Open Source Integrated Infra-Structure Using Ansible Configuration Management

Supervised By
Dr. Ahmed Elnakib

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Faculty Of Engineering
Mansoura University

A Graduation Project
Dept. of Electronics and Communications Engineering

Presented By
1. **Dyaa Eldin Ahmed Mohamed Khalil**.
2. **Shimaa Mohamed Elboghdady**.
3. **Shimaa Shehata Ahmed Elmeligy**.

2016

Motivation :

- One of the most important objectives for large companies is how to **manage**, **keep** and **secure** data .
- Data saved on a place call **data centers** .

Motivation :

- **Traditional data centers** became a difficult solution as :

1. It **costs** thousands of dollars as it needs **large number of physical hardware** .

2. It contains less security.

Objectives :

• **Our project used concept of Software Defined Data Center (SDDC) to improve data center to :**
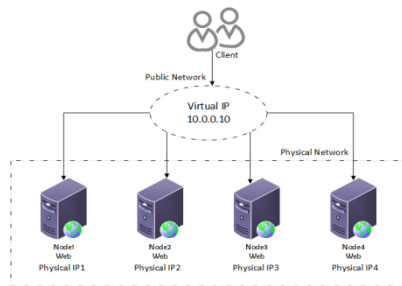
• Reduce Hardware .

• Increase stability.

• Increase data reliable .

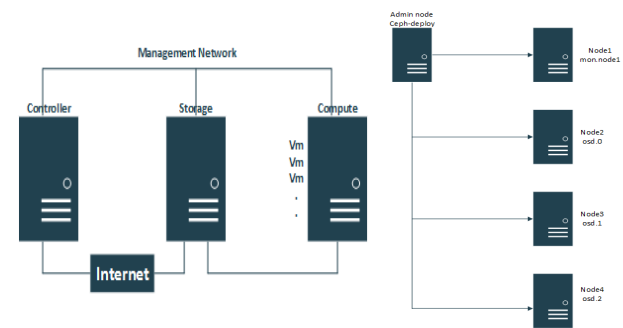• Achieve high availability .

• Increase security .

• Fast deployment .

Overview of selected products :
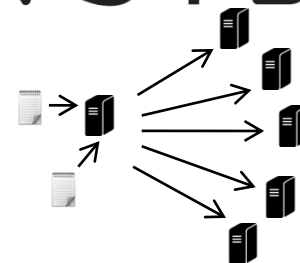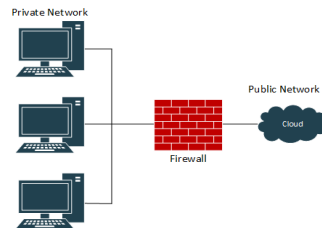
Project stages:

Implement OpenStack cloud computing .

Deploying Ceph storage .

OpenStack integration with Ceph block device (RBD) .

Deploy cluster over OpenStack Infrastructure .

Firewall configuration .

Create a design achieve project objectives .

Automate the design .

Open**Stack** :

- **Open source cloud computing platform .**

- **Infrastructure-as-a-Service "IaaS" solution .**

- **Aims for simple implementation, massive scalability, and a rich set of features.**

Management Network

Controller

Storage

Compute

Vm
Vm
Vm

Internet

Open**Stack** :

Controller Node : manage all OpenStack services and nodes .

Storage Node : contains the disks that the Block Storage and Shared File System services provision for instances .

Compute Node : runs the hypervisor portion of Compute that operates instances .
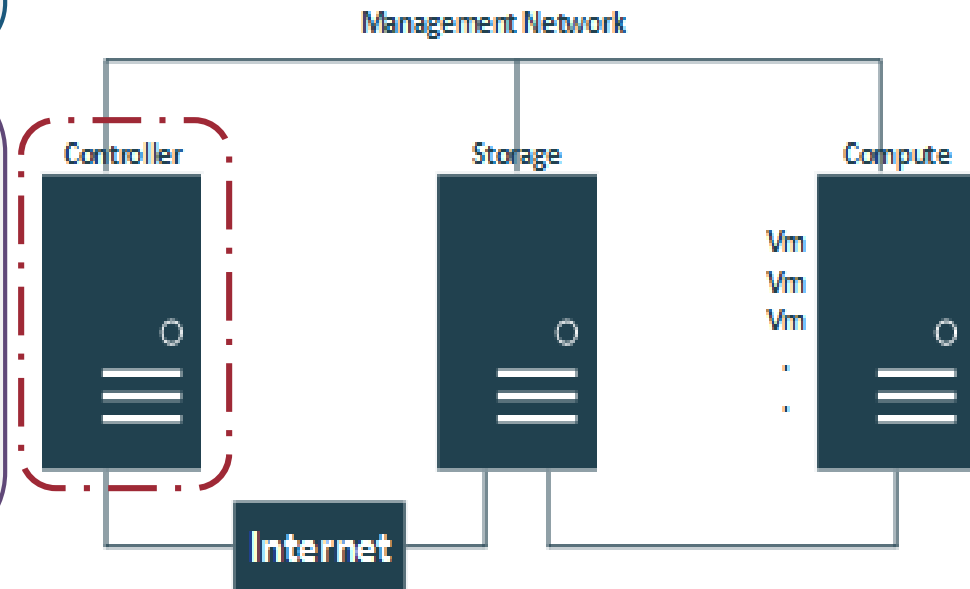
Management Network

