Hewlett Packard
Enterprise

HPE Synergy Image Streamer Primer

A technical reference guide

Technical Guide

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About this document

Abstract

This document provides an introduction and overview of the HPE Synergy Image Streamer solution. It serves as a technical guide to get the reader familiar with the fundamental topics and basic concepts of the HPE Synergy solution with Image Steamer. For detail on Image Streamer usage and technical information please see the HPE Synergy Image Streamer User Guide.

Note to the reader

It is recommended that the reader already be familiar with HPE Synergy management architecture and the HPE Synergy Composer powered by HPE OneView. Certain concepts explained in this document assume the reader possesses basic knowledge of Synergy hardware, configuration constructs and networking. For further information regarding the HPE Synergy solution see www.hpe.com/composable. For further information regarding HPE OneView see www.hpe.com/info/oneview.

Synergy Image Streamer – An Introduction

Image Streamer is a management appliance option in the HPE Synergy solution that is used to deploy stateless compute nodes within the Synergy environment. The Image Streamer solution offers a stateless deployment experience for bare-metal compute nodes by managing and maintaining the software state (Operating System and settings) separate from the physical state (firmware, BIOS settings, etc.). Boot volumes for the compute nodes are hosted and maintained on the Image Streamer appliance as iSCSI boot volumes. Image Streamer uses scripts and build plans to generalize and personalize the OS boot volumes during capture and deployment.

Architecture

This section describes the architecture of the Image Streamer appliance as well as how it fits into the broader HPE Synergy Management architecture.

The Image Streamer appliance – under the hood

The Image Streamer appliance is a physical appliance comprised of a core Linux based OS, Image Streamer software, and repositories for OS volumes and images. All of these components reside on an 800GB SSD drive.

The core OS provides low level services for the Image Streamer solution, such as cluster management, networking, database, and web services.

Image Streamer software is made up of resource managers and the user interface. The resource managers include artifact management, deployment management, and storage management. The resource managers provide the logic for managing Image Streamer resources and controlling the interaction between these resources as well as the interaction with the HPE Synergy Composer appliance. The user interface provides the mechanism with which the deployment administrators manage Image Streamer resources. The user interface is comprised of both the graphical interface as well as an application programming interface (API).

Image Streamer's SSD drive contains two partitions. The first partition stores binaries and the Image Streamer database. The second provides the repository where OS volumes and images are stored. HPE Synergy compute nodes boot from OS volumes stored in this repository.

Image Streamer in the Synergy management architecture

Physical networking

As another management appliance in the HPE Synergy Solution, the Image Streamer is installed in one of the management device bays inside of the HPE Synergy frame. The protruding device in figure 1 shows the bottom management device bay.

Figure 1: Bottom management device bay of a Synergy frame

The frame link modules in the back of the HPE Synergy frame provide the external network uplinks for both the Image Streamer appliance and the Composer appliance. For Image Streamer, these uplinks will provide connectivity to a deployment network. For the Composer, they will provide connectivity to a management network.

When an Image Streamer is identified in a frame, the uplink ports on both frame link modules in that frame are assigned to Image Streamer and dedicated to a deployment network. The Image Streamer deployment network can only communicate through the frame link modules that exist within the same frame. This provides the shortest communication path, and the consumption of both uplink ports insures redundancy for the compute node boot volumes.

In constrast, the HPE Synergy Composer appliance is capable of communicating out of any frame link uplink port within the management ring provided that it has not been consumed by an Image Streamer appliance. The Image Streamer management interface is tightly integrated with the Composer allowing management access to Image Streamer through the same communication path used to access the Composer.

The following image provides a visual explanation of this for a three frame HPE Synergy configuration.

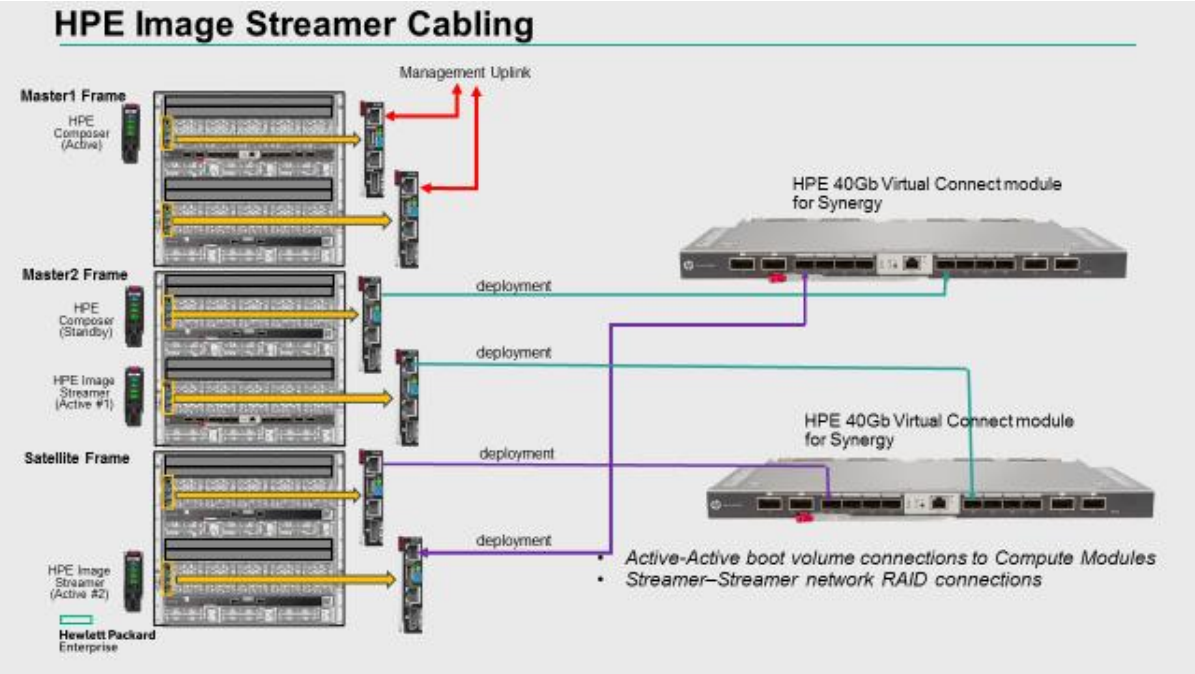

Figure 2*:* Synergy 3 Frame logical enclosure physical cabling with Image Streamer

Notice the middle frame in the figure 2. Both ports from the frame link modules that appear on the right of the frame are providing Image Streamer connection to the deployment network. The standby Composer in the middle frame communicates through the internal frame link network then out of one of the frame link modules in the top frame to the external management network provided by an upstream switch.

The deployment network, you will notice from the figure above, does not connect through an upstream switch. The Image Streamer is directly connected outside of the frame to the Virtual Connect modules for HPE Synergy. The Virtual Connect modules are installed in the frames and provide downlink connectivity to the Synergy compute modules. This physical path from Image Streamer to the compute nodes provides the compute nodes connectivity to the images and OS volumes presented throught Image Streamer. Expect more on that process in a later section.

Logical Networking

In the previous section there was reference to two networks, management and deployment. This section goes into more detail on each.

The management network provides administrative access to the HPE OneView interace of the Composer as well as the administrative user interface of Image Streamer. From the Image Streamer standpoint, access to the management network is configured as active/standby. Should there be an interruption on the active management path, traffic to the Image Streamer interface will fail over to the standy path. The Image Streamer cluster is also in an active/standby configuration. The Image Streamer administrative interface will move to the standby appliance in the event of an interruption. Image Streamer and Composer must both reside on the same management network.

