CUSTOMER CASE STUDY:
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Cole Engineering Services and PCTE Build Military Readiness with VMware Cloud Foundation

COLE ENGINEERING SERVICES, INC.
a By Light Company

Cole Engineering Services, Inc. designs, builds and runs systems and processes that enable cyber training for the integrated multi-domain fighting force. The company is the prime contractor for PCTE in support of the U.S. Army and U.S. Cyber Command.

Industry

Public Sector

VMware footprint

- VMware® Cloud Foundation®
- VMware Avi™ Load Balancer
- VMware vDefend™ Firewall

Countries worldwide face increasing threats from cyberattacks. The United States Department of Defense (DoD) sought to create a new training environment to ensure individual, team, and mission force readiness. This was the genesis of the Persistent Cyber Training Environment (PCTE), a virtual space where teams across the globe can train against cyber threats in real-world conditions. Prime contractor Cole Engineering Services, Inc. (CESI) brings together key technologies and expertise to ensure the continuous evolution and mission success of PCTE. With VMware Cloud Foundation, CESI and PCTE prepare DoD and Joint Cyberspace Operations Forces for threats from anywhere.

Moving into cyberspace

PCTE was chartered in 2017 to enable military cyber personnel to train faster, maintain currency in their skill sets, and ensure operational readiness. PCTE supports the United States Cyber Command and follows traditional military training methods, using repeatable sets and reps to build skills on easy-to-use training ranges anytime, anywhere.

Initially a competitive effort between multiple integrators, PCTE selected CESI as the company to design, build, and operate the future of the overarching PCTE enterprise in 2021. The program continues to leverage multiple commercial and government software providers, so an environment that enables a complex mix of teams and stakeholders is paramount. “We had to ensure that we had a collaborative environment, not one rife with conflict,” says Gillon Helman, VP, CESI.

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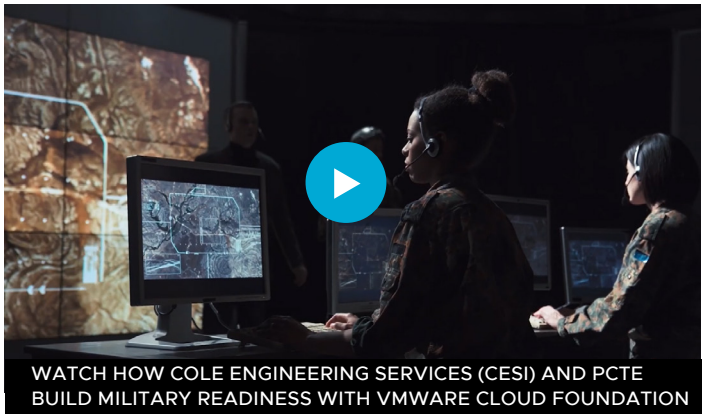

Using Agile methodologies, CESI coordinates the efforts of a team that includes several hundred people from the military; vendors, including Broadcom, NetApp, and F5; industry and academic experts; and foreign government partners, including the Five Eyes Intelligence Oversight and Review Council alliance between Australia, Canada, New Zealand, the United Kingdom, and the U.S.

Building an on-demand cyber training ground

To achieve its mission, CESI needed to build a cyber training ground with high availability and performance for on-demand use by military personnel and partners around the world. It needed an environment with seamless scalability for thousands of concurrent users and to meet heavy usage peaks during large, complex training exercises. The organization needed a distributed, multi-tenancy structure for compartmentalized, controlled access to resources. The environment also needed to be easy to manage.

CESI designed a scalable architecture for a globally distributed system working as a single platform. To minimize downtime, the team removed all single points of failure. All networking is a dual path, and all devices are highly available. Speed is essential. “If we move at the speed of cyber, we fall behind,” says Helman. “National security compels us to move as fast as possible and using the Agile process enables us to do so.”

The workspace for PCTE is divided into ranges modeled after military training ranges. This is where cyber warriors learn to detect and intercept attacks on IT infrastructure, including networks, software platforms and applications. Deployed on-demand, ranges are built out in short order.

Behind the scenes, PCTE is developing a new enterprise environment that leverages VMware Cloud Foundation to synchronize and manage the enormous volume of content needed to set the stage for an exercise. Primary applications and management systems also run on VMware Tanzu Kubernetes Grid, now an add-on to VMware Cloud Foundation. PCTE currently hosts roughly four petabytes of content and is expected to grow by two to three times over the next two years.

