ITG Executive Summary

January 2012

VALUE PROPOSITION FOR IBM POWER SYSTEMS: PLATFORM CHOICES FOR THE ENTERPRISE SAP INFRASTRUCTURE

Challenges

The challenges facing SAP users have never been greater. In today's economy, the focus for many organizations remains on keeping costs down. But other challenges remain. Trends toward greater volatility of markets, erosion of traditional forms of competitive differentiation, industry concentration and the effects of globalization have not diminished.

A growing number of businesses recognize that they cannot postpone investment for the future. New capabilities are needed to drive growth, increase competitiveness and improve operational efficiency. Short-term pressures, as well as opportunities to build long-term market position are leading businesses to deploy the latest generation of SAP Business Suite 7 solutions.

The business value of SAP solutions has been demonstrated among the company's more than 100,000 customers worldwide. However, for solutions to be fully effective, system infrastructures that can handle the size and complexity of latest-generation SAP environments must be put in place. They must also deliver performance required by users, maintain quality and continuity of service and minimize risks.

This report is about dealing with such challenges. Specifically, it looks at the value proposition for employing IBM Power Systems, the AIX operating system and PowerVM virtualization for core SAP system infrastructures. These are compared to use of Windows and x86 Linux servers with VMware in comparable roles.

The value proposition for Power Systems is based on two main themes: (1) that Power Systems enable significantly lower overall IT costs than use of x86 servers; and (2) that they enable organizations to create compact system infrastructures that are more stable, scalable and resilient than Windows or x86 Linux equivalents.

Costs

In three representative SAP Business Suite 7 deployments in retail, distribution and manufacturing companies, three-year IT costs for use of Power Systems average 35 percent less than for Windows server and 32 percent less than for x86 Linux equivalents. Figure 1 summarizes these results.

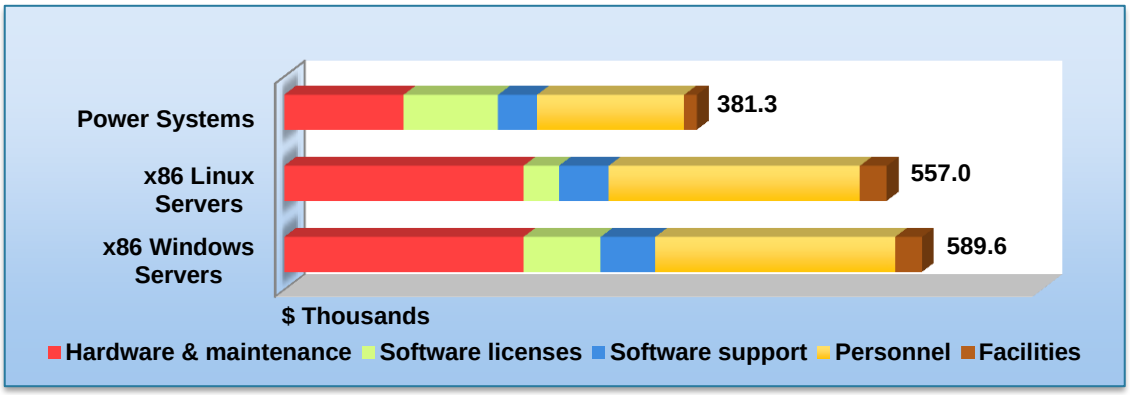

Figure 1: ***Average Three-year IT Costs***

These comparisons are for companies with $150 to $650 million in sales. SAP stacks include Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Supply Chain Management (SCM), Product Lifecycle Management (PLM), Business Intelligence (BI) and other systems. Landscapes include production along with test, development, quality assurance and other non-production instances.

Power Systems calculations are for use of Power 720, 740 and 750 systems with AIX 7, PowerVM and PowerHA SystemMirror clustering. Windows server calculations are for use of branded x86 hardware with Intel 7500 (Nehalem EX) or 5600 Series processors, Windows Server 2008 R2, VMware vSphere 5 and clustering facilities.

Three-year costs include hardware acquisition and maintenance, software licenses and support, system administration personnel and facilities, including energy consumption and data center occupancy. Hardware, maintenance, license and software support costs were calculated using "street" prices; i.e., discounted prices reported by users.

The basis of these calculations, along with details of installations, landscapes, configurations and cost structures may be found in the Detailed Data section of this report.

