

IndependentAssessment

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Capacity Management: A Continuous Practice for Boosting IT Infrastructure ROI

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This paper is intended for IT directors, CxO's, storage managers, and non-IT personnel who are responsible for ensuring smooth IT infrastructure operation and performance

Executive Summary

Organizations are seriously hindered in managing their IT Infrastructure for optimal CAPEX and OPEX by their inability to answer the most basic questions about IT infrastructure resource usage. Unable, for example, to say with any certainty how much storage capacity the organization actually is using today and how that compared to a year ago, managers have no way to predict how much storage the organization will need next year.

This inability to identify and monitor resource usage leads to a number of problems. System downtime increases due to unanticipated resource constraints. Even before that application performance may suffer as the applications begin to run short of system resources. Administrative overhead increases as staff scramble find, deploy, and reallocate resources. Meanwhile the organization's work is being disrupted.

Despite the problems associated with a lack of effective capacity management, few organizations practice capacity management and planning as an ongoing management discipline. This results partly from the labor-intensive nature of the capacity management discipline and partly from the lack of automated, multi-vendor, enterprise-scale tools.

Although often associated with storage, capacity management addresses the entire end-to-end IT infrastructure of servers, switches, various appliances, network bandwidth, and applications. Effective capacity management must keep pace with the growth of all the elements of the IT infrastructure, not just storage. It also must take into account business and market factors that can impact infrastructure performance and availability

Capacity management tools are sorely needed and the requirements finally are becoming clear. A few vendors, such as Hewlett-Packard (HP) have introduced enterprise capacity management tools that reduce or eliminate the manual effort involved in capacity management and planning. The HP Storage Essentials Suite provides a set of integrated heterogeneous functionality along with a portfolio of value-added modules to enable organizations to monitor, plan, analyze, manage, and report on storage usage.

Where organizations have deployed such capacity management tools, the results have been impressive. An IT manager at a major life insurance and financial services company reports: *"HP's automated capacity planning showed us how much unused capacity we had on the floor. It allowed us to increase storage utilization and get to the point of just-in-time storage."* That's a point every organization should want to reach.

Introduction: Can you answer these questions

If the CEO asked you these questions today, could you answer?

How much server and storage capacity do we have now?

How much did we have last year, last month, last week?

Which are the fastest growing applications?

How much is actually used and who uses it?

How much will we need to purchase next year?

At a time when IT infrastructure like storage is taking up an ever increasing amount of the total IT budget, these surely are critical questions. Yet even a surprising number of IT managers cannot answer them with any accuracy. Except in the most general terms, they simply don't know how much storage they have. They certainly won't know who the biggest users are or what they actually are doing with it or how fast usage is growing. As for next year, forget it. Of course, most business managers wouldn't be able to answer, but that's not surprising. The same questions can be asked of servers, switches, and network bandwidth and the responses would be similar.

The answers to questions like these impact everything from the performance of the organization's critical business applications to the company's ability to introduce new products and services to its ability to understand the return on its IT investment. To effectively answer questions like these the organization needs to practice ongoing capacity management and planning.

This paper will:

- Describe the importance of capacity management as an ongoing practice
- Review common capacity management practices
- Identify the challenges of capacity management
- Introduce technologies and automation like HP Storage Essentials that address the challenges
- Highlight the IT and business benefits
- Provide practical steps to better manage capacity

Ultimately, it will show you how to answer the above questions with accuracy and confidence.

Capacity management impacts everything

IT infrastructure costs are spiraling out of control. With the increasingly low cost of server, storage, and network hardware over the past decade, it became very easy for companies to simply throw more IT resources, more storage, more servers, more switches at every situation. Rather than try to manage storage capacity, for example,

managers figured it was cheaper to buy more to solve an application performance problem than to do the painstaking and labor-intensive work to identify existing idle storage capacity and reallocate and re-provision it. Managers did the same with servers and network switches.

As a result, IT infrastructure is growing at startling rates, as much as 50-100% a year, sometimes more. Compounding matters, over provisioning is rampant. At the same time IT resource utilization is low, as little as 5-10%. Often more than half of the IT resources sit idle.

