

```
1 # Elile Architecture Document
2
3 ## 1. System Overview
4
5 Elile is an employee risk assessment platform that performs
6 comprehensive background investigations for pre-employment
7 screening and ongoing employee monitoring. The system operates
8 at global scale with locale-aware compliance enforcement.
9
10 #### 1.1 Design Principles
11
12 - **Compliance-First**: All operations are gated by jurisdiction-
13 specific compliance rules
14 - **Audit Everything**: Complete traceability of all data access and
15 decisions
16 - **Provider Agnostic**: Abstracted interfaces for data providers
17 and AI models
18 - **Resilient**: Graceful degradation when providers are unavailable
19 - **Scalable**: Async-first design supporting high-volume
20 concurrent screenings
21 - **Configurable**: Flexible service tiers and options to match
22 diverse customer needs
23
24 #### 1.2 Key Actors
25
26 | Actor | Description |
27 |-----|-----|
28 | **Requesting System** | HRIS or screening portal initiating
background checks |
29 | **Subject** | Employee or candidate being screened (consent
required) |
30 | **Reviewer** | Human analyst reviewing findings and making
decisions |
31 | **Administrator** | System admin configuring compliance rules
and providers |
32
33 ---
34
35 ## 2. Service Model
36
37
```

29	The platform offers configurable service options across three dimensions: **Tier** (depth), **Vigilance** (frequency), and **Degrees** (breadth).		
30	### 2.1 Service Tiers (Depth of Investigation)		
31			
32	Controls *what* data sources are queried and the thoroughness of analysis.		
33			
34			
35	Tier	Name	Description
36	-----	-----	-----
37	**T1**	Standard	Comprehensive screening using core data sources
38	**T2**	Enhanced	Standard + premium data sources (behavioral, OSINT, data brokers)
39			
40	````		
41			
42	TIER COMPARISON		
43			
44	Check Category	Standard (T1)	Enhanced (T2)
45)		
46	Identity Verification	✓ Multi-source	✓ + Biometric
47	Criminal (Domestic)	✓ National+Cnty	✓
48	Criminal (International)	✓	✓
49	Employment History	✓ 5 employers	✓ Full + gaps
50	Education	✓ All claimed	✓ + Activities
51	Credit/Financial	✓ Where permtd	✓
52	Alternative Financial	○	✓
53	Bankruptcy/Liens/Judgments	✓	✓
54	Sanctions/PEP	✓	✓

55	Civil Litigation	✓ Federal+State	✓	
56	Regulatory/License Verification	✓ + Enforcement		
57	Adverse Media	✓ Keyword	✓ AI-analyzed	
58	Digital Footprint/OSINT	○	✓	
59	Social Network Analysis	○	✓	
60	Behavioral/Data Broker	○	✓ (consented)	
61	Location Pattern Analysis	○	✓ (consented)	
62	Dark Web Monitoring	○	✓	
63	Extended Network (D3)	○	✓	
64				
65	Default Human Review	Analyst	Investigator	
66				
67	✓ = Included	○ = Not included / Not available		
68	```			
69				
70	### 2.2 Vigilance Levels (Monitoring Frequency)			
71	Controls *how often* re-screening occurs for ongoing monitoring.			
72				
73	Level Name Frequency Checks/Year Use Case			
74	----- ----- ----- ----- -----			
75	**V0** Pre-screen One-time only 1 Contractors, low-risk roles			
76				
77	**V1** Annual Every 12 months 1 Standard regulated employees			
78				
79	**V2** Monthly Every 30 days 12 Elevated risk, trading, treasury			
80				
81	**V3** Bi-monthly Twice per month 24 Critical infrastructure, nuclear			
82				
83	VIGILANCE MONITORING SCOPE			

84			
85	Level	Frequency	What's Monitored
86			
87	V0	One-time	N/A - no ongoing monitoring
88			
89	V1	Annual	Full re-screen (same as initial)
90			
91	V2	Monthly	Criminal records, sanctions/PEP
92			adverse media, regulatory actions,
93			civil litigation
94			
95	V3 alerts	2x/month	V2 checks + real-time sanctions
96			+ continuous adverse media monitoring
97			+ dark web monitoring (Enhanced only)
98			
99	```		
100			
101	### 2.3 Search Degrees (Relationship Breadth)		
102			
103	Controls *how wide* the relationship/connection analysis extends		
104	.		
105	Degree	Name	Scope
106	-----	-----	-----
107	**D1**	Subject Only	Direct information about the subject
		Standard, Enhanced	

108 | **D2** | Direct Connections | Subject + immediate associations
| Standard, Enhanced |
109 | **D3** | Extended Network | D2 + second-degree connections |
| **Enhanced only** |

110

111 ````

112

113 | DEGREE SCOPE DETAILS

114 |

115 | D1: SUBJECT ONLY

116 | | Subject's personal records only

117 |

118 | D2: DIRECT CONNECTIONS (includes D1)

119 | | Current/former employers (company sanctions, health

120 | |)
| | Business entities where subject is officer/director

121 | | | Business partners / co-founders

122 | | | Household members (shared addresses)

123 | | |)
| | | Disclosed relationships

124 |

125 | D3: EXTENDED NETWORK (includes D1 + D2) - Enhanced only

126 | | Directors/officers of connected entities

127 | | Subsidiary/parent company chains

128 | | Beneficial ownership tracing

129 | | Second-degree business connections

130 | | Shell company detection

131 | | Political exposure through connections

132 |

133

134 ````

135

136 ### 2.4 Human Review Options

137

138 Independent add-on controlling level of human oversight.

139

140 | Option | Description | Typical Use |

141 |-----|-----|-----|

142 | **Automated Only** | AI-generated report, no human review |
Cost-sensitive, low-risk |

143 | **Analyst Review** | Human analyst reviews findings, validates
accuracy | Standard default |

144 | **Investigator Escalation** | Deep-dive investigation on flagged
items | Enhanced default |

145 | **Dedicated Case Manager** | Named analyst for high-touch
cases | Executive, VIP |

146

147 ### 2.5 Configuration Validation

148

149 ` ``

150

151 | VALID CONFIGURATION COMBINATIONS |

152

153

154

155

TIER	DEGREES	VIGILANCE	REVIEW	
Standard	+ D1	+ V0-V3	+ Any	✓ Valid
Standard	+ D2	+ V0-V3	+ Any	✓ Valid
Standard	+ D3	+ Any	+ Any	✗ Invalid
Enhanced	+ D1	+ V0-V3	+ Any	✓ Valid
Enhanced	+ D2	+ V0-V3	+ Any	✓ Valid
Enhanced	+ D3	+ V0-V3	+ Any	✓ Valid

163

164

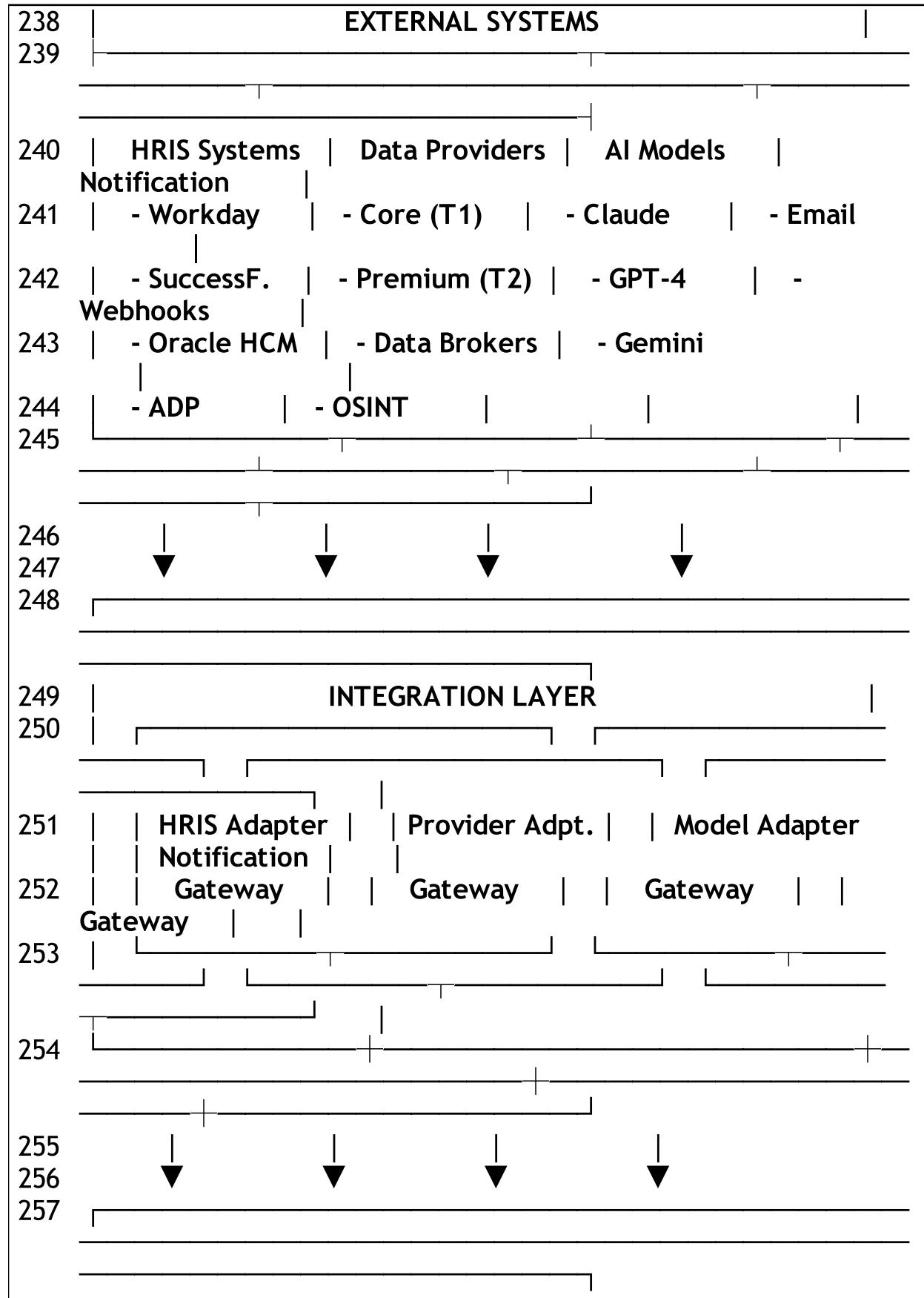
165 | CONSTRAINT: D3 (Extended Network) requires Enhanced tier

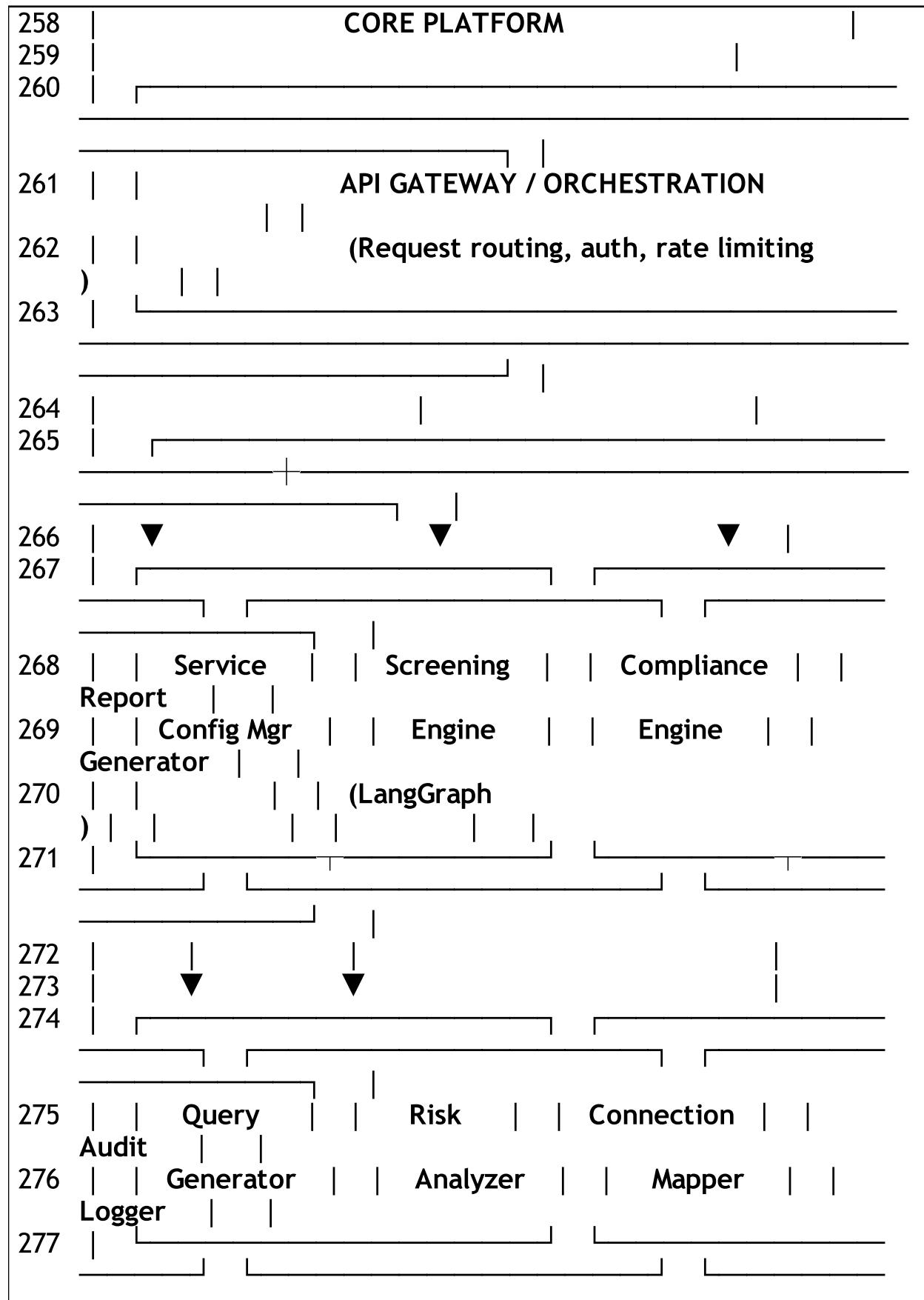
```
166
167 ````
168
169 ### 2.6 Service Configuration Model
170
171 ```python
172 class ServiceConfiguration(BaseModel):
173     """Complete service configuration for a screening."""
174
175     tier: ServiceTier      # standard | enhanced
176     vigilance: VigilanceLevel    # v0 | v1 | v2 | v3
177     degrees: SearchDegree      # d1 | d2 | d3
178     human_review: ReviewLevel    # automated | analyst |
179     investigator | dedicated
180
181     # Custom overrides (optional)
182     additional_checks: list[CheckType] = []
183     excluded_checks: list[CheckType] = []
184
185     def validate(self) -> bool:
186         """Validate configuration constraints."""
187         # D3 requires Enhanced tier
188         if self.degrees == SearchDegree.D3 and self.tier != ServiceTier.ENHANCED:
189             return False
190         return True
191
192 class ServiceTier(str, Enum):
193     STANDARD = "standard"
194     ENHANCED = "enhanced"
195
196
197 class VigilanceLevel(str, Enum):
198     V0_PRESCREEN = "v0"      # One-time
199     V1_ANNUAL = "v1"        # Every 12 months
200     V2_MONTHLY = "v2"       # Every 30 days
201     V3_BIMONTHLY = "v3"     # Twice per month
```

