White Paper

Ensuring Network and Application Performance for AWS, Microsoft Azure, and Other Public Cloud Providers

Sponsored by: Riverbed

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August 2017

IDC OPINION

Digital transformation — the process of creating value, growth, and competitive advantage through new digital offerings, business models, and business relationships — has become a critical imperative for enterprises worldwide. In the process, digital transformation is fundamentally changing how business gets done.

Cloud computing has emerged as an essential means by which enterprises realize digital transformation. In fact, public cloud services are perceived as enablers of business agility, and the public cloud services market has rapidly expanded to form an essential foundation for digital business. IDC has estimated that public cloud IT services revenue will exceed $204.5 billion in 2020, growing at a compound annual growth rate (CAGR) of 21.5% from 2016 to 2020 — almost seven times the overall rate of IT growth (see Figure 1). In 2020, public IT cloud services will account for 58% of the overall $355 billion spent on applications, development and deployment tools, infrastructure software, storage, and servers.

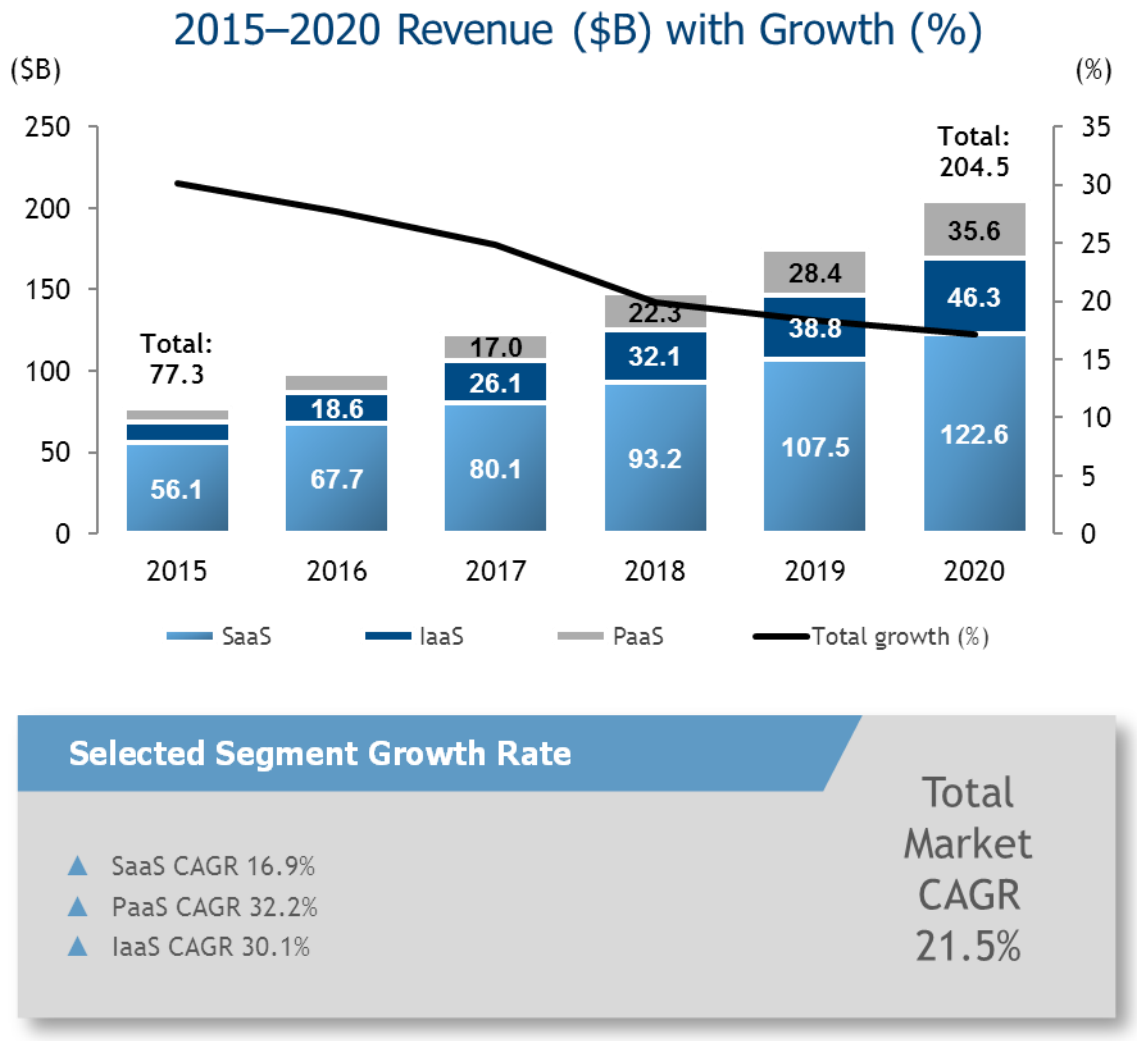
Moreover, about 62.7% of more than 6,000 enterprise IT organizations that participated in the 2016 edition of IDC's comprehensive *CloudView Survey* indicated that they were already using or were planning to use public cloud infrastructure as a service (IaaS) by the end of 2016. This finding aligns with IDC's view that a growing proportion of enterprises have shifted to a "cloud first" strategy over the past several years. In the ensuing years, as an even greater percentage of IT spending shifts to the cloud, many organizations will steadily move toward a "cloud only" posture. IDC believes that as that process plays out, 60% of enterprise IT will be off-premise by the end of 2018, driven in large part by enterprise adoption of public cloud services.

