🚧 CrackX 🚧

Core Principle

- The app must work even **without internet** at the road site
- Internet is used **only when absolutely required**

🔌 ONLINE vs OFFLINE (Very Clear)

✅ Works OFFLINE (Most of the App)

- Photo capture
- AI detection (YOLO model)
- Bounding boxes + confidence
- Damage type identification
- Temporary GPS storage
- **Multilingual UI (Marathi, Kannada, Hindi, English)**
- Issue queueing (store locally)

🌐 ONLINE (ONLY 2 FEATURES)

1. Sync reported issues to server
2. Map / Zone resolution (when network available)

That’s it. Everything else is offline-first.

👥 USERS & FEATURES (OFFLINE-FIRST)

1️⃣ Citizen / Customer (Offline-First)

📱 What Works OFFLINE

- 📸 **Capture Photo**
    - Uses phone camera
- 🤖 **On-Device AI Detection**
    - YOLO model runs locally
    - Shows:
        - Damage type
        - Red bounding box

        - Confidence score
- 📍 **GPS Capture**
    - Location saved locally
    - No internet needed
- 🌐 **Multilingual User Interface**
    - Supported languages:
        - Marathi
        - Kannada
        - Hindi
        - English
    - Language selected during first app launch
    - Language files are **bundled inside the app**, so UI works fully offline
- 📦 **Offline Submission Queue**
    - If no internet:
        - Report is saved locally
        - Marked as **"Pending Sync"**

🌐 What Needs INTERNET (Minimal)

- 🔄 **One-Tap Sync**
    - Upload photo + detection result + GPS when internet is available
- 🗺️ **Zone Mapping**
    - Nearest Solapur Municipal Corporation zone fetched once
    - Zone data cached for future offline use

🎯 Citizen Benefit

- Works in low-network and no-network areas
- No dependency on constant data connection
- Very fast and simple experience

2️⃣ Road Safety Officer (RSO)

📱 What Works OFFLINE

- 📋 View assigned issues (cached)
- 📸 Upload repair photo (stored locally if offline)
- 🔁 Status updates saved locally until sync

🌐 What Needs INTERNET

- 🔄 Sync with municipal server
- 🗺️ Map view (optional)
- 📲 Emergency contact activation

⚠️ **RSO phone number is never visible offline**
→ Prevents misuse for minor issues

3️⃣ Admin (Mostly Online, Still Lightweight)

Admin is not field-based, so online usage is acceptable.

Features

- Model status monitoring
- Reports & summaries
- Zone-wise analytics
- Sync monitoring

🔄 OFFLINE-FIRST APP FLOW

1. **Offline** – Citizen captures photo → AI runs → result shown instantly
2. **Offline** – GPS stored → report saved locally
3. **Online later** – User taps **"Sync Reports"**
4. **Online** – Zone resolved → issue sent to correct RSO
5. **Offline → Online** – RSO fixes road → uploads proof → syncs later
6. **Online** – Admin sees full lifecycle

🗺️ Map Strategy (Offline-Optimized)

- Use **Mapbox smartly**
- Download Solapur zone boundaries once

- Cache locally
- Offline zone detection using GPS
- Online only for:
  - First-time setup
  - Map / zone updates

🧰 VERY LIGHTWEIGHT TECH STACK (React Native)

📱 Frontend (Phone + Laptop)

- React Native (Expo)
- Lightweight and easy to install
- Runs on:
  - Android phone
  - Laptop (Android emulator / Expo Web)

🤖 AI (Offline)

- YOLO model converted to:
  - ONNX / TensorFlow Lite
- Runs completely on-device

💾 Local Storage

- SQLite / AsyncStorage
- Stores:
  - Reports
  - Images
  - GPS
  - Sync status

🌐 Minimal Backend (Only for Sync)

- Simple REST API
- Single endpoint: /sync-reports
- Cloud storage for images

🗺️ Maps

- Mapbox SDK
- Offline tiles + cached zones

🌐 **Language Handling**

- Preloaded translation files for:
    - Marathi
    - Kannada
    - Hindi
    - English
- Google Translate API **only for future updates (optional)**