THE EDGE COMPUTING REPORT

HOW ADVANCES IN EDGE COMPUTING ARE ADDRESSING KEY PROBLEMS IN THE HEALTHCARE, TELECOMMUNICATIONS, AND AUTOMOTIVE SECTORS

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BUSINESS INSIDER INTELLIGENCE

KEY POINTS

- **Edge computing is a data processing model that offers users an alternative to cloud-based IoT data analysis and management.** It allows users to reduce data transmission and cloud storage costs by processing data near where it's produced, instead of sending it back to the cloud or a remote data center.

- **These systems are becoming more sought-after parts of the wider IoT ecosystem.** According to Business Insider Intelligence's 2017 Global IoT Executive Survey, 40% of companies that provide IoT solutions reported that edge computing came up more in discussion with customers in 2017 than it did the year before.

- **Edge computing can help companies in a number of industries, including healthcare, telecommunications, and the automotive space, address specific problems with cloud reliance.** These include security issues, access issues, and transmission efficiency concerns.

- **In healthcare, companies and organizations are using edge computing to improve telemedicine and remote monitoring capabilities.**

    - Edge computing systems like local edge-based databases help to improve security and collect and analyze data from sensors and other devices around a hospital. This keeps data within the organization's confines and under its control, making it simpler to ensure that data is kept secure and comply with privacy regulations.

- Edge computing systems can improve access to digital technology in healthcare by adding local processing and analysis capabilities to ambulances and remote monitoring devices, offering healthcare providers more data.

- Using an edge computing solution can also reduce data storage needs in healthcare by analyzing locally, finding key points, and discarding what's no longer needed. One study found that using edge systems for remote teletherapy for treating Parkinson's disease could reduce data storage needs by 99%.

- **For telecoms, edge computing is helping to reduce network congestion and enabling a shift toward the IoT platform market.**

    - A secure experience is paramount for any company choosing an IoT platform provider. However, every time data is transmitted to the cloud, it is temporarily vulnerable to interception, making it difficult to provide this assurance. Offering an edge computing solution can help telecoms win more business in the IoT platform market by luring customers focused on security.

    - While telecoms generally offer broad network coverage, there are still areas where they're unable to broadcast a signal for clients. A telecom that's looking to provide an IoT platform doesn't want to be locked out of projects that require data collection and analysis in these areas. Edge computing is a natural fit for these instances, since these solutions don't need connectivity.

    - Because edge computing solutions process data locally, companies can choose to send only meaningful insights to the cloud, thereby reducing data loads on telecom networks.

- **In the automotive space, edge computing systems are enabling companies to increase the capabilities of connected cars and trucks and approach autonomy.**

    - Edge computing solutions can allow vehicle operators and fleet managers to increase control over how and when cars and trucks connect to the cloud. Relying on an edge system adds a buffer between the car's core systems and the cloud, resulting in another layer where security measures can be incorporated to make penetrating a vehicle's defenses more difficult.

    - Automakers plan to equip their vehicles with Level 5 autonomous capabilities, meaning the cars will be able to drive themselves in all environments without human intervention. In a cloud model, that would require near-constant connectivity. As a result, automakers and suppliers are collaborating to develop more powerful edge computing hardware to serve as the brains of an autonomous vehicle.

    - The plethora of sensors that enable cars and trucks to take on more of the driving burden will also generate massive amounts of data — up to 4,000 GB per day. Edge computing systems can pre-process much of this data and reduce the amount that needs to be sent to the cloud.

- **The central vendors in the edge computing market will primarily be companies that are already active in the IoT space and are expanding their offerings.** Companies like Dell, HPE, Intel, Amazon, Microsoft, and GE will provide edge computing hardware and software to enable users to adopt the technology, while startups will enter the space and provide more tailored solutions.

- **Edge computing systems will allow companies across industries to reduce their dependence on cloud computing.** This will offer key savings in cloud contracts as well as network utilization expenses, but edge solutions will be best employed in concert with cloud solutions, rather than as a tool to replace them altogether.

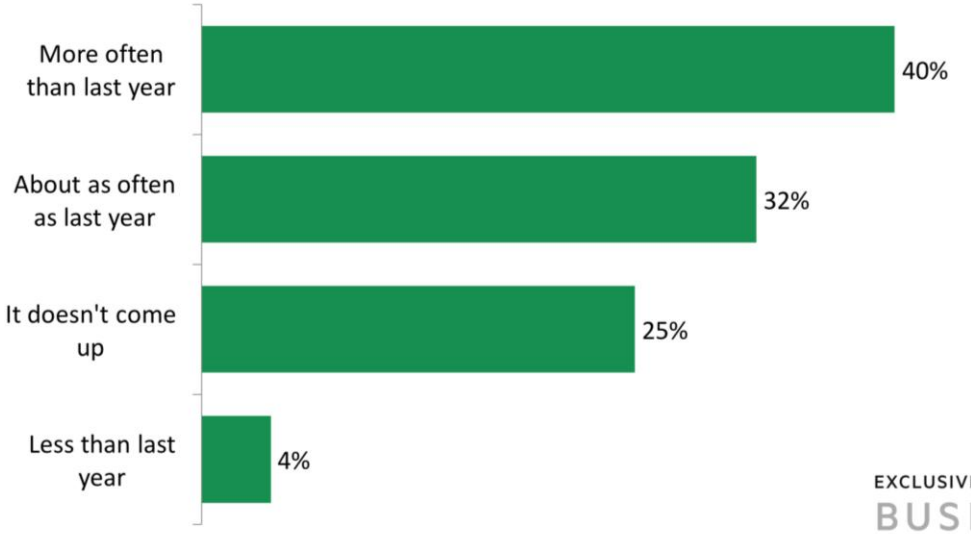
Download the charts and associated data in Excel »

INTRODUCTION

Edge computing — also known as fog computing — is a data processing model that uses sensors and connected devices to transmit data to a nearby computing device for processing, instead of sending it back to the cloud or a remote data center. This model can offer users an alternative to cloud-based IoT data management, but it can also work in tandem with such systems, allowing users to reduce data transmission and cloud storage costs. And it's becoming a more sought-after part of the wider IoT ecosystem — 40% of companies that provide IoT solutions reported that edge computing came up more in discussion with customers in 2017 than it did the year before, according to Business Insider Intelligence's 2017 Global IoT Executive Survey.

Edge Computing Becoming A More Sought-After Part Of IoT Solutions

Q: Does edge computing — processing data from devices where it's created rather than in the cloud — come up more with your customers than it did last year?



Source: Business Insider Global IoT Executive Survey, n=85 IoT providers, 2017

EXCLUSIVE DATA FROM BUSINESS INSIDER INTELLIGENCE

In particular, edge computing solutions can help companies across industries mitigate a few common problems that stem from reliance on the cloud:

- **Security issues.** Connecting IoT devices and other computing systems to the cloud opens them up to potential security vulnerabilities. Edge computing solutions reduce the number of data streams going to and from the site of connected devices. This can limit the exposure of critical data by minimizing how often it's transmitted. Further, since edge devices can pre-process data, less is sent to the cloud — and almost nothing comes back — so there's less data to secure overall.

