# Technical Overview of Cougaar Software's (CSI) Approach to Next Generation Agentic Artificial Intelligent (Agentic AI)

What: *Agentic Unified Reasoning for Orchestrated Response & Action (AURORA) Artificial Intelligence (AI)* is a class of next-generation Agentic-AI decision support framework that integrates people, intelligent agents, and large language models within a shared, always-up-to-date understanding of the situation grounded in space and time. Multiple plans can be developed and tested within the system, allowing leaders to deeply analyze their available courses of action and select the most suitable. At the heart of AURORA AI is a real-time Hybrid Knowledge Graph, a living situational model of the world grounded in system state, time, and space. This Situational Reasoning Framework (SRF) model is continuously analyzed and refreshed by ActiveEdge agents as sensors, systems, and reports deliver new data.

Most AI solutions today rely heavily on LLMs, which are powerful but lack real understanding of their environment. AURORA AI approach uses LLMs as components of a broader AI system, maintains context in time and space, reasons about plans, and makes decisions in transparent and trustworthy ways. This breaks new ground in replicating human-level reasoning and decision-making.

Because everyone and everything in AURORA AI works from the same shared picture, the system can recognize threats/opportunities, anticipate changes, and coordinate actions far more effectively than traditional tools. A Hierarchical Task Network (HTN) provides a proven, effective, and explainable mechanism to orchestrate Large Language Models (LLMs) are participants in this reasoning process, ensuring their insights remain grounded, current, traceable, and mission-aligned.
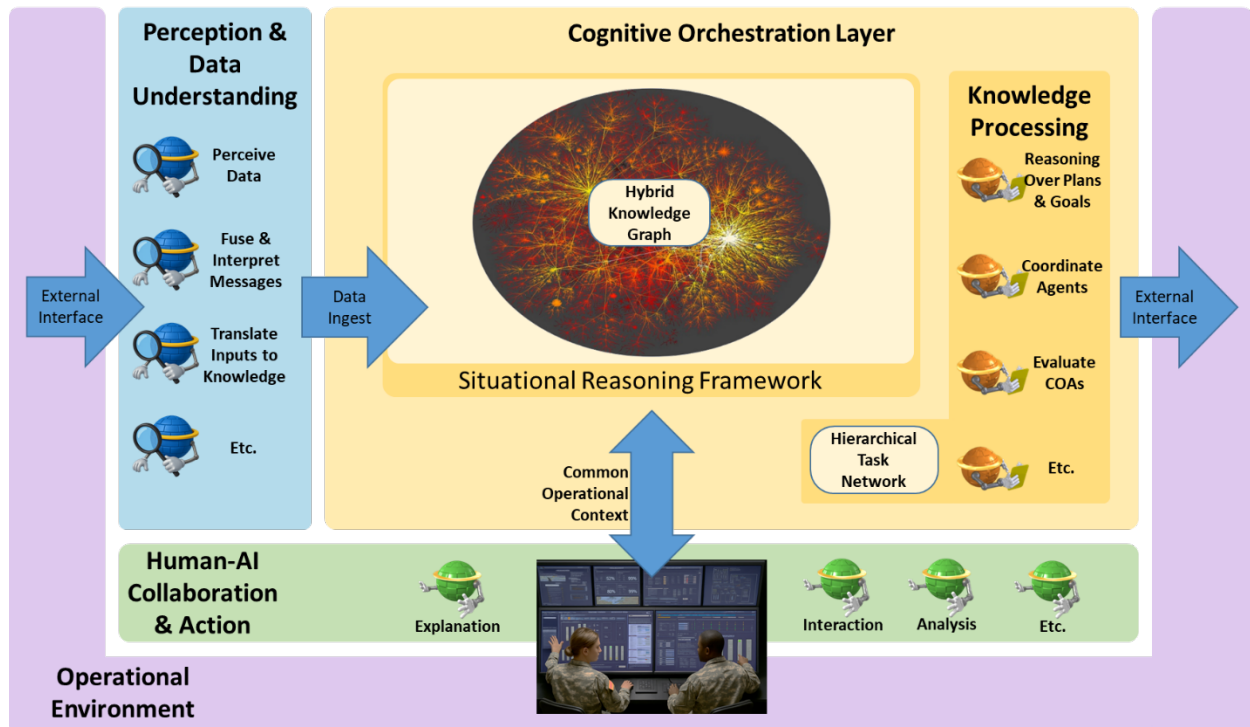
This common situational understanding results in a shared world state that includes space and time as first-class members. This forms the perfect environment for humans and AI agents to collaborate naturally as a virtual staff. AURORA AI helps generate and refine plans, compare courses of action, and adjust to changes as circumstances unfold. The result is a unified decision environment where agents,

models, and operators think together, enabling faster, clearer, and more confident decisions across defense, logistics, transportation, energy, manufacturing, and enterprise operations.

How: AURORA AI works by giving humans, intelligent agents, and LLMs a single, shared understanding of what is happening. At the center of the system is a real-time Hybrid Knowledge Graph, a living situational model of the environment that tracks people, resources, plans, tasks, warnings, and expected outcomes. This hybrid knowledge graph is what maintains the current world state including time and space. As new information comes in from sensors, systems, or operators, this model monitors plan execution and updates automatically so everyone and everything is working from the same picture.

