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eBOOK

A Journey Through Hybrid IT and the Cloud

by Keith Townsend

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Introduction

The public cloud allows end-users to consume mission-critical services without involving traditional IT. At some point, though, end-users realize that the public cloud still requires IT skills or integration with on-premises IT systems.

The public cloud has had a definitive impact on enterprise IT operations. If your organization hasn't fully migrated to the public cloud, you may experience challenges. Whether the need is to integrate Infastructure as a Service (IaaS) offerings, such as AWS® or Software as a Service (SaaS) offerings, such as Workforce, the resulting environment complicates IT operations.

Therefore, you've been "voluntold" to embrace cloud at some level. Some aspects of your infrastructure remain in a traditional infrastructure while another part runs on cloud infrastructure. Or, you are proactive and want to help ensure that your organization prepares for digital transformation. The result? You must embrace hybrid IT. What does that mean for the network, storage, compute, monitoring, and staff? This eBook tackles each of these areas.

The desire is to give you, the reader, real-world examples of these challenges. Further, the goal is to tell you what worked and didn't work. So, you'll get a lot of first person references referring to the author.

Chapter 1: Defining Hybrid IT

It's critical for infrastructure teams to develop a hybrid IT strategy. If you doubt your environment has a hybrid IT infrastructure, chances are you are wrong. Hybrid IT isn't limited to the vision of a single pane of glass that allows you to seamlessly move workloads from your data center into a public cloud service. Commonly referred to as hybrid cloud or cloud bursting, this vision is a bit of a unicorn. The cloud-bursting idea originates from the way infrastructure teams design and manage data centers.

Hybrid IT is the integration of on-premises IT services and cloud-based services. Hybrid IT includes any combination of SaaS, Infrastructure as a Service (IaaS), or Platform as a Service (PaaS), with traditional IT infrastructure. Think of something as simple as internet access. At one point in history, an internet outage remained an inconvience to operating a business. Think of how many business processes and services depend on cloud-based applications today. If you lost access to the internet, what business processes suffer as a result?

Do you find that when a service outage occurs, you spend more time figuring out the source of the outage instead of the steps to resolve the issue? For example, an end-user calls complaining about the inability to log into Saleforce®. Is the issue with Salesforce or is it your on-premises Active Directory® service?

Infrastructure professionals may first consider their needs when thinking of cloud solutions. The first service to come to mind is IaaS vs. PaaS and SaaS. Amazon EC2® popularized the concept of virtual machine (VM) instances running in someone else's data center. However, the impacting growth is happening outside of the virtual machine construct. Business users are beginning to consume cloud-based services directly. Cloud services operated and paid for directly by business entities is the new shadow IT.

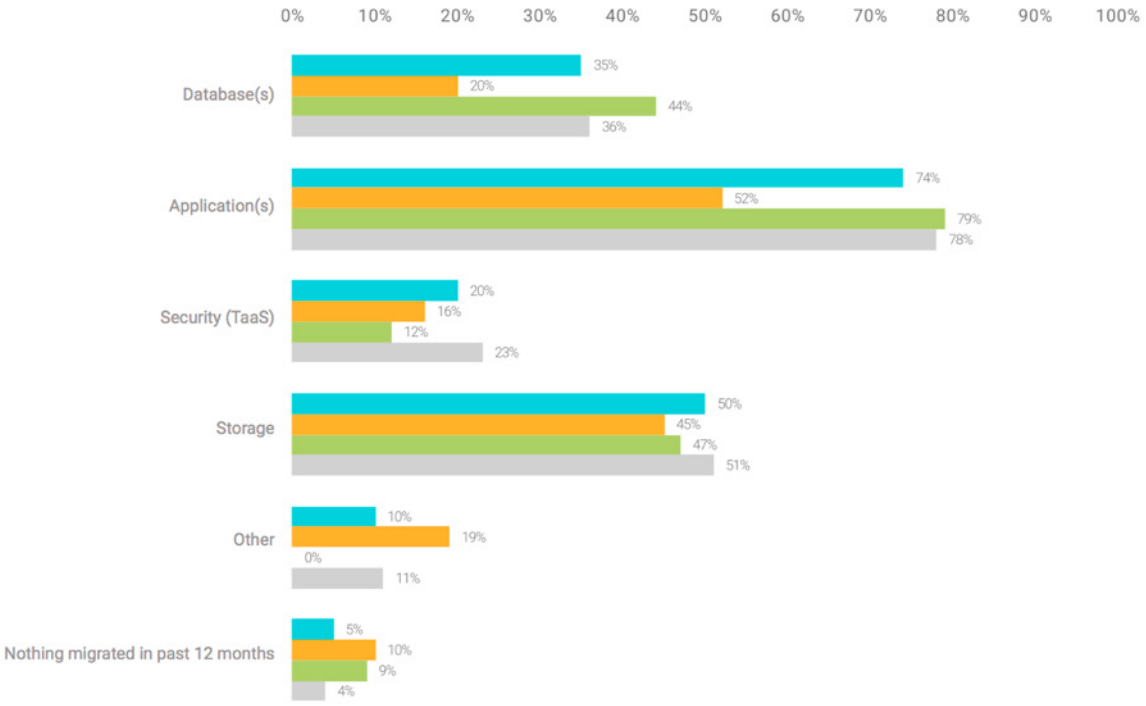


Figure 1.1 – Areas IT Infrastructure has migrated application. Source: IT Trends Index 2017: Portrait of a Hybrid IT Organization.

From a simple perspective, end-users just want to get their jobs done. According to a survey conducted by SolarWinds, 74% of respondents migrated applications to the cloud. While the SolarWinds research is an impressive stat by itself, my experience bears out some of the drivers of the migration of applications to the cloud. From my experience, the key shift is the focus on the application. Public cloud offerings allow end-users to deploy applications and processes that allow them to compete within their industry.

The simple way to consume cloud is via SaaS and PaaS solutions. Look no further than Salesforce as an example. Salesforce has spawned an ecosystem that competes with Oracle® and SAP® business applications. Andreessen Horowitz® (A16) calls SaaS and PaaS the great equalizers. These services allow relatively small companies to leverage complex business processes, such as cash-to-order, logistics, and payment technologies, without the incredible startup costs and time associated with traditional infrastructure. Small startups disrupt previously entrenched incumbents, using the capability of the public cloud.

It's this simple consumption combined with a significant business value that has driven the end-users to adopt SaaS and PaaS. These applications soon become mission critical. It's not uncommon for an IT organization to discover they have a hybrid IT environment via a priority-1 (P1) ticket opened due to a cloud provider outage. While IT hadn't offered the service directly, end-users see cloud services as an extension of services provided by IT.

Welcome to hybrid IT. Regardless if a measured deployment is forced upon you by the business, your environment is hybrid.

Chapter 2: The Hybrid Network

Networking is the foundation of a successful hybrid IT infrastructure. There are three options for connecting to a cloud provider's infrastructure.

1. Public internet
2. VPN
3. Dedicated connection

I'll provide an overview and example of each of the three, as well as some lessons learned.

