eBook

40 Edge Use Cases That Will Shape the World

Edge Computing: The Next Major Computing Shift

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For many of us, it often feels like technology changes faster than we can keep up. That smartphone you bought last year may already feel slow or is missing that new feature. Your 4k TV may look underwhelming beside an incredibly sharp 8k model. While undoubtedly impressive, these technology changes are incremental: small steps along a linear path. Once every decade or so, a fundamental shift in technology occurs. We saw it with the leap from mainframes to personal computers, the introduction of the internet, mobile phones, social networking, and cloud computing. Now, this shift is occurring again with Edge computing & 5G.

Mainframes   Client Server   Internet   Cloud   Mobile   Edge

Edge computing leverages the benefits of the Cloud with its massive scale but delivers compute and process capabilities much closer to the end device, rather than from a central location. Edge computing distributes workloads to local network locations around the world. The result is significantly lower latency and more intelligent network slicing and bandwidth utilization. Sounds all very technical, doesn't it? To put it simply, Edge computing and the ability to process data closer unleashes the potential of a myriad of new applications spanning transportation and logistics, smart cities, rural and emerging nation connectivity, and much, much more.

SMS	Internet	Mobile Video
0.1 MB/Second	0.1-.5 MB/Second	0.1-1k MB/Second
2G 1991	3G 1998	4G 2008
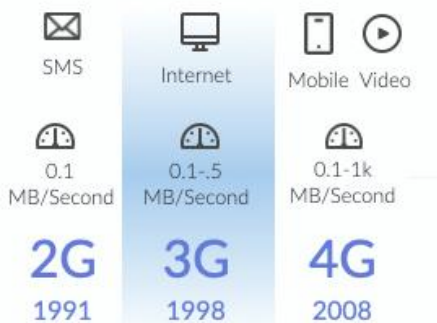
Like many of the fundamental technology shifts of the past, a confluence of factors is needed to go from incremental improvements to disruptor. For the Edge, this is 5G. In the early 1990's to early 2000's telecommunications networks rolled out capabilities to support simple messaging, limited roaming services, and early support for data and mobile internet (2G,3G). In the mid-2000s, 3.5G, and later 4G, improved IP services for voice and data enabling a richer internet experience from mobile devices, and along with the iPhone launched the app ecosystem we know today. Until now, telecommunications networks were not designed to deliver on the Edge's promise of high bandwidth and low latency. 5G promises a 10x boost in download speeds in comparison to 4G LTE.

The Edge & 5G Will Power the Future of Apps

At the same time as Edge and 5G are making it possible to reimagine entire industries, consumer and business trends are influencing what this future may look like. Mobile is now the norm with mobile time online almost 4x that of desktops, and in this year, we are expected to watch an average of 100 minutes a day watching videos, up 19% from 2019. And businesses know this. They are expecting to increase video marketing spend by $16b to over $60b in 2021. All of this is leading to a massive data increase over the next few years, with American's generating 3.14gb of internet traffic every minute! At the same time, often accelerated due to the pandemic and social distancing, organizations are supporting employee-generated video shared internally in an effort to stay connected.

So, what will this new world look like? Video is only the beginning. This eBook describes 40 use cases where Edge & 5G will reshape our lives.

Edge Use Cases

Transportation & Logistics

Autonomous Vehicles

Autonomous vehicles rely on millions of inputs every second to adjust speed and direction. Much of this processing can be achieved with onboard computers. Edge-enabled vehicles will be able to communicate with nearby cars and local data points for additional information pertaining to traffic flow, weather, and more.

Freight Tracking & Routing

Trains and trucks can utilize Edge locations even in low-coverage areas to constantly update freight locations, monitor temperature or hazmat regulations, and when partnered with autonomous vehicles and robotics for loading/unloading, automatically reroute based on inclement weather.

Connected car

Connected cars shall constantly monitor engine, fluids, tires, and electricals relaying information to Edge locations for software updates, maintenance schedules, recalls, and proactively identify issues based on thousands of other vehicles with similar mileage, components, or geographic locations.

Ports & Docking

Safely docking massive ships loaded with millions of tons of freight into crowded ports and harbors can be greatly improved by utilizing ship-based Edge locations that constantly measure distances, waves, current, and nearby vessels to dramatically reduce risk. In addition, by allowing the Edge and AI, ships can dock closer together, freeing up valuable port space.

