What’s covered here?

- Entity Relationship Diagram (ERD)
- UML (Unified Modeling Language) Notation
- Crow’s Foot Notation

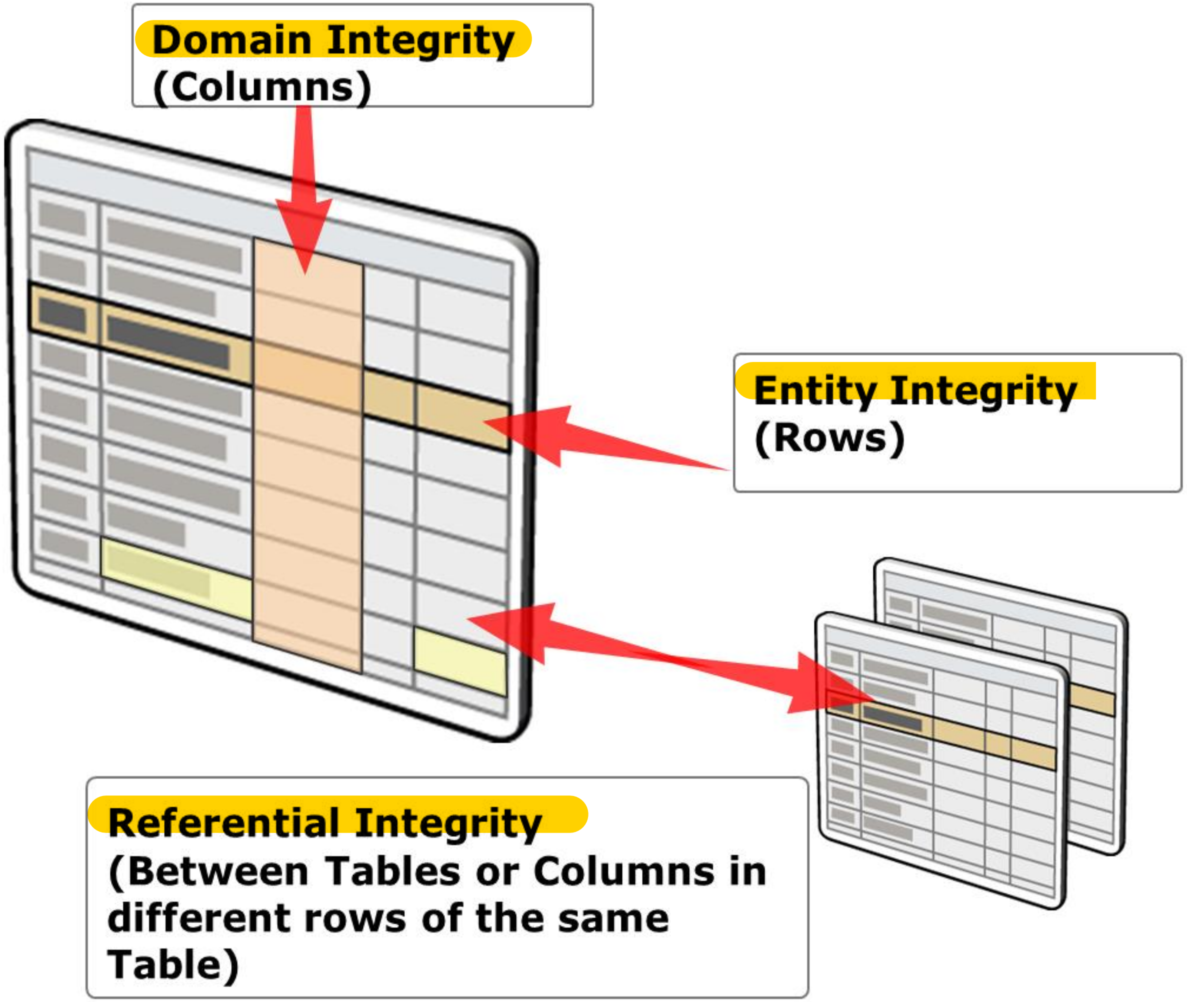
Concepts of the ER Model

- Entities
- Attributes
- Relationships

Types of Keys

Key	Description
Candidate	A field or combination of fields that uniquely identifies each record in a table. A table can have many candidate keys. Any one of the candidate keys can be chosen as the primary key of the table. Once the primary key is chosen, other candidate keys become just key fields, or alternate keys.
Primary	The field that would always accept unique value and never hold a blank value is identified as primary key. The combination of two fields as a primary key is called composite primary key.
Foreign	A field that matches the primary key column of another table.

