

# Solaris and Linux

Seal Rock Research White Paper

Seal Rock Research

David Burns

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## Introduction

Only the Solaris Operating System makes sense for UltraSPARC servers. But Sun offers Solaris, Red Hat or SUSE Linux for its Opteron and Xeon servers. Which should customers install?

This paper provides key facts to help customers choose between Linux and Solaris for x86/Opteron servers. Each section focuses on a key area that exposes important differences between Solaris and Linux. It covers

- Performance and scalability
- Security
- Stability
- Application availability
- Technical support and cost
- Hardware support

Some things this paper will **not** cover:

- Choice of desktop operating systems – we are only talking servers here
- Installation – that only happens once, and there are many sources for reviews that cover installation
- Comparisons of different Linux distributions – these are easy to find on websites that specialize in Linux

## Executive summary

Table 1 summarizes the topics this paper covers.

Category	Linux	Solaris	Our take
Performance	Fully competitive, especially with 2.6 kernel	Sun focus on performance has led to gains. DTrace offers practical performance benefits.	Either will do for many deployments. Performance-critical applications may benefit greatly from DTrace
Security	ACLs available now; other advanced	ACLs, RBAC, PRM,	Solaris leads

	facilities under development	Solaris Containers	
Application availability	Widespread	Light but growing	Linux ahead, but check with vendors
Stability	Rapid change, multiple centers of control. Enterprise versions alleviate this.	Predictable lifecycle, Solaris Application Guarantee	Solaris leads, despite Enterprise Linux lifecycle promises
Support options	Free support may have issues. Vendors offer support with varying degrees of flexibility	Flexible support plans	Evaluate vendors
Cost	Red Hat is generally more costly. Otherwise competitive	Free for production use. Support pricing is competitive, transparent and non-coercive. Solaris Containers enable cost saving through consolidation.	Get competitive bids
Hardware support	Broader support, and supports older hardware	Excellent support for mainstream hardware	Check for compatibility before deploying either

Table 1: Summary

## Overview of Solaris and Linux

From the outside, Solaris and Linux are both UNIX™ operating systems. They share the same basic structure, use similar or identical commands and configuration files, and support the same style of programming.

But inside, the differences are deep. Solaris descends from the original code written at Bell Laboratories and UC Berkeley. The fact that its entire development team works at Sun means that Sun can establish standards for consistency, code review, documentation, and compatibility. Its association with Sun hardware means that Sun has the incentive and means to innovate in ways that are difficult in the more diffuse Linux world.

Linux is not an operating system, but a project. Linus Torvalds and a diverse, international group of designated maintainers develop the Linux kernel. The maintainers work at different companies, each with different agendas and priorities, but the central guidance provided by Torvalds maintains direction and focus. Distribution vendors integrate the Linux kernel with large suites of other software to create the actual operating systems that end customers use.

Separate teams create and maintain each piece of open-source software in a Linux distribution, and each separate project sets its own goals and policies. Linux is the result of growth and

evolution; Solaris is the result of design and planning. Both models have advantages. Linux is faster to adapt to new trends. Solaris is more stable and consistent, but also capable of some kinds of innovation that are hard to replicate in the open-source model.

These philosophical and structural differences between Linux and Solaris are a matter of degree, and affect the flavor of the resulting operating system more than actual use. Sun is a major contributor to open source projects, and Solaris ships with an increasing amount of open-source code. Sun has committed to opening the source of Solaris, under a license as yet undetermined.

The Linux kernel is free under the terms of the GNU General Public License (GPL). You can acquire and run many Linux distributions without a license or other fee. If you do, you are likely to encounter the erratic support, short version lifecycles, and limited infrastructure that have led to the success of subscription distributions. At the same time, the cost of subscription distributions has increased to exceed the cost of Solaris.

## Performance

### Sun's x86 focus

In the past, Sun focused on feature parity with Solaris on SPARC, not on performance, in developing the x86 version of Solaris. Sun announced early in 2002 that development of Solaris 9 for x86 would be "deferred". Many interpreted that move as a sign Sun intended to abandon support for x86 processors.

