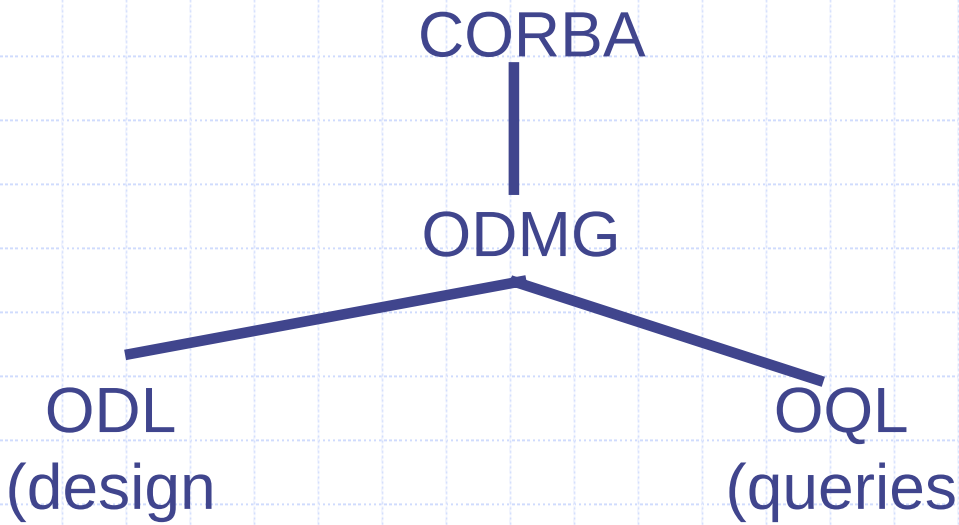
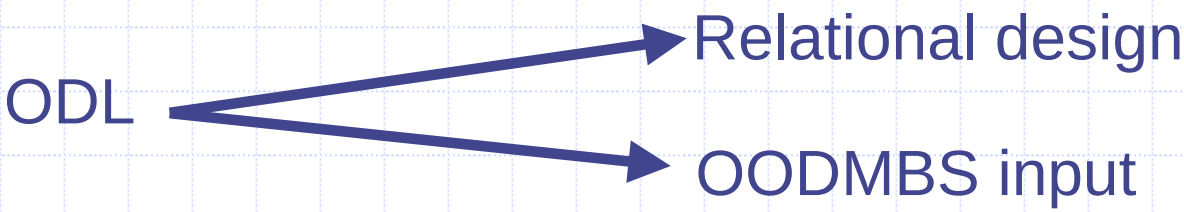
Object Definition Language

- Design language derived from the OO community:
- Can be used like E/R as a preliminary design for a relational DB.

