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The network highway of tomorrow

Redefining enterprise networking

Written by

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About the report

The network highway of tomorrow: Redefining enterprise networking is an Economist Intelligence Unit report, sponsored by:

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This report explores the drivers that will shape enterprise networking in the near future. We explore the opportunities for organisations to redefine their networking infrastructure to best support computing advances in cloud and virtualisation, and the actionable takeaways for how companies can achieve the best results.

Within this report, we define enterprise networking as an organisation's communications foundation. This allows computers and related devices to connect across departments and networks, facilitating a wide range of activities. By edge computing, we refer to the distributed computing paradigm that brings computation and data storage closer to where they are needed, improving response times and saving bandwidth. We define cloud as the self-sustained, on-demand availability of computer system resources, such as data storage and computing power, among other things.

The report is based on desk research and in-depth interviews with leading experts in enterprise information technology (IT):

- **Richard Christopher**, global head of network services, Standard Chartered
- **Johna Till Johnson**, CEO and founder, Nemertes Research
- **Zeus Kerravala**, founder and principal analyst, ZK Research

Introduction

Why an upgraded enterprise connectivity fabric is mission-critical

Digital transformation has gone from novelty to norm in recent years—one would be hard pressed to find any organisation today that is not a digital organisation.

Terms like hybrid cloud, the Internet of Things (IoT) and edge computing are no longer industry-insider jargon, restricted to the confines of the IT department. Instead, they are increasingly becoming top-of-mind among the C-suite.

Nonetheless, it is not just next-generation technology itself that will make or break a business today, but rather the integration of all of these technologies, apps, users and locations together. In other words, what is now mission-critical for organisations is the one thing that joins all of these dots: the network.

In the increasingly hybrid, distributed and dynamic IT landscape, chief technology officers (CTOs), chief information officers (CIOs) and IT department heads must operate like orchestra conductors—streamlining hybrid apps, networks and heightened user demands—in order to provide the best quality digital experiences and access to end-users.

According to 2018 Global Market Insights forecasts, the enterprise networking market is set to soar from US$62bn in 2017 to US$90bn in 2024.[1] That makes it imperative for CIOs, CTOs and IT leaders to be agile, efficient and competitive while delivering connectivity, security and performance seamlessly to these end-users and applications.

A recent IT Priorities survey revealed that 44 percent of respondents cited upgrading their networking foundations as a top priority for 2018.[2]

Similarly, Interop ITX's "7 Enterprise Networking Trends for 2018" report found that companies are increasingly focused on adding bandwidth, exploring ways to modernise their networks with software and expanding their networking capabilities.[3]

1. https://www.globenewswire.com/news-release/2018/12/19/1669316/0/en/Enterprise-Networking-Market-to-reach-90bn-by-2024-Global-Market-Insights-Inc.html
2. https://searchnetworking.techtarget.com/feature/As-2018-IT-budgets-rise-network-upgrades-become-priority
3. https://www.networkcomputing.com/networking/7-enterprise-networking-trends-2018

Chapter 1

The key drivers of enterprise networking 2.0

Dual forces are at play when it comes to the reinvention of enterprise networking. First, the stakes are higher than ever before to guarantee seamless application performance across the enterprise. Second, CTOs, CIOs and IT department heads must ensure all-encompassing security, performance and visibility along the user journey.

However, this is only possible if there are no network failures or interruptions, such as unplanned downtime, security attacks or severe problems with network congestion.

Zeus Kerravala, founder and principal analyst at ZK Research, recalls an instance where a retailer tried to improve its in-store experience by installing tablets that displayed a larger range of merchandise. "Unfortunately, there was so much latency in the Wi-Fi network that it had the reverse effect," he says. "It annoyed the customers because they were looking at a tablet that was trying to reload, and it wound up driving people out of the store. Businesses are constantly developing new ways to deliver a greater customer experience through advanced digital channels, but the network has to be reliable," says Mr Kerravala.

Most IT leaders will recall a time not too long ago when they owned every element of the enterprise network, including the apps people used and the devices they employed, along with when and where they could work. "IT owned everything from the entire stack," recalls Mr Kerravala. "Today, it is quite different."

Indeed, companies developing their advanced networks increasingly have little to no influence over how, where or with what their distributed customers and employees connect.

"Trillions of dollars and industry reputations are riding on the performance across networks, but the network itself is hard to control," says Johna Till Johnson, CEO and founder at Nemertes Research. "This is leading to the development of new technologies that deliver a high-quality end-to-end experience. CIOs have to assume that they don't know what the end-user is connecting on. It can be anywhere—from the very best to the worst."

