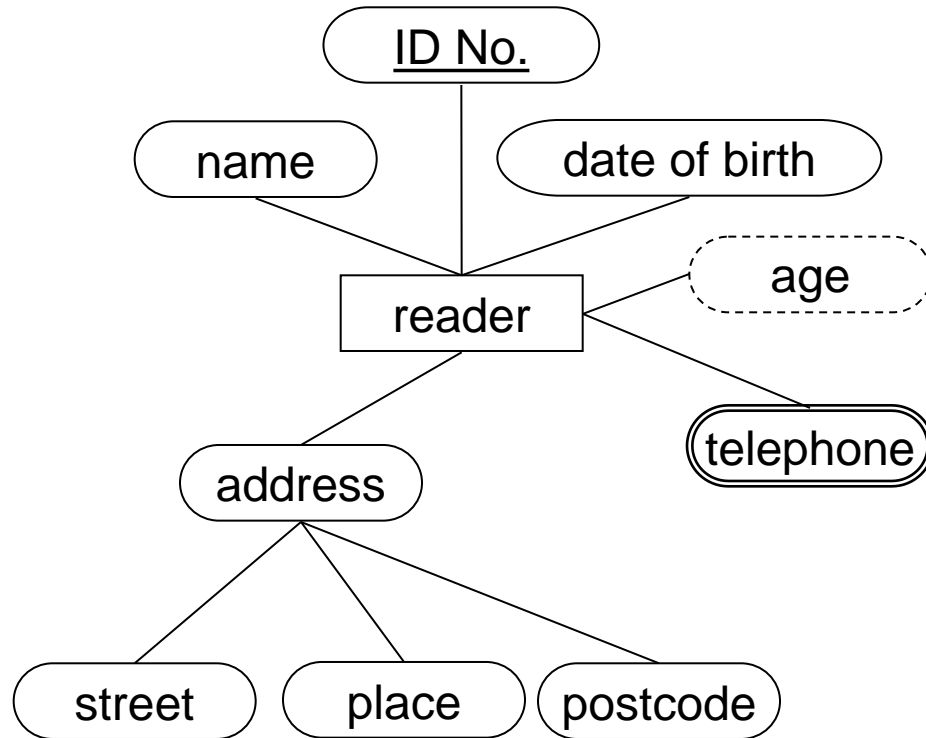# MDA104: Tutorial 2 Relational Model Conversion from ERD
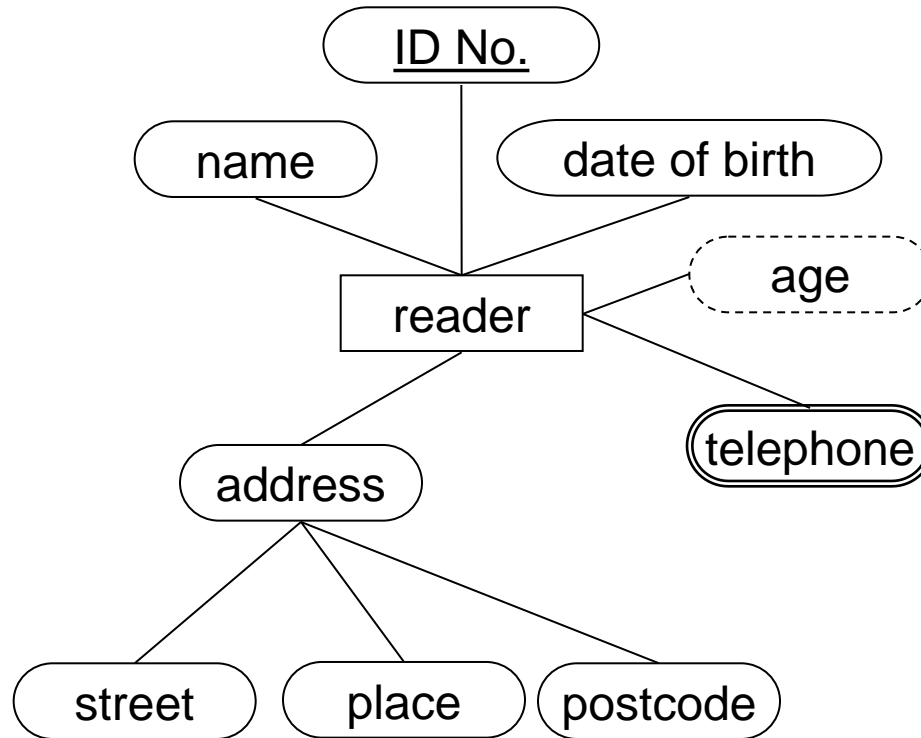
Vlastislav Dohnal

2

- Convert the following E-R model to a relational model.

