INTERNSHIP COMPLETION REPORT

Ignite Skylabs (IGSL), Pondicherry

Intern Name	Yuvaraja M
Institution	B.Tech - Final Year (Computer Science)
Organization	Ignite Skylabs (IGSL), Pondicherry
Internship Period	March 2024 - December 2025
Duration	19 Months
Role	Full-Stack Developer / Mobile App Developer
Total Projects	6 Product Deliverables
Report Submitted On	April 2026

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1. EXECUTIVE SUMMARY

This report documents the product development work carried out during a 19-month internship at Ignite Skylabs (IGSL), Pondicherry, from March 2024 to December 2025. Over the course of the internship, six production-grade products were designed, developed, and deployed across domains including public transit, enterprise operations, document services, and smart infrastructure.

The internship provided hands-on exposure to full-stack development, mobile application engineering, real-time systems, multi-organization architecture, and Vision ML integration. Security was treated as a first-class concern throughout all product development cycles. Three production applications — Ridemap V2, PrintA4, and ParkWheels — underwent continuous security auditing, and active threat incidents including a denial-of-service attack on the Ridemap backend were identified and mitigated in production.

All products were built under live operational conditions and were either shipped to end users or launched at institutional events.

2. ORGANIZATION OVERVIEW

Ignite Skylabs (IGSL) is a Pondicherry-based product engineering and technology startup focused on building scalable software solutions across mobile, web, and enterprise domains. The organization operates across multiple product verticals including transportation technology, digital transformation for manufacturing clients, and smart infrastructure.

Attribute	Details
Organization	Ignite Skylabs (IGSL)
Location	Pondicherry, India
Domain	Product Engineering, SaaS, Mobile Apps
Intern Role	Full-Stack Developer / Mobile App Developer
Reporting Structure	Engineering Team

3. PROJECT SUMMARY

The following table provides a consolidated view of all six products developed during the internship period.

#	Project	Type	Tech Stack	Key Outcome
1	Ridemap V2	Mobile Application	React Native, Firebase, WebSocket, Google Maps	10K+ downloads, 4.2+ stars, 530+ reviews
2	Ridemap Fleet Admin Panel	Web Dashboard	React.js, TypeScript, Redux, Firebase	Multi-org superadmin architecture
3	Ridemap PassChecker App	Mobile Utility App	React Native, SQL, React Navigation	Bus pass validation + onboard/ deboard attendance
4	PrintA4			

#	Project	Type	Tech Stack	Key Outcome
		Kiosk Printing Solution	React, Node.js, MongoDB, WebSocket	India's first mobile-to-kiosk print service
5	Lucas TVS DOJO 2.0	Digital Transformation	React, Express, MongoDB, Android Studio	Kiosk self-enrollment + admin dashboard
6	ParkWheels	Smart Parking Solution	React, Vision ML, MongoDB	Launched at MVIT ELAN 2025

4. PROJECT 1 - RIDEMAP V2

4.1 Overview

Ridemap V2 is a consumer-facing mobile application built with React Native, providing real-time bus tracking, route optimization, in-app chat, bus pass management, and an integrated AI chatbot for commuter assistance.

Project Name	Ridemap V2
Type	Mobile Application (Android)
Platform	Google Play Store
Role	Mobile App Developer
Status	Live and Active

4.2 Tech Stack

Layer	Technology
Frontend	React Native, Tailwind CSS (NativeWind)
Navigation	React Navigation
Maps	Google Maps
Real-time	WebSocket
Backend Services	Firebase (Auth, Firestore, Cloud Messaging)
Dev Tools	Android Studio, Git

4.3 Key Features

- Real-time bus location tracking on interactive maps via Google Maps
- Optimized route suggestions based on live traffic and bus availability
- In-app commuter chat for peer-to-peer communication
- Digital bus pass management with QR-based validation support
- AI chatbot for commuter queries and route assistance
- Push notification system for bus arrival alerts

4.4 Development Contributions

- Developed and shipped Ridemap V2 as a ground-up rebuild of the existing Ridemap application
- Integrated WebSocket-based real-time bus tracking to replace polling-based location updates
- Implemented bus pass management module with digital validation workflows
- Integrated AI chatbot module for in-app user assistance
- Collaborated on Google Maps rendering and route overlay features

4.5 Security Work

Security was a primary focus for Ridemap V2 given its production scale and public-facing nature. Continuous security auditing was conducted throughout the app's lifecycle.

