

Database Management Systems

Entity Relationship Diagram

Malay Bhattacharyya

Associate Professor

Machine Intelligence Unit
and
Centre for Artificial Intelligence and Machine Learning
Indian Statistical Institute, Kolkata

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1 The Entity-Relationship Diagram

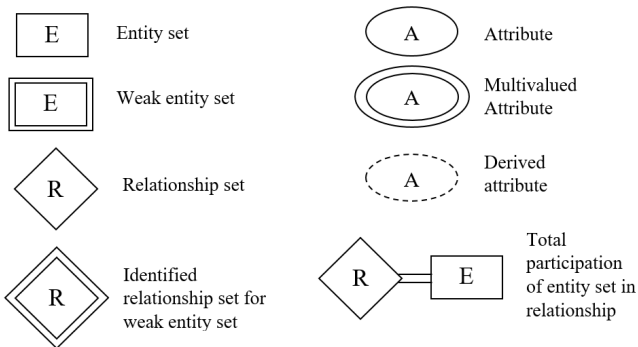
- Components
- Real-life Examples

The components in Entity-Relation (E-R) diagram

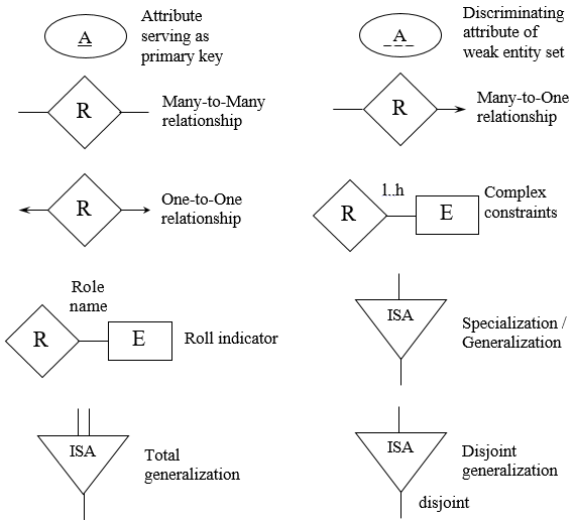
An E-R diagram graphically represents the entire logical structure of a database. It comprises the following components.

- Rectangles
- Double rectangles
- Diamonds
- Double diamonds
- Ellipses
- Double ellipses
- Dashed ellipses
- Lines
- Double lines
- and so on

The components in Entity-Relationship (E-R) diagram

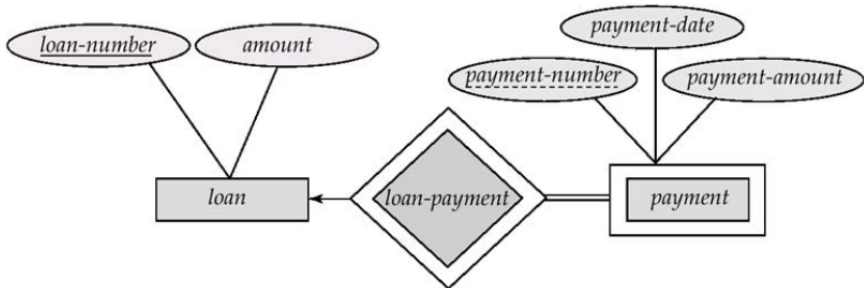


The components in Entity-Relation (E-R) diagram



Discriminating attribute of weak entity set

A primary key does not exist for a weak entity set. However, it contains a partial key termed as *discriminating attribute* that can identify a group of entities from the entity set.



The combination of *discriminating attribute* and primary key of the strong entity set makes it possible to uniquely identify all entities of the weak entity set.

