Topic: N132-139

Charles River Analytics Inc.

Distributed Analysis Tool for Enterprise Monitoring (DATEM)

Net-centric fleet operations generate an abundance of health and status data that can require skilled engineers to interpret to identify and isolate failing systems (Tier III support). DATEM, a TRL-8 machine learning system targeting Ship's Signals Exploitation Equipment (SSEE) Increment F, instantly pinpoints failed ship sub-component (e.g., DATEM automatically identifies 91% of failures) just from ships' health and status signals, enabling Tier I technicians to resolve Tier III-level troubleshooting. This results in quicker, more accurate failure resolutions at lower tiers of support, which maximizes up-time, increases operational availability, and lowers costs. For 35+ years Charles River Analytics has been solving critical DoD research and operational problems using Artificial Intelligence. Beyond deploying to SSEE, we aim to solve other Navy critical health and status data understanding problems by adapting DATEM to new systems.

Technology Category Alignment:

Maintainability/Sustainability

Contact:
Joe Gorman
jgorman@cra.com
(617) 491-3474522
https://www.cra.com/

SYSCOM: NAVWAR

Contract: N68335-18-C-0358

Corporate Brochure: https://navystp.com/vtm/open_file?type=brochure&id=N68335-18-C-0358

Tech Talk: https://atsi.adobeconnect.com/ps9vuaotgwwh/

Department of the Navy SBIR/STTR Transition Program

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NAVWAR PAO: 29 Jan 2020

Topic # N132-139

Distributed Analysis Tool for Enterprise Monitoring (DATEM)

Charles River Analytics Inc.

WHO

SYSCOM: NAVWAR

Sponsoring Program: PMW-120

Transition Target: Ship's Signals Exploitation Equipment (SSEE) Increment F

TPOC:
843-218-5497

Other transition opportunities: DATEM technology can be adapted to other Navy critical health and status data understanding problems to accelerate fault identification and repair. DATEM's Cable Calibration Tool (CCT) could be used on other calibration data that is difficult to interpret but well understood by experts. DATEM's Fault Report Analytics and Tools (FRAT) and Diagnostic Data Tool (DDT) are also broadly applicable to other Navy systems that collect similar types of data, e.g. Distributed Common Ground System-Navy (DCGS-N).

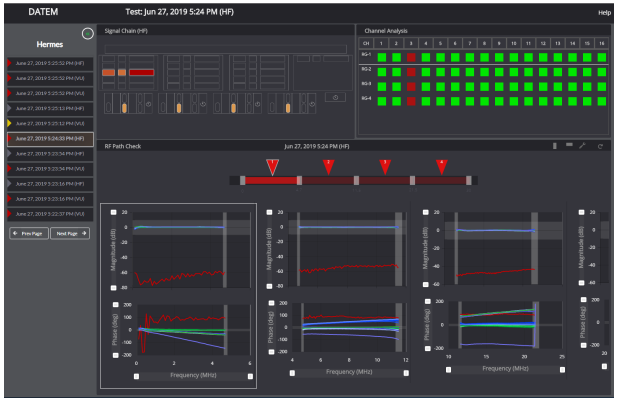

Image Courtesy of Charles River Analytics

Notes: DATEM provides tools for reducing costs and increasing mission readiness by automatically detecting and localizing system failures. DATEM's data-driven analysis was recently demonstrated running on JWICS (TRL-8), where DATEM was able to detect 91% of failing Cable Calibration tests (outperforming existing approaches by 35%).

WHAT

Operational Need and Improvement: Net-centric fleet operations generate an abundance of health and status data, but it can require skilled engineers to interpret that data to identify and isolate failing systems (known as Tier III support). The ability to quickly respond to failures by pushing the resolution to lower tiers of support maximizes uptime and increases operational availability.