Threat	Response
Denial-of-Service (DoS) Attack	Identified anonymous attacker targeting the Ridemap backend; mitigated via firewall rules with automated IP blocking and rate limiting
Unauthorized API Access	Firebase Auth enforcement on all protected endpoints
Bus Pass Tampering	QR validation tied to server-side pass state; client cannot self-approve
WebSocket Abuse	Connection-level rate limiting and authentication token validation on socket handshake

Key security incident: An active DoS attack was detected against the Ridemap backend from an anonymous attacker. The attack was pinpointed, and a firewall-level response was implemented with automated IP blocking and rate limiting mechanisms, restoring service stability and preventing recurrence.

- Participated in continuous security audits of the production application
- Implemented and validated rate limiting across backend API routes
- Configured firewall rules with automated IP blocking for anomalous traffic patterns
- Enforced authentication and authorization at the WebSocket layer
- Reviewed and hardened Firebase security rules for Firestore and Realtime Database

4.6 Outcomes

Metric	Value
Play Store Downloads	10,000+
User Rating	4.2+ Stars
Reviews	530+
Security Incidents Resolved	DoS attack identified and mitigated in production
Engagement Impact	Significant increase over V1

5. PROJECT 2 - RIDEMAP FLEET ADMIN PANEL

5.1 Overview

The Ridemap Fleet Admin Panel is an enterprise-grade web dashboard for managing bus fleets across multiple organizations. The existing admin dashboard was rearchitected to support a multi-organization model, enabling centralized superadmin control alongside organization-level admin access, all within a single unified interface.

Project Name	Ridemap Fleet Admin Panel
Type	Web Dashboard (Enterprise)
Role	Frontend Engineer
Status	Deployed

5.2 Tech Stack

Layer	Technology
Frontend	React.js, TypeScript
State Management	Redux
Backend Services	Firebase (Auth, Firestore, Real-time DB)
Dev Tools	Git

5.3 Architecture Design

The rearchitecture introduced a two-tier access model:

Role	Access Scope
Superadmin	Full visibility across all organizations; manage orgs, fleets, and users
Admin	Scoped to their organization; manage routes, buses, and operators

Key architectural decisions:

- Introduced organization-level data partitioning in Firestore
- Implemented role-based routing and component-level access guards in React
- Centralized Redux store structured to support dynamic org context switching

5.4 Key Features

- Multi-organization support within a single dashboard session
- Role-based access control (Superadmin and Admin tiers)
- Fleet overview: bus status, live locations, route assignments

- Organization management: add/edit/remove organizations
- User management: operator and admin account provisioning

5.5 Development Contributions

- Led the rearchitecture of the admin panel from a single-org to multi-org model
- Designed and implemented the Redux store structure for multi-org state management
- Built role-based access control logic at the route and component level
- Migrated existing admin features to the new multi-org data model

5.6 Security Work

- Enforced strict Firebase security rules ensuring admins cannot access cross-org data
- Implemented front-end route guards backed by server-side token claims
- Validated all org-scoped API calls server-side to prevent privilege escalation
- Ensured superadmin actions are logged for auditability

6. PROJECT 3 - RIDEMAP PASSCHECKER APP

6.1 Overview

Ridemap PassChecker is a mobile utility application designed for bus in-charges to validate passenger bus passes and record attendance. The app enables in-charges to scan onboarding passengers, verify the validity of their digital bus passes, and mark both onboard and deboard attendance, generating high-level insights on bus ridership.

Project Name	Ridemap PassChecker
Type	Mobile Utility Application
Role	Mobile App Developer
Status	Deployed to field operators

6.2 Tech Stack

Layer	Technology
Frontend	React Native
Navigation	React Navigation
Database	SQL (Local + Sync)
Dev Tools	Git

6.3 Key Features

- QR/barcode scanning for digital bus pass verification
- Real-time validation of pass authenticity and expiry status
- Onboard attendance marking at point of boarding
- Deboard attendance marking at destination stops
- Ridership analytics dashboard for bus in-charges (travel patterns, peak hours)
- Offline-first SQL storage with sync capability

6.4 Development Contributions

- Designed and implemented the bus pass scanning and validation module
- Built onboard and deboard attendance workflows with SQL persistence
- Developed ridership insights screen with aggregated travel analytics
- Implemented offline-first data handling to support low-connectivity environments

