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Enterprise Guide to Edge-Native Applications

What it means to be Edge-Native

White Paper by

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Innovate Faster.
Operate Smarter.

Contents

In this two-part white paper series, we look at why organizations should consider edge computing, and how edge-native applications will boost success on the edge.

In this, part one of the series, we examine:

- Rising interest in edge computing
- How being edge-native differs from being cloud-native
- The need for an event-driven architecture
- Why organizations need edge-native applications

The second part of this series examines:

- How to build edge-native applications
- How to develop edge-native strategies
- Measuring the success of edge-native investments
- Best practices for success

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Introduction

The term ‘the edge’ is often used to convey the ultimate frontier – a place where excitement, adventure, risks, and rewards are to be found, and which serves as the threshold between what is reality and what is possibility. It is no less true with edge computing.

Quite simply, we are witnessing the digitization of everything. The world is becoming dominated by digital programs and applications and most everything is now dependent on software.

Likewise, the way that organizations use technology and the way in which interactions take place between things and people is being completely redefined. The ‘edge’ is required to enable these changes and is at the forefront of innovation connecting the physical and digital worlds.

In simple terms, edge computing is a distributed computing approach that brings data storage and analysis closer to the actual source of that data. The idea is to decrease response times in accessing, analyzing, and acting on data, as well as save on the bandwidth needed to move it back and forth from one location to another, and reduce overall costs.

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While edge computing as a concept has been around for a while, adoption rates have remained low. Among the reasons: the proper software development approach to take advantage of potential benefits hasn't been used; and there is also huge diversity in use cases, which vary so widely that there isn't a simple, single technology model.

Changing that picture has been the rise of edge-native applications, which use an application architecture that is designed specifically to run on the edge in a distributed computing environment. Edge-native applications can allow for greater flexibility and reliability than a cloud-only approach. They also improve performance while reducing data security and privacy risks.

Cloud Data Isn't Edge Data

Edge Data		Cloud Data
Ephemeral	**Permanence**	Long-Lived
Short half-life of value	**Value**	Long-term value
Noisy	**Quality**	Clean
Local	**Scope**	Global
Highly distributed	**Structure**	Consolidated
Mostly data in motion, in use	**State**	Mostly data at rest
Massive	**Scale**	Massive

Rising interest in edge-native applications

With the exponential growth in digital business and digital transformation efforts, we are seeing far more digital data flow between assets – and people – at the edge.

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Examples include the increase in Industry 4.0, retail of the future, augmented reality in factories, home automation, etc. All of these technological advances rely on the exponential growth of data. It isn't just that we are adding more new devices – it's that existing assets and equipment are becoming part of the IoT. This will result in rapid new adoption of edge computing.

But just including the edge in an organization's application infrastructure won't produce the hoped-for benefits of low latency, increased performance, and geo-spatially defined processing that edge computing offers. And an on-premises data center doesn't come close to providing the benefits needed for processing and analyzing data created on the edge.

Indeed, the edge computing market size is expected to grow from

$36.5 billion in 2021 — TO — **$87.3 billion** by 2026

at a Compound Annual Growth Rate (CAGR) of 19.0%, according to a recent study by ReportLinker.

Only through an edge-native approach can organizations take full advantage of this new distributed computing landscape. And as organizations will quickly learn, the edge environment will be the future of computing.

Leading retailers are well on the way, already taking advantage of edge-native applications in brick-and-mortar stores. These applications enable the updating of electronic shelf labels, using smart shopping carts as both a point-of-sale system and for shopping list route planning, using object recognition cameras for digital inventory replenishment, and integrating immersive technologies such as augmented reality.

