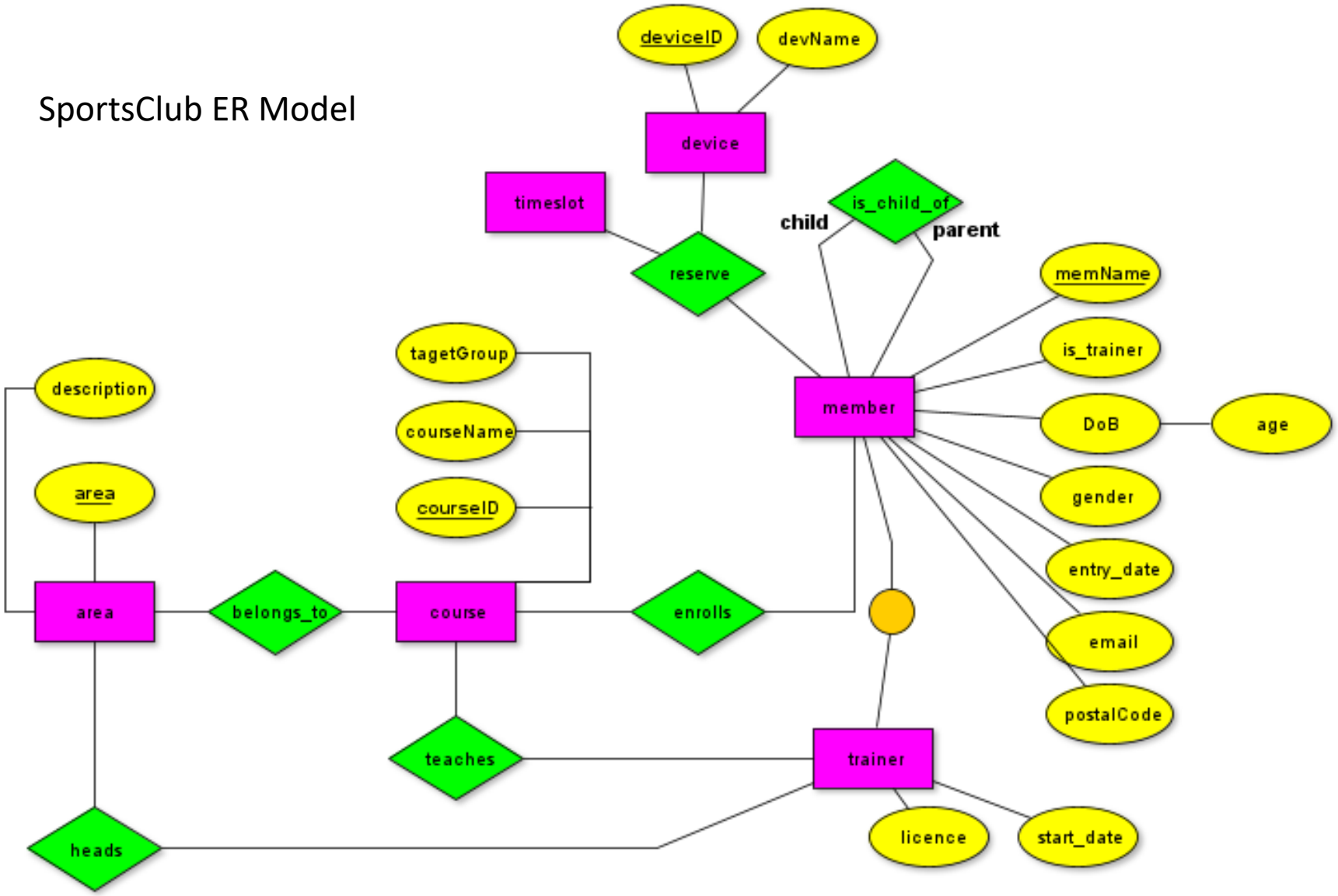
Assignments
Normalization
Referential Integrity
October 20th, 2023

