How The Emerging Compute Continuum Drives Edge Computing

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Predictions 2020: Edge Computing

The build-out of the edge computing infrastructure is underway, as companies hustle to reap the enormous data-mining benefits that lie ahead. But this evolution of edge computing requires a reconsideration of where and how to allocate computing resources as well as a seasoned ecosystem to deliver the core hardware and software technologies that have sparked innovation in the world of IoT.

GROUNDWORK FOR EDGE COMPUTING EXPANSION

This Forrester Predictions report identifies 2020 as a tipping point for edge computing, driven by the rise of 5G cellular networking, maturing cloud models and relentless improvements in hardware and software as part of a maturing Internet of Things (IoT) infrastructure that now supports any application.

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But if 2020 is the breakout year for edge computing, it's true that it's not been an overnight success. Rather, it is the product of several years' work as the Arm ecosystem coalesced around hardware and software standards, greater technology choice and end-to-end security capable of supporting a robust platform to democratize compute. The system we see evolving is far more dynamic than before: It's a compute continuum rather than a cloud-dominated architecture. This continuum delivers a greater ability to embed the right compute resource at the right point from cloud to edge server and endpoint device to achieve maximum efficiencies. The benefits are significant:

- Improved responsiveness by reducing decision-making latency
- Increased data security and privacy
- Lower power
- Less network bandwidth
- Maximized efficiency, reliability and autonomy
- Reduced infrastructure and operational costs.

There is one further reason that the current compute evolution is accelerating: Because the traditional cloud model is becoming brittle. Global internet protocol (IP) traffic will soar three-fold from 2017 to 2022, rising at a rate of 26 percent per year. Total IP traffic could be 396 exabytes (EB) a month by 2022, according to Cisco's Visual Networking Index. Global mobile traffic may rise even faster: The index suggests a seven-fold jump in the same period to a total of 77.5 EB a month of mobile traffic, from just 11 EB in 2017. So, building ever more massive data centers is never going to be the right answer.

DATA OVERLOAD

Consider just one use case: In the future, Arm anticipates 500 million high-definition (HD) image sensors will produce 300 EB of data per month. That will exceed available bandwidth to the edge network, let alone the cloud. But in a compute continuum context, much of that data can be efficiently or cost-effectively computed on edge devices or endpoint devices, such as a camera. Responsiveness is quicker, data transiting costs lower, and privacy and security (by virtue of images being retained locally rather than sent to the cloud) is improved.

This compute continuum has emerged because technology providers are building heterogeneous computing solutions around core, efficient CPUs and supplemented where appropriate by specialized processors, such as GPUs, NPUs, VPUs and other semiconductor technologies. This system-on-chip heterogeneity is central to the success of the compute continuum. Nowhere is this better illustrated than in artificial intelligence (AI) and machine learning (ML) systems that use heterogeneous compute to drive more functionality from the cloud to the edge and endpoints.

The expansion of edge and endpoint computing on this continuum is already sparking innovation. Consider Neurotechnology's Face Verification SDK, which provides biometric identity verification for large-scale, high-security applications. It allows face verification to be performed offline, simplifies integration of facial authentication applications for PCs and mobile devices, performs 'liveness' detection to reinforce anti-spoofing measures. All biometric data is kept on-device.

MANAGING AND OPTIMIZING EDGE COMPUTE

Another key challenge that must be overcome in this evolved world is how IoT systems will be set up, provisioned, managed and monitored as edge compute expands. It's unrealistic to require companies to roll their own software infrastructure technologies to do so.

Instead, solutions such as Arm's Pelion IoT Platform have filled the vacuum to deliver such services. Pelion enables companies to easily connect trusted IoT devices on global networks, invisibly administer them, and extract real-time data to drive competitive advantage.

Built-in Device Management functionality enables secure and reliable onboarding, connection, updates, and lifecycle management of different types of connected devices while Data Management features make trusted data from IoT devices and relevant enterprise data fully accessible. Lastly, Connectivity Management allows secure and cost-effective connection of IoT devices on multiple network standards with a single global mobility contract.

