	Not null - Characters (256) depending on the number of authors
	Corresponding authors	Simple	False	Not null - Characters (256)
REVIEWER	Email	Simple / Composite	True	Not null - Email formatting (Character +

				@ + domain name)
	First Name	Simple	False	Not null - Character (256)
	Last Name	Simple	False	Not null - Character (256)
	Phone number	Simple / Composite	False	Numerical (10) or Country's indicator + Numerical (10)
	Affiliation	Simple	False	Not null - Character (256)
	Topics of interest	Simple	False	Not null - Character (256)

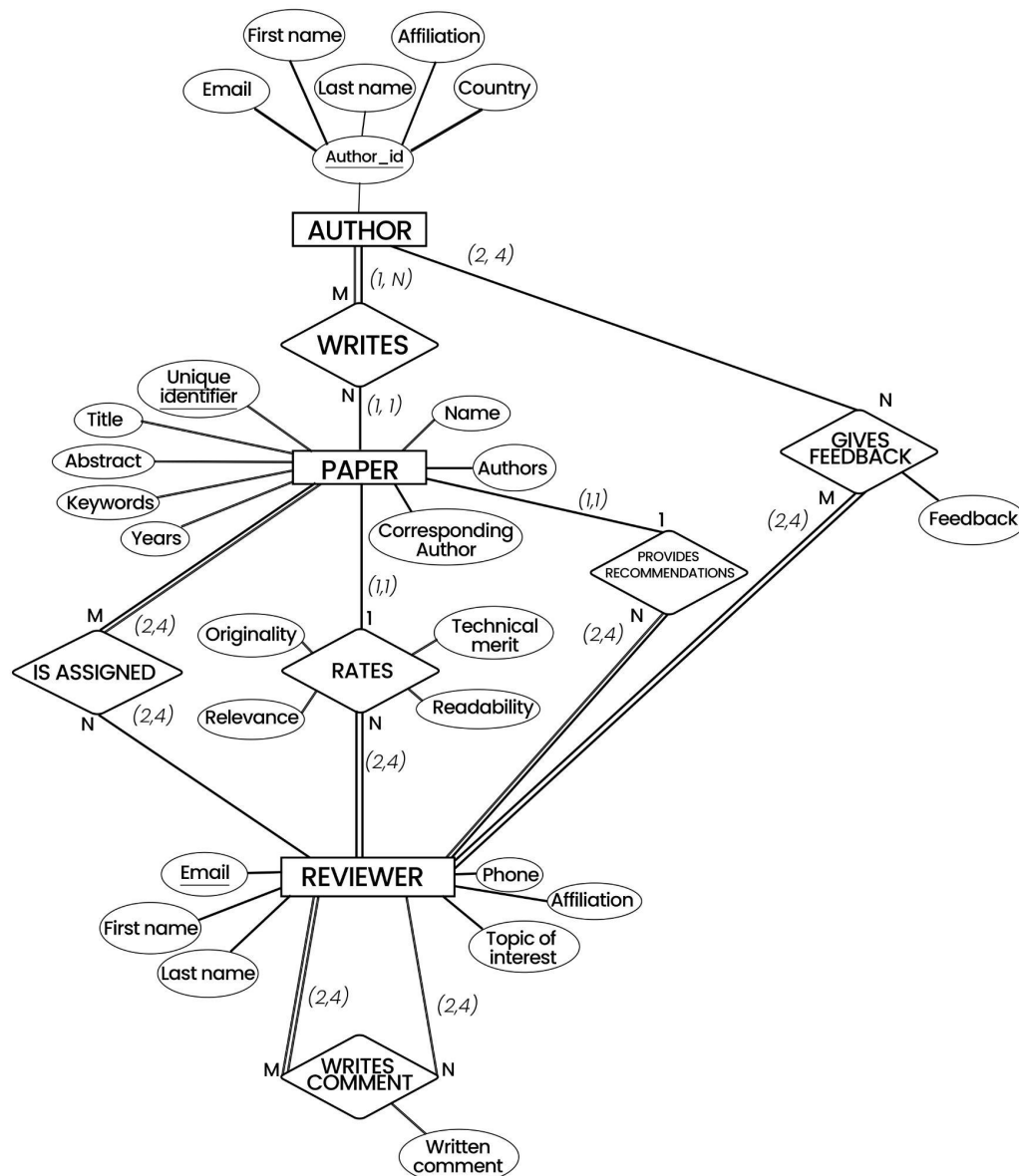
*Explanation: All the attributes of the authors are considered as key because none of them are keys. As stated in the book page 68, sometimes several attributes together form a key. They need to be represented inside a composite attribute.