Instead, Sun has moved from retreat to advance in the x86 space. Sun delivered an x86 version of Solaris 9 later in 2002. Since then Sun has delivered a series of increasingly capable x86 and Opteron systems. Sun has also committed to improving Solaris performance on one to four processor x86 and Opteron systems.<sup>1</sup> Sun treats performance deficiencies in Solaris as severity 1 defects, and the Solaris change logs now have many descriptions of fixed bugs like

```
4775225 getpeername() is slow on Solaris when compared to Linux.
```

Sun engineers' blunt frankness in acknowledging these shortcomings may be one of the best indicators of how serious Sun is about performance.

### Linux performance improvements

Linux developers have also been focusing on performance. The 2.4-series Linux kernel was good enough for many business needs, but did not scale well for common server workloads. The many improvements in the 2.6 kernel make Linux a true enterprise-class operating system, capable of managing large databases and heavy transaction loads.

### A horserace

Linux and Solaris are in a performance horserace. This can only be good for users of both operating systems. Sun recently published two record-setting SPEC jAppServer2002 benchmarks, which illustrate this point<sup>2</sup>.

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<sup>1</sup> [http://techupdate.zdnet.com/techupdate/stories/main/Sun\\_Red\\_Hat\\_gird\\_for\\_traditional\\_OS\\_battle.html](http://techupdate.zdnet.com/techupdate/stories/main/Sun_Red_Hat_gird_for_traditional_OS_battle.html)

<sup>2</sup> <http://www.spec.org/jAppServer2002/results/jAppServer2002.html>

Category	Hardware	Operating System	Price-performance	Improvement over prior record holder
Dual Node	Sun Fire V20z	Red Hat Enterprise Linux AS Release 3	\$101.10/TOPS	15%
Multiple Node	Application servers: Sun Fire V20z  Database server: Sun Fire V40z	Solaris 9, x86 Platform edition	\$82.74/TOPS	40%

Table 2: SPECjAppServer2002 results

These benchmarks do not directly compare Linux and Solaris 9, but they prove that either operating system can generate record-setting results.

Solaris 10 delivers even higher throughput than Solaris 9 in many common computing tasks, including the SPEC jAppServer2002 benchmark in which Solaris 9 has already set the price-performance record shown above. Sun has provided the results shown in Figure 1.