The deployment network, or more accurately storage network, provides iSCSI connections from the OS volumes stored on Image Streamer to the compute nodes that boot from these volumes. The deployment network is active/active.

Configuration of the management and deployment networking on the Image Streamer appliance is done automatically during the creation of the Logical Enclosure containing Image Streamer. More on that later.

The deployment domain

In a previous topic it was explained that the Image Streamer appliances are connected directly to the Synergy 40Gb Virtual Connect modules as an internal connection type. In addition, HPE Synergy composable fabrics comprised of HPE Synergy 40Gb Virtual Connect modules cannot span more than one logical enclosure. From that the following can be derived:

Image Streamer deployment domain = Logical Enclosure

In a production environment, one redundant pair of Image Streamer appliances is required for each logical enclosure.

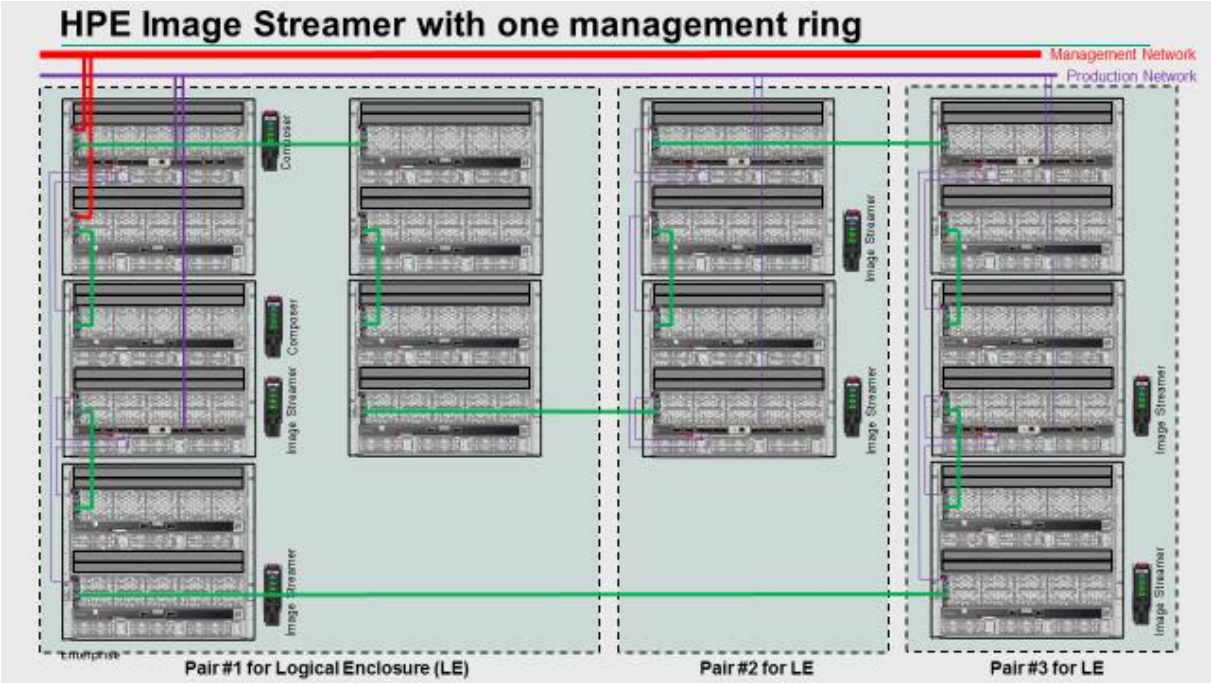

Figure 3: Three logical enclosures each containing one HA pair of Image Streamer appliances.

Each light green shaded box in figure 3 represents a logical enclosure (LE), each having a pair of Image Streamer appliances capable of deploying HPE Synergy Compute nodes only within the LE in which they are installed.

Configurations

There are two possible configurations for a Synergy Image Streamer environment. Very simply put, they are 1.) Test and development (non-production) environment configuration. 2.) Production environment configuration.

This section will explain these two environments.

Single frame/Single appliance – Test/Dev

The single frame/single Image Streamer environment is a non-production configuration. A single frame configuration offers no redundancy for management or deployment. It contains a single HPE Synergy 12000 frame with one HPE Synergy Composer appliance, a single Image Streamer appliance and one OS volume repository.

This special configuration was developed primarily to serve as a cost effective environment for testing and developing deployment and capture operations for a production environment.

Specific steps are required to be followed when bringing up this environment so that the Image Streamer appliance does not reserve both management uplink ports on the frame link modules. For more information on installation and configuration please see the HPE Synergy Image Streamer User Guide.

Multiple frames/Multiple appliances - Production

In short, multiple frames with multiple appliances are required in order to provide redundancy and high availability. Features expected in a production environment. While this sounds self-explanatory, it bears a bit more elucidation.

Recalling a previous discussion on the HPE Synergy networking architecture with Image Streamer, here is a refresher and a few other points to assist in the explanation.

- When an Image Streamer appliance is identified in a frame, the uplink ports on both frame link modules in that frame are assigned to Image Streamer.

- Image Streamer appliances are deployed in pairs for high availability.
- Only one Image Streamer can be installed in a single Synergy frame. See the first bullet.
- Image Streamer uplink ports are only used for deployment or, more precisely, to provide access to iSCSI boot volumes.
- The HPE Synergy Composer can utilize any uplink port in any frame that does not have an Image Streamer appliance installed.
- A minimum of 3 frames must exist in the HPE Synergy management ring in order to configure a logical enclosure that utilizes Image Streamer.

The last bullet is mostly explained by the others, but merits further explanation.

In this configuration there are two Image Streamer appliances, each in a separate frame, and each with redundant paths to their storage repositories. This achieves high-availability for Image Streamer. A requirement for any production environment.

That is two frames, why require the third? An HPE Synergy Composer (or better yet, two) are needed to manage the environment. Recall the first bullet. The third frame gives additional uplink ports for management access to the Composers.

We have cloned figure 2 into figure 4 to reinforce the three frame minimum starting point for enabling the Synergy solution with Image Steamer.

