Creating Value and Opportunity at the Service Provider Network Edge

Enabling Application Delivery in the Distributed Hybrid Cloud

First in a Series

ACG Research and Red Hat have developed a five-part series to highlight new revenue opportunities available to communications service providers (CSPs) using edge computing to deliver applications and services in open distributed hybrid clouds. This is the first brief in the series, and it provides the business context for the opportunities. Three companion briefs then focus on edge applications in individual promising industry segments. The final piece in the series highlights a set of capabilities it is important for CSPs to develop in making their edge offerings successful.

A Summary of the Opportunities' Value

We project the annual revenues available to CSPs from introducing new edge applications in the manufacturing, health care and mobile video sectors to be $62 billion globally by 2026. CSPs will have opportunities to bring edge applications into more industry segments (by a factor of at least two) and with more applications (again by a factor of at least two)[1] than we have analyzed in these three sectors in this series, leading us to project that over $100 billion in new annual revenues from delivering edge applications across all segments will be available to CSPs by 2026. This is at or above the order of magnitude of the existing market for managed network services. Should CSPs succeed in capturing that level of revenue from edge applications in that timeframe they will surely be adding materially to the value of their operations.

[1] Energy production and distribution; transportation and logistics; connected vehicle (V2X); education; and retail being prominent among the additional segments.

The Edge Is a Remarkably Large, Global Canvas for Innovation: Who Will Help Users Benefit from Its Potential?

At the network edge a **new** class of applications is emerging. They deliver value beyond what's possible in applications already running in endpoints (in smartphones, industrial machine controllers, meters, and other endpoints) and by applications running in deeper cloud computing platforms (such as search engines, collaboration systems, and SaaS based enterprise applications). Edge applications deliver this new value by meeting requirements that can only be met in locations near the end user and intelligent endpoints. They:

- Work within **tightly bounded latencies** that cannot be met by applications running further away, making them uniquely valuable in fast response use cases
- Use **location awareness** as a part of determining what they should do
- Meet **data sovereignty** requirements that constrain where information may be worked on and kept
- Reduce costs by avoiding network charges for sending large volumes of information to and from more centralized data centers

Edge infrastructures enabling the applications are adding a new tier into the global cloud computing environment and are playing an important role in creating a significantly more capable world. More versatile networking, more elastic computing, advances in machine learning and analytics, and more scalable automation are making edge applications possible where they have not been in the past.

Edge applications will be delivered using three principal deployment models, each suited to particular customer and solution circumstances. First, some companies will manage the deployments on their own, in a do it yourself implementation, supporting them with their IT and business unit teams, perhaps augmented by a systems integrator. In other cases, service providers of one type or another will supply and manage edge computing infrastructure and a set of applications running in it, installed on the end customer's premises. Public cloud providers could combine an edge offering with their larger distant cloud services, or communications service providers could deliver edge applications as a service in the same manner they do for networks and other applications. A third model will be for edge applications to be deployed as an integrated component of a service provider's network, providing an application to customers made possible by running the application closer to the user or device.

All of these modes will be used for delivering new edge applications

The New Communications Service Provider Edge

Communications service providers have unique assets and talents to apply in edge application delivery. For example, they already run large-scale, distributed networks capable of supporting enterprise, public sector, and consumer service offerings. These place them within the zone of viability (for latency and locality) to expand into edge applications efficiently. In many cases CSPs also include customer and location awareness in their offerings, which are critical in many edge applications. Figure 1 illustrates how CSPs' networks already bring them close to end users in many different application categories, giving them a strong position to build upon in supporting them. We see edge application platforms being used in both fixed and mobile network services and linked via CSPs' managed networks into cloud application centers of many types.

