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Six Real-World Approaches to Managing Hybrid IT Environments

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Executive Summary

Operators of enterprise datacenters face a rapidly evolving technology landscape and a cloud-powered wave of disruption that is changing business models, connectivity, workload management and much more. Driving this change is the growing availability and adoption of opex-based 'off-premises' services, such as public cloud, X-as-a-service and colocation datacenter offerings.

Yet not all workloads are being, or can be, outsourced. This has meant operators are increasingly managing 'hybrid' IT environments – that is, a mix of off-premises services and privately owned, internal 'on-premises' datacenter capacity – which is creating new complexities and challenges.

How is having workloads in different environments changing the requirements for hardware, software, networking and operational procedures? Which management strategies and tactics are proving successful?

We asked several infrastructure leaders at different enterprises in the US, UK and Asia-Pacific these and other questions. In separate hour-long (often 90-minute) in-depth interviews, they described how their capacity locations are changing, and their different approaches to managing them, including the challenges and the lessons learned.

While the experiences, strategies and use of innovative technologies by these enterprises in managing hybrid IT environments varied greatly, there were clearly some common themes. Some of the key takeaways include:

- Risk, cost and IT service performance were the most common vectors in assessing the suitability of different datacenter environments, on a workload-by-workload basis.

- Enterprises that are managing hybrid environments are investing in:
  - Software for greater visibility into on- and off-premises datacenter environments
  - Management software tools
  - Standard operating procedures
  - Recruiting and retaining staff

- As executives in our study show, it is possible with hybrid IT environments to reduce datacenter capital and operating costs while maintaining or even improving on high levels of availability.

- Standardized capacity management and operational processes, ongoing assessment mechanisms per location, and new approaches to off-premises capacity in incremental steps are among the most successful strategies in managing hybrid IT environments.

"I don't expect to reduce on-prem capacity at all, but I do expect that all new workloads, which is the larger pie, will go off-prem."

– Infrastructure Strategy Manager at a major UK retailer (Use case 1)

"Anyone with a credit card can put something in the cloud, and that's both attractive and scary to an enterprise, and very hard to control."

– Global Manager of Datacenter Operations at a large US financial services firm (Use Case 4)

"We don't know anything about our vendors' risks. They have an SLA they say they'll meet, until they don't. It's not to say that they are less reliable than we are in our own datacenters – they are probably more reliable because they do it at a bigger scale – but we have no visibility."

– Global Manager of Datacenter Operations at a large US financial services firm (Use Case 4)

"Our C-suite believes that the public cloud is cheaper than what we do on-prem. We've told them repeatedly it isn't."

– Director, Datacenter Facilities and Tech at a large US healthcare provider (Use case 2)
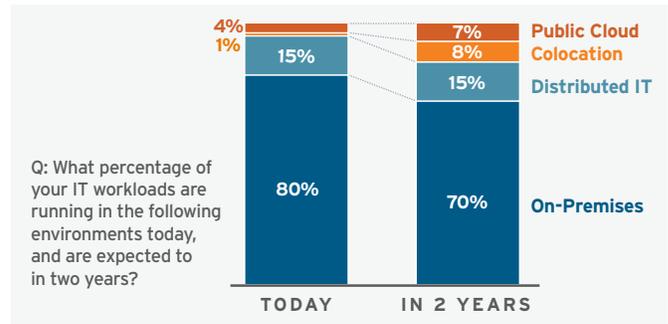
"Be open to change. Internal datacenters aren't going to be here forever. Be ready to move with them."

– Manager, Datacenter Facilities and Infrastructure Service Delivery at a major US retailer (Use case 6)

Use Case 1

To meet future capacity growth, this retailer is in the early stages of using colocation and public cloud. Connectivity capabilities and cost control are key drivers.

SNAPSHOT	
Industry	Retail
Revenue	$500m+
Location	UK
Job title	Infrastructure Strategy Architect
Duration using multiple datacenter capacity types	For the past 5 years

Q: What percentage of your IT workloads are running in the following environments today, and are expected to in two years?

