

Integrating the Oracle Database Appliance with the Sun ZFS Storage Appliance to Achieve High Availability and Security

Hardware and Software
Engineered to Work Together

Disclaimer

- This room is an unsafe harbour
 - No one from **Oracle** has previewed this presentation
 - No one from **Oracle** knows what we are going to say
 - No one from **Oracle** has supplied any of our material
-
- You may rely upon this presentation to make decisions for your enterprise

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Agenda

- Introductions
- Executive Summary
- Puzzle Pieces (HA)
- ODA
 - What and Why
 - Installation
 - Value Adds
- ZFS File System
 - Pooling
 - Redundancy
- ZFS Storage Appliance
- Questions

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Daniel A. Morgan



Oracle ACE Director



Consultant to Harvard University



University of Washington Oracle Instructor, ret.



The Morgan of Morgan's Library on the web



Board Member: Western Washington OUG

- Member of the Compucom Oracle team
- More than 500 RAC clusters built
 - Largest RAC 24 nodes at OOW 2005
 - Largest DB 1.2PB
 - 2 x 10 node clusters w/ DataGuard



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Hans Forbrich



Oracle ACE Director

- First ACE Director in Canada



Oracle University Instructor of the Year 2009-2010

- Owner: Forbrich Computing
 - Consultancy to City of Lethbridge, City of Edmonton, Government of Alberta, ATCO, Alberta Blue Cross ...
- Founder: Shen Group
- Coding since in 1969
- Around Oracle stack since 1984
- Developer, Admin, Operations, Architect, CTO

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Executive Summary

- Never make a technology argument when a financial argument will suffice
 - Your CFO wants to talk about ROI not IOPS
 - Will this technology support our organization's needs?
 - Can we right-size it today and will it scale for tomorrow?
 - Does it meet our regulatory and compliance requirements?
 - What is involved in migrating current operations to it?
 - Can our existing team deploy and maintain it?
 - Can we find qualified technologists who already know it?
 - Can the vendor(s) involved fully support the tech stack?
 - How will this affect our customers?
 - How will this affect our financial position?
 - capital expense to obtain it
 - operating expense to maintain it
 - future retirement expense

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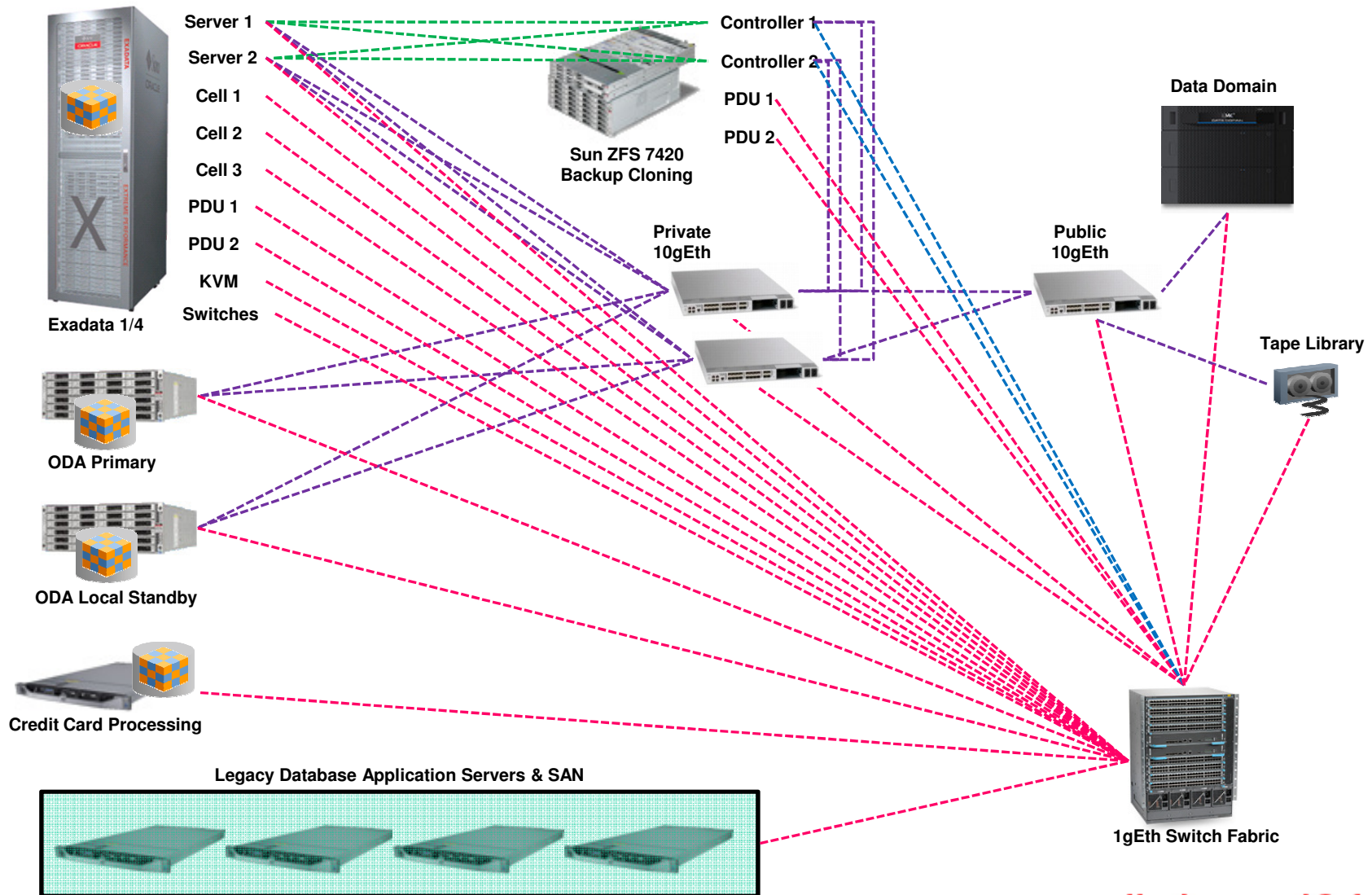
Questions we as IT professionals must answer

- Why does deployment take so long and cost so much?
- Why are we spending so much on support?
- Why does patching so often break something else?
- Why do we spend so much time fighting fires?



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Puzzle Pieces



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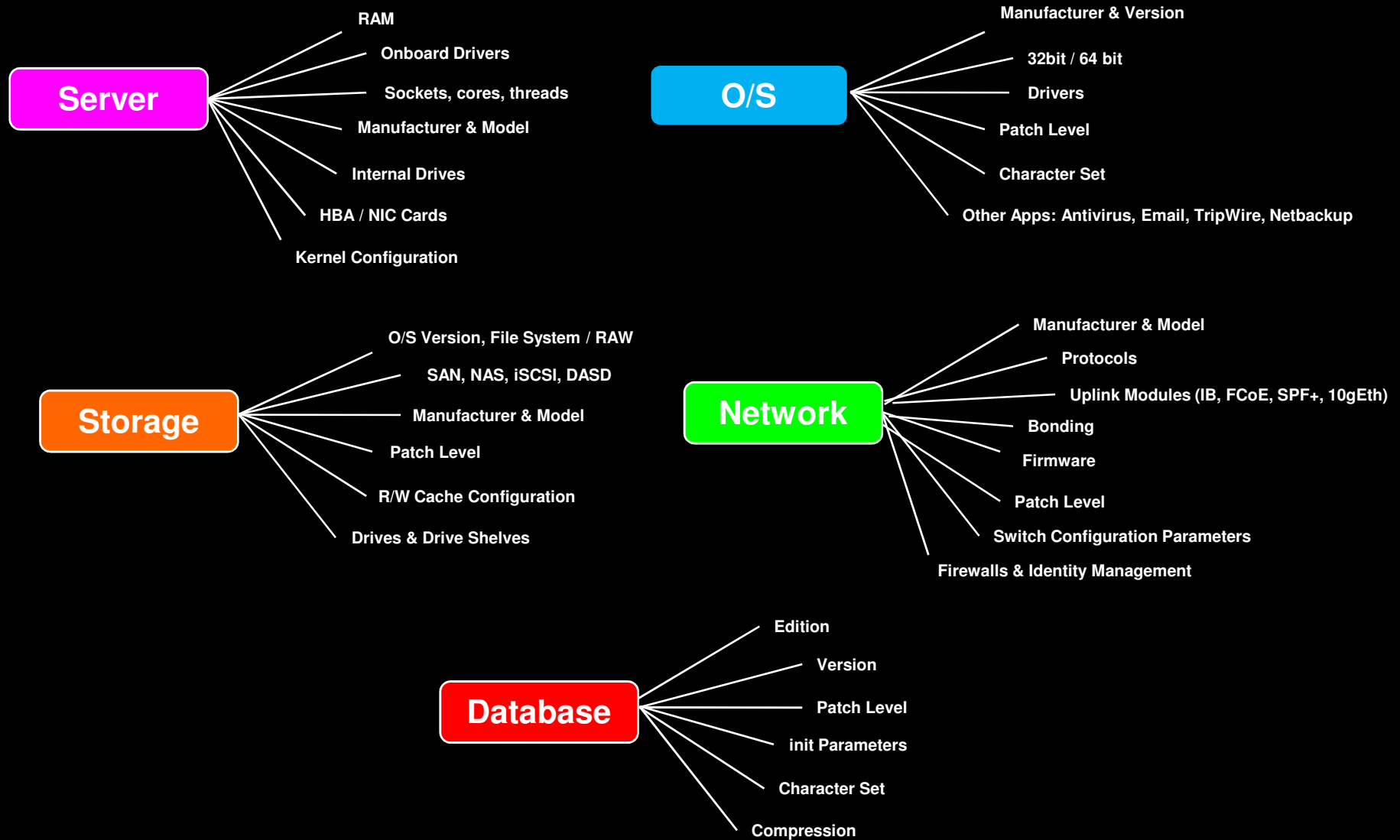
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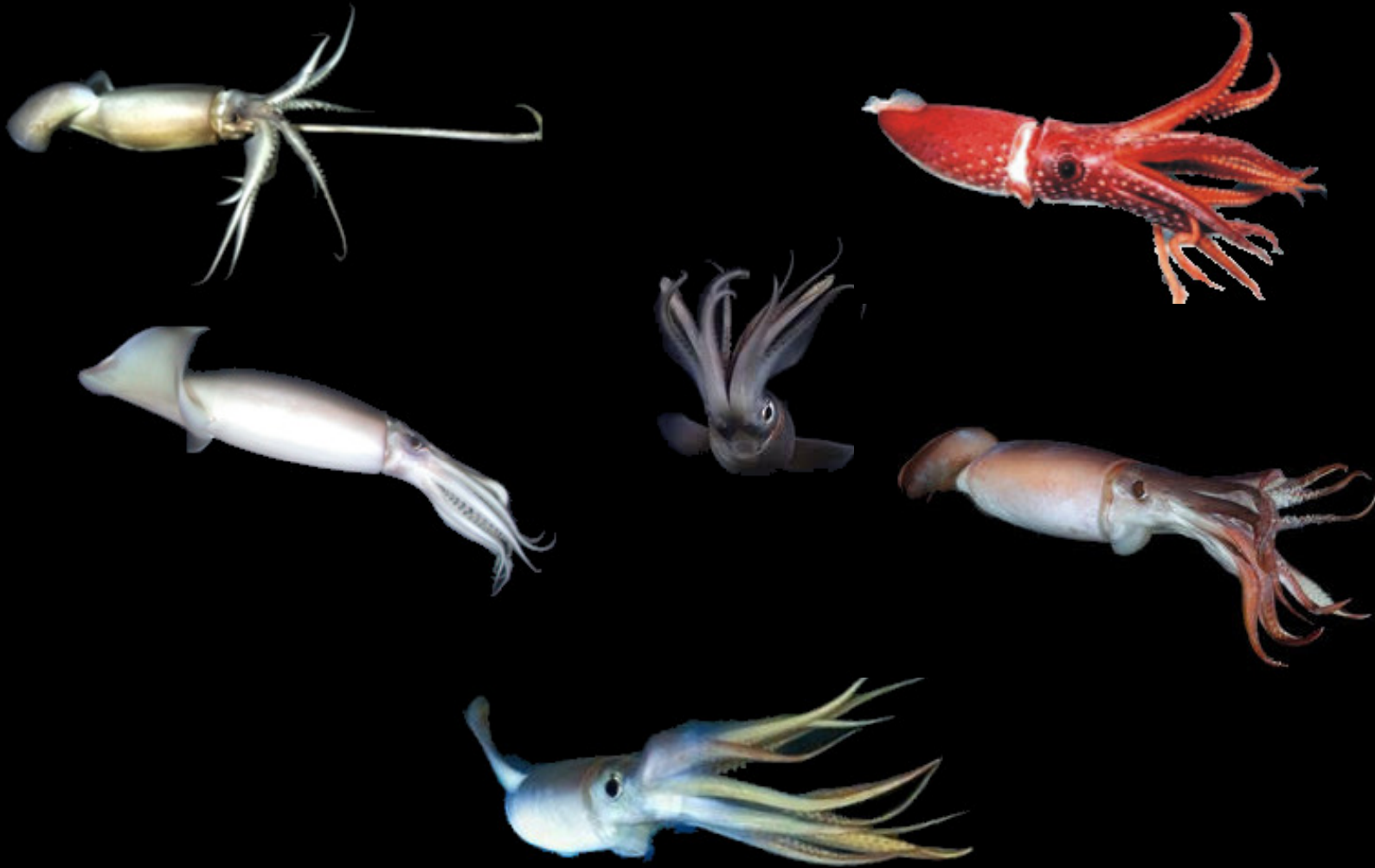
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Static Puzzle Pieces



Animated Puzzle Pieces



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It's hard to embrace a barrel of squid



Puzzle Pieces

- The decisions we've made in the past guarantee that
 - No one has ever built a RAC cluster with our configuration
 - No one has ever applied operating system and firmware patches to our configuration
 - No one has ever patched to our configuration
 - Oracle has never tested and certified our configuration
 - No one in support can exactly duplicate our environment

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LONELINESS

IF YOU FIND YOURSELF STRUGGLING WITH LONELINESS, YOU'RE NOT ALONE.
AND YET YOU ARE ALONE. SO VERY ALONE.

The Solution

make different, and better, decisions

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What is an ODA?