3

- **Convert the following E-R model to a relational model.**
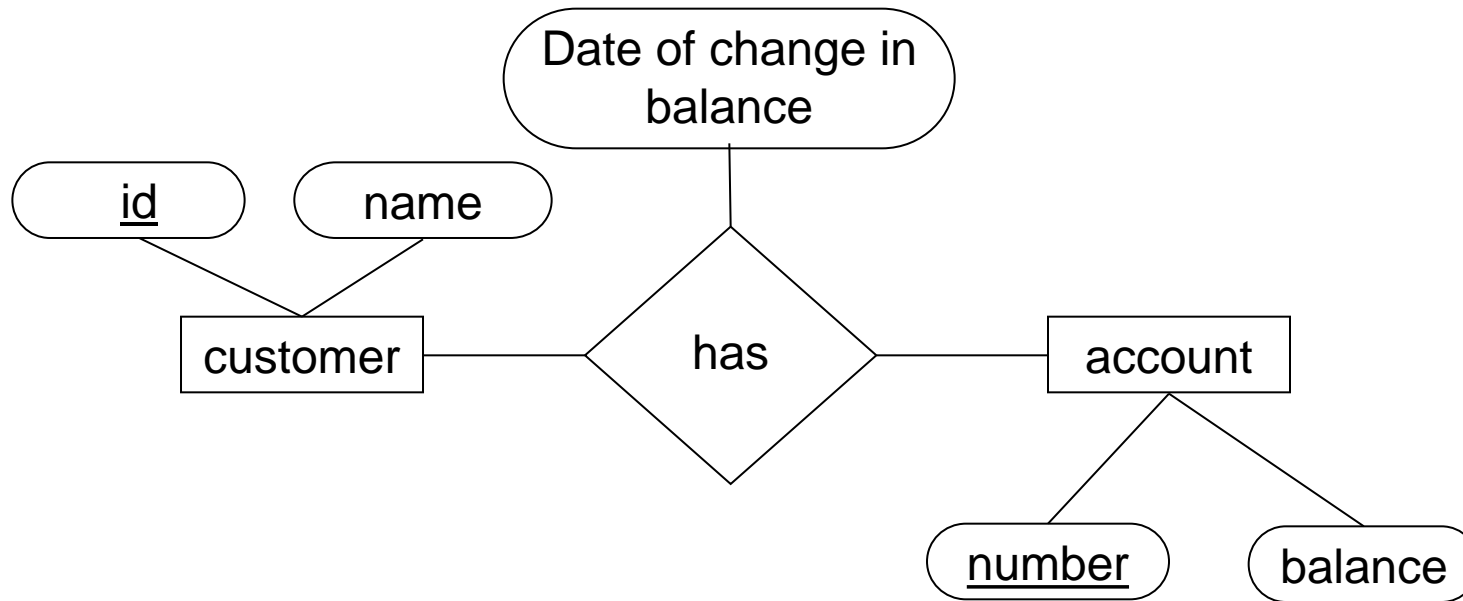
- Solution:
  - A table for Reader:

  Reader(<u>id_no</u>, name, date of birth, address_street, address_place, address_postcode)

