Migrate VM-Based Enterprise Workloads to Google Cloud for Optimal Price, Performance, and Security

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Public cloud platforms provide the scale, elasticity, and operational efficiency that enable enterprises to both innovate and deliver more products and services to the market faster. This increased ability to innovate provides enterprises a competitive advantage and the businesses agility to stay ahead of their competition. Enterprises should leverage the business agility that public cloud infrastructure enables to their strategic advantage. Thus incorporating a cloud platform is an inherent part of their initiatives to modernize their IT infrastructure.

Enterprise cloud adoption is not without challenges. Enterprises cite a lack of skill set, decision fatigue, operational challenges, security concerns, and unpredictable TCO as significant inhibitors to adopting a public cloud service provider. Information technology decision makers (ITDMs) are caught between the need to innovate faster and the fear of instability and mismatched expectations. This dilemma is why enterprises that partner with a trusted service provider before, during, and after migration are more likely to succeed in their cloud journey.

Google Cloud is an ideal platform for virtual machine (VM)–based applications due to its key technical capabilities, such as high-performing virtual machines, including compute-optimized and memory-optimized VMs; custom sizes for virtual machines; high-performance network infrastructure for faster data transfers; and data protection capabilities. Google Cloud provides free-to-use, industry-standard tools for migrating VM-based applications from on-premises environments and other clouds to Google Cloud. Such tools provide minimal-click migration paths for simple applications and more straightforward paths for multilayered applications. Google Cloud also provides database migration tools that enable enterprises to migrate MySQL-like databases to Google Cloud.
Google Cloud and its technology partners provide end-to-end migration services that assist enterprises during all phases of migration. Enterprises can leverage this white-glove partnership enabled by Google Cloud to assess their business needs, plan and execute application migration, and optimize cloud resources after application migration. After migrating critical business applications to Google Cloud, enterprises can also leverage services offered by Google Cloud and partners to modernize their applications based on cloud-native technologies or rebuild their applications on the cloud to leverage higher-order cloud services, such as Google AI Hub.

Moving VM-based primary workloads to Google Cloud enables enterprises to rapidly reduce on-premises datacenter footprint, minimize operational overhead, and increase agility to innovate faster. Migrating VMs also provides a strong foundation for enterprises to modernize applications or rebuild applications to consume more cloud-native services, thereby positioning them to leverage future technology innovations easier and faster.

IDC recommends that ITDMs take a multiphased approach to migrate their business applications to public cloud platforms such as Google Cloud. They should start with migrating VM-based applications to cloud and continue their migration journey by modernizing applications and rebuilding their applications already running on cloud platforms. IDC also recommends that partnering with a trusted services partner during and after migration can result in a migration to the cloud that is stress free, successful, and cost effective.

From IDC's perspective, ITDMs should consider Google Cloud as the preferred cloud services partner — owing to Google Cloud being a reliable platform for VM-based applications; a trusted partner before, during, and after application migration; and an innovator to future proof the enterprise IT infrastructure.
Public Cloud: Adoption Trends and Challenges

Public cloud platforms offer scale, operational efficiency, and elasticity that provide enterprises with business agility. This agility enables enterprises to innovate faster and outpace their competition. In the quest for faster innovation, enterprises are looking at IT infrastructure as an enabling asset. As such, they should embrace and leverage public cloud platforms to their strategic advantage. There is a significant shift among enterprises in their approach to the public cloud in recent years. Enterprises cite the ability to scale existing business applications, retire on-premises infrastructure, gain competitive advantage, and access newer technologies as key motivators to adopting public cloud. However, public cloud adoption is not without challenges. IDC observes dichotomous industry trends in the adoption of public cloud platforms as described in the sections that follow.
Acceptance
Enterprise adoption of public cloud infrastructure is rapidly growing. According to IDC’s 2019 IaaSView Survey (see IaaSView 2019: Executive Summary, IDC #US45597819, October 2019), 81% of respondents are using public cloud infrastructure, with about 42% of them leveraging multiple public cloud service providers. This use of public cloud infrastructure is also supported by an increased enterprise spend on public cloud infrastructure in recent years. According to Market Analysis Perspective: Worldwide Public Cloud Infrastructure as a Service, 2019 (IDC #US45536219, September 2019), the enterprise spending on public cloud infrastructure is growing at a faster rate than the spending on traditional IT infrastructure and is expected to exceed spending on traditional IT infrastructure by 2022.

