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The Network Automation Benchmark

Automation, AI and ML in Network Management

Overview

From physical to virtual to cloud (and now multi-cloud) infrastructures, networks are getting more and more diverse. For network professionals, managing across such hybrid environments is a growing challenge. On top of that, increasing adoption of software-defined networking (SDN) and SD-WAN technologies are adding new virtual, overlay, and underlay constructs and elements, all making the network stack even more difficult to holistically understand. These factors make accurate network visibility and effective network management harder than ever to achieve.

What's the answer to managing today's networks? Automation, based on advanced data integration and analytics, according to growing trends and many in our industry. Humans and manual processes can no longer keep pace with network innovation, evolution, complexity, and change. That's why we're hearing more about "self-driving networks," "self-healing networks," "intent-based networking," and other concepts which aim to apply artificial intelligence (AI), machine learning (ML), and automation to support modern network operations.

Collectively, this shift is being referred to as "AIOps" (i.e. artificial intelligence for operations). In the simplest form, an AIOps approach is one that leverages multiple sources of real-time and historical monitoring data, adds contextual enrichments, applies AI/ML to recognize patterns and anomalies worthy of actions, and automates corrections, however and wherever practical. Such systems can operate around the clock, at any hour of the day, and respond long before humans can manually sift through vast swaths of data to make discoveries themselves.

The potential benefits of AIOps, which include significantly improving responsiveness and effectiveness, are what makes the approach highly appealing. For instance, by better leveraging existing, available network data, AIOps can reduce the most time-consuming manual troubleshooting and analysis tasks, so that networking teams can focus more on growth rather than firefighting. AIOps concepts can also be applied to enhancing awareness and accuracy for better network engineering, capacity management, and cost control. Further, AIOps includes integrated automations to address and correct issues, ultimately ensuring fast, secure, and performant delivery of digital services.

In the broader IT context, AIOps is already being utilized. For example, AIOps for IT operations can dramatically reduce ticket noise by detecting and escalating only actual root cause issues to the IT help desk for faster resolution. For security teams, AIOps technology can sort through an array of false positives to flag actual malicious incidents for remediation.

With AIOps already taking shape within other technology groups, Kentik® conducted a survey at one of the biggest networking events of the year, the recent Cisco Live U.S. 2019 conference, to gauge progress within the network engineering, management, and operations sector. This report aims to help fellow networking professionals understand adoption and readiness for automation, AI, and ML in our industry so that these professionals can better prepare within their own organizations.

Methodology

Kentik surveyed 388 conference attendees during the **Cisco Live U.S. 2019** conference held in San Diego, California. The survey respondents varied in titles, including C-level, SVPs / VPs, directors, managers, engineers, architects, and developers. The largest majority of respondents (50%) reported having the title of "network engineer." Respondents hailed from multiple industry sectors, including education, energy, finance, government, healthcare, technology, and more.

Summary of Findings

- **The move to cloud is still underway for a few, as multi-cloud becomes a reality for many.** As noted in our overview, moving to the cloud, and especially multi-cloud, is one of the driving factors behind the need for network automation. While 76% of our respondents indicated they were using cloud services, nearly a quarter (24%) report that their organization has not yet moved to the cloud. Of those with cloud services, 60% are working in a multi-cloud environment, so the complexity ramp is a swift one.
- **Network automation is taking shape.** Eighty-five percent (85%) of respondents said their organization has one or more types of automation, and yet only 27% of respondents said their organization is "extremely prepared" or "very prepared" for full automation. Progress is being made, however, up from just 15% of respondents feeling "extremely" or "very" prepared via Kentik's 2018 survey.
- **The energy sector leads the network automation trend.** Healthcare and government are behind the curve. Outside of the technology industry, the energy sector is reportedly the most prepared for full automation. Thirty percent (30%) of energy sector respondents reported that their organization is "extremely prepared" or "very prepared" for full automation. In the healthcare industry, only 3% of respondents reported that their organization is "very prepared" for full automation. Government respondents led among industries "not at all prepared," with 21% of the sector noting this response.
- **Networking processes like compliance and incident response are least likely to be automated.** The majority (53%) of respondents are using automation for network configuration. Policy management was the second-most automated process, cited by 40% of respondents. Processes such as compliance, incident response, and cloud bursting received lower response rates. We believe this may be due to the level of human interpretation and investigation that still needs to exist, as these processes are often regulated and/or are more directly associated with impacting a business and its revenue.
- **Machine learning is growing in importance for network management… regardless of who you ask.** Up 20% since our 2018 survey, 65% of respondents said that machine learning is now extremely important" or "very important" for network management. This reflects both the steady maturation of and comfort with ML as a technology, as well as the relentless march of complexity, causing network pros to seek help in reducing time and effort required to monitor and troubleshoot network and application performance in large, complex environments.

- **AIOps adoption among network professionals is very early stage, but the industry appears ready for it to help with network management.** Only 22% of respondents reported that their organizations are actively using or planning to use AIOps tools today. However, clear majorities are prioritizing automation and ML, which are two of the three major foundational elements of AIOps (with the third being data integration and enrichment). This paints a bright future for AIOps approaches to network management tools, technologies, and practices.