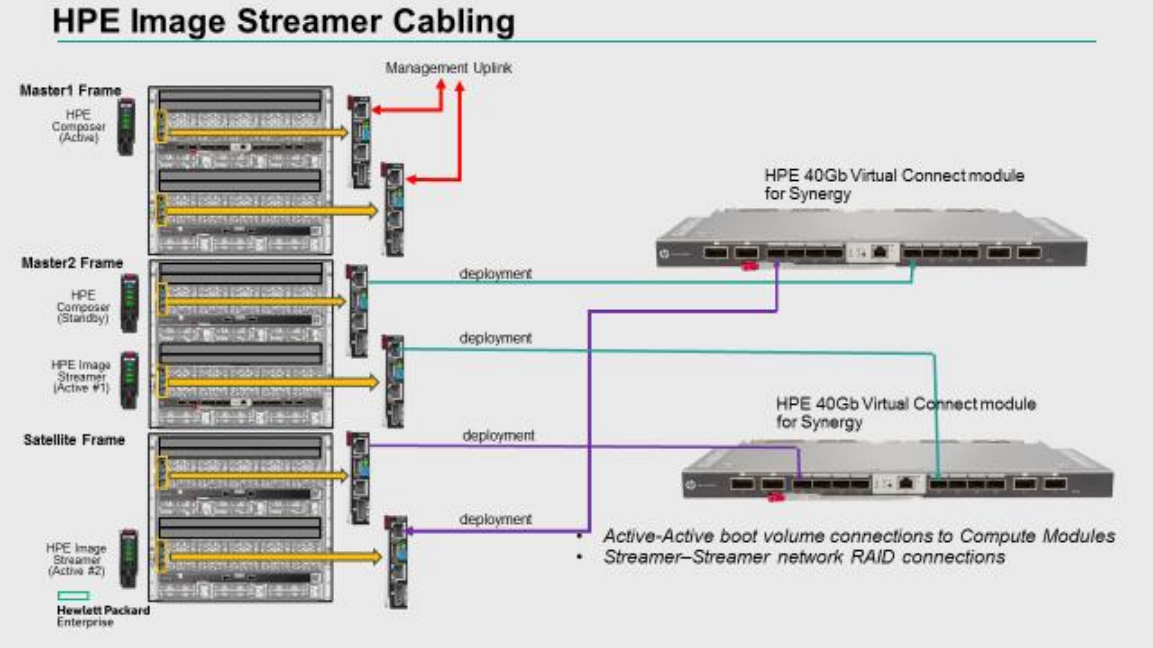

Figure 4: Image Streamer appliances in the bottom two frames consume both uplink ports. Uplink ports in the top frame are the only ones available for accessing the Synergy Composer appliance on the management network.

This configuration, as mentioned above, provides high availability for Image Streamer. How is the same accomplished for the Composer in this scenario?

While it is a best practice to use management uplink ports for the Composer from the same frame in which the Composer is installed, it is not a requirement. Recall from a previous section, the Composer is capable of communicating through any management uplink port in the Synergy management ring that is not consumed by an Image Streamer appliance.

In figure 4 above, the Composers are installed in the top and middle frames. All uplinks in the middle and bottom frame are utilized by Image Streamer. That leaves the management uplinks in the top frame availbe for the Composers in this three frame example. The Composer in the middle frame is accessible from the management uplinks in the top frame.

In summary, a production environment presumes redundancy and high availability. To achieve this in a Synergy Image Streamer environment, a minimum of three frames are required in the management ring when creating the first Image Streamer enabled logical enclosure. Subsequent logical enclosures in the same management ring with Image Streamer require a minimum of only two Synergy frames to satisfy production availability requirements.

Scalability and High Availability

The previous topic discussed Image Streamer high availability in some detail. However, that context was limited to a single logical enclosure environment. This section covers that topic as it pertains to Image Streamer in the context of the entire Synergy management ring spanning multiple logical enclosures.

More detail on the initial configuration process will be covered later in the document, but for the purposes of this topic suffice it to say that when the first Image Streamer logical enclosure is created, Image Streamer is automatically integrated with the Composer(s) that are responsible for the management ring.

The pair of Image Streamers in this first logical enclosure (remember Image Streamers are deployed in pairs) becomes the primary pair. As additional logical enclosures with Image Streamer pairs are added to the ring, these pairs are automatically configured as secondary pairs. No additional configuration needed.

The Image Streamer primary pair acts as the Composer interface to all Image Streamer pairs in the ring as well as the manager for all secondary pairs. The primary pair replicates golden images to the secondary pairs, and is responsible for managing OS boot volume creation and configuration on the appropriate secondary pair for the target compute nodes booting from these volumes.

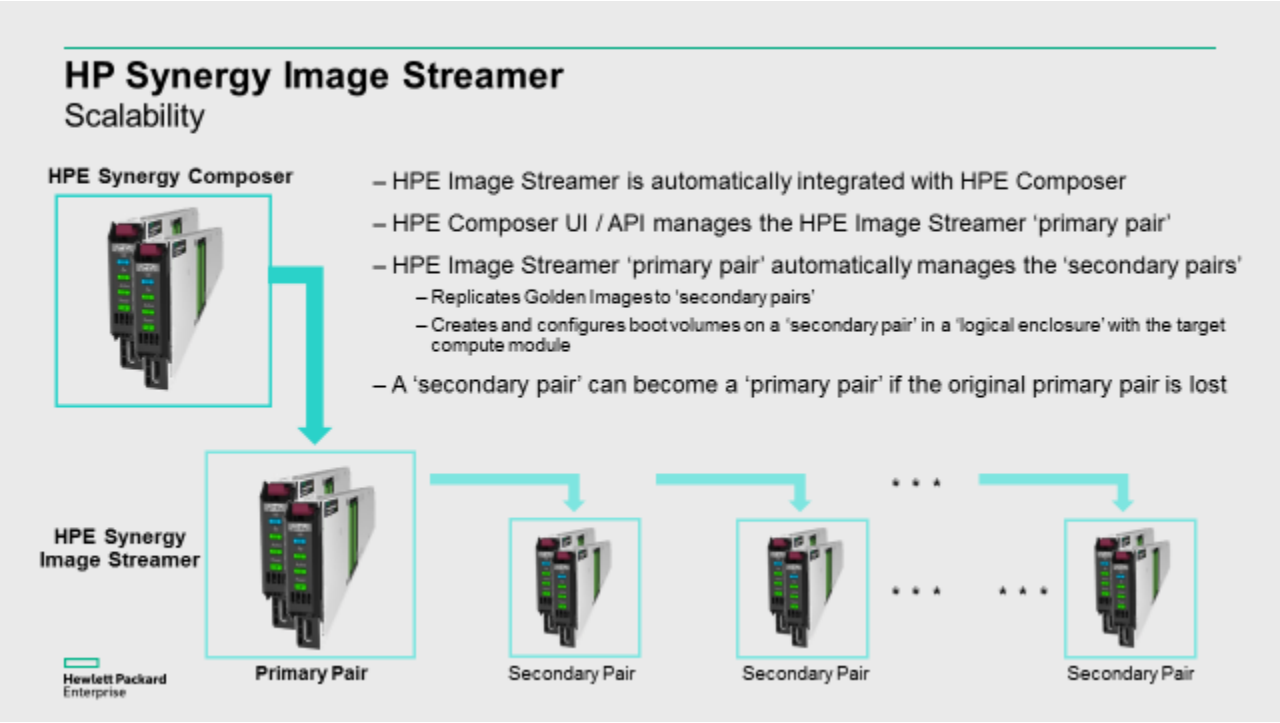

Figure 5: Image Streamer scalability. Primary pairs and secondary pairs

The secondary pairs also act as standbys to the primary pair. Should both appliances in the Image Streamer primary pair fail, a secondary pair would take over as the primary interface for Image Streamer management. This is another high availability feature.

Other high availability features were covered in a previous section, but they merit another mention here.

- The Image Streamer management interface in a logical enclosure is configured as an active/standby cluster on the appliance pair
- The storage interface of an Image Streamer pair is an active/active configuration
- Each Image Streamer in a logical enclosure provides two active paths on the storage network for a total of four active paths across the Image Streamer pair.

