

How Cisco IT Plans and Executes a Large-Scale Data Center Application Migration

Moving applications and services between data centers aligns with business growth enablement and data center capacity and resiliency goals.

EXECUTIVE SUMMARY	
CHALLENGE	• Migrate ~1350 applications, 500 databases, and many related services into a new data center • Implement the migration in accordance with Cisco's capacity, resiliency, and IT transformational business requirements
SOLUTION	• Adherence to application migration framework, process and governance structure set forth in global data center program • Collaborative, cross-functional program structure with strong senior management support
RESULTS	• Throughout the migration, progress measured against baseline; metrics represent business requirements and overall health of the program
LESSONS LEARNED	• Put accountability on application owners for migration • Architect the desired migration end-state and use as a framework for decisions • Account for user experience before migrating

Cisco IT Case Study / Data Center / Application Migration.

Successful, large-scale application migrations must be carefully planned, documented, and implemented with close collaboration and communication between IT and business application stakeholders across the organization. This case study describes how Cisco IT plans and executes a large-scale migration of applications and services between data centers in accordance with business growth, capacity, resiliency, and IT transformational objectives set forth in the company's global data center strategy. Cisco customers can draw on Cisco IT's real-world experience in this area to help support similar enterprise needs.

Challenge

For all enterprises, minimizing disruption and mitigating business risk are critical to a successful large-scale application migration, such as moving from one data center to another. When Cisco moved data center operations from San Jose, California, into a new data center in Richardson, Texas, the migration involved approximately 1350 applications, 500 databases, and many related foundational (server, storage, and network) and platform application

(middle tier) services. Additionally for Cisco IT, the migration of applications and data center services must adhere to business-driven requirements defined in Cisco's long-term global data center strategy.

A cornerstone of Cisco's strategy is to enable business growth through optimized capacity, increased resiliency, and IT transformation. The global data center strategy is not simply about increasing capacity and resiliency today, or even in the near future. It is about enabling Cisco's business to grow into new products, new markets, and new theaters. Accordingly, the key strategic elements are delivered via integrated roadmaps, and an application migration approach that focuses on resiliency and transformation versus mass migrations.

"We have found that many companies first focus on capacity, then resiliency, and later attempt transformation. Cisco's global data center strategy is differentiated by our intent to deliver on specific capacity, resiliency, and transformation milestones simultaneously as opposed to sequentially over time," says Shaw-Jen Chang, senior director, IT, and co-director for Cisco's global data center program.

"The scope of a large-scale migration combined with infrastructure, application, and business transformational goals—while factoring in the latency impact and execution with close to no downtime—is a very complex effort to

plan," says Rajesh Bansal, senior manager, IT, Network and Data Center Services at Cisco.

To address the resiliency, capacity, and IT transformational business requirements put forth in Cisco's data center strategy, and meet the latency, portfolio management, and myriad other challenges inherent to a large-scale application migration, Cisco IT initiated the global data center program. Executing within the program's cross-functional, highly collaborative structure and governance model is integral to Cisco IT's successful data center migrations.

"Many data center programs build new facilities but have a difficult time migrating applications to them and making effective use of the data center assets," says John Manville, vice president, Network and Data Center Services at Cisco. The global data center program developed and implemented application migration framework, process, and governance structures, while applying metrics, and then used these to successfully migrate applications to the new data centers. I congratulate the team for making the migration a reality in a transparent way and adding significant business value."

Solution

Cisco IT Global Data Center Program

Under the auspices of the global data center program, Cisco IT collaborates with IT cross-functional groups and application and service stakeholders across the organization to help facilitate business growth through capacity and resiliency improvements, and IT transformation in the data center. Capacity involves not only building and occupying data centers but also optimizing demand and consolidating data centers, where appropriate. Optimized growth enablement is delivered through new technology and process innovations including virtualization, information lifecycle management, consolidation of network fabrics, server technology improvements, hardware refreshes, and through the sharing of network and data center infrastructure.

Resiliency improvements include increasing data center tiers, deploying a multi-site architecture, moving out of high-risk geographies, and improving availability and recoverability. In the area of transformation, Cisco IT is revamping its services approach to reflect that of an internal service provider, in which IT resources such as storage and compute power are accessed (delivered) as services cost effectively.

