Emerging technologies driving smart industry transformation
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The world is undergoing a massive shift away from traditional manufacturing techniques to new methods that increasingly use innovative technology. Industrial solution builders need to rethink business and operating models in order to stay competitive. Modern factories are now capturing rich data along every step of the manufacturing process. When this data is fed into new technologies that enable Artificial Intelligence (AI), factories are able to reach new levels of efficiency and quality never before possible.

Emerging technologies such as Edge Computing, Artificial Intelligence (AI), Machine Learning (ML), Computer Vision and Multi-Cloud are making an impact. Organizations are moving from designing siloed products to connected platforms and ecosystems, while traditional business models are shifting to as-a-Service. Business value is migrating away from legacy products to the data these products generate and the insights they drive. Industrial companies need to rethink their products and services in order to thrive in a data-driven environment or risk being left behind by more nimble, digitally native competitors. Technology must evolve to support this transformation.

AI set to turbocharge the factory floor

Innovation has always been a hallmark of the manufacturing industry. In the early stages of Industry 4.0, smart sensors and smart devices made their debut on the factory floor. Over time, we saw the emergence of smart factories that leveraged inventory and analytical systems. Vision systems followed, bringing higher levels of accuracy to assembly and quality inspection. Today, Edge computing and 5G technology have enabled smart, interconnected factories, where new and legacy systems can communicate and exchange huge volumes of data. With the falling prices to store this data, many factories are holding on to it in the hopes it can be used later to add value. AI is the engine that can consume and study this legacy data and apply these learnings to the factory of tomorrow.

We believe AI is the next revolution that will turbocharge the factory floor. As AI technologies standardize across industries, becoming an AI-driven organization will be fundamental to survival. According to IDC, by 2022, 75 percent of enterprises will embed intelligent automation into technology and process development, using AI-based software to guide innovation.

Accelerating your data-driven AI journey

As the volume, variety and velocity of data continues to grow, manufacturers can now access data that was previously unavailable. Although it has become increasingly difficult to store, manage, process and secure that data, savvy organizations are transforming and modernizing to reap the benefits of emerging technologies. Today industrial companies are not only gathering massive amounts of data from historically unattainable workloads, but they are also performing analysis at the Edge and moving data to the Cloud. We are now entering an era, where compute is
following the data, and where AI has become the core technology for data-driven innovation.

**Making faster decisions with AI at the Edge**

When the goal is to make faster data-driven decisions, rather than train new behaviors or patterns, pushing AI to the Edge allows for quick execution on data streams. As the bandwidth of available data expands due to the explosion of sensors on equipment and the use of higher-resolution video, the latency of transporting that data to the Cloud for decision-making creates latency on the factory floor. The sheer volume of data can also make transportation to the Cloud cost prohibitive. This is an example of data gravity. Since latency, volume and cost of transport of the data keeps the data in place, it is necessary to bring the compute closer to the data.

Bringing the right technology to the Edge gives a two-fold advantage. First, rather than transporting the data to the Cloud and back for answers, companies can make immediate decisions using the near real-time analytics and data insights delivered at the Edge. Second, the data can be aggregated and refined at the Edge, moving only the most relevant data to the Cloud for further analysis.

**Insights into the future: AI and quality control**

AI can significantly improve quality control by identifying potential issues early in the process. Applying AI to images and measurements taken during various stages of a manufacturing process can help identify problems with a product as it is being assembled and before it is finished. This early detection saves factory resources and reduces wasted time in assembly. In fact, according to Forbes, AI has increased defect detection in quality control by up to 90 percent. iv

How does this work in practice? If there are 20 manufacturing steps involved in making a product, the first symptoms of failure may be visible in the early steps, when inconsistencies are detected in the data. AI can be trained on the factory sensor data and final test logs to detect anomalies that humans might miss. Correctly identifying the potential failure in the early steps allows the factory to stop work and reduce future losses on a product that is less likely to be functional by the end of the line. When the cost of the steps associated with a failed product is weighed against the continually falling cost of creating and analyzing data from the assembly line, the advantages of AI at the Edge become clear.

**Meeting data at the source to enable predictive maintenance**

As an illustration of AI-enabled innovation, imagine a motor in a factory line that continuously produces telemetry data as it runs and rotates. This motor creates vibration patterns in three axes, and all can be measured by computer.

In the past, a summary of the data, including averages or outliers, would have been sent to the data center or Cloud. Today, with Edge technologies, the compute resides right at the motor, where an AI inference algorithm can monitor and instantly send alerts when something out of the ordinary occurs.

As the compute is now at the Edge and analyzing the raw sensor data available, it provides us with refined insights about the health of the motor. We would not be able to access instantaneous insights by performing analytics with consolidated or aggregated data. However, having immediate access to unfiltered raw data is the key to identifying subtle trends that can indicate or predict failure.
Self-improving AI

While initial inference happens at the Edge, data continues to be valuable in the Cloud. The Cloud will continue to be a primary place for deep analytics, new rules, training models that use historical data, and the creation of “things to look for.” This is done by opportunistically re-training in the Cloud.

