Inside the Telco Cloud

Quantified realities from service provider network transformation case studies

vmware®

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Unlock Telco Cloud Transformation

In the race to capitalize on new digital services, communications service providers (CSPs) need new kinds of tools. They need the flexibility to continually reassemble network resources in new ways. And they need the agility to quickly create and update service offerings as new opportunities arise.

In short, CSPs need to be able to operate more like hyperscale cloud providers. They need a telco cloud.

Today, VMware is helping CSPs tap into new cloud capabilities to transform their businesses. With the VMware® Telco Cloud™ portfolio, we can help you implement a unified, multi-vendor, multi-cloud platform for new software-driven services. Through the transformation from 4G to 5G, we can help you automate operations, accelerate service delivery, monetize your 5G and edge investments, and bring your customers a new generation of dynamic, differentiated services.

Capturing the Growing Opportunity

Worldwide digital transformation and the rise of 5G brings incredible opportunity for service providers. With new 5G network capabilities, CSPs will fuel new applications and business models in the digital enterprise, industry, the Internet of Things (IOT), and many other areas.

Mobile Communications Market Transformation—By the Numbers

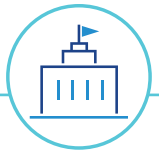
$13.1 trillion
in economic sales

$10 trillion
of value

75%
of new private networks

50+ billion
IOT-connected devices

5G will generate $13.1 trillion in economic sales enablement by 2035, supporting over 22.8 million jobs.[1]



More than $10 trillion of value from digitalization in five key industries over the next decade depends on the telecom industry.[1]

At least 75% of new private networks in 2022 will be 5G, up from 31% at the end of 2020.[2]

50+ billion IOT-connected devices are expected by 2028.[3]

Yet 5G also brings significant challenges. To deliver new digital services with the speed and scale customers expect, CSPs must radically reimagine their networks and operations. They will also need to make major capital investments in new technology—even as they continue to face rising costs to support existing network services.

1. World Economic Forum, How superfast internet will democratise computing and help close the digital divide, April 2021.
2. Analysys Mason, Analysys Mason Research's telecoms, media and technology predictions for 2022, November 2021.
3. Grand View Research, Telecom Services Market Size, Share and Trends Analysis Report by Service Type (Mobile Data Services, Machine-To-Machine Services), by Transmission (Wireline, Wireless), by End-Use, by Region, and Segment Forecasts, 2021-2028.

$1.1 trillion

The amount mobile operators will spend on CapEx, 2020–2025

$990 billion

The cumulative CapEx CSPs will allocate to 5G, 2020–2027

20–50%

The amount CSPs can expect network traffic and infrastructure spending to increase

Rising Costs, Growing Challenges

- **$1.1 trillion:** The amount mobile operators will spend on CapEx between 2020 and 2025, with more than 75% of that related to 5G.[4]
- **$990 billion:** The cumulative CapEx CSPs will allocate between 2020 and 2027 to 5G related network investments—65% of total CSP CapEx during this period.[2]
- **20–50%:** The amount CSPs can expect network traffic and infrastructure spending to increase even if they delay 5G investments, based on historic trends.[5]

There is only one way to navigate these challenges and capitalize on the 5G opportunity: CSPs need to build more flexibility, agility and automation into their network and business operations. They need to mirror the techniques used by the most successful hyperscale technology companies in the world. They need to embrace the telco cloud.

Welcome to the Telco Cloud

A telco cloud is a next-generation, distributed network architecture that bridges the world of traditional communications networks with state-of-the-art cloud architectures and operations. Telco clouds combine:

- **Software-defined infrastructure** to provide greater flexibility and control over network infrastructure and resources
- **Network functions virtualization (NFV)** to decouple network functions from physical hardware while meeting performance requirements of next-generation services
- **Cloud-native technology** to run telco network resources like cloud applications, with increased resiliency, flexible upgradability and massive scalability
- **Automation and orchestration** to drive down complexity and enable CSPs to control resources distributed across thousands of sites and multiple clouds
- **Service assurance** to simplify and optimize operations end-to-end

4. GSMA Intelligence, 2025 capex outlook (2020 update): the $1 trillion investment, March 2020.
5. McKinsey & Company, The road to 5G: The inevitable growth of infrastructure cost, February 2018.

