Department of Information Technology

A.P. Shah Institute of Technology

G.B.Road,Kasarvadavli, Thane(W), Mumbai-400615

UNIVERSITY OF MUMBAI

Academic Year 2019-2020

A Project Report on

Autonetics and Administration for IT Laboratories

Submitted in partial fulfillment of the degree of
Bachelor of Engineering(Sem-8)
in

INFORMATION TECHNOLOGY

By
Karthikeyan (16104050)
Uddhabendra Maity (16104062)
Atharv Shetty (16104061)

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Under the Guidance of
Dr. Sameer Nanivadekar
Prof. Vishal Badgujar

PRESENTATION FLOW

- **Abstract**
- **Problem Definition**
- **Objective**
- **Introduction**
- **Literature Survey**
- **Project Timeline Chart**
- **Theory (Proposed work/Implementation/Diagrams etc.)**
- **Conclusion**
- **Future Scope**
- **References**
- **Publication**

ABSTRACT

❖ Majority of IT labs in today's academic institutions face operational issues in the management of multiple systems simultaneously. The best example would be when a particular software needs to be installed in the labs, it becomes a tedious and time consuming process for the lab assistant to manually install the software in each and every system in the lab.

❖ Also in some cases where the students forget to shutdown their respective computers, it becomes the responsibility of the lab assistant to shutdown the PCs manually. These challenges cause lack of access control and inadequate security. Moreover, there is lot of work pressure which leads to sub-optimal work schedules. To keep track of access records of the systems, we would also be designing a web-based GUI which records and displays the access information of PCs too.

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.

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 create a GUI for authorized & effortless execution of playbooks.
- To unleash the full potential of Ansible for IT automation.

INTRODUCTION

- As we are using a free and open-source platform for our purpose, many labs can be automated using the same architecture at a very feasible price.

- Ansible provides the automation of IT infrastructure which includes – creation of virtual machine, installation of new softwares, Docker containers.

- We can configure our own cluster and make it up and running without any sort of human intervention. Ansible does its work like a professional if customized with proper facts and experience.

- Ansible works over SSH ensure that the target Machine or Server is accessible over SSH. It supports all type of SSH authentication.