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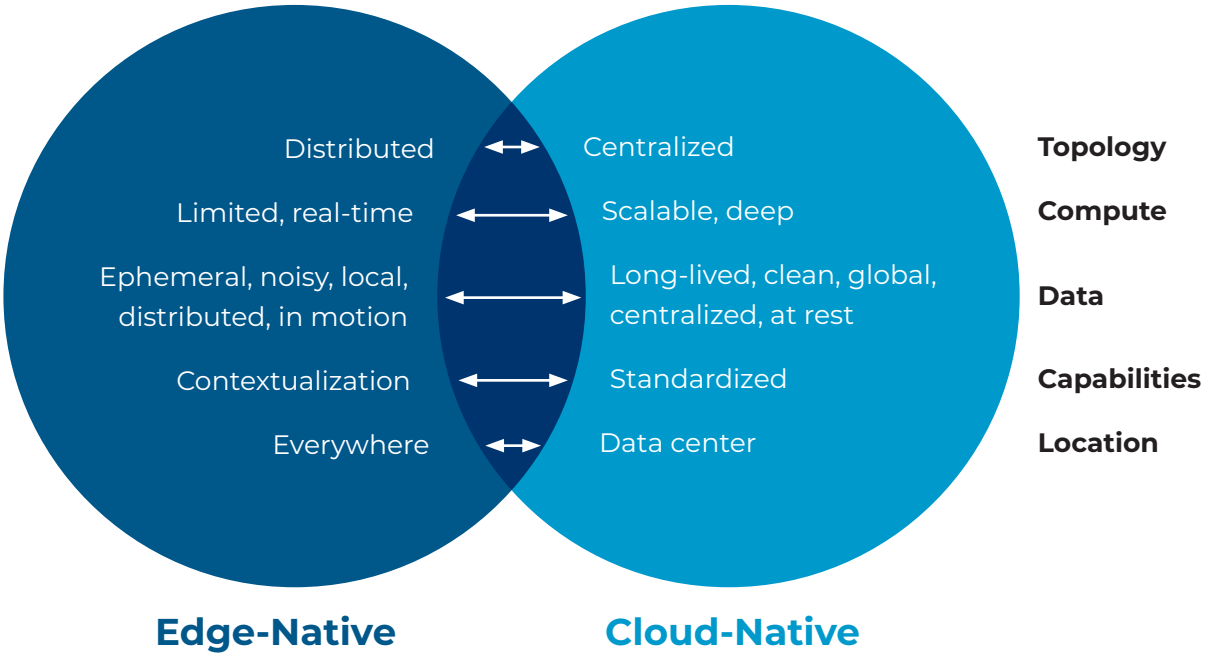
How edge-native differs from cloud-native

There is a widespread misconception that the edge is simply an extension of the cloud. It is not, and for edge computing to be truly effective, it needs a different type of software development and deployment environment.

Cloud computing and edge-native applications take an essentially opposite approach to how they deal with five key elements – topology, compute, data management, capabilities, and location. And while they are different, they also complement each other.

Edge-Native Is Not Cloud-Native — Exactly



Edge-native applications are software applications specifically designed to run in this distributed environment. How they are orchestrated and constructed is different. Likewise, they are designed for edge hardware and edge portability, versus generic applications.

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Edge-native development does not require that everything on the edge actually be native. Instead, it means that there are certain things you need to do architecturally, and based on the model of the system, to enable it to fully take advantage of the edge.

A major difference between edge-native and cloud-native is that the cloud is centralized, requiring data to be transmitted to the centralized cloud site for processing. The edge takes the opposite tack, is highly distributed, and moves the processing as close to the source of the data as possible.

Because of this distinction, the difference between two cloud server farms is trivial. The difference between two edge locations is night-and-day to the relationship of a data source.

The nature of edge data is also different. One way to think of it is the process of sifting sand for gold. Unlike data in the data center, a primary goal of processing at the edge is to find the gold and destroy the sand as soon as possible.

That adds a whole new level of complexity. You're now talking not only about the resources that are available, but where they are located, and the relationship based on processing power distance to the data source itself.

Edge-native also requires not just one cloud location that is centralizing things, but many edge locations processing separate bits of data – all connected for peer-to-peer communication.

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The need for an event-driven architecture

To realize the full benefits of edge computing, edge-native applications also rely on an event-driven architectural model, which is asynchronous, rather than a traditional request-based approach.

In a request-based approach, the receipt of a request triggers an appropriate response or action. With an event-driven architecture, event generators (or edge nodes) respond to an event happening, and they then trigger other associated event-driven systems.

To put the difference in simple terms:

a request-based (or request-response) system would say

“do this,”

while an event-driven system would say

“this event happened”

and trigger immediate analysis of published data by various parts of the system to determine the appropriate action.

By using an event-driven architecture, edge-native applications have seamless application mobility and loose coupling within the environment. They can act on insights from streaming data as it happens, make changes immediately, and migrate application logic to other edge locations as needed.

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Organizations need to understand that moving data analysis and actions to the edge requires a different processing model in which everything can happen in real time. It is not just a matter of developing something to run on the edge. It's a matter of being able to actively or dynamically move the processing location, between edge nodes or between edge and cloud, as the application is running.