- **Access issues.** Relying on the cloud to store data, process it, and send back insights means that an IoT solution can't offer any real-time benefits to a company without connectivity. Edge computing systems provide these live insights regardless of whether there's a network connection available, greatly expanding where companies and organizations can use connected devices and the data they generate.

- **Transmission efficiency.** The volumes of data that connected devices generate are only going to rise as companies use more devices and video, and feed information into data-hungry AI and machine learning systems. Edge computing can lower cloud storage requirements and reduce transmission costs for all of this data, since processing occurs where it's created and less needs to be sent to the cloud.

In this report, Business Insider Intelligence examines how edge computing is reducing companies' reliance on cloud computing in three industries by mitigating issues each faces. First, we focus on the healthcare industry, where providers are turning to edge computing solutions to secure and more efficiently process the growing troves of data they generate. Next, we delve into the seemingly paradoxical interest that telecommunications companies have in edge computing solutions and the steps they're taking to bolster offerings. And finally, we focus on the role of edge computing solutions in vehicles, and how these systems will be crucial in reducing logistics costs and enabling autonomous cars.

HEALTHCARE IS FINALLY GOING DIGITAL, AND DATA VOLUMES ARE SKYROCKETING

After a slow start, healthcare providers are finally exploring ways to update their practices for the digital age. But the implementation of these new solutions is creating problems, namely with security, communication, and speed, that are arising from the massive amounts of data they generate. There are two areas that Business Insider Intelligence is tracking in its Digital Health coverage that are leading to huge increases in data that needs to be secured and processed: telemedicine and remote patient monitoring (RPM).

- **Telemedicine, or using mobile technology to deliver services like remote doctor consultations and monitoring, allows providers and payers to expand their healthcare delivery options.** Examples of telemedicine solutions include self-service kiosks and app-based consultations.

- **RPM refers to using devices to track people's health data in real time.** This allows healthcare providers to identify problems as they occur and log longitudinal data to make more accurate assessments.

While these practices offer providers and payers the opportunity to lower costs and increase access, they also raise new problems, thanks to reliance on the standard cloud computing model. Here's a look at how the three problems we defined above are manifesting in healthcare:

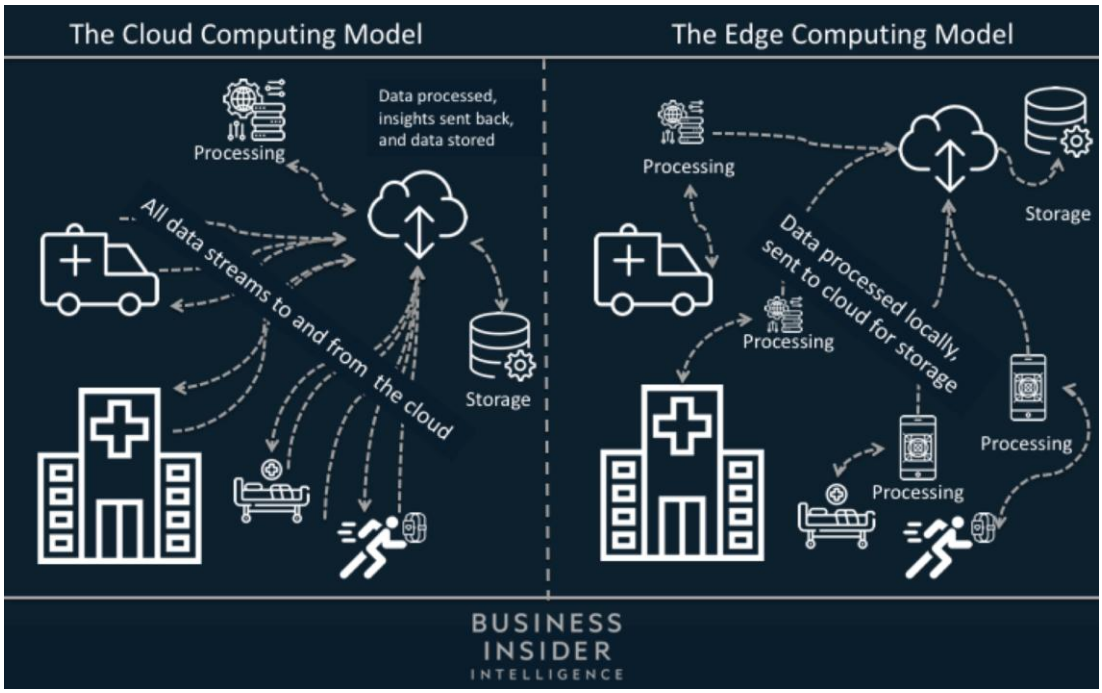
- **Security issues.** Health data is more strictly governed than most data, with laws like HIPAA providing guidelines for what information must be secured and how. This is a huge feat that will only be amplified as the number of sources of medical data grows — now, companies and organizations will have to secure data procured at telemedicine terminals and from RPM devices, rather than just at a clinic. These terminals and remote devices currently transmit data to cloud servers — for AI and machine learning technologies to analyze — which adds yet another location where the data needs to be secured.

- **Access issues.** RPM devices often use cellular connections — either built into the device or linked to a patient's smartphone — to transmit data to the cloud and aren't able to provide useful information otherwise. Those cellular connections, while widespread, aren't ubiquitous and can drop out or become unreliable, making the devices that use them only suitable for noncritical monitoring applications.

- **Transmission efficiency.** Many RPM and remote therapy devices provide immediate feedback to users — for instance, a Fitbit can provide real-time data on the number of steps a person takes, while more sophisticated devices perform processes like ECG monitoring or speech analysis for Parkinson's patients. Instant feedback can assist with decision-making or provide alerts, but the latency of cellular networks often proves a major hurdle. Additionally, the amounts of data the more intensive RPM devices create can be unsustainably expensive to transmit to the cloud over mobile connections.

Why Edge Computing Can Help

Edge computing promises to mollify the issues telehealth and RPM raise by changing the way data is handled, transmitted, and analyzed. Below we examine how this model can mitigate difficulties in each of the three problem areas: security, access, and transmission efficiency.



Security

Edge computing systems are able to store data securely and make it quickly accessible by moving the site of processing to where the data is created. One way that healthcare organizations can accomplish this is by setting up edge databases that collect and analyze data from sensors and other devices around a hospital.

