Eucalyptus is a Linux-based software architecture that allows organizations to create and manage scalable private and hybrid clouds within their existing IT infrastructure. It allows users to utilize their own hardware, storage, and network resources using a self-service interface on an as-needed basis. Eucalyptus was originally developed by Eucalyptus Systems and stands for Elastic Utility Computing Architecture for Linking Your Programs To Useful Systems.

Eucalyptus serves two primary purposes: Infrastructure as a Service (IaaS) and compatibility with Amazon's EC2 Cloud and S3. As an IaaS platform, Eucalyptus enables organizations to deploy virtual machines, storage systems, and networks, allowing for efficient execution of applications and services. It is also designed to be compatible with Amazon Web Services, specifically EC2 and S3, allowing users to set up their own private or hybrid clouds using Eucalyptus.

The Eucalyptus architecture consists of several components. The Cluster Controller (CC) manages one or more High Performance Computing (HPC) clusters, and the Cloud Controller (LC) acts as the front end for the entire ecosystem, interacting with client tools and other components. The Node Controller (NC) manages the life cycle of instances running on each node, while the Walrus Storage Controller (WS3) serves as a simple file storage system. The Storage Controller (SC) allows for the creation of snapshots of volumes for persistent block storage.

Eucalyptus uses various terminologies, including images, instances, networking, access control, elastic block storage, and auto-scaling and load adjusting. Images refer to fixed collections of software modules and configuration information, which become Eucalyptus machine images (EMIs) when uploaded to the cloud. Instances are the execution of these images, and networking can be divided into static mode, system mode, and managed mode. Access control is used to limit client access, and elastic block storage provides block-level storage volumes. Auto-scaling and load adjusting allow for the creation or destruction of instances or services based on requirements.

Eucalyptus offers different operation modes, including managed mode, managed (No VLAN) node, system mode, and static mode. Managed mode provides network isolation through VLANs and assigns two IP addresses to each virtual machine. Managed (No VLAN) node does not provide network isolation, and system mode is the simplest mode with minimal features. Static mode is similar to system mode but allows for more control over IP address assignment.

The advantages of using Eucalyptus cloud include the ability to benefit from both the private and public cloud, compatibility with Amazon machine images, a similar API to Amazon Web Services, integration with DevOps tools like Chef and Puppet, the potential to be an alternative to OpenStack and CloudStack, the ability to create hybrid clouds, and the ability to extend services to other organizations by delivering their own data centers into a private cloud.