

# Oracle SuperCluster T5-8

## Security Guide



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# Accessing Oracle SuperCluster T5-8 Security Resources

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This guide provides information about planning, configuring, and maintaining a secure environment for Oracle SuperCluster T5-8.

These topics are covered in this section:

- [“Security Task Overview”](#) on page 1
- [“Security Information for SuperCluster Components”](#) on page 3

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## Security Task Overview

This table provides a summary of the tasks involved in securing Oracle SuperCluster T5-8.

Use this table in conjunction with the security documents listed in [“Security Information for SuperCluster Components”](#) on page 3.

Task	Links
<b>1. Before your system arrives, plan for a secure integration into your environment.</b>	
<b>a. Access security information.</b>	<a href="#">“Security Information for SuperCluster Components”</a> on page 3
<b>b. Read these white papers:</b>	<a href="http://www.oracle.com/technetwork/server-storage/sun-sparc-enterprise/documentation/o13-052-osc-t5-8-security-1989641.pdf">http://www.oracle.com/technetwork/server-storage/sun-sparc-enterprise/documentation/o13-052-osc-t5-8-security-1989641.pdf</a>
<ul style="list-style-type: none"><li>• <i>Oracle SuperCluster T5-8 Platform Security Principles and Capabilities</i></li><li>• <i>Secure Database Consolidation Using the Oracle SuperCluster T5-8 Platform</i></li></ul>	<a href="http://www.oracle.com/technetwork/server-storage/engineered-systems/supercluster-whitepapers-1965427.html">http://www.oracle.com/technetwork/server-storage/engineered-systems/supercluster-whitepapers-1965427.html</a>
These white papers describe how to deploy the system using Oracle SuperCluster’s integrated security capabilities.	

Task	Links
c. Review security guidelines.	<p>“Understanding Hardware Security Guidelines” on page 5</p> <p>“Software Security Guidelines” on page 8</p> <p>“Network Security Considerations” on page 8</p>
2. While completing the <i>Oracle SuperCluster T5-8 Configuration Worksheet</i> , select configuration options that correspond to your security policies and environment.	
a. Before making any configuration changes, review the default security settings.	“Default Security Settings” on page 11
b. Review the preconfigured network services to ensure they will integrate securely into your network.	“Default TCP/IP Ports and Services” on page 15
3. After installation, perform immediate security measures.	
a. Secure the hardware.	“Understanding Hardware Security Guidelines” on page 5
b. Change all preconfigured passwords. Note - Oracle SuperCluster T5-8 uses preconfigured passwords for initial installation and deployment that are widely known.	“Changing Passwords on Default User Accounts” on page 12
4. Configure SuperCluster security features in accordance with your security architecture and policies:	
a. Establish and configure isolation of the hardware, workload, network traffic, database, and storage.	<p>a - d are covered in the white paper titled <i>Secure Database Consolidation Using the Oracle SuperCluster T5-8 Platform</i> available at:  <a href="http://www.oracle.com/technetwork/server-storage/engineered-systems/supercuster-whitepapers-1965427.html">http://www.oracle.com/technetwork/server-storage/engineered-systems/supercuster-whitepapers-1965427.html</a></p>
b. Configure the system to control access to data.	
c. Take advantage of built-in cryptographic services.	
d. Ensure quality of service for all the components.	
e. Before deploying the system in your production environment, thoroughly test the security configuration.	
5. After deployment, ensure ongoing security.	
a. Use SuperCluster features to ensure optimum security for the life of the system.	“Managing SuperCluster Security” on page 19
b. Monitor and audit critical aspects of the system.	“Monitoring and Auditing” on page 22
c. Ensure that the Quarterly Full Stack Download Patches (QFSDP) are applied to the system.	“Software and Firmware Updating” on page 24

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# Security Information for SuperCluster Components

Indepth security information is available for each of the major Oracle SuperCluster T5-8 components.

Use these tables to locate applicable security guides and white papers.

**TABLE:** Hardware Security Documentation

Component	Title	Links
SPARC T5-8 servers	<i>SPARC and Netra SPARC T5 Series Servers Security Guide</i>	<a href="http://www.oracle.com/goto/T5-8/docs">http://www.oracle.com/goto/T5-8/docs</a>
Exadata storage servers	<i>Exadata Database Machine Security Guide</i>	On the Exadata storage servers, in the /opt/oracle/cell/doc directory
ZFS Storage Appliance	<i>Oracle ZFS Storage Appliance Security Guide</i>	<a href="http://www.oracle.com/goto/ZS3-ES/docs">http://www.oracle.com/goto/ZS3-ES/docs</a>
InfiniBand switches	<i>Sun Datacenter InfiniBand Switch 36 Hardware Security Guide</i>	<a href="http://docs.oracle.com/cd/E36265_01">http://docs.oracle.com/cd/E36265_01</a>
Cisco 4948 Ethernet switch	<i>IPv6 First-Hop Security Configuration Guide, Cisco IOS Release 15.1SG</i>	<a href="http://www.cisco.com/c/en/us/td/docs/ios-xm1/ios/ipv6_fhsec/configuration/15-1sg/ipv6f-15-1sg-book.html">http://www.cisco.com/c/en/us/td/docs/ios-xm1/ios/ipv6_fhsec/configuration/15-1sg/ipv6f-15-1sg-book.html</a>

