Application Migration to Cloud
Best Practices Guide

A phased approach to workload portability
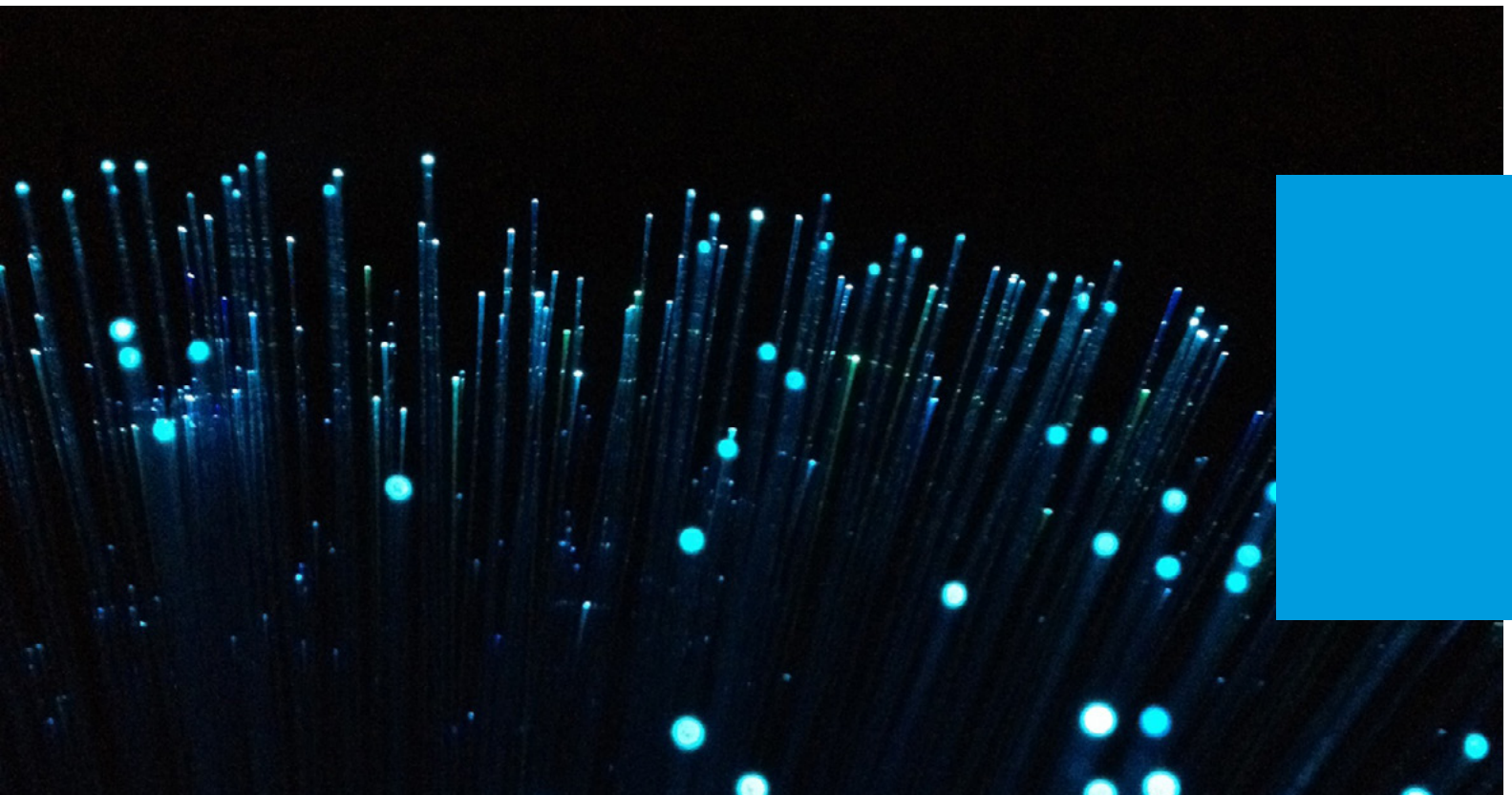

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Today's IT organization is expected to play a leading role in increasing revenue and margins, improving employee productivity, differentiating from the competition, and enhancing customer experience. All of this means that, in the modern enterprise, IT is a driver of business growth.

