



**Creating a Virtual IT Infrastructure
with Parallels Workstation**

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About Parallels

Parallels, Inc. is a privately held, fast-growing software company based in Herndon, Virginia that is focused on developing industry-leading workstation and server virtualization technologies. The Parallels team, which includes nearly 60 business development, engineering, and support professionals, is one of the most mature in the industry. Core team members have been working in high technology since 1995, and have been entirely focused on virtualization technologies since 1999. The company offers three primary products to address all of an enterprise's virtualization needs:



Parallels Workstation 2.1, the world's first hypervisor-based desktop virtualization solution, is the most powerful, easy-to-use, cost effective desktop virtualization solution available today.

Parallels Server is due in the first half of 2006 and is a next-generation server virtualization solution that enables IT managers to create multiple virtual servers on a single Windows- or Linux-powered physical server. Because each virtual server is entirely self-contained, IT managers can monitor, access, and change individual virtual server settings, reboot, or recover data without affecting any other virtual or physical server operations.

Parallels Enterprise Server is due in 2006 and is a pure-hardware server virtualization and management solution that pools hardware resources and dynamically allocates them to virtual servers as necessary. This ensures that each physical server is used to its maximum potential and each virtual server always has the resources it needs to operate efficiently.

Document Summary

During the technology boom of the 1980s and 1990s, IT infrastructure became the backbone of the modern enterprise. Companies and organizations worldwide invested hundreds of billions of dollars into creating complex IT environments to meet their employees' needs, which, as a result of the constantly changing business and technology climate, were often in a perpetual state of obsolescence. During the last ten years, the solution was simply to upgrade existing workstations and servers, or add additional hardware to accommodate new requirements. The offspring of this short-sighted approach are monstrous IT environments that contain disparate operating systems, hardware standards, and applications, and, as a result, are extremely difficult and expensive to manage and maintain. This white paper will examine the consequences of the boundless IT expansion of the last 25 years, and how virtualization technologies, like Parallels Workstation, can help address them. Parallels Workstation is a powerful desktop virtualization solution that empowers users with the ability to create several isolated, independent, fully operational virtual machines on a single physical PC. By virtualizing the desktop, Parallels Workstation helps IT administrators create a simple, efficient virtual IT infrastructure to satisfy their enterprise's evolving technology needs, while simultaneously reducing hardware, software, personnel, and overall operating costs.

The Problem with Traditional IT Infrastructures

In order to meet constantly evolving needs and address continually improving software, IT managers during the 1980s and 1990s embraced a "buy and try" solution; administrators would simply buy new machines to run new software configurations, or upgrade hardware and software on existing machines, one at a time. This approach created a Frankenstein-like IT environment — a large, incongruent collection of overpowered hardware, lumbering slowly and awkwardly. The traditional method of IT management presents four key problems:

1. High hardware costs

Under the "one application, one machine" IT infrastructure model used by most enterprises, an IT manager must add a new machine each time a new job function is added. For example, a Linux-powered machine needs to be equipped and configured differently than a Windows-powered PC, a desktop computer built for a graphic designer needs a different hardware and software configuration than one built for a software developer, etc. Because a company's needs are constantly evolving, more and more machines must be purchased or existing machines must undergo costly upgrades to satisfy those needs.

Another factor contributing to high hardware costs is the insistence of most IT managers to build machines to handle the "worst case" workload. Often, administrators overpower desktop computers in an attempt to shield the system from a crash or unbearably low performance during an extreme workload. The result is a series of underutilized high-performance machines that inefficiently use only about 10% their computing power in average day-to-day use.

2. Inefficient for use in the modern mobile business climate

The internet, wireless connectivity, and a wide variety of portable computing devices, such as laptops, handhelds and PDAs, make today's business climate entirely mobile. Unfortunately, the traditional "one machine, one application" model for IT is not suited for the rapid pace of business today. Typically, machines are limited by a single, static operating system and by inflexible hardware configurations. Working with multiple operating systems requires the use of numerous computers. Therefore, users accustomed to working in more than one computing environment are forced to operate at less than full capacity when away from their home workstations. In a traditional IT infrastructure, the only remedy to this

problem is to either equip all of the enterprises workstations with multiple machines, or force traveling employees to encumber themselves with more than one portable PC. This quandary of productivity vs. convenience is particularly relevant to sales engineers, QA managers and software developers, most of who are accustomed to working concurrently with several platforms.