Calculations do not include database costs. However, there may be significant cost variations depending on which database is employed. Oracle 11g Database is licensed by SAP at 15 percent of SAP Application Value (SAV), or 18 percent if Oracle Real Application Clusters (RAC) is employed. In comparison, IBM DB2 9.7 and Microsoft SQL Server are priced at eight percent of SAV.

Users employing DB2 9.7 on Power Systems may experience higher performance than with Oracle 11g Database. Synergies between Power Systems and DB2 designs in memory handling, I/O and other areas may significantly increase system-level throughput. DB2 strengths in compression, performance optimization, automation and other areas may also contribute to lower system and storage costs.

Concentration

Lower costs for Power Systems are due to multiple factors, of which the most important may be characterized as concentration. Power Systems execute larger workloads per core than Windows servers. This is a function not only of higher per core performance, but also of industry-leading mechanisms that enable system capacity to be used more efficiently than Windows and x86 Linux servers.

For example, in the comparisons presented in this report, Power Systems with 12, 22 and 64 cores execute workloads that equal or exceed those handled by Windows server and VMware configurations with 48, 96 and 232 cores.

Greater efficiency is enabled by the ability of Power Systems to vary a wider range of configuration parameters, including numbers of threads; use of dedicated or shared processors; cache size, main memory and I/O; four types of hardware- and software-based partitioning; and processor, memory and/or storage pools.

When these capabilities are exploited, a broad spectrum of users have reported that, in practice, the actual amount of work performed by Power Systems may be three to seven times greater than raw performance measurements would indicate.

A key strength is that PowerVM is tightly integrated with AIX workload management. Resources can be allocated to and reallocated between partitions, and execution processes monitored and controlled across them with a degree of precision that far exceeds VMware capabilities. Risks that workloads will interfere with each other are minimized.

One result is that, while PowerVM partitioning is routinely employed even for complex, high-volume production systems, VMware is not. Even vSphere 5 cannot manage partition workloads with sufficient granularity, or react to workload changes fast enough, to provide comparable capability. [1]

If Windows or x86 Linux servers with VMware are employed, SAP landscapes must be spread across multiple servers, inflating hardware, software, system administration and facilities costs. Figure 2 shows an example for one of the companies upon which comparisons are based.