Challenges
While enterprise adoption of public cloud infrastructure is increasing, enterprises are also facing challenges migrating their applications to the public cloud and managing them on cloud platforms after migration. Enterprises cite a lack of skill set, decision fatigue, operational complexity, security concerns, and unpredictable costs as critical inhibitors to adopting public cloud. A recent IDC study shows that about 40% of respondents lacked in-house expertise on cloud-native technologies, more than 30% of respondents expressed concerns about data security in transit and unauthorized access to data, and more than 35% of respondents expressed concerns on higher costs of migration. About 50% of the respondents expressed concerns about costs, billing, and TCO. Enterprises are also posed with decision fatigue regarding application migration — how to select an appropriate migration path, which workloads to prioritize, when to migrate, and how to optimize cloud resources after migration are among the issues.

The ITDM Dilemma
Even with their lingering concerns, enterprise IT decision makers are looking to leverage all the advantages in terms of flexibility and efficiency that the public cloud enables. They are also looking to reduce capital expenses by decreasing the on-premises footprint and achieve better TCO/ROI by optimizing their resource utilization on the cloud. However, ITDMs are discouraged by the challenges they face in adopting the public cloud. They are caught in a cloud dilemma — between the need to innovate faster and the need for operational stability.
Enterprises are seeking best practices on cloud migration — what, when, why, and how of migrating primary business workloads to cloud. To these ends, enterprises are turning to cloud service providers for assistance during migration and post-migration to manage applications on cloud and cloud resources. Cloud service providers are best positioned to offer such assistance before, during, and after workload migrations to the cloud.

**Workload Migration Trends**

Recent IDC studies show that less than 20% of enterprise workloads have been migrated to the public cloud so far. Most of the applications that fall into this category are based on virtual machines and are migrated with no code changes (lift and shift) or with minimal configuration changes (lift, touch, and shift). Migrating VM-based applications enables enterprises to minimize on-premises infrastructure and operational overhead. Migrating VMs also positions enterprises for easier adoption of higher-order technology innovations such as artificial intelligence (AI)/machine learning (ML) services and builds a stronger foundation for infrastructure modernization and digital transformations. Enterprises are then better positioned for a mature adoption of public cloud so that they can move mission-critical and business-critical workloads across the organization through standardization and automation.

Among enterprise workloads, data management and data analytics workloads are the fastest-growing workloads in the cloud. Among Windows-based workloads, structured data management applications and business applications are the fastest-growing workloads on cloud infrastructure. By 2022, most of these Windows-based applications will be based on cloud infrastructure. Key drivers that influence migration of VM-based workloads to public cloud include the ability to scale existing applications, better performance than on-premises infrastructure, and the possibility of global reach.
Why Google Cloud?

Digital transformation journeys need a logical place to start, and public cloud platforms are an ideal place to begin with. Migrating VM-based applications to the public cloud proves to be the fastest migration path to the cloud. Migrating VM-based applications also provides a solid foundation to leverage higher-order innovations and nuanced application modernization.

Google Cloud provides enterprises an ideal platform to rapidly create a cloud footprint by migrating VM-based applications, reducing on-premises hardware, and thereby freeing IT admins to reclaim their time for higher-priority work. In addition, Google Cloud gives enterprises access to the same datacenter technologies that power world-renowned products such as Gmail, Google Search, and YouTube. In effect, Google Cloud can be the ideal platform for enterprise applications based on the key differentiators described in the sections that follow.

**Business Impact Driven by Advanced Technical Features**

Enterprise applications rely on the underlying infrastructure for both business continuity and performance. The higher the performance of supporting infrastructure, the better the performance of enterprise applications. In a public cloud environment, enterprise applications perform best when running on high-performance virtual machines and high-performance network infrastructure that supports faster data transfers.

