



Presented To:

**Greater Northwest New Mexico Manufacturing Extension Partnership
Manufacturing Day 2023**

October 10, 2023

Who We Are

Emerging Technology Ventures Inc. (ETV) designs, builds, deploys, and supports:

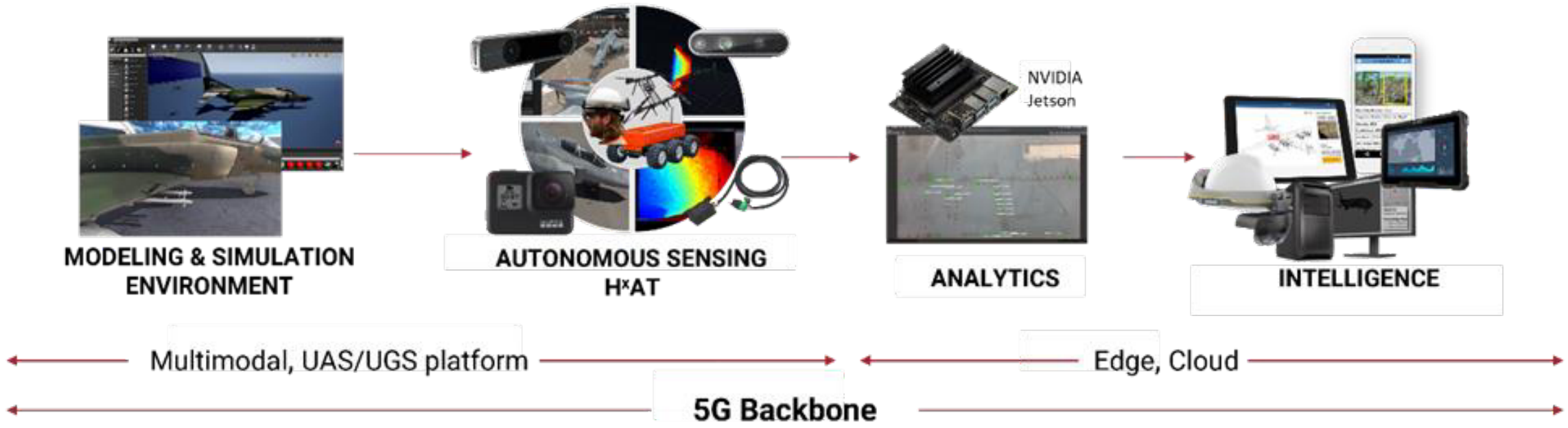
- Autonomous platforms (Air, Ground, Maritime) with:
 - o Multimodal sensing
 - o Real time AI-driven edge analytics
 - o Human-Robot teaming for inspection and maintenance in complex environments
- Building user trust in AI solutions is critical for KeenAI® and ETV
- Workforce development is key for ETV's company growth, especially in a rural area where we operate
 - o The NMEDD Job Training Incentive Program has been essential for our staff development



UAS Flight Testing at the Alamogordo, NM Airport

Our Product

KeenAI[®] is an agile, extensible architecture that autonomously senses, understands, decides, and acts to deliver actionable intelligence in complex environments. KeenAI[®] is built for the future of the Global Analytics of Things.



