



# JOINT PROGRAM EXECUTIVE OFFICE ARMAMENTS & AMMUNITION

## TACTICAL AMMUNITION MANAGEMENT MICRO SERVICES (TAMMS)

AI4SE & SE4AI

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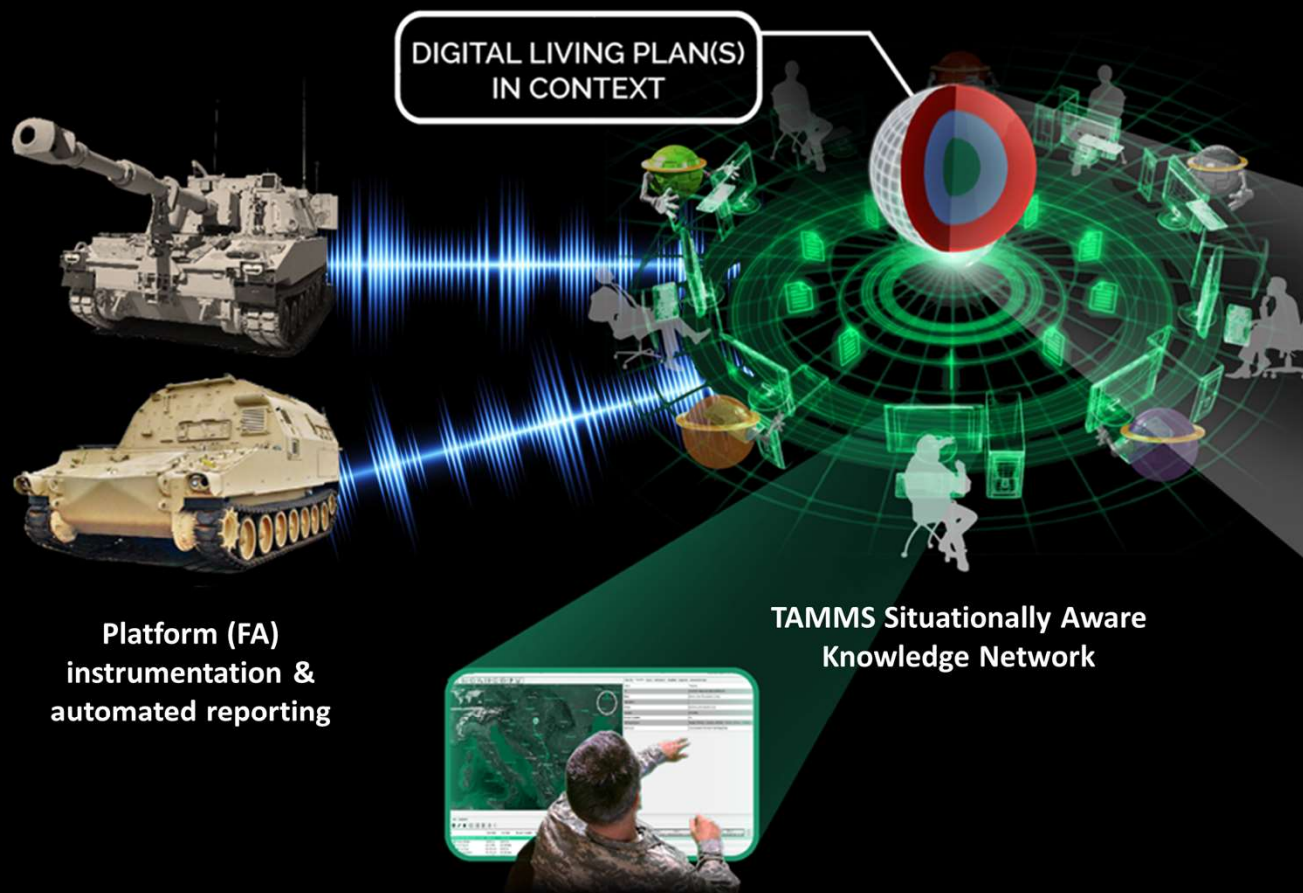
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# Tactical Ammunition Management Microservices (TAMMS)

*Ammunition Demand to Sustainment Response*

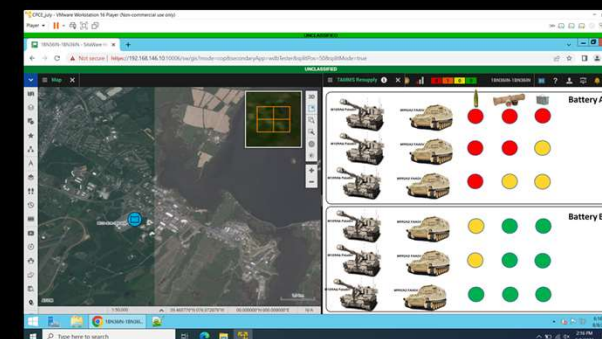
**TAMMS sustainment solution aims to:**

- 1. Collect real-time platform ammunition inventory**
- 2. Transform data collected into actionable sustainment knowledge**
- 3. Manage materiel flow against trending demand**

