

SBIR Topic Number:
AF06-283

SBIR Title:
Threat Detection, Validation, and Mitigation Tool for Counterspace and Space Situation Awareness (SSA) Operations

Contract Number:
FA9453-07-C-0003

SBIR Company Name:
Data Fusion & Neural Networks, Broomfield, CO

Technical Project Office:
AFRL Space Vehicles Directorate, Kirtland AFB, NM

This Air Force SBIR/STTR Innovation Story is an example of Air Force supported SBIR/STTR technology that met topic requirements and has outstanding potential for Air Force and DoD.

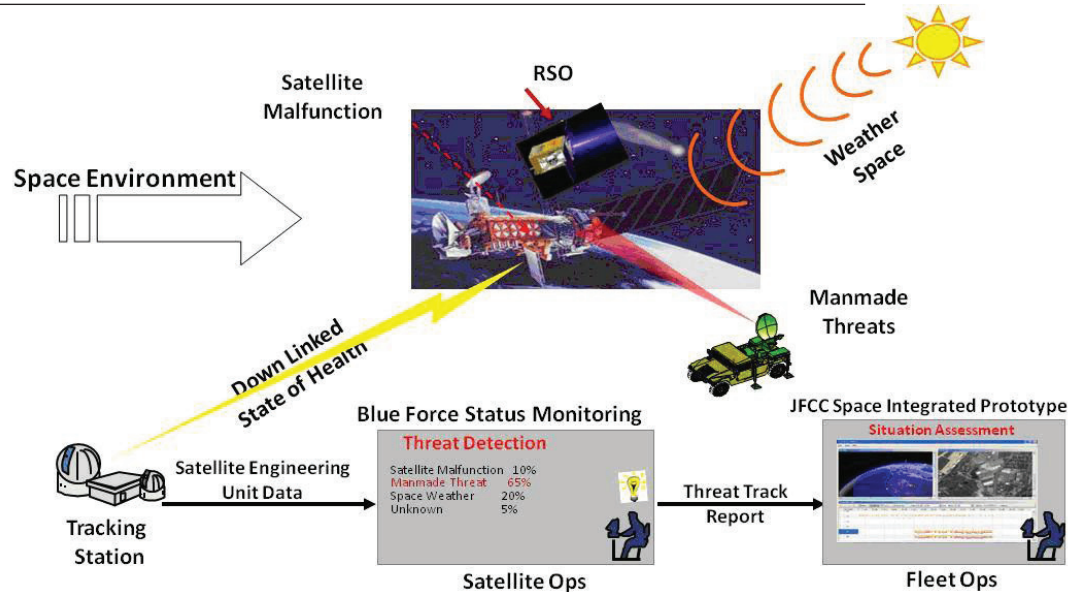


Figure 1: Blue Force Status (BFS) Satellite-As-A-Sensor (SAS) software provides automated abnormality detection needed for Space Situation Awareness (SSA)

Threat Detection, Validation, and Mitigation Tool for Counterspace and Space Situation Awareness (SSA) Operations

- The Air Force needs to automatically integrate numerous complex sources of Space Situation Awareness (SSA) data to provide a consistent, collaborative, and timely representation of the space situation
- Data Fusion & Neural Networks (DF&NN) has delivered three software based technologies relating to abnormal satellite state of health detection and cause characterization, abnormality and threat event tracking, and abnormal space catalog update detection
- Since the software is data driven, it is affordably applicable to detection, tracking, and characterization of any monitored system to include cyber attacks, vehicles, ships, aircraft, unmanned aerial vehicles, and factories
- The software is designed to support multiple joint-service and defense initiatives

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Air Force Requirement

The Air Force needs to automatically integrate numerous complex sources of Space Situation Awareness (SSA) data to provide a consistent, collaborative, and timely representation of the space situation.

Three specific Air Force needs addressed in this SBIR effort are as follows: (1) provide timely automated SSA tracking for orbital, direct ascent, laser, and radio frequency interference threats; (2) provide timely automated Blue Force Status (BFS) based upon anomaly detection (ANOM) neural networks software learning of the state of health (SOH) available from each satellite; and (3) provide timely automated Abnormal Catalog Update (ACU) detection based only upon space catalog data.

SBIR Technology

Data Fusion & Neural Networks (DF&NN) has delivered the following three software based technologies under this SBIR project:

- ANOM: Abnormal Satellite SOH detection and cause characterization
- Event Track: Abnormality and threat event detection, tracking, and characterization
- ACU: Abnormal space catalog update detection

Potential Application

The SBIR-developed capabilities have been delivered for planned operations use in support of multiple joint-service and defense initiatives.

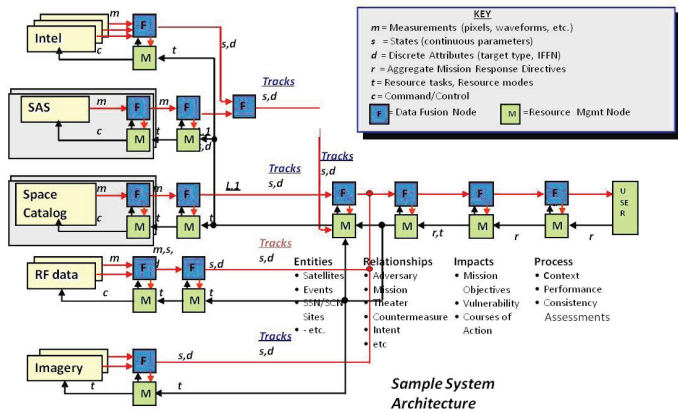


Figure 2: Satellite-As-A-Sensor (SAS) and Abnormal Catalog Update (ACU) support entity, relationship, mission impact, and process assessments



SBIR/STTR

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The Blue Force Status (BFS) Satellite-As-A-Sensor (SAS) software provides automated abnormality detection needed for Space Situation Awareness (see Figure 1 on Page 1). The ACU software was integrated as a web service into a joint-service prototype (see Figure 2).

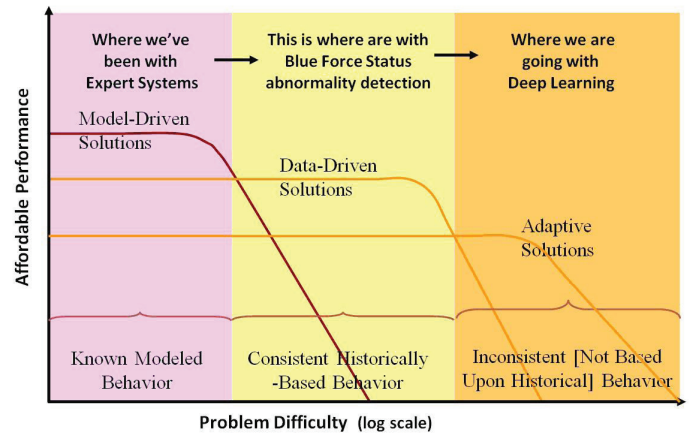


Figure 3: Data driven and adaptive solutions provide affordable performance as difficulty increases

Since this software is data driven, it is affordably applicable to detection, tracking, and characterization of any monitored system (i.e., generating status measurands) to include cyber attacks, vehicles, ships, aircraft, unmanned aerial vehicles, and factories (see Figure 3)).

Company Impact

DF&NN is pursuing patents on ANOM and ACU. The company has grown from one to six employees during the SBIR Phase II effort and has good prospects to grow further.

DF&NN's mission is to develop adaptive and affordable data fusion and resource management systems for the Department of Defense.