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EDGE COMPUTING

THE IMPORTANCE OF EDGE COMPUTING IN INDUSTRIAL ENVIRONMENTS

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...means that high-performance systems are being deployed into challenging environments.
In this article, we will look at some of the reasons why edge computing is so important and how these systems are connected.

THE INTERNET

The internet has been with us for nearly 3 decades, and in that time, it has evolved from a simple method of sharing information to a powerful computing tool. At the beginning of the internet age, the speed of communication was limited by the hardware and infrastructure. The use of conventional telephone lines, combined with the processing capabilities of the best computers, meant that there was a speed limit imposed on communication.

As the power of computers and the speed of communication improved, so too did the capacity of the internet. The ability to send more data in a shorter time allowed users to share larger files such as videos for the first time, but the speed was still sufficiently limited to make real-time streaming as we now know it impractical.

The advent of high-speed internet, delivered by broadband or the recently introduced 5G wireless networks, has made real-time communication possible. No longer is it necessary to rely on physical hardware to store or process information. Instead, the user's device is a tool with which to gain access to the internet.

THE ADVANTAGES OF THE COMPUTING IN THE CLOUD

Cloud computing allows users to access the almost limitless resources of the internet from a handheld or mobile device. The storage and computing power is hosted in data centres, which can be located anywhere in the world. The services delivered by these data centres range from the simplest remote storage of data to the most sophisticated software applications available.

The key advantages of cloud computing are that the user is no longer tied to one location, nor are they limited by the applications installed on their device. Free from the requirements to work from a dedicated computer, the user can access information and work from wherever necessary.

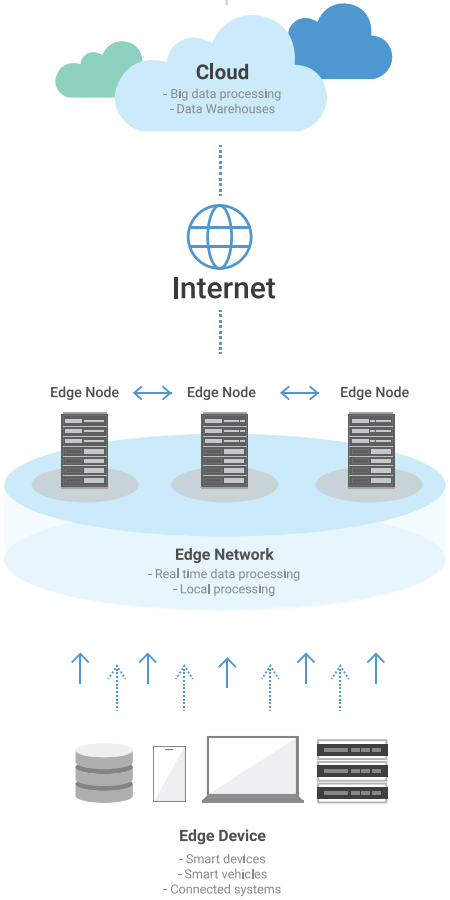
This has allowed users and organisations to develop a more modern way of conducting business. Employees can work remotely while still having access to all the data and services of the organisation. This has combined with the latest machine-to-machine communication that powers the Internet of Things (IoT). The IoT is enabling factories or other large-scale installations to work as single entities, sharing data to provide more efficient processes, regardless of their physical location.

IF THE CLOUD IS THE FUTURE, WHY EDGE COMPUTING?

Cloud computing offers users and organisations unprecedented freedom to work and develop systems that are not fixed to one location. With data shared over high-speed internet connections, and data centres delivering the computing power necessary to process information remotely, we could argue that there is no longer the need for local equipment. And yet there is huge growth in the use of sophisticated processing equipment that is installed on-site or, in the jargon, at the edge of the network. This equipment is referred to as edge computing.

In contrast to cloud computing which relies on an internet connection to process and store data remotely, edge computing places its processing power as close to the point of use as possible. In an age where the cloud is providing access to enormous storage and computing potential, the use of edge computing might seem like a backwards step.

However, the need to transmit information over long distances is one of the key reasons for the growth of edge computing. As businesses and organisations embrace the latest technology, they generate a huge volume of data, which must be collected and transmitted to the cloud. As this volume grows even further, the need for additional services to connect to the cloud also grows, bringing with it an increase in cost. Using edge computing equipment to process much of this data locally will reduce the load on communication equipment.