2.2 Identifying the relationship between entity sets using the following table template:

Entity A	Relationship name	Entity B	Cardinality Ration (1:1,1:N, N:1,M:N)	Attribute of Relationship Types	Justify your answer
AUTHOR	Writes	PAPER	M:N		A paper is written by several author and an author can write several papers
PAPER	Is assigned	REVIEWER	M:N		A paper is assigned several reviewer and the reviewer can assign several paper
REVIEWER	Rates	PAPER	N:1	Originality (Numerical	The reviewer rate one

				min 0 max 10) Relevance (Numerical min 0 max 10) Technical (Numerical min 0 max 10) Merit (Numerical min 0 max 10) Readability (Numerical min 0 max 10)	paper but a paper is rated by several reviewer
REVIEW ER	Writes comment	REVIE WER	M:N	Written comment	Several reviewers write comment to several reviewers
REVIEW ER	Provides recommendati ons	PAPER	N:1		Paper is commented by several reviewer but a reviewer comment only one paper
REVIEW ER	Gives feedback	AUTH OR	M:N	Feedback	Several reviewers give feedbacks to several authors

2.3 Design an ER schema for review database based on information provided in task 2, and entities defined in 2.1 with relationships defined in 2.2. You are free to make additional assumptions if you feel that some information is missing. Make sure to **document all assumptions** that you make. Please justify your assumptions.



Task 3. Bank database (25 points)

Consider the ER diagram shown below for part of a BANK database. Each bank can have multiple branches, and each branch can have multiple accounts and loans. Provide answers on the following statements:

A. List a strong (nonweak) entity type in the ER diagram

My Answer: Bank is a strong entity type in the ER diagram.

B. Is there a weak entity type? If so, give its name, partial key, and identifying relationship

My Answer: There is one weak entity type in this diagram which is Bank_Branch. Its partial key is Branch_no and it has one identifying relationship which is Branches. The identifying relationships means that the Branch_no refers to the main bank in its unique identification attribute.

C. What constraints do the partial key and the identifying relationship of the weak entity type specify in this diagram?

My Answer: The constraint that the partial key and the identifying relationship specify here is that, the weak entity needs to refer to the strong entity in its unique attribute. Its strong entity here is Bank.

D. List the names of all relationship types and specify the (min,max) constraint and each participation of an entity type in a relationship type. Justify your answer.

Entity name	Relationship name	min,max	Justify your answer
Bank	Branches	(1, N)	The bank can have one branch or several. It cannot have zero branch because in that case it would be only the bank, not the bank with branches or it would be the branch itself
Bank_Branch	Branches	(1,1)	A bank branch has at least one bank and at max one bank. A branch can not be a mix of two banks and at the same time cannot be related to no bank. Otherwise it would be a bank in itself, not a branch.
Bank_Branch	Loans	(0:N)	A branch can have 0 loan (for example when starting) but can generate an infinite number of them.
Bank_Branch	Account	(0:N)	Again, when starting a bank branch can have 0 account and then grow the number of account infinitely in theory.
Account	Accts	(1, 1)	An account has at least and at max one bank_branch related. An account cannot have 0 bank related or several bank related in theory.
Account	A_C	(1, N)	An account needs to have at least one customer but can have several or them
Customer	A_C	(1, N)	To be a customer, you need to have at least one account in the bank, because 0 account cannot register a customer. However, a customer can have multiple accounts.
Customer	L_C	(0, N)	A customer does not need to have a loan to be a customer but can have multiple.
Loan	L_C	(1, N)	A loan exists because it has been generated by at least one customer. A loan can be owned by several customers.

Loan	Loans	(1, 1)	A loan is created in at least and at max one bank branch. A loan cannot exist without a bank branch and cannot be emitted by several bank branches.
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Task 4. Baseball organization database (25 points)

4.1 Identify all superclass entities (with their attributes) and subclasses in the table below:

Superclass	Attributes	Subclass	Subclass Attributes
PERSONNEL	Id		
	Date of birth		
	Place of birth		
	First name		
	Last name		
		PLAYERS	Batting orientation
			Lifetime batting average
		COACHES	
		MANAGERS	
		UMPIRES	
PLAYERS		PITCHERS	Lifetime earned run average
TEAM	Name		
	City		
	Division		
	League		
	GAMES	Home	
		Visiting	
		Date	
		Score	

