

## MARKET ANALYSIS

### Worldwide Server Power and Cooling Expense 2006–2010 Forecast

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#### IDC OPINION

The issue of power and cooling in the datacenter has become a top priority for IT executives. Working with customers and applying IDC data sets against industry standards of datacenter thermal metrics, it is apparent that the evolution of the datacenter has been outpaced by the rate of server technology advancement. Driven by demands for higher levels of compute performance, yet constrained by tight budgets, datacenters have increased in density, with smaller servers running faster processors. The resulting rise in power consumption has become a significant cost factor for the business' operating expense, while cooling capacity has become a limiting factor in terms of IT expansion. In 2005, \$26.1 billion was spent to power and cool the worldwide installed base of servers. This is more than double the cost from 10 years ago of \$10.3 billion. Additional findings include:

- ☒ Over the next five years, the expense to power and cool the worldwide installed base of servers is projected to grow four times compared with the growth rate for new server spending. IDC expects server power and cooling costs to increase at an 11.2% CAGR to \$44.5 billion over the forecast period. This expense is equal to 70% of the overall new server spending in 2010.
- ☒ IDC has learned that there is an organizational disconnect within most companies between IT purchasers and the facilities personnel who are responsible for utilities within the datacenter. Proactive companies are merging facilities with IT to better measure and manage datacenter operation costs.
- ☒ It critical that IT vendors position themselves as part of the solution rather than part of the problem. There is significant opportunity for vendors that develop a product message that resonates with the multiple customer stakeholders, including facilities, IT purchasers, datacenter managers, and finance.
- ☒ Customers are shifting their purchasing criteria, taking into consideration not only system performance but also the power and thermal characteristics. The industry is responding with energy-efficient systems, power management tools, and advanced cooling technology.

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## IN THIS STUDY

This IDC study examines the mounting electrical expense to power and cool the worldwide installed base of servers and forecasts this expense for the next five years. An analysis is provided on the factors causing the historical increase and the resulting impact on the datacenter and the business organization. To provide proper market context, historical and forecast data is shown for new server spending and server installed base. This study does not include hardware expenses associated with power and cooling equipment.

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## Methodology

This study represents a compilation of data from a wide array of IDC sources, including IDC's worldwide installed base forecast and IDC's quarterly server forecast. The data is compiled from the work of IDC's network of researchers who track quarterly and annual system and server shipments. Forecast data is current as of September 2006. Market data is acquired and refined based on a number of IDC proprietary and public sources, both primary — including direct contact with server suppliers and resellers and primary end-user research — and secondary — including published financial and trade data, company press releases, and news articles.

The information is then filtered through IDC's forecasting and analysis process. This is an ongoing, iterative process in which initial forecasts are made, analyzed, and revised through the cooperation of IDC analysts worldwide.

Specific assumptions are as follows:

- ☒ Typical server system wattages were used for each CPU type (2005 values for x86, EPIC/RISC, and CISC are 415, 2,600, and 8,600W, respectively). Historical wattages were collected from industry sources; future wattages were projected based on historical trends and industry interviews.
- ☒ All enterprise-based servers run for 24 hours a day. A worldwide average of \$0.10 per kilowatt-hour for commercial electricity is assumed.
- ☒ Current systems utilization will remain as commonly stated (anywhere in the range of 10–20%).
- ☒ The electricity cost to cool a server is estimated at an industry average of 80% of cost to power.

## SITUATION OVERVIEW

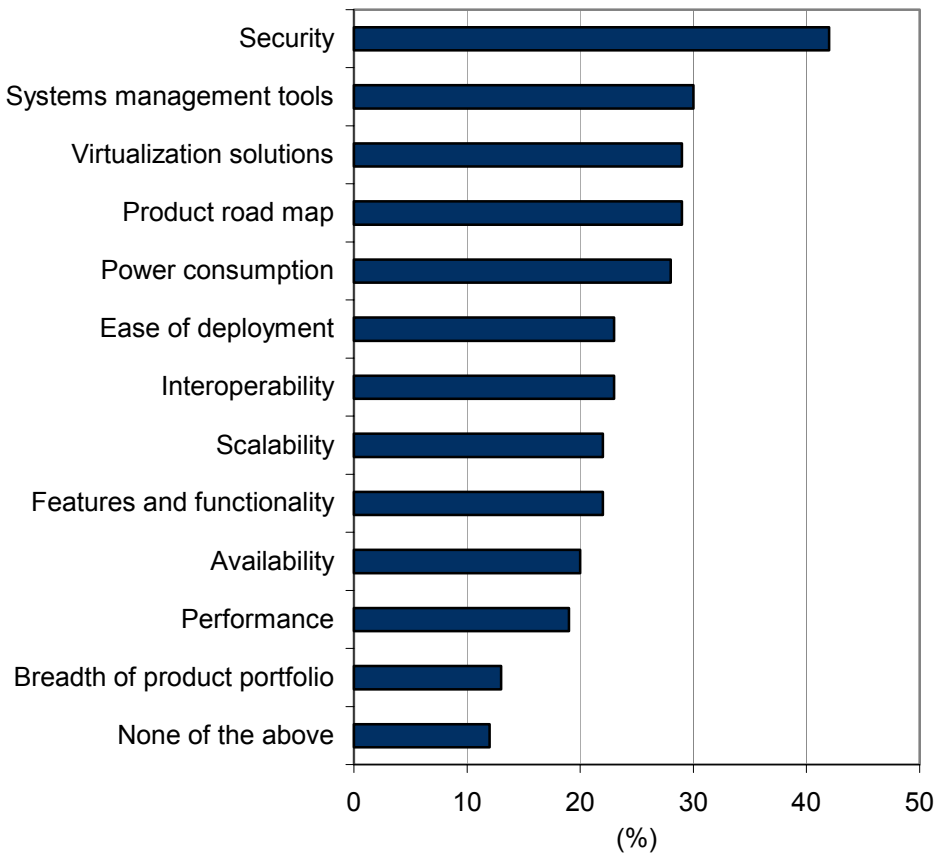
Until recently, the electricity cost to power and cool servers was not a top concern for IT executives. Instead, the charge given to IT executives was to constantly seek gains in processing performance to match the growing IT requirements of the business. Technological advancement in servers has enabled processing to become commoditized. However, power consumption has become a significant expense for

the enterprise, and cooling capacity is often a limiting factor in the expansion ability of the IT infrastructure.

