# UBUNTUNET Connect 2017

# A Virtual Computing Lab for the Kenyan Research Community

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*Transforming education through ICT*

# Agenda

➢KENET Virtual Lab Background and History.

➢Overview of the Architecture.

➢Physical Hardware.

➢Software/Application modules.

➢Storage Architecture.

➢Security Enforcement.

➢Automation.

➢Use cases.

➢Metrics

➢Conclusion.

# Background

➢The design and deployment commenced on November 2016.

➢Need for a more powerful and robust virtual environment for KENET training boot camps and technical services test bed.

➢KENET's approach
  ➢Deploy a cluster model for seamless management and computing resources management.

# Background cont..

➢A cloud solution with a self provisioning feature for ease of use and user management.
➢A secure solution to curb possible abuse scenarios.
➢24/7 access to the lab.

# Overview of the architecture
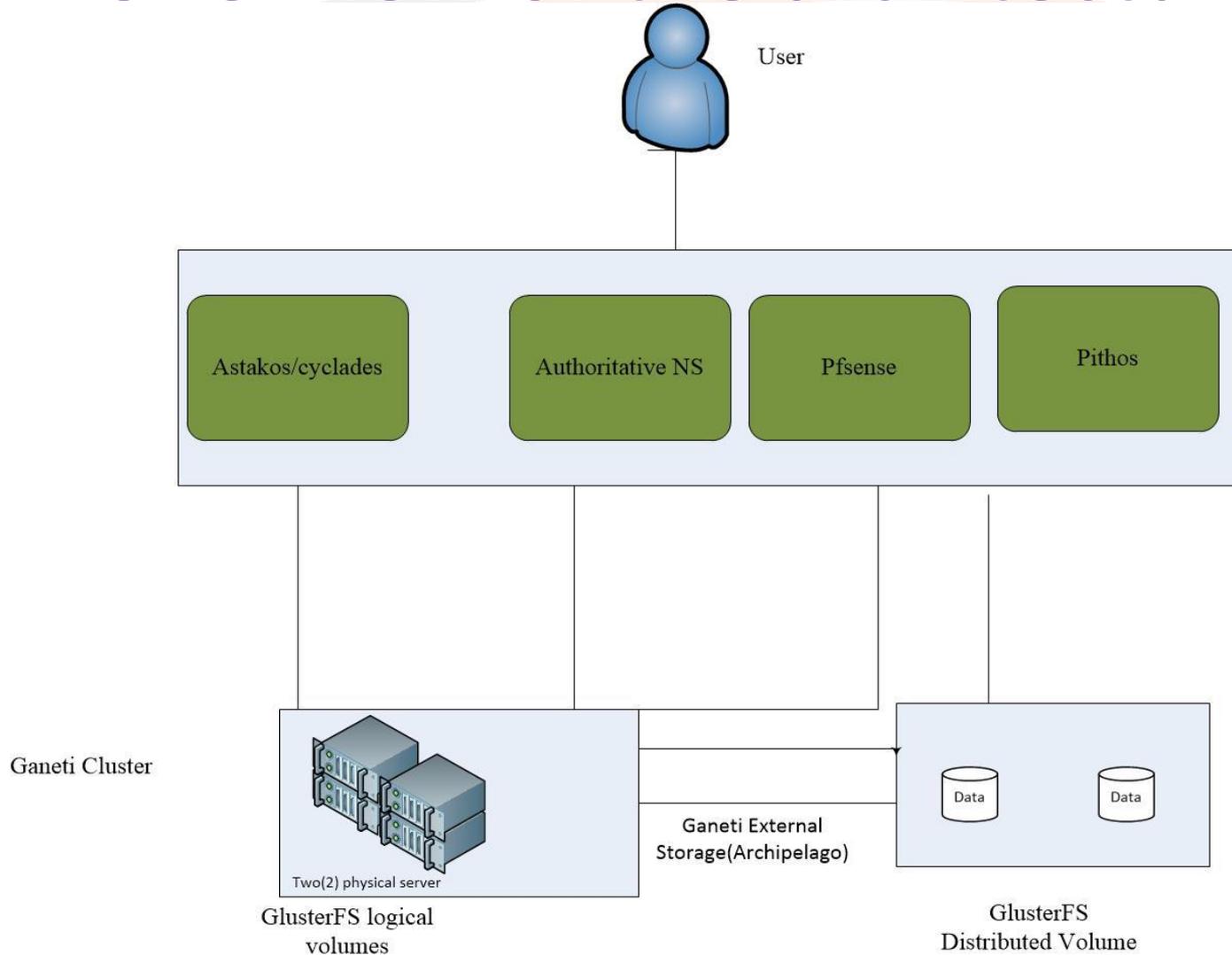
# Physical Hardware

➢2 physical Servers –Dell R530.

