ByRyde Smart Transportation Optimization Network (STON)

SMART Grants Program FY2026 | Funding Opportunity No. 693JJ326NF00010 | CFDA 20.932

1. TECHNOLOGY READINESS ASSESSMENT (TRL 1–8)

ByRyde's platform is at Technology Readiness Level 7–8, representing the highest maturity level achievable prior to full commercial deployment. The following table documents the evidence supporting each TRL level achieved, demonstrating systematic technology development from basic principles through system-level demonstration:

TRL Level	Definition	Status	Evidence
TRL 1	Basic Principles Observed	COMPLETE	Market research, technology feasibility study, competitive analysis
TRL 2	Technology Concept Formulated	COMPLETE	Architecture design, AI integration strategy, business model canvas
TRL 3	Experimental Proof of Concept	COMPLETE	Initial GPT API testing, demand model prototypes, UI wireframes
TRL 4	Technology Validated in Lab	COMPLETE	Working AI endpoints, database schema validated, API framework tested
TRL 5	Technology Validated in Relevant Env.	COMPLETE	Multi-screen app with live APIs, real-time features, end-to-end flows
TRL 6	System Demonstrated in Relevant Env.	COMPLETE	120+ features across 67 screens, 170+ endpoints, all integrations live
TRL 7	System Prototype Demonstrated	COMPLETE	Full platform testable via Expo Go, all systems integrated and functional
TRL 8	System Complete and Qualified	IN PROGRESS	Pre-production validation underway, multi-market deployment pending

TRL 7–8 Evidence Summary: The ByRyde platform is a complete, integrated system that has been demonstrated in a representative operational environment. All 120+ features are functional, all 15 AI endpoints are operational, all external API integrations (Tesla, Stripe, Firebase, Agora, Google Cloud) are live, and the platform is testable by end users via the Expo Go application. The remaining TRL 8 milestone—full system qualification through multi-market deployment with real users—is precisely the objective of the proposed SMART Grant project.

2. TECHNICAL INFRASTRUCTURE INVENTORY

The following comprehensive inventory documents every technology component, its current version, operational status, and role within the STON architecture:

2.1 Frontend Technologies

Technology	Version	Status	Purpose
React Native	0.76+	Production	Cross-platform mobile framework (iOS, Android, Web)
Expo SDK	52+	Production	Development and deployment framework
TypeScript	5.x	Production	Type-safe application development
React Navigation	7+	Production	Screen navigation and routing
TanStack React Query	5.x	Production	Server state management and caching
React Native Reanimated	3.x	Production	High-performance animations
React Native Maps	1.18.0	Production	Map display and interaction

Expo Camera/Image Picker	Latest	Production	Photo capture and document upload
Expo Location	Latest	Production	GPS tracking and geofencing
@expo/vector-icons	Latest	Production	Icon library (Feather icons)

2.2 Backend Technologies

Technology	Version	Status	Purpose
Node.js	20 LTS	Production	Server runtime environment
Express.js	4.x	Production	HTTP API framework (170+ endpoints)
PostgreSQL	16+	Production	Primary relational database (70 tables)
Drizzle ORM	Latest	Production	Type-safe database query builder
WebSocket (ws)	8.x	Production	Real-time bidirectional communication
JSON Web Tokens (JWT)	Latest	Production	Authentication and session management
node-cron	Latest	Production	Scheduled task execution
PDFKit	Latest	Production	PDF document generation
zlib	Native	Production	File compression for ZIP archives
bcrypt	Latest	Production	Password hashing and security

2.3 External API Integrations

Service	Provider	Status	Endpoints / Features
AI Engine	OpenAI GPT-5.2	Operational	15 specialized endpoints (demand, earnings, safety, etc.)
EV Fleet Mgmt	Tesla Fleet API	Operational	Battery, GPS, diagnostics, charging, vehicle commands
Payments	Stripe Connect	Operational	Payments, payouts, subscriptions, instant pay
Real-Time DB	Firebase Firestore	Operational	Ride matching, messaging, notifications
Voice/Video	Agora RTC	Operational	In-app calling between drivers and riders
Maps	Google Maps Platform	Operational	Directions, geocoding, places, distance matrix
Translation	Google Cloud Translation	Operational	12-language real-time translation
Push Notifications	Expo Notifications	Operational	Cross-platform push notification delivery
Crash Detection	Device Accelerometer	Operational	Automatic crash detection and emergency alerts
Identity Verification	Stripe Identity	Operational	Driver identity and document verification

