

INTELLIGENT COMPUTING

CHIP

[www.chip.in](http://www.chip.in)

at the heart of technology

Supplement to CHIP July 2009



# opensolaris™

2009.06

- An introduction to OpenSolaris
- What's new and unique
- Installing and getting started
- How OpenSolaris can work for you



# SUN OPEN-SOURCE UNIVERSITY MEETUP (OSUM) CHANGE (Y)OUR WORLD

## Free and Open Source Software is Changing Our World (good for society as a whole):

- FOSS promises a world of digital freedoms
- The freedom to participate, collaborate, create, use and deploy
- Open Source = Expanded opportunity
- Increased flexibility
- New communities
- Continual innovation

## Free and Open Source Software is Changing Your World (good for student career opportunities):

- Build skills for careers in IT
- Great for student projects
- Empowers independent learning
- Communities create opportunity for collaboration
- Free

Sun is the leading contributor to Free and Open Source Software. Our support of the OSUM Community is part of our commitment to ensure that students are able to realize the benefits of FOSS to Change (Y) Our World.

## Change (Y)our World.

> [Sun.com/students](http://Sun.com/students)



Join the conversation with other students worldwide through Sun's Open-Source University Meet-Up (OSUM). OSUM (pronounced 'awesome') is a global community of students that are passionate about Free and Open Source Software and how it is Changing (Y)our World. We call it a 'Meet-up to encourage collaboration between student groups to create an even stronger open source community.'

Through its on-campus activities, Sun sponsored OSUMs will receive access to technical information that can be shared with OSUM members via technical demonstrations. Additionally, online web courses, through the Sun Academic Initiative program will be available to the OSUM to provide an opportunity to get its members Sun Certified.

Sun will provide a social networking web site for all registered OSUMs. This online presence will enable the OSUM community to connect with other student developers worldwide. OSUMs can collaborate online in forums and community groups with other student developers who share their technical interests.

### Create an OSUM at your school and you will gain access to:

- Hands-on training via Tech Demos and Student Projects
- Free and low-cost student resources, such as the Sun Academic Initiative featuring free training and discounted certification
- Resources to help host OSUM events

### And once a university has an established OSUM forum, you and your peers can take advantage of Sun's sponsorship for OSUM meetings, including:

- Sun speakers to provide technical demonstrations on open-source technologies
- Sun sponsorship of OSUM meetings, including giveaways and food and beverage support
- Access to the Sun OSUM online community, which provides a feature-rich social networking site for student-developer OSUMs

Sun, a company that innovates, leads with actions and shares technology to drive economic and social progress worldwide, offers students the technology, tools, and opportunity to achieve success – in school, career and life. From our training and the latest advancements delivered by industry experts and the community at large, Sun provides students the tools with which they can share and develop ideas and goals, ultimately changing their world.

Join this global social networking community and connect to thousands of students from around the world. Get started by selecting your language and registering.

Registering is easy – simply visit <http://osum.sun.com> and click through the few questions. Then you're there.

If your student club would like to take advantage of Sun support – to register your club, go to:

<http://developers.sun.com/students/osum/index.jsp>

Sun Microsystems, Inc. 4150 Network Circle, Santa Clara, CA 95054 USA Phone 1-650-960-1300 or 1-800-555-9SUN Web [sun.com](http://sun.com)

© 2008 Sun Microsystems, Inc. All rights reserved. Sun, Sun Microsystems, the Sun logo, and The Network is the Computer are trademarks, registered trademarks, or service marks of Sun Microsystems, Inc. in the United States and other countries. Other brand and product names are trademarks of their respective companies. Information subject to change without notice.

# Editorial

---

In a world dominated by Windows on the desktop, and with devoted followings for Linux and Mac OS X, it's easy to forget that alternatives exist. A relative newcomer to the scene, OpenSolaris hasn't so far been very widely known outside a few selective geeky circles, but that is fast changing. The latest version, released in June 2009, is the most user-friendly to date. It has a simple graphical desktop environment and familiar software out of the box, and is available as a live CD that you can just boot from to try out the OS without affecting your computer's hard drive at all. End-user-oriented improvements in this version include driver support, simple file restoration, and software installation using the IPS package manager. Underneath the hood, there are features that no other mainstream desktop environment can match, such as the real-time debugging utility DTrace and the awesome ZFS file system which can support files larger than we have numbers or units to describe!

This guide is aimed at demystifying OpenSolaris and illustrating how it can be useful to you. If you are a software or Web developer, you should undoubtedly give it a look. If you are interested in high-performance computing or cluster computing with virtualized networking, OpenSolaris definitely has some tricks you should check out. And even if you're just a casual home user, this operating system offers you yet another choice. So do check out the live CD bundled with this issue of CHIP and refer flip through the pages of this booklet while taking your first steps with OpenSolaris.

– TEAM CHIP

---

# Contents

---

Why OpenSolaris? .....	4
The Communities behind OpenSolaris .....	5
The unique features of OpenSolaris.....	6
What's new in version 2009.06.....	8
The OpenSolaris Desktop .....	9
Useful Applications .....	10
Workshop: Installation using VirtualBox .....	11
Workshop: Your first development projects.....	12
In the words of.....	14

# Why OpenSolaris?

The answer to why anyone should be interested in OpenSolaris lies in defining what it is in the first place. More than just an operating system, more than just a programming exercise, OpenSolaris is a worldwide community of enthusiasts and advocates who are passionate about open-source software and philosophy. For Sun, the company behind enterprise-level processing hardware and web development platforms including the universally popular Java, OpenSolaris is a series of steps inside the open source world, where global communities of committed developers work alongside paid engineers to create a dynamic, robust and modern operating system. So popular has it been that the guts of OpenSolaris are slated to eventually power future versions of the venerable Solaris operating system.



## opensolaris™

Given its pedigree, OpenSolaris could easily make sense for anyone who needs a strong, well supported computing platform for anything from simple Web surfing and office productivity tasks to high-performance environments where virtualization and storage are mission-critical. However where it really shines is for software and Web developers, because of the loads of tools it provides as well as the community of developers who are invested in building it.

