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<WATMS >

Functionality specification

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Version history

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Name	Role	Company	Date	Signature

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Content

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Introduction

The Wildlife Activity Tracking and Monitoring System (WATMS) is a comprehensive digital solution designed to support wildlife conservation, management, and research activities within the State of Arstotzka. The system integrates a web application, a mobile application, and an IoT-based data collection layer to enable real-time monitoring of wildlife behavior, movements, and environmental conditions. WATMS aims to improve decision-making for wildlife administrators, enhance efficiency for field researchers and reservation workers, and ensure secure, reliable access to critical data. By combining geospatial tracking, multimedia observations, and sensor-based monitoring, the system provides a centralized platform for collecting, analyzing, and visualizing wildlife-related data while meeting strict performance, security, and accessibility requirements.

Scope of the project

What Will Be Implemented

The project will implement the following components and functionalities:

- A **mobile application** for field researchers and reservation workers, supporting:
  - Real-time and offline wildlife observations
  - Uploading geotagged photos and videos
  - Access to IoT device data (GPS collars, motion sensors)
  - Task management, alerts, and environmental reporting
  - Multilingual support (English, French, Spanish, Swahili)
- A **web application** for administrative users, providing:
  - Centralized data management and analysis
  - Visualization of animal movements using maps and heatmaps
  - Report generation and data export
  - User and role management
  - IoT device configuration and maintenance scheduling
  - Language support for English and French
- An **IoT integration layer**, enabling:
  - Secure data transmission from GPS-enabled animal collars and sensors
  - Real-time monitoring of animal movements and activity alerts
- A **secure backend system**, ensuring:
  - End-to-end encrypted communication
  - Centralized data storage and synchronization
  - Sub-500ms response time for data access and visualization

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Concepts

The WATMS project is based on the following key concepts:

- **Wildlife Monitoring** – Continuous observation of animals using both human input and sensor-generated data
- **Geospatial Tracking** – Use of GPS data to monitor animal movement and habitat usage
- **Internet of Things (IoT)** – Network of sensor-enabled devices transmitting real-time wildlife data
- **Offline-First Mobile Design** – Ability to capture data without network connectivity and synchronize later
- **Role-Based Access Control (RBAC)** – Restricting system functionality based on user roles
- **Data Visualization** – Use of maps, heatmaps, and dashboards for intuitive data analysis
- **End-to-End Encryption** – Securing data throughout its entire transmission lifecycle
- **Multilingual Support** – Ensuring accessibility for users from different linguistic backgrounds

Role description

The system defines the following primary user roles:

- **Field Researchers**
  - Record wildlife observations, behaviors, and health conditions
  - Upload geotagged photos and videos
  - Access real-time and historical tracking data
  - Work in offline mode during field operations
- **Reservation Workers**
  - Deploy, monitor, and maintain IoT devices
  - Receive and respond to activity alerts
  - Schedule patrols and report environmental issues
  - Monitor restricted zones and unusual animal movements
- **Administrators**
  - Manage users, roles, and system configurations
  - Analyze aggregated wildlife data
  - Generate reports and visualizations
  - Oversee IoT device deployment and maintenance
  - Ensure system security and performance compliance

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Assumptions and dependencies

Assumptions

- Users have access to compatible mobile devices and modern web browsers
- IoT devices provide accurate and reliable sensor data
- Users possess basic technical proficiency
- Wildlife reserves have intermittent but eventual internet connectivity
- System users follow defined data entry and operational procedures

Dependencies

- Availability of GPS and sensor data from third-party IoT hardware
- Reliable cloud or on-premise server infrastructure
- Map and geolocation services for visualization
- Mobile operating system support (Android/iOS)
- Secure authentication and encryption frameworks

List of requirements

Requirements related to functionality

- **User Authentication and Role Management**

The system shall support secure user login and role-based access control for researchers, reservation workers, and administrators.

- **Wildlife Observation Recording**

Users shall be able to record animal sightings, behaviors, and health conditions using the mobile application.

- **Geotagged Media Upload**

The system shall allow users to upload photos and videos with automatic location and timestamp metadata.

- **IoT Data Integration**

The system shall receive, store, and display real-time data from GPS collars and motion sensors.

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- **Offline Data Entry and Synchronization**

The mobile application shall allow offline data entry and automatically synchronize data once connectivity is restored.

- **Alerts and Notifications**

The system shall generate alerts for unusual animal movements or proximity to restricted areas.

- **Data Visualization and Heatmaps**

Administrators shall be able to visualize animal movement patterns using interactive maps and heatmaps.

- **Report Generation**

The web application shall support the generation and export of detailed analytical reports.

Requirements related to characteristics

- **Performance**

The system shall provide a response time of less than 500 milliseconds for data access and visualization under normal load.

- **Security**

All data communication between IoT devices, mobile applications, web applications, and servers shall use end-to-end encryption.

- **Reliability**

The system shall ensure consistent operation and prevent data loss during offline-to-online synchronization.

- **Scalability**

The system shall support the addition of new users, devices, and monitored regions without performance degradation.

- **Usability**

The mobile and web applications shall feature intuitive interfaces suitable for use in field conditions.

- **Availability**

The system shall be accessible 24/7 with minimal planned downtime.

- **Maintainability**

The system shall be modular to allow easy updates, bug fixes, and feature extensions.

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- **Localization**

The mobile application shall support English, French, Spanish, and Swahili, while the web application shall support English and French.