VMware Software-Defined Edge for Telco

Unleash enterprise transformation, new telco revenue streams with automated, programmable edge services
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Across every industry, businesses are investing in new digital tools to transform operations. Increasingly though, those operations happen far from centralized data centers out at the edge, where connections can get spotty and resources constrained.

How can enterprises overcome these barriers and bring AI, automation, and other next-gen applications to all their distributed locations? Now, communication service providers (CSPs) have an answer: the software-defined edge (SDE).

Read on to learn how SDE can transform both enterprise operations and telco revenues, and how VMware can help you deliver it.

A Rising Tide of Digital Transformation

In the drive to boost efficiency and gain a competitive edge, enterprises worldwide are adopting new data-driven operating models and operational technology (OT) systems. Using real-time applications like AI analysis and decision-making, factory automation, digital twins, and many others, these businesses aim to optimize every aspect of operations. Such efforts hold enormous potential, but they create new technology requirements that legacy architectures can’t support.

Gartner predicts that by 2025, half of enterprise data will be generated outside the centralized data centers where most enterprise and cloud applications are hosted.¹ This imbalance creates a unique opportunity. Organizations that can collect, analyze, and act on data directly at distributed locations can gain a significant competitive advantage. Service providers that enable those capabilities—that deliver real-time intelligence everywhere businesses need it—can play a larger and more valuable role in their customers’ mission-critical operations.

If you’re part of a CSP organization seeking to capitalize on the growing enterprise edge opportunity, the time to act is now. But you won’t succeed with yesterday’s one-size-fits-all managed services. You’ll need more customizable, application-aware delivery models and the ability to extend those models everywhere customers need them on demand. Enter the software-defined edge.

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¹. Gartner. Gartner research: Trusted insight for executives and their teams, July 24 2023
². Market.us, Global Enterprise IOT Market by Offering, April 2024
Inside the Edge Opportunity

What exactly is the edge?
“Edge” encompasses both:

- Location: The enterprise edge lives outside centralized data centers, and often far from most enterprise computing and IT resources.
- Function: Edge applications analyze and act on data at distributed locations close to where the data is generated, often in real time.

These characteristics make edge models distinct from traditional applications, which typically backhaul data from distributed sites to a centralized data center for processing and analysis.

Introducing the Software-Defined Edge

SDE provides the digital infrastructure for bringing right-sized cloud computing infrastructure to dispersed locations, close to where endpoints generate and consume data. It provides edge applications with the programmable telco network, automatically providing each distributed workload with the compute and connectivity it needs, while managing everything as a software-defined overlay. Enterprises can use SDE to transform business operations, while telco partners manage everything on their behalf. Meanwhile, telcos can optimize their networks, differentiate their offerings, and deliver more value to their customers’ businesses.

For telcos, SDE represents both a foundation for network modernization and a new category of service offering. As CSPs embrace infrastructure cloudification and disaggregation, SDE provides essential automation for managing distributed RAN and core resources at scale. Once deployed, the same SDE framework also provides a platform for delivering new enterprise edge solutions that combine cloud computing with connectivity and other telco-managed services. CSPs can offer connectivity, security, local compute and storage resources, and remote manageability as a comprehensive edge solution that automatically meets the requirements of each distributed application workload in real time.
Why can’t current architectures meet emerging edge requirements?
For real-time OT applications like robotic automation, autonomous vehicle control, extended reality (XR), and many others, routing data back through a centralized data center would introduce too much latency. Others, like computer vision for quality control or retail theft prevention and remote asset monitoring generate so much data that the cost to transport and process it all centrally would be exorbitant.

How can enterprises solve this problem?
The answer is to bring cloud intelligence out to distributed enterprise sites, but this is easier said than done. Edge locations, whether owned by telcos or enterprises, can vary greatly. A customer factory, an emergency vehicle, and a nearby cell tower can all act as edge sites, but will have very different resources available depending on size, location, connectivity, and onsite IT support. It’s incredibly difficult to centrally manage edge services if each location requires specialized hands-on provisioning and management.

