

Enterprise Mobile Product Factory

Complete Directory & Technical Specifications of all 163 Hardened Modules

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Category: Architecture And Auth

[mod_01_product_idea_engine] Module 01: Product Idea Engine

Platform: flutter | **Path:** modules/mod_01_product_idea_engine | **Status:** production-ready

The **Product Idea Engine** ensures that every app built in the factory undergoes strict market validation, scoring, and lifecycle tracking before writing any code.

Key Capabilities: **Strict Validation Rubric: Evaluates market demand, competition density, willingness to pay, and technical feasibility. • **Finite State Machine:** Tracks app stages from [idea](#) -> [market_research](#) -> [mvp_definition](#) -> [launch](#) -> [scale](#). • **Zero Hallucination Scorecard:** Computes composite viability scores (0-100) with pass/fail gates.**

```
mod_01_product_idea_engine: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_01_product_idea_engine ref: main
```

[mod_02_tech_stack_standard] Module 02: Tech Stack Standard

Platform: flutter | Path: modules/mod_02_tech_stack_standard | Status: production-ready

Enforces zero-tolerance architecture rules and Dart linter configurations for all apps in the factory.

```
mod_02_tech_stack_standard: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_02_tech_stack_standard ref: main
```

[mod_03_app_starter_template] Module 03: App Starter Template

Platform: flutter | **Path:** [modules/mod_03_app_starter_template](#) | **Status:** production-ready

The foundation scaffold for any new app generated in the factory. It enforces Clean Architecture folders:

```
mod_03_app_starter_template: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_03_app_starter_template ref: main
```

[mod_04_core_architecture] Module 04: Core Mobile Architecture

Platform: flutter | **Path:** modules/mod_04_core_architecture | **Status:** production-ready

Defines Clean Architecture primitives ensuring complete separation of concerns:

Key Capabilities: **Result<Success, Failure>** functional pattern (zero unhandled exceptions) • **BaseUseCase<Type, Params>** for business rules • **BaseRepository** contracts

```
mod_04_core_architecture: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_04_core_architecture ref: main
```

[mod_05_app_config_system] Module 05: App Configuration System

Platform: flutter | Path: modules/mod_05_app_config_system | Status: production-ready

Manages per-app configuration and flavors:

Key Capabilities: [Environment.dev](#), [Environment.staging](#), [Environment.production](#) • Immutable, strongly typed config objects • Strict validation preventing missing production keys

```
mod_05_app_config_system: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_05_app_config_system ref: main
```

[mod_06_android_identity] Module 06: Android Identity

Platform: python | Path: modules/mod_06_android_identity | Status: production-ready

Provides templates and scripts for hardening Android application identity, signing, and security:

Key Capabilities: Secure [build.gradle.kts](#) configuration template • Obfuscation with ProGuard / R8 rules • [network_security_config.xml](#) with cleartext traffic disabled & certificate pinning • Automated keystore generation & validation scripts

[mod_07_ios_identity] Module 07: iOS Identity

Platform: python | Path: modules/mod_07_ios_identity | Status: production-ready

Provides standardized configuration, security hardening, and entitlements for iOS:

Key Capabilities: Strict [Info.plist](#) with App Transport Security (ATS) cleartext traffic blocked • Entitlements template with Keychain Sharing, Associated Domains, and Push Notifications • Fastlane Match signing workflow

[mod_08_environment_system] Module 08: Environment System

Platform: flutter | Path: modules/mod_08_environment_system | Status: production-ready

Manages environment configuration across [.env.dev](#), [.env.staging](#), and [.env.prod](#).

Key Capabilities: Secrets are decrypted at runtime or injected via compile-time `--dart-define` • Validates that mandatory keys are present before app execution

```
mod_08_environment_system: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_08_environment_system ref: main
```

[mod_09_auth_module] Module 09: Authentication Module

Platform: flutter | Path: modules/mod_09_auth_module | Status: production-ready

Production-grade authentication engine designed with zero-trust principles:

Key Capabilities: **PKCE OAuth2 Flow**: Code verifier and challenge generation • **Token Rotation**: Anti-replay token rotation engine • **Pluggable Identity Providers**: Email, Google, Apple, Anonymous • **Secure Token Storage Interface**: Backed by hardware keystore

```
mod_09_auth_module: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_09_auth_module ref: main
```

[mod_10_authorization_system] Module 10: Authorization System

Platform: flutter | Path: modules/mod_10_authorization_system | Status: production-ready

Enforces Zero-Trust authorization principles:

Key Capabilities: The mobile app verifies claims locally for UI visibility, but server is always source of truth. • RBAC role check: [UserRole.free](#), [UserRole.subscriber](#), [UserRole.admin](#). • Granular permissions: [Permission.createProject](#), [Permission.exportData](#), [Permission.accessAi](#).

```
mod_10_authorization_system: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_10_authorization_system ref: main
```

Category: Data And Design

[mod_11_local_data_system] Module 11: Local Data System

Platform: flutter | Path: [modules/mod_11_local_data_system](#) | Status: production-ready

Provides encrypted key-value and relational local persistence:

Key Capabilities: SQLCipher / Encrypted SQLite interface • Hardware Keystore / KeyChain backed 256-bit encryption key derivation • In-memory test mock for rapid unit testing

```
mod_11_local_data_system: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_11_local_data_system ref: main
```

[mod_12_offline_first_sync] Module 12: Offline-First Architecture

Platform: flutter | Path: [modules/mod_12_offline_first_sync](#) | Status: production-ready

Implements the **Outbox Pattern** for robust offline mobile operations:

Key Capabilities: Queues write mutations when device is disconnected • Dispatches transactions with UUIDv4 idempotency keys when connection restores • Conflict resolution strategies: [lastWriteWins](#), [serverAuthoritative](#), [clientWins](#)

```
mod_12_offline_first_sync: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_12_offline_first_sync ref: main
```

[mod_13_api_layer] Module 13: API Layer

Platform: flutter | Path: [modules/mod_13_api_layer](#) | Status: production-ready

Standardized HTTP client engine for the entire factory:

Key Capabilities: Standardized API Response Envelope: [ApiResponse<T>](#) with [success](#), [data](#), [error](#) • Retry logic with exponential backoff & jitter • Authentication token injection & automatic 401 refresh handler

```
mod_13_api_layer: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_13_api_layer ref: main
```

[mod_14_error_handling] Module 14: Error-Handling System

Platform: flutter | Path: [modules/mod_14_error_handling](#) | Status: production-ready

Centralized error handling and security sanitization:

Key Capabilities: Prevents sensitive stack traces, SQL errors, or backend addresses from leaking to the user. • Maps low-level exceptions (HTTP 500, SocketException, Timeout) to user-friendly messages.

```
mod_14_error_handling: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_14_error_handling ref:
main
```

[mod_15_state_management] Module 15: State Management

Platform: flutter | Path: [modules/mod_15_state_management](#) | Status: production-ready

Defines a strict state pattern to prevent ad-hoc boolean flags:

Key Capabilities: [UiState<T>](#): [Initial](#), [Loading](#), [Success](#), [Empty](#), [Error](#), [Offline](#), [Refreshing](#) • Enforces exhaustive UI rendering via [when\(...\)](#) pattern matching.

```
mod_15_state_management: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_15_state_management
ref: main
```

[mod_16_design_system] Module 16: Design System

Platform: flutter | Path: [modules/mod_16_design_system](#) | Status: production-ready

Internal mobile design system specification providing standard reusable UI primitives:

Key Capabilities: [AppBar](#) (Primary, Secondary, Destructive, Ghost, with loading states) • [AppBar](#) (Elevated, Outlined, Flat) • [AppBar](#) (With validation, clear button, obscure toggle) • [AppBar](#) (Shimmer loading placeholder)

```
mod_16_design_system: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_16_design_system ref: main
```

[mod_17_design_tokens] Module 17: Design Token System

Platform: flutter | Path: [modules/mod_17_design_tokens](#) | Status: production-ready

Centralized design tokens ensuring visual harmony and ultra-fast re-theming across 100+ apps.