  - Derived attribute is ignored (not explicitly stored in table)
  - Composite attribute as its components.
  - Multivalued attribute as a separate table
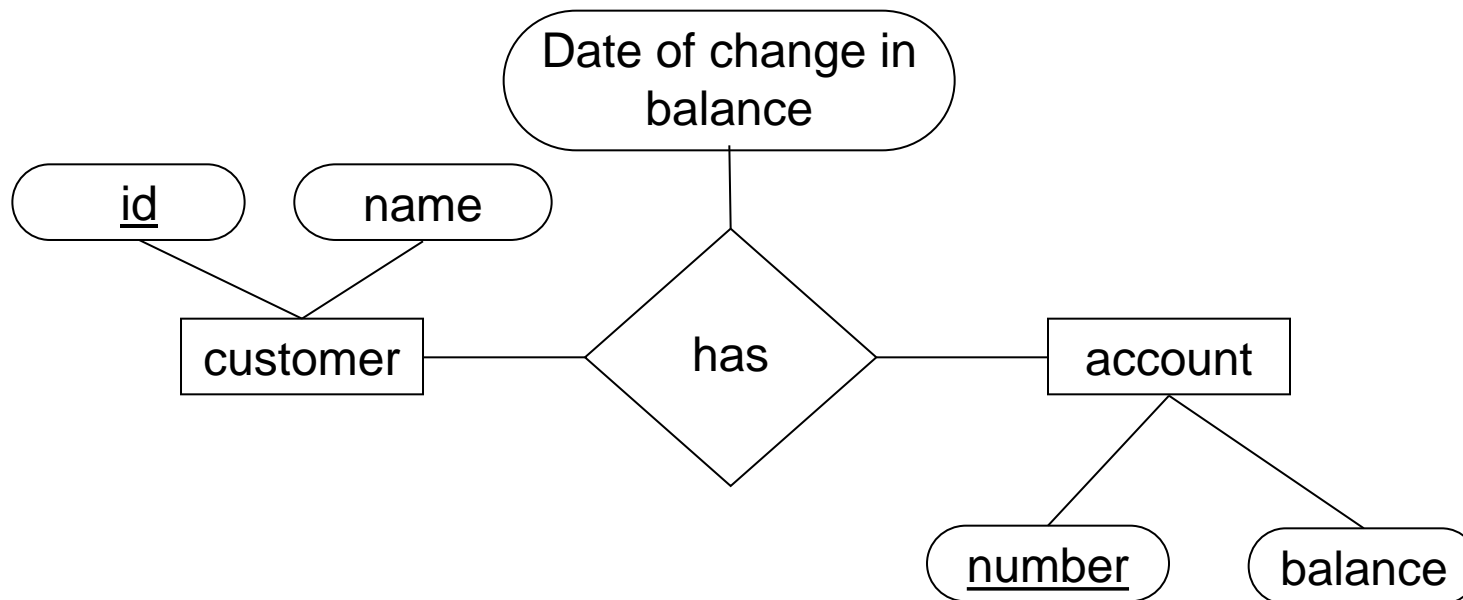
  Reader_phone(<u>id_no</u>, <u>telephone</u>)

4

- **Convert the following E-R model to a relational model.**
  - Consider the different mapping cardinality (m-n, 1-n, n-1, 1-1).
    - How will the relational model change?

5

- **Convert the following E-R model to a relational model.**
  - Consider the different mapping cardinality (m-n, 1-n, n-1, 1-1).
    - How will the relational model change?

- **Solution: (for illustration, which is m-n)**

Customer(id, name)
Account(number, balance)
Has(customer_id, account_number, date_of_change_in_balance_change)

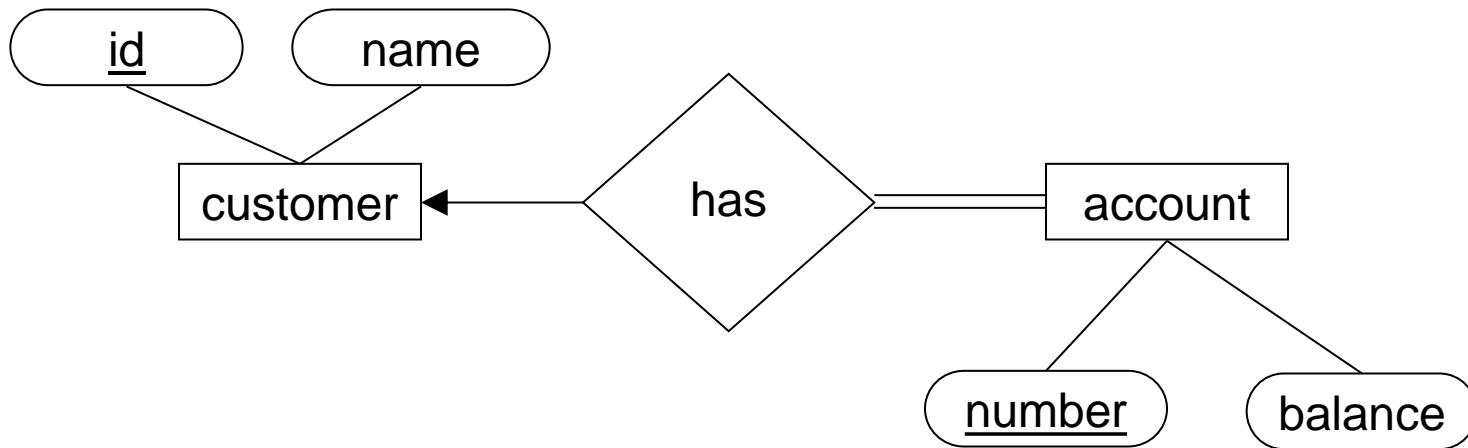 - If cardinality is 1-m, i.e. customer may have multiple accounts, but account has only one owner

Has(customer_id, account_number, date_of_change_in_balance_change)

