ISO/IEC/IEEE 29148:2018

“SISTEMA INTELIGENTE DE MONITOREO Y ASISTENCIA PARA EL BIENESTAR INTEGRAL DEL CUERPO POLICIAL”

Version 1.1 (Pre- approved)

Documented by **Artemis**

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REVISION HISTORY

Table 1: Document Versioning

Name	Date	Changes	Version
Initial Proposal	12/09/2025	–	1.0
Changes for approval by *Dr. Ray Brunett Parra Galaviz*	19/09/2025	**Specifications have been re-drafted regarding**: use of hardware (smart devices); the alert system will now also send notifications to the supervisor; datasets will be used for project development; corrections in dependencies regarding hardware use; mention of future updates for depression and PTSD detection has been removed; a domain for deployment has been defined.	1.1

AGREEMENT OF CONFORMITY

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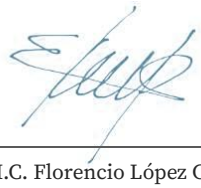

M.C. Florencio López Cruz

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1. INTRODUCTION

1.1 Document Purpose

The purpose of this document is to specify and define the detailed requirements for the development of the "Sistema Inteligente de Monitoreo y Asistencia para el Bienestar Integral del Cuerpo Policial". This document will serve as a guide for the development team, ensuring that the final product meets the objectives and expectations established in this academic project.

1.2 Product Scope

This document specifies the requirements for the first version of a monitoring system focused on the detection and assistance of stress and anxiety in police officers. The final product will be a comprehensive platform that combines a mobile application, a web application, and an API, with a Machine Learning component. The goal is to use biometric data from smart devices to identify risk states and alert both the officer and their supervisor.

1.3 Definitions, Acronyms, and Abbreviations

- Dataset: A collection of information organized in a structured format that allows for easy analysis and processing.
- API: Application Programming Interface.
- Django: A web development framework in Python.
- EDA: Electro-dermal activity.
- Frontend: The user interface of the applications (web and mobile).
- HR: Heart Rate.
- HRV: Heart Rate Variability.
- ML: Machine Learning.
- Clustering: A non-supervised learning technique in ML that organizes data into groups or clusters based on the similarity of their characteristics.

- DigitalOcean: A cloud service provider that offers infrastructure as a service and platform as a service to developers.

1.4 References

- ISO/IEC/IEEE 29148:2018 - Systems and software engineering — Life cycle processes — Requirements engineering.
- The Use of Sensors to Detect Anxiety for In-the-Moment Intervention — National Library of Medicine. Available at https://pmc.ncbi.nlm.nih.gov/articles/PMC9936367/
- Wearable devices for anxiety & depression — National Library of Medicine. Available at https://pmc.ncbi.nlm.nih.gov/articles/PMC9884643/
- Wearable Artificial Intelligence for Anxiety and Depression — Journal of Medical Internet Research. Available at https://www.jmir.org/2023/1/e42672/

1.5 Document Summary

This document has been designed in an organized manner in three main sections, in order to provide the reader with a complete view of the product to be developed.

1) Introduction: This first section describes the purpose, product scope, definitions, and basic references that will allow for a better understanding of the details mentioned in the following sections.
2) Product Summary: This is where an overview of the system, its functions, constraints, and user characteristics is provided.
3) Requirements: This section details the functional and non-functional requirements (quality of service, security, etc.) and system design, necessary to understand the complete operation of the product.

2. PRODUCT SUMMARY

2.1 Product Perspective

The system is an autonomous product that connects to an ecosystem of existing devices and technologies. It will integrate with standard wearable devices (smartwatches) and will communicate via an API with a mobile application for simple data visualization and a web application for complete data monitoring using Machine Learning.

2.2 Function Products

Each system functionality has been designed to support both police officers in the field and supervisors in charge of monitoring, based on data collection and analysis.

Police officer

- Biometric monitoring: Sending HR and HRV data from the wearable device.
- Alert generation: Automatic emission of notifications to the officer when elevated levels of stress or anxiety are detected.
- Geolocation: Location logging for their safety and to facilitate a quick response in emergencies.
- Emergency situation management: An automatic distress alert will be activated from the device, sending a signal with its precise location to the supervisor when an HR is detected that is too high or nonexistent.
- Recommendation system: Receiving personalized suggestions to manage stress, such as breathing exercises, based on biometric data.

