



THE TOP 5 REASONS FOR 64-BIT BUSINESS INTELLIGENCE

A WHITE PAPER BY MICROSTRATEGY



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I. EXECUTIVE SUMMARY

The 64-bit computing era has arrived. From personal computers to high-end servers running scientific applications, 64-bit computing architecture is rapidly replacing the previous generation of 32-bit computers. Since the widespread availability of 64-bit processors in 2003, 64-bit computing prices have steadily declined while computing power – faster clock speeds, multiple processing cores per central processing unit (CPU) chip, more addressable memory (RAM) access – has increased. At the same time, 64-bit Linux and Windows operating systems have ushered in an era of inexpensive 64-bit operating system platforms once dominated by Unix. The result is powerful but inexpensive 64-bit computing.

More importantly, 64-bit systems solve the instability and performance issues that plague 32-bit systems. The promise of 64-bit computing is to transform unstable and increasingly expensive to maintain 32-bit computing applications into robust, cost effective, high performance applications.

Business intelligence (BI) applications are especially well-suited to 64-bit computing because they require data-intensive analysis which involves processing large amounts of data and/or performing complex data joins to calculate accurate report results. Over the past 15 years, BI has evolved from reports with simple data summations to reports with sophisticated statistical calculations that require data-intensive analysis. More business people running more reports increases the strain on the BI application even further. Under these BI usage conditions, 32-bit BI is becoming obsolete.

The answer is 64-bit BI.

This paper presents data and findings collected from (1) over 40 surveys and focus groups with organizations that use MicroStrategy Universal, the 64-bit version of MicroStrategy BI software; (2) applications installed on 64-bit BI systems; (3) 64-bit BI performance testing data; and (4) independent third-party research. This paper will explain how 64-bit BI addresses the limitations of 32-bit BI and demonstrate the benefits achieved by MicroStrategy organizations that run 64-bit BI.

The data shows that 41% of MicroStrategy BI installations are already running 64-bit BI. The research points to five main reasons for the broad adoption of 64-bit BI.

1. Cost Effectiveness: The vastly improved stability inherent in 64-bit BI pays for itself in reduced staffing expenses and the ability to consolidate servers.
2. Faster Performance: The expanded computing resources of a 64-bit system, particularly memory, makes BI run faster.
3. Self-service: Business people are able to conduct analysis quicker, take advantage of more BI functionality, and create their own reports and analysis without help from the information technology (IT) organization.
4. Mainstream Acceptance: The risk with moving to 64-bit BI is minimal. MicroStrategy Universal offers flexible hardware and operating system options and provides a straightforward path to 64-bit BI.
5. Mature Technology: The 64-bit computing architecture is mature, widely available, powerful, and inexpensive.

II. INTRODUCTION

In the 1980s and 1990s, 32-bit processors reigned as the dominant computing architecture. Businesses invested heavily in 32-bit applications that successfully improved employee productivity and effectiveness. By the late 1990s, these 32-bit systems experienced reliability issues due to increased application demand. In particular, the 4 GB memory limitation associated with the 32-bit architecture caused system instability and degraded performance which, in turn, increased administrative costs. Organizations had two basic choices when faced with unstable 32-bit systems: purchase very expensive, proprietary 64-bit systems or restrict application usage.

The original 64-bit systems were expensive because they matched proprietary 64-bit processor architectures with proprietary operating systems; processor families and operating systems could not be mixed-and-matched. For example, the IBM AIX operating system could only run on IBM's PowerPC central processing units (CPUs or simply processors). IBM AIX could not run on the Sun SPARC processors. Additionally, there were a very limited number of applications available for 64-bit servers. Powerful but expensive, 64-bit systems were cost prohibitive for all but the most intensive computing needs.

Consequently, most IT organizations remained on less expensive 32-bit architectures and chose to govern or limit system access and usage. For BI applications, this generally translated to an information rationing policy that restricted a business person to a limited number of reports, amount of data, or access time. This rationing, driven by 32-bit limitations, diminished the value of BI for users to have full and timely access to the information they needed.

Today, organizations no longer need to choose between investing in expensive 64-bit systems and restricting information from their business people. Since 2003, 64-bit systems have become readily available and inexpensive. Processor and memory prices have declined while power – faster clock speeds, multiple cores per CPU, more access to memory – has increased.

The principal 64-bit computing benefit comes from the vast increase in the amount of addressable system memory – 16 Exabytes (16 billion GB), compared to just 4 GB with 32-bit computing. Figure 1 provides a tabular comparison of processor architectures by memory capacities.