Business Insider Intelligence spoke with FairCom about its cTreeEDGE IoT database technology that's aimed at critical applications where latency is paramount. A hospital using FairCom's edge database can use beacons and other devices spread throughout the building and linked to patient-monitoring systems to gather data. Those feeds are stored in a centralized edge database within the hospital, and whenever a beacon is triggered — like when a smart hospital bed enters an elevator to transfer from the ED to surgery — information is displayed on the patient's arrival or automatically relayed to personnel, informing them of allergies or showing recent treatments, for example. An edge computing solution with a local database allows these companies to house their own data and bypass the minimum of four to six seconds it can take for data to be sent to the cloud, processed, and returned to a device, according to FairCom COO Alysha Brown.

By maintaining an edge database to house the primary data, a hospital or other healthcare organization can keep the data within its confines and under control, making it simpler to ensure that data is kept securely and comply with privacy regulations. Data from these devices is also transferred (and exposed to potential hackers) less often, with smaller volumes of data being transmitted more infrequently, according to FairCom's business development coordinator, Evaldo Oliveira. Companies like FairCom, with experience designing secure databases, can help provide systems that these risk-averse organizations can trust.

Access

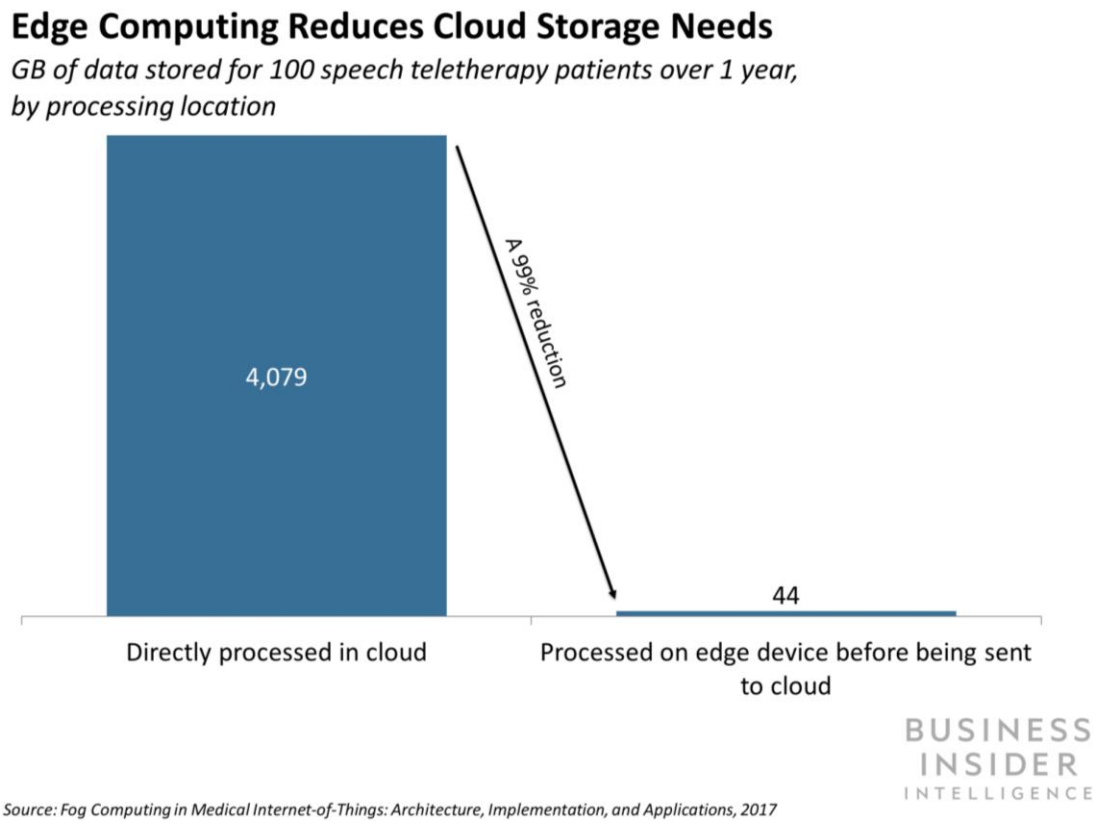
Healthcare providers want to be able to deliver care as quickly as possible, but first responders like emergency response services are often limited in their ability to communicate the information necessary to transition a patient from a mobile treatment venue to a hospital. That's because an ambulance can't rely on an internet connection to relay information to providers at a hospital because cellular coverage will inevitably leave gaps. By utilizing an edge computing system to record, process, analyze, and store data from sensors and tools within an ambulance, it can be used as a far more capable first site of care. Powerful edge hardware can even support local AI solutions to interpret data and flag serious warning signs.

Edge computing can also eliminate many problems associated with cellular-based RPM devices, which can't be relied on for critical monitoring. A cardiac patient, for instance, can't rely on a system that needs constant connectivity because they may enter places where that connectivity could drop — like a subway or rural area. Shifting the processing of the data an RPM device creates to the device directly, while transmitting data to the cloud for storage when connectivity is available, allows companies to get around this problem and offer critical condition monitoring through remote devices.

Transmission Efficiency

Using edge solutions can give patients and providers actionable insights faster. If a patient is wearing a traditional portable ECG, for example, the monitor will typically record data that's analyzed later after it's turned in to a clinic. However, some solutions transmit this data — using Bluetooth, like Qardio's device, for instance — to a smartphone, where it's analyzed before being sent to a healthcare provider. And other devices on the market already, like AliveCor's KardiaBand for the Apple Watch, analyze and display readings on the device itself.

Additionally, edge computing can reduce data storage needs by analyzing locally, finding key points, and discarding what's no longer needed. A paper on fog computing applications in medicine from researchers at the University of Rhode Island looked at exactly how much organizations might expect in savings from using edge systems.



It found that edge processing could reduce the amount of cloud storage that an organization needs by up to 99%. The study looked at home-based speech teletherapy for 100 patients with Parkinson's disease and found that a local system was able to analyze the data about as well as a cloud platform could over the course of a year. It also reduced cloud storage costs from $94, based on AWS S3 pricing, to just $1.

And that doesn't factor in savings in networking costs from reduced use, which will only grow as teletherapy deployments and similar remote medicine projects move beyond 100 patients — though cloud pricing also gets incrementally cheaper as companies store more data. The paper's findings suggest that healthcare organizations can utilize edge computing solutions to communicate critical information faster, while spending less to store and safeguard it.

TELECOMS ARE MAKING A PLAY FOR THE IoT – BUT HURDLES REMAIN

As the smartphone market approaches saturation, competition among telecoms is growing incredibly fierce. Essentially all consumers are now existing subscribers somewhere, which means these companies' only hope to win more users is to get them to switch carriers.

One way they're competing with each other — especially in the US market — is by offering unlimited data plans to consumers at lower costs. They're also including perks like zero-rating specific video streaming services through partnerships that don't count against a user's monthly data allowance. As a result, consumers are using more data than in prior years, and that's making telecoms desperate to reduce data loads on their networks and avoid congestion issues like AT&T encountered with the release of the iPhone.