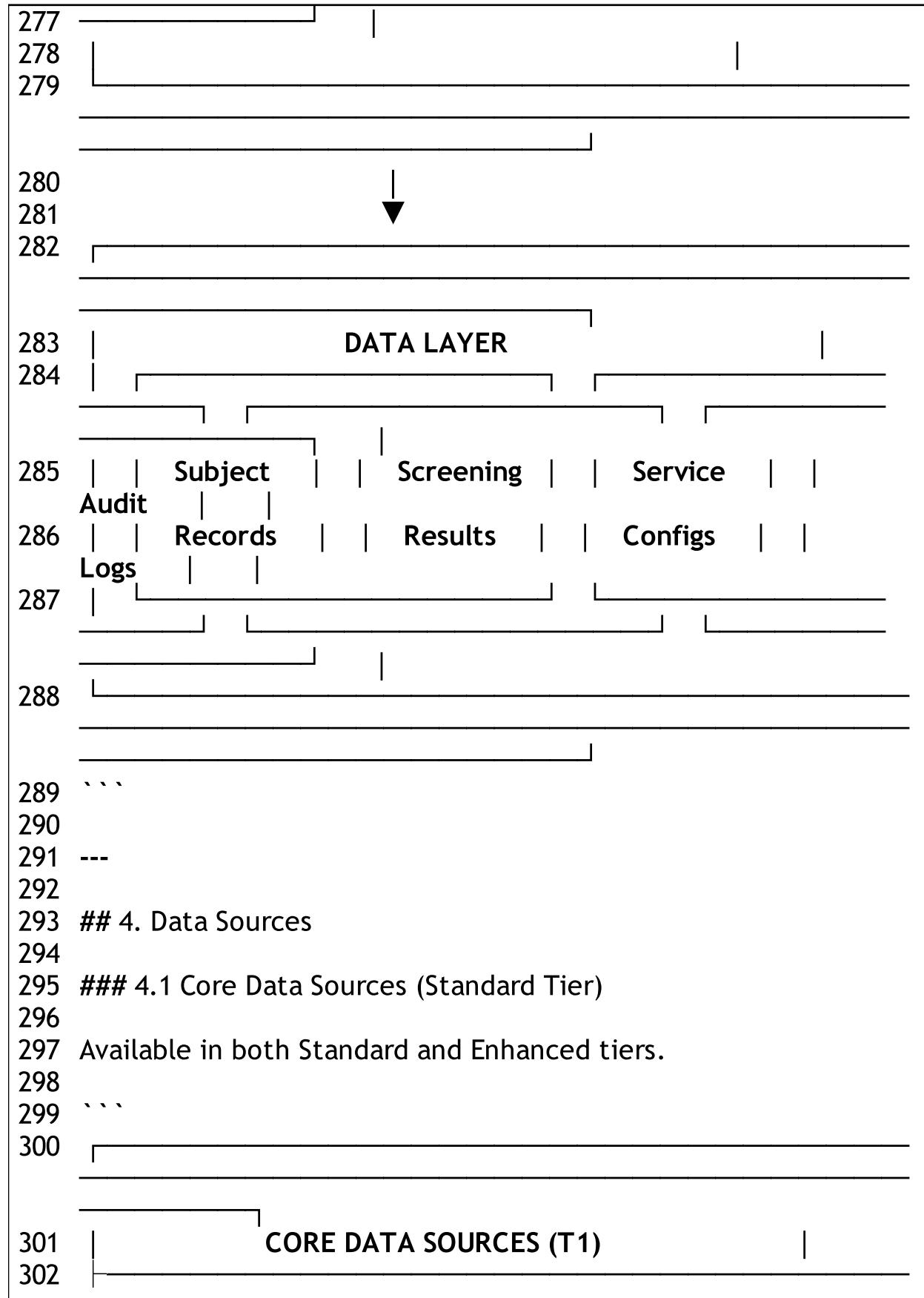
```

202
203
204 class SearchDegree(str, Enum):
205     D1 SUBJECT = "d1"      # Subject only
206     D2 DIRECT = "d2"      # Direct connections
207     D3 EXTENDED = "d3"    # Extended network (Enhanced only)
208
209
210 class ReviewLevel(str, Enum):
211     AUTOMATED = "automated"
212     ANALYST = "analyst"
213     INVESTIGATOR = "investigator"
214     DEDICATED = "dedicated"
215     ``
216
217 ### 2.7 Typical Role Configurations
218
219 | Sector | Role | Tier | Vigilance | Degrees | Review |
220 |-----|-----|-----|-----|-----|
221 | Government | Administrative | Standard | V1 | D1 | Analyst |
222 | Government | Policy/Intel | Enhanced | V2 | D2 | Investigator |
223 |-----|
223 | Government | Classified | Enhanced | V3 | D3 | Investigator |
224 | Finance | Operations | Standard | V1 | D1 | Analyst |
225 | Finance | Client Advisory | Standard | V2 | D2 | Analyst |
226 | Finance | Trading/Treasury | Enhanced | V3 | D2 | Investigator |
227 |-----|
227 | Finance | C-Suite | Enhanced | V2 | D3 | Dedicated |
228 | Energy | Field Ops | Standard | V1 | D1 | Analyst |
229 | Energy | Control Room | Standard | V2 | D1 | Analyst |
230 | Energy | Nuclear | Enhanced | V3 | D2 | Investigator |
231
232 ---
233
234 ## 3. High-Level Architecture
235
236 ``
237

```







302

303 |

304 | **IDENTITY VERIFICATION**

305 | | Government ID databases (SSA, DVLA, national registries)

306 | | Address verification (postal, utility databases)

307 | | Multi-source identity confirmation

308 |

309 | **CRIMINAL RECORDS**

310 | | National criminal databases

311 | | County/state court records

312 | | International criminal (Interpol, country-specific)

313 | | Sex offender registries

314 |

315 | **EMPLOYMENT VERIFICATION**

316 | | The Work Number (Equifax)

317 | | Direct employer verification

318 | | Professional reference checks

319 |

320 | **EDUCATION VERIFICATION**

321 | | National Student Clearinghouse

322 | | University registrar verification

323 | | Professional certification bodies

324 |

325 | **FINANCIAL RECORDS (where permitted)**

326 | | Credit bureau reports (Experian, Equifax, TransUnion)

327 | | Bankruptcy filings (PACER, national registries)

328 | | Tax liens and judgments

329 | | Property records

330 |

331 | **SANCTIONS & WATCHLISTS**

332 | | OFAC SDN List

333 | | UN Security Council sanctions

334 | | EU/UK sanctions lists

335 | | PEP databases (World-Check, Dow Jones

```
335 ) |  
336 | └── National law enforcement watchlists |  
337 |  
338 CIVIL LITIGATION |  
339 | └── Federal court records (PACER) |  
340 | └── State court records |  
341 | └── Arbitration/mediation records |  
342 |  
343 REGULATORY & LICENSING |  
344 | └── Professional license verification |  
345 | └── FINRA BrokerCheck |  
346 | └── State bar associations |  
347 | └── Medical board records |  
348 | └── SEC IAPD |  
349 | └── Industry-specific regulators (NRC, FERC, etc |  
. ) |  
350 |  
351 ADVERSE MEDIA (Keyword-based) |  
352 | └── News archives (LexisNexis, Factiva) |  
353 | └── Public records aggregators |  
354 |  
355 |  
  
356 ````  
357  
358 **Core Provider Categories:**  
359  
360 | Category | Providers | Check Types |  
361 | ----- | ----- | ----- |  
362 | Aggregators | Sterling, HireRight, Checkr | Full suite |  
363 | Credit Bureaus | Experian, Equifax, TransUnion | Credit,  
Identity |  
364 | Court Records | PACER, CourtListener, state systems | Criminal  
, Civil |  
365 | Sanctions | World-Check, Dow Jones, OFAC direct | PEP,  
Sanctions |  
366 | Employment | The Work Number, direct verification |  
Employment history |  
367 | Education | NSC, direct verification | Education |
```


399	LOCATION / MOVEMENT DATA (with consent)
400	Foursquare / Factual (venue visits)
401	SafeGraph (foot traffic patterns)
402	Placer.ai (location analytics)
403	Travel pattern analysis
404	
405	ALTERNATIVE FINANCIAL DATA
406	Utility payment history
407	Rental payment history (Experian RentBureau)
408	BNPL usage patterns
409	Bank transaction analysis (Plaid, Finicity - consented)
410	Crypto wallet analysis
411	
412	ADVANCED ADVERSE MEDIA
413	AI-powered sentiment analysis
414	Context-aware relevance scoring
415	Multi-language monitoring
416	Social media sentiment
417	
418	RELATIONSHIP INTELLIGENCE
419	Beneficial ownership databases (OpenOwnership, etc)
420	Corporate registry deep analysis
421	Shell company detection algorithms
422	Political connection mapping
423	Pipl / FullContact (identity resolution)
424	Extended network graph analysis
425	
426	
427	```
428	
429	**Premium Provider Categories:**
430	
431	Category Providers Data Types
432	----- ----- -----

433	Data Brokers Acxiom, Oracle Data Cloud, Experian Marketing Behavioral, interests, demographics
434	Identity Resolution Pipl, FullContact, LiveRamp Cross-platform identity linking
435	Location Intelligence Foursquare, SafeGraph, Placer.ai Movement patterns, venue visits
436	Alternative Finance Plaid, Finicity, Experian RentBureau Transaction data, payment history
437	OSINT Platforms Maltego, SpiderFoot, custom tools Digital footprint aggregation
438	Dark Web Recorded Future, Flashpoint, DarkOwl Leak detection, threat intel
439	Corporate Intelligence OpenCorporates, Orbis, Dun & Bradstreet Beneficial ownership, corporate links
440	
441	### 4.3 Data Source Compliance Considerations
442	
443	Data Type Compliance Concern Mitigation
444	----- ----- -----
445	Behavioral/Interest data May proxy for protected classes Filter categories, document business necessity
446	Location data Privacy laws, consent requirements Explicit consent, purpose limitation
447	Social media GDPR Art. 9, EEOC concerns Limit to public, exclude protected content
448	Dark web Data provenance concerns Use for security only, not adverse decisions
449	Data broker segments FCRA applicability unclear Exclude from adverse action basis
450	Political/religious indicators Protected in most jurisdictions Exclude from analysis
451	
452	---
453	
454	## 5. Data Persistence & Evolution
455	
456	The platform implements a comprehensive data persistence strategy to optimize costs, enable cross-screening data reuse, and support longitudinal risk analysis.
457	

458 **### 5.1 Entity Data Lake**

459

460 Centralized storage for all discovered entities with cached provider data.

461

462 ````

463

464 | **ENTITY DATA LAKE** |

465 |

466 |

467 | **ENTITY REGISTRY** | | |

468 |

469 | All entities (subjects + discovered connections

):

470 | | - Individuals (employees, candidates, associates

)

