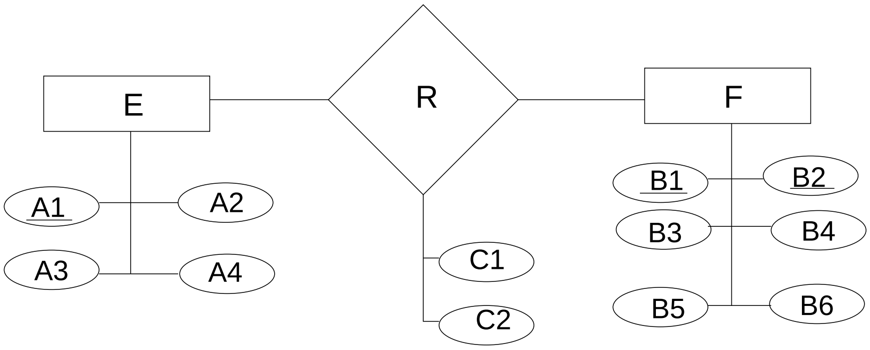
Cal Poly **CPE/CSC 366:** Database Modeling, Design and Implementation Alexander Dekhtyar

From E-R Models to Relational Databases
Examples

Converting Relationship Sets

Many-to-Many Relationship Sets



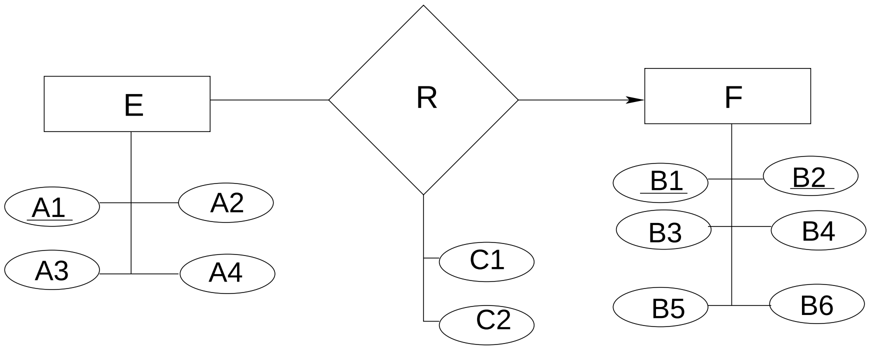
Relational Schema:

E(A1, A2, A3, A4)
F(B1, B2, B3, B4, B5, B6)
R(EA1,FB1, FB2, C1, C2

Notes:

- C1 and C2 can participate in the primary key of F (either jointly, or separately).
- R.EA1 is a foreign key referencing E.
- R.FB1,R.FB2 is a foreign key referencing F.

Many-to-One Relationship Sets



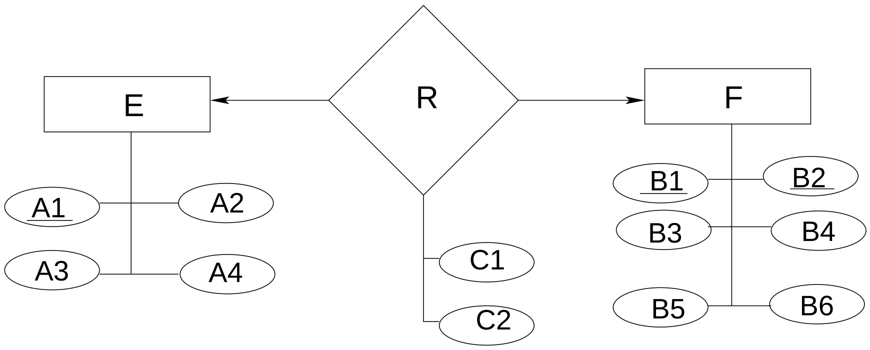
Relational Schema:

E(<u>A1</u>, A2, A3, A4, FB1, FB2, C1, C2)
F(<u>B1</u>, <u>B2</u>, B3, B4, B5, B6)

Notes:

- E.FB1,E.FB2 is a foreign key referencing F.