**TABLE:** Software Security Documentation

Component	Title	Links
Oracle Solaris 11 OS	<ul style="list-style-type: none"><li>• <i>Oracle Solaris 11 Security Guidelines</i></li><li>• <i>Securing the Network in Oracle Solaris 11.1</i></li><li>• <i>Oracle Solaris 11.1 Administration: Security Services</i></li></ul>	<a href="http://www.oracle.com/goto/Solaris11/docs">http://www.oracle.com/goto/Solaris11/docs</a>
Oracle Solaris 10 OS	<i>Oracle Solaris 10 Security Guidelines</i> <i>Oracle Solaris Administration: Security Services</i>	<a href="http://www.oracle.com/goto/Solaris10/docs">http://www.oracle.com/goto/Solaris10/docs</a>
Oracle Solaris Cluster	<i>Oracle Solaris Cluster 4.1 Security Guide</i>	<a href="http://docs.oracle.com/cd/E29086_01">http://docs.oracle.com/cd/E29086_01</a>

**TABLE:** Software Security Documentation (Continued)

Component	Title	Links
Oracle Solaris Cluster	<i>Oracle Solaris Cluster 3.3 Security Guide</i>	<a href="http://docs.oracle.com/cd/E37745_01">http://docs.oracle.com/cd/E37745_01</a>
Oracle Database (including Database Vault and Label Security)	<ul style="list-style-type: none"> <li>• <i>Oracle Database 11g (11.2) Security Guide</i></li> <li>• <i>Advanced Security Administrator's Guide</i></li> <li>• <i>Database Vault Administrator's Guide</i></li> <li>• <i>Label Security Administrator's Guide</i></li> <li>• <i>Enterprise User Security Administrator's Guide</i></li> </ul>	<a href="http://docs.oracle.com/cd/E11882_01/nav/portal_25.htm#database_security">http://docs.oracle.com/cd/E11882_01/nav/portal_25.htm#database_security</a>
Oracle ILOM	<i>Oracle ILOM Security Guide Firmware Release 3.2.x</i>	<a href="http://docs.oracle.com/cd/E37444_01">http://docs.oracle.com/cd/E37444_01</a>
Oracle VM Server for SPARC	<i>Oracle VM Server for SPARC 3.1 Security Guide</i>	<a href="http://docs.oracle.com/cd/E38405_01">http://docs.oracle.com/cd/E38405_01</a>
Oracle Enterprise Manager Ops Center	<i>Oracle Enterprise Manager Ops Center Security Guide</i>	<a href="http://docs.oracle.com/cd/E11857_01/nav/management.htm">http://docs.oracle.com/cd/E11857_01/nav/management.htm</a>

**TABLE:** Additional Security Information

Information	Links
Oracle Security and Compliance for Oracle Database	<a href="http://www.oracle.com/technetwork/database/security">http://www.oracle.com/technetwork/database/security</a>
Oracle SuperCluster articles and white papers	<a href="http://www.oracle.com/technetwork/server-storage/engineered-systems/supercluster-whitepapers-1965427.html">http://www.oracle.com/technetwork/server-storage/engineered-systems/supercluster-whitepapers-1965427.html</a>
Identity management and security articles	<a href="http://www.oracle.com/technetwork/articles/idm">http://www.oracle.com/technetwork/articles/idm</a>
Oracle VM Server for SPARC technical white papers	<a href="http://www.oracle.com/technetwork/server-storage/vm/overview">http://www.oracle.com/technetwork/server-storage/vm/overview</a>



# Understanding Oracle SuperCluster T5-8 Security Guidelines

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These sections describe Oracle SuperCluster T5-8 security guidelines and features:

- [“Understanding Hardware Security Guidelines” on page 5](#)
- [“Software Security Guidelines” on page 8](#)
- [“Network Security Considerations” on page 8](#)

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## Understanding Hardware Security Guidelines

These sections describe hardware security guidelines:

- [“Access Restrictions” on page 5](#)
- [“Serial Numbers” on page 6](#)
- [“Drives” on page 6](#)

### Access Restrictions

- Install Oracle SuperCluster T5-8 and related equipment in a locked, restricted-access room.
- Lock the rack doors unless service is required on components within the rack. Doing so restricts access to hot-pluggable or hot-swappable devices, and to USB ports, network ports, and system consoles.
- Store spare field-replaceable units (FRUs) or customer-replaceable units (CRUs) in a locked cabinet. Restrict access to the locked cabinet to authorized personnel.
- Periodically verify the status and integrity of the locks on the rack and the spares cabinet to guard against, or detect, tampering or doors being accidentally left unlocked.

