

# Normalization Exercise 6

# Normalization Exercise 6 - Design Document

**Database Purpose:** Track internal job referrals

## **Exercise Description:**

- Refine the design to conform to the 3<sup>rd</sup> normal form
- Meet the following business rules and design requirement

## **Business Rules:**

- Track all internal job referrals
- Need to store the addresses history for an applicant
- Multiple applicants may have the same address
- Need to keep only the primary phone for an applicant
- Need to keep only the primary email address for an applicant
- EmployeeDepartment has a department code
- Details about a department are stored in another database

## **Design Requirements:**

- Use Crow's Foot Notation

**Current Database Design (UNF)**

## **Referral**

<b>*ApplicantID</b>
<b>ApplicantName</b>
<b>Address1</b>
<b>Address2</b>
<b>Address3</b>
<b>Phone</b>
<b>Email</b>
<b>*JobID</b>
<b>JobDescription</b>
<b>ApplicationDate</b>
<b>EmployeeID</b>
<b>EmployeeName</b>
<b>EmployeeDepartment</b>
<b>ApplicationStatus</b>
<b>ReferralBonus</b>


# Unnormalized Form (UNF)

## Take to 1<sup>st</sup> NF

### Current Database Design (UNF)

#### Referral

<b>*ApplicantID</b>
<b>ApplicantName</b>
<b>Address1</b>
<b>Address2</b>
<b>Address3</b>
<b>Phone</b>
<b>Email</b>
<b>*JobID</b>
<b>JobDescription</b>
<b>ApplicationDate</b>
<b>EmployeeID</b>
<b>EmployeeName</b>
<b>EmployeeDepartment</b>
<b>ApplicationStatus</b>
<b>ReferralBonus</b>



*Composite Attribute,  
Multi-value Attribute,  
Repeating Groups,  
Many-to-many relationship?*

# Unnormalized Form (UNF)

## Take to 1<sup>st</sup> NF

Current Database Design (UNF)

### Referral

*ApplicantID
ApplicantName
Address1
Address2
Address3
Phone
Email
*JobID
JobDescription
ApplicationDate
EmployeeID
EmployeeName
EmployeeDepartment
ApplicationStatus
ReferralBonus

Composite

Repeating Groups

# Corrected Composite Attributes and Repeating Groups Conform to 1<sup>st</sup> NF

Address	
*AddressID	
StreetNumber	
City	
State	
ZipCode	

Referral	
*ApplicantID	
ApplicantLName	
ApplicantFName	
Phone	
Email	
*JobID	
JobDescription	
ApplicationDate	
EmployeeID	
EmployeeLName	
EmployeeFName	
EmployeeDepartment	
ApplicationStatus	
ReferralBonus	

# First Normal Form (1<sup>st</sup> NF)

## Take to 2<sup>nd</sup> NF Next

*Partial Dependency?*

**Address**

<b>*AddressID</b>
<b>StreetNumber</b>
<b>City</b>
<b>State</b>
<b>ZipCode</b>

**Referral**

<b>*ApplicantID</b>
<b>ApplicantLName</b>
<b>ApplicantFName</b>
<b>Phone</b>
<b>Email</b>
<b>*JobID</b>
<b>JobDescription</b>
<b>ApplicationDate</b>
<b>EmployeeID</b>
<b>EmployeeLName</b>
<b>EmployeeFName</b>
<b>EmployeeDepartment</b>
<b>ApplicationStatus</b>
<b>ReferralBonus</b>

# First Normal Form (1<sup>st</sup> NF)

## Take to 2<sup>nd</sup> NF Next

**Address**

<b>*AddressID</b>
<b>StreetNumber</b>
<b>City</b>
<b>State</b>
<b>ZipCode</b>

**Referral**

<b>*ApplicantID</b>	
<b>ApplicantLName</b>	
<b>ApplicantFName</b>	
<b>Phone</b>	
<b>Email</b>	
<b>*JobID</b>	
<b>JobDescription</b>	
<b>ApplicationDate</b>	
<b>EmployeeID</b>	
<b>EmployeeLName</b>	
<b>EmployeeFName</b>	
<b>EmployeeDepartment</b>	
<b>ApplicationStatus</b>	
<b>ReferralBonus</b>	

*Partial Dependency*

# Corrected Partial Dependency Conform to 2nd NF

Address	
<b>*AddressID</b>	
StreetNumber	
City	
State	
ZipCode	

Applicant		Job	
<b>*ApplicantID</b>		<b>*JobID</b>	
ApplicantLName		JobDescription	
ApplicantFName			
Phone			
Email			

Referral	
<b>*ApplicantID</b>	
<b>*JobID</b>	
ApplicationDate	
EmployeeID	
EmployeeLName	
EmployeeFName	
EmployeeDepartment	
ApplicationStatus	
ReferralBonus	



# Second Normal Form (2nd NF)

## Take to 3rd NF Next

*Transitive Dependency?*

**Address**

<b>*AddressID</b>
StreetNumber
City
State
ZipCode

**Applicant**

<b>*ApplicantID</b>
ApplicantLName
ApplicantFName
Phone
Email

**Job**

<b>*JobID</b>
JobDescription

**Referral**

<b>*ApplicantID</b>
<b>*JobID</b>
ApplicationDate
EmployeeID
EmployeeLName
EmployeeFName
EmployeeDepartment
ApplicationStatus
ReferralBonus

# Second Normal Form (2nd NF)

## Take to 3rd NF Next

**Address**

<b>*AddressID</b>
StreetNumber
City
State
ZipCode

**Applicant**

<b>*ApplicantID</b>
ApplicantLName
ApplicantFName
Phone
Email

**Job**

<b>*JobID</b>
JobDescription

**Referral**

<b>*ApplicantID</b>
<b>*JobID</b>
ApplicationDate
EmployeeID
EmployeeLName
EmployeeFName
EmployeeDepartment
ApplicationStatus
ReferralBonus

*Transitive Dependency*



# Corrected Transitive Dependency and Conform to 3<sup>rd</sup> NF

**Address**

<b>*AddressID</b>
StreetNumber
City
State
ZipCode

**Applicant**

<b>*ApplicantID</b>
ApplicantLName
ApplicantFName
Phone
Email

**Job**

<b>*JobID</b>
JobDescription

**Referral**

<b>*ApplicantID</b>
<b>*JobID</b>
ApplicationDate
EmployeeID
ApplicationStatus
ReferralBonus

**Employee**

<b>EmployeeID</b>
EmployeeLName
EmployeeFName
EmployeeDepartment

# Need to Implement the Address Rules

**Address**

<b>*AddressID</b>
<b>StreetNumber</b>
<b>City</b>
<b>State</b>
<b>ZipCode</b>

**Applicant**

<b>*ApplicantID</b>
<b>ApplicantLName</b>
<b>ApplicantFName</b>
<b>Phone</b>
<b>Email</b>

**Job**

<b>*JobID</b>
<b>JobDescription</b>

**Referral**

<b>*ApplicantID</b>
<b>*JobID</b>
<b>ApplicationDate</b>
<b>EmployeeID</b>
<b>ApplicationStatus</b>
<b>ReferralBonus</b>

- Need to store the addresses history for an applicant
- Multiple applicants may have the same address

**Employee**

<b>EmployeeID</b>
<b>EmployeeLName</b>
<b>EmployeeFName</b>
<b>EmployeeDepartment</b>

# Implemented the Address Rules

**Address**

<b>*AddressID</b>
StreetNumber
City
State
ZipCode

**Applicant**

<b>*ApplicantID</b>
ApplicantLName
ApplicantFName
Phone
Email

**Job**

<b>*JobID</b>
JobDescription

**Referral**

<b>*ApplicantID</b>
<b>*JobID</b>
ApplicationDate
EmployeeID
ApplicationStatus
ReferralBonus

**ApplicantAddress**

<b>*ApplicantID</b>
<b>*AddressID</b>

**Employee**

<b>EmployeeID</b>
EmployeeLName
EmployeeFName
EmployeeDepartment

# Done with Normalization

**Address**

<b>*AddressID</b>
StreetNumber
City
State
ZipCode

**Applicant**

<b>*ApplicantID</b>
ApplicantLName
ApplicantFName
Phone
Email

**Job**

<b>*JobID</b>
JobDescription

**Referral**

<b>*ApplicantID</b>
<b>*JobID</b>
ApplicationDate
EmployeeID
ApplicationStatus
ReferralBonus

**ApplicantAddress**

<b>*ApplicantID</b>
<b>*AddressID</b>

**Employee**

<b>EmployeeID</b>
<b>EmployeeLName</b>
<b>EmployeeFName</b>
<b>EmployeeDepartment</b>

# What To Do Next?

- Create entities in Design Tool
- Don't add any additional entity or attribute
- Establish relationships between entities
- Pay attention to Multiplicity
- Pay attention to type of relationship
  - Identifying vs Non-Identifying
- Avoid unnecessary relationships
- Label PKs and FKs