TODAY
- 4% Public Cloud
- 1% Colocation
- 15% Distributed IT
- 80% On-Premises

IN 2 YEARS
- 7% Public Cloud
- 8% Colocation
- 15% Distributed IT
- 70% On-Premises

STRATEGIC VISION AND BUSINESS DRIVERS

This UK-based retailer plans to retain most of its on-prem datacenters to run its significant legacy applications. For future growth, it plans to use more managed hosted services and, to a lesser degree, colocation and public cloud. It is also expanding in colocation to exploit those datacenters' cross-connects to public clouds – that is, direct networking connections to service providers inside the same facilities.

Some of these initiatives are experimental. A stated goal is to analyze and compare the end-to-end costs of different approaches over three years, when it will reassess the picture.

CHALLENGES AND OBSTACLES

Due to data locality and sovereignty requirements, the retailer must maintain a local datacenter presence, including for public clouds (in UK-based facilities). While it is keen to embrace public cloud, particularly during peak retail seasons, managing costs and measuring them end-to-end is challenging.

It also lacks software to dynamically provision public cloud workloads in an automated way, based on costs and forecasted needs. Management tools from public cloud providers are largely inadequate to, for example, automatically switch off an unused VM (virtual machine).

"We're being driven by the necessity to use cloud development environments without really understanding the cost."

Another challenge is maintaining a broadly consistent level of server performance across different datacenter environments and IT hardware generations in order to avoid, for example, performance issues when VM management software moves workloads from one environment to another.

For its distributed IT, in server rooms at its retail stores, it is assessing a serverless architecture using hosted cloud. However, the added risk of dependency on local networks or network outages has left this an unresolved challenge.

INNOVATION AND ROADMAP

Using cross-connects within two colocation datacenters, the retailer can lower its networking costs by eliminating its private MPLS (multiprotocol label switching) connections for retail stores. The colos' cross-connects promise consistent low latency and high security, and will become an extension of its internal network. For its different types of connections and services within colocation, the retailer is developing multiple security frameworks.

Its initial approach to public cloud is small and experimental. It combines data from providers and from its homegrown software to run stress tests at least once a week. The retailer plans to develop a capacity management tool to determine the all-in cost of public cloud and to help predict future capacity needs.

A commercial DCIM (datacenter infrastructure management) platform is used for power and environmental visibility and to manage assets in its on-prem datacenters. To bridge the gap between facilities and IT operations, it plans to integrate DCIM data with its ITSM and IT business process management systems.

"We believe that our colo model allows us to be much more granular in how we apply expensive security services. We see that as an economic benefit."

LESSONS LEARNED

In determining the best execution venue, security, performance and latency requirements should be factored into the total cost analysis, along with data transit and application license costs. Taking these factors into account, the retailer advises that the public cloud is not always cheaper.
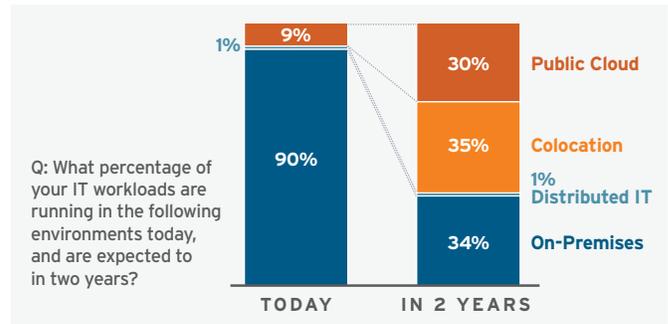
It says the most important KPIs (key performance indicators) should focus on business and financial – rather than infrastructure – metrics.

"I'm not really interested in infrastructure metrics. I want as close to a business metric as I could come up with for that particular service."

Use Case 2

With a top-down cloud-first mandate, this healthcare provider is struggling to educate executives that, given its requirements, a wholesale move to public cloud is neither viable nor economically feasible.

SNAPSHOT	
Industry	Healthcare
Revenue	$10bn+
Location	US
Job title	Director, Datacenter Facilities and Technologies
Duration using multiple datacenter capacity types	For at least 20 years

Q: What percentage of your IT workloads are running in the following environments today, and are expected to in two years?

TODAY
- 1%
- 9%
- 90%

IN 2 YEARS
- 30% Public Cloud
- 35% Colocation
- 1% Distributed IT
- 34% On-Premises

STRATEGIC VISION AND BUSINESS DRIVERS

The C-suite at this healthcare provider instituted a 'cloud first' mandate whereby most workloads, which it currently runs on-prem, will eventually move to the public cloud.

