FOR MANY ENTERPRISE APPLICATIONS, THE CLOUD IS READY FOR PRIME TIME

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This is the first of three articles on how large enterprises can take advantage of cloud computing. It addresses the applications and platforms that are immediately suitable for the cloud. The second article will focus on migrating legacy systems to the cloud; the third will describe an effective cloud operating model.

THE CLOUD IS INCREASINGLY where large enterprises should be hosting a wide range of applications and platforms, given its cost, capabilities, and flexibility. By adopting the cloud for building and migrating business systems, large enterprises can free their IT teams from managing basic computing infrastructure, such as servers, storage devices, switches, and databases, and empower them to generate greater value by taking advantage of the latest technology and tools.

The cloud is especially well suited for at least four types of systems that generate large and "spiky" workloads in computing, storage, or networking resources, or that can benefit from the cloud's advanced digital and data technologies:

- Data and advanced analytics platforms
- Platforms for hosting new digital workloads
- Platforms for transforming and migrating legacy IT workloads
- Collaboration platforms

Typically, however, organizational inertia and regulatory restraints (both real and perceived) prevent many large enterprises from making the move. Business and IT executives can sometimes convince themselves of the need to maintain bespoke on-premises computing resources, but the reality is that many cloud providers have developed hyperscale capabilities and advanced technologies that offer a more secure and cost-effective platform than the computer rooms of most large enterprises.

To be sure, organizations must identify the right type of cloud—multitenanted public cloud, on-premises private cloud, or any of the many variations in between—for their

specific applications and systems. They also need to evaluate tradeoffs among cost (pay-as-you-go can be prohibitive for large workloads), benefits, and risk (especially the potential lock-in from using a provider's proprietary technologies) for each use. And they face hard decisions regarding the broader issues of migration and operating model (which we will address in subsequent articles). But at a technical level, the cloud is fast becoming the IT engine of the future.

Why the Cloud Makes Sense

While many large enterprises select the cloud to save money—and they do generally save 15% to 40% of IT operating costs—its primary benefits are increased agility and better performance.

Speed and Agility. BCG experience suggests that by turning to the cloud, large enterprises are often able to bring out services 30% to 60% faster, compared with creating bespoke in-house infrastructure. Provisioning lead times can decline from months to minutes, given the wide range of standard patterns and advanced technology orchestration capabilities offered by cloud vendors.

Development and deployment of services and functionality also speed up dramatically on the cloud. In addition, the cloud can reduce risk by improving data resilience, security monitoring, and user access. Finally, many of the cloud-enabled ways of working, such as agile and DevOps (a silo-breaking development method) deliver higher-quality solutions faster.

The cloud's data management capabilities enable large enterprises—even those with an overhang of traditional technology, such as home-grown, open-source data and analytics platforms—to respond faster and at a lower cost to emerging requirements involving fraud, know-your-customer, and verifiable supply chain regulations.

In fact, moving to the cloud can force enterprises to clean up and curate existing enterprise data sources and establish more effective data management practices. Finally, cloud vendors push out frequent updates to their software so companies always have the latest technology.

Higher Performance. BCG experience across a range of clients suggests that large enterprises that move to the cloud effectively can improve delivery of IT services by 25% to 50% and free up scarce IT staff to serve business customers. The time involved in buying, configuring, and testing infrastructure radically shrinks.

For instance, cloud vendors have built global fiber networks that enable superfast provisioning and nearly instantaneous access to limitless storage and computational power. The cloud vendor, rather than IT staff, also conducts automated end-to-end performance and security monitoring. Meanwhile, IT staff can access intuitive state-of-the-art development tools provided by the vendor and open-source community.

Cloud vendors typically refresh their hardware every two years, compared with every four to seven years at most large enterprises, leading to a 20% performance improvement. This improvement comes via the benefits of Moore's Law, as well as from faster data retrieval and improved operating systems and virtualization software.

With the latest equipment, cloud vendors can offer highly reliable, scalable functionality at higher service levels and with increased automation. Vendors also provide detailed inventory and accounting of cloud usage and costs, allowing IT staff to simplify and standardize their computing footprint. (To be sure, organizations must manage the downsides of cloud computing, such as loss of control over when and how key features are rolled out and the availability of many different tools.)

The major public cloud vendors, such as Amazon, Google, Oracle, and Microsoft in the US and Alibaba and Tencent in China, are also pushing the envelope with such innovations as "serverless computing." (See the sidebar, "On-Demand Computing.")

ON-DEMAND COMPUTING

Vendors, constantly searching for the next cloud innovation, are offering serverless computing, which executes code on demand rather than in prepurchased bundles. (The code is still executed on a server, but the vendor owns it.) Serverless computing is also known as "functions as a service" (FaaS), and all the major vendors offer their own branded versions: AWS Lambda, Azure Functions, Google Cloud Functions, and IBM Cloud Functions. Rather than commit in advance to purchasing resources, the customer only pays when an event triggers the execution of code—for example, a file is stored or a user accesses a web page arrival. This delivery model works well in many different settings: cleaning up a data set, processing streamed data on the fly, or automating backups and other daily tasks.