Either way, user expectations for reliable services are the same. "Because they can't control it, IT leaders have to manage around it," says Ms Johnson. "That's why we are seeing customer experience technology rising to the top of enterprise efforts."

Next-generation networking infrastructures must provide seamless performance across the enterprise—regardless of whether the user is on-premises or in the cloud.

"Our employees want to work in more agile workspaces," says Richard Christopher, global head of network services at Standard Chartered. "They want the same experience whether they're working in a shared breakout area or whether working at their desk, or when they're working remotely."

Customers also expect a seamless connection and quick resolution to problems regardless of their devices, locations or circumstances. While enterprises have generally met these demands with multi-cloud computing and storage functionalities, the exponential increase in demands will require networks that are even faster, more reliable and vastly more capable of complex tasks.

Enterprises hoping to keep up must further extend their networks and cloud capabilities, as well as develop new products and services capable of transforming customer experiences and business models.

For example, in insurance, a minor car accident traditionally would have required hours of effort by insureds, police officers, repair shops, and insurance adjusters and claims processors. The processes would be drawn out for months. However, insurers are increasingly offering customers ways to submit quick video snapshots of accidents, triggering a series of semi-automated reporting capabilities among insurance firms and mechanics, sometimes even pulling relevant road camera footage from policing agencies. With enough real-time capture and communications, total repair and settlement can take as little as a few minutes.

In this advanced networking scenario, consumers are more satisfied with the experiences because their claims can be resolved quickly and easily. In addition, an insurance company that can offer a more automated and integrated approach is likely to earn a loyal customer base and increase its bottom line.

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Chapter 2

Rethinking the design of network infrastructure

When redesigning the enterprise connectivity of tomorrow, it is important that organisations develop an infrastructure that can be administered centrally, distributed remotely and operated globally.

Central administration

In order to have a comprehensive overview of how the data centre and cloud apps are all interconnected with branch and mobile users, CTOs, CIOs and IT department heads must develop an integrated management platform and enterprise networks that seamlessly connect headquarters, enterprise data centres, cloud networks, and branch wireless and wired LANs (local-area networks).

To achieve this, there are many enterprise networking opportunities for organisations to explore, namely those around software-defined wide area networks (SD-WANs), virtualisation and network aggregation to further empower enterprises to define and manage the ways in which their headquarter, branch and remote employees access the cloud and other important corporate resources—such as data, applications or other productivity and collaboration-enhancing capabilities.

SD-WANs will become one major platform by which enterprises connect and fully integrate the edges of the enterprise to each other, corporate data centres and cloud-based resources.

The ultimate goal is to build controllable, secure distributed networks that expand beyond the purely private enterprise WANs of the past to incorporate internet connectivity and cloud access. These would also deliver the highest-quality experience for users through intelligent application-aware routing, policy-based provisioning of WAN services and the agility to adapt rapidly to changing network conditions.

Remote distribution

As network performance becomes increasingly important, some companies are moving applications and data closer to their users, where a user may be a customer, another process or even another cloud. With edge computing, the network latency—the length of time it takes for traffic to traverse the network—should decrease and free up bandwidth into the centralised data centre.

> "We live in a world where everything is connected, and from a business perspective you need to understand how all these connections fit together to improve the customer experience."
>
> Zeus Kerravala, founder and principal analyst, ZK Research

"To somebody who has a business, this level of connectivity and responsiveness is really at the heart of digital transformation," says Mr Kerravala. "We live in a world where everything is connected, and from a business perspective you need to understand how all these connections fit together to improve the customer experience."

Now that networking solutions have advanced, companies can configure their networks to fit different types of performance and availability requirements. Network aggregation is a helpful solution, as it enables enterprises to combine several network connections in parallel in order to increase throughput beyond what a single connection could sustain, and to provide redundancy in case one of the links should fail.

Organisations today must consider putting their content as close as possible to the user, according to Ms Johnson, given that they no longer have control over where the user is located.

"The first thing companies must consider is how to design their applications to be latency-tolerant. The second thing is how they should think about content distribution to ensure that the content is local to the users in order to shrink that latency even more, because again, you don't control that last mile," she says.

Global orchestration

With business operations being more globalised and networking more distributed than ever before, it's important for CTOs, CIOs and IT department heads to aim to deliver a consistency of experience, performance and security across all apps and users, regardless of location.

Given the increasingly on-demand nature of cloud services, networking solutions need to be automatically provisioned and application traffic needs to be dynamically routed to an optimal path.