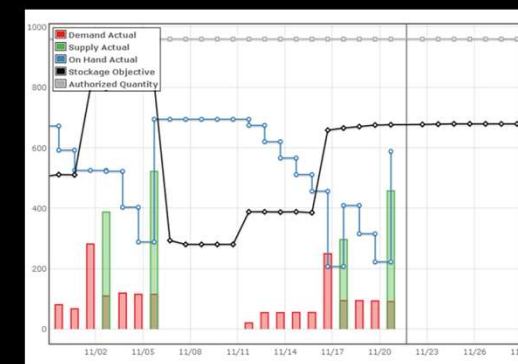


Platform (FA)  
instrumentation &  
automated reporting

TAMMS Situationally Aware  
Knowledge Network



Platform Ammo Inventory Levels



Sustainment Projections &  
Ammunition Posture



Sustainment Transportation Plans

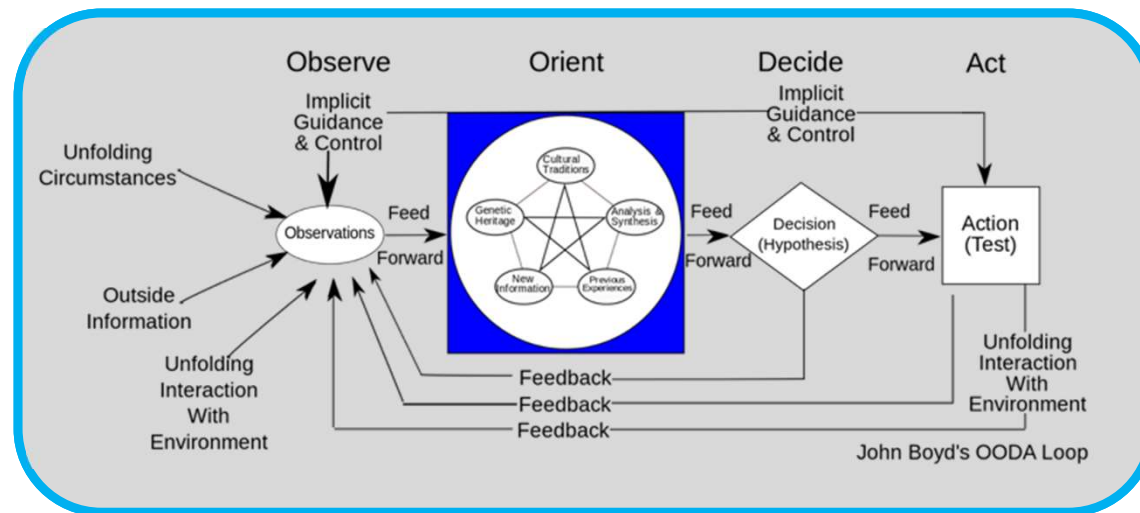
**TAMMS enables human-AI teams to conduct ammunition sustainment planning, analysis, assessment, and execution management on real-time consumption trends**

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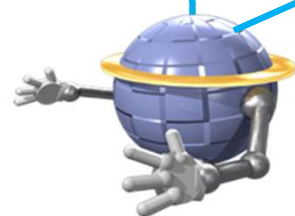
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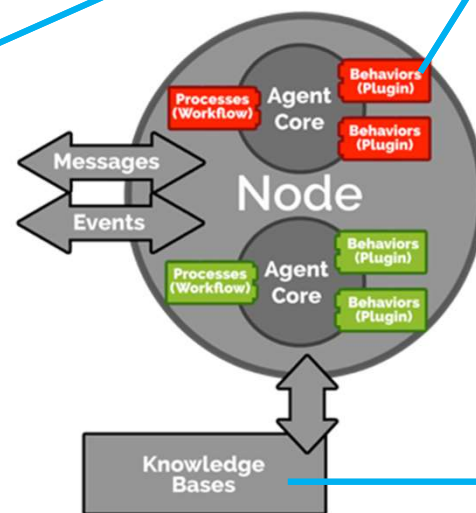
# Emulating Human Cognition with Agents



Onboard OODA Loop



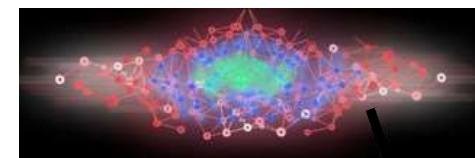
A Cognitive Agent



The 'Node' which holds core services and multiple cognitive agents

Function	Technique
Planning	HTN Planning
Resource Allocation & Sched	Genetic Programming
Routing	A*
Pattern Recognition	ML
Strategy	Game Theory
World State Reasoning	Inference & Deduction

Broad Mix of AI/ML, OR, and Math Reasoning Techniques







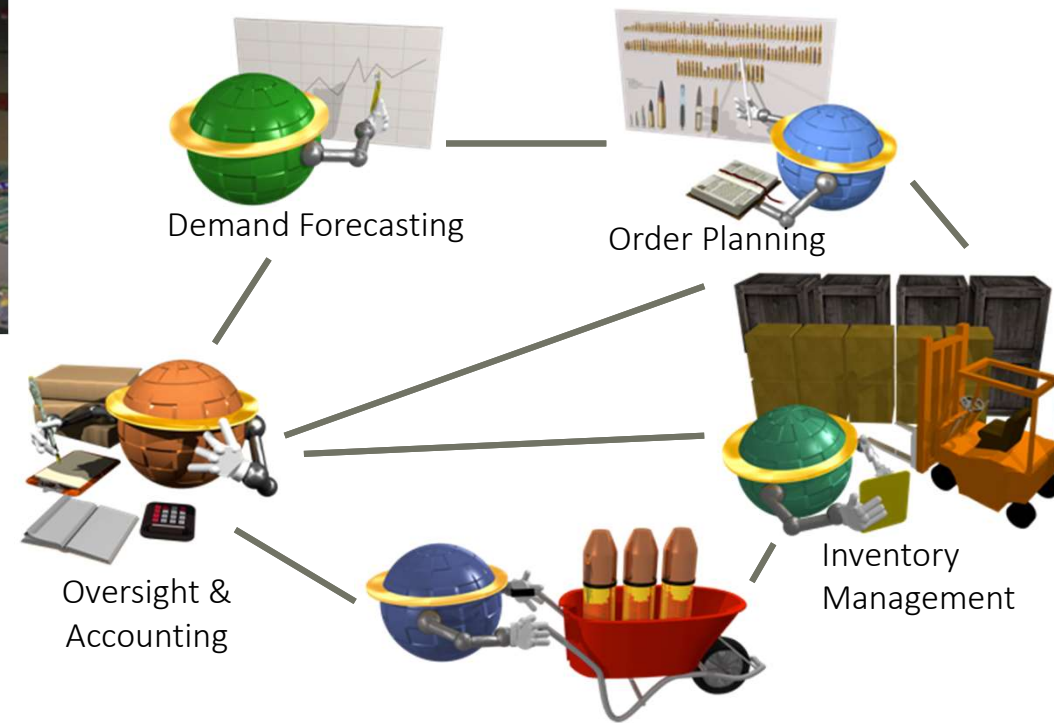
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# Agents are each Specialists, Working Together Like a Staff...



