1DV503/1DT903 Database Technology and Modeling

Samuel Berg
School of Computer Science, Physics
and Mathematics, Linnaeus University, Sweden
sb224sc@student.lnu.se

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 attributes (type, min, max, value, NULL/NOT NULL)
DEPARTMENT	Unique ID	Simple	True	String max 256 characters / Integers
	Name	Simple	True	String max 256 characters
PHYSICIAN	Unique ID	Simple	True	String max 256 characters / Integers
	Name	Composite	False	String max 256 characters
	Address	Complex Attributes	False	String max 256 characters
PATIENT	Unique ID	Simple	True	String max 256 characters / Integers
	Name	Composite	False	String max 256 characters
	Phone	Simple	False	NOT NULL / String / Integers
	Address	Complex Attributes	False	String max 256 characters
	Insurance ID	Simple	True	NOT NULL / String
APPOINTMENT	Appointment ID	Simple	True	String max 256 characters / Integers
	Physician ID	Simple	True	String max 256 characters / Integers

	Nurse ID	Simple	True	String max 256 characters / Integers
	Patient ID	Simple	True	String max 256 characters / Integers
	Start Date	Complex Attributes	False	String max 256 characters / Integers
	End Date	Complex Attributes	False	String max 256 characters / Integers
	Room	Complex Attributes	False	String max 256 characters / Integers
NURSE	Unique ID	Simple	True	String max 256 characters / Integers
	Name	Composite	False	String max 256 characters
	Position	Simple	False	String max 256 characters
MEDICATION	Unique ID	Simple	True	String max 256 characters / Integers
	Code	Simple	True	String max 256 characters / Integers
	Name	Composite	False	String max 256 characters
	Brand	Simple	False	String max 256 characters
	Description	Simple	False	String max 256 characters
PROCEDURE	Unique Code	Simple	True	String max 256 characters / Integers
	Name	Composite	False	String max 256 characters
	Cost	Simple	False	Integers
ROOM	Unique Number	Simple	True	String max 256 characters / Integers
	Type	Composite	False	String max 256 characters
	Availability (Available/Busy)	Simple	False	String max 256 characters / Integers

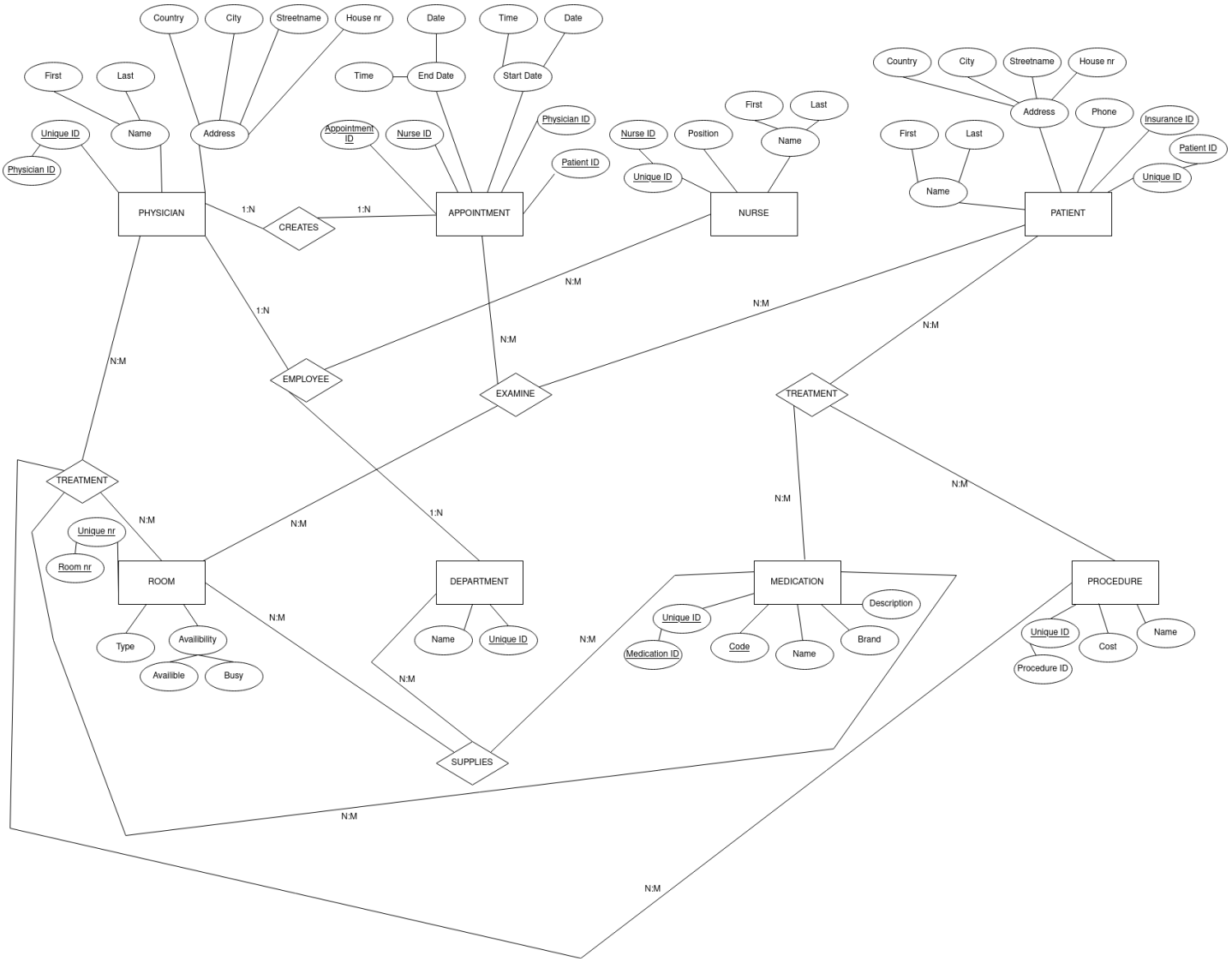
1.2 Identifying the relationship between entity sets using the following table template:

