**Database Normalization – AttendCRM**

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**What is Database Normalization?**

Database normalization is the process of structuring a relational database to reduce data redundancy and improve data integrity. It involves dividing large tables into smaller, related tables and defining relationships among them.

We apply normalization in phases, each called a “normal form.”

**1NF – First Normal Form**

**Unnormalized Table (Single flat table with repeated data):**

| **ID** | **Full Name** | **Email** | **Date1** | **Status1** | **Date2** | **Status2** |
| --- | --- | --- | --- | --- | --- | --- |
| 1 | Alice | alice@email.com | 2025-06-20 | Present | 2025-06-21 | Absent |

* Repeating columns (Date1, Date2, etc.)
* Not atomic (multiple values in one row)

**Converted to 1NF:**

| **ID** | **Full Name** | **Email** | **Attendance Date** | **Status** |
| --- | --- | --- | --- | --- |
| 1 | Alice | alice@email.com | 2025-06-20 | Present |
| 2 | Alice | alice@email.com | 2025-06-21 | Absent |

**2NF – Second Normal Form**

**Problem in 1NF:**

* Full Name and Email are repeated.

**Partial Dependency (Still in 1NF):**

* All fields depend on the composite key (email + date), but not completely.

**Break into two tables:**

**Table: Users**

| **User ID** | **Full Name** | **Email** |
| --- | --- | --- |
| 1 | Alice | alice@email.com |

**Table: Attendance**

| **ID** | **User ID** | **Attendance Date** | **Status** |
| --- | --- | --- | --- |
| 1 | 1 | 2025-06-20 | Present |
| 2 | 1 | 2025-06-21 | Absent |

**3NF – Third Normal Form**

**Goal:**

* Remove transitive dependencies.
* Ensure each non-key attribute depends only on the primary key.

**Final Tables:**

**admin**

| id | username | password (hashed) |

**users**

| **id** | **full\_name** | **email** | **username** | **password** | **role** | **status** | **profile\_picture\_url** | **login\_type** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |

* profile\_picture\_url: Stores URL or filename of user's profile photo
* login\_type: Indicates whether user logged in using system credentials, Google, or Facebook

**attendance**

| **id** | **user\_id** | **attendance\_date** | **status** | **remarks** | **marked\_at** |
| --- | --- | --- | --- | --- | --- |

* Duplicate attendance entries for the same user and date are prevented
* Each user can mark attendance once per day

**Conclusion**

Database normalization helps build a clean, scalable schema. The AttendCRM system is normalized to 3NF for:

* Data integrity
* Efficient storage
* Flexibility to support features like profile pictures and social logins
* Prevention of duplicate attendance entries