With more and more data running on the edge, organizations need the ability to react to it – process it and act on its insights – quickly. A request-based architecture simply won't provide that ability. What is needed is the ability to respond to generated data insights in real time, and better yet, predict next actions. This ability can be achieved by edge-native applications running asynchronously from the rest of the network.

Rather than using a static deployment model, an organization would now have a dynamic deployment model, meaning it is able to move things as needed. It would also need to have logic about when to move it and how.

That is really the frontier of what edge computing and edge-native applications can enable – the ability to dynamically move processing in the environment in a way that we've never seen before. That is a major challenge, which is why an organization needs a truly agile, loosely coupled architecture.

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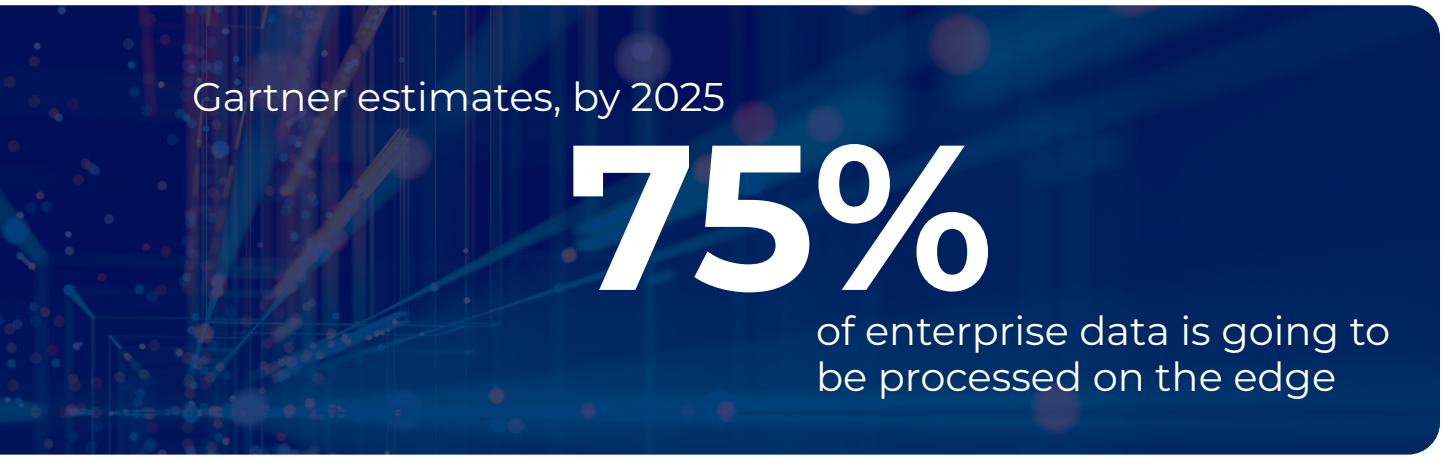
Why organizations need edge-native applications

One of the most important reasons that organizations need to invest in edge computing and edge-native applications is simple: the proliferation of real-time or streaming data that must be acted on as it is created.



The increase in such data is so great, in fact, that research firm Gartner estimates that by 2025, 75% of enterprise data is going to be processed on the edge. That is an astronomical change in where data is currently analyzed and acted on.

Toward that goal, many companies are looking to add edge capabilities to their existing product offerings, from SAP to Salesforce to ERP (enterprise resource planning) systems. Organizations that have existing cloud-based products are trying to determine how they can best make their products run on the edge as well. Many are making significant efforts to embrace this new edge environment.

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Edge-native applications offer several benefits in those efforts:

Real-time processing and analysis of data

Edge-native applications reduce the distance required for information to travel. Computing is done closer to the source of data creation, resulting in a much faster response time.

Resiliency

Resiliency is improved by the fact that access to the data is distributed across multiple edge nodes with, in most cases, each edge node dedicated to a specific set of data sources. If an edge node fails, you may lose access to the data sources it manages but the remainder of the system continues running. In contrast, if all data sources deliver their data to a cloud application, a failure of the cloud application brings the entire system down.

Increased performance and scalability

Whenever a new edge application or device is incorporated into the system, an edge-native development platform can enable dynamic deployment and redeployment of resources across the system.

Dynamic deployment

Organizations need the ability to add or change system components of applications and to have ease in moving data locally, to the cloud, or to the edge as needed. As a result, there is great interest in cloud-to-edge data migration, in which data that is normally hosted and running in the cloud is able to be moved to the edge in order to increase performance. This also enables more rapid distribution of business logic to edge nodes.

