RELATIONAL DATABASES

OBJECTIVES

- DEFINE AND GIVE AN EXAMPLE OF A SUBTYPE
- DEFINE AND GIVE AN EXAMPLE OF A SUPERTYPE
- STATE THE RULES RELATING TO ENTITIES AND SUBTYPES, AND GIVE EXAMPLES OF EACH
- APPLY THE RULES OF SUPERTYPE AND SUBTYPE BY EVALUATING THE ACCURACY OF ER DIAGRAMS THAT REPRESENT THEM
- APPLY THE RULES OF SUPERTYPE AND SUBTYPE AND INCLUDE THEM IN A DIAGRAM WHEN APPROPRIATE

PURPOSE

- SUPERTYPES AND SUBTYPES OCCUR FREQUENTLY IN THE REAL WORLD
  - FOOD ORDER TYPES (EAT IN, TO GO)
  - GROCERY BAG TYPES (PAPER, PLASTIC)
  - PAYMENT TYPES (CHECK, CASH, CREDIT, DEBIT)
- YOU CAN TYPICALLY ASSOCIATE ‘CHOICES’ OF SOMETHING WITH SUPERTYPES AND SUBTYPES.
- FOR EXAMPLE, WHAT WILL BE THE METHOD OF PAYMENT?
- UNDERSTANDING REAL WORLD EXAMPLES HELPS US UNDERSTAND HOW AND WHEN TO MODEL THEM.

EVALUATING ENTITIES

- OFTEN SOME INSTANCES OF AN ENTITY HAVE ATTRIBUTES AND AND/OR INSTANCES DO NOT HAVE.
- IMAGINE A BUSINESS WHICH NEEDS TO TRACK PAYMENTS FROM CUSTOMERS WHO CAN PAY BY CASH, CHECK, OR CREDIT/DEBIT CARD.
- CUSTOMERS WHO PAY CASH MAY NOT HAVE ANY DETAILS OF THE PAYMENT STORED OTHER THAN DATE, AMOUNT ETC.
- CUSTOMERS WHO PAY BY CARD, THEIR CARD NUMBER, EXPIRY, CCV AND NAME MUST BE STORED.
- ALL PAYMENTS HAVE SOME COMMON ATTRIBUTES: PAYMENT DATE, PAYMENT AMOUNT ETC.

EVALUATING ENTITIES

- SHOULD WE CREATE A SINGLE PAYMENT ENTITY OR THREE SEPARATE ENTITIES CASH, CHECK AND CREDIT CARD?
- AND WHAT HAPPENS IF IN THE FUTURE WE INTRODUCE A FOURTH METHOD OF PAYMENT?

SUBDIVIDE AN ENTITY

- SOMETIMES IT MAKES SENSE TO SUBDIVIDE AN ENTITY INTO SUBTYPES
- THIS MAY BE THE CASE WHEN A GROUP OF INSTANCES HAS SPECIAL PROPERTIES, SUCH AS ATTRIBUTES OR RELATIONSHIPS THAT EXIST ONLY FOR THAT GROUP
- IN THIS CASE, THE ENTITY IS CALLED A “SUPERTYPE” AND EACH GROUP IS CALLED A “SUBTYPE”

