CONCEPT STUDY · INTERACTIVE PROTOTYPE

EventPass: High-throughput event gate ticketing with offline cryptographic token validation and screenshot replay barriers.

Local cryptographic ticket validation and duplicate scan barrier. Passes utilize dynamic rotating TOTP tokens signed with elliptic-curve cryptography; scanners store scanned token hashes in local SQLite memory to intercept duplicate entries instantly without requiring an active internet connection.

INDUSTRY VERTICAL
Hospitality & Member Services

DOMAIN SECTOR
Event Operations & Access Control

PROTOTYPE STACK
Next.js / TypeScript

TARGET PRODUCTION RUNTIME
React Native / Expo

Executive Summary

Priya, lead gate manager at a 12,000-person outdoor music festival, supervises 16 turnstile lanes in remote festival grounds where cellular towers are completely saturated. Fraudulent attendees attempt to enter using duplicated screenshot passes shared across multiple phones.

Online ticketing scanners fail completely when cellular towers drop under crowd density, while simple static QR codes allow attendees to share screenshots, resulting in duplicate unauthorized admissions and security hazards.

Operational Hurdles & The Failure of Conventional Approaches

In real-world mobile deployments within Hospitality & Member Services, applications encounter operational friction that desktop web portals never face.

Core Engineering Challenges Addressed:

1. Operational Bottleneck: Online ticketing scanners fail completely when cellular towers drop under crowd density, while simple static QR codes allow attendees to share screenshots, resulting in duplicate unauthorized admissions and security hazards.

2. Data Integrity Risk: Traditional approaches rely on synchronous network calls that fail under unstable cellular handoffs or high concurrency.

3. User Experience Impact: Frustration occurs when users lose in-progress work or receive misleading feedback from unbuffered user interfaces.

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Architectural Solution & Interface Design

Demonstrated UX & Architecture Decision:

Local cryptographic ticket validation and duplicate scan barrier. Passes utilize dynamic rotating TOTP tokens signed with elliptic-curve cryptography; scanners store scanned token hashes in local SQLite memory to intercept duplicate entries instantly without requiring an active internet connection.

Principal Interface Screens (5 Views):

1. **High-Speed Scanner Viewfinder**
   Full-screen camera scanner with illuminated target reticle and high-contrast status banner.
2. **Admitted Pass Screen (Green)**
   Audible chime and green flash displaying attendee tier (VIP, General, Artist) and gate.
3. **Duplicate Alert Screen (Red)**
   Urgent red alert displaying exact timestamp and turnstile lane of original entry scan.
4. **Manual Attendee Lookup Sheet**
   ID and order number search for guests with shattered screens or dead batteries.
5. **Turnstile Throughput Telemetry**
   Real-time ingress stats showing scans/minute and gate capacity distribution.

Interactive Journey: Festival Turnstile Scan to Duplicate Fraud Interception

Engage scanner → Scan VIP Pass #A-101 (Admitted) → Disconnect network → Rescan same token → Observe red duplicate rejection with timestamp.

1. Open EventPass turnstile scanner for Gate 3
2. Scan attendee Alex VIP pass: observe instant green admission chime (180ms)
3. Simulate complete loss of cellular network connectivity (offline mode)
4. Scan attendee Blake presenting duplicated screenshot of same VIP pass
5. Observe immediate high-contrast RED warning: "DUPLICATE ENTRY DETECTED"
6. Inspect logged audit detail: original pass was admitted at 18:04:12 at Gate 3

Reset Mechanism: One-click reset to initial cleared scanner cache.

Handled Edge Cases & Exception Recovery

⚠ **Edge Condition #1:**
Duplicate ticket detected alert showing exact timestamp (e.g. "Scanned 4m ago at Gate 2") to deter fraud

⚠ **Edge Condition #2:**
Damaged screen manual override allowing supervisor ID verification and pass redemption

⚠ **Edge Condition #3:**
Battery-saver high-contrast scanner mode extending mobile device runtime by 40% in bright sunlight

Actual Prototype vs. Target Native Production Runtime

Actual Prototype Stack

Platform & Framework:

Next.js / TypeScript

Languages:

TypeScript, Tailwind CSS

Gate scanner simulator demonstrating rapid-fire pass scanning, duplicate screenshot detection, and offline verification.

Target Production Stack

Platform & Framework:

React Native / Expo

Languages & Storage:

TypeScript, VisionCamera, SQLite, Sodium Cryptography

Hardware camera optimization, 60fps barcode decoding, and local public-key cryptographic signature validation.

Explicit Prototype Boundaries & Validation Methodology

Documented Prototype Limitations:

- Simulated in browser using HTML5 video stream and mock barcode tokens; does not access physical device laser scanner hardware.
- Cryptographic signatures verified in JavaScript without native C++ libsodium hardware acceleration.

Target Production Telemetry:

Audit gate scan throughput and fraudulent entry attempts across a 3-day music festival.

Commercial Offer Alignment & Handover Guarantees

This technical concept study directly demonstrates the design, state-machine architecture, and resilience engineering delivered under FFNA Solutions' fixed-scope programs:

Product Prototype Sprint

2-week fixed sprint delivering high-fidelity interactive simulation with edge recovery.

Mobile MVP Launch

6–8 week end-to-end production build with backend API, store release, and full IP transfer.

Handover Guarantee

100% intellectual property ownership transferred upon milestone completion. Comprehensive technical documentation, architecture runbooks, and zero vendor lock-in.