



## Fog Computing in IIoT

Everyone has heard of the cloud and all its storage and computing capabilities. But not as many people have heard of the fog. Fog Computing is cloud computing that can be found closer to the ground. In other words, the fog is cloud capabilities closer to edge computing such that less collected data needs to flow to the cloud in order to be processed and analyzed. Since this computing is done near the edge, the extension of the cloud in this case, on the ground, is called fog. In fog computing, the analysis of the collected data is done in a gateway, or data hub, or a smart edge device. This analysis keeps the river of data flowing to the cloud at a manageable flow. Knowing that fog computing is done closer to the edge and not so reliant on the cloud, it must also be stated that cloud computing is not substituted for fog computing, but that the two work in conjunction with each other to productively and efficiently keep the production going.

Fog computing allows for cloud capabilities that are closer to the process and saves on time for huge data sets to be transferred far distances back and forth to the cloud. Even though fog computing can use smart edge devices, it is different from edge computing. Edge computing relies on PLCs and automation controllers on the edge to handle most of the computing, while fog computing relies on a gateway or smart hub, close to the source, that can handle and process the data that is being obtained. This difference is key to understanding fog computing and how it can complement the abilities of cloud computing. By using fog computing, time to transfer and analyze the data points is significantly decreased, thus allowing companies to make more crucial decisions as soon as possible and not days down the road.

One of the best ways for fog computing to work cohesively with cloud computing is through a



Edge computing relies on PLCs and automation controllers on the edge to handle most of the computing



fog computing relies on a gateway or smart hub

## The **PASS OFF**



pass-off. The fog computing gateway may receive the data from the smart devices in real time, analyze it for useful information, and hold it for a few hours or days. After a certain amount of time, the gateway may pass along a summary of the data received to the cloud so that the cloud has less data being passed to it. The central cloud can then overview and possibly reanalyze the data from all the gateways across the company for better business strategies and more in-depth insight. The company can then decide whether more parameters or changes need to be made to the process so that it is running as efficient as possible. This infrastructure of a fog computing gateway passing already analyzed data to the central cloud allows for the sensors and smart devices connected to the gateway to reap the immediate benefits of analysis. This also allows for the central cloud to receive all the data in concise and manageable data transfers that allow for even more accurate analysis of the data for more insightful business changes. This infrastructure can also be scaled correctly

depending on the size of the company and what they wish to achieve. Any multitude of gateways can be formed and transfer the data as long as there is the infrastructure in place to sustain the stream of data.

Through these incremental data transfers, security is not compromised either. If data was passed straight to the cloud from the smart device, its possible that the stream could be affected or compromised. By breaking the flow into smaller steps, companies can maintain the security that the strive for. Security barriers and firewalls can be implemented in between transfers so that nothing can be compromised or affected.

Fog Computing allows for cloud capabilities closer to the edge devices doing the work in the field, wherever that may be. By lowering the cloud closer to the ground, companies can leverage their newfound connectivity with the benefits of making real time decisions and efficiently analyze their data for cost-effective production.

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