ManTech
Securing the Future

SCHEDULE FOR WORK

ST3P™
Version 3.0

ManTech's Secure Tactical Edge Platform (ST3P™) v3.0
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A ManTech White Paper

BACKGROUND

Maintaining information dominance at the tactical edge is a critical challenge. Given the advances in active monitoring, data analytics, network or security operations center (NOC/SOC) technologies, and security information and event management (SIEM), we are now able to provide robust active defense mechanisms to protect the core enterprise. However, defending the tactical edge presents numerous additional challenges. Warfighters are often operating in a disconnected, intermittent and limited bandwidth (DIL) environment and current deployed edge nodes do not have enterprise equivalent connectivity, storage or processing - directly affecting initial point of data ingest processing efficiency.

Traditionally in a hierarchical military command and control (C2) infrastructure, information flowed predominately from higher headquarters to lower tactical units. The task, collect, process, exploit and disseminate (TCPED) cycle has depended upon deployed units' ability to collect large amounts of tactical data on missions. That tactical data underwent light on-site analysis, but ultimately needed to be transported in bulk to central locations for in-depth process and exploitation. This rear echelon analysis often occurs without providing any immediate insight (dissemination) back to the warfighter on station. In fact, analysis and dissemination to operational units can often be late, impacting tactical and strategic planning as well as mission execution.

NEED

This top-down flow worked well when computers, sensors and communications systems were large components or bulky hardware builds making these valuable and complex devices high-demand/low-density assets. Combined exponential increases in compute power with miniaturization has made greater processing power more available in small(er) devices. The tactical warfighter as well as the strategic command post will benefit from continuing to push processing power to the lowest echelon possible. Currently, warfighter tactical operations are informed by data collected from a variety of local sensors. This sensor data can be collected, processed and exploited locally on AI-enabled hardware systems in small form factors in terms of size and power, while still offering considerable compute and storage. Sensor data locality, sensitivity and package size certainly place constraints on forward operating tactical hardware. As such, it is inherent that distributed tactical operations be empowered to conduct distributed computations over interconnected systems in order to process local sensor data. Adding to the above constraints, tactical environments tend to be congested as well as contested, offering only intermittent or low bandwidth connectivity. Autonomous adaptation and machine learning that support distributed compute is needed, as is the hardware that can support this activity. Local sensor data can be refined by local devices to deliver autonomous cyber defense, target recognition and electromagnetic spectrum awareness (just to name a few) and ultimately add efficiency to centralized data fusion by refining/easing data dissemination. Centralized compute, which may have more powerful computational capabilities, may lay underutilized unless refined tactical data is disseminated appropriately and in a timely fashion.

As discussed, today's advances in both Machine Learning (ML) and Artificial Intelligence (AI) as well as storage density/storage organization provide the opportunity to translate elements of manual analysis into algorithms that not only run in core, enterprise data centers, but also run on associated data sets at collection points. Today's advances in hardware and networking technologies provide the opportunity to deploy hybrid cloud infrastructure to bring scalable data analytics and storage to the tactical edge, resulting in discoverable and transportable dense data storage for more immediate awareness of the operational picture and influence for speed to decision.

CHARACTERISTICS OF THE CHALLENGE:

Deployed Compute and Data Analysis at the Tactical Edge

- Data collection using modern, local sensors is growing exponentially.
- High capacity storage not historically robust enough to retain all local sensor tactical data / intelligence products.
- Compute capacity at the tactical edge is limited

and not optimized to handle these robust data sets.

- Processing is time consuming and manual, lacking AI enablement/automation.
- Cloud sync takes time, and due to limited or no bandwidth is often incomplete in disconnected operations.

