
Report on

The Centre of Excellence in Cloud Computing

Cloud Lab @ SIET

In recent years, advances in technology have made it possible to create low-cost lab setups that can effectively perform various scientific experiments. One such approach is the use of thin clients and Docker containers. In this report, we will explore the advantages and disadvantages of using thin clients and Docker containers for a low-cost lab setup and how it can benefit the scientific community. A Thin Client is a computer that runs from resources stored on a central server instead of a localized hard drive. Thin clients work by connecting remotely to a server-based computing environment where most applications, sensitive data, and memory, are stored.

What are Thin Clients?

Thin clients are low-cost computers that are designed to run applications that are hosted on a server. They are designed to be simple and easy to maintain, making them an ideal choice for a low-cost lab setup. Thin clients are typically used in a virtual desktop infrastructure (VDI) where the user interface is hosted on a remote server, and the thin client provides the user access to the virtual desktop environment.

What is Docker?

Docker is an open-source platform that enables developers to create, deploy, and run applications in containers. Docker containers are lightweight, portable, and can run on any platform, making them an ideal choice for a low-cost lab setup. With Docker, you can create multiple isolated environments on a single machine, making it possible to run multiple applications on a single server.

Advantages of using Thin Clients and Docker for a Low-Cost Lab Setup:

Cost-effective:

1. Thin clients are much cheaper than traditional desktop computers, making them an ideal choice for a low-cost lab setup. Docker containers are also lightweight and can run on low-cost hardware, making them an ideal choice for a low-cost lab setup.

Scalability:

2. With thin clients and Docker containers, it is easy to scale up or down depending on the needs of the lab. Adding more thin clients or Docker containers is a straightforward process, making it easy to accommodate changes in the lab's workload.

Easy to Maintain:

3. Thin clients and Docker containers are easy to maintain, making them an ideal choice for a low-cost lab setup. With thin clients, the server does most of the heavy lifting, making it easier to maintain and update the lab's infrastructure. With Docker containers, each container is isolated from the others, making it easier to maintain and update individual applications without affecting the entire lab environment.

Security:

4. Thin clients and Docker containers can improve security in a lab environment. Thin clients rely on a server to handle all the processing, which means that the sensitive data is never stored on the thin client itself. Docker containers provide an isolated environment, which reduces the risk of one application affecting another in the same environment.

A low-cost lab setup using thin clients and Docker containers can offer several advantages for students, including:

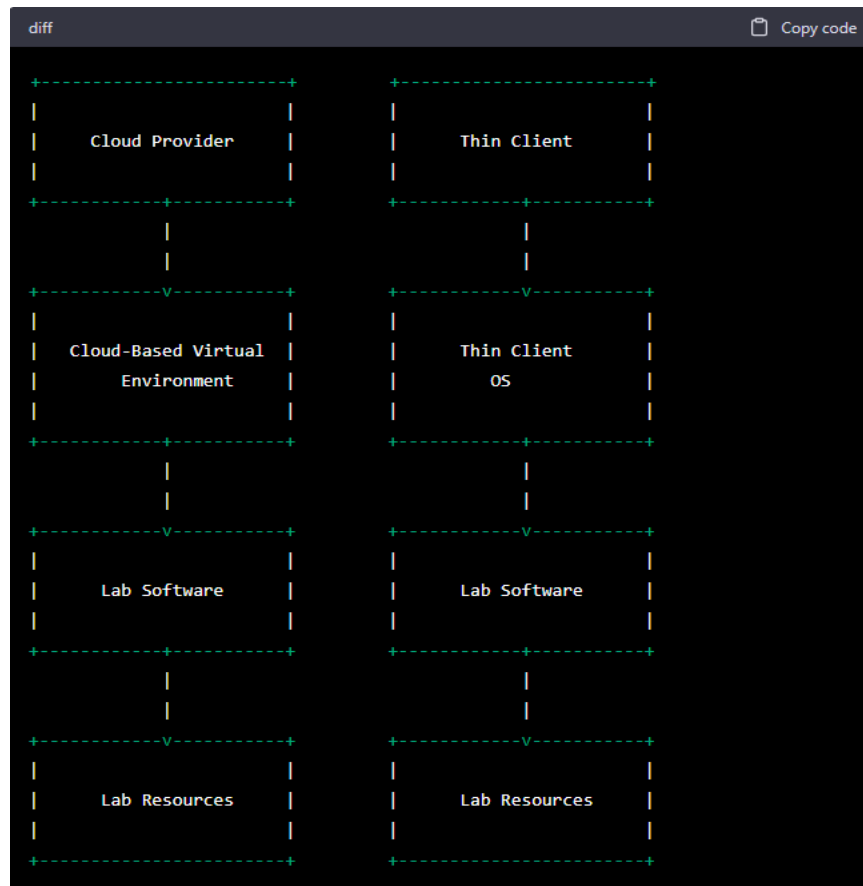
1. **Accessible and Cost-Effective:** One of the main advantages of a low-cost lab setup is that it is accessible to more students. Students who may not have access to expensive lab equipment or who may not have the financial means to afford expensive software can still participate in scientific experiments and learn valuable skills. This can increase the inclusivity of scientific education.
2. **Flexibility and Scalability:** Thin clients and Docker containers provide a flexible and scalable lab environment. Students can access the lab from anywhere with an internet connection, making it possible to participate in scientific experiments and complete lab work at their convenience. Additionally, the lab can easily scale up or down depending on the needs of the class or the experiment.
3. **Improved Collaboration:** Thin clients and Docker containers can facilitate collaboration between students. Students can work together on lab assignments and experiments, sharing data and resources within the lab environment. This can promote teamwork and enhance learning.
4. **Real-World Experience:** A low-cost lab setup using thin clients and Docker containers can provide students with real-world experience using modern scientific tools and technologies. Docker containers are widely used in the industry, and exposure to this technology can prepare students for future careers in science and technology.
5. **Security and Control:** Thin clients and Docker containers provide a more secure lab environment. Each user operates within their own container, which reduces the risk of data breaches or security issues. Additionally, the lab instructor or administrator can control the resources and permissions granted to each user, ensuring that the lab environment remains secure and efficient.

Cloud-based labs offer many advantages for colleges, including:

1. **Cost-Effective:** Cloud labs require minimal upfront investment in hardware and infrastructure, making them a cost-effective solution for colleges looking to provide lab resources to students.
2. **Accessibility:** Cloud labs can be accessed from anywhere with an internet connection, making them accessible to remote students or those who cannot physically attend the lab. This can increase the inclusivity of scientific education.
3. **Scalability:** Cloud labs can easily scale up or down depending on the needs of the class or the experiment. This allows colleges to provide lab resources to a larger number of students without worrying about physical space constraints.
4. **Flexibility:** Cloud labs offer flexibility in terms of scheduling and availability. Students can access the lab at any time that is convenient for them, which can help accommodate different schedules and time zones.
5. **Security:** Cloud labs offer increased security, as each user operates within their own virtual environment. This reduces the risk of data breaches or security issues.
6. **Collaboration:** Cloud labs can facilitate collaboration between students. Students can work together on lab assignments and experiments, sharing data and resources within the cloud environment. This can promote teamwork and enhance learning.
7. **Real-World Experience:** Cloud labs can provide students with real-world experience using modern scientific tools and technologies. Cloud-based lab environments are widely used in the industry, and exposure to this technology can prepare students for future careers in science and technology.

Overall, cloud-based labs offer many advantages for colleges, including cost-effectiveness, accessibility, scalability, flexibility, security, collaboration, and real-world experience. These benefits can help colleges provide high-quality lab resources to students while also preparing them for successful careers in science and technology.

Architecture of the Lab



In this diagram, the cloud provider hosts a cloud-based virtual environment, which includes the lab software and resources. The virtual environment can be accessed by thin clients, which run a lightweight operating system that allows them to connect to the cloud environment and run the lab software. The lab software and resources are stored in the cloud-based virtual environment and are accessed by thin clients over the internet. Overall, this setup allows for a cost-effective, accessible, and scalable lab environment that can be accessed from anywhere with an internet connection. The use of thin clients reduces the need for expensive hardware, while the cloud-based virtual environment provides a flexible and secure lab environment that can be easily scaled up or down as needed.