471 | | - Organizations (employers, business entities)

472 | | - Addresses (residences, business locations)

473 |

474 |

475 |

476 |

477 | **DATA SOURCE CACHE** | | |

478 |

479 | Per-entity, per-source cached results:

480 | | - Raw provider response (encrypted)

481 | | - Acquisition timestamp

482 | | - Freshness status (fresh | stale | expired)

483 | | - Cost incurred

484 | | - Source provider

485 |


```
513 | |
514 | |     SHARED CACHE (Platform-wide) |
515 | | |
516 | |     Paid external sources - shared across all customers |
517 | |     : |
518 | |     - Court records (PACER, state courts) |
519 | |     - Corporate registries |
520 | |     - Sanctions/PEP lists |
521 | |     - Credit bureaus |
522 | |     - Data brokers (Acxiom, etc.) |
523 | |     - OSINT providers |
524 | |     - All paid API responses |
525 | |
526 | |
527 | |     CUSTOMER-ISOLATED CACHE (per tenant) |
528 | |     ) |
529 | |     Customer-provided data - isolated per customer |
530 | |     : |
531 | |     - Employee records from HRIS |
532 | |     - Internal verification results |
533 | |     - Customer-specific reference checks |
534 | |     - Proprietary risk assessments |
535 | |
536 | |
537 | |     ```` |
538 | |
539 | |     ### 5.3 Data Freshness Model
```

540

541 Different data types age at different rates:

542

543 | Data Category | Freshness Window | Stale Window | Rationale

544 | ----- | ----- | ----- |

545 | Sanctions/PEP | 0 (always refresh) | N/A | Regulatory
requirement |

546 | Criminal records | 7 days | 30 days | Court batch updates |

547 | Adverse media | 24 hours | 7 days | Time-sensitive |

548 | Civil litigation | 14 days | 60 days | Less time-sensitive |

549 | Credit/Financial | 30 days | 90 days | Monthly cycles |

550 | Corporate registry | 30 days | 90 days | Quarterly filings |

551 | OSINT/Digital | 30 days | 90 days | Online presence evolves |

552 | Employment verification | 90 days | 180 days | Stable data |

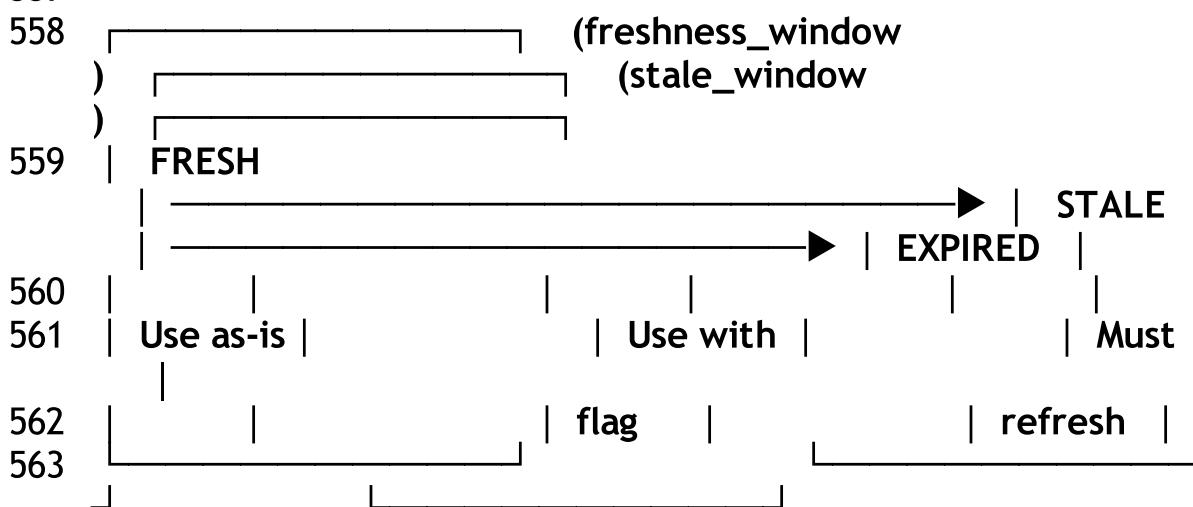
553 | Behavioral/Data broker | 90 days | 180 days | Patterns change
slowly |

554 | Education | 365 days | Never expires | Rarely changes |

555

556 **Freshness States:**

557 ````



564 ````

565

566 ### 5.4 Stale Data Policy (Tier-Aware)

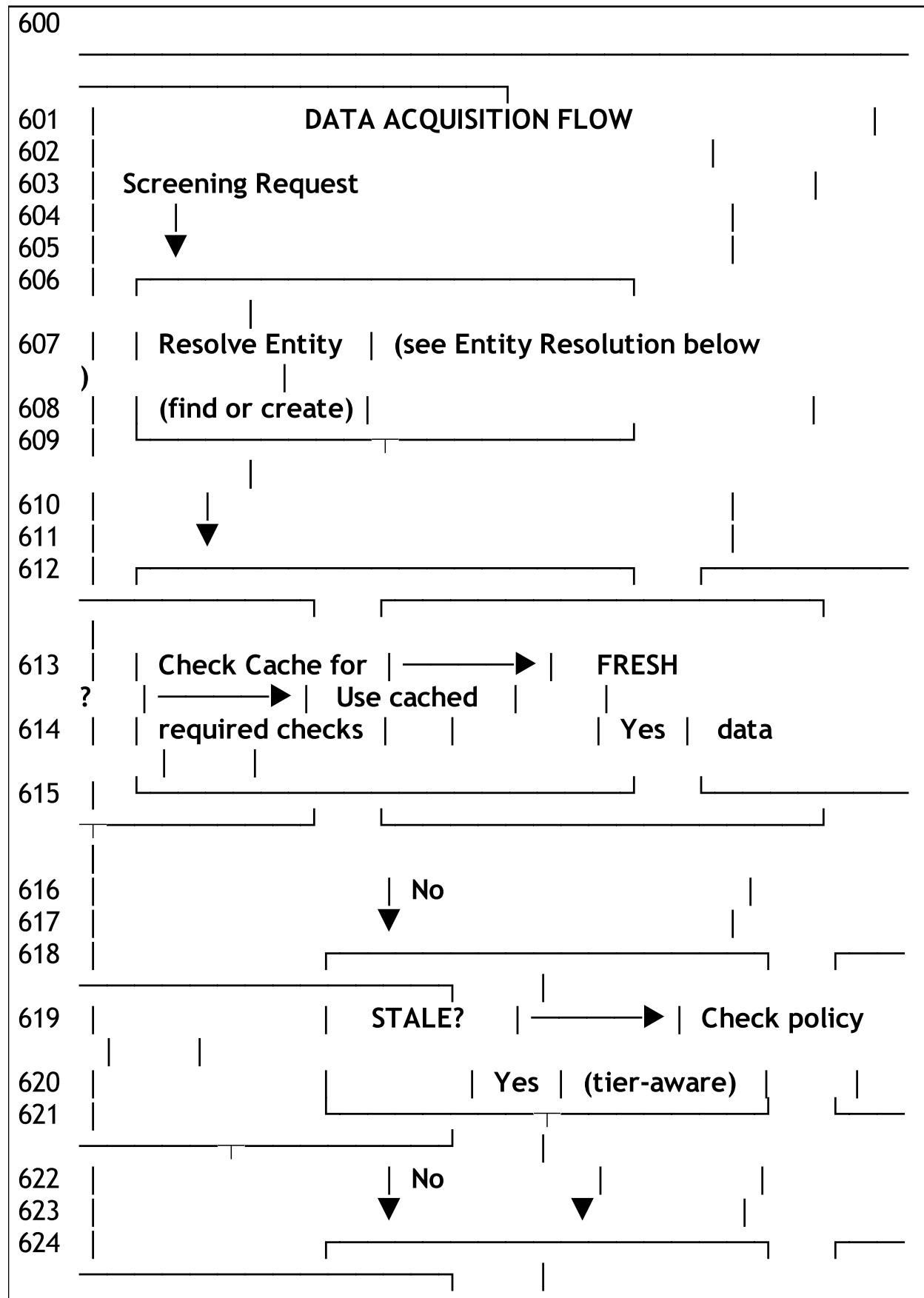
567

568 When data is stale, behavior varies by check type and service tier

:

569

570	```		
571			
STALE DATA POLICY MATRIX			
572 STALE DATA POLICY MATRIX			
573			
574			
575	Check Type	Standard Tier	Enhanced Tier
576			
577	Sanctions/PEP	BLOCK (refresh)	BLOCK (refresh)
)			
578	Criminal records	Use + flag	BLOCK (refresh)
579	Adverse media	Use + flag	BLOCK (refresh)
580	Civil litigation	Use + flag	Use + flag
581	Credit/Financial	Use + flag	Use + flag
582	Employment verification	Use + flag	Use + flag
583	Education	Use + flag	Use + flag
584	Corporate registry	Use + flag	Use + flag
585	Behavioral/Data broker	N/A	Use + flag
586	OSINT/Digital footprint	N/A	Use + flag
587			
588	BLOCK = Wait for fresh data before proceeding		
589	Use+flag = Proceed with stale data, flag in report,		
590	queue async refresh		
591			
592	All policies configurable at platform level		
593			
594			
595	```		
596			
597	### 5.5 Data Acquisition Flow		
598			
599	```		
600			

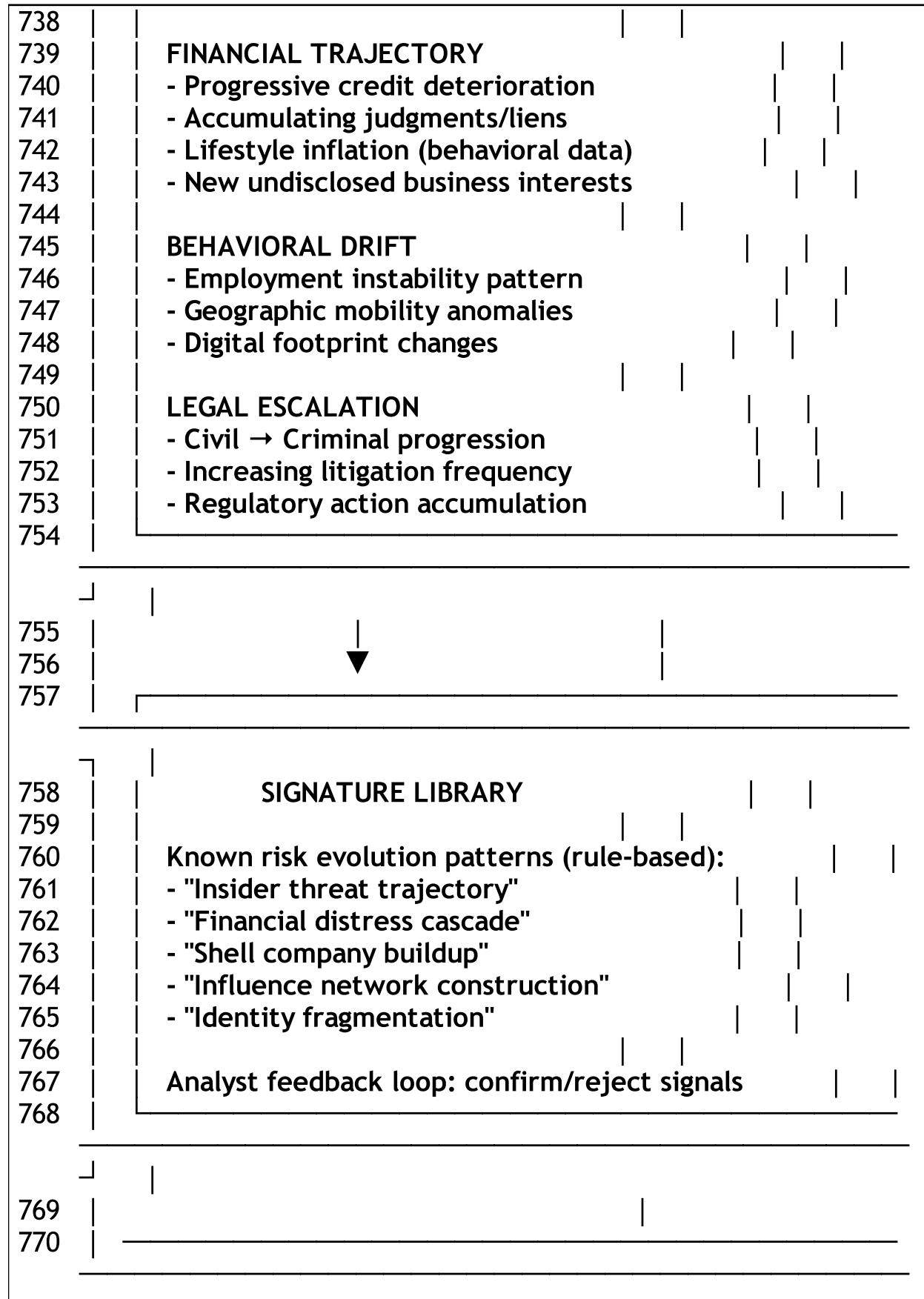


```
625 | EXPIRED / | | Use + flag OR
626 | MISSING | | Block + wait |
627 |
628 |
629 |
630 |
631 | Query Provider | |
632 | + Cache Result | |
633 | + Track Cost | |
634 |
635 |
636 |
637 ````
638
639 ### 5.6 Entity Resolution
640
641 Matching/deduplicating entities across screenings with tier-based
       human review:
642 ````
643
644
645 ENTITY RESOLUTION FLOW
646
647 Incoming Entity
648
649
650
651 | EXACT MATCH | ----- Match found -----> Use
       existing entity |
652 | (SSN, EIN, |
653 | passport) |
654
```

```
654 | |
655 | | No match
656 | |
657 | |
658 | | FUZZY MATCH | ----- High confidence -----> Use
659 | | existing entity | |
660 | | (name+DOB+addr) | (score > 0.95)
661 | |
662 | | Ambiguous (0.70 - 0.95)
663 | |
664 | | TIER CHECK | |
665 | |
666 | |
667 | | STANDARD TIER | | ENHANCED TIER
668 | | |
669 | | Auto-resolve: | | Queue for human review
: | |
670 | | - Score > 0.85 → match | - Analyst validates match
| |
671 | | - Score < 0.85 → new entity | - Can merge/split entities
| |
672 | | - Flag uncertainty in | | - Resolution audit trail | |
673 | | report | | | |
674 | | | |
675 | |
676 | |
677 | | No match (score < 0.70)
678 | |
679 | |
```

```
680 | Create new entity
681 |
682 |
683 ``
684
685 ### 5.7 Versioned Entity Profiles
686
687 Each screening iteration creates an immutable profile snapshot:
688
689 ``
690 |
691 | ENTITY PROFILE STORE
692 |
693 | Entity: John Smith (employee_12345)
694 |   | Profile v1 (2024-01-15) — Pre-employment screening
695 |   |   | Findings snapshot
696 |   |   | Risk score: 0.15 (low)
697 |   |   | Connections: 12 entities
698 |   |   | Data sources used: [list]
699 |
700 |   | Profile v2 (2024-07-15) — 6-month monitoring
701 |   |   | Findings snapshot
702 |   |   | Risk score: 0.22 (low) ↑
703 |   |   | Connections: 18 entities (+6)
704 |   |   | Delta from v1: New civil judgment discovered
705 |   |   | Data sources used: [list]
706 |
707 |   | Profile v3 (2025-01-15) — Annual re-screen
708 |   |   | Findings snapshot
709 |   |   | Risk score: 0.45 (medium) ↑↑
710 |   |   | Connections: 35 entities (+17)
711 |   |   | Delta from v2: 3 new shell companies detected
```

```
711 |           |
712 |           └── Evolution signals: [network_expansion_rapid]
713 |               |
714 |               └── Data sources used: [list]
715 |
716 ``
717
718 ### 5.8 Risk Evolution Analytics
719
720 Pattern detection across profile versions to identify emerging
risks.
721 ``
722 ``
723
724 |           └── RISK EVOLUTION ANALYZER
725 |
726 |           └── PHASE 1: RULE-BASED SIGNATURES (Initial Implementation)
727 |
728 |
729 |           └── TEMPORAL PATTERN DETECTOR
730 |               |
731 |               └── Analyzes profile version deltas for:
732 |
733 |                   └── NETWORK EVOLUTION
734 |                       - Rapid network expansion (>200% in 6mo = shell co
735 |                           .)
736 |                           └── - New high-risk connections appearing
737 |                               - Connections to newly-sanctioned entities
738 |                               - Network clustering changes
```



