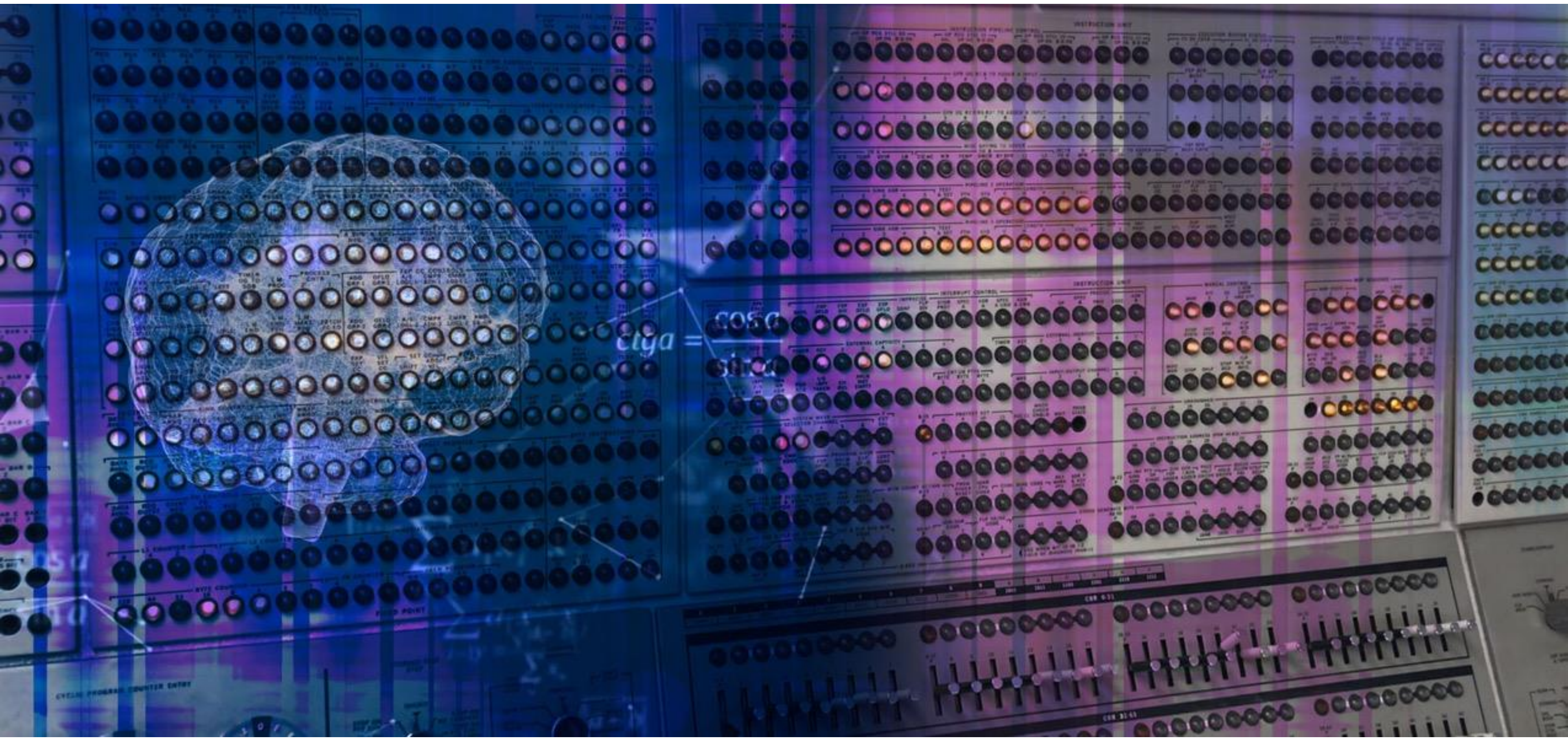

White Paper

Multi-Access Edge Computing Raises the Bar for Cloud-Native Observability

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The confluence of edge computing, 5G, and cloud-native computing is bringing new capabilities to telecom operators, enterprises, and hyperscale cloud service providers. At the core of this confluence is multi-access edge computing (MEC), a next-generation approach to edge computing that leverages the power and flexibility of 5G.

