

Entity Relationship Diagram

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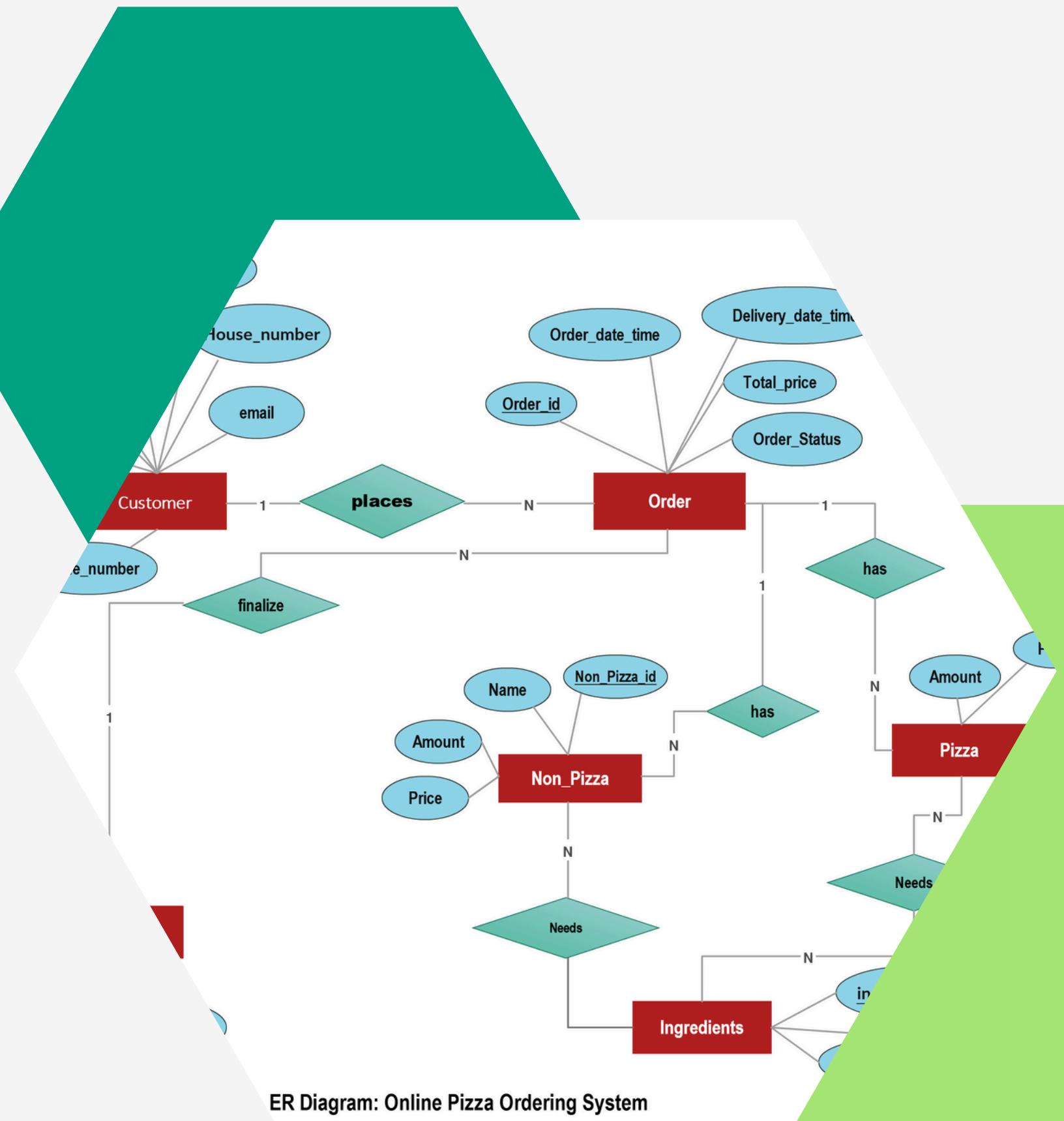
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Entity Relationship Modeling

Entity-Relationship Diagram (ERD): identifies information required by the business by displaying the relevant entities and the relationships between them.



Entity Relationship Modeling (Cont'd)

- What entities need to be described in the model?
- What characteristics or attributes of those entities need to be recorded?
- Can an attribute or a set of attributes be identified that will uniquely identify one specific occurrence of an entity?
- What associations or relationships exist between entities?