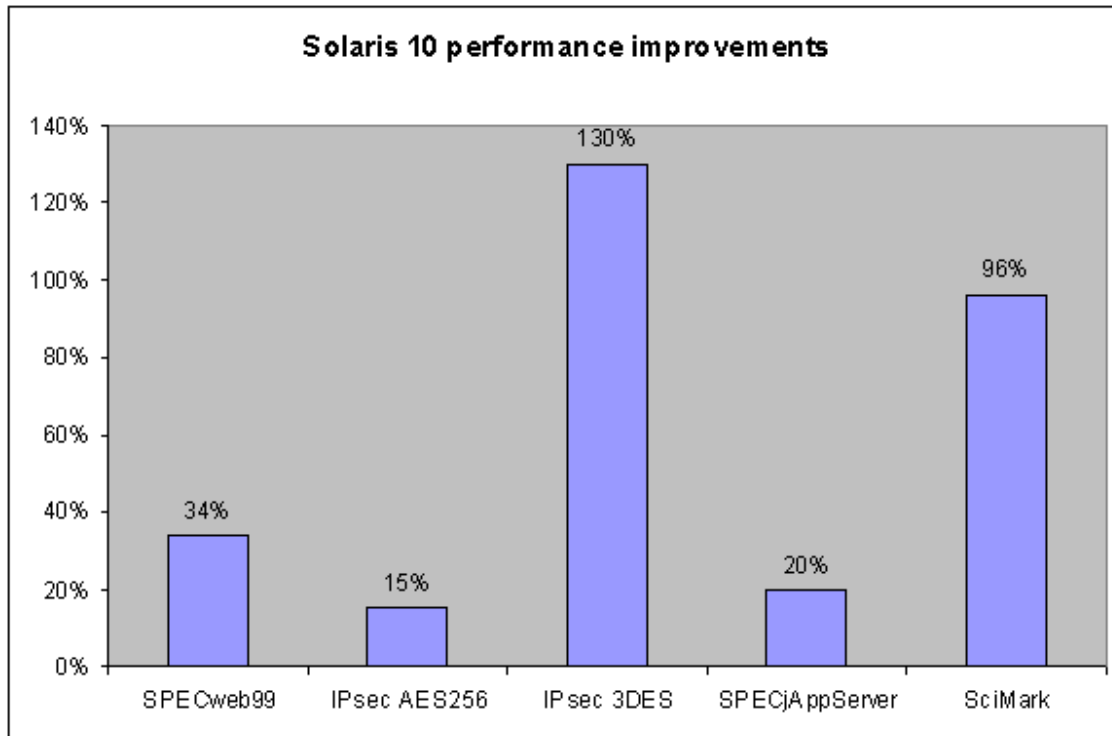


Figure 1: Solaris 10 benchmarks compared to Solaris 9 on same x86 system

## **Tuning and optimization**

Benchmarks are only a starting point in knowing how an operating system will perform under a particular load. Configuration and tuning are the key to getting the best performance.

## **DTrace**

Solaris 10 has DTrace, a new facility for application monitoring and performance tuning. DTrace can dynamically instrument any software activity on a Solaris 10 system. With DTrace, you can have real-time visibility of current program and operating system behavior on running, production systems.

- DTrace can be used on production systems without changing configurations, installing additional software, or interrupting current operations
- DTrace gives complete visibility across process and user/kernel boundaries
- Thousands of probe points are pre-defined
- User-defined probes can be easily generated on the fly for any process or library

Sun teams using DTrace report significant gains in performance, even on systems running financial services applications that were previously considered highly optimized.

At first glance DTrace may seem unimportant to most customers, since it will be used mostly by developers and advanced administrators. But DTrace is a major advance in making it easy to see and understand problems in complex software systems. This is a key advantage, both in finding and fixing bugs, and in enhancing the performance of software systems. Customers will benefit by having higher quality and better performing software.

## **Linux tuning options**

Linux has no equivalent to DTrace. Linux developers use a number of tools, such as *oprofile*, a system-wide profiling facility, and *strace*, which traces system calls and signals, to gather the same kind of information DTrace makes available.

The closest equivalent to DTrace in Linux is probably the Linux Trace Toolkit, which, with the separate DProbes facility, provides a similar type of dynamic tracing. However, using Linux Trace Toolkit requires building, installing, and booting a special kernel. This severely limits the use of LTT on production systems.

## **Score - performance**

- Either Solaris 9 or Linux can provide excellent performance for server applications.
- Sun is moving vigorously to improve the performance of Solaris 10 on x86 systems.
- Linux will not stand still, and the resulting race for performance will benefit users.
- In DTrace, Solaris 10 has an innovative and useful tool for tuning and optimization. Linux has no equivalent facility.

# Security

## Flaws and vulnerabilities

Operating system and application flaws are the most important risk to system security. Malicious users or programs exploit flaws to gain control over a system, or to interfere with its operation. All operating systems have flaws. The rate at which vulnerabilities are reported seems to vary with the amount of hacker interest in attacking systems. Attempting to quantify security by counting vulnerabilities is a futile exercise.

Vigilant administrators who apply patches as required can use either Solaris or Linux without undue worry.

## Proactive security

Solaris has far outpaced the traditional UNIX security model. Solaris has long supplied such features as access control lists for files and system objects, and role-based access control.

Linux has also improved on traditional Linux security, but trails Solaris.

The most important enhancements to traditional UNIX security are access control lists (ACLs), role-based access control (RBAC), and process rights management (PRM).

## Access control lists

Administrators use access control lists to specify exactly who can read, write, or execute system objects such as files. Both Solaris and Linux support ACLs.

## Role-based access control

Administrators use role-based access control to delegate limited authority to subsets of users. In Solaris RBAC is fully integrated, and administrators use standard utilities such as *useradd* to administer user roles.

RBAC in Linux is provided by the SE Linux patch, which requires a non-standard kernel and additional utilities. SE Linux is slated to be a part of Red Hat Enterprise Linux 4.