How can service providers help?
When it comes to managing connectivity—ensuring that distributed locations have the right network and security to meet local requirements—many enterprises already work with CSPs to create flexible network overlays in the form of software-defined wide-area networks (SD-WAN). Now, a similar intelligent overlay model can be applied to manage distributed workload processing with a software-defined edge. And no one is better equipped than service providers to deliver it.

An SDE solution provides three overarching capabilities

• Right-size infrastructure
  The most transformative edge use cases have very different real-time requirements—and different local resources available to meet them—than legacy applications. This is because edge workloads are both highly specialized and tightly constrained by local hardware resources. While edge workloads can be virtualized, the scale of consolidation that can be achieved is around 6:1 (rather than the typical 100,000:1), because edge application workloads tend to have far more specialized requirements than those in a typical data center. As a result, automating and optimizing edge resources requires a deep understanding of each workload. Fortunately, we have a highly successful model for achieving this: SD-WAN. Like SD-WAN, SDE provides application-aware intelligence to understand what each distributed workload requires, in real time, to meet mission-critical application requirements.

• Zero-touch orchestration
  As enterprises and CSPs launch new digital innovations at dispersed locations, their sprawling IT environments grow more challenging to manage, especially at sites with limited IT resources. SDE replaces traditional push-based management with an intelligent overlay across the distributed network. Using zero-touch provisioning and pull-based orchestration, edge applications can request network and computing resources, and SDE automatically delivers what each workload needs, when it needs it. From providing access to Git repositories to enabling real-time configuration and updates, edge applications can act as their own administrators to enable even the most performance-sensitive use cases.

• Programmable connectivity
  SDE links distributed edge sites with the telco network to allow applications to program the network directly. It identifies the latency, throughput, and other characteristics that each workload needs and provides the optimal connectivity—whether wired, terrestrial wireless, or non-terrestrial/satellite—to enable it, in real time. Using open APIs accessed through the SDE overlay, enterprise applications will be able to dynamically program telco networks to create new slices with dedicated resources, prioritized traffic management, and embedded security to meet unique requirements.
Unleash Telco Transformation

Most enterprises already work with a telco partner to provide physical links to distributed edge locations, and often, managed SD-WAN. Now, by augmenting WAN connectivity with SDE, CSPs can create comprehensive edge offerings to deliver more advanced digital capabilities wherever customers need them.

CSPs bring extensive experience managing vast networks at scale, with a physical footprint that extends from remote customer locations to the cloud, and everywhere in between. By working with a telco partner, enterprises can focus on using new edge capabilities under a “Lean IT” model, while the CSP manages the distributed environment. CSPs can bundle compute, connectivity, and intelligent orchestration—along with security, collaboration, managed Wi-Fi, fixed wireless access, and other add-ons—into a complete next-gen edge offering with a single monthly bill.

The SDE Advantage

What can telcos do with new SDE capabilities?

• **Generate new revenues**
  Facing rising costs and flat revenues, CSPs need new options to increase margins and monetize network investments. SDE provides an ideal framework to enable new offerings in industrial and OT automation, Internet of Things (IoT), and other high-value enterprise services.

• **Deliver more value**
  The SDE toolkit can deliver more advanced, software-programmable edge solutions that other ecosystem players can’t duplicate. CSPs can enable advanced distributed use cases, delivering the throughput and latency that next-gen OT applications require under service-level agreements (SLAs).

• **Modernize the network**
  Enterprises continue adopting cloud-native software that can communicate with applications and clouds programmatically. But most telco networks still can’t participate in the cloud-native world, cutting them out of this growing ecosystem. With programmable edge solutions, CSPs can accelerate open cloud transformation while optimizing their own distributed resources.

• **Simplify distributed management at scale**
  SDE enables CSPs to automatically provision and manage all distributed edge devices and infrastructure remotely. Using a common intelligent overlay, they can visualize and control the complete distributed environment—LAN, WAN, infrastructure, endpoints, and more.