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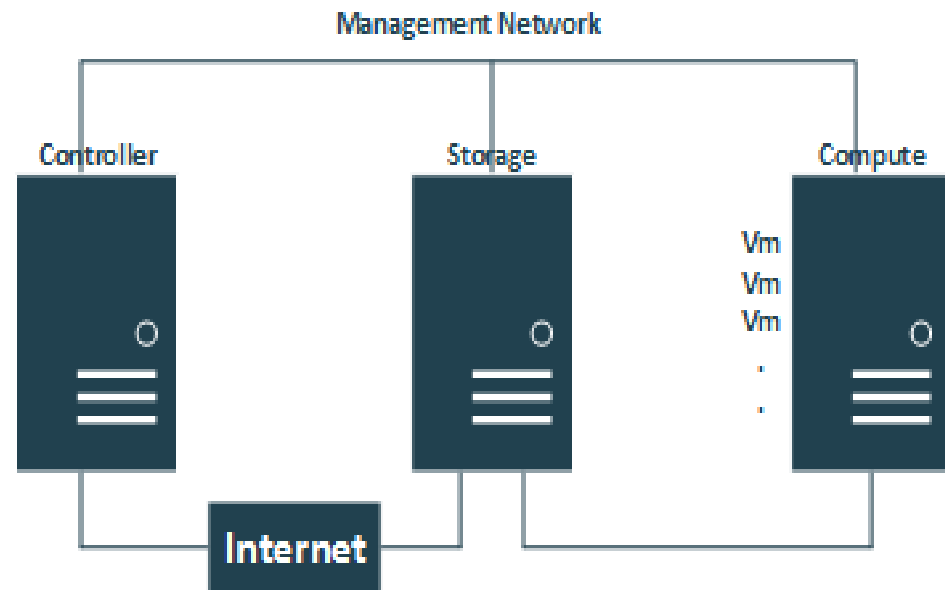Deploy cluster over OpenStack Infrastructure .

Firewall configuration .

Create a design achieve project objectives .

Automate the design .

ceph

- **open source project** , **distribute object storage designed to provide high performance**, **reliability and scalability** .

Admin node
Ceph-deploy

Node1
mon.node1

Node2
osd.0

Node3
osd.1

Node4
osd.2
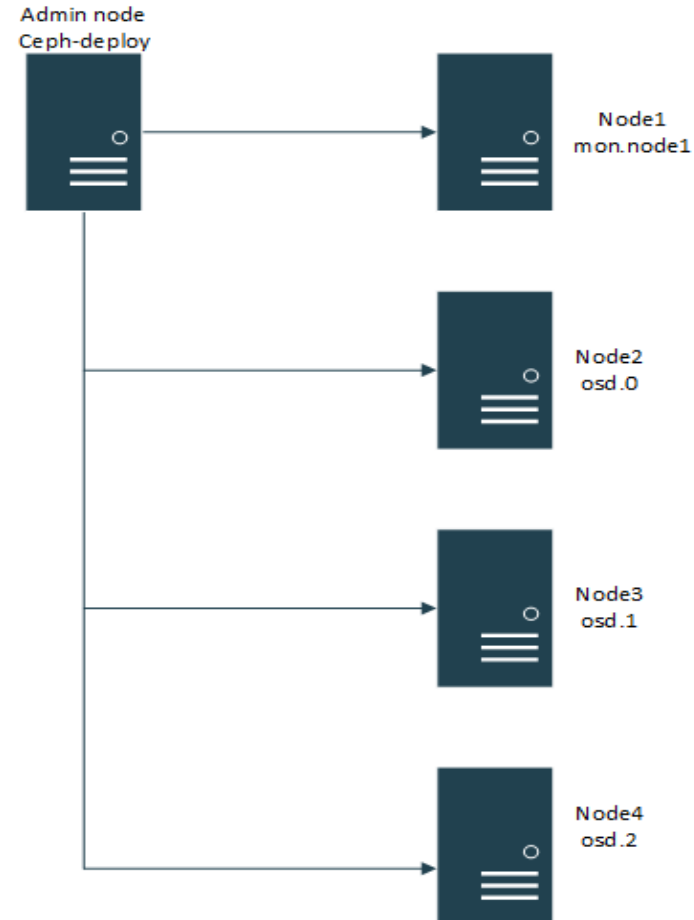
ceph

Structure :

1. **Admin node** : used to manage and deploy all clusters .

2. **Monitor nodes** : used to monitor all clusters and it's has a map to all of them .