Artifacts

Artifacts is the term used within the Image Streamer management environment that defines the entities containing the steps and logic for capturing and deploying OS images. Artifacts include the following:

- Plan Scripts – Logic for the customization and generalization for capturing and deploying images
- Build Plans – Define the sequence in which plan scripts are execution
- Golden Images – Block level copies of the OS installation that is generalized for mass deployment
- Deployment Plans – A combination of golden images and build plan steps
- Artifact bundles – Zip archives that can contain any of the above artifacts

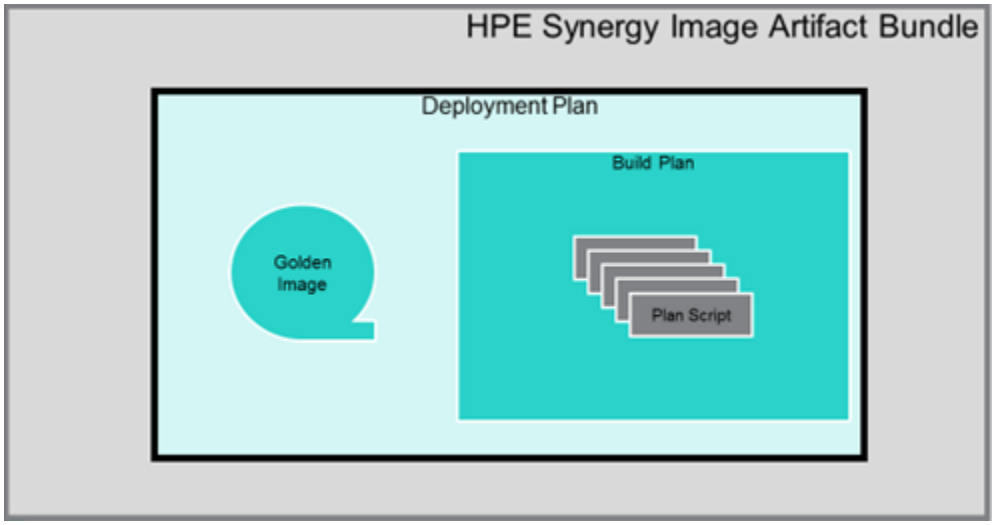

Figure 6: Image Streamer artifact bundle

Plan Scripts

Plan Scripts are the base artifact type. During an image capture process these scripts serve to generalize the image by removing host specific information such as hostname and IP address. During the image deployment process these scripts serve to personalize the image (now an OS boot volume) by setting host information in the form of custom attributes. More on custom attributes shortly.

There are three types of plan scripts. Capture type plan scripts are only for use in capture build plans. Deploy type plan scripts are only for use in deploy build scripts. General type plan scripts are for use in both.

When developing plan scripts, it is a best practice to limit them to as granular a scope as possible. A plan script should accomplish one task, such as mount a filesystem. Singular task oriented plan scripts are much more portable and easier to debug than monolithic plan script that seek to accomplish everything.

Plan Scripts are guestfish shell scripts. Guestfish is a command line tool or shell used for virtual machine filesystem manipulation. Guestfish provides its own set of commands for interacting with the filesystem and allows embedding standard shell commands within the guestfish scripts. For a full listing of guestfish commands and help, see libguestfs.org

Within the Image Streamer environment, guestfish is executed within a non-privileged user environment that is mapped to the SELinux guest role. This guest user is provided a restricted shell and provided a home directory in a separately mounted scratch partition. This prevents plan scripts from having direct access the the Image Streamer OS.

The guestfish environment is perfectly suited for customizing Linux and ESXi configurations, but not ideal for Windows operating systems. Windows operating systems will be addressed in a future release of Image Streamer.

Custom attributes are defined directly within the plan scripts. From the plan scripts, the custome attributes are bubbled up to the deployment plans and ultimately to the server profiles utilizing these deployment plans.

Custom attributes use the sytax of “@name:value@”, or “@name@”. The value is optional and serves as the default for the attribute. For example, “@hostname:my-esxi-host@”, creates the attribute *hostname* and assigns it the default value of *my-esxi-host*. On execution, every instance of the attribute definition (between the @ signs) in the script will be replaced with the attribute value set in the server profile. In the figure below, the Deplyment Settings are the custom attributes defined in the plan scripts used by the “HPE-ESXi 5-single management NIC” deployment plan.

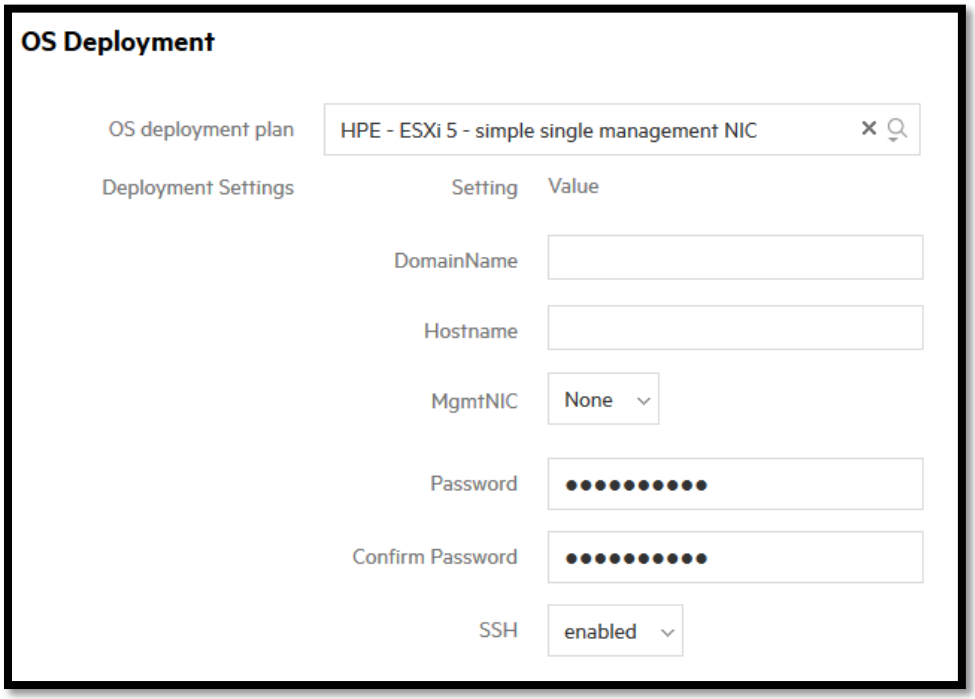

Figure 7: Custom attributes in the server profile definition

Custom attributes can further be defined within the build plans in which they are included. A full definition of custom attribute, their usage, and types supported by Image Streamer, is beyond the scope of this document. For more information on custom using custom attributes see the HPE Synergy Image Streamer User Guide.

OS Build Plans

Build plans provide the order of execution for customization of the OS volumes. That is they provide the order in which plan scripts are executed within a deployment plan. A build plan can contain many plan scripts, or none at all.

Build plan types are limited to either a deploy type or capture type. Capture type build plans are used in capturing golden images. Deploy type build plans are used for deploying OS volumes.

As stated earlier, build plans can further define custom attributes by specifying their types, and constraints. Further defining the attribute type within a build plan can determine how that attribute is presented to the user in the profile as well provide constraints as to what values are permitted for the attribute. Take the “Password” and “Confirm Password” attributes in figure 7 as an example. Setting their *type* as *password* tells the HPE OneView interface to hide their values from prying eyes.

Build plans can also override plan script defined default values for custom attributes. Changing plan script defaults will not change the defaults defined in the build plan.

The behavior of an attribute may differ between use cases. Defining attribute types and changing default values within the build plans allows a single plan script to be shared amongst those use cases and provides portability and flexibility to the plan scripts.

