Database Management Systems

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Overview

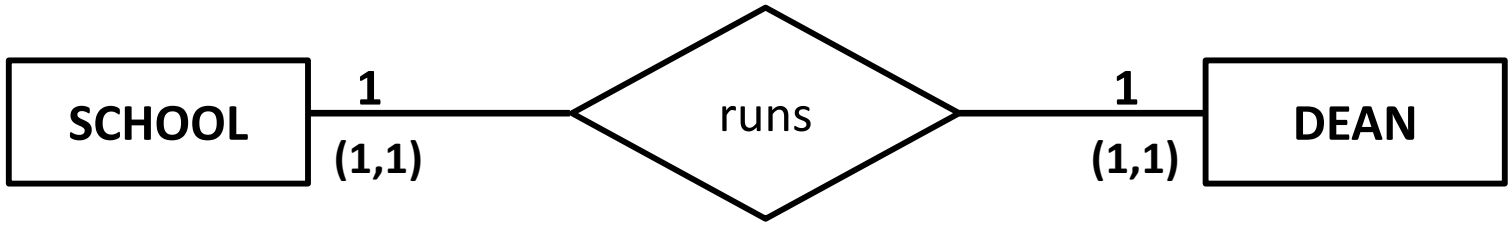
- Data modeling in organization cont.

Developing an E-R Diagram

- The development of an E-R diagram is an iterative process that involves designers and end users. It is based on interviews, reports, business forms,...

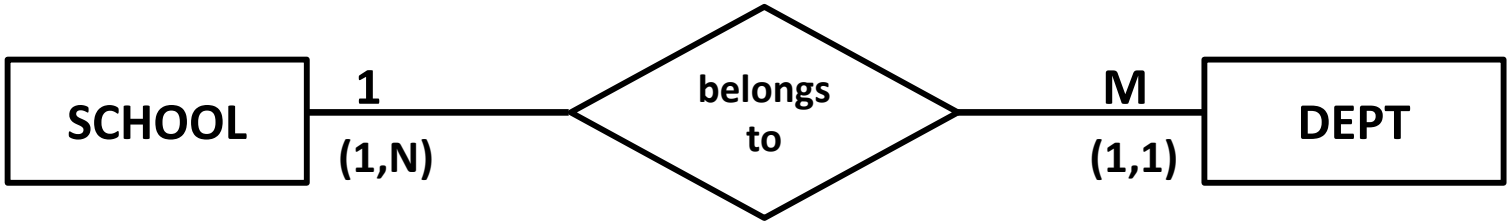
- Example: We want to develop an E-R diagram for a "typical" USA University:

1. The university is divided into different schools. Each one has a Dean.



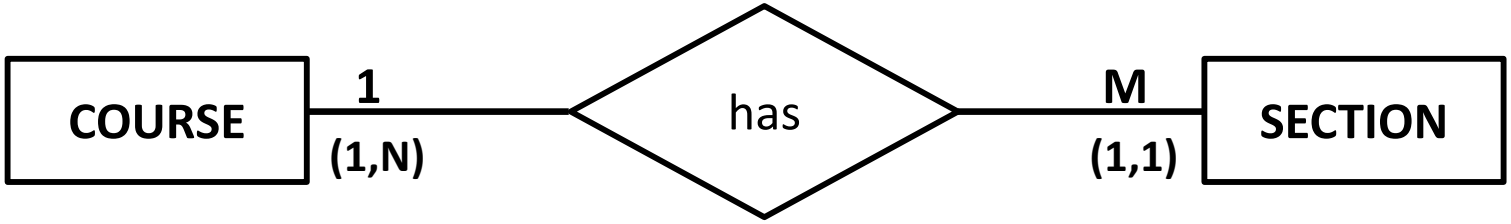
Example Cont…

2. Each school is composed of several departments.



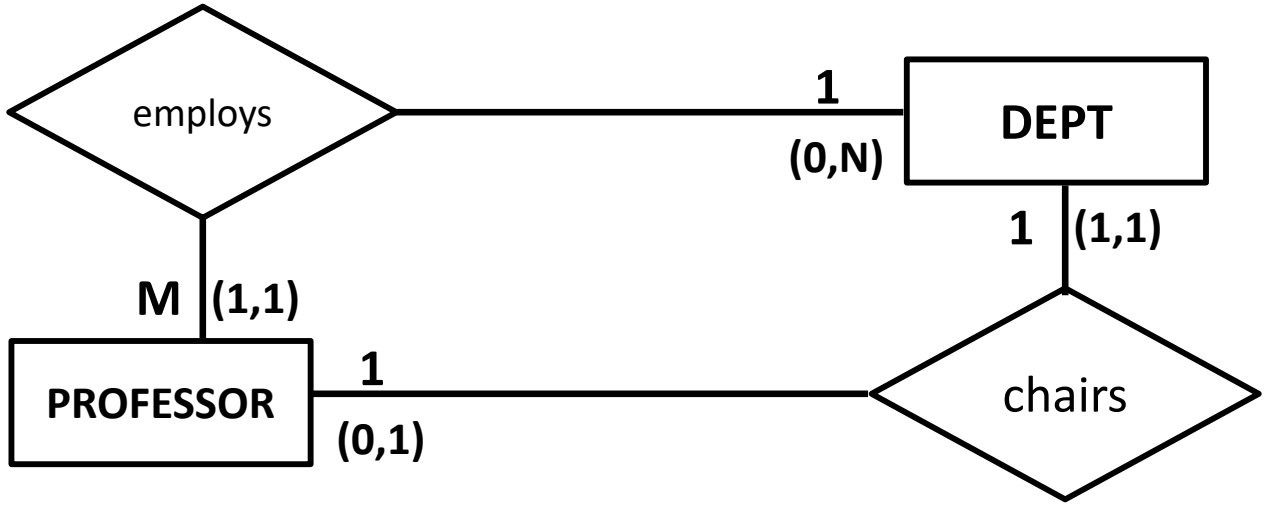
3. Each department offers several courses.

4. A course have several sections.

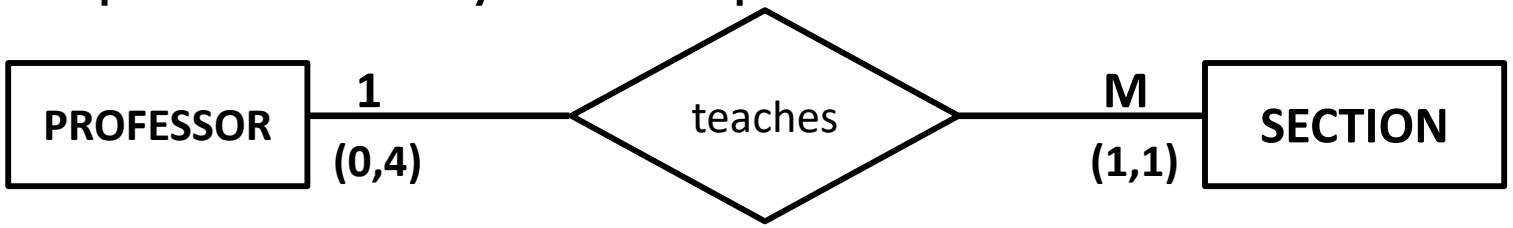


Example Cont…

5. Each department may employs several professors, but each professor belongs to a single department. Each department is chaired by a chair, who is also a professor.

