

2015 State-of-the-WAN Report

The Software Defined WAN Emerges

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Introduction

The wide area network (WAN) is a critically important topic for number of reasons including:

- The latency, jitter and packet loss that is associated with the WAN often cause the performance of applications to degrade;
- The WAN can be a major source of security vulnerabilities;
- Unlike most of the components of IT, the price/performance of WAN services doesn't obey Moore's Law;
- The outage of a WAN link often causes one or more sites to be offline;
- The lead time either to install a new WAN link or to increase the capacity of an existing WAN link can be quite lengthy.

A discussion of wide area networking is extremely timely because after a long period with little if any fundamental innovation, the WAN is now the focus of considerable innovation. As a result, for the first time in a decade network organizations have an opportunity to make a significant upgrade to their WAN architecture and design.

The goal of this e-book is to provide research-based insight into the current state of the WAN. Towards that end, this e-book examines topics such as:

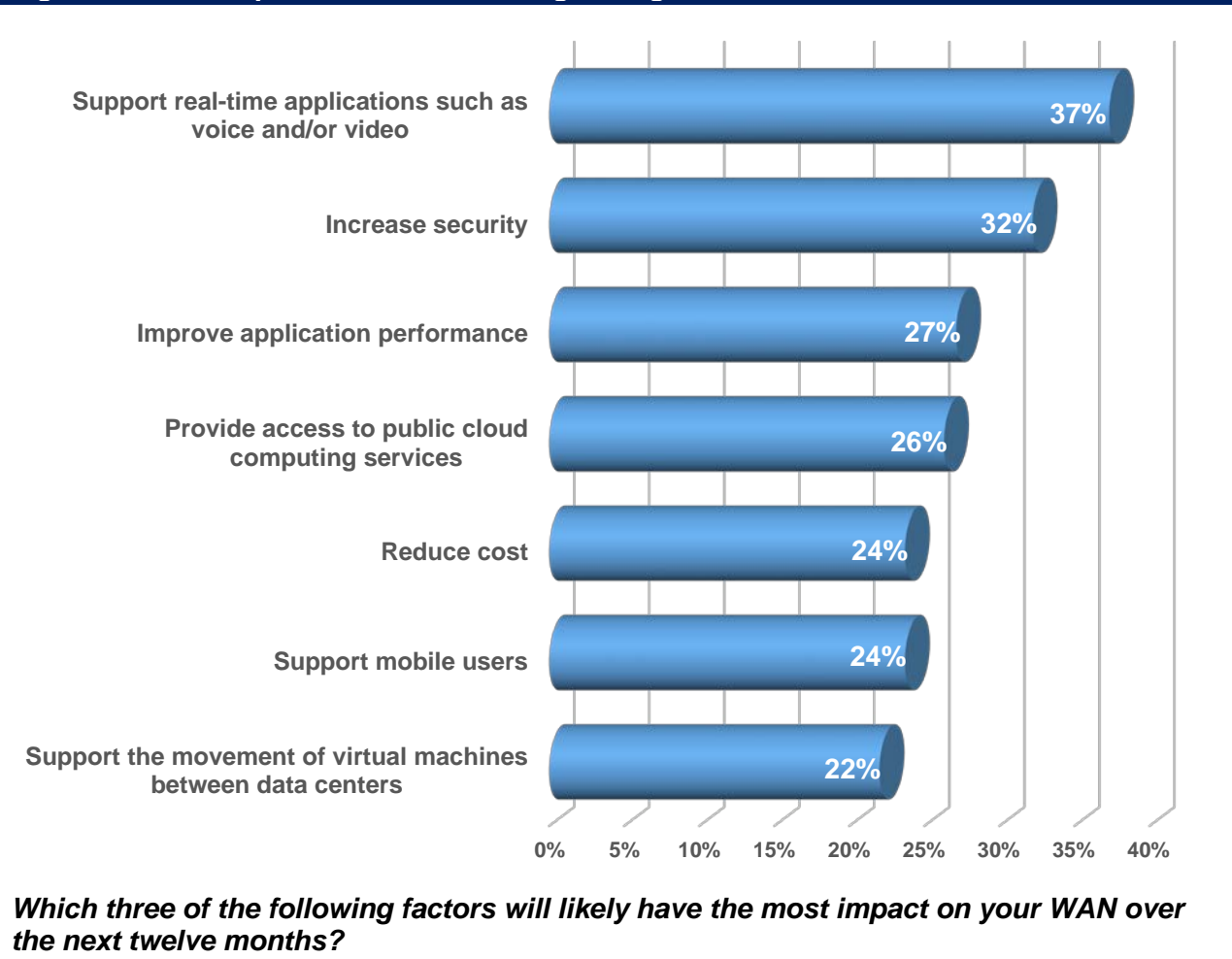
- What factors are driving change in the WAN?
- How are WAN budgets changing?
- How are network organizations approaching WAN design?
- How receptive are network organizations to new vendors of WAN functions?
- What are the driving or inhibiting factors in implementing a Software-Defined WAN (SD-WAN)?

This e-book is part of a two-part series that is focused on the WAN. The second e-book, [The 2015 Guide to WAN Architecture and Design](#), describes a hypothetical company that has a traditional approach to WAN design. It then presents alternative scenarios directly from the e-book's sponsors that describe how the company should evolve its WAN.

What are the Factors Driving Change in the WAN?

The factors that are driving change in the WAN reflect a more thorough integration of “All Things IT” from simply supporting traditional applications. Two factors are particularly important. Supporting real-time services comes in as the top driver, and, based on both this and additional surveys, it seems that video is a major part of this. Increasing security is the second strongest driver for change. And, not surprisingly, improving application performance remains extremely important.

