Understanding the Relationship between Cloud Management and Workload Placement

How Consistent Cloud Management Drives Workload Optimization

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Introduction

The decision of where to run applications has grown steadily more complex and cloudier over the past decade. On the heels of the transition from physical to virtualized infrastructure, public and private cloud infrastructure consumption models came to the fore. Cloud consumption allows end-users to provision, scale, and deprovision in a self-service fashion, bypassing weeks or even months of requirements gathering and solution procurement and integration. As cloud infrastructure has matured, organizational use has accelerated: 94% of organizations use public cloud services today (inclusive of both infrastructure- and software-as-a-service providers). While most would assume this is due to a clear public cloud functionality advantage, in fact, private clouds have evolved to keep pace with public cloud capabilities: 84% of respondents say their on-premises infrastructure is as easy, or easier, to manage than public cloud alternatives; 82% say the same about the level of performance and ease of access provided by on-premises infrastructure; 79% feel on-premises infrastructure agility is as good, or better than, cloud infrastructure; and 76% say their on-premises infrastructure matches public cloud options in terms of scalability (see Figure 1).

Figure 1. On-premises Infrastructure Capabilities versus Public Cloud Alternatives

Workload placement flexibility has always been critical, and since the dawn of the cloud era, has become even more critical. More than four out of five organizations (83%) say achieving workload placement flexibility is a top-5 priority among all technology initiatives. The unintended consequence of leveraging multiple clouds is complexity. Despite the increasing propensity of organizations to offload their infrastructure to public cloud service providers (CSPs) and their continued progress optimizing their on-premises environments, 73% of respondents agree that using infrastructure in the public cloud (or multiple public clouds) in addition to on-premises infrastructure has added complexity to IT operations.

Organizations need a better way to holistically and efficiently manage all of their infrastructure regardless of where workloads run. More consistent cloud management can eliminate IT complexities for administrators and drive efficiency for application developers to code once and run anywhere.

To validate if, and to what degree, organizations agree they need to improve cloud infrastructure management, ESG, Dell Technologies, VMware, and Intel Corporation collaborated on a global survey of 1,257 IT decision makers at enterprises and midmarket organizations that use both public cloud infrastructure and are operating a modern on-premises private cloud environment. Unless otherwise noted, the data in this report originates from this body of research.

**Growing Cloud Proliferation and Its Intrinsic Challenges**

As the use of public cloud services has grown over time, so has the tendency for organizations to use *multiple* infrastructure-as-a-service providers. More than four out of five organizations using IaaS today report they partner with more than one service provider. This behavior is expected to continue with 86% reporting they expect to consume infrastructure from multiple cloud providers 36 months from now. If anything, the public cloud infrastructure partner picture is apt to get more complicated: Relative to today, the portion of cloud users that consume cloud infrastructure from more than 3 service providers is expected to double over the same time period (from 15% to 31%) (see Figure 2).

**Figure 2. Multi-cloud Usage, Today and in the Future**

Approximately how many unique public cloud infrastructure service providers does your organization currently use? How many do you expect to use 36 months from now? (Percent of respondents, N=1,257)

![Multi-cloud Usage Chart](chart.png)

One of the chief reasons behind public cloud infrastructure adoption is the opportunity to simplify IT operations. Organizations believe that by offloading infrastructure to a CSP, they will spend less time patching, provisioning, monitoring, troubleshooting, and securing it, freeing up staff to focus on other efforts. But the realities often diverge from these preconceived notions: Cloud infrastructure must be monitored or the organization risks paying for idle resources, and most service providers still put the onus of OS, network, and firewall configurations on the cloud customer. Public cloud is not a magic wand that makes IT management disappear. In many cases, the opposite is true: Increasing cloud use increases complexity. Each CSP makes available to its customers a variety of native management tools. But each toolset has different interfaces, capabilities, strengths, and weaknesses. Administrators must learn, monitor, and pivot among...
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each of these tools. ESG believes this is a major contributing factor behind the nearly three-quarters (73%) of organizations that say increasing complexity has been a result of using infrastructure in the public cloud (or multiple public clouds) in addition to on-premises infrastructure.

**Cloud Service Management Tool Sprawl**

As noted, different clouds have different native controls for customers to use to monitor and manage cloud infrastructure. As more public clouds are used by the organization, more tools are often used to manage the associated infrastructure. The research data shows this trend, with half of organizations using 3 or more CSPs today also reporting that they juggle more than 5 management tools to monitor and maintain that cloud infrastructure. On the other end of the spectrum, organizations using 1 or 2 CSPs today tend to need fewer tools to administer cloud-hosted resources (see Figure 3).

