

Integration Tool using Internet of Things in Smart Architecture of Passenger Processing at Airport Terminal

Rupali Dahake, Pallavi Mirajkar



Abstract: Digital technology and Internet of things is acting as turning force on aviation industry. It is also noted that airport IoT solutions are leading in efficient airport operations and smooth passenger flow. The proposed architecture is to gear smart passenger processing through sensor, connected devices, artificial intelligence and analytical decision making. It also focuses on great potential of IoT integration in end to end passenger processing at airport terminal. This proposition helps in 'always stays a connected passenger' concept. The proposed concept gives new dimension to check-in to boarding in smart way. The use of IoT will help to enhance security efficiency, shorter and better traveller experience with selecting capabilities in IoT. The Internet of Things (IoT), a network of connected smart devices through sensors which are used to communicate and collect the smart data which are analysed with augmented intelligence, such analysed data used to perform act across the applied area.

Keywords: Internet of Things (IoT), Passenger Processing, Integrated Architecture, Smart airport.

I. INTRODUCTION

Aviation Industry is dynamic, responsive and distinctive from any remaining business. An air terminal gives the first impression for visitors as an entry to the country, the state. No matter what the size or kind of customers it gives, the frame of the air terminal's services and the complexity and cost components are similar, whether international or domestic. A 24x7 business enterprise will be adaptable and cost effective to fulfill quickly evolving consumer requirements. Air terminals must be adaptable, industry and receptive to rising flight conditions as air traffic growing. Recently, air travel demand has been increasing significantly and is expected to continue to rise in the medium term. Billions of travelers go through airports every year. Aviation industry can use connected technologies to more efficiently implement effective passenger, luggage and airplane processing systems to avoid congestion, spread the demand over time, and better manage health risks, while optimizing processing times.

Manuscript received on 30 June 2022 | Revised Manuscript received on 30 July 2022 | Manuscript Accepted on 15 July 2022 | Manuscript published on 30 July 2022.

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It requires investment to make a solitary, interconnected network that will be prepared for use to help air terminals get smart. Today, numerous air terminals execute implement isolated solution for smart air terminals. Smart Airport based on IoT solutions are leading effectively in various administrative work, visualized safety, and hyper-personalized customer experiences. Proposed smart air terminal management system expects to automate travellers handling and flight management, to further develop administrations, work with air terminal agents' tasks and offer passengers a pleasant and safe journey.

II. LITERATURE REVIEW

S. Bouyakoub *et.al* expressed that the IoT vision improves network from "any-time, any-place" for "any-one" into "any-time, any-place" for "anything". When these things are connected to the network, an ever-increasing number of smart processes and services are conceivable which can uphold our economies, climate and health. Then again, Air transport has become one of the fundamental components of globalization. Its improvement has been dramatic for quite a long time, following the innovative advances of flight on one side, and the propensity of men to continue on the other. With rapidly expanding traffic, the ongoing planned operations and foundation models of air terminals should unavoidably advance to adjust rapidly and sustainably. To make the traveller venture more fluid, air terminals are progressively utilizing new advances. In this paper, author has proposed air terminal management frameworks in light of the IoT worldview, where travellers, stuff, plane or the takeoff relax are considered as "things". Our smart air terminal management framework plans to mechanize travellers handling and flight the board ventures, to further develop administrations, work with air terminal specialists' undertakings and proposition travellers a wonderful and safe experience of journey.[1]

Dominik Mrňa *et. al.* has proposed that the aspects of execution of the Internet of Things idea into air terminal activities. It recommends regions that would be firmly connected with the Internet of Things. These regions essentially concern the handling of travellers or their stuff and would have the option to altogether accelerate the entire interaction. The subsequent part concerns the increment of passenger comfort by giving information during their stay at the air terminal. This new framework could altogether work on the quality of travel.

