InterSect360™ Market Advisory Service

2008 Technical HPC Server Market Review

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EXECUTIVE SUMMARY

This Tabor Research report presents our 2008 server revenue estimates for the traditional High Productivity Computing (HPC) market. Tabor Research estimates that the traditional HPC server market generated approximately $7.50 billion in revenue in 2008, declining from $7.76 billion in 2007. The traditional HPC server market declined 3.4% year-over-year.

Key estimates from the study include:

- The Supercomputer segment represents a respectable 18.5% of the HPC market. Supercomputers were the only product class to experience growth during 2008.

- HP led the market in 2007 and 2008, with IBM within three share points of the lead. Each company has captured about a third of the market for the last three years.

- In 2008, HPC sales in EMEA and Asia-Pacific showed positive growth while North America declined in growth. North America still represents over half of the market at 54.5%.

- The largest portion of sales in economic sectors went to Commerce/Industry with 45.0% of the market.

INTRODUCTION

This Tabor Research report presents our 2006, 2007, and 2008 server revenue estimates for the traditional High Productivity Computing (HPC) market. In addition, historical data for the market is provided. Market size and growth estimates are provided for the total market and the market segmented by: system class, geographic region, and economic sector. In addition, market shares for suppliers are provided for the overall market and for product class.

Tabor Research defines HPC as the use of servers, clusters, and supercomputers – plus associated software, tools, components, storage, and services – for scientific, engineering, or analytical tasks that are particularly intensive in computation, memory usage, or data management. HPC is used by scientists and engineers both in research and in production across industry, government, and academia. Within industry, HPC can frequently be distinguished from general business computing in that companies generally will use HPC applications to gain advantage in their core endeavors – e.g., finding oil, designing automobile parts, or protecting clients' investments – as opposed to non-core endeavors such as payroll management or resource planning.

At the highest level, Tabor Research divides the HPC market into "Traditional HPC" and "Edge HPC" segments, as follows:

- Traditional HPC – HPC systems used by scientists and engineers in research, development, and production across industry, government, and academia.

- Edge HPC – Edge-of-the-envelope business applications whose profiles mirror traditional HPC workflows. This includes emerging applications made possible by the conjunction of ideas and technologies at the leading edge of computing.

This report considers the Traditional HPC market. We believe that the Traditional HPC market represents about two-thirds of the total HPC market by total product spending. Servers are the largest component of the traditional market, accounting for about a quarter of the total HPC budget.[1] Market size estimates are based on supplier research combined with end-user survey data to produce a total market model and forecast.

METHODOLOGY

Estimates for this report are developed using a top-down methodology that combines public data from suppliers, discussions with suppliers and other interested parties, system installation data obtained in our Site Census Survey, and analyst opinion. The methodology has three major stages:

1. Supplier model development – This is the primary component of the overall methodology and is divided into three steps. We begin by deriving the business unit revenue from which HPC revenue estimates are extracted, by progressively accounting for other revenue sources within the business unit. The process involves the following steps:

   - Preliminary data collection – Revenue and segment distribution (e.g. geographic sales) data is collected from such sources as financial reports, press releases, and supplier presentations. Data is collected at the level that includes HPC server sales, usually a business unit. For companies that are exclusively focused

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[1] Tabor Research, *InterSect360 Market Advisory Service:* "Site Budget Allocation Map," November 2008.

on the HPC market, this business unit would be the entire company; for larger companies this unit might be responsible for multiple product types (e.g., servers, storage, workstations, and so on.)

- Estimated server revenue – The top-level value is then reduced to account for non-server revenues (i.e., storage, services, workstations, etc.). Specific information may be available in financial reports, although for larger organizations it is usually subsumed into overall figures. When the information was not available, Tabor Research made estimates based on overall market distributions and analyst opinion.

- Estimated HPC server revenue – Tabor Research divided the server value into Traditional HPC, Edge HPC, and other revenues. The share of servers assigned to Traditional HPC ranges from 100% for HPC-focused companies to as little as 10% for companies with broad product portfolios and a more general sales model in terms of participation in a wide range of market segments. Estimates were based on several factors: system installation data in our Site Census Survey, overall market distributions, and analyst opinion.

