Chapter 5
Fog Computing in Industrial Internet of Things

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ABSTRACT

Fog computing, often projected as an extension to cloud, renders its design to deal with challenges of traditional cloud-based IoT. Fog enlightens its features of low latency, real-time interaction, location awareness, mobility support, geo-distribution (smart city), etc. over cloud. Fog by nature does not work on cloud instead on a network edge for facilitating higher speeds. Fog pulls down the risk of security attacks. Industrial sector is revolutionized by ever changing technical advancements and IoT, which is a young discipline embraced by industry thereby bringing in IIoT. Fog computing is viable to Industrial processes. IIoT is well supported by the middleware fog computing as industrial process requires most of the task performed locally and securely at end points with minimum delay. Fog, deployed for industrial processes and entities which are part of internet, is gaining importance in recent times being titles as fog for IIoT. Additionally, as industrial big data is often ill structured, it can be polished before sending it to cloud resulting in an enhanced computing.

INTRODUCTION

Fog Computing, is an embodiment that uplifts the edge gap of resource availability by placing operations and resources at the edge of a network. This is a decentralized architecture providing computation at a level ahead of cloud computing which succeeded in bringing down the services to an intermediate level in the hierarchical structure at the tip, generally network components, and yet holding data up with the cloud. It immensely brings the essence of cloud intimate to the network where the data originates and survives operated, promising proponents that reduce the bandwidth requirement. With all the above-mentioned

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characteristics, Fog Computing offers leverage inefficiencies like faster processing and lowered rate of resource consumption at a reducing expensive factor.

Besides offering a path full of enhancements, fog computing is characterized by Geographical distribution, mobility factor, interfacing real-time applications, Environmental heterogeneity, and synchronizing interoperability (Pouryousefzade & Akbarzadeh, 2019). Fog computing, spelled as fog networking strives to build control, management, and format on the backbone i.e. Internet.

CHARACTERISTICS OF FOG COMPUTING

- **Geographical Distribution**: Fog offers uplifting uninterrupted deployment services for providing QoS to mobile components and motionless Edge devices. The node is geographically spread over various environmental at different phases.
- **Mobility factor:** Communication between mobile devices is made possible by this mobility factor using SDN protocols, which separates the identity of the host from the identity of location with a distributed indexing system.
- **Interfacing Real-time Applications**: Interacting with real-time applications and devices is an urging requirement for Fog (Peter, 2015). These may include supervising requirements like critical processes with sensors or fog devices, real-time exchange of information for a traffic monitoring system (Vasey, 2018). By default, fog applications are capable of handling real-time processing providing QOS instead of batch processing structurally.
- **Environmental Heterogeneity:** Structurally defined, Fog computing is virtualized offering storage, computation, and services of network with the main cloud and devised, components at the termination. FOG heterogeneity servers maintain hierarchical blocks at distributed locations.
- **Synchronizing Interoperability**: The usage of interoperability between fog devices, support and guarantee services over large range like streaming data and real-time processing supporting the analysis of data and predictive decision making.
- **Huge Wireless Access:** Here wireless access protocols and gateways are examples of node proximity in FOG to end-user.

ROLE OF FOG

- Real-time big data industrial mining intending an increased performance.
- Being able to gather data from various types of sensors parallel.
- Speed computation of collected data for generating commands for actuators, robots with agreeing on latency.
- Use of translation protocols and mapping for sensors and robots that are incompatible.
- Handling the power management system.

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