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↙ your next...

Physical Servers

Midmarket organizations considering physical server upgrades must evaluate their environments, sift through offerings and integrate the servers with existing tools.

BY GREG SCHULZ

- + Needs and Requirements
- + Understanding Your Options
- + Putting It All Together

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EVALUATION

Needs and Requirements

When contemplating a server upgrade, consider your IT environment, growth potential and whether virtualization is for you.

When is it time to buy a new server—and what exactly do you need? Whether you've made this decision already or someone else has tasked you with the assignment, buying a new server for your IT department can be a long process. There are a number of different types, models and options, including blade centers, freestanding floor models, 1U rack mounts and more—not to mention your options if you're considering a virtual or cloud-based environment.

And that's just scratching the surface: There are myriad options to consider, including packaging, functionality, interoperability, performance, availability, survivability, capacity, energy efficiency and the economics associated with servers to navigate.

To guide you through these complex efforts, we will cover three important components:

- ▶ Determining needs and requirements.
- ▶ Understanding your options.
- ▶ Putting it all together.

There are many types of physical servers with various features, functions, costs and other attributes, just as there are a diverse set of business and application needs. To find the right server, first understand your business and application requirements. With this

information, aligning various server functionalities to meet or exceed these needs becomes easier.

To get started, determine what the rest of your IT infrastructure environment looks like. Include how many servers you have, what operating systems and applications are installed and what tools and features you are looking to add.

On the acquisition front, do you typically buy from only one manufacturer, or different ones depending on the specific acquisition or application scenario? Do you have all Hewlett-

Packard Co., Dell Inc. or IBM servers, or a mix of them, all running various applications or operating systems? Likewise, is yours an all-Microsoft shop, or do you have a mix of vendors, software and tools?

What does your IT networking environment look like, both locally and for remote or Internet access? For example, if you have 1 Gigabit Ethernet (1GbE) to your existing servers, but you also have a switch that supports 10 GbE, you could include 10 GbE on your new server. On the other hand, if your existing network is not 10 GbE capable, you would have to upgrade those items.

Understanding your networking capabilities is also important if you plan to leverage cloud-based servers, which require networking service in order to access the applications running on them. Likewise, if you're looking to deploy a virtual desktop infrastructure, your network must be able

to support the traffic and activity hosted on your new server.

Additional questions to ask include:

► **How are you currently protecting your IT environment and all associated data?** What are your current business continuity and disaster recovery plans, and do you have requirements to enhance your application (and data) availability or survivability via server clustering or other means? Have you started to consolidate or virtualize your application servers; if not, are you planning to?

► **Do you need to support specialized devices or items attached to your servers?** Are there specific requirements for special keyboard, video, mice, USB or serial ports; CD or DVD drives; networking devices; RAID cards; third-party graphics; or specialized adapters?

With adapter or expansion cards,

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→ SERVER CATEGORIES

- Small, floor-standing towers or rack-mounted 1U and 2U servers.
- Medium-sized, floor-standing towers or larger rack-mounted servers.
- Blade centers and blade servers.
- Large floor-standing servers, including mainframes.
- Specialized fault-tolerant, rugged and embedded processing or real-time servers.
- Virtual servers or virtual machines (VMs) running on physical servers.
- Cloud servers (essentially a VM service offering).

for example, many new servers come with peripheral component interconnect-enhanced (PCI-E) capabilities, along with some backward-compatible support for PCI-X (the predecessor to PCI-E). The adapters you need for your new server will factor into the packaging or the amount of expansion capabilities necessary.

► **Do you have a growth- or capacity-forecast plan that reflects business objectives and future demand?**

A performance and capacity plan can be a simple and straightforward way of showing what you had in the past, including usage or historical trends, as well as current and predicted

usage needs. Capacity plans and forecasts can assist in factoring your availability, server response time, storage, networking and software licensing requirements, as well as current and future energy demands.

► **Could you benefit from tiered servers?** There are many different types of servers and a plethora of packaging options, processors and features. Generally speaking, different servers are aligned to different categories, classes or tiers of business and application functionality (see “Establishing IT Services Using Tiered IT Resources,” below). For example, the top tier serves the needs of the

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→ ESTABLISHING IT SERVICES USING TIERED IT RESOURCES

Categories of services can be established to meet different business objectives, and then aligned with proper technologies. The following sample chart can be used for servers, storage and other technologies to meet specific service-level agreement objectives.

