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Where does the modern edge begin and end?

The edge is where the data and action are, and only automation can keep up with managing it

The edge has become a critical part of the network, which has given rise to an important new question: Where does the network core end and the edge begin?

Not too long ago, the answer would have been obvious—the core is in the data center, and the edge is everything else—from the wiring closet to the computers. But today, it's not so simple. The edge is everywhere. The device on which you are reading this is an edge device, but so is the delivery truck at the curb, the thermostat in the hallway, and the millions of sensors occupying warehouses, railroad cars, and retail outlets.

Why does the edge matter?

The edge is important because it is part of the network that's close, but not necessarily closest, to where data is produced or consumed. There are many reasons to move data and data processing to the edge:

- **Increased throughput and lower latency:** The more processing you perform close to the user or endpoint, the faster your response.
- **Improved network traffic management:** Keeping traffic off the wide area network (WAN) and cloud services lowers costs.
- **Greater reliability:** Connectivity to and from the edge can be unreliable. Edge devices must perform autonomously, so the business doesn't halt.
- **Better data security:** Data processed at the edge has a smaller footprint than data sent back and forth to the cloud.
- **Increased agility and scalability:** Companies can deploy applications where they bring the most value by deploying them at the edge.

All these advantages are changing how networks are built, and business gets done. Lin Nease, chief technologist and fellow at Hewlett Packard Enterprise, says whole new business models are developing that rely only on the edge and cloud, with no significant core infrastructure that the customer needs.

"We are seeing sensor-based monitoring companies that sell annuity-based services, such as vibration sensors," according to Nease. "They may connect to the cloud-based service provider over Wi-Fi, but they may also just connect over a cellular connection. In that case, the customer has nothing else to install or maintain." There is a core, but it's the service provider's problem. Even better, deployment doesn't require special expertise and can be handled entirely by the customer.

Nease says deployment at the edge enables swarm learning to improve the service of these sophisticated devices, "Customers at the edge can report problems, and the service provider incorporates this information into their procedures for recognition of and response to issues."

The edge improves performance and lowers cost

If performance weren't an issue, very little would need to be at the edge. Keeping all functions in the network core and on-premises would be simpler and probably cheaper. We could batch transactions and return results when they were ready.

But the performance and cost matter a lot, and both are improved by edge processing. Fast hardware at the edge provides speedier responses. It keeps traffic off WAN connections and out of the cloud, helping businesses avoid the cost overruns common with public cloud deployments.

Pervasive automation is critical to making the edge practical for customers and affordable. Automation of these tasks is not just good; it's essential. The volume of transactions could be so high that work would be impossible if humans had to get involved.

Once you start looking, you'll see large edge networks everywhere. For example, electronic toll collection systems now automate the entire process from identifying vehicles to sending out violation notices based on license plate numbers read by cameras. Many jurisdictions are increasingly automating traffic enforcement with connected cameras and radar.

As another example, Nease notes he recently went through an airport security checkpoint that uses facial recognition. Officials told him to simply look into the camera, and he was quickly identified and allowed to pass through. Some people may be uncomfortable with facial recognition for a variety of reasons, but the system was fast and efficient, he says. However, such systems require sophisticated local processing and record management. The record of the passenger's face must be available locally for verification, and since passenger and immigration records are sensitive data, security must be designed with expert oversight.

The importance of central oversight

Managing the edge would be much easier if all hardware and local conditions were identical, but that's not the case.

Internet service provider networks for television are an excellent example of how challenging it can be. Providers have a variety of modems and set-top boxes at the edge (that is, the customer location) with different performance levels, security, and capabilities. Managing and supporting all of this requires good record-keeping and an awareness of how changes impact each device. The result is that networks like these are economical only if deployments, management, and support are as automated as possible.

One advantage of the edge is that it can continue functioning even if its primary internet connections are down. Nease points out that this scenario is common in large retail installations. "The store can't shut down, and it doesn't have to," he says. "All the inventory information is there for them to use, although they may not be able to say, for example, whether items are in stock in other stores. Even point-of-sale can continue. They may use a cellular backup for those transactions or let them go through and process the credit card requests in batch later on."

Autonomous vehicles are another example of edge devices that "must keep functioning offline because they can't assume the network will be up," Nease notes.

All these edge devices and the data on them need to be managed. Doing so requires a global policy and strong, cloud-based central oversight.

"The data creators, like thermostats and lights, create a lot of data, but collecting and making sense of all the data is complicated," Nease says. "Centralized management and automated oversight are requirements, and it's often the most challenging part of the solution."

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