INDIAN INSTITUTE OF INFORMATION TECHNOLOGY

Dharwad
ज्ञानेन विकासः

IaaS and Hybrid Eucalyptus-AmazonEC2

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The Alan Turing Institute

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Indian Institute of Information Technology, Design and Manufacturing, Jabalpur

IaaS and Hybrid Cloud

A. **Orchestration and Virtualization**
   - **Orchestration**
   - **Virtual machines**
     - **Type-1, native or bare-metal hypervisors**
     - **Type-2 or hosted hypervisors**
     - **Both Type 1 and Type 2**

B. Hybrid Eucalyptus and Amazon-EC2

Infrastructure as a Service (IaaS)

- IaaS are online services
  - provide high-level APIs used to dereference (or abstract) various low-level details of infrastructure like
    - physical computing resources,
    - location,
    - data partitioning,
    - scaling,
    - security,
    - backup
- IaaS deals with Cloud Orchestration and Virtualization

https://en.wikipedia.org/wiki/Infrastructure_as_a_service

Examples of IaaS Clouds

IaaS involves the use of a Cloud Orchestration and Virtualization Technologies like

- Eucalyptus
  - Hypervisors (KVM, Xen, VMware)
  - Private and
  - Hybrid cloud computing with Amazon Elastic Compute Cloud (EC2)
- Open Stack,
  - OpenStack-native REST API and
  - Hybrid cloud computing with CloudFormation-compatible Query API
- Apache Cloudstack
  - virtualization, such as KVM, VMware vSphere, including ESXi and vCenter, and XenServer/XCP.
- OpenNebula.
  - Hypervisors (VMware vCenter, KVM, LXD and AWS Firecracker)

https://en.wikipedia.org/wiki/Infrastructure_as_a_service

Examples of IaaS Clouds

- Amazon Web Services
- AppScale
- Box
- Bluemix
- CloudBolt
- Cloud Foundry
- Cocaine (PaaS)
- Creatio
- EngineYard
- GreenQloud
- IBM Cloud
- iland
- Joyent
- Linode
- Lunacloud
- Microsoft Azure
- Mirantis
- Netlify
- Nimbula
- Nimbus
- OpenIO
- OpenNebula
- OpenStack
- Oracle Cloud
- OrionVM
- Rackspace Cloud
- Safe Swiss Cloud
- SoftLayer
- Zadara Storage
- libvirt
- libguestfs
- OVirt
- Virtual Machine Manager
- Wakame-vdc
- Virtual Private Cloud OnDemand

https://en.wikipedia.org/wiki/Infrastructure_as_a_service

Orchestration

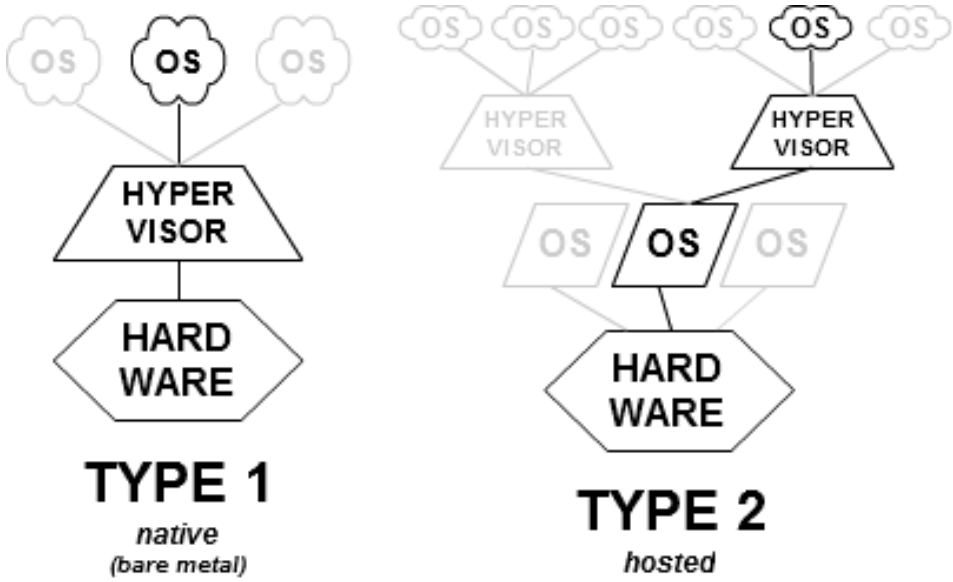
- Automated configuration, coordination, and management of
  - service-oriented architecture,
  - virtualization,
  - provisioning,
  - converged infrastructure and
  - dynamic datacenter.
- To meet requirements of Applications, Data, and Infrastructure.
- Difference Between
  - Workflows Automation are processed and completed as processes within a single domain for automation purposes.
  - Orchestration includes a workflow and provides a directed action towards larger goals and objectives.

