

# Should You Care About Solaris 11?

PETER BAER GALVIN



Peter Baer Galvin is the CTO for Corporate Technologies, a premier systems integrator and VAR ([www.cptech.com](http://www.cptech.com)).

Before that, Peter was the systems manager for Brown University's Computer Science Department. He has written articles and columns for many publications and is co-author of the *Operating Systems Concepts* and *Applied Operating Systems Concepts* textbooks. As a consultant and trainer, Peter teaches tutorials and gives talks on security and system administration worldwide. Peter is also a Lecturer at Boston University. He is a Senior Contributor to *BYTE* and *newdomain.net*. Peter blogs at <http://www.galvin.info> and twitters as "PeterGalvin." [pbg@cptech.com](mailto:pbg@cptech.com)

With only minor fanfare, Oracle announced the first official customer-ready release of Solaris 11 on 11/10/2011. Oracle decided to announce on a Thursday rather than a Friday, which is a shame because releasing Solaris 11 on 11/11/11 would have been epic. Back in the day, say around the turn of the century, a major new Solaris release would have drawn quite a lot of attention from IT management worldwide. The luster has been somewhat lost due to the Solaris is open/closed/open/we-are-not-saying nature of its development history, the widespread growth of Linux as an enterprise OS, and the potential customer nervousness about the future of Solaris as now owned by Oracle.

However, that does not mean that Solaris 11 is uninteresting, unremarkable, or un-innovative. Quite the opposite. Below, I delve into the details of Solaris 11, what makes it pertinent, and why it should be given full consideration as a commercial-grade, full-featured, and powerful operating system. Also not to be ignored are the variants of OpenSolaris, each of which has an interesting take on the future of operating systems.

## Features

Oracle is touting Solaris 11 as "The First Cloud OS" [1]. Certainly that statement comes with marketing hyperbole, but the features included in Solaris 11 (S11) do provide the basis for a scalable and manageable operating system. When combining S11 with the Oracle Enterprise Manager Ops Center [2] (free to use on systems with Solaris support contracts), Solaris gains some site-wide management features which help meet that claim.

Solaris 11 has several new features and enhances several older Solaris 10 features. To understand the potential utility of Solaris 11 it is important to understand the entire feature set. The list below is complete and indicates the nature of the feature (updated (U) or new (N)):

- ◆ Package management system (N)—The new image packaging system (IPS) starts from scratch and solves many of the long-standing problems of the previous System V package management system. The new system is much more like Debian Linux in that all packages have versions, are network-update-able via the Internet package repositories, and are digitally signed for security. No before or after scripting is allowed, resulting in packages that are independent, removable, and reinstallable. The biggest overall change is the lack of a patching system. Rather than a patch, a new version of a package incorporates any changes. Packages

understand dependencies and thus an update or install of one package might result in a cascade of other updates or installations. Also, package installation can occur in parallel, so updating a system with many zones, for example, is much faster than before. The previous package and patching system still exists to allow installation and updating of pre-S11 packages.