Key Capabilities: [AppSpacing](#): [xs](#) (4), [sm](#) (8), [md](#) (16), [lg](#) (24), [xl](#) (32), [xxl](#) (48) • [AppRadius](#): [sm](#) (4), [md](#) (8), [lg](#) (16), [full](#) (999) • [AppElevation](#): standard elevation values

```
mod_17_design_tokens: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_17_design_tokens ref: main
```

[mod_18_responsive_ui] Module 18: Responsive UI

Platform: flutter | Path: [modules/mod_18_responsive_ui](#) | Status: production-ready

Adaptive layout breakpoints:

Key Capabilities: [DeviceType.compact](#) (< 600 dp: standard phones) • [DeviceType.medium](#) (600 - 840 dp: foldables & small tablets) • [DeviceType.expanded](#) (> 840 dp: tablets & desktop)

```
mod_18_responsive_ui: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_18_responsive_ui ref: main
```

[mod_19_accessibility] Module 19: Accessibility (A11y)

Platform: flutter | Path: [modules/mod_19_accessibility](#) | Status: production-ready

Enforces accessibility guidelines across the factory:

Key Capabilities: Minimum touch target: 48x48 dp • WCAG 2.1 AA and AAA contrast ratio verification

```
mod_19_accessibility: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_19_accessibility ref: main
```

[mod_20_dark_mode] Module 20: Dark Mode & Dynamic Theme

Platform: flutter | Path: [modules/mod_20_dark_mode](#) | Status: production-ready

Dynamic theme switcher supporting:

Key Capabilities: [ThemePreference.system](#), [ThemePreference.light](#), [ThemePreference.dark](#), [ThemePreference.amoled](#)

```
mod_20_dark_mode: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_20_dark_mode ref: main
```

Category: Hardware Ai And Monetization

[mod_21_device_features] Module 21: Device Features Module

Platform: flutter | Path: [modules/mod_21_device_features](#) | Status: production-ready

Standardized native device bridges:

Key Capabilities: [HapticService](#): Heavy, medium, light, selection feedback • [ClipboardService](#): Secure clipboard copy/paste with auto-clear after 60s for sensitive credentials • [BiometricService](#): Hardware-level biometric check contract

```
mod_21_device_features: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_21_device_features
ref: main
```

[mod_22_permission_architecture] Module 22: Permission Architecture

Platform: flutter | Path: [modules/mod_22_permission_architecture](#) | Status: production-ready

Enforces the Golden Rule of Mobile Permissions:

Key Capabilities: Never request permissions on cold launch. • Present a contextual rationale explaining the user value first. • Handle [granted](#), [denied](#), [permanentlyDenied](#), and [restricted](#) gracefully.

```
mod_22_permission_architecture: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_22_permission_architecture ref: main
```

[mod_23_push_notifications] Module 23: Push Notifications

Platform: flutter | Path: [modules/mod_23_push_notifications](#) | Status: production-ready

Handles notifications across Android (FCM) and iOS (APNs):

Key Capabilities: Token registration & automatic refresh sync • Foreground, background, and cold start tap handling • Deep link routing via payload parameters

```
mod_23_push_notifications: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_23_push_notifications ref: main
```

[mod_24_analytics] Module 24: Analytics

Platform: flutter | Path: [modules/mod_24_analytics](#) | Status: production-ready

Privacy-centric event dispatcher:

Key Capabilities: Strictly scrubs PII (emails, passwords, phone numbers, auth tokens) • Pluggable providers (PostHog, Mixpanel, Firebase, Amplitude) • Consent mode gatekeeper (requires user consent under GDPR)

```
mod_24_analytics: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_24_analytics ref: main
```

[mod_25_crash_monitoring] Module 25: Crash Monitoring

Platform: flutter | Path: [modules/mod_25_crash_monitoring](#) | Status: production-ready

Standardized error reporting:

Key Capabilities: Captures unhandled asynchronous Dart zone errors • Adds structured breadcrumbs (navigation, button taps, network requests) • Scrubs sensitive authorization headers before submitting reports

```
mod_25_crash_monitoring: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_25_crash_monitoring
ref: main
```

[mod_26_performance_monitoring] Module 26: Performance Monitoring

Platform: flutter | Path: [modules/mod_26_performance_monitoring](#) | Status: production-ready

Tracks mobile performance KPIs:

Key Capabilities: Cold and warm startup duration • Screen transition rendering time • Network request latency

```
mod_26_performance_monitoring: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_26_performance_monitoring ref: main
```

[mod_27_ai_client_module] Module 27: AI Client Module

Platform: flutter | Path: [modules/mod_27_ai_client_module](#) | Status: production-ready

Client-side AI integration:

Key Capabilities: Never includes sensitive raw AI provider keys in client binary. • Routes all AI requests through [mod_28_ai_cost_gateway](#). • Supports Server-Sent Events (SSE) streaming for typing animations.

```
mod_27_ai_client_module: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_27_ai_client_module
ref: main
```

[mod_28_ai_cost_gateway] Module 28: AI Cost Control & Gateway

Platform: flutter | Path: [modules/mod_28_ai_cost_gateway](#) | Status: production-ready

Protects profitability and prevents abuse:

Key Capabilities: Token quotas per user tier (Free: 5/day, Pro: 100/day, Unlimited: 500/day) • Rate limiting using Token Bucket algorithm • Automatic model fallback (Claude 3.5 Sonnet -> GPT-4o -> Gemini 1.5 Flash)

```
mod_28_ai_cost_gateway: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_28_ai_cost_gateway
ref: main
```

[mod_29_subscription_system] Module 29: Subscription System

Platform: flutter | Path: [modules/mod_29_subscription_system](#) | Status: production-ready

Cross-platform subscription management:

Key Capabilities: Tier abstraction: [Tier.free](#), [Tier.monthlyPro](#), [Tier.annualPro](#), [Tier.lifetime](#) • Never relies on local boolean flags alone; validates with server receipts

```
mod_29_subscription_system: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_29_subscription_system ref: main
```

[mod_30_purchase_security] Module 30: Purchase Security

Platform: flutter | Path: [modules/mod_30_purchase_security](#) | Status: production-ready

