

# **Real-Time Digital Supply Chain Networks™, An Emerging Technology Required for Today's Logistics Operations And Tomorrow's Mission Continuity**

**David P. Stephens, Michael C. Bruens, and David Collado**

4055 Valley View Ln, #1000

Dallas, Texas 75244

UNITED STATES OF AMERICA

[dstephens@onenetwork.com](mailto:dstephens@onenetwork.com); [mbruens@onenetwork.com](mailto:mbruens@onenetwork.com); [dcollado@onenetwork.com](mailto:dcollado@onenetwork.com)

## ***ABSTRACT***

*The success of joint military logistics operations can be significantly improved through a multi-party digital supply chain network that provides a single interface to all mission partners and addresses issues commonly encountered in any joint operation. It solves the extensive master data management problems that exist today while honoring data sovereignty commitments. Without a "Single Version of the Truth," (SVOT) logistics decisions often result in inefficiencies of staff, lack of visibility into materials/supplies, and their location. Multi-tier Control Towers enable real-time visibility and mission planning, with execution, on the same system. Prescriptive analytics, artificial intelligence (AI), and machine learning (ML) capabilities add enhanced logistics functions that can be automatically executed, ensuring items are where you need them when you need them.*

*Today's forward tactical operations lack visibility and key logistics support tools, requiring additional staff and supplies for any mission. Denied, Disrupted, Intermittent, and Limited (bandwidth) (DDIL) operations can be technically supported in complex and austere environments. A proper solution is highly secure, based on commercial capabilities, never goes legacy, is supply and transportation agnostic, and approved for the United States Department of Defense (US DoD) operations. A network platform can embrace existing Enterprise Resource Planning (ERP) and legacy environments, provide (International Traffic in Arms) ITAR compliance, interoperability with current logistic solutions deployed by the US DoD, support multiple languages, real-time collaboration, low code software development kit (SDK), and complete end-to-end financial and audit capability.*

## **1.0 INTRODUCTION**

In recent years vulnerabilities in supply chains have been exacerbated and highly visible, causing issues across industries. Addressing vulnerabilities within the defences' supply chain is imperative to mission readiness and saving lives. How can we strengthen and build resilience within the defence supply chain as it's an integral part of deterrence and defence posture as this impacts a wide range of stakeholders from military personnel of the North Atlantic Treaty Organization (NATO) countries to civilians across the globe?[1]

One Network Enterprises, Inc. (hereafter referred to as ONE) is pleased to provide support to NATO. Today, we support not only the US DoD, which focuses on providing end-to-end management and visibility for multiple services and commodities, but a large extensive global commercial network of over 100,000 companies, two of which were recognized in the top five for sustained supply chain excellence [2]. In today's commercial and Government sectors, integration, unification, and true real-time, in-transit visibility are lacking to increase operational synergy in the supply chain. There is no doubt improving supply chain synergy will improve overall operations. ONE provides a secure multi-party, multitier, cloud-based Digital Supply Chain Network™. This innovative solution (in production today, managing over \$25 billion United States Dollars in US DoD assets) can assist NATO with improved supply chain visibility and accountability, regardless of

commodity. Strengthening and building resilience in Defence Supply Chain is not only essential to the first line of deterrence and defence, but it also has the ability to:

- Improved support to the warfighter,
- Operate in austere environments
- Meet multi-tier and multi-service challenges
- Integrate and modernize with both end-to-end visibility and end-to-end actionability
- Secure and reliable with best-of-breed availability
- Seamless integration with existing legacy and ERPs; enhance overall business process
- Multi-national and multi-level Master Data Management, honoring all data sovereignty requirements
- Compliance in a diverse international environment.
- Choices in development, configuration, and implementation through a low-code, backward compatible Developers Network, including SDK and public Application Programming Interfaces (APIs), to deploy modules in a never legacy environment

Logistics support is at the forefront of a successful supply chain. Needed is the ability to not only eliminate and reduce risks within the defence supply chain but also have the ability to anticipate potential issues and be responsive when they occur, as soon as they occur. A real-time solution that can assist decision-making is vital to readiness, responsiveness, and reinforcement.

A multi-lingual, Foreign Military Sales (FMS)-capable, supply and transportation agnostic solution provides a “SVOT” through our Digital Supply Chain Network™. It operates as a system of record or system of engagement, providing actionable logistics supply chain visibility support to meet mission objectives. Combined with a disconnected operations capability, the solution will enhance logistics visibility for military operations. The Digital Supply Chain Network™, powered by NEO, ONE’s proprietary AI/ML system, is a revolutionary multi-party network that is the world's first and only real-time decision-making supply chain suite. It enables an unlimited number of trading partners to plan, execute, monitor, synchronize, and optimize in real-time on the network. The solution can embrace current systems and optimize them of the network for increased visibility and actionability synergy. The figure below provides a high-level visual representation of Digital Supply Chain Network™ capabilities.