In the last part, this paper talks about choices for execution of the idea at different chose air terminals. It includes data for status of these air terminals for computerized change and accessibility of the digital tool for such a change.[2]

Abdullah Alghadeir et.al concluded that the air terminal administration is an extremely complicated task as large number of travellers should be managed consistently in such manner as to give consumer satisfaction to every single individual traveller which in itself is a challenge. The specific venture recognizes the different parts of web, RFID technology and IoT that can incorporate positive part in further developing the air terminal administrations and change the air terminals to brilliant air terminals with proposed IoT design. In a perspective of recent developments, there are different aspects of flying areas that should be thought of, like remote correspondence and systems administration of the air terminal activities. Through the utilization RFID innovation with IoT and embedding small portable application into a wide variety of extra devices and equipments that are utilized in everyday tasks; this will empower new type of communications and doing of different activities with ease of use. The significant strength RFID innovation and IoT, particularly in the flight business, is the high effect that it has on majority of the tasks that are done in the air terminals.[3]

R. AlMashari et. al has proposed work to refine a older air terminal framework to a significant, improved, and a real time system in view of IoT innovation. Today, increased request of flights and air terminal traffic prompts the need of further developing the traveller's experience that numerous air terminals fail to convey. Smart air terminals can work on the experience of the traveller and representative by facilitating and re-architecting the cycle and experience that they go through. Implementing smart air terminals will surprisingly work on working efficiencies, traveller benefits, and high level security capacities. Consequently, this paper presents an IoT-based smart air terminal arrangement that contains a mobile application point of interaction and sensor network frameworks incorporated with cloud. The system is carried out and tested that is robust, safe, and secured. [4]

Alghadeir et. al proposed that Internet is to interface everything, for example, associating things like transportation organizations, communication internet network, and so on. Every one of the elements will be associated through a network structure that will allow all channels to interconnect and communicate with one another in a simple mode. This will additionally transform into a decent wellspring of inspiration for incorporating a more proficient transport system. By utilizing the proposed engineering in proposed research work, the air terminals can be changed into smart air terminals with the mix of Radio Frequency Identification (RFID) innovation and Internet of Things (IoT) which will permit all concerned a quick admittance to relevant data about different tasks expected by the travellers and administrative make use of smart air terminal offices. It will guarantee improved proficiency and adequacy of the relative operations of smart Airport administrations. Subsequently, departures, arrivals, luggage delivery and inviting guests - everything which will be dealt with in a smart manner with the assistance of proposed architecture. Smart air terminal innovation will prompt

numerous developments in the aeronautics area, which thus will build the proficiency and efficiency of the whole air terminal administration framework. This construction will offer customized types of assistance and content to various travellers at the air terminal and ensures that every single traveller who enters the air terminal will get a definitive traveller experience and satisfaction.[5]

Zhu Pan et. al has investigated the justification for why the common flying ventures connect incredible significance to service quality, yet the travelers are not much satisfied. And afterward it advances a logical arrangement in view of humanism and interconnected intelligent equipment. The paper likewise characterizes the idea of a smart air terminal which is a blend of productive self-administration process with Internet of things for offline air terminal, new data stage for online air terminal, and new information platform with large information. As per the most recent requirements of traveller administrations and the development of software and equipment innovation, seven operations of smart air terminal are recorded, which will totally further develop the current travel insight of common aviation travellers.[6]

Kumar, S et. al has concluded that IoT stand out enough to be noticed of analysts and designers around the world. IoT designers and scientists are cooperating to expand the innovation for huge scope and to benefit the general public to the highest possible level. Though, enhancements are conceivable provided that we think about the different issues and deficiencies in the current specialized approaches. In proposed work, we introduced a few issues and difficulties that IoT designer should consider to foster a better model. Additionally, significant application areas of IoT are likewise talked about where IoT engineers and analysts are engaged. As IoT isn't just offering types of services yet additionally creates an immense amount of data. Consequently, the significance of big data analysis is discussed which can give accurate decisions that could be used to develop an improved IoT framework.[7]

Deepti Mishra et. al expressed that Radio recurrence ID (RFID) has been distinguished as one of the ten major contributory advancements of the 21st Century. This innovation has tracked down a quickly developing business sector, and a rising variety of enterprises is utilizing RFID to work on the proficiency of their tasks and to acquire competitive advantage. In the aviation industry, significant air terminals/airlines have been searching for the valuable chance to take on RFID in the space of stuff dealing with for quite a while. Many pilot tests have been finished at various U.S., European, and Hong Kong air terminals. RFID labels were viewed as undeniably more precise than standardized tags, and their exhibition was likewise estimated to be well over that of standardized identifications. The proposed paper presents the state of RFID reception arranging, architecture and execution at a significant airline which focus on superior administrations because of further developed baggage handling, on expanded air terminal/airline security. This is achieved by incorporating RFID innovation along with networking and database technologies. [8]

