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TAPTALK AAC SYSTEM & ARCHITECTURE

COMPREHENSIVE HOW-TO MANUAL & MASTER BLUEPRINT

SYSTEM OVERVIEW & PURPOSE:

TapTalk is an Augmentative and Alternative Communication (AAC) platform designed for non-verbal children on the autism spectrum. It builds upon open-source standards to provide a customizable, 100% Free Forever, offline-first assistive communication aid. This document details each software element, user-facing feature, security protocol, database configuration, and self-healing systemd daemon composing the TapTalk ecosystem. Point any AI agent or systems developer to this file for complete context.

System Core Element	Technical Details	Licensing & Architecture
Speech Engine	Web Speech API (Synthesized Voice rate/pitch control)	GPL-3.0 / W3C Standard
Symbol Registries	7,780 self-hosted vectors (Mulberry, Twemoji, ARASAAC)	Creative Commons BY-SA 4.0
Database Engine	SQLite v3 WAL Mode (64MB Cache Buffer)	Public Domain / High Efficiency
Caching Layer	Redis RAM Cache (< 1ms read response latency)	Redis Source Available License
Security Shield	ModSecurity WAF + OWASP CRS + Cloudflare Edge Proxy	PCI-DSS Compliant Gateway
Data Pipe / Scraper	39,776 Irish leads, 24,877 verified emails, 260 worksheets	SQLite Master Sync
Self-Healing Watchdog	Linux systemd timers (sitecraft-watchdog.timer)	POSIX Shell Locks

SECTION 1: TAPTALK AAC COMMUNICATOR ELEMENT DETAIL

1. Visual Grid System & OBF Boards

The interface renders a customizable grid layout populated with ARASAAC and Mulberry pictograms. Each button represents a word, action, or phrase. Users navigate via standard Open Board Format (OBF) board trees. Custom board grid column counts can be modified on the options screen to adapt to the child's cognitive or fine motor needs (e.g., 2x2 grid for beginners up to 8x8 grids for advanced users).

2. Dynamic 2-Tier Interactive Glossy Folders

Folders enable category nesting (e.g., Food -> Fruits -> Apple). They are color-coded to align with standard Fitzgerald Key grammar classifications (nouns = orange, verbs = green, social = pink, descriptors = blue). The interface uses CSS glassmorphic cards with backdrop blur layers, preventing visual clutter while maintaining high depth.

3. Speech Synthesizer Voice Bridge

When visual tiles are tapped, words are added to a top text strip. Clicking the speech bubble triggers the local Web Speech API synthesis engine. System options support pitch adjustments, speed rate modifications, and custom presets such as 'Child Cheerful' or 'Young Female' to give non-verbal children a personalized voice.

4. Google OAuth 2.0 Auth Gate & Profile Persistence

TapTalk integrates Google Identity Services. Upon signing in, a user's local board edits, active color theme, custom tiles, and speech analytics logs are automatically synchronized to the server database. This persistence allows a family to configure the board on a PC and instantly reload it on the child's Android/iOS tablet.

5. Parental Security & PIN Lock

To prevent children from accidentally editing boards or accessing settings, a customizable 4-digit PIN lock guards options, theme configurators, and parent-facing speech log outputs.

6. Speech Analytics & IEP Progress Metrics

TapTalk records spoken vocabulary to track therapy goals. Key metrics include 'Motor Automaticity Score' (speed of navigation repeating target phrases) and 'IEP Goal Progress' (frequency of request formations). Data can be filtered and exported to CSV for Speech & Language Pathologists (SLPs) and special education educators.

SECTION 2: BACKEND INFRASTRUCTURE & HEALING SPECIFICATIONS

1. ModSecurity Web Application Firewall (WAF)

Operating on port 80/443 on the OVHcloud VPS (51.210.11.1), ModSecurity runs alongside Apache. It filters incoming requests against OWASP Core Rule Sets, actively blocking brute-force, SQL injection, LFI, and automated bot probes before reaching the PHP API layer.

2. Cloudflare Edge Proxy

DNS zones `sitecraft.ie`, `aac.sitecraft.ie`, and `www.sitecraft.ie` route through Cloudflare proxy IP pools. Cloudflare forces Post-Quantum TLS 1.3 encryption, provides global DDoS protection, and decreases page load latencies through content delivery network (CDN) caching of symbol vector images.

3. Redis RAM Caching Engine

The PHP API v1 leverages a Redis database on localhost. It caches read responses (like autism news feed and AT grant eligibility matrices) in memory with a default time-to-live. Response times are minimized to sub-1ms, avoiding SQLite file locks during simultaneous user requests.

4. B2B Directory Lead Harvester Pipeline

A background crawler extracts Irish business leads into Excel worksheets. The master file

`Bluebell\_Inchicore\_Businesses\_v6\_MAIN.xlsx` contains 39,776 leads, 24,877 verified emails, and 260 worksheets. The dataset is exposed securely to internal systems through `/api/export\_leads.php`.

5. Unbreakable Systemd Watchdog & Locking

Two systemd timers regulate cron jobs: `sitecraft-harvester.timer` (executes hourly) and `sitecraft-watchdog.timer` (executes every 5 minutes). The execution wrapper scripts use strict lockfiles (e.g. `/tmp/sitecraft\_harvester\_root.lock`) to prevent script execution overlaps and handle stale lock cleanups automatically during restarts.

Systemd Lock Wrapper Logic Spec:

```
#!/bin/bash LOCKFILE="/tmp/sitecraft_watchdog_root.lock" if [ -e "$LOCKFILE" ] && kill -0 $(cat "$LOCKFILE") 2>/dev/null; then echo "[!] Collision detected. Watchdog task already executing." exit 1 fi echo $$ > "$LOCKFILE"
# Run audit telemetry routines... rm -f "$LOCKFILE"
```

SECTION 3: REST API V1 SPECIFICATION REGISTRY

The REST API exposes system metrics, news, speech analytics, and user settings. The base routing is configured via mod_rewrite in ``/var/www/html/aac.sitecraft.ie/api/v1/.htaccess`` pointing to ``/api/v1/index.php``.

Route	Method	Description	Output Fields
/api/v1/health	GET	Health status, WAL cache parameters, symbol counts.	api_status, self_hosted_symbols, database_engine, redis_ca
/api/v1/system/blueprint	GET	Non-security WAF, CDN, VPS, and sync specifications.	cybersecurity_shield, cloud_infrastructure, leads_harvester
/api/v1/news	GET	Fetches curated SEN & Autism News Feed articles.	title, source, link, pubDate
/api/v1/speech/analytics	GET	IEP therapy telemetry, top phrase tallies.	total_words_spoken_today, top_phrases, iep_goal_progress
/api/v1/profile	GET/POST	Fetches or updates child details, speech voice, pin settings.	email, child_name, speech_engine, active_theme, pin_lock_e
/api/v1/grants/status	GET	Department of Education Circular 0010/2013 AT Grant validation	validation, out_of_pocket_cost, eligibility, required_forms
/api/v1/telemetry	POST	Logs anonymous button tap strings to SQLite database.	phrase, logged_at, status
/api/v1/sync	POST	Saves grid backups and customized symbols globally.	board_id, tiles_count, sync_timestamp

Example Request Curl:

```
curl -X GET -H "X-API-Key: taptalk_dev_key" \ https://aac.sitecraft.ie/api/v1/system/blueprint
```

Example Response Body:

```
{ "status": "success", "code": 200, "message": "System Topological Blueprint Fetched", "data": {  
  "cybersecurity_shield": { "waf_status": "active", "engine": "ModSecurity WAF & OWASP Core Rule Set" } } }
```