The complexity and detail of models vary between suppliers due to the size and complexity of their business and the type of data available.

2. Supplier surveys and community discussions – Tabor Research sent the modeled estimates to HPC suppliers for comments. Based on an iterative process with each supplier, we solicited adjustments and updated the model accordingly. We also discussed the model results and overall size and direction of the market with other interested parties in both the supplier and user community. Such discussions are held on an ongoing basis.

3. Iteration and refinement – Information from all sources is used to update estimated values within the model. Supplier input is generally given the highest weight, but it is balanced against data from other sources where appropriate. In addition, insight and data derived from discussions with suppliers and industry sources are used to update estimates for which no supplier input is available.

Methodology Limitations

There are, of course, constraints to the process of collecting supplier data. The need to protect proprietary company information, coupled with regulatory requirements, creates limitations on the amount of information a company can share. These factors lead to some methodological limitations that are worth noting:

- Reporting restrictions – Government regulations on how public companies report financial performance to investors and the public limits what companies can report on specific business units or market performance. The effect of these regulations can vary significantly based on company organization and policy.

- Data as a competitive resource – Companies view data on their own product performance within the market as a source of competitive intelligence and make strategic decisions as to how much of that data they wish to release. There are three major inducements for releasing data when possible. First, it supports the development of the market-sizing and forecasting models that are necessary for business planning and product positioning purposes. Second, it allows the companies to measure how well they are performing in various markets. And third, it helps them promote their products and business strategies. It is necessary for multiple suppliers to release this data to third parties in order for estimates based on total market values to be developed and to provide some level of credibility for these estimates.

- <u>Privately held companies</u> – Privately held companies are not required to release any business performance information to the public. In general, these companies closely guard their data, only releasing it under non-disclosure agreements that generally prevent its use in our models.

Tabor Research believes these limitations will continue to be mitigated over time through the use of data from our Site Census Survey which provides information on installed systems, our Budget Map Survey which provides budget distributions and directions and buying intentions. Results from these studies are used to verify and calibrate our supplier models.

Notes on Estimates

We provide the following notes on our estimates:

- <u>Estimates for "Other" suppliers</u> – The majority of our effort was concentrated on the major suppliers; however, we also developed estimates for a number of other suppliers that sell into the traditional HPC market. These less-detailed estimates were combined into an "Other" category. More-detailed models for these individual suppliers will be developed in the future as required to improve our modeling accuracy.

MARKET RESULTS

An Interesting Year

May you do business in interesting markets – Ancient Cybernetic Curse

2008 was an interesting year for the entire world economy, not only because it was a recession year, but also because it started with a speculative bubble in petroleum and other commodities and ended with the housing bubble starting a financial domino effect that is still rippling through the economy. Thus the fourth quarter recorded the majority of the losses from the year's economic dramas.

In an "average" Q4, HPC revenue can be expected to be between 26% and 28% of total revenue for the year. In this non-average year, Q4 accounted was down about 10.4% year-to-year and accounted for about 25% of HPC sales. Overall HPC server revenue only showed growth in the second quarter, and was down about 4.4% for the year. Only Cray and Sun showed positive growth in the HPC market for the year; other vendors reported declines ranging from -2% to -25%.

Tabor Research estimates that worldwide spending in the Traditional HPC server market declined by 3.4% to $7.50 billion in 2008 compared to $7.76 billion in 2007. The declining market in 2008 after 10.4% revenue growth in 2007 can be almost entirely attributed to the economy. The highlights include:

- <u>Large systems prevail</u> – Larger systems are generally purchased based on long sales cycles, long-term contracts, and with extended acceptance periods that delay revenue recognitions. Funds for these large ticket items are committed or spent prior to the quarter of system delivery or acceptance. Thus, surprisingly, high-end systems sales are often the last to see the effects of economic downturns. In contrast, it is easier for organizations to hold up spending on short sales cycle purchases such as entry-level and midrange systems.