However, they're also searching for new revenue streams, and for this, many telecoms have turned to the IoT. Verizon, for example, has spent billions of dollars acquiring companies in the vehicle fleet management and drone markets to expand its footprint and establish relationships with companies utilizing those services. Others, like Vodafone, are offering enterprise and consumer IoT services, on their own as well as through partnerships. These services offer additional revenue, but they also add to network congestion.

As telecoms wade further into the IoT to provide services and platforms, they are being forced to figure out how to manage all of the data these devices collect. Today, these needs are met by transmitting data to the cloud where it's processed, analyzed, and stored, and insights are sent back to the site of the IoT solution. Below we look at how the key problems with the cloud model are impacting telecoms:

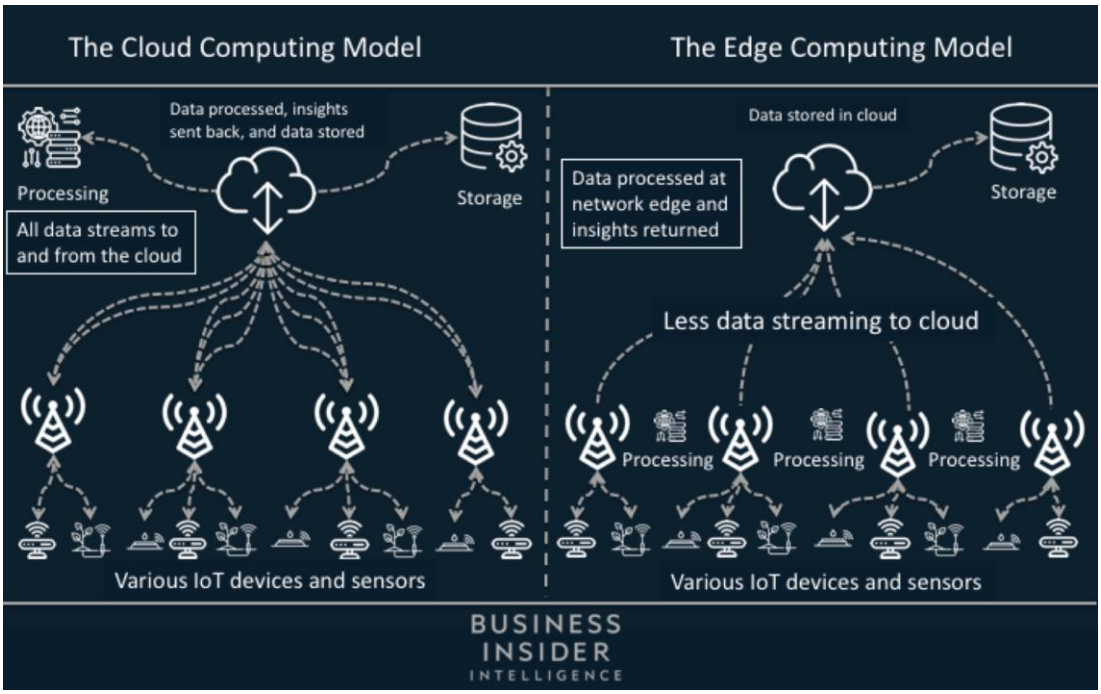
- **Security issues.** As telecoms attempt to cater to companies leveraging IoT devices, many are starting to offer managed IoT services through a central platform that can house data and perform analysis. One of the most important things a telecom needs to do to get customers onto such a platform is ensure that they offer a secure experience. However, every time data is transmitted to the cloud, it is temporarily vulnerable to interception, making it difficult to provide this assurance.

- **Access issues.** Companies don't always set up IoT projects in areas where there's reliable cellular service — oil and gas extraction is a prime example. This means that, while a company can work with an IoT partner to gather data from devices and have it sent to the cloud for analysis, there is no way to get real-time insights or automate procedures based on that data, since it has to travel to the cloud and back. A telecom that's looking to provide an IoT platform doesn't want to be locked out of such projects and needs solutions that let it compete for IoT business in those types of segments.

- **Transmission efficiency.** IoT devices create massive volumes of data, but not all of that data is useful. With rising video data volumes, in particular, enterprise IoT customers are being forced to send more data to the cloud than is actually necessary to derive actionable insights. For telecoms, this means they're sending data over their networks that is discarded almost immediately after cursory analysis.

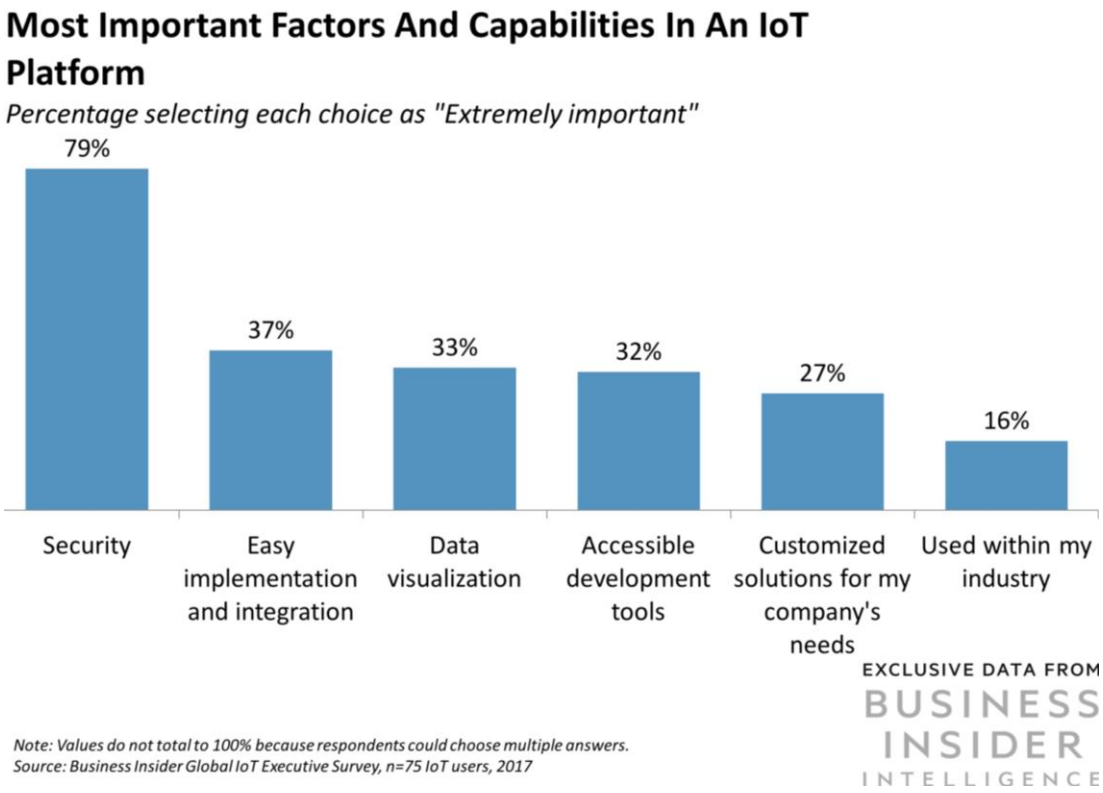
Why Edge Computing Can Help

Telecoms are among the most prominent proponents of edge computing, paradoxically, as they provide the networks that transmit data from IoT devices to cloud platforms. That's because they need to offer this option to customers in order to remain attractive providers and mollify concerns about potential issues with the cloud.



