Making multi-cloud work

Your expert guide to managing multiple cloud services and pitfalls to avoid in your multi-cloud strategy

In this e-guide:

The benefits of using multiple cloud services are clear. Besides tapping the best capabilities of each cloud service provider, enterprises can also hedge against potential vendor lock-in and enable redundancy in their cloud infrastructure. That said, managing multiple cloud services can be a challenge when it comes to monitoring costs, service uptimes and keeping tabs on data that is being held in multiple locations. In this e-guide, read more about the tools you can use to manage multiple cloud services, the mistakes to avoid in multi-cloud storage management and tips to rein in costs in your multi-cloud strategy.

8 steps to effective multi-cloud cost management

John Edwards, Freelancer

The financial and productivity benefits associated with embracing a multi-cloud environment are well-known. But multi-cloud infrastructures are complex, with many different providers and service terms. When working with multiple clouds, it's easy to waste money without even realizing it.

Multi-cloud cost management should be a priority from the start. While the cloud itself has relatively low costs initially, moving cloud workloads and dealing with multiple cloud providers can be tricky. Budgeting too severely is not the way to go with multiple clouds either, as vital features like management, monitoring and security should not be sidestepped because of their price tags.

Luckily, there are practical steps that you can take to avoid additional cloud costs. Here are eight ways to ensure that your organization gets the full value from its multi-cloud investment:

1. Investigate all available options

Research is the best and most reliable tool for multi-cloud cost management.

"Businesses need to understand and evaluate their needs and which providers offer the best pricing," said Paul Sussex, a financial services principal at professional services firm Ernst & Young.

It's essential to understand workload demand patterns to arbitrate costs across providers and leverage on-demand services effectively. "In the cloud, elastic storage may be less expensive with one provider than another that might have cheaper CPU pricing," he noted.

It's also important to understand what capabilities, such as third-party services or tools, are needed to accommodate workloads.

"In some cases, it can be more effective to choose a basic infrastructure provider or even keep an existing internal environment," Sussex concluded.

2. Map out your strategy

Careful upfront planning is always necessary for effective multi-cloud cost management. Evaluate all of the available options and pick the one with a cloud-native architecture that's most suitable for the workload, said Mike Fitzgerald, global solutions director at SoftwareOne, a software asset management and cloud optimization software and services provider.

"Evaluate all your on-premises workloads and prioritize and migrate the workloads that are going to get the biggest benefits," he said. Do not blindly lift

and shift workloads to the cloud -- some workloads may just have to be retired instead of sent into the cloud. "The planning and the initial assessment will assure that you are cost-optimized from day one," Fitzgerald said.

3. Fully analyze business requirements

"Organizations often deploy application components to multiple cloud environments as per business requirements," Sussex said. Yet this approach, when made without fully considering its larger, real-world implications, can lead to higher costs.

"Using application workflows and relationships in conjunction with business requirements can reduce data hops across cloud boundaries," he said.

4. Use insightful, reliable monitoring

Continuously monitoring infrastructure use is a highly effective way of ensuring that resources and money aren't being wasted in a multi-cloud environment.

"We've seen lots of examples where customers inadvertently deploy significant additional resources within Azure or AWS and then [get] walloped with a significant increase in costs," said Julian Boneham, a director at N4Stack, a firm that helps customers manage and optimize their data and cloud platforms. "We

all know that public cloud platforms give the opportunity to ramp resources up and down on demand, but this only provides a cost benefit if the utilization is managed effectively and underutilized resources are avoided."

5. Ensure proper data classification and tiering

Tiering and classifying data is essential to multi-cloud cost management. Skipping this step can lead to expensive data transfers that require the movement of data from one platform to another.

"Segregation of data across multi-cloud platforms to serve local applications and systems is favorable over data replication across cloud platforms," Sussex observed.

6. Don't be short-sighted

Multi-cloud cost management needs to be treated as a continuous, ongoing initiative and not a one-time activity.

"Don't instantly assume there will be cost-savings," declared Joe Kinsella, CTO and founder of VMware subsidiary CloudHealth Technologies, a cloud optimization platform provider. "The simple truth is that managing multi-cloud

effectively takes time and proper planning to secure buy-in across business units and teams."

Cost-savvy organizations make the effort to align cloud costs to business key performance indicators. "For example, cost per user per month, cost per document per month," he said.

7. Exercise strong management

A multi-cloud environment gives an organization tremendous flexibility in deploying and supporting mission-critical applications.

"However, if multi-cloud environments are left unmanaged, the associated costs can spin out of control rather quickly because of additional layers of complexity," Sussex said. "Companies often struggle with hidden costs associated with unnecessary cloud data migrations [and] compute and storage resources, ultimately failing to deploy cloud resources at a cost that best fits business needs."

8. Don't scrimp on security

The biggest multi-cloud cost management mistake adopters make is failing to understand that the cloud provider isn't responsible for data and other stored

assets, said Debbie Zaller, privacy leader at Schellman & Company, an independent security and privacy compliance assessor. Data breaches occur often, and organizations that mistakenly place their trust in their cloud providers are often left holding the bag after an attack. "This not only increases costs to add in security controls after the breach, but the breach itself is very costly," she explained.

5 multi-cloud storage management mistakes to avoid

John Edwards, Freelancer

Multi-cloud storage is a great way to cut costs, ensure reliability and boost storage performance. What's not so great is when a simple management error or oversight makes the approach unreliable or unsafe.

These problems and others can be avoided with thoughtful planning and coordinating efforts within your organization. Along with overcoming internal hurdles, such as security and spending, you need to have a vetting strategy in place prior to choosing among potential cloud vendors.

Don't lose time or money by falling into a multi-cloud storage management trap. Check out these five common mistakes you should avoid.

1. Developing a fragmented cloud management strategy

One of the biggest mistakes multi-cloud adopters make is developing a plan by accident rather than by design. "When individual decision-makers choose cloud

providers based on personal preference, habit or other arbitrary criteria, the organization doesn't have a multi-cloud storage strategy; it has a multi-cloud storage mess," said Rich Petersen, co-founder and president of JetStream Software, a cross-cloud data management software firm.

IT teams often have their own requirements and priorities and frequently adopt different clouds based on productivity needs. "The result is that IT doesn't know what data is where, who owns it and what the access controls and encryption policies are," said Anand Babu Periasamy, co-founder and CEO of MinIO, developer of the MinIO cloud storage stack. "This exposes them to a number of issues -- namely, security, application portability and duplicative storage."