Types of Data Integrity



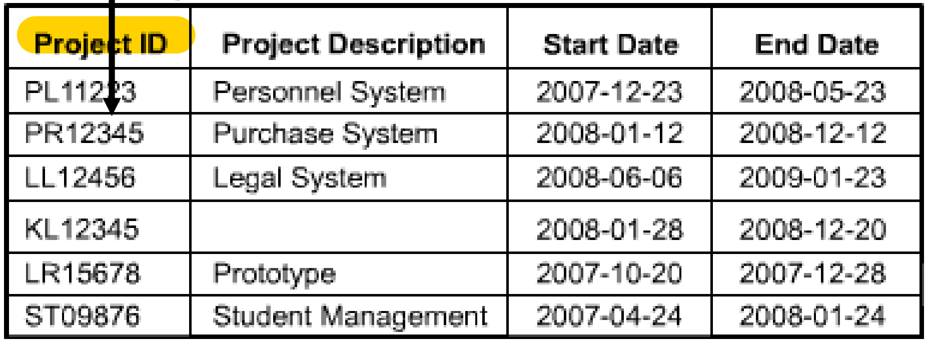
Domain Integrity
(Columns)

Entity Integrity
(Rows)

Referential Integrity
(Between Tables or Columns in different rows of the same Table)