- <u>North American sales slide</u> – North America, particularly the U.S., has been the dominant consumer of HPC systems. In 2008, its sales declined 9.1% as businesses either put purchases on hold or scaled back on planned purchases. Europe and Asia/Pacific helped minimize the U.S. downturn and continued to show revenue growth. 2009 may be different as the U.S. economic crisis has globalized.

- <u>Academic sites contracted HPC spending</u> – In September, both academic and commercial sites were optimistic about future HPC budget increases. Using a very rough estimate, the expected growth was between 10% and 15% over the next two years. As the economy entered its steep decline, so did the available funds for fourth-quarter purchases. We see the academic sector as the most vulnerable to economic downturns, particularly for entry-level and midrange system sales. Factors contributing to this exposure include: continual pressure on government spending caused declines in available funds, a drop in corporate sponsorships/partnerships as industry pulls back, and a steep decline in endowments. Given these factors, any discretionary spending can be halted.

More detailed estimates of HPC revenue sizing for the Traditional HPC market by product class, geography, and economic sector are provided in the following sections.

2006-2008 Traditional HPC Market Revenue by Server Product Classes

Tabor Research categorizes the server market into four separate server product classes. Server product class is defined as the top-level segmentation for computer systems. This segmentation is oriented towards supplier organizations and sales strategies and is based on system configuration, sales strategy, price band, and sales channel.

Tabor Research defines the HPC server product classes as follows:

- Supercomputer – Servers specifically designed or configured to address problems that cannot be effectively addressed by general purpose systems. Although generally seen as scientific and engineering systems, supercomputers can be used for any application that requires extraordinary capabilities in such areas as computational power, I/O performance, or scalability.
- High-end HPC – Generally used to support larger organizations, often with several independent subgroups. These systems can also be dedicated to supporting large ongoing (often mission-critical) applications.
- Mid-range HPC – Generally used to support small organizations or projects.
- Entry-level HPC – Generally used to support individuals, small groups, or for dedicated applications.

Tabor Research provides suppliers guidelines in determining which product class is most appropriate for each of their product lines. [See Table 1.] These guidelines will be updated periodically to reflect current market conditions.

Table 1
Computer System Class Characteristics

Class	Typical Characteristics			
	Price range	Number of processors	Sales model	Sales cycles
Supercomputer	Multi-million dollar	Thousands	Direct through sales rep; competitive bids	120 to 540 days
High-End HPC	$250,000 -- $1,500,000	Hundreds to thousands	Almost entirely direct, unusually through sales rep; competitive bids	60 to 180 days
Mid-Range HPC	$50,000 - 249,999	40 to 200	Mostly direct; multiple bids common	30 - 120 days
Entry-Level HPC	Under $49,999	40 or fewer	Direct or indirect, some web transactions; buyer might not seek multiple bids	0 to 60 days

Source: Tabor Research, 2009

The revenue division and shares by product class for 2007 and 2008 are given in Tables 2 and 3. The Supercomputer segment represents a respectable 18.5% of the market, and the remaining three segments are fairly evenly distributed,

ranging between 26% and 29%. The high end of the market (Supercomputer and High-End HPC) gained share while the Entry-Level HPC share declined.

Table 2
Traditional HPC Revenue by Product Class ($K)

	2006	2007	2008
Supercomputer	$1,180,766	$1,279,829	$1,384,760
High-End HPC	$1,953,448	$2,166,858	$2,132,403
Mid-Range HPC	$1,993,429	$2,189,018	$2,062,097
Entry-Level HPC	$1,904,034	$2,125,658	$1,918,887
Total	$7,031,676	$7,761,364	$7,498,147

Source: Tabor Research 2009

Table 3
Traditional HPC Revenue Share by Product Class (%)

	2006	2007	2008
Supercomputer	16.8%	16.5%	18.5%
High-End HPC	27.8%	27.9%	28.4%
Mid-Range HPC	28.3%	28.2%	27.5%
Entry-Level HPC	27.1%	27.4%	25.6%
Total	100.0%	100.0%	100.0%

Source: Tabor Research 2009

As mentioned previously, overall Traditional HPC server revenue declined by 3.4% in 2008. [See Table 4.] Revenue for higher-end systems grew the most with supercomputer revenue growing about 8.2%, driven in large part of Cray's $137 million fourth quarter (if Cray Q4 had been closer the other three quarters the segment as a whole would have seen growth of about 0.5%). High-End HPC servers declined moderately given the economy. The Mid-Range and Entry-Level HPC servers both saw declines in revenue with the Entry-Level HPC segment feeling the brunt of the economic downturn.

