



Smart Virtual Appliances Made Easy with IBM Image Construction and Composition Tool

IBM Redbooks Solution Guide

In a traditional deployment model, software is installed on physical servers and it is configured for a particular data center environment. Deploying a business solution or provisioning a server to perform quality assurance testing can take days or weeks.

Cloud deployment models shorten the deployment time, but they require making the operating system, middleware software, and application deployment independent of a specific hardware configuration.

A smooth transition from traditional to cloud deployment models can be achieved by packaging the software stacks into industry standard *virtual appliances*. The IBM® Image Construction and Composition Tool can be used to construct custom virtual appliances that can be provisioned with several cloud deployment platforms.

This IBM Redbooks® Solution Guide introduces the IBM Image Construction and Composition Tool and provides an overview of its features, benefits, and architecture. This information is intended for software architects, cloud solution architects, and cloud administrators who need to understand the business value of building virtual appliances and the IBM Image Construction and Composition Tool.

As noted above, a smooth transition from traditional to cloud deployment models can be achieved by packaging the software stacks into industry standard *virtual appliances*. A key part of this transition involves using IBM Image Construction and Composition Tool. This tool is the IBM tool for creating virtualized workloads that target several private cloud deployment platforms, including both IBM and third-party platforms. This tool is unique in its ability to support a wide range of cloud offerings. It is also the only tool in the marketplace that can create virtual appliances for both x86 and IBM Power Systems™ hardware architectures.

Virtual appliances that are created with IBM Image Construction and Composition Tool can be deployed by several private cloud deployment platforms, such as IBM Systems Director VMControl™, IBM SmartCloud® Entry, IBM PureFlex™ System with Flex System Manager appliance, IBM SmartCloud Provisioning, and IBM SmartCloud Orchestrator.

Figure 1 shows the IBM Image Construction and Composition Tool web-based user interface.