MEC leverages cloud-native principles to abstract software from hardware, and to abstract application workloads from software infrastructure. This software-defined approach gives MEC unprecedented performance and flexibility, but it also comes with challenges that require modern management and service assurance techniques.

Cloud-native observability is one element of this new approach to management, as are automation and artificial intelligence. This combination of management technologies is essential for scaling MEC to meet the needs of all of its constituencies as the edge continues to mature.

The Rise of Multi-Access Edge Computing (MEC)

There's an old saying that *the cloud is just someone else's data center*. For better or worse, this maxim is true – albeit numerous data centers in nondescript buildings across the planet.

Regardless of the number of such facilities and who owns them, there's no escaping the fact that the cloud is *somewhere else* – wherever said data centers find themselves.

Sometimes *somewhere else* just isn't good enough. There's the pesky speed of light, guaranteeing that getting anything from here to there will take some non-zero amount of time. If we're in a hurry, even lightspeed isn't fast enough.

Einstein isn't done with us yet. If the speed of light isn't the problem, perhaps it's *gravity*. As in *data gravity*. Not only does it take time to schlep our bits from here to there, it also takes money. And if we have a lot of data, it might take a lot of money to move all of them to the cloud.

Wouldn't it be great if we could carve off a chunk of the cloud move it closer to where we need it? Now we can do all the number crunching we like locally with no speed of light issues, sending only that information to the cloud that needs to be there.

We call these local fragments of the cloud the *edge*. Edge computing shifts compute and storage resources – the essence of the cloud – wherever we want it.

We can bring compute to our data, resolving the data gravity problem for data-intensive use cases like AI inferencing. We can also reduce our latency, speeding up data round trips so that they're finally fast enough to support real-time applications.

Just one problem: we're still missing a piece of the puzzle. The cloud isn't just about compute and storage. There's also the network.

Why 5G is Essential to MEC

Given the diversity of edge components and associated use cases – everything from cameras to automobiles to point-of-sale systems – we can't simply rely on the good old Internet any longer.

No worries. 5G is on the way.

While it's true 5G represents the next generation of mobile telephony – faster phones! Download movies in seconds! – it's actually a set of protocols that deliver different capabilities at different distances.

A simple way to think about this multiplicity of protocols: 5G promises to replace 4G LTE for our phones, while also replacing Wi-Fi for our homes and businesses, and Bluetooth for short distance communications.

But there's more to this story. 5G goes beyond each of these earlier generation protocols, bringing entirely new capabilities to mobile telephony, home and business connectivity, and in particular, to the edge.

We call this combination of edge computing and 5G *multi-access edge computing*.

MEC leverages 5G to extend the functionality of networks to various edge computing scenarios. In essence, MEC brings cloud computing and an IT service environment together at the edge, in close proximity to mobile telephony users as well as edge devices.

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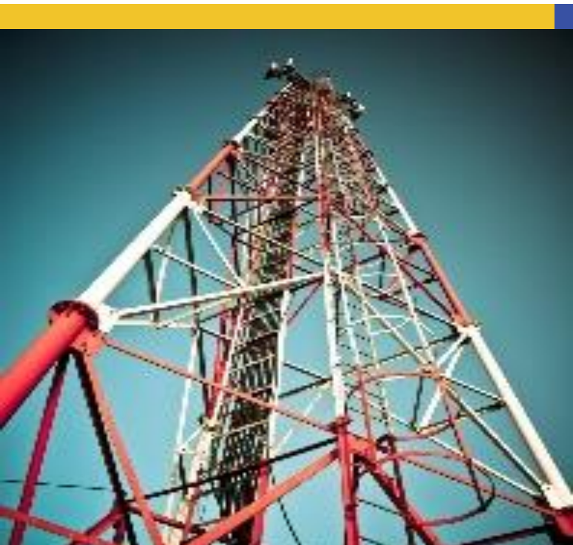
The ultra-low latency of short-range 5G protocols brings real-time behavior to the edge, essential for autonomous vehicles, automated factory robot control, remote surgery, and other time-sensitive applications.

