**Project X: Automated University Attendance System**

**Research**

**1. What is the purpose of Project X?**

**Answer:  
Project X aims to develop an automated attendance system to address the inefficiencies and vulnerabilities of manual attendance tracking in educational institutions. Traditional methods like paper logs and spreadsheets are prone to human error, manipulation, and are time-consuming. This system proposes using QR code technology, geolocation, and cloud storage to streamline and secure the process.**

**2. What are the primary objectives of the system?**

**Answer:  
The general objective is to create a secure, QR-based attendance platform for Davao Oriental State University (DOrSU).  
Specific objectives include:**

* **Eliminating paper-based tracking.**
* **Implementing secure QR code scanning for student identity verification.**
* **Utilizing a cloud database for real-time storage.**
* **Providing documentation for scalability and implementation.**

**3. What are the scope and limitations of Project X?**

**Answer:  
Scope:**

* **Designed for academic institutions.**
* **Features device registration, QR-based student verification, and geolocation validation.**
* **Stores data securely using MongoDB in the cloud.**

**Limitations:**

* **Requires devices with cameras and internet access.**
* **QR scanning may be sensitive to lighting.**
* **Not integrated with existing LMS/SIS platforms.**
* **No biometric or multi-factor authentication.**
* **Effectiveness depends on user adoption.**

**4. Who are the users and what are their roles?**

**Answer:**

* **Administrator: Manages users, devices, courses, and reports.**
* **Lecturer: Registers devices, takes student photos, and records attendance.**
* **Student: Identified via QR code and has attendance logged automatically.**

**5. How does the system handle device registration and attendance?**

**Answer:**

* **Devices must be registered and authenticated before use.**
* **Attendance is recorded when a student scans a QR code using a lecturer’s device.**
* **The record includes student ID, name, timestamp, and course info.**
* **Data is stored in real-time in the cloud.**

**6. What technologies are used in Project X?**

**Answer:**

* **Frontend: React.js**
* **Backend/API: Node.js with REST architecture**
* **Database: MongoDB**
* **Authentication: JWT-based with hashed passwords**
* **QR Code Module: Time-sensitive QR generation and scanning**

**7. How does the system ensure security and privacy?**

**Answer:**

* **Enforces strong passwords and optional 2FA.**
* **Uses HTTPS for secure data transmission.**
* **Implements Role-Based Access Control (RBAC).**
* **Complies with privacy standards (e.g., GDPR).**
* **Data like photos and student IDs are securely stored.**

**8. What are the system’s performance and availability expectations?**

**Answer:**

* **Response time under 2 seconds.**
* **Real-time check-in and QR scanning.**
* **75% uptime during academic hours.**
* **Daily backups and 24-hour recovery support.**

**9. Is the system scalable and compatible across platforms?**

**Answer:  
Yes. It is designed for DOrSU campuses, supports departmental segmentation, and scales with increasing users. The system supports mobile and desktop environments across Windows, macOS, Android, and iOS.**

**10. What future features could enhance Project X?**

**Answer:**

* **SMS/Email notifications for absences or updates.**
* **Admin dashboards with analytics.**
* **Machine learning for anomaly detection.**
* **Biometric attendance options.**

**11. How can Git be used to manage the development of Project X?**

**Answer:  
Git can be used as a version control system to manage and track changes in the development of Project X by allowing multiple developers (e.g., backend, frontend, and database contributors) to work simultaneously without conflict. Key uses include:**

* **Branching: Each developer can work on separate features (e.g., qr-scanning, auth-module, ui-design) without interfering with the main codebase.**
* **Commit History: Git records every change made, making it easier to track bugs or revert to previous versions.**
* **Collaboration: Using platforms like GitHub, GitLab, or Bitbucket, the team can review code, discuss issues, and merge updates via pull requests.**
* **Backup & Deployment: Git repositories act as backups and can also be linked to CI/CD pipelines for automated deployment.**

**Sample Workflow for Project X:**

1. **Clone the main repository:  
   git clone https://github.com/username/project-x-attendance.git**
2. **Create a new branch:  
   git checkout -b feature/qr-code-generator**
3. **Commit changes:  
   git commit -m "Added QR Code generation module"**
4. **Push to remote:  
   git push origin feature/qr-code-generator**
5. **Open a pull request for code review and merge.**

**Helpful Link:**

**Git - The Simple Guide  
https://rogerdudler.github.io/git-guide/**

**This guide is excellent for beginners and helps understand basic Git operations like clone, commit, push, pull, and merge.**

**12. Why is Git important in developing systems like Project X?**

**Answer:  
Git ensures that developers can work collaboratively without overwriting each other’s code. In Project X, where backend (Node.js), frontend (React.js), and database (MongoDB) modules evolve simultaneously, Git helps in:**

* **Isolating new features with branches**
* **Rolling back errors with version history**
* **Coordinating team work using pull requests**
* **Preventing merge conflicts with staging areas and code reviews**

**Link: https://www.atlassian.com/git/tutorials/why-git**

**13. What is a Git branch, and how is it used in Project X?**

**Answer:  
A Git branch allows developers to diverge from the main line of development and work independently. In Project X, each module (e.g., qr-scanner, auth-api, admin-dashboard) can be developed in its own branch.**

**Example:**

**git checkout -b feature/attendance-module**

**This allows changes to be made and tested without affecting the production code until ready.**

**Link:** [**https://git-scm.com/book/en/v2/Git-Branching-Branches-in-a-Nutshell**](https://git-scm.com/book/en/v2/Git-Branching-Branches-in-a-Nutshell)

**14. What is a pull request (PR), and why is it important?**

**Answer:  
A Pull Request (PR) is a way to ask for your code changes in a branch to be reviewed and merged into another branch (usually main or develop). For Project X, a PR ensures that code meets quality and security standards before being deployed.**