OpenSolaris is based on much the same UNIX codebase that lies beneath Linux and Mac OS X. It even uses the same Gnome graphical desktop environment by default as many popular Linux distributions, leading to a certain amount of familiarity. Many Linux users use the OpenOffice productivity suite for all their text documents, spreadsheets

### OPENSOLARIS VS LINUX

With a similar codebase and GUI, it's easy to wonder how much of a difference there really is. Here are a few of the main points:

- **A guided codebase:** OpenSolaris development is directed by a strict structure, whereas Linux has several distributions managed by different community groups.
- **ZFS:** Linux does not yet support ZFS, thus missing out on its many advantages for both desktop users and data centers.
- **DTrace:** While a version of this is available on Mac OS X, Linux has no such offering.
- **Stability and backwards compatibility:** OpenSolaris has a slight edge here because of its kernel's Solaris roots.
- **Software support:** Linux currently offers more packages and some distributions have easier package management support. Drivers are also sometimes better supported under Linux.
- **Image:** Linux currently attracts more attention, and newer software such as Gnome is more likely to be available for it first.

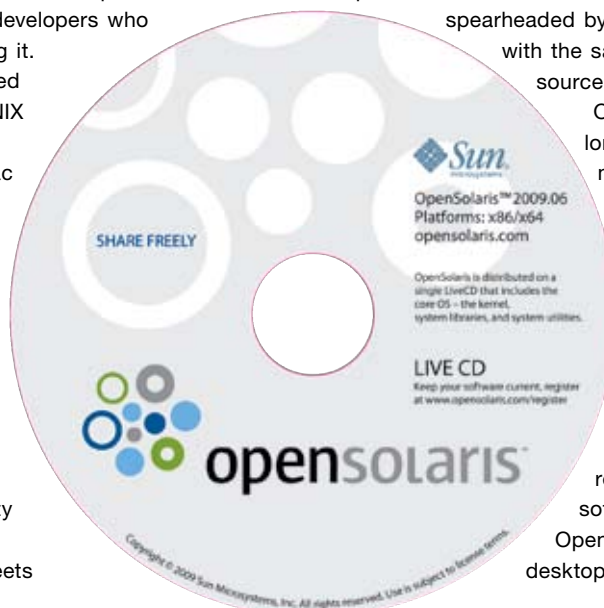
and database work because of its open-source roots as well as its known strengths. Many Windows users have also tried OpenOffice and have decided to use it as a cost-effective and fully capable alternative to paid office suites.

OpenSolaris is an entire operating system spearheaded by the same company with the same approach to open-source ideals.

Of course it also has a long way to go any many more things to achieve.

Recent versions have improved common annoyances such as driver support and laptop power management, and work is still in progress. Each new version brings new refinements and better software support, making

OpenSolaris a powerful desktop OS condenser.





# The Communities behind OpenSolaris

**M**ore than just software, massive communities exist around OpenSolaris. Everyone can get involved! Development for OpenSolaris follows the open-source principles of community participation and full transparency. Multiple communities support the planning and development behind each feature and component. These can all be found and managed through [www.opensolaris.org](http://www.opensolaris.org). Membership is free and open, and absolutely anyone can immediately begin to contribute to the process.

OpenSolaris.org hosts the complete open source code of the OpenSolaris operating system. This can be freely searched through and is cross-referenced and indexed, making it easy to find multiple instances of a specific function. Learning about the source code is also made easy by hyperlinking and defining each element. Source code is available for the kernel, networking, libraries, and also commands from Sun's Solaris operating system. More information is being posted, with the aim of eventually putting up everything that is legally free to distribute.

The OpenSolaris.org community consists of both software professionals and end users who believe in the open-source philosophy and wish to participate in refining the project. Even non-coders can help with writing documentation, creating artwork, evangelizing, and reporting bugs.

For any process to get started, an idea first needs to be posted. Anyone can suggest a project or module to be taken up by the community, which will be voted upon to determine its suitability and value. Every feature and enhancement to OpenSolaris is developed in this way: fully transparent and visible to the community.

The Communities portal ([opensolaris.org/os/communities](http://opensolaris.org/os/communities)) hosts several groups dedicated to specific aspects of OpenSolaris development, such as different hardware platforms, key features, high-performance computing, printing, laptop optimization and even gaming! Key amongst these are the OpenSolaris User Groups ([opensolaris.org/os/community/advocacy/usergroups/](http://opensolaris.org/os/community/advocacy/usergroups/)), which exist as resources for information, evangelism and advocacy. The groups are largely based on geographic locations and exist all over the world, with several active ones in India. The Bangalore OSUG is one of the most active in the world, with talks, demos, and seminars every few weeks.



## OSUM

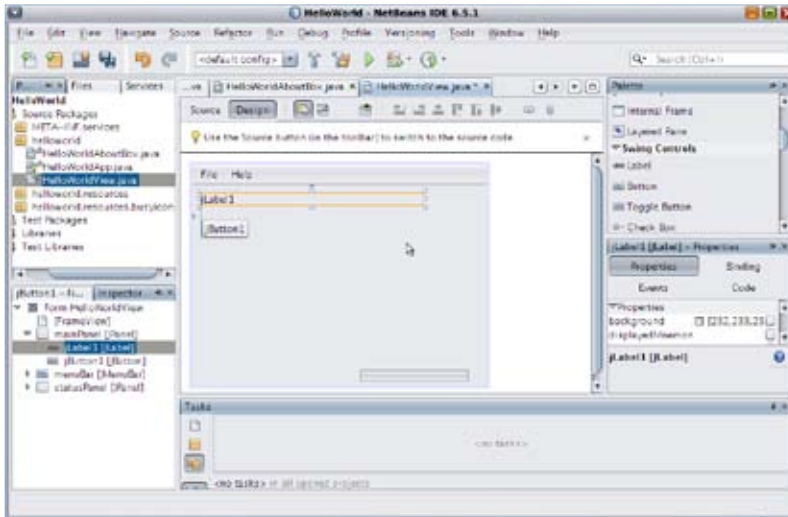
Another of Sun's initiatives is through the grassroots level at universities. Open Source University Meetups (OSUMs, pronounced "awesome") are communities of students who stand to benefit from free and open-source software. OSUMs receive access to technical information, demonstrations, and online courses. The OpenSolaris group ([osum.sun.com/group/osumopensolarisgroup](http://osum.sun.com/group/osumopensolarisgroup)) is currently discussing new features in version 2009.06.

In India, OSUMs exist in over 200 institutes, including the IITs, IIITs, NITs, BITS, and dozens of other state-level universities as well as computer science and engineering institutions. Each university has a student ambassador who coordinates activities and liaises with Sun to arrange for resources for the group.