MANTECH RESPONSE

ManTech Advanced Systems International, Inc. (ManTech) analyzed these characteristics of the challenge to drive solution requirements – minimum storage levels, delivered as a service mesh, container management, GPU compute

opposed to seconds, minutes or hours. With the introduction of modern AI applications, the aim is not to eliminate the human in the decision-making process, but to use autonomous capabilities to scan, detect and assess threats in milliseconds and present the relevant threat data to the warfighter. Manual-autonomous processing teaming is meant to reduce the cognitive load on the operator or analyst at the tactical edge. Modern sensors generate an enormous amount of raw data – potentially petabytes of data in a very short period of time. While an AI capability is software based, this AI capability must be delivered with high-performance compute
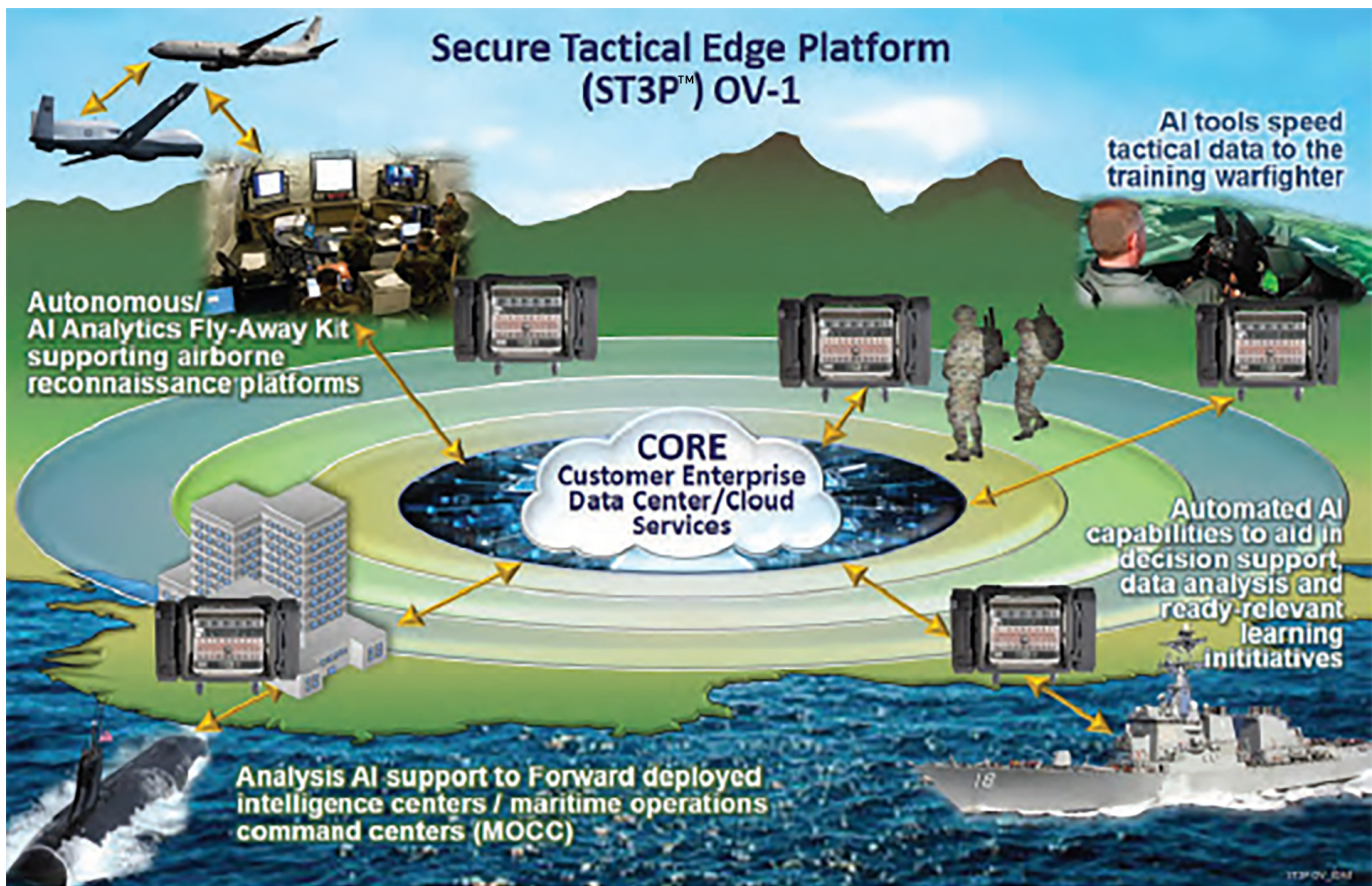

Exhibit 1. ST3P™ **Operational View**

integrations, levels of automation, and transport management – that will provide cross-domain able C2 solutions at the tactical edge as part of a Secure Tactical Edge Platform.