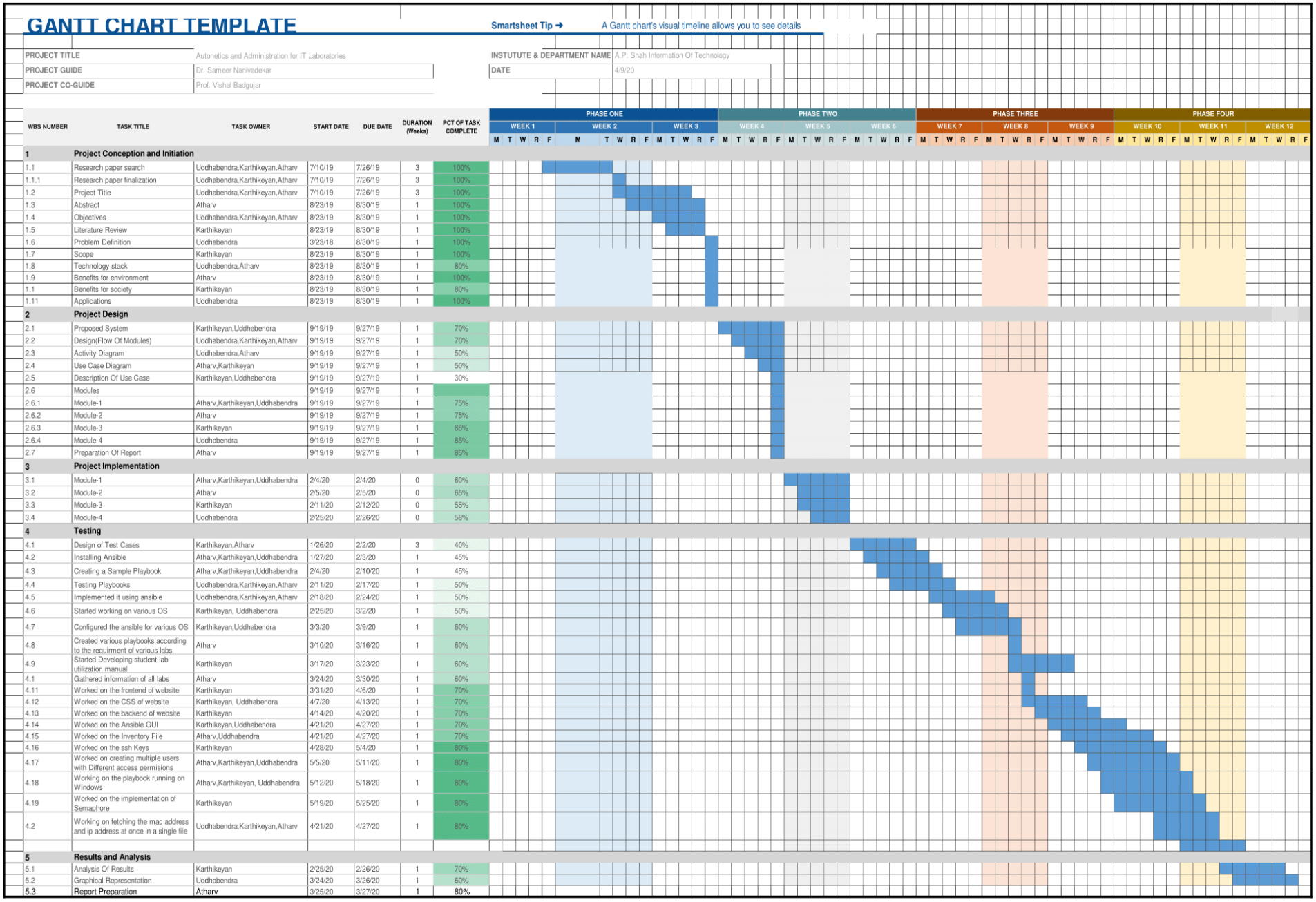
LITERATURE SURVEY

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

Project Timeline Chart



GANTT CHART TEMPLATE

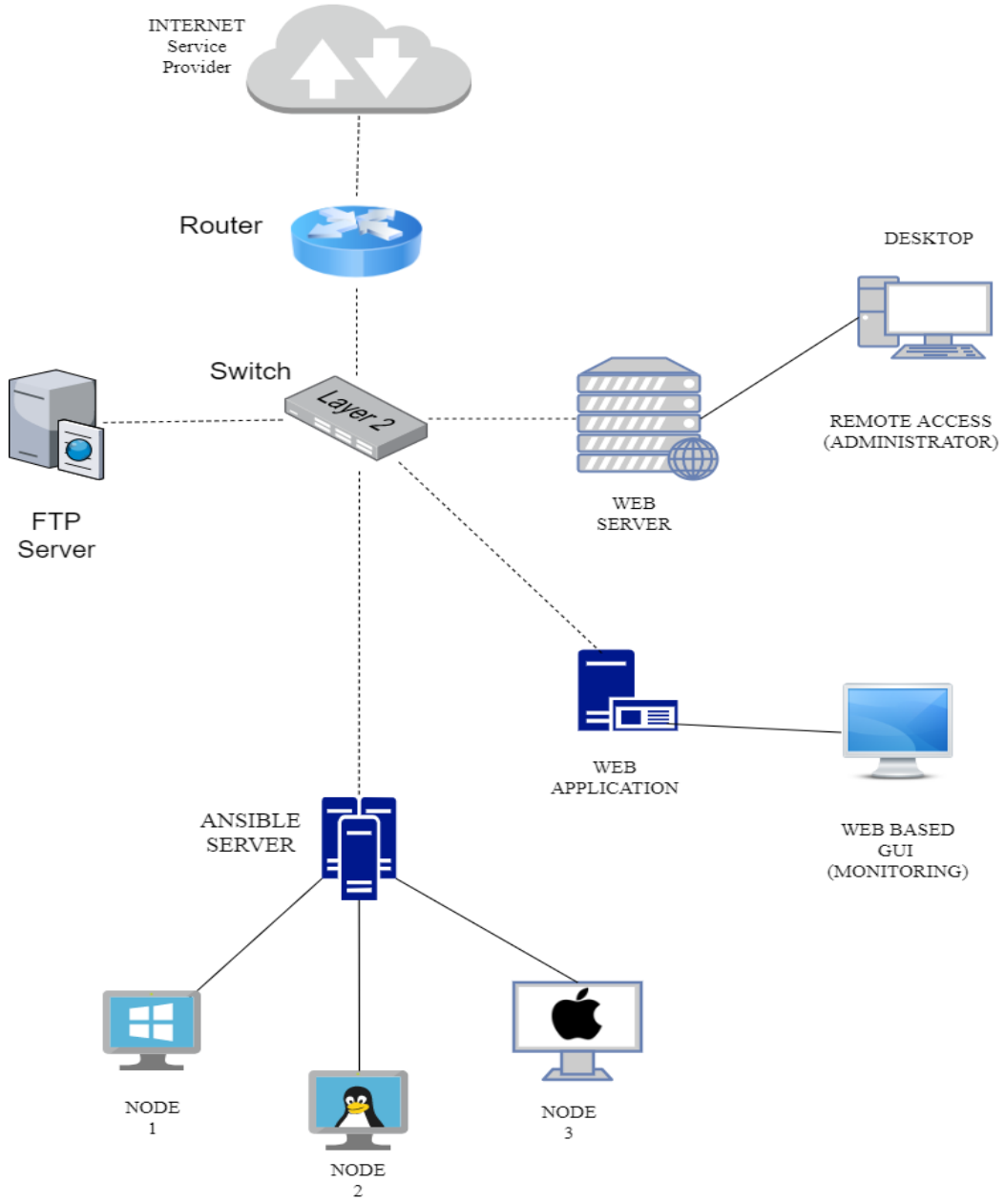
Smartsheet Tip ➜ A Gantt chart's visual timeline allows you to see details

PROJECT TITLE	Autonetics and Administration for IT Laboratories	INSTUTUTE & DEPARTMENT NAME	A.P. Shah Information Of Technology
PROJECT GUIDE	Dr. Sameer Nanivadekar	DATE	4/9/20
PROJECT CO-GUIDE	Prof. Vishal Badgujar		

