

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

 Corporate Brochure: [https://navystp.com/vtm/open\\_file?type=brochure&id=N68335-17-C-0151](https://navystp.com/vtm/open_file?type=brochure&id=N68335-17-C-0151)

# Department of the Navy SBIR/STTR Transition Program

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## WHO

**SYSCOM:** ONR

**Sponsoring Program:** Data Focused Naval Tactical Cloud EC, Distributed Common Ground Station

**Transition Target:** Tactical Service Oriented Architecture (TSOA) / Marine Air-Ground Task Force Command, Control and Communications program office (MC3)

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**Other transition opportunities:** The technology is applicable to any application that draws data from a graph database, e.g., Navy Command and Control Program Office (PMW-150), Defense Readiness Reporting System-Navy (DRRS-N), and Distributed Common Ground-Surface System (DCGS) Marine Corps & Navy

**Notes:** Previously, Charles River developed a tool to guide the warfighter through a formalized approach to assessing, analyzing, and forecasting human behavior (Contract Number FA8650-04-C-6403). The tool eventually underwent a successful Military Utility Assessment in 2008 and an Extended User Assessment with a Joint agency.

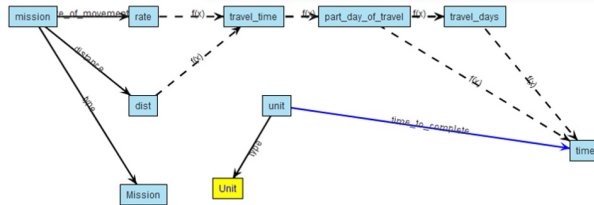


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## WHAT

**Operational Need and Improvement:** Service-wide graph databases are increasingly used to store the vast amounts of information collected and used by the military. These graph databases have no schema, which makes it easy to add any new type of data quickly and easily, but it also means that the data is not organized to support specific applications. Technology is needed to translate the raw graph data into data that directly supports applications. The needed technology would be analogous to the "view" mechanism provided by relational databases, which translates database tables into virtual tables that are organized for specific applications. The example application is calculating unit readiness scores and predicting measures of performance (MOPs) from diverse raw data.

**Specifications Required:** Translating raw graph data into graph "views" for specific applications may involve collecting data from diverse branches of the graph and performing complex calculations over that data. The cost of specifying these queries and calculations must be minimized.

**Technology Developed:** Grammars for Graph-based Assessment of Mission Readiness (GGRAMR) provides a framework for the graph database equivalent of relational database "views." The views are created by graph grammars that transform raw graph data into graph data that is organized in specific ways to support critical applications. The GGRAMR framework includes algorithms for learning the needed graph grammars from examples. The technology is demonstrated by creating views of graph data that directly support the calculation of unit readiness scores, and creating views that support predicting measures of performance (MOPs) for mission essential tasks.

**Warfighter Value:** GGRAMR significantly reduces the time and expertise required to provide Warfighters with access to critical information. This provides the Warfighter with more information for a lower cost. For example, writing the queries and formulas required to calculate unit readiness and predict measures of performance would be a major effort and requiring highly skilled database engineers. GGRAMR greatly simplifies this process, and learns much of what is required from available examples.

## WHEN

**Contract Number:** N68335-17-C-0151 **Ending on:** January 19, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Base: Interim technology demonstration	N/A	Working components	4	3rd QTR FY18
Base: Final technology demonstration	Med	Working end-to-end	6	1st QTR FY19
If Option 1 awarded, final technology demonstration	Med	Option 2 award	7	4th QTR FY19
If Option 2 awarded, final technology demonstration	Med	Phase III award	8	3rd QTR FY21

## HOW

**Projected Business Model:** Charles River has over 30 years of steady growth providing innovative, cost-effective solutions through intelligent systems R&D. Over 100 Charles River projects have produced a wealth of advanced-technology prototype software that can facilitate the rapid integration of critical technology into operational systems. Charles River will license the technology to Prime contractors and/or graph database vendors and continue to support research and development contracts.

**Company Objectives:** Charles River seeks to meet with government representatives of Programs of Record that involve large graph databases and Prime contractors that support large graph databases that are interested in 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.

**Potential Commercial Applications:** Graph databases have widespread commercial applications as schema-less databases and cloud computing become more popular. Licensing this technology to a graph-database vendor would be an ideal way to achieve widespread deployment of the technology. Internet search engines would benefit from the maturation of data retrieval based on concept graph grammars. Currently, information retrieval is limited to word searches with some support to graph searches. Information retrieval by subject, delivered without redundancy, would transform information delivery.

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