Google Cloud supports high-performance VMs and compute- and memory-optimized VMs, custom VM sizes, and faster data transfers. Enterprise customers leverage these technical capabilities to improve application performance, scale, and business continuity. According to Google, a leading food and pharmacy retailer in Canada gained 4x performance improvements on its online grocery site, and a popular digital marketing agency scaled up by 10x to support billions of queries per day by running its applications on higher-performance VMs across multiple Google Cloud regions.
Enabler for Higher-Order Services

Enterprise customers cite the ability to leverage higher-order cloud services as one of the motivators to adopt public cloud platforms. Google Cloud offers higher-order services, such as data management, business analytics, and productivity suites, and technology innovations, such as artificial intelligence, machine learning, and cognitive services. After migrating VM-based applications to Google Cloud, enterprise customers are better positioned to leverage such higher-order services and technology innovations. For example, according to Google, a leading nonprofit research organization was able to improve patient outcomes by speeding image analysis by 12x through Google Cloud ML Engine.

White-Glove Partnerships for Successful Application Migration

Google Cloud provides white-glove partnership for application migration through migration tools and services that enable enterprise customers in their cloud migration journey.

Google Cloud provides free-to-use, industry-standard migration tools that enable easier compute and data migration from on-premises and other clouds to Google Cloud. Google Cloud also provides end-to-end migration services in partnership with technology partners that enable enterprises to assess, plan, and execute application migration to Google Cloud efficiently without impacting their business continuity. Enterprises can also leverage services offered by vetted Google partners to modernize their applications using container technologies. As they mature in their cloud adoption journey, enterprises can leverage technology partners to rebuild their applications using cloud-native services offered by Google Cloud.

Through this white-glove partnership with Google Cloud, enterprises can start migrating their VM-based applications to Google Cloud, continue leveraging higher-order services, and modernize their applications, thereby leveraging the scale, agility, and elasticity of Google Cloud Platform (GCP) to the fullest. According to Google, a global ethics cosmetics brand migrated its entire global ecommerce site to Google Cloud within a month and was able to reduce infrastructure costs by 40%.
Secure by Design

Enterprises cite security concerns as one of the top inhibitors to adopting public cloud. They are concerned by how their data is stored and secured on public cloud environments, how their data is protected during transfer and transactions, transparency on data management and protection features, and whether the public cloud platform meets their organization's compliance regulations.

Google Cloud provides a scalable and secure platform that offers multiple layers of security mechanisms to protect customer data. All data stored on the Google Cloud Platform is protected both at rest and in transit. Google Cloud supports industry-standard identity services, access control mechanisms, and endpoint services to ensure the right level of access to enterprise resources. Google Cloud customers also benefit from the industry-leading security infrastructure that Google enables for all its services such as G Suite. In addition, Google Cloud supports compliance to industry-specific regulatory requirements such as HIPAA. Enterprise customers can leverage these capabilities, features, and services to scale and secure their applications and data on Google Cloud with confidence.

Customer content — data generated by customers or provided to Google Cloud, such as data stored in Google Cloud Storage and disk snapshots — is encrypted at rest when stored on Google Cloud at various granularities. Each Google Cloud service, such as Google Compute Engine, splits customer data at a different level of encryption granularity. For example, Google Cloud Storage and Google Cloud Database services encrypt per chunk of data (of sizes varying from 256KB to 8MB). Google Compute Engine encrypts virtual disks, snapshot groups, and VM images.

Customer data to be protected is divided into chunks, and each chunk is protected by an individual encryption key called a digital encryption key (DEK). These encryption keys themselves are encrypted by a key encryption key (KEK). Google’s Key Management Service (KMS), a scalable service that manages these encryption keys, employs multiple levels of protection, including digital encryption keys, key encryption keys, and a master key (root KMS) to a physical safe to which less than 20 Google employees have access to globally. Keys are stored closer to data to ensure acceptable latency. KMS is highly scalable and replicated across Google’s datacenters globally to ensure high availability, low latency, and global access to keys. All other customer metadata stored on Google Cloud are protected through Google’s security infrastructure and protected by storage-level encryption mechanisms.
Infrastructure abstractions are evolving at a rapid pace, enabling application developers to focus more on business logic at higher granularities. Application design patterns are also evolving in response to these abstractions, with an increasing number of distributed, microservices-based applications being implemented. An IDC study estimates that more applications will be implemented in the next five years than in the past 40 years. Such applications need support for modern infrastructure abstractions such as containers, functions, and accelerated hardware. Enterprises adopting cloud platforms to modernize their infrastructure should start exploring how to leverage modern infrastructure abstractions.