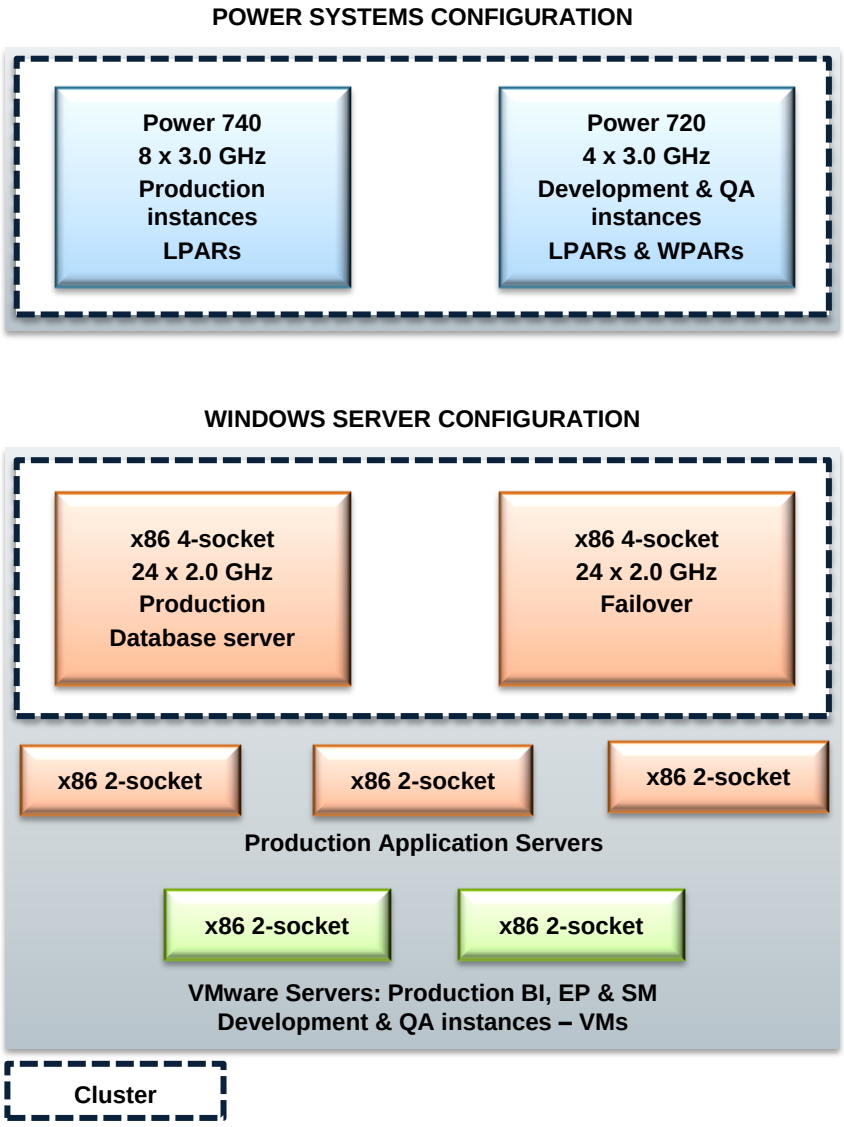

Figure 2: ***Power Systems Concentration Effect – Example***

In this example, both systems employ Oracle 11g for database serving. Oracle has not certified any of its products for use with VMware, and takes the position that it will provide support only for issues that either are known to occur on the native operating system, or can be demonstrated not to be a result of running on VMware.

[1] Based upon survey results referenced in *Value Proposition for IBM POWER7 Based Systems: x86 Server Consolidation in SAP Enterprise Environment*, a Management Brief released by the International Technology Group in February 2011 (http://www-01.ibm.com/common/ssi/cgi-bin/ssialias?infotype=SA&subtype=WH&htmlfid=POL03081USEN)

For this reason, organizations are often reluctant to deploy production Oracle databases in VMware Virtual Machines (VM), and employ a dedicated production database server. This is the case in the Windows Server configuration shown above. In the Power Systems configuration, database instances run in Power logical partitions (LPARs) and workload partitions (WPARs), for which there are no Oracle support limitations.

Among SAP users, VMware is typically employed for test, development, quality assurance and other non-production instances, and for comparatively light-duty production applications.[2] In contrast, Power Systems SAP users routinely employ PowerVM for all types of instance, including even large-scale production systems.

A number of specific technologies contribute further to lower Power Systems costs. Denser chip designs, for example, boost performance and reduce energy costs. On-chip memory compression may boost performance for SAP ERP workloads by up 65 percent using the same physical memory size. These and other Power technologies are described later in this report.

Personnel costs are also lower for Power Systems than for Windows and x86 Linux servers. This reflects greater concentration (fewer servers and software instances must be managed) as well as higher levels of integration and automation in Power environments.

IBM Capacity Upgrade on Demand (CUoD) arrangements, which are offered for Power 770 and larger models, also merit comment. Additional processors may be activated on an "as needed" basis by users, or automatically by systems, to handle growth. Additional capacity is paid for only while it is in use. There are no x86 equivalents. If additional capacity is required, a new server must be purchased.

Infrastructures

SAP system infrastructures determine, in no small measure, the performance and quality of service experienced by users. The levels of availability, recovery and security they enable may materially reduce – or increase – business risk exposure. The stability of underlying hardware and systems software structures affect a wide range of variables.

The appeal of Power Systems for SAP deployment reflects not only of the cost and concentration advantages of this platform, but also its ability to meet key infrastructure requirements. This is particularly the case in the following areas:

- ***Stability***. An unstable system environment increases risks of performance bottlenecks, interruptions of service, and loss or corruption of data. Instability also has potentially significant cost implications. It may be necessary to devote additional server and personnel resources to compensate for weaknesses in underlying platforms.

  From this perspective, there are significant differences between x86 and Power Systems platforms. An x86 server environment normally includes at least two components – hardware (including firmware) and operating systems – from different vendors, and may include databases, hypervisors, clustering software and management tools from others.

  Organizations depend upon multiple suppliers with different business priorities, product strategies, development and support practices and patching and upgrade schedules. In some cases, vendors are not known for the stability and predictability of their product cycles.