Table 4
Traditional HPC Revenue Growth 2007-08 (%)

	2008
Supercomputer	8.2%
High-End HPC	-1.6%
Mid-Range HPC	-5.8%
Entry-Level HPC	-9.7%
Total	-3.4%

Source: Tabor Research 2009

2006-2008 Traditional HPC Market Revenue by Vendor

HP led the traditional HPC server market in 2008 with about 34.4% of the market. In addition, further data on the IBM sales distribution between servers, storage, and services has dropped IBM into the number-two slot for both 2007 and 2008. That said, IBM remains within in three share points of the lead. Dell held the third position in the market with a 10.0% share. Evaluation of end-user data has led us to increase the amount of Dell servers attributed to HPC sites in our model. These three companies made up over three quarters of the market, with no other company garnering double-digit share. Cray had an excellent year, largely based on strength in the supercomputer segment, while SGI faltered significantly, contributing to another bankruptcy in 2009. [See Tables 5, 6, and 7.]

Table 5
Traditional HPC Server Revenue Growth –
By Vendor ($K)

	2006	2007	2008
HP	$2,299,942	$2,629,025	$2,577,522
IBM	$2,396,214	$2,536,120	$2,366,337
Dell	$647,069	$768,788	$753,478
Sun	$546,089	$617,096	$627,312
Cray	$162,795	$133,455	$218,970
SGI	$192,968	$221,880	$165,829
Other	$786,600	$855,000	$788,700
Total	$7,031,676	$7,761,364	$7,498,147

Source: Tabor Research 2009

Table 6
Traditional HPC Server Revenue Share –
By Vendor

	2006	2007	2008
HP	32.7%	33.9%	34.4%
IBM	34.1%	32.7%	31.6%
Dell	9.2%	9.9%	10.0%
Sun	7.8%	8.0%	8.4%
Cray	2.3%	1.7%	2.9%
SGI	2.7%	2.9%	2.2%
Other	11.2%	11.0%	10.5%
Total	100.0%	100.0%	100.0%

Source: Tabor Research 2009

Table 7
Traditional HPC Server Revenue Growth –
By Vendor

	2006	2007	2008
HP		14.3%	-2.0%
IBM		5.8%	-6.7%
Dell		18.8%	-2.0%
Sun		13.0%	1.7%
Cray		-18.0%	64.1%
SGI		15.0%	-25.3%
Other		8.7%	-7.8%
Total		10.4%	-3.4%

Source: Tabor Research 2009

2006-2008 Traditional HPC Market Revenue by Geographic Regions

Tabor Research utilizes four broad geographical areas to categorize regional HPC supplier revenue:

- North America – Canada and the United States
- Latin America – Central and South American countries (including Mexico)
- EMEA – Western, Central, and Eastern European, Middle Eastern, and African countries
- Asia-Pacific – Asian and Pacific countries (including Japan)

In 2008, HPC sales to North America continued to represent the majority with 54.5%, but due to the economic climate in the U.S., North America saw a decline in share. Overall the total amount of Traditional HPC server revenue fell in North America to below 2006 levels. Sales to EMEA accounted for 28% of revenues, up 4.1% from 2007, while Asia-Pacific gained 8.8%. We believe that the growth in EMEA resulted from the economic decline hitting that market later than in North America, and we attribute Asia-Pacific growth to indigenous HPC vendors ramping up in 2008. [See Tables 8, 9, and 10.]