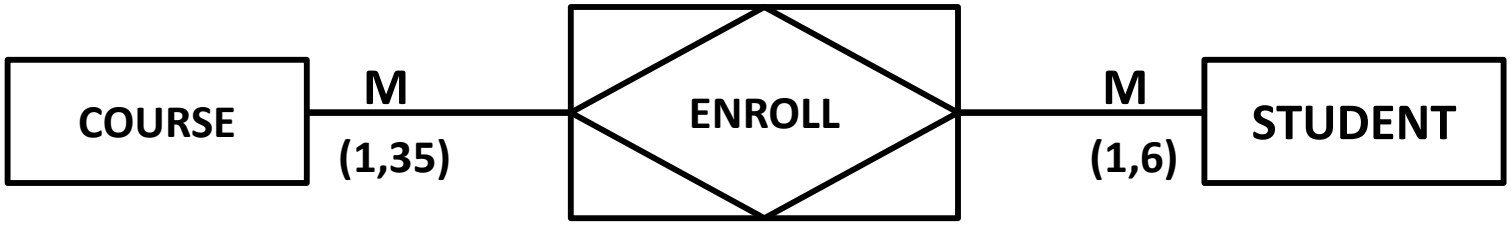


6. Each professor may teach up to 4 sections.



Example Cont…

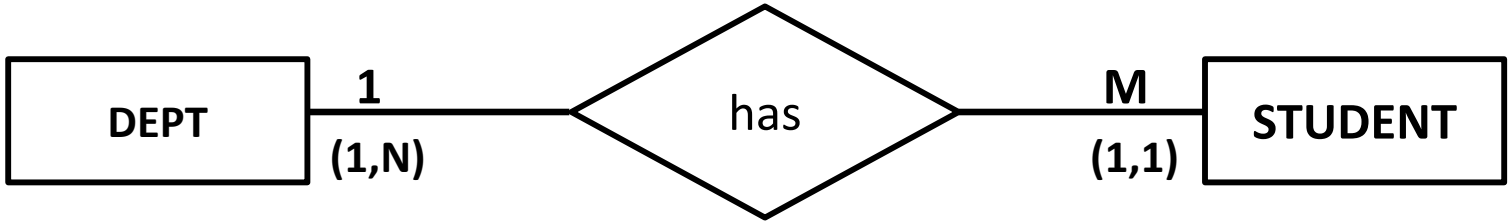
7. Each student can take up to 6 courses. Each course has a capacity of 35 students.



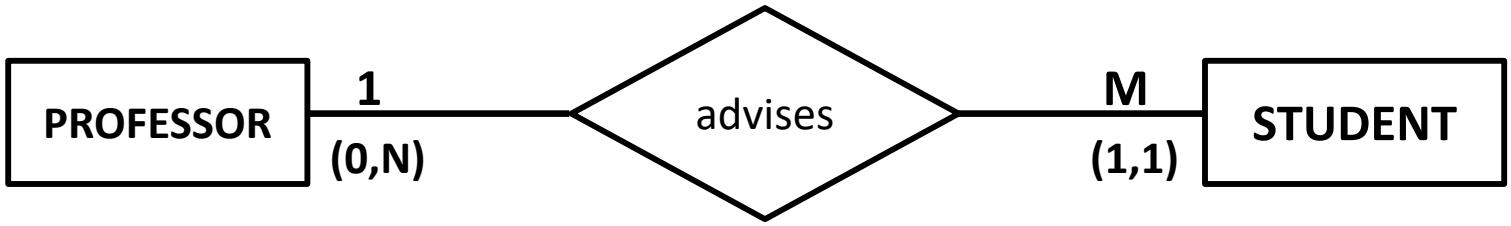
The relationship ENROLL between SECTION and STUDENT is M:M, therefore, need an associative entity.

Example Cont…

8. Each department has several student majoring in that department. But each student has one major.



9. Each student is advised by one professor, but a professor may advise many students.



Example Cont…

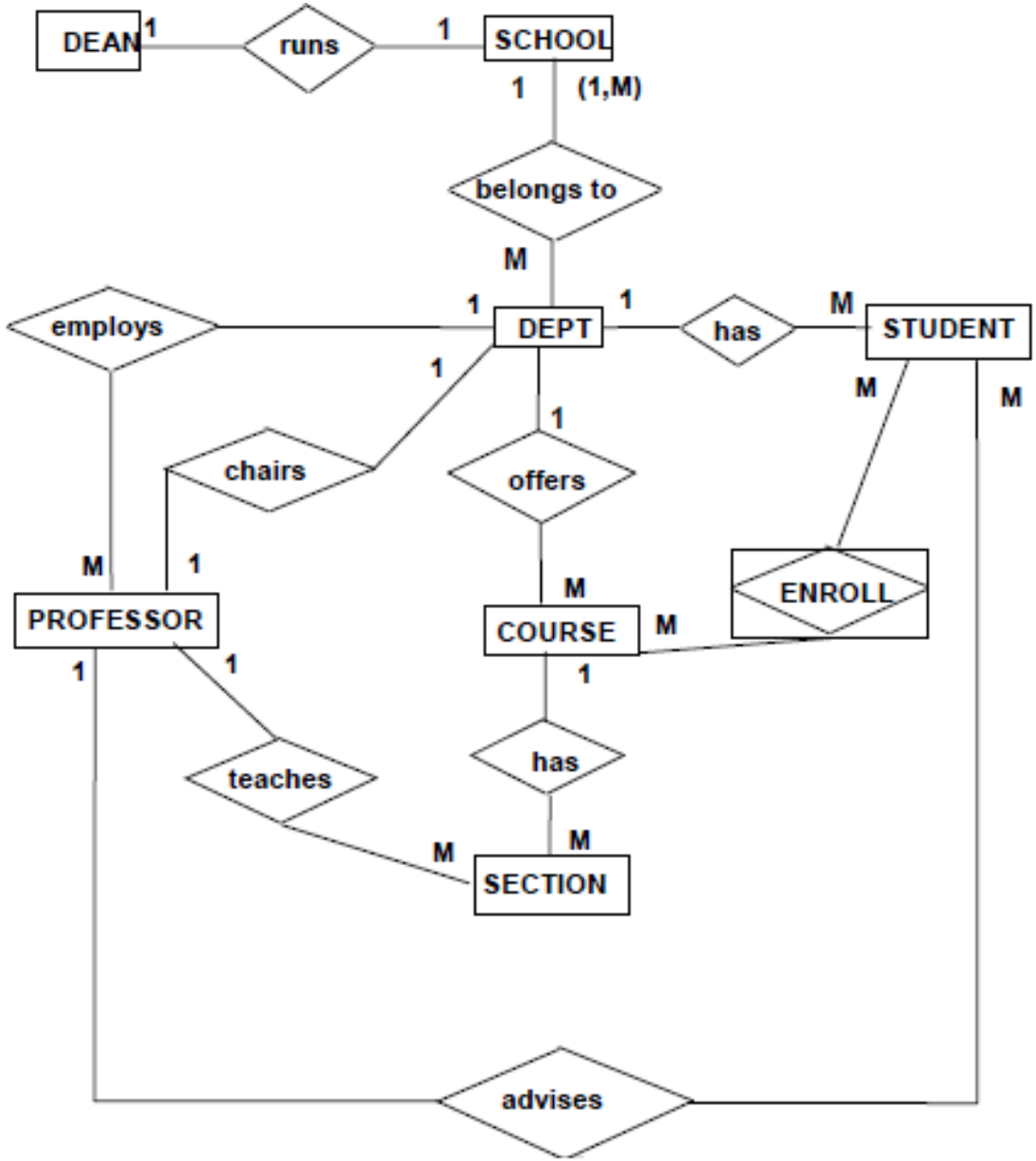
- The database for the university includes 7 entities:

  SCHOOL, DEAN, DEPT, PROFESSOR, COURSE, SECTION, and STUDENT

- It includes 10 relationships:

Relationship	Relation 1	Relation 2
belongs to	school	department
runs	dean	school
employs	department	professor
offers	department	course
has	department	student
contains	course	section
teaches	professor	section
advises	professor	student
chairs	professor	department
enrolls	student	section

Example Cont…



Example Cont…

- The conceptual Relational Database schema (E-R model represented in the form of table structure) for the university is:

1. SCHOOL (**scode**, sname, saddress, sphone , **deanID**)
   foreign key (deanID) references DEAN (deanID)

2. DEAN (**deanID**, deanName, deanPhone)

3. DEPT (**deptNum**, deptPhone, deptAddress, **scode**, **chair**)
   foreign key (scode) references SCHOOL (scode)
   foreign key (chair) references PROFESSOR (facID)
   chair is the facID of the chairperson of the department

Example Cont…

4. PROFESSOR (**facID**, SSN, name, address, phone, salary, **deptNum**)
   foreign key (deptNum) references DEPT (deptNum)

5. COURSE (**courseNum**, courseName, credit, **deptNum**)
   foreign key (deptNum) references DEPT (deptNum)

6. SECTION (**callNum**, **courseNum**, **facID**, days, time, location)
   foreign key (courseNum) references COURSE (courseNum)
   foreign key (facID) references PROFESSOR (facID)

Example Cont…

7. STUDENT (**sID**, SSN, name, address, major, **deptNum**, **advisor**)

   foreign key (deptNum) references DEPT (deptNum)

   foreign key (advisor) references PROESSOR (facID)

8. ENROLL (**sID**, **courseNum**, grade)

   foreign key (sID) references STUDENT (sID)

   foreign key (courseNum) references COURSE (courseNum)

Example

- The university keeps track of each student's name, student number, current address, permanent address and phone, birthdate, gender, year of study (1st, 2nd, 3rd, 4th), major department, minor department (if any), and degree program (B.A., B.Sc., ..., Ph.D.). Some user applications need to refer to the city, county, and post code of the student's permanent address and to the student's last name.

- Each department is described by name, department code, office number and office phones. Both name and code have unique values for each department.

- Each course has a course name, description, code number, number of semester hours and offering department. The value of the code number is unique for each course.

Example Cont…

- Each module has an instructor, semester, year, course and module number. The module number distinguishes different modules of the same course that are taught during the same semester/year; its values are 1, 2, 3, ..., up to the number of modules taught during each semester.

- A grade report has a student, module and grade.

Summary

- Learn how to model E-R diagram, entities selection, relationships and cardinalities assignment