[2] Based upon survey results referenced in *Value Proposition for IBM POWER7 Based Systems: x86 Server Consolidation in SAP Enterprise Environment*, a Management Brief released by the International Technology Group in February 2011 (http://www-01.ibm.com/common/ssi/cgi-bin/ssialias?infotype=SA&subtype=WH&htmlfid=POL03081USEN)

Support may pose particular challenges. Because the limitations in Oracle support for VMware described earlier, for example, issues must often be replicated on a non-virtualized server.

VMware has expanded its support for Oracle in an attempt to deal with this situation. Resolution of issues, however, may still be a time-consuming process, and many organizations regard this approach as representing unacceptable risk for production database servers.

In comparison, Power Systems, AIX and PowerVM have been developed and are maintained by a single vendor, IBM. Different hardware and software components have been closely integrated, optimized and tested by the company. Problems are less likely to occur. If they do, support professionals may address entire system environments, and diagnosis and resolution are typically faster and more effective than for multivendor x86 environments.

- ***Scalability***. Experience has shown that SAP solution stacks and workloads continue to expand even if the business itself is not growing. For example, user experiences suggest that the richer software structures of SAP Business Suite 7 typically require more processor power than earlier SAP solutions.

  This is particularly the case if Unicode is implemented. According to SAP, Unicode transitions average increases of 10 to 30 percent in processor power, 40 to 50 percent in main memory and 10 to 60 percent in database size. Increases are highest if the 16-bit Unicode Transformation Format (UTF-16) is employed.[3]

  Stresses placed on underlying platforms are magnified when organizations seek to consolidate servers. Although "scale-out" architectures may play a role in handling growth, consolidation typically places a premium on "scale-up" capabilities. From this perspective, there are marked differences between x86 and Power Systems platforms.

  According to recent SD benchmark results, Hewlett-Packard ProLiant DL servers – which are the most commonly-employed x86 servers for SAP deployment – show a scalability range of 4.8 times between the dual-socket DL380 G7 configured with Intel Xeon 5600 processors, and an eight-socket DL980 equipped with latest-generation Intel E7 10-core processors.

  In comparison, Power Systems show a scalability range of 24 times between the entry-level, dual-socket Power 730 and a top-of-the-line 32-socket, 256-core Power 795 equipped with 256 POWER7 cores. Figure 3 illustrates this disparity.

DATE	CONFIGURATION	SAPS	RANGE
IBM POWER SYSTEMS			
6/10/2011	730 2/12 x POWER7 3.7 GHz	28,680	
11/15/2010	795 32/256 x POWER7 4 GHz	688,630	24x
HEWLETT-PACKARD PROLIANT			
8/5/2011	DL380 G7 2/12 x X5690 3.4 GHz	28,480	
6/3/2011	DL980 G7 8/80 x E7-4870 2.4 GHz	137,470	4.8x

Figure 3: ***SAP SD Scalability Ranges – Power Systems and x86 Servers***

Higher Power Systems scalability extends to virtualization. In 2010, for example, an International Technology Group (ITG) survey of SAP VMware users found that, for dual-socket servers based on Intel Xeon 5500 and 5600 series processors, numbers of VMs ranged from 4 to 15, and averaged slightly more than 10.

[3] SAP Note 1139642 released October 8, 2011. (http://www.saptechno.com/sap-notes.html?view=sapnote&id=1139642)

For four-socket servers employing Intel Xeon 7400 and 7500 series processors, the range was 12 to 32 VMs, with an average of around 17 VMs. In contrast, SAP Power users routinely support 50 to 100 partitions, and many support hundreds on single platforms.

PowerVM scalability, as well as support for Red Hat and SUSE Enterprise Linux, also position Power Systems as candidates for x86 server consolidation. User experience has been that, in consolidating pre-Nehalem x86 servers running mixed workloads onto Linux on Power (LoP), an average of around four virtual servers may run on a single Power core.

High-end Power models may be configured with up to 96 (Power 780) and 256 cores (Power 795), and up to 960 and 1,000 partitions respectively. In practice, consolidation ratios vary widely depending on application and workload characteristics. It is clear, nevertheless, that significantly higher levels may be achieved with Power Systems than with x86 servers and hypervisors.