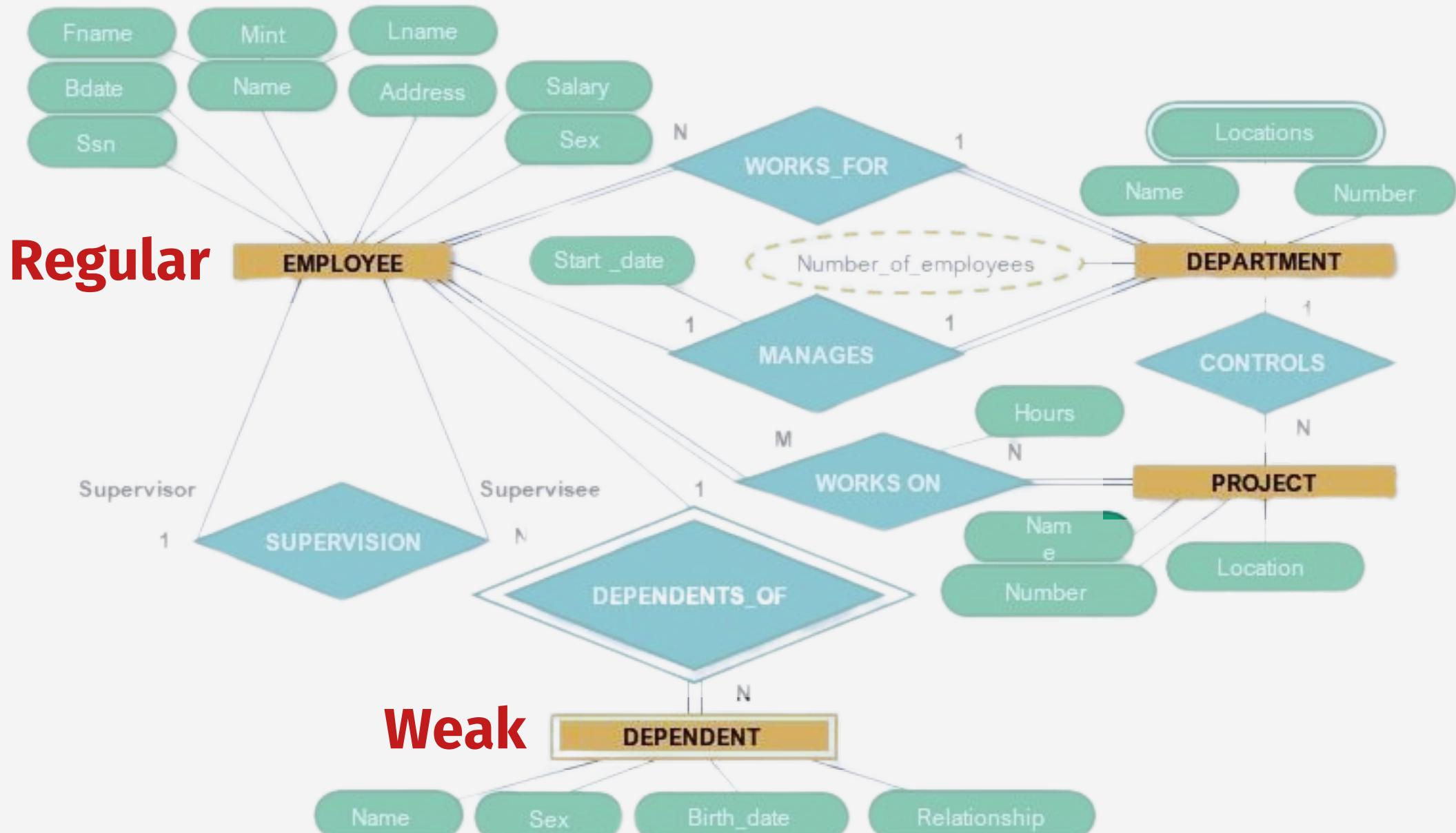


Definitions

Entity

Is a thing in the real world with an independent existence. Physical existence (for example, a particular person, car) or conceptual existence (for instance, a job, or a university course).

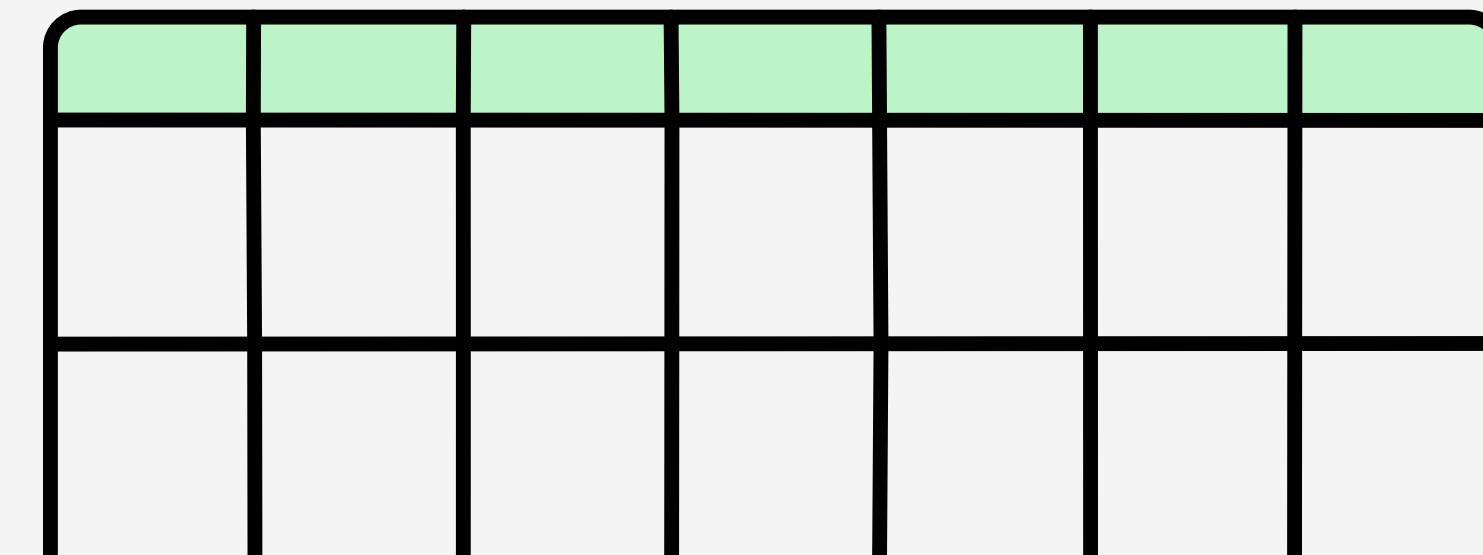
Types of entities: Weak- Regular



Definitions

Entity Instance

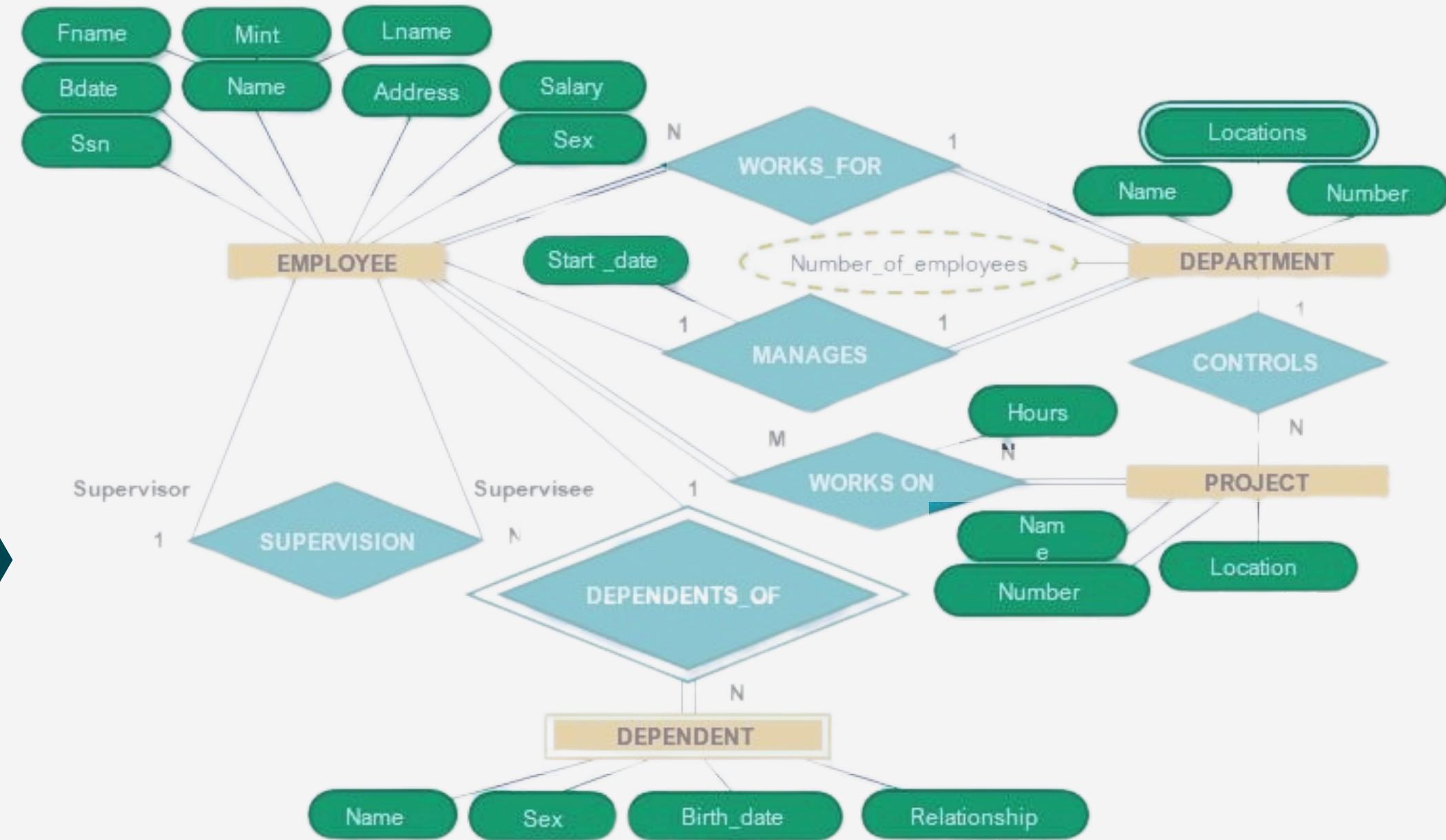
Is a particular occurrence of an entity. For example, each person is an instance of an entity, each car is an instance of an entity, etc.