Figure 1: Most Important Factors Driving Change in the WAN



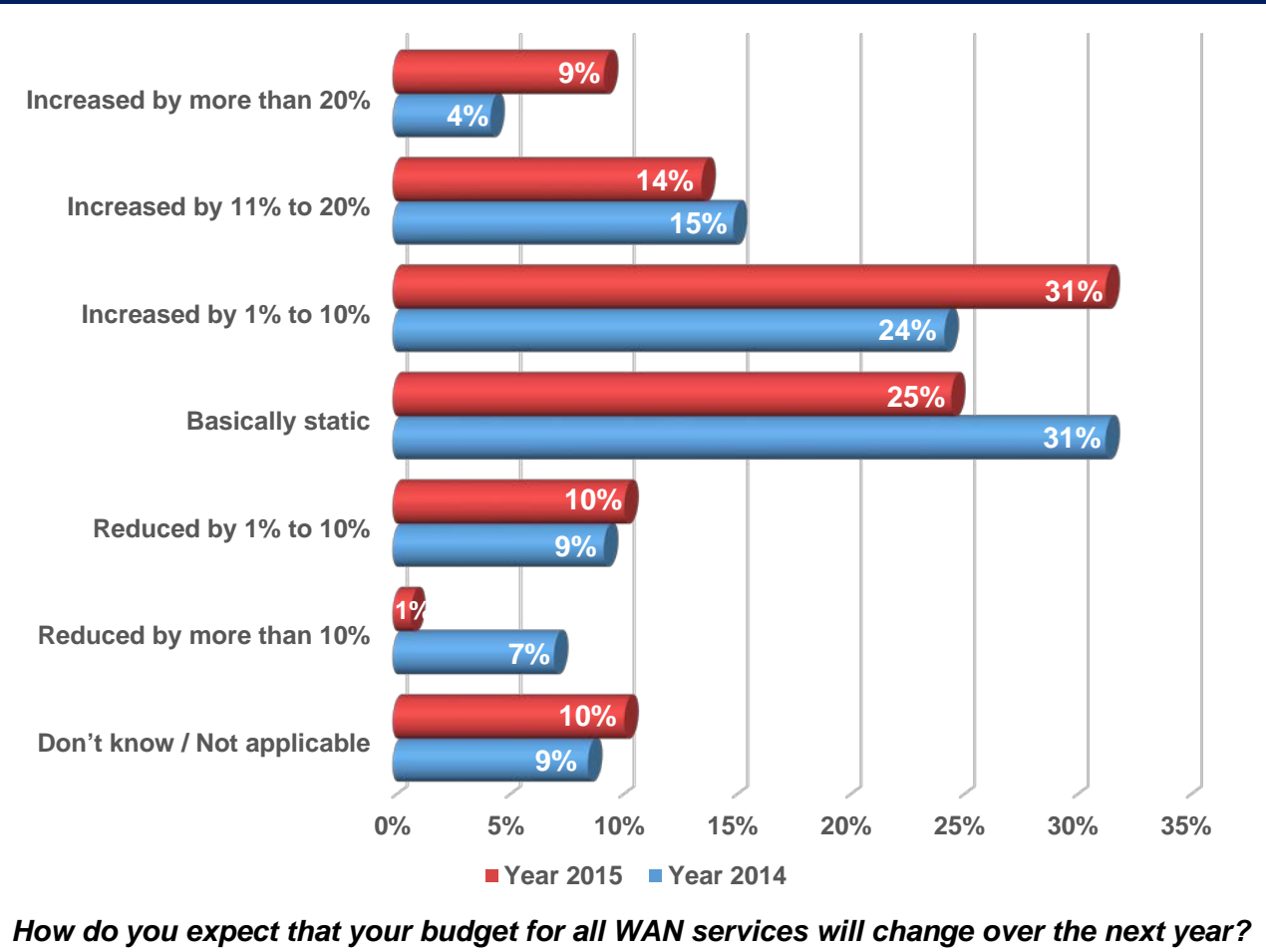
When compared to the factors that were driving change in the WAN a year ago, both the need to support real-time applications and the need to provide more security experienced a significant increase.

Reducing costs is seen as being slightly less important than found in a similar survey last year, as will be further borne out by the indications of budget changes.

How are WAN Budgets Changing?

The world is looking bright for WAN budgets for 2015. As compared with levels reported in our [2014 survey](#), there are significant increases particularly in those who report increases of more than 20% and increases of up to 20%, while the reductions of more than 10% are significantly lower.

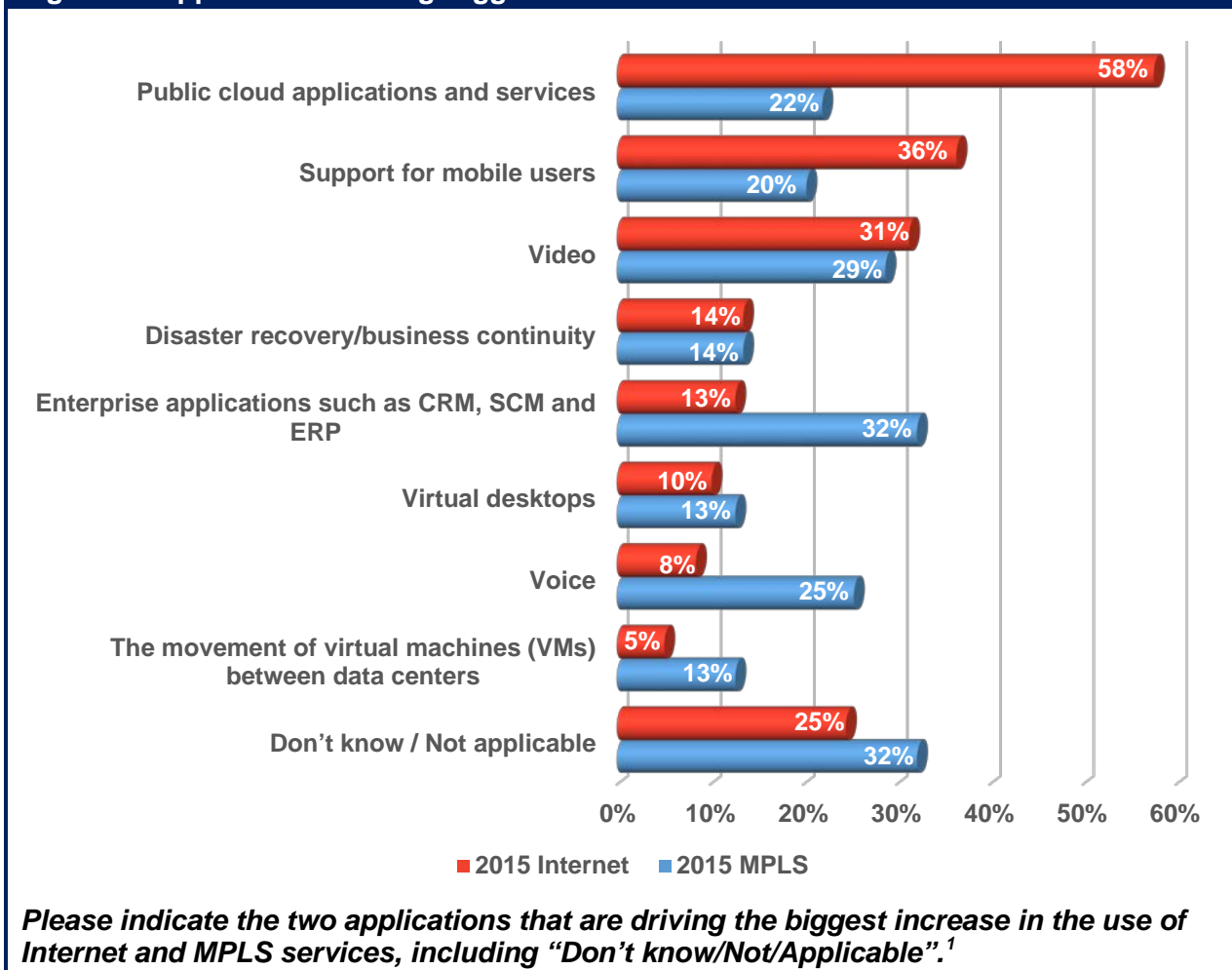
Figure 2: Anticipated WAN Budget Increase



What are the Primary Drivers for Increasing Internet and MPLS Service Use?

