AI-Based Situational Awareness System

Prepared For:
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DAMI-CD Initiative Div
United States Army, Program Executive Office for Intelligence, Electronic Warfare and Sensors (PEO IEW&S), Program Manager Biometrics

AI-Based Situational Awareness System
Proposal & White Paper

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SEVA INNOVATIONS

1. EXECUTIVE SUMMARY

The **AI-Based Situational Awareness System** is a unified, advanced solution designed to enhance operational readiness and real-time intelligence capabilities in Department of Defense (DoD) tactical and strategic environments. Integrating cutting-edge technologies—including facial recognition, object detection, automatic speech recognition (ASR), speech-to-translation, and speaker diarization—the system delivers multi-domain situational awareness crucial for modern battlefield operations.

This solution operates effectively even in contested or degraded network environments, providing edge inference capabilities and secure synchronization with command systems when connectivity is restored. The platform empowers DoD personnel with real-time, automated analysis and actionable intelligence to ensure mission success.

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2. OBJECTIVES

- Develop deployable AI models for:
  - Facial recognition
  - Object detection and tracking
  - Automatic speech recognition (ASR)
  - Speech-to-translation for cross-language operations
  - Speaker diarization for distinguishing individuals in multi-speaker scenarios
- Integrate and fuse data from multi-modal sources, including:
  - Electro-optical and infrared video feeds
  - Radar (including SAR)
  - Acoustic and seismic sensors
  - RF spectrum monitoring
- Enable real-time alerting and visualization of threats and events
- Support secure, bandwidth-efficient synchronization with command centers
- Deliver operational flexibility for:
  - Edge computing on tactical hardware
  - Cloud-based analytics when connectivity allows
- Provide modular APIs and SDKs for integration with other defense systems

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3. TECHNICAL REQUIREMENTS

- AI Frameworks:
  - PyTorch / TensorFlow for model development and deployment
  - OpenCV for real-time video analysis
- Hardware acceleration support:

  - NVIDIA Jetson
  - Intel Movidius
  - AMD ROCm GPUs
- Multi-threaded processing for concurrent video streams
- Secure communication interfaces:
  - RESTful and gRPC endpoints
  - TLS 1.3 encryption
- Role-Based Access Control (RBAC) and comprehensive logging
- Data standards compliance:
  - JSON / XML for structured data exchange
  - STANAG 4609 for video metadata
- OS Support:
  - Linux (RHEL 8+, Ubuntu 22+)
  - Windows Server 2019+

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4. SYSTEM ARCHITECTURE

Edge Analytics Layer

- Hosts AI inference models for real-time object and facial detection, scene classification, and video summarization.
- Runs on low-power hardware suitable for forward deployments.

Data Fusion Layer

- Merges multi-sensor inputs for enhanced situational awareness.
- Performs confidence scoring and geo-tagging for detected objects and events.

Communication & Security Layer

- Manages secure communication with Command & Control (C2) systems.
- Supports operation across JWICS, SIPRNet, and approved commercial networks.
- Provides end-to-end encryption and session logging.

User Interface Layer

- Displays live video feeds with overlays, alerts, and interactive maps.
- Compatible with standard browsers and ruggedized tactical displays.

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5. TECHNICAL PROPOSAL OVERVIEW

This proposal introduces a modular AI architecture that combines state-of-the-art computer vision and speech technologies with secure communications and user-friendly interfaces. The system will:

- Deliver real-time threat detection and alerts
- Reduce false positives through multi-model ensemble AI
- Offer configurable threat thresholds for different mission scenarios
- Provide post-mission replay for analysis and debriefing
- Ensure flexible integration for future sensors and data types

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6. OPERATIONAL ADVANTAGES

- Autonomous monitoring of mission-critical areas
- Reduced cognitive load for human operators
- Enhanced situational awareness under degraded communications
- Rapid deployment on varied tactical hardware
- Full compliance with DoD cybersecurity and data protection standards

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7. RELEVANT STANDARDS & COMPLIANCE

- MIL-STD-188-220D – Tactical data communications
- STANAG 4609 – Digital motion imagery standards
- NIST SP 800-53 – Security controls framework
- FIPS 140-2/197 – Cryptographic standards
- DoD STIGs – Security hardening and compliance

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8. DEVELOPMENT TIMELINE

Stage	Task	Duration
1	Requirements Analysis & System Design	3 weeks
2	AI Model Training & Testing	5 weeks
3	Edge Device Integration	3 weeks
4	Multi-sensor Data Fusion Implementation	3 weeks
5	UI Development & Visualization	3 weeks
6	System Testing & Validation	3 weeks
7	Documentation & Delivery Preparation	2 weeks

Stage	Task	Duration
Total Duration		**22 weeks**

9. ROM COST ESTIMATE

Cost Category	Amount (USD)
Facial Recognition Module Development	$300,000
Object Detection Module Development	$250,000
Automatic Speech Recognition (ASR)	$200,000
Speech-to-Translation	$140,000
Speaker Diarization	$150,000
Subtotal of Component Market Prices	**$1,040,000**
Less 15% Integrated System Discount	-$156,000
Discounted Total	**$884,000**
Adjustment for R&D Project (70% of total)	-$265,200
Recommended R&D Project Budget	**$620,000**

Detailed Rationale: - Budget covers all development, integration, testing, and compliance for a unified AI situational awareness platform. - Includes data collection, annotation, model training, API development, dashboards, and DoD-specific requirements. - Supports advanced customization and user training for operational personnel.

10. CONCLUSION

The **AI-Based Situational Awareness System** offers a powerful, secure, and highly modular platform for modern defense operations. Through real-time intelligence fusion, automated alerts, and advanced analytics, the system provides the DoD with critical capabilities for enhanced situational awareness and mission success. It bridges the tactical edge with strategic command infrastructure, ensuring actionable insights are available whenever and wherever required.