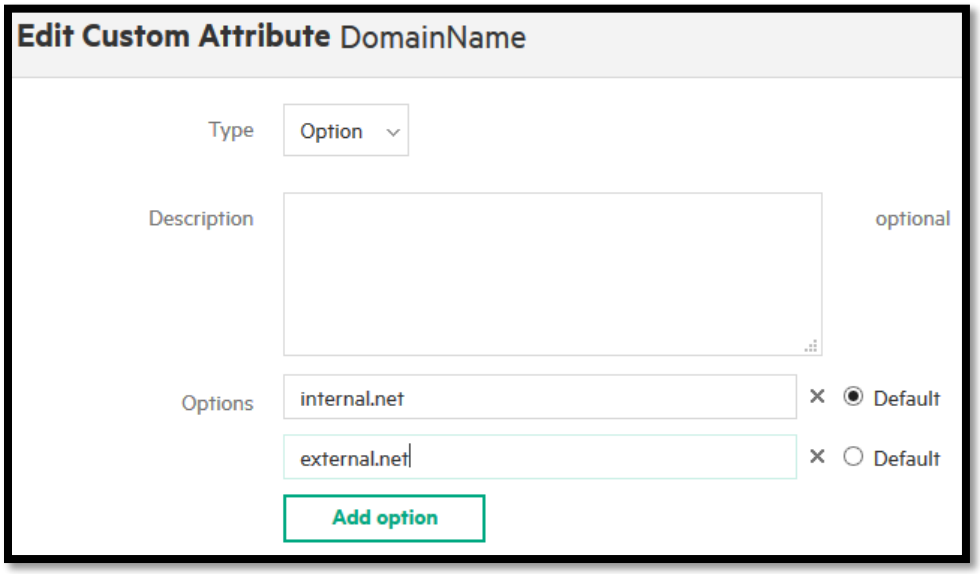

Figure 8: Setting the DomainName type to Option within the build plan presents a drop down list in HPE OneView.

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Golden Images

Golden images are the base configuration for an OS volume. This may be just the OS, or it may contain an application stack. What is contained in a golden image depends on the desire and ability for the setting to be generalized during image capture and customized during OS deployment.

Golden images are block level copies of existing OS volumes that are then compressed on the Image Streamer appliance. These compressed images can be downloaded from, and uploaded to, any Image Streamer appliance. The golden image capture process is done through the Image Streamer administrative interface and typically associated with a capture build plan that contains the plan scripts to generalize the image.

Golden images are replicated between the primary and secondary appliance pairs in a Synergy management ring.

When golden images are loaded into an appliance they are expanded to a golden volume to allow for faster deployment to OS volumes.

Deployment Plans

Deployment plans marry a golden image to the build plan logic (aka plan scripts) that customize the image when it is deployed to an OS volume

Deployment plans can also specify if attributes are to be hidden during the profile creation process, and if the attributes are to be editable or read-only.

Figure 9 shows a snippet from the interface for creating a deployment plan. It contains a golden image and an OS build plan. The check boxes under “Visible on deployment” determine if the attribute is presented during the profile creation process. The padlock symbol is used to set the attribute as read-only in the profile.

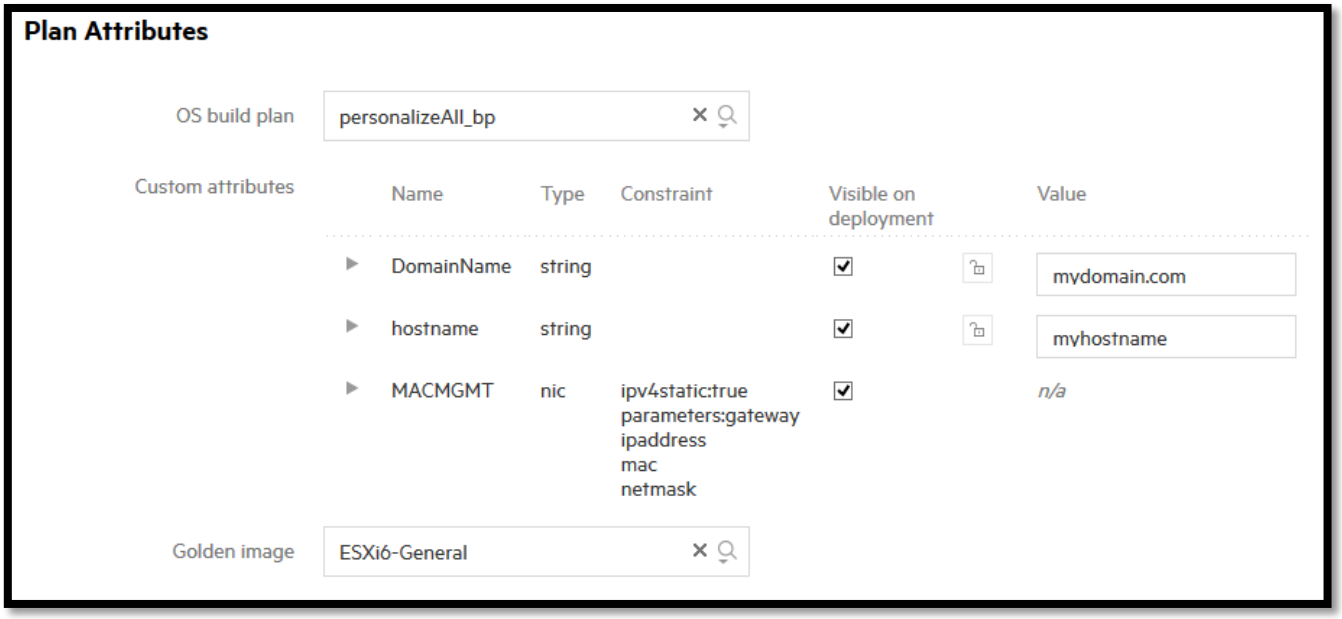

Figure 9: Deployment plan creation

Artifact Bundles

An artifact bundle is a collection of artifacts. Simple, right? Before moving on to the next topic, however, there are some details worthy of mention regarding artifact bundles.

An artifact bundle is a user created entity containing any or all artifacts on the Image Streamer appliance. Artifacts included during bundle creation are compressed to a zip file and stored on the appliance. The zipped artifact bundle can then be downloaded for offline storage or uploaded to other Image Streamer appliances in the environment.

Uploading an artifact bundle to an appliance does not extract its contents. Properties of the bundle contents can be viewed once it is uploaded but the artifact bundle must be extracted in a separate operation to utilize the plan scripts, build plans, etc that are part of the bundle. If naming conflicts exists between existing artifacts and artifacts being extracted the user is prompted to confirm renaming the artifacts. The artifacts are not extracted without this confirmation.

All lower level artifacts are automatically selected when a higher level artifact that depends on them is chosen in the bundle creation process. For example, selecting a deployment plan for a bundle will pull in the OS build plan, and all plan scripts used by the build plan into the artifact bundle.

Artifacts can be set to read-only during bundle creation time. This will prevent the artifacts from being edited on any appliance to which they are uploaded and extracted.

HP Enterprise provides artifact bundles for certain supported operating systems. These artifact bundles and other Image Streamer content can be downloaded from https://github.com/HewlettPackard. The HPE provided artifacts should not be directly altered. The user may customize the artifacts to suit their deployment needs, but it is recommended to create copies of the working HPE artifacts and customize the copies.

