Image Construction and Composition Tool
Version 1.0

User Guide

IBM

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Contents

Chapter 1. Overview

You can use the IBM® Image Construction and Composition Tool to build virtual images for deployment into cloud environments. The Image Construction and Composition Tool is model-driven and easy-to-use. It is designed to facilitate a separation of concern and tasks, where experts build software bundles for reuse by others. This design approach greatly simplifies the complexity of virtual image creation and reduces errors. The Image Construction and Composition Tool is designed to enable efficient reuse and management of virtual images and software in a cloud environment. It provides the capability to build and share virtual images that are self-descriptive, customizable, and easily managed.

The IBM Image Construction and Composition Tool builds reusable image assets that can be deployed into VMware ESX and PowerVM clouds. The Image Construction and Composition Tool can deploy to VMware ESX directly or from IBM Workload Deployer. PowerVM deployments are only supported with IBM Workload Deployer. The Image Construction and Composition Tool does not currently support zVM images or clouds.

Creating virtual images with Image Construction and Composition Tool versus traditional methods

Creating and managing virtual images is a challenging and complex task. Using traditional approaches, virtual image creation is a long and error-prone procedure that lacks standardization and does not allow a high degree of reuse. However, many of the operations and software content *should* be standardized and reusable. A successful approach to virtual image creation must ensure both the capability for reuse and standardization, and the capability to customize virtual images. This presents an additional challenge, that of combining reuse and standardization with a high degree of customization and deployment into specific environments.

Traditional virtual image creation is complex and requires much specialist knowledge of different fields and disciplines. The following table compares the virtual image creation process using a traditional approach versus using the Image Construction and Composition Tool.

Table 1. Comparing methods of creating an image

Traditional virtual image creation process	Image Construction and Composition Tool virtual image creation process
Creating a virtual image using a traditional approach is complex and requires much specialized knowledge: 1. Create a virtual machine. 2. Install and configure software on the virtual machine. This process requires significant specialized knowledge of the particular software. 3. Test the virtual machine and software. 4. Develop configuration scripts and edit the image metadata as required. Requires knowledge of virtualization technology. 5. Save the disk image. 6. Test the virtual image configuration.	Creating a virtual image using the Image Construction and Composition Tool is an easy-to-follow process. It involves the following steps, none of which requires specialist knowledge: 1. Choose a base virtual image. 2. Add a predefined software bundle. 3. The Image Construction and Composition Tool automatically installs and configures the software bundle. 4. Test the virtual image. 5. Save the virtual image.

Model-driven virtual image creation

The Image Construction and Composition Tool is based on a model-driven approach to virtual image creation. You use the Image Construction and Composition Tool user interface to build a model of the virtual image you want by combining models of a base operating system and software bundles as the main building blocks. Each building block contains a rich semantic and functional model that describes the contents of the components, for example, the products installed, supported operating system, prerequisites, requirements, and so on. Each building block also contains the installation and configuration operations and their parameters. The availability of all this metadata makes it possible to validate the model. The validation can check for things such as the following:

- If all of the prerequisites are selected and installed.
- If the base virtual image is compatible with all of the software bundles.
- If the installation order is correct.

All of this validation is completed before physically installing the software on a virtual machine, which reduces the risk of potential problems during the installation process.

Automated installation process

When you have created the virtual image model in the Image Construction and Composition Tool, the actual software installation and image building process is fully automated. It does not require any user skills or input, regardless of the cloud environment or operating system.

Virtual image life cycle management

After virtual images are created, the life cycle management of those virtual images presents an additional challenge. With a traditional approach, it is not always possible to identify the contents of any particular virtual image and any given virtual image can resemble a *black box*, the contents of which are unknown. You might know that the virtual image contains a particular operating system, but you probably do not know at any particular point if, for example, a monitoring agent is

installed on the virtual image, or what virtual images do not comply with security policies. As new software patches become available, you might not know which virtual images need to be updated. If your virtual image management process cannot adequately meet these challenges, the value of your virtual images is diminished.

The Image Construction and Composition Tool greatly enhances the efficiency of virtual image life cycle management. Virtual images that you create are self-descriptive. At a glance, you can see the contents of the virtual image. The virtual images are also highly customizable and easily managed. You can easily export virtual images to another system and other users can import virtual images that you create. Virtual images created using the Image Construction and Composition Tool have a high degree of interoperability with other IBM products and software.

Virtual image creation and activation

The Image Construction and Composition Tool makes it easy to create virtual images of your operating system and software content. The tool supports multiple individuals and organizations. Content is added based on expertise and that expertise is captured in the tool, facilitating reuse and propagation. Virtual image builders can use the encapsulated content created by experts to build virtual image without requiring in-depth knowledge of the operating system or software installation. Specialists build software bundles, which are then available for virtual images builders to access when they are creating virtual images.

The primary users of the Image Construction and Composition Tool are:
- Operating system specialists who use the tool to specify and create base operating system virtual images for organizational use
- Software specialists who use the tool to specify and create software bundles encapsulating software content
- Image builders who use the tool to build virtual images for deployment by selecting the operating system and software
- Cloud administrators who want to provide users of their cloud with virtual machines with preinstalled software

The following diagram illustrates how primary users interact with the Image Construction and Composition Tool to create operating system virtual images, define software bundles, and create virtual images for deployment.
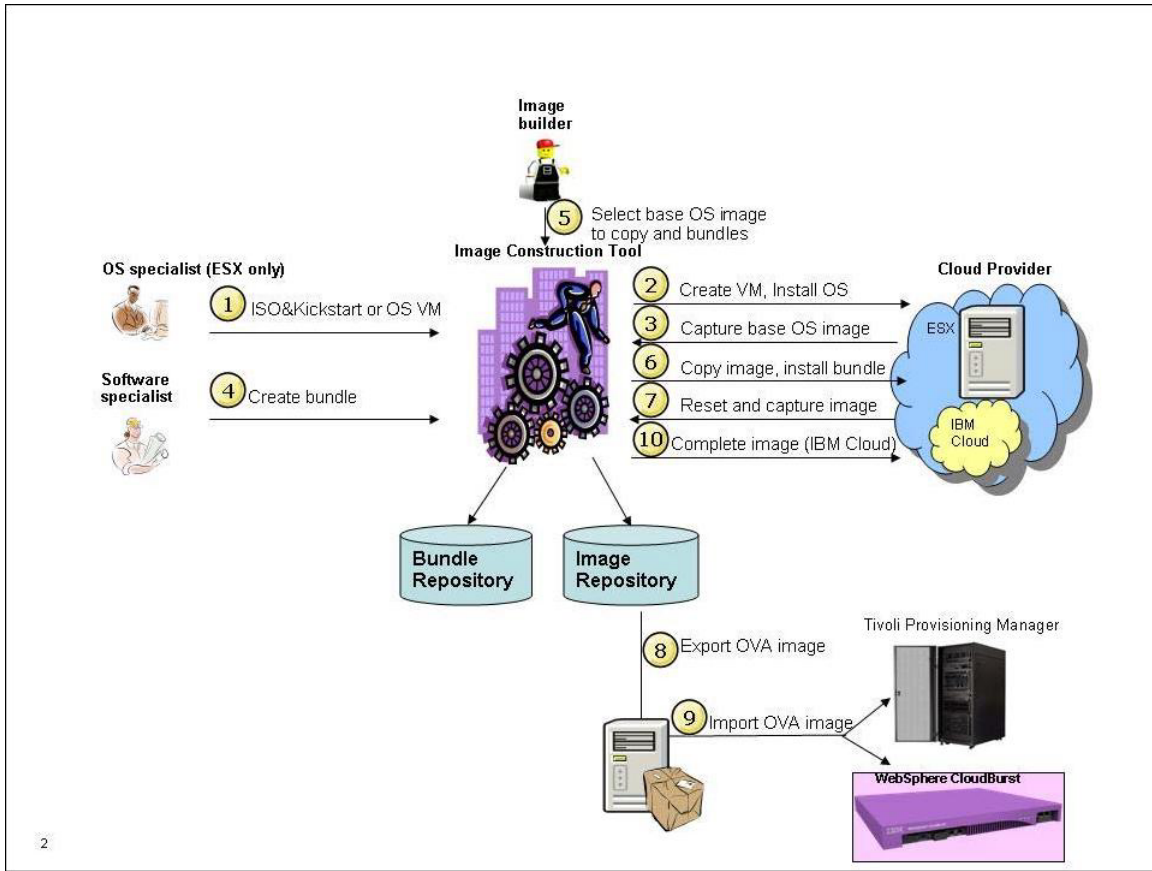
The following steps outline the typical business process:

1. An OS specialist uses the Image Construction and Composition Tool to provide the specifications of the operating system image to build. The OS specialist creates a base operating system image and makes it available to virtual image builders in the organization.

2. Software specialists use the Image Construction and Composition Tool by providing installation and configuration files and data. The software specialist creates a software bundle and makes it available to image builders.

3. Virtual image builders use the Image Construction and Composition Tool to choose their base virtual image and software content to construct a virtual image.

4. Users export the virtual image as an OVA file so that it can be imported and deployed into VMware

Chapter 2. Getting Started

This section describes system requirements, how to configure and start the Image Construction and Composition Tool, and how to configure the tool to begin building virtual images.

The following topic describes the process for downloading the Image Construction and Composition Tool: Downloading the IBM Image Construction and Composition Tool

The following topic describes the process for installing the Image Construction and Composition Tool: Installing the IBM Image Construction and Composition Tool

Image Construction and Composition Tool user interface

The Image Construction and Composition Tool user interface is intuitive, user friendly, and easy to use. The user interface is designed on progressive disclosure principles, where only the menus and options that are valid at a particular point are displayed and available for selection. Options and buttons that are not valid for any particular context do not display until you are in a context in which you can use them. As well as being easy-to-use and navigate, the user interface automatically validates the values that you enter to ensure that they are consistent, highlighting any fields for which the values are not valid.

When you access the Image Construction and Composition Tool, the tool opens on the **Welcome** page. The **Welcome** page contains links to each of the main Image Construction and Composition Tool pages. These main pages provide access to the key functions of the tool. You access the main pages by either clicking through the navigational toolbar at the top of the page or by clicking the links on the **Welcome** page.

The menu bar at the top of the **Welcome** page is always available from every page in the Image Construction and Composition Tool, providing you with quick and easy access to the main functions. The main pages in the Image Construction and Composition Tool are briefly described in the following table.

Table 2. Main Image Construction and Composition Tool pages

Page	Functions provided
Images	You can: • Import virtual images from your cloud provider • Create new virtual images • Extend, edit, or capture existing virtual images • Delete virtual images • Search for existing virtual images • Share software bundles by either importing them from or exporting them to a remote system • Create new software bundles • Clone existing software bundles • Publish software bundles • Delete existing software bundles • Search for existing software bundles
Administer	You can: • Configure your cloud provider • Change your password • Download log files

The recommended screen resolution for the Image Construction and Composition Tool user interface is 1024 by 768. For some views in the Image Construction and Composition Tool interface, you might want to set the screen resolution higher, but this is not a requirement.

If you are accessing the user interface for the first time, you are prompted to create a cloud provider definition. All actions performed in the Image Construction and Composition Tool are based on a given cloud provider.

Automatic validation on the user interface

The Image Construction and Composition Tool user interface automatically validates field values that you enter and options that you select as you complete tasks. This validation occurs as you work and helps you to avoid issues by highlighting potential problems before you save your work. The validation is known as syntactic and checks that all required fields on the user interface have realistic values and provides you with immediate feedback about the validity of those values.

The Image Construction and Composition Tool also completes backend semantic validation when you save your work. When this validation is run, any errors or warning or information messages are displayed for you to view on the page.

Universal identifiers

When you are creating virtual images or bundles or other assets using the Image Construction and Composition Tool, you enter a unique universal identifier (ID) for the asset. The universal ID identifies an Image Construction and Composition Tool asset across different repositories. The universal ID uses an OSGI (Open Service Gateway Interface) like notation, with a reverse domain name and a version in the format `major.minor.macro` and an optional qualifier, for example, `com.ibm.images.was_1.0.0` for a WebSphere® Application Server base virtual

image. In this example, the version is not the WebSphere Application Server version, it represents the virtual image version. In general, you can use any dotted notation to create a universal ID, such as `icon.image.base.rhel56_1.0.0`.

The universal ID allows the Image Construction and Composition Tool to look up bundles independently from the repository in which they are stored. If there are different bundle repositories, the virtual image builder or Image Construction and Composition Tool can assume that if two assets have the same universal ID, they are identical and the tool can use either of the two. The universal ID field is a required field because all assets must be referenced and available for search and reference by the tool. The universal ID provides a unique way of referencing an Image Construction and Composition Tool asset across several repositories.

Progressive disclosure design

To enhance the usability and user friendliness of the interface, the Image Construction and Composition Tool design is based on progressive disclosure design principles. The Image Construction and Composition Tool provides context-driven menu and content. Buttons, menu options, and user interface elements are only displayed and available for selection if they are valid for your context at any particular point in the application. This reduces the potential for errors and aids user comprehension and understanding of the features and functions of the tool. Progressive disclosure reduces the amount of information on the screen and streamlines your focus for tasks by minimizing the number of options to only those that are relevant.

System requirements

Ensure that your system meets the virtualization and browser requirements for using the IBM Image Construction and Composition Tool.

IBM Workload Deployer

To install the IBM Image Construction and Composition Tool, you must ensure that the following system requirements are met:

Supported Operating Systems:
- SuSE Linux Enterprise Server 11 SP1 32-bit or 64-bit
- RedHat Enterprise Server 5.6 32-bit or 64-bit

Hardware requirements (Physical or virtual):
- Minimum requirements: 1 CPU - physical or virtual 1 GB memory - physical or virtual
- Suggested requirements: 2 CPUs - physical or virtual 2 GB memory - physical or virtual
- 100 GB of disk space for building Native VMWare images
- 60 GB of disk space if only building IBM Cloud or IBM Workload Deployer

Additional requirements:
- Ensure that additional disk space is reserved for the growth of the /drouter directory. This is a directory used by IBM Image Construction and Composition Tool. 100GB is recommended.
- Ports 80 (default HTTP) and 443 should not be in use or reserved by other applications.

VMware ESX

VMware ESX 3.5 or VMware ESX 4.0 is required.

- The virtual server where you want to deploy IBM Image Construction and Composition Tool must have:
  - Minimum of 1 processor, 1 GB memory, and 100 GB disk space for the IBM Image Construction and Composition Tool virtual image.
  - Minimum 500 GB disk space for software bundles, virtual images, and exported OVA files.
  - About a dozen IP addresses in a common subnet
- You must have Administrator access to the virtual server where you want to deploy the IBM Image Construction and Composition Tool virtual image.
- A software depot server is recommended for the software that you want to deploy since software is not stored in a software bundle.
- If you are running IBM Installation Manager to install the IBM Image Construction and Composition Tool, port number 443 must be open and available on the system on which you are installing the application.

When you are installing Image Construction and Composition Tool on a Linux system, the network must be configured properly for DNS. The TCP/IP DNS configuration must be configured so that both forward and reverse DNS lookups work. This is required because Image Construction and Composition Tool uses DNS lookups to find and use the host names of the deployment IP addresses entered for VMware ESX cloud providers.