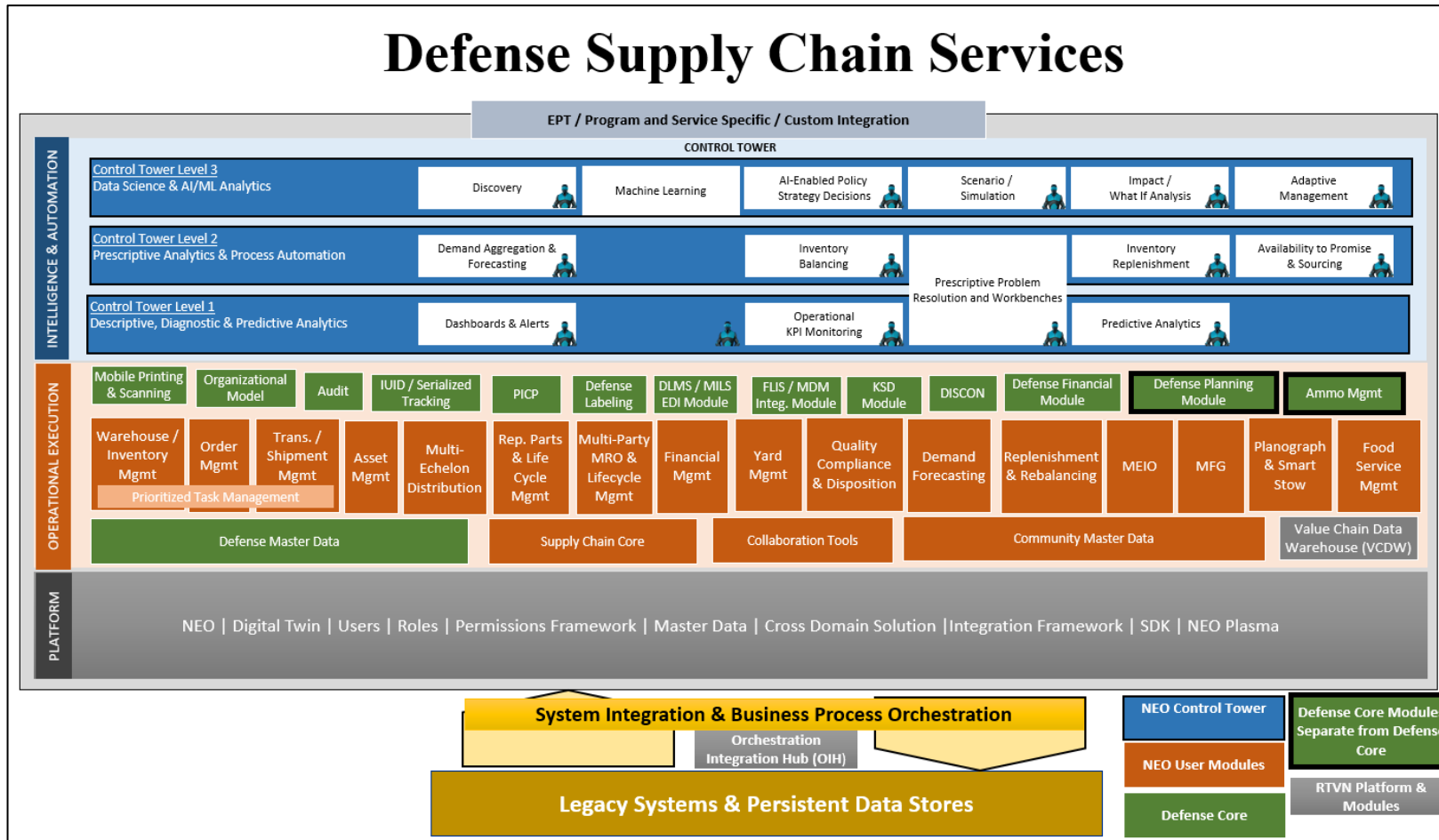


Figure 1. Defence Supply Chain Services. Commercial platform tailored to solve defence challenges.

A Digital Supply Chain Network can provide additional benefits to joint and combined operations:

- **Is Supply Class Agnostic** –supporting all supply classes, so military organizations can now manage ALL supply classes on a single platform.
- **Enhanced Capability** – provides complete visibility of managed assets, including assets managed by other services, organizations, and countries, and knows the true value of inventory stocks.
- **Increased Flexibility** – works with military processes as needed and is easily configured to meet specific military doctrinal and legal/country-specific mandates.
- **Enables Joint and Combined Services** – The Platform is multi-party, multi-echelon, allowing military services to build on each other's investments and collaborate more closely.
- **Supports Future Growth** – embraces other technologies, and the ONE Development Network (DevNet) SDK enables solutions to be adapted, extended, and built from scratch to support future needs fully.

## **2.0 DISCUSSION**

### **2.1. Solution Functionality**

As a multi-party, multi-tier enterprise network, the solution is deployed as a network service, meaning all capabilities are available to all users through a permissions model. Suppose a customer wishes to implement new capabilities modules that were not originally part of the initial deployment. These modules can be configured and “turned on” as a new software version is promoted into the production environment. The platform's modular nature allows new functionality to be added and extends existing functionality with new modules. This approach enables new software features to be added while preserving existing functionality. It guarantees backward compatibility for all modules and applications configured, developed, and/or deployed, reducing support and sustainment costs as the platform modernizes.

The solution offers about 1,000 backward compatible public APIs allowing for rapid onboarding of partners to stay ahead of a constantly changing environment. This solution, combined with the Developers Network and full service-oriented architecture (SOA) capabilities, enables 3rd parties to develop new services and applications or extend, configure and modify applications and services.

Today, a federated Master Data Management (MDM) approach dramatically increases visibility and capabilities across multiple logistics and mission systems while providing a multi-tier bill of materials, lot/serial tracking and management, and entirely publishing and subscribing to MDM capabilities used by both commercial and Federal organizations. All modifications are supported by the never legacy model and integrated into the solution, ensuring availability to customers utilizing the multi-party federated network. The solution is capable of multiple features, including but not limited to forecasting and planning; ammunition management; warehouse management; transportation management; collaboration across the network; invoicing; and financial close-out. A high-level view of functions/capabilities available to customers is illustrated in **Figure 1**.

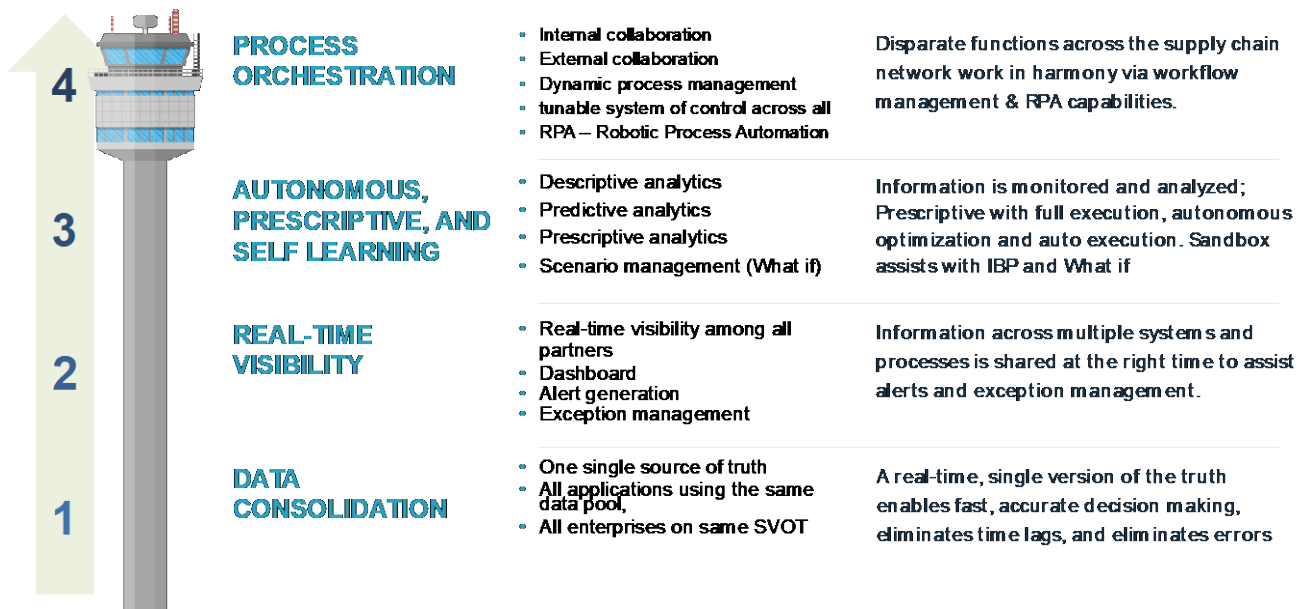
The multi-party, multi-tier Control Towers, deployed at multiple levels, is the only Control Tower solution that provides all of the following:

- Real-Time SVOT across your environment and into your partners
- End-to-End Visibility

- Planning and Execution on one platform (vs. planning on "stale," outdated information)
- Predictions and Prescriptions that enhance alerts and decision making
- Autonomous planning and optimization
- Global demand/supply match (get it where it is needed)

There is a rich set of modules available to all users. Enabled through the platform, NEO, and industry core capabilities, they are combined as a multi-tier solution and modeled to provide customers with various supply chain management capabilities.