The issue of power and cooling is now drawing major attention within the server industry (see Figure 1). IT executives rank power and cooling in the top 5 among current concerns. The situation is very different then a few years ago, when power and cooling would barely register in surveys. Faster processors, increased server density, and expanding server footprints have combined to have a significant effect on the expense of operating datacenters.

**FIGURE 1**

Top Concerns Facing IT Executives



n = 482

Source: IDC, 2006

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## **Server Components Increase in Speed and Capability**

In 1965, Intel cofounder Gordon Moore predicted that transistor density would double every 18 months and, to date, server processors have increased their performance along this prediction line. Customers have continually demanded improved response times and systems able to run increasingly complex applications. To deliver systems that meet these requirements, vendors have incrementally improved the performance of the system components, specifically faster processors, memory, and disk drives.

While these gains in performance have benefited IT's compute capabilities, it has translated into an increase in the power consumption and cooling requirement of the installed servers. To illustrate the impact of the datacenter, an average server today consumes 400W of power compared with an average of 150W 10 years ago. This increase in the power consumed at peak load has required facilities to draw more power not only to the systems but also to cooling units for the additional heat generated.

### ***Adoption of High-Density Computing***

A second technological trend in the server industry has been the adoption of smaller form factors. To facilitate IT expansion within a finite amount of datacenter floor space, enterprises have deployed more dense server systems. IDC estimates that server system density has increased by 15% annually over the last 10 years as companies have shifted from pedestal servers to rack-optimized systems and the beginning of mainstream adoption of blade servers. In 1996, companies deployed an average of 7 servers per rack; today, the average has increased to 14 servers per rack. Looking forward, the continuing adoption of blade servers will result in an average of 20 servers per rack.

The drive for density has increased the pressure on power and cooling management at the rack level. In today's datacenter, managers plan to support 6–8kW per rack, up significantly from the year 2000, when the average power consumption per rack was 1kW. Customers with plans to build new datacenters are anticipating requirements that account for 20kW per rack. As the industry moves to high density, datacenters have experienced larger power draws and hotspots that are subject to failures and reliability concerns.

### ***Expansion of Server Installed Base***

According to IDC's worldwide installed base forecast, the server installed base has risen annually at a rate of over 15%. IDC estimates that there will be over 35 million servers worldwide in 2010. The cause of the escalation of the installed base is due to two contributing factors: an expanding server footprint within the organization and the shift in nature of the systems deployed.

In today's environment, significant emphasis is placed on the availability and reliability of server systems. As such, it is not uncommon to have a business application being supported by more than one server. Additionally, as enterprises scale up new

processes such as email and Web applications, they are required to deploy an even greater number of systems.

Second, the type of server systems in an enterprise datacenter has changed in the last two decades. In the past, a small number of large mainframes were used to support the majority of IT requirements. Today's IT environment is quite different. Due to the pressure to reduce acquisitions costs and the introduction of new technologies at lower prices, customers have evolved their purchasing patterns. This trend has resulted in companies with distributed IT environments, to a point where it is not uncommon for IDC to work with customers that are managing thousands of servers. The fact that business departments frequently request servers with maximum configurations to ensure future available capacity has compounded the issue in terms of how datacenters are able to power and cool the systems.

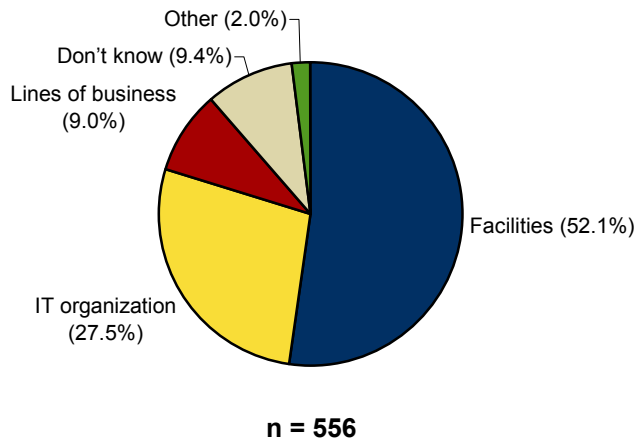
### ***Business Organization and Infrastructure Obstacles***

As with most cases, part of the mounting power and cooling problem is due to the organization of the business. In *Data Center of the Future* (IDC special study #06C4799, April 2006), a disconnect was observed between the datacenter manager and the IT purchaser. Power and cooling requirements have been the domain of the datacenter manager within the facilities department (see Figure 2), whereas the IT purchaser has been responding to the needs of business managers for increased computing power. This divide is one reason why, until recently, the power and thermal characteristics of servers have been an afterthought in many IT managers' minds.