Real-time behavior, however, is only part of the MEC story. Combine low latency with AI inferencing at the edge for an exploding range of possibilities – many of which are still a gleam in the eyes of their inventors.

In this way, MEC promises to revolutionize the as-yet nascent Internet of Things (IoT). In addition to the latency and data gravity benefits, MEC will address issues of energy use and battery life as well. 5G also brings a far greater density of IoT endpoints to MEC than other communications protocols could – a capability that as yet no one has exploited.



The long-term promise of MEC is wide open. MEC will provide new compute platforms to support telecom workloads such as content delivery networks and other workloads. Additionally, it will also provide operators with the ability to offer new services to customers (in partnership with the hyperscalers) to run customer workloads.

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MEC and the Cloud

The worlds of cloud/edge computing and 5G that collide in MEC have quite different contexts. The cloud has always consisted of layers of abstraction that leverage open standards and open source software to implement flexible, dynamic infrastructure. The edge wouldn't be possible without these fundamental cloud principles of openness and abstraction.

5G, in contrast, comes from a world steeped in proprietary technologies – in particular, the *radio access network* (RAN).

RAN is the software and hardware that enable mobile telephony operators to provide wireless connectivity services to the public. Throughout the various generations of RAN – 2G, 3G, and today's 4G LTE – RAN technologies have been largely proprietary.

To address this problem, the broader telecom industry has been looking for ways to avoid problematic vendor lock-in as it moves to 5G. As a result, the industry is implementing open architectures like OpenRAN, which leverages modern cloud-native computing – the latest generation of infrastructure best practices that underlie both the cloud and the edge.

Both telecom operators as well as enterprises can implement software-only mobile functions or cloud-based Software-as-a-Service (SaaS) applications that run anywhere – in a cloud or on the edge – on any brand of hardware.

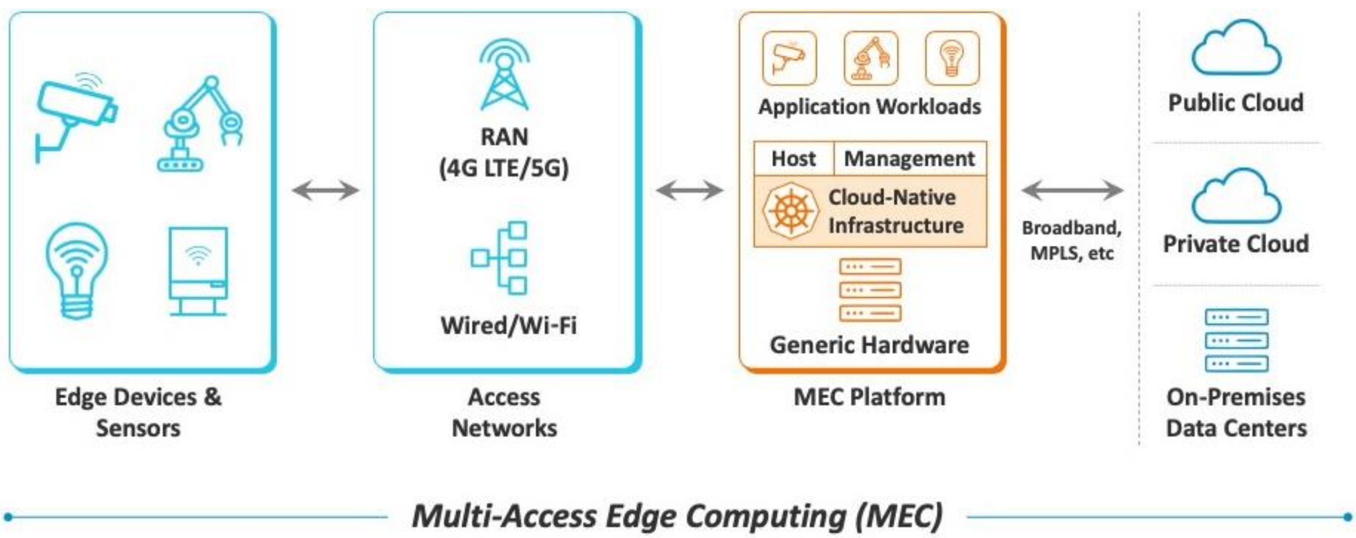
This open, cloud-native approach enables MEC to leverage abstractions that separate software from the underlying hardware. As a result, both telecom operators as well as enterprises can implement software-only mobile functions or cloud-based Software-as-a-Service (SaaS) applications that run anywhere – in a cloud or on the edge – on any brand of hardware.

