**Functional Dependency**

X -> Y, asserts that when attributes of R agree on X, they must all agree on Y

Movies(title, year, length, studio, studioAddress)

title, year -> length, studio

studio -> studioAddress

A -> B = A -> B1, A -> B2, … A -> Bn

A -> B, B -> C, then A -> C

Closure Example:

Student(SSN, sName, address, HScode, HSname, HScity, GPA, priority)

SSN -> sName, address, GPA

GPA -> priority

HScode -> HSname, HScity

{SSN, HScode}+ = {SSN, sName, address, HScode, HSname, HScity, GPA, priority}

**Entity-Relationship Model**

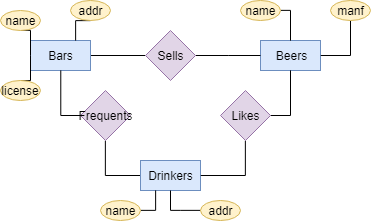
Entity: thing

Entity Set: collection of similar entities

Attribute: property of an entity set

Entities are defined by a square and are representative of a relation

Relationships are defined by a diamond and depict a connection between two Entities

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Many-many relationship: an entity can be connected to many entities

Many-one relationship: multiple entities where each can only point to one entity

Subclass is a special case or “is a” relationship, defined by a triangle

A weak entity set is an entity that can be defined on its own and requires another entity

**Relation Data Model**

Columns are called “Attributes” and have an associated Datatype

Rows are called “Tuples” and correspond to each attribute

Database: collection of relations

Database Schema: set of all relation schemas

Domain: element type associated with each attribute

Relation Example: Movies(title: string, year: integer, length: integer, genre: string)

Relation Keys are Underlined

Keys can either be UNIQUE or PRIMARY KEY, both can be used to define tuples

**Relational Database**

Decomposition Example: with join markers

Student(SSN, sName, address, HScode, HSname, HScity, GPA, priority)

s1 = (SSN, sName, address, **HScode**, GPA, priority)

s2 = (**HScode**, HSname, HScity)

s1 joined s2 = Student

BCNF Example: A -> B is nontrivial and A is a superkey

Student(SSN, sName, address, HScode, HSname, HScity, GPA, priority)

SSN -> sName, address, GPA

GPA -> priority

HScode -> HSname, HScity

Key = {SSN, HScode}, violates BCNF

S1(SSN, sName, address, GPA, priority) S2(SSN, HScode, HSname, HScity)

Key1 = { SSN } Key2 = { SSN, HScode }

GPA -> priority VIOLATES HScode -> HSname, HScity VIOLATES

S3(GPA, priority) S5(HScode, HSname, HScity)

S4(SSN, sName, address, GPA) S6(SSN, HScode)