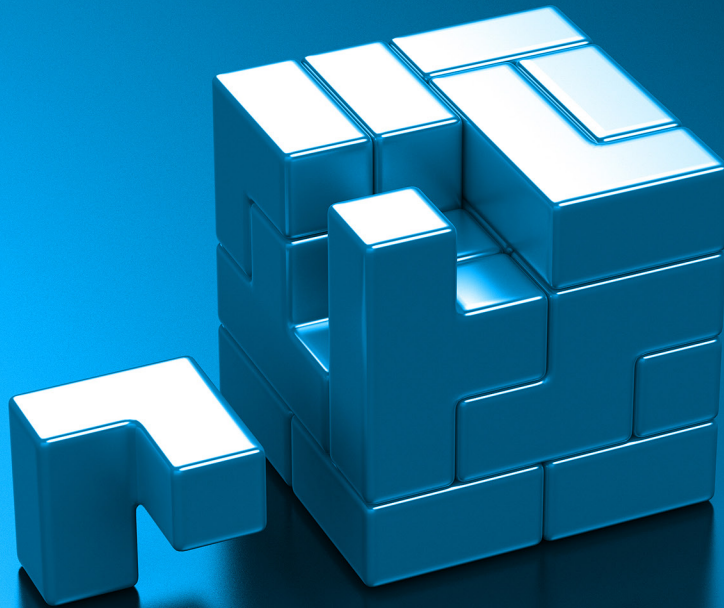# PUTTING THE PUZZLE TOGETHER:
Partnerships for Custom AI Deployments

For the first time, federal agencies have an opportunity to integrate emerging technologies, such as artificial intelligence (AI) and machine learning (ML), in a variety of ways and locations never before possible. One, for example, is directly at the network's edge through high performance compute (HPC) embedded systems. This means that HPC capabilities are no longer relegated to vast rooms of main frames or data centers – but can be deployed in rugged, server-class machines, each featuring one or more graphics processing unit (GPU) for accelerated processing. This accelerated processing at the edge is particularly critical for AI-enabled applications, such as disaster relief, intelligence gathering, or cyber security, where real-time insights are critical.

However, deploying AI models at the edge is not without its challenges. First and foremost, operating in austere environments creates limits for power consumption, latency, size, and weight of compute nodes, while placing additional requirements on environmental factors, such as

temperature management or vibration control. Further, data center-level security and systems management expertise at the edge can be challenging. In addition, quality AI needs constant feedback loops and model retraining, requiring the need to federate data and update models over the air with minimal downtime. These are significant challenges that must be addressed to achieve the opportunity to shorten time to insight, accelerate real-time decision making, and, ultimately, enable a mission advantage.

In addition to the infrastructure challenges, many federal agencies are finding that a wide AI skills gap exists within its department personnel, and the task of workforce retraining does not meet its project timelines. These agencies are weighing the benefit of retraining their workforce with the opportunities to leverage commercial off-the-shelf AI applications that are already created to address many of its requirements.

POWER THE MISSION: ACCELERATE AI THROUGH CUSTOM INFRASTRUCTURE

Many federal environments are too unique for off-the-shelf solutions, but still require the security, reliability, and support of Tier 1 infrastructure providers. Federal agencies, and the federal systems integrator (FSI) and original equipment manufacturer (OEM) communities, must work together to design AI solutions that will capture, process, store, manage, and importantly – protect – data and the insights generated in these rugged, non-traditional environments.

Dell Technologies OEM Solutions helps customers design solutions on Dell Technologies Tier 1 infrastructure, with the right technology to meet their needs. For customers requiring GPU-accelerated infrastructure, OEM Solutions' end-to-end engineering capabilities coupled with NVIDIA's pre-validated baseline software development toolkits, software containers, and reference architectures means mission partners can build and deliver customized solutions at the speed of the mission.

Frequently, the requirement for custom infrastructure is the need to operate in a harsh environment. The Department of Defense and federal civilian deployments often require customized solutions that are resilient on the go. This means being able to support missions in rugged environments with extreme temperatures, excessive dust, or significant vibration levels. Solutions often must fit into spaces much more limited than traditional data centers – in temporary field offices, vehicles, airplanes, or ships, for example. OEM Solutions has worked with customers to develop industry leading solutions to meet these requirements, which are now widely deployed throughout the Army and other military services.

Another important infrastructure consideration is the high processing power requirement. Even the latest generations of traditional central processing unit (CPU)-only infrastructure are not delivering the performance that AI and ML solutions require to process and analyze the volume and diversity of data collected. This is driving more and more federal agencies and FSIs to insist that GPUs be part of a baseline configuration.

