Technology Area of Interest
Integrated Survey Program Digital Transformation

USSOCOM Integrated Survey Program (ISP) Digital Transformation seeks Industry innovation in geospatial survey collection, production, dissemination and continuous innovation of the existing data centric, software-intensive system. Commercial solutions should include automated tools and workflows with technologies for collection to enable survey data generation and geo-registration as well as correlation of 2D and 3D geospatial data by multiple providers/sensors and be capable of integrating geospatial data to enable rapid 3D modeling and dissemination to individual SOF operators at the tactical edge. Survey data packages will contribute to a global SOF-unique, standards-based geospatial data foundation.

New AI/ML and advanced algorithms for computer vision are required to meet SOF requirements for battlespace visualization supporting real world mission planning scenarios. The Technology Area of Interest is focused on new, novel, or provocative commercial solutions with architectures and technical attributes that can be prototyped during a 3–5-month period and operationally fielded through an agile methodology via the Software Acquisition Pathway. Proposed solutions should include metrics for assessing prototype capabilities prior to fielding and for technology maturation or optimization during production. Successful prototype projects may transition to production in 2022.

Objectives:

Exterior 3D Capture: Hardware/software solution to collect and process exterior Areas of Interest (AOI) exceeding 10-acres in size resulting in a georeferenced, photorealistic 3-dimensional (3D) reconstruction interoperable with other 3D model formats. Exterior AOIs will include a variety of manmade structures and natural terrain features in an urban setting. Resulting 3D model must be in a neutral (non-proprietary) format not exceeding 200 MB per acre. Resulting 3D model must be exportable as a site plan in a 2D Computer Aided Design (CAD) format through an automated process, delineating significant manmade features like buildings, pavement, and barriers. Resulting 3D model must be exported in a 2D georeferenced orthographic imagery format. Collection time should not exceed 1 man-hour per acre, and local processing time should not exceed 2 man-hours per acre. Resulting 3D model must have an absolute geodetic accuracy tolerance within 3-meters horizontal and vertical and a relative accuracy tolerance within 3-feet horizontal and vertical.

- *Note: Currently, ISP is investigating small Unmanned Aerial System (sUAS) technology as a potential solution for exterior 3D capture. SUAS provides geodetically accurate 3D reconstruction and orthographic imaging capabilities when processed with photogrammetry software.*

Interior 3D Capture: Hardware/software solution to collect and process structural interiors exceeding 200,000-square feet in size, resulting in a photorealistic 3-dimensional (3D) reconstruction interoperable with other 3D model formats. Structural interiors will include commercial office space, residences, and industrial layouts. The ability to accurately render

doors and windows as well as significant mechanical (i.e., air handling units), electrical (i.e., junction boxes and generators), and plumbing (i.e., main water valves) features is critical. Resulting 3D model must be in a neutral (non-proprietary) format not exceeding 200 MB per floor of a multi-story building. Resulting 3D model must be exportable as a floor plan in a 2D Computer Aided Design (CAD) format through an automated process, delineating wall thickness, stairwells, doorways, and windows. Collection time should not exceed 1 man-hour per 4,000-square feet, and local processing time should not exceed 2 man-hours per 4,000-square feet. Resulting structural 3D model must have a relative horizontal and vertical accuracy within 6-inches.

- *Note: Currently, ISP is investigating Terrestrial LIDAR Scanning (TLS) technology as a potential solution for interior 3D capture. TLS provides sub-centimeter accurate 3D reconstructions when processed with point cloud registration software. A major drawback of TLS scanning is extended collection time and large file sizes.*

Interior Mobile Collection: Small form with mobile application solution to collect data elements of structural interiors. Application must provide photography, object mensuration, x/y/z location, and feature attribution functionality for all doors, windows, mechanical, electrical, and plumbing elements within a structural interior. Application should rely on Artificial Intelligence/Machine Learning (AI/ML) functionality to automatically recognize and populate pre-defined element attributes, with an option to override auto-populated data through the user interface. Application will employ AI/ML to learn from collected data, identify patterns, and make decisions with minimal human intervention. Application must segment collectible elements by compound, structure, and floor. Collected data must be exportable as a database with corresponding photo attachments for import into Geographic Information System (GIS) software.

5G Enabled Cloud Computing: Developed in conjunction with the objectives above, a Software-as-a-Service (SaaS) model will create a centralized application portal to process survey data into 3D models and/or 2D floorplans. To work effectively, cloud applications must rely on low bandwidth down range. As 5G mobile networks continue to propagate geographically, ISP surveyors theoretically can leverage 5G capabilities to upload and download data to cloud architecture. The minimum download/upload speeds a network must provide for it to be classified as 5G are 20 Gbps per second down and 10 Gbps up - the minimum download/upload speeds for the first iteration of 4G were 150 and 15 megabits, respectively. At a minimum, a Cloud Sharing model can be leveraged to push survey data to garrison in near real time to accomplish data management/publication tasks.

- *Note: Classification guidance will require additional objectives to address secure 5G data transfer.*

Network Dissemination: User interface solution to visualize and exploit georeferenced 3D models via web browsers. Solution must ingest point cloud, tessellated mesh, and constructive solid geometry file types, to include textures and geospatial data. User interface must provide mensuration, clipping box, and viewshed analysis interaction. Navigation must include orthographic and relative views, top and side views, and point of view (POV) mouse/keyboard

controls. Database interoperability is required to visualize specified points, attributes, and associated photo/video attachments. Solution must employ compression algorithms to enable visualizations in limited bandwidth environments. Solution cannot leverage the WebGL (Web Graphics Library) API as a rendering engine.

3D Model Compression: File compression solution to increase efficiency and loading speed of 3D objects over limited bandwidth networks. Solution must support compressing points, connectivity information, texture coordinates, color information, normals, and any other generic attributes associated with geometry while maintaining geodetic information. Solution must rely on open-source code (i.e., C++, JavaScript) to encode/decode data. Ideal solution will compress original file to 5% of its original size. Must be compatible with tessellated mesh and point cloud source files.

Game Design / Interactive 3D: A user interface solution to transition ISP geospatial datasets into immersive 3D environments which facilitate end-user interaction and contextualization. A gaming simulation will include environment design based on existing data; level design based on existing compound, structure, and floorplan 3D models; programmed to enable point-and-click user interaction with feature class elements; institute clash detection to recognize walls, floors, and ceilings; capable of mouse/keyboard, game controller, or mobile device interfacing; deliverable via networked and non-networked systems (i.e., web browsers, computers, mobile hardware).

Enterprise Services & DevSecOps Pipeline: Leveraging existing USSOCOM enterprise services and DevSecOps pipelines are preferred over creating unique software services. Enterprise services include technical services such as cloud infrastructure, software development pipeline platforms, common containers, virtual machines, monitoring tools, and test automation tools. Automated security and testing should be incorporated to the maximum extent possible throughout the software development and delivery lifecycle. The selected DevSecOps pipeline should provide tools that support and integrate automated testing, security scans, logging, and monitoring. Successful prototypes must transition to operational use on USSOCOM classified networks prior to production.

Security: Access to relevant data and networks for both prototyping and production requires personnel with a Top Secret Clearance and SCI eligibility. Other security requirements and security-related functions apply during potential follow-on production.

Technical questions may be sent to MSS@socom.gov by 26 May 2021.