1 The Relational Database Model
CST272

3 Creating the Unnormalized Table
- List the fields
- Select a primary key
  - The field (or concatenation of two or more fields) that uniquely identifies each record

4 Unnormalized Table
Purchase Order (PO number, PO date, Vendor number, Vendor name, Address, City, State, ZIP code, Product number, Product, Unit price, Quantity, Extension, Subtotal, Tax, Shipping, Discount, PO total)

6 To Convert from Unnormalized to 1NF
- Identify, list and remove repeating groups
- Modify Primary key (concatenated fields)
- Important: In 1NF there always will still be just one table

9 1NF (First Normal Form)
Payables (PO number, PO date, Vendor number, Vendor name, Address, City, State, ZIP code, Product number, Product, Unit price, Quantity, Subtotal, Tax, Shipping, Discount, PO total)

To Convert from 1NF to 2NF
- Identify the determinants
  - A listing of every possible combination of elements (fields) that make up the 1NF primary key
- Identify the functional dependencies
  - Which non-key fields rely on which determinants to determine their value
- For the new 2NF tables, the determinants are the primary keys

2NF (Second Normal Form)
Purchase Order (PO number, PO date, Vendor number, Vendor name, Address, City, State, ZIP code, Subtotal, Tax, Shipping, Discount, PO total)
Payables (PO number, Product number, Unit price, Quantity)
Product (Product number, Product)

To Convert from 2NF to 3NF
- Within the existing 2NF tables, identify the non-key determinants
  - Any non-key fields that could be a primary key for other fields in one of the 2NF tables
- Identify those functional dependencies
- Create new table(s) from the determinant(s) and functional dependency(cies)
- Do not remove the non-key determinant(s) from original table(s)

3NF (Third Normal Form)
Vendor (Vendor number, Vendor name, Address, City, State, ZIP code)
Purchase Order (PO number, Vendor number, Subtotal, Tax, Shipping, PO total, PO date)
Payables (PO number, Product number, Unit price, Quantity)
Product (Product number, Product)

Finalize the Tables in Database Design Language
- Present the 3NF tables with all keys:
  - Primary keys—that field which uniquely identifies (differentiates) a record from all other records in the table
  - Alternate (secondary) keys—a field that could have been the primary key but is not; DBMS must enforce that values of field are unique for every record
  - Foreign keys—a field that links to field values in another table; a foreign key value must match the primary key of one of the records in table to which it joins, or be null
**DBDL (Database Design Language)**

Vendor (Vendor number, Vendor name, Address, City, State, ZIP code)

Purchase Order (PO number, Vendor number, Subtotal, Tax, Shipping, PO total, PO date)
  FK  Vendor number → Vendor

Payables (PO number, Product number, Unit price, Quantity)
  FK  PO number → Purchase Order
  FK  Product number → Product

Product (Product number, Product)

---

**Unnormalized—Contact Listing**

Vendor (Vendor number, Vendor name, Contact, Telephone)

---

**Merge the Tables**

- If you have two tables with the identical primary key, they should be *merged into a single table*.
- The results of each new normalization should be merged into the existing tables from previous normalizations.

**DBDL—The Merged Tables**

Vendor (Vendor number, Vendor name, Address, City, State, ZIP code, Contact, Telephone)

Purchase Order (PO number, Vendor number, Subtotal, Tax, Shipping, PO total, PO date)
  FK  Vendor number → Vendor

Payables (PO number, Product number, Unit price, Quantity)
  FK  PO number → Purchase Order
  FK  Product number → Product

Product (Product number, Product)

---

**DBDL—The Final Tables**

Vendor (Vendor number, Vendor name, Address, City, State, ZIP code, Contact, Telephone, Fax, Term days, Term percent, Date last order)

Purchase Order (PO number, Vendor number, Subtotal, Tax, Shipping, PO total, PO date,
  Bill date, Discount date, Due date)
  FK  Vendor number → Vendor

Payables (PO number, Product number, Unit price, Quantity, Back ordered?)
  FK  PO number → Purchase Order
  FK  Product number → Product

Product (Product number, Product)