https://en.wikipedia.org/wiki/Orchestration_(computing)

Virtualization

Hypervisor: Runs one or more virtual machines is called a *host machine*, and each virtual machine is called a *guest machine*.

- Type-1, native or bare-metal hypervisors
- Type-2 or hosted hypervisors:



https://en.wikipedia.org/wiki/Hypervisor

Type-1, native or bare-metal hypervisors:

run directly on the host's hardware to control the hardware and to manage guest operating systems.

- SIMMON and IBM's CP-40 (first Hypervisors late 1960s)
- Microsoft Hyper-V and Xbox One system software
- VMware ESXi (formerly ESX),
- Nutanix AHV,
- XCP-ng,
- Oracle VM Server for SPARC and x86,
- POWER Hypervisor, and
- Xen.

https://en.wikipedia.org/wiki/Hypervisor

Type-2 or hosted hypervisors:

run on a conventional Operating-system of a host machine like a process as a guest machine

- Oracle VirtualBox,
- Parallels Desktop for Mac,
- QEMU,
- VirtualBox,
- VMware Player and
- VMware Workstation

https://en.wikipedia.org/wiki/Hypervisor

Both Type 1 and Type 2

are kernel modules

- Linux's KVM (Kernel-based Virtual Machine)
- FreeBSD's bhyve (Berkeley Software Distribution BSD)

https://en.wikipedia.org/wiki/Hypervisor

IaaS and Hybrid Cloud

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B. Hybrid Eucalyptus and Amazon-EC2