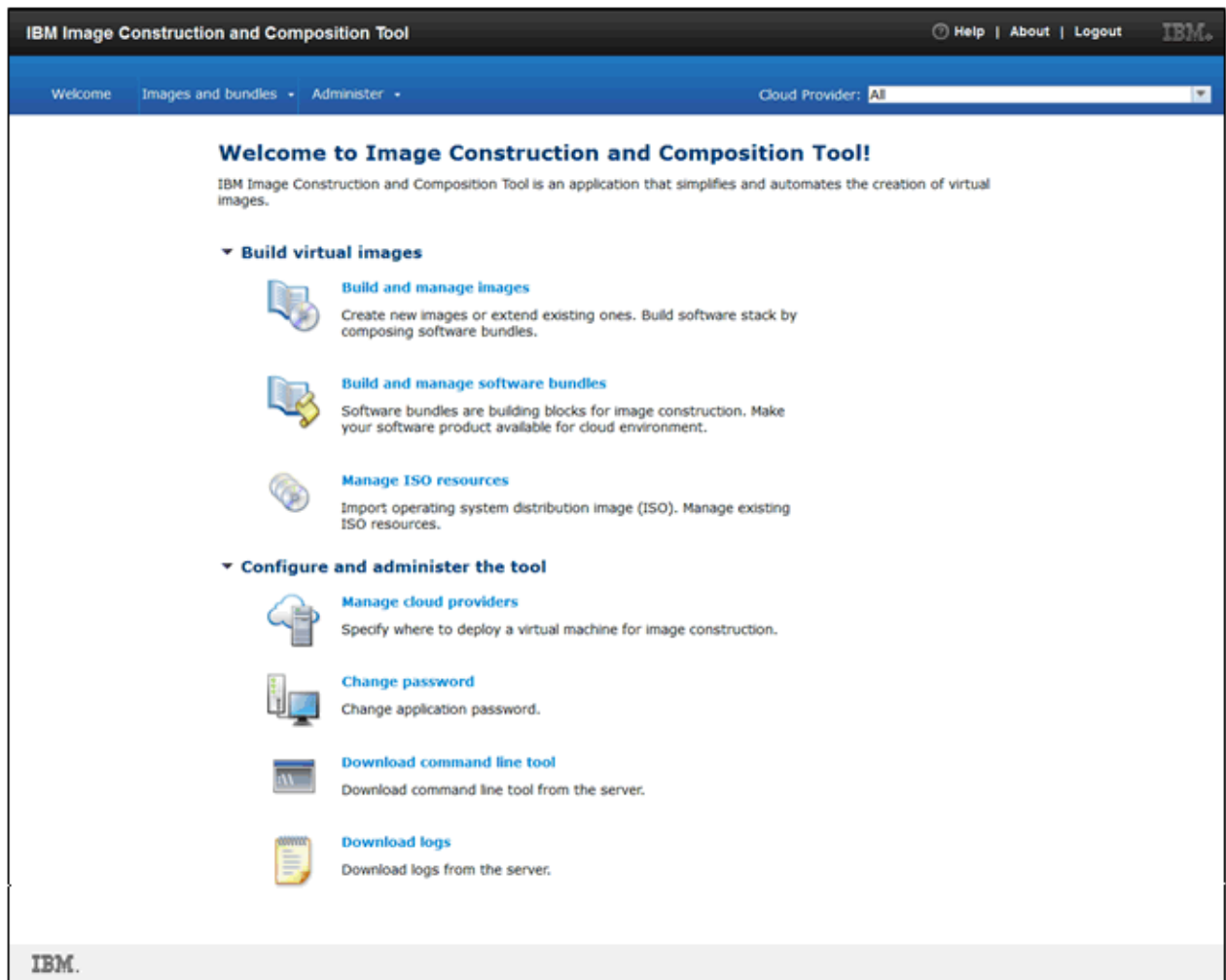


Figure 1. IBM Image Construction and Composition Tool Welcome page

Did you know?

- With the use of virtual appliances, deployment times can be reduced from weeks to hours or even minutes.
- With virtual appliances, software vendors can better control the integrity of their products. The software virtual appliance can be digitally signed. A digital signature ensures the integrity and the security of the content. The cloud deployment platform rejects the deployment of an appliance with a compromised digital signature.
- Packaging a solution as a virtual appliance allows you to use the expert integration skills of the specialist that built the ready-to-deploy package, requiring much less expertise from the people performing the deployments.
- IBM Image Construction and Composition Tool is the only tool in the marketplace that can create virtual appliances for both x86 and Power Systems hardware architectures.

- The IBM Virtual Appliance Factory is a self-enablement toolkit that provides automated tools to help independent software vendors (ISVs) pre-package application solutions for deployment in KVM and IBM PowerVM® environments. IBM makes it easy for ISVs to create virtual appliances by using a step-by-step factory approach with a proven methodology, preferred practices, and a downloadable set of Web 2.0 tools that includes IBM Image Construction and Composition Tool. For more information, see IBM Virtual Appliance Factory, found at http://www-304.ibm.com/partnerworld/wps/servlet/ContentHandler/stg_com_sys_virtual_appliance_factory.

Business value

Creating virtual appliances with IBM Image Construction and Composition Tool and deploying them to cloud environments provides the following benefits.

Faster time-to-value and lower skills requirements

- Shorter installation times. Software stacks that are packaged as virtual appliances can be deployed in minutes rather than days or weeks.
- Shorter configuration time. Self-configuration can be achieved by including an agent (activation engine) in the virtual appliance that accepts runtime parameters from the deployment platform.
- Eliminates the need for the post-deployment application reconfiguration. Data center personnel often do not have the domain knowledge that is necessary to perform advanced customization tasks, which are not required because a smart appliance can self-activate the entire software stack upon deployment.

Quicker transition to a Cloud Enabled Data Center with lower initial investment

- Addresses key issues: standardization and software licensing.
- Hides the complexity of the virtualization infrastructure.
- Enables advanced automation and provisioning.
- Enables core cloud-computing attributes: automation, self-service, agility, metering, and charge back, with faster time to value.