Naturally it's imperative for networking solutions to be instantaneously connected to the cloud, given the fact that users need to be able to connect anytime from anywhere. For this to be possible, organisations must enable gateways and connectivity between on-premises offices and virtual private clouds.

As no user experience is the same, the network path should also be customised depending on application or location.

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Steering toward self-driving wide area networks

Brian Kracik
Senior director, product marketing, Oracle

It was in the late 1980s at university when I discovered the considerable amount of decision-making that had to be programmed into self-driving cars. Steering a car by light reflecting off a white line on the road revealed how vulnerable we would be in potential life-and-death situations where the white line disappears or pedestrians step in our path.

Forty years later, the world of self-driving vehicles are much more reliable thanks to advances in machine learning (ML) and artificial intelligence (AI). Metaphorically, the network needs to act as a self-driving car for enterprises, ensuring applications take advantage of the digital superhighway, the country road and the local city street, dynamically reacting to traffic congestion, pedestrians, potholes, ice and other obstacles by self-configuring and self-correcting. In other words, when applications encounter digital congestion, latency, jitter and packet loss, the self-driving network reroutes its passengers to the intended destination, on time and without incidents.

Enter Oracle Communications: Driving automated intelligence into the enterprise network

Digital business is a major focus for all enterprises and applications are critical to an organisation's success, providing secure, reliable and high-quality experiences to employees, partners and customers. Hence it is paramount that enterprises conquer the challenges emerging around new computing paradigms and processes, such as the following:

- Enterprise applications moving off the enterprise premises and into the cloud;
- Customers, employees and partners shifting to a more modernised style of plug-in work, whether in an office, at home or on a mobile device;
- Pressure to deliver dispersed applications securely and efficiently.

Gone are the days where a simple application ran on a centralised computer, as today's communications paradigm requires access to networks, services, applications and other users. As a result, a self-driving, self-healing wide area network is required that is aware of applications using the network, and securely and reliably delivers traffic where it needs to go and with high Quality of Experience (QoE).

Oracle delivers on these expectations with a specific type of network: a software-defined wide area network (SD-WAN). Its integrated SD-WAN technology provides intelligence, awareness and policy to network traffic, while ensuring the network is less complex so that administrators can simplify how they configure, manage and troubleshoot.

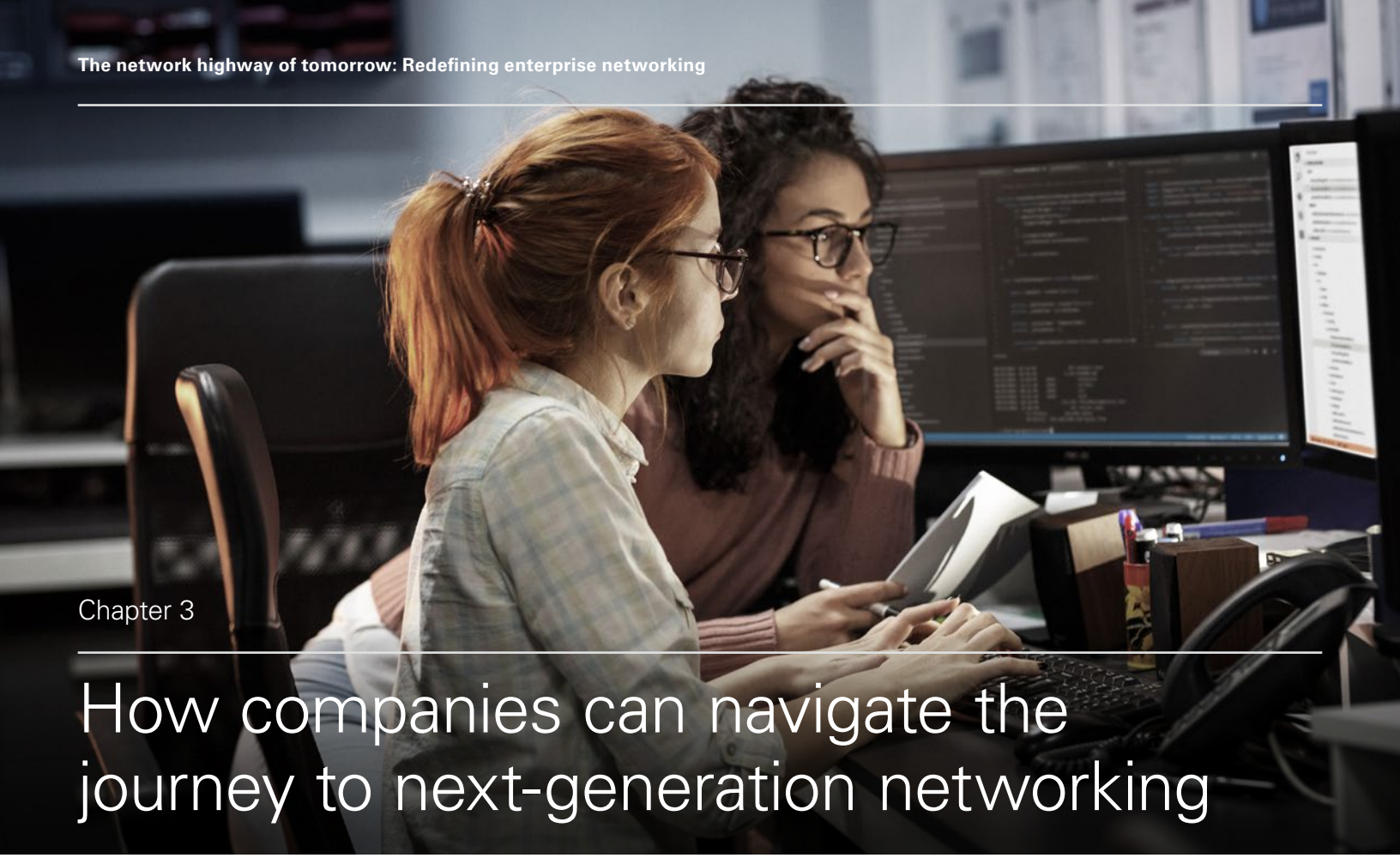
Oracle Communications' self-driving, self-healing SD-WAN takes advantage of all the different "roads" available to the destination, quickly recognising and adapting to network issues to prevent failures and maintain a high QoE for mission-critical and even less-important applications. Think of it as Waze for application packets, where a highly advanced machine learning system continuously measures what is occurring across all possible roads, among pairs of locations—each one distinct in its direction and type of traffic congestion. Based on its assessment, it reacts, in fractions of a second, to road blocks, accidents, potholes or anything else that might impede traffic getting to its desired location.

