

AI Detection to CoP Integration

Project Progress Report - PRODUCTION READY

Phase Timeline

PHASE 01: Foundation [=====] 100% (6/6 DONE)

PHASE 02: Core Features [=====] 100% (5/5 DONE)

PHASE 03: Offline-First [=====] 100% (4/4 DONE)

PHASE 04: Security & Performance [=====] 100% (8/8 DONE)

PHASE 05: Production Deployment [=====] 100% (7/7 DONE)

Test Coverage

Service	Tests	Status
Geolocation Service	27	PASS
CoT Service	15	PASS
Audit Trail Service	41	PASS
Offline Queue Service	37	PASS
Config Service	4	PASS
JWT Service	12	PASS
API Key Service	18	PASS
Rate Limiter Service	14	PASS
Input Sanitizer Service	22	PASS
Cache Service	16	PASS
Security Service	20	PASS
Auth/Middleware/Endpoints	37	PASS
Monitoring Infrastructure	51	PASS
Acceptance Tests	14	PASS
TOTAL	331+	ALL PASS

Key Deliverables

Phase 01-03: Core Pipeline

AuditTrailService: Immutable event logging, 10 event types, database persistence

OfflineQueueService: SQLite queue, persistence, recovery, connectivity monitoring

GeolocationService: Photogrammetry-based geolocation with confidence levels

CotService: TAK/ATAK compatible CoT XML generation with type codes

Complete Detection Pipeline: Image to photogrammetry to CoT to TAK output

Phase 04: Security & Performance

JWT RS256 Authentication with token refresh and revocation

- API Key Management with scope-based access control
- Token Bucket Rate Limiting (per-client, per-IP)
- Input Sanitization (SQL injection, XSS, path traversal, command injection)
- In-Memory Caching with TTL and LFU eviction
- Security Headers (HSTS, CSP, X-Frame-Options)
- Prometheus Metrics endpoint (/metrics)
- Locust Load Testing Framework (3 user profiles)

Phase 05: Production Deployment

- Kubernetes Architecture (blue-green, HPA 3-10 replicas, topology spread)
- ArgoCD GitOps (auto-sync, self-heal, drift detection)
- Sealed Secrets for encrypted credentials in Git
- Prometheus + Loki + Grafana observability (19 alerts, 4 dashboards)
- Terraform IaC (VPC, EKS, RDS, S3, IAM modules)
- Helm Charts (10 templates)
- Disaster Recovery (daily backup, rollback < 120s)

Data Flow Architecture

Image Input → Auth/Rate Limit → Input Sanitization → Photogrammetry → CoT XML → TAK Push → [If Offline: Queue Locally] → Audit Trail + Prometheus Metrics

Completion Status

Phases Completed: 5/5 (100%)

Tests Passing: 331+ (100%)

Test Coverage: 93.5% (Target: 80%)

Test Failures: 0 (0%)

Feature Status: PRODUCTION READY (All Phases Complete)

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Project: AI Detection to CoP Integration | Status: Production Ready (Phase 04-05 Complete)