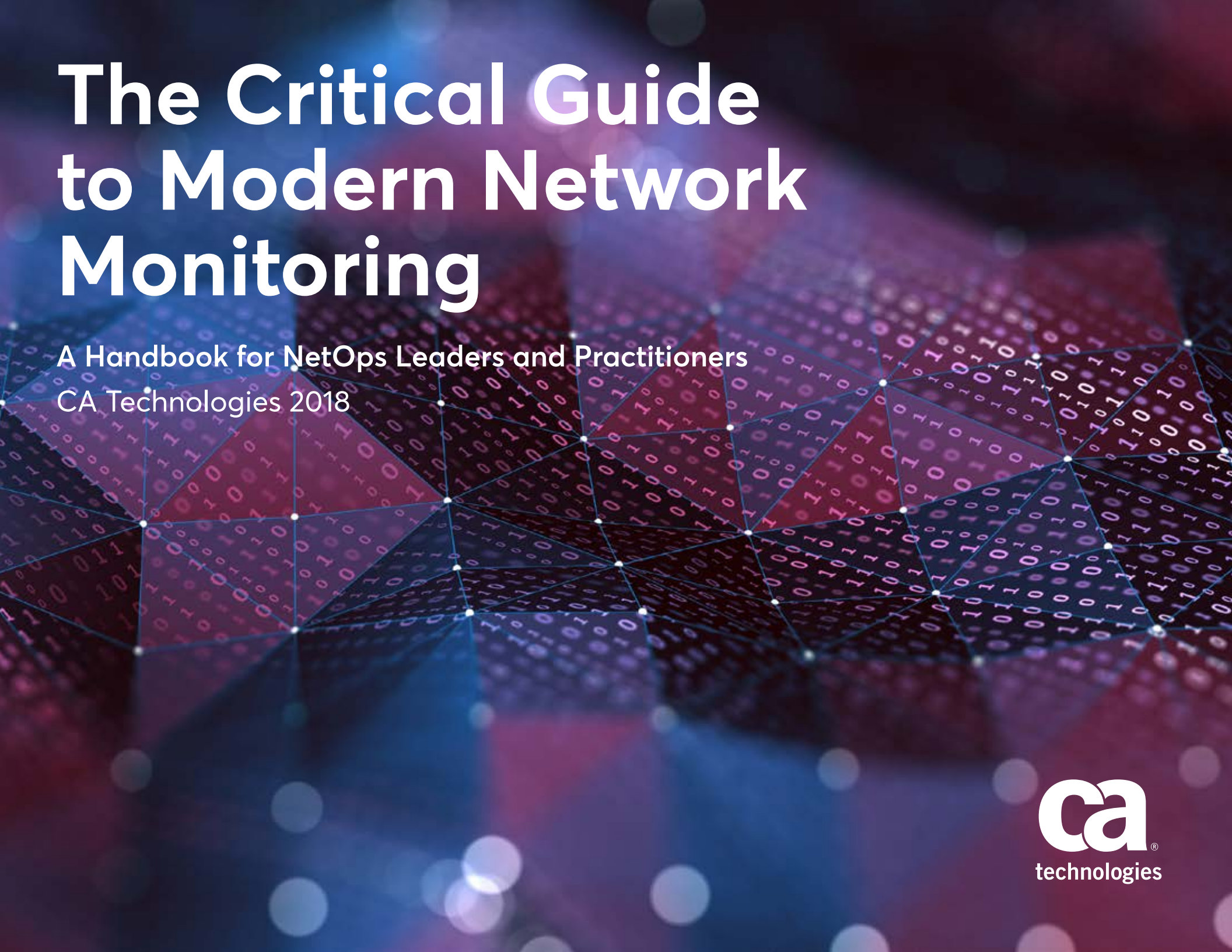


The Critical Guide to Modern Network Monitoring

A Handbook for NetOps Leaders and Practitioners

CA Technologies 2018

ca technologies

CHAPTERS

Suddenly, the network is cool again. Tech trends such as the Internet of Things, software-defined networking and growing end-user expectations all add up to a demand for "dialtone" network performance and reliability. But as the data deluge continues to accelerate, and as organizations continue to rely on multiple clouds to achieve business goals, how can the network keep up, much less meet tomorrow's demands? This e-book looks at the trends that are impacting the enterprise network—the modern network—the issues it creates for NetOps professionals, and how organizations can act today to plan for tomorrow.

CHAPTER ONE

NETWORK COMPLEXITY: THE HIDDEN DANGER

The modern network is complicated. (Is there a way to simplify it?)

With the multiplicity of devices, mobile workforces, the Internet of Things (IoT), unified communications, rich media, messaging, streaming and more, the massive growth in network traffic continues. Networks today are absolutely essential to meeting your customers' constantly evolving computing needs.

They have, in effect, become entirely dependent on the network, in almost all aspects of their jobs and lives, from communications to shopping to banking to entertainment and beyond.

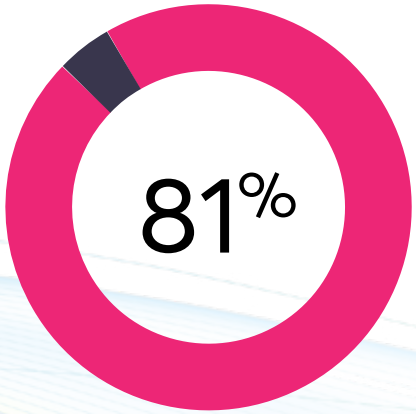
And they just want their stuff to work—flawlessly, and all the time.

