Buying an OS? Remember, you're really buying a philosophy

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Your options are many (Windows, Mac OS, Solaris, AIX, LINUX, plus others), and the commitment is major, so choose carefully

FIG. 2: .NET applications on Linux is the focus of Ximian's Mono project. Mono Documentation Browser rendering a method description.

Did your boss ever tell you not to spec any sole source suppliers in your system design? What boss in his or her right mind wouldn't? Yet, we all sole source every time we opt to go with Windows, Mac OS, Solaris, AIX, or one of the other proprietary operating systems (OS) out in the market these days. At the same time, our other option—specifying LINUX, an OS into which nearly everyone in the world has free access via its source code—can make we conservative sorts a little uncomfortable as well. How do we know that the product is stable and secure? And how do we know that we have the latest version? These are tough questions.

Let's think about it another way: if your application calls for a 2-inch 6-32 machine screw, any manufacturer's screw will do the job as long as it meets your other mechanical specs. But what if there were only one manufacturer of this particular screw? How much would it cost? Would its cost seem as though it were plated with gold instead of nickel?

In this article, we'll look at the current trends in major operating systems—both at the client and server levels.

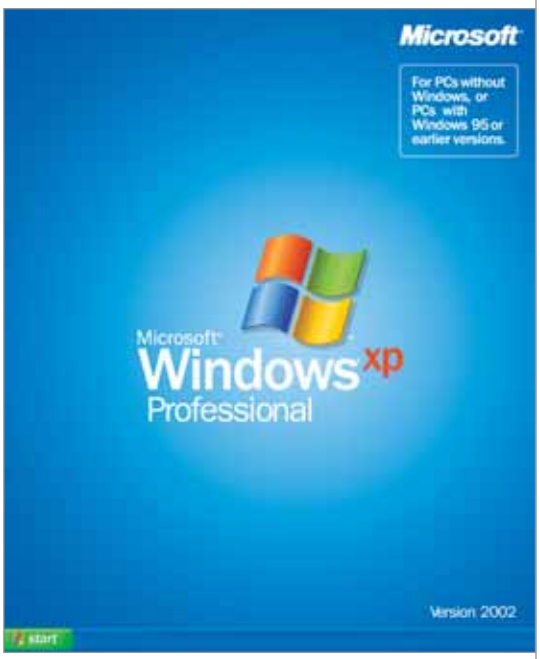

FIG. 1: Microsoft Windows XP is available in Home and Professional versions, and follows the 32-bit path of Windows NT.

Windows XP

Debuted in February of 2001 and officially released on the 25th of October, 2001, Windows XP (Home and Professional versions) continues Microsoft's 32-bit path, which began with Windows NT and moved to Windows 2000. Some have argued that Windows XP *(Fig. 1)* is to Windows 2000 what Windows 98 was to Windows 95—a minor upgrade. Industrial software vendors, for the most part, had jumped on the bandwagon within six weeks to a year. Wonderware had enabled InTouch and ActiveFactory to support the new system within 50 days, and Iconics, for example, supported XP in its GENESIS32 6.1 in March of 2002.

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FIG. 3: Windows 2000 Advanced Server for datacenter applications grew out of Windows NT technology. Windows Server 2003 combines .NET technology and Windows 2000 Server technologies.

In Windows XP (both versions), Microsoft sought to make its OS more bullet-proof. For example, XP contains a system called Driver Signing, the net effect of which is that only Microsoft-certified and tested drivers are guaranteed to work. Yes, you can use drivers that aren't certified, but they may not function properly, or you may not be able to install them at all. Another hardening feature that Microsoft added is protection to keep you from writing over necessary DLLs when you install new (or older) programs. In the Professional version of XP, several updated administrator and remote admin functions have been added.

In the Home version, multimedia is the key, allowing home users to run the latest games. Just keep in mind that, next to real-time industrial control, games pose the greatest demands on any system. Microsoft has updated DirectX and Media Player, and has added new multimedia and video tools.

