WHITE PAPER

The Rise of the Hybrid WAN: Meeting the Challenge of the Cloud

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INTRODUCTION

Server virtualization provided a foundation and an on-ramp for private and hybrid cloud computing. While offering tremendous business benefits, however, the hybrid cloud — leveraging both private and public cloud — has introduced increasing complexity for IT requirements and a need for global, instantaneous access to distributed applications and data, an essential prerequisite for faster time to value.

Enterprises increasingly recognize that application workloads are critical to the success of their business. They also recognize that the composition, nature, and deployment of cloud workloads represent an entirely new set of challenges. These factors directly impact the role that hybrid cloud networks will play in the success of evolving enterprise business models.

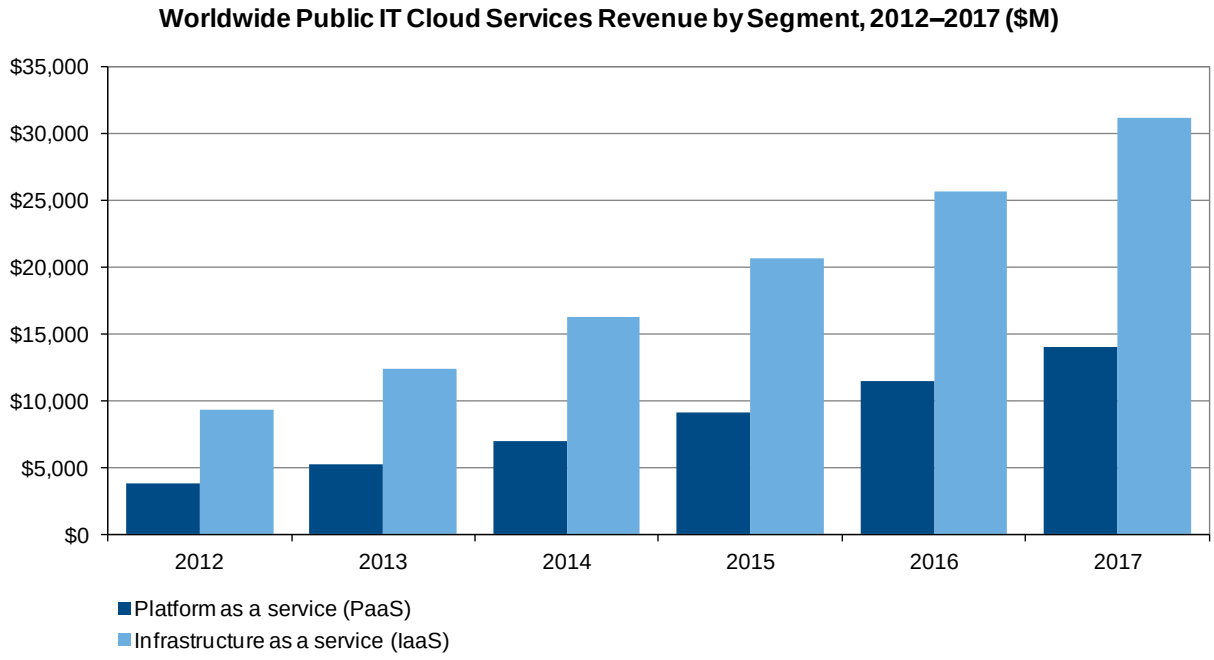
Adoption of hybrid cloud is not limited to early adopters. IDC has found that public IT cloud services will have a compound annual growth rate (CAGR) of 23.5%, five times that of the IT industry as a whole. IDC expects that by 2017, public IT cloud services will drive 17% of IT product spending and nearly half of all growth in applications, system infrastructure software, platform as a service (PaaS), servers, and basic storage.

Enterprises are adopting hybrid cloud, particularly as it relates to their application infrastructure. Software as a service (SaaS) will remain the largest public IT cloud services category throughout the forecast period, capturing 59.7% of revenue in 2017. The fastest-growing categories will be PaaS and infrastructure as a service (IaaS), with CAGRs of 29.7% and 27.2%, respectively.