## LINKS TO INDIAN OSUGS

Bangalore OSUG	<a href="http://opensolaris.org/os/project/bosug/">opensolaris.org/os/project/bosug/</a>
Bhimavaram OSUG	<a href="http://opensolaris.org/os/project/bvrm-osug/">opensolaris.org/os/project/bvrm-osug/</a>
Chennai OSUG	<a href="mailto:mail.opensolaris.org/mailman/listinfo/ug-cosug">mail.opensolaris.org/mailman/listinfo/ug-cosug</a>
Hyderabad OSUG	<a href="http://opensolaris.org/os/project/hosug/">opensolaris.org/os/project/hosug/</a>
India OSUG	<a href="http://www.facebook.com/">www.facebook.com/</a> (search for India Open Solaris User Group)
Madurai OSUG	<a href="http://opensolaris.org/os/project/madosug/">opensolaris.org/os/project/madosug/</a>
Mumbai OSUG	<a href="http://opensolaris.org/os/project/mmosug/">opensolaris.org/os/project/mmosug/</a>
Mumbai University OSUG	<a href="http://opensolaris.org/os/project/muosug/">opensolaris.org/os/project/muosug/</a>
NIT Hamirpur OSUG	<a href="mailto:mail.opensolaris.org/mailman/listinfo/ug-nit-hamirpur">mail.opensolaris.org/mailman/listinfo/ug-nit-hamirpur</a>
NIT Warangal OSUG	<a href="http://opensolaris.org/os/project/nit-hamirpur-osug/">opensolaris.org/os/project/nit-hamirpur-osug/</a>
Pune OSUG	<a href="http://opensolaris.org/os/project/posug/">opensolaris.org/os/project/posug/</a>

# The unique features of OpenSolaris



## WEB 2.0 DEVELOPMENT

Everything you need to start working on Web 2.0 development is available either out of the box or after a few simple steps to install the required packages. Sun's own Java Runtime Environment is of course included, as is support for the JavaFX platform that enables applications to run across devices such as mobile phones, game consoles, and home entertainment devices. Support for PHP and MySQL is also more robust. NetBeans is a complete integrated development environment for the creation of desktop, mobile and web applications with Java, C and C++ as well as JavaScript and PHP.

## DTRACE

DTrace (Dynamic Tracing Framework) is a tool developed by Sun for detecting and fixing problems with software and even the OS kernel in realtime by identifying anomalies in CPU and RAM resource consumption as well as allowing developers to comb through detailed reports of how any running software interacts with other threads and processes while accessing resources. Developers can customize commands and scripts that analyze and report on exactly what they need to know. DTrace is available on a few other UNIX-based platforms, but is not currently available on Linux.

## IP MULTIPATHING

Those working in critical production environments need to be sure they never fall off their networks due to physical hardware failure or human error. IPMP creates redundancy for many types of network failures by linking multiple network interfaces to the network infrastructure in your office or facility. Running applications could have their communications routed transparently through multiple physical paths without any modifications or overheads, since the routing is not handled by them. Heavy traffic loads can also be balanced across multiple interfaces.



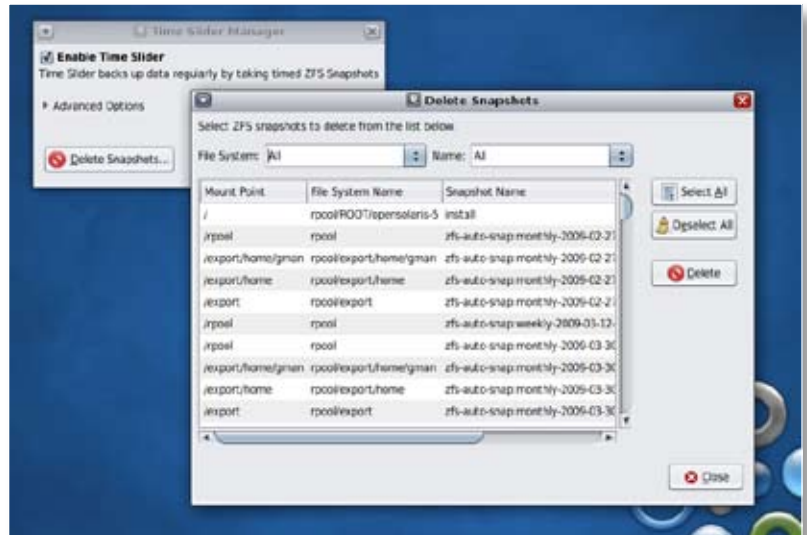
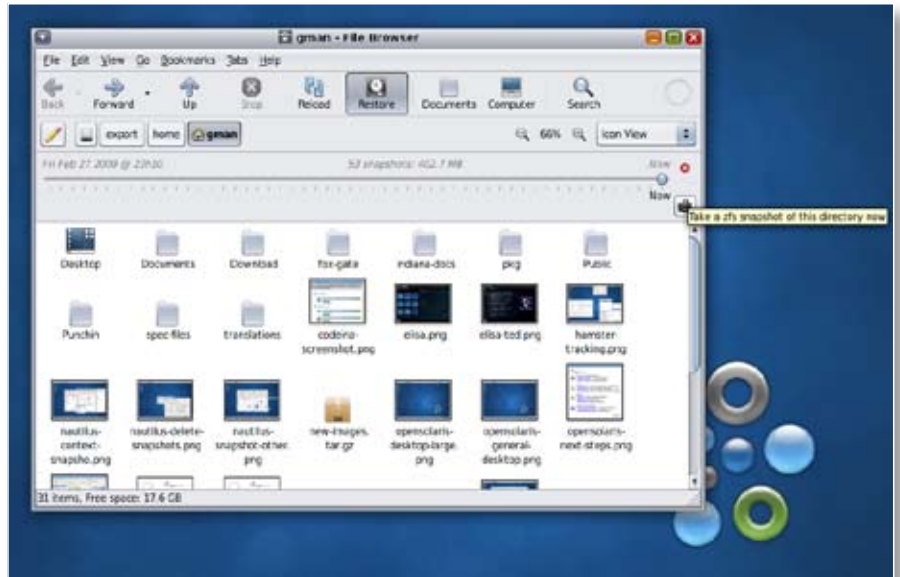
## NETWORK AUTOMAGIC

OpenSolaris can detect connections and automatically configure your PC on a wired or wireless network. Especially useful when switching between Wi-Fi hotspots at home, work or outdoors, this allows you to instantly browse the Web and access shared network resources without any user intervention. If required, manually configuring a network is no problem at all. A standard administrator control panel lets users key in their IP address, DNS details and even Wi-Fi network security key.

