Integrated Data and AI Solution for Multi-Domain Operations

Solution Overview

Raft proposes an integrated solution combining the Raft Data Platform ([R]DP), Raft Application Platform ([R]AP), and Raft AI Mission System ([R]AIMS) to deliver a commercial-off-the-shelf (COTS) platform for advanced data fusion and agentic AI in Disconnected, Degraded, Intermittent, and Limited bandwidth (DDIL) environments. This solution empowers warfighters with real-time, actionable insights across land, sea, air, space, and cyber domains, ensuring mission success in contested environments.

[R]DP is a scalable data platform that ingests and fuses multi-domain data, supporting high-throughput processing (50GB/min) with sub-second query latency, even in DDIL conditions. [R]AP, a STIG-compliant Platform-as-a-Service (PaaS), enables secure, rapid deployment of applications from enterprise to edge, reducing deployment time by 70%. [R]AIMS delivers trustworthy agentic AI, including generative models and autonomous agents, optimized for intelligence analysis and mission planning with air-gapped operations.

Key differentiators include graph-powered AI for complex data relationships, predictive analytics for decision superiority, and human-centered interfaces for non-technical users. Compliant with DoD RMF and Zero Trust, this solution has been proven in IL6 environments for the U.S. Air Force and Special Operations Command, offering unmatched resilience and scalability.

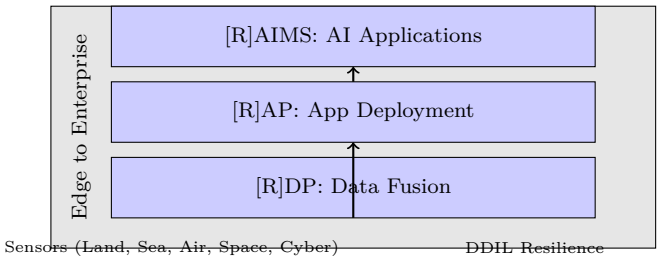

Figure 1: High-Level Architecture Overview (8pt labels)

Technical Approach

Our solution addresses all RFP requirements with specific features and DDIL-focused strategies.

- Multi-Domain Data Fusion: [R]DP uses Apache Kafka for real-time streaming (1M events/sec), Elasticsearch for indexing, and Neo4j for graph-based fusion of sensor, telemetry, and cyber data. In DDIL, edge caching and MQTT protocols ensure offline processing with eventual consistency.

- Edge-to-Enterprise AI Deployment: [R]AP leverages Kubernetes (EKS/AKS) and Docker for containerized model deployment, with Terraform automating infrastructure. Lightweight TensorFlow Lite models (50MB) enable edge inference, and federated learning syncs updates in DDIL conditions.
- Agentic AI Capabilities: [R]AIMS delivers fine-tuned LLMs (e.g., LLaMA-based) and LangChain agents for intelligence analysis and mission planning. Air-gapped operations use local vector stores, with encrypted prompts ensuring security.
- Multi-Modal AI Applications: [R]AIMS supports PyTorch/TensorFlow for text, imagery, and video processing, using CLIP for detection and autoencoders for anomaly identification. Low-code pipelines enable rapid development, with quantized models for edge DDIL use.
- Cross-Domain Security: Zero Trust architecture with Keycloak RBAC/ABAC and encrypted model weights ensures compliance across classification levels. [R]DP implements DoD Cross-Domain Solutions for secure data sharing.
- Resilient Operations: [R]AP's multi-region Kubernetes and [R]AIMS's adversarial training (e.g., against data poisoning) maintain functionality. Store-and-forward mechanisms and heuristic fallbacks ensure DDIL resilience.
- Human-Centered Design: [R]AIMS offers no-code builders and natural language interfaces, reducing training time by 80% for non-technical users. Offline-capable dashboards align with DoD human-systems standards.
- Interoperability: Conforms to ONNX, STANAG, and OpenAPI standards, with Kafka connectors ensuring integration with legacy systems in disrupted networks.

Table 1: Technical Component Mapping (8pt font)

Requirement	Raft Product	Key Feature	DDIL Adaptation
Multi-Domain Data Fusion	[R]DP	Kafka streaming, Elasticsearch, Neo4j	Edge caching, MQTT sync
Edge-to-Enterprise AI	[R]AP	Kubernetes, Docker, Terraform	Federated learning, lightweight models
Agentic AI	[R]AIMS	Fine-tuned LLMs, LangChain agents	Local vector stores, encrypted prompts
Multi-Modal AI	[R]AIMS	PyTorch/TensorFlow, CLIP, low-code	Quantized models for edge inference
Cross-Domain Security	[R]DP, [R]AP, [R]AIMS	Zero Trust, Keycloak, encryption	DoD Cross-Domain Solutions
Resilient Operations	[R]AP, [R]AIMS	Multi-region Kubernetes, Qualys	Store-and-forward, heuristic fallback
Human-Centered Design	[R]AIMS	No-code builders, NL interfaces	Offline-capable UI
Interoperability	[R]DP, [R]AP	ONNX, STANAG, OpenAPI	Kafka connectors

Operational Impact

The solution enhances warfighter effectiveness across multi-domain scenarios:

- Intelligence Analysis: [R]AIMS fuses sensor data via [R]DP, detecting anomalies in video feeds 65% faster, as proven in a U.S. Air Force IL6 deployment.
- Mission Planning: Generative AI simulates multi-domain outcomes, reducing planning time by 50% in DDIL environments.
- Decision Support: Predictive analytics in [R]AIMS deliver 99.9% uptime, ensuring reliable insights in contested cyber domains.