- Each staff cell has same basic skills
- Each staff cell has specialized skills
- Each staff cell has a position & role
- They operate together executing missions
- They communicate explicitly & implicitly
- Each maintains situational awareness
- The commander oversees and directs as necessary

Theater Ammo Application  
Agents Teams Solve Problems  
*[we call them a Society of Agents]*



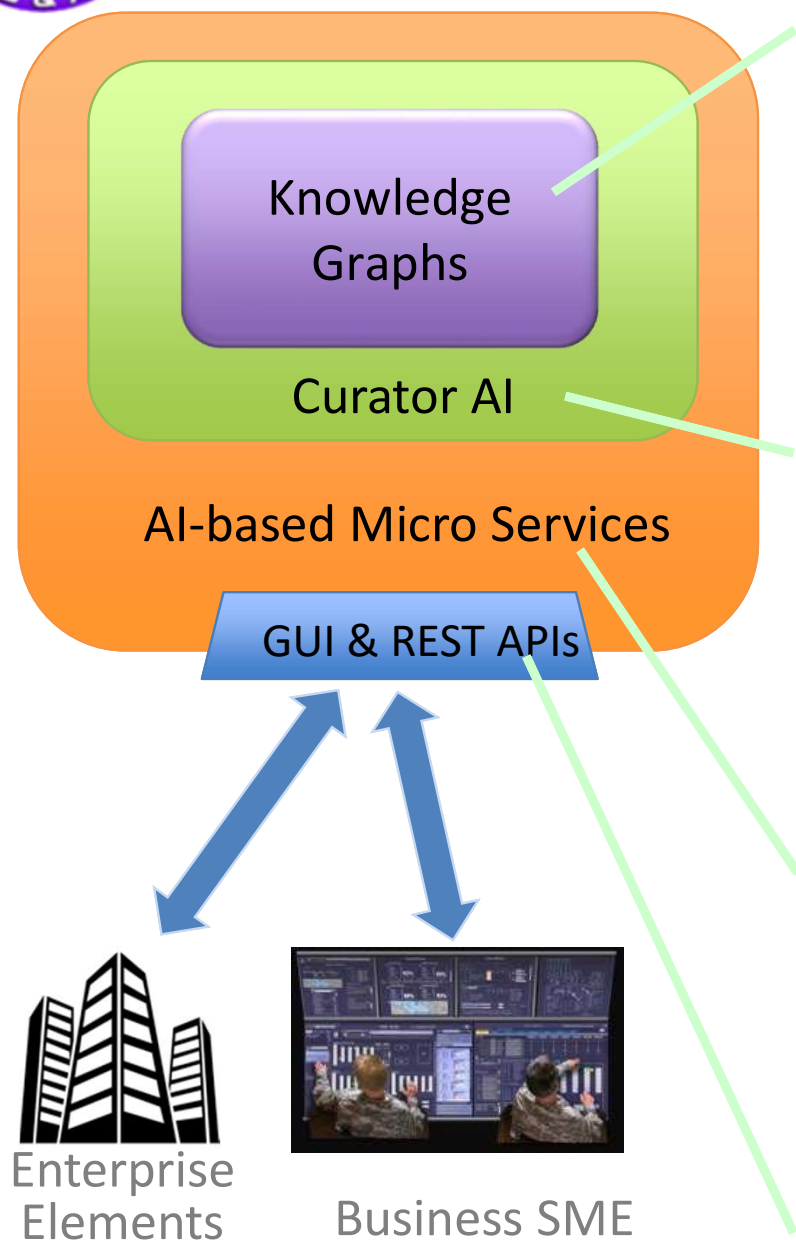
**GOAL:** Minimize inventory while  
ensuring customer demand met

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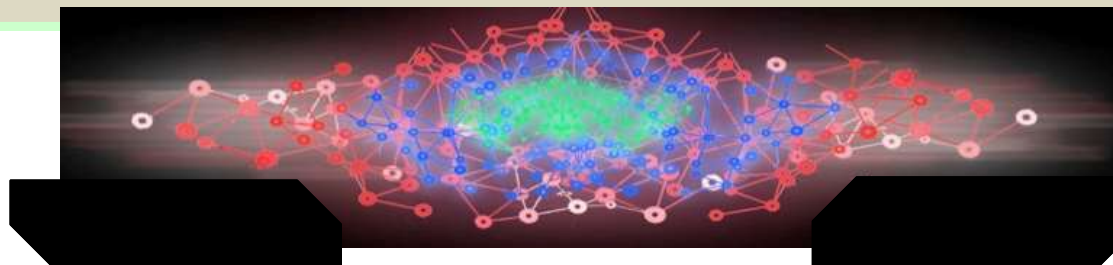
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# AI-Curation Knowledge Graph Node Concept