Traditional, siloed IT infrastructures can create barriers to achieving these objectives. The lack of flexibility is costly and increases the time required for IT service delivery. Business growth can also be constrained by poor application workload performance, which impacts employee productivity and degrades the customer experience.

Cloud alternatives

The public cloud provides an alternative to traditional data center architectures. It offers flexible infrastructure and on-demand availability that provides the agility to accelerate time-to-value.

However, many enterprises are reluctant to place data assets in the public cloud; they're concerned about security and control of those assets, as well as latency that can degrade application performance. Additionally, the cost of public cloud can become prohibitive as workloads grow.

Private cloud

As an alternative, many enterprises are migrating assets to private cloud infrastructure, providing the same agility as public cloud but maintained on-premises and under IT control.

- By the end of 2016, 56% of application workloads will be deployed in private or hybrid clouds[1]
- By 2018, more than 60% of enterprises will have at least half of their infrastructure on cloud-based platforms[2]
- For the period 2014-19, IT spending on private cloud will grow at a 14% CAGR, versus non-cloud IT infrastructure spending, which will decline at 1.4% CAGR[3]

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A hybrid cloud approach

Successfully leveraging cloud technology is a matter of finding the right mix of public and private cloud environments. A hybrid approach—one that provides a mix of public, private, managed, and traditional services—will allow IT to provide faster time-to-value and improved efficiency from the enterprise data center. At the center of this hybrid approach is your own private cloud, which provides the advantages of ownership, control, security, and economics.

The technology is readily available, and with best practice solutions, time-to-value for cloud migration is much shorter today than it was just a few years ago.

[1] Voice of the Enterprise Cloud Computing Customer Insight Survey, 451 Research, Q4 2014
[2] Roundup Of Cloud Computing Forecasts And Market Estimates, 2015<http://www.forbes.com/sites/louiscolumbus/2015/01/24/roundup-of-cloud-computing-forecasts-and-market-estimates-2015/#7a54256c740c>, Forbes, January 2015
[3] Report "Worldwide Cloud IT Infrastructure Spending Forecast to Grow 26% Year Over Year in 2015, Driven by Public Cloud Datacenter Expansion, According to IDC,"<http://www.idc.com/getdoc.jsp?containerId=prUS25732415> July 2015

Migrating workloads to private cloud empowers IT to achieve significant business outcomes:

- Redefine compute economics—Reduce IT costs by up to 40%, thus freeing up investment for new services that drive growth for the business.
- Accelerate service delivery—Deliver application changes 55% faster, accelerating IT's time-to-value for a more responsive business
- Enable continuous delivery—Utilize a DevOps approach for agile lifecycle management of applications within the data center that power the business
- Minimize "shadow IT"—Where needed, regain secure control of applications and data, and improve overall ROI by offering a better experience for the lines of business.
- Deliver on Service Level Agreements (SLAs)—With better control, predictability, and efficiency, IT can confidently exceed SLAs and evolve beyond a traditional cost-center relationship to a strategic partner with the business. The benefits are clear and proven, but the pathway to migration may not be as clear. Application migration involves many complex tasks, such as determining the right type of cloud for each workload, performing the actual migration process, and validating the migration to ensure connections, service levels, security, and performance are all maintained or enhanced.

Best practices for cloud migration

Enterprise IT leaders face myriad choices and decisions for cloud delivery models. There are several cloud alternatives: public, private, and hybrid (utilizing a combination of public and private). Each has its merits, so it is important to find the optimal strategy that delivers the right outcome for the business and the right operational efficiencies for IT.

Here are some critical questions for enterprise IT teams to explore:
- What is the best infrastructure for each workload?
- Are there workloads that should be "off limits" for cloud migration?
- How do we quantify the benefits of cloud migration?
- How do we prioritize workload migration?
- How do we conduct migration without disrupting current business?
- Is there a methodology that makes sense for untangling these questions?

A cloud workload portability methodology

Over the past few years, HPE has developed a cloud workload portability method based on five consecutive phases: Discovery, Suitability, Mapping, Migration, and Enablement. These phases help organizations understand what existing workloads are suited to the cloud, and how to then determine the right mix of cloud services for a business. These phases are described below.