In both versions, Microsoft has recreated the GUI, attempting to make it simpler to use. Decide for yourself on this one. If you've been accustomed to the Win 2000/98 or Mac look and feel, the new XP interface will take a little getting used. No doubt your first question will be, "Where did they put my __?" (You fill in the blank.)

Windows XP Server???

If you've been looking for "Windows XP Server," it doesn't exist under that name. Several months ago I was informed by Microsoft representatives that this product would assume the moniker of Windows .NET Server. But don't bother trying to find this product on the Microsoft Web Site. Microsoft has renamed its server yet another time to Windows Server 2003, which does incorporate much of .NET's functionality.

.NET is Microsoft's strategy of linking suppliers, vendors, and manufacturers together in real time via the Web—providing the technologies that can assist in supply chain integration and management. The .NET initiative can be confusing because it is a company-wide effort that ranges from development tools to end user applications. .NET includes a development platform for writing software, Web services, Microsoft server applications, new tools that use the new development platform, and Hailstorm, the Passport centralized single-sign-on system that is being integrated into Windows XP.

Interestingly enough, there is an open source project underway to provide .NET functionality on the Linux platform. Ximian (www.ximian.com) announced the launch of the Mono project (http://www.go-mono.com), an effort to create an open source implementation of the .NET Development Framework. Mono includes: a compiler for the C# language, a runtime for the Common Language Infrastructure (also referred to as the CLR) and a set of class libraries *(Fig. 2)*. The runtime can be embedded into your application. Mono has implementations of both ADO.NET and ASP.NET as part of its distribution.

Introducing Windows Server 2003

On a recent visit to Microsoft's home page, I found a link called "Why upgrade from Windows NT Server 4.0?" Clicking on it takes you to the Windows Server 2003 page. I'm sure that many of you may not have yet moved to Windows 2000 Server *(Fig. 3)* unless your industrial software vendor/system integrator helped you make the move. At least a couple of vendors that I talked to are already testing the new server OS,

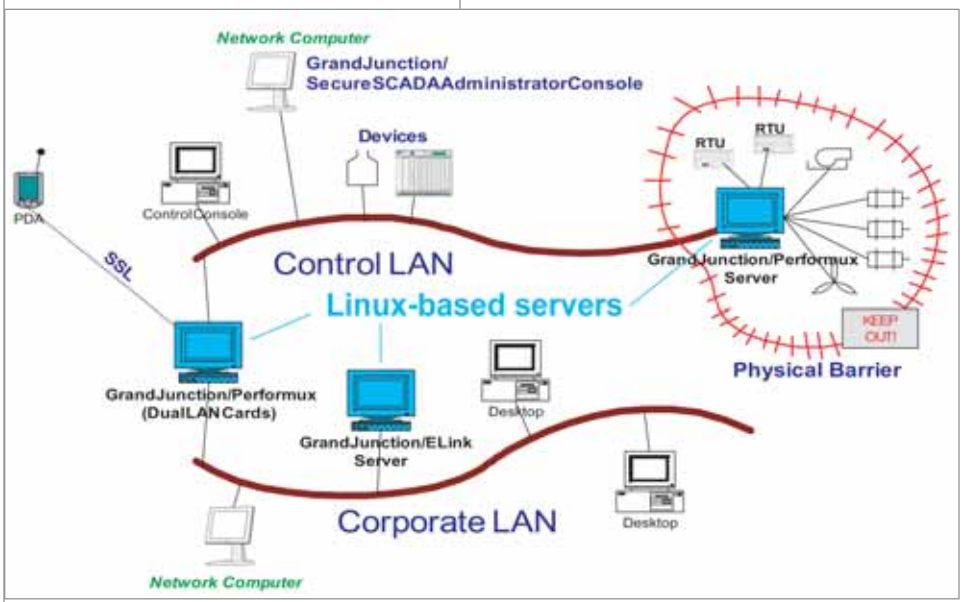

FIG. 4: Verano's Performux and SELinux can be combined to provide secure transmission of SCADA information wherever it's needed. Traditionally UNIX products, they are now available on Linux.

