Savitribai Phule Pune University

M.Sc.(Computer Science)

Progress Report for CS-651-MJP : Full Time Industrial Training (IT)

(This Progress report is to be submitted monthly to the college guide/Mentor)

Name of College	Rajmata Jijau Shikshan Prasarak Mandal's ARTS, COMMERCE & SCIENCE COLLEGE
Roll No./ID and Name of Student	ANANTU AJAYAN VISHWAKARMA
Date of Report Submission	
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Name of Organization	Tata Consultancy Services
Date of Joining in the organization	25/12/2024
Name of Industry Guide/Supervisor	Ms. Sonali Parab
Name of College Guide/Mentor	Prof. Swapnil More Sir

1.Introduction

In March, the final month of my internship at Tata Consultancy Services (TCS), I shifted my focus from learning to **applying** everything I had studied over the past two months. The goal for this phase was to simulate real-time scenarios and gain hands-on experience in a controlled lab environment that closely resembled a production setup. I worked on integrating services and tools such as **Nagios for monitoring**, **Commvault for backups**, **SELinux for security enforcement**, and **systemd for service management**.

By combining these technologies into a unified workflow, I was able to test, troubleshoot, and understand how these components work together in managing enterprise-level Linux systems. This phase not only strengthened my technical capabilities but also gave me valuable insight into the practical aspects of Linux system administration.

2. Work Undertaken

In March, my tasks revolved around **full-scale system setup and integration**. I took initiative to independently plan, deploy, and test a series of Linux services and configurations. Key work activities included:

- **Web Server Deployment**:
    - Installed and configured Apache HTTP servers on RHEL-based virtual machines.
    - Customized index pages and confirmed server availability across the network.

- **Monitoring with Nagios**:
    - Integrated Apache and other services into Nagios monitoring.
    - Configured service checks, defined host groups, and set alert thresholds.
- **Backup Setup with Commvault**:
    - Created and scheduled file system backup jobs.
    - Simulated backup and recovery processes to understand data protection flow.
- **Security with SELinux**:
    - Enforced SELinux policies on web services and tested access restrictions.
    - Used audit2allow and semanage to handle denials while maintaining security.
- **Service Management and Logs**:
    - Managed background services using systemctl to enable, restart, and monitor services.
    - Diagnosed system errors through log analysis using journalctl and files in /var/log/.
- **Automation**:
    - Created shell scripts to automate routine tasks like log cleanup, service status checks, and user activity reports.

This hands-on experience helped simulate a real-world Linux administration environment where multiple tools and services must be deployed, monitored, and maintained together.

3. Learning and Skill Development

This month was especially impactful for building **confidence and fluency in practical Linux administration**. Some of the key skills I developed include:

- **Troubleshooting**:
    - Gained the ability to quickly isolate and fix issues by checking logs, verifying configuration files, and restarting services.
- **Service Integration**:
    - Learned how different components like Nagios, Apache, SELinux, and systemd interact with each other and how to manage dependencies.
- **Automation and Scripting**:
    - Used Bash scripting to reduce repetitive manual work and ensure consistency across tasks.

- **Security and Monitoring**:
    - Improved awareness of system security practices through the use of SELinux and log monitoring.
    - Understood how proactive monitoring helps in reducing downtime and improving system performance.

These skills are essential for any Linux administrator and have prepared me to handle more complex production scenarios.

4. Challenges Faced

The process of **integrating multiple tools** into a single functional system brought with it several challenges, including:

- **Tool Compatibility**:
    - Making sure that tools like Nagios, Commvault, and SELinux did not interfere with each other required fine-tuning and understanding their internal workings.
- **SELinux Denials**:
    - Enforcing SELinux sometimes caused services (like Apache) to fail silently due to permission denials. Identifying the root cause using audit logs and tools like audit2why required patience and attention to detail.
- **Nagios Plugins**:
    - Creating custom plugins and ensuring they returned valid output that Nagios could parse was a technical challenge. I had to learn about exit codes, plugin formatting, and host/service configurations.
- **Multi-VM Management**:
    - Managing a test environment with several virtual machines required careful tracking of IPs, hostnames, and services.

Despite these difficulties, the challenges became valuable learning opportunities and helped improve my resilience as a system administrator.

5. Architecture and Contributions

By March, I was able to design and build a **mini-enterprise lab environment** using virtual machines that reflected real-world setups. Notable contributions and implementations include:

- **Integrated Lab Environment**:
    - Set up and linked services across multiple VMs to simulate a full-stack Linux environment.
- **Documentation and Scripts**:
    - Created basic documentation for Apache, Nagios, and SELinux setup procedures.
    - Developed **custom Nagios plugin scripts** to monitor disk usage, memory status, and custom applications.
- **Service Recovery Planning**:
    - Practiced creating recovery plans using Commvault to restore services and data after simulated failure.
- **Process Optimization**:
    - Identified ways to improve monitoring and logging efficiency by filtering logs, setting alerts, and scheduling regular checks.

These contributions not only helped in my personal learning but also served as reusable assets for future interns or team members.

6. Future Plan

With a solid foundation in place, I now plan to **advance my Linux system administration skills** by exploring additional tools and broader platforms:

- **Automation with Ansible**:
    - Learn how to automate infrastructure provisioning and configuration management using Ansible playbooks.
- **Advanced Scripting**:
    - Deepen my knowledge of Bash scripting and start learning Python for more complex tasks and integration.

- **Cloud Platforms**:
    - Begin exploring cloud-based Linux administration through platforms like **AWS** and **Microsoft Azure** to understand scalability, containers, and hybrid setups.
- **Security and Monitoring Best Practices**:
    - Study more advanced SELinux modules and monitoring integrations for enterprise compliance.

My goal is to continue building my skills to eventually manage production-grade Linux systems in hybrid (on-prem + cloud) environments with high security, performance, and automation standards.

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