Olamilekan Shobayo et. al. proposed that IoT will give solution for the loss of luggage and harm to clients' assets are the normal defects looked in the aviation industry all over the world. Travellers in other transportation areas are likewise in risk of baggage theft as they travel from area to another. Thusly, a framework should be planned and created to combat these issues. The framework has a GSM/GPS module that is coordinated into the tracking system to keep it effectively associated and an Arduino microcontroller is added to the framework for data handling. The framework gives the area of luggage on a map for tracking it and, that can be accomplished when the GPS module recovers the area directions of the luggage and sends it to the microcontroller for handling. Then, the processed data is sent as a SMS through the GSM module, which gives an association between the luggage and the traveller utilizing the GSM correspondence framework. This IoT based gadget provides travellers with the benefit of seeing the ongoing area of their luggage from anyplace in the world. Also, if executed, this system will diminish the pressure experienced by the both travellers and the aviation industry in finding missing bags. [9]

W. Shehieb et. al. has stated that Travelers' baggage is being accounted for missing in large amount yearly at air terminals all over the world because of a numerous reasons. It makes pressure on passenger at the destination air terminals and brings about extra protection costs for the airlines. An air terminal luggage security system is introduced in the proposed paper to act as solution for this issue. The proposed system guarantees that passenger will leave the air terminal with just their own baggage. The system depends essentially on the RFID (radio recurrence distinguishing proof) innovation. RFID labels, put on both the passenger's ticket and baggage, will contain electronically stored encrypted data by scanning luggage tags with a barcode reader. And also, a camera is utilized to catch the picture of passenger's ticket and software tool has been implemented for image processing which is used to get information for a reference data set. A model system has been implemented and effectively tested [10]. *Aruna Rajapaksha et. al.* has concluded that Smart air terminal idea is the future of aviation industry. There are a few key functional regions recognized in the air terminal process to propose digital transformation as traveler operations, luggage handling with and border control by administrative organizations. Significant parts in carrying out the smart air terminal capabilities are Aviation security, Passenger comfort, Operational productivity and Optimizing limited assets. Each component is facilitating the process with comfortable and effective activity with current innovation like RFID Screening, IoT, Big data analysis and different highlights of digital transformation. Smart Check-in, Self-boarding, Indoor route, Biometric administrations, Using smart wearable, RFID luggage tags, Self-stuff tagging, Kiosks for Lost Luggage, Border control and Airport Apps for Mobile Devices can recognize as application apparatuses of the smart air terminal idea. Need to focus on difficulties to develop the smart air terminal activity. [11] *Xiong, H, et. al.* has proposed an integrated approach to the prediction of air passenger index. The air traveller list is characterized and classified by the K- means clustering strategy. On the basis

of mutual data (MI) standard, the data entropy is utilized to analyze and select the key affecting variables of air traveller travel. The proposed model is approved by traveller throughput information of the Shanghai Pudong International Airport, China. The investigational results demonstrate the model achievability and viability by contrasting them and conventional strategies, like ARIMA, LSTM, and other AI models, beat by the MI-SVR model [12].

Honglin Xiong et. al. has handled the functional and administrative difficulties initiated by the air terminal traveler throughput increment. To accomplish this objective, the information on air terminal traveler throughput was changed. Author has compared actual values and predicted values of the different model (a) ARIMA, (b) ARIMA+conditional entropy, (c) LSTM, (d) LSTM+conditional entropy, (e) SVR, and (f) SVR+conditional entropy. Xiong et al. were assessed by the K-means clustering strategy, which shows the traveler stream at common flight air terminals. Author has proposed a mixed MI-SVR model, assesses the key impacting factors for further developing the forecast results. Affecting variables chosen in this study incorporates minimum temperature, weather conditions, and wind direction. In view of the proposed MI-SVR technique, tests were completed on verifiable air terminal traveller throughput. Experimental results represent the effectiveness and benefits of the proposed strategy. [13]