If you're responsible for managing or maintaining the network in your organization, this is pretty much how the conversation between you and your customers goes.

But with this greater dependency comes the hidden danger:

Now that networks have reached the next generation, network performance must be constant, consistent and global, 24/7 across all devices, applications, geographies and architectures. And that's the biggest challenge. Networks must rapidly adapt to ever-changing consumer demands, application migrations to hybrid cloud architectures and dynamic software-defined network (SDN) architectures.

The core characteristic of SDNs is their malleability. But this ability to expand and contract dynamically based on consumer demand brings with it the issue of how to monitor and manage them effectively. Whether it's Nokia® Nuage Networks™, Cisco® Application Centric Infrastructure (Cisco ACI™), VMWare NSX®, Juniper® OpenContrail™ technology, OpenDaylight™ technology or OpenStack® technology, all need to be monitored—not individually but holistically. Having a complete view of the full stack is the only way NetOps can have full control of the network environment—SDNs and traditional networks together.



of respondents currently or plan
to use SDN ad NFV technologies.[1]

In this old-meets-new world, NetOps has a big challenge:

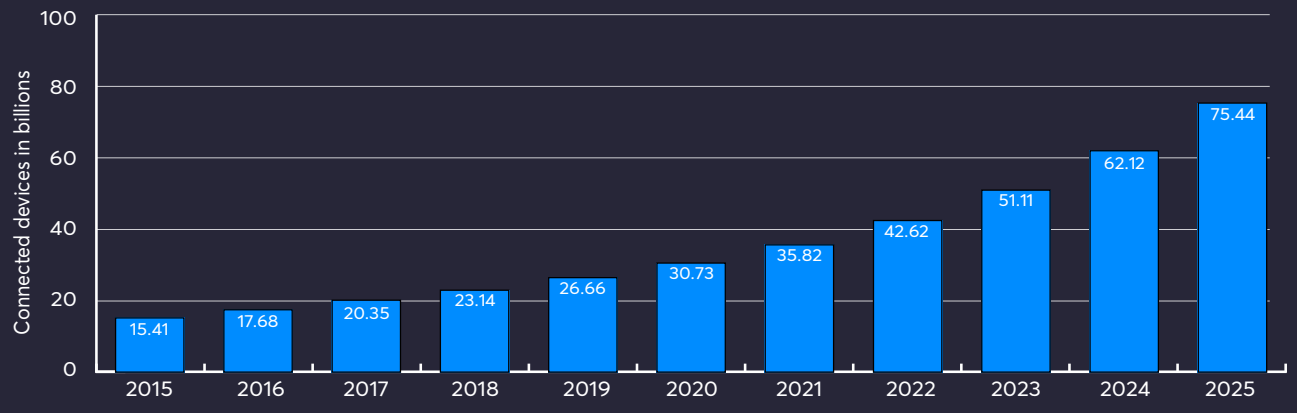
Today's monitoring strategies consisting of multiple, siloed network monitoring tools are not designed for scalable visibility into dynamic SDNs, and without full-stack visibility, the ability to futureproof is essentially impossible. The solution: an easy, unified and scalable approach to managing and operating mixed environments by using consolidated tools that provide equal visibility into SDNs and traditional networks alike.

Every day,
the network delivers[2]:
3B internet searches
5M hours of network streaming
230B emails

Every minute,
it delivers[3]:
4M text messages

Every hour,
it delivers[4]:
3M Instagram messages

There will be an estimated 30 billion IoT devices by 2020[5]



The Top Five Reasons for Network Complexity

Network virtualization has brought extraordinary scale, depth and flexibility to the enterprise—but it has also brought complexity. Here's why.

1. Data Proliferation

Work. Entertainment. Finance. Commerce. Communication. Almost every aspect of daily life is reliant on the exchange of data, and it's growing every day. If Netflix® and YouTube™ ceased to exist, more than half of broadband traffic would disappear.

2. Application Proliferation

Enterprises typically have thousands of applications and thousands of data-producing devices fighting for network bandwidth—everything from self-serve kiosks to smart watches. It's estimated that by 2020, there will be 30 billion IoT devices.[6]

3. Cloud

SaaS. PaaS. IaaS. Cisco® predicts that in this multicloud universe, 92 percent of workloads will be processed by cloud data centers by 2020. The problem: less visibility, because traditional network monitoring can't see into the new hybrid cloud environments to measure performance.[7]

4. Old and New Networks

Integration between traditional and cloud-based networks invariably leads to performance challenges. Simply put, enterprise applications are best suited for legacy LANs. And dependence on network reliability is directly proportional to the reliability of WAN delivery of enterprise-critical applications.

5. Virtualization

Network functions virtualization (NFV) and SDN are fast emerging as go-to network technologies as the need to automate provisioning becomes greater. But though a hyper-converged networking infrastructure offers a more dynamic, virtualized environment, it's also far more complex.

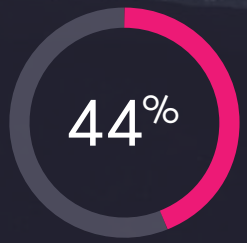
CHAPTER TWO

NETWORK VISIBILITY: ONE VIEW

The modern network is everywhere. (Are you seeing all of it?)