- An appliance
 - A single line on the invoice ... plus the power chords
 - But you get root and sys: The customer is in control
- Announced last year at OpenWorld
- Engineered two server RAC cluster in a 4U case
 - 24 CPU cores
 - 192 GB of RAM
 - 12 TB of direct attached storage with ASM triple mirroring
 - 1TB RAID 1 disks for O/S and Oracle binaries
- One size fits all ... but ...
- License only the resources you need
- Cores licensed dictate all on-board Oracle licensing

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ODA in Pictures



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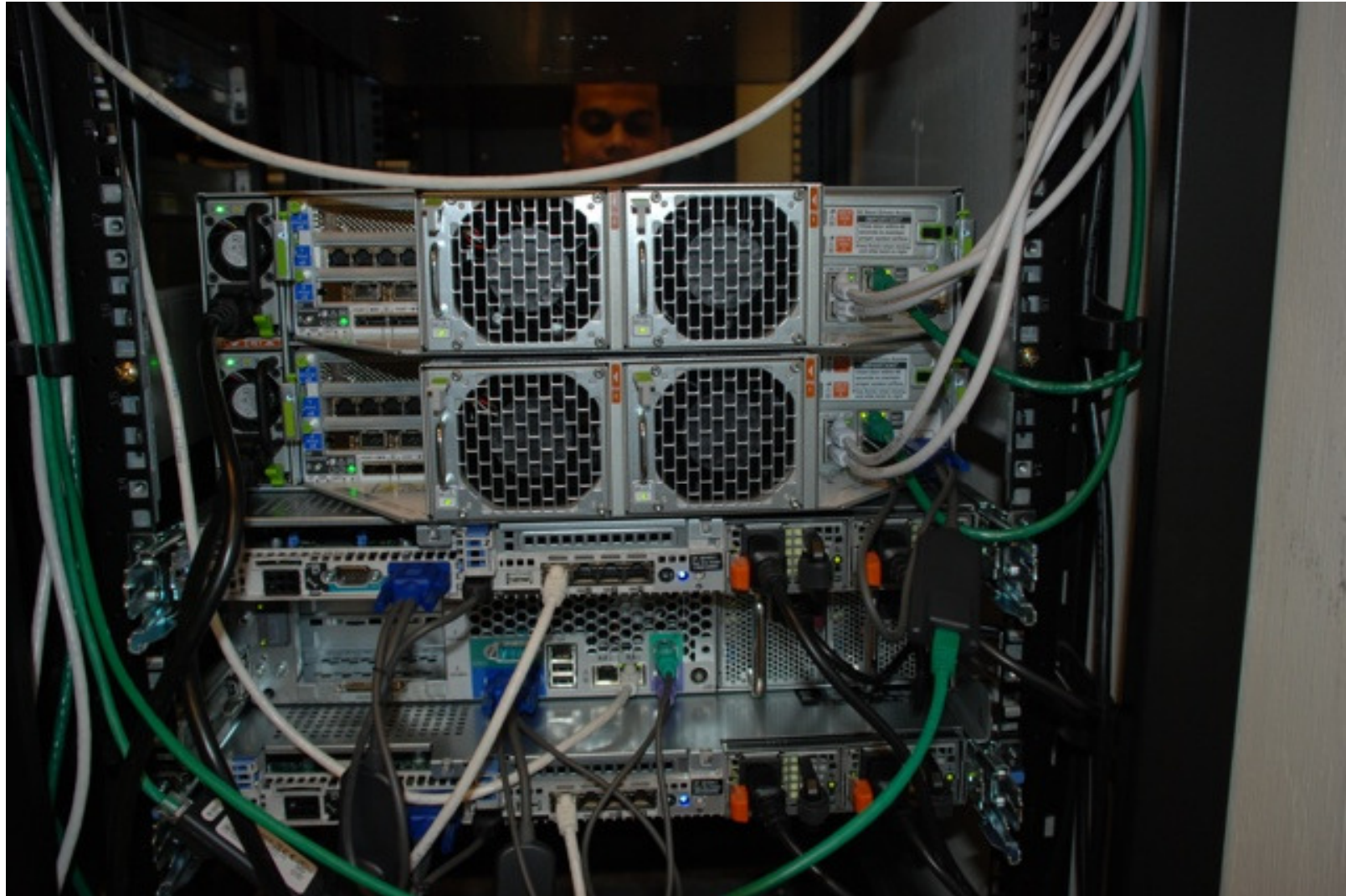
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ODA in Pictures



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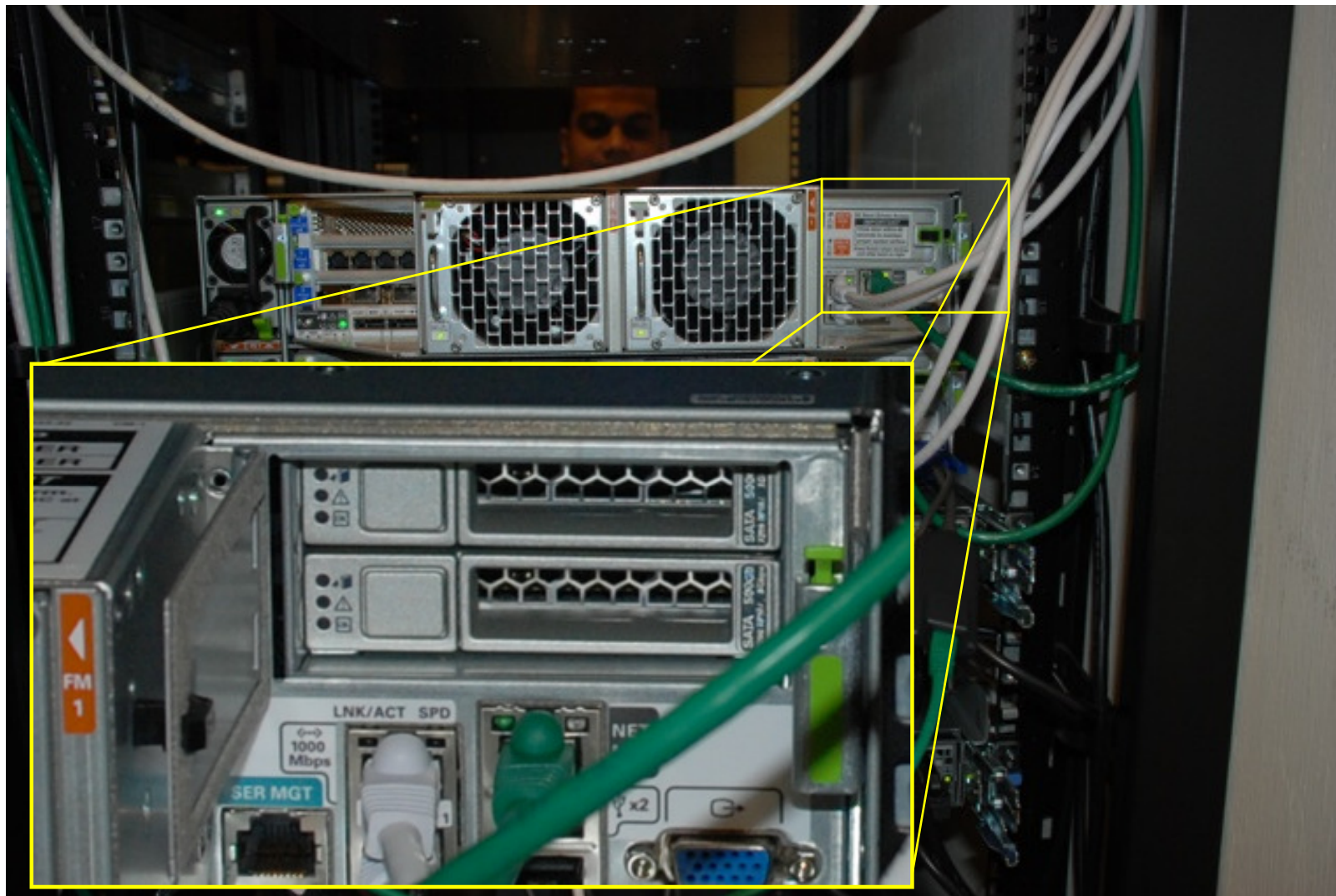
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ODA in Pictures



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Why an ODA?

- Minimize complexity from rack-and-stack through database deployment
- Fewer resources required to deploy
 - UNIX System Admins: not required
 - Network Admins: not required
 - Storage Admins: not required
- Ease of maintenance and patching
 - One patch combines O/S, drivers, networking, infrastructure
 - One patch database
- Supports multiple Oracle databases
- Petabyte storage available with ZFS
- Can form the basis for deploying HA applications in organizations that lack in-depth technical resources

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No rolling patches ... and they are not childproof



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Discussion

Installation

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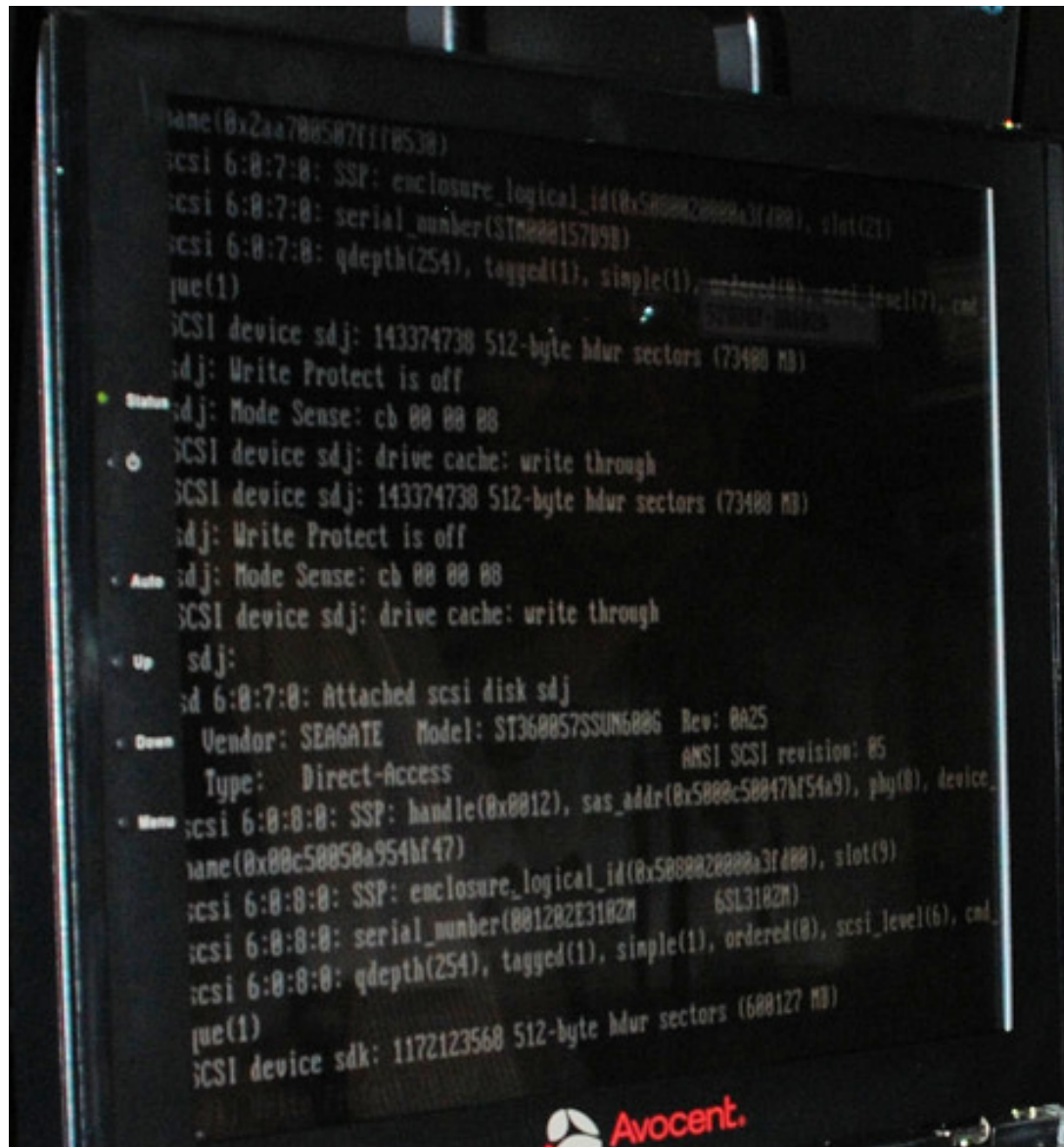
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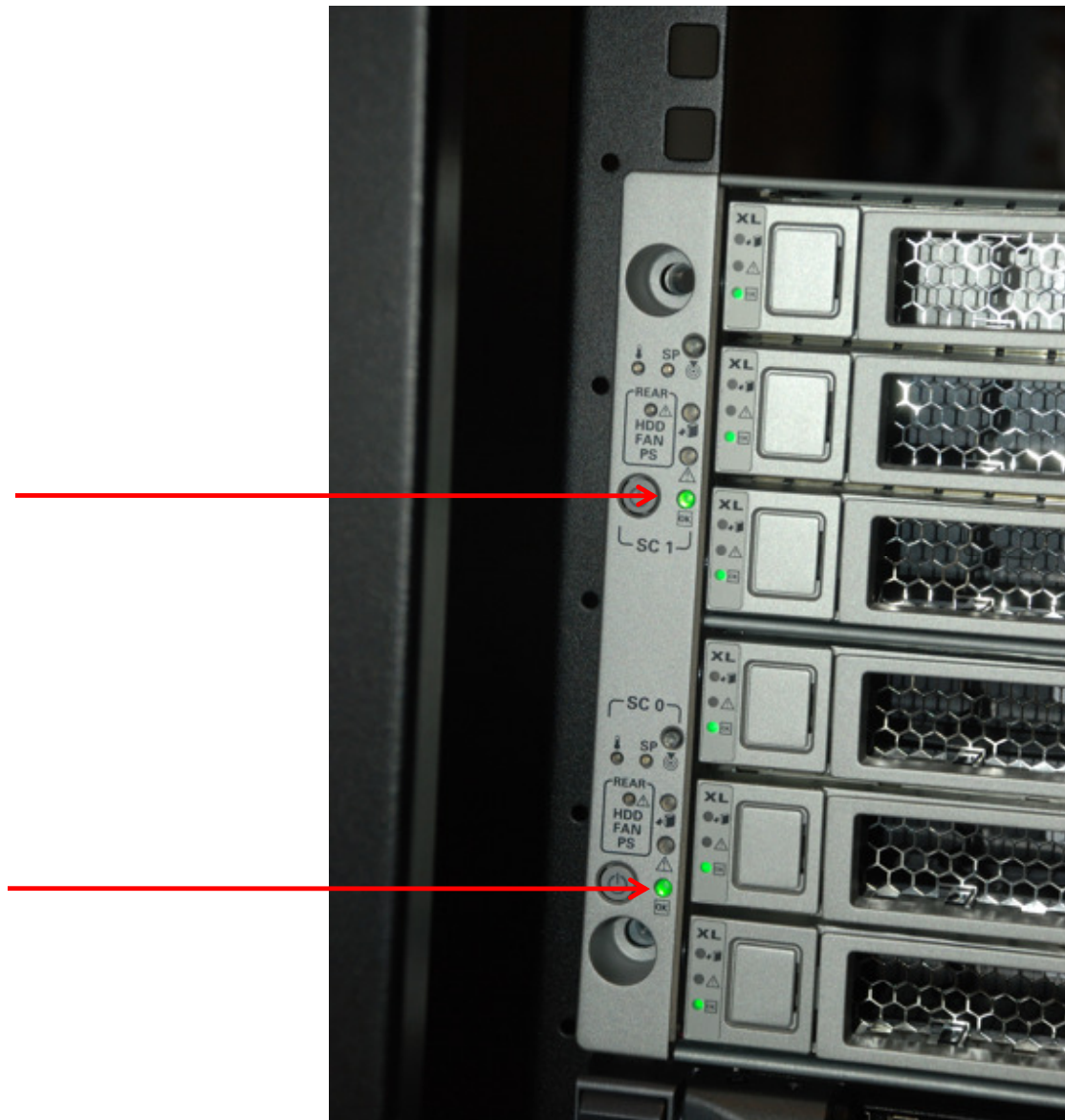
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Step 1: Power On