Google’s support for open source is well known; the company is a leading contributor to popular open source projects such as TensorFlow, Kubernetes, and Knative. Google Cloud supports an open platform that enables enterprises to look beyond virtual machines. Enterprise customers can modernize their applications on Google Cloud by leveraging managed services such as Google Kubernetes Engine (GKE), Google Anthos, and Google Cloud Functions. Google Cloud customers can also run their machine learning workloads on accelerated hardware, such as TPUs, offered only by Google Cloud. Google Anthos, a managed hybrid infrastructure offering from Google, enables enterprise customers to manage both traditional VM-based enterprise applications and modern applications seamlessly. Google Anthos also provides easier migration paths to on-premises applications to cloud through migration tools.

Thus migrating VM-based applications to Google Cloud is the first step of the infrastructure transformation journey and puts customers in a strong position to leverage modern infrastructure abstractions. This in turn allows customers to continue their infrastructure transformation journey.
How to Leverage Google Cloud Platform

Multiphased Approach to Cloud Migration

IDC models cloud adoption maturity based on various attributes, including, but not limited to, operational automation, success KPIs, and the presence of standardized processes. Since enterprises are at various levels of cloud adoption maturity, IDC recommends taking a multiphased approach to cloud migration that enables them to progress in their cloud adoption maturity as they advance in their cloud adoption journey. Most enterprises are at the early stages of their adoption maturity and are better served through partnerships with a cloud service provider as they progress in their migration journey.

Google Cloud enables a multiphased cloud migration journey that includes the following four phases (assess, plan, migrate, and optimize):

Assess: Enterprises should assess their on-premises landscape and their use cases, explore migration paths and solutions, and determine the appropriate migration path. Google Cloud also provides free assessment services that enterprise customers can leverage in this phase.

Plan: Enterprises should develop a migration plan that details appropriate migration paths for the applications, the right set of tools and solutions to leverage, the priority of workloads, and partners to enlist. Google Cloud helps enterprises arrive at this migration plan. This phase also includes working with Google Cloud to design the right cloud architecture that leverages appropriate technologies, services, and solutions.

Migrate: To execute the migration plan, enterprises should seek the help of service partners and providers. Google Cloud offers various tools and services to assist enterprises in this phase, including Migrate for Compute Engine to move VMs directly into Google Compute Engine, Google Cloud VMware Solution by CloudSimple to migrate VMware workloads to GCP, and Migrate for Anthos to migrate and modernize VMs directly into containers in Google Kubernetes Engine.

Optimize: To derive the best value out of cloud infrastructure and resources, enterprises should standardize their operations and leverage both cost and billing management tools as well as available higher-order services. Google Cloud provides features and enables services in partnership with technology partners to assist enterprises in this phase of cloud migration. Figure 1 shows how multiphased migration enabled by Google Cloud maps to the IDC recommended approach to cloud migration.
At any given stage of cloud migration, there are four broad migration paths that enterprises can take to migrate workloads from on-premises infrastructure to public cloud infrastructure:

**Rehost or lift and shift:** The workload architecture and code base are not heavily modified before migration into the public cloud. This is the easiest and most common migration path to pick when customers are migrating VM-based workloads.

**Refactor or component-level upgrade:** The workload continues to function in the same manner as before, but internal changes are made in the underlying components to better leverage services available in the cloud. Examples include the adoption of database as a service, broader platform as a service (PaaS), and native cloud-based management tools. Here, the application is rebuilt to leverage higher-level services offered by the cloud services provider.

**Re-architect or change the application architecture:** The application continues to serve the same business functionality but is now architected to operate under a cloud-native framework (i.e., migrating to containerized/serverless architectures).
Replace with a public cloud SaaS: The application is replaced with a SaaS equivalent offering similar capability. Examples include the migration from an on-premises hosted email server to G Suite.

IDC recommends selecting appropriate application migration paths based on the level of adoption maturity, nature of the application, and availability of skill set (see Figure 2). As enterprises progress in their cloud adoption journey, they should leverage the appropriate migration path and reevaluate applications already migrated to the cloud platform.