The life-cycle incongruity of the datacenter and the systems deployed within it has caused issues for customers as well. Depending on the scale, designing and building a datacenter can take between several months to years, with an expected service-life upward of a decade. In contrast, a server today can literally be purchased and deployed within days, with an expected lifespan of three to four years. This difference in lifespan combined with the pace of server evolution means that datacenters are challenged to support systems for which they were not originally designed.

**FIGURE 2**

**Primary Responsibility for Power and Cooling Expense**



Source: IDC, 2006

**FUTURE OUTLOOK**

**Forecast and Assumptions**

Table 1 introduces the assumptions used by IDC's server analysts who follow the enterprise server market space. Specific assumptions are as follows:

- ☒ Typical server system wattages were used for each CPU type (2005 values for x86, EPIC/RISC, and CISC are 415, 2,600, and 8,600W, respectively). Historical wattages were collected from industry sources; future wattages were projected based on historical trends and industry interviews. An illustration for x86 wattages is displayed in Figure 3.
- ☒ All enterprise-based servers run for 24 hours a day. A worldwide average of \$0.10 per kilowatt-hour for commercial electricity is assumed.
- ☒ Current systems utilization will remain as commonly stated (anywhere in the range of 10–20%).
- ☒ The electricity cost to cool a server is estimated at an industry average of 80% of cost to power.

IDC's estimate of the electrical expense to power and cool the worldwide installed base of servers through 2010 is presented in Table 2. This table also presents 2005–2010 new server spending from IDC's worldwide quarterly forecast. It is evident from the table that the expense to power and cool the installed base of servers is projected to grow four times compared with the growth rate for new server spending.

An illustration for x86 wattages is displayed in Figure 3.

**TABLE 1**

Key Forecast Assumptions for the Worldwide Server Market, 2006–2010

Country or Region	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
<b>Macroeconomics and political assumptions</b>				
Economy	IDC assumes that worldwide and regional economic growth will be better in 2006 than 2005. Western Europe should pick up to over 2%, Japan should improve, and the United States should come in at over 3.5%. There are plenty of concerns, however, so we have lowered our certainty rating.	<b>Moderate.</b> The economy — in its stability and steady growth — is now a positive influence on IT spending.	↑	★★★★☆
Policy	Compliance is still driving some IT spending, including Sarbanes-Oxley, Basel II, and HIPAA. We don't expect compliance spending to crowd out other IT initiatives; in fact, compliance record keeping could spur initiatives in other areas as companies clean up their act.	<b>Moderate.</b> Compliance spending seems to be funding itself through better-run business operations.	↑	★★★★☆
Internet policy	While there has been much recent news about Internet security, privacy, and overseas censorship, the policy initiative with the most potential impact is the carrier move in the United States to be allowed to charge differential pricing for Internet access and the use of new higher-speed circuits being installed. IDC assumed last quarter that carriers would have a 50:50 chance of passing legislation allowing them tiered pricing for different classes of customers. Recent votes in the U.S. House and Senate raise our assumption to a 70% likelihood.	<b>High.</b> Legislation allowing carriers to offer different pricing and service to different sets of customers would enhance the position of large, entrenched customers and the carriers themselves while inhibiting innovation among start-ups and competitors. The "Internet" would bifurcate into two.	↓	★★★★☆
Profits	2006 profits will be less than 2005's 15% growth, but still in double digits, according to Consensus Economics' May 2006 poll.	<b>High.</b> Company profits will still be high enough to fund IT&C initiatives that either cut costs elsewhere or drive increased revenue.	↑	★★★★☆

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Country or Region	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
Profit expectations	We expect no major surprises, either up or down, overall. The major airlines are sick, and oil-dependent industries will feel a crunch, but the market has already taken that into account.	<b>Low.</b> Profit expectations affect business confidence, which affects IT&C investment.	↔	★★★★☆
Iraq	The conflict in Iraq will continue to be messy throughout 2006, creating political disruptions, but the chance for economic disruptions is minimal. For now, IDC assumes that there will be no activities or initiatives sufficient to affect IT&C market forecasts.	<b>Low.</b> There is little reason for economic uncertainty over Iraq to impact IT&C spending.	↔	★★★★☆
Other Middle East	The political situation in Israel and Hamas' leadership of the Palestinians dramatically increases political uncertainty in the area. However, IDC assumes that that political uncertainty won't affect the global economy.	<b>Low.</b> Peace in the region would improve foreign investment and, ultimately, lessen terrorism. The opposite is more or less the current situation.	↔	★★★★☆
Contagion	We are assuming that the bird flu virus will not mutate into a form that would create a pandemic. We are also assuming no major outbreaks of mad cow disease.	<b>Moderate.</b> Mad cow in the United States could affect a major part of the U.S. economy, at least temporarily. The mutation of the H5N1 bird flu virus could lead to a global pandemic. This would have a severe impact on both the long-term and short-term global economy.	↔	★★★★☆
Other geopolitics	We are assuming that terrorism alerts remain high but that none will be sufficient to change the global economic or IT&C outlook.	<b>Moderate.</b> Business decision and project initiation will begin in line with a better economic outlook.	↔	★★★★☆
U.S. fiscal policy, deficits, trade imbalance	These are all areas that affect the long-term economic outlook for the world; however, their short-term impact is muted. IDC assumes these will not affect short-term IT&C forecasts.	<b>High.</b> A crash of the dollar or the use of economic power to drive U.S. political decisions could affect the world economy.	↔	★★★★☆

