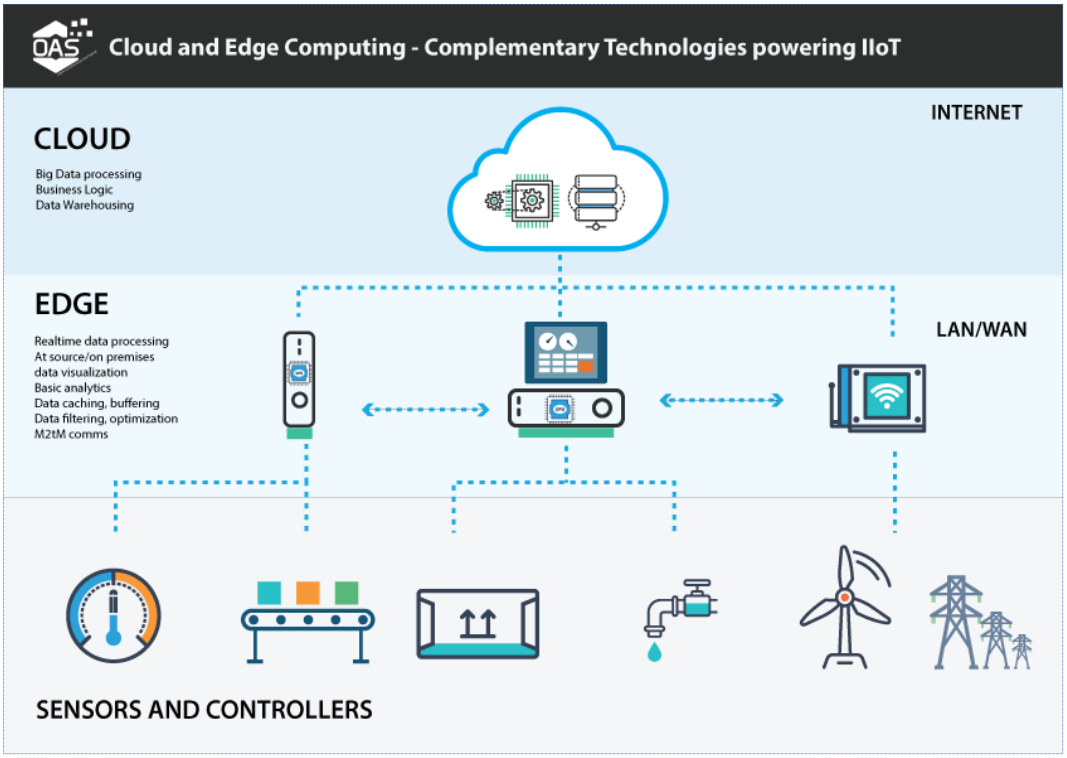
Topic Info 3: Edge Computing 5G

Part 1: EDGE COMPUTING

Edge computing – as opposed to cloud computing – is where data is processed locally, at the network edge. Edge computing is an open, distributed IT architecture of which decentralized processing is a typical feature. Edge computing creates not only the basis for mobile computing, but also the technologies of the Internet of Things (IoT). In the context of edge computing, data is in fact processed directly by a (mobile) device, a local PC, or a server without being transferred to a data center.



Why edge computing?

One of the reasons why edge computing came about was the desire to optimize temporal and data-based resources: it is often not necessary to first upload certain data from IoT devices into the cloud, only to transfer the responses back to the local network afterwards. What is much more useful and above all more efficient is to have specific processing tasks performed locally by intelligent routers. Based on its underlying principle, edge computing speeds up the processing of data streams. With edge computing it is possible, for example, to process data in real time, i.e., without latency. Devices and smart applications are then able to respond to data, even when they are still being processed. This in turn means that delays can be avoided, which is crucial for certain technologies such as self-driving cars. Moreover, edge computing offers organizations and companies various other benefits.

Edge computing: the components

For any companies and organizations interested in the idea of edge computing, it is of course worth knowing what its components are. The following elements are required where edge computing is to be implemented:

- A highly virtualized platform placed at the network edge to ensure that network services, storage, and servers are available between traditional cloud data centers and the devices
- Computing capacity for local data processing on the relevant devices, whether car, aircraft, or wind turbine
- A version of distributed computing

Where edge computing is used alongside cloud computing, large volumes of unstructured data can be processed. The aim of edge computing is to process batches or generate real-time interactions. It is of course not necessary for all edge computing components to be connected to the Internet around the clock. It is in fact a typical feature of edge computing that data is processed offline at times. As regards

the network topology, a number of different types are feasible – from the traditional Internet through to peer-to-peer ad-hoc networks.
If the data is processed on the relevant device, only a small amount of data has to be transported to another IT instance. In addition to the time and cost benefits achieved in this way, edge computing can also improve security provided that adequate encryption is in place.

Edge computing: the pros and cons at a glance
As explained earlier, edge computing has a number of benefits. However, as is often the case, there are also risks associated with it. A summary illustration of the pros and cons is provided below.