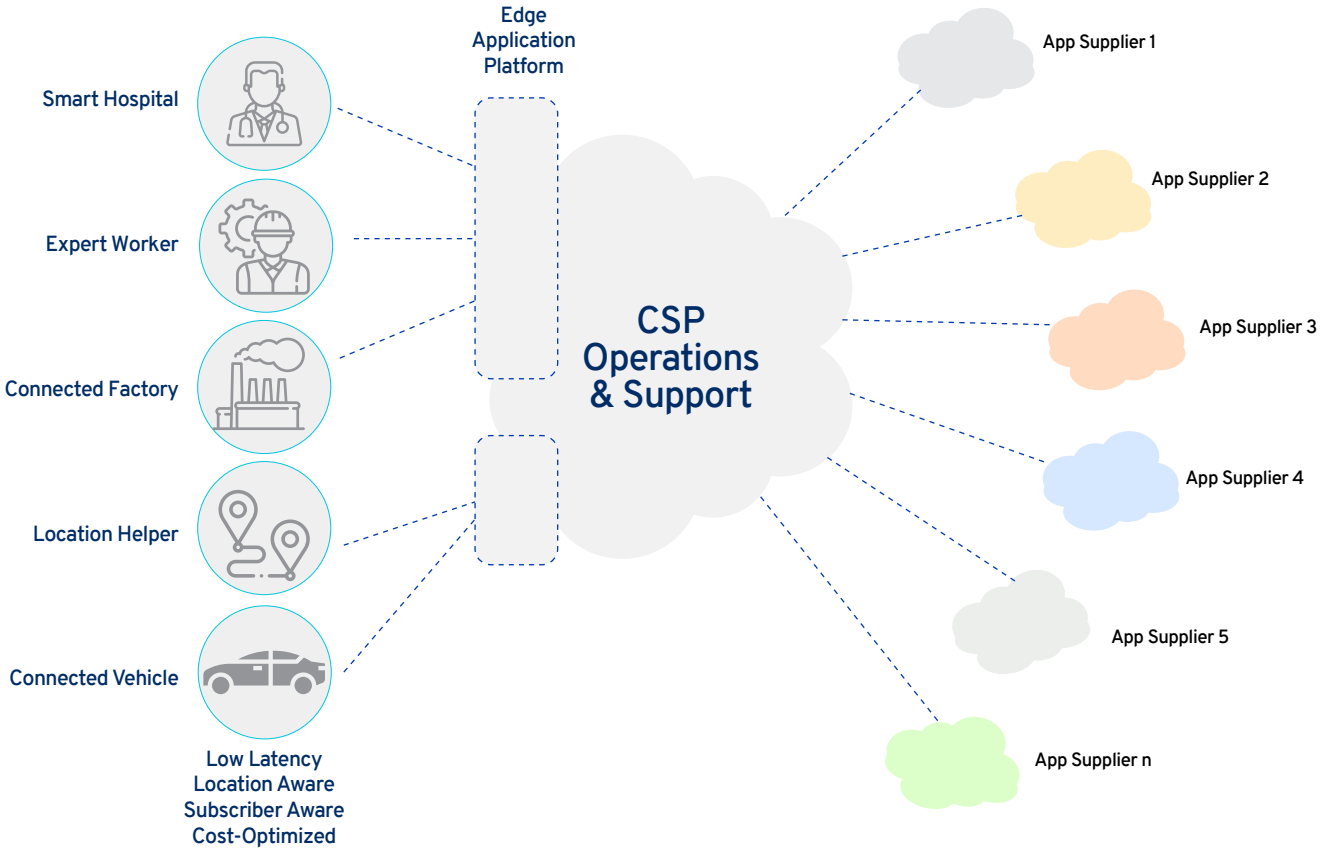

Figure 1. CSPs Benefit from Close Proximity to Endpoints + Familiarity with End Users

CSPs also have hard-earned experience meeting service level agreements in multiple environments. They have developed skills managing customer relationships across an increasingly diverse set of services. In most cases they have established strong brand awareness in the communities they serve, creating a predisposition that CSPs can be candidates for bringing innovative offerings into a new and value-adding space.

