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# THE VIRTUAL CLOUD NETWORK

Is the Next Phase in Network Evolution

**WHITE PAPER**

Prepared by

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**ZK Research**  
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Kerravala Consulting

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**ABOUT THE AUTHOR**

*Zeus Kerravala is the founder and principal analyst with ZK Research. Kerravala provides tactical advice and strategic guidance to help his clients in both the current business climate and the long term. He delivers research and insight to the following constituents: end-user IT and network managers; vendors of IT hardware, software and services; and members of the financial community looking to invest in the companies that he covers.*

**INTRODUCTION**

Businesses are evolving faster than ever before. Key technologies such as the cloud, mobility and the Internet of Things (IoT) are enabling organizations to undertake broad and deep digital transformations—changing the way companies operate, creating new business models and lifting employee productivity to new heights.

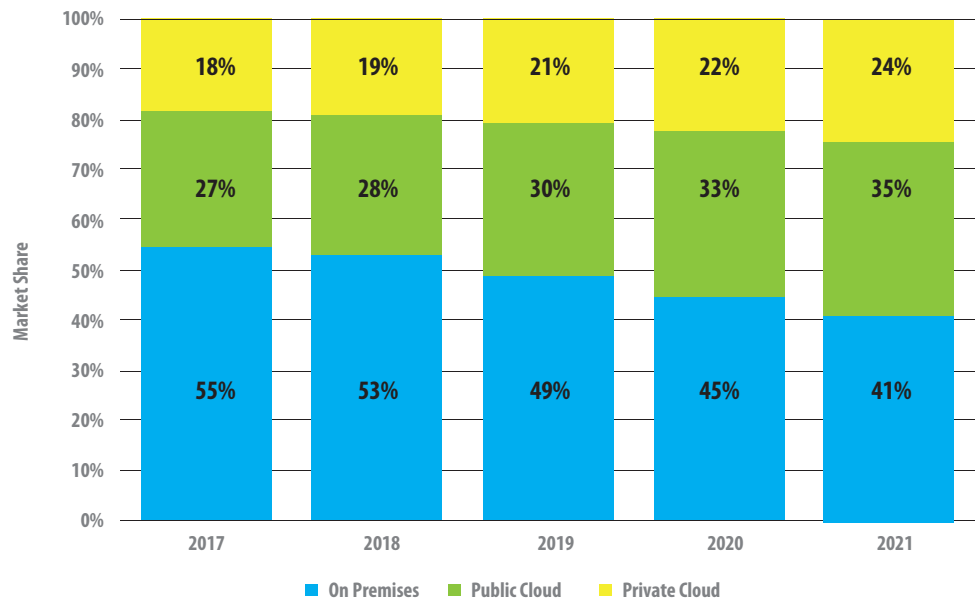
As digital transformation takes root in enterprises, a parallel shift is occurring from massive centralized data centers to the cloud and then to the edge of the network. It is at the edge where customer engagement and rich interactions are now happening; it’s also where customers and enterprises alike generate valuable data and insights. But to make it work—and to extract every bit of value—all of this needs to be connected back to the business.

This is no longer theory; it’s actually happening. The ZK Research 2018 Cloud Forecast is all the proof you need. This five-year forecast for cloud computing shows workloads in traditional data centers are on a sharp decline, with public and private clouds ascending. In 2018, traditional on-premises data centers hold 55% of workloads, while public and private cloud hold a combined 45%. By 2019, traditional IT infrastructure will dip below 50%, and it will sit at 41% in 2021, when public and private cloud combined will hold 59% of the market ([Exhibit 1](#)).

One of the most significant impacts of technology’s rapid evolution is that the network must evolve to enable organizations to fully capitalize on the resulting hyperconnectivity.

Networking has always been about connecting users to applications, but apps were more centralized in the data center era. Now, apps are distributed and data is everywhere, so networking must evolve to connect the many silos of hardware designs and devices. Working with different sys-

**Exhibit 1: Cloud to Outstrip On Premises by 2019 and Dominate the Market by 2021**



ZK Research 2018 Cloud Forecast

tems, different dashboards and completely different technologies makes life hard—or impossible—for IT teams. Enterprises need a common software-based abstraction to make these advances a practical reality.

Network evolutions have happened along with every major compute change—from the main-frame days when the network was simple, to the client/server era when the network became more complex, to the dawn of the internet age when the network was suddenly mission critical. At each step, the network has changed and become increasingly more valuable.

We now sit on the precipice of another massive change. With compute resources more scattered everywhere, networks must transform to handle the changing demands. In this report, ZK Research examines these trends and explores how a new network model—one based on virtual cloud networking—can help alleviate the strains on today's enterprises.