Mapping cardinality constraints – Style 1

Crow's Foot / Information Engineering Notation:



Mapping cardinality constraints – Style 2

Chen Notation:



1:N (n=0,1,2,3...)
one to zero or more

M:N (m and n=0,1,2,3...)
zero or more to zero or more
(many to many)

1:1
one to one

Mapping cardinality constraints – Style 3

Bachman Notation:



one to one



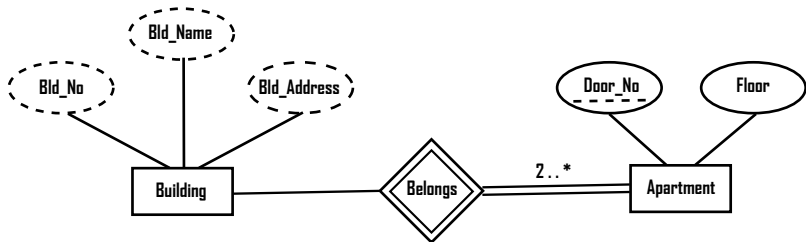
zero or more to one or more



one to one or more

Let us brainstorm!!!

Consider the following E-R diagram. It represents the details about real-estate properties of a company. The diagram has been prepared by a novice developer without much understanding of Relational Data Model. Can you list up the inconsistencies present in the diagram?



Let us brainstorm!!!

Here follow the problems in the given E-R diagram:

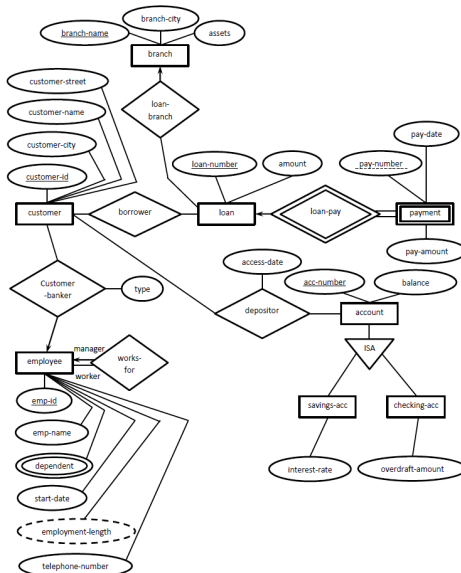
- (i)** All the attributes of the entity set Building cannot be of derived type (shown with dashed ellipses). There is no other attribute from which they will be derived.
- (ii)** If Belongs is weak relation (shown with double diamond), either of the Building or Apartment has to be a weak entity set (shown with double rectangle).
- (iii)** The mapping cardinality constraints (shown with 2..*) and participation constraints (shown with double line) are conflicting for the entity set Apartment. If the minimum cardinality constraint is 2 it cannot be a total participation.
- (iv)** If there is a discriminating attribute (shown with dashed underline) for the entity set Apartment, then there has to be a set of attributes that can serve as the primary key (shown with underline) for the related entity set Building.

Entity-Relation (E-R) diagram – Specialization and generalization

In E-R diagrams, specialization (and also generalization) is depicted by a triangle component labeled ISA (standing for “is a”) which denotes that an entity (say a musician) “is a” part of another entity (say a person).

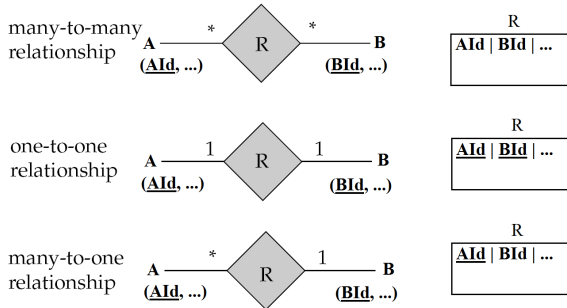
The ISA relationship may also be referred to as a superclass-subclass relationship. Higher- and lower-level entity sets are depicted as regular entity sets—that is, as rectangles containing the name of the entity set.

The E-R diagram for a banking system



Converting an E-R diagram to relations

The mapping cardinality constraints help to identify the primary keys in the relations constructed from the relationship sets.