- ◆ **Boot Environments (N)**—Live Upgrade is gone, replaced by a new boot environment facility and boot environment manager. Now that ZFS is the only root file system, its features are bearing fruit throughout the system, as exemplified in the boot environment manager. A new boot environment is created automatically by the package system if it is making major package updates, or manually at any point by the sysadmin. It is a ZFS clone of the existing root pool, with the new changes applied. The previous version is retained, allowing easy rebooting to a pre-changed environment. Further, many versions are kept by default, but are delete-able as needed. Booting to any of these reveals the system as it was at the time of that boot environment. Package upgrades take place on a live system (within the new clone), and just the downtime of a reboot is needed to switch between environments.
- ◆ **Automated Installer (N)** replaces Jumpstart and its brethren with one unified automatic installation tool. The new tool, of course, understands the new packaging and boot environment facilities. It also understands zones and can automatically create zones after its automatic installation or update of Solaris from the AI server.
- ◆ **Network virtualization and quality of service (aka Project Crossbow) (N)**—At long last Crossbow is available for the masses, rather than just in the open source preview releases. Crossbow is a breakthrough networking facility, layered on top of the previous network stack redesign that brought better performance and scalability. With Crossbow, the sysadmin can create an entire virtual network within a Solaris instance, including, for example, virtual NICs, switches, routers, firewalls, and load balancers. All those components can work together to route, filter, and balance traffic between zones within a system. The quality of service component gives fine-grained control over network flows, allowing bandwidth management on a per-protocol or per-NIC basis. If the sysadmin wants ftp to use at most 5 Mbps of network bandwidth, a couple of commands gets it done.
- ◆ **DTrace (U)** is now fully network-aware for exploration and debugging of network code, and has other minor changes.
- ◆ **Zones (U)** and virtualization are a bit confusing. Oracle renamed LDOMS to be Oracle VM for SPARC, while Oracle VM for x86 is a totally separate facility based on Xen. Of course, Zones are fully distinct from those two as well. The best course of action is to ignore the names and choose the right facility based on your use case. Zones have been updated and have gained some features, but also have lost some features. For example, Solaris 8 and Solaris 9-branded zones were supported with Solaris 10 as a way to capture a previous-OS system and run its apps within S10. S8 and S9-branded zones are no longer supported, but Solaris 10 zones within S11 are supported. That is, you can capture a Solaris 10 system and run it as a branded zone within S11. Unfortunately, you can only do so if the S10 system has no zones on it. If it does have zones, the best path is to virtual-to-virtual (v2v) the zones to the S11 system, making them S10-branded zones within an S11 system. Also gone from S11 are whole-root zones. Now that we have ZFS file system cloning, whole-root zones are no longer needed, since all S11 zones behave that way (they allow modification of even system directories). For sparse-zone-like operations, S11 zones have an “immutable” mode which

implements partial or complete read-only operation. Finally, zones now allow NFS server services. Unfortunately, zones themselves still cannot be stored on an NFS server.

- ◆ ZFS (U) is a revolutionary file system/volume manager that in S11 gets several new features, including block-level encryption.
- ◆ Oracle Enterprise Manager 12c (U) adds a host of features and adds support for some S11 features, including OS installation, package management, zone management, and system monitoring. Oracle's goal for the tool is to provide complete life-cycle management of Solaris.

There are many other changes within S11, including LDAP client and Active Directory client integration, improved role-based access control (RBAC), auditing and logging, and more cryptographic functions with hardware acceleration when run on SPARC hardware.

## How to—and Should You?—Upgrade

It is important to note that there is no seamless upgrade path from S10 to S11. Rather, the zone management tools can capture S10 zones or the S10 global zone and turn them into an S10-branded zone that can run within S11. This method should be sufficient for most uses, but it is disappointing that no direct upgrade can take place. The lack of that upgrade path is an indicator of how major the changes between S10 and S11 are.

Which brings us to one aspect of the OS wars: ISV support. Without ISV support, a great operating system can become a footnote in history. ISVs need to understand the potential of Solaris and to determine whether their products will be supported on Solaris. To fully embrace Solaris 11 an ISV needs to adapt to the new package management system, but the old System V package system still works, as do older binaries. At a minimum, an ISV needs to test their existing application on Solaris, which is a low barrier to entry.

## Impacts and Choices

Oracle, while unclear on some areas of its product plans, is being very clear in one area. Oracle is firmly committed to making Solaris and Oracle Linux the best places to run Oracle's other software products. The "run Oracle on Oracle" mantra is heard loud and clear at their conferences and within their documents and announcements.

Oracle is claiming, for example, that many internal changes were made to Solaris to support Oracle Database, including performance, reliability, and security improvements. Oracle also allows the use of specific features of Solaris to optimize Oracle DB license use. Consider that the Oracle rules for what is considered "hard partitioning" (and therefore is allowed to limit the CPU cores that need to be licensed) include several Solaris and SPARC options but fewer options for other technologies [3]. Certainly, running Oracle software products on Oracle hardware and operating system products makes sense for support reasons, although a given site should do a full analysis of price, performance, and features among the various options to determine which platform is the overall "best" solution for them.

While considering the platform options, a site should also consider the new kids on the block. (That is not an endorsement of the band by the same name.)

