



# BAHIR DAR UNIVERSITY

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Operating System and System Programming Project

Title: solaris os

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## 1.1 Introduction

Solaris is a Unix-based operating system originally developed by Sun Microsystems, now owned by Oracle Corporation. Known for its scalability, stability, and advanced features, Solaris has been widely used in enterprise environments for servers, data centers, and mission-critical applications.

## Background

Solaris evolved from SunOS, which was based on BSD Unix. In 1992, Sun Microsystems rebranded SunOS 5.0 and its associated tools and environment as **Solaris 2.0**, integrating it with the **System V Release 4 (SVR4)** kernel. This move aimed to unify various Unix systems and bring together the best features of BSD, System and Xenix.

Solaris quickly became a preferred platform for SPARC-based hardware systems and offered extensive support for symmetric multiprocessing (SMP), multithreading, and large-scale memory management.

## Motivation

The development of Solaris was driven by several motivations:

1. **Enterprise-Grade Reliability:** To create a robust, fault-tolerant operating system for servers and critical business applications.
2. **Scalability and Performance:** To support the growing demand for scalable computing resources and efficient use of high-end hardware.
3. **Advanced Features:** To integrate innovative technologies like ZFS, DTrace, and Zones that enhance system administration, performance analysis, and data integrity.
4. **Cross-Platform Compatibility:** To support both SPARC and x86 architectures, making Solaris flexible and widely deployable.
5. **Security and Manageability:** To offer a secure, manageable environment suitable for cloud and virtualized data centers.

## 1.2 The objective of installing the Solaris Operating System

**(OS)** is to set up a stable, secure, and high-performance Unix-based environment tailored for enterprise-level computing. Specifically, during installation, the objectives include:

1. **Preparing the System:**
  - Detecting hardware components.
  - Partitioning disks and selecting file systems.
  - Configuring boot settings.
2. **Installing Core Solaris Software**
  - Deploying the Solaris kernel and essential system software.

- Installing necessary drivers and support for hardware.
- Setting up system services and network support.
- 3. **System Configuration:**
  - Configuring host name, IP address, DNS, and time zone.
  - Setting root password and creating user accounts.
  - Selecting and installing optional software packages.
- 4. **Ensuring Security and Stability:**
  - Applying initial system security settings.
  - Ensuring system integrity checks and access controls.
- 5. **Creating a Functional Environment:**
  - Making the system ready for development, server hosting, or enterprise applications.
  - Supporting services like ZFS file system, SMF (Service Management Facility), and virtualization.

## 1.3 Requirements of Solaris OS

The requirements of Solaris OS can be divided into **hardware requirements**, **software/system requirements**, and **functional/enterprise requirements**. These define what is needed to install, run, and effectively use Solaris, especially in enterprise environments.

### 1.4 Hardware Requirement

**For x86 Architecture:**

- **Processor:**
  - 64-bit x86 processor (Intel or AMD)
  - Compatible with Intel Pentium, Xeon, AMD Opteron, etc.
- **Memory (RAM):**
  - Minimum: 1 GB (Solaris 10)
  - Recommended: 2 GB or more (for Solaris 11)
- **Hard Disk Space:**
  - Minimum: 5–10 GB (varies by version)
  - Recommended: 20 GB or more for full installation and updates
- **Display:**
  - VGA-compatible graphics adapter
- **Network:**
  - Ethernet or wireless network card (for network services and updates)

### 1.5 Software System Requirements

- **Bootloader and File System Support:**
  - UFS, ZFS (default in later versions like Solaris 10 and 11)
- **BIOS or UEFI Support:**
  - BIOS for legacy systems, UEFI support for newer x86 systems
- **Virtualization Support (optional but useful):**

- Support for Solaris Zones or branded zone
- Hypervisor (for hosting or being hosted)

### 3. FunctionalEnterprise Requirements

These are the features or capabilities Solaris is designed to meet:

- **High Availability:** To run critical systems without downtime
- **Security:** Secure user access, role-based access control (RBAC), encrypted file systems
- **Scalability:** Support for large memory and CPU systems, suitable for enterprise servers
- **Performance Monitoring:** Tools like DTrace for real-time debugging and performance tracking
- **Data Integrity:** ZFS ensures self-healing, high-integrity storage management
- **Virtualization:** Through Solaris Zones, allowing lightweight and efficient virtualization

## 1.6 Installation Steps of Solaris OS (Solaris 11 Example)

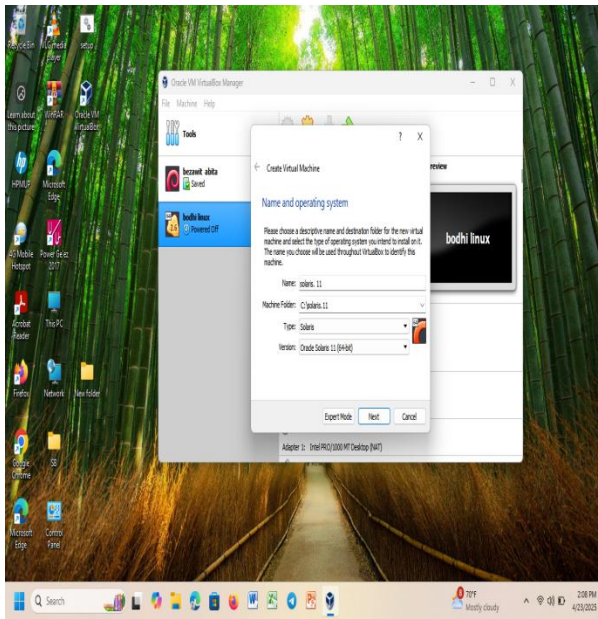
### Step 1: Download Solaris ISO

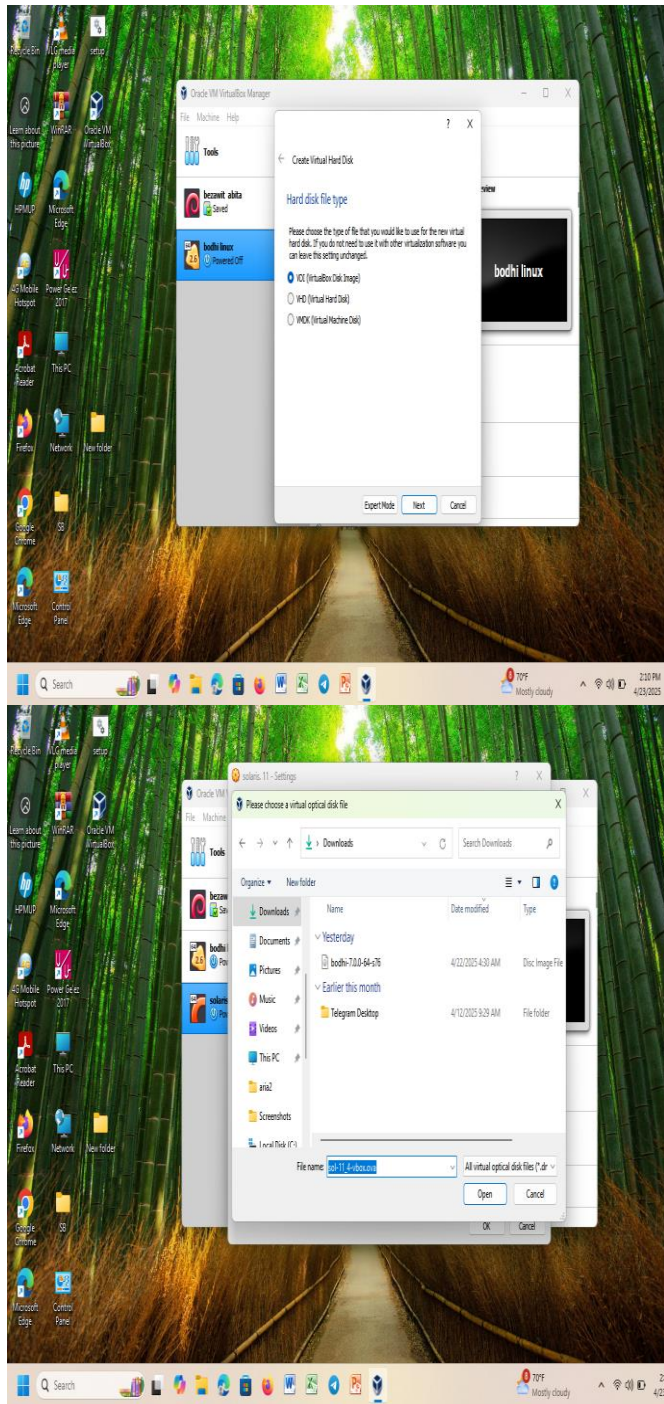
1. Visit the official Oracle Solaris download page:  
<https://www.oracle.com/solaris/>
2. Choose Solaris 11 ISO for x86 or SPARC.
3. Create an Oracle account if needed (free).