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The success of Cisco IT's global data center program relies heavily on senior management support. "For any application migration to be successful in this type of program, commitment from senior management is critical, and this includes VP level and above within the functional organizations and business units," says Kamal Gangwani, program manager, IT, Network and Data Center Services at Cisco, and a lead in the global data center program. "High-level management needs to understand the benefits of the program, why we're doing it, and what's in it not just for the functional organizations but for Cisco as a whole. Commitment from senior management will automatically give validation and help to focus a program structure. We're assured that sufficient resources will be put into the analysis, planning, and execution to make the migration successful."

Cross-Functional Program Structure

Cisco IT approaches application migration holistically, executing on the company's global data center strategy

through an IT cross-functional program structure. The structure encompasses a small program management office (PMO) that coordinates cross-functional activities to achieve operational priorities and objectives.

“At the onset of developing the program team, we determined a staffing strategy that would leverage existing functional and process expertise. We felt the best way for us to drive execution and deliver the vast amount of work was to take advantage of existing frameworks,” says Julie Finan, senior director, IT, Network and Data Center Services at Cisco. “This approach had a huge impact on driving adoption across our IT and business communities because they were already familiar with the way things worked. The ability to have the functional leaders matrix into the program ultimately set the aggressive pace of migrations. We are also finding a huge benefit at the end of program because we have little, to no, complex staffing transitions.”

Specifically, the global data center program PMO establishes and manages the program governance and organizational change management, monitors resources alignment and budget, develops and reports key program metrics, and provides the escalation process for program issue resolution and operations. An organization change management and communications team operates at the program level across four primary tracks:

IT buildout track. Delivers optimal capacity efficiently in advance of migration requirements and new business demand for all data centers.

Application migration track. Ensures that business applications and data services align with target data centers, and are architected, implemented, and operated at a level of resiliency defined in the recovery requirements. The application migration track is composed of a cross-functional virtual group that depends on collaboration between the application and infrastructure teams for success. Specifically, the application migration track is responsible for:

- Planning strategy and scheduling to create the migration timeline/roadmap.
- Planning cross-functional reporting by the IT business partners, IT Demand Clearing group (capacity management), and the Enterprise Release Management Organization (ERMO).
- Project execution and application migration status tracking and reporting.

Technical capabilities track. Drives, validates, certifies, and introduces new transformational and foundational capabilities to first client adopters in line with the global data center strategy and in partnership with multiple IT organizations.

Data center operations track. Delivers the critical foundational data center-related management capabilities, methodology, technology, skills, and processes to enable service and IT transformation.

Execution occurs across all four tracks.

Cisco IT is the conduit for planning, facilitating, and reporting on all aspects of the migration to IT cross-functional groups, including data center management and operations. Across the organization, Cisco IT communicates often with the owners of the applications and data services being migrated, who are referred to as global business process (GBP) partners, to ensure that they are prepared for the migration, and to represent and support them during planning and delivery of their applications and services to the new data center.

“GBP primes” are assigned to the global data center program to represent their functional organization. GBP primes are responsible for coordinating the end-to-end application migration for their GBP’s application portfolio, which includes planning, scheduling, prioritization, funding, resourcing, execution, normalization, and decommission.

In addition to the program activity and management across the four primary tracks, the following teams provide

input throughout the application migration process:

Project DeVirt team. Addresses capacity constraints with a focus on improving energy and data center efficiencies, decommissioning un-utilized servers, and virtualizing servers as required.

Resiliency team. Develops a resiliency framework (see section below) that encompasses application business criticality tiering and resiliency success metrics, and drives execution of the framework in partnership with the IT GBP teams.

Implementation operations team. Focuses on moves, changes, and deployments of new network, hosting, storage, and unified communications infrastructures.

Architecture team. Maps the strategic imperatives to a scalable infrastructure architecture through capability transformation, and champions its adoption.

Acquisitions team. Drives and delivers new infrastructure capabilities that align with the needs of Cisco's acquired companies and partners, in collaboration with data center management. Special considerations for applications being migrated from a Cisco acquisition site to the new data center are factored into the migration planning process.

Resiliency Framework

A cornerstone of the resiliency framework is the ability for Cisco IT to provide an acceptable level of continuous service operations in the case of unplanned occurrences. It includes delivering high availability during planned and unplanned changes, continuing most and restoring all services with minimal impact in a small-scale data center loss, and continuing mission-critical and restoring all services in a large-scale data center loss.

