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Computing at the Edge Rather than delving straight into the wonders of futuristic technology, let us commence with a mythic tale. An ancient story set during the reign of King Robert recounts the wisdom of one of his courtiers, Lord Varys. Renowned for his astuteness, Lord Varys was responsible for preservation of peace in the kingdom. With help from his 'little birds', he would gather information on all the events occurring in the realm, then filter out the critical matters and only present those to the palace council. However, as the king expanded his territory, Varys found himself incapable of sifting through and resolving every trivial affair. Exasperated, Varys decided to upgrade his helpers, by replacing his 'little birds' with people. By delegating responsibility to them for resolving minor scuffles, and only presiding over crucial situations, Varys helped restored order and harmony in the kingdom. The above story provides an intuition into the principle behind the paradigm known as 'Edge Computing'. On replacing the council, the 'little birds' and Varys' employees with a server, dumb terminals and smart devices respectively, the connotation becomes apparent. So what exactly is Edge Computing? Edge computing is a distributed programming paradigm, which aims to shift intelligence towards the data generating edge of the network. By exploiting network gateways and smart devices to perform computations on behalf of the cloud, it helps a network improve response times and save bandwidth. Prior to the adoption of edge computing, devices would collect data and upload it on the cloud, which would then perform all required computations and send back the results. However, as computational capabilities improve, most modern devices can afford to spare adequate resources to perform the requisite computations by themselves. For instance, driverless vehicles have more than 50 CPUs, which can implement most essential tasks without any assistance from the cloud. In this particular example, latency cannot be tolerated, making edge computing a necessity. With the growing omnipresence of IoT devices and the ever-increasing production of data, network bandwidth is reaching its limit, making it difficult for the server to respond quickly. The Need for Edge Computing Consider this scenario. Suppose there are ten surveillance cameras in a building, that record and send live footage to a cloud server. The cloud detects motion in the video and checks for intruders, and then executes the necessary action. However, in a housing society, thousands of such cameras would be required, which may cause the network capabilities to fail and the traffic to cause latency. In such a situation, replacing regular surveillance cameras with smart cameras proves to be much more efficient. These cameras monitor the environment and only connect to the server when motion is detected, drastically reducing traffic on the network and consequently improving network speed. Innovations such as driverless cars, IoT devices or AI-enabled applications, which demand low latency, high resilience, and proximity to users, cannot work efficiently with the existing cloud computing paradigm. IoT systems operate differently as compared to existing data center workloads, since they create massive datasets which are not suitable for transmission over the cloud. With 5G ready to infiltrate the network industry, in-house edge servers could radicalize communication. Addition of an intelligent layer (mini datacenter) to control all local equipment will significantly reduce the burden on the central server. Conclusion Edge Computing allows decentralization of intelligence and resources, which increases the security and privacy of the system, and reduces load on the server. While this approach is beneficial in many cases, it is not without flaw. Multiple intelligent nodes imply multiple configurations, which pave the way for erroneous configurations. This may result in significant financial loss. Additionally, replacing an outdated, unintelligent device with a smart one may increase vulnerability, since the new device is a computer itself and can be compromised. Nevertheless, edge computing is an essential constituent of many industries today and is helping shape upcoming technology as well. It has gained wide acceptance in the industry and it is here to stay until better solutions are found.