OEM Solutions and NVIDIA work closely with customers to design, test, and validate GPU-enabled solutions that meet the rigorous operating conditions of these agencies.

"We are increasingly seeing an era of continuous computing – and helping to build environments where sensors and machines operate autonomously, running AI and enterprise applications in data centers, in the cloud, and also at the edge. NVIDIA, together with partners like Dell Technologies OEM Solutions, develop the AI platforms that offer end-to-end performance, security and reliability, regardless of the operating environment,"

Anthony Robbins,
VP of NVIDIA Public Sector

POWER THE AGENCY: ACCELERATE AI THROUGH SKILLS

However, it is not enough to have capable hardware. Currently, a major hurdle to developing AI capabilities within federal agencies is the workforce skills gap. This has not gone unnoticed and is a high priority across government. In February of 2019, the White House issued an **executive order**, recognizing the importance of training current and future generations with the skills to develop and apply AI technologies, and offered other mandates for accelerating AI innovation across the government.

OEM Solutions' technology partnership with NVIDIA addresses this gap in three notable ways: providing access to NVIDIA software engineers and data scientists to accelerate the development process; offering extensive training and hands-on workshops to build AI proficiency; and supporting NVIDIA's GPU developer conference, **GTC** (GPU Technology Conference), which is now one of the world's largest AI conferences, designed for knowledge sharing and skills development.

The NVIDIA Deep Learning Institute offers hands-on training in AI, accelerated computing, and accelerated data science. "Developers, data scientists, researchers, and students can get practical experience powered by GPUs in the cloud," said Craig Clawson, head of the NVIDIA Deep Learning Institute. "IT professionals can access a broad

range of courses on designing and managing infrastructure to support AI, data science, and HPC workloads across their organizations." To date, NVIDIA has trained over 250,000 people through this program and continues to add more content and training methods.

COLLABORATION IN ACTION: ACCELERATE AI THROUGH SOFTWARE APPLICATIONS

For many agencies, organic development of in-house AI skills and custom developed applications is not an option. OEM Solutions' designs can sometimes fit the need. Built on Dell Technologies infrastructure, these turnkey solutions that provide AI capabilities out of the box are commercially available, increasing time to value.

One such solution is from OEM Solutions customer, Digital Harmonic. Digital Harmonic offers a software application, PurePixel, which provides programmatic image enhancement in support of threat detection and mitigation, powered by pre-validated and configured Dell EMC PowerEdge servers that utilize NVIDIA GPUs and optimized software from the NVIDIA NGC catalog.

Another customer, Kinetica, worked hand in hand with OEM Solutions and NVIDIA to develop a preconfigured solution, designed on PowerEdge R730/R740 servers to support their leading analytical in-memory databases. Kinetica is able to take large, complex streaming data sets – both structured and unstructured – and run analytics at the edge, including location-based and predictive analytics. Leveraging NVIDIA GPUs, Kinetica's software can handle nearly any workload configuration and run intensive, mission-critical applications for both large and small enterprise environments.

This solution can provide insight for teams that require geographic information system (GIS) tracking or location-based analytics, risk modeling, real-time supply chain

insights, predictive maintenance, network analysis, outage prediction, and fraud detection. The U.S. Postal Service deployed the Kinetica solution to optimize the operations of several-hundred-thousand vehicles and employees, using visualizations and analytics of real-time data to efficiently deliver goods to more than 154 million addresses across the U.S.

Digital Harmonic and Kinetica have benefitted from OEM Solutions' end-to-end engineering capabilities, program management, support, services, and global supply chain. In addition, these solutions are Dell Technologies OEM Engineered Solutions, which means customers can purchase these solutions directly from Dell Technologies.

BRINGING AI TO LIFE

Today's problems are complex, but industry and government have the capabilities to solve even the most challenging problems – together.

> Building the digital future means collaborating to put rapid proof-of-concept pilots into production and design market-ready solutions for unique mission requirements.

Working with Dell Technologies OEM Solutions and NVIDIA, agencies and mission partners can bring their AI solutions to life – and to their customers – at mission speed.

ABOUT OEM SOLUTIONS

OEM Solutions partners with customers to design their innovative in-market solutions by leveraging Dell Technologies tier 1 infrastructure and capabilities including engineering, program management, global support, global secure supply chain, and much more. This allows companies to bring ideas to the world faster, create better customer experiences and drive their customers' digital transformation.

To learn more, visit DellTechnologies.com/OEM/Military.