Achieve vendor independence

- The virtual appliances can be ported across management stacks, making migration among virtualization vendors and among data centers fairly easy and nondisruptive.
- Vendor independence can be achieved by adopting a software stack installation and activation methodology that works unchanged on all target deployment platforms. The IBM Image Construction and Composition Tool shines in this area.

Solution overview

Even when you use the tool as a single user, IBM Image Construction and Composition Tool takes multiple user roles into consideration.

Operating system specialist

The operating system (OS) specialist is responsible for generating base OS disk images, which are one of the most important raw materials that are used in the IBM Image Construction and Composition Tool build process.

Software specialist

The software specialist creates software artifacts that are called software bundles. The software bundle is another raw material that the virtual appliance builder uses to generate complete solutions as virtual appliances. The software specialist needs skills on the software components (for example, IBM WebSphere® Application Server, IBM DB2®, or your tools, applications, and solutions) that are packaged into a software bundle.

Virtual appliance builder

The virtual appliance builder assembles the base image and one or more software bundles, which constitute a solution, into a self-contained virtual appliance. The virtual appliance is the end product that the IBM Image Construction and Composition Tool constructs. It is a cloud artifact that can then be used to deploy software solutions into a public or private infrastructure as a service (IaaS) environment.

Figure 2 shows the end-to-end process of creating a virtual appliance with the IBM Image Construction and Composition Tool.