Administrators of Linux distributions without RBAC can use *sudo* to assign a user the right to run certain programs as other users, usually root. This partly achieves the security goals of RBAC, by giving limited administrative capabilities to some users without giving them full root privileges. *Sudo* is potentially brittle and architecturally inferior to RBAC. For example, if a user can use *sudo* to run a program that allows shell access, that user can get full root privileges just by invoking the shell.

## Process rights management

With process rights management, administrators grant individual processes only the privileges they need to perform the work assigned to them. While ACLs and RBAC are most useful in a system with logged-in users, PRM has wider applicability. PRM creates a defense in depth against security breaches, limiting the damage that even a compromised application can do. Process rights management is a feature of Solaris 10, and is not available in Linux.

## System partitioning

System partitioning is not just a security technology. By consolidating applications on a single server, while isolating each application and its configuration from all others, system partitioning facilities can simplify administration and reduce costs. But this ability to create entire environments isolated from one another has powerful uses for security as well.

Solaris implements partitioning through Solaris Containers. Containers are virtualized environments running in a single instance of Solaris. Processes running in a container can access only the resources allocated to that container. This provides a highly secure environment for consolidation of multiple applications on a single server.

Some Linux administrators use VMware for system partitioning. VMware runs as an application on a host operating system and creates virtual machines to run guest operating systems. Different guest operating systems can run on a single system. The tradeoff for this benefit is both memory and performance overhead.

In the absence of true system partitioning, *chroot* jails can provide file system isolation for applications. While useful, *chroot* controls only access to file system objects, and provides no protection if a rogue process acquires root privileges.

User Mode Linux, included in SUSE Linux Enterprise Server 9, is sometimes mentioned as an option for system partitioning. User Mode Linux is a tool for testing, debugging, and experimentation. It is neither intended to be, nor suitable as a system partitioning facility for production environments.

Table 3 shows the status of selected security technologies in Solaris and Linux.

Table 3: Selected security facilities, Solaris and Linux

	<b>Solaris</b>	<b>Linux</b>
Access control lists	Yes	Yes
Role-based access control	Integrated into operating system and standard utilities	SE Linux patch, currently requires custom kernel. Will be included in RHEL 4
Process rights management	Included in Solaris 10	No
System partitioning	Solaris Containers included in Solaris 10	VMware imposes additional overhead and substantial cost  <i>chroot</i> jails provide file system isolation for applications.

This is an area in which Solaris is clearly ahead.

## Score - security

- Solaris leads Linux in the power and sophistication of its security features.

- Linux is not insecure. Experienced administrators can configure Linux to provide a high degree of security.
- Solaris Containers in Solaris 10 provide a powerful facility for system partitioning, with applications that go beyond security.

## Stability

A stable operating system lets you maintain applications, configurations, and procedures with few or no modifications. Forced version upgrades, frequent reboots after patches, or needing to change configurations to stay current with security patches are signs of instability.

### Stability of versions and lifecycle support

Sun's operating system lifecycle model is:

- Sun announces end of life for a version at least six months before the last ship date, when at least two successor versions are available
- Full support (except requests for enhancements and cosmetic bugs) continues for two years after the last ship date
- Contract customers can receive three more years of telephone support and patch access, but no new patches.

This could be called the bitter-end model of product support.

Early adopters of Linux were plagued by a version treadmill that frequently required them to upgrade servers or risk running unsupported software. Linux vendors heard their customers' pain. Both SUSE and Red Hat now promise to provide support and security maintenance for their enterprise distributions for five or more years from first customer shipment.

### Stability of interfaces

A second facet of stability is the ability to keep applications running in the face of change: if you do have to upgrade or patch, will your applications still run?

Sun guarantees that the application binary interface of Solaris is identical from one version of Solaris to the next. An application compiled for one version of Solaris will still run on the next version of Solaris. If an application stops working because of a change in the way Sun's ABIs work, Sun will fix it in the operating system. No other vendor issues this kind of guarantee.

