Milestone 3: Systems Design

ITAM Systems Design

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IFT 540: Info Systems Development

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Background

Problem Statement

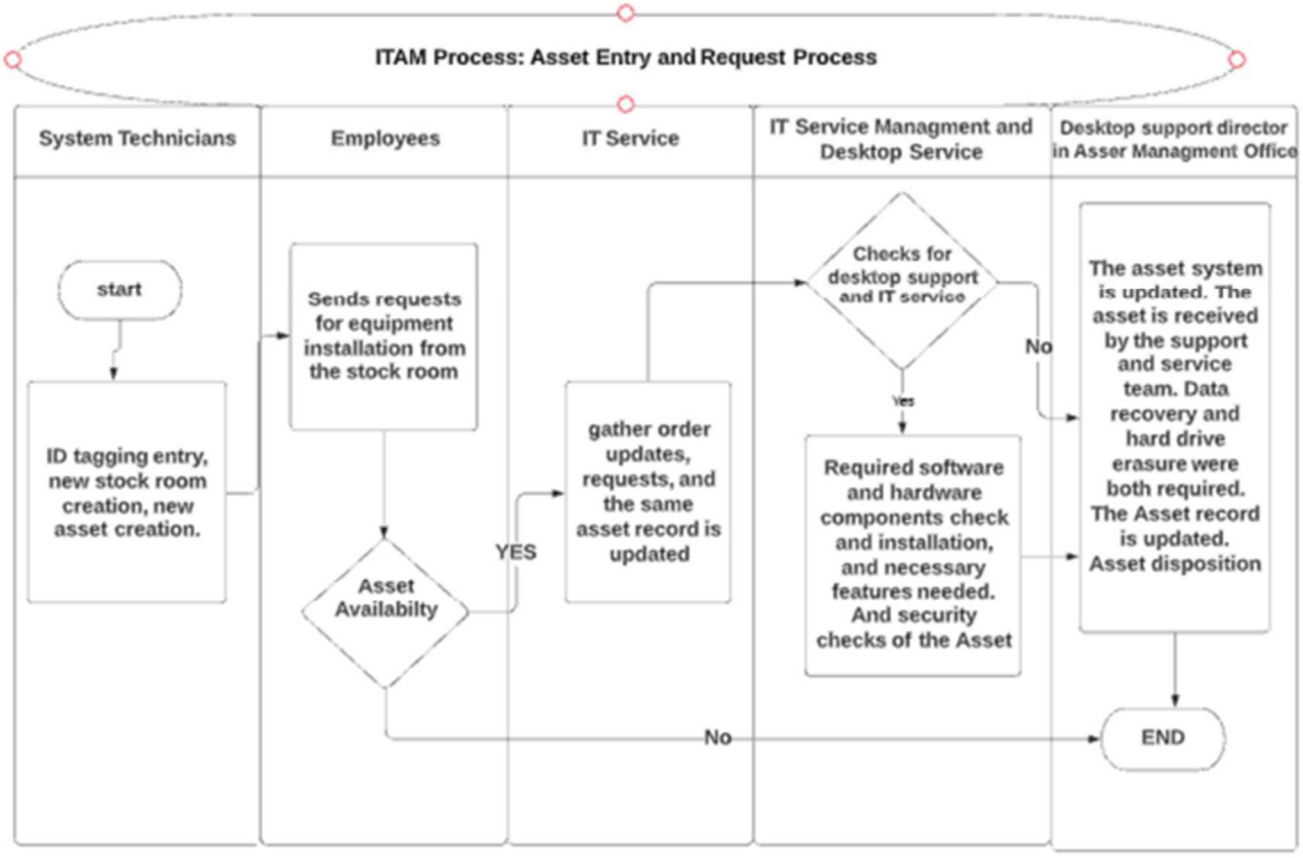
The current strategy involves recording assets in distributed excel spreadsheets that are managed by multiple entities. This approach of storing data lacks the consistency and regularity required to produce executive-level dashboards that are also cost-effective. Because the data is input manually, there is a high risk of errors in data entry, validation, and reporting. There is no established system for maintaining the asset's status and tracking the quantity of assets available in the stockroom. The current security system is ineffective at limiting access to the stockroom and role-based access for data interaction.

Technology Solution

To effectively tackle the shortcomings of manually maintaining the database, the asset management system can be completely automated which reduces human errors such as data entry and validation in the asset management system, this in-turn helps in data delivery and storage with the help of ITAM procedure. This technology employs effective ways for securing the data contained in the repository, as well as managing the information flow and tracking the stockroom's assets.

