

# Ubuntu Explorer – Technical Documentation

## 1. System Overview

Ubuntu Explorer is a human-centred, AI-powered tourism ecosystem that connects tourists, SMEs, and institutions across South Africa and the G20.

- **Tourist Mobile App (Android & iOS):** personalised recommendations, gamified learning, safety features.
- **Business Owner Portal:** visibility, analytics, engagement tools.
- **Tourist Experience Panel (AI):** personalisation engine balancing tourism flows.

## 2. System Architecture

### Frontend

- **Mobile App:** React Native for cross-platform (iOS, Android).
- **Web Portal:** React.js + TailwindCSS for SME dashboard.
- **Tourist Panel:** Web-based AI dashboard for recommendations.

### Backend

- **API Layer:** Node.js + Express for REST APIs.
- **AI/ML Layer:** Python (TensorFlow, scikit-learn, PyTorch) for:
  - Recommender systems (content + collaborative filtering).
  - Natural Language Processing (chat-based travel assistant).
  - Anomaly detection (safety alerts, fraud detection).
- **Database:**
  - PostgreSQL (relational, structured business + user data).
  - MongoDB (unstructured: preferences, logs, feedback).

### Cloud Infrastructure

- **Hosting:** AWS/Azure cloud (scalable containers with Docker + Kubernetes).
- **CDN:** Cloudflare for global reach and DDoS protection.

- **Monitoring:** Datadog / AWS CloudWatch for real-time analytics.

### **3. Key Features**

#### **Tourist App**

- **AI Personalisation:** Hidden gems, cultural recommendations, real-time suggestions.
- **Gamification:** Quizzes, cultural challenges, badges.
- **Safety Features:**
  - **SOS Panic Button.**
  - **Quick Share Location.**
  - **Emergency contacts integration.**

#### **Business Owner Portal**

- **Business visibility listings.**
- **Analytics dashboard** (traffic, engagement, conversion).
- **Booking & feedback management.**

#### **Tourist Experience Panel (AI Dashboard)**

- **Real-time insights for tourists.**
- **Predictive modelling to balance flows** (avoid overcrowding).
- **Cross-country cultural comparisons for G20 scaling.**

### **4. Security & Data Protection**

- **Encryption:** AES-256 at rest, TLS 1.3 in transit.
- **Authentication:** OAuth 2.0 + Multi-Factor Authentication (MFA).
- **Access Controls:** Role-based access (RBAC) for admin, SMEs, users.
- **POPIA Alignment:** Consent-driven data collection; anonymisation of analytics.
- **Monitoring & Incident Response:** 24/7 intrusion detection + breach reporting system.

- **Backups:** Automated, encrypted daily backups with 30-day retention.

## 5. Scalability & Resilience

- **MVP Phase (South Africa):**
  - 10k–50k active users.
  - 1k SMEs onboarded.
  - Single-region cloud deployment.
- **Growth Phase (Year 2–3, G20 Expansion):**
  - Multi-region deployments (Asia, EU, Americas).
  - Multi-language packs (including indigenous & minority languages).
  - AI models retrained with G20 cultural & safety datasets.
- **Resilience:**
  - Auto-scaling containers (Kubernetes).
  - Redundant architecture across availability zones.
  - Disaster recovery with <1hr RTO (Recovery Time Objective).

## 6. Integrations & APIs

- **Payments:** PayFast (SA), Stripe (global).
- **Maps & Navigation:** Google Maps, Mapbox.
- **Social Media:** Instagram, TikTok, YouTube API hooks for sharing.
- **Tourism Data:** Integration with national tourism boards + open datasets.

## 7. Development & Deployment

- **Version Control:** GitHub with CI/CD pipelines.
- **Testing:** Unit (Jest), Integration (Postman), Load (JMeter).
- **Deployment:** CI/CD with GitHub Actions → AWS Elastic Beanstalk / Kubernetes clusters.