Cloud based IT Infra with Central Identity

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Phase I – Project Report

Project Guide

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Abstract

The main objective of “Cloud based IT Infra with Central Identity” is to utilize exisiting hardware, turn them into private clouds and access all of its services using Central Identity, which can be available to third party developers as API with dynamic role management and service endpoints.

New private cloud based IT Infra is aimed to develop using some opensource tools like OpenStack, NFS, LDAP, Ubuntu and etc

Expecting to surve with high computational virtual machines to the research, academic, learning purpose, virtual labs rather than dedicated lab hardware.

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Introduction

1.1 Introduction

"Cloud Based IT Infra with Central Identity" is a complete solution, based on private cloud to enhance and effiecient utilization the IT Infrastructure of an emerging Universities and Organizations with Central Identity for all its users to access its services.

It is going to be developed in 3 phases

- *Private cloud*
- *Deploying Network Services*
- *Central Identity*

1.1.1 Private Cloud

Private Cloud establishment is targeted for hardware resource pooling, providing high computational and scalable virtual machines for deploying network based applications (smtp, proxy, ftp), web application and Network storage.

1.1.2 Deploying Network Services

Configuration of Uniform hardware experience over the complete university includes single sign on on every device, configuration of mail servers etc.

1.1.3 Central Identity

Essential part that combines normal network services(proxy, mail, etc.) and organizational web & native applications. In addtion to that this central identity is available to thrid party developers as API with dynamic based role user authentication protocols.

Chapter 2

Motivation & Approach

2.1 Existing System

- The environment we observed is our university, it cosists of 7000 students and more than 500+ faculty with 6 core Engg. departments apart from 2 years of PUC course.
- Each Department is having strength of 700 students they arrenged these students into various various classes of 60 to 70 each, total 10 to 12 number.
- Each student is provided with one Laptop with 2G RAM, 1.5GHz Clock speed and 200 GB Harddisk Storage.
- All students are using these sytems for more than 8 hours in a day.
- All these students has to provided with course content and course labs, they are maitaining dedicated labs with 50 - 60 machines.

2.2 Problems under consideration

We have observed these problems over our University

- Failed to maintain large user load web services and network applications.
- No Central Identity, Storage & High capacity hardware resource pool.
- Inadequate resource requirements for Research.
- Dedicated computer course labs like Matlab, VLSI, etc. and these labs are useful only at lab hourse most of time they are idle.
- Redendent data and failed to moniter the content over student laptops.

2.3 Proposed System

To avoid above mentioned observations we are proposing one new system with

- Cloud based hardware resources clustering.
- Central Identity for Network Applicaitons with REST API.
- Dynamic user role management.
- Providing Virtual Labs (MatLab, etc.,).
- High Configurational Virtual Machines for research.

2.4 Approach

We want to make use of entire departmental hardaware resources more on its students laptops capacity and create a common pool of resources hence easy to maintain and moniter.

We want to provide signle sign on implentation in each class of 60-70 laptops. such that user can use his own unique username to access university resources and later he can use the same password for network based or web based applications such as updates, mails, examinations, results etc.

User data can be data is retrevied from the Storage server like nfs while loging in to his laptop in any class room and his laptop's computational and storage capacity is used by the private cloud extentions that it make his laptop as slave node when ever laptop is available.

User can develop application and they can use Central Identity in their application with user control and access specifations for API calls.

Chapter 3

System Design

3.1 Users & IT Services

We are grouping all IT Services that are required for University into one and identifing the user who will going to use them. All Users are catagorized into 4 groups [1]

- Studens
- Developers
- Staff, faculty
- Researches

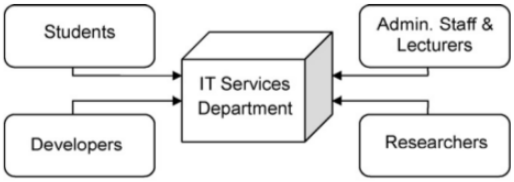

Figure 3.1: Simplified structure of the main users of IT services in a typical university.