Increasingly, the worldwide IaaS market is dominated by a small number of large vendors. The dominance of the top vendors — with AWS leading, followed by Microsoft Azure — is expected to continue through the next several years. Indeed, IDC believes that by 2020, the top 5 cloud IaaS/PaaS providers will control at least 75% of the market as compared with about 50% of the market in 2016.

The growth of cloud is having major ramifications on the enterprise wide area network (WAN). The traditional WAN first emerged during the client/server era, when applications resided exclusively in enterprise datacenters. As such, the WAN was not architected for the cloud, nor was it intended to enable and support digital transformation.

FIGURE 1

Worldwide Public IT Cloud Services Revenue



For more details, see *Worldwide and Regional Public IT Cloud Services Forecast, 2016-2020* (IDC #US40739016, December 2016).

Source: IDC, 2016

This is the reason we have seen the rise of SD-WAN, which has responded to the needs of enterprises that are increasingly dependent on the cloud and on a workforce requiring "anytime, anywhere" application access. IDC research indicates that demand for SD-WAN solutions is robust, especially from the growing number of enterprises embracing public cloud services and seeking to strengthen their degree of customer engagement. In fact, IDC forecasts that the worldwide SD-WAN market for infrastructure and services will exceed $8 billion in 2021.

In lockstep with cloud growth and its ramifications on the enterprise WAN, IDC notes the rise of agile development models and continuous development, which are intended to expedite the application development process and accelerate business outcomes in the cloud.

Indeed, monolithic application development is being superseded by microservices, which involve the development and decomposition of complex applications into independent processes communicating with each other using language-agnostic APIs. These services are small, highly decoupled, and focused on executing discrete tasks, allowing for an interlocking "Lego" approach to development that offers benefits such as modularity and speed. In that respect, microservices' architectural approach to development is intertwined with the burgeoning DevOps movement, which also prizes automation and agility as a means to faster business outcomes.

Taken together, public cloud — and the development approaches it has spawned — offers several compelling benefits, including the aforementioned business agility, elastic scalability, operational flexibility, and cost savings. That said, running applications in the public cloud is not without its challenges, which include the following:

- **Network complexity.** The networking required to support public cloud applications must be highly dynamic, and that often introduces complexity. Enterprises must simplify how they design, deploy, and manage their networks while making no compromises in overall network performance and robustness.
- **Poor application performance.** Long network paths, resulting from backhauling or geographic distance, can result in latency and jitter that affect application performance. In addition, application performance can be affected by bandwidth constraints attributable to insufficient link capacity, connection quality, and traffic congestion.
- **Lack of troubleshooting visibility.** Cloud application performance issues can be difficult to troubleshoot and resolve, especially when monitoring schemes and tools are vexed by blind spots between the cloud-based application and the end users.
- **Lack of comprehensive tools to support DevOps.** To accommodate cloud applications in public cloud providers such as AWS or Azure, organizations must add tools that support DevOps by diagnosing application performance problems all the way down to the offending code, SQL, web service, network, or system resource. Without the right tools, these problems will be difficult to detect and resolve.