- Store cabinet keys in a secure location with limited access.
- Restrict access to USB consoles. Devices such as system controllers, power distribution units (PDUs), and network switches can have USB connections. Restricting physical access is a more secure method of accessing a component since it is not susceptible to network-based attacks.

## Serial Numbers

- Record the serial numbers of the components in Oracle SuperCluster T5-8.
- Security-mark all significant items of computer hardware, such as replacement parts. Use special ultraviolet pens or embossed labels.
- Keep hardware activation keys and licenses in a secure location that is easily accessible to the system manager in system emergencies. The printed documents might be your only proof of ownership.
- Securely store all the information sheets that are provided with the system.

## Drives

Hard drives and solid state drives are often used to store sensitive information. To protect this information from unauthorized disclosure, sanitize drives prior to reusing, decommissioning, or disposing them.

- Use disk-wiping tools such as the Oracle Solaris `format(1M)` command to completely erase all data from the drive.
- Organizations should refer to their data protection policies to determine the most appropriate method to sanitize hard drives.
- If required, take advantage of Oracle's Customer Data and Device Retention Service. Refer to this document:  
<http://www.oracle.com/us/support/library/data-retention-ds-405152.pdf>



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**Caution** – Disk-wiping software might not be able to delete some data on modern hard drives, due to the way that they manage data access.

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# SPARC T5-8 Hardware Security

All of the security principles that are outlined in the *SPARC and Netra SPARC T5 Series Servers Security Guide* apply to the SPARC T5-8 servers in SuperCluster. This security guide is available at: <http://www.oracle.com/goto/T5-8/docs>

## OBP

By default, the SPARC T5-8 OBP is not password-protected. You can enhance the security of the SPARC T5-8 by restricting access to the OBP by performing these actions:

- Implement password protection.
- Check for failed OBP logins.
- Provide an OBP power-on banner.

## Oracle System Firmware

The Oracle system firmware that runs on the SPARC T5-8 servers uses a controlled update process to prevent unauthorized modifications. Only the superuser or an authenticated user with proper authorization can use the update process.

## Secure WAN Boot

WAN boot supports varying levels of security. You can use a combination of the security features that are supported in WAN boot to meet the needs of your network. A more secure configuration requires more administration, but also protects your system data to a greater extent.

- For the Oracle Solaris 10 OS, refer to the information on securing WAN boot installation configuration in *Oracle Solaris Installation Guide: Network-Based Installations* at: [http://docs.oracle.com/cd/E26505\\_01](http://docs.oracle.com/cd/E26505_01)
- For the Oracle Solaris 11 OS, refer to *Securing the Network in Oracle Solaris 11.1* available at: [http://docs.oracle.com/cd/E26502\\_01](http://docs.oracle.com/cd/E26502_01)

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# Software Security Guidelines

- Ensure that all default passwords are changed as soon as the system is installed.
- When creating user accounts, use role-based access control (RBAC) features to disable the ability to directly log in to common OS accounts such as `root`, `grid`, and `oracle`. Instead, create individual user accounts for each administrator. After logging in with their individual account, the administrator can use `su` to run privileged commands, when required.
- Create and use Oracle ILOM user accounts for individual users to ensure a positive identification in audit trails.
- Disable unnecessary protocols and modules in the OS.
- Restrict the capability to restart the system over the network.
- Limit SSH listener ports to the management and private networks.
- Use SSH protocol 2 (SSH-2) and FIPS 140-2 approved ciphers.
- Use intrusion prevention systems on servers to monitor network traffic flowing to and from Oracle SuperCluster T5-8.
- Use host-based intrusion detection and prevention systems for increased visibility within Oracle SuperCluster T5-8. By using the fine-grained auditing capabilities of Oracle Database, host-based systems have a greater likelihood of detecting inappropriate actions and unauthorized activity.
- Use application and network-layer firewalls to protect information flowing to and from Oracle SuperCluster T5-8. Filtering network ports provides the first line of defense in preventing unauthorized access to systems and services.  
  
Network-level segmentation using Ethernet VLANs and host-based firewalls enforce inbound and outbound network policy at the host level. SuperCluster T5-8 includes a configured software firewall by default.
- Use encryption features such as Transparent Data Encryption (TDE) and Oracle Recovery Manager (RMAN) encryption for backups.
- Use centralized audit and log repositories to aggregate the security-relevant information for improved correlation, analysis, and reporting.