OpenRAN infrastructure is one example of software important to telecom operators that can leverage MEC. However, MEC has much broader applicability. Any low-latency customer workload is a prime candidate for MEC as well.

For example, game streaming may need to move as their consumers move location and will most likely need to communicate with other elements hosted in the public cloud or the customers own hybrid cloud. MEC is ideally suited to address such challenges.

Understanding the MEC Platform

To support this cloud-centric approach, the MEC platform contains two functional areas: *host* and *management*, as shown in the figure below. Within the MEC host (which typically runs at the edge), the MEC platform provides the compute, storage, and network resources that provide a cloud-like environment.



In addition, the platform offers service and application assistance for mobile applications, including authentication and authorization of such services, along with their discovery, advertisement, and notification.

The management layer handles the management of both host and system-level entities, where the combination of these elements provides the foundation for instantiating and scaling mobile applications and services in a granular and dynamic manner.

Given the fact that cloud-native architectures underlie MEC deployments, it's no surprise that the major cloud service providers (CSPs) are rolling out OpenRAN-based services. In fact, even though 5G will take a few more years to roll out completely, the time is now for the CSPs to get in the game.

Because OpenRAN essentially commoditizes the RAN infrastructure, the mobile operator's value-add must be at the application layer. For telecoms that have historically thought of themselves as connectivity providers, this application-centricity heralds a new way of thinking about their business.

Operators and customers will need to understand these new edge topologies in order to respond to any disruption – not simply disruption to connectivity, but also impacts to new quality of service metrics associated with these customer workloads.

Perhaps the most important aspect of the OpenRAN-empowered MEC, in fact, is the separation of concerns between application workloads and the underlying infrastructure they run on. In other words, the RAN itself becomes programmable. The true scope of possibility, however, is limited only by the imagination.

MEC Management Challenges

Combining 5G and cloud-native computing into MEC converges the worlds of telecommunications and IT for both the telcos as well as the enterprises who leverage MEC to support a wide range of edge-centric applications.

With this new IT-centricity for next-generation communications infrastructure comes traditional IT concerns of monitoring, management, and service assurance in general.

Fortunately, cloud-native computing is evolving the way enterprises approach monitoring and management, extending these traditional techniques to *cloud-native observability*.

Cloud-native observability leverages the built-in telemetry that elements of the infrastructure generate to provide the logs, traces, and metrics that engineers require to gain insight into issues, resolve them, and ideally prevent them.

When elements of the infrastructure don't generate adequate telemetry, observability leverages software agents or other monitoring devices to gather the information that engineers require.

In traditional hybrid IT environments consisting of on-premises data centers combined with public and private clouds, observability technologies are relatively straightforward.

In an edge computing environment, in contrast, gaining the level of visibility and control necessary to manage such widely distributed infrastructure is a markedly more difficult challenge.

Such visibility into behavior at the edge, including network-level visibility into packets and flow, is critical for maintaining control over MEC. Remember, many edge-based transactions remain on the edge, never interacting with on-premises data centers or clouds.