Security

A secure experience is paramount for any company choosing an IoT platform provider. In our 2017 Global IoT Executive Survey, 79% of companies using IoT solutions called security an “extremely important” factor in an IoT platform.



An edge solution reduces the amount of data sent to the cloud, thus limiting exposure. Consider a supply chain solution that's used to track the location and movement of goods within a warehouse — if a traditional model is employed, all of that data is put at risk of interception during transmission to the cloud and back again. With an edge-based platform, an on-site system gathers this data and analyzes it, offering workers and management key insights in real time, without creating those points of vulnerability.

In an edge model, data may be transmitted to the cloud for storage, but in smaller amounts and with less detail. That means that if a hacker were to breach the system, they wouldn't get access to particularly sensitive information. Edge computing solutions allow for a multilayered security approach that combines hardware, network, and cloud security measures, according to AT&T VP of Intelligent Edge Josh Goodell. Because of this ability to increase security, edge solutions are likely to be very attractive to potential customers, and therefore make sense as an offering for telecoms looking to carve out a piece of the IoT platform market.

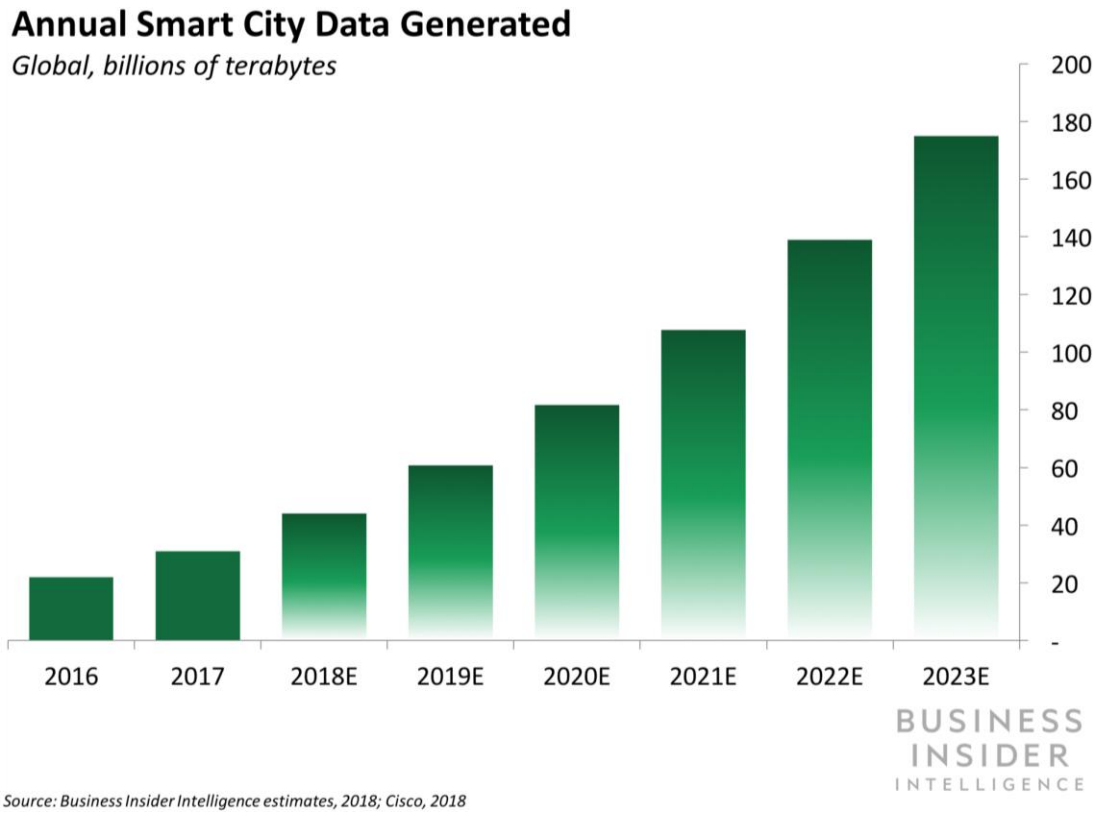
Access

While telecoms generally offer broad network coverage, there are still areas where they're unable to broadcast a signal for clients. That's particularly true in industries like offshore oil and gas extraction and mining, where worksites are typically remote. Telecoms have struggled to provide consistent IoT services to companies in these sectors, due to a lack of internet connectivity to leverage on the ground. By offering an edge computing solution that doesn't rely on external connectivity, telecoms like Orange or Vodafone can offer real-time insights to customers operating in hard-to-cover areas.

An edge platform would enable an oil company to link multiple systems to a gateway that combines factors like temperature data, pressure readings, and other indicators to predict malfunctions or determine when to try a different drilling approach. That gateway could take the results and, using local AI and machine learning capabilities, provide intelligent automation based on real-time inputs. This kind of setup is only possible via an edge model, meaning that telecoms will need to offer such platforms to effectively serve companies in oil and gas or similar industries. Otherwise, these sectors will remain out of reach.

Transmission Efficiency

Because edge computing solutions process data locally, companies can choose to send only meaningful insights to the cloud, thereby reducing data loads on telecom networks. In the current cloud model, enterprises are effectively paying telecoms to clog up wireless networks and transmit data for analysis that doesn't need to be retained. Using an edge solution, on the other hand, limits the likelihood that data transmitted to the cloud will eventually be rendered obsolete and deleted. In particular, edge computing could greatly improve efficiency when processing the growing volumes of data-rich video from security cameras and other camera-based monitoring solutions — Business Insider Intelligence forecasts that smart city systems, which include connected cameras, will generate nearly 180 billion terabytes of data a year by 2023.