Leading-edge customers, such as Shiseido, the world's third-largest cosmetics company, use Arm's data platform to ingest, integrate, store, prepare and then discover vast amounts of data, including loyalty membership data, second-party data such as media website viewing data, and third-party public data-management platform (DMP) information.

This adoption has improved Shiseido's CRM engagement and ad performance, given its teams improved data analysis and visualization and delivered a 20 percent increase in revenue from loyalty members. This led to an 11 percent increase in overall revenue.

Logistics-solutions provider Zebra Technologies' real-time load-monitoring solution SmartPack Trailer is installed at warehouse doors to help optimize loading and ensure the right package ends up in the correct truck. Additionally, Zebra uses the Pelion IoT Platform to manage ruggedized mobile Android computers used by large retailers around the globe.

CONCLUSION

The complexity of the build-out of the edge computing infrastructure can't be understated, even with the enormous data-mining benefits that lie ahead. This is neither a one-size-fits-all technology play nor a one-company opportunity for success. It requires a vast and seasoned ecosystem that revolves around core hardware and software technologies that have sparked IoT innovation.

This ecosystem is helping push the 2020 tipping point this report describes and will open the door to new business models as enterprises race to tap new sources of data that will deliver efficiency gains to their businesses and better experiences to their customers. For more information, please download our new whitepaper, "A New Ecosystem for a New Era in Compute."

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Predictions 2020: Edge Computing

New Form Factors, Partnership Strategies, And The Promise Of 5G Will Converge To Catapult Edge Toward Mainstream

by Abhijit Sunil, Dan Bieler, Naveen Chhabra, Brian Hopkins, Andre Kindness, Michele Pelino, Jeff Pollard, and James Staten

November 4, 2019

Why Read This Report

Edge computing has been among the most important trends associated with cloud computing and has enabled a multitude of use cases, beyond IoT and embedded systems, for infrastructure and operations (I&O) professionals. The components of edge computing have been steadily maturing, and so has the industry definition of it. This report looks at five Forrester predictions for 2020 in the edge computing space.

Key Takeaways

It's Time To Step Up Investment In Edge Computing

Enablers for edge computing are evolving at a rapid pace. 5G and enhanced communications will aid the connectivity ecosystem. Maturing cloud models will aid in the maturity of edge use cases; customer experience remains among the key drivers. AI, the internet of things (IoT), and smart ecosystems are a few examples of use cases that are at the forefront and will see more application in the coming months.

2020 Will See Evolved Infrastructure Form Factors And Business Models For Edge

Edge computing won't replace cloud or data centers but will instead extend the ecosystem. Thus, we'll see similar maturity cycles for the edge, starting with standardized compute, storage, and networking product offerings, along with mature business models.

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with Glenn O'Donnell, Jenny Thai, and Diane Lynch

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Customer Experience Is The Key For Edge Computing

Edge computing brings computing close to the customer, so all the use cases that enable and influence customer behavior will be the first motivations for edge. IoT will heavily drive use cases, but edge computing will go beyond these, from addressing on-demand compute to enabling real-time app engagements. Edge computing will augment cloud and on-premises to enable new customer experiences.[1] And 54% of global mobility decision makers whose firms are implementing edge computing believe that the flexibility to handle present and future AI demands will be among the biggest edge computing benefits.[2] While edge is admittedly tied more to connectivity requirements than cloud is, the economics of cloud will come into play at the edge. This indicates the vast potential that edge presents to a range of players, from traditional telcos to major public cloud firms.[3] These players have a huge opportunity to clarify what edge can do for customers and get on the bandwagon early. Forrester expects 2020 to be a breakout year for edge computing.

- **Fit, form, and function will drive development of custom form factors.** So far, hardware vendors have relied on existing form factors to serve the compute, storage, and network requirements at the edge. Edge computing is characterized by the variety in applicable use cases in multiple industries. The unique requirements put forth by operating conditions like space, temperature, vibrations, connectivity, and resiliency will mandate that hardware vendors develop custom form factors to deliver infrastructure needs at edge locations. For example, running a standard rack, tower, or blade server, storage in an autonomous car isn't possible, and the compute and storage requirements for the aerospace industry will be vastly different from those of a hospital network. Non-x86 processor architectures (e.g., ARM or Tensor) will begin to feature prominently in 2020, when we'll see all infrastructure vendors launch programs to develop custom form factors that serve specific scenarios.

