SRM Institute of Science and Technology

Department of Computer Applications

Delhi – Meerut Road, Sikri Kalan, Ghaziabad, Uttar Pradesh – 201204

Circular – 2020-21

MCA 1st semester
IT INFRASTRUCTURE MANAGEMENT (PCA20S01L)

Lab Manual

Lab 1: Case Study and Hands-on Training

Title

Introduction to IT Infrastructure Management and Basic System Setup

Aim

To understand the fundamental components of IT infrastructure and gain hands-on experience with basic system setup and configuration.

Procedure

1. **Case Study Analysis:**
    - Read and analyze the provided case study related to a small to medium-sized business (SMB) IT infrastructure.
    - Identify the key IT infrastructure components discussed (e.g., servers, networking devices, storage, operating systems, applications).
    - Discuss potential challenges and solutions related to the infrastructure described in the case study.
2. **Hands-on Training - Basic System Setup:**
    - **Virtual Machine (VM) Creation:** Create a new virtual machine using a virtualization software (e.g., VirtualBox, VMware Workstation).
    - **Operating System Installation:** Install a chosen operating system (e.g., Windows Server, Ubuntu Server) on the newly created VM.
    - **Network Configuration:** Configure basic network settings (IP address, subnet mask, gateway, DNS) for the VM.
    - **User Account Management:** Create a new user account and assign appropriate permissions.
    - **Software Installation:** Install a basic application or utility (e.g., a text editor, a web server like Apache/Nginx if applicable).
    - **Verification:** Verify that the installed OS and application are functioning correctly.

Source Code

(This section will contain specific scripts, configuration files, or commands used during the hands-on training. For example, shell scripts for automation, network configuration files, or simple program code if applicable to the hands-on task.)

```
# Example: Basic network configuration commands (Linux)
# sudo ip addr add 192.168.1.10/24 dev eth0
```

```
# sudo ip link set eth0 up
# sudo ip route add default via 192.168.1.1

# Example: Simple web server installation commands (Ubuntu)
# sudo apt update
# sudo apt install apache2 -y
# sudo systemctl enable apache2
# sudo systemctl start apache2
```

Input

(This section will describe any specific inputs provided to the system or application during the hands-on training. For example, command-line arguments, user inputs, configuration values, or sample data.)

- Operating System ISO image.
- Network configuration details (IP address, subnet mask, gateway, DNS server).
- User account details (username, password).
- Configuration parameters for installed software.

Expected Output

(This section will describe the expected results or observations after performing the procedure. For example, successful OS installation, network connectivity verification, application functionality, or command output.)

- Successfully installed operating system on the virtual machine.
- VM able to communicate with other devices on the network.
- New user account created and accessible.
- Installed application running as expected.
- Verification of services (e.g., web server accessible via browser).

Lab 2: Case Study and Hands-on Training

Title

Network Infrastructure Design and Implementation

Aim

To analyze a network infrastructure case study and implement basic network configurations on virtual devices.

Procedure

1. **Case Study Analysis:**
    - Review a case study focusing on network design requirements for a growing organization.
    - Identify network topology, addressing schemes, and security considerations.
    - Propose improvements or alternative designs based on the case study.
2. **Hands-on Training - Network Configuration:**
    - **Virtual Router/Switch Setup:** Use network simulation software (e.g., GNS3, Cisco Packet Tracer) or virtual machines to simulate routers and switches.
    - **IP Addressing:** Configure IP addresses and subnet masks on interfaces.
    - **Static Routing:** Implement static routes to enable communication between different subnets.
    - **VLAN Configuration (if applicable):** Create and configure VLANs on virtual switches.
    - **Basic Firewall Rules (if applicable):** Implement simple access control lists (ACLs) or firewall rules.
    - **Connectivity Testing:** Ping and traceroute commands to verify network connectivity.

Source Code

(This section will contain specific network device configurations, scripts, or commands used during the hands-on training.)

```
# Example: Cisco IOS commands for router configuration
# Router>enable
# Router#configure terminal
# Router(config)#interface GigabitEthernet0/0
# Router(config-if)#ip address 192.168.1.1 255.255.255.0
# Router(config-if)#no shutdown
# Router(config)#ip route 192.168.2.0 255.255.255.0 192.168.1.254
```

Input

(This section will describe any specific inputs provided to the network devices or simulation software.)

- Network topology diagram.
- IP addressing plan.

- VLAN requirements.
- Security policies.

Expected Output

(This section will describe the expected results or observations after performing the procedure.)

- All devices configured with correct IP addresses.
- Successful ping and traceroute between different network segments.
- VLANs correctly segmenting network traffic.
- Implemented firewall rules effectively blocking/allowing traffic as intended.

Lab 3: Case Study and Hands-on Training

Title

Server Management and Services

Aim

To explore server management best practices through a case study and configure essential server roles and services.