Definitions

Attribute

The particular properties that describe the entity. An EMPLOYEE entity may be described by the employee's name, age, address and salary attributes.



Weak Entity Characteristics:

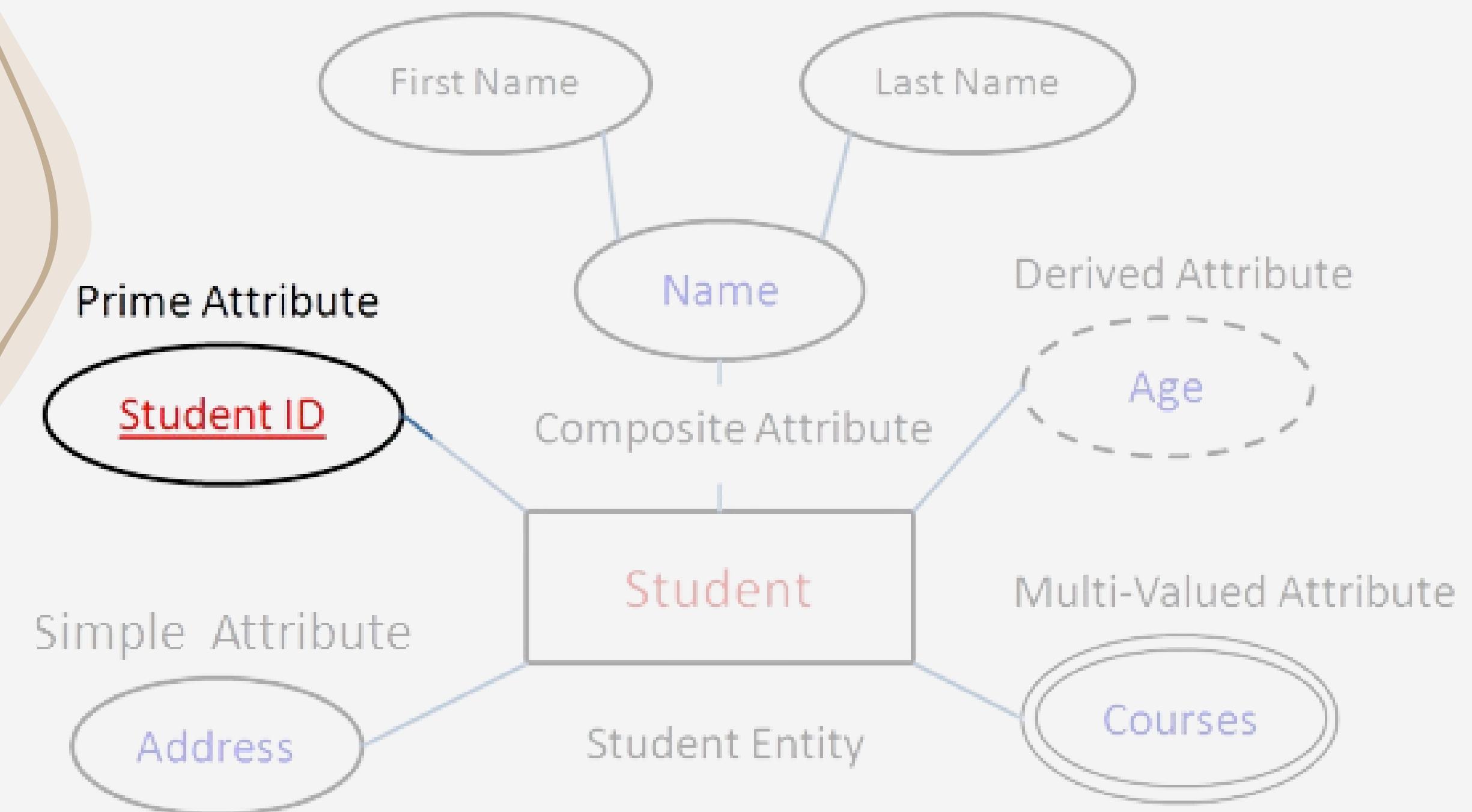
- Lack of Unique Identifier
- Existence Dependency
- Incomplete on their Own

Use Case:

Weak entities are commonly used to represent subordinate or dependent entities in scenarios like order items, parts of a whole, or components of a larger entity.

