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ORACLE SOLARIS 11.1—WHAT'S NEW

BEST UNIX® FOR ORACLE
DEPLOYMENTS

BUILT FOR CLOUD
INFRASTRUCTURES

KEY FEATURES

- 8x faster database startup and shutdown and online resizing of the database SGA

- Kernel Mode Acceleration for Oracle Real Application Clusters (Oracle RAC)

- 4x faster Oracle Solaris Zones updates

- Oracle Solaris Zones on Shared Storage

- Engineered for scale and performance

KEY RESOURCES

- Oracle Solaris 11 resources on the Oracle Technology Network

- Oracle Solaris 11 how-to guides

- Oracle Solaris 11.1 product documentation

- *Oracle Solaris 11.1* and *Oracle Solaris Optimizations for the Oracle Stack* datasheets on oracle.com/solaris

Oracle Solaris, the industry's most widely deployed UNIX® operating system, delivers mission critical cloud infrastructure with built-in virtualization, simplified software lifecycle management, cloud scale data management and advanced protection for public, private and hybrid cloud environments. Engineered to work together with Oracle Database, middleware and applications, Oracle Solaris 11 delivers unique features to increase performance, streamline management and automate support for Oracle deployments. Oracle Solaris 11.1 adds new features to ensure fast, secure, and reliable deployments in large-scale cloud environments and enterprise data centers.

Introduction

Oracle Solaris 11.1 is the first update to the Oracle Solaris 11 operating system, released in November 2011. This document highlights important changes for Oracle Solaris 11.1.

Oracle Solaris 11.1 focuses on:

- Optimizations for the Oracle Database, Java and Engineered Systems products
- Cloud enhancements for deploying Oracle Solaris-based Infrastructure as a Service

Along with the latest version of Oracle Solaris Cluster and Oracle Enterprise Manager 12*c* Ops Center, this update provides an ideal environment for transforming the traditional data center into a mission-critical cloud. It is now quicker and easier to provision and manage multiple workloads leading to significant TCO improvements.

Install or update to Oracle Solaris 11.1 now!

Note: Please consult "Oracle Solaris 11 11/11—What's New" for details about Oracle Solaris 11 11/11.

New Features for System Administrators

Key enhancements delivered in Oracle Solaris 11.1 are discussed in the following sections:

- Installation
- System configuration
- Virtualization
- Security and Compliance

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- Networking
- Data management
- Kernel/platform support
- Network drivers
- User environment

Installation

Simple, scalable installation technology is the key to efficiency in the data center and a flexible deployment at cloud scale.

Automated Installer

The Automated Installer is a modern enterprise-class installation framework for automated system provisioning. Automated Installer reduces complexity through improved integration with other Oracle Solaris technologies, helping to reduce up-front and ongoing costs of deployment. Using a network installation service, systems can be installed according to a specified installation manifest, which details the system configuration, what software should be installed, and any virtualized environments that should also be provisioned.

Automated Installer Enhancements

A number of enhancements have been added to the Automated Installer to allow for automatic provisioning of systems. Oracle Solaris 11.1 has added support for a new set of role-based authentication control (RBAC) profiles and authorizations for managing the Automated Install service, including the profile `Install Service Management`. This allows for delegation of installation tasks.

The Automated Installer command line utility, `installadm`, now supports three new options, `update-service`, `update-profile`, and `set-service`, to improve flexibility for administrators maintaining a set of installation services. Oracle Solaris 11.1 also supports the ability to specify a manifest location with a system boot argument.

Interactive Installation to iSCSI Targets

The ability to install to iSCSI target LUNs has been included in the interactive installers, namely the interactive text and live media installers. Administrators can choose between installing on local disks or connecting to a remote iSCSI disk using DHCP auto-discovery or by manually specifying a target IP address, iSCSI target name and LUN, and initiator name. This allows installed OS images to be maintained in a central location.

Support Service Integration

The Oracle Solaris 11.1 installers now support the ability to automatically connect to Oracle support services through the integration of Oracle Configuration Manager (OCM) and Oracle Auto Service Request (ASR). By providing My Oracle Support credentials to take advantage of Oracle's support services, administrators can benefit from automatic generation of service requests and reporting of system configuration data. The two new services (OCM and ASR) are enabled by default. To meet privacy concerns no information about any users on a system is collected, only system configuration information. Both services are enabled through two new Oracle Solaris 11.1 install screens. The first allows entering your My Oracle Support credentials. The second screen is for specifying a proxy server, if used.
For more information about OCM, see http://www.oracle.com/goto/solarisautoreg

For ASR, see http://www.oracle.com/us/support/systems/premier/auto-service-request-155415.html

System Configuration

Simple SMF Manifest Creation Tool

The svcbundle(1M) command makes it easier to generate SMF manifests and profiles. By providing a few options on the command line, the user can generate a wide variety of manifests and profiles. This relieves the user from the burden of writing XML files.

Improved SMF Service Configuration

A number of changes have been introduced in Oracle Solaris 11.1 to improve ease of use while administrators edit the system configuration in the SMF configuration repository. The introduction of new options to `svccfg(1M)`, `extract`, and `delcust`, helps administrators to better understand the administrative customizations that have been made on a system and apply those changes to other systems. Improvements have also been made to `svccfg editprop` to allow administrators an easier way of making changes to the service configuration using a text editor, and some of the infrastructural service properties typically less interesting administrators are now hidden.