PUBLIC INTERNET

In the public internet-based connectivity option, SaaS and PaaS application traffic traverses the public internet. Browser-based SSL encryption is used to provide a secure encrypted connection to the hosted data and applications.

One of my first experiences with hybrid IT involved a web-based leasing application. At the time, I worked for a large global bank. The real estate investment division managed approximately 110-properties thoughout the United States. From a pure legacy perspective, the environment offered a common operational challenge.

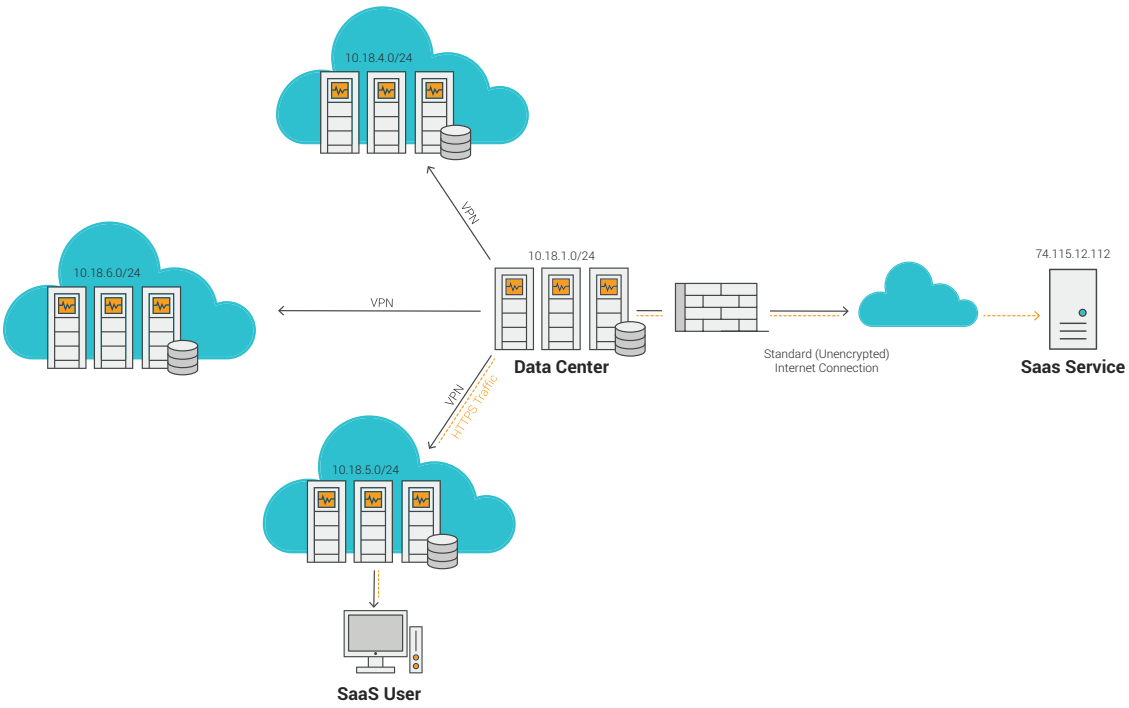


Figure 2.1: SaaS routed via corporate VPN

The company acquired and divested an average of five properties a month. Provisioning a secure connection back to the bank's infrastructure in a timely manner was a challenge given traditional carrier options. Therefore, we settled on a meshed VPN solution that leveraged commodity broadband connectivity. In a global financial organization, security is the top consideration. Therefore, local site internet browsing flowed through the VPN tunnel. The flow is represented in Figure 2.1.

The design proved effective for traditional web browsing. However, the latency from the rental property office back to the enterprise data proved too great for the application. Ultimately, my team had to file a security policy exception and route traffic out of the property's local internet connection for the SaaS application. The change in flow is represented in Figure 2.2. While this approach worked for a single application, it didn't scale for multiple SaaS applications.

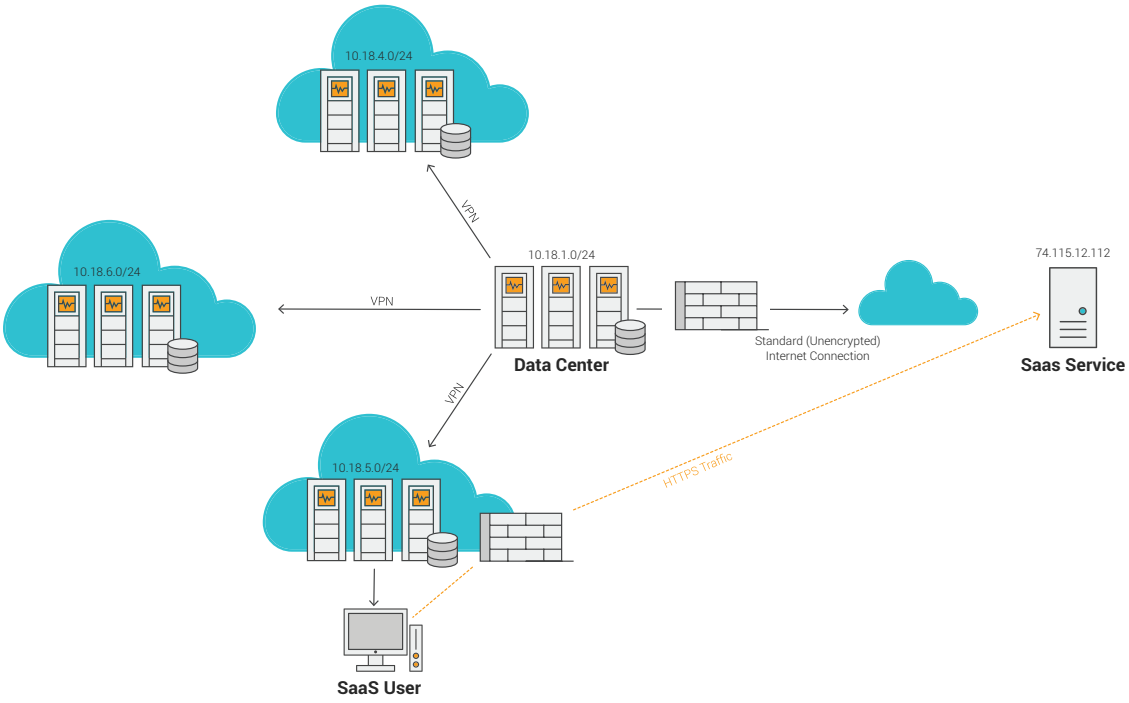


Figure 2.2: SaaS via direct internet access

Looking at services such as Google® Docs and Office 365®, the industry has begun to address the challenge of SaaS applications accessed over the web. Vendors offer hardware and software-based acceleration services to provide higher levels of compression and file caching to reduce the impact of latency for SaaS applications

VPN

A site-to-site VPN offers a higher level of flow control and security between the local data center and public cloud. It's common to have application landscapes spread across the private data center and public cloud. A common example is having a development environment in the public cloud and production in the private data center. VPN is an ideal connectivity option to allow seamless access via the corporate network.

