

Techniques

Entity-Relationship Modeling Technique

Overview

This section describes the definition of entity types and their relationships. It defines entity and relationship concepts, their documentation and various guidelines and rules concerning the development of **an entity relationship model**.

Entity relationship modeling enables us to describe data and its inherent structure. The **entity relationship model** is represented as **a diagram**, known as the entity relationship diagram. This diagram is used to show our understanding of data and is used in later stages of the Application Development Methodology as a basis for data structure design.

Concepts

Cardinality

A business rule indicating the number of times a particular object or activity may occur.

Object Cardinality

Cardinality of a Dependency

The number of executions of each process that may occur before or after each execution of the other process.

Cardinality of a Subprocess

The number of times a subprocess is executed during each execution of the process of which it forms a part.

Cardinality of a Relationship Type

The number of pairings in which an entity may participate in the relationship membership.

In the example on relationship pairing and grouping, many persons may live at one address. This **multiplicity** is an important property of a relationship and is known as cardinality.

Example of One-To-Many Cardinality

The example on relationship pairing includes a cardinality based on the observation that "each PERSON lives at one and only one ADDRESS," and the inverse, "each ADDRESS has many PERSONs." One-to-many is the most common form of cardinality. It may be written as **1:M**.

Forms of Cardinality

There are three forms of cardinality:

- * **One-to-one (1:1)**: For example, PERSON married to PERSON, where a PERSON may be married to one and only one other PERSON and vice versa.
- * **One-to-many (1:M)**: For example, BOOK printed as EDITION, where each BOOK may be printed in several EDITIONs, but each EDITION is a printing of a single BOOK.
- * **Many-to-many (M:N)**: For example, AUTHOR writes BOOK, where any AUTHOR can write many BOOKs, and any BOOK can be written by many AUTHORs.

One-to-Many Relationship

Given any grouping under a one-to-many relationship, there will be one entity paired with one or more entities of the same or another type. For the entities with a "one" membership (e.g., ORDER placed by one CUSTOMER), there is a single, identifiable, related entity (e.g., the customer who placed the order). For entities with a "many" membership, however, there are no easily identifiable related entities.

Example of one to many relationship

Consider the relationship "CUSTOMER may place one or more ORDERs." From the viewpoint of an order, the customer who placed it is easily distinguished because there is only one of them. It is not so simple to distinguish a particular ORDER for a given CUSTOMER, however. You need to use some method for distinguishing any one ORDER from all other ORDERs for that CUSTOMER,

because there may be many orders. Similarly, if ORDER has a one-to-many relationship to ORDER ITEM, for each ORDER ITEM there is a single ORDER and a single CUSTOMER. For each CUSTOMER, however, there is no one uniquely identifiable ORDER or ORDER ITEM.

Cardinality Restrictions

Fixed Cardinality

A type of cardinality condition in which a cardinality of a dependency, relationship or subprocess is always the same number.

A relationship may have fixed cardinality (e.g., BUDGET consists of twelve PERIODs, or CHILD is born to two PARENTs). With fixed cardinality, the number of entities participating in each grouping is known for at least one of the entity types.

Cardinality Condition

A type of predicate condition that places constraints on the cardinality of a dependency, relationship or subprocess.

Condition

A rule expressed in terms of predicates or constants that describes an aspect of the business that causes the business to decide to do some activity or to stop some activity.

Process conditions test the states of the business at the time of execution and change the business process depending on the results of the test.

Procedure conditions test the states of the attributes or fields or the actions of the operator at the time of execution and change the computer procedure depending on the result.

Condition Logic

The condition logic is an expression of a predicate condition that may be expressed in the form "If P then Q".

Conditional Statement

A unit of activity in an action diagram wherein a condition is expressed that controls a subsequent process, procedure or step execution.

Selection Condition