Advanced Management Virtual Machine (AMVM)

HPE Image Streamer provides the Advanced Management Virtual Machine to assist in the development and troubleshooting of artifacts. AMVM enables the administrator to access the compute node OS volumes created by Image Streamer prior to the compute node booting in order to validate customizations performed by plan scripts and OS build plans. Shell scripts are provided within AMVM for configuring the iSCSI initiator and for mounting and unmounting volumes.

In addition, AMVM, resides on the HPE Synergy management network with access to the HPE Synergy Composer and Image Streamer appliances. This provides a built-in platform for developing scripts to access the composable infrastructure unified API with tools such as Chef, Puppet, and Ansible.

AMVM is created as part of the Image Streamer configuration process that occurs during a HPE Synergy logical enclosure creation task. An AMVM is created on both the active and standby node in an Image Streamer clustered pair, but only running on the active node at any point in time.

AMVM is not set to start by default once the logical enclosure creation task completes. Since it consumes resources on the Image Streamer appliance it is recommended to start AMVM when it will be actively used and to shut it down when not in use. See Appendix A in this document for sample commands for interacting with the HPE Synergy REST API to start and shutdown AMVM.

Deployment Overview

Image Streamer is not your father's deployment tool. Most bare-metal deployment tools involve booting the target server to a service OS (think Anaconda or WinPE) which configures the OS partitions and installs and configures the operating system. Even in a fully automated environment this is a time consuming operation. Multiply that by the potentially thousands of servers that exist in an enterprise environment, and we actually now know where all the time has gone.

With HPE Synergy Image Streamer, the above process is a one time operation. The first step in an Image Streamer deployment is building the golden image from a reference host operating system. The reference host is built and configured using the typical process of booting the host to a service OS to perform the installation. All subsequent deployments utilizing the golden image take only seconds for image creation and customization.

The Image Streamer deployment is initiated through the HPE OneView interface by creating a server profile that is assigned an Image Streamer deployment plan. The expanded golden image – the golden volume – is smart cloned to create the OS volume. The OS volume is then mounted and customized via deploy plan scripts on the Image Streamer appliance. Once the OS volume customization is complete the volume is placed in server volume storage and configured as an iSCSI boot target. HPE OneView automatically configures the iSCSI boot connections to the remote volume. The target server can now be booted to its OS volume.

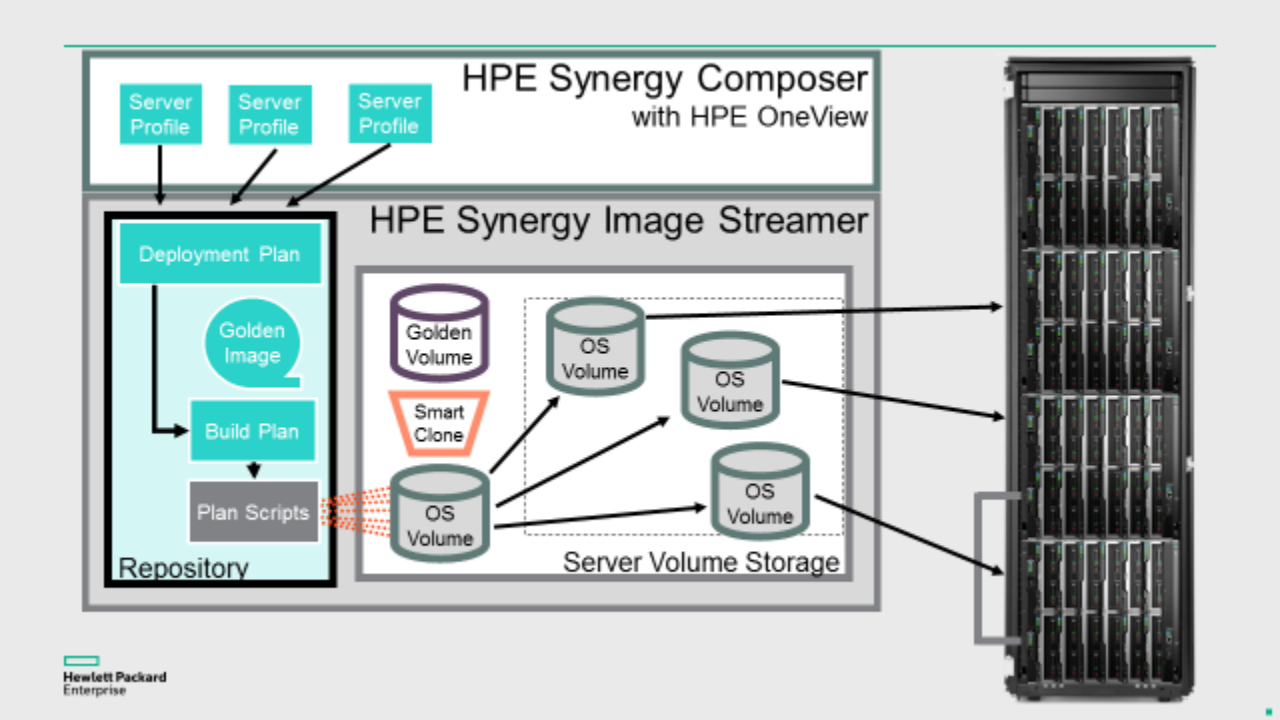

Figure 10: Image Streamer deployment process initiated by the server profile

Configuration and Use

Setup basics

This section covers the basics (hence the title) of configuring the Synergy management environment for Image Streamer. Only the setup steps for a production configuration are included in this section. For more detail and for specific instructions for the multframe configuration and single frame test/dev configuration see the HPE OneView User Guide for Synergy at www.hpe.com/info/synergy-docs

Summary of steps

1. Create an IPv4 address pool for Image Streamer management

   IP Address from this pool are given to the various Image Streamer interfaces on the management network. Both the storage and management clusters of Image Streamer will have addresses assigned from this pool. These addresses must be in the same subnet as those assigned to the Synergy Composer.

2. Create a second IPv4 address pool for Image Streamer deployment

   These address are for the iSCSI boot network. The Image Streamer targets and compute node initiators will receive addresses from this pool.

3. Create a management network and associate it with the management IPv4 address pool

   This network is assigned to the OS Deployment server.

4. Create a deployment network and associate it with the deployment IPv4 address pool

   This network is assigned to the enclosure group.

5. Add the OS deployment server

6. Create a logical interconnect group (LIG) with an uplink of type Image Streamer carrying the deployment network

   These uplinks are directly connected to the frame link modules in the frames containing the Image Streamer appliances.

7. Create an enclosure group (EG) setting the OS Deployment settings to match the configuration.

   The deployment settings on the EG define the address pool that will be utilized to configure connections to the iSCSI boot network.

8. Create the Image Streamer enabled logical enclosure using the LIG and EG from above.

The LE creation process will configure the Image Streamer management cluster and install and configure the Image Streamer storage cluster. Not long, and it will be ready to use.

My First Golden Image

Due to the potential size of a golden image, these may not be supplied in an HPE artifact bundle. This section will describe how to create a golden image from scratch and make it available for deployment within the HPE Synergy Image Streamer environment.

Step 1: Create a deployment plan for creating an emtpy OS volume

Golden images are created from OS volumes that exist in the Image Streamer storage repository. In order to capture and initial golden image for a given operating system an empty volume deployment must be done and an operating system installed to this volume manually.

From the HPE OneView main menu select OS Deployment Servers. From the presented screen there is a link to the Image Streamer UI. Select the link to open the Image Streamer UI.