Administrative Edit

The `pfedit` utility is a per-file authorization-based command for editing administrative files. Administrators can delegate the ability to edit specific administrative files. Editing operations do not run in a privileged mode, and the changes are auditable.

New Logging Daemon

`rsyslog`, the popular daemon for message logging, has been included in Oracle Solaris 11.1. It is not enabled by default, but administrators can switch to this new logging daemon by disabling `svc:/system/system-log:default` and enabling `svc:/system/system-log:rsyslog` using SMF administrative utilities.

Virtualization

Oracle has a comprehensive suite of virtualization solutions offering choice and flexibility for the full spectrum of business and application needs. In this update, Oracle continues to integrate and innovate across the product set, which includes Oracle Solaris Zones, Oracle VM Server for SPARC, and Oracle VM Server for x86. Oracle Solaris 11 was designed with the cloud in mind, and it now includes new capabilities in the areas of performance, security, and ease of deployment, which are all tightly integrated with the updated virtualization features.

Oracle Solaris Zones

Oracle Solaris Zones technology provides built-in secure and isolated runtime virtual environments in which to deploy enterprise applications. In Oracle Solaris 11 11/11, Oracle Solaris Zones technology was more tightly integrated into the operating system. Zones are easier to create and manage, more flexible and functional, and provide a great level of resource management and monitoring. In addition, there is the ability to perform a physical-to-virtual migration of an Oracle Solaris 10 environment. Now significant new

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functionality is available in Oracle Solaris 11.1

Oracle Solaris Zones on Shared Storage

This feature allows for configuring, installing, and running Oracle Solaris Zones hosted directly on arbitrary storage device objects, such as Fibre Channel or iSCSI targets. Now it is possible to specify and configure the path to the device directly by the `zonecfg`(1M) command. The zone is then automatically encapsulated into its own zpool. The aim is to simplify deployment, administration, and migration of Oracle Solaris Zones. See the `zoneadm`(1M) and `zonecfg`(1M) man pages and the documentation in *Oracle Solaris 11.1 System Administration: Oracle Solaris Zones, Oracle Solaris 10 Containers, and Resource Management*.

Parallel Zones Update

The time required to update a system has been dramatically improved in Oracle Solaris 11.1, particularly for systems that include multiple Oracle Solaris Zones virtual environments. A new ability to update zones in parallel has shown up to a 4x speedup on systems with 20 zones. Coupled with boot environments, administrators can directly benefit from fast and safe system updates.

Performance Improvements for Install and Attach Operations

Enhancements to install and attach operations on Oracle Solaris Zones have made zone system management operations much faster. A 27 percent decrease in the time it takes to install a zone, and a 91 percent decrease in the time it takes to attach a zone have been observed. Along with the ability to update zones in parallel, this means that planned service implementations or planned outages can be much shorter.

File System Statistics for Oracle Solaris Zones

Until now, global zone administrators had no way of monitoring activity in a particular zone, nor could non-global zone administrators monitor `fstype` activity in their own zones. This update provides a per-`fstype kstat` (kernel statistic) for each zone. The global zone also has a `kstat` exclusively reporting its activity.

Oracle Solaris Zones RAD Module

The Remote Administration Daemon (RAD) provides a protocol to be used for the secure, remote administration of Oracle Solaris components. Oracle Solaris 11.1 introduces the first RAD module that can be used to manage zones remotely in a secure and consistent way.

`lofi` Performance Improvements

Oracle Solaris 11.1 introduces some performance gains in the `lofi` stack. `lofi` devices are used quite extensively to allow zones access to file systems (and they are also used by Oracle Solaris Zones with the shared storage feature) providing significant performance gains. Read performance has been increased by up to 90 percent, while write performance is up to 6x better. There is also the ability to share the data via `lofi`-mounted devices (albeit in read-only mode) between multiple zones.

InfiniBand Enhancements

Oracle Solaris 11.1 introduces support for RDSv3 (Reliable Datagram Service Version 3) inside an Oracle Solaris Zone. Now Oracle Database can take advantage of its specialized and accelerated communications protocol from within Oracle Solaris Zones; this is highly beneficial especially for engineered systems.

Oracle Solaris Zones "Unavailable" State

A new Oracle Solaris Zones state has been introduced called `unavailable`. This state allows `pkg` operations to work even if a zone's storage is not available. This state is important for the Oracle Solaris Zones on Shared Storage implementation.

IPoIB Datalink Administration Using `zonecfg(1M)`

This feature improves the usability of zones on InfiniBand. With this feature, IP over InfiniBand (IPoIB) data links can be configured under `anet` resources in the same way as VNICs using `zonecfg()`.

Security and Compliance

Oracle Solaris is designed to be secure, it includes an array of technologies that ensures confidentiality of data, isolates applications, contains users and administrators, and protects from network based threats. The secure by default posture of Oracle Solaris 11 is a baseline secure system appropriate for many environments that can be customized to address expected risks. Building on this solid base of features, new capabilities are aimed at enhancing the security of cloud deployments and easing the tasks of meeting both internal and external compliance requirements.