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Country or Region	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
Oil prices	IDC expects oil prices to stay in the range of \$60–75 a barrel. There is debate now about whether prices will go up further or in fact fall. IDC still assumes that the higher prices are the result of demand and, to some extent, the fall of the dollar over the last several years.	<b>Moderate.</b> The new higher oil prices — up 100% in two years — seem to have been internalized by the market. A sudden upward spike would affect GDP growth and hence IT&C spending. A spike downward, however, would have a lesser short-term effect.	↔	★★☆☆☆
Inflation	Inflation remains under control, although the stock market has been made nervous. Consensus Economics' May poll forecast that in the United States is that consumer prices will rise just over 3% in the United States and 2% in Western Europe and remain flat in Japan. We assume the United States will continue to raise interest rates cautiously.	<b>Moderate.</b> Low inflation keeps interest rates low and leads to more capital spending, including IT&C.	↔	★★★★☆
Unemployment/job creation	Unemployment worldwide will stay about the same as 2005 levels. The U.S. rate seems to be at its structural low (5%), but U.S. job creation is barely keeping up with workforce growth. In Western Europe, Germany, France, and Italy will flirt with double-digit unemployment, but many other countries will look more like the United States. In Japan, where unemployment used to be in the 1–2% range, unemployment will be about 4–5%.	<b>Moderate.</b> More employment drives more need for IT&C infrastructure and is a lagging indicator of economic recovery; job creation should be accompanied by a willingness to invest in other areas.	↔	★★★★☆
Exchange rates	In 2004 the dollar lost 8% against the euro and almost as much against the yen and the pound, but in 2005 it rose about the same. The U.S. dollar has now fallen back against both, and IDC assumes that the dollar will trend down but that fluctuations will not be serious enough to affect IT&C forecasts.	<b>Low.</b> A stabilizing dollar will make it easier for vendors to manage supply lines and will stabilize the prices of imports and exports.	↓	★★★☆☆

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Country or Region	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
Wild cards	We are assuming that there will be wild card events, but we are predicting no single one. As one scientist has put it, there is a high probability of a low probability event taking place.	<b>Low.</b> General uncertainty and political malaise could lead to a fall in business and consumer confidence, which could affect IT&C spending.	↓	★☆☆☆☆
<b>Technology developments</b>				
Convergence	Convergence is a complex phenomenon working at many levels — convergence of the telephone network and the Internet; of communications and IT technologies; of consumer and enterprise technologies; and even of storage, routing, and processing in the datacenter. Of these, perhaps the most overarching is the convergence of voice, video, and data communications. IDC assumes that this convergence is a permanent phenomenon and that it will pick up pace as the decade wears on. One measure — by 2009, IDC expects 1.5 billion users on the Internet and 3 billion users of the phone network. With 2.5 billion mobile users, the overlap will be significant.	<b>High.</b> Convergence will drive new competitive dynamics, offer new applications and functions to customers, and strain the legal and regulatory systems. It will also drive increased IT&C spending.	↑	★★★★☆

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Key Forecast Assumptions for the Worldwide Server Market, 2006–2010

Country or Region	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
Dynamic IT	<p>IDC has identified the next style of computing — dynamic IT for dynamic enterprises — as a style that dramatically increases the effectiveness of IT. Dynamic IT will both support business strategy and IT operational efficiency through 12 key hinge technologies. For more information, see <i>Hinge Technologies for the Dynamic Enterprise</i> (IDC #31371, May 2004). Within dynamic IT are a number of important subtrends — virtualization in the datacenter, data federation, software as a service (SaaS), and composite and rule-based applications. IDC assumes the transition to dynamic IT will be slow and labored, but proceed nonetheless.</p>	<p><b>Moderate.</b> Dynamic IT, by adding coherence to the enterprise usage of IT, would spur the market. However, confusing choices for enterprises and funding hurdles for new infrastructure will balance this impetus to market growth.</p>	↔	★★★★☆
Software industry transformation	<p>The software industry is going through a major transformation, from basic architecture (service oriented architecture [SOA]) and the way software is written (composite applications) to the way software is delivered (SaaS) and even funded (advertising based). IDC assumes that this transformation will take a decade but that it will, when done, allow for much faster and more dynamic delivery of software functionality. See <i>What CIOs Want from Software Vendors</i> (IDC #32154, October 2004) about the software complexity crisis, <i>Worldwide SOA-Driven Software 2005–2009 Forecast: On a Course of Disruption</i> (IDC #34660, December 2005) on SOA, and <i>Top 10 Predictions for 2006: Software as a Service</i> (IDC #34872, February 2006) for a discussion of SaaS.</p>	<p><b>Moderate.</b> The new software creation and delivery models should allow for quantum increases in the ability to deliver and integrate new software functionality to IT&amp;C systems. This should increase overall spending, even as it lowers costs.</p>	↑	★★★★☆☆

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Key Forecast Assumptions for the Worldwide Server Market, 2006–2010

Country or Region	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
The Google effect	A term coined by IDC's Frank Gens in <i>IDC Predictions 2006</i> (IDC #TB20051201, December 2005), the "Google effect" refers to the impact on the market and the industry of potential competition from Google or other nontraditional suppliers of software or systems functionality. The impact can be felt in the concept of online or streaming applications, new forms of databases, Web-delivered desktop software, integration of Internet and enterprise search and other functionality, content delivery, and even wireless communications. IDC assumes that the Google effect will accompany and accelerate the software industry transformation.	<b>Low.</b> Look for faster development of the SaaS model, more development of composite applications, and more directly competitive products (e.g., desktop search).	↑	★★☆☆☆
Service industry transformation	The rise of offshore IT services and the increased integration of IT services inside business services are creating a new dynamic for IT services firms. On the one hand, they now face price competition from offshore providers, and on the other, they are impelled to make their own investments in offshore capabilities. At the same time, they must develop a strategy to deal with or find opportunity in business services. Finally, they are dealing with new service delivery models (on-demand, utility computing) and pricing models (pay-as-you-go, risk-reward contracts).	<b>Moderate.</b> IDC believes that low-cost offshore services will increase the market for IT services (see the <i>Price Elasticity in the Services Market and the Impact of the Offshore Model</i> , IDC #PR03L, May 2004). We also believe there is tremendous opportunity in business services.	↑	★★★★☆