In the hybrid IT infrastructure, VPN inherits many of the same limitations as traditional IT WAN. Some of the challenges include the inability to guarantee class of service, unpredictable latencies, and bandwidth contention brought by a shared medium. Adding to these challenges is a limited amount of bandwidth. For example, as of this writing, Azure® limits VPN connections to 1.25 Gbps.

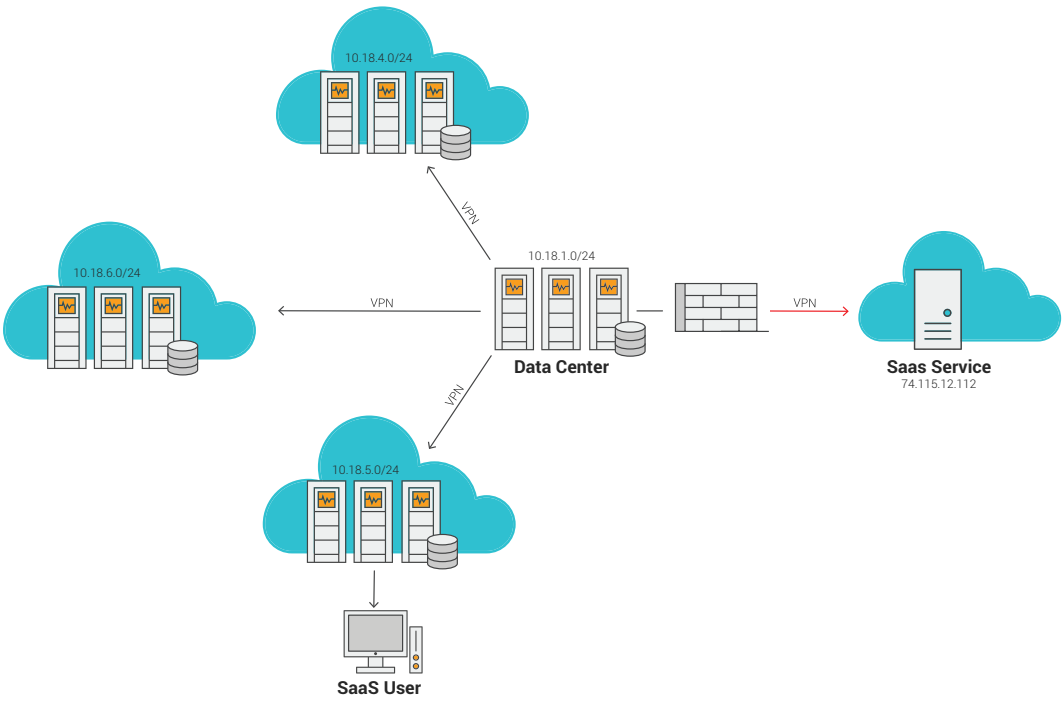


Figure 2.3: Site-to-Site Cloud VPN

If VPN remains an option, many of the traditional remedies apply to VPN-based cloud connectivity. IaaS cloud providers offer WAN acceleration instances and SD-WAN products via their marketplace. Coupled with virtual appliances on the private side, these solutions offer a reduction of the impact of internet-based VPN.

A note on IP addressing

Tempted to skip this section? Don't underestimate the importance of IP addressing. It's important to understand the network, addressing options of each of the major cloud providers. A better plan is to have an IP address scheme ready for each major cloud provider. Chances are, someone within your organization has a public cloud project in-flight or already deployed. Don't get caught flat-footed without a plan on how to handle IP addressing at the onset of a cloud deployment.

DEDICATED CONNECTION

I could write a small eBook on dedicated connection options for public cloud. I'll keep this at a high-level that applies across each of the major cloud providers.

It's important to understand that cloud providers don't provide direct connectivity. Cloud providers rely on carriers and carrier-neutral facility (CNF) co-locations (colo) to provide high bandwidth, dedicated connections. Customers are responsible for provisioning access to the CNF colo. From that point, the cloud provider arranges the cross connection to the carrier facilities in the colo.

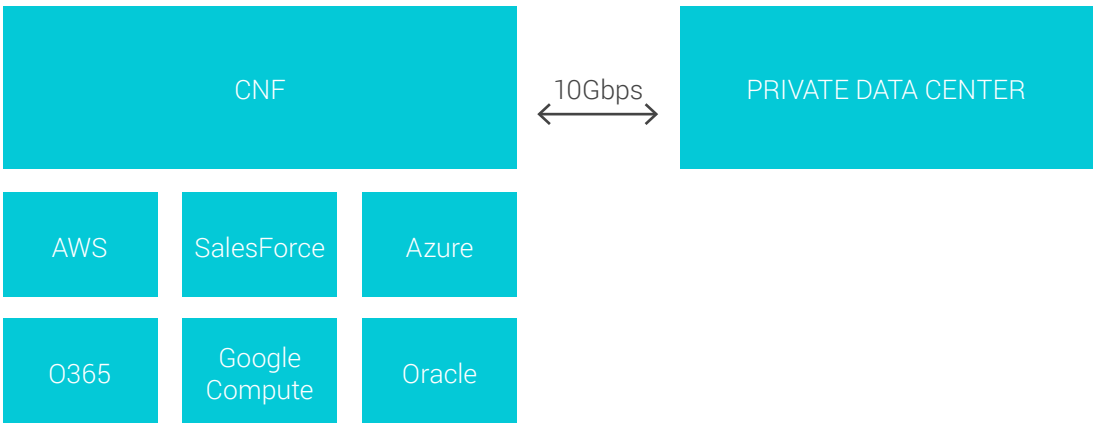


Figure 2.4: CNF

Connection options from the cloud providers infrastructure to the carrier facilities range between sub-1Gbps and 10Gps. Latency from the cloud provider to your data center depends on the connection between the colo and the customer data center. Some applications may require co-locating servers at the colo to ensure overall application performance.

I've experienced challenges even with dedicated connectivity. A typical challenge of large WANs complicates hybrid infrastructures. In a private data center, network managers create physical networks with multiple entry points. In my earlier example of 110-sites, in addition to the VPN mesh for smaller sites, the network included MPLS connectivity for larger sites. The largest of sites received dedicated point-to-point connections.

I've found a wide range of options for cloud connectivity. The most common challenge remains latency. As is typical with corporate WAN, a combination of available bandwith and latency determines application performance. It's important to investigate options with your network carriers. Many carriers provide services, such as MPLS connectivity to a cloud provider. The public cloud provider's infrastructure becomes another site within the MPLS network. Also, carriers simplify the connectivity options. Instead of a fixed 1Gpbs of 10Gbps connection, carriers offer wider bandwidth options ranging from sub-1Gbps to 10Gbps.