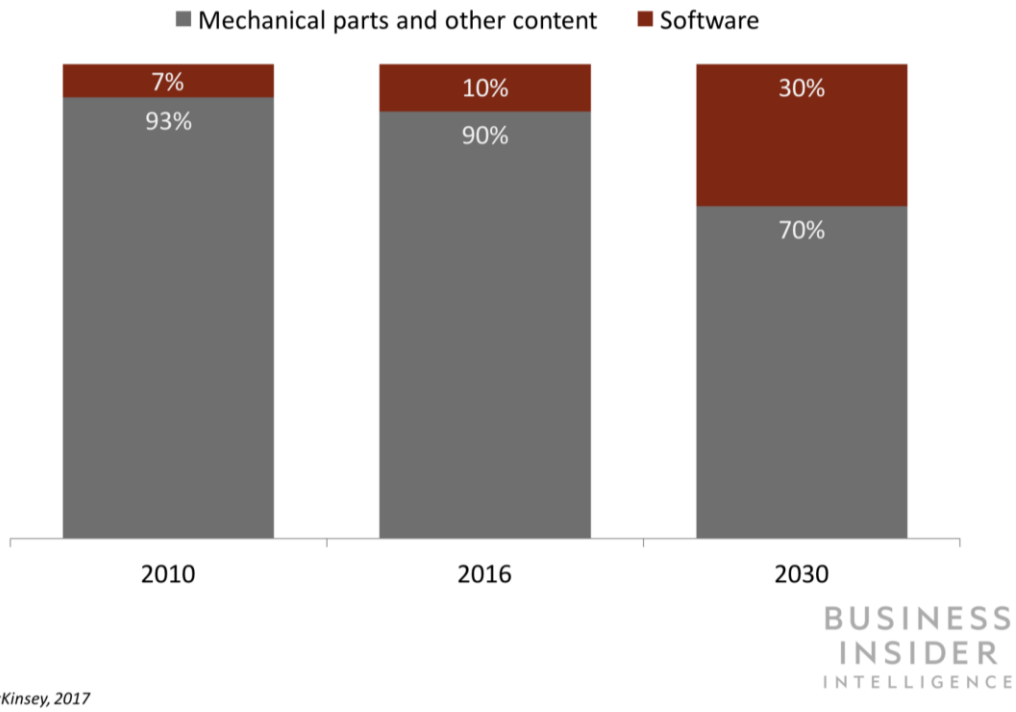
AT&T Labs, for example, is working with hardware partners to develop computing systems that can be deployed at the edge of a cellular network, where it could then perform analysis for enterprise and municipal clients. The telecom could intercept and process video data from connected cameras locally at the cellular tower site, instead of transmitting large data files to the cloud. Verizon is also testing a service for smart cities that uses connected cameras with built-in deep learning to analyze video footage as it's recorded.

Edge computing solutions will process about half of all enterprise-generated data by 2022, up from just 10% today, according to Gartner. This represents an enormous opportunity for telecoms, as building and promoting such solutions will enable these companies to better compete in the IoT platform market, while reducing the strain on their own networks.

VEHICLES ARE MORPHING INTO LARGE-SCALE COMPUTING PLATFORMS

Vehicles are growing more complex with each new model and turning into full-scale computing platforms. A typical high-end passenger vehicle could feature $6,000 of computing equipment by 2022, according to IHS Markit. By 2021, semiconductors for the automotive sector alone will make up almost 10% of global fabrication, per IC Insights estimates. And software will be nearly a third of the overall content in a vehicle by 2030, according to McKinsey.

Software As A Percentage Of The Total Content Of An Average Vehicle



Source: McKinsey, 2017

Vehicles are using this hardware and software to create huge amounts of data for drivers, fleet operators, and manufacturers to use to make their cars and trucks more efficient. Line-haul trucks record operational data, for example, for regulatory purposes and to help fleet managers improve efficiency. More automakers are also building monitoring systems into consumer vehicles that provide feedback on operation to the owner and record data to send back to the manufacturer. Beyond gathering data, vehicles are adding advanced driver assist systems (ADAS) and autonomous driving capabilities. These systems shift part of the driving to the vehicle itself, but they rely on powerful computing systems and AI to accomplish it. Business Insider Intelligence estimates that there will be more than 2.5 million semi- and fully autonomous vehicles on US roads by 2023.

As vehicles come to rely on connectivity, many manufacturers are using cloud systems to relieve the rising computing burden that's falling on their cars and trucks. But performing data processing and analysis in the cloud won't be sufficient to meet emerging needs in the automotive space, especially as autonomous cars take to the roads. Here's how the three common issues with cloud reliance could impact automakers:

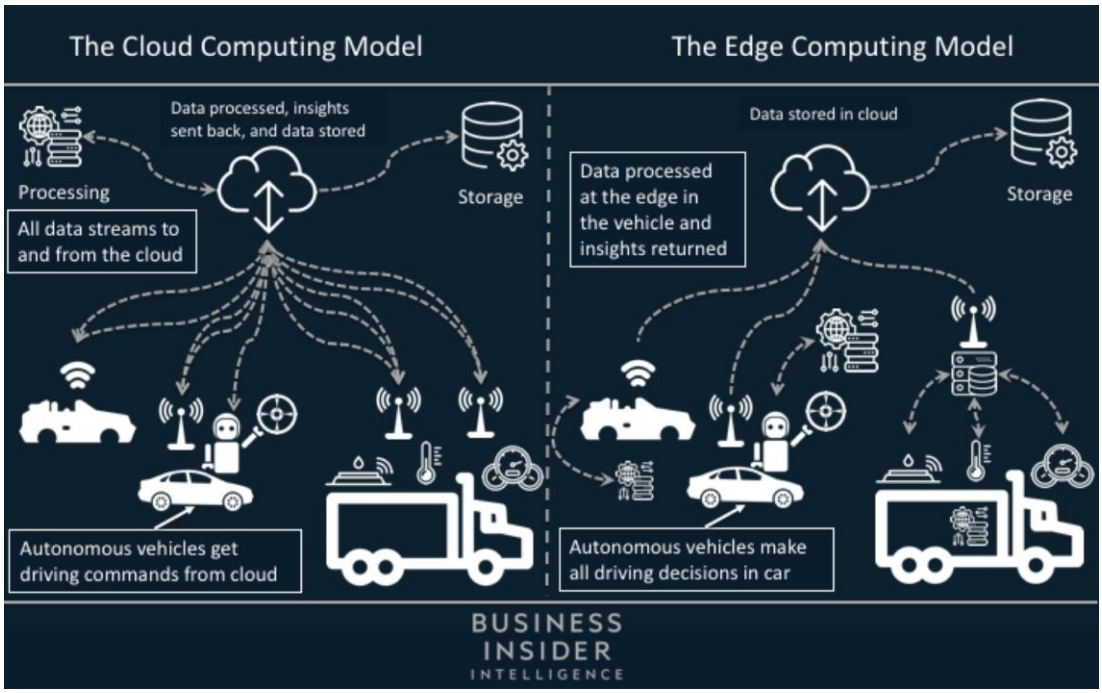
- **Security issues**. Adding connectivity and utilizing cloud computing systems in vehicles creates access points for potential hackers to bypass security remotely. From there, they can access data or even take control of a vehicle. This threat has led to criticism of automotive cybersecurity practices. And, as vehicles get more self-driving capabilities, the potential for hijacking will become an even bigger concern for automakers to reckon with. As a result, vehicles won't be able to securely rely on external sources for critical data and systems.