Ranges are deployed to secure segregated tenants and assigned dedicated IT resources to optimize performance and control access without crossover. PCTE uses VMware vDefend Firewall for this micro-segmentation and network security, as well as advanced threat protection services.

VMware Cloud Director abstracts the environment into a virtual data center. This maps to the PCTE multi-tenancy structure to ensure resources are compartmentalized and access is controlled. VMware Cloud Director will also assist in bidirectional catalog synchronization across the globe to manage content distribution between platforms based on permission sets, currently being done through the manual shipping of DVDs. VMware Professional Services and NetApp collaborate to deliver the virtualized infrastructure, trusted storage, and global content synchronization needed by PCTE, built on a strategic partnership spanning 20 years and 20,000 joint customers.

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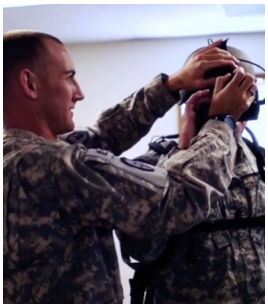
Virtualizing for rapid scale-up and scale-out

PCTE underpins ranges with a core virtualization platform that rapidly allocates hardware and resources. As demand grows, PCTE can easily add capacity using templates that pre-define the new components and automatically build the additional virtual infrastructure. This templatized scale-out and scale-up approach, provided by VMware Cloud Foundation and backed by VMware Validated Solutions, simplifies expansion and lifecycle management. PCTE is rapidly growing, with an expected tenfold increase in users over the coming years.

Monitoring and load balancing play a vital role in platform performance. Network, operations, and security teams use



the VMware Aria Suite to identify problems as they occur and resolve them quickly. VMware Avi Load Balancer optimizes operations, including central orchestration of virtual services, simplified troubleshooting with network-to-app latency, and load balancing capacity management, enabling rapid scaling and timely request management.

Delivering the largest single multinational exercise

With PCTE, the Cyber Mission Force (CMF) can replicate real-world networks and systems in a virtual environment to increase cyber skill sets. The platform is a complicated product ecosystem wrapped in an easy-to-use interface that allows instructors to create cyber ranges. End users in the CMF can bring up these ranges and begin training within minutes. The same exercise can run as many times as needed to build the skill sets required to complete the mission.

"We've seen an increase in scale on the Cyber Mission Force ranges that we've been running," says Helman. "For example, this past year, Cyber Shield was the largest single exercise run on the platform, including more than 18 nation-states, 525 cyber force personnel, and a range including over 1,200 devices."

This would have been almost impossible in the past without VMware Cloud Foundation and supporting infrastructure technologies. The new platform can be accessed across the world on-demand. The team can monitor what is happening inside the ranges and adjust resources for each virtual machine within the range. "We optimize to save resources so that we can deploy more ranges and train more cyber personnel at a much more rapid pace," says Helman.

Accelerating past the speed of cyber

CESI manages the platform, including architecture and design, DevSecOps, software integration, testing, platform security, help desk, exercise support, content development, exercise planning, network operating center, and security operating center.

The first major test of the platform was for Cyber Flag 2020, amid the global pandemic. Without the new collaborative platform, the exercise as defined could not have taken place because cyber operators were not allowed to travel.

Three cyber training events during the summer months—Cyber Flag, Cyber Shield and Cyber Yankee—all run on PCTE, creating a surge in platform use during that time period. "It makes sense for us to use a multi-cloud environment to surge those large-scale events for that short period of time so that we're not displacing current users on our on-premises platforms," says Helman.

Demand for the platform continues to increase as events unfold worldwide and cyber skills evolve. PCTE is available to the entire CMF and the Five Eyes intelligence alliance.

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Securing nations around the world

Currently, PCTE supports up to 4,500 simultaneous users from a pool of 12,000 total users. The platform supports nearly 100,000 powered-on virtual machines (VMs) and four petabytes of content catalog data. Over the next two years, PTCE expects these numbers to increase to 30,000 concurrent users, 300,000 VMs and 12 petabytes of data.

The PTCE platform design ensures that capacity scales with the demand signal coming from USCYBERCOM, foreign nation-state partners and agencies within the U.S. government. With the addition of artificial intelligence and machine learning, Helman expects to deliver greater capabilities to cyber warriors at an even faster pace.

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