CLOUD AGGREGATOR

What if you want dedicated connectivity to not only SaaS, PaaS, and IaaS solutions, but a mix of these solutions from multiple providers? Some carriers offer cloud aggregation solutions. The provider will host equipment in a CNF and aggregate several cloud providers. The carrier advertises the public IP of the services sitting behind their network. If a user requests a Salesforce application, the traffic routes via the dedicated connection. In theory, the connection is much faster or lower in latency than accessing the application over the public internet. Smaller SaaS providers may prove an exception.

SaaS proves a consistent challenge thoughout my cloud journey. Smaller SaaS providers may host their services in private data centers or a small colo facility. You may find connecting to a CNF provides coverage for the majority of SaaS providers. However, smaller SaaS providers may not use a major CNF. You must work with that provider directly to secure a dedicated high-speed network connection.

A NOTE ON DESIGN

I find myself constantly reorienting for hybrid design. A pitfall I've consistently experienced occurs when a public cloud network inherits a private data center's design. Public cloud networks don't have the same limitations as the private data center. Think about instance connectivity. If I have a web-facing server in the private data center, I need to concern myself with the available bandwidth entering and leaving my data center. As a result, I may artificially limit the bandwidth of the server. Internet bandwidth isn't a bottleneck in the public cloud. At least it's not a problem for most applications the typical enterprise may build. Most public cloud providers give as much internet bandwidth you are willing to purchase and consume.

The ample availability of bandwidth on the public cloud side and the lack of bandwidth on the private data center results in capacity planning and performance issues. Again, a topic too big for just one chapter in an eBook, but important enough that I felt compelled to mention it. You can find more on this and similar topics on my YouTube® channel or the well-produced SolarWinds Lab™.

Chapter 3: Hybrid Data

Public cloud storage is cheap, deep, and performant. It is the honey that brings users to the service. I talked with an executive who said that his company now has more data in Amazon S3™ than it generated in its first three years of operation. The company hasn't grown that fast; the data has grown. In the case of AWS, it's cheaper to store the data in S3 than on enterprise-grade storage within the data center. The explosion of data within both the private data center and the public cloud presents a unique challenge to hybrid IT operations.

DATA GRAVITY

As data grows in the private data center, we've become accustomed to moving the compute closer to the data vs. moving the data to the compute. Public cloud adds a layer of complexity to the data gravity equation. In talking to a researcher using AWS for high performance compute (HPC) workloads, I asked him how could AWS be any better. He gave careful thought to my question. The return answer – a faster connection to AWS to move more data to the service.

Cloud service providers offer impressive compute capability against large data sets. Cloud based machine learning (ML) and artificial intelligence standout as services not easily recreated in the private data center due to the amount of compute required.

Cloud services make it possible for you to rent physical media, ranging from portable mini-storage arrays to mobile data centers, and have it delivered via semi-trucks into the public cloud. The cost to import and store the data is the honey to entice the use of cloud services. Data transfer via the internet or a dedicated connection does not usually add any costs except those for physical connectivity. As of this writing, the rental fee for a 50TB Snowball™ is only $200. Conversely, moving data out of the cloud is quite expensive.

Figure 3.1: AWS offers the SNOWMobile to inject PBs of data

Moving data is one of the most frustrating aspects of hybrid IT. Other challenges involve the cloud provider. Each cloud provider develops a variation of the strategy to charge for moving data. You may also find that there is a lack of maturity regarding tools for data replication and synchronization. I've found that when employing a multi-cloud strategy, it helps to consider the data's center of gravity.

WHERE IS THE CENTER?

The cheapest and fastest data transfers are the ones that don't happen. Data portability starts with understanding when not to transfer data. Conceptually, the best logical approach is to establish a center of gravity for data. That center may be a specific cloud provider's object store. When an enterprise application residing in the data center needs access, only the bits of data that are needed to conduct a transaction are transmitted.

That's the idea, at least. Even the best ideas break at scale. I've discovered that the center of gravity for data lies in the nature of the individual application. Many organizations deploy dozens of critical applications. In my research example, the center of gravity for the research data lived in object storage in the cloud provider. The inverse is true for the file system that stores SAP data in Oracle. The enterprise data center may continue as the center of gravity. In the hybrid IT world, cloud-based workloads require access to SAP data, and the inverse use case applies.

Moving SAP data to the public cloud presents, in most cases, an insurmountable challenge. SAP and ERP, in general, is heavy. The tentacles of ERP reach throughout many data center apps. Simply moving SAP data to another data center creates a chain effect on other data center applications. In the example of the research data and SAP data, we've established two significant centers of gravity for data. One leverages the object storage of a cloud provider, and the other leverages the block storage of a traditional storage array.

Point solutions are available to solve problems in specific use cases. I haven't come across a product or design that supports the full complexity of hybrid IT. Most solutions I've encountered leverage appropriately sized bandwidth and workload to provide access to data without having to move it. When it's impractical to move the compute to the data, hybrid IT organizations limit the cost of data copy by leveraging direct connections. Cloud providers offer reduced data transfer rates when customers purchase direct connections.

DATA PROTECTION

While performing a disaster recovery (DR) assessment for a large enterprise, I discovered that the organization used hundreds of SaaS providers. SaaS both simplifies and complicates DR. Premium SaaS providers offer DR options as part of their service level agreement (SLA). In a hybrid IT environment, architects must consider the availability of data from a variety of services. SaaS, IaaS, PaaS and private data centers may all require different backup solutions.

Data backup is a fundamental offering of any IT organization. Traditional on-premises solutions may prove too limited for the hybrid IT infrastructure. A simple challenge is IaaS-based data. While it's possible to point a backup tool to a cloud-based VM, the limited bandwidth and data transfer charges add complexity to the requirements.

Traditional backup solutions focus on block and file system-based data sources. The source systems consist of a combination of arrays, VMs, and bare metal servers. Advancements such as block-based replication have enabled impressive long-distance disaster recovery. Once an initial data set is replicated from one data center to another, only the blocks that change replicate over a distance. Workloads consisting of TBs of data benefit from the protection of storage-based replication. Recovery point objectives (RPO) of close to zero become achievable, while translating the capability across a hybrid infrastructure tends to be challenging.

When considering backup tools, it's important to look to tools that are cloud aware. For instance, data deduplication (dedupe) before backup proves a critical feature. The cheapest and fastest data transfer is the data that doesn't require a transfer. If you maintain a copy of data on-premises, you don't need to back up the same data. Your data protection tool should account for redundant data. This approach mimics the intent of traditional enterprise solutions, which is to shrink the amount of data needed to hydrate DR in case of failure.

Another option for backup is inter-region replication or backup. Public cloud providers offer reduced transfer rates to replicate data to a different region of the service. You can manually script the replication, use tooling available in the cloud provider, or leverage a product in the marketplace of the cloud provider. Some backup vendors integrate on-premises backup solutions with cloud-based appliances to allow seamless operations and a consistent backup policy across IaaS regions and private data centers.

SaaS-based applications are a bit more complicated. Some SaaS providers build applications on IaaS instances delivered in a customer's public cloud portal. The object storage or block storage is directly accessible by backup tools. Most SaaS providers hide the underlying infrastructure from their customers. Without access to the raw storage infrastructure, customers must rely on APIs, data exports, and approved third-party backup services.

