

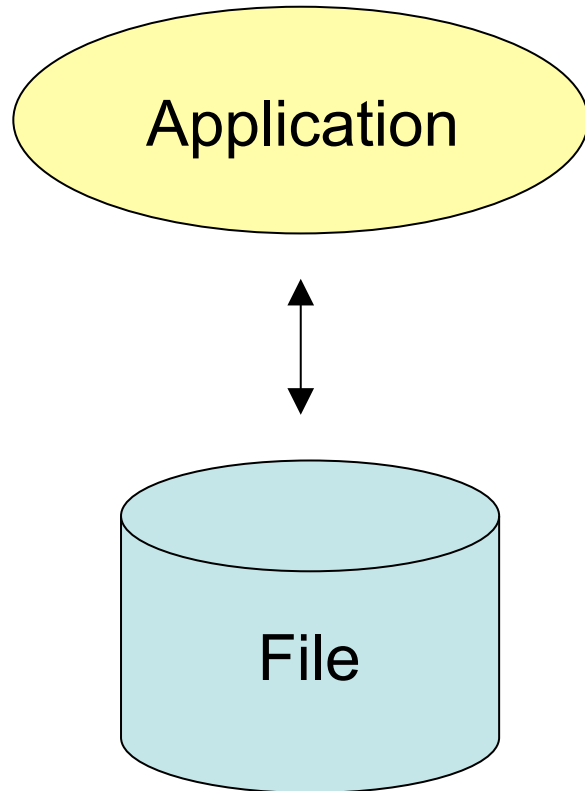
A4B33DS

Zdeněk Kouba

kouba@fel.cvut.cz

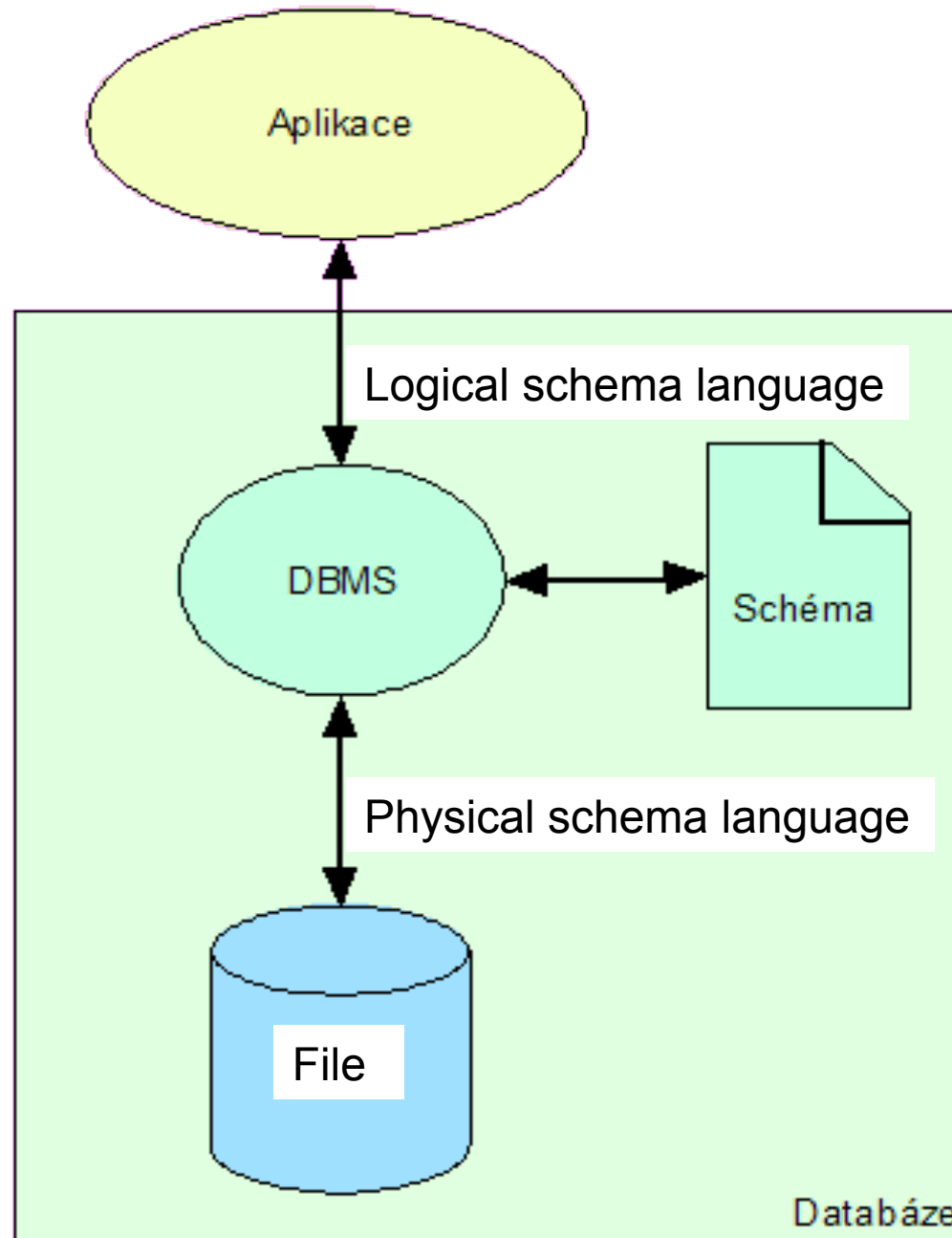
<http://cw.felk.cvut.cz/doku.php/courses/a4b33ds/start>