Analysis of Findings

AS THE MOVE TO CLOUD CONTINUES, MULTI-CLOUD LOOMS LARGE

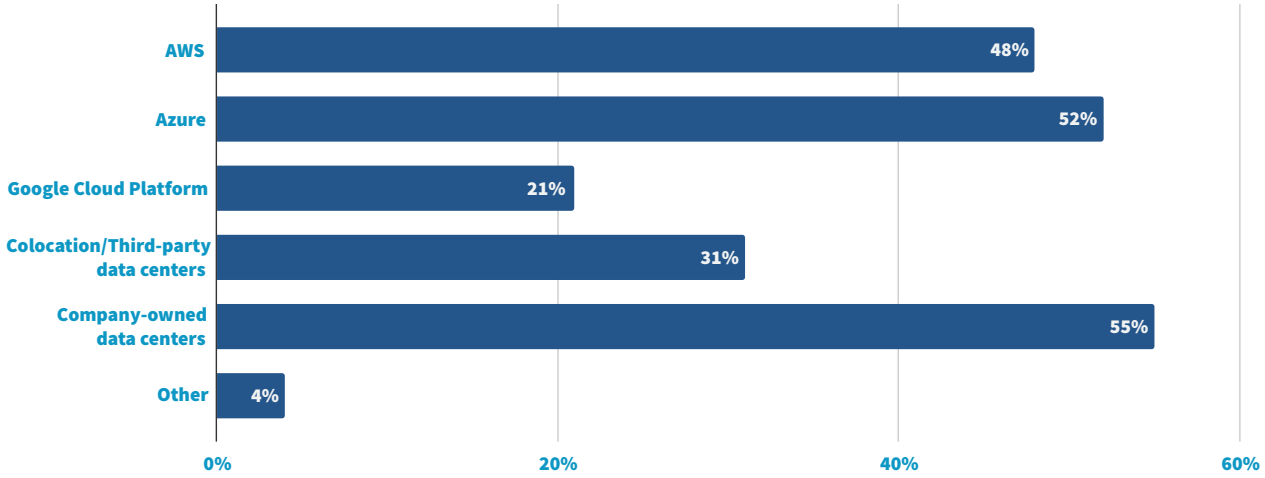
Moving to the cloud, and across multiple clouds, drives the need for automation. Cloud is also an embodiment of automation. That's because when you move to the cloud, you don't always know what's happening behind the scenes. You're paying a cloud service provider to manage some part of the experience, even if it's just keeping the services up and running. That is someone else automating what the cloud provides for you.

As such, we included a question in our survey about cloud usage. What we found was that at the Cisco Live conference (a user conference which started with a focus on physical networks), **nearly a quarter (24%) of the 388 respondents reported that their organization has not yet moved to the cloud. Despite this, nearly half of those using cloud (47%) reported using multiple cloud providers.**

Of the 76% who are using cloud services:

- **The majority (53%) are using a single cloud provider, but nearly half (47%) are using multiple cloud providers.**
- **The most common provider in use (52%) is Microsoft Azure.** Close behind Azure, forty-eight percent (48%) of respondents using cloud services reported using Amazon Web Services (AWS), and 21% reported using Google Cloud Platform (GCP).

Which cloud providers does your organization use?

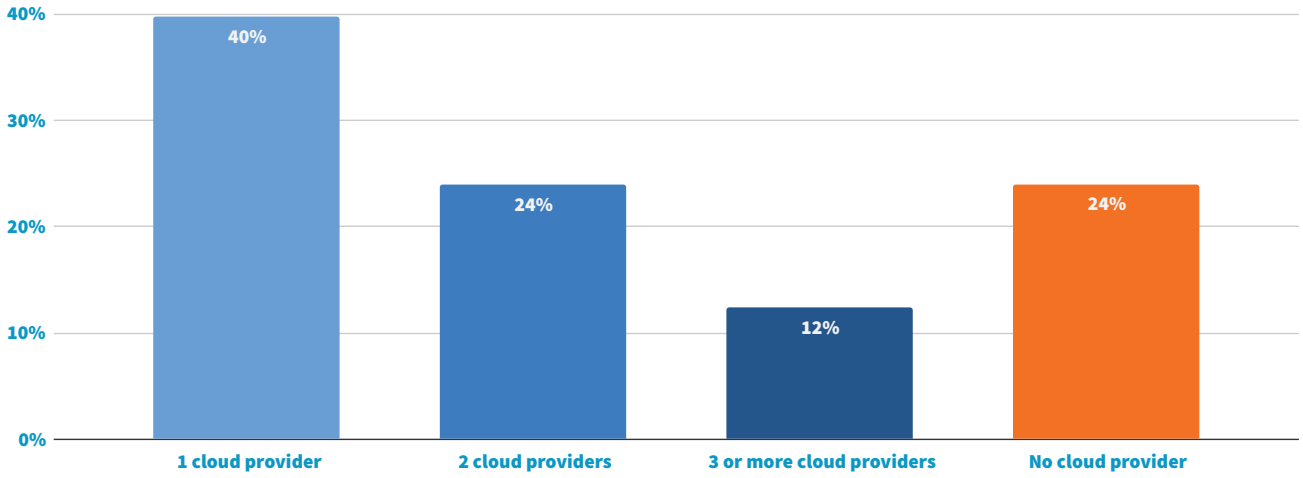


Data from 388 respondents. Note chart values do not sum to 100% as this is a "select all that apply" question.

What About Hybrid and Multi-cloud Use?

Forty percent (40%) of respondents noted using *only one* cloud. Another 24% reported using *two* cloud providers, and 36% said that their organization uses *two or more* cloud providers. Among the surveyed users, multi-cloud adoption is roughly similar to single-cloud adoption (154 single-cloud users versus 141 multi-cloud users).

How Many Clouds are in Use in Each Organization?