At the heart is an Intelligent Control Tower, rated by Nucleus Research as the leader in Supply Chain Control Towers [3]:



**Figure 2. Multi-Tier Supply Chain Control Tower Capabilities. Supply chain control towers have recently evolved and provide visibility immediately to all Allied Partners and their industrial bases. Advance control towers offer real-time visibility, collaboration, and robust AI capabilities to move beyond decision-support to decision-making and autonomous control.**

Vital operational benefits include:

- A comprehensive transportation management and logistics model that represents all parties, the network, and processes from planning through execution delivers real-time management of all transportation activities;
- Best in class continuous planning and optimization with integrated execution
- The ability to identify in real-time issues, predict their impact on performance, and resolve them quickly and optimally;
- Advanced analytics, reporting & insight leveraging a SVOT drive improved carrier, supplier, and personnel performance;
- Detailed tracking of transactional and resolution history for continuous improvement;
- Detailed tracking and tracing of equipment and passengers, monitored against planned timelines.

Through AI/ML, NEO, the intelligent agent technology, provides users with predictive and prescriptive analytics for advanced problem solving and optimization at the network level. The NEO platform supports these technologies and analyzes their interval streaming data to provide a clear, rich, real-time picture of your supply chain. The Control Tower delivers an intuitive and configurable dashboard that displays critical location data, movement vectors, and other monitoring devices and sensor information. Intelligent NEO agents continuously monitor data streams and compare the plan information to relevant execution activities. Agents identify variances and departures from the plan and alert you to the impact on related logistics, supply chain activities, and the customer. NEO agents then consider all practical options based on available resources and constraints in your network and recommend cost-effective solutions – to keep your supply chain operations running optimally.

A Logistics Control Tower solution allows customers to drive superior service and cost for both domestic, intra-company, and international moves and supports all transport modes: truckload, less than truckload (LTL), intermodal (e.g., ship, truck, and rail), air, parcel, and ocean. With integrated warehouse management, dock-door scheduling, yard management, chain-of-custody, and order management capabilities, it delivers the highest service level and lowest cost of goods in a single solution.

The Logistics Control Tower solution also includes the Global Logistics Gateway (GLG). The GLG leverages AI/ML technology and connects shippers to thousands of carriers and logistics service providers (LSP). GLG is where carriers and LSP connect one time to the network and collaborate with multiple shippers already on the network. It leverages advanced technology to integrate across all data sources to process, transform, and monitor carrier data to support real-time location and event-based updates within the platform.

# GLOBAL LOGISTICS GATEWAY

## NETWORK OF NETWORKS Connected through ubiquitous architecture

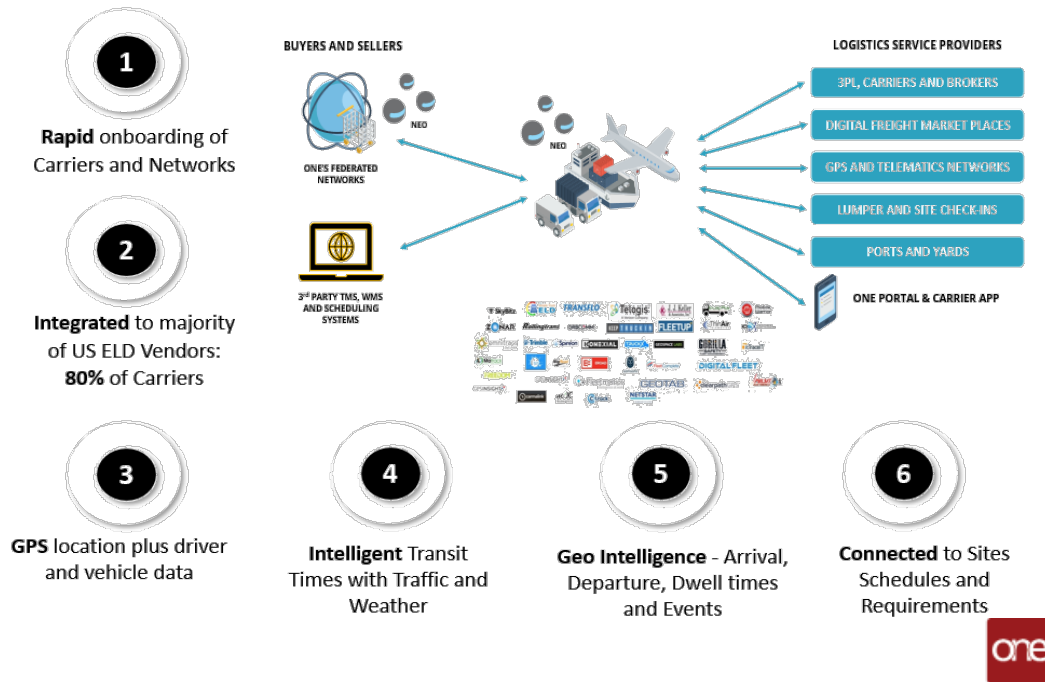


Figure 3. Global Logistics GatewayThe Global Logistics Gateway provides opportunities for Allied Partners by enabling them to source freight, supplies, and transportation capabilities.

At the center of the planning, the solution is NEO, which continuously learns and adjusts to meet the specific needs of extended enterprises. NEO is:

- Built on three layers of planning, leveraging modern techniques
- Inherently multi-tier and multi-party
- Simultaneously improves demand accuracy, reduces supply variability, and eliminates all system and nonessential lead times
- Planning and Execution are married using real-time data
- All propagation issues are translated and propagated to all parties in near real-time
- Embedded control tower layer with “NEO Adaptive Flows”



**Figure 4. The Digital Supply Chain Network™ Continuous Constraint-Based Supply/Demand Planning & Execution**The solution allows Allied Partners to improve readiness, responsiveness, and reinforcement while reducing disruptions by synchronizing all planning and execution across all defence supply chain participants, including but not limited to allied armed forces, manufacturers, and suppliers.

The GLG processes about 1.2 million shipments/month with corresponding orders. Overall, we see 12 million+ transactions through our Digital Supply Chain Network™ system monthly. In short, our set of capabilities and related information enables the solution to improve demand forecast accuracy for future supplies by solving the number one demand-side problem with emergency response supply chains, lack of visibility to actual consumption, and a false picture of demand.