Entity A	Relationship Name	Entity B	Cardinality Ration (1:1, 1:N, N:1, M:N)	Attribute of Relationship Types	Justify your decision
Department	EMPLOYEE	Nurse	1:N	One-to-many	One department can have several nurses
Department	EMPLOYEE	Physician	1:1	One-to-one	One department has only one physician
Department	SUPPLIES	Medication	1:N	One-to-many	One department can supply patients with different types of medication
Department	SUPPLIES	Room	1:N	One-to-many	One department can supply different types of rooms
Physician	CREATES	Appointment	1:N	One-to-many	One physician can create several appointments
Physician	EMPLOYEE	Nurse	1:N	One-to-many	One physician controls several nurse in its department
Physician	TREATMENT	Medication	N:M	Many-to-many	Multiple physicians can prescribe different medications
Physician	TREATMENT	Procedure	N:M	Many-to-many	Multiple physicians can appoint different treatment
Physician	TREATMENT	Room	N:M	Many-to-many	Multiple physicians can book multiple rooms
Patient	EXAMINE	Appointment	1:N	One-to-many	One patient can have

					multiple appointments
Patient	EXAMINE	Room	N:M	Many-to-many	Multiple patients can be in multiple rooms and moved in between them
Patient	TREATMENT	Medication	N:M	Many-to-many	Multiple patients can have multiple medications
Patient	TREATMENT	Procedure	N:M	Many-to-many	Multiple patients can have multiple procedures
Appointment	EXAMINE	Room	N:M	Many-to-many	Multiple appointments can be in several rooms
Medication	TREATMENT	Procedure	N:M	Many-to-many	Several different medications can be used for multiple procedures
Medication	TREATMENT & SUPPLIES	Room	N:M	Many-to-many	Different medications can be used in multiple rooms
Procedure	TREATMENT	Room	N:M	Many-to-many	Different procedures done in different rooms

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 ratio.



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 Type	Key Attribute	Value sets of attributes (type, min, max, value, NULL/NOT NULL)
AUTHOR	Email	Simple	True	String max 256 characters / Integers
	Name	Composite	False	String max 256 characters
	Affiliation	Simple	False	String max 256 characters