**Figure 2.** Selecting an Appropriate Application Migration Path

- **Workload characteristics (level of modularity)**: Refers to the extent of tight integration between different components or stacks of the workload. A highly modular workload lends itself more easily to refactoring or re-architecting.

- **Cloud skill set availability**: Refers to the extent to which the organization has readily available access to the skills needed to develop, deploy, and operate applications in the public cloud. This may be in-house or through services partners and evolves during migration journey.

Source: IDC, 2019
Cloud Migration Journey to Google Cloud

Migration Paths Supported by Google Cloud

Google Cloud provides tools and services that enable enterprises in every step to migrate their applications to Google Cloud. Specifically, Google Cloud enables migration paths, with each providing a strong foundation, as mentioned in the sections that follow.

Migrating VM-Based Applications

Migrating VM-based applications to Google Cloud involves recreating virtual machines on Google Cloud with minimal or no code changes. Applications continue to behave the same way they did on-premises. This is the easiest migration path with less disruption to business continuity as it doesn’t require re-architecting or rewriting of applications. This also minimizes the barrier to entry to cloud for enterprise IT administrators as it provides an environment on Google Cloud like the on-premises environment administrators are used to. This migration path is referred to as “rehost or lift and shift” under IDC taxonomy.

Migrating VM-based applications provides a fast and efficient path to move to Google Cloud due to its effectiveness, suitability to many enterprise applications, and minimal disruption. Through this migration path, enterprise workloads can leverage the scale, performance, and security provided by Google Cloud without compromising on application availability or performance. Migrating VM-based applications also enables enterprises to expand their cloud footprint rapidly, thereby positioning themselves to divest on-premises infrastructure faster. This also reduces the operational overhead for IT admins, who then can focus more on activities and innovations that improve business agility.

Most enterprise applications are best served by migrating them to cloud due to their characteristics, resource utilization patterns, and dependence on the continuous availability of infrastructure. This is also the least disruptive migration path as it doesn’t need any significant refactoring of applications. Most Windows-based enterprise applications — including data management, data analytics
applications, and business applications — are best suited for this migration path. Key limitations of this migration path include inefficient resource allocation on cloud and the potential for higher costs. Aggressive approaches to migrating VM-based applications could also result in missed opportunities to modernize or rebuild applications.

**Modernizing Applications**

Modernizing applications refers to re-architecting applications to leverage cloud-native technologies such as containers and other infrastructure abstractions. This migration path is commonly referred to as “re-architect” under IDC taxonomy.

Containerization provides better performance, faster start-up times, and a much larger scale than running applications on virtual machines. Re-architecting also refers to breaking down applications into smaller components or microservices. This migration path also enables adopting modern design paradigms and processes such as continuous integration/continuous deployment (CI/CD) and DevOps.

Modernization is the most suitable migration path for new (greenfield) applications, web-scale applications, and applications with less integration among their components/services. This migration path increases operational efficiency, optimizes resource utilization, and enables higher developer agility into infrastructure operations.

Modernization also involves a steep learning curve around mastering a rapidly evolving technology space. Enterprises are also wary of the stability, maturity, and longevity of some of the tools and technologies involved.

**Rebuilding Applications**

Rebuilding refers to rebuilding applications by replacing application subcomponents with suitable higher-order cloud services. This migration path is referred to as “rebuild” under IDC taxonomy.

For example, the data access layer of an application can be rebuilt to use cloud databases, such as Google Cloud SQL. A recent IDC study shows that every cloud service consumed influences the consumption of at least one additional cloud service. This migration path thus enables enterprises to be in a better position to leverage the latest technology innovations, such as AI/cognitive services including Google AI Hub, and other scalable cloud services, such as Google Cloud Spanner.

Rebuilding applications requires more training and planning and involves possible disruption to business continuity.
Google Cloud Migration Tools and Services

Google Cloud provides definitive guidance to enterprise cloud migration through a structured approach referred to as “Google Cloud Adoption Framework.” Using the Google Cloud Adoption Framework, an enterprise can assess its cloud adoption maturity and devise a successful migration plan accordingly. Google Cloud also provides free discovery and assessment services that enterprises can leverage during the planning phase.

