

Topic: N15A-T017

Charles River Analytics, Inc.

Grammars for Graph-based Assessment of Mission Readiness (GGRAMR)

Charles River Analytics, a 30-year old applied research firm focused on intelligent systems applications, has worked with the University of Maryland, Baltimore County (UMBC) to develop Grammars for Graph-based Assessment of Mission Readiness (GGRAMR); providing a framework for the graph database equivalent of relational database “views.” Creating views of graph data that directly support the calculation of unit readiness scores, and support predicting measures of performance (MOPs) for mission essential tasks, it transforms raw graph data into graph data that is organized in specific ways to support critical applications. GGRAMR significantly reduces the cost and complexity of working with graph databases and would greatly benefit programs, such as the Defense Readiness Reporting System-Navy (DRRS-N) that must draw on diverse data from large graph databases.

Technology Category Alignment:

Advanced Computing/Software Development

Human Computer Interfaces (HCI) for Decision Making

Information Collection/Management

Networks and Communications

Synthesis/Analytics/Decision Tools

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SYSCOM: ONR

Contract: N68335-17-C-0151

Booth: 200

Room: Club Room East

Presenting: Apr 11th at 3:40 PM

 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-17-C-0151

Topic: AF141-054

DECISIVE ANALYTICS Corporation

Building Open-domain Semantic Search (BOSS)

To date, traditional search techniques such as Information Retrieval (IR) and Information Extraction (IE) have been executed independently providing information that is not analysis ready and is limited in scope. The Building Open-domain Semantic Search (BOSS) technology will combine the strengths of IR and IE into a single capability and address the mutual limitations of both. It will allow users to explore data from any domain through a search that returns structured results. This search capability is semantically-based, allowing users to search text data based on what it means instead of the numerous ways that meaning might be expressed. Decisive Analytics is an Employee-owned company providing data processing capabilities that move beyond simple extraction by automatically organizing, identifying, and extracting activities and relationships from large corpora of text, imagery, video, and audio. We are seeking opportunities to transition this capability to programs where identifying threats from a large corpus of multi-source data set in real time is a difficult challenge.

Technology Category Alignment:

Machine Perception, Reasoning and Intelligence

Advanced Computing/Software Development

Human Computer Interfaces (HCI) for Decision Making

Information Collection/Management

Synthesis/Analytics/Decision Tools

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Contract: N68335-17-C-0545

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Department of the Navy SBIR/STTR Transition Program

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SPAWAR SBIR PM 28 Dec 2018

Topic # AF141-054

Building Open-domain Semantic Search (BOSS)

DECISIVE ANALYTICS Corporation

WHO

SYSCOM: SPAWAR

Sponsoring Program: Distributed Common Ground System-Navy (DCGS-N)

Transition Target: Distributed Common Ground System-Navy (DCGS-N)

TPOC:
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Other transition opportunities: DCGS-A, AF DCGS, Securities and Exchange Commission, Special Operations Command, FBI

Notes: BOSS will combine the strengths of Information Retrieval and Information Extraction into a single capability allowing users to explore data from any domain through a search that returns structured results. This search capability is semantically-based, allowing users to search text data based on what it means instead of the numerous ways that meaning might be expressed.

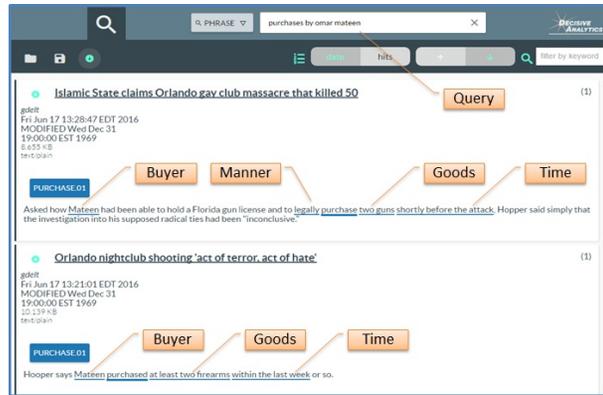


Image Courtesy of Decisive Analytics Corporation, Copyright 2018.