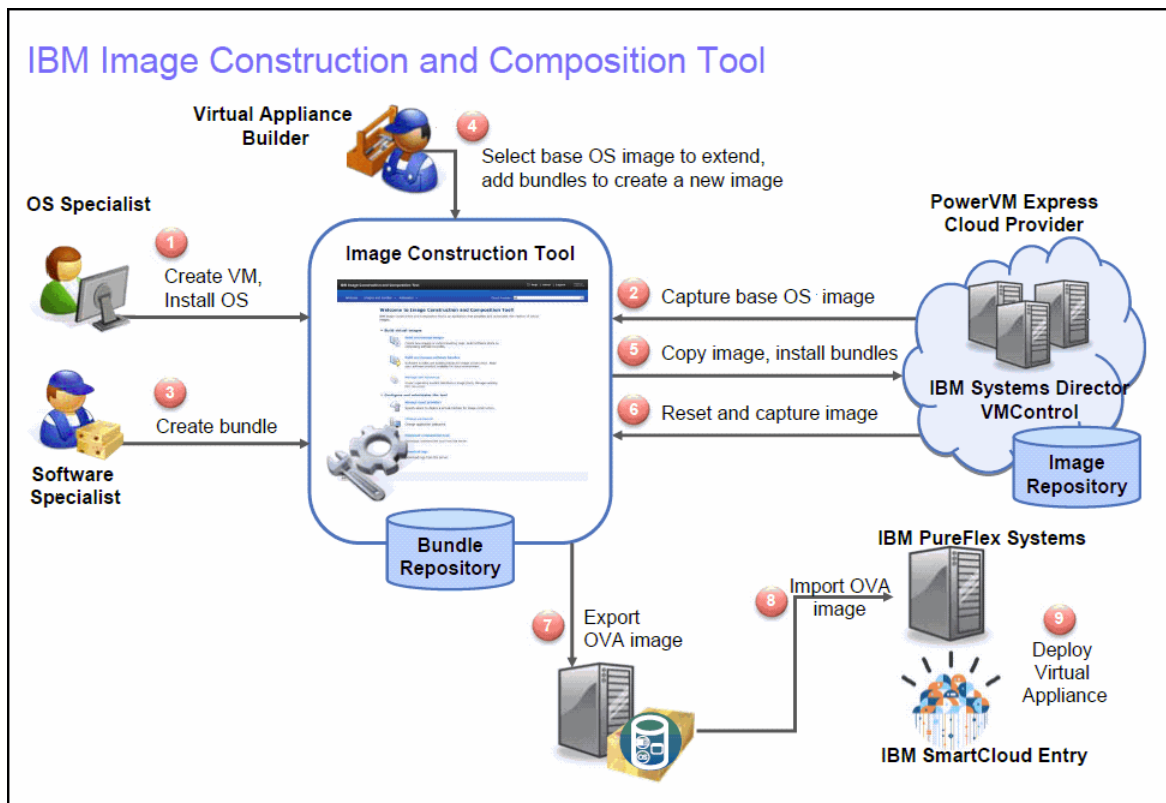


Figure 2. Building a virtual appliance - end-to-end process

1. The operating system specialist creates one or more virtual machines (possibly with different processor, memory, and disk combinations) and installs the required operating system and latest fixes.
2. Capture that virtual machine as an extendable and reusable base virtual appliance image by using the IBM Image Construction and Composition Tool.
3. The software specialists use the IBM Image Construction and Composition Tool to create software bundles for each software package, middleware, or tool that is needed.
4. The virtual appliance builder extends the base image and adds software bundles to create an image.

5. The software specialists write and test special installation scripts that are used during synchronization time. These scripts give the smart virtual appliances the intelligence to reconfigure themselves based on the environment so that the software solution is up and running when deployed. You can use software bundles to include additional software content in a virtual image. Synchronization is the process of creating a VM by deploying the virtual image, deploying all the software bundles, and then, in order, running the defined installation script of each bundle. The software bundles installation script is run according to the order that is specified in the virtual image.
6. After the virtual image is synchronized, the capture process takes a snapshot of the VM and saves it as a new image in the IBM Systems Director VMControl repository. Reset scripts are run just before the virtual image is captured to reset the virtual image state to ensure that any unplanned content is not captured.
7. Export the image as an Open Virtual Appliance (OVA) archive. This step entails capturing an image from the IBM Systems Director VMControl repository and transferring a compressed version of the image to a target system.
8. The `ova.zip` file is decompressed and imported from a Hypertext Transfer Protocol (HTTP) server.
9. Deploy the virtual appliance. This task is performed outside IBM Image Construction and Composition Tool as many times as required. You can deploy virtual appliances by using any of the following products: IBM Systems Director VMControl, IBM Flex System™ Manager, IBM SmartCloud Entry, IBM SmartCloud Provisioning, or IBM SmartCloud Orchestrator.

Solution architecture

The IBM Image Construction and Composition Tool has three components:

- The GUI, which is a web-based interface with which the tool user interacts
- The REST API, which is implemented by a RESTful web service that runs on top of HTTP and connects the GUI with the engine of the tool
- The engine, which is the brain of the tool and where all the business logic runs

The engine has two roles:

- Provisions base images.
- Connects to the guest OS after the VM is running to install the packages that are described in the model that is associated with the image.

Figure 3 shows a component-level view of the tool.