Note: This documentation assumes an SSH-enabled server. For VMware ESX, there are particular steps that you must perform to use SSH connections as the root user to the Image Construction and Composition Tool virtual machine. See the VMware article with detailed instructions.

Browser

You require Mozilla Firefox v 3.6.x or Mozilla Firefox v 4 to access the Image Construction and Composition Tool web interface. Microsoft Internet Explorer Versions 7 and 8 are also supported.

Note: The recommended screen resolution is 1024 by 768. For some views in the Image Construction and Composition Tool web interface, you might want to set the screen resolution higher, but this is not a requirement.

Changing your Image Construction and Composition Tool user password

You can change your Image Construction and Composition Tool user password from the user interface.

Procedure

1. Click **Administer > Change password**.
2. Enter your new password in the **New password** field and verify it in the **Verify password** field, observing the following requirements:
   a. Enter alphanumeric characters only.
   b. Your password must be a minimum of 8 and a maximum of 20 characters.

c. You must enter at least one uppercase character.

d. You must enter at least one lowercase character.

e. You must enter at least one number.

3. Click **OK**.

VMWare configuration

Configuring VMware ESX as your cloud provider

You can configure VMware ESX as your cloud provider.

About this task
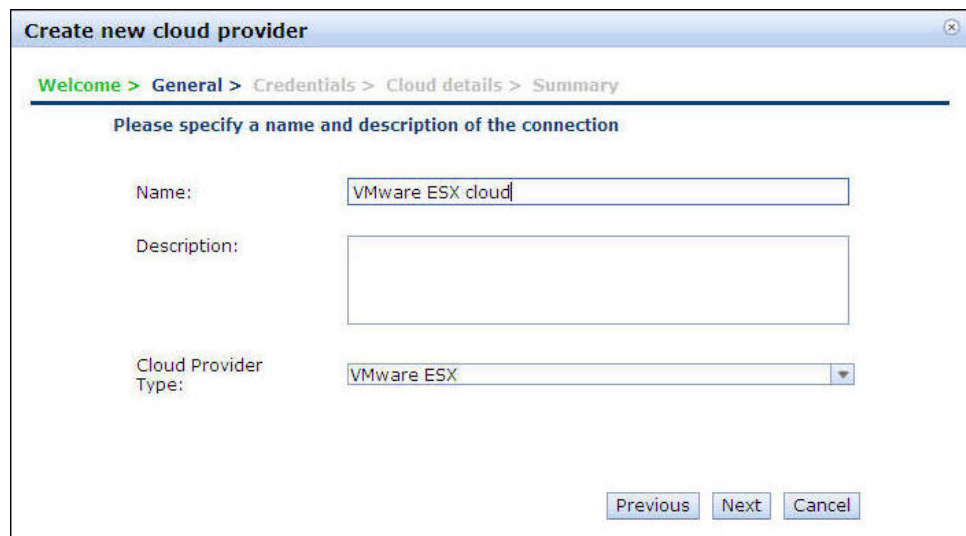
If you are opening the Image Construction and Composition Tool for the first time, the tool opens on the **Create a new cloud provider** dialog box. If a cloud provider has already been configured, the tool does not open on the **Create a new cloud provider** dialog box. If the **Create a new cloud provider** dialog box does not open automatically, click **Administer > Manage cloud providers** and then ![plus icon] to begin configuring VMware ESX as cloud provider.

Important: You cannot edit your cloud provider configuration after it is created. The VMware ESX cloud provider does not support images in which the virtual machine has snapshots. You must remove the snapshots from your virtual machine before attempting to use the virtual machine in Image Construction and Composition Tool. The VMware ESX cloud provider does not support ESX hosts that use Resource Pools.

Procedure

1. On the **Create a new cloud provider Welcome** page, click **Next**.

2. On the **General** page, enter the following values, then click **Next**:

   - **Name**: Enter a name for the cloud provider, such as VMware ESX.
   - **Description**: Enter a brief description.
   - **Cloud Provider type**: From the menu, select VMware ESX.

3. On the **Credentials** page, enter your user name, password, and location for the VMware ESX server. You can enter either the host name or IP address for the VMware ESX server location.

4. On the **Cloud details** dialog box, enter network information. Enter the subnet address, netmask, gateway address, primary DNS, and secondary DNS for the network to buil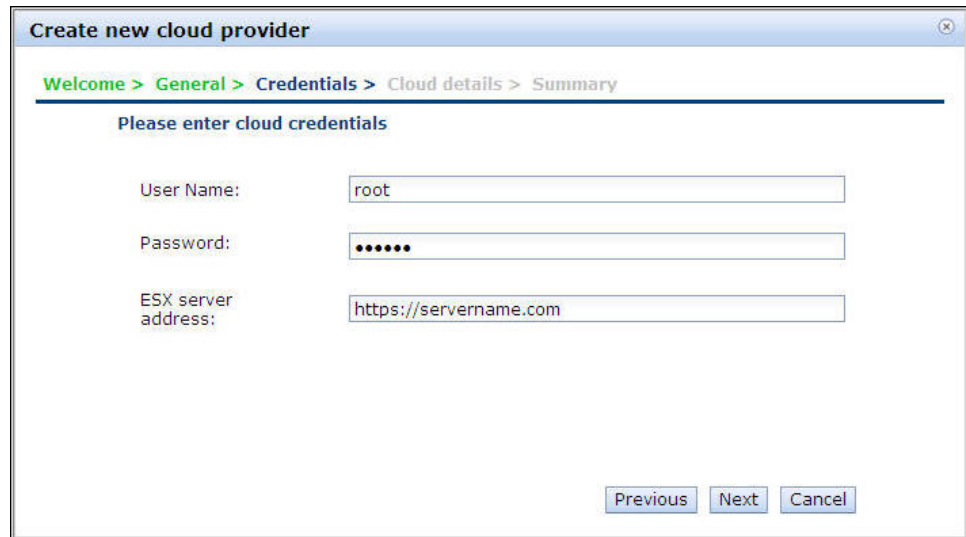d the virtual machines. In addition, provide one or more IP addresses for the Image Construction and Composition Tool to use when it creates virtual machines:

   - **Deployment network name**: Image Construction and Composition Tool automatically populates this value.
   - **Datastore**: Image Construction and Composition Tool automatically populates this value. If there is more than one data store available, select one from the list.
   - **Subnet address**: Enter the subnet address for the configuration. For example, `92.42.78.0`.
   - **Netmask**: Enter the netmask value for the configuration. For example, `255.255.255.0`.
   - **Gateway address**: Enter the gateway address for configuration. For example `92.42.78.1`.
   - **Primary DNS**: Enter the primary DNS. For example `92.42.106.2`.
   - **Secondary DNS**: Enter the secondary DNS, for example, `92.42.106.2`.

   You can enter deployment IP addresses or IP address ranges. To do this, click

   and enter the IP address ranges. Ensure that you add available IP addresses that can be resolved using a reverse DNS lookup and ensure that you use the Enter key after entering each IP address to ensure that it is saved in the table. You cannot edit your cloud provider configuration after it is created so ensure that you enter valid IP addresses. Then click **Next**.

```
Create new cloud provider                                                    ⊗

Welcome > General > Credentials > Cloud details > Summary

    Please enter the ESX datastore and network details that will be used to deploy
    and build images.

    An error occured, check network connection, validate user name/password.

    Deployment          Cloud Test                                      ▼
    network name:

    Datastore:          testdatastore                                   ▼

    Subnet address:     2.67.89.1

    Netmask:            255.255.255.0

    Gateway

                                          Previous   Next   Cancel
```

5. Review the details on the **Summary** dialog box. If you want to go back and makes changes, click **Previous** and make the required changes. When you are satisfied that all of the details are correct, click **Done**.

Configuring IBM Workload Deployer as a provider

You can configure IBM Workload Deployer as the cloud provider.

About this task

A cloud provider is a service provider that offers storage or software services on a private or public network that is referred to as a cloud. It means the storage and software is available for access from the Internet.

By configuring IBM Workload Deployer as a cloud provider, you make the assets from IBM Workload Deployer available for use in the Image Construction and Composition Tool. To create an IBM Workload Deployer provider in the Image Construction and Composition Tool, you must wait for around 5 minutes after the cloud group is created in IBM Workload Deployer, then start a new Image Construction and Composition Tool session to pick-up the new group as a drop-down selection item for target cloud group.

Procedure

1. To configure IBM Workload Deployer as a cloud provider, click **Administer > Manage cloud providers** from the Image Construction and Composition Tool tool main menu.

2. From the Cloud Providers page, click

.

3. Click **Next**.

4. On the Create a new cloud provider dialog box, enter the following details:
   - **Name**: Enter a name for the provider, for example, IBM IWD.
   - **Description**: Enter a description.
   - **Cloud Provider Type**: Select **IBM Workload Deployer** and then click **Next**.

5. Provide the host name or IP address of the cloud provider in the Host name field. Provide a user name and password that has both access to the IBM Workload Deployer user interface and the appropriate permissions to perform the intended actions. Please refer to the IBM Workload Deployer documentation for the appropriate permissions. The Image Construction and Composition Tool dynamically retrieves data from the cloud based on your login details.

6. Click

.

SmartCloud Enterprise configuration

Configuring IBM SmartCloud Enterprise as a provider

A cloud provider is a service provider that offers storage and software services on a private or public network that is referred to as a cloud. The storage and software is available for access from the Internet. You can configure IBM SmartCloud Enterprise as your cloud provider. Configure IBM SmartCloud Enterprise as a cloud provider to make assets from IBM SmartCloud Enterprise available for use in the Image Construction and Composition Tool.

About this task

If you are opening the Image Construction and Composition Tool for the first time, the tool opens on the **Create a new cloud provider** dialog box. If a cloud provider other than IBM SmartCloud Enterprise has already been configured, the tool does not open on the **Create a new cloud provider** dialog box. If the **Create a new cloud provider** dialog box does not open automatically, complete the first three steps in the following procedure. If the **Create a new cloud provider** dialog box opens automatically, you can skip to step 4.

Important: Enter the details carefully as you cannot edit your cloud provider configuration after it is created.

Procedure

1. To configure IBM SmartCloud Enterprise as a cloud provider, click **Configure > Manage cloud providers** from the Image Construction and Composition Tool **Welcome** screen.

2. From the **Cloud Providers** page, click .

3. Click **Next**.

4. In the **Create a new cloud provider** dialog box, enter the following details, and then click **Next**:
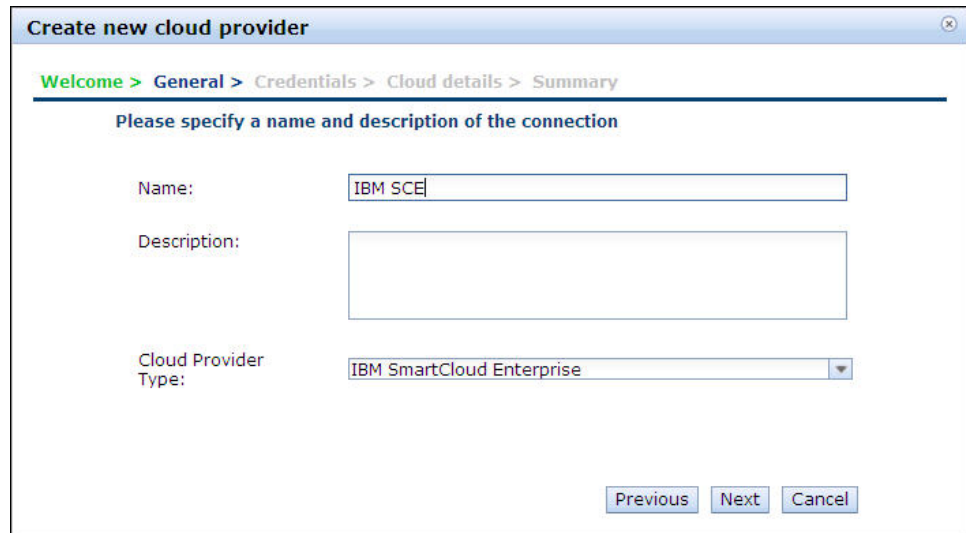
   Name Enter a name for the IBM SmartCloud Enterprise provider, for example, IBM SCE. It is good practice to specify a name that indicates the data center location. For example, you could enter something like IBM SCE Singapore DC.

   Description
           Enter a description.

Cloud Provider Type
    Select **IBM SmartCloud Enterprise**.

5. In the **Credentials** dialog box, enter the user ID and password for your IBM SmartCloud Enterprise account. The Image Construction and Composition Tool dynamically retrieves data from the cloud based on your log-in details. If you cannot complete this step successfully, check the connectivity between the Image Construction and Composition Tool deployed VM and IBM SmartCloud Enterprise. Try to log in to IBM SmartCloud Enterprise directly. Make sure that the server can connect with the cloud (not just your client on which the browser is running). The Image Construction and Composition Tool server attempts to connect to the IBM SmartCloud Enterprise administrative component using this URL: `www-147.ibm.com`. Therefore, the system must be able to resolve this URL, for example, via DNS.

   Note: It is good practice to use the same set of credentials (user ID and password) for all IBM SmartCloud Enterprise cloud providers that you configure. If you configure more than one IBM SmartCloud Enterprise cloud provider, using the same set of credentials (user ID and password) for each of these cloud providers ensures that any virtual images created have immediate access to all of the software bundles included in the virtual image.

6. In the **Data center and key pair** section, enter the following details:
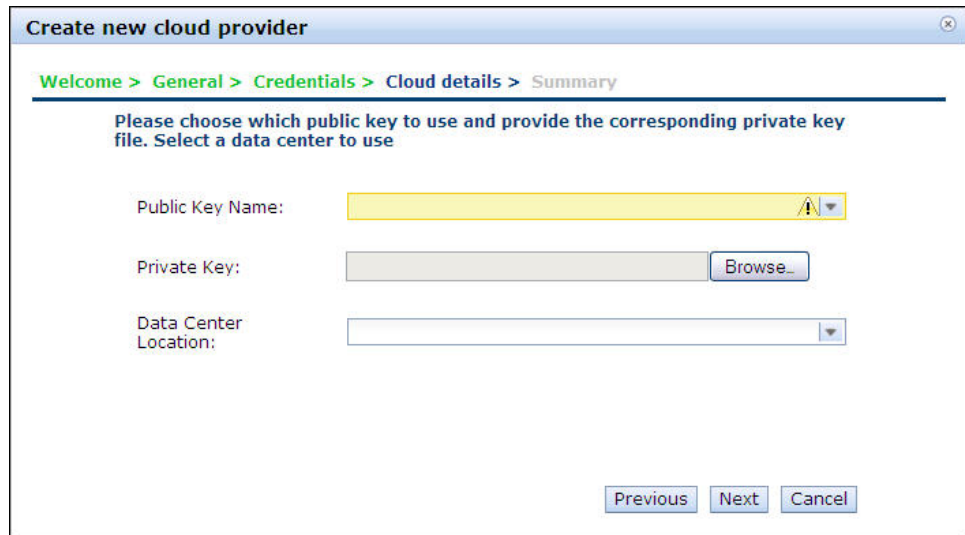
   Public Key Name:
       Enter the public key to use when creating deployed VM instances on the IBM SmartCloud Enterprise. You can access the public key from the **Account** tab in your IBM SmartCloud Enterprise account. For more information about managing IBM SmartCloud Enterprise keys, see the *IBM SmartCloud Enterprise User's Guide*.