Lab Exercises

SportsClub ER Model



Relations‘ schema SportsClub

member: {[memName: string, isTrainer:Boolean, email:string, postalCode: integer, DoB: date, gender: enum, entryDate:date; **is_child_of: string**]}

trainer: {[**memName: string**, license: Boolean, startDate:date]}

area {[**area:string**, description: string, **manager: string**]}

course {[**courseID: integer**, courseName: string, targetGroup: string, **area: string**, **memName: string**]}

device: {[**deviceID:int**, devName:string]}

enrollment{[**memName:string, courseID: integer**]}

reservation: {[**timeslot:datetime**, **memName:string, deviceID:int**]}
with unique constraint on {[timeslot:datetime, deviceID:int]}

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1. SportsClub Database

Constraints on reservation table:

1. Insert a tuple with {timeslot1, member1, device1}

2. Verify that it is NOT possible to insert the tuple:
   {timeslot1, member1, device2}

   What error message do you get?

3. Verify that it is NOT possible to insert the tuple:
   {timeslot1, member2, device1}

   What error message do you get?

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2. SportsClub Database: Check Constraints

Add the following check constraints to the member table:

1. The entry data cannot be before the opening data of the club. The opening date was 2015-01-01.

2. The attribute 'isTrainer' is only to acccept 1 or 0 values. It defaults to 0.

3. The FK parentID MUST NOT refer to its own PK (PK of the same tuple) but must refer to a different tuple.

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3. Computed Attribute

Add the column “age” as computed column to the member table in the spotsclub database

- Does it need to be a virtual or a stored column? Why?

  Research mariadb knowledgebase to find out the difference between virtual and stored. Then explain what is needed for the age column.

- Develop the expression that calculates age out of DoB
  Copy down the ALTER statement

- Verify that ages are computed correctly. Change a DoB to verify that calculation also changes.

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4. Referential Integrity

1. Add meaningful referential integrity constraints to all FKs of sportsClub and university database.

2. Use all options at least once.

3. Test each option to verify that they work as you intended.

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5. Normal Forms

article_ ID	article_ description	price	storage Location	stock	supplier	telephone supplier
1	skis	200	Vienna	50	A	123456
1	skis	200	Munich	25	B	234567
2	tent	150	Berlin	10	C	345678
3	snowshoes	100	Berlin	50	A	123456
4	boots	50	Vienna	150	A	123456
4	boots	50	Cologne	5	A	123456
4	boots	50	Munich	15	B	234567
4	boots	50	Munich	5	D	589944

In which normal form is the relation?
Write down the assumend existing FDs.
Decompose into 3rd normal form.
Do some reverse engineering and draw a well-designed ER model out of your normalized relations.

6. NF

An agency manages in its database IT Freelance people that work for different companies on different projects. For a specific project a freelancer can only work in one function.

FreelancerWork

SSN	Company ID	Company Name	Function	ProjectID	startDate
01136	1	TBG Bank	Project Manager	1	2020-01-01
74589	2	Bank Imereti	Developer	2	2020-10-01
55587	3	Telavi Wines	Project Manager	3	2019-10-01
01136	4	Poti Port	Tester	4	2021-02-01
12345	4	Poti Port	Developer	4	2019-11-01
12345	4	Poti Port	Tester	5	2021-01-01

1. What is the key?
2. Which FDs presumably exist?
3. In what normal form is the relation?
4. Transform the relation into3rd NF / BCNF.