The pros of edge computing

- Data is processed at fast speed due to reduced network traffic
- The networked devices on the Internet of Things continue to function even when the Internet is down or when the cloud connection causes delays
- Sensitive customer and company data do not have to be transferred to the cloud, but instead remain where they are

The cons of edge computing

- There may be insufficient capacity, for example when large amounts of data are processed, or insufficient storage space as both storage and computing requirements are irregular
- Devices need to be better monitored and better protected to prevent misuse or failure

Conclusion: edge computing does not mean the end of cloud
The fact is that edge computing is still in its infancy – just as the cloud was a few years ago. That is why the computing activities of companies and organizations continue to focus on the cloud. Besides, the majority of IT experts predict that edge computing is not going to replace cloud computing. Instead, they believe that both concepts or systems will coexist in the future and be used as complementary systems.

Source: https://www.cloudcomputing-insider.de/was-ist-edge-computing-a-742343/

Part 2: 5G and edge computing

All IoT applications, for example in the area of vehicle-to-vehicle communication, public safety, and the sensory networks of smart cities, require a more reliable and scalable device-to-device connectivity than can be achieved with the current LTE networks. (…)

As becomes clear from this, edge computing will be particularly important for the 5G network as a way of reducing the pressure on the fifth-generation network. With edge computing, the enormous volumes of data generated by the vast number of connected (IoT) devices are processed directly at the network edge. That means processing takes place at source, i.e., where the data are produced, instead of transferring the data traffic via a remote data center. Edge computing thus significantly reduces latency, which makes it crucial for the success of 5G scenarios. A self-driving car, for example, can only function properly if the data from all sensors is processed in real time, i.e., with a latency of less than a millisecond (ultra low latency), allowing the information needed for driving the car to be derived instantly.

Edge computing is only possible through the virtualization of the network
The benefits of edge computing have already resulted in a considerable increase in the performance and capabilities of IoT projects in recent times. Established operators and new market players have launched a number of new cloud and server technologies on the market that are designed to ensure the functionality of data centers effectively "at the edge." According to the IDG, 43 percent of the data generated by the IoT will be processed by edge computing by next year in order to remain on top of the flood of data produced. The joint project "Digitales Testfeld Autobahn" [Digital Test Field Motorway] of Continental, Deutsche Telekom, Fraunhofer ESK, and Nokia Networks also uses edge computing technologies in order to ensure latencies fit for 5G for car-to-car communication. However, edge computing also entails new requirements that the network must meet. This changes the network architecture. Adapting the network to the requirements of 5G and edge computing is in turn crucially dependent on the virtualization of the network functions (NFV).

Appropriate network monitoring

The agility of the network environment is improved through NFV. It allows operators to adapt their networks more quickly and put new (IoT) services in operation within just a few minutes rather than a few days. However, it also makes the operation and maintenance of a network more complex. That means NFV is a double-edged sword. It is absolutely crucial for the service quality of the authentication services, routing and switching functions, and the domain name services that the virtual functions in a virtual network actually work properly. If an operator fails to keep an eye on these components, the end user or the networked IoT device are likely to be affected negatively as a result.

That means that 5G depends on the flawless functioning of the virtualized network and the devices and services connected to it. Monitoring the data and network traffic is therefore vital in order to ensure this flawlessness.

However, the majority of the huge volumes of data on the Internet of Things is transferred in an unstructured manner and in formats that cannot be implemented despite the use of advanced analytics tools. This is partly due to the high transmission speed. Without harmonizing the data it essentially becomes worthless because its quality is no longer sufficient to derive business information from it. Using edge computing makes this situation even more complex. Traditional network monitoring and protection tools are then no longer adequate to offer operators the tools they need for this environment. Service Assurance, however, is a means by which the performance of the virtualized network can be continuously monitored and adjusted. Service Assurance thus becomes more than just a means of solving and avoiding problems, as it also offers comprehensive functions for the management of network resources.

Smart use of data

In addition, the data generated by virtual components delivers to companies and providers the insights they need to adjust the network functions and components. In time, this flow of information and the insights gained from it will enable networks to work in a fully automated manner and continuously optimize themselves. This will allow providers and companies to allocate the network capacities to those areas where they are most needed: whether for the purpose of managing peaks in network demand or, as in the case of IoT traffic, managing the requirements of smart cities, autonomous vehicles, or smart factories. Therefore, operators should use a smart data solution in order to maintain transparency across all aspects of the IoT life cycle – from the testing phase to monitoring and analyzing live traffic and through to network orchestration and automation.

Moreover, this intelligent data, also referred to as smart data, offers additional meta data. It enables operators to gain new insights on how the connected IoT devices and machines behave in the network, how they interact with the network, and what type of traffic they generate. In addition, smart data can point to anomalies within the network, such as network overload.

Edge computing prepares the industry for the future

Although only at the beginning of its deployability in the mass market, edge computing's benefits such as low latency and high scalability will be crucial to the success of the technologies of the future, such as 5G. Apart from edge computing, the virtualization of network components will also be vital for 5G operators. With this, an appropriate way of monitoring networks is becoming increasingly important in order to keep a check on the significantly more complex networks and ensure their flawlessness.

Source: https://www.funkschau.de/telekommunikation/artikel/156877/
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