This situation results from the lack of effective capacity planning. Capacity planning isn't rocket science. Rather it is a basic management discipline that, in the simplest terms, identifies resources, monitors usage, and, based on that and other factors, tries to project future resource needs. Without effective capacity management and planning organizations suffer from a number of IT problems. These include:

- Over buy/over provision storage, servers, bandwidth—since it seems easier and cheaper to just buy more and throw it at every problem, organizations do. Often budget policies—spend it or lose it—encourage this.
- Poor performance—while some applications have resources to spare other applications are hitting their maximum resource thresholds, which degrades performance.
- Increased likelihood of system downtime—applications suddenly run out of resources and crash, which results in costly and disruptive downtime and leads to a wasteful scramble to acquire, find, and reallocate the particular resource.
- Higher IT overhead—although the resources initially may be cheap to buy, deploying and then managing them on a daily basis add considerable administrative overhead.
- Reduced ability to plan for the future—without knowing how much resource actually is being used, it is impossible to ascertain with any accuracy how much will be needed going forward.
- Reduced ability to control costs—valuable resources are likely sitting idle or underutilized. Since management cannot readily identify idle resources, they cannot be put to productive use.

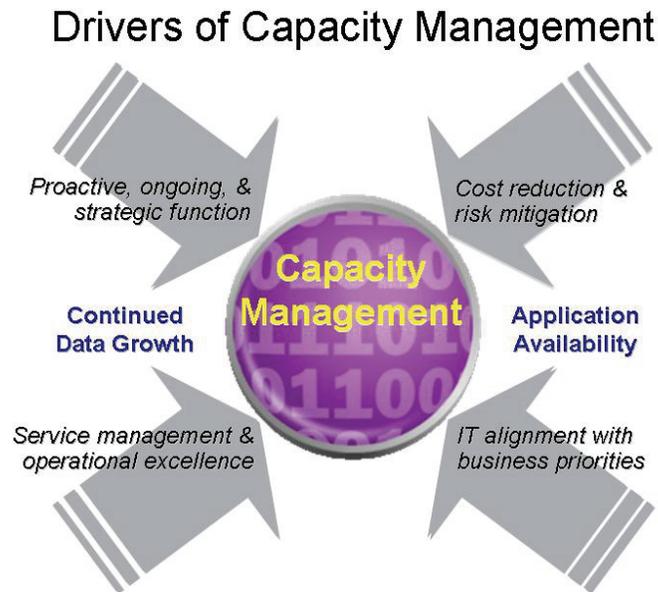
6 steps to effective capacity management

1. Identify your current capacity demands
2. Continuously report what you had last year (last month, last week) and which users and applications consume which resources
3. Calculate utilization (as a percentage of the resource)
4. Identify under/over-utilized and unused resources
5. Apply intelligent analytics based on historical trending (ignore anomalies)
6. Deploy automated SRM provisioning and capacity management tools as appropriate

Beyond the direct IT implications, the lack of effective capacity management impacts the organization's general business planning, budgeting, and forecasting efforts. In the end, the bottom line suffers given the importance of IT in organizations today.

Common capacity management practices today

Although the lack of effective capacity management clearly impacts organizations many fail to make a consistent or sustained effort to practice capacity planning and management. Although not complicated capacity management can be labor-intensive, especially without the use of automated tools.



Continued data growth and demand for application availability are driving the need for ongoing IT resource capacity planning and management

Today organizations are likely to follow one or more of these approaches to capacity management:

- Do nothing—just as it says, these companies can't answer the questions above and don't worry about it until an auditor or a crisis forces them to confront it.
- Hit or miss—companies make sporadic, typically one-time efforts in response to a specific crisis. Once the crisis is resolved, they go back to whatever they were doing before, usually nothing.
- Manual log checking—a labor-intensive process in which somebody has to access each device to check its log. Sometimes the logs are downloaded into a spreadsheet and consolidated. Often, however, they are simply printed out, annotated by hand using pencil and paper, stuffed into a binder, and forgotten.
- Vendor-provided tool—organizations turn to an automated tool provided by a vendor, often their primary server or storage vendor. Such a tool is better than the above approaches, but it typically is limited to that vendor's devices.