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# Network Security Considerations

This list provides a number of security features worth considering to enhance network security.



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**Caution** – Ensure that you fully test these features before you deploy the system in your environment.

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- Configure administrative and operational services to use encryption protocols and key lengths that align with current policies. Cryptographic services provided by Oracle SuperCluster T5-8 benefit from hardware acceleration, which improves security without impacting performance.
- Create separate software owner accounts for Oracle Grid Infrastructure and Oracle Database software installations. Use these accounts when deploying Oracle SuperCluster T5-8.
- Disable unnecessary network services, such as TCP small servers or HTTP. Enable only necessary network services, and configure these services securely.
- Create a login banner to state that unauthorized access is prohibited.
- Use access control lists to apply restrictions where appropriate.
- Set time-outs for extended sessions and set privilege levels.
- Use the port mirroring capability of the switch for intrusion detection system (IDS) access.
- Implement port security to limit access based upon a MAC address. Disable auto-trunking on all ports for any switch connected to Oracle SuperCluster T5-8.
- Limit remote configuration to specific IP addresses using SSH.
- Require users to use strong passwords by setting minimum password complexity rules and password expiration policies.
- Enable logging and send logs to a dedicated secure log host.
- Configure logging to include accurate time information, using NTP and timestamps.
- Secure the IB Switches:
  - Use network switch port security features if they are available.
  - Lock the Media Access Control (MAC) address of one or more connected devices to a physical port on a switch. If a switch port is locked to a particular MAC address, then superusers cannot create back doors into the network with rogue access points.
  - Disable a specified MAC address from connecting to a switch.
  - Manage the Ethernet switch configuration file offline and limit access to the file to only authorized administrators.
  - Use each switch port's direct connections so the switch can set security based on its current connections.
  - Use authentication, authorization, and accounting (AAA) features for local and remote access to a switch.
- Secure VLANs:

- Use a static VLAN configuration.
- Disable unused switch ports, and assign an unused VLAN number.
- Assign a unique native VLAN number to trunk ports.
- Limit the VLANs that can be transported over a trunk to only those that are strictly required.
- Disable VLAN Trunking Protocol (VTP), if possible. If disabling VTP is not possible, then set the management domain, password, and pruning for VTP. In addition, set VTP to transparent mode.

# Understanding Oracle SuperCluster T5-8 Security Settings and Services

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These sections describe Oracle SuperCluster T5-8 security guidelines and features:

- [“Default Security Settings” on page 11](#)
- [“Changing Passwords on Default User Accounts” on page 12](#)
- [“Default TCP/IP Ports and Services” on page 15](#)

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## Default Security Settings

Oracle SuperCluster T5-8 software is installed with many default security settings. Whenever possible, use the default secure settings:

- Password policies enforces a minimum password complexity.
- Failed login attempts cause a lockout after a set number of failed attempts.
- All default system accounts in the OS are locked and prohibited from logging in.
- Limited ability to use the `su` command is configured.
- Unnecessary protocols and modules are disabled from the OS kernel.
- Boot loader is password protected.
- All unnecessary system services are disabled, including `inetd` (Internet service daemon).
- Software firewall is configured on the storage cells.
- Restrictive file permissions are set on key security-related configuration files and executable files.
- SSH listen ports are restricted to management and private networks.
- SSH is limited to v2 protocol.
- Insecure SSH authentication mechanisms are disabled.
- Specific cryptographic ciphers are configured.
- The switches are separated in the system from data traffic on the network.

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# Changing Passwords on Default User Accounts

After Oracle SuperCluster T5-8 is installed, the system is configured with a set of user accounts and passwords. The root SSH equivalence is enabled.

These topics describe the default user accounts and passwords:

- “Change Passwords on Default Accounts” on page 12
- “Default User Accounts and Passwords” on page 13
- “Change the Exadata Storage Server Passwords” on page 14
- “Change the Ethernet Switch Password” on page 14

## ▼ Change Passwords on Default Accounts

Before deploying the system, perform these actions:

### 1. Change all user account passwords on all components.

See “Default User Accounts and Passwords” on page 13.

Ensure that you create strong passwords. Refer to the security guides for each component. The guides are listed in “Security Information for SuperCluster Components” on page 3.

You must change Oracle Solaris passwords for each logical domain and for each zone.

### 2. Limit use of the `root` superuser account.

Instead, create user accounts with the Oracle Solaris OS RBAC facility.