3. **OSD nodes** : used to store data .
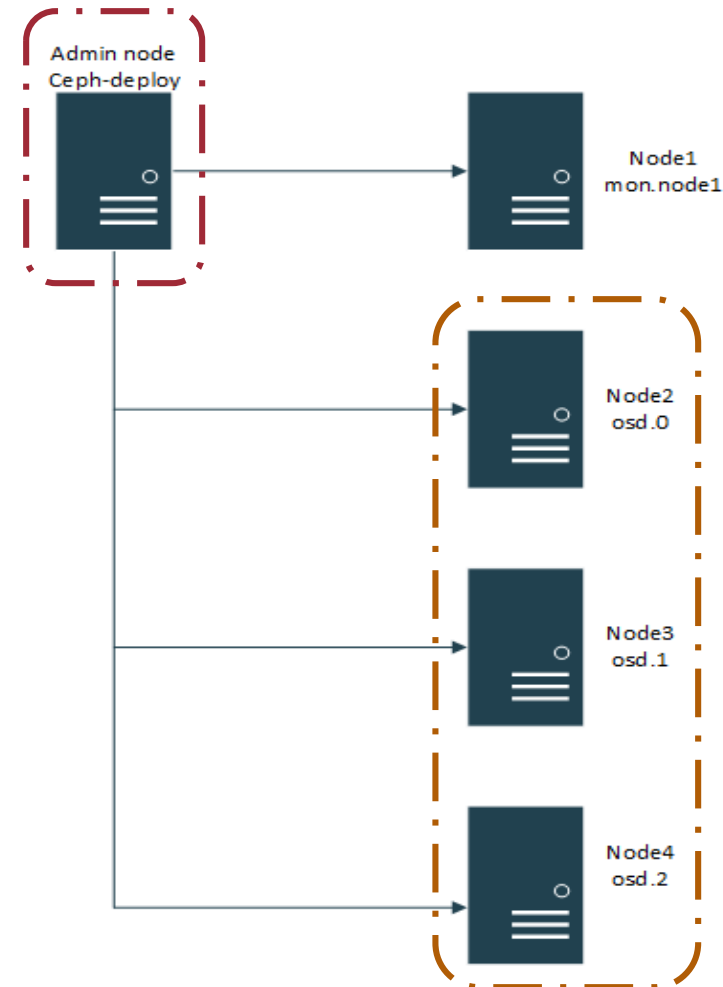
ceph

Why we use Ceph ?

1- Open source project .

2- Distributed and Replication :
Data distributed over Ceph cluster and replicated to ensure data reliability .

3- Scalability :
It is flexible to add and remove resources .

4- Software based storage :
Doesn't depend on Hardware type or size .

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OpenStack + ceph :

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Red Hat Clustering :

A **group** of servers and other resources that act as a **single** system to provide **high-availability** services and resources by redundant multiple machines .

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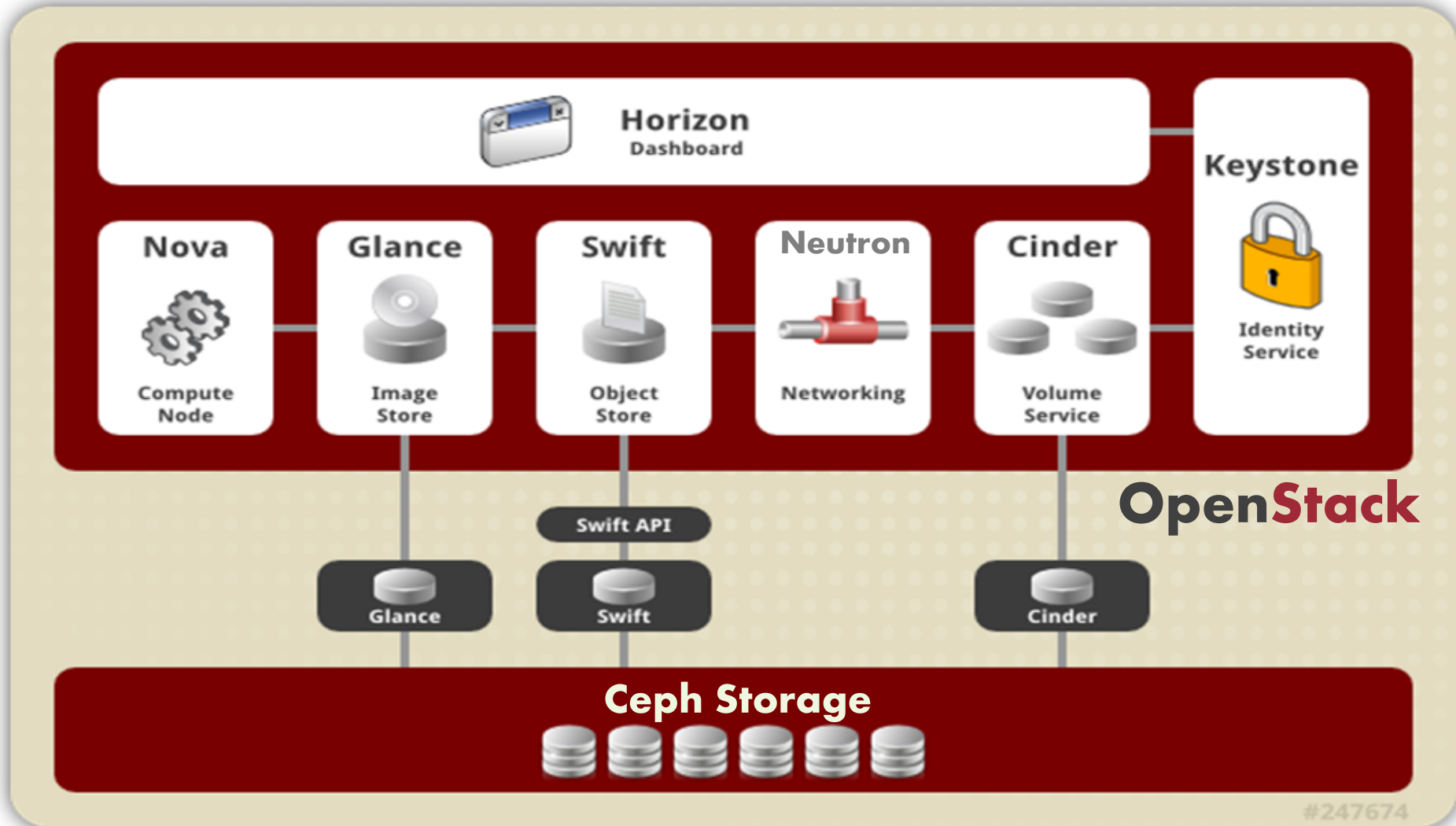
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🔥🧱 **Firewall** :