All deployments intend to provide a new enhanced user experience, one that is designed from the beginning to support better decisions with an architecture that is scalable and highly secure. ONE’s solution provides flexibility, with the ability to look at aggregated information for strategic trends and root-level data for tactical decisions using the same unified, trusted, and secured data model. It shall enable easy, intuitive “drill-down” capabilities, and the End User can explore available data to see the big picture and the details. Furthering this approach, the solution incorporates the capability of Contextual Help, or context-sensitive help, that provides the proper help/assistance at the specific place where a user needs it. Rather than searching through documents



or general help files, assistance (basic data/documentation developed in the item above) is available on the exact screen/place where it is needed. Hover-overs and clickable icons can be made available for users, reducing help desk calls, improving overall business process performance, and enhancing user experience.

The users can create and customize reports and dashboards, enabling views to remain aligned with changing business roles and conditions. Some features include operational dashboard portlets, integrated pivots, executive dashboards, and cost/performance analytics using NEO's enhanced AI analytics. Because of our multi-tier architecture combined with our robust permissions model, reports, dashboards, and control towers can be configured at any level and for any role, with access to data and execution capabilities controlled by the permissions assigned to a specific role.

In a network-based solution, your digital twin environment and your supply chain networks are the same. Then you do not need to configure and support separate instances, and the underlying data used by your analytics/optimizers will always be accurate and up-to-date. Your digital twin is a current and accurate rendering of your assets and supply chain. In addition, you can run what-if scenarios, select the optimal plan, and immediately deploy it. ONE offers a network platform for real-time supply chain management. It provides a digital twin that is a sandbox and a natural extension of your supply network platform. It uses ML and A.I. algorithms to help organizations evaluate scenarios, recommend optimal decisions, and solve supply chain problems. Suppose your planning/operations platform and the digital twin are the same system aided by A.I. In that case, they can help identify and solve problems across the Network and across all time horizons. The problems, decision-support, and autonomous decision execution can be strategic in nature (based on network options that will benefit you years from now) or they can be problems expected to occur in the next few hours (specific issues that need immediate resolution).

The technology platform and architecture have been specifically designed to deliver digital twins to customers and organizations with core capabilities in scenario-driven predictive and prescriptive analytics and multiple algorithmic approaches applied to demand and supply modeling across the network. The Digital Twin represents a product or process and a predictive model designed to improve that product or process. The vision of our Digital Twin in the next 3-5 years would be to generate accurate and valuable results that would not be able to be reached without exposing actual units to the needed stress to replicate mission processes. This would increase the benefits of using our digital twin twofold: a) finding issues that would lead to failures and b) evaluating changes related to troublesome variables/measures.

## 2.2 Solution Examples – Munitions

A Digital Supply Chain Network can provide end-to-end capabilities across the entire mission focus, delivered through the configuration and modeling of commercial modules to a business process. The solution supports multi-process business variability so that multiple organizations can utilize the same capabilities differently in the same software instance.

A case study examines mission-essential capabilities for end-to-end management of munitions. Capabilities available would include:

- **Warehousing** – Provides Care of Stocks in Stores (COSIS) from receipt into stock to issue and subsequent returns, as required. Location transfers, storage work orders (SWO), re-warehousing, inspection actions, and inventory processes are included. Multiple Condition Defect Codes (CDC) per item are supported. Captures and manages the Net Explosive Weight (NEW), Hazard Class, Storage Compatibility, and Security Category authorized in each magazine/storage location. Reports all discrepancies to ensure compliance, maximizing safety while minimizing risk and errors. Multi-level storage sublocations are available, including grid locations, bins, International Standards Organization Military-owned, Demountable Container (ISO MILVAN), and open storage locations. This is an accessible solution that is scalable, multinational warehousing framework that aligns with the three NATO battle decisive munitions (BDM) Highly Visibility Projects.

- **Flexible Lot/Serial Control** – Managed by expiration date, install date, service life, and in-use date (i.e., captured flight time) for items like commercial nitroglycerin dynamite, Cartridge Actuated Devices & Propellant Actuated Devices (CADS/PADS), simunitions and other munitions assets.
- **Serialized Assets** – Track serialized assets by Item Unique Identification (IUID) (Serial Number) from initial receipt to storage area, including missile maintenance conversion to other missile Department of Defence Identification Code/National Stock Number/National Item Identification Number (DODIC/NSN/NIIN), transfers of location or military service branch and up to and including Demilitarization, FMS and Expenditure or Loss action.
- **Disconnected Operations (DDIL operations in austere environments)** – Work anywhere with the patented Platform to Platform Integration (P2PI) disconnected client, which allows storing and forward with hardened mobile computers with scanners. P2PI is designed to work over low bandwidth devices like Iridium modem, military communication equipment (SINGARS, GSWAN), and other tactical networks along with commercial or military internet/intranet services. Inventory actions, pick/pack lists, containerization, shipment receipts, issues, returns, transfers, complete round build-ups, and inspections are accomplished while disconnected from the enterprise, with sync later.
- **Real-Time Planograph** – Provides a planograph view of each storage location and is updated in real-time as transactions are being processed (i.e., magazine transfers, issue and receipt transactions, and warehouse storage processes).
- **Customer Orders** – Manages customer orders from initial placement (internal to the system or received external via Defense Logistics Management System (DLMS) or other transaction messages Electronic Data Interchange (EDI) by NSN / NIIN, Part number / Commercial and Government Entity (CAGE), or Department of Defense Identification Codes (DODIC) to the issue turn-ins / returns, residue by NSN, and excess. The system captures the receipt from the internal property book either as auto-push/auto-receipt or receipt notification by the user into the associated property book.
- **Container Operations** – The system manages containerization build-up and teardown processes for bulk transfers, individual line items, or bulk item issuance.
- **Radio Frequency Identification (RFID)** – Captures RFID tracking information and associates it to the appropriate line-item asset.
- **Inspections** – Ease of useability to conduct various types of inspections or surveillance processes with handheld devices for serviceability, reclassification notifications, or end-of-life adjustments.
- **Kitting** – Create and manage ‘kits’ of various stock numbers that can be issued and received by organizations for deployment or training.
- **Repairable Parts and Life Cycle Management** - A real-time SVOT for the forward deployment of products and reverse logistics and repairable. Optimizes the highest desired service level at the lowest possible costs for new purchases, repairables, and return processes.
- **Complete Round Count/All Up Round** – Calculates all up rounds that have to be built from multiple components. For Aviation Ordnance, as an example, the system looks at the part number configuration, including all interchangeable parts. It calculates how many of each type or variant of the all-up round can be built with on-hand stocks available.
- **Autonomous and AI-Assisted Planning** – A Demand Planning module enables plans by stockage objectives, and reorder points can be either automatic through ONE's intelligent NEO agents, or it can suggest reordering quantities for the end-user to consider and execute. Intelligent NEO agents use ML and can be taught to “learn” what actions need to be taken for certain conditions to maximize stock and parts utilization. Planning uses various data sets to determine Courses of Action (COAs), which may include storage area (sq. ft. or total pallet count), Total Munitions Requirement (TMR), Storage location authorizations, unit authorization/ allowances, demand history by unit, by Ammunition Supply Point (ASP), by geo-location and other data sets modeled in the system.