## SECTION II: THE HYPERCONNECTED ERA HAS ARRIVED

One fundamental of today's digital world is that everything is connected. If something isn't connected today, it will be soon. Everything from buses and pill bottles to heart monitors and factory equipment is hooked up to the business network. But connecting everything is only the first step in creating a digital business. Those simple connections are not enough. To succeed in the digital economy, a business must be able to take advantage of those connections to extract all the data and intelligence that the network can provide to then support critical business decisions in real time.

As more devices, compute power, data and interactions are pushing to the edge, this creates new experiences and will forever change how people and things interact. Pervasive connectivity from the data center to the cloud to the edge ensures that the business has access to these valuable insights.

## Digital Transformation in Action

**For some**, the idea of digital transformation and the network edge is hard to grasp. Think of an airline. For decades, airlines have utilized technology in everything from avionics and navigation to fuel efficiency and logis-

tics—but they have steered clear of technology that we all take for granted 30,000 feet below. Now, looking for every competitive edge possible to improve customer experiences, airlines are deploying high-speed internet streaming, the

ability to use mobile payments and other technologies. The challenge of undertaking such initiatives is even more complicated because the target for all the bits is a plane flying high above Earth at 600 miles per hour. Therefore, traditional

IT—centralized in a massive data center—wouldn't work. The bits wouldn't move fast enough. It takes the cloud and the edge network to put the data closer to the user and ensure it can make the trip high in the air above the real clouds.

*As the network has evolved, compute and data have become more dynamic and distributed, making the network and its security more important than ever.*

Let's examine a few markers of this radical shift:

**The cloud is fundamentally changing everything.** The way developers design, build and release apps was transformed by the cloud—they can now move faster than ever. Perhaps more profoundly, the way people consume apps has been forever changed by the cloud. Apps are no longer device dependent, so people can get work done wherever they are and by using whatever device they happen to have with them at the time.

**Apps are no longer monolithic and vertically integrated.** Apps used to be islands of information. They could rarely share information with other critical pieces of infrastructure. Now, apps are disaggregated and distributed, can fetch data and other information from multiple sources, and can exist in different locations outside of the data center—in the cloud, at the edge of the network and in the billions of IoT devices that will exist in previously unimagined locations.

**Data and workloads are no longer tethered to physical location.** Data and workloads used to be tied to physical locations—constrained by either a computer or a corporate network. To get work done, users had to be onsite or in front of a computer. With the cloud, data and workloads are free from physical locations. They can exist in public or private clouds, at the edge of the network, on IoT devices—or a mix of the three. Consequently, people now have freedom to access critical assets wherever and whenever they need them, and those assets can move as needed between clouds, on demand.

These points emphasize that compute is the most critical infrastructure element in this app-driven revolution. As an ambient resource that can be accessed at any time by any other resource, compute exists in several different ways on the network—as cloud-based apps and services, in the burgeoning serverless frameworks, in edge computing and fog resources, and on ubiquitous mobile networks.

The pervasive nature of compute will generate massive stores of data as the number of connected devices and users skyrockets. IT departments will struggle with these new demands as they try to use existing infrastructure and tools to connect the avalanche of data and applications.

As we noted, the network has undergone several evolutions since the dawn of the computer age. But today's compute revolution—led by software, the cloud and new apps—has been accelerating unlike any transformation in the past. In the process, compute has left networking in the dust. That's because traditional networking has been tied to costly custom hardware rather than simpler and far superior software-based approaches in the app and cloud world that automate and orchestrate deployments, provide a suite of virtual services, and come with high performance and reliability built in.

As the network has evolved, compute and data have become more dynamic and distributed, making the network and its security more important than ever. Meanwhile, managing the network and ensuring it is secure has become an increasingly complex undertaking.

*The dynamics around the cloud, branch and edge are demanding a different type of network.*

Until recently, the network wasn't of much interest to business leaders; it was table stakes. "Get the network gear in place, make sure it has the bandwidth we need, and then don't bug me about it again." But with so much business-critical information traversing the average network today, it's become an asset that's a fundamental part of any strategy. Business leaders know that a properly aligned network can support and drive innovation across a company. Therefore, IT organizations need to change their mind-set from simply supporting infrastructure to focusing on the apps and data that the infrastructure supports.

So, what is the right model for IT groups to pursue?