WBS NUMBER	TASK TITLE	TASK OWNER	START DATE	DUE DATE	DURATION (Weeks)	PCT OF TASK COMPLETE
1	**Project Conception and Initiation**					
1.1	Research paper search	Uddhabendra,Karthikeyan,Atharv	7/10/19	7/26/19	3	100%
1.1.1	Research paper finalization	Uddhabendra,Karthikeyan,Atharv	7/10/19	7/26/19	3	100%
1.2	Project Title	Uddhabendra,Karthikeyan,Atharv	7/10/19	7/26/19	3	100%
1.3	Abstract	Atharv	8/23/19	8/30/19	1	100%
1.4	Objectives	Uddhabendra,Karthikeyan,Atharv	8/23/19	8/30/19	1	100%
1.5	Literature Review	Karthikeyan	8/23/19	8/30/19	1	100%
1.6	Problem Definition	Uddhabendra	3/23/18	8/30/19	1	100%
1.7	Scope	Karthikeyan	8/23/19	8/30/19	1	100%
1.8	Technology stack	Uddhabendra,Atharv	8/23/19	8/30/19	1	80%
1.9	Benefits for environment	Atharv	8/23/19	8/30/19	1	100%
1.1	Benefits for society	Karthikeyan	8/23/19	8/30/19	1	80%
1.11	Applications	Uddhabendra	8/23/19	8/30/19	1	100%
2	**Project Design**					
2.1	Proposed System	Karthikeyan,Uddhabendra	9/19/19	9/27/19	1	70%
2.2	Design(Flow Of Modules)	Uddhabendra,Karthikeyan,Atharv	9/19/19	9/27/19	1	70%
2.3	Activity Diagram	Uddhabendra,Atharv	9/19/19	9/27/19	1	50%
2.4	Use Case Diagram	Atharv,Karthikeyan	9/19/19	9/27/19	1	50%
2.5	Description Of Use Case	Karthikeyan,Uddhabendra	9/19/19	9/27/19	1	30%
2.6	Modules		9/19/19	9/27/19	1	
2.6.1	Module-1	Atharv,Karthikeyan,Uddhabendra	9/19/19	9/27/19	1	75%
2.6.2	Module-2	Atharv	9/19/19	9/27/19	1	75%
2.6.3	Module-3	Karthikeyan	9/19/19	9/27/19	1	85%
2.6.4	Module-4	Uddhabendra	9/19/19	9/27/19	1	85%
2.7	Preparation Of Report	Atharv	9/19/19	9/27/19	1	85%
3	**Project Implementation**					
3.1	Module-1	Atharv,Karthikeyan,Uddhabendra	2/4/20	2/4/20	0	60%
3.2	Module-2	Atharv	2/5/20	2/5/20	0	65%
3.3	Module-3	Karthikeyan	2/11/20	2/12/20	0	55%
3.4	Module-4	Uddhabendra	2/25/20	2/26/20	0	58%
4	**Testing**					
4.1	Design of Test Cases	Karthikeyan,Atharv	1/26/20	2/2/20	3	40%
4.2	Installing Ansible	Atharv,Karthikeyan,Uddhabendra	1/27/20	2/3/20	1	45%
4.3	Creating a Sample Playbook	Atharv,Karthikeyan,Uddhabendra	2/4/20	2/10/20	1	45%
4.4	Testing Playbooks	Uddhabendra,Karthikeyan,Atharv	2/11/20	2/17/20	1	50%
4.5	Implemented it using ansible	Uddhabendra,Karthikeyan,Atharv	2/18/20	2/24/20	1	50%
4.6	Started working on various OS	Karthikeyan, Uddhabendra	2/25/20	3/2/20	1	50%
4.7	Configured the ansible for various OS	Karthikeyan,Uddhabendra	3/3/20	3/9/20	1	60%
4.8	Created various playbooks according to the requirment of various labs	Atharv	3/10/20	3/16/20	1	60%
4.9	Started Developing student lab utilization manual	Karthikeyan	3/17/20	3/23/20	1	60%
4.1	Gathered information of all labs	Atharv	3/24/20	3/30/20	1	60%
4.11	Worked on the frontend of website	Karthikeyan	3/31/20	4/6/20	1	70%
4.12	Worked on the CSS of website	Karthikeyan, Uddhabendra	4/7/20	4/13/20	1	70%
4.13	Worked on the backend of website	Karthikeyan	4/14/20	4/20/20	1	70%
4.14	Worked on the Ansible GUI	Karthikeyan,Uddhabendra	4/21/20	4/27/20	1	70%
4.15	Worked on the Inventory File	Atharv,Uddhabendra	4/21/20	4/27/20	1	70%
4.16	Worked on the ssh Keys	Karthikeyan	4/28/20	5/4/20	1	80%
4.17	Worked on creating multiple users with Different access permisions	Atharv,Karthikeyan,Uddhabendra	5/5/20	5/11/20	1	80%
4.18	Working on the playbook running on Windows	Atharv,Karthikeyan, Uddhabendra	5/12/20	5/18/20	1	80%
4.19	Worked on the implementation of Semaphore	Karthikeyan	5/19/20	5/25/20	1	80%
4.2	Working on fetching the mac address and ip address at once in a single file	Uddhabendra,Karthikeyan,Atharv	4/21/20	4/27/20	1	80%
5	**Results and Analysis**					
5.1	Analysis Of Results	Karthikeyan	2/25/20	2/26/20	1	70%
5.2	Graphical Representation	Uddhabendra	3/24/20	3/26/20	1	60%
5.3	Report Preparation	Atharv	3/25/20	3/27/20	1	80%

PHASE ONE: WEEK 1, WEEK 2, WEEK 3
PHASE TWO: WEEK 4, WEEK 5, WEEK 6
PHASE THREE: WEEK 7, WEEK 8, WEEK 9
PHASE FOUR: WEEK 10, WEEK 11, WEEK 12