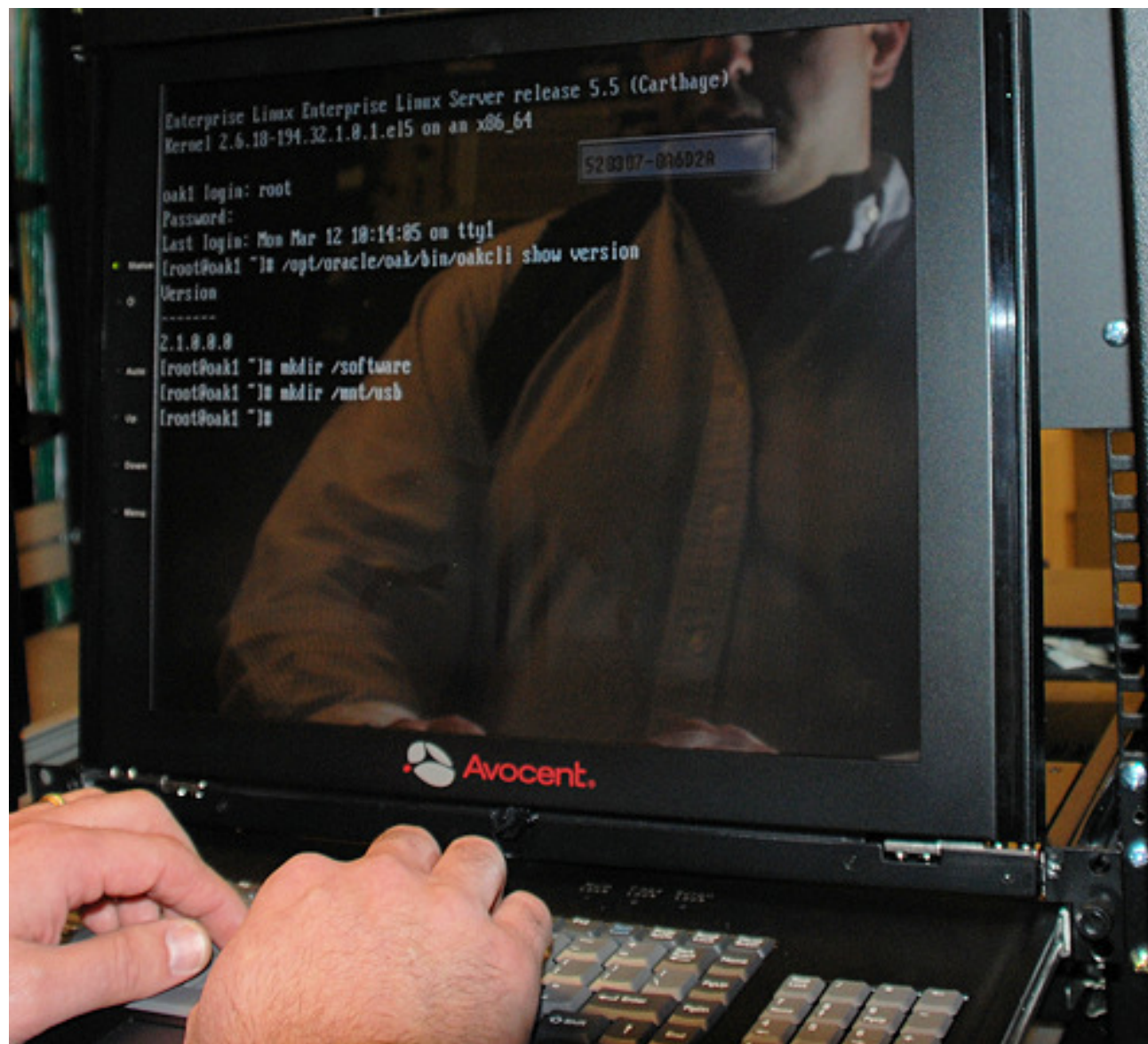
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Step 2: Wait for OK Lights



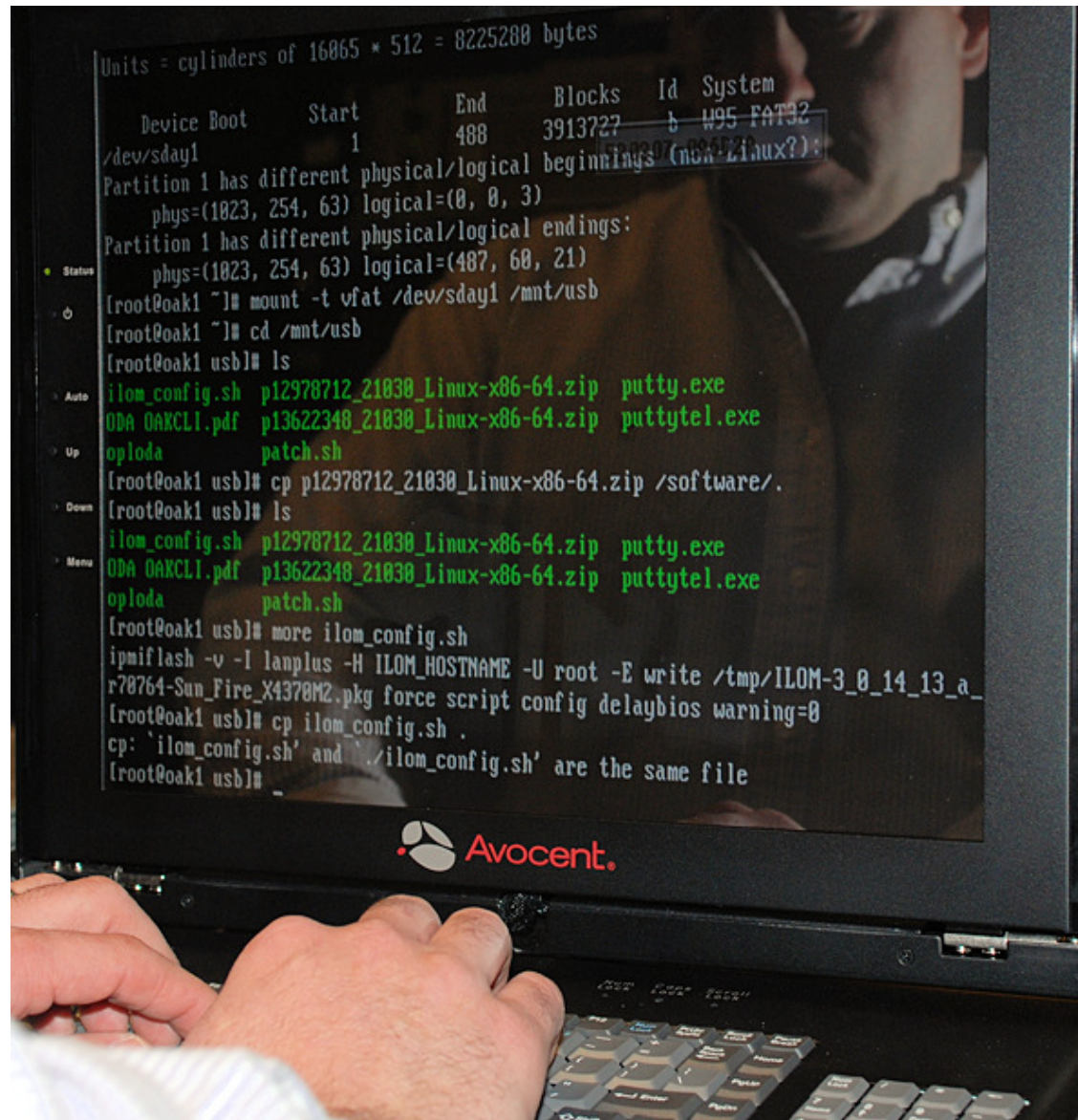
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Step 3: Log In as root



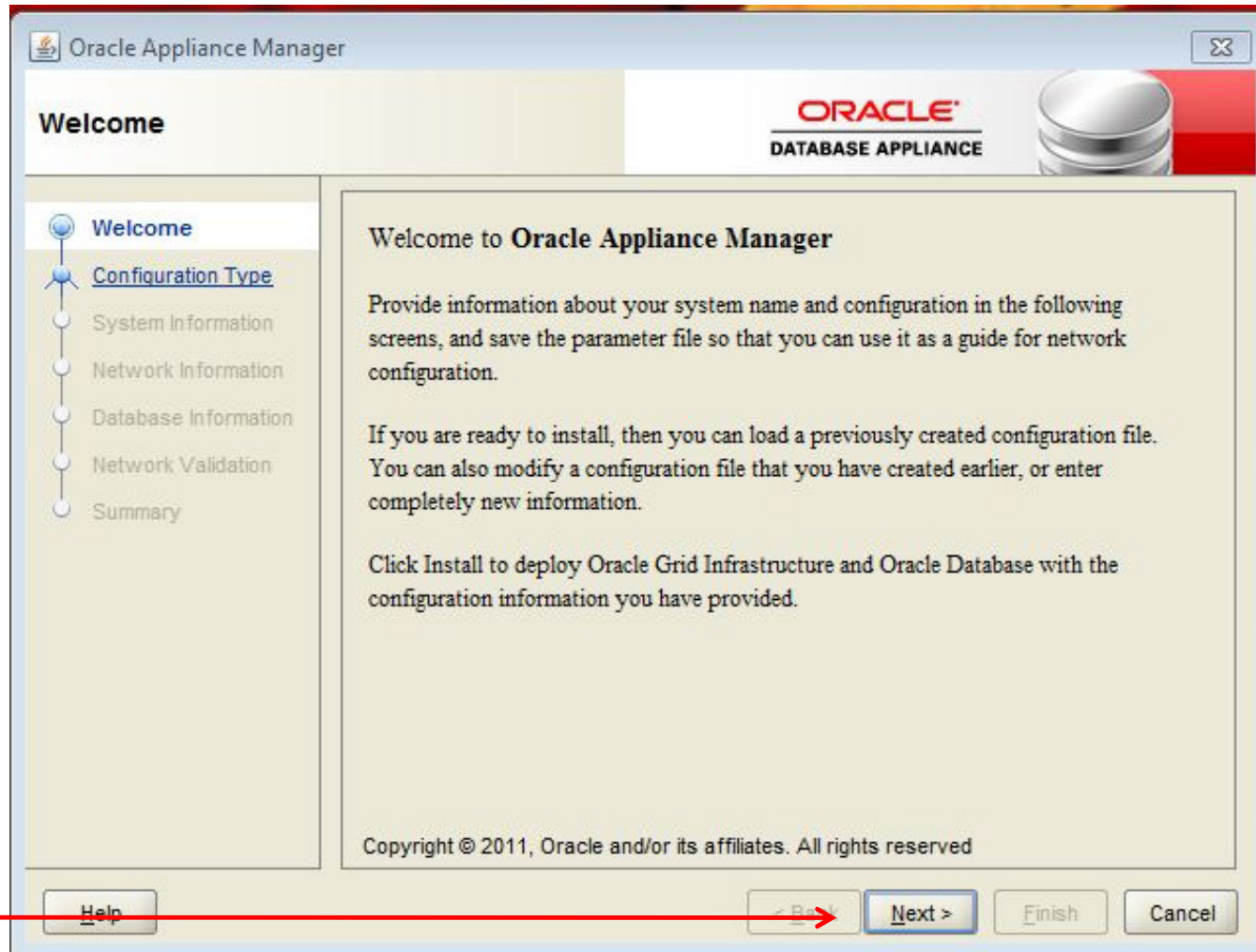
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Step 5: Perform ILOM Configuration



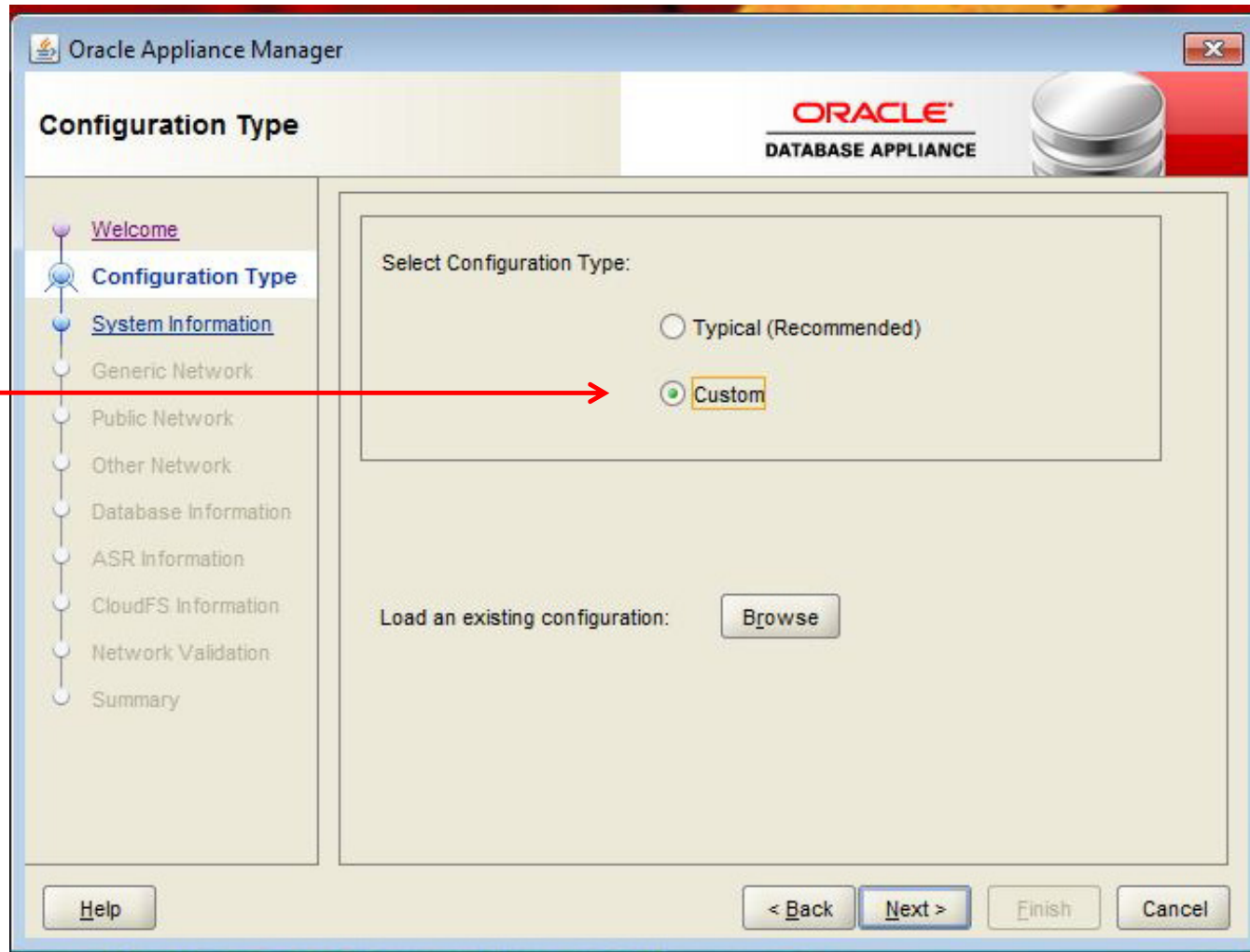
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Install Screens: 1



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Install Screens: 2



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Install Screens: 3

Oracle Appliance Manager

System Information

ORACLE
DATABASE APPLIANCE

System Name: hqodarac02t

Region: America

Timezone: America/Los_Angeles

Database Deployment: RAC

Database Backup: Local

New Root Password:

New Root Password(confirm):

Help

< Back Next > Finish Cancel

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Install Screens: 4

The screenshot shows the 'Generic Network' configuration window in the Oracle Appliance Manager. The window has a title bar 'Oracle Appliance Manager' and a red header with the 'ORACLE DATABASE APPLIANCE' logo. On the left is a navigation pane with steps: Welcome, Configuration Type, System Information, Generic Network (selected), Public Network, Other Network, Database Information, ASR Information, CloudFS Information, Network Validation, and Summary. The main area contains the following fields:

- Domain Name:
- ☐ No DNS Server available
- DNS Servers:
- NTP Servers:

At the bottom are buttons for Help, < Back, Next >, Finish, and Cancel.

