Alcatel-Lucent® Wireless Cloud Element, Powered by VMware

The network enables the cloud, and communications service providers run the networks. That's a very powerful combination. The Alcatel-Lucent® WCE solution, powered by VMware vSphere®, offers lower latency, better control of bandwidth, and the ability to provide a guaranteed quality of service for virtual RNCs. This enables service providers to adjust to rapid change.

— Adolfo Hernandez, President, of Alcatel-Lucent's Software, Services & Solutions Group

KEY HIGHLIGHTS

Challenge

To enable communication service providers to run the Alcatel-Lucent® Wireless Cloud Element (WCE) using a centrally-managed, cloud computing architecture.

Solution

Alcatel-Lucent® Wireless Cloud Element solution that is powered by the VMware® virtualization and cloud computing platform. For more information, contact an Alcatel-Lucent sales representative.

Highlights

- Provides a unified cloud architecture that enables computing resources and infrastructure on demand.
- Hosts network function types on a range of industry standard, high-volume servers, switches, and storage.
- Enables multiple, fully virtualized Radio Network Controllers (RNCs), and provides rapid scaling to quickly and efficiently support massive RNC operations.
- Reduces the total cost of ownership (TCO) with significant savings from reduced hardware and infrastructure.
- Increases the return on investment (ROI) due to operational efficiencies and increased flexibility though virtualization.
- As a foundation technology, VMware virtualization enables next gen solutions and network function virtualization.

Alcatel-Lucent® Wireless Cloud Element, Powered by VMware, Enables Flexible, Scalable, High Performance Virtual RNCs

"Alcatel-Lucent® is truly leading with innovation in the Radio Network Controller market. Their Wireless Cloud Element Radio Network Controller (WCE RNC) is available now and it offers true network function virtualization on VMware. The Alcatel-Lucent WCE RNC is a key industry differentiator that offers a virtualized user plane, as well as control plane, that is cloud ready."

Sanjay Katyal, VMware Vice President of the Global Strategic Alliances Organization

Alcatel-Lucent® wants to deliver a "carrier cloud" to communications service providers – One that brings the benefits of the cloud to service provider networks and business operations – using secure, reliable, high-performance communications networks. This includes a unified Wireless Cloud Element (WCE) that allows service providers to enable fully virtualized Radio Network Controllers (RNCs). This success story describes how Alcatel-Lucent developed their WCE solution, powered by the VMware vSphere®, and the excellent results they achieved in this effort.

Introduction

The mission of Alcatel-Lucent (http://www.alcatel-lucent.com/) is to realize the potential of a connected world. Alcatel-Lucent is at the forefront of global communications, providing products and innovations in IP and cloud networking, as well as ultra-broadband fixed and wireless access, to service providers and customers worldwide. Alcatel-Lucent is a recognized leader for innovation in making global communications more sustainable, affordable, and accessible. With a revenue of $14.45 billion in fiscal 2012, Alcatel-Lucent has over 72,000 employees worldwide.

Alcatel-Lucent Wireless Cloud Element

The public cloud model enables applications and data storage to be accessed on demand from data centers across the internet. However, some services require a level of quality and performance that the public cloud model is unable to provide.

The Alcatel-Lucent® Wireless Cloud Element (WCE) solution delivers a highly flexible, scalable, high performance, cost efficient unified cloud computing architecture.

Alcatel-Lucent® Wireless Cloud Element, Powered by VMware

"Network functions virtualization consolidates many network equipment types to industry standard high-volume servers, switches, and storage using virtualization. These network equipment types can be moved to, or instantiated in, various network locations, without the need to install new equipment. The benefits include reduced CAPEX and OPEX, reduced time-to-market and improved ROI."

— *See http://www.etsi.org/technologies-clusters/technologies/nfv*

PROFILE

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Global communications systems / services

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US Executive Offices
600-700 Mountain Avenue
Murray Hill, New Jersey, U.S.A.

Solution
Wireless Cloud Element (WCE)

VMWARE AT WORK

VMware vSphere 5.5 / ESXi 5.5
- VMware vSphere® 5.5 Enterprise Edition®
- ESXi® 5.5

VMware vCenter
- VMware® vCenter Server® 5.5

DEPLOYMENT ENVIRONMENT

Primary application
Wireless Cloud Element (WCE)

The Alcatel-Lucent WCE solution provides the same cloud architecture that enables a data center to deliver virtually unlimited computing resources. It uses virtualization to decouple the one-to-one relationship between the physical network element and network functions, where multiple virtual RNCs can share a single data center.

The WCE solution spans a wide variety of deployment models. These include single- or multi-technology (WCDMA/LTE) solutions, large configurations built by adding additional commodity hardware, and software deployment on top of an existing cloud. Virtualization of the controller applications and independence from the computing platform addresses the entire market, while controlling verification costs.

The WCE solution delivers lower latency, better control of bandwidth, and the ability to provide a guaranteed quality of service (QoS). By doing so, the WCE solution allows service providers to meet the stringent performance demands of consumers and enterprises. The virtualization of network functions consolidates many network equipment types into a range of industry standard, high-volume servers, switches, and storage.

In addition, the WCE solution implements network functions in software to enable them to be moved or instantiated at various network locations, without requiring new equipment to be installed, and it maintains code compatibility.

Alcatel-Lucent WCE, Powered by VMware

Alcatel-Lucent chose VMware®, a key partner, to power WCE's high performance cloud architecture using its VMware vSphere 5.5 virtualization and cloud computing platform, with the ESXi 5.5 hypervisor. Alcatel-Lucent picked VMware vSphere because it provides an optimal platform that is flexible, scalable, highly available, and secure. VMware vSphere is also best suited to increase the consolidation of network equipment types to industry standard, high volume servers and infrastructure.

