



ARQUITECTURA TÉCNICA DEL SISTEMA

FRONTEND LAYER

WEB CLIENT

SPA

Framework: **Vanilla JS + Charts.js**

Bundle: **HTML5, CSS3, ES6+**

Endpoint: http://<raspi-ip>:3001

Protocol: HTTP/1.1, WebSocket (opcional)

API GATEWAY LAYER

API GATEWAY

PROXY

Server: **NGINX + Flask**

Load Balancer: **Round Robin**

Port: 3001

SSL: TLS 1.2+ (opcional)

Rate Limit: 100 req/min



Security: CORS, Rate Limiting, JWT Validation

MICROSERVICES LAYER

AUTH SERVICE

FLASK

Runtime: **Python 3.9+ / Flask 2.x**

Auth: **JWT (RS256)**

Endpoints:

POST /auth/login

POST /auth/refresh

POST /auth/logout

USER SERVICE

FLASK

Runtime: **Python 3.9+ / Flask 2.x**

ORM: **SQLAlchemy 1.4+**

Endpoints:

GET/POST/PUT/DELETE /users

GET /users/{id}/profile

YOLO SERVICE

AI/ML

ML Framework: **YOLOv5 + PyTorch**

Model: **yolov5s.pt (28MB)**

Endpoints:

POST /detect/image

POST /detect/batch

GET /model/info



Performance: ~100ms inference time, GPU aceleration (CUDA)

DATA PROCESSING LAYER

DATA COLLECTOR

FLASK

Queue: **Redis/Celery (opcional)**

Batch Size: **100 records/batch**



Data Flow: YOLO → Collector → MySQL → Grafana

DATABASE LAYER

MySQL DATABASE

RDBMS

Version: **MySQL 8.0+**

Engine: **InnoDB**

Port: 3306
Charset: utf8mb4
Connection Pool: 20 connections

users	
id	INT PRIMARY KEY
username	VARCHAR(50) UNIQUE
email	VARCHAR(100)
password_hash	VARCHAR(255)
created_at	TIMESTAMP

detections	
id	INT PRIMARY KEY
user_id	INT FOREIGN KEY
image_path	VARCHAR(255)
objects_detected	JSON
confidence_score	DECIMAL(3,2)
detection_time	TIMESTAMP

MONITORING & ANALYTICS

GRAFANA DASHBOARD

ANALYTICS

Version: Grafana 9.x

Data Source: MySQL Connector

Port: 3000
Dashboards: Detection Analytics, User Activity, System Health



FLUJO DE DATOS DEL SISTEMA

- 1 Cliente Web envía imagen via HTTP POST → API Gateway
- 2 Gateway valida JWT → Auth Service
- 3 Imagen procesada → YOLO Service (inferencia ML)
- 4 Resultados de detección → Data Collector
- 5 Data Collector → INSERT en MySQL (tabla detections)
- 6 Grafana consulta MySQL → Dashboards en tiempo real
- 7 Respuesta JSON con detecciones → Cliente Web

COMPONENTE	TECNOLOGÍA	PUERTO	RECURSOS	ESCALABILIDAD
Frontend	HTML5/JS/Charts.js	3001	~50MB RAM	CDN, Caching
API Gateway	NGINX + Flask	3001	~200MB RAM	Load Balancer
Auth Service	Flask + JWT	5000	~100MB RAM	Stateless
User Service	Flask + SQLAlchemy	5001	~150MB RAM	Horizontal
YOLO Service	Flask + PyTorch	5002	~2GB RAM + GPU	GPU Cluster
Data Collector	Flask + Redis	5003	~100MB RAM	Queue Workers
MySQL	MySQL 8.0	3306	~1GB RAM	Master-Slave
Grafana	Grafana 9.x	3000	~300MB RAM	HA Setup