



PostgreSQL Project

Small Company Database

Αλέξανδρος Στολτίδης (2824)

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Files and Installation

File Structure

- **Database** or **Database.accdb**: MS-ACCESS Tables, Queries, Forms, Reports and Switchboard
- **Diagrams** (Directory)
 - **ER_Diagram** or **ER_Diagram.erx**: Entity Relationship (ER) Diagram
 - **RDM** or **RDM.draw.io**: Relational Data Mapping (RDM) Diagram
- **Images** (Directory)
 - **Database_Forms** or **Database_Forms.png**: MS-ACCESS Forms
 - **Database_Reports** or **Database_Reports.png**: MS-ACCESS Reports
 - **Database_Tables** or **Database_Tables.png**: MS-ACCESS Tables
 - **ER_basic_notation** or **ER_basic_notation.png**: Basic ER Diagram
 - **ER_min_max** or **ER_min_max.png**: ER Diagram with (min, max)
 - **RDM** or **RDM.png**: Relational Data Mapping Diagram
- **Project Instructions** (Directory)
 - **Instructions** or **Instructions.pdf**: Project Instructions
 - **Installation Guide** or **Installation Guide.pdf**: Installation Instructions for PostgreSQL, ODBC Driver and MS-ACCESS Connection

Installation

For Relational Data Mapping (RDM) Diagrams Install Draw.io or Open From Browser with <https://app.diagrams.net/>

For PostgreSQL and MS-ACCESS Follow the Instructions on **Installation Guide**

Execution

Open Database or Database.accdb with Microsoft Access

Go to Forms→Switchboard, Right Click and Open

If you have an ODBC Installed Run Queries with Pass-Through

Small Company Database

Basic Structure and Data

A company consists of many **Departments**, **Employees** and **Projects**

Department's Attributes
Name

Employee's Attributes
First Name
Last Name
Phone Number

Project's Attributes
Name

Database Relations

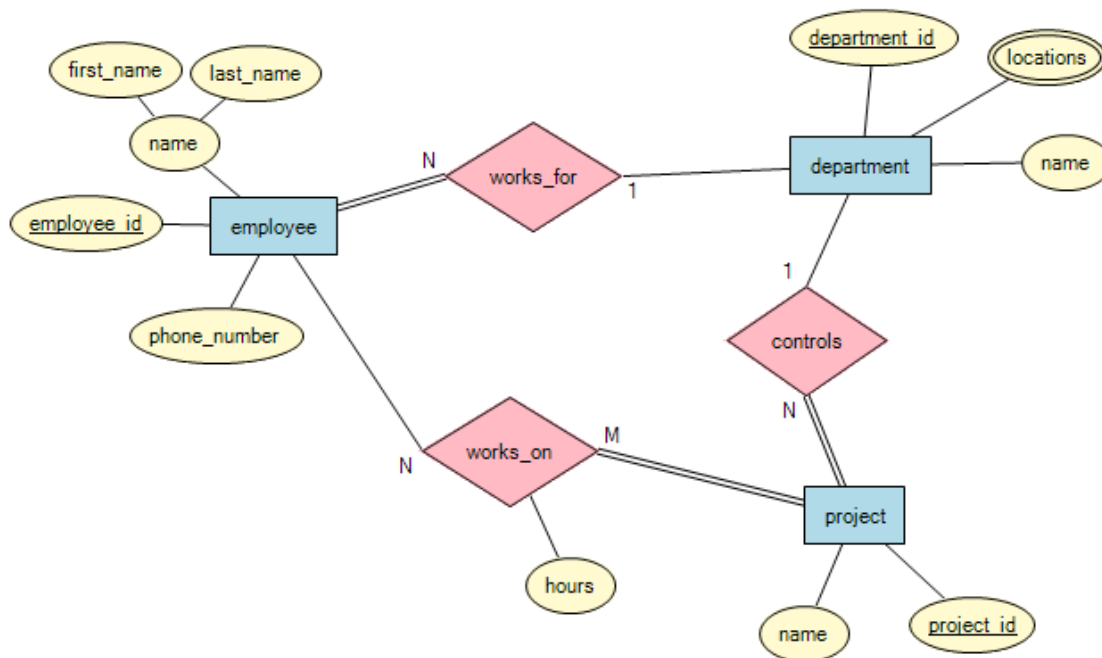
1. A **Department** can, but is not necessary, to have many **Employees** (0, N)
2. A **Department** can, but is not necessary, to control many **Projects** (0, N)
3. An **Employee** must necessarily work for only one **Department** (1,1)
4. An **Employee** can, but is not necessary, to work on Many **Projects** (0, N)
5. A **Project** must be controlled by only one **Department** (1, 1)
6. A **Project** must be developed by at least one **Employee** (1, N)