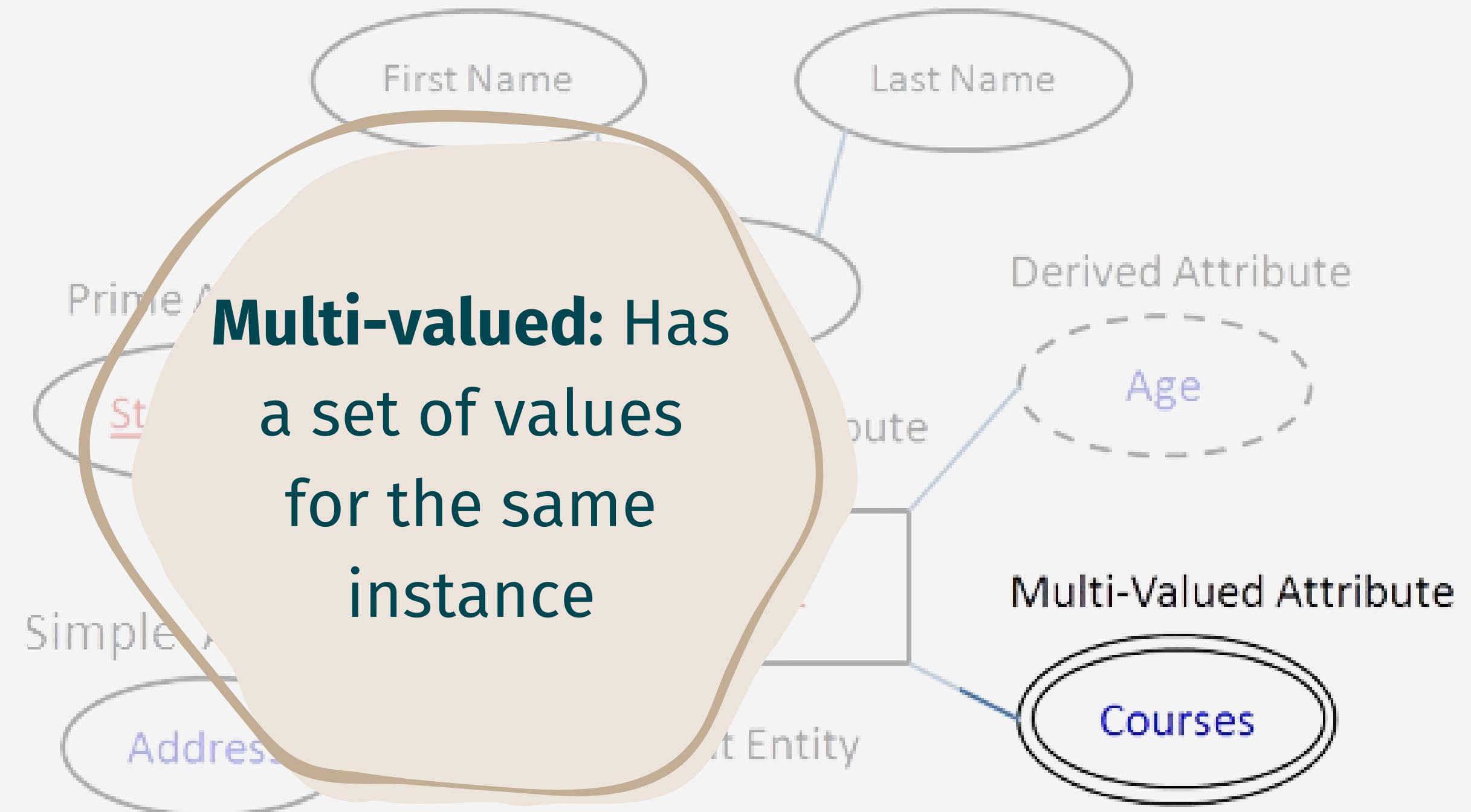
Attribute Types

Key: An attribute whose values are distinct (unique) for each entity and can be used to uniquely identify the record