TIER 0

- \$\$\$\$
- Mission critical
- Business cannot function without
- Time sensitive
- Highly available
- Low RTO & RPO
- Must be secure
- Time is money
- Downtime is a lost opportunity

TIER 1

- \$\$\$
- Business essential
- Some impact to business
- Good availability
- Low to medium RTO and RPO
- Some downtime can be tolerated

TIER 2

- \$\$
- Business important
- Little impact to business
- Some delay OK
- Basic availability
- Medium RTO/ RPO
- Downtime is tolerated

TIER 3

- \$
- Business optional
- Minimal disruption
- Delay tolerable
- Some availability
- High RTO/RPO

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best in class, mission-critical applications or business functions that require high performance and availability—and lost time is lost opportunity. The lower tiers of the service focus on cost reduction or avoidance.

As a result, tiered servers refer to the level of service that various business and application usage is linked to. Your organization may have templates, tiers or service categories already defined for how IT resources are used. If not, now would be a good time to consider developing them in conjunction with your solution provider or other resources.

► **What about the cloud servers?**

Cloud servers are essentially virtual servers provided as a service from a solution provider on an hourly, daily, weekly, monthly or other on-demand basis. The charges or fees will vary depending on usage, processing capabilities, memory demands, data storage capacity and protection level. For some IT environments, cloud servers can help avoid the cost and overhead of buying and maintaining physical servers and associated software.

While you can run hypervisors on your physical servers and create your own virtual servers, and even a private cloud, shifting ownership to a cloud provider may reduce costs even further by driving up the utilization of a shared server.

When deciding on a cloud vs. a private server, take a step back and look at your big-picture business strategy.

For smaller environments or special circumstances, moving all or some applications to a cloud, pay-as-you-

Understand your needs and requirements by mapping IT resources to specific business activities.

go or subscription-based model can be advantageous. However, there can be hidden fees and service issues associated with the cloud. Thus, think of cloud servers or services as another tier of IT servers at different costs and availability points.

BOTTOM LINE

Start simple. Understand your needs and requirements by mapping IT resources to specific business activities. Instead of speaking *GHz*, *giga-byte*, *ports* or *protocols* to the business people, learn their language and map resource usage to what they understand. For example, prove business value by saying something like, “With X number of servers and Y amount of memory, you can support 1,000 email users each with a specific mailbox size and availability.” Approaching both sides of the fence can help you move forward on the momentum of your success. ■

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VENDOR OFFERINGS

Understanding Your Options

Once you've determined which servers work the best for your business, it's time to focus on specific product offerings.

You know the requirements your new physical server must meet, but how do you align what you need with what's available to you? Let's take a look at some of your options—as well as the long list of buzzwords—to determine the features that are most important to your environment. In other words, let's get through all of the noise.

As explained in Chapter 1, there are a number of different types, styles and models of physical servers. The most

commonly deployed servers are the small, floor-standing pedestals, towers, under-desk or desktop servers, as well as 1U and 2U rack servers. But to find the best option, there are a number of very specific areas you should consider.

PROCESSING GHZ, SOCKETS, CORES AND THREADS

A processor or chip sits in the core of every server, taking on the actual computing work of accessing memory and I/O devices.

Just like servers, there are a number of processor options to wrap your head around: 32- or 64-bit, x86 open or proprietary, single or multi-core and various forms of intelligent power management schema, memory and I/O options. Beyond the basics, some

processors also provide some advanced functionality, capable of automatically turning cores on or off (depending on workload demands via application or operating system software tools) as a way to save energy during idle periods, or increasing or decreasing clock speed to either boost performance or slow it to a leisurely pace.

A server processor can contain one or more cores, meaning a single socket could have a dual or quad processor supporting one or more active threads. A server with a single socket,

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single core and single thread can execute only one instruction or operation at a time. On the other hand, a dual socket and quad core with one thread could, software permitting, execute eight instructions simultaneously without constraint. Likewise, a quad socket, quad core would enable 16 instructions, allowing a hypervisor and operating system to potentially allocate those resources to virtual CPUs for application performance load balancing.

If you need more performance or processing power than a single server can provide, cluster across server blades, individual rack mounts or floor-model servers. Assuming that operating systems, hypervisors and applications can utilize concurrent threads, cores and sockets, this increased density can address various performance and application needs. However, if your current applications, operating systems or hypervisors are not able to fully utilize all of those features, don't be up sold.

Also keep in mind that licensing models have changed. Some applications and software are no longer licensed by the size of the server alone, but based on the number of cores and sockets. Perform the necessary due diligence to ensure that you are meeting the licensing requirements when using multi-socket, multi-core processors.