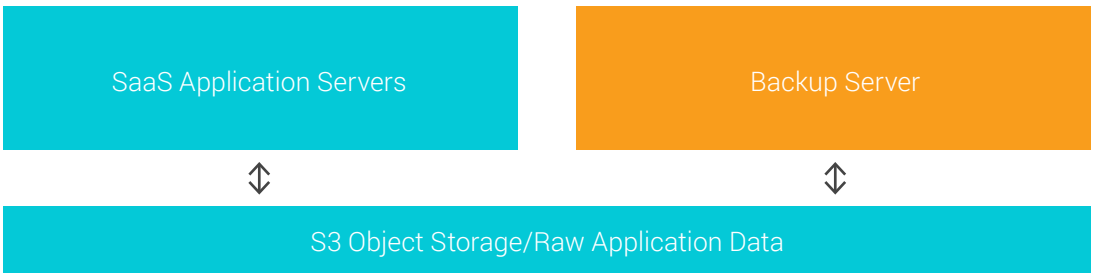


Figure 3.2: SaaS applications that leverage S3 storage

A more fundamental question surrounding SaaS data is, "What do you do with raw data exports?" The market for SaaS backup remains immature. I've not come across solutions that work universally across every SaaS provider. Even solutions that support multiple SaaS providers encounter natural limits imposed by differing SaaS architectures. The backup needs of a cloud-based ERP stand in contrast to the backup needs of a SaaS-based cloud management portal.

Data portability remains a challenge, as well. A SaaS product may enable Salesforce.com databases to be backed up. However, Salesforce is the only provider of its CRM solution. While CRM data is exportable to an XML format, and a backup application maintains several versions, targets for data restoration remains limited. If Salesforce were to go out of business, a data transformation accompanied by a business process refactoring would occur as your organization transitioned to a new CRM platform.

Chapter 4: Compute

One of the largest challenges in the hybrid infrastructure is the placement of workloads. Before discussing workload placement, it's worthwhile to discuss the appeal of public cloud compute beyond the obvious elastic attributes.

From a pure cost perspective, it's difficult to justify the cost of a single public cloud instance when comparing it to internal resources. The fixed cost associated with an existing private cloud seemingly counters the appeal of public cloud workloads. A single Windows® 2012 R2 instance can cost anywhere from a few hundred dollars a month to a few thousand dollars a month in the public cloud. If you have an existing KVM environment, the cost of the same Windows 2012 R2 server is negligible.

Most enterprise IT organizations don't charge back for VM instances. Even with the actual cost exposed, business users select public cloud over traditional data center workloads. The key is identifying the appeal of public cloud and appropriately placing the workload in the service that best fulfills the requirements. For some insight, I thought it would be helpful to look at a micro-use case.

HOME LAB VS. PUBLIC CLOUD

I have to admit that public cloud computing is addictive. I have a pretty respectable lab at home that has three VMware vSphere® hosts, six physical cores, and a total of 96GB of RAM. It's large enough to run a VMware® vSAN storage cluster. However, I find myself consuming public cloud-based resources when I want to learn new technologies such as Docker®, Kubernetes®, or test features in Windows Server®. Public cloud is void of virtually any friction.

The ability to go to a portal, select an instance type and size, hit deploy, and receive an instance isolated from my production lab is powerful. I may use a couple of large instances the size of my lab for a few hours for less than $20USD. While the workloads are ephemeral, I save the golden image to my image catalog and leverage the progress during a later lab. It's simply quicker for me to spin it up and tear it down in the cloud vs. my home lab.

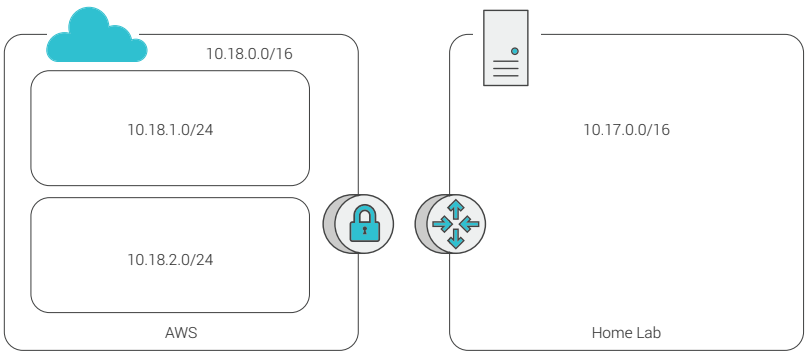


Figure 4.1: AWS to Home Lab Network

I do find certain labs best match my home lab. Specifically, the attributes of infrastructure labs match the capabilities of my home lab infrastructure. Hypervisor testing is best suited for physical hardware. The ability to take a USB drive and install KVM on bare metal hardware is a very different experience than simply consuming a virtualized infrastructure. Another home lab use case involves a legacy application that relies on infrastructure for redundancy.

Legacy applications rely on redundant storage, network, and compute subsystems. It's difficult to replicate the redundancy of legacy infrastructure in the public cloud. If I want to test the impact of a live VM migration on an Oracle application, I'm hard pressed to find a public cloud option to perform that level of testing. It's the legacy app use case that factors into the decision of where to place a workload.

APPLICATION ANALYSIS

I need to quantify the difference between application analysis and application rationalization. Application rationalization is a business process, while application analysis is a technical process. In application rationalization projects, business analysts help to identify overlapping business functions between enterprise applications, as well as other business value indicators. The goal of an application rationalization project focuses on reducing the number of applications within an organization. Application analysis is focused on determining the most appropriate environment to host an application. Application rationalization is a business-driven activity and carries the internal politics of any budget impacting exercise. The technical team drives application analysis.

Data collection for application analysis looks similar to application rationalization data. Tread carefully in launching such a review. First make sure you communicate the intent of the interview and data collection is to determine if a target application qualifies for public cloud vs. private data center infrastructure.

This eBook focuses on the infrastructure portions of hybrid infrastructure. I make assumptions that the application development and business teams determine the application requirements and architecture. The application team feeds these requirements to the infrastructure team, and the infrastructure team determines the best platform to run the application. Of course, in some instances, a business decision to consume a SaaS solution occurs before a conversation with the infrastructure team. Again, this is an ideal state. Sometimes you are faced with a brownfield scenario where you inherent a pre-existing IaaS-based application. For the sake of scope, I'll focus on the ideal workflow. There are important takeaways for the brownfield in the greenfield workflow.

For the reasons highlighted in the previous chapters, running a single application across multiple clouds is difficult if not impractical. Most environments I've witnessed deploy applications in a single platform rather than across multiple platforms. With that said, a critical first step begins with application analysis.

Application analysis reviews the technical attributes and dependencies of each application. There are tools available to perform the analysis. While tools are available, I don't want to under communicate the complexity or effort required to identify the appropriate environment for each application.

DECISION FACTORS

From a high level perspective, there are several factors in determining the proper environment for an application. The weight applied to each factor depends on the organization. The following list represents the most critical factors I've noted in my journeys.