   Private Key:
       Enter the private key to use when creating deployed VM instances. The private key is your private key that you previously generated and downloaded from IBM SmartCloud Enterprise and saved to your local system. This file has a `.rsa` file extension. If necessary, you can generate a new private key by clicking **Generate new key** from the **Account** tab in your IBM SmartCloud Enterprise account. For more information about managing IBM SmartCloud Enterprise keys, see the *IBM SmartCloud Enterprise User's Guide*.

Data Center Location

From the menu, select a data center location.

7. Click **Next**.
8. Review the **Summary** dialog box, then click **Done**.

Chapter 3. Working with virtual images

The IBM Image Construction and Composition Tool provides the capability to both specify and build virtual images.

About this task

Virtual images include both the metadata and the binary content required to support deployment. The virtual images created by the IBM Image Construction and Composition Tool contain all the information required for specific deployment platforms to create specific deployed VM instances.

The virtual images created include the OVF file and other metadata to support Workload Deployer patterns, including the ability to provide configuration parameters during the pattern deployment process. Specifically, this version of the tool creates OVA formatted virtual images ready for import and use in Workload Deployer v2.0.0.2 and Tivoli® Provisioning Manager v7.2.0.1. The OVA includes OVF extensions for used by the Workload Deployer pattern editor.

In many organizations, virtual image creation is logically broken up into two main roles:

- First, an operating system specialist creates base operating system virtual images following company and cloud specifications.
- Next, virtual image builders use these base virtual images and add software content, such as middleware and applications. Virtual image builders can reuse resources such as software bundles that were created by other experts. Some software bundles, for example DB2® or WebSphere Application Server software bundles can be very specialized and complex, and the virtual image builder does not need to be involved in their creation. Instead, the virtual image builder reuses the software bundles created by the DB2 or WebSphere Application Server specialists and only needs to work with the parameters and configuration made available by the specialists. While the Image Construction and Composition Tool supports both the operating system specialist and virtual image builder roles, one person can perform both roles if they have the required knowledge.

To work with virtual images, click the **Build and Manage Images** link on the **Welcome** page.

If you are creating virtual images, the IBM Image Construction and Composition Tool provides virtual image validation feedback, helping you to ensure that your virtual images are created correctly. This is useful for problem prevention. The Image Construction and Composition Tool includes syntactic and semantic validation.

- Syntactic validation checks that all required fields on the user interface have realistic values and provides you with immediate feedback about the validity of those values.
- Semantic validation ensures that your virtual image as a whole is consistent. This validation is performed by the server and is done only when you save changes.

The validation report entries have three severities, `info`, `warning`, or `error`. If your virtual image has any `error` severity validation entries, any synchronize or capture action for the virtual image might fail. However, if the synchronize or capture action succeeds, the resulting virtual image might not be usable. The Image Construction and Composition Tool does not currently prevent synchronization or virtual image capture, but if there are errors, a dialog box prompts you to confirm if you want to proceed with the synchronization.

Working with enablement bundles

Enablement bundles are bundles that hide cloud-specific details. They provide a building block for you to build virtual images using cloud-independent bundles. When you are building a virtual image, the Image Construction and Composition Tool automatically selects an enablement bundle for your virtual image that matches your cloud provider and operating system and version.

The Image Construction and Composition Tool automatically selects an enablement bundle for your virtual image. During the virtual image building process, the Image Construction and Composition Tool does not allow you to remove the enablement bundle from your virtual image. If you are creating a virtual image and the base virtual image already contains an enablement bundle, the Image Construction and Composition Tool does not perform any action.

When working with virtual images and bundles, you must keep the enablement bundles in the Image Construction and Composition Tool workspace. When you select a base virtual image, Image Construction and Composition Tool automatically adds the appropriate enablement bundle to it. After you extend your virtual image and give it a name, symbolic name, version, and description, you see the following in the Operating System section of your virtual image:

`Activation Framework: <name of enablement bundle selected by the tool>`

You can then proceed to add bundles to your virtual image and synchronize it.

Important: Do not delete the `Enablement Bundle for IBM SmartCloud Enterprise` enablement bundle. This bundle is required for IBM SmartCloud Enterprise.

If the enablement bundle is removed or not available, the following information is displayed in the Operating System section of your virtual image:

`Activation Framework: <Not found>`

If you accidentally delete this enablement bundle, you can re-import it from the following location: `<installation_path>/icn.app/private/expanded/ibm/ icn.enablement-1.1.0.0/bundles/R1/sbce/ ICON_Abstraction_Bundle_for_the_IBM_Cloud.ras`

where `<installation path>` is similar to `/opt/IBM/icon`

Creating a Base Image with the VMware ESX Cloud Provider

The first step in building an image for deployment is creating the base operating system image.

About this task

Creating a base operating system is a multi-step process. The first two steps are the creation of a base virtual machine and the installation of the operating system. The image creation tool provides two options:

1. Create the base OS manually outside of the Image Construction and Composition Tool:
   a. Create a virtual machine.
   b. Deploy the operating system to the virtual machine.
   c. Create an OVA file that you will import into the Image Construction and Composition Tool.
   d. Import the created OVA into the Image Construction and Composition Tool.
2. Import the virtual machine directly into the Image Construction and Composition Tool. Information on how you can perform this action is provided in "Importing a virtual machine into Image Construction and Composition Tool" on page 18.

In either case, the tool then extends the base OS virtual machines with deployment target specific files, collects metadata for packaging of the base operating system image, and performs the final packaging. The following example shows extension of the base OS with the OVF activation engine for Workload Deployer.
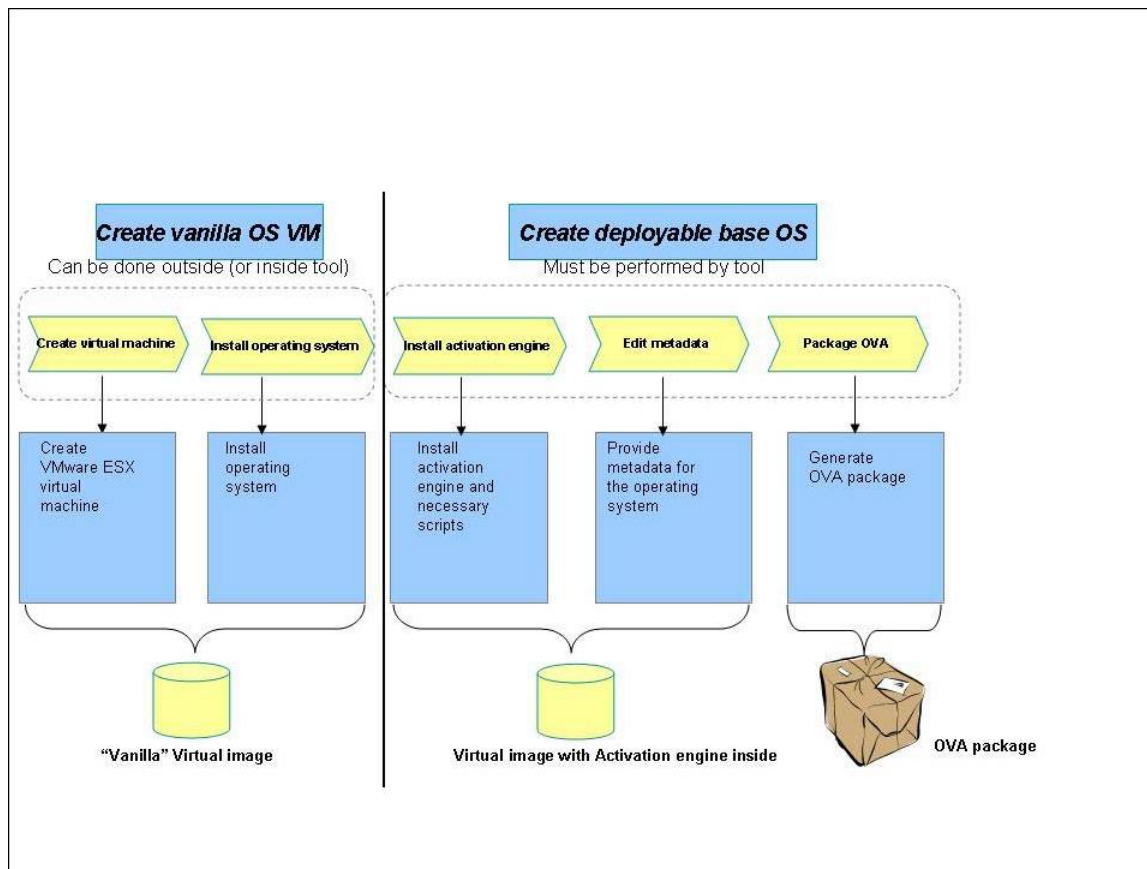
IBM Hypervisor Edition images (for example: Websphere Application Server Hypervisor Edition) can also be directly imported and used.

Import base images from IBM Workload Deployer

When you have configured IBM Workload Deployer as a cloud provider, you can import base images from IBM Workload Deployer.

About this task

Before you can import base images from IBM Workload Deployer, you need to have IBM Workload Deployer configured as a cloud provider. For information on configuring IBM Workload Deployer as a cloud provider, refer to "Configuring IBM Workload Deployer as a provider" on page 11. The steps provided in this topic do not differ based on the operating systems that are associate with the images. For example, the same procedure applies to Linux and AIX images.

Procedure

1. Select the IBM Workload Deployer provider (top-right corner drop-down)
2. Click **Images > Build Images** from the Image Construction and Composition Tool main menu.
3. Click the Import button (

).
4. Select the image that you want to import from the list of images that are displayed in the left pane of the images page. You can search for images by name or keyword.
5. Select the images that you want to add, and click **Add**. The actual image content does not transfer to the Image Construction and Composition Tool, only a copy of the metadata is saved to the Image Construction and Composition Tool.
6. Click **Import**.

Importing a virtual machine into Image Construction and Composition Tool

You can import a virtual machine running on a VMware ESX hypervisor into the Image Construction and Composition Tool. To do this you capture the virtual machine as a base image and import it into the Image Construction and Composition Tool. The VMware ESX cloud provider does not support virtual images in which the virtual machine has snapshots. You must remove the snapshots from your virtual machine before attempting to use the virtual machine in Image Construction and Composition Tool.

About this task

The virtual machine that you are importing must meet the following conditions:
- The base operating system on the virtual machine must be one of the following:
  - Red Hat Enterprise Linux v5.4
  - Red Hat Enterprise Linux v5.5
  - Red Hat Enterprise Linux v6.0
  - Red Hat Enterprise Linux v6.1
  - SUSE Linux Enterprise Server v11.1

- Network Manager must be disabled or uninstalled.
- SELINUX must be set to permissive or disabled.
- VMware tools must be installed on the virtual machine that you are importing.
- SSH must be running and available.
- The virtual machine hard disks must be of SCSI type (IDE disk types are not supported).
- The virtual machine can have one or more hard disks.
- Multiple network interfaces are not supported. The virtual machine must have only one network interface.
- Snapshots must be deleted.
- Delta disks are not supported.
- IBM Workload Deployer does not support ext4 (fourth extended) file systems types. If you want to export the image for IBM Workload Deployer, you cannot use an ext4 file system.

Before beginning this task, you must have created and selected a VMware ESX cloud provider in the Image Construction and Composition Tool. The hypervisor address used in the cloud provider must be the hypervisor on which the virtual machine that you want to import is running. The virtual machine must be started and must be configured with and available on an IP address that Image Construction and Composition Tool can reach on the network.

Attention: Do not use a critical or important virtual machine that you cannot afford to get disrupted or damaged. Depending on the contents of the virtual machine, the Image Construction and Composition Tool might install and reset the virtual machine and change its state to something that you do not want. This could include resetting network settings. After you have imported a virtual machine into Image Construction and Composition Tool, do not restart and import the virtual machine again.

Procedure

1. From the Image Construction and Composition Tool **Welcome** page, click **Images > Build images**.

2. Click ![plus icon] and click the **Create image from running VM** option. Then click **Proceed**.

3. On the **Import Images from Running VM** dialog box, enter the following details:
   - **Name**: enter a name for the virtual machine that you are creating.
   - **Universal ID**: Enter a universal ID for the virtual machine that you are creating. This is a required field.

     Note: The value that you enter for **Universal ID** must be unique when combined with the value that you enter in the **Version** field. For example, you can enter the same value in the **Universal ID** field for two assets, provided that you enter a different value in the **Version** field. These values provide uniqueness to assets across repositories, allowing resources to be identified. The **Version** and **Universal ID** fields are validated according to OSGI conventions. For the **Universal ID** field, you can use alphanumeric characters, an underscore, a dash, or a period. A period is not allowed as the first character. For version, the format is:

<major>.<minor>.<micro>.<qualifer> where *major*, *minor*, and *micro* are all numeric and required, while *qualifier* is optional and can contain the same type of characters as the universal ID.

- **Version**: Enter a version number for the new virtual machine that you are creating.
- **Description**: Enter a description for the new virtual machine that you are creating.
- **IP Address**: Enter the IP address of the virtual machine that you are importing.
- **User ID**: Enter the user name of the user to connect to the virtual machine.
- **Password**: Enter the password for the user.

4. Click **Create**.

Results

A new image is displayed on the user interface, the status of which is `Importing`. The Image Construction and Composition Tool connects to the virtual machine and creates or edits required properties, installs Activation Engine 2.1.1 if required, and then resets and shuts down the virtual machine. The Image Construction and Composition Tool the copies the virtual machine disk files into Image Construction and Composition Tool and updates Image Construction and Composition Tool properties based on the new virtual machine. When this process is finished the status of the new image changes to `Completed` and you can then extend the image. On completion of the import process, the virtual machine remains shut down. You can restart the virtual machine and you can use it independently of Image Construction and Composition Tool.

Building a virtual image

Building a virtual image involves selecting a base image, adding one or more software bundles, and specifying the installation and configuration requirements. To work with virtual images, click the **Build and Manage Images** link on the **Welcome** page.