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Install Screens: 5

Oracle Appliance Manager

Public Network

ORACLE
DATABASE APPLIANCE

Navigation:

- Welcome
- Configuration Type
- System Information
- Generic Network
- Public Network**
- Other Network
- Database Information
- ASR Information
- CloudFS Information
- Network Validation
- Summary

Public Network Configuration:

	Node1-Name	Node1-IP	Node2-Name	Node2-IP
Public	hqodrac02s	10.221.0.21	hqodrac02t	10.221.0.25
VIP	hqodrac02s	10.221.0.23	hqodrac02t	10.221.0.27
SCAN	hqodrac02t-s	Addresses	10.221.0.24	10.221.0.28
Netmask	255.255.255.0		Gateway	10.221.0.1
Interface	bond0			

ILOM Configuration:

	Node1-Name	Node1-IP	Node2-Name	Node2-IP
ILOM	hqodrac02s	10.221.0.22	lrac02bt-ilor	10.221.0.26
Netmask	255.255.255.0		Gateway	10.221.0.1

Buttons: Help, < Back, Next >, Finish, Cancel

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Install Screens: 6

Oracle Appliance Manager

Other Network

ORACLE
DATABASE APPLIANCE

Navigation:

- Welcome
- Configuration Type
- System Information
- Generic Network
- Public Network
- Other Network**
- Database Information
- ASR Information
- CloudFS Information
- Network Validation
- Summary

	Node1-Name	Node1-IP	Node2-Name	Node2-IP
bond1	rac02t1-net1		rac02t2-net1	
Netmask		Gateway		
bond2	rac02t1-net2		rac02t2-net2	
Netmask		Gateway		
xbond0	rac02t1-net3		rac02t2-net3	
Netmask		Gateway		

Buttons: Help, < Back, Next >, Finish, Cancel

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Install Screens: 7

Oracle Appliance Manager

Database Information

ORACLE
DATABASE APPLIANCE

Database Name: TEST

Database Class: Medium

Database Language: AMERICAN

Database Block Size: 8192

Database Characterset: AL32UTF8

Database Territory: AMERICA

Navigation: Welcome, Configuration Type, System Information, Generic Network, Public Network, Other Network, **Database Information**, ASR Information, CloudFS Information, Network Validation, Summary

Buttons: Help, < Back, Next >, Finish, Cancel

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Install Screens: 8

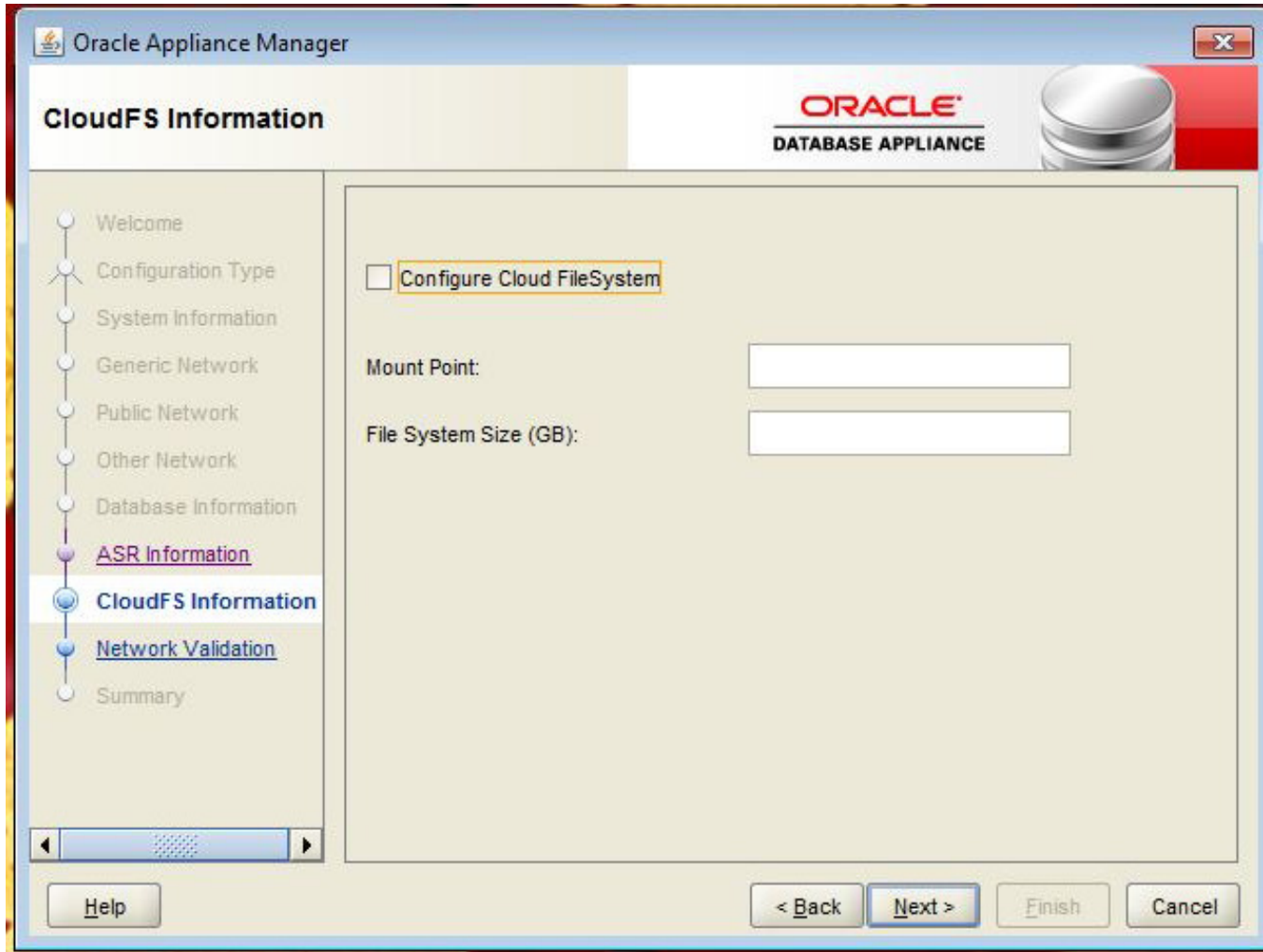
The screenshot shows the 'Oracle Appliance Manager' window with the 'ASR Information' tab selected. The left sidebar contains a list of steps: Welcome, Configuration Type, System Information, Generic Network, Public Network, Other Network, Database Information, ASR Information (highlighted), CloudFS Information, Network Validation, and Summary. The main area of the window contains the following options and input fields:

- ☐ Configure Oracle Auto Service Request (ASR)
- Proxy Server Name:
- Oracle Online Account Username:
- Oracle Online Account Password:

At the bottom of the window, there are buttons for '< Back', 'Next >', 'Finish', 'Cancel', and a 'Help' button.

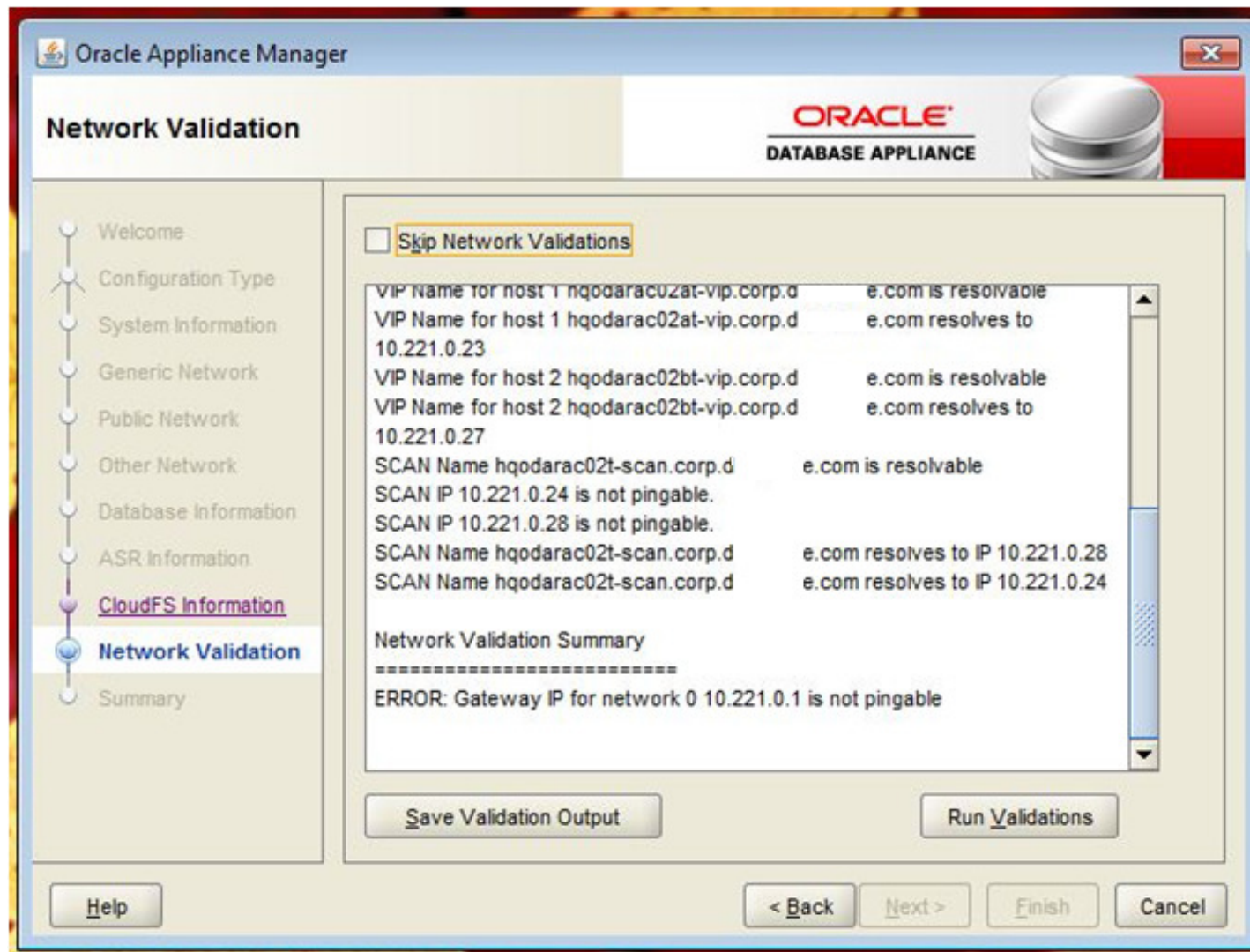
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Install Screens: 9



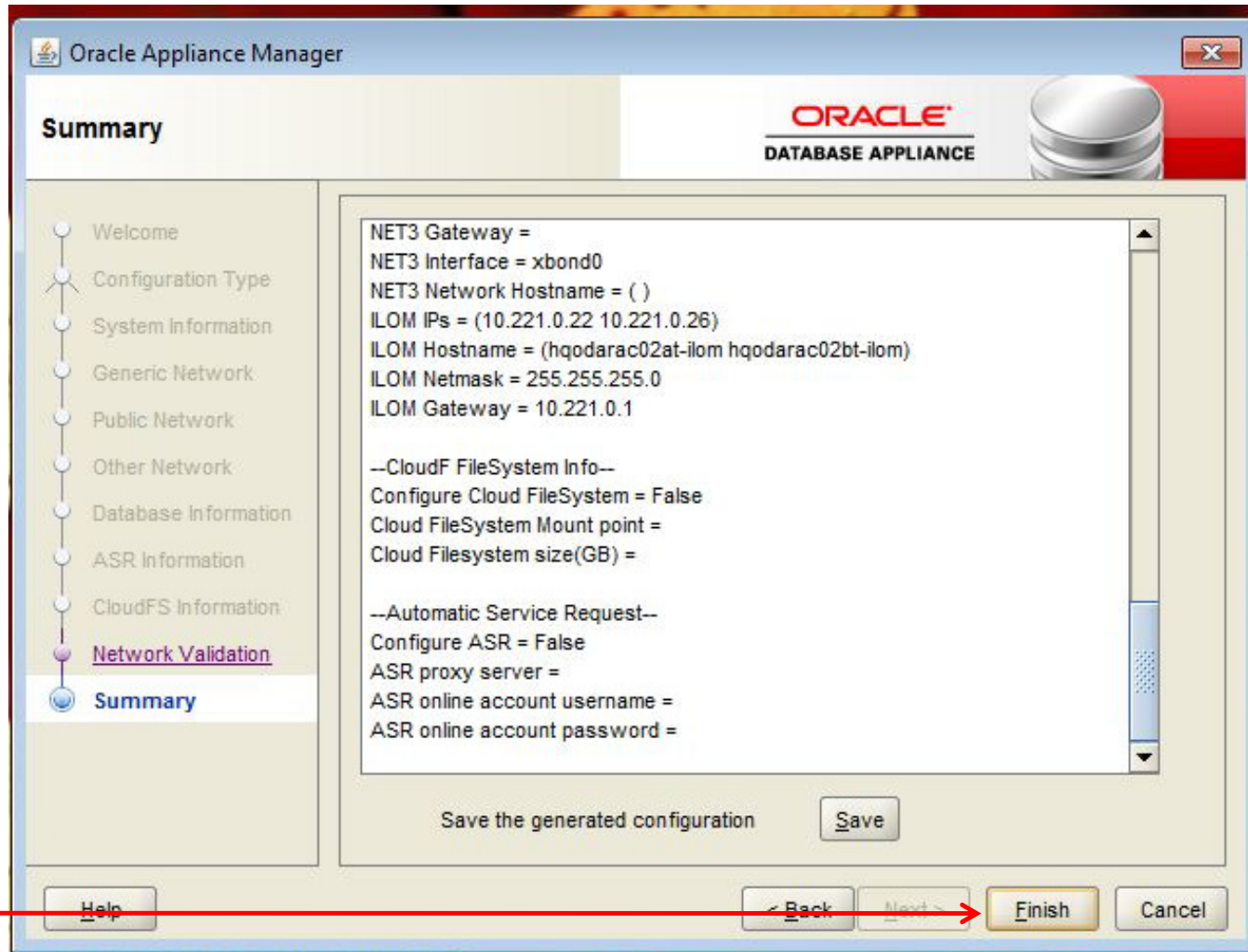
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Install Screens: 10



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Install Screens: 11



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Value Adds

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ILOM: System Information: Overview

Oracle(R) Integrated Lights Out Manager - Windows Internet Explorer

https://192.0.2.101/iPages/suntab.asp Certificate Error Yahoo! Search

Webroot File Edit View Favorites Tools Help

Oracle(R) Integrated Lights Out Manager

ABOUT 1 Warning REFRESH LOG OUT

User: root Role: aucro SP Hostname: orclsys2-ilom

Oracle® Integrated Lights Out Manager

System Information System Monitoring Power Management Storage Configuration User Management Remote Control Maintenance

Overview Components Fault Management Identification Information Banner Messages Session Timeout Versions

System Overview

View system summary information. You may also change power state and view system status and fault information.