» Cost

- Based on infrastructure requirements, which application host is the most cost-effective? Some organizations place a monetary value on risk. If risk translates into monetary value, it should be factored into cost.

» Architecture

- Is the application design appropriate for the targeted platform? An obvious example is a stateful application, such as a Microsoft® SQL-based application designed for redundant infrastructures. The inverse plays into the consideration as well. If the application leverages Functions as a Service (FaaS), the private infrastructure must provide a FaaS platform.

» Dependencies

- Are there any latency or application dependencies that marry the application to the private data center or the cloud? See my repeated SAP example. If low latency to SAP data is a requirement of a web-based transactional application, public cloud may prove to be the least desirable environment.

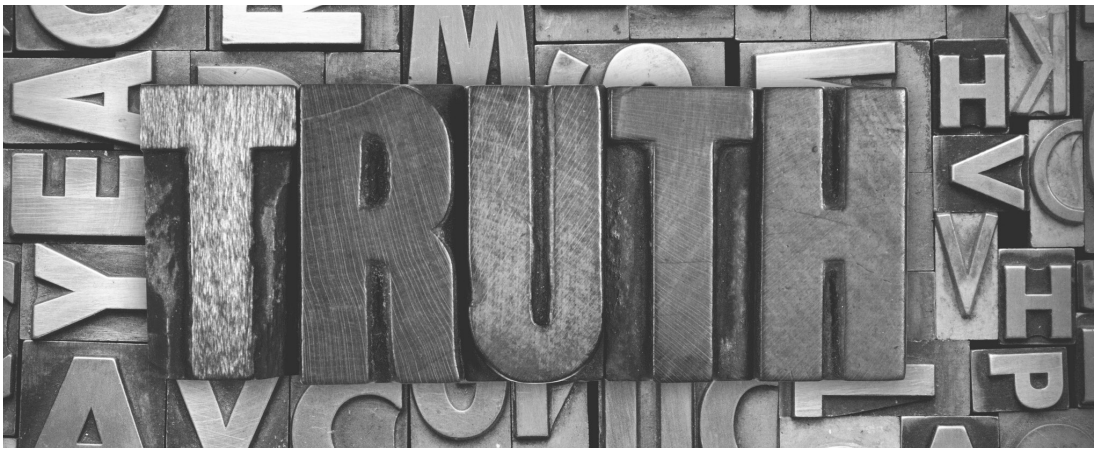
» Data sovereignty

- Are there regulatory, legal, or administrative reasons to keep the data and processing of the data within a specific region?

» Agility/Friction

- Similar to my lab use case, friction and agility are factors. The ability to quickly spin up and spin down (fail fast) workloads represent tangible business value. The needs of the developer in many times outweigh the other attributes of the application analysis.

THE TRUTH FROM THE FIELD



I've attempted to take a logical approach to determining where to run workloads. What's the truth from the field? Sometimes senior leadership gives the cloud-first command. In the cloud-first command, it doesn't matter the appropriate platform for the target workload. The result includes dealing with imbalances in budgets, performance, and operations. The best advice, keep these factors at the ready. You'll need them during the eventual application analysis that follows after the impact of these imbalances rises to the top of the hill of challenges.

Chapter 5: Monitoring

Configuring networks, moving data, and deploying services in the hybrid infrastructure is relatively straightforward. Successful Day-2 operations separate successful hybrid IT operations from unsuccessful operations. Service monitoring continues to be one of the most critical responsibilities of an infrastructure team. Some portions of the hybrid cloud looks like traditional enterprise resources. However, the public cloud doesn't offer insight into the physical infrastructure.

In the private data center, monitoring agents and integration provides detailed information from the hardware to the hypervisor up to the guest and the application. Organizations spend years mapping and perfecting system dependencies. The signs of a mature operations team include failure correlation. For example, a hardware failure results in the failure of a Windows host. The Windows server hosts an Oracle database. While three failures occur, the mature operations process identifies a single event with two impacted services.

Mature monitoring enables a reduced mean time to repair (MTTR) for services impacted by infrastructure failure. Every layer of abstraction reduces the ability to correlate physical hardware failure with service availability. Adding data center clustering solutions, including Docker and Kubernetes, results in additional layers of abstraction.

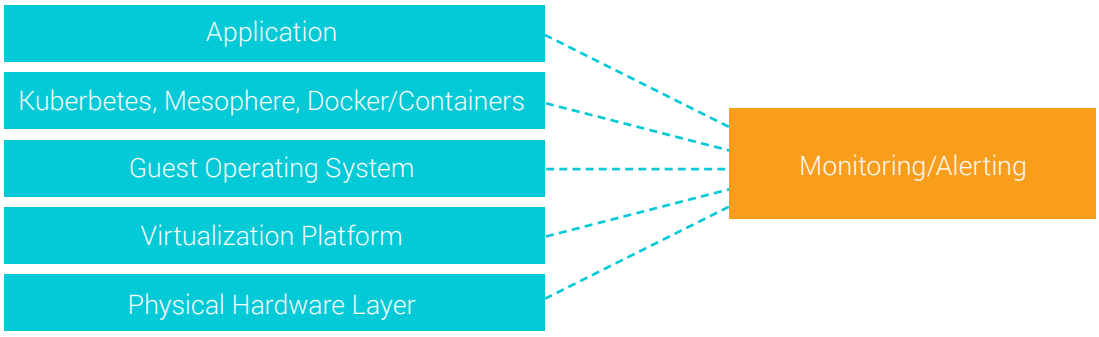


Figure 5.1: Monitoring & Abstraction

The challenges presented by public cloud don't result in the inability to reduce the MTTR. There's just a lot of work involved to achieve the same level of maturity as the private data center.

APPLICATION MONITORING

It's difficult to take a monitoring tool designed for the private data center and point it across hybrid infrastructure and gain the same level of insights. I wrote earlier that application rationalization is a loaded term and project. Application rationalization examines the business impact and overlap of applications. Likewise, a tools rationalization project must take place to examine the overlap and applicability of tools for a hybrid infrastructure.

If existing tools lack hybrid infrastructure features, operations teams must weigh the value that the tool adds to MTTR. It's critical that the ability to understand event correlation survives the tools selection process.

IT tool engineers and architects must start at the application when evaluating tools. Monitoring tools require application awareness. The concept of application awareness demonstrates a mature approach to monitoring. For example, it's not enough to determine if an OS or even application is responding. Application response time adds value to infrastructure monitoring. Operation teams should make a habit of baselining application response times via snapshots of operations. A solid monitoring solution creates alerts when baseline deviations occur. In turn, operations teams investigate the underlying services against SLAs of the underlying infrastructure. It's not a surefire method to determine the performance of the underlying system, but application response time provides a data point.