Figure 1 shows the 2012–2017 revenue growth for PaaS and IaaS.

FIGURE 1

Growth of PaaS and IaaS



Source: IDC, 2014

While these numbers speak to the public cloud portion of the hybrid cloud, growth of the private cloud is similarly robust. IDC estimates that the worldwide market for private cloud IT infrastructure was worth $12.3 billion in 2012 and will nearly double to more than $22.2 billion in 2017. IDC also forecasts that the worldwide hosted private cloud market will be worth about $24.3 billion in 2016. As applications proliferate throughout the hybrid cloud, a hybrid wide area network (WAN) must evolve to meet the needs of application and data delivery.

Whereas traditional networks focused on well-defined topology between datacenters and branch offices, the aforementioned trends are driving accelerated adoption of meshed connectivity to both premise-based and cloud-hosted workloads. As a result, the criticality and the value of the enterprise WAN are heightened as it becomes integral to the delivery of applications from datacenters – within the enterprise and the private cloud as well as in the public cloud – to remote users at branch offices.

In IDC's annual *WAN Manager Survey* for 2014, enterprise respondents indicated that improving business processes, reducing their overall cost structure, and increasing employee productivity ranked as the top business initiatives driving network and IT investments during the next 12 months. Their top 3 technology initiatives are improving WAN security, enhancing the performance of business applications on the WAN, and strengthening WAN data backup and recovery capabilities. Respondents also indicated clearly that they want to pay for services on a per-use basis, instead of paying a fixed fee, and will be using more hosted and cloud services in the year ahead. They also are seeking to leverage the cloud for infrastructure purposes.

The Changing Dynamics of Application Workloads in the Cloud Era

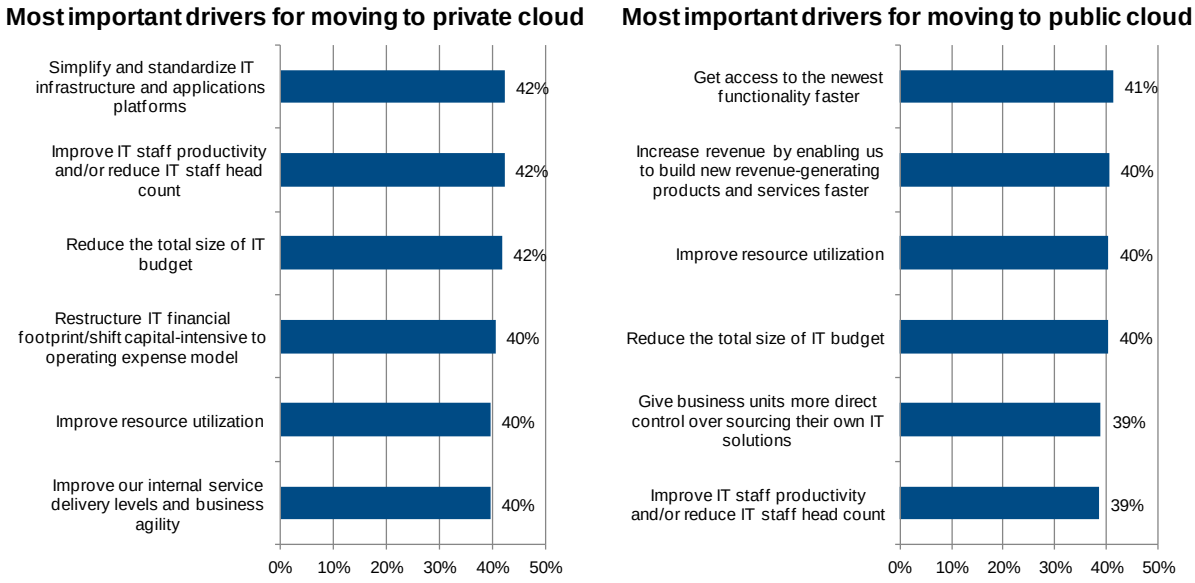
As the market data cited in the introduction attests, the IT industry is in the midst of a major sea change. Just as client/server supplanted the mainframe era, cloud now is gradually superseding the client/server era.