Discovery

The first phase is Discovery, consisting of a set of processes, tools, and procedures that create a comprehensive view of the end-to-end IT environment. The Discovery process identifies workloads and the servers on which they run (physical and virtual), storage devices and databases used, resource-consumption patterns, networks and components, relationships and dependencies among all these entities, and finally the associated costs of ownership and operations.

Discovery answers three important questions:
- Are we ready for the cloud?
- What is the current application workload and technology landscape?
- What are the business priorities (i.e., the relative importance of applications)?

The Discovery process goes beyond simple asset identification through the use of on-site installed discovery tools (like HPE Universal Directory or similar tools). Data is gathered and analyzed to provide input into the next phase of the process, a Suitability assessment.

Tool capabilities during Discovery include:
- Dependency mapping with flexibility to provide multiple maps based on varied criteria
- Groupings of workloads by affinity, protocol, and other factors
- Network density planning (capacity needed)
- Definition of cloud-migration drivers (performance, lifecycle, etc.)
- What-if scenarios (for example, price modeling)
- Cloud cost comparison and optimization

*How do we prioritize workload migration?
How do we conduct migration without disrupting current business?*

In addition to creating an inventory of workload information, Discovery accomplishes three additional objectives: First, it detects any "shadow IT" activity, such as unsanctioned public cloud use by individual business units and any corresponding networking components. This allows a more comprehensive view of the existing environment. Second, the Discovery process engages stakeholders from outside IT in the transformation process and provides early insight into potential project risks. Third, Discovery identifies the relative importance to the business of each application, which helps in understanding the operational and strategic advantages of moving specific application workloads to the cloud.

Discovery provides a transparent view of the full scope of potential private cloud migrations with roughly an 80% degree of confidence, and a foundation for well-informed and confident migration decisions.

Suitability

The Suitability assessment is a formal study of the application workloads applying industry standards and best practices to determine which workloads should move to the cloud, which should not, and why.

Suitability answers the questions:
- Which workloads should we move to the cloud?
- What can we expect the costs and benefits to be?
- What technology is required for migration?
- Where is the low-hanging fruit?

The Suitability phase uses a combination of automated and manual approaches to assess workloads across four dimensions:

1. Business suitability—prioritize business and IT needs to gauge cloud-adoption feasibility at an organizational level

2. Financial suitability—establish the financial feasibility of cloud adoption and justify the ROI of application workload migration to the cloud

3. Technical suitability—map application characteristics to characteristics of cloud platforms to determine technical fit

4. Application functionality mapping—map application workload functionality to the cloud platforms of choice (mapping includes IT environment and application dependencies, workload categorization, automation of development and operations, reference architectures, and infrastructures)

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The Suitability assessment will determine one of four possible outcomes for each application workload reviewed:
- No benefit from moving the workload to the cloud
- Workload cannot functionally, technically, or economically move to the cloud
- No business or economic priority to move the workload to the cloud
- Workload is a migration candidate

The Suitability assessment will also determine the degree of difficulty in completing each workload migration, from simple one-step migration processes to more complex and phased approaches. The end result of this phase is a qualified list of workloads capable of running in target clouds and ready for a physical migration, including a predictable scale of migration scope and effort, the hardware requirements to host migrating workloads, and a clear view of costs, benefits, and ROI for each migration.

Mapping

With a list of candidate workloads for cloud migration, as provided by the Suitability assessment, you are ready to make decisions regarding final workload targets. Successful decision-making requires further review of the best migration-delivery models—in-house traditional delivery, private cloud, hybrid cloud, or public cloud. Mapping combines automated approaches with manual review to map workloads to their target platforms.

In the Suitability phase, we answered the question, "Which workloads are candidates to move?" Now, the Mapping phase takes that a step further and answers:
- Which workloads should we move to the cloud?
- What type of cloud should we move them to (private, hybrid, public)?
- What are the hardware/software requirements to make the move?

Mapping takes inputs from the Suitability assessment and uses analytic algorithms to evaluate the best target for each workload. For workloads that would be best suited to public cloud, the process also identifies potential cloud providers that would best meet workload requirements.