Modern GPUs are designed for massive parallel processing, creating the ability to carry out data intensive analytics on sensor data in milliseconds

in order to handle these AI-driven processing requirements. ST3P™ improves speed of decision making by automating and augmenting data ingest, processing and tagging ultimately delivering curated 'information on demand' to the decision maker. Improving decision making speed, by delivering information deltas, will reduce time between sensor detection and warfighter engagement.

In building this solution, ManTech focused on the "Why" as various use case concepts of operations understood by our system experts, battlefield C2 experience, and customer feedback. The goal of our solutions is to:

- Improve Speed of Decision Making.
- dentify critical data for Accelerated Transport.
- Meet tactical edge Size, Weight, and Power constraints.
- Orchestrated environment for application and data resiliency and scalability.

The result is a system that brings developed AI automation to provide actionable insight as data is collected at the edge. The same automated data analysis results that immediately inform the tactical scenario on site are also prioritized for transport back to the enterprise to further influence decision in operations, both tactical and strategic.

- Minimum configuration 1PB of effective all flash storage.
- Integrated data-at-rest encryption AES-256 DARE (FIPS-140-2 Validated).
- Built in snapshot replication for global analyst access.
- Analyst from afar capability via global virtual desktop infrastructure (VDI).
- GPU accelerated machine learning and inference.
- Flexible GPU capability – virtual/bare-metal/ passthrough.
- Containerized capability supports flexible deployment options.
- Hardware Enforced Cross Domain Solution (CDS) Cybersecurity Architecture accredited for CDS for Mission Specific Data Sharing.
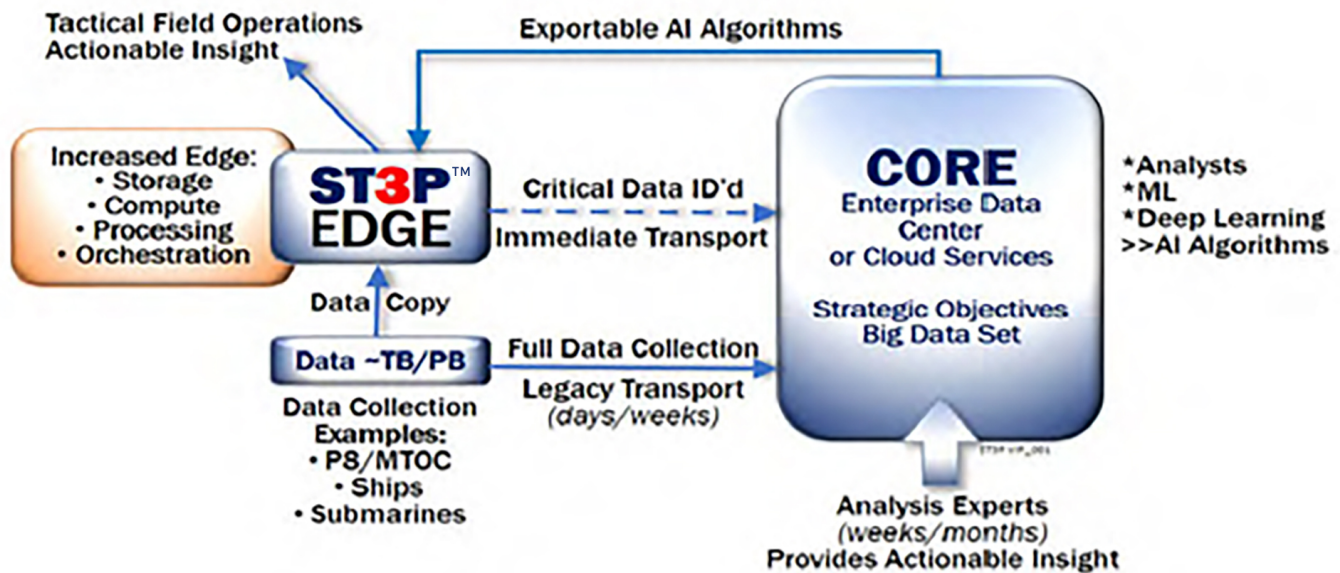

Exhibit 2. Speed to Decision – Ease of Transport

ManTech's Secure Tactical Edge Platform (ST3P™) hardware backbone hosts all of this immense capability. ManTech's integration and AI experience allows us to design and manufacture this customized solution in order to meet the needs of the end user.