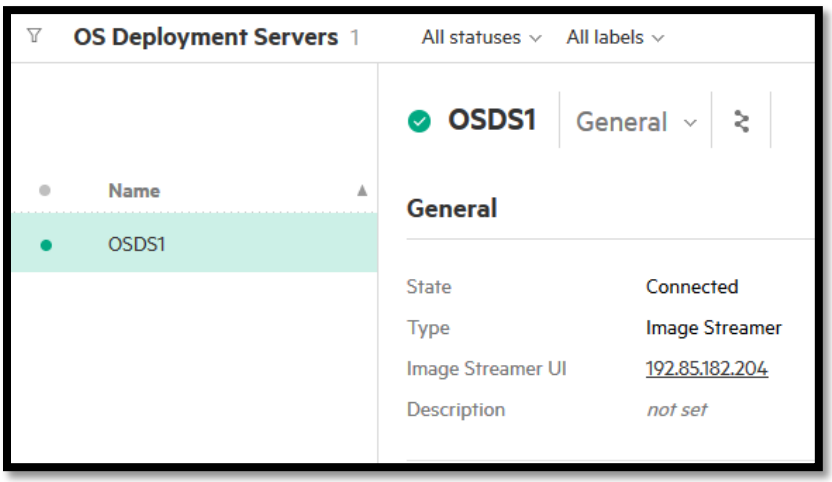

Figure 11: Deployment servers view from the Synergy Composer interface

From the Image Streame UI, select Plan Scripts from the main menu. Create a new plan script of type Deploy and add the script contents below.

echo “@volumesize:20480@” > /dev/null

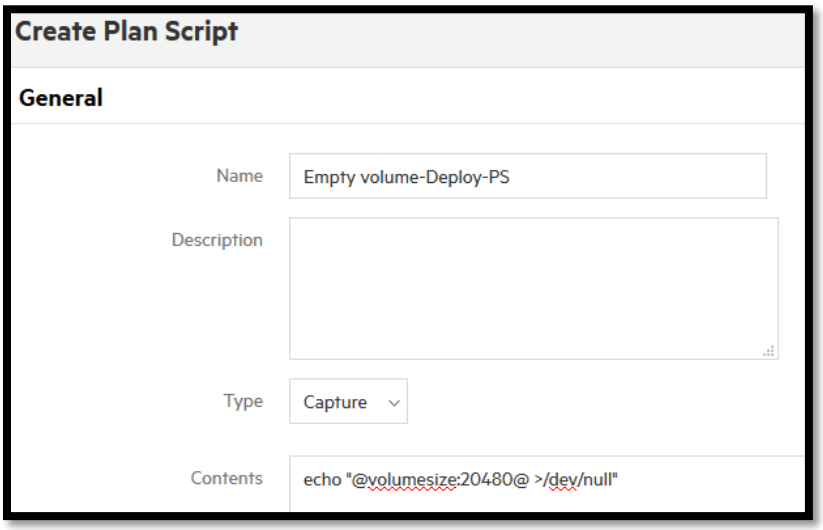

Figure 12: Setting the volume size attribute default value in a plan script

From the Image Streamer main menu, select OS Build Plans. Create a new OS build plan of type Deploy and add the previously created plan script as the only step. Notice the plan script created a custom attribute, “volumesize”, with a default size of 20GB.

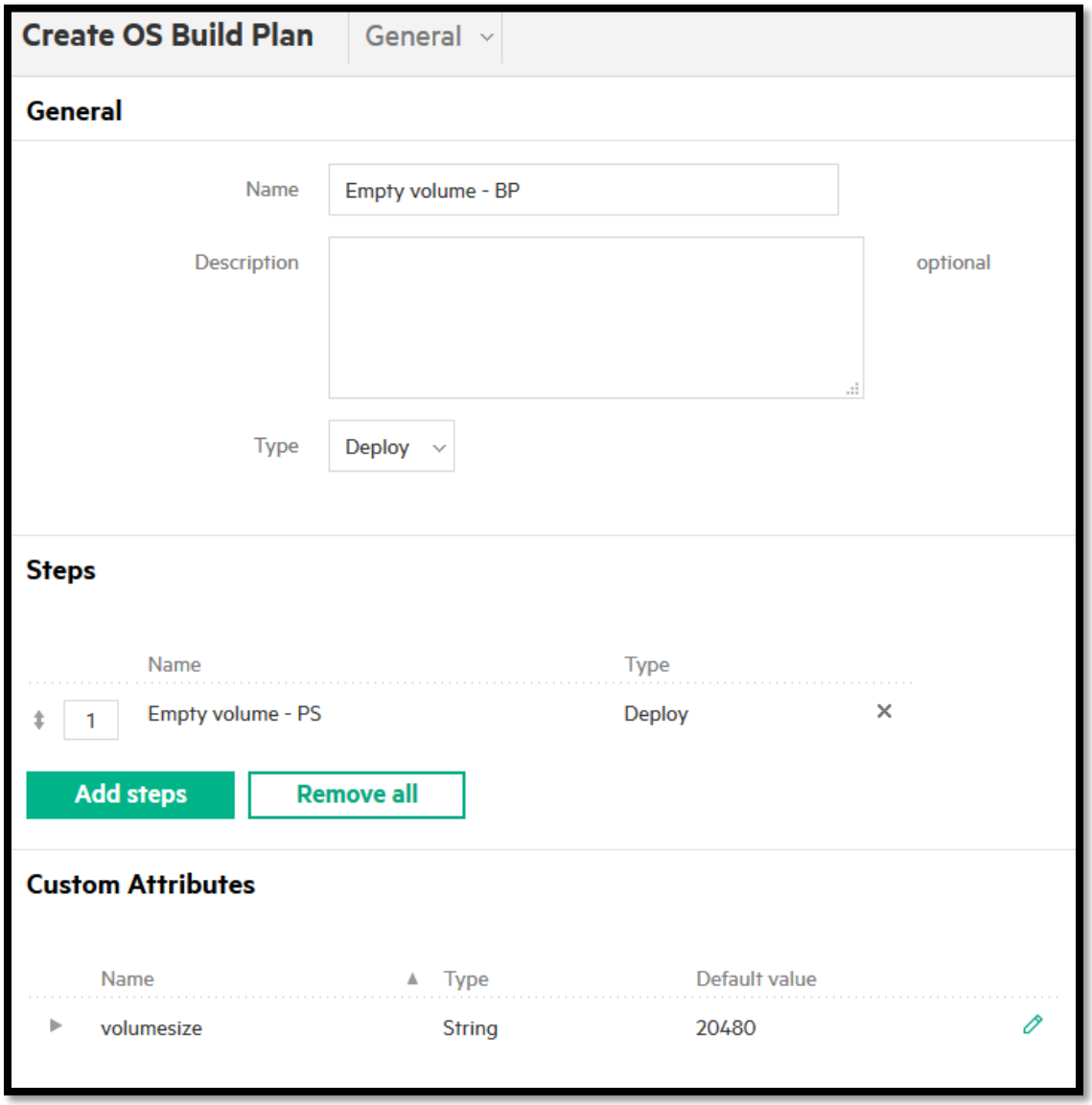

Figure 13: Creating and OS build plan

Select Deployment Plans from the Image Streamer main menu. Create a deployment plan using the build plan created previously with no selection for Golden image.