3. Expensive, time-consuming maintenance

Managing an IT infrastructure that contains disparate hardware configurations, operating systems and software requires a large number of technicians, each of which must have a deep understanding of all in-use systems. Skilled labor of this kind is not cheap; each trained and certified technician can cost a company as much as \$75,000 per year. Due to space and expense limitations, very few support teams are equipped with machines that can emulate every possible user configuration. This means that technicians are forced into one of two inefficient assistance cycles; they can either attempt a possible solution, see if it is effective, and then repeat the process as necessary (known as "guess and check"), or engage in a time-consuming visit to the problematic workstation. Both scenarios lead to team inefficiency, frustrated end-users, and significant employee downtime.

4. Massive operating costs

It is an immutable fact that computers take up space and run on electricity. And, of course, the more computers that an enterprise operates, the less physical space is available, and the higher energy bills will be. Often, specialized machines are left on but idle, resulting in an inefficient use of space and an unnecessary energy expense. This problem is compounded by the significant infrastructure and energy costs associated with maintaining an appropriately climate-controlled environment for hardware components.

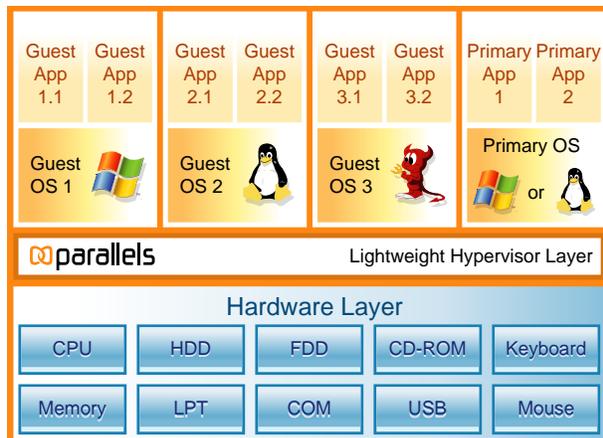
The Move to Virtual Infrastructures

When the global economy slowed following the September 11th attacks in the United States, enterprises worldwide realized that their current approach to IT management was unsustainable. Facing dwindling liquid cash reserves and falling market valuations, enterprise IT managers began searching for a way to decrease their annual hardware investments and lower operating expenses while still providing their workforces with the tools and resources they needed to operate effectively and efficiently. The situation was a classic "catch-22"; how could an enterprise reduce the number of computers it operated, but still maintain productivity? The answer came with the development of virtualization technology, which gave IT administrators the ability to create self-contained, independently running virtual machines on a single physical computer.

Parallels Workstation for Desktop Virtualization

Parallels Workstation is the most powerful, easiest-to-use, cost-effective desktop virtualization solution available today. It empowers any user, from experienced professional developers to sales executives to casual home users, with the ability to create completely networked, totally secure independent, maximally stable virtual machines on a single physical machine.

The product works by mapping the host computer's hardware resources directly to the virtual machine's resources, allowing each virtual machine to operate identically to a stand-alone computer. Each virtual machine works with its own processor, RAM, floppy and CD drives, I/O devices, and hard disk — everything a physical computer contains.



Parallels Workstation's hypervisor-powered virtualization engine enables users to run multiple virtual machines on a single physical computer

Parallels Workstation 2.0 is also the first desktop virtualization solution to include a lightweight hypervisor, a mature, trusted technology originally developed in the 1960s to maximize the power of large mainframes. Hypervisor technology dramatically improves virtual machine stability, security and performance by using a thin layer of software, inserted between the machine's hardware and the primary operating system, to directly control the host machine's hardware profiles and resources. It not only makes Parallels Workstation-powered virtual

machines secure, stable and efficient, but also empowers Parallels Workstation users to fully realize the benefits of built-in hardware virtualization technologies like Intel VT and AMD Pacifica.

Parallels Workstation provides a number of key benefits that alleviate the stresses created by traditional IT infrastructures:

Reduced hardware expenses

Because Parallels Workstation enables users to work with multiple operating systems simultaneously — and seamlessly switch between them — there is no need to dedicate an entire machine to a single operating system. From one Parallels Workstation-powered location users can load and use the ideal operating system to compete necessary tasks, which ensures that users always have the software and operating system configuration they need to work to their maximum potential, and that each high-powered physical machine is maximizing its available computing power. Because Parallels Workstation is available at only \$49 per license compared to several hundred dollars for a moderately powered desktop PC, IT departments can immediately save costs while improving employee productivity.