The two dominant WAN services today are Internet-based services and MPLS services. The responses to a question asking which two applications are driving the biggest increase in the use of these services are shown below.

Figure 3: Applications Driving Biggest Increase in MPLS and Internet Services



¹ There is a relatively large percentage of "Don't know / Not applicable" responses. There are two reasons that a respondent may choose this. In one case, they simply don't know. In the second case, it might truly be "Not applicable." This would especially be the case if an organization were totally dependent on Internet-based networking and did not use MPLS.

The survey instrument was designed such that the respondents were required to enter two responses for each (so the total of all percentages is 200%). If the question was not applicable, the individual checked this option twice, thereby somewhat inflating the percentage. This would also be inflated in the event that there was only one major driver, although the individual could have checked the same driver twice.

While a lot of the results are self-explanatory, there are some results that deserve special attention. First, the dominance of Internet services for access to public cloud applications and services is a given. The extent to which these services are a driver for MPLS seems to be a little surprising given the relatively small number of providers that accept MPLS access. That said, if the company backhauls its Internet traffic on its MPLS network, more Internet traffic means more MPLS traffic. From this perspective, the amount of MPLS traffic makes a lot of sense.

On the other hand, since the “Enterprise application” would, by inference, likely be located at data centers within the Enterprise, this being a driver for MPLS makes sense. In particular, these applications are a stronger driver for MPLS than for Internet-based services due to the inherently higher Quality of Service [QoS] and security that accompanies MPLS and these applications require.

The extent to which voice and video are drivers for MPLS is essentially the same as last year. It is our take that voice and video are drivers for MPLS for intra-company voice and video since MPLS provides excellent QoS.

Voice and video as drivers for increased Internet usage is a different story. Voice over the Internet is a relatively weak driver for *increased* usage is probably due to this already being a well-established technology. At the same time, there is a quite significant increase – a whopping 11% - from last year in terms of video being a major driver for *increased* traffic. This is viewed as being due to an increase in company-to-company video, which is not easily accomplished via MPLS. Also, we are in the midst of the emergence of technologies that make intercompany video much more attractive, from applications like Skype for Business (formerly known as Lync Enterprise Voice) to technologies like WebRTC.

The Status of Internet Backhaul

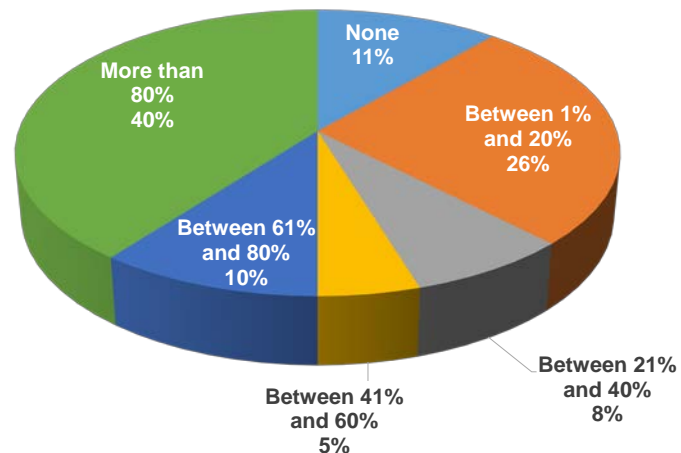
Over the past couple of decades, providing for appropriate Internet access, especially for widely distributed organizations, has been a conundrum. In addition to Internet-only access (which some companies use) and MPLS-only access (which is never the case), there are two obvious solutions for combining the two. On the one hand, each site might have dual WAN connections – one to the Internet and one to the corporate net, presumably via MPLS. On the other hand, all traffic could be backhauled to the corporate data center and then go to the Internet (or not) depending on the traffic type and application.

Each approach has its advantages. Benefits of backhauling to the corporate datacenter include integrated management for the entire network, simplifying security, and the ability to consolidate traffic so that all traffic is conglomerated into one or more very fast connections. However, this solution requires that all Internet traffic has to transit the expensive MPLS network. This adds both cost and delay. At the same time, direct connection to the Internet provides a both a backup and probably slightly more responsive connection.

The survey results show that there is a quite polar approach to how Internet traffic is handled. Of course, there are some organizations that do absolutely no backhaul. These are likely SMBs that have very few sites and are likely to use the Internet for their primary networking functions. Additionally, 26% of respondents indicated that they do limited backhauling, bringing to total of none or limited to over one third of the organizations.

At the other end of the spectrum fully half do significant backhauling, with 40% indicating that they backhaul more than 80% of their traffic.

Figure 4: Internet Traffic Backhauled to Data Center



How much of your Internet traffic that originates in your branch offices do you currently backhaul to a data center before handing it off to the Internet?

Backhauling Internet traffic is becoming an increasingly important topic. As shown in **Figure 1** and **Figure 4**, providing access to public cloud computing is one of the primary factors that are driving change in the WAN and, by a wide margin, providing access to public cloud applications and services is the primary driver of increased Internet access. As discussed in [The 2015 Guide to WAN Architecture and Design](#), one of the characteristics of many of the SD WAN solutions that are currently available is that they provide for a more efficient way to access public cloud providers without sacrificing security and control.

How Much Interest is there in Implementing SDN in the WAN?

The [2015 Guide to SDN and NFV](#) reported on the results of a survey that was administered in late 2014. The respondents to this survey were asked to indicate the factors that were driving their company's interest in SDN. The two factors that were indicated the most were:

- Better utilize network resources;
- Perform traffic engineering with an end-to-end view of the network.

While better utilizing network resources is a benefit of implementing SDN in either the LAN or the WAN, performing traffic engineering with an end-to-end view of the network is primarily a benefit of implementing SDN in the WAN.

The respondents to this survey further demonstrated their interest in implementing SDN in the WAN when they indicated how broadly they expected their campus, WAN and data center networks would be based on SDN three years from now. Their responses show that IT organizations believe that three years from now that SDN deployment in data centers will be highly pervasive and that there will also be significant SDN deployment both in the WAN and in campus networks.

Table 1: Anticipated SDN Deployment

	Campus Networks	WAN	Data Center Networks
Exclusively based on SDN	1%	2%	6%
Mostly SDN	10%	6%	20%
Hybrid, with SDN and traditional coexisting about equally	34%	36%	50%
Mostly traditional	29%	31%	10%
Exclusively traditional	13%	13%	4%
Don't know	12%	12%	10%

What is a Software Defined WAN?

