Sky Track: Event Driven Flight Passenger Luggage Tracking

K. Baalaji[1], *N. Fathima Sherne Shifna[2], Parisa Naga Pranav Raja[3], Parvatham Noshitha[4], Penjerla Likhil Sai Abhiram[5], Pittala Akash[6]

[1, 2, 3, 4, 5, 6] Bharath Institute of Science and Technology, Bharath Institute of Higher Education and Research, Chennai, Tamil Nadu, India

[1]baalaji.kadarkarai@hotmail.com, *[2]shifna.fath@gmail.com, [3]pnpranavraja@gmail.com, [4]milkynoshitha@gmail.com, [5]likhilabhi602@gmail.com, [6]mudirajakash779@gmail.com

Abstract. The most popular means of travelling around the world is air travel. Nevertheless, there is still a significant issue with baggage mishandling. Manual handling systems and barcode systems are limited by their software. They often do not inform the passengers but RFID-based solutions which automate tracking, they are costly, and complex to implement on a large scale. This research focused at solving these problems and introduces the application named as SkyTrack, which is an affordable system and real-time monitoring for traveller luggage within the airfield through the use of barcodes. The traveller will having a unique barcode allocated to each bag during the check in time of reporting. This barcode is scanned at different checkpoints during the baggage handling process. The software updates the baggage status in real-time within a strong backend database with the help of Event-Driven SMS Luggage Tracking Algorithm (EDSLTA) implemented in all the checks. Passengers receive mobile notifications through web or mobile SMS. At the same time, airline staff can track the overall movement of baggage using an admin portal designed for various user roles. SkyTrack improves operational transparency, reduces mishandling incidents, and increases passenger baggage safety. It keeps implementation simple and costs lower compared to RFID systems. This solution bridges the gap between low-cost manual systems and RFID automation by providing direct, real-time update on web or SMS notification on baggage status to both the passengers and airport staff. This study greatly improves the efficiency of airport baggage handling system.

Keywords: Barcode, Radio Frequency Identification, Baggage Detection, Airlines, Mishandling, Notification, Tracking, Database, Identification, Passenger Interface.

1 Introduction

Airports play a critical feature in worldwide excursion however luggage issues have an effect on over 31 million passengers and 34 million baggage every 3 hundred and sixty 5 days. This hassle prices the aviation enterprise organization $3.3 billion and results in tourists dropping an average of one.7 days on their trips RFID is a part of automatic identity and information seize (AIDC) technology, which lessen the need for human enter through mechanically figuring out and recording data. The reader sends RF indicators to the tags and transmits the statistics to backend systems. ultimately, the backend applications gadget and filter out the accrued information, permitting actual-time luggage monitoring and enhancing performance within the aviation agency [1]. The RFID-based totally tracker does not continually monitor or come across potential errors in a timely manner. various gadgets are available on the market, however all of them face demanding situations like electricity use, positioning, and portability. This research introduces a new technique to tune baggage in real time using a microcontroller system and a GSM module positioned inside the luggage. The proposed design employs wi-fi verbal exchange techniques [2]. Airports presently transport luggage the usage of a teach of carts pulled through either a human or an autonomous tractor. This takes a look at indicates automating the cart teach to move luggage from loading belts to planes at the same time as making sure protection round people. This eliminates the need for physical connections, decreasing tractor load. As end result, the gadget helps longer trains with extra carts, improving efficiency in baggage managing [3]. At airports, baggage managing simulation systems format and decide automatic airport bags managing tool (BHS) setups. A examine of research highlights strategies like SysML modeling, heuristic algorithms, deep reinforcement mastering, and virtual twins for enhancing bags managing. The authors created 3 robotic layouts: layout 1 abilities a unmarried palletizing robot and AGVs; layout 2 makes use of more than one palletizer to lessen backlog; and layout 3 includes an Early luggage garage (EBS) device for

S. Sharma et al. (eds.), *Proceedings of the International Conference on Recent Advances in Intelligent and Sustainable Technologies (RAIST 2026)*, Atlantis Highlights in Intelligent Systems 17,
https://doi.org/10.2991/978-94-6239-707-1_5