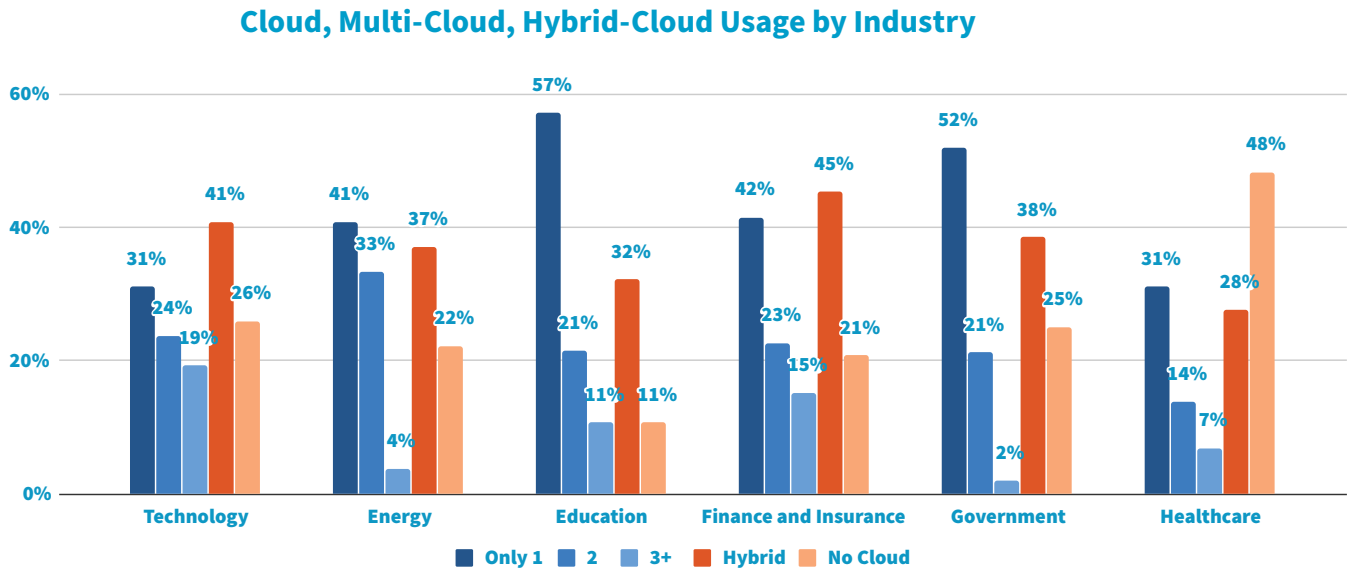


Data from 388 respondents.

Cloud Usage by Industry

When looking deeper at cloud, hybrid, and multi-cloud data by industry, some very interesting variations become apparent in adoption rates:

- **Adoption leaders:** The greatest adopters of cloud services are the education sector, with only 11% not using any form of cloud. But interestingly, the vast majority of education respondents (57%) indicated that they only use one cloud provider — the highest percentage of any industry group.
- **Multi-cloud users:** Technology and finance sectors gave the strongest responses confirming multi-cloud use, at 43% and 38% respectively, with the energy sector close behind at 37% and education at 32%. Technology (19%) and finance (15%) sectors indicated the highest percentages of organizations using "three or more" cloud providers, and thus are dealing with the most complex, mixed operating environments.
- **Adoption followers:** Healthcare trailed the rest of the field by a significant margin, with nearly half (48%) indicating no cloud usage and the smallest percentage (21%) indicating multi-cloud was in use. Related to this, the sector also indicated the smallest percentage of hybrid environments (28%).



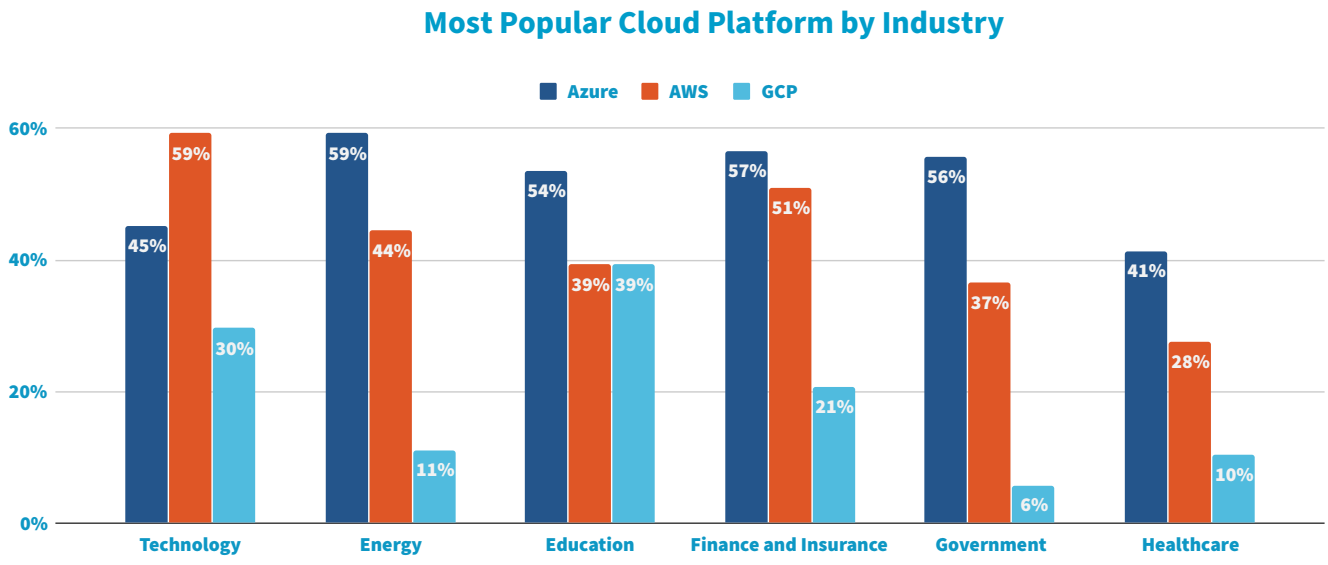
Significant (and possibly surprising) differences in cloud adoption by industry group

Cloud Provider Preference by Industry

Overall, Microsoft Azure is the most common cloud provider for Cisco users, and this was true across almost all industry sectors. However, when we looked into the findings by industry, the technology industry deviated.

The majority (59%) of technology industry respondents reported using AWS; however, a large contingent (45%) also indicated use of Azure. In general, these preferences are a bit out of synch with broader industry measures of cloud adoption, where AWS holds a significant lead over both Azure and GCP.

Our findings do not reflect a detailed assessment of total workloads, which may vary from simply whether a provider is in use or not. It's also likely that many organizations using closely-related applications, such as Office 365, may also have some engagement with the related cloud services but perhaps not significant activity."