There are two dangerous consequences of becoming a multi-cloud operation by accident, Petersen said. "The first is the cost of uncoordinated and unnecessarily redundant storage management operations," he said. "The second is the risk of improper data management, which could include failure to properly back up and protect some data or accidental disclosure of sensitive data."

2. Not using common data management tools across multiple clouds

Use cloud-native data and storage tools across multiple clouds, said Jeff Kim, CEO of Kmesh, a multi-cloud data orchestration SaaS platform provider.

"Instead of using AWS Aurora or RDS [Relational Database Service], the customer could smartly use Cassandra or MongoDB -- open source -- which can be set up on any cloud," he said. Kubernetes, meanwhile, can be used to easily manage apps across multiple clouds.

3. Failing to analyze and understand application performance requirements

Failing to understand the performance needs of each application generally results in spending too much money on unnecessary, expensive storage or suffering unacceptably slow response.

"Analyze the storage performance profile of your cloud VMs [virtual machines] using tools specifically designed to intelligently find and report the potential bottlenecks," said James D'Arezzo, CEO of Condusiv Technologies, a company specializing in software-only storage performance technologies for virtual and physical server environments.

4. Deploying inadequate security

A multi-cloud storage security failure can be costly to an enterprise's finances and reputation. "Companies who suffer a data breach will spend millions to restore their databases to safe compliance," said John Taylor, CTO of Panzura,

a multi-cloud file services provider. "Moreover, companies will also be impacted by the hurt and mistrust stemming from their customers, who feel understandably violated."

When organizations fail to create an adequate security strategy prior to deploying their multi-cloud storage management strategy, they unknowingly weaken their security posture and expose themselves to the possibility of data breaches, Taylor said.

In fact, data breaches are often far more devastating than data loss. "You can recover data, even if there is some loss, but data breaches bring with them legal liability," Periasamy said.

"IT leadership needs to acknowledge the challenges and opportunities presented by a multi-cloud approach and craft a strategy, complete with policies and controls, to ensure that they know what data exists, where, when and with what permissions," Periasamy said. "The goal is not to create barriers, but rather to ensure visibility."

5. Falling victim to vendor lock-in

Vendor lock-in is generally viewed as a strategic mistake. The damage it can cause ranges from trivial to serious. At a minimum, being locked in to a single cloud provider is inconvenient, since the customer loses price leverage, said

Peter Guagenti, CMO of MemSQL, a database management software developer. "At most, they sacrifice business for their architecture, losing out on flexibility and agility or paying a competitor for cloud technology."

A true multi-cloud storage strategy enables organizations to tap into the unique capabilities of cloud-independent vendors, prioritize business over architecture and drive better costs. "But companies cannot achieve any of these benefits if they are locked in to a single vendor," Guagenti said.

The best way to avoid lock-in is to align with products and vendors that are cloud-agnostic. "Rather than choosing technology from a cloud provider, businesses must select ones that are cloud-independent, driven by a community of users and that work with all cloud providers," Guagenti said. "For example, rather than using one of Amazon's databases, businesses can choose a SQL-based database that works across multi-cloud and hybrid environments and integrates with all vendors."

Automation drives next wave of multi-cloud management tools

David Linthicum, Chief Cloud Strategy Officer

Enterprises adopt multi-cloud strategies so they can select the services that best fit their needs. However, the number of cloud services can easily multiply and add management complexity. The right tool can help -- but enterprises need to choose carefully.

As the market for multi-cloud management tools continues to evolve, it can be difficult to find the right fit. Market consolidation is just one of the many factors enterprises need to consider. Many leading third-party vendors have been acquired -- Microsoft, for example, bought Cloudyn, and CloudHealth Technologies is now a part of VMware. Consolidation will continue in the future, which will likely slow the research and development momentum needed to improve these third-party tools. Organizations need to consider if ownership change at their preferred vendor will affect the product, and, ultimately, their multi-cloud management strategy.

In addition, special-purpose multi-cloud management tools, such as those built for security, cost and performance, won't always be the end game for a lot of enterprises. Orchestration frameworks such as Kubernetes, and the

applications platforms built on top of them, can sometimes offer more management consistency for multi-cloud deployments. Products such as OpenShift abstract the underlying infrastructure and treat management as a foundational architectural component, rather than a tool that's bolted on after the fact.

Multi-cloud tools evolve

Multi-cloud management tools have changed a lot in the last several years. These tools were once used as brokerage services or abstraction layers that boiled public clouds down to the lowest common denominator. But, as organizations move to higher-level cloud services and agile development practices, these tools are now more about enabling automation and governance.

The next generation of multi-cloud management tools and approaches focus on three features:

Automation

Ops-focused tools deal with cloud services in terms of individual components that they need to track. They do so by automating the use of the services by "what" and "who" to assist with security. For example, they might track which developers are using which specific services, for what purpose and when. The

tool logs all service usage to enable automated updates, change management and configuration management, which are fundamental to development and operations.

Abstraction

This approach deploys services on top of the native cloud services and creates a single way to look at storage, compute, security and other resources across different cloud platforms. The idea is to provide a common way to look at storage, compute and other related IT concepts in order to bring the back end down to the native API level. This technology reduces human intervention, which, in turn, limits mistakes and speeds up management.

However, keep in mind that if you hide more native services under abstraction services, you dilute the value of those services and are left with a least-common-denominator approach. For example, if you use a common storage concept and just use a service to store, retrieve and delete, you may miss out on native services, such as rollbacks, that are limited to a single provider.

Container orchestration

Container orchestration, made popular by technologies like Kubernetes, enables native cloud services to be managed as containersEnterprises can cluster and manage them with container orchestration tools.

They can pool resource to scale and manage them as single clusters or groups. Developers and operations teams have more control over their workloads because they can deal with containers as micro or macro concepts.

This approach is developer- and ops-focused and can provide portability between clouds. Enterprises have rapidly moved to these tools because containers are standard and not married to any technology stack. However, not all applications are easily placed in containers. For example, COBOL and file-based database systems don't have good deployment analogs for containers. This requires a redevelopment effort, as well as a redeployment effort.

What's next for multi-cloud management tools? The current market landscape indicates there's a clear need for multi-cloud management. Most enterprises won't be able to resist the use of more than one cloud, so there will need to be tools to enable enterprises to do so at scale.

Watch for vendors to focus on machine learning to support those efforts. Companies such as CA Technologies and Densify are already building AI into their services, and expect it to be an area of focus for even more companies in the future as they seek to help enterprises manage their workloads across multiple environments.