Enterprises clearly see value in both private and public cloud, and many view the private cloud as the "on-ramp" to the public cloud. Nonetheless, as IDC found in its 2013 *CloudTrack Survey,* business and IT decision makers ascribe different value propositions to private and public cloud. They see the cloud in general as a means of achieving a reduced IT budget, improved resource utilization, and better IT staff productivity.

But they're drawn specifically to public cloud for its ability to provide fast access to new features and functionality, to facilitate fast introduction of new revenue-generating services, and to provide direct control to business units seeking to source IT solutions. Meanwhile, distinct reasons for moving to private cloud include simplifying and standardizing IT infrastructure and platforms, shifting from a capex business model to an opex business model, and enabling improved internal IT service delivery and greater overall business agility (see Figure 2).

FIGURE 2

Reasons for Moving to Cloud



n = 1,109

Base = businesses and IT decision makers currently using cloud or planning to use cloud within the next 12 months

Source: IDC's *CloudTrack Survey,* 2013

The motivations hold rich promise, but they entail significant technological and operational change. Although much discussion has ensued regarding the datacenter implications of virtualization and cloud, the consequences for the WAN also are hugely significant. As hybrid cloud models take hold,

WAN performance becomes absolutely critical for latency-sensitive workloads and inter-datacenter business continuity. Accordingly, as enterprises plan and implement comprehensive cloud strategies, WAN architectures need to be considered alongside and in conjunction with datacenter infrastructure.

Indeed, many enterprises will run an array of application workloads at a variety of locations, with certain legacy applications running in the private cloud (for latency, portability, security, or compliance reasons) and with desktop and less sensitive applications running as SaaS applications (such as Office 365 and salesforce.com) in the public cloud. What's more, many newer virtualized workloads will begin life in a private cloud, only later to benefit from cloud bursting and other public cloud migration scenarios. "Shadow IT," or the greater autonomy exercised by business units to run applications in the cloud, represents an additional challenge for IT departments that must take ultimate responsibility for the integrity of all enterprise workloads.

This diversity of cloud workloads complicates application performance across the WAN, which not only should be devised and constructed to account for the mobility of the workforce and other stakeholders but also must adapt to where applications reside, at any given time, in a hybrid cloud. It's important to note, of course, that workload mobility — within and between datacenters — is as much a reality as workforce mobility. There's a dynamism inherent in hybrid cloud that was not present in client/server computing, where workloads and clients remained relatively static on an unchanging north-south axis compared with cloud's multiplicity of east-west (server to server) and north-south traffic patterns within and between datacenters. Given that our field of reference is hybrid cloud, these challenges pertain not only to the enterprise but also to public cloud service providers offering SaaS, PaaS, and IaaS.

For all involved, and especially for the enterprise parties, an additional complication is that the cloud procurement model is distinctly different from procurement policies and procedures associated with client/server computing. Whereas enterprises and service providers formerly operated on a capex model, buying equipment and licensed software as capital expenditures, they now perceive private and public cloud as a means of delivering greater operational efficiencies and as a mechanism for transitioning to an opex business model. This was borne out in the results of IDC's 2013 *CloudTrack Survey,* cited previously in this section, wherein respondents cited the appeal of the opex model as a major motivator for the adoption of private cloud.

The Need for a Hybrid Cloud WAN

In light of the forthcoming growth of hybrid cloud computing, the WAN must be reimagined and built to support an entirely new set of application delivery requirements.

As noted previously, many enterprises will embrace a hybrid cloud approach in which application workloads and data traverse private datacenters and the public cloud and then perhaps a branch office before moving back to the cloud. For the WAN, what was once, in the client/server era, a predictable range of traffic patterns will be transformed into an anarchic environment that is difficult to manage, much less to predict.