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and have verified that their products will run on it. If you're interested in some of the new and improved features that Windows Server 2003 will have, see the sidebar, "Windows Server 2003—New features."

Sixty-four bit systems are not too far off in the future. Built around Intel's new 64-bit Itanium® processor, Microsoft's Windows Advanced Server, Limited Edition is available as an OEM product on certain hardware products running the new Intel chip. The OS will become part of the Windows Server 2003 family in the near future. In addition to handling up to eight processors, the new OS will remove the current limit of physical addressable memory of 4 Gbytes and increase it to 16 terabytes. It will provide hardware error detection and prediction, be interoperable with 32-bit Windows, and support the familiar Windows programming model.

If you're looking for the Workstation version of this 64-bit OS, you'll probably find that Windows XP 64-bit will be made available to PC manufacturers in late spring or early summer, according to Microsoft sources.

Linux: On the desktop

While I'm not ready to do my Control Solutions International editorial work on Linux—mostly because the applications I use aren't available on it—I'm seeing emerging interest in desktop Linux. Much of this, however, is coming from vendors who traditionally provided UNIX* applications. A good example is Verano's (Mansfield, MA) Performux™, a SCADA application for large utilities. Based on the company's RTAP technology (formerly an HP product for HP-UX and other UNIX machines), the software *(Fig. 4)* provides real-time instant awareness, fast memory-resident database, a scan system to interface legacy plant devices, alarm and event management, and dedicated HMI visualization in a Web-based display.

*(*UNIX is a registered trademark of The Open Group in the United States and other countries.)*

FIG. 5 (left): Red Hat Linux is available for several hardware platforms including the new Intel Itanium 64-bit processors.

A second Linux product, Secure SCADA™, is compliant with NSA's SELinux (Security Enhanced Linux) extensions, manages and protects a system from cyber-intrusion, and provides an add-on security shield for existing control systems.

And if you do have a high-powered application that needs the additional memory and horsepower that an Itanium processor-based machine provides, Intel and Red Hat *(Fig. 5)* have jointly announced Red Hat Linux for HP Workstations zx2000 and zx6000. While this is certainly overkill for a HMI application, it's not for others. For example, these systems will handle high floating-point applications used by scientists and

Why upgrade to Windows Server 2003

Maybe you haven't yet upgraded to Windows 2000 Server. If you're still on NT Server, you may want to skip Windows 2000 Server and go right to Windows Server 2003. Here are Microsoft's selling points on why you should consider the upgrade.

1. Easy to deploy, manage, and use—With its familiar Windows interface, Windows Server 2003 is easy to use. New streamlined wizards simplify the setup of specific server roles and routine server management tasks. In addition, administrators have several new and improved features designed to make it easier to deploy Active Directory. Large Active Directory replicas can be deployed from backup media, and upgrading from earlier server operating systems such as Microsoft Windows NT® is easier with the Active Directory Migration Tool (ADMT), which copies passwords and is fully scriptable. Remote Installation Services help administrators quickly create system images and deploy servers.

2. Secure infrastructure—Windows Server 2003 lets organizations take advantage of existing IT investments, and extend those advantages to partners, customers, and suppliers by deploying key features like cross-forest trusts in the Microsoft Active Directory® service as well as Microsoft .NET Passport integration. Identity management in Active Directory spans the entire network, helping ensure security throughout the enterprise. It's easy to encrypt sensitive data, and software restriction policies can be used to prevent damage caused by viruses and other malicious code.

3. Enterprise-class reliability—Availability, scalability, and performance—Reliability is enhanced through memory mirroring, Hot Add Memory, and health detection in Internet Information Services (IIS) 6.0. For higher availability, the Microsoft Cluster service supports up to eight-node clusters and geographically separated nodes. Windows Server 2003 is faster with up to 140 percent better file-system performance as well as significantly faster performance for Active Directory, XML Web services, Terminal Services, and networking.

