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Virtual Appliances Are Coming

by James Staten

for IT Infrastructure & Operations Professionals



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New Standard Should Ease Application Deployments

by James Staten

with Galen Schreck and Ben Echols

EXECUTIVE SUMMARY

A new virtualization specification, the Open Virtualization Format (OVF), was ratified this month, and lays the foundation for a fundamental change in how enterprises deploy and manage software. It allows ISVs to deliver applications that can be installed with a single click, even applications that span multiple separate server installs and have complex configurations. This development has ramifications on how users recover applications, clone golden images, and ensure license compliance. OVF can be a sea change for IT but will require wide adoption by ISVs, toolkits aimed at enterprise administrators (not just ISVs), and a big push by customers. Several ISVs are promoting this appliance delivery methodology, including Oracle and SAP. Will you? And should you?

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Forrester interviewed 15 vendor and user companies, including Citrix Systems; County of Maui, Hawaii; Fortisphere; GSD&M Idea City; IBM; Microsoft; Novell; Oracle; RedHat; rPath; ShuffleMaster; T2 Systems; VMware; and two additional enterprises that asked not to be named.

Related Research Documents

["Ten Common Questions About x86 Server Virtualization"](#)

June 17, 2008

["What Applications Are Enterprises Virtualizing?"](#)

March 6, 2008

["The Case For Virtual Appliances"](#)

November 6, 2007

EVEN IN A VIRTUAL ENVIRONMENT, APPLICATION DEPLOYMENT CAN BE A ROYAL PAIN

Deploying complex enterprise applications can mean an agonizing exercise of numerous installers, configuration troubleshooting, and multiple restarts. Your selection of operating system, middleware, and hardware (or virtual hardware) spells the difference between a good deployment and one with performance or stability problems. Once you get to a known good configuration, it's fairly easy to lock it down using a virtual machine (VM) template, but how do you ensure it stays in that known good state? And few virtualization management tools let you store a template of an application that spans multiple VMs. And why are you going through all this pain for a commercial application? Shouldn't that be the software vendor's job? Sheesh!

Well, there may finally be a simpler way, thanks to the OVF that the Distributed Management Task Force (DMTF) ratified this month. This XML-based descriptor specification lets independent software vendors (ISVs) and you create virtual appliances for one-click, known good configuration deployment.

Enterprise Standards Often Conflict With ISV Guidelines

It's partly our own fault, the infrastructure and operations professionals, that application deployment is such a challenge. Each enterprise sets its own hardware, operating system, and middleware standards to maximize operational efficiency across applications and get the best price. Thus I&O pros have to live with our own decisions that conflict with what the ISV specifies as the optimal configuration of its application. These tradeoffs most often are:

- **You want standard OS loads, ISVs want something different.** I&O pros tend to take a long time to ratify a new version or patch level of an operating system while they ensure the version doesn't compromise the availability or manageability of their infrastructure or open up vulnerabilities or inspection gaps. While an ISV may give the stamp of approval to a new OS for its program, that may not be true for the whole portfolio.
- **Middleware standard eases management too.** Middleware adds another dimension to every operating system we support but proliferate far more easily. The net result is hundreds of app servers, Web servers, message buses, queues, and other elements that have to be managed.
- **Management tools are always playing catchup.** Whether element managers, monitors, security tools, or automation engines, your systems management tools of choice have the unenviable task of having to support everything in your data center. Enterprises often will delay the upgrade of a standard element until BMC Performance Manager supports it, for example.

The ISVs Are Often To Blame, Too

The days of the single, monolithic executable are history.

- **Large enterprise applications are moving to a service-oriented architecture model.** This helps create a modular environment that fits more needs and adapts to different business

processes. Whether you're using a true Web services model or simply wiring together several executables, the installation process isn't as simple as one click any more. For example, how many DVDs do you have to install to get the IBM WebSphere Commerce suite up and running these days? And which ones are you supposed to install, anyway?

- **ISVs don't always support *your* configuration.** ISVs would incur prohibitive costs if they attempted to support every variation of deployment that is possible with their software. As a result, they prioritize the most common configurations and those that support their strategic partnerships and directions. If your configuration standards fall outside of these parameters, you're either out of luck or will be adding yet another configuration variant into your catalog.

