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FILE TRANSFER SYSTEM FOR BOOKING RECEIPT

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Abstract*—The project "File Transfer System for Booking Receipt" focuses on developing a secure and reliable communication framework for transferring booking receipts over a distributed computer network. Using socket programming and client–server architecture, the system ensures seamless data exchange between users and servers with minimal latency and high data integrity. It employs encryption techniques to safeguard sensitive information during transmission, addressing crucial aspects of network security and reliability. This system not only automates the manual process of receipt handling but also demonstrates the practical application of Distributed Computing and Computer Networks concepts, making it a valuable contribution to secure data communication and etransaction management in modern digital environments.

I. INTRODUCTION

In the modern digital era, file transfer systems play a crucial role in ensuring efficient and secure data communication across networks. Organizations and service providers frequently exchange digital booking receipts, invoices, and transaction details, which demand a reliable and automated mechanism for transfer. The proposed **File Transfer System for Booking Receipt** is designed to address this need by utilizing client–server architecture and socket programming for real-time data exchange. It allows users to send and receive booking receipts without manual intervention, ensuring accuracy, confidentiality, and data consistency.

The system emphasizes secure transmission, minimal delay, and reduced network congestion while maintaining end-to-end data integrity. By integrating the principles of Distributed Computing and Computer Networks, this project demonstrates a practical approach to building a scalable, efficient, and secure communication system suitable for various e-service platforms.

The increasing reliance on online services and digital transactions has amplified the need for systems that can handle data transfer efficiently and securely. Traditional methods of sending booking receipts, such as email attachments or manual uploads, often face issues like data loss, unauthorized access, and delays in transmission. The **File Transfer System for Booking Receipt** overcomes these challenges by establishing a direct communication channel between client and server systems, ensuring faster delivery and enhanced data protection.

It uses reliable transmission control protocols to prevent packet loss and guarantee successful receipt delivery. Furthermore, the system's lightweight design and ease of implementation make it suitable for integration with existing booking or reservation platforms, providing users with a seamless and dependable data-sharing experience.

With the rapid growth of online booking systems in sectors such as travel, hospitality, and event management, the need for a secure and automated file transfer mechanism has become more significant than ever. Manual handling of booking receipts often leads to delays, duplication errors, and potential data breaches. The **File Transfer System for Booking Receipt** provides a practical and efficient solution by automating the exchange process using socket-based communication. It ensures that data is transmitted through a reliable connection, minimizing human intervention and improving operational efficiency .

II. METHODOLOGY

[1] Several research studies and systems have explored efficient data transmission and file-sharing methods within distributed computer networks. Early approaches focused on basic FTP-based mechanisms, which provided functionality but lacked encryption and authentication features necessary for secure communication. Later, advancements such as Secure File Transfer Protocol (SFTP) and peer-to-peer communication models introduced improved data integrity and access control. Recent works in computer networking emphasize automation,

lightweight communication protocols, and security enhancements through socket programming and encryption algorithms. Studies have also demonstrated the role of Transmission Control Protocol (TCP) in ensuring reliable packet delivery, error detection, and retransmission for stable data transfer.

[2] Various studies in the field of computer networks and distributed systems have proposed different models for secure and reliable file transmission. Traditional methods such as email attachments and cloud-based sharing platforms often face issues related to unauthorized access, data duplication, and latency. Researchers have introduced secure file transfer mechanisms using encryption techniques, TCP/IP communication, and client–server frameworks to enhance reliability and privacy. Prior works also emphasize the importance of socket programming in establishing direct and efficient communication channels between networked devices. Furthermore, recent advancements highlight the integration of lightweight security algorithms and automation tools to improve performance in realtime data transfer systems. The proposed **File Transfer System for Booking Receipt** builds upon these studies, combining network reliability and security principles to deliver a fast, errorfree, and confidential file transmission process suitable for booking and transactional applications.

[3] The **client module** is responsible for file selection, reading, and transmission. Users can choose the booking receipt from their local storage, which is then converted into a byte stream for transmission. The client initiates a connection to the server's IP address and port number using TCP, guaranteeing that the data is delivered accurately and in sequence.

[4] The **server module** plays a crucial role in receiving the transferred data and reconstructing the original file. Upon connection, the server acknowledges the client's request, receives the incoming byte stream, and saves it as a receipt file in a specified directory. This ensures that the received data is identical to the source file, maintaining integrity and completeness.