Converting an E-R diagram to relations

```
branch(branch-name, branch-city, assets)
customer(customer-id, customer-name, customer-street,
customer-city)
loan(loan-number, amount)
payment(pay-number, pay-date, pay-amount)
employee(emp-id, emp-name, dependent, employment-length,
start-date, telephone-number)
account(acc-number, balance)
savings-acc(acc-number, balance, interest-rate)
checking-acc(acc-number, balance, overdraft-amount)
loan-branch(loan-number, branch-name)
borrower(customer-id, loan-number)
loan-pay(loan-number, pay-number)
customer-banker(customer-id, emp-id, type)
depositor(customer-id, acc-number, access-date)
works-for(emp-id, emp-id)
```

The E-R diagram for Amazon Freedom Sale

The screenshot shows the Amazon India homepage. At the top, the Amazon.in logo is on the left, followed by a search bar with a dropdown menu set to 'All'. To the right of the search bar are links for 'Hello. Sign in', 'Account & Lists', 'Orders', 'Try Prime', and a shopping cart icon with '0' items. Below the search bar, there's a delivery location 'Andharmanik 743503', a 'Shop by Category' dropdown, and links for 'Your Amazon.in' and 'Today's Deals'. A large banner for the 'Freedom Sale' is prominent, featuring a yellow and red 'FREEDOM SALE' badge with the dates '8TH - 11TH AUG' and the text 'Start shopping'. Below the banner, there are four promotional tiles: '10% Instant Discount* with SBI Credit Cards' (with a note '*Also with Credit Card EMI | T&C apply'), 'NO COST EMI on 10 crore+ products' (for Debit/Credit cards, with a 'SAJAJ FINSERV' logo), 'FREE DELIVERY on first order*' (with a note '*T&C apply'), and 'EXCHANGE OFFER Up to *6,000 off* on exchange' (with a note '*T&C apply').

Blockbuster Deals

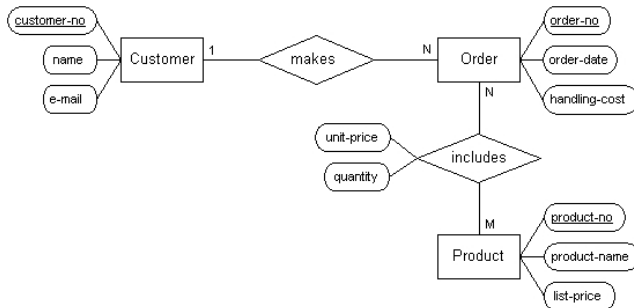
[All Available](#)[Upcoming](#)[Missed](#)[Category ▾](#)

The E-R diagram for Amazon Freedom Sale

Amazon is celebrating the 74th Independence Day of India through Freedom Sale during August 8-11, 2020. Amazon plans to store the details about their products, customers, and the orders that are placed by the customers in a relational database. Prepare an E-R diagram based on the following requirements.

- 1 Each product has a unique identifier, a name, and a listed price.
- 2 Each customer has a unique identifier, a name, and an e-mail ID.
- 3 Every order placed under the Freedom Sale includes a unique identifier, a date, and a handling cost.
- 4 There is a unit price and quantity associated with each order for a particular product.

The E-R diagram for Amazon Freedom Sale



The E-R diagram for a polyclinic

Suppose a polyclinic wishes to store the information about their doctor and patient details in a database. Prepare an E-R diagram considering the following features.

- 1 Each doctor having chamber in the polyclinic has a unique ID, a first name and a last name.
- 2 Each patient attending the polyclinic has a unique ID, a first name, a last name, and a insurance number (not necessarily unique).
- 3 Each doctor has specialization (one or more) with ID and descriptions. However, no two doctors can have the same specialization.
- 4 Each patient has diagnosis details (one or more) with a unique code.
- 5 A doctor can attend multiple patients and a patient can visit multiple doctors.

The E-R diagram for a polyclinic

