Computing at The Edge

Before talking about the futuristic tech, let me tell you an ancient story.
Long, long ago, in the palace of king Robert, there was a lord named Varys. He was renowned for his knowledge. His secret was his "little birds" spread all across the state of Westeros. They observed all the happenings in the territory and recited them in front of Varys. Genius then filtered all the critical matters and took it to the council for discussion and further actions. That's how the committee resolved most of the issues before they got escalated. With time and God's grace, Robert's territory expanded manifolds, making it difficult for the board to manage the state. Varys wasn't able to work with the flood of raw information he was bombarded with by his little birds. The distance made it difficult to respond to problems needing immediate response. Everything became chaotic. Frustrated, Varys decided to replace his little birds with intelligent people. People who were capable of making on-the-spot decisions (based on the set of rules provided to them) and only came to the council for critical matters and reporting their actions. This great solution of lord Varys restored harmony in Robert's Kingdom.

The great solution in the above narrative is the basis of what we call "Edge Computing". For all of you Who haven't GoT the above story (pun intended), replace the council with cloud/mainframe server, little birds with dumb terminals/IT equipment, and intelligent employees with smart devices.
Okay, I'll explain it with a technical example. Suppose there are ten surveillance cameras in a building that record and send live footage on the cloud. Cloud looks for motion in the video and checks for intruders and then takes the necessary action. If we connect hundreds of thousands of such surveillance cameras, Our network capabilities may fail, and this traffic may cause latency. So we replace the regular surveillance cameras with smart cameras. These cameras keep an eye and only connect to the server whenever motion is detected, drastically reducing the traffic on the network and making it a lot faster.
Before the era of Edge computing, devices used to collect data and upload it on the cloud. Then the cloud <u>did</u> all the computations and <u>sent</u> it back to the device. With the rise in IoT devices (projected to increase to 43 billion before 2023) and ever-increasing production of data (1.5GB of data per day/person), network bandwidth is reaching its limit, making it difficult for the server to respond quickly.
Today most of the devices are smart and have enough computation power to spare (mostly running full-fledged Linux). For example,
Driverless vehicles have more than 50 CPUs, which can be employed to do most of the required computations in the car itself without a need to talk with the cloud. Also, we cannot afford latency in such a scenario, making edge computing a necessity.

Why Edge Computing?

Innovations like driverless cars, IoT devices, and AI-enabled applications that demand low latency, high resiliency, and proximity to users cannot work efficiently with the existing cloud computing paradigm. IoT systems work differently than existing data center workloads since they create massive datasets (like data emitted from sensors).
Edge computing aims at moving the intelligence towards the data generating edge of the network exploiting network gateways, smart objects, and mobile phones to do the computations on behalf of the cloud. Nowadays, when 5G is coming into the picture, in-house edge servers (mini datacenters) can radically change the tech industry. Adding an intelligent layer (mini datacenter) in the factory to control all the equipment will significantly reduce the burden on the central server.

Some other advantages of Edge computing are,
- Decentralizing the intelligence and resources makes the system more secure and private.
- Reduces the load on the server
- Reduces the load on the network

Shortcomings

- With multiple intelligent nodes comes multiple configurations, which makes it easy to make a mistake and do the wrong configuration for any device. The bad setting of any of the devices may cause significant losses to the company.
- Hacking vector increases. Making our old dumb device smart also makes them more vulnerable (since it is now a computer in itself with various connectivity options).

Final Thoughts

Edge computing is an essential ingredient in many industries today and is shaping our future tech as well. With all its pros and cons, tech giants have widely accepted this paradigm, and it is here to stay until we come up with some better solutions. Do you have one?