Database application



- sequential access files
- direct access files
- index-sequential access files

Database application



Requirements on a DBMS:

- Schema
 - (Standardized) Query language (e.g. SQL)
 - Query language API (e.g. ODBC, JDBC, JPA)

 - Response time, throughput optimization

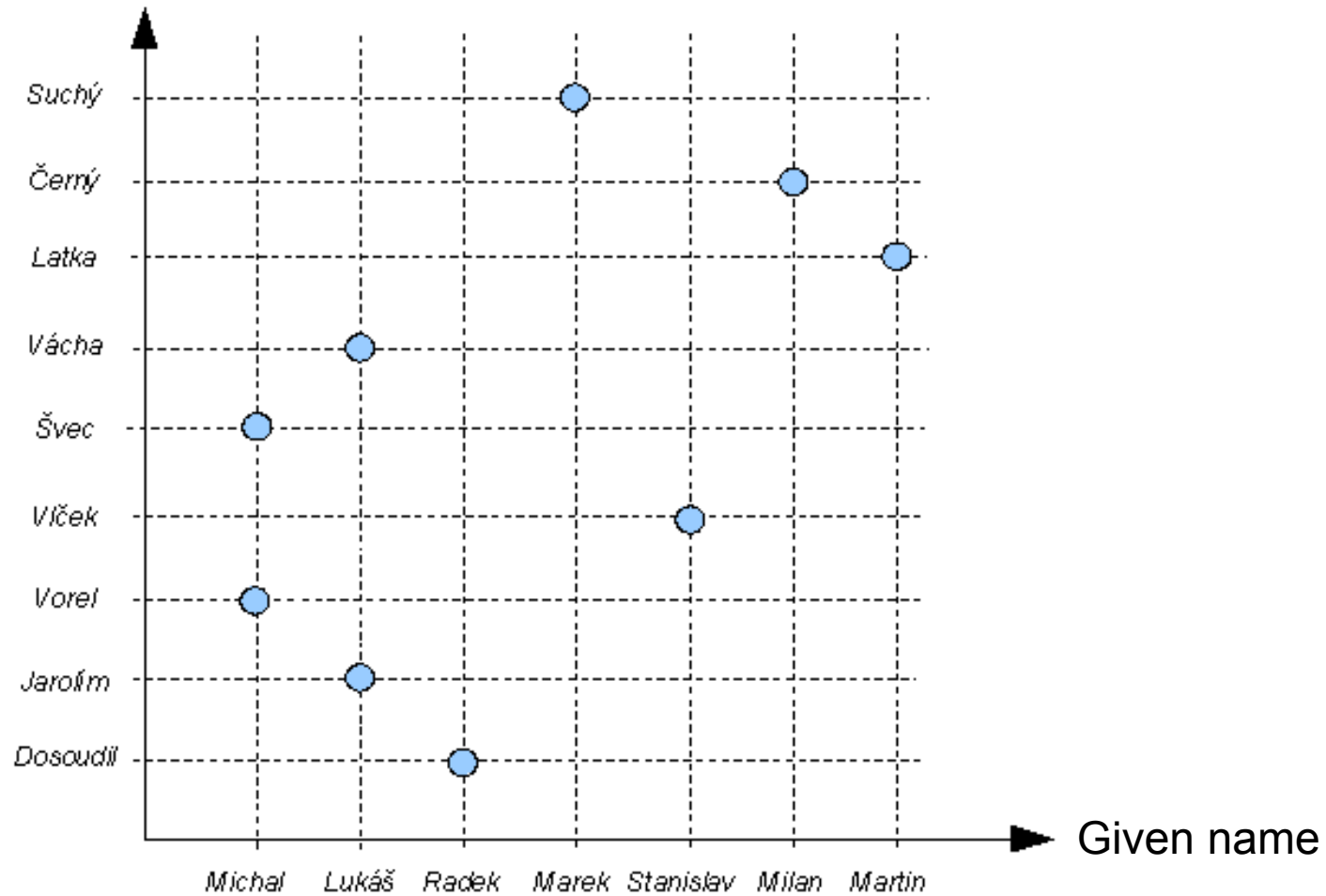
 - Concurrency - transactions
 - Client-server architecture
-
- Reliability – failure recovery (RAID)
 - Data replication
 - High availability (e.g. ORACLE Data Guard)