Semantically enhanced hybrid knowledge graphs support objects, graphs, and semantics in one integrated, scalable & secure structure



Curator AI cleans and processes incoming data, reasons about new data and changes in context, services access requests, performs maintenance, and monitors network for patterns



AI-based Micro Services provide modular functions for – multi-vendor, knowledge-graph based, and end application independent



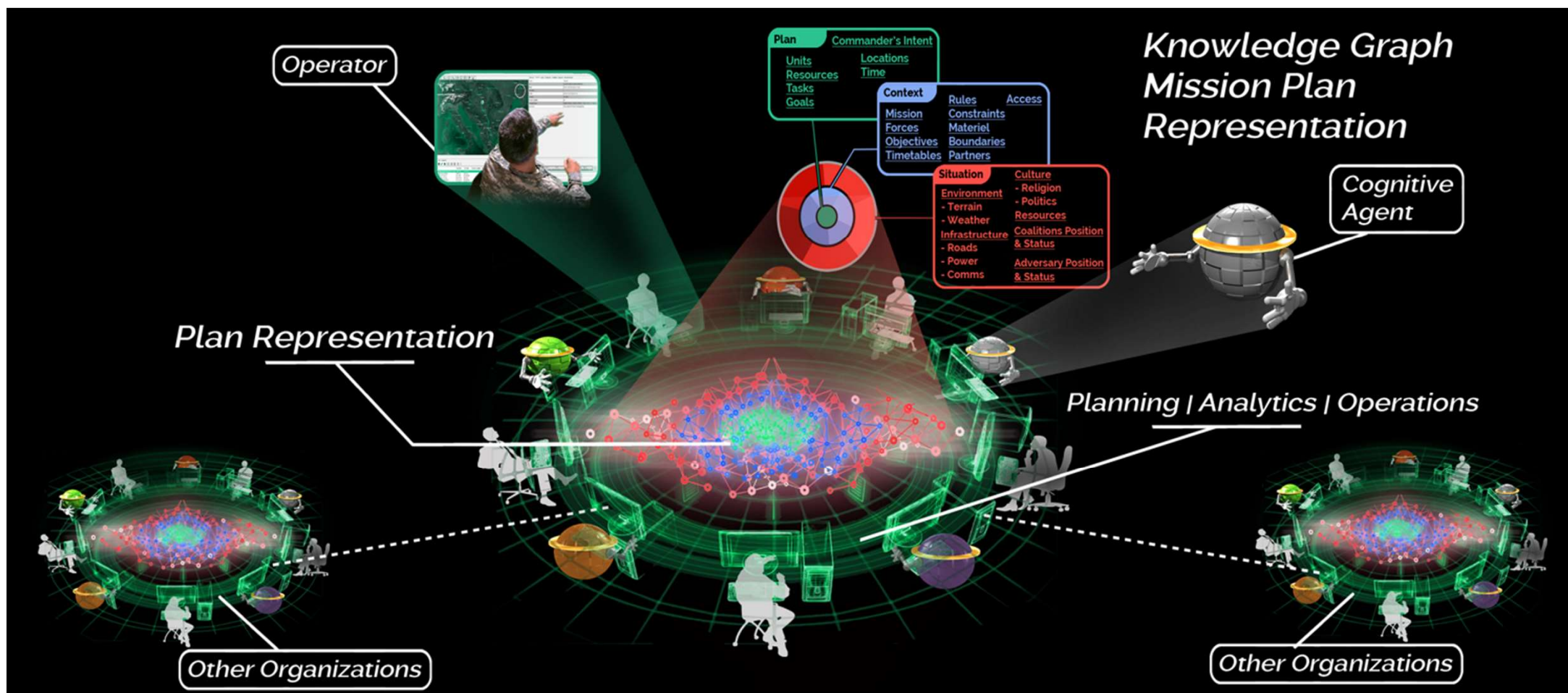
Collaborative UI for viewing data analysis and resolutions. REST APIs provide language independent standard access





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# Hybrid Knowledge Graphs Supporting Human-Collaborative Decision Making