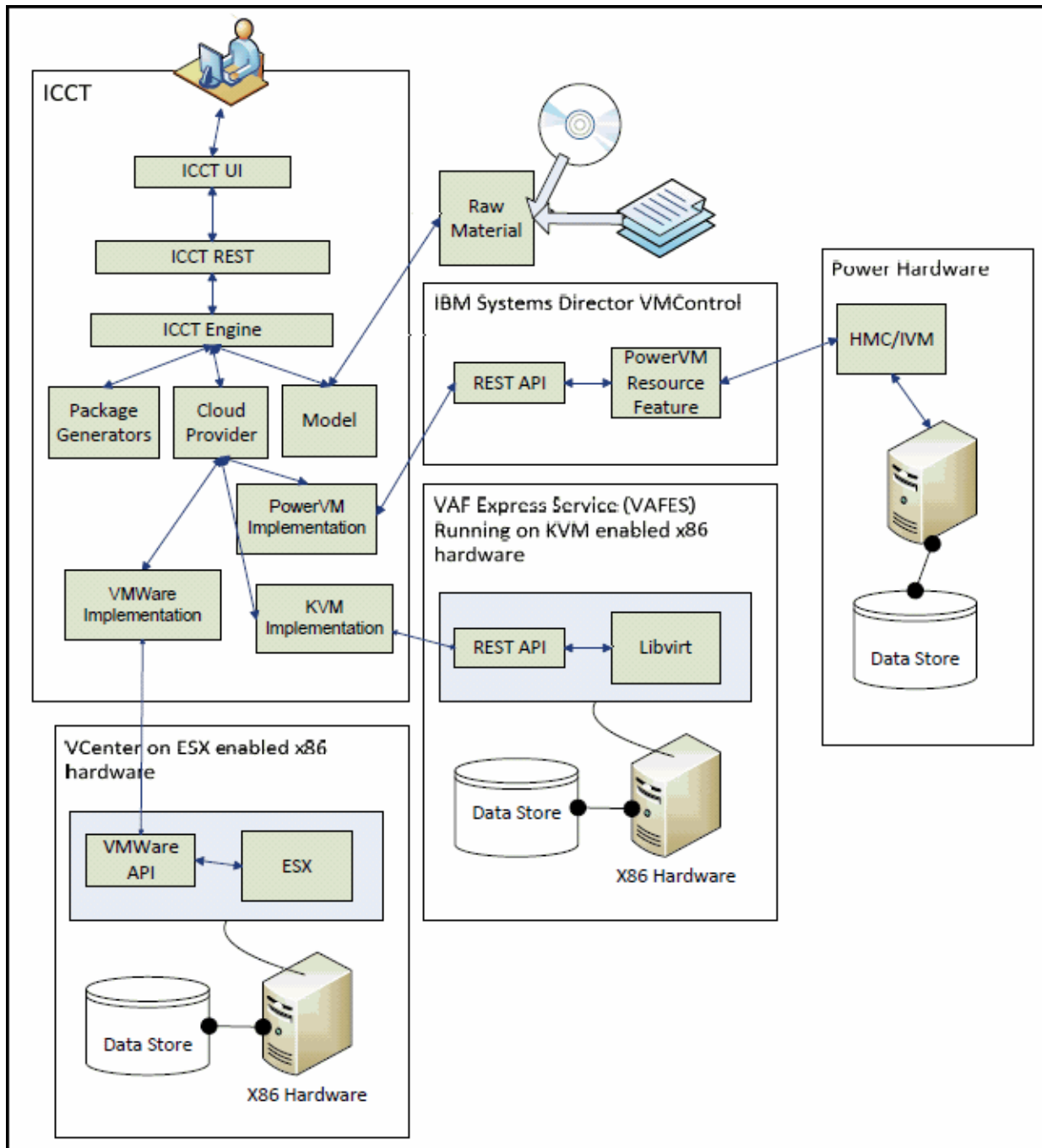


Figure 3. High-level component view of the IBM Image Construction and Composition Tool

The Model

The IBM Image Construction and Composition Tool is a model-driven tool. It relies on the model to tie the tool artifacts into a logical entity. The following artifacts of the tool are described by the model:

- Base OS images
- Software bundles
- Cloud providers

- Media images
- Base OS image instances

Package generators

The package generator is a piece of code that can automatically generate a package that contains all the artifacts in all the bundles that are added to a base OS image. Package generators are OS-specific. For example, one package generator might be for Linux and a different one might be for IBM AIX®.

Cloud providers

A cloud provider is responsible for all necessary operations to manage the lifecycle of a VM. A cloud provider must have the following minimum capabilities:

- Deploy a VM from a base OS image.
- Start or stop a VM.
- Capture a VM as an extended base OS image.
- Delete a VM.

IBM Image Construction and Composition Tool supports the following cloud providers:

- VMware
- KVM
- PowerVM
- IBM Workload Deployer
- IBM PureApplication™ System
- IBM SmartCloud Enterprise
- IBM SmartCloud Provisioning 2.1 or higher
- OpenStack

Note: Figure 3 shows only the cloud providers that are covered in *Creating Smart Virtual Appliances with IBM Image Construction and Composition Tool*, SG24-8042-01.

Usage scenarios

IBM uses IBM Image Construction and Composition Tool software bundles to install and configure several IBM products and solutions, including the OS and middleware products that are required. You can find several examples in the IBM Integrated Service Management Library, found at <https://www.ibm.com/software/brandcatalog/ismlibrary/>. Enter "ICCT software bundle" in the Search field to see a list of virtual appliances that install and configure IBM software.