Police supervisor

- Monitoring dashboard: A web platform that allows real-time visualization of the physiological and operational status of officers under their command.
- Alert generation: Receiving automatic notifications when elevated risk levels are detected in officers.
- Geolocation: Viewing the location of officers on a map to enhance safety and facilitate emergency response.
- Profile segmentation: Classifying officers into risk groups (using clustering techniques), which allows for the implementation of personalized prevention strategies.
- Event logging: Function to manually log high-tension or traumatic events in an officer's profile, to correlate them with biometric data and their psychological well-being.

2.3 Product Constraints

- Hardware: The system will only implement the use of one smart device due to the lack of necessary resources for the creation, distribution, and data collection from these devices.
- ML Training: The Machine Learning model will be trained with a public Dataset of information collected by a variety of smartwatches, and will later be complemented with real information sent by the smart device.
- Scope: The current system will only monitor blood oxygen level, heart rate, and stress and anxiety levels in users.

2.4 User Characteristics

Table 2: User Characteristics

Name	Technical Level	Needs
Police officer	Beginner, average user.	Simple interface, clear notifications, minimal interaction with the application, communication reliability.
Police supervisor	Intermedium.	Clear dashboard, real-time alerts, ability to view the status of multiple officers at once, access to reports and analysis.

2.5 Assumptions and Dependencies

Assumptions:

- It is assumed that officers will wear the devices throughout their work hours, ensuring that the biometric data obtained is monitored continuously and correctly.
- It is assumed that officers have basic knowledge, sufficient for the use and connection of the devices, which are the smartwatch and a phone.

Dependencies:

- Availability of access to development tools, libraries for ML use, a database, and a stable internet connection.

2.6 Requirements Allocation

Table 3: Requirements allocation

Requirement	Mobile	WEB	API	ML
Biometric monitoring	✔		✔	
Risk prediction			✔	✔
Alert generation	✔	✔	✔	
Monitoring dashboard		✔	✔	
Geolocation	✔	✔	✔	
Historical data analysis		✔	✔	
Profile segmentation		✔	✔	✔
Emergency situation management	✔	✔	✔	
Event logging		✔	✔	
Recommendation system	✔		✔	✔

3. REQUIREMENTS

3.1 External Interfaces

3.1.1 User Interfaces

WEB Application Interface (Supervisor): The web interface serves as the main control panel for the supervisor, providing a comprehensive overview of the team's situation.

Upon accessing the site, the supervisor must log in by entering their credentials (e.g., email and password). If the credential check is successful, an interactive dashboard displaying a general overview of the team's status will be shown. This dashboard will include:

- A real-time geolocation map displaying the location of each officer.
- A list of officers with a color-coded status indicator (green for "normal," yellow for "low stress," red for "stress/anxiety alert").
- A summary of recent alerts.
- The supervisor can select a particular officer to access their detailed profile, where they can view trend graphs for HRV and HR over time, as well as activity data.
- There is also access to a historical data analysis section, allowing the supervisor to generate reports and observe long-term behavioral patterns.
- A user management section is available, enabling the supervisor to register new officers or edit existing profiles.
- There will be a special event log section, which allows the supervisor to manually document incidents relevant to each officer's history.

Mobile Application Interface (Officer): The mobile interface is designed to be minimal-ist and non-intrusive, focusing on critical information and functionalities.

- When launching the application for the first time, the user must log in with valid credentials provided by their supervisor. If successful, a simple main screen will be displayed, showing the officer's status as well as their stress level.
- The main screen will include a clear and visible button to "activate an emergency alert," which will send a distress signal along with their location. This function will also be triggered automatically when their HR (heart rate) is excessively high, undetectable, or extremely low.
- A specific section will allow the user to send synthetic data to the API for the purpose of verifying the system's operation, considering that sensor implementation is not planned for this phase of the project.
- The officer will be able to receive alert notifications on their phone when a risk state is detected, or when the system offers recommendations to reduce stress.

- There will be a section to view recent alerts and, if necessary, a brief explanation of why the alert was triggered.

The interface will remain as simple as possible so as not to distract the officer, allowing them to carry out their duties efficiently.

3.1.2 Hardware Interfaces

- The DigitalOcean platform will be used as a cloud service provider for deploying the web application and its API.

3.1.3 Software Interfaces

- Mobile Application – API: Communication through secure HTTP requests.
- WEB Application – API: Communication through secure HTTP requests to retrieve and send data.
- API – ML Server: The API will send biometric data for processing and receive predictions.
- Django REST Framework – Database: Django's ORM will be used for connecting to and handling transactions with the database.