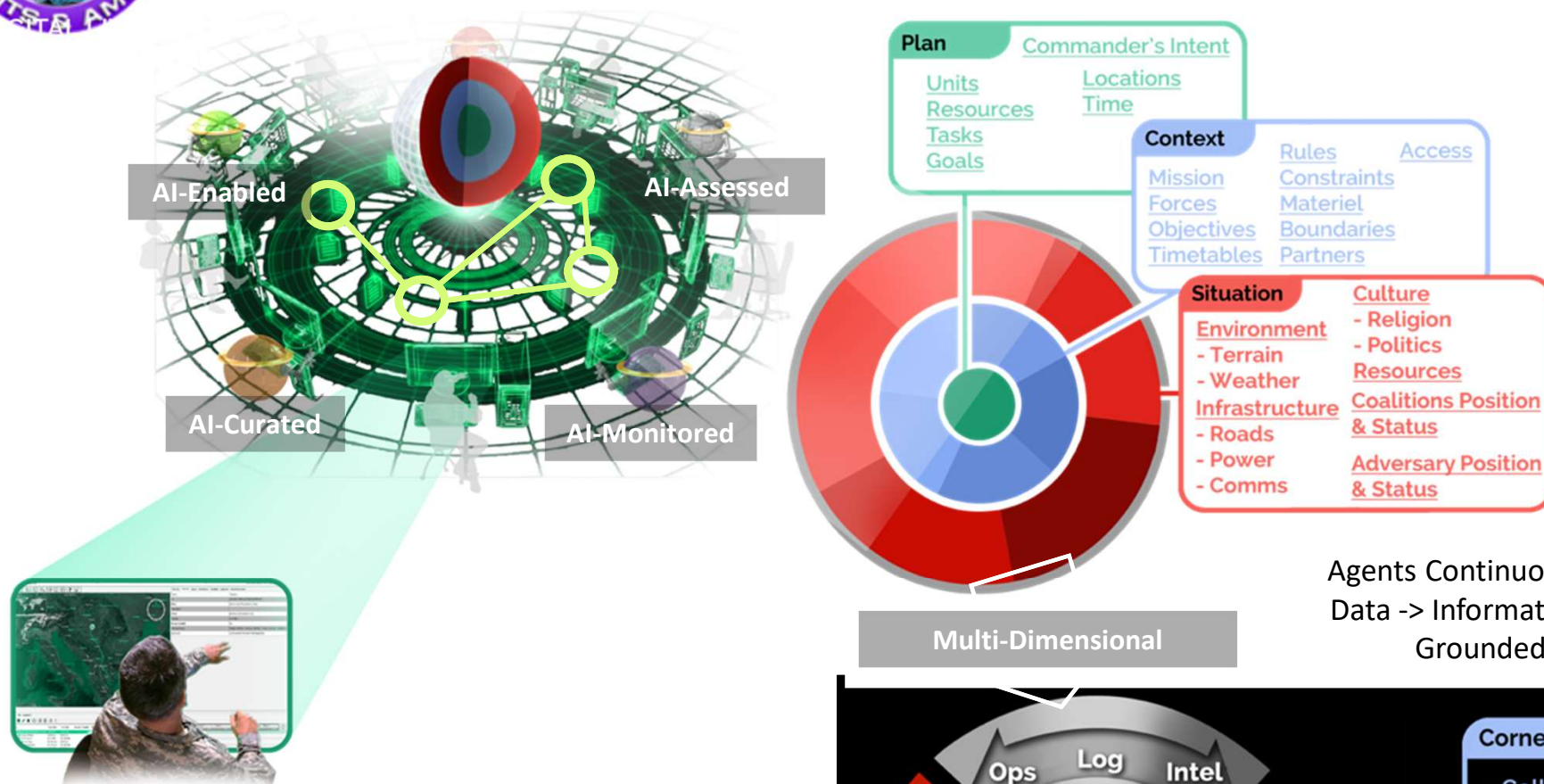
- Distributed, Collaborative, Knowledge-based
- Integrated plans, schedules, resource allocations and routes
- Analytics is integrated throughout, information constantly updating
- Decisions are made with awareness, understanding and analysis
- Humans are directing, while Autonomy is managing every details

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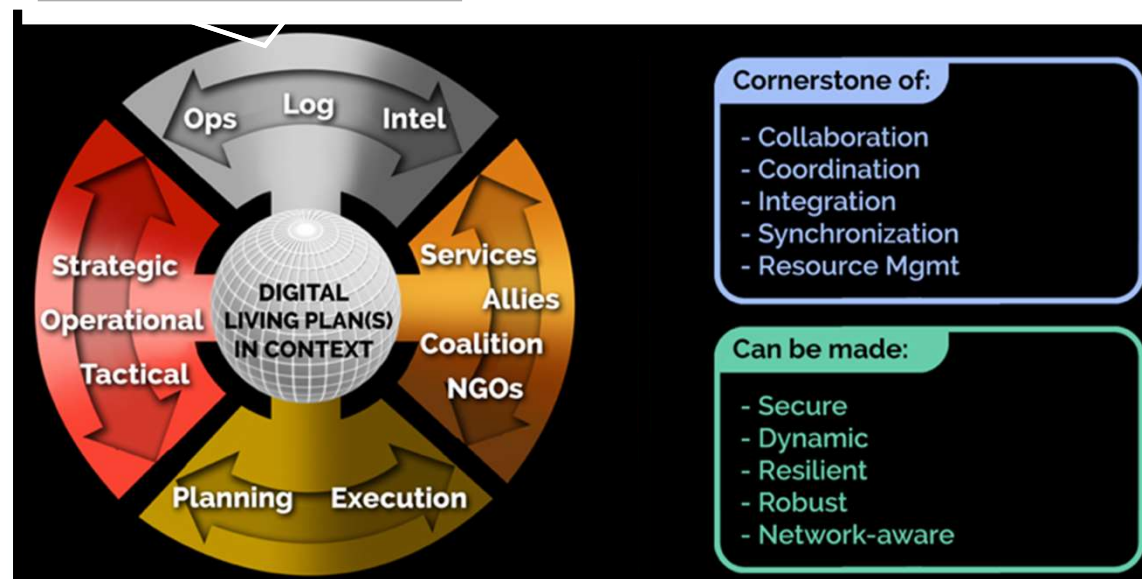


# Knowledge & Plans are the Key



Agents Continuously Transforming  
Data -> Information -> Knowledge  
Grounded in Context

Enables both humans and  
systems/autonomy to understand  
meaning of Plans & Situation





# TACTICAL AMMUNITION MANAGEMENT MICRO SERVICES (TAMMS)

**Problem Statement:** There is no effective management system for ammunition within the tactical realm for aggregating consumption, managing on-hand supplies, predicting future needs, and optimizing the delivery system(s) to meet those needs.