Database technologies

- Hierarchical model
- Network model
- Relational
- Object-oriented
- Object-relational

Relation

Family name



Relation – a table

Michal	Vorel
Michal	Švec
Lukáš	Vácha
Radek	Dosoudil
Marek	Suchý

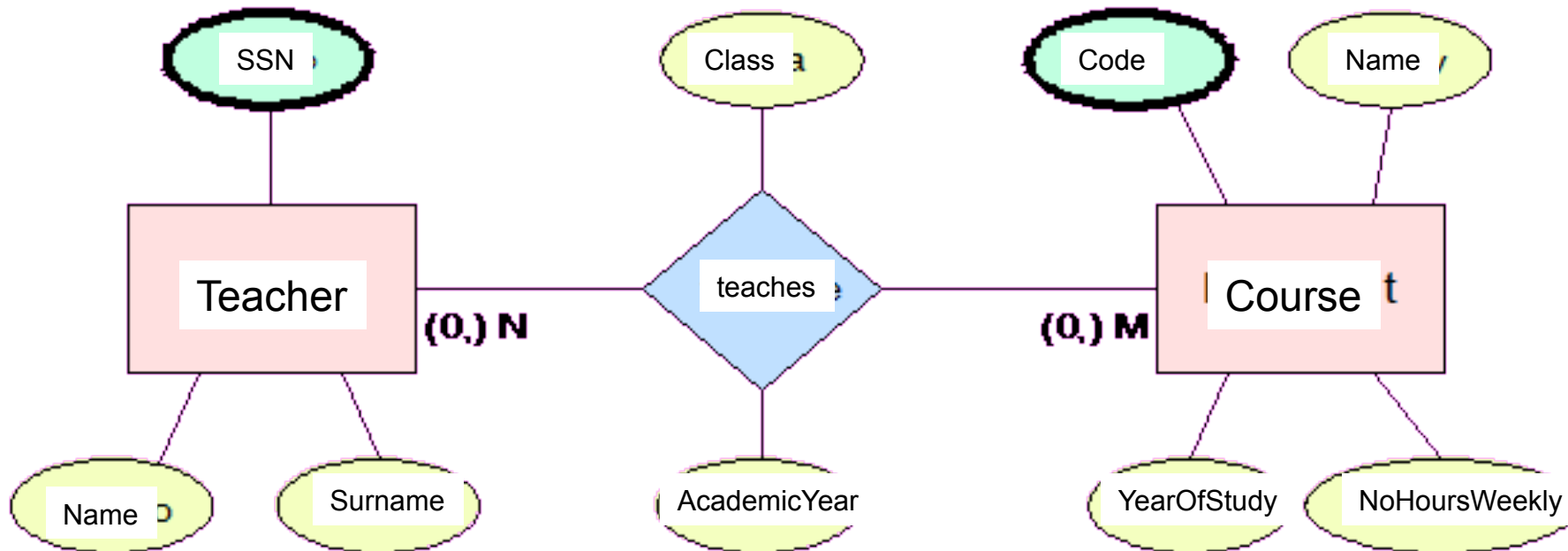
... Etc.

