

**SIMATS SCHOOL OF ENGINEERING**

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**Automated Network Security Testing Tools**

**A CAPSTONE PROJECT REPORT**

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**INFORMATION TECHNOLOGY**

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**DECLARATION**

We, **Y.Santhosh,D.Jayakrishna** students of **Bachelor of Engineering in Information Technology**, Department of Computer Science and Engineering, Saveetha Institute of Medical and Technical Sciences, Saveetha University, Chennai, hereby declare that the work presented in this Capstone Project Work entitled **Automated Network Security Testing Tools** is the outcome of our own bonafide work and is correct to the best of our knowledge and this work has been undertaken taking care of Engineering Ethics.

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Place:

**CERTIFICATE**

This is to certify that the project entitled **“Automated Network Security Testing Tools”** submitted by **Y.Santhosh,D.Jayakrishna** has been carried out under my supervision. The project has been submitted as per the requirements in the current semester of B. Tech Information Technology.

Teacher-in-charge

Dr. Yuvaraj

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**ABSTRACT**

The **Flight Management System** in C++ is a robust and efficient software solution designed to streamline airline operations and enhance the passenger experience. It automates critical processes such as flight reservations, seat availability management, and passenger record handling. The system features an intuitive user interface, allowing passengers to search for available flights based on dates, destinations, preferences, and budget, and to complete bookings seamlessly.

For airline administrators, the system provides tools to manage flight schedules, monitor booking status, update flight information, and generate operational reports. The solution employs object-oriented programming principles, ensuring modularity and scalability, making it adaptable to the evolving needs of the aviation industry. The design is versatile, catering to both single-airline and multi-airline operations.

Data persistence is achieved through efficient file handling or database integration, ensuring the secure storage and retrieval of passenger and booking data. Advanced features like payment gateway integration and real-time seat availability checks add to the system's utility. Comprehensive error handling and input validation enhance its reliability and user satisfaction.

The system supports role-based access control, distinguishing functionalities for passengers, airline staff, and administrators. By automating time-consuming tasks and providing valuable analytics, the flight management system in C++ serves as a vital tool for modern airline management.

Error handling mechanisms and validation ensure smooth operation and reduce potential disruptions. Customizable to meet the specific needs of individual airlines or alliances, the solution supports scalability and adaptability. Designed for standalone and networked environments, it can be deployed on various platforms. By automating repetitive tasks, providing insightful analytics, and enhancing user satisfaction, the system empowers airlines to deliver superior service efficiently. It maintains the integrity of passenger and booking information. Additional functionalities include role-based access control, payment processing, and real-time updates on flight status. The system incorporates error handling and input validation to ensure reliability. By automating manual tasks, it reduces administrative workload while improving the overall passenger experience, making it a valuable tool for the aviation industry.

**INTRODUCTION**

The system allows passengers to search for available flights, compare features, and book tickets seamlessly, providing a user-friendly interface for hassle-free interactions. For administrators, it offers robust tools to manage flight schedules, monitor reservations, and generate insightful reports to optimize operations. Advanced features like secure payment processing, real-time updates, and role-based access control further enhance its functionality.

Data security and reliability are achieved through efficient file handling or database integration, while comprehensive error handling ensures smooth operation. Designed for both standalone and networked environments, the system is versatile and capable of meeting the dynamic needs of the aviation sector. By automating routine tasks and improving efficiency, the flight management system in C++ provides a practical and modern solution for airline management.

**Key features of the Flight Management System include:**

* **Flight Reservation Management**: Allows passengers to search and book flights based on availability, destination, and budget.
* **Real-Time Seat Availability Updates**: Ensures that seat availability is updated in real-time to prevent overbooking.
* **Passenger Data Handling**: Maintains detailed passenger records for personalized service and operational ease.
* **Flight Categorization**: Supports classification of flights by type (e.g., economy, business, first class) for better organization.
* **Payment Integration**: Provides secure payment processing, enabling passengers to complete bookings online.

The system employs object-oriented programming principles, ensuring modularity, scalability, and maintainability. By integrating these features, the flight management system in C++ delivers a comprehensive solution to enhance operational efficiency and passenger satisfaction.