The ability to manage data in the Cloud and consolidate and sample data from several Edge deployments can deliver tremendous insights. In addition, development lab data can be leveraged to design new models that use data from much larger populations, and which are capable of detecting failures. As new early warning symptoms for failures are identified by Cloud-based training, these new rules can then be updated and redistributed out to the Edge.

Accelerating beyond the standard with cutting-edge technology

The AI ecosystem is transforming how data is gathered, stored and used as machines run new algorithms on innovative processing architectures. This presents an enormous inflection point for data-driven innovation, new infrastructure opportunities, different ways to build products and more efficient processes.

Acceleration technologies are set to play a key role in managing AI and ML workloads. These accelerators perform parallel computation and faster execution of AI decisions, compared to traditional CPU architectures. Offload technology is currently being developed for AI workloads at the Edge as well as in the data center and Cloud.

Accelerators are driving optimization for specific areas such as natural language processing, AR/VR, speech recognition and computer vision. Some of these accelerators specialize in inferencing and are being integrated into end-devices such as autonomous vehicles, cameras, robots and drones, where they drive real-time data processing and decision making. When accelerators are applied to the correct workload, the outcome creates a phenomenal advantage in compute performance for training or inferencing. The addition of accelerators delivers measurable results that include cost-efficiency, lower latency, and faster decision-making.
AI use cases enable transformational outcomes

Ultimately, success with AI means creating information that is more valuable than the collective knowledge of the organization and acting on those findings in the most efficient and effective way. This combination of a “data first” culture, backed by AI insights and unprecedented levels of automation, changes everything from supply chain, materials, quality and order management through to production processes, factory equipment maintenance, order fulfillment, logistics and services.

For example, the partnership between Noodle.ai, Dell Technologies, Intel and Big Steel is revolutionizing Industry 4.0 with an Edge-to-Edge AI network while OTTO Motors has worked with Dell Technologies to digitize material flow for the world’s largest manufacturers through autonomous technology.

The importance of AI to industrial solution builders

Technology can help organizations improve product quality, increase productivity and enhance customer satisfaction. These are important considerations for solution builders, irrespective of whether they deploy or maintain the equipment.

As businesses and factories continue to become more intelligent and interconnected, they can start working with other smart factories and organizations in a broader ecosystem to engage in demand shaping. In turn, this can provide opportunities to proactively respond to trends and anticipate customer expectations, or even pivot a company to shift customers to new products or provide new and interesting alternatives to existing products.

Considerations when building solutions

When designing solutions powered by AI, it is important to find systems that are flexible and scalable to allow for future growth. As many new processing technologies are being created for various AI workloads, the selected infrastructure must be capable of working with new offload technologies. Systems using proprietary interfaces among components can lock customers into solutions that force compromise in other areas.

The Edge is one area where those compromises may be expensive and make a solution less viable. Equally critical is a software architecture that can scale as more information is gathered from a device or as the number of devices increases. Considering these factors and striking the right balance is critical to success.

How Dell Technologies OEM Solutions can help

According to McKinsey, many organizations struggle to create AI value at scale, even though 99 out of 100 companies that have deployed AI report positive business value. The challenges are common: aligning business owners and IT on next steps and engaging resources to fully embed AI into the organization’s processes. Engaging the correct technology partner for your AI journey is extremely important.

Dell Technologies OEM Solutions and Intel can help customers connect the right technology with their workload at any stage of their AI journey. We enable solution builders to make compelling products that are designed to be deployed in the field, in remote and harsh environments, with the same quality, reliability and security applied to data centers. Our team of engineers...
and program managers can help organizations architect systems that will fit today, while focusing on tomorrow’s opportunities. Importantly, our customers will benefit from access to our secure global supply chain, global services and broad partner ecosystem.

Since analytics are happening throughout the process, end-to-end solutions can be adjusted, and AI can be improved anywhere across the infrastructure. OEM Solutions can enable customers by providing either industry-standard or customized hardware to address unique customer needs, all built around open standards and based on Intel technology.

It is imperative that the optimal products be selected and designed for wherever and whenever they are needed. Importantly, industry IT and OT infrastructure needs to stay nimble, capable of quickly pivoting to address new opportunities that AI has helped to identify.

AI technologies can help customers drive transformational outcomes. To discover the correct technical solution for your workload and stage in the AI journey, contact your Dell Technologies OEM Solutions representative.

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

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i Digital industrial transformation Reinventing to win in Industry 4.0  
ii AI-fueled organizations: Reaching AI's full potential in the enterprise  
iii IDC FutureScape: Worldwide Artificial Intelligence 2020 Predictions  
iv 10 Ways Enterprises are Getting Results from AI Strategies  

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About Dell Technologies 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.