The aforementioned challenges can be addressed with emerging solutions that simplify how networks are designed, deployed, and managed and that also provide improved visibility and performance of applications resulting in a better end-user experience.

SITUATION OVERVIEW

Simplifying Network Connectivity to the Cloud

As mentioned in the preceding section, network complexity is a major challenge associated with cloud-based applications running in AWS, Microsoft Azure, or other public cloud vendors. To realize the full benefits of cloud, in fact, the issues associated with network complexity must be met and resolved.

As previously mentioned, the traditional enterprise WAN was not architected for the era of cloud computing. In addition, the enterprise WAN is complex to operate — onerous to configure, deploy, and manage. In fact, most WANs in operation today are configured manually, on a device-by-device basis

that is time consuming and inherently inefficient. Further contributing to WAN inefficiency is the traditional WAN's hub-and-spoke architecture, which necessitates backhauling cloud-bound traffic from branch offices to the datacenter and only then out to where applications reside in the cloud before going back through the datacenter and then finally back to branch offices.

Fortunately, with the advent of SD-WAN, steps can be taken in the following areas:

- **Increased IT agility with simple provisioning of network services for cloud apps.** Agility should be an inherent benefit of cloud. Unfortunately, traditional approaches to wide area network architectures and network provisioning work against that objective. What's needed is a simpler approach to provisioning the network services that support cloud-based applications. What's more, the imperative for increased IT agility is also driving strong demand for fast application delivery.
- **Seamless, secure network connectivity.** Enterprises also must ensure that they have seamless, secure end-to-end network connectivity that extends within and from enterprise out to the cloud — and between clouds.
- **Easily managed orchestration.** Instead of managing networks through the configuration of individual devices, the focus should be on policy-based orchestration that is aligned with business intent and the needs of applications. At the same time, it should be easy for IT professionals to set up global or local policies.
- **Transport-agnostic networking.** Another critical facet of providing cloud connectivity to the enterprise — including branch offices and remote sites — involves ensuring that the networking approach is agnostic to the underlying transports, regardless of whether they are broadband internet, 4G/LTE, or MPLS. The approach to networking should be oriented toward application needs rather than administering to the requirements associated with the underlying transport networks.
- **Global orchestration beyond the WAN and into the cloud.** To achieve the goal of operational efficiency and superior performance, an SD-WAN should leverage business-aligned, policy-based automation to define QoS and access privileges for all applications and users. It should also ensure automated and secure connections between cloud networks and branches and provide integration with all network and security services for assured performance. It also should provide efficient management of local breakouts and fine-grained path control.
- **Prioritization of application traffic.** Another important capability is prioritization of application traffic. Business-critical applications should be classified and prioritized appropriately so that they receive the necessary bandwidth and QoS assurance.
- **WAN optimization.** Even cloud applications can benefit from WAN acceleration and optimization. The performance of cloud applications can be adversely affected by bandwidth constraints, latency, and application contention. WAN optimization can be applied to overcome these challenges. In addition, WAN optimization and SD-WAN can be combined in converged branch solutions to form a policy-based, application-oriented, and transport-agnostic network overlay that ensures the performance of increasingly critical cloud applications.
- **Unified management of branch LAN (wired/wireless).** In a certain respect, SD-WAN can be seen as a platform that sets the stage for automated, policy-based provisioning and management of the branch WAN. This becomes increasingly important as cloud applications demand as-as-service IT at branch and remote offices.