> • **Firewall is a network security provides secure connectivity between internal and external networks .**

Private Network

Firewall

Public Network

Cloud

> • **In our project we used Iptables (software firewall) .**

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Project Design :
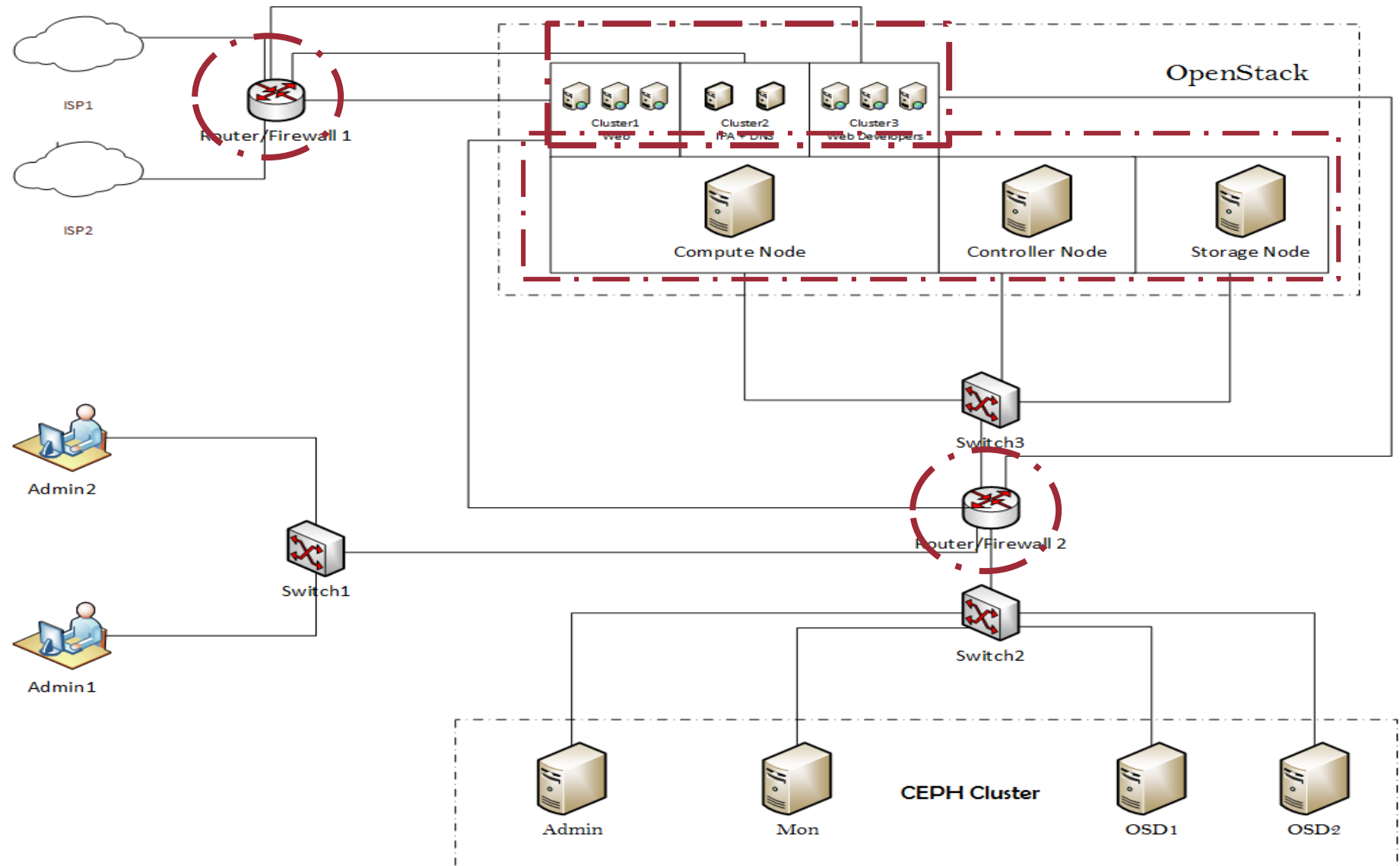
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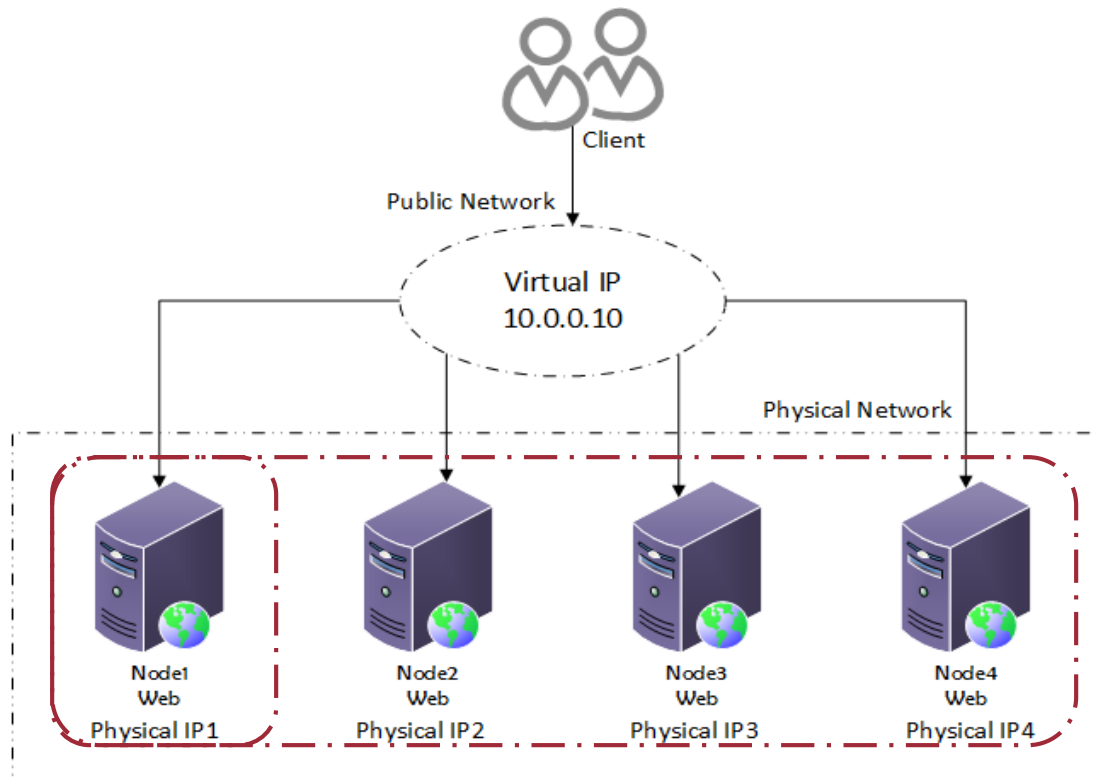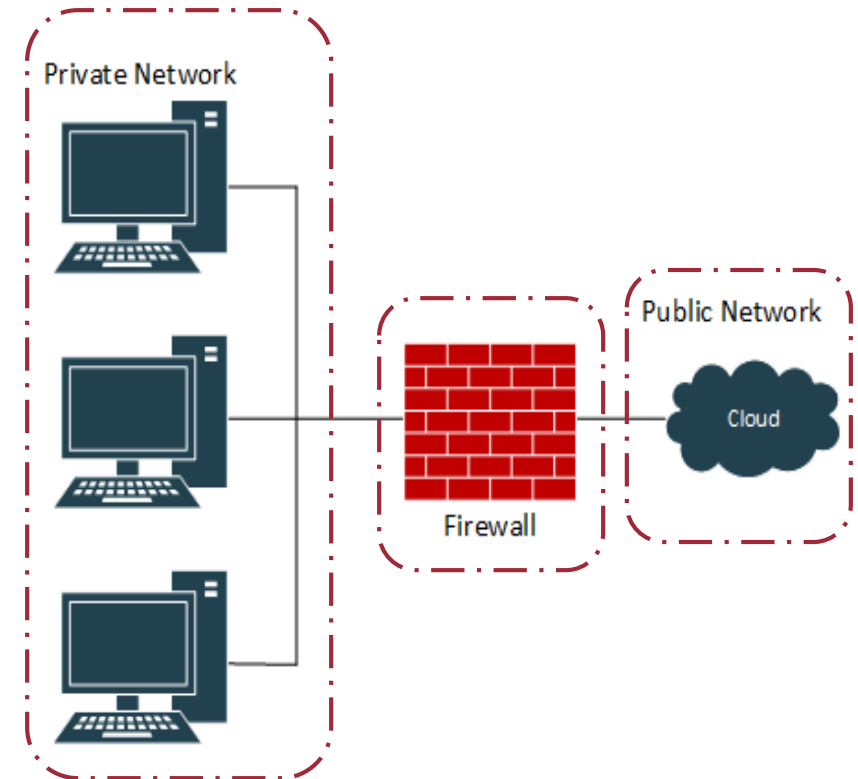
Create a design achieve project objectives .