About this task
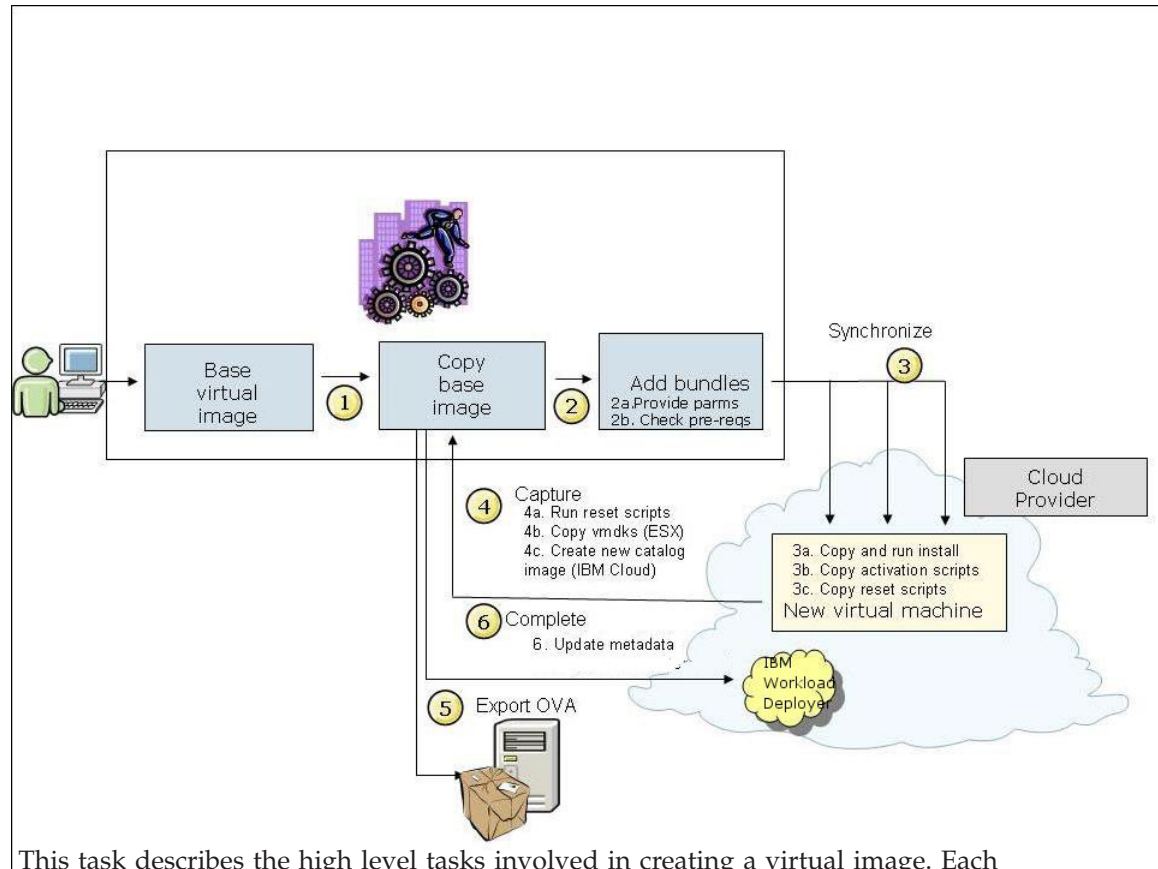
This task describes the high level tasks involved in creating a virtual image. Each of these tasks is described in detail in subsequent topics.

The minimum IBM Workload Deployer user permissions that are required to extend a virtual image are:

- Deploy patterns in the cloud
- Create new catalog content
- Cloud administration - Read only view

To test the resulting image, the following permission is needed in addition to those listed for extending a virtual image:

- Create new patterns

Procedure

The following steps describe the overall process:

1. Select the base operating system virtual image and use the **Extend** command to copy the information about the base virtual image into Image Construction and Composition Tool. The tool does not copy or modify the base OS virtual image during this step.
2. Select the software bundles to add to the new virtual image and specify the installation and deployment parameters for the software bundle. This step creates a list of software to install into the virtual image. The tool does not copy or modify the actual software during this step.
3. Save the virtual image and then synchronize the virtual image. The synchronization process starts your base virtual image in the build

environment, performs the software bundle installations, and then performs
any additional configuration specified in the software bundles. The Image
Construction and Composition Tool starts a deployed VM from the base
operating system virtual image, and during this step, files are copied and
installation tasks run.

4. Manually log on to the deployed VM and verify the correct installation of the
software bundles. After the verification, capture the virtual image.

The capture process updates the metadata for the new virtual image including
any added software bundle configuration parameters. No export is required for
IBM Workload Deployer; the virtual image is stored within IBM Workload
Deployer. The capture process captures the updated disks from the deployed
VM and creates a physical copy of the virtual image disks, updated with your
changes. The Image Construction and Composition Tool stores the new virtual
image in the Image Construction and Composition Tool VM. You can now
optionally export the virtual image.

5. Export the virtual image. This process takes information about the selected
virtual image, the target deployment platform, and the disks to create a
package ready for deployment. The virtual image format is an OVA package.
The OVA package contains the metadata necessary for importing the virtual
image and deploying it. The target host for the OVA must be an SSH enabled
server. The Image Construction and Composition Tool uses the default SSH
port (22) to transmit the virtual image to the target host.

Using a virtual image as a template

You can use an existing virtual image as a template for a new virtual image that
you are creating. To create an image using an existing virtual image as a template,
you select the virtual image that you want to use as the template. Then you select
a base virtual image to extend with the virtual image you used as a template.
When applying a template, Image Construction and Composition Tool focuses on
the products mentioned by the template, regardless of the bundles from which
they come. You do not have to use the same bundles as the bundles in the
template.

About this task

When you are using a template to create a virtual image, the Image Construction
and Composition Tool identifies the valid base virtual image options for your
virtual image rather than listing all of the base virtual image options available
from your cloud provider. You can use an virtual image template to create a virtual
image even if there are no bundles defined in the virtual image that you are using
as a template.

Procedure

1. From the **Cloud Provider** menu, select your cloud provider.
2. From the Image Construction and Composition Tool **Welcome** page, navigate to
the **Images** page by clicking the **Build and Manage Images** link.
3. Click .

Create New Image ⊗

General > Template > Base Image > Summary

Provide general details for new image

Name: Pet Clinic

Universal ID: com.ibm.images.petclinic

Version: 1.1.0

Description:

Previous | Next | Cancel

4. From the **General** section on the **Create New Image** wizard, enter a name, universal ID, version, and description for your virtual image. Then click **Next**.

5. From the **Template** section of the **Create New Image** wizard, search for and select a template that you want to use for the virtual image that you are creating. To choose a template, you select a virtual image that has software products that you want to include in the virtual image that you are creating. Then click **Next**.

6. Optional: select a base virtual image from the completed virtual images of the target cloud provider. If you select a base virtual image, the base virtual image that you select is the base for the new virtual image to be created. If you do not select a base virtual image, Image Construction and Composition Tool checks all base virtual images of the target cloud provider that are compatible with the template virtual image. Then click **Next**.

After you click **Next**, Image Construction and Composition Tool searches for solutions that match the template virtual image that you selected. A solution comprises a base virtual image plus zero or more software bundles. After the search has been completed, Image Construction and Composition Tool displays up to 10 solutions (the closest matching 10 solutions). Each solution comprises one base virtual image and zero or more software bundles. The top-ranking solution is selected by default, but you can browse through all solutions and choose any one. A solution with zero software bundles corresponds to a virtual image that already exists (and therefore does not need to be created), whereas a

solution with at least one software bundle corresponds to a virtual image that Image Construction and Composition Tool needs to create for you (using the name, universal ID, version, and description that you provided).

7. Select the virtual image that you require and click **Done**.

    Note: When IBM SmartCloud Enterprise is configured as your cloud provider, every time that you extend a virtual image, you are provisioning a new deployed VM. Normal IBM SmartCloud Enterprise pricing applies for each new deployed VM that is provisioned.

Results

The virtual image that you created is displayed in the **Images** page.

Adding software bundles to virtual images

You can use a software bundle to add software content to a virtual image.

Procedure

1. From the **Welcome** page, click **Images > Build images**. Then select the virtual image to which you want to add a software bundle.

2. Click [icon] to extend the virtual image. Enter the following details in the **Extend an Image** dialog box:

    Name Enter a name for the new virtual image that you are creating. This is a required field and the name you enter must not exceed 50 characters.

    Universal ID
    Enter a unique identifier for the new virtual image that you creating. This is a required field.

    Version
    Enter a unique version number for the new virtual image that you are creating. This is a required field.

    Description
    Enter a description for the new virtual image that you are creating. This is an optional field.

3. Click [icon] to start configuring the extended virtual image. If you want, you can change the name and description for the new virtual image on the page that is displayed.

4. Click the **Software Bundles** section, and click [Add bundle] .

5. Select the software bundles that you want to include in the virtual image and click **Add**. Use the [up/down arrow icons] icons to specify the order of installation for the software bundles into the virtual image. The Up and Down arrow icons are displayed only for planned software bundles, not for software bundles that are already installed.

6. Click on a software bundle to see the installation and deployment parameters. If the software bundle creator provided configuration options for the software bundle, the first set of options is displayed in the **Install** section. These options represent parameter data that you can provide to the installation process (that is, the location of the product files). The second set of parameters defines

configuration options that are made available during the deployment of the virtual image. Review the values for the **Install Parameters**, **Deploy Parameters**, **Licenses**, and **Products**:

a. Review the installation parameters for the software bundle and determine if you need to make any changes or customization for the particular virtual image that you are creating. Installation parameters are used during virtual image synchronization to install the products in the software bundle. Examples are installation locations or the locations of product binaries. You might need to customize parameters based on the requirements for your software bundle. For example, if you are installing a DB2 software bundle, you might need to specify parameters values for DB2 binaries or the location of a DB2 response file. Generally, you need to make changes to installation parameters to match your specific requirements. If you do not change parameter settings that do not match your specific requirements, there might be errors in the virtual image and errors might occur during run time.

b. Review the deploy parameters for the software bundle and identify if you want to change any parameters or accept the default values. Deploy parameters are used during virtual image deployment, when the deployed VM is created. Deploy parameters are used to customize the product for the environment for which they are being created, for example, an LDAP server host name and port numbers. You can make the deployment parameters editable at deployment time by clicking .

7. When you finish making your changes, click **Save**. After you click **Save**, the state of the virtual image changes to `Out of sync`. As you edit the virtual image, the Image Construction and Composition Tool identifies any missing or invalid input by highlighting any invalid entry or by including a message in the validation status section. When you save, the Image Construction and Composition Tool completes semantic validation to ensure that the virtual image definition is consistent. For example, it validates that the specified software bundle order satisfies any dependency requirements. This validation is performed by the server and is done only when you save your changes. The validation report entries have three severities, `info`, `warning`, or `error`. If your virtual image has any `error` severity validation entries, any synchronize or capture action for the virtual image is likely to fail. Even if the synchronize or capture action succeeds, the resulting virtual image might not be usable.

Synchronizing virtual images

Synchronization is a process where the Image Construction and Composition Tool creates a running deployed VM from the base operating system virtual image that you specified. It then executes the selected software bundles into the environment, copying files and running scripts as defined in the software bundle. The software bundles are executed according to the order specified in the virtual image definition.

About this task

To synchronize a virtual image, you need an extended virtual image with software bundles in a planned state. Any software bundles that have already been executed as part of a synchronization process are not executed again if you synchronize the virtual image.

Procedure

1. From the **Images** page, select the extended virtual image with the planned software bundles that you want to synchronize.

2. Click **Synchronize**. When you click **Synchronize** for a VMware ESX cloud provider image the **Deployment Parameters** wizard is displayed if you have installed software bundles in the virtual image. The wizard prompts you to enter values for the deployment parameters, such as passwords. Default deployment values that were specified during software bundle creation are displayed. Make changes to the deployment parameters, as required. When you click Synchronize for an IBM Workload Deployer cloud provider image, you are prompted to select a cloud group for deployment of the image, and a root password for the image. Deployment Parameters are not allowed or supported for the IBM Workload Deployer cloud provider.

3. As the synchronization process proceeds, any license terms and conditions contained as part of the virtual image are displayed, along with a list of bundles already in the virtual image or to be included in the virtual image. You must accept the terms and conditions for the synchronization to proceed.

   Note: Do not attempt to delete your image while it is synchronizing.

4. Click the circle arrow icon to view the progress of the synchronization process. You can perform the synchronize step multiple times. If you synchronize a virtual image more than once, each synchronization executes any additional planned software bundles. After executing a software bundle, the tool moves that software bundle to the **Installed** section under the **Software** tab for the virtual image.

   If the synchronization process fails, you can edit the list of planned software bundles and resynchronize by clicking **Synchronize** again.

   Note: Resynchronizing the virtual image does not result in another execution of the software bundle. To re-execute a software bundle, you must make a new copy of the virtual image, add the updated software bundle, and synchronize. If there are errors detected by the Image Construction and Composition Tool validation, a dialog box is displayed and prompts you to confirm if you want to proceed with the synchronization. Errors do not prevent synchronization from completing. If errors are reported during a synchronization process, some of these errors might be serious enough to cause a failure of the virtual image. If the synchronization process is successful, the resulting virtual image might not be usable. Investigate any errors reported and make sure that they are not significant.

Results

When the synchronization process starts, a deployed VM is created using the base virtual image. After it has been created, the deployed VM IP address is available to view from the **Virtual System** twistie on the virtual image details panel. You can also download the standard out and standard error files for the installation scripts from the console. To do this, expand the Virtual System twistie and click **Download logs**. For more information about how to download the logs, see "Virtual image resynchronization information for a virtual image synchronization that failed" on page 51. You can also connect to the deployed VM, for example using SSH, to review other logs generated by the bundle.

Capturing virtual images

When a virtual image is in the synchronized state, you can capture it.

About this task

To start a capture process, click **Capture**.

For a synchronized VMware ESX cloud provider image, the capture process captures the updated disks from the deployed VM and creates a new, updated, physical copy of the virtual image disks. The Image Construction and Composition Tool stores the new virtual image in the local repository.

For a synchronized IBM Workload Deployer cloud provider image, the capture process captures the updated disks from the virtual machine and creates a new, updated, physical copy of the virtual image disks into the IBM Workload Deployer catalog. The Image Construction and Composition Tool then updates the metadata for the image from the local repository to reflect changes made to the image in the extend and synchronize phases.

Exporting images

The export step takes the image specification and the virtual machine disks and produces a virtual image ready for use by a deployment tool. The Image Construction and Composition Tool exports the image as an OVA file ready for use in Workload Deployer and Tivoli Provisioning Manager.

About this task

When using an IBM Workload Deployer cloud provider, export is not supported within the Image Construction and Composition Tool. To export an image that has been built using an IBM Workload Deployer cloud provider, you will need to perform this action directly from IBM Workload Deployer.

Procedure

1. Click **Export**.
2. Provide the target location and credentials for the export.

   For VMware ESX cloud provider, you can specify a private key and passphrase or user name and password when specifying the credentials. You can choose an Open Virtualization Format format for your deployment from the **OVA file format** menu. Choose one of the following:

   WebSphere CloudBurst Appliance
   > Click this option if the OVA is for WebSphere CloudBurst Appliance, IBM Workload Deployer or Tivoli Provisioning Manager.

   IBM Workload Deployer 3.1(or higher), VMware VirtualCenter
   > Click this option if you are planning to use the OVA directly in VMware ESX.

   Note: IBM Workload Deployer does not support ext4 (fourth extended) file systems types. If you want to export the image for IBM Workload Deployer, you cannot use an ext4 file system.
   You can monitor the status of the export process in the Image Construction and Composition Tool, and when complete, the image is ready for use.
3. For Workload Deployer, use the Workload Deployer Add image user interface, CLI, or REST API to import the image into the catalog.
4. For Tivoli Provisioning Manager, go to the master images panel. From the action drop-down box, select **Import Master Image** to import the image into the catalog.

5. For VMware, you must deploy through a VirtualCenter and not directly to ESX or ESXi. For example, if you are using the VMware vSphere Client, click **File->Deploy OVF Template** to deploy a VMware OVA.