Figure 4 shows a view of IBM solutions that are pre-packaged as virtual appliances that can be downloaded from the IBM Integrated Service Management Library.

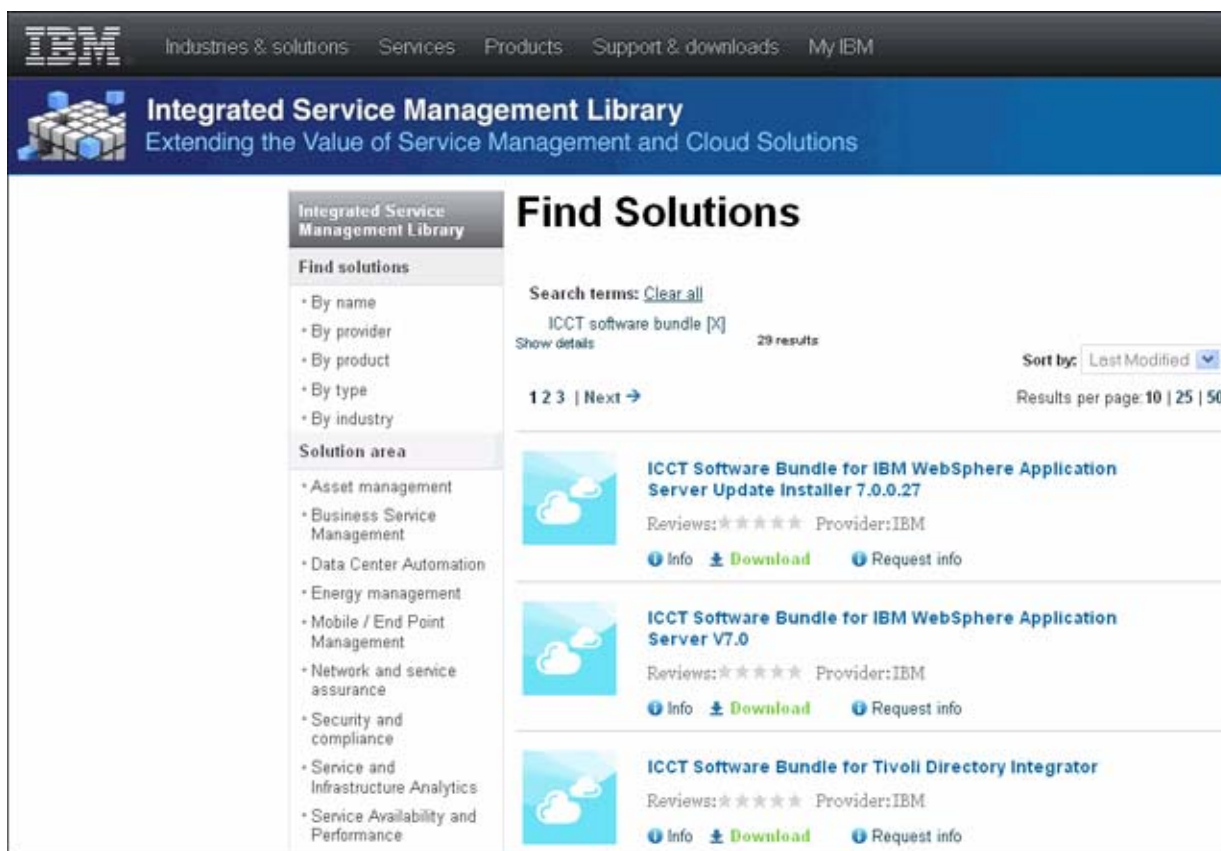


Figure 4. List of IBM solutions that are packaged as virtual appliances with ICCT

Hundreds of ISVs use virtual appliances that are created with IBM Image Construction and Composition Tool to pre-package solutions that combine an ISV's application with middleware components and the operating system for rapid deployment with minimal customization. Virtual appliances for PureFlex are built by ISVs with tools that are provided by the Virtual Appliance Factory (VAF) with support from IBM Innovation Centers (IICs). PureFlex virtual appliances that are Ready for IBM PureSystems™ require either PowerVM or KVM hypervisors. At the IBM PureSystems Center, found at <https://www-304.ibm.com/software/brandcatalog/puresystems/centre/>, you can access solutions from IBM and IBM Business Partners and updates to systems and solutions that were pre-packaged as virtual appliances using IBM Image Construction and Composition Tool.

