Accelerate Cloud Initiatives with Cisco UCS and Ubuntu OpenStack

What You Will Learn
This document is intended for IT decision makers. It describes how the combination of Cisco UCS® configurations running Ubuntu OpenStack can be used to quickly and efficiently deploy massively scalable cloud infrastructure. Topics discussed include the business and technical value of the solutions and how the solutions can be used to support computation-optimized, storage-intensive, and mixed workload environments.
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Companies around the world are turning to the Cisco Unified Computing System™ (Cisco UCS™), Ubuntu OpenStack, and Inktank Ceph Enterprise to accelerate the process of building, scaling, and maintaining cloud infrastructure.

### The Need for Cloud Computing

Today’s hypercompetitive business climate creates challenges for IT departments. Management’s demands to deliver more business applications and services on a moment’s notice creates pressure on IT staff, who already struggle with data center infrastructure that fails to keep pace and pushes the boundaries of budget constraints. Cloud computing is rapidly transforming businesses and organizations by providing access to flexible, agile, and cost-effective IT infrastructure. These elastic capabilities help accelerate the delivery of infrastructure, applications, and services with the right quality of service (QoS) to increase revenue.

### Cisco UCS and Ubuntu OpenStack: Your Fast Path to the Cloud

OpenStack is an open source cloud-building software developed by a community of open source developers and participating organizations. The project seeks to address all types of clouds by delivering solutions that are simple to implement, are massively scalable, and have a comprehensive set of features. OpenStack software consists of a series of interrelated projects that control pools of computing, storage, and networking resources throughout a data center. All these resources are managed through a dashboard, which gives administrators control while empowering users to provision resources through a web interface or an API (Figure 1).
Community innovation is creating new opportunities for cloud computing. Many organizations are turning to OpenStack technology to create massively scalable cloud infrastructure. Canonical, the commercial sponsor of Ubuntu, a Linux distribution, was the first company to commercially distribute and support OpenStack. Ubuntu remains the reference operating system for the project. Canonical provides mission-critical and enterprise support to OpenStack users around the world through Ubuntu Advantage. Since 2011, Canonical has included the latest version of OpenStack in every Ubuntu release, and makes it available for the latest long-term support (LTS) with five years of support for both Ubuntu and the respective OpenStack distribution (starting with Icehouse on Ubuntu 14.04). After you’ve deployed Ubuntu OpenStack, you can move to newer OpenStack versions, available in Canonical’s unique Ubuntu Cloud Archive, and benefit from all their new features quickly and easily.

Ubuntu OpenStack provides a comprehensive set of open APIs that span computing, storage, network, and scalability services along with an open, plug-in architecture for customization and extension. Although cloud-enabled applications developed to documented API standards can run on organization premises, in public clouds, or on a combination of the two (hybrid cloud) for greater flexibility and business agility, having the right infrastructure underneath is important.

Cisco UCS: The Right Foundation for Ubuntu OpenStack Deployments

Virtualized infrastructure is the foundation of most cloud environments. Cisco UCS leads the way in virtual infrastructure innovation, integrating industry-standard, x86-architecture Intel® Xeon® processor-based servers with networking and storage access into a unified system (Figure 2). Server, networking, storage, and intelligent management resources work together in a self-aware and self-integrating system. This design delivers greater computing density and network simplicity in a smaller footprint that reduces operating costs.

Transcending the boundaries of traditional blade chassis and racks, Cisco UCS creates a physically distributed, centrally managed system that delivers scalability

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OpenStack Components

- **Nova** for physical and virtual resource provisioning
- **Swift and Cinder** for block-based storage management and placement
- **Neutron** for network device configuration and support for secure network containers
- **Keystone** for identity management
- **Glance** for management of virtual machine images

![OpenStack Architectural Components](image)
Cisco UCS

Cisco UCS delivers a radical simplification of traditional architecture with the first self-aware, self-integrating, converged system that automates system configuration in a reproducible, scalable manner.

- More than 90 world records on critical benchmarks
- The benefits of centralized computing, through a single point of management, delivered to massive scale-out cloud applications
- Self-aware and self-integrating system
- Automatic server provisioning through association of models with system resources
- Standards-based, high-bandwidth, low-latency, lossless Ethernet network

Figure 2. Cisco UCS Is a Single Unified System

and performance. A unified fabric supported by a single, distributed virtual switch interconnects all server resources. The system represents a radical simplification compared to traditional architecture, resulting in lower capital and operating costs.

Accelerate Your Journey to the Cloud with Cisco UCS and Ubuntu OpenStack

Cisco UCS technology has helped companies around the world change the fundamental nature and management of their virtual infrastructure. Now that same technology, available in preconfigured Cisco UCS Solution Accelerator Paks, can be combined with Ubuntu OpenStack to simplify the process of implementing and deploying cloud infrastructure that handles a wide range of workloads (Figure 3).