770 |
771 |
772 | **PHASE 2: ML AUGMENTATION (Future, when data**
| **accumulates)** |
773 |

774 | - Training data from confirmed Phase 1 signals
775 | - Anomaly detection for unknown patterns
776 | - Pattern discovery from historical profiles
777 | - Human-in-the-loop validation
778 |
779 | Prerequisites:
780 | - Sufficient profile version history
781 | - Labeled outcomes (confirmed risks, false positives)
782 | - Analyst feedback corpus
783 |
784 |

785 | ````
786 |
787 **### 5.9 Data Retention Policy**
788 |
789 | Data Class | Default Retention | Configurable | Notes |
790 | -----|-----|-----|-----|
791 | Profile versions | Indefinite | Yes | Core analytical value |
792 | Findings/analysis | Indefinite | Yes | Core analytical value |
793 | Connection graphs | Indefinite | Yes | Core analytical value |
794 | Raw provider responses | 1 year | Yes | Minimize storage |
795 | Behavioral data | 2 years | Yes | Privacy consideration |
796 | Audit logs | 7 years | No | Compliance requirement |
797 |
798 **### 5.10 GDPR Erasure Capability**
799 |
800 | ````
801 |

802 | **GDPR ERASURE PROCESS** |

```

803
804 | Triggered by:
805 |   - Subject erasure request (Art. 17)
806 |   - Locale-based automatic policy (EU subjects)
807 |   - Customer-initiated purge
808
809 | Process:
810 |   1. Validate request (identity, legal basis)
811 |   2. Identify all entity references across system
812 |   3. For each data class:
813 |     - Delete OR anonymize (configurable)
814 |     - Anonymization preserves aggregate analytics
815 |   4. Cascade through:
816 |     - Entity registry
817 |     - Profile versions
818 |     - Cached provider data
819 |     - Connection graphs (remove or anonymize edges)
820 |   5. Create audit record of erasure (retained for compliance)
821 | )
822 |   6. Notify dependent systems
823
824 | Exceptions (retained per legal requirement):
825 |   - Audit logs (anonymized subject reference)
826 |   - Aggregated/anonymized analytics
827 |   - Legal hold data
828
829 ...
830
831 ### 5.11 Data Models
832
833 ```python
834 class Entity(BaseModel):
835     """Core entity in the system."""
836     entity_id: UUID
837     entity_type: EntityType # individual | organization | address
838     canonical_identifiers: dict[str, str] # SSN, EIN, passport, etc.
839     created_at: datetime

```

```
840
841     # Cross-reference tracking
842     screenings: list[UUID] # Screenings referencing this entity
843     related_entities: list[EntityRelation]
844
845
846 class CachedDataSource(BaseModel):
847     """Cached data from a provider for an entity."""
848     cache_id: UUID
849     entity_id: UUID
850     provider_id: str
851     check_type: CheckType
852
853     # Origin (determines sharing scope)
854     data_origin: DataOrigin # paid_external | customer_provided
855     customer_id: UUID | None # Set if customer_provided
856
857     # Freshness
858     acquired_at: datetime
859     freshness_status: FreshnessStatus # fresh | stale | expired
860     fresh_until: datetime
861     stale_until: datetime
862
863     # Data
864     raw_response: bytes # Encrypted
865     normalized_data: dict
866
867     # Cost tracking
868     cost_incurred: Decimal
869     cost_currency: str
870
871
872 class EntityProfile(BaseModel):
873     """Versioned profile snapshot for an entity."""
874     profile_id: UUID
875     entity_id: UUID
876     version: int
877     created_at: datetime
878
879     # Trigger
```

```
880 trigger_type: ProfileTrigger # screening | monitoring |  
881   manual  
882  
883   # Snapshot  
884   findings: list[Finding]  
885   risk_score: RiskScore  
886   connections: list[EntityConnection]  
887   connection_count: int  
888  
889   # Sources used  
890   data_sources_used: list[DataSourceRef]  
891   stale_data_used: list[DataSourceRef] # Flagged stale sources  
892  
893   # Comparison to previous  
894   previous_version: int | None  
895   delta: ProfileDelta | None  
896  
897  
898 class ProfileDelta(BaseModel):  
899     """Changes between profile versions."""  
900     new_findings: list[Finding]  
901     resolved_findings: list[Finding]  
902     changed_findings: list[FindingChange]  
903  
904     risk_score_change: float  
905     connection_count_change: int  
906     new_connections: list[EntityConnection]  
907     lost_connections: list[EntityConnection]  
908  
909     # Computed signals  
910     evolution_signals: list[EvolutionSignal]  
911  
912  
913 class EvolutionSignal(BaseModel):  
914     """Detected pattern in profile evolution."""  
915     signal_type: str # e.g., "network_expansion",  
916       financial_deterioration"  
916     confidence: float  
917     severity: str # low | medium | high | critical
```

```

918     description: str
919     contributing_factors: list[str]
920     pattern_signature: str | None # Reference to known pattern
921     library
922
923     # Analyst feedback (for ML training)
924     analyst_confirmed: bool | None
925     feedback_timestamp: datetime | None
926
927 class DataOrigin(str, Enum):
928     PAID_EXTERNAL = "paid_external"    # Shared cache
929     CUSTOMER_PROVIDED = "customer_provided" # Isolated
930     cache
931
932 class FreshnessStatus(str, Enum):
933     FRESH = "fresh"
934     STALE = "stale"
935     EXPIRED = "expired"
936     ``
937
938 ---  

939
940 ## 6. Core Components
941
942 ### 5.1 Service Configuration Manager
943
944 Validates and manages service configurations for screenings.
945
946 ``
947
948 |          SERVICE CONFIGURATION MANAGER          |
949 |          |  

950 |          |  

951 |          |          CONFIGURATION VALIDATOR          |

```

```
952 | |
953 | | Validates:
954 | | - Tier/Degree constraints (D3 → Enhanced only)
954 | |
955 | | - Locale compatibility
956 | | - Customer entitlements
957 | | - Check type availability
958 |
959 |
960 | |
961 |
962 | | DATA SOURCE RESOLVER
963 |
964 | | Maps configuration to specific data sources:
965 | | - Tier → Available provider categories
966 | | - Degrees → Relationship query scope
967 | | - Vigilance → Monitoring schedule
968 |
969 |
970 | |
971 |
972 | | ENTITLEMENT CHECKER
973 |
974 | | Verifies customer has access to requested:
975 | | - Tier level
976 | | - Vigilance frequency
977 | | - Specific data sources
978 | | - Human review levels
979 |
980 | |
```