Digital transformation has created an onslaught of new networking technologies that has become all but impossible for network professionals to adequately manage. Today, network managers in half of all enterprises have to grapple with 11 or more network tools simultaneously just to get a sense of what's happening. It's simply too much for any NetOps team to handle.[10]

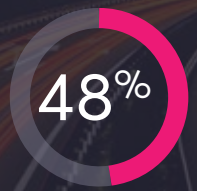
Enterprise Management Associates (EMA) research has found that those who use one to three network monitoring and troubleshooting tools on average catch 73 percent of network problems before users detect and report them. But organizations that use 11 or more network monitoring tools typically catch only 48 percent of network problems, and 37 percent of those deal with several outages a day.[11]



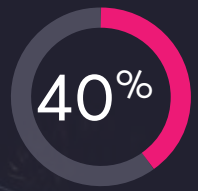
of traffic on enterprise networks

originates from external cloud services such as infrastructure-as-a-service (IaaS) and software-as-a-service (SaaS).[8]

When asked to rank the principal benefits of network performance management technologies,



respondents identified improved visibility and simplified operations as the biggest value.[9]



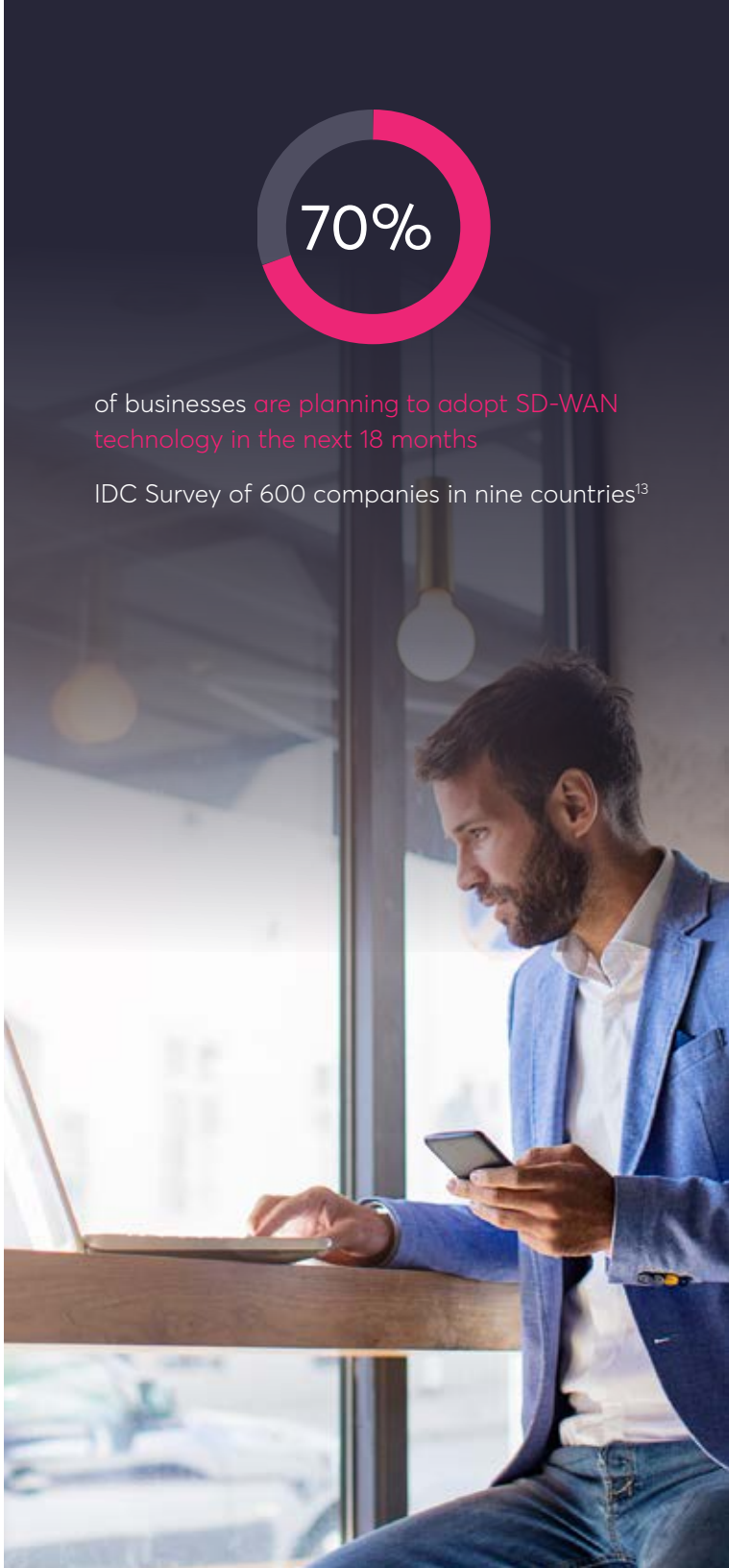
They also cited enhanced productivity from improved network performance.[9]

The problem is that certain network tools are designed to monitor certain aspects of network and application performance but are not engineered to monitor new networking technologies at all.

For example, software-defined WAN (SD-WAN)—emerging as a replacement for multiprotocol label switching (MPLS)—is not sufficiently supported by network monitoring tools. More than 66 percent of SD-WAN adopters just add another tool, or have opted to outsource management to their network service providers.[12]

This multiplicity of tools has led to "swivel-chair management," where data is extracted from one system and manually entered into another. Beyond the obvious problems of duplication of effort and increased possibilities for human error, there's the overwhelming problem of just being able to stay in control. Without a comprehensive approach to managing traditional and SDN environments, NetOps cannot get the extended visibility it needs to help ensure better performance with minimal service disruptions.