Assessing Cloud-Provider Preferences by Industry

Overall, the large number of multi-cloud users, as well as the balanced popularity of AWS and Azure service usage, indicates that these **networking pros are already dealing with significant operational complexity.**

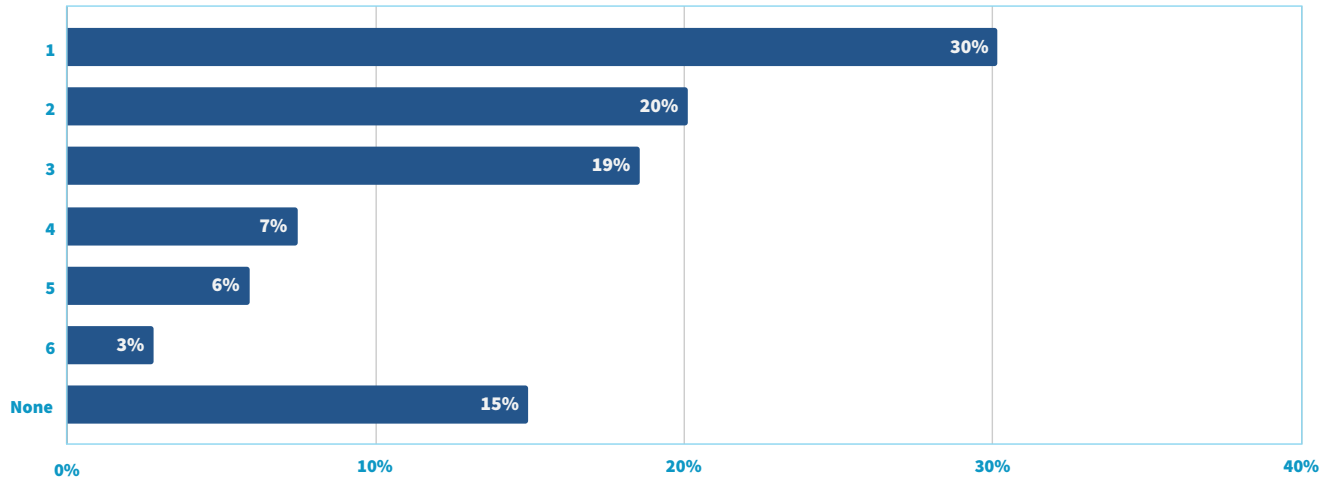
This complexity drives the need for advanced approaches to monitoring, analytics, and automation, such as those addressed by AIOps solutions, to allow agility, rapid response to issues, and ready adaptation to mixed infrastructures.

NETWORK AUTOMATION IS TAKING SHAPE

As mentioned above, cloud adoption brings with it a wave of automations, even if they are not directly visible. We were interested in how well, or not, automation is taking hold in the daily lives of networking professionals on a broader basis. When asked about automation, the vast majority (85%) of respondents reported having at least one network automation deployment in place. Fifty-five percent (55%) have two or more deployments.

On average, respondents have two types of automation. We will review the specific processes being automated later in this report; however, this is promising to see networking professionals being willing to adopt automation at such high rates. Not long ago, network automation was largely shunned as frightening and unreliable. That has changed with the introduction of server virtualization, cloud, and SDN. Broader IT organizations are no longer willing to wait for networks to be manually configured.

Number of Network Automation Deployments



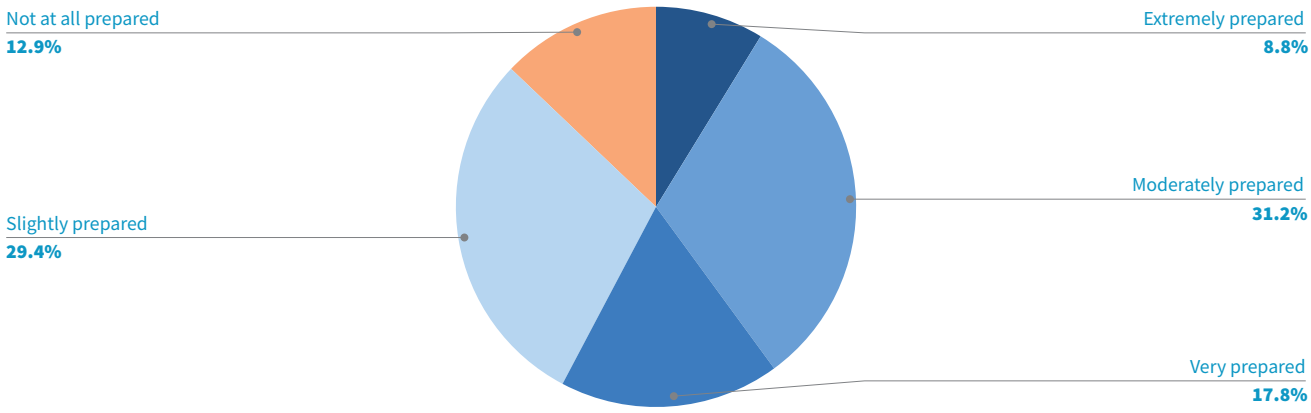
Data based on 388 responses

From Basic Automation to Full Automation

Having some automation in place is great, but the long-term goal is to move towards pervasive automation. We asked respondents about their readiness to move from automating just one or a few network processes to a state of full network automation. Specifically, we asked: "How ready is your organization for full automation to manage network performance and network security?"

Twenty-seven percent (27%) of respondents reported that their organization is either "extremely prepared" or "very prepared" for full automation.

How ready is your organization for full automation to manage network performance and network security?



Data from 388 respondents.