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### Step 2: Create a Virtual Machine (Optional for VM Install)

1. Open VirtualBox or VMware.
2. Create a new VM:
  - Type: **Other/Unknown** or **Solaris**
  - RAM: At least 2 GB
  - Disk: 20 GB (VDI or VMDK)





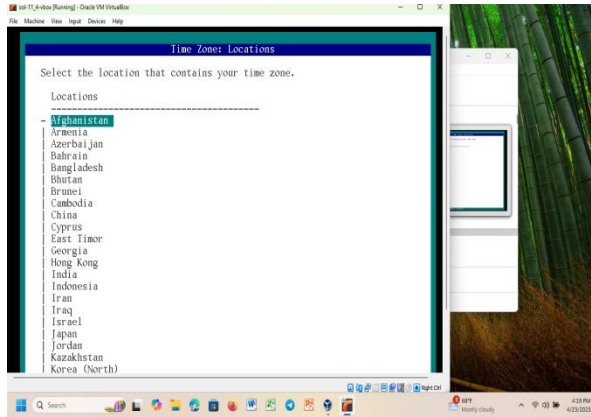
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### Step 3: Boot from the Solaris ISO

1. Attach the downloaded ISO to the VM or boot from USB on physical hardware

## Step 4: Choose Installation Option

1. Select Install Oracle Solaris from the boot menu.
2. Wait for the graphical installer to load.

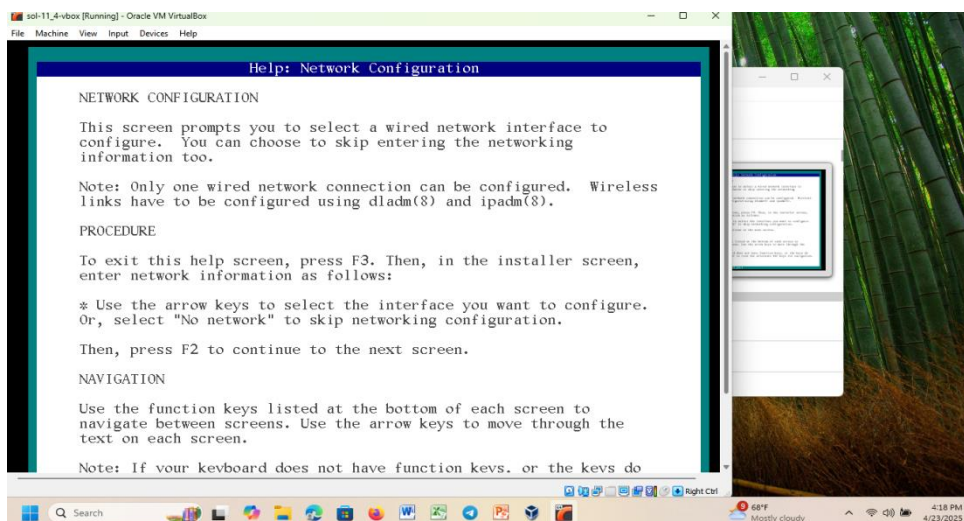


## Step 5: Set Language, Timezone, and Keyboard

1. Choose your preferred settings.
2. Click **Next**.

## Step 6: Configure Installation Target

1. Select the target disk for installation.

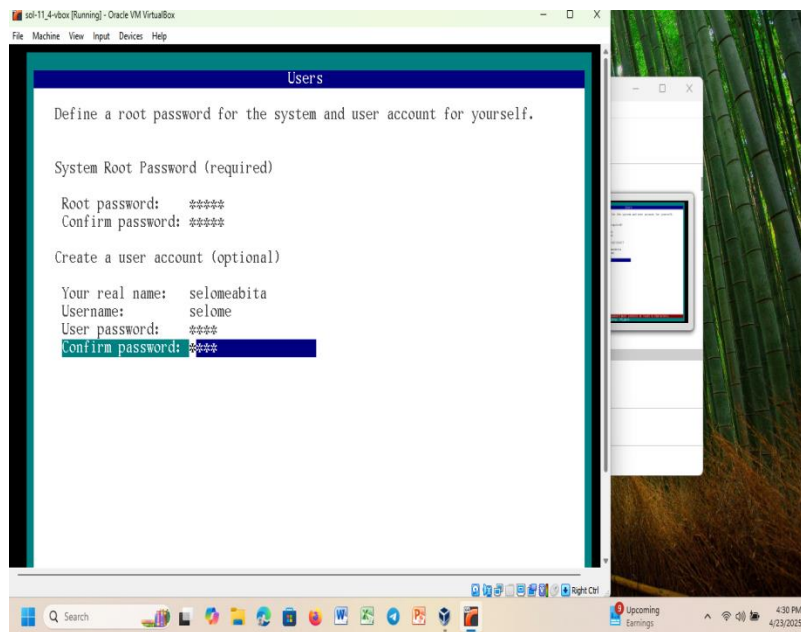


Optionally choose to install over a network or local disk.



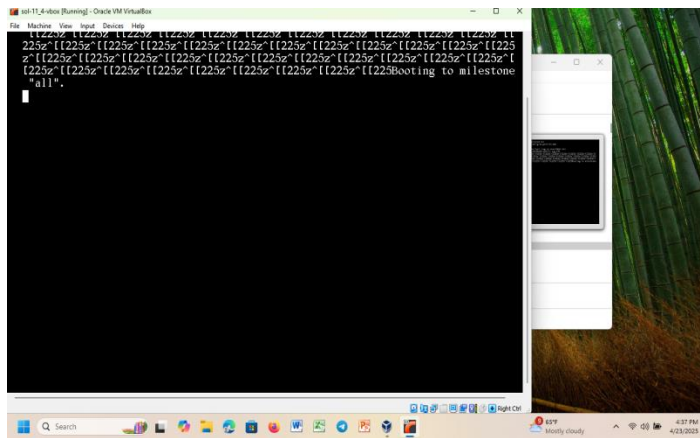
## Step 7: Set Root Password and User Account