Retail & Advertising

AI-targeting

Position cameras in retail or public locations that utilize facial recognition and AI to fetch and stream in real-time advertising onto connected screens targeted to the individual's age, gender, race, and whether they have children, pets, and more, all before they walk past the screen. Capture demographics to determine traffic flow and further time-based optimizations.

HD Videos

Deliver optimized high-quality videos even across low-connectivity areas. Minimize data transfer costs by caching and serving videos from local Edge sites, and with the augmented reality and smart mirrors, allow the customer to see garments in real-time.

Personal Stylist

Smart mirrors that allow a customer to get personal style guides based on build, skin tone, hairstyle, facial shape, size, and available sales and inventory to augment clothing choices. Eliminate potential wear and reduction of transmissible diseases from multiple shoppers trying on garments. Generate a personal style guide for consumers to build brand affinity and cross-sell opportunities.

Point of Sale

Connect registers to the Edge to provide immediate and secure credit card validation, frequent shopper rewards, and calculate taxes and/or currency exchanges.

Intelligent Garments

Items of clothing with be embedded with tiny chips that, through communication with smart devices such as a connected washing machines, can monitor wear and fabric condition, constantly updating data via local Edge locations to optimize amount of fabric softener, washing machine spin rate, and water temperature to extend the life of garments, not only providing a higher return for the consumer, but dramatically reducing environmental impact of the textile industry.

Holographics

Holographic advertising which can project products and people in 3D space will transform what was previously restricted to 2-dimensional 3D space. With the high bandwidth made possible through the edge and localized processing, realistic projections could transform such iconic places as Times Square in the years to come. As holographics grows in popularity, it is entirely conceivable that this technology will make its way into the workplace too with virtual meetings.

Travel & Immigration

Digital Passport / Connected Traveler

Utilize a digital passport on the traveler's phone to automatically process thousands of visas at ports of entry through Edge-based apps that combine facial recognition and immigration systems to check and update travel authorizations. Such as a system, with its ability to work in low coverage areas and location specific processing which can work even if the internet fails can be deployed in every border port of entry, including rural or unmanned regions.

Image recognition

Image recognition allows the identification of valid travelers and also restricted travelers or devices. Utilizing Edge technology pushes computational logic to edge locations based in or near airports or sensitive sites thereby greatly reducing the

possibility of bad actors interrupting data feeds and increasing processing time to allow security agents to react to threats in real-time.

Real-time translation

Current internet or app-based translation services typically rely on good cell or WIFI signals. Whilst this is acceptable for many situations such as airports or cities, these translation services struggle when travelers visit rural locations, or where they have not signed up for roaming data services. In addition, streaming video can be used to provide the viewer with facial expressions and lip movements to assist in correct pronunciation and interpretation.

AR gate directions

Reduce traveler stress and confusion when navigating airports by overlaying an optimized route to a gate or connecting flight by using real-time location data, security cameras, and connecting flight information.

Personalized assistance

Travelers may utilize Edge and streaming video to connect with real-time concierge services from airports, hotels, or cities services. With the Edge, the customer may not need to sign up for roaming data services and still receive high quality video streams.

Smart Cities

Traffic management

Traffic lights and connected cars can communicate via Edge locations to adjust when lights will change, slow or bunch up traffic to optimize traffic flow based on immediate data inputs such as accidents and lane closures.

Public transportation

Similar to traffic management, the Edge can connect trains, buses, and other forms of public transportation for more efficient operations, including the ability to measure number of passengers, embarkment and disembarkment locations, and dynamically adjust the number of services available in order to provide a better experience.

Smart Grids

Smart utility grids can leverage the Edge for providing localized connectivity and low-latency monitoring of services to ensure quality of service, from real-time adjustments of temperature or water pressure, appropriate mix of chemicals for water treatment and more. Infrastructure components such as water piping or roads can be instrumented with microchips to proactively monitor for corrosion and defects before a major fault occurs. In addition, with the ongoing concern faced with supply chain hacking, smart grids can limit exposure via the Edge and minimizing single point of entry with data and logic managed in the cloud.