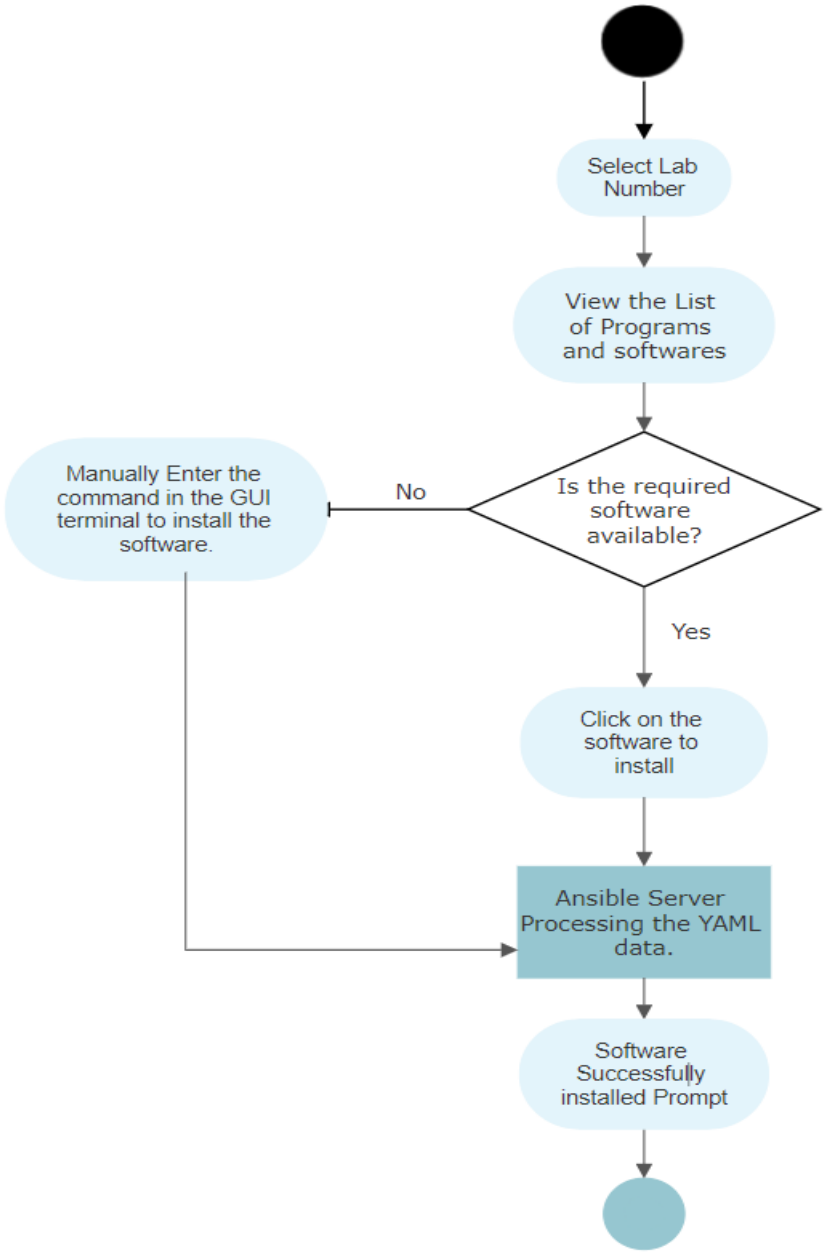
PROPOSED ARCHITECTURE



TECHNOLOGY STACK

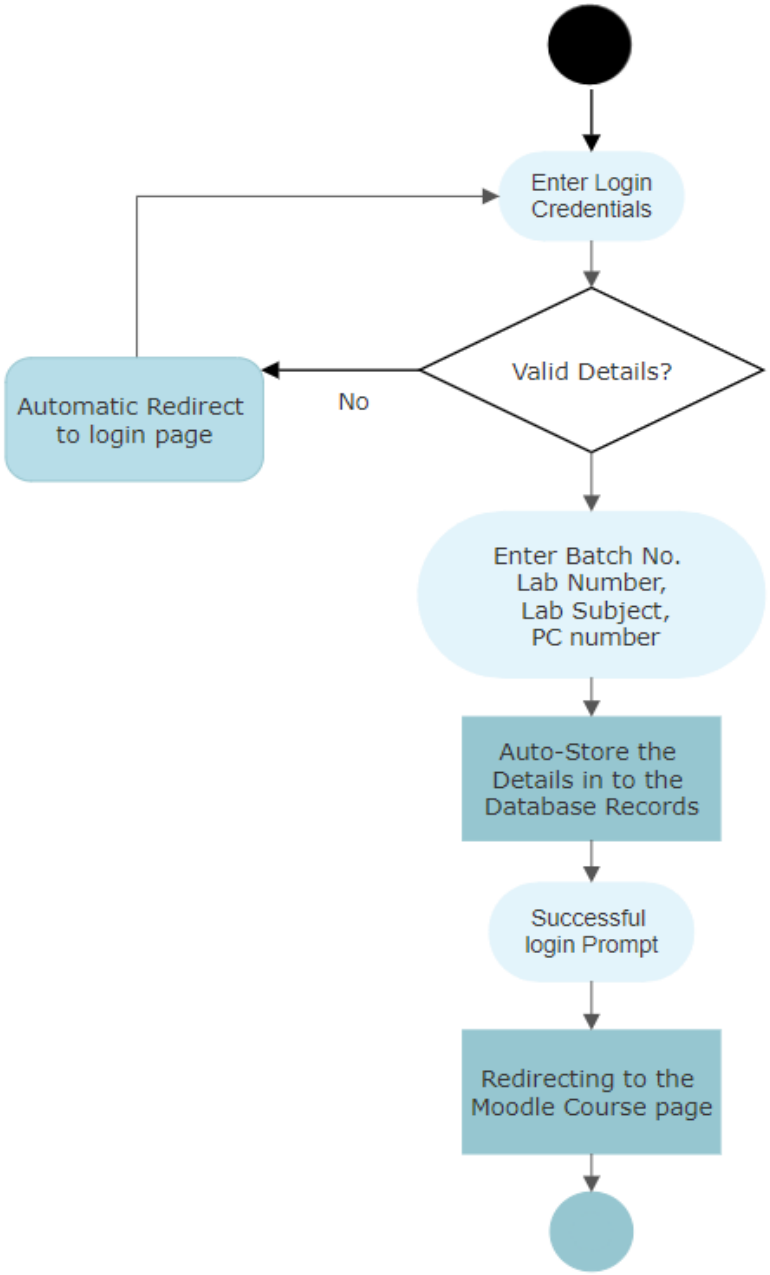
- Ansible tool is used in our project
- Ansible server is used for hosting the web application
- Database: MariaDB
- Nodes will be Linux, Ubuntu, Windows
- Front End: Semaphore, Python, HTML5

