DATABASE SYSTEMS PROJECT REPORT

SYSTEM ANALYSIS:

BACKGROUND RESEARCH:

This project aims to develop an inventory system for tracking workstations, laptop computers, and the software installed on these computers used by employees in a large multinational consulting company. The system analysis included understanding the company's requirements, the existing practices regarding inventory management and industry standards for database designing.

KEY ISSUES:

The main challenges or issues that were kept in mind to ensure the effectiveness of the database system are listed below.

1. **DATA ACCURACY:** The data entered and stored in the database must be accurate and updated regularly to have up-to-date information. This is extremely crucial for the successful operation of a database system as inaccurate data can lead to disturbances in decision-making and operations of the company.

2. **SCALABILITY:** The database system must be able to accommodate the growing inventory and staff of the company. This is extremely important in the long run as the company's growth would involve increase in workforce and inventory. Even with the increase in this, the database must be able to handle large amounts of data without any significant performance degradation.

3. **EASY TO NAVIGATE:** The interface must be easy to navigate for easy data entry and retrieval by employees of the company. This will reduce errors and streamline the work process.

4. **EFFICIENT AND ACCURATE QUERIES:** Efficient queries regarding retrieval of certain inventory and employee data is crucial to make sure that users can get the data that they want easily. This enhances the overall user experience.

BUSINESS RULES:

The business rules that were followed while making the ER Diagram and the database are as follows:

1. Each workstation or laptop must have a unique inventory tag number.
2. Workstation or Laptop can be assigned to multiple employees over time.
3. Software packages can be installed in multiple laptops.
4. Employees must be associated with at least one workstation or laptop.
5. Only personnel with authorization must be able to access, enter and modify data.

DESCRIPTION OF DATABASE IMPLEMENTATION:

DATABASE MODEL:

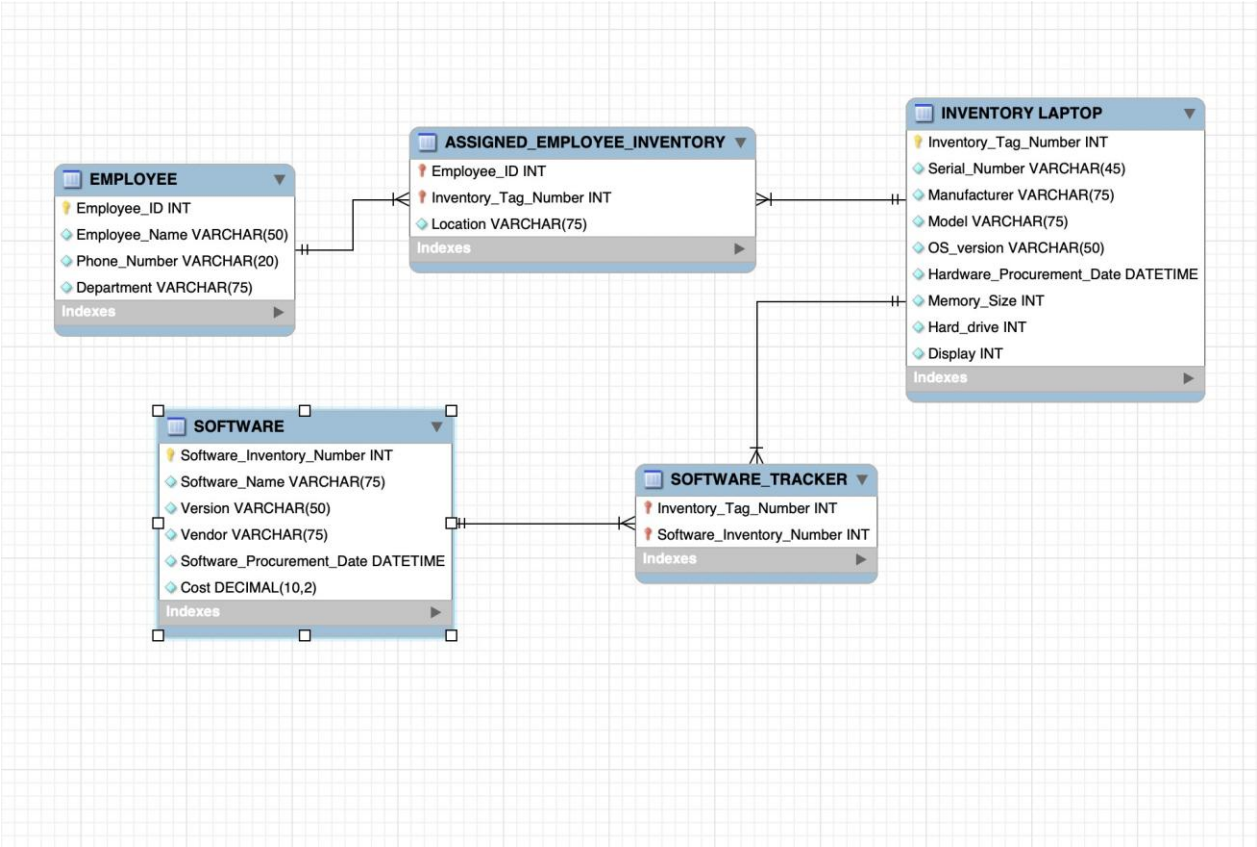
The database model consists of five tables namely:

EMPLOYEE, ASSIGNED_EMPLOYEE INVENTORY, INVENTORY LAPTOP, SOFTWARE, SOFTWARE_TRACLER.

These tables are designed based on the identified entities in the case and their relationships.

The figure below is the ER diagram which helps us identify the relationships and the tables.

ER DIAGRAM:



DESIGN AND DEVELOPMENT:

1. An ER diagram was created by first identifying all the entities and keeping in mind the business rules of the case. The foreign keys, and primary keys were identified in all the tables and the relation was studied between the tables using the ER diagram.
2. The database tables were then created using SQL commands, with appropriate data types.
3. Relationships were established between the tables using the foreign keys.
4. Sample queries were developed for the scenarios mentioned in the case study to retrieve inventory and employee data.

NORMALIZATION OF TABLES:

The process of normalizing the tables is done to eliminate redundancy of data and also improve the integrity of the data. It is observed that the following are the relationships between the tables in the database:

1. EMPLOYEE and ASSIGNED_EMPLOYEE_INVENTORY tables exhibit a one to many relationship. This represents the scenario where one employee can be assigned to several laptops. Each laptop is assigned to only one employee at a time.
2. INVENTORY LAPTOP and ASSIGNED_EMPLOYEE_INVENTORY tables exhibit a one to many relationship. This means that each laptop in the inventory can be assigned to multiple employees over time, meaning changes in user/usage.
3. INVENTORY LAPTOP and SOFTWARE TRACKER tables exhibit a one to many relationship. This is the scenario where each laptop can have multiple software packages installed. Each software package is tracked separately for each laptop.
4. SOFTWARE and SOFTWARE_TRACKER tables exhibit a one to many relationship.

This means each software package can be tracked multiple times in the software tracker which would reflect installations in different laptops. It means one software package can be installed on multiple laptops.

DEVELOPMENT OF SAMPLE QUERIES:

1. Displaying inventory tag number and hardware details of a computer assigned to a particular employee.

The code below when run gives us the result that John Doe was assigned to inventory tag

number 101, serial number SNOO1, manufacturer model XPS 15, OS_version Windows 10, Hardware_Procurement ID 2023-01-15, memory size 16, hard drive 512 and display 15

```
13
14 •  SELECT
15        INV.Inventory_Tag_Num,
16        INV.Serial_Number,
17        INV.Manufacturer,
18        INV.Model,
19        INV.OS_Version,
20        INV.Hardware_Procurement_Date,
21        INV.Memory_Size,
22        INV.Hard_Drive,
23        INV.Display
24    FROM
25        INVENTORY_LAPTOP INV
26    JOIN
27        ASSIGNED_EMPLOYEE_INVENTORY AEI ON INV.Inventory_Tag_Num = AEI.Inventory_Tag_Num
28    JOIN
29        EMPLOYEE EMP ON AEI.Employee_ID = EMP.Employee_ID
30    WHERE
31        EMP.Employee_Name = 'John Doe'; -- Replace 'John Doe' with the employee's name
32
```

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Result Grid Filter Rows: Search Export:

Inventory_Tag_Num	Serial_Number	Manufactur...	Model	OS_Version	Hardware_Procurement_D...	Memory_Size	Hard_Drive	Display
101	SN001	Dell	XPS 15	Windows 10	2023-01-15 00:00:00	16	512	15

2. Listing all software packages installed on a specific computer.

The result below shows us that the computer with inventory tag number 101 had three software packages installed in it namely Microsoft Office 365, Norton Security, Tableau Desktop with

versions 2023, 2023, 2023.1 and vendors Microsoft, NortonLifeLock and Tableau Software respectively.

```
/*
   2. List All Software Packages Installed on a Specific Computer
This query lists all software packages installed on a computer identified by its inventory tag number. Replace 101
SELECT: Chooses the software name, version, and vendor to display.
FROM: Starts selection from the SOFTWARE table.
JOIN: Links the SOFTWARE table with SOFTWARE_TRACKER using the Software_Inventory_Number, which ensures that only
WHERE: Focuses the query on a computer with a specific Inventory_Tag_Num, which in this example is 101.
   */
    SELECT
    SFT.Software_Name,
    SFT.Version,
    SFT.Vendor
FROM
    SOFTWARE SFT
JOIN
    SOFTWARE_TRACKER ST ON SFT.Software_Inventory_Number = ST.Software_Inventory_Number
WHERE
    ST.Inventory_Tag_Num = 101; -- Replace '101' with the specific inventory tag number
```

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Result Grid Filter Rows: Search Export:

Software_Name	Version	Vendor
Microsoft Office 365	2023	Microsoft
Norton Security	2023	NortonLifeLock
Tableau Desktop	2023.1	Tableau Software

3. Finding out which computer model is the most popular

It is observed from the result that the most popular computer model is Macbook pro 16” with a total_count of 2.

```
    3. Find Out Which Computer Model is the Most Popular
This query determines which computer model is the most popular based on the number of assignments to employees.

SELECT: Selects the computer model and counts the number of occurrences.
FROM: The data is pulled from the INVENTORY_LAPTOP table.
GROUP BY: Aggregates the data by the model of the laptops.
ORDER BY: Arranges the results in descending order based on the count of each model.
LIMIT: Restricts the output to just the most popular model.
    */

    SELECT   Model, COUNT(*) AS Total_Count
FROM
    INVENTORY_LAPTOP
GROUP BY
    Model
ORDER BY
    Total_Count DESC
LIMIT 1;
```

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Result Grid | Filter Rows: Search | Export: | Fetch rows:

Model	Total_Count
MacBook Pro 16"	2

4. Listing top 3 software packages installed in the company.

The result helps us identify that the top three software packages installed in the company are Microsoft Office 365, Adobe Photoshop, and AutoCAD with an installation count of 3,3 and 3 respectively.

```
4. List Top 3 Software Packages Installed in the Company
This query identifies the top 3 software packages installed in the company based on the number of installations.

SELECT: Selects the software name and counts the installations.
FROM: Starts from the SOFTWARE table.
JOIN: Links SOFTWARE to SOFTWARE_TRACKER to consider only installed software.
GROUP BY: Groups the results by software name.
ORDER BY: Sorts the software names by the number of installations, in descending order.
LIMIT: Limits the output to the top three software packages.
*/

SELECT
    SFT.Software_Name,
    COUNT(*) AS Installation_Count
FROM
    SOFTWARE SFT
JOIN
    SOFTWARE_TRACKER ST ON SFT.Software_Inventory_Number = ST.Software_Inventory_Number
GROUP BY
    SFT.Software_Name
ORDER BY
    Installation_Count DESC
LIMIT 3;
```

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Result Grid | Filter Rows: Search | Export: | Fetch rows:

Software_Name	Installation_Cou...
Microsoft Office 365	3
Adobe Photoshop	3
AutoCAD	3

DATA SOURCES:

The data regarding the employee records, workstation/laptop inventory and software inventory were collected online.

FINDINGS:

Our findings involved getting an understanding about the most popular software packages, and computers. We could also find out the number of software packages installed in a particular

computer and also the details about the said software. Also, we found out about what computer was assigned to which employee. This gives us a complete clear understanding of the workflow in the company.

Details of a software installation assigned to an employee:

John Doe was assigned inventory tag number 101, serial number SNOO1, manufacturer model XPS 15, OS_version Windows 10, Hardware_Procurement ID 2023-01-15, memory size 16, hard drive 512, and display 15.

Details about which software packages were installed in a particular computer:

The computer with inventory tag number 101 had three software packages installed in it namely Microsoft Office 365, Norton Security, Tableau Desktop with versions 2023, 2023, 2023.1 and vendors Microsoft, NortonLifeLock and Tableau Software respectively.

Details about the most popular computer:

The most popular computer model is Macbook pro 16” with a total_count of 2.

Details about the top three software packages in the company:

The top three software packages installed in the company are Microsoft Office 365, Adobe Photoshop, and AutoCAD with an installation count of 3,3 and 3 respectively.

REVIEW ON DATABASE INTEGRITY AND SECURITY POLICY:

DATA INTEGRITY:

To ensure data integrity the following rules were implemented:

1. Normalization techniques were used in the making of the database to ensure minimal data redundancy and ensure data consistency.

2. Only entering valid and accurate data can ensure data validation helps in better accuracy and understanding of data.

3. Utilization of foreign key constraints ensured that the data was consistent across the database.

SECURITY POLICY:

1. Access to employee records, inventory details, and software licenses should be granted only to authorized personnel in the company.

2. User authentication techniques like passwords, biometrics etc can be enforced to identify the users accessing the database.

3. Network security measures like firewalls can be implemented to protect the database from external threats.

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