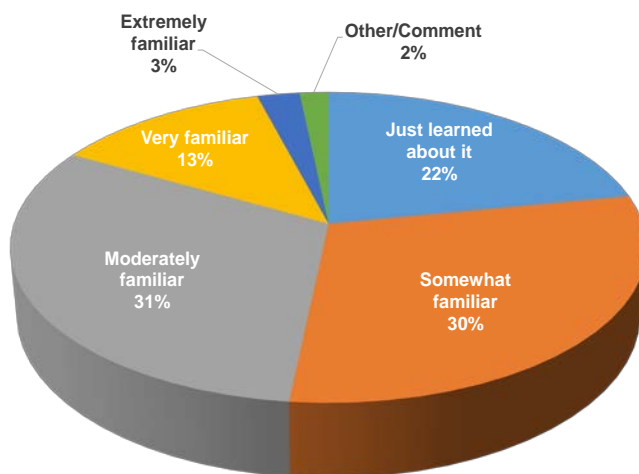
As is the case with any software defined network, a Software defined WAN (SD-WAN) centralizes the control function into a SDN controller. The controller abstracts the user’s private network services from the underlying IP network and enables the operation of the user’s private network services via centralized policy. The controller also enables the automation of management tasks such as configuration and provisioning.

Leveraging the underlying WAN platforms, which may include physical or virtual routers, the controller sets up virtual overlays that are both transport- and technology-agnostic. Under the direction of the controller, the WAN platforms implement functions such as QoS, path selection, optimization and security, often using dynamic multi-pathing over multiple WAN links.

A SD-WAN may be implemented by an enterprise IT organization or by a network service provider. In the former case, the users of the SD-WAN are primarily the company’s employees. In the latter case, the users are the companies which subscribe to the SD-WAN service.

Over half of the survey respondents indicated that they either just learned about a SD-WAN from the definition that was in the survey instrument or they were just somewhat familiar with the concept. This lack of familiarity isn’t surprising given that a SD-WAN is an emerging concept. It does, however, highlight the need for more education on this topic.

Figure 5: Familiarity with SD WAN



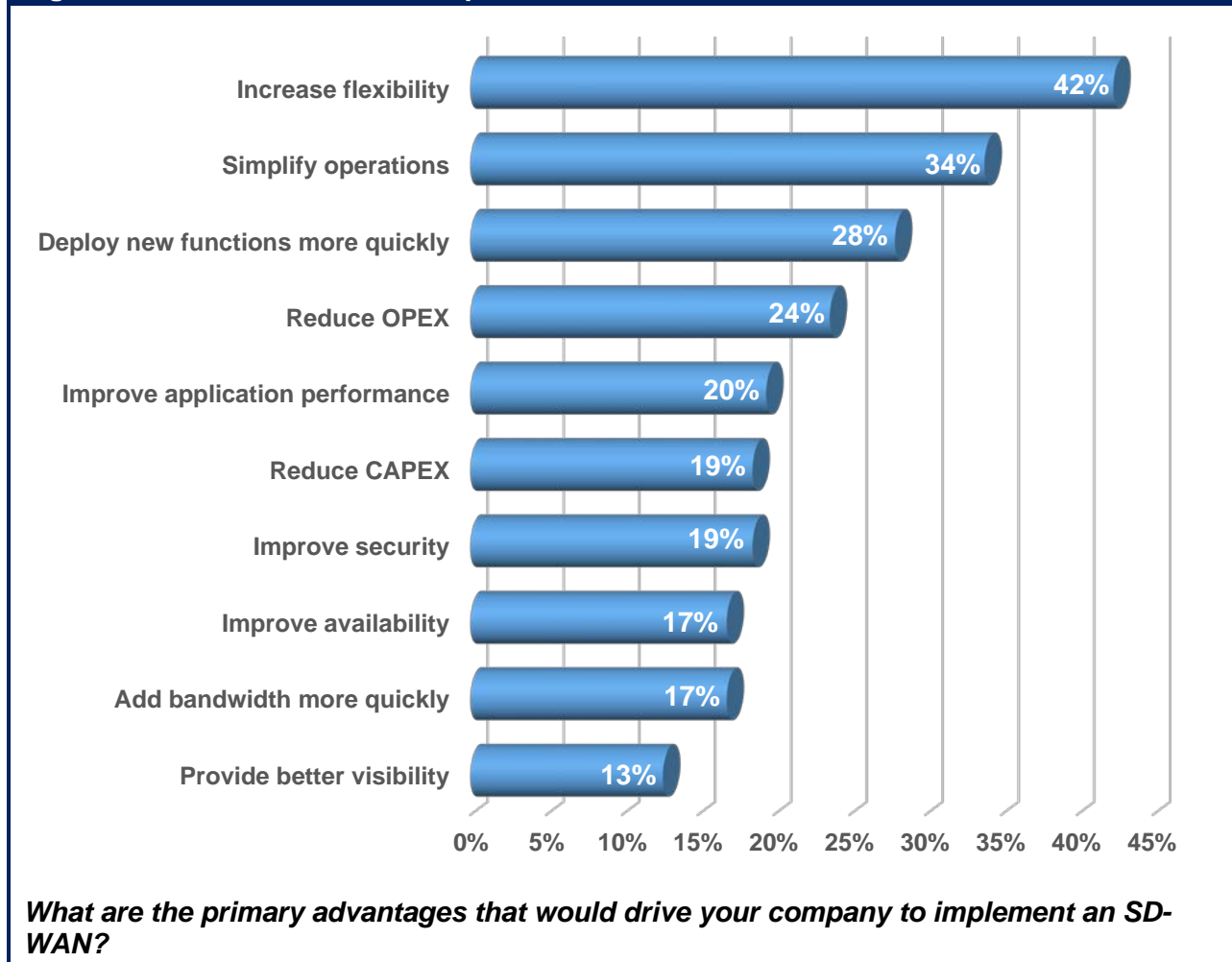
How familiar are you with the concept of a Software Defined WAN (SD WAN)?

What are the Drivers of SD-WAN Adoption?

The top three drivers of SD-WAN deployment are:

- Increase flexibility
- Simplify operations
- Deploy new functions more quickly

Figure 6: Drivers for SD-WAN Implementation



There is no question that each of these drivers is important. However, each of these drivers is considered to be a soft savings which means that it can be difficult to show direct tangible benefits. For example, nobody would argue that it isn't a good thing to be able to deploy new network functions more quickly, but what are the associated business benefits? Does it increase revenue? Does it reduce the company's bottom line cost or reduce customer churn?