THE PROBLEM WITH LATENCY

There is also a concern over the speed required to communicate with the cloud. While some applications are not time-sensitive, other processes require very low latency. Latency is defined as the time needed for a command to be completed. In a range of situations, from high-speed manufacturing to the employment of safety systems, the latency introduced when data is transmitted to the cloud is undesirable. By using edge computing systems, data can be processed quickly, and latency is kept to a minimum.

Edge computing also enables rapid reconfiguration. Modern manufacturers are embracing the flexibility that can be achieved by employing the latest IoT technology. Many edge computing devices are industrial controllers that can be reprogrammed and repurposed quickly, often using cloud services to deliver new software. Once configured correctly, these devices can control the local process, all while communicating with the cloud to provide real-time information about production.

It is therefore important to understand that edge and cloud computing are not mutually exclusive. Rather, they are complementary. Edge computing can provide local control, reducing latency and bandwidth requirements, while providing the cloud with the necessary information for organisations to manage their facility efficiently.

REAL-WORLD APPLICATIONS FOR EDGE COMPUTING

In many of these examples, we have considered them from the viewpoint of a traditional manufacturing environment. Edge computing is highly suitable for the latest smart factory applications. The smart factory is a facility that unifies all aspects of its operation, from production and logistics to maintenance and management. Edge computing can reduce the volume of information that must be shared around the smart factory, all while providing the responsiveness that the manufacturing process requires.

However, the functionality that is so useful to the smart factory can be just as powerful in other applications. The world of agriculture is adopting the same connected approach to technology, with farmers making use of remote sensors, machinery and vehicles. In this case, the dispersed nature of the farm and the large areas over which equipment must function make both edge and cloud computing attractive solutions. Equipment such as autonomous farm machinery uses local controllers to manage its operation, while at the same time it communicates over the latest 5G networks with the cloud-based management of the farm itself.

Similar techniques can be applied in urban environments, where traffic management communicates with vehicles to create an integrated network. The latest V2X (vehicle-to-X) technology allows cars to share information with other road users and the signalling infrastructure (the "X" in the acronym covers all of these). However, as safety is of paramount concern in these situations, the vehicles themselves will use edge computing technology to ensure that response times are as low as possible. Even the tiny latency introduced by using the cloud to analyse road conditions and potential hazards would compromise safety.

Even as the demand for cloud computing grows, edge computing has huge potential in a wide range of industries. However, this will place additional demands on equipment and the engineers who must build and maintain it.

ADVANCED COMPUTING IN HARSH ENVIRONMENTS

Deploying computing equipment to the edge of the network means placing these devices close to the point of use. This may mean that sophisticated systems will be exposed to a wide range of conditions from which they must be protected.

The factory floor can be an unforgiving place. Depending upon the industry, control systems can be exposed to extremes of temperature and dangerous chemicals, while devices fitted to machinery can be subjected to vibration and shock. Computing equipment used in these environments must be protected from damage, but also need to be robust enough to perform, even under these harsh conditions. The electronic connectors that provide the vital link with the factory network and the cloud beyond must provide superior reliability to prevent breaks in communication.

Similar challenges face equipment that is destined for the smart farm or city, with the additional requirement that they be protected from damage caused by wind and weather. Even in applications that use wireless communication such as the 5G network, devices need to be connected to sensors and local power supplies. It is often these connectors that must withstand the worst conditions.

Engineers responsible for designing and maintaining edge computing equipment must rely on components that will provide rugged reliability, while at the same time delivering superior performance. Connectors must be capable of transmitting high-speed data or delivering power efficiently, even when conditions are harsh.

SUMMARY

The next generation of smart systems, whether used in the factory, the farm or the city, will combine to form a highly complex infrastructure. They employ a combination of cloud-based and local equipment, working in harmony to provide the best aspects of each technology. Far from competing, edge computing and cloud computing are in fact complementary technologies with much in common.

Deploying these technologies in the field or on the factory floor demands connectors that can withstand the harshest conditions and still deliver the performance needed to process huge volumes of data. Choosing the right connector is vital to harness the full potential of edge computing.

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