A private network, built on carrier-grade equipment (which it is converting to software-defined), connects IT inside its hospitals and health-plan sites to a centralized on-premises datacenter.

To reduce its datacenter footprint and achieve more of an opex model, it will retain one of two on-prem datacenters, for disaster recovery, and move its core centralized IT to colocation. (Networking will account for about two-thirds of migration costs.) Distributed IT capacity, which captures and analyzes data from medical equipment, must remain to meet low-latency and storage requirements.

*"Our management's **belief is that we won't have our own significant on-prem datacenters** over the long term."*

CHALLENGES AND OBSTACLES

After investigation, the healthcare provider concluded that no public cloud-based services currently meet its requirements for its electronic health records and genomics data. Even when it becomes viable, the resources to migrate into a new system, and the cost to store records in a public cloud, would be excessive. The healthcare provider expects to house these workloads at colocation datacenters, backed up by its on-prem datacenter, for the next five to ten years.

"Our execs didn't think it would cost this much to transport and store large amounts of data in the cloud."

INNOVATION AND ROADMAP

At its colocation facility, which is still being constructed, the healthcare provider has contracted a large private suite that will include physical access control vestibules and rack-level security. To ensure reliability of the datacenter's critical infrastructure, including concurrent maintainability during planned (and unplanned) maintenance, it paid the colo to have the facility design Tier III certified by the Uptime Institute (a 451 Group company).

*"If you look at any [standard] colo service agreement, **it's not in favor of the customer.**"*

It also hired a lawyer with direct expertise to negotiate its SLA (service-level agreement) with the colo to include measures and multiple avenues of action that go beyond 'standard' contracts. These include arbitration clauses and a limited number of unplanned events over a set period of time – rather than a limit of their cumulative duration.

It has deployed commercial DCIM software at its on-prem datacenter, as well as a separate system to dynamically adjust cooling based on the upper limits of ASHRAE's guidance, which has shaved 20-30% off its power costs.

For its distributed IT sites, it plans to upgrade them using prefabricated micro-modular datacenters with preinstalled remote monitoring.

The company's stated cloud-first strategy has caused concern for datacenter and IT staff about their job security. To counter this, the healthcare provider offers training for different environments, including those outside of their current roles.

*"In order to retain staff, even in their current jobs, **you've got to train them for their next job, or the next possible job.** That's how we've been able to retain people."*

LESSONS LEARNED

A key lesson for this manager was understanding that homegrown software and regulated workloads will likely remain on-prem or within colocation, while all others are targets for public cloud. They advise becoming educated about different datacenter environments, and then proactively educating upper management on the realities, including cost, service availability and risk profiles, of each.

"You have to be [upper] management's trusted planning partner versus the vendor."

Use Case 3

This retailer is managing its hybrid datacenter environment by using a consistent set of tools, where possible, including at its distributed IT locations.

SNAPSHOT	
Industry	Retail
Revenue	$500m+
Location	US
Job title	Director, Infrastructure and Chief Information Security
Duration using multiple datacenter capacity types	For at least 20 years

Q: What percentage of your IT workloads are running in the following environments today, and are expected to in two years?

TODAY: Public Cloud 20%, 20%, On-Premises 60%
IN 2 YEARS: Public Cloud 40%, Distributed IT 20%, On-Premises 40%
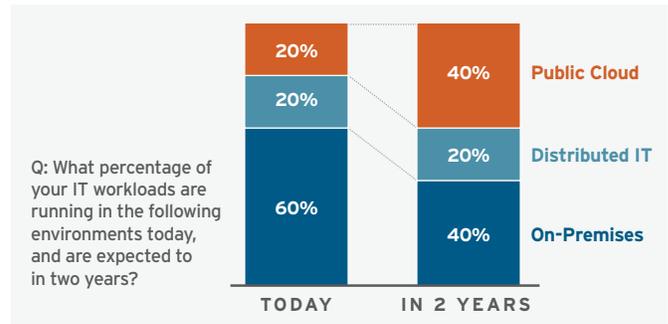
STRATEGIC VISION AND BUSINESS DRIVERS

This retailer is increasingly relying on public cloud services for capabilities that it lacks internally – specifically, database-as-a-service, hosting externally facing websites and application containers, among other services.