Prevents in-app purchase piracy and tampering:

Key Capabilities: Server-side cryptographic verification of Google Play and Apple App Store receipts • Webhook signature validation (HMAC SHA-256) • Anti-tamper validation prevents client-side binary modification

```
mod_30_purchase_security: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_30_purchase_security ref: main
```

Category: Growth And Security

[mod_31_ads_module] Module 31: Ads Module

Platform: flutter | Path: [modules/mod_31_ads_module](#) | Status: production-ready

Advertising infrastructure:

Key Capabilities: Supports Banner, Interstitial, and Rewarded ads • Dynamic remote switch ([ads_enabled = false](#) for subscribers) • Frequency capping prevents user fatigue

```
mod_31_ads_module: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_31_ads_module ref: main
```

[mod_32_remote_config] Module 32: Remote Configuration

Platform: flutter | Path: [modules/mod_32_remote_config](#) | Status: production-ready

Enables instant app adjustments without App Store re-submission:

Key Capabilities: Type-safe string, integer, boolean, and JSON getters • Fallback defaults ensure offline resilience

```
mod_32_remote_config: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_32_remote_config ref: main
```

[mod_33_feature_flags] Module 33: Feature Flags

Platform: flutter | Path: [modules/mod_33_feature_flags](#) | Status: production-ready

Enables gradual feature rollouts:

Key Capabilities: Deterministic hashing via SHA-256 ensuring user remains in the same bucket • Percentage rollouts (10%, 50%, 100%) • Kill-switch support

```
mod_33_feature_flags: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_33_feature_flags ref: main
```

[mod_34_deep_link_system] Module 34: Deep Link System

Platform: flutter | Path: [modules/mod_34_deep_link_system](#) | Status: production-ready

Universal links and custom scheme router:

Key Capabilities: Validates URI structure and sanitizes path and query params • Routes users to exact screens (e.g. [/product/:id,/referral/:code](#))

```
mod_34_deep_link_system: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_34_deep_link_system ref: main
```

[mod_35_sharing_system] Module 35: Sharing System

Platform: flutter | Path: [modules/mod_35_sharing_system](#) | Status: production-ready

Standardizes social sharing across apps:

Key Capabilities: Generates formatted share cards and attribution links • Prepares sanitized shareable text and assets

```
mod_35_sharing_system: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_35_sharing_system ref: main
```

[mod_36_viral_loops] Module 36: Viral Loops Module

Platform: flutter | Path: [modules/mod_36_viral_loops](#) | Status: production-ready

Built-in viral growth mechanics:

Key Capabilities: Cryptographic referral code generation • Multi-tier referral reward entitlement unlock

```
mod_36_viral_loops: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_36_viral_loops ref: main
```

[mod_37_onboarding_engine] Module 37: Onboarding Engine

Platform: flutter | Path: [modules/mod_37_onboarding_engine](#) | Status: production-ready

Modular onboarding controller:

Key Capabilities: Manages sequential slides, persona selection, and permission priming • Persists completion status

```
mod_37_onboarding_engine: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_37_onboarding_engine ref: main
```

[mod_38_app_lifecycle] Module 38: App Lifecycle Guardian

Platform: flutter | Path: [modules/mod_38_app_lifecycle](#) | Status: production-ready

Monitors application execution state:

Key Capabilities: Cold start vs Warm start detection • Automatic flush of pending mutations and analytics before OS kills background process

```
mod_38_app_lifecycle: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_38_app_lifecycle ref: main
```

[mod_39_security_hardening] Module 39: Security Hardening & Anti-Tamper

Platform: flutter | Path: [modules/mod_39_security_hardening](#) | Status: production-ready

Hardens apps against attacks:

Key Capabilities: Root / Jailbreak check indicators • Debugger attachment detection • Screenshot & screen recording prevention flags

```
mod_39_security_hardening: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_39_security_hardening ref: main
```

[mod_40_data_validation] Module 40: Data Validation & Sanitization

Platform: flutter | Path: [modules/mod_40_data_validation](#) | Status: production-ready

Sanitizes all user inputs before persistence or transmission:

Key Capabilities: Strict email, phone, URL validation • Anti-XSS HTML entity escaping • Anti-SQLi parameter validation

```
mod_40_data_validation: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_40_data_validation ref: main
```

Category: Backend Storage And Qa

[mod_41_database_architecture] Module 41: Database Architecture

Platform: flutter | Path: [modules/mod_41_database_architecture](#) | Status: production-ready

Encrypted SQLite migration engine:

Key Capabilities: Manages sequential schema migrations ([V1__init.sql](#), [V2__add_indexes.sql](#)) • Atomic transaction wrapping ensures no partial migrations on crash

```
mod_41_database_architecture: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_41_database_architecture ref: main
```

[mod_42_file_storage] Module 42: File Storage & Upload

Platform: flutter | Path: [modules/mod_42_file_storage](#) | Status: production-ready

Uploads files directly to S3 / Cloud Storage via presigned URLs:

Key Capabilities: File size validation and MIME-type verification • Never streams file uploads through application API servers directly

```
mod_42_file_storage: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_42_file_storage ref: main
```

[mod_43_background_jobs] Module 43: Background Job System

Platform: flutter | Path: [modules/mod_43_background_jobs](#) | Status: production-ready

Coordinates WorkManager (Android) and Background Tasks (iOS):

Key Capabilities: Enforces network constraints ([requiresUnmeteredNetwork](#), [requiresCharging](#)) • Executes periodic background sync safely without draining battery

```
mod_43_background_jobs: git: url: https://github.com/sh15aa/Appreusable.git path: modules/mod_43_background_jobs
ref: main
```

[mod_44_app_backend_template] Module 44: App Backend Template

Platform: python | Path: [modules/mod_44_app_backend_template](#) | Status: production-ready

Zero-trust isolated backend server template built with Python FastAPI:

Key Capabilities: Strict JWT authentication and authorization • Rate limiting with SlowAPI • Isolated SQLite / PostgreSQL database connection • Structured JSON logging

[mod_45_cicd_factory] Module 45: CI/CD Factory

Platform: python | Path: [modules/mod_45_cicd_factory](#) | Status: production-ready

Reusable GitHub Actions workflows and Fastlane templates:

Key Capabilities: [ci_android.yml](#): Builds signed Android App Bundle (AAB), executes tests, uploads to Play Store Internal Track • [ci_ios.yml](#): Builds signed iOS IPA via Fastlane Match, uploads to Apple TestFlight

[mod_46_automated_testing] Module 46: Automated Testing Suite

Platform: flutter | Path: [modules/mod_46_automated_testing](#) | Status: production-ready

Utilities for test-driven development:

Key Capabilities: Mock HTTP response dispatcher • Standard test fixtures

```
mod_46_automated_testing: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_46_automated_testing ref: main
```

[mod_47_golden_user_journey] Module 47: Golden User Journey

Platform: python | Path: [modules/mod_47_golden_user_journey](#) | Status: production-ready

Defines Maestro / Patrol end-to-end automation scripts for the primary conversion funnel:

[mod_48_device_test_matrix] Module 48: Device Test Matrix

Platform: python | Path: [modules/mod_48_device_test_matrix](#) | Status: production-ready

Standardized test matrix configuration for Firebase Test Lab / AWS Device Farm:

[mod_49_release_checklist] Module 49: Release Checklist Pre-Flight

Platform: python | Path: [modules/mod_49_release_checklist](#) | Status: production-ready

Automated Python pre-flight auditor script that verifies all 32 critical release criteria before store submission.

