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Wildlife Activity Tracking and Monitoring System

Functionality specification

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Version history

Version	Date	Author	Comment

Document certification

Name	Role	Company	Date	Signature

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Content

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Introduction

The State of Arstotzka is launching the Wildlife Activity Tracking and Monitoring System (WATMS) to modernize wildlife conservation and field operations. This integrated platform—combining web, mobile, and IoT technologies—will enable real-time tracking of animal movements, streamlined data collection, and efficient management of field activities. With multilingual support, offline functionality, and strong security measures, WATMS will provide researchers, reservation workers, and administrators with a reliable, data-driven foundation for protecting and managing Arstotzka's wildlife resources.

Scope of the project

In-Scope: What Will Be Implemented

1. Web Application (Administrative Portal)

- User management and role-based access control
- Visualization dashboards for wildlife activity and IoT device data
- Dynamic heatmaps showing animal movement patterns
- Reporting tools for generating analytical and operational reports
- Configuration of system settings and IoT device deployment schedules
- Support for English and French

2. Mobile Application (Field Research & Reservation Operations)

- Real-time wildlife observation recording (sightings, behavior, health)
- Uploading geotagged photos and videos
- Annotation tools for field notes and environmental observations
- Access to IoT device data (GPS collars, motion sensors, alerts)
- Offline data entry with automatic synchronization
- Multilingual support: English, French, Spanish, Swahili
- Tools for reservation workers (patrol scheduling, poacher reports, habitat change reports)

3. IoT Integration

- Communication with GPS-enabled animal collars and motion sensors
- Real-time data ingestion into the central server
- Device status monitoring and maintenance tracking
- End-to-end encrypted communication between IoT devices and the server

4. System Infrastructure & Security

- Centralized backend server and database
- API services for mobile, web, and IoT communication
- End-to-end encryption across all communication channels
- Performance optimization to meet sub-500ms response time for data access and visualization

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Out-of-Scope: What Will Not Be Implemented

- Manufacturing or physical deployment of IoT hardware (collars, sensors, etc.)
- Development of AI-based predictive analytics beyond basic visualization
- Integration with third-party wildlife databases or external government systems
- Drone-based monitoring or aerial surveillance features
- Public-facing portals or citizen mobile apps
- Automated decision-making tools for conservation policies
- Long-term data storage infrastructure beyond the project's defined capacity
- Hardware procurement, network installation, or field connectivity solutions
- Training programs for field staff (unless explicitly added as a separate deliverable)

Concepts

WATMS - Wildlife Activity Tracking and Monitoring System
IoT – Internet of things
geotagged photos - image that has location information—such as GPS coordinates—embedded in its metadata, showing where the photo was taken.
Dynamic heatmaps - interactive visual map that updates in real time to show changing patterns or activity levels using color intensity.
end-to-end encryption - security method where data is encrypted on the sender's device and can only be decrypted by the intended recipient, preventing anyone else from accessing it during transmission.

Role description

1. Field Researcher
Collects wildlife observations and uploads geotagged media using the mobile app.
2. Reservation Worker
Deploys and maintains IoT devices, monitors alerts, and reports field incidents.
3. System Administrator
Manages users, system settings, data access, and administrative reporting.
4. Data Analyst / Wildlife Analyst
Analyzes collected data and visualizations to support conservation decisions.

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Assumptions and dependencies

Assumptions

- Field teams have mobile devices capable of running the WATMS app.
- IoT devices (GPS collars, sensors) are available and compatible with the system.
- Network connectivity is available periodically for data synchronization.
- Administrators and field staff will participate in required training.

Dependencies

- Reliable IoT hardware for continuous data collection.
- Network infrastructure for data transmission and syncing.
- Backend server, database, and cloud services for system operation.
- Third-party tools for mapping, encryption, and multilingual support.

List of requirements

Requirements related to functionality

1. User Management

Allows **System Administrators** to create, edit, and assign roles to users so that each person has appropriate access.

Wildlife Observation Recording

Enables **field researchers** to log sightings, behaviors, and health notes directly in the mobile app.

Media Upload (Geotagged Photos/Videos)

Supports capturing and uploading location-tagged images and videos to enhance observation records..

Offline Data Entry

Allows users to record data without connectivity and automatically syncs it when the network is available.

IoT Device Data Integration

Retrieves real-time information from GPS collars and sensors to track animal movement and activity.

Alert Monitoring

Notifies **reservation workers** of unusual animal movements or proximity to restricted areas.

Environmental and Incident Reporting

Lets **users** report habitat changes, poaching signs, or other field incidents through the mobile app.

Patrol Scheduling

Provides tools for planning, assigning, and tracking patrol activities within protected areas.

Data Visualization (Heatmaps & Dashboards)

Displays animal movement patterns and system data through interactive maps and dashboards.

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Reporting Tools

Generates summaries, analytics, and operational reports for **administrative decision-making**.

Requirements related to characteristics

1. Performance

The system must respond to data access and visualization requests within 500ms to ensure smooth user interaction.

2. Security

All data exchanged between IoT devices, mobile apps, web apps, and the server must be encrypted to protect sensitive wildlife information.

3. Reliability

The system must operate consistently, support offline data entry, and ensure that all data syncs correctly when connectivity is restored.

4. Usability

Interfaces must be intuitive and easy to navigate for field researchers, reservation workers, and administrators, regardless of technical skill.