**Figure 3. Number of Management Tools to Administer Cloud Infrastructure**

| Number of Monitoring and Management Tools Use Across Their Public Cloud Infrastructure Footprint, by Number of CSPs in Use. (Percent of Respondents) |
|---|---|---|
| 1 CSP in use | 2 CSPs in use | 3+ CSPs in use |
| 16% | 34% | 47% |
| 1% | 35% | 38% |
| 1% | 11% | 26% |
| 21% | 50% |

Furthermore, the data clearly shows that generally the tools used to manage off-premises cloud infrastructure cannot also be used to manage on-premises infrastructure. When asked what proportion of private cloud infrastructure the organization manages with the same tools used to manage and monitor public cloud infrastructure, only 26% reported they can operate the majority of their on-premises infrastructure with the same tool sets they use in the public cloud.

Clearly organizations, particularly those leveraging multiple public clouds today, would benefit from solutions that provide a seamless cloud experience. This management experience would allow administrators to ramp faster, reduce human error, and reduce costs through tool rationalization.

**Other Public Cloud Concerns**

As multi-cloud operating models gather momentum within organizations, there is more to consider than just day-to-day management complexities. What else keeps IT stakeholders up at night? We asked respondents who expected their organization’s public cloud use (i.e., the portion of their data residing in any public cloud) to increase if this trend had any inherent risks. The majority said they were concerned about their organization’s ability to protect and secure data (58%). Many (52%) also harbor concerns about escalating operational costs. Only 11% had no reservations (see Figure 4).
Application Containers Increase Mobility

Of course, there is more to consider than just risk and CSP costs. Multi-cloud complexity also brings with it a significant application rework tax. That is, when there are differences in public cloud and private cloud infrastructure, developers must consider those differences and customize their code for each environment. If they don’t, they may make application architecture decisions that can drive up costs (such as applications with unnecessary data egress to an external microservice) or security risks. However, requiring developers to rework an application for different environments is costly and ultimately, due to resource constraints, may leave apps locked into a single environment.

One solve organizations are exploring is application containerization, which increases application mobility. According to ESG research, 26% of enterprises use containers for production applications today, with another 57% expecting to ramp up utilization over the next 12 months. However, containers are a relatively nascent technology, which introduces questions about staff skills and familiarity, container orchestration tools and processes, and protecting data.

Hybrid Cloud Is Here to Stay

The data clearly shows that organizations are operating in a hybrid cloud reality, with some apps and workloads residing on-premises and others residing on public cloud infrastructure. ESG believes this hybrid model will be durable for the foreseeable future. As discussed, organizations are partnering and expect to continue to partner with multiple public CSPs.

On the other hand, on-premises environments have functional parity with public cloud alternatives. In fact, respondents are 2x as likely to give the functional edge in terms of security and manageability to on-premises environments over cloud
environments. Respondents are also 1.8x as likely to think that on-premises environments are more performant than cloud environments, and 1.4x more likely to think costs are lower on-premises.

The end result is that organizations demand the flexibility to run workloads on whatever cloud, on- or off-premises, they want: 83% of organizations make achieving workload placement flexibility a top-5 priority among all technology initiatives, with 27% actually describing workload flexibility as their most important priority (see Figure 5). Reasons for this span development, cost, security, and technology roadmaps.

**Figure 5. Importance of Enabling Workload Placement Flexibility**

With respect to other technology initiatives, how important is it for your organization to enable choice in workload placement (i.e., to enable your organization to run workloads on whatever cloud, on- or off-premises, it wants)? (Percent of respondents, 1,257)

Source: Enterprise Strategy Group

Development teams at organizations are moving faster than ever before. It is not uncommon for developers to push code to production multiple times per day, a stark contrast to the annual application update cycles of yesteryear. With application functionality and design evolving faster, the best infrastructure environment for the application today may not be the same in a month or even a week later. Organizations need to enable workload mobility, without injecting onerous application rewriting requirements. While cloud-native application development efforts continue to ramp up, hybrid cloud infrastructure provides app dev teams with the flexibility that maturing applications require. As these rapidly developed capabilities become more important to the organization, new considerations quickly come into play. Security incidents, for example, influence these workload placement decisions. If a CSP suffers from a major data breach, what organization wouldn’t want to quickly and easily repatriate its workloads based on its assessment of risk? This is why it is important to identify the workloads that have become critical to the business and to the outcomes it is working to achieve—so that the needs of that workload can be met with consistency and scalability for continued business success. The ability to adjust where workloads run in real time also allows organization to capitalize on changing economic profiles among clouds. For
example, if a public cloud provider dramatically cuts its prices or if an on-premises technology refresh dramatically reduces on-premises operational costs, the organization would be better positioned to reduce workload costs.

