

IBM Leads Industry with High-Value Technical Computing Solutions

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Executive Summary

Across many industries, scientists, engineers, and analysts increasingly rely on High Performance Computing (HPC) or Technical Computing infrastructure to solve challenging problems in engineering, manufacturing, finance, risk analysis and life sciences. However, many businesses lack the time, money and/or expertise to build, manage and operate these environments from scratch. So, companies are now choosing to buy pre-integrated solutions that are optimized to drive more innovation, improve productivity and reduce time to market, at the same time reducing costs, complexity and deployment risks.

As a result, value in Technical Computing is migrating from hardware alone to an integrated stack including hardware, software, and services. Hence, some pioneering IT solution providers are investing in building a Technical Computing ecosystem to maximize the delivery of business value to their clients – particularly companies who often use several applications that must be integrated in a business workflow. This requires systems and hardware vendors to invest with Independent Software Vendors (ISVs) and other software providers to make their infrastructure optimized for applications.

With its infrastructure optimized for applications, we believe, IBM is outflanking competitors in Technical Computing and fast-tracking the delivery of client business value by providing an expertly designed, tightly integrated and performance optimized architecture for several key applications. These IBM Application Ready Solutions for technical computing come with a complete cluster including servers, network, storage, operating system, management software, parallel file systems and other run time libraries, all with commercial-level solution support.

These offerings represent a major innovation in providing business value for Technical Computing and give IBM a significant first-mover advantage. They enhance IBM's differentiation in Technical Computing and deliver client value by providing best-in-class cluster integration and reference architectures which in turn reduces cluster deployment time, complexity and risks.

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Optimizing Business Value

Growth and Value Drivers in Technical Computing

High Performance Computing (HPC) or Technical Computing helps businesses across multiple industries achieve the speed, agility, insights and competitive advantage to deliver innovative products, increase revenues, and improve operational performance. Today, Technical Computing has become even more critical to solve large-scale interdisciplinary problems, handle the exponential growth of data, provide more real-time analytics and insights, and comply with stricter regulations. As a result, the HPC market is expected to grow to \$33.43 billion in 2018¹ with an estimated healthy CAGR of 6.6% from 2013-2018.

But today, rising operational IT costs (labor, energy, and facilities) and lower application latency² remain key challenges for many organizations. Consolidating and sharing HPC infrastructure reduces these escalating operational costs while improving reliability and utilization, thereby greatly improving the total cost of ownership (TCO). Further, consolidating and co-locating data with compute resources lowers latency, improves collaboration and productivity, and better secures sensitive enterprise data.

Additionally, there are new opportunities, such as the greater use of software tools and technologies³ to manage large-scale IT infrastructures, especially for High Performance Data Analysis (HPDA), forecasted to reach \$1.4 billion⁴ in 2017 in server revenues.

To overcome challenges and capitalize on these emerging opportunities, leading Technical Computing solution providers are integrating high-performance systems, clusters and storage with workload and resource management software and parallel file systems with key applications from ISVs and other partners – optimizing their infrastructure for applications.

Why Build Optimized Infrastructure for Applications?

Increasingly businesses are looking for solutions that go beyond traditional individual Technical Computing component value propositions such as speed, performance, scalability, reliability, availability, and energy-efficiency or compute density. They want all this value seamlessly integrated with their applications, conformant with common open industry standards and supported end-to-end. In other words, clients are looking for optimized infrastructure solutions for applications that deliver added value through better up-front integration and also reduce deployment time, complexity and risks. There are several key drivers for this:

- A typical end-user, who is very specialized in a certain domain such as engineering, life sciences, finance, geophysics, etc., may not be an expert in technical computing systems, networking and middleware. This makes it hard for these users to maximize performance, utilization and value from the infrastructure for their particular applications.
- Even as several ISVs and application providers have optimized their applications' performance for clusters, many firms find it challenging to fully utilize these capabilities because they do not have the technical skills to efficiently deploy and manage a cluster.

¹ Market Report January 2014 <http://www.prweb.com/releases/high-performance/computing-hpc-market/prweb11533432.htm>

² HPC market research April 2014 <http://unified-communications.tmcnet.com/news/2014/04/07/7764254.htm>

³ IDC Top 10 HPC Trends for 2014 - #8 Trend – focus on SW stack <http://www.hpcwire.com/2014/04/10/idc-details-hpc-market-momentum/>

⁴ IDC Revenue for HPDC market <http://www.scientificcomputing.com/articles/2014/03/big-data-meets-hpc>

Technical Computing market size and growth robust and healthy

Labor, energy and facilities costs and application latency high

Software tools and Big Data analytics are new growth opportunities

Skills crucial to optimize infrastructure for Technical Computing applications

Must right-size compute with right-placed data for Big Data analytics

Improved performance and faster time-to-value with reduced costs, complexity and risks

Competitive assessment along five key business value dimensions

As a result, they either struggle with sizing, building, integrating, provisioning and supporting a cluster infrastructure themselves, or they compromise on performance.

- With the emergence of HPDA and the blurring of boundaries between Technical Computing and Big Data analytics, there's a pressing need to manage data and compute together especially for Hadoop⁵. This requires high performance data/file servers coupled with agile workload schedulers and resource managers to meet stringent deadlines and service level agreements (SLAs).