- **Access issues.** Automakers and fleet operators are leveraging cloud resources to store and analyze data from their vehicles, primarily using cellular connectivity. And some executives have discussed using cloud computing for autonomous vehicle guidance and data processing once faster 5G networks are widely deployed. However, that would likely limit where autonomous driving systems could be used, especially given some of the limitations of 5G technology, which won't work as well without direct lines of sight and could be impacted by inclement weather.

- **Transmission efficiency.** The introduction of myriad sensors to vehicles is generating massive quantities of data — one autonomous vehicle could generate 4,000 GB of data every day, according to Intel's estimates. Moreover, total data exchanged between vehicles and the cloud could reach 10 billion GB per month, based on Toyota's forecasts. This raw data streaming to the cloud can be critical for improving autonomous driving capabilities, but the volume is staggering and could overwhelm both cloud systems and cellular networks.

Why Edge Computing Can Help

Using edge computing to shift data processing and analysis to the vehicle and away from the cloud can help automakers, autonomous vehicle developers, and fleet operators create powerful systems capable of operating securely and without a network connection.

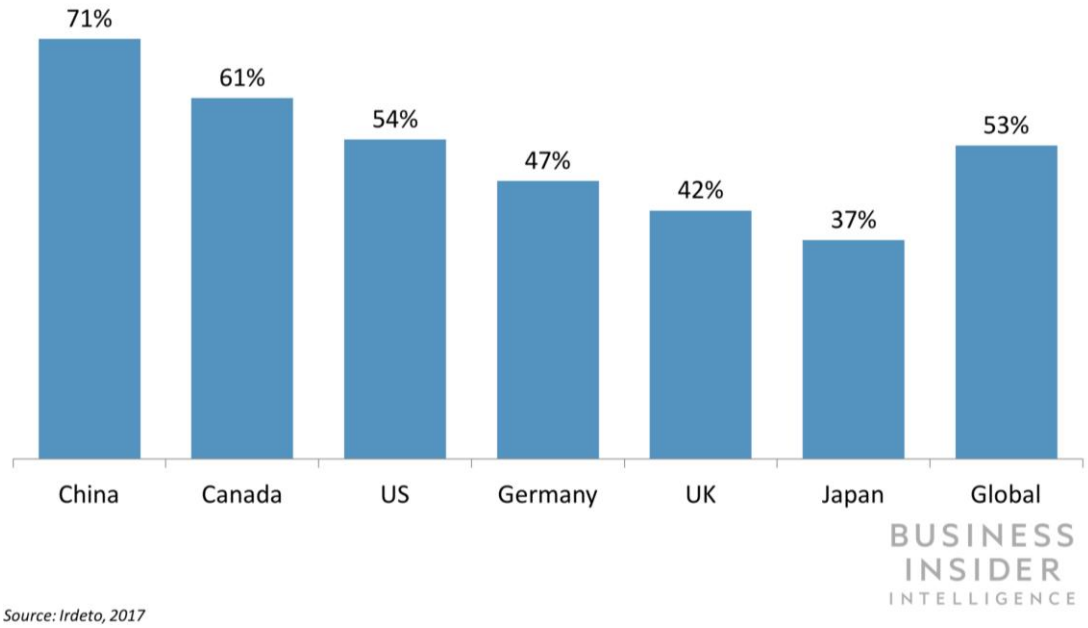


Security

Vehicles traditionally only needed a good lock to remain secure. But now they generate massive amounts of personal and private data about users and the vehicles themselves. Moreover, automakers, along with their tech partners, are trying to turn the car into a digital platform where passengers consume media, communicate, and work, meaning they're logged into services that transfer even more data to the vehicle's computer.

Consumers Are Concerned About Connected Car Security

Q: Are you likely to research your car's ability to protect itself from a cyberattack?



Source: Irdeto, 2017

Edge computing solutions can allow vehicle operators and fleet managers to increase control over how and when cars and trucks connect to the cloud. Relying on an edge system adds a buffer between the car's core systems and the cloud, resulting in another layer where security measures can be incorporated to make penetrating a vehicle's defenses more difficult.

Additionally, storing data locally for critical functions like maps helps to improve security by ensuring that no third parties can spoof a signal, impersonate a trusted source, and provide inaccurate information to the vehicle. While this would be a nuisance for a driver trying to get turn-by-turn navigation, it would be a far greater issue for a delivery driver being sent to the wrong address or made unable to locate a depot, and it would be a critical danger for an autonomous vehicle that is supposed to make its way to a certain set of coordinates.

Some manufacturers are already taking steps toward the edge. Cadillac has mapped out more than 130,000 miles of US highways for its Super Cruise system — the only places where its semi-autonomous system can operate. The data is stored in the vehicle's trunk and the onboard computer systems combine the stored data with the vehicle's sensors to control the car — under driver supervision — on those stretches of highway. This task would be much harder and less secure if Cadillac tried to rely on cloud systems to supply this data.

Access

Automakers plan to equip their vehicles with Level 5 autonomous capabilities, meaning the cars will be able to drive themselves in all environments without human intervention. In a cloud model, that would require near-constant connectivity, but roads can often go through areas where signals will drop out, whether that's underground or in rural areas. And, even with the growth of high-speed, low-latency 5G networks, many vehicles will spend significant amounts of time beyond the reach of these networks. That can be due traveling through urban areas where signal quality could drop between skyscrapers, driving through rural locations where towers are spaced far apart, or entering areas where telecoms haven't deployed 5G yet.

Automakers and suppliers are collaborating to develop more powerful edge computing hardware to serve as the brains of an autonomous vehicle. Companies from the computing market like Intel and Nvidia are fast becoming key partners in the automotive space.

- Intel developed the EyeQ5 deep learning platform to allow autonomous vehicles to process data created by sensors observing road conditions. The chipset allows vehicle-routing AI to continuously improve by using this data to virtually review decisions.