**Process:**

* **Developer creates a branch and pushes code**
* **Opens a PR on GitHub**
* **Reviewer checks for bugs or vulnerabilities**
* **If approved, the code is merged**

**Link:** [**https://docs.github.com/en/pull-requests**](https://docs.github.com/en/pull-requests)

**15. How do you resolve merge conflicts in Git?**

**Answer:  
Merge conflicts occur when two branches change the same part of a file. In Project X, this could happen if two developers edit the same module, like the QR code scanner.**

**To resolve:**

1. **Git will mark conflict areas like this:**

**<<<<<<< HEAD**

**Code from main**

**=======**

**Code from your feature branch**

**>>>>>>> feature/branch**

1. **Manually edit the file, choose the correct code.**
2. **Mark as resolved:**

**git add filename**

**git commit**

**Link: https://www.git-tower.com/learn/git/ebook/en/command-line/advanced-topics/merge-conflicts**

**16. What is .gitignore, and what should be ignored in Project X?**

**Answer:  
.gitignore is a file that tells Git which files/folders to exclude from tracking. In Project X, you should ignore:**

**node\_modules/**

**.env**

**dist/**

**.DS\_Store**

**logs/**

* **node\_modules/ – Too large, can be reinstalled via npm install**
* **.env – Contains sensitive info like database passwords**
* **logs/ – Irrelevant for code versioning**

**Link:** [**https://git-scm.com/docs/gitignore**](https://git-scm.com/docs/gitignore)

**17. How can GitHub Actions be used in Project X?**

**Answer:  
GitHub Actions allows automation like testing, building, and deployment. For Project X:**

* **Run unit tests automatically when code is pushed**
* **Build frontend/backend before merge**
* **Auto-deploy to cloud on main branch push**

**Example .github/workflows/node.yml:**

**name: Node.js CI**

**on: [push]**

**jobs:**

**build:**

**runs-on: ubuntu-latest**

**steps:**

**- uses: actions/checkout@v2**

**- run: npm install**

**- run: npm test**

**Link:** [**https://docs.github.com/en/actions**](https://docs.github.com/en/actions)

**18. How do you generate QR codes in React Native?**

**Answer:  
To generate QR codes in a React Native application, the library react-native-qrcode-svg can be used. This library allows you to render QR codes based on dynamic or static data like student IDs or session tokens.**

**Steps:**

1. **Install the library:**

**npm install react-native-qrcode-svg**

1. **Example usage:**

**import React from 'react';**

**import { View } from 'react-native';**

**import QRCode from 'react-native-qrcode-svg';**

**export default function QRGenerator() {**

**return (**

**<View>**

**<QRCode value="studentID=12345&session=67890" size={200} />**

**</View>**

**);**

**}**

**Use Case in Project X:  
Generate session-specific QR codes for each class to ensure secure, real-time attendance check-ins.**

**Reference:**[**https://github.com/awesomejerry/react-native-qrcode-svg**](https://github.com/awesomejerry/react-native-qrcode-svg)

**19. How do you perform unit testing and Test-Driven Development (TDD) using Jest in React Native?**

**Answer:  
Jest is a JavaScript testing framework that supports unit testing in React Native. In TDD, tests are written before implementation, ensuring that every component behaves as expected.**

**Steps to Set Up:**

1. **Install testing libraries (if not pre-installed with Expo):**

**npm install --save-dev jest @testing-library/react-native**

1. **Configure Jest in package.json:**

**"jest": {**

**"preset": "react-native",**

**"setupFilesAfterEnv": ["@testing-library/jest-native/extend-expect"]**

**}**

**Example of Unit Test:  
Component (QRCodeButton.js):**

**import React from 'react';**

**import { Button } from 'react-native';**

**export default function QRCodeButton({ onGenerate }) {**

**return <Button title="Generate QR" onPress={onGenerate} />;**

**}**

**Test (QRCodeButton.test.js):**

**import { render, fireEvent } from '@testing-library/react-native';**

**import QRCodeButton from './QRCodeButton';**

**test('calls onGenerate when button is pressed', () => {**

**const mockGenerate = jest.fn();**

**const { getByText } = render(<QRCodeButton onGenerate={mockGenerate} />);**

**fireEvent.press(getByText('Generate QR'));**

**expect(mockGenerate).toHaveBeenCalled();**

**});**

**Use Case in Project X:  
Use TDD to ensure key functions like QR code generation, attendance logging, and API calls work as intended.**

**References:**

* **https://jestjs.io/docs/tutorial-react-native**
* **https://testing-library.com/docs/react-native-testing-library/intro/**

**20. How does Expo Go scan QR codes over a mobile hotspot?**

**Answer:  
Expo Go can load your development app via QR code even when the development machine is using a mobile hotspot, as long as both devices are on the same network.**

**Steps:**

1. **Connect both your laptop (host) and phone (device) to the same mobile hotspot.**
2. **Start Expo in LAN mode:**

**npx expo start –lan**

1. **Open Expo DevTools in your browser and scan the QR code using the Expo Go app on your phone.**

**Troubleshooting:**

* **Ensure your firewall allows LAN connections.**
* **Disable VPNs that may block LAN traffic.**
* **If LAN fails, switch to tunnel mode:**

**npx expo start --tunnel**

**Use Case in Project X:  
Testing attendance scanning on actual student mobile devices via Expo Go while developing in environments without traditional routers.**

**Reference:  
https://docs.expo.dev/workflow/expo-cli/**

**Conclusion**

An Automated University Attendance System presents many opportunities to enhance administrative efficiency and student engagement. By leveraging modern technologies and best practices, your project can contribute significantly to the evolution of academic attendance tracking.