Reduced data security and privacy risk

Edge-native applications process data close to the local device on which it was created and only send data to a central database or cloud database when action is needed there. The result is that less sensitive data is shared between different points in the network, and this makes it less likely that data is put at risk. Image streams by cameras are a great example.

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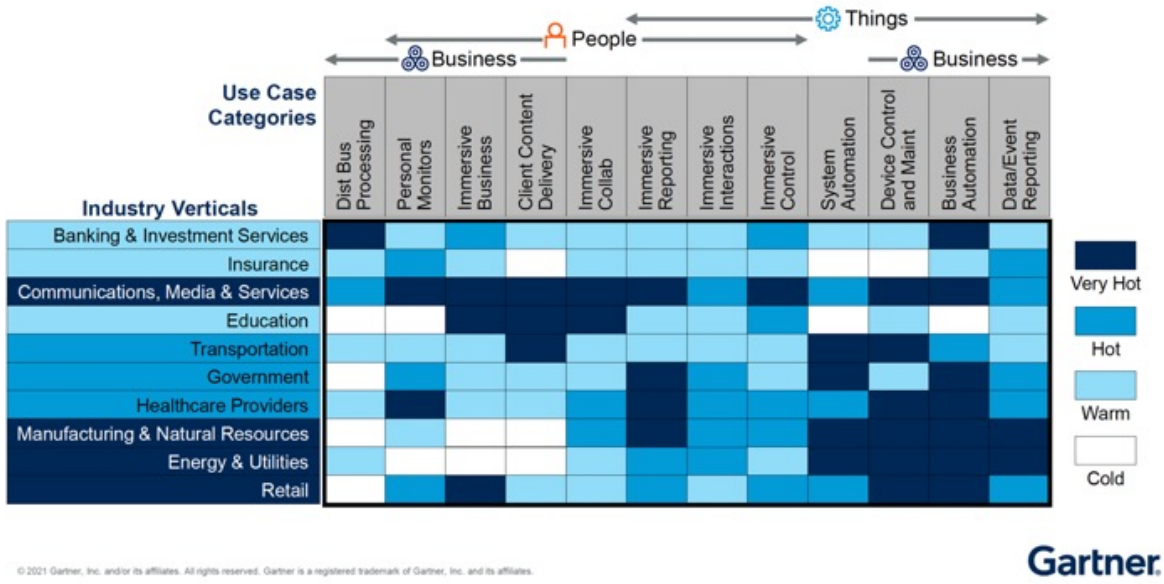
Examples of edge-native applications

If Gartner's prediction about the near future of edge-native applications is true, growth in that area will be significant. As a result, two groups of companies are taking an early lead in pursuing edge-native applications: cloud service providers and telecommunications organizations.

Cloud service providers do not see the edge as a competitive landscape but as a new potential market area. They have no intention of missing out on the benefits of edge computing and are establishing themselves early on as one of the primary providers of edge computing.

Edge Computing Industry Heat Map



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Gartner

The other group seriously interested in edge-native applications are telcos, which are looking to take their cloud model and run it on edge devices. Telcos also see the edge as a new data infrastructure frontier. Many are and will be rolling out MECs (multi-access edge computers), with the idea of eventually owning the edge computing space across all regions.