3.2 Functionals

Table 4: FR-001: User Management

ID	001		
Type	Functional	**Priority**	High
Name	User Account Management.		
Description	The system must allow a supervisor to create, edit, and delete user accounts for officers and supervisors, including assigning roles.		

Table 5: FR-002: Credential Validation

ID	002		
Type	Functional	**Priority**	High
Name	Credential Validation.		
Description	The system must validate user credentials when logging in to the web application (Supervisor) and the mobile application (Officer).		

Table 6: FR-003: Reception of Biometric Data

ID	003		
Type	Functional	**Priority**	High
Name	Reception of Biometric Data.		
Description	The system must receive synthetic data (HR, HRV) from the mobile application and store it in the database.		

Table 7: FR-004: Risk Detection and Prediction

ID	004		
Type	Functional	**Priority**	Medium
Name	Risk Detection and Prediction.		
Description	The Machine Learning module must process biometric data to detect patterns that indicate stress or anxiety and predict possible episodes.		

Table 8: FR-005: Automatic Alert Activation

ID	005		
Type	Functional	**Priority**	High
Name	Automatic Alert Activation.		
Description	The system must automatically generate an alert when a high risk of stress or anxiety is detected, or when the HR is abnormally high or zero. The alerts generated will be sent as alert notifications to the officer's mobile application and to the supervisor's monitoring panel.		

Table 9: FR-006: Geolocation recording and display

ID	006		
Type	Functional	**Priority**	Medium
Name	Geolocation recording and display.		
Description	The system must record the officer’s GPS location and display it in real time on the supervisor’s dashboard map.		

Table 10: FR-007: Dashboard Visualization

ID	007		
Type	Functional	**Priority**	High
Name	Dashboard Visualization.		
Description	The web application must display a dashboard with a list of officers, their risk status color-coded, and a summary of recent alerts. Additionally, it must allow the supervisor to select an officer to view historical trend charts of HR and HRV, as well as other activity data.		

Table 11: FR-008: Historical Data Analysis

ID	008		
Type	Functional	**Priority**	Medium
Name	Historical Data Analysis.		
Description	The web application must allow the supervisor to access reports and visualizations of historical data for the identification of patterns and trends.		

Table 12: FR-009: Event log

ID	009		
Type	Functional	**Priority**	High
Name	Event log.		
Description	The web application must allow the supervisor to manually log relevant incidents in an officer's history for analysis purposes.		

Table 13: FR-010: Recommendation System

ID	010		
Type	Functional	**Priority**	High
Name	Recommendation System.		
Description	The mobile application must display personal recommendations (e.g., breathing exercises) to the officer based on the analysis of their biometric data.		

3.3 Quality of Service

3.3.1 Performance

Table 14: NFR-001: API Response Time

ID	001		
Type	Non-functional	**Priority**	Medium
Name	Api Response Time.		
Description	The API response time for sending biometric data must not exceed 500 ms.		

Table 15: NFR-002: Prediction Time

ID	002		
Type	Non-functional	**Priority**	High
Name	Prediction Time.		
Description	The system must process biometric data and generate a risk prediction in less than eight seconds.		

Table 16: NFR-003: Dashboard Load

ID	003		
Type	Non-functional	**Priority**	Medium
Name	Dashboard Load		
Description	The web application must load the supervisor dashboard in less than three seconds, even when multiple officers are being monitored.		

3.3.2 Security

Table 17: NFR-004: Data Encryption

ID	004		
Type	Non-functional	**Priority**	High
Name	Data Encryption		
Description	The API and the database must protect sensitive personal and biometric information through encryption.		

Table 18: NFR-005: Authentication System

ID	005		
Type	Non-functional	**Priority**	High
Name	Authentication System		
Description	Access to the web dashboard must be protected by a user authentication and role system (supervisors only).		

3.3.3 Reliability

Table 19: NFR-006: Alert Backup

ID	006		
Type	Non-functional	**Priority**	Low
Name	Alert Backup		
Description	The alert system must have a backup mechanism (e.g., SMS) in case the notification cannot be delivered through the application.		

3.3.4 Availability

Table 20: NFR-007: High Availability

ID	007		
Type	Non-functional	**Priority**	Medium
Name	High Availability		
Description	The system must have 99% availability to ensure continuous monitoring of the officers.		