For more information, refer to the *Oracle Solaris 11.1 Administration: Security Services* document at: [http://docs.oracle.com/cd/E26502\\_01](http://docs.oracle.com/cd/E26502_01)



# Default User Accounts and Passwords

Component	User Name	Password	User Account and Password Information
SPARC T5-8 servers	<ul style="list-style-type: none"> <li>• root</li> <li>• oracle</li> <li>• grid</li> </ul>	<p>welcome1</p> <p>welcome1</p> <p>welcome1</p>	<ul style="list-style-type: none"> <li>• <b>Oracle Solaris 11.1</b> – Refer to <i>Managing User Accounts and User Environments</i> document at: <a href="http://docs.oracle.com/cd/E26502_01">http://docs.oracle.com/cd/E26502_01</a></li> <li>• <b>Oracle Solaris 10</b> – Refer to <i>Oracle Solaris Administration: Basic Administration</i> at: <a href="http://docs.oracle.com/cd/E26505_01">http://docs.oracle.com/cd/E26505_01</a></li> </ul>
Exadata Storage Servers	<ul style="list-style-type: none"> <li>• root</li> <li>• celladmin</li> <li>• cellmonitor</li> </ul>	<p>welcome1</p> <p>welcome1</p> <p>welcome1</p>	See “Change the Exadata Storage Server Passwords” on page 14.
Oracle ZFS Storage ZS3-ES	<ul style="list-style-type: none"> <li>• root</li> </ul>	welcome1	Refer to the “Users” section in the <i>Oracle ZFS Storage Appliance Administration Guide</i> at: <a href="http://www.oracle.com/goto/ZS3-ES/docs">http://www.oracle.com/goto/ZS3-ES/docs</a>
InfiniBand switches	<ul style="list-style-type: none"> <li>• root</li> <li>• nm2user</li> </ul>	<p>welcome1</p> <p>changeme</p>	Refer to “Controlling the Chassis” in the <i>Sun Datacenter InfiniBand Switch 36 HTML Document Collection for Firmware Version 2.1</i> at: <a href="http://docs.oracle.com/cd/E36265_01">http://docs.oracle.com/cd/E36265_01</a>
PDUs	<ul style="list-style-type: none"> <li>• admin</li> <li>• root</li> </ul>	<p>welcome1</p> <p>welcome1</p>	Refer to “Changing Interface Settings” in the <i>Sun Rack II Power Distribution Units User’s Guide</i> at: <a href="http://docs.oracle.com/cd/E19844-01">http://docs.oracle.com/cd/E19844-01</a>
Oracle ILOM on:	<ul style="list-style-type: none"> <li>• SPARC T5-8 servers</li> <li>• Exadata Storage Servers</li> <li>• ZFS storage appliance</li> </ul>	welcome1	Refer to “Configuration and Maintenance” in the Oracle ILOM documentation collection, at: <a href="http://docs.oracle.com/cd/E24707_01/html/E24528">http://docs.oracle.com/cd/E24707_01/html/E24528</a>
InfiniBand Oracle ILOM	<ul style="list-style-type: none"> <li>• ilom-admin</li> <li>• ilom-operator</li> </ul>	<p>ilom-admin</p> <p>ilom-operator</p>	Refer to the InfiniBand documentation at: <a href="http://docs.oracle.com/cd/E36265_01">http://docs.oracle.com/cd/E36265_01</a>
Ethernet switch	<ul style="list-style-type: none"> <li>• admin</li> </ul>	welcome1	See “Change the Ethernet Switch Password” on page 14.

## ▼ Change the Exadata Storage Server Passwords

1. **Log into the storage server as root using the preconfigured password** `welcome1`.
2. **Change the password for the root, celladmin, and cellmonitor accounts.**  
Syntax: `passwd username`  
Example: **`passwd celladmin`**  
You are prompted to enter a password.

---

**Note** – The `celladmin` user runs all services on the cell. The `cellmonitor` user is used for monitoring purposes, but cannot run services on the cell.

---

For more information about Exadata Storage Server security, on the Exadata storage servers, go to the `/opt/oracle/cell/doc` directory and refer to these documents:

- *Exadata Database Machine Security Guide*
- “Understanding Operating System Security of Oracle Exadata Storage Servers” in the *Exadata Storage Server Software User’s Guide*

## ▼ Change the Ethernet Switch Password

1. **Connect a serial cable from the Ethernet switch console to a laptop or similar device.**  
The default serial port speed is 9600 baud, 8 bits, no parity, 1 stop bit, and no handshake.

```
sscsw-adm0 con0 is now available
Press RETURN to get started.
```

2. **Put the switch in enable mode.**

```
sscsw-adm0> enable
```

3. **Set the password.**

```
sscsw-adm0# configure terminal
Enter configuration commands, one per line. End with CNTL/Z.
sscsw-adm0(config)# enable password *****
sscsw-adm0(config)# enable secret *****
sscsw-adm0(config)# end
sscsw-adm0# write memory
```

```
*Apr 24 14:25:05.893:%SYS-5-CONFIG_I:Configured from console by
console
Building configuration...
Compressed configuration from 2502 bytes to 1085 bytes [OK ]
```

#### 4. Save the configuration.

```
sscsw-adm0# copy running-config startup-config
```

#### 5. Exit from the session.

```
sscsw-adm0# exit
```

#### 6. Disconnect the laptop from the Ethernet switch.

---

## Default TCP/IP Ports and Services

This section provides a list of services with listening ports and a description of the different port states.

