

Performance And Flexibility Serve The Enterprise

Research Reveals Path To Maximize
Linux Performance

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Executive Summary

For companies running a Linux environment, x86 servers have long been a suitable infrastructure option that offers many of the capabilities of robust enterprise-level hardware at an affordable price. However, as applications place increasingly demanding workloads on infrastructure, companies that opted for x86 are beginning to examine their strategy more closely. Performance, reliability, and security are becoming concerns for running newer, more performance-hungry, business-critical applications on x86 Linux. Also, the costs of managing and powering an x86 server farm are not as competitive as they once were, especially as IT leaders consider the *total* cost of ownership.

Companies that hope to stay competitive in the marketplace must begin to consider alternatives to x86, or else they will find themselves at a serious infrastructure disadvantage. Performance and flexibility embedded in the architecture can scale in a way that the number of servers can't, as applications and data grow in depth and complexity.

It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change.

— Charles Darwin

In January 2015, IBM commissioned Forrester Consulting to study and evaluate whether enterprises' hardware and operating system environments are facing challenges from increasingly demanding workloads from applications and data.

In conducting a quantitative survey with 150 North American application developers, IT architects, and strategists, Forrester found that while these companies are very cautious about making a major ecosystem change, they recognize that increasing demands for performance, stability, and reliability mean they must plan and articulate a clear path to a more robust, performance-oriented architecture. Qualitative interviews of six senior-level IT decision-makers confirmed these trends and provided concrete anecdotal examples of these changes in action.

KEY FINDINGS

Forrester's study yielded three key findings:

- › **IT professionals are starting to see the limits of their commodity operating environments.** The concerns revolve around applications' scalability, agility, and ability to combine transactional data with other analytics. The operating environment influences application scalability and data infrastructure, and as complexity and volume of both applications and data grow, a more powerful and flexible hardware environment that can live in the same footprint becomes critical.
- › **Applications requiring performance and flexibility are growing, and that is where IT leaders are finding the least satisfaction with their current server infrastructure.** IT leaders and their technology partners, therefore, need to nurture a robust applications development and delivery ecosystem as part of their efforts. This is a task that requires a holistic view and approach. Throwing hardware at the problem will only increase frustration.
- › **IT professionals remain challenged to control cost and change management.** The cost savings from commodity hardware no longer mask the total cost of ownership, especially as the volume and complexity of applications, data, and the hardware on which it runs are rapidly increasing. This means that a stable environment with flexibility and room to grow becomes an attractive option. The overall performance superiority of RISC platforms running Linux presents a possible solution for overall performance, especially with mixed workloads.

IT And The Total Cost Of Ownership

The conventional wisdom for many years was that x86 servers were cheap and easy to manage, resulting in a proliferation of server racks that even today run many basic applications for enterprises. That thinking still exists today, but IT professionals charged with managing an increasingly complex infrastructure are beginning to wonder if they are measuring the full cost of their technology ecosystems.

Forrester Consulting surveyed 150 North American IT decision-makers in enterprises of 1,000-plus employees about their current infrastructure and where they see both opportunities and challenges in the new world of big data and multichannel, multidevice working environments. IT leaders see the following elements in their current environment:

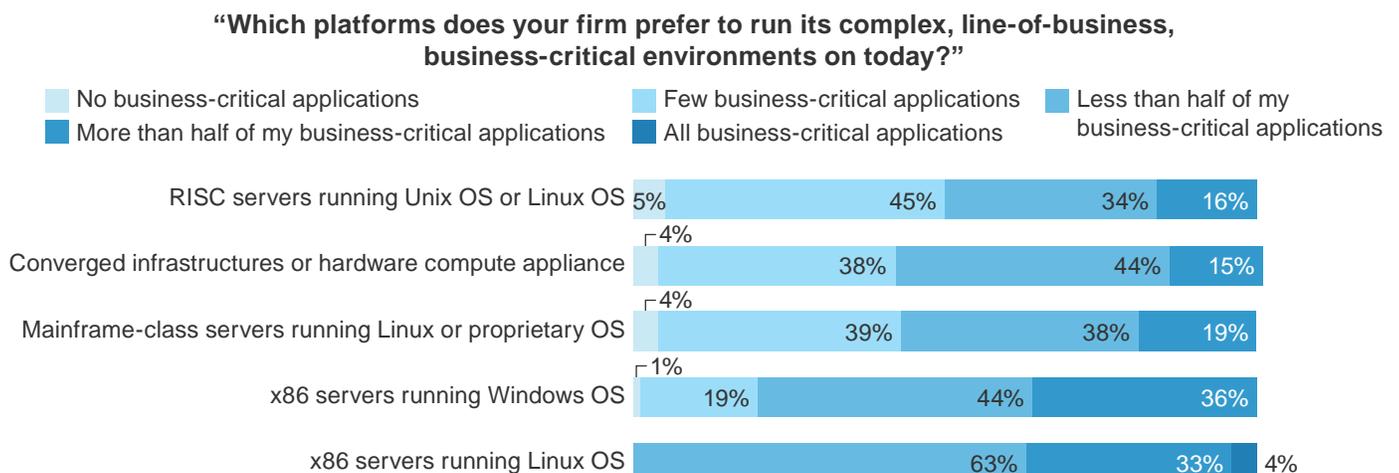
› Linux is the workhorse in many server ecosystems.

Although most enterprises run mixed environments, they reported using x86 systems running either Windows or Linux (often referred to as “Lintel” systems) for their business-critical apps, such as web management utilities, productivity apps like email, and application development solutions. Thirty-seven percent of respondents reported they ran more than half or all of their apps on Linux, and 36% reported that they ran Windows (see Figure 1).

› **Lines of business are demanding more complex, power-hungry applications and the ability to exploit increasing amounts of data.** This means the technology infrastructure must become more powerful and more flexible to support these needs. IT professionals surveyed said that while they use Linux systems to run basic applications like websites, email, and accounting, they do not use them as much for high-performance computing or newer technologies like mobile applications (see Figure 2).

› **IT professionals must deal with the changing physical infrastructure.** In spite of the cost management challenges in today’s IT world, IT professionals must also keep up with the business. Sixty percent of the survey respondents have seen an increase in their application release rate over the past two years, which has driven increases in software licensing costs, number of servers, staffing, and utility costs. A vice president of web operations at a digital content company observed: “When we first started, the entire production and staging fit on a pizza box-[sized server]. That then grew to the size of two refrigerators. Then it grew even more. Our footprint keeps growing [to keep pace with] compute performance.”

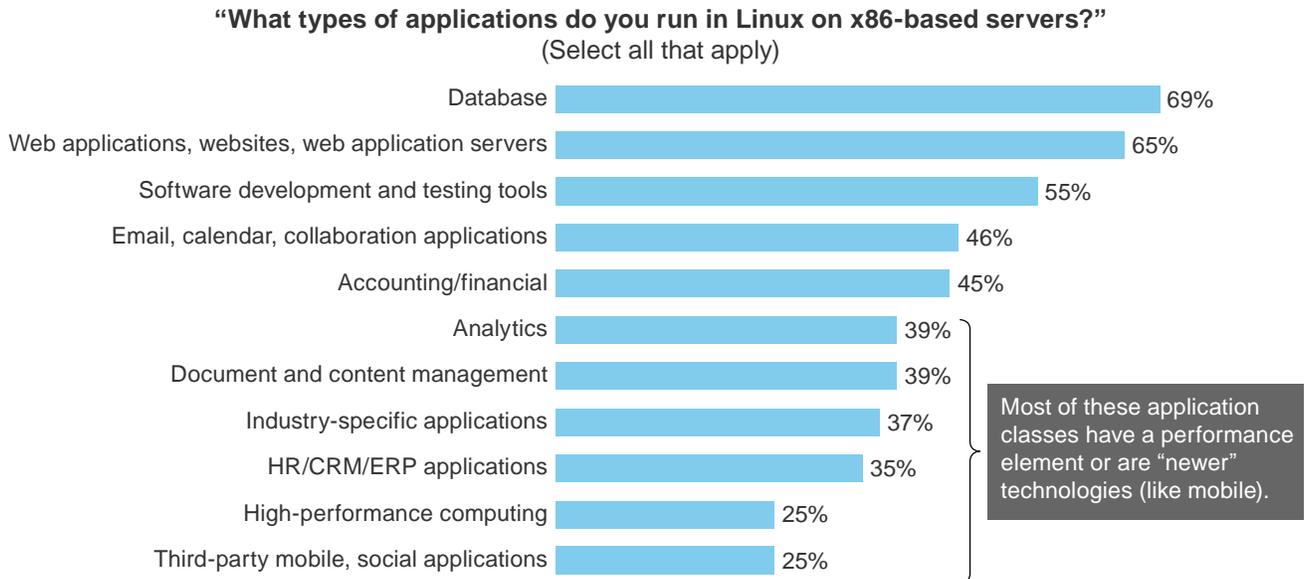
FIGURE 1
Lintel Servers Run The Basics In Mixed Ecosystems