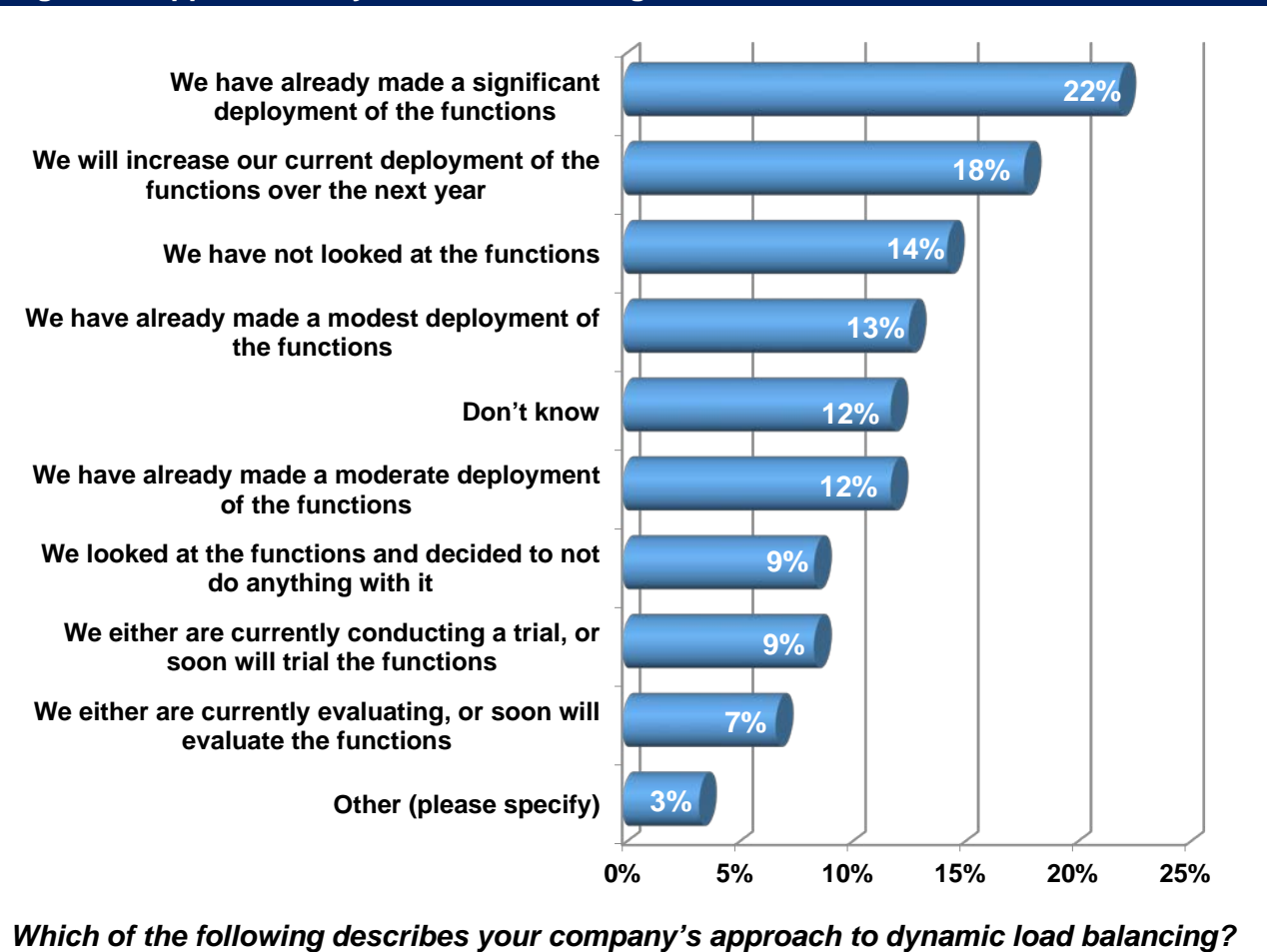
It is interesting and somewhat surprising that reducing OPEX was fourth on the list. While it can be difficult to build a business case for an investment in the WAN based on soft savings, it is relatively easy to build such a business case if there are hard cost savings. One of the key promises of an SD-WAN is that it will either reduce the amount of money that a company spends with their service providers or reduce how much that spend increases. The potential hard cost savings that result from implementing an SD-WAN is an important topic for vendors and network organizations to explore. Even if these hard savings don't justify a company making an investment in the SD-WAN, the combination of hard and soft savings might.

Do Network Organizations Care About Dynamic Multi-Pathing?

As mentioned, dynamic multi-pathing is often a component of an SD WAN. One approach to leveraging this function is to dynamically load balance traffic over both MPLS and Internet links with the goal of reducing the capacity, and hence the cost, of the MPLS links while replacing the reduced MPLS bandwidth with relatively inexpensive Internet bandwidth. An alternative approach is to use this function to cap the current MPLS capacity and on a going-forward basis only add relatively inexpensive Internet bandwidth.

When asked about their use of dynamic multi-pathing, the most common answer was that network organizations have already made a significant deployment of this function. The second most common answer was that they would increase their current deployment over the next year.

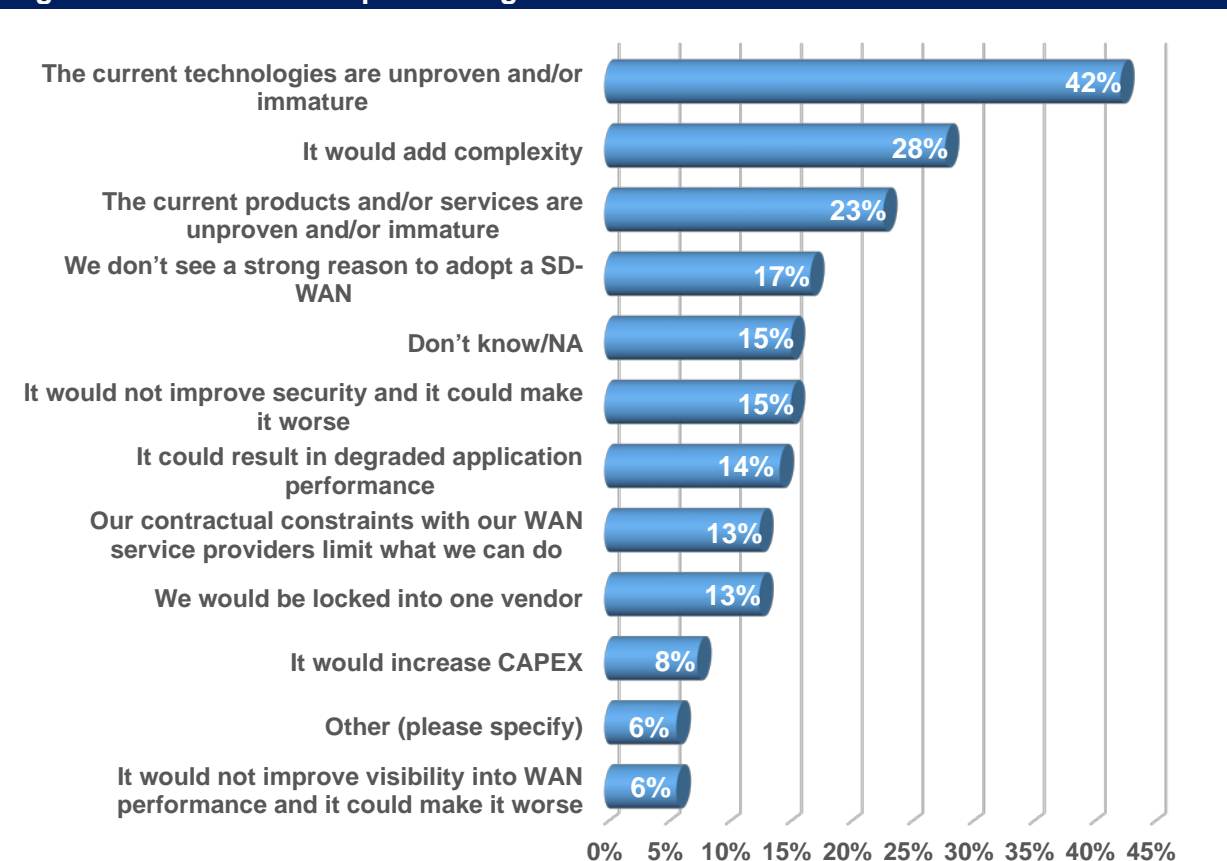
Figure 7: Approach to Dynamic Multi-Pathing