Relationship x Relation

Peter Chen, Peter Pin-Shan (March 1976):

"The Entity-Relationship Model – Toward a Unified View of Data".

ACM Transactions on Database Systems 1.



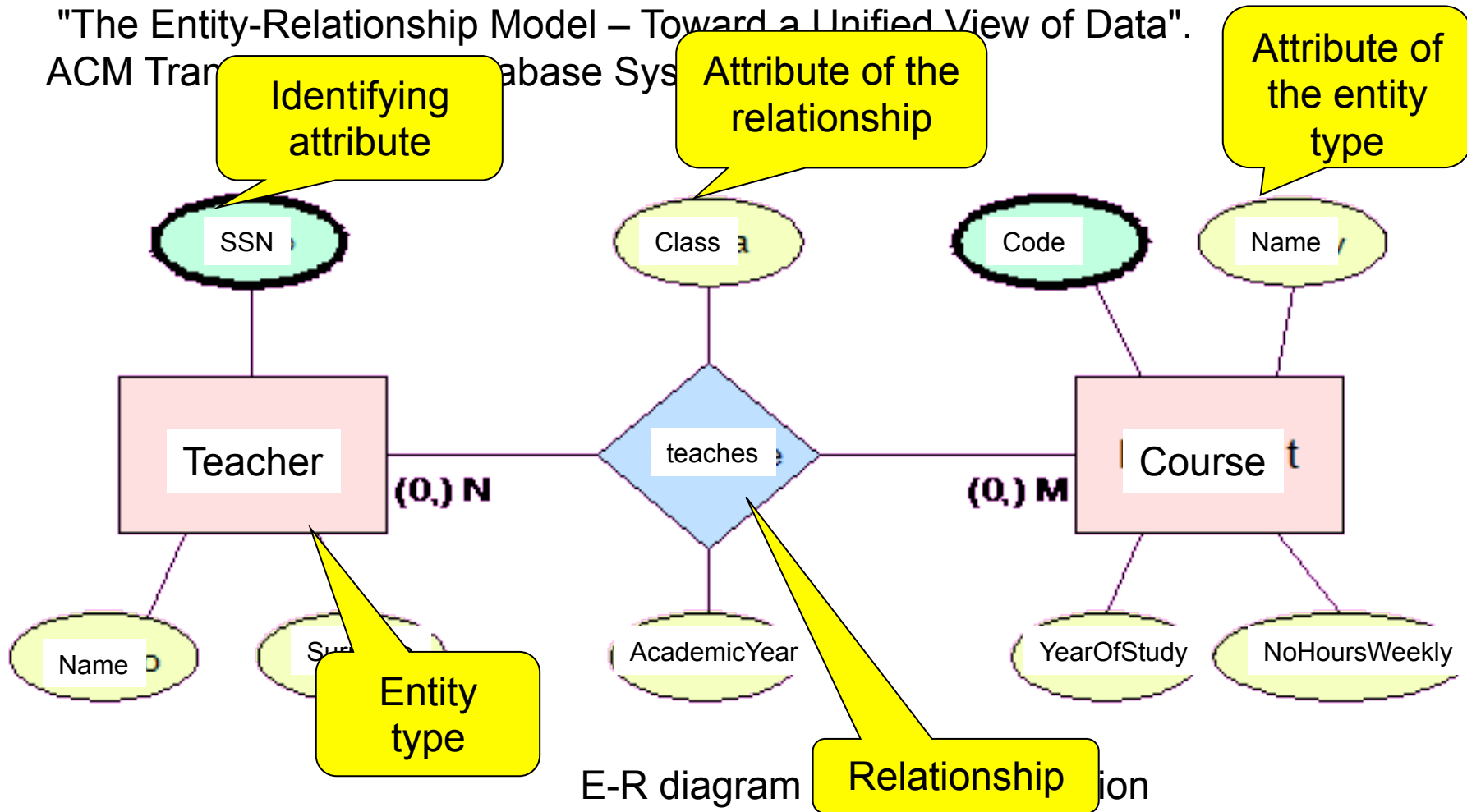
E-R diagram in Chenn's notation

Relationship x Relation

Peter Chen, Peter Pin-Shan (March 1976):

"The Entity-Relationship Model – Toward a Unified View of Data".

