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Virtualizing UC: Reaping the Benefits and Understanding the Issues for Real-Time Communications

Sponsored by: Avaya

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October 2009

PROBLEM DEFINITION

Unified communications (UC) as an industry term is an apt description of the convergence in communications applications that will be deployed in the enterprise as new investments are made. UC is enabled through IP communications and therefore resides on (or has dedicated hooks into) the datacenter. The effort to centralize UC is happening alongside an increasingly common datacenter technique known as virtualization. Virtualization is essentially a piece of software that when installed on a server, tricks each application — which in the past may have required its own dedicated server(s) — into thinking it's running on its own hardware. In reality, each application is running on a partitioned portion of the server (known as a virtual machine or VM).

Because most workloads today run at low utilization rates on servers (10% is normal), server consolidation has been a primary driver for virtualization adoption. By grouping several workloads on a single server, each on its own VM, higher, more efficient utilization can be achieved while still allocating sufficient resources to execute each workload. Virtualization can improve utilization rates to as high as 60–70%. Theoretically these rates could be improved upon even further if companies were willing to go beyond a 6–7:1 application-to-server ratio. Today most companies remain cautious, however.

From a management perspective, virtualization allows IT staffs to manage server-based applications independent of the hardware on which they reside. Management benefits include application provisioning, maintenance, high-availability guarantees, and disaster recovery. Virtualization also allows physical servers to run multiple operating systems (OS).

Virtualization and UC application migration onto the datacenter are happening side by side and create an interesting and challenging dilemma. Virtualization today is primarily being applied to traditional server-based applications with flexible minimum response times, low utilization rates, and low input/output requirements (e.g., CPU and database access). The requirements are quite the opposite for real-time communications where application delay is not permitted. A disadvantage of virtualization has been that application efficiencies (e.g., application request to databases or CPU resources) can be lost as the VM accesses the hardware indirectly. The question becomes: Can virtualization support real-time communications?

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DATACENTER BARRIERS TO UC ADOPTION

UC solutions are designed to provide a way of delivering, managing, and supporting all of the various types of communications that an organization or individual requires in both horizontal and vertical industry business processes. Certain levels of centralization, the use of common standards, and the appropriate middleware are required to make the necessary integrations between communications functions, applications, and business processes.

A major barrier to UC adoption today is that communications applications — IP or non-IP — remain stovepiped and run on closed dedicated appliances. UC components such as VoIP, for instance, are present in nearly every organization, but IDC estimates that at best just 5–10% of IP PBX shipments are purely software based. The remaining 90–95% are dedicated IP PBX appliances.

Another barrier to datacenter-driven UC adoption is that unlike traditional datacenter applications such as ERP, CRM and even email, real-time applications such as VoIP and IP video have unique workload and utilization requirements. This is the fundamental difference between real-time communications and traditional datacenter applications. If an email is received seconds after it should have been delivered, it does not impact the value of the application. Conversely, if VoIP calls have delay and jitter, resulting in unacceptable voice quality, the entire value of voice as an application can be lost. Of course, potential disruptions such as VoIP call jitter depend as much on the enterprise's network infrastructure outside the datacenter as they depend on the servers on which these applications run.

Whether IP or not, communications functions by and large remain in the hands of telecommunications directors and managers and not IT. As organizations migrate their infrastructures to take advantage of the promises of UC, the lines between these roles will increasingly blur. For now, however, there are still political, budgetary, and ownership obstacles to overcome. What IT and telecom managers both desire is simpler and centralized methods of managing user and equipment configurations as well as the ability to deliver applications to their organizations from a central location. Decentralized architectures and disparate management consoles not only are difficult to manage but also are essentially the antithesis of UC. UC benefits IT as much as it benefits end users.

Virtualization gives IT staffs a single view of their server assets and allows them to provision each application independent of the hardware it resides on. Each application can thereby be optimized based on its workload requirements, made highly available, and delivered to any user connected to the virtualized server infrastructure.

Though UC applications have historically been decentralized, they will increasingly move into the datacenter for UC enablement, simplicity of management, communications-enabled business process (CEBP) enablement, and virtualization benefits. Businesses could benefit if UC vendors decoupled real-time applications from server hardware using virtualization while maintaining the unique requirements and minimum response time requirements for real-time communications.