- ***Cloud integration.*** Deployment of new applications, workload growth and reductions in process cycle times have accelerated the pace of change in SAP environments. Cloud computing, which offers the potential for faster, more granular application, database and infrastructure modifications, has emerged as a major focus among SAP users.

  Cloud computing addresses a broad range of user requirements. One of its core sources of value is, however, in provisioning of virtual servers in a fraction of the time required by conventional techniques (e.g., 10 minutes compared to one day) while maintaining quality of service.

  Power Systems are full participants in IBM SmartCloud solutions for SAP. In private as well as public clouds, Systems leverage PowerVM capabilities for highly granular partitioning and real-time workload management. Users also benefit from the strengths of this platform in availability, security and other areas described below.

  A further advantage is that, within cloud networks, platform-level system management facilities provided by AIX and IBM Systems Director on Power Systems interlock with higher-level IBM Tivoli service management solutions. The same levels of enterprise management capability may be realized as in conventional environments.

- ***Availability.*** Decades of experience have shown that outages affecting core SAP transactional systems may bring businesses to a halt. The effects are compounded when systems extend beyond transaction processing to address higher value-added processes of communication, analysis and interaction with customers, partners and employees.

  Disruption of these processes may have equally significant bottom-line impacts. Customer queries may go unanswered. Sales opportunities may be missed. Decisions may be delayed or made based on inadequate data. The effects of failing to get the right information to the right person, at the right time, may be as serious as failure to deliver a component to a plant, or a shipment to a customer.

  The fact that non-transactional applications may be deployed on different platforms does not materially affect the vulnerability equation. CRM, analytics and other solutions interact with and/or depend upon data supplied by core ERP systems. If these are down, the organization will, at best, be working with stale information. The consequences may be a great deal worse.

  Industry trends exacerbate vulnerabilities. Adoption of "just in time" practices and "lean" operating models magnify the impact of supply chain disruptions. Faster cycle times across a wide range of industries and processes have similar effects. Internet commerce and globalization reinforce pressures for 24/7 uptime.

The challenges of maintaining continuous availability are daunting under any scenario. But they are magnified – potentially by orders of magnitude – when systems are characterized by complex interdependent software structures, diverse and often unpredictable workloads, high levels of concurrency and sustained growth over multi-year periods.

Although other factors may also contribute, the capabilities of underlying platforms have a major influence on availability levels. For example, for the three SAP users for which IT costs are calculated, "costs of downtime" range from 53 to 63 percent less, and average 59 percent less for use of Power Systems than for Windows servers. Figure 4 illustrates these differences.

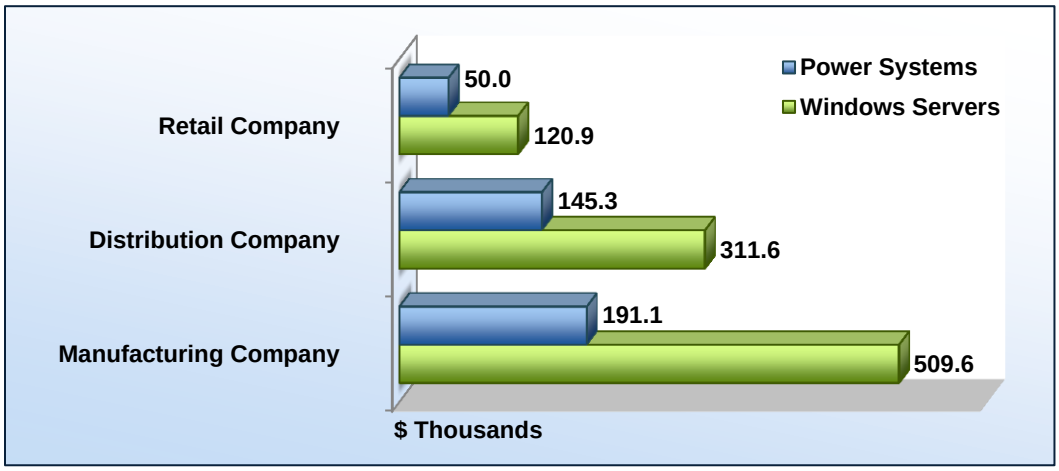

Figure 4: ***Three-year Costs of Downtime***

For all three companies, costs of downtime include costs of ***supply chain disruption*** such as idle and underutilized logistics capacity, including facilities, transportation equipment and personnel; costs of delivery delays, including additional inventory carrying costs; costs of order and transportation scheduling changes; and other items.