NAVIGATING DOWN MEMORY LANE

Computers rely on memory. Server

memory, which includes external disk storage, is used for storing operating system software and all the associated tools, utilities, application programs and data.

Main memory or RAM, also known as dynamic RAM (DRAM) chips, is packaged in different ways, with a common form being dual inline memory modules. DRAM memory access speed is referred to in terms of older DDR2 (667 MHz) or newer DDR3 (1333 MHz). RAM main memory on a server is the fastest form of memory, second only to internal processor or chip-based registers—L1, L2 or local memory.

In general, more memory is better; however, the speed of the memory is also very important. Different versions and implementations of virtualization solutions support various memory configurations and limits. Check with specific vendors' compatibility lists for supported configurations and memory requirements. Also check with vendors for supported configurations of 32-bit and 64-bit processors, single-core, dual-core, quad-core or eight-way processors, along with I/O cards and drivers for networking and storage devices.

NETWORKING WITH YOUR STORAGE AND YOUR USERS

Take a look at what functionality is built into the server or provided on server blades for general-purpose networking along with attachment of disk storage. What is there in terms

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of 10 Gb Ethernet (10 GbE), and how many ports as well as 3G (3Gb) or 6G (6Gb) Serial-Attached SCSI (SAS) for disk storage attachment (internal or external), along with serial, video and USB ports? Also look at expansion capabilities for additional mezzanine cards for blade servers, or PCI-E cards for networking, storage and other peripherals.

PCI SIG Multi-Root IO Virtualization (MR-IOV), a relatively new and emerging feature for servers, enables advanced connectivity, including adapter sharing. MR-IOV will enable multiple, physically separate adjacent servers to share a PCI-E adapter card, allowing the virtualization of servers that otherwise could not be consolidated. MR-IOV can also boost scaling capabilities beyond normal physical limits in high-density servers by placing adapter cards in shared external expansion slots.

RACK THEM, STACK THEM, PACK THEM, POWER AND COOL THEM

Do you have free space in cabinets or racks for an additional server? If you have a blade system, do you have room for an additional blade? Free space in cabinets and racks and even any available floor space, can—as far as physical packaging goes—influence the type of server you should consider.

For example, if you are out of available floor space but have room in cabinets or racks, you may be forced to find a server to fit those confines.

On the other hand, if part of the role of the new servers is to consolidate older systems, which would free up more room in the future, you will still need temporary space during the transition and upgrades.

Physical-, facility- and environmental-based considerations (think: habitats for technology) include power, cooling and heating, ventilation and air conditioning systems, and will also affect your server options. Keep in mind where your available primary power source is and where your uninterruptible backup power supplies and generators live. While there may be enough floor, rack or cabinet space, there may be a constraint on the accessibility of power or cooling capacities.

And when it comes to power, efficiency is king. Many energy utility companies provide incentives, rebates and other programs to reward efforts in power conservation and efficiency. While some rewards are based on the overall reduction of energy consumption via consolidation or upgrades, others reward reducing or maintaining the power footprint during business growth (i.e., doing more with what you have).

Similar to shopping for home appliances, when searching for energy-efficient servers, look for those that are Energy Star server-certified or qualified. These often have advanced intelligent power management features and 80 Plus efficient power supplies. Check with your local energy and solution providers for a

list of available programs. But start early—some programs must be initiated before beginning any upgrades.

DO YOU NEED A SAN OR NAS?

While there is a trend toward networked and shared storage using storage area networks and network-attached storage, many servers still have built-in disk drives. For those applications or environments where dedicated internal storage is still needed, there are many options in terms of performance and capacity—with most shifting toward the physically smaller and energy-efficient 2.5-inch SAS devices. Many servers are also either shipping with (or provide as an option) PCIe SAS RAID adapters for boosting the performance of internal and external storage.

MEASURING AND COMPARING SERVER PERFORMANCE

Server performance comparisons can be disparate, like comparing apples to oranges in even the best-case scenarios. With this in mind, when evaluating servers, consider performance at low power-setting modes as well as the energy and cooling requirements during normal and heavy processing times.

Also factor in all of the metrics that can be used to determine server performance: percent of CPU processor utilization, response time, number of transactions, messages, compute

operations, I/O operations, files or videos served per second and the number of MHz or GHz. However, effective performance should be measured by how well all of the components work together under different load or work conditions.