Many enterprises and cloud providers, the latter of which obviously provide cloud-based subscription services, are seeking to fully embrace the cloud model of self-service provisioning and IT as a service (ITaaS). Virtualization also offers the opportunity for cloud service providers to differentiate in other areas, such as with performance-based SLAs and other services.

Often, as both enterprises and service providers ramp up virtualization and provision virtual machines (VMs), they seek to support them with agile infrastructure that can be provisioned faster and less expensively, from an opex standpoint, than traditional physical appliances. An added benefit, especially for large cloud service providers offering multitenant services with full isolation, is that virtual appliances can confer lower capex expenditures. Rather than having to buy physical appliances in advance of the demand for network and security services – such as load balancing, WAN optimization, and firewalling – cloud service providers can spin up virtual appliances that ride alongside virtualized workloads.

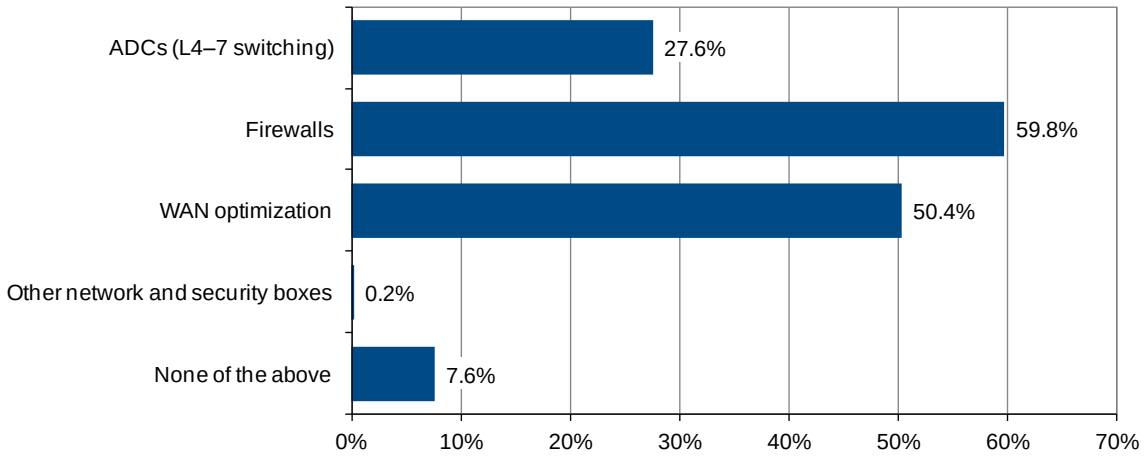
IDC is noting steady and accelerating growth in virtual appliances for network and security services, consistent with interest and growth in software-defined networking (SDN) and network functions virtualization (NFV), both of which are manifestations of networking's response to the demands of cloud.

This has been especially true for services such as firewalls and WAN optimization. In a recent SDN survey, IDC asked respondents whether the adoption of SDN would cause them to reassess or redeploy a number of specific types of physical appliances as virtual appliances. About 60% of respondents indicated they would redeploy firewalls as virtual appliances, and more than 50% said they would virtualize their WAN optimization (see Figure 3).

FIGURE 3

Cloud and SDN: Triggers for Virtual Appliances

Q. Has/will the adoption of SDN caused/cause your organization to reassess or redeploy any of the following physical appliances as virtual appliances (software)?



n = 500

Base = all respondents

Notes:

The survey/data is managed by IDC's Quantitative Research Group.

Data is not weighted.

Multiple responses were allowed.

Use caution when interpreting small sample sizes.

Source: IDC's *SDN Survey,* April 2014

This shift to virtualized network and security services is driven by continued technical advances in server virtualization, which makes virtual appliances increasingly attractive, and by the business and technological imperatives of cloud computing. Enterprises and cloud providers alike are seeking operational and business agility, IT efficiency, the shift to an opex business model and to lower operational costs, and, wherever possible, a lower capex profile.