Compliance Reporting & SCAP Support

Oracle Solaris now includes the OpenSCAP framework for configuration management compliance reporting, the tool and framework are in the `pkg:/security/openscap` package. It implements part of the Security Content Automation Protocol (SCAP) standards as defined by the National Institute of Standards and Technology (NIST) and others for automated security reporting. Companion reporting templates for enterprise will be released as a separate package initially targeting PCI. SCAP Reporting templates for public sector entities (such as DISA STIG) can be obtained by traditional methods.

Extended Application Security Policies

Extended policies enhance the privilege system allowing fine-grained security policies to be applied to applications. In previous releases an application like a web server could be explicitly granted access to administrative ports (under 1024), in this release that can be further restricted to specific ports (80,443). These policies can be configured using the new `profiles` auto-complete command.

Enhanced Exploit Mitigation

Solaris now provides two new mechanisms for exploit mitigation. The first is Address space layout randomization (ASLR) , which differs the program memory address layout preventing some types of overflow attacks. This is a configurable per executable to allow multi-process

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applications using shared memory to operate correctly. This can be set using the new `sxadm` command; selected shipped binaries will enable this by default.

Secondly, Oracle Solaris now supports Supervisory Mode Execution Prevention (SMEP) when running on Intel processors; this prevents user memory from being executed when running in a privileged/kernel mode. This is automatic with no configuration needed.

PAM Enhancements

Per-User Authentication Policy via PAM - This feature adds the ability to configure the PAM stack on a per-user basis as an alternative to the current system-wide stack. An example use case would be to require high-level administrators to use two-factor authentication, while normal users would log in normally. This new PAM policy can be specified either in a user's extended attributes [see `user_attr`(4)] or in a profile assigned to the user using the new `pam_policy` keyword and a new PAM service module named `pam_user_policy`(5).

PAM Directory Configuration - There is now support for Pluggable Authentication Module (PAM) configuration using a directory hierarchy and per-service files in `/etc/pam.d/`. This allows better modularity of PAM components for packaging and is more interoperable with other PAM implementations. The traditional mechanism of configuring PAM via the single `/etc/pam.conf` configuration file is supported and searched first.

SunSSH – FIPS 140-2

SunSSH supports Federal Information Processing Standard (FIPS) 140-2. A new option has been added to `ssh(1)` and `sshd(1M)` for configuring execution in FIPS-140 mode. Refer to *System Administration Guide: Security Services*, `ssh(1)`, and `sshd(1M)` for information about this feature.

Cryptographic Enhancements

sha2(3EXT) and libmd(3LIB) - Implements NIST approved SHA variants SHA512/224 and SHA512/256 described in Federal Information Processing Standard (FIPS) Publication 180-4, Secure Hash Standard (SHS).

SHA-224 - The Solaris Cryptographic Framework introduces support for SHA-224, the SHA-2 hash algorithm variant for 224-bit digests. SHA-224 is available as a standalone hash algorithm and as part of the PKCS#11 cryptographic library implementation.

Performance Enhancements – Various performance enhancements to speed up cryptographic operations on both Intel and SPARC hardware platforms.

Kerberos Support for Multiple Master Key Distribution Centers

Oracle Solaris Kerberos now supports multiple master key distribution centers (KDCs), such as Active Directory, when changing a Kerberos principal's password. See the `krb5.conf`(4) man page sections describing `admin_server` and `kpasswd_server` for more information.

High-Performance SSH/SCP

SunSSH has been enhanced to increase performance of SSH bulk transfer over high bandwidth, high latency links.

Security Evaluations

Oracle Solaris is currently "In evaluation" under both a FIPS 140-2 Solaris Cryptographic Framework Evaluation and a Common Criteria Operating System Protection Profile evaluation at EAL 4+. More information can be found at http://www.oracle.com/technetwork/topics/security/security-evaluations-099357.html.

Security – Trusted Extensions and Multi-level Security

Oracle Solaris enhances support for high assurance environments, extending the current multi-level security features to meet governmental security needs. These features are traditionally implemented using hierarchal security labels that reflect sensitivity (secret, top secret, etc). "Trusted" features are an integrated part of Solaris and built into the operating system and not bolted on. For more information, see the *Oracle Solaris Trusted Extensions Configuration and Administration* guide.

Support for Oracle Solaris Cluster

Labeled security/Trusted Extensions mechanisms are now supported when using Oracle Solaris Cluster 4.1.

Per File Security Labeling / Multilevel ZFS

Multilevel ZFS provides the capability for individual file security labeling in addition to the current zone based labeling. This allows multiple labels to be used (and enforced) within a zone. This assists in migration from Trusted Solaris 8 environments.

Labeled Networking – CALIPSO for IPv6

Oracle Solaris now implements the IETF IPv6 CALIPSO protocol option alongside the current Trusted Extensions IPv6 CIPSO. By default, IPv6 will be enabled on Trusted Extensions systems using CALIPSO as the security labeling protocol.

Primary and Secondary Labeled Zones

Labeled zones can now share a common label, as opposed to previously requiring a unique label. This feature provides greater flexibility when configuring the security policy for labeled zones. For example, two zones with the same label can have different services enabled, different multilevel port policies, different privilege limits, and different network policies.

For backward compatibility, zones that previously had unique labels are referred to as primary labeled zones. Additional zones that are sharing the label of a primary labeled zone are called secondary labeled zones.

