

# Cboard Enhancement – Technical Architecture Diagram (Full Version)

## High-Level Layered Architecture

Client Devices (Tablet / Mobile / Desktop Browsers) -> Nginx (Static Hosting + Reverse Proxy) -> React Frontend (Enhanced Cboard) -> PHP REST API Layer -> MySQL Database Cluster -> AI Services (Jyutping Engine, Predictive Typing, Symbol Recommendation) -> External Services (OCR, TTS).

### **Layer 1: Client & Frontend**

- React SPA based on Cboard. - Modules: Profile Manager, Editing Mode, Communication Mode, Scanning Engine UI, Jyutping Keyboard, Games, Translator. - Accessibility: switch scanning controls, eye-tracking integration hooks. - Communicates with backend via JSON over HTTPS.

### **Layer 2: API Gateway / Web Server**

- Nginx terminates HTTPS and serves React build as static files. - Reverse proxies /api/\* requests to PHP-FPM. - Handles caching headers for static assets.

### **Layer 3: PHP REST API Layer**

- RESTful endpoints grouped by domain: \* /api/auth/\* (login, register, token refresh) \* /api/profiles/\* (CRUD profiles, assign users, import/export) \* /api/cards/\* (CRUD cards, layouts, media upload) \* /api/jyutping/\* (search dictionary, suggest candidates, log learning) \* /api/logs/\* (card usage, exports) \* /api/transfer/\* (QR/cloud/email tokens) \* /api/ai/\* (predictive typing, symbol recommendation) - Implements input validation, authentication and rate limiting. - Uses database abstraction layer or ORM for MySQL access.

### **Layer 4: MySQL Database Layer**

- Core tables: users, profiles, cards, profile\_cards, jyutping\_dictionary, jyutping\_learning\_log, action\_logs, profile\_transfer\_tokens, ocr\_history. - Indexed columns for fast lookup on profile\_id, user\_id, jyutping\_code, created\_at. - Supports daily backups and point-in-time recovery.

### **Layer 5: AI & NLP Services**

- Jyutping Engine: \* Input: partial Jyutping string, context text, user\_id. \* Output: ranked list of Chinese characters/words and predicted completions. - Predictive Typing Service: \* Uses language model (local or external) for next-character/next-word suggestions. - Symbol Recommendation Service: \* Maps text or Jyutping sequences to candidate AAC symbols. - Exposed to PHP via REST or gRPC endpoints.

### **Layer 6: OCR & External Integrations**

- OCR Service: \* Accepts image upload from frontend. \* Returns extracted Chinese text. - TTS Service: \* Provides Cantonese and English voices. \* Called by frontend or backend to get audio URLs. - Logging/Analytics integrations as needed.

## ***Security & Compliance***

- All external calls via HTTPS. - JWT-based session tokens or secure cookie. - Role-based access control for admin functions. - Logging of key events for SRAA/PIA compliance.

## ***Deployment Topology (Typical)***

- Frontend + Nginx on one VM/container. - PHP-FPM + API code on application VM/container. - MySQL on dedicated database server (with replica if needed). - AI and OCR services on separate scalable nodes (GPU-enabled where necessary).