Enterprises use virtual appliances that are built with IBM Image Construction and Composition Tool to pre-package development and test environments. They can reduce the time that it takes to set up a development and test environment from weeks to minutes and, in the process, eliminate errors and improve the usage of physical resources that are dedicated to development and test tasks.

Integration

Virtual appliance patterns are needed when you want to deploy complex software architectures. For example, a WebSphere Application Server deployment might require a Deployment Manager node, several custom nodes, HTTP Server nodes, and one or more DB2 nodes. Each node can be implemented as a single-virtual-machine appliance. Then, a solution architect uses a pattern editor to assemble a collection of virtual appliances into a virtual appliance pattern. IBM Workload Deployer implements a fully functional pattern editor that can use virtual appliances that are created with the IBM Image Construction and Composition Tool.

The new, tighter integration between IBM Workload Deployer and IBM Image Construction and Composition Tool takes place over a cloud provider connection that is defined in the tool interface. This link allows images in the IBM Workload Deployer image catalog to be viewable from the tool.

Figure 5 illustrates a typical use case for virtual appliance patterns.

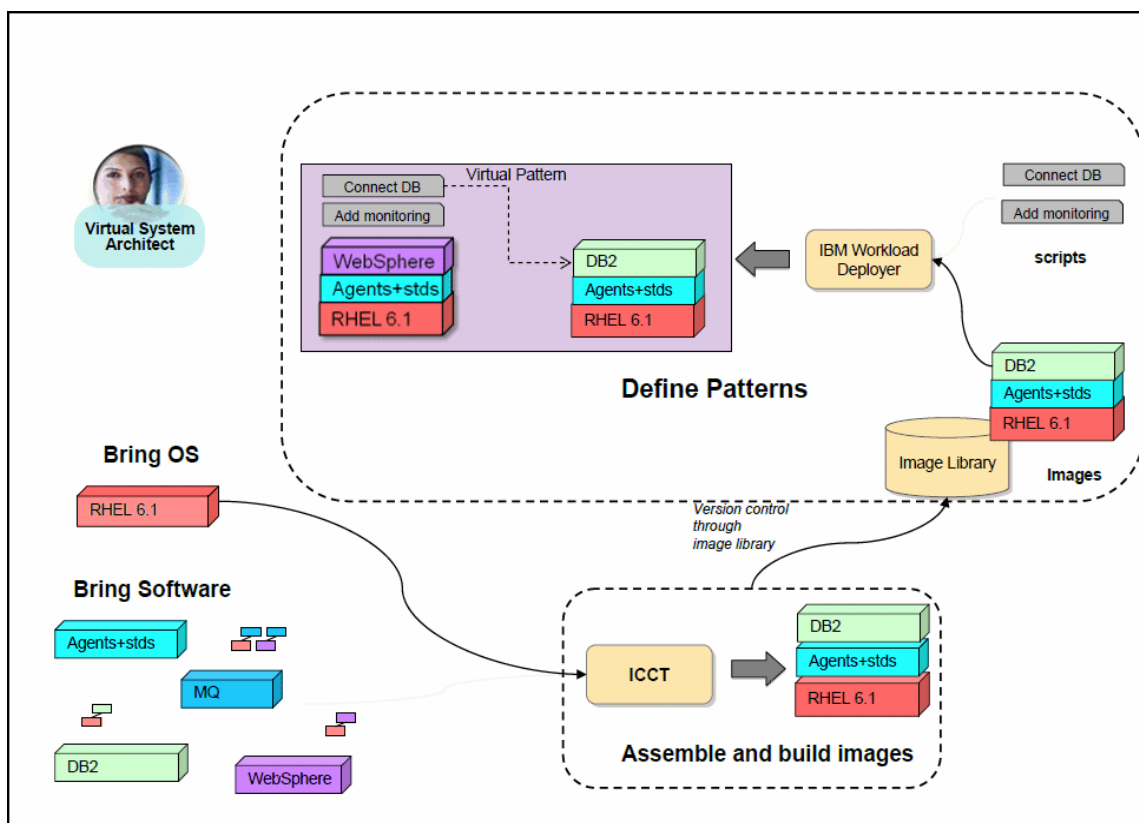


Figure 5. IBM Image Construction and Composition Tool and IBM Workload Deployer integration - creating virtual appliance patterns

1. Import a running VM image into the IBM Image Construction and Composition Tool (ICCT), which creates a base virtual appliance (image) that can be extended.
2. Extend the imported images with bundles to add the wanted software components, such as middleware and user applications.
3. Export the resulting, synchronized image in a standard compliant Open Virtual Appliance (OVA) archive (an OVA .tar file).
4. Import the OVA .tar file into the IBM Workload Deployer virtual image catalog.
5. Use the IBM Workload Deployer Pattern Editor to compose a virtual appliance deployment pattern.

6. The image is now available in the IBM Workload Deployer image catalog and can be included in virtual system patterns and deployed to the cloud.

Supported platforms

The IBM Image Construction and Composition Tool is shipped with IBM cloud offerings, such as IBM SmartCloud Provisioning, IBM SmartCloud Entry, IBM SmartCloud Orchestrator, and IBM Workload Deployer, but it is a separately installable tool. The way that you can obtain the installable image of the tool depends on the cloud management product that you implement in your organization.