980

981 ````

982

983 **### 5.2 Screening Engine (LangGraph Orchestration)**

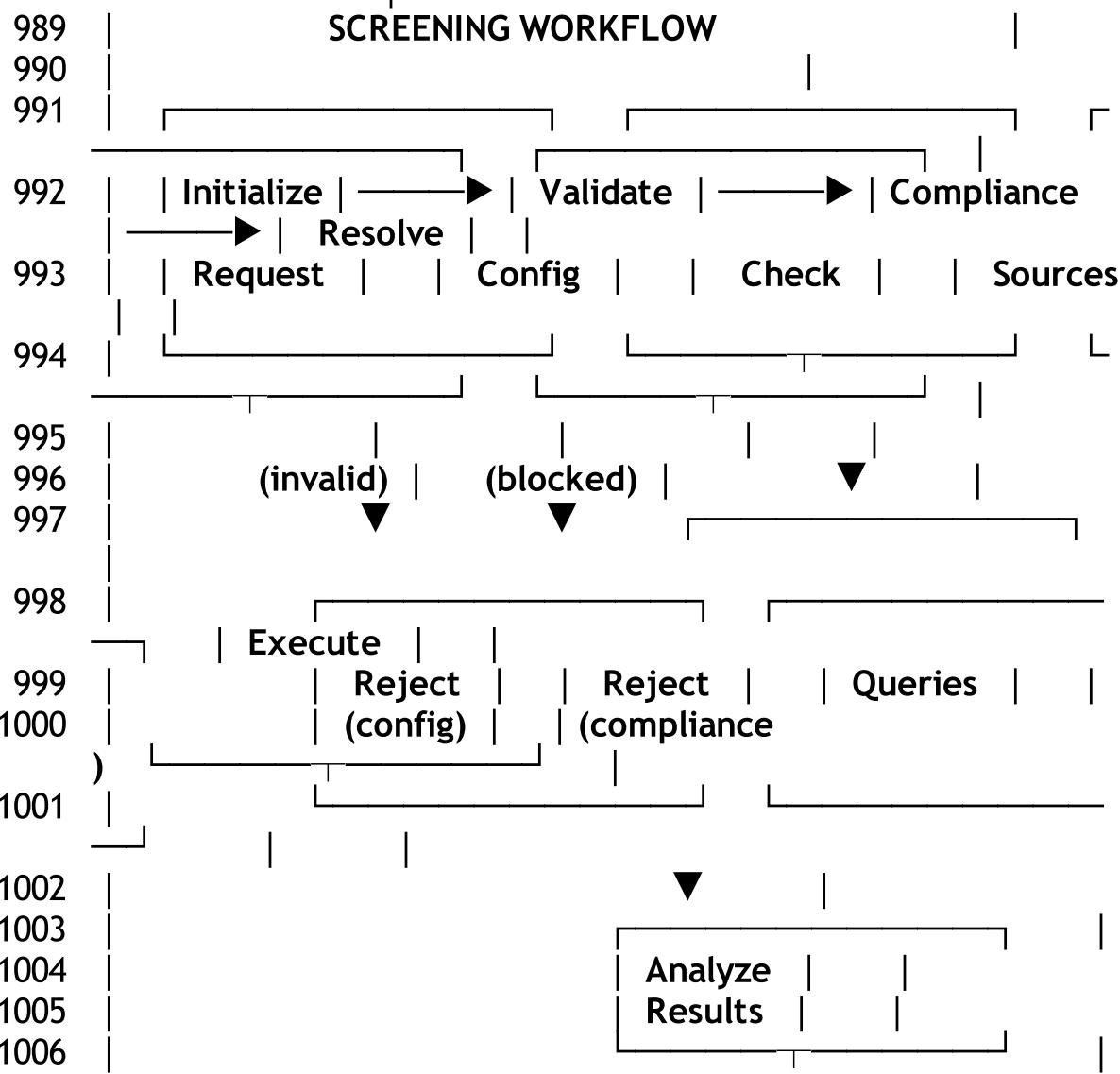
984

985 The central workflow engine that orchestrates the screening process.

986

987 ````

988



```

sequenceDiagram
    participant Human
    participant Review
    participant Score
    participant Map
    participant Report
    participant Risks
    participant Connections
    participant Complete
    participant Expand
    participant Network

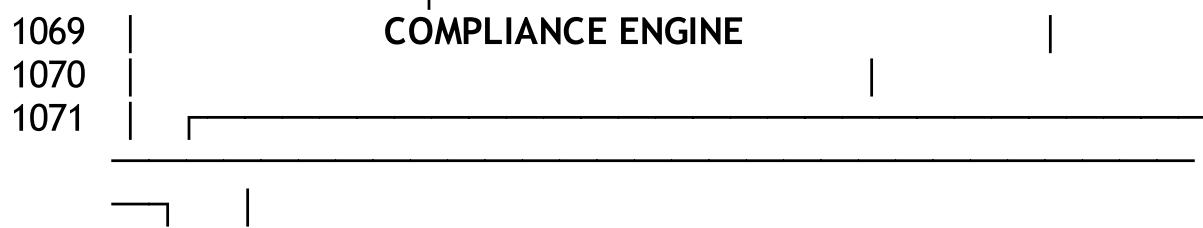
    Note over Human, Review: (D2/D3)

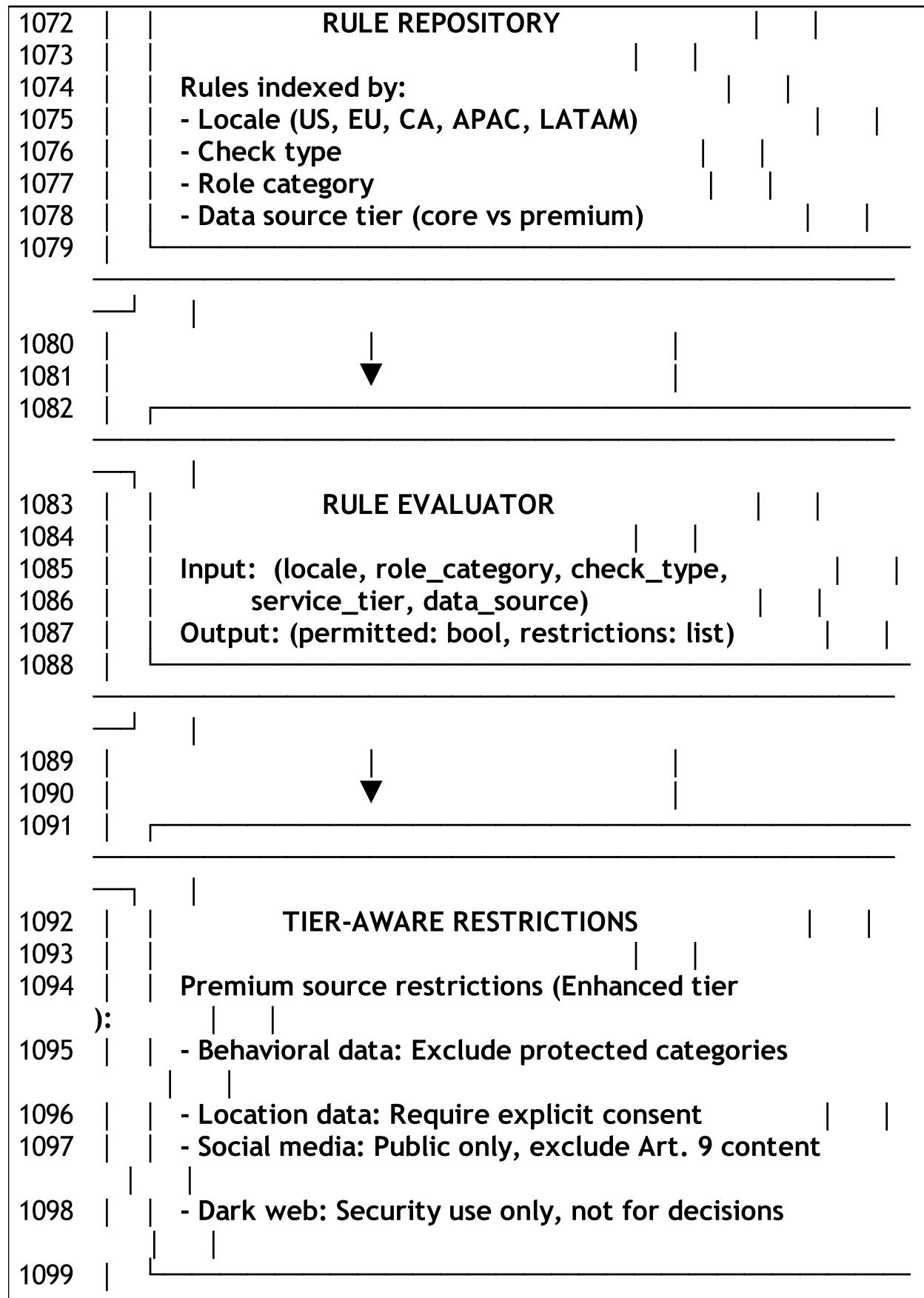
    Human->>Score: Generate
    Note over Score: (D2/D3)
    Score->>Map: Score
    Map->>Connections: Map
    Map->>Report: Report
    Report->>Risks: Risks
    Report->>Connections: Connections
    Risks->>Connections: Risks
    Human->>Complete: Complete
    Human->>Expand: Expand
    Review->>Score: Review
    Note over Score: (D2/D3)
    Score->>Complete: Complete
    Complete->>Expand: Expand
    Expand->>Network: Network
    Network->>Human: Network

```

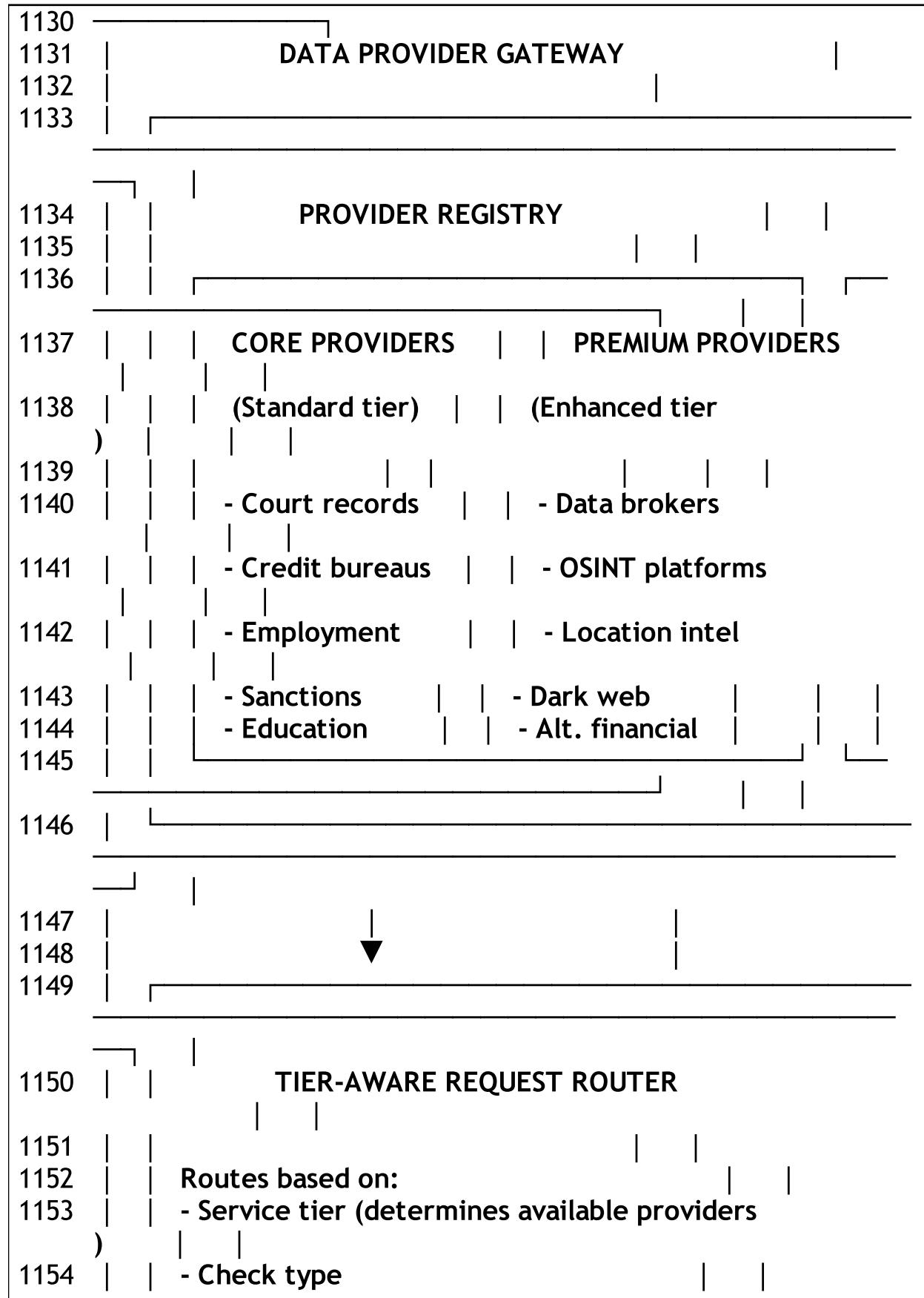
The diagram illustrates a sequence of steps in a process. It starts with 'Generate' (line 1009) which feeds into 'Score' (line 1008). 'Score' then feeds into 'Map' (line 1009), which in turn feeds into 'Connections' (line 1010). 'Connections' and 'Report' (line 1009) both feed into 'Risks' (line 1010). 'Risks' and 'Report' also feed into 'Connections'. Following this, 'Human' (line 1016) performs 'Complete' (line 1016) and 'Expand' (line 1016). 'Review' (line 1017) feeds into 'Score' (line 1008). 'Score' then feeds into 'Complete' (line 1016). Finally, 'Complete' feeds into 'Expand' (line 1016), which then feeds into 'Network' (line 1017). 'Network' feeds back into 'Human' (line 1016).