1. Set a strong root password.
2. Create a regular user account.



## Step 8: Review and Install

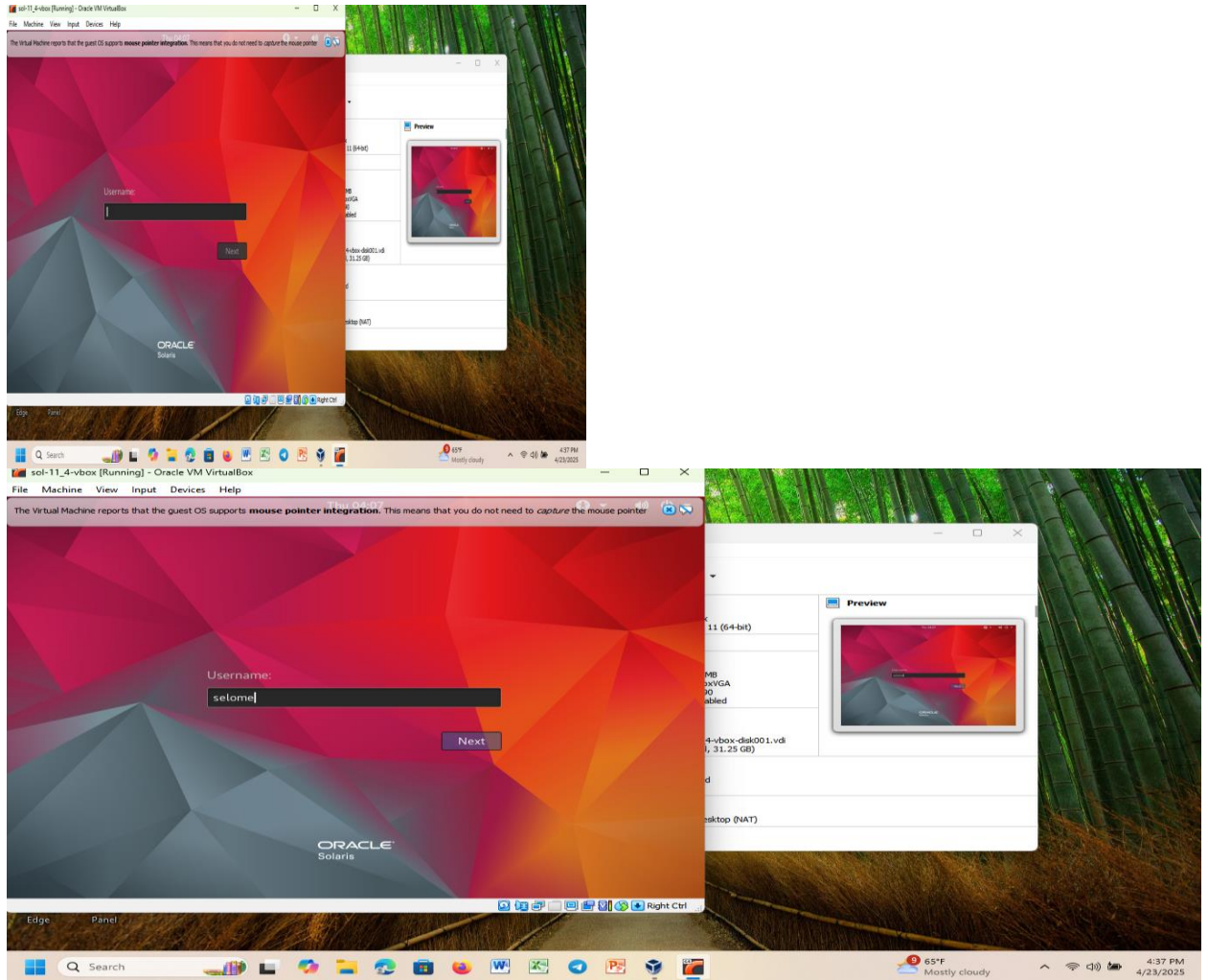
1. Review the summary.
2. Click **Install**.
3. Wait for the installation to complete.



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## Step 9: Reboot and Log In