Trusted Networking Extended Policy

Trusted Networking Extended Policy extends the Oracle Solaris Trusted Extensions label policy specification to include networking interfaces. It allows system administrators to assign security labels to network interfaces in the same manner as the host label specification. This new feature helps to ensure that systems on same network use the same label policy. It also greatly increases the flexibility and scalability of trusted network deployment. See the

`tncfg`(1) man.

Networking

Edge Virtual Bridging (EVB)

EVB extends network virtualization features into the physical network infrastructure allowing users to manage bandwidth and to increase utilization of network resources. EVB is an IEEE standard that defines new protocols and mechanisms for exchanging information about virtual links between hosts/stations and a switch/bridge. Support for the EVB Virtual Station Interface (VSI) Discovery and Configuration Protocol (VDP) and the Edge Control Protocol (ECP) are new in this release.

Using EVB, properties (such as the bandwidth limit) of the Oracle Solaris Virtual NIC (VNIC) can be exchanged with the switch so that the switch can be configured accordingly for the VNIC.

The standard is defined in the IEEE 802.1Qbg specification. Additional information can be obtained from `evb`(7P), `vdpd`(1M), and `dladm`(1M).

Data Center Bridging (DCB)

DCB allows the same network fabric to be used for both Ethernet and storage traffic reducing overall infrastructure costs in a datacenter. Support for enhanced transmission selection (ETS) based on IEEE 802.1Qaz has been added to the DCB functionality introduced in Oracle Solaris 11 11/11. This will provide guaranteed bandwidth and lossless Ethernet transport for converged network environments where storage protocols share the same fabric as regular network traffic.

Oracle Solaris Link Aggregation to Span Across Multiple Switches

Link aggregation support in Oracle Solaris 11, being 802.3ad–compliant, does not allow aggregations to span across multiple switches. Thus, an administrator can either work with a single switch configuration (availability might suffer since the switch becomes a single point of failure) or use vendor-specific mechanisms to explicitly configure switches.

This feature extends Oracle Solaris link aggregation to provide for a solution that is independent of the switch vendor to span aggregations across multiple switches.

VNIC Migration

Associations between Physical NICs (PNICs) and Virtual NICs (VNICs) can now be changed without an outage in the network configuration. For example, if a PNIC becomes saturated, a VNIC associated with one key application can be migrated across to another PNIC (one with available bandwidth) without taking an outage.

InfiniBand: RDS SMF service

RDS provides high-bandwidth, low-latency, and reliable interprocess communication over InfiniBand based on the RDS socket API version 3 protocol. In Oracle Solaris 11.1 this enhances performance of the InfiniBand fabric in Engineered Systems such as the SPARC

SuperCluster. The RDS service can be enabled or disabled by a new SMF service. This feature can be applied to non-global zones in addition to the global zone, and the driver can be removed using the `modunload`(1M) command after all RDS services in the zones are disabled.

Data Management

Federated File System (FedFS)

The Oracle Solaris 11 11/11 release included a new NFS feature called NFSv4 referrals. Referrals are a way for an NFSv4 server to point to file systems located on other NFSv4 servers, as a way of connecting multiple NFSv4 servers into a uniform namespace. They are useful when you want to create what appears to be a single set of file names across multiple servers, and you prefer not to use `autofs`(4) to do this. This forms the basis for FedFS (Federated File System) – a single unified namespace spanning multiple servers where client access is seamlessly redirected when looking up or modifying (NFS) data

The Oracle Solaris 11.1 release adds support to the existing `nfsref`(1M) command to create and manage FedFS-based referrals, as well as related management tools. Administrators can publish new and existing file systems into a single namespace with these tools.

See the manual *Managing Network File Systems* and the following man pages for more information: `nfsref`(1M), `reparsed`(1M), `libreparse`(3LIB), and `reparse_add`(3).

Group Availability with `AUTH_SYS` and NFS

When a system is configured such that a user can belong in more than 16 groups, the NFS server will make these groups available as if they were sent over the wire by using look-aside groups using the name service.

`suriadm`: Administer Shared Objects Based on Storage URIs

To simplify connecting shared storage to Zones Solaris 11.1 provides the `suriadm` command to handle the mapping of storage URI naming to system devices. It also provides other utility functions for mapping storage devices via protocols including including iSCSI and FibreChannel.The `suriadm` command-line administration tool allows system users to manage storage objects via storage URIs. The command allows users to parse, map, unmap, and query the state of mappings and look up storage URIs. See `suriadm`(1M) and `suri`(5) for more information.

ZFS File Sharing Improvements

The ability to share ZFS file systems has been improved with the following primary enhancements:

- A file system can be shared by setting the new `share.nfs` or, for CIFS, the share.smb property.
- There is better inheritance of share properties to descendent file systems.