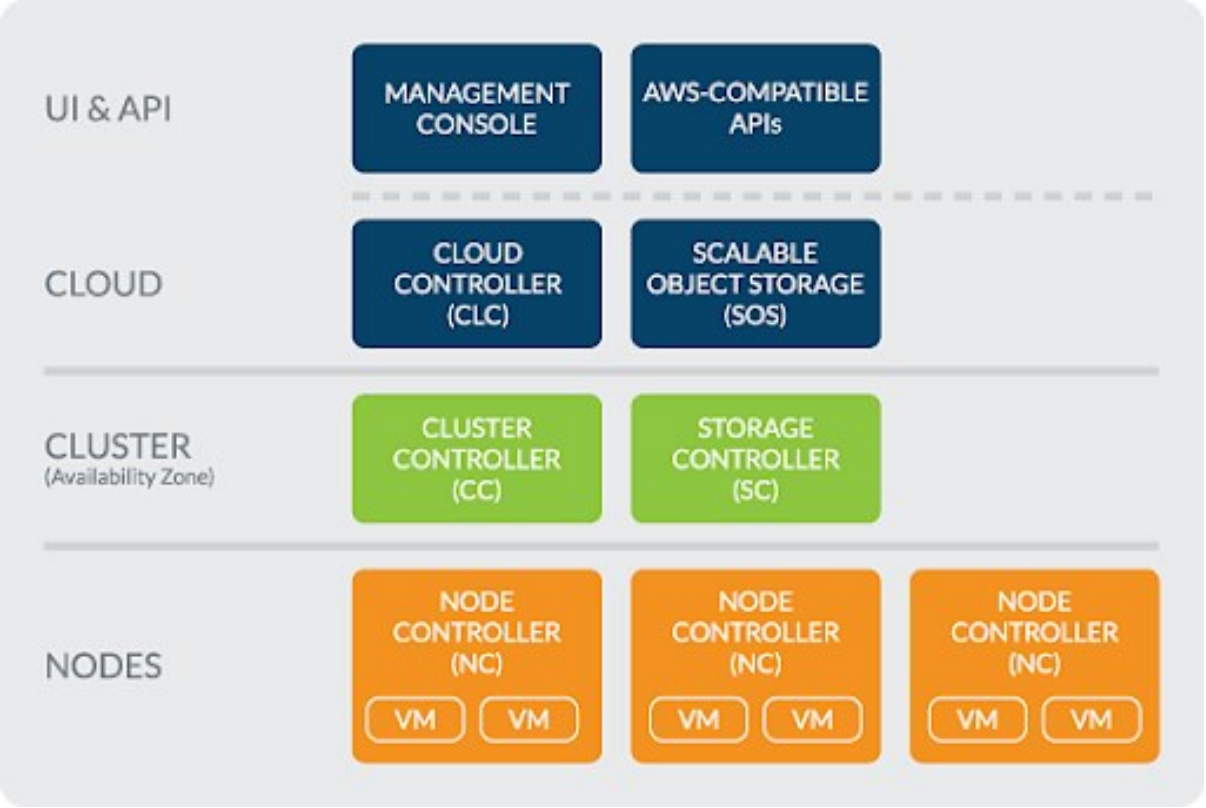
Eucalyptus Cloud

- Eucalyptus **cloud** is highly scalable.
- **Eucalyptus Cloud Components:** The six components are grouped into three separate levels.
- Cloud Level: The Cloud level of the computing architecture is comprised of only two components and while used by many users, the transactions at each component are typically small.
  - Cloud Controller (CLC)
  - Scalable Object Storage (SOS)
- Cluster Level (i.e., Availability Zone)
  - Cluster Controller (CC)
  - Storage Controller (SC)
  - VMware Broker (Optional)
- Node Level: The Node level may have many components, but each component only supports a few users, even though the transactions are larger. This **distributed cloud architecture** is flexible enough to support businesses of any size.
  - Node Controller (NC)

https://www.eucalyptus.com/eucalyptus-cloud/iaas/architecture

Web Service Components in Eucalyptus

Cloud Controller (CLC): For administrators, developers, project managers, and end-users to manage virtualized resources (servers, network, and storage), and high-level scheduling decisions.



https://docs.eucalyptus.cloud/eucalyptus/4.4.5/admin-guide/system_concepts.html

Web Service Components in Eucalyptus

- **Cluster Controller (CC)** executes on a machine that has network connectivity with machines running the Node Controller (NC) and the CLC. It schedules and manages VM network.
- **Storage Controller (SC)** interface with various storage systems (NFS, iSCSI, SAN devices, etc.).
- **Walrus** allows users to store persistent data, organized as buckets and objects for Virtual Machine (VM) images and user data.
- **Node Controller (NC)** executes on any machine that hosts VM instances, and controls VM activities: execution, inspection, and termination.

https://docs.eucalyptus.cloud/eucalyptus/4.4.5/admin-guide/system_concepts.html

Amazon EC2, EBS, and S3

Amazon Elastic Compute Cloud (EC2):

- Pay per usage: rent Virtual Machines (VMs) to run applications
- Elastic: scalable deployment of applications by web services
- Amazon Machine Image (AMI) instance contains desired software
- Create, launch, and terminate instances,
- Amazon switched its own retail website platform to EC2 and AWS

Amazon Elastic Block Store (EBS) provides raw block-level storage that can be attached to Amazon EC2 instances used by Amazon Relational Database Service (RDS).

Amazon Simple Storage Service (S3) provides scalable storage infrastructure through a web service interface.

https://en.wikipedia.org/wiki/Amazon_Elastic_Compute_Cloud
https://en.wikipedia.org/wiki/Amazon_S3
https://en.wikipedia.org/wiki/Amazon_Elastic_Block_Store