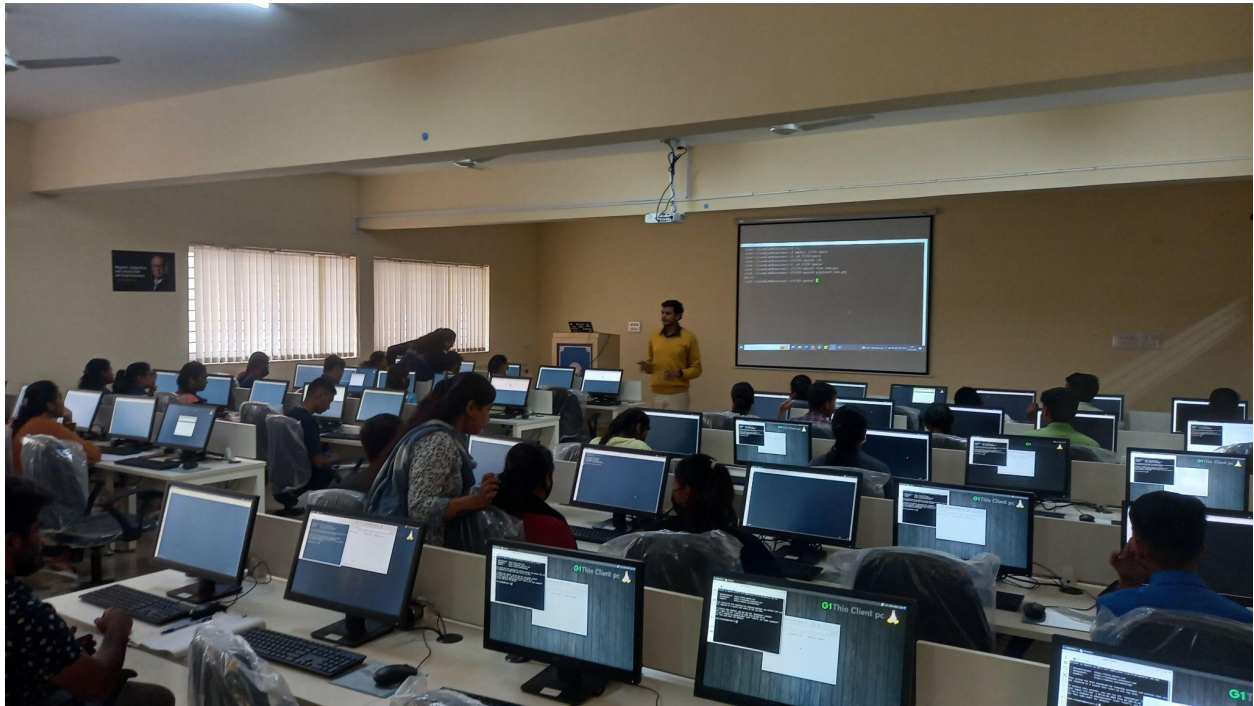
Objectives

1. Establish a Cloud Computing CoE to provide cutting-edge Cloud Computing based business solutions to Industry.
2. To carry out research on state-of-the-art Cloud Computing based business-technology orientation
3. Position SIET as the go-to Institute for Industry and Academia
4. Train engineers/scholars on the development of unique business models
5. Publish research articles, and file for copyrights and patents

Date of Inauguration: **12 -12-2022**

Inauguration by: **Dr. Vidyashankar**
Honourable Vice Chancellor,
VTU, Belagavi





Conclusion:

In conclusion, a low-cost lab setup using thin clients and Docker containers is an excellent option for those looking to create a cost-effective lab environment. The use of thin clients and Docker containers provides scalability, easy maintenance, and improved security. While there are some disadvantages to using this approach, the advantages outweigh them, making it an ideal choice for a low-cost lab setup.