A Look Back at Last Year

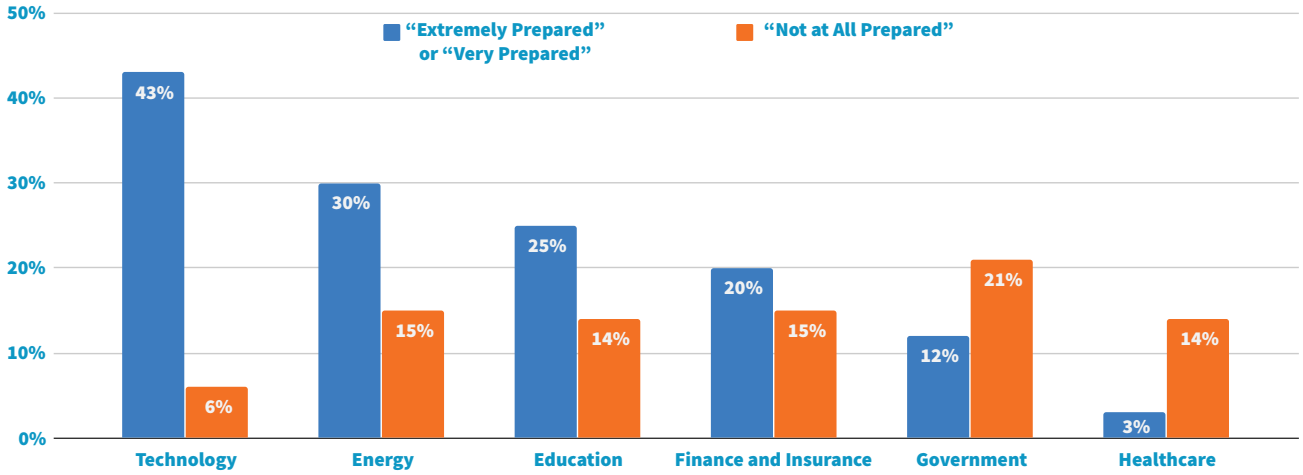
By comparison, Kentik asked this same question in a survey at last year's Cisco Live 2018 event. The 2018 results showed that only 15% of respondents felt their organization was either "extremely prepared" or "very prepared." While this is not a huge absolute percentage, it is worth noting that over the course of just one year, **the relative share of organizations feeling "extremely prepared" or "very prepared" for full automation nearly doubled (+80%).**

We feel this reflects increasing demand for—and comfort with—automation, and we expect to see readiness continue to grow in the future.

AUTOMATION CURVE: ENERGY SECTOR AHEAD; HEALTHCARE & GOVERNMENT BEHIND

Outside of the technology industry, the energy sector is most prepared for full automation. Thirty percent (30%) of energy sector respondents said their organization is "extremely prepared" or "very prepared" for full automation. On the opposite end of the spectrum, in the healthcare industry, only 3% of respondents reported that their organization is "extremely prepared" or "very prepared." Government respondents led among industries "not at all prepared," with 21% of the sector noting this response.

How ready is your organization for full automation to manage network performance and network security?



Comparing eadiness for full automation of network performance and security by industry

By comparison, and leading the whole pack on automation-readiness, 43% of technology industry respondents said their organization is "extremely prepared" or "very prepared" for full automation. However, because the tech industry includes many digital businesses that were built in, on, or for the cloud and should, by nature, be more technologically advanced, we've chosen take a look beyond it in calling out the energy sector as being ahead of the automation curve.

Why Does the Energy Sector Lead?

For the energy sector, automation is widely accepted. This industry is already doing a lot of industrial automation (e.g. oil and gas processing and the monitoring of onshore and offshore pipelines). It's easy for this industry to make the case and apply many of the same automation approaches to their networks.

Additionally, for teams running energy-sector networks, there's a lot of work that goes into making sure the networks are highly advanced and highly functioning. We believe **the energy sector is learning that it must be more hands-off in many network management processes, including those where automated systems can sift through various data sources to detect potential issues faster than the human eye.**

After all, a network outage could cause production issues, leading to a direct hit to business—not to mention the potential impact on the economy.

Why Do Healthcare and Government Trail Behind?

The healthcare industry appears to be the least "fully" prepared. Zero respondents in this industry reported that their organization is "extremely prepared" for full automation. Only 3% of respondents reported that their organization is "very prepared" for full automation.

At the same time, 21% government-employee respondents said their organization is "not at all prepared" for full automation — higher than any other industry marked itself in being not ready.

We believe the healthcare and government industries are behind the automation curve, largely due to the fact that they're regulated and individualized industries. For example, **in the healthcare industry, there's still debate over the risk of connecting medical devices like insulin pumps and pacemakers to networks.** For this industry specifically, when you do something wrong, it literally could mean life or death. As such, mistrusting automation as opposed to trained professionals results in a slower uptake.

For government agencies, much of the feeling of not being prepared for full automation may be due to the fact that **government systems are typically built on legacy technology and do not receive the rate and regularity of technology refresh enjoyed by other sectors.** Unless an organization's technology stack was created to be ready for it, achieving full automation still requires a lot of heavy lifting.

That Being Said...

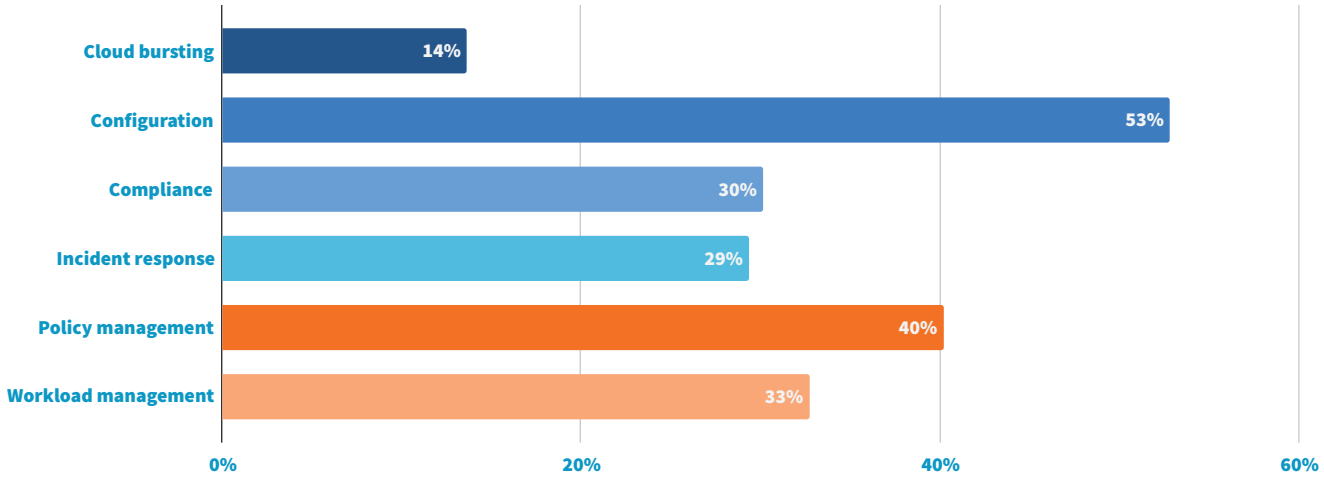
Across all industries, respondents typically fall somewhere in the middle on the automation-readiness scale. Majority of the total 388 survey respondents (60%) said they're either "moderately" or "slightly prepared." This is still a positive result, as it shows pervasive awareness of automation and its benefits, and recognition that preparation is essential.