In the past, Linux lacked a similar institutional commitment to stable interfaces. The Linux Standard Base (LSB), a project of the Free Standards Group, is changing that. The goal of LSB is to enable software applications to run on any conforming system.<sup>3</sup> LSB has succeeded, in that the major Linux vendors have agreed to a standard binary operating system interface.

Both of Red Hat and SUSE Linux (and Sun's Java Desktop System 2) are certified to LSB 1.3<sup>4</sup>. Despite this, applications compiled for one version of a Linux distribution cannot necessarily be expected to run correctly on other distributions, or even on subsequent versions of the same distribution. For customers, this means that an application you purchase for one version of Linux may or may not be supported on a subsequent release.

<sup>3</sup> [http://www.linuxbase.org/modules.php?name=FAQ&myfaq=yes&id\\_cat=1&categories=General+Info#17](http://www.linuxbase.org/modules.php?name=FAQ&myfaq=yes&id_cat=1&categories=General+Info#17)

<sup>4</sup> [http://www.opengroup.org/lsb/cert/cert\\_prodlst.tpl](http://www.opengroup.org/lsb/cert/cert_prodlst.tpl)

## **Number of errata and patches**

Some reviewers, and even some vendors, try to quantify the stability and/or security of operating systems according to the number of errata found and patches issued. This ignores the fact that, while applying too many patches may be annoying, applying too few would be disastrous.

As Solaris 10 is now preparing for first customer shipment, early adopters may experience a period of greater than normal change. This is a normal part of the cost of using the latest software.

Red Hat and SUSE are both preparing major new versions for release in 2005, and their early adopters will also face the possibility of more frequent than usual patches.

## **Score - stability**

- Linux provides adequate version stability, but does not match the tenacity of Sun's lifecycle support for Solaris.
- Solaris has stable interfaces, and Sun guarantees their forward compatibility.
- Linux is moving toward a definition of stability with the Linux Standard Base, but its practical effect for customers has thus far been small.
- Solaris and both of the major subscription Linux distributions are preparing to release major new versions. Early adopters are likely to experience frequent patches and updates.

## **Application availability**

### **Solaris**

Thousands of software vendors support Solaris. Until recently, most have supported only Solaris running on SPARC processors.

As Sun continues to drive performance for the x86 version of Solaris, we believe that more ISVs will support Solaris on x86 as well as SPARC.

Oracle, which has widely publicized its support for Linux, now also supports Solaris on x86 processors. This marks an important turning point in ISV support for Solaris on x86, and makes a vital enabling application available for many other ISVs.

Solaris ships with over 130 open-source applications and packages. Many more open source applications are available at [www.sunfreeware.com](http://www.sunfreeware.com) or on the Solaris Companion CD of open-source applications. In addition, many open-source projects provide make files or build scripts for Solaris.

Moreover, Solaris 10 can execute Linux binaries through its Solaris Linux Application Environment. This makes it possible to use Linux applications unmodified on Solaris systems.

### **Linux**

Publicity campaigns by IBM and Oracle have raised the profile of Linux among commercial ISVs. Most key applications are now available on at least one Linux platform. But few software vendors support Linux generically. ISVs support platforms, not standards, because you cannot test an application on a standard.

The availability of open source applications for Linux is unsurpassed, and many open source projects are based primarily on Linux.

Key enabling applications often support only one or two top subscription distributions. Even within those distributions, vendors often support a limited selection of versions. For example, Oracle has used 64-bit SUSE Linux Enterprise Server 9 in published benchmarks, but does not list SLES 9 as a supported operating system.

Some software vendors, stung by incompatibilities, certify their Linux applications only to specific kernel releases, library versions, or patch levels. Before installing Linux to support a specific application, check these requirements carefully.

## Score

- For x86 systems, Linux leads Solaris in availability of both commercial and open-source applications
- Most commercial applications support only the major subscription distributions, and the need for specific versions, libraries, or patches may complicate administration
- Sun is making strides to increase the number of applications that run on Solaris on x86

## Licensing and support

### Support for free Linux distributions

Given the high price of support from some Linux subscription vendors, some customers may be tempted to use a free distribution. Free support for free Linux distributions comes from the Linux community.

