

Setting Up of an Efficient Linux Based Computing Environment

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Abstract—Different types of users need different functionalities and therefore need different computing environments. For an individual user, a single standalone machine is sufficient. Schools, Institutes, Small and Medium Enterprises require an efficient multi-user environment to optimize the use of system resources. Linux provides a solution to this. The paper compares three different scenarios for setting up a Linux Computing Environment. They are as follows: 1) Standalone machines 2) Standalone with shared home directory and common authentication 3) Computers using remote server login (shell as well as GUI).

Keywords—Linux, Computing Environment, NFS, DHCP, NIS Authentication, Xrdp, Remote Installation, rdesktop.

I. INTRODUCTION

Linux is a free and open source operating system with high stability. It can run on any hardware and makes very efficient use of system's resources. It is innately secure and therefore most suitable for multi-user environment. This paper provides information about different ways to set up Linux based computing environment, their benefits and drawbacks. Following are the 3 different ways in which Linux environment can be set up.

II. BASIC REQUIREMENTS

- Good LAN with broadband Internet Connectivity.
- Switches and Router to connect machines in LAN and to the Internet.
- An installation server properly configured for network installation of Linux Operating System and application Software (as per requirements).

III. DIFFERENT WAYS TO SET UP LINUX WORK ENVIRONMENT

A. Standalone machines

- 1) Hardware Requirements:
 - Server for remote, unattended operating system installation, with any desktop machine configuration.
 - Client desktop machine with a good configuration connected in LAN.
- 2) Benefits:
 - Failure of one system would not affect other systems.
- 3) Drawbacks:
 - High hardware configuration is required for each system. Hence the cost is high
 - The installation process is time consuming as the Operating System needs to be installed on every machine separately.

- All the application software has to be installed individually on each machine.
- It consumes more Internet bandwidth as every system needs to be frequently updated individually
- Location constraint: User has to use the same machine every time he/she needs to access his/her data.
- Administrator needs to create users on individual machine.
- Backing up of data is tedious since each computer's home directory needs to be backed-up.

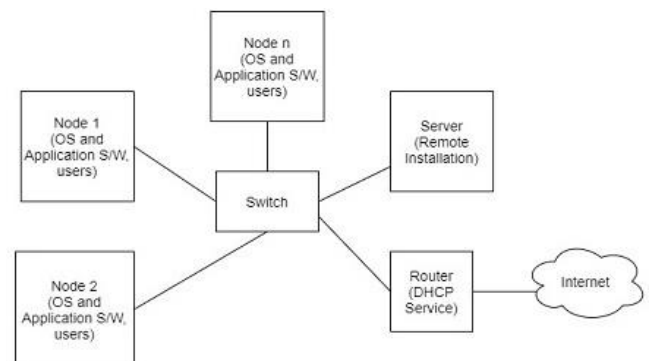


Fig. 1. Architecture of Standalone machine

- 4) Server End Configuration:
 - Remote Installation Configuration: To install Operating System on client machines.
 - DHCP: To allot dynamic IP address and boot files, if needed, to client machines.
 - NFS Configuration: To access files over computer network during installation process.
- 5) Client End Configuration:
 - Operating System and Application software
 - Creating users on each client machine
- 6) Implementation Steps for Standalone machine:
 1. Server installation on any desktop machine and configure same for remote installation.
 2. Installation of operating system on client machines using remote installation server.
 3. Installation of application software on client machines as per requirement.
 4. Create users on each machine.

5. Verify each machine by logging in for one or two users.

B. Standalone with shared home directory and common authentication

1) Hardware Requirements:

- Server with good hardware configuration for remote, unattended operating system installation and to share home directory and also to provide NIS services to all the clients.
- Client desktop machine with a good configuration connected in LAN.

2) Benefits:

- Administrator creates users only on the server whereby the user home directories are created on the server.
- The home directory is exported from the server using NFS protocol.
- Backing up of data is easier as it has to be backed up only from the home directory on the server.
- Location constraint is removed. Hence, the user can use any computer in the network and access his / her own home directory.

3) Drawbacks:

- Installation of applications uses high Internet bandwidth.
- High hardware configuration is required for the client systems. Hence the cost is high.
- The installation process is time consuming as the Operating System needs to be installed on every

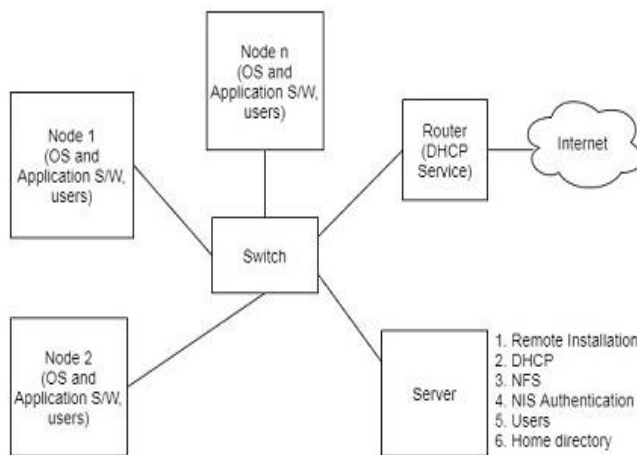


Fig. 2. Architecture of Standalone with Shared Home Directory

machine separately.

- All the application softwares have to be installed individually on each machine.

4) Server End Configuration:

- Remote Installation Configuration: To install Operating System on client machines.
- DHCP: To allot dynamic IP address and boot files, if needed, to client machines.
- NFS Configuration: To allow access to home directory over network
- NIS Authentication: Single point authentication for all users.

5) Client End Configuration:

- Operating System and Application softwares

- Configure system authentication resources to handle NIS authentication on client side.
- Configuration to mount home directory with correct permissions.