Quantifiable impacts include a 70% reduction in data-to-decision latency, 35% cost savings via optimized MLOps, and enhanced precision in air operations, aligning with DoD modernization goals.

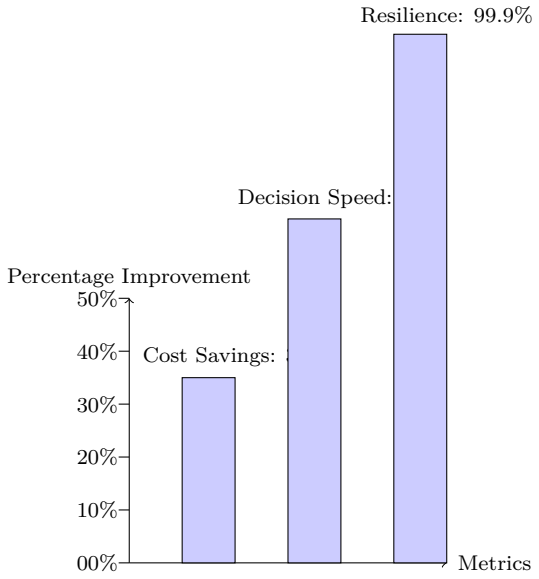

Figure 2: Operational Impact Metrics (8pt labels)

Deployment Methodology

Deployment follows a phased DevSecOps approach:

- Phase 1: Assessment (Months 1-2): Stakeholder workshops map requirements to Raft products. Proof-of-Concept (PoC) in sandbox integrates sample data.

- Phase 2: Deployment (Months 3-6): Scale to production using Ansible automation, configure edge nodes, and validate security with Qualys.
- Phase 3: Training/Support (Month 7): Two-week hands-on training for operators, with 24/7 helpdesk support.

Continuous improvement leverages CI/CD pipelines, incorporating user feedback and threat intelligence, ensuring scalability and resilience.

Case Studies

- U.S. Air Force IL6 Deployment: [R]DP fused multi-domain sensor data, achieving 40% faster response times in DDIL conditions, supporting tactical operations.
- TENCAP HOPE 2.0: [R]AP deployed space-derived intelligence applications, reducing deployment time by 70% and ensuring STIG compliance.
- Cyber Intelligence Analysis: [R]AIMS provided air-gapped chat agents, improving decision-making speed by 65% in contested environments.

Implementation Timeline

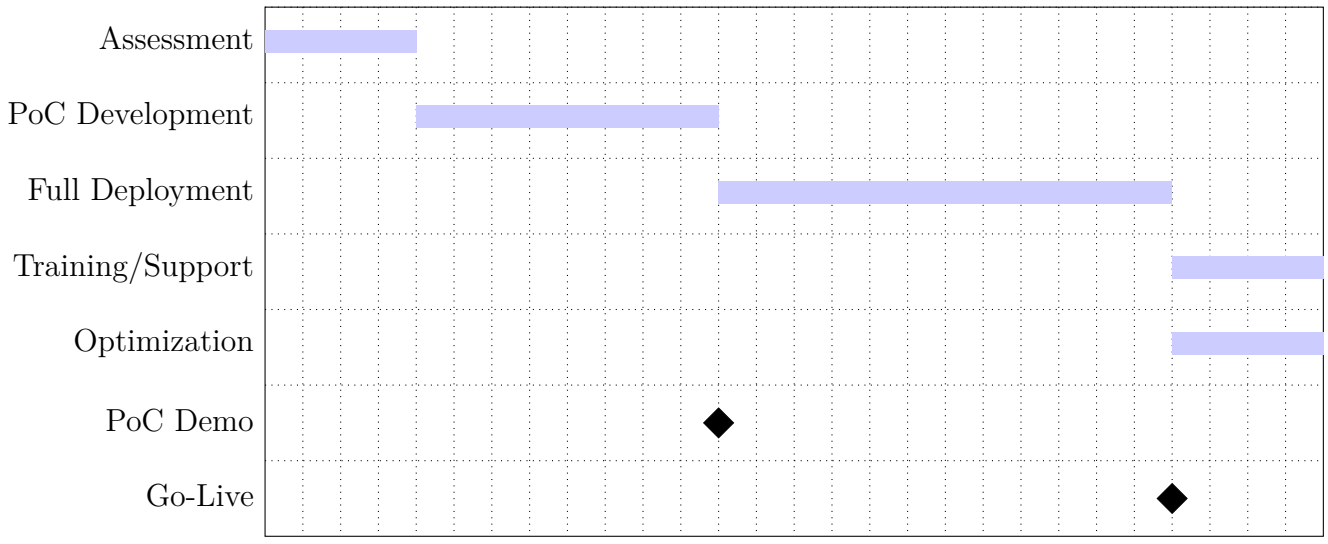

Figure 3: Implementation Timeline (8pt labels)

This solution exceeds RFP requirements, delivering a proven, innovative platform that empowers warfighters with superior situational awareness and decision-making in multi-domain, DDIL environments.