Community support really means self-support. Flexibility, curiosity, persistence, and at times a thick skin are required when seeking help in public forums. Nonetheless, organizations with technical know-how but limited budgets can lower their costs through self-support.

With community support, problems are exposed in a public forum. The open source model exploits the network effect of people sharing knowledge of software and its defects. If you do not want competitors or others to know about the problems you have or the technologies you use, be careful in using community support in open forums, and be aware that your Linux vendor's support department may use community forums to find answers to your questions.

Rough-and-ready support in Linux: An ISV requests some bug fixes. The responses are from a Linux kernel maintainer.

isv: ... *I would like to see this bug fixed first.*

maintainer: Then either fix it and post the patch, or write a detailed bug report and hope that someone else fixes it. That's how it works. You have no support contract with me.

Source: Linux Kernel Mailing List,  
<http://www.uwsg.iu.edu/hypermail/linux/kernel/0408.0/1528.html>

## Paid support options

Many small businesses, and most medium and larger businesses purchase support for the systems that provide their computing infrastructure and run their key business applications. For operating systems this support usually comes from the operating system vendor.

Table 4 shows the technical support options available from Red Hat, Sun, and SUSE.

Vendor	License model	Support model	24x7 support available
Red Hat	Subscription	Bundled	Only for top product (RHEL AS)
Sun	Perpetual / free	Unbundled	Yes
Novell / SUSE	Subscription	Unbundled	Yes

Table 4: support models

Sun and Novell offer flexible, unbundled support options. These are preferable to Red Hat's approach, especially for customers who may self-support or purchase support from a VAR or service provider.

## Cost

Solaris 10 is available for free for both commercial and non-commercial use. Supported installations of Solaris will pay an annual subscription fee for each supported system as shown in Table 5, based on the level of support and the number of installed CPUs.

CPUs	Basic support (online fixes, upgrades, and training)	Standard support (Basic plus 5 x 12 technical support)	Premium support (Standard plus 7 x 24 technical support)
1	\$120	\$240	\$360
2	\$240	\$480	\$720
4	\$480	\$960	\$1440

Table 5: Solaris subscription pricing

For systems with more than four processors, multiply the single-processor price by the number of installed processors.

A processor in Sun's scheme is a physical module, not a processor core. A server with four CPU chips, each of which contains two cores, actually has eight CPUs as seen by the operating system, but its owner would pay the four-processor price for Solaris.

Sun's pricing for Solaris 10 is simple and symmetric. It has no feature designed to coerce customers to purchase a particular product or service.

The main benefit to customers is flexibility. With free licensing, IT personnel can create test configurations, quickly get new projects started, or use their work operating system at home without violating the terms of a contract. For supported systems, customers can choose the level of support required for each system and pay accordingly.

While Linux is notionally free, you will have to pay a subscription fee in order to run either Red Hat Enterprise Linux or SUSE Linux Enterprise Server.

For use on x86 and Opteron servers, Red Hat Enterprise Linux costs between \$349 and \$2499 per year per system. Red Hat Enterprise Linux subscriptions priced below \$1499 are limited in both memory and number of CPUs supported.

CPUs	Basic support (online fixes, upgrades)	Standard support (Basic plus 5 x 12 technical support)	Premium support (Standard plus 7 x 24 technical support)
1	\$349	\$799	\$2499
2	\$349	\$799	\$2499
4	N/A	\$1499	\$2499

Table 6: Red Hat Enterprise Linux subscription pricing

SUSE Linux Enterprise Server costs between \$349 and \$899 per year for non-HPC server configurations. Support for SUSE Linux is sold separately, with a wide variety of options ranging from per-server, electronic-only support at \$900 per server per year, to enterprise-wide agreements including dedicated personnel. The nature and complexity of Novell's programs make direct comparisons on a per-server basis difficult, except at the basis level:

CPUs	Basic support (online fixes, upgrades)
1	\$349
2	\$349
4	\$899

Table 7: SUSE Linux Enterprise Server Upgrade Protection pricing

Figures 3, 4, and 5 compare list subscription prices for Solaris 10 and Red Hat Enterprise Linux 3.0 for basic, standard, and premium support. Solaris 10 prices are 31% to 86% below Red Hat's prices for the same system and support level.

