Proposal for RapidRide Ticketing System

A Modern, Secure, and Accessible Transit Ticketing Solution

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1 Executive Summary

RapidRide is a lightweight, secure, and extensible fare system for public transit. Designed for mid-sized municipalities such as Rapid City, South Dakota, it offers a cost-effective, open, and auditable alternative to commercial transit fare platforms.

Using digitally signed QR code tickets and a flexible mobile-friendly interface, RapidRide empowers riders and administrators with secure, modern infrastructure—without the costs or complexity of proprietary systems.

2 Project Scope

- Deploy a mobile- and kiosk-friendly digital fare platform
- Enable digital ticket purchase via Stripe integration
- Support secure QR-code-based validation
- Provide tools for fare enforcement, reporting, and expansion
- Ensure accessibility for all riders, including offline and low-tech options

3 System Overview

3.1 Frontend

The RapidRide client is a cross-platform application written in Qt/QML using PySide6, providing:

- A secure user wallet for ticket storage
- Stripe checkout integration for ticket purchasing
- QR code generation and display for scanned validation
- Offline ticket caching for intermittent connectivity

3.2 Backend

The backend is built in Python using FastAPI, supporting:

- Ticket generation using ED25519 digital signatures
- Ticket validation against cryptographic and database records
- User login, wallet synchronization, and Stripe session handling

4 Deployment Plan

1. **Phase 1: MVP (Proof of Concept)** 2–4 weeks
   - Core ticket generation, QR validation, and Stripe checkout
   - Basic enforcement scanner page
   - Pilot on a small number of devices or routes
2. **Phase 2: Fleet Rollout and Admin Features** 4–6 weeks
   - Wallet management dashboard (optional)
   - Driver/passenger usage analytics
   - Training and support for operators

5 Cost Estimate

Software Development

- Initial system deployment: $3,500-$8,500
- Optional expansion (reporting, dashboards): $1,200–$5,000

Hardware Requirements

One MiniPC running Debian Stable is recommended for backend infrastructure. Hardware costs for such a PC range from $200-$500. The frontend client can run on existing Android tablets, iPhones, or Linux laptops with cameras for validation.

6 Ongoing Support and Additional Development

After deployment of the core RapidRide system, ongoing support and additional development are available at the following rates:

Ongoing Support

- **Standard Support (Monthly)** $400/month
  - Covers small bug fixes, basic questions, user support, and monthly maintenance updates
  - Includes up to 4 hours/month of development time
- **On-Demand Support (Hourly)** $40/hour
  - For updates, troubleshooting, or deployment help beyond the base agreement

Additional Development

New features, expansions, or tooling requests are billed at:

- **$40/hour for planned development**
- Flat-rate feature pricing available upon request

All code remains GPL-licensed and open to the City of Rapid City, with no proprietary restrictions.

7 Future Add-Ons and Expansion Opportunities

The RapidRide system is designed to be modular and extensible. The following features can be added after the initial deployment as the needs of the transit system evolve. Each item includes a preliminary cost estimate based on hourly development and integration effort.

1. Admin Dashboard and Reporting

A secure web interface for transit administrators to view usage statistics, download ticket data, and manage users or routes.

- Estimated Cost: $1,200–$2,500
- Features: Ticket sales analytics, per-route breakdowns, user activity logs

2. Offline Ticket Validation Mode

Support for offline validation devices (e.g., fare inspector tablets) with a locally cached list of valid ticket IDs and signatures.

- Estimated Cost: $800–$1,500
- Benefits: Ensures validation works without network coverage

3. Multi-Ride and Time-Limited Tickets

Support for configurable ticket types such as 10-punch passes, 24-hour unlimited ride passes, or monthly passes with expiration logic.

- Estimated Cost: $1,000–$2,000
- Includes: Additional ticket issuance rules and validation logic

4. Kiosk Mode for Public Purchase Stations

Deployable kiosk version of the client UI for ticket sales at transit centers or bus stops using touchscreens or tablets.

- Estimated Cost: $1,000–$1,800
- Requirements: Touch-optimized UI, persistent kiosk login, printer integration (optional)

5. Multi-Language Support

Add Lakota, Spanish, or other regional language translations to the user interface.

- Estimated Cost: $600–$1,200
- Language toggle and UI translation tables

6. Inspector/Admin Tablet Mode

Special login mode with access to ticket scanning tools, on-board metrics, and summary data for fare inspectors or drivers.

- Estimated Cost: $800–$1,500
- Device provisioning and PIN-based access

7. Ticket Sharing or Gifting

Support for users to transfer a valid ticket to another rider via QR scan or link.

- Estimated Cost: $700–$1,200
- Requires: Ticket re-issuance and ownership swap logic

8. Custom Branding and Theming

Visual design upgrades to reflect the branding of Rapid Transit or other agencies.

- Estimated Cost: $400–$900
- Includes color schemes, logos, and landing screens

All estimates are preliminary and based on a rate of $40/hour. Bundled development packages or feature prioritization may reduce overall cost.

8 License and Code Ownership

The RapidRide ticketing system is developed and maintained by the author and is provided under the terms of the **GNU General Public License v3 (GPL-3.0)**.

This ensures:

- The source code remains free and open to the public
- Modifications and derivative works must also be licensed under GPL
- The City of Rapid City is granted full rights to use, deploy, and modify the system
- The developer retains ownership of the original codebase and its licensing terms

This licensing model ensures long-term transparency, prevents vendor lock-in, and aligns with the values of public digital infrastructure.

For reference, the full license text is available at: `https://www.gnu.org/licenses/gpl-3.0.html`

9 Conclusion

RapidRide provides a high-trust, low-friction fare system without vendor lock-in or heavy infrastructure costs. With a pilot-ready QR-based deployment and a path for secure digital operations, it is a strong foundation for the modernization of Rapid City public transit.

A Appendix: References

- ED25519 Cryptographic Signatures: `https://ed25519.cr.yp.to/`
- Qt + PySide6 Documentation: `https://doc.qt.io/qtforpython/`
- Stripe Payments: `https://stripe.com/docs`
- FastAPI Web Framework: `https://fastapi.tiangolo.com`