Table 8
Traditional HPC Revenue by Geographic Regions ($K)

Regions	2006	2007	2008
North America	$4,129,854	$4,494,692	$4,083,708
EMEA	$1,765,960	$2,022,320	$2,101,794
Asia-Pacific	$1,019,835	$1,098,856	$1,192,519
Latin America	$116,027	$145,496	$120,127
Total	$7,031,676	$7,761,364	$7,498,147

Source: Tabor Research 2009

Table 9
Traditional HPC Revenue Share by Geographic Regions (%)

Regions	2006	2007	2008
North America	58.7%	57.9%	54.5%
EMEA	25.1%	26.1%	28.0%
Asia-Pacific	14.5%	14.2%	15.9%
Latin America	1.7%	1.9%	1.6%
Total	100.0%	100.0%	100.0%

Source: Tabor Research 2009

Table 10
Traditional HPC Revenue Growth by Geographic Regions (%)

Regions		2007	2008
North America		8.8%	-9.4%
EMEA		14.5%	4.1%
Asia-Pacific		7.7%	8.8%
Latin America		25.4%	-14.7%
Total		10.4%	-3.4%

Source: Tabor Research 2009

2006-2008 Traditional HPC Market Revenue by Economic Sectors

This report utilizes three different categories to allocate sales to the various economic sectors. Those groups are:

- Commerce/Industry – Business organizations involved in designing, developing, manufacturing, selling or distributing products and services.
- Government – National, state/regional/provincial, and local government organizations including: non-national security agencies, national security agencies, and national laboratories.
- Academia – Public and private colleges and universities, not-for-profit research organizations, and consortia of academic institutions.

The largest portion of sales by economic sector went to Commerce/Industry at 45%, with Government representing 34% of spending and Academia 20%. Overall market shares did not change dramatically from 2007 to 2008. We believe that the Academic sector saw the greatest effect from the economic downturn as endowment funds shrank and state budgets were tightened. Commerce/Industry saw moderate declines as companies put the brakes on spending in Q4. The Government sector was relatively stable, due in part to HPC's importance to core national security activities, and in part to the fact that government purchases are often made with previously committed money. Some government systems revenue also reflects previously installed systems that have completed acceptance tests. [See Tables 11, 12, and 13.]

Table 11
Traditional HPC Server Revenue by Economic Sector ($K)

Economic Sector	2006	2007	2008
Commerce/Industry	$3,006,960	$3,471,353	$3,372,867
Government	$2,400,162	$2,596,086	$2,585,543
Academia	$1,624,554	$1,693,925	$1,539,737
Total	$7,031,676	$7,761,364	$7,498,147

Source: Tabor Research 2009

Table 12
Traditional HPC Server Revenue Share by Economic Sector (%)

Economic Sector	2006	2007	2008
Commerce/Industry	42.8%	44.7%	45.0%
Government	34.1%	33.4%	34.5%
Academia	23.1%	21.8%	20.5%
Total	100.0%	100.0%	100.0%

Source: Tabor Research 2009

Table 13
Traditional HPC Server Revenue Growth by Economic Sector (%)

Economic Sector	2006	2007	2008
Commerce/Industry		15.4%	-2.8%
Government		8.2%	-0.4%
Academia		4.3%	-9.1%
Total		10.4%	-3.4%

Source: Tabor Research 2009

TABOR RESEARCH ANALYSIS

Traditional HPC vs. the Economy

To understand the impact of the current economic climate on the traditional HPC market, we must consider three sets of market dynamics: impact on computer sales overall, impact on commercial computing markets, and impact on traditional HPC markets.

1. Economic conditions vs. computer sales overall – We see several major factors impacting server sales as the economy declines. These include:

   - General spending suspensions – An initial response to any economic downturn is to conserve cash wherever possible and attempt to wait out the storm. The immediate effect of such conservation is a reduction in discretionary spending.

   - Bottom-up losses – Spending suspensions tend to affect low-end purchases first, as these are often made from discretionary or non-committed budgets. Funds for larger system purchases may have already been set aside, or they may have been contractually committed to a purchase and thus more difficult to pull back.

   - Effects of downsizing – Organizations that respond to a downturn by downsizing staff, halting new projects, shutting down marginal business units, etc., have fewer requirements for all types of resources including computers. We see this as a midterm effect on computer sales.