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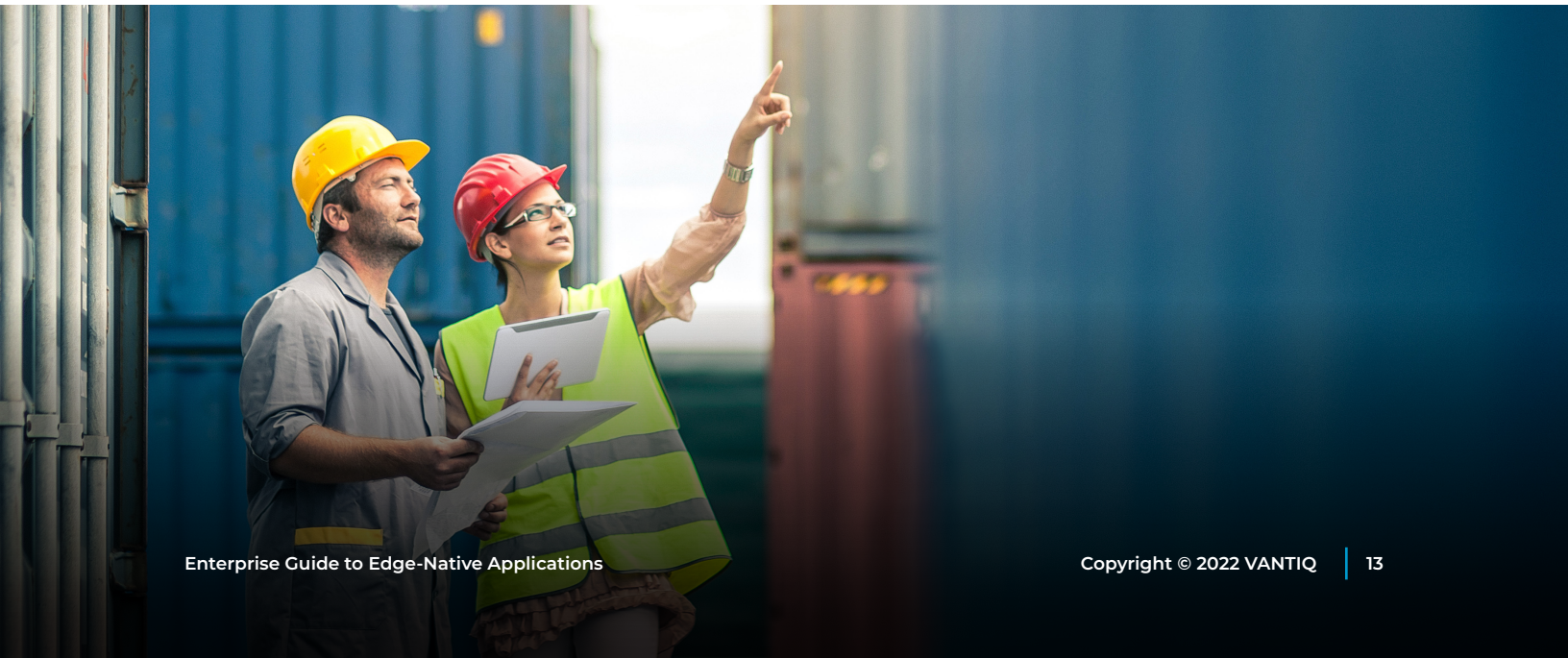
In the meantime, organizations wanting to see edge-native applications in action have several potential use cases they can look to.

As noted, retailers can take advantage of edge-native applications in brick-and-mortar stores. Use cases include the updating of electronic shelf labels, using smart shopping carts as both a point-of-sale system and for shopping list route planning, using object recognition cameras for digital inventory replenishment, and integrating immersive technologies such as augmented reality. The advantage of edge-native applications here is the ability to handle large amounts of real-time data and typically low latency requirements in these environments.

In the automotive industry, manufacturers can use edge-native applications in autonomous vehicles to monitor battery performance and optimize how environmental conditions impact batteries.

In the shipping industry, shippers and distributors can use edge-native applications within containers or on container ships to look for door-opening events or theft and to monitor conditions within containers for environmentally controlled goods.

Other devices taking advantage of edge-native applications include camera sensors with object recognition capabilities. These cameras have built-in edge processing capabilities that enable object recognition to run on the camera. Sensitive data can be filtered out by edge-native applications without having to share raw camera feeds or any object or facial recognition with a cloud server.



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Conclusion

The bottom line is that the amount of real-time data being created is skyrocketing, and organizations must be able to act on that data immediately in order to benefit from the insights it provides. Those organizations that invest in edge computing and edge-native applications now will have a decided advantage.

As research firm Gartner notes, the majority of data (an estimated 75%) will be created on the edge in as little as three years from now. That makes it important that organizations immediately start investigating how they can take advantage of edge-native applications.

Part two of this white paper series will help organizations in that quest. You will learn how to build edge-native applications; how to develop edge-native strategies; how to measure the success of edge-native investments; and best practices for success.

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About Vantiq

Vantiq is the leading low-code platform for building and deploying real-time distributed solutions. Built on a next-generation event-driven architecture, Vantiq enables highly scalable and low-latency analysis of real-time streaming data from IoT devices, cameras, and enterprise systems to drive situational awareness for safety, security, and operational efficiency. Vantiq was founded in 2015 by software veterans Marty Sprinzen and Paul Butterworth, co-founders of Forte Software.

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