To ensure that each application and service being migrated has the appropriate level of resiliency, the resiliency team and IT GBPs collaborate and develop a framework that encompasses:

- An end-to-end resiliency process.
- An architecture schematic that includes a mechanism for identifying business criticality of applications and services.
- Governance to ensure adherence to global data center resiliency compliance standards. IT GBP teams use the resiliency framework to complete compliance standards for each of their applications and services migrating to the new data center.
- Exception management to ensure that lack of adherence to compliance standards is reviewed and approved.
- Education to ensure that all IT teams understand the resiliency framework components.

Application Migration Planning Strategy and Framework

Migration Planning Strategy

Careful, comprehensive, upfront planning goes a long way in helping to shorten the duration of a migration, and reduce impact and risk to the business (e.g., application downtime, performance degradation). The migration plan details all the applications and services that will be moved, and where, how, and when they will be moved.

The migration planning process generally involves determining the migration requirements, identifying a framework that takes into account application owner and system / hardware requirements in the current and future data center environment, and creating and documenting the migration plan. Planning is developed in partnership

with IT and data center operations stakeholders, with transparent, collaborative management of interdependent project functions and related inputs and outputs. Planning typically begins three to six months in advance of the relocation.

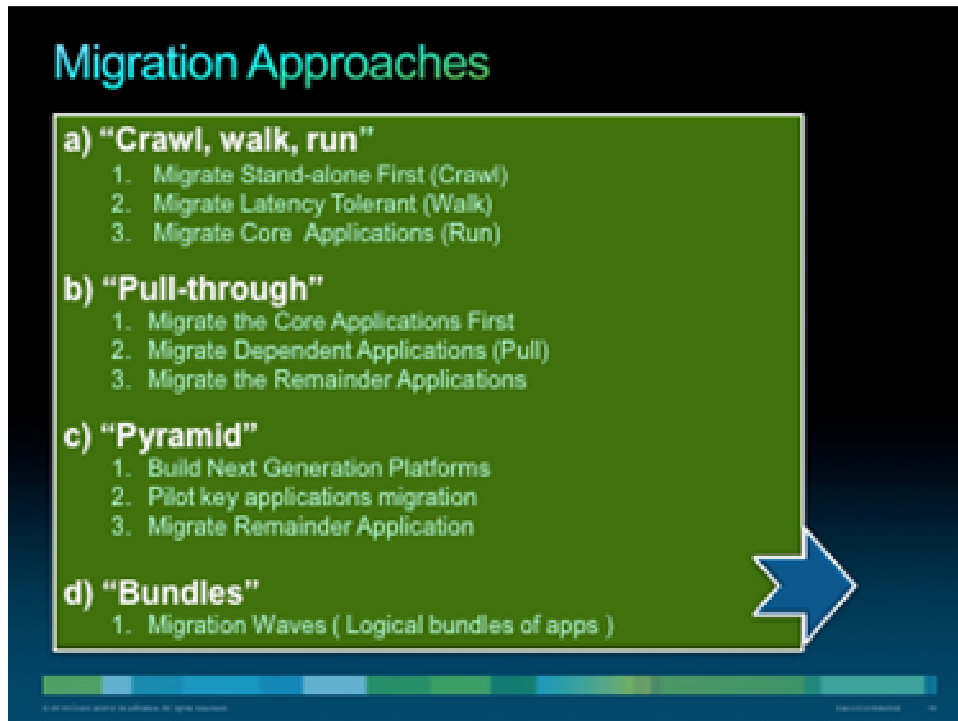
Cisco IT's application migration planning strategy encompasses the following program objectives and guidelines:

- Develop, utilize, and manage a repeatable, scalable, and defined process to move existing applications to the new data center.
- Use an inventory template for data gathering and application bundling. The inventory correlates each piece of hardware, operating software, application, and client. There needs to be a clear understanding of how the applications being migrated interact with other systems and applications, and the interdependencies should be included in the inventory.
- Leverage the latest reference guides, application migration checklists, and roadmap planning collateral.
- Adopt a quarterly planning cycle: two quarters ahead of go live, roadmap four to six quarters visibility.
- Align integrated roadmap bundle (logical grouping of applications) with ERMO quarterly and non-quarterly releases.
- Engage with application migration project managers and capacity management representatives to determine the number of applications that can move based on resource and funding allocations.
- Integrate planning with the resiliency and DeVirt teams.

Migration Options

Cisco IT does not assume a one-size-fits-all approach to any application migration, but rather assesses each migration approach based on the individual application type and migration requirements (Figure 1).