**TABLE 1**

Key Forecast Assumptions for the Worldwide Server Market, 2006–2010

Country or Region	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
Pervasive computing	This term refers to the proliferation of client devices and end-user or end-use devices at the network edge. By 2009, IDC expects five times as many non-PC devices to be connected to networks than PCs — including converged cell phones and networked entertainment and gaming devices, automobiles, building automation systems, and industrial controllers. This doesn't even count RFID tags and sensors. IDC assumes that communicating client devices will proliferate at 5–10 times the rate of PCs installed. Devices will both converge (cell phones with more functionality) and diverge (single-use devices, such as RFID readers).	<b>High.</b> The addition of billions of devices to the network edge will drive the need for more enterprise systems to deploy, manage, and make use of them. It will also shift the prevailing traffic from the center of the network outward to edge inward, which will affect computing and communications architectures.	↑	★★★★☆
Demographics	The aging of the workforce in the developed world and the growth of the workforce in lower-cost geographies will affect both the supply of IT&C and the demand. These may be long-term trends, but they are already manifest in the globalization of the workforce and the slow IT&C market growth in places like Western Europe. IDC assumes that the center of IT&C supply will migrate toward Asia and Eastern Europe, but that in general it will also diversify. IDC also expects renewed foreign direct investment (FDI) and venture capital (VC) funding for emerging markets such as China and India.	<b>Moderate.</b> The rise of offshore IT services and business services suppliers, the diversification of services supply points into "blended" models, and both increased diversification of the entire IT&C supply chain and risk from potential political or economic disruption will continue.	↔	★★★★☆

**TABLE 1**

Key Forecast Assumptions for the Worldwide Server Market, 2006–2010

Country or Region	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
Form factor changes	New vendors will enter the blade market, and product portfolios will continue to expand.	<b>High.</b> The ongoing enhancement and introduction of different types of blade server products by tier 1 and tier 2 vendors is expected to continue as customers further understand the capabilities and benefits of this emerging form factor.	↑	★★★★★
Form factor changes	Blade adoption was solid during 2Q06, with a 39.4% spending increase and growth of nearly 30% in unit shipments.	<b>High.</b> With Dell entering the market, IBM driving crossovers lower in the SMB blade chassis, and HP broadening its blade portfolio at the processor level, IDC believes the total customer addressable market for blade solutions will continue to expand.	↑	★★★★☆
Form factor changes	Volume in the blade space will shift primarily to 2-socket and 4-socket systems.	<b>Moderate.</b> Customer usage scenarios in the blade market favor 2-socket and above configurations.	↔	★★★★☆
Chip or CPU type dynamics — x86	x86 processor-based servers are expected to achieve more moderate unit growth rates during 2006.	<b>Moderate.</b> Average system values (ASVs) for x86 servers have increased in some segments as a result of larger configurations to support virtualization efforts, which is leading to more moderate unit shipment growth rates in 2006.	↑	★★★★☆
Chip or CPU type dynamics — RISC	The RISC server market continued the revenue declines experienced over the past 18 quarters, excluding 2Q05. Shipment units declined 17.5% for the same period.	<b>Moderate.</b> We believe the return of declines in RISC-based server revenue will continue as customers opt to explore other alternatives.	↔	★★★★☆

**TABLE 1**

Key Forecast Assumptions for the Worldwide Server Market, 2006–2010

Country or Region	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
Chip or CPU type dynamics — EPIC	Revenue continued to increase strongly in year-over-year comparisons for EPIC-based servers as additional vendors introduced products. IDC is now expecting a slower ramp for EPIC-based server sales as HP focuses on the transition from PA-RISC, Alpha, and MIPS-based NonStop systems over the next few years.	<b>Moderate.</b> HP's Integrity product family customers are deploying production workloads for their EPIC-based systems as the average size of configurations continue to increase.	↔	★★★★☆
Chip type and operating system developments — CISC	Worldwide, IDC believes servers based on CISC processors will lose share throughout the forecast, declining from 11.9% in 2005 to 7.4% in 2010 share of revenue. The majority of these systems are mainframes capable of running the IBM zOS operating systems.	<b>Moderate.</b> The increased maturity of large SMP Unix/RISC machines and the development of scale-out solutions based on smaller nodes using high-speed interconnects will continue to chip away at traditional CISC-based server market share, particularly for high-end mainframes that are aging within the customer installed base.	↔	★★★★☆
Chip type and operating system developments — x86	Linux-based x86 servers are expected to achieve moderate unit growth rates throughout 2006.	<b>Moderate.</b> These systems have expanded their share of the high-performance computing market as well as being well suited for security and Web serving workloads. As more customers deploy clusters or farms of smaller systems to tackle the workloads previously only accomplished on more scalable SMP systems, it is expected to further drive Linux server growth and adoption.	↔	★★★★☆