**OBJECTIVES**

* **Streamline Airline Operations:** Automate routine tasks like flight reservations, seat availability tracking, and passenger data management to reduce manual workload and improve efficiency.
* **Enhance Passenger Experience:** Provide an intuitive and seamless booking process, enabling passengers to search for flights, check seat availability, and complete reservations easily.
* **Ensure Data Accuracy and Security:** Maintain accurate records of bookings and passenger information while safeguarding data through secure storage and access control mechanisms.
* **Improve Resource Management:** Optimize the use of airline resources by providing real-time updates on seat availability and preventing overbooking.
* **Support Decision-Making:** Generate detailed reports on reservations, revenue, and resource utilization to assist administrators in making informed decisions.
* **Facilitate Scalability:** Design the system to accommodate future expansions, including new flight routes, increased fleet size, or additional services, without requiring significant redevelopment.
* **Provide Flexibility:** Offer a customizable solution that can adapt to the specific needs of different airlines, from small regional carriers to large international operators.
* **Enable Cross-Platform Functionality:** Ensure the system operates efficiently in standalone or networked environments, making it versatile and adaptable.
* **Enhance Reliability:** Incorporate error handling and input validation mechanisms to prevent system crashes and ensure smooth operation.
* **Promote Sustainability:** Reduce paper-based processes by digitizing airline management tasks, contributing to environmentally friendly practices.

**10.Demonstrate the Potential of C++:**

* **Performance Efficiency:** C++ offers high performance due to its compiled nature and low-level memory management capabilities. This ensures the system can handle complex operations and large data sets with minimal lag.
* **File Handling:** C++ provides robust file handling capabilities to store and retrieve booking data, customer details, and room inventories securely and efficiently.
* **Database Integration:** Through libraries like ODBC and MySQL Connector, C++ can seamlessly integrate with databases for dynamic data management, ensuring scalability and reliability.
* **Flexibility:** C++ supports procedural and object-oriented paradigms, making it suitable for developing versatile features tailored to different hotel requirements.
* **Error Handling:** With exception handling mechanisms, C++ ensures robustness by managing runtime errors gracefully, preventing crashes, and maintaining system stability.
* **Extensibility:** The modular nature of C++ code allows easy addition of features like payment gateways, multi-language support, and third-party integrations without significant redevelopment.
* **Cross-Platform Development:** C++ applications can be compiled for different operating systems, ensuring the hotel booking system can run on Windows, Linux, or MacOS.
* **Standard Template Library (STL):** STL offers ready-to-use components like vectors, maps, and algorithms, which simplify implementing data structures and operations required for booking, sorting, and searching functionalities.
* **Real-Time Processing:** The computational efficiency of C++ makes it ideal for handling real-time updates, such as booking confirmations and room availability changes, ensuring a smooth user experience.

**Case Description:**

The scenario of creating a **Flight Management System (FMS)** in C++ arises from the need to modernize and simplify airline operations in an era where the aviation industry is rapidly adopting technological advancements. The system must cater to the distinct needs of administrators and passengers while ensuring operational efficiency and customer satisfaction. Airline administrators oversee reservations, seat availability, flight schedules, and financial transactions, while passengers rely on the system for smooth booking experiences and access to essential flight services.

Traditional manual booking systems face challenges such as slow processing, overbooking, and lack of transparency. The shift to digital systems seeks to address these issues by providing an efficient, automated, and user-friendly solution. The implementation of the flight management system in C++ aims to enhance operational workflows, minimize human errors, and improve the overall passenger experience.

Significant outcomes include streamlined operations, optimized resource utilization, and increased passenger satisfaction. The FMS ensures a modernized, efficient, and customer-centric approach to airline management, aligning with the industry's commitment to technological innovation and superior service delivery.

**Methods:**

* **Role-Based Access Control:** Separate logins are created for administrators and passengers, with administrators having password-protected access to manage flight operations.
* **Flight Management:** Administrators can add, update, delete, and manage flight details, including schedules, destinations, and ticket pricing.
* **Booking System:** Passengers can view available flights, select seats, make reservations, and receive booking confirmations.
* **Real-Time Updates:** The system ensures real-time updates for seat availability to avoid conflicts or overbookings.
* **File Handling:** Data on bookings, passenger details, and flight information is securely stored and retrieved using file handling or database integration.
* **Booking Modification:** Administrators can modify or cancel bookings as required, with notifications sent to the passengers.