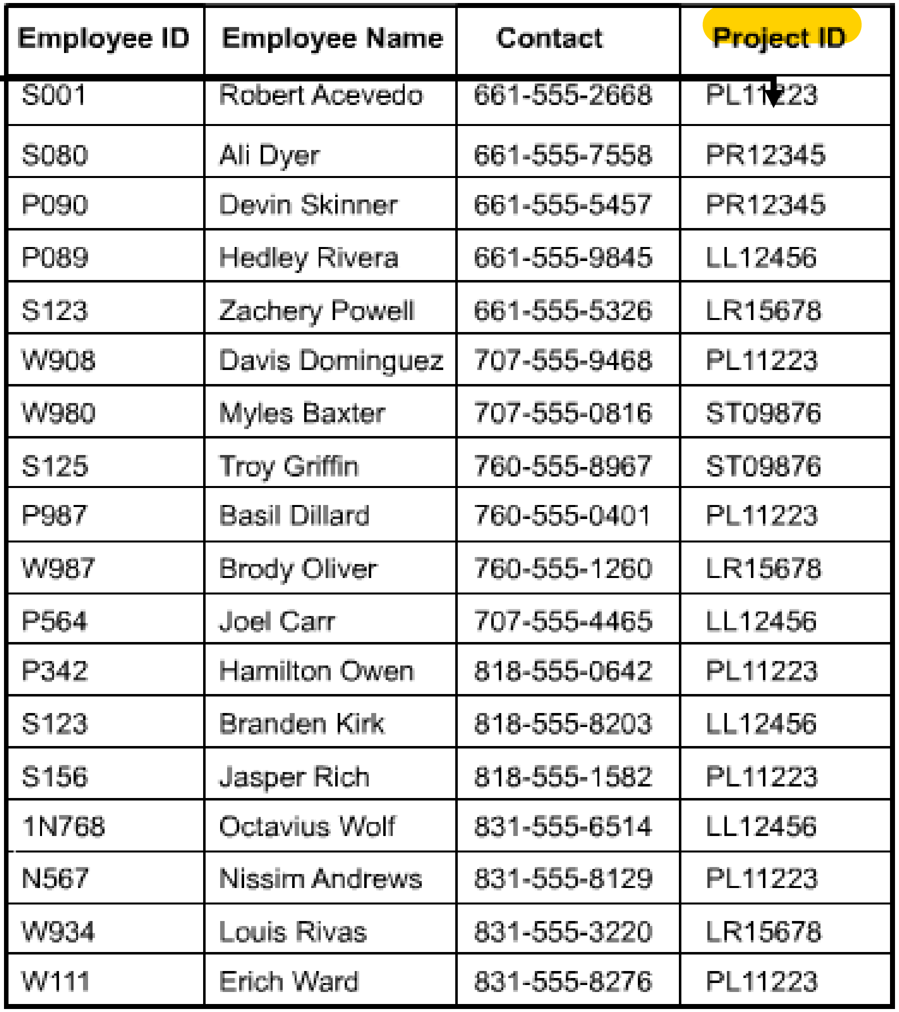
Relationships

Common attribute



Project ID	Project Description	Start Date	End Date
PL11223	Personnel System	2007-12-23	2008-05-23
PR12345	Purchase System	2008-01-12	2008-12-12
LL12456	Legal System	2008-06-06	2009-01-23
KL12345		2008-01-28	2008-12-20
LR15678	Prototype	2007-10-20	2007-12-28
ST09876	Student Management	2007-04-24	2008-01-24