ManTech moved from concept and analysis to determine the following specifications to drive the design, integration, and development of our tactical edge platform prototype:

ST3P™ offers a modular high-bandwidth-capable, rugged, secure and scalable solution capable of performing real-time data analytics in a DIL environment, delivering on the triple demand to be simultaneously Secure, Powerful and Resilient.

The combination of increased storage, compute, processing, and automated orchestration creates the capability to tackle complex automated data analytics at the point of collection. With the data copy for

analysis at the edge and the processing power to run complex algorithms, the application of AI/ML drives speed to decision and ease on transport.

- Powers the data pipeline at every stage with flexible compute and storage.
- Easily scales at each ingestion point when more performance is needed.
- First ever solution to bring compute power to offer ML and AI options to the Tactical Warfighter. Enablement native AI at the edge
- Pre-built AI modeling library that can be fine-tuned based on mission requirements and updated quickly using microservices framework and tools.
- Integrated in a unified management control plane by open API.
- Lab validated design that has a unified US-based support model.

The ST3P™ prototype is composed with technology that is already being used in DoD enterprise infrastructure. ManTech can provide flexible, customizable deployment models to provide an as-a-service model, leveraging a fully integrated solution using 'best of breed' technologies.
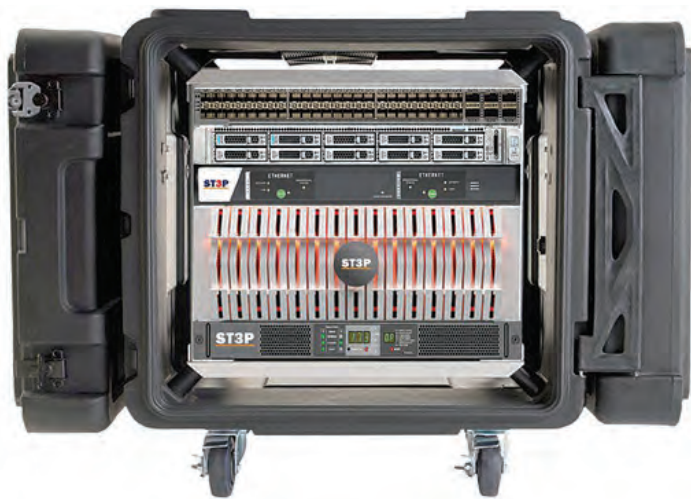

Exhibit 3. ManTech's ST3P™ Device

- Completely customizable capability to layer on independent software vendors for specific uses cases such as predictive maintenance and algorithms for full motion video analysts.
- Agile solution that perpetually refreshes storage and compute with cutting edge technology in the field non disruptively in a Platform-as-a-Service (PaaS) model.

- Validated secure supply chain on all products in this stack with US based support.

CLOUD TECHNOLOGY APPLICATION

ST3P™ provides the ability to containerize the dependencies for applications that remain stove-piped while concurrently providing capabilities that fully exploit all the advantages of cloud-based technologies. Based on an open architecture approach that leverages the benefits of an advanced service mesh which delivers:

- Microservices automation.
- Services load management/balancing.
- Automated versioning enabling simultaneous application versions to route according to specified routing rules.
- Zero Trust Model (ZTM) access control.
- Automatic log and traffic monitor.

ST3P™ execution is a paradigm shift from legacy offerings that are only able to tackle predefined and static requirements. With integrated automated orchestration of containers and storage, ST3P™ delivers on the deployment, scaling, and management necessary to meet changing compute and data processing resource demands without a heavy strain on system or database administrators. To further enhance operational security at the tactical edge, ManTech's adoption of a Zero Trust Model (ZTM) provides security professionals the ability to make the network "invisible," granting visibility and access only to those applications and services that users need to perform their job. ManTech has also developed novel Autonomous Cyber Defense capabilities and deployed them at the tactical edge.

Through application of these technologies, ST3P™ brings the key benefits to run important applications, store and process data at the tactical edge as if you were connected to cloud-based services:

Resiliency – offering fault tolerant and scalable services even though physically separated and isolated locations utilizing minimal/no bandwidth.

Availability – paired with high resiliency, services are fully redundant offering high processing uptime.