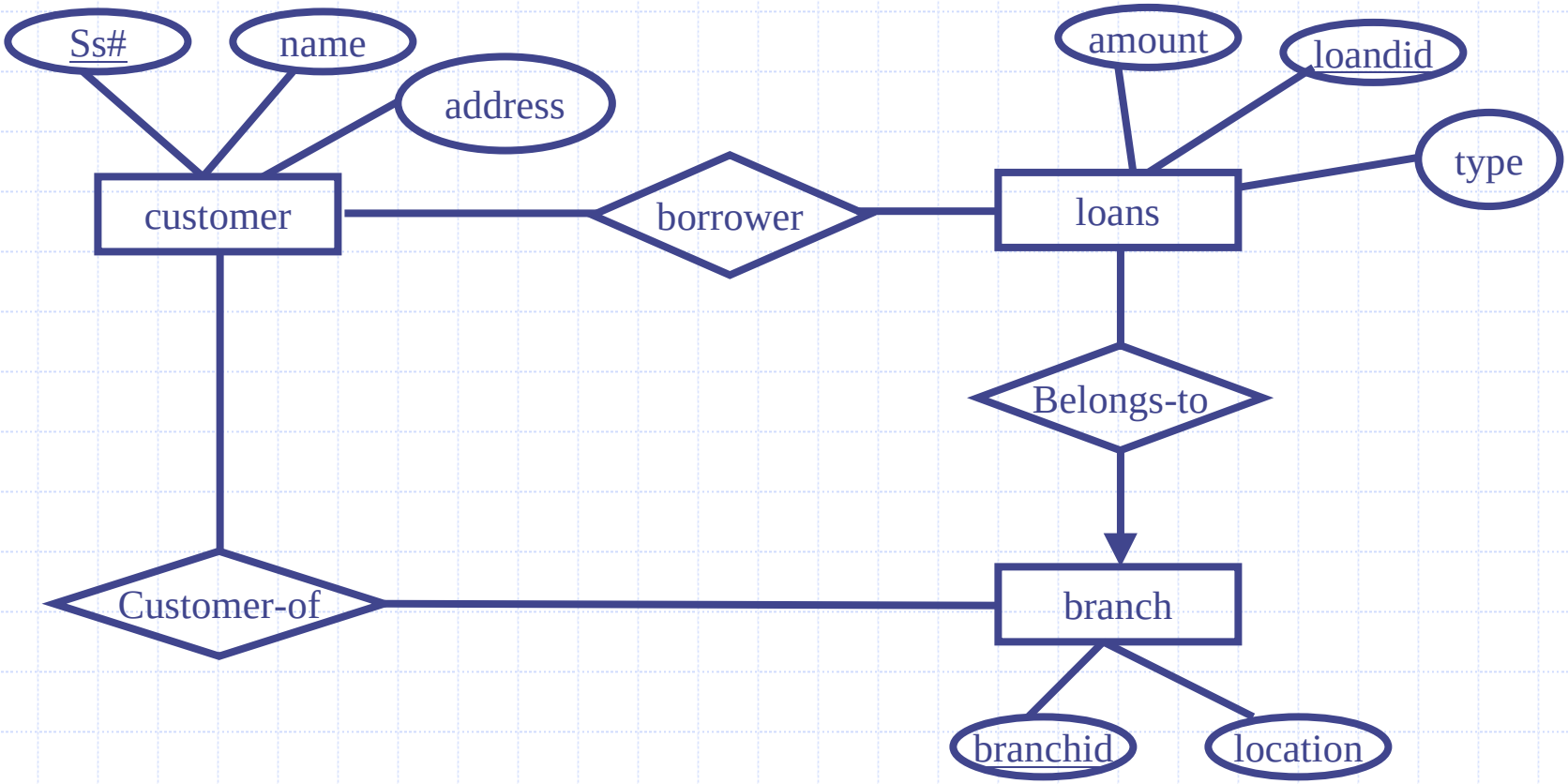




ODL

- Class Declarations
  - interface < name > {elements = attributes, relationships, methods }
- Element Declarations
  - attribute < type > < name > ;
  - relationship < rangetype > < name > ;
- Method Example
  - float gpa(in: Student) raises(noGrades)
    - float = return type.
    - in: indicates Student argument is read-only.
      - Other options: out, inout.
    - noGrades is an exception that can be raised by method gpa.

Banking Example 1



- ***Keys:*** **ss#, loanid, branchid**
- ***Cardinality constraint*: each loan belongs to a single branch**

Banking Example (II)

- interface Customer {
  attribute string name; attribute integer ss#;
  attribute Struct Addr {string street, string city, int zip} address;
  relationship Set<Loans> borrowed
  inverse Loans::borrower;
  relationship Set<Branch> has-account-at
  inverse Branch:patrons;
  key(ss#)
  }
- Structured types have names and bracketed lists of field-type pairs.
- Relationships have inverses.
- An element from another class is indicated by < class > ::
- Form a set type with Set<type>.

Loans Example (III)

- interface loans {
  attribute real amount;
  attribute int loanid;
  attribute Enum loanType {house, car, general} type;
  relationship Branch belongs-to
  inverse Branch::loans-granted;
  relationship Set<Customer> borrower
  inverse Customer::borrowed;
  key(loanid)
}

- Enumerated types have names and bracketed lists of values.