1. Eject the ISO or remove boot media.
2. Reboot the system.
3. Log in using the created user account.

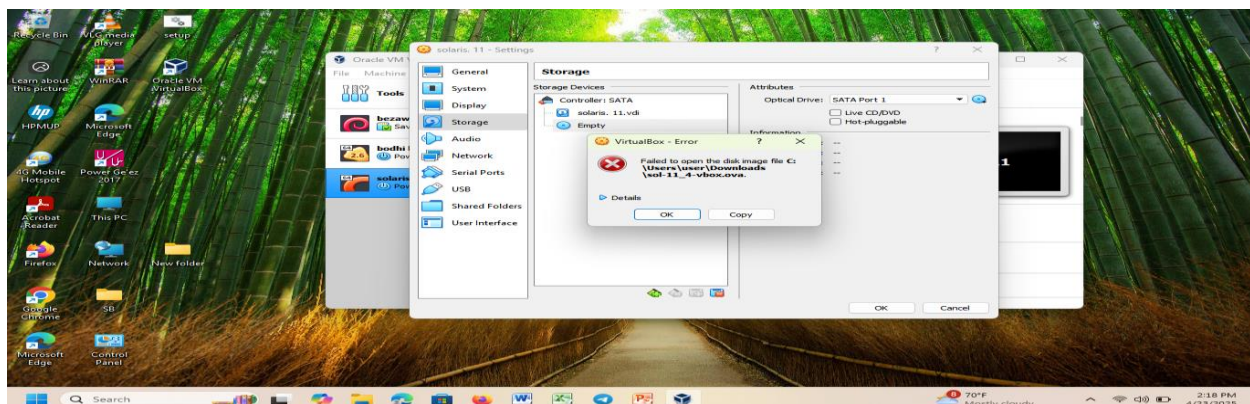


## 1.7 Common Solaris OS Installation Problems and Solutions

This document provides a summary of common issues encountered during the installation of the Solaris Operating System, along with their causes and recommended solutions.

Issue	Cause	Solution
<b>ISO Not Booting</b>	Corrupt ISO, incorrect VM settings	Re-download ISO, verify checksum, ensure VM is set to boot from optical drive
<b>Hardware Incompatibility</b>	Unsupported CPU/chipset	Check Oracle's Hardware Compatibility List (HCL), use a virtual machine as a fallback

<b>BIOS/ACPI Errors</b>	Conflicting BIOS settings	Disable Secure Boot, enable Legacy/Compatibility mode, enable VT-x/AMD-V
<b>Blank Screen After Boot</b>	Unsupported graphics resolution/driver	Use text installer mode or set lower resolution; try VESA-compatible display
<b>Disk Not Detected</b>	Incompatible virtual disk controller	Use IDE/SATA instead of SCSI; check if disk is initialized/formatted
<b>Installation Freezes</b>	Low RAM or CPU settings	Assign at least 2 GB RAM, 2 CPUs; use basic graphics mode if needed
<b>Network Not Detected</b>	NIC not compatible or DHCP failed	Use Bridged Adapter or NAT in VM; configure network manually if needed
<b>GRUB/Bootloader Issues</b>	Bad bootloader install or wrong disk order	Boot live CD → chroot → reinstall GRUB or correct /boot/grub/menu.lst
<b>Locale or Timezone Incorrect</b>	Wrong input during install	After install: use sysconfig or edit /etc/default/init
<b>Lost Root Password</b>	Forgotten credentials	Boot in single-user mode → mount root FS → passwd root to reset



## 1.8 Filesystem support solaris os

### ZFS (Zettabyte File System) Primary FS

- Default file system in Solaris 10 and 11

- Advanced features: snapshots, compression, encryption, self-healing
- Great for performance, data integrity, and scalability

## UFS (Unix File System)

- Older file system, used in Solaris 9 and early Solaris 10
- Still supported but mostly for legacy systems

## TMPFS

- In-memory file system for temporary files (like `/tmp`)

## LOFS (Loopback File System)

- Lets you mount directories in multiple places

## HSFS, ISO 9660

- For CD/DVD file systems (read-only)

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## NFS (Network File System)

- For sharing files over the network

**1. Data Integrity** ZFS automatically detects and corrects data corruption using checksums. It's like having built-in file health monitoring.

**2. Snapshots & Clones** You can create instant, space-efficient snapshots of your system (for backups, rollbacks, testing). Clones let you make writable copies instantly.

**3. Built-in RAID & Volume Management** No need for separate tools — ZFS combines volume management (like LVM) and file system in one. You can create **storage pools** that span multiple disks.

**4. Compression & Deduplication** Saves space automatically without extra tools. Great for storage efficiency.

**5. Scalability** ZFS can handle **huge datasets** — up to zettabytes (1 billion terabytes!). It's built for big, enterprise-level storage.

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## 6. Self-healing

### 1.9 Advantages and disadvantage of solaris os

#### Advantages of Solaris OS:

**1. Powerful ZFS File System** Advanced features like snapshots, compression, self-healing, and high scalability.

#### 2. Scalability & Performance

- Designed for high-end servers and enterprise workloads.
- Efficient on SPARC and x86 systems.

**3. Security** Role-Based Access Control (RBAC), Process Rights Management, and Zones provide strong isolation and access control.