Delivering applications with the simplicity and agility users expect from cloud-based services will be a necessary attribute on the edge from the start. CSPs have been gaining strengths important for edge deployments with their growing experience in cloud-native and cloud-based technologies in 4G and (increasingly) 5G mobile networks, in enterprise services using SD-WAN, and in cloud-based IT. They have also increased their familiarity with webscale operators operations in many cases by supporting services that extend into webscalers' infrastructures for their customers.

The Span of Revenue Multipliers at the Edge Is Broad

Springing from this advantageous position, the scope of applications in which CSPs are well-positioned to create offerings is significant. It spans enterprise, public sector, and consumer-oriented use cases.

In the enterprise sector alone we have identified up to two dozen distinct subsectors in which edge applications can deliver measurable benefits (Figure 2).

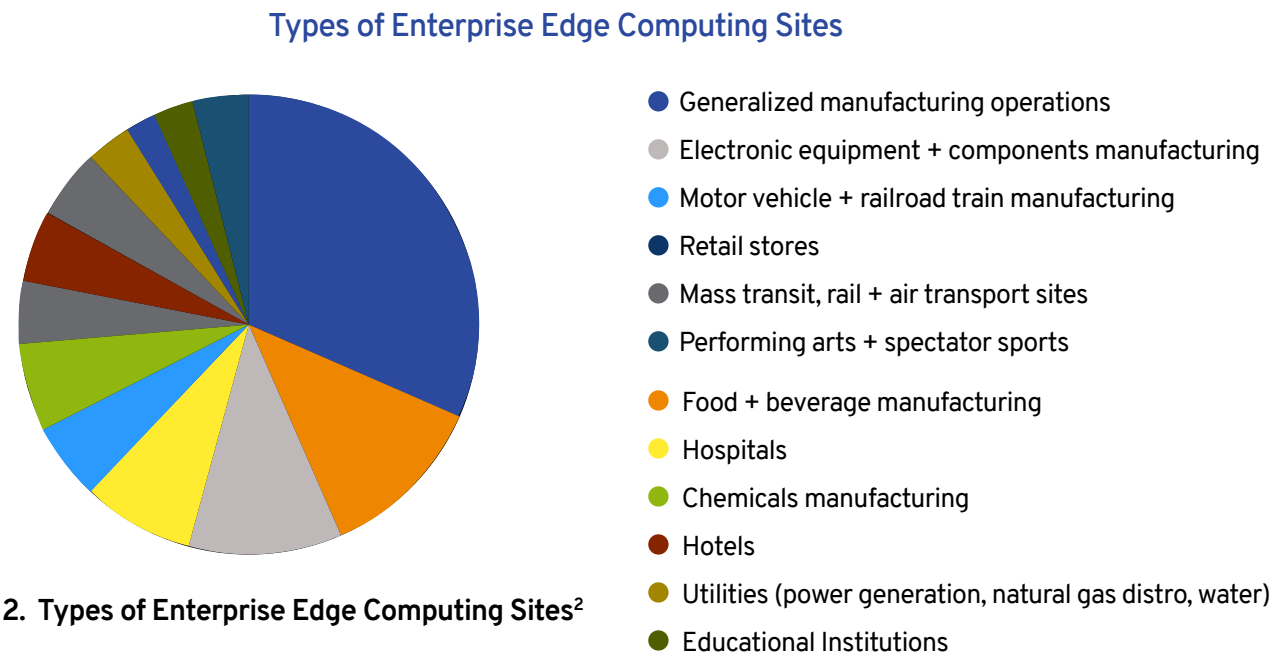

Figure 2. Types of Enterprise Edge Computing Sites[2]

[2] Source: ACG Research, WW Forecast of Edge Computing Revenues, 2019.