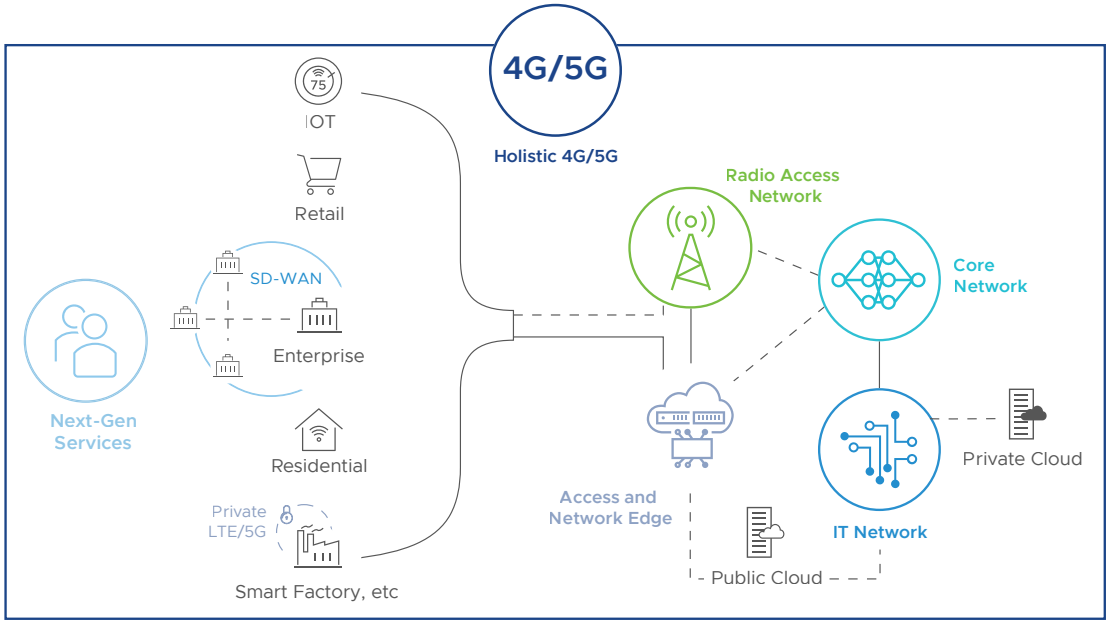
Deliver a broader set of new and traditional communication services, and the network functions that enable them, over a common virtualized infrastructure

These technology capabilities converge within a distributed computing network that can extend cloudified resources end-to-end across a CSP's footprint: in data centers, core networks, the radio access network (RAN), edge sites and public clouds.

The telco cloud advantage

The term "telco cloud" arose to describe the growing adoption of multi-cloud computing in the telecommunications industry. It highlights the huge change that comes when CSPs transition away from traditional network infrastructures built from vertically integrated, proprietary hardware, and seek to become digital service providers (DSPs) using cloud-based technologies.

The transition to telco cloud represents a profound evolution in the way telco networks are set up, run and managed. Service providers gain new, automated ways to deploy virtualized and programmable network infrastructure and to take advantage of artificial intelligence (AI) and machine learning (ML). And they adopt innovative cloud business practices that change the way networks operate.



With a telco cloud, you can deliver a broader set of new and traditional communication services, and the network functions that enable them, over a common virtualized infrastructure. Network functions are no longer tied to a piece of hardware. Instead, you can instantiate virtual or cloud-native network functions—such as 5G core and RAN functions—wherever they're needed, and continually reassemble them in new ways to meet new needs.

With these capabilities, a telco cloud breaks down many of the barriers that restrict CSP growth by providing the agility, performance and scalability needed to thrive in the digital era. You can modernize your operations and business, and you can build future-ready networks to handle not just today's but also tomorrow's most dynamic applications.