   - Loss of credit – A unique issue in today's environment is the severely restricted credit markets. Thus, even organizations that wish to make capital purchases may not be able to secure financing.

   - Gray market competition – In cases where sectors of the economy contract, the availability of used computers can spike as companies sell the equipment either because of bankruptcy or in an attempt to avoid it. We see this as a long-term effect, and do not currently consider it as a major threat.

2. Commercial computing factors – In addition to the above factors, we see several issues effecting commercial computing markets to a much greater extent than traditional HPC markets:

   - Virtualization – Wherever the move to server consolidation through the use of virtualization technologies was not already in high gear, the current economic conditions may kick it in. This is a case of having your cake and eating it too; by increasing utilization of existing computers, IT managers can expand delivered computing performance without capital expenditures – and possibly save their jobs – all at once. This issue is mitigated in the HPC markets because servers tend to be fully utilized, thus eliminating the opportunity to recapture unused resources.

   - Cloud options – Cloud computing (including utility, SaaS, and grid) is a logical extension of virtualization concepts. Even if many of these strategies are not effective, users will still delay restarting capital purchases as they explore cloud computing options.

   - Trickle-down effect – Reductions in demand for goods and services associated with recessions inevitably reduce requirements for business equipment (including computing) needed to manage and deliver those goods and services.

3. Traditional HPC factors – High productivity computing has a number of characteristics that provide some degree of immunity to economic downturns:

    •   <u>Ability to keep up with Moore's Law</u> – HPC has been defined as the sector of the industry that is always looking for the next most powerful computer. Scientific and engineering problems continue to expand as we learn about what we don't know, and we seek the next highest level in design fidelity. Subsequently, we do not expect underlying demand to contract or be addressed even in the short term by server consolidation technologies.

    •   <u>Core activity</u> – Product design and development is a core activity for industries involved in HPC, and these organizations must maintain their products' competitive position despite (perhaps especially in) economic downturns. Similarly, national security mission requirements are either unaffected or increased by times of global economic instability.

    •   <u>Tabor Research results</u> – Although not a fundamental characteristic of the market, a number of Tabor Research studies completed in the second half of 2008 have indicated that users expect their budgets to continue to grow. These expectations did not appear to be affected by the economic downturn. Although we believe that the current conditions will have some effect on spending over the short term, we see these studies as indicating that the need for HPC technology still exists and in that sense, the HPC market is still healthy, even if 2008 overshadowed this need and put the brakes on any growth.

Taking all of these factors and year-to-date performance into account, we believe that no matter how great the need, the HPC market cannot be totally immune to the economic downturn. The fourth quarter turmoil heightened the fear of the future, leading to frozen budgets and thus lengthened sales cycles. Discretionary spending in the academic community was greatly affected as endowment funding took hard hits from losses from investments and donations. Until the economy shows signs of recovery, there will be an impact on revenue growth.

ADVICE TO SUPPLIERS

Tabor Research studies and long-term experience lead to our belief that the HPC market is so closely tied to research and development of the next generation of products, scientific advancement, and national security that it will continue to be active during economic downturns and among the first markets to reflect economic recovery. Our advice to vendors is to continue to seek opportunities in HPC by maintaining strong customer relations and support. Successful companies will competitively market tangible productivity gains for users. Specific tactical advice includes:

•   <u>High-end strategy</u> – Expect the best opportunities in high-end segments of the market and adjust short-term strategies if necessary.

•   <u>Complete solutions</u> – Be aware that users are spending declining percentages of their HPC budgets on the server components and increasing relative spending on storage, software, and services. The HPC data management component in particular will be important to focus on in 2009 and 2010.

•   <u>Emphasize upgrades</u> – Provide existing customers with affordable options for system expansion or upgrades to maintain account control and ongoing working relationships.

- <u>Revisit support contracts</u> – Provide extended service contracts to those customers who might not be able to upgrade on affordable terms.

- <u>Sales cycles</u> – Be patient with lengthening sales cycles. Offer end users opportunities for working through and around their budget constraints.

- <u>Continue product development</u> – Continue to maintain product line competitiveness and prepare for increased competition once the recovery begins.