4. Lower TCO through new and improved tools—The Windows Resource Manager lets administrators set resource usage (for processors and memory) on server applications and manage them through Group Policy settings. Network-attached storage helps consolidate file services. Other improvements include support for Non-Uniform Memory Access (NUMA), Intel Hyper-Threading technology, and multi-path input/output (I/O), all of which help "scale up" servers.

5. Easy creation of dynamic intranet and Internet Web sites—IIS 6.0, the Web server included in Windows Server 2003, provides enhanced security and a dependable architecture that offers application isolation and greatly improved performance. Microsoft Windows Media® services makes it easy to build streaming media solutions with dynamic content programming as well as faster and more reliable performance.

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engineers that require large memory bandwidth and memory latency. These Itanium workstations have shown performance figures of a floating point SPCEfp2000 score of 1,400 achieved on the HP zx6000 1 GHz running Red Hat Advanced Workstation and Intel 7.0 compilers.

For the humble desktop

If you've tried any desktop version of Linux, you may be thinking that it's very close to being as easy to use as Windows. However, a few things need work. For example:

- Changing screen color-depth and resolution are not easy under X-windows, and often requires running a command line or a primitive GUI to accomplish it.
- Fonts can be scattered all over the system rather than being in one location, and are not organized as in Windows or the Mac. Some Linux distributions include font managers to make installation easier, but results can be mixed.
- Lin-Neighborhood and gnomba are two solutions to Windows' Network Neighborhood or My Network Places, which try to make SAMBA (Linux's PC networking "drivers") easier to use, but getting either one to work flawlessly can sometimes be a challenge.
- While there are many drivers now available for hardware, installing them is not usually automatic if you do it after the initial Linux installation.
- Besides GNOME and KDE GUIs, there are several others that you can use, almost making the choice more difficult than it needs to be.

Several vendors are attempting to make Linux a friendly desktop. One notable example is Lindows.com; others include Mandrake Linux 9.0 and Red Hat Linux 8.0.

Commercial interest in desktop Linux is increasing, and now there is a brand new show for it—dubbed the Desktop Linux Summit. The first was held in San Diego Feb. 20 and 21st. Several vendors made their presence known, including Lindows.com, Sun Microsystems, Bitstream, Microtel, Linux Professional Institute, OpenOffice.org, and others. The standard shows, such as LinuxWorld in New York, also featured many exhibits and conferences relating to desktop Linux—not to mention real-time embedded Linux and Linux for enterprise-level applications.

Linux servers grab market share

The Gartner Group predicts that the Linux server market will more than double by 2005, from $1.8 billion to $3.8 billion.[1] The problem, of course, with numbers like this is that, if you should decide to set up a Linux server yourself using an existing machine, and use free downloaded software from any Linux distribution, your machine isn't counted in the official market figures. What you gain in purchasing from a vendor like Red Hat (in addition to being counted in the official numbers) is that you get varying degrees of service based on what you're willing to spend. In addition, you get a Web-based update service just like you get with Microsoft's Windows Update Web site.

6. Fast development with integrated application server—Microsoft ASP.NET enables high-performance Web applications. With .NET-connected technology, developers are freed from having to write tedious "plumbing" code and can work efficiently with the programming languages and tools they already know. Existing applications can be easily repackaged as XML Web services. UNIX applications can be easily integrated or migrated. Developers can quickly build mobile-aware Web applications and services through ASP.NET mobile Web Forms controls and other tools.

