Automated utilities asset inspection using cloud-based AI/ML

Dell Technologies and Noteworthy AI are helping electric utilities ensure the reliability, resiliency, and safety of the distribution grid via vehicle-mounted hardware, proprietary computer vision technology, and cloud software.

Key benefits

of the Dell Technologies Noteworthy AI co-engineered platform solution for asset inspection for utilities

- Secure on-premises private cloud platform

- Turn-key validated Reference Architecture from Dell Technologies and Noteworthy AI

- Optimized application performance, simplified management, and high scalability

- Integrated automated operations and lifecycle management provided by VxRail HCI

- Rich set of data services from PowerScale; including data deduplication and compression

- Faster asset inspection

- Simplified existing GIS data enrichment

- Reduced operations and maintenance costs

Introduction

Across the US, there are over 185 million utility distribution poles with most power poles are much older than their useful life expectancy. Utilities typically are required to inspect poles on 5 years cycles. Reliance on these poles is increasing exponentially due to the explosive growth of electric vehicles and other electrification efforts, while increasing threats from extreme weather and aging infrastructure are creating maintenance challenges. These threats require new technologies to improve reliability and mitigate risk on today's electric grid. The process of inspecting and accurately inventorying all grid assets is essential for grid managers. To date, this process has been primarily manual, slow, and expensive. The electric utility industry needs affordable, efficient, and scalable methods of conducting grid asset inspection and improving asset inventory accuracy.

Noteworthy AI developed a solution called Inspector to collect and analyze data on the distribution grid more inexpensively, quickly, and consistently than before, leveraging existing resources such as trucks and crews that are already in operation. Inspector is a platform for autonomous data collection and analysis that combines vehicle-mounted cameras, AI, and cloud software, and evaluates distribution assets during routine vehicle operations with zero impact on the crew—turning regular truck use into opportunities for passive data collection and analysis. Inspector improves situational awareness, safety, and risk-mitigation programs, and helps to reduce operations and maintenance (O&M) costs.

Dell Technologies, Noteworthy AI, and NVIDIA work in partnership to provide a solution that automates distribution asset inspection and inventory using computer vision, edge computing, geospatial databases, and AI.

Noteworthy Inspector solution

Noteworthy AI's Inspector solution consists of two products: Inspector Edge and Inspector Cloud. Inspector Edge is a camera and compute system that mounts on fleet vehicles to collect and analyze data. Inspector Cloud is web-based software that visualizes the results. Inspector performs three core tasks:

- Geolocation using an onboard GPS system and stereo vision cameras to accurately estimate the geographic coordinates of utility poles.

- High-resolution imagery of utility poles.

- Computer vision and other machine learning techniques used to analyze the imagery.

Inspector Edge uses NVIDIA's Jetson GPU to compute at the edge due to its low power consumption and high performance, and NVIDIA software solutions such as Jetpack, DeepStream, and TensorRTTM enable advanced low latency image processing and analytics.