Processor Architecture	Mainstream Adoption Year	Typical Server Memory	Theoretical Memory Maximum
64-bit	2008	64 GB – 512 GB	16,000,000,000 GB
32-bit	1996	2 GB – 4 GB	4 GB
16-bit	1984	64 KB	64 KB

Figure 1: Nearly limitless 64-bit system memory provides ample space to support the most demanding applications.

A 64-bit system does not experience the memory contentions that 32-bit systems face when trying to find adequate memory to run applications. These 32-bit memory contentions cause instability and performance degradation. The expanded memory afforded with 64-bit processors allows applications to perform more operations in-memory, which results in better performance and stability.

For BI, 64-bit systems hold tremendous promise. However, simply running BI applications on 64-bit systems will not necessarily result in improved stability and performance. The BI applications must be written for 64-bit to leverage all of the memory resources available. Available since 2004, MicroStrategy Universal is written and fully compiled to enable true 64-bit BI.

This paper explores the top five reasons that MicroStrategy customers decided to migrate to 64-bit BI.

III. REASON 1: 64-BIT BI IS COST-EFFECTIVE

“64-bit has made our life considerably easier on the maintenance side.”

– AARP, American Association of Retired Persons

The improved stability of 64-bit BI pays for itself in reduced staffing expenses and the ability to consolidate servers. The number one reason cited by MicroStrategy customers for their move to 64-bit was cost savings. Specifically, customers found that 64-bit systems enable them to significantly reduce staffing costs due to less required maintenance as compared with the outdated 32-bit systems. In addition, the ability to consolidate multiple 32-bit servers onto a single 64-bit server reduced operating expenses.

IMPROVED SYSTEM STABILITY REDUCES STAFFING COSTS

The primary factor contributing to the high costs of operating 32-bit BI is system instability. As 32-bit systems age and the BI demands increase, staffing costs to maintain these systems grow rapidly. Companies with 32-bit systems find that their BI systems require more administrative support to keep the applications up and running to accommodate expansion beyond the original scope of the system.

IDC reports that the primary cost in maintaining a BI system is staffing for administration and maintenance (see Figure 2)¹. As the health of 32-bit systems degrades, the proportion of staffing expenses increases.

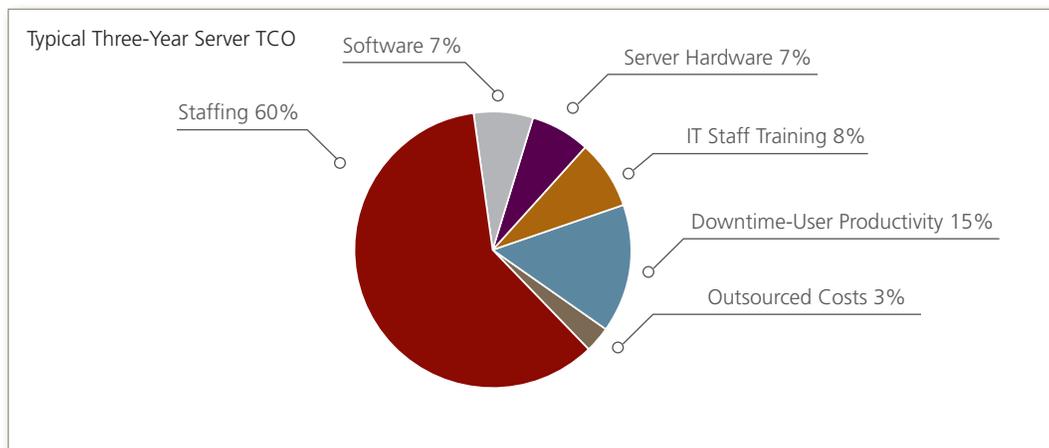


Figure 2: Source: IDC. Based on more than 300 interviews conducted across numerous platforms, presented in composite form. “Demonstrating Business Value: Selling to Your C-Level Executives.” Three Year Server TCO. April 1, 2007.

¹ “Demonstrating Business Value: Selling to Your C-Level Executives.” Three Year Server TCO. April 1, 2007.

MicroStrategy customers who moved to 64-bit BI on MicroStrategy Universal cited that within 12 to 24 months, the investment paid for itself in staff savings, including the upfront costs associated with new hardware and operating systems. MicroStrategy Universal customers report high system stability, superior uptime availability, and higher user satisfaction scores.

SERVER CONSOLIDATION REDUCES COSTS

Server consolidation was another primary source of cost reduction. Running and maintaining many 32-bit servers becomes increasingly expensive, whereas standardizing on fewer servers and operating systems with 64-bit provides considerable cost savings. With the declining costs of 64-bit hardware and operating systems, many 32-bit servers can easily be consolidated onto a single 64-bit server.