Multi-cloud management tools fall short of expectations

Paul Korzeniowski, Freelance Writer

Companies continue to invest in multi-cloud strategies. This gives them access to a breadth of services, but it also creates management challenges due to platform differences.

Multi-cloud management can simplify deployments across disparate environments and lower maintenance costs. However, the tools currently available on the market remain a work in progress. Their shortcomings force users to take on a great deal of complex systems integration work -- a burden most enterprises are unable to bear.

As a result, many enterprises that deploy more than one cloud often manage those environments autonomously, instead of using a multi-cloud management tool. With this approach, resources are wasted, workloads are unable to move to the preferred platform and users pay more than they should. What they need is a unified offering to ease these troubles.

Enterprises desire more

Organizations want vendors to deliver more comprehensive multi-cloud management services, though the industry hasn't settled on the system requirements or delivery mechanisms for these tools, according to Roy Illsley, an analyst at Ovum, a market research company.

"Corporations are looking for a multi-cloud management nirvana," Illsley said. "No vendor now delivers it. At best, they have 70% or so of the functionality that users want."

Corporations want features that support cross-cloud orchestration and provide visibility into different cloud services' performance. This would give companies the ability to automate certain maintenance tasks, such as dynamically moving a workload from one cloud to another.

Multi-cloud users also want to conduct cost and risk analysis to determine the best fit for their workloads, and they want to enact policies across clouds, such as network security, in a consistent, automated manner. For that to occur, the management tools need to recognize and respond to cloud platform system changes -- capabilities that remain a work in progress.

Third-party vendors put in enormous effort to link the various cloud-native management systems. There aren't standards that outline how different

management systems exchange information, so each vendor must build connections, one at a time, between systems. This pulls management data from the various platforms into a single console for users, but because of the complexity involved, few management vendors are able to offer much more than that.

To compound the problem, these connections are made via each supplier's management APIs. Due to competitive demand, public cloud vendors concentrate on their own system's management capabilities, rather than open those systems to others. As a result, the current APIs are not as rich as autonomous management systems, and functionality is lost when different systems are connected.

However, there are signs that the major cloud vendors might change in the face of user demand. In April 2019, Google Anthos -- previously known as Google Cloud Services Platform -- was made generally available. It provides a common software tack that runs on Google Cloud and on premises, but it's also designed to manage workloads on third-party clouds like AWS and Microsoft Azure. Still, because the service is so new, it remains to be seen how deeply Anthos will integrate with those other platforms.

Users must fill in the gaps

Vendors continue to make promises about multi-cloud system capabilities, but it has become increasingly difficult for users to believe them. Once the conversation turns from the hypothetical to the real-life scenarios, there's always a catch, Illsley said.

"Unless you are Facebook or Google, you do not have enough manpower to tweak these systems enough so that they function in a complete, true multi-cloud management fashion," Illsley said.

For example, a multi-cloud management system might require a dedicated Python programmer to integrate and maintain the system, but that's not a position most companies have on staff. The orchestration functions that many users desire are only available to enterprises with large tech support staffs and technical experts that can build those capabilities themselves.

Compare tools for multi-cloud Kubernetes management

Tom Nolle, President

Kubernetes continues to evolve in many directions, which can make it difficult to understand its relationship with other IT trends -- especially multi-cloud.

Users can create a Kubernetes cluster and deploy containers inside VMs on any public cloud or on premises, but they still need to manage scaling and resiliency within those environments. Cloud providers offer managed services to address these problems, but those tools aren't built for a multi-cloud Kubernetes architecture.

Cloud providers' managed Kubernetes services handle resource deployment and management, including load balancing and network connections. But organizations need a Kubernetes framework that can cross those lifecycle management "islands" if applications run across cloud boundaries.

Popular tools for multi-cloud Kubernetes deployments

Users who want to deploy a multi-cloud Kubernetes strategy do have options. Here are some of the tools available to make container architectures work across multiple platforms:

NetApp Kubernetes Service -- formerly StackPointCloud -- is a well-known and mature service that provides a common administration console for multiple Kubernetes deployments. Each cloud represents a separate cluster, and you can spin up a cluster in any of the popular public clouds. However, it doesn't support on-premises Kubernetes. If a multi-cloud deployment includes a private data center, the cloud and data center workloads need to remain separate.

Cloudify offers a higher-level, model-driven orchestration tool that's open source and can deploy Kubernetes on multiple clouds, as well as on bare metal or inside VMs. Cloudify doesn't augment Kubernetes; instead, it treats Kubernetes and any cloud provider's Kubernetes service as a class of resource. This makes Cloudify a good tool to harmonize different hosting approaches, and not just different cloud providers. Still, some users won't like the additional layer of abstraction.

Terraform is an infrastructure as code (IaC) tool that provides a common hosting framework. It creates a single virtual pool of hosting resources for

Kubernetes on any number of public clouds or private data centers. However, the advanced features in cloud providers' managed Kubernetes services don't translate to Terraform, which can limit what you can do on a given platform.

Rancher is a Kubernetes-centric framework that works with bare metal, VMs, on premises and on multiple public clouds. Rancher creates a three-level architecture, with application workload management at the top and unified cluster management in the middle. The bottom layer consists of the various public cloud Kubernetes engines and Rancher's own Kubernetes engine for private infrastructure. Users can opt for cloud providers' managed Kubernetes offerings or handle management on their own.

Platform9 Managed Kubernetes is a SaaS approach to hybrid and multi-cloud Kubernetes. It works on all the popular cloud platforms, as well as on an enterprise's own servers. It's a "bring-your-own-infrastructure" approach that handles all hosting resources through a central management console and adapts to virtually any hosting environment. Platform9 deploys VMs, containers and even serverless, so it's very flexible. Many observers see Platform9 as a competitor to Rancher.

Red Hat OpenShift with Tectonic combines a Kubernetes-centric vision of abstract infrastructure with resource pools that can span public cloud and on-premises hosting. OpenShift takes an on-premises-centric view of multi-cloud and hybrid cloud, rather than a SaaS model, because it's based on tools an IT pro would be accustomed to inside their own data center. The OpenShift-

Tectonic combination is new, so check the progress of the integration and the feature enhancement plans regularly when you consider your options.

Juke, from HTBase, which is now owned by Juniper Networks, extends both the control and data planes of a Kubernetes deployment, so it provides the network layer needed to create a uniform deployment framework across clouds and data centers. Juke has strong support for multi-tenancy, which makes it an attractive option for cloud providers and a good choice for users who need significant application isolation for governance or security.