[mod_50_aso_factory] Module 50: ASO Factory

Platform: python | Path: [modules/mod_50_aso_factory](#) | Status: production-ready

App Store Optimization (ASO) metadata engine:

Key Capabilities: Generates localized titles (max 30 chars), subtitles (max 30 chars), and descriptions • Analyzes keyword density and character limits for Google Play and Apple App Store

Category: Factory Orchestration

[mod_51_screenshot_factory] Module 51: Screenshot Factory

Platform: python | Path: [modules/mod_51_screenshot_factory](#) | Status: production-ready

Automates App Store and Google Play screenshot generation:

Key Capabilities: Standard 5-slide layout narrative: • Fastlane Snapfile configuration and templating

[mod_52_review_monitoring] Module 52: Review Monitoring & AI Categorization

Platform: python | Path: [modules/mod_52_review_monitoring](#) | Status: production-ready

Harvests and classifies store reviews using rule-based and AI sentiment analysis:

Key Capabilities: Categories: [Bug](#), [FeatureRequest](#), [PricingComplaint](#), [Praise](#), [Confusion](#) • Generates actionable backlog issues with priority scores

[mod_53_analytics_dashboard] Module 53: App Analytics Dashboard

Platform: python | Path: [modules/mod_53_analytics_dashboard](#) | Status: production-ready

Aggregates product KPIs across the 100-app portfolio:

Key Capabilities: DAU, MAU, Retention (D1, D7, D30) • MRR, ARPU, Churn Rate, LTV • Exportable to SQLite / Postgres / JSON

[mod_54_health_scorecard] Module 54: Product Health Scorecard

Platform: python | Path: [modules/mod_54_health_scorecard](#) | Status: production-ready

Algorithmic scorecard evaluating the operational health of any app in the portfolio:

Key Capabilities: Stability (Crash-free rate) • Retention (D1, D7) • Monetization (Conversion %) • Rating (Store average)

[mod_55_app_factory_db] Module 55: App Factory Database

Platform: python | Path: [modules/mod_55_app_factory_db](#) | Status: production-ready

Central registry tracking all 100+ applications across their lifecycle:

Key Capabilities: Product metadata, bundle IDs, backend URLs, store statuses • SQLite database schema with migrations

[mod_56_automated_cli] Module 56: Automated Product Creation CLI (factory-cli)

Platform: python | Path: [modules/mod_56_automated_cli](#) | Status: production-ready

Command-line interface to scaffold a new independent production mobile app with 1 command:

[mod_57_ai_agent_team] Module 57: AI Agent Team Prompts & Specs

Platform: python | Path: [modules/mod_57_ai_agent_team](#) | Status: production-ready

System prompts and operational playbooks for the 15 specialized AI agent roles:

[mod_58_dev_pipeline] Module 58: 16-Phase Gatekeeper Pipeline

Platform: python | Path: [modules/mod_58_dev_pipeline](#) | Status: production-ready

Orchestrates the 16 phases of app development with strict entry and exit criteria:

Key Capabilities: Phase 1: Discovery • Phase 2: Validation • Phase 3: PRD • Phase 4: UX • Phase 5: UI

[mod_59_architecture_boundary] Module 59: Architecture Boundary Linter

Platform: python | Path: [modules/mod_59_architecture_boundary](#) | Status: production-ready

Enforces boundary separation:

Key Capabilities: Prohibits cross-app imports ([app-001](#) cannot import [app-002](#)) • Ensures shared modules do not import app-specific feature code

[mod_60_portfolio_registry] Module 60: Master Portfolio Registry & Monorepo

Platform: python | Path: [modules/mod_60_portfolio_registry](#) | Status: production-ready

Orchestrates the 100+ app portfolio monorepo:

Key Capabilities: Melos / Dart workspace management • Bulk testing, linting, and dependency upgrading across all 60 modules and 100 apps

[mod_61_isolation_guardian] Module 61: Isolation Guardian

Platform: python | Path: [modules/mod_61_isolation_guardian](#) | Status: production-ready

Enforces **Rule 61: The Most Important Factory Rule**:

[mod_62_one_click_synthesizer] Module 62: One-Click Product Synthesizer

Platform: python | Path: [modules/mod_62_one_click_synthesizer](#) | Status: production-ready

Implements **Rule 62: The 'One-Click' Future**.

[mod_63_master_checklist_tracker] Module 63: Master Checklist & Progress Tracker

Platform: multi-platform | Path: [modules/mod_63_master_checklist_tracker](#) | Status: production-ready

Implements **Rule 63: The Complete Factory Layers & Master 360+ Task Checklist**.

Category: Zero Trust And Data Security

[mod_64_threat_modeling] Module 64: Threat Modeling Module

Platform: python | Path: [modules/mod_64_threat_modeling](#) | Status: production-ready

Automates STRIDE / DREAD threat modeling for every mobile feature before production:

[mod_65_security_boundary] Module 65: Security Boundary Module

Platform: python | Path: [modules/mod_65_security_boundary](#) | Status: production-ready

Enforces the core rule: **The mobile application must always be treated as potentially compromised**.

[mod_66_zero_trust_api] Module 66: Zero-Trust API Module

Platform: python | Path: [modules/mod_66_zero_trust_api](#) | Status: production-ready

Every API request undergoes a multi-layer verification chain:

[mod_67_object_authorization] Module 67: Object-Level Authorization (BOLA Defense)

Platform: python | Path: [modules/mod_67_object_authorization](#) | Status: production-ready

Guards against OWASP API1: Broken Object Level Authorization.

[mod_68_property_authorization] Module 68: Property-Level Authorization (BOPLA Defense)

Platform: python | Path: [modules/mod_68_property_authorization](#) | Status: production-ready

Guards against OWASP API3: Broken Object Property Level Authorization.

[mod_69_function_authorization] Module 69: Function-Level Authorization

Platform: python | Path: [modules/mod_69_function_authorization](#) | Status: production-ready

Guards against OWASP API5: Broken Function Level Authorization.

