



Consolidation Methodology

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Consolidation Methodology

Editor's Note - This article is the complete fourth chapter of the Sun BluePrints™ book, *Consolidation in the Data Center*, by David Hornby and Ken Peple (ISBN #0-13-045495-8), which is available at www.sun.com/books, amazon.com, and Barnes & Noble bookstores.

When we first started working on consolidations, we quickly realized that we needed to define a methodology that was simple, complete, and that could be used repeatedly. We needed a methodology that didn't require us to reinvent the wheel each time we started a new project. This sounded like a complex task; however, when we broke consolidation into component parts, it became clear that the individual steps were things that we and our customers do every day.

The methodology discussed in this chapter is generally used for consolidating servers and applications, but the same steps and techniques can be applied to other types of consolidation (for example, storage, network, and shared services consolidations).

This chapter addresses the following topics:

- “Following a Consolidation Methodology” on page 2
- “Completing Project Phases” on page 8

Following a Consolidation Methodology

This section examines the basic methodology that we have followed in our consolidation projects since 1997. While the methodology is based on the simple concepts of assess, architect, implement, and manage, there are several nuances to its application in a consolidation project.

In addition to these four phases, we also include a short, business-oriented assessment at the front end. We call this additional piece a feasibility study because, in many ways, it assesses whether or not a consolidation is feasible.

The following graphic shows the specific areas to address during each of these phases:

Feasibility	Assessment	Architecture	Implementation	Manage
Business objective	Application	Application groupings	Application	Enterprise management
Success criteria	Servers / OS	Server architecture	Servers	Optimization
Target servers	Storage	Storage architecture	Storage	Monitoring
Target storage	Network	Network architecture	Network	Infrastructure
TCO/ROI	Security	Security architecture	Security	Security
	Infrastructure	Infrastructure	Infrastructure	○ ○ ○
	TCO/ROI	TCO/ROI		TCO/ROI

FIGURE 0-1 Detailed Phases of Consolidation

Note – This section of the chapter is devoted to helping you understand the big picture of the overall consolidation process. Specific information about performing the tasks required to complete each of these phases is presented in the chapters dedicated to each of these topics.

Determining the Feasibility of the Project

During this phase, you create a feasibility study that defines the customer's business objectives and the expected results of the project, defines the project scope, and simulates the expected reduction in total cost of ownership (TCO) and the expected return on investment (ROI). The documentation you create during this phase is an essential tool for selling a consolidation project to executive-level decision makers.

Assessing the Current Environment

Assessing the current environment is the most frequently overlooked, yet important phase of an implementation project. During this phase of consolidation, study and document the current environment to provide the basis for the architecture phase of the consolidation project. Because no consolidation environment is a “green-field” data center, this assessment is vital to the success of the overall consolidation. The goal of the assessment phase is to ensure that all of the assumptions made during the business justification phase are proven, and that all of the requirements and dependencies for the architecture are documented. This documentation is the deliverable for the assessment phase of a consolidation project.

To provide complete documentation of the current environment, you must address the following major topics:

- Application requirements
- Platform requirements
- Storage requirements
- Networking requirements
- Security requirements
- Infrastructure and operations requirements

There are two dangers during this phase of the project. The first is that you may perform too cursory an assessment, failing to uncover significant dependencies, which could jeopardize the consolidation viability. This oversight may lead to expensive architectural revisions or even to the failure of the project during the prototyping phase. The other danger is that you may perform too detailed an assessment, wasting time on minutiae that are not relevant to the consolidation. This detailed effort can reduce project momentum and negatively affect the return on

investment. Unfortunately, it is difficult for a project manager to judge the depth of the assessment without substantial experience in the environment or other consolidation projects. Information about gauging the level of detail you should apply to the assessment phase is presented in the assessment chapter.

Assess Application Requirements

Application profiling is the most important and difficult part of the assessment phase. Just as the TCO drives the business side of consolidation, application requirements drive the technical side. Because this profiling is so important, we recommend that most assessments begin with this task.

Typical tasks for this part of the assessment include:

- Interviewing application owners and maintainers
- Describing major software components
- Creating a flowchart of network inputs and outputs
- Describing an operational schedule
- Identifying and describing important dependencies
- Creating a road map for the future growth of the application

During this assessment, document all of the various aspects of the application. This documentation is the deliverable for this assessment.

Assess Platform Requirements

Platform assessment has dual purposes. The first is to simply document the hardware and its configuration. The second is to determine its utilization and capacity. While this seems more complicated than application assessment, most of the hard work can be automated.

There are many tools that document systems for you. Of course, in a well-managed information technology (IT) shop, all of this work is already done. Unfortunately, few of us actually work in well-managed IT shops. As such, some kind of system inventory package needs to be deployed. This package can range from simple shell scripts to elaborate framework modules like Tivoli Inventory.

Topics to examine during this assessment include:

- Verifying inventories
- Assessing technical configurations
- Estimating utilization
- Assessing physical environmentals (electrical, footprint, HVAC, etc.)

Security topics are addressed during a separate security assessment.

Assess Storage Requirements

Storage assessment is very similar to platform assessment. In fact, in many consolidation projects, platform and storage assessment might be undertaken as a single task using the same manpower. However, with the burgeoning complexity and sophistication of enterprise storage, we believe this should be a separate task in its own right. This condition is especially true in environments that employ storage area network technology.

Again, the deliverable for this part of the assessment is a report that covers the technical findings, corporate standards, and storage architecture road map for the current environment, as well as a capacity plan.

In addition, you should assess requirements for the following types of storage:

- Online storage of applications and data
- Near-line storage for disaster recovery
- Offline storage for backup

Security topics are addressed during a separate security assessment.

Assess Networking Requirements

When assessing network requirements, gather relevant information about the communications capabilities necessary for server or application consolidations. This information usually involves an assessment of configuration and performance requirements.

Topics to examine during this assessment include:

- For configurations, assess the topology and technologies utilized for the network.
- For performance, assess throughput, bandwidth, and latency. Ideally, you should gather this information for each server or application in the consolidation.

Assess Security Requirements

Consolidated environments can present some complex security problems. Just as platform and storage assessment can be performed as one task, security can be considered part of operations. However, with the ubiquitous Internet connections present in almost every major data center, security cannot be emphasized enough. As such, we recommend that you break security into its own assessment phase. This separation emphasizes security needs and highlights the need for specialized assessment skills.

Security assessment should focus on the following four major areas:

- Security operations
- Security policy and standards

- Security procedures
- Security implementation

The deliverable from this assessment is a written report that addresses the four areas of assessment. This assessment is also a very good candidate for outsourcing.

Assess Infrastructure and Operations Requirements

Infrastructure assessment looks at the intangible parts of the IT environment. This assessment includes the operations, physical environment, and supporting services necessary for the computing environment. Sun PS typically provides a service called Sun Ready Availability Assessment that performs much of this assessment. However, it is important to keep in mind that during this assessment, we are looking forward in the consolidated environment to the future requirements for that environment. We are not looking backward at the needs of the current environment. As such, even the best data centers will be lacking in various areas. For example, if the computing environment consists entirely of department-level servers (like Sun Enterprise 450 servers), the administrators are probably inadequately trained to assess the operational complexities of a Sun Fire 15K server. We feel this assessment is the second most important part of the assessment phase. While these deficiencies should not directly affect the short-term success of the project, they will play a huge role in the long-term success of the consolidated environment. This assessment is often a candidate for outsourcing unless you have significant experience with consolidation.

Document Requirements and Dependencies

Once you complete all of the assessments for an application, create a summary document that contains the high-level requirements and dependencies for the consolidation. Include this information in a recommendation from the assessment team that explains why an application is or is not a good candidate for consolidation. Present this document during a milestone meeting that takes place between the assessment phase and the architecture phase.

Designing an Architecture for a Consolidated Environment

The architecture phase utilizes the requirements and dependencies identified during the assessment phase to design a new consolidated environment. This phase includes the following tasks:

- Creating an initial solution
- Prototyping that concept

- Revising the initial solution
- Documenting the solution

While this is the normal methodology for designing any computing environment, there are some specialized components to this architecture methodology. Most of these components are covered in Chapter 8; however, it is important to understand that this architecture phase may not be as in-depth as it would be if you were creating a “green-field” architecture.

Implementing the Consolidation

Taking the results of the assessment and architecture phases, it is now time to actually execute the consolidation. Careful planning and comprehensive testing are key to the execution of this phase. While this task may appear daunting the first time, it is actually the easiest part of the consolidation.

Most implementation phases can break down into six major tasks. They are:

- **Specify.** For this task, analyze the architecture and identify the hardware and software configurations required to realize it. In many organizations, this is when a “build specification” is created.
- **Build.** With the build specification in hand, install and configure the hardware and software. This task includes physically installing hardware, loading operating systems, and basic testing for applications and functionality.
- **Test.** Testing is the key to the implementation phase. There are two parts to this task:
 - The first part involves testing the built hardware and software to ensure they meet the standards required to begin the migration or consolidation. (This process is probably already a standard within most organizations.)
 - The second task is specific to migrations and consolidations. This task involves testing the migration and consolidation methodology, and requires you to complete multiple runs of migration and functionality testing. You can then script and time the entire migration, or consolidation, to ensure that it can be run within the amount of time you have.
- **Tune.** Tuning for the new platform and operating environment needs to be applied to the application, server, and operation procedures to ensure the new environment works in an optimal mode. This process includes adding resource management tools and techniques to control resource utilization in the new environment.
- **Train.** Administration staff need to be trained on the operation of new equipment, software, and procedures used in the consolidated environment. We recommend that you begin training during the implementation phase, so staff can be useful during the deployment. Oftentimes, training is conducted in concert with the build task of this phase.

- **Deploy.** After building the consolidated environment, training the staff, and testing all migration and consolidation plans, migrate (or consolidate) your environment. This task includes migrating applications and data, as well as testing the new environment.
- **Document.** With the new environment tested and in place, update all old documentation to accurately represent the new environment.

As you can imagine from the preceding description, this phase tends to be heavily dependency-driven. It provides the greatest test of your project management abilities.

Managing the Consolidated Environment

After the consolidation has been implemented and taken into production, there is still plenty of work to do. Managing the consolidated environment often requires dramatically different technologies and procedures than were required by the pre-consolidation environment. During this final phase of consolidation, follow the recommendations from the infrastructure assessment performed during the assessment phase, and plug any gaps that have appeared in the new environment.

Completing Project Phases

The key to successfully using this methodology is to complete each phase before you begin the next one. Further, you should always ensure that you not only complete each phase before moving to the next, but that you do so in the order presented in this chapter. To understand the consequences of ignoring these recommendations, consider the following analogy.

Imagine that you are building a new house and you have found the perfect site, and have hired an architect to design your new home. After a short while, you get impatient and take the plans (which are incomplete) to your contractor. The contractor recommends that you wait for the architect to complete the plans, but you want to get started. Responding to your desire to proceed, the contractor pours the foundation and begins framing the house. Then, the architect tells you that he has identified building code issues that necessitate changing the first draft of the plans. Because you didn't allow the architect to complete the planning phase before the contractor began implementing them, and because changes must be made to the original plans, the contractor has to tear out what he has done and must start over. This is an expensive mistake, which is time consuming and frustrating. You would have been better off waiting until the plans were completed.

Consolidation is much the same. If you use a complete methodology and don't stray from it, you'll be successful. If you don't, it's likely that you'll have problems.

Related Resources

This article is the fourth chapter from the Sun BluePrints book *Consolidation in the Data Center* (ISBN #0-13-045495-8). Refer to the book for more information about the topics presented in this article.

About the Authors

David Hornby has been with Sun for five years in Sun Professional Services (Sun PS) and in Sun's Global Sales Organization. While with Sun PS, he specialized in server consolidation and data center consulting, helped develop the Sun PS consolidation methodology, and participated in the sale and implementation of multiple server consolidation projects. David currently focuses on consolidation and TCO strategies. Prior to joining Sun, he spent 25 years in IT with an emphasis on providing IT solutions to business problems. He has over 10 years experience managing IT organizations at the CIO level.

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