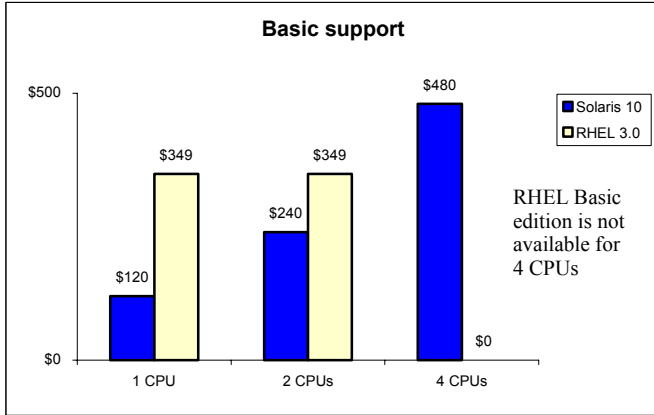


Figure 2: Annual cost of basic support for Solaris 10 and Red Hat Enterprise Linux 3.0

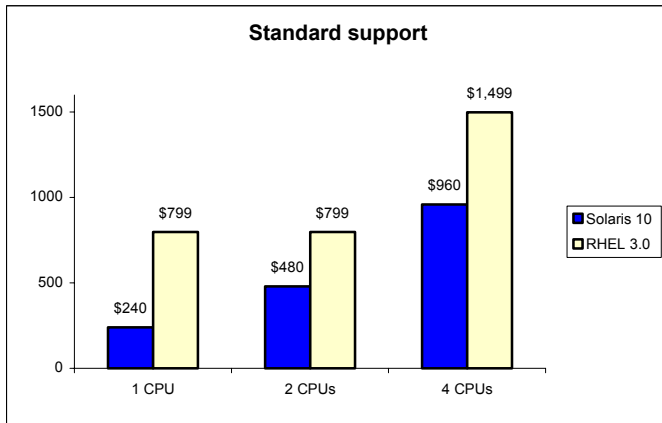


Figure 3: Annual cost of standard support for Solaris 10 and Red Hat Enterprise Linux 3.0

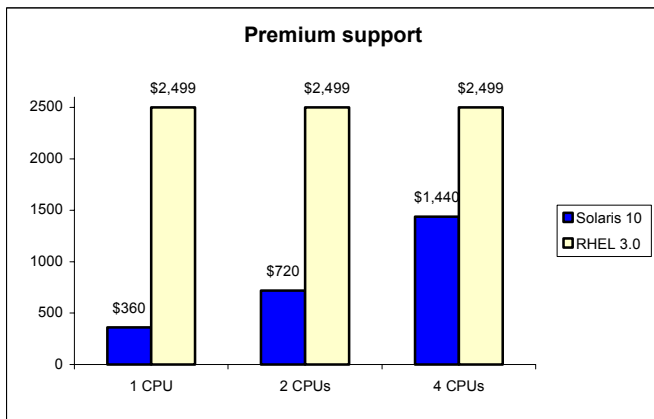


Figure 4: Annual cost of premium support for Solaris 10 and Red Hat Enterprise Linux 3.0

## Risk and Indemnification

Sun has full licensing rights to Unix software, and indemnifies customers using Solaris against intellectual property risks.

Novell indemnifies Linux customers who meet certain requirements, including a \$50,000 minimum purchase.

Red Hat does not indemnify customers, but only promises to replace any software in Red Hat Linux which is found to violate a third party's intellectual property rights, as long as the customer has a registered Red Hat Enterprise Linux subscription.

Each Linux user should assess the requirements for indemnification and act accordingly. So far, no court has found any company liable for intellectual property or copyright violations for running Linux.

## **TCO**

Some vendors have tried to show that the total cost of ownership for one operating system is lower than that for others. Unfortunately, there is no generic way to calculate total cost of ownership. Every organization has different requirements for performance and availability, different tolerances for risk, and different standards for system maintenance and monitoring. Take these factors into account to calculate your own TCO, and do not rely on vendor-funded studies of this metric.