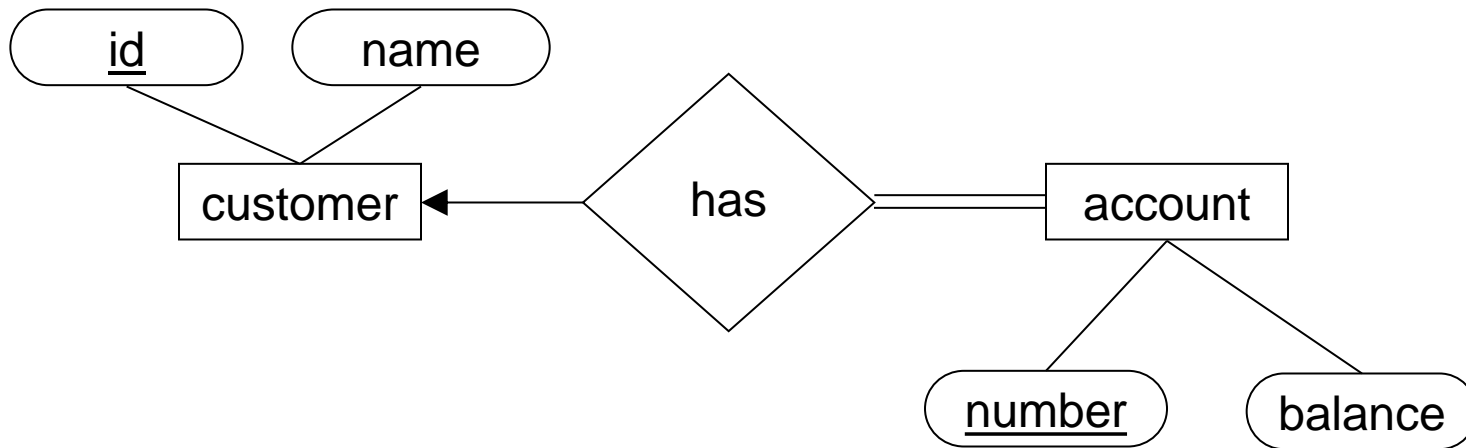 - Tables Customer, Account remain unchanged

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- Convert the following E-R model to a relational model.

7

- **Convert the following E-R model to a relational model.**

- **Solution:**
  - Cardinality is 1-m, but account <u>must have</u> an owner, so we may optimize:

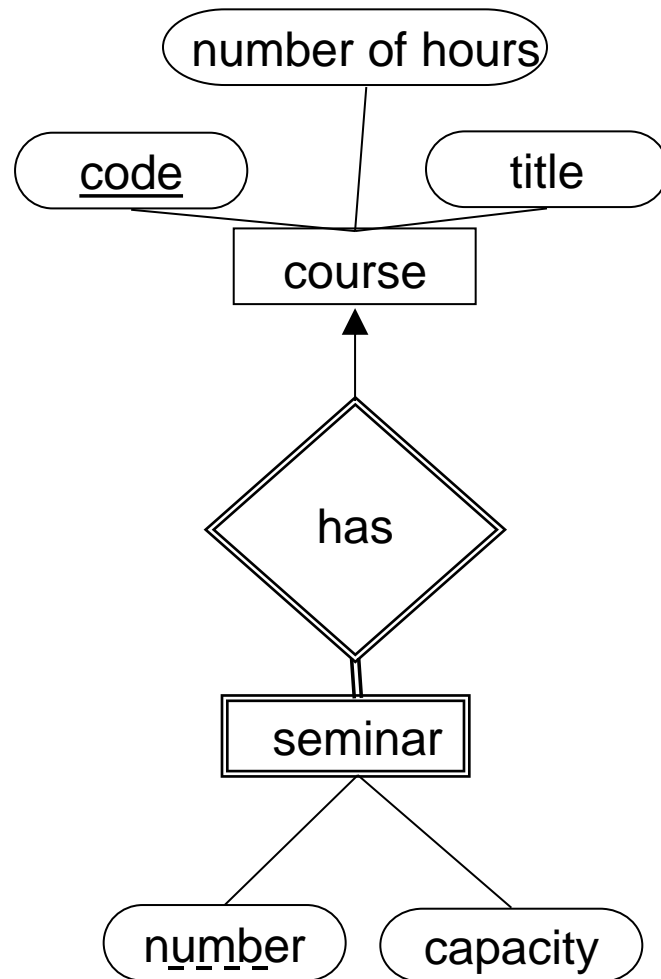 **Customer**(<u>id</u>, name)
  Account(<u>number</u>, balance, <u>customer_id</u>, date_of_change_in_balance_change)