The number of sites in each sector varies, globally. In the aggregate there are several million enterprise sites at which edge nodes have the potential to be deployed. These could be supported by a CSP as an extension to its managed services. CSPs and other operators also have several million locations within their own network infrastructures in which edge resources can be deployed, primarily in telco clouds.

Spotlight on Three Sectors with Valuable Applications to Pursue Now (and Moving Forward)

Although the number of sectors to pursue is large, we spotlight three in this series to illustrate deployments in which CSPs currently have the opportunity to engage. These can be worked on today and have end user communities prepared to benefit from them. They are:

- Manufacturing control and optimization
- Enhanced video and media streaming
- Improved health-care services

We developed a separate brief for each of these sectors to highlight the opportunities, including:

- Customer segment/s involved
- Function and value of example applications
- Infrastructures used
- Consumption models
- Size of market
- Ecosystem members with whom CSPs will need to collaborate
- Revenue sharing models

In all of the cases we acknowledge the strengths CSPs bring to the offerings. In parallel we explore the requirement for CSPs to expand on their established competencies by growing the set of partners with whom they work in creating these new applications. The innovation and evolution required drive a new synergy among developers of the endpoints benefiting from the new applications and providers of the platforms making the applications possible. The solutions require new relationships and new operating models to be mastered. Without these, stakeholders will not fully realize the prospective benefits of the applications.

In the manufacturing, health care, and mobile video sectors alone, we project the value of this new opportunity for CSPs to be on the order of $62 billion annually, worldwide, by 2026. Each sector's contributions to that total are shown in Table 1. Each brief in the series analyzes an application in much further detail. With focus and execution, CSPs can capture significant and material benefits by enabling the delivery of these new offerings.

Industry Sector	Edge Application Offerings	Incremental WW CSP Annual Revenues 2026 ($ Bln)
Manufacturing	Production control, QA, materials management, safety, analytics, AI	$40 Bln
Health Care	Imaging + diagnostics, practitioner collaboration, premises safety	$5 Bln
Mobile Video	Streaming optimization, remote worker expert support, public safety video	$17 Bln
Total		**$62 Bln**

Table 1. New Annual Revenues Available to CSPs by 2026 from Edge Application Offerings

Red Hat's Role and Value in Creating the Open, Distributed Hybrid Clouds from Which Edge Applications Will be Delivered

The scale of the opportunities and the diversity of the customer sets using the solutions highlight the importance to CSPs of selecting a robust set of enabling technologies (and their suppliers) with whom to build and deliver their offerings. They will need to choose a strong, flexible underlying cloud-native infrastructure platform as well as industry-specific application offerings for targeted verticals.

To address the opportunity, CSPs will need to create large-scale implementations that take advantage of their own telco clouds and have the opportunity for using public cloud partners in a hybrid model. As the leading supplier of commercial open-source solutions, Red Hat has the cloud platform offerings with tools for operations, automation, and modern application development that the new set of applications

requires. CSPs can rely on Red Hat's portfolio, experience, and ecosystem of partners to help capture their edge application opportunities.

While the value of cloud-based application delivery has proven itself well across a wide range of industry sectors and use cases, new applications at the edge have a number of constraints not present in larger cloud environments that must be addressed for them to work well. In general the size of an edge installation is three or more orders of magnitude **smaller** than installations in larger central clouds.[3] Thus edge applications need to be developed expecting fewer resources available to them locally than software designed for running in a larger cloud.

Additionally edge applications function in a more distributed mode than many applications. Their operational scope focuses on the requirements **at the local edge** while they can also fit into a larger solution by integrating with functions in a central cloud. Operationally, edge applications also need capabilities built in to handle becoming isolated from components running centrally (in case of transport outage or other cause) that other applications do not.

Ideally, edge applications will run in a distributed, open, hybrid cloud with the versatility to work cohesively across the **full** range of environments that cloud-based applications require, at the edge and in multiple, larger central clouds. Red Hat infrastructure software has the range of capabilities to support applications at either the edge or in distributed hybrid clouds. A view of this is shown in Figure 3.