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BENEFITS OF VIRTUALIZATION

Prior to virtualization developments for the x86 server market, virtualization was a technology available only to the largest customers that owned IBM mainframe systems. Today, virtualization has expanded and is widely understood and used in the volume server market. IDC estimates that about 15% of all servers have been virtualized.

Server consolidation was the first large-scale workload to be adopted by customers, though secondary and tertiary benefits began to emerge in attractiveness and practicality for customers, including availability, reliability, ability to have an effective and consumable disaster recovery plan, and more.

Cost savings. Server consolidation naturally leads to cost savings, but these savings come in many forms (see Table 1). Beyond downsizing the number of physical servers on site, power and cooling costs also drop in proportion to the number of servers cut. IDC survey data indicates that companies that have adopted virtualization for data applications have saved upwards of 23% over one-year periods in hardware savings, real estate, and power and cooling upon virtualizing their infrastructure.

TABLE 1

Cutting Costs via Server Consolidation

Category	Without Virtualization	With Virtualization
Hardware consolidation	1:1 (application:server)	6–7:1 (application:server)
Hardware utilization	10%	60–70%
Power costs (25 servers)*	$4,500/year	$2,025/year
Cooling costs (25 servers)*	$3,750/year	$1,690/year

* IDC estimates

Source: IDC, 2009

High availability. Virtualization technology allows for the provisioning of VMs across the network (to another physical server or to a SAN) to address scenarios for planned and unplanned downtime, such as when a physical server is being repaired or upgraded or when a hardware failure occurs. For planned downtime, the VMs are proactively moved to alternate servers for continued processing (often using live migration of running VMs) while the originating physical server is repaired or upgraded. For an unplanned hardware failure, VMs shared on a SAN can be restarted on another server with only minimal downtime.

Hardware abstraction. This includes use of virtualization to abstract the OS from the hardware for flexibility reasons, but not for consolidation (only one VM per physical server). It may be used for mission-critical, performance-sensitive applications (e.g., real-time communications) where possible resource contention is not desired, but IT desires the flexibility gained by implementing a common installation framework and a common approach for managing, maintaining, and updating software applications.

Test and development. Virtualization can greatly increase the speed and robustness of test and development environments. Fast provisioning from premade, clean templates quickly reproduces the desired operating environments. Snapshotting, rollback, and replay capabilities allow developers to exactly reproduce, repeat, and debug testing procedures. The ability to integrate, test, and develop customized UC applications benefits greatly from this aspect of virtualization.

Dynamic resource scheduling. This is the automatic and real-time rebalancing of workloads to ensure service levels. Advanced virtualization management software has a catalog of available hardware resources and receives an ongoing feed of performance data from VMs. If a workload is experiencing a load spike, the resource scheduling software can use the live migration feature of the hypervisor to move a running VM without interruption to a server with more available resources or spin up additional instances to assist with the load.

Tiering. This includes using multiple hypervisors and different feature levels (high availability, etc.) to create multiple execution tiers with different service levels, functionality, and costs. In a UC instance, a real-time communications function such as a voice call would require higher service levels than a non-real-time application such as voicemail when bundled on a single server.

Management and deployment of applications. Virtualization allows for simpler and rapid deployment of applications from centralized management consoles. Rather than having to install an application on each physical server, IT departments can flexibly and quickly deploy applications to any of their certified virtualized servers — wherever they may be — via the virtualization platform.

IMPLEMENTING SOLUTIONS

In the current economic situation, companies are assessing if their UC plans are strategic to their overall corporate priorities, how they can leverage what they already have, and what incremental steps they can take in the meantime to continue forward progress, but at a decreased cost. A business case for unified communications has to include a mix of IT and business benefits. Forward-looking IT staffs are looking at the savings that many UC applications and architectures can provide. Flexible UC architecture can be a strategic asset to the business.

From a performance standpoint, applications that have high utilization and high I/O requirements have been the poorest candidates for virtualization. Underlying UC technologies such as VoIP are unique in the fact that they require minimum response times in order for sessions to go on smoothly. VoIP would require handling multiple streams of I/O simultaneously with a minimum latency requirement. Virtualizing real-time applications, such as VoIP, removes some of the features and benefits of

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virtualization due to their unique workload attributes. For example, live migration would almost certainly interrupt and drop calls, which would preclude the use of some availability and resource optimization features.

Buyers interested in virtualizing UC applications must understand these differences between running real-time applications in a completely open environment mixed with non-real-time applications on the same server versus traditional dedicated appliances.