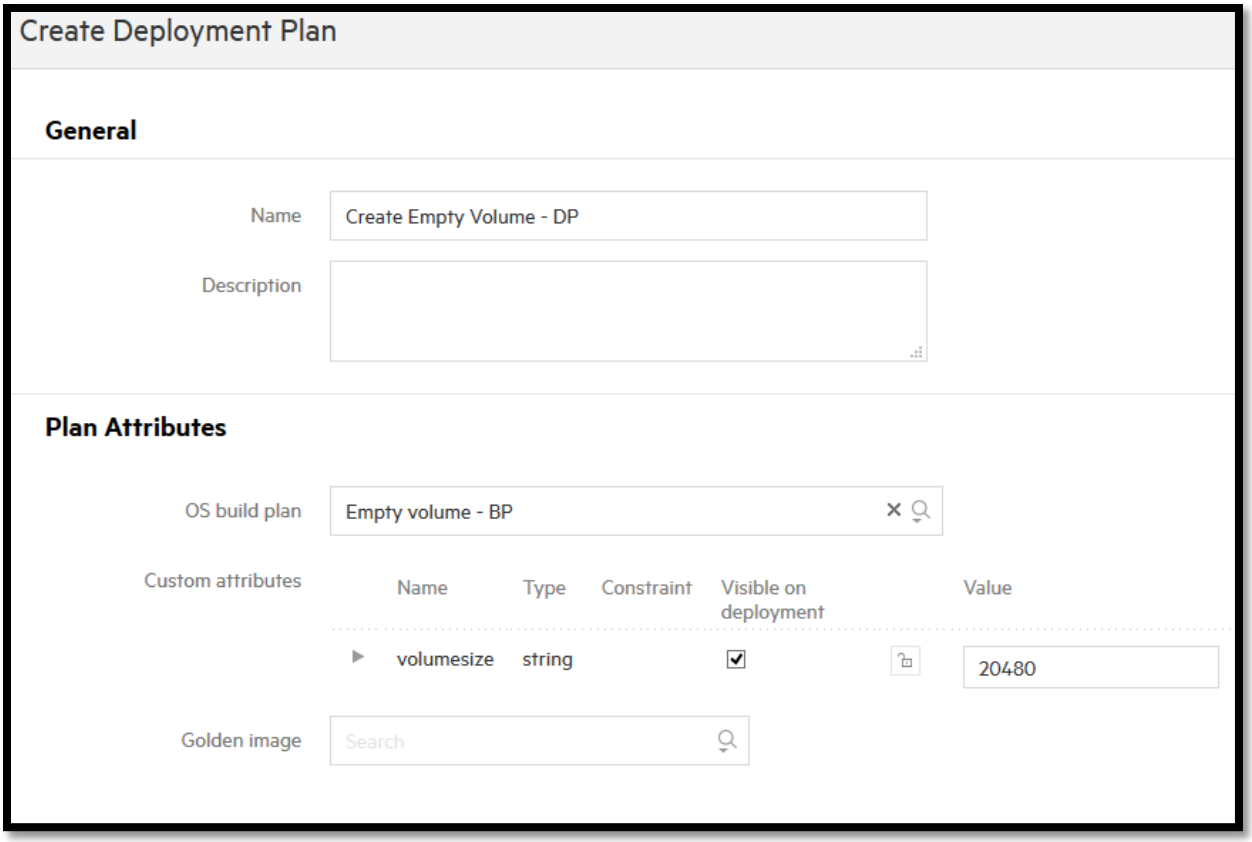

Figure 14: Creating a deployment plan

Step 2: Create the server profile utilizing the empty volume deployment plan
The Image Streamer deployment process is initiated from within the HPE Synergy Composer interface through the server profile creation process.

In the Composer main menu, select *Server Profiles*. Create a new server profile and select a target compute node for the server profile from the Server Hardware drop down box. Once the target compute node is selected the OS deployment plan dialog becomes active. Select the deployment plan created in the previous step from the list box.

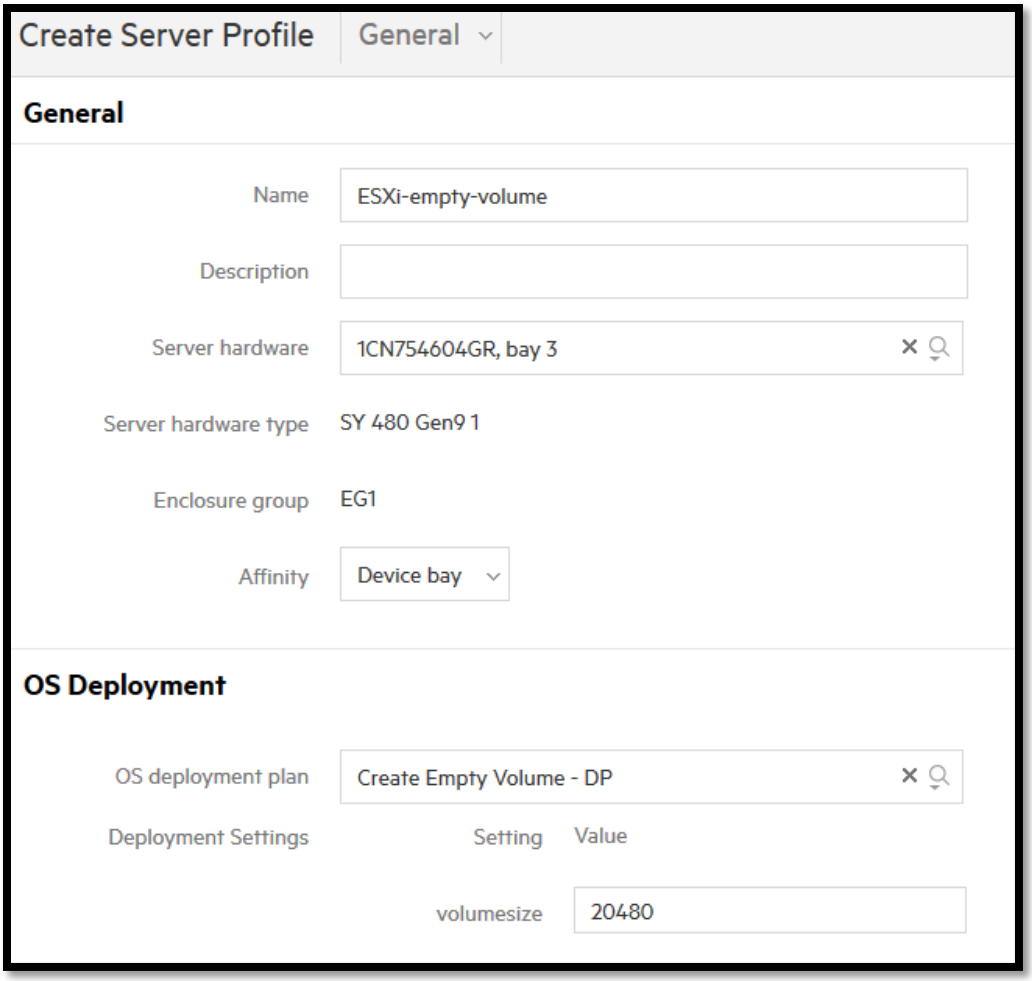

Figure 15: Assigning an OS deployment plan to a server profile

Notice the volumesize attribute has been presented to the server profile. This attribute is editable in the server profile. Change the volumesize value to an appropriate size to accommodate the intended operating system.

Scroll down in the Create Server Profile dialog to the Connections section. Notice that two network connections have been automatically created. These two connections are assigned to the deployment network and provide the iSCSI boot paths to the OS volume that is created as part of the server profile creation.