Base: 150 North American IT decision-makers with responsibility for infrastructure at companies of 1,000+ employees

Source: A commissioned study conducted by Forrester Consulting on behalf of IBM, April 2015

FIGURE 2
Intel Runs Fewer Performance Or New Technology Applications



Base: 150 North American IT decision-makers with responsibility for infrastructure at companies of 1,000+ employees

Source: A commissioned study conducted by Forrester Consulting on behalf of IBM, April 2015

› **The workhorses are running fewer of the newer, performance-hungry applications.** Figure 2 shows not only the core applications that x86 systems run for many enterprises, but it also shows that IT leaders rely much less on x86 Linux systems to run newer, performance-hungry applications. One CIO of a major healthcare enterprise that includes both a healthcare division (hospitals, doctors’ offices) and research arm indicated very clearly that research applications and tools are much more performance-driven and run with a different computing environment, one that does not rely on an x86 backbone.

Today’s Environments Push The Limits Of Current Infrastructure

With increasing demand for collecting, analyzing, and using data in innovative ways, and doing all of that through a multichannel, multidevice process in real time, IT leaders are seeing a real need to be flexible, security-minded, and mindful of performance requirements. IT’s challenges to be a better business partner and keep the day-to-day

operations going are coming together to create an inflection point in the ongoing evolution in many businesses’ technology ecosystems.

The changes in the ecosystem drive several challenges, including the following:

› **Flexibility and performance problems hinder agility and scalability.** When asked about where they were satisfied and unsatisfied with current system capabilities, survey respondents clearly pointed to flexibility and performance, rating applications’ agility, scalability, and analytics capability as their areas of lowest satisfaction (see Figure 3). One interview respondent, who is currently running his customer-facing applications on x86 servers, was blunt in his criticism: “Performance-wise, we can’t scale in our current infrastructure. x86 just isn’t fast enough.”

› **IT leaders see the demand for applications that require performance, flexibility, and stability.** At the same time their satisfaction is low around flexibility and performance, IT leaders are anticipating that workload demands over the next 12 to 24 months will come from