Procedure

1. **Case Study Analysis:**
    - Analyze a case study involving server deployment and management challenges (e.g., high availability, scalability, security patches).
    - Discuss different server roles (e.g., web server, database server, file server) and their importance.
    - Propose solutions for the challenges identified in the case study.
2. **Hands-on Training - Server Roles Configuration:**
    - **Web Server Installation:** Install and configure a web server (e.g., Apache HTTP Server, Nginx, IIS) on a dedicated VM.
    - **Database Server Setup:** Install and perform basic configuration of a database server (e.g., MySQL, PostgreSQL, SQL Server Express).
    - **File Server Configuration:** Set up a shared folder with appropriate permissions on a server.
    - **User and Group Management:** Practice creating and managing users and groups on the server.
    - **Service Management:** Start, stop, and restart various server services.

Source Code

(This section will contain specific configuration files, scripts, or commands used during the hands-on training.)

```
# Example: MySQL installation and basic setup (Ubuntu)
# sudo apt update
# sudo apt install mysql-server -y
# sudo mysql_secure_installation
# sudo systemctl status mysql
```

Input

(This section will describe any specific inputs provided to the server or during configuration.)

- Server operating system installation media.
- Database credentials.
- Shared folder paths and permissions.
- User and group names.

Expected Output

(This section will describe the expected results or observations after performing the procedure.)

- Web server accessible via a web browser.
- Database server running and accessible for connections.
- Shared folder accessible with correct permissions from a client machine.
- Users and groups managed effectively.
- Server services responding to commands.

Lab 4: Case Study and Hands-on Training

Title

Data Storage and Backup Solutions

Aim

To understand various data storage technologies and implement basic backup and recovery procedures.

Procedure

1. **Case Study Analysis:**
    - Examine a case study on data loss scenarios, storage capacity planning, or disaster recovery.
    - Compare different storage types (e.g., DAS, NAS, SAN) and their use cases.
    - Discuss the importance of backup strategies (e.g., full, incremental, differential) and recovery plans.
2. **Hands-on Training - Storage and Backup:**
    - **Disk Management:** Add a new virtual disk to a VM and format it.
    - **Partitioning:** Create partitions on the new disk.
    - **Mounting Filesystems:** Mount the new filesystem for use.
    - **Basic Backup Utility:** Use a built-in operating system backup utility (e.g., `rsync` on Linux, Windows Backup) to back up specific files or directories.
    - **Restore Operation:** Perform a restore operation from the created backup.
    - **Snapshot Creation (if applicable):** Create and manage VM snapshots.

Source Code

(This section will contain specific commands, scripts, or configuration used for storage and backup.)

```
# Example: Disk partitioning and formatting (Linux)
# sudo fdisk /dev/sdb # Use 'n' for new partition, 'w' to write changes
# sudo mkfs.ext4 /dev/sdb1
# sudo mkdir /mnt/backup_drive
# sudo mount /dev/sdb1 /mnt/backup_drive

# Example: rsync for backup
# rsync -av --delete /source/directory/ /destination/directory/
```

Input

(This section will describe any specific inputs or parameters for storage and backup operations.)

- Virtual disk size.
- Backup source and destination paths.
- Backup schedule (if automated).

Expected Output

(This section will describe the expected results or observations after performing the procedure.)

- New virtual disk successfully added, partitioned, and formatted.
- Filesystem mounted and accessible.
- Backup operation completes successfully with no errors.
- Files are successfully restored from the backup.
- VM snapshots created and manageable.

Lab 5: Case Study and Hands-on Training

Title

Monitoring and Troubleshooting IT Infrastructure

Aim

To analyze IT infrastructure monitoring challenges and gain hands-on experience with basic monitoring tools and troubleshooting techniques.

Procedure

1. **Case Study Analysis:**
    - Analyze a case study related to IT infrastructure outages, performance degradation, or security incidents.
    - Discuss the importance of proactive monitoring and alert systems.
    - Identify common troubleshooting methodologies and tools.
2. **Hands-on Training - Monitoring and Troubleshooting:**
    - **System Resource Monitoring:** Use built-in OS tools (e.g., Task Manager on Windows, `top`/`htop`/`free` on Linux) to monitor CPU, memory, disk I/O, and network usage.
    - **Log File Analysis:** Examine system and application log files to identify errors or warnings.
    - **Network Troubleshooting Tools:** Use tools like `ping`, `traceroute`, `netstat`, `ipconfig`/`ifconfig` to diagnose network connectivity issues.
    - **Process Management:** Identify and manage running processes on a system.
    - **Basic Service Restart:** Practice restarting a problematic service to resolve an issue.
    - **Problem Simulation:** Simulate a minor issue (e.g., stopping a service, misconfiguring a network setting) and then troubleshoot it.

Source Code

(This section will contain specific commands or scripts used for monitoring and troubleshooting.)

```
# Example: Linux monitoring commands
# top
# free -h
# df -h
# journalctl -xe # For systemd logs
# tail -f /var/log/apache2/error.log # For Apache error logs

# Example: Network troubleshooting
# ping google.com
# traceroute 8.8.8.8
# netstat -tuln
```

Input

(This section will describe any specific inputs or scenarios for monitoring and troubleshooting.)

- Simulated error conditions.

- Specific log files to analyze.
- Network addresses for testing.

Expected Output

(This section will describe the expected results or observations after performing the procedure.)

- Ability to identify system resource bottlenecks.
- Successful identification of errors/warnings in log files.
- Accurate diagnosis of network connectivity issues.
- Problematic processes identified and managed.
- Simulated issues successfully resolved through troubleshooting steps.