Elasticity – seamlessly resizes and responsively scales to required compute requirements.

Security – keyed/tokenized isolation of services paired with transport layer security (TLS) application process interface (API) connectivity.

ManTech's ST3P™ solution simplifies content delivery and smart-syncs to any cloud (e.g., on-premise, hybrid, full cloud). With our vision of *Bringing Digital to Mission™* using open-standards' interfaces, data communication, and content delivery, ST3P™ is designed to provide ManTech customers with a strategic path to fully exploit cloud-based technology ahead of any near-peer adversary to bring actionable edge insight. ST3P™ employs Cloud technologies and advantages to this solution:
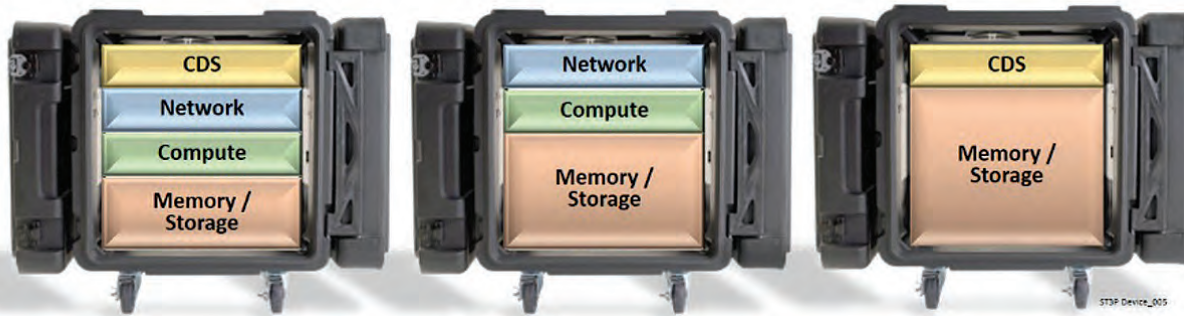
and statistics collection.

• Infrastructure can be extended globally across an enterprise to thousands of servers in multiple domains.

ST3P™Performance AI

• ST3P-delivered GPU architecture offers the performance of up to 100 CPUs in a single GPU. Also, ST3P user interfaces empower users to fast-track AI, high-performance computing (HPC), and graphics processing, enabling data handling challenges that were ¬-once thought impossible to be approached with ease.

ST3P™ CDS

• Unlike software-based firewalls, ManTech's solution

Exhibit 4. ManTech's ST3P™ Device can be delivered in dozens of modular versions and sizes, meeting user requirements.

ST3P™ Integrated Switch

Provides high-performance, density, low latency, and exceptional power efficiency in a range of form factors.

• ST3P™ switches provide ground-breaking cloud scale technologies to support flexible migration and communications options with highly scalable cloud architectures and enterprise data centers. This resiliency offered by ST3P enables priority automated edge to core synchronization when connected and full user environment when not.

ST3P™ Unified Computing Environment

• Enables server, fabric, and storage provisioning as well as, device discovery, inventory, configuration, diagnostics, monitoring, fault detection, auditing,

• mechanism. An LED transmits data on the source side of the data diode, and a photo receiver collects it on the destination side.

• Two-way communication continues seamlessly with the source and destination networks on each side of the data diode through built-in proxy computers. Data physically cannot be sent from the receiver back to the LED, securing the source network from external access.

ST3P™ Scalable AI Data Engine

• Built for organizations that demand speed to insight and cannot afford to let any single infrastructure component artificially limit their pipeline throughput.

• As computing demands grow, additional servers can be automatically provisioned in the high-performance fabric and instantly gain access to all available data sets. Similarly, as storage capacity or performance demands grow, additional resources

can be added to the solution with no downtime or reconfiguration.

SUMMARY

ST3P™ provides data analytics and automation at the tactical edge to increase speed of decision and simultaneously easing immediate transport issues. When connected, ST3P™performs as a hybrid/multi-cloud solution connected to a user-defined core; when disconnected it fully functions as an on-premise cloud. The developed architecture brings flexible, dynamic hardware utilization and container management for continuous application layer integration and deployment. Packaged with ManTech services and support, ST3P™ delivers the integration of talent and technology to securely deliver at speed within a secured approach to mission and solutions.

LEARN MORE
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