Cloud's influence on Kubernetes

Cloud-based managed Kubernetes continues to shape the trajectory of Kubernetes as a whole. This can be seen through the various add-ons that can accommodate multi- and hybrid-cloud deployments, including Kubernetes plugins from vendors such as Red Hat, and the emergence of Isto as a service mesh.

Moreover, organizations are now forced to think of Kubernetes orchestration as the management of various installations, as opposed to the management of different Kubernetes clusters. In that context, the various clouds become those installations and act as extensions of your resources. A hierarchical model of Kubernetes is emerging, with lower and higher layers that work together and span all kinds of infrastructure.

Kubernetes' strength has always been its open framework and APIs that enable so much integration. That integration process continues to redefine Kubernetes and its ecosystem, which means multi-cloud Kubernetes support, and the managed Kubernetes services from cloud providers, will continue to evolve. Users will have to carefully track the progress of their chosen tools, even after they've made their choice.

▪ ANZ businesses prefer hybrid cloud

Aaron Tan, Executive Editor, APAC

Australia and New Zealand (ANZ) businesses are using public cloud services, but many still prefer a hybrid cloud environment over a single public or private cloud, according to a report published by Information Services Group (ISG).

In addition, they are adopting a multi-cloud strategy by using several cloud providers for different services. Most managed service providers (MSPs) in ANZ are also acting as "cloud brokers", helping enterprises navigate various cloud options and migrate existing workloads to multiple cloud environments, ISG said.

"Almost all service providers have developed their own version of a platform that offers a one-stop shop for rapid, secure and efficient enterprise application cloud migration that supports multiple clouds," said Lisa Borden, partner and head of ISG in ANZ.

However, compared to their US and UK counterparts, ANZ firms are slower to adopt public cloud services, ISG noted.

Private cloud use is also higher in ANZ than it is globally, with VMware and Microsoft among the favourite suppliers. Many ANZ businesses still need to be

educated about the technology advances available through the cloud, according to ISG.

In August 2018, VMware took the wraps off its VMware Cloud on Amazon Web Services (AWS) in Australia in a widely anticipated move that is expected to raise the supplier's standing among Australian enterprises operating in an increasingly hybrid cloud environment.

AWS executives had claimed that the service was more cost-effective than other hybrid cloud offerings, with further savings if enterprises took up one-year or three-year subscriptions, with savings of 30% and 50%, respectively.

In the public sector, restrictive policies by the Australian government have limited the number of cloud vendors that store classified government data, but ISG sees greater opportunities for public agencies to adopt cloud solutions as more suppliers with unique offerings enter the market.

Microsoft currently operates two regions for Azure cloud services in Australia that handle protected and unclassified government data. The services are being delivered through datacentres operated by Australian-owned Canberra Data Centres.

When it comes to DevOps, businesses in ANZ have not made it a priority when developing applications thus far – even as Australia's DevOps market is warming up.

Singapore companies gearing up for hybrid cloud

Aaron Tan, Executive Editor, APAC

Singapore enterprises are increasingly in favour of hybrid cloud as they move away from traditional datacentres, a study has found.

According to Nutanix's inaugural *Enterprise cloud index*, Singapore companies plan to reduce their use of traditional datacentres from 42% to 17% over the next two years. Over the same period, they are looking to increase their use of hybrid cloud by 150%.

If their plans are followed through, Singapore companies could outpace their global and regional peers in hybrid cloud use by 5% and 7% respectively, the study noted.

Those that already run private cloud datacentres are also looking to leverage public cloud services in a hybrid cloud environment.

According to the study, which polled 2,300 senior IT decision makers – including 700 in Asia-Pacific (APAC) – from medium-to-large enterprises across the globe, Singapore respondents expect to halve their private cloud adoption over the next one to two years.

However, shifting more workloads to the public cloud comes with its own set of problems.

For one, the study revealed that Singapore organisations are struggling to keep public cloud costs in check, with 46% of respondents going over budget on their public cloud spending, second only to South Korea (49%).

Other issues include service disruptions and user experience. Despite Singapore's excellent connectivity, respondents cited end-user experience (34%) and disruptions when updating (32%) as key challenges for the public cloud. These issues were significantly more pronounced in Singapore than elsewhere.

"Singapore remains ASEAN's digital gateway and a key pillar within the wider APAC data landscape, pushing boundaries to achieve its vision of a smart nation," said PK Lim, managing director of Nutanix ASEAN.

"What we are seeing in this report is a realisation among enterprises that joining the data dots via a hybrid cloud infrastructure will become critical if we are to maintain and maximise our strategic advantage," he added.

Besides hybrid cloud, Singapore respondents also cited the internet of things as well as artificial intelligence and machine learning as having the most positive influences on business today.

The findings of Nutanix's study mirrored those that were uncovered by TechTarget's *IT priorities 2018* survey, where 24% of ASEAN respondents cited hybrid IT as a priority, representing a growth rate 23% year-on-year.

With more ASEAN organisations looking to implement hybrid cloud, about a third of IT professionals expect to roll out public cloud infrastructure services this year – higher than the APAC average of 25%.

Alibaba Cloud teams up with SMU on training programme

Aaron Tan, Executive Editor, APAC

Alibaba Cloud will run a series of training courses together with Singapore Management University (SMU) to help small and medium-sized enterprises (SMEs) plug into the digital economy.

The first of its kind outside China, the training programme, which aims to train more than 1,000 working professionals in Singapore, will be offered at the SMU Academy, the professional training arm of SMU, from March 2019.

The courses, such as big data analytics, cloud computing, internet of things (IoT), will be conducted by Alibaba Cloud experts who will use real-world case studies to provide actionable insights into applicable technologies and strategies for participants.

Industry-specific courses for the retail, finance, logistics and manufacturing sectors are also available for those who want to learn how cloud computing, artificial intelligence (AI) and blockchain can be applied in their respective fields.

The courses will be funded by SkillsFuture Singapore, with 70% of the course fee subsidy for Singapore citizens and permanent residents, and 90% course

fee subsidy for citizens aged 40 and above, and for SMEs that send their local employees for the training.

Leveraging its faculty expertise, SMU will also develop cases of successful technology adoption by local companies, which in turn will be used as teaching resources for the programme.

In addition, a mentorship scheme is being planned to help participating SMEs implement tech-enabled strategies for their businesses.