Product Name: SUN FIRE X4370 M2 SERVER

Part/Serial Number: 30102851+1+1 / 1146FMW00R

Host Power: On Change...

System Status: Normal View...

BIOS Version: 12010304

SP Hostname: orclsys2-ilom

Uptime: 0 days, 00:40:38

IP Address: 192.0.2.101

ILOM Version: v3.0.14.13.a r70764

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ILOM: System Monitoring: Sensor Readings

The screenshot shows the Oracle(R) Integrated Lights Out Manager (ILOM) web interface in a Windows Internet Explorer browser. The address bar shows the URL <https://192.0.2.101/iPages/suntab.asp>. The page title is "Oracle(R) Integrated Lights Out Manager". The user is logged in as "root" with the role "auro" and the SP Hostname is "ordsys2-ilom". The page has a "1 Warning" icon and buttons for "REFRESH" and "LOG OUT". The main navigation menu includes "System Information", "System Monitoring", "Power Management", "Storage", "Configuration", "User Management", "Remote Control", and "Maintenance". The "System Monitoring" tab is selected, and the "Sensor Readings" sub-tab is active. The "Sensor Readings" section displays a table of sensor data. The table has three columns: "Name", "Type", and "Reading". The table lists various sensors, including "/SYS/PEER/PRSNT", "/SYS/PEER/HOST_POWER", "/SYS/PEER/FAN_FAULT", "/SYS/PEER/_+5_V_FAULT", "/SYS/PEER/SERVICE", "/SYS/PEER/SP_FAULT", and several "/SYS/MB/P0/D0/PRSNT" through "/SYS/MB/P0/D3/PRSNT" entries. The "Reading" column shows the status of each sensor, such as "Present", "State Asserted", and "State Deasserted".

Name	Type	Reading
/SYS/PEER/PRSNT	Entity Presence	Present
/SYS/PEER/HOST_POWER	OEM	State Asserted
/SYS/PEER/FAN_FAULT	Fan	State Deasserted
/SYS/PEER/_+5_V_FAULT	Voltage	State Deasserted
/SYS/PEER/SERVICE	OEM	State Deasserted
/SYS/PEER/SP_FAULT	OEM	State Deasserted
/SYS/MB/HBA/PRSNT	Entity Presence	Present
/SYS/MB/P0/D0/PRSNT	Entity Presence	Present
/SYS/MB/P0/D1/PRSNT	Entity Presence	Present
/SYS/MB/P0/D2/PRSNT	Entity Presence	Present
/SYS/MB/P0/D3/PRSNT	Entity Presence	Present

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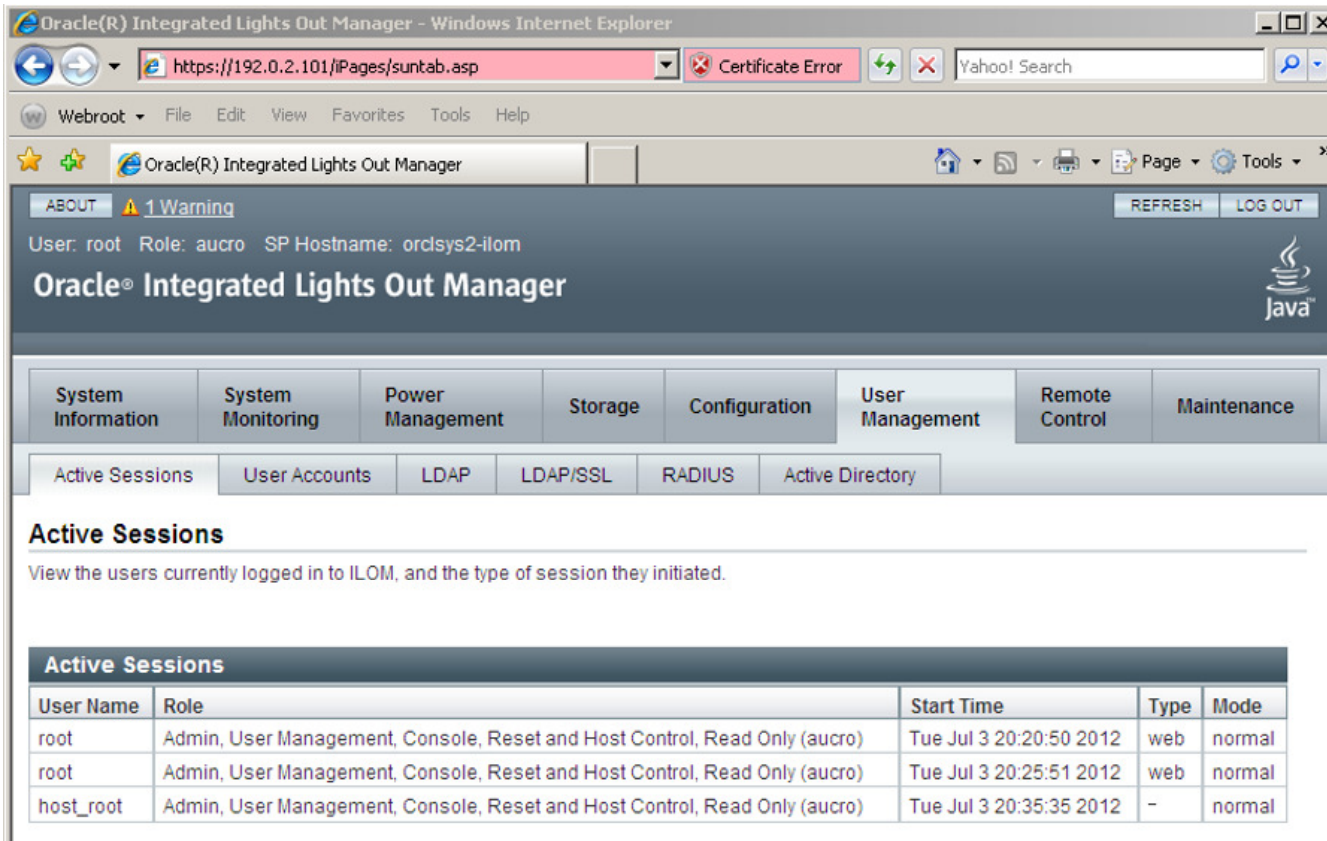
ILOM: System Monitoring: Event Logs

The screenshot displays the Oracle(R) Integrated Lights Out Manager (ILOM) web interface within a Windows Internet Explorer browser. The address bar shows the URL <https://192.0.2.101/iPages/suntab.asp>. The interface includes a navigation menu with tabs for System Information, System Monitoring, Power Management, Storage, Configuration, User Management, Remote Control, and Maintenance. Under the System Monitoring tab, there are sub-tabs for Sensor Readings, Indicators, and Event Logs. The Event Log tab is selected, showing a table of events. The table has columns for Event ID, Class, Type, Severity, Date/Time, and Description. The events listed are:

Event ID	Class	Type	Severity	Date/Time	Description
961	Audit	Log	minor	Tue Jul 3 20:42:01 2012	root : Close Session : object = "/SP/session/type" : value = "www" : success
960	Sensor	Log	minor	Tue Jul 3 20:36:36 2012	OEM : /SYS/PEER/HOST_POWER : State Asserted
959	Audit	Log	minor	Tue Jul 3 20:36:11 2012	root : Close Session : object = "/SP/session/type" : value = "www" : success
958	Audit	Log	minor	Tue Jul 3 20:34:17 2012	KCS Command : Clear Message Flags : success
957	Audit	Log	minor	Tue Jul 3 20:34:17 2012	KCS Command : Set BMC Global Enables : enable flags = 0x0 : success
956	IPMI	Log	minor	Tue Jul 3 20:28:50 2012	ID = 206 : 07/03/2012 : 20:28:50 : System Firmware Progress : BIOS : System boot initiated : Asserted
955	IPMI	Log	minor	Tue Jul 3	ID = 205 : 07/03/2012 : 20:28:42 : System Firmware Progress : BIOS : Option ROM

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ILOM: User Management: Active Sessions



Oracle(R) Integrated Lights Out Manager - Windows Internet Explorer

https://192.0.2.101/iPages/suntab.asp Certificate Error Yahoo! Search

Webroot File Edit View Favorites Tools Help

Oracle(R) Integrated Lights Out Manager

ABOUT 1 Warning REFRESH LOG OUT

User: root Role: aucro SP Hostname: ordsys2-ilom

Oracle® Integrated Lights Out Manager

System Information System Monitoring Power Management Storage Configuration User Management Remote Control Maintenance

Active Sessions User Accounts LDAP LDAP/SSL RADIUS Active Directory

Active Sessions

View the users currently logged in to ILOM, and the type of session they initiated.

User Name	Role	Start Time	Type	Mode
root	Admin, User Management, Console, Reset and Host Control, Read Only (aucro)	Tue Jul 3 20:20:50 2012	web	normal
root	Admin, User Management, Console, Reset and Host Control, Read Only (aucro)	Tue Jul 3 20:25:51 2012	web	normal
host_root	Admin, User Management, Console, Reset and Host Control, Read Only (aucro)	Tue Jul 3 20:35:35 2012	-	normal

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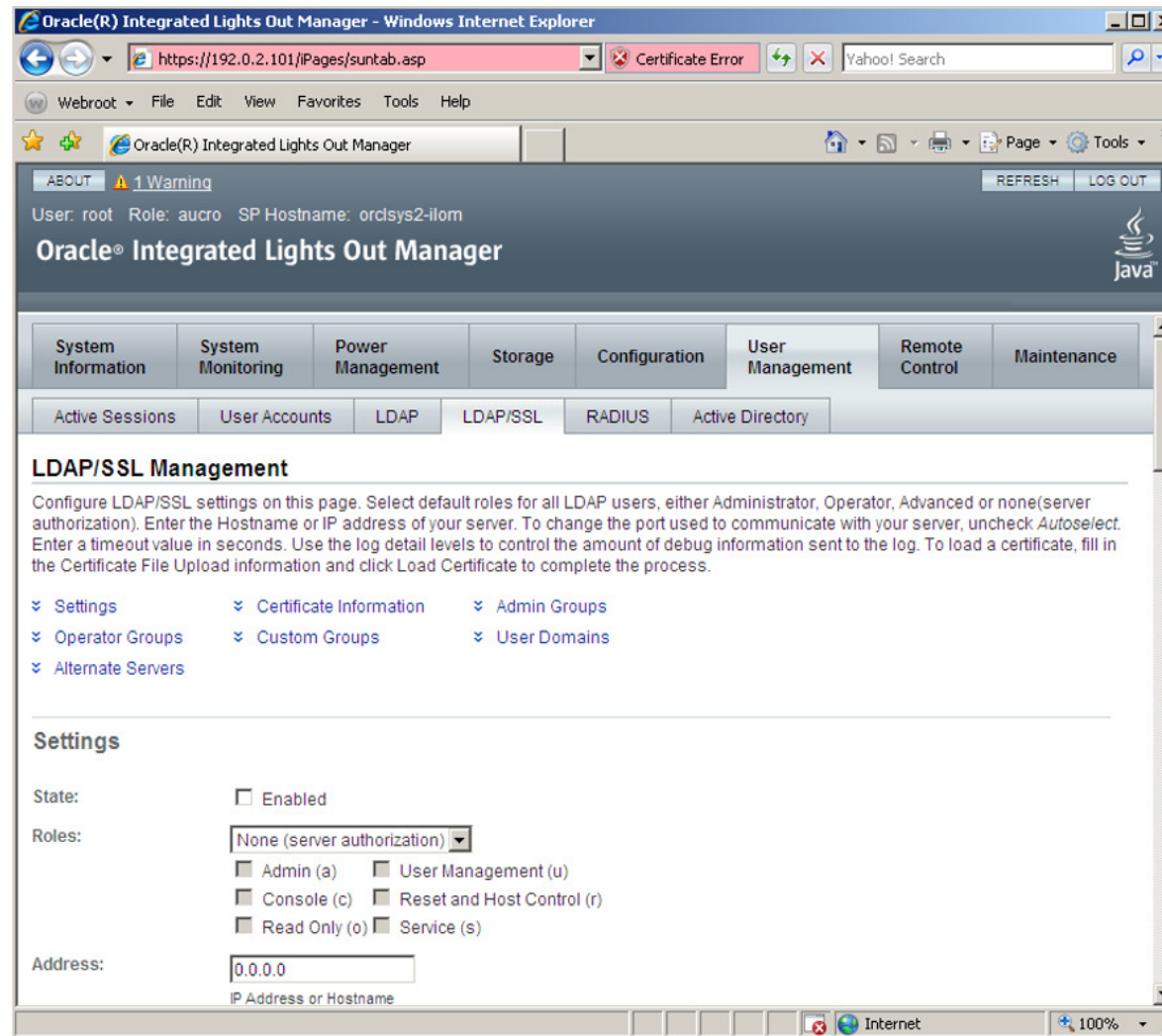
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ILOM: User Management: LDAP / SSL