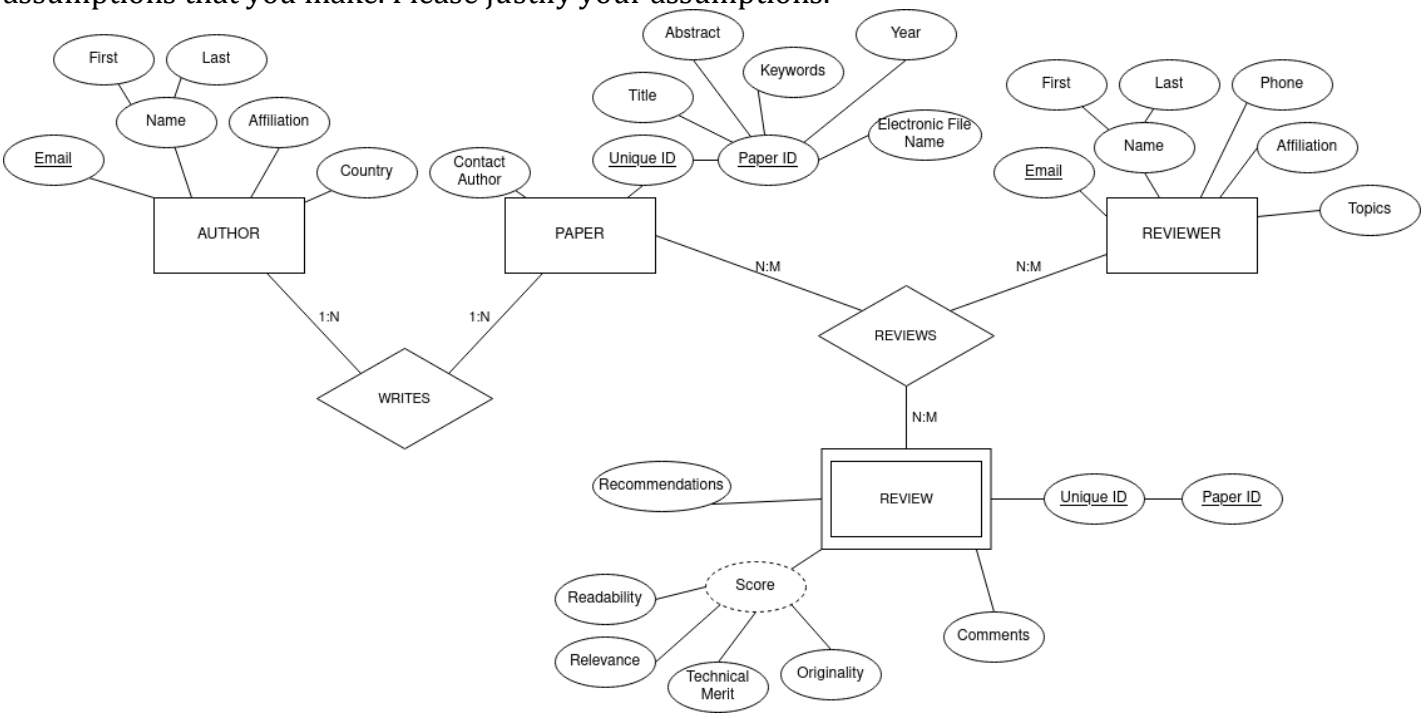
	Country	Simple	False	String max 256 characters
PAPER	Unique ID	Multivalued	True	String max 256 characters / Integers
	Contact Author	Composite	False	String max 256 characters
REVIEWER	Email	Simple	True	String max 256 characters / Integers
	Name	Composite	False	String max 256 characters
	Phone	Simple	False	String max 256 characters / Integers
	Affiliation	Simple	False	String max 256 characters
	Topics	Multivalued	False	String max 256 characters / Integers
REVIEW	Unique ID	Simple	True	String max 256 characters / Integers
	Score	Multivalued	False	String max 256 characters / Integers
	Recommendations	Simple	False	String max 256 characters
	Comments	Simple	False	String max 256 characters / Integers

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 decision
Author	WRITES	Paper	N:M	Many-to-many	Several authors can write multiple papers
Paper	REVIEWS	Reviewer	N:M	Many-to-many	Several papers can be reviewed by multiple reviewers

Paper	REVIEWS	Review	N:M	Many-to-many	Several papers can have multiple reviews
Reviewer	REVIEWS	Review	N:M	Many-to-many	Several reviewers can have left multiple reviews

*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. Y*ou 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)

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

ANSWER: CUSTOMER

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

ANSWER:

Name: BANK_BRANCH

Partial Key: Branch_no

Identifying Relationship: Has_Branches

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

ANSWER: There is no unique identifier for the records in the entity.

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.

ANSWER:

Relatiship Type	Relationship Name	MIN, MAX	Justify your answer
One-to-many	Has_Branches	1:1, 1:N	A BANK has a MIN of 1 branch and MAX of 1 branch, (1:1). A BANK_BRANCH has a MIN of 1 branch and MAX of N branches, (1:N).
One-to-many	Has_Accounts	1:1, 1:N	A BANK_BRANCH has a MIN of 1 account and a MAX of 1 account, (1:1). Created accounts are at MIN 1 account and at MAX N accounts, (1:N).
One-to-many	Loans	0:1, 1:N	A BANK_BRANCH has a MIN of 0 loans and MAX of 1 loan, (0:1). A LOAN is at MIN 1 amount and at MAX N amount, (1:N).
Many-to-many	A_C	1:N, 1:N	There can be a MIN of 1 account and a MAX of N accounts, (1:N). MIN of CUSTOMERS is 1 and MAX number of CUSTOMERS is N, (1:N).
Many-to-many	L_C	1:N, 1:N	MIN of 1 CUSTOMER with a loan and MAX of N CUSTOMERS with loans, (1:N). MIN of 1 LOAN and MAX of N LOANS, (1:N).

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**
PEOPLE	Personnel	UMPIERS	Personnel ID
PERSONNEL	Personnel ID, Personnel Details (Name, Date of Birth, Place of Birth)	COACHES, MANAGERS	
TEAMS	Name (ID), Location, Division, League	HOME, VISITING	

		PLAYERS	Batters (Batting Average, Orientation), Pitchers (Earned Run Average)

4.2 Design an enhanced entity-relationship diagram (EER). Provide justification for designed relationships between entities, defined superclasses, and subclasses.
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!