The result is that 70 percent of a network manager's typical workday is spent troubleshooting: preventing, reacting, firefighting. Only 30 percent of their time is spent performing tasks that are even remotely productive. Simply put, there is no certainty in a typical network manager's day—but there is plenty of stress.[14]



The top challenge to successful network operations cited by EMA is lack of end-to-end network visibility.

The second greatest challenge is lack of resources. No wonder the number of network monitoring tools being used is directly proportional to the effectiveness of the staff using them. Having more tools doesn't necessarily translate into more stable networks.

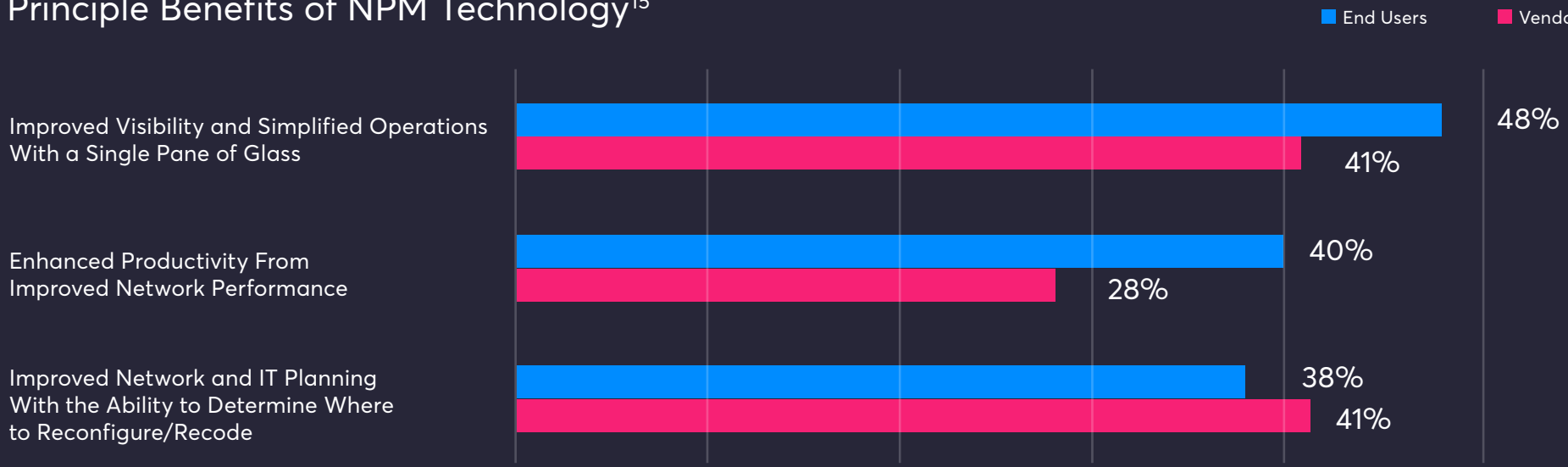
Finally, the migration to SDN technologies will not happen overnight. Very few enterprises, if any, will do a rip and replace of existing networking technology for modern architectures. Physical and virtual environments, then, have to coexist and be wholly visible at the same time. An integrated approach is the only truly feasible approach.

NetOps to the Power of One

Effective network management today starts with one view: a convergence of network operations that enables network managers to perform comprehensive and scalable monitoring and analytics that includes four critical factors.

1. **One NetOps portal** with full-stack monitoring and management for traditional and modern architectures, spanning the greatest number of protocols and vendor landscapes. More and more, enterprises are virtualizing every part of the network, but that doesn't mean traditional network infrastructure will disappear anytime soon.
2. **One OpenAPI** that enables customization of the NetOps experience. Just as today's consumers demand personalized experiences, NetOps should demand the ability to customize methods of ingesting and presenting network data. The result is a truly intuitive, personalized experience that enables faster triage and better executive consumption.
3. **One data collector** that spans multiple protocols and doesn't rely on old-school polling mechanisms, but instead uses modern, scalable and real-time streaming functionality that can keep up with the speed and dynamism of current and future network architectures.
4. **One context** for troubleshooting application experience issues related to network impact, with only the relevant protocols and endpoints (physical, virtual or logical) surfaced. This enables network operations staff to focus on what's important by removing any "noise" and simplifying root cause analysis with a minimal number of clicks to resolution, even in highly virtualized environments.

Principle Benefits of NPM Technology[15]



CHAPTER THREE

NETWORK INTELLIGENCE: NETOPS, BIG DATA, AND ANALYTICS

The modern network offers many insights. (But how can you see more?)

It used to be a lot easier to keep your network up and running while keeping pace with customer demands at the same time. Today, however, networks have transformed into something far more complex, involving many more moving parts. And keeping them moving requires continual monitoring and optimization of your network through the use of modern network monitoring tools.

CA Technologies has adopted the term "FITPAL" as the selection criteria for choosing a network monitoring tool. FITPAL—which stands for Fault, Inventory, Topology, Performance, Application and Logs—is the convergence of all the data streams needed for advanced visibility and healthy operations across traditional and software-defined networks.

Fault

Inventory

Topology

Performance

Application

Logs

FITPAL is the convergence of all the data streams needed for advanced visibility and healthy operations across traditional and software-defined networks.

The modern network needs a regular checkup. FITPAL helps enable you to see all the vital signs.