Automate the design .

ⒶANSIBLε:

Ansible is an **open source** <u>**automation tool**</u> for configuring , managing and deploying all servers **at the same time** instead of managing each server individually .

Ansible Server

Playbook (Script)
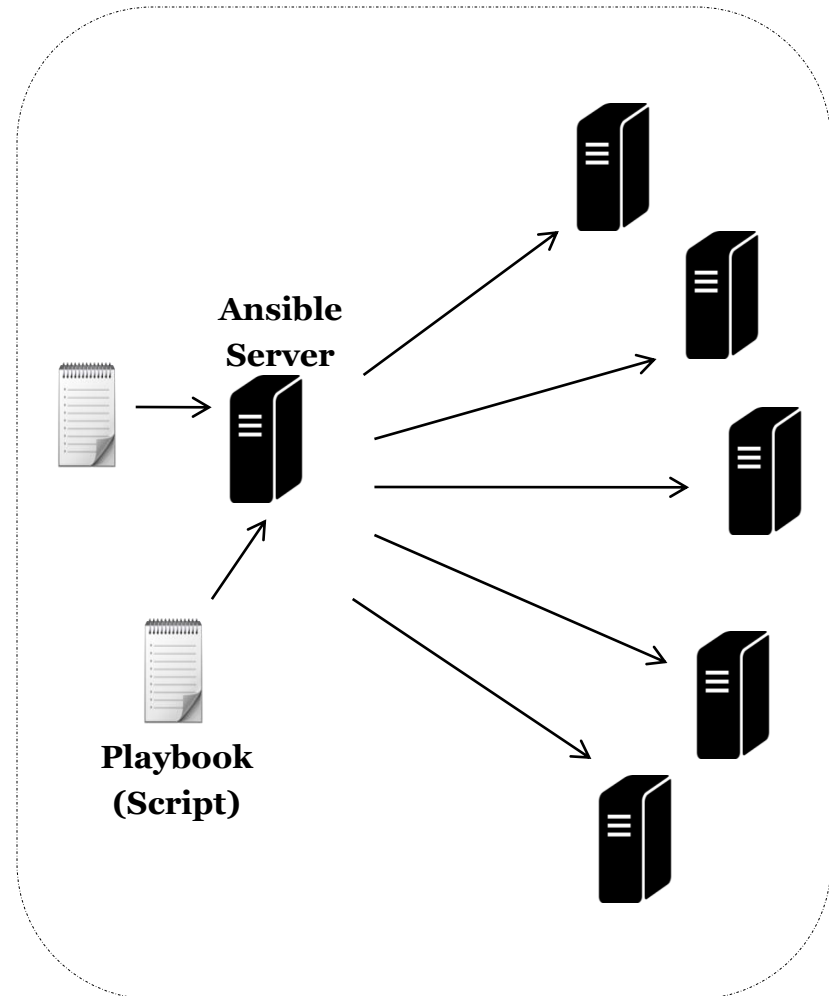
ANSIBLE:

Why we use Ansible ?

Easy to read .

Easy (to learn and setup) .

Large number of modules .

Run on OpenSSH .

Agent less .

ANSIBLE

How Ansible Work ?

1. Ansible playbook describe :
-Hosts to configure .
- Tasks to be run on this hosts .

192.168.1.31

192.168.1.32

192.168.1.33

192.168.1.34

192.168.1.35

Host Inventory

Ansible Management Node

Playbook

SSH trusted

SSH trusted

SSH trusted

SSH trusted

SSH trusted
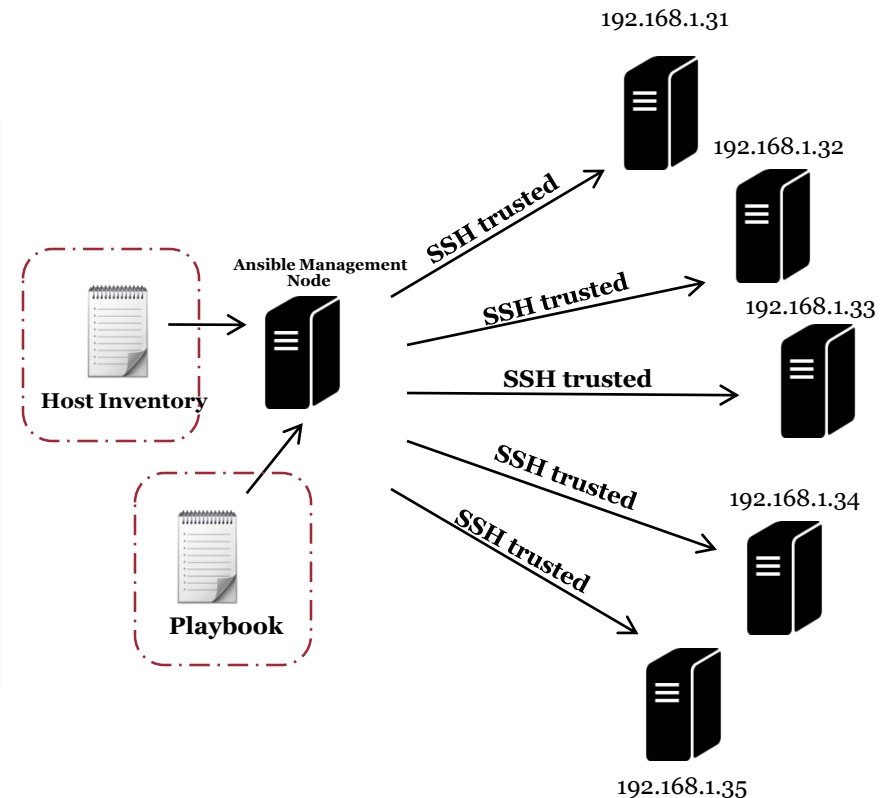
∆NSIBLE

How Ansible Work ?