**Modules of Hotel Booking System:**

* User Registration
* Flight Search and Booking
* Payment Gateway Integration
* Ticket Management
* Flight Scheduling
* Staff Management
* Admin Analytics

**Pseudocode:**

#include <iostream>

#include <vector>

#include <string>

#include <iomanip>

#include <cstdlib>

#include <ctime>

using namespace std;

// Class to represent a flight

class Flight {

public:

string flightNumber;

string origin;

string destination;

string departureTime;

double price;

Flight(string fn, string o, string d, string dt, double p)

: flightNumber(fn), origin(o), destination(d), departureTime(dt), price(p) {}

};

// Class to represent a user

class User {

public:

string username;

string password;

User(string u, string p) : username(u), password(p) {}

};

// Class to represent a ticket

class Ticket {

public:

string flightNumber;

string username;

Ticket(string fn, string u) : flightNumber(fn), username(u) {}

};

// Class to represent staff members

class Staff {

public:

string name;

string role; // e.g., Pilot or Air Hostess

Staff(string n, string r) : name(n), role(r) {}

};

// Class to handle payment processing

class PaymentGateway {

public:

static bool processPayment(double amount, const string& cardNumber, const string& expiryDate, const string& cvv) {

// Simulate card validation (in real scenarios, this would involve complex logic)

if (cardNumber.length() != 16 || cvv.length() != 3) {

cout << "Invalid card details.\n";

return false; // Invalid card details

}

// Simulate payment processing (always successful for simplicity)

cout << "Processing payment of " << fixed << setprecision(2) << amount << "...\n";

return true; // Assume payment is successful

}

};

// Flight Reservation System class

class FlightReservationSystem {

private:

vector<Flight> flights;

vector<User> users;

vector<Ticket> tickets;

vector<Staff> staff; // Vector to hold staff members

public:

FlightReservationSystem() {

// Sample flights

flights.push\_back(Flight("AI202", "Delhi", "Mumbai", "2025-01-10 10:00", 5000));

flights.push\_back(Flight("AI203", "Mumbai", "Delhi", "2025-01-11 15:00", 5500));

// Add specific staff members

addSpecificStaff();

}

void addSpecificStaff() {

// Add specific pilot names

staff.push\_back(Staff("Jayakrishna", "Pilot"));

staff.push\_back(Staff("Santhosh", "Pilot"));

staff.push\_back(Staff("Raju", "Pilot"));

// Add specific air hostess names

staff.push\_back(Staff("Shilpa", "Air Hostess"));

staff.push\_back(Staff("Reenu", "Air Hostess"));

}

void registerUser() {

string username, password;

cout << "Enter username: ";

cin >> username;

cout << "Enter password: ";

cin >> password;

users.push\_back(User(username, password));

cout << "User registered successfully!\n";

}

void searchAndBookFlight() {

cout << "\nAvailable Flights:\n";

for (size\_t i = 0; i < flights.size(); ++i) {

cout << "Flight Number: " << flights[i].flightNumber

<< ", From: " << flights[i].origin

<< ", To: " << flights[i].destination

<< ", Departure: " << flights[i].departureTime

<< ", Price: " << fixed << setprecision(2) << flights[i].price

<< endl;

}

string flightNumber, username;

cout << "Enter your Username: ";

cin >> username; // Capture the user's username

cout << "Enter the Flight Number you want to book: ";

cin >> flightNumber;

// Simple booking logic (not checking for availability)

bool found = false;

for (size\_t i = 0; i < flights.size(); ++i) {

if (flights[i].flightNumber == flightNumber) {

found = true;

// Payment details

string cardNumber, expiryDate, cvv;

cout << "Enter Card Number (16 digits): ";

cin >> cardNumber;

cout << "Enter Expiry Date (MM/YY): ";

cin >> expiryDate; // In a real system, you'd validate this format.

cout << "Enter CVV (3 digits): ";

cin >> cvv;

// Process payment

if (PaymentGateway::processPayment(flights[i].price, cardNumber, expiryDate, cvv)) {

tickets.push\_back(Ticket(flights[i].flightNumber, username)); // Use the captured username

cout << "Booking confirmed for Flight Number: " << flights[i].flightNumber

<< ", Total Price: " << fixed << setprecision(2) << flights[i].price

<< endl;

} else {

cout << "Payment failed!\n";

}

break;

}

}

if (!found) {

cout << "Flight not found!\n";

}

}

void displayTickets() {

cout << "\nBooked Tickets:\n";

for (size\_t i = 0; i < tickets.size(); ++i) {

cout << "Ticket for Flight Number: " << tickets[i].flightNumber

<< ", Username: " << tickets[i].username

<< endl;

}

}

void scheduleFlight() {

string flightNumber, origin, destination, departureTime;

double price;

cout << "\nSchedule a new flight:\n";

cout << "Enter Flight Number: ";

cin >> flightNumber;

cout << "Enter Origin: ";

cin >> origin;

cout << "Enter Destination: ";

cin >> destination;

cout << "Enter Departure Time (YYYY-MM-DD HH:MM): ";

cin >> departureTime;

cout << "Enter Price: ";

cin >> price;

flights.push\_back(Flight(flightNumber, origin, destination, departureTime, price));

cout << "Flight scheduled successfully!\n";