There are many different workload similarity and benchmarking tools (including Iometer and Microsoft ESR, as well as those from Standard Performance and Evaluation Corp. and the Transaction Processing Performance Council), but the best test and comparison tool is whatever most closely resembles the application or workload the server will be supporting.

WHAT YOU NEED VS. WHAT YOU WANT

Categorize your requirements into three groups: what you need, what you want and what you would like to have. It may sound simple, but it will ensure that your basic requirements are met and are not changed by others in an attempt to sell you on more advanced or optional features during the acquisition process.

BOTTOM LINE

Be an informed buyer and do your research. Understanding your requirements and all the server options and functionality available will ensure that you are meeting the needs of both the business and IT. ■

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IMPLEMENTATION

Putting It All Together

You're almost there. Learn how to acquire and configure your new servers to integrate with existing tools.

Finding the best server for your IT environment depends on your organization's specific needs, requirements and constraints. Ultimately, the best server will be the one that meets and exceeds your primary requirements, while providing some extra features and capabilities to improve performance now and into the future. ■ Once you have narrowed down your search and found a solution to meet your midmarket needs, the next steps are acquisition,

installation, configuration and on-going management. The options and decisions made during the selection process should help determine how easily the solution will integrate into your hardware and software environment, as well as how well it will integrate with the people, processes and skill sets required to maintain it.

Primary physical server manufacturers include Apple Inc., Cisco Systems Inc. (Unified Computing Systems), Dell Inc., EMC (Vblock), Fujitsu, NEC Corp., Hewlett-Packard Co., IBM, Oracle Corp./Sun, Silicon

Graphics International Corp. and Super Micro Computer Inc. These companies are represented by a mix of direct sales, direct touch markets and technical support, as well as channel value-added resellers (VARs) and solution providers that bundle their applications

with different hardware offerings.

Most vendors, including VARs, should provide various tools, such as sizers or calculators, to help guide you through the server selection process. Which company to buy from will depend on your specific environment's size, current affiliations, preferences, purchasing guidelines or policies.

JUSTIFYING THE ACQUISITION

You may have determined your needs or requirements from a business, application and technology stand-

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point—and found options and alternatives—but how do you get approval and funding for your server project? In Chapter 1, we discussed the role and importance of a capacity forecast and plan. Not only is a forecast useful in determining needs and requirements but, when translated into business impact and benefits, it's also a powerful tool for seeking acquisition approvals. As such, it is important to include your planning forecast as part of your justification for business terms documentation.

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Part of a reseller's value add is assisting you in the justification process. Seek out available services, either for a fee or as part of the pre-sales support. For example, a VAR should be able to help you prepare a capacity forecast plan, identify suitable alternatives and available options, price out specific models and features and help you find all the rebates and incentive programs available to you from local energy providers.

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MANAGEMENT TOOLS AND DEPLOYMENT

In addition to the initial setup and configuration process, other tasks will include stabling snapshot schedules and integrating your new server with your current applications. There are a number of management tools with wizards and other easy-to-use features to help you facilitate rapid setup, configuration, initial deployments and ongoing day-to-day operations.

With server virtualization becoming more prominent in midmarket environments, integration with hypervisor tools is also important and, as a result, end-to-end (E2E) management should also be considered. E2E

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management enables virtual servers, storage networking equipment, storage devices and associated software to be centrally managed—easing some of the burdens on smaller IT shops. Consequently, look for servers with the tools as well as ability to support E2E solutions, to reduce many of the management task complexities.

Servers are essential for running business applications and processing data. Demand for server compute power continues to increase, and servers depend on electrical energy to function. Moving forward, expect

continuous improvement on the server front—especially in processing capabilities and functionalities—while also fitting into smaller energy footprints and improving energy efficiencies in power and cooling.

Look for servers with the tools as well as ability to support end-to-end solutions, to reduce many of the management task complexities.

If cost savings are a key objective, in addition to reducing hardware costs, consider how software costs—including licenses and maintenance fees—can be reduced or shifted to boost savings.

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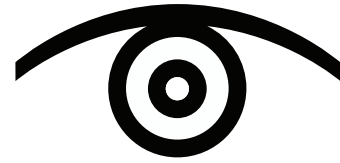
Look for a server solution that meets or exceeds your basic needs, is flexible and resilient enough to grow in and adapt to your changing business requirements, and that truly works for you—not the other way around. ■

Greg Schulz is founder of The Server and Storage-IO Group, an independent IT advisory and consultancy firm. He has authored the books *The Green and Virtual Data Center (CRC)* and *Resilient Storage Networks*. Find him on Twitter [@storageio](#).

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