**Goal:** Design, develop and deploy a **Sense and Response/ Adaptive Planning human-collaborative decision support capability** to demonstrate the concept of unification of several prototype sustainment capabilities allowing **collaboration and synchronization between ammunition supply, distribution, order management and fulfillment operations.**

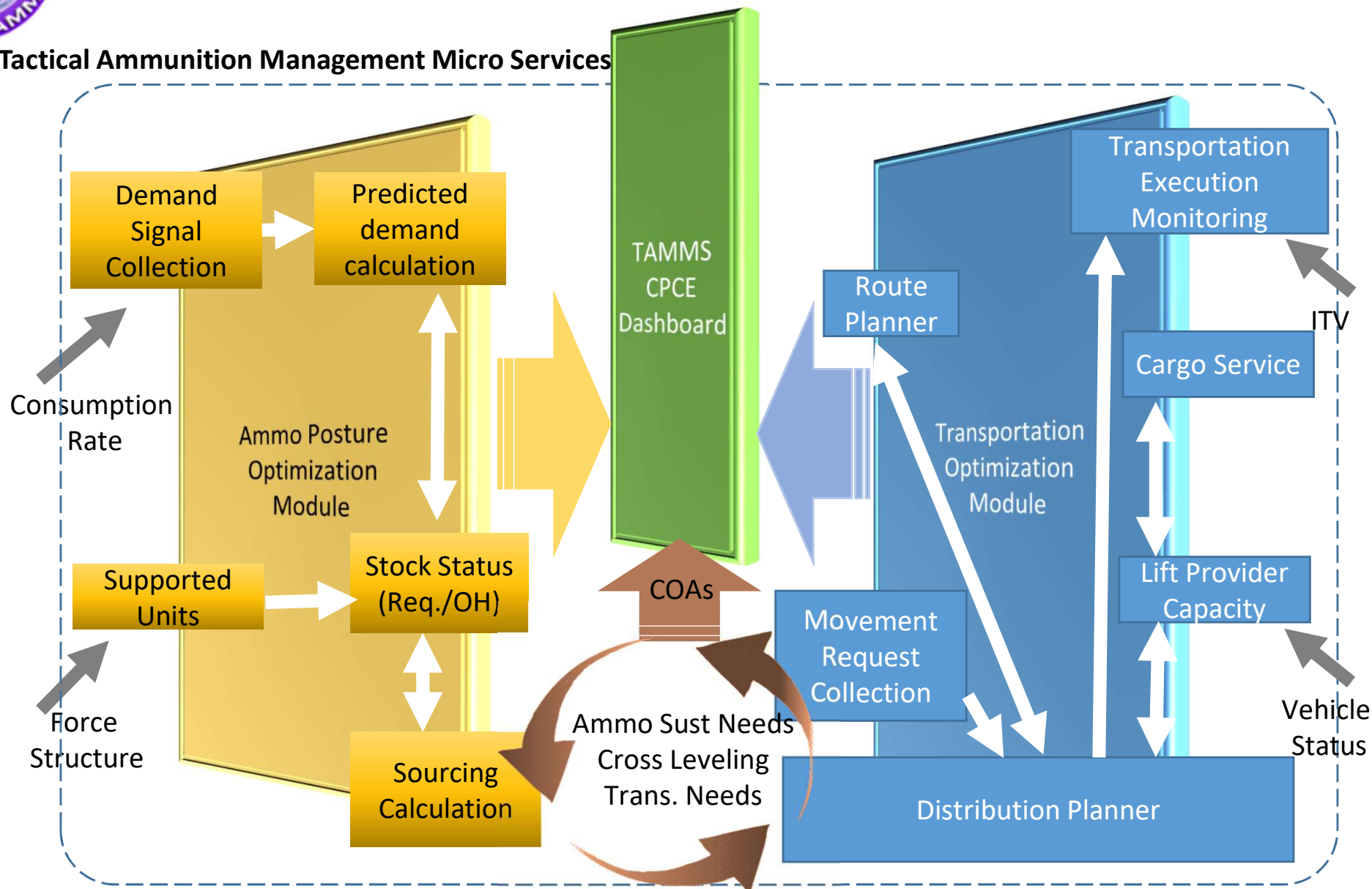
**Benefit(s):** An integrated, AI enabled, optimized ammunition management system that will provide key inputs to overall sustainment mission command capabilities and also inform lethality decisions.