CHALLENGES AND OBSTACLES

The retailer has struggled to determine the best venue to run workloads to meet performance needs and to fill gaps in its staffing expertise – all within budget. Educating its finance teams was part of this challenge.

With capacity in the public cloud, the retailer also believes it has much less control over the future of its services. For example, there is less predictability about how much services will cost, when they will be upgraded, or even whether they will be available in five or 10 years' time.

Another hurdle is the higher level of complexity that comes with having different datacenter environments, particularly with regard to managing network performance. Understanding where there are latency problems that are causing application performance issues or federating workloads between multiple datacenters and the cloud has been very complicated, particularly for legacy (non-cloud) applications.

"The biggest challenge of all is cost control, and management and financial applicability of capitalization."

INNOVATION AND ROADMAP

While its 'best execution venue' decision-making and infrastructure benchmarking processes are fairly immature (primarily Excel-based spreadsheets created in-house), the retailer has extended its web-based on-prem asset visualization software to the public cloud. It now applies the same set of software tools for asset management, visualization and security to all its datacenter environments, including distributed IT.

It also enforces data-privacy addendums with its public cloud providers (it uses multiple clouds) to control the flow of data and for identity and access management.

Visibility and remote control of its distributed IT environment, spanning hundreds of server rooms or closets in retail locations, has been achieved by installing cabinets with power and environmental monitoring and controls (pre-installed). They enable remote power on and off capability and access controls. However, the retailer would prefer to use a smart appliance capable of environmental and health monitoring with a 4G mobile connection separate from its network to provide connectivity if the primary network goes down – to avoid the expensive dispatch of a technician.

For the next two years, the retailer is focused on developing the capability to identify service issues in as close to real-time as possible.

"Security has not particularly been a challenge; all the cloud providers that we leverage have no difficulty explaining their security posture and aligning it to our own."

"If I had my dream, we would have the visibility to predict failures before they occur."

LESSONS LEARNED

Treating workloads the same regardless of where they are running by using the same management, security and other tools, where possible, has been hugely beneficial to the retailer.

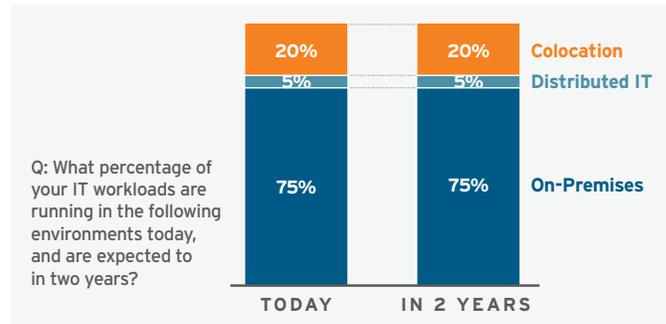Also, creating an ongoing review process for public cloud capacity is key. For example, by not having a policy to power down unutilized servers in the cloud, it cost roughly double to run some non-production workloads in the cloud compared with on-premises.

"My biggest advice to anybody is avoid the hype, avoid the temptation, and start planning what you want to do six months in advance before moving any assets to a public cloud."

Use Case 4

Across a highly distributed IT footprint, this financial services company navigates its uptime and risk-profile requirements with tightly integrated IT and facilities departments.

SNAPSHOT	
Industry	Financial Services
Revenue	$500m+
Location	US
Job title	Global manager of datacenter operations
Duration using multiple datacenter capacity types	For 10 to 12 years

Q: What percentage of your IT workloads are running in the following environments today, and are expected to in two years?

	TODAY	IN 2 YEARS	
Colocation	20%	20%	
Distributed IT	5%	5%	
On-Premises	75%	75%	

STRATEGIC VISION AND BUSINESS DRIVERS

Industry regulations and strict data security and sovereignty requirements have deterred this financial services company from hosting significant workloads in the public cloud. A lack of transparency into infrastructure resiliency (equipment redundancy) in public clouds and insufficient SLAs are also barriers. Aside from minor test-and-development workloads, it does not plan to use a public cloud for at least the next two years, but instead plans to grow inside its internal and colocation facilities.

