# STAT 624 ASSIGNMENT- NORMALIZE THIS!
# GROUP 30

*Vedang Gupte* *UIN-231002609*
*Srishti Rath* *UIN-532008700*
*Hemanth* *UIN-531006073*
*Sneha Mishra* *UIN-733000826*
*Bingwen Liu* *UIN-816005959*

**1. EventLog violates the first, second, and third normal form. For each level of normalization, explain why EventLog is in violation. Be specific.**

1NF Violation:
1NF is nothing but all the values in each cell of the table should be atomic, and the table shouldn't have repeating groups. In the event log table, the first normal form is violated in ComponentFailed1, ComponentFailed2, and ComponentFailed3. These three columns have the same type of information, and they all have multiple values in each cell. The date of installation and the component itself are two different pieces that should be in separate columns to satisfy 1NF.

2NF Violation:
2NF requires that a non-key attribute should not be dependent on only a part of the primary key. The primary key is composed of (FailureTime+RepairTime+RepairTechID) as given. However, the information about the technicians like RepairTechName and RepairTechSkillLevel can be inferred from only the RepairTechID. It is not dependent on the FailureTime and RepairTime. Thus, it is dependent on part of the primary key and does not satisfy 2NF.

3NF Violation:
3NF requires that there should not be any transitive dependency, and non-key attributes should only be functionally dependent on the primary key. However, the column MultiComponentFailure is dependent on the values in the columns ComponentFailed1, ComponentFailed2, and ComponentFailed3. It is derived from these columns, hence violating 3NF.

**2.** Create a collection of tables representing all of the data in EventLog that satisfies the first, second, and third normal forms. All data in the EventLog table should be represented somewhere in your collection of tables, but you can remove any redundant information. Provide complete tables with all of the rows and columns filled in, not just the names of the columns.

| Primary |
| --- |
| Foreign |

**Technicians**

| RepairTechID | RepairTechName | RepairTechSkillLevel |
|---|---|---|
| 73 | Amabilia Leona | Advanced |
| 527 | Gabrijela Smith | Intermediate |
| 8891 | Gautam Nataliya | Beginner |

**Components**

| ComponentID | InstallationDate |
|---|---|
| A | 12/03/1995 |
| B | 07/04/1996 |
| C | 08/23/2005 |

**Events**

| EventID | RepairTechID | FailureTime | RepairTime |
|---|---|---|---|
| 1 | 73 | 12/02/18 2:34 AM | 12/18/18 3:17 PM |
| 2 | 527 | 12/02/18 2:34 AM | 12/18/18 3:17 PM |
| 3 | 73 | 03/23/19 4:46 PM | 04/23/19 10:55 AM |
| 4 | 73 | 08/30/19 12:58 AM | 09/07/19 9:14 PM |
| 5 | 8891 | 08/30/19 12:58 AM | 09/26/19 5:28 AM |
| 6 | 527 | 12/03/19 1:56 AM | 12/29/19 1:40 AM |

**EventComponent**

| **EventComponentID** | **EventID** | **FailedComponent** |
|---|---|---|
| 1 | 1 | A |
| 2 | 1 | C |
| 3 | 2 | B |
| 4 | 3 | B |
| 5 | 3 | A |
| 6 | 3 | C |
| 7 | 4 | C |
| 8 | 4 | B |
| 9 | 5 | A |
| 10 | 6 | B |
| 11 | 6 | A |

**3**. For each level of normalization, explain the specific steps you have taken to bring your new collection of tables into compliance with the first, second, and third normal form. Be specific.

First, we noticed that the table has non-atomic values which violate the 1NF form.

**To convert this to 1NF-**

- We separated the DateInstalled into a separate table, called Components. This has the ComponentID as the Primary Key and DateInstalled. This ensures atomicity
- We removed the repeating group of ComponentFailed and put the data in a single column

**To convert this to 2NF-**

- We removed the partial dependency on RepairTechName and RepairTechSkillLevel on RepairTechID by creating a seperate Technicians table. This has the RepairTechID as the Primary Key, and the other columns are RepairTechName and RepairTechSkillLevel.

**To convert this to 3NF-**

- We created an EventID for the Events table containing RepairTechID, FailureTime, and RepairTime.
- We removed the MultiComponentFailure column
- The data in the MultiComponentFailure column was represented in a new table named EventComponent, which contains the EventComponentID as Primary Key, along with EventID and FailedComponent. This maps the relationship between one event and multiple components

**4**. Identify the primary keys for each table in your new collection of tables. Composite primary keys are acceptable.

**Table- Technicians**

Primary key - RepairTechID

**Table- Components**

Primary key- ComponentID

**Table- Events**

Primary key-EventID

**Table- EventComponent**

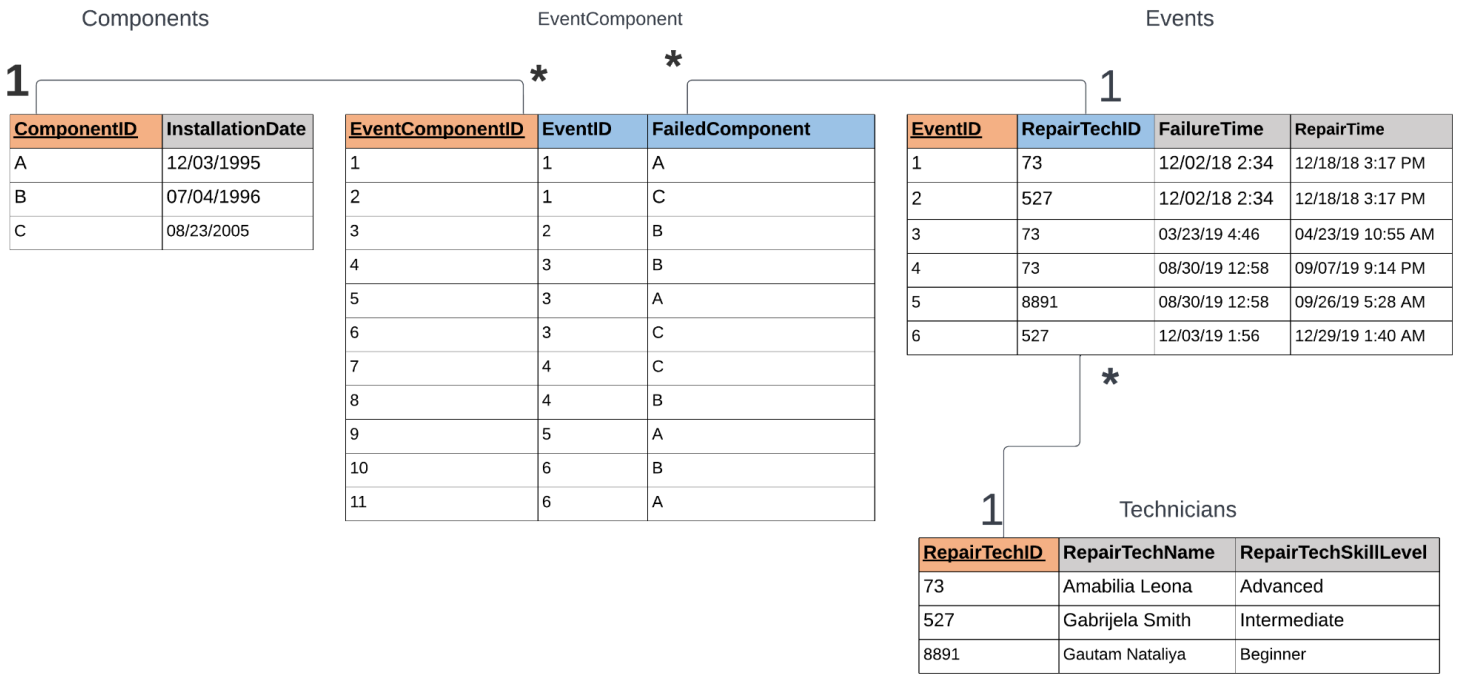
Primary key-EventComponentID

**5.** Identify the types of relationships (one-to-one, one-to-many, many-to-many) among the fields in your tables. Be specific about which field corresponds to the 'one' vs. 'many'. Use the `primary key' and `foreign key' terminology when appropriate.

- RepairTech-Events
  - One to Many - One RepairTechID can have multiple EventIDs assigned to them
  - Foreign Key - RepairTechID is the foreign key in Events table

- Events-EventComponent
  - One to Many- One EventID can have multiple EventComponentID
  - Foreign Key - EventID is the primary key in Events which is a foreign key in EventComponent

- Component- EventComponent
  - One to Many- One ComponentID can have multiple EventComponentID
  - Foreign Key - ComponentID is the foreign key in EventComponent




| ComponentID | InstallationDate |
|---|---|
| A | 12/03/1995 |
| B | 07/04/1996 |
| C | 08/23/2005 |

| EventComponentID | EventID | FailedComponent |
|---|---|---|
| 1 | 1 | A |
| 2 | 1 | C |
| 3 | 2 | B |
| 4 | 3 | B |
| 5 | 3 | A |
| 6 | 3 | C |
| 7 | 4 | C |
| 8 | 4 | B |
| 9 | 5 | A |
| 10 | 6 | B |
| 11 | 6 | A |

| EventID | RepairTechID | FailureTime | RepairTime |
|---|---|---|---|
| 1 | 73 | 12/02/18 2:34 | 12/18/18 3:17 PM |
| 2 | 527 | 12/02/18 2:34 | 12/18/18 3:17 PM |
| 3 | 73 | 03/23/19 4:46 | 04/23/19 10:55 AM |
| 4 | 73 | 08/30/19 12:58 | 09/07/19 9:14 PM |
| 5 | 8891 | 08/30/19 12:58 | 09/26/19 5:28 AM |
| 6 | 527 | 12/03/19 1:56 | 12/29/19 1:40 AM |

| RepairTechID | RepairTechName | RepairTechSkillLevel |
|---|---|---|
| 73 | Amabilia Leona | Advanced |
| 527 | Gabrijela Smith | Intermediate |
| 8891 | Gautam Nataliya | Beginner |