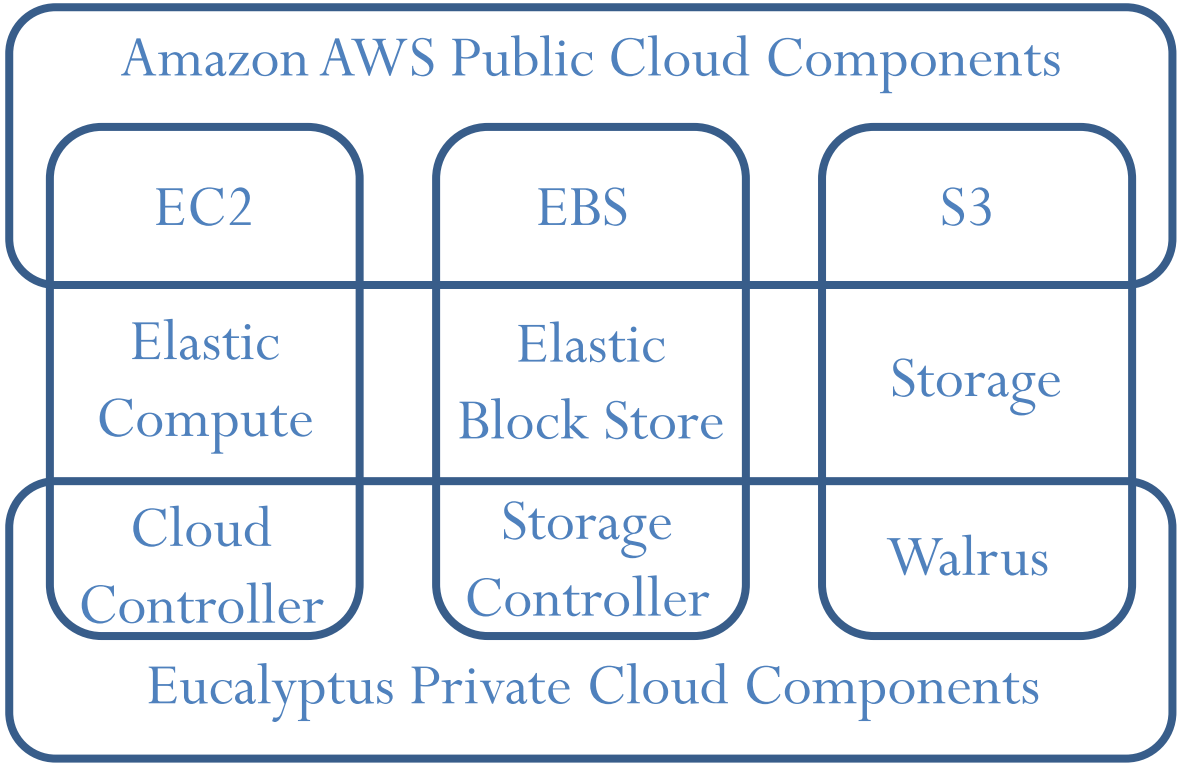
AWS-Eucalyptus Compatibility

Feature: AWS →→ Eucalyptus

Elastic: EC2 → → CC

Elastic Block Store: EBS → → Storage Controller

Storage: S3 → → Walrus



https://docs.eucalyptus.cloud/eucalyptus/4.4.5/admin-guide/system_concepts.html

AWS-Eucalyptus Compatibility

- AWS-Compatible API is implemented on top of Eucalyptus.
- AWS Tools — how to configure and use with Eucalyptus,
  - https://github.com/eucalyptus/eucalyptus/wiki/AWS-Tools
- Consumer use or reuse AWS-Compatible tools, images, and scripts.
- Tools in the eucalyptus cloud ecosystem can communicate with AWS.