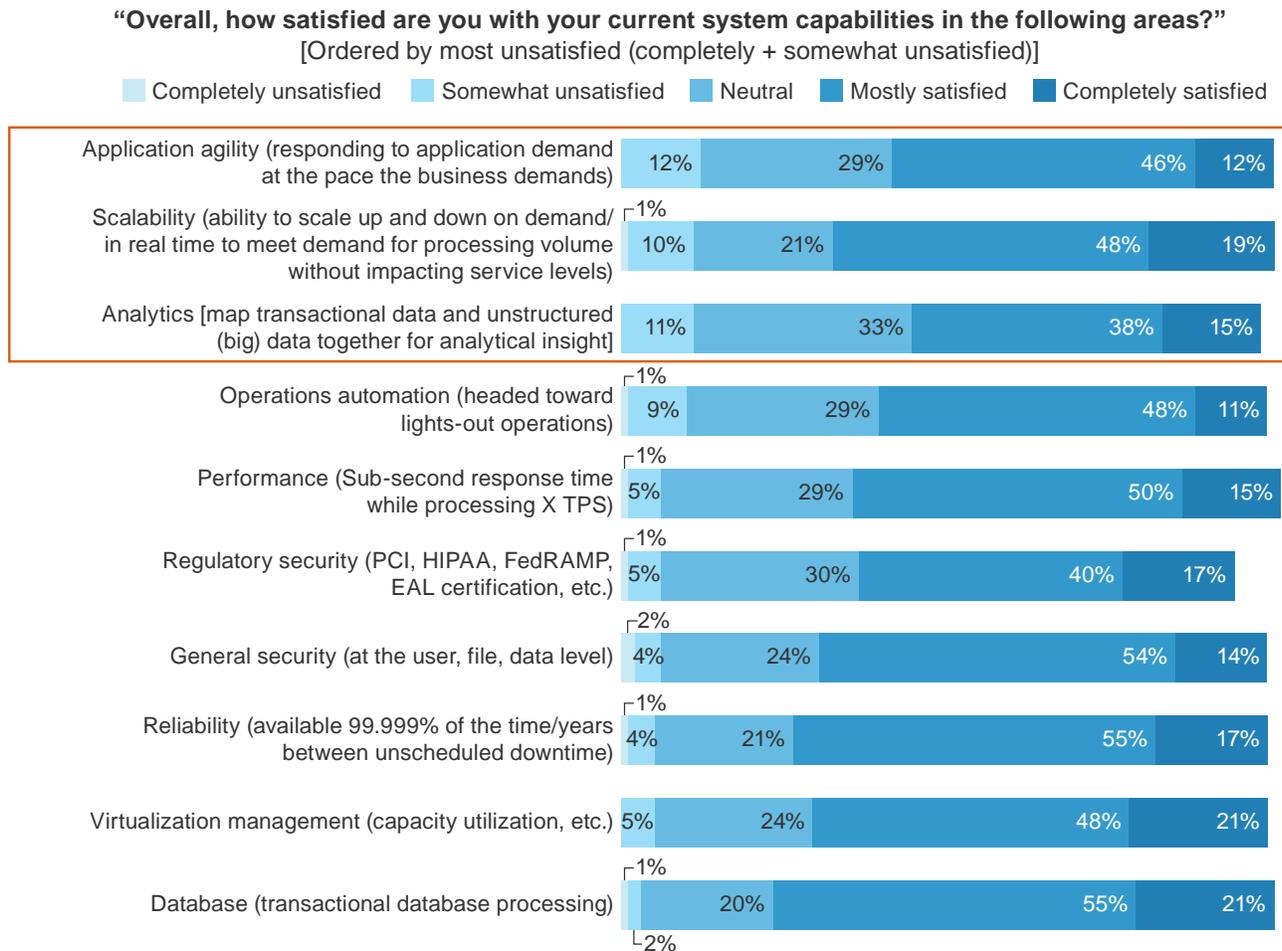
remote and or compute-intensive applications, including cloud management applications; data and analytics applications; and mobile applications. These applications will demand better capabilities in virtualization management, database processing, security at the user/file/data levels, and real-time scalability.

- › **The struggle is real; supporting legacy systems and meeting new business demands create an overly complex computing environment.** Meeting all of these growing demands with their current computing architecture concerns many survey respondents. Sixty-one percent see their computing environment as overly

complex. Higher complexity results in greater uptime and security, a higher cost to monitor and maintain, and a more daunting process to change or replace anything in the ecosystem. There comes a tipping point in every ecosystem's life, and the IT leaders surveyed are keeping a close eye on all the factors.

- › **It's not just the technology; it's the people.** In addition to dealing with the cost of new or replacement hardware, operating systems, and applications, IT leaders are also considering the total business cost of either maintaining or switching their computing ecosystems. Fifty-two percent of respondents pointed to building out a new skill set for

FIGURE 3
Analytics, Scalability, And Agility Challenge Current Operating Environments



Base: 150 North American IT decision-makers with responsibility for infrastructure at companies of 1,000+ employees

Source: A commissioned study conducted by Forrester Consulting on behalf of IBM, April 2015

staff as a risk, in addition to the 70% looking at total effort and costs around porting applications. One CIO of a healthcare organization told us, “All our support staff is locked into [our current ecosystem]; how would we support [the new servers] during reskilling?” However, the cost risks also exist in the current ecosystem, as complexity and layers added for data analytics, cloud integration, and a bloated server footprint are beginning to tax current capabilities and challenge conventional thinking. In the same conversation, the healthcare CIO said, “We are starting to hit that crossover point, where investing in a new performance structure will be the right decision for our future growth, instead of rip and replace every two to three years.”