Virtualization Eases This Pain . . . To A Degree

Prior to virtualization, testing numerous OS and software configurations meant multiple bare-metal installations and teardowns of physical servers (often more than one) as I&O professionals pounded their way through to a known good configuration. Now you can speed up this process significantly. Virtualization lets you:

- **Freeze a good configuration in a template.** When building an installation, you can now start from a clean OS, OS plus middleware, or higher level applications stored in a virtual machine template. You can clone this template easily, as many times as necessary, as you test the next element of an installation. Plus this configuration is almost completely portable. Even if you have multiple server vendors and hardware configurations, you don't need to create and test multiple variants.
- **Pack multiple VMs on less hardware.** You can test an installation as a collection of VMs all running on the same physical server, even if you will deploy it differently once the known good configuration is set. This eases the test lab burden and cost significantly while going through this process.
- **Test element changes without having to rebuild the whole server.** And once the known good configuration is finished, you can simply clone its template, swap out a single element in the stack, and test this variation. Cloning lets you test multiple changes at the same time, with each change verified in isolation if needed.
- **Apply changes to production more easily.** Virtualization's live migration capabilities make it easy to apply updates and swap in changed elements. You can simply stop the older virtual machine and start up the new one. If a failure occurs with the new one, simply restart the old one.

But Multi-VM Installations Are Still Hard To Manage

While the same procedures can be applied when an application spans multiple VMs, it's much harder to manage with today's virtualization tools. The industry is addressing this, but isn't throwing more tools at a complex problem treating the symptom, not the disease?

THERE HAS TO BE A BETTER WAY: ENTER VIRTUAL APPLIANCES

This problem has been solved in one part of nearly every enterprise's infrastructure — the infrastructure appliances. These dedicated boxes provide email spam filtering, firewalls, load balancing, network attached storage, and other services, and are plug-and-play products that you set and forget. The box comes preconfigured with its OS, middleware, and applications. It calls home for updates and often ties into your management infrastructure. But you buy it because it's so simple to set up and manage. The same benefits can now be delivered without the separate or proprietary hardware.

Virtual appliances should have the following unique capabilities:

- **They install in one click.** Virtual appliances are essentially VM templates with a known good configuration chosen by the ISV that install as one unit and start with a simple activation.

“... most other solutions required us to load an OS, configure it, add some middleware, load some databases and config files, etc. Dozens of hours wasted trying to get these applications up and running.” (Coan Dillahunt, director of enterprise systems, GSD&M Idea City, who has deployed the Accellion Virtual Appliance large file transfer solution)

- **They require no special hardware.** The chief complaint from enterprise IT about hardware-based server appliances is the nonconformity of these offerings. Although IT administrators can monitor the appliances, they don't fit into major initiatives of consolidation, virtualization, and standardization. Virtual appliances are just another payload that runs on the approved standard hardware.

“[Virtual appliances] save us space, power, and cooling versus my physical appliances.” (David Judd, systems analyst, County of Maui, Hawaii, who has deployed the KACE V-KBOX systems management solution)

- **They're easier to manage and more secure.** While you don't get to choose the OS or middleware the ISV selects, you don't have to manage them either. And since the hypervisor isolates each VM from the other, you don't have to worry as much about vulnerabilities spreading to other applications. Plus ISVs can take more steps in an appliance to optimize their solution, such as stripping down the OS to just the elements they need, which reduces the attack surface for a hacker and can yield significant performance gains for the application. Most virtual appliances are updated simply by replacing the old one with a new one, which is somewhat acceptable but often a pain to manage. A better approach, taken by many of the appliances built with the rPath appliance management platform, is to call home for updates and leave it to the ISV to fully manage the update process.

“We're an all Windows shop and deployed the [MindTouch Deki virtual appliance], which is based on Linux. We had no hesitation about deploying it, because MindTouch took responsibility for the whole thing.” (Jim Hutchins, CIO, T2 Systems)

But Today's Virtual Appliances Have Their Drawbacks

Despite all their good qualities, the virtual appliances available today make some significant tradeoffs that prevent their true value from coming through. Here are some of the main drawbacks:

- **Appliances are single VMs for the most part.** If the solution to be delivered requires the installation of multiple VMs, that's multiple appliances today.
- **Appliances are often little more than VM templates.** Except for appliances packaged using rPath's tool, today's virtual appliances are little more than virtual disk files that can easily be cloned, modified, and taken apart by anyone. They also lack self-updating, call home, and other management features, which undermines their value as appliances. Thus there's a wide proliferation of so-called appliances in the appliance directories on vmware.com, citrix.com, and other locations. These templates are great for quickly evaluating applications, but don't really solve your management dilemma.
- **Appliances are hypervisor-dependent.** The appliances you can download and purchase today are formatted to work with a single hypervisor. If an ISV wants to support multiple hypervisors, it has to construct separate appliances for each platform, and often these packages are not the same and can have different performance characteristics and virtual device drivers and specifications. Emerging tools such as Novell SuSe Studio let you create a known good appliance once, then quickly output replicas tuned to additional hypervisor targets, addressing these issues during the subsequent builds.
- **There's no trust mechanism.** Most appliances don't have an application verification mechanism to make sure that the version you buy and download comes from the original author and is licensed, unmodified software.¹

