Solution Brief

Industry 4.0: Industrial Internet of Things on NetApp

Key Benefits

At the Edge

By using NetApp® ONTAP® Select, you can leverage the capabilities and time-tested benefits of ONTAP even at the edge of the IoT continuum. When integrated with partners ruggedized edge devices, or with the release of NetApp MAX data, NetApp offers higher performance and higher throughput where large data is being ingested.

At the Core

In addition to the many benefits offered by ONTAP, one of the key advantages of the edge environment is the capability to run analytics in QoS isolated containers or virtual machine environments.

In the Cloud

NetApp has a leading position in both the public and private cloud environments. For enterprise-wide, plant-to-plant comparisons, NetApp and our partners are well suited to help connect these once isolated plants to the enterprise. By offering both private and public cloud options, we can address any concerns or corporate governance requirements about data sovereignty, security, and cost.

Analytics

There is a growing need to preprocess all of the collected IoT data in place, and move only the resulting insights, alarms and alerts, or trends to the enterprise. With the release of NetApp ONTAP AI, NetApp offers industry-leading abilities, including AFF A800 NVMe-connected flash storage, to drive the throughput required by GPU-based compute platforms like NVIDIA DGX-1.

Abstract

Similar to the Internet of Things (IoT) in general, the Industrial IoT (IIoT) covers many use cases, industries, and applications. Although it's initially focusing on optimizing operational efficiency and maintenance, IIoT could soon transform companies and countries, opening up a new era of economic growth and competitiveness. NetApp envisions a future in which the intersection of people, data, and intelligent machines has a profound effect on the productivity, efficiency, and operations of industries around the world. By leveraging NetApp's wide portfolio of storage, compute, data mobility, and data security options, we can provide the performance, scalability, and robustness to meet your IIoT needs.

The Challenge

Businesses must find new ways to improve their operational processes, gain production efficiencies, improve product quality, and reduce their health and safety risks. The fourth industrial revolution is here—and it's all about enabling the next phase of digital transformation.

Innovative trends that are enabling this industry 4.0 transformation include:

- Reduced cost of sensors on industrial equipment that monitors operational conditions, vibration, temperature, pressure, RPM, and so on.
- Advancements in machine learning (ML) and deep learning (DL) algorithms that are validated and provide valuable insights into equipment condition monitoring.
- Reduced IT infrastructure costs, resulting in greater offset in costs versus realized operational benefits.
- The ability to connect these once-standalone industrial sites to the internet, and to cloud services.
- Insights from monitored operations are being compared plant-to-plant to determine enterprisewide best practices.
- Regulatory requirements are driving the demand to preserve auditable records for how products are manufactured and distributed.

Industrial Internet of Things (IIoT) data is growing at an accelerating rate, now estimated by IDC and other analysts to be beyond 35% growth year over year. Currently, data is in the range of 44 zettabytes in volume. NetApp fits into this high-growth market by providing both the infrastructure and the operating environment to enable the digital transformation and to help enterprises to realize the value of this wealth of IIoT data. NetApp can help manage and secure your data as it moves from edge to core to cloud and as it is processed and presented to key decision makers.