## ZFS AND TIME SLIDER

The ZFS file system supports unimaginably large data storage devices and file sizes of up to 16 exbibytes (16 x 1,152,921,504,606,846,976 bytes)—way more than anyone can imagine using today! On a more immediately practical level, ZFS allows for multiple snapshots of a single hard drive or array, which are maintained even after data is moved or deleted. These snapshots consume minimal overheads and allow users to check the state of a drive at any prior time, and could help restore deleted files. OpenSolaris implements Time Slider, a simple draggable bar in the GNOME file explorer, which lets you drag backwards and check what changes have been made to files at any point and restore previous versions of these files. You can even reset your computer to its factory state by sliding all the way back.

OpenSolaris automatically creates snapshots every hour, day, week and month. Version 2009.06 improves Time Slider by allowing users to manage snapshots, create custom ones, and delete unnecessary ones.



## ZONES AND BRANDED ZONES

Zones are containers that run virtualized instances of OpenSolaris so that administrators can manage how programs and processes run at different levels of permission. Every program can run inside its own zone, which gives it access to whichever of the host operating system's resources a user desires. This also means that rogue applications can never bring down the entire operating system and can never consume more resources than are allocated to them. These are of course completely transparent to the programs running inside them.

Branded zones takes the concept a step further, allowing entirely different operating environments, such as Linux, to be virtualized inside a zone with any number of programs running. Linux binaries can therefore run without any modifications.

## TOOLS FOR ADMINISTRATORS

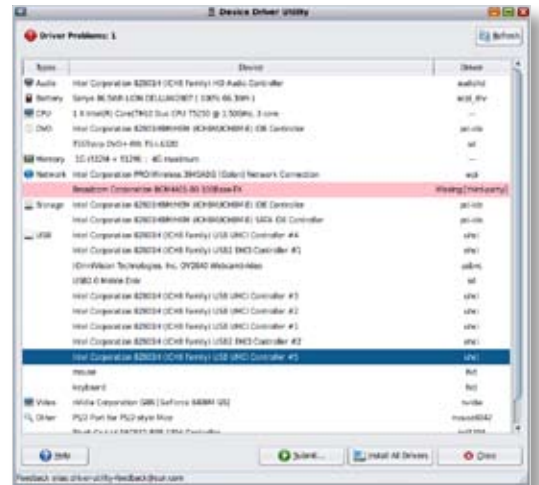
- **Hands-free install:** An automatic, scripted, network-driven mechanism for installing OpenSolaris on differently configured machines with different requirements. You can also automatically add specific packages to the installation wherever required.
- **Distribution Constructor:** Create your own OpenSolaris image with custom scripts for installing additional packages for specific purposes. You can burn bootable CDs or create USB media.

# What's new in version 2009.06

Sun now delivers new versions of OpenSolaris on a six-monthly schedule. Version 2009.06 is the latest and most evolved version to date. Apart from vastly improved performance and hardware support, this version introduces new tools for desktop users, software developers, and systems administrators alike.

## DRIVERS

OpenSolaris should be able to detect all your drivers without needing any user input or additional downloads. Even the Live CD detects your screen resolution, configures the sound, and can use your computer's wired and wireless network adapters right out of the box. Those with more exotic hardware need not worry: the latest version 2009.06 supports most of the latest wireless network devices, motherboard chipsets and graphics cards, including the workstation varieties. The bundled Device Driver Utility can profile all your hardware and alert you to any potential problem areas before you begin installing OpenSolaris.



around user-developed software packages. Anyone can submit a package for approval, after which it is peer reviewed by community developers. A dedicated repository called /contrib is available to all users, and once a package is approved, it is marked as trustworthy and is available to everyone for download.

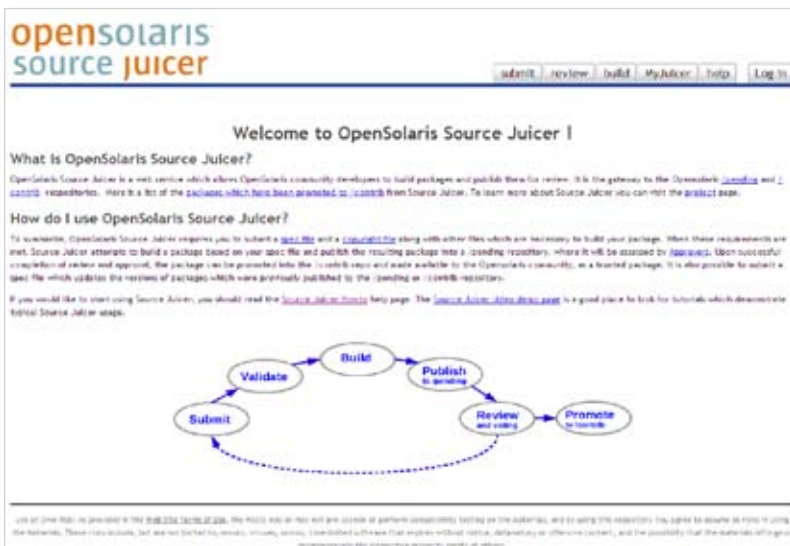
## SOURCE JUICER

This project has existed for a while but is propelled into the spotlight with the 2009.06 release. Opening up one more avenue for flexible management of installable software, Source Juicer (<http://juicer.opensolaris.org>) is a community based

## CROSSBOW AND NETWORKING ENHANCEMENTS

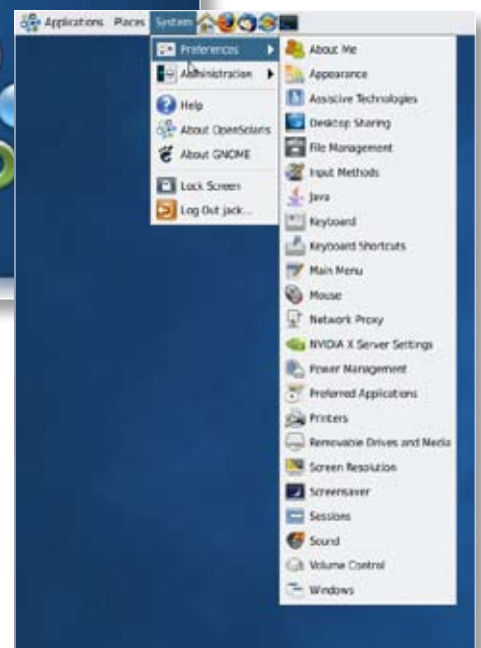
For the first time, OpenSolaris 2009.06 delivers Project Crossbow, a set of tools for managing virtualized networks on a single computer. This allows a number of virtual machines running on one PC to have independent network access through virtual network interface controllers, which also allows users to control what exactly each VM has access to. VMs can then have different QoS and bandwidth priority levels and security settings, and can be used to run network services independently of the host machine. Each virtualized network interface is governed by a virtual network switch, which also runs on the host machine, enabling VMs to interact with each other as if they were independent PCs. This can be used to test software that uses distributed computing architectures, for example. Different applications can be exposed to different VNICs with specific ports open or blocked.