Providing Comprehensive End-to-End Visibility

With the advent of the cloud-connected enterprise, there's an unprecedented need for comprehensive application and network visibility. Unfortunately, IT teams still struggle to provide unified views into application and network performance that can be easily understood by multiple stakeholders.

As enterprises pursue digital transformation as a critical business imperative, they increasingly recognize that application performance is integral to business performance and to digital experience management (DEM). They understand that applications are the means by which their businesses interact with customers, collaborate with partners, and enable their employees to succeed. That said, these enterprises might have less appreciation for the complexity in today's hybrid application environments in which applications are built on interdependent services, incorporate data from multiple sources, and depend on infrastructure to operate smoothly.

For cloud applications resident at AWS, Microsoft Azure, or other public cloud vendors, end-to-end visibility becomes both more challenging and increasingly important. In this context, there's a need for real-time monitoring that extends across network infrastructure and that also provides insight into application performance and end-user experience. The challenge is more daunting because SaaS and IaaS environments are outside the control of the enterprise IT departments and because migrating to these environments can be difficult without visibility into application dependencies, end-user experience, and overall application performance.

In responding to this challenge, enterprise IT departments sometimes adopt multiple approaches involving disparate point products. Unfortunately, a reliance on multiple point products can result in blind spots that compel IT departments to resort to speculation and guesswork. This piecemeal approach also fails to provide the full breadth and integration that is essential for proactively managing business outcomes in a digital environment.

What's needed is a comprehensive approach to pervasive visibility that continuously monitors and blends insights gathered from all end-user devices (mobile, physical, and virtual), networks, infrastructure, and applications, irrespective of where the applications reside.

Such end-to-end visibility gives IT the ability to:

- Troubleshoot performance issues that might otherwise be hidden in blind spots.
- Set, measure, and manage service levels from the cloud edge all the way to end users, meeting SLA and other commitments to business units.
- Continually improve cloud application performance and preemptively address issues that would otherwise affect the digital user experience.

Improve Performance and Accelerate Releases of Cloud-Based Applications

As the enterprise embrace of cloud grows stronger, DevOps practitioners are under increasing pressure to deliver frequent, high-quality releases of cloud-based applications. This is primarily because developers are moving away from monolithic applications and toward the microservices-based development architectures previously discussed in this white paper. These new application architectures are inherently complex. Layers of dynamic microservices are distributed across multiple environments, including private and public cloud, and are interconnected by broadband internet and MPLS. To compound matters further, the geographic dispersion of end users and the variety of devices they use add further complexity.

With an integrated portfolio of APM and NPM tools that include end-user experience monitoring, IT operations professionals and developers can possess a single management interface that provides the visibility and insights required to identify root causes of application performance issues. Capabilities in this area should include:

- Analytics that illuminate hidden performance issues in application software and pinpoint their causes down to the code level
- Detailed diagnostics that obviate the need for developers to replicate bugs, which can be eliminated faster in dev/test/production

What's more, extensive insights into end-user experience enable developers, operations, and application owners to:

- Prioritize tuning and optimization efforts with rich details into transactions or financial performance.
- Make informed planning decisions, with greater understanding of the performance and business implications.
- See trends relating to the adoption and performance of applications from release to release.

Moreover, open APIs allow DevOps-oriented teams to consume and act on performance diagnostics across the development life cycle. This automates the collection, sharing, and analysis of application and network performance metrics, resulting in faster development and testing of applications. It also facilitates closer collaboration and makes performance data actionable through contextual insights that can be leveraged by all members of the team.

CONCLUSION

Cloud computing has emerged as an essential means by which enterprises realize digital transformation. In fact, public cloud services are perceived as enablers of business agility, and the public cloud services market has rapidly expanded to form a foundation for digital business.

Despite the tremendous promise and tangible business benefits that public cloud can deliver, challenges remain in areas such as simplifying network connectivity to the cloud, providing complete end-to-end digital experience management, and improving the performance and accelerating the release cycle of cloud-based applications. These challenges must be addressed and overcome if enterprises are to derive maximum benefit and value from their increasingly significant investments in applications residing at AWS, Azure, or other public cloud vendors.

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