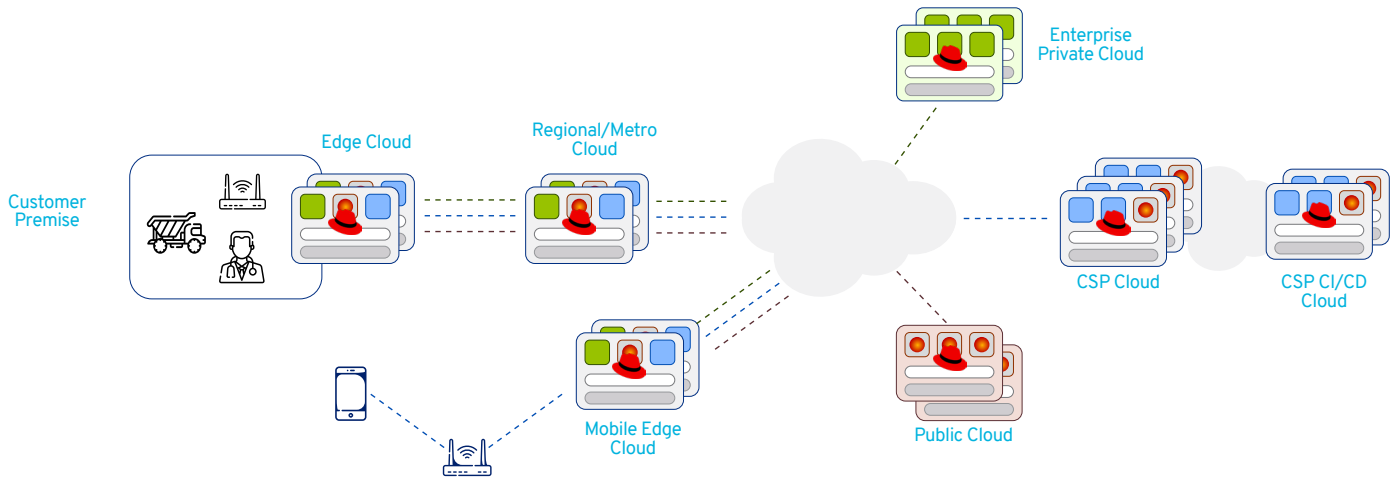

Figure 3. Red Hat's Role in Delivering Edge Applications in a Distributed, Open, Hybrid Cloud

[3] Twenty servers in a relatively robust edge cloud resource pool is one thousand times (or three orders of magnitude different from) the size of a twenty thousand server hyper scaler site (which is even on the smaller side of most hyper scalers' data center sizes).

In the diagram the Red Hat software is running in both premises-based **and** operator edge installations (left-hand side). It is also running in each of centralized data centers that edge applications typically need to integrate with on the right-hand side (enterprise, CSP, and/or public operator data centers). Finally, we see the Red Hat software supporting application development and delivery in a CSP's continuous integration, continuous delivery DevOps cloud. Each of these environments is supported by Red Hat operating system, storage, and cloud platform software, along with automation software to support the deployment and ongoing operation.

In the briefs that follow in this series, we address new applications in manufacturing, health care, and video application environments and elaborate on the expanded ecosystem capabilities CSPs will need to reap maximum value from their edge application delivery investments. We also highlight the versatility in Red Hat's end-to-end portfolio in each of the sector cases to show its value in creating the distributed, open, hybrid cloud that CSPs and their ecosystems need to deliver on the promise that new edge applications have.

This research is sponsored by Red Hat

About the Author

Paul Parker-Johnson is ACG's principal analyst and lead for research on hybrid, multi-cloud technologies and their use in private, edge and public clouds. His current work is focused on use cases in industry 4.0 and vertical segments in which it is gaining uptake, including the use of machine learning and AI in distributed operations models. pj@acgcc.com