6.5 Security Work

- Pass validation is performed server-side; verified server response required
- QR codes are non-replayable using session tokens to prevent reuse

- Operator authentication enforced before accessing scan or attendance features
- Local SQL data encrypted to prevent data exposure on compromised devices

6.6 Outcomes

Metric	Description
Validation Accuracy	Real-time server-side verification of bus passes
Attendance Coverage	Onboard and deboard events logged per trip
Insights Delivered	Per-passenger, per-route, and per-day ridership data

7. PROJECT 4 - PRINTA4

7.1 Overview

PrintA4 is India's first kiosk-based printing service, developed as part of IGSL. It enables individuals and organizations to print documents directly from mobile devices via a secure cloud-connected kiosk, with documents ready within seconds.

Project Name	PrintA4
Type	Kiosk Printing Solution (Web + IoT)
Website	printa4.in
Role	Full-Stack Developer
Status	Live

7.2 Tech Stack

Layer	Technology
Frontend (Kiosk UI)	React.js, Tailwind CSS
Backend	Node.js
Database	MongoDB
Real-time	WebSocket
Dev Tools	Git

7.3 Key Features

- Mobile-to-kiosk document upload with instant delivery
- Secure, user-friendly kiosk interface for document preview and print
- Real-time print job status updates via WebSocket
- Support for multiple document formats
- Organization-level deployment with access control

7.4 Development Contributions

- Built the React-based kiosk UI with a clean, accessible interface for public use
- Engineered the Node.js backend for document upload, storage, and print job handling
- Implemented WebSocket layer for real-time communication between mobile upload and kiosk
- Integrated MongoDB for print job queuing and audit logging

7.5 Security Work

PrintA4, as a publicly accessible kiosk service, was subject to continuous security auditing given its exposure to anonymous public users.

Threat Surface	Mitigation
Malicious File Uploads	File type validation and size limits enforced at upload endpoint
Unauthorized Print Access	Print jobs are scoped to session tokens; cross-user job access is blocked
API Abuse / DoS	Rate limiting on upload and print endpoints
Kiosk Tampering	Kiosk UI runs in a locked-down kiosk browser mode; no file system access
Data Retention	Uploaded documents purged from storage after print job completion

- Conducted continuous security reviews of the upload and print pipeline
- Implemented server-side file validation to reject malicious payloads
- Applied rate limiting on all public-facing API routes
- Ensured uploaded documents are ephemeral and not retained post-print
- Hardened WebSocket endpoint to reject unauthorized kiosk connections

8. PROJECT 5 - LUCAS TVS DOJO 2.0

8.1 Overview

DOJO 2.0 is a digital transformation initiative for Lucas TVS, a leading automotive component manufacturer. The project replaced manual trainee enrollment and evaluation processes with a kiosk-based self-enrollment system and a React.js admin dashboard, improving accuracy and reducing operational overhead.

Project Name	Lucas TVS DOJO 2.0
Client	Lucas TVS
Type	Digital Transformation / Enterprise Web App
Role	Full-Stack Developer
Status	Deployed at Lucas TVS facilities

8.2 Tech Stack

Layer	Technology
Frontend (Dashboard)	React.js, Tailwind CSS
Backend	Express.js
Database	MongoDB
Kiosk App	Android Studio
Real-time	WebSocket
Dev Tools	Git

8.3 Key Features

Kiosk (Self-Enrollment Terminal)

- Touchscreen-based trainee self-enrollment at factory entry points
- Identity capture and registration without manual HR intervention
- Training module assignment based on role and department

Admin Dashboard

- Trainee tracking: enrollment status, training progress, completion
- Evaluation management: assign assessments, capture scores, generate reports
- Department-level analytics on training completion rates
- Export capabilities for compliance and audit reporting

8.4 Development Contributions

- Developed the React.js admin dashboard for trainee lifecycle management
- Built the Express.js API layer connecting the kiosk app and admin panel
- Designed MongoDB schemas for trainee records, training modules, and evaluations
- Implemented real-time status updates between kiosk enrollment and dashboard

8.5 Security Work

- Role-based access control enforced at the API level
- Kiosk terminals operate in a restricted session mode preventing unauthorized access
- All trainee data transmitted over authenticated, encrypted channels
- Admin dashboard access protected by session-based authentication

8.6 Outcomes

Metric	Description
Manual Effort Reduction	Automated enrollment and evaluation tracking
Data Accuracy	Eliminated manual entry errors
Reporting	On-demand training completion and evaluation reports

9. PROJECT 6 - PARKWHEELS

9.1 Overview

ParkWheels is an in-house smart parking solution developed at Ignite Skylabs. The product uses Vision ML models to detect vehicle occupancy in parking slots, providing real-time slot availability to users. ParkWheels was officially launched at MVIT's ELAN 2025 Annual Culturals.