Entity Relationship (ER) Representation

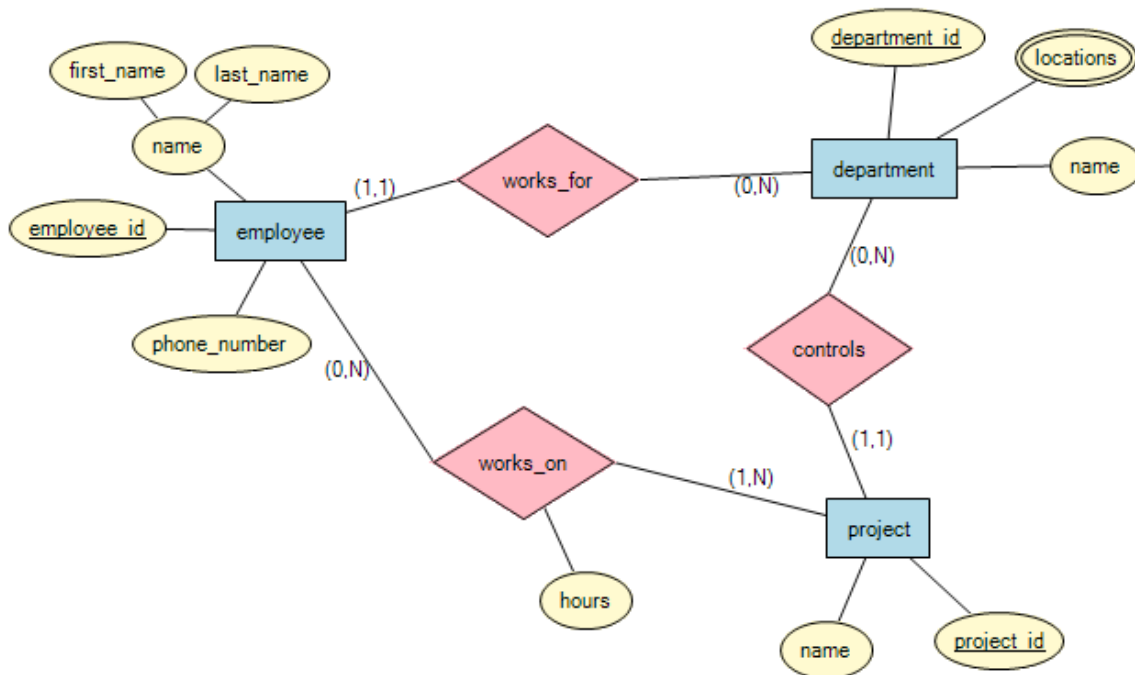
Instructions to Open the ER Diagram

1. On Submit Folder Search for the File **Diagrams/ER_Diagram** or for **Diagrams/ER_Diagram.erx**
2. Download and Launch ER2SQL
3. On **ER2SQL** go to **File** → **Open** and Select the **Diagrams/ER_Diagram** or the **Diagrams/ER_Diagram.erx**

ER Diagram (Basic Notation)



ER Diagram ((min, max) Notation)



Relational Data Mapping

Instructions to Open the Relational Data Mapping Diagram

Download and Install Or Open Online Draw.io from <https://app.diagrams.net/>

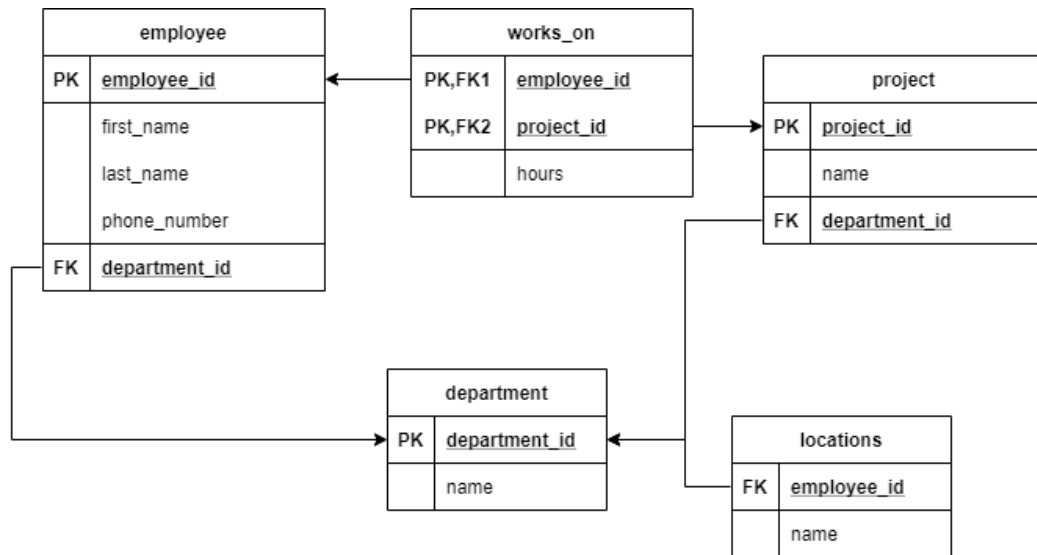
Online Driver

- **Open Existing Diagram** or
- **File** → **Open from** → **Device** and Select **Diagrams/RDM** or **Diagrams/RDM.draw.io**