Figure 1. Application Migration Approaches



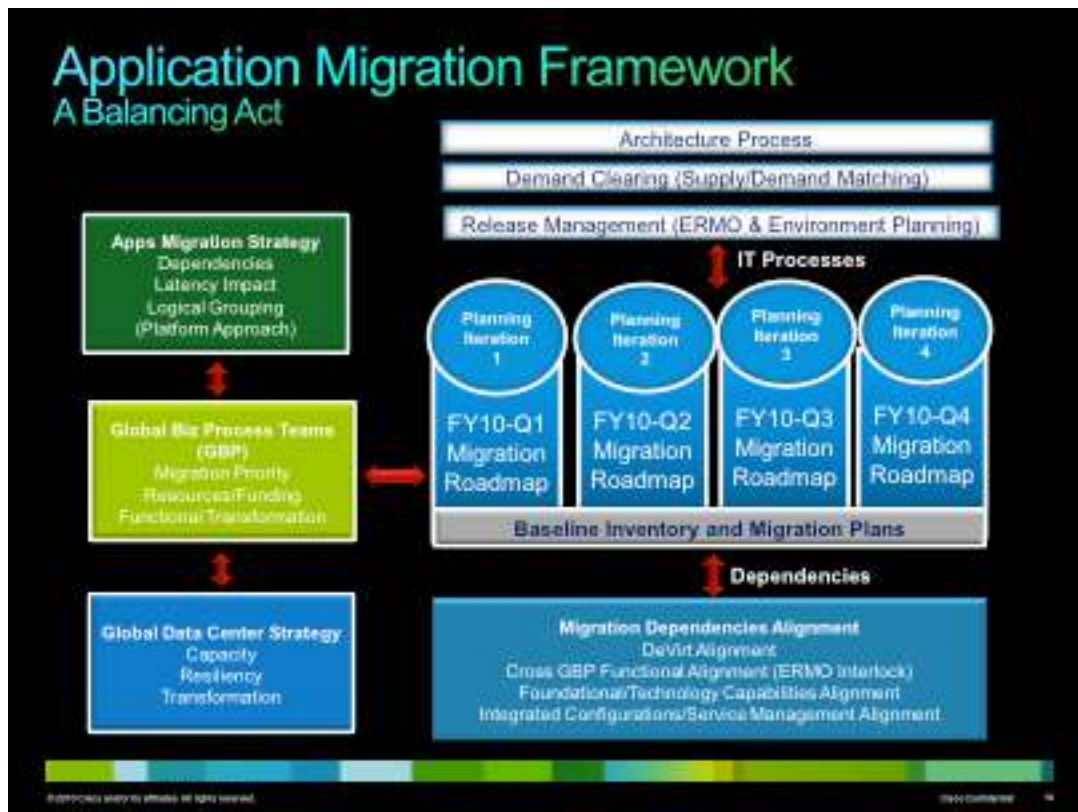
In planning for an application migration from one data center to another, Cisco IT considers the following transformation options:

- **Re-architect** applications, as needed, to operate optimally within the new data center environment. To contribute to overall system resiliency, applications are re-architected with failure and automated graceful recovery in mind.
- **Retire** sunset applications and platforms.
- **Consolidate** similar applications (e.g., reduce number of versions, instances, products, packages and functionalities, etc.)
- **Hot swing** applicable applications. Involves setting up compatible hardware in the new data center and quickly switching over the applications that require minimal downtime (e.g., duration typically minutes to two hours).
- **Cold migration** of applicable applications. Involves setting up replacement hardware in the new data center for applications that can be offline for a longer duration; migration can be up to one day.
- **Lift and shift** applicable applications. Involves physical move of existing hardware and applications to the new location. It allows for multiday downtime and is typically used for all non-business critical applications.

Migration Framework

Cisco IT is directly responsible for developing and executing an application migration framework that includes cross-functional engagement by multiple processes and functions (Figure 2). The purpose of the framework is to operationalize the migration process, facilitate adoption of the framework by documenting and communicating to all stakeholders, and gain economies of scale by leveraging a standard migration process.

Figure 2. Cisco IT Application Migration Framework



IT Application Migration Engagement Team

Cisco IT formed the Infrastructure Application Migration Engagement (iAME) team to provide pre-engagement consulting to the GBPs who are migrating their applications and services to the new data center. Pre-engagement consulting consists of:

- Assisting GBPs in putting together a high-confidence migration roadmap aligned with business, functional, architectural, and infrastructure foundational capability (technology) roadmaps by analyzing their entire end-to-end application portfolio.
- Validating application dependencies as identified by the GBPs and IT and recommending additional dependencies identified by infrastructure stakeholders.
- Providing performance and latency impact analysis based on application dependencies provided by the GBPs, and the migration strategy and technology stack changes.