One-to-One Relationship Sets



Relational Schema 1:

E(<u>A1</u>, A2, A3, A4, FB1, FB2, C1, C2)
F(<u>B1</u>, <u>B2</u>, B3, B4, B5, B6)

Notes:

- E.FB1,E.FB2 is a foreign key referencing F.

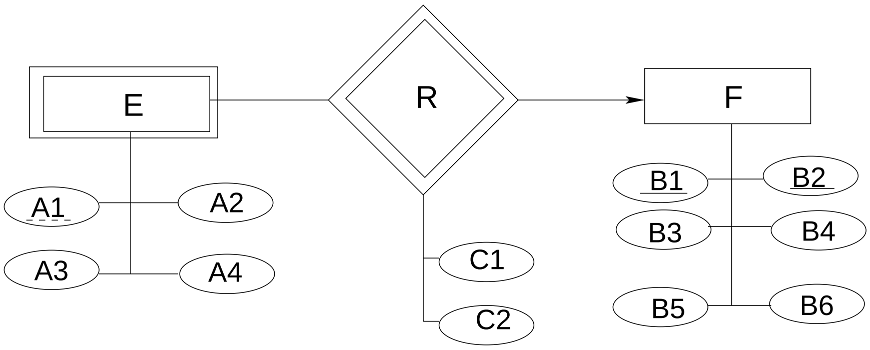
Relational Schema 2:

E(<u>A1</u>, A2, A3, A4)
F(<u>B1</u>, <u>B2</u>, B3, B4, B5, B6, C1, C1, EA1)

Notes:

- F.EA1 is a foreign key referencing E.

Weak Entity Sets



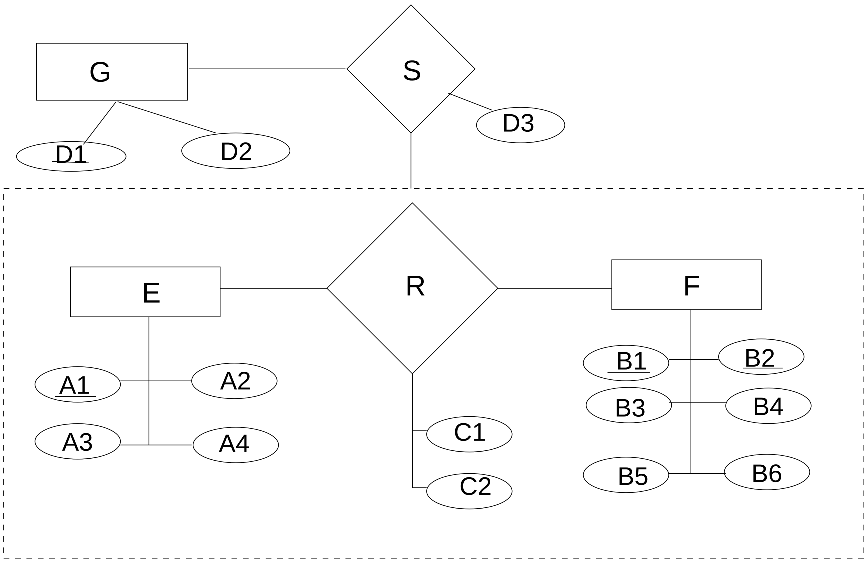
Relational Schema:

E(A1, A2, A3, A4, FB1, FB2, C1, C2)
F(B1, B2, B3, B4, B5, B6)

Notes:

- E.FB1,E.FB2 is a foreign key referencing F.