Leon Chen, country manager for Singapore and Indonesia at Alibaba Cloud, noted that the partnership with SMU will equip local businesses with the right tools and technology to propel Singapore towards its smart nation vision.

"We hope to provide actionable advice through a blend of success stories and our holistic approach to technology to help create a future-ready Singapore," he added.

Alibaba's training initiative in Singapore follows the heels of a similar programme spearheaded by Amazon Web Services (AWS) and the National Trades Union Congress (NTUC) in May 2018.

Also aimed at SMEs, the AWS programme trains participants on the basics of cloud computing, as well as applying IoT technologies to their businesses.

According to Synergy Research Group, AWS remained the clear public cloud leader in all four of the world's major regions in terms of cloud infrastructure and platform service revenues during the third quarter of 2018.

While Alibaba Cloud was ranked fourth worldwide, it was the second biggest cloud provider in the Asia-Pacific region, thanks to its dominance in its home market China.

Trust is key to Microsoft's APAC cloud play

Aaron Tan, Executive Editor, APAC

Having served enterprises longer than most other public cloud suppliers, Microsoft's knack for selling to large companies – and gaining their trust – has been instrumental to its success, and more so as conversations around cloud computing are increasingly centred on the hybrid cloud.

It is this trust from enterprises that Microsoft hopes to bank on as it expands its cloud footprint across the Asia-Pacific (APAC) region, according to Danette Seward, senior director for intelligent cloud at Microsoft Asia.

In an exclusive interview with Computer Weekly, Seward talks up Microsoft's cloud momentum in APAC, how it differentiates itself from its rivals, and the company's priorities in 2019.

How is Microsoft approaching the cloud market in Asia differently from others?

Seward: The first question that CIOs or CEOs often ask me when I sit down with them is: "Tell me why I'm even talking to you?"

Our message in Asia is no different from our broader global message. The first is trust and Microsoft has run on trust for a long time – from our heritage, and from an operating system and productivity suites perspective.

The second differentiator is around developer productivity through our acquisitions, such as GitHub, and more recently Xoxco, a software product design and development studio known for its conversational artificial intelligence (AI) and bot development capabilities. So across the board, we are providing developers with toolkits and open source environments to help them become more productive in everything they do.

The third differentiator is about weaving AI into everything we do. We do have some great internal use cases around what we're doing with AI that we share with enterprises.

And the last differentiator is our hybrid message. A lot of people talk about hybrid, but I think our differentiator is that we deliver that hybrid experience in a consistent manner – beyond just connecting a private cloud to the public cloud. We offer a consistent cloud environment for developers to build applications and take them into production.

Tell me a little more about the adoption of Azure Stack in this part of the world. Is it being used or tested by customers right now? What are some of the common use cases that you're seeing?

Seward: Azure Stack been very successful across Asia. We have some great examples in China and Hong Kong, as well as in Indonesia, where it has been used by telcos and managed service providers (MSPs). The recent Asian Games in Indonesia, for example, ran on Azure Stack.

The telcos and MSPs have also lined up a series of use cases to deploy Azure Stack across the region, whether it's in a disconnected mode running in Indonesia, sitting on Telstra's floor, or in a connected mode tethered to the public cloud.

I feel like about half of my job is hiring, which is a really beautiful thing because it speaks to the investment that we're making to bring in the right talent and train them.

Danette Seward, Microsoft Asia

Apart from the differentiators that you mentioned, I would think that because Microsoft has been working with enterprises much longer than some of the other public cloud service providers have, you would have more experience selling to large enterprises. Would you say that has been critical to your success in the market?

Seward: Yes, absolutely. I think that's wrapped into my point on trust, because our customers know we operate at enterprise grade. They know that Microsoft has, at its core, enterprise products and offerings. Our sales force and our engineering team are very connected to large enterprise customers.

Across the APAC region, what would you say would be the sweet spots from an industry and geographical perspective? APAC is a very diverse place, and I reckon you would have different strategies for emerging versus mature markets. There's never a single strategy that will cover them all, right?

Seward: I think you're spot on. In every market, customers are moving at different paces. When I'm in Australia, I talk to financial customers, automobile manufacturers and small business startups.

As for sweet spots, I think it's more dependent on the customer mindset and their willingness to lean into and understand what's happening from a digital transformation perspective than it is about regions and industries. Don't get me wrong, I think you're spot on that when we talk to customers in some parts of APAC, we would have a connected car story that plays very well in Japan, Australia and Thailand, for example.

But I think it's more about customer mindset than a specific industry. That seems a little odd, but these days some customers are more willing to digitally transform than others, so they can innovate and not get left behind.

I want to talk a little more about the trust aspect that you mentioned earlier on. We understand there can be downtimes for cloud service providers, and Azure has faced some outages of late. How are you addressing customer concerns about these issues?

Seward: You ask great questions. But I think there's nothing that our customers don't ask us as well. And frankly, from our point of view, I think no matter what, we are invested as a company in making sure that the cloud experience for enterprises is a trusted, reliable and stable one.

We build based on what our customers need and we see varying levels of demand. Interestingly, the last few years have been a huge learning experience for me around the gaming industry in South Korea. You would think large enterprises would be the demanding ones, but actually the requirements from gaming companies far exceed what we've seen from any enterprise customer.

We've had really explosive growth since we launched our South Korea datacentre in 2017 and we've brought on board some of the biggest gaming companies and smaller ones too. That has helped us to make sure we continue to improve the capabilities of our datacentres globally. Our enterprise customers have pushed us to certain levels, but the gaming customers are pushing us even harder.

Speaking of datacentres, are you looking to expand your datacentre footprint in APAC? I know you may not be able to reveal specific plans, but generally speaking, how do you assess whether you want to add an extra region or availability zone? Also, are you able to share more about what you're doing in the government sector? I understand Microsoft also has datacentres in Australia that cater to government customers.

Seward: Good questions. Let's start with our strategy for evaluating where we're going to open up a datacentre. Our strategy in Asia is not any different from our global view on our investments and growth. Globally, we've grown from 42 regions to 54 regions – 17 of them in Asia – in a little more than 12 months. We continue to invest in the market, and I see no slowdown in our investment.

Is there any more depth behind that? Sure, but not that I'm privy to, frankly. I'm not holding back any major secrets. You know, we continually evaluate and I think from an Asia investment perspective, we've done quite well. I feel really comfortable and our clients are comfortable with what we have.