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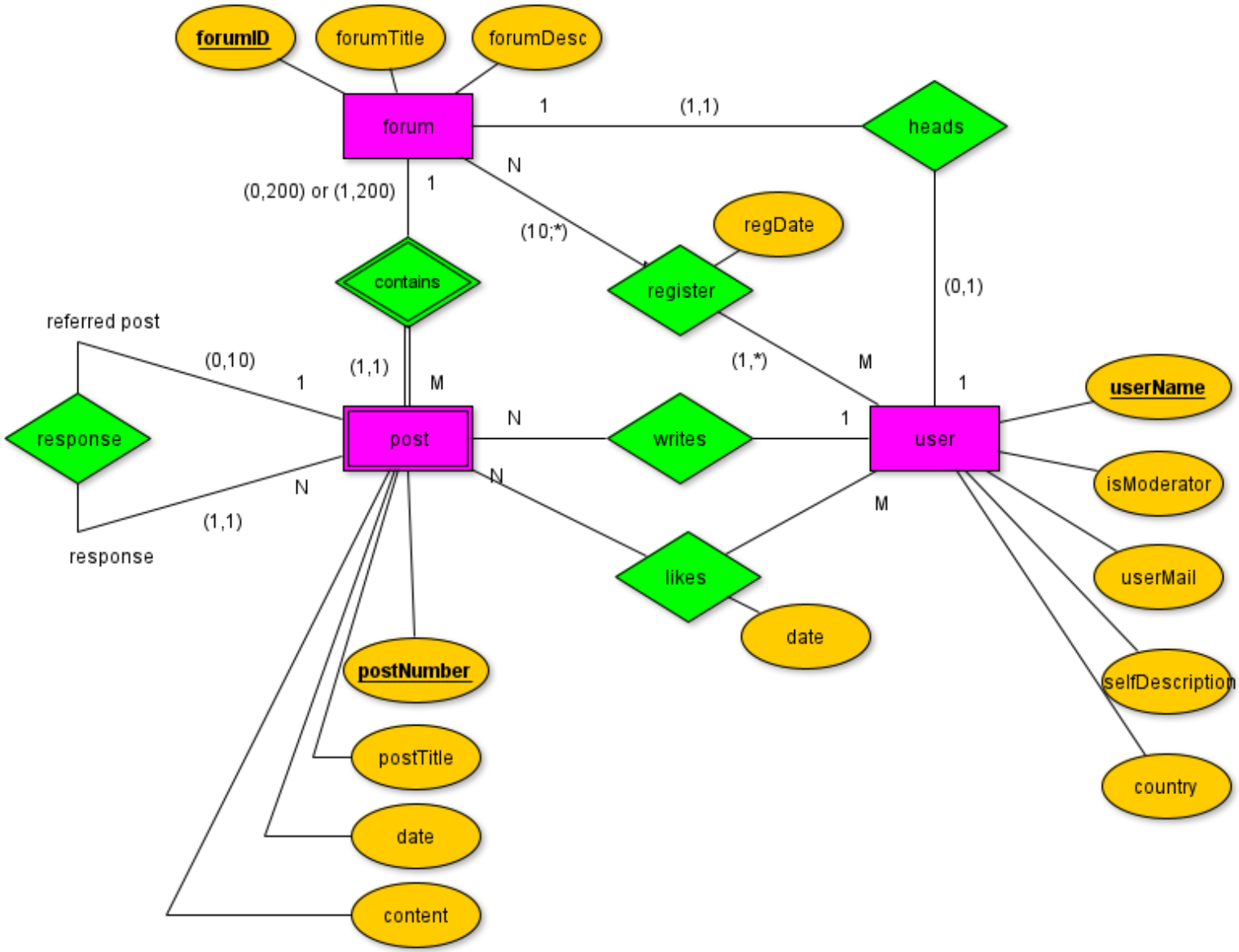
7. Mapping of Internet Forum ER Model