High-Density Configuration

Many popular business enterprise applications and high-performance computing applications require horizontally scalable cloud infrastructure. This configuration focuses on the capability to add servers as demand increases and allows the
solution to offer massive horizontal scalability without sacrificing networking and storage performance.

**Mixed-Workload Configuration**
The mixed-workload configuration is designed for cloud infrastructure that must support a wide variety of applications. Providing balanced computing, networking, and storage resources, this preconfigured solution can help solve some of the biggest performance and provisioning challenges companies face with application infrastructure.

**Storage-Intensive Configuration**
With big data initiatives on the rise, many enterprise applications spend much of their time interacting with underlying storage systems. Data-centric applications, such as databases and enterprise applications, require access to high-performance, massively scalable storage infrastructure.

**Massively Scalable Storage with Inktank Ceph**
Inktank Ceph Enterprise is an open source, massively scalable, software-defined storage system that runs on Cisco UCS attached to commodity storage systems. Inktank Ceph Enterprise allows you to access the storage through object, block, and file system modalities in a single, self-managing, self-healing platform designed with no single point of failure. The combination of Cisco UCS and the Inktank Ceph storage system is well suited for service providers and IT departments trying to increase efficiency and reduce costs.

Inktank Ceph Enterprise interfaces with all open source–based OpenStack releases through the APIs, especially the OpenStack Swift and Cinder storage components (Figure 4). Unlike every other storage solution for OpenStack, Inktank Ceph Enterprise uniquely combines file, object, and block interactions into one complete storage powerhouse for all your cloud needs. Inktank Ceph Enterprise is a total

![Figure 3. Cisco UCS Configurations for Cloud Infrastructure Deployments](image-url)
replacement for the OpenStack Swift component with distinctive features such as intelligent nodes and a revolutionary deterministic placement algorithm, along with a fully integrated network block device for OpenStack Cinder. This fully distributed storage cluster and block device decouples computing from storage in OpenStack and allows mobility of virtual machines across your entire cluster. The Inktank Ceph Enterprise block device provides copy-on-write cloning that enables you to quickly create a thousand virtual machines from a single master image, requiring only enough space to store their subsequent changes.

**The Cisco UCS, Ubuntu OpenStack, and Inktank Ceph Advantage**

The combination of Cisco UCS, Ubuntu OpenStack, and Inktank Ceph Enterprise provides an excellent platform for computation-optimized, mixed, or storage-centric applications that need to run in private, public, or hybrid cloud infrastructure.

**Open Architecture**

A market-leading, open alternative to expensive, proprietary environments, the simplified architecture of Cisco UCS running Ubuntu OpenStack and Inktank Ceph Enterprise delivers greater scalability, manageability, and performance at a significant cost savings compared to traditional systems, both in the data center and the cloud. Using industry-standard x86-architecture servers and open source software, the Cisco®, Canonical, and Inktank solution enables IT departments to deploy cloud infrastructure today without concern for the support challenges, often associated with open-source distributions, or hardware or software vendor lock-in.

**Accelerated Provisioning**

Cloud infrastructure must be able to flex on demand, to provide infrastructure to applications and services on a moment’s notice. Cisco UCS simplifies and accelerates cloud infrastructure deployment through automated configuration. The intelligent infrastructure abstracts server identity, personality, and I/O connectivity.
from the hardware, enabling these characteristics to be applied on demand. Every aspect of a server’s configuration, from firmware revisions and BIOS settings to network profiles, can be assigned through the system’s open, documented, standards-based XML API or Cisco UCS Manager GUI. Cisco service profile templates establish policy-based configuration for server, network, and storage resources and can be used to logically preconfigure these resources even before they are deployed in the cloud infrastructure.

One-touch provisioning of OpenStack technology is available for cloud environments on Cisco UCS running Ubuntu OpenStack. The Cisco OpenStack Installer handles the bootup of bare-metal systems and installs and configures the cloud software infrastructure (Figure 5):

- **Configures Cisco UCS Manager**: The Cisco UCS Manager software is configured with policies that enable the software to automatically discover chassis and servers and create and assign their service profiles.

- **Applies the configuration**: The installer begins the process by applying the Cisco UCS bare-metal configuration using the Python software development kit (SDK). Cisco UCS is preconfigured with pools of hostnames and IP addresses.

- **Starts the event listener**: The Cisco OpenStack Installer starts the event listener, which looks for changes to attached servers so they can be automatically provisioned with the appropriate service profiles.

- **Adds servers to Ubuntu OpenStack**: Servers are added to the application cluster following an event completion notice from Cisco UCS Manager. During this process, preexecution (PXE) boot devices are deployed, and the nodes are registered with the database component of Ubuntu OpenStack.

