Department of Information Technology

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UNIVERSITY OF MUMBAI

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A Project Report on

Autonetics and Administration for IT Laboratories

Submitted in partial fulfillment of the degree of
Bachelor of Engineering(Sem-7)
in
INFORMATION TECHNOLOGY

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1.Project Conception and Initiation

Introduction

- In our system, we try to eradicate the problem regarding the administration of labs. A powerful, systematical and efficient Lab management system is required which will resolve all these basic and generic problems with less human labor. The basic technology that we implemented in our system is Ansible.
- Ansible is used to automate the administration of labs. Here every lab will have its separate playbook. In that playbook a certain set of rules will be written and accordingly the automation of the labs will be done.
- Ansible is a simple open source IT engine which automates application deployment, cloud provisioning and many other IT tools.
- Ansible uses playbook to describe automation jobs, and playbook uses very simple language i.e. YAML (It’s a human-readable language & is commonly used for configuration files) which is very easy for humans to understand, read and write.

1.1 Abstract

Often it is observed that many of the PC's are remained switched on even when the labs are not in use resulting in an inefficient use of power and resources. Also the PCs have to be manually switched off by the lab assistants after the end of lab sessions if the students haven't shut it down themselves.

In some lab sessions, a particular software or simulation tool (eg. NS2 simulator, rapidminer) has to be installed in each and every PC in the lab at the same time which results in a great amount of time wastage and also pushes the centralized server to its limits.A powerful,systematical and efficient Lab management system is required which will resolve all these basic and generic problems with less human labor. In our case, the Ansible tool which was developed to simplify complex orchestration and configuration management tasks has been chosen.

1.2 Objectives

- To Automate the Software installation process
- To Automate the PC shutdowns
- To regulate the user identity of every PC along with time in a digital format
- To alert the users about the remaining time of the current lab session
- A proper GUI will be created which will display the important announcements
- To unleash the full potential of Ansible for IT automation

1.3 Literature Review

Sr No.	1
Title/Author	M. Balliauw and X. Decoster, "Automated Delivery," in Pro NuGet, pp. 179–214, Springer, 2013
Method used	Automation using Network interface and scripting
Advantage	Effective Package Management
Disadvantage	➢High Bandwidth Consumption ➢Client-Server node Failure leads to catastrophic issues.
Extracted Methodology	Dependency Management

Sr No.	2
Title/Author	D. Palma and T. Spatzier "Topology and orchestration specification for cloud applications (TOSCA)," 2015
Method used	Management using Cloud Computing With cloud based applications.
Advantage	Does not mandate the use of any specific security mechanism or technology
Disadvantage	Expensive Infrastructure and maintenance for small Areas.
Extracted Methodology	Security considerations

Sr No.	3
Title/Author	Pavel MasekMartin ŠtůsekJan Krejčí "Unleashing Full Potential of Ansible Framework: University Labs Administration " 2018
Method used	Ansible Framework
Advantage	Supports a variety of frameworks
Disadvantage	Limited to the capabilites of the Ansible framework
Extracted Methodology	Effective usage of Playbook in remote management

1.4 Problem Definition

- In current labs of university most of the administrative work is done manually which consumes lot of time and efforts.

- With the help of Ansible framework and a proper supporting GUI which can unleash and maximize the full potential of the servers, many of the current lab administrative problems can be resolved.

1.5 Scope

- The proposed system will be helpful for modernizing the current lab scenarios in the universities.
- This is completely an open source project and thus the total outcome expenditure is very low. Due to this, even the universities in the rural areas can claim benefit out of this.
- The GUI will have a tutorial at the beginning for the lab handlers.
- The project can be easily developed further as per the requirements of the lab

1.6 Technology stack

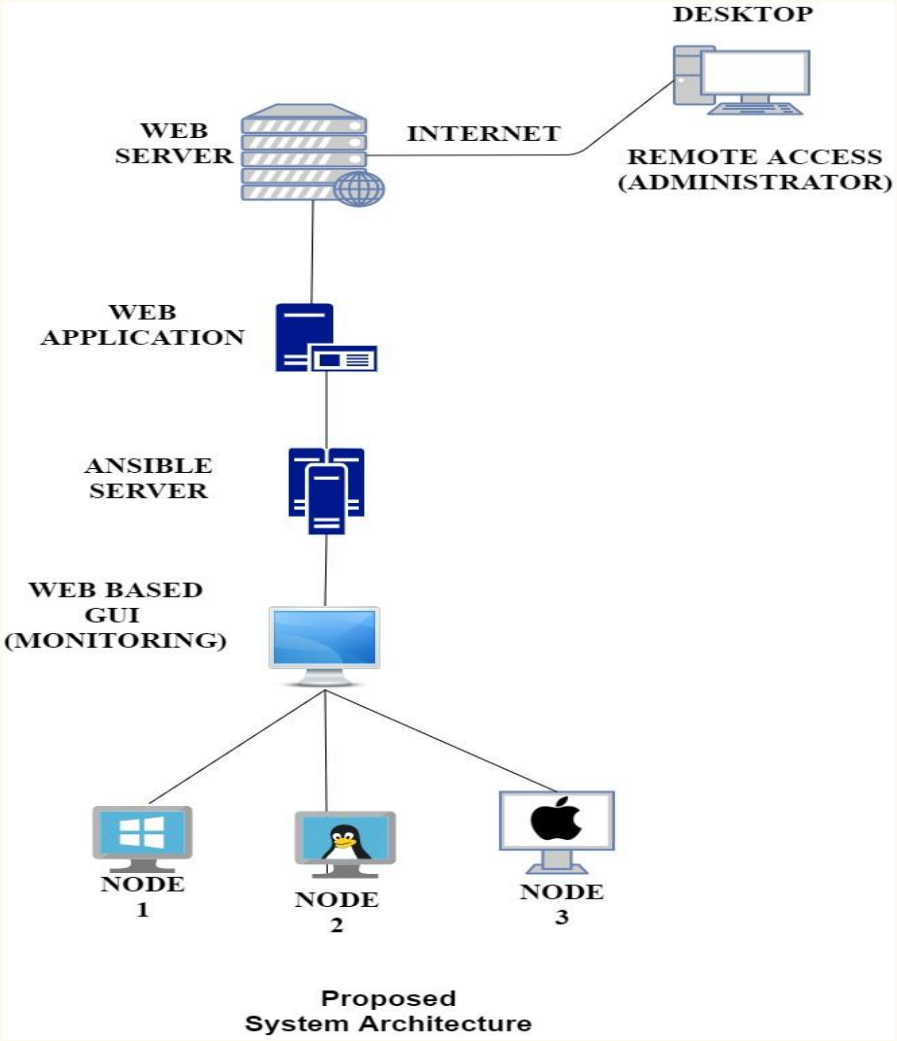
- **Hosting** : Ansible Web Server
- **Nodes** : Linux, Ubuntu,Windows
- **Database** : MySQL
- **Front End** : Python, HTML5 , Semaphore

1.7 Benefits for environment & Society

- Simplified GUI will allow powerful and customized remote node management.
- Reduced workload since Ansible works on a Centralized environment.
- Remote nodes can be shut down by the Administrator with ease, thereby cutting unwanted electricity usage by a system in idle state.
- Secure remote management and file transfer as Ansible uses SSH protocol for its operations.

2. Project Design

2.1 Proposed System



Proposed System Architecture

2.2 Design(Flow Of Modules)

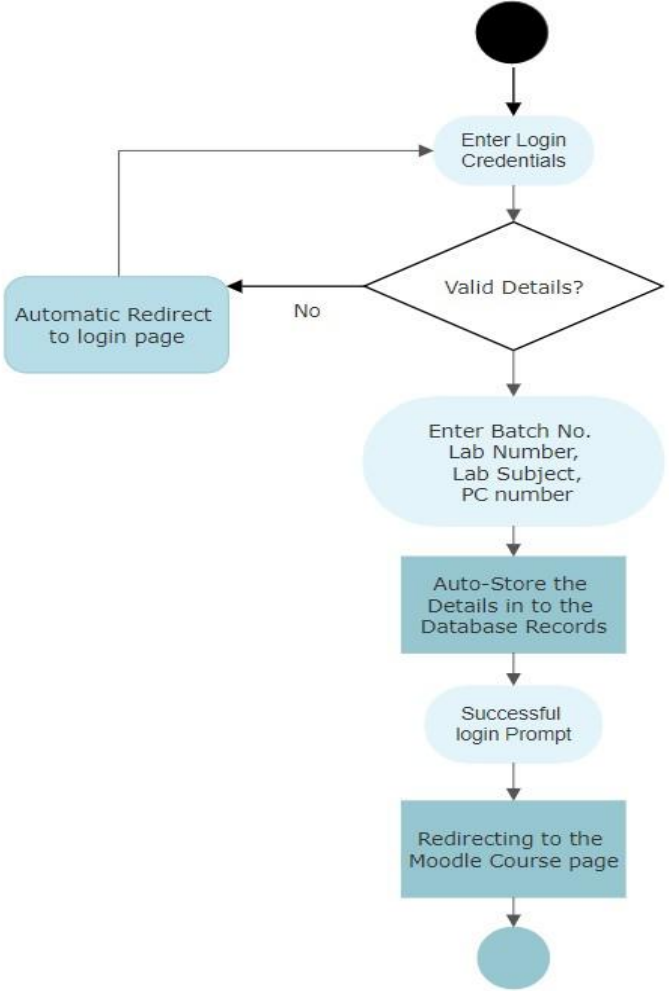
2.3 Description Of Use Case

▪**Students** need to enter their details on the Lab Utilization Webpage after which they can use the installed softwares.

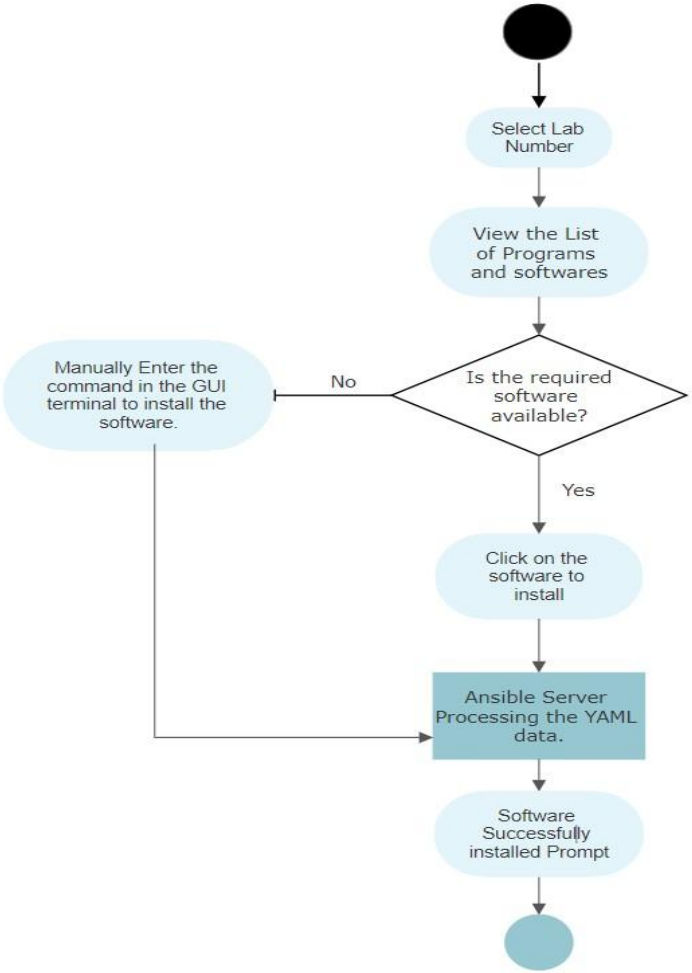
▪**Lab incharge** personnel can view lab utilization records, remotely shut down the system as well as manage softwares installed on their respective labs. They cannot view lab utilization records, remotely shut down the system or modify software packages of systems which do not belong to their allotted lab.

▪**Administrators** can view lab utilization records, remotely shut down the systems as well as manage software packages installed of any system of any lab. Administrator can perform remote OS installation with Kickstarter along with preset parameters like Disk partitions, Networking configurations etc

2.4 Activity diagram

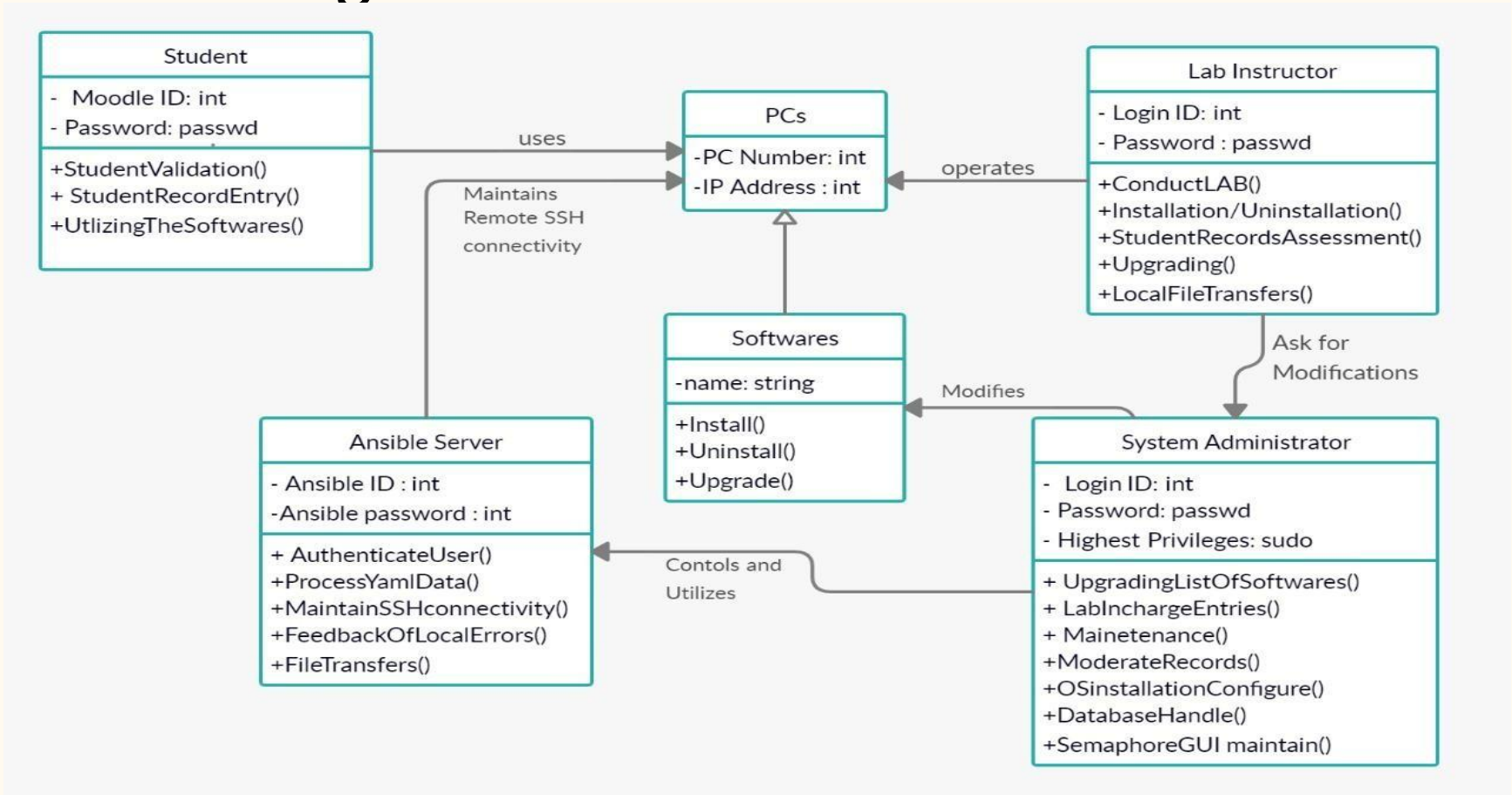


Activity Diagram considering Student's POV



Activity Diagram considering LAB in-charge's POV

2.5 Class Diagram



2.6 Module-1 Ansible Server

Ansible server will be used for hosting the Ansible environment through the whole network via the LAN connection and thus all ansible related queries and commands for lab automation can be easily carried throughout.

Operations which will be performed through Ansible server are:-

- Remote software installation/uninstallation
- Remote system shutdown
- Remote file transfer
- Running Ansible Module commands.
- Running remote terminal/shell commands

2.6 Module-2 Online Lab Utilization Record Module

The students will be prompted to enter their details in this website like :-

- User ID
- Password
- Batch
- Subject
- Lab No.

All these informations would be stored in a database which can then be examined by respective Lab incharges and Admins.

Module-3 Kickstarter

▪OS installation takes a lot of time. We are automating this task by integrating an open source tool into our system called as Kickstarter.

▪This will not only help in installing operating systems on multiple systems remotely, but also make the required configurations such as disk management, network configurations, etc.

Module-4 Semaphore

▪Ansible Semaphore is an Open Source UI for Ansible, an alternative to Ansible Tower. The software is free to use and fully open source, released under MIT license.

▪The backend of Semaphore is written in Go while the frontend is written in Angular. This tool allows you to launch Ansible Tasks from a Web interface. It has support for LDAP authentication, provides RESTful API and alerting via email and Telegram.

2.7 References

- [1] Pavel MasekMartin ŠtůsekJan Krejčí, “Unleashing Full Potential of Ansible Framework: University Labs Administration” May 2018

- [2] Nishant Kumar Singh ,Amity University,”Automated Provisioning of Application” June 2017

- [3] J. O. Benson, J. J. Prevost, and P. Rad, “Survey of automated software deployment for computational and engineering research,” in System Conference (SysCon), 2016 Annual IEEE, pp. 1–6, IEEE, 2016.

3.Planning for next semester

Planning

- GUI for Ansible scripts using Semaphore
- Windows OS node remote management using Ansible-WRM
- Kickstart dual boot with Ansible
- Local hosting of Lab Utilization webpage

Thank You