For comprehensive information about securing the Oracle Supercluster T5-8 network, refer to the network documentation for Oracle Solaris:

- Oracle Solaris 11 library:

<http://www.oracle.com/goto/Solaris11/docs>

- Oracle Solaris 10 library

<http://www.oracle.com/goto/Solaris10/docs>

This table lists the typical listening ports for a logical domain on Oracle SuperCluster T5-8. The state listed represents the state of the port after the system is initially configured and before any users have logged in.

**TABLE:** Listening Ports

<b>Service</b>	<b>Address Family AF_INET6 is IPv6 AF_INET is IPv4</b>	<b>Port No.</b>	<b>State</b>
/usr/lib/nfs/mountd	AF_INET6	39124*	IDLE
	AF_INET	40167*	IDLE
	AF_INET6	41858*	IDLE
	AF_INET	64956*	IDLE
/usr/lib/ep/eptelemon	AF_INET	61666	IDLE
/usr/sbin/cupsd	AF_INET6	631	LISTEN
	AF_INET	631	LISTEN
/usr/lib/nfs/lockd	AF_INET6	4045	LISTEN
	AF_INET	4045	LISTEN
/usr/lib/nfs/statd	AF_INET6	46535*	IDLE
	AF_INET6	33612*	IDLE
	AF_INET	63711*	IDLE
	AF_INET	41346*	IDLE
/usr/sbin/rpcbind	AF_INET6	111	LISTEN
	AF_INET6	44464*	IDLE
	AF_INET	111	LISTEN
	AF_INET	64773*	IDLE
/usr/lib/ldoms/vntsd	AF_INET	5001	LISTEN
	AF_INET	5002	LISTEN
/opt/SUNWldm/bin/ldmd	AF_INET	64535	IDLE
	AF_INET	56967	IDLE
	AF_INET	6482	ESTABLISHED
	AF_INET	8101	LISTEN
/usr/lib/nfs/nfs4cbd	AF_INET6	51946*	IDLE
	AF_INET	35389*	IDLE
/usr/lib/nfs/nfsd	AF_INET6	2049	LISTEN
	AF_INET	2049	LISTEN
/usr/lib/inet/inetd	AF_INET	50197*	IDLE
	AF_INET6	54077*	IDLE
	AF_INET6	69	IDLE

**TABLE:** Listening Ports (*Continued*)

Service	Address Family		Port No.	State
	AF_INET6 is IPv6	AF_INET is IPv4		
/usr/lib/ssh/sshd	AF_INET6		22	LISTEN
/usr/bin/sendmail	AF_INET		25	LISTEN
	AF_INET6		25	LISTEN
	AF_INET		587	LISTEN
/usr/lib/inet/ntpd	AF_INET		123	IDLE
	AF_INET6		123	IDLE

\* The service uses a range of different ports so the port number might be different each time the service runs, but the number is similar to the number shown in the table.

This table provides descriptions of the different states.

**TABLE:** Port States

State	Description
BOUND	Bound, ready to connect or listen.
CLOSED	Socket is not being used.
CLOSING	Closed, remote shutdown and awaiting acknowledgment.
CLOSE_WAIT	Remote shutdown is waiting for the socket to close.
ESTABLISHED	Connection established.
FIN_WAIT_1	Socket closed and connection is shutting down.
FIN_WAIT_2	Socket closed and waiting for remote shutdown.
IDLE	Idle, opened but not bound.
LAST_ACK	Remote shutdown and closed, awaiting acknowledgement.
LISTEN	Listening for incoming connections.
SYN_RECEIVED	Initial synchronization of the connection is underway.
SYN_SENT	Actively trying to establish connection.
TIME_WAIT	Wait after close for remote shutdown retransmission.