Figure 5. The Cisco UCS OpenStack Installer Provides One-Touch Provisioning
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- **Passes control to Ubuntu OpenStack:** After providing an inventory of nodes to the control nodes, the installer passes control of operations to the Ubuntu OpenStack software for virtual machine provisioning.

**Virtual Infrastructure Density**
Cisco UCS enables cloud infrastructure to meet ever-increasing guest operating system memory footprint demands on fewer physical servers. The system’s high-density, high-performance design increases consolidation ratios for 2-socket servers, saving the capital, operating, physical space, and licensing costs of running virtualization software. Cloud infrastructure can host applications using less-expensive servers without sacrificing performance. As a result, IT departments can put more virtual machines on each server, reducing physical server sprawl and breaking down management silos.

**Simplified Networking**
Addressing the increasing need for better design and control, Cisco UCS provides greater network density with less cabling and complexity. Cisco Unified Fabric integrates Cisco UCS servers with a single high-bandwidth, low-latency network that supports all system I/O. This fabric carries IP, storage, and management traffic over redundant 10 Gigabit Ethernet and Fibre Channel over Ethernet (FCoE) networks. This approach simplifies the architecture and reduces the number of I/O interfaces, cables, and access-layer switch ports required compared to the requirements for traditional cloud infrastructure deployments. This unification can reduce network complexity by up to a factor of three, and the system’s wire-once network infrastructure increases agility and accelerates deployment with zero-touch configuration.

All I/O traffic meets at a single specific and redundant point, at which it is efficiently and consistently managed, increasing network security, simplifying management, and reducing errors. This approach eliminates server and hypervisor-resident switching, condensing three network layers into one and reducing capital and operating costs. With the capability to interconnect physical servers and virtual machines as functional equivalents, the architecture delivers outstanding visibility and control that lets virtual networks be managed with the same level of control as physical networks.

**Cost-Effective Storage Scaling**
Cisco UCS enables Inktank Ceph Enterprise cloud storage to meet ever-increasing capacity demands with ease and efficiency. The use of high-density, high-performance Cisco UCS servers and commodity storage saves capital and physical space, and the self-managing capabilities of both greatly reduce operating costs. Cloud storage infrastructure can host Inktank Ceph using cost-effective Cisco UCS servers without sacrificing I/O performance. As a result, IT departments and service providers can put all their cloud data on this simplified, highly available storage infrastructure.

**Collaboration Leads to Innovation**
Deep collaboration enables Cisco and Canonical to deliver cloud infrastructure solutions that are rooted in technical innovation and market strength. Cisco has shaped the future of computing by developing technology that transforms the

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**Ubuntu OpenStack**
Ubuntu OpenStack is fully compatible and tested with many of the technologies that organizations already run, such as VMware vSphere, SolidFire storage, and Microsoft Windows, so you can connect to your infrastructure. Canonical offers a range of products and services to ease your Ubuntu OpenStack cloud journey, from everyday support to customized consulting for complex cloud deployments. The Ubuntu Advantage service package includes tiered support options for your cloud infrastructure, instances, and services, and access to Canonical Landscape, the world’s leading Ubuntu systems management tool.
way that people connect, communicate, and collaborate. Canonical, the world’s leading provider of OpenStack software, has joined forces with Cisco to offer a comprehensive and versatile cloud computing solution.

These powerful allies share a common vision to deliver a standards-based, cohesive, unified environment that easily scales to meet business needs while reducing total cost of ownership (TCO). Both companies actively participate in open and industry standards, including the OpenStack community, to help ensure that technology advancements align with customer priorities. With the combination of Cisco UCS and Ubuntu OpenStack, organizations can benefit from a complete architectural approach that supports data center modernization and delivers cloud infrastructure without the risk of vendor lock-in.

**Conclusion**

Ubuntu OpenStack provides a robust foundation for cloud-enabled applications. If your business has already deployed virtual infrastructure with Cisco UCS, adding Ubuntu OpenStack is the next step toward implementing cloud infrastructure. Similarly, if your IT department has adopted or is considering OpenStack technology, moving to Ubuntu OpenStack and Inktank Ceph Enterprise running on Cisco UCS offers the agility needed to stay ahead of the competition.

**For More Information**

- For more information about Cisco solutions for cloud computing, please visit [http://www.cisco.com/go/cloud](http://www.cisco.com/go/cloud).
- For more information about Cisco and OpenStack, please visit [http://www.cisco.com/go/openstack](http://www.cisco.com/go/openstack).
- For more information about Ubuntu OpenStack, please visit [http://www.ubuntu.com/cloud/ubuntu-openstack](http://www.ubuntu.com/cloud/ubuntu-openstack).