- **Total Multi-Tier Visibility** – Provides inventory visibility across all tiers of ammunition management from National, Strategic, Operational and Tactical levels, based on role and permission. Visibility for/of Vendors/Industrial base (key suppliers and Original Equipment Manufacturers (OEMs)) can be included.
- **Control Tower** – Supports the fusion of data across multiple parties, including but not limited to Requisitions, Advance Shipping Notice (ASNs), Track and Trace, Projected Inventory Views (PIVs), capacities, etc.
- **Procurement to Delivery** – Manages the procurement process from contract submission to the receipt of inventory from the vendors, including delivery schedule planning.
- **Master Data Management** – Manages master data by integrating with any authoritative data/data source. The system will maintain a substitution/interchangeability listing for DODICs and the Prime substitution relationship in order of fulfillment (i.e., primary sub, secondary sub).
- **Complex Configuration Forecasting with Demand Sensing** – Robust Capability to compute not just independent demand but also dependent demand across assets, carcasses, and spare parts. Embraces not just history but all order forecasts in forward operational and retail locations to provide a demand sensing and consumption service in the Network.
- **Autonomous Forecasting** – Autonomous intelligent forecasting agents determine forecasting calculations at a user-defined cadence. Automatically monitors demand signals (point of sales/issue) for aberrations and continuously adjusts demand and supply plans to ensure customer service levels are met.
- **Flexible Financials** – Manage procurement and expenditure transactions. Use the general ledger/financial system of record or integrate with the general ledger of choice.

### **2.3. Solution Implementation.**

A “hybrid agile” process is used for implementations. During implementation, business objectives are defined in the early phases of the project, and these objectives are monitored throughout the process to ensure they will be met during the validation process.

- The Vision Document identified key “outcomes” desired for the modernized process
- Solution demonstrations identify “gaps” in “to be” process
- Six-week sprint durations deliver increased capabilities at each drop
- Heavy customer involvement and interaction at each stage (Vision, Solution Description, User Acceptance Testing, Gap Analysis)
- Much more effective than refactoring software or waterfall approach
- Defines and prioritizes key value themes with high-level process flows
- Rapidly configure solution (code) and correct/rework based on customer feedback
- Speeds up process to deliver the desired outcome

A notional implementation is depicted below in **Figure 5** and is adjustable/configurable to meet customer requirements.

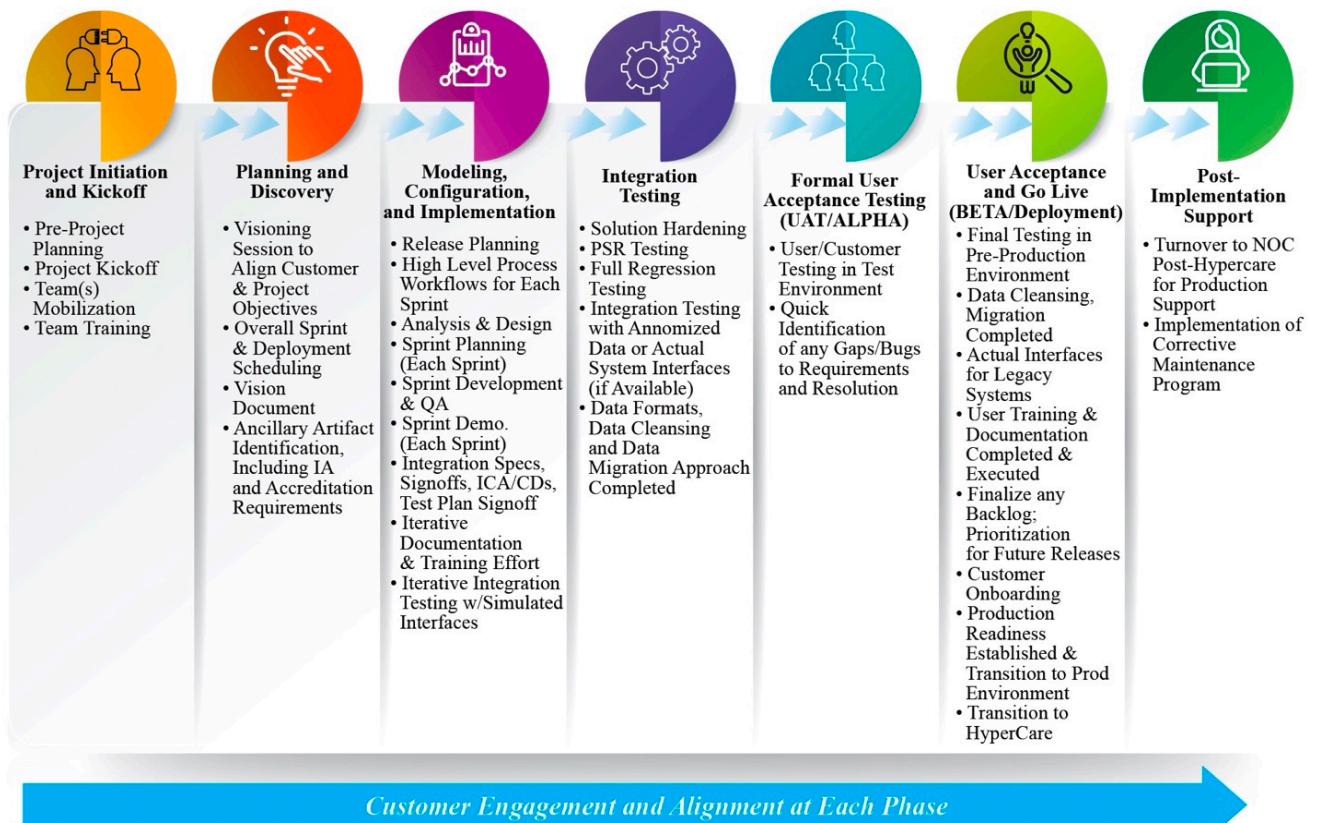


Figure 5. Notional Implementation Snapshot. Using a hybrid-agile process combines the best of both approaches allowing for agility focused on the outcome.

## 2.4. Solution Operation and Integration

The Digital Supply Chain Network™ is a multi-enterprise, secure, cloud-based Application Platform-as-a-Service (aPaaS), which offers identical capabilities as Platform-as-a-Service (PaaS), plus additional features that digitally support the entire business. The cloud-based aPaaS stack and Software-as-a-Service (SaaS) applications are deployable on-premise, 3rd party clouds, and country-specific cloud environments, ensuring NATO can operate on their “cloud of choice.” Multiple cloud instances to be federated, expanding the Digital Supply Chain Network™ with active fault tolerance and cross-data fail-overs, enabling best-in-class up-times with automated fail-over protection.