# Keeping Oracle SuperCluster T5-8 Secure

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These topics describe the Oracle SuperCluster T5-8 features that you can use to maintain security over the life of the system:

- [“Managing SuperCluster Security” on page 19](#)
- [“Monitoring and Auditing” on page 22](#)
- [“Software and Firmware Updating” on page 24](#)

---

## Managing SuperCluster Security

Oracle SuperCluster T5-8 leverages the security management capabilities of a variety of products including Oracle ILOM, Oracle Enterprise Manager Ops Center, Oracle Enterprise Manager, and Oracle’s Identity Management Suite. These sections describe the details:

- [“Oracle ILOM for Secure Management” on page 19](#)
- [“Oracle Identity Management Suite” on page 20](#)
- [“Oracle Key Manager” on page 20](#)
- [“Oracle Enterprise Manager” on page 21](#)
- [“Oracle Enterprise Manager Ops Center \(Optional\)” on page 21](#)

## Oracle ILOM for Secure Management

Oracle ILOM is a service processor embedded in many Oracle SuperCluster T5-8 components. Use Oracle ILOM to perform these out-of-band management activities:

- Provide secure access to perform secure lights-out management of the SuperCluster components. Access includes web-based access protected by SSL, command-line access using Secure Shell, and IPMI v2.0 and SNMPv3 protocols.

- Separate duty requirements using an RBAC model. Assign individual users to specific roles that limit the functions that they can perform.
- Provide an audit record of all logins and configuration changes. Each audit log entry lists the user performing the action and a timestamp. This capability enables you to detect unauthorized activity or changes and attribute those actions back to specific users.

For more information, refer to the Oracle Integrated Lights Out Manager 3.1 documentation at: [http://docs.oracle.com/cd/E24707\\_01](http://docs.oracle.com/cd/E24707_01)

## Oracle Identity Management Suite

Oracle Identity Management suite manages the end-to-end lifecycle of user identities and accounts across an organization. The Oracle Identity Management suite includes support for single sign-on, web-based access control, web services security, identity administration, strong authentication, and identity and access governance.

Oracle Identity Management can provide a single point for managing identity and access to not only applications and services running on Oracle SuperCluster T5-8, but also for the underlying infrastructure and services that manage it.

For more information, refer to the Oracle Identity Management documentation at: <http://www.oracle.com/technetwork/middleware/id-mgmt/documentation/index.html>

## Oracle Key Manager

Oracle Key Manager is a comprehensive key management system (KMS) that simplifies the management and monitoring of encryption keys that protect information at rest.

Oracle Key Manager supports enterprise-class environments with a highly scalable and available architecture that can manage thousands of devices and millions of keys. This feature operates on a hardened operating environment, enforces strong access control and role separation for key management and monitoring operations, and optionally supports the secure storage of keys in Oracle's Sun Crypto Accelerator 6000 PCIe Card, a FIPS 140-2 rated hardware secure module.

In the context of Oracle SuperCluster T5-8, the Oracle Key Manager can authorize, secure, and manage access to encryption keys used by Oracle StorageTek encrypting tape drives, Oracle Databases encrypted using Transparent Data Encryption, and encrypted ZFS file systems available on the Oracle Solaris 11 OS.



For more information, refer to the Oracle Key Manager documentation at:  
[http://docs.oracle.com/cd/E26076\\_02](http://docs.oracle.com/cd/E26076_02)

## Oracle Enterprise Manager

Oracle Enterprise Manager suite is a comprehensive and integrated cloud management solution that focuses on lifecycle management of applications, middleware, databases, and physical and virtual infrastructure (using Oracle Enterprise Manager Ops Center). Oracle Enterprise Manager provides these management technologies:

- Supports detailed monitoring, event notification, patching, change management, continuous configuration, and compliance management, and reporting for the application, middleware, and database.
- Enables you to centrally maintain security configuration settings as well as access control and auditing policies for groups of databases. Access to these functions can be limited to authorized individuals, ensuring that management access supports compliance mandates for separation of duty, least privilege, and accountability.
- Supports strong authentication using a variety of methods, fine-grained access controls, and comprehensive auditing, ensuring that management of the Oracle SuperCluster T5-8 environment can be accomplished in a secure manner.

For more information, refer to Oracle Enterprise Manager documentation at:  
<http://www.oracle.com/technetwork/oem/grid-control/documentation/oem-091904.html>

## Oracle Enterprise Manager Ops Center (Optional)

Oracle Enterprise Manager Ops Center is an optional technology that you can use to manage some security aspects of Oracle SuperCluster T5-8.

Part of the Oracle Enterprise Manager suite, Oracle Enterprise Manager Ops Center is a converged hardware management solution that provides a single administrative interface for servers, OSs, firmware, virtual machines, zones, storage, and network fabrics. Oracle Enterprise Manager Ops Center is installed by default on Oracle SuperClusterT5-8.

You can use Oracle Enterprise Manager Ops Center to assign administrative access to collections of physical and virtual systems, monitor administrator activity, detect faults, and configure and manage alerts. Oracle Enterprise Manager Ops Center supports a variety of reports that enable you to compare systems against known configuration baselines, patch levels, and security vulnerabilities.