ACM Trans Database Sys



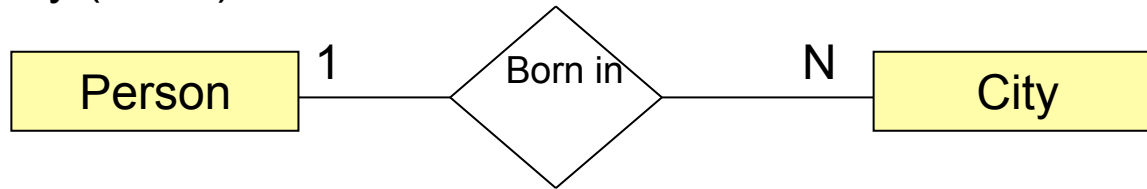
E-R diagram

Relationship

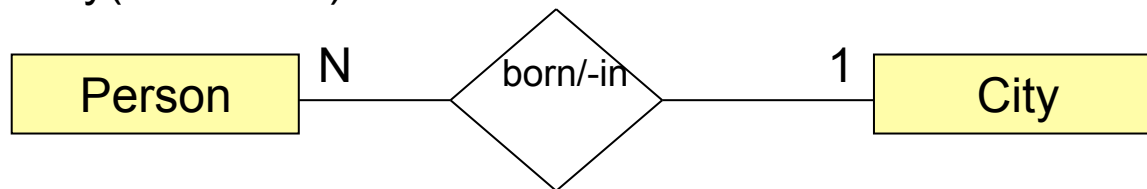
tion

Cardinality x connectivity

Cardinality (Chen):



Connectivity (UML):



Unfortunately, the DB community (practicians) did not accept the word „connectivity“.

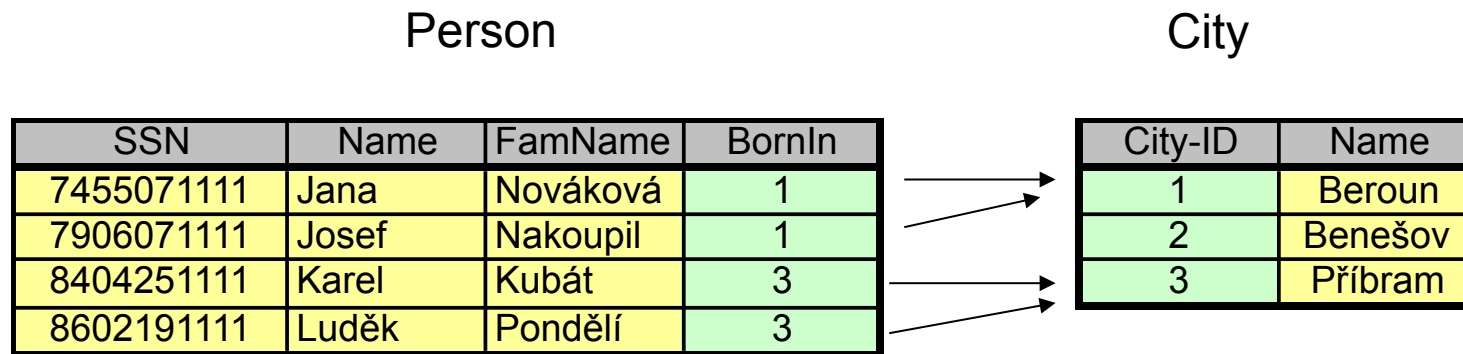
Data modelling process (schema creation)

Conceptual model	Real world model – independent on DB technology
Logical model	Depends on technology (relational), independent of the vendor (Oracle)
Physical model	Depends on particular DB product/version

Relational (99,9%) => conceptual model sometimes skipped

Relational DB technology

Implementation of an Entity type - a table
Implementation of a relationship – key, foreign key