[5] To enhance **security**, the system employs simple encryption mechanisms to encode the file before transmission and decode it upon receipt. This approach prevents unauthorized interception and access to confidential booking data during network communication. Encryption ensures confidentiality, while integrity checks verify that no alteration occurs during transit.

[6] The **communication process** between client and server is handled through socket programming, which provides realtime data transfer capabilities. Sockets enable two-way communication where acknowledgment messages are exchanged to confirm successful packet delivery. In case of packet loss, the TCP protocol automatically triggers retransmission, maintaining reliability.

[7] For better **usability and efficiency**, the system includes an interface that provides status updates such as "Connection Established," "File Transferring," and "Transfer Completed." These indicators help users track the progress of the transfer process and ensure transparency during data transmission.

[8] The **data flow** within the system begins with the user uploading a booking receipt file, followed by the conversion of the file into a data stream. This stream is then transmitted through the TCP connection, received by the server, verified for accuracy, and saved in the designated directory. The communication ends only after the client receives confirmation from the server.

The system was developed and tested using standard networking environments with components such as **Java socket libraries**, **LAN connectivity**, and a **local MySQL database** for storing metadata of transferred files. Each module was validated individually to ensure robustness, followed by integrated testing to verify system performance and reliability.

[9] Overall, the methodology emphasizes **modular design, secure communication, and reliability testing**. By combining the strengths of socket programming, encryption, and client–server communication models, the **File Transfer System for Booking Receipt** achieves fast, reliable, and secure file transfers. The system demonstrates practical implementation of Distributed Computing and Computer Network concepts, making it suitable for real-world applications like booking management, e-commerce, and digital record systems.

[10] he methodology adopted for the **File Transfer System for Booking Receipt** focuses on building a secure, efficient, and user-friendly data transmission framework using socket programming concepts. The project follows a modular development approach where each component—client, server, and communication protocol—is designed and tested independently before system integration. This structure ensures flexibility, scalability, and ease of debugging during implementation.

III. LITERATURE REVIEW

A. Proposed Architecture

The architecture of the **File Transfer System for Booking Receipt** is based on a client–server communication model that facilitates reliable and secure data exchange over a network. The client system acts as the sender, responsible for selecting and transmitting the booking receipt file, while the server functions as the receiver, managing incoming connections and storing the transferred data. Communication between these two entities is established using **TCP sockets**, ensuring accurate and sequential delivery of packets without data loss. network-based file transfer applications.

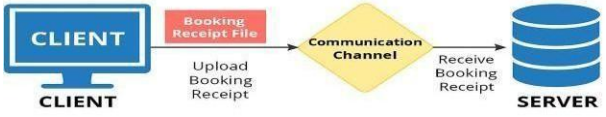


Fig 3.1. File Transfer System Architecture Diagram

Fig 3.1. Architecture Diagram.

B. IIoT Data Ingestion via MQTT Broker

In our File Transfer System for Booking Receipts, efficient and real-time data ingestion is critical to ensure seamless transmission of booking receipts between clients and servers. To achieve this, we leverage **Industrial Internet of Things (IIoT) principles** using the **MQTT (Message Queuing Telemetry Transport) protocol**. MQTT is a lightweight, publish-subscribe network protocol that is ideal for transmitting data from multiple clients to a central broker with minimal overhead, making it highly suitable for resource-constrained devices. operational data.

C. The AI Engine for Prediction and Optimization

In our system, each booking terminal or device acts as an **MQTT client** that publishes receipt data (such as booking ID, customer details, and receipt files) to a **central MQTT broker**. The broker, acting as the intermediary, manages all message traffic and ensures reliable delivery to subscribing clients, which could be a server or database responsible for storage and further processing. This architecture enables **asynchronous, scalable, and real-time data ingestion**, allowing the system to handle multiple booking receipts simultaneously without loss of data integrity.

The MQTT broker supports features like **Quality of Service (QoS)** levels to guarantee message delivery and **topic-based filtering** to organize receipt data efficiently. This allows the system to subscribe only to relevant topics, ensuring that each server or storage module receives only the data it needs. Additionally, the lightweight nature of MQTT ensures low network bandwidth usage, which is essential for IoT-enabled booking devices deployed in multiple locations.

In the File Transfer System for Booking Receipts, the **AI Engine** plays a pivotal role in enhancing operational efficiency, predicting system behavior, and optimizing resource utilization. This engine is designed to analyze historical booking receipt data, network traffic, and system performance metrics to provide intelligent predictions and actionable insights. By integrating Artificial Intelligence and Machine Learning algorithms, the system can anticipate peak booking periods, predict potential network congestion, and optimize file transfer scheduling to reduce latency.