A compliance component of the review ensures that the recommendations meet privacy and security requirements. There will be cases in which workload

targets will be pre-determined. This can be driven by an enterprise's own strategy (e.g., a desire to bring everything in-house), compliance and regulatory requirements (e.g., security for government projects or HIPAA for healthcare), or other business reasons. Even in these special cases, applying Mapping may reveal conditions that will advise the enterprise to reconsider their previous decisions for the ultimate business benefits.

The Mapping process validates the assumptions made during the Suitability phase, providing IT with confidence in decisions on workload cloud-migration targets and ensuring strict compliance with privacy and security regulations. The result is an ordered set of workloads and workload groups, along with recommendations on the computing environment (including specific hardware requirements and configurations for private cloud hosting) that can best meet the workload/group requirements.

Migration

The fourth phase, Migration, moves the workloads from their sources to their target destinations. This activity requires the use of specialized software and results in intact and operational workloads at the destination locations (data centers or clouds) that can be immediately used. The Migration process answers the questions of how to move the targeted workloads to the cloud efficiently and how to mitigate risk in the process.

Typical workload migration can be a time-consuming, costly, and high-risk process. In enterprise environments, there may be thousands of workloads to move. Often workloads must be migrated one at a time and even taken out of production, disrupting business. Manual processes require highly skilled data-center resources. In addition, compliance and security can be compromised if software agents are installed or if workloads are shipped off-site to be re-platformed, which are both common practices.

The Migration process answers the questions of how to move the targeted workloads to the cloud efficiently and how to mitigate risk in the process.

A best-practice approach uses automated workload-migration service tools to migrate workloads or workload groups to their targets. Features to consider when selecting migration tools include:
- Agentless vs. agent-based approach
- Support for live migrations and bulk transfers
- Support for source and target platforms and hypervisors (hypervisor agnostic)
- Properties such as speed, reliability, scalability, usability, and security

Best-practice tools provide the capabilities for moving workloads quickly and in bulk (which is essential for tightly coupled applications) and can also move live application workloads without disrupting business operations. Benefits of an automated approach using the right toolset can include:
- Any-to-any environment migrations
- No disruption to operations
- No need for scarce skill sets to support migration
- Migration behind a firewall

The result of this process is a reliable migration of application workloads to the right type of IT environment.

Enablement

The final phase, cloud Enablement, validates the connections, service levels, security, and performance considerations of the newly migrated applications. The Enablement phase answers the questions:
- Were all the target workloads migrated successfully
- Did we achieve the expected value?

Once the designated workloads have been migrated, the next step is to validate that the migration was successful by answering the following:
- Are all linkages and connections between applications the same after migration as they were before?
- Are all SLOs/SLAs being met at the same level or better than before migration?
- Are all security and compliance requirements being met?
- Have all risks and threats been considered, analyzed, contained, and managed?

Essential to the migration process are answers these key questions: How do we move these workloads to the cloud efficiently? How do we mitigate risk in the process?

The Enablement phase ensures that your cloud-based applications perform at the same level of IT maturity or higher than before migration and that the applications continue to maintain and enhance the same business functionality that they supported before migration.

The Enablement phase introduces the next stage of IT planning to optimize operations in the cloud-computing environment. This can include optimizing workloads, refreshing IT processes to support DevOps, and enabling the developer community with continuous integration and continuous delivery (CI/CD) processes to adapt agile application lifecycle management processes.

Finally, the Enablement phase should set up your business to measure the effectiveness of your cloud initiative and to assess its ongoing value. That assessment includes:
- Did we achieve operational advantages in terms of cost, ease of use, etc.?
- Did we achieve strategic advantages (e.g., are we in position to build better products and services, have we improved sales capabilities, and do we serve customers better)?
- Did we achieve an economic advantage in terms of profitability?

Enablement guarantees that things work today and puts the business in position for continuous improvement moving forward.

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Summary: Cloud migration should be customized for your business

As you consider which of your existing workloads can be moved to a cloud environment, we recommend that you don't accept a vendor's "one size fits all" approach, if that is presented as an option.

Based on our experience, HPE instead recommends that businesses start the cloud migration process with the discovery of existing workloads and their unique characteristics. This information will feed into an analysis of migration feasibility to determine the most suitable workload delivery models (in-house private cloud, hybrid cloud, or public cloud). The next step is mapping effective tangible migrations that save time and money and reduce business risk. Since improvement is a continual process, we also recommend ongoing validation of migration results and benefits.