For example, if you share a parent file system, the descendent file systems are shared automatically:

```
# zfs set share.nfs=on tank/home
name=tank_home,path=/tank/home,prot=nfs
name=tank_home_user1,path=/tank/home/user1,prot=nfs
```

```
                              name=tank_home_user2,path=/tank/home/user2,prot=nfs
```

If you set a new share property on the parent file system, the new share property is
automatically set on the descendent file systems, for example:

```
# zfs set share.nfs.nosuid=on tank/home
name=tank_home,path=/tank/home,prot=nfs,nosuid=true
name=tank_home_user1,path=/tank/home/user1,prot=nfs,nosuid=true
name=tank_home_user2,path=/tank/home/user2,prot=nfs,nosuid=true
```

Support for Removable `lofi` Device

With a removable `lofi` device, you can change the disk image file without deleting the
`lofi` device or map one disk image file to multiple `lofi` devices at the same time in a
read-only manner. For more information, see the `lofiadm`(1m) man page.

iSCSI Optimization Using SPARC T4 Hardware CRC32 Instruction

Oracle's SPARC T4 CPU supports CRC32 instructions in hardware. This feature is utilized by
the Oracle Solaris iSCSI initiator pseudo driver to accelerate the CRC32 algorithm. This
feature improves the iSCSI data throughput while reducing CPU utilization. For more
information, see the SPARC T4 documentation.

Kernel/Platform Support

Oracle Solaris 11.1 has been architected to provide support for massive compute and memory
capacity, virtualization, and reliability, availability, and serviceability (RAS) for new
hardware systems. In turn, Oracle software running on the combination of Oracle hardware
and Oracle Solaris can leverage the many system-level enhancements to deliver optimized
performance.

For example, the virtual memory subsystem has been redesigned to scale to support
configurations in the 100TB range and is envisaged to support rapid instantiation and efficient
operation of massive databases. Some of the immediate benefits delivered in Oracle Solaris
11.1 include the memory predictor which monitors large memory page use and adjusts the size
of the memory pages to better match application needs, providing improved performance, and
Optimized Shared Memory (OSM). With OSM, the Database System Global Area (SGA) can
be resized online without a reboot and Database startup and shutdown is 8x faster.

In the kernel itself, there has been a long history of improvements to benefit Oracle software,
the latest being acceleration for Oracle RAC where improvements in lock management are
expected to yield up to 20 percent throughput improvement over Oracle Solaris 11 11/11.

Integrated Support for Oracle VM Server for SPARC

Oracle VM Server for SPARC 2.2 is now in the IPS repository for Oracle Solaris 11.1. This
facilitates installation and maintenance for SPARC T-Series servers. Please see the *Oracle VM
Server for SPARC 2.2 Administration Guide* for further details.

Power Management

The Power Aware Dispatcher (PAD), which was originally implemented for x86 systems, is
now available on sun4v platforms such as the SPARC T4 Servers, ensuring reduced power
consumption for idle CPUs. The feature is on by default and can be disabled using
`poweradm`(1M).

Power Management and Oracle VM Server for SPARC

Power Management (PM) policy information is communicated between the Oracle Solaris kernel and the hardware platform as set in the Oracle Integrated Lights Out Manager (Oracle ILOM). This feature coordinates PM policy information between the Oracle Solaris PM Resource Manager and the PM Resource Manager for Oracle VM Server for SPARC. The Oracle Solaris interface to this capability is the existing `poweradm`(1) interface. The default Oracle Solaris PM policy will now be based on the platform PM policy, and the platform PM behavior will honor Oracle Solaris guest PM policies set by `poweradm`(1M).

Single-Root I/O Virtualization

As enterprises push for better returns through higher consolidation ratios and the virtualization of all their applications, software-emulated I/O is rapidly becoming a limiting factor for virtualization. The demand to virtualize I/O–intensive applications, such as the database, and technical/compute–intensive applications and to move to a fully virtualized, dynamic data center requires an I/O architecture that can deliver near native performance, increased throughput, and flexibility. Oracle Solaris 11 introduced support for the single-root I/O virtualization (SR-IOV) framework, which defines extensions to the PCI Express (PCIe) specification to allow efficient sharing of PCIe devices among virtual machines, both in hardware and software. Support for a number of I/O devices that are capable of SR-IOV has been added in Oracle Solaris 11.1.

x86 Platform

Oracle Solaris continues to support the latest-generation Intel and AMD CPUs along with FMA enhancements and driver developments to ensure Oracle Solaris can leverage the latest system designs. Check the Oracle Solaris 11 Hardware Compatibility List for a full list of systems supported with this release.

Improved Hardware Support

There is a new default boot loader on x86 platforms. GRUB 2 is now the default boot loader on x86 platforms and provides full support for booting from disks that are larger than 2 TB. In addition, GRUB 2 supports the UEFI-specified, GPT partitioning scheme. GRUB 2 introduces several changes to how systems are booted and how the x86 boot loader is managed, including the following key changes:

- Configuration: The GRUB 2 configuration is syntactically different from the GRUB Legacy configuration. The `menu.lst` file used by GRUB Legacy has been replaced by a new configuration file, the `grub.cfg` file. Unlike the `menu.lst` file, the `grub.cfg` file uses a more complex syntax and is, therefore, not intended to be edited by a user. Another reason the file should not be manually edited is because certain processes and commands trigger an automatic regeneration of the file, and any edits would subsequently be overwritten.

- Partition indices and device naming: GRUB 2 uses 1-based indices for partition indices and a changed device naming scheme.

- Boot loader and GRUB menu administration: Several new `bootadm` subcommands for managing the boot loader and the GRUB menu have been introduced. All of the administrative tasks that were done previously by editing the `menu.lst` file are now performed by using these new `bootadm` subcommands.