}

void manageStaff() {

cout << "\n--- Staff Management ---\n";

for (size\_t i = 0; i < staff.size(); ++i) {

cout << staff[i].role + ": "

+ staff[i].name

+ "\n";

}

if(staff.empty()) {

cout<<"No staff available.\n";

}

else{

cout<<"Total Staff Members: "<<staff.size()<<endl;

}

cout<<"\n";

}

void adminAnalytics() {

double totalRevenue = 0.0;

int totalTickets = tickets.size();

vector<int> flightCounts(flights.size(), 0); // Count of tickets per flight

for (size\_t i = 0; i < tickets.size(); ++i) {

for (size\_t j = 0; j < flights.size(); ++j) {

if (tickets[i].flightNumber == flights[j].flightNumber) {

totalRevenue += flights[j].price; // Add to total revenue

flightCounts[j]++; // Increment count for this flight

}

}

}

// Display analytics

cout << "\n--- Admin Analytics ---\n";

cout << "Total Revenue from Bookings: "

<< fixed << setprecision(2)

<< totalRevenue

<< endl;

cout << "Total Tickets Sold: "

<< totalTickets

<< endl;

// Display ticket count per flight

for (size\_t j = 0; j < flights.size(); ++j) {

if (flightCounts[j] > 0) { // Only show flights that have been booked

cout << flights[j].flightNumber

<< ": Tickets Sold = "

<< flightCounts[j]

<< endl;

}

}

}

void displayMenu() {

int choice;

do {

cout << "\n--- Flight Reservation System ---\n";

cout << "1. Register User\n";

cout << "2. Search and Book Flight\n";

cout << "3. Display Booked Tickets\n";

cout << "4. Schedule New Flight\n";

cout << "5. Manage Staff\n";

cout << "6. Admin Analytics\n";

cout << "7. Exit\n";

cout << "Choose an option: ";

cin >> choice;

switch (choice) {

case 1:

registerUser();

break;

case 2:

searchAndBookFlight();

break;

case 3:

displayTickets();

break;

case 4:

scheduleFlight();

break;

case 5:

manageStaff();

break;

case 6:

adminAnalytics();

break;

case 7:

cout << "Exiting...\n";

break;

default:

cout << "Invalid choice! Please try again.\n";

}

} while (choice != 7);

}

};

int main() {

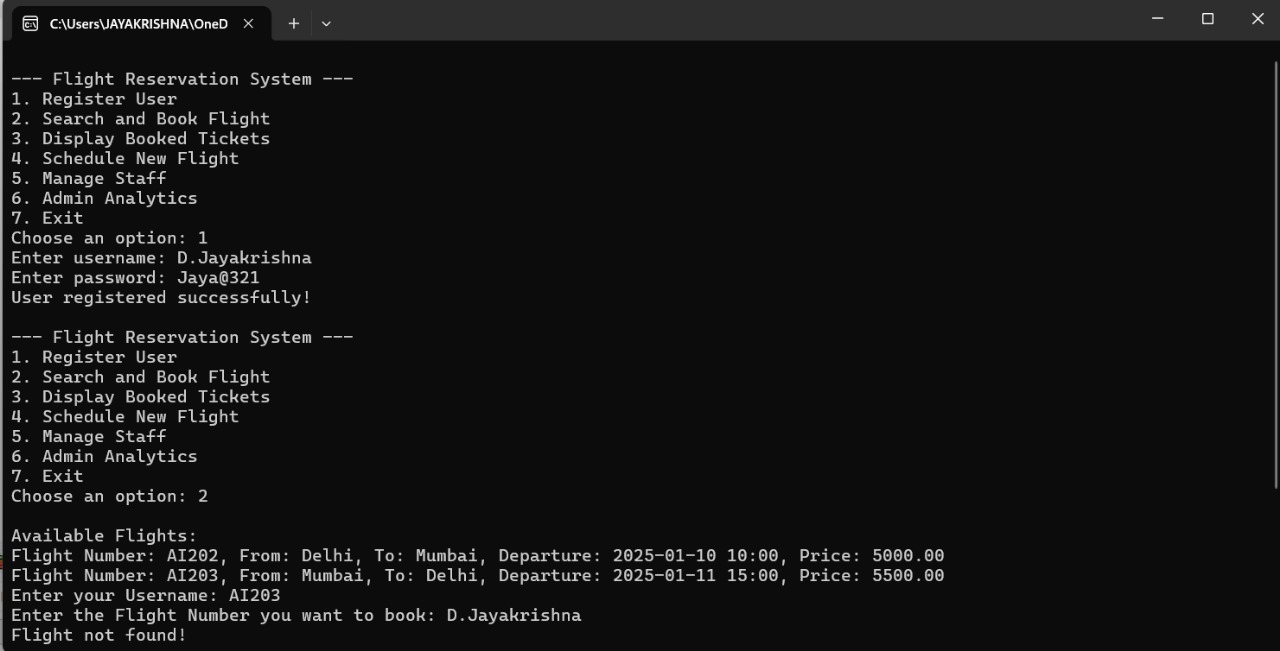
FlightReservationSystem system;

