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Asset Tracking Solution Based On Iot

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Abstract- The purpose of is to integrate and implement IoT technology with Asset Tracking Solution. Asset Tracking Solution is a program that manages and monitors the IT assets found. It tracks an asset for its entire duration in the organization. You can manage LAN as well as work from home endpoints from a central location. Using FATS, you can manage both hardware and solution assets in your network anywhere, anytime, from your laptop or mobile phone. Fixed Assets Tracking Solution applies asset with Unique Asset Id (UAID) by means of barcode or RFID tags. These tags can be in compliance with requirements of various authorities like IEEE, SOX, etc.

Keywords **– Fixed Assets Tracking, IoT, REST API, Android.**

I. INTRODUCTION

An asset tracking system is important to all types of organizations, but especially within companies that rely heavily on assets for operations. Airlines, construction companies, fleet companies, and manufacturers, for instance, all need to track and maintain complex equipment. In these industries, equipment downtime results in lost productivity, revenue, and potential damage to customer relationships. However, even companies in less equipment-heavy industries still need to manage asset performance. For instance, a hotel company or restaurant chain has dozens of buildings that all need to be properly maintained to ensure the safety and comfort of employees and customers. Less visible assets, such as HVAC systems, water heaters, and sprinkler systems for fire protection are no less important. If one of these assets stops working, you could be putting your building occupants' health and safety in jeopardy. IT assets, such as servers and firewalls, are also critical when it comes to protecting your customers' data. Asset tracking isn't just for maintenance personnel, facilities managers, and IT leaders. It's also important to accounting and purchasing managers responsible for tracking inventory.

II. LITERATURE SURVEY

1. Potential Optimization, Simulation, and Decision Analysis Asset Management Applications
This literature documents the work performed during phase one of Project 0-5534, "Asset Management—Texas Style." The overall purpose of the research is to develop state-of-the-practice asset management methodologies for the Texas Department of Transportation (TxDOT). These methodologies will support current decision-making processes for allocating funds to the different asset categories managed by TxDOT. During the first year of this project, the specific research focus area was resource allocation decisions regarding advance acquisition of right-of-way and the construction of new highway capacity facilities. Simulation, optimization, and decision analysis methodologies were explored for examining the trade-offs between using funds for these two alternative purposes.

2. Resource Allocation and Utilization Process in Asset Management
Monitor assets, inspection schedule, and maintenance work from the same place in a dedicated command center with a visual display of the asset alongside potential safety hazards and permits. View asset status according to operator findings or data from external systems.

3. National Conference on Transportation Asset Management
The conference program featured a variety of topics highlighting best practices in traditional topic areas as well as emerging issues from the changing world impacting asset management.The traditional topic areas covered topics such as risk management, life cycle planning (LCP), and Transportation Asset Management Plan (TAMP) development. Emerging topics were also featured, addressing subjects such as resilience, sustainability, and equity. A total of 466 transportation asset management practitioners registered for the virtual conference.

Participants represented federal, state, and local transportation agencies; regional planning organizations; transit agencies; academia; and private industry. Representatives from 21 state departments of transportation attended as members of a pooled fund established by the Iowa Department of Transportation. Many of these participants served as conference moderators and recorders. The conference was sponsored by Transportation Research Board (TRB) committee AJE30, Transportation Asset Management, and the American Association of State Highway and Transportation Officials (AASHTO).

[4] Performance Measures and Targets for Transportation Asset Management

The program is developed on the basis of research needs identified by chief administrators of the highway and transportation departments and by committees of AASHTO. Each year, specific areas of research needs to be included in the program are proposed to the National Research Council and the Board by the American Association of State Highway and Transportation Officials. Research projects to fulfill these needs are defined by the Board, and qualified research agencies are selected from those that have submitted proposals. Administration and surveillance of research contracts are the responsibilities of the National Research Council and the Transportation Research Board.