Improved operating costs

The virtual infrastructure created by Parallels Workstation is significantly more cost effective than a traditional IT infrastructure. Because each physical machine can host multiple virtual machines, guest operating systems and associated software and hardware configurations, less physical machines are required to complete the same amount of work. This leads to a more efficient use of physical office space, and helps to curb energy costs, especially those associated with individual machine cooling and overall climate control.

More efficient IT administration

Testing new software, updates or patches in a virtual environment prior to deployment to physical environments ensures that potentially hazardous bugs or conflicts can be identified and eliminated before they can do damage to servers or individual machines. IT managers can also test and optimize complex, multi-tier applications on a single machine.

The Move to Virtual Infrastructures

Stronger security

Parallels Workstation helps to secure an enterprise's entire IT environment. For example, a virtual machine can be created specifically to handle web browsing and general internet traffic, another for email, and another to access the enterprise's intranet. This partitioning of tasks across multiple machines is particularly useful in the case of a hacking attempt, virus infection, or other malicious attack; since each virtual machine is totally independent, an infected or attacked virtual machine can easily be shut down, thus minimizing damage to other critical systems.



Using Parallels Workstation, users can create several secure, mobile, and entirely independent virtual machines on a single, physical PC

Maximum mobility

Virtual machines created with Parallels Workstation are stored as files on the hard drive of a physical machine, meaning that each virtual machine profile can be easily zipped and ported, either physically or electronically, to a new machine anywhere in the world. This ensures that users who spend time on the road or work from several offices are able to access their usual applications, profiles, and settings, regardless of their location.

Optimized for hardware virtualization

Parallels Workstation's lightweight hypervisor enables the product to fully support the features and benefits of new hardware virtualization technologies like Intel's VT and AMD's Pacifica architectures. This optimization means that IT departments will be able to immediately utilize hardware virtualization technologies, rather than undergo a costly upgrade to make their applications compatible with newly acquired hardware.

Implement a Virtual IT infrastructure with zero training

Parallels Workstation offers two key tools — a virtual machine creation wizard and a clean, web-inspired interface — to help IT professionals and enterprise end users move to a virtual infrastructure with zero training time. The powerful wizard enables users to create virtual machines in seconds by answering a few simple questions about the virtual machine's hardware profile and operating system. Once created, virtual machines are controlled by the industry's cleanest, most user-friendly management console available. Users can single click to option menus and easily start, stop and pause virtual machines.

Parallels Workstation in Action: Sample Scenarios

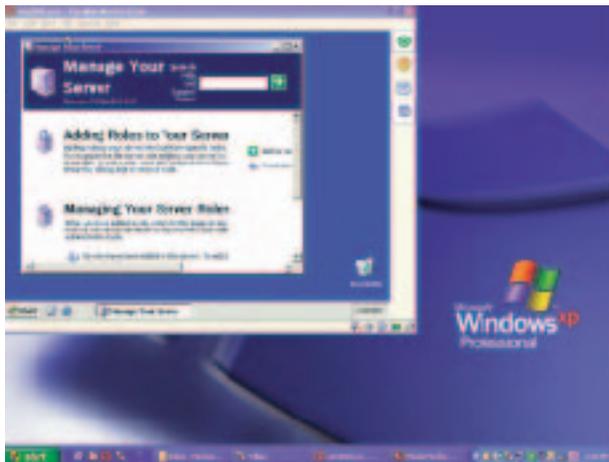
Accelerate Software Development

In the face of a looming deadline, how can a development team stay on track and on budget, despite the fact that progress is moving slowly because each team member has to constantly switch between dedicated machines to program, self-test and debug their code?

The Parallels Workstation Solution: By installing Parallels Workstation on a high-powered workstation PC, each development team member is able to create a complex, multi-tiered virtual world on their desktop. By piping a debugger from the primary operating system to the guest operating system running inside a virtual machine, developers are able to program and self-test new code in multiple environments in real time.