VMware: Leading the Telco Cloud Transformation

At VMware, we're helping CSPs around the globe reimagine their networks and businesses by tapping into new telco cloud capabilities. Why do so many operators partner with us? First, because we provide some of the best digital capabilities in the industry. But just as important, our DNA as a company—our basic reason for being—aligns closely with CSPs' transformation vision for a more flexible and agile future.

We combine extensive experience in traditional telco environments with state-of-the-art software and multi-cloud capabilities. We were an early pioneer in virtualizing network functions and disaggregating them from dedicated hardware, enabling software-driven control.

We know how to bring modern, cloud-centric approaches to complex traditional environments while minimizing risk. And, unlike many in this space, we've never been beholden to any vendor's solution or any hyperscaler's cloud. We provide a horizontal platform with multi-vendor, multi-cloud capabilities. So, you always have the freedom to work with the partners and cloud providers you choose.

A sustainable approach to software-centric architectures

From a global responsibility perspective, service providers around the world make transformation decisions while carefully weighing sustainability measures to ensure they have a positive impact on the planet. From a financial perspective, CSPs appreciate that their energy consumption constitutes between 20 and 40% of network OpEx.[6]

As the move to 5G is expected to increase energy consumption by 150–170%, CSPs appreciate that making transformation decisions with sustainability measures in mind will affect their bottom line.[7] If it works smarter and manages workloads better, some sources estimate that the information and communications technology (ICT) industry can prevent emissions at a rate of 10 times its own footprint by 2030.[8]

The ICT industry can prevent emissions at a rate of

10 times

its own footprint by 2030.

6. GSMA, Energy Efficiency: An Overview, May 2019.
7. Vertiv, Actionable Steps for Managing 5G Energy Consumption, July 2021.
8. GeSI, #SMARTer2030: ICT Solution for 21st Century Challenges, June 2015.

1.2 billion

metric tons avoided

80%

reduction in time

52%

reduction of RAN emissions

The above stats are staggering, so with our customers' sustainability goals in mind (as well as our own), we set out to make sure service provider networks would be as green as possible. VMware's 2030 Agenda illustrates our dedication to green network operations, but if you peel back the onion, you'll find there are several areas in which VMware helps CSPs with steep sustainability goals.

Emissions

1. **347,968,000 MWh energy savings and 1.2 billion metric tons of carbon emissions avoidance** from 2003 to 2019 was estimated by IDC based on the IT infrastructure efficiencies from VMware technologies.[9] VMware virtualization platforms reduce the amount of hardware required to operate and grow business operations.
2. **Up to 80% reduction in the time it takes to deploy cell sites, in turn reducing emissions-producing resources to support deployments** thanks to VMware Telco Cloud Automation™.[10] The platform automatically packs virtualized RAN functions onto servers, which reduces the number of servers required and decreases the carbon emissions associated with having to drive out to cell sites and deploy and test equipment.
3. **Up to 52% reduction of RAN network emissions** with intelligent workload placement and migration. A proof-of-concept demonstrated at MWC 2022 showed how VMware Telco Cloud Platform™ can turn infrastructure telemetry into end-to-end AIOps for the data center to perform context-aware resource allocation based on power grid carbon intensity. The optimized algorithm emits 1,090 fewer grams of greenhouse gases compared to business-as-usual—a savings of up to 10.5%.[11]

9. IDC, Enabling More Agile and Sustainable Business Through Carbon-Efficient Digital Transformations, August 2020.
10. VMware internal source, results will vary and are not guaranteed.
11. VMware, Placing Telecom Workloads to Minimize Energy Consumption and Reduce Carbon Emissions, February 2022.

Energy efficiency

1. **Flattened worldwide data center energy consumption** over the past decade despite more than a twelvefold increase in Internet traffic and eightfold increase in workloads thanks to virtualization, a technology pioneered by VMware in 1998.[12]
2. **Compute lifecycle management improvements yielding power savings** from hypervisors that shut down resources when not needed, consolidate workloads on fewer resources as they age, send low-requirement workloads to a server as it ages, and make resources last longer through dynamic lifecycle management.