CHALLENGES AND OBSTACLES

The company uses homegrown DCIM software to visualize and manage risk in its on-prem datacenters. While the software is able to auto-discover IP-connected assets, a full-time employee is required to track non-connected assets and resolve conflicting data. While the system is highly accurate, it cannot be replicated at any colocation datacenter.

In a highly regulated industry, the risk profile of its datacenters is a priority. It has IT distributed among more than 100 offices worldwide, where it monitors 25,000-30,000 infrastructure points in total. IT expertise at these locations is typically lacking, and some monitoring and automation of these remote offices is enabled by its DCIM software. The company is reluctant to add more remote access and control because it could also increase its risk profile.

Scaling different datacenter environments also increases complexity. Ensuring IT performance and managing error reports for tens of thousands of pieces of equipment is daunting.

*"[In colocation datacenters] we have no idea when things are not working, and we don't understand why. **We are just in the dark.** That is very unnerving to an enterprise that's used to having more visibility."*

*"The biggest challenge is keeping everything good [normal operating status] because **it's not just monitoring the alarms and the alerts, it's being able to resolve them.**"*

INNOVATION AND ROADMAP

This company's chief operating officer is responsible for both the IT and facilities departments. The company eliminated silos – such as server, storage, networking and facilities – and uses a single team to manage its datacenters. It cross-trains employees and is moving toward having mostly generalists.

Datacenter capacity and operational planning are joint IT-facilities processes. Decisions on capacity and infrastructure review processes run through the COO, including quarterly reports on cost per kW (kilowatt) of IT capacity by location, as well as risk assessment and performance reviews of colocation providers.

The company monitors a uniform set of KPIs across on-prem and colocation environments. It also uses a unified set of standard operating procedures and policies. A single workflow (change management) and ticketing system for all IT and physical facility equipment is used for all environments.

*"We all know that putting a server in Manhattan is very expensive, so you limit it to what must be there for latency reasons. **Anything that doesn't have to be there, you push to a lower-cost location.**"*

LESSONS LEARNED

Knowing the resiliency of each datacenter is key, as is planning for issues and practicing failover processes.
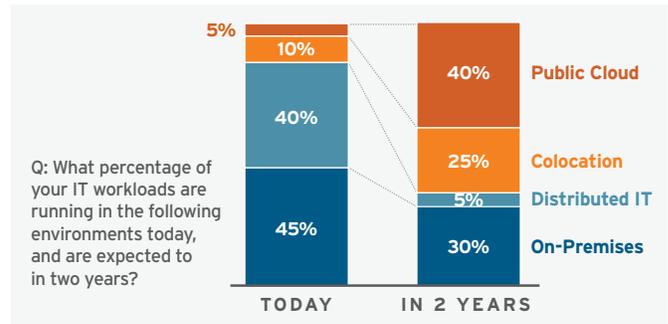
Robust software for operational and asset visibility is essential to operating in hybrid datacenter environments and is also useful for capacity planning and asset management.

*"What we think of as **resiliency is not location resiliency, it's vendor diversity.**"*

Use Case 5

This university seeks to shift its datacenter capex to opex with a large planned move to colocation and public cloud. Standardizing processes, tools, data ingestion and other areas is proving to be a challenge.

SNAPSHOT	
Industry	Education (tertiary)
Revenue	$100m to $500m
Location	Asia-Pacific
Job title	Architecture and Security Manager
Duration using multiple datacenter capacity types	For 10 years

Q: What percentage of your IT workloads are running in the following environments today, and are expected to in two years?

TODAY
- 5%
- 10%
- 40%
- 45%

IN 2 YEARS
- 40% Public Cloud
- 25% Colocation
- 5% Distributed IT
- 30% On-Premises

STRATEGIC VISION AND BUSINESS DRIVERS

This university is seeking to add off-premises capacity to shift its datacenter spending from capex to opex, in order to smooth out its spending over time and reduce its administrative overhead.

It views the cost of new on-premises capacity as too high and would prefer to reduce management of its hardware infrastructure. Its IT workloads are mostly virtualized, enabling it to pull most of its distributed IT (primarily communication equipment closets) back into an on-prem centralized datacenter. The plan is to decommission its on-prem disaster recovery (DR) datacenter and migrate that capacity to a colocation facility.