- Key
- Primary key
- Foreign key

Relationship Person – City:

cardinality N : 1
0,N : 0,1

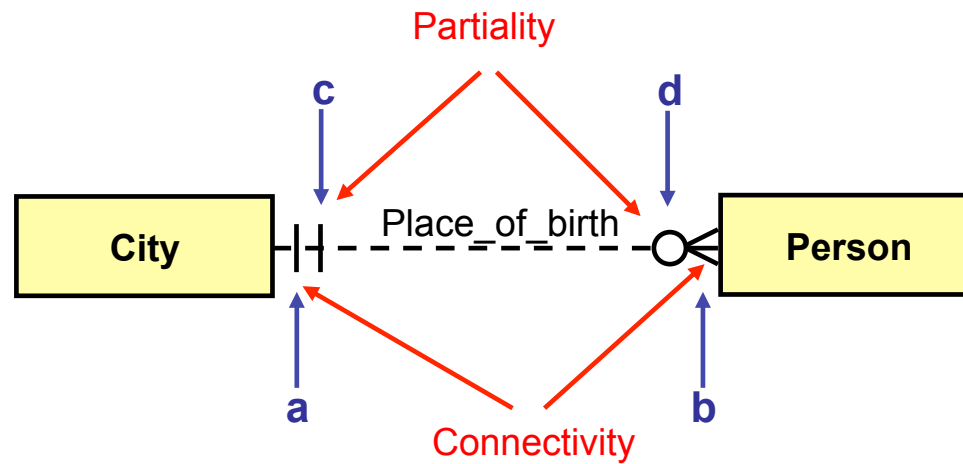
Relation as a(n) (equi)JOIN of other relations

Rodne_cislo	Jmeno	Prijmeni	Narozen
7455071111	Jana	Nováková	1
7906071111	Josef	Nakoupil	1
8404251111	Karel	Kubát	3
8602191111	Luděk	Pondělí	3

Město-ID	Název
1	Beroun
2	Benešov
3	Příbram

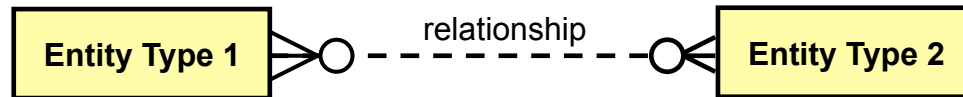
Rodne_cislo	Jmeno	Prijmeni	Narozen	Název
7455071111	Jana	Nováková	1	Beroun
7906071111	Josef	Nakoupil	1	Beroun
8404251111	Karel	Kubát	3	Příbram
8602191111	Luděk	Pondělí	3	Příbram

