

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).