While the consolidation of many BI applications onto one server can increase the workload for reporting and analytics, MicroStrategy Universal is designed to handle the largest BI information demands, all from a single server. Single server scalability is enhanced due to expanded memory capacity and the increased number of CPUs available in 64-bit platforms. If more hardware resources are needed, more processors can simply be added to the server. MicroStrategy can make full use of the additional resources. Figure 3 shows that response times remain constant as the number of users and processors double.

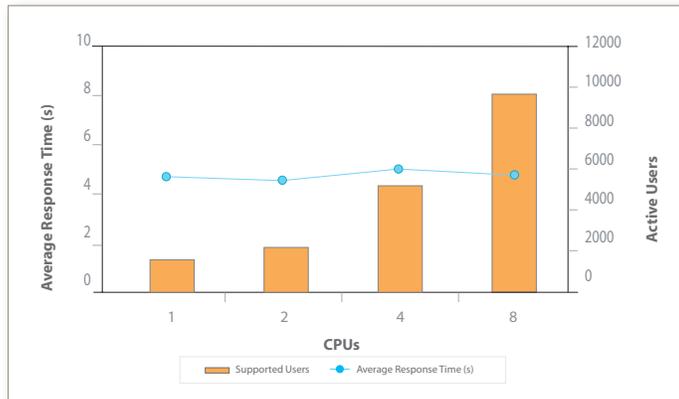


Figure 3: The average response time stays constant when the number of users and number of CPUs double. A scalable BI server fully leverages additional CPUs within a single server.

Source: MicroStrategy Universal Edition: Delivering Increased Business Intelligence Capacity Through MicroStrategy Universal Edition.

IV. REASON 2: 64-BIT BI DELIVERS FASTER PERFORMANCE

“It will be faster. There’s no mystery.”

– FAMIQ, Argentina’s Leading Stainless Steel Manufacturer

The expanded computing resources of a 64-bit system, particularly expanded memory capacity, makes BI run faster. Companies running MicroStrategy Universal cited overall faster performance compared to 32-bit BI. This enhanced performance can be directly attributed to MicroStrategy Universal’s ability to address the much larger memory resources of 64-bit systems and perform more operations in memory. Server operations executing in memory perform much faster than those that require disk access. Figure 4 depicts the ways in which MicroStrategy Universal leverages the expanded memory capacity of 64-bit processors.

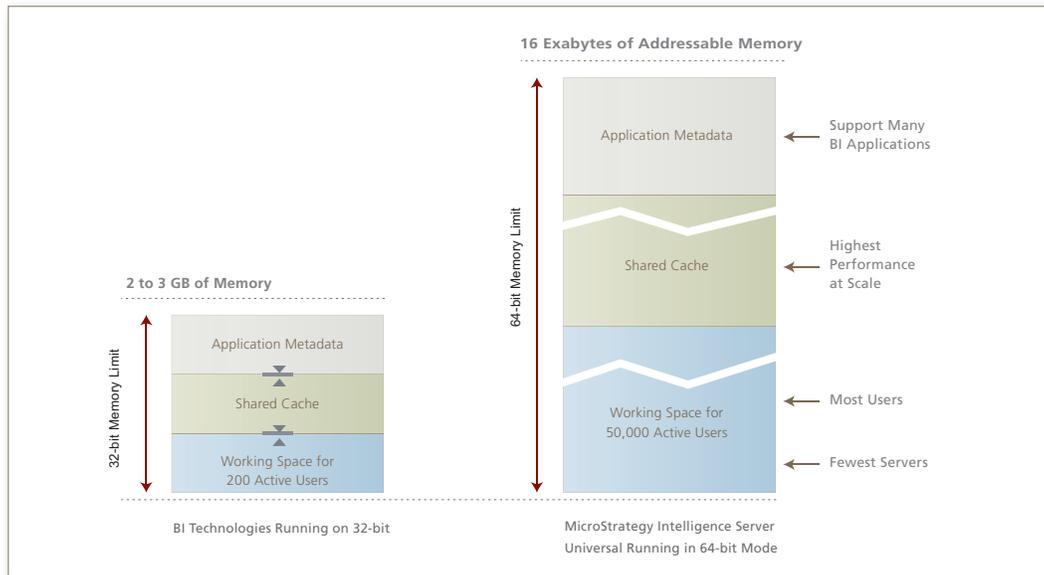


Figure 4: MicroStrategy Universal efficiently manages the much larger memory space to improve overall performance through multi-level shared caches.

MicroStrategy Universal provides multi-level shared caching capabilities to ensure that users have fast access to reports and analysis. With 64-bit, the performance further increases because more addressable memory allows MicroStrategy Universal to cache far more information such as database connections, application information, prompt answers, and report results.