  - Reference to customer is added as customer_id, which is a foreign key to Customer
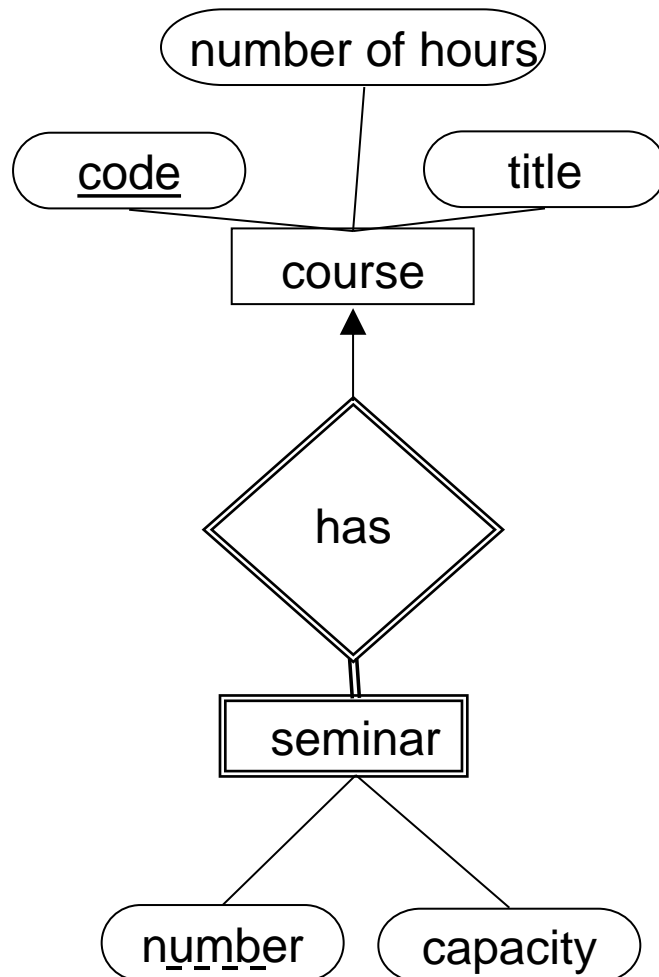 - No table for "has" is created!

8

- Convert the following E-R model to a relational model.

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- **Convert the following E-R model to a relational model.**

- **Solution:**
  - We have weak entity, which is analogous to the previous slide.
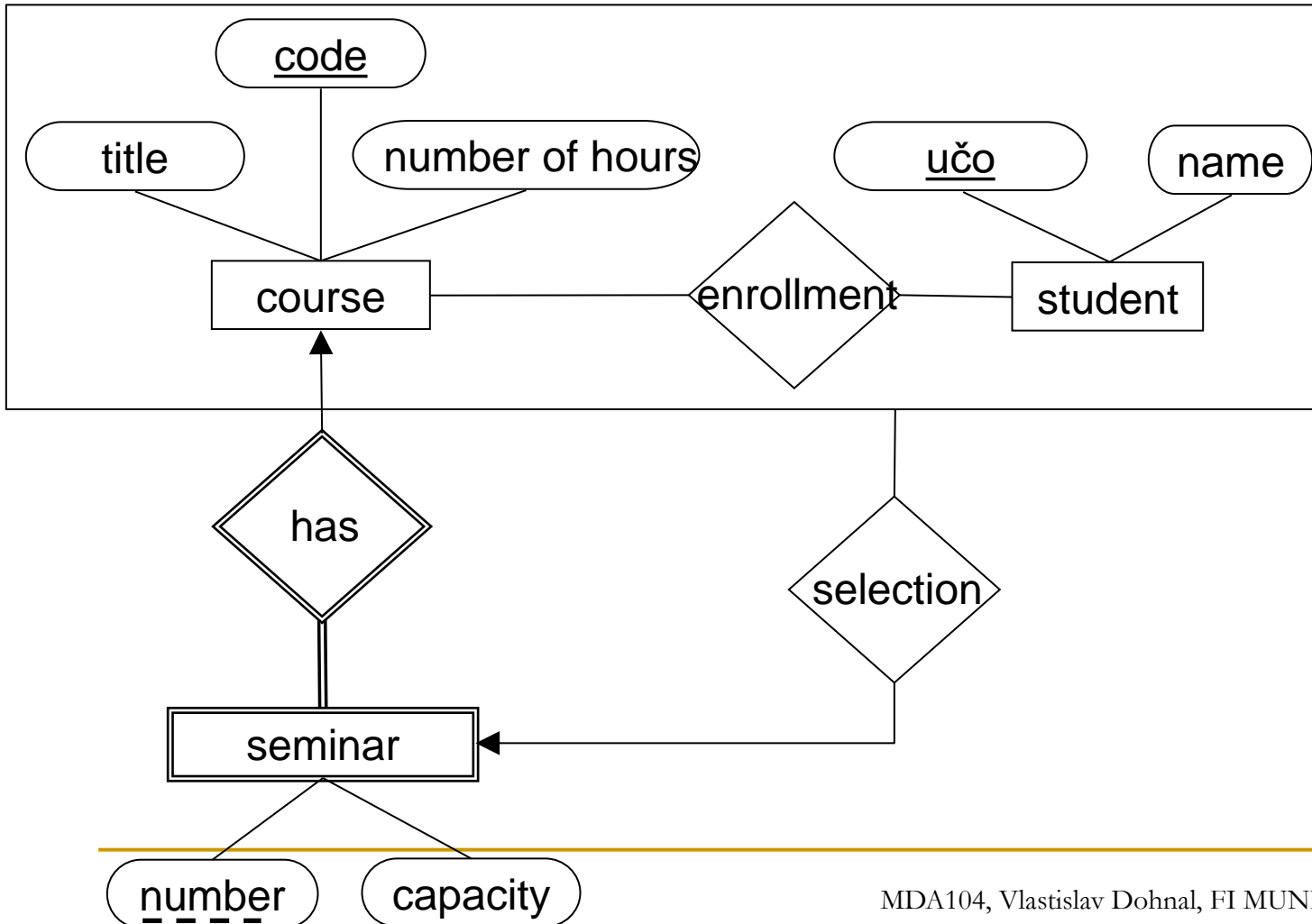
Course(<u>code</u>, title, number_of_hours)