7. Easy to find, share, and reuse XML Web Services—Windows Server 2003 includes Enterprise UDDI Services, a dynamic and flexible infrastructure for XML Web services. This standards-based solution enables companies to run their own UDDI (Universal Description, Discovery and Integration) directory for intranet or extranet use, making it easy to discover Web services and other programmatic resources. Developers can easily and quickly find and reuse the Web services available within the organization. IT administrators can catalog and manage the programmable resources in their network. Enterprise UDDI Services also helps companies build and deploy smarter, more reliable applications.

8. Robust management tools—Expected to be available as an add-in component, the new Group Policy Management Console (GPMC) allows administrators to deploy and manage policies that automate key configuration areas such as users' desktops, settings, security, and roaming profiles. A new set of command-line tools lets administrators script and automate management functions, allowing most management tasks to be completed from the command line if desired. The Volume Shadow Copy service improves backup, restore, and system area network (SAN) manageability tasks.

9. Empower users while lowering support costs—With the new shadow copy feature, users can retrieve previous versions of files instantly, without requiring costly assistance from a support professional. Enhancements to the Distributed File System (DFS) and File Replication service (FRS) provide users with a consistent way to access their files wherever they are. The remote access Connection Manager can be configured to give virtual private network (VPN) access to users without those users having to know the technical connection configuration information.

10. Expertise from a worldwide network of partners and certified professionals—Organizations have access to a wide range of solutions and expertise available worldwide, including 750,000 partners delivering hardware, software, and services as well as 450,000 Microsoft Certified Professionals (MCPs).

Find more on this on Microsoft's Web site at http://www.microsoft.com/windows.net-server/evaluation/whyupgrade/top10best.mspx

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What's helping to promulgate Linux servers is the support being given the technology by the big hardware companies (e.g., SGI, SUN, HP and IBM). Pushed along by IBM's strong support of Linux from the hardware, middleware,

FIG. 6: IBM's Linux Web site can be found at http://www.ibm.com/linux

and database environments *(Fig. 6)*, vendors such as L-Soft, with its LISTSERV® product for UNIX and IBM S/390 systems, have joined the effort to offer more and more application products on Linux. Another prime example is SAP's enterprise software application server, which is supported on IBM's hardware (zSeries 64-bit) and DB2 database platforms *(Fig. 7)*.

An increasing number of companies are running virtual Linux systems inside IBM S/390 mainframe computers to reduce hardware and operations costs. Thousands of virtual Linux systems can run on a single mainframe in this manner. Hardware or software upgrades can be installed in much less time than it would take with thousands of separate servers.

Clustering for power in Paris

The clustering capability of Linux has made it attractive for high-end applications. For example, Paris, France-based Compagnie Générale de Géophysique (CGG) performs geophysical surveys and provides three-dimensional images of Earth's subsurface that enable oil companies to pinpoint reserves before committing drilling dollars. To help grow its 16% share of the $3.8 billion seismic services market, CGG is relying on massive computing capabilities.

Says Dave Jones, CGG's business development manager, software sales, Europe/Africa, "Compared to our classic large server solution, adding another rack of clusters is a simple matter. And Linux scales up to thousands of machines, which answers the problem of our exploding data volumes."

CGG's cluster solution consists of 512 dual-processor IBM xSeries 330 1GHz Pentium III servers *(Fig. 8)* at the company's London location and 128 identical servers in Paris, France. The IBM servers run Red Hat Linux, and the two clusters are networked, allowing CGG the flexibility to run jobs wherever capacity exists. While IBM provided technical support, Paris-based IBM Business Partner and Linux specialist Adequat provided a turnkey solution, installing the Linux operating system and racking, stacking and connecting the servers. IBM and Adequat will perform ongoing support for the clusters. IBM Global Services assisted in the financing of the project.

With its Linux clusters, CGG has 1.25 teraflops of processing power, or five times the company's previous capacity. Given its need to obtain the best price/performance and lowest total cost of ownership, CGG is understandably pleased. Says Jones, "Our IBM and Linux solution saves up to 50% of the cost of alternative enterprise server solutions delivering comparable capabilities." [2]

Another example of clustering comes from MSC Software, a global provider of simulation software, services, and systems. Nittetsu Plant Design, an affiliate company of Nippon Steel Corp., announced that Nittetsu's System Engineering Department has selected MSC.MarcDDM (Domain Decomposition Method) and the MSC.Linux cluster system to solve complex engineering problems. Nittetsu Plant Design specializes in designing iron-making processes and environmental plants.