SUBTYPE CHARACTERISTICS

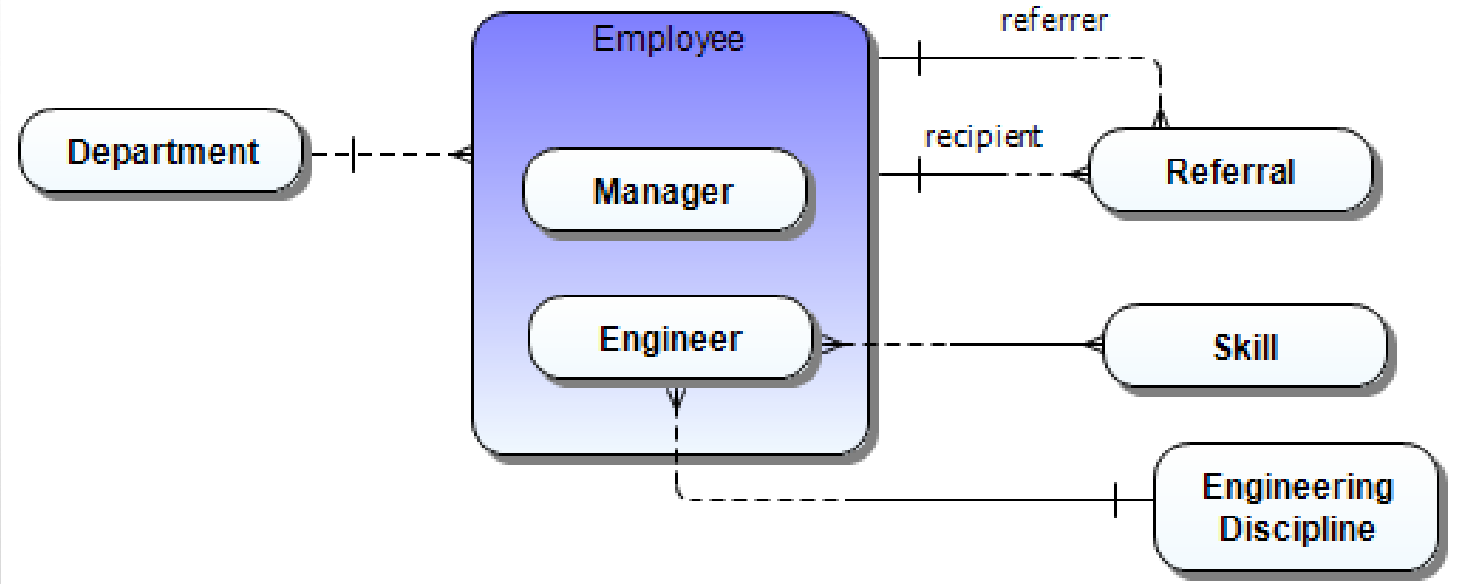
- A SUBTYPE:
  - INHERITS ALL ATTRIBUTES OF THE SUPERTYPE
  - INHERITS ALL RELATIONSHIPS OF THE SUPERTYPE
  - USUALLY HAS IT OWN ATTRIBUTES OR RELATIONSHIPS
  - IS DRAWN WITHIN THE SUPERTYPE
  - NEVER EXISTS ALONE
  - MAY HAVE SUBTYPES OF ITS OWN

SUPERTYPE SUBTYPE EXAMP

- A CLIENT COULD BE EITHER AN INDIVIDUAL PERSON OR A COMPANY. FOR A CLIENT YOU MAY STORE FIRST NAME AND LAST NAME BUT FOR A COMPANY YOU WOULD STORE THE COMPANY NAME AND THE INDUSTRY
- THE COMMON ATTRIBUTES ARE LISTED AT THE SUPERTYPE LEVEL

SUPERTYPE SUBTYPE

- EMPLOYEE IS THE SUPERTYPE OF MANAGER AND ENGINEER
- SUBTYPES INHERIT ALL ATTRIBUTES AND RELATIONSHIPS FROM THE SUPERTYPE.
- A MANAGER AND ENGINEER WILL HAVE A RELATIONSHIP WITH DEPARTMENT
- ONLY AN ENGINEER WILL HAVE A RELATIONSHIP WITH SKILL AND ENGINEERING DISCIPLINE



ALWAYS MORE THAN ONE SUBTYPE

- WHEN AN ER MODEL IS COMPLETE, SUBTYPES NEVER STAND ALONE. IN OTHER WORDS, IF AN ENTITY HAS A SUBTYPE, A SECOND SUBTYPE MUST ALSO EXIST.
- A SINGLE SUBTYPE IS THE SAME AS THE SUPERTYPE.
- THIS CONCEPT LEADS TO 2 SUBTYPE RULES:
  - EXHAUSTIVE: EVERY INSTANCE OF THE SUPERTYPE IS ALSO AN INSTANCE OF ONE OF THE SUBTYPES. ALL SUBTYPES ARE LISTED WITHOUTH OMMISION.
  - MUTUALLY EXCLUSIVE: EACH INSTANCE OF A SUPERTYPE IS AN INSTANCE OF ONLY ONE POSSIBLE SUBTYPE

ALWAYS MORE THAN ONE SUBTYPE

- AT THE CONCEPTUAL MODELLING STAGE, IT IS GOOD PRACTICE TO INCLUDE AN OTHER SUBTYPE TO MAKE SURE THAT YOUR SUBTYPES ARE EXHAUSTIVE – THAT YOU ARE HANDLING EVERY INSTANCE OF THE SUPERTYPE.