On the WAN, however, additional factors come into play. In addition to the enterprisewide objectives of gaining operational efficiency, shifting to an opex business model, and achieving near- and long-term cost savings, there are challenges and opportunities that relate specifically to the WAN in the context of hybrid cloud. In particular, many enterprise IT organizations will need to think carefully about how best to optimize and maximize their various WAN connections and investments. The next-generation WAN will invariably encompass several technologies, protocols, and networks, including the IP-based Internet, private lines, MPLS, and metro Ethernet (IDC's *WAN Manager Survey* found that connectivity between business locations is the top application driving adoption of Carrier Ethernet services). In this mix of WAN alternatives, secondary connections often will lie dormant or underutilized, and application performance can suffer when traffic is indiscriminately directed to one overloaded connection or another.

It's essential for the hybrid WAN to take cloud requirements into full account and to deliver the following:

- Familiar and predictable user experience across any kind of network
- Consistent security across all applications and across all networks
- Cost-effectiveness that allows for deployment anywhere, which will become increasingly important as the Internet of Things (IoT) proliferates
- High levels of availability and reliability, so machine-to-machine (M2M) and user-initiated client communications do not experience outages or failures

Critical WAN Considerations for the Hybrid Cloud

To deliver those benefits, enterprise IT departments will have to take several considerations into account — looking out beyond the capabilities of WAN optimization — as they revamp their WANs for the hybrid cloud. Broadly speaking, these considerations span areas such as management, acceleration, security, and control. In this section, we dig deeper into questions and considerations that need to be assessed to provide WAN capabilities that can deliver on the full promise of the hybrid cloud.

Direct Internet Access for Branch Offices

With workloads residing at SaaS providers as commonly as at private datacenters, direct Internet access to branch offices can result in increased productivity, greater application availability, branch infrastructure consolidation (through server virtualization), and other business and operational benefits. If done properly, it also entails no compromise on security. That said, control and security factors must be taken into account to ensure that business-critical branch data is protected when in motion and at rest. Technologies are available that ensure the requisite security, including AES disk encryption (for data at rest), accelerated IPSec, SSL acceleration, centralized control (including peer authentication), application-based policy management, and secure access (using technologies such as TACACS+ and RADIUS).

Use of In-Region and Out-of-Region Cloud Providers

The use of in-region cloud providers, those in close proximity to your datacenter and major business centers, helps move critical data closer to cloud services and to users, resulting in faster application and data delivery, lower latency, and higher levels of availability. Application-based management can provide further value in this context, and acceleration technologies can be applied to provide greater enhancement to operational agility and time to value.

For a variety of potential reasons, however, enterprises sometimes will be compelled to use out-of-region SaaS providers. In these cases, the enterprise WAN should be capable of extending to and incorporating cloud infrastructure hubs at IaaS providers.

Lower-Cost Broadband for Backup Services

Wherever possible, IT departments should consider using lower-cost broadband connections rather than private lines for backup services. The cost savings can be substantial, and WAN optimization technologies can ensure that broadband connectivity is fully exploited for cloud backup and storage. Some customers might even be able to leverage low-cost broadband as their primary means of WAN connectivity. Again, WAN optimization technology can ensure that the pipe is fully exploited, and it can help enterprises meet recovery point objectives (RPOs) and recovery time objectives (RTOs) related to business continuity.

Path Selection Technology

If a branch office is to maintain direct connectivity with two or more networks, branch intelligence must be applied to identify and select the right network for each application. In this context, policy can facilitate the substitution of relatively expensive MPLS connections with lower-cost broadband connections. Technologies are available that assign applications to a specific path and provide locations with multiple-path connections. More recently, capabilities have been introduced that enable application-based real-time traffic decisions. As a result, enterprise IT departments can apply policies that select the fastest, least congested path between sites or the most available path between locations. Path selection technology also can improve branch office availability and hybrid cloud performance by complementing MPLS, where appropriate, with local Internet access. An additional benefit is that path control technology buttresses high levels of availability by preventing links from becoming unbalanced or from being affected by variable network conditions. Real-time path selections can even detect spikes in packet loss and latency and switch application traffic to another connection before application performance is compromised.