Administrators can further monitor IP-based traffic between virtual containers exactly as they would monitor traffic between physical computers on a network.





# The OpenSolaris Desktop



Pop in the free OpenSolaris Live CD and make sure your computer's BIOS settings allow you to boot from your optical drive. Your computer will boot straight into OpenSolaris after asking you to confirm the language you'd like to use (just press [Enter] to accept the default, English). You can get a feel of the OS without making any changes to your hard drive and without any fear of partitioning or losing data.

OpenSolaris uses Gnome as its desktop manager, so many Linux users will be familiar with it already. Gnome comes with dozens of useful and entertaining tools including a file manager, browser, productivity applications and even games. You can even enable Compiz for brilliant 3D desktop effects including wobbly windows and desktop transitions.

Installing OpenSolaris to your hard drive is as simple as double-clicking the 'Install' icon. A fully graphical wizard will guide you through the process. Simply select the hard drive or partition it's going to live on, specify a username and password, then confirm your time zone, and in a few clicks you're done!

Installation takes around 15 minutes depending on your hardware and requires no user intervention after the first few questions. Your system will reboot before automatically loading your new graphical OpenSolaris desktop for the first time.

## OPENSOLARIS FOR NEWBIES

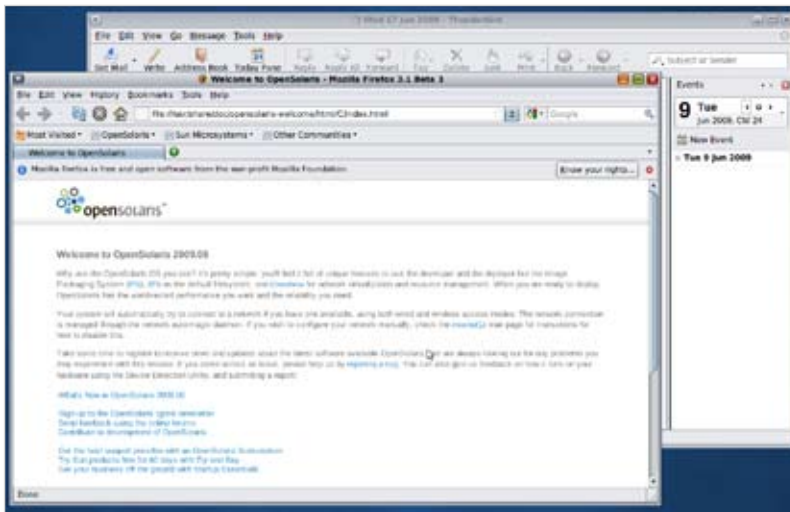
While thousands of pages of documentation exist online delving deep into the core of OpenSolaris and exploring what makes it tick, it can be daunting for new users. Here are a few tips:

- The Live CD has a fairly comprehensive Getting Started guide which can be found right on the desktop.

- In case your mouse isn't immediately detected, the shortcut [Alt]+[F1] will open the Applications menu.
- You can find tutorials online at [www.sun.com/training](http://www.sun.com/training) and <http://opensolaris.org/os/newbies/>
- Another excellent resource is [http://wiki.genunix.org/wiki/index.php/OpenSolaris\\_New\\_User\\_FAQ](http://wiki.genunix.org/wiki/index.php/OpenSolaris_New_User_FAQ)

# Useful Applications

OpenSolaris also gives users plenty of applications to run. A few essentials are already installed when you boot up for the first time, and thousands of others are only a few clicks away.



## FIREFOX AND THUNDERBIRD

Perhaps the world's best-known open-source program, the Web browser Firefox is preloaded and ready to go. A quick-launch icon can be found in the menu bar to help you get started. Whether you are using the Live CD or have installed OpenSolaris to your hard drive, Firefox will have you up on the Web as soon as your Internet connection is detected and/or configured. You have access to the thousands of add-ons and extensions that Firefox is famous for, and Windows users will be familiar with its features like the smart address bar and private browsing. Accompanying Firefox is Thunderbird, its matching email client. It only takes a few steps to set up an email account. Thunderbird comes with powerful features for organizing and sorting mail, spam filters that learn how to filter mail based on your specific usage patterns. By default, Thunderbird under OpenSolaris comes with the Lightning add-on for managing schedules and calendars.

## OPENOFFICE.ORG

OpenOffice.org is one of the most popular free office suites available. It's a great alternative to Microsoft Office and interoperates well with files

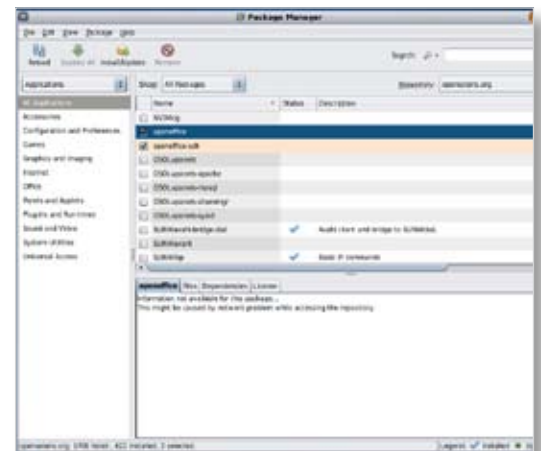
saved in Office formats. OpenOffice.org 3 includes Writer, Calc and Impress for all your documents, spreadsheets and presentations, while Draw and Base take care of your illustrations and database management tasks.

## CODEINA

Codeina allows users to play most types of audio and video files as well as install additional codecs for newer formats. You can browse through a collection of codecs, many of which are free, to enable rich multimedia playback features.

## VIRTUALBOX

VirtualBox is Sun's own cross-platform desktop virtualization software. You can create, import and export virtual machines, and the host software runs across Solaris, Windows, OS X and Linux. This not only allows you to safely try out a new version of an OS, but also to run several independent environments and manage their permissions for greater security. VirtualBox is an indispensable tool for developers and enthusiasts.



