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PUSHING BOUNDARIES: EDGE COMPUTING COULD CHANGE THE CLOUD

WHAT'S COVERED?

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For the last decade or so, cloud computing has been all the rage. Ditch your on-premises equipment! Move everything to cloud! It's faster. Safer. Cheaper. Better.

So we began moving quickly into the cloud.

And now? Well, now there's a new kid on the block. Edge computing is the next big thing. And it's poised to change the IT landscape once again.

The "global edge computing market is estimated to reach $6.72 billion by 2022," according to CB Insights.

Why all the attention on edge now? Simply put, we're connecting more devices than ever before

20 billion connected devices by 2020 - Gartner

and the current infrastructure won't be able to manage. The Internet of things (IoT), machine learning (ML), artificial intelligence (AI), self-driving cars, and 5G, that's why.

WHAT IS EDGE COMPUTING AND WHY DOES IT MATTER?

Edge computing is a mesh network of data centers that process and analyze data where it's collected. Rather than transferring data to a

centralized data-storage warehouse (the cloud), data is processed as close to the source as possible. This is known as the "edge" of the network.

Think of sensors within motors, drilling rigs, pumps, generators, surveillance cameras, cars. All of these things are constantly monitoring, constantly gathering data. This data doesn't necessarily need to be sent to a centralized system to be processed. Instead, this data is processed locally so it can be acted upon faster.

It's how your self-driving car knows not to hit a pedestrian. It's how your Nest thermostat knows how to adjust the temperature. And it's how your Alexa knows the weather in your hometown.

What's interesting is this is how most computing took place before the cloud. Like bell-bottoms or skinny ties, edge is a return of sorts. The emergence of IoT, ML, AI, and the development of