ACTIVITY DIAGRAM



Lab in-charge’s perspective

ACTIVITY DIAGRAM



Student's perspective

USE CASE DIAGRAM

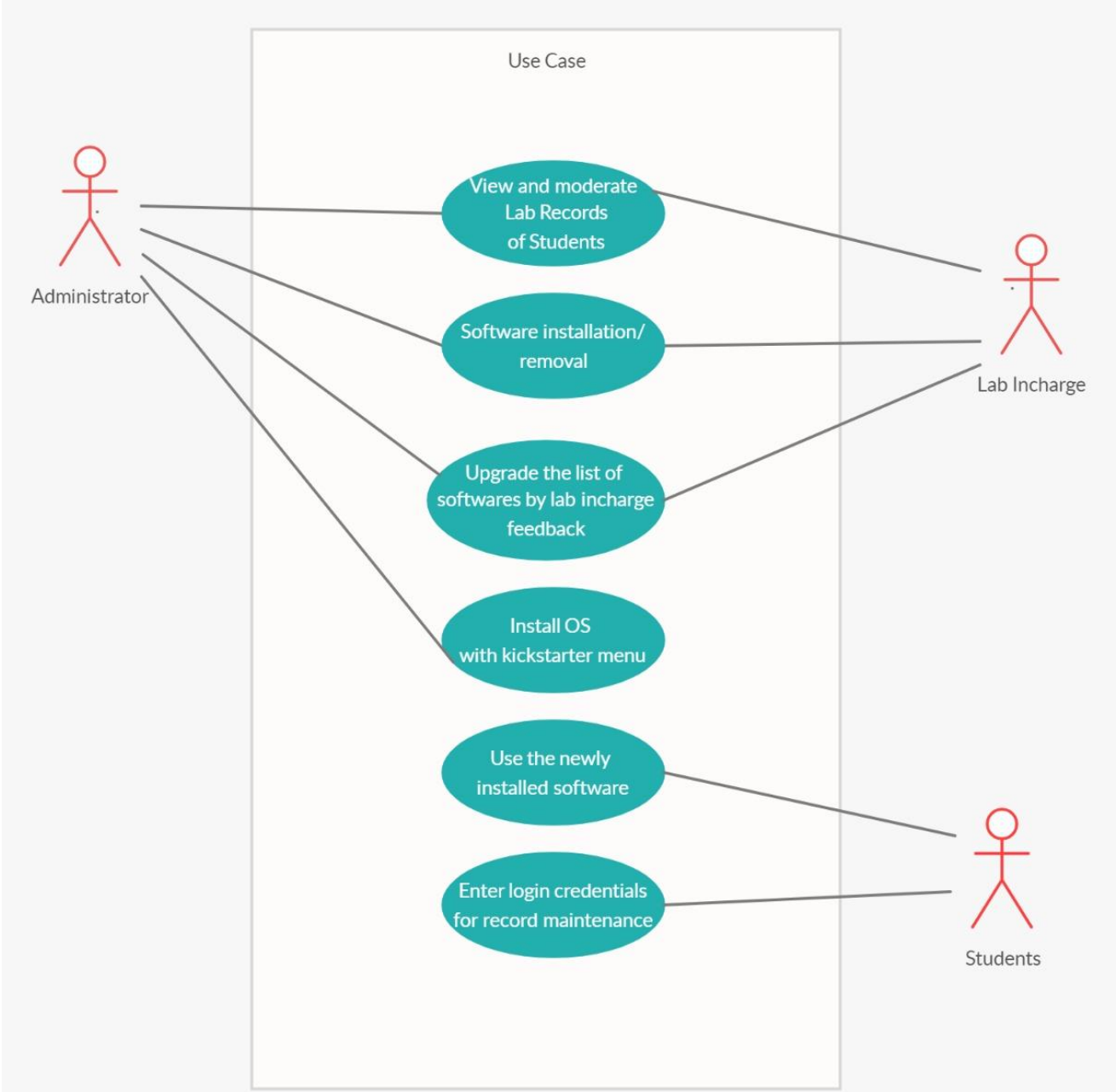
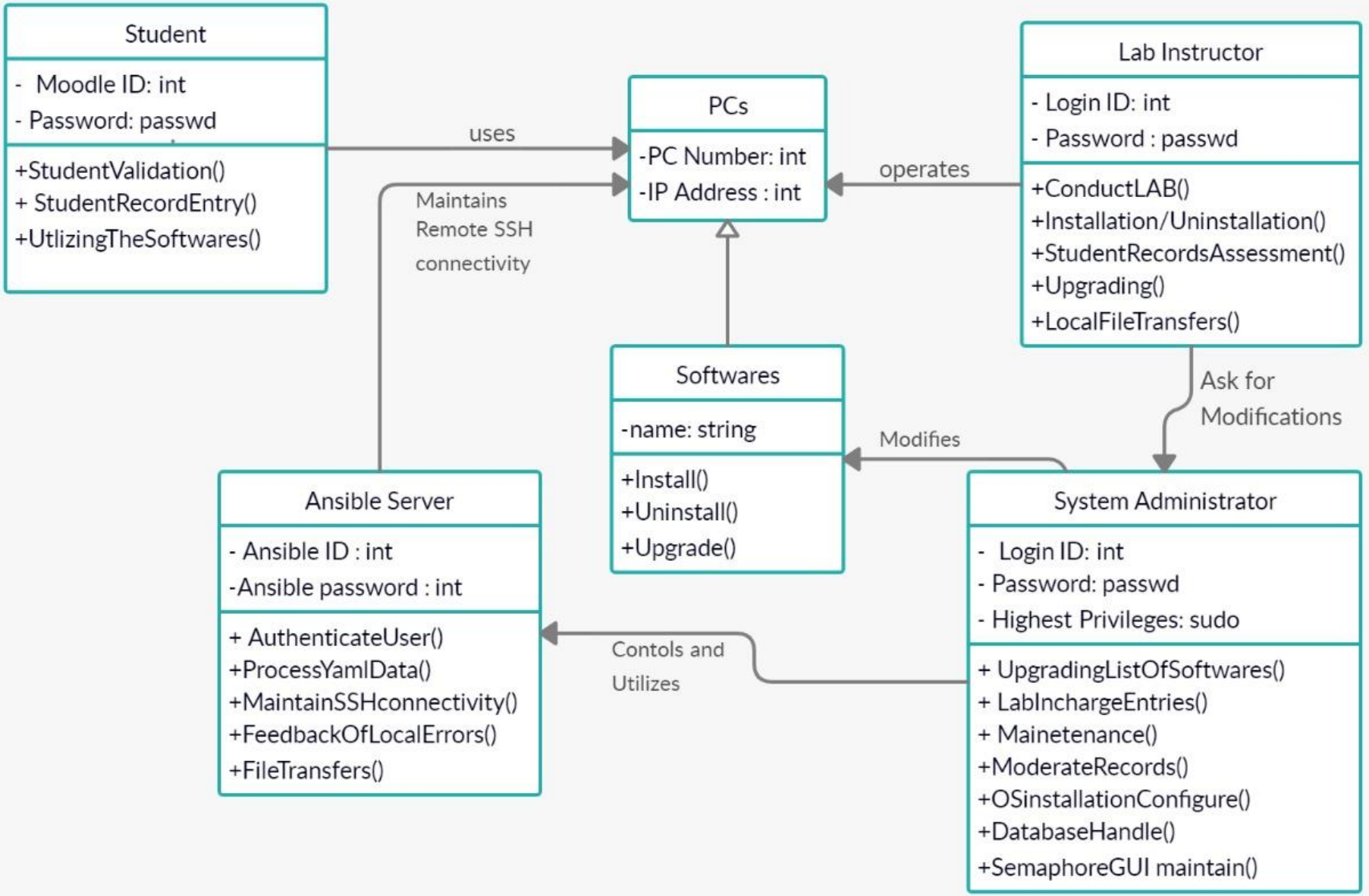


Figure 5 : Use Case