WHAT

Operational Need and Improvement: The quantity of text available to Navy Intelligence analysts has become too large for any single person (or even any organization) to read, identify all relevant information, and fuse the discovered information with the existing knowledge base. In addition, there is a vast array of formats and writing styles being used across the variety of data sources containing unstructured text (e.g. MEPED, IPIRs, USMTF, and Kleig-Lites). Existing search and natural language processing (NLP) technologies can only partially address the problem of exploiting unreadably-large amounts text. Search products currently provide excellent data exploration tools allowing analysts to cover a broad range of information. Natural Language Processing capabilities provide structured results that are analysis-ready, but are only able to accurately operate on a limited fraction of the available data. Combined, these limitations require the user to spend significant time and effort to manually filter and organize the search results for analysis.

Specifications Required: The goal of this topic is to research and develop an advanced indexing and search capability that combines Information Retrieval (IR) and Information Extraction (IE) methods to: (1) dynamically model user information needs, including building models for retrieving entities, events, and relations; (2) rapidly search large (web scale) volumes of textual data to identify relevant information; (3) return relevant information with precision and recall which exceeds the current state-of-the-art; and (4) enable users to refine or change their information needs over time through interacting with the system.

Technology Developed: To address this, the BOSS data discovery capability will be semantically-based to allow users to search based on the meaning of the data rather than having to determine the numerous ways a concept might be expressed.

Warfighter Value: Information Retrieval provides excellent data exploration tools, but does not yield analysis-ready information. Information Extraction provides structured results that are analysis-ready, but the information scope is limited. The BOSS approach to semantic search will allow users to fully explore information based on operational needs, whether those are specific needs (e.g. such as "Chinese ships with ship-to-air missile capability"), general needs (e.g. topics such as "piracy events around the world"), or points in-between (e.g. less constrained event type queries, such as "recent military activity in the South China Sea").

WHEN

Contract Number: N68335-17-C-0545

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Testing in DCGS-N Capabilities Assessment Lab	Low	Successful tests by DCGS-N Capabilities Assessment Team	6	February 2019
Exercise Testing in DCGS-N Inc 2	Low	Transition to DCGS-N Inc 2	7	June 2019
Operational Testing in DCGS-N Inc 2	Med	Completion of all testing and accreditation requirements	8	November 2019
Deployment within Operational DCGS-N Inc 2	Med	Full capability within the deployed DCGS-N System	9	May 2020

HOW

Projected Business Model: The business model for this effort is a mix of license fees and custom development for various user communities. Through our experience, we know that this capability requires some custom development for different domains to produce effective results.

Company Objectives: Below is a list of transition partners that can benefit from this technology. DCGS-N / DCGS-A / AF DCGS: Semantic analysis is a powerful and flexible tool to help analysts understand the large corpora of unstructured data. DAC's automated capability results in a large reduction in the labor required to perform document analysis. Inclusion of these developed methods of processing large scale data repositories of documents will be important to these customers.

The Intelligence Community including the CIA, DIA, NSA, NASIC, MSIC, NGA, and others have requirements for analysts to automatically make senses out of large amounts of unstructured text data.

Potential Commercial Applications: Financial Analysts: Investment management and other financial market analysts have a need to analyze complex data sets about companies and industries. Many of these problems mimic the problems facing intelligence analysts: analysis must draw from huge amounts of data, a variety of expertise is required, and understanding and managing the data is crucial to success. Through a self-funded marketing effort, DAC has past performance and relationships with banks, hedge funds, and investment advisers in the financial markets and has validated this requirement.

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Topic: N141-078

Vigilant Cyber Systems, Inc.