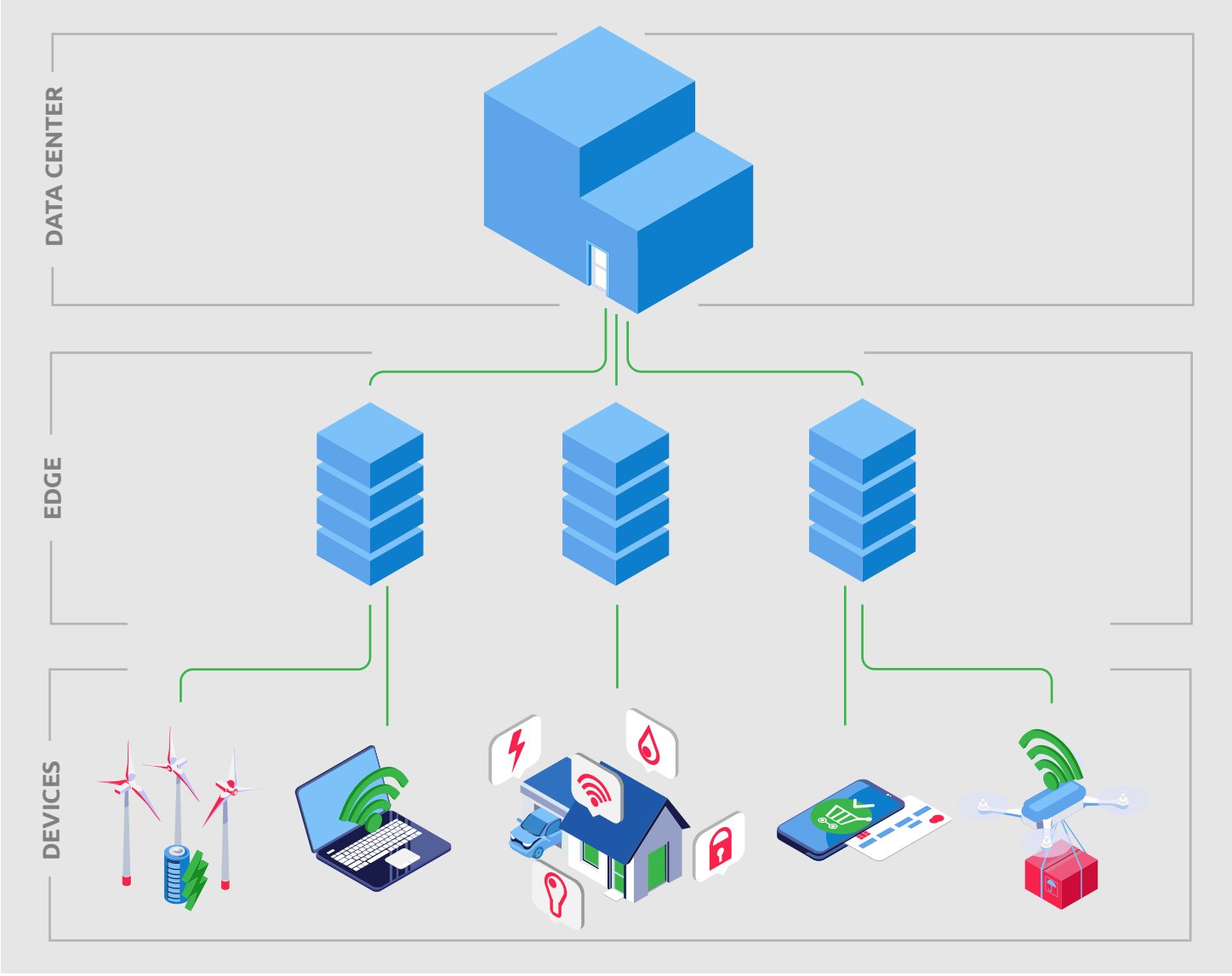

FIGURE 1 (EDGE DIAGRAM)

5G networks has made edge inevitable.

Think of edge computing like a human's sympathetic nervous system — your fight or flight response. You don't need time to process whether you're touching a burning stove. You just jerk your hand away. This is how edge computing acts in regard to the cloud. It's the quick reaction to a hand on a burning stove.

It's also worth noting, at this point, what edge is not. A few sensors connected to a computer is not edge computing; that's just an easy way to provide access to local information. However, if that sensor is gathering information, processing it, and sending that processed data somewhere else for more processing, that is edge computing.

Edge is also not a network, it's a computing process. However, in some cases, edge computing does require gateway servers, microdata centers, and other network devices, creating a fog network.

WHAT IS FOG COMPUTING?

A term coined by Cisco in 2014, fog computing (also referred to as fog networking or fogging) is the layer of network connections between edge devices and the cloud; edge computing is the computational processes happening near the data source. Fog networking makes edge computing faster and more efficient.

Fog computing distributes data between routers, gateways, servers, and microdata centers to collect and analyze data more efficiently between the data source and the cloud. Fog computing

THE LIMITATIONS OF CLOUD

The cloud has enabled us to have a more connected world, one that seemed impossible just a few decades ago. But it's not entirely built to handle the explosion of data we're seeing from connected devices.

Telemedicine, patient care, vehicle communications — these require time-critical processing. A delay of a few milliseconds can literally be the difference between life and death. If your self-driving car fails to recognize a person in the road, even in what seems like a minute time difference, that could be a big problem.

Transmitting time-sensitive data to the cloud in areas with poor connectivity could also pose a series of issues. As we rely on devices more and more in our everyday lives, a delay of milliseconds can make a big difference.

Lastly, relying solely on the cloud can be a big problem if outages occur.