3. ORGANIZATIONAL READINESS ASSESSMENT

3.1 Team Capacity and Availability

All key personnel have been identified, their qualifications verified, and their availability confirmed at the effort levels specified in the project budget. The team can begin project activities within 30 days of award notification:

Role	FTE	Availability	Start Readiness
Principal Investigator / CEO	0.50	Confirmed	Immediate upon award
Co-PI / CTO	0.75	Confirmed	Immediate upon award
Lead AI/ML Engineer	1.00	Confirmed	Within 30 days of award
Senior Full-Stack Developer	1.00	Confirmed	Within 30 days of award
Data Scientist	0.50	Confirmed	Within 60 days of award
UX/UI Research Designer	0.25	Confirmed	Within 60 days of award

3.2 Administrative Compliance Checklist

The following administrative prerequisites have been completed or are in active progress to ensure compliance with all federal grant administration requirements:

Requirement	Status	Reference / ID	Notes
SAM.gov Registration	Active	R6QDGZFNW5M3	Annual renewal scheduled
Grants.gov Account	Active	Authorized submitter confirmed	AOR designation complete
CAGE Code	Pending	Assigned upon SAM registration	In process
NAICS Codes	Registered	518210, 511210, 485310	Primary and secondary codes
UEI (Unique Entity ID)	Assigned	R6QDGZFNW5M3	Active in SAM.gov
EIN / Tax ID	Active	41-2834015	IRS assignment confirmed
Financial Mgmt System	Operational	Accrual-based accounting	2 CFR 200.302 compliant
Indirect Cost Rate	Established	10% de minimis	Per 2 CFR 200.414(f)
Audit Compliance	Ready	Single audit if >$750K	Per 2 CFR 200 Subpart F
Insurance Coverage	Active	GL + Cyber + Professional	Certificates available

4. DETAILED 24-MONTH IMPLEMENTATION TIMELINE

The following timeline presents specific milestones and deliverables for each project phase, demonstrating a clear and achievable path from award to completion:

Month(s)	Phase	Key Activities	Deliverables
Pre-Award	Preparation	Platform dev complete, team assembled, partnerships formalized	TRL 7-8 platform, signed MOUs
1	Kickoff	Federal reporting setup, kickoff meeting with SMART PO	Kick-off meeting notes, reporting templates
1-2	IRB & Planning	IRB application, market deployment plans, driver surveys	IRB approval, market plans, survey instruments
2-3	Infrastructure	Multi-market cloud deployment, data pipelines, baselines	Deployed infrastructure, baseline report
3-4	Recruitment	Driver recruitment (NY, LA), onboarding materials	Recruitment materials, training protocols
4-6	Pilot Phase 1	Launch NY + LA (100 drivers each), data collection begins	200 active drivers, Q2 progress report
7-9	Pilot Phase 2	AI model calibration, feature iteration, interim analysis	Calibrated AI models, interim data report
10-12	Expansion Prep	Chicago, Houston, Atlanta setup, additional recruitment	3 new market deployments, Q4 progress report
13-15	Full Scale	500+ drivers across 5 markets, A/B testing at scale	500+ active drivers, A/B test results

16-18	Data Collection	Peak data collection, longitudinal analysis begins	Complete dataset, Q6 progress report	
19-21	Analysis	Impact assessment, statistical analysis, paper drafting	Draft publications, impact analysis report	
22-24	Closeout	Final reporting, publication submission, data archival	Final report, 2+ publications, archived data	

5. COMPREHENSIVE RISK REGISTER

A formal risk register has been developed identifying fourteen (14) potential risks to project success. Each risk is assessed for probability (Low/Medium/High), impact severity (Low/Medium/High), and assigned a specific mitigation strategy and responsible owner:

ID	Risk Description	Prob	Impact	Mitigation	Owner
R1	OpenAI API service disruption	Low	High	Fallback to GPT-4, cached responses	CTO
R2	Tesla Fleet API access changes	Low	Med	OCPP/OCPI alternatives, modular design	CTO
R3	Driver recruitment shortfall	Med	High	$50 incentive, multi-channel, referrals	PI
R4	IRB approval delay	Med	Med	Pre-submission consult, expedited pathway	PI
R5	AI model accuracy below target	Low	Med	A/B testing, continuous training, ensemble	AI Lead
R6	Data privacy breach	Low	High	SOC 2, encryption, pen testing, IR plan	CTO
R7	Budget overrun	Low	Med	2% contingency, quarterly budget reviews	PI
R8	Key personnel departure	Low	High	Cross-training, documentation, succession	PI
R9	Regulatory environment changes	Low	Med	Legal counsel monitoring, modular compliance	PI
R10	Transit authority data delays	Med	Low	Multiple contacts, alternative GTFS sources	CTO
R11	Competitive market response	Low	Low	First-mover advantage, IP protection	PI
R12	Cloud infrastructure failure	Low	High	Multi-region deployment, auto-failover	CTO
R13	Participant survey fatigue	Med	Med	Streamlined instruments, incentive structure	Data Sci
R14	Publication rejection	Med	Low	Multiple journal targets, conference papers	PI

6. SUSTAINABILITY & TRANSITION PLAN

Post-grant sustainability is a core design principle of the STON. The following transition plan ensures that project outcomes, technology investments, and community benefits are sustained and expanded beyond the 24-month grant period:

6.1 Financial Sustainability

Five diversified revenue streams (ride commission, Pro/Elite subscriptions, instant pay fees, Boost marketplace, byryde.com fees) provide financial independence from federal funding. Projected Year 2 revenue of $15 million and Year 3 revenue of $45 million exceed operational costs by 5–10x. No ongoing federal investment is required to maintain or expand platform operations.

6.2 Technology Sustainability

The cloud-native architecture (React Native, Express.js, PostgreSQL) uses open-source, industry-standard technologies with active community support, ensuring long-term maintainability without vendor lock-in. AI models improve autonomously through production data feedback loops, creating compounding performance returns without additional training investment. The modular API architecture enables incremental feature additions and third-party integrations without system-wide refactoring.

6.3 Market Expansion Plan

The five-market pilot validated by SMART Grant funding provides the evidence base for nationwide scaling. Post-grant expansion targets 25 metropolitan areas within 36 months and nationwide coverage within 60 months, funded through commercial revenue and private investment. Adding a new market requires only configuration changes—no code modification—enabling 2–4 week market launch cycles.

6.4 Knowledge Dissemination & Open Data

Research findings will be disseminated through: minimum two (2) peer-reviewed publications in transportation journals (Transportation Research Record, Journal of Intelligent Transportation Systems); conference presentations at TRB Annual Meeting, ITS America, and AASHTO; anonymized and aggregated datasets made available through DOT's data.transportation.gov repository per the DOT Open Data Policy; and a public-facing project summary report documenting methodology, findings, and lessons learned for use by other SMART Grant applicants and transportation practitioners.

7. DATA MANAGEMENT PLAN OVERVIEW

In compliance with DOT's Open Data Policy (Order 3400.1) and 2 CFR 200.315, the STON implements a comprehensive data management plan:

- Data Collection: Platform telemetry (ride data, AI recommendations, EV metrics, safety events), user surveys (baseline, monthly, exit), and administrative records (enrollment, retention, earnings) collected under IRB-approved protocols with informed consent.
- Data Storage: PostgreSQL database with AES-256 encryption at rest, TLS 1.3 encryption in transit, role-based access control (RBAC), and automated backup (hourly snapshots with 90-day retention).
- Data Privacy: CCPA and GDPR-aligned framework with user consent management, data portability (export), right-to-deletion, and data minimization principles. Personally identifiable information (PII) stored separately from analytical data with pseudonymization.
- Data Sharing: Anonymized, aggregated datasets available to DOT and research partners per grant requirements. Individual-level data available only under IRB-approved data use agreements with appropriate privacy protections.
- Data Retention: Research data retained for minimum 3 years post-project per 2 CFR 200.334. PII deleted within 12 months of project completion unless participant consent authorizes extended retention.
- Data Security: Planned SOC 2 Type II audit within 12 months of award, annual penetration testing, incident response plan with 24-hour notification requirement, and quarterly security reviews.

8. CONCLUSION

ByRyde Corp is exceptionally well-positioned to execute the proposed Smart Transportation Optimization Network project. The combination of a fully functional technology platform at TRL 7–8, an experienced and committed project team, established technology and community partnerships, comprehensive administrative compliance, and a clear path to financial sustainability creates a uniquely low-risk, high-impact investment for the SMART Grants Program. The project can begin within 30 days of award notification, with all infrastructure, personnel, and partnerships in place for immediate execution of the 24-month research, deployment, and validation plan.