Characteristics of Optimized Infrastructure for Applications

We define “Optimized Infrastructure for Applications in Technical Computing” to be a carefully designed, pre-integrated and performance optimized system (typically a cluster) for a set of applications. The architecture consists of hardware and software components, install scripts, and bill of materials that can be deployed on premise or as a hybrid cloud.

This architectural framework must be flexible so that the system can be repurposed, if needed, for other customer applications to maximize utilization and efficiency. So it is a general purpose system that's not confined to only one narrow set of applications. Here are some key benefits of optimized infrastructure for applications:

- **Faster time-to-value:** Key application-enabled business processes are deployed faster with greater reliability because of extensive validation before reaching the client.
- **Improved performance:** Applications run faster because they are optimized for compute and storage resources.
- **Reduced costs and complexity:** Resource and workload management software improve IT resource utilization and manageability.
- **Lower IT risks:** Clients benefit from minimal deployment and operational issues as a result of end-to-end support for the validated solution and its components.

Competitive Assessment

Based on public information and sources, we provide here our assessment of some key Technical Computing solution providers⁶ (Cray, Dell, HP, IBM and SGI). We evaluate each solution provider **only** by how well their cluster solutions are optimized for applications using five key criteria:

- Technical computing software capability
- Level of application integration
- Ease of deployment and use
- Application and industry coverage
- End-to-end solution support.

These findings are summarized in Table 1, followed by a brief high-level discussion.

⁵ HPC and Big Data Analysis boundaries collide <http://siliconangle.com/blog/2013/10/28/big-data-meets-hpc-in-production-environments-wikibon-looks-at-four-leading-vendors/>

⁶ Research and Markets: Global HPC Market 2014 <http://ibm.ulitzer.com/node/3059194>

IBM is the clear leader with IBM Application Ready Solutions

Validated Application Ready Reference Architecture with IBM Intelligent Cluster with Elastic Storage and Platform Computing provide first-mover advantage

	IBM	SGI	Cray	Dell	HP
Technical Computing Software Capability					
Level of Application Integration					
Ease of Deployment and Use					
Extent of Application and Industry coverage					
End-to-end Solution Support					

Table 1: Competitive Analysis Summary of Application Ready Solution Providers
(More dark shade in circles is better)

While all solution providers are at various stages in optimizing their infrastructure for applications, IBM is the clear leader with [IBM Application Ready Solutions for technical computing](#). There are several reasons:

- Technical Computing Software Capability:** IBM continues to make substantial investments in key industry leading Technical Computing infrastructure software components – [Platform Computing](#) for resource managers and schedulers, and [IBM Elastic Storage with General Parallel File System \(GPFS\) technology](#) for high performance data management. Cray, SGI and HP have several strategic partnerships to get these capabilities through competitors of Platform Computing and Elastic Storage.
- Level of Application Integration:** IBM [Intelligent Cluster](#) solutions feature industry-leading IBM System x servers, storage, software and third-party components that provide a wide choice of technology within an integrated, delivered system. IBM tests and optimizes each system for reliability, interoperability and maximum performance, so clients can quickly deploy the system to achieve their business goals. HP, Cray and SGI have similar capabilities with “factory-testing”.

IBM goes one step further and pre-integrates and validates a carefully architected cluster with Platform Computing and GPFS to optimize application performance based on an application-specific [reference architecture](#) developed in partnership with ISVs and application providers. This architecture optimizes compute and storage performance based on deep industry, application and systems knowledge. SGI and Cray also offer some pre-integrated solutions capability leveraging strategic partners. SGI’s large shared memory capabilities provide some additional differentiation for HPDA.

IBM provides commercial solution-level support for the complete cluster and the associated infrastructure software

IBM Application Ready Solutions lower complexity and risks and improve time-to-value for clients

- **Ease of Deployment and Use:** IBM provides install scripts to quickly deploy the infrastructure optimized for the application, enabling users to become productive more quickly. Additionally, the hardware and software components in the cluster are customizable to allow the best performance or the best price/performance ratio.
- **Industry and Application Coverage:** IBM, SGI and Cray have good coverage and expertise for many industries in traditional Technical Computing and HPDA.
- **End-to-end Solution Support:** In most instances, the ISVs or application providers provide support for the application. IBM provides commercial solution-level support for the complete cluster *and the associated infrastructure software*.

Conclusions

Value in Technical Computing is migrating from hardware to complete integrated solutions. IT solution providers are investing in building infrastructure solutions optimized for applications in Technical Computing and High Performance Data Analysis (HPDA). This is particularly valuable for businesses that lack the time, resources and expertise to build the infrastructure from scratch. Additionally, these clients also demand ease of deployment and use, and end-to-end solution support.

Developed in partnership with leading ISVs and applications providers across a range of industries, [IBM Application Ready Solutions for technical computing](#) provide the IT industry's best combination of technical computing software capability in workload, resource and data management, level of application integration, ease of deployment and use, industry and application coverage and end-to-end solution support. These solutions represent a major innovation in providing business value for Technical Computing and give IBM a significant first-mover advantage.

For businesses, these IBM Application Ready Solutions improve time-to-value while lowering deployment complexity and risks through expertly designed pre-integrated, performance-optimized solutions for Technical Computing and HPDA.

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