Zhang, H has concluded that the capability of Internet of things or IoTs can be referred to as the collection of any object need to be persistently tracked, associated and cooperated through different means like RFID innovation, worldwide situating framework, and other communication devices and advances. The Internet of Things empowers all standard actual objects to be autonomously structure an intelligent interconnected network. Subsequently, the IoT is turning into an increasingly more significant part to the new generation of data innovation with many substantial applications in different fields particularly in the solution of smart air terminals which need advance technologies to take care of numerous. In proposed research paper, a several IoT substantial cases as partial solutions for smart air terminal are examined and discussed IoT based stuff computerized self check-in framework to IoT based air terminal. [14]

III. PROPOSED WORK

As IoT is vital part of new generation of emerging information technology. The proposed structural architecture is combination of all components of IoT and fully integrated with supportive IoT drivers. The components of IoT are expressed in the five stages as collect, communicate, aggregate, analysis and act. The supportive technologies drivers are considered as sensor, network, standard, artificial Intelligence and decision making. These IoT components and technologies drivers are fully integrated with passenger processing stages as given below in figure (1).



The working structural architecture of IoT in passenger processing is explained with the help of diagram.

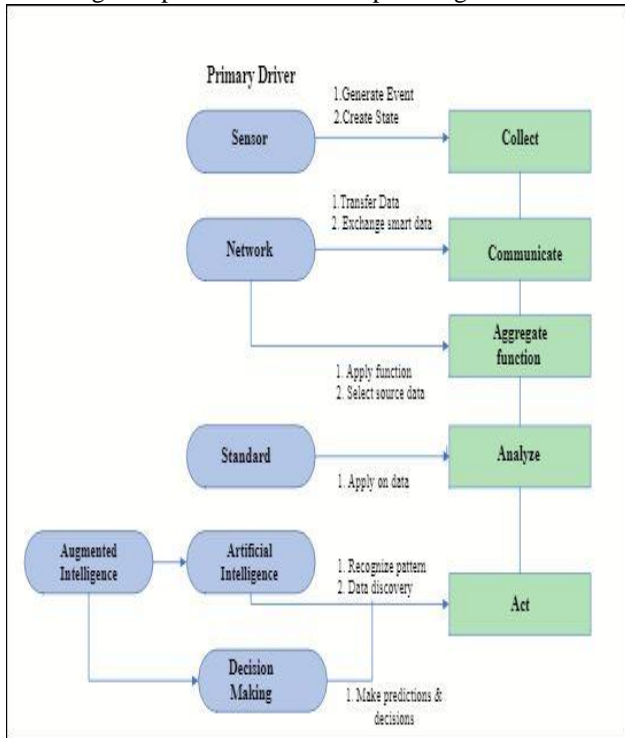


Figure 1: Architecture of IoT in Passenger Processing

The sequence and associations are elaborated in the following step lines.

1. **Collect:** Digital sensors collect threads of information in the form of states or events.
2. **Communicate:** With the help of network technology data is communicated and exchange between other components as smart data.
3. **Aggregate:** Network performs slicing and dicing connected assets to discover valuable data and summarized data.
4. **Analysis:** Data is analysed based on events, behaviours, patterns and relationship.
5. **Act:** Based on Augmented intelligence smart decisions are build and shared for next state or event.

These five steps are iteratively is applied on each stage of passenger processing collaboratively to implement IoT solution at airport terminal.

IV. CONCLUSION

The various technologies have been utilized to implement the concept of smart airport. The reviewed literature and IoT application highlights to generate efficiency gain in ease implementation. The proposed concept reshaping the airport passenger processing by developing the focus on core optimized working model. The collaboration of each operation in passenger processing with IoT technology gives new dimension to great travel experience. It can also enhance overall passenger satisfaction. The proposed architecture supports setting up very high standards in implementing IoT in all airport management systems. The unique integration model and working flow noted that IoT components and associated drivers are working most effectively in passenger processing system. In addition to

this, it is providing overview of smart airport which directly inclined to intelligent and new generation of automation in services.

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