### **Score – licensing and support**

- Linux has no cost advantage over Solaris.
- In comparison with Red Hat Linux, Solaris is generally less expensive and more flexible.

## **Hardware support**

Linux supports a wide range of x86 hardware, including many obscure and/or obsolete platforms and components. You may be able to leverage this support to get value out of older hardware, or to start a skunkworks project with old systems that happen to be on hand.

Solaris currently supports a fairly narrow base of x86 hardware, but the hardware that is supported comprises the most useful set of recent and current x86-based server hardware. Still, check the hardware compatibility list at <http://www.sun.com/bigadmin/hcl/> before deciding on Solaris for x86 systems.

### **Score – hardware support**

Linux leads in hardware support, but Solaris supports the most popular and common modern server configurations.

## **Summary**

### **Performance**

Solaris and Linux are in a performance horserace. Current versions of Linux perform very well on commodity servers, as does Solaris. Solaris has DTrace, a superior tool for eliciting the highest

possible performance for a specific application or deployment, and customers requiring the highest performance should consider Solaris.

### **Security**

Solaris leads Linux in the power and sophistication of its security facilities, including

- Role-based access control
- Process rights management
- System and resource partitioning

### **Stability of versions and interfaces**

With the rise of subscription-based enterprise distributions, Linux has achieved adequate version stability. Despite the efforts of the LSB project, the interface stability of Linux is not sufficient to allow ISVs to support Linux generically. Sun guarantees the stability of Solaris' application binary interfaces.

### **Application availability**

While Sun is making strides in getting ISV support for Solaris on x86 and Opteron processors, Linux leads in the availability of applications. Linux also supports a wider range of hardware.

### **Technical support and cost**

Sun offers the greatest flexibility in its technical support programs, and in many cases the lowest cost. Customers can purchase only the level of support required for each server – for example, premium support for mission-critical application servers, standard support for workgroup servers, and basic or even no support for compute-farm servers.

Novell offers flexible, unbundled support alternatives for its enterprise Linux versions. Red Hat's support options tend to be less flexible and more expensive, and are bundled with its Advanced Server product.

Sun's new pricing model for Solaris – free for commercial use, with unbundled support priced per CPU – promises to work profound effects on the operating system market, the details of which will only become clear with time.

For most deployments, Solaris is priced lower than Red Hat Enterprise Linux or SUSE Linux Enterprise Server. Even free Linux distributions now offer no cost advantage compared to Solaris. It is no longer possible to cut costs by switching from Solaris to Linux.

### **Conclusions and recommendations**

Either Solaris or Linux can fill almost any enterprise role.

Linux is and will continue to be an excellent choice in many server roles. Its steadily improving performance and capabilities mean that Linux will maintain its momentum among ISVs and customers.

Solaris is superior to Linux in some important areas. Decision makers who are not constrained by application availability or hardware support should seriously consider Solaris for deployment on x86/Opteron servers.

Organizations contemplating a switch from Solaris on SPARC to Linux can maximize the value of their existing IT skills and infrastructure, while minimizing the risks and costs of moving to a different platform, by adopting Solaris on Opteron or Xeon servers.

Organizations that have found Linux to be more expensive or less satisfactory than expected may find that Solaris offers an effective alternative.

Organizations without a significant investment in either operating system can compare the benefits and risks of these excellent alternatives.

For **custom** applications, choose Solaris. DTrace, the Solaris Application Guarantee, and Solaris' unparalleled stability will protect your investment in development and make it the better choice.

If you want to run **commercial** applications, you may have no choice. Linux leads in ISV support on x86 platforms. But check with vendors before buying – they may have a Solaris version in the works.

For **open-source** applications, the choice is more difficult. Solaris offers Linux binary compatibility, and most common open-source applications are readily available as native Solaris binaries. But many open-source projects are based in Linux. This means that installation and configuration may be easier, and community support more readily available. This may trump Solaris' superior security facilities and overall lower cost.

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## **About the author**

David Burns is a senior technical analyst for Seal Rock Research, a technology-focused market research firm in San Francisco. Seal Rock Research uses both Linux and Solaris on x86 platforms.

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