OVF SOLVES THE WORST OF THESE PROBLEMS

To address shortcomings with virtual machines and to accelerate the appliance model, the vendor community got together to create a standard. The resulting OVF lets ISVs fully characterize a software distribution in a way that makes life a lot easier.² The standard:

- **Supports single- and multi-VM configurations.** An OVF package can contain complex, multi-tier services consisting of several VMs. It can specify a hierarchy of VMs, installation order, and inter-VM configuration. Via OVF, even a very complex three-tier ERP installation could be deployed with a single click. The descriptor stores detailed instructions on virtual hardware configuration, storage and network resources, inter-VM communications means, and other user-readable descriptive information necessary to streamline the deployment of the solution. If the needed configuration isn't available, the software doesn't install.

- **Adds integrity checking through public key infrastructure.** This lets ISVs sign the virtual appliance package and adds the basic schema necessary for management of software licensing.³ Thus it ensures the enterprise customer that the package is authentic and can self-govern cloning and other uses that would otherwise violate the terms of the license agreement.
- **Is extensible and open.** The OVF metadata is based on XML and the extensible Common Information Model (CIM) that lets vendors, virtual infrastructure providers, and other parties extend the specification to describe and enable new capabilities and features that are unique to their platforms and solutions.
- **Is hypervisor-agnostic.** OVF is virtualization platform- and disk format-agnostic and doesn't even specify a hypervisor as a dependency, so the OVF packaging could be used to ease physical installations as well. It is also OS- and host platform-independent. However, the ISV must take certain steps to ensure this agnosticism applies.

The Portability Of OVF Packages Will Vary

While the specification enables the portability of a virtual appliance from hypervisor to hypervisor, ISVs have to make this happen in their design of the package. And in version 1 of the specification they have options that will result in three classes of appliances:

- **Level 1 will only support a single type of installation.** These will typically be appliances built as a snapshot of a powered-on VM. This type of appliance will only run on a fixed configuration of virtual and/or physical hardware and only on a specific version of a hypervisor. This will be the simplest step for ISVs, so expect to see lots of these initially, especially while VMware maintains its dominant market share.
- **Level 2 will only support a single hypervisor.** The second type will only include the drivers for a single hypervisor or version of hypervisor but should be deployable in most hardware and virtual hardware configurations. This is the next simplest step for ISVs, one they will take to reach a large audience and again, as long as VMware maintains dominant market share.
- **Level 3 appliances will be truly hypervisor-agnostic.** This class of appliance will be packaged to support the devices of multiple hypervisors. The guest OS will perform hardware device discovery and install the right specialized drivers to interact with the underlying virtual platform.

SOME APPLIANCE CAPABILITIES STILL NEED TO BE ADDRESSED

While OVF is a great first step toward a true appliance model of set-and-forget for the end customer, it still lacks some of the key capabilities that preexisting appliance creation products like rPath's rBuilder provide, such as the self-update, self-manage capabilities. It also needs a lot of maturing to handle specific network configuration details such as understanding how to connect to a database

that sits behind the firewall and allows only TCP/IP packets across the DMZ. The metadata specification of OVF allows for the management of licenses for commercial software in the package, but it doesn't let customers provide their own existing license keys when they already have a site-wide license for an included element. For example, if the appliance includes Microsoft Windows and you already have an ELA, it won't prevent you from paying for it again when you buy the appliance. Also, since the standard was crafted in the DMTF, not all members of the vendor community (and very few enterprises) have thus far contributed fully to its creation.⁴

ENTERPRISE BENEFITS ABOUND FROM THIS NEW DEVELOPMENT

Whereas the introduction of virtualization has let enterprises make significant gains in speed and overall cost of application deployment, OVF and virtual appliances extend these gains much further. Forrester believes your organization will see the most benefit from:

- **Simpler and faster deployment of commercial applications.** The quest for a known good configuration will end with the download from the ISV. While a single appliance that meets all customers' needs may not apply in every case, it will be much easier for an ISV to translate the specification of elements needed for your deployment into a single OVF file that meets your specific requirements. Imagine getting a single download of Oracle Financials from the vendor that incorporates all the modules you need, prewired and properly configured and customized.⁵ OVF creation tools will also let VARs do this configuration and appliance creation for you. There are seven virtual appliance toolkits now coming to market (see Figure 1).