Research data shows how fluid workload placement is today: 77% of surveyed organizations have repatriated a mission-critical cloud-hosted workload back on-premises. For example, 24% of organizations running ERP (common examples included SAP and Oracle) on-premises reported they had previously run those workloads on cloud infrastructure, but had repatriated them due to unforeseen issues. Similarly, 25% of organizations running machine learning workloads on-premises and 23% of those running traditional analytics on-premises reported having had to repatriate those workloads from cloud infrastructure.

When asked what factors led to workload repatriation, most often organizations reported issues with security, costs (either they were unexpectedly high or too variable), and being locked in to the technology roadmap of the CSP as motivating factors (see Figure 6).

Figure 6. Reasons Organizations Repatriate Public Cloud Workloads

<table>
<thead>
<tr>
<th>Reason</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Difficulty implementing security measures</td>
<td>32%</td>
</tr>
<tr>
<td>Cost(s) exceeded expectations</td>
<td>32%</td>
</tr>
<tr>
<td>Unpredictable costs</td>
<td>29%</td>
</tr>
<tr>
<td>Limited access to new technologies</td>
<td>29%</td>
</tr>
<tr>
<td>Inability to support scalability requirements</td>
<td>27%</td>
</tr>
<tr>
<td>Difficulty providing adequate protection of applications or data</td>
<td>26%</td>
</tr>
<tr>
<td>Inability to meet availability expectations</td>
<td>26%</td>
</tr>
<tr>
<td>Experienced a security breach/incident</td>
<td>26%</td>
</tr>
<tr>
<td>Inability to meet functionality or usability expectations</td>
<td>25%</td>
</tr>
<tr>
<td>Difficulty maintaining or proving compliance</td>
<td>25%</td>
</tr>
<tr>
<td>Inability to meet elasticity expectations</td>
<td>24%</td>
</tr>
<tr>
<td>Poor or unpredictable application performance</td>
<td>22%</td>
</tr>
</tbody>
</table>

Source: Enterprise Strategy Group

Ultimately, an optimized hybrid cloud environment must enable organizations to choose the right location for a workload, at the right time, based on business requirements, in order to deliver the right outcomes.
The Criticality of Workload Placement Flexibility Among Cloud Leaders Today

For the purposes of this research, only organizations that have consolidated their public cloud management tools and are using those same tools to manage the majority of their on-premises environment were considered to have a high degree of cloud management consistency (or are considered “Cloud Leaders” in this paper). Just 5% of the respondents surveyed have actually achieved consistent cloud management (see Figure 7).

Figure 7. Characteristics and Scarcity of “Cloud Leaders”

By examining the workload placement practices of these leading organizations, we can validate (or invalidate) the hypothesis that hybrid cloud is likely to be the dominant operating model for the foreseeable future.

ESG asked these organizations what workloads they considered to be their most mission-critical and then asked where they chose to run them. As shown in Figure 8, organizations with the greatest ability to run their workloads wherever they want do not act in a uniform fashion. This makes sense as organizations’ requirements for their workloads vary wildly in terms of performance requirements, fault tolerance, regulatory requirements, cost model preferences, and many other characteristics. The right operating model for data warehouse, backup environment, ETL, and analytics workloads (and any other) differs from organization to organization. It is the job of the IT organization to ensure the business can select the right workload location based on the unique requirements of any critical workload.

