

***RESEARCH PAPER ON OPERATING SYSTEM***

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**Introduction To Operating System – IT5510**

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# **Introduction: -**

An Operating system is a collection of software that manage computer hardware resources and provides common service for computer programs (IJIRT,2014). The important element of a software in any system is an operating system. For completion of any task in application / program principally it needs an operating system to operate. There are different types of operating system which are categorized on basis of their control and sort of application they support, the categories are:

* Real Time Operating system (RTOS)

Used to operate Scientific Instruments and machinery at industrial level. A RTOS has a limited interface capability to end user requirements.

* Single – User, Single Task

Every task on computer is designed in this way that only one user can do a only one task at a particular time only. one user can do a single task at a time.

* Single User, Multi-Tasking

Desktop and laptop could be the best example for this OS. Windows and MacOS are the platform for operating serval task at a single time.

* Multi User

Multiple User OS allow n numbers of users to use the computer resources simultaneously. UNIX, VMS and MVS are the example of this OS.

Every OS has its own functions to operate that includes Booting, provide a User Interface, handle system resource and provide file management system to users. But in today’s Era Linux has taken the lead in the IT industry and Mr Sahil Bhardwaj in his paper IJIRT 2014, has explain with comparing another OS.

# **Linux: -**

It’s a UNIX based OS. Linus Torvalds is the creator of Linux and kept OS as a free based although its been a “Open Source” it has been changing a lot to its original conception. It doesn’t hold copyright with any person and its free to download and utilizes.

**LINUX History: -**

The journey of Linux begins in 1991with the project of a student Linus Torvalds to invent a new OS kernel, from that point the subsequent Linux piece has been set apart by consistent development throughout its history. Since the underlying arrival of its source code in 1991, it has developed from few C documents under a permit disallowing business dispersion to its state in 2009 of more than 370 megabytes of source under the GNU General Public License.

**Timeline of GUI** (Source: - “*RESEARCH PAPER ON OPERATING SYSTEM*” , Sahil bhardwaj , sahib Arora, Sachin Malik , IJIRIT , Volume 1 , page no. 773 (2014) )

|  |  |
| --- | --- |
| Year | Events |
| 1957 | Bell Lab initiate need of a working framework for their lab and at that time they were using various batch. At bells labs BESYS OS was created to deals with their needs. |
| 1971 | UNIX released with its first edition 11/03/1971. “Unix Programmers Manual by K.Thompson & D.M. Ritchie”. Over 60 commands were developed with the combination of cat (Concatenate file) boot (reboot system) b (compile B Program); |
| 1972 | Unix was out with second edition on December 6. |
| 1973 | Ritchie Rewrote B and known as the Language C. |
| 1973 | On February Unix Released its third edition. |
| 1973 | November Fourth Edition of UNIX was published. |
| 1974 | June Fifth edition of UNIX was free |
| 1991 | Linus Torvalds introduce to its LINUX as a student in Finland. |
| 1994 | LINUX was introduced by the Red Hat |
| 1994 | Ransom Love and Bryan Spark founded Caldera Inc in 1994 |
| 1994 | October 26 Net Based 1.0 Released |
| 2001 | January 4 Source code of kernel in Linux Version 2.4 released by Torvald |
| 2001 | In late December Microsoft files a trademark suit against Lindows.com |
| 2004 | April 14, Name change from Lindows to Linspire. |
| 2004 | October 20, a final name given and Ubuntu release. |

**Advantages of Linux: -**

On the off chance that you’re putting together your choice with respect to value at that point Linux is directly for you. Majorly all programming languages like Python, Ruby, Java, C/C++ are Supported by Linux. Linux also know as the native supporter for SSH, which would also help the client server to manage. Commands like apt-get makes Linux as the one of the popular choices for other programmers. Linux is a perfect solution for the privacy buff. Linux distribution do not collect much data (or none). Also, user don’t need to put an additional tool to protect your privacy. One of the major advantages of using Linux is customization. If you like tweaking your system look Linux is perfect for you.