The traditional appliance model for communications was tightly linked to proprietary hardware that was prepackaged and preconfigured yet did not coincide with datacenter requirements. Neither telecommunications nor IT professionals at enterprises required knowledge of the unique requirements of running real-time communications applications in the datacenter.

UC vendors concerned about maintaining a high-quality experience are balancing the virtualization benefits without compromising any of the reliability and high quality of the end-user experience. For this reason, buyers should pursue a thoughtful approach, one that exists somewhere in between implementing the real-time applications on dedicated appliances and a general-purpose datacenter host pool of servers and applications.

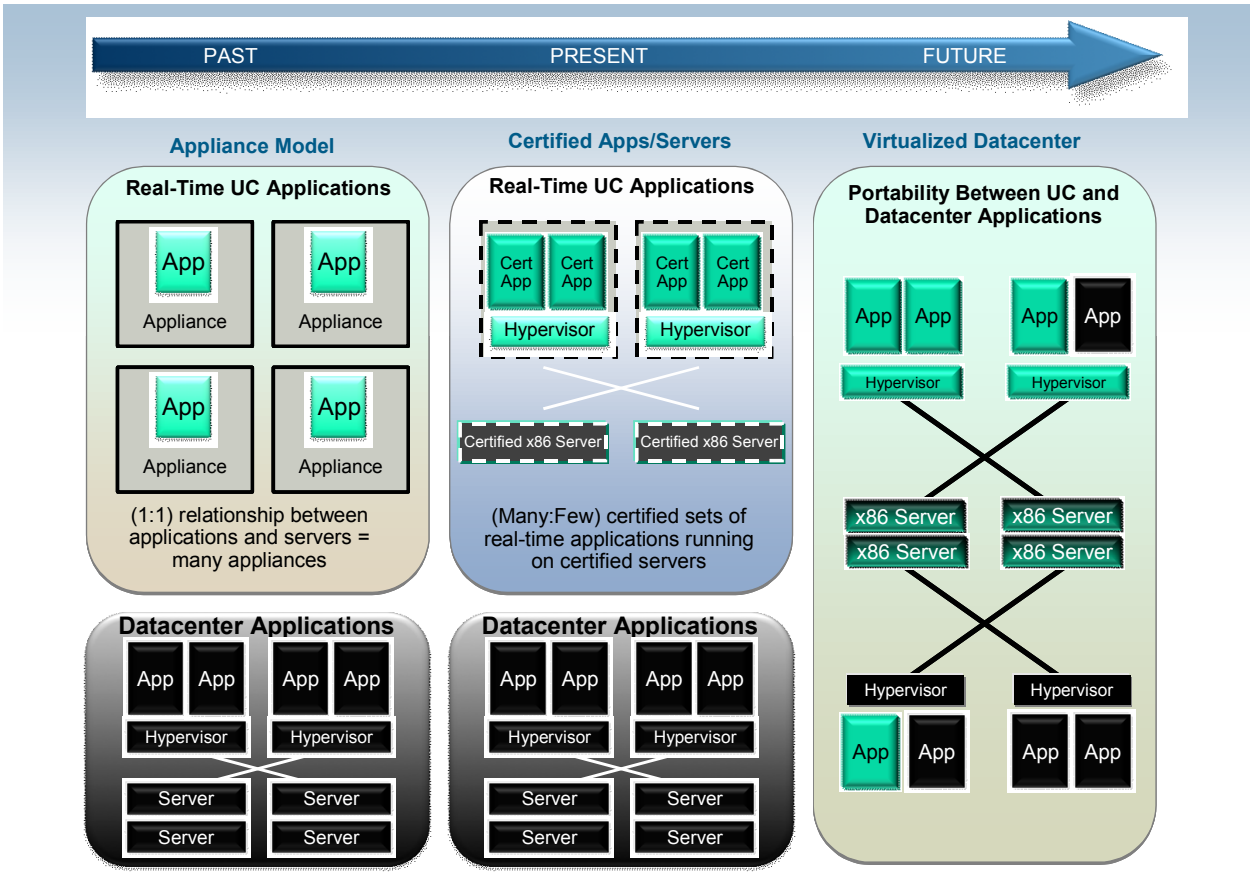
AVAYA: EXAMPLE OF A BALANCED APPROACH

The newly developed Avaya Aura™ System Platform technology leverages standard virtualization software to run multiple certified UC applications on certified x86 servers. The technology adheres to the Distributed Management Task Force Inc.'s (DMTF) Open Virtualization Format (OVF). OVF is an open, secure, portable, efficient, and extensible format for the packaging and distribution of software to be run in virtual machines. Avaya Aura System Platform is designed to give customers many of the benefits of virtualization without compromising performance.