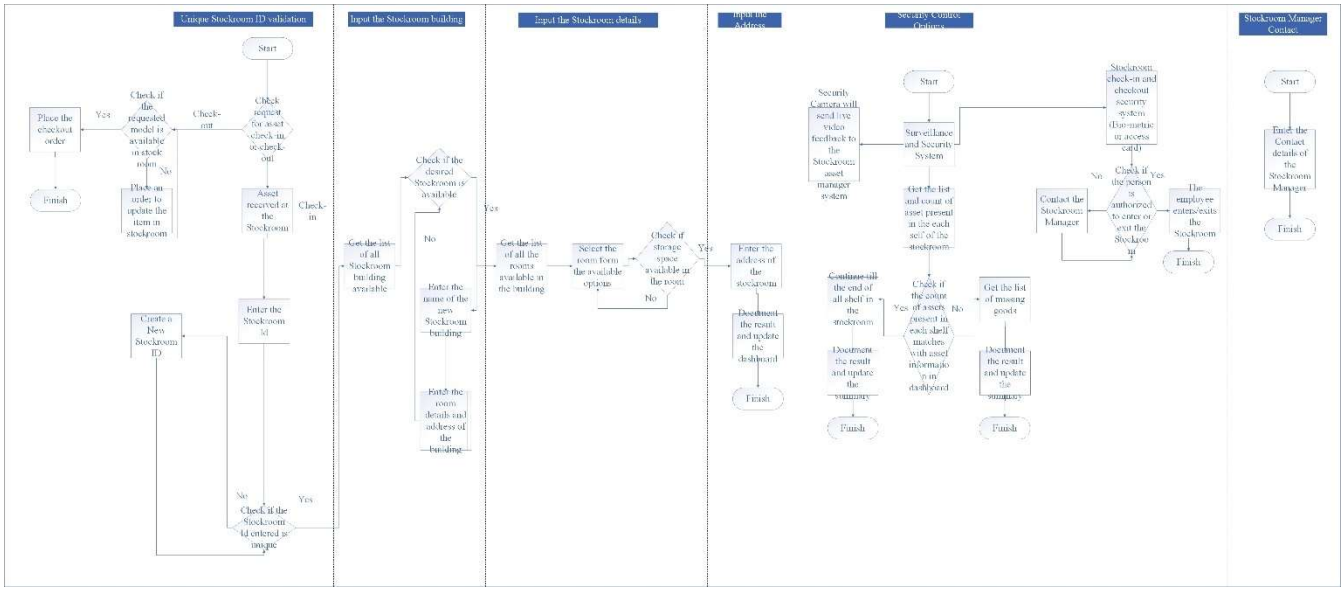
Process Maps

Serial Asset Tracking and Asset entry process



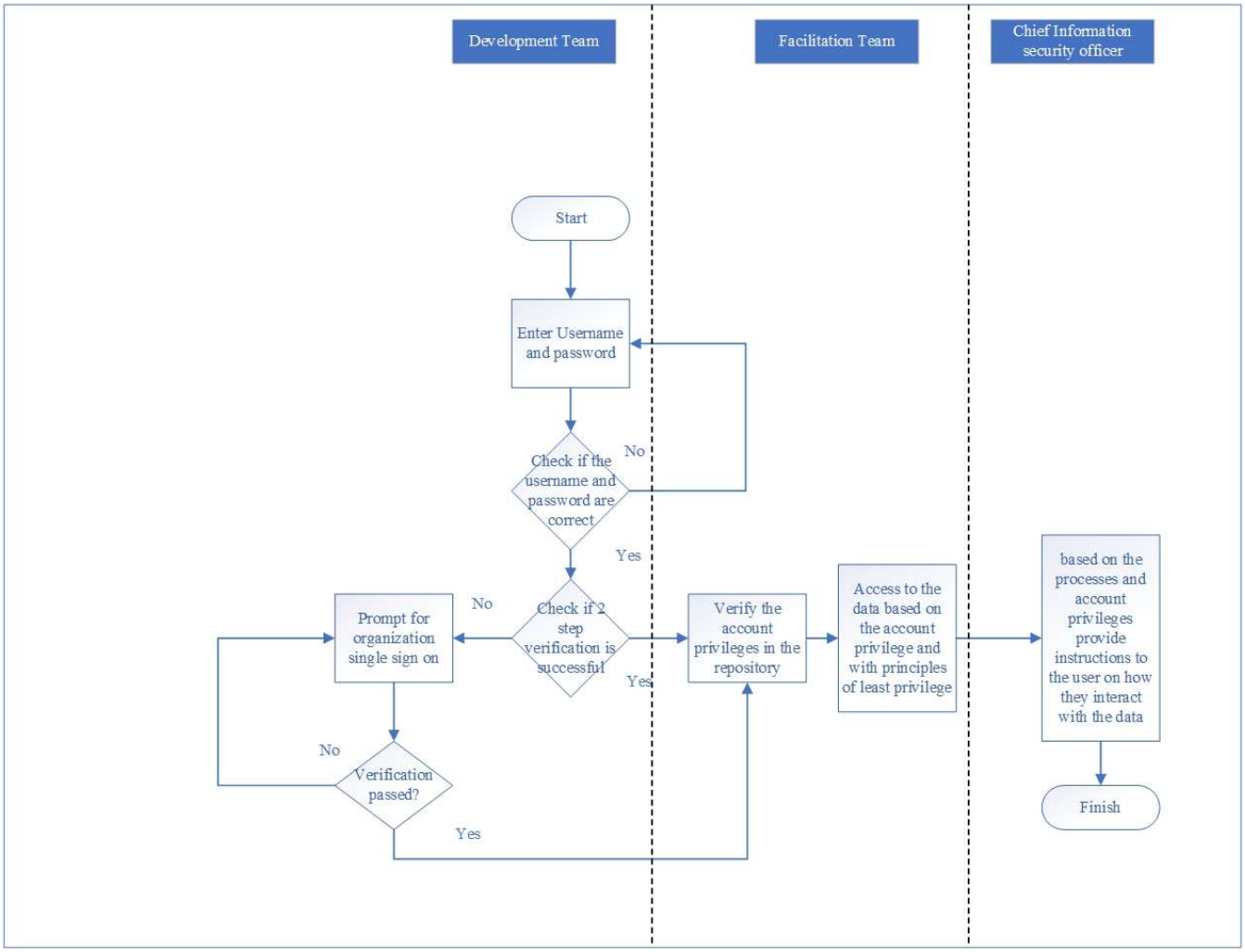
The system will allow the employees to select the stockroom in which they wish to store the assets. Employees will be able to choose an asset through the system and system will allow for changes in asset condition (new, good, fair, and unusable), as well as status (like availability, on order, lost or stolen, retired). The request will be sent by the system, A technician's user interface for completing the request. A fulfillment process flow to track activity completion and requests for pickup will be communicated to customers. The system will provide updates on asset review and assignment and will maintain an up-to-date inventory of stock room locations (IT Asset Management: It's all about Process, n.d.).