See `bootadm`(1M).

- GRUB screens and menus: Some procedures, for example, editing the GRUB menu at boot time, work slightly different in Oracle Solaris 11.1. For more information about the differences between GRUB 2 and GRUB Legacy, see *Booting and Shutting Down Oracle Solaris 11.1 Systems*.

UEFI-Based System Installations

UEFI stands for "Unified Extensible Firmware Interface". It is an industry initiative to modernize the booting process. Oracle Solaris 11.1 now supports installation to x86 systems with UEFI firmware. The latest version of the Grand Unified Boot Loader, GRUB 2 has been added as the default x86 boot loader, which not only supports UEFI-specified, GPT partitioning schemes, but also disks that are larger than 2 TB.

Note that UEFI firmware of version 2.1 or later is required and that such firmware functionality is not available on SPARC platforms.

SAS2 HBA Support in `pmcs` Driver

The SG-XPCIESAS-GEN2-Z HBA (Host Bus Adapter) is based on the SPCv 8018 chip from PMC-Sierra. The `pmcs` driver, which currently supports the previous generation HBA (based on the SPC 8001 chip), has been updated to support the new device. The card is SAS2.1-compliant and has 16 phys capable of operating at 6 Gb/sec. The driver continues to use SCSAv3 interfaces.

NUMA I/O Topology Information for Non-Global Zones

This feature provides local zones with access to the NUMA I/O topology of the system by providing a new `-d` option to the `lgrpinfo`(1) command. Users can provide a device path to `lgrpinfo`(1) and can get the IDs of the lgroups that are closest to the device. This enables customers to determine the NUMA I/O topology of the system from inside local zones. The man page for `lgrpinfo`(1) has more details on how to use the feature.

Improved Viewing of Per-CPU Statistics

The performance analysis commands `mpstat`(1m), `cpustat`(1m), and `trapstat`(1m) provide a line of statistics output for each CPU. If there is a large number of CPUs, there is far too much data for a person to interpret, which makes it difficult to spot the interesting and relevant data. New options have been added to sort, aggregate, and display the data in a more condensed format.

For more information, see the new options described in the man pages for each command.

Network Drivers

Driver for Sun Netra 6000 Virtualized 40 GbE NEM

Oracle's new 40 GbE NEM features the next-generation PCI switch with 10Gb/40Gb networking interface all on one chip. It supports PCIe Gen2 speeds, SR-IOV, and 1x40Gb or dual 10Gb/1Gb Ethernet network interfaces. As a shared device, it supports up to 12 PCIe uplinks; so 12 blades can be connected in a C48 chassis, or 10 blades can be connected in a C10 chassis. On the downstream, it connects the two NIU (2x10Gb, or 1x40Gb) interfaces.

The `sxge` driver attaches to the NIU devices (PCI vendor-id 0x108e, device-id 0x2078) providing support for the latest in high-bandwidth networking.

Continual Improvement of Network Device Drivers

The driver for the Broadcom NetXtreme NIC (`bnx`) is now available for the SPARC platform and has been enhanced to include fault management and fast reboot capabilities.

The `ixgbevf` driver now includes SR-IOV support for the for Intel "Twinville" Ethernet Controller X540.

New USB 3.0 Support

To support USB 3.0 high-speed data transfer in new systems, the USB host controller driver, `xhci`(7D), ensures hub and mass-storage devices now can work in the USB 3.0 mode when they are inserted into xHCI ports. Legacy USB devices continue to work when they are connected to xHCI ports with the exception of USB audio/video devices. Please refer to the `xhci`(7D) and `usba` (7D) man pages for details.

User Environment

Unicode 6.0 Support in CCK Locales

The locale common method shared object supports Unicode 5.1 now. The goal is to support new characters of Unicode 6.0 for CCKT locales (CCK locales include the UTF8 locale for Simplified/Traditional Chinese, Korean, and Thai.)

Phrase Query

The `man` command with the `–k` or `–K` option takes a query phrase and returns a list of pages matching the query. It is a more effective query, distinct from term query, to help users quickly find the man page of interest.

For more information, see the `man`(1) man page.

Sound System Enhancement

The PulseAudio sound server has been introduced; see `pulseaudio`(1)**.** Additional information can be found at http://pulseaudio.org.

`libidnkit`(3)

The idnkit-1.0 library and utilities in Oracle Solaris have been updated to the latest version 2.1.

Recently the Internationalized Domain Names for Applications 2003 (IDNA2003) RFCs that were supported with the idnkit-1.0 library have been obsoleted and replaced with the new IDNA2008 RFCs. Consequently, JPRS (Japan Registry Services Co., Ltd.) also updated their idnkit library and released the new version to support the IDNA2008.

This update will also transparently update the existing iconv code conversion modules between ACE/ACE-ALLOW-UNASSIGNED and UTF-8 to adopt the IDNA2008 standard.