Not only is it aware of the applications using the roads, but it gives priority to important or time-sensitive applications and steers traffic to the roads that are the clearest, and it has the flexibility to run any application over any combination of transports that will provide the quickest route to the desired destination.

The SD-WAN also acts as a type of "traffic cop" ensuring that too much traffic doesn't try to arrive at the same destination all at once, allowing interactive and real-time applications like voice and video conferencing to safely run at high quality over less-expensive shared public internet connections.

With Oracle Communications' self-driving, self-healing system, administrators set high-level policy on how the entire network should behave and prioritise application traffic when competition for WAN bandwidth occurs. This is a significant improvement from alternatives that force administrators to map applications to particular networks. Simply put, self-driving, self-healing SD-WANs keep the roads clear, automatically and intelligently, thus providing the best experience possible.

For more information see **Oracle.com/SDWAN**.



Chapter 3

How companies can navigate the journey to next-generation networking

Talent and culture

CIOs, CTOs and IT department heads today are wondering what they should be doing to prepare their teams for the onslaught of objects and devices that will ultimately be coming onto their networks, and at speeds and scale never before encountered. Can their existing teams handle the massive amounts of data and traffic coming their way, and what do they need to know in the realms of cloud, virtualisation, big data, analytics, machine learning, virtual and augmented reality, artificial intelligence, and IoT technologies?

Fostering new skills is an integral part of preparing for these transformational changes. According to our expert interviewees, success with next-generation enterprise networking will depend on evolving IT skill sets. For example, Mr Kerravala believes that today's IT teams need more network engineers who are savvy in software development and can code new apps for emerging edge use cases. They should also possess strong analytics skills and understand modern cloud architectures.

Success with next-generation enterprise networking will depend on evolving IT skill sets.

Mr Christopher believes that experts in the field see the advantages of this shift and want to be part of an exponential learning experience. They want to develop new skills and make themselves more marketable.

"It feels like it's really something that is aimed for people who are coming into the network space who must know about a traditional network approach. Also, they have the ability or the desire to learn, to turn networks more into code and more into software," he says.

"Functions and departments no longer live in siloes. Nowadays, things have become so dynamic and so distributed that almost every type of IT is interdependent on each other. CIOs, CTOs and IT leaders must work towards fostering more collaborative cultures within their organisations."

Zeus Kerravala, founder and principal analyst, ZK Research

While the skills gap for IT workers remains significant, steps are being taken to foster positive change.

