BiTMICRO ACUMEN™ Ultra-Low SWaP Network Storage for Industrial IoT (IIoT)

This multi-part blog series will discuss the growth of Industrial IoT (IIoT) and its use in various industries and applications. It will also focus on new requirements being imposed on IIoT data capture and storage devices to ensure that this growth and adoption continues.

New requirements for IIoT includes:

- Ensuring cybersecurity
- Minimizing power consumption and reducing weight and size
- Improving portability and mobility
- Simplifying management and integration
- Delivering greater performance and capacity

Part 1 – Introduction to IoT

Gartner, a leading technology analyst organization, defines IoT as:

"The network of physical objects that contain embedded technology to communicate and sense or interact with their internal state or the external environment."[1]

In other words, IoT devices are things that sense what's going on inside them or with their surroundings. They share that information with other IoT devices, a common infrastructure, and people.

It's difficult to discuss IoT and IIoT without first understanding where it began. IoT has its roots in telemetry.

What is Telemetry?

A telemetering device is anything with a sensor that can measure something like temperature, distance, speed, height, and send that information across a wire to another device or person. The concept of telemetering is not new; it's been around for well over a century. Telemetering information over wire had its origins in the 19th century. In 1874, French engineers built a system of weather and snow-depth sensors on Mont Blanc that transmitted real-time information to Paris. In 1906 a set of seismic stations was built with telemetering to the Pulkovo Observatory in Russia. In 1912, Commonwealth Edison developed a system of telemetry to monitor electrical loads on its power grid. The Panama Canal (completed 1913–1914) used extensive telemetry systems to monitor locks and water levels.[2]

Telemetry continues to be used today. Remote sensors sending real-time data over the wire can be found in meteorology, oil and gas, mining, transportation, agriculture, resource management, and security, just to name a few.

[1] Gartner Glossary (https://www.gartner.com/en/information-technology/glossary/internet-of-things)
[2] Mayo-Wells, "The Origins of Space Telemetry", Technology and Culture, 1963

What is an IoT?

The basic definition of an IoT device is similar to that of telemetering. It's anything with a sensor that can send what it senses across the internet. At its most basic core, the only difference between a telemetry device and an IoT device is that the former uses a wire to transmit data, and the latter uses the internet.

The IoT devices of today still use the basic concept of telemetry, making measurements and reporting them, but that's where the similarities end. Because an IoT device is connected to the internet or a cloud, it can share its information with other IoT devices, AI and analytical systems, intelligent infrastructures, and a nearly infinite number of people. A modern-day IoT device may not only send information, but it can also receive information. If it's part of a larger system, it can also instruct the system to take action.

One of the best examples of today's IoT would be consumer products such as autonomous passenger vehicles and smart homes.

Autonomous vehicles can have dozens of IoT devices that exchange information with other IoT devices, other IoT enabled vehicles, and a central or distributed system. They can also share information with an external infrastructure that collects, analyzes, and makes decisions. That infrastructure is not only collecting information from one vehicle but from thousands of other vehicles and other sources such as traffic sensors, meteorology devices, emergency services, and public road repair departments. By having this meshed, intelligent network, not only can the autonomous vehicle drive without human intervention, but it will also follow the safest and most time and fuel-efficient route. Another important benefit of IoT enabled vehicles being able to communicate with each other and a common infrastructure, is that they can exchange crucial information to prevent collisions and avoid hazardous conditions such as icy roads. Authorities expect the number of accidents to reduce by nearly 90% once the self-driving technology is implemented across the globe.

The smart home is another example of IoT where lighting, heating and air conditioning, appliances, media, and security systems connect to the same infrastructure. As an example, by using GPS tracking and a driving application, your home knows when you will be arriving. When you arrive home, the security company is notified, the lights will be on, the media center is playing your favorite tune, and the house is at the perfect temperature. When integrated with other applications, your favorite meal can arrive at your doorstep before you sit down.

The goal of IoT is to make your life easier and safer so you can be more efficient and enjoy more of the things you like to do.

This brings us to Industrial IoT or IIoT.

What is Industrial IoT (IIoT)?

Industrial Internet of Things (IIoT) is IoT at a higher level. It's best described as a meshed network of sensors, devices, instruments, and machines interconnected with computers, AI systems, and industrial applications. IIoT is enabled by technologies such as cybersecurity, cloud computing, edge computing, mobile technologies, machine-to-machine communication, advanced robotics, smart sensors, big data, and AI/cognitive computing.

It is the goal of IIoT to improve the overall knowledge, productivity, and safety of any industrial venture. Similar to IoT, IIoT devices communicate autonomously with each other, enabling them to identify trends and take action based on historical and real-time data. This allows an endless number of industries to become increasingly more automated and efficient.

Examples of IIoT applications include:

- A 300-ton autonomous mining truck in Australia covered in dust and operating in extremely high temperatures is transporting half a million pounds of rock. IIoT monitors the vehicle's load capacity, fuel consumption, engine strain, and other elements to streamline operational efficiency. IIoT ensures the autonomous mining truck stays on track, stops and starts exactly where it should, and avoids collisions with other trucks, equipment, and people.
- An IIoT remote weather station capturing video, temperature, wind, humidity, and other information operating on Mount Everest and connecting to the internet via a satellite. The data is analyzed in real-time and against historical data to assist meteorologists in understanding climate patterns and to aid in making predictions to assist people such a mountain climbers.
- A copper ore processing plant in Siberia uses IIoT to monitor and manage the health of systems in real-time. IIoT tracks the utilization of equipment to understand current and potential capacity and maintenance requirements. IIoT can identify bottlenecks and increase, stop, or divert processes to maximize throughput.
- An unmanned hydropower plant in the Amazon relies on IIoT. With IIoT, the infrastructure can control many processes, including efficient power distribution and load-balancing, and predict maintenance and repair. IIoT can even start emergency shutdown processes without human intervention.
- A cornfield in Iowa combines IIoT with AI to monitor temperature, precipitation, wind speed, soil health, and sunlight to optimize irrigation, fertilization, and pest control. IIoT, coupled with IA, provides more efficient ways to produce healthy and profitable crops.

IIoT is rapidly expanding as more and more industries discover its cost, safety, and knowledge benefits. IIoT is fueled by demand and benefits from continuous advancements in areas such as automation, sensor technology, networking, robotics, and artificial intelligence. The IIoT market size is expected to reach USD 949.42 billion by 2025, according to a new report by Grand View Research, Inc. It is projected to expand at an amazing CAGR of 29.4% during the forecast period.[3]

[3] Grand View Research (https://www.grandviewresearch.com/press-release/global-industrial-internet-of-things-iiot-market)

This exciting growth in IIoT places more requirements on IIoT data capture, storage, and sharing devices. BiTMICRO developed the ACUMEN Ultra-Low SWaP Network Storage Node to support the IIoT requirements in terms of storage density, portability, network accessibility, security, and ultra-ruggedness. It is the world's first 24W PoE-powered secure NAS with dual 10GbE ports. It is fanless, housed in a rugged, shock resident, EMI sealed enclosure, and reliably operates even in environments with minimal airflow. Cable connectors are rugged, multi-insertion, and environmentally sealed. The ACUMEN Node is purposely designed for continuous operation in the harshest conditions.

Future blogs will focus on these new requirements including; cybersecurity, high performance, and mobility. We'll review why they are needed, how they can be achieved, and the added benefits they provide.

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Business Development

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