"The iAME team encourages great collaboration between the GBPs and various infrastructure teams, who can come together and formulate a game plan and clear footprint of how applications should be laid out in the new data center," says Venkat Chandrasekar, project manager, IT, Advanced Technology Services at Cisco. "The iAME team also has helped make demand clearing a much easier process. Through multiple discovery meetings with the GBPs and IT subject matter experts on the iAME team who own some of the application bundles slated for migration, we have been able to streamline demand clearing and complete the commits even faster."

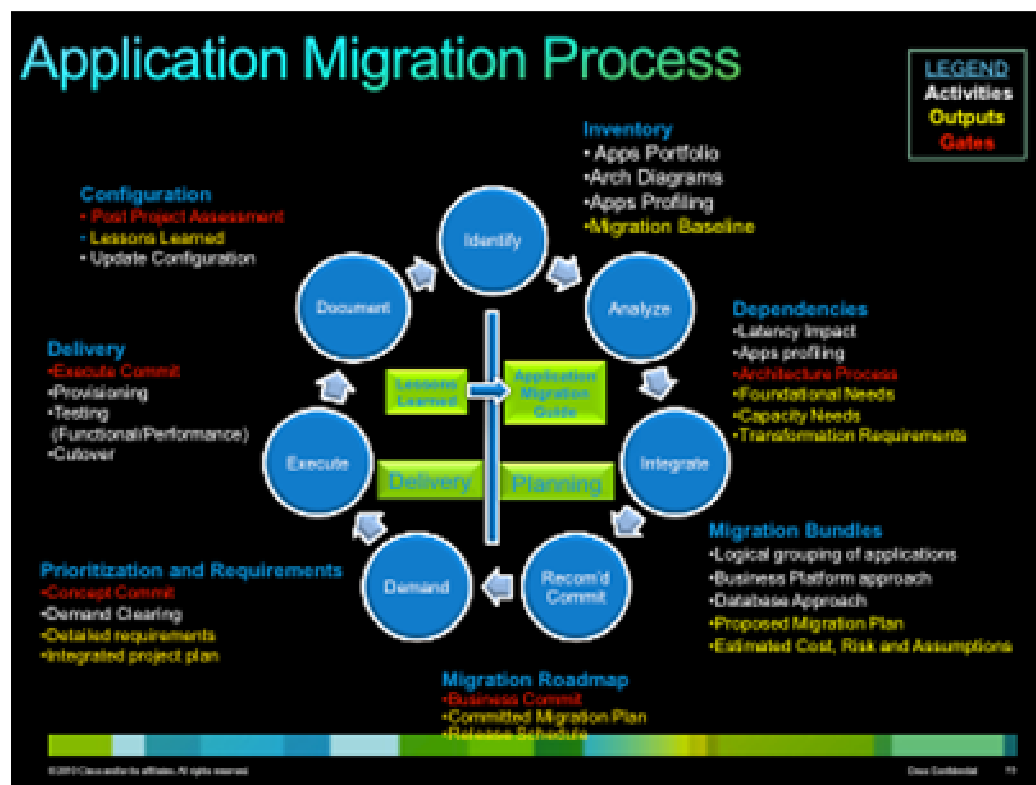
The iAME team focuses not only on merging infrastructure technology roadmaps with application migration roadmaps but also on helping to consolidate source databases into fewer targeted databases that are more

scalable, resilient, easy to manage, and cost effective for Cisco. “This approach helps us to plan required capacity for both immediate migrations as well as future migrations,” adds Chandrasekar. “By understanding the entire portfolio of applications, we can recommend the right level of performance and latency testing, which if not done early enough can slow down or stall migrations due to unacceptable business service-level agreements.”

Migration Process and Deliverables

Figure 3 depicts Cisco's application migration process and corresponding deliverables. The purpose of the process flow is to provide GBPs guidance on the steps required to complete a migration.