Calculations also allow for ***customer-related costs*** including lost sales; late delivery, imperfect order and other penalties; costs of billing delays; and reduced productivity of and additional work performed by sales, customer service and related personnel. Additional industry-specific costs are added for the retail and manufacturing companies. These calculations are again documented in the Detailed Data section.

There is no serious dispute that Power Systems deliver significantly higher availability than x86 servers. Industry surveys have consistently reported that Power Systems experience fewer, shorter outages than any competitive Windows, Linux or UNIX platform. This is the case for planned as well as unplanned outages, and for clustered and standalone configurations.

Power Systems are equipped with more than 200 major reliability, availability and serviceability (RAS) features. AIX and PowerVM also incorporate industry-leading technologies that minimize risks of unplanned outages, facilitate recovery from hardware or software failure and reduce the frequency and duration of planned outages.

Power Systems may, moreover, be equipped with IBM PowerHA SystemMirror software. This is one of the industry's most robust high availability clustering solutions, with a 20-year track record of supporting some of the world's largest SAP systems. It is a great deal more reliable than x86 equivalents.

- ***Security***. For more than a decade, security has been a growing concern for SAP users. Databases typically include a great deal of sensitive information, while other components of SAP environments are also vulnerable to hacking and malware infection.

  Windows is the world's most hacked platform, and the number of Windows malware variants is greater than for other operating system. x86 versions of Linux run a close second, and hypervisors such as VMware and, for x86 Linux environments, Xen and Kernel-based Virtual Machine (KVM) have also emerged as increasingly common targets.

  Users have found that AIX and PowerVM are a great deal less vulnerable than Windows, x86 Linux and VMware. Statistics from the National Vulnerability Database maintained by the U.S. National Institute of Standards and Technology (NIST) that confirm this picture are cited later.

  AIX and PowerVM security strengths may reduce not only business risk exposure, but also the costs of maintaining effective security. Additional tools may be required, and the amount of time spent on security administration tasks is typically higher in Windows server environments. This is allowed for in full time equivalent (FTE) staffing levels for Power Systems and Windows servers in the cost comparisons presented in this report.

These and related subjects are discussed in more detail in the following Business View and Technology View sections of this report.

Conclusions

The number of platform options for SAP deployment is declining. Poor price/performance levels have undermined demand for competitive UNIX platforms such as HP Integrity and Oracle Sun SPARC-based systems, and key software vendors – including Oracle, Microsoft and Red Hat – have ceased development for the Intel Itanium processor upon which the Integrity platform is based.

The Power Systems share of SAP installations continues to expand. Worldwide, more than 18,000 Power platforms support SAP systems for more than 6,000 customers. These include some of the world's largest ERP systems, along with a wide range of other SAP applications in organizations of all sizes.

SAP deployments also form a large segment of IBM's Migration Factory business, which has completed close to 4,000 migrations from competitive UNIX platforms to Power Systems over the last five years. More than 45 percent of these occurred during 2010 and the first half of 2011.

With competitive UNIX platforms out of the picture, the field narrows to IBM Power Systems and x86 servers. This is rarely an either/or choice. Most Business Suite 7 users will continue to employ Windows and x86 Linux servers for lighter-duty SAP and complementary systems, and to host e-mail, collaboration, file/print serving, and comparable applications.

It is less clear, however, that x86 servers are appropriate for the core systems that form the backbone of enterprise SAP environments. The main issue is not the performance of Intel processors but the constraints imposed by Microsoft, Linux, VMware and other x86 software. Vendors of these deal in mass-market "commodity" solutions. SAP Business Suite 7, however, is not a commodity solution.

In critical areas of functionality, Power Systems are – by wide margins – better equipped to handle the workloads generated by, and provide the resiliency mandated for systems that, quite literally, "run the business." They are equally, if not better equipped to handle the stresses that key business and technology trends will place on SAP system infrastructures in the future.

The challenges that face SAP users in today's economy are not small. There is no need to add to them unnecessarily.

Additional Information

This ITG Executive Summary is based upon results and methodology contained in a Management Brief released by the International Technology Group. For copies of this Management Brief, please email requests to Contact@ITGforInfo.com.

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