All University IT Services are deployed in a private cloud, constructed over exsiting infrastructure, that can be browdly viewed as

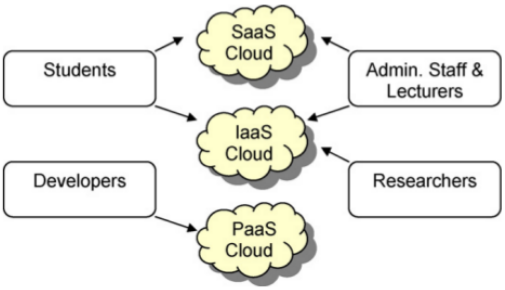

Figure 3.2: Simplified structure of the main users of IT services in a typical university now using the services of cloud computing

3.2 Components Identified

In this project we are restricting ourselves to some componets of the above mentioned system, we are planing to develop them in upcoming semister. We have done literature survey about these componets

- Central Identiy
  - Single Sign on
  - Identity Management
  - Dynamic Role Based Access Control
  - Hybrid version with REST API to third party
- Network Components
  - AAA, LDAP, NFS
- Cloud Infrastructure
  - Cloud Computing, Private Clouds, Open Source tools

Chapter 4

Central Identiy

4.1 Single Sign on

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4.3 Dynamic Role Based Access Control

4.4 Hybrid version with REST API to third party

4.5 Conclusion

Chapter 5

Network Components

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6.1.2 Challenges

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6.1.4 Deployment Models

6.2 Private Clouds

6.3 Introduction

6.4 Open Source Tools

6.5 Comparisions

6.6 Conclusion

Chapter 7

Implentation and Specifications

7.1 Implentation

For maintining above kind of envronment we have to setup one private cloud which will gives the highly scalable virtual machines to server the user need services on fly.

We want to develop minal system with the above guidelines in a lab environment of 10 Master nodes and 5 client machines with uniform operating system and nfs data share. Later extended upto departmental level.

7.2 Specifications

- 15 Laptops with below configuration (10 Master Nodes + 5 Slave Nodes)
  - 4GB RAM, 500 GB Harddisk, Intel i3 processor 1.5GHz Clock
- Class C Network
  - Static IP for Master Nodes
  - DHCP / Static IP for Slave Nodes
- Uninterrupted power suply for Master Nodes.

7.3 Desired Technologies

- Opensource private cluod tools such as Openstack, Cloudstack, etc.
- Ubuntu 14.04 Server LTS.
- LDAP Active Directories, Kerbrose, Squid for Network proxy.
- OAuth 2.0 with extended dynamic roles managment.
- Nodejs for Implementation of OAuth 2.0 as REST API.
- Git for Version control.
- Ascii doc / python shpenix & Latex for Documentation.

7.4 Expcted Results

We are expecting the below results after successfull implemenation of "Cloud Based IT Infra with Central Identity" in lab enviroment with above mentioned specifications

- Hardware resoucre clusters from Master Nodes
  - 40 GB RAM
  - 5TB of Hard disk
  - 15 GHz Clock Speed
- Hardware resoucre clusters from Slave Node (available only at active period)
  - 20 GB RAM
  - 2TB of Hard disk
  - 7.5 GHz Clock Speed
- Well Documented Implementation of Central Identity for
  - Single Sign on of Client Machines.
  - Network applications proxy, mails.
  - University Web Services and Departmental websites.
  - Third party OAuth 2.0 Implemenation as API.
- Dynamic user role management for both Web and Native applications as API.
- Central Cloud Storage Pool.
- High Computational Virtual Machines.
- Virtual Labs insted of Dedicated labs in Remote Desktop or in SSH protocol.
- Content or Data Monitering in a Organization.
- Get full recovery and achieve more than 99.99% services up time.
- Extendable to several departments and Universities.

Chapter 8

Further Work

8.1 Further Work

Some modular design and works goes here

Chapter 9

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- Bootstrap, http://getbootstrap.com
- Stack Overflow http://stackoverflow.com/