

SRO KNOWLEDGE INFRASTRUCTURE

01 HIGH-LEVEL SYSTEM TOPOLOGY

SRO Engine : Learning Decision Support Infrastructure | Enterprise Ready

Architecture Pattern : Decoupled & Event-Driven Microservices Architecture
Frontend Layer : Next.js 14 (App Router) + Zustand + Tailwind / Shadcn UI
API Proxy / Gateway : Nginx Reverse Proxy (SSL/TLS Termination, CORS Hardening)
Backend Engine : FastAPI (Python 3.11+) | Async Architecture with AsyncPG
Async Task Queue : Celery Workers + Redis Broker (LLM Task Isolation)
Data Tier : PostgreSQL 15 (48 Tables / 8 Domains) + SQLite Client Encryption

02 CORE SYSTEM DATA FLOW & SRO ENGINE SPEC

[Doc Input] → [Atomic Extraction] → [Deterministic Binding] → [HITL Review] → [Analytics]

- Deterministic Engine : 100% OBEC & Bloom's Taxonomy Alignment (Zero Hallucination)
- Client-Side Security : AES-256-GCM + HMAC-SHA256 Anonymization (Zero Plaintext DB)
- Token Efficiency : Low-Cost JSON Node Output (Gross Margin > 80%)

03 ENTERPRISE CAPABILITIES

⚡ High Scalability

Stateless API, Horizontal Scaling, Celery Workers แยก LLM Tasks, Connection Pooling รองรับพันคนพร้อมกัน

🔌 Plugin Architecture

BasePlugin Interface, Multi-LLM Provider (Gemini/OpenAI/Ollama/Thai LLM & On-Premise), Rate-limit Retry

🛡️ PDPA Compliance

Tenant Isolation, AES-GCM Encryption, ป้องกันการเข้าถึง ข้อมูลข้ามสถานศึกษา

🔒 Human-in-the-Loop

AI ไม่ตัดสินใจแทน 100% ครูอนุมัติผ่าน Verification Endpoint ก่อนบันทึกจริง

04 TECH STACK SUMMARY

Frontend : Next.js 14, Zustand, Axios, Socket.io
Backend : FastAPI, Pydantic V2, SQLAlchemy 2.0 Async, Alembic, AsyncPG
Security : JWT Auth, AES-256-GCM, Tenant Isolation, CORS Hardening