Fault: Capturing fault data becomes more valuable when it can be correlated to performance issues in a "single pane of glass." For example, if a fault occurs but has negligible impact on application performance, remediation can take a back seat to more pressing issues.

Inventory: In hybrid or multicloud environments, it is imperative to have a good handle on physical, virtual and logical network elements. With infrastructure inventory data coming from multiple data sources, it's easy to lose track of what's where. Ultimately, you can't manage what you don't know about.

Topology: Using topology mapping, network managers can determine if neighboring infrastructure is causing a performance impact on a given application, providing insight into if or how routing should be adjusted, surfacing a hidden problem.

Performance: There are many aspects to performance data in heterogeneous environments. Modern multiprotocol networks demand that network operations track SNMP, API, packet and flow data, often from multiple vendors, in real time.

Application: Since the customer experience is the most important metric, having the ability to triage application experience issues back to network infrastructure is a critical requirement for networks today and in the future.

Logs: Having the ability to perform log analytics against the other five FITPAL elements provides predictive capabilities for fault, performance and capacity planning.

To see how healthy your network monitoring is,
take the FITPAL Network Health Assessment **now** >

The greater your visibility of FITPAL data, the greater your ability to ascertain availability and performance, and to troubleshoot and fix problems as they arise. Of course, your ability to see this data is just the first step—the next is the ability to turn it into actionable intelligence for your NetOps teams.

The key is to have contextual visibility of the customer experience. This is actionable data that enables you to troubleshoot physical, virtual or logical devices or components in relation to the rest of the network, ultimately reducing the number of clicks to speed triage.

Right now, however, lack of actionable data is the primary reason that the first indication of most networking problems is user impact. To tackle this issue, enterprises must use a toolset that combines traditional and software-defined network elements into a single analytics platform. This toolset must be capable of real-time handling of all the FITPAL data elements while presenting relevant data, such as fault reporting, within a converged NetOps solution.

With networks incorporating traditional, SDx, NFV, IoT and SD-WAN elements, network tools must be in a continual state of discovery, constantly looking for new elements being created or transitions between hypervisors of network element and workload alike. A centralized analytics engine that brings together data gathered from monitoring and topology can provide predictive and automation capabilities to the enterprise, should support network self-healing and application-to-infrastructure correlation, and should predict customer impact based on any network event.

Ultimately, tying network monitoring data back to an analytics engine can reveal insights that provide operational intelligence while anticipating possible impact on the user experience itself.

Six Considerations for Enterprises in Choosing a Modern Network Monitoring Platform

1. One dashboard that supports traditional, software-defined and virtual networking in a single context
2. A futureproof platform that offers high scalability and real-time performance
3. An OpenAPI that allows integration with business intelligence dashboards and reporting
4. FITPAL data streams offering "in context" and comprehensive diagnostics to speed triage
5. Elimination of network blind spots introduced by cloud workload migrations
6. Modern analytics that consistently look for optimization opportunities

CHAPTER FOUR

NETWORK FUTURE: NETWORK OPERATIONS AND ANALYTICS FROM CA

The modern network is demanding. (How will you manage it?)

Digital transformation has created a new application economy that demands greater speed, rapid customization, constant performance, better reliability and 24/7 availability. But it's not just about technological change—it's about operational change, too, which in effect pivots entirely on the enterprise network environment.

CA's Network Operations and Analytics platform converts inventory, topology, device metrics, faults, flow and packet analysis into actionable intelligence for network operations teams. The solution provides an out-of-the-box, single-pane-of-glass dashboard that's ready to use, without having to learn a new network management tool. An OpenAPI portal enables network teams to design their own dashboard and reporting experience.

With the ability to have deep visibility and context of network issues—across all application service chains, individual network nodes and endpoints—NetOps now has the ability to significantly reduce time to resolution while enhancing user experience satisfaction.

Real-World Impact of Selecting the Right Network Tools

Challenged by scalability issues with its existing monitoring solution, a global telecommunications services provider opted for CA Technologies' network management platform. The results were dramatic.

After adopting the CA Technologies solution, the company saw the overall end-user experience improve by more than 75 percent, along with a similar increase in scalability. It also gained significantly more predictive network analytics capabilities.[16]

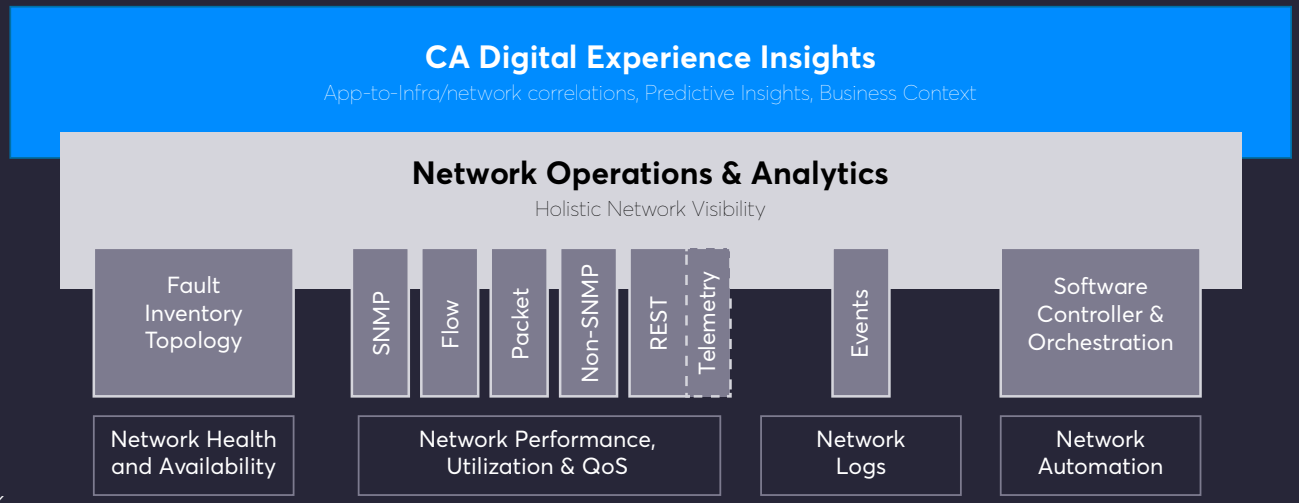
On the other end of the spectrum, a global banking company adopted the CA Technologies solution and not only reduced its network complexity and improved its ability to monitor virtual networks by more than 50 percent, but was also able to deliver an improved user experience and speed mean time to resolution.[17]