CHALLENGES AND OBSTACLES

The university plans to use more public cloud services, although data integration between on-prem datacenter systems and across multiple cloud platforms is a concern. Access to data from public cloud services in a format compatible with its internal systems has been a challenge. The university expects that the APIs provided by public clouds will change over time, and anticipates having to continually re-engineer the way it retrieves data from public clouds and integrates it internally.

Determining if off-prem capacity is delivering on expected value is also problematic. The most important factors that it monitors closely are performance (including response times) and level of support. It currently does not have a formal process or tool to do this analysis. The university currently relies on its contractual SLAs, a cloud services checklist and some in-house calculations.

Monitoring and reporting across its different datacenter environments is complicated by not having software that can span all locations.

*"We are looking **at an integration layer that will help us manage all integration points."***

*"We use the usual suspects internally [for infrastructure monitoring], but **nothing that we have can be moved over to the cloud or looks at cloud services."***

INNOVATION AND ROADMAP

One of the university's initiatives is to upgrade its network to enable enhanced connectivity (better performance, lower latency) allowing for:

- a reduction of its distributed IT by virtualizing the workloads and running more in its centralized on-prem datacenter; and
- increased flexibility in choice of off-premises service providers without the restrictions of having to use a local provider because of application/services latency issues.

Data security and governance is a top priority. The university has internally developed and adopted a 160-point security checklist for cloud services. Its policy is that all cloud services, no matter how minor, must pass the security checklist and be approved by a Director of IT. As its public cloud usage increases, the university expects to employ dedicated contract or SLA managers. Their role will be to help standardize processes for performance measurements and uptime guarantees across different public clouds.
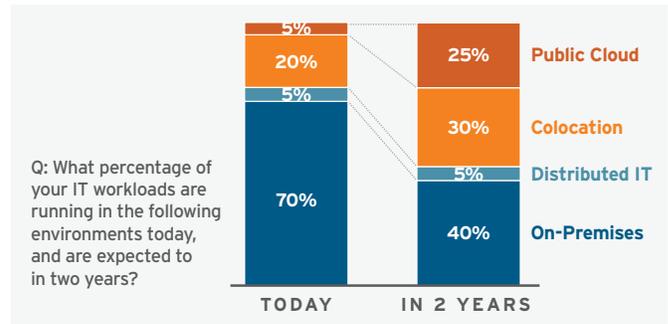
LESSONS LEARNED

SLA management is critical when using off-premises capacity, as are SLA terms that are stricter than what is considered standard. A team with a broad range of expertise is needed to help manage and analyze processes across different datacenter environments.

The university has also found that moving to cloud services or hosted solutions has freed up staff time (particularly around administration and upgrade tasks) to focus more on services and applications. This is changing its staffing requirements toward more software development and automation skills.

Use Case 6

This retailer is standardizing and simplifying, from hardware and software to operational procedures, in order to successfully expand its off-premises capacity.

SNAPSHOT	
Industry	Retail
Revenue	$500m+
Location	US
Job title	Manager, Datacenter Facilities and Infrastructure Service Delivery
Duration using multiple datacenter capacity types	For 4.5 years

Q: What percentage of your IT workloads are running in the following environments today, and are expected to in two years?

TODAY
- 5%
- 20%
- 5%
- 70%

IN 2 YEARS
- 25% — **Public Cloud**
- 30% — **Colocation**
- 5% — **Distributed IT**
- 40% — **On-Premises**

STRATEGIC VISION AND BUSINESS DRIVERS

During its peak season, this retailer leases additional equipment in its two on-prem datacenters to accommodate greater IT demand – an effective but costly strategy.

During the next five years, it plans to migrate one of these datacenters to a colocation facility, and use more public cloud to meet peak demand.

*"We believe **we are always going to be hybrid**. We'll always have a small footprint inside our internal datacenter, but we are looking to expand as much as possible in the cloud."*

CHALLENGES AND OBSTACLES

Its IT applications are mostly homegrown and interdependent, meaning that when one is moved to a different datacenter, several other applications must move with it (to limit latency). This requires more physical IT hardware than can be handled by its distributed server rooms at its retail locations.

With public clouds, the retailer lacks real-time visibility of its capacity – providers' online portals are not always responsive, which can lead to inadvertent overprovisioning. Forecasting software and hardware licenses in public clouds is also a challenge.