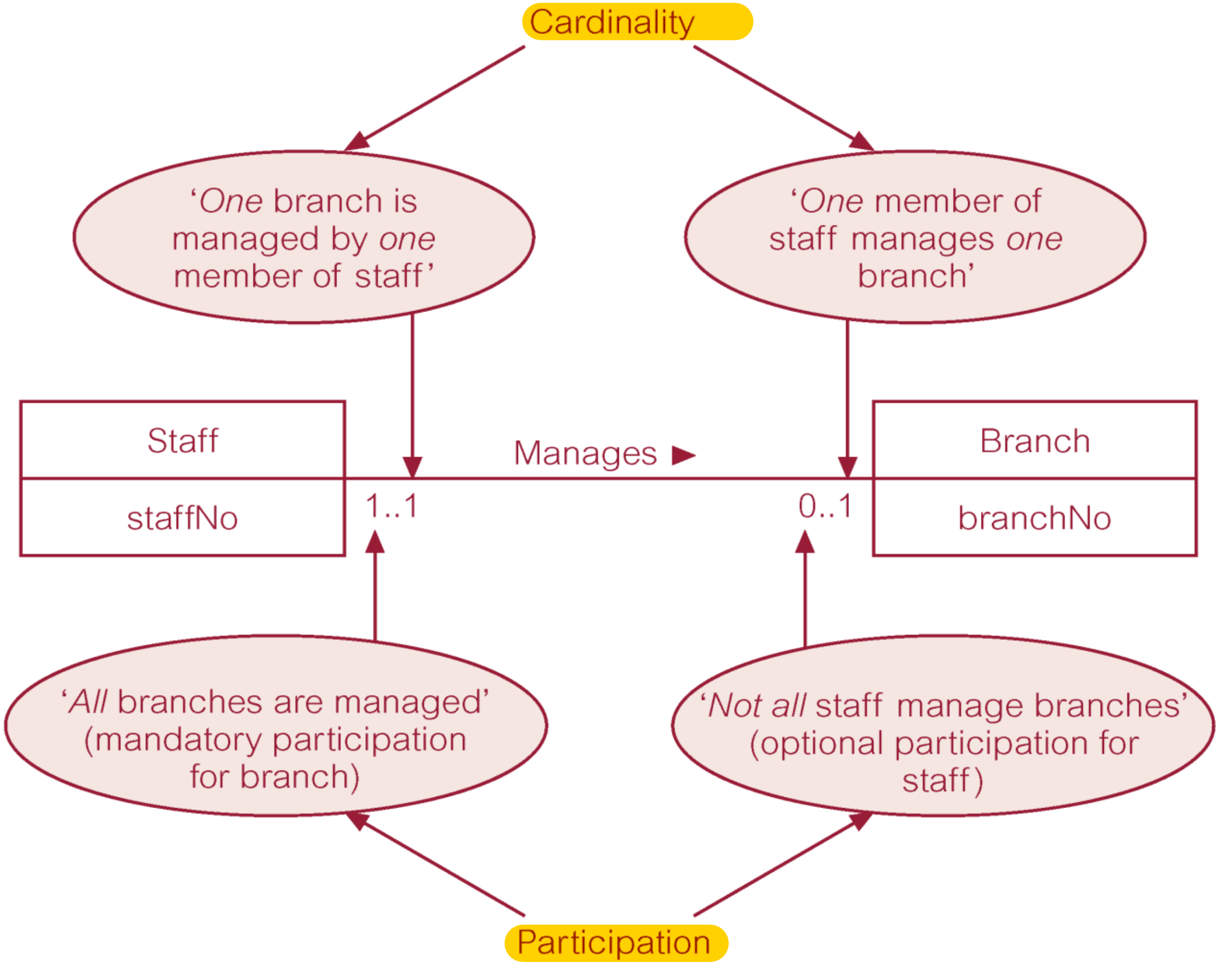
Projects entity



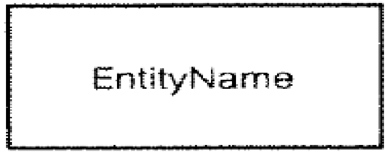
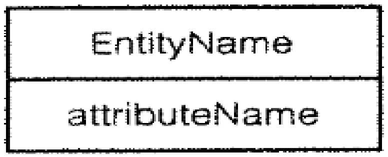
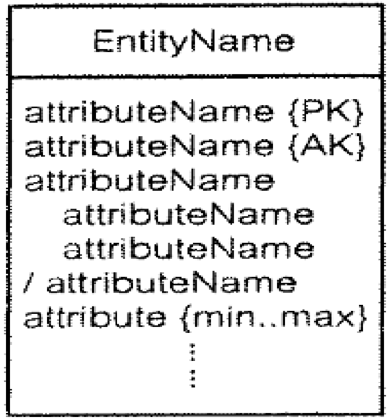
Employee ID	Employee Name	Contact	Project ID
S001	Robert Acevedo	661-555-2668	PL11223
S080	Ali Dyer	661-555-7558	PR12345
P090	Devin Skinner	661-555-5457	PR12345
P089	Hedley Rivera	661-555-9845	LL12456
S123	Zachery Powell	661-555-5326	LR15678
W908	Davis Dominguez	707-555-9468	PL11223
W980	Myles Baxter	707-555-0816	ST09876
S125	Troy Griffin	760-555-8967	ST09876
P987	Basil Dillard	760-555-0401	PL11223
W987	Brody Oliver	760-555-1260	LR15678
P564	Joel Carr	707-555-4465	LL12456
P342	Hamilton Owen	818-555-0642	PL11223
S123	Branden Kirk	818-555-8203	LL12456
S156	Jasper Rich	818-555-1582	PL11223
1N768	Octavius Wolf	831-555-6514	LL12456
N567	Nissim Andrews	831-555-8129	PL11223
W934	Louis Rivas	831-555-3220	LR15678
W111	Erich Ward	831-555-8276	PL11223

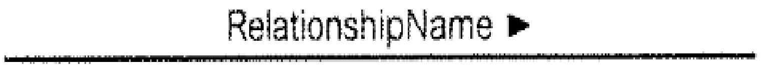
Employees entity

UML Notation

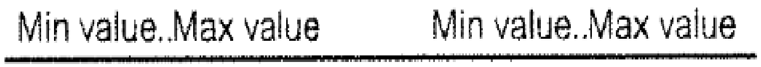

Cardinality
'*One* branch is managed by *one* member of staff'
'*One* member of staff manages *one* branch'
Staff
staffNo
Manages ►
1..1
0..1
Branch
branchNo
'*All* branches are managed' (mandatory participation for branch)
'*Not all* staff manage branches' (optional participation for staff)
Participation