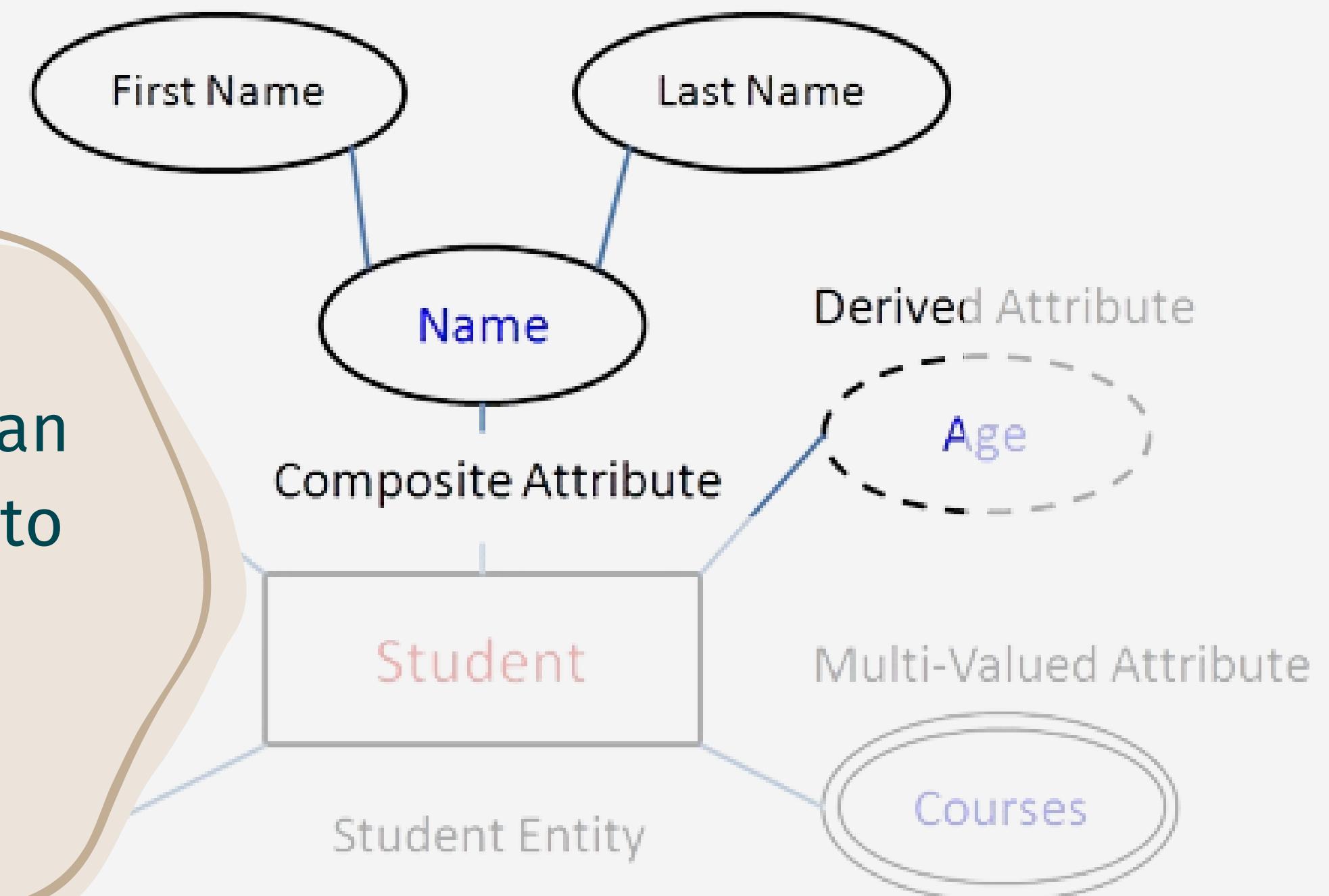
Attribute Types

Multi-valued: Has a set of values for the same instance



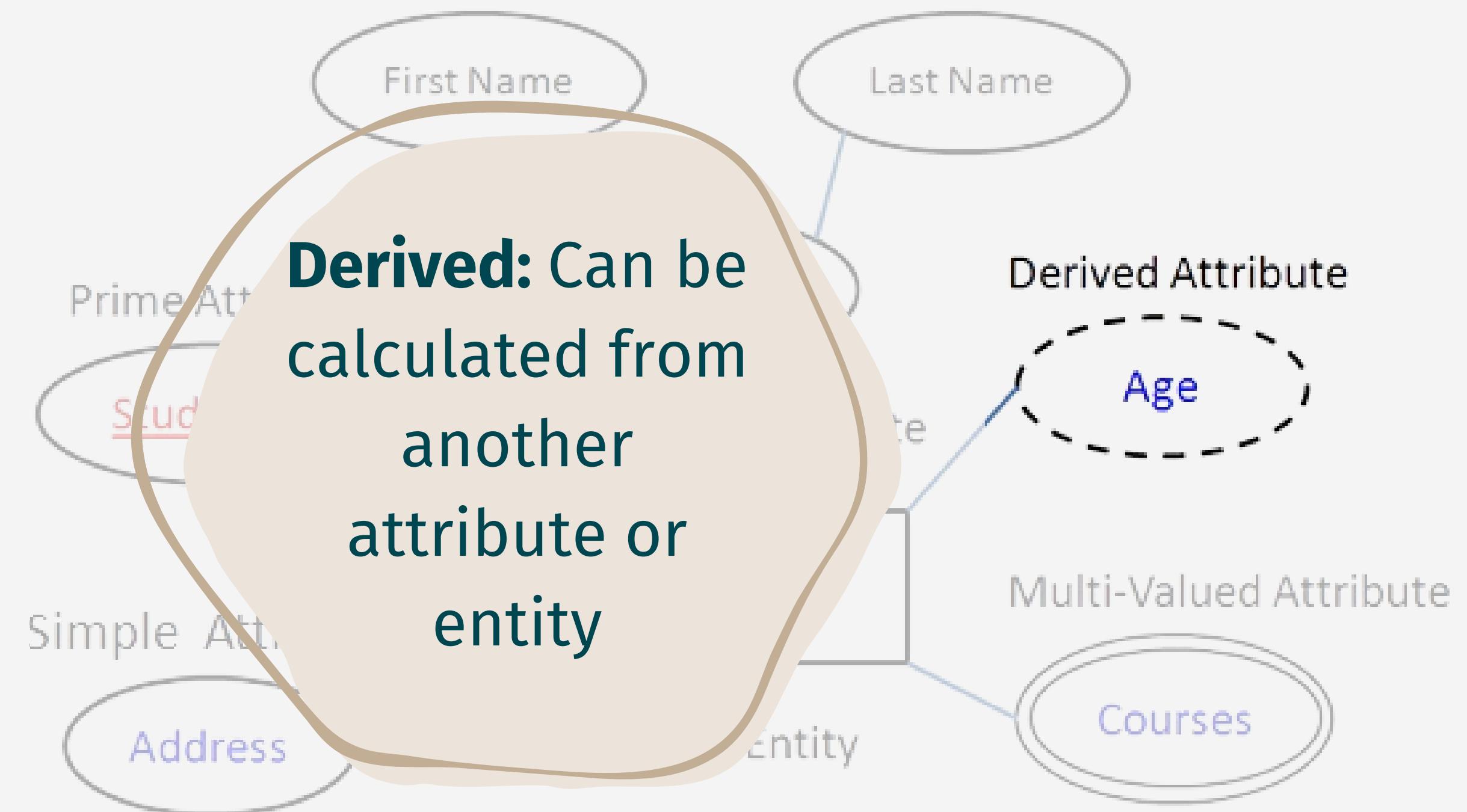
Attribute Types

Composite: Can be divided into smaller subparts



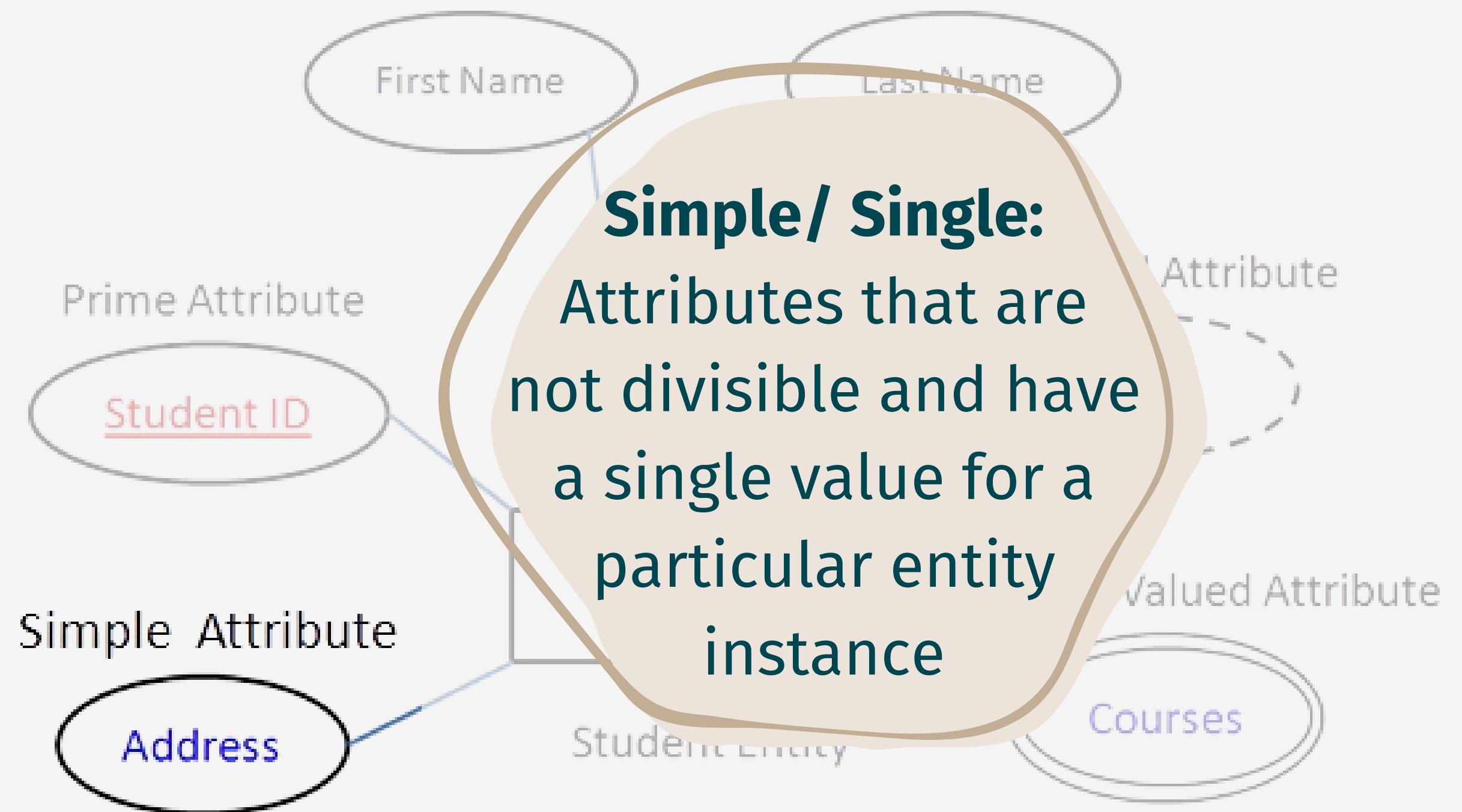
Attribute Types

Derived: Can be calculated from another attribute or entity

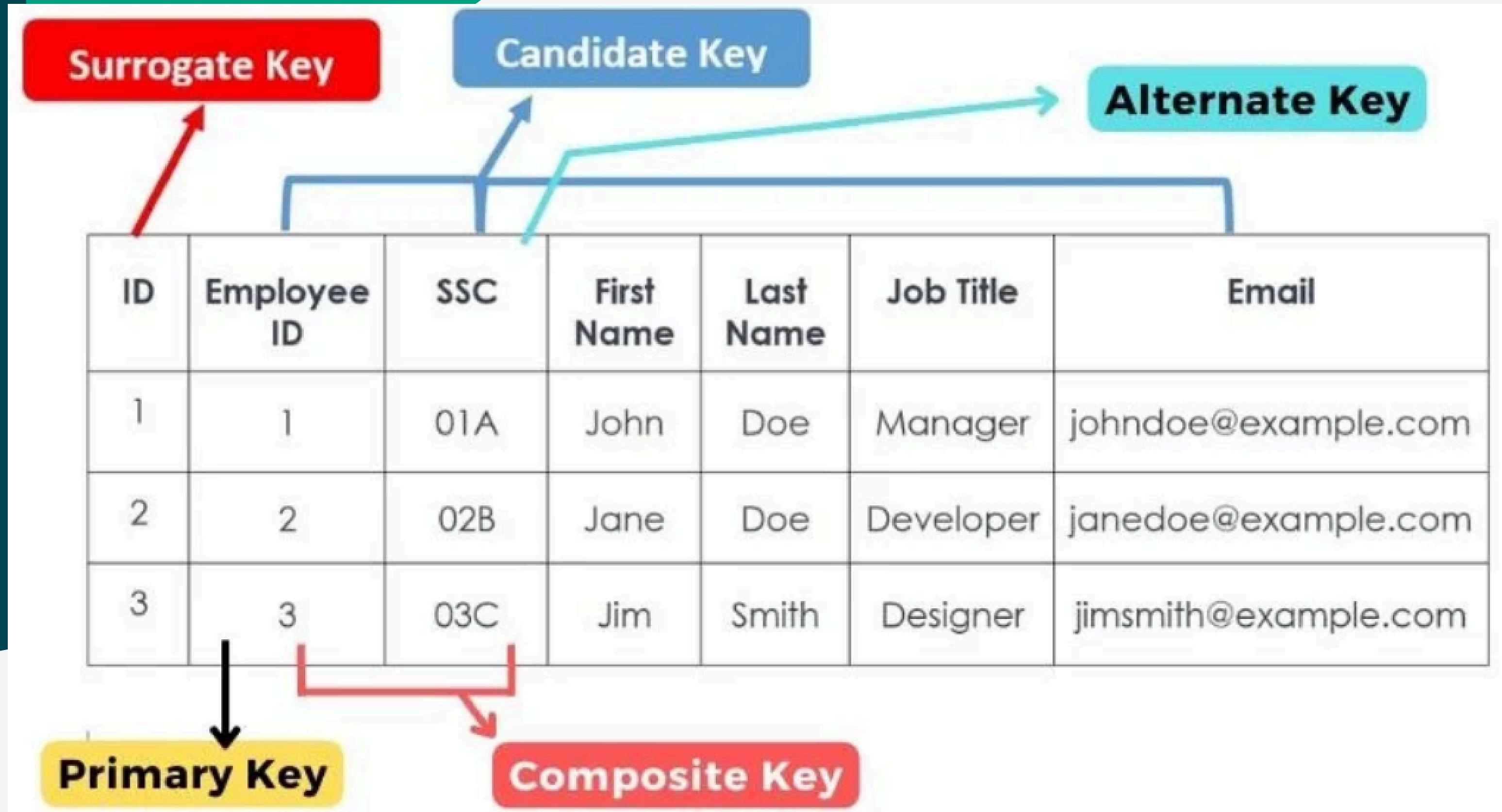


Attribute Types

Simple/ Single:
Attributes that are
not divisible and have
a single value for a
particular entity
instance



Database Keys



Relationships

Is a connection between entity classes.

Participation

Specifies the minimum number of relationship instances that each entity can participate with.

Degree of a relationship

Is the number of participating entity.

Cardinality Ratio

Specifies the maximum number of relationship.