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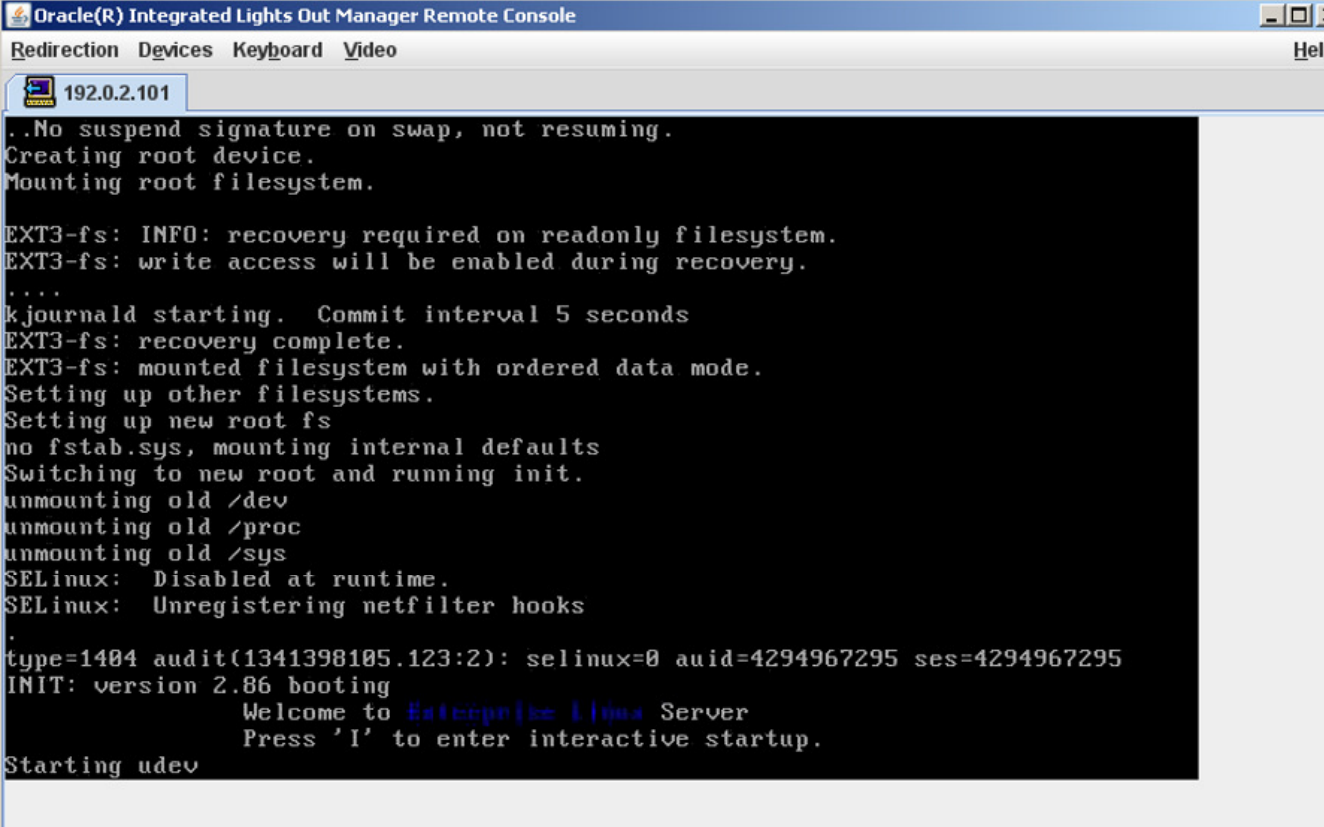
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Remote Control: Host Control: Remote Console



The screenshot shows a window titled "Oracle(R) Integrated Lights Out Manager Remote Console". The window has a menu bar with "Redirection", "Devices", "Keyboard", "Video", and "Help". Below the menu bar is a tab labeled "192.0.2.101". The main area displays a text-based boot log for a Linux system. The log includes messages about swap, root device creation, filesystem mounting, journaling, and SELinux status. It ends with a welcome message to the Linux Server and a prompt to press 'I' for interactive startup.

```
..No suspend signature on swap, not resuming.
Creating root device.
Mounting root filesystem.

EXT3-fs: INFO: recovery required on readonly filesystem.
EXT3-fs: write access will be enabled during recovery.
....
kjournald starting. Commit interval 5 seconds
EXT3-fs: recovery complete.
EXT3-fs: mounted filesystem with ordered data mode.
Setting up other filesystems.
Setting up new root fs
no fstab.sys, mounting internal defaults
Switching to new root and running init.
unmounting old /dev
unmounting old /proc
unmounting old /sys
SELinux: Disabled at runtime.
SELinux: Unregistering netfilter hooks
.
type=1404 audit(1341398105.123:2): selinux=0 auid=4294967295 ses=4294967295
INIT: version 2.86 booting
       Welcome to Enterprise Linux Linux Server
       Press 'I' to enter interactive startup.
Starting udev
```

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ILOM Warning Message



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Full Support for High Availability

- RAC
- Data Guard
- RMAN
- Streams
- OEM Cloud Control 12c
 - Diagnostic Pack
 - Tuning Pack
 - Data Masking Pack

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One Button Solutions

- Fully scripted, one button, solutions, for
 - Build
 - Secure
 - Migration
 - Bare Metal Restore
 - Data Guard
 - GoldenGate
 - RMAN Backup

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Support Center

Document Display - Mozilla Firefox

File Edit View History Bookmarks Tools Help

oracle.com https://support.html.oracle.com/epmos/faces/jsp/SearchDocDisplay.jspx?_afLoop=6463580628317000&type=DOCUMENT&id=1449552.2&displayInd=1

ORACLE MY ORACLE SUPPORT PowerView is Off

Welcome, Daniel (0) Contact Us Help Sign Out

Dashboard Knowledge Service Requests Patches & Updates Community Certifications Systems Reports More... Search Knowledge Base Advanced

Document Display

Search: ODA STIG

1 - 2 Back to Results

Place holder for STIG Implementation Script for Oracle Database Appliance

Information Center: Oracle Database Appliance

Information Center: Oracle Database Appliance [ID 1449552.2]

Content Refreshed: 27 Jun 2012

Information Centers

- Overview
- Hot Topics
- Resources
- Sun System Handbook
- Hardware Compatibility Lists

Refine Search By Task

- Use Product
- Troubleshoot
- Patching And
- Maintenance
- Install And Configure
- Upgrade
- Optimize Performance

Alerts

View the most up-to-date high impact and urgent issues for your product.?

- ALERT - ODA (Oracle Database Appliance) Mandatory OAK Patch 2.1.0.3.1 [Document 1452085.1 Updated: 04/23/2012]

News & Announcements

Read recently published news and announcements about your product.

No Results

New Troubleshooting and Problem-Solution Documents

Read recently published Troubleshooting and Problem-Solution documents about your product

- NEW ODA SETUP: FAILS WITH DOMAINNAME OF "EXAMPLE", NOT EXAMPLE.COM [Document 1455719.1 Updated: 05/04/2012]
- DBUA (DataBase Upgrade Assistant) failing with "Cannot find the ORACLE_HOME for the database" on ODA (Oracle Database Appliance)

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STIG Download

☆ Oracle Database Appliance DoD C&A STIG [ID 1456609.1]

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In this Document

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Applies to:

Oracle Database Appliance
Generic Linux

Main Content

The Department of Defense(DoD) DISA Information Assurance Process includes Certification and Accreditation(C&A) including the Security Technical Implementation Guides(STIGs). These are guidelines and scripts that are run to advise on securing and locking down database, operating system, application servers, and other system components.

Currently, DoD customers are running various Oracle products that go through the DoD C&A process including the STIG process. General STIG Information is available at: - <http://iase.disa.mil/stigs/>

The Oracle Database Appliance(ODA) is a fully integrated system of software, servers, storage, and networking in a single box that delivers high-availability database services. Oracle engineered Oracle Database Appliance for simplicity. Accordingly, Oracle aims to provide a more simplified configuration and patching process.

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STIG Script

- STIG Script Syntax

- The script logs its actions in the `"/opt/oracle/oak/log//hostname/stig/"` directory
- **-check** checks the system for guideline violations
- **-force** re-runs the script even if there are no violations
- **-fix** used to implement guideline recommendations
- lock and unlock options can be used to enable or disable direct ssh logging as root. Direct ssh login as root is required for Patching and therefore before patching, the unlock needs to be executed.

Sample usage

```
#./stig.sh -fix
```

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STIG Script Output: Category 1

```
2012-06-28 01:18:12 : Running stig script version: '1.0'
2012-06-28 01:18:12 : Executing script : ./stig.sh -check
2012-06-28 01:18:12 : Checking for stig violations on system 'orclsys1'
```

2012-06-28 01:18:12 : List of Category-1 stig violation found by script

```
2012-06-28 01:18:12 : [STIG ID : LNX00140] : [CHECK] : Password for grub not enabled : FOUND
2012-06-28 01:18:12 : [STIG ID : GEN004640] : [CHECK] : sendmail decode command is not commented in /etc/aliases : FOUND
2012-06-28 01:18:12 : [STIG ID : LNX00320] : [CHECK] : Privilege account 'shutdown' is present : FOUND
2012-06-28 01:18:12 : [STIG ID : LNX00320] : [CHECK] : Privilege account 'halt' is present : FOUND
2012-06-28 01:18:12 : [STIG ID : LNX00580] : [CHECK] : Ctrl-Alt-Del combination to shutdown system is enabled : FOUND
2012-06-28 01:18:13 : [STIG ID : 2006-T-0013] : [CHECK] : RealVNC rpm is installed on system : FOUND
2012-06-28 01:18:13 : [STIG ID : LNX00040] : [CHECK] : Support for usb device found in kernel : FOUND
```

2012-06-28 01:18:13 : List of Category-2 stig violation found by script

```
2012-06-28 01:18:13 : [STIG ID : GEN000020] : [CHECK] : Single user mode boot is enabled without a password : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN000340] : [CHECK] : Non privileged account oprofile found on system : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN000340] : [CHECK] : Non privileged account avahi-autoipd found on system : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN000460] : [CHECK] : pam_tally not used to lock account after 3 consecutive failed logins : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN000800] : [CHECK] : remember not used in PAM configuration files : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN000600] : [CHECK] : Force of at least one lower case character is not set for password : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN000600] : [CHECK] : Force of at least one upper case character is not set for password : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN000620] : [CHECK] : Force of at least one numeric character is not set for password : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN000640] : [CHECK] : Force of at least one special character is not set for password : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN000480] : [CHECK] : Login delay is not enabled in /etc/pam.d/system-auth : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN000700] : [CHECK] : Maximum age for a password change is more than 60 days : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN000540] : [CHECK] : Password can be changed more than once in 24 hours : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN000580] : [CHECK] : Password length is less than 8 characters : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN001120] : [CHECK] : Direct login as root is enabled from ssh : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN002100] : [CHECK] : ekshell supported by the pam.rhost : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN002960] : [CHECK] : Access to cron is not through cron.allow and cron.deny : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN003080] : [CHECK] : Permission of file /etc/crontab is more permissive than octal 600 : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN003200] : [CHECK] : Permission of file /etc/cron.deny is more permissive than octal 600 : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN005400] : [CHECK] : Permission of file /etc/syslog.conf is more permissive than octal 640 : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN000920] : [CHECK] : Permission of directory /root is more permissive than octal 700 : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN003865] : [CHECK] : tcpdump rpm is installed on system : FOUND
2012-06-28 01:18:13 : [STIG ID : GEN004000] : [CHECK] : Permission of file /bin/traceroute is more permissive than octal 700 : FOUND
2012-06-28 01:18:13 : [STIG ID : LNX00340] : [CHECK] : Unnecessary account ftp found on system : FOUND
```

2012-06-28 01:18:35 : List of Category-3 stig violation found by script

```
2012-06-28 01:18:35 : [STIG ID : GEN004560] : [CHECK] : sendmail version is not hidden. : FOUND
```

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However

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However

- We MAY want to preserve the 4TB ASM disk for data
- We may want more storage for
 - FRA, Flashback DB files, RMAN files ...
 - Clone
 - Data Masking
 - Real Application Testing
 - Staging
 - Logs
 - And so on

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Data Masking Pack

- Offers the ability to mask regulated or confidential data on test and development systems
- Mask format libraries
- Mask definitions
- Masking techniques
 - Condition-based masking
 - Compound masking
 - Deterministic masking
- Application masking templates import or export
- Mask format library import or export
- Masking script generation
- Clone and Mask workflow

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Choices

- ASM
 - Raw devices
- Clustered Storage
 - Which one? OCFS2, VxFS, ...
- Non-Clustered Storage
 - Non-blocking visibility on both nodes
 - dNFS, CIFS ...

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ASM?

- Excellent decision for database storage
- Perhaps not optimal as a file system
 - ACFS?
- Requires raw disk to be presented to ODA
- Traditional HBA discussion

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Clustered File System?

- Several CFS available for Linux
 - Need expertise
 - Wire it yourself
 - Tech concerns
 - File sizes
 - File counts
- Still traditional HBA discussion

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Non-clustered File System?

- Local File System
 - May be suitable for some applications,
 - But we have two separate hosts in ODA
 - Standard Linux-oriented
 - Still traditional HBA discussion

- [d]NFS
 - Vendor: NetApp, Oracle ZFS Appliance
 - OpenFiler?

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Additional concern – silent corruption

- An undetected or uncorrectable error can occur on average once every 10-20 TB of data storage OR transfer
 - In modern systems that could mean a corruption in a little as 15 minutes
- ZedFS was designed to combat this challenge
 - Checksum on all blocks
 - Copy on Write (preserve original block, not write in place)
 - Hot spares in pool
 - Auto-healing from ZFS mirror
 - Scrub instead of fsck
 - Monthly (or weekly for consumer disks)