This capability is a disruptive supply chain technology and business model unique to the market. ONE's real-time multi-party platform is the only technology that enables genuine, many-to-many multi-party transactions and workflows across all trading partners. NEO, the ML and intelligent agent technology, powers the platform and enables the autonomous supply chain. NEO runs across the network in the background, continually scanning for potential issues and optimizing the supply chain. The solution is delivered uniquely beyond what SaaS, PaaS, and traditional software providers can provide. It starts with a PaaS framework supported by a standard data model, built for specific industries and enabled by an actual many-to-many network. By design, the architecture takes a different approach than traditional technology companies and therefore has a profound effect. The unique multi-party network platform adapts to your unique business problems and your specific industry. Our unique business model allows ONE to price, deploy, and support solutions and your actual use of the system in an entirely different way from what was previously possible.

The Digital Supply Chain Network provides a suite of software that provides ease of integration, a tunable system, and cloud-based solutions, increasing the adoption and incorporation of legacy and autonomous

systems. We offer a dual-use platform with tailored integration using low-code development tools and over 950 public APIs. Integrations look different for each client (and each country) based on each unique supply chain platform or legacy system; however, the approach is the same. The solution can embrace and enhance current business processes in legacy systems and (if necessary) replace existing systems with new network applications, while filling the gaps in supply chain business processes. This has significant advantages as a business process can be enhanced first (for example, eliminating the “swivel chair” across multiple systems for a single transaction) and provides the ability to “replace” the legacy system, often in a self-funding manner. Everyone connected to the network has appropriate access to everything through a robust permissions model where the business processes and access to data are controlled by the permissions assigned to that role or user. The platform uses Open Standards with a low-code, backward-compatible Developers Network called DevNet. We have extended the business modeling environment with our multi-party programming technology and other design tools, such as workflow and data model designers, to configure existing modules instead can inject custom code (e.g., Reports, Interfaces, Conversions, and Extensions (RICE) Objects) that is difficult to support. This eliminates the sustainment overhead that plagues legacy ERP systems and inhibits modernization while supporting the implementation as commercial-off-the-shelf (COTS). Unlike other solutions, planning and execution are performed on the same platform with the same real-time data (where current solutions plan using “stale” data and have no path to the effective execution of that plan). You can Bring Your Own Intelligence (BYOI) and use ONE's “Plug Points” to integrate into your current Business Intelligence tools to execute the supply chain.

The solution provides a coherence “SVOT” framework across the entire enterprise including your mission partners, allowing for the configuration of individual multinational ammunition warehousing solutions toward specific national requirements. The system balances supply and demand at each node in real-time. Early supply disruption detection and automated issue resolution are available through NEO smart prescriptions. The solution has the ability to continue mission-essential operations in austere environments (with limited or no connectivity) supporting Disconnected Operations through the patented P2PI.

Harmonization of all data models with the business processes is managed by a federated, multi-tier Master Data Model. Multi-tier Bill of Materials and Item/Lot level management of all items are attainable either at rest or in transit. A complete set of supply chain execution modules that can be configured to a specific business process, and still be supported as COTS, where modernizations can be implemented as a customer chooses. The solution facilitates multi-tier, multi-party optimization, and collaboration with incremental and continuous planning. Multi-level control towers enable visibility and actionability. Users will increase productivity and efficiency by accessing visibility inside their network and making decisions based on real-time data.

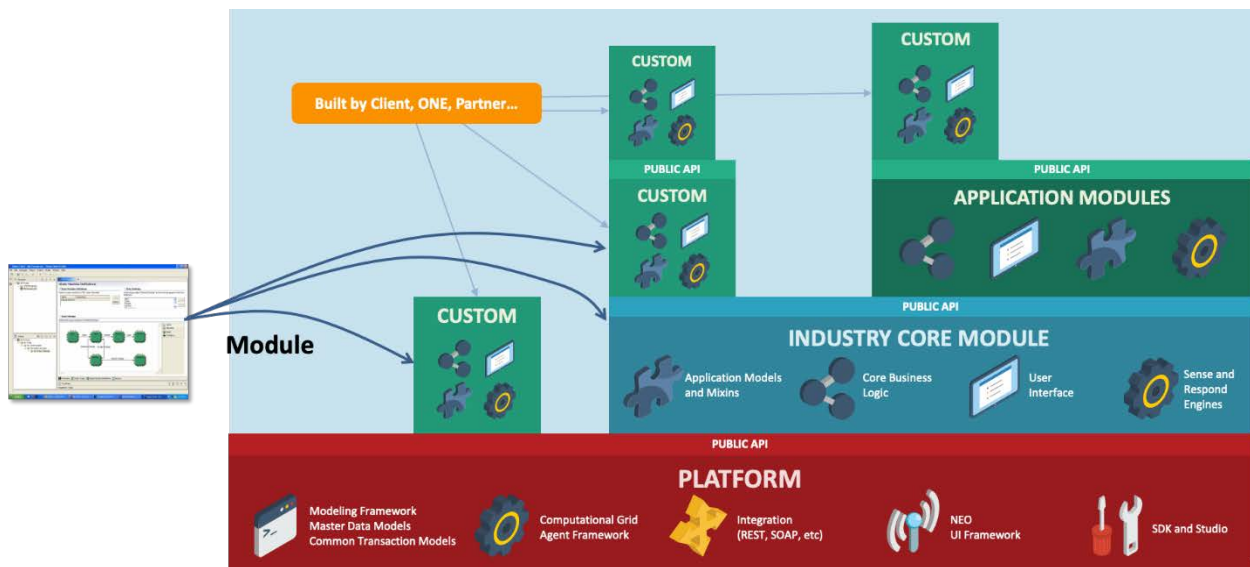
From strategic planning to quick turnarounds, the cloud-based aPaaS solution typically exceeds requirements. The solution allows multiple cloud instances to be federated into the Digital Supply Chain Network™ as the first line of defence, with active-active fault tolerance and cross data center failovers, enabling 99.99% up-times. However, in the rare event of a failure, on-site business continuity “hot spares” complemented by offsite live replication means most downtime is minimal and resolves within seconds or minutes. Within each identical site, the system is further broken down by major competent areas all running in the VMware cluster for high availability failover. Dual multi-vendor Internet Service Provider (ISP) connections are fed through an Intrusion Detection System (IDS). The traffic is further secured via dual hot-hot backup firewalls that supply the traffic to the dual hot load balancing system. Dual inbound feeds are essential to ensure that if one communications provider goes dark, the other will continue to operate. The load balancers detect where the traffic should be directed based on the type of traffic (example: user traffic versus integration traffic) to the proper application servers and balance for throughput and performance.