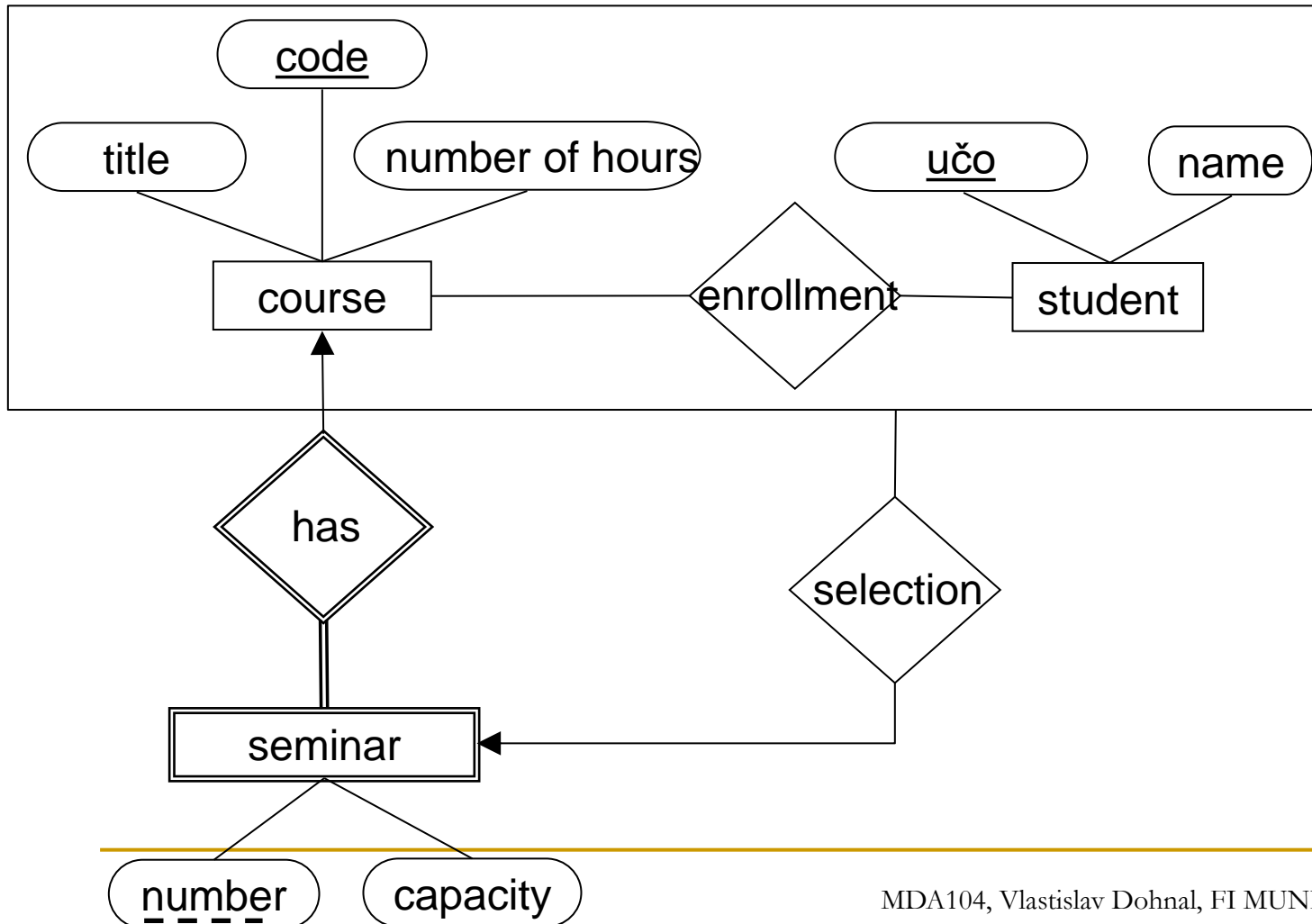**Seminar**(<u>code</u>, <u>number</u>, capacity)