# COLLABORATIVE SUSTAINMENT PLANNING

## Tactical Ammunition Management Micro Services



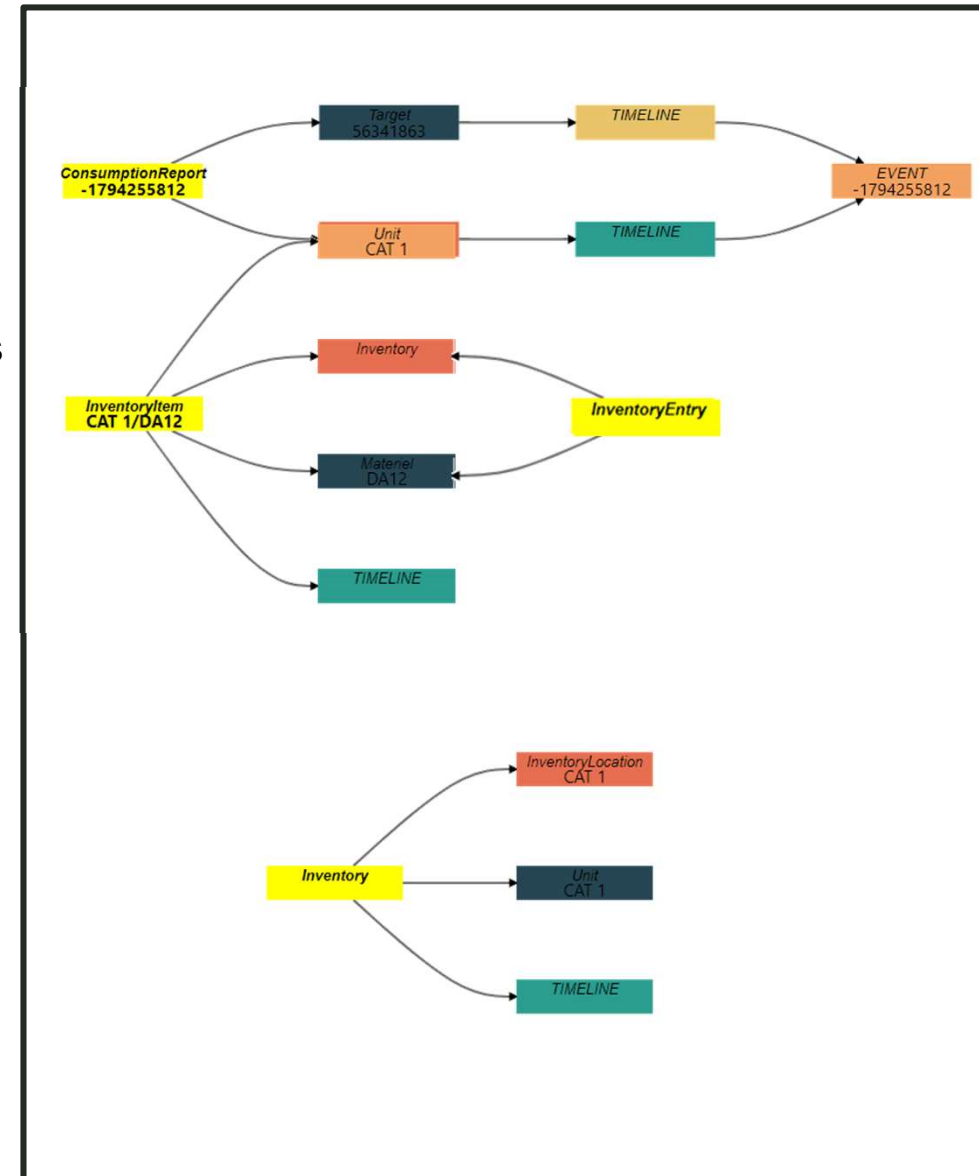
Ammo posture and transportation optimization capabilities combined into courses of action that satisfy all requirements



# TAMMS KNOWLEDGE GRAPH CURATION

TAMMS AI agents populate  
and curate the knowledge graph:

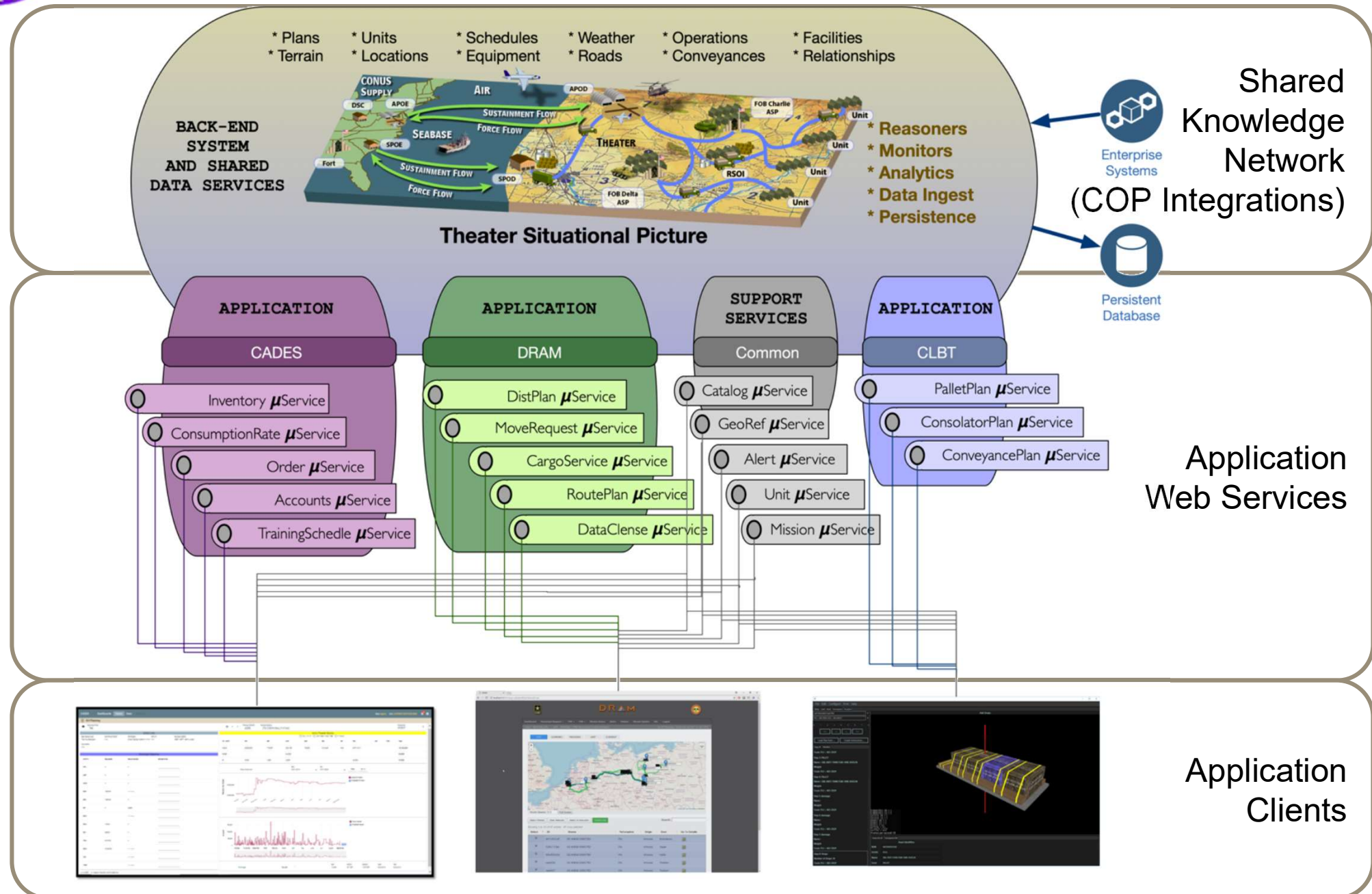
- Data from the battlefield
  - Platform ammo inventory updates/expenditures
  - Records of fire
  - Contextual operational information
  - Sustainment node inventories
  - Transportation capabilities
- Accumulated knowledge
  - Predicted Demand
  - Required stockage objectives
  - Sourcing solutions
  - Transportation plans
  - Integrated movement program