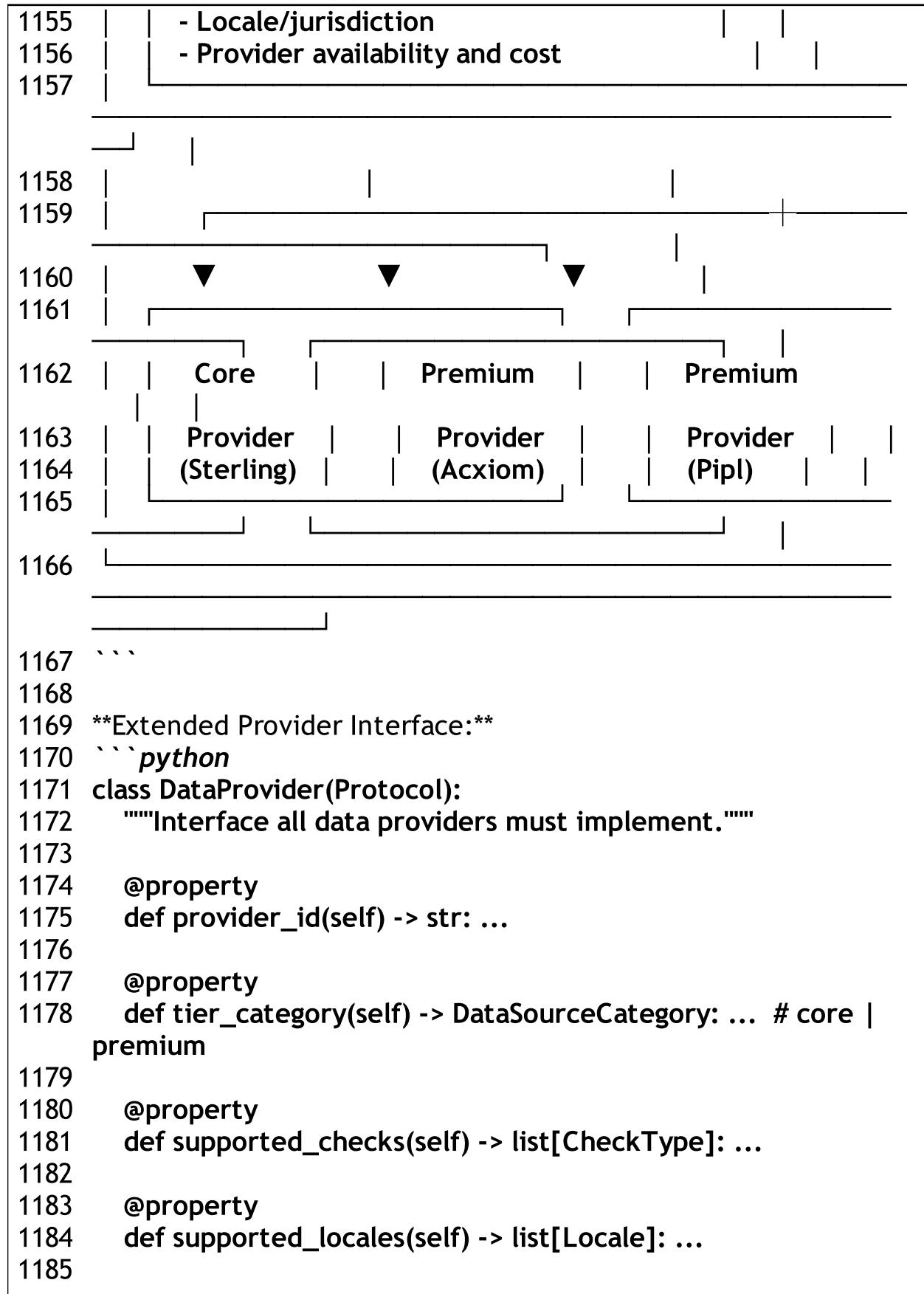
```
1037  permitted_checks: list[CheckType]
1038  blocked_checks: list[BlockedCheck]
1039
1040  # Search state
1041  current_degree: SearchDegree # d1 | d2 | d3
1042  queries: list[SearchQuery]
1043  results: list[SearchResult]
1044
1045  # Entities discovered (for D2/D3)
1046  discovered_entities: list[Entity]
1047  entity_queue: list[Entity]  # Entities pending investigation
1048
1049  # Analysis
1050  findings: list[Finding]
1051  risk_score: RiskScore
1052  connections: list[EntityConnection]
1053
1054  # Output
1055  report: Report | None
1056  status: ScreeningStatus
1057  review_status: ReviewStatus # pending | in_review |
    approved | escalated
1058
1059  # Audit
1060  audit_trail: list[AuditEvent]
1061  ``
1062
1063  ### 5.3 Compliance Engine
1064
1065 Enforces jurisdiction-specific rules, now tier-aware.
1066
1067  ``
1068  _____
```





```
1099
1100
1101
1102
1103 **Extended Rule Definition:**  
1104 ````python  
1105 class ComplianceRule(BaseModel):  
1106     locale: Locale  
1107     check_type: CheckType  
1108     role_categories: list[RoleCategory] | None # None = all roles  
1109  
1110     # Tier applicability  
1111     applicable_tiers: list[ServiceTier] # Which tiers this rule  
applies to  
1112     data_source_category: DataSourceCategory # core |  
premium  
1113  
1114     permitted: bool  
1115     conditions: list[Condition]  
1116     lookback_years: int | None  
1117     required_disclosures: list[DisclosureType]  
1118     data_restrictions: list[FieldRestriction]  
1119  
1120     # Premium source specific  
1121     requires_explicit_consent: bool = False  
1122     excluded_data_categories: list[str] = [] # e.g., ["political", "  
religious"]  
1123 ````  
1124  
1125 ### 5.4 Data Provider Gateway  
1126  
1127 Unified interface with tier-aware routing.  
1128  
1129 ````  
1130
```

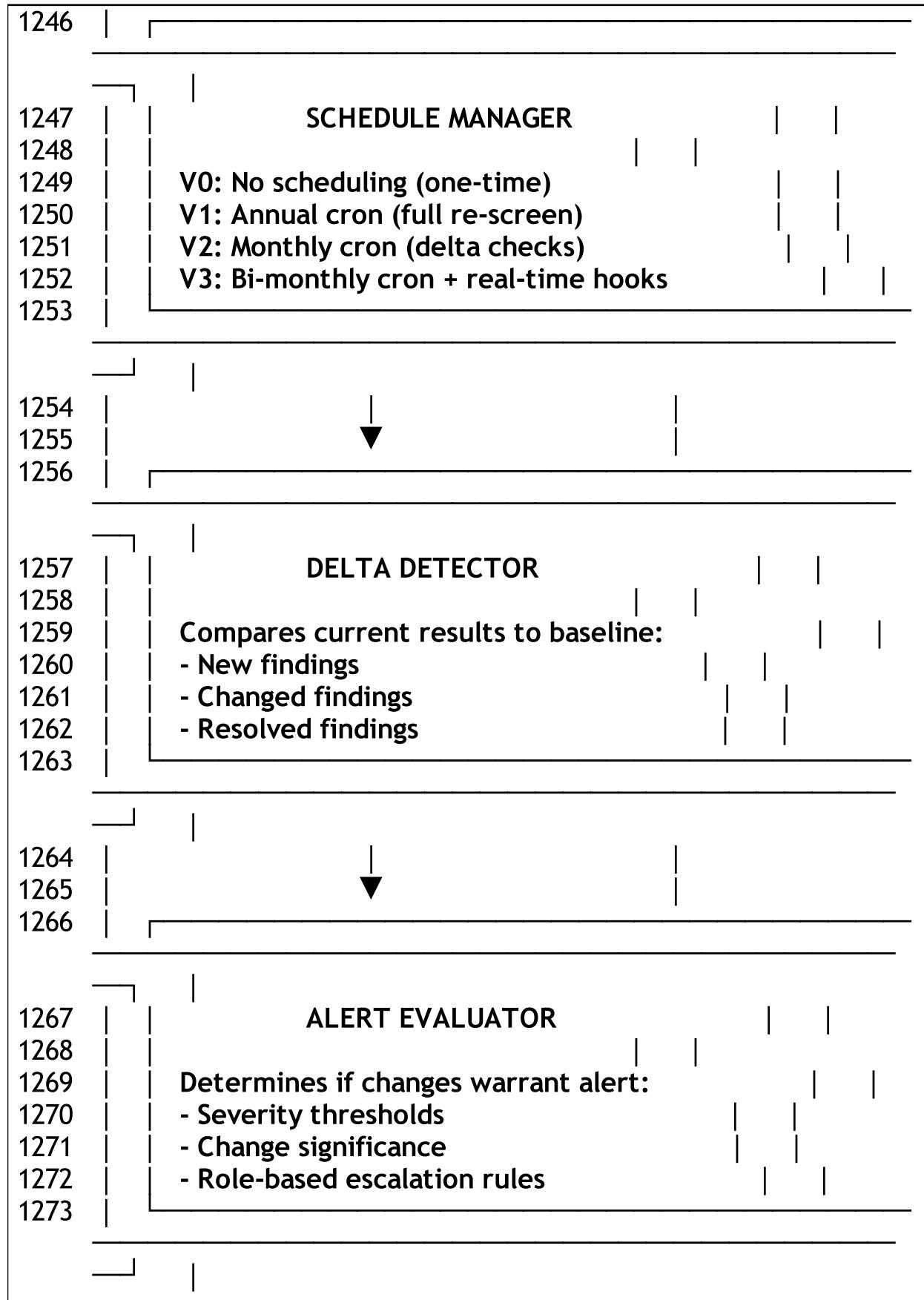


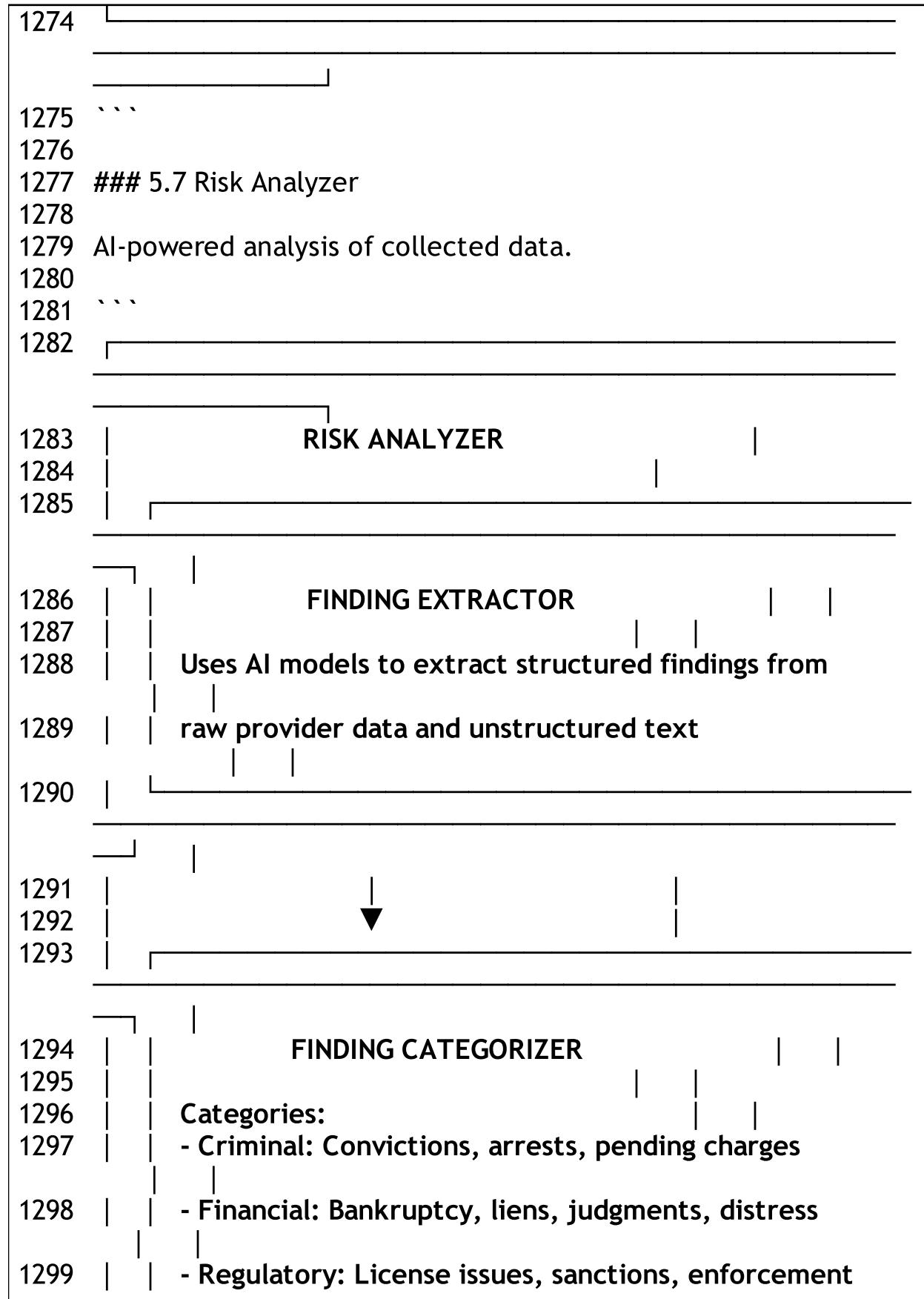


```
1186 @property
1187     def cost_tier(self) -> CostTier: ... # For billing/optimization
1188
1189     async def execute_check(
1190         self,
1191         check_type: CheckType,
1192         subject: SubjectInfo,
1193         locale: Locale,
1194         degree: SearchDegree, # May affect query scope
1195     ) -> ProviderResult: ...
1196
1197     async def health_check(self) -> ProviderHealth: ...
1198     ...
1199
1200     ### 5.5 Connection Mapper (Degree-Aware)
1201
1202     Maps relationships with depth controlled by search degree.
1203
1204     ...
1205
1206     |           CONNECTION MAPPER           |
1207     |           |           |
1208     |           |           |
1209     |           |           |           |           |
1210     |           |           |           |           |
1211     |           |           |           |           |
1212     |           |           |           |           |
1213     |           |           |           |           |
1214     |           |           |           |           |
1215     |           |           |           |           |
1216     |           |           |           |           |
1217     |           |           |           |           |
1218     |           |           |           |           |
```