➢RAM – 192GB(Combined Ram 384GB)

➢Disk storage – 50TB each

➢CPU – 40 CPU's each(Intel(R) Xeon(R) CPU E5-2660 v3 @ 2.60GHz).

# Software/Application modules

1)Ganeti

➢Ganeti is a virtual machine cluster management tool built on top KVM or Xen.

➢The cluster has two physical nodes running on KVM hypervisor.

➢KENET has an existing cloud setup running on Ganeti ( Main reason we preferred building the virtual lab using a Ganeti cluster setup model ).

# Software/Application modules cont..

1)Synnefo

➢Synnefo is a complete open source IaaS cloud stack written in Python.

➢Provides Compute, Network, Image, Volume and Object Storage services.

➢Synnefo manages multiple Ganeti clusters at the backend(Currently managing one cluster).

# Synnefo components

1) Astakos (Identity management)

➤ Identity management component which provides a common user base to the rest of Synnefo. Astakos handles users, resource management and quotas enforcement.

➤ Supports local, LDAP, shibboleth, Google and twitter authentication.

➤ Provides a registration feature where users register using their valid email addresses.

# Synnefo components

2) Pithos (Object storage service)

➢Pithos is the Object/File Storage component of Synnefo.

➢ Users upload files on Pithos using either the Web UI, the command-line client or native syncing clients e.g. agykyra.

➢You can also share files with other users with specific read/write permissions.

# Synnefo components

3)   Cyclades (Compute/Network/Image/Volume Service)

➢Cyclades is the Synnefo component that implements the Compute, Network, Image and Volume services.

➢Users have full control over their virtual machines: create, start, shutdown, reboot, and destroy the VMs.

➢Provision custom virtual machines (VMs) resources using the defined  templates (flavours).

➢Dual IPv4/IPv6 connectivity for each VM, easy.

➢Construct arbitrary L2 topologies

# External Storage architecture(Glusterfs)

➢GlusterFS is an open source, distributed file system.

➢Can scale up to petabytes of storage.

➢KENET virtual computing lab adopts glusterfs storage by combining two volumes of 25TB each from the two ganeti node and presents a total of 50TB.

➢The storage is then presented to all the ganeti nodes, Cyclades, and pithos virtual machine as an NFS mount.

# Authoritative Name servers

➢Unique registered domain that has three (3) authoritative name servers running as virtual machines on the Ganeti cluster.

➢Once a user deploys a virtual machine a domain name that follows a defined sequence is generated and real time updates to the authoritative name servers executed through custom script leveraging on dynamic dns functionality.

# Pfsense Firewall gateway

➢Opensource firewall.

➢The firewall runs as a virtual machine in the Ganeti cluster.

➢All the virtual machines are assigned public IP address that are routed through the pfsense firewall for filtering purposes.

➢Choke point for all virtual machine traffic, filtering and shaping for both incoming and outgoing traffic.

➢The pfsense also provides caching dns service to all the virtual machines.

# Automation

➢Customized python scripts interacting with the Cyclades snf-manage interface.

➢Enforcing VM duration policies.

➢All images registered with a time tag describing the associated VM life time e.g. (1 week, 1 month).

➢Static time definitions in seconds that compares to the VM time delta.

➢If the time since creation is greater than the image defined duration the VM is deleted.

# Automation cont..

➤ Real time NS records update python script leveraging on dynamic dns functionality (Cron Job).

➤ DNS garbage collector python script which deletes obsolete A records.

# Use cases

➤ Computing environment for Training boot camps and online courses e.g. ISOC Unix online course.

➤ Sandbox environment for testing services before migrating to production environment.

➤ Creation of custom images running specific tools and applications for learning purposes e.g. MATLAB

# Usage Metrics

➢Twelve(12) different operating systems available.

➢300 Virtual machines spawned since deployment.

➢Twenty(20) participants successfully completed the ISOC online Unix course using the platform.

➢Seventy(70) concurrent running Virtual machines have been tested so far.

# Rolling out the service to the community

➢Awareness workshops (faculty workshop held on September 2017).

➢Engage member's through relevant mailing lists.

➢Web conference webinar (frequent webinar for university technical staff undertaking ISOC NetOps course).

# Conclusions

➢Adoption of robust opensource Virtual computing lab model by other NRENs.

➢Active community working around Ganeti and synnefo providing adequate support and improvement of these components.

➢More automated functionalities to be implemented as need arises.

# Questions

# Thank You

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