Develop a Methodology for Cyber-Electronic Warfare Battle Damage Assessment (BDA) using Game Theory

Vigilant Cyber Systems, Inc. (VCS) has developed the Cyber Battle Damage Assessment Tool (CyBDAT). A modeling tool that enables a comparative analysis between information related capabilities and traditional kinetic fires during mission planning, within Computer Network Attack (CNA), Computer Network Exploitation (CNE) and Electronic Attack (EA) events. Using game theoretic modeling we have developed a methodology to quantify the value of cyber exploits and electronic attack within the context of relevant mission threads to rapidly inform decision made on the battlefield. VCS is currently working closely with the Joint Technical Coordinating Group for Munitions Effectiveness (JTTCG-ME) from the Naval Surface Warfare Center (NSWC). They have developed several data standards to quantify specific data required to create comparison numbers between kinetic and cyber, and CyBDAT is incorporating these data standards into current testing, with the end goal being that CyBDAT will roll directly into the JTTCG-ME's efforts of building a tool to provide this comparison.

Technology Category Alignment:

Machine Perception, Reasoning and Intelligence

Advanced Computing/Software Development

Assuring Effective Missions

Trust Foundations

Modular/Open/Reconfigurable Architectures

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SYSCOM: ONR

Contract: N68335-18-C-0048

Booth: 204

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 Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-18-C-0048

Department of the Navy SBIR/STTR Transition Program

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ONR Approval #43-4388-18

Topic # N141-078

Develop a Methodology for Cyber-Electronic Warfare Battle Damage Assessment (BDA) using Game Theory

Vigilant Cyber Systems, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: Code 30

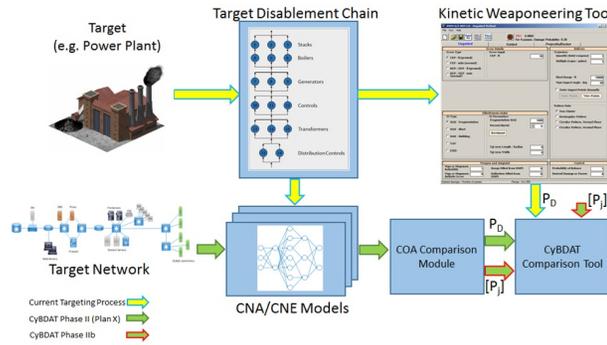
Transition Target: JTCG-ME

TPOC:

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Other transition opportunities: Army Cyber command, US Cyber Command



Concept of Operations for CyBDAT

WHAT

Operational Need and Improvement: Current mission planning toolkits do not include the ability for planning staff to compare kinetic and cyber fires, especially against cyber physical systems. CyBDAT provides a comparison tool based on probability models that allow mission planners to set their preferences across 20 different success measures including probability of kill, attribution, persistence, and many others. Current planning methods require intensive research on an individual case by case basis for inserting cyber fires into mission planning, whereas CyBDAT will pull from a database with dozens of preassigned mission templates, weapons, and the statistical data behind each attack.

Specifications Required: - This tool must be able to quantify the contribution of Computer Network Attack (CNA), Computer Network Exploitation (CNE), and Electronic Attack (EA) to the warfighting outcome in the physical realm.

- Design and implement an automated range for experiment, measurement and test of attacks on Cyber Physical Systems (CPS)
- Design a tool to perform the Course-of-Action (CoA) analysis for cyber attacks
- Design a tool to enable the comparative analysis between cyber and kinetic attacks on Cyber-Physical Systems

Technology Developed: VCS has successfully developed a range capable of standing up virtual targets for cyber physical systems. We have successfully demonstrated this capability on military and civilian vehicles, as well as a simple industrial control system (chemical plant). We are currently working on a higher fidelity virtualized system based on Siemens PLCs replicating a power distribution station.

Warfighter Value: Rapid virtual capability to test industrial control systems both offensively and defensively on the CPS range.

Toolkit for tactical commanders to allow them to accurately assess the probabilities and outcomes of using different cyber weapons and directly compare them to the kinetic alternatives.

WHEN

Contract Number: N68335-18-C-0048 **Ending on:** June 10, 2022

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Virtual Range Demonstration on Realistic ICS Target	Low	PM Opinion of Demonstration	5	2nd QTR FY19
Classified Option Exercised with Classified DD254 and SCIF	Med	Contract modification executed and SCIF approved	N/A	3rd QTR FY19
Incorporation and validation of JTCG-ME Data Standards into CyBDAT tests	Med	JTCG-ME Sign-Off on Test Results and Test Reports using their standards	6	1st QTR FY20
Participate in classified military training exercise	Low	Successful participation as determined by PM	5	1st QTR FY19

HOW

Projected Business Model: Sell CyBDAT directly to JTCG-ME as completed product, and incorporate into their mission planning suite of tools for cyber BDA and cyber mission planning.