References:

- RFC 5890, "Internationalized Domain Names for Applications (IDNA): Definitions and Document Framework": http://www.ietf.org/rfc/rfc5890.txt

- RFC 5891, "Internationalized Domain Names in Applications (IDNA): Protocol": http://www.ietf.org/rfc/rfc5891.txt

- RFC 5892, "The Unicode Code Points and Internationalized Domain Names for Applications (IDNA)": http://www.ietf.org/rfc/rfc5892.txt

- RFC 5893, "Right-to-Left Scripts for Internationalized Domain Names for Applications (IDNA)": http://www.ietf.org/rfc/rfc5893.txt

- RFC 5894, "Internationalized Domain Names for Applications (IDNA): Background, Explanation, and Rationale": http://www.ietf.org/rfc/rfc5894.txt

- RFC 5895, "Mapping Characters for Internationalized Domain Names in Applications (IDNA) 2008": http://www.ietf.org/rfc/rfc5895.txt

- "Unicode Technical Standard (UTS) #46: Unicode IDNA Compatibility Processing": http://www.unicode.org/reports/tr46/

News for Developers

A growing set of tools and resources is available to developers to help develop and certify new applications and to validate existing applications for deployment on Oracle Solaris 11.

- Oracle Solaris Preflight Applications Checker: www.oracle.com/technetwork/server-storage/solaris11/downloads/preflight-checker-tool-524493.html

- Oracle ExaStack Labs: Available to Oracle Partner Network Gold-level members for application certification www.oracle.com/partners/en/opn-program/oracle-exastack/labs/exastack-enablement-resources-411633.html

- Oracle Solaris Studio: www.oracle.com/technetwork/server-storage/solarisstudio/overview/index.html

- Integrated Java Virtual Machine (JVM): Updates are now managed using the Image Packaging System (IPS)

Migration guides and technology mapping tables for AIX, HP-UX and Red Hat Linux: http://www.oracle.com/technetwork/systems/solaris-developer/index.html

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For More Information

Take advantage of the key Oracle Solaris resources that are available:

Oracle Solaris 11.1 download	http://www.oracle.com/technetwork/server-storage/solaris11/downloads/index.html
Oracle Solaris 11.1 main product page	http://www.oracle.com/technetwork/server-storage/solaris11/overview/index.html
Oracle Solaris 11.1 Technology Spotlights page	http://www.oracle.com/technetwork/server-storage/solaris11/technologies/index.html
Oracle Solaris 11.1 documentation	http://www.oracle.com/technetwork/server-storage/solaris11/documentation/index.html
Oracle Solaris 11.1 training	http://www.oracle.com/technetwork/server-storage/solaris11/training/index.html
Oracle Solaris 11.1 support	http://www.oracle.com/technetwork/server-storage/solaris11/training/index.html#q3
"Oracle Solaris 11 11/11—What's New"	http://www.oracle.com/technetwork/server-storage/solaris11/documentation/solaris11-whatsnew-201111-392603.pdf
Oracle Solaris 11 how-to guides and white papers	http://www.oracle.com/technetwork/server-storage/solaris11/learnmore/index.html
Oracle Solaris Cluster page	http://www.oracle.com/technetwork/server-storage/solaris-cluster/index.html
Oracle Solaris Studio page	http://www.oracle.com/technetwork/server-storage/solarisstudio/overview/index.html
Oracle Enterprise Manager Ops Center page	http://www.oracle.com/technetwork/oem/ops-center/index.html
Oracle Solaris blog	https://blogs.oracle.com/solaris/
OTN Garage blog	https://blogs.oracle.com/OTNGarage/category/Solaris
Oracle Solaris information on Oracle.com	http://www.oracle.com/solaris

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Content of the Update

Here is a list of all new packages in Oracle Solaris 11.1:

Name	Summary
backup/rdiff-backup-26	Local/remote mirror and incremental backup utility
backup/rdiff-backup-27	Local/remote mirror and incremental backup utility
cde/locale	CDE localization runtime environment
compress/xz	XZ Utils - loss-less file compression application and library.
developer/astdev93	AT&T AST development utilities
developer/build/automake	A Makefile generator
developer/build/automake-111	A Makefile generator
developer/java/jdepend	Java Design Quality Metrics
developer/java/jpackage-utils	JPackage utilities
developer/lexer/jflex	Fast Scanner Generator
developer/parser/byaccj	Parser Generator with Java Extension
developer/parser/java_cup	Java source interpreter
developer/python/pylint-26	pylint - python code static checker
developer/python/pylint-27	pylint - python code static checker
developer/versioning/mercurial-26	The Mercurial Source Control Management System
developer/versioning/mercurial-27	The Mercurial Source Control Management System
driver/graphics/mga	MGA Graphics for SPARC ILOM device driver
driver/management/ipmi	OpenIPMI compliant Baseboard Management Controller
driver/storage/lsc	LSI MPT SAS 3.0 HBA driver
image/graphviz/graphviz-python-27	Python 2.7 bindings for Graphviz
library/audio/pulseaudio	Sample Rate Converter for audio
library/java/java-demo	Java Sample and Demonstration Applications (VERSION) java -version will display 1.7.0_07-b10
library/json-c	JSON Implementation in C
library/libedit	Libedit - Command line editor library
library/libee	event expression library
library/libestr	extended string handling library
library/liblouis	Support for contracted braille
library/liblouisxml	Support for braille transciption services for XML documents.
library/perl-5/openscap-512	Perl 5.12 bindings for the Open implementation of SCAP
library/python-2/cherrypy-27	Pythonic, object-oriented HTTP framework
library/python-2/coverage-27	The coverage.py Python code coverage tool
library/python-2/jsonrpclib	Python implementation of JSON-RPC v2.0
library/python-2/jsonrpclib-26	Python implementation of JSON-RPC v2.0
library/python-2/jsonrpclib-27	Python implementation of JSON-RPC v2.0
library/python-2/lcms-26	The Little Color Management System
library/python-2/lcms-27	The Little Color Management System
library/python-2/libxml2-27	The XML library - Python 2.7 bindings
library/python-2/libxsl-27	The XSLT library - Python 2.7 bindings
library/python-2/logilab-astng-26	logilab-astng - Python Abstract Syntax Tree New Generation
library/python-2/logilab-astng-27	logilab-astng - Python Abstract Syntax Tree New Generation
library/python-2/logilab-common-26	common python libraries for logilab applications