Google Cloud provides free-to-use, industry-standard tools for compute and data migration needs. Migration tools for compute include Migrate for Compute Engine, Google Cloud VMware Solution by CloudSimple, and Migrate for Anthos. Migrate for Compute Engine enables migrating compute-intensive applications to Google Compute Engine by recreating appropriate virtual machines with underlying operating systems, settings, and the right resource configurations on Google Cloud. Enterprise applications such as data management and data analytics can be easily migrated to Google Cloud through this service. Google Cloud VMware Solution by CloudSimple enables native VMware capabilities on Google Cloud by supporting a VMware SDDC environment on GCP. This enables easier migration of VMware vSphere-based workloads to GCP. Migrate for Anthos enables automatically converting a VM into a container in Google Kubernetes Engine while migrating, thereby locating a legacy application alongside a cloud-native framework and effectively enabling the enterprise to leverage Google Cloud for different types of applications.

Migrating databases to Google Cloud helps enterprises run and manage applications at global scale while optimizing both efficiency and flexibility. Whether migrating proprietary databases to open source databases or modernizing traditional databases to cloud-native databases, Google Cloud and its partners offer database migration guides and tools that help simplify database migration life cycle, from assessment to validation. Databases can be migrated to Google Cloud using 100% open source–compatible databases such as Cloud SQL for MySQL and PostgreSQL, Cloud Memorystore for Redis, and Cloud Bigtable (HBase client for Java), along with open source partner databases such as MongoDB, DataStax, Elastic, Neo4j, InfluxData, and Redis Enterprise. Google Cloud also enables built-in features like an external master for Cloud SQL that helps minimize downtime during migration.

Google Cloud enables end-to-end cloud migration through the aforementioned services and tools, in conjunction with its technology partners. Enterprises can leverage this white-glove partnership to plan, execute, and optimize their application migration journey to Google Cloud.
**Post-Migration**

Migrating VM-based applications is only the first step in the enterprise infrastructure modernization journey. While this path provides a rapid way to leverage the scale of the cloud platform, additional benefits of cloud can be unlocked further when enterprises standardize their operational practices on the cloud. Some enterprises also express disappointment over cost, as the cloud resources may not have been optimally allocated. To combat this issue, Google Cloud offers VM rightsizing and customer instance types, as well as comprehensive billing and cost management tools to keep cloud budgets under control.

Google Cloud, in partnership with technology partners, enables enterprises to advance in their migration journey by assisting them with application migration and rebuilding applications.

Figure 3 shows the timeline of a typical enterprise migration to Google Cloud. Note that various groups within an enterprise may be at different steps of their migration journey, with overlapping phases between organizations.

**Figure 3.** Enterprise Migration Journey to Google Cloud

*Source: IDC, 2019*
Enterprises are increasingly leveraging public cloud infrastructure to their advantage. IDC expects this trend to continue. Indeed, IDC expects that spending on public cloud infrastructure will grow at a faster rate than spending on traditional IT infrastructure. By 2022, public cloud spending will surpass spending on traditional on-premises infrastructure.

Migrating VM-based applications is the fastest and easiest way to migrate enterprise applications to public cloud. Among business workloads, data management, data analytics, and application development and testing workloads will be the fastest to migrate to the public cloud. IDC also expects Windows-based workloads to shift significantly to cloud-based environments. Even those enterprises with constraints on moving data out of on-premises infrastructure are seeking ways to enable an as-a-service model of consumption of infrastructure through hybrid cloud infrastructure options.
Public cloud service providers such as Google Cloud are expected to continuously add value to the end user by enabling higher-order services, offering more options for managed services, establishing partnerships with service providers, and democratizing innovations such as AI/ML.

Public cloud platforms are expected to be an essential component of modern enterprise infrastructure. To this end, enterprises will leverage partnerships with service providers toward public cloud adoption and invest more in training and upskilling their employees. Enterprises will also standardize their internal processes and IT consumption models based on as-a-service delivery models.

**Essential Guidance for ITDMs**

**Consider IT as a Profit Center**

ITDMs should consider IT as a profit center rather than as a cost center. By looking at IT as a profit center, ITDMs can modernize their IT infrastructure to leverage business agility and competitive advantage. They should also consider the public cloud platform as a critical enabler in their infrastructure modernization journey.