Market Segments



MARKET SEGMENTS



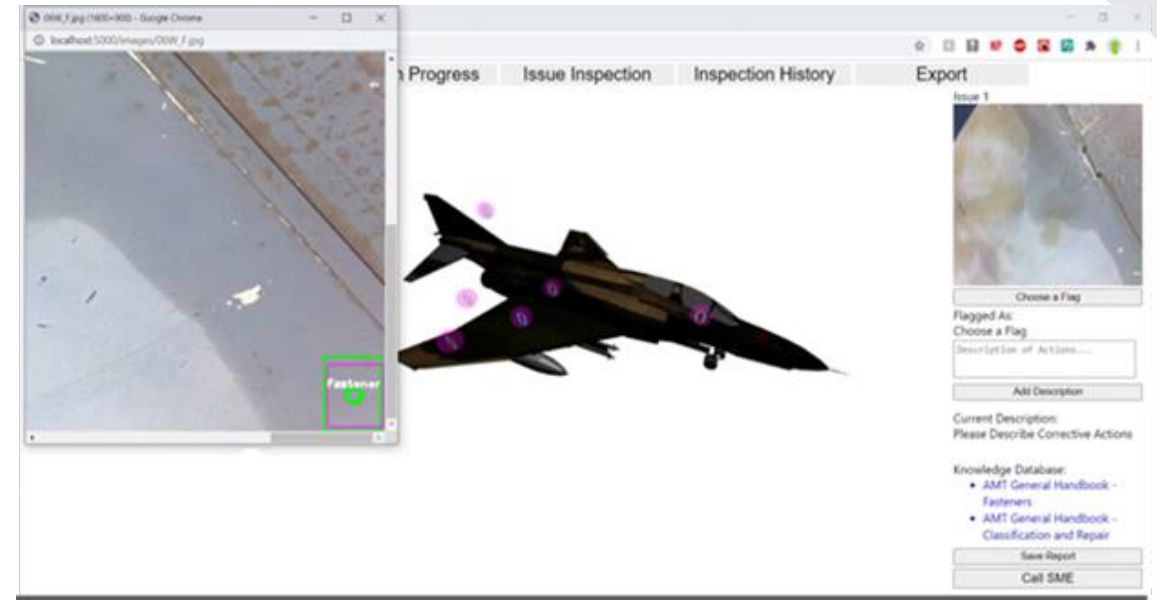
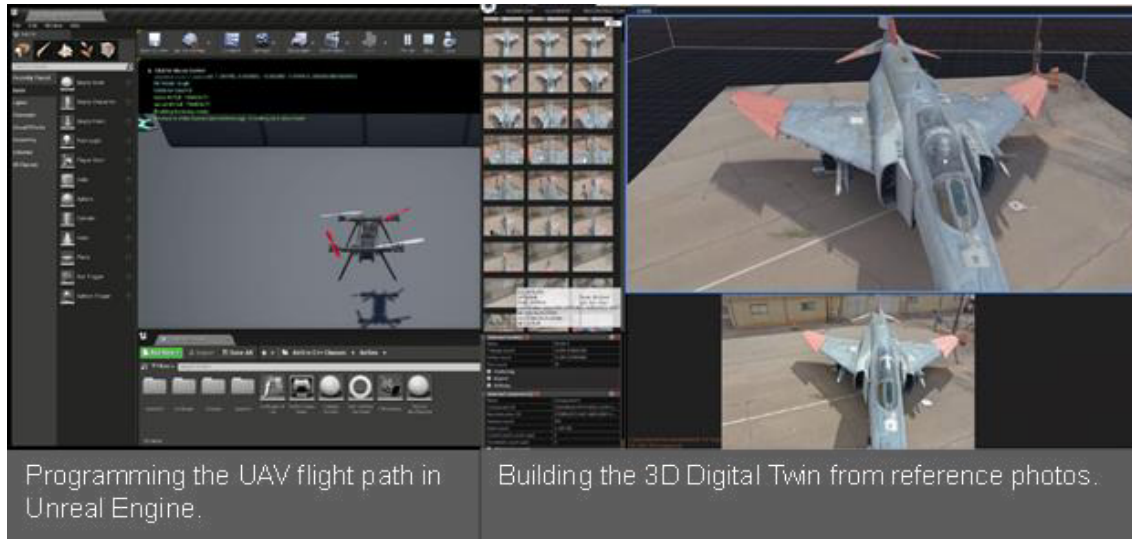
KeenAI[®]'s Market Segments include Precision Agriculture, Critical infrastructure Inspection, Aircraft Inspection, Renewable Energy, and Defense.

KeenAI[®]'s creation and development were aided by two contract awards:

- 2020's US Navy Phase I Small Business Innovation Research (SBIR) Accelerated Delivery and Acquisition of Prototype Technologies (ADAPT) titled "Autonomous Inspection, Damage Classification, and Repair Support System for Expeditionary Naval Aviation Maintenance," and
- 2021 and 2022's NASA Phase II Small Business Technology Transfer (STTR) titled "Digital Twin Data Acquisition System for Institutional Facility Management."