Project Name	ParkWheels
Type	Smart Parking Solution (Web + ML)
Launch Event	MVIT ELAN 2025 Annual Culturals
Role	Full-Stack Developer
Status	MVP Launched

9.2 Tech Stack

Layer	Technology
Frontend	React.js
ML / Vision	Vision ML Models (slot occupancy detection)
Database	MongoDB
Dev Tools	Git

9.3 Key Features

- Real-time parking slot occupancy detection via Vision ML
- Live slot availability dashboard for users and operators
- Slot-level status tracking (occupied, available, reserved)
- Scalable architecture to support multi-zone parking layouts

9.4 Development Contributions

- Integrated Vision ML pipeline output into the backend data layer
- Built the React.js dashboard for real-time slot availability display
- Designed MongoDB schema for slot state, zone mapping, and occupancy history
- Contributed to the product launch preparation for MVIT ELAN 2025

9.5 Security Work

ParkWheels, as a camera-integrated infrastructure product, was audited for both application-level and data-privacy concerns.

Threat Surface	Mitigation
Unauthorized Camera Feed Access	Camera endpoints restricted to internal network; no public exposure
ML Pipeline Manipulation	Input validation on camera frames before inference
Slot State Tampering	Slot state writes restricted to ML services; dashboard is read-only
API Abuse	Rate limiting on the slot availability API
Data Privacy	No personally identifiable information (PII) stored; only occupancy status

- Conducted security audit of the ML pipeline's data ingestion/output layers
- Ensured the dashboard has no write access to slot state
- Validated that no PII or vehicle identification data is retained in MongoDB
- Restricted camera feed access to internal network interfaces only

10. SECURITY-FOCUSED DEVELOPMENT

Security was treated as a core engineering responsibility throughout the internship, not an afterthought. Three production applications — Ridemap V2, PrintA4, and ParkWheels — were under continuous security auditing throughout their operational lifecycle.

10.1 Security Principles Applied

Principle	Application
Defense in Depth	Multiple layers of protection (firewall, rate limiting, auth, validation) applied at every tier
Least Privilege	Each role, service, and component was granted only the minimum access required
Secure by Default	Security rules and access restrictions configured at initialization
Fail Securely	Invalid or unauthorized requests rejected with safe defaults
Audit Logging	Critical actions (admin operations, print jobs, enrollment) logged for traceability

10.2 Key Security Incident: DoS Attack on Ridemap Backend

During the production operation of Ridemap V2, an anonymous attacker launched a Denial-of-Service (DoS) attack targeting the Ridemap backend infrastructure. The incident was handled as follows:

Phase	Action
Detection	Anomalous traffic patterns identified through backend monitoring
Investigation	Attack source pinpointed to a specific IP range through log analysis
Mitigation	Firewall rules deployed with automated IP blocking for offending sources
Hardening	Rate limiting mechanisms enforced across all backend API routes
Outcome	Service stability restored; repeat attack attempts automatically blocked

10.3 Security Practices Across All Projects

Security Practice	Projects
Rate Limiting on API endpoints	Ridemap V2, PrintA4, ParkWheels, Fleet Admin
Automated IP Blocking (Firewall)	Ridemap V2
Role-Based Access Control (RBAC)	Fleet Admin, DOJO 2.0, PassChecker
Server-Side Input Validation	PrintA4, PassChecker, ParkWheels
Authentication on WebSocket handshake	Ridemap V2, PrintA4

Security Practice	Projects
Firebase Security Rules hardening	Ridemap V2, Fleet Admin
Ephemeral sensitive data handling	PrintA4
Read-only frontend architecture	ParkWheels
No PII retention	ParkWheels
Encrypted local storage	PassChecker