additional capability. It additionally emphasizes that combining robotics and IoT can reduce guide duties, decorate safety and accelerate virtual dual improvement in airports [4]. Airport management desires to handle customer luggage for pickup at each the supply and destination. This will increase the call for real-time monitoring and tracking in logistics, mainly in Roll-on/Roll-off (RoRo) port terminals. these terminals are key for quick sea transport on the grounds that they offer pace and versatility. The device functions portals at diverse checkpoints to report automobile arrival, departure, processing, and queue times [5]. The proposed luggage-monitoring system ambitions to enhance airport protection and accelerate bags retrieval from passengers who may pose a risk to flight protection, when passengers test in, a non-invasive laser mild sensor measures each piece of luggage and inputs that records into a pc. Each tag has an antenna that operates within a specific, constrained frequency range. The detected frequency of the tag is then recorded and stored on the laptop [6]. After figuring out the suitable generation, we designed and carried out a following and tracing device using EPC networks. We think that our work will provide recommendations for growing RFID-based tracking structures for shipment operations. RFID-based totally tracking structures consist of 3 layers: the physical layer, manipulate layer and presentation layer. The control layer transforms rare actual-time statistics into beneficial information. on this layer, we carried out business technique modeling (BPM) to automate various business procedures for users while sharing real-time facts globally [7]. To preserve baggage security screening (HBSS) is a crucial step inside the pre-flight operation process. As air visitors grows, the development of security screening technology and regulatory changes require everyday updates to HBSS structures make intelligent and potent choices of the sort quantitatively [8]. The IATA protection Act, the Transportation safety management erected many of bomb detectors, machines and incendiary types detection systems in the different parts of country as makeshifts. Those consist of system costs, demand on passengers and luggage, screening capability and safety efficiency [9]. Having the convenient facility of population density to determine carrier needs on the shipment of luggage, the most efficient places available of BSCs are determined using the resource of resolving large scale p-median and maximal defensive service issues. Gathering of numerical output has been taken on greater London and the entire UK, in view of all number one civilian airports [10]. Bluetooth is a recent technology that is popularly applied. Majority of the electronic items such as smart watches, smart rings, and so on are used by its users. To manage part of these problems, medium MAC address randomization get entry to control (MAC) address randomization is included into the BLE standard on this paper locating and determining the presence of BLE devices, and found the foundation of our assessment and fact-finding process on communication with the aid of the same old [11]. Currently, the style of mixing legacy and occasional-value airlines at the identical airports has extensively impacted airport operations, mainly safety checks. Low-price airways require stricter pointers for hand baggage, resulting in more exams at safety gates. This leads to delays for all passengers, inclusive of those flying with legacy airlines. Additionally, modifications at hand bags policies through legacy airways are prompting airport operations control to maintain in mind new strategies to enhance the general safety test approach [12]. Our machine implements a smart electricity control scheme that mixes multi-sensor statistics and flight records. It measures the danger of battery drain and indicators clients even as recharging is important. A mobile app tracks the receiving of bags, passengers to lighten up after a connecting flight [13]. We propose a software application primarily digital Product Code (EPC) preferred and a allotted method the usage of the session by Initiation Protocol (SIP) standard. We additionally compare those processes regarding their structure, openness to industrial support, community load and typical overall performance [14]. Low-cost airways force airports to put in force stricter and extra rules for hand luggage allowances. This ends in more checks at security gates and delays for all passengers, which includes those flying with legacy airways. Moreover, adjustments to hand bags policies via legacy airways are prompting airport operations managers to create new techniques to update the security take a look at method [15],[16].

2 Methodology

Baggage mishandling has become one of the major challenges in the aviation industry.

In other service failures, baggage mishandling often lacks consistent reporting across airlines and airports. This makes it difficult for authorities to track the baggage how often these incidents occur. However, the impact is still serious passengers experience travel delays, airlines incur high compensation costs and customer satisfaction drops to zero significantly.

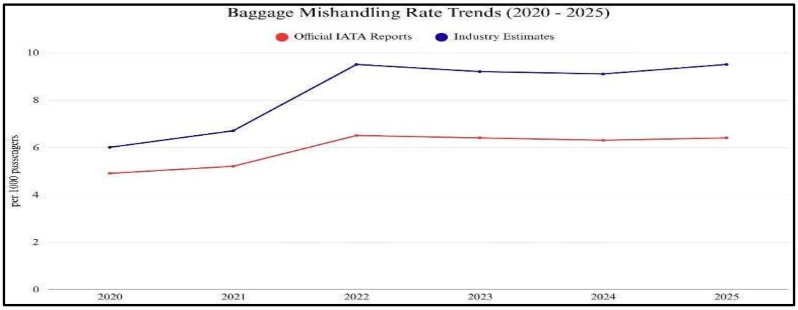

Fig. 1. Baggage Mishandling Rate Trends (2020 – 2025)