Networks exist and are managed in silos—think of the data center network, a campus network, branch and edge networks, and public and private cloud networks. Each is different (i.e., different designs and different infrastructures) and will remain so. They require different skills, tools and processes. This is the opposite of agile; it takes too long to implement change and react. And with more and more devices and things connecting, this will only get more complex.

Software-defined networks were a step in the right direction. But moving to a software model while relying on the same old architecture won't get the job done these days. The data center approach—and the architectures that it involves—simply don't work in the cloud. Moreover, cloud architectures don't work at the edge of the network. To move into this new era, IT organizations will need an entirely new type of network.

### **SECTION III: A NEW MODEL FOR THE ENTERPRISE NETWORK IS NEEDED**

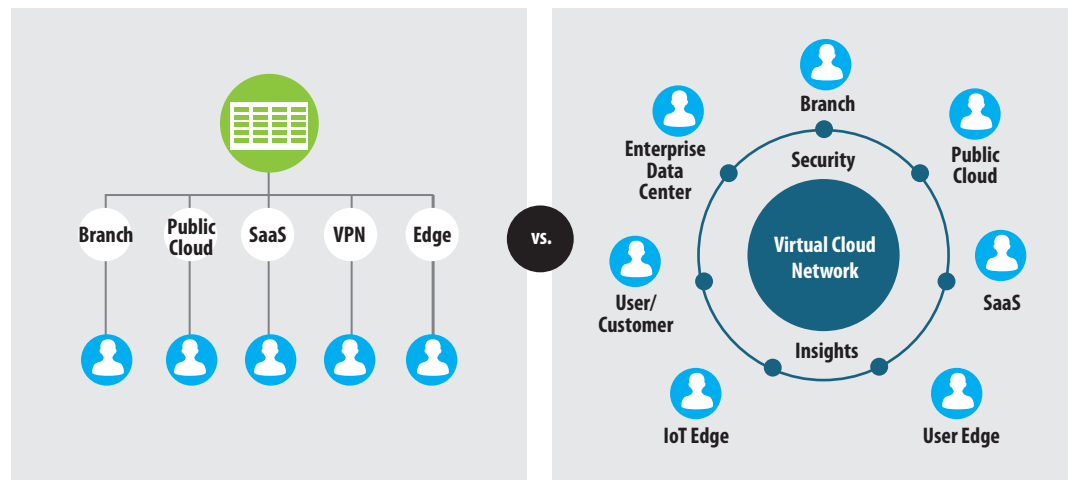
It's clear that the dynamics around the cloud, branch and edge are demanding a different type of network—one designed to handle the varying demands of the digital enterprise. ZK Research sees a virtual cloud network (VCN) as the best example of this new type of network. [Exhibit 2](#) compares the old model with the new digital enterprise model.

In the old model, depicted on the left side of [Exhibit 2](#), the enterprise communicated with the various network elements using different silos—such as branch, public cloud, software as a service (SaaS), virtual private network (VPN) and edge.

As the fabric of a distributed world, a virtual cloud network is a single network abstraction that creates consistency regardless of the underlying hardware or services. It offers consistency from "the core to the hand" and provides pervasive connectivity (and security) for users to apps and businesses to data, wherever they are—consistently, from the data center to the cloud and the edge. The elements connected to a virtual cloud network (depicted on the right side of [Exhibit 2](#))—branch, public cloud, SaaS, user edge, IoT edge, user/customer and enterprise data center—all run on a common network with a consistent set of services.

The virtual cloud network is built on the same principles that underlie the cloud. Consequently, it can serve the needs of everything from the smallest firms to the largest cloud-scale companies equally.

**Exhibit 2: A New Model for the Digital Enterprise**



ZK Research, 2018

The key characteristics of a virtual cloud network are as follows:

**Automated:** The provisioning, deployment and management of network and security services across the enterprise have historically been done manually, leading to high amounts of human error and slow deployment cycles (Exhibit 3). Automation can significantly speed this up and reduce unplanned downtime to zero. Also, automation will free up valuable engineering time, enabling those resources to focus on innovation and strategic initiatives.