We did just launch two new regions in Australia, which was a big investment and something we're really excited about. So that was a really positive thing last year. We are also a very partner-centric company. We look to our partners, like some of the MSPs and the telcos in Indonesia. Right now, we have a really good relationship with them and we did deliver to that market very successfully. We will continue to evaluate what the right approach is.

You would think that large enterprises would be the demanding ones, but actually the requirements from gaming companies far exceed what we've seen from any enterprise customer.

Danette Seward, Microsoft Asia

What is your sense of the cloud pie in the region? Do you see the pie growing at a much faster rate? Do you think what you're doing right now –

with regard to those four key differentiators – is enough to tip the scales and close the gap between Microsoft and the others in the market?

Seward: The pie is definitely getting bigger. Before, customers were just doing development and testing on the cloud, but now they're going into full production in a lot of cases. So the pie is absolutely growing. Do I think we are doing the right things from an engineering perspective, an investment perspective and a sales perspective? Yes, absolutely I do, and it is all centred on how we engage with our clients and what our clients tell us they need.

One of the beautiful things about Microsoft is that we listen to our customers and then we figure out how to make the right investment and deliver what they need. So yes, I am comfortable that we are doing the right things. We can always do more – for instance, integrating acquisitions like GitHub and really leveraging what they are doing in Asia.

You talked about the end-user customers, but what about the independent software vendors [ISVs]? Singapore's Infocomm and Media Development Authority (IMDA) recently launched an initiative to get smaller ISVs up to speed with cloud-native development, to either build new cloud-native applications or to turn monolithic applications into cloud-native ones. IMDA sees that as critical for the local tech industry to move forward. What are your thoughts on that?

Seward: For me personally, ISVs are incredibly near and dear to my heart. I've spent a large part of my career working with partners and I know how vital they are – even more so in this cloud-first world that we're in. Those native, born-in-the-cloud ISVs are critical to our success. So we do spend a tremendous amount of time fostering those relationships, which could be through partners and developer communities. We do a tremendous amount of work around those communities.

And that's why the GitHub acquisition makes sense, right?

Seward: Yes, absolutely. There is absolutely a community approach, from a developer's perspective, that we're looking at. That can be everything from individual developers all the way up to the enterprise. So we are definitely engaging with them, not only directly through community efforts, but also through a lot of development organisations. I spend a significant amount of time in Melbourne with ISVs to help them broaden their reach across Asia. So it is a really important and critical part of our go-to-market strategy.

What would be your priorities for the coming year from a business development perspective?
Seward: From a business perspective, I'd say it is flat-out growth. I don't see this slowing down. I don't see our customers slowing down either, so we've got to continue to run fast enough to keep up with them and deliver to their expectations, which I think we can do.

What about getting the talent that you need to keep things going?

Seward: That's a good question. I feel like about half of my job is hiring, which is a really beautiful thing because it speaks to the investment that we're making to bring in the right talent and train them.

In Asia, I don't think there would be anybody saying that talent is abundant here. That said, talent does exist in the market. And from a diversity perspective, it absolutely exists in the market and we've made some huge strides in that.

But in addition to that, I think we are not the solution to everything, either. We do what we're good at, but we also have a great partner community. It's important that we continue to embrace our partners for their strengths. That's a critical part of how we will grow our business this year.

IBM's APAC CEO talks up next chapter of cloud adoption

Aaron Tan, Executive Editor, APAC

The future is hybrid cloud, as IBM and other IT suppliers have declared, given that there will always be enterprises that continue to maintain some workloads on-premise while moving others to the public cloud. At the same time, they are looking at more pervasive use of artificial intelligence (AI) across the enterprise.

IBM's Asia-Pacific CEO Harriet Green described this as the next chapter of cloud adoption, one where enterprises move even more business applications to the cloud, while increasingly operating in a multi-cloud world.

In an exclusive interview with Computer Weekly, Green, who is IBM's head honcho in India, South Asia, ASEAN, Australia, New Zealand and South Korea, offers insights on the challenges that CEOs are facing in the region, how IBM is helping enterprises ease into the next phase of cloud adoption, and what its impending acquisition of Red Hat means for its customers in the region.

What do you think are the most common challenges that CEOs in the Asia-Pacific region are facing?

Harriet Green: Over the past five years, we've invested $40bn to really ensure that we're able to meet the needs of the changing technology, business and social environment – whether that's in cloud, security, blockchain or quantum computing. For the first time in the middle of last year, our revenues reflected that. Over half of our revenues were from the strategic initiatives and those new areas.

The world now is extremely interesting. As we think about society and technology, it's really all around this exponential explosion in the amount of data. Whether people call it the new air or new oil, this explosion of data and how enterprises deal with that is at the core of this. How that data is being used by each company to create new products and services, improve client and customer interaction, as well as cost savings, is really where all of this comes together.

So, in the context of this data, the things that appear to be on the minds of CEOs are: "How can we use the data we have to be more efficient, effective and to create new products and services? How can we use this data to scale up our AI experiments or the things that we've been doing?

"How do we have the most agile and flexible cloud environment to enable us to do the things that we need to get done? Then how do we train, develop and support our people? How do we have the right skills that we need? And how are we on the right line of good tech, bad tech, good enterprise, bad enterprise as we make good use of this data?"

You would've seen out of all of the commentary that about 20% of companies' workloads have moved to a cloud environment. These workloads have usually been microservices that are native and born on the cloud. We can see this as the first chapter. The next 80% of the cloud opportunity focuses on shifting business applications to the cloud and optimising everything from supply chains to sales. This is the next chapter of the cloud.

In chapter two, it's about managing multiple cloud environments and managing data so we can scale the AI pilots that we've done to be able to have an impact on operations and business. How do we ensure that they're not locked in to any individual cloud environment? As you know, IBM has been long-term supporter of open source, starting with our $1bn investment in Linux 20 years ago.

IBM has been investing in the emerging high-value segments of the IT industry and the acquisition of Red Hat really doubles down and reinforces the major role we play in this trillion-dollar hybrid environment, and that we can help manage these multiple clouds. We have the capabilities, we have the experience. We've been helping major enterprises – whether they are airports, banks or airlines – manage tougher workloads and to bring them into a robust, open and secure working environment.

The third piece is skills. Together with our partners around the world, IBM has created a new education model called P-Tech, where we train young people to get practical knowledge and capabilities – for example, around cloud architecture so they can quickly make a contribution in the workplace, even

without a traditional college degree. In Asia-Pacific, the P-Tech model is now in Australia, Singapore, Korea, and the Philippines, and we plan further expansion later this year.