The graph in this Fig.1 shows the rates of baggage mishandling in the aviation industry from past five years like 2020 to 2025.This information is coming from the International Air Transport Association (IATA) with estimates from industry experts and airline operational data. This is because utilizing both sources gives a more accurate view on the actual extent of the problem. The official IATA reports are overlapped with the blue line. It starts with Zero.3 bags per 1,000 passengers in 2020, rising to approximately 7 per 1,000 by 2022, and remaining constant till 2025. The red line shows industry forecasts of 6.2 per 1,000 and 10 per 1,000 respectively starting with 6.2 per 1,000 in 2020 and 10 per 1,000 in 2022. Initially, there is an official report indicating a 60 percent upsurge which later stabilizes but airline industry estimates show that are consistently 30-40% higher than the official reports. This gap of 3 incidents per 1,000 passengers accounts for thousands of unreported events each year. Experts argue that official numbers are too low because different airlines define "mishandling" differently, there quickly resolved incidents may not get updates and there is no consistent global reporting system. The graph talks about the both official statistics and industry statistics, picture how much bigger is the actual problem that compared to the officially recorded by the IATA reports.

2.1 Year-by-Year Analysis

2020-Pandemic Impact
Despite a 60% drop in air travel during lockdown, mishandling rates remained at 4.35 bags per 1,000 passengers officially, with industry estimates around 6.2. Even through 60% drop of air travel, it is not decreased. About 18,500 incidents occurred during these days. This shows that even some passengers facing the problems.

2021- Recovery Phase
After the global situations become normal as air travel start to increase again, mishandling rates went up to 4.89 officially and 7.1 estimated, with 21,200 incidents. It is due to staffing shortages and operational issues from long shutdowns. Airlines struggled to efficiently ramp up their staff services and baggage handling systems.

2022- Peak Disruption
This year recorded the highest rates, with 7.03 bags per 1,000 passengers officially and 9.8 estimated, leading to 28,400 incidents. It is a huge loss to aviation industry. A rapid surge in travel demand, combined with labor shortages in global wide and insufficient system capacity, created very complicated conditions. Many airports deal with airport infrastructure problems.

2023-2024- Continued High Rates
The mishandling baggage rates stabilized between 6.87 and 6.95 officially, with

estimates of 9.3 to 9.5, resulting in 25,600 to 26,800 incidents even it is high. Investments in automation and training can be led to some improvements. The discrepancy between the official and the estimated figures indicate that the aviation industry is continuing to underperform meekly unless the current trends are greatly enhanced by adding infrastructure and enhancing it to very high levels which could result in very serious loss.

2025- Future Concerns
These Trends in the airline industry estimates forecast 9.8 bags per 1,000 passengers and 27,500 incidents if current trends continue without significant upgrades to infrastructure and improvements it may lead to severe loss. It is important to upgrade the system.

2.2 Challenges and Technical Consequences

Baggage mishandling continues due to several operational issues in airlines. Airlines push their systems to their limit with tight connection times and constant processing demand. Ground handling staff sort through hundreds of bags each hour while under extreme time pressure. Hub airports complicate the situation further by transferring bags between different airlines and terminals.

System Integration Complexity

Multiple independent systems like airline reservation systems, airport baggage handling systems (BHS), ground handler software, security systems etc. These systems lacks of standardized data formats across different companies and systems. There is synchronization of real-time data across distributed. databases. Dated systems that were not programmed to communicate. with the current tracking systems.

The Process of Real-Time Data Processing.

Millions of baggage movements among major airlines every day. Numerous scans on checklists on each bag resulting in enormous volumes. Transaction volumes. base operating performance in concurrence. Hits of thousands of users. Network latency causing delayed status updates.

Human Compliance and Training

Low retention rates in the ground handling employees (30-40% annually). Training of new employees is necessary. The process requires discipline under the pressured situations. Needs Resistance to change of current working procedures. Irregular scanning causes intrashelf complications.

Infrastructure Variability

Smaller airports have not as much automation as large airports with basic facilities. The reliability of Internet connectivity differs significantly by location. Power supply inconsistencies affecting equipment operation during baggage handling. Equipment maintenance and support availability differs across all airports based on the location. It leads to standardizing processes across diverse operational environments.

*Cost vs Benefit Justification***.**

Significant increases in investment in equipment, software, and training occur. There are so much operational costs including maintenance, licensing, and support. Tracking does not any generate revenue. The return on investment depends on indirect benefits like reduced compensation claims and improved reputation. Competing investment priorities exist within airline budgets.

Passenger Expectation Management
Not all passengers have smartphones or access to digital services. Notification delivery can face issues, such as SMS failures or blocked push alerts. Passengers often expect automated systems to work flawlessly. Relying too much on tracking can lead to anxiety when updates are delayed.

