Sense & Respond Logistics Technology Roadmap Executive Summary

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For additional information on this study please contact

COUGAAR SOFTWARE, INC.
Dr. Todd M. Carrico
tcarrico@cougaarsoftware.com
(703) 506-1700

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1 Executive Summary

The Department of Defense is facing unprecedented challenges as the 21st century unfolds, as the Joint Operating Environment (JOE) 2008 describes:

> The next quarter century will challenge U.S. joint forces with threats and opportunities ranging from regular and irregular wars in remote lands, to relief and reconstruction in crisis zones, to sustained engagement in the global commons. During this time, the causes of conflict will vary from rational political calculation to uncontrolled passion. Our enemy's capabilities will range from explosive vests worn by suicide bombers to long-range precision-guided cyber, space, and missile attacks. The threat of mass destruction – from nuclear, biological, and chemical weapons – will likely expand from stable nation-states to less stable states and even non-state networks.
>
> It is impossible to predict precisely how challenges will emerge and what form they might take. Nevertheless, it is absolutely vital to try to frame the strategic and operational contexts of the future, in order to glimpse the possible environments where political and military leaders will work and where they might employ joint forces.[1]

Similarly, it is challenging, but necessary to understand the logistics capabilities that will be required to support these forces. United States National Security Capabilities must have tremendous adaptability, flexibility and collaboration; so too must the DoD logistics system be equally adaptive, flexible and collaborative. Sense and Respond Logistics (S&RL)[2] offers the promise of being the conceptual paradigm and technological approach to building such logistics capability.

Unfortunately S&RL is both a concept undergoing evolution, as well as a technological approach to a system of systems with varying levels of maturity. Although there is considerable commercial interest in the topic, commercial requirements are too simple to support military capabilities. To reach to the potential of S&RL, a senior leader, champion or focused organization in the DoD must take a leadership role in developing both the concept and the technology. Fortunately, the effort to develop the S&RL concept within the DoD has been underway since at least 2001 with considerable progress made in understanding its role in logistics and planning transformation. In addition, the underlying technology is maturing in both the commercial sector and in military R&D to the extent that targeted pilots and demonstration projects are feasible and warranted.

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[1] Department of Defense United State Joint Forces Command, *The Joint Operating Environment* (JOE) 2008.

[2] S&RL refers specifically to Sense and Respond *Logistics*. S&R refers more generally to Sense and Respond which is a broader concept that covers many business issues, including the narrower concept of S&RL. It should be noted that S&RL is probably the most promising and comprehensive application of S&R.

However, current efforts have not had sufficient coordination, resulting in duplication of efforts and lack of synergy across capability areas and services. This is an especially large concern in areas of technological efforts when coordination can act as a capability multiplier. It would be of great benefit to all parties if a Technology Roadmap were developed so all participants understand the current state of the technology, what capabilities are feasible, and where scarce R&D and demonstration money should be targeted.

This Report is designed to provide such a S&RL Technology Roadmap. It identifies the logistics and technology capabilities required for a S&RL system, maps them to operational capabilities, and provides a gap analysis with conclusions and recommendations based on the results.

It is hoped that this product will facilitate informed decision making through the linkage of S&RL capabilities to technologies to maturity milestones. As much as possible, this project has identified and engaged the programs and organizations that are taking key roles in the maturation of the technologies, as well as many of the ultimate customers of the technologies and the resulting capability.

The Roadmap provides the milestones against which DoD can measure progress towards achieving the S&RL vision, goals and objectives. The Roadmap will also provide a top-level concept of how the technologies will come together to achieve the desired capabilities from both a technical (logical) and organizational (operational) perspective.

Like any First Generation Roadmap product, by design it is a living document with the scope limited to establishing a methodology, developing initial data to test the model and laying out the road forward to deploying functional capabilities. In effect this report produces an initial model or tool to support S&RL capability development. From this analysis we have come to several conclusions and recommendations for moving forward.