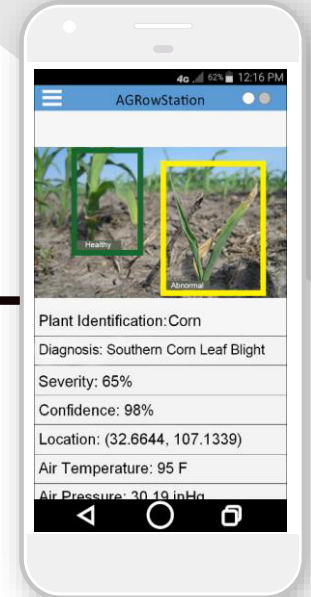
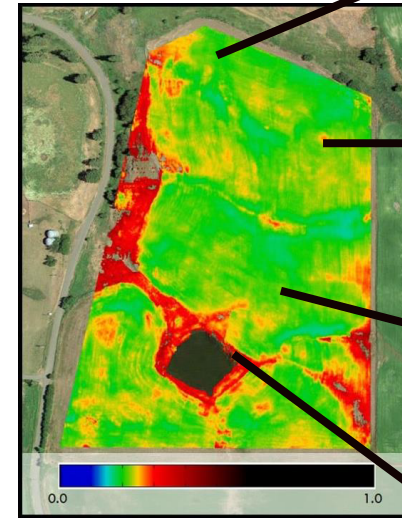
Our Value Proposition

KeenAI®'s patent-pending technology addresses the Data Rich Information Poor (DRIP) issue prevalent among users faced with mountains of data. Its architectural framework cues and drives response mechanisms through multimodal sensing and fusion, a neural network engine for analysis and decision, and user workflow integration.



Current Applications and Use Cases

Precision Agriculture Crop Inspection for Pests, Disease, Weeds, Nutrient Deficiencies



Integrated Sensing

Analytics

UI Intelligence

Multi-modal, Multi-platform

Edge, Cloud

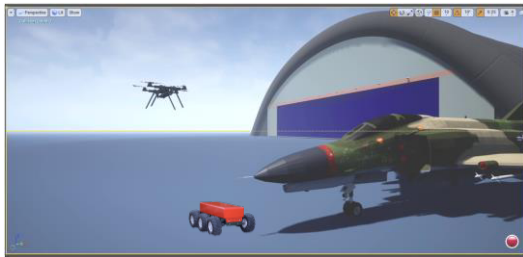
5G Backbone

Current Applications and Use Cases

Aircraft Inspection, Damage Classification, and Repair Support System
Navy SBIR Phase I (complete) & Phase II (submitted)



Autonomous Inspection Planning and Execution



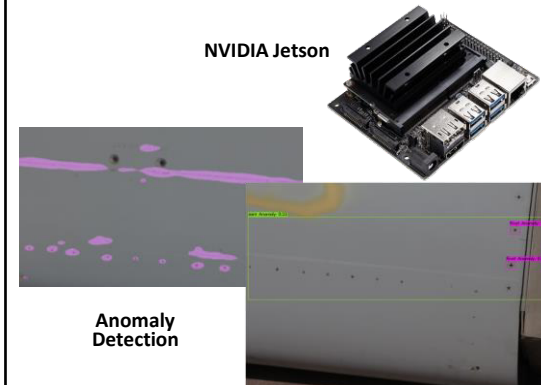
- Microsoft AirSim-developed M&S environment (w/ Unreal Engine) is utilized to create autonomous inspection plans by tail number for UAS/UGS (PX4/ArduPilot)
- M&S environment includes weather and other effects with 5G spectrum models
- Ability to test new sensor performance
- Microsoft HoloLens 2 and tablet for maintainer training

Multimodal Sensing



- Maintainer enters tail number on Maintainer Workstation (MW) to recall digital twin and repair history through Teamcenter along with inspection plans
- Maintainer selects autonomous inspection plan(s) and initiates UAS/UGS
- Multimodal sensor suite captures visual, LiDAR, and thermal imagery
- Anomalies are identified at the edge
- Maintainer can control UAS/UGS for closer inspection of anomaly and safety override

Anomaly Detection at the Edge



- NVIDIA Jetson identifies and characterizes each anomaly (corrosion, fasteners, cracks) at the edge w/AWS & Azure hooks
- Expansion to thermal imagery to provide subsurface anomaly detection including delamination in composites
- Convolutional Neural Network enhanced with semantic segmentation for greater precision and analytics
- Anomalies are mapped on the latest 4D digital twin of the platform and transferred to MW for resolution