More Rigorous Quality Assurance Testing

In the development life cycle of any cross-platform application, the Quality Assurance team needs to efficiently test software in multiple environments in a short period of time. Testers do not have the time to shuttle between dedicated machines to execute testing, and can not afford to waste time waiting for machines to restore the "clean slate" that they need to effectively examine software.



Parallels Workstation enables programmers to test and debug code simultaneously in multiple operating environments

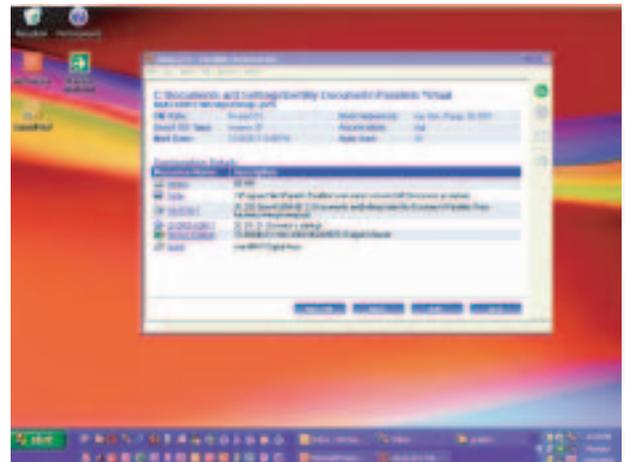
The Parallels Workstation solution: Using Parallels Workstation, QA testers can create multiple virtual machines at their workstation. Each virtual machine can emulate a specific real-world environment that includes customized OS operation, hardware configurations, and software availability. Because each virtual machine is encapsulated in its own file set, testers can easily reset them with a single mouse click, drastically reducing the time it takes to create a "clean slate" testing environment. All Parallels Workstation virtual machines are entire self-contained and run completely independent of other virtual and physical machines, so a guest operating system crash, shut down, reboot or reconfiguration on one virtual machine does not affect the operations being executed on others.

Improving Desktop and Customer Support

Conventional IT infrastructures make desktop support a difficult task. Because IT technicians are unable to re-create user conditions at the help desk due to space and hardware limitations, they often have to spend a significant amount of time visiting user workstations to resolve problems, rather than just talking a user through a solution.

In customer support the problem is even more daunting. How can customer support agents help clients, who may be located thousands of miles away, with their technical problems? Of course, an on site visit is impossible, and due to a limitless combination of possible user hardware configurations, operating environments, and computing power, customer support agents often have to "guess and check" their way through technical issues.

The Parallels Workstation solution: Using Parallels Workstation, help-desk technicians and customer support agents can create virtual machines that exactly match user configurations. By recreating problems inside a virtual machine that is identical to a user's operating environment, IT technicians are able to solve problems effectively without leaving their workstations, thus maximizing their work time, and minimizing user downtime. Customer support agents are able to quickly address user concerns regardless of their computer setup or physical location, ensuring that a technical issue is resolved correctly in one short support session. Because Parallels Workstation virtual machines are entirely independent from one another, multiple support issues can be undertaken at one time, and individual virtual machines can be restarted or reconfigured without impacting the performance of other virtual machines.



Using Parallels Workstation, customer support agents and desktop technicians can accurately emulate any hardware and OS configuration. Here, a customer support agent is creating an XP-powered virtual machine that exactly matches a customer's computer

Parallels Workstation in Action: Sample Scenarios

Combining a Legacy Infrastructure with Modern Technology

Many companies, especially those in the financial and insurance industries, run mission-critical programs on legacy systems such as OS/2 and MS-DOS. Many of these systems are incredibly antiquated and can only run on machines that have hardware profiles that are five, ten, or even more, years old. Because modern computers do not support the drivers to run such systems, enterprises must maintain aging machines and hire technicians who are well versed in older technologies and operating systems. The problem is compounded by the fact that in addition to running legacy systems, enterprises need their employees to have access to modern systems and software, so they can carry out standard day-to-day tasks.

The Parallels Workstation solution: Parallels Workstation supports a wide variety of guest operating systems, including all Windows releases from 3.11 to XP, popular Linux distributions with kernels 2.2, 2.4 and 2.6, FreeBSD 4x and 5x, and IBM's OS/2 & eComStation families. By creating virtual machines that are specifically designed to run legacy systems, users can easily work simultaneously with up-to-date desktop software as well as critical legacy software, all from a single workstation. Hardware and support costs are significantly reduced because only one IT infrastructure needs to be maintained and supported, and worker productivity increases because all critical modern programs and legacy systems are easily accessible and highly available.