Utilize CyBDAT and support cyber testing via virtual range to setup and run tests both offensively and defensively for DoD customers who care about medium fidelity virtual versions of ICS and other CPS.

Company Objectives: The VCS core competencies are DoD Cyber Testing and Evaluation support, software development, and penetration testing. We primarily focus on providing SME level consulting to DoD customers, including the testing and training communities. We feel that CyBDAT could be marketed directly to this community, leveraging our existing competencies and relationships. We also anticipate the automated range piece of this research can support future penetration testing and validation testing efforts for cyber physical systems. As the automated CPS range becomes more robust we see a strong commercialization path of hosting testing exercises on the range, or taking the Range Management Software Suite and incorporating it into larger tests and training exercises such as Bold Alligator.

Potential Commercial Applications: Virtual range supporting commercial ICS customers such as oil and gas industry, and automobile industry for cyber testing CPS assets.

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Topic: N162-131

Charles River Analytics, Inc.

System for Group Learning and Optimization of Collaborative Workflows (GLOW)

Instead of training each Sailor in every mission-relevant skill—a costly proposition—it makes sense to optimize a team’s collective expertise. Group Learning and Optimization of Collaborative Workflows (GLOW), is a task distribution, collaboration, and peer review platform that optimizes team output, giving Naval Officers accurate data on Sailors’ strengths so they can make better training and tasking decisions to craft diverse, knowledgeable teams. Charles River Analytics, maker of intelligent systems solutions, has successfully demonstrated the feasibility with the development of a prototype Collaborative Workspace. GLOW will support rapid learning and development of group expertise for platforms such as the Distributed Common Ground System-Navy (DCGS-N) Program; teams will be constructed based upon collective expertise and individuals will acquire new knowledge and skills through peer collaboration.

Technology Category Alignment:

Human/Autonomous System Interaction and Collaboration

Human Computer Interfaces (HCI) for Decision Making

Personalized Assessment, Education, and Training

System Interfaces & Cognitive Processes

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Contract: N68335-18-C-0119

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Department of the Navy SBIR/STTR Transition Program

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ONR Approval #43-4388-18

Topic # N162-131

System for Group Learning and Optimization of Collaborative Workflows (GLOW)

Charles River Analytics, Inc.

WHO

SYSCOM: ONR

Sponsoring Program: Distributed Common Ground System-Navy (DCGS-N) Program

Transition Target: The technology will transition to appropriate Navy and commercial training and simulation efforts. We expect this system to immediately and tangibly benefit the Navy and DoD by enabling collaboration across a number of complex tasks, including collaborative intelligence analysis with DCGS-N.

TPOC:

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Other transition opportunities: Navy Personnel Command (NPC) personnel management systems

Notes: The image shows the basic concept of operations of GLOW, which uses automated services to support interface tools centered on a Decompose, Execute, Assess loop.

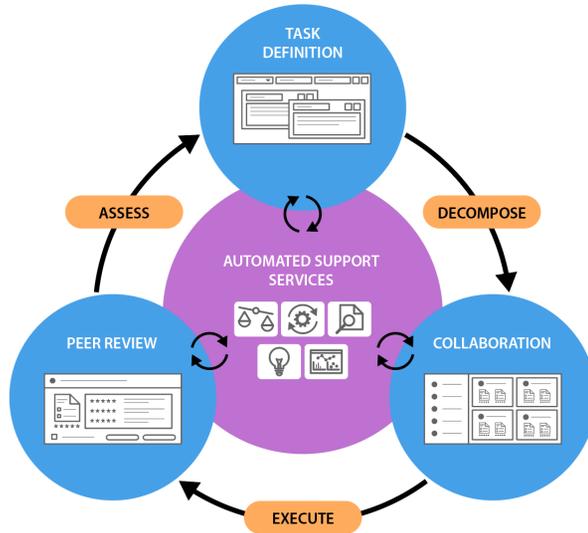


Image courtesy of Charles River Analytics, Inc.