**4. Solaris Zones (Containers)** Lightweight virtualization for running multiple isolated environments on one OS instance — very efficient!

**5. Stability & Reliability** Known for rock-solid uptime and robustness in mission-critical environments (telecoms, banking)

**6. Enterprise Feature** Built-in tools for network management, resource control, and service management (SMF).

#### Disadvantages of Solaris OS:

**1. Limited Software & Community Support** Compared to Linux or Windows, fewer applications and a smaller user base.

**2. Steep Learning Curve** Solaris administration can be complex, especially for new users.

**3. Less Hardware Compatibility** Not all x86 hardware is supported out of the box.

**4. Proprietary Nature** Oracle controls Solaris, which limits flexibility and open-source collaboration. **5. Declining Popularity** Oracle shifted focus, and many organizations have moved to Linux, leading to reduced updates and slower development.

### 1.10 conclusion

Solaris is a **powerful and reliable enterprise operating system**, best known for its **ZFS file system, strong security**, and **scalability**. It's a solid choice for **data centers, servers**, and **mission-critical applications** that demand uptime and performance. However, its **limited**

**community support, steep learning curve, and declining popularity** make it **less suitable for general-purpose or modern development environments** compared to Linux. **In short:** Use Solaris if you need enterprise-grade stability and ZFS features — but for most other cases, especially modern cloud or dev environments, **Linux might be the better fit**.

## 1.1 Future outlook and recommendation of Solaris OS

**Future Outlook for Solaris OS** Oracle has slowed development and reduced open-source involvement. Most new server deployments now favor Linux due to its flexibility, ecosystem, and community support. **Still Used in Legacy and Enterprise Systems** Some large organizations (especially in finance, telecom, and government) still rely on Solaris for legacy apps and stability. Solaris will likely persist in niche enterprise roles, but its market share will continue to shrink. **Lack of Active Innovation** Fewer updates, features, and developer interest compared to Linux and BSD. Oracle's strategy appears focused on maintaining rather than expanding Solaris.

### Recommendation

- You already have a Solaris-based infrastructure or legacy systems that depend on it.
- You need enterprise-level features like **ZFS, Solaris Zones, and long-term stability**.
- You work in an environment where **uptime and security** are more critical than software variety.

**Avoid Solaris OS if** You're starting a **new project or deployment** — especially in cloud, containers, or modern app dev.

- You need broad **hardware support**, a wide **software ecosystem**, or strong **community resources**.
- You value **open-source flexibility** and frequent updates.

### Better Alternatives Going Forward:

- **Linux (e.g., RHEL, Ubuntu, CentOS Stream, Debian)** for modern servers, development, and cloud-native workloads.
- **FreeBSD** if you want ZFS with an open-source OS and Unix-like structure.

## Virtualization in Modern Solaris OS

### What is Virtualization in Solaris?

Virtualization in Solaris allows you to run **multiple isolated environments** (virtual systems) on a single physical system. Solaris supports:

- **Solaris Zones (Containers):** Lightweight OS-level virtualization
- **Kernel Zones:** Full OS virtualization with independent kernels
- **LDOMs (Logical Domains):** Hardware virtualization (on SPARC systems)

## Why Use Virtualization in Solaris?

Benefit	Description
Resource Efficiency	Maximize hardware use by running multiple environments on one system
Security & Isolation	Zones/domains are isolated — one crash won't affect others
Cost Reduction	Fewer physical servers needed, lowering power and maintenance costs
Easy Management	Zones are easy to create, clone, snapshot, and manage
TestingDev Friendly	Safely test updates or apps without affecting the host or other zones

## How to Use Virtualization in Solaris

### Solaris Zones (Non-global Zones)

Solaris Zones are the most common virtualization method. They share the host OS kernel but are isolated from each other

#### Kernel Zones

- Provide full OS virtualization with separate kernels
- Useful when different kernel versions are needed

### LDOMs (on SPARC Systems)

- Hardware virtualization: divide a SPARC server into multiple logical domains
- Each domain has its own OS, CPUs, memory, and devices

#### Managed using:

- `ldm` command
- Oracle VM Server for SPARC