Creating software bundles

A software bundle contains and describes the software available for use within a virtual image. The software bundle specification for the software includes information that the Image Construction and Composition Tool needs. It includes how to install the software, prerequisites of the software, and parameters available for customizing the software.

The Image Construction and Composition Tool includes sample bundles provided by IBM and provides the ability to define your own bundles.

Creating a software bundle requires specialized knowledge of how the software works and is normally completed by a software specialist. This approach where an expert creates bundles using their advanced and specialized knowledge and embeds their knowledge in the software bundle, making it available for others, is known as separation of concerns. Because of this separation of concerns, the virtual image builder using the software bundle does not require understanding of the specifics of installation, activation, and reset of the software.

Understanding the integration between the Image Construction and Composition Tool and the deployment tools helps in designing your bundles. The software bundle specification uses a process where a set of installation tasks is performed once, by the virtual image builder initially creating the virtual image. A set of configuration tasks is then performed for each virtual image deployment. The recommendation is to define common tasks for all instances or time-intensive tasks, such as, installing large binary files, as part of the software bundle installation so the tasks run only once. Along with the installation tasks, the software bundle provides for different deployment-time configurations of the software. The use of deployment-time configuration parameters reduces the number of virtual images that you require by providing you with a means of customizing the software for each deployment.

Creating a new software bundle

You can create software bundles for software installation on your virtual image. Creating a software bundle is a specialist task and you need expert knowledge of the software that you are including in the software bundle. After you have created the software bundle, other users can access and add the software bundle to virtual images that they are creating.

About this task

For each software bundle, you can specify the following information:

Requirements
Generally, software has specific prerequisites such as the type of operating system and version. You can list these prerequisites in the Requirements section of a software bundle. When you add a software bundle to a virtual image, the Image Construction and Composition Tool performs a check to ensure that prerequisites are met.

Installation tasks
You can define the files to copy and the command to run to perform the

installation. The Image Construction and Composition Tool uses information that you supply to automate the transfer of files and execution of your installation program. You can also define parameters and provide parameter values to your installation scripts. Defining these parameters helps specify information such as the mount points in your virtual image, the target location for the application you are installing, and much more.

Activation tasks

Virtual images provide the ability to capture the state of a system, including preinstalled and preconfigured software. Along with effectively preserving an installed software stack, virtual images preserve also the configuration of that software. Some of the software configuration (for example, IP addresses, host names, user names, passwords, and other parameters) might vary for each deployment of the virtual image.

Manually updating this dynamic configuration information after each activation process is not a viable solution. To effectively address this issue, define tasks that run during the virtual image activation process and make the necessary configuration updates.

The Image Construction and Composition Tool supports necessary configuration updates. You can define activation scripts that are run during the virtual image deployment process. These scripts are used for deployment time reconfiguration of settings based on data such as new IP addresses, host names, and other deployment-time characteristics. You define these activation scripts and any associated parameters, and the tool copies them into the virtual image during the synchronize step.

The base operating system virtual images used with the ESX Cloud Provider must contain the provided IBM Activation Engine.

Note: You must add the Activation Engine to virtual images that you construct for the IBM SmartCloud Enterprise using the "ICON Abstraction for IBM SmartCloud Enterprise" software bundle.
The Image Construction and Composition Tool automatically adds any activation tasks you specify as configuration steps in the activation engine. This means that your activation scripts are performed in an automated fashion as part of the virtual image deployment process. Any activation scripts provided by you runs after the scripts included in the Activation Engine. The activation process follows the Open Virtualization Format (OVF) standard.

Firewall rules

The software bundle author can indicate that particular network ports and port ranges, including their protocol, are to be opened if there is a firewall blocking ports by default.

Reset tasks

The virtual image build process starts the deployed VM and software installed in the virtual image. You can include scripts to clean up and reset any files that you do not want in the final virtual image. For example, you might want to reset passwords, or remove log files or temporary passwords generated during the virtual image creation process before using the virtual image for deployments. 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. When creating a software software bundle, the software bundle creator can provide a reset script, the purpose

of which is to clean up any state that the corresponding software bundle installation might have added to the virtual image.

Bundle validation

The Image Construction and Composition Tool provides validation for software bundle creation. This is useful for problem prevention. The validation executed includes syntactic and semantic validation:

- Syntactic validation checks that all required fields on the user interface have realistic values. It provides you with immediate feedback as you enter values on the user interface.

- Semantic validation ensures that your software bundle as a whole is consistent. This validation is performed by the server and is completed only when you save your changes. Unlike the syntactic user interface validation, the semantic validation displayed on the user interface is not updated as you work, only when you explicitly save your software bundle. The validation report entries have three severities, `info`, `warning`, or `error`.

Procedure

1. From the **Welcome** page, click the **Build and Manage Software Bundles** link to open the **Bundles** page, then click ⊕ to begin creating a software bundle.

2. Enter a name, universal ID, version, and optionally, a description. From the **Storage Location** menu, choose where you want to store the software bundle, either locally or in your IBM® SmartCloud Enterprise account. If you choose to store the software bundle in your IBM® SmartCloud Enterprise account, you can also select a value for the **Community** menu to specify who can access the software bundle. The **Version** and **Universal ID** are required fields. The universal ID must be unique when combined with the value that you enter in the **Version** field. For example, you can enter the same value in the **Universal ID** field for two assets, provided if you enter a different value in the **Version** field. These values provide uniqueness to assets across repositories, allowing resources to be identified. For the **Universal ID** field, you can use alphanumeric characters, an underscore, a dash, or a period. A period is not allowed as the first character. For version, the format is: `<major>.<minor>.<micro>.<qualifer>` where *major*, *minor*, and *micro* are all numeric and required, while *qualifier* is optional and can contain the same types of character as the universal ID.

   You can click the **Uses IBM Installation Manager** check box if you want to enable software bundle creation using IBM Installation Manager. If you click this check box, the **Create a New IM Bundle** dialog box is displayed. Enter the following values in the dialog box, then click **Create**:

   - In the **Installation Manager response file** field, click **Upload response file** and upload an Installation Manager response file. After you upload your response file, the specified destination is displayed in the **Destination** field as-is and read-only.

   - In the **Product install user** field, specify the system user to perform the installation. IBM Image Construction and Composition Tool creates that user on the target system first, then performs installation using that user.

   - Specify how many password-protected repositories are required by the response file.

     Note: For each password-protected Installation Manager repository, you must provide the repository URL, the repository user name, and the repository password on the **Install** tab.

When you click **Create**, a script file is generated to complete the following tasks:

- Disables SELinux (required by IBM Installation Manager).
- (optional) Creates product installation system user.
- Downloads and installs IBM Installation Manager from public repositories.
- Creates a credential file for password-protected repositories.
- Performs product installation using IBM Installation Manager.

3. Add any additional information to the **General** tab. You can enter details for the publisher and the products in the software bundle.

4. To create prerequisites, complete the following:

   a. Click the **Requirements** tab.

   b. Click to add requirements for operating systems, software, or bundles. If you are adding supported operating system requirements, complete the **Supported Operating Systems** section for your software bundle, describing the supported operating system, operating system distribution, architecture, and version requirements. You can leave fields empty if there are no specific requirements.

   c. Complete the **Required Software** section to specify the software requirements for your software bundle. You can enter the name of the software and the version.

   d. Complete the **Required Bundles** section to specify the bundles required for the installation. You can choose from bundles available in the bundles repository. To add bundles, select the software bundle from the list and click **Add**.

| General | Requirements | Install | Configuration | Firewall | Reset |

Manage Bundle Requirements
Requirements for installing the bundle: Required Operating System(s), Product()s and Bundles(s)

▼ **Supported Operating Systems:**

➕ Add Operating System

Expand All | Collapse All

▶ 🗔

▼ **Required Software**

➕ Add Required Software

Expand All | Collapse All

▶ 🗔

▼ **Required Bundles**

➕ Add Required Bundle

No Required Bundle specified.
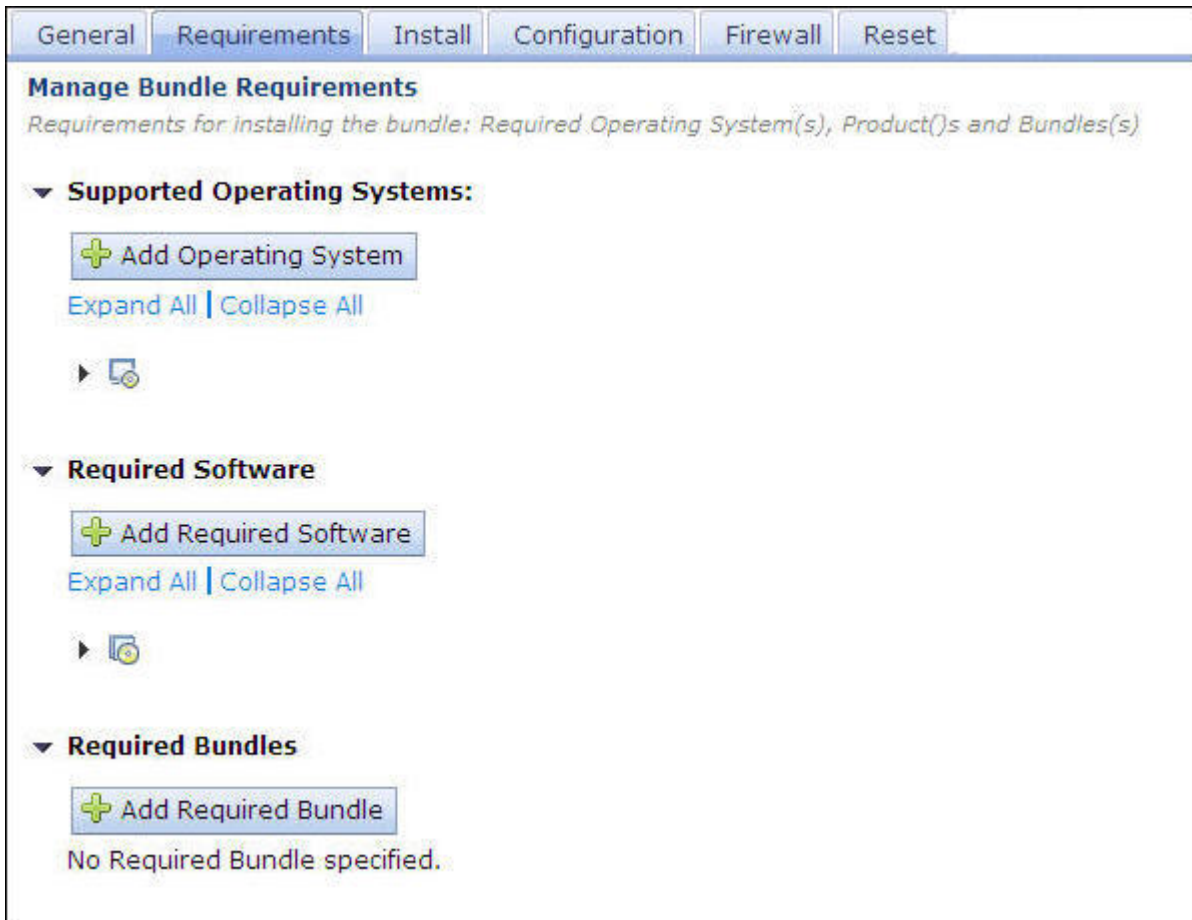
The Image Construction and Composition Tool checks the supported operating systems against the operating system in the base virtual image selected by the virtual image builder. The tool checks the software prerequisite information against other software bundles selected for or installed in the virtual image. To use software prerequisites, ensure that the name provided for the **Name** field matches the name of the software bundle on which there is a dependency.

5. Specify how to install the software content on the **Install** tab, following the steps described in the following table:

*Table 3. Specify the software to install on your instances*

Task	Description
1. Specify files to copy to the targets	You specify the software installation packages that you want to install on the targets from the **Install** tab. You must also include any installation scripts required for the installation: 1. In the **Files to copy** section, click ![plus icon]. 2. Select the files that you want to copy to the target. All of the files that you select are included in the same directory before the **Run Command** runs. You can upload files from your local system or from a remote system. If you are uploading files from your local system, select the **Local** option and click **Browse** to search for and select the file. If you are uploading files from a remote system, for example installation packages, select the **Remote** option and enter the URL for the remote file. Select the **Upload and package with bundle** option if you want the file to be copied into the software bundle. If you do not select the **Upload and package with bundle** option, the file is copied to the virtual image from which the software bundle is installed. 3. Click the **Make executable** option if the file that you are uploading is an executable file. 4. Click **Upload**. The files that you include are displayed as a hyperlink and you or other users can click and download them after you have created the software bundle. **Important:** Make sure that the scripts that you are using to install the software return a zero value to indicate successful installation. The Image Construction and Composition Tool interprets a value that is greater than zero as failure and your virtual image cannot be synchronized. The installation script must check for error conditions relevant to the installation of the software bundle. For errors that you think compromise the software bundle installation, make sure that an exit code value greater than zero is returned, indicating failure. If a script returns no exit code explicitly, the exit code of the last command of the script is implicitly returned. Make sure that the software bundle installation script can handle parameters in the following format: `scriptname -parameter1 <parameter1 value> -parameter2 <parameter2 value>` You must save your installation script in the correct format for your operating system. A sample installation script is available here.
2. Specify the command to install the software	From the **Run Command** menu, select the command that you want to use to install the software. The run command is run from the directory to which it was copied. It can reference entries selected for **Files To Copy** using only the file name, because all files are located in the same directory. Image Construction and Composition Tool creates one directory per software bundle being added to the virtual image and prevents conflicting file names.
3. Specify the user that installs the software	In the **Run as** field, specify the `root` user as the user to install the software. You must run the script as the `root` user. **Note:** Image Construction and Composition Tool does not create or validate the user on the deployed VM. If you do not specify a valid user, this might cause a failure of the software bundle installation.

Table 3. Specify the software to install on your instances (continued)

Task	Description
4. Define the parameters that the installation scripts can access	In the **Arguments** section, define parameters that your installation scripts can access. To define an installation parameter, you define a name, label, and value. The **Name** column defines the name by which your scripts access the parameter, for example, the environment variable name. Use the **Label** column to specify the display name for the parameter in the Image Construction and Composition Tool. The **Value** column represents the default value for the parameter. The Image Construction and Composition Tool can override the default values before the installation process. If you are using IBM Installation Manager for software bundle creation, values such as repoURL, repoUserName, and repoPassword values are displayed in the **Arguments** list.