Performance And Mixed Workloads Require A More Powerful Operating Ecosystem

As complexity and performance requirements increase, IT professionals must respond in a thoughtful, holistic way to the needs of the business. The 20-plus-year “rip-and-replace” pattern - buying a large number of cheap x86 servers that get replaced every three to four years - may not be the most effective strategy anymore. One IT director at a North American manufacturer summed it up this way: “For us, the last four generations of x86 servers have already been considered commodity servers. Buy it, run it for three to four years; when it starts to fail, throw it out and buy a new one.” IT professionals need a server strategy that is both stable and holistic, in a way that x86 may not be able to deliver.

“For us, the last four generations of x86 servers have already been considered commodity servers. Buy it, run it for three to four years; when it starts to fail, throw it out and buy a new one.”

— IT director at a North American manufacturer

IT leaders in this study were mindful of the following considerations and opportunities:

- › **As pressures around total performance and flexibility increase, the need for a powerful, stable technology ecosystem grows.** More than 70% of survey respondents felt that dynamic reallocation of resources to cope with surges in user demand was an important to critical requirement. This went hand in hand with the need to have a high sustained level of capacity utilization. An IT director using commodity x86 servers told us: “I would love to see x86 have the same ability as [other server technologies], like hypervisors, live partitioning, and allocation of CPU-RAM resources. Interoperability is also big. . . .” That’s not to say the change is easy. This kind of flexibility requires not only changes in hardware, but a significant change management effort for the organization. Fortunately, there are partners increasingly attuned to hybrid environments that can support the changes the business is driving.
- › **Technology is going back to the future, where power and flexibility mean balancing standardization and customization.** The looming demands for scalability and change velocity are stressing the infrastructure in ways that were unthinkable even five years ago. IT professionals must design and support customer-facing services in a hyper-dynamic environment increasingly dominated by mobility and big data. This is forcing infrastructure designers to turn to some of the fundamentals of systems engineering, including a more pragmatic notion of standardization. As with most balancing acts, the answer is neither total nor zero standardization. Astonishingly, many IT organizations rely heavily on off the shelf configurations, and use very few systems engineering practices to fine tune and maximize their ecosystem. The business technology future of technology management requires an obsession with systems design and engineering.¹
- › **As the ecosystem scales, IT teams must manage the big cost drivers and allow for flexibility and change management.** IT leaders in this study were clear about the priorities when scaling applications — software licensing costs, accurate forecasting of workload, I/O rates, and application response time. Meeting these challenges requires a robust computing environment and a high-performance staff. Such requirements point to a carefully considered investment over time in a higher-performance computing environment, and RISC servers

running Linux were clearly on a number of respondents' radar. They ranked the environment highly for performance, scalability, reliability, and running performance-hungry applications (see Figure 4). RISC vendors are aware of these challenges, and many are creating or improving evolutionary support services like software porting, data management, and support of mixed environments.

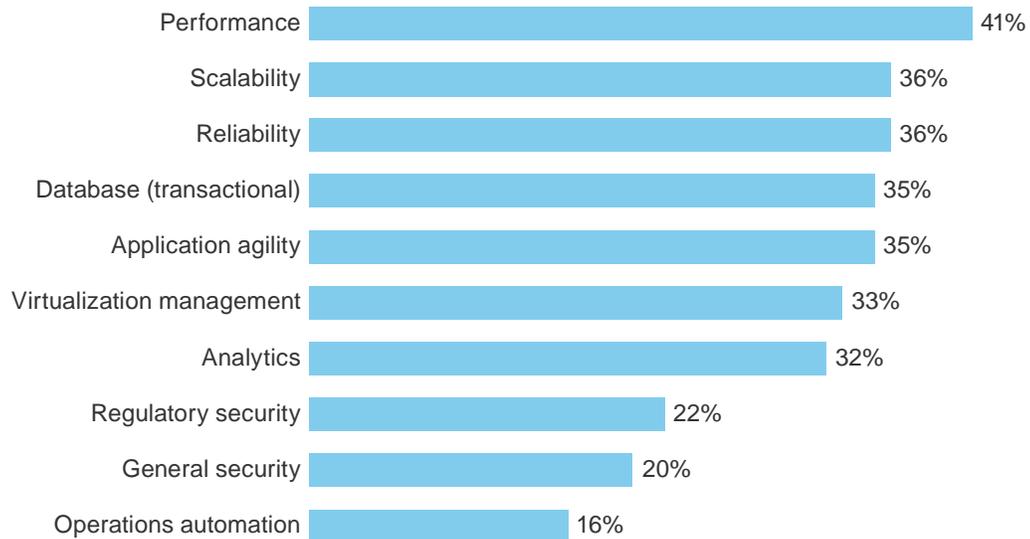
› **The respondents to this survey are mindful of the costs of migration and change.** Learning lessons from the past are shaping a more balanced, holistic view of the future. IT leaders surveyed are looking carefully at their options. They will stick with a “throwaway server strategy” (x86) unless they see a 25% total cost of ownership savings. But the healthcare CIO we interviewed was very clear about where he planned to draw the line, which was driven by total cost of ownership. His equation weighs the cost of licensing and the skill set of his development and