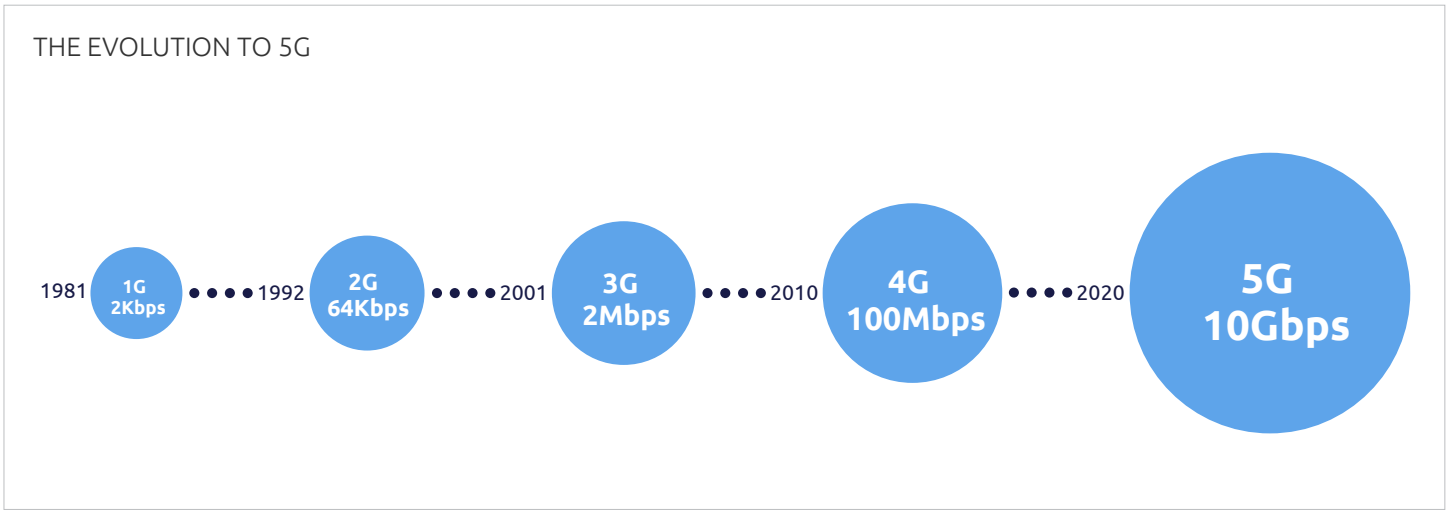

FIGURE 1 (SOURCE: CTIA THE RACE TO 5G)

"reduces the amount of data that is transferred to the cloud for processing and analysis, while also improving security," according to a 2016 TechCrunch article.

In short, fog computing always uses edge computing, but edge computing doesn't always use fog computing.

WHAT'S DRIVING THE PRIORITIZATION OF EDGE COMPUTING?

5G

With Sprint and Verizon aiming to launch small 5G networks in the first half of 2019 and other major carriers right behind them, the case for edge computing becomes much stronger — and more urgent. While these launches are test cases for nationwide deployments in the next few years, the IT world is faced with a chicken-and-the-egg scenario: Does edge require 5G or does 5G need edge computing.

With IoT encouraging exponential growth in connected devices, traffic, and the subsequent data produced by both, there's no doubt we'll need a strong network backbone to handle it all. 5G promises to be that backbone.

Promising to support up to 100,000 active devices per square kilometer — 50x more than 4G — 5G has the potential to support growing data needs and reduce network congestion. Some are working to get that number closer to 1 million active devices.

Of course, while 5G will be available to all of us eventually, it's really meant to enable the devices we're becoming so accustomed to — drones, autonomous vehicles, ML and AI, wearable and smart home devices, and even robots. 5G isn't about getting better cell phone service; it's about getting more deeply connected.

Autonomous Vehicles

Perhaps the best use case for edge, autonomous vehicles run on a complex network of connected sensors, cameras, motors, pumps, batteries, etc.

that need to constantly process data within the vehicle. The milliseconds of delay in transmitting critical information to the cloud could be disastrous.

These vehicles also communicate with one another, sharing weather data, road conditions, and accident and construction detours. By communicating directly through edge computing, rather than through the cloud, vehicles are able to process time-sensitive data quickly and efficiently.