Stockroom Management and Request process



The stockroom analyzes each request to determine whether it is for asset check-in or checkout. If the request is for asset check-in, the asset is assigned a unique stockroom ID and the information of the room where it is held, as well as the building's address, are logged. When an asset checkout request is received, the system checks to see if the asset is in the inventory; if it is, the system will successfully complete the processes necessary to give the asset to the user; if it is not, a request will be raised to update the stockroom with the item. Security and surveillance systems are employed to keep the stockroom secure and trace any changes made to the repository's contents. The Stockroom manager's contact information is entered so that he can be contacted for assistance.

System Security Function



The organization's employee should input the username and password to access the repository's data; if the username and password are correct, the system will determine the account's privileges and policies and then provide the appropriate access level data depending on the account privileges. If the username and password are incorrect, the system will redirect the employee to the organization's single sign-on page and unable to access the data until the account is confirmed correctly (System Security, 2021, para. 8).

Functions and Requirements Table

FUNCTION	REQUIREMENTS
Serial Asset Tracking and Asset entry process.	• Asset states to see the status of the order • 'In use', 'available', 'on order', 'lost'& 'stolen' are specified in the status of order • Asset management life cycle is aligned to asset state. • Unique identifiers to cancel out the duplication of data • An interface to select model, stockroom if in stock, if it is assigned to in use. • All the entries and modification of entries should be kept in a repository for all the data to reside. • Equipment to affix serial number on the asset • Hardware and software to read the serial number and asset tags is required • All the users should be connected to a centralized server
Stockroom Management and Request process.	• The stockroom number must be set up in the standard Enterprise structure - made up of five characters, three of which are numbers, and two are used to describe the stockroom. • A platform for the submission of requests should be built. • One stockroom number can be used in different buildings, but one building can't have more than one stockroom number. • The layout of the building and the list of all the rooms in the building must already be in the system. If the room is new, the employee or the stockroom manager should enter the details manually. • A cloud space is required to keep the track of assets are on each shelf in the Stockroom and summary dashboard with the number of assets available. • All the people who work in the stockroom will have to set up an account and choose

	a type of security control, whether physical or digital. • The Stockroom manager will have admin access to a database that has information about each room and there should be one stockroom manager for every building and they will have to check the dashboard to see if there have been any changes to the data.
System Security Function	• Employees must be granted access to the organization's single sign-on solution. • The system should be developed so that it complies with all of the organization's security policies and requirements for enterprise security, as well as with applicable government regulations. • The system's security should be capable of identifying malware, denial of service attacks, and preventing unauthorized processes from accessing system resources. • The system should support a high user traffic.

User Interface

1. Profile Management

Description

Profile Management plays the important role in this application as it deals two of the main functions –Role based control access and Security Measures. The application starts by showing user the name of the company and version of the application software (Fig 1) being used. The user is then redirected to a login screen asking for Employee Id and password with two options of signing in for existing users and signing up for new users (Fig 2). Every employee ID is already assigned to one of different access levels based on their roles in the company. So, users of different access levels will be redirected to different pages when logging in with their employee ID. For the first time users who select the option of Sign up are taken to a sign up page where they need to provide details of their Name, Contact Number, Email, Address, DOB and set a password (Fig 3). The user then has to verify their Phone number for Two factor authentication and Email to change or reset their password. After a user sign in with heir employee ID and password, they have to go through a Second Verification in the form of Two factor authentication (Fig 4). This can be done in either of the 3 ways available with options to change or add a new device for second authentication. The users can go through by receiving a notification or a call on their device. Successful Login directs the users to the dashboard screen of their respective roles.

