**V: Domain Expertise Layer**

The Domain Expertise Layer is the knowledge core of Atlas PALM v1.5, powering the Atlas Insight Engine with a comprehensive, cannabis-specific knowledge base that delivers accurate, credible, and legally compliant insights. This layer enables users—heroes in their cannabis journey—to explore strains, understand terpene profiles, and navigate global regulations with confidence, guided by mentor-driven responses. Building on v1.0’s robust strain library and expertise, v1.5 expands the knowledge base to over 2,000 strains, integrates real-time regulatory data across 50+ regions, and enhances personalization through user journaling. This section provides a detailed, developer-focused overview of the layer’s structure, capabilities, technical implementation, and safeguards, with references to Appendices C (JSON Schemas), D (Simulation Tests), E (OpenAPI Specifications), and F (Domain Ontology). Designed for the development team, including Chat, it ensures clarity for implementation and integration, supporting the May 5, 2025, delivery.

**5.1 Overview and Mission**

The Domain Expertise Layer serves as the factual and contextual intelligence hub, housing a dynamic Cannabis Knowledge Graph that supports complex queries (e.g., “sativa with limonene, legal in WA”). Its mission is to provide personalized, safe, and compliant guidance by combining verified data, SME (Subject Matter Expert) insights, and real-time regulatory updates. v1.5’s advancements—expanding the strain library to over 2,000 entries and integrating live regulatory feeds—ensure 99% data accuracy (Appendix D). For developers, this layer is critical for enabling precise strain matching, retail integration, and compliance, with API endpoints detailed in Appendix E and ontology structures in Appendix F. The 2,000+ strain library aligns with industry-standard datasets, such as Kannapedia’s 2,241 strains, ensuring credibility and relevance.

**5.2 Knowledge Graph Structure**

The Cannabis Knowledge Graph is a query-optimized, graph-based ontology (Appendix F) that organizes cannabis-related data for efficient retrieval and complex reasoning. Key components include:

* **Strain Metadata**: Genotype (indica, sativa, hybrid), lineage, cannabinoid profiles (THC, CBD), dominant/secondary terpenes (e.g., myrcene, limonene).
* **Experience Tagging**: Effects (uplifting, calming, creative, restful), mapped to user goals.
* **Effect Indexing**: Quantified outcomes (energy, anxiety relief, sleep induction, appetite), validated by SME input.
* **Product Types**: Flower, vape, edible, tincture, topical, beverage, with onset and duration data.
* **Consumption Methods**: Inhalation, ingestion, topical, including risk factors and metabolism pathways.
* **Terpene Profiles**: Descriptions, aromas, effects, and synergy mappings (e.g., myrcene for sedation).
* **Interaction & Safety Flags**: Medication risks, overuse warnings, mental health considerations, ensuring compliance.
* **Regulatory Data**: Real-time THC/CBD limits, licensing requirements (e.g., Canada’s Cannabis Act, EU GMP standards), updated via API feeds (Appendix E).

The graph, expanded in v1.5 to cover 50+ regions, supports queries like “CBD strain for anxiety, legal in EU” with 99% accuracy (Appendix D). Its structure is detailed in Appendix F, with nodes (strains, terpenes) and edges (effects, regulations).

**5.3 The Atlas Strain Library**

The Atlas Strain Library is a cornerstone feature, offering a dual-interface for education and personalization:

* **Atlas Library**: A curated, searchable collection of 2,000+ strains, enhanced by SME insights (e.g., Jake George’s cultivation notes). Includes filters for effect, terpene, and region, accessible via API (Appendix E).
* **Personal Collection**: A user-curated journal for strains saved, tried, or of interest, with:
  + Like/dislike toggles.
  + Personal notes/journaling (e.g., “Blue Dream helped sleep but felt heavy”).
  + Ratings (1–5) and session logs for tracking.
  + Pattern recognition (e.g., “You prefer high-limonene strains socially”).

Users add strains from the Atlas Library to their Personal Collection via a “+” interaction, stored in Postgres/Redis (Appendix C), enabling continuous insight layering and personalization, with 95% user trust (Appendix D).

**5.4 Strain Matching Algorithm**

The Strain Matching Engine delivers personalized recommendations using:

* Inputs from Mentor Matrix (Section IV) and Intent & Journey Mapping (Section III).
* Historical preferences from Personal Collection (Appendix C).
* Target effects (e.g., “calm but not sleepy”).
* Avoidance tags (e.g., “no high THC”).
* AI weighting model, trained on outcome satisfaction trends, validated in simulations (Appendix D).

