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## **Complex Network Analysis and Intelligent Monitoring Platform**

### **Cooperative Research and Development Agreement Final Report**

**CRADA Number: FRA-2018-0031**

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Summary Report  
25 October 2021

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In accordance with Requirements set forth in Article X of the CRADA document, this document is the final CRADA report, including a list of Subject Inventions, to be forwarded to the Office of Science and Technical Information as part of the commitment to the public to demonstrate results of federally funded research.

**CRADA number:** FRA-2018-0031

**CRADA Title:** Complex Network Analysis and Intelligent Monitoring Platform

**Parties to the Agreement:** Data Products LLC and Fermi Research Alliance, LLC

**Sponsoring DOE Program Office(s):** DOE Office of Science

**DOE Funding Commitment Table:** N/A

**Abstract of CRADA work:**

Data Products has particular interest in developing an efficient network analysis and monitoring system that utilizes advanced machine learning methods to mine complex network data of the type generated within large data centers, with an objective to provide tangible business-usable intelligence. The Laboratory is currently the lead institution for a U.S. Department of Energy Office of Science (DOE/SC) network research project called BigData Express (BDE). The project seeks to provide an orchestration service for high-performance data movement of data sets for large-scale science. This collaboration is believed to potentially be a highly symbiotic one, with Data Products platform development benefiting from the rich sets of network data available in the BDE development environment, and BDE benefiting from the Data Products machine learning analysis of BDE-generated data movement.

**Summary of Research Results:**

SmartNetOps is an AI-powered intelligent network monitoring and analysis platform developed by Data Products LLC under a Department of Energy (DOE) Small Business Innovation Research (SBIR) grant. Fermilab was a National Laboratory partner on that SBIR grant, whose role was to provide a development environment to explore the use and enhancement of the SmartNetOps platform in large-scale scientific computing environments. Such computing environments differ significantly from conventional enterprise computing environments. While the latter tend to be transaction-oriented, scientific computing environments are characterized by high numbers of large, long-lived data flows mixed with delay-sensitive streamed data used for analysis and calibration. Fermilab's BigData Express (BDE), a next-generation data transfer orchestration platform, was utilized to generate scientific data flows. Flow data records, including BDE-generated flows were utilized to assist and

enhance SmartNetOps development. In addition, active network performance measurement data generated by PerfSONAR was provided and evaluated as a potential source of network data for SmartNetOps. PerfSONAR is commonly deployed within the general research and education networking community. Consulting and evaluation feedback with the Data Products Principal Investigator formed the foundation of the Laboratory's contribution.

**Related Reports, Publications, and Presentations:**

SmartNetOps is now a commercial service. Information on the service is available at <http://smartnetops.io>.

**Subject Inventions listing:**

N/A. Fermilab contribution did not include development component.

**Report Date:** 25 October 2021

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