10.4 Continuous Security Auditing

- Reviewing API endpoints for authentication gaps and missing authorization checks
- Testing for common web vulnerabilities (injection, broken access control)
- Validating firewall and rate limiting configurations after each deployment
- Reviewing third-party dependency versions for known CVEs
- Stress testing real-time WebSocket endpoints for abuse potential

11. TECHNICAL SKILLS MATRIX

Technology	Proficiency Level	Projects Used In
React Native	Advanced	Ridemap V2, PassChecker
React.js	Advanced	Fleet Admin, PrintA4, DOJO 2.0, ParkWheels
TypeScript	Proficient	Ridemap Fleet Admin Panel
Redux	Proficient	Ridemap Fleet Admin Panel
JavaScript (ES6+)	Advanced	All Projects
Firebase	Proficient	Ridemap V2, Fleet Admin Panel
Node.js / Express	Proficient	PrintA4, DOJO 2.0
MongoDB	Proficient	PrintA4, DOJO 2.0, ParkWheels
SQL	Working	Ridemap PassChecker
Google Maps	Working	Ridemap V2
WebSocket	Advanced	Ridemap V2, PrintA4, DOJO 2.0
Vision ML Integration	Working	ParkWheels
Android Studio	Working	Ridemap V2, DOJO 2.0
Tailwind CSS	Advanced	Ridemap V2, PrintA4, DOJO 2.0
Git	Advanced	All Projects
Application Security (AppSec)	Proficient	Ridemap V2, PrintA4, ParkWheels
Firewall Configuration	Working	Ridemap V2
Rate Limiting / DoS Mitigation	Working	Ridemap V2, PrintA4, ParkWheels
RBAC Design	Proficient	Fleet Admin, DOJO 2.0, PassChecker

12. LEARNINGS AND OUTCOMES

12.1 Technical Learnings

- Gained hands-on experience building and shipping production-grade mobile apps on the Google Play Store
- Developed expertise in real-time systems using WebSocket for live tracking and print dispatch
- Learned multi-organization data architecture and role-based access control design patterns
- Applied Vision ML model integration in a real-world smart infrastructure context
- Worked across the full product lifecycle from requirement gathering to deployment
- Gained direct experience in production incident response through the Ridemap DoS attack

12.2 Security Learnings

- Understood how real-world DoS attacks manifest and how to respond effectively
- Learned to apply security at the firewall, backend, API, and storage layers
- Developed appreciation for the principle of least privilege in multi-role system design
- Practiced continuous security auditing as a development discipline
- Built intuition for identifying attack surfaces in public-facing and kiosk-based applications

12.3 Professional Learnings

- Collaborated in a cross-functional team with product managers, designers, and hardware teams
- Understood the operational demands of client-facing deployments (Lucas TVS, MVIT)
- Gained experience in managing multiple concurrent project deliverables
- Practiced documentation, version control discipline, and code review workflows

12.4 Summary of Outcomes

Category	Outcome
Products Shipped	6 production-grade products
Play Store Metrics	10K+ downloads, 4.2+ stars, 530+ reviews (Ridemap V2)
Public Launch	ParkWheels at MVIT ELAN 2025
Enterprise Deployment	Lucas TVS DOJO 2.0 at manufacturing facilities
Live Services	PrintA4 (printa4.in), Ridemap (Play Store)
Architectures Designed	Multi-org fleet dashboard, offline-first mobile app
Security Handled	DoS attack on Ridemap backend detected and mitigated
Security Audits	Continuous auditing across Ridemap V2, PrintA4, ParkWheels

13. CONCLUSION

The 19-month internship at Ignite Skylabs was a comprehensive and high-impact product development experience. Across six distinct products, the work spanned consumer mobile apps, enterprise dashboards, kiosk solutions, and ML-integrated infrastructure tools, covering the full spectrum of modern full-stack development.

Security was not a peripheral concern but a central engineering priority. From mitigating a live DoS attack on a production system to conducting continuous security audits across three products, the internship built real-world security engineering skills that complement the broader full-stack experience.

Each product was built under real operational constraints, shipped to live users or institutional clients, and contributed directly to Ignite Skylabs' product portfolio. The internship substantially strengthened both technical depth and security-first engineering mindset in preparation for a career in software and secure systems development.

Report prepared by Yuvaraja M | Internship at Ignite Skylabs | March 2024 - December 2025