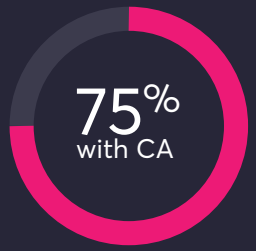
How can one platform serve the needs of both large enterprises and smaller companies? CA's Network Operations and Analytics platform delivers an out-of-the-box, single-pane dashboard that's ready to go, as well as an OpenAPI portal that lets network teams design their own dashboard and reports.

CA closes the gaps and delivers a comprehensive network monitoring and management solution designed with tomorrow in mind. The ability to gain deep full-stack visibility into network issues in context reduces the time to resolution, helping to ensure the kind of user experience that keeps customers happy.

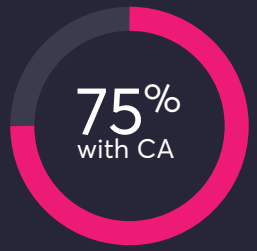
CA's Network Operations and Analytics at a Glance Through a Single, Unified Dashboard

- Highly scalable and adaptable network availability and performance monitoring system monitoring four million items at 500,000 metrics per second, presented on a customizable dashboard.
- Unified and comprehensive performance, network fault, root cause, packet and flow analysis, enabling proactive change management, noise reduction and reporting enabling continual optimization of network infrastructure and the business services running on top of it.
- Application-centric visibility into SDN and network virtualization technologies with seamless support for Cisco ACI™, Cisco® SDWAN, Nokia® Nuage Networks™, VMWare NSX®, Juniper® OpenContrail™ technology, OpenDaylight™ technology and OpenStack® technology, among others.





Global 500 banking company **improves** monitoring scalability[18]



Global 500 Telecommunications company **improves** overall end-user experience[19]

Large enterprise financial services company **improves** virtual network monitoring[20]

CHAPTER FIVE

NETWORK SUCCESSES: USE CASES

The modern network is diverse. (Are you in control?)

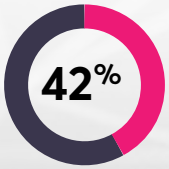
SD-WAN Monitoring

Extended visibility to optimize NetOps

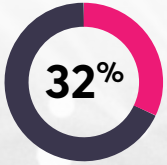
SD-WAN is a specific application of SDN that's applied to the WAN and used to connect enterprise networks, including branch offices and data centers across geographies. Today, 88 percent of distributed enterprises are deploying SD-WAN or are planning to soon.

The ability for SD-WAN to replace MPLS with the Internet to provide direct and secure access to the public cloud is a huge benefit, but as SD-WAN supports the migration of critical applications to the cloud, it introduces visibility gaps.

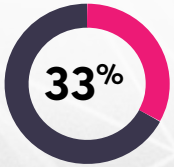
Recent analyst research reveals that SD-WAN presents additional network operations challenges:[22]



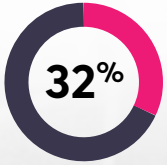
of early SD-WAN adopters express concerns about managing VNFs after consolidation of their remote-site infrastructure



are concerned about SD-WAN intelligence making automated traffic forwarding decisions for them



are worried about the need for on-site IT staff to manage new SD-WAN infrastructures



stress the concern for unified performance monitoring of SD-WAN and legacy WAN technologies

As SD-WAN supports the cloud workload migrations, network monitoring tools must provide insights into these new architectures. It is essential for network operations to trace the root cause of performance problems to the cloud provider, the service provider network or the internal enterprise for reduced service disruptions.

Additionally, network operations needs to adopt a comprehensive and unified approach to managing traditional WAN and SD-WAN environments that offers extended visibility into both and enables end-to-end network operations.

CA's SDN relationship mapping addresses concerns with VNF management

CA's solution is designed to monitor and visualize relationships among network elements (physical, virtual and logical) rather than just monitoring individual device metrics. This visibility is important because it enables network operations to understand how suboptimal conditions with one network element impact other elements within the deployed service.

CA validates the traffic decisions made by SD-WAN intelligence

CA provides insight into the individual provider networks that SD-WAN technology abstracts for hybrid WAN connectivity. The solution validates the routing and forwarding decisions made by SD-WAN and correlates application performance issues with the offending service provider network. These new monitoring capabilities remove the complexity inherent in SD-WAN connectivity abstraction and validate the forwarding decisions of an intelligent SD-WAN solution.