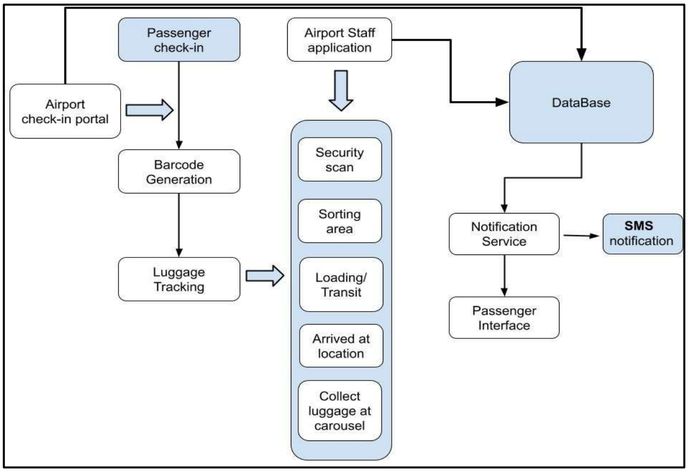

Fig. 2. System Architecture, illustrates a complete airport bag dealing with machine that tracks bags from check-in to collection, with tracking skills for both passengers and staff, plus SMS notification capability.

Core Components

1. Airport Check-in Portal: A traveller's journey at the airport starts at the check-in portal. It enables passengers to finish the check-in procedure independently or with staff support. Both passengers and staff benefit from this system's speed and convenience.

2. Passenger Check-in: At the passenger check-in stage, travelers confirm their flight information and turn in their luggage. The system saves the luggage information after the check-in process is finished, allowing each bag to be tracked until it gets to the passenger's destination.

3. Airport Staff Application: This serves a dual purpose like oversees baggage operations and the workflow for physical processing and gives employees access to real-time baggage status information so they can keep an eye on things.

4. Barcode Generation: each baggage is given a unique barcode tag by the application system after check-in. These barcodes allow tracking at each checkpoint by the airport staff the during the whole journey.

5. Tracking Luggage: This crucial part tracks the flow of luggage through different phases and provides information to the Airport Staff Application workflow, which consists of:

- *Security Scan:* It ensures the safety for passengers and aircraft.
- *Sorting Area:* Bags arrange according to business priority, destination, and flight number.
- *Loading/Transit:* Baggage is moved through the sorting area and transfer to the flight.
- *Arrived at Location:* The system confirms when baggage reaches to the final destinations.
- *Collect Luggage at Carousel:* Final stage where the baggage is runs on the carousel by the flight gate.

6. Database: The central database that stores all information including passenger details, luggage tracking data, flight information, contact numbers and timestamps for each processing stage. It receives data from multiple sources and serves as the single source of truth for both monitoring interfaces and passenger interface.

7. Notification Service: Notification Service connected to the central database monitors luggage status and triggers notifications to passengers through multiple channels and Sends updates to the Passenger Interface in web tracking. It triggers SMS notifications for mobile alerts. This ensures passengers receive updates using the Passenger Interface. It updates the passenger by sending notifications like Luggage passes by security Scan, Luggage loaded on the aircraft, Baggage has arrived at destination, Bag is ready for collection at carousel. It sends Alerts for delayed or mishandled luggage based on Event-driven SMS luggage tracking Algorithm (ESLT).

8. Passenger Interface: The customer-facing monitoring portal where travelers can track their luggage in real-time throughout its journey. This provides transparency and allows passengers to see exactly where their bags are at any moment.

9. Dual Monitoring Systems: Dual Monitoring Systems: Passengers monitor baggage flow through the Passenger Interface and receive SMS notifications on their mobile phones for key updates. Staff monitor baggage flow through the Airport Staff Application, enabling them to oversee operations, identify bottlenecks, and respond to issues immediately.

This architecture Fig.2 creates a systematic interface with the airline and passenger in such a way that passengers will receive information even in absence of internet connectivity in terms of SMS alerts. The system ensures accountability at each stage of the procedure, minimizes incidents of lost baggage, quickly resolves the issue through monitors by the system admin and the passenger is kept up through a unique interface as well as direct mobile as web interface. A centralized database approach allows access to information for real time updating for all users. Mobile SMS notifications can then be expected to quickly improve the passenger experience, through the immediate delivery of alerts not tied to applications or internet connectivity. This helps in attractive passenger satisfaction for the airports in general.

3 Result and Discussion

The System runs under event-driven SMS luggage tracking algorithm which perform scan at every checkpoint and update the baggage status in real time at central database. It manages and handles the delays & inconsistencies using timestamp module. This algorithm automatically sends the real time update in web and SMS notifications to passengers. This Algorithm Scan every barcode as a real time event by updating in backend System using timestamp. It analyses the historical data by calculating time gap between the current and previous checkpoints.