For more information, refer to the Oracle Enterprise Manager Ops Center documentation at: [http://docs.oracle.com/cd/E27363\\_01/index.htm](http://docs.oracle.com/cd/E27363_01/index.htm)

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**Note** – For previous versions of Oracle Enterprise Manager Ops Center, the Ops Center software was installed and run from the SuperCluster system. Beginning with the Oracle Enterprise Manager Ops Center 12c Release 2 (12.2.0.0.0) release, the Ops Center software must be installed and run on a system outside of the SuperCluster system.

---

## Monitoring and Auditing

Whether for compliance reporting or incident response, monitoring and auditing are critical functions that you must use to gain increased visibility into the IT environment. The degree to which monitoring and auditing is employed is often based upon the risk or critical nature of the environment.

Oracle SuperCluster T5-8 provides comprehensive monitoring and auditing functionality at the server, network, database, and storage layers, ensuring that information can be made available in support of audit and compliance requirements.

These sections describe workload and database monitoring and auditing:

- “Workload Monitoring and Auditing” on page 22
- “Database Activity Monitoring and Auditing” on page 23
- “Monitoring the Network” on page 23

## Workload Monitoring and Auditing

The Oracle Solaris OS has a comprehensive auditing facility that can monitor administrative actions, command-line invocations, and even individual kernel-level system calls. This facility is highly configurable, offering a global, per-zone, and even per-user auditing policies.

When the system is configured to use Oracle Solaris Zones, audit records for each zone can be stored in the global zone to protect them from tampering.

Oracle Solaris auditing provides the ability to send audit records to remote collection points using the system log (`syslog`) facility. Many commercial intrusion detection and prevention services can use Oracle Solaris audit records as an additional input for analysis and reporting.

Oracle VM Server for SPARC leverages the native Oracle Solaris auditing facility to record actions and events associated with virtualization events and domain administration.

For more information, refer to the Monitoring and Maintaining Oracle Solaris Security section in the Oracle Solaris Security Guidelines at:

[http://docs.oracle.com/cd/E26502\\_01](http://docs.oracle.com/cd/E26502_01)

## Database Activity Monitoring and Auditing

Oracle Database support of fine-grained auditing enables you to establish policies that selectively determine when audit records are generated. This capability helps you focus on other database activities and reduces the overhead that is often associated with audit activities.

Oracle Audit Vault and Database Firewall centralizes the management of database audit settings and automates the consolidation of audit data into a secure repository. This software includes built-in reporting to monitor a wide range of activities, including privileged user activity and changes to database structures. The reports generated by Oracle Audit Vault and Database Firewall provide visibility into various application and administrative database activities, and provide detailed information to support accountability of actions.

Oracle Audit Vault and Database Firewall enables the proactive detection and alerting of activities that might indicate unauthorized access attempts or abuse of system privileges. These alerts can include both system and user-defined events and conditions, such as the creation of privileged user accounts or the modification of tables containing sensitive information.

Oracle Audit Vault and Database Firewall Remote Monitor can provide real-time database security monitoring. This feature queries database connections to detect malicious traffic, such as application bypass, unauthorized activity, SQL injection, and other threats. Using an accurate SQL grammar-based approach, this software helps you quickly identify suspicious database activity.

For more information, refer to the Oracle Audit Vault and Database Firewall documentation at: [http://docs.oracle.com/cd/E37100\\_01/index.htm](http://docs.oracle.com/cd/E37100_01/index.htm)

## Monitoring the Network

After the networks are configured based on the security guidelines, regular review and maintenance is needed.

Follow these guidelines to ensure the security of local and remote access to the system:

- Review logs for possible incidents and archive them in accordance with your organization's security policies.
- Perform periodic reviews of the client access network to ensure that host and Oracle ILOM settings remain intact.

For more information, refer to the security guides for the Oracle Solaris OS:

- Oracle Solaris 11 OS – <http://www.oracle.com/goto/Solaris11/docs>
- Oracle Solaris 10 OS – <http://www.oracle.com/goto/Solaris10/docs>

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## Software and Firmware Updating

Oracle SuperCluster T5-8 updates are provided in QFSDP. Installing the QFSDP updates all components at the same time. This practice ensures that all components continue to run on a combination of software versions that have been fully tested together by Oracle.

Obtain the latest QFSDP from My Oracle Support at:  
<http://support.oracle.com>

For details about the latest supported software and firmware, refer to the *Oracle SuperCluster T5-8 Product Notes*. This document is available on the first compute node in this directory: `/opt/oracle/node/doc/E40166_01/index.html`

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**Note** – Only Upgrade, update, or patch individual components in isolation for reactive maintenance under the advice of Oracle support.

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