The following figure shows an example of the installation section of a software bundle:
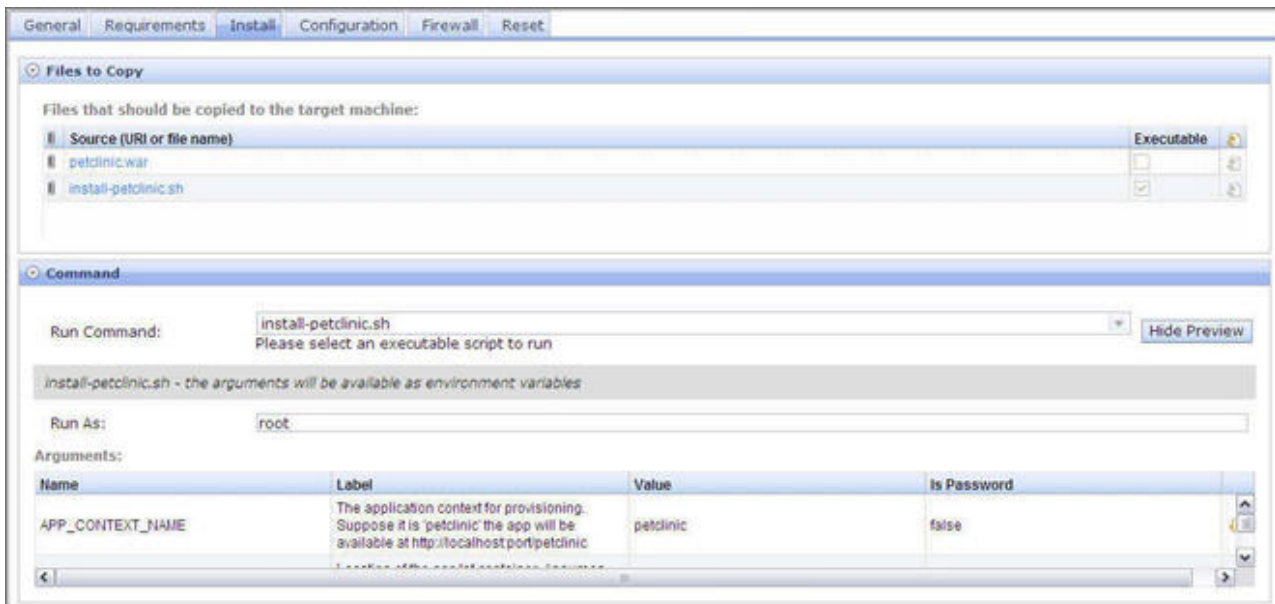
6. To define activation scripts and other artifacts necessary for deployment-time configuration, go to the **Configuration** tab. You use the **Configuration** tab to configure the software in a new instance of a deployed VM. Complete the following steps:

   a. Similar to the **Install** tab, in the **File To Copy** section, define the location of the files that you want to copy or upload them from your local machine and the target location in the virtual image. The files that you include are displayed as a link and you or other users can click and download them after you have created the software bundle.

   b. After defining the necessary files to copy, you define the different configuration steps required for successful activation. First, you define an operation name. The tool automatically constructs a service name based on the operation name. The service name is the name of the operating system service that the Image Construction and Composition Tool automatically creates for you during the synchronization process. The tool places the service into the /etc/init.d directory on the virtual image. The operation name becomes the name of the configuration step in the activation engine.

c. From the **Run Command** menu, select an option for the command to run during the configuration step. You can define parameters to be available to your activation scripts in the **Arguments** section. You can click an existing parameter or create a new parameter for the activation script.

The following figure shows an example of configuration information for a software bundle. When including the software bundle shown in the following figure, a number of events occur during the synchronization process:

a. The Image Construction and Composition Tool copies the `ConfigSample.sh` script to the Activation Engine directory. (Either `/opt/IBM/AE/AS`, or `/opt/ibm/ae/AS` for Activation Engine 2.1).

b. The Image Construction and Composition Tool adds a new operating system service in the `/etc/init.d` directory named `ConfigSample`.

c. The Image Construction and Composition Tool adds a new configuration step named ConfigSample to the list of steps saved in the activation engine metadata. The data for this step includes information about what command to run during the completion of the step. This information comes directly from the command you enter in the **Run Command** field for the software bundle in the Image Construction and Composition Tool.

Details of "Config Sample" operation

Operation name: Config Sample

Service rame: Config_Sample

⊙ Files to Copy

Files that should be copied to the target machine:

Source (URI or file name)	Executable	
ConfigSample.sh	☑	

⊙ Command

Run Command: ConfigSample.sh   ▼   Hide Preview

Run As: root

Arguments:

Name	Label	Value	Is Password	×
config_rsg	Configuration parameter	Activation in action	☐	×

⊙ Dependencies

Services required by this operation:

Service id	×
None defined	

The result of adding the configuration step shown in the previous figure is that during the virtual image deployment process, the new ConfigSample operating system service starts. This service invokes the core components of the IBM Activation Engine, and submits the name of the configuration step to start (in this example, ConfigSample). The activation engine looks up the information for the ConfigSample step, and starts the /opt/IBM/AE/AS/ ConfigSample.sh script that you provided and that the Image Construction and Composition Tool previously copied into the virtual image. The activation engine passes all of the parameters (and their values) listed in the Arguments section as arguments to the script.

The tool makes sure that the OVA produced includes any parameters as part of the product section of the OVF file. The deployment products pass the parameters and their values in an OVF environment document.

If some of your activation scripts access parameters not defined as part of the configuration step they belong to, they can do so by reading from the

/opt/IBM/AE/AP/ovf-env.xml file (note, this file might be in a slightly different directory such as /opt/ibm/ae/AP/ovf-env.xml). Because the Image Construction and Composition Tool automatically integrates your activation scripts into the activation engine, they do not need to understand the specifics of the activation engine or OVF standard.

7. On the **Firewall** tab, specify port numbers that must be open. You can specify fixed single ports and port ranges, or ports or port ranges specified using configuration parameters. Either enter network port numbers, or use the drop-down menu to select configuration parameter values to use, as shown in the following figure:
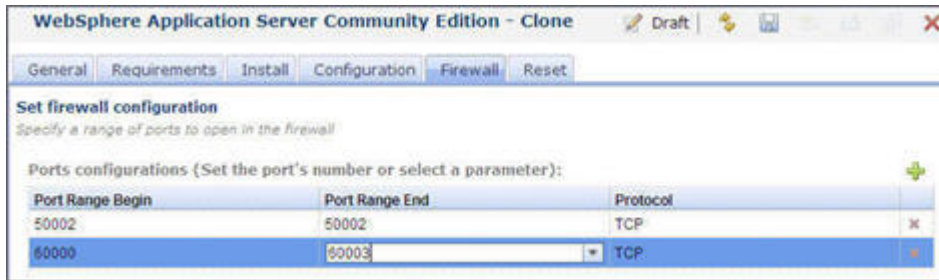
In this release of the Image Construction and Composition Tool, firewall settings have no effect on VMware ESX virtual images.

8. When creating a software bundle, the software bundle author can provide a reset script. The purpose of the reset script is to clean up any state that the corresponding software bundle installation might have added to the virtual image. On the **Reset** tab, you can define reset tasks. To use reset, complete the following tasks:

a. Upload the reset script and related files in the **Files to Copy** section. Even though the Image Construction and Composition Tool allows you to specify the location of the uploaded files in the **Files to Copy** destination folder, Image Construction and Composition Tool always puts them in the directory of the activation framework. The files that you include are displayed as a link and you or other users can click and download them after you have created the software bundle.

b. From the **Run Command** menu, select an option for the name of the script that you want the Image Construction and Composition Tool to use to reset the software bundle.

c. Use the **Run As** field to specify the root user. You must run the script as the root user.

d. Use the **Arguments** section to specify any parameters for the script. The Image Construction and Composition Tool processes the parameters as follows, where *parameter_number* is a value in the **Arguments** field and *value_number* refers to the corresponding value in the **Arguments** field:

   script -parameter1 <parameter1 value> -parameter2 <parameter2 value>

9. Click ⬛ to save your software bundle. When you save, the Image Construction and Composition Tool completes validation to ensure that your software bundle is consistent. Review any errors, warnings, or information messages to determine if you need to make changes or take corrective action.

10. If you want to publish the software bundle, click [icon]. Note that if you publish the software bundle, you can no longer edit the software bundle or make any changes to it, but you can still clone it.

Results

You can view the newly-created software bundle in the asset catalog of your IBM SmartCloud Enterprise account, as follows:

1. Log in to your IBM SmartCloud Enterprise account.
2. Click **Control Panel**.
3. Click **View asset catalog**.
4. Click the **Developer Cloud** filter.
5. Search for the software bundle that you created by entering the name you specified for the software bundle. You can also check for the most recently modified software bundle.

Cloning existing software bundles

You can make a copy of an existing software bundle to create a new derivative software bundle.

About this task

By creating a software bundle using the clone operation, the Image Construction and Composition Tool automatically copies configuration information from the source software bundle to the new software bundle. All the data you provided in the requirements, install, configuration, and reset sections of the source software bundle are cloned in the new software bundle. The Image Construction and Composition Tool puts the new software bundle in draft state so that you can make revisions and changes.

Procedure

1. You can clone any software bundle by selecting it and clicking [icon].
2. Enter a name, version, and universal ID and optionally, a description for your new software bundle:
   a. In the **Name** field, enter a name for the software bundle. This is a required field.
   b. In the **Version** field, enter a unique version number for the software bundle. This is a required field.
   c. In the **Universal ID** field, enter a unique ID for the software bundle that you are creating. This is a required field.

      Note: The **Version** and **Universal ID** fields are validated according to OSGI conventions. For the **Universal ID** field, you can use alphanumeric characters, an underscore, a dash, or a period. A period is not allowed as the first character. For version, the format is:
      `<major>.<minor>.<micro>.<qualifier>` where *major*, *minor*, and *micro* are all numeric and required, while *qualifier* is optional and can contain the same types of character as the universal ID.
   d. Optionally, you can enter a description in the **Description** field.

e. From the **Storage Location** menu, choose whether to store the software bundle on your local system or in the Rational Asset Manager of your IBM® SmartCloud Enterprise account.

f. If you choose to store the software bundle in your IBM® SmartCloud Enterprise account, you can also select a value from the **Community** menu to specify who can access the software bundle.

Uploading large files when creating software bundles

When creating software bundles that use large files for product installation, such as large RPM files or large executable files, do not try to upload these files into the software bundle using the Image Construction and Composition Tool web user interface.

If you are creating software bundles that use large files for product installation, do not include the large files in the software bundle. Instead, access the large files at installation time using the software bundle installation scripts. To do this successfully, you must write the software bundle installation scripts such that they are provided with the location of the binary files at runtime and can copy them to the new deployed VM on which the software bundle is going to be installed. You can do this in either of the following ways:

- Hardcode the location of the external large files in the installation script.
- In the installation script, use parameters for the location of the external large files.

  This option is useful because it allows others who use the software bundle to put the large files in locations that are suitable for their network and environment. In this case, the software bundle script must specify parameters such as LOCATION, the values for which are provided when a user is synchronizing a new virtual image with the software bundle in planned state. The LOCATION value is then used by the software bundle installation script at runtime to find the external large files.

Sharing a software bundle

You can share a software bundle with other systems and users. Sharing a software bundle involves either importing a software bundle from another system or exporting a software bundle to another system. You can also import a software bundle from a local system or export a software bundle to a local system. Sharing software bundles facilitates reuse and allows you to access and use software bundles that already exist and that contain encapsulated expertise of software experts who created the software bundles.

About this task

This task describes how to import an existing software bundle from another system. To import the software bundle, you need to know the name of the remote system and you must have access and credentials to that system.

Note: The procedure for exporting a software bundle is similar. If you want to export a software bundle to another system, select the software bundle and click

. Then enter the required values for the export, which are similar to the values for importing a software bundle. If you are exporting a software bundle to another system, you can authenticate using a private key file and passphrase or using a password.

Procedure

1. From the Image Construction and Composition Tool Welcome page, click **Build and Manage Software Bundles**.

2. To begin importing a software bundle, click [icon] .

3. In the **Import a bundle** dialog box, enter the following:

   a. In the **File location** field, enter the complete path of the file you want to import from the remote system.

   b. In the **User name** field, enter the name of the user to connect to the remote system. The username is optional and is needed only if the remote system requires it.

   c. In the **Password** field, enter the password of the remote system. The password is optional and is needed only if the remote system requires it.

   d. In the **Verify password** field, confirm the password.

   e. From the **Storage Location** menu, choose the location where the software bundle is stored.

   f. If you choose to store the software bundle in your IBM® SmartCloud Enterprise account, you can also select a value for the **Community** menu to specify who can access the software bundle.

4. Click **OK**.

5. In the **Importing <filename>** screen, enter the details for the software bundle that you are importing. If the Universal ID or version of the software bundle that you are importing is not unique on the system on which you are importing the software bundle, you must enter a unique ID or version. For information about the fields that display on the screen, see "Creating a new software bundle" on page 28.

Results

The Image Construction and Composition Tool imports the software bundle to the system and you can use it to create virtual images or you can modify it to suit your requirements.

Chapter 4. Create a sample virtual image

IBM provides a simple software bundle sample that you can use to learn the virtual image building process.

Creating an image using the sample bundle

You can use the sample bundle to produce a VMware virtual image.