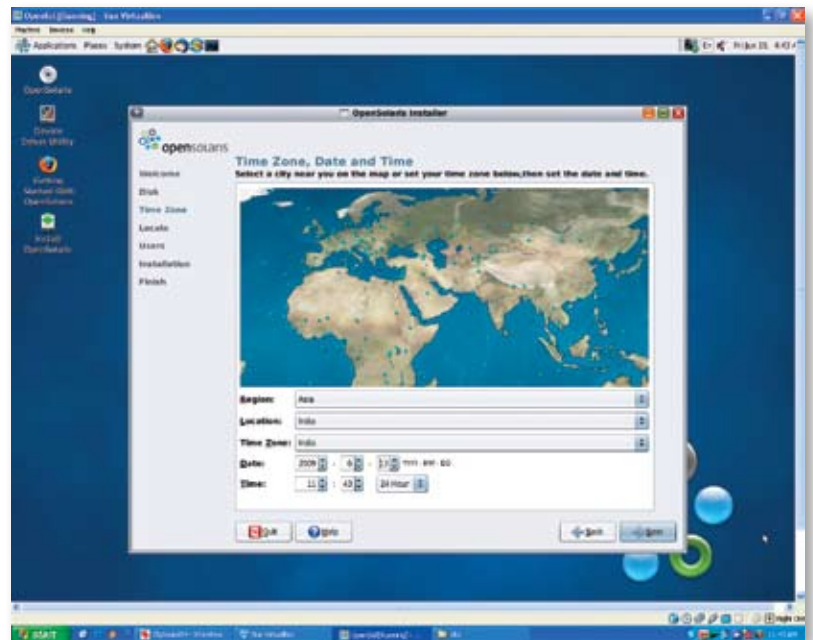
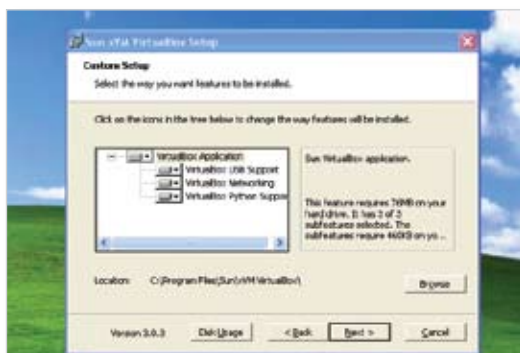
Double-click the 'Install more software' icon on the desktop to launch the OpenSolaris package manager. Here's where you can browse through thousands of free, open-source programs neatly sorted by category. Depending on your usage and requirements, you can choose the software you want to download and install. Casual users should browse through the multimedia players and other utilities, while software developers will find a vast array of tools for their specific needs.

# Installation using VirtualBox

You can also try OpenSolaris on your Windows, Linux or Mac OS X computer using VirtualBox, an desktop virtualization solution. Virtualization allows you to run potentially buggy or problematic software inside a container so that even if the program crashes its operating system, your actual computer, is unaffected. Simply close or restart the container, which is nothing more than a program running on your actual computer, to pick up where you left off. Similarly, virtualization lets you try out entire operating systems such as OpenSolaris without partitioning your hard drive or causing any permanent system changes. We'll use a Windows XP system as the host in this example. You can use your OpenSolaris CD or mount a downloaded ISO image on your hard drive if that's more convenient for you.

**NOTE:** If your PC supports hardware virtualization, i.e. Intel VT or AMD V, make sure this is enabled in the BIOS. You will notice immediate performance improvements due to the optimizations they contain specifically to speed up virtualization.

**STEP 1:** Download and install the version of VirtualBox suitable for your operating system from [www.virtualbox.org/wiki/Downloads](http://www.virtualbox.org/wiki/Downloads). This will also



install extra drivers on your PC to allow containers to access your network and hardware resources.

**STEP 2:** Once installed, simply run VirtualBox. You'll see a window with space for a list of VMs and controls for creating new ones. Create a new VM to install OpenSolaris in by clicking the 'New' button on the taskbar.

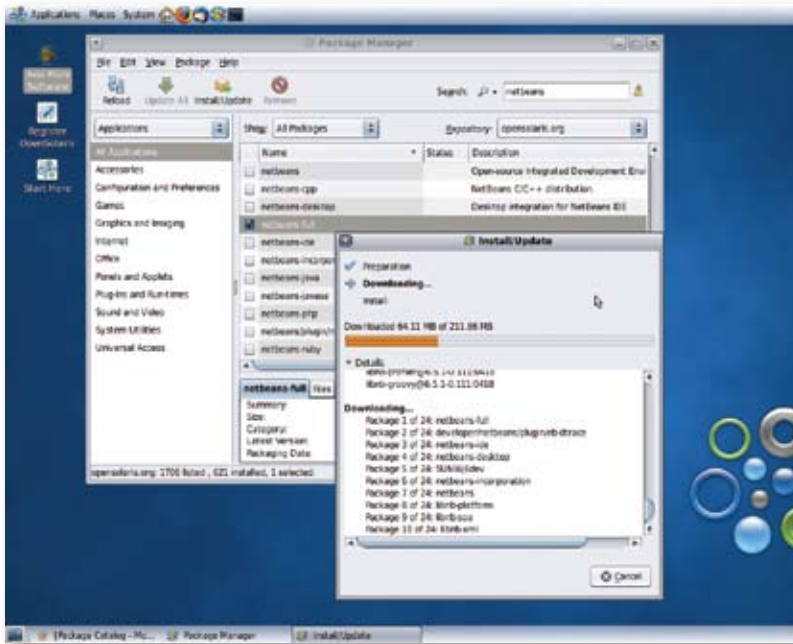
**STEP 3:** Type in a name for your new VM and select 'Solaris' and 'OpenSolaris' as the OS type and version that it will host respectively. The next few steps allow you to allocate a portion of the host's RAM and hard drive space to the VM.

**STEP 4:** Back at the main interface, you can now see your new VM's configuration. Click the 'Start' icon to actually run the VM and install OpenSolaris inside it. Point the wizard to your CD drive or ISO image and it will automatically take over.

**STEP 5:** You can now see the Live CD booting up inside a VM window just as it would on your PC if you were actually booting from it. Follow exactly the same steps as a normal installation, i.e. double-click the 'Install OpenSolaris' icon to install it—all this will still be done inside the VM.

**STEP 6:** Now you can run your OpenSolaris VM anytime you want by starting or stopping it through the main VirtualBox window. You can alter its configuration and even save a snapshot of it at a particular state to roll back to that state anytime.

# Your first development projects



OpenSolaris makes it extremely easy to work with development applications. We have two examples here of projects created with Java and PHP respectively. The first thing to do is download the Netbeans IDE application by opening the package manager and simply searching for “netbeans”. Download the package called ‘netbeans-full’ and install it. You can then launch it by clicking ‘Applications | Developer Tools | Netbeans’.