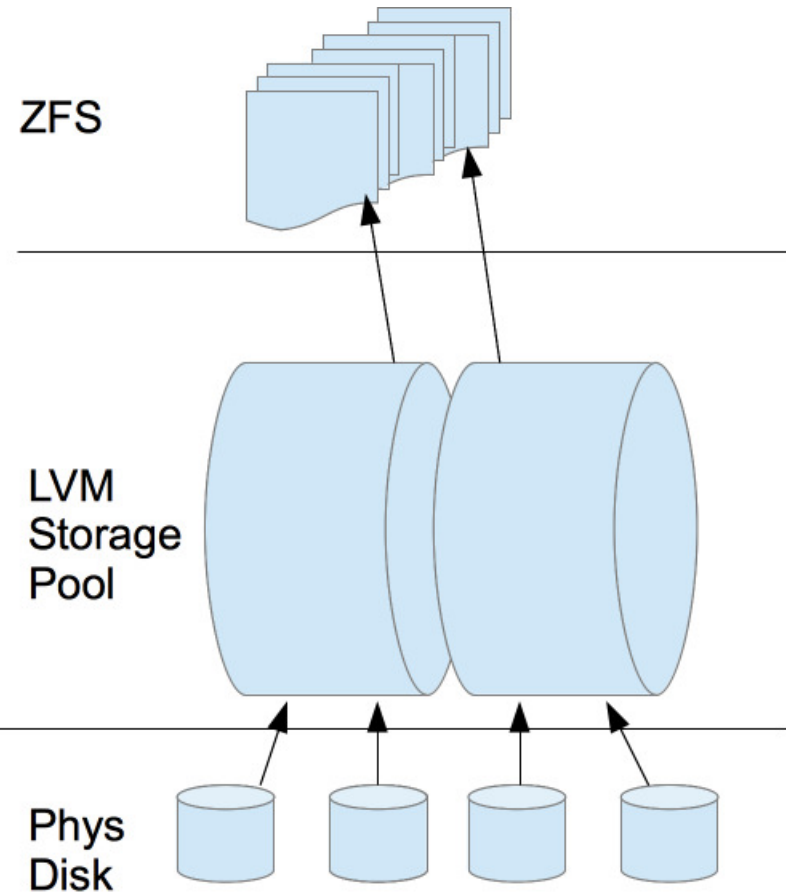
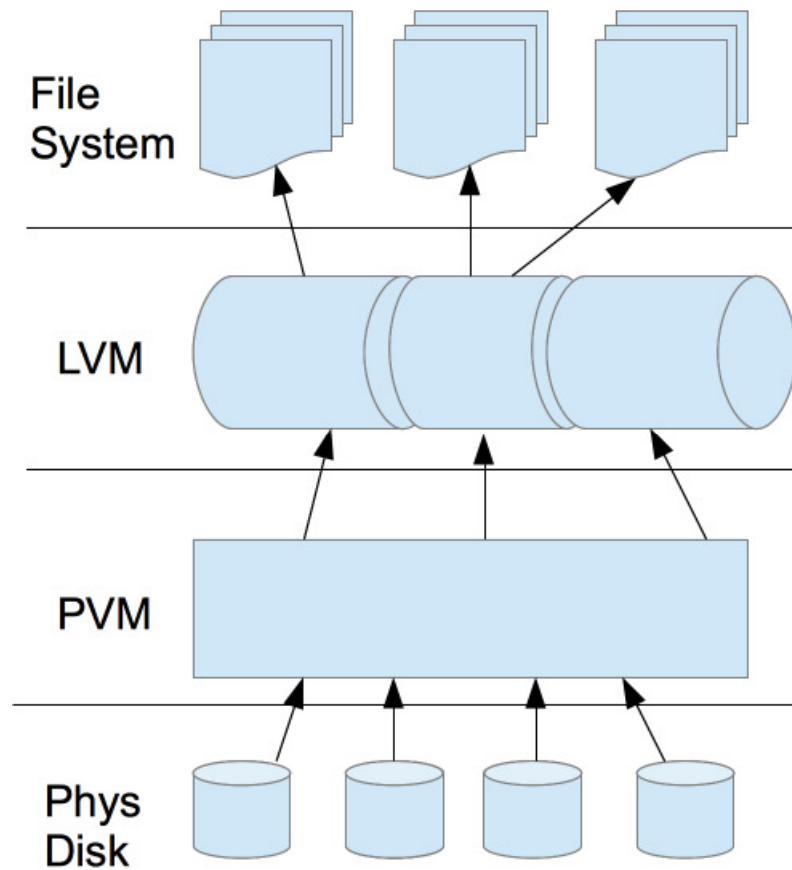
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Traditional File System stack vs ZFS



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Quick Notes

- RAID
 - ZFS cannot fully protect the user's data when using a hardware RAID controller, as it is not able to perform the automatic self-healing unless it controls the redundancy of the disks and data.
 - Instead, ZFS provides it's own RAID counterparts within the Storage Pool
- ZFS provides a hot-spare storage pool manager and a 128-bit, Copy on Write File System
- Capacity
 - Single file: 16 exabytes
 - Files in a pool: 264
 - Disks in a pool: 264
 - Pools in a system: 264

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Where do you want to invest your time and treasure?

- Reinventing the wheel?
- Designing physical architecture?
- Applying one-off patches?
- Becoming Linux security experts?
- Writing shell scripts?

or would you rather be ...

- Managing your applications, users, and data?
- Optimizing your applications to maximize customer satisfaction?

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ZFS Storage Appliance

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ZFS Storage Appliance

- ZFS file system with advanced error detection and self-healing capabilities
- Integrated with Oracle Engineered Systems
- Both ZFS Deduplication and Compression or Hybrid Columnar Compression
- Hybrid Storage Pools
- Simultaneous multiprotocol support across multiple network interconnects, including GbE, 10 GbE, fibre channel and InfiniBand
- Integrated with OEM Grid Control
- Web-based storage management
- Integrated real-time storage analytics

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What is a ZFS Appliance?

- Enterprise class Network Attached Storage (NAS)
- Choose the size that meets your needs
- Hybrid Columnar Compression (w/o an Exadata)
- Hybrid storage pools for DRAM and Flash caches
- DTrace storage analytics
- Use for
 - Backup and Restore
 - Cloning
 - Data Masking



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ZFS Configurations

Sun ZFS Storage Appliance Configurations						
	Key Requirement	Maximum Storage Capacity	Space (Rack Units)	Write Optimized Flash	Read Optimized Flash	Cluster Option
Sun ZFS Storage 7120	Low-priced entry-level system with all software features	177 TB	2U/controller, 4U/disk shelf	73 GB	N	N
Sun ZFS Storage 7320	Entry-level cluster option for high availability	432 TB	1U/controller, 4U/disk shelf	Up to 1.2 TB	Up to 2 TB per controller	Y
Sun ZFS Storage 7420	Best price/performance	1.73 PB	3U/controller, 4U/disk shelf	Up to 7.0 TB	Up to 2 TB per controller	Y

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ZFS Specifications

Sun ZFS Storage Appliance Specifications			
	Sun ZFS Storage 7120	Sun ZFS Storage 7320	Sun ZFS Storage 7420
Architecture			
Processor	1x 4-core 2.4 GHz Intel® Xeon® Processor	2x 4-core 2.4 GHz Intel® Xeon® Processor, per controller	4x 8-core 2.0 GHz or 10-core 2.4GHz Intel® Xeon® Processors per controller
Main memory	48 GB	Up to 144 GB per controller	Up to 1 TB per controller
Base Configurations			
Configuration options	<ul style="list-style-type: none"> • 3.3 TB to 177 TB using either high-speed (15,000 RPM) or high-capacity (7,200 RPM) SAS-2 disks • Controller contains 11 HDDs and one SSD cache, supports up to two additional disk shelves with 24 disks each (300 GB, 600 GB, 2 TB, or 3 TB) 	<ul style="list-style-type: none"> • 6 TB to 432 TB using either high-speed (15,000 RPM) or high-capacity (7,200 RPM) SAS-2 disks • Supports up to six disk shelves with 20 or 24 disks each (300 GB, 600 GB, 2 TB, or 3 TB) and up to four optional write-optimized SSDs per shelf 	<ul style="list-style-type: none"> • 6 TB to 1.73 PB using either high-speed (15,000 RPM) or high-capacity (7,200 RPM) SAS-2 disks • Supports up to 24 disk shelves with 20 or 24 disks each (300 GB, 600 GB, 2 TB, or 3 TB) and up to four optional write-optimized SSDs per shelf

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ZFS In The Data Center



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ZFS 7420



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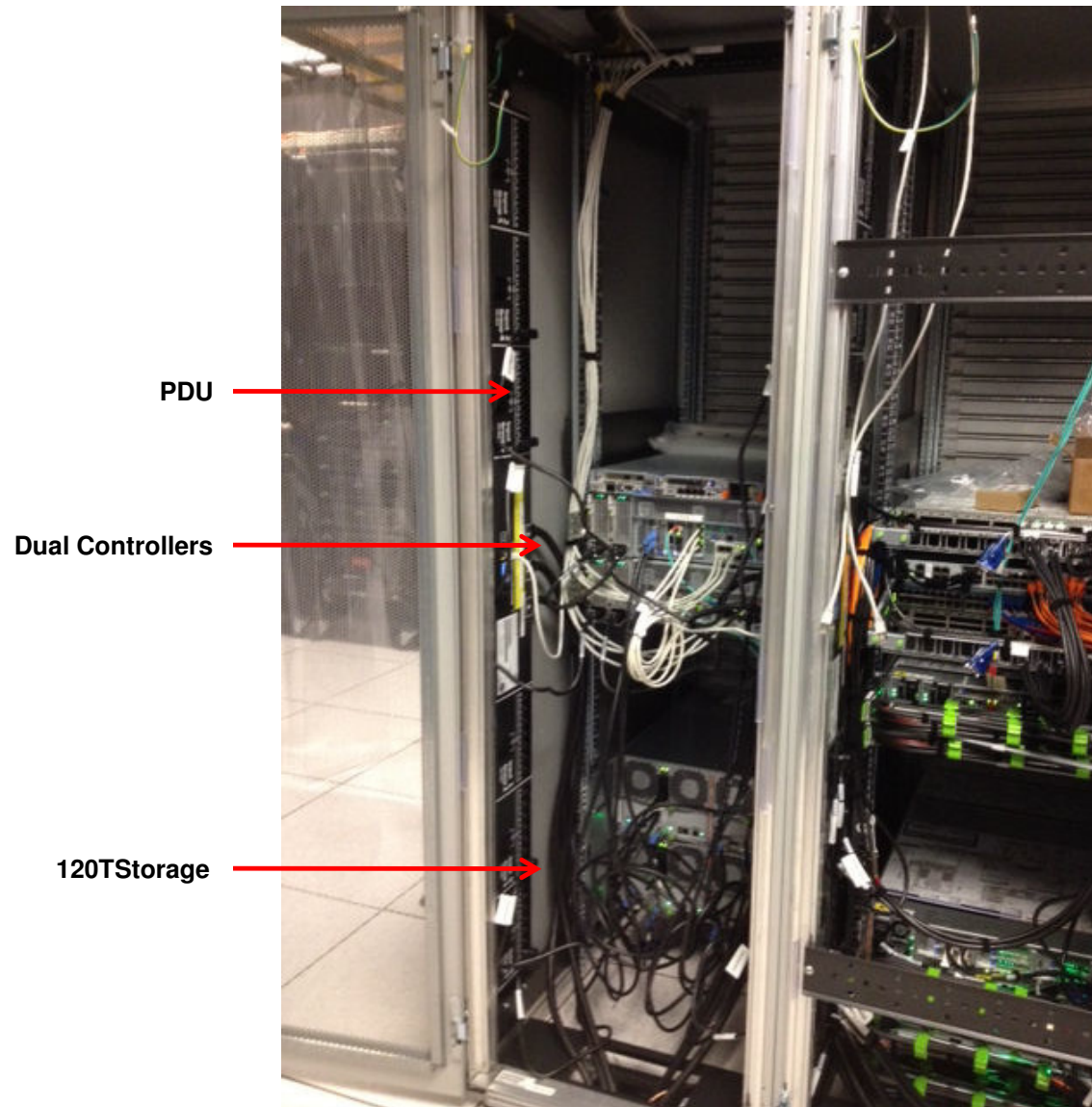
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ZFS Internals




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ZFS BUI

The screenshot displays the ZFS BUI interface for a Sun ZFS Storage 7420 appliance. The top navigation bar includes tabs for Configuration, Maintenance (highlighted), Shares, Status, and Analytics. Below this, there are sub-tabs for Hardware, System, Problems, Logs, and Workflows. The main content area shows the system name 'c0zfs742001p' and its details: Manufacturer (Oracle), Model (Sun ZFS Storage 7420), Serial (1235FMJ00N), Processors (4x2GHz Intel(r) Xeon(r) CPU E7- 4820 @ 2.00GHz), and Memory (512GB). To the right, system storage information is listed: System 932GB (2 disks), Data -, Cache -, Log -, and Total 932GB (2 disks). Below this, a 'Disk Shelves' section shows a table of disk shelves with columns for NAME, MFR/MODEL, RPM, DATA, CACHE, LOG, and PATHS. The table lists two shelves: 1235FMD003 and 1235FMD002, both Sun Microsystems, Inc./Sun Disk Shelf (SAS-2) 7200, with 54.6TB of data and 137GB of log space.

Configuration Maintenance Shares Status Analytics

HARDWARE SYSTEM PROBLEMS LOGS WORKFLOWS



 [Show Details](#)

c0zfs742001p  

Manufacturer Oracle System 932GB (2 disks)
Model Sun ZFS Storage 7420 Data -
Serial 1235FMJ00N Cache -
Processors 4x2GHz Intel(r) Xeon(r) CPU E7- 4820 @ 2.00GHz Log -
Memory 512GB Total 932GB (2 disks)

Please wait...

Disk Shelves

NAME	MFR/MODEL	RPM	DATA	CACHE	LOG	PATHS
 1235FMD003	Sun Microsystems, Inc./Sun Disk Shelf (SAS-2)	7200	54.6TB	-	137GB	2
 1235FMD002	Sun Microsystems, Inc./Sun Disk Shelf (SAS-2)	7200	54.6TB	-	137GB	1

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ZFS Config Services

The screenshot shows the 'Configuration' tab of the ZFS Config Services web interface. The user is logged in as Daniel Morgan. The interface displays a list of services categorized into 'Data Services' and 'Directory Services'. Each service row includes a status indicator (green dot for online, grey dot for disabled), the service name, its status, a timestamp, and icons for refresh and power.

Data Services				
NFS	Online	2012-9-24 15:29:31		
iSCSI	Online	2012-9-20 17:49:51		
SMB	Online	2012-9-24 14:23:46		
FTP	Disabled	2012-9-20 17:49:03		
HTTP	Disabled	2012-9-20 17:49:03		
NDMP	Online	2012-9-20 17:52:33		
Remote Replication	Online	2012-9-20 17:49:50		
Shadow Migration	Online	2012-9-20 17:49:50		
SFTP	Online	2012-9-21 18:50:18		
SRP	Disabled	2012-9-20 17:49:03		
TFTP	Disabled	2012-9-20 17:49:54		
Virus Scan	Disabled	2012-9-20 17:49:03		
Directory Services				
NIS	Disabled	2012-9-20 17:52:31		
LDAP	Disabled	2012-9-20 17:52:31		
Active Directory	Disabled	2012-9-20 17:49:03		
Identity Mapping	Online	2012-9-20 17:52:33		

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ZFS BUI

Daniel Morgan@c0zfs742001p LOGIN HELP

Configuration Maintenance Shares Status Analytics

SERVICES STORAGE NETWORK SAN CLUSTER USERS PREFERENCES ALERTS

About Storage Configuration
Storage is configured in pools that are characterized by their underlying data redundancy, and provide space that is shared across all filesystems and LUNs.
During the configuration process, you will select which devices to allocate to a storage pool and the redundancy profile most appropriate to your workload, balancing performance, availability, and capacity.
Importing storage will search all devices attached to the system for existing pool configurations, from which you can select one as the system pool. This option is used to migrate pools between systems, and in some cases can recover pools that were destroyed inadvertently.

Available Pools IMPORT

HOST : POOL	DATA PROFILE	LOG PROFILE	STATUS
c0zfs742001p:GENERIC	Single parity, narrow stripes	-	Online
c0zfs742001p:PARTRECOV	Single parity, narrow stripes	-	Online
c0zfs742001p:CLONEDB	Mirrored	-	Online
c0zfs742001p:RMANBACK	Mirrored	Mirrored log	Online

c0zfs742001p:GENERIC ADD UNCONFIG **Allocation**

Please wait...

Data Profile Single parity, narrow stripes
Log Profile -
Pool Status Online
Data Errors No known persistent errors
Scrub Status Scrub completed: 0 errors
2012-9-24 15:29:46 (0h0m)
SCRUB

Device Status

No device faults have been detected in the storage pool.

