Experiment 4 : QR-Enabled Faculty Availability System

AIM:

To develop a real-time, QR-based faculty availability indicator that allows faculty to manage their availability status and weekly schedule without a backend server, enabling students to check this information instantly via a mobile-friendly interface.

APPARATUS:

- Frontend: React with TypeScript, Tailwind CSS for styling.
- Libraries: qrcode.react for QR code generation, browser's localStorage for data persistence.
- Development: Code editor (e.g., VS Code), modern web browser for testing.

THEORY:

The system operates as a self-contained web application using React and TypeScript for a dynamic, component-based interface. It employs a dual-view architecture: a faculty admin panel for status and schedule management, and a student read-only view. Data is stored locally using browser localStorage and shared via QR codes through a compact binary encoding scheme. This scheme converts availability status and timetable slots into a 41-bit string, encoded into a 7-character URL-safe string, eliminating the need for a server or database while ensuring efficient data transfer.

PROCEDURE

1. **Setup**: Develop the React application with TypeScript, integrating Tailwind CSS for styling and qrcode.react for QR code generation.
2. **Faculty Interaction**: Faculty access the admin panel, toggle their overall availability (Available/Unavailable) using a switch, and edit their weekly schedule by clicking time slots to mark them as Free or Busy. Data is saved to localStorage.
3. **Student Interaction**: Students scan the faculty's QR code, which directs them to a URL with an encoded hash. The student view decodes this hash to display the faculty's status and timetable.
4. **Encoding Process**: Use custom binary encoding to compress the 41-bit state (1 bit for overall status, 40 bits for timetable slots) into a 7-character string for QR code sharing.
5. **Testing**: Verify QR code scanning, status toggling, and timetable display on various mobile devices.

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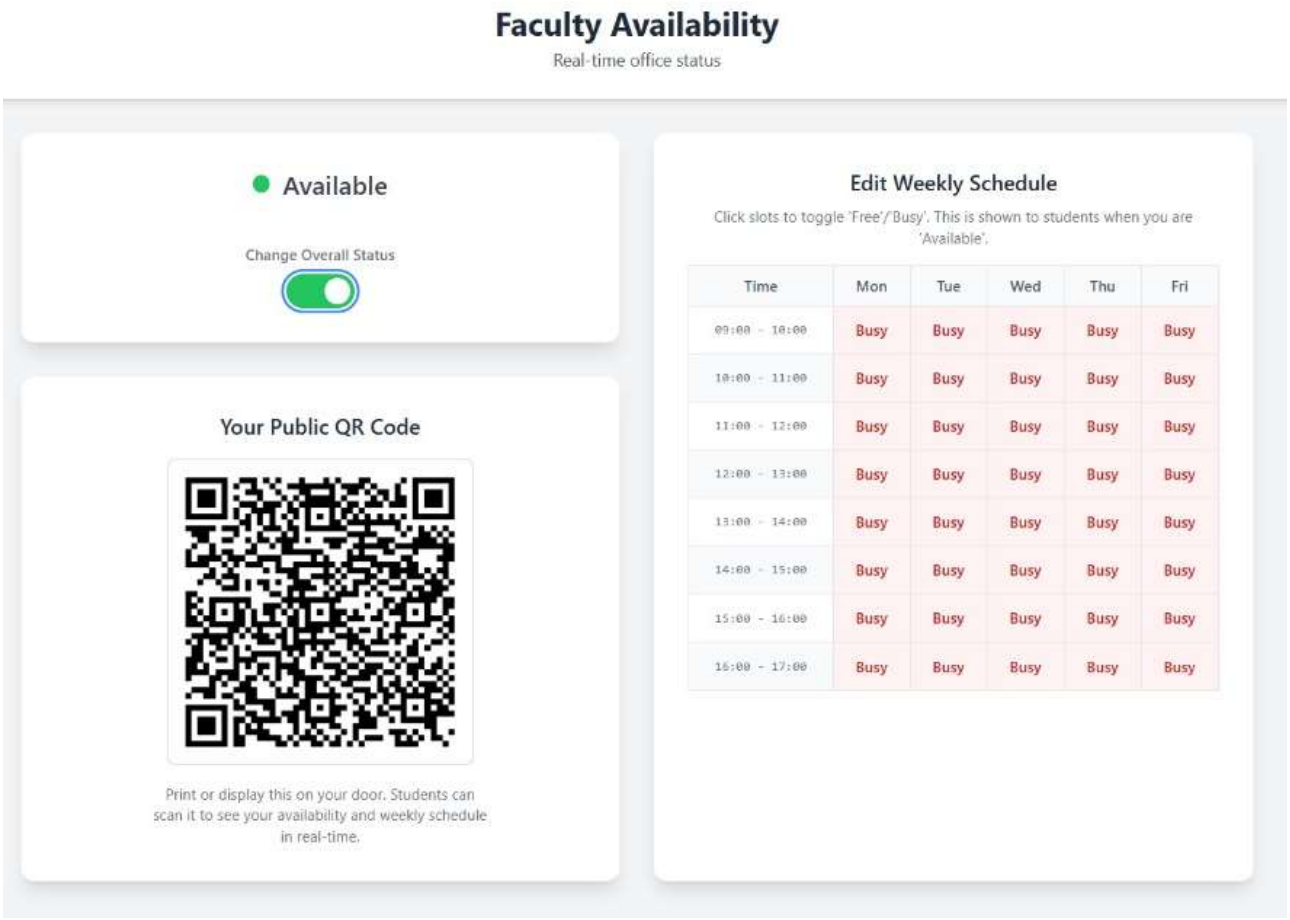
SIMULATION:

The system is a serverless React app where faculty toggle availability and edit a 40-slot timetable, saved in localStorage. A 41-bit string (1 bit for status, 40 for slots) is encoded into a 7-character QR code via qrcode.react. Students scan the QR code, and the app decodes the hash to display real-time status and schedule, enabling efficient, no-backend data sharing.



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Faculty Availability

Real-time office status

Unavailable

Change Overall Status

Your Public QR Code

Print or display this on your door. Students can scan it to see your availability and weekly schedule in real-time.

Edit Weekly Schedule

Click slots to toggle 'Free'/'Busy'. This is shown to students when you are 'Available'.

Time	Mon	Tue	Wed	Thu	Fri
09:00 - 10:00	Busy	Busy	Busy	Busy	Busy
10:00 - 11:00	Busy	Busy	Busy	Busy	Busy
11:00 - 12:00	Busy	Busy	Busy	Busy	Busy
12:00 - 13:00	Busy	Busy	Busy	Busy	Busy
13:00 - 14:00	Busy	Busy	Busy	Busy	Busy
14:00 - 15:00	Busy	Busy	Busy	Busy	Busy
15:00 - 16:00	Busy	Busy	Busy	Busy	Busy
16:00 - 17:00	Busy	Busy	Busy	Busy	Busy

RESULTS

- **Faculty Experience**: Faculty can easily toggle their status and edit their weekly schedule, with changes saved locally and reflected in the QR code instantly.
- **Student Experience**: Students scanning the QR code see the faculty's current status and timetable in a clear, read-only format on their mobile devices.
- **Performance**: The system is lightweight and fast, leveraging browser capabilities without server dependency.
- **Security**: Data is confined to the user's device, ensuring privacy without external storage.

CONCLUSION

This QR-based faculty availability system effectively provides a real-time, serverless solution for managing and sharing faculty availability. By using localStorage and a compact binary encoding scheme, it offers a practical, secure, and mobile-friendly tool that reduces student visits during unavailable times and enhances campus efficiency.

APPLICATIONS

- **Educational Institutions**: Simplifies faculty-student coordination without infrastructure overhead.
- **Remote Teaching**: Allows faculty to share availability remotely via digital QR codes.
- **Event Management**: Can be adapted for real-time availability tracking of staff at events.
- **Personal Use**: Useful for individuals managing open office hours or consultations.