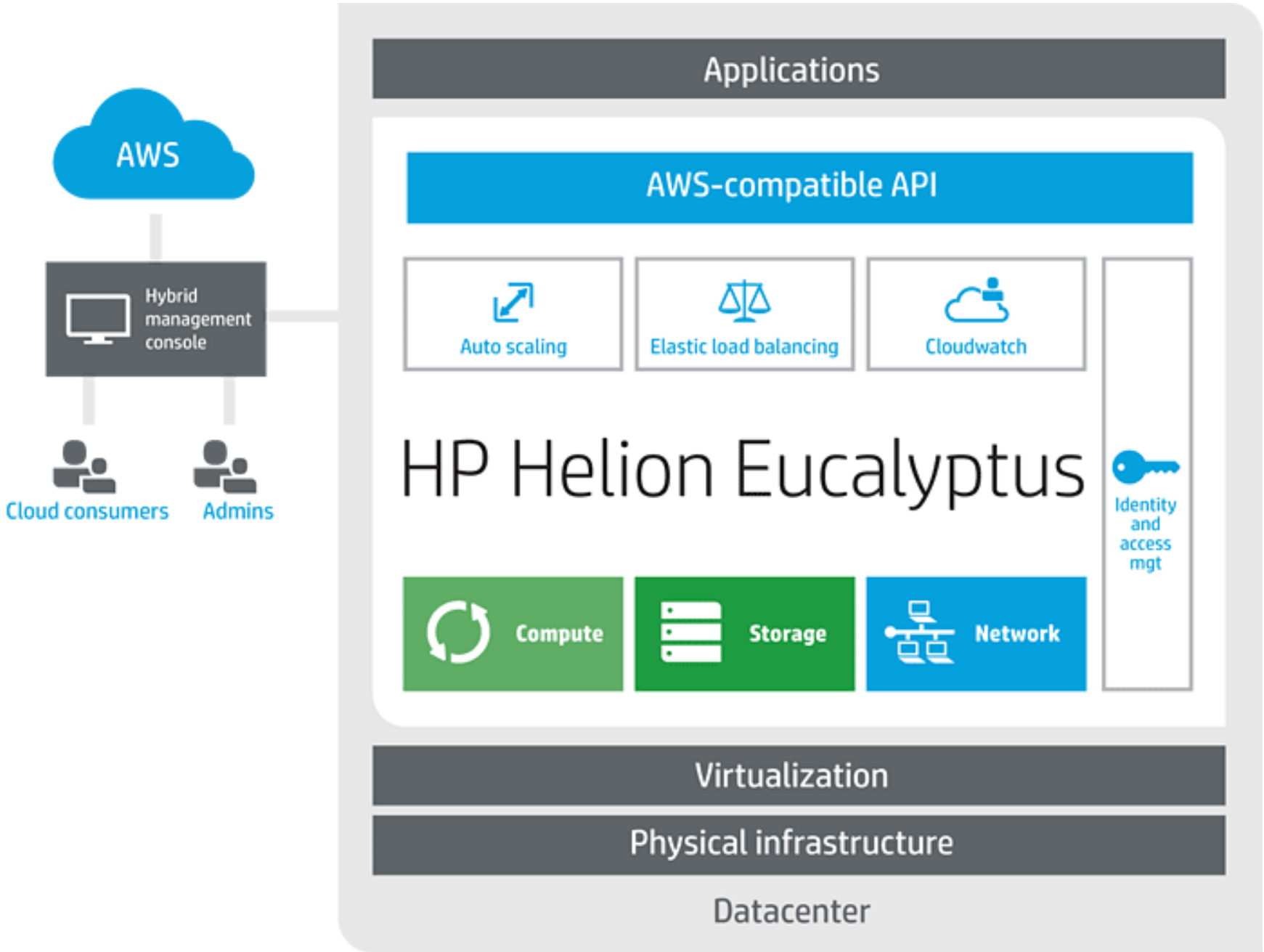
https://github.com/eucalyptus/eucalyptus/wiki

AWS-Eucalyptus Compatibility

Add instances and virtual machines as traffic demands increases

- *Autoscaling* – to scale Eucalyptus cloud resources up or down
  - to maintain performance and meet SLAs.
  - Amazon EC2-compatible APIs and tools.
- *Elastic Load Balancing* –Distributes incoming application traffic and service calls across multiple Eucalyptus workload instances.
- *CloudWatch* – Resources and Applications Monitoring tool like Amazon CloudWatch
  - The collection of metrics, set alarms, and identify trends
  - take action to ensure applications continue to run smoothly.

https://en.wikipedia.org/wiki/Eucalyptus_(software)



https://en.wikipedia.org/wiki/Eucalyptus_(software)

תודה רבה
Hebrew

Ευχαριστώ
Greek

Danke
German

Спасибо
Russian

धन्यवादः
Sanskrit

Merci
French

ধন্যবাদ
Bangla

நன்றி
Tamil

شكراً
Arabic

ಧನ್ಯವಾದಗಳು
Kannada

Thank You
English

നന്ദി
Malayalam

Grazie
Italian

多謝
Traditional Chinese

ధన్యవాదాలు
Telugu

આભાર
Gujarati

ਧੰਨਵਾਦ
Punjabi

धन्यवाद
Hindi & Marathi

Gracias
Spanish

多谢
Simplified Chinese

https://sites.google.com/site/animeshchaturvedi07

Obrigado
Portuguese

ありがとうございました
Japanese

ขอบคุณ
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감사합니다
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