While the prediction of 10 million self-driving vehicles on the road by 2020 looks to be quite a ways off, there's no doubt autonomous vehicles are closer to our new reality than not. And with each one producing up to 20 terabytes of data each day, we're going to need a better way to handle all that new information.

BENEFITS OF EDGE COMPUTING

Clearly, there are benefits to edge computing or we wouldn't be talking about it. It will have a significant influence in areas that gather large amounts of data. We already touched on a few, but industries relying on facial recognition or spatial awareness will also rely heavily on edge computing. Edge won't be restricted to a few industries, though. Like cloud, it will eventually become the default for nearly everything that needs to process data quickly. Here's why:

Speed

As pointed out earlier, edge computing is hugely advantageous in cases of high-speed data processing and analytics. Anywhere a short response time is needed — and we're talking milliseconds here — reducing latency is the prime focus. Edge offers that. Because data is processed so close to its source, lag time is drastically reduced.

Decreased Bandwidth

Edge computing and fog networks reduce the data load on the main network. Because both offer more efficient ways to produce, analyze, package, and ship data, there's less data traveling long distances. This will become increasingly important as more data floods existing networks that are already struggling to keep pace.

Privacy and Security

Honestly, the jury is still out in regards to privacy and security. Some claim edge networks get less attention from a security standpoint, so they're more susceptible to lazy security practices or open wifi networks. Strong passwords or two-factor authentication are easy fixes.

Most likely, because edge computing doesn't require continuous internet connectivity, it becomes more secure. And because data is localized, should a breach of some kind occur, it's less likely to affect data downstream from the breach. Lastly, unlike the cloud, where data is stored in massive amounts, disjointed, smaller pieces of data actually become safer.

THE CASE FOR CUSTOM HARDWARE

Of course, edge computing is only as good as its hardware. And because each edge computing

case is so unique, there will be greater attention given to the custom network rack hardware and cooling infrastructure required to facilitate it.

While the sensors, networking, and compute hardware may be standardized, the mechanical solutions that house the edge computing environment — network, storage, power, and server rack cabinets, chassis, and enclosures — will need increased levels of complexity and customization. These customizations may be the only way to deliver the reliability, security and performance requirements edge computing demands.

Edge computing will require specialized racking solutions. What's required to keep autonomous vehicle fleets running will be much different than smart medical devices or drilling rigs.

Edge computing could create more than $200 billion in hardware value in the next five to seven years. - McKinsey

FINAL THOUGHTS

Cloud networks aren't going anywhere; edge will not be a replacement. The most likely scenario — one that's already playing out — is that edge is the next step beyond cloud networks. It becomes an added layer, an evolution of cloud, that opens up new advantages and opportunities as we connect more pieces of our lives through devices.

"The cloud will become a strategically used resource where only the most important information is sent. The cloud can analyze, integrate and then send back only its most important learnings to the edge device in a reciprocal relationship," says IoT trackers Postscapes.

As edge architecture gets implemented at a greater rate to match growing demand for devices, we'll soon find ourselves surrounded by these networks. They power our farms, drive our cars, and order our groceries. Machine learning and artificial intelligence will make them smarter and growing connectivity will make them more robust. Edge will change the way products are sold, services are delivered, and companies develop.

Hewlett Packard Enterprise is investing $4 billion over four years in edge computing. Amazon and Sequoia just invested more than $530 million in autonomous vehicle technology company Aurora. Edge is coming. Are you ready?

BEFORE YOU CUSTOMIZE...

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ABOUT TENERE

Tenere has been providing single-source custom data center rack solutions — from prototype to production — to technology companies for more than 15 years. They are a leading North American contract manufacturer of custom mechanical solutions for Cloud Infrastructure, Network Architecture, Fiber Optics, Self-Serve Kiosk, Autonomous Transportation, and Renewable Energy companies.

They have industry-leading expertise in prototyping, design for manufacturability, tooling, sheet metal fabrication and stamping, injection molding, assembly, integration, testing, and supply chain.

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