3.4 Design and Implementation

3.4.1 Distribution

Table 21: NFR-008: Scalable Architecture

ID	008		
Type	Non-functional	**Priority**	Medium
Name	Scalable Architecture		
Description	The database architecture must be scalable to handle large-scale data distribution in the future.		

3.4.2 Maintenance

Table 22: NFR-009: Source Code Structure

ID	009		
Type	Non-functional	**Priority**	Medium
Name	Source Code Structure.		
Description	The system's source code must be structured in a modular way, with well-defined components and low coupling, to facilitate maintenance, the addition of new functionalities, and bug fixing.		

3.4.3 Portability

Table 23: NFR-010: Application Compatibility

ID	010		
Type	Non-functional	**Priority**	High
Name	Application Compatibility		
Description	The web application must be functional and visually consistent in the latest versions of the main stable browsers; likewise, the mobile application must be functional only on the Android operating system.		

3.4.4 Cost

Table 24: Costs and Requirements

Category	Description	Estimated Cost
Human	Back-End and Front-End Developers.	$0 (Academic project with no established salaries).
Materials	Development Computers.	$0 (Developers' own equipment is available).
	Cloud Server.	$210 MXN
Technological	Frameworks and Libraries (Django, Django REST Framework, Scikit-learn, PostgreSQL.)	$0 (They are open source).

Total cost:	$210 MXN

3.4.5 Delivery Time

The first functional version of the system must be finalized before December 4, 2025, following each of the planned development stages according to the scheduled dates.

SISTEMA INTELIGENTE DE MONITOREO Y ASISTENCIA PARA EL BIENESTAR INTEGRAL DEL CUERPO POLICIAL

Artemis ™

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Desarrollador FS / ML	Ed M. Rubio	Ed
Desarrollador FS / ML	Efraín L. Dávila	Efraín
PM / Desarrollador FE	Isaac L. Guerrero	Isaac

Fecha de inicio:	15 de septiembre de 2025
Fecha de cierre:	5 de diciembre de 2025
Duración	81 días de duración
Progreso general:	7%

TAREA	PRIORIDAD	ASIGNADO	PROGRESO	FECHA DE INICIO	FECHA FINAL	DURACIÓN
PLANEACIÓN						
Análisis de la problemática.	Alta	Alejandro / Ed / Efraín / Isaac	100%	15 de septiembre de 2025	20 de septiembre de 2025	6
Establecimiento de objetivos.	Alta	Alejandro / Ed / Efraín / Isaac	100%	18 de septiembre de 2025	20 de septiembre de 2025	3
Documentación del SRS.	Alta	Ed / Isaac	50%	20 de septiembre de 2025	22 de septiembre de 2025	3
Revisión del SRS.	Alta	Alejandro / Ed / Efraín / Isaac	0%	22 de septiembre de 2025	26 de septiembre de 2025	5

Illustration 1: Diagram Gantt Chart (sample)

4. VERIFICATION

The verification of the requirements will be carried out through a three-stage testing process to ensure that the system meets all the established objectives:

- Unit Tests: Will focus on individually testing code components, such as API logic, user authentication, and the proper functioning of the Machine Learning model.
- Integration Tests: Will validate that the communication between the different modules (mobile application, web, API, and database) is fluid and secure.
- System Tests: Will simulate the real use of the product, evaluating the performance of the dashboard, geolocation, automatic alert activation, and the overall user experience.

5. APPENDICES

5.1 Project Management Tool

We opted for **Trello** due to its simplicity and visual approach, ideal for a team that needs a minimal learning curve and a clear view of the work. Trello organizes tasks on a digital board, composed of lists representing the project's workflow (e.g., “To-Do”, “In Progress”, “In Review”, “Done”). Each task becomes a card that we can move between these lists as work progresses. What makes it useful for our project is its ability to integrate additional functionalities through Power-Ups. A key Power-Up we could use is the Gantt chart view. This would allow us to take all the tasks and their deadlines and visualize them in a formal timeline. This diagram would be essential for long-term planning, to identify dependencies between tasks, and to ensure that the entire project stays on track for the delivery date.

5.2 Communication Tool

We chose **Discord** as our main communication channel. Although known for the gaming community, its server structure adapts perfectly to the organization of a development project. We could create text channels to segregate and organize conversations by specific

topics. For example, we could have a #technical-questions channel to solve code problems, a #ux-ui-design channel to share and discuss interface prototypes, and a #general channel for announcements and meeting coordination. In addition to text channels, Discord's voice channels would allow us to have quick and efficient meetings without the need to schedule complex calls. This flexibility would facilitate real-time collaboration, which is crucial for quickly solving problems or for working together on a project feature. Ultimately, Discord would give us a centralized and organized platform for all team communication.