WAN Optimization — Virtualized Wherever Possible

Implicit in many of the previous considerations is the importance of a coherent and comprehensive approach to the wide area network.

Just as IT departments should consider WAN optimization wherever it can confer business value — across all relevant datacenters, branch operations, and cloud infrastructure where possible — they also should consider whether virtualized WAN optimization is a fit for their organizations and their application requirements. Significant benefits can accrue from the deployment of WAN optimization as a virtual, rather than a physical, appliance. Among those benefits are increased agility and flexibility for hybrid

cloud applications (whether located in a private or public cloud), the transition to an opex model (rather than a capex model associated with amortized hardware appliance purchases), concomitant capex savings (less hardware purchased), and branch infrastructure consolidation and related efficiencies.

WAN Intelligence, Control, Security, and Optimization

Understanding that WAN optimization is table stakes for the next-generation WAN, enterprises should pursue vendors and solutions that address a range of hybrid cloud requirements. Next-generation hybrid WAN solutions should offer WAN intelligence (through application-related monitoring and analytics), control (through policy-based prioritization of business-critical applications across the WAN), extensive data security (through mechanisms such as data encryption to the network edge and to SaaS providers), and optimization (through mechanisms such as data reduction to maximize bandwidth utilization).

Dynamic WAN Deployment Capacity

The hybrid cloud is inherently elastic, responding dynamically to varying requirements, and the hybrid WAN for the cloud also will have to accommodate exceptional WAN elasticity. With WAN elasticity, enterprise IT departments are able to easily acquire WAN optimization and WAN services in small or large increments, as circumstances require, scaling up or down when necessary to support their application delivery objectives.

WAN Visibility Tools

To get the most from their investments in applications, data, the hybrid cloud, WAN connectivity, and WAN optimization, enterprise IT departments should carefully assess whether their current portfolios of WAN visibility tools provide the requisite insight into full-stack metrics associated with application delivery and performance. In an ongoing effort to ensure that application policies and infrastructure technologies are well aligned with business objectives, enterprise IT departments must be able to measure and correlate valuable performance-related metrics associated with the WAN. Ideally, WAN visibility tools should give IT departments the intelligence to proactively manage WAN connectivity in support of application and business objectives.

SDN and the Software-Defined WAN

As cloud computing compels enterprises to pursue SDN to overcome the limitations of traditional network infrastructure in the datacenter and the enterprise campus, it only makes sense to extend the approach to the WAN. A software-defined WAN, as a full complement to enterprise SDN, starts with a robust architecture that can guarantee delivery of SLAs. It should also provide end-to-end application visibility, automated onboarding and provisioning, and support for automated and programmatic routing and security policies. It's also important to look at how WAN technologies support popular cloud orchestration platforms, SDN controllers, and open standards.

CONCLUSION

As market data strongly attests, enterprises are embracing or will embrace the hybrid cloud. They ascribe distinct value propositions to private and public cloud, and they recognize the benefits that accrue from an approach to cloud adoption that affords the utmost flexibility in deciding when and where to run business-critical workloads.

The requirements associated with cloud computing already have reverberated through datacenter networking, with SDN arising as an architectural approach that provides the network with the agility and responsiveness – through automated provisioning, programmatic management, and integration with cloud orchestrations platforms – that it lacked previously. Now the focus is turning to the WAN and to how it must be overhauled to accommodate the dynamic requirements of hybrid cloud computing. In fact, the WAN is an increasingly critical foundational element in the realization and fulfillment of hybrid cloud.

Enterprises adopting hybrid cloud must give careful and thorough consideration to a WAN strategy that offers the same sort of operational efficiencies and business agility that they seek to derive from SDN in the enterprise datacenter and the campus. A software-defined WAN provides the complementary missing piece or capstone for hybrid cloud application delivery.

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