INNOVATION AND ROADMAP

The retailer is simplifying and standardizing, as much as possible, across its different environments. It plans to streamline its legacy applications, and it mandates that all new applications are cloud-native so they can run in public environments. It is adopting converged IT systems on-prem and at its colo, to reduce costs and simplify maintenance.

The retailer is also implementing software-defined networking, enabling it to reduce networking switches, sometimes from five to just one. It is also shortening IT equipment leases, from five years down to two- and three-year leases, to more cost-effectively support its consolidation and outsourcing moves.

For visibility on-prem, the retailer deploys commercial DCIM monitoring and asset management software, as well as separate RFID management. It uses the same RFID system at its colocation datacenter to enable consistency across its power and cooling KPIs and other metrics.

*"Shifting from a capex to an opex model unfortunately means that instead of being able to depreciate something over a three to five or 15-year period, **we now have to come up with that bill every month**."*

Operational process consistency has also been key. A version of its on-prem standard operating procedures is written into its SLAs with colocation and cloud suppliers.

Perhaps the retailer's most beneficial tactic has been ongoing and multi-disciplinary communication and planning. Managers of networking, servers, datacenter facilities and operating systems meet on a weekly basis. They regularly review feedback, including feedback around capacity requirements, from business users and application development and service-delivery teams..

LESSONS LEARNED

A lesson learned is that colocation and public clouds are not always an affordable option. Also, having different types of datacenter capacity requires more versatile, often more tech-savvy, staff. Additional training and higher compensation has been required.
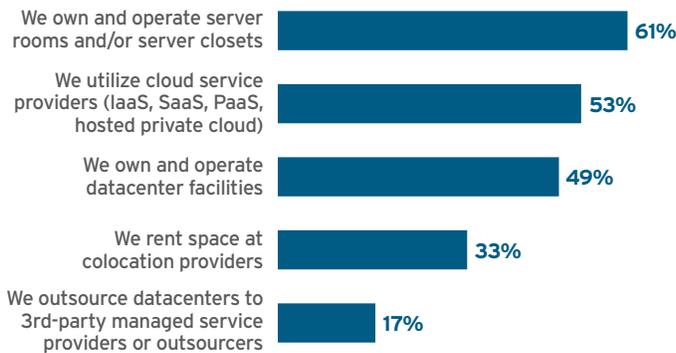
Developing strict operational processes is key, and ensuring that these requirements are part of SLAs and operations-level agreements (OLAs) with colocation and cloud service providers is crucial.

*"You have to know [off-premises] is not going to be cheaper... and you lose a huge amount of control. **To gain some of that control back, all you can rely on are your SLAs and OLAs**."*

Conclusion

The shift from privately owned, internal 'on-premises' datacenter capacity toward off-premises resources is well under way, as the data in the figure below shows. Yet when we asked a large number of enterprises about their different types of IT environments, it was also clear that the extent of the migration of workloads off-premises is only partial – most enterprises use a mix of on- and off-premises capacity. Even within on-premises environments, there is typically a mix of server rooms or server closets and larger datacenter facilities.

Which of the following IT environments are in use to suport your organization? Please select all that apply.

We own and operate server rooms and/or server closets — 61%
We utilize cloud service providers (IaaS, SaaS, PaaS, hosted private cloud) — 53%
We own and operate datacenter facilities — 49%
We rent space at colocation providers — 33%
We outsource datacenters to 3rd-party managed service providers or outsourcers — 17%

Source: 451 Research's Voice of the Enterprise: Datacenter Transformation, 2017

Operational datacenter space in square feet globally

	2013	2016	2020
CLOUD	5%	7%	11%
COLOCATION/WHOLESALE	12%	15%	16%
ENTERPRISE	83%	78%	73%
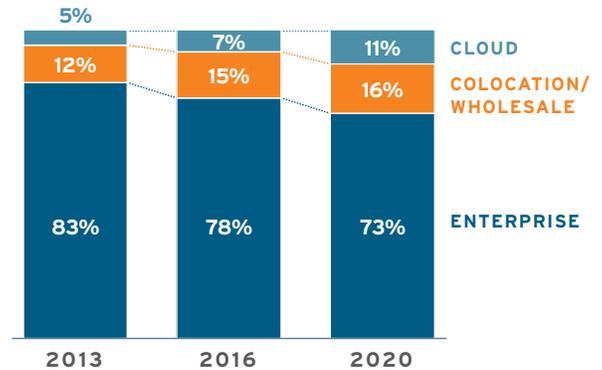
Source: 451 Research Datacenter Monitor, 2017