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library/python-2/logilab-common-27	common python libraries for logilab applications
library/python-2/lxml	Pythonic 2.6 binding for the libxml2 and libxslt libraries
library/python-2/lxml-27	Pythonic 2.7 binding for the libxml2 and libxslt libraries
library/python-2/m2crypto-27	Python interface for openssl
library/python-2/mako-27	Template library written in Python
library/python-2/net-snmp-26	The Net-SNMP - Python 2.6 bindings
library/python-2/net-snmp-27	The Net-SNMP - Python 2.7 bindings
library/python-2/nose	A unittest-based testing framework for python that makes writing and running tests easier
library/python-2/nose-26	A unittest-based testing framework for python that makes writing and running tests easier
library/python-2/nose-27	A unittest-based testing framework for python that makes writing and running tests easier
library/python-2/openscap-26	Python 2.6 bindings for the Open implementation of SCAP
library/python-2/ply-27	Lex and yacc parsing tools for Python
library/python-2/pybonjour-27	Python bindings for bonjour / dns-sd
library/python-2/pycups-26	Python language bindings for CUPS
library/python-2/pycups-27	Python language bindings for CUPS
library/python-2/pycurl-27	Python bindings for libcurl
library/python-2/pyopenssl	Python interface to the OpenSSL library
library/python-2/pyopenssl-27	Python interface to the OpenSSL library
library/python-2/setuptools	Download, build, install, upgrade, and uninstall Python packages easily
library/python-2/setuptools-27	Download, build, install, upgrade, and uninstall Python packages easily
package/pkgbuild	pkgbuild - rpmbuild-like tool for building Solaris packages
print/filter/enscript	A plain ASCII to PostScript converter
runtime/java/jre	Java Platform Standard Edition Runtime Environment (VERSION) java -version will display 1.7.0_07-b10
security/compliance/openscap	Open implementation of SCAP; a line of standards managed by NIST
service/network/evb	IEEE 802.1Qbg EVB support
service/security/key-management/sparc-enterprise	Key management modules for SPARC Enterprise
shell/ksh93	Ksh93 - The AT&T Korn Shell
source/demo/ksh93	KornShell demos
support/explorer	Oracle RDA/Explorer Data Collector
system/desktop/ldtp-27	Linux Desktop Testing Project
system/electronic-prognostics	Electronic Prognostics
system/graphics/fbconfig/fbconfig-mga	MGA Graphics Configuration and Diagnostics Software
system/graphics/sunvts/sunvts-mga	MGA Graphics Diagnostics Software
system/input-method/iiim-xim	IIIM and XIM library Pacakge
system/kernel/oracka	Oracle RAC Kernel Support
system/library/iconv/unicode-core	Core iconv modules for Unicode
system/library/storage/suri	Storage URI support
system/management/rad/module/rad-usermgr	RAD user/role management module
system/management/rad/module/rad-zonemgr	RAD zones module
system/management/visual-panels/doc	Visual Panels - API Documentation
system/management/visual-panels/panel-examples	Visual Panels - Example Panels

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system/management/visual-panels/panel-usermgr	User Manager GUI
system/management/visual-panels/panel-usermgr/locale	Localization for User Management Settings GUI
system/management/visual-panels/panel-zconsole	Zone Console Panel
system/management/visual-panels/panel-zconsole/locale	Localization for Zone Console Settings GUI
system/rsyslog	reliable and extended syslogd
web/php-53	PHP Server
web/php-53/documentation	PHP Server Documentation
web/php-53/extension/php-apc	APC extension module for PHP
web/php-53/extension/php-idn	IDN extension module for PHP
web/php-53/extension/php-memcache	Memcache extension module for PHP
web/php-53/extension/php-mysql	MySQL extension module for PHP
web/php-53/extension/php-pear	PHP Extension and Application Repository
web/php-53/extension/php-suhosin	Suhosin extension module for PHP
web/php-53/extension/php-tcpwrap	Tcpwrap extension module for PHP
web/php-53/extension/php-xdebug	XDebug extension module for PHP
web/php-common	PHP Server
web/server/apache-22/module/apache-php52	PHP Server for Apache Web Server
web/server/apache-22/module/apache-php53	PHP Server for Apache Web Server
web/server/apache-22/module/apache-wsgi	mod_wsgi plugin for Apache Web Server v2.2
web/server/apache-22/module/apache-wsgi-26	Python 2.6 mod_wsgi plugin for Apache Web Server v2.2
web/server/apache-22/module/apache-wsgi-27	Python 2.7 mod_wsgi plugin for Apache Web Server v2.2

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