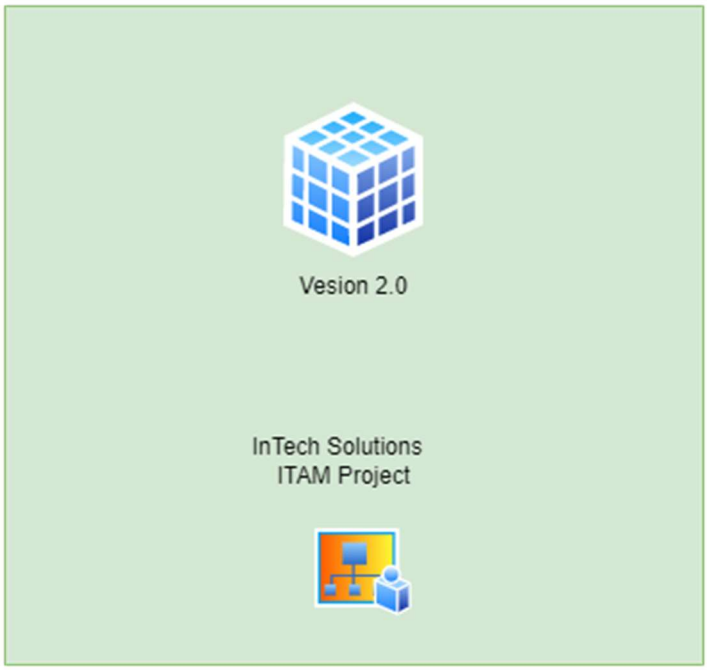


Figure 1: Asset Management Software

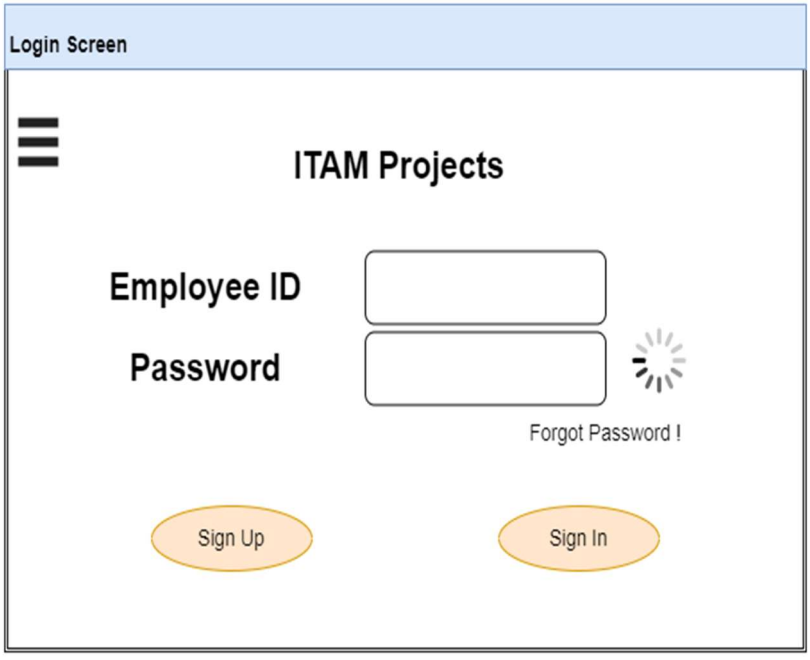


Figure 2: Login Screen

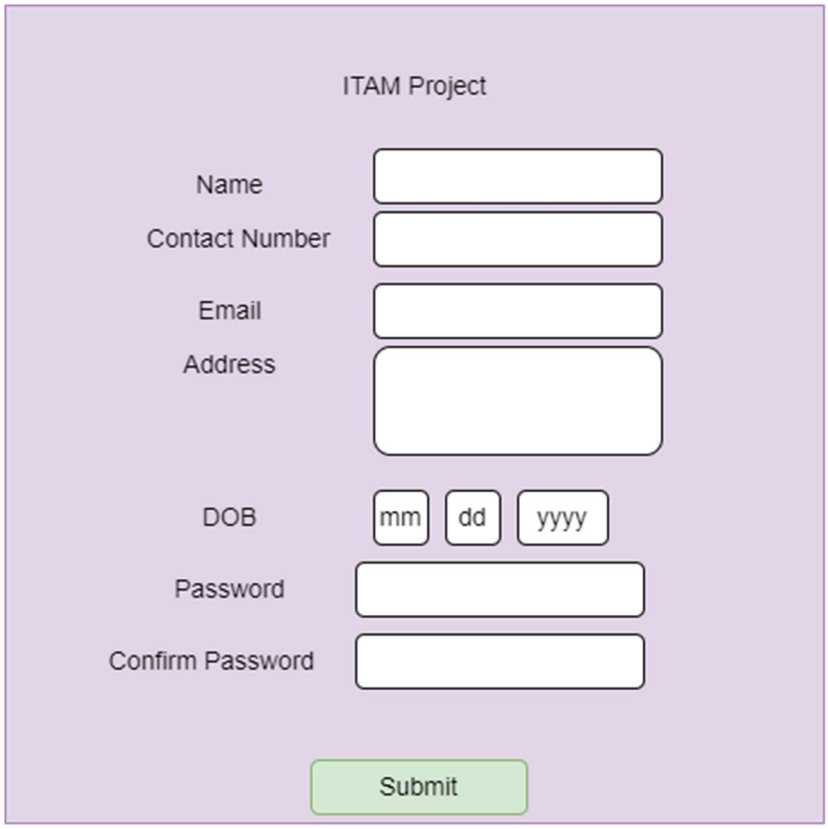


Figure 3: Sign up Page

Figure 4: Two Factor Authentication

2. Asset Operation Management

Description

The Users with asset Manager level access will be led to the Dashboard as shown below (Fig 5). The page displays information such a total asset count, the cost of total assets, Required number of assets and orders for assets. The Asset performance is shown in the form of a visually distinctive graph and categories of different assets is shown in the form of a pie chart. The logs of the employees can be at the bottom of the screen. There are different options available to the manager at the left of the screen where they can perform action like adding assets, check reports and messages, access media and cloud storage and view employee logs (Fig 6). By using the Add asset option the user will be directed to Asset Management Page (Fig 7). The asset manager can update or delete an asset by using this interface.

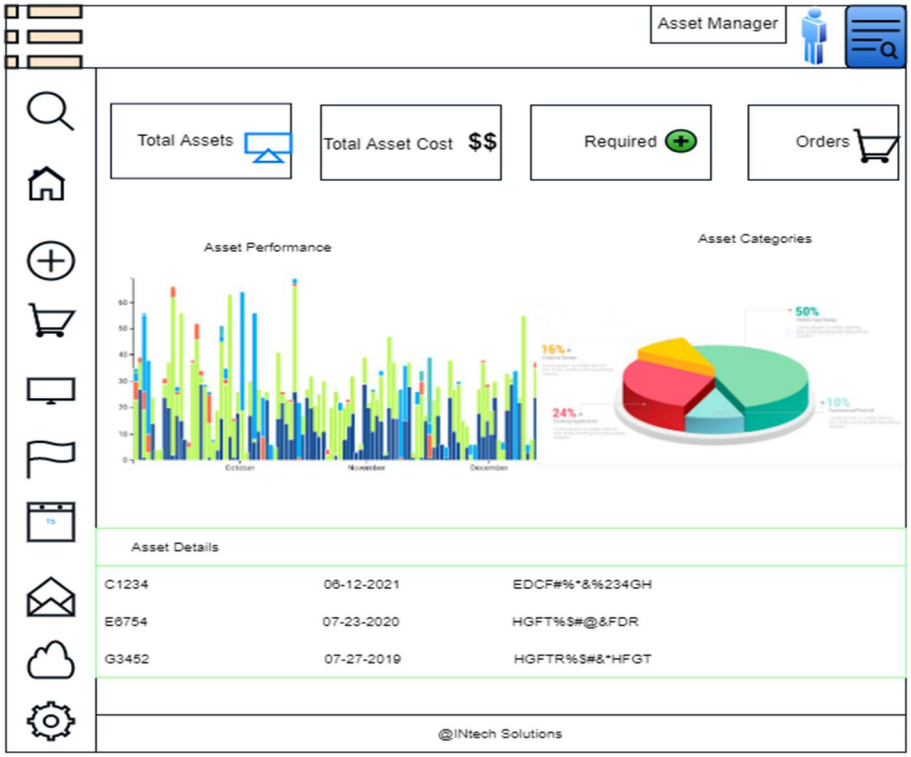


Figure 5: Asset Dashboard

Figure 6: Employee logs

3. Asset Entry Management

Description

The System technician manger has also same user screen as asset manager with additional feature of adding an asset. By using the Add asset option the user will be directed to Asset Management Page (Fig 7). The System Manager can use the add asset option on this page to redirect to a new interface where he needs to provide the details of new asset (Fig 8). He needs to enter the asset ID consisting of product number and asset tag, asset name, asset version and also the details of to whom the asset is assigned to. There are also technical details drop down on the right side of screen

where additional details about the asset can be added. A confirmation mail is also sent to the registered Email address of the system manager before the asset is added.