• **Increase visibility**
  SDE provides deep analytics and insight into both telco and customer edge applications. Administrators can quickly, easily detect and remediate problems—especially important at distributed edge sites with little or no onsite support.

Meanwhile, enterprise customers using telco offerings can improve the stability and performance of critical business and OT applications at distributed sites, while a telco partner manages everything on their behalf. They can apply real-time AI decision-making, computer vision, XR, and other innovations everywhere they’re needed across distributed factories, branches, vehicles, and other edge locations. Best of all, enterprises can focus on using applications, instead of managing and supporting them.
Unlock New Enterprise Use Cases

What kinds of opportunities exist for new telco offerings and revenue streams around emerging edge use cases?

Industrial/Manufacturing
- **AI-enabled computer vision** to inspect quality in real time and identify threats to worker safety.
- **Predictive maintenance** using smart sensor data to improve machine uptime as much as 50%.
- **Grid optimization** with self-monitoring systems that make real-time data-driven decisions to maximize uptime and efficiency.
- **Digital twin analysis** for OT environments to reduce downtime, maintenance, and energy consumption.
- **Extended reality** to empower remote onsite workers to perform more advanced installations and maintenance.

Retail
- **AI-enabled computer vision** for loss prevention, real-time inventory monitoring, and customer heat maps.
- **Personalized customer experiences** such as real-time targeted marketing and digital mirrors that display alternate product options.
- **Reduced in-store infrastructure** by consolidating point-of-sale (POS) and back-office systems.

Healthcare
- **Remote monitoring** for patients in hospitals, assisted living facilities, and at-home care to improve patient safety and caregiver flexibility.
- **Assisted diagnosis** that puts real-time AI/ML analysis of patient data at the fingertips of clinicians in the field for safer, more accurate decisions.
- **Remote/assisted surgery** using real-time computer vision and AI-assisted surgery, empowering expert specialists to treat patients at remote locations.

VMware SDE Portfolio

As a longtime partner to both CSPs and enterprises, VMware can provide everything telcos need to capitalize on the growing edge opportunity. Our comprehensive SDE portfolio provides the “glue” connecting telco networks to distributed enterprise edge environments and enables end-to-end management with a flexible software-defined overlay.
Right-size Infrastructure: VMware Edge Compute Stack

VMware Edge Compute Stack (ECS) provides the automated right-sized compute infrastructure required by distributed next-gen enterprise and OT applications. It automatically shrinks the edge compute stack to the most efficient possible hardware footprint for each location—an essential capability when managing hundreds or thousands of heterogeneous edge sites at scale. VMware ECS provides:

- **Edge-optimized runtime and orchestration platform** to enable frictionless management of both real-time and non-real-time edge applications and infrastructure.
- **Automated right-sizing** to make the best use of available infrastructure across disparate edge locations—from factories to telco PoPs to cell towers.
- **Pull-based architecture** that simplifies operations by automating most aspects of edge infrastructure maintenance, even in sites with limited connectivity.
- **Flexible cloud architecture** that allows telcos to support evolving compute and application needs by simply updating VMs and containers.
Zero-Touch Orchestration: VMware VeloCloud SD-WAN, Edge Cloud Orchestrator, and Security

To provide dynamic real-time orchestration of distributed edge resources, VMware builds on its longstanding leadership in SD-WAN and cloud. Our VeloCloud portfolio combines the industry-leading VMware VeloCloud SD-WAN solution with VMware Edge Cloud Orchestrator (VECO), along with our secure access service edge (SASE) and remote access solutions, to enable secure zero-touch provisioning and management. This enables CSPs to create more advanced, customized edge solutions, while simplifying management of thousands of telco and customer edge sites at scale.

- **VeloCloud SD-WAN** uses any underlying telco-provided WAN link at each site (including 5G/LTE, fixed wireless access, satellite, broadband, MPLS, and other connectivity options), bundling them together into a programmable intelligent overlay. On top of secure connectivity, it provides traffic prioritization, remediation, problem detection, and more.