**Take a Multiphased Approach to Cloud Migration**

Many enterprise applications are virtualized and are currently hosted on on-premises traditional IT infrastructure. Enterprises should target “low-hanging fruit” by migrating VM-based applications through lift and shift as their first step. This enables them to leverage the scale and elasticity that the public cloud provides while building trust, comfort, and familiarity with the cloud that they are migrating to. After migrating VM-based applications, enterprises can consider other migration paths such as re-architecting or rebuilding an application to consume higher-order cloud services. Enterprises should also be flexible to revisit the selection of the appropriate migration path for a given workload during the cloud migration journey.

**Partner with Service Providers**

ITDMs should partner with cloud service providers/technology partners in their migration journey to the cloud to overcome decision fatigue, follow best practices, and avoid common pitfalls. Partnering with the right partner also enables enterprises to overcome operational challenges and unpredictable TCO.
Opportunities

Enterprises are looking for a trusted partner that provides them with an ideal platform to run their business applications, assists them through their migration journey, and places them in a position of strength to take advantage of rapidly evolving technology innovations. Google Cloud is well positioned to be such a trusted partner to enterprises due to the reasons mentioned in the sections that follow.

**Reliable Platform for Virtual Machine–Based Applications**

Google Cloud provides an open, vendor-agnostic platform to support applications based on both Windows and Linux operating systems. Google Cloud enables applications running on virtual machines to maximize performance through faster boot times, compute- and memory-optimized VMs, custom VM sizes, rightsizing, high-performance networking, optimal resource allocation, and scalable infrastructure.

**Trusted Partner Before, During, and After Migration**

Google Cloud provides a white-glove partnership that enables enterprises a stress-free path to application migration. Google Cloud also enables enterprises to standardize cloud infrastructure consumption and optimize cloud resources after migration through modernization services offered by technology partners.

**Innovator Future Proofing Enterprise IT infrastructure**

As Google Cloud continues to enable higher-order capabilities and industry-specific solutions and infuse latest innovations such as AI and machine learning to enhance product capabilities, Google Cloud can future proof the needs of enterprise IT infrastructure. After building a strong foundation on Google Cloud, enterprises can adopt such innovations readily. They are better positioned to experiment and evaluate such innovations that may appear far from their reach otherwise.
Challenges

Google Cloud must gain more mindshare among enterprises. Given the strong consumer appeal of Google's primary businesses and engineering-focused history, Google Cloud is lesser known to be a preferred vendor for enterprises. Some aspects of delivering to enterprise customers, such as licensing agreements and long sales cycles, are nontechnical and need a robust support infrastructure in place. This support infrastructure includes, but is not limited to, legal, sales, channels, partners, marketing, alliances, and procurement. Google Cloud has significantly increased investments in these areas recently, which, along with strong technical capabilities, is expected to enable Google Cloud to be a reliable cloud services partner to enterprises.

IDC recommends that enterprises leverage Google Cloud for their infrastructure modernization initiatives. Enterprises should take a multiphased approach to their application migrations to the cloud, starting with migrating VM-based applications. Having reached critical mass on Google Cloud, enterprises should then consider modernizing or rebuilding their applications to take advantage of higher-order cloud services. Enterprises should also leverage migration tools and services offered by Google Cloud and technology partners to their advantage in this application migration journey.

Recommendations to ITDMs

- ITDMs and transformational CIOs should consider IT as a profit center rather than a cost center and leverage public cloud platforms such as Google Cloud as the foundation of modern IT infrastructure.

- ITDMs should consider standardizing IT infrastructure based on the as-a-service model of infrastructure delivery to enable elasticity and agility that a public cloud platform enables internally.
Recommendations to IT Admins/SREs

- Administrators of traditional IT environments should consider public cloud infrastructure as an enabler rather than as a threat and get equipped with cloud computing skills.

- Administrators should lead the infrastructure modernization journey by offloading operational overhead to cloud service providers and be the enabler of running business applications on the public cloud.

Recommendations to LOB Owners

- LOB owners should take a multiphased approach to leverage public cloud platforms to scale their existing business applications and modernize or rebuild the applications.

- LOB owners should accelerate their adoption of Google Cloud by leveraging migration tools and services offered by Google Cloud and technical partners.
About IDC

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