3 years'
worth of TCO savings

3. **Three years' worth of total cost of ownership (TCO) savings** as modeled by ACG. The model illustrates the power and emissions savings based on unique CSP network characteristics as enabled by VMware Telco Cloud Platform RAN, VMware RIC and xApps and rApps from the VMware RIC partner ecosystem.[13]
4. **A traffic-based RAN energy savings rApp** is in trial with a customer. The app reduces energy consumption by selectively activating and deactivating RAN frequency layers based on traffic and loading in the network. The app's role in energy reduction deactivates capacity layers when the traffic is light, such as during the night, leaving only the coverage layer. Conversely, when traffic ramps up, the app can progressively activate the capacity layers.

25% savings
on power and carbon

5. **25% power and carbon savings** for telco and edge environments from deep cooling technology. Based on AI and big data technologies, DeepCooling—codeveloped with Quarkdata and Intel—accurately predicts and matches the optimal cooling in the data center. The technology uses equipment operation metrics in the cooling chain to model energy usage. It monitors dynamic environments to adjust parameters in each cooling system link, in turn saving power and reducing costs.[14]
6. **2x spectral capacity for about the same electricity investment** with VMware Telco Cloud Platform RAN, VMware RIC and Cohere Technologies xApp for spectrum efficiency, which has delivered up to 2x efficiency in a lab test while saving 30% spectrum through app modernization.[15]

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12. IEA, Data Centres and Data Transmission Networks, September 2022.
13. ACG Research, Economic Benefits of the VMware Telco Cloud Automation and Horizontal Infrastructure, November 2020.
14. Intel, Carbon-Neutral Computing Technology for Sustainable Economic Development—Emission Reduction Innovation for Data Centers in the Context of New Infrastructure Development, August 2021.
15. Vodafone, Vodafone and partners boost 5G capacity in the first multi-vendor RAN intelligent controller implementation, June 2021.

Pioneering Telco Transformation with VMware—By the Numbers

265+

certified VNF/CNFs in our open ecosystem to fuel innovation[16]

Layer 2–7

security simplified with multilayer control

8 leadership roles

with major industry alliances and associations

Up to 38%

OpEx savings by breaking down technology silos with a multi-cloud platform[13]

Accelerate Cloud Transformation

The VMware multi-vendor, multi-cloud platform for software-driven services provides a horizontal foundation for dynamic and automated operations. This foundation accelerates your network transformation—which, in turn, accelerates service delivery.

But technology is only part of our story. We've also invested in a broad telco cloud partner ecosystem to help you monetize your investments more quickly.

When you work with VMware, you gain access to more than 220 virtualized and containerized network functions (VNFs and CNFs) from diverse industry leaders, all certified and ready to deploy on day one. That means most of the integration effort and tooling you'll need to start delivering next-generation cloud-based services is already done. Instead of needing months to integrate and deploy new network technologies, you can do it in a fraction of the time.

Four Pillars of Telco Cloud Transformation

The VMware Telco Cloud portfolio combines a suite of products and services to help you modernize your network and RAN. You can use the power of AI-driven automation and orchestration to tap into multi cloud platforms, multiaccess edge computing (MEC), private 5G and other next-generation solutions.

The VMware Telco Cloud portfolio is built to help you succeed in four key transformation imperatives:

Modernize the network

Disaggregate the RAN

Enable multi-cloud programmability

Monetize the distributed edge

16. VMware, Velocity with Variety: The VMware Ready for Telco Cloud Program Surpasses 265 Certified Network Functions, August 2022.

Modernize the Network

Network modernization remains the centerpiece of CSP transformation, and the key to breaking down technology silos and eliminating geographic limitations. By modernizing your environment with virtualization and cloud-native technologies, networks become agile, portable and dynamic, with improved uptime and efficiency.

Now, you can realize the same benefits that virtualization and cloud-native technologies have enabled in the world's largest data centers in telco networks. With automated workload portability across a multi-cloud environment, you can free your network from the limitations of rigid hardware centric operating models. And you can deliver network resources as a service and monetize your network in new ways.

VMware Telco Cloud Platform

VMware Telco Cloud Platform helps you deploy CNFs and VNFs side-by-side within the same environment, and automate operations from core, edge, to public cloud. The platform's multi-vendor ecosystem of certified network functions makes it easy to onboard and deliver next-generation services and stake a leadership position in new markets and business models.