## PHP

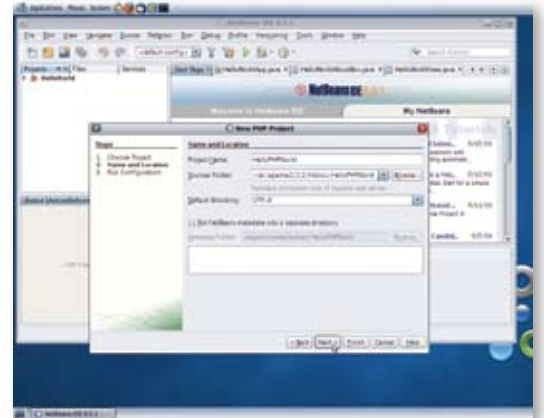
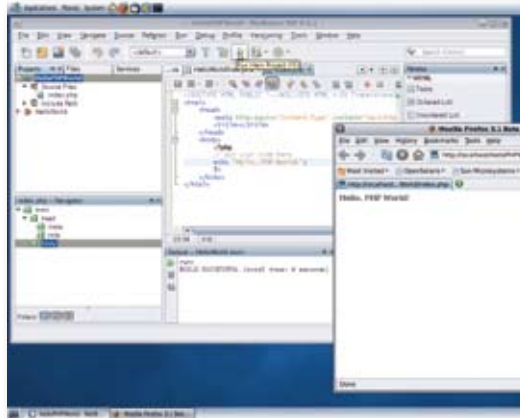
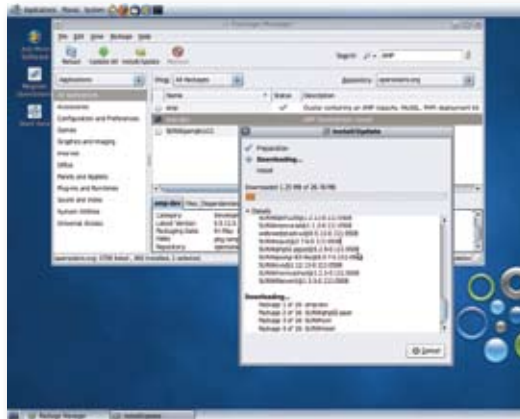
**STEP 1:** Using the package installer, download and set up “Amp-dev”. Then go to ‘Applications | Developer Tools | Web Stack Initialize’ and enter your root password to continue. Also run ‘Applications | Developer Tools | Start Apache2/MySQL Servers’ since these services need to be running for the project.

**STEP 2:** Start Netbeans and click ‘File | New Project’. Select ‘PHP’ and then ‘PHP Application.’ In the next screen, type “HelloPHPWorld” as the project name and click next. Click Next again and then click finish. You have now made a PHP Application Project.

**STEP 3:** Now type the following in the code window:

```
echo "Hello, PHP World!";
```

Run the application by clicking on the green "play" button. You have your PHP application running!





## JAVA

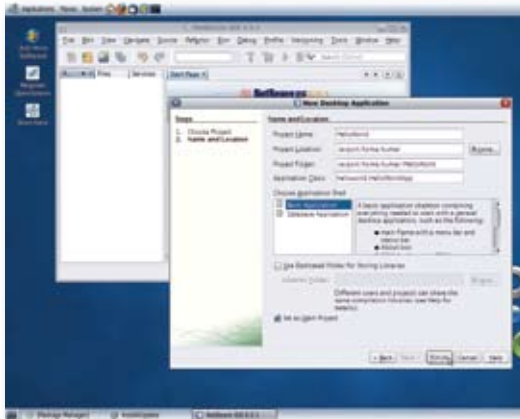
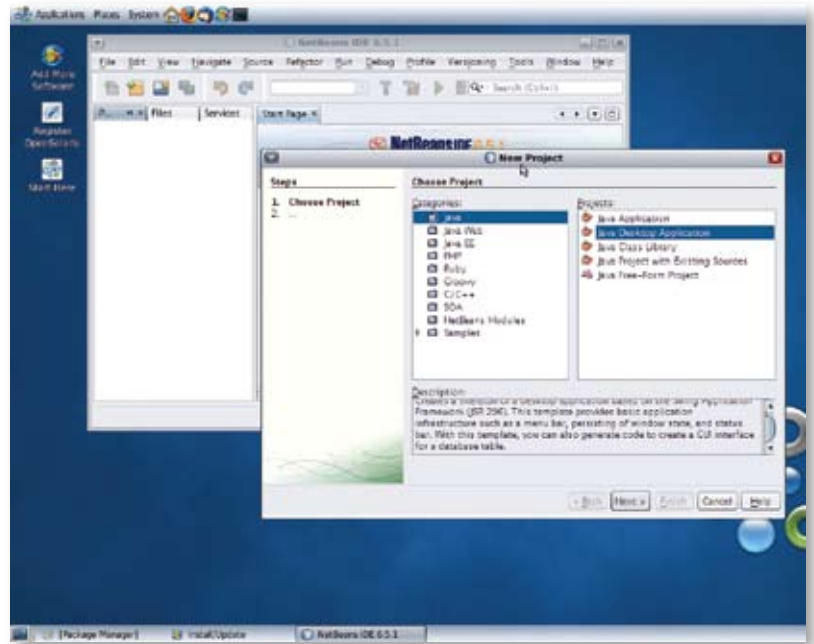
**STEP 1:** In Netbeans, click 'File | New Project' and select 'Java' and then 'Java Application'. Follow the wizard to create a Basic Application and name it "HelloWorld".

**STEP 2:** In the design window that appears, drag and drop a label and a button as shown below. Remove the text from 'jLabel1' and change the text property of 'jButton1' to 'Greet!'

**STEP 3:** Right-click on 'jButton1' and go to 'Events | Action | actionPerformed'. In the code window insert the following handling code in the demarcated space after the comment " // TODO add your handling code here:."