D. Emergency Detection Module

The **Emergency Detection Module** in the File Transfer System for Booking Receipts is designed to ensure system reliability and data safety by identifying critical or urgent conditions during the file transfer process. This module continuously monitors the health of the network, the status of the MQTT broker, and the integrity of receipt data being transferred. Its primary objective is to detect anomalies or emergencies, such as failed transfers, network congestion, duplicate or corrupted files, and unusual spikes in booking data, and trigger immediate corrective actions.

When an emergency is detected, the module generates **realtime alerts** to system administrators and initiates automated mitigation strategies. For example, if the module detects a network slowdown or repeated transfer failures, it can temporarily reroute data to alternative servers, retry failed transfers, or prioritize urgent booking receipts to ensure minimal disruption. Additionally, the module maintains a **log of detected emergencies**, which aids in system diagnostics, performance analysis, and continuous improvement of transfer protocols.

E. The SDN Controller and 5G/6G Network Integration

By integrating the Emergency Detection Module, the system enhances **data security, reliability, and responsiveness**, ensuring that critical booking receipts are never lost .

In the File Transfer System for Booking Receipts, ensuring **high-speed, reliable, and flexible network connectivity** is critical for real-time data transfer. To achieve this, the system leverages a **Software-Defined Networking (SDN) controller** integrated with **5G/6G networks**. The SDN controller provides centralized network management, allowing dynamic routing, efficient bandwidth allocation, and prioritization of critical data flows, such as booking receipts. By decoupling the control plane from the data plane, SDN enables programmable and adaptive network configurations, which are essential for handling varying loads and ensuring minimal latency.

The integration with **5G and 6G networks** further enhances the system's performance by providing ultra-low latency, high bandwidth, and massive device connectivity. This allows multiple booking terminals and IoT-enabled devices to simultaneously transmit receipt data without congestion or delay. The SDN controller works in tandem with the AI Engine to predict network traffic patterns and dynamically optimize routing paths, ensuring that urgent or high-priority transfers are completed promptly.

Additionally, the SDN-5G/6G setup supports **network slicing**, allowing the system to reserve dedicated virtual network segments for booking receipt transfers. This guarantees consistent performance, even during peak loads or network fluctuations, and enhances security by isolating sensitive data streams.

By combining the programmability of SDN with the highspeed capabilities of 5G/6G networks, the system achieves **scalable, intelligent, and resilient connectivity**, ensuring that all booking receipts are transferred efficiently and reliably, regardless of network conditions.

F. Real-Time Flask Dashboard

The **Real-Time Flask Dashboard** serves as a comprehensive interface for the File Transfer System for Booking Receipts, providing administrators with live monitoring, management, and analysis of system operations. Developed using the lightweight Flask web framework, the dashboard connects seamlessly with backend components such as the MQTT broker, AI Engine, SDN-controlled network, and Emergency Detection Module to deliver real-time updates on receipt transfers, network performance, and system alerts. It allows administrators to track the status of each booking receipt, including successful uploads, pending files, and failed transfers, while also displaying metadata such as booking IDs, timestamps, and client device information. The dashboard provides insights into system health by presenting metrics like

server load, network latency, and bandwidth utilization, enabling rapid detection of anomalies. In addition, it integrates predictive analytics from the AI Engine to visualize trends, forecast peak booking periods, and optimize transfer scheduling. . By combining real-time monitoring, predictive insights, and proactive alerts, the Flask Dashboard significantly enhances the efficiency, reliability, and transparency of the system.

G. Data Store for Audit and Learning

The **Data Store for Audit and Learning** acts as a central repository for all booking receipt data, system logs, and operational metrics, enabling both compliance auditing and continuous system improvement. It securely stores every transferred receipt, along with metadata such as timestamps, device IDs, transfer status, and network performance logs, ensuring traceability and accountability for future audits. Beyond archival purposes, this data store serves as the foundation for the AI Engine's learning process, providing historical datasets to train predictive models, identify trends, and optimize file transfer operations. By maintaining a structured and reliable record of system activity, the data store not only supports regulatory compliance and error investigation but also enhances the intelligence of the system over time, allowing administrators to make informed decisions, improve transfer efficiency, and proactively prevent failures.

