www.pipelinepub.com
Volume 19, Issue 9

It's Time to Rethink Edge Interconnection

By: Ivo Ivanov

Hype is easy, substance is harder. That's the harsh reality bearing down on us as we rush to capitalize on the endless possibilities of edge computing. The Gartner Hype Cycle—which tracks innovations, our expectations, and our ability to deliver on them—places edge computing in the "Peak of Inflated Expectations" phase. Next will come the "Trough of Disillusionment" before we embark on the coveted "Slope of Enlightenment," where the technology will come of age, and we can reach optimum productivity.

Our expectations around edge computing are certainly inflated, but they're not misguided. We simply need to overcome the technical hurdles and physical security issues facing the industry, to allow for a more rapid and seamless transfer of data between the edge and the countless enterprises, network operators, and data centers that make up our global data network. These are the three "big players" when it comes to moving data, and the success of edge computing rests on their ability to interconnect and hone their data streams in a way that is fast, frictionless, and secure.

Network operators, enterprises, and data centers represent the "digital interconnection triangle"—the heart, hands, and brain of edge innovation. The heart is 5G connectivity, the hands are the countless IoT devices that are emerging, and the brain is artificial intelligence—all of which will have unique computing requirements at the edge if we are to realize the technology's true potential. In this article, we'll look at these requirements in more detail, as well as at the bandwidth and data stream challenges that the big players will need to overcome in order to innovate at the edge. First, let's examine where edge computing is today and what use cases are being adopted or pursued.

Living on the edge

At its core, edge computing is a distributed information technology architecture that puts data processing, analysis, and even intelligence as close as possible to the endpoints that gather data and use it to make decisions. Processing data at the edge can offer incredible benefits, from improved

performance and real-time analysis to better data security and cost-effectiveness. Consumer-facing industries, for instance, are pursuing edge computing so that they can offer a more personalized customer experience by gathering and analyzing endpoint data in real-time. Healthcare facilities are becoming more reliant on edge computing to provide in-hospital patient monitoring instead of relying on third-party clouds to process data. Edge computing is also a critical component in smart city infrastructure, allowing sensors and IoT devices to monitor energy use, manage traffic, and even carry out predictive maintenance.

Life on the edge is good. It's fast, it's streamlined, and it's necessary if we are to continue down this path of real-time analytics, automation, and rapid data processing. But first, we must lay the path.

The importance of interconnection at the edge

If our edge computing goals are to be realized across myriad industries, we need a more efficient way of interconnecting players within the connectivity ecosystem. The digital interconnection triangle of 5G, IoT, and AI is a disruptive force, but they need to be managed effectively. As enterprises start to take advantage of these technologies, they will need to adopt new interconnection service regimes that are customized for their particular needs—there is no one-size-fits-all approach here.

Before we look at how these new interconnection services might work, let's first break down the interconnection triangle and address its needs.

5G, and eventually 6G, is the **heart** of innovation. 5G is capable of handling a wide range of frequencies and the transmission of multiple data streams at once. It was designed to handle data from a large number of sensors and other endpoints and has become one of the foundational pillars of IoT. It offers reduced latency and better application response times and makes it easier for businesses to collect and process data securely.

The Internet of Things (IoT) is the **hand** of innovation. The number of IoT devices around the world is expected to triple in the next decade, from 9.7 billion in 2020 to almost 30 billion by 2030. These are the "hands" gathering the data, from sensors and smart cameras to uCPE equipment, servers, and processors. Some of these devices will reside on business premises, while some will reside in edge computing data

centers. The heart (5G) is capable of connecting these devices, but managing such an enormous volume of data will not be possible without a brain. That **brain** comes in the form of artificial intelligence (AI). AI will bring the logic management and maintenance of data streams, allowing ecosystems to take advantage of new innovative use cases. For this to work effectively and at speed, AI computations must also be carried out at the edge instead of in a centralized cloud computing facility as has been the standard for many years.

The interconnection of these three big technologies is all about speed, security, and efficiency. The cloud is a great facilitator, but if our real-time edge computing dreams are to be realized, we mustmove beyond it and consider that some processing must be done on-site. Data can be aggregated locally using edge intelligence, and only what is necessary should be sent to the cloud. The cloud will, however, remain an essential part of the interconnection ecosystem and will enable many use cases that are not possible with edge computing alone. A balance must be struck, depending on an organization's needs.

The next generation of edge interconnection

We've already touched on a few of the use cases that edge computing will enable, but that's only scratching the surface. Picture a factory floor where IoT devices can monitor temperature, humidity, pressure, sound, moisture, and radiation to give real-time predictions on how a machine might perform or when it might break down. Or where machine learning can allow devices to evolve their own processing and operational capabilities based on changing conditions or resources. These capabilities are within reach and are being realized now, but to fully democratize these capabilities and make them accessible to all, the masses of data generated by businesses needs to be intelligently sorted. Some data will need to be processed locally with extremely low latency to enable rapid responses, and some data will be better sent to the cloud where optimal connectivity and fast transmission of data will become critical. There are also questions around compliance, security, and privacy, such as which data will need to be stored long-term and which data will need to be discarded after serving its purpose.

These are complex data management demands. Software-defined networking (SDN), network function virtualization (NFV), and carrier-grade interconnection services can already make the handling of this data more efficient and secure.

SDN allows network administrators to centrally manage and configure network devices through software rather than manual configuration, which greatly simplifies network management. With SDN, administrators can more easily define policies and manage traffic flows, making it simpler to route data where it needs to go. NFV takes this concept a step further by virtualizing network functions such as firewalls, load balancers, and intrusion detection systems. By running these functions on virtual machines rather than physical hardware, administrators can more easily scale up or down as needed, and quickly deploy new services without the need for new hardware. **Carrier-grade interconnection services**, on the other hand, provide a reliable and high-performance way to connect different networks together. By leveraging these services, organizations can quickly and easily connect to multiple networks without having to deal with complex and time-consuming routing configurations. The result is a way of governing, managing, and optimizing data streams in a way that allows businesses to move to a combination of cloud and edge computing effectively and with minimal risk.

What's next for edge interconnection?

The emerging technology of the software-defined internet exchange (SD-IX) is set to become a crucial tool for further optimizing edge computing performance and efficiency. An SD-IX platform uses software to create a virtual network that enables dynamic and flexible interconnection between different network domains, including cloud providers, content providers, and internet service providers. By leveraging software to create a virtual network, SD-IX enables faster data transfer and reduces latency by creating direct connections between different network domains. This results in improved performance and reduced delays, making it easier to manage the vast amounts of data that are generated at the edge, without sacrificing performance.

The time to innovate is here, but first we must rethink interconnectivity to make the edge more accessible for aspiring businesses. Today, the right interconnection solution can help to optimize traffic flows. Tomorrow, SD-IX will emerge as a way of further optimizing those traffic flows for the masses of data we can expect to be processing.