The IBM Installation Manager is used to install the IBM Image Construction and Composition Tool. Typically, the installable image contains both components. However, the Installation Manager is platform-dependent. Therefore, to successfully install it, you need a version that supports the OS on which you are installing the tool. Therefore, the installation process is split into the following parts:

- Installing the IBM Installation Manager
- Installing the IBM Image Construction and Composition Tool

IBM Image Construction and Composition Tool can be installed on Red Hat Enterprise Linux (RHEL) 64-bit and on AIX.

Ordering information

IBM Image Construction and Composition Tool is included in the cloud management solutions that are listed in Table 1. Ordering information is shown in that table.

Table 1. Ordering part numbers and feature codes

Program name	PID number	Charge unit description
IBM Workload Deployer IBM Cloud Capacity Entitlement (in PVU) IBM Workload Deployer Image for x86 Systems V1.0 IBM OS image for AIX Systems V1.0:	7199 72X 9231 200 5725-D64 5725-F60	1000 PVUs (bundled with initial purchase) Required for each PVU of hardware capacity that is used to run a virtual application on X86 hardware Required for each PVU of hardware capacity that is used to run a virtual application on IBM Power Systems hardware
IBM SmartCloud Entry for IBM Flex System V3.x with 1 Year S&S IBM SmartCloud Entry for IBM Flex System V3.x with 3 Year S&S	5641-SC4 5641-SC6	Per Managed Chassis
IBM SmartCloud Provisioning V2.1	5725-C88	
IBM SmartCloud Orchestrator V2.2 (only available through IBM Passport Advantage)	5725-H28	Resource Value Units (RVUs)

Related information

For more information, see the following documents:

- IBM Redbooks publication *Creating Smart Virtual Appliances with IBM Image Construction and Composition Tool*, SG24-8042
<http://www.redbooks.ibm.com/abstracts/sg248042.html>
- IBM Image Construction and Composition Tool Information Center
http://pic.dhe.ibm.com/infocenter/tivihelp/v48r1/topic/com.ibm.sco.doc_2.2/ICON/topics/iwd_cicn_overview.html
- IBM Offering Information page (announcement letters and sales manuals):
http://www.ibm.com/common/ssi/index.wss?request_locale=en

On this page, enter the program name from Table 1, select the information type, and then click **Search**. On the next page, narrow your search results by geography and language.

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This document was created or updated on August 19, 2013.

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