

# Schemas

Employee(employee\_id, first\_name, last\_name, phone, email, title, department, business\_unit, hired\_date, status)

Lead(lead\_id, name, country, status, probability, source, analysis, date\_created, owner\_id, contact\_id)

Contact(contact\_id, first\_name, last\_name, phone, email, title, organization)

Customer(customer\_id, owner\_id, parent\_entity\_id, legal\_entity\_name, country, address, industry, type, status, date\_created)

Customer\_Contact(customer\_id, contact\_id)

Opportunity(opportunity\_id, customer\_id, sold\_to\_id, owner\_id, name, start\_date, close\_date, stage, est\_revenue, date\_created)

Quote(quote\_id, opportunity\_id, bill\_to\_id, ship\_to\_id, name, content, status, created\_date, approved\_date)

Screening\_Record(screening\_record\_id, modified\_by\_id, customer\_id, issue\_type, status, source, pending\_action, date\_created, date\_updated)

## Prove the relational schema is in BCNF

Below analyze each relation and ensure that for every non-trivial functional dependency  $X \rightarrow Y$ ,  $X$  is a superkey of the relation.

### 1. Employee

$\text{employee\_id} \rightarrow \text{first\_name}, \text{last\_name}, \text{phone}, \text{email}, \text{title}, \text{department}, \text{business\_unit}, \text{hired\_date}, \text{status}$

- employee\_id is the primary key
- All non-key attributes are functionally dependent on employee\_id
- No other non-trivial functional dependencies exist

### 2. Lead

$\text{lead\_id} \rightarrow \text{name}, \text{country}, \text{status}, \text{probability}, \text{source}, \text{analysis}, \text{date\_created}, \text{owner\_id}, \text{contact\_id}$

- lead\_id is the primary key
- All non-key attributes are functionally dependent on lead\_id
- No other non-trivial functional dependencies exist

### 3. Contact

contact\_id → first\_name, last\_name, phone, email, title, organization

- contact\_id is the primary key
- All non-key attributes are functionally dependent on contact\_id
- No other non-trivial functional dependencies exist

### 4. Customer

customer\_id → owner\_id, parent\_entity\_id, legal\_entity\_name, country, address, industry, type, status, date\_created

- customer\_id is the primary key
- All non-key attributes are functionally dependent on customer\_id
- No other non-trivial functional dependencies exist

### 5. Customer\_Contact(customer\_id, contact\_id)

- (customer\_id, contact\_id) is the composite primary key
- No other attributes exist, so no other functional dependencies are possible

### 6. Opportunity

opportunity\_id → customer\_id, sold\_to\_id, owner\_id, name, start\_date, close\_date, stage, est\_revenue, date\_created

- opportunity\_id is the primary key
- All non-key attributes are functionally dependent on opportunity\_id
- No other non-trivial functional dependencies exist

### 7. Quote

quote\_id → opportunity\_id, bill\_to\_id, ship\_to\_id, name, content, status, created\_date, approved\_date

- quote\_id is the primary key

- All non-key attributes are functionally dependent on quote\_id
- No other non-trivial functional dependencies exist

#### 8. Screening\_Record

screening\_record\_id → modified\_by\_id, customer\_id, issue\_type, status, source, pending\_action, date\_created, date\_updated

- screening\_record\_id is the primary key
- All non-key attributes are functionally dependent on screening\_record\_id
- No other non-trivial functional dependencies exist

In conclusion, all relations in the schema are in BCNF because for each relation:

1. The primary key is a superkey.
2. All non-key attributes are fully functionally dependent on the primary key.
3. There are no non-trivial functional dependencies where the left side is not a superkey.

This satisfies the definition of BCNF, where for all functional dependencies  $\alpha \rightarrow \beta$ ,  $\alpha$  is a superkey for the relation schema R.