When it comes to adding IT resources to an existing infrastructure, businesses typically acquire servers, storage and applications on a project-by-project basis. The reason for this is that it is easier and more logical to do, as a project's requirements are smaller, bounded and simpler to size than taking all existing assets into account. While the cost of equipment acquisition may be low, the complexity of supporting many resources is high.

In a recent poll by IT research firm Gartner, approximately 90 percent of IT staff has indicated that they are currently planning to consolidate their IT assets. It is estimated that about 80 percent of all IT operating costs are due to ongoing technical and end-user support of an entire IT infrastructure. That leaves 20 percent for server and storage capital acquisition. If consolidation of IT assets represented a return on investment (ROI) on fixed costs in one year, then reevaluating the entire IT infrastructure is compelling.

In order to consolidate the entire IT infrastructure from end to end, CIOs must consider the following:

- Physical facilities
- Servers
- Storage
- Applications
- Networks
- Remote offices
- Technical and end-user support

Of course, this is not the complete picture. There are other consolidation considerations. For example, load balancing, computing support resources such as file and print services, Web services and other intranet services should be included. Here we'll focus on two of the primary and costliest technologies and their reduction in cost: server and storage consolidation. What follows from this consolidation exercise is a marked reduction in not only support costs but application support and application license costs as well.

**Best Practices**

Determining which servers and storage farms should be consolidated must be done in a step-by-step, ordered approach. The resultant roadmap provides the company with an action plan. The action plan provides guidance before, during and after the actual consolidation. The following is a set of recommended steps toward successfully planning for and completing a server and storage consolidation program.

**Step 1: What resources are redundant?**

- Identify those resources that duplicate functionality and can be concentrated in fewer physical entities. Here, redundancy means duplication of services; it does not mean those resources that are used as mirror sites or function as backup and disaster recovery sites.
- Conduct and collect server and storage profiles. This includes configurations, usage logs, storage layout, application datasets and user groups.
- Compare each resource's services with all other servers and storage in the company's intranet. If business functions are duplicated between two or more resources, then the servers and storage devices so identified are consolidation candidates. However, be certain to confirm that if the resources analyzed are remotely located, then the performance and response times of those remote resources being centralized or consolidated does not decrease.
- Prioritize which resources are the best candidates for centralization and consolidation, taking into account departmental functional boundaries, availability of service levels and performance considerations.
- Confirm whether LAN (local area network), MAN (metropolitan area network) and WAN (wide area network) bandwidths will be sufficient to support a proposed change to the infrastructure. Include in the total cost of ownership (TCO) calculation (see below) and fold these requirements into the design phase (Step 3).
- Verify that required levels of security — authentication, authorization, audit and accounting, integrity and confidentiality — are preserved. In some cases, the changes due to consolidation will require different methods of security or increased levels of security. Ensure that these findings are included in the TCO calculations as well as the design phase.
- Perform the cost analysis on existing infrastructure, including capital acquisition, depreciation, maintenance and support over three to five years. That is, perform an analysis of the TCO.
- Perform estimated cost savings on those resources that may be consolidated.
Step 2: Business case for consolidating resources

- Determine where consolidated resources can be reasonably implemented. It is critical to include representatives from each department or functional area that will be affected by these proposed changes. (It is prudent to include these people from the start so as to achieve consensus and buy-in.)
- Present cost-benefit analysis to executive staff along department and business process boundaries first. Summarize total cost savings (both variable and fixed) of the total savings.
- Calculate TCO and project ROI.
- Indicate the phases within which the consolidation plan will be designed and implemented.
- Above all, make certain that the consolidation plan includes backup and disaster recovery support; this should have been done prior to the consolidation planning. However, one must be sure not to expose the company to a disaster scenario that was already accounted for in the pre-consolidation environment.