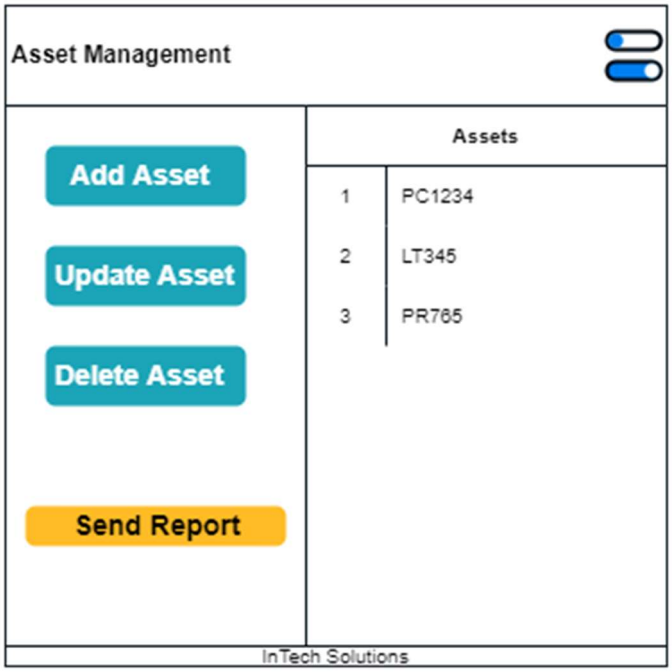


Figure 7: Asset Management Page

Figure 8: New Asset Details

4. Stockroom Management

Description

The dashboard for the stockroom manager is as shown below (Fig 9). It shows the week's statistics of total assets, new assets, the usage time and new issues in the form of a visually distinctive horizontal bar graph. The dashboard also displays a line graph indicating stockroom usage space. The employee logs can be viewed at the bottom of the screen. The options provided at the side are similar but the stock room manager has the option of stock room management.

The option of add stockroom directs the manager to a new page (Fig 10). The manager has the option of adding a new stockroom and updating or deleting an existing one. This page also displays the existing stockrooms their details and any issues related to them. When a new ticket for an asset is generated, it tells the stockroom manager about the new asset or about the issues of assets in the stockrooms.

The stockroom manager is redirected to a new interface to add a stockroom (Fig 11). The details about the new stockroom are to be added by the manager. A Unique stockroom Id need to be entered. The manger also needs to provide details like the stockroom name, address, the building in which it is located and a picture of the building. This information helps in easy differentiation of stockrooms and makes it easy to locate them physically. By using the Dropdown feature in the right side of the screen the manager can add the details of the assets stored. A confirmation mail is sent to the stockroom manager's registered Email before adding the stockroom to the company's database.