Specifications Required: PMW-120 desires the capability to monitor and determine the operational condition and effectiveness of PMW-120 fielded systems afloat. Some of the knowledge desired includes whether PMW-120 systems that are installed on Navy ships are operating correctly as designed and tested, have network connectivity and sufficient bandwidth, system hardware is functioning properly, operators are suitably trained and data is being delivered and utilized effectively and correctly. The developed software solution should be capable of being monitored from a shore location and able to determine the above knowledge without additional instrumentation being installed, and would function as a tripwire to alert the program office before the system degrades to the point of a Casualty Report (CASREP) or significant warfighter dissatisfaction.

Technology Developed: DATEM's suite of tools use data-driven models to detect and localize system faults. (1) the CCT is TRL 8 and is currently being fielded at Naval Information Warfare Center (NIWC) Atlantic to detect and localize faults in calibration test results. CCT's approach can be generalized to other calibration data to isolate faults. (2) the FRAT provides natural language understanding for Casualty Report (CASREP) and 2Kilo reports to normalize information across reports and to increase the speed at which CASREPs are closed. (3) the DDT monitors system-level health and status data to determine when the system is trending towards failure. The DDT provides predictive health and status. (4) DATEM's Systemic Behavior Analytics (SBA) are integrated into each of DATEM's other tools to identify systemic faults including operators incorrectly using the system.

Warfighter Value: The ability to quickly detect and repair system faults improves mission readiness. DATEM's ability to identify failures and determine the cause improves operational availability by driving the resolution to lower tiers of support decreasing the time to repair and increasing system uptime.

WHEN

Contract Number: N68335-18-C-0358 **Ending on:** November 20, 2019

Milestone	Risk Level	Measure of Success	Ending TRL	Date
Integrate CCT into the Synchro Dashboard and demonstration on Joint Worldwide Intelligence Communications System (JWICS)	N/A	Detects 91% of faults, outperforming existing approach by 35%	7	November 2017
CCT fielded at NIWC Atlantic processing data from 30+ ships in real-time	Low	DATEM used to support ISEA help desk	8	October 2019
Initial demonstration of the FRAT	Low	Demonstrate ability to normalize information across declassified CASREP and 2Kilo data	3	August 2019
FRAT integration into Synchro dashboard (if option is exercised)	Med	Demonstrate integration of JWICS and ability to process live CASREPs	5	August 2020
Initial demonstration of DDT (if option is exercised)	High	Leverage DATEM research with diagnostic health and status data to build data-driven models for predictive maintenance	3	August 2021

HOW

Projected Business Model: Charles River Analytics is working directly with the engineers of the health and stats reporting tools that DATEM will integrate with. Once integrated, Charles River will provide initial user support and modification for operational requirements. Beyond transitioning DATEM technology to government applications, we are pursuing opportunities to transition DATEM commercially including providing monitoring for devices in the Internet of Things (IoT).

Company Objectives: Charles River Analytics has a proven track record of applying cutting edge research to problems of critical importance to the DoD. Charles River Analytic's mission is to develop innovative solutions to complex human-systems challenges in Unmanned Systems, Decision Support, Human Behavior, and Advanced Training Platforms by exploiting and extending our expertise in Information Fusion, Computational Intelligence, and Human-Computer Interaction, and by excelling in activities across fundamental science and technology areas, responsive research and development services, and innovative deployed products, with a customer focus at all times.

Potential Commercial Applications: DATEM technologies can be licensed to other commercial entities that will use them directly or incorporate them as added functionality to their other commercial products. In particular, we consider companies in the Information Technology (IT) Operations Management market (e.g., Splunk (www.splunk.com) and Boundary (www.boundary.com)) as potential licensees of this technology. We also see an opportunity for DATEM to provide a monitoring and alerting service for the market emerging around the Internet of Things (IoT). Monitoring and alerting in the IoT provides a rich opportunity to combine DATEM technologies with other Charles River technologies for advanced probabilistic reasoning, multi-agent systems design, and visualization to provide unique applications and services. The Gartner Group estimates that the IoT will include 26B units by 2020 and that the market for supporting services could reach $300B by then (Middleton, Kjeldsen, Tully et al., 2013).

Contact: Joe Gorman, Principal Engineer & Director Engineering, Decision Management Systems
jgorman@cra.com (617) 491-3474 x522