WHAT

Operational Need and Improvement: The Navy must train and deploy effective teams in complex domains, from intelligence analysis to field medicine. Training individual personnel in all the skills and knowledge required by these tasks would be cost-prohibitive and inefficient. Instead, teams should be constructed to optimize their collective expertise. To construct these teams, the Navy needs a team development system that manages task and learning assignments to dynamically build the expertise required to achieve evolving task objectives.

Specifications Required: While adaptive learning methods have been developed for individual learners, new approaches are needed to automatically optimize the whole learning ecosystem by considering not just the parameters of an individual but also parameters of target content, peer interaction, as well as the instructor within group performance. Special focus should be devoted to rapid convergence, and efficient exploration of all ecosystem parameters.

It is clear that in order to develop group expertise, it is not necessary that each individual in a group achieve maximal possible (individual) expertise. Rather, of greater importance is how to develop complementary expertise, and how to develop mechanisms for efficient communication and collaboration among group members. While the potential for large-scale collaboration has been demonstrated in certain domains, further efforts are required to generalize these findings to other domains where expertise is required.

Technology Developed: Group Learning and Optimization of Collaborative Workflows (GLOW) Collaborative Workspace will enable teams to decompose complex tasks into work chunks that can be performed by contributing team members, execute (or learn to execute) those tasks while efficiently applying the collective expertise of the team, and assess performance on those tasks through an integrated peer review process.

Warfighter Value: We expect the full-scope GLOW system to immediately and tangibly benefit the Navy and DoD by enabling collaboration across a number of complex tasks, including collaborative intelligence analysis with DCGS-N. We also anticipate immediate benefits for personnel management; detailers will be able to construct more effective teams with the collective expertise to succeed.

WHEN

Contract Number: N68335-18-C-0119 **Ending on:** February 11, 2020

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Formative Prototype Evaluation	N/A	Users report positive value of tool over similar products	3	3rd QTR FY17
Component Evaluation Studies	Low	Each component shows value over control group on key metrics for efficiency, quality, and relevance.	5	2nd QTR FY19
Full-scope Platform Evaluation Studies	Med	Full-scope system shows value over control group on key metrics of efficiency, quality, relevance, and user satisfaction.	6	4th QTR FY19
Targeted Transition Platform Evaluation	Med	Full-scope system shows value over existing tools in operational environment on key metrics of efficiency, quality, relevance, and user satisfaction	7	4th QTR FY21

HOW

Projected Business Model: We plan to distribute GLOW as a "freemium" commercial application that allows distributed research teams to effectively collaborate with a free-to-use product designed for that purpose, and then sells add-ons that provide custom options, private environments, and other tools specific to the needs of medium and large companies across a variety of research and development sectors. In these R&D companies, GLOW can be used to characterize the skills and capabilities of research personnel, as well as facilitate the selection of teams and training objectives across those personnel to address target research objectives. Once teams are formed (either using GLOW, or using other, more traditional corporate team management approaches), the GLOW Collaborative Workspace can enable rapid, cooperative research to address project requirements and review team solutions to those requirements.

Company Objectives: Charles River Analytics is seeking Government programs or groups that make heavy use of distributed and/or multi-disciplinary teams, to discuss the potential value of GLOW as a tool to form, manage, and develop those teams. Our interest includes both potential transition partners and interesting use cases that would help refine the technology and suggest key features or constraints to incorporate.

Potential Commercial Applications: This technology will primarily support rapid learning and development of group expertise by developing methods for adaptive presentation of materials and efficient evaluation and testing strategies. Therefore, this technology can be easily transferred to all institutions that require learning, training and evaluation of its personnel. This includes educational institutions as well as businesses that depend on continuous training and re-training of its employees. Commercially, the results of this effort are positioned to significantly impact the do-it-yourself learning community, a \$200 million market in the US and UK alone.

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