# Tire Aggregator Enterprise Application

Project Document – Multi-Regional Tire Distribution Platform

## 1. Executive Summary

The Tire Aggregator Enterprise Application is a web-based e-commerce and inventory management platform designed to centralize tire distribution operations across multiple regions (e.g., Australia/New Zealand). The system aggregates 20+ tire brands and product lines, supporting B2B and B2C customers while enabling multi-branch SKU management for 13+ locations.  
  
The application streamlines the supply chain for industries such as trucking, buses, agriculture, mining, and industrial machinery by offering real-time inventory visibility, supplier integration, and automated reordering. Inspired by proven solutions like Tyres4U and BMF ProVis, the platform ensures scalability, security, and sustainability for enterprise-level operations.

## 2. Business Challenges

1. SKU Complexity: High SKU volumes for thousands of tire variations across multiple brands. Diverse product specifications (size, rim, TPMS compatibility, ply rating).  
2. Geographic Distribution: Managing stock across 13+ branches with different demand/supply patterns. Real-time visibility of stock transfers and availability.  
3. Specialized Product Ranges: Agricultural tires, mining machinery tires, industrial tires with niche requirements.  
4. Real-Time Supplier Data: Pricing, delivery lead times, and ad-hoc inventory updates from multiple suppliers.  
5. Operational Inefficiencies: Manual reordering, lack of automation, and delays in demand forecasting.  
6. Customer Experience Challenges: B2B buyers demand integration with ERP, while B2C buyers expect e-commerce ease.

## 3. Solution Overview

Core Features:  
- Multi-Branch SKU Management: Centralized catalog with real-time branch-level inventory tracking. Stock transfers between branches.  
- User-Friendly Catalog & Search: Advanced filters: vehicle type, tire size, brand, application, and industry. Compatibility lookup for TPMS and rims.  
- Supplier Integration: APIs for real-time pricing, inventory, and order status (similar to BMF ProVis). Supplier-specific dashboards.  
- Automated Reordering: Barcode/RFID scanning. Configurable min/max stock triggers with auto-purchase orders.  
- CRM & Sales Modules: Customer profiles (B2B fleets, retail buyers). Order archives, reordering history, loyalty pricing tiers.  
- Technology Stack: Frontend: React, Next.js, Material UI. Backend: Node.js, Express.js, microservices architecture. Database: PostgreSQL / MongoDB. Cloud: Azure or AWS (multi-region deployment). ERP Integration: SAP/Oracle connectors. Authentication: Microsoft Azure AD for SSO and role-based access.

## 4. Technical Requirements

- Backend: Microservices for inventory, orders, supplier API sync, and CRM. Event-driven architecture (RabbitMQ/Kafka).  
- Frontend: Responsive UI for web and mobile. Multi-lingual, multi-currency support.  
- Security: Role-based access via Azure AD (Admin, Supplier, Branch Staff, B2B, B2C). End-to-end encryption (TLS 1.3).  
- Analytics & Reporting: Sales performance dashboards. Inventory turnover and supplier SLA tracking. Audit logs for enterprise compliance.

## 5. Project Implementation

Phased Rollout:  
- Phase 1 (6 months): Catalog setup, SKU management, and multi-branch inventory.  
- Phase 2 (4 months): Supplier API integrations. Automated reordering with RFID/barcode scanning.  
- Phase 3 (6 months): CRM, TPMS compatibility, eco-tracking for sustainability projects.  
  
Budget (Indicative):  
- Development & Engineering: $600K  
- Cloud Infrastructure: $120K/year  
- ERP & Supplier Integrations: $150K  
- Training & Change Management: $80K

## 6. Compliance & Sustainability

- Integration with tire recycling initiatives such as Tire-Derived Aggregate (TDA) usage reporting.  
- Automated reporting for landfill diversion compliance.  
- Sustainability dashboards for eco-conscious fleets.

## 7. Success Metrics

- 30% reduction in overstocking and understocking through automated demand forecasting.  
- 20% faster order processing using supplier APIs.  
- Improved data governance via Azure AD and audit trails.  
- Regulatory compliance achieved for TDA grants and recycling laws.

## 8. Risks & Mitigation

1. Data Synchronization Delays – Mitigation: Real-time APIs with fallback caching and queue-based updates.  
2. Supplier Onboarding Delays – Mitigation: Prioritize large suppliers with ASA Auto compatibility.  
3. User Adoption Resistance – Mitigation: Extensive training and phased rollouts with branch-level pilots.  
4. Cybersecurity Risks – Mitigation: Azure Security Center, periodic penetration testing.

## Additional Notes

- UI/UX Mockups: Catalog search page with filters for vehicle, brand, and size. Inventory dashboard for branch managers. Supplier integration dashboard with pricing and lead times.  
- KPIs: On-time supplier delivery rate ≥ 95%. Inventory turnover improvement by 25%. Compliance with eco-grants via TDA usage reporting.