# **Components of Linux: -**

## Network Structure in Linux

Internet is a father of the Linux which offers all the required networking tools and features to integrate all the network structure. In Linux is quite easy to get connected with the networks is to get configured with the network card configured with the YaST. To get access with internet one can use PPP via modem, ISDN or through other means with YaST also.

# Hardware and BIOS required

When Linux microprocessor get power up, it starts performing to find the location of ROM chip. This step is the initial instruction which is responsible for setting the hardware and loads up into the OS. The implementations and interface to this functionality vary from machine to machine but responsibility remains the same.

A close up of a device

Description automatically generated

*Fig 1.1: -* Boot process Stages in Linux

Native console holds the characteristic of the serial port which means you don’t need video hardware. All the errors and hardware failure are been redirected to the LinuxBIOS. When a Linux is been operated in a huge number the probability of hardware failure is much larger than for a single machine. Day by day due to increasingly integrated, Linux BIOS is rising the meet the demand for greater code reuse and flexibility.

# File System and storage

In Linux variety type of standard partitioning disk with their file formats are present such as XFS, Btrfs, ReiserFS, ext2, ext3, ext4, jfs. Shared environment from storage is best for booting rather than doing a clustered file system format. If the file is non-Linux like NTFS, Mac/ os, Microsoft etc. For partitioning of disk in Linux also certain things need to keep in mind like

* Always have back up and recovery of data.
* Partition can be made in space limitation
* Disk management – Administrative Function.

Finally, encryption which relates to the safety of the data. In a disk Encryption, the whole disk is encrypted will require special code to decrypt it. Disk encryption is also a necessary building and may be a legal issue based for the geographical location implement it also.

# Security

One of the questions keep wondering about security on Linux that do we need to worry about? Most people have the telephone company at their home which is like a medium of DSL internet connection. They would assign a internet protocol (IP) address that distinguished them from other users on internet and supplied them with a DSL modem which is connected to phone line. So, in family everyone can gain the access to internet without any network cables throughout the house and could have a wireless network. For remote login into a computer SSH utility is used called ssh (Secure shell) As long as it is connected to internet or direct via cable modem or indirectly via router Linux kernel is having a very good chance that you won’t escape the attention of those who make their business for any reason and try to break into other computer system.

# Principals of an operating system: -

# Types of devices

Linux can recognize two different kind of devices: Random – access block devices for example like Disks and second is Character devices for example tapes and serial lines. On behalf of each device in file system as a device file, user read or write a file on device the data comes from or goes to device where it represents. As such there is no special program/ application/ programming methodology, for catching interrupts. Polling a serial port are the required access devices to send a file to the printer so one can just write

$ cat (Name of file) > /dev/lp1

So, the content of file is printed but requirement is that printer should understand that file. However, it is not worth of it because on a same network many people are connected so everyone can’t cat to their file to print instead of that one should use a special program to send file printer is lpr. This program has some limitation like only one file print at a time and automatically it will send to printer as soon as the previous file prints get over. There is some notes for device file that already exits even though the device itself might not be installed. So just because user have a file /dev/ sda it really doesn’t mean that have an SCSI hard disk. Although it has all devices file that make installations program simpler, and new hardware.

# Resource Management in Linux

In Linux we can found serval types of resources management like

* File and directory management: - All the files which are created by user are called ordinary/ regular file it includes data file, program file, object file and executable file.

And the files which is stored physical devices are called directory file. To view any file user can use

* Ls -l|grep ^d
* Process management: - which ever program is executed comes under this category. A process is associated with program instruction and data program counter all the CPU register, containing temporary data. Each process has data like process ID, Owner, Priority etc. Each process is represented by a ***task\_struct***
* IPC (inter process communication): - Each process communication with kernel to co ordinate their activity the LINUX IPC facilities provide a method for multipurpose to communicate with one another. In IPC mechanism it supports many files such as Pipes, FIFO, Signals System V IPC.
* Memory management: - The term itself refers to the mechanism implemented by an OS to provide an application with memory related services. This include Virtual memory, protected memory and shared memory. The system never allocates physical memory directly. So, each process had a virtual view of memory.