Use Parallels Workstation to run nearly any x86 operating system

Sharing Complex Product Demonstrations

In order for a sales team to be effective, team members must be able to share its full potential with a prospective client. This means demonstrating its ability to work in rigorous environments, operated in an active network, and easily transmit data to users enterprise-wide who may be operating in disparate operating systems with grossly different hardware. In a traditional IT infrastructure, a demo of this magnitude is exceptionally difficult; a sales team member would need access to a significant amount of network bandwidth as well a significant number of machines. On the road, where a sales professional may only have access to one laptop running a single operating system, a complex, multi-environment demonstration is impossible.

The Parallels Workstation Solution: By creating several virtual machines on a portable laptop, sales teams can demonstrate their software's full capabilities in real multi-tier or networked environments, without being tethered to a physical, off-site infrastructure of servers and workstations.

Creating a Mobile Workforce

A traditional IT infrastructure shackles a user to his or her workstation. When traveling, or working from a foreign workstation in an alternate office, a user must adapt to a new computing environment. Users must waste time adapting to a new workstation configuration, reloading files or essential software, and re-establishing a comfortable "look and feel". As a result, productivity suffers and the overall speed of business slows.

The Parallels Workstation Solution: In a virtual environment, each virtual machine can be zipped into a file and loaded into any other machine running Parallels Workstation. This makes user profiles entirely portable, meaning that users are just as productive on the road as they are at their home office.

Building an Ideal Teaching Environment

In order for technology students to be adequately prepared for the "real world", they must be well versed in a number of standard operating systems and programming languages. In an academic setting, efficient and effective training in these critical subjects is often limited by insufficient classroom space to house necessary desktop computers with necessary operating systems and by the sheer cost of supplying the class with sufficiently powerful hardware. In addition, physical machines are inflexible when it comes to errors — even small student mistakes can result in a frustrating, time consuming reboot and protracted recovery effort.

The Parallels Workstation Solution: Parallels Workstation enables instructors to create self-contained virtual machines in which students can work with multiple operating systems, hardware configurations and software sets simultaneously. Virtual machines can be reloaded at the end of each session, ensuring that students will have a clean, error-free environment to work with each time they come to class. In addition, virtual machines can be easily reconfigured on-the-fly to modify teaching or training conditions, and because data and profiles are maintained in a data file on the primary operating system (which can be copied into a backup file on a hard drive, floppy disk or CD-ROM) a recovery effort involves nothing more than a simple replacement of the damaged file with a clean copy of the original virtual machine file.

Conclusion

Combining a Legacy Infrastructure with Modern Technology

Virtualization is the most cost efficient answer to the expensive, time consuming, space monopolizing IT legacy of the 1980s and 1990s. Thousands of companies and organizations worldwide are embracing desktop virtualization technologies — like Parallels Workstation — to:

- **Reduce hardware costs** by breaking with the "one machine, one application" approach to IT infrastructure management.
- **Lower overall operating expenses** by accelerating IT help desk and customer support response times and efficiency, by more efficient use of office space, and through the reduction of energy costs associated with operating and cooling workstation machines and the entire office environment.
- **Run legacy systems** like OS/2 and MS-DOS alongside modern office applications on an up-to-date computer, rather than maintain a separate infrastructure and support system.
- **Streamline application development** by enabling programmers to write, apply and self-test code in several disparate environments at one time.
- **Employ more rigorous QA testing procedures** by enabling QA testers to simultaneously test a product in multiple operating systems and with multiple hardware configurations.
- **Empower sales teams with fully functional demonstrations** that simulate complex, multi-tiered, fully networked conditions from a single laptop.
- **Build an effective, mobile workforce** by ensuring that users are able to work using the same hardware and software configuration, as well as desktop look and feel, from anywhere in the world, on any PC.
- **Create student friendly teaching environments** that give students the ability to explore multiple operating systems and hardware configurations at the same time, without the worry that their actions will result in a time-consuming reboot or a complicated data recovery attempt.

Contact

For more information on how Parallels Workstation can help your enterprise move to a virtual IT infrastructure, please contact the Parallels Sales Team.

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