Relationship

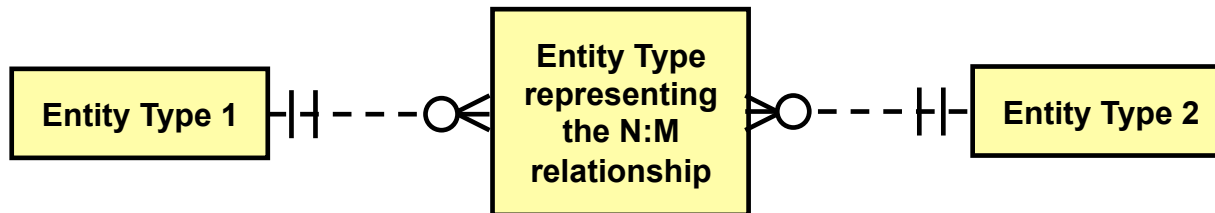


Notation „Crow's Foot“

Relationship N:M

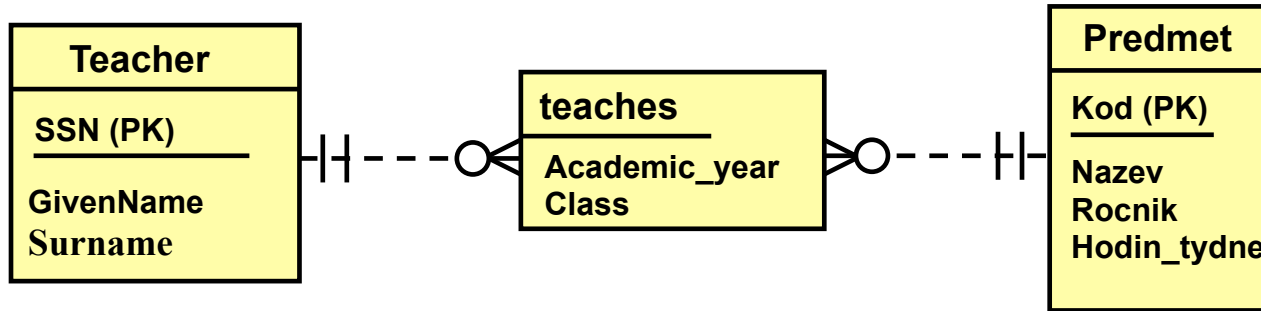


Decomposition of an N:M relationship into two 1:N relationships



Notace Crow's Foot

Relationship N:M

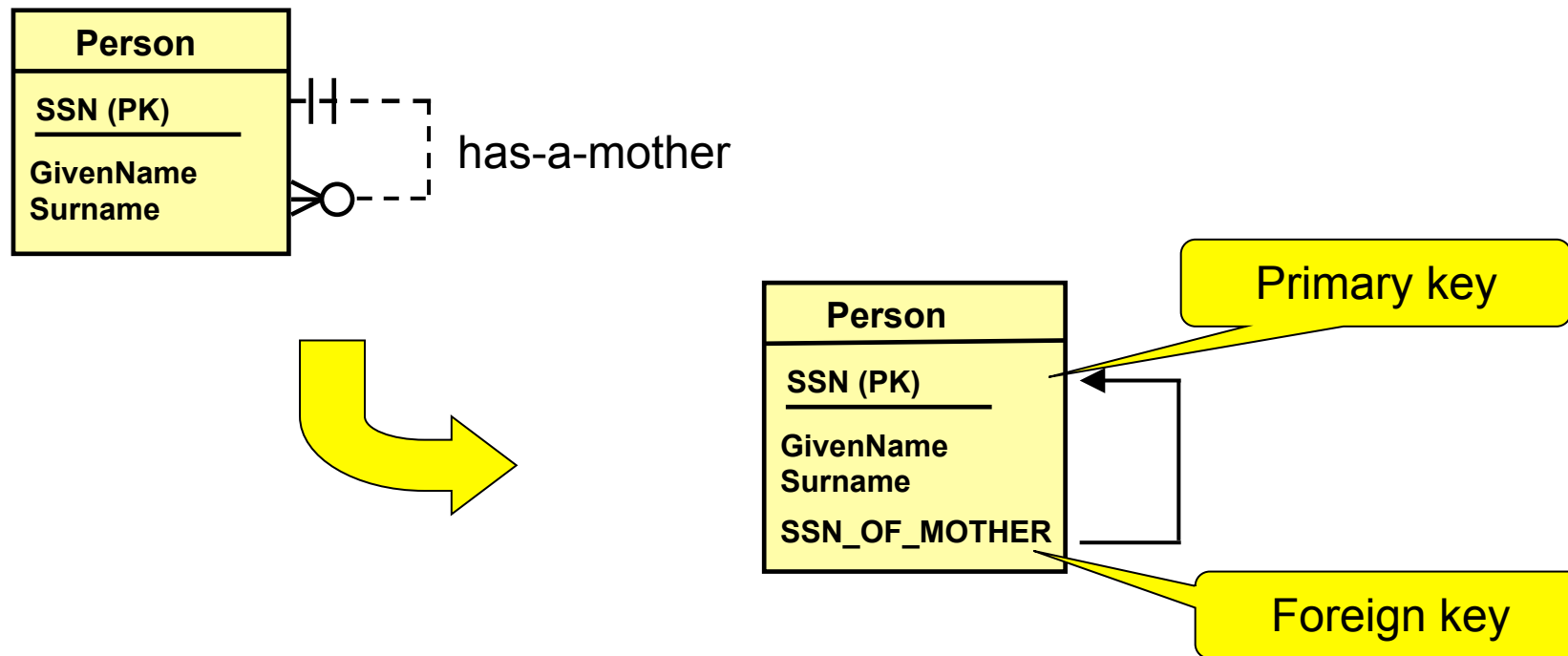


Notace Crow's Foot

Recursive relationship

How shall we model a relationship between a person and its mother?

The mother is a Person, too. => It should not be represented by another table!



Crow's Foot Notation