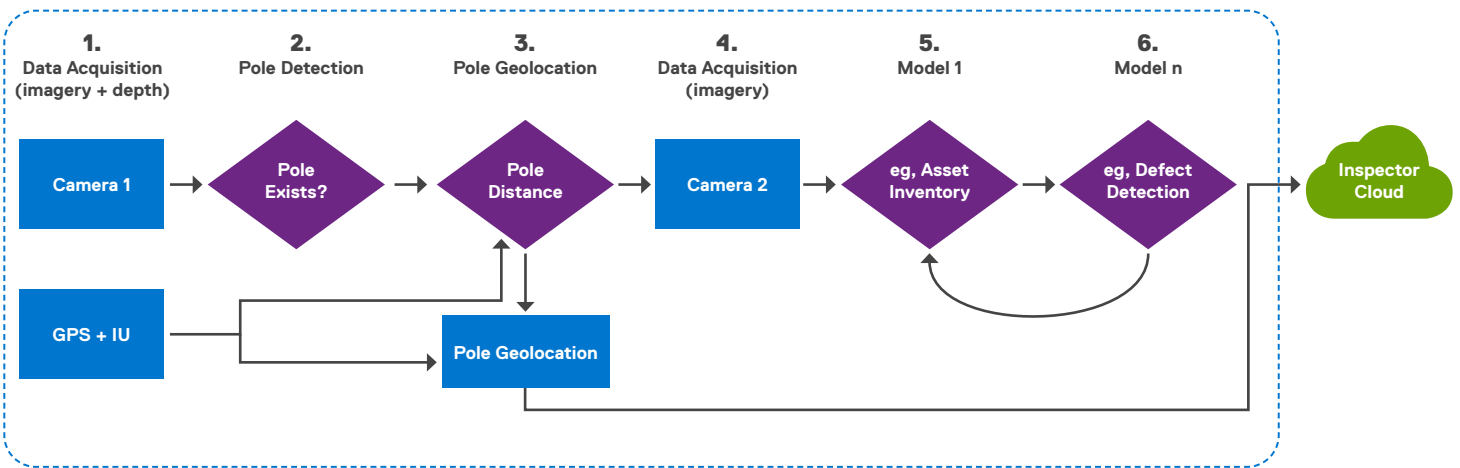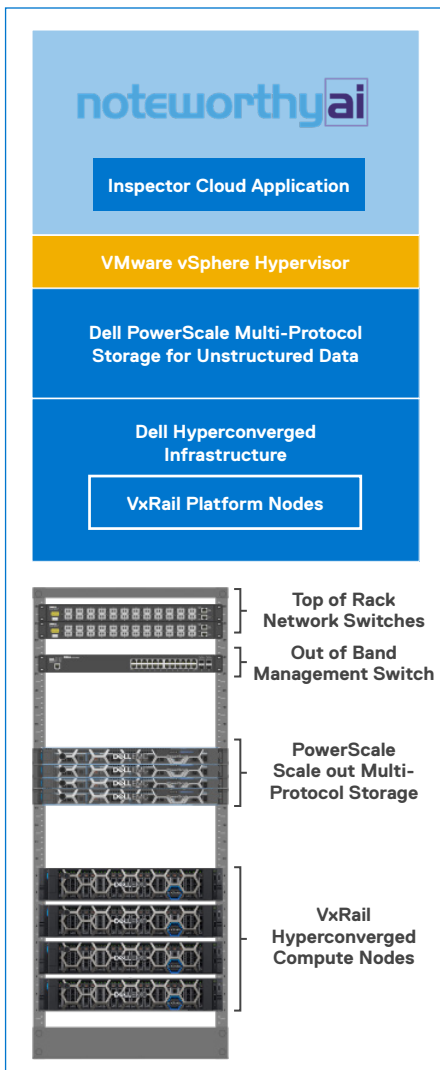**Figure 1.** How the Noteworthy AI Inspector Edge process works

Figure 2. Dell Technologies validated platform design for Noteworthy AI's Inspector solution

Inspector Edge is designed to work despite challenging, variable environmental conditions such as lighting, weather, and vehicle velocity. Mounted directly onto fleet vehicles, the camera system is optimized to produce consistent, high-resolution RGB images with low motion blur and low distortion. Additionally, high-fidelity 3D point clouds are generated to enable LiDAR-like precision without the cost and complexity typically required with such solutions. AI and computer vision at the edge enable real-time alerting and a lower total cost of compute over data processing in the cloud.

Inspector Cloud displays detected poles on a map, with individual pole information, including high-resolution images and AI results produced by Inspector Edge, through a single click. A robust search engine enables rapid searching using natural language queries, with data auto-populated with asset tags, serial numbers, and more due to the high-resolution imagery and computer vision capabilities of Inspector Edge. Inspector Cloud is available as a fully hosted offering in the Noteworthy AI Google Cloud Platform; however, some customers prefer an on-premises private cloud or multi-cloud offering due to the sensitive nature of the data being collected. In partnership with Dell Technologies, Noteworthy AI developed the validated Inspector Cloud deployment architecture that installs and runs in an on-premises data center. This secure, private cloud platform enables an optimized turnkey solution that leverages Dell's market leading VxRail hyperconverged architecture and PowerScale NAS data store (Figure 1).

Dell Technologies validated design for Inspector on-premises deployments

Dell Technologies has been assisting utilities develop their multi-cloud strategies to determine the optimal platform for specific workloads. The reality is most electric utilities operate in a multi-cloud configuration. In collaboration with Noteworthy AI software engineers, Dell Technologies deployed a dedicated on-premises infrastructure configuration in their Proof-of-Concept Engineering Lab in Cork, Ireland. The object was to port their public cloud-based Inspector software onto VxRail Hyperconverged Infrastructure and leverage the Dell PowerScale NAS platform to provide a data store for the truck-mounted camera computer vision image capture (Figure 2).