III. PROJECT DESCRIPTION

The proposed solution, IOT ATS mainly consist of 6 parts:

1. RFID Tags
2. RFID Reader
3. Encryption of Tags
4. Cloud Synchronization Services
5. Android Application
6. Administration Console

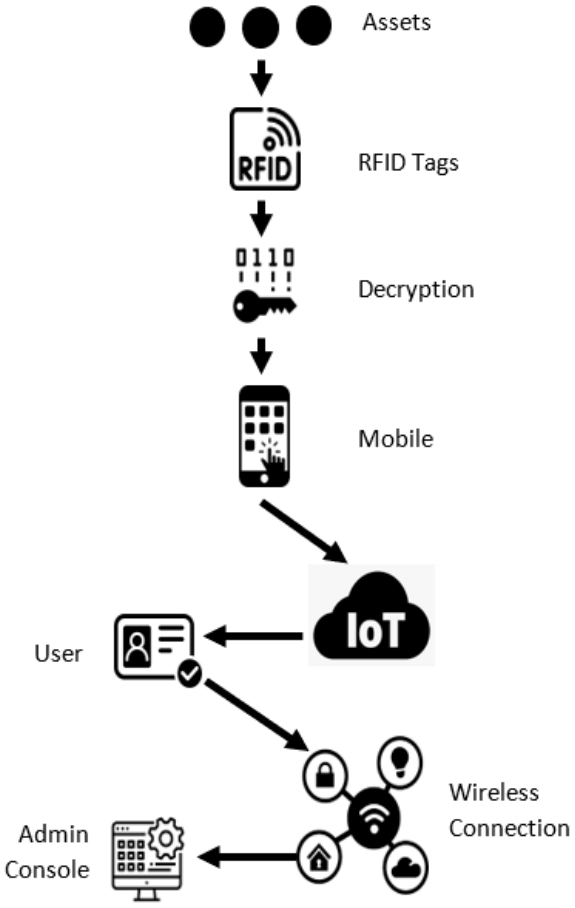

Fig 1. Block Diagram

As per the architectural diagram of IOT ATS the solutions consists of RC522 RFID 13.56 MHz Reader Module as the core element. This is further connected to an Android Mobile device which has the integrated firmware for reading and decryption of the scanned RFID barcodes. The scanned data is then processed inside the mobile application and forwarded to the administration console for data validations. WIFI here uses radio frequencies to deliver signals between devices. As per IEEE 802.11x By using radio waves, it provides wireless high-speed internet and network connections. The mobile device is connected to backend admin console using WIFI connection. A computer's wireless adapter translates data into a radio signal and easily transmits it using an antenna. After that, a wireless router receives the signal and decodes it. The router is there also to send information to the internet using a wired Ethernet connection. The data packets are secured and validated using standard windows authentication techniques.

The Internet of Things or IOT is a new and a potentially disruptive technology paradigm. It describes several technologies such as RFID, short range wireless communications and research desciplines that can connect physical objects from the real world to the internet. To implement IoT Solutions, they software development approaches like Scrum and Kanban, also, others are adapted viz; Large-Scane Scrum, Scaled Agile Framework and so on. and many methods have proposed such as Ignite IoT Methodology and Iot Methodology. Most of them have taken agile thinking as a strategy.

There are a variety of databases commonly used for IoT: among them, some relational databases like PostgreSQL, and many noSQL databases like MongoDB, Cassandra, and InfluxDB, as well as specialized IoT solutions like Azure IoT. [APIs have] become one of the advanced technological widgets that bring together applications, devices, data and the cloud. Tesla Model S JSON APITrack this API is not an official Tesla API, however it is based on the Tesla Model S and it provides Documentation used by the iOS and Android apps. This API can help developers in the auto industry to go beyond controlling just one car since logged in users can add several vehicles at a time. Unofficial Tesla Model S API works like a remote control from a mobile phone, with vehicle controls to charge the car, Flash the lights, honk the horn and get status reports about battery charge and open doors. Cloud computing is another technology injection to be used in this IOTATS for integration of scanned RFIDs with the online connected data sources with encrypted handshakes to ensure and confirm the data scanned is logical and has no discrepancies. The final output from the reader to the application is then processed and validated on the server.