CLASS DIAGRAM



IMPLEMENTATION

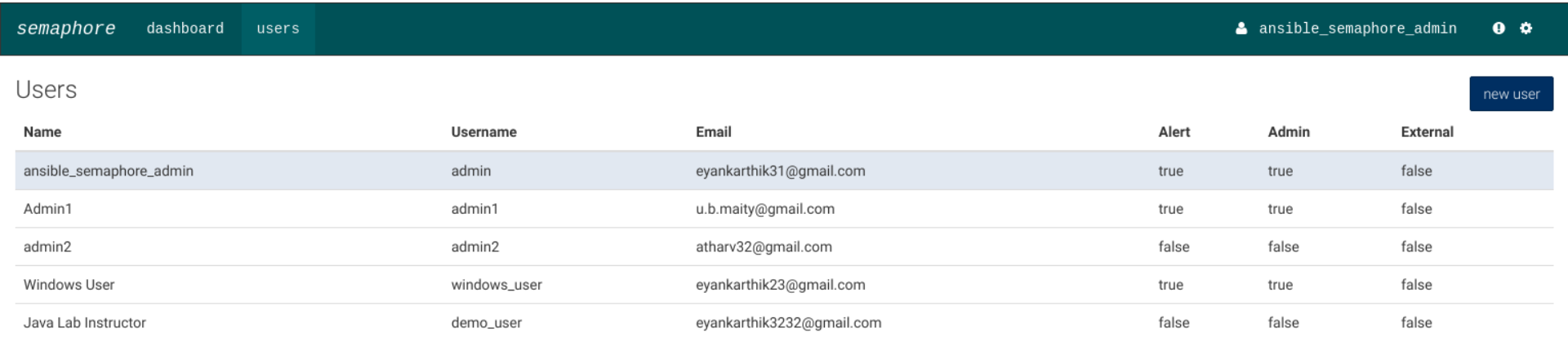
- **Sample playbook for installing the essential set of tools for networking in a college laboratory infrastructure:-**