What are the Inhibitors to SD WAN Deployment?

The top inhibitor to SD-WAN deployment is the unproven and/or immature nature of the current technologies, products and services. This inhibitor will dissipate over time as the enabling technologies mature and vendors and service providers evolve their products and services. The fact that this survey data indicates that complexity is an inhibitor to SD WAN deployment is in line with survey data presented in other sources. That survey data shows that network organizations are concerned with the complexity associated with any implementation of SDN. Hopefully as technologies, services and products mature, vendors and service providers will ensure that complexity is no longer an issue.

Figure 8: Inhibitors to implementing an SD-WAN



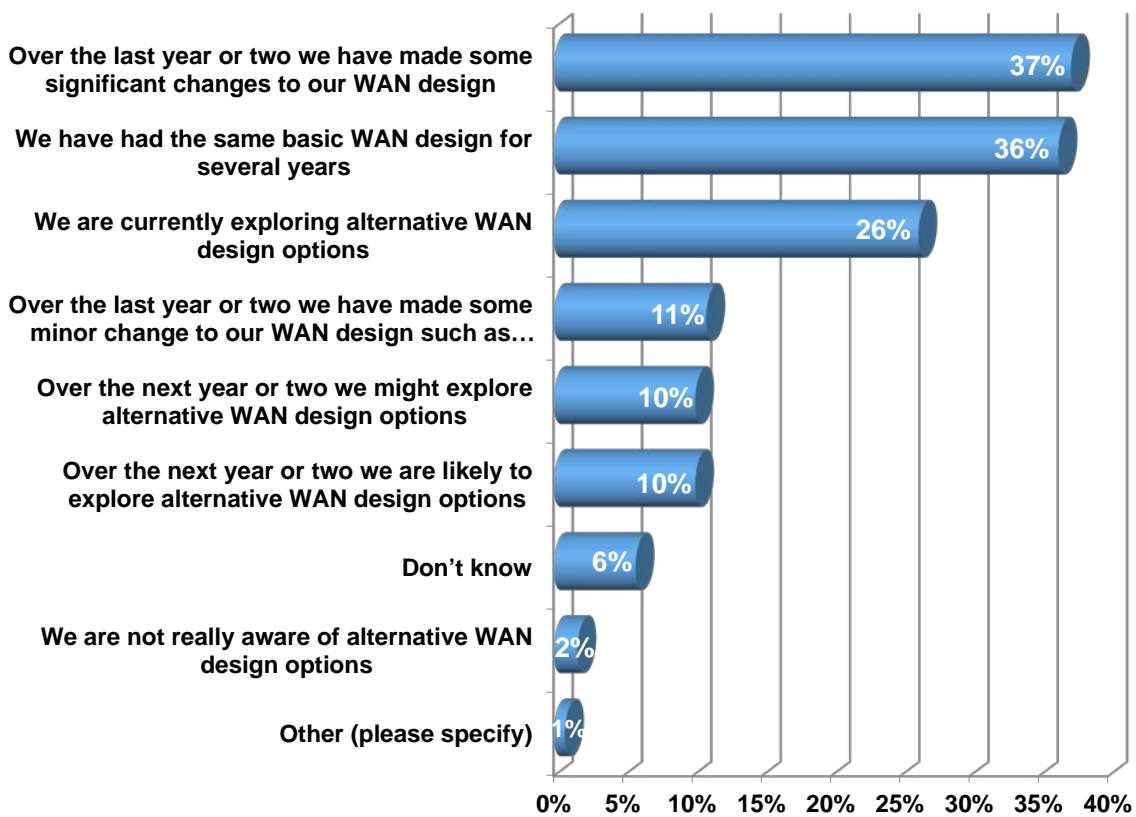
What are the primary concerns that would inhibit your organization's implementing an SD-WAN?

The fact that network organizations don't see a strong reason to adopt a SD-WAN is in line with the previous discussion that network organizations see that the top three drivers of SD WAN are soft savings and that it can be difficult to make a compelling business case based on soft savings. As previously mentioned, it is relatively easy to make a compelling business case if there are hard savings and vendors need to help network organizations create these business cases.

How are Network Organizations Approaching WAN Design?

When it comes to WAN design, network organizations tend to fall into two very different camps. Over a third of network organizations belong to the camp that have had the same basic WAN design for several years. Over a third of network organizations also belong to the other camp in which they have made some significant changes to their WAN design over the last year or two. In addition, independent of which camp they belong to, network organizations have a very strong interest in exploring alternative WAN design options.