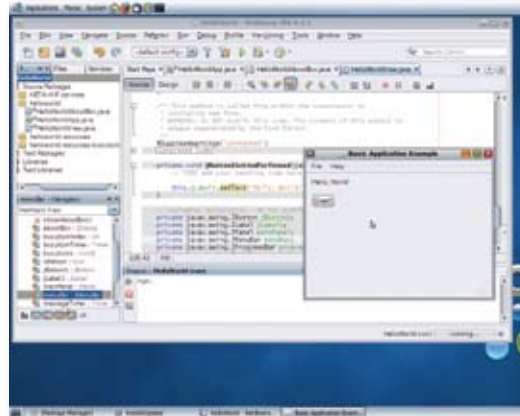
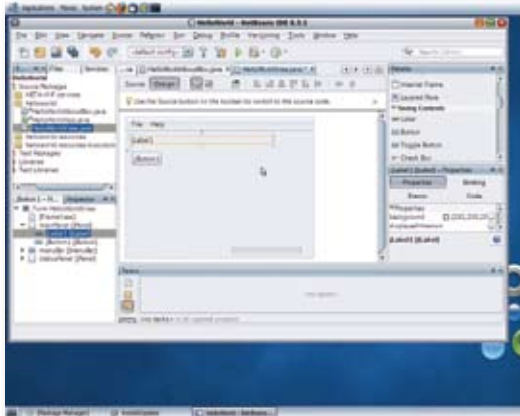
```
this.jLabel1.setText("Hello, World!");
```

**STEP 4:** Run the application by clicking on the green 'Play' button and see the results!



Netbeans is a powerful integrated development environment. One of its main strengths is its cross-platform nature. Netbeans is free and is available for Windows, Linux, Mac OS X and of course Solaris, making it easy to collaborate between people who use different operating systems. You can use it to program in Java, JavaScript, Ruby, PHP, CSS, Ajax, C, C++, Python, Java SE and JavaFX amongst other languages.

Notice how it automatically completes the text you type, such as whenever you type a period. Several other shortcuts exist to help you get your work done quickly. Visit [www.netbeans.org](http://www.netbeans.org) for loads of tips, tricks, tutorials and support.



## In the words of...



**GLYNN FOSTER** is an OpenSolaris product manager at Sun Microsystems, helping to coordinate the OpenSolaris six monthly releases. Glynn has been a former member of the OpenSolaris Governing Board, board director at the GNOME Foundation and continued open source activist. Glynn has been extensively involved in open source communities for almost a decade and joined Sun in 2000. Glynn's blog can be found at <http://blogs.gnome.org/gman> and twitters at <http://www.twitter.com/glynnfoster>.

**Q** What is your personal vision for OpenSolaris? What directions would you like to see it grow in over the next few years?

**A** OpenSolaris is a distribution based on free and open-source software that gets released every six months or so, making sure that the latest technologies that are developed in various communities around the world get into the hands of users to help them in their day-to-day tasks. Over the past couple of years we've tried hard to lower the barriers of entry for new users of the operating system, making installation easy and introducing a new network-based packaging system, IPS, that can leverage all the benefits of the ZFS file system. You can expect OpenSolaris to continue on that path, including the latest innovations and popular software that people are using. We've even had a few ports to different platforms occurring, and people building appliances to meet their needs!

**Q** Would you say OpenSolaris is suitable as the primary OS for regular home or office users? Would you like to see OpenSolaris give Windows some competition in this area?

**A** More people are trying out free software solutions at home and in the office and finding they are often good replacements for proprietary software. While we've typically been focused on the technology early adopters and developers, OpenSolaris can of course be used on end-user desktops and kiosks. OpenSolaris includes much of the same free and open source software that you can see on Linux distributions—the GNOME desktop, Firefox web browser and OpenOffice.org office suite. I think you will be able to use free and open-source software, like OpenSolaris, to give Windows a run for its money in the years to come!

**Q** How is OpenSolaris influencing development and ideas about how future versions of Solaris should be handled?

**A** Solaris was often considered a pretty complex operating system. While it provides absolutely superb performance, scalability and security, it

was often hard to install and hard to administer. That's why we launched the OpenSolaris project, in an attempt to reduce those complexities. We improved the installation experience by creating a LiveCD and introduced a new network-based package management system allowing users to download additional software from on-line repositories. OpenSolaris is the next generation Solaris, and you can expect to see an enterprise-focused product derived from all the things we've been doing with the OpenSolaris OS.

**Q What is the coolest part about OpenSolaris that you absolutely love? What is the one thing you would love to see added to it?**

**A** One of the coolest things in OpenSolaris is the ZFS file system, and it's now the default file system out of the box! That means you can use its snapshot feature to quickly take backups of your data, and recover them if you accidentally delete or modify your documents. We've also made package management use ZFS, by performing system updates on a clone of your system, and quickly allowing you to switch back if for some reason your update fails.

Some of the cooler projects in the pipeline are adding de-duplication support to ZFS—helping you to preserve space by reducing duplication on your file system. We've also got encryption support and user/group quotas coming soon!

**Q What would you say to anyone who doubts that open source software is capable or robust enough to meet their needs?**

**A** I'd say "try it". I think a lot of people are surprised by how good the quality of the software is!

**Q How important is student/community evangelism for OpenSolaris as well as OSS in general? What do you think is most important for encouraging and fostering this community?**

**A** Hugely important! We recognize that the students of today are the users, developers and administrators of tomorrow and it's important to encourage them to use OpenSolaris, along with other open source software, and listen to their feedback so we can help make it better. We also recognize that it's important to build and grow a wide and diverse community around the source code, and encourage new people to contribute back to the community. It's important to be continuously encouraging to new people coming to the project, and helping them find out where they can contribute best according to their skills and making them feel at home.

## USEFUL LINKS

Here's a collection of links for anyone interested in further reading about Sun, OpenSolaris, and any of the projects related to it. There's a world of open-source development out there. Go ahead and get involved!

- Resources for students, especially those in fields related to computer science: [sunstudentcourses.com](http://sunstudentcourses.com) hosts a number of courses that students can take online to augment their classes, and [sun.com/students](http://sun.com/students) is more of a community with audio and video sharing.
- Loads of information and resources for software developers and community members: [developer.sun.com](http://developer.sun.com)
- A newsletter of all the exciting goings-on at Sun and its open-source projects, designed especially for systems admins: [sun.com/bigadmin](http://sun.com/bigadmin)
- The definitive melting pot of OpenSolaris culture! Geeky blogs, discussions and other resources for those who contribute to the project: [planet.opensolaris.org](http://planet.opensolaris.org)
- The homepage of the Open Source University Meetups site, where you can register to find groups in your area and share photos and videos, and network for career-building potential: [osum.sun.com](http://osum.sun.com)
- Learn more about using OpenSolaris. Especially useful for beginners and anyone who wants in-depth discussions of the latest features in version 2009.06: [opensolaris.com/learn](http://opensolaris.com/learn)
- Two projects closely related to OpenSolaris: Project Kenai ([kenai.com](http://kenai.com)) is Sun's cloud-based developer initiative. Developers from around the world can find each other to collaborate on the next big idea, as well as host their applications and code online. Zembly ([www.zembly.com](http://www.zembly.com)) is an online platform for developing social media applications such as widgets for Facebook, Meebo, and other Web 2.0 sites.