“After the virtual appliance experience we've had, we'd definitely deploy other applications as virtual appliances — almost anything except maybe [Microsoft] Exchange or an enterprise database. We're considering deploying backup software as [virtual appliances] next.” (Jim Hutchins, CIO, T2 Systems)

- **Simpler demonstration of new products.** Want to try before you buy? Download an OVF file, install it in a single click, and see how it works. No scheduling a visit from sales or hassling with configuration setup. You can find lists of demo appliances on the Web sites of rPath, VMware, and many other virtual appliance vendors.
- **No more patch and pray.** With a virtual appliance, the ISV is wholly responsible for the integrity of the entire software stack in its appliances and can either provide a mechanism for patching deployed appliances or send you an updated appliance or just the VMs that were patched for you to deploy.⁶
- **Faster support.** If you run into a problem, ISVs can quickly and easily diagnose your problem because they know the exact configuration you have deployed. They can bring up a clone in their own support environment and quickly reproduce the problem.

Figure 1 Virtual Appliance Toolkits

Vendor	Product	Expected availability	OVF support?	Notes
Citrix Systems	Project Kensho	Tech preview available now; final release by end of year*	Yes	Open source OVF toolkit
JumpBox	Powered by JumpBox	Now	Yes	Online service that provides automated assembly of software components into a JumpBox appliance. All major virtualization environments are supported, including Amazon EC2.
Novell	SuSe Studio	Q1 2009	In public beta; due later this year	Appliance toolkit for ISVs that allows customization of SuSe Linux as "JeOS" (just enough OS) for appliance optimization, testing, and delivery. Supports all major hypervisors.
RedHat	Thincrust.net	Tech preview available now; final release date undetermined	Planned; date undetermined	Provides a virtual server-optimized version of RedHat Enterprise Linux server and Fedora tools to help ISVs lock down a known-good configuration of their software.
rPath	rBuilder	Now	2009	Appliance management platform that incorporates call-home, self-updating, and other capabilities.
VMware	OVF Tool	Now	Yes	Command line utility (for scripting/automation) to convert OVF files into VMware Virtual Infrastructure, Server, and Workstation formats and vice versa (i.e., import VMs from VI/Server/Workstation to OVF format).
VMware	VMware Studio	Now	Yes	OVF-based authoring environment for building appliances, integrating them with VMware Infrastructure, and periodically publishing updates directly to deployed appliances

*Citrix plans to offer a commercial version of Project Kensho after its initial open source release.

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Source: Forrester Research, Inc.

Build Your Own Appliances

Nothing says OVF only applies to ISVs. In fact, there are several ways that infrastructure and operations professionals can take advantage of the format for your own purposes. You can:

- **Lock down a known good configuration.** Configuration management of home-grown applications and services can be simplified with OVF as well. Once the configuration is confirmed, store it as a virtual appliance that can be easily deployed to another data center

or location. Since the metadata lets you encrypt and sign the appliance, you can ensure safe distributed deployment.

- **Simplify disaster recovery.** When you have to declare a disaster, virtualization lets you quickly restart your application at a DR site or service provider. But how can you be certain that configuration differences won't slow down your recovery effort? Packaging your backup servers as OVF appliances ensures the portability of these workloads, increasing the reliability of startup. You can even use virtual appliances to restart physical workloads on virtual hardware.
- **Flexibly deploy and migrate services across infrastructures.** Portability can also mean deploying or moving a service from your primary data center to a colocation facility, managed host, or cloud computing platform.⁷ An eCommerce application, for example, could live entirely within your data center until the holiday shopping season, when you may want to clone it or move it entirely up to a cloud service where it can access massive capacity.⁸

RECOMMENDATIONS

PUSH FOR APPLIANCE PROLIFERATION

The introduction of virtual appliances and the OVF specification are signs of virtualization's maturity, delivering greater productivity and efficiency. If you are a fan of physical appliances, chances are you will love virtual appliances even more, especially if complex application installations can finally be made simple. But the vendor community won't move aggressively in this direction if you don't signal your interest. So Forrester recommends doing the following:

- **Ask your key ISVs for their virtual appliances road maps.** Find out what their strategy is for supporting virtual deployments and when they plan to provide appliances. Citrix, Novell, rPath, VMware, and others are delivering ISV tools for building OVF appliances. Be sure to determine which level of appliance they plan to provide as well, as this can determine portability and affect your virtualization deployment strategy.
- **Try out virtual appliances available today.** A proliferation of commercial software is available as pre-OVF appliances today. Get familiar with the virtual appliance concept and what benefits it can bring to your organization. Chances are you may already have a few installed, as many of the virtualization management tools on the market today come as a virtual appliance, such as those from VKernel and the PlateSpin tools from Novell. Directories of virtual appliances can be found on the Web sites of the vendors that are providing appliance toolkits.
- **Ensure your hypervisor infrastructure will support OVF.** Nearly every virtualization platform has pledged its support of OVF, but few can read and import an OVF file today. Determine when each platform you deploy will support it and to what degree so you can determine if appliance portability will be possible (and valuable) in your environment.

WHAT IT MEANS

DO YOU STILL NEED TO BE IN THE OS ADMINISTRATION BUSINESS?

If virtual appliances take off, the main implication for enterprise infrastructure and operations professionals will be some loss of control. ISVs will build the VMs, which could proliferate non-standard guest OS and middleware. However, the burden of managing and maintaining these software layers will shift to the ISV, reducing your lines of support and easing problem diagnostics. But you will be more vulnerable to ISV prioritization of the problem and have less means of fixing it yourself. This could result in increased tensions between ISVs and enterprise managers, but the benefits will likely outweigh the consequences. Played forward, this change could make management of guest OS and middleware layers less of a server administration burden as management of the hypervisor layer takes precedence. After all, the hypervisor isolates VMs from each other, making it more difficult for a vulnerability or availability issue of one software stack to affect another.

SUPPLEMENTAL MATERIAL**Companies Interviewed For This Document**

Citrix Systems	RedHat
County of Maui, Hawaii	rPath
IBM	ShuffleMaster
Microsoft	T2 Systems
Novell	VMware
Oracle	

ENDNOTES

- ¹ Many of the OS, hypervisor, and appliance toolkit vendors have begun collaborating to address this issue outside of OVF. For example, incorporating SUSE Linux Enterprise Server, rPath and VMware have separately agreed on a mechanism with Novell that ensures trust for appliance build with rBuilder or VMware Studio. A similar effort has been launched by VMware, called VMware Certified Virtual Appliance.
- ² The Distributed Management Task Force (DMTF) also announced the Virtualization Management or VMAN initiative as an umbrella effort over OVF that will seek to standardize and drive interoperability of virtual machine management tools. Source: DMTF Web site (http://www.dmtf.org/newsroom/pr/view?item_key=c0a5e6c1c18290ec2a3c174734d7cb8f78b75022).
- ³ It should be noted that in the 1.0 specification, the license management scheme is very rudimentary; for example, it simply shows the license and prompts for “acceptable.” So a lot of work is needed to bring this up to the standards many ISVs are seeking from OVF by itself.

- ⁴ In its defense, the DMTF said that membership fees are only \$6,000 per year for vendors and \$4,000 per year for end users (and free to approved universities), which is low compared with other industry standards organizations. The OVF spec has been publicly available since early June, and anyone, including nonmembers, can comment via the feedback link on the same page as the spec. The DMTF said it has received input from non-DMTF members and encourages further comment so that they can be incorporated into future versions.
- ⁵ At the Next Generation Data Center Conference this past August, Oracle announced its support of the OVF format and its intentions to delivery all its software as virtual machine templates in the future.
- ⁶ There are also tools from RedHat, Novell, and rPath that allow multiple appliance updating to be managed centrally within your firewall. An update proxy centralizes all these call home update requests, allowing you to schedule these updates and better control multi-appliance installations.
- ⁷ Support for cloud computing platforms is another area where maturity is needed, as many clouds don't use standard hypervisors and lack the APIs that would be necessary for appliances to be deployed with confidence.
- ⁸ At the Next Generation Data Center Conference this past August, Citrix CTO Simon Crosby, one of the principal authors of OVF, said that it is a goal of Project Kensho, which was open sourced at the show, to support Amazon Web Services' .ami virtual machine format as a target deployment for OVF appliances. Source: Simon Crosby's blog (<http://community.citrix.com/blogs/citrite/simoncr/2008/08/08/Kensho+-+Po+rtability,+Ubiquity...+Now+with+Extra+Freedom!>).

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