Delving into workload distribution patterns and IT budgets, our research showed that while many are edging toward off-premises datacenters, overall spending on in-house (on-premises) infrastructure and resources is holding steady. By 2019, organizations anticipate that just under half (46%) of enterprise workloads will run in on-premises IT environments, with the remainder off-premises, according to 450 enterprise respondents in our 2017 global study. Clearly, hybrid IT environments have become the norm.

This is affecting datacenter managers and operations in various ways. As the commentators in our study indicated, legacy applications are typically unsuited to run off-premises, which is driving more enterprises to modernize existing workloads, wherever possible, and to develop net new applications built for the cloud. Other forces that are shaping enterprise strategies around the best execution venue for workloads include:

- Cost
- Data sovereignty and governance
- Security
- IT performance (latency)
- Control

*"From a **security perspective, we have a cloud checklist.** There's about 160 points that we ask people to fill out... it can be quite daunting for people who say, 'We only want to use this little cloud service.'"*

- Architecture and Security Manager of a university in Asia-Pacific (Use case 5)

Tactics for successfully managing different environments can vary, from DCIM software development and deployment to arbitration clauses in third-party service-level agreements. The approaches of those in our study, while varied in specifics, focused on some common areas:

- 'Best execution venue' decisions, taking into account -
  - Risk
  - Cost
  - IT service performance
- Operations and management across different environments
- Visibility into off-premises datacenters
- Recruiting and retaining staff

Looking ahead to the next few years, these existing complexities will likely be compounded by an anticipated wave of new distributed IT, driven by the Internet of Things, distributed cloud and other emerging edge computing workloads. New datacenter form factors, as well as new cloud computing and networking approaches, will be required. However, as detailed by the datacenter executives in our study, it is possible to reduce datacenter capital and operating costs while maintaining or even improving on high levels of availability – using standardized capacity management and operational processes, ongoing assessment mechanisms per location, and new approaches to off-premises capacity in incremental steps, among other strategies.

> *"We have staff who own the whole stack for infrastructure, all the way through to the application runtime environment – everything except for writing the code. Once the code is in production, we own it, from the minute someone says it doesn't work through to operations and performance management. That way it doesn't really matter where the workload is sitting – there's a generalist skill set to know how to support it."*
>
> - Director, Infrastructure and Chief Information Security at a major US retailer (Use case 3)

Methodology

We spoke with IT infrastructure leaders at six different enterprises, all of whom are extremely familiar with their respective organization's datacenter and IT deployments and strategy. Each enterprise was deploying a mix of at least three of the following IT environments, with varying volumes and approaches:

- Privately owned, on-premises datacenter, including:
  - A stand-alone datacenter
  - Multiple distributed IT locations (branch offices, server closets and server rooms)
- Leased space at a colocation provider
- Public cloud 'production' capacity, such as AWS, Azure, Google, etc. (includes production workloads, not just test and development)

All of the subjects in our study are known to 451 Research. They agreed that we could publicly share their responses to our questions on the condition of anonymity.

Below is a high-level description of their organization's industry, size and location, as well as their job title and the length of time their company has been using a 'hybrid' datacenter approach, with a mix of on- and off-premises capacity.

	USE CASE 1	USE CASE 2	USE CASE 3	USE CASE 4	USE CASE 5	USE CASE 6
Industry	Retail	Healthcare	Retail	Financial Services	Education (tertiary)	Retail
Revenue	$500m+	$10bn+	$500m+	$500m+	$100m to $500m	$500m+
Location	UK	US	US	US	Asia-Pacific	US
Job title	Infrastructure Strategy Architect	Director, Datacenter Facilities and Technologies	Director, Infrastructure and Chief Information Security	Global manager of datacenter operations	Architecture and Security Manager	Manager, Datacenter Facilities and Infrastructure Service Delivery
Duration using multiple datacenter capacity types	For the past 5 years	For at least 20 years	For at least 20 years	For 10 to 12 years	For 10 years	For 4.5 years