6) Overcoming drawbacks of Standalone machine:

- Location constraint is removed.
- Single Point back up.

7) Implementation steps for Standalone with shared home directory and common authentication

1. Server installation of Operating system
2. Configuring server for remote booting.
3. Installing services such as automatic ip address allotment protocol, File sharing protocol.
4. Create users on server.
5. Authentication service for users.
6. Allot shared home directory to users.
7. Installation of operating system as well as application software as per requirements on individual computers.
8. Setup a procedure to mount home directory exported by the server.
9. Verify each machine by logging in for one or two users as well as verify mounted home directory.

C. Computers using remote server login (shell as well as GUI)

1) Hardware Requirements:

- Server with a good configuration connected in LAN.
- Client desktop machine or Thin clients with low end configuration connected in LAN.

2) Benefits:

- All users are created on the server.
- The application software is installed only on the server. Hence, it reduces the installation time.
- As data is centralised, it has to be backed up only from a single location i.e. the server. Hence backing up of data is considerably easy.
- Location constraint is removed. Hence, the user can use any computer in the network.
- The server has to be upgraded often. But there is no need to upgrade every client machine. Therefore, the bandwidth required is less.
- Installation of application software on the client machine is not needed.
- Hardware configuration of the client is low. Hence the cost is reduced.

3) Drawbacks:

- Hardware configuration of the server is very high. Hence the cost is marginally more
- Server failure affects all the client machines.

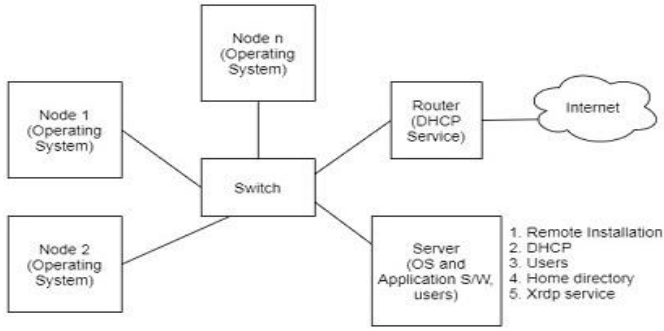


Fig. 3. Architecture of Computers with Remote Server Login

4) Server End Configuration:

- Remote Installation Configuration: To install Operating System on client machines.
- DHCP: To allot dynamic IP address to client machines.
- Xrdp Service: To support Remote Desktop Protocol

5) Client End Configuration:

- Operating System, remote access software.

6) Overcoming drawbacks of Standalone with shared home directory:

- Location constraint is removed.
- Single Point back up.
- Manpower required is less and upkeep.
- Internet Bandwidth required is also less.

7) Implementation steps for Computers using remote server login (shell as well as GUI)

1. Server installation of Operating system and application software as per requirement.
2. Configuring server for remote booting for installation of operating system on user machine.
3. Installing services such as automatic IP address allotment protocol, File sharing protocol and remote logging service.
4. Create users on server.
5. Authentication service for users.
6. Allot home directory to users.
7. User install operating system and remote login service.
8. Verify on each machine by remotely logging in on to server is the user able to access server and its services such as application software etc.

TABLE I. COMPARISON OF THREE DIFFERENT SCENARIOS

Sr. No.	Properties	Standalone machines	Standalone with shared home directory and common authentication	Computers using remote server login (shell as well as GUI)
1	Internet bandwidth required	High	High	Medium
2	Hardware Requirement	Desktop machine configuration for client and server	Good configuration for server, Desktop machine configuration for client	Good configuration for server, Low end configuration for client
3	Backing up data	From each individual machine. Tedious	From the home directory on the server. Easier than Standalone machine	From the server (Single point backup). Easier than both the scenarios
4	Location Constraint	Yes	No	No
5	Users created	On each client machine	On the server (user home directories on the server)	On the server
6	Installation of Application S/W	On each client machine	On each client machine	Only on the server
7	Services configured	Remote Installation, DHCP, NFS	Remote Installation, DHCP, NFS, NIS Authentication	Remote Installation, DHCP, Xrdp

IV. CONCLUSION

Different types of users need different functionalities and therefore need different computing environments. For an individual user, a single standalone machine is sufficient. Schools, Institutes, Small and Medium Enterprises require an efficient multi-user environment to optimize the use of system resources. Linux provides a solution to this. As discussed above, following are the different scenarios for setting up a Linux Computing Environment:

1) Standalone machines. 2) Standalone with shared home directory and common authentication. 3) Computers using remote server login (shell as well as GUI).

Each of them has its own set of benefits and drawbacks. The user has to decide what type of environment is the most competent for his job as per availability of resources and manpower. But as far as optimization is concerned the third scenario is the most efficient as it overcomes the drawbacks of scenario 1 and 2 mentioned above. It reduces the cost, manpower and hardware resources as all application software are installed on the server, backup is at a single point, user can have a roaming profile. To conclude, Linux provides an effective, and secure work environment as per requirements of the user and can significantly reduce the overall cost of ownership and operations the organization.

REFERENCES

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APPENDIX

D

DHCP: Dynamic Host Configuration Protocol is a client/server protocol that automatically provides an Internet Protocol (IP) host with its IP address.

N

NFS: Network File Sharing is a distributed file sharing protocol allowing a user on a client computer to access files over a computer network.

NIS: It is a client–server directory service protocol for distributing system configuration data such as user and host names between computers on a computer network.

R

RIS: Remote Installation Services is an automated installation technology that can be used to create installation images of operating systems or of complete computer configurations, including desktop settings and applications and can then be made available to users at client computers.

U

Unattended Installation: It is an automated installation technology that can be used to install or upgrade an operating system with minimal user intervention.

X

Xrdp: It is an open source remote desktop protocol server (rdp).