Teams of engineers have started from the last release of OpenSolaris and are creating their own distributions from that base. They are coordinating their efforts, in that they will contribute their changes into project illumos [4]. Think of that project as the new OpenSolaris. From there, several distributions are advancing rapidly, making use of the core and solving specific problems. OpenIndiana [5] is a general-purpose release. Nexenta [6] is a commercial release mostly designed to be a storage platform. And Joyent [7] recently released their SmartOS open source and free variant of illumos, with rich cloud-computing features. SmartOS keeps the core of OpenSolaris, replaces the new package management system with the one from BSD, and adds KVM-flavored containers to allow other operating systems such as Windows and Linux to run unmodified. While SmartOS can scale vertically, the design goals seem to be horizontal scaling with a management framework that allows monitoring, management, and automation of a farm of SmartOS systems.

## The Future

No one outside of Oracle (and perhaps few inside) knows what the long-term future of Solaris is. Will it become an embedded OS that is used only for Oracle's Engineered Systems/Appliances? Is there enough demand, ISV support, and Oracle support for it to remain a leading general-purpose enterprise operating system? Certainly my discussions with IT management range from "We've moved on from Solaris," through "If only we were still running Solaris," and on to "We're moving back to Solaris." Fundamentally, it's my firm belief that no other common, commercial operating system has a better feature set than Solaris, especially as those features relate to production operation.

In the history of computing, there have been many failures of "better" engineering. Even as far back as Multics [8], the operating system that launched thousands of other operating systems, including UNIX, just having better functionality did not mean commercial or even cult-following success. Domain/OS [9] from Apollo was advanced for its time, as was TOPS-20 from Digital Equipment Corporation [10]. And let's not get started on the holy war of "operating system X was better than Microsoft Windows." In fact, all of the UNIX vendors of the time, in the 1990s, were worried about Windows NT winning the operating system wars and practically becoming the only major operating system. This continued until Scalability Day [11], when Microsoft tried and failed to prove that Windows NT could scale—at least according to the entertaining and informative presentation/rant by Bryan Cantrill at the LISA '11 conference [12].

So where does that leave IT environments in terms of operating system choices? As usual, the choice of operating system will depend on feature need, in-house skill set, ISV support and recommendation, and a bit of arbitrariness. Solaris 11 does score well in several of those areas at many companies, and thus should be part of the consideration.

The Solaris offspring such as SmartOS, Nexenta, and OpenIndiana are worth considering if their features meet your goals. The case can be made for Solaris being a cost-effective platform, considering its free zone functionality, which provides very efficient virtualization, for example, or its capped zones, which can effectively reduce the number of licensed cores for some software products (including Oracle's). Add to that the production-ready functionality of DTrace and ZFS and it becomes difficult to not have Solaris on a short list of operating system platforms.

I would love to hear your thoughts about Solaris 11 and its future, and whether it makes your short list.

### **References**

[1] The First [Oracle] Cloud OS: <http://www.oracle.com/technetwork/server-storage/solaris11/overview/index.html>.

[2] Oracle Enterprise Manager Ops Center <http://www.oracle.com/technetwork/oem/grid-control/overview/index.html>.

[3] Oracle partitioning options: <https://www.oracle.com/us/corporate/pricing/partitioning-070609.pdf>.

[4] illumos: <https://www.illumos.org/>.

[5] OpenIndiana: <http://openindiana.org/>.

[6] Nexenta, a commercial release mostly designed to be a storage platform: <http://www.nexenta.com/corp/>.

[7] Joyent, SmartOS with cloud computing features including KVM: <http://www.joyent.com/>.

[8] Multics: <http://www.multicians.org/unix.html>.

[9] Apollo Domain/OS: <http://en.wikipedia.org/wiki/Apollo/Domain>.

[10] DEC TOPS-20: <http://en.wikipedia.org/wiki/Tops-20>.

[11] MS Scalability Day: [http://news.cnet.com/Scalability-Day-falls-short/2100-1001\\_3-279928.html](http://news.cnet.com/Scalability-Day-falls-short/2100-1001_3-279928.html).

[12] Bryan Cantrill at the LISA '11 conference: <http://www.youtube.com/watch?v=-zRN7XLCRhc>.