For Nittetsu's evaluation of the MSC.MarcDDM and MSC.Linux technologies, MSC.Software conducted a bench-

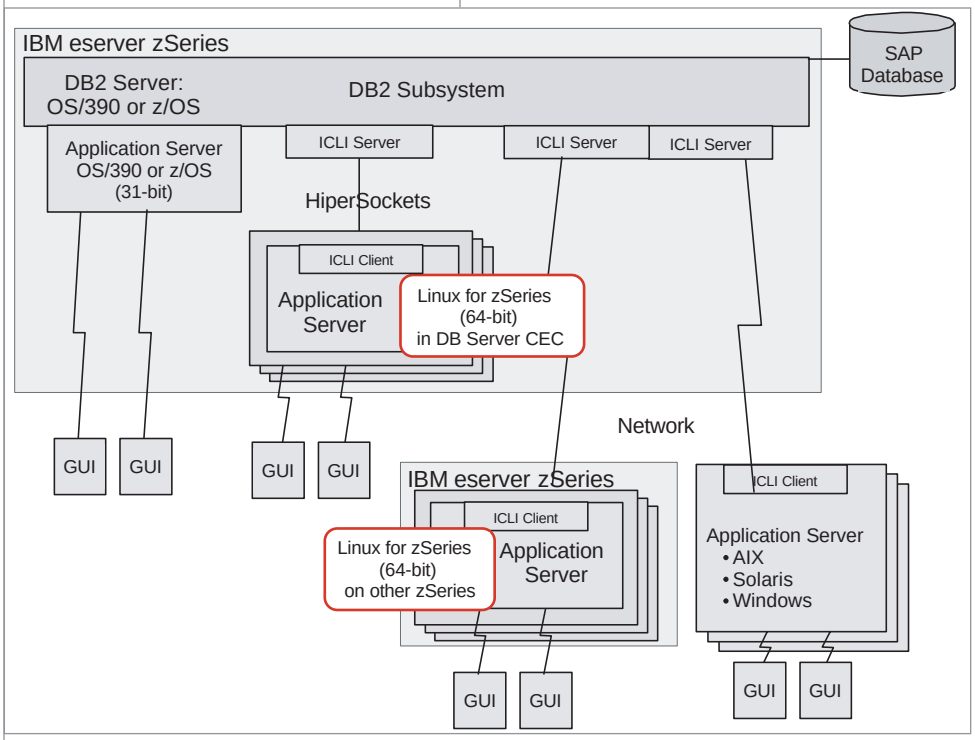

FIG. 7: With the SAP Application Server on Linux for zSeries, users have added freedom of choice in selecting the appropriate SAP implementation environment.

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mark study on thermal and stress analysis on both UNIX and Linux environments. This benchmark showed that analysis performed under a Linux cluster is significantly faster than UNIX for thermal and stress analysis.

"Nittetsu Plant Designing Corporation expects further efficiency in the design process for in-house and engineering phenomenon which has not been examined conventionally by performing more analysis case testing as well as large-model analysis with DDM parallel computing capability in MSC.Marc under Linux cluster environment," said Atsushi Yumoto, System Engineering Department of Nittetsu Plant Designing Corporation.