- Multiple disparate tools—here the organization deploys tools from multiple vendors, each focusing on the vendor's resource. The tools, typically, do not communicate with each other. Instead, administrators need to jump from tool to tool, each with its own management console, which results in a highly fragmented view.

The ideal approach is to deploy a single, automated enterprise tool. Such a tool would monitor multiple devices from different vendors. It would pull the data into a single management console where it can be viewed and assessed in a normalized fashion. From there it would be a straightforward step to add analytics for historical trending or forecasting. Other tools enable thin provisioning, a technique that lets an organization more fully utilize its existing storage capacity, thereby delaying the need to acquire more.

Applying Capacity Planning: Does this sound familiar?

Through capacity planning, companies can avoid the situation ABC Manufacturing, a hypothetical company, found itself in when it needed to ramp up production for a new product line and its ERP system suddenly ground to a halt. With media promotions for the new item breaking and distributors clamoring for product, ABC suddenly couldn't move production through its system.

This could have been easily avoided if ABC had followed these simple capacity management steps:

- 1) Continuously monitor what you have. ABC had 120TB of storage capacity in total, which should have been more than enough.
- 2) Determine utilization overall and by critical application. At ABC utilization was generally low, 24TB amounting to 20% utilization, leaving it with 96TB of unused storage. It did not, however, drill down to individual key applications. Managers felt they had plenty of capacity to spare.
- 3) Understand service level constraints for key applications. ABC's ERP system had 10TB of storage allocated to it but was using almost 8TB, nearly 80% utilization. To maintain service levels, the ERP system needed 20% capacity to spare. Otherwise, performance would slow or even halt. The ERP system was at a danger threshold.
- 4) Anticipate changes in workload and be prepared to reallocate IT resources as necessary. The new product was projected to increase revenue by 10% in the first year. That represented a major ERP workload increase. ABC already was dangerously close to the ERP service level threshold but nobody realized it.

Without capacity planning managers at ABC panicked and fired off rush orders for 50TB of costly new storage, a 40% increase in storage. Now the company had 170TB overall and immediately allocated 10 TB of the new storage to the ERP system. Even assuming the ERP system would use all 10TB of the new storage ABC still had a low utilization rate of about 20% since it had bought far more storage than it needed.

A better strategy would be to use capacity management tools like HP Storage Essentials to see which applications were near resource capacity thresholds and which had resources to spare. Then ABC could reallocate resources to balance utilization. If ABC had done that all along, it could have avoided buying the additional 50 TB in the first place and still met current and future ERP service levels by reallocating unutilized capacity it already had.

HP commissioned a leading research firm to study the issue and it turned up similar findings. In the study a company running a 50TB storage environment could save more than \$1.8 million over three years through automated storage resource management/capacity planning. A much larger storage environment, one with several hundred terabytes of storage, found that the biggest payoff came from increased capacity utilization. Specifically, improved storage utilization enabled the company to reduce annual storage growth from 60% to 30%, effectively avoiding the purchase of many terabytes of capacity. Overall, the company was able to identify and resolve inefficiencies that allowed it to achieve savings of \$20 million over five years for each 100 terabytes of deployed storage capacity.

The power of effective capacity management

Capacity management helps the organization in a number of ways. To begin, capacity management, when combined with the latest automated tools, can minimize the amount of IT infrastructure it buys and free administrators for other tasks.

In the same way, it enables the organization to make capacity management a standard part of its ongoing operating procedures. Because much of the data collection, asset discovery, mapping and other activities can be automated, they can be performed on a regular schedule without taxing staff resources.

In addition to the resource acquisition and labor savings, there are other advantages to capacity management. These include:

- Addressing the heterogeneous IT infrastructure—automatically discover and track the many different systems and devices from myriad vendors and find and collect the necessary data. Simply logging into that many different systems otherwise can be a trying undertaking.
- Handle rapid infrastructure growth—every month, quarter, and year brings demands for more IT resources. Enterprise capacity management makes it possible to cope with skyrocketing amounts of data, applications, and users.
- Increase staff efficiency and productivity—enterprise capacity management tools take over the labor-intensive, skill-intensive tasks of accessing, finding, collecting, and analyzing data from multiple systems.
- Accurate data—to be useful the collected data must be accurate and timely. Capacity management ensures this.
- Consistent historical data record—once data is collected tools can normalize and combine it with other data to create a historical record over time. Without such a record, trend analysis is impossible.