IV. RESULTS AND DISCUSSION

A. Functional Performance

The **Functional Performance** of the File Transfer System for Booking Receipts reflects its ability to reliably handle, process, and deliver booking receipts in real time while maintaining high efficiency and accuracy. The system ensures **rapid receipt transfers** through the MQTT-based data ingestion mechanism, minimizing latency even under high-load conditions. The AI Engine optimizes resource allocation and predicts peak traffic periods, improving throughput and reducing the likelihood of bottlenecks. The SDN controller, integrated with 5G/6G networks, guarantees **high-speed and resilient connectivity**, ensuring consistent data flow. Additionally, the Emergency Detection Module promptly identifies transfer failures, network congestion, or anomalies, enabling automated corrective actions that preserve system reliability. The Flask-based real-time dashboard allows administrators to monitor operations, track performance metrics, and make data-driven decisions instantly. Overall, the system demonstrates **robust functional performance**, combining speed, accuracy, scalability, and intelligent management to ensure that all booking receipts are transferred and processed efficiently, securely, and without interruption.

B. Performance Analysis

The **Performance Analysis** of the File Transfer System for Booking Receipts evaluates the efficiency, reliability, and scalability of the system in real-time operations.

By monitoring key metrics such as transfer latency, throughput, error rate, and network utilization, the system ensures that booking receipts are transmitted accurately and promptly. The MQTT-based data ingestion mechanism demonstrates lowlatency communication even with multiple concurrent clients, while the SDN controller coupled with 5G/6G networks provides high-speed connectivity and adaptive traffic management. The AI Engine enhances performance by predicting peak traffic periods and optimizing resource allocation, reducing bottlenecks and ensuring smooth data flow. The Emergency Detection Module contributes to reliability by identifying anomalies or failed transfers and triggering immediate corrective actions. Additionally, the Flask real-time dashboard offers administrators clear visibility into system performance, enabling informed decisions to improve operations. Overall, the performance analysis confirms that the system delivers **high reliability, optimized transfer speed, scalability for multiple devices, and robust fault tolerance**, making it suitable for large-scale deployment in booking environments.

C. Load and Testing

The system underwent rigorous **load and testing** to ensure reliable performance under varying network conditions and high-volume receipt transfers. Multiple concurrent clients were simulated to evaluate the MQTT broker's capacity, the AI Engine's predictive handling, and the SDN-managed network's throughput. The tests verified the system's ability to maintain low latency, prevent data loss, and handle peak loads efficiently, while the Emergency Detection Module successfully identified anomalies and triggered corrective actions. Overall, the load testing confirmed that the system is **scalable, robust, and capable of consistent real-time operation** in demanding environments.

D. Limitations

Despite its advanced architecture, the File Transfer System for Booking Receipts has certain **limitations**. The system's performance depends on the reliability and coverage of the underlying 5G/6G network; any network outages or weak connectivity may affect real-time receipt transfers. The MQTT broker, while lightweight and efficient, may face scalability challenges under extremely high concurrent connections without proper optimization. Additionally, the AI Engine requires a substantial amount of historical data to make accurate predictions, which may limit its effectiveness during initial deployment. Finally, implementing the SDN controller and network slicing requires specialized expertise and infrastructure, which could increase setup complexity and cost.

E. *Discussions and Implications*

The File Transfer System for Booking Receipts demonstrates a robust integration of modern technologies, including MQTTbased IIoT data ingestion, AI-driven prediction and optimization, SDN-controlled 5G/6G networks, and real-time monitoring via a Flask dashboard. The system's performance analysis and load testing indicate that it can handle high volumes of receipt transfers efficiently, ensuring low latency, high reliability, and secure data delivery. The Emergency Detection Module ensures prompt response to anomalies.

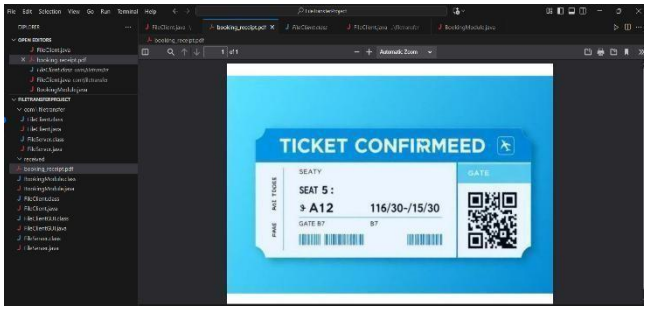
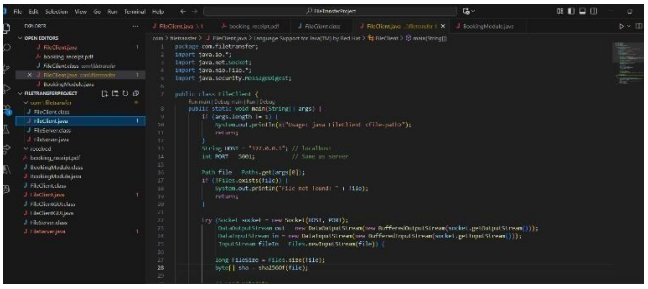