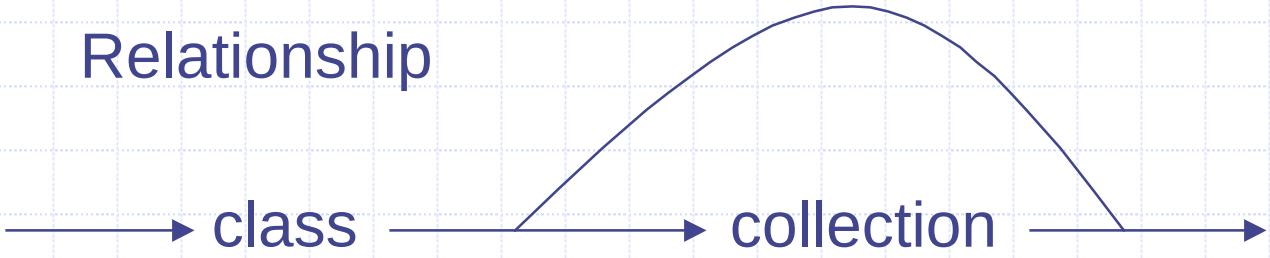
Bank Example (IV)

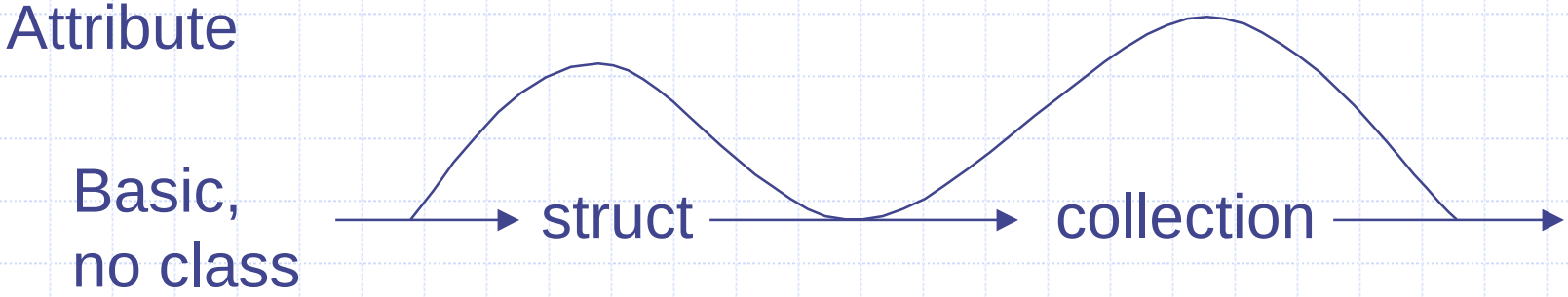
- interface Branch {
  attribute integer branchid;
  attribute Struct Customer::Addr location;
  relationship Set<Loans> loans-granted
  inverse Loans::belongs-to;
  relationship Set<Customer> patrons
  inverse Customer::has-account-at;
  key(branchid);
  }
- Note reuse of Addr type.

ODL Type System

- Basic types: int, real/ float, string, enumerated types, and classes.
- Type constructors: Struct for structures and four collection types: Set, Bag, List, and Array.

Limitations on Nesting





ER versus ODL

- E/R: arrow pointing to “one.
- ODL: don't use a collection type for relationship in the “many" class.
  - Collection type remains in “one.”
- E/R: arrows in both directions.
- ODL: omit collection types in both directions

- ODL only supports binary relationship.
- Convert multi-way relationships to binary and then represent in ODL
  - create a new connecting entity set to represent the rows in the relationship set.
  - Problems handling cardinality constraints properly!!

Roles in ODL

- No problem; names of relationships handle roles.”

```
interface employee {
        attribute string name;
        relationship Set<Employee> manager
                inverse Employee::worker;
        relationship Set<Employee> worker
                inverse Employee::manager
}
```

Subclasses in ODL

- Subclass = special case = fewer entities/objects = more properties.
- Example: Faculty and Staff are subclasses of Employee. Faculty have academic year (9 month salaries) but staff has a full-year (12 month salary).

ODL Subclasses

- Follow name of subclass by colon and its superclass.
- interface Faculty:Employee {
  attribute real academic-year-salary;
  }
- Objects of the Faculty class acquire all the attributes and relationships of the Employee class.
- Inheritance in ODL and ER model differ in a subtle way
  - in ODL an object must be member of exactly one class
  - in ER an object can be member of more than one class

Keys in ODL

- Indicate with key(s) following the class name, and a list of attributes forming the key.
  - Several lists may be used to indicate several alternative keys.
  - Parentheses group members of a key, and also group key to the declared keys.
  - Thus, (key(a_1; a_2; : : : ; a_n)) = “one key consisting of all n attributes." (key a_1; a_2; : : : ; a_n) =“each a_i is a key by itself.
- Keys are not necessary for ODL. Object identity and not keys differentiates objects