Figure 9: Approach to WAN Design

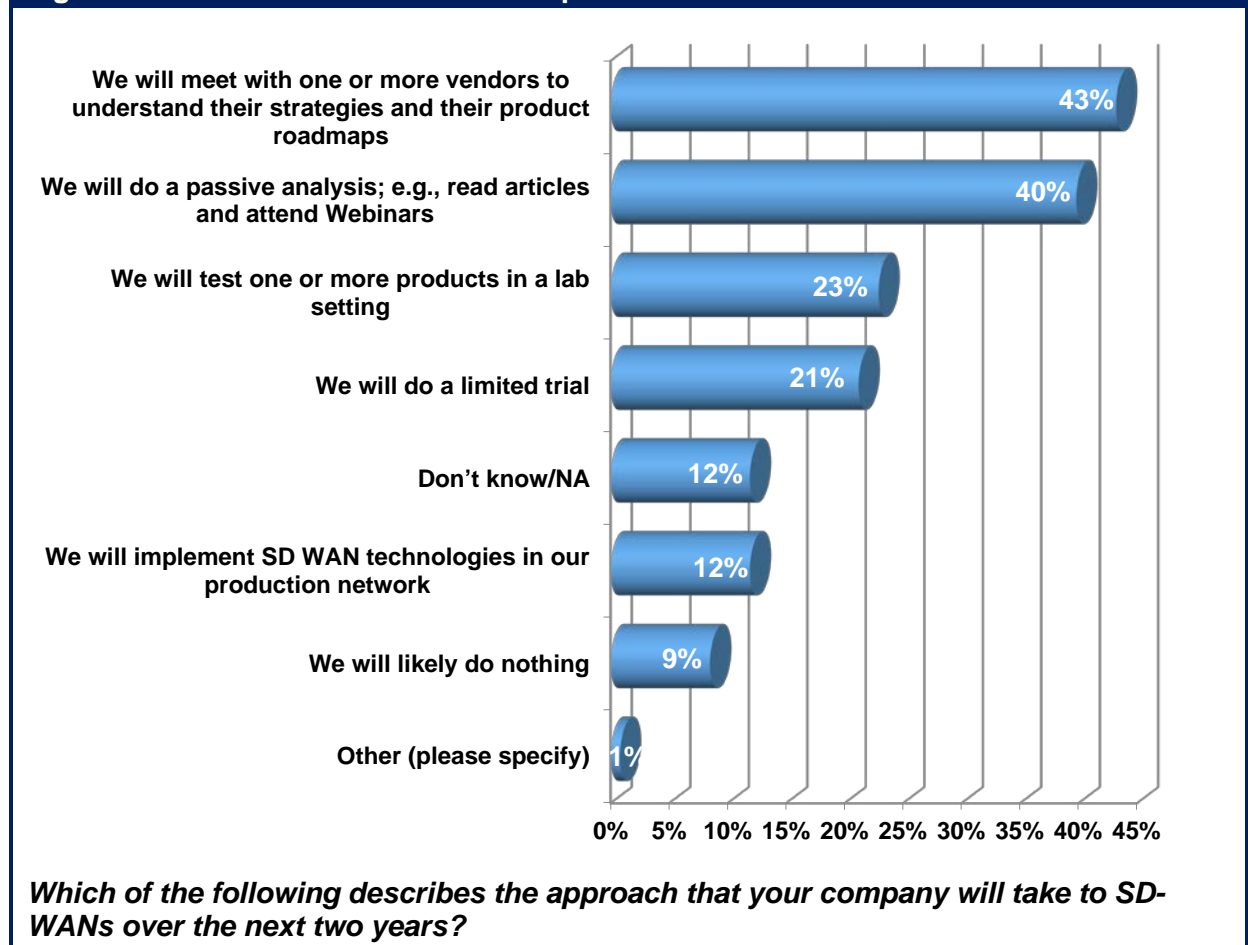


Which of the following describes your network organization's approach to WAN design?

How are Network Organizations Approaching SD-WANs?

The fact that over the next two years that a third of network organizations intend to either implement SD-WAN technologies in their production network or do a limited trial of those technologies demonstrates the breadth of interest in SD-WANs. In addition, the bulk of network organizations intend to do a passive analysis (i.e., reading articles and attending Webinars) and/or work with vendors to understand their strategies and their product roadmaps. The extent of this interest presents a great opportunity for network organizations to pressure vendors to create templates for a compelling business case that can be used to justify an investment in SD-WAN technologies.

Figure 10: SD WAN Evaluation and Implementation Plans

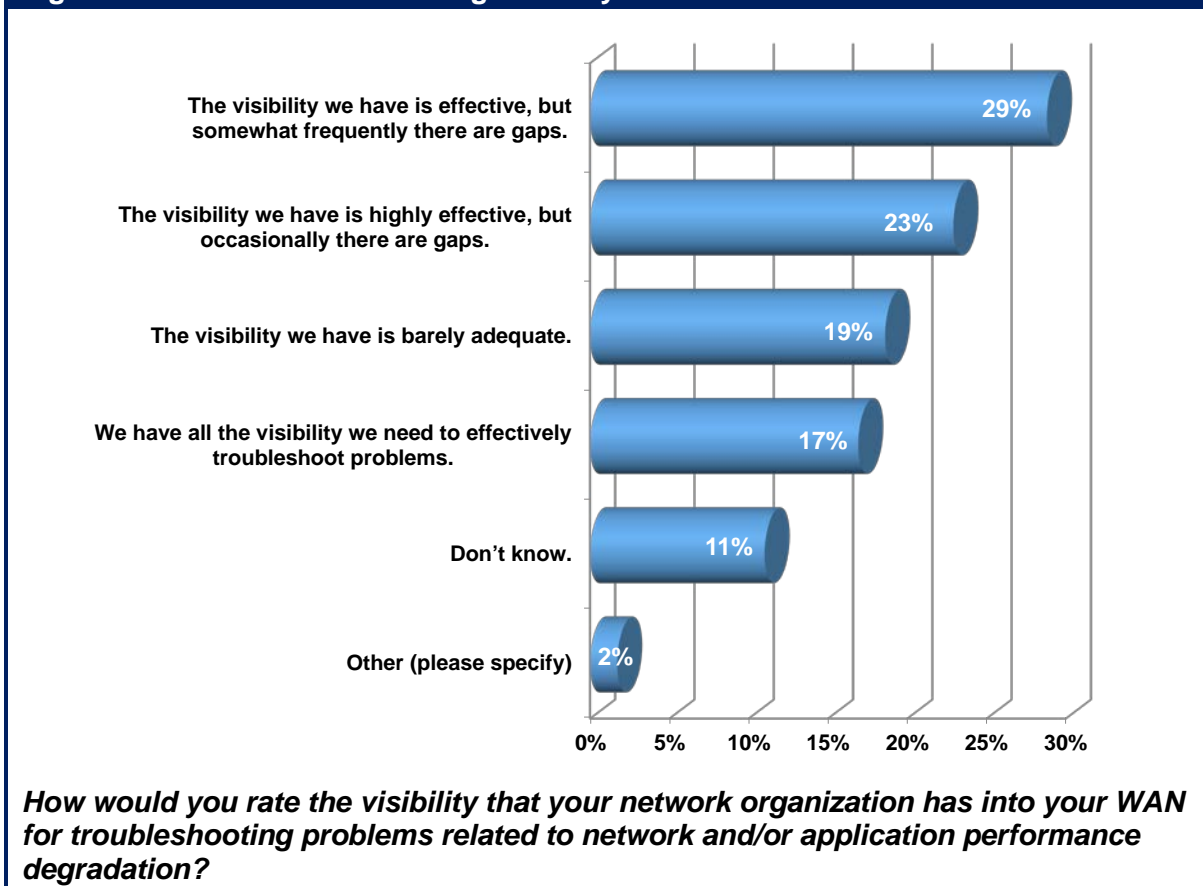


Do Network Organizations have the Visibility They Need?