With measurable performance benefits, customers have been able to quickly expand the server memory resources of their 64-bit BI. MicroStrategy Universal customers run with a minimum of 16 GB of random access memory (RAM). Enhanced performance and stability combined with minimal budget requirements allowed most customers to expand to 64 GB, and some customers have moved to 128 GB, 256 GB, and even 512 GB of memory.

NEW BI PERFORMANCE ACCELERATORS

The expanded memory space in 64-bit systems can allow query processing to occur in server memory rather than on disk. Running “in-memory” is far faster. To take full advantage of In-memory BI requires the expanded memory space that only 64-bit BI can offer. BI industry expert Cindi Howson agrees:

“The advent of 64-bit not only means you can cram more sophisticated applications with more users and greater concurrency onto a single server, it also has a profound impact on in-memory analysis of data. In-memory means super fast — a million times faster than accessing the same data from a disk.”²

MicroStrategy 9 introduced new In-memory BI capabilities for even faster performance, offered through the MicroStrategy OLAP Services product. Customers have implemented MicroStrategy In-memory to improve often-used queries that can be shared among many users or complex queries that have long database execution times. Figure 5 depicts a test conducted by MicroStrategy in which a package of 210 reports were run against an Oracle database using the industry standard TPC-H data model and reports. The test found In-memory BI running on MicroStrategy Universal 64-bit delivers a 3x to 50x performance improvement.

Total Rows of Data	In-memory Cube Size	Concurrent Queries	Average Processing Time per Report	Improvement Factor
30 million	8.7 GB	10		3.2x
		20		3.3x
60 million	15.6 GB	10		6.7x
		20		10.3x
120 million	29.5 GB	10		49.7x
		20		36.4x

Figure 5: MicroStrategy Universal with In-memory BI can deliver a 3x to 50x performance improvement.

V. REASON 3: 64-BIT BI IMPROVES SELF-SERVICE

“Upgrading to 64-bit was a no-brainer. It’s allowed us to add more users, more scorecards, more dashboards.”
 – Republic National Distributing Company, the second largest distributor of premium wine and spirits in the United States

With 64-bit BI, self-service empowers business people to conduct analysis quicker, take advantage of more BI functionality, and create their own reports and analysis without IT help. MicroStrategy customers reported that BI usage in their organization is on the rise with increasing requests for more reports, more users, and more interactivity. They also noted that the traditional BI model of IT developing reports and dashboards for users is unsustainable. There are simply far too many requests from business users for IT to meet the escalating demand.

To satisfy the needs of the business, companies are turning to self-service BI whereby business users create reports and dashboards for themselves. An Intelligent Enterprise article quoting research conducted by David Hatch, Aberdeen VP of technology research, states:

“The top performers [organizations using BI] are focusing efforts on creating a self-service approach to BI that enables non-technical workers to obtain information and analytic capabilities without burdening the IT staff.”³

MicroStrategy customers stated that 64-bit BI was instrumental in executing a self-service BI strategy. MicroStrategy Universal provided the ability to open up more investigative analyses, expand BI functionality, and enhance report and dashboard design capabilities to many more business users.

IMPROVED DATA COMPREHENSION

The 32-bit memory limitations constrain the number of reports and investigative data manipulations such as drilling and filtering, which slows the pace of report development and discovery for BI users. With the additional memory available with 64-bit BI, MicroStrategy Universal customers said their users could “connect the dots much faster,” and experienced improved data comprehension and decision making. Users reported that they were able to run significantly more reports, the reports contained more robust analyses, and the business context of the data was easier to understand.

³ Intelligent Enterprise, BI Is A Top Technology On Executives’ Wish Lists, Antone Gonsalves, July 20, 2009.

FULL BI FUNCTIONALITY

Companies running MicroStrategy Universal are better able to leverage the full functionality of MicroStrategy software, including richer dashboards, more detailed enterprise reports, sophisticated analytical manipulations, complex data mining and predictive analytics, and alert-driven information delivery. Without a 64-bit system, this level of analysis puts greater strain on CPU and memory resources, which can create significant performance degradation and even failure when the memory resources are exhausted. To address these performance issues, a 32-bit system would need more servers, which still may not provide sufficient memory. With a 64-bit system, more hardware resources – more CPUs and more memory – can simply be added, resulting in strong performance and efficiencies. Figure 6 depicts the expanded functionality available to 64-bit applications.