NetApp®

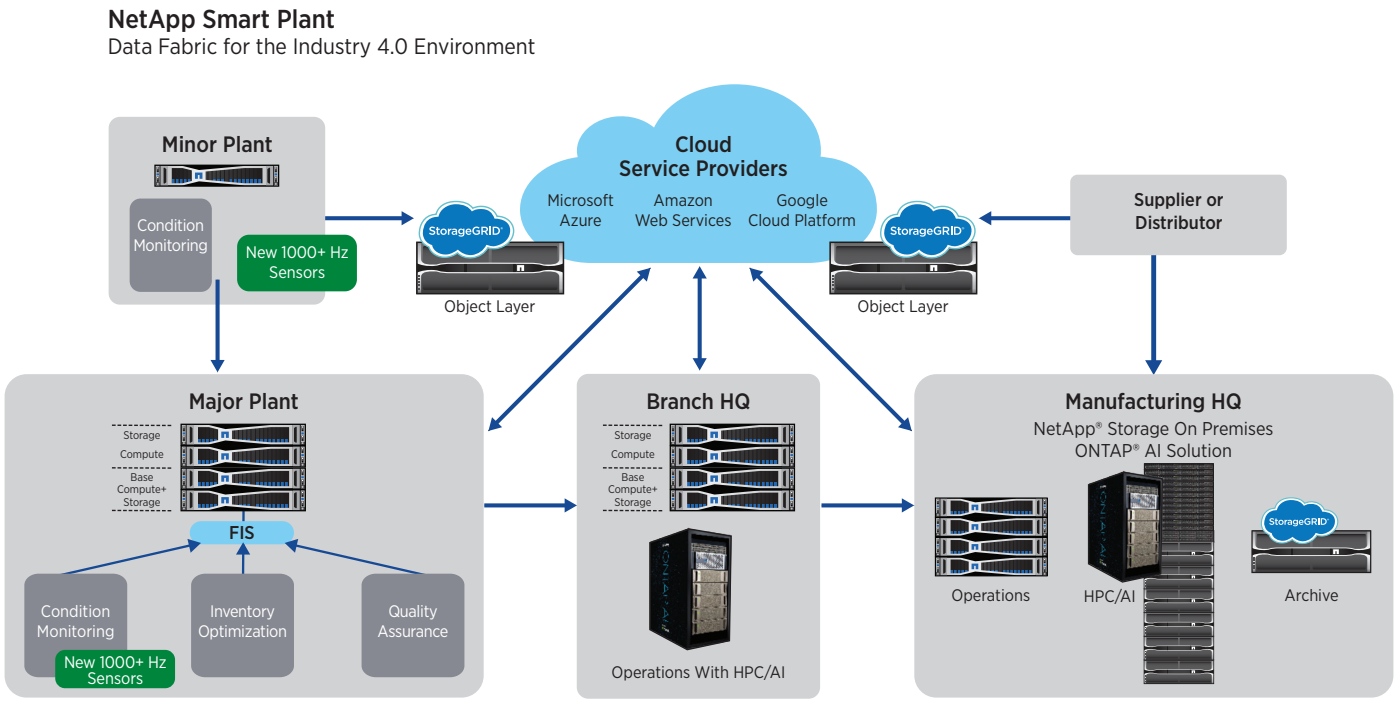

Figure 1) NetApp smart plant.

NetApp Smart Plant

To understand how to build a smart plant in the Industry 4.0 world, it's necessary to understand the typical IoT workflow in this space. Even though industries, customers, and end products vary dramatically, for NetApp it's all about data volumes, data flows, data protection, and ultimately the analysis of that data at the locations where the decision makers are. Figure 1 depicts industrial plants of different sizes and complexity and their various industrial processes. These plants might also be connected in different ways to the enterprise.

Let's first examine the more complex "Major Plant." It's common to find multiple lines in such a plant:

- **Condition Monitoring.** Robotics are being used to a greater degree in modernized plants, to gain accuracy and efficiency and to reduce overall operating costs. These systems generate tremendous amounts of data. The information coming from such systems is typically referred to as "time series data." Per second or subsecond, vibration, temperature, pressure, RPM, strain, and so on are monitored as indicators of how the system is functioning. This data is aggregated in a local data historian that is optimized for such data. Through equipment condition monitoring, enterprises are moving away from time-based maintenance of the equipment to condition-based maintenance. This increases uptime, overall throughput, and profitability.
- **Inventory Optimization.** Inventories are monitored constantly in most plants to keep track of the balance between too much inventory and insufficient inventory. Too much can take up precious space, while insufficient levels can cause unplanned downtime due to lack of raw input materials. Supply-chain management is essential in modern plants. Data from this cell typically uses RFID tagging of both input and output materials and products. Different data repositories and algorithms are used to monitor and optimize these processes, as well as operator health and safety.
- **Quality Assurance.** Many industry regulatory bodies are demanding quality inspections of manufactured products. These inspections might include X-rays and various forms of image scanning to identify nonvisible defects. It could also include using 4K resolution cameras with sophisticated algorithms, instead of people, to conduct visual inspections. Image data might not be conducted at the same rate as the time series data from condition monitoring, but the volumes of each data sample are vastly greater. Image data does not compress effectively, and because it's tied to the quality of the sold product, it's likely that it is required to be persisted for a longer period of time.

In the major plant at least three very different types of data are being produced at different rates, with different volumes, for different purposes, each with its own sensitivity regarding when the data needs to be accessed for processing and decision making. NetApp works directly with you to determine the nature and relative importance of these zones and the data that is produced.

You can leverage the breadth of the NetApp product portfolio to build an IIoT solution across the entire IoT continuum and every section of the data workflow.