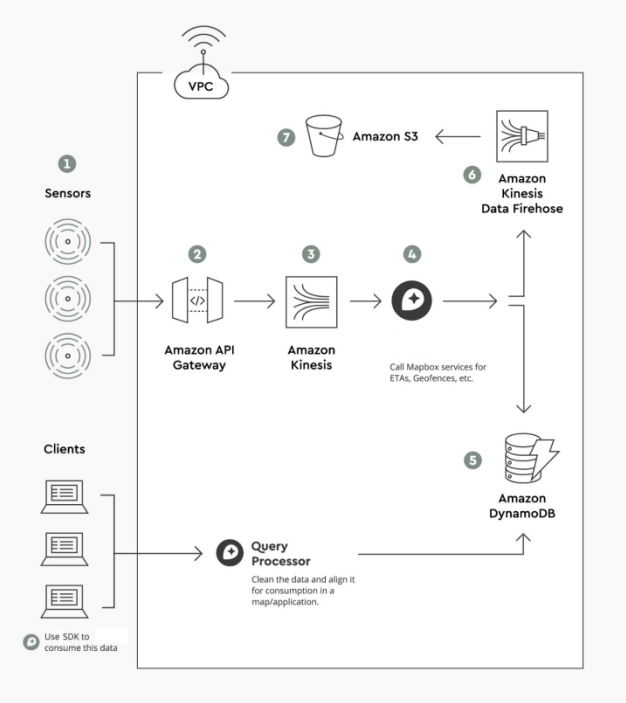

Fig 2. Data flowchart

Asset management involves making decisions to enable network companies to maximize long-term profits by providing customers with a high level of service with acceptable and manageable risk. One of the major costs in "Asset Management" is the cost of maintaining system resources, for example, taking preventive measures, collectively referred to as preventive maintenance (PM). Overall reliability may be enhanced by reducing the duration/frequency of outages.

PM activity can affect frequency by preventing the actual causes of failure. Therefore, PM is profitable when reliability exceeds the cost of implementing PM scale. Therefore, an architecture is needed to incorporate a system policy that links maintenance of system resources with increased system reliability. This is part of a broader concept of wealth management. Every RFID system consists of three components: a scanning antenna, a transceiver and a transponder. When the scanning antenna and transceiver are combined, they are referred to as an RFID reader or interrogator. There are two types of RFID readers -- fixed readers and mobile readers. The RFID reader is a network-connected device that can be portable or permanently attached. It uses radio waves to transmit signals that activate the tag. Once activated, the tag sends a wave back to the antenna, where it is translated into data.

IV. DESIGN AND IMPLEMENTATION

This solution deploys a pipeline using AWS infrastructure to ingest, enrich, store, and retrieve live location data. Data flows through the solution in four phases:

1. Data ingestion
Data is ingested into the pipeline from any device that measures and transmits location, such as an Automotive Vehicle Location (AVL) sensor or a mobile device with GPS. After AWS IoT Core ingests the data, it is forwarded to AWS Kinesis for processing. This solution comes with a test IoT harness for sending sample messages into the pipeline. You can create your own asset application to measure and transmit location using the Mapbox Navigation SDKs for Android and iOS.

2. Data enrichment
Once the data has entered the Kinesis stream, an AWS Lambda function enriches each data point with geofence status and elevation. Geofences define areas of interest for your business that you want to track, such as no-park zones defined by the city government for a bike share application. Elevation data allows you to create route profiles from historical data for route planning, fuel optimization, and vehicle simulation. Geofence status is added by querying the API, and polygon geofences are defined using the Datasets Editor. High-precision elevation information is added by querying the Terrain-RGB dataset from the Raster Tiles API. You can customize how your data is enriched in the AWS Lambda function. For example, you can call a third-party service such as the Directions API to calculate traffic-aware ETAs. You can also retrieve business-specific information from a database, such as delivery time SLA's or package contents.

3. Data storage
Once enrichment is complete, the data is written to an AWS DynamoDB table and simultaneously archived to AWS S3. DynamoDB stores the current state of all assets, while S3 serves as a low cost, long-term archive for all historical data.You can move data from S3 into a data warehouse for historical analysis. For example, you could identify frequent truck idling locations and the impact on fleet fuel efficiency in the past quarter.

4. Data retrieval
The data in DynamoDB can be consumed via a REST API powered by AWS API Gateway and AWS Lambda. The API transforms the data into GeoJSON using TurfJS for use with GL JS. You can build a live asset tracking dashboard or customer delivery status map using the API to retrieve data from DynamoDB. This solution includes a sample web dashboard which connects directly to the API and visualizes live asset location and state.

5. Output Results
The output of the Asset Tracking Solution using IOT is captured into an RDMS database environment which are integrated to the RFID devices using sync services. The captured RFID tags are processed against the Master Data references of Main Asset Tables and then the results are generated based on the comparisons against the Master

Data with reference to current location where the RFID scanning operation is performed.