CA enables easy monitoring and management of SD-WAN technologies

It is imperative that organizations use existing experience, processes and workflows to take on the complexity that comes with any new technology. CA offers one converged operational user interface (UI) providing deep visibility (traffic, flow, trends, performance, fault, systems, apps) across traditional and modern networks. Quick health indicators and intuitive visualizations enable help desk staff and NOC engineers easy troubleshooting of complex SD-WAN infrastructures to reduce service disruptions.

CA delivers unified monitoring of SD-WAN and traditional WAN

CA removes the swivel chair approach to monitoring new technologies. The solution automatically adds SD-WAN tabs to existing dashboards, allowing operations to manage traditional WAN and SD-WAN technologies with the same workflows and processes they use with their existing environment. This functionality easily addresses the concerns about unifying management of SD-WAN and traditional WAN infrastructure.

CA Network Operations Analytics provides a scalable, comprehensive approach to unified monitoring of SD-WAN and legacy WAN performance without the need for NetOps teams to learn a new management tool. CA continues to expand its modern network monitoring capabilities through a converged platform for improved end-to-end visibility and coverage of traditional network technologies, as well as the latest SDN architectures in the market today. CA's solution also extends its capabilities to virtual customer premise equipment (vCPE) and software-defined data center (SDDC) use cases for comprehensive service assurance from the enterprise to the cloud.

"CA addresses the hottest software-defined networking technologies today. With the integration of fault, device, flow, and packet analysis, CA Technologies delivers a comprehensive approach to unified monitoring and analytics of SD-WAN and traditional WAN technologies."

Enterprise Management Associates

Cisco® Application Centric Infrastructure (Cisco ACI™)

Comprehensive end-to-end network coverage

Cisco ACI is a tightly coupled, policy-driven solution that integrates software and hardware. The hardware for Cisco ACI is based on the Cisco Nexus® 9000 family of switches. The software and integration points for Cisco ACI include a few components, including Additional Data Center Pod, Data Center Policy Engine, and Non-Directly Attached Virtual and Physical Leaf Switches.

As a data center SDN underlay, Cisco ACI is helping to transform enterprise networking. Cisco ACI offers greater flexibility, dynamism and automation—but these constant changes can't be seen with traditional networking monitoring tools. Next-generation networking technology like Cisco ACI requires next-generation monitoring.

Cisco ACI presents network operations challenges:

1. The Cisco APIC GUI (Element Management System) is great for the network engineers designing and deploying the network, but it doesn't offer network operations any advantages to troubleshooting the network. It lacks the monitoring scale required by SDN, along with easy operational troubleshooting workflows and triage scenarios.
2. Cisco ACI abstracts the physical network into virtual and logical layers and entities, which means a lot more devices and interfaces on the network than ever before, all moving around and sucking up data center resources with the click of a mouse.
3. Cisco ACI centralization and abstraction can also mean a lot more noise on the network. This technology has 23,000 events defined in it, with hundreds of unique messages and alarms. That many events and faults can flood your network and affect an operations team's ability to troubleshoot efficiently. If you can't get ahead of the noise, your NOC will be inundated.

Successful Cisco ACI deployments don't end with network architects and engineers

A successful transfer of a production Cisco ACI environment from engineering teams to the network operations teams (NOC) depends on making Cisco ACI monitoring easy, scalable and manageable for the NOC and depends on the following:

- **Operationalizing SDN** The NOC needs out-of-the-box (OOTB) standard operations workflows with less clicks to troubleshooting and triaging complex SDN environments like Cisco ACI.
- **Enabling "relationship triage"** Cisco ACI introduces new inventories and new topologies that need to be auto-discovered, understood and visualized to be managed effectively.
- **Monitoring multiple data sources** like flow packet, SNMP, performance, REST, non-SNMP, etc., because there are many languages being spoken in today's data center based on a variety of vendor technologies.
- **Correlating network impact to applications** and critical business services via high speed and high scale packet analysis. Cisco ACI makes it difficult to access packet data, and the large amount of traffic generated by this technology demands advanced monitoring scalability.
- **Correlating Cisco ACI events**, reducing the noise and dumping non-critical alarms to allow the NOC to focus on the real pain point of any outage for faster triage.
- **Delivering a single operations experience** with easy OOTB dashboards for NOC personnel to correlate network health with faults and events for modern technologies like Cisco ACI, SD-WAN, vCPE to traditional SNMP performance, flow and traffic analysis and TCP/Application transport analysis in one unified platform.
- **A full stack network monitoring platform** needs to feed an intelligent analytics backplane for advanced network triage and network automation possibilities.

CA's Network Operations and Analytics for Cisco ACI provides industry-leading visibility into the components and infrastructure that comprise today's software-defined data centers. The ability to understand how logical entities in the Cisco ACI fabric are affected by physical infrastructure is essential for an overall picture of network health. The CA solutions provide advanced analytics and visibility to improve triage and help ensure the agility and health of Cisco ACI deployments while providing true performance of the application and application path.

Four Reasons You Can Depend on CA for Cisco ACI Deployments

Effective network management today starts with one view: a convergence of network operations that enables network managers to perform comprehensive and scalable monitoring and analytics that includes three critical factors.

