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Functionality specification

Wildlife Activity Tracking and Monitoring  
System (WATMS)

## WILDLIFE ACTIVITY TRACKING AND MONITORING SYSTEM (WATMS)

### Functionality specification

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## Functionality specification

## Wildlife Activity Tracking and Monitoring System (WATMS)

## Version history

Version	Date	Author	Comment

## Document certification

Name	Role	Company	Date	Signature

## Functionality specification

## Wildlife Activity Tracking and Monitoring System (WATMS)

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# Introduction

The Wildlife Activity Tracking and Monitoring System (WATMS) is a comprehensive digital ecosystem designed to support wildlife management, conservation research, and field operations. It integrates a web application, a mobile application, and IoT-enabled tracking devices to collect, process, and visualize wildlife activity data in real time. The system enables field researchers, reservation workers, and administrative personnel to collaborate efficiently and make data-driven decisions that support wildlife protection and habitat preservation.

# Scope of the project

## In Scope

- Development of a web application for administrative management, analytics, reporting, and system configuration.
- Development of a mobile application for field researchers and reservation workers, supporting online and offline operation.
- Integration with IoT devices, including GPS collars, motion sensors, and environmental sensors.
- Real-time data ingestion, processing, and visualization.
- Multi-language support (mobile: EN/FR/ES/SW; web: EN/FR).
- End-to-end encrypted communication across all system components.
- Sub-500ms response time for data access and visualization.

## Out of Scope

- Manufacturing of IoT hardware devices.
- Long-term data warehousing beyond operational requirements.
- AI-based predictive analytics (unless explicitly added later).
- Third-party system integrations not mentioned in the tender.

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## Concepts

- IoT Device: A sensor-enabled device (e.g., GPS collar, motion sensor) that transmits wildlife activity data.
- Observation: A field-recorded data point including species, behavior, location, media attachments, and annotations.
- Alert: A system-generated notification triggered by unusual animal movement or proximity to restricted zones.
- Patrol Task: A scheduled activity assigned to reservation workers for monitoring or intervention.

## Role description

- Field Researcher: Records wildlife observations, uploads media, annotates findings, and reviews IoT data.
- Reservation Worker: Manages IoT device deployment, responds to alerts, reports environmental issues, and performs patrols.
- Administrator: Manages users, configures system settings, oversees IoT deployments, and analyzes collected data.

## Assumptions and dependencies

- IoT devices will be provided by the contracting authority or third-party vendors.
- Mobile users may operate in low-connectivity environments; offline mode is essential.
- The central server infrastructure will support high-availability and low-latency requirements.
- All system components must comply with data-protection regulations applicable in Arstotzka.

## List of requirements

### Requirements related to functionality

#### Wildlife Observation Recording

- Field researchers can record wildlife observations including species, behavior, health condition, timestamp, and geolocation.
- Observations support geotagged photos, videos, and annotations.
- Offline mode allows data entry without connectivity and syncs automatically when online.

#### IoT Device Data Integration

- System ingests real-time telemetry from GPS collars, motion sensors, and environmental sensors.
- Mobile and web apps display live and historical device data.
- All IoT communication is encrypted.

#### Real-Time Animal Movement Monitoring

- Web app visualizes animal movement via heatmaps, trails, and habitat-usage analytics.
- Alerts trigger for unusual movement or proximity to restricted areas.

#### IoT Device Deployment & Maintenance Management

- Reservation workers can register, deploy, inspect, and maintain IoT devices.
- System tracks device health, battery status, and connectivity.
- Maintenance logs are stored centrally.

#### Patrol Scheduling & Task Management

- Administrators create and assign patrol tasks.
- Workers update task status, attach notes, and submit completion reports.

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### Environmental Incident Reporting

- Workers can report habitat degradation, poaching indicators, or environmental hazards.
- Reports include geolocation, severity, photos/videos, and notes.

### Administrative Analytics & Reporting

- Web app generates reports on wildlife activity, IoT device performance, and field operations.
- Reports include charts, tables, and geospatial visualizations.
- Export to standard formats is supported.

### User & Access Management

- Role-based access control (RBAC) for administrators, researchers, and reservation workers.
- Administrators manage accounts, roles, and authentication settings.
- User and access management

### System Configuration

- Administrators configure species lists, alert thresholds, restricted zones, and device parameters.
- All configuration changes are logged.
- System configuration

### Offline Operation

- Mobile app supports full offline functionality for observations, patrol tasks, and incident reports.
- Automatic synchronization occurs when connectivity is restored.
- Offline operation

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### Requirements related to characteristics

#### Performance

- Data retrieval and visualization must respond in under 500ms.
- Real-time IoT data ingestion must operate without loss.
- performance requirements

#### Security

- Mandatory end-to-end encryption.
- RBAC enforced across all system components.
- Audit logs for critical actions.
- security requirements

#### Usability

- Interfaces optimized for field conditions (low light, gloves, outdoor visibility).
- Consistent multi-language support.
- usability requirements

#### Reliability

- System supports high availability and fault tolerance.
- IoT ingestion must handle intermittent connectivity.
- reliability requirements

#### Scalability

- System must scale with increasing numbers of IoT devices, users, and data streams.
- Architecture supports horizontal scaling.
- scalability requirements