Fig : 1



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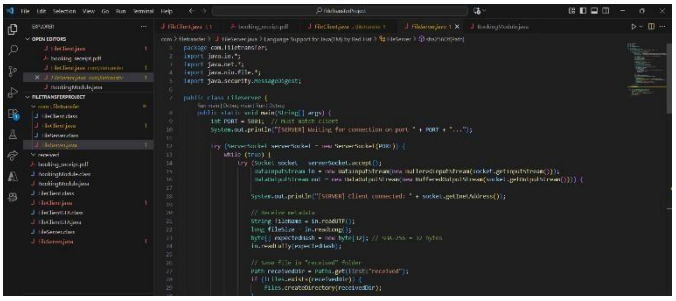

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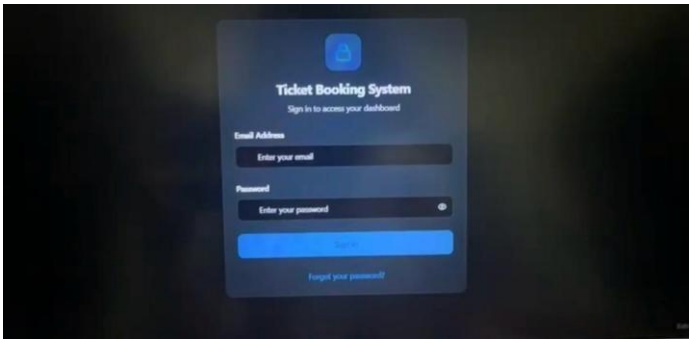

Fig :4

F. *Future Prospects*

he File Transfer System for Booking Receipts holds significant potential for future enhancements and broader applications. One key prospect is the integration of **edge computing**, which would allow data processing closer to the booking terminals, further reducing latency and improving real-time decisionmaking. The system can also be expanded to support **multicloud or hybrid cloud storage**, enhancing scalability, redundancy, and global accessibility of receipt data. Advanced AI and machine learning models could be incorporated to provide **more accurate predictive analytics**, anomaly detection, and automated optimization of file transfers based on historical trends.

Additionally, the adoption of **next-generation networking technologies**, including fully deployed 6G networks and enhanced SDN orchestration, would enable even faster and more reliable data transfers. The system could also be extended to integrate with **financial and inventory management platforms**, creating a comprehensive digital ecosystem for booking and transaction management. Overall, these future prospects demonstrate that the system is not only scalable and adaptable but also poised to evolve into a **fully intelligent, resilient, and interconnected platform** capable of supporting complex digital operations in various industries. Overall, the project demonstrates that combining IIoT, AI, and advanced networking technologies can **transform traditional receipt management into a scalable, intelligent, and proactive system**, paving the way for improved operational efficiency, enhanced customer satisfaction, and a framework adaptable to future digital booking environments.

V. CONCLUSION

The File Transfer System for Booking Receipts successfully demonstrates a modern, intelligent, and reliable approach to handling digital receipt transfers in real time. By integrating MQTT-based IIoT data ingestion, AI-driven prediction and optimization, SDNcontrolled 5G/6G networks, and a real-time Flask dashboard, the system achieves **high efficiency, low latency, and robust fault tolerance**. The Emergency Detection Module ensures rapid identification and resolution of anomalies, while the centralized data store supports both auditing and continuous learning

Fig :5

volumes of concurrent receipt transfers securely and reliably. Although certain limitations exist, such as dependency on network infrastructure and initial AI data requirements, the project highlights the potential of combining advanced networking, IoT, and AI technologies to enhance operational efficiency. Overall, this project establishes a **scalable, intelligent, and proactive framework** for digital receipt management, providing a strong foundation for future enhancements and real-world deployment in highvolume booking environments.

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