Avaya evaluated the prospect of provisioning applications into generic virtualization environments in which real-time and non-real-time applications run concurrently on a single server. The company determined that stringent qualifications for servers eliminated many of the variables and intangibles that come with an "anything goes" approach. Therefore, Avaya Aura System Platform adheres to the certified UC concept shown in Figure 1.

FIGURE 1

The Virtualization Continuum for Unified Communications



Source: IDC, 2009

Avaya's goal was to package a solution set that leverages the many cost-cutting and efficiency gains virtualization provides without compromising delivery. Avaya has time-tested experience delivering reliable real-time communications functionality and understands the complexities of ensuring required QoS levels. The company made the calculated decision to customize the solution for certified applications on certified off-the-shelf x86 servers to guarantee high performance.

An Avaya Aura System Platform implementation immediately provides the benefits of cost savings through server consolidation, high availability, and hardware abstraction from the OS. Additionally, the benefits of test and development, dynamic resource scheduling, tiering, and management and deployment of applications can be achieved within a certified UC server and application pool. Upgrades and updates are simplified by simply updating the virtual machine image instead of having to deal with independent applications.

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One application template that Avaya has deployed to a virtual machine is specifically tailored to midsize enterprises and consists of five applications. The Avaya Aura System Platform aggregates Avaya Aura Communication Manager (supporting voice, video, and call center ACD), messaging server, media services, SIP support, and application enablement and utilities (serviceability, management, DHCP/HTTPS) on a single server. The solution supports up to 2,400 users and up to 250 locations, and installation can be completed in about one hour. The midsize solution was built to provide organizations with fewer resources and less capital than large enterprises a means to flexibly and easily deploy a scalable UC solution at an affordable price point.

A high-availability option is available when customers replicate the VM on an alternate Avaya-certified server. Overall, the solution consolidates four servers and physical gateways into a single server while simplifying installation, upgrades, and maintenance.

Avaya Aura System Platform technology gives developers the flexibility and test and development environments to deploy UC without disrupting other applications. The platform currently supports Avaya UC applications. It also allows for customized application development using Avaya APIs.

AVAYA: FUTURE OFFERINGS

Organizations looking to deploy new IP communications infrastructure are taking a close look at how that infrastructure will enable new communications applications in both the near term and the long term. Avaya will continue to evaluate and engineer Avaya Aura System Platform toward the goal of supporting application portability within a generic datacenter environment without compromising real-time UC QoS.

The common system architecture of the Avaya Aura System Platform ensures customers that their current and future UC deployments on the platform can all be managed inside a singular framework with a common look and feel. This is perhaps the most flexible and management-friendly aspect of the solution because it gives customers investment protection for future Avaya UC purchases and allows IT administrators to have an aggregated view of their UC ecosystem.

In building the Avaya Aura System Platform on industry-standard virtualization and OVF standards in recognition of the virtualization continuum for UC shown in Figure 1, Avaya sought to give customers a future path toward flexible and interchangeable data applications and UC applications.

Avaya expects customers to desire increased server and third-party application integration flexibility and interoperability. The company intends to open Avaya Aura System Platform to other standard x86-based servers and third-party applications in the future with a qualification process.

SUMMARY AND CONCLUSION

Because VoIP and other real-time communications technologies are resource intensive and response time sensitive, consolidation with other applications on a physical server is risky. Avaya purposefully engineered its approach to virtualization to leverage some of the benefits of the technology but to specifically avoid critical failures to real-time applications relative to application availability, end-user experience, and QoS.

As real-time communications applications migrate to the datacenter, virtualization technology will improve to support these unique requirements. Buyers looking to virtualize their UC environments will have to evaluate certified server approaches such as the Avaya Aura System Platform that provide immediate benefits while simultaneously putting customers on a path toward a portable approach.

The virtualization continuum for UC discussed throughout this document is a visual display of the current state and capabilities of off-the-shelf x86 servers, UC datacenter-based applications, and virtualization technology. Avaya applied this knowledge to UC virtualization on the Avaya Aura System Platform solution to help enterprises achieve UC deployments inside the datacenter.

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