- Telco Cloud Platform—Public Cloud
- Telco Cloud Platform RAN

Telco Cloud Platform in Action

- DISH chose VMware to deploy the nation's first 5G, cloud-native open RAN.
- Telia Company selected VMware Telco Cloud Platform as the common network horizontal digital platform on top of which 4G and 5G core network functions—both virtualized and containerized—will run.
- For Singtel, the VMware platform provides flexibility to deploy VNFs from multiple vendors on a consistent, open platform that suits its unique needs.

Powerful Outcomes[17]

VMware Telco Cloud Platform customers gain significant value from the platform. Here are examples from several of our customers:

- **40% improvement** in time to design, build, test and deploy services
- **50% cost savings** for deploying new services
- **Short three-month deployment time** for new integrated virtual managed services solution.

17. VMware internal source, results will vary and are not guaranteed.

VMware Telco Cloud Infrastructure in Action

- Virgin Media O2 uses VMware Telco Cloud Infrastructure to rapidly design, build, test and implement VNFs, boosting the delivery of new services.
- Telia Company uses VMware to create a common network horizontal digital platform on top of which 4G and 5G core network functions—VNFs and CNFs—will run across 24 sites in six countries
- Vodafone selected VMware to help complete the rollout of network virtualization infrastructure across its European business and 21 markets in total.

VMware Telco Cloud Automation in Action

- Vodafone selected VMware to deliver a single platform to automate and orchestrate all workloads running on its core networks across Europe, starting with 5G standalone.
- Rogers leverages VMware to unify their network and IT infrastructure to enable great efficiency economies and reduce costs

VMware Telco Cloud Infrastructure

VMware Telco Cloud Infrastructure offers a consistent, software-defined horizontal infrastructure to create multi-cloud 4G core services, with optimized performance and resiliency. You can improve scale and automate lifecycle management of virtualized network resources, with built-in security that protects your infrastructure and services in multitenant environments. VMware Telco Cloud Infrastructure™ paves a clear and simple path toward cloud-native 5G while protecting current infrastructure investments.

Powerful Outcomes[18]

VMware Telco Cloud Platform customers gain significant value from the platform. Here are examples from several of our customers:

- **50% cost savings** for deploying new services
- **40% improvement** in time to design, build, test and deploy services
- **50% faster** time to market above legacy deployments
- **0 performance tax**[19] when compared to bare-metal deployments

VMware Telco Cloud Automation

Telco Cloud Automation brings VMware's years of experience in cloud management, networking, orchestration and automation to your telco modernization journey. A multi-vendor-ready platform, VMware Telco Cloud Automation accelerates time to market for network functions and services, reducing deployment times from months to minutes.

Powerful Outcomes[18]

- **15% improvement** to configuration management, thanks to end-to-end provisioning and configuration
- **344% return on investment** (ROI) over 5 years[13]
- **23% TCO** savings over 5 years[13]

18. VMware internal source, results will vary and are not guaranteed.
19. VMware, vSphere Performance Equivalent to Bare Metal for RAN Workloads, September 2021.

VMware Telco Cloud Service Assurance

VMware Telco Cloud Service Assurance gives you the holistic visibility and operational intelligence you need to manage complex, multi-vendor virtual and physical environments, from core to edge to RAN, in a single pane of glass. The solution combines automated service assurance with fault management, performance management, service management, root cause analysis and service impact analysis, all in one platform.

VMware Telco Cloud Service Assurance in Action

- DISH works with VMware to manage service assurance across its multi-cloud network with software-centric approaches that allow it to create and deliver customized services.

Powerful Outcomes[20]

95% faster issue remediation, thanks to automated problem identification

99.7% real-time alarm identification **increased customer SAT score**, translating to ~$9M additional revenue per year.

2x efficiency gains through reassignment of 75% of the NOC staff.