**TABLE 1**

Key Forecast Assumptions for the Worldwide Server Market, 2006–2010

Country or Region	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
Chip type and vendor strategies — EPIC	IDC believes that HP's PA-RISC product line will make a slow transition to Itanium by 2008 and beyond. Therefore, we have forecast a major portion of spending to transition from RISC to EPIC in the 2006–2008 time frame to reflect HP's strategy.	<b>Moderate.</b> Due to these trends, we expect EPIC adoption to continue to ramp during 2006 as shipments increase. IDC believes EPIC-based systems will account for about 10.8% of overall server spending by the end of the forecast period.	↑	★★★★☆
<b>Labor supply</b>				
IT talent	No constraints are envisioned. In the monthly U.S. CIO Tech Poll, there is a question about the IT labor supply. In January 2006, 20% said it was "hard to find," up from a low of 3% in May 2003 — but down from over 50% in January of 2001. Overall, IDC believes there are 30 million people either working for IT companies (10 million) or as IT professionals in end-user companies (20 million) in the world. The supply is growing at 2% a year. Despite the negative growth of computer science graduates in the United States and Western Europe, IDC sees severe problems in the next five years.	<b>Moderate.</b> The availability and skill level of talent has a direct impact on markets as diverse as network security and outsourcing. The availability may affect some markets or adoption rates, such as the development of SOA, but in general there will be other, more immediate gating factors.	↔	★★★★★
Distribution of talent	The swing to emerging geographies is evident. The number of scientists and engineers in the United States and Western Europe is falling compared with the number in China and India, while the growth in IT-related employees is three times the world average.	<b>Moderate.</b> The migration will increase the overhead costs of finding, recruiting, and managing talent from global pools. It should, however, also lower costs and may even lead to more innovation.	↑	★★★★☆

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Country or Region	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
<b>Capitalization</b>				
Venture	Venture funding in the United States, at \$21 billion in 2005, is now above 1998 levels and has been level for four years. Western Europe's level is still much lower than that of the United States, while venture money in China and Asia/Pacific is growing rapidly, albeit from a small base (e.g., the VC base in China is over \$1 billion now). IDC assumes that venture funding is no impediment to innovation.	<b>High.</b> There doesn't seem to be a funding limitation to IT&C innovation that would alter IT&C forecasts.	↑	★★★★☆
Stocks	In 2005, the stock market rose slowly, but without euphoria. There was little impact on the outlook for IT&C. We expect stocks not to be a factor in 2006 when it comes to IT&C forecasts.	<b>Moderate.</b> Rising stock prices increase business confidence; falling prices can drive lower economic expectations.	↔	★★☆☆☆
<b>Market characteristics</b>				
Hardware	Hardware markets continue to defy gravity and remained positive in 2005. IDC expects about the same performance in 2006, with pockets of both growth and decline. IDC assumes 6–7% growth in IT hardware spending (including network equipment sold to carriers and enterprises) in 2006.	<b>Moderate.</b> Hardware spending, about 40% of total IT spending, drives spending as well in software and services.	↑	★★★★☆
Software	The software market will remain a mix of slow-growth and high-growth markets. Business-oriented software — collaboration, messaging, analytics, and business metrics — is higher growth than most infrastructure-related software, with the exception of security. IDC assumes worldwide software spending in 2006 will be 7–8%.	<b>Moderate.</b> Software spending, about 20% of total IT spending, can drive spending in both hardware and IT and business services.	↔	★★☆☆☆

**TABLE 1**

Key Forecast Assumptions for the Worldwide Server Market, 2006–2010

Country or Region	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
Services	IT services will grow but at a muted rate as companies implement smaller, quicker-payback projects. Price declines are expected as offshore sourcing and blended models (offshore, nearshore, onshore) increase. IDC expects worldwide IT services spending growth in 2006 of 5–7%. Worldwide BPO spending should fall in the 10–14% range.	<b>Moderate.</b> IT services spending can affect the rate of overall solution adoption, as well as the migration to dynamic IT. It accounts for about 40% of IT spending	↔	★★★★☆
Telecom	The telecom industry's drastic cut in capital spending (capex) from 2000–2004 has now largely been absorbed in the IT market. For a good review, see <i>Worldwide Carrier Capex Forecast and Analysis, 1999–2004: 4Q03 Update</i> (IDC special study #30659, January 2004). IDC expects worldwide telecom services growth of 4%.	<b>Moderate.</b> The IT industry has already factored the telecom industry spending into its internal forecasts; the key is the pace at which convergence takes place.	↔	★★★★☆
The Internet	Internet adoption is still going strong, especially in emerging economies. In the next four years, 500,000,000 new users will come online and commerce will double. By the end of 2006, over 50% of Internet households will be broadband.	<b>High.</b> Analysts and pundits may underestimate the impact of the Internet because the "buzz" is gone. It will be enabler for both new markets and new business models	↑	★★★★☆
Market dynamics — worldwide	The worldwide server market is expected to grow approximately 1% with respect to revenue in 3Q06 over the same quarter in 2005.	<b>Moderate.</b> We are seeing continued investment in server hardware as economic conditions improve more rapidly in some regions, albeit at a slower rate.	↔	★★★★☆
Market dynamics — United States	IDC now expects 3Q06 spending in the United States to grow 4.9% compared with 3Q05.	<b>Moderate.</b> Market conditions have improved in the United States, and overall spending is increasing at a moderate pace.	↔	★★★★☆