  - Code is added to seminar, which implements the reference to the corresponding course.
  - Primary is a compound of code and number
    - Allows having a course to number seminars starting from 1.

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- Convert the following E-R model to a relational model.

- Convert the following E-R model to a relational model.

- Solution:

Course(<u>code</u>, title, number_of_hours)
Student(<u>učo</u>, name)
Enrollment(<u>code</u>, <u>učo</u>)

  - Standard conversion so far…

- Weak entity set:

Seminar(<u>code</u>, <u>number</u>, capacity)

  - No table for "has"

- Aggregation of enrollment has no impact to tables!
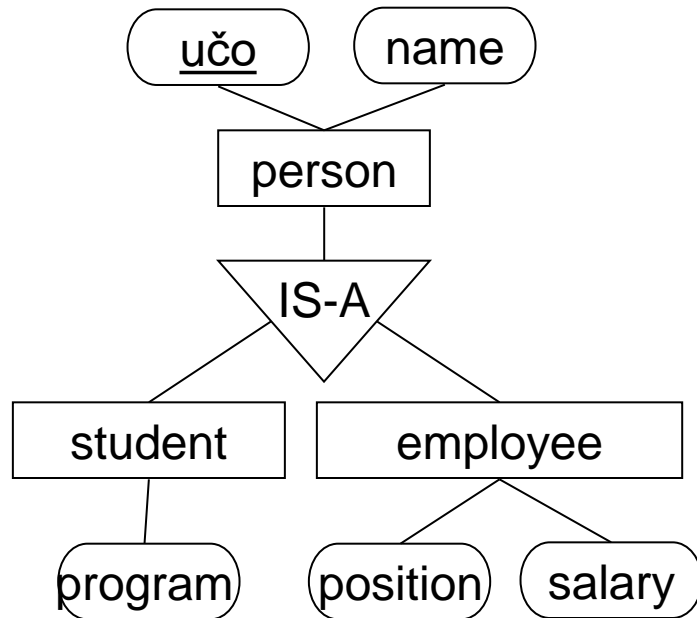
- Selection leads to the table:

Selection(<u>code</u>, number, <u>učo</u>)

  - Form by attributes of PK from connecting tables, i.e.
    - Code, number (from seminar)
    - Code, učo (from student)

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- Convert the following E-R model to a relational model.

- Consider different cases of generalization/specialization constraints
  - Disjoint vs. overlapping
  - Total vs. partial
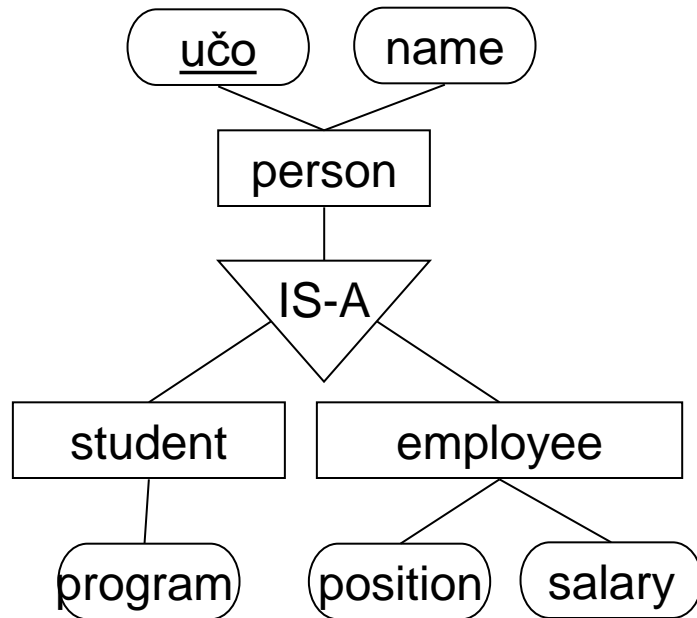
13

- Convert the following E-R model to a relational model.

- Consider different cases of generalization/specialization constraints
  - Disjoint vs. overlapping
  - Total vs. partial

- Solution: (general one)
  - Tables for each entity set with references in the specialized ones.