1.1 Conclusions

1. The capabilities we have identified to implement a full S&RL vision have a broader scope than current logistics capability efforts such as JCAs and future concepts in support of Joint Logistics. In fact, S&RL capabilities not only cover the full breadth of DoD logistics with cross-organizational capabilities, but also bleed horizontally into other areas such as adaptive planning, current and future operations, intelligence, command and control and net-centricity.
2. Similarly there is a vertical depth of S&RL that integrates users with a broad range of common and customized information leading to relevant operating pictures that reach across/between echelons and across/between functional areas.
3. It is not possible to realize the promise of S&RL from within traditional logistics stovepipes. Such a bottom up siloed approach risks duplicative and potentially counter-productive efforts and hinders the ability to give users a picture broad enough for good decision making. There is a need for overall portfolio/enterprise strategy, guiding the overall investment in future logistics capabilities, specifically in

knowledge management and decision-making in a DoD wide logistics information enterprise.
4. There are major S&RL capabilities that can be enabled with today's technology.
5. Future enterprise-side S&RL requirements will require government intervention since government S&RL advanced capability requirements are beyond the scope of commercial needs.
6. To avoid duplication in this effort, DoD S&RL investments must be coordinated and targeted to those that are not being met commercially.
7. Contrary to popular belief, S&RL can be implemented without replacing most of today's major critical systems. That is, S&RL can be an enhancement to current DoD systems since, by design, it adds only a thin layer of functionality over the existing systems.
8. Full S&RL capability will make the DoD a leader in enterprise logistics and support previously identified needs to support the industrial base, including acceleration of the Web 3.0 / Semantic Web development.

1.2 Recommendations

1. For S&RL to survive in the environment of the DoD, the S&RL champion must provide leadership to:
    a. Publish, promote and foster the S&RL concept.
    b. Continue educating the community as to the vision, concept and strategy; and more importantly what is technologically doable and demonstrate the "Art of the Possible."
    c. Closely track and support DoD S&RL projects.
    d. Identify other efforts that could be part of S&RL.
    e. Work with organizations and programs outside the logistics community to reach other directly related areas such as planning and operations. In particular, S&RL can be a critical enabler of adaptive planning and execution.
    f. Sponsor and lead a S&RL community of interest, perhaps with collaborative Web 2.0 type technology.
    g. Develop a technology tracking/scouting effort to proactively find and support technology that is essential to S&RL. This process should include active outreach to the commercial technology community, especially small business with high innovation.
2. The Logistics Capability Portfolio Manager (CPM) should take responsibility for the success of S&RL and lead in the development of a DoD wide logistics information / logistics systems enterprise. This will avoid duplication of efforts, support capability development within the DoD and technological development from the commercial sector. This includes supporting initiatives that might support S&RL, learning from and reusing successful initiatives. The S&RL concept along with Adaptive Planning and Execution (APEX) may well be the first true cross-portfolio integrating concepts which could link the existing CPMs of Command & Control (C2), Battlespace Awareness (BA), Logistics (Log) and Net-Centricity (NC).

3. Develop a DoD-wide logistics strategy to include development of a S&RL Roadmap play book/tool kit to allow for more rapid implementation of capabilities. This report and its methodology are a start for this process. Certainly this report should be updated and moved to an electronic "living document" format on a collaborative portal. In addition, the toolkit might include tools to automate the process of matching logistics requirements to S&RL capabilities which would then generate the technologies required and their technical readiness.
4. Focus investment to accelerate necessary R&D, support experimentation and create early-stage capability. Specifically, the investment money should target areas identified in this report that the commercial sector are not tackling with sufficient effort and where increased investment can make a significant difference. Develop demonstration and pilot projects to show the art of the possible and bring Initial Operating Capability (IOC) to the community as soon as possible.
    a. Demonstration projects should be targeted to close the technology gap in advanced S&RL capability.
    b. Pilot projects to bring S&RL capabilities that can be used by the services now to gain support for S&RL by showing real value to the end-user.
5. Reuse existing DoD investment wherever possible to save money and time; and instead rely on the thin layer of intelligence that S&RL uses to maximize the value of existing systems and data.
6. Avoid significant efforts in over-architecting S&RL. Instead focus on developing a common framework and tools that can support code re-use and common access to data and processes. The foundation for such an approach has already been developed by DARPA for a highly distributed, loosely coupled cognitive architecture.

1.3 In summary

Given the S&RL logistics as a concept for the DoD derives from the writings of Steven Haekel, who viewed Sense and Respond primarily as a concept grounded in the role of leadership and decision-making, this quote is an appropriate way to end this summary and transition to the rest of the report.