Open *networkingtools.yml /etc/ansible/yamlv1 Save

```
1 ---
2 # Installing All Essential tools for networking for lab 313
  ( Faster Process )
3 - hosts: client1
4   become: yes
5   become_method: sudo
6   tasks:
7
8   - name: Installing all essential Networking tools
9     apt:
10      name: "{{ item }}"
11    with_items:
12      - nmap
13      - iftop
14      - vnstat
15      - iptraf
16      - hping3
17      - dstat
18      - bmon
19      - tcpdump
20      - wireshark
```

Ansible login GUI for LAB instructors

User Manager for Admins



Name	Username	Email	Alert	Admin	External
ansible_semaphore_admin	admin	eyankarthik31@gmail.com	true	true	false
Admin1	admin1	u.b.maity@gmail.com	true	true	false
admin2	admin2	atharv32@gmail.com	false	false	false
Windows User	windows_user	eyankarthik23@gmail.com	true	true	false
Java Lab Instructor	demo_user	eyankarthik3232@gmail.com	false	false	false

Playbooks for different LABS

semaphore dashboard users ansible_semaphore_admin

Autonetics of IT LABS

- Dashboard
- Task Templates
- Inventory
- Environment
- Key Store
- Playbook Repositories
- Team

Task Templates

new template

Alias	Playbook	SSH Key	Inventory	Environment	Repository	
Data Mining LAB	LAB405.yml	key	ansible_semaphore_inventory		apsitlabs	hide copy run
Git Installation	git.yml	key	ansible_semaphore_inventory		apsitlabs	hide copy run
Networking Lab	LAB302.yml	key	ansible_semaphore_inventory		apsitlabs	hide copy run
Python LAB	LAB317.yml	key	ansible_semaphore_inventory		apsitlabs	hide copy run
SDL Lab	LAB301.yml	key	ansible_semaphore_inventory		apsitlabs	hide copy run
Shutdown	shutdowns.yml	key	ansible_semaphore_inventory		apsitlabs	hide copy run
VMware LAB	LAB303.yml	key	ansible_semaphore_inventory		apsitlabs	hide copy run
Wireless Networking Lab	LAB313.yml	key	ansible_semaphore_inventory		apsitlabs	hide copy run

Inventory file

Edit Inventory

```
1 [client1]
2 ansadm@10.101.1.143
3 #[client2]
4 #ansadm@10.101.1.144
5
6 #ansible_ssh_common_args=' -o StrictHostKeyChecking=no'
7
8
```