Maintainer Resolution of Anomalies



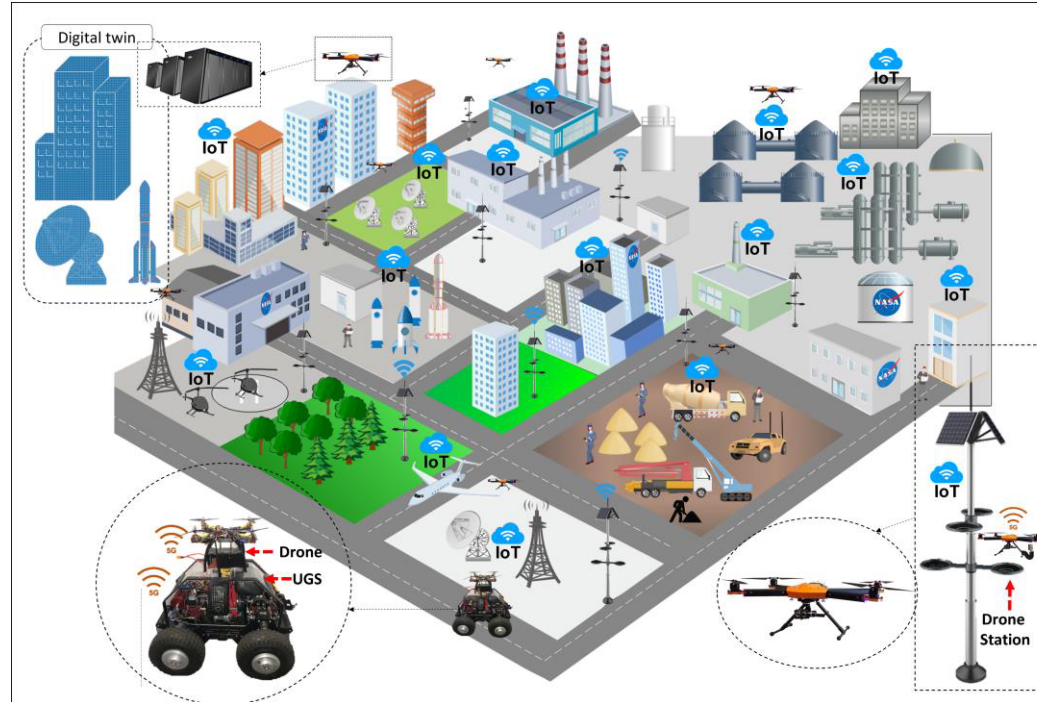
- MAINTAINER WORKSTATIONS (MW)**
- MW options include desktop, tablet, and HoloLens 2 (FPV over the shoulder look)
 - MW displays tail number 4D digital twin “as-is” before inspection w/new anomaly layers (anomaly type) geo-located on 4D digital twin
 - Maintainer has access to repair history, anomaly specific knowledge base, and SME engineering reach back
 - Inspection and engineering resolution record is created for supervisor approval and transmission through Teamcenter w/ updated digital twin

← IBM Maximo Digital Thread →

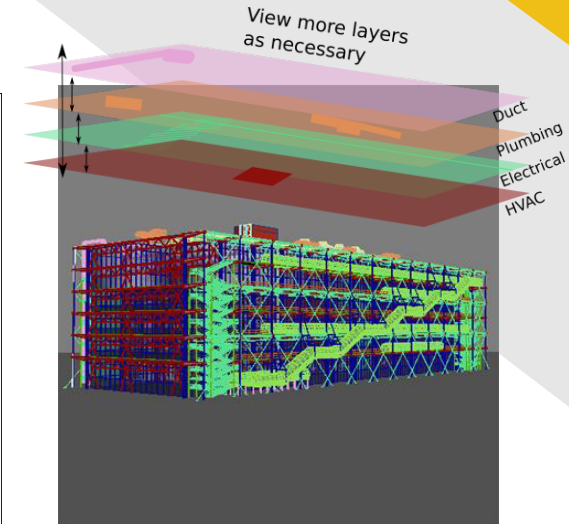
Current Applications and Use Cases

4D Digital Twin Data Acquisition System For Institutional Facility Management
NASA STTR Phase I (complete) & Phase II (ongoing)

- In response to NASA’s **digital transformation goals for model-based solutions** in the area of “Digital Twin” Institutional Management and Health/Automated Decision Support of Agency Facilities.
- Solution supports localized and distributed management of NASA’s terrestrial facility constellation **providing near real-time status of the facility environment for predictive condition-based maintenance.**
- Feasibility assessment included **adaptation for application in multiple environments** including **space facilities.**



Completed IBM’s AI Mentorship program; current **IBM Partner with Embedded Solutions Agreement** with focus on IBM Maximo integration (NASA deployed solution) and Trusted AI standards and processes.



Operational Concept

- 4D view of area of interest w/change detection
- Consolidated system view w/layered subsystem view
- AI models built on inter-relationships between layers
- Compute at the edge w/cloud reachback to evolve models

Thank You!

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