> An enterprise's ability to adapt depends on how it processes information. From complexity theorists we learn that all successfully adapting systems have something in common: They transform apparent noise into meaning faster than apparent noise comes at them. Sense-and-respond organizations leverage this information into a generic way of fostering adaptive sensemaking and action. The particulars of what is sensed and how it is interpreted are role-specific, and depend on the amount of adaptability required. No role requires more careful design of its adaptive loop than the one accountable for translating apparent noise into meaning about when and how to adapt the way the organization adapts. That role, of course, is leadership.[3]

[3] Stephan Haekel, *Adaptive Enterprise, Creating and Leading Sense-and-Respond Organizations*, 1999

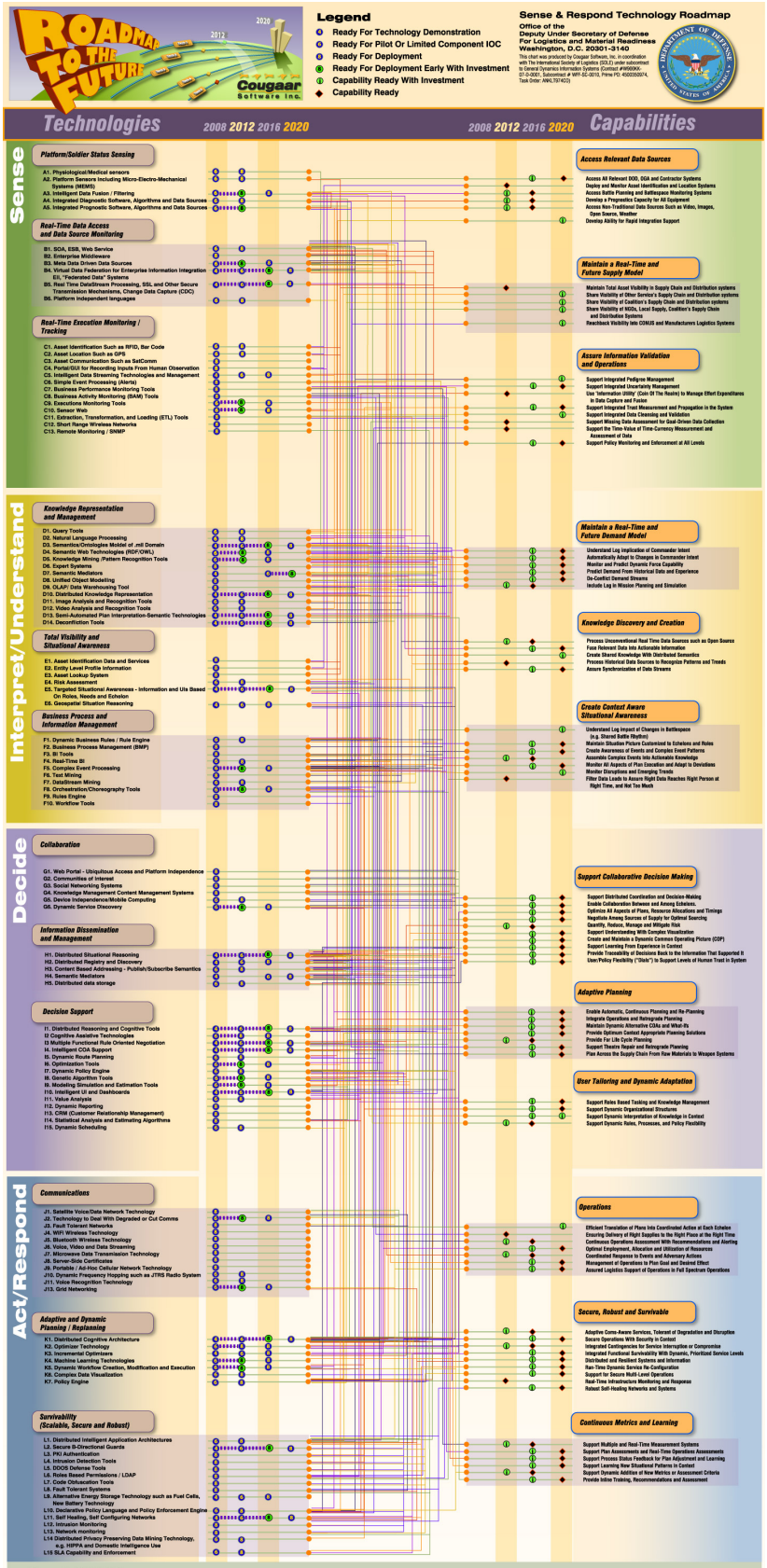

Figure 1: S&RL Technology Roadmap Visualization