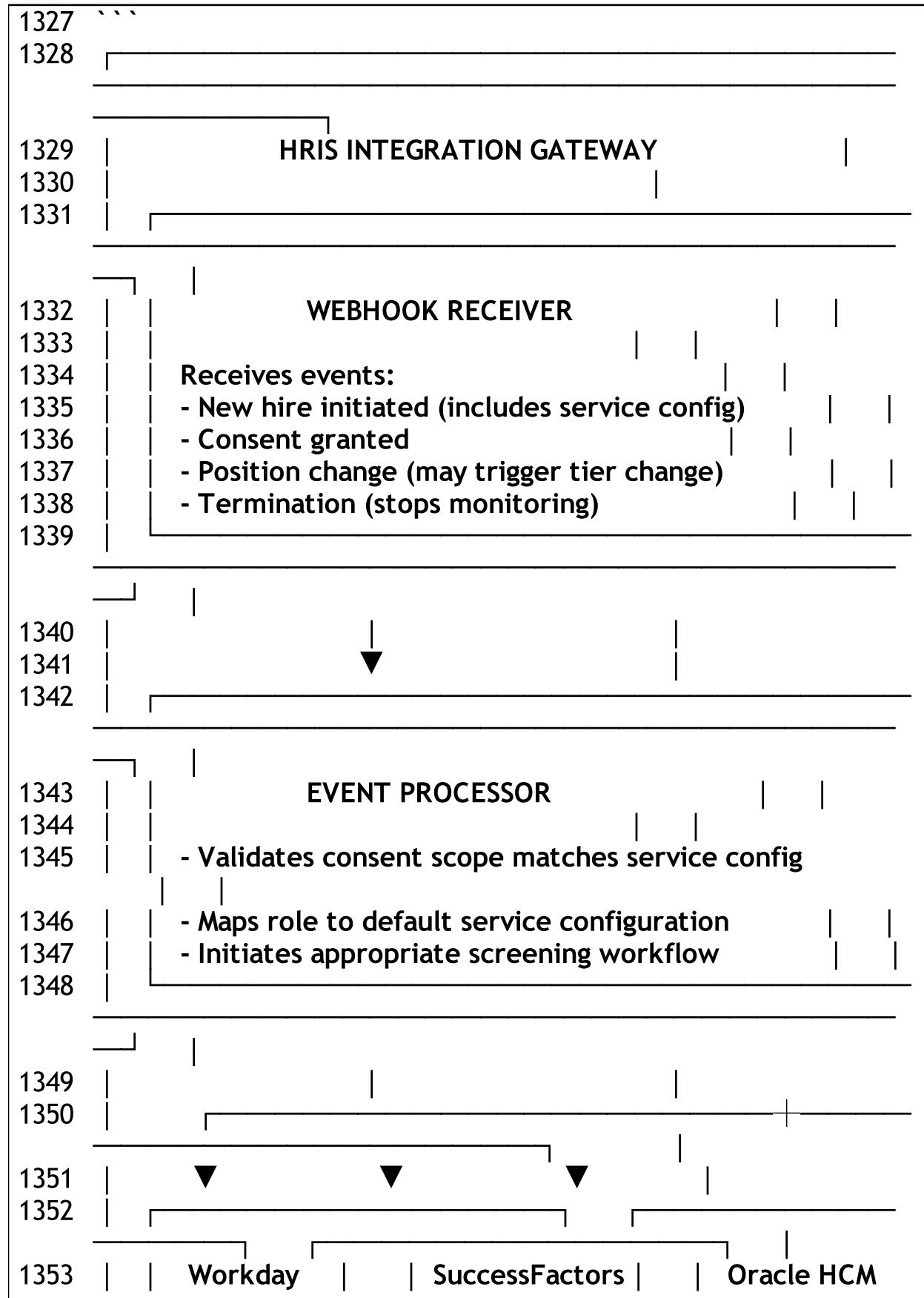
```
graph TD
    CM[CONNECTION MAPPER]
    CM --- H1[ ]
    CM --- H2[ ]
    CM --- H3[ ]
    CM --- H4[ ]
    CM --- H5[ ]
    CM --- H6[ ]
    CM --- H7[ ]
    CM --- H8[ ]
    CM --- H9[ ]
    CM --- H10[ ]
    CM --- H11[ ]
    CM --- H12[ ]
    CM --- H13[ ]
    CM --- H14[ ]
    CM --- H15[ ]
    CM --- H16[ ]
    CM --- H17[ ]
    CM --- H18[ ]
    EE[ENTITY EXTRACTOR]
    EE --- O[Extracts entities from findings:  
- Organizations (employers, businesses)  
- Individuals (associates, directors)  
- Addresses (shared residences)]
    O --- O1[ ]
    O --- O2[ ]
    O --- O3[ ]
    O --- O4[ ]
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```

```
1218 |           |
1219 |           |           DEGREE CONTROLLER
1220 |           |
1221 |           |           D1: Extract entities, do not investigate
1222 |           |           D2: Investigate direct connections (queue entities
1223 |           |           )
1224 |           |           D3: Investigate + queue second-degree connections
1225 |           |
1226 |           |           ↓
1227 |           |
1228 |           |
1229 |           |           GRAPH BUILDER
1230 |           |           Builds relationship graph:
1231 |           |           - Subject → Entity connections
1232 |           |           - Entity → Entity connections (D2+)
1233 |           |           - Risk propagation through connections
1234 |           |
1235 |           |
1236 |           |           ``
1237 |           |
1238 ### 5.6 Vigilance Scheduler
1239 |
1240 |   Manages ongoing monitoring based on vigilance level.
1241 |
1242 |   ``
1243 |   |
1244 |           VIGILANCE SCHEDULER
1245 |           |
```





```
1299 | |
1300 | | - Reputation: Adverse media, litigation | |
1301 | | - Verification: Discrepancies in claimed history
1302 | | - Behavioral: Concerning patterns (Enhanced only)
1303 | | - Network: Risky connections (D2/D3 only) | |
1304 |
1305 |
1306 |
1307 |
1308 | | RISK SCORER | |
1309 | | Inputs: | |
1310 | | - Finding severity | |
1311 | | - Finding recency | |
1312 | | - Role relevance (financial crime → finance role) | |
1313 | | ) | |
1314 | | - Confidence level | |
1315 | | - Corroboration across sources | |
1316 | | - Connection risk propagation (D2/D3) | |
1317 | | ) | |
1318 | | Output: Composite risk score with category breakdown | |
1319 |
1320 |
1321 ``
1322
1323 ### 5.8 HRIS Integration Gateway
1324
1325 Connects to HR systems for consent and workflow.
1326
```



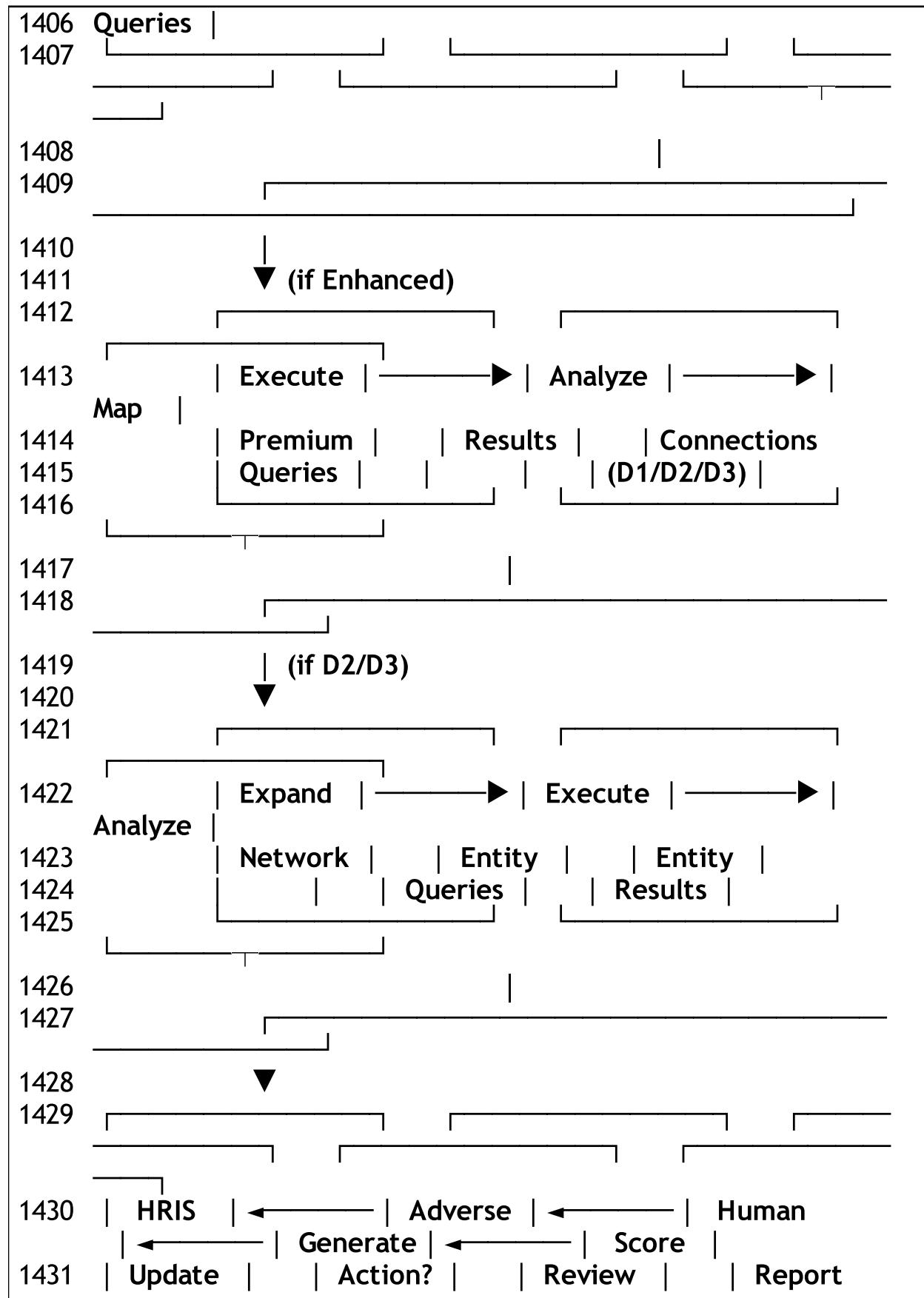
```
1353 |   |   |
1354 |   |   Adapter   |   |   Adapter   |   |   Adapter
1355 |   |   |
1356 |   |   |
1357 |   |   |
1358 |   |   RESULT PUBLISHER
1359 |   |   |
1360 |   |   - Status updates
1361 |   |   - Risk summary (detail level configurable)
1362 |   |   - Monitoring alerts
1363 |   |   - Adverse action workflow triggers
1364 |   |   |
1365 |   |   |
1366 |   |   ...
1367 |   |   |
1368 |   |   ### 5.9 Audit Logger
1369 |   |   |
1370 |   |   Comprehensive logging for compliance.
1371 |   |   |
1372 |   |   ...
1373 |   |   |
1374 |   |   AUDIT LOGGER
1375 |   |   |
1376 |   |   |
1377 |   |   EVENT COLLECTOR
1378 |   |   |
1379 |   |   Captures all events including:
1380 |   |   - Service configuration used
```

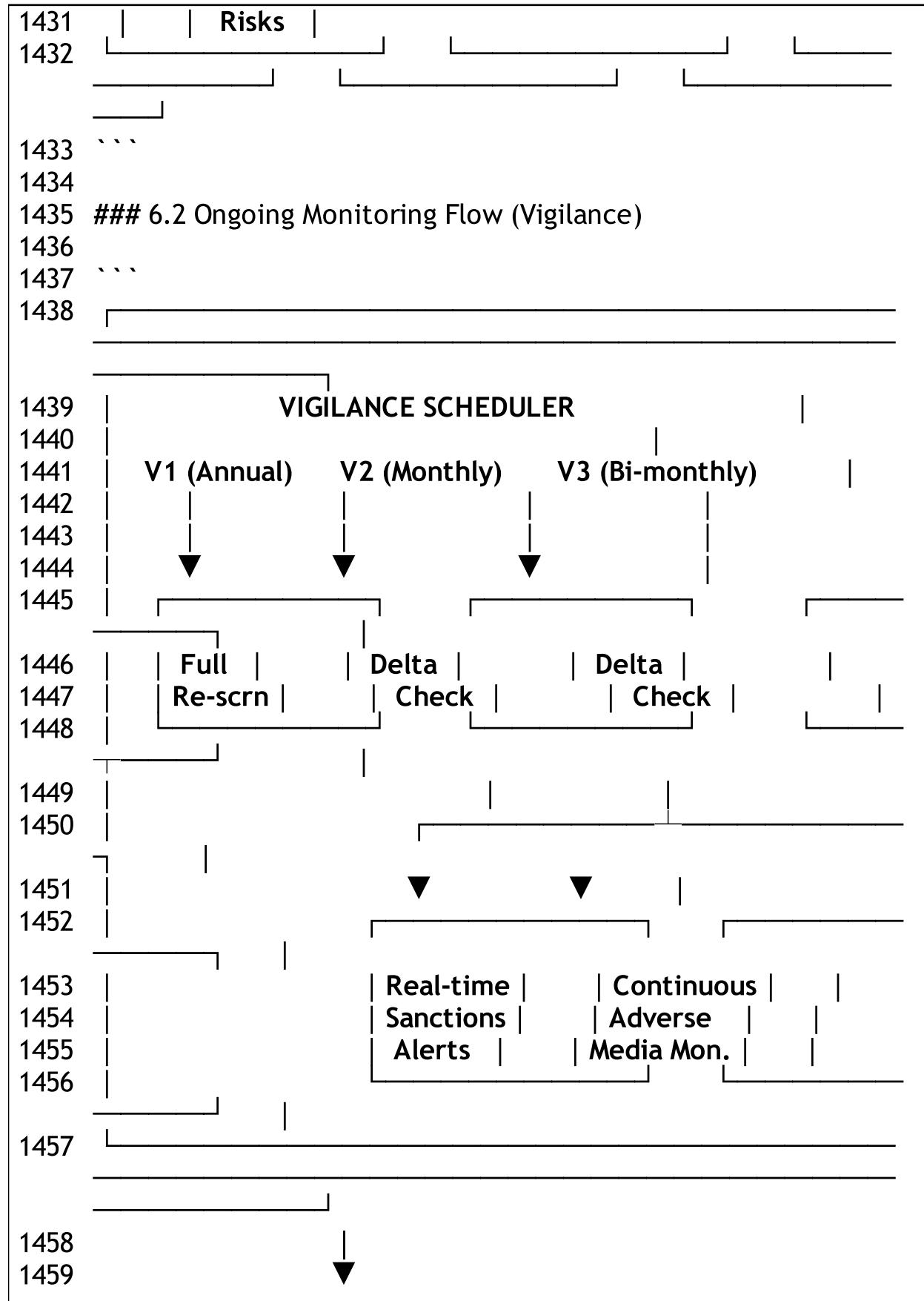
```