Optimal, Agile, Secure Cloud Architecture

For the WCE solution, VMware's cloud architecture provides for:

- **Multi-tenancy**: W-CDMA and LTE applications share physical resources. Multi-tenancy provides for secure segregation of resources and data through instance isolation and VMware resource pools.

- **Horizontal scalability**: Flexible configurations control the number of virtual machines used within a single tenant, taking advantage of large-scale computing resources.

- **Elastic capacity**: Provides the elasticity needed to extend and increase resources on demand, and to rapidly expand resource capabilities.

- **Power control**: As capacity breathes throughout the day, hardware using operating system power control, can cycle up and down, thereby increasing energy efficiency.

- **Geographic redundancy**: Ensures that a fault in one location does not disable the entire system, providing for reliability and availability.

- **Zero-downtime maintenance**: Using the inherent capabilities of virtualization, shadow tenants can be created for fast enablement and rapid deployment of new software or fixes during maintenance and upgrade procedures.

For the WCE solution, VMware vSphere 5.5 virtualization abstracts the physical hardware from the x86 Linux Redhat Enterprise guest operating systems. VMware vSphere provides for rapid integration, rapid allocation of computing resources, and rapid access to resources on demand. It facilitates operational efficiencies, including faster response times, immediate access to datacenter resources, extensive security to safeguard virtual servers, personal information, and data, and simplified management.

The WCE solution uses VMware vSphere® Distributed Resource Scheduler™ (DRS) in semi-automatic mode for virtual machine assignment. DRS anti-affinity rules provide for high availability, and to ensure that active and standby virtual machines do not reside on the same physical host.

VMware vSphere® High Availability® (HA) ensures that applications run reliably in the event of an unplanned hardware failure. When a host failure occurs and the active virtual machine fails, VMware HA auto-restarts the active virtual machine on the first available host in the VMware cluster to standby mode, making the system redundant and highly available again in a few minutes.

VMware® vCenter Server® provides for centralized monitoring, including aggregating all resident virtual machines and hosts. vCenter uses patented analytics and an integrated approach to dramatically simplify management tasks, such as to provide sufficient CPU and memory resources. vCenter proactively ensures health, efficiency, and compliance with IT policies.

Scalable, High Performance, Reliable Virtual Infrastructure

The Alcatel-Lucent WCE solution uses VMware infrastructure to enable virtual networking elements that are similar to those used in the physical environment, but with some advanced capabilities.

The VMware infrastructure used in the WCE solution includes:

- **Virtual network interface card (vNIC)**. Provides support for at least 8 VMXNET3 vNICs per virtual machine. Each virtual machine has its own vNIC.

- **Virtual Distributed Switch (vDS)**. A vSphere vDS acts as a single virtual switch across all associated hosts that is managed by administrators, thereby ensuring a consistent network configuration.

- **VLANs**. Provides support to enable virtual networks to join physical VLANs or to support QoS policies. VLAN tagging on the source or destination IP is based on the vNICs.

- **LBT load balancing**. LBT is an advanced vDS feature that provides for dynamic balancing of traffic between port groups.

- **Central Management**. Network policies on vDS get pushed down to the host automatically when the host gets added to the distributed switch.

The Results – WCE with Virtual RNC = Carrier Grade Performance

Alcatel-Lucent and VMware worked together to test the WCE solution running the virtual RNC. The initial results have been very encouraging. They demonstrate that the Alcatel-Lucent WCE running on the VMware platform delivers excellent carrier-grade performance. All of the testing results passed well within acceptable limits. The key results include:

- Significantly, the virtual RNC surpassed the capacity that any Alcatel-Lucent RNC has ever achieved. The load level greatly exceeded the capacity of the traffic generators and the test infrastructure had to be expanded in order to continue scaling.

- The virtual RNC was able to immediately take advantage of the next generation of hardware, leverage the virtualization benefits provided by the VMware ESXi hypervisor, and realize a greater than 50 percent capacity gain with no software changes.

- Regression tests on all of the standard traffic profiles show excellent key performance indicators (KPIs) at rates that greatly exceeded the capabilities of the currently deployed RNC.

- The virtual RNC was able to span multiple shelves of computing equipment on the first attempt, demonstrating the strength of virtualization to decouple applications from the physical environment.

- The multi-shelf test also demonstrated the decoupling of the virtualization environment itself, as two versions of the VMware ESXi hypervisor where used simultaneously. This type of situation may be present during an infrastructure upgrade.

- The shadow upgrade procedure has proven to be remarkably powerful for the virtual RNC. Packet data connections were demonstrated to automatically reconnect after the upgrade. The cell site activation occurred so rapidly after shadow upgrade that the data users were unaware of the magnitude of change in the network.

- Elastic growth was tested within a virtual RNC under load by adding UE Management Unit nodes (UMUs) to a virtual RNC already running twice the maximum capacity of the 9370 RNC. Traffic was immediately dispatched to the UMUs. Within 20 to 30 seconds, the traffic in the virtual RNC was evenly distributed across all of the UMUs.

The test results show that the Alcatel-Lucent WCE solution offers one of the most advanced systems available. Alcatel-Lucent WCE provides for the dynamic allocation of resources using an elastic, highly available cloud architecture, powered by VMware. It also delivers best-in-class performance when running on Linux-based software