Meanings of UML Notations

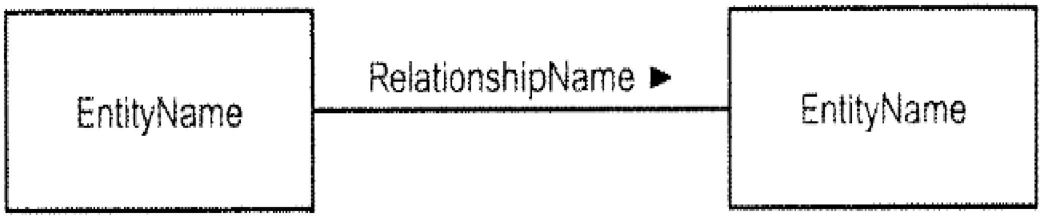
UML Notation	Meaning
 EntityName	Entity.
 EntityName attributeName	Entity with primary key {PK} attribute.
 EntityName attributeName {PK} attributeName {AK} attributeName attributeName attributeName / attributeName attribute {min..max} ⋮	Entity with attributes. The primary key attribute is labeled with {PK}. Any alternate keys are labeled with {AK}. Components of composite attribute are listed below and indented to the right. Derived attributes are identified with / at start of attribute name. Multi-valued attributes are labeled with the range of possible values {min..max} for attribute.


RelationshipName ▶

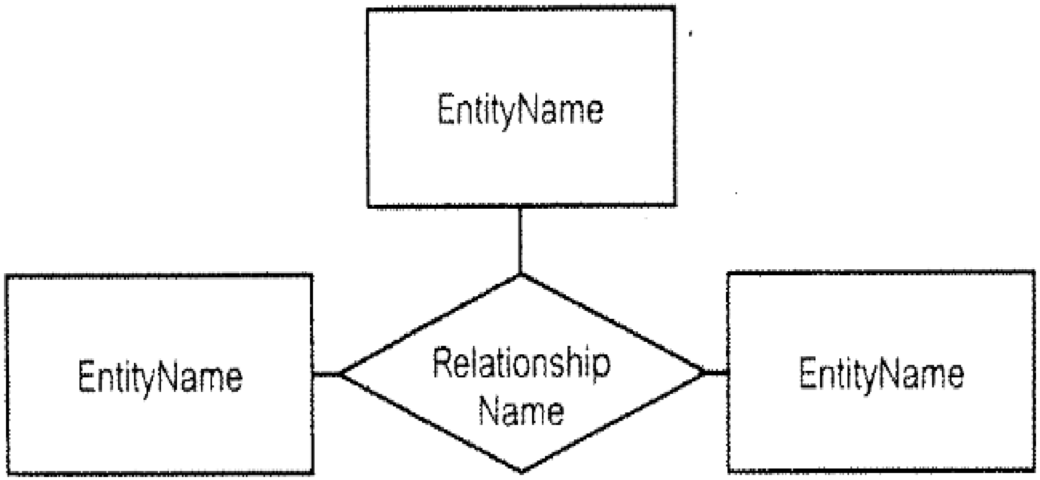
Relationship labeled with relationship name and directional arrow.


Min value..Max value
Min value..Max value

Relationship with multiplicity constraints (Min Value..Max Value).