Aggregation



Relational Schema:

E(A1, A2, A3, A4)
F(B1, B2, B3, B4, B5, B6)
R(EA1,FB1, FB2, C1, C2
G(D1, D2)
S(GD1, D3, REA1, RFB1, RFB2)

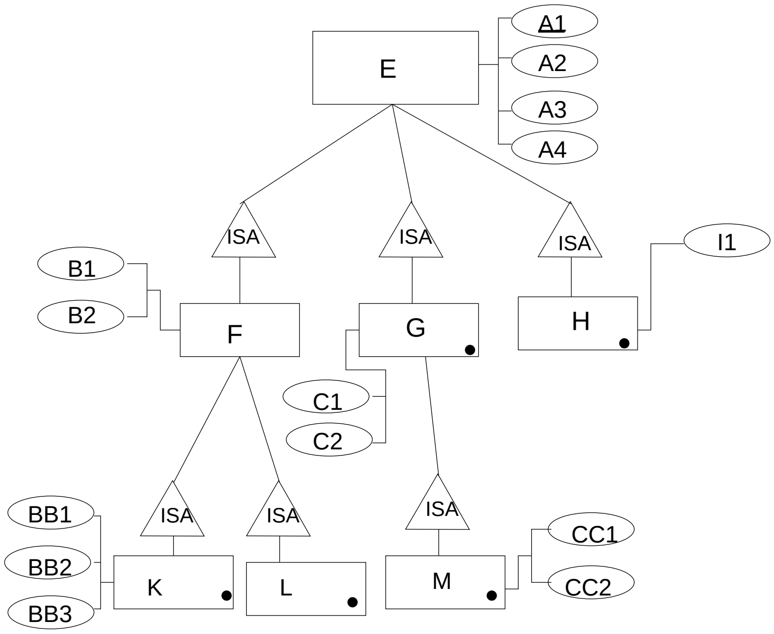
Notes:

- C1 and C2 can participate in the primary key of F (either jointly, or separately). If this is the case, they must be included in the attribute list for S.
- R.EA1 is a foreign key referencing E.
- R.FB1,R.FB2 is a foreign key referencing F.
- S.GD1 is a foreign key referencing G.
- S.REA1, S.RFB1, S.RFB2 is a foreign key referencing R. S.REA1 is a foreign key referencing E. S.RFB1, S.RFB2 is a foreign key referencing F.

Class Hierarchies

In this example, E is the class "container", which has four attributes common to all subclasses in the hierarchy, including the primary key, A1. E has three disjoint subclasses, F,G and H. Entities in F must belong to at least one, but possibly, both ubclasses, K and L. G has a subset of its entities belonging to subclass M.

(note, black dots identify entity sets that contain actual physical entities in this hierarchy.)



E-R approach

Relational Schema:

E(<u>A1</u>, A2, A3, A4)
F(<u>EA1</u>, B1, B2)
G(<u>EA1</u>, C1, C2)
H(<u>EA1</u>, I1)
K(<u>EA1</u>, BB1, BB2, BB3)
L(<u>EA1</u>)
M(<u>EA1</u>, CC1, CC2)

Notes:

- F.EA1, G.EA1, H.EA1, K.EA1, L.EA1 and M.EA1 are all foreign keys referencing E.

Object-Oriented Approach

Relational Schema:

EFK(<u>A1</u>, A2, A3, A4, B1, B2, BB1, BB2, BB3)
EFL(<u>A1</u>, A2, A3, A4, B1, B2)
EG(<u>A1</u>, A2, A3, A4, C1, C2)
EGM(<u>A1</u>, A2, A3, A4, C1, C2, CC1, CC2)
EH(<u>A1</u>, A2, A3, A4, I1)

Notes:

- Tables are created **only** for those entity sets that contain physical entities (i.e., for all terminal paths in the hierarchy).

Universal Table

Relational Schema:

E(<u>A1</u>, A2, A3, A4, B1, B2, BB1, BB2, BB3, C1, C2, CC1, CC2, I1)

Variants

- **Universal table with type:** Add an attribute specifying which terminal class an object belongs to:

  E(<u>A1</u>, Type, A2, A3, A4, B1, B2, BB1, BB2, BB3, C1, C2, CC1, CC2, I1)

- **E-R approach with type:** modify E and F to specify subtype of each tuple:

  E(<u>A1</u>,Type, A2, A3, A4)
  F(<u>EA1</u>,Type, B1, B2)