[mod_70_admin_security] Module 70: Admin Security Module

Platform: python | Path: [modules/mod_70_admin_security](#) | Status: production-ready

Hardens internal management dashboards:

Key Capabilities: Mandatory MFA / WebAuthn Passkeys • Maximum 15-minute idle session timeout • Step-up re-authentication required for destructive operations (drop DB, refund, price change)

[mod_71_break_glass_access] Module 71: Break-Glass Access

Platform: python | Path: [modules/mod_71_break_glass_access](#) | Status: production-ready

Emergency elevated access protocol:

Key Capabilities: Temporary time-bounded access (maximum 1 hour) • Requires explicit justification and dual authorization • Generates immutable audit log

[mod_72_secrets_management] Module 72: Secrets Management

Platform: python | Path: [modules/mod_72_secrets_management](#) | Status: production-ready

Enforces zero secrets in source code, APKs, or IPAs:

Key Capabilities: Integration with AWS Secrets Manager / HashiCorp Vault / GCP Secret Manager • Client receives only ephemeral, scoped tokens

[mod_73_secret_rotation] Module 73: Secret Rotation

Platform: python | Path: [modules/mod_73_secret_rotation](#) | Status: production-ready

Tracks secret age, rotation schedule, and automated revocation:

Key Capabilities: Maximum secret lifespan: 90 days • Automated alerts when secrets exceed 75 days without rotation

[mod_74_key_management] Module 74: Key Management Module

Platform: python | Path: [modules/mod_74_key_management](#) | Status: production-ready

Separates cryptographic keys by purpose:

Key Capabilities: Data Encryption Keys (DEK) • Key Encryption Keys (KEK) • App Signing Keys • Webhook Signing Keys • OAuth Client Secrets

[mod_75_database_security] Module 75: Database Security Module

Platform: python | Path: [modules/mod_75_database_security](#) | Status: production-ready

Database hardening rules:

Key Capabilities: TLS enforced on all connections • Least-privileged database user roles (read-only replicas, write-only queues) • Query timeout enforced (5000ms max)

[mod_76_database_tenancy] Module 76: Database Tenancy Isolation

Platform: python | Path: [modules/mod_76_database_tenancy](#) | Status: production-ready

Ensures complete logical or physical isolation for all 100+ apps:

Key Capabilities: App A's backend and database cannot query App B's tables

[mod_77_backup_recovery] Module 77: Backup & Disaster Recovery Verification

Platform: python | Path: [modules/mod_77_backup_recovery](#) | Status: production-ready

> "A backup that has never been successfully restored is not a proven backup."

[mod_78_disaster_recovery] Module 78: Disaster Recovery (RPO / RTO)

Platform: python | Path: [modules/mod_78_disaster_recovery](#) | Status: production-ready

Defines and audits Recovery Point Objective (RPO) and Recovery Time Objective (RTO):

Key Capabilities: Target RPO: <= 15 minutes • Target RTO: <= 60 minutes

Category: Scale Abuse And Integrity

[mod_79_multi_region] Module 79: Multi-Region / Availability Module

Platform: python | Path: [modules/mod_79_multi_region](#) | Status: production-ready

Orchestrates multi-region failover and CDN edge caching for 1M+ user scale:

Key Capabilities: Edge caching for static assets • Health checks with automatic failover between Primary and Secondary regions

[mod_80_autoscaling] Module 80: Autoscaling Module

Platform: python | Path: [modules/mod_80_autoscaling](#) | Status: production-ready

Multi-metric autoscaler for backend containers:

Key Capabilities: Scales on: CPU, Memory, Requests/Sec, Queue Depth, DB Connection Pool Saturation

[mod_81_load_shedding] Module 81: Load Shedding Module

Platform: python | Path: [modules/mod_81_load_shedding](#) | Status: production-ready

Under extreme traffic spikes (>95% capacity), gracefully degrades non-critical features:

Key Capabilities: Disables expensive AI generation & video rendering • Preserves authentication, reads, and core data operations

[mod_82_circuit_breaker] Module 82: Circuit Breaker Module

Platform: python | Path: [modules/mod_82_circuit_breaker](#) | Status: production-ready

Prevents cascading outages when external providers fail (OpenAI, Stripe, Firebase):

Key Capabilities: States: **CLOSED** (Normal), **OPEN** (Tripped - fast fail), **HALF_OPEN** (Trial recovery)

[mod_83_retry_idempotency] Module 83: Retry Safety & Idempotency

Platform: python | Path: [modules/mod_83_retry_idempotency](#) | Status: production-ready

Prevents double-charging, duplicate orders, or double-spent AI credits:

Key Capabilities: Mandates [Idempotency-Key](#) header on all mutating POST/PUT requests • Returns cached response if idempotency key has already been processed

[mod_84_rate_limiting_matrix] Module 84: Rate-Limiting Matrix

Platform: python | Path: [modules/mod_84_rate_limiting_matrix](#) | Status: production-ready

Multi-dimensional rate limiting:

Key Capabilities: Login: 10 attempts / 10 min per IP • AI Generation: 20 requests / min per User • File Upload: 5 uploads / min per Device • Password Reset: 3 requests / hour per Account

[mod_85_abuse_prevention] Module 85: Abuse-Prevention Module

Platform: python | Path: [modules/mod_85_abuse_prevention](#) | Status: production-ready

Detects non-hacking abuse:

Key Capabilities: Credential stuffing • Referral farming (multiple accounts using same device fingerprint) • Coupon & promotional credit abuse

[mod_86_bot_defense] Module 86: Bot / Automation Defense

Platform: python | Path: [modules/mod_86_bot_defense](#) | Status: production-ready

Selective friction engine:

Key Capabilities: Never puts CAPTCHAs everywhere • Evaluates device integrity signals, request timing velocity, and headless browser signatures

[mod_87_replay_protection] Module 87: Replay-Attack Protection

Platform: python | Path: [modules/mod_87_replay_protection](#) | Status: production-ready

Guards against captured request replay:

Key Capabilities: Nonce verification with sliding timestamp window (300 seconds)

[mod_88_session_security] Module 88: Session Security Module

Platform: python | Path: [modules/mod_88_session_security](#) | Status: production-ready

Multi-device session manager:

Key Capabilities: Session listing, remote revocation, and automatic logout of all devices on password change

[mod_89_token_security] Module 89: Token Security Module

Platform: python | Path: [modules/mod_89_token_security](#) | Status: production-ready

Cryptographic token lifecycle:

Key Capabilities: Access tokens: 15-minute lifespan • Refresh tokens: Rotated on every use; reuse detection revokes entire token family

[mod_90_device_secure_storage] Module 90: Device-Side Secure Storage

Platform: flutter | Path: [modules/mod_90_device_secure_storage](#) | Status: production-ready

Hardware-backed secure storage:

Key Capabilities: Android: EncryptedSharedPreferences with Android Keystore 256-bit AES-GCM • iOS: Keychain Services with [kSecAttrAccessibleAfterFirstUnlockThisDeviceOnly](#)

```
mod_90_device_secure_storage: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_90_device_secure_storage ref: main
```

[mod_91_app_integrity] Module 91: App Integrity Module

Platform: python | Path: [modules/mod_91_app_integrity](#) | Status: production-ready

Server-side verification of mobile environment attestation:

Key Capabilities: Google Play Integrity API • Apple App Attest / DeviceCheck • Backend rejects requests if binary or device integrity fails

[mod_92_tamper_resilience] Module 92: Tamper & Reverse-Engineering Resilience

Platform: flutter | Path: [modules/mod_92_tamper_resilience](#) | Status: production-ready

Multi-layered client-side defense:

Key Capabilities: Debugger detection ([ptrace](#) / [sysctl](#)) • Root & Jailbreak file indicators • Integrity signals forwarded to backend for risk scoring

```
mod_92_tamper_resilience: git: url: https://github.com/sh15aa/Appreusable.git path:
modules/mod_92_tamper_resilience ref: main
```

[mod_93_network_security] Module 93: Network Security Module

Platform: python | Path: [modules/mod_93_network_security](#) | Status: production-ready

Enforces TLS 1.3, strict certificate validation, WebSocket security, and absolute ban on cleartext HTTP traffic.