The application has been designed to be separated for security and ease of maintenance into several types of application servers, including User Interface (UI), grid task managers (GRID), integration servers (INTEG), monitoring services, etc. Each of these types of application servers is hosted in a high availability environment so that if any item failed, the application is automatically moved and assumed by available systems. The design

enhances the “Never Legacy” design so that one component can be upgraded without the need for the entire system to be upgraded, which reduces risk during deployment and maintenance cycles. The database cluster is also run in a high availability environment so that if the need arises due to hardware failure the other active server assumes the tasks. Each of the database servers is sized to handle the full load without degradation and is extensible to meet the ever-growing needs of NATO without the need to take down the environment.

The solution can also be deployed in a disconnected austere environment, which allows you to execute your mission anywhere with the patented P2PI disconnected client, to store and forward with hardened mobile computers with scanners. Inventory actions, pick/pack lists, containerization, shipment receipts, issues, and returns, transfers, complete round build-ups, and inspections can be accomplished while disconnected from the enterprise, with syncing to the Enterprise at a later time when connection has been restored. For longer periods of operation, a Deployed Server can be implemented, providing full capability in a network-challenged environment. A typical use case would be the deployment on an afloat platform where critical activities are essential regardless of available bandwidth.

Disconnected Operations is also designed to work over low bandwidth devices like Iridium modem, military communication equipment, and other tactical networks (SINCGARS in data mode, Satellite) along with commercial or military internet/intranet services. A deep layered modular architecture consisting of a transactional execution platform, an industry core layer, application layer, and an Enterprise Process Template (EPT) is utilized to manage any interfaces or specific data/data models unique to a particular customer. Public APIs at each layer are never deprecated, thus guaranteeing that any module that is configured or built with the DevNet SDK will never "break" as the solution upgrades, allowing modernizations as the customer chooses while ensuring that the configured solution will never go legacy. A backward compatible low-code SDK with a business process design layer is used to configure existing modules or build new capabilities on top of any layer in the architecture. Any module inherits the features/capabilities of a lower module, accelerating deploying new capabilities. Through the utilization of the DevNet SDK, implementations can be supported as COTS and modernizations are available as a customer chooses. The figure below illustrates a simplified architecture depicting this capability.



**Figure 6. Platform Architecture. ONE's COTS platform is tailorable to the requirements of Allied Partners with the advantage of new capabilities.**

An SDK and NEO Platform enables developers to rapidly build, customize, and run powerful multi-party Network applications. Unlike most "network" applications that consist of a conglomeration of separate applications, the NEO Platform is designed from the ground up to enable multi-party networks. This means that all modules work together seamlessly and intelligently with a "SVOT" for all parties and modules.

With the NEO SDK, users can quickly:

- Set up integration with other software systems
- Create new reports
- Create new data models
- Extend existing data models
- Created user input forms

The application is designed with scalability in mind. The application server tier runs using a Java application server on Linux VMs. These virtual machines can easily be scaled up and down based on demand (more users, integration, Master Data/Legacy system to handle the load). Scalability can either be done manually or automated in clouds like AWS and Azure. The robust multi-party development services blend with best-in-class Cloud APIs such as OpenAI, IoT Services, Twillio, and other cloud platforms. ONE converts existing data structures through an embracing methodology which is built with a bidirectional integration layer allowing easy incoming and outgoing message flow where data received/pulled then can be used within the core system as needed. This method allows for the integration of legacy systems (instead of replacing them), integrating data into an MDM solution. This allows for seamless integration of data structures.

The solution leverages existing modules created by ONE for other customers, both commercial and defence, while providing the ability to enhance functionality and integration interfaces. ONE works with a customer to ensure data integration through Extract, Transform, and Load (ETL) process, this includes migrating authoritative data in our MDM model, which can be extended for a customer and still be supported as COTS.

ONE's integration framework provides support for many different protocols and formats, including HTTPS, SFTP, AS2, XML, JSON, CSV, Flat Files, SAP Idocs, DLMS, MILS, and more.

Challenges of data gathering, cleansing, and synchronization are resolved through our MDM process. The Multi-party MDM solution provides comprehensive enablement of MDM processes:

- **Data Modeling:** Enables complex relationship modeling between application sources, between products and services, and between parties with Community Master Data Models for intra- and inter-enterprise modeling.
- **Data Gathering:** Provides configurable user forms to gather unstructured data as a data request. Use role and geo-based permissibility to handle distributed ownership at site-, organization- or enterprise-level.
- **Data Cleansing and Computation:** This allows configurable validation rules and customizable workflows to find and correct data errors
- **Reviews and Approvals:** Includes configurable approval routing rules for sending data to authorities for approval—complete audit trail of changes and approval history.
- **Master Data Reconciliation:** Multi-domain, fully reconciled master data models cover an extensive body of 400+ supply chain models, including site, item, routing guide, carrier contracts, fleet, and equipment.
- **Data Publishing:** Enables subscription-based publishing of changes to Master Data to relevant parties. Users can subscribe through alerts, emails, and download-friendly CSVs. Permissions ensure that clients receive only the data they are allowed to receive.
- **Monitoring and Alerts:** Includes a complete set of analytics and performance metrics.

Through a combination of a federated architecture and a robust permissions model, data can be protected and only viewed/accessed by roles that have the appropriate approvals. Data can be blocked, anonymized, or actual data can be viewed and used based on the permissions allowable for that user. The Federated Architecture allows data to reside in any country that has data sovereignty requirements, honoring that country's rules. This master data management approach also allows countries to maintain their data representations without a wholesale change to nomenclature and a host NATO solution would be the publish and subscribe hub as appropriate.

Our DevNet-Enabled Modular Architecture Enables Extensibility. ONE's platform is designed to be highly extensible and enables the swap-ability of core modules. This allows a solution that fits your requirements as if built to purpose yet is fully supported during its lifecycle with ONE's "never legacy" approach. It also helps provide rapid deployments implemented through a "value first" agile methodology for a self-funding strategy where value is realized each step of the way.

From a joint and combined operational perspective, NATO requires a flexible and actionable robust logistics network to support the joint and combined warfighter. NATO requires a system to not only have visibility, but also actionability capability on that visibility. For example, if a country requires ammunition support, the country can request that support, and that ammunition will be sourced using AI/ML to determine the most efficient method to reduce logistics cycle time, including warehousing visibility, transportation management, in-transit visibility, and receipt and payment for ammunition can all be completed on the ONE solution, in multiple languages, as needed. The solution integrates international industrial base manufacturers, suppliers, and carriers with full master data management capability and digitized records. It is both supply and transportation agnostic, simultaneous forecasting, planning, execution capability, and finance/auditability built-in.