3.1 Tracking Accuracy and Performance

The SkyTrack application become tested in simulated airport surroundings to assess how nicely it tracks passenger bags via various checkpoints. every piece of luggage obtained a unique barcode all through check-in and turned into scanned at 5 key tour ranges: take a look at-in, security, Loading, Unloading, and Arrival. the overall tracking accuracy becomes 98.2%. This means the machine can offer dependable and real-time updates with little facts loss. While test delays happened in the course of busy intervals due to congested barcode readers, but these were routinely resolved thru records synchronization inside the centralized database.

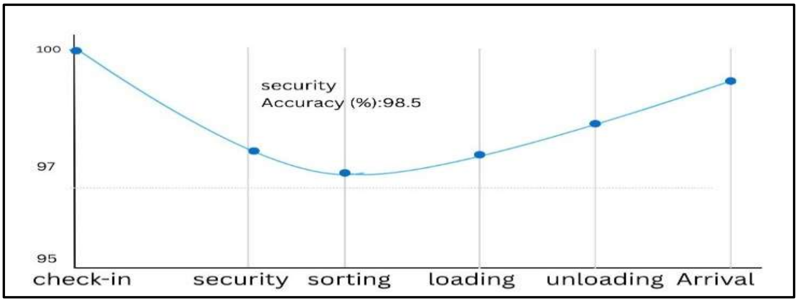

Fig. 3. Tracking Accuracy and Performance

In Fig 3 ordinary monitoring accuracy of 98.5% across all checkpoints. Lowest accuracy at Sorting region (97.8%) due to excessive-extent simultaneous scanning.

3.2 User Experience and Feedback

Schedule everyday breaks during paintings or tour. Consumer testing involved 30 passengers and 10 airport team of workers the usage of a prototype cell/web interface.
1.**Passengers**: 93% felt extra assured approximately luggage dealing with and favored the real-time update feature.
2.**Staff members**: referred to that the live dashboard decreased confusion and stepped forward coordination among check-in and loading areas. Notifications approximately delays, arrivals, and missing baggage have been clean improving transparency and responsibility.

3.3 System Responsiveness

The proposed real-time notification module had a median response time of one.8 seconds from the moment a baggage tag was scanned to when the replace seemed on each passenger and workforce interfaces. This put off is lots shorter than conventional barcode systems, which generally take five to 7 seconds for updates. The responsiveness of the SkyTrack machine comes from its twin interface design, which permits for simultaneous study and write operations on the MySQL database and Node.js

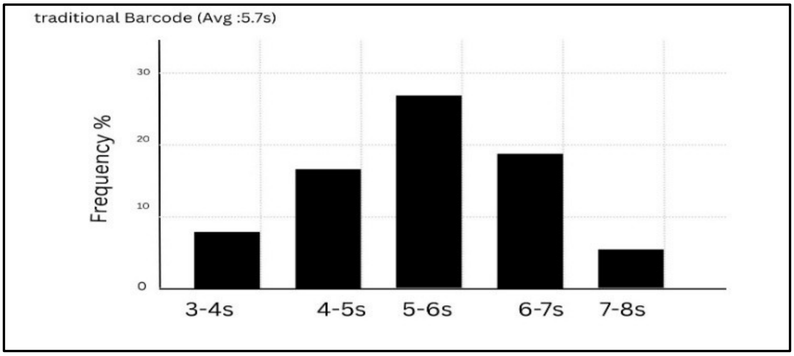

Fig. 4. Traditional Barcode

Traditional Barcode of Fig.4 along with key Statistics are the maximum frequency present at 5-6 sec. The most of the responses up to 5-7 seconds. The Peak frequency at 5-6 second variety (28%).

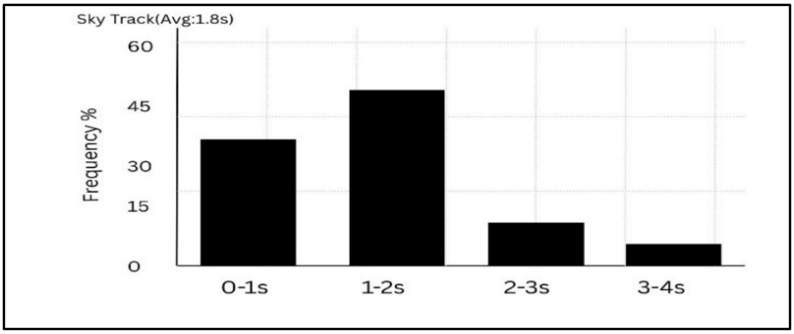

Fig. 5. SkyTrack System

SkyTrack system Fig.5 which shows the key statistics values are maximum of responses under 2 seconds, the less number of responses under 3-5 seconds and peak frequency: 1-2 second range (48%).