2. When you run yaml playbook , Ansible will open parallel SSH connections to all remote hosts , and start to run tasks on it .
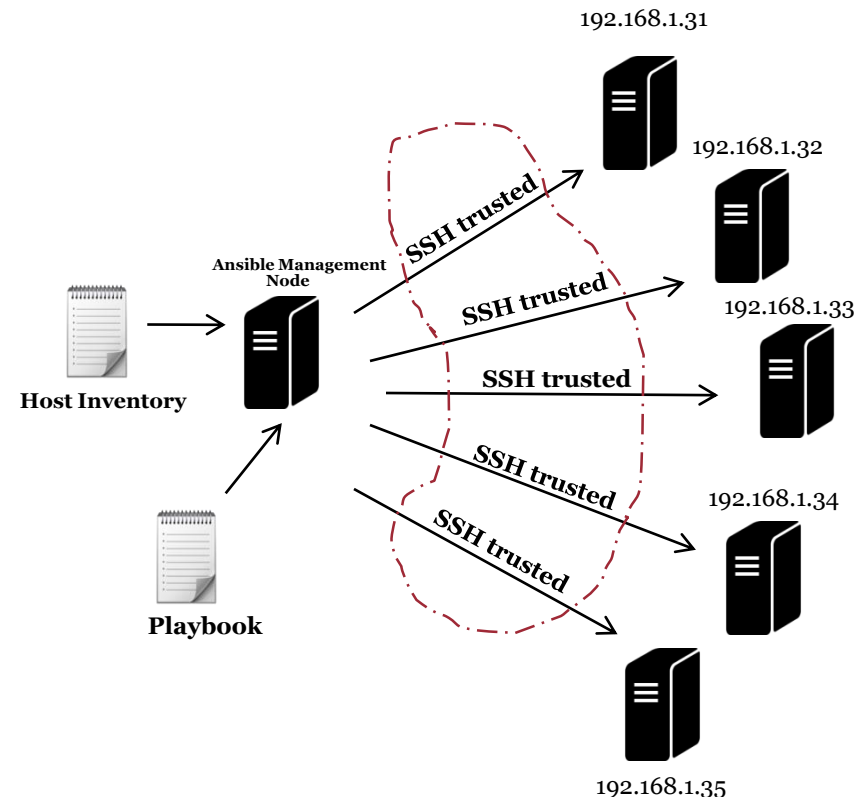
ANSIBLE

How Ansible Work ?

3. At playbook running , Ansible generate python script for tasks , copy and run them at the remote hosts through SSH connection .
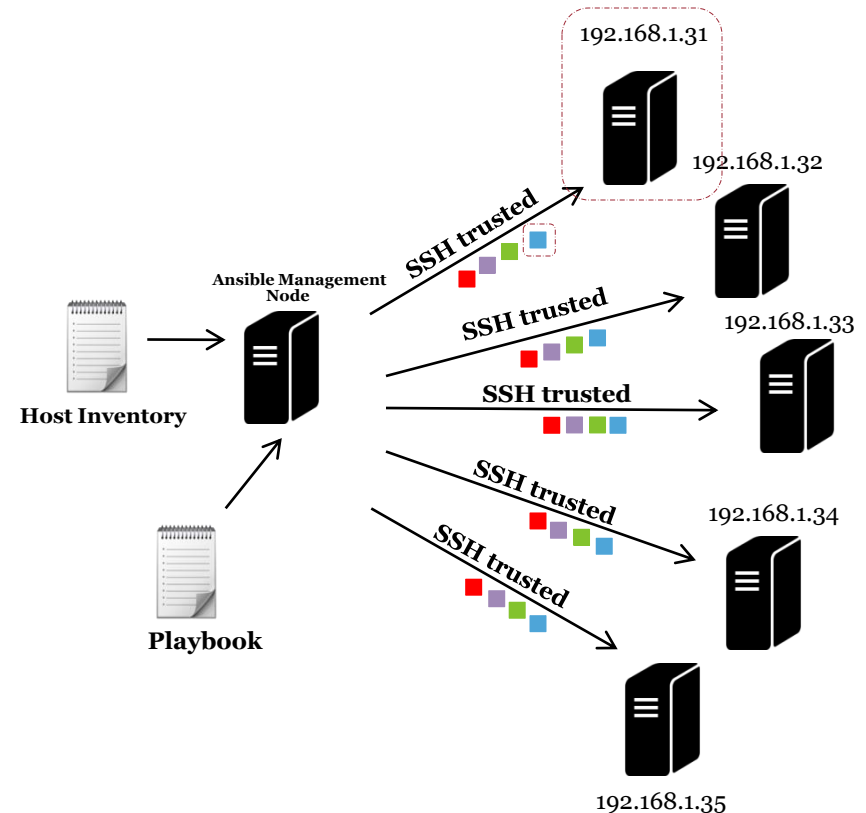
ANSIBLE

How Ansible Work ?