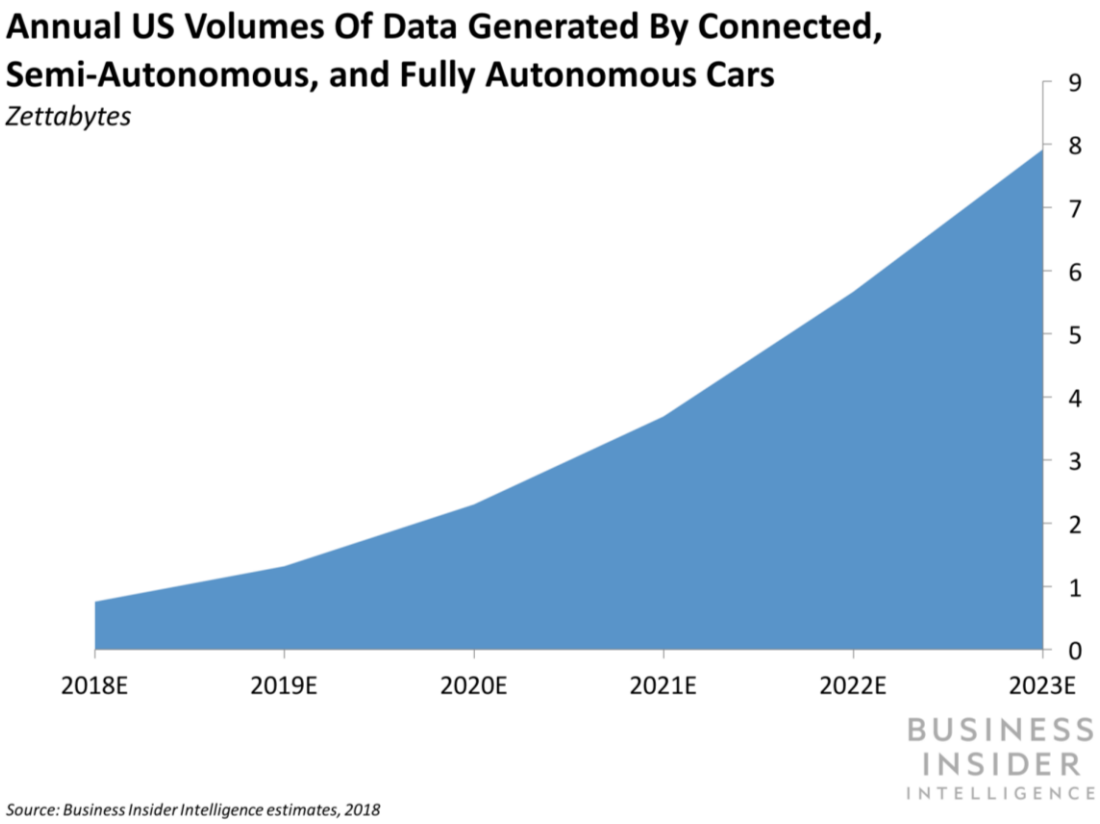
- Nvidia continues to iterate on its Drive vehicle platform by offering a range of autonomous driving options led by the Pegasus computing system. These leverage Nvidia's graphics processing origins to interpret the sensor data the car uses.

- AMD is using its graphics processing experience to work with Tesla on specialized processors based on its Ryzen chip design to allow the automaker to incorporate autonomous technologies into its vehicles.

These companies' systems provide vehicles with extensive local computing and edge processing capabilities, so they can operate independently of network connectivity.

Transmission Efficiency

The increasing complexity of vehicles and the amount of data they record pose a problem for automakers and operators looking to process that data. Trying to use all of that data by sending it to the cloud will overwhelm both mobile networks and cloud systems; a single car generates thousands of GB of data every day, and that's before the addition of autonomous features. By 2023, vehicles in the US will generate 8 zettabytes (ZB) annually, up from 0.72 ZB in 2018, according to Business Insider Intelligence estimates.



Source: Business Insider Intelligence estimates, 2018

Technology partners have edge computing solutions that can reduce the amount of data moving back and forth to cloud storage for both logistics fleet managers and companies developing autonomous vehicles. For line-haul trucks, operators or manufacturers can include edge gateways that can monitor various systems, coordinate communication, ensure regulatory compliance, and perform advanced data analytics, all from within the truck. One leading vendor of this type of system is Dell, which offers advanced gateways with native analytics capabilities, ELD compliance tools, a range of connectivity options, and numerous sensors — this is all a part of Dell's $1 billion push into edge computing. These systems provide drivers with real-time information on performance while reducing the data that needs to be relayed to fleet managers through pre-processing on the edge system.

Vehicles with ADAS or autonomous capabilities need to incorporate powerful computing systems like those described above to perform numerous tasks, such as routing and object recognition, without a constant connection to the cloud. These systems are able to perform tasks like machine learning and AI training and development within the vehicle. They're able to distill the multitude of data to behaviors for the AI to consider and engage in based upon observed circumstances, rather than storing massive quantities of data from sensors and monitors in the vehicle. These findings will generally be communicated to the cloud over 5G networks, so that the autonomous driving systems can continue to improve across the board, but the amount of data being sent will be cut down drastically, saving the developers in network transmission costs.

THE FUTURE OF EDGE COMPUTING

For companies looking to employ edge computing systems and solutions, there will be a broad selection of vendors offering both hardware as well as managed edge services.

- **On the hardware side, traditional enterprise technology suppliers are trying to take advantage of the growth of edge computing.** Dell's planned $1 billion investment into edge computing products will allow it to bring that hardware to market. Similarly, HP Enterprise is looking to develop systems and products to enable edge computing, and plans to spend $4 billion over the next four years in this effort. And as discussed above, chipmakers like Nvidia, Intel, and others are developing hardware to enable edge computing systems.

- **Companies that provide and maintain IoT platforms are also taking steps to add edge computing options to their services.** Amazon's AWS, for instance, has built numerous edge computing capabilities into its IoT platform, most recently adding the full capabilities of its primary cloud computing system to an edge device. Other major IoT platform vendors including Microsoft, GE, and Hitachi have also introduced support for edge computing.

- **Additionally, there's room for startups in the edge computing market.** Business Insider Intelligence spoke with one such company, Litmus Automation, an IoT platform startup that specializes in edge computing solutions, earlier this year. While these startups don't have the resources of companies like Amazon or Microsoft, they're able to offer specifically tailored solutions for the issues that some companies face.

In most cases, these edge systems are meant to exist in tandem with cloud computing, rather than replace the cloud altogether. Cloud systems are better suited for long-term storage, for instance, and there are some highly complex AI and machine learning tasks that aren't necessarily practical or cost-efficient with an edge device. Edge computing is best thought of as a tool within a company's wider arsenal of digital transformation options that can be used to reduce costs and transform operations by obtaining real-time insights.

THE BOTTOM LINE

- Edge computing is a data processing model that offers users an alternative to cloud-based IoT data analysis and management.
- This model can help companies in a number of industries address specific problems with cloud reliance, namely security issues, access issues, and transmission efficiency concerns.
- In healthcare, companies and organizations are using edge computing to improve telemedicine and remote monitoring capabilities.
- For telecoms, edge computing is helping to reduce network congestion and enabling a shift toward the IoT platform market.
- In the automotive space, edge computing systems are enabling companies to increase the capabilities of connected cars and trucks and approach autonomy.
- The central vendors in the edge computing market will primarily be companies that are already active in the IoT space and are expanding their offerings. These include Dell, HPE, Intel, Amazon, Microsoft, and GE.
- Edge computing systems will allow companies across industries to reduce their dependence on cloud computing. But edge solutions will best be employed in concert with cloud solutions, rather than as a tool to replace them altogether.

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