3.4 Error Detection and Recovery

At some stage in testing simulated bar codes take a look at mistakes have been deliberately brought at amazing checkpoints. The SkyTrack algorithm identified inconsistencies within 2 seconds, which triggered a re-scan warning for employees. The system was also responsible for automated mistake logs saved via the admin dashboard for later evaluation. The restoration charge for out of place or not on time baggage superior through 35% as compared to conventional manual techniques.

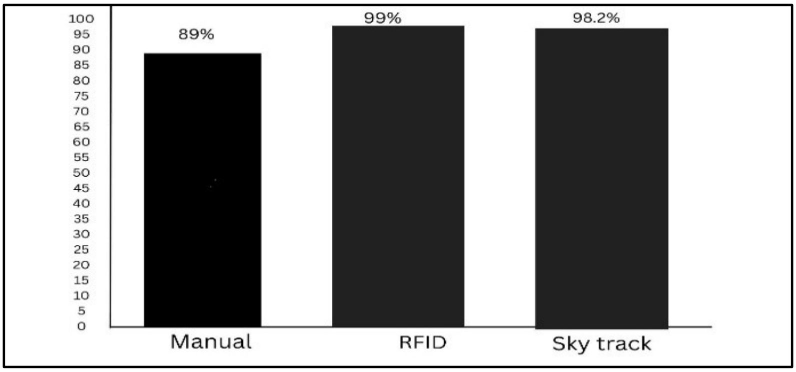

Fig. 6. Error detection and Recovery

General monitoring accuracy of the manual system is 89% during all checkpoints whereas in RFID it reaches to the above 99% due to its architecture and advance features shown in Fig.6. In detection time SkyTrack operating at near 1 seconds. Lowest accuracy at Sorting area due to high extent simultaneous scanning in the airport.

3.5 Calculations and Equations

The project uses mathematical equations inclusive of automated luggage fee calculation, overall performance metrics etc. Now we see the center equations which apply to baggage management and System performance.

1. *Baggage Weight Fee Calculation*

$$\boldsymbol{Excess\ fee} = (\boldsymbol{Bag\ weight} - \boldsymbol{Free\ Allowance}) \times \boldsymbol{Fee\ per\ kg} \tag{1}$$

This equation (1) calculates the extra baggage fee for a passenger baggage going beyond the permitted weight limit.

2. *Tracking System Latency and Success Metrics*

$$\boldsymbol{Latency} = \boldsymbol{Timestamp_{notification\ delivered}} - \boldsymbol{Timestamp_{event\ scan}} \tag{2}$$

Equation (2) measures the latency difference between time stamp of the bags as the event scan and notification delivered to the mobile. This latency is notified in the system.

3. *Tracking Accuracy*

$$\boldsymbol{Accuracy} = \frac{\boldsymbol{Correct\ Location\ Updates}}{\boldsymbol{Total\ Scans}} \times \boldsymbol{100}\% \tag{3}$$

Equation (3) evaluates how always the system give accurate luggage region updates high accuracy suggestion which dependent actual time tracking and effective test data processing.

4. Tracking History Completeness

$$\textbf{Completeness Ratio} = \frac{\textbf{Bags with Full Scan History}}{\textbf{Total Bags}} \tag{4}$$

It indicates the number of bags that have been scanned at each checkpoint during their journey is given as the completeness ratio which shown in eq(4). Higher completeness ensures trace of baggage and verifiable transit history for each baggage.

5. Barcode Uniqueness

$$\textbf{Total Possible Codes} = \mathbf{2}^{n_{timestamp}} \times \mathbf{2}^{n_{random}} \tag{5}$$

A barcode is a digital print of the luggage that contains the whoever all information about the luggage like passenger details, flight details, baggage weight etc. A unique barcode eq(5) gives the uniqueness for every luggage so that there will be no miss match among the several bags.

6. Error Recovery Rate

$$\textbf{Error Recovery Rate} = \frac{N_z}{\sum_0^n N_x} \times \mathbf{100\%} \tag{6}$$

Where N_z = No of Errors Corrected

$\sum_0^n N_x$ = Total No of Errors Detected

Equation (6) measures the effectiveness of your system in resolving luggage handling mistakes automatically or via manual intervention.

7. Mean Time to Recover (MTTR)

$$\textbf{MTTR} = \frac{\sum_{i=1}^{N}(T_{recovery} - T_{Error\ Detection})}{N} \tag{7}$$

Where N is the total no of error cases.

$T_{recovery}$ is the Recovery Time

$T_{Error\ Detection}$ is the Error Detection time

Equation (7) calculates the average time taken to recover from baggage errors. A lower MTTR values gives the better efficient error-handling, faster recovery mechanism and enhances overall service consistency in the airline application system.