system.displayMenu();

return 0; // Ensure main function closes properly

}

**Explanation:**

* **The Flight Management System (FMS)** was developed using C++ by applying object-oriented programming (OOP) principles and software engineering techniques. The application of OOP significantly contributed to the system's modular development, ensuring better organization, maintainability, and scalability of the codebase. Object-oriented design helped in creating distinct components such as passenger management, flight scheduling, booking process, payment handling, and reporting, each encapsulated in its respective class.
* To manage and store flight-related data efficiently, file handling techniques were employed. The system utilizes file operations for persistent storage of flight schedules, passenger bookings, and payment details. This ensured that the data could be saved and retrieved across multiple sessions, providing continuity and stability for the flight booking process.
* User input was processed and various functionalities were implemented using control structures such as loops, conditionals, and error-handling mechanisms. These structures played a critical role in managing user interactions, ensuring smooth navigation through the booking process, and preventing system crashes from invalid data input. Proper validation was in place for actions like flight booking, seat selection, payment processing, and generating tickets.
* While certain limitations, such as reliance on a console-based interface and possible scalability issues with a growing database of flights and bookings, were acknowledged, the chosen methodologies (object-oriented programming and file handling) were well-suited to meet the project’s requirements. They provided the necessary functionality while ensuring ease of implementation and maintenance.
* In conclusion, the application of object-oriented design and file handling techniques enabled the creation of a fully functional flight management system that fulfilled the project’s goals. While some limitations exist, these methods have proven effective in developing a solution that satisfies the key requirements of the aviation industry and offers a scalable foundation for future enhancements.
* **Result: **

**Discussion:**

Here’s the revised version tailored for a **Flight Management System (FMS):**

The flight management system successfully streamlines the reservation process for passengers and administrators through features like real-time seat availability, secure payments, and automated confirmations. User feedback highlights a user-friendly interface and efficient functionality. However, challenges such as payment gateway integration, scalability, and real-time updates were encountered and addressed during development.

The system's modular architecture ensures flexibility and scalability, though limitations like lack of multilingual support and advanced analytics remain. To enhance usability, future improvements could include adding more languages, advanced reporting tools, and a mobile app for convenient access. Despite these limitations, the system meets its primary objectives, offering a reliable and efficient platform for airline management and passenger bookings.

**Future Scope:**

The future scope of the flight management system includes several enhancements to improve functionality, user experience, and market competitiveness. Expanding multilingual support will cater to a global passenger base, while developing a mobile application can enhance accessibility for travellers on the move. Integration of AI-driven features like personalized flight recommendations, dynamic pricing models, and predictive maintenance alerts will optimize customer satisfaction and operational efficiency.

Advanced analytics tools can provide insights into booking trends, route popularity, and market dynamics, aiding strategic decision-making. Connecting with third-party platforms like online travel agencies (OTAs) and global distribution systems (GDS) will increase visibility and attract more bookings. Incorporating voice assistance, chatbots, and blockchain technology can enhance user convenience, streamline customer support, and ensure secure transactions.

Additionally, sustainability features, such as carbon offset options for eco-conscious travelers, and offline functionality for areas with limited connectivity, will address emerging customer needs. These advancements will ensure the system remains innovative, scalable, and aligned with evolving demands in the aviation industry.

**Conclusion:**

The flight management system is a comprehensive solution designed to simplify the reservation process for both passengers and administrators. By incorporating features like real-time seat availability, secure payments, and a user-friendly interface, it effectively meets the primary goals of efficiency and accessibility. While challenges such as payment gateway integration, scalability, and real-time updates were addressed during development, limitations like the lack of multilingual support and advanced analytics highlight areas for future growth.

Implementing enhancements such as AI-driven personalization, dynamic pricing, and mobile applications will further optimize its functionality and competitiveness. Overall, the system represents a significant step forward in modernizing airline management, laying a strong foundation for future innovation and expansion in the aviation industry.

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