Person(u̲č̲o̲, name)
Student(u̲č̲o̲, program)
Employee(u̲č̲o̲, position, salary)

  - To allow faster filtering by "type" of person, we typically add such an attribute, so:

Person(u̲č̲o̲, name, type)

  - Type contains
    - "P" for person,
    - "S" for student,
    - "E" for employee, and
    - "X" for being student and employee at the same time.

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- **For the given relational scheme, create an E-R diagram.**
  - Useful if you do not have any docs for an existing system.

customer

ssn	name	street	place
700523/4532	Novák Petr	Brněnská 25	Praha
565130/9823	Černá Lucie	Kartouzská 10	Brno

telephone

ssn	number
700523/4532	602123569
565130/9823	549491111
700523/4532	777895364

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- **For the given relational scheme, create an E-R diagram.**
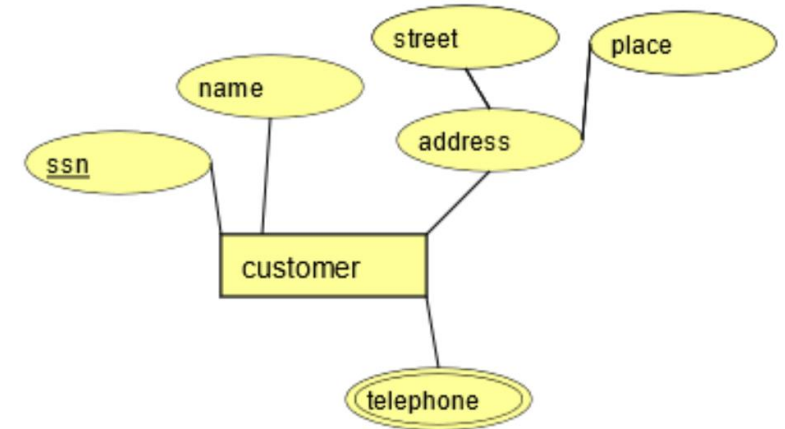   - Useful if you do not have any docs for an existing system.

customer

ssn	name	street	place
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telephone

ssn	number
700523/4532	602123569
565130/9823	549491111
700523/4532	777895364

- **Solution:**

- Street and place as a composite attribute
- Telephone numbers as a multivalued attribute

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- For the given relational scheme, create an E-R diagram.

branch

title	street	place
Praha-Spořilov	Brněnská 25	Praha
Brno-Královo pole	Kartouzská 10	Brno

account

number	balance
P-152	3000
P-015	1700
B-094	4000

maintains

branch_name	account_number
Praha-Spořilov	P-152
Praha-Spořilov	P-015
Brno-Královo pole	B-094

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- For the given relational scheme, create an E-R diagram.

- Solution:

branch

title	*street*	*place*
Praha-Spořilov	Brněnská 25	Praha
Brno-Královo pole	Kartouzská 10	Brno

account

number	*balance*
P-152	3000
P-015	1700
B-094	4000

maintains

branch_name	*account_number*
Praha-Spořilov	P-152
Praha-Spořilov	P-015
Brno-Královo pole	B-094
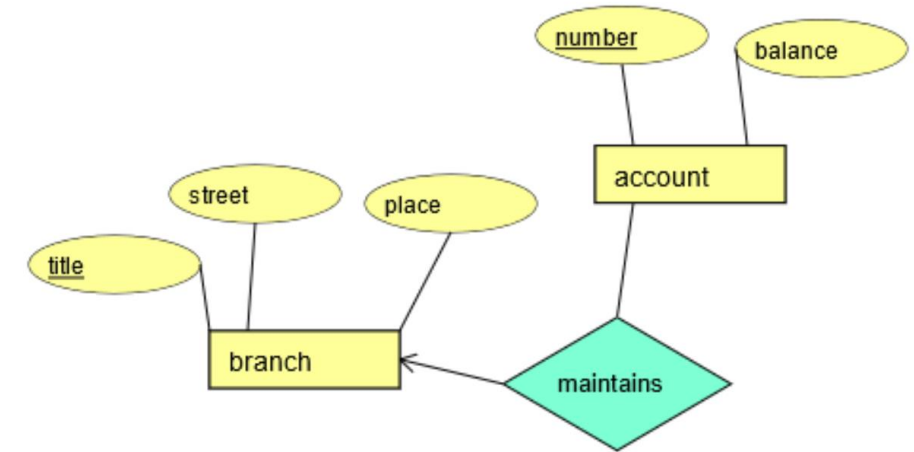
- ☐ Use of composite attributes is not mandatory
- ☐ Mind mapping cardinality
  - It must respect PK in the table!