AURORA AI uses distributed reasoning to make sense of this constantly changing world. Instead of following rigid workflows, the system continuously looks for patterns, detects problems early, and updates plans as conditions change. This keeps AURORA AI "plan-ready," meaning it always has valid options prepared, not just a single recommended course of action. CSI has been designing and building intelligent agent systems since 2004 and AURORA-class systems since 2021.

LLMs participate as helpful assistants rather than independent decision-makers. AURORA AI provides them with the right context- facts, goals, constraints, summaries- so their responses stay grounded and useful. They help expand ideas, interpret ambiguous information, and explain complex issues in natural language, while the SRF ensures their suggestions are consistent with mission needs.

AURORA AI's orchestration layer ties everything together. It decides which agents or services should handle which parts of the problem, keeps information flowing back into the knowledge graph, and resolves inconsistencies so the whole system behaves as one coordinated team. Each update adjusts the system's understanding of time, space, and state, keeping plans aligned with the real world. This is what makes AURORA AI adaptive, coherent, and explainable.

Planning is one of the clearest examples of this collaboration. Using its shared world model and the HTN planner, AURORA AI constantly builds and compares potential plans, updates them as new data arrives, and anticipates when future steps might fail. It can warn users early, propose alternatives, and realign activities before small issues grow into major problems.

Humans remain central throughout. AURORA AI presents explanations, recommendations, and alternatives in ways that are transparent and traceable. Operators can see why the system believes something, check the evidence, and work with it to adjust plans. In this role, AURORA AI acts like a virtual staff, an always-on partner that understands the situation, reasons about it, and adapts alongside its human teammates.

AURORA AI is advancing the capability of AI systems as well as the speed in which they can be developed and deployed. The below table highlights the advanced enabled by the AURORA AI architecture.

Feature	Standard Agentic AI	CSI Agentic AI
Current Situational Awareness	Maintained in an ad hoc fashion and submitted w/ LLM Prompt as context or RAG	Maintained in a Hybrid Knowledge Graph (HKG) with reasoning and logic supporting necessary LLM actions

Support for Planning	Outlines a plan based on prompt, limited current awareness	Uses current location, state, readiness, and tasking as a basis for HTN Planning, Scheduling, Routing
Execution Monitoring	Typically user driven queries and analysis, or using conventional data-level monitoring and analysis	Transforms data into knowledge-in-context, used for spatial, temporal, and state reasoning and pattern analysis
Managing Details	Limited to training and prompt context, different agents perform different functions triggered by data or user	Different functional agents, optimized for their assigned task, managing every detail of logistics, operations, intel, fires, etc. collaborating through HKG
Reducing Cognitive Load	Standard automation and static or dynamic workflow techniques, providing answers in language friendly forms	Dynamic automation through HTN and contextual reasoning, language and visual presentation orchestration
Trust and Explainability	Can explain reasoning, but may or may not actually correlate to process employed	Can provide detailed and traceable process accounting and intermediate results, as well as relevant situational and contextual factors.

Why: Modern military, government, or commercial missions operate in environments where conditions change quickly, information is incomplete or inconsistent, and decisions must be made under pressure, in a timely manner. Unlike traditional or generative AI systems, which are often reactive, AURORA AI acts proactively, using reasoning and observation to perform complex actions, adapts to the environment and works toward a larger objective. This means providing situation understanding in terms of its state, space, and time with a reasoning chain that is transparent and explainable.

AURORA AI directly addresses this gap. By maintaining a shared, real-time understanding of goals, plans, resources, risks, and the time-space-state context in which operations unfold, it enables every part of the organization, people, agents, and AI models, to operate from the same current picture. This leads to decisions that are more consistent, transparent, and aligned with mission intent and supports execution by monitoring progress and identifying issues early. It also ensures that incoming data is interpreted in context, improving data quality and reducing the noise that overwhelms operators today.

For end-users, the benefits are concrete and immediate. AURORA AI reduces decision delays by predicting issues early, evaluating potential options, and preparing adjustments before disruptions escalate. It continuously monitors operations, highlights emerging problems, and presents actionable recommendations that can be traced back to the underlying evidence. For DoD, this means faster Course of Action (COA) development and earlier risk detection. Whether Government or commercial entity AURORA AI means faster Courses of Action (COA), earlier risk detection, improved interagency and cross organizational coordination, reduced decision delays, improves efficiency, reduces downtime and strengthens forecasting.

AURORA AI also dramatically lowers cognitive burden. Instead of requiring humans to interpret dozens of separate dashboards or data feeds, the system integrates information, analyzes it, and brings forward only what matters along with clear explanations and alternatives. Operators remain in control, but with

less manual effort and greater situational understanding. This human-AI teaming increases tempo, improves coordination, and enhances mission resilience.

Finally, AURORA AI is designed to be flexible and responsive to future developments. Its modular architecture integrates with existing systems, supports any LLM or analytics engine, and can run in enterprise environments, tactical networks, or at the edge. This protects existing investments and provides organizations with a scalable path to trustworthy, mission-aware AI.

In short, AURORA AI delivers operational clarity, decision confidence, and mission resilience in the moments when they matter most. It goes beyond automation to provide AI that truly understands the situation and collaborates with humans to achieve better outcomes across any domain.

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