Procedure

1. Download the sample bundle as a RAS file from the Download tab on the AlphaWorks web site.

2. Once downloaded, transfer the bundle to the /opt directory of the virtual machine for the Image Construction and Composition Tool. Import the sample by accessing the Image Construction and Composition Tool web interface and then clicking on the **Bundles** link. On the bundles page, click **Import** to import the sample bundle. The following figure shows the import of the ICON_Sample_Bundle.ras bundle from the /opt directory.
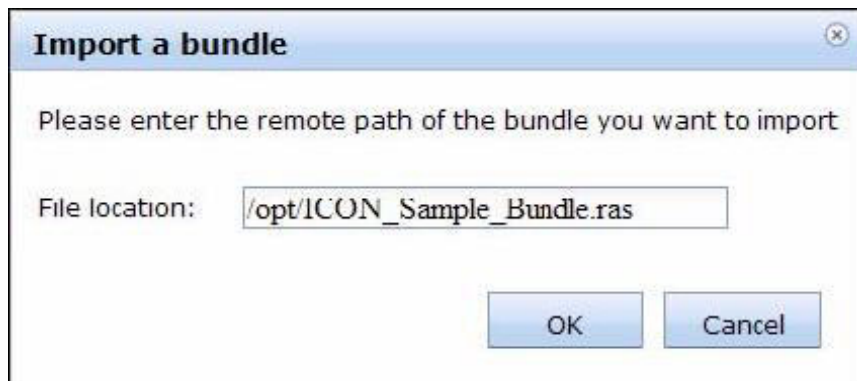
3. When the import process completes, you can view the bundle's definition. First, click the **Install** tab. The installation configuration specifies an install.sh script to copy to the /tmp directory of the virtual machine during the synchronization process. The following figure shows the installation definition for the sample bundle.
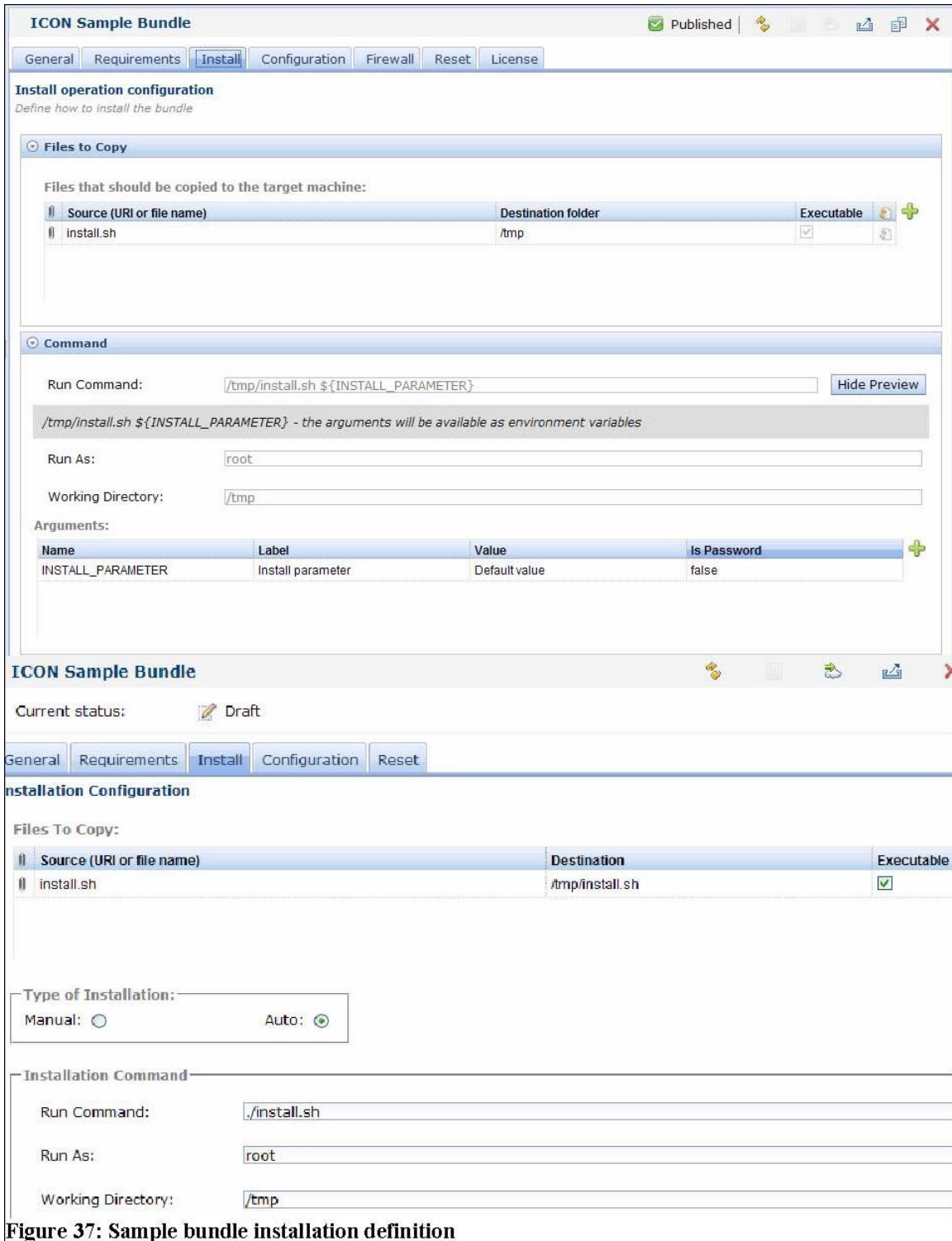
Figure 37: Sample bundle installation definition

4. Now, click on the **Configuration** tab. Here you will see the bundle contains a
   ConfigSample.sh script file. The configuration definition indicates the Image
   Construction and Composition Tool should copy the script to the
   ${ACTIVATION_DIR} directory. This directory houses the deploy-time
   configuration scripts that are part of the activation engine within the virtual
   image. Depending on the version of the IBM activation engine you are using in
   your image, this may be the /opt/IBM/AE/AS directory or the /opt/ibm/ae/AS

directory. The configuration information for the bundle also defines a new configuration step and operating system service that will invoke the ConfigSample.sh script upon the activation of the image. The following figure shows this configuration information.

ICON Sample Bundle ✅ Published

General | Requirements | Install | **Configuration** | Firewall | Reset | License

Deploy-time configuration
Define how to configure the bundle in a new instance of a virtual machine

Config Operations

ConfigSample

Details of "ConfigSample" operation

Operation name: ConfigSample

Service name: ConfigSample

⊙ **Files to Copy**

Files that should be copied to the target machine prior to install:

	Source (URI or file name)	Destination folder	Executable	
	ConfigSample.sh	${ACTIVATION_DIR}	☑	

⊙ **Command**

Run Command: ${ACTIVATION_DIR}/ConfigSample.sh   [Hide Preview]

${ACTIVATION_DIR}/ConfigSample.sh -config_msg ${Configuration parameter}

Run As: root

Arguments:

Name	Label	Value	Is Password	
config_msg	Configuration parameter	Activation in action	false	

ICON Sample Bundle

Current status: 📝 Draft

General | Requirements | Install | **Configuration** | Reset

Deploy time configuration

Files To Copy:

	Source (URI or file name)	Destination
	ConfigSample.sh	/opt/IBM/AE/AS/ConfigSample.sh

Configuration Steps:

Configuration Step Name	Service Name
ConfigSample	activation.ConfigSample

Details of configuration step: ConfigSample

┌ Operation Command ─

Run Command: /opt/IBM/AE/AS/ConfigSample.sh

Run As: root

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Working Directory: /

Arguments:

In addition to providing the activation script and defining a new configuration step, the bundle definition includes the *config_msg* parameter. The ConfigSample.sh script will print the value of this parameter to a log file during the activation process.

5. You can use this bundle to create a custom image. Click the **Images** link on the top menu bar, and then select the desired base image. Click **Extend** on the toolbar in the image details view, and then click the **Software** tab. Click the **Add** icon and add the *ICON Sample Bundle* to the image. After adding the bundle to the image, click **Save** to save the changes. You can now synchronize the image by clicking **Synchronize**. If you selected an ESX cloud provider, you will provide a *password* for the root user on the virtual machine created during the synchronization process. When the synchronization process completes, the image status should be Synchronized as shown in the following figure:
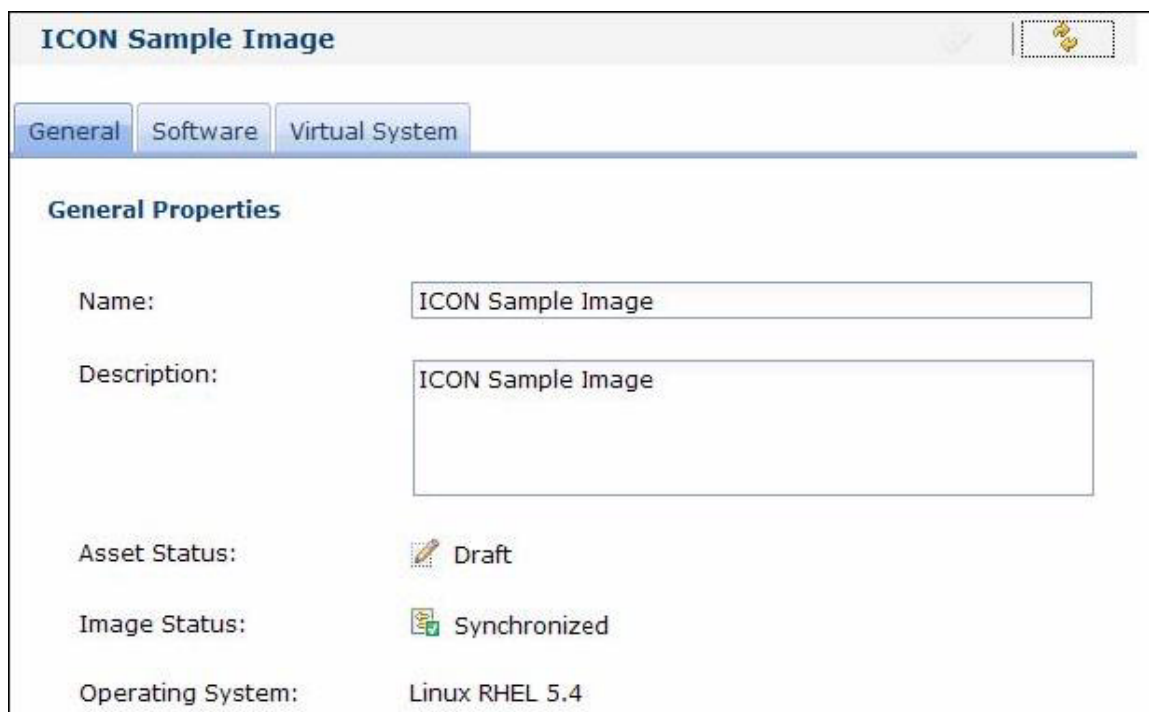
6. Click on the **Virtual System** link to determine the IP address of your virtual machine. Login as the *root* user using the password you provided in the synchronization dialog. Change directories to the /tmp directory and enter ls. An example is shown in the following figure:

7. You should see the install.sh script defined in the bundle as well as a sample_install.log file as shown in the following figure. When the Image Construction and Composition Tool invokes the install.sh script, the install script creates the sample_install.log file. In addition to the install script, the synchronization process also copies the ConfigSample.sh script to the

/opt/IBM/AE/AS directory as shown in the following figure:

```
-bash-3.2# cd /opt/IBM/AE/AS
-bash-3.2# ls
ConfigHV.sh               DeleteHealthPolicies.py
ConfigLicense.sh          federate.pl
ConfigLocale.sh           installAppService.sh
ConfigNET.pl              installOSService.sh
ConfigNET.sh              installService.sh
ConfigNetworkPort.py      ntp.conf.org
ConfigNTP.sh              startVirtualImageApplicationServices.sh
ConfigPWD2.sh             startVirtualImageServices.sh
ConfigPWD.sh              stopVirtualImageApplicationServices.sh
ConfigSample.sh           stopVirtualImageServices.sh
ConfigSSH.sh              unfederate.pl
ConfigSystem.py           UpdateOdrPortNumbers.py
ConfigVNC.sh              updateVirtualHost.jacl
createODR.jacl            validateParams.sh
createWebServer.jacl
```

8. After verifying the installation process was successful, navigate back to the image in the Image Construction and Composition Tool and click **Capture**. You can monitor the status of the capture process, and when it completes the images status updates to *Deployable*. Once in this state, you can export the image as an OVA file by first clicking **Export**. Provide the host of an SSH-enabled server, as well as the path you want to store the OVA and login credentials for the server. The following figure shows the image export dialog:

Export image as OVA   ⊗

To what location should the image be exported?

Remote host:	cbvm-111.rtp.raleigh.ibm.com
Remote path:	/ovas/sample
User name:	root
Password:	••••••••
Verify password:	••••••••

OK   Cancel

9. When the image export process completes, you should see the OVA file on the specified server at the specified path as shown in the following figure:

```
cbvm-111:/ovas/sample # ls -l
total 2148584
-rw-rw-rw- 1 root root 2197995520 Aug 18 21:33 ICON_Sample_Image.ova
cbvm-111:/ovas/sample #
```

Using the sample image in Workload Deployer Appliance

You can import the OVA of the sample image into a Workload Deployer Appliance catalog.

Procedure

1. Login to an appliance, navigate to the virtual images section of the catalog and click the **Add** icon. Provide the location of the OVA and the login credentials for the server hosting the file as shown in the following figure:

Enter the remote path of the virtual image you want to import.

* OVA file location: cbvm-111.rtp.raleigh.ibm.com:/ovas/sample

User name: root

Password: ••••••••

Verify password: ••••••••

OK   Cancel

2. After the image import process completes, accept any licenses associated with the image. You should see a part in the image that matches the name of the bundle defined in the Image Construction and Composition Tool. In this case, the part name is *ICON Sample Bundle* as shown in the following figure:

ICON Sample Image

Description:	Redhat Enterprise Linux Server
Created on:	Aug 18, 2010 9:44:09 PM
Current status:	Read-only
Updated on:	Aug 18, 2010 11:04:47 PM
License agreement:	Accepted [view...]
Hypervisor type:	ESX
Operating system:	LINUX (RHEL5.4)
Version:	1.0
Image reference number:	default
Product IDs (e.g., 5724-X89):	Click to add
Contains parts:	ICON Sample Bundle

3. You can use this image to create new Workload Deployer patterns. Click on the **Patterns** link, and then click on the **Add** icon to add a new pattern. Provide a `name` and `description` for your new pattern as shown in the following figure:

Describe the pattern you want to add.

*	Name:	ICON Sample Pattern
	Description:	Pattern containing ICON Sample Bundle Par

OK   Cancel

4. Click **OK**, and then click the **Edit** icon to enter the pattern editor. In the *Parts* listing on the left, you should see the part for the image imported from the Image Construction and Composition Tool as shown in the following figure:

Pattern Editor

Search...

▽ **Parts (44/44)**

7.0.0.2, ESX, LINUX (SLES11)

⊙ Extendable nodes
WebSphere Process Server 7.0.0.2 for 32 bit SUSE 11
7.0.0.2, ESX, LINUX (SLES11)

⊙ Full function control node
WebSphere Process Server 7.0.0.2 for 32 bit SUSE 11
7.0.0.2, ESX, LINUX (SLES11)

⊟ IBM HTTP servers
WAS with WXS client
1.0.0, ESX, RedHat Enterprise Linux 5 (RedHat Enterprise Linux 5)

⊟ IBM HTTP servers
WebSphere Application Server 7.0.0.11
7.0.0.11, ESX, SLES 11 (Novell SUSE Linux Enterprise Server 11)

⊟ IBM HTTP servers
WebSphere Application Server 7.0.0.11
7.0.0.11, ESX, RedHat Enterprise Linux 5 (RedHat Enterprise Linux 5)

⊟ IBM HTTP servers
WebSphere Application Server 7.0.0.11 with Intelligent Management Pack 6.1.1.2
7.0.0.11, ESX, SLES 11 (Novell SUSE Linux Enterprise Server 11)

⊟ IBM HTTP servers
WebSphere Portal HV
6.1.5, ESX, LINUX (SLES10SP2)

⊙ ICON Sample Bundle
ICON Sample Image
1.0, ESX, LINUX (RHEL5.4)

5. Drag and drop this part onto the pattern canvas, and then click the **Done editing** link in the top right corner of the page. On the pattern page, click the **Deploy** icon to initiate the deployment process. Provide a unique name for the new virtual system, select a cloud group for deployment, and then configure the new part in the pattern. The following figure shows the configuration panel for the ICON Sample Bundle part in the pattern.

Fill in the required values for this part of the pattern.

Name: ICONSampleBundle

*   Virtual CPUs: 1

*   Memory size (MB):   2048

*   Password (root):   ••••••••

*   Verify password: ••••••••

*   Password (virtuser):   ••••••••

*   Verify password: ••••••••

*   Configuration message: Activation task invoked!

     OK   Cancel

6. Besides the virtual machine settings and passwords, notice the *Configuration message* field. Workload Deployerexposes this parameter because it was a parameter in the *Configuration* definition of the Image Construction and Composition Tool bundle that produced this part. Click **OK** and then click **OK** again to begin the deployment process.