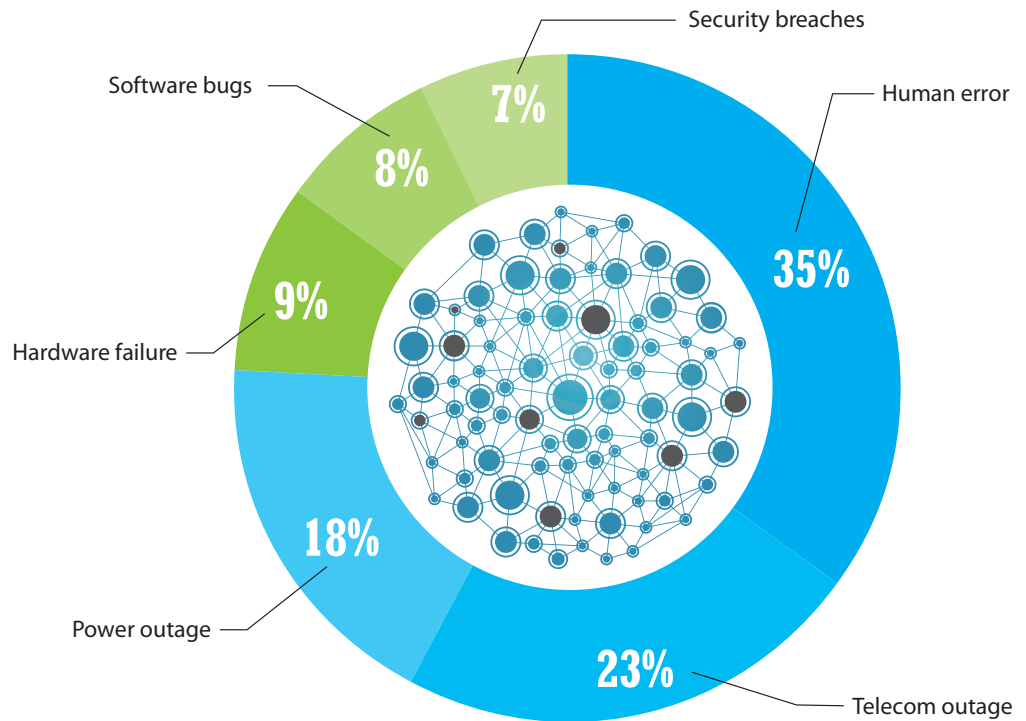
**Programmable:** Application development and network operations are coming together, and programmers need the ability to access network services in order to build differentiated applications that create competitive advantage.

**API accessible:** The days of configuring the network and accessing information through a command line interface (CLI) have come to an end. Obviously, application developers will prefer to interface with the network via application programming interfaces (APIs), but so should network engineers who can manage the network through the same interfaces. This can greatly reduce the complexity associated with network operations.

**Elastic:** The cloud enables businesses to add compute and application resources on demand and then scale up capacity quickly. The network requires the same level of elasticity to ensure applications are performing optimally regardless of where workers, applications or data are located.

**End to end:** Network operations teams have historically treated the network as a set of discrete places, such as the campus, branch, data center and edge. Applications, of course,

**Exhibit 3: Human Error Creates Significant Downtime**



ZK Research 2017 Network Purchase Intention Study

traverse all of these and require consistency in the areas of performance and security. A virtual cloud network considers the network in its entirety and removes these silos.

**Autonomous:** Over time, a virtual cloud network will be autonomous and dynamically reconfigure as the business environment changes as dictated by business policy. For example, if an organization decides that it's safest to put all IoT devices in a single, secure zone and then something is moved out of the zone, the network should adapt to extend that segment.

**Machine learning based:** The network is generating massive amounts of network data—far too much for even the most experienced engineer to connect the dots to understand what is happening. Machine learning can be used to recognize breaches, spot congestion points that might be impairing application performance and even predict when issues will occur before they happen so corrective action can be taken before they impact the business.

**Application centric:** Legacy networks are designed without considering what types of applications are currently running on them and what kinds of services and resources are required. A virtual cloud network is built with the needs of all types of applications—cloud and on-premises—in mind.

## The Future

Although we are years away from a totally autonomous network, a virtual cloud network lays the foundation for it. In the not-too-distant future, organizations will define business policies that govern how the network operates and responds. As conditions change, the network will reconfigure itself based on these rules.

A key to the virtual cloud network is that it's independent of the physical infrastructure. Consequently, any network or security service can be delivered to any point when required. This is critical in protecting workloads and dynamic resources whether they exist on virtual machines, containers or even a native application on a bare metal system.

Of course, the virtual cloud network is software centric rather than hardware centric. Software decouples the control elements from the underlying hardware. With network services abstracted from the infrastructure, they become a set of services that can be applied anywhere. In a hardware-based network, a service is specific to that physical device and the location where it resides. On the contrary, with a software-centric network, every part of the network is treated as equally important.

IoT, mobility and cloud rely on the network, and the virtual cloud network is the business fabric that ties everything together. The virtual cloud network integrates security into the network and moves management into an event-driven function over the long term.