- Sophisticated analytics—once collected the data must be analyzed. Trend analysis is one type of analytics. Forecasting is another. No PhDs necessary.
- Flexible management reporting—resource usage data is useless if nobody looks at it. The right tools put data into meaningful, readable, and flexible reports that managers can use.
- Reliable hardware, software, management projections—allows control over IT purchasing by identifying the rate of utilization and consumption, effectively slowing the need to buy or over-provision IT resources.

Among both general and IT top management capacity planning usually is not a priority until there is a crisis. With effective capacity management and planning, however, organizations can avoid such crises and the costly and disruptive scramble that follows.

That said, it quickly becomes clear that capacity management, especially at the enterprise level, benefits from a technology-based solution. There are point products that collect some data for one device or another, and there are reporting and analytic tools that can generate useful reports once data has been collected.

Organizations looking to automate the capacity management and planning process find themselves trying to cobble together multiple device management products, data repositories, diverse analytics, and various reporting tools. Since fully integrating this variety of tools is difficult at best, administrators still must manually pull together the data and massage it for analytics and reporting.

Ideally, what they need is an automated tool that meets the following criteria:

- Designed for wildly heterogeneous environments
- Capable of rapid scaling
- Automates discovery and topology mapping
- Performs ongoing, regularly scheduled consistent monitoring
- Provides flexible data reporting with alerts and thresholds
- Retains data for historical trending
- Supports sophisticated analytics for trending and forecasting
- Offers flexible management reporting
- Allows for fast deployment and simple management and usage

In addition, organizations may want such capabilities as correlation with chargeback tools and integration with asset management and license management tools.

HP Storage Essentials meets these criteria. Heterogeneous, it scales in all dimensions—capacity, performance, discovery, reporting, multi-vendor support—to keep pace with rapid data growth and heterogeneous infrastructure change. It automatically discovers and graphically maps storage network topology, provides and extensive customizable

library of reports, monitors storage usage, and extrapolates trends to forecast future needs.

Of course, automation isn't the full answer. A proactive approach to capacity planning requires people be involved. People need to interpret the data collected by the tools with an eye toward broader issues ranging from the likelihood of an acquisition to activity in the product development pipeline to other factors that will affect the market and the company going forward. Any of these factors can impact infrastructure performance, availability, and demands on IT resources.

Benefits of capacity management

Capacity management provides benefits across three broad areas: 1) cost savings, 2) improved performance/increased uptime, 3) better management decision making.

Capacity management saves money through the identification of underutilized and idle resources. Companies often are surprised to discover they have gigabytes of unused storage they had forgotten about. Once aware of these resources, they can use them to delay future purchases.

Organizations also experience labor savings through automated capacity management tools. Administrators can be more productive, enabling each administrator to handle more storage or more servers. The automated tool saves administrator time, freeing them for other work.

Capacity management enables better performance and avoids system downtime by helping to ensure that all applications and systems have sufficient resources. The tool alerts managers before resource consumption reaches a level that impacts performance or brings down the system. Alerted in advance, they can reallocate resources or acquire and deploy new resources non-disruptively.

Finally, capacity management tools enable better IT decision making through flexible management reporting and analytics. Managers know the resources that are being used and the rate at which they are being consumed. When combined with other information, such as plans for new product introductions or new business acquisitions, managers can make intelligent, informed forecasts of when they will need more resources and how much. In short, they will know how much they have and be able to accurately gauge how much they will need in the future.

From a business standpoint, organizations can expect the following payback:

- Reduced CAPEX by delaying future IT investments
- Improved ROI through greater resource utilization
- Increased productivity through automation, which reduces OPEX
- Smarter purchasing and lower prices through planned acquisitions, aggregated purchases for volume discounts, and avoidance of rushed orders
- Improved overall productivity through better system performance, less downtime

Summing up the benefits of capacity management delivered in her organization, an IT manager at a major life insurance and financial services company reports:

“HP’s automated capacity planning showed us how much unused capacity we had on the floor. It allowed us to increase storage utilization and get to the point of just-in-time storage.”

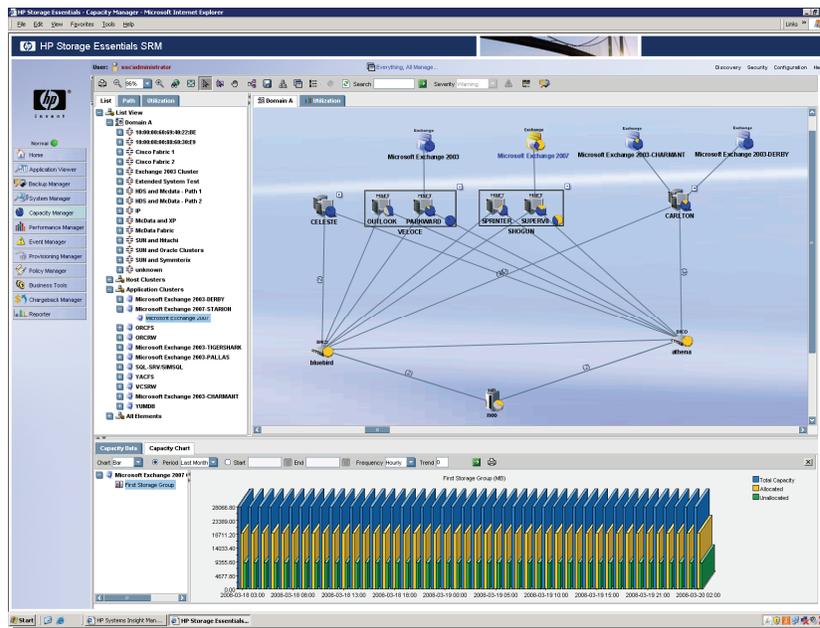
Would your organization like to get to that point? The lesson of ongoing capacity management is clear: Capacity management can pay off big in IT investment savings, increased systems performance and availability, higher staff productivity, and better IT decision making, and it all starts with the ability to accurately answer those pesky questions and keep answering them as the environment changes.

Appendix 1: HP Storage Essentials Enterprise Edition

HP Storage Essentials Enterprise Edition is a family of open standards-based SAN management and storage resource management products that enable an organization to quickly and simply visualize, monitor, report, provision, and manage its heterogeneous storage environment.

It delivers a number of features and benefits:

- **Visualization**—Automatically discovers and maps the storage network topology and pictorially displays objects, paths and zones between an application and the LUN on which the corresponding data resides.
- **Reporting**—An extensive library of reports satisfy requirements related to capacity management and planning, performance management, asset management and chargeback. Reports can be customized and scheduled for automatic e-mail distribution.
- **Capacity management**—Monitors availability and utilization at host, switch and array. Historical trends are extrapolated to forecast future capacity demands and identify areas that are under-utilized.
- **NAS management**—Provides comprehensive Network Attached Storage (NAS) management capabilities for HP ProLiant Storage Server (NAS) and NetApp® network storage solutions. Lets managers visualize their distributed NAS solutions while unifying SAN and NAS management.



HP Storage Essentials Capacity Manager for Exchange

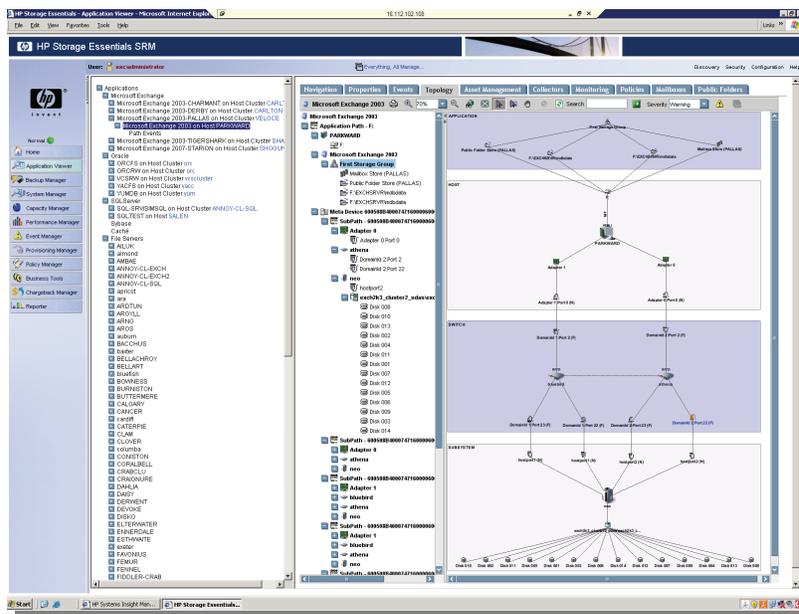
- **Application viewers**—Allows managers to monitor the capacity and performance of Oracle, MS SQL, Sybase, MS Exchange, and InterSystem's

Cache databases so they can anticipate and pinpoint the root causes of capacity, performance and availability problems.

- **Backup management and reporting**—Extends HP Storage Essentials Suite with powerful backup resource management and reporting, ensuring health and performance of your data protection infrastructure. Reports on statistics such as backup resources, success/failure, SLAs, backup volume, job size and client history. Supports HP Data Protector and Veritas Netbackup applications.

HP Storage Essentials Enterprise Edition includes the following components to help with capacity management and planning:

- **File System Viewer**—automated scalable, file-level storage resource management (SRM) capabilities for file servers connecting to direct-attached storage (DAS), network-attached storage (NAS) or storage area networks (SAN); provides the file system scanning, analysis and reporting capabilities needed to reclaim wasted disk space, verify file server availability, monitor user consumption and classify unstructured data for ILM initiatives



HP Storage Essentials Application Viewer for Exchange

- **Report Designer**—visual custom reporting capabilities for any audit, service level management, planning and communications needs by providing an intuitive design environment that facilitates the creation of sophisticated reports for storage consolidation, capacity planning, asset management, chargeback, SLA management and other IT initiatives; includes tables, cross-tabs, charts, invoices, forms and sub-reports that can be customized using intuitive interfaces and tools
- **Global Reporter**—roll-up reporting capabilities that deliver aggregated views of distributed data center storage for enterprises that implement multiple instances of the HP Storage Essentials; summarizes key storage statistics from different elements in the storage infrastructure to enable more efficient

management of enterprise-wide storage operations and strategic IT initiatives such as capacity planning and data center consolidation

- Chargeback Manager—asset management and accounting capabilities that associate storage infrastructure costs with business initiatives for the purpose of accelerating the ability to accurately meter utilization, calculate and control storage costs, increase revenue, and differentiate service offerings to better meet customer demands; leverages the HP Storage Essentials unified database of application, host, fabric switch and storage system connectivity information to effectively manage the costs of storage services, whether following asset-based or depreciation-based methodologies.
- Exchange Viewer—real time application-to-spindle monitoring of the performance of Microsoft Exchange from message stores through the SAN to storage system disks, discovers and highlights messaging dependencies on Windows hosts, HBAs, fabric switches and storage systems; enables the pinpointing all the components needed for daily operations or to recover from a system crash.
- Database Viewer—real time application-to spindle management of Oracle, Sybase , Microsoft SQL Server and InterSystem's Cache databases for capacity, performance and dependency management; automatically discovers Oracle databases, tablespaces and files; Sbase databases, devices and files; and MS SQL Server databases, file groups and files; and graphically depicts their dependencies on the SAN; represents the path each element takes through mount points, host servers, volume management software, HBAs, fabric switches and storage systems in a single, integrated view
- NAS Manager--visualize and centrally manage distributed storage capacity, performance, health, and dependencies; provides a common platform for managing DAS, NAS and SAN infrastructure; automatically discovers storage assets; collects a wide range of capacity, performance and configuration details; and maps the topology. IP network connections to devices as well as Fibre Channel connections to SAN fabric switches and storage systems for NAS gateway configurations in a single, integrated view
- Backup Manager--an optional plug-in that extends backup resource management, monitoring and reporting to improve the health, capacity utilization and performance of the data protection infrastructure; reports on statistics such as backup resources, success/failure, SLA, backup volume, job size and client history; maps backup dependencies on SAN resources, and extends topology to tape libraries and drives and backup servers

For more details go to: www.hp.com/go/storageessentials

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