Eucalyptus Architecture (as of 1.6.2)

Eucalyptus software components are organized into **three tiers**:

Top-level components provide entry points into the system over standard protocols. *Cloud Controller* performs cloud-wide management (of users, keys, VM instances, disk images, clusters, etc.) as well as resource provisioning and scheduling.

Cluster-level components mediate between the top-level components and the nodes of a particular cluster, which may be behind a two-way firewall. *Cluster controller*, in particular, abstracts resources of a cluster so as to simplify cloud-wide scheduling.

Each cluster node designated for hosting VM instances runs a *node controller*, which manages the instances running on it as well as their storage.

The components communicate using either SOAP with WS-security or REST with signatures.

The user can interact with the system through several **interfaces**:

The *Web interface* enables account management (user sign-up, downloading of user credentials, account configuration) and supports basic queries (e.g., listing of images and instances).

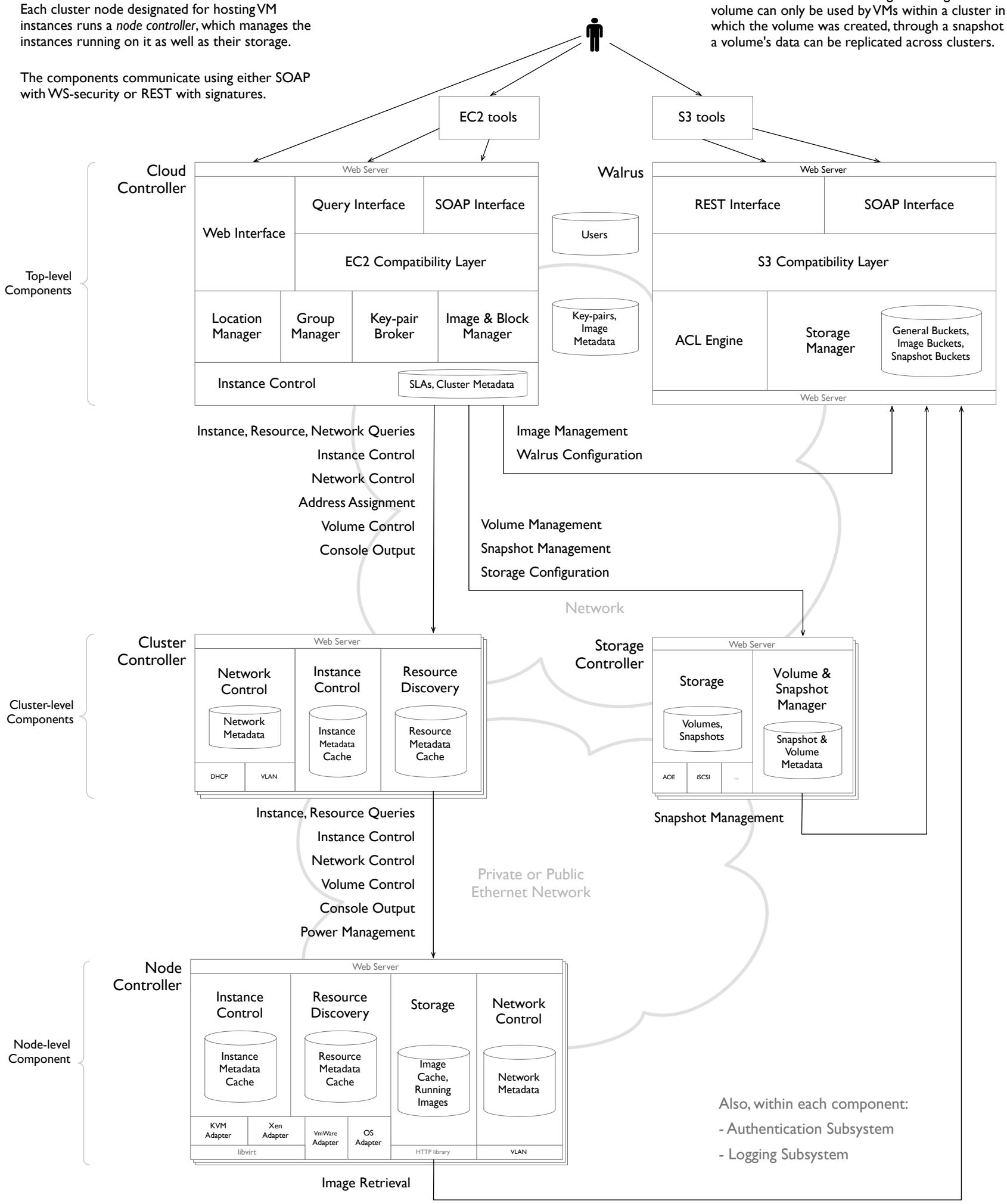
HTTP-based *SOAP* and *Query/REST*-style interfaces enable full control of execution, network, and storage, either through command-line tools or programming libraries.

Administrators use the same interfaces with additional powers.

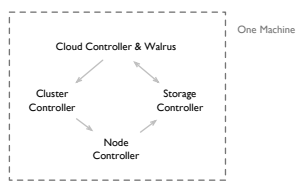
Two types of **storage** services are available to Eucalyptus users:

Key-value storage, where a key is associated with a "bucket" of data (a flat collection of files), is implemented by a top-level component named *Walrus*, which is interface compatible with Amazon's S3 service. The buckets are accessible both from outside and from within the cloud, from any cluster. Disk images uploaded into Walrus can be used for booting VM instances.

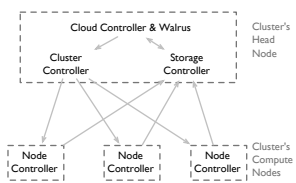
Block storage - akin to a traditional disk partition - is implemented by a cluster-level component named *Storage Controller*. The controller stores *volumes* of disk blocks, which can be captured at any point in time as *snapshots*. Snapshots are forwarded to Walrus for storage. Although a volume can only be used by VMs within a cluster in which the volume was created, through a snapshot a volume's data can be replicated across clusters.



"Laptop" deployment



One-cluster deployment



Multi-cluster deployment