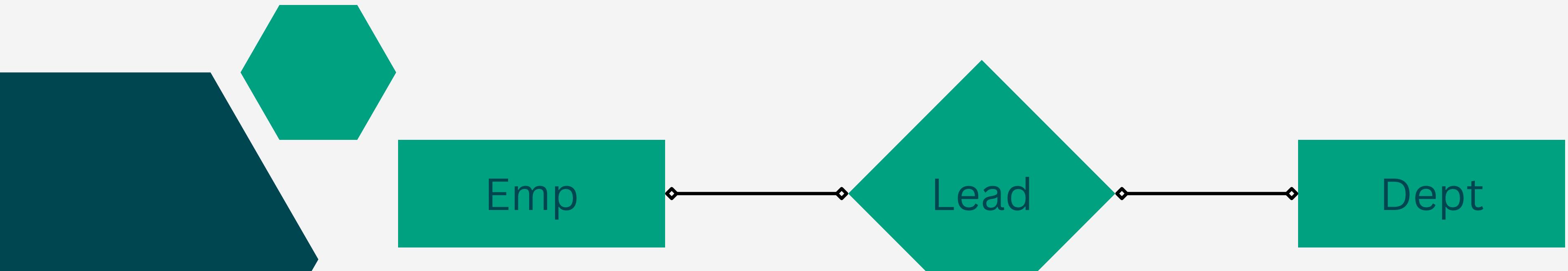
Degree of a relationship

1. Unary/ Recursive:



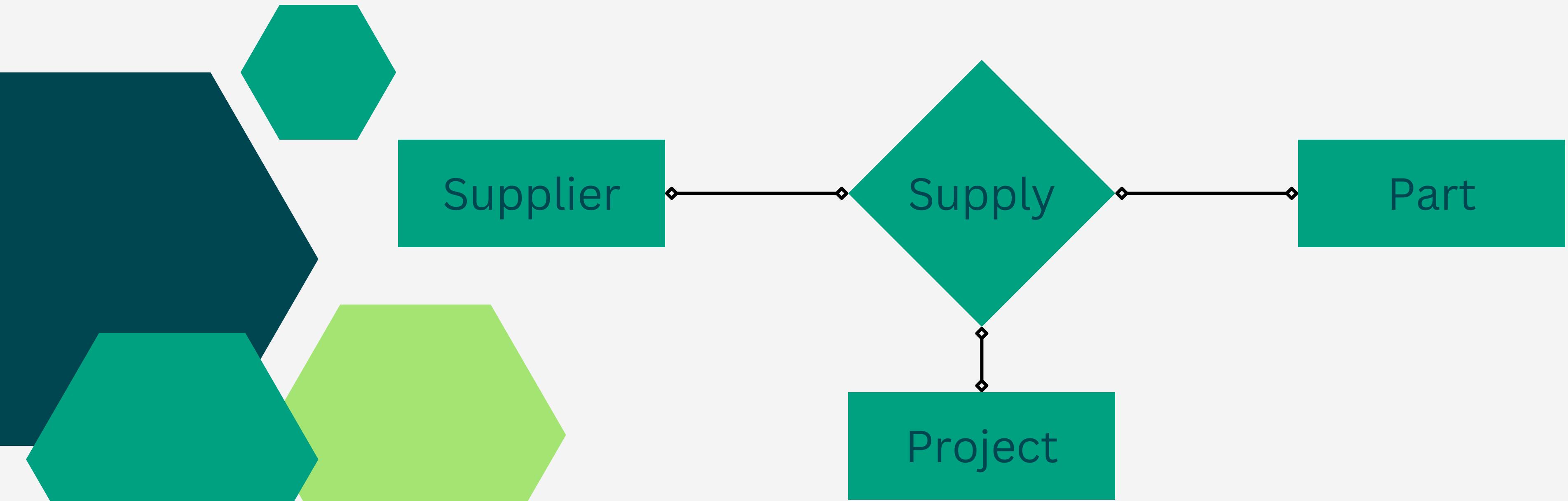
Degree of a relationship

2. Binary:



Degree of a relationship

3. Ternary:



Cardinality Ratio:

1. One to One:



Cardinality Ratio:

2. One to Many:



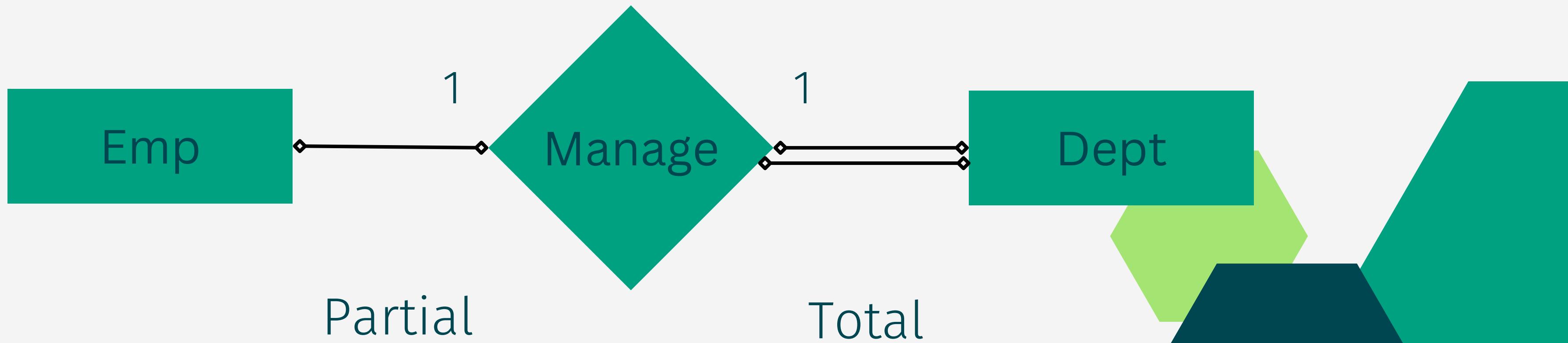
Cardinality Ratio:

3. Many to Many:



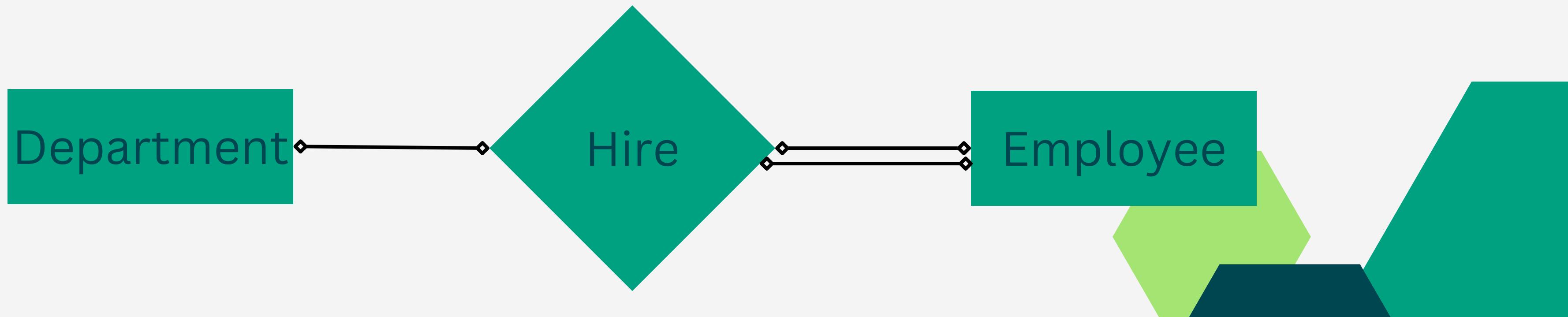
Participation:

1. Total/ Full Dependency/ Mandatory
2. Partial/ Partial Dependency/ Optional

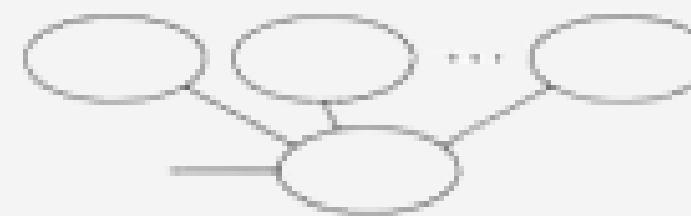


Participation Example

- A department may hire many employees (Zero or more)
- An employee must be employed by a department (Department membership is Optional, Employee membership is Mandatory)