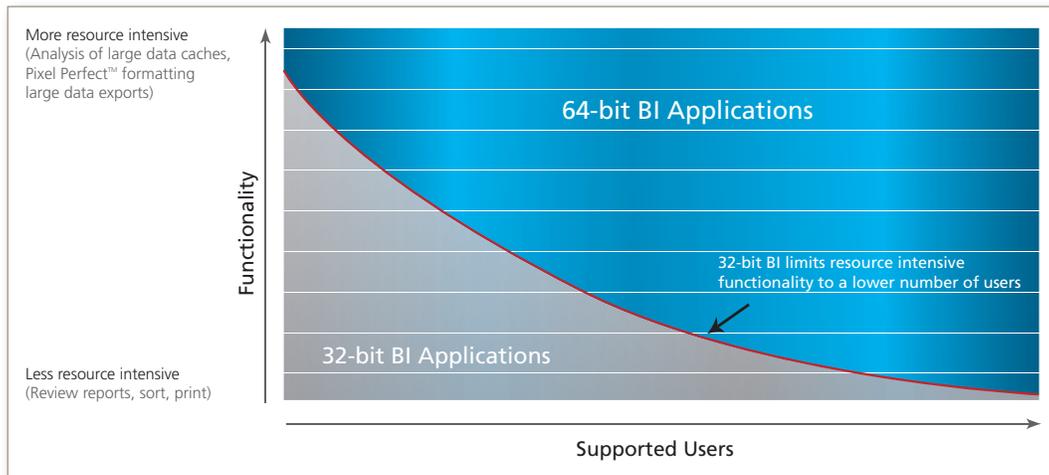


Figure 6: MicroStrategy Universal Edition extends the benefits of key functionality. Increased memory means more BI functionality is available to more users.

RICHER, FASTER REPORT AND DASHBOARD CREATION

64-bit BI enables faster report creation. Compared to simply running reports, creating reports requires more design functionality, more design objects, and more data access (Figure 7). MicroStrategy Universal customers reported that 64-bit BI provided the necessary memory space to give business users access to these components, while still ensuring overall BI system performance. In general, 32-bit BI systems were developed assuming the design activities were limited to a small group of BI developers, and consequently, were not able to handle the stress of hundreds or thousands of users creating their own reports.

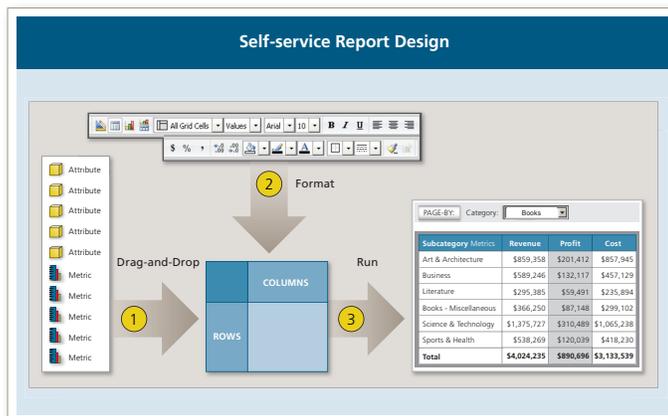


Figure 7: Business people can easily assemble reports from business dimensions and metrics and then format the reports using intuitive Office-like formatting controls.

Similarly, 64-bit BI enables faster and richer dashboard creation for business people. Dashboards are immensely popular because of their interactivity and “at-a-glance” insights. MicroStrategy offers dashboard templates and design assistants to enable business people to easily create professional-looking dashboards. While dashboard formatting, layout, and rendering can place greater stress on the processors and memory, MicroStrategy Universal customers found that after moving to 64-bit BI, they had available capacity to encourage users to build unlimited numbers and types of dashboards without assistance from IT. Figure 8 depicts dashboard creation with MicroStrategy via dashboard templates and design assistants.