- **VMware Edge Cloud Orchestrator** provides single-pane-of-glass management of distributed edge resources and solution components (SD-WAN, ECS instances, security, and more) across all telco and customer locations. Applying both pull- and push-based administration, it extends SDE intelligence to all remote sites, including those with limited hardware and onsite support. VECO uses advanced analytics to track the health and status of all edge resources to provision, connect, and secure each workload with the right set of policies to automatically meet real-time application requirements. It also simplifies lifecycle management of distributed edge resources, including enabling CSPs to create site profiles once and scale them out to thousands of locations.

- **VMware VeloCloud SASE, secured by Symantec** combines VeloCloud best-in-class SD-WAN capabilities with Symantec Security Service Edge (SSE) services for secure, reliable, optimized branch access.

- **VMware VeloCloud SD-Access** provides simple, cloud-managed Zero Trust Network Access (ZTNA) capabilities to securely connect remote users and devices anywhere, anytime.
Network Programmability: VMware Telco Cloud Platform

VMware Telco Cloud Platform (TCP) provides the programmable network foundation for SDE. TCP facilitates network programmability by enabling telco networks to speak the same cloud-native language as the enterprise applications running on them. Now, the network can expose the compute, connectivity, and RAN resources available to each edge location via APIs. Applications can then program the edge to provide the right resources to each workload, in real time. VMware TCP enables:

- **Faster, simpler cloud transformation** with a flexible horizontal platform optimized for core and RAN workloads, with cloud-smart automation and end-to-end orchestration and management.
- **End-to-end visibility and assurance** across RAN and core, with root-cause analysis and remediation.
- **Advanced edge intelligence**, continually tracking health and status of all distributed networks to inform SDE decision-making.
- **Network programmability and open APIs**, with a large and growing partner ecosystem to support innovative edge use cases.
- **Best-in-class multi-vendor partner ecosystem** spanning core and RAN, and even third-party applications running on the RAN Intelligent Controller (RIC).
Every day,
VMware works with leading enterprises in key verticals around the world, as well as the cloud and telco service providers supporting them. We understand the challenges that businesses are struggling with and the emerging edge use cases they’re counting on to transform their operations. As a longtime trusted partner to both telcos and enterprise, we’re ready to bring that knowledge to you.

To learn more about how you can tap into the next-generation edge to deliver new innovation and value to enterprise customers, explore more about:
- Software-defined edge
- Telco cloud transformation

VMware: A History of Telco Innovation
Why should CSPs work with VMware to capitalize on the growing enterprise edge opportunity? Because we understand digital transformation—for both telcos and their enterprise customers.

VMware has been helping CSPs cloudify their networks to unleash new agility and automation for years. That journey starts in core networks, where solutions like VMware TCP turn traditional telco infrastructure into a flexible horizontal cloud platform, with visibility and cloud-smart automation end to end. More recently, we brought cloud flexibility and programmability to radio access networks with VMware TCP RAN. Now, with the VMware SDE solution, we’re extending the programmable telco network—and the cloud transformation it enables—all the way out to distributed customer locations.

When you work with VMware, you benefit from:
- **Groundbreaking intelligent overlay**: VMware VeloCloud SD-WAN provides the intelligent overlay needed to bridge distributed edge compute and networking infrastructure with the programmable telco network, setting VMware apart from any other vendor in the space.
- **Proven orchestration intelligence**: VMware’s asynchronous, zero-touch, pull-based orchestration approach is already widely adopted and successful in large-scale distributed networks. Now, we’re bringing the same capabilities to SDE.
- **Industry-leading SD-WAN solution**: VMware VeloCloud is the world’s leading SD-WAN, with a huge global customer base that already knows and loves the solution. By selling SDE as an extension to your customers’ preferred SDN solution, you can quickly expand your portfolio and foothold among enterprise customers.
- **Targeted use case solutions**: Some CSPs have tried other approaches to building out multi-access edge computing (MEC) infrastructure but struggled to generate business. With VMware, you can take the opposite approach: starting with specific customer and industry needs, and then assembling a complete solution—infrastructure, orchestration, and programmable connectivity—to meet them.