20. VMware internal source, results will vary and are not guaranteed.

Disaggregate the RAN

Disaggregation brings cloud-first principles to the RAN, making it far more dynamic and flexible than yesterday's RANs. With RAN network functions implemented in software running on commodity servers, you can control resources more easily across thousands of distributed sites. You can reduce cost and space requirements compared to dedicated appliances—without sacrificing performance. And you can tap into open, multi-vendor approaches to RAN innovation.

VMware Telco Cloud Platform RAN in Action

- Telecom Italia (TIM) leverages VMware for end-to-end network function virtualization and automation in their O-RAN expansion plans.
- DISH uses VMware software in their RAN to serve as a powerful foundation for their cloud-native, software-defined 5G network.
- NTT DOCOMO leverages VMware virtualization expertise to bring agility to their transforming RAN network.

VMware Telco Cloud Platform RAN

Designed specifically for 5G RAN, VMware Telco Cloud Platform RAN helps you drive down complexity across rapidly increasing distributed RAN sites, and simplify operations and scalability. VMware's RAN ecosystem handles the complexities of RAN function integration and optimizes performance and resource utilization, so you can focus on monetizing your RAN resources more quickly.

Powerful Outcomes[21]

- **Less than 10ms latency** equivalent to bare-metal solutions, ideal for telco RAN workloads
- **Major reduction of vRAN function deployment time** accelerates the scale-out of distributed cell sites

21. VMware internal source, results will vary and are not guaranteed.

Enable Multi-Cloud Programmability

Modernizing your network and business involves cloudifying your environment—and likely working with multiple internal and external clouds. VMware can help you enable programmability across your multi-cloud environment, simplifying network operations and automating service delivery across end-to-end network resources.

By using an architecture that's multi-vendor and multi-cloud by design, you can protect your business against service disruption, improve scalability and preserve flexibility to work with the vendors and partners you choose.

VMware RAN Intelligent Controller

With the VMware RAN Intelligent Controller (RIC), you can modernize your RAN to be open and programmable. Our open, standards-aligned RIC solution disaggregates control and management functions from the underlying data plane. You gain a more flexible and future-proof RAN, with the ability to continually introduce new best-of-breed, multi-vendor software solutions.

Powerful Outcomes[21]

The RIC allows application developers to tap into network data, process it and modify RAN behavior. This process opens the RAN to innovation with unlimited potential including solutions proven to improve spectrum utilization by up to 2x in 4G and 5G networks.

VMware RIC + MU-MIMO xApp
increase cell capacity by up to 2x
in low-bands and up to 4x in mid-bands.

Energy Saving rApp activated on VMware RIC
reduces cell power consumption by up to 15%.

VMware RIC in Action

- DISH runs their RAN workloads on top of VMware platforms and are trialing the RIC to help create custom solutions from our vibrant ecosystem of RIC innovators, use RAN programmability to automate its network and enhance security of the network.
- Vodafone trialed a multi-vendor Open RAN architecture, including VMware RIC and MU-MIMO Scheduler xApp from Cohere. As a result, spectrum efficiency was significantly improved—2x the cell's capacity.
- Airtel worked with VMware for their O-RAN PlugFest, to demonstrate the benefits of the RIC together with the Traffic Steering xApp. Monitoring cell load and instructing the gNB to hand over a user with poor service to a target gNB with sufficient RF resources, improving the quality of experience of the user.

Monetize the Distributed Edge

The next-generation edge opens up a wide range of business opportunities. By unifying distributed edge and private 5G resources, you can bring secure, high-speed, low-latency network services and applications closer to end users. You can deploy and integrate disparate edge and private 5G resources more easily and cost-effectively, without sacrificing performance.

VMware Edge Solutions

VMware edge solutions enable unique edge use cases including private 5G by providing a versatile foundation for highly secure and flexible private mobile networks that run alongside other edge-native applications. You can explore VMware edge products, including:

- VMware Edge Compute Stack
- VMware SD-WAN
- VMware SASE
- Private Mobile Networks

Start Your Cloud Transformation

Ready to bring the flexibility, scalability and speed of the cloud to your business? Let the leader in telco cloud transformation help you build a multi-vendor, multi-cloud platform to unleash a new generation of services.

Learn more at https://telco.vmware.com/.

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