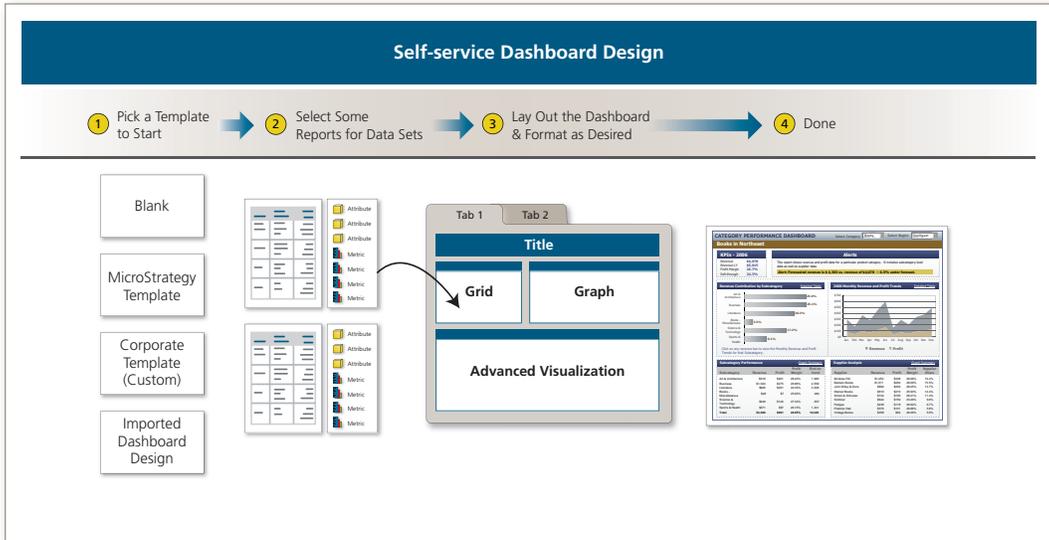


Figure 8: Business people can easily create professional-looking dashboards using dashboard templates.

VI. REASON 4: 64-BIT BI IS MAINSTREAM

“The enormous increase in addressable memory provided by 64-bit business intelligence gives us the ability to expand the use of existing applications, add more functionality, and develop new applications in other areas of the business.”

– Lowe’s Companies

Making a significant infrastructure change such as new server hardware or a new 64-bit operating system can be daunting. In contrast, the risk of moving to 64-bit BI is minimal. MicroStrategy Universal has a field-proven track record, having been fully compiled to 64-bit since 2004. MicroStrategy Universal offers flexible 64-bit hardware and operating system options and provides a fast, straightforward path to 64-bit BI.

41% OF MICROSTRATEGY INSTALLATIONS ARE 64-BIT

Customer research found that 41% of installations are already using MicroStrategy Universal and the pace of the move is accelerating, growing from just a 5% share in 2005 to a 41% share as of Oct 1, 2009 (see Figure 9).

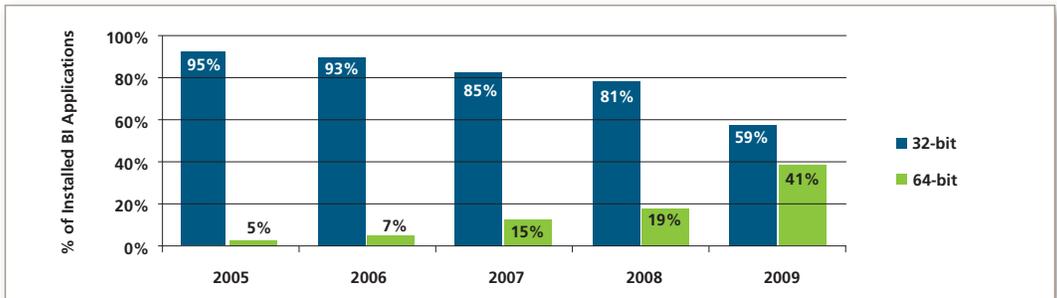


Figure 9: MicroStrategy software installations are increasingly moving to 64-bit BI.

MicroStrategy Universal is mature, mainstream technology. At 41% adoption, MicroStrategy customers are nearly exiting the “early majority” phase of the technology adoption lifecycle popularized by Geoffrey Moore’s seminal book, *Crossing the Chasm*, and based on the “Diffusion of Innovations” research by Dr. Everett Rogers (see Figure 10).

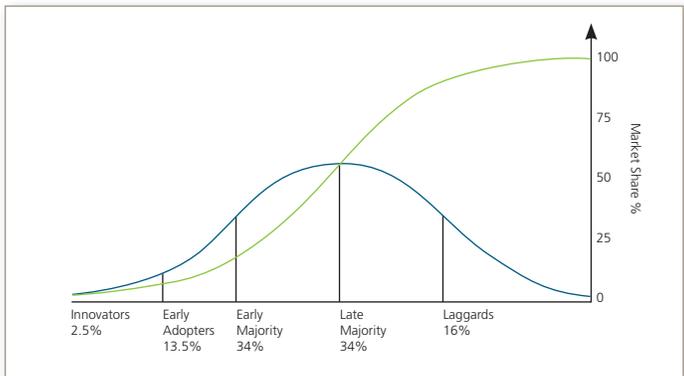


Figure 10: The diffusion of innovations according to Rogers⁴. The technology adoption lifecycle (shown in blue) compared with market share (shown in green).

64-BIT OPERATING SYSTEM FLEXIBILITY

The flexibility to choose any 64-bit operating system is highly valuable as IT organizations evaluate future hardware and software strategies. MicroStrategy Universal is feature complete across all 64-bit Unix, Linux, and Windows operating systems, enabling customers to change operating systems freely without sacrificing functionality. Figure 11 depicts the fairly even spread of MicroStrategy Universal installations across operating systems and Figure 12 shows the percentage of each operating system family in comparison to all BI application installations.

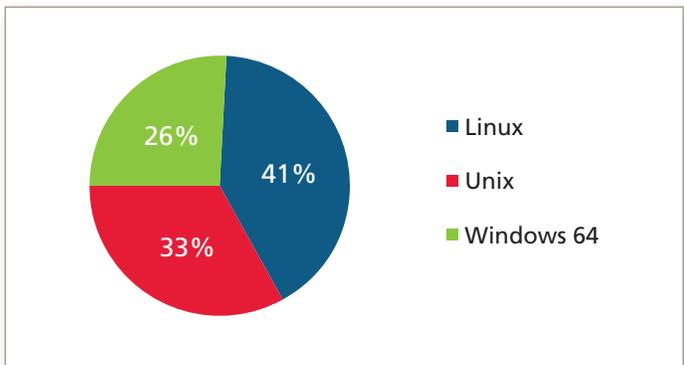


Figure 11: MicroStrategy Universal installations are spread fairly evenly across the major 64-bit operating system categories.

⁴ Wikipedia, Diffusion of Innovations, http://en.wikipedia.org/wiki/Diffusions_of_innovations

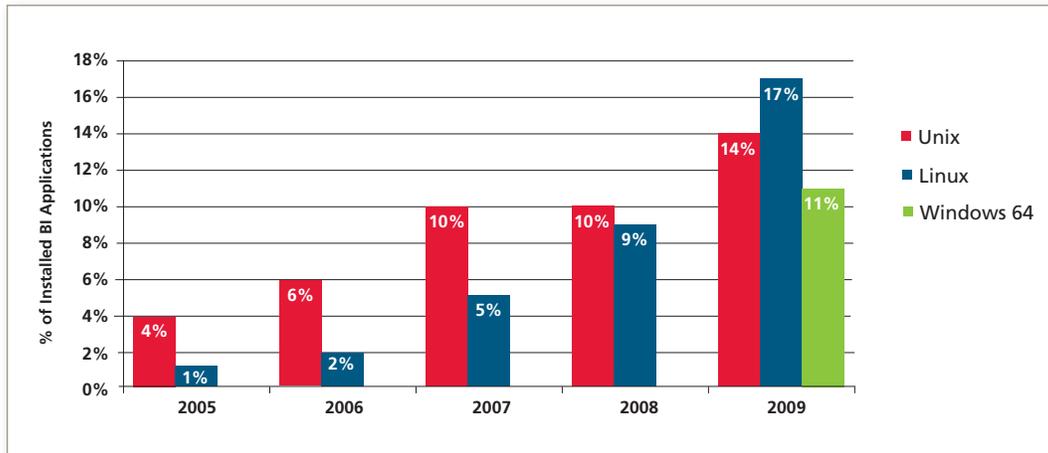


Figure 12: MicroStrategy Universal installations as a percentage of all installed operating systems. Any percentage remainder reflects installations running on Windows 32-bit operating systems.

Unix: Continued Steady 64-bit Adoption of IBM AIX, Solaris, and HP-UX

The early adoption of MicroStrategy Universal was driven by customers dedicated to the integrated hardware and software combinations offered by Sun Solaris, IBM AIX, and HP-UX. These three Unix operating systems together represent a compound annual growth rate of nearly 70% for MicroStrategy Universal installations. MicroStrategy Universal customers cited performance, stability, and native server virtualization as reasons for running on these long-established platforms.

Linux: 64-bit BI Leader

While MicroStrategy Universal customers are fairly evenly split across 64-bit operating systems, Linux has a lead at 41% of the 64-bit BI installations. Linux represents 17% of total installations across all operating systems, 32- or 64-bit. Linux has a 200% compound annual growth rate for MicroStrategy Universal installations since being introduced. Research shows that customers initially chose Linux because upfront costs were inexpensive; there was also an ample supply of Linux expertise available to help minimize ongoing costs. Customers found Linux delivered high performance with impressive stability. Lastly, customers cited the massive innovation and development efforts behind Linux as a safe operating system platform choice going forward.

Windows 64: Strong Demand

Since MicroStrategy announced support for the Microsoft Windows 64-bit operating system in March 2009, there has been significant demand to deploy MicroStrategy Universal on 64-bit Windows. Deployment grew from 0% to 26% of the total MicroStrategy 64-bit installations in just six months. Customers report that Windows remains a good choice for them when looking for a familiar environment.

MOVING TO 64-BIT BI IS STRAIGHTFORWARD

The biggest challenge in moving to 64-bit is the migration to a new combination of hardware and operating system. The fears of prolonged downtime, lost functionality, and disrupted BI service can stagnate migrations.