[mod_94_webhook_security] Module 94: Webhook Security Module

Platform: python | Path: [modules/mod_94_webhook_security](#) | Status: production-ready

Hardens webhook receivers (Stripe, RevenueCat, Firebase):

Key Capabilities: HMAC SHA-256 signature verification • Max timestamp drift: 300 seconds • Webhook idempotency ledger

[mod_95_file_upload_security] Module 95: File-Upload Security Module

Platform: python | Path: [modules/mod_95_file_upload_security](#) | Status: production-ready

Never trusts extension or [Content-Type](#):

Key Capabilities: Inspects magic bytes (JPEG: [FF D8 FF](#), PNG: [89 50 4E 47](#), PDF: [25 50 44 46](#)) • Generates randomized UUID filenames • Direct upload via presigned S3/GCS URLs with 15-minute expiration

[mod_96_ssrf_protection] Module 96: SSRF Protection Module

Platform: python | Path: [modules/mod_96_ssrf_protection](#) | Status: production-ready

Guards against OWASP API7: Server-Side Request Forgery.

Category: Io Security And Supply Chain

[mod_97_input_security] Module 97: Input Security Module

Platform: python | Path: [modules/mod_97_input_security](#) | Status: production-ready

Comprehensive input validation firewall:

Key Capabilities: SQL injection • NoSQL injection • Command injection • Path traversal • Prompt injection defense for LLMs

[mod_98_output_security] Module 98: Output Security Module

Platform: python | Path: [modules/mod_98_output_security](#) | Status: production-ready

Production response shaping:

Key Capabilities: Scrubs password hashes, internal database IDs, stack traces, and cloud provider metadata from all JSON responses.

[mod_99_error_leak_prevention] Module 99: Error-Leak Prevention

Platform: python | Path: [modules/mod_99_error_leak_prevention](#) | Status: production-ready

Ensures production errors return a generic message + UUID correlation ID:

[mod_100_security_logging] Module 100: Security Logging Module

Platform: python | Path: [modules/mod_100_security_logging](#) | Status: production-ready

Structured JSON logging for security events:

Key Capabilities: Login success / failure • Password reset • Privilege changes • Rate limit triggers • Never logs raw passwords, full credit card numbers, or auth tokens.

[mod_101_audit_log_system] Module 101: Audit Log System

Platform: python | Path: [modules/mod_101_audit_log_system](#) | Status: production-ready

Immutable audit ledger:

[mod_102_security_monitoring_siem] Module 102: Security Monitoring / SIEM

Platform: python | Path: [modules/mod_102_security_monitoring_siem](#) | Status: production-ready

Aggregates auth logs and API metrics to detect security anomalies (e.g. 50 failed logins in 1 minute).

[mod_103_security_alerting] Module 103: Security Alerting Module

Platform: python | Path: [modules/mod_103_security_alerting](#) | Status: production-ready

Multi-channel alerting (Slack, PagerDuty, Email) when security thresholds are breached.

[mod_104_incident_response] Module 104: Incident Response Module

Platform: python | Path: [modules/mod_104_incident_response](#) | Status: production-ready

Step-by-step incident response playbook:

[mod_105_emergency_controls] Module 105: Automatic Emergency Controls

Platform: python | Path: [modules/mod_105_emergency_controls](#) | Status: production-ready

Remotely freeze operations in case of an attack:

Key Capabilities: Disable AI generation • Freeze payments • Block abusive IP/account • Force user re-authentication

[mod_106_force_upgrade] Module 106: Force-Upgrade System

Platform: python | Path: [modules/mod_106_force_upgrade](#) | Status: production-ready

Protects users against critical client vulnerabilities:

Key Capabilities: [min_supported_version](#): Hard block if older • [recommended_version](#): Soft prompt • [blocked_versions](#): Explicit list of revoked releases

[mod_107_remote_kill_switch] Module 107: Remote Kill Switch

Platform: python | Path: [modules/mod_107_remote_kill_switch](#) | Status: production-ready

Secure remote feature toggles:

Key Capabilities: Kill switches must be authenticated via dual-operator signatures • Cached locally with TTL fallback

[mod_108_supply_chain_security] Module 108: Supply-Chain Security

Platform: python | Path: [modules/mod_108_supply_chain_security](#) | Status: production-ready

Audits dependencies across all 60+ modules:

Key Capabilities: Checksum lockfile verification ([pubspec.lock](#), [package-lock.json](#), [poetry.lock](#)) • Automated CVE vulnerability scanning

[mod_109_sbom_generator] Module 109: Software Bill of Materials (SBOM)

Platform: python | Path: [modules/mod_109_sbom_generator](#) | Status: production-ready

Generates CycloneDX / SPDX SBOM JSON for every production build:

Key Capabilities: Documents all direct & transitive dependencies, licenses, and hashes

[mod_110_dependency_policy] Module 110: Dependency Policy & Evaluation

Platform: python | Path: [modules/mod_110_dependency_policy](#) | Status: production-ready

Pre-install vetting for new packages:

Key Capabilities: License check (MIT, Apache 2.0, BSD allowed; GPL/AGPL rejected) • Maintainer activity within last 12 months

[mod_111_secure_build_env] Module 111: Secure Build Environment

Platform: python | Path: [modules/mod_111_secure_build_env](#) | Status: production-ready

Hardens CI/CD runners:

Key Capabilities: Ephemeral containers with zero persistent storage • Secrets injected only into environment memory, never written to disk

[mod_112_reproducible_builds] Module 112: Reproducible Builds

Platform: python | Path: [modules/mod_112_reproducible_builds](#) | Status: production-ready

Addresses OWASP MASWE: Non-reproducible builds.

[mod_113_artifact_signing] Module 113: Artifact Signing & Provenance

Platform: python | Path: [modules/mod_113_artifact_signing](#) | Status: production-ready

Signs production artifacts with SHA-256 and records build provenance (Git commit, build ID, signer identity).

[mod_114_cicd_security] Module 114: CI/CD Pipeline Security

Platform: python | Path: [modules/mod_114_cicd_security](#) | Status: production-ready

Prevents pipeline poisoning:

Key Capabilities: Step-level least-privilege permissions (`permissions: read-all`) • Secrets masked in console output

[mod_115_branch_protection] Module 115: Git Branch Protection

Platform: python | Path: [modules/mod_115_branch_protection](#) | Status: production-ready

Enforces GitHub branch protection policies:

Key Capabilities: Mandatory PR reviews • Passing status checks (SAST, Tests, Linter) • Signed commits required

Category: Compliance And Sast Dast

[mod_116_sast_scanner] Module 116: Static Application Security Testing (SAST)

Platform: python | Path: [modules/mod_116_sast_scanner](#) | Status: production-ready

Scans Dart and Python code for hardcoded secrets, insecure random generators, and missing SSL checks.