V. CLOUD DEPLOYMENT

There are a variety of databases commonly used for IoT: among them, some relational databases like PostgreSQL, and many noSQL databases like MongoDB, Cassandra, and InfluxDB, as well as specialized IoT solutions like Azure IoT. [APIs have] become one of the advanced technological widgets that bring together applications, devices, data and the cloud.

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VI. RESULTS AND DISCUSSION

The output of the Asset Tracking Solution using IOT is captured into an RDMS database environment which are integrated to the RFID devices using sync services. The captured RFID tags are processed against the Master Data references of Main Asset Tables and then the results are generated based on the comparisons against the Master Data with reference to current location where the RFID scanning operation is performed.

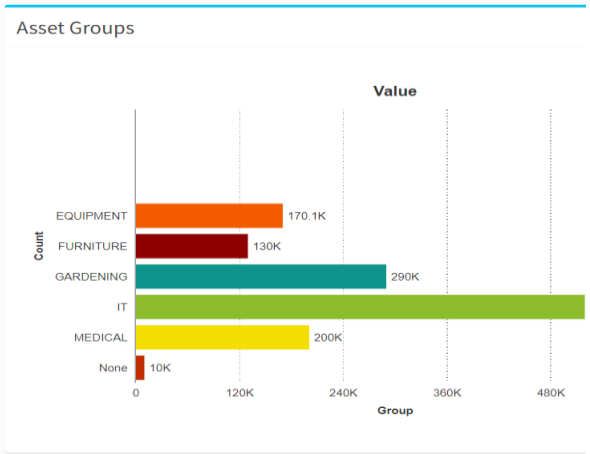

Fig 3. Asset Value by Asset Group

The figure 3 and figure 4 shows the grouping of identified assets based on Asset Group. It shows the current value and the number of assets which are included as part of the asset tracking activity.

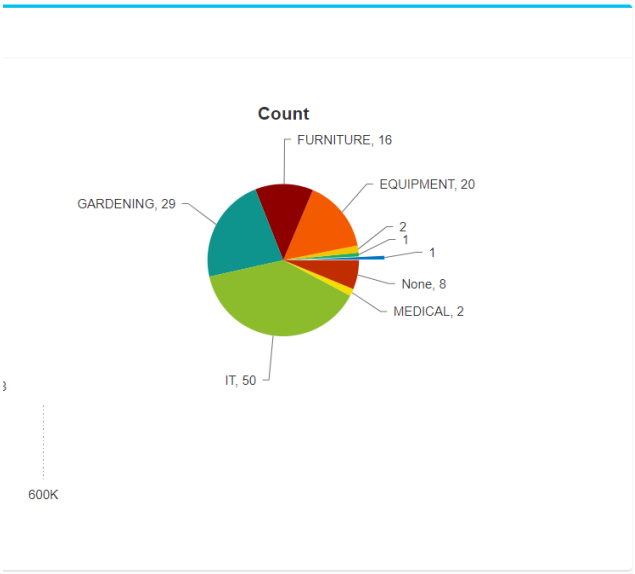

Fig 4. Asset Count by Asset Group

The figure 5 and figure 6 shows the grouping of identified assets based on Asset Regions. It shows the current value and the number of assets which are included as part of the asset tracking activity. The tracking activity is performed in three different locations which includes International Airport, Citycenter and Hyderabad. Whenever we update, change, or add an asset, it is automatically added, updated or changed to your fixed asset register. This will sit in a dedicated reports section for you to isolate, monitor, edit and filter data and export it.

