

Axient Program Highlight: Delivering Digital Engineering Across the Lifecycle

Executive Summary

Digital Engineering (DE) transforms the Systems Engineering process for designing complex systems through the use of models, as opposed to documents, to integrate data and disciplines across the lifecycle. DE capabilities can include multi-domain analysis, advanced analytics, digital twins, artificial intelligence, autonomous systems, human-machine integration, and integrated modeling and simulation. Employing DE techniques and capabilities allows our engineering teams to emphasize speed of delivery and decision-making, continuous adaptation, and frequent capability upgrades.

Axient Tools

Multidomain Analysis. Axient's **Mission Lifecycle Development Lab (MLDL™)** provides a simulation, test, and wargaming environment to measure military utility of operational spacecraft and fielded weapons systems against threats.

Digital Twins, Advanced Analytics, Data Visualization, AI/ML. Axient engineers developed **RIMFIRE®**, an effective failure reporting system that identifies corrective actions to increase system reliability, improve maintenance practices, and elevate even higher on-wing time.

Autonomous Systems. Axient's **autonomous intelligent flight management system (AIFMS)** is a situational awareness and response, vehicle-centric, safety software for UAS (Unmanned Aircraft Systems).

CUSTOMERS

- Missile Defense Agency
- MDA Program Executive Office
- US Navy
- US Space Force
- US Army PEO M&S
- AFRL

CAPABILITIES

Digital Twin. Axient has developed a satellite digital twin to support Hypersonic Sensor Hardware in-the-loop (HSH) testing for the MDA. This twin provides true kinematic state data to scene generation software. The HSH lays a foundation to support pre-flight testing/evaluations for new and upcoming programs within MDA.

AI/ML. Axient created an AI Development and Execution Environment (AIDEE) testbed for the MDA PEO for Advanced Technology (MDA/DV) to prototype, demonstrate, and assess Artificial Intelligence (AI) and its application to big data analytics for the Missile Defense System. This testbed consists of a suite of ML (machine learning) and deep learning (DL) approaches, simulation capabilities, and processing tools. It is used to execute supervised learning tasks with large data sets of multi-spectral infrared (IR) imagery collected by MDA assets during flight tests and exercises to aid in automating analysis efforts and detecting anomalies in performance, interfaces, or data, and to enable autonomous feature extraction with varying perspectives. Axient engineers use classical machine learning, reinforcement learning, and image-based learning AI/ML techniques to analyze new sensor concepts and do performance assessments. AI/ML techniques augment existing EO/IR systems to do feature extraction and object recognition to determine sensor characteristics and automate sensor operations.



Axient Tools Continued

Modeling and Simulation. Axient's **MLDL™** provides M&S capabilities across the full lifecycle, from analysis of alternatives to operational assessments. Axient's **PULSEbox™** is a comprehensive and integrated high-fidelity RF and IR scene generation and injection simulation capability for the Integrated Air and Missile Defense (IAMD) environment that provides the highest fidelity threat and target data and simulations developed for MDA and US Navy.

Contract Highlights

PEO M&S

Modeling, MBSE. Axient digital engineers embedded in the PEO Missiles and Space organization are using MBSE models of to support the Army's Integrated Fires (IF) initiatives. They use MBSE models to expands on heritage C-RAM and C-UAS fielded capabilities to create a layered interconnected system of defenses and weapon systems to support multi-domain operations.



MDA Innovation in the Workplace Team Award

Because of Axient's forward-thinking DE defense strategies like HSH

RRSW

Axient develops and deploys advanced technology capabilities to help modernize and improve the intelligence planning, exploitation, and dissemination (PED) capabilities and outcomes for our warfighting and intelligence communities. Axient delivers a diverse portfolio of capabilities and incremental improvements to overseas Special Operations Forces to include satellite communication exploits, friendly force tracking (FFT), and target track locate (TTL) covert applications.

RISE

Recurve is an AFRL mission hosting a space-based Banshee mesh network to explore network behavior in multi-domain applications. It will demonstrate beyond line of sight (BLOS) networking communications and inherent PNT capabilities. Axient delivered on all phases of the mission from concept and requirements development through mission operations. Our electrical engineers developed the maximum power-point trackers (MPPTs) and developed a hardware test simulator to exercise the MPPTs across the full range of expected solar array inputs.

XVI is an AFRL BLOS Range Extension Demonstration mission. **XVI** extends a 'Theater Tracking' capability using Link 16 communications to a 100 nautical mile area of responsibility (AoR). It demonstrates the ability to participate in a terrestrial tactical data link from low Earth orbit (LEO). Axient supports development of the operations ground system and final bus characterization, testing, and operations.