Summary of ERD Notation

Symbol	Meaning	
	Entity	
	Weak Entity	
	Relationship	
	Identifying Relationship	
	Attribute	
	Key Attribute	
	Multivalued Attribute	
		Composite Attribute
		Derived Attribute
		Total Participation of E_2 in R
		Cardinality Ratio 1: N for $E_1:E_2$ in R
		Structural Constraint (min, max) on Participation of E in R

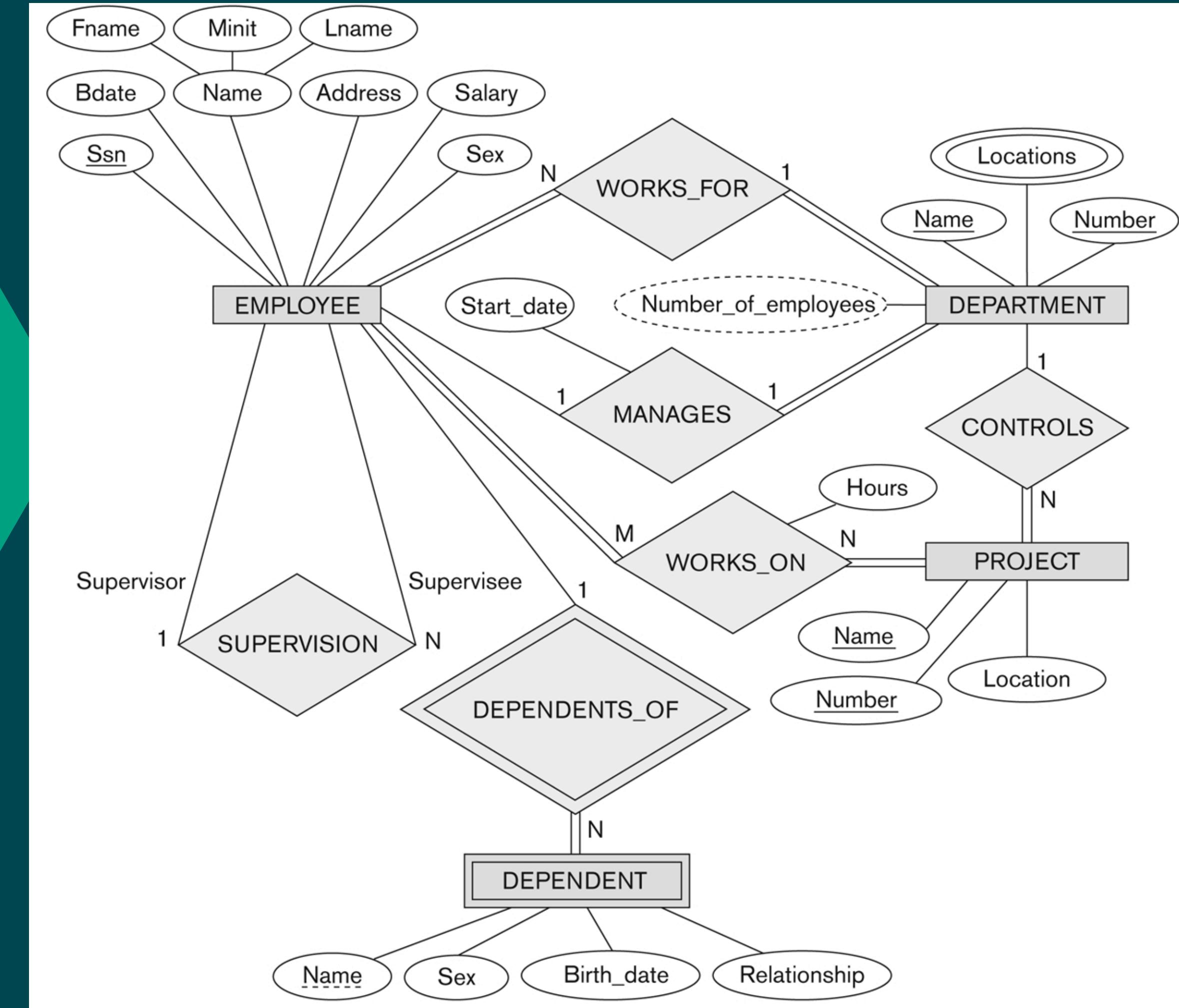
Example

- A company is organized into departments. Each department has a unique name, a unique number, and a particular employee who manages the department. A department may have several locations.
- A department may control a number of projects, each of which has a unique name, a unique number, and a single location. A project must controlled by a department

Example (cont'd)

- We store employee's name, social security number, address, salary, gender and birth date. An employee must be assigned to one department and must work on one or more projects, which are not necessarily controlled by the same department. We keep track of the number of hours per week that an employee works on each project. We also keep track of the direct supervisor of each employee.
- We want to keep track of the dependents of each employee for insurance purposes. We keep each dependent's first name, gender, birth date and relationship to that employee.

Example (cont'd)



ERD Case Study 1

- An organization makes many models of cars, where a model is characterized by a unique name and a suffix (such as GL or XL) and an engine size.
- Each model is made up from many parts and Each part has a description, an id code, production year, and many images.
- each part may be used in the manufacturing of more than one model.

ERD Case Study 1

- Each model must be produced at just one of the firm's factories, which are located in London, Birmingham, Bristol, Wolverhampton and Manchester - one in each city. Each factory has number of machines, capacity, and computer system used (OS , DBMS, Internet).
- A factory produces many models of cars and many types of parts.

ERD Case Study 2

- A country bus company owns a number of buses. A bus is characterized by number, No. of Chairs, Options (AC , Automatic, PS), and brand-name.
- Each bus is allocated to a particular route, although some routes may have several buses. Each route is described by KM, start point, end point and the duration.

ERD Case Study 2

- Each route can pass through a number of towns.
- A town may be situated along several routes. We keep track of unique name and station names in each town.
- One or more drivers are allocated to one route during a period of time. The system keeps information about the driver's name, mobile number, hire date, basic salary, job grade.
- The system keeps information about any changes in the allocations of the drivers to the routes.

ERD Narrative: Lab

- A database for a banking system is used to control withdrawal, deposit and loan transactions with customers.
- Banks which use this system have many branches; each branch has a unique name, unique address and phone.
- The system stores information about customers as unique customer ID, name, address, and phones.

ERD Narrative: Lab

- Each customer has one Account identified by unique Account number, amount, last transaction date (Day, Month and Year).
- The system records Transaction number, Transaction type, Transaction date, Transaction amount and time. The system records the branch name where the transaction occurred.
- A Customer can make any type of transactions (Withdrawal or Deposit) from any branch of the bank.

Questions?