1. **All-in-one comprehensive monitoring**
   Broad capabilities to acquire, present and analyze across the entire network stack.
2. **End-to-end assurance**
   Cisco ACI network performance metrics along with traditional data centers, enterprise and service provider networks with expert dashboards.
3. **Deep diagnostics and rich analytics**
   Converging device availability, flow, faults and packet analysis within specific contextual workflows to bring granular visibility into Cisco ACI application and service performance along with advanced analytics for capacity planning, percentile and deviation from normal operational intelligence.
4. **Advanced scale**
   Monitoring scale for the most dynamic and complex networks in the world, while delivering the same access and experience, over an extended historical period, with little to no data loss.

CHAPTER SIX

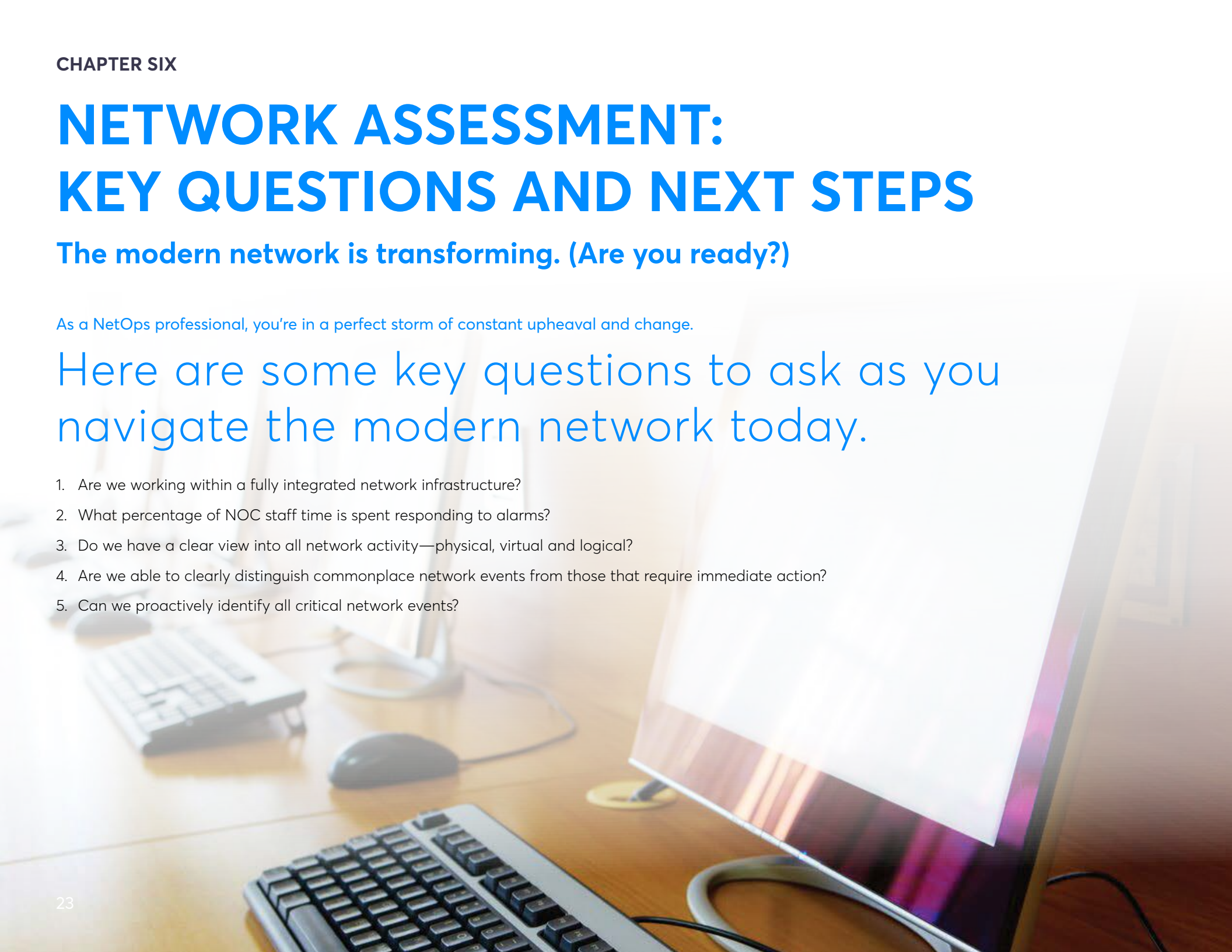
NETWORK ASSESSMENT: KEY QUESTIONS AND NEXT STEPS

The modern network is transforming. (Are you ready?)

As a NetOps professional, you're in a perfect storm of constant upheaval and change.

Here are some key questions to ask as you navigate the modern network today.

1. Are we working within a fully integrated network infrastructure?
2. What percentage of NOC staff time is spent responding to alarms?
3. Do we have a clear view into all network activity—physical, virtual and logical?
4. Are we able to clearly distinguish commonplace network events from those that require immediate action?
5. Can we proactively identify all critical network events?



Discover the power of CA Network Operations Analytics.

Book a demo with a CA NetOps expert today.

CA's Network Operations and Analytics dashboards can efficiently troubleshoot issues across the entire network stack, from traditional to Cisco ACI to SD-WAN architectures and across multiple data sources, including Fault, Flow, Performance Packet, REST and SNMP. The result is a single workflow that enables NetOps to identify and quickly isolate network issues impacting critical applications. Book your free demonstration with a NetOps expert from CA and learn how CA's Network Operations and Analytics can help your organization:

- Understand the new monitoring imperative
- Achieve end-to-end Cisco ACI, SD-WAN and cloud monitoring
- Obtain application-centric network visibility
- Gain insights in massively scalable environments
- Get closed-loop service validation through analytics

Learn how at ca.com

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