Asset Management

Organizations can tag assets with RFID chips and utilize the Edge to provide connectivity even in the most remote locations such as offshore oil rigs. The Edge can also be utilized to monitor asset quantity and rely resupply needs back to centralized locations on a determined schedule.

Field Service

Field service agents can utilize the Edge and Augmented Reality headsets to perform hands-free maintenance of assets. With the ultra-low latency benefits of the Edge, agents can operate naturally, and safely without having to wait for instructions, especially when working on sensitive or dangerous repairs.

Manufacturing

Robotics

As manufacturing relies more and more on robotics, Edge locations can be deployed in factories or other locations providing the ability to process data in near real-time. With the additional access to these intelligent processing locations, it is likely that the robots themselves will become cheaper to develop as they can offload complex instructions to the Edge, without sacrificing performance.

Smart Safety devices

Safety equipment can utilize the low-latency and low-bandwidth needs of the Edge to provide connected services to monitor the environment in real-time for potentially hazardous situations not visible to the human eye. For example, miner's safety hats could be equipped with sensors designed to warn the wearer of toxic fumes, or alert of cave-ins reported by other team members.

3D Printing

3D printing is already growing in importance for manufacturing and currently requires large volumes of data to be transmitted in order to get it's print instructions. This can limit where such printers can be deployed. As Edge locations become more prevalent, we will not only see it more common in smaller manufacturing plants, but also in remote areas such as oil rigs, cattle stations, and farms where ordering replacement parts can take weeks.

Remote Work

Video based training

Organizations can take advantage of the Edge and high-definition video stream to create video-based training programs for employees. Videos can be centrally managed and tagged for appropriate audiences, then pushed to the Edge to reduce bandwidth costs, with the confidence that potentially sensitive information can only be

viewed by registered devices. And with the possibility of virtual reality and augmented reality, training may become increasingly immersive.

Daily video digest

With offices closed and employees working remotely, the need to stay connected with company happening requires different approaches to collaboration. One such approach is the creation of a daily video digest which can be streamed to employees, regardless of location. Daily video digests may include video notes from the executive team or summaries of zoom meetings collated into a central location.

Edge security

With the rise of distributed workforces, more corporate data than ever before is being shared across public internets. Although many organizations utilize VPNs and encryption technology, the majority of services they utilize are still located in the cloud. Cloud solutions, by nature, centralize information offering the potential of a single point of penetration for hackers. The Edge and its distributed approach federates ingress and can perform localized progressing of information, thereby limiting the amount of sensitive information transmitted across the internet.

Remote Life

Video-based fitness apps

Many of us already utilize a fitness tracker of some sort, most of this is textual or graphical based. With the Edge, it is expected that video will take a much more prominent role, from personalized video coaching which relies on AI and Augmented Reality to offer tips on form, to wearables that constantly stream route and locale information to your peripheral vision.

Distance learning

The pandemic has caused a massive surge in the number of students relying on distance learning, with video apps playing a large role. Many students struggle with either poor video quality due to bandwidth or processing issues, or simply do not learn as well in a remote environment. With the Edge's ability to stream much higher quality video, and the potential for new technologies such as holographics, augmented reality and wearable technology, distance learning of tomorrow may be a much more immersive experience.

Connected home

As smart devices become more commonplace in homes, the amount of bandwidth and processing capacity will increase. With neighborhood Edge locations, much of this processing can be done without the need to consume large amounts of internet bandwidth and deliver richer experiences such as high-fidelity music, gaming and more. As home devices can rely on Edge processing, the cost, complexity, and size of these devices will dramatically decrease.

Intelligent language learning

Augmented reality and virtual reality will be able to improve the way that we learn new skills such as a language. Until now, you either learned a language with audio cues via an app, or in-person via a class. A large part of learning languages involves visual cues such as facial expressions and lip reading. With Edge driving the adoption of AR and VR, future language apps will likely utilize wearable technology to help the learner with pronunciation by providing feedback on shape of mouth and expressions.

Healthcare

Virtual reality surgery training

Interns and residents shall be able to utilize virtual reality and holographic technology to practice surgery in virtual 3D space. Edge locations, specific to colleges or businesses working on highly confidential research projects, can feed data to enrich the virtual experience and gain vital data to further research without the risk of data breaches.