Security: Important no matter the platform

If you think that you're secure because you run a Linux, UNIX, or Mac OS platform, rather than Windows, think again. According to an Aberdeen*Group Perspective* (Vol. 1 No. 35, 11-12-2002), open source software, commonly used in many versions of Linux, UNIX, and network routing equipment, is now the major source of elevated security vulnerabilities for IT buyers. Security advisories for open source and Linux software accounted for 16 out of the 29 security advisories—about one of every two advisories—published for the first ten months of 2002 by CERT (www.cert.org, Computer Emergency Response Team). Keeping pace with Linux and open source software are traditional Unix-based software products, which have been affected by 16 of the 29—about half of all—advisories during 2002. During this same time, vulnerabilities affecting Microsoft products numbered seven, or about one in four of all advisories. (For more on this, see http://www.aberdeen.com/2001/research/11020005.asp.)

But if you are using Windows, be sure to stay on top of security patches and bug fixes. You can do it from the Windows update site. If you're running Windows 2000 (Server or Workstation), Windows XP or later, you can set up the system to automatically update itself as it downloads fixes and patches from the Microsoft Web site. Although I've never experienced any problems with these updates, some people have had problems with machines that do not restart. An issue is that several Windows 2000 Server and Workstation patches insist that you restart the machine after applying the patch, which is definitely not too convenient if you have to interrupt a batch process you have going. In most cases, UNIX and Linux patches do not involve restarting the computer.

FIG. 8: IBM's xSeries 330 1 GHz dual processor Pentium servers combine to form economical clusters of Linux computers. Courtesy IBM.

References

[1](http://www.lsoft.com/news/S390.asp)
[2](http://www-3.ibm.com/software/success/cssdb.nsf/CS/NAVO-4YXQAW?OpenDocument&Site=linuxatibm).

The future of Linux in China

I recently interviewed Yufang Sun, chairman, board of directors, of Redflag Software Co. Ltd based in Beijing to get a better handle on Linux's penetration in the Peoples Republic of China. Red Flag, according to Sun, has been busy localizing Linux for China, educating the market, and developing more applications with partners. The three-year-old company has already successfully sold Linux into government, education, railways, post office, and banking applications. It sold more than 1 million desktop versions in 2002.

Red Flag, however, uses a different approach to Linux than U.S. vendors, explained Sun. "The market in China is a little different from the U.S. A comprehensive line of Red Flag Linux solutions has been introduced. These include Red Flag Linux Desktop, a Linux Server product spanning from low-end to high-end, Red Flag Embedded Linux for set-top boxes, PDAs, and thin clients plus industry solutions based on the Red Flag platform."

I asked Sun what is the future of real-time Linux in China. Sun: "We provide a soft real-time feature for customers. Linux has a lot of code that can not run on a hard real-time Linux kernel. Now real-time in China is handled by RTOSes like VxWorks and QNX, and other home-made OSes such as HOPEN, Zyco, Elix, etc." However, Red Flag's embedded product, ControLinux, has found its way into POS devices, controllers, and medical devices. Although most Chinese engineers are not writing their own RTOSs, according to Sun, they've been looking at ways to substitute embedded Linux for commercial RTOSs when and where they can.

According to Sun, "Linux has made amazing progress in the last two years, especially in localizing it to China. It looks and works quite similarly to Windows. Both are based on GUIs and, meanwhile, there are equivalent Windows applications on Linux, (e.g., to replace Word, Excel, PowerPoint, Media Player, etc.)."

Linux competes against other UNIXs and Windows in China. Noted Sun, "There are several UNIX versions, such as IBM AIX, HP-UX, SGI Irix, Sun Solaris, SCO UNIX; Linux such as Red Flag and CS&S, etc.; and Windows. UNIX versions usually are used in middle and high-level servers. Linux versions are used in servers, desktops, and embedded systems; and Windows versions are found usually in low-level servers, especially x86 servers and desktops. In desktops Windows has about 90% volume."

Finally, Sun stressed that his company is not an island. Relationships with U.S. companies are very important. "Almost all leading IT companies are in the U.S. We have close relationships with IBM, Intel, HP, Oracle, and others. We are a software platform distributor, and every IT player is our partner." In addition, Sun expects to be a key player in the Open Source communities, sharing the Chinese localization work it's done.