This issue of good tech is really important to CEOs. Where do you land on this issue of whose data is it? In chapter one of cloud, only a few collaboration and social media businesses have been the protagonists whose business models are predicated on selling your data.

As you know, IBM has not done that. We may hold the encryption keys and we may have worked on deeply intensive programmes, but it is our clients' data to do with as they will, and we were one of the first companies to issue our ethics and our transparency beliefs and principles around data.

In 2000, we had our first data privacy officer as we've really looked to ensure that these issues are managed and today, we have offerings and capabilities that enable clients to detect any unconscious bias that is being code into their products.

So, for example, if clients are using AI to determine if someone should be insured or not, we can assess every element of the code and capability, and give a clear reason why someone may have been denied or approved for a particular insurance policy.

Can you provide examples of how IBM has helped Asia-Pacific enterprises in the areas that you've just mentioned?

Green: We have a lot of clients here in Asia-Pacific and I'll name some and tell you what we're doing. We have worked with logistics startup FreshTurf, which is using blockchain to simplify deliveries in Singapore or Pacific International Lines, to develop the first successful electronic bill of lading to speed up the time it takes to transfer shipment documents from seven days to just one second.

There's also Westpac, Australia's oldest bank, that has moved its core banking capabilities to a secure and hybrid cloud environment, which enables it to make changes and be more efficient. It has also saved significant amounts of money in pulling all of its data into a cloud environment. Another one of our clients is DBS which has a centre of excellence for robotic process automation.

In Australia, Woodside, the country's largest energy company, has major rigs, and relies heavily on its engineers' experience and knowledge to run the rigs. An engineer may have 30 years of knowledge, which we've been able to pull into Watson so that other engineers can tap all that experience and knowledge to manage major rig installations.

So, Asia-Pacific has been a huge user of all of these different technologies – blockchain, AI at scale and cloud – to move forward in this great exponential change of technology in industry.

Asia-Pacific is obviously a very diverse market. Do you see any market dynamics that might be different from the rest of the world?

Green: Going back to what you were asking about CEOs, they're thinking about people, process and data. For people, how do they get the skills they require? For process, they've started these AI pilots, so how do they scale those now?

The process that we use with our IBM Garages, with our agile methodology, is a real theme. We have capabilities in centres across the region, including India, Australia, Korea and ASEAN. Our clients are immensely open to the process part of it.

For data, they are looking at what more data they need to go into the next phase, because you cannot use all of this data without the next phase of agile open cloud environment. It needs to be open. It needs to be secure. It needs to be scalable in this second chapter of the cloud.

You talked a lot about the second chapter of cloud. But in the fullness of time, do you envision entire IT infrastructures that we know of today moving completely to the public cloud at some point?

Green: Well, what we've seen in the first chapter is that some workloads and capabilities have moved to cloud, mainly public cloud. But we see that most clients have multiple clouds, multiple experiments and usage, and that many clients are not able to move their core workloads into a public environment.

IBM made the bet some years ago on hybrid cloud when no one was talking about it. Now, everyone is talking about hybrid cloud because that's the way the market has experimented. As we move into chapter two, clients are looking at their core complex workloads and what they can continue doing in a public cloud, what things need to be in a secure hybrid cloud environment and what needs to be entirely managed in a private cloud. Clients are realising that being locked in to any one cloud provider is probably not in their long-term interest.

When you think about the world that came before chapter one, IBM ran the infrastructures of most of the world's companies. Today, clients want us to be able to help them manage multiple clouds. They need to be able to deploy AI at scale, which is why we made the big announcement around Watson available anywhere, on any environment – on-premise and on any private or public cloud.

And as they move between different workloads and the different levels of cloud architecture, they have to consider any potential breachability, exposure and insecurity. We have the experience to help enterprises in those areas.

You talked briefly about Watson Anywhere. What took IBM so long, given that you were one of the forerunners in this space even before the current public cloud providers came up with AI services that they are now delivering through their platforms?

Green: I don't think it's about what took us so long. The issue is the rate and pace of evolution. We have thousands of pilots and work that clients have done

using Watson. Now clients are beginning to want to be able to scale Watson as a set of processes they use across their business and across multiple clouds to achieve the sort of cognitive enterprise that they're looking for.

To be a cognitive enterprise, you have to begin to experiment with Watson and see where AI works inside your organisation. But as you scale that up, you'll need to have a hybrid cloud environment to enable scaling. So, I'm not sure it's what's taken us so long – it's really about the fact that as the market and clients evolve, they want to be able to scale that across multiple clouds and we are ready to do that.

You could ask what has taken us so long to buy Red Hat? We've been talking about hybrid cloud for a long time. We saw that clients were using the cloud and the public cloud for certain cloud native apps, but that's only 20% of the workloads that companies put into cloud.

I was with an airline client recently and they were talking about their core cargo apps and workloads, and how they could transition to a secure, open, entirely safe environment. So this is the evolution that IBM is making available.

This might be a little bit too premature for you to comment on, but are you able to share a little bit about what the Red Hat acquisition would mean for your customers in Asia-Pacific? I know the Red Hat guys quite well, and some of them are former IBMers as well.

Green: Yeah. And what are they saying?

To be honest, some of them are a little unsure about what it means for them, as with any acquisition. What would you say to them then, especially those who had left IBM to join Red Hat?

Green: It's very important timing for Red Hat, which has been a hugely successful startup. As they looked to scale and invest in their business globally, they started to look at what partnerships made sense. Really, if you look at it, we are the ideal partner.

When compared with other cloud providers such as Microsoft and Amazon, IBM has been a leading contributor in many open communities: from Linux, to Java/Eclipse, to an ecosystem of strong partners. IBM's and Red Hat's partnership has spanned 20 years, with IBM serving as an early supporter of Linux, collaborating with Red Hat to help develop and grow enterprise Linux, and more recently to bring enterprise Kubernetes and hybrid multi-cloud solutions to customers. So why would we invest in such an extraordinary company and not allow it to be who and what it is?

So, Red Hat's communication on the acquisition has been very much around the investment, the scaling, and the pure synergy of what we can do together. It's a marriage that has been made in heaven and we need to ensure that we work together effectively. We have been a partner of Red Hat in our services. And we have already, as a major partner, been working to provide services and

support to clients, along with other companies, not exclusively, and there is no friction in that provision of services.

So, for many, there's a very good view of the future as we invest and scale. IBM has already invested over $40bn in five years to ensure that we're a leader in security, blockchain and hybrid cloud, and Red Hat will be the beneficiaries of this. There's enormous trust between the senior teams that will benefit clients.

