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TUTORIAL

File System

Topics

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File System Types in Linux

Red Hat Linux allows you to create different partition types, based on the file system they will use. The following is a brief description of the different file systems available, and how they can be utilized.

- **ext2** — An ext2 file system supports standard Unix file types (regular files, directories, symbolic links, etc). It provides the ability to assign long file names, up to 255 characters. Versions prior to Red Hat Linux 7.2 used ext2 file systems by default.
- **ext3** — The ext3 file system is based on the ext2 file system and has one main advantage — journaling. Using a journaling file system reduces time spent recovering a file system after a crash as there is no need to **fsck** the file system. The ext3 file system will be selected by default and is highly recommended.
- **software RAID** — Creating two or more software RAID partitions allows you to create a RAID device.
- **swap** — Swap partitions are used to support virtual memory. In other words, data is written to a swap partition when there is not enough RAM to store the data your system is processing.
- **vfat** — The VFAT file system is a Linux file system that is compatible with Windows 95/NT long filenames on the FAT file system.
- **JFS** :JFS stands for **Journalled File System**, and it is developed by **IBM for AIX Unix**. It is an alternative to the Ext file system. It can

also be used in place of Ext4, where stability is needed with few resources. It is a handy file system when CPU power is limited.

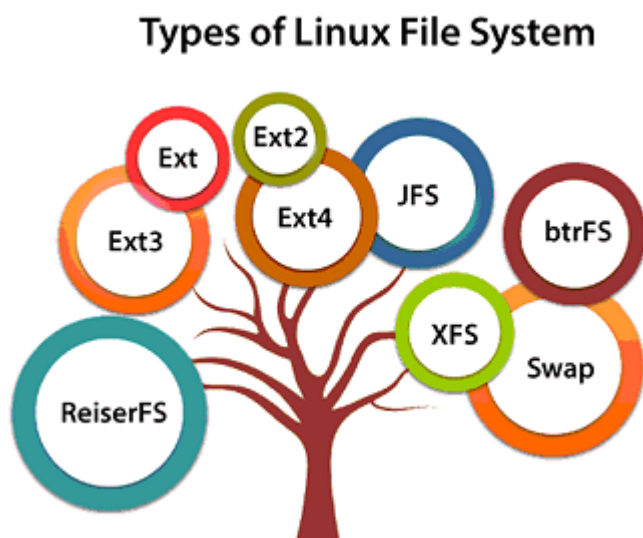


Fig 2.5 File System types in Linux

File Manager

Each distribution implements the File Manager utility, which is used to navigate the file system. It can locate files and, when a file is clicked upon, either it will run if it is a program, or an associated application will be launched using the file as data. This behavior is completely familiar to anyone who has used other operating systems. To start the File Manager, you will have to locate its icon, a file cabinet, which is easily found under Favorites or Applications. The File Manager (Files in the case of Ubuntu) will open a window with your Home directory displayed. The left panel of the File Manager window holds a list of commonly used directories, such as Computer, Home, Desktop, Documents, Downloads and Trash. You can click the Magnifying Glass icon on the top-right of the File Manager window to search for files or directories (folders).

Home Directories

The File Manager lets you access different locations on your computer and the network, including the Home directory, Desktop, Computer, Network, and other attached devices. The Browse

Network and Connect to Server options access networked and shared devices, such as file servers and printers present on the local network. Every user with an account on the system will have a home directory, usually created under /home, and usually named according to the user, such as /home/codequotient. By default, files the user saves will be placed in a directory tree starting there. Account creation, whether during system installation or at a later time, when a new user is added, also induces default directories to be created under the user's home directory, such as Documents, Desktop, and Downloads.

Mounting a File System

Mount Points

Before you can start using a filesystem, you need to mount it to the filesystem tree at a mount point. This is simply a directory (which may or may not be empty) where the filesystem is to be attached (mounted). Sometimes, you may need to create the directory if it does not already exist. If you mount a filesystem on a non-empty directory, the former contents of that directory are covered-up and not accessible until the filesystem is unmounted. Thus, mount points are usually empty directories.

Mounting and Unmounting

The mount command is used to attach a filesystem (which can be local to the computer or, as we shall discuss, on a network) somewhere within the filesystem tree. The basic arguments are the device node and mount point. For example,

```
$ sudo mount /dev/sda5 /home
```

will attach the filesystem contained in the disk partition associated with the /dev/sda5 device node, into the filesystem tree at the /home mount point. There are other ways to specify the partition

other than the device node, such as using the disk label or UUID. To unmount the partition, the command would be:

```
$ sudo umount /home
```

Note the command is `umount`, not `unmount`! Only a root user (logged in as root, or using `sudo`) has the privilege to run these commands, unless the system has been otherwise configured. If you want it to be automatically available every time the system starts up, you need to edit `/etc/fstab` accordingly (the name is short for filesystem table). Looking at this file will show you the configuration of all pre-configured filesystems. `man fstab` will display how this file is used and how to configure it. Typing `mount` without any arguments will show all presently mounted filesystems.

The command `df -Th` (disk-free) will display information about mounted filesystems, including the filesystem type, and usage statistics about currently used and available space.

Taking, Restoring, and Deleting Snapshots

There are three operations related to snapshots, as follows:

Take a snapshot. This makes a copy of the machine's current state, to which you can go back at any given time later.

- If your VM is running, select **Take Snapshot** from the **Machine** pull-down menu of the VM window.
- If your VM is in either the Saved or the Powered Off state, as displayed next to the VM name in the Oracle VM VirtualBox main window, click the **List** icon next to

the machine name and select **Snapshots**. The snapshots window is shown. Do one of the following:

- . Click the **Take** icon.
- . Right-click on the **Current State** item in the list and select **Take**.

In either case, a window is displayed prompting you for a snapshot name. This name is purely for reference purposes to help you remember the state of the snapshot. For example, a useful name would be "Fresh installation from scratch, no Guest Additions", or "Service Pack 3 just installed". You can also add a longer text in the **Description** field.

Your new snapshot will then appear in the snapshots list. Underneath your new snapshot, you will see an item called **Current State**, signifying that the current state of your VM is a variation based on the snapshot you took earlier. If you later take another snapshot, you will see that they are displayed in sequence, and that each subsequent snapshot is derived from an earlier one.

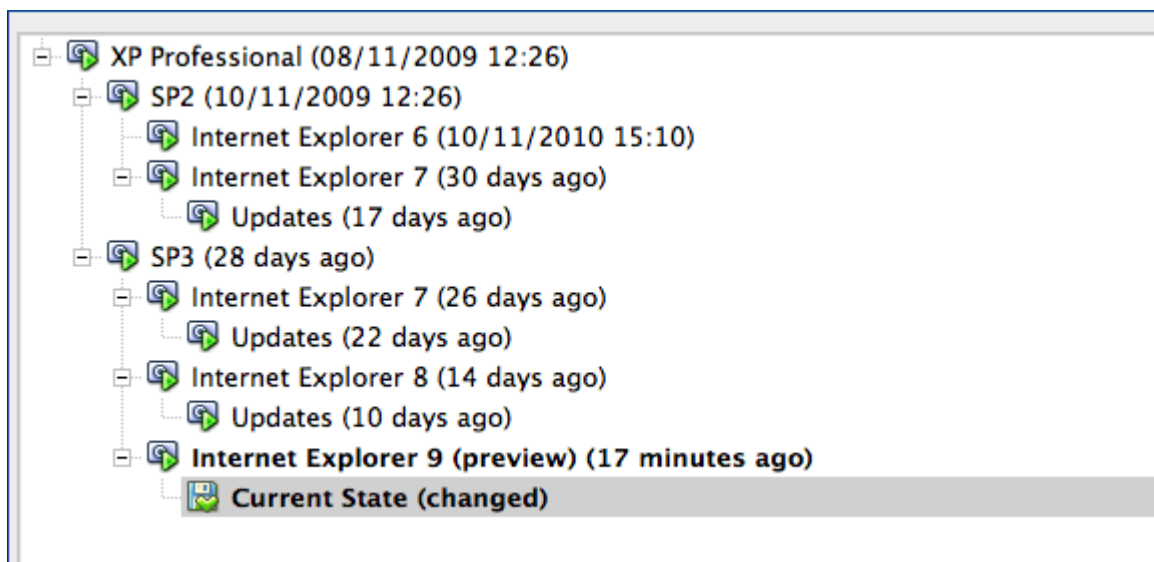


Fig 2.5 Snapshots List for a Virtual Machine

Oracle VM VirtualBox imposes no limits on the number of snapshots you can take. The only practical limitation is disk space on your host. Each snapshot stores the state of the virtual machine and thus occupies some disk space.

Restore a snapshot. In the list of snapshots, right-click on any snapshot you have taken and select **Restore**. By restoring a snapshot, you go back or forward in time. The current state of the machine is lost, and the machine is restored to the exact state it was in when the snapshot was taken.

Linux Graphical User Interfaces

A graphical user interface, commonly known as GUI, is the graphical environment of your operating system — where you have a desktop and mouse pointer. Your screen displays your application panels and icons as well. Various GUI are as under:

KDE Plasma:-

KDE Plasma is a very popular desktop environment. Its lightweight design and customization options make KDE Plasma very versatile. You have convenient features like mobile phone integration with your Linux system using KDE Connect.

The browser integration allows you to connect with a smartphone browser and use it as a remote control for browsing on your desktop, skipping music tracks on your computer, receiving notifications, and more. You can also share the clipboard between all devices connected with KDE Connect which is very handy.

The KDE Plasma desktop experience gives users a lot of control over the desktop look and feel. Users can choose their colour scheme, move panels anywhere they want them to be, or use a different system font. Users can download custom widgets and add anything from clocks to calendars straight on their panel.

KDE is available on Kubuntu, KDE Neon, OpenSUSE and Fedora KDE. For a full list you can check out the KDE website.

GNOME:-

The GNOME desktop environment has been a popular choice for many Linux users over the years. It's popularity is due to the clean, minimalistic look.

GNOME has been designed with usability in mind and is the perfect setup for people that just need the basics to get some work done on their Linux machine. All of the features that it offers are tucked away neatly in a desktop dock or application list.

This stability has meant that there are lots of popular Linux distros that use it as their default, and there are forks too like Cinnamon which is used with the very popular Mint Linux.

GNOME is a great desktop environment for those who want to customize their experience, but it can be heavy on resources. Older systems might struggle a little if they don't have enough RAM, or if the processor is a few too many generations behind.

GNOME is a solid choice for experienced and new users alike. Most major distros ship with a few desktops environment options, and GNOME is very often included in this list. Distros that include it by default are Fedora, Ubuntu, Debian and OpenSUSE, to name a few.

XFCE:-

The XFCE desktop environment is an excellent choice for those who want to have a more lightweight and customizable experience than GNOME offers. The interface can be customized, and the features that you use most are available with one click from your application dock or menu bar, so it's a good choice for PC enthusiasts that enjoy customizing their desktops.

XFCE proves to be a great choice if you need an environment that balances performance with user experience. It's light on resources but still provides powerful customizations and features.

XFCE is so lightweight that it runs surprisingly well on older hardware. The interface, which might seem familiar to Windows users, thanks to its layout which feels modern and is visually appealing despite being quite light on system resources.

It falls a little short with its customization options, but if you are after a desktop environment that looks good and runs well right out of the box, then this is a good choice.

LXDE

LXDE is another lightweight desktop environment that uses system resources sparingly, which means it can be used with a cheaper embedded board (like a Raspberry Pi) or an old salvaged computer.

There's an active community behind LXDE as well. LXDE is highly customizable, so you can keep the components that you need and throw the rest out depending on what you want it to do.

The end result is that LXDE is a desktop environment that's lightweight and fast. It uses less RAM than most of the other desktop environments in our list, and it has fewer dependencies on different distributions or platforms.

LXDE provides the user with an easy-to-use interface that is responsive and simple to learn. If you're looking for a free, lightweight desktop environment that is easy to use and provides the basics of what a Linux interface needs, LXDE might be for you.

LXDE doesn't have as many features as some of the other environments do, but it also means that your system components can be a little on the older side when choosing a computer to run it from.

MATE:-

MATE is a Linux desktop environment that forked from GNOME 2. MATE was created for users that didn't like the direction that

GNOME 3 was headed, which means that it has all of the features you would expect from a more polished desktop environment.

MATE has many applications within it that allow it to work as well as it does. It uses Caja as a filesystem, Pluma as a text editor, Atril for document reading, and much more.

MATE is a stable environment, and it also works well for users with older hardware. It's not as flashy or updated as KDE Plasma or GNOME are currently, but that might be the perfect fit for a project PC.

In short:

- Choose **KDE** for cross device operation and great visuals for modern machines.
- Choose **GNOME** for a no nonsense,minimalist desktop.
- Choose **XFCE** for a familiar desktop that runs well on older systems.
- Choose **LXDE** for low powered systems that need all the resources you can spare.
- Choose **MATE** for users that long for the familiarity of GNOME with user led



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