5.3 Database model

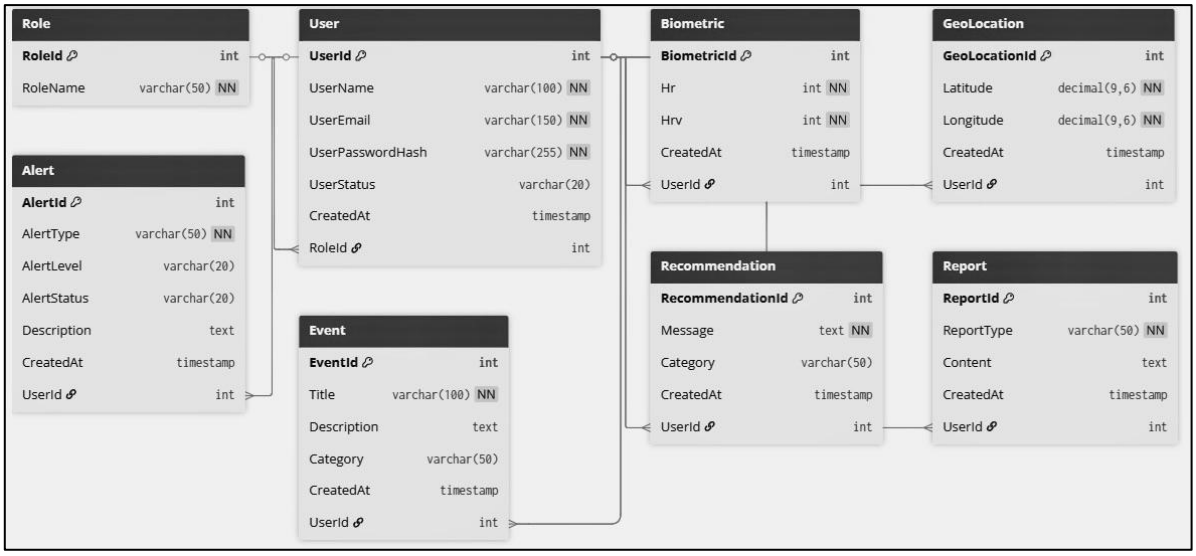

Illustration 2: Current version of the ERD

5.4 Sequence diagram

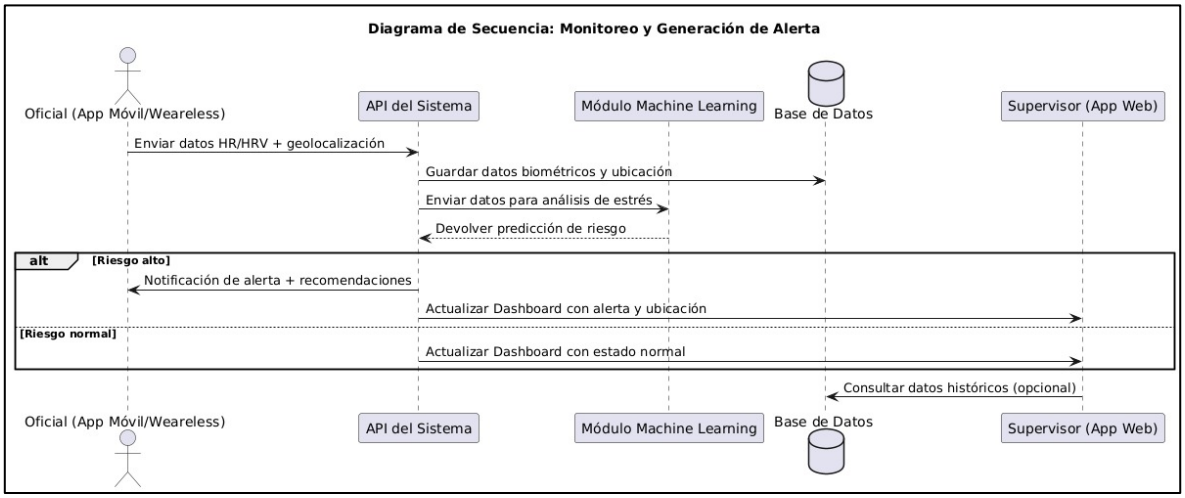

Illustration 3: First version of the sequence diagram