The virtual cloud network provides several critical business benefits, including the following:

**Accelerated digital transformation:** A virtual cloud network can speed up an organization's digital journey by ensuring consistent connectivity and security to all parts of the business.

**Improved security:** Historically, securing a network has been a chore. But with the virtual cloud network, security is intrinsic and no longer gets in the way of operating the network; it is integrated into the core functions.

**Data insights:** The virtual cloud network provides ubiquitous and consistent connectivity to all elements of the business, improving the ability to process and generate business insights in real time.

**Operational consistency:** Breaking down the network silos will impart significant benefits to the business. These benefits go beyond the typical total cost of ownership (TCO) calculated in technology purchases—extending to all parts of a business.

**Policies that follow users and apps:** Policies used to be network based, so apps and users had to adapt. With the virtual cloud network, network policies are portable and work for the users and the apps wherever they need them.

## SECTION III: WHAT TO LOOK FOR IN A VIRTUAL CLOUD NETWORK SOLUTION PROVIDER

Virtual cloud networking is a burgeoning network category. There are numerous options and solution providers to consider. The decisions a business makes when selecting a solution could mean the difference between success and failure.



## Benefits of a Virtual Cloud Network

**CROSS-FUNCTIONAL AWARENESS** that eliminates technical silos and breaks down organizational silos

**FASTER TIME TO MARKET** that means a company can release products and realize revenue quicker than ever

**SIMPLIFIED MANAGEMENT** that means IT staff can manage the needs of the network while focusing on other pressing IT needs

For IT staff, a virtual cloud network provides an opportunity to achieve the following:

**TAKE A LEADERSHIP ROLE** in a company that rolls out a virtual cloud network by leading innovation.

**ADVANCE BEYOND** their previously defined networking career path.

**RESKILL** and take on work that is of higher value to the company and their career.

When contemplating a networking strategy for digital business, companies should consider that a virtual cloud network should fulfill the following criteria:

**Be software based and hardware independent:** A virtual cloud network should abstract the network from the underlying hardware and should be entirely software based.

**Work with all forms of compute infrastructure:** A virtual cloud network should be adept at working with virtual machines, cloud implementations and containers.

**Be automated and orchestratable:** A virtual cloud network should have extensive automation capabilities that can make the network run independently—or with only minimal human intervention. It should also orchestrate requests, quickly automating network configurations.

**Have a programmable infrastructure with rich APIs:** A virtual cloud network should have a suite of APIs that facilitate connections with a wide variety of applications. It should be programmable so that it can respond to traffic trends.

**Be built on cloud-native principles:** Using a network that was built in another era is a non-starter. A virtual cloud network should be built with the same ideas that underlie cloud-native software. Most importantly, it should be a retrofit of a hardware-based network.

**Work with any underlying hardware or cloud service:** A virtual cloud network should work seamlessly with any hardware or cloud service, including infrastructure as a service (IaaS), platform as a service (PaaS) and SaaS.

**Include consistent, integrated security:** These days, security is of paramount importance. Businesses don't want to see their names splashed across social media as the latest hacking victim. A virtual cloud network should include intrinsic security that is consistent and naturally integrated across the entire solution.

**Be run from a single pane of glass:** Being able to manage the network from one location and one screen is critical to the smooth functioning of an IT organization—and is a significant attribute of a virtual cloud network.

## SECTION IV: CONCLUSION AND RECOMMENDATIONS

The world is hyperconnected. Today's networks were designed for a different era. We now need a different approach—one focused on distributed applications, compute resources and the need for consistent connectivity and security from the data center to the cloud and the edge.

This paper has outlined the brave new world of virtual cloud networking. Now, ZK Research offers a few recommendations and observations to help enterprises that are considering their virtual cloud network options:

**Modernize with a virtual cloud network.** The virtual cloud network is the best example of the new type of software-based, hardware-independent network. It's clear that the cloud and IoT trends are demanding a different type of network—one designed from the ground up to handle the varying demands that arise from the new model of the digital enterprise. Only a virtual cloud network fits the bill.

**Look for a cloud-native design.** Some next-generation networks are retreads of hardware-based approaches, with a few tweaks to make them look like modern implementations. A virtual cloud network solution should be built from the ground up with the latest challenges in mind (including IoT and cloud) and a focus on applications and data.

**Think five years out.** Your network is probably showing its age, and it's probably causing headaches every day. You're probably itching to replace it. But don't rush into a solution without thinking about your evolving needs. Are today's needs the same as those you had five years ago? Probably not. And your needs will be vastly different five years in the future. Look for a solution that is extensible and elastic—that's the virtual cloud network you should choose.

## CONTACT

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