Figure 3. Application Migration Process and Deliverables



The migration process and delivery steps are defined as follows:

- **Identify** the scope of the migration in the current cycle. This step involves collecting application inventory from all GBPs targeted for delivery in the current planning cycle (typically three to four quarters from the current quarter), third-party application dependencies, internal application dependencies, and other application environment details.
- **Analyze** the application inventory received in the previous step. Validate the feasibility of migrating the application in the current cycle, and analyze all dependencies, establish processes for data migration, and determine the level of transformation. Understand the latency impact of moving the applications to the new data center, and compatibility with services and virtualization efforts in the new environment.
- **Integrate**, which involves taking the applications that passed all the criteria for the current planning cycle

and organizing them into closely coupled bundles that can go through the execution as a single entity. Baseline the migration roadmap, and apply enterprise architecture policy and process and compliance standards.

- **Recommend/commit** involves taking the various migration bundles identified by the GBPs and organizing them into waves that can be implemented as part of the ERMO release schedule. ERMO facilitates the discussion to assemble the individual GBP roadmaps into an integrated release roadmap.
- **Demand** involves capacity and release management process teams creating an execution plan that can be implemented for the current release cycle.
- **Execute** on the plan created in the previous steps and proceed through the various project lifecycle gates until the application go live. Facilitate change requests as needed and verify application readiness.
- **Document/support** involves updating the new configuration in the configuration management database, which is the single source of truth for all of the applications, and documenting lessons learned throughout the migration process. Such documentation helps train staff and simplifies the next application migration.

Program Governance

Program governance is largely facilitated through a series of regularly scheduled collaborative forums. The forums facilitate accountability among the various GBPs, application owners, and data center stakeholders throughout the entire application migration process.

Steering committee. Composed of IT cross-functional vice presidents, the steering committee meets biweekly and oversees the overall status and health of the global data center program by monitoring critical path items, metrics, and escalations.

Operating committee. Composed of IT cross-functional directors, the operating committee meets weekly and oversees the roadmap and migration activities.

Change advisory board. Composed of program and application stakeholder representatives, the change advisory board provides support for integrated change control by reviewing and approving or rejecting requested changes, and helping to assess and prioritize changes. Change requests are reviewed in the weekly Global Data Center Program Review Board meetings.

GBP primes planning meeting. Weekly meeting attended by the IT GBP primes assigned to the global data center program to represent their functional organization. They help ensure that the migration plan stays on track and that projects corresponding to their organization are moving forward. Representatives from infrastructure, such as demand clearing and implementation, are also at these meetings

“The weekly primes meeting is a great collaboration forum for both the GBPs and the infrastructure teams,” says Chandrasekar. “GBPs can bring attention to migration issues or escalation points in their organizations, and infrastructure teams can get the migration challenges they’re facing heard by the GBPs. This regular exchange helps provide the migration teams with clear direction on how to proceed.”

Delivery tracking meeting. Weekly meeting attended by delivery project managers from the infrastructure and GBP teams. They track infrastructure provisioning required for migration per the migration plan.

Cross-track meeting. Weekly meeting attended by global data center program track leads. They provide the status of their track, highlighting issues and risks.

Results

Reporting and Metrics

Throughout the migration, Cisco IT tracks and reports progress of the migration, measuring it against the baseline and keeping a pulse on confidence in the migration plan through periodic surveys. The application migration track also has performance and efficiency metrics to improve the migration process.

Cisco IT's metrics represent several aspects of the migration, including resiliency, capacity, IT transformation, and overall program health. The "plan to commit" metric, for example, shows how well the application migration plan measured up to the actual execution. For each phase of the release schedule (e.g., quarterly), IT compares the number of applications planned for migration in that release period to the actual number of applications that migrated.

Lessons Learned

From its own experience, Cisco IT offers the following takeaways for organizations embarking on an application migration in the data center.

- Put accountability on the application owners for migration. Infrastructure should collaborate with application owners to plan and execute the migration.
- Architect the desired migration end-state and use as a framework for decisions.
- Plan for infrastructure and application transformation, and consider custom infrastructure requirements during the planning process.
- Take into account latency and performance impacts early in the planning process.
- Depend on iterative planning processes to continuously align with changing business requirements.
- Account for the user experience before migrating. Build mechanisms into the process that will help ensure that the migration is transparent and disruption-free for users.
- Remember that one size does not fit all. Assess the migration approach based on individual application type and migration requirements.
- Reassess each migration release. Document lessons learned.

For More Information

How Cisco IT Migrates Critical Applications from HP Superdome to Unified Computing System:

http://www.cisco.com/web/about/ciscoitwork/data_center/docs/Cisco_IT_Case_Study_OracleMigrationtoUCS.pdf

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