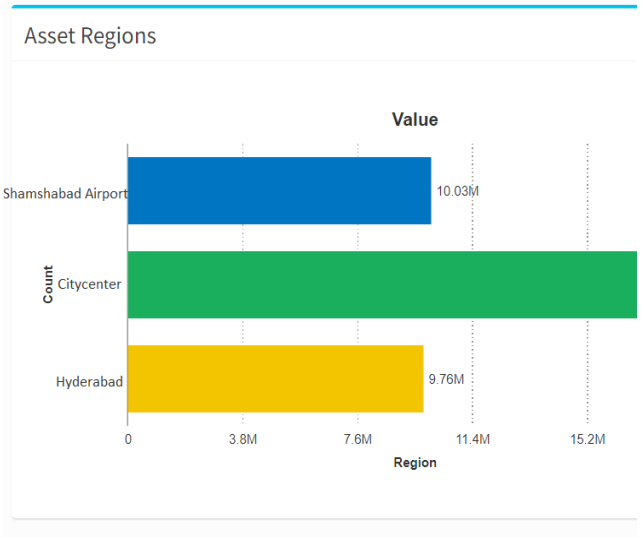

Fig 5. Asset Value by Asset Region

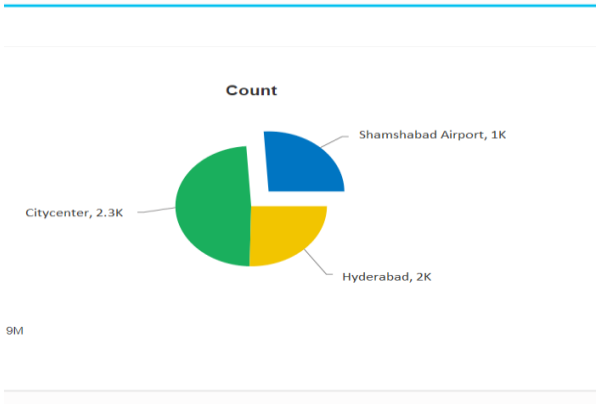

Fig 6. Asset Count by Asset Region

Overall, asset tracking software works by allowing you to update data on your assets onsite, then manage, view, and update them remotely. We can mix and match these functionalities, but with automated reporting features, you save as much time and money as possible. Fixed asset register is useful for monitoring how your assets are behaving, where they are and who has them, meaning your audit trail is tighter than ever, much more controlled and infinitely more transparent.

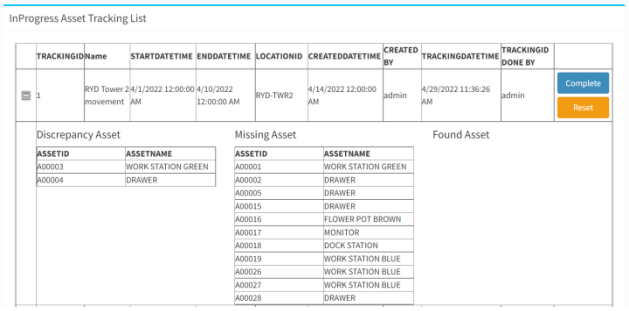

Fig 7. Asset Tracking Data

VII. CONCLUSION

With the research and development till now, the problem of manually tracking the assets is overcome using the RFID technology and integrating the solution with IOT has made it more helpful from the tracking and notification aspect of it. IoT enablement is used for Fixed Assets Tracking System that can monitor assets and its conditions. Not only do this solution helps us to better track our asset, it also permit back office administrators to monitor assets remotely. We have looked for various connectivity with pre-existing state-of-the-art technologies like Wifi and GPS over RFID. Also discussed various issues that can occur over the manual tracking of an asset which can lead to erroneous outputs. As any uncontrolled fault occurs during manual process can lead to misleading data which cannot be corrected, this has been overcome using the IOT based platform. So, a proper method is implemented such that it leads to minimum risks of failure and accuracy of data in terms of asset's location and status. IoT can be used to diagnose faults of machines, it also plays an important role in diagnosing and detecting transformer faults. It can help engineers / operators to make the right decisions for any emergency intervention and choose the best one. Maintenance strategy for power transformers.

VIII. FUTURE WORK

There also is work being done on standardization which should bring us better update mechanisms for IOT integrations in future. We can conclude the automation of tracking the Assets using IOT integrated platform for upgradation. A more enhanced version of Fixed Assets Tracking Solution can be implemented using Machine Learning (ML) and Artificial Intelligence (AI) based algorithms. Intelligent asset tracking can be a powerful solution in transportation, and ST sensors with machine learning core which can implement the decisions necessary for viable and sustainable AI-based solutions for Asset Monitoring and Maintenance operations. Using a wireless IoT enabled Asset Tracking node and software with AI and ML, we can build decision tree algorithms for our assets. Implementing ML & AI in asset management could lead us to implement a better decision-making model for asset's Performance, its Health, the associated Risk and Consequences. Artificial intelligence is used to improve, maintain, and operate industrial facilities through asset management. This will provide engineers and maintenance operators with better decision-making tools.

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