4. Ansible repeat all the steps for each task .

192.168.1.31

192.168.1.32

SSH trusted

Ansible Management Node

SSH trusted

192.168.1.33

Host Inventory

SSH trusted

SSH trusted

192.168.1.34

SSH trusted

Playbook

192.168.1.35

our tools : user interactive

If you want to automate OpenStack press 3 :

```
root@ansible:~                    ×   root@dyaa-HP-EliteBook-8460p: /home/dyaa    ×   dyaa@dyaa-HP-EliteBook-8460p: ~

[root@ansible ~]# sh /etc/ansible/script.sh


                Integrated infrastructure using ansible conf management
=================================================================================

This script deploy ceph , openstack , integrate openstack with ceph , deploy pacemaker cluster over openstack
If you want to deploy product press number beside product

                        1- deploy all infrastructure
                        2- deploy ceph storage
                        3- deploy openstack cloud
                        4- integrate ceph with openstack
                        5- deploy redhat clustering


=================================================================================

Note: look at our book to know how to prepare nodes before deployment

Contact info :

                        ==========================================
                        ||    smart.tuxproj@gmail.com           ||
                        || linkedin.com/in/the-smart-tux-93a904122 ||
                        ==========================================


choose no of product you want to deploy: █
```
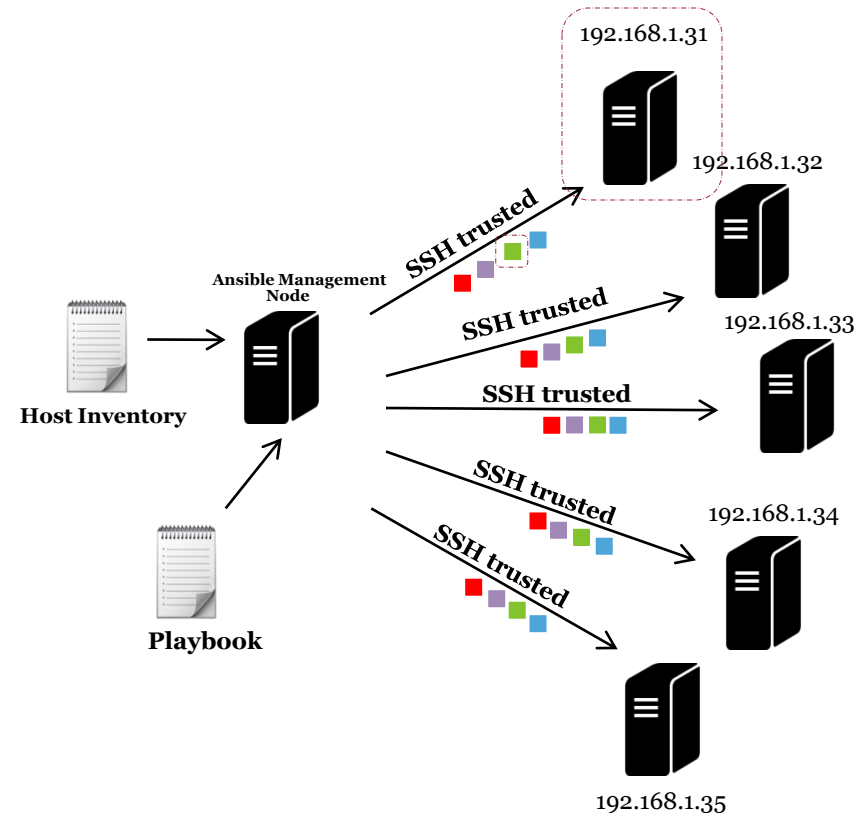
Results : **OpenStack automation**

```
**** Installation completed successfully ******

Additional information:
 * Time synchronization installation was skipped. Please note that unsynchronized time on server instances might be
 problem for some OpenStack components.
 * File /root/keystonerc_admin has been created on OpenStack client host 192.168.1.11. To use the command line tool
s you need to source the file.
 * NOTE : A certificate was generated to be used for ssl, You should change the ssl certificate configured in /etc/
httpd/conf.d/ssl.conf on 192.168.1.11 to use a CA signed cert.
 * To access the OpenStack Dashboard browse to https://192.168.1.11/dashboard .
Please, find your login credentials stored in the keystonerc_admin in your home directory.
 * To use Nagios, browse to http://192.168.1.11/nagios username: nagiosadmin, password: 632ed0e2a46f4071
 * The installation log file is available at: /var/tmp/packstack/20160701-003459-5yQ0go/openstack-setup.log
 * The generated manifests are available at: /var/tmp/packstack/20160701-003459-5yQ0go/manifests
[root@controller Desktop]#
```

our tools : user interactive

If you want to automate Ceph press 2 :

```
root@ansible:~            ×   root@dyaa-HP-EliteBook-8460p: /home/dyaa    ×   dyaa@dyaa-HP-EliteBook-8460p: ~

[root@ansible ~]# sh /etc/ansible/script.sh


              Integrated infrastructure using ansible conf management
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                         =========================================


choose no of product you want to deploy: █
```

Results : Ceph automation

```
😣 🔵 🔲  root@ansible:~
changed: [admin]

TASK [install ice_setup and ceph-deploy] ***************************************
changed: [admin]
 [WARNING]: Consider using yum, dnf or zypper module rather than running rpm


TASK [install ceph use ice_setup] *********************************************
changed: [admin]

TASK [install ceph] ***********************************************************
changed: [admin]

TASK [modify ceph.conf1] ******************************************************
changed: [admin]

TASK [modify ceph.conf2] ******************************************************
changed: [admin]

TASK [install mon repo service] ***********************************************
changed: [admin]

TASK [modify osd repo] ********************************************************
changed: [admin]

TASK [install ceph mon service] ***********************************************
changed: [admin]

TASK [install ceph mon service] ***********************************************
changed: [admin]

PLAY RECAP ********************************************************************
admin                      : ok=24    changed=15    unreachable=0    failed=0
mon                        : ok=7     changed=2     unreachable=0    failed=0
osd1                       : ok=7     changed=2     unreachable=0    failed=0
osd2                       : ok=7     changed=2     unreachable=0    failed=0
repo                       : ok=7     changed=2     unreachable=0    failed=0
```

our tools : user interactive

If you want to automate Cluster press 5 :

```
root@ansible:~          ×   root@dyaa-HP-EliteBook-8460p: /home/dyaa   ×   dyaa@dyaa-HP-EliteBook-8460p: ~

[root@ansible ~]# sh /etc/ansible/script.sh


                Integrated infrastructure using ansible conf management
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                        =========================================


choose no of product you want to deploy: 
```

Results : Cluster automation

Conclusion :

We build data center to achieve :

1 • High availability by using pacemaker cluster .

2 • Data reliable by using Ceph storage .

3 • Low cost by using less physical servers by using OpenStack cloud computing .

4 • High security by using firewall and make secure design .

5 • Faster deployment by using Ansible configuration management .

Future work :

- Add new features to the script such as **Graphical User Interface** (GUI) .
- Add new features such as centralized management using **Red Hat satellite** (RHS) .
- Marketing our project over our website and Competitions .
- Publish our code for any user to be able to modify or add new features .