## **2.5. Solution Security**

The solution is in the process of FedRAMP certification. Systems are in production in multiple US DoD organizations, with active Authority to Operate (ATO)s through the Risk Management Framework (RMF)



process at the Impact Level (IL) IL2, IL4, and IL5 level, with ATOs for both the enterprise and disconnected environments, with commitments from several customers to move into IL6 (SIPR) equivalent environments. The solution relies on standard secure network protocols such as HTTPS, SFTP, AS2, and SMTP. ONE encrypts information in transit and at rest. At-rest encryption is delegated to our Pure Storage SAN, an AES 256, FIPS 140-2 validated encryption device, and the SAN provides self-service key management.

The solution is National Institute of Standards and Technology (NIST) compliant and is certified by the United States Air Force, United States Navy, and the United States Marine Corps via the Risk Management Framework process. ONE is industry certified and complies with all required standards, rules, and regulations, including but not limited to:

- ISO 27001 Certified
- 7012/Controlled Unclassified Information (CUI) Certified
- General Data Protection Regulation (GDPR) Compliant
- ITAR Compliant
- Defense Federal Acquisition Regulations Supplement (DFARS) 252.204-7019 Compliant
- Privacy Shield Certified 48
- US DoD IL4/IL5 Compliance
- US DoD Cybersecurity Maturity Model Certification (CMMC)
- DFARS 252.204-7012 & NIST Special Publication (SP) 800-171 Compliant
- RMF Practitioner – Risk Management Framework
- Executive Order 12829 - National Industrial Security Program compliance
- Code of Federal Regulation (CFR) § 52.204-21 - Basic Safeguarding of Covered Contractor Info Systems

Any configuration, modelling or development follows a formally documented Secure Development Policy, identifying processes used to ensure that the software developed, released, and/or hosted by ONE follows consistent and auditable security practices. A published Secure Development Policy defines every aspect of the process, including but not limited to: roles, secure development policy management, training, requirements review, source control, code reviews, code scans, third-party library reviews, live scans, security testing, release gates, and access control. We enhance this process through source code vulnerability scans and periodic penetration testing for all major releases, working closely with customers to share those results and rapidly implementing any necessary mitigation strategies. Any remediation done for one customer is available to all customers.

The platform provides access controls, utilizing a role-based permissibility system to control user access within the application. Clients' superusers/administrators can grant the appropriate role-based access controls and permissions to allow users to segment and view data and create relevant alerts based on their unique scoped access/permissions. This feature is beneficial for organizations like NATO that work closely with various user types such as approved Transportation Service Providers (TSP), case manager contractors, etc. We consistently monitor and assess Security Technical Implementation Guides (STIGs) and their impact on the solution and take action to implement changes that are required to meet the published STIGs. ONE monitor any STIG updates published and evaluates what changes may be required/needed, and then works with our customers to implement, test, and deploy the changes on an agreed-upon schedule. This can be done specifically to support NATO operations.

We utilize a third-party library scanning tool to identify and address security vulnerabilities and dependencies related to third-party libraries. This tool scans for Common Vulnerabilities and Exposures (CVEs), in third-party libraries and identifies upgrade paths for the same. ONE is ISO 27001 certified. We utilize NIST SP

800-171 security controls and support numerous security certifications cited earlier. We have a dedicated support staff to discuss security concerns, including an Information System Security Officer (ISSO) with over 16 years of Information Technology security experience, a Facility Security Officer (FSO), and a backup FSO.

### **3.0 CONCLUSION**

Many variables can impact and disrupt defence supply chains, and mission readiness cannot be compromised in an unpredictable world. Supply chains are highly complex and critical yet they must be resilient, with the ability to sense, adapt and respond. Existing vulnerabilities have challenged the reliability of traditional supply chain networks, exposing their inadequacies. A multi-party and multi-tier, cloud-based Digital Supply Chain Network™ is a transformative solution, providing a “SVOT”, matching demand to supply to transportation instantly, resulting in immediately increased production, agility, and responsiveness that equal true value optimization, in whatever way you measure it. The solution embraces and replaces traditional enterprise systems and places control in the Control Tower with real-time end-to-end visibility and actionability. The AI-powered solution marries planning to execution through a network of suppliers/vendors, support sustainment, and manufacturing.

With over 100,000 companies connected to the network and over 17,000 global logistics providers, the network allows users to onboard just once and connect instantly with anyone on the network while maintaining a state-of-the-art permissibility security framework ensuring access to data is strictly controlled. The highly secure solution, already approved for US DoD operations and private sector business worldwide, will never go legacy with consistent updates, is cloud-based, and has a modular architecture with a low-code SDK, to give users choices on adding new capabilities. The tuneable system of control, coupled with an extensive integration layer, allows harmonization of ERP and legacy systems, providing the ability to embrace, connect, coordinate, enhance, and/or replace (if desired) current systems with multiparty workflows and backward compatibility combined with a federated multi-party publish and subscribe master data management solution.

Most solutions require customers to emphasize planning or execution. Yet, today's global supply chain success requires real-time planning to be wed to real-time performance, to harmonize the full spectrum of operations. The Digital Supply Chain Network™ marries planning and execution, and is the world's first and only real-time decision-making and execution supply chain suite. It provides unprecedented synergy between all users, and the ability to see the entire network and multiple supply chains instantaneously, using enhanced AI and ML technologies.

A Digital Supply Chain Network™ empowers you to drive the lifecycle of supply and transportation processes with precision and integration, including supply-agnostic procurement, contracting, transportation-agnostic shipment planning with real-time visibility execution, and world-class financial reporting with full end-to-end audibility.

- [1] NATO, “Deterrence and defence,” NATO, Jun. 25, 2021. [https://www.nato.int/cps/en/natohq/topics\\_133127.htm](https://www.nato.int/cps/en/natohq/topics_133127.htm)
- [2] “25 Best Supply Chain Companies for 2022: See the List,” *Gartner*. [https://www.gartner.com/en/articles/the-gartner-supply-chain-top-25-for-2022?utm\\_campaign=ONE%20Community&utm\\_medium=email&\\_hsmi=2&\\_hsenc=p2ANqtz-\\_pD11zvPH5bE5MIQ7vPwl9bdDaHLm\\_xR\\_Dc-ubfrbMnLNUF\\_8sZ4xD0Rt6FMPbXKFxmWh6RW1Qr7LmRXhXHDUbZb2qhQ&utm\\_content=2&utm\\_source=hs\\_email](https://www.gartner.com/en/articles/the-gartner-supply-chain-top-25-for-2022?utm_campaign=ONE%20Community&utm_medium=email&_hsmi=2&_hsenc=p2ANqtz-_pD11zvPH5bE5MIQ7vPwl9bdDaHLm_xR_Dc-ubfrbMnLNUF_8sZ4xD0Rt6FMPbXKFxmWh6RW1Qr7LmRXhXHDUbZb2qhQ&utm_content=2&utm_source=hs_email) (accessed Jun. 16, 2022).
- [3] “Control Tower Technology Value Matrix 2021,” *Nucleus Research*. <https://nucleusresearch.com/research/single/control-tower-technology-value-matrix-2021/> (accessed Jun. 16, 2022).