According to research conducted by CultureIQ, 94 percent of executives and 88 percent of employees they surveyed "believe a distinct workplace culture is important to business success".[4] This is true in the enterprise networking realm; culture is a huge item on the agenda of CIOs, according to Mr Kerravala.

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Security

Networks are also a source of extended risk, given that applications, data and services are now available from any location, and networks span multiple hosting environments, whether fixed or mobile. The most common security threats derive from distributed denial of service, phishing, ransomware, worms and other types of malware attacks.

To combat these threats, companies can employ tactics to ensure ubiquitous security throughout the network, its users and their connected devices. However, according to Mr Kerravala, IT leaders need to first change the way they think about security.

"Twenty years ago, IT used to know every device that was on the network. Today, most IT departments don't know what's on the network because of the rise of IoT," he says.

This is because IT historically managed security through the protection of endpoints. Traditionally, companies could simply get their employees to put anti-virus software on their laptops. At present, though, they must also monitor the control points into the network—as something that they do have control over—and try to automate many of those functions.

Ms Johnson believes the golden rule for security is to pursue a "zero trust" model, which is based on the belief that an organisation should not automatically trust anything inside or outside its perimeters, but must verify anything trying to connect to its systems before granting access. This approach upends an old model where firewalls protected the inside of the environment from the outside, so the inside was trusted and the outside was untrusted.

"Nowadays, companies must replace their security strategies with a new structure of highly granular, highly distributed trust so that you're granting trust on a case-by-case basis, whether it's mobile devices or individual devices, individual applications within the devices, individual users in particular locations and so on," says Ms Johnson. "For example, [a user] is trusted if she is coming in on the corporate network, but not trusted if she's coming in from Starbucks."

For example, a financial services client of Ms Johnson's that had 112 different websites wanted to consolidate them into one single point of contact for the users.

"From a security perspective, that opened up a whole lot of holes because they had to integrate and consolidate the security for all of these and ensure that the application development didn't break any of their security paradigms," she says.

4. https://cultureiq.com/blog/company-culture-employee-engagement-statistics/

Networks have grown too big and too complex to operate without automated services.

Automation

In order to enhance efficiency while mitigating human error and operating expenses, IT leaders can implement network automation technologies whereby software automatically configures, provisions, manages and tests network devices.

These technologies support functions ranging from device discovery and basic network mapping to more complex workflows like network configuration management and provisioning of virtual network resources.

"If you were to just upgrade your infrastructure, but then keep all the operational tasks the same, I don't really know if companies would get the benefit they're looking for," says Mr Kerravala.

"CIOs often tell me that it's very important that their IT teams understand how to help them drive the company forward. But they're so busy running the day to day, they don't have any time to focus on innovation," he adds. "Automation would allow a business to take big steps because people could work better and faster."

Mr Kerravala recognises that many IT teams fear automation and resulting job loss. But networks have grown too big and too complex to operate without automated services.

"Automation helps networks react to change seamlessly," he says. And as new devices connect to the network, they can be automatically analysed based on signature or traffic pattern and security breaches can then be detected. "If you had to manually test and validate every operating system on your networks, you'd never be able to keep up with the curve. Automation frees up IT time for more strategic pursuits."

At Standard Chartered, Mr Christopher says he has a network automation vertical that collects data and develops scripts to spot trending events that may degrade network service over time. "We've used a combination of development and off-the-shelf products to help us with the approach," he says. "So we're not just sitting and waiting for things to go wrong; we're actually going out there and looking for events and messages on the network that can help us predict incidents before they happen."

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Conclusion

Why upgrading the enterprise network highway is a business imperative

It is no longer optional for businesses to invest in next-generation networking infrastructure to propel their organisation safely into the digital age. Rather, it is a business imperative, as the quality of their user experiences—employees or consumers alike—depends on it.

Just as urban planners upgrade highway infrastructure to reduce traffic congestion or road accidents, CTOs, CIOs and IT department heads must upgrade the networking highway of the future now that people and apps are more distributed and dynamic than ever before.

To connect all of the moving parts of the enterprise IT landscape to be agile, secure and seamless, CIOs, CTOs and IT department heads should do the following:

1. Centralise network administration and orchestration, whether for data centres, mobile users, cloud networks, or branch wireless and wired LANs.
2. Operate globally by way of automation technologies that ensure the most enhanced quality of service and access for all apps and users, and provide end-to-end performance monitoring and security measures.

After all, says Mr Christopher, the end goal of redefining enterprise networking infrastructure should always be to provide the user with the best possible experience.

"The customer experience is more important than the technology behind it," he says. "The technology is just there to join the dots together."

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