Advanced automation with Dell VxRail hyperconverged infrastructure

The adoption of virtualized hyperconverged infrastructure (HCI) provides a software defined storage configuration integrated into, and delivered by, Dell VxRail nodes. Utilities can now eliminate the capital expense and operational expense spending associated with procuring and maintaining separate SAN and redirect resources to more value-add activities. The VxRail HCI platform automates and eliminates many manual administrative and maintenance activities with automated infrastructure patching and system upgrades that no longer require planned downtime. This results in drastically improved lifecycle management capabilities, and lower total cost of ownership, while enhancing data security, compliance, and data protection services.
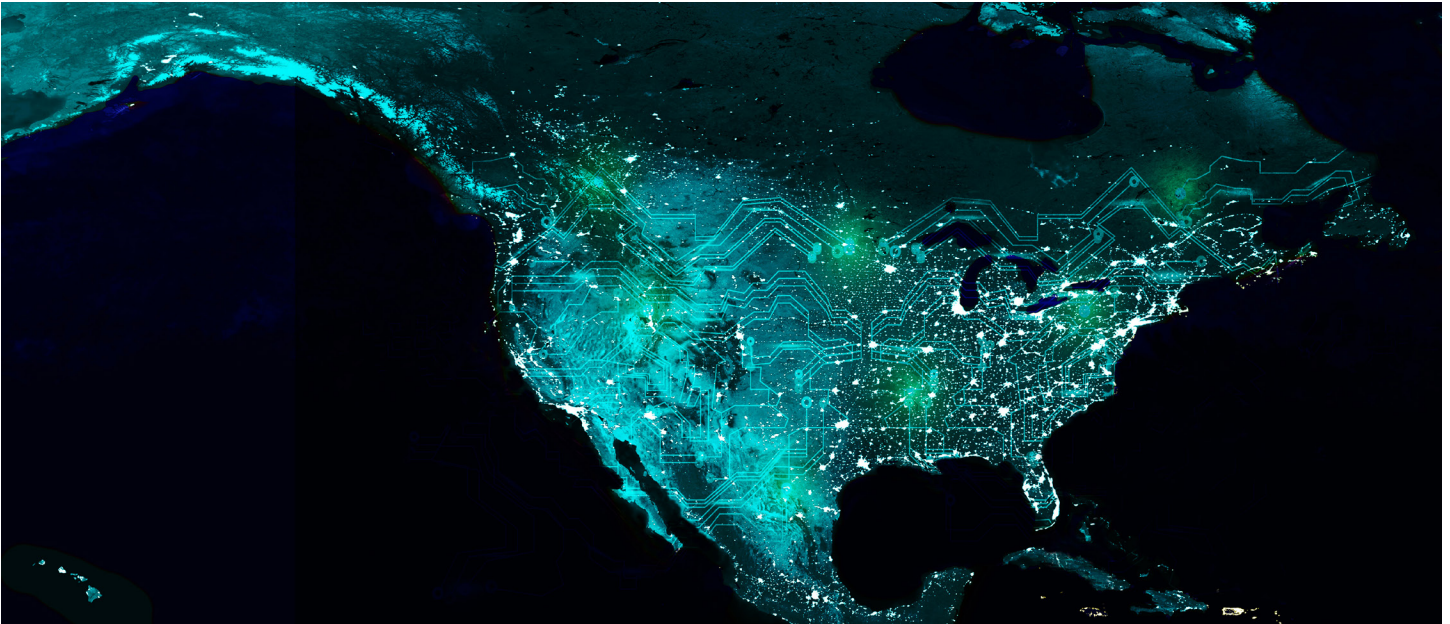
Dell PowerScale – unstructured data storage for the data era

With the volume of video data rapidly growing, there is enormous potential for enhanced asset management capabilities and better intelligent insights. As organizations grapple with the additional workload from computer vision data and realize the impact related to their IT infrastructure, it is critical to provide proven solutions that address these evolving system requirements. The Dell Technologies approach to addressing mobile camera system requirements is to provide high-performance and scalable architecture storage strategies that specifically address the unique camera dataflow and workload requirements. Dell PowerScale is a highly efficient and massively scalable storage option that protects video data for long-term retention. PowerScale offers enterprise-grade data protection: from Data-at-Rest Encryption (DARE) and self-encrypting drives, to quadruple failure protection, video data is protected from accidental, premature, and malicious deletion.

This mobile camera-based asset inspection solution generates large volumes of data. With Dell PowerScale's scale-out architecture, utilities can easily scale performance and capacity based on the specific requirements of their business. Organizations can increase cluster capacity to petabytes of storage by simply adding another node—with no downtime or disruption.

Delivering real-time asset inspection solutions and more

With the growth of data analytics capabilities in the energy industry, utility companies need an advanced analytics organization and strategy that will align their business needs with the most effective technologies available. This includes operating their key compute intensive AI/ML models on-premise, optimizing the costs associated with a public cloud-only architecture for their data analytics workloads, and ensuring the security of their asset management workloads and data.

As the utilities industry continues to evolve in response to industry drivers such as the clean energy transition, decarbonization, and energy security, Dell Technologies is committed to working with our partners to provide them with an open and scalable infrastructure designed to deliver solutions that will address the distribution grid challenges of today and tomorrow.

Learn More about Our Utilities Solutions.   **Contact** a Dell Technologies Solutions Expert.

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