While the physical infrastructure remains abstracted, operation teams gain insight via baseline deviations. Noisy neighbor monitoring is an example. In a traditional environment, a VM host provides details on I/O bottlenecks, CPU utilization, and memory utilization. Based on the automated performance metrics, manual processes rebalance workloads based on the physical stresses of the underlying infrastructure. Some tools take a baseline reading of cloud-based OS instances. By using the baseline, monitoring tools determine the performance of the underlying infrastructure, potentially identifying noisy neighbors on a VM host. Operation teams leverage the data for workload placement.

SAAS MONITORING

I need to take a deep breath before launching into this section. SaaS monitoring is another one of those areas that deserves its own chapter. I will, however, point you to resources provided by the sponsors of this eBook. SolarWinds gave me complete editorial freedom and didn't require that I mention any of their products. However, they do a great job of providing an overview of capability. Check out these resources.

Application Monitoring:
https://traceview.solarwinds.com

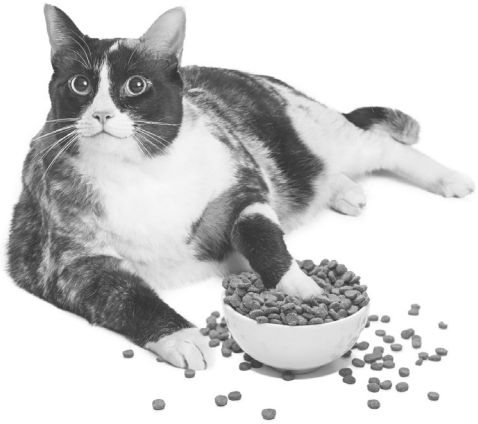
SaaS Monitoring:
https://www.solarwinds.com/pingdom
https://www.solarwinds.com/librato

There are several approaches to take when monitoring SaaS applications. The SaaS ecosystem is vast. It's difficult to determine if performance issues are related to large batch processes running in a customer environment, or performance issues experienced within the SaaS provider. I chose to take a high-level view of this topic. The idea is to focus on tools that monitor baseline performance.

Some tools achieve the baseline by leveraging probes across several points of presence (PoP). Some of these PoPs consist of existing customers with anonymized data. With real data from real customers, SaaS monitoring services provide a solid indication of SaaS provider-related issues vs. a customer-related infrastructure. Other providers leverage synthetic nodes positioned throughout the world to sample access times to SaaS providers. The benefit of the synthetic approach includes a consistent sample methodology. Monitoring providers have the flexibility of placing intrusive tooling on the probs. There is the potential of adding rich analytics as well.

A lack of standards across SaaS providers limits the breadth of providers covered. I've performed infrastructure assessments for small SaaS providers. Some of the SaaS providers I reviewed lacked the tools to monitor their infrastructure. It is difficult to find a SaaS monitoring provider that offers customer insights.

DON'T FORGET CAPACITY MANAGEMENT



Performance monitoring bleeds into capacity management. The dream of hybrid IT includes workload mobility. On paper, workload mobility makes sense. In practice, dependencies and data gravity results in unrealized expectations. However, monitoring tools prove helpful in re-evaluating the best platform for growing data and applications. Many organizations find that applications originally positioned for public cloud mature and result in a new infrastructure profile. Workloads originally suited for public cloud based on cost now favor private data centers based on data from monitoring.

Monitoring tools lead to a better understanding of the underlying infrastructure. Architects do well to mine monitoring data for capacity planning. Potentially, architects gain the ability to plan the placement of workloads based on the business growth and a data-driven understanding of the hybrid infrastructure.

Chapter 6: Organization

There's countless challenges when it comes to hybrid IT. So, where do you start when you're about to embark on your hybrid IT journey? I've spent a lot of time talking about technology as well as some time spent discussing processes. What about people? Looking at big analyst firms, the recommendation suggests breaking the IT organization into two segments. One to focus on legacy technology, and another to focus on cloud technologies. It is a tempting model.

Challenges associated with a dual speed IT organization include having an extended ecosystem. While your team posesses the technical skill to execute on hybrid IT, business functions, such as finance, HR, and compliance, represent a short list of departments that interact with hybrid IT. This creates a need to educate the entire organization on hybrid IT.

It's difficult to train existing employees to adopt cloud operations. Throughout this eBook, I've shared my struggles with adapting my mindset to include public cloud as part of daily IT operations. I consume hours of content each week to help me better understand cloud-based operations and challenges. However, as I've noted, hybrid IT impacts organizations outside of IT. There's a need to help ensure that your staff understands the whole picture and fully supports the transition. In most cases, organizations simply lack the resources to maintain two separate teams.

I can share the path I've taken and the techniques used by the teams I've led who have embraced hybrid IT. I'll share three areas of focus for any sized organization in undertaking change for the hybrid IT infrastructure.

STEP 1: TALK TO THE BUSINESS

I've stayed away from the term digital transformation until now. The bottom line of any industry is competition. Organizations of all sizes know that startups leveraging cloud-based technologies tend to disrupt traditional business models. Ridesharing, digital entertainment, and SaaS applications are just some examples of startups that have successfully leveraged cloud-based infrastructures.

Your co-workers understand these challenges. There is a real need to reduce friction related to consuming the product or services of your organization. These business pressures drive shadow IT and unapproved SaaS solutions. It's critical for your team to understand the challenges of your business. This seems obvious, but I've talked to many network engineers, virtualization engineers, and storage architects who still believe that their career success solely depends on perfecting their technology knowledge. For the network administrator, understanding BGP is the same in manufacturing or retail, for example. While technically true, the drivers for hybrid IT demonstrate the value of domain knowledge.

For example, it's important for the network administrator to both understand BGP and the business value of software-defined WAN (SD-WAN) in a company that frequently turns over retail properties. In truth, the value of IT hinges on the ability to support the end business.

IT managers must lead the transformation and help introduce their teams to business users and processes. Hardcore engineers and engineering managers may benefit by thinking of this step as a requirement. Hybrid IT enables agility, and its key engineers should understand the end goal.

STEP 2: TALK TO THE COMMUNITY

Reading this eBook is a good first step in looking beyond your walls. In the past, I've been critical of engaging consulting companies because there's not a one-size-fits-all approach to hybrid IT. Large consulting companies prefer toolboxes that borrow from previous engagements. That said, there is enough data for consulting companies to use to help you evaluate your infrastructure and create a roadmap for maturity. Receiving insights across your industry and the entire IT landscape helps you move forward. Large analyst firms also provide similar insights, even if they are not as tailored to your environment.

Attending conferences is another way to engage the community. Listening to speakers, such as myself, gives you a high-level understanding of the challenges of hybrid IT. But the relationships you forge in the hallways of the convention center may prove to be even more productive. If you participate in social media, here's a short list of community members to follow.

» Mark May @cincystorage

» Nigel Poulton @nigelpoulton

» Theresa Miller @24x7ITConnect

» Stuart Miniman @stu

» Alastair Cooke @DemitasseNZ

» Exchange Goddess @ExchangeGoddess

I've met network automation engineers from webscale companies in the lunch line of small conferences. I still benefit from the insights of those conversations. While I don't have the web scale challenges of these large enterprises, I've taken the lessons from their journey and applied them to my environments.