Doctor clean rooms

Hospitals will deploy Edge locations to enable the use of augmented reality within surgery rooms. Information such as AI recognition of arteries, animations of blood flow, density and clots, and overlays of x-ray scans onto the patient will greatly reduce the potential of infections by keeping the surgeon's hands clear of any external contaminants.

Telemedicine

Telemedicine and high-quality videos streams via distributed edge locations will allow doctors to perform highly specialized procedures across the internet. In addition to consultations where the quality of a video may make the difference between a right or wrong diagnosis for a patient, in the near future we may also see surgeons remotely controlling robots, where even sub second details could cause a patient to hemorrhage.

Artificial limbs

Artificial limbs will increasingly become much more complex, from on-limb AI based on environmental impacts such as weather, surface composition, and incline, and with the Edge, utilize real-time processing to constantly optimize movement mechanics through machine learning and analysis of the limb providers research and other patients with similar devices.

Privacy & data residency

Cloud-based solutions require data to be sent across the Internet to centralized locations. In addition to data sovereignty and regulatory mandates, there is concern that patient privacy is at risk to the growing number of cyber-attacks. Edge locations

enables organizations to deploy devices independently of network providers thereby greatly reduce where data is transmitted and processed.

Social Good

Rural connectivity

Many areas around the world, in particular rural communities, often struggle with connectivity for internet services. Utilizing regional edge locations, communities can offer services such as weather updates, local road closures, fire and tornado warnings, and family services for citizens.

Crop management

Emerging nations can leverage localized Edge services to keep remote farms updated on items such as water availability and spread of infestations. In addition to textual information, the Edge's benefits of lower-bandwidth rich media types such as images and videos can be utilized to educate farmers on mitigation strategies, guidance to prevent disease outbreak, and visual identification of pests.

Endangered species tracking

With the constant threat of poaching, many countries have implemented specialized ranger services responsible with tracking and protecting endangered species. Edge networks can provide ultra-low bandwidth to connect tracking devices and report locations to rangers. Warnings can be established if an animal has not moved for a period of time, or has moved out of park boundaries, potentially alerting authorities of poaching activities.

Water Treatment

With an estimated 11% of the world's population without access to clean water, remote water treatment systems can be established that rely on distributed Edge locations to intelligently monitor water quality and, in real-time, adjust chemical levels required to safely treat water.

Sustainability

Microchips shall be embedded into materials such as textiles, metals and concrete to monitor quality and impact of surrounding conditions. This information can be transmitted to edge locations and used to increase the life expectancy, and thereby impacting sustainability, of a device, car, or structure by performing constant adjustments, or recognizing potential faults and weaknesses before they cause structural damage.

[1]https://www.gartner.com/en/documents/3981952/top-10-strategic-technology-trends-for-2020-empowered-ed

Summary

Through the combination of 5G Edge and 5G technologies, every part of our lives will be transformed. The promise of the internet to connect everyone and everything will become closer to reality. No longer will bandwidth or where someone lives be a limiting factor to an end user's experience.

To achieve this vision, the ability to create 5G Edge solutions must be democratized. Developers must be empowered to extend existing apps to take advantage of the 5G Edge or build entirely new 5G Edge native apps. This is why we created the EdgeNet and The 5G Edge API -- to eliminate the complexity of working with networks, telecommunications stacks, and regional deployments to deliver a simple, yet powerful set of 5G Edge APIs for developers.

Together, with EdgeNet and the 40 Edge use cases described in this eBook, and with the AlefEdge Platform, the future of apps is now in the hands of every developer. It's time for you to make the future.

Getting Started

Learn more about The 5G Edge API and how to get involved at https://developer.alefedge.com/. Creators can sign up for our Early Access program to stay up-to-date on the EdgeNet developer community.

About AlefEdge

AlefEdge, the innovator behind the 5G Edge Internet, delivers the superpowers of a programmable 5G Edge to developers and enterprises through The5G Edge API. Responding to trends of Internet decentralization, Alef has integrated mobile networking with Edge computing in its flagship platform, EdgeNet. By abstracting the complexity of 5G, EdgeNet unleashes a massive Edge Internet economy by securely enabling developers to build 5G Edge services that include artificial intelligence, the Internet of Things, Industry 4.0 manufacturing, smart cities, virtual and augmented reality, and more.

AlefEdge is headquartered in New York City, with offices in India and Brazil.