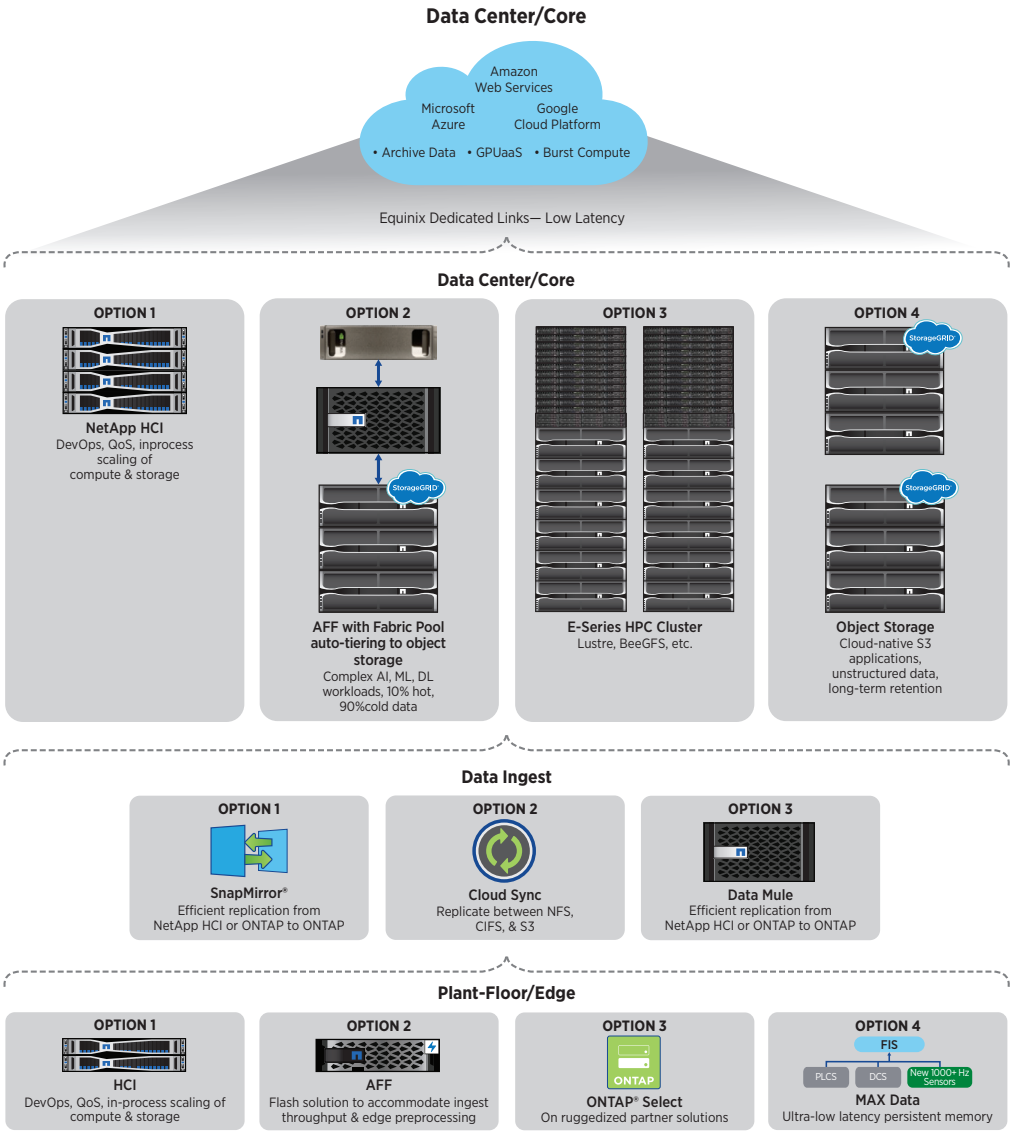

Figure 2) NetApp plant floor dataflow.

Conclusions

Industrial IoT can vastly improve connectivity, efficiency, scalability, time savings, and cost savings for all types of industrial organizations. Some organizations are already experiencing the benefits of IIoT through cost savings from predictive maintenance, improved safety, and increased operational efficiencies. IIoT networks of intelligent devices allow industrial organizations to break open data silos and connect all of their people, data, and processes from the factory floor to the executive offices. Business leaders can use IIoT data to get a full and accurate view of how their enterprise is doing, which helps them to make better decisions. Leveraging the full product portfolio, NetApp can help this industrial transformation by streamlining the process of data migration from edge to core to cloud and enhancing the speed, throughput, and capabilities of the analytics that are necessary in IIoT.

About NetApp

NetApp is the data authority for hybrid cloud. We provide a full range of hybrid cloud data services that simplify management of applications and data across cloud and on-premises environments to accelerate digital transformation. Together with our partners, we empower global organizations to unleash the full potential of their data to expand customer touchpoints, foster greater innovation and optimize their operations. For more information, visit www.netapp.com. #DataDriven