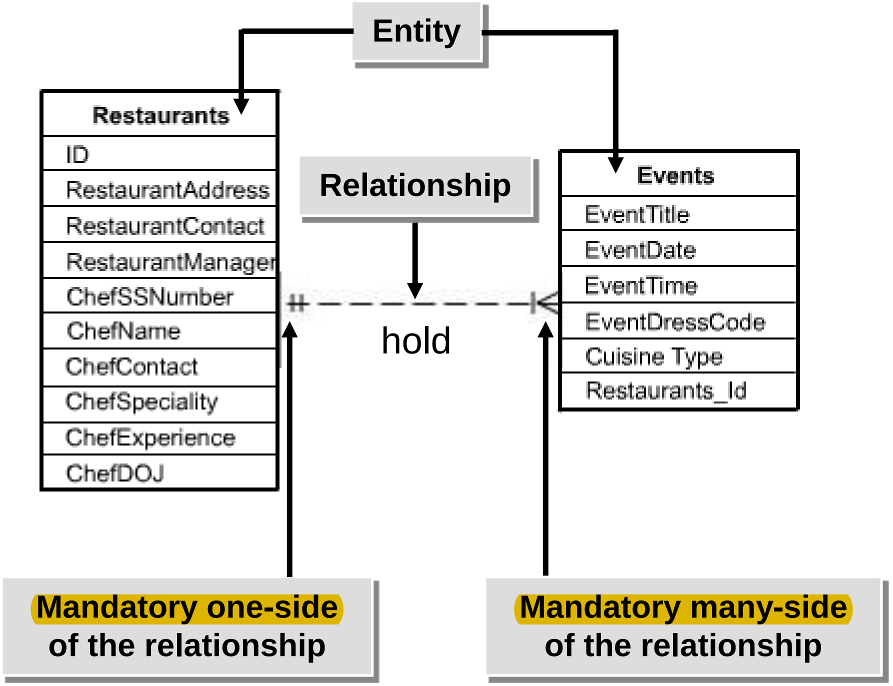

EntityName
RelationshipName ▶
EntityName

Binary relationship.


EntityName
EntityName
Relationship Name
EntityName

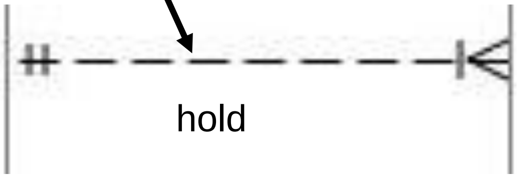
Complex (ternary) relationship.

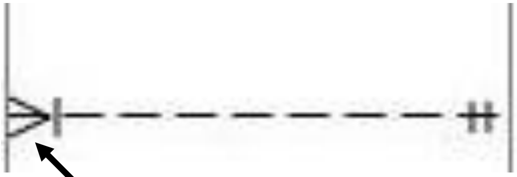
Crow's Foot Notation


Entity
Restaurants
ID
RestaurantAddress
RestaurantContact
RestaurantManager
ChefSSNumber
ChefName
ChefContact
ChefSpeciality
ChefExperience
ChefDOJ
Relationship
hold
Events
EventTitle
EventDate
EventTime
EventDressCode
Cuisine Type
Restaurants_Id
Mandatory one-side of the relationship
Mandatory many-side of the relationship

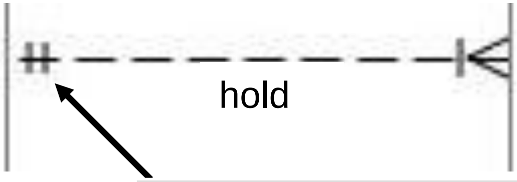
Meanings of Crow's Foot Notations

Primary Key *

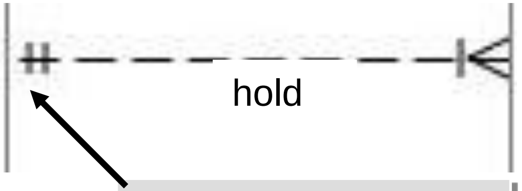

Relationship between entities


Many-side of a relationship

Meanings of Crow's Foot Notations

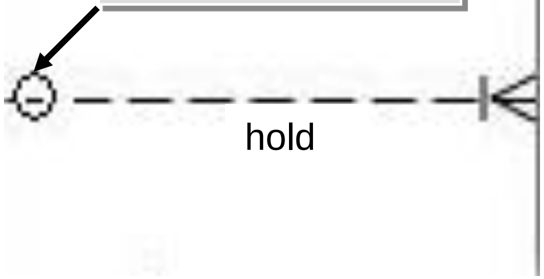


One side of a relationship



Mandatory relationship

Optional relationship



- Data modeling
  - Requires knowledge of business and technical aspects of the solution
  - Is an iterative process
  - Helps to ensure that solutions meet the stated requirements