0 errors

Data	7.88T
Parity	2.91T
Reserved	128G

Data + Parity 4 disks
Spare 0 disks
Log 0 disks
Cache 0 disks

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ZFS BUI

		Configuration	Maintenance	Shares	Status	Analytics
		HARDWARE		SYSTEM	PROBLEMS	LOGS
				WORKFLOWS		
Alerts 119 Total				100-119		
ALERTS		FAULTS		SYSTEM		
				AUDIT		
				PHONE HOME		
TIME	EVENT ID	DESCRIPTION				TYPE
2012-9-24 15:29:46	63714813-695f-c125-f88e-e434ebd2f7d	The system has finished scrubbing the ZFS pool 'GENERIC'.				Minor Alert
2012-9-24 15:29:46	a6838d57-8ee4-43d2-e42f-c695e62ccb0e	The system has begun scrubbing the ZFS pool 'GENERIC'.				Minor Alert
2012-9-24 15:14:54	4ada53dd-7124-cfc6-dbd1-c279f717d381	The system has finished scrubbing the ZFS pool 'RMANBACK'.				Minor Alert
2012-9-24 15:14:53	8e22aee9-a6b4-4c79-cbf9-f61bb1b5fe8d	The system has begun scrubbing the ZFS pool 'RMANBACK'.				Minor Alert
2012-9-24 14:23:44	2d5106de-ee58-c299-c247-8882df53fb7	Network connectivity via datalink ixgbe0 has been established.				Minor alert
2012-9-24 14:23:44	0a2e7265-49b1-cb50-e280-d1812ff449d1	Full IP connectivity via interface ixgbe0 has been established.				Minor alert
2012-9-24 14:23:44	cd81ccf9-8ee1-eb79-f46e-9e86513c2ad3	Network connectivity via port ixgbe0 has been established.				Minor alert
2012-9-24 14:23:30	985892eb-6a10-653d-c73a-d901f91f5443	Network connectivity via datalink ixgbe0 has been lost.				Major alert
2012-9-24 14:23:30	0d81abd7-c431-e3b4-835f-cfcc01170dac	IP connectivity via interface ixgbe0 has been lost due to link-based failure.				Major alert
2012-9-24 14:23:30	b979b7b9-9129-e2d5-ae44-b5bc6bc3c1ae	Network connectivity via port ixgbe0 has been lost.				Minor alert
2012-9-24 14:23:16	78d4a9b8-5664-44a9-afd7-d8eab505b33a	Full IP connectivity via interface ixgbe2 has been established.				Minor alert
2012-9-24 14:23:15	d8a8d18b-346c-665e-c9af-acef6acdd23c	Network connectivity via datalink ixgbe2 has been established.				Minor alert
2012-9-24 14:23:15	b55569fb-330b-496a-a619-cd30001473de	Network connectivity via port ixgbe2 has been established.				Minor alert
2012-9-24 14:23:10	9022ff22-7be1-e65c-f929-da96173fa21f	IP connectivity via interface ixgbe2 has been lost due to link-based failure.				Major alert
2012-9-24 14:23:10	d70af351-ca2a-cb6d-8a54-b6e9f1366c8b	Network connectivity via datalink ixgbe2 has been lost.				Major alert
2012-9-24 14:23:10	01c8f48b-06a9-c95c-d560-efe98a944f39	Full IP connectivity via interface ixgbe2 has been established.				Minor alert
2012-9-24 14:23:10	2246e904-22ad-4a40-ca2c-d5f5b2d357ec	Network connectivity via port ixgbe2 has been lost.				Minor alert
2012-9-24 14:23:10	ddcc68fb-eaef-4b7f-83a4-9ca3e75d0543	Network connectivity via datalink ixgbe2 has been established.				Minor alert
2012-9-24 14:23:10	de514e43-5839-6b58-92a3-e31a44caeb06	Network connectivity via port ixgbe2 has been established.				Minor alert
2012-9-24 14:23:10	68f550f6-d4f2-c76e-ea2b-babf8d03c455	IP connectivity via interface ixgbe2 has been lost due to link-based failure.				Major alert

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ZFS BUI

The screenshot displays the ZFS BUI Configuration page, specifically the Network section. The top navigation bar includes tabs for Configuration, Maintenance, Shares, Status, and Analytics. Below this, a sub-navigation bar lists SERVICES, STORAGE, NETWORK (selected), SAN, CLUSTER, USERS, PREFERENCES, and ALERTS. The main content area is titled 'Network' and includes a brief instruction: 'To configure networking, build Datalinks on Devices, and Interfaces on Datalinks. Click on a pencil icon to edit object properties. Select an object to view its relationship to other objects. Drag objects to extend Aggregations or IP Multipathing Groups.' The page is divided into three main columns: Devices, Datalinks, and Interfaces. The Devices column shows 12 total devices, categorized by BUILT-IN (igb0, igb1, igb2, igb3) and various PCIe slots (PCIe 3, PCIe 6, PCIe 7, PCIe 2). The Datalinks column shows 4 total datalinks, including igb0, igb1, ixgbe0, and ixgbe2. The Interfaces column shows 4 total interfaces, including head1 net0, head2 net1, private10gb, and private10gb2. A 'Please wait...' message is visible in the center of the Datalinks column.

Devices	Datalinks	Interfaces
BUILT-IN		
igb0 (1Gb full)	igb0 (via igb0)	head1 net0 (IPv4 static, 192.168.40.248/22, via igb0)
igb1 (1Gb full)	igb1 (via igb1)	head2 net1 (IPv4 static, 192.168.40.249/22, via igb1)
igb2 (link down)	ixgbe0 (Custom MTU(9000), via ixgbe0)	private10gb (IPv4 static, 10.221.112.49/24, via ixgbe0)
igb3 (link down)	ixgbe2 (Custom MTU(9000), via ixgbe2)	private10gb2 (IPv4 static, 10.221.112.50/24, via ixgbe2)
PCIe 3		
ixgbe0 (10Gb full)		
ixgbe1 (link down)		
PCIe 6		
ixgbe2 (10Gb full)		
ixgbe3 (link down)		
PCIe 7		
ibp2 (port down)		
ibp3 (port down)		
PCIe 2		
ibp0 (port down)		
ibp1 (port down)		

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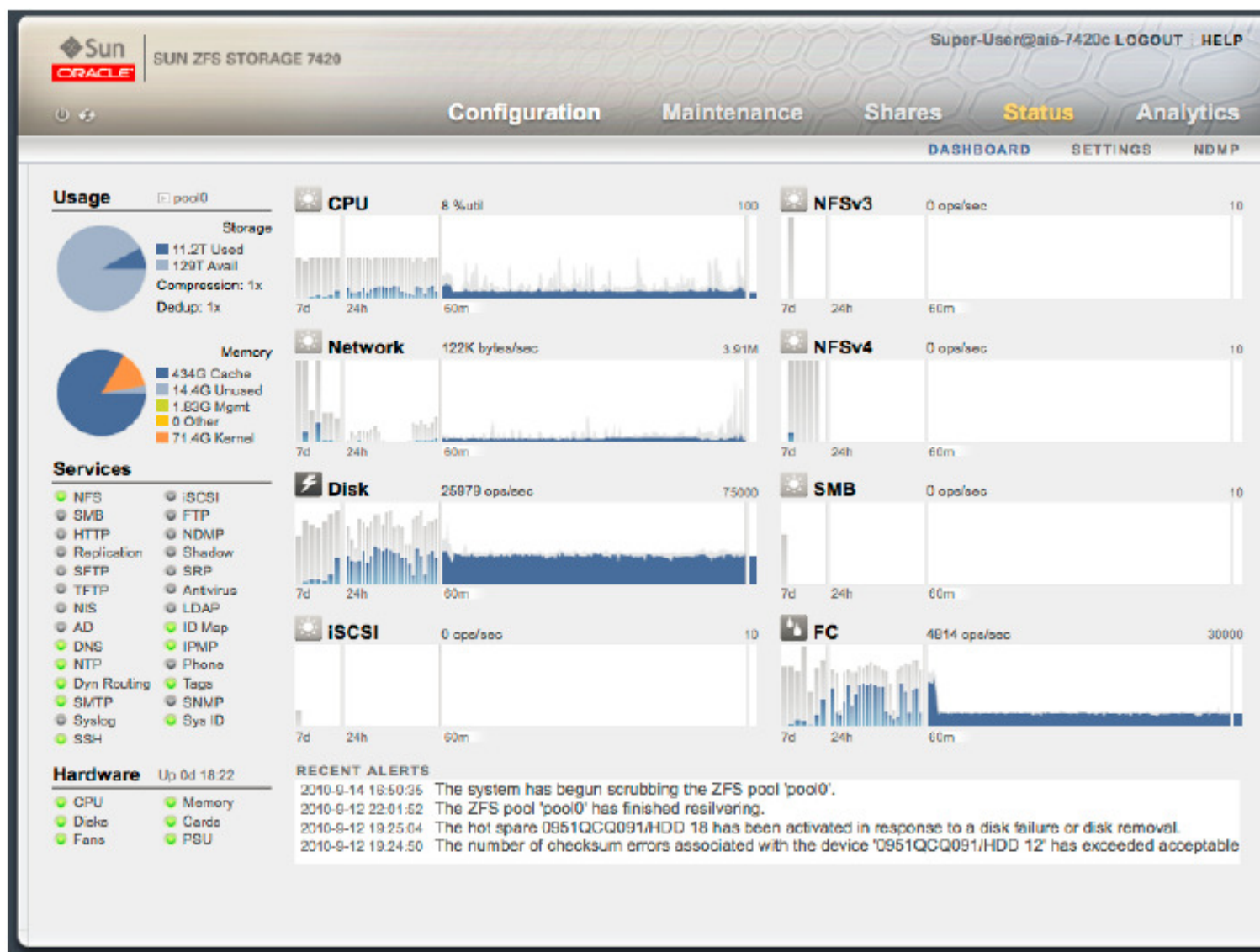
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Integrating Oracle Database Appliance with Sun ZFS Appliance to Achieve HA Security

Presented: Oracle OpenWorld - 3 October, 2012

ZFS Storage Appliances



Software
Engineered to Work Together

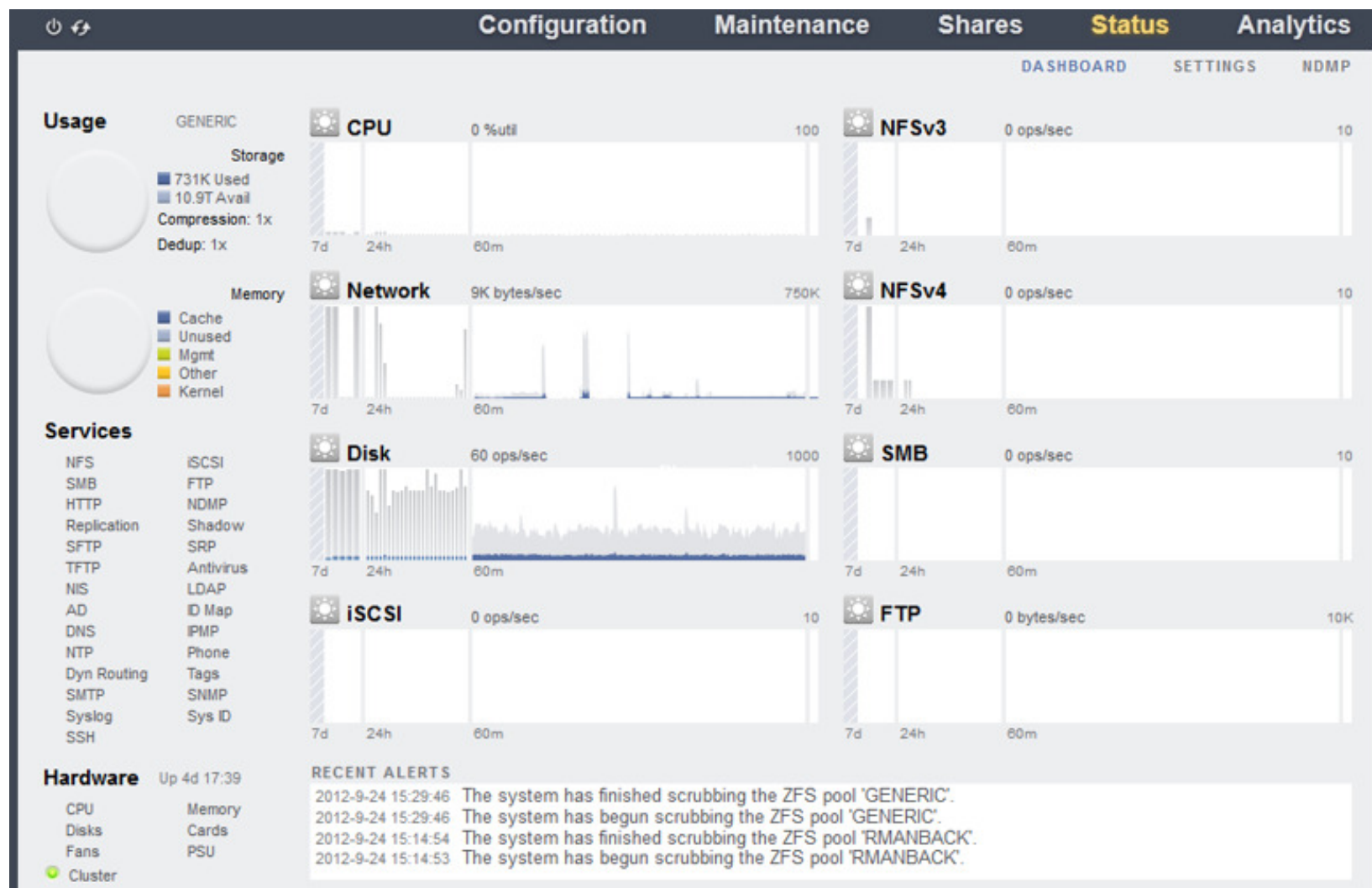
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ZFS BUI



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How Does This Change Our Jobs?

Job Title	Loses	Gains
Storage Admins	Time wasted monitoring competing loads on the storage appliance balancing competing need to read/write cache, and allocation of disk.	More efficient storage environment as it is all file system.
Network Admins	Pain and suffering	Time to devote to troubleshooting, security monitoring, and other value-added tasks.
System Admins	<ul style="list-style-type: none">▪Gives up appliance root password▪Gives up 2:00am support calls	
Database Admins		Patching operating system, firmware, and database as a single unit with patches previously tested for compatibility

Your ODA is not a general purpose computer, will not be hosting files, applications, middleware, etc.

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How Does This Change Our Jobs?

- Storage Admin
 - No longer required
- Network Admin
 - Only required for public network interface
- System Admin
 - Advise on configuration
 - Install backup agent (ie NetWorker)
 - Install security software (ie TripWire)
- DBA
 - Just like with ASM ... assumes broader responsibility for deployment and patching
 - Gives up large amounts of unproductive time debugging configurations

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Questions

**ERROR at line 1:
ORA-00028: your session has been killed**



Thank you

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