Figure 8. Workload Placement Practices of ‘Cloud Leaders’

How does your organization run its mission-critical workloads? (Percent of "Cloud Leaders")

<table>
<thead>
<tr>
<th>Workload Type</th>
<th>On-premises (in our data center)</th>
<th>Off-premises (hosted in a public cloud)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data extract, transform, and load (ETL, N=31)</td>
<td>55%</td>
<td>45%</td>
</tr>
<tr>
<td>Data warehousing (N=37)</td>
<td>51%</td>
<td>49%</td>
</tr>
<tr>
<td>Analytics and reporting (N=34)</td>
<td>50%</td>
<td>50%</td>
</tr>
<tr>
<td>Data backup and recovery (N=41)</td>
<td>46%</td>
<td>54%</td>
</tr>
<tr>
<td>Big data (N=52)</td>
<td>40%</td>
<td>60%</td>
</tr>
</tbody>
</table>

Source: Enterprise Strategy Group
The Developer Dilemma Created by Cloud Complexity and How to Solve it

The public cloud can clearly place a strain on development teams: Relying on numerous cloud-native developer tools, adapting to different cloud infrastructure environments, and functional differences across clouds all impact developer design requirements and decisions. For teams that want to continue to accelerate development times and functionality rollouts, complexity and application rework are nonstarters.

Similarly, on-premises environments can cause issues for developers. It is not uncommon for organizations to support a host of legacy applications built with proprietary solutions, which are heavily customized and hard to modify. This combination makes it hard for developers to build expertise, slows them down, and introduces greater risk in terms of software vulnerabilities and errors. What can organizations do?

Drive Cloud Consistency

Organizations should strive to implement infrastructure solutions designed to enable a consistent operating model and simplified management regardless of the underlying infrastructure. This would allow for developers to:

- Build once and run anywhere, enabling workload mobility and eliminating rework, which in turn frees up developers to innovate. More than three-quarters of Cloud Leaders (77%) say that increasing cloud management consistency has accelerated development at their organization.

- Grow developer expertise as consolidating the number of environments and tools they need to be familiar with allows them to build expertise, efficacy, and efficiency. It is even better if the platform is a familiar one. Nearly all respondents (98%) of Cloud Leaders say increased cloud management consistency has made developers’ jobs easier because they only need to write for one environment.

- Ensure data protection across hybrid cloud regardless of how workloads are deployed—VMs, Kubernetes containers, and cloud-native apps.

Technical Teams See the Value of Consistent Cloud Infrastructure

When we asked respondents about how more consistent cloud management would impact developers, the expected results were significant:

- ESG asked respondents if increasing cloud consistency to the point where developers only needed to build for one environment would make their lives easier. Almost all (97%) said “yes!”—clearly, eliminating application redevelopment efforts for multi-cloud scenarios would be a net-positive for development teams.

- ESG also asked respondents if increasing cloud consistency would actually make it easier for development teams to push code to production, and 96% reported the affirmative. Additionally, the majority (56%) expected the result would be daily (or more often) code releases, accelerating functionality improvements and software innovation (see Figure 9).
- Nearly three-quarters of respondents (74%) that have yet to achieve cloud management consistency today say that increased management consistency would speed cloud development and migrations. This means projects completed in the cloud will get done faster and at a lower cost. Asking respondents to quantify these benefits further, they reported a 27.5% average expected reduction in cloud migration/development budget overages, and a 37.5% average expected reduction in cloud migration/development missed timelines relative to their current capabilities.

- By reducing application rework, organizations should see a material reduction in time needed to shift workload location, freeing up IT staff to become responsive to the needs of rapid application development. This is exactly what the data shows. ESG asked respondents how long it typically takes for their organization to change where an application is run (i.e., move a workload from one public cloud to another or to on-premises infrastructure). While two-thirds (66%) of organizations with consistent cloud management report they can port a workload from one cloud to another in less than a week, 68% of organizations with fragmented cloud environments report the timeline would be multiple weeks or even months (see Figure 10). Crunching the numbers, the average calendar time advantage enjoyed by organizations with a consistent cloud management experience relative to those without is about 2.4 work-weeks per cloud migration. The ability to shave time off these types of moves can be the difference between an organization gaining a competitive edge over its peer group or being left behind, bogged down in a prolonged migration effort. Said another way: Cloud Leaders are 5.1x more likely than non-Leaders to say they can migrate workloads in under a week.

Figure 9. Expected Frequency of Code Releases, after Increasing Cloud Management Consistency

<table>
<thead>
<tr>
<th>How often do you think your organization would deploy new code if it used the same management tools regardless of infrastructure location? (Percent of respondents, N=1,190)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hourly or more often</td>
</tr>
<tr>
<td>8%</td>
</tr>
</tbody>
</table>

Source: Enterprise Strategy Group
• Finally, ESG asked respondents how the IT organization is viewed by developers at the organization. Those that deliver a consistent cloud management experience today were 2.1x more likely to be viewed positively, either as a competitive differentiator or high-value service provider (89% versus 42%, see Figure 11).