INCIDENT RESPONSE & COMPLIANCE LEAST LIKELY TO BE AUTOMATED

As part of our inquiry into the number of network automation deployments currently happening, we also looked into which types of automations are in use. We found that **a majority of respondents (53%) are deploying automation for configuration purposes, and 40% reported using automation for policy management.**

These activities would include processes such as deploying new elements, turning up new interfaces, updating access lists and passwords, and making changes to firewall rules. These types of tasks tend to lend themselves more readily to automation because they do not require as much human interpretation and/or investigation, as compared to a task such as compliance, which only 30% of respondents said they automate, or incident response, which 29% of respondents reported automating.

Where is your organization deploying automation?



Note: Chart does not equal 100% as this is a "select all that apply" question

It's also worth noting that, despite the rise of hybrid and multi-cloud environments, cloud bursting is being automated the least for organizations. Cloud bursting happens when an application runs in a data center or private cloud and is programmed to expand capacity and/or move part of the workload, or "burst," into a public cloud when the demand for computing capacity spikes. In this case, only 14% of respondents reported that their organization deploys automation to do cloud bursting. Since the whole point of cloud bursting is to do so on an automated, dynamic basis, our conclusion is that the networking components to enable cloud bursting are most likely already in place and don't need to change during bursting, and/or cloud bursting is a special enough use case that it is not common amongst this cohort of respondents.

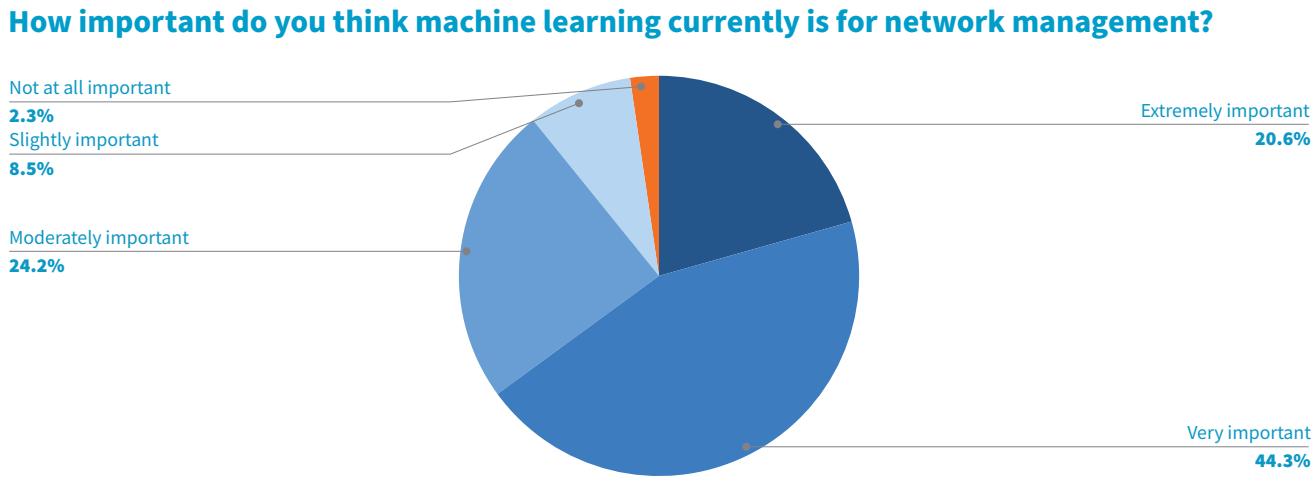
Regardless of where the automation is happening, it is encouraging to see organizations embracing it. **However, there is still a lot of space left for more automation, especially with the rise of cloud.**

MACHINE LEARNING IS GROWING IN IMPORTANCE FOR NETWORK MANAGEMENT... REGARDLESS OF WHO YOU ASK

Going beyond automation, we asked respondents about machine learning (ML). Specifically, we wanted to understand how various industries view the current importance of machine learning for network management.

An overwhelming 65% of respondents said that ML is now "extremely important" or "very important" for network management. This finding is up 20% from the survey we conducted last year, by comparison, when we asked this same question at Cisco Live 2018. Back then, results showed that just over 45% felt ML was "extremely important" or "very important" for network management.