In an edge computing environment, gaining the level of visibility and control necessary to manage widely distributed infrastructure is a markedly more difficult challenge. Such visibility into behavior at the edge, including network-level visibility into packets and flow, is critical for maintaining control over MEC.

Application workloads, furthermore, may actually be distributed across edge, on-premises, and cloud environments, complicating the observability challenge.

Edge computing requires the additional deployment of compute infrastructure at the edge, away from the cloud or data center – as well as network functions and applications across the infrastructure. All of these challenges complicate the system management and service assurance efforts.

Observability tools for the edge must therefore follow MEC best practices. Service assurance requires the calculation of key performance indicators within the edge itself, combined with the ability to take local remediation action if necessary.

As 5G rolls out and edge computing continues to mature, these challenges will only become more urgent. Telecom operators – and to an increasing extent, enterprise operations personnel – will require visibility across MEC-delivered workloads.

Point management products will not suffice for either of these constituencies. Everyone responsible for the management of MEC will require a 'single pane of glass' for monitoring and managing workload health across cloud, data center, and edge infrastructure.

This single pane of glass MEC observability technology, like the technology that BMC offers, must provide automated correlation, not just across application workloads, but across application infrastructure and wired/wireless network infrastructure as well.

Operational engineers across the MEC landscape must be able to leverage AI and automation to provide predictive analyses of observability information, ideally with automated remediation of many issues.

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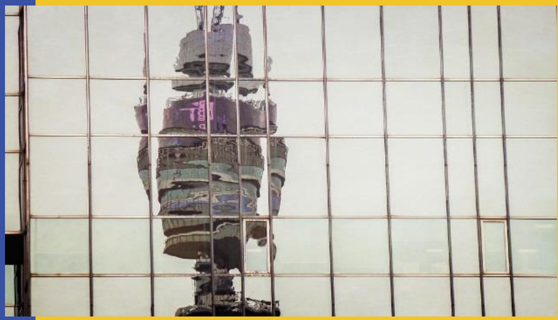

Network teams also require customer impact analysis across the edge, while application developers need immediate, actionable insight into root causes of problems and how they affect the application development and deployment landscape.

Only with such next-generation observability and management will edge computing rise to the challenges of IoT in the near term, and modern cloud-native computing overall.

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The Intellyx Take

Who's in charge of the MEC story?

The 5G rollout is driving new capabilities in the RAN, as it becomes fully software-defined and programmable. Are the mobile operators in charge?

The major CSPs, aka the hyperscalers, are rolling out software and services for MEC implementations at both telecoms and enterprises. They alone have the scale and market dominance to unify the edge/cloud story. Perhaps they're running the show?

Or are the enterprises leading the way? Regardless of the scope and paradigm-shifting nature of MEC, we could still argue that the entire story is one of infrastructure – a means to an end.

The point of all that infrastructure is to support application workloads we put in front of people – customers, employees, and others. Perhaps then the relationships between companies and their customers are driving force for MEC.

Regardless of who's in charge, there's no question that the complexity of the underlying technology continues to explode – largely because it *can*. The management infrastructure must keep pace, and to do so, it must leverage cloud-native observability, automation, and AI.

This technology must largely manage itself, where humans take an increasingly empowered role in the day-to-day operations of the edge.

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Jason Bloomberg is a leading IT industry analyst, author, keynote speaker, and globally recognized expert on multiple disruptive trends in enterprise technology and digital transformation.

He is founder and president of Digital Transformation analyst firm Intellyx. He is ranked #5 on Thinkers360's Top 50 Global Thought Leaders and Influencers on Cloud Computing for 2020, among the top low-code analysts on the Influencer50 Low-Code50 Study for 2019, #5 on Onalytica's list of top Digital Transformation influencers for 2018, and #15 on Jax's list of top DevOps influencers for 2017.

Mr. Bloomberg is the author or coauthor of five books, including *Low-Code for Dummies*, published in October 2019.

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