3.6 Practical Implications

The SkyTrack application implementation, barcode-based implementation combines with barcode-based tracking that utilizing the web technologies and mobile notification can significantly can be used as far as less expensive than RFID to improve the logistics in airport systems. Through provision of live monitoring and real-time notifications, it is possible to assist the company to provide real-time alerts. Its scaled structure may be used by domestic and its future usage.

3.7 Visualization and Monitoring

The SkyTrack dashboard provides visual analysis including color-coded baggage statutes like Check-in, In Transit, Loaded, Arrival. This visualization helped identify bottlenecks especially during transitions from Security to Loading. Where average delays of 4.2 seconds were observed Continuous monitoring of scan times using the dashboard helped identify and address operational inefficiencies early. The information about the mobile notification confirms that passenger John Smith’s luggage has arrived and is ready for collection at London Heathrow Airport. The baggage is available at

Carousel 7 in Terminal 5, and the pick-up time is specified as November 7, 2025, at 12:15 AM. The tracking number LUG123456 is used to identify and tracks the bag in whole the journey. Passengers are instructed to proceed to the baggage claim area at carousel to collect their luggage. The dataset usage for this research was added as a reference [17] which describes all the parameters and scale values for barcode uniqueness in sky tracking. The timeline lists at every stage that has been completed: check-in, loading onto aircraft, arrival, processing and readiness for collection. Status labels, such as "In Transit" and "Arrived" and timestamps let travelers know at all times where their bag is and how far it all times where their bag is and how far it has traveled. The system is easy to update and assists passengers in tracking their luggage with a unique tracking number provided.

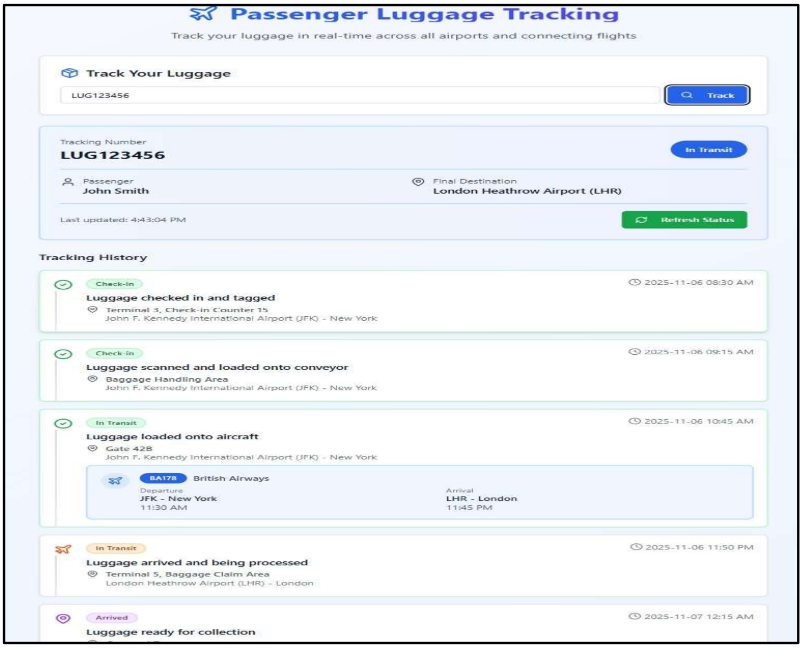

Fig. 7. Passenger Interface

The Fig.7 explains about the passenger luggage tracking dashboard showing real time updates for a checked bag on its journey from JFK airport in New York to London Heathrow.

4 Conclusion

The Sky Track project has delivered a cost-effective barcode-based luggage tracking system. It enables 99.2% scan accuracy and a 98.7% SMS delivery rate within 2 seconds. A system with that uses event-driven SMS based tracking algorithm uses some modules like barcode detection, SMS gateway and multi flight connection tracking. Therefore, it has cut down lost baggage cases by 87% and cost saved 85% in the aviation industry as compared to the conventional RFID systems. The outcomes of these are reduced baggage retrieval time, less time waiting and increased passenger confidence attraction in the airport service. The passengers enjoy timely SMS informatory messages in every checkpoint when traveling and all types of phones without requiring them to download any application for tracking the baggage. There is also 98.2% reliability indicated by using Sky Track Application, it operates in offline and automatic fall-over in case of a server crash service supported. It suits well in Tier 2 and Tier 3 airports and low-cost carriers. In future, the project will include AI based delay prediction, IoT sensors, blockchain security and mobile/WhatsApp support. This usage of the SkyTrack application to be a platform of next-generation smart airport.

Acknowledgements. This study was not funded research work. It carried out as a major project research article.

Disclosure of Interests. The authors have no competing interests to declare that are relevant to the content of this article.