Not every engineer or administrator attends every event. It's critical to develop an internal forum for sharing lessons from the extended community. Depending on the size of your organization, the forum includes options, such as a dedicated Slack® channel, a wiki page, or lunch and learns. The task of wrapping your organization's mind around hybrid IT is a major piece of work. It's best to break the work into distributable chunks.

STEP 3: LEARN THE PLATFORMS

An output of the previous step results in a focus of potential platforms for your infrastructure. Technology is technology. At the end of the day, engineers should learn the specifics of the platforms. If you are a leader, you have options for supporting the acquisition of these new technology skills.

Formal training is always an option. The AWS Architect is one of the most popular public cloud certification paths. It is a great start in learning public cloud concepts. Hybrid IT material by AWS focuses on AWS services. Microsoft offers Azure training. Microsoft has a vested interest in the success of hybrid IT. The AzureStack platform provides shops vested in Microsoft's Azure cloud a way to mix on-premises and public cloud environments. Likewise both Microsoft and Cisco introduced cloud-focused certification tracks. Microsoft has the Microsoft Certified Systems Engineer (MCSE) certification focused on cloud platform infrastructure. Cisco offers a Cisco® Certified Network Associate (CCNA) and Cisco Certified Network Professional cloud tracks.

Providing a lab is fairly frictionless and straightforward. As I noted in the computing chapter, I use public cloud resources to augment my home lab. Microsoft provides enterprise license agreement customers with several Azure credits to test or leverage the service. AWS and Google offer free levels of their services to familiarize your staff with the offerings.

A WORD ON BUDGETS

Managers on the cloud journey often tell me that funding hybrid IT is a real challenge. The lion's share of IT infrastructure budget is spent on "keeping the lights on" versus spending budget allotments on transformational projects. Finding the money to fund new monitoring solutions, labs, training, and consulting is difficult.

I advise managers to look at the operations portion of their budget. As I noted earlier, companies such as Microsoft are embracing public cloud as part of their enterprise license agreement. Almost every vendor includes some cloud component in their updated license program. It's worthwhile to look through these agreements to identify training and service credits. The approach limits your choice of solutions, but provides an opportunity for transformation given budget restraints.

Conclusion

Hybrid IT is a real thing. IT organizations can choose to embrace hybrid IT or maintain the status quo. I don't believe status quo is an option. Internal customers proactively search out technical solutions to real business challenges. We have reached a point where we can add value to our businesses by joining the conversation, or watch from the sidelines and let our businesses move on without IT support.

SolarWinds Products for Hybrid IT

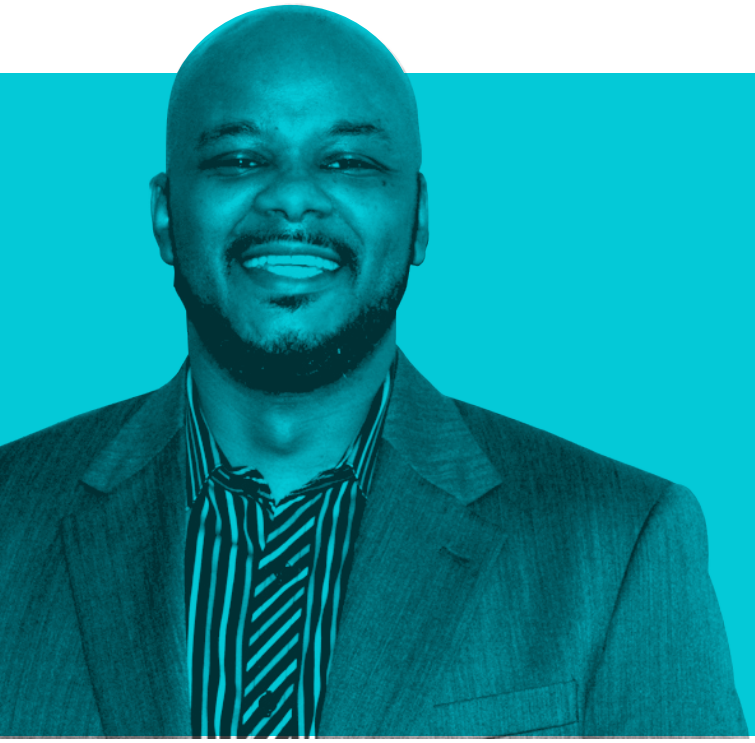
Server & Application Monitor is server performance, capacity, and hardware health monitoring software that allows you to monitor more than 200 applications from a single dashboard. It features automatic application discovery and dependency mapping. Download your free trial now at SolarWinds.com.

Storage Resource Monitor is multi-vendor storage performance and capacity monitoring software. It gives users real-time storage visibility into NAS and SAN arrays, including EMC®, NetApp®, Dell®, Hitachi®, and many more. With SRM, you can see all storage layers, including virtualization and applications.

Virtualization Manager is a performance and monitoring tool, that provides monitoring for both vSphere® and Hyper-V® environments. Virtualization Manager allows you to be proactive, save time, and money with a centralized management dashboard.

Pingdom makes your websites faster and more reliable with powerful, easy-to-use uptime and performance monitoring. With Pingdom, you gain the following features: uptime monitoring, real user monitoring, transaction monitoring, page speed monitoring, immediate alerts, and API.

Librato helps to easily aggregate cloud metrics into real-time monitoring dashboards for instant visibility. Key features include: 40+ turnkey integreations, 80+ community integrations, data processing & correlation, amazing data visualization, and alerts.



ABOUT THE AUTHOR

Keith Townsend is Principle of The CTO Advisor LLC. The CTO Advisor LLC is an advisory and media creation organization focused on providing education and research for enterprise IT. Keith is a respected analyst with 20 years of IT experience. You may recognize Keith from his work on TheCube, as a contributor to Wikibon, or as a frequent Tech Field Day delegate. Keith also regularly contributes to leading publications, including TechTarget, ZDNet, and Techrepublic. Keith, along with his co-host Mark May, produces an enterprise technology podcast for Enterprise Architects who are responsible for IT Infrastructure. You can find the podcast and Keith's blog at www.thectoadvisor.com

References

Here's a link to other resources you may find useful in your hybrid IT journey.

1. Community-led free technical training online https://vbrownbag.com/
2. Keith's YouTube channel https://youtube.com/virtualizedgeek
3. Solarwinds Labs YouTube program https://www.youtube.com/user/solarwindsinc
4. Tech Field Day Technology Deep Drive Sessions http://techfieldday.com/events/
5. The CTO Advisor Podcast http://www.thectoadvisor.com/podcast
6. Cloudcast podcast http://www.thecloudcast.net/
7. PacketPusher's Datanuaghts podcast http://packetpushers.net/series/datanauts-podcast/
8. Netflix techblog https://medium.com/@NetflixTechBlog
9. Amazon Web Services youtube channel https://www.youtube.com/user/AmazonWebServices
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11. Virtual Design Master cloud/virtualization community http://www.virtualdesignmaster.io/
12. VMware User Group http://vmug.com