[mod_117_dast_scanner] Module 117: Dynamic Application Security Testing (DAST)

Platform: python | Path: [modules/mod_117_dast_scanner](#) | Status: production-ready

Automated API fuzzer testing for:

Key Capabilities: SQL injection payloads • BOLA ID manipulation (`/api/v1/user/1` vs `/api/v1/user/2`) • Rate limit thresholds

[mod_118_penetration_testing] Module 118: Penetration Testing

Platform: python | Path: [modules/mod_118_penetration_testing](#) | Status: production-ready

Standard operating procedure & checklist for mobile and API penetration testing.

[mod_119_owasp_masvs_test] Module 119: OWASP MASVS / MASTG / MASWE Test Suite

Platform: python | Path: [modules/mod_119_owasp_masvs_test](#) | Status: production-ready

Conforms to OWASP Mobile Application Security Verification Standard (MASVS v2.0) and MASWE 1.0 (78 catalogued weaknesses).

[mod_120_privacy_engineering] Module 120: Privacy Engineering & Data Mapping

Platform: python | Path: [modules/mod_120_privacy_engineering](#) | Status: production-ready

Maintains an automated data map:

[mod_121_data_classification] Module 121: Data Classification

Platform: python | Path: [modules/mod_121_data_classification](#) | Status: production-ready

Classifies all data into 5 tiers:

[mod_122_data_retention_engine] Module 122: Data Retention Engine

Platform: python | Path: [modules/mod_122_data_retention_engine](#) | Status: production-ready

Automates scheduled data purging:

Key Capabilities: Access logs: purged after 90 days • Soft-deleted accounts: purged after 30 days • Temporary upload files: purged after 24 hours

[mod_123_account_deletion_pipeline] Module 123: Account-Deletion Pipeline

Platform: python | Path: [modules/mod_123_account_deletion_pipeline](#) | Status: production-ready

Apple Guideline 5.1.1 & GDPR Article 17 (Right to Erasure) compliant pipeline:

[mod_124_child_age_safety] Module 124: Child & Age Safety

Platform: python | Path: [modules/mod_124_child_age_safety](#) | Status: production-ready

COPPA & Age-Appropriate Design Code (AADC) compliance:

Key Capabilities: Age gate before registration • No behavioral ads or tracking for users under 13

[mod_125_compliance_engine] Module 125: Regulatory & Store Compliance Engine

Platform: python | Path: [modules/mod_125_compliance_engine](#) | Status: production-ready

Continuously audits compliance:

Key Capabilities: Google Play Data Safety • Apple App Privacy Nutrition Labels • GDPR / CCPA privacy policies

Category: Cloud Iam And Observability

[mod_126_third_party_risk] Module 126: Third-Party Risk Module

Platform: python | Path: [modules/mod_126_third_party_risk](#) | Status: production-ready

Audits all external SaaS & SDK integrations (OpenAI, Stripe, Firebase, Mixpanel):

Key Capabilities: Documents data egress, country of processing, and compliance posture.

[mod_127_third_party_isolation] Module 127: Third-Party Failure Isolation

Platform: python | Path: [modules/mod_127_third_party_isolation](#) | Status: production-ready

Ensures that if an external provider (Analytics, AI, Push) goes down, the core mobile app remains operational.

[mod_128_cost_abuse_protection] Module 128: Cost-Abuse Protection

Platform: python | Path: [modules/mod_128_cost_abuse_protection](#) | Status: production-ready

Hard limits to prevent massive cloud/AI bills:

Key Capabilities: Per-user daily cost caps (\$1.00/day for free users, \$15.00/day for pro users) • Global kill-switch when daily spend reaches \$500.00

[mod_129_billing_anomaly_detection] Module 129: Billing Anomaly Detection

Platform: python | Path: [modules/mod_129_billing_anomaly_detection](#) | Status: production-ready

Monitors sudden spikes in API, SMS, or AI consumption (e.g. 5x increase over historical baseline).

[mod_130_cache_security] Module 130: Cache Security

Platform: python | Path: [modules/mod_130_cache_security](#) | Status: production-ready

Guards Redis / Memcached against cross-user cache contamination:

Key Capabilities: Prefixes all keys with `tenant_id:user_id` • Enforces TTL on all cached records

[mod_131_queue_security] Module 131: Queue Security

Platform: python | Path: [modules/mod_131_queue_security](#) | Status: production-ready

Protects message queues (RabbitMQ / SQS / Redis Streams):

Key Capabilities: Message signature verification • Poison pill dead-letter queue (DLQ) after 3 failed attempts

[mod_132_job_idempotency] Module 132: Job Idempotency

Platform: python | Path: [modules/mod_132_job_idempotency](#) | Status: production-ready

Ensures background workers never process duplicate tasks (e.g. sending 2 emails, processing 2 invoices).

[mod_133_observability_pillars] Module 133: Observability Pillars

Platform: python | Path: [modules/mod_133_observability_pillars](#) | Status: production-ready

Unified telemetry engine:

Key Capabilities: Structured JSON Logs • Prometheus / Datadog Metrics • OpenTelemetry Distributed Traces

[mod_134_distributed_tracing] Module 134: Distributed Tracing

Platform: python | Path: [modules/mod_134_distributed_tracing](#) | Status: production-ready

Propagates `traceparent` and correlation IDs across Flutter -> API Gateway -> Backend -> Database.

[mod_135_db_performance_engine] Module 135: Database Performance Engine

Platform: python | Path: [modules/mod_135_db_performance_engine](#) | Status: production-ready

Optimized for 1M user scale:

Key Capabilities: Connection pooling limits (max 20 per pod) • Slow query threshold logger (> 200ms) • Mandatory index verification on foreign keys

[mod_136_pagination_guard] Module 136: Pagination & Query Limits

Platform: python | Path: [modules/mod_136_pagination_guard](#) | Status: production-ready

Never permits unbounded `SELECT *`:

Key Capabilities: Mandatory cursor pagination • Hard limit of 100 items per page

[mod_137_search_abuse_guard] Module 137: Search Abuse Protection

Platform: python | Path: [modules/mod_137_search_abuse_guard](#) | Status: production-ready

Protects search endpoints against ReDoS and resource exhaustion:

Key Capabilities: Max query length: 100 characters • Rejects wildcards at query start (`*query`)

[mod_138_api_versioning] Module 138: API Versioning & Deprecation

Platform: python | Path: [modules/mod_138_api_versioning](#) | Status: production-ready

Manages API lifecycle:

Key Capabilities: Returns **Sunset**: <date> and **Deprecation**: true HTTP headers for deprecated endpoints.

[mod_139_api_inventory] Module 139: API Inventory & Shadow Endpoint Detection

Platform: python | Path: [modules/mod_139_api_inventory](#) | Status: production-ready

OWASP API9 compliance:

Key Capabilities: Catalog of all registered production endpoints • Automated alerts if traffic is observed on unregistered endpoints.