However, most problems that can arise in the transition are the result of poorly designed BI architectures that have been patched together due to technology acquisitions over many years.

Conversely, MicroStrategy Universal was designed organically to ensure a seamless migration to 64-bit BI. There are three primary architecture principals that illustrate this point. First, MicroStrategy Universal is 100% compatible with MicroStrategy metadata. MicroStrategy metadata is the cornerstone of the architecture storing BI application information such as reports, dashboards, metrics, and filter definitions in a relational database. Once MicroStrategy Universal is installed, it simply needs to be pointed to the existing metadata and all reports and dashboards are immediately ready for use. MicroStrategy also includes a regression testing product, MicroStrategy Integrity Manager, which can automate the testing process to ensure a smooth and quick move to 64-bit BI. Second, MicroStrategy Universal shares a single code base for all operating systems, ensuring functional parity, regardless of operating system. Third, all MicroStrategy products are 100% compatible with MicroStrategy Universal. End users, developers, and administrators receive the same full-featured BI functionality, intuitive development interfaces, and comprehensive monitoring and management tools, regardless of which operating system is used.

VII. REASON 5: 64-BIT BI COMPUTING IS HERE AND NOW

“64-bit is definitely more scalable than 32-bit. It's enabled us to build much larger reports and has opened the door for a lot more BI functionality in the future.”

– AutoTrader.com

The underlying 64-bit technology is mature, widely available, powerful, and inexpensive. It is built for the long-term. Once considered an architecture reserved exclusively for high-end servers, 64-bit computing is now widely in use in personal computers and laptops. The introduction of Intel-based x86-64 processors in 2003 opened the door for IT departments to consider 64-bit systems running on commodity-priced hardware. Today, the 64-bit computing market is mature, with the cost, availability, and operability of 64-bit systems obsolescing 32-bit computing.

ALL HARDWARE IS NOW 64-BIT

With the advent of 64-bit processors based on the Intel-based x86-64 architecture in 2003, the market has broadly adopted 64-bit systems as prices significantly declined and power increased. As of 2009, all server processors from Intel and AMD operate at 64-bit, even the least expensive. At the same time, 32-bit CPU production has been discontinued except to support highly specialized systems. As such, 32-bit hardware is not only difficult to find, but far more expensive than the widely available and more powerful 64-bit processors.

SERVER OPERATING SYSTEMS ARE STANDARDIZING ON 64-BIT

Accompanying the advances in 64-bit architectures, 64-bit operating systems have evolved to take full advantage of the expanded computing capabilities. Unix 64-bit operating systems have been established since the early 1990s, with Linux and Windows following suit around 2000. In this time, 64-bit operating systems have established themselves as mature and robust with proven track records of high uptime availability and high performance.

Furthermore, all Unix, Linux, and Windows operating system innovations and developments are now centered around 64-bit operating systems, pushing 32-bit systems to obsolescence. Microsoft has published dates for

discontinuing support for its Windows 2003 32-bit operating systems in 2010⁵. While the dominance of 64-bit operating systems is prevalent in the data center, even personal computers and laptops and their associated software applications will likely be entirely converted to 64-bit operating systems by 2014⁶.

The widely available, powerful, and inexpensive 64-bit processors and memory combined with proven 64-bit operating systems have established the era of 64-bit computing. Considering the fact that current 64-bit systems can access less than 1% of the theoretical memory maximum, it is reasonable to conclude that 64-bit systems represent a safe computing investment now and well into the future.

VIII. CONCLUSION

The 64-bit computing era is here for the long-term. Prices for 64-bit hardware continue to decline while computing power steadily increases. Competition among operating systems provides organizations more choices and favorable pricing. The result is powerful, but inexpensive, 64-bit computing. Most importantly, the promise of 64-bit computing is to transform unstable and increasingly expensive to maintain 32-bit computing applications into robust, cost effective, high performance applications.

For MicroStrategy customers, 64-bit BI means more information for more users with higher performance and higher BI system availability. Beyond the initial cost efficiency and performance benefits of 64-bit, MicroStrategy Universal establishes a stable foundation for future BI expansion. MicroStrategy Universal customers report that 64-bit delivers increased BI capacity through the ability to add more users, run more reports, access more data, perform advanced calculations more frequently, or develop brand new BI applications. With 64-bit, companies can react more quickly to changes in business and market conditions, with better access to critical information.

⁵ Microsoft lifecycle support page. <http://support.microsoft.com/lifecycle/?LN=en-us&p1=3198&x=16&y=10>
⁶ Gartner Group, Plan to Implement Some 64-Bit Versions of Windows 7, Oct 6, 2009

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