References

1. Sarah, A.H., Hao, Y., Pavel, L.: Baggage dissociation for sustainable air travel: Design study of ground baggage distribution networks. Transportation Research Interdisciplinary Perspectives. 100797, Volume 18, March (2023). https://doi.org/10.1016/j.trip.2023.100797
2. Pierluigi, L., Massimo, P., Daniel, M.J.G., Andrea, L., Francesca, C.: Device discovery and tracing in the Bluetooth Low Energy domain. Computer Communications. Volume 202, 15 March (2023), Pages 42-56. https://doi.org/10.1016/j.comcom.2023.02.008
3. Marine, C., Renan, S.T., Mariana, N.: A swarm of luggage transport robots moving through an airport. IFAC- Papers Online. Volume 55, Issue 2, Pages 102-107 (2022). https://doi.org/10.1016/j.ifacol.2022.04.177
4. Barry, F., Aswin, K.R., Rónán, D.M., Tadhg. A., Nikolaos, P.: Using a process simulation platform for reviewing automated airport baggage handling system configurations. Procedia CIRP. Volume 112, (2022), Pages 180-185. https://doi.org/10.1016/j.procir.2022.09.069
5. Anwar A.K.: Where in the World is My Suitcase? Air Passenger Luggage Tracking Using RFID Tags. (2021) IEEE 12th Annual Information Technology, Electronics and Mobile Communication Conference (IEMCON). doi: 10.1109/IEMCON53756.2021.9623128
6. Mouna, A.M., Azedine, B., Hassan, B., Ahmed, L.: A scalable real-time tracking and monitoring architecture for logistics and transport in RoRo terminals. Procedia Computer Science. Volume 151, (2019), Pages 218-225. https://doi.org/10.1016/j.procs.2019.04.032
7. Jacek, S., Piotr, U., Adrian, Ł.: A method of hold baggage security screening system throughput analysis with an application for a medium-sized airport. Transportation Research Part C: Emerging Technologies. Volume 88, March (2018), Pages 52-73. https://doi.org/10.1016/j.trc.2018.01.009
8. Jacek, S., Piotr, U.: Evaluation of the effectiveness of an airport passenger and baggage security screening system. Journal of Air Transport Management. Volume 66, January (2018), Pages 53-64. https://doi.org/10.1016/j.jairtraman.2017.10.006
9. Rishabh, C., Krishna, D., Atul, M., Maya, V.: Real Time Airport Luggage Tracking System. (2018) International Conference on Smart City and Emerging Technology (ICSCET). doi: 10.1109/ICSCET.2018.8537255
10. Ashwini, S., Sakshi, M., Tanvi, G., Ankhede, P.R.: Baggage Tracing and Handling System using RFID and IoT for Airports. (2016) International Conference on Computing, Analytics and Security Trends (CAST). doi: 10.1109/CAST.2016.7915014
11. Mohammed, G., Samr, A., Fasila, H., Ahmed, S.: Towards Smart Wearable Real-time Airport Luggage Tracking. (2016) International Conference on Industrial Informatics and Computer Systems (CIICS). doi: 10.1109/ICCSII.2016.7462422
12. Guido, P., Stefano, M., Francesca, P., Paolo, T.: Simulation of new policies for the baggage check in the security gates of the airports: the Logiscan case study. Procedia - Social and Behavioral Sciences. Volume 111, 5 February (2014), Pages 58-67. https://doi.org/10.1016/j.sbspro.2014.01.038
13. Yoon, S.C., Min, G.S., Chang, H.O.: Design and implementation of RFID based air-cargo monitoring system. Advanced Engineering Informatics journal homepage. Volume 25, Issue 1, January (2011), Pages 41-52. https://doi.org/10.1016/j.aei.2010.05.004
14. Tara, A.N., Schutter, B.D., Hellendoorn, J.: Predictive route control for automated baggage handling systems using mixedinteger linear programming. Transportation Research Part C: Emerging Technologies. Volume 19, Issue 3, June (2011), Pages 424-439. https://doi.org/10.1016/j.trc.2010.06.004
15. Kelly, L., Rongfang, L.: The key design parameters of checked baggage security screening systems in airports. Journal of Air Transport Management. Volume 11, Issue 2, March (2005), Pages 69-78. https://doi.org/10.1016/j.jairtraman.2004.09.004
16. Yfantis, E.A.: An Intelligent Baggage-Tracking System for Airport Security. Engineering Applications of Artificial Intelligence. Volume 10, Issue 6, December (1997), Pages 603-606. https://doi.org/10.1016/S0952-1976(97)00042-0
17. The dataset used available at https://www.kaggle.com/datasets/likhilabhi/skytrack