Orientation Challenge: Edge-, fog- and cloud computing

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1. Introduction:

Edge-, fog- and cloud computing are internet of things (IoT) concepts that represent different layers of computing infrastructure that process the generated data from IoT devices. How do these communication layers work. How are they connected to eachother. How are they applied in today's world? What are their advantages and disadvantages? The main focus of this research is to answer these questions and potentially answer more than what is asked.

2. Edge computing:

Edge computing is based on processing the data received from the devices closer to where it is being generated. This enables the data being processed at greater speeds leading to action-led results to be real time**.** Rather than the data being stored on the cloud, it is stored on the device itself**[1].**

Common examples of edge computing is in industry 4.0. Think about the usage of multiple machines, processes and systems operating in real-time. This precision needs to be met in order to combine this data with machine learning to achieve results for taking the best action based on this data. Think if a certain production section of a whole production line fails. The machines should adapt and this is made possible through edge computing.

Edge computing is well known within the manufacturing sector. One big name that can come up is the company Siemens. They started manufacturing radios and electronics in the early 1900s. in modern times they offer software, sensors, PLCs and many more. In their warehouse I believe they would be using edge computing to manufacture their products at a high-speed rate. They store the information within the machines themselves rather than a server.

If it is simply the robots with doing the robots in edge computing, then I don't think they need to adapt to any of the other layers. If the development of the mist computing continues to grow, then I can see them being a better alternative. This is all assuming that the current machines are not using machine learning in unison with edge computing at their maximum potential.

3. Fog computing:

Fog computing is a step further from edge computing. It focuses on bringing the computation and data storage (cloud) closer to the edge layer. This enables that fog computing is less reliant on the cloud for specific resource-intensive tasks. This improves the performance and reducing latency. This can also reduce costs since it brings the computing and data storage closer, resulting in less data that needs to be transmitted back to a central location for processing **[2].**

There is also **mist** computing that takes this a step further by bring the computation and data storage even closer to the network edge. This is possible by using devices such as mist computing servers. These are low-power servers that can be deployed in large numbers**[2].**

Some big name companies that utilize fog computing include: Microsoft, Dell, Intel Corporation, Cisco Systems, and Amazon. Personal assistants such as Siri (Apple) and Alexa (Amazon) are available across devices and are compatible with most, such as smartwatches. This presence concludes that we can count on fog computing to become a crucial part of various industry verticals**[5].**

With that being said they are well on their way of becoming completely fog computing rather than cloud computing. Since we are opting for both speed and security, I would not change this network layer for any of the other two.

4. Cloud computing:

Cloud computing is the process of making use of hosted devices, such as data storage, servers databases, and software over the internet. The data is stored on physical servers which are maintained by a cloud service provider. Unlike edge computing, cloud computing instead stores data on the cloud instead of the hard drive or storage device**[3].**

There a few differences between cloud and edge computing. One being that edge computing can offer faster data storage and computing. So fast that it is the deal solution for processing data in real-time. Cloud computing is better suited for processing larger amounts of data that is not time-sensitive. In terms of security, cloud computing platforms are inherently more secure due to vendors' and organizations' implementation of the latest cybersecurity measures. The data is more secure this way**[4].**

As mentioned in the fog computing section, personal assistants such as Siri or Alexa make use of cloud computing. The way this is works is they detect "wake words" and then perform the rest of the speech to text conversion in the cloud. This does reduce the compute power needed at the edge, however it is not very optimal from a performance standpoint**[6].**

With this information available, I would also opt for this technology to go into a different network layer. The reason for this is to improve performance. If this was based in edge computing then the response time in between conversation would be decreased. This also offer offline availability for when there is no internet available. Ideally this can be done in the fog layer. The only concern that may come up is the processing of sensitive data, which the cloud layer can protect better than the other two.

5. Bibliography

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