# Deployment in Linux

Every organization has some needs in system to ensure that it works perfectly so in accordance to it planning of deployment is necessary. So, to start a deployment it took a necessary time to ensure that user understood the following aspect

* The physical architecture into which i2 analyse is to be deployed.
* The structure of data to be analysed, both existing and planned.
* The security infrastructure into which i2 must integrate.
* The location of any external data sources that need to be accessed.

A screenshot of a cell phone

Description automatically generated

*Fig1.2: -* **Deployment structure in Linux Distribution.**

Some key points need to know by user before going to deployment user should know the network address of the server that is intended to host i2 analyse. This information is required during the deployment procedure.

# User Management

User are divided into three categories in Linux and its important to understand while discussing user management

* User
* Groups
* Permissions

**CentOS** User In that also two types are present

* System Accounts – used for a daemon or other piece of software
* Interactive Accounts – Usually assigned to a user for accessing system.

The major difference between these two accounts is that in system accounts are disallowed from interactive login visa shell or physical console login. While in interactive accounts used by end users to access computing resources from either a shell or physical console login.

**Groups**

Linux is a convenient to users to manage groups for an administration to combine the user within containers applying permissions-sets applicable to all group members. For example, all users in accounting may need same file. Thus, we make an accounting group, adding accounting users. Some common commands for managing group are

* chgrp
* groupadd
* groups
* usermod

# Recovery if things go wrong

In Linux there is a solution for crash data that is SSH In, sometimes accessing the console is too much of pain or its simply not working. In that situation it might still be able to get into system over your network with SSH. If ubuntu install and isn’t running SSH its simple enough to install. Just paste the “sudo apt install openssh-server” User can jump into another computer and use SSH to access ubuntu. But major thing to include the username and IP address of ubuntu machine. Another way is Alt + SysRq + REISUB which is combination of **ALT** and SysRq by pressing on keyboard. This combination of key tells Linux Kernel to stop listening to everything else and pay attention to user input. So, it would bypass the crash and reboot the system, after that key press R\_E\_I\_S\_U\_B in order that will terminate the process on machine and unmount the drive and reboot the system. When system boots up again, everything should be back to normal.

# Security Principals

Linux security principals are divided into 5 types

1. **Know your System(s)** – What should be a primary role that software needs and required person access. Security measures involves password, configure management, Documentation.
2. **Least amount of privilege** – Each process running or install package might become a target So user should minimal/ basic installation and allow only a limit number of people for access who really need to it.
3. **Perform defence in depth –** protect the system by applying serval layer of security. This principle is named: “Defences in depth” and can be compared to get to the core, User need to peel layer by layer. One broken defence might help us protect against full compromise. He measurement need to take consider is IP table / Nft tables and hardening of software components.
4. **Protection is key, detection is a must –** protection of assets is the where security forces. User should also consider that one day his defence can be broken. So therefore, Linux came with Linux Audit framework to set up proper detection method and Remote Logging too and last Data should be back up.
5. **Know your enemy –** currently user is facing a lot of problem for protecting his system in a right manner. It is advisable to perform a risk analysis and see in depth what potential threats system might bear to that problem. The actions need to take consider are Vulnerability scans, Penetration test and Risk analysis.

# Conclusion: -

So, at last it concludes that accommodative fields surroundings for OS as a solution for interdepended hardware beginning amongst multiple Operating System. As a solution for interdependence hardware beginning amongst multiple operating system. We have bestowed its subject field and recommended an execution method for the ix86 using Linux as base operating system. We had also characterized areas of relevance. Although the execution communication has centralized around on the ix86 using Linux the idea bestowed may be prolonged to other subject fields and other base operating system in order to render the same ability.

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