7. When the deployment completes, login to the virtual machine created by Workload Deployer. Navigate to the /opt/IBM/AE/AR directory and verify the contents of the ConfigSample.out file as shown in the following figure. The Image Construction and Composition Tool added the ConfigSample.sh script as part of the activation engine. As such, the script runs during the image deployment process. In this case, the script simply logs the value of the *Configuration parameter* deployment parameter to the ConfigSample.out file as shown in the following figure:

```
-bash-3.2# cd /opt/IBM/AE/AR
-bash-3.2# ls
ConfigLocale.err   ConfigNTP.out        ConfigSample.err   ConfigVNC.out
ConfigLocale.out   ConfigPWD_ROOT.err   ConfigSample.out   License.err
ConfigNET.err      ConfigPWD_ROOT.out   ConfigSSH.err      License.out
ConfigNET.out      ConfigPWD_USER.err   ConfigSSH.out      ovf-env.ar
ConfigNTP.err      ConfigPWD_USER.out   ConfigVNC.err      ovf-env.done
-bash-3.2# cat ConfigSample.out
Running configuration task::config_msg is Activation task invoked!
```

Chapter 5. Troubleshooting issues with Image Construction and Composition Tool

Use the information and content included here to understand how issues occur during Image Construction and Composition Tool processes.

Server log files for troubleshooting Image Construction and Composition Tool issues

You might need to check the Image Construction and Composition Tool server log files occasionally to determine where problems have occurred.

For any Image Construction and Composition Tool process

To access the Image Construction and Composition Tool server log files, click the **Download logs** link from the **Welcome** screen. Save the ZIP file to a convenient location, then unzip the file and examine the log files. The ZIP file contains the following server log files:

- The `trace.log` file is the most recent trace file.
- The `error.log` file is the most recent error file.

You can also access the log files by clicking **Administer > Download logs**.

Virtual image resynchronization information for a virtual image synchronization that failed

If you are synchronizing a virtual image and the deployed VM for the virtual image is created, but the synchronization fails, you can download log files for the synchronization. If the synchronization fails before the deployed VM is created, no log files are available.

About this task

If the synchronization failed after the deployed VM was created, but before the Image Construction and Composition Tool attempts to install bundles, the following log files are available:

- `error.log`
- `trace.log`

If the synchronization fails during or after bundle installation, the following log files are available:

- `error.log`
- `trace.log`
- `err.log`
- `out.log`

The `err.log` and `out.log` files are the log files for the bundle installation during a synchronization.

To download the log files, complete the following steps.

Procedure

1. From the **Images** screen, expand the **Virtual System** section of the image that you were synchronizing.
2. Click **Download logs**. The ZIP file containing the log files is downloaded.

Universal ID and version must be unique

The universal ID for every asset must be unique. If you clone an image and you do not enter a unique universal ID and version number combination for the newly cloned image, you receive an error message.

Symptoms

You are cloning an image and you receive the following error message:

```
Cannot create the image: Error: Unable to load /resources/images?cloudProviderId=2 status:409
```

If you receive this error message, the universal ID and version for the newly cloned image are not unique.

Causes

The universal ID for the new image that you are cloning must be unique.

Resolving the problem

Enter a unique universal ID for the cloned asset.

Time lag when deleting virtual images

If you delete a virtual image from Image Construction and Composition Tool, it might take some time for the virtual image to be completely removed from view in the user interface.

Symptoms

A virtual image that you deleted is still displayed in a view in the user interface. You can view and select the virtual image for some time until the deletion process has completed.

Causes

There is a user interface refresh issue that causes a deleted virtual image to remain in view until the deletion process has completed. The deletion process can take some time to complete.

Resolving the problem

Wait until the deletion process has completed and refresh your browser.

Note: The final time that you refresh the resource and then select the virtual image, you receive an `unable to load resource` error message because the virtual image has been deleted at this point. After this, Image Construction and Composition Tool automatically refreshes itself.

Use the current file link does not work correctly

The **Cancel - use the current file** on the **Files to Copy** section on the **Install** or **Config** tab for a software bundle might not work correctly. If you upload a file to the **Files to Copy** section on the **Install** or **Config** tab for a software bundle, save that file and edit it. After saving and editing the file, you then select a new file to upload, and then change your mind and click on **Cancel - use the current file**, the file is still updated with the new file even though you tried to revert to the previous file. The IBM Image Construction and Composition Tool user interface does not revert to the previous file correctly.

Symptoms

The **Cancel - use the current file** button on the **Files to Copy** section on the **Install** or **Config** tab for a software bundle might not update files correctly.
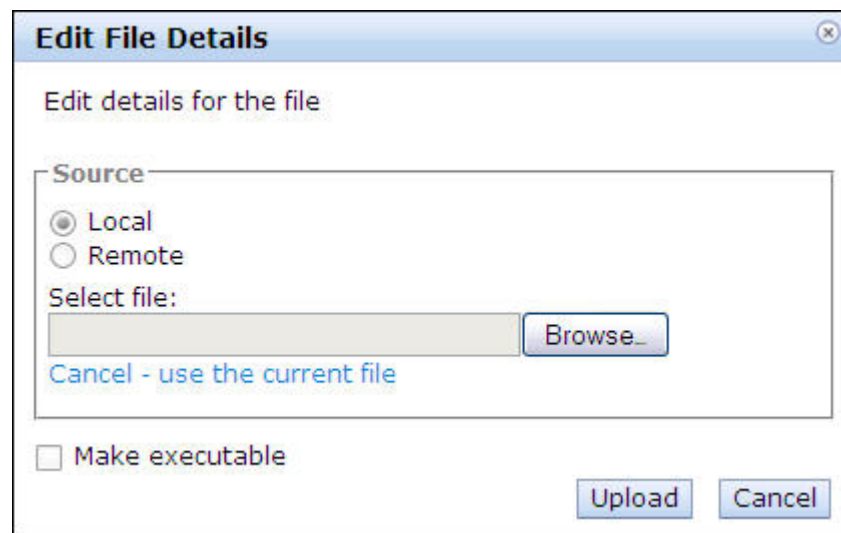
Resolving the problem

Use the **Cancel** button if the file is not being updated correctly. If you click the **OK** button and see wrong file, refresh the software bundle to omit all the changes.

Image Construction and Composition Tool installation is not successful

Before running the IBM Installation Manager installer to install Image Construction and Composition Tool on a system, make sure that port number 443 is not in use by another application. If port number 443 is not open and available, Image Construction and Composition Tool fails to start after you have completed the installation.

Symptoms

The Image Construction and Composition Tool fails to start and a ZSO error occurs.

Causes

Port 443 is already in use by some other application.

Diagnosing the problem

You receive an error message similar to the following:

```
CWPZC8028E: An unknown ZSO error occurred.
Launching of the ZSO failed with return code -1
CWPZT0601E: Error: Command start failed
```

This error message is displayed in the Installation Manager log file, which by default is /var/ibm/InstallationManager/logs/ant/<date_time>.log where date_time is something similar to 20111024_1201.

Resolving the problem

Before running the installer to install Image Construction and Composition Tool, make sure that port number 443 is open and available on the system on which you are installing the application.

VMware ESX error if you use virtual machines with snapshots

If you use virtual machines with snapshots in VMware ESX, you receive an error in the trace log file. VMware ESX does not support images where the virtual machine has snapshots.

Symptoms

You receive an error message in the trace log file that contains output similar to the following:

```
java.io.IOException: disk conversion of /drouter/ramdisk2/mnt/
raid-volume/raid0/templates/2/base-rhel55-64-000001-delta.vmdk
from monolithicFlat to streamOptimized failed!
```

In the preceding example, the -delta.vmdk syntax indicates that there are snapshots in the virtual machine.

Causes

The VMware ESX cloud provider does not support images in which the virtual machine has snapshots.

Diagnosing the problem

You receive an error message similar to the following in the trace.log file:

```
[2011-10-17 17:50:52:509 EDT] 00001198 IconImageExpo
I com.ibm.cloud.icn.execution.engine.IconImageExporter
compressMonolithicFlatToStreamOptimizedDisk About to
convert monolithicFlat router/ramdisk2/mnt/raid-volume
/raid0/templates/2/base-rhel55-64-000001-delta.vmdk to
streamOptimized disk /drouter/ramdisk2/mnt/raid-volume
/raid0/tmp/exportedImages/a0e04b2c-54c6-4b84cebed0e2a37
/base-rhel55-64-000001-delta.vmdk[2011-10-17
17:50:52:691 EDT] 00001198 IconImageExpo E com.ibm.cloud
.icn.execution.engine.IconImageExporter compressMonolith
icFlatToStreamOptimizedDisk Disk conversion failed for
/droudisk2/mnt/raid-volume/raid0/templates/2/base-rhel55
-64-000001-delta.vmdk exited with 1[2011-10-17
17:50:52:693 EDT] 00001198 IconImageExpo E com.ibm.cloud
.icn.execution.engine.IconImageExporter compressMonolith
icFlatToStreamOptimizedDisk disk conversion of /drouter/
ramdt/raid-volume/raid0/templates/2/base-rhel55-64-000001
```

```
-delta.vmdk failed[2011-10-17 17:50:52:693 EDT]
00001198 IconImageExpo E com.ibm.cloud.icn.execution.eng
ine.IconImageExporter convertToStreamOptimized Unable to
 convert file /drouter/ramdisk2/mnt/raid-vaid0/templates
/2/base-rhel55-64-000001-delta.vmdk from monolithicFlat
to streamOptimized.java.io.IOException: disk conv
ersion of /drouter/ramdisk2/mnt/raid-volume/raid0/templat
es/2/base-rhel55-64-000001-delta.vmdk from monolithicFlat
 to streamOptimized failed!at com.ibm.clou
d.icn.execution.engine.IconImageExporter.compressMonolith
icFlatToStreamOptimizedDisk(IconImageExporter.java:582)>
at com.ibm.cloud.icn.execution.engine.IconImageE
xporter.convertToStreamOptimized(IconImageExporter.java:
413)at com.ibm.cloud.icn.execution.engine
.IconImageExporter.run(IconImageExporter.java:238)
at java.lang.Thread.run(Thread.java:736)
```

Resolving the problem

To avoid this problem, do not use virtual machines that have snapshots. Remove
the snapshots from your virtual machine before using the virtual machine in IBM
Image Construction and Composition Tool.

Virtual Image capture fails

If your virtual image capture fails, you might need to delete the failed virtual
image and then recreate the virtual image. Then complete the capture process
again.

Symptoms

Your virtual image capture fails and you receive the following error message:

```
Capture failed Failure to initiate capture. There are insufficient resources to capture the image.
Check your private instance quota. Image cannot be saved.
```

Resolving the problem

Delete the failed virtual image and recreate the virtual image. Then complete the
capture process again.

Synchronization fails for a virtual image imported from a running virtual machine

If you import a virtual image from a running virtual machine, the virtual image
does not synchronize if Network Manager is running on the virtual machine.
Network Manager must be disabled on the virtual machine.

Symptoms

The virtual image does not synchronize.

Causes

Network Manager has not been disabled on the virtual machine.

Resolving the problem

Disable Network Manager on the virtual machine and import the virtual image again.

To disable network manager, complete a procedure similar to the following:

1. From the command line, run the following:

   ```
   service NetworkManager stop
   ```

2. Run the following command:

   ```
   chkconfig NetworkManager off
   ```

3. Ensure that the interfaces are not controlled by Network Manager by editing the following items in the /etc/sysconfig/network-scripts/ifcfg-eth0 file:

   ```
   NM_controlled = no
   ```

   ```
   and
   ONBOOT=yes
   ```

After you have disabled Network Manager on the virtual machine, try to import and synchronize the virtual image again.

Files are not replaced correctly

If you add a file to the **Files to Copy** section on the **Install**, **Config**, or **Rest** tab of a software bundle and later replace that file, the content of the file is not updated, even though the name of the file is updated correctly in the Image Construction and Composition Tool user interface. The content is updated correctly after you save the software bundle.

Symptoms

If you replace the file in the **Files to Copy** section on the **Install**, **Config**, or **Rest**tab of a software bundle, the content of the file is not updated unless you save the software bundle. However, the name of the new file is displayed in the Image Construction and Composition Tool user interface.

Resolving the problem

Save the software bundle before clicking on the file to download the contents.

Limitation when deleting images that are synchronizing

There is currently a limitation in Image Construction and Composition Tool that you cannot successfully delete an image while it is synchronizing. Do not attempt to delete images while they are in the process of synchronizing.

Symptoms

Your image is synchronizing and the synchronization is not proceeding smoothly.

Resolving the problem

Do not delete an image while it is synchronizing. Wait until the synchronization process has completed and then you can delete it.

Virtual image synchronization fails

This section lists common reasons why your virtual image synchronization might fail.

Virtual image synchronization fails because of return code value

Virtual image synchronization fails if you use a script for the bundle installation that produces a return code value that is greater than zero. When you specify a script for bundle installation, the script must produce a zero value to indicate successful installation. The Image Construction and Composition Tool checks the return value of the installation scripts used in bundles. When the Image Construction and Composition Tool receives a zero return code, this indicates success and the synchronization process can proceed.

Symptoms

Virtual image synchronization fails.

Causes

The script used to install software in a bundle does not return a zero value.

Resolving the problem

Make sure that the scripts that you are using to install the software return a zero value to indicate successful installation. The Image Construction and Composition Tool interprets a value greater than zero as failure and your virtual image cannot be synchronized. The installation script checks for error conditions relevant to the installation of the bundle. For errors that you think compromise the bundle installation, an exit code greater than zero must be returned, indicating failure. If a script returns no exit code explicitly, the exit code of the last command of the script is implicitly returned. Make sure that the bundle installation script can handle parameters passed in the following format:

```
scriptname -parameter1 <parameter1 value> -parameter2 <parameter2 value>
```

A sample installation script is as follows:

```
#!/bin/sh
#
# Licensed Materials - Property of IBM
# (C) Copyright IBM Corp.  2011
# All Rights Reserved
# US Government Users Restricted Rights -Use, duplication or
# disclosure restricted by GSA ADP Schedule Contract with IBM Corp.
#
# ----------------------------------------------------------------
#
# Description:
#   Sample install script for an ICON bundle
#
#

function usage ()
{
 echo ""
 echo " Usage :"
 echo "     installBundleSample.sh -parm1 \"parm1value\" -parm2 \"parm2value\""
 echo ""
```

```
 exit 1
}

echo "$0: === Starting Install of Bundle Sample === "
echo

echo "$0:     Arguments are: $* "
echo

#Init
MY_PARM1="Default parm1 value"
MY_PARM2="Default parm2 value"

echo "$0:     Parsing Arguments "
echo
#Read arguments
while [ $# -ne 0 ]
do
    case $1 in
    -parm1*)
       MY_PARM1=$2
       ;;
    -parm2*)
       MY_PARM2=$2
       ;;
    *)
       ;;
esac
shift 1
done

# Now perform the work and actually do the install stuff - check the return code
echo "$0:     About to do the real work..."
echo parm1 is "$MY_PARM1"      parm2 is "$MY_PARM2"
if [ $? -gt 0 ]; then
    echo "$0: echo $MY_PARM1 $MY_PARM2 failed" >&2
    exit 1
fi


# finish up and return zero to indicate everything went ok
#    (non-zero return code signifies an error)
echo " "
echo "$0: Done."
exit 0
```

Virtual image synchronization fails if virtual image name is longer than 50 characters

Your virtual image synchronization fails if the name you specified for your image exceeds 50 characters. 50 characters is the limit for virtual image names.

Symptoms

Virtual image synchronization fails.

Causes

The virtual image name must not exceed 50 characters.

Resolving the problem

When you are creating your virtual images, use names that do not exceed 50 characters.

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