FaaS is different from traditional cloud services in two critical and beneficial ways:

- Pricing is more granular and enterprises do not pay for resources that they are not using.
- Management is performed at the level of functions rather than virtual machines. Developers can focus on code rather than systems management.

The Most Common Cloud Workloads

As noted earlier, large enterprises tend to focus their cloud workloads on four primary use cases, each of which has a powerful underlying logic. For enterprises considering a move to the cloud, these four uses would be a good place to start.

Data and Analytics Platforms. The cloud's advanced technological capabilities make data and analytics an attractive choice for migration. A major global bank, for example, has selected Google Cloud as its default platform for detecting potential fraud and money-laundering activity, while a major European retailer is relying on a Microsoft Azure-hosted platform to generate customer insights. At least four types of data and analytics workloads fit on the cloud:

- **Artificial Intelligence and Machine Learning.** The major cloud vendors are among the leaders in scalable, commercial AI and machine learning offerings. In some cases, they offer algorithms that have already been trained with data, so they are already on the steep slope of the learning curve.
- **Distributed Parallel and Grid Computing.** Cloud vendors have the computing scale to offer these intensive workloads faster and at lower cost than most of their customers. A major investment bank, for example, reduced its liquidity calculations from hours to minutes on the cloud. Similarly, the investment banking arm of a large financial institution is using cloud-based grid computing to dynamically mark its book to market.
- **Stream Processing and Internet of Things Applications.** The cloud is well suited for applications that identify patterns and insights from devices and sensors in real time. A major North American logistics company relies on these cloud-based applications to reroute vehicles and optimize mileage. For particularly time-sensitive workloads, delivery on "fog computing"—which pushes computing capacity, data, and services closer to the connected devices—is emerging as an option to minimize latency. A major medical-diagnostics company is relying on this hybrid model to enable real-time monitoring of hospital patients.
- **Extract, Transform, and Load Data Warehousing Applications.** Large enterprises, including a large UK bank

and a US telecommunications provider, are increasingly using the cloud to clean up large existing data sets and to host their traditional data platforms (such as Hadoop) in order to improve performance and throughput. In addition, third-party data sets and web services are readily available on the cloud and easy to integrate into digital apps. Incorporating these features into on-premises applications would take much more effort and increase latency.

Platforms for Hosting New Digital Workloads. New digital workloads belong on the cloud. Full stop. The difficulties of migrating existing workloads to the cloud simply do not exist for new digital activities. Several large companies are taking advantage of this opportunity. For example, a global international energy and service company uses Amazon Web Services to host the infrastructure for its smart-home service, while Sky, a British satellite broadcaster and pay TV provider, hosts much of its mobile Sky Go platform for smartphones and tablets on Google Cloud. And a large universal bank is building digital channels for corporate clients with tool sets and designs available on Google Cloud.

Platforms for Transforming and Migrating Legacy IT Workloads. Enterprises typically start with applications that are "cloud ready" and hosted on distributed servers running Windows or Linux. A large steel manufacturer, for example, is moving distributed workloads to on-premises infrastructure managed by IBM's Bluemix platform as an intermediate step before moving to a public cloud. Société Générale is migrating 80% of its technology infrastructure to Amazon Web Services and Microsoft Azure by 2020, while Lloyds Bank in the UK is moving many of its application workloads to a private cloud.

Legacy workloads hosted on mainframes are typically the last to migrate. It generally takes at least three years to make these workloads cloud-ready. The timing is dependent on business ambition and constrained growth in legacy platforms.

Collaboration Platforms. The earliest workload of large enterprises to move to the cloud, collaboration platforms offer a relatively straightforward migration path. ITV, a British broadcaster, has introduced Gmail and Google's other digital development and communication tools to improve productivity, collaboration, and digital innovation. Similarly, a Big Four accounting and professional services firm moved to cloud-based collaboration tools so that teams bidding for work could become more efficient and effective.

How to Manage On-Premises Workloads

Large enterprise often still need to host some workloads on-premises for regulatory or redundancy reasons. But even in this context, they should design these workloads for the public cloud and then create a local version using Azure Stack or similar technology. This approach forces enterprises to focus on simplicity and standardization and on cleaning up data using management tools offered by cloud vendors. For enterprises that prefer to make the most of their on-premises cloud workloads, such vendors as Rackspace and Cycle Computing (recently acquired by Microsoft) can simplify the management of cloud infrastructure.

THE CLOUD IS the wave of the future for large enterprises. The technical, business, and cost benefits are too compelling to ignore. By embracing the cloud, business and technology leaders can bend the arc of IT toward value creation and customer satisfaction.

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