[mod_140_edge_security_headers] Module 140: Edge Security Headers

Platform: python | Path: [modules/mod_140_edge_security_headers](#) | Status: production-ready

Injects industry-standard HTTP security headers:

Key Capabilities: **Strict-Transport-Security**: max-age=63072000; includeSubDomains; preload • **X-Content-Type-Options**: nosniff • **X-Frame-Options**: DENY • **Content-Security-Policy**: default-src 'none'

[mod_141_ddos_resilience] Module 141: DDoS Resilience

Platform: python | Path: [modules/mod_141_ddos_resilience](#) | Status: production-ready

Cloudflare / AWS Shield edge defense:

Key Capabilities: Layer 7 rate-shedding rules • Blocks geo-IP anomalies and known malicious autonomous systems (ASNs)

[mod_142_network_segmentation] Module 142: Network Segmentation

Platform: python | Path: [modules/mod_142_network_segmentation](#) | Status: production-ready

VPC 3-tier network topology:

[mod_143_cloud_iam] Module 143: Cloud IAM Least Privilege

Platform: python | Path: [modules/mod_143_cloud_iam](#) | Status: production-ready

Generates least-privilege IAM policies:

Key Capabilities: Application pods receive only read access to specific S3 buckets • Zero wildcard * permissions

[mod_144_environment_isolation] Module 144: Environment Isolation

Platform: python | Path: [modules/mod_144_environment_isolation](#) | Status: production-ready

Strict audit preventing dev/staging from communicating with production databases or buckets.

[mod_145_production_data_protection] Module 145: Production Data Protection

Platform: python | Path: [modules/mod_145_production_data_protection](#) | Status: production-ready

Never dumps real customer records into developer laptops:

Key Capabilities: Synthetic test data generator producing realistic mock users and transactions.

Category: Enterprise Scale Gate And Monitoring

[mod_146_support_tool_security] Module 146: Support-Tool Security

Platform: python | Path: [modules/mod_146_support_tool_security](#) | Status: production-ready

Hardens customer support dashboards:

Key Capabilities: Masks PII (emails masked as j***@gmail.com, phone numbers as +1 ***-***-1234) • Support agents cannot view raw passwords or execute arbitrary database updates.

[mod_147_social_engineering_defense] Module 147: Social-Engineering Defense

Platform: python | Path: [modules/mod_147_social_engineering_defense](#) | Status: production-ready

Standard operating procedure for account recovery:

Key Capabilities: Mandates out-of-band identity verification before password reset or email changes.

[mod_148_fraud_detection] Module 148: Fraud Detection

Platform: python | Path: [modules/mod_148_fraud_detection](#) | Status: production-ready

Flags high-risk transactions:

Key Capabilities: Payment velocity checks (> 3 failed card attempts in 10 minutes) • Disposable email domain blocking

[mod_149_release_rollback] Module 149: Release Rollback System

Platform: python | Path: [modules/mod_149_release_rollback](#) | Status: production-ready

1-command atomic rollback:

Key Capabilities: Reverts Kubernetes / Docker container tags to prior known-good SHA within 30 seconds.

[mod_150_canary_releases] Module 150: Canary Releases

Platform: python | Path: [modules/mod_150_canary_releases](#) | Status: production-ready

Progressive rollout engine:

Key Capabilities: Steps: 1% -> 5% -> 25% -> 50% -> 100% • Automated rollback if canary error rate exceeds 0.5%

[mod_151_feature_gated_migrations] Module 151: Feature-Gated Migrations

Platform: python | Path: [modules/mod_151_feature_gated_migrations](#) | Status: production-ready

Dual-schema backward compatibility:

Key Capabilities: Phase 1: Add new column (nullable) • Phase 2: Dual-write from new app version • Phase 3: Backfill old rows • Phase 4: Make column non-null

[mod_152_security_regression_suite] Module 152: Security Regression Suite

Platform: python | Path: [modules/mod_152_security_regression_suite](#) | Status: production-ready

> "A vulnerability should never be fixed only once."

[mod_153_security_scorecard] Module 153: Security Scorecard per App

Platform: python | Path: [modules/mod_153_security_scorecard](#) | Status: production-ready

14-dimension security scorecard release gate:

[mod_154_security_release_gate] Module 154: Security Release Gate

Platform: python | Path: [modules/mod_154_security_release_gate](#) | Status: production-ready

Pipeline gatekeeper blocking production deployment unless 100% of critical security checks pass.

[mod_155_1m_user_scale_gate] Module 155: 1M User Scale Gate

Platform: python | Path: [modules/mod_155_1m_user_scale_gate](#) | Status: production-ready

Simulates 10k, 50k, 100k, and 1M registered user loads:

Key Capabilities: Peak RPS capacity testing • Database read/write IOPS under load

[mod_156_capacity_planning] Module 156: Capacity Planning Engine

Platform: python | Path: [modules/mod_156_capacity_planning](#) | Status: production-ready

Calculates required compute pods, database storage, and egress bandwidth based on projected MAU.

[mod_157_chaos_testing] Module 157: Chaos & Failure Testing

Platform: python | Path: [modules/mod_157_chaos_testing](#) | Status: production-ready

Simulates real-world infrastructure failures:

Key Capabilities: Simulates sudden database dropouts • Simulates Redis cache eviction • Verifies system recovers automatically within 10 seconds

[mod_158_business_continuity] Module 158: Business Continuity Module

Platform: python | Path: [modules/mod_158_business_continuity](#) | Status: production-ready

Playbooks for major external failures:

Key Capabilities: Cloud provider outage • Stripe / RevenueCat payment gateway outage • OpenAI / AI provider outage

[mod_159_vulnerability_disclosure] Module 159: Vulnerability Disclosure Program (VDP)

Platform: python | Path: [modules/mod_159_vulnerability_disclosure](#) | Status: production-ready

Provides standard [security.txt](#) and responsible disclosure guidelines for security researchers.

[mod_160_security_patch_pipeline] Module 160: Security Patch Pipeline

Platform: python | Path: [modules/mod_160_security_patch_pipeline](#) | Status: production-ready

Automates patching shared factory modules across all 100+ apps:

[mod_161_blast_radius_control] Module 161: Blast-Radius Control

Platform: python | Path: [modules/mod_161_blast_radius_control](#) | Status: production-ready

Never auto-updates all 100 apps at once when a shared module changes:

Key Capabilities: Enforces semantic versioning on shared packages • Gradual rollout of shared components to 5 canary apps before widespread deployment

[mod_162_factory_security_monitor] Module 162: Factory Security Monitor

Platform: python | Path: [modules/mod_162_factory_security_monitor](#) | Status: production-ready

Central CLI & dashboard aggregating security posture across the 100-app portfolio:

Key Capabilities: Compliance status • Expiring certificates & keystores • Outdated dependencies

[mod_163_final_production_architecture] Module 163: Final Production Architecture

Platform: python | Path: [modules/mod_163_final_production_architecture](#) | Status: production-ready

The unified synthesis of the complete 163-module production system: