

Cisco Moves to Hybrid Cloud Model, With Open-Source Stack



Cisco IT Insights

Introduction

Cisco IT is moving to a hybrid cloud model. The journey started in 2011, when we built our private cloud. It's called CITEIS, for Cisco® IT Elastic Infrastructure Services. With CITEIS, employees can self-provision application infrastructure—compute, storage, and networking—in just 15 minutes. So far we have virtualized 92 percent of our application environment.

As scalable as CITEIS is, it's still a challenge to keep up with the huge increase in big data and mobile devices. That's why the hybrid model makes sense. It gives us the flexibility to host workloads either on CITEIS or service provider clouds, and even to move them back and forth. The decision to host a given workload outside our own data center depends on security requirements, SLAs for performance and availability, and costs.

Extending CITEIS to service provider clouds requires open standards. This article describes our new open-source cloud stack.

Challenge

Cisco IT has 30,000 application workloads. Some of these workloads must be hosted on our private cloud. Examples include HR applications containing personal information, customer lists, and applications requiring the highest availability.

We are comfortable moving certain other workloads to service provider clouds. An example is the training portal we provide for engineers studying for the CCIE exam. Availability is important, but a brief outage won't disrupt the business. And security is not critical because the content is public.

To move virtual machines between our private cloud and service provider clouds, we needed open standards throughout our private cloud stack.

When we first built CITEIS, we used the VMware stack, which has proprietary interfaces. Over time, we've automated more and more VMware activities, using Cisco Intelligent Automation for Cloud. VMware has been valuable for CITEIS. But we needed a different solution as we moved to a hybrid cloud because service providers prefer to use open-source reference standards.

Solution

We have begun shifting to open standards in our CITEIS stack, and currently use three open-source applications: OpenStack, OpenShift, and Ceph.

OpenStack: Allows Us to Move Workload Between Clouds

We use OpenStack to provide infrastructure as a service (IaaS). OpenStack Compute (code-named Nova) is our cloud computing fabric controller. OpenStack Neutron provides “networking as a service” between interfaces.

OpenStack uses open-source APIs, which service providers prefer. As a result, we can now dynamically provision compute, storage, and network resources on any host that uses OpenStack. The host can be in our private cloud or a service provider cloud. We can even split a single workload across CITEIS and service provider clouds.

Currently we are encouraging our developers to become familiar with OpenStack. If they have an application running on VMware, they can build a parallel OpenStack environment in about three minutes, with a few clicks. They do that in the CITEIS Express environment, which provides one to two virtual machines at no cost. After developers are confident that the application performs as expected with OpenStack, they move it to the CITEIS virtual data center environment for production. That, too, takes just a few clicks, because Cisco Intelligent Automation for Cloud orchestrates the process. Automation saves application developers from having to learn the OpenStack and VMware interfaces.

By December 2015, we expect to have moved approximately 8500 of 30,000 workloads to OpenStack—65 percent. The entire Cisco WebEx® environment is already on OpenStack. So is newsroom.cisco.com.

Cisco IT currently takes advantage of OpenStack and other lifecycle tools to dynamically allocate loads among our private clouds. These loads include our Texas Metro Virtual Data Center (MVDC), the Cisco data center in Research Triangle Park, North Carolina, and other data centers around the world. In the future, we will also add service provider clouds for burst capacity. The ability to move workload back to our private cloud when we have the capacity will lower cloud service provider fees for bandwidth and I/O operations per second.

OpenShift: Platform as a Service That Scales Automatically

OpenShift Origin is platform as a service (PaaS) that operates on top of OpenStack. Cisco IT is starting to use OpenShift in our PaaS platform, which developers use to build, test, deploy, and run applications in CITEIS. Developers provision platform services using a self-service site powered by Cisco Prime™ Service Catalog. They have a choice of development languages: Java, Ruby, Node.js, Python, PHP, or Perl. They also have a choice of data stores.

Approximately 90 percent of our application development is now done using OpenShift. Building a complete application-lifecycle environment—including source control management, continuous build, automated deploy, disposable infrastructure, and continuous test—takes less than one hour.

The major advantage of OpenShift is that it can dynamically scale virtual machines up or down based on workload. OpenShift calls this “scaling gears.” Automated scaling helps us provide a great user experience without requiring operations staff to manually increase the number of application instances. Say we’re building a new HR application. We can write a policy that tells the application to add virtual machines depending on how busy the application is. It releases the additional virtual machines when workload returns to normal.

Ceph: Makes Commodity Storage Available Enough for Archives

CITEIS provides enterprise storage platforms for our production applications. These platforms are hardened, redundant, and provide advanced features that increase storage efficiency.

Archival data storage, in contrast, does not necessarily require enterprise-class disks. Therefore, we are beginning to experiment with open-source storage operating systems to lower costs for archival data storage. Some teams are using Ceph, open-source software that makes it possible to use commodity disks with confidence. Ceph works around the fact that commodity disks fail more frequently than enterprise disks. It creates multiple copies of data, on different disks. If a disk fails, employees can still retrieve the data from one of the other disks hosting a copy of that data. The user experience is the same. Whenever a disk fails, Ceph immediately creates another copy of the data on another disk.

Approximately 1000 workloads are already on Ceph. About half of these workloads are for the CITEIS Express development environment, which provides 1-2 virtual machines at no cost. The remaining workloads are for engineering archival storage. Cisco engineers never discard revisions of their work, so storing the constantly growing archives on commodity disks lowers costs.

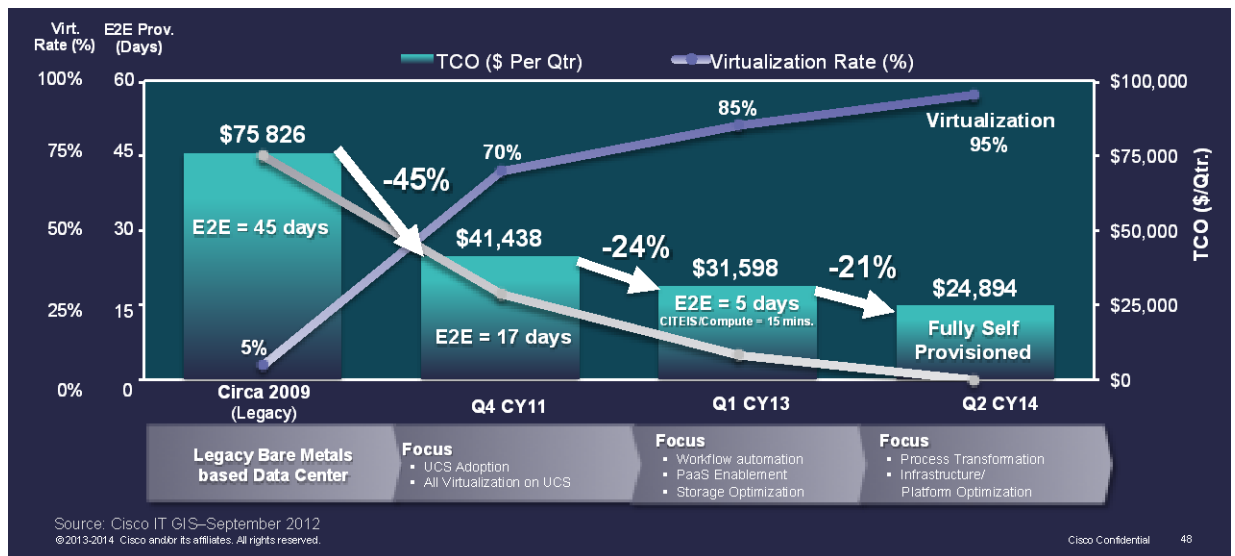
Results

Since we introduced the CITEIS private cloud, total cost of ownership for IT infrastructure has dropped by more than 66 percent (Figure 1). We expect that using open-source software will decrease costs by another 5 percent, a conservative estimate. Savings include:

- Approximately US\$1 million annually from reduced VMware licensing costs.
- Manpower savings, from reducing the time needed to introduce new IT services from six months to less than 30 days.
- At least several million in capital savings from using commodity disks with Ceph for appropriate workloads, such as archival storage. We'll realize these savings even if we replace only one-fourth of our current archival data storage. Since the proof of concept in August 2013, the Ceph environment has grown seven times larger.

We expect additional savings in the future, from lower cloud service provider fees. Currently we host certain non-critical applications, including the CCIE training portal, on service provider clouds. Using OpenStack, we have the option to move that workload over the network to CITEIS when capacity is available. This capability will lower cloud service provider fees for CPU and bandwidth usage.

Figure 1. Open Standards is the Latest Innovation to Decrease CITEIS TCO



Next Steps

We are developing automated processes to easily migrate workloads from VMware to OpenStack, using Puppet Open Source tools. In August 2014, we will start using the newest version of OpenStack, code-named Ice House.

For More Information

To read Cisco IT case studies about a variety of business solutions, visit Cisco on Cisco: Inside Cisco IT www.cisco.com/go/ciscoit.

Note

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