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- **Emerging 5G deployments will require firms to reassess and align edge strategies.** In 2020, 5G network coverage will finally increase significantly in developed markets to connect products, sensors, and data across key industrial use cases, including enabling autonomous robots and drones, creating 3D space maps to enhance worker productivity, and using video cameras or industrial wearable devices to rapidly process critical environmental data or enhance quality assurance processes. Edge infrastructure often plays a critical role in connecting, processing, and analyzing data from these 5G use cases as close as possible to the location of the connected product, user, or device. Outside these developed metros, 5G won't yet be a reality. Network infrastructure stakeholders must assess their firm's requirements for, and availability of, critical 5G applications and align their edge architecture with existing cloud capabilities and these 5G use case requirements.[4]
- **Telcos will acquire CDNs and colocation vendors to extend value.** Missing out on cloud still stings carriers, which are now clawing at edge in the hope of not missing out on the next big thing. While carriers will have an extensive role to play in edge computing, especially as 5G and edge computing use cases continue to entangle, there's very little that carriers can offer compared with others that have more familiarity in distributed computing architectures. Cloud vendors, infrastructure OEMs, IoT independent software vendors, big data, and AI startups are rushing to enable more data processing, analytics, and event-driven edge automation outside traditional cloud and data center environments. This rush to the edge will create acquisition opportunities for large, well-funded firms as vendors seek competitive advantage. Several major telecommunication companies will look to expand their global edge footprint by acquiring content delivery network (CDN) or colocation vendors — again. Telcos will integrate the acquired edge infrastructure to expand their distributed edge compute management offerings as customers begin piloting customer engagement and IoT automation solutions that exploit submillisecond response times. Only a few will succeed.
- **Companies will choose multivendor packaged solutions over single vendors.** As companies deal with bandwidth and connectivity limitations throughout the world, businesses will soon realize that edge compute platforms and connectivity are too complex and costly to design, maintain, or connect. Companies will work with edge compute integrators for a particular market to support their edge solutions instead of building and deploying their own. This will give rise to new ecosystem partnerships between telcos, customer experience consultancies, vertically focused software, billing platforms, and IT and business customers. In 2020, tech leaders must learn to design hierarchical orchestration across network elements, including network operating systems, cross-stratum orchestration, lifecycle services, and software-defined networking.
- **The edge cloud service market will grow by at least 50%.** Public megacloud providers such as Amazon Web Services (AWS) and Microsoft; telecommunication companies such as AT&T, Telstra, and Vodafone Group; platform software providers such as Red Hat and VMware; CDNs such as Akamai Technologies; and data center colocation providers such as Digital Realty are innovating to provide basic infrastructure-as-a-service (IaaS) and advanced cloud-native programming services

on distributed edge computing infrastructure. Telecommunication companies are contributing to edge open source projects like Akraino, and colocation vendors like Equinix are investing in software abstraction layers that run on their distributed infrastructure. The goal of these vendors is to offer IaaS and platform-as-a-service (PaaS) services that run independently of or with only intermittent connectivity to public cloud and data center assets. In 2020, this nascent market will begin to see explosive growth as startups partner with enterprises and large vendors to explore possible business models that depend on near real-time responsiveness for customer empowerment.

Endnotes

[1] See the Forrester report "Edge Computing Will Radically Alter Your Infrastructure Strategy."

[2] Source: Forrester Analytics Global Business Technographics® Mobility Survey, 2019.

[3] Our data shows that 16% of global mobility decision makers are planning to implement edge computing within the next 12 months and 10% have already implemented it. Source: Forrester Analytics Business Technographics Mobility Survey, 2019.

[4] See the Forrester report "Check The 5G Pulse Of Your Communications Service Provider."

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