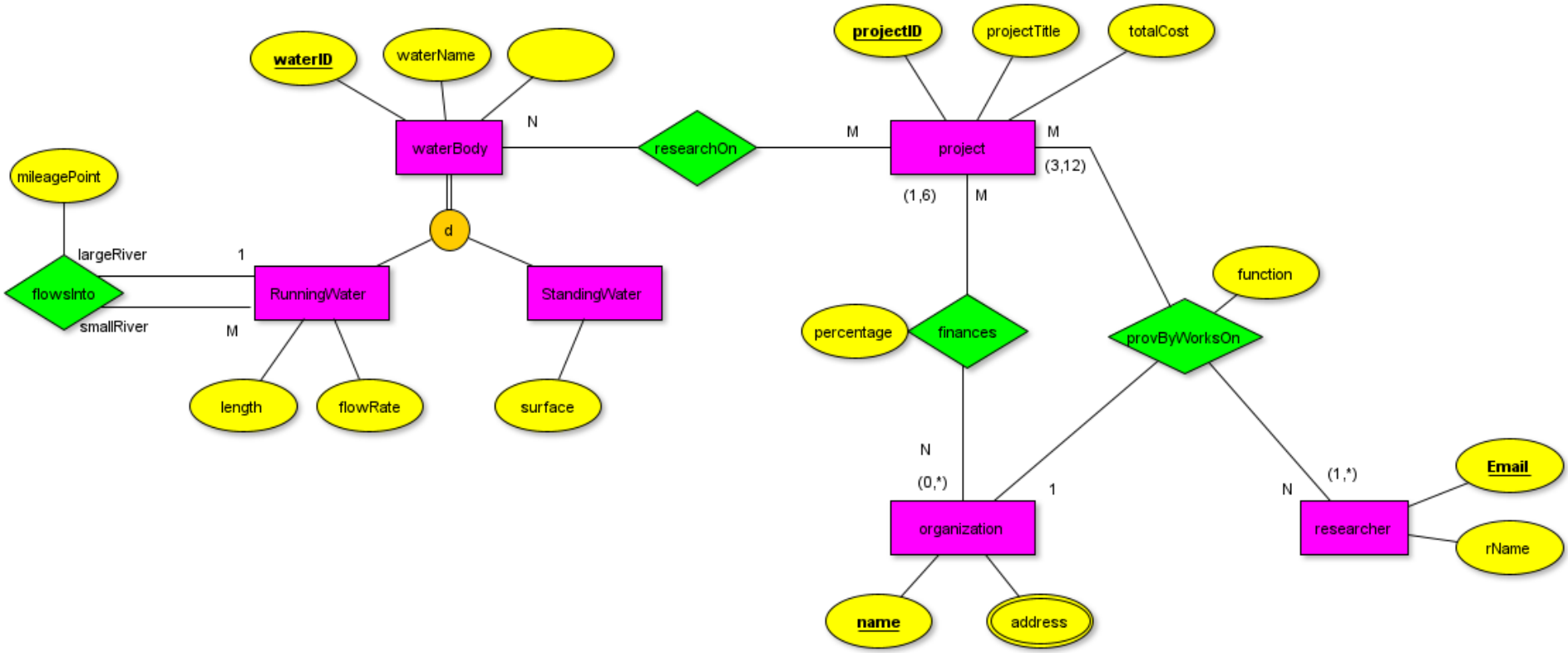


7. Mapping of Internet Forum ER Model

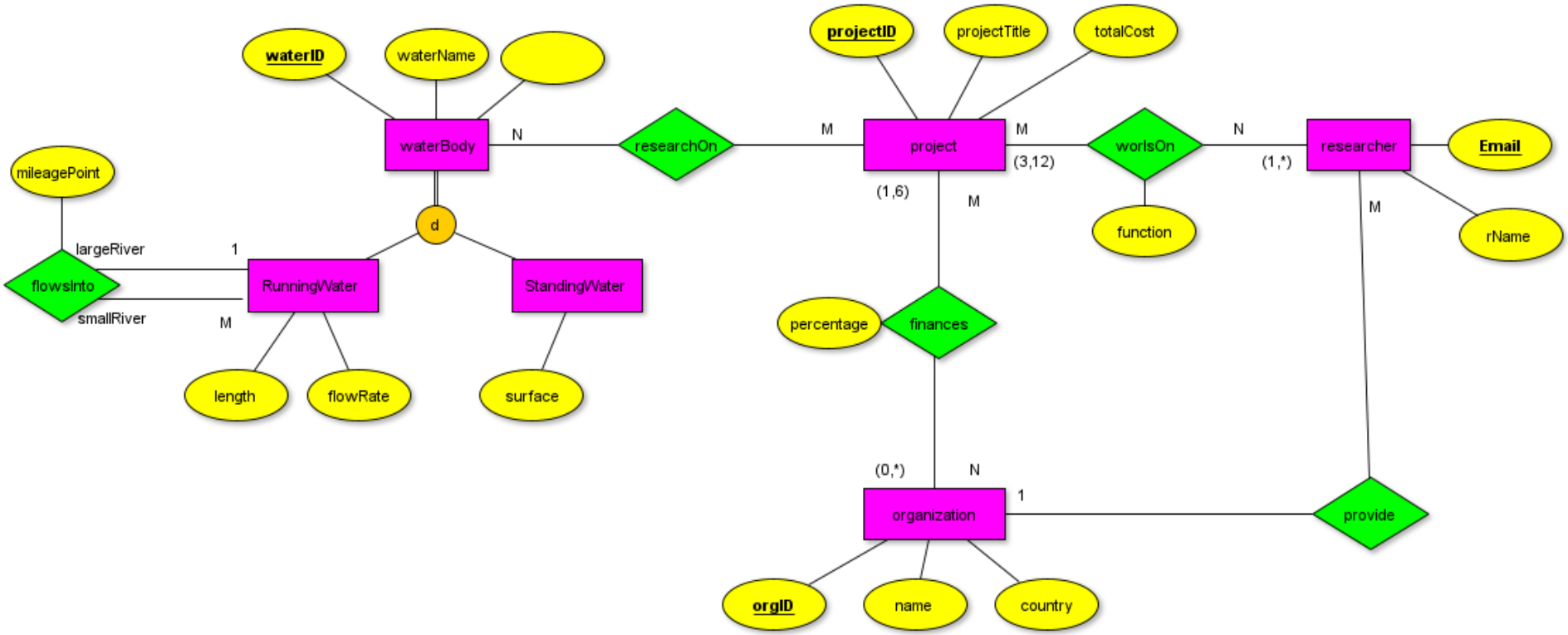
1. Map the internet forum ER model into a database schema.
2. How many final relations do you get?
3. Mark PKs, FKs and PKs that are FKs at the same time.
4. Are there FKs that need to be unique? if so, mark accordingly.
5. The attribute country could be mapped as a separate look-up table. What is a look-up table? Why would it be suitable here?
6. Feel free to implement the schema as extra exercise.

Central Exercises

8. Mapping Waterbody ER Model



8. Mapping Waterbody ER Model



8. Mapping of Waterbody ER Model

1. Map the waterbody ER model into a database schema.
2. Can you apply a horizontal partitioning? If so, partition horizontally, if not, partition vertically.
3. How many final relations do you get? What does this depend on?
4. Mark PKs, FKs and PKs that are FKs at the same time.
5. Are there FKs that need to be unique? if so, mark accordingly.
6. We developed two slightly different ER models, one with a ternary and one with binary relations. How do the schema's of the two models differ?
7. Feel free to implement the schema as extra exercise.

9. NF / BCNF

The table empProject keeps track of which employee works on what projects in what function. Of each employee, the relation stores the social security number and the employee ID. Employees can work on different projects and can have a different function in each project they work on. The table also keeps track of the date that an employee started to work on the project.

EmpProject

SSN	Emp_ID	Function	ProjectID	startDate
01136	1	Project Manager	ERP	2020-01-01
74589	2	Developer	ERP	2020-10-01
55587	3	Project Manager	Portal	2019-10-01
12345	4	Tester	CRM	2021-02-01
12345	4	Developer	Portal	2019-11-01
12345	4	Tester	Linux	2021-01-01

1. What is the key or what are the candidate keys?
2. Which FDs exist?
3. In what normal form is the relation?
4. Transform the relation into BCNF. Can you preserve all FDs while decomposing?

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10. NF / BCNF

Given is the following relation:

ISBN: {ISBN:int, title:string, authorID:int, authorlName:string, authorFName:string, authorEmail:string, authorTelNumber:int, publishingHouse:string, publishingDate:date}

1. Can we tell the NF of the relation?
2. Which FDs exist?
3. Transform the relation into 3rd / BCNF.

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