1381 |     | - Data sources queried (with tier) |
1382 |     | - Premium source access (Enhanced tier) |
1383 |     | ) |
1384 |     |     | - Degree expansion decisions |
1385 |     |     | - Vigilance check executions |
1386 |
1387 |
1388 |
1389 |     | IMMUTABLE LOG STORE |
1390 |     | |
1391 |     | Append-only with cryptographic integrity |
1392 |
1393 |
1394 ``
1395
1396 ---
1397
1398 ## 7. Data Flow
1399
1400 ### 6.1 Pre-Employment Screening Flow
1401
1402 ``
1403 |
1404 |     | HRIS | -----> | Validate | -----> | Resolve |
1405 |     | Request | -----> | Compliance | -----> | Execute |
1406 |     |         | Config | Sources | Filter |
1407 |     |         | (T/V/D) | (T1/T2) | |

```

The diagram illustrates the flow of data processing. It starts with a list of actions (1381-1385) enclosed in a box. A horizontal line extends from the end of this box to the start of a vertical line. This vertical line has a downward-pointing arrow between lines 1386 and 1387. Below this arrow is another horizontal line with brackets spanning from line 1388 to the end of the list (line 1403). The text 'IMMUTABLE LOG STORE' is centered above the bracketed area. Below this, the list continues with 'Append-only with cryptographic integrity' (1391), followed by several blank lines (1392-1393), three dots (1394), a dash (1395), another dash (1396), and a section header '## 7. Data Flow' (1398). The next section, '### 6.1 Pre-Employment Screening Flow' (1400), is preceded by three dots (1401). The final part of the diagram shows a sequence of boxes and arrows: 'HRIS' (1404) leads to 'Validate' (1404), which leads to 'Resolve' (1404). Below 'HRIS' is 'Request' (1405), which leads to 'Compliance' (1405), which leads to 'Execute' (1405). Below 'Compliance' is 'Config' (1405). Below 'Execute' is 'Sources' (1405), which leads to 'Filter' (1405). Below 'Request' is 'Core' (1406), and below 'Sources' is '(T1/T2)' (1406).





```

1460
1461 | Delta | -----> | Alert | -----> | Trigger
1462 |-----> | HRIS |
1463 | Detected | Evaluate | Review | Notify |
1464 ````
1465
1466 ---
1467
1468 ## 8. API Design
1469
1470 ### 7.1 Core Endpoints
1471
1472 | Endpoint | Method | Description |
1473 |-----|-----|-----|
1474 | `/v1/screenings` | POST | Initiate new screening with service config |
1475 | `/v1/screenings/{id}` | GET | Get screening status/results |
1476 | `/v1/screenings/{id}/report` | GET | Download screening report |
1477 | `/v1/subjects/{id}/monitor` | POST | Start ongoing monitoring |
1478 | `/v1/subjects/{id}/monitor` | PUT | Update vigilance level |
1479 | `/v1/subjects/{id}/monitor` | DELETE | Stop monitoring |
1480 | `/v1/service-configs` | GET | List available service configurations |
1481 | `/v1/service-configs/validate` | POST | Validate a service configuration |
1482 | `/v1/compliance/rules` | GET | List compliance rules |
1483 | `/v1/audit/events` | GET | Query audit log |
1484
1485 ### 7.2 Screening Request Schema
1486
1487 ````python
1488 class ScreeningRequest(BaseModel):
1489     # Subject identification
1490     subject: SubjectInfo
1491

```

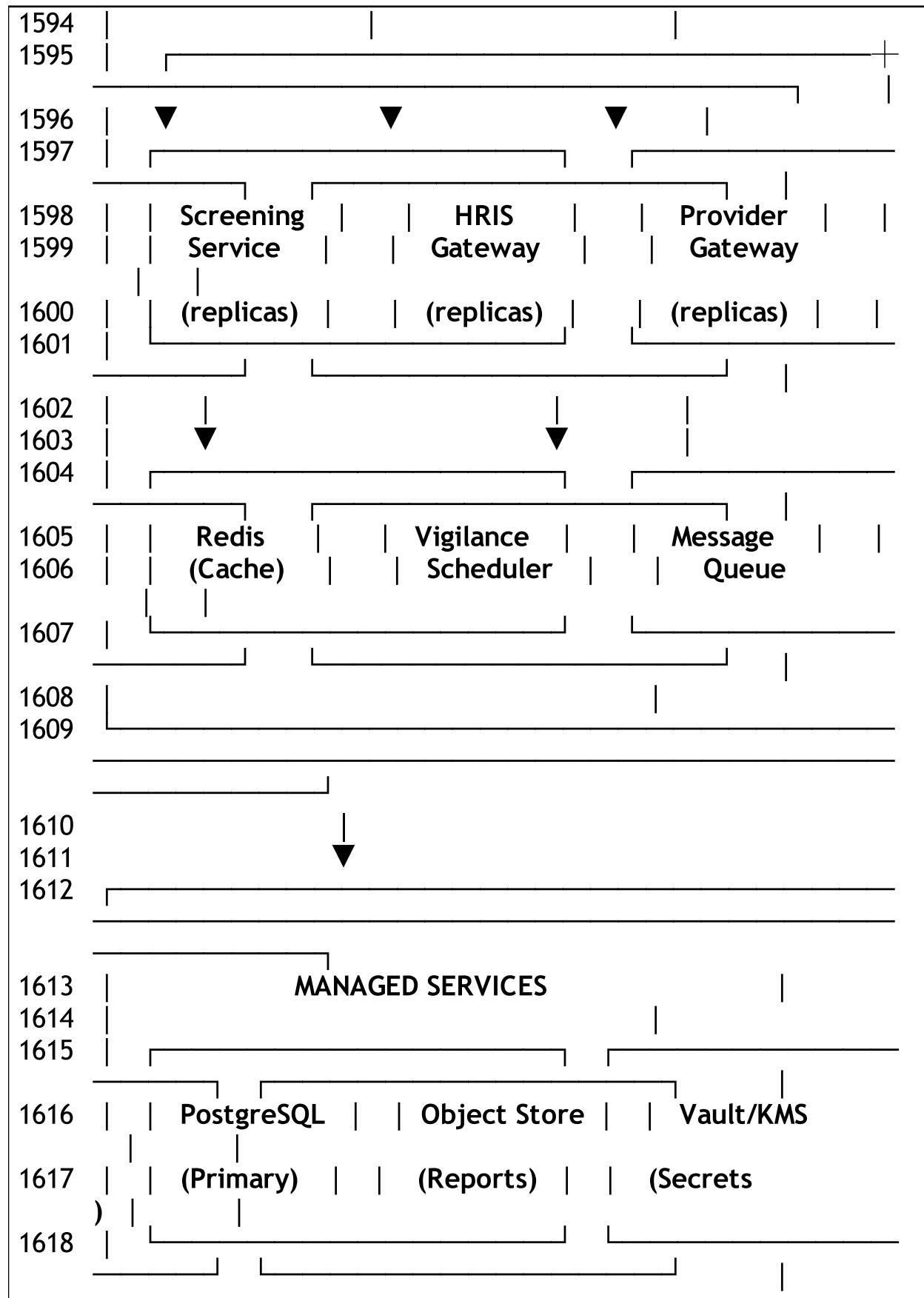
```

1492 # Compliance context (REQUIRED)
1493 locale: Locale
1494 role_category: RoleCategory
1495
1496 # Service configuration (REQUIRED)
1497 service_config: ServiceConfiguration
1498
1499 # Or use preset
1500 # service_preset: str # e.g., "government_classified"
1501
1502 # Workflow
1503 callback_url: str | None
1504 priority: Priority = Priority.NORMAL
1505
1506 # Consent reference
1507 consent_reference: str
1508
1509
1510 class ServiceConfiguration(BaseModel):
1511     tier: ServiceTier          # standard | enhanced
1512     vigilance: VigilanceLevel # v0 | v1 | v2 | v3
1513     degrees: SearchDegree    # d1 | d2 | d3
1514     human_review: ReviewLevel # automated | analyst |
1515         investigator | dedicated
1516
1517     # Optional customizations
1518     additional_checks: list[CheckType] = []
1519     excluded_checks: list[CheckType] = []
1520     ``
1521
1522
1523 ## 9. Security Architecture
1524
1525 ### 8.1 Data Protection
1526
1527 | Data Type | At Rest | In Transit | Access Control |
1528 |-----|-----|-----|-----|
1529 | PII | AES-256 encryption | TLS 1.3 | Role-based + need-to-
1530   know |

```

1530	Premium source data AES-256 + additional isolation TLS 1.3
	Enhanced tier entitlement
1531	API Keys Vault/HSM TLS 1.3 Service accounts only
1532	Audit Logs Encrypted, immutable TLS 1.3 Append-only, admin read
1533	Reports Encrypted TLS 1.3 Time-limited access tokens
1534	
1535	### 8.2 Access Control Model
1536	
1537	```
1538	
1539	RBAC + ABAC HYBRID
1540	
1541	Roles:
1542	- admin: Full system access, compliance rule management
1543	- analyst: Review findings, generate reports
1544	- operator: Initiate screenings, view status
1545	- auditor: Read-only access to audit logs
1546	- service: Machine-to-machine API access
1547	
1548	Attributes:
1549	- locale: Restricts access to locale-appropriate data
1550	- organization: Multi-tenant isolation
1551	- tier_access: Standard vs Enhanced data access
1552	- clearance: Access to sensitive findings
1553	
1554	```
1555	
1556	### 8.3 Data Retention
1557	
1558	Data Type Retention Period Basis
1559	----- ----- -----
1560	Screening results 7 years FCRA, SOX
1561	Premium source data 30 days raw, 7 years findings
	Minimize exposure

```
1562 | Audit logs | 7 years | Compliance |
1563 | Consent records | Duration of employment + 7 years | Legal |
1564
1565 ---
1566
1567 ## 10. Technology Stack
1568
1569 | Layer | Technology | Rationale |
1570 |-----|-----|-----|
1571 | Language | Python 3.14 | Async support, AI/ML ecosystem |
1572 | Orchestration | LangGraph | Stateful workflows, conditional
routing |
1573 | AI Models | Claude, GPT-4, Gemini | Multi-model redundancy |
1574 | API Framework | FastAPI | Async, OpenAPI, validation |
1575 | Database | PostgreSQL | ACID, JSON support, mature |
1576 | Cache | Redis | Session state, rate limiting |
1577 | Queue | Redis Streams / RabbitMQ | Async job processing |
1578 | Scheduler | Celery / APScheduler | Vigilance scheduling |
1579 | Secrets | HashiCorp Vault | Secure credential management |
1580 | Observability | OpenTelemetry + Prometheus | Tracing,
metrics |
1581 | Logging | structlog + ELK | Structured audit logs |
1582
1583 ---
1584
1585 ## 11. Deployment Architecture
1586
1587 ``
1588
1589 | KUBERNETES CLUSTER
1590 |
1591
1592 | INGRESS / API GATEWAY
1593 |
```



1619

1620 ````

1621

1622 ---

1623

1624 ## 12. Open Questions / Decisions Needed

1625

1626 1. **Provider Strategy**: Build direct integrations vs. use aggregator (Sterling/HireRight)?

1627 2. **Multi-tenancy**: Single instance multi-tenant vs. tenant-per-deployment?

1628 3. **AI Model Selection**: Which model for which task (extraction vs. scoring)?

1629 4. **Report Format**: PDF generation approach, template system?

1630 5. **Adverse Action Workflow**: Full FCRA workflow in-system vs. HRIS-managed?

1631 6. **Premium Data Consent**: Separate consent flow for Enhanced tier data sources?

1632 7. **Billing Integration**: Usage-based billing hooks for tier/vigilance/degree?

1633

1634 ---

1635

1636 ## 13. Implementation Phases

1637

1638 This section will be expanded after architecture review.

1639

1640 | Phase | Focus | Key Deliverables |

1641 |-----|-----|-----|

1642 | 1 | Foundation | Service model, core screening, compliance engine |

1643 | 2 | Standard Tier | Core data providers, D1/D2 connections |

1644 | 3 | Enhanced Tier | Premium providers, D3 network analysis |

1645 | 4 | Vigilance | Scheduler, monitoring, delta detection |

1646 | 5 | HRIS Integration | Workday connector, consent workflow |

1647 | 6 | Production | Security hardening, scalability, observability |

1648

1649 ---

1650

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