**Code Snippet**: Example strain matching logic, used by the Domain Expertise Layer:

function matchStrain(userInput, preferences, region) {

const strains = require('./strain\_database.json'); // See Appendix F

return strains.filter(s =>

s.effects.includes(userInput.goal) &&

preferences.regionAllows(s, region) &&

!preferences.avoid.includes(s.cannabinoid)

).sort((a, b) => b.matchScore - a.matchScore).slice(0, 3);

}

// Example: matchStrain({ goal: "relaxation" }, { avoid: ["high\_thc"] }, "EU") → [{ strain: "Harlequin", cbd: true }]

Recommendations include a primary match, alternatives, and warnings, structured in output schemas (Appendix C).

**5.5 Retail Locator Integration**

The layer supports buy-local functionality via:

* **Dispensary API Sync**: Pulls live inventory and metadata from third-party APIs (Appendix E), e.g., licensed dispensaries in WA.
* **Geolocation-Based Lookup**: Matches strains to user location, cached with TTL logic for privacy.
* **Affiliate Linking**: Pushes users to partnered products, configurable via API (Appendix E).

This integration, tested for 99.9% uptime (Appendix D), enhances user access to compliant products.

**5.6 Experience Pairing Logic**

The layer pairs strain recommendations with:

* **Context Tags**: Calm, focus, creativity, based on user intent (Section III).
* **Product Types**: Gummies for sleep, vapes for social settings.
* **Time of Day**: Evening strains for relaxation, daytime for focus.

Feedback from Personal Collection (Appendix C) refines pairings, adapting to tolerance or usage patterns, with 90% user satisfaction (Appendix D).

**5.7 Legal and Medical Safeguards**

To ensure compliance and safety:

* **Compliance Flags**: Prevents medical misrepresentation, enforced by Cultural Context Filter (Appendix C).
* **General Education**: Offers informational guidance, not medical advice, per Appendix B protocols.
* **Professional Referrals**: Redirects users to licensed professionals for medical queries, logged in feedback schemas (Appendix C).

These safeguards achieve 100% regulatory compliance across 50+ regions (Appendix D).

**5.8 SME and Creator-Sourced Expansion**

The layer collaborates with SMEs (e.g., Jake George) to:

* Ingest authored content for strain and terpene data.
* Add creator-endorsed products, accessible via API (Appendix E).
* Adapt educational modules for diverse learning styles, planned for Q3 2025 (Section XI).

**5.9 Technical Implementation**

The layer leverages a graph database, real-time APIs, and schema-driven logic:

* **Graph Database**: Neo4j hosts the Cannabis Knowledge Graph (Appendix F), optimized for complex queries.
* **API Feeds**: Real-time regulatory updates from 50+ regions, integrated via /data endpoint (Appendix E).
* **Schema Validation**: Uses domain schemas (Appendix C) for data retrieval and response formatting.
* **Caching**: Redis caches frequent queries, reducing latency by 20% from v1.0 (Appendix D).

**5.10 Performance Metrics**

Validated by the Simulation Framework (Appendix D):

* **Data Accuracy**: 99%, ensuring reliable strain and regulatory data.
* **Query Latency**: <100ms for knowledge graph queries, contributing to 500ms total latency.
* **Compliance**: 100%, with real-time regulatory checks.
* **User Trust**: 95%, driven by personalized recommendations.
* **Throughput**: Supports 10,000 queries/second, enabled by Neo4j and Redis.

These metrics confirm the layer’s readiness for production.

**5.11 Alignment with v1.0 and Advancements**

Compared to v1.0, v1.5 enhances scope and compliance:

* **v1.0**: ~1,000-strain library, static regulatory data, 90% accuracy.
* **v1.5**: 2,000+ strains, real-time regulatory feeds, 99% accuracy (Appendix D).

Version history is in Appendix A, with ethical protocols in Appendix B.

**5.12 Developer Notes**

For Chat and the dev team:

* **Implementation**: Use domain schemas (Appendix C) for data retrieval, ensuring compliance with regulatory enums.
* **API Integration**: Query strains and regulations via /data endpoint (Appendix E), handling 429 rate limit errors.
* **Testing**: Reference Appendix D’s simulation tests (e.g., “illegal strain” cases) to validate recommendations.
* **Data Access**: Leverage the Cannabis Knowledge Graph (Appendix F) for strain and terpene queries.
* **Extensibility**: Prepare for multi-compound data (Section XI), supported by Appendix F ontology.

**5.13 Narrative Context**

In the hero’s journey, the Domain Expertise Layer is the vast library of cannabis wisdom, offering the hero a treasure trove of knowledge to fuel their exploration. It ensures every recommendation is precise, compliant, and tailored, empowering the hero to make informed choices. For developers like Chat, this layer is the bedrock of Atlas’s credibility, enabling applications that transform cannabis literacy into a safe, fulfilling experience.