Figure 9: Stockroom Manger Dashboard

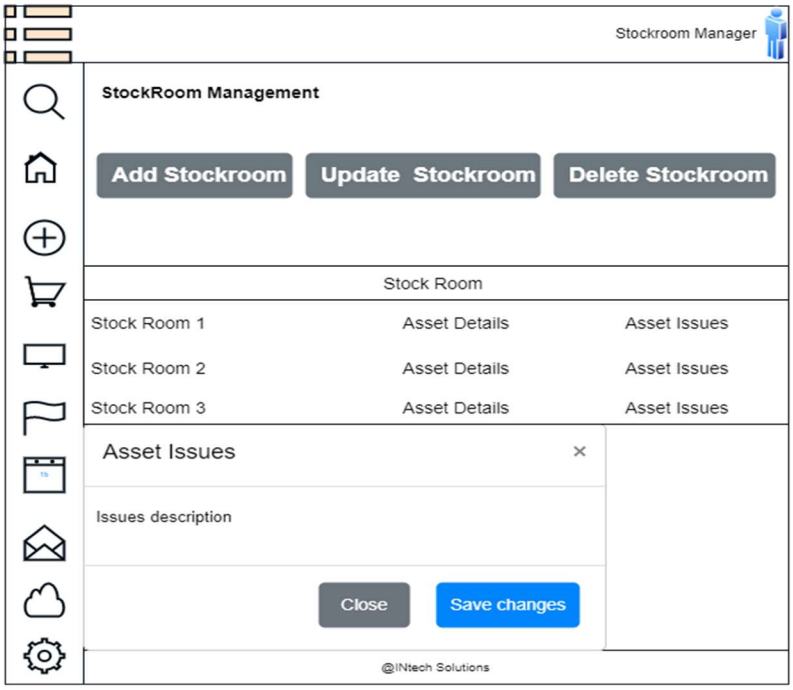


Figure 10: Add Stockroom Page

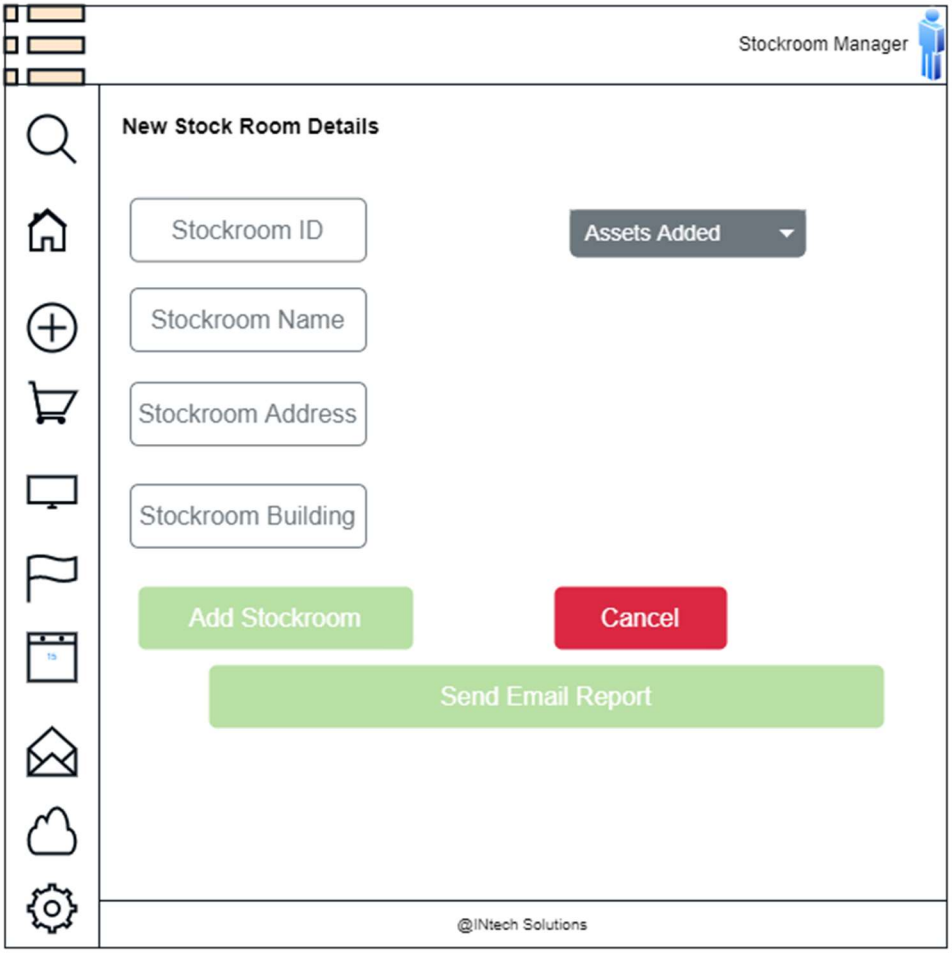


Figure 11: Stockroom Details Page

5. Service Management

Description

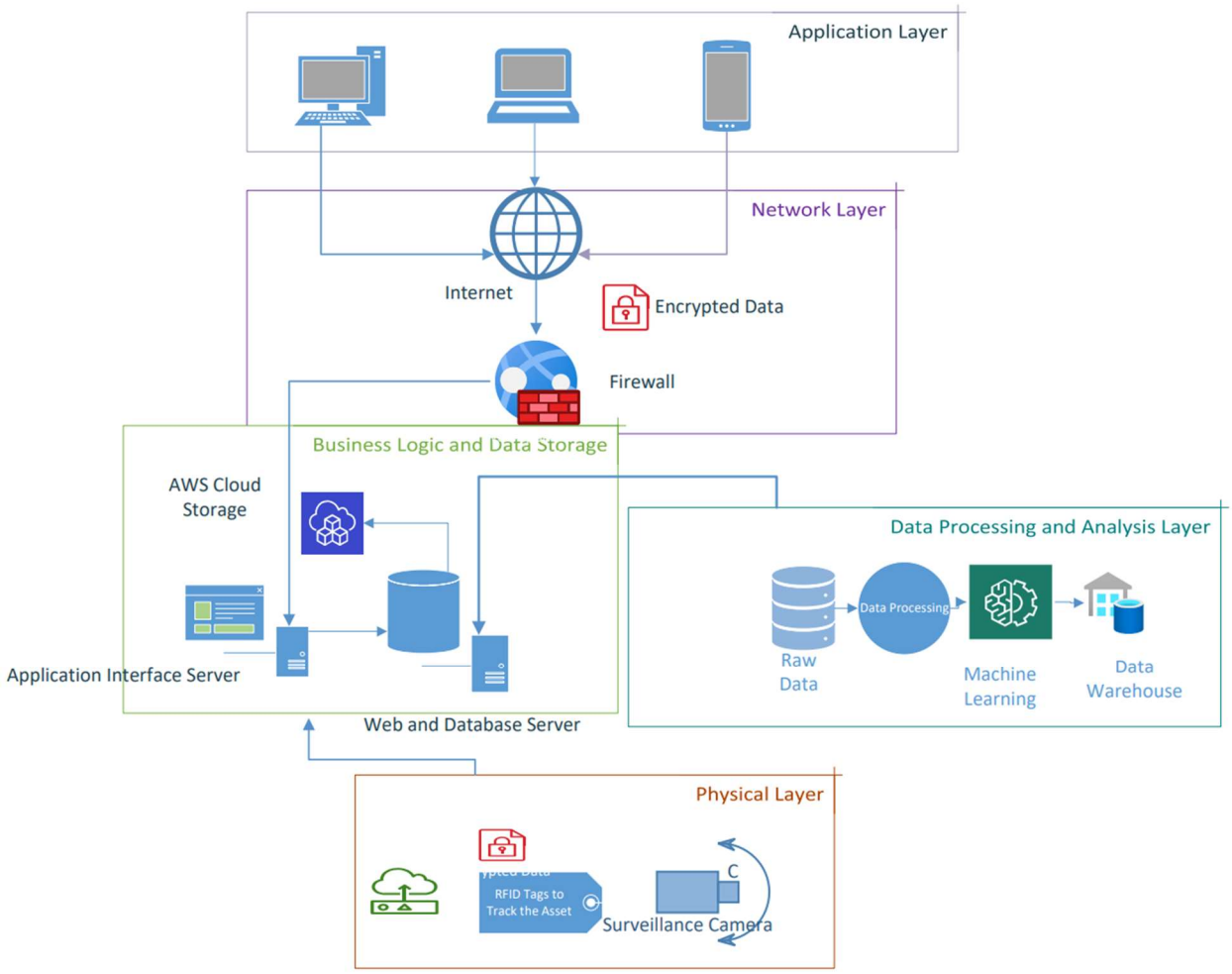
Every employee in the company can raise request to IT department to avail assistance ranging from installing equipment to assistance in installing, maintenance and upgrading the software. The application helps IT service manager in sorting out these requests. The dashboard for IT service manager can be used to access the Requested services, fulfilled services, Pending services and service installations (Fig 12). By accessing the requested services option, the manager is directed to a new

page where the requests can be sorted into different categories and can be assigned to different employees of the IT department.

Figure 12: Service Management Page

Infrastructure Architecture

Network Topology



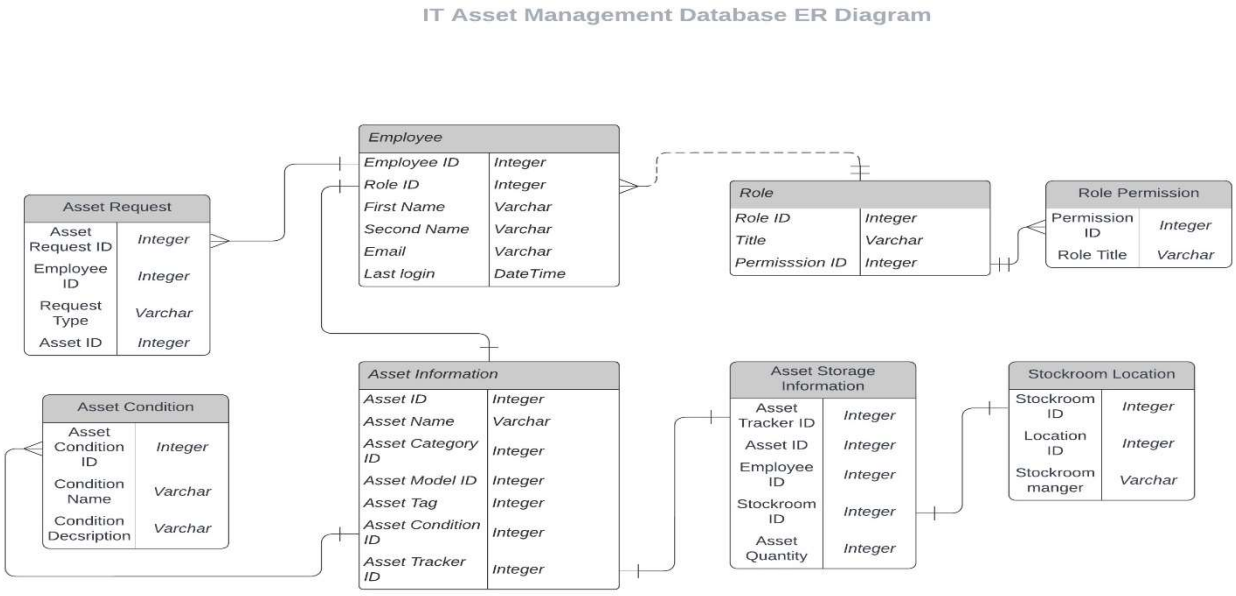
The network topology diagram above depicts the devices, connections, and paths that were used to develop the ITAM technology solution; it assists users in determining which devices are connected and how they communicate with one another.

The application layer lets end users to access data on laptops, mobile devices, and personal computers via web browsers and email clients. This area provides end users with asset data. In the business process and data storage layer, machine learning models are used to process raw data such as asset usage history, asset location, asset cost, and asset amount in order to analyze asset utilization,

anticipate asset performance, and characterize root causes of asset failures. Before communicating asset data to other layers in the network structure for further processing, the network layer encrypts it. The physical layer consists of assets that have sensors, RFID tags, and barcodes attached. Additionally, this layer provides applications for security and surveillance.

Information Architecture

Entity Relationship Diagram



Entities and Relationships:

Entity Name	Attribute	Datatype
Employee	Employee ID	INT (Primary Key)
	Role ID	INT (Foreign Key)
	First Name	VARCHAR(30)

	Second Name	VARCHAR(30)
	Email	VARCHAR(30)
	Last Login	DATE TIME

Entity Name	Attribute	Datatype
Role	Role ID	INT (Primary Key)
	Title	VARCHAR(30)
	Permission ID	INT (Foreign Key)

Entity Name	Attribute	Datatype
Role Permission	Permission ID	INT(Primary Key)
	Role Title	VARCHAR(30)

Entity Name	Attribute	Datatype
Asset Information	Asset ID	INT (Primary Key)
	Asset Name	VARCHAR(30)
	Asset Category ID	INT
	Asset Model ID	INT (Foreign Key)
	Asset Tag	INT
	Asset Condition ID	INT (Foreign Key)
	Asset Tracker ID	INT (Foreign Key)

Entity Name	Attribute	Datatype
AssetCondition	Asset Condition ID	INT(Primary Key)
	Condition Name	VARCHAR(50)

	Condition Description	VARCHAR(`100)

Entity Name	Attribute	Datatype
Asset Storage Information	Asset Tracker ID	INT (Primary Key)
	Asset ID	INT(Foreign Key)
	Employee ID	INT(Foreign Key)
	Stockroom ID	INT(Foreign Key)
	Asset Quantity	INT

Entity Name	Attribute	Datatype
Stockroom Location	Stockroom ID	INT (Primary Key)
	Location ID	INT(Foreign Key)
	Stockroom Manager	VARCHAR(30)

Entity Name	Attribute	Datatype
Asset Request	Asset Request ID	INT (Primary Key)
	Employee ID	INT(Foreign Key)
	Request Type	VARCHAR(20)
	Asset ID	INT(Foreign Key)

Cardinality between the Entities:

Entity 1	Entity 2	Cardinality Type
Employee	Role	1: N
Role	Role Permission	1: N
Employee	Asset Information	1: N
Asset Information	Asset Storage Information	1:1
Asset Storage Information	Stockroom Location	1:1
Asset Information	Asset Condition	1: N
Employee	Asset Request	1: N

- Each employee is assigned a role and the access level for each employee is determined by the role that exists in the database.
- Multiple assets can be assigned to an employee, and they are tracked by connecting the employee ID with the appropriate asset ID.
- The Asset information table contains information about the asset's location, whereas the Asset storage information table contains information about the stockroom ID and quantity of the asset accessible in the stockroom.
- A single location may include numerous Stockrooms, each of which may store a variety of assets.
- An asset may exhibit several asset states, including healthy operation, asset failure, etc.
- Additionally, a table is created to track any requests made to the stockroom, which can be either asset submission or asset retrieval.

Security and Privacy Architecture

Due to the very sensitive information that information technology firms possess; they have always been extremely appealing targets for cyber threats. Best practices demand developing and implementing an Asset Management Plan for physical assets with three main factors (Operations of the assets in the firm, Maintenance of the assets, and analyzing the Risks). Businesses must recognize, assess, and handle the security risks posed by all devices, networks, and data. They must also examine risk on a constant basis and isolate untrustworthy assets from the rest of the network.

The following are the potential security risks and the accompanying control methods that will be applied in our technology solution to handle Confidentiality, Integrity, and Availability:

Intrusion Detection

The technology will use system-based and network intrusion detection algorithms to detect unwanted intrusions. It will evaluate data acquired by users' web browsers for security purposes, such as detecting hacked browsers, preventing fraudulent authentications, and ensuring that the assets work properly.

Security Logs

access log entries of all the systems used, routers, firewalls, operating systems and network switches will be maintained. Additionally, log information for all assets located in the relevant stockroom is preserved to facilitate security assessments and analysis. In the event of security breach impacted employees will be notified through email.

User Authentication

Access to the stockroom and asset management system requires authentication using one of the protocols provided, including OpenID Connect, user ID/password, OAuth, SSO sign on, or social login. Following successful login, a randomly generated sessionID is kept in employee's browser to enable the employee to maintain and track session status.

Physical Security

The Stockroom will be accessible only to authorized staff. The facilities are protected by 24-hour guards, two-factor access screening, interior and outdoor security cameras, and escort-controlled access. In the event of a power outage, uninterruptible source of power is used to ensure the efficient transmission of data from the local server to the cloud servers.

Viruses

The technological solution will scan attachments and other Asset data uploaded by employees for viruses and will not damage or jeopardize the system as a result of containing a virus.

Data Encryption

The Technology solution protects data and communications throughout transmissions between an employee's network and the server, including via Transport Layer Encryption (TLS), which leverages at least 2048-bit RSA server certificates and 128-bit symmetric encryption keys.

Reliability and Backup

The stockroom's asset information is kept on Local database server and a copy of this will also be based on the cloud sever for increased availability and reliability. All assets submitted to or retrieved from the stockroom are immediately replicated on a localized database up to the last committed transaction. Backups are integrity-checked and are stored in the secured data warehouse. A stockroom manager will perform backups, as any deletions made throughout the process will result in the loss of data with no option of recovery (Salesforce, 2022).

Programming

Technologies Used:

a. Docker – Docker is a containerization software which is used to run, test, deploy a software on an independent platform irrespective of the resources available. It is an open-source software that can be run in any environment. In this platform you can build images and containerize them and enable microservices to communicate between each of the different containers to enable dependency in between each of the services.

b. Spring Initializer – It is a web-based tool that is used to bootstrap the structure of a spring boot, this platform can be used to inherit all the dependencies to create functioning API's and Microservices that enable strong communication between different features and services.

c. MongoDB – It is a flexible schema that can be used to build any database to store any kinds of data of the end user on a safe and reliable database, it also provides feasibility to the developer and is an easy method to program the data that is stored in this database, this feature increases the scalability and its versatility helps transactions between various modern databases.

d. Postman – This is an application used for authentication and testing API's, it is a HTTP graphical interface that tests HTTP services based on user request. It provides a set of responses for the user to further validate based on the input provided to the Graphical interface.

e. Visual Studio Code – This is one of the most versatile codes editing IDE's that can be used to code and debug any kind of application, it's flexibility and interactive features makes it easy to perform all sorts of actions from debugging to testing and also help build applications from scratch.

Programming languages used:

a. Spring Boot – It is a java Framework, used to build API's and Microservices, it is one of the easiest and most secure means of transaction to fetch and map data based on the business requests, it creates a fully functional environment to communicate between different services and modules
b. Java – It is an object-oriented programming language that helps manipulating and producing software for multiple requirements, its flexibility helps it to operate in all kinds of platforms and also is a great platform to work on producing different kinds of software's like app development, web development, user interface development and so forth.
c. HTML, CSS and JavaScript – These languages are the basic cones for any web application or interactive browsers, these can be called the building pillars for any website that is used in this modern day and their ease to master makes them a great resource to have in any programmer's tool box.
d. Tkinter – it is a python framework that is used to create a Graphical user interface for any application, it is a simple and easy to learn framework which provides dynamic applications an easy-to-understand user interface. The widgets available in their arsenal are

very strong that they can produce high level user interfaces with minimal code and understanding

e. MySQL – It is a relational database system that can be used to create tables for a database, it helps store passwords, user names and also the data of each individual user in a secure platform where data can be pushed or retrieved based on the requirement of the user, administrator or for any authentication process, it is one of the high-level database languages that is used by many Full Stack developers to create databases for complicated applications.

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