SMARTGUARD AI

THE DEFINITIVE TECHNICAL SPECIFICATION

Comprehensive Platform & Intelligence Manual

Prepared for: Senior Cybersecurity Evaluation

Platform Version: 2.0.0 (Elite Evolution)

Authorized Release: 2026

1. SYSTEM ARCHITECTURE & TECH STACK

1.1 Backend Engine: FastAPI & Python

The backend is built using FastAPI, chosen for its ultra-high performance and asynchronous capabilities. Unlike traditional synchronous frameworks, FastAPI allows the SmartGuard engine to process multiple heavy file scans concurrently without blocking the intelligence pipeline. It leverages Pydantic for data validation, ensuring that every security result is strictly typed and professional.

1.2 Frontend Interface: Streamlit & Custom CSS

The primary dashboard is powered by Streamlit, integrated with a bespoke custom CSS design system (Obsidian Enterprise). Streamlit was selected to bridge the gap between data-intensive machine learning and a professional user interface. It enables real-time reactive updates for the Cinematic Scan Sequences and allows for the integration of Plotly.js for advanced technical visualizations.

2. DATA LIFECYCLE & STORAGE

When a user uploads a file to SmartGuard AI, the system follows a secure, transient lifecycle:

Step 1: In-Memory Ingestion

The file is sent over a TLS 1.3 encrypted connection. It is ingested as a byte stream. The actual file content is never permanently stored on our disk during standard analysis to maintain maximum user privacy.

Step 2: Multi-Layer Decomposition

The engine performs signature matching, heuristic randomness checks (Entropy), and ML pattern recognition. Only the metadata and results (risk score, detections) are captured.

Step 3: History Logging

Scan results are persisted in logs/malware_history.json. This file stores the filename, SHA-256 hash, Risk Score, and a unique Session User ID. This allows for User-Specific Isolation, ensuring one user cannot see another users scan archive.

3. MACHINE LEARNING & INTELLIGENCE

3.1 The NSL-KDD Dataset

The Neural Core of SmartGuard AI is trained on the NSL-KDD dataset, a world-standard benchmark in cybersecurity research. Provided by the Canadian Institute for Cybersecurity (University of New Brunswick), this dataset contains thousands of real-world network and file attack patterns. It was selected because it eliminates redundancies found in the older KDD 99 dataset, resulting in a more accurate and less biased model for detecting modern threats likes Probes, DoS, and Rootkits.

3.2 Model Architecture

The platform utilizes an Ensemble Voting Classifier consisting of a Random Forest model (for structural feature importance) and a Multi-Layer Perceptron (for non-linear pattern matching). We

also utilize SMOTE (Synthetic Minority Over-sampling Technique) during training to ensure the model is equally effective at identifying rare, critical zero-day exploits.

4. FEATURE MECHANICAL OVERVIEW

- Cinematic Scan Sequences

Uses st.status and time-staggered status updates. This isn't just aesthetic; it slows down the UI to a human-digestible pace while the high-speed backend completes its analysis, providing feedback on which neural bridge is being established.

- Actionable Remediation Guides

Translates mathematical risk scores into physical security steps. A score > 90 triggers critical isolation protocols, whereas < 40 provides Safe Monitoring advice. It acts as a digital first-aid kit for users.

- Side-by-Side Comparison

Forensic tool that uses set-theory to find the Threat Contrast. It highlights exactly which malicious indicators are present in Specimen A but absent in Specimen B.

5. FINAL TECHNICAL SPECIFICATIONS

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PRIMARY LANGUAGE:     Python 3.10+
UI FRAMEWORK:         Streamlit (Enterprise Theme)
API LAYER:            FastAPI (Uvicorn ASGI)
ML DATASET:           NSL-KDD (UNB CIC)
ENCRYPTION:           TLS 1.3 / AES-256 (History)
SCANNING SPEED:       < 200ms (Core Engine)
DETECTION LAYERS:     Signatures, Entropy, Neural Core
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