Downloaded Program

- **File** → **Open** and Select **Diagrams/RDM** or **Diagrams/RDM.draw.io**

Relational Data Mapping Diagram Relations



3NF and BCNF

Employee Table

<u>employee_id</u>	first_name	last_name	phone_number	department_id
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Department Table

department_id	name
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Locations Table

employee_id	name
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Project Table

project_id	name	department_id
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Employees - Projects (works-on) Table

employee_id	project_id	hours
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3NF Criteria

- Must be in 1NF
- There are NO Transitive Dependencies

All Above Tables Indicate that all 3NF Criteria are Valid

- 1) There are no Transitive Dependencies since Non-Prime Attributes Depend Only on Prime Attributes (Primary Keys)
- 2) Are in 1NF
 - All Columns of each Table have Different Column Names
 - Every Cell Can Store Single Values
 - All Inputs in the Same Column have the Same Format

BCNF Criteria

- 1) Must be in 3NF
- 2) If $\mathbf{A} \rightarrow \mathbf{B}$ then \mathbf{A} must be a Super Key
If \mathbf{A} Derives \mathbf{B} and \mathbf{B} is a Prime Attribute \mathbf{A} Can Not be a NON-Prime Attribute

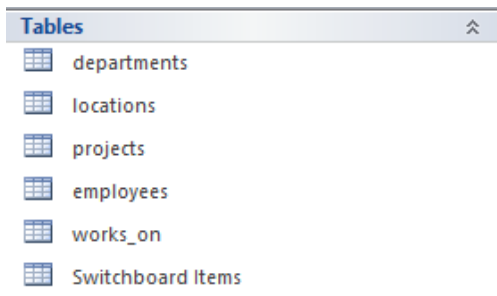
All Above Tables Indicate that all BCNF Criteria are Valid

- 1) All Above Tables are in 3NF
- 2) No Prime Attribute is Derived by a Non-Prime Attribute

Database with MS Access

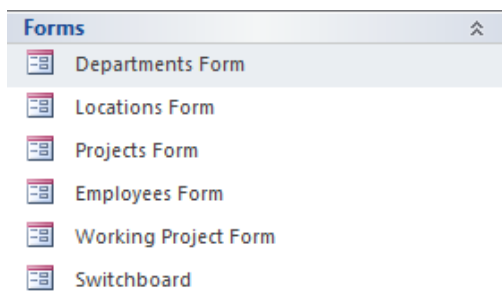
Tables

- **Departments**
- **Employees**
- **Locations** (Attached to **Departments**)
- **Projects**
- Work On (Relationship Between **Employees** and **Projects**)
- Switchboard Items (Used for Switchboard)



Forms

- **Departments Form** to Insert a Department
- **Locations Form** to Insert a Location
- **Projects Form** to Insert a Project
- **Employees Form** to Insert an Employee
- **Working Project Form** to Assign Project to Employee
- **Switchboard** to Control All Forms Above



Reports

- **Employees and Projects:** Displays Employee's Info and the Name of the Project the Employee is working on
- **Employees and Departments:** Displays Employee's Info and the Name of the Department the Employee is working for
- **Departments and Projects:** Displays Department's Name and the Name of the Project the Department Controls
- Departments Table: Displays all Departments
- Locations Table: Displays all Locations
- Projects Table: Displays all Projects
- Employees Table: Displays all Employees



Switchboard and Database

Open Switchboard

On Microsoft Access

1. **Forms** → **Switchboard** (Right Click → Open)
2. Navigate Options Connected to Forms

(Note: Maintain Data Option Feature is to be Added on Future Versions)

Upcoming Update

- Connect Database to a Node.js API with “pg” Driver to get rid of MS-ACCESS
- Implement Delete and Maintain Queries to Accomplish a Complete Database Functionality (CREATE, INSERT, UPDATE, DELETE)
- Create a Trigger to Randomize IDs if they are not Specified, like MongoDB Does
- Create a Super-Class Person to Overlap or Disjoint with the Different Employees the Company may have

Sources and Studying Material

Relational Data Mapping: <https://www.youtube.com/watch?v=CZTkgMoqVss>

ACCESS Forms: <https://www.youtube.com/watch?v=dEaQlrw3CZY>

ACCESS Reports: <https://www.youtube.com/watch?v=1XUeGq80R5Q&t=55s>

ACCESS Switchboard: <https://www.youtube.com/watch?v=NF2GSvzV7qg&t=163s>

3NF: https://www.youtube.com/watch?v=aAx_JoEDXQA

BCNF: <https://www.youtube.com/watch?v=NNjUhvwwOrk&t=103s>