Respondents see multifaceted value from increasing cloud management consistency, and much of that value will funnel down to development teams. IT organizations focused on enabling their developers, rather than being a roadblock, should be acutely focused on increasing cloud consistency.
The Bigger Truth

For almost all organizations, cloud adoption has outpaced the implementation of common management tools and infrastructure experiences spanning those clouds (both off-premises and on-premises). For development teams, this means time-consuming and costly application redevelopment efforts are needed to migrate workloads among clouds. In practice, organizations can rarely spare the effort, meaning workloads are not always placed according to their requirements.

ESG research shows that introducing consistent cloud infrastructure and operations can solve this problem, improving developer experience and effectiveness, reducing costs and budget overages, reducing risk, and giving organizations the opportunity to make workload placement decisions in a thoughtful way based on need.

How Dell Technologies Cloud Can Help

This ESG Research Insights Paper was commissioned by Dell Technologies, VMware, and Intel Corporation, all of which are keenly focused on helping organizations achieve their cloud goals with Dell Technologies Cloud. As has been discussed in depth in this paper, any technology decision must be made with consideration for the people, processes, and current state accounted for. Dell Technologies is focused on meeting organizations where they are and delivering the technology and services solutions necessary to help them architect a winning multi-cloud IT strategy that builds on existing service standards and skillsets to unlock better outcomes. Dell Technologies Cloud is a set of cloud infrastructure solutions designed to enable a consistent operating model and simplified management across private clouds, public clouds, and edge locations, which reduces the barriers of cloud adoption and provides the ability to let application and business requirements determine where workloads reside. This vision for the Dell Technologies portfolio is based on Dell’s understanding of cloud as an operating model, not a place, and ambition to become the trusted technology partner for organizations that are looking to reduce the complexity of multiple cloud environments with a consistent infrastructure and operations layer.

To learn more about how Dell Technologies Cloud can help you, start here.
Appendix – Research Methodology and Respondent Demographics

To gather data for this report, ESG conducted a comprehensive online survey of IT decision makers from private- and public-sector organizations in 11 countries: US (33%), Canada (4%), UK (13%), France (9%), Germany (7%), Singapore (5%), Australia (5%), India (4%), Hong Kong (3%), Brazil (8%), and Mexico (8%). The survey was fielded between September 17, 2019 and October 12, 2019. To qualify for this survey, respondents were required to have influence in the purchase of cloud investments (public or private) at organizations utilizing public cloud infrastructure and operating modernized on-premises data center environments.

After filtering out unqualified respondents, removing duplicate responses, and screening the remaining completed responses (on several criteria) for data integrity, a final sample of 1,257 respondents remained.

All respondents were provided an incentive to complete the survey in the form of cash awards and/or cash equivalents. Note: Totals in figures and tables throughout this report may not add up to 100% due to rounding.

The figures below detail the demographics of the respondent base: individual respondents’ current job responsibilities, as well as respondent organizations’ total number of employees and primary industry.

**Figure 12. Survey Respondents, by Job Title/Level**

Which of the following best describes your current job title/level? (Percent of respondents, N=1,257)

- Senior IT management, 53%
- IT management, 21%
- Most senior IT executive, 19%
- C-level executive, 2%
- Senior management, 2%
- Individual contributor, 3%
In which of the following areas of IT do you have significant involvement in the purchase process for your company? (Percent of respondents, N=1,257, multiple responses accepted)

- Public cloud: 87%
- Virtualization/private cloud: 82%
- Data center infrastructure: 81%
- Cybersecurity/information security: 78%
- Endpoint devices: 69%
- Analytics/business intelligence: 67%
- Enterprise applications: 66%

Source: Enterprise Strategy Group

How many total employees does your organization have worldwide? (Percent of respondents, N=1,257)

- 1,000 to 2,499: 21%
- 2,500 to 4,999: 17%
- 5,000 to 9,999: 14%
- 10,000 to 19,999: 9%
- 20,000 or more: 11%
- 500 to 999: 16%
- 100 to 249: 4%
- 250 to 499: 7%

Source: Enterprise Strategy Group
Figure 15. Survey Respondents, by Industry

What is your organization’s primary industry? (Percent of respondents, N=1,257)

- Technology, 26%
- Manufacturing, 17%
- Financial, 11%
- Retail/Wholesale, 9%
- Health Care, 8%
- Communications & Media, 7%
- Government, 2%
- Business Services, 5%
- Other, 15%

Source: Enterprise Strategy Group

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