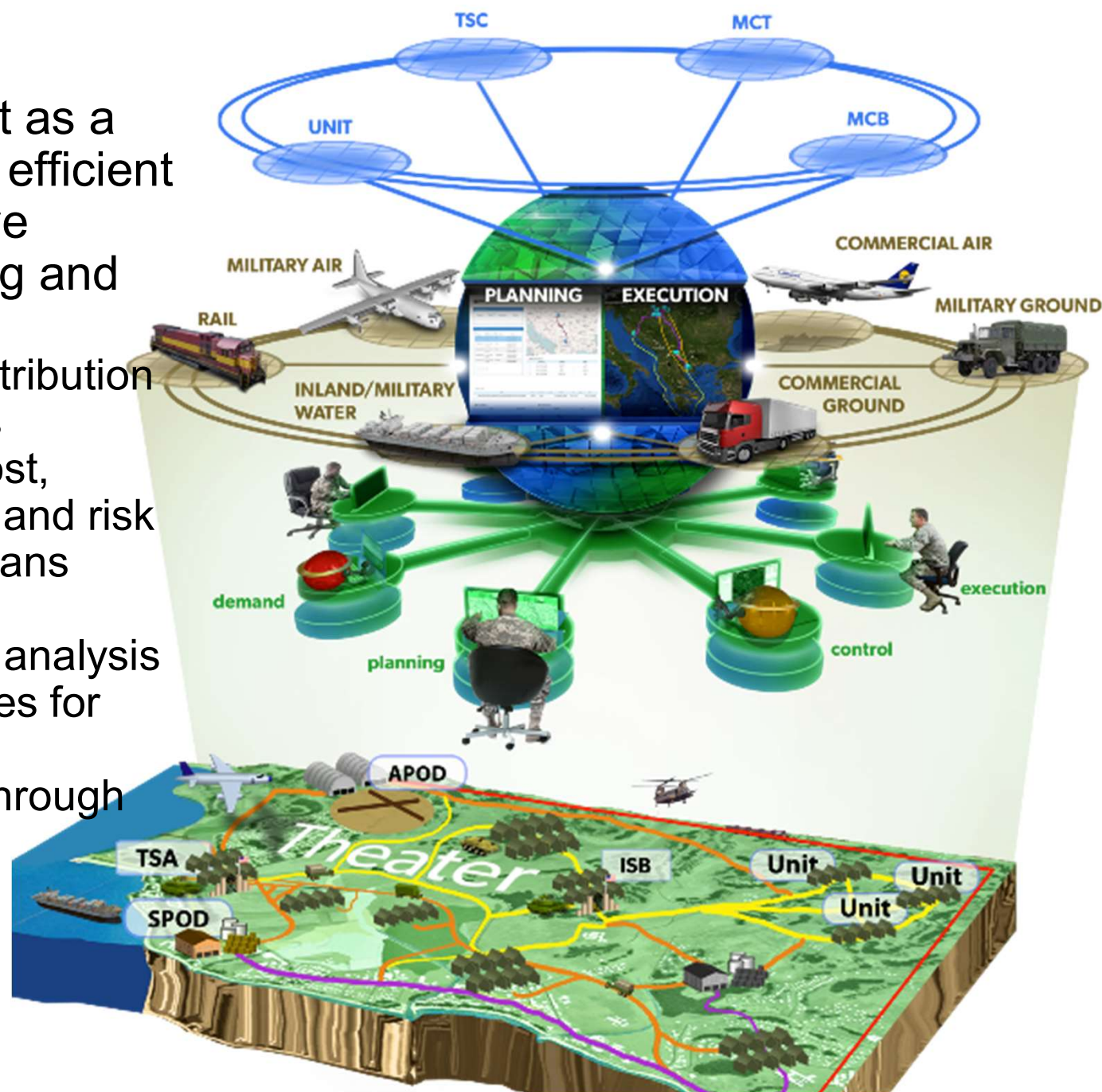
# TAMMS TIERED MICROSERVICES ARCHITECTURE





# Virtual Staff for Human-Machine Teaming

- AI software agents act as a virtual staff to support efficient human-AI collaborative transportation planning and tasking
  - Planning available distribution options across modes
  - Analyzing plans for cost, schedule, complexity, and risk
  - Ranking movement plans based on priorities
  - Providing simulation / analysis
  - Identifying opportunities for data cleansing
  - Reporting execution through dashboards
  - Alerting users to real-time deviations







# AI for Sustainment Mission Command