This would indicate that **there is a growing awareness of how ML can help network pros, likely due to a combination of advancing maturity of the underlying technology, coupled with increasing pain experienced in trying to apply and scale manual processes.**



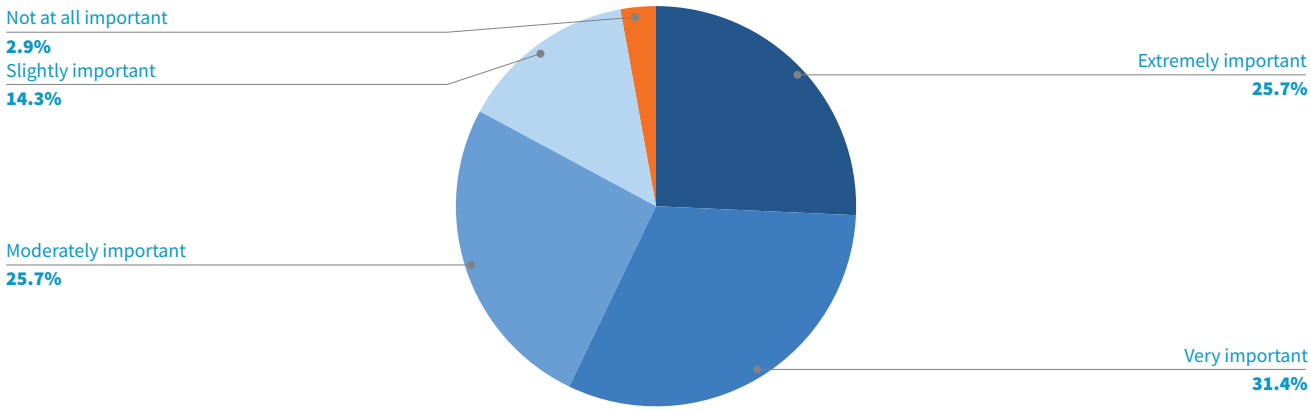
Importance of machine learning for network management, year 2019 responses

Executive vs. Technical-level Thoughts on Machine Learning

To understand if opinions vary by role, we also broke the numbers down by title. Specifically, we looked at responses from executive-level titles (e.g. C-level, SVP, VP, etc.) and compared those to technical titles (e.g. developer, engineer, architect, etc.) to see whether thoughts might vary at different levels of organizations.

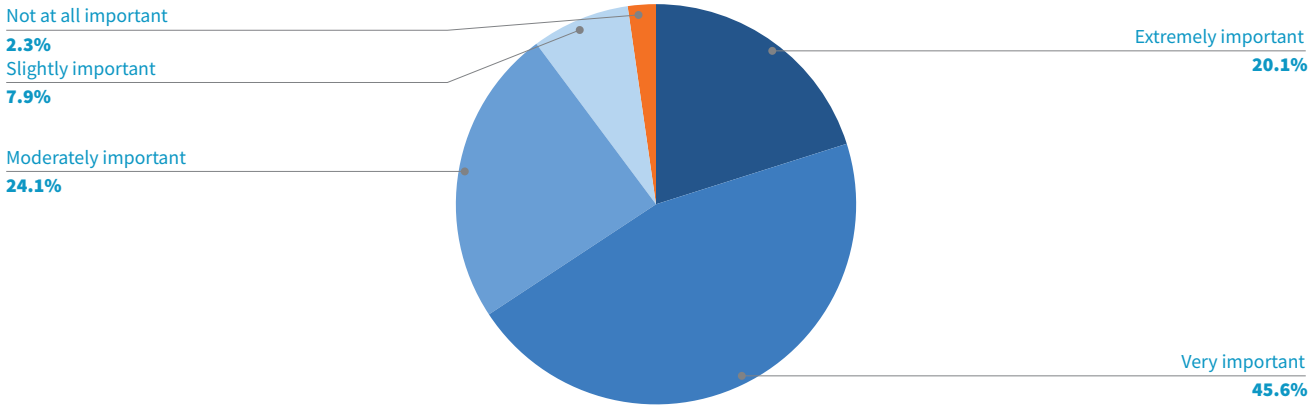
Opinions were fairly similar regardless of title. Fifty-seven percent (57%) of executive-level respondents said that ML is now extremely important" or "very important" for network management. Only slightly more (66%) technical titles said ML is now "extremely important" or "very important" for network management.

Executive input on the current importance of ML in networking



Note: Chart reflects responses from C-level, SVP, VP, and director level titles

Technical input on the current importance of ML in networking



Note: Chart reflects responses from developer, engineer, and architect titles

In many cases, executives tend to respond more strongly as to the need for and value of emerging technologies; however, in this case we observed the opposite. We feel this reflects on the urgency also felt by those in the technical trenches for help with a growing range of challenges.

Thoughts on Machine Learning by Industry

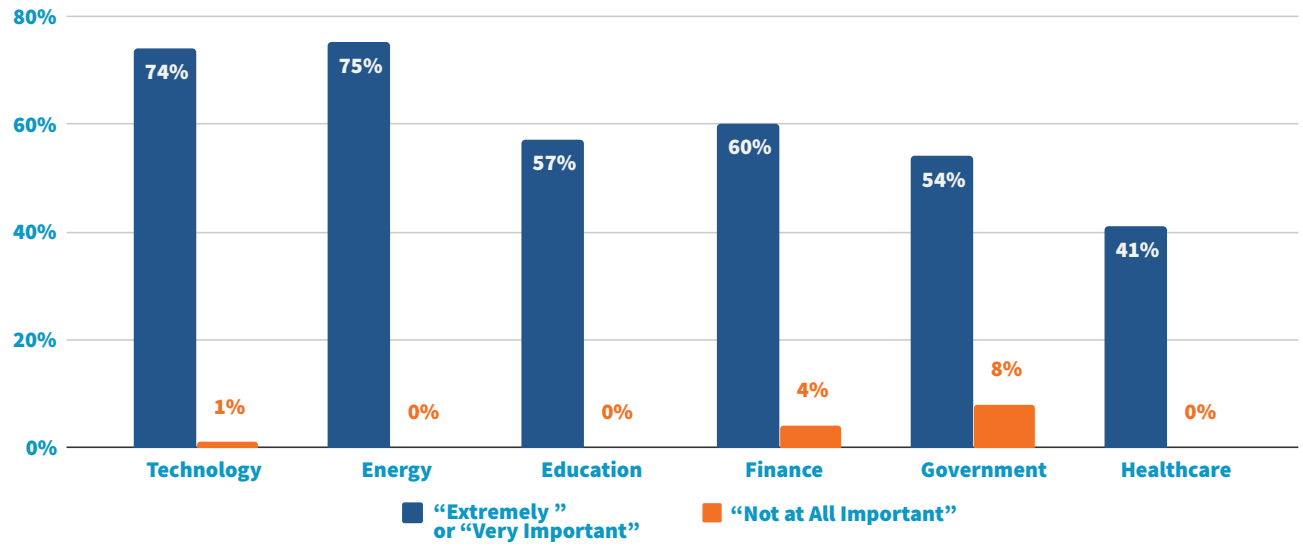
In addition to looking at opinions of machine learning by title, we also studied the breakdown by industry. Similar to the trends we observed regarding automation, the energy and healthcare sectors again stood out:

- In the energy sector, an overwhelming majority of respondents (75%), the most of any vertical group, said that ML is now “extremely important” or “very important” for network management. Not a single person in this vertical considered ML to be “not at all important.”
- Healthcare had the smallest majority of respondents (41%), compared to the other industries,

who marked machine learning as being “extremely important” or “very important” for network management.

- A significant majority of government respondents (54%) believe ML is extremely or very important but also registered the largest percentage of respondents (8%) of any vertical who felt that ML was not important at all.
- Technology and finance were the only two industries where some respondents felt machine learning has no role in network management.

Importance of Machine Learning in Network Management by Industry



AIOps: Hype Term or Dawn of a New Era in Network Management?

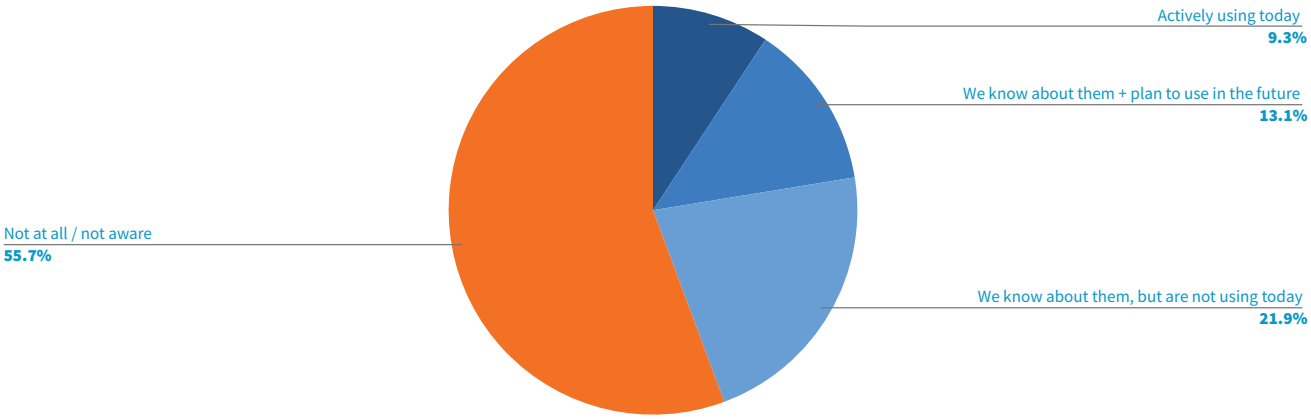
In our final section of the survey, we wanted to gauge how far networking professionals have advanced at applying automation, AI, and ML to their roles. Specifically, we asked: “Are you using any AIOps tools today?”

What we found was that only 9% of respondents reported that they are actively using AIOps tools today. Another 13% indicated that they were aware of AIOps tools and planned to use them in the future. Collectively, this means that **less than one quarter of respondents have some level of engagement with AIOps tools.** Another 22% were *aware* of AIOps tools but had not plans to use them. The overwhelmingly largest response, 55% in total, indicated that they were *unaware* of AIOps tools.

This result seems to be at direct odds with other findings in our research. A super-majority (87%) of respondents reported that their organization is somewhere between being “slightly” to “extremely” prepared for full network automation; and a strong majority (65%) said they believe that machine learning

is now “extremely important” or “very important” for network management. And yet so very few claim that they are using AIOps tools.

Are you using any AIOps tools today?



WHY DOES THE AIOPS GAP EXIST?

Since AIOps is a relatively new concept in industry circles, it is entirely possible that we have caught the networking professional audience somewhat by surprise. While there is growing understanding and appreciation of the core elements that comprise AIOps (namely the merging of multiple datasets, data enrichment, ML, and automation), there is not the same level of awareness of AIOps as an encompassing strategy, at least when it comes to network management tools. Supporting this conclusion were the many ad hoc conversations that took place at the Cisco Live event, during which networking professionals expressed curiosity regarding AIOps, wanting to make sure they weren’t falling behind on the latest technology trends.

Our conclusion is that, **while there is a certain “hype” aspect to the term AIOps, it is more than just that; it represents a collection of capabilities that exhibit strong demand and strong adoption.** Consequently, we expect to see awareness and adoption of AIOps tools by networking professionals grow steadily in the months and years ahead.

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Summary

The technology landscape today's networking professionals must navigate is daunting, and the challenges they face are not getting simpler or fewer. Cloud adoption continues to advance, and a large and growing percentage (nearing a majority) face the stark daily reality of operating in a multi-cloud environment.

Networking professionals in most industries are actively embracing network management technologies that can help, in the form of automation and machine learning. However, the real promise that lies ahead is in bringing those capabilities together in a holistic AIOps strategy for network management tools, technologies, and best practices.

We are early in this phase of market advancement, but the rationale and the commitment is there, and it appears that AIOps for networking professionals could indeed be the dawning of a new era of efficiency, productivity, and responsiveness, despite rampant technology change and growth, ultimately empowering organizational success.

ADOPTING AIOPS FOR NETWORKING PROFESSIONALS

For businesses running complex networks that exceed human operational scale, Kentik® is the provider of the only AIOps platform specifically designed for network professionals. Kentik uniquely unifies diverse data streams across cloud and traditional infrastructure to produce instant insights that accelerate network team efficiency, automate issue resolution, and create new business capabilities. Kentik is based in San Francisco. Learn more at kentik.com.