support team against the ability to be flexible and responsive to his business partners.

As businesses demand speed, agility, and responsiveness to new opportunities, no corner of an enterprise's IT organization will go unchanged, including the server ecosystem on which it runs. Performance, flexibility, and a healthy eye on the business bottom line create opportunities to make a better, more powerful operating platform that can help win, serve, and retain customers.

FIGURE 4
RISC-Linux Servers Are Attractive For Flexibility And Performance

“In which of the following areas has your organization realized benefits, or does it expect to realize benefits, from using an RISC server running Linux OS?”
(Select all that apply)



Base: 88 North American IT decision-makers with responsibility for infrastructure at companies of 1,000+ employees

Source: A commissioned study conducted by Forrester Consulting on behalf of IBM, April 2015

Key Recommendations

Business success depends upon a crisp, agile technology infrastructure. As the business pivots to becoming customer obsessed, technology leaders must create and support a performance-driven infrastructure that can deliver the best customer experiences. This means that IT executives must take a more holistic business view of their systems and practices and be prepared to become masters of flexibility, agility, and change management. Forrester Consulting's survey of 150 North American application developers, IT architects, and strategists yielded several important recommendations:

- › **Total cost of ownership must consider more than the hardware.** In the past, many IT professionals would make decisions and measure cost based on the sticker price of both hardware and operating systems. This worked well when business requirements were fairly stable and the price of x86 Linux systems was so relatively low. Now, the added mixes of real-time analytics requirements, a proliferation of mobile devices, and rapid-fire business demands add cost and complexity. Focus less on a two- to three-year hardware purchase cycle, and focus more on agility, flexibility, and change management.
- › **Business technology demands more flexibility and total performance.** Business demands, in turn, put pressure on the technology ecosystem. Respondents in this survey see their environments becoming more complex and performance hungry, and their servers must power more complex and distributed services. This will bring an end to the “throwaway” server strategy and require IT leaders to make decisions in a more holistic way, considering the total cost of ownership
- › **IT leaders must manage their domain as a business.** There is no magic formula for success. Most IT leaders who responded to this survey run mixed environments and look to make shifts in technology when costs and the business need warrant. Make the change as cost and change management considerations align, and don't be shy about asking your server vendors for a clear path addressing these needs.

Appendix A: Methodology

In this study, Forrester conducted an online survey of 150 North American application developers, IT architects, and strategists to find out what computer operating platform(s) they use, how they use them, and their factors of consideration for changing or updating that platform. In addition, Forrester Consulting interviewed six senior-level IT decision-makers to get observations and insights on how their operating environments support their technical and business goals. The study began in January 2015 and was completed in April 2015.

Appendix B: Supplemental Material

RELATED FORRESTER RESEARCH

“Optimize Scalable Workload-Specific Infrastructure For Customer Experiences,” Forrester Research, Inc., August 11, 2014

“Brief: The Virtualization Conundrum — Don’t Plan On Getting Rid Of Your Physical Servers,” Forrester Research, Inc., December 11, 2014

“Create An Infrastructure An Operations Transformation Road Map,” Forrester Research, Inc., July 25, 2014

Appendix C: Endnotes

¹ Source: “Optimize Scalable Workload-Specific Infrastructure For Customer Experiences,” Forrester Research, Inc., August 11, 2014.