Step 3: Design the approved consolidation plan

- Confirm the consolidation plan with all department and business process managers.
- Finalize the order in which the consolidation roadmap will be executed.
- Architect and map out the physical and logical topologies.
- If load balancing of servers and storage has already been implemented, determine whether the need to balance loads over the to-be-consolidated systems and resources is warranted.
- Grid computing architectures may have already been implemented. If so, it was done to provide a level of load balancing and resistance to failure, thus maximizing availability for a particular department or business process. Connecting multiple server and storage nodes may still be needed. Resource consolidation should include this design consideration, but physically collocated in the same physical data center.
- Outline data and resources migration plans.
- Predict potential failure scenarios and prioritize their probability of occurrence.
- Confirm that network bandwidths and security levels are sufficient.

Step 4: Develop policy and procedure plans

- Create new set of policies for the consolidated environment. This includes responsible persons by department and business process.
- Rewrite business processes support policies, including availability, backup, restore and disaster recovery, accounting for the cost of that support and business need. In essence, the company is writing its own service level agreement (SLA) to itself.
- Determine technical support procedures for newly architected intranet.
- Document data migration procedures from the data and resources migration plan outline (Step 3).
- Document contact and escalation personnel for each department, business unit and critical business process.
- Capture security policies and procedures. Highlight these throughout the plan.

Step 5: Implement new infrastructure

- Notify each department and business process manager as to the schedule of test, quality assurance and production environment implementation. This is sometimes referred to as the “go-live” plan.
- Execute the phased consolidation plan as per the published implementation schedules.
- Configure each consolidation subunit (i.e., by function or departmental boundary). Put into place in a pre-production environment. Do not bring the plan into the production environment until test and stability steps are done (Step 6).
- Test or “burn in” newly acquired and configured resources. Time to burn-in will vary; a general rule-of-thumb is three to five days.
- After consolidated resources are observed to be stable, bring them online into the production environment. Continue to test for accessibility and performance.
- Reinitiate load balancing in new architecture where appropriate and applicable.

Step 6: Evaluate consolidation implementation

- Conduct a debrief session with department and business processes management as to the behavior of the new architecture. Obviously, the post-consolidation levels of functionality and performance must be the same or better than the pre-consolidation environment.
- If functionality and performance metrics are degraded, escalate issues to technical support for resolution.

Step 7: Monitor consolidated resources

- This is the logical best-practices step after the implementation and evaluation steps. An historical record of behavior, availability and performance will show areas for improvement or modification.
- Use network, systems and storage management tools to capture events and normal operations.
- Review and modify operating expenses along with the accompanying impact on the previously calculated TCO and ROI.

Step 8: Iterate consolidation implementation where needed

- Once historical data is assembled and reduced for reporting purposes, any weakness in the plan and its implementation will be found. Also, changes to the model are expected as business needs and priorities change over time. Moves, additions and changes are part of the everyday fabric of any IT data center.
- Determine where improvements should be made and what cost impacts will occur as a result of any iterative change.
- Review and modify operating expenses along with the accompanying impact on the previously calculated TCO and ROI.
• Decide whether any iteration is justified by business need at this time.

**Step 9: Plan the work and work the plan**

A successful consolidation plan includes the previous steps: planning, cost justification, support of real and expected business needs, preservation of IT functionality and performance, and protection of intellectual property. The recommended best-practice steps encompass the most common considerations when initiating server and storage consolidation. Only these two primary areas of consolidation were discussed, as they represent the greatest investment in an IT infrastructure.

As mentioned above, the major percentage of the investment is in support and maintenance costs. Only 20 percent of an IT data center’s fixed expenses are due to hardware and software. Other factors include the cost to support or build out a data center, pay for or lease the building housing the data center, provide telecommunications services, or supply power, heating, ventilation and air conditioning. And the majority of the expenses incurred are still due to server and storage support.

**The final test of a successful consolidation is:**

1. Was the design well planned, and was it followed throughout the process?
2. Were availability and performance levels preserved or improved?
3. Did the successful implementation of the IT data center’s consolidation result in measurable and sustainable cost savings?

Your company’s consolidation efforts should result in an affirmative answer to all three of these questions.