Increasingly, many companies, including airlines, want to claim that they are technology companies and are trying to bring technology back into their organisations, rather than outsourcing it to someone like IBM. What are your thoughts on that?

Green: I see a CEO or meet with a board daily. The major themes on their minds are the ones that I've sort of shared with you, which is around equipping their companies with the necessary skills to navigate enormous changes in technology. What things do we do ourselves? What things do we get help from IBM and others? Which things are best done by specialists?

IBM is one of the very few technology companies that can provide the end-to-end capability for our largest clients, whether it is Westpac, ANZ Bank or Bharti, whether it's pervasively encrypted, totally secure hardware, through to services, hybrid cloud, software and the AI to scale. Many clients find that that capability gives them enormous security and sense of confidence.

Other companies may say: "I want your help in how we scale AI and to do a full assessment of all of these AI pilots that we have and what the next step is in using the agile methodology. And then you do that for us, and where does that lead to?"

Other clients like FreshTurf might say: "We have a brilliant idea and we're a startup – how do you provide us with the right technology and connect us to the wider ecosystem to enable us to be successful?"

It's a marvellous time and we are having more of those discussions, but a client chooses. The great thing about IBM is that whether it's around skills and the P-Tech education model, or around the process and how our client scales AI, or whether it's around the next chapter of cloud, we can meet the smallest and largest needs.

One thing I would say is that for most of the really hard stuff – those core business applications that run a bank or an airline – IBM has supported those and will help clients in whatever way they need to transition them to a secure, hybrid multi-cloud environment.

Managing data in a multi-cloud world

Aaron Tan, Executive Editor, APAC

For years, Southeast Asian logistics company Ninja Van has been relying on a public cloud infrastructure service to power its operational systems that work out delivery routes and assign packages. But as its business has grown, it has had to contend with a growing cloud bill.

"It's beginning to become more expensive and some people have been talking about cloud jail, where you get locked in to a single cloud provider," says Shaun Chong, chief technology officer at Ninja Van. "Soon, you may have to pay up to $1m a month as you scale up your business."

While some companies may choose to move some systems on-premise to manage costs and avoid being tied to a single cloud provider, the reality is that it is hard to walk away completely from the benefits of cloud computing – faster deployment, utility-based pricing that parks IT spending under a company's operating expenditure, and access to the latest technologies.

To avoid supplier lock-in, more businesses in the Asia-Pacific region are looking at a multi-cloud strategy, where they take their pick from the best cloud applications, platforms and infrastructure offerings to work alongside in-house systems in their datacentres.

"The increasing willingness to adopt multiple software-as-a-service (SaaS) offerings, coupled with the need to distribute risk in their infrastructure strategy by engaging with multiple service providers, is driving the move towards a multi-cloud, hybrid IT environment," says Nishchal Khorana, director of emerging technologies cloud and datacentre digital transformation at Frost & Sullivan Asia-Pacific.

Daphne Chung, research director for cloud at IDC Asia-Pacific, says organisations are also using various cloud services to optimise IT costs based on specific workloads or projects, such as finding the cheapest way to deal with test and development requirements for a project that may only run for a short period of time.

"There are a number of other reasons, of course, such as backup or disaster recovery," says Chung, adding that organisations may also end up with multiple cloud services through mergers and acquisitions, or if a cloud service has a specific feature that is not offered by others.

With multi-cloud expected to be the norm, Khorana says organisations will have to face the complex task of pulling together a seamlessly integrated data management strategy that will integrate disparate cloud services and automate movement of data across their cloud ecosystems.

Several storage and data management software suppliers are already working with enterprises to identify and manage key data management issues, such as

ensuring data is always accessible, having a single pane of glass to manage data across cloud services, as well as security and compliance.

"How portable is your data and workloads?" says IDC's Chung. "What would it take to migrate them if necessary? How accessible is the data by the necessary applications or workloads? Can you get your data back if need be? How will that work? Is there holistic management across the vendors and does it meet integration requirements?"

Chris Lin, senior vice-president at Veritas Asia-Pacific and Japan, says his firm has been making "tremendous progress" in helping organisations manage their data and applications dynamically in a multi-cloud, hybrid environment, including on-premise virtual and physical infrastructure. "Our customers are already restoring applications in the cloud, and moving applications between public clouds," he says.

On the data side, Lin says it is critical for enterprises to know where their data is held in a multi-cloud environment. In fact, Veritas has developed what it calls an "Information Map" that offers enterprises visibility into their data through the use of metadata, so they can make decisions about what data to archive, delete or keep on public cloud services or in their datacentres, he says.

For now, Veritas's Information Map does not offer visibility into data housed in cloud applications such as Salesforce.com or NetSuite, although Lin says that capability will be added at a later date.

Data migration challenge

But gaining data visibility is only the first step. Paul Haverfield, HPE's chief technologist for datacentre hybrid cloud technologies, says organisations will also have to grapple with migrating data from one public or private cloud service to another in a multi-cloud setup.

"Data migration and portability are very similar to the age-old problem that storage vendors had in migrating data from different storage arrays," he says, noting that data migration was a major technical challenge for a long time until storage suppliers developed specialised features to move data between storage platforms.

Although cloud services are built for lock-in, Haverfield predicts that "Microsoft will start to offer services to specifically move Amazon workloads and data to Azure relatively pain-free and with minimal disruption, which was what we had to do as storage vendors".

Much of this only became possible in recent years with the rise of software-defined storage (SDS), which decouples storage from a specific hardware platform. The technology is still not well understood in the Asia-Pacific region, but is gaining traction, with many users evaluating or testing it in their IT environments, says IDC.

Gurpal Singh, IDC's senior market analyst, says SDS systems are characterised by high availability, easy scalability and are well suited to offer a unified interface for storing and managing data across a multi cloud environment.

"With SDS, one can integrate the infrastructure and provide the IT guys with a consolidated view so that it can be easily managed, then automate tasks wherever possible between multi-cloud workloads with an objective to make data easily accessible across geographic locations," says Singh.

In a report published in February 2017, Scott Sinclair, senior analyst at Enterprise Strategy Group, noted that it is still early days for SDS and multi-cloud data management.

"With a number of technology providers already offering multi-cloud data management solutions, or at least having the right foundational architectures in place, these solutions have already begun to experience traction," he wrote. "Given the expected demand, this space could easily become the IT segment to watch over the next few years."

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