**TABLE 1**

Key Forecast Assumptions for the Worldwide Server Market, 2006–2010

Country or Region	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
Market dynamics — midterm worldwide	In the midterm, IDC expects worldwide server hardware spending to increase in 2006, which we now expect to grow about 1% to \$55.4 billion.	<b>Moderate.</b> The optimism from previous quarters continues within some regions as economic conditions and subsequent server hardware spending increase slowly.	↔	★★★★☆
Market dynamics — midterm United States	IDC believes U.S. spending will grow 5.3% in 2006 to nearly \$21.6 billion.	<b>Moderate.</b> We have maintained the U.S. growth rate for 2006, which accounted for the potential impact of slower spending due to improvements in server utilization as a result of the use of virtualization technologies.	↔	★★★★☆
Market dynamics — long-term worldwide	In a longer-term view, IDC assumes the worldwide economy will continue to recover.	<b>Low.</b> The compound annual growth rate (CAGR) for the worldwide server market is expected to be about 2.7% with respect to revenue and 11.6% with respect to units over the five-year forecast period ending in 2010.	↔	★★★☆☆
Market dynamics — long-term United States	IDC believes the U.S. server market will grow to about \$25.3 billion by 2010, which represents a 4.3% five-year CAGR.	<b>Low.</b> While revenue is expected to grow near the mid-single digits over the next five years, we believe unit shipments will increase at a 13.9% CAGR over the forecast.	↔	★★★☆☆

**TABLE 1**

Key Forecast Assumptions for the Worldwide Server Market, 2006–2010

Country or Region	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
<b>Consumption</b>				
Saturation	The concept of saturation is a tricky one in the context of IT&C. Markets that seem saturated (e.g., PC shipments in the United States), can be "unsaturated" by new price thresholds or new functionality (DVD playback) that spur faster replacement or bring new users into the market (e.g., seniors). Thus IDC assumes that while all markets have a fixed number of potential adopters (people or companies), there is usually a price, feature, or solution that can drive additional spending. Also with IT generally less than 3% of an enterprise's expenses (or a country's GDP), there is tremendous opportunity to turn internal spending on staff or business processes into external spending on IT&C products and services. IDC assumes that market "saturation" will be a moving target that varies by submarket but that, in almost all cases, it can be countered.	<b>Moderate.</b> There will be a general increase in the amount of research and marketing devoted to segmentation; there will also be potential organization disruption as vendors realign to better approach these segments.	↑	★★★★☆
Buying sentiment	IT&C buyers have switched from neutral to optimistic, as evidenced by IDC's <i>2005 Barometer Survey</i> and ongoing FutureScan measurements. There seems to be no irrational sentiment against IT&C, as there was several years ago.	<b>High.</b> If buyer sentiment remains high, then spending could beat forecasts.	↑	★★★★☆☆

**TABLE 1**

Key Forecast Assumptions for the Worldwide Server Market, 2006–2010

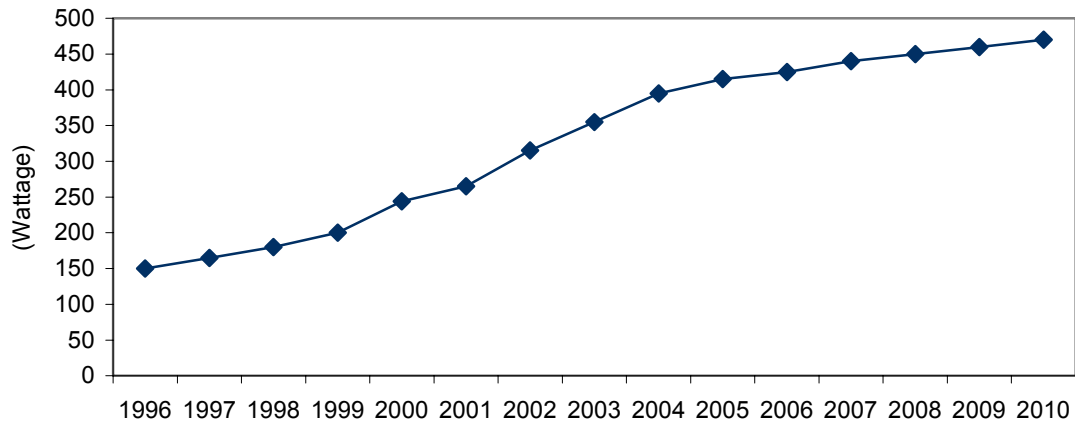
Country or Region	IDC Assumption	Impact	Accelerator/ Inhibitor/ Neutral	Certainty of Assumption
Small and medium-sized business (SMB) dynamics	The SMB market is expected to continue its modest growth in 2006. Low-end 1- and 2-socket capability x86-32 servers utilizing a Microsoft Windows operating system are anticipated to capitalize most heavily on the growth in this market segment. However, Linux is beginning to make some inroads into this market segment.	<b>Moderate.</b> The SMB market is a segment that continued to provide server sales while soft economic conditions persisted. There is evidence of continued spending within this part of the market, albeit typically for smaller systems configurations.	↑	★★★★☆

Legend: ★☆☆☆☆ very low, ★★☆☆☆ low, ★★★☆☆ moderate, ★★★★☆ high, ★★★★★ very high

Source: IDC, 2006

**FIGURE 3**

x86 Server Average Power Wattage, 1996–2010



Source: IDC, 2006

**TABLE 2**

Worldwide Expense to Power and Cool the Server Installed Base,  
2005–2010 (\$B)

	2005	2006	2007	2008	2009	2010	2005–2010 CAGR (%)
Power and cooling	26.1	28.9	32.5	36.6	40.7	44.5	11.2
New server spend	54.9	55.4	57.3	59.2	60.8	62.8	2.7

Note: See Table 1 for key forecast assumptions.