The marketplace is crowded with tools and services that are positioned as being able to provide network organizations with all of the visibility into their WAN that they need for troubleshooting problems related to network and/or application performance degradation. However, whether it is the deficiencies of those tools or the troubleshooting processes used by network organizations, less than one out of five network organizations has all of the visibility that they need to effectively troubleshoot problems. In addition, roughly half of network organizations report that visibility into their WAN that either has frequent gaps or that is barely adequate.

The current rather dismal state of WAN visibility combined with the growing interest in SD-WANs creates an opportunity and a challenge for network organizations. The opportunity is that by implementing an SD-WAN, network organizations might be able to increase their visibility into the WAN. The challenge is that network organizations need to ensure that as they explore SD-WAN alternatives they evaluate the visibility provided by each of those alternatives.

Figure 11: WAN Troubleshooting Visibility



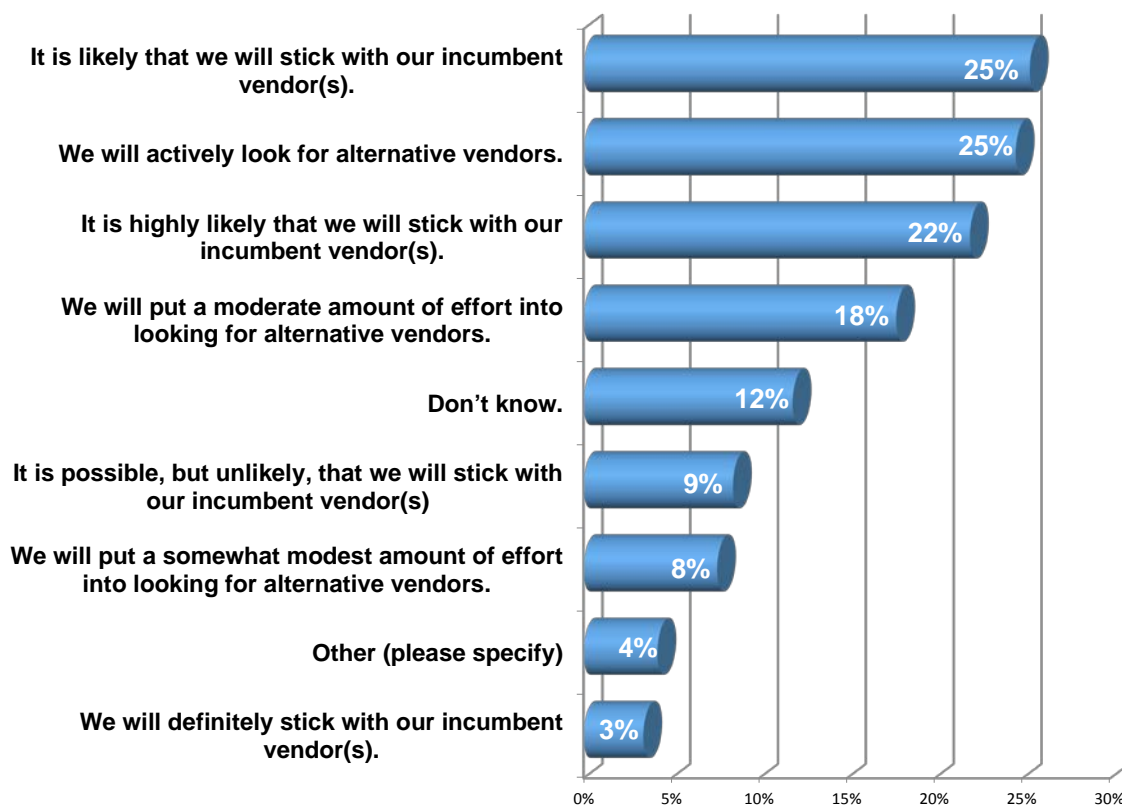
Will Network Organizations Stay with their Current Vendors?

SD-WANs represent a fundamental transformation in terms of how network organizations implement a WAN. As is the case with any fundamental transformation in the IT industry, some vendors will gain and some will lose market share.

Over the next two years, as network organizations redesign their WANs, a quarter of them either will or likely will stick with their current providers of L4 – L7 functions such as firewalls and WAN optimization controllers. By contrast, a quarter of network organizations will actively look for alternative providers.

Given the previously discussed inhibitors to the adoption of a SD-WAN, two keys to success for any vendor in this space are to reduce the complexity of their product and/or service and to demonstrate how their product and/or service results in significant cost savings.

Figure 12: Interest in Looking for New Vendors



If your network organization were to redesign its WAN over the next year or two, which of the following describes how you will approach the selection of vendors who provide value added functions, such as WAN optimization controllers or firewalls, on top of basic transmission services?

Summary of Key Findings

In the preceding pages, we took an in-depth look at each of the survey questions. The findings show:

- The primary factors driving change in the WAN are support for real-time applications, increasing security, and improving applications performance.
- WAN budgets are looking brighter than they were a year ago.
- The primary drivers for increasing Internet service use are public cloud applications and service, plus the support for mobile users and video support. By contrast, the most significant driver to MPLS was for support of intra-Enterprise applications including data applications plus voice and video.
- The use of Internet backhaul is becoming critically important and more effective support of Internet traffic is potentially a major advantage of using Software Defined WAN (SD-WAN) services.
- There is significant interest in the use of Software Defined Networking in the WAN, even though this is a relatively new concept.
- The general perception is that the major drivers for SD-WAN implementation are “soft” savings including increasing flexibility, simplifying operations, and deploying new functions more quickly. However, network organizations should also look at the potential “hard” savings of reducing OPEX.
- The major inhibitors to SD-WAN implementation are the state of maturity of current products and services and a perception of added complexity.
- Multi-pathing is a significant component of SD-WANs, and most organizations have already made a significant deployment or will increase of this function.
- While many organizations have had the same WAN design for several years, about two-thirds of the organizations have made significant design changes or are exploring alternative designs.
- The majority of organizations are exploring or planning to explore SD-WAN alternatives.
- Very few organizations feel that they have all the visibility they need for troubleshooting problems related to network and/or application performance.
- The question of sticking with incumbent vendors is up in the air. While most are likely or very likely that they will stick with their incumbent vendors, many will evaluate others options.

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Jim Metzler has a broad background in the IT industry. This includes being a software engineer, an engineering manager for high-speed data services for a major network service provider, a product manager for network hardware, a network manager at two Fortune 500 companies, and the principal of a consulting organization. In addition, he has created software tools for designing customer networks for a major network service provider and directed and performed market research at a major industry analyst firm. Jim's current interests include cloud networking and application delivery.

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