cancel save changes

SSH access keys

Update Access Key

Key Name: key

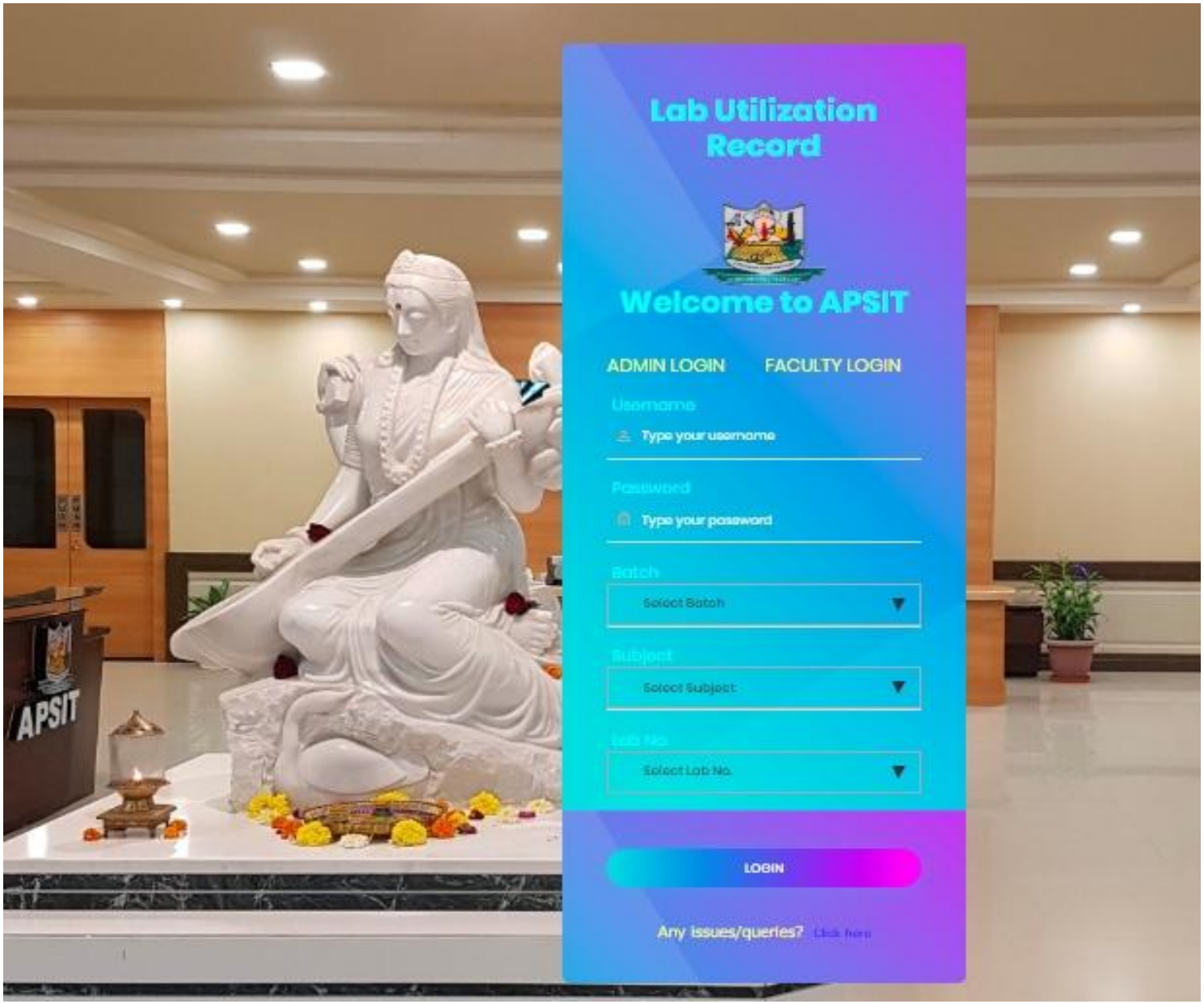
Key Type: SSH Key

Public Key:

```
ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAABAQC
pMdWz+ycHle9nZHNUuND4MQ7E9elMKR
LlviRz+fkDAJbc0VY118K3u3syt7JLPTxw8
NxHL4LebatkHoBk9CEvgqW3hqcrI0yvYjBU
YaMrlyK2N6n3yOEzqsQljpDqNAXqWAwfBr
ga3sobdcMdu7kH0DvLjyMPagzd8pu+VgvL
5WtOTggBTgvUCMxV4s2WdC5nnQll+ghrsp
orA+Dzntfz1L76DiV2tCicOr2UFhiYnxGxmLi
LJ7ASPquEif1YMjB7NN9sL8P3X9VapG5xq
v+MO/xexbRbWDhpfkrO9jWVgZePzJJe4ca
Sdwf/sNBOBCM0VzPa3ll9uJ/BVz55PYxB
apsit@ansadm
```

Public key is **optional** (unless you are using SSH certificates) however you should set it so you can identify your private key by its fingerprint. Private keys are not available for reading later from the UI.

Student Lab Utilization Record



Centralized monitoring of lab utilization logs

UserID wise Records

Sr No.	Username	Batch	Subject	Lab No.	Date and Time(yyyy-mm--dd hh:mm:ss)
1	18101001	B1	ASL	317	2020-02-09 08:22:13
2	18101001	B1	AL	303	2019-09-28 13:59:48
3	18101001	B2	ASL	302	2019-09-22 14:19:36
4	18101001	B3	ASL	406	2019-09-22 14:18:43
5	18101001	B3	ASL	406	2019-09-22 14:17:22
6	18101001	B2	ASL	303	2019-09-22 14:10:06
7	18101001	B2	NDL	317	2019-09-22 14:07:59
8	18101001	B1	NDL	313	2019-09-22 14:06:20
9	18101001	B1	NDL	317	2019-09-22 14:04:53
10	18101001	B2	ISL	405	2019-10-29 16:18:19
11	18101001	B1	AL	303	2019-09-28 14:01:08
12	18101001	B1	AL	303	2019-09-28 14:07:00

CONCLUSION

The main motive of our work is to create a trustworthy, efficient and real-time system for administration of IT labs in universities. Now all the administrative tasks inside the lab can be executed at a very minimal time and effort with our system. The overall purpose was to minimize the efforts and ensure rapid deliveries of the needed softwares through automation. These objectives have been checked successfully and we hope to enhance the system furthermore and increase the advancements in our system. Thus we are making an effort to implement this system in the current university labs and modernize the IT labs methodically.

FUTURE SCOPE

Integration of IOT : We plan to integrate IOT interfaces in our system for controlling all the electrical appliances throughout the lab remotely.

Using Docker containers for easy deployment of applications in real time.

Enhancing centralized administration : Providing real time log generation to the system administrators for moderating the student's usage during exams or placements.

REFERENCES

[1] Xavier Decoster and Maarten Balliauw“Automated Delivery in Pro Nuget” October 2016.

[2] D.Palma and T.Spatzier. December 2016 “Topology and orchestration specification for cloud applications (TOSCA) ” November 2013

[3] Pavel MasekMartin and ŠtůsekJan Krejčí, “Unleashing Full Potential of ansible Framework: University Labs Administration” May 2018

PUBLICATION

Paper entitled "**Autonetics and Administration for IT Laboratories**" has been presented in "**IEEE International Conference on Convergence to Digital World – Quo Vadis (ICCDW 2020)**" by Karthikeyan Venkatachalam, Uddhabendra Maity, Atharv Shetty,

Dr. Sameer Nanivadekar and Mr. Vishal Badgujar .