Source: IDC, 2006

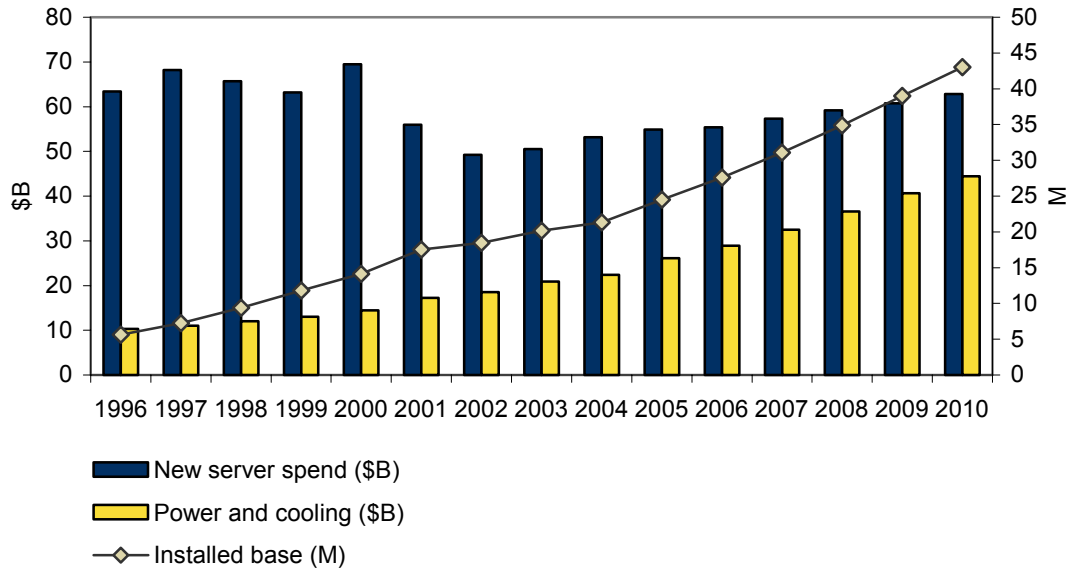
Figure 4 depicts a graphical view of the expense to power and cool the installed base of servers and the new server spending from 1996 through 2010. It also overlays the server installed base for the same time period. The data illustrates that for \$1 of new server spend in 2005, \$0.48 was spent on power and cooling. This is a sharp increase from 2000, when the ratio was \$1:\$0.21. In 2010, it is projected that this ratio will rise to \$1:\$0.71.

As the issue of power and cooling has become significant to the enterprise, datacenter managers must now pay closer attention to certain factors that will influence the cost of running the IT infrastructure. Two scenarios that examine the cost of electricity and power consumption as variables are as follows:

- ☒ An enterprise currently manages 1,000 servers. (typical mix, with vast majority being x86 and the rest in order of RISC, EPIC, and CISC). Based on the 2005 data, the four-year cost to power and cool these servers is \$3.8 million. A 2% annual rate increase in the cost of electricity would raise this cost by almost \$200,000 (a 5% increase).
- ☒ The same enterprise is expecting to double the server count in the next five years. During that time frame, if the enterprise steadily deploys new servers (which are expected to gradually increase each year in power consumption), the five-year electrical expense will be \$9.1 million. If the enterprise is able to keep the average power draw constant by deploying more energy-efficient servers, the expense will reduce to \$5.2 million (a 44% cost savings)

**FIGURE 4**

Worldwide Expense to Power and Cool the Server Installed Base, 1996–2010



Source: IDC, 2006

## ESSENTIAL GUIDANCE

It is clear to any observer of the server industry that power and cooling has become a significant factor. IDC believes vendors and customers need to be proactive on power and cooling within the context of overall datacenter management. Forward-thinking companies are integrating facilities and IT departments into a single organization, realizing this structure is better aligned to recognize potential challenges and address the business requirements.

The power and cooling problems confronting customers are both financial and infrastructure related. The rising expense of keeping servers up and running is becoming a significant factor to a business' operating margin. Considerable savings can be realized by implementing policies on energy consumption, viewing energy as a manageable expense, and utilizing effective power and cooling solutions. In terms of IT infrastructure, the increase in power requirements is impacting the datacenter's ability to meet the computational demands of the business. According to IDC studies, over 40% of datacenter customers report power demand outstripping supply, while cooling capacities at their threshold have become a limiting factor in deploying new systems. An opportunity exists to deliver energy-efficient systems and power management tools that enable customers to reduce the growth rate in energy consumption and dynamically provision power and cooling to individual systems within the datacenter.

Virtualization technology also has a role to play in the power and cooling arena. Through virtualization, customers are able to consolidate underutilized servers in their datacenters. While increases in utilization rates will draw more power per server, this will be more than offset by the reduction in the number of systems operating.

Finally, it is important to develop a clear and defined message around power and cooling that resonates with each of the customer stakeholders, including CFO/finance, datacenter planners and managers, facilities department, and IT purchasers. IT vendors must be able to identify the specific pain points of each stakeholder and articulate the benefits realized by adopting the vendor's solutions.

## LEARN MORE

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### Related Research

- ☒ *Power and Cooling in the Datacenter: Challenges, Impacts, and Forecast* (IDC special study, forthcoming)
- ☒ *IBM Strengthens AMD Partnership, Extends Opteron-Based Server Line* (IDC #203011, August 2006)
- ☒ *HP Rolls Out New Blade Chassis with Virtualization, Management, and Network Partners in Mind* (IDC #202184, June 2006)
- ☒ *The Impact of Power and Cooling on the Datacenter Infrastructure* (IDC #201722, May 2006)
- ☒ *Data Center of the Future* (IDC special study #06C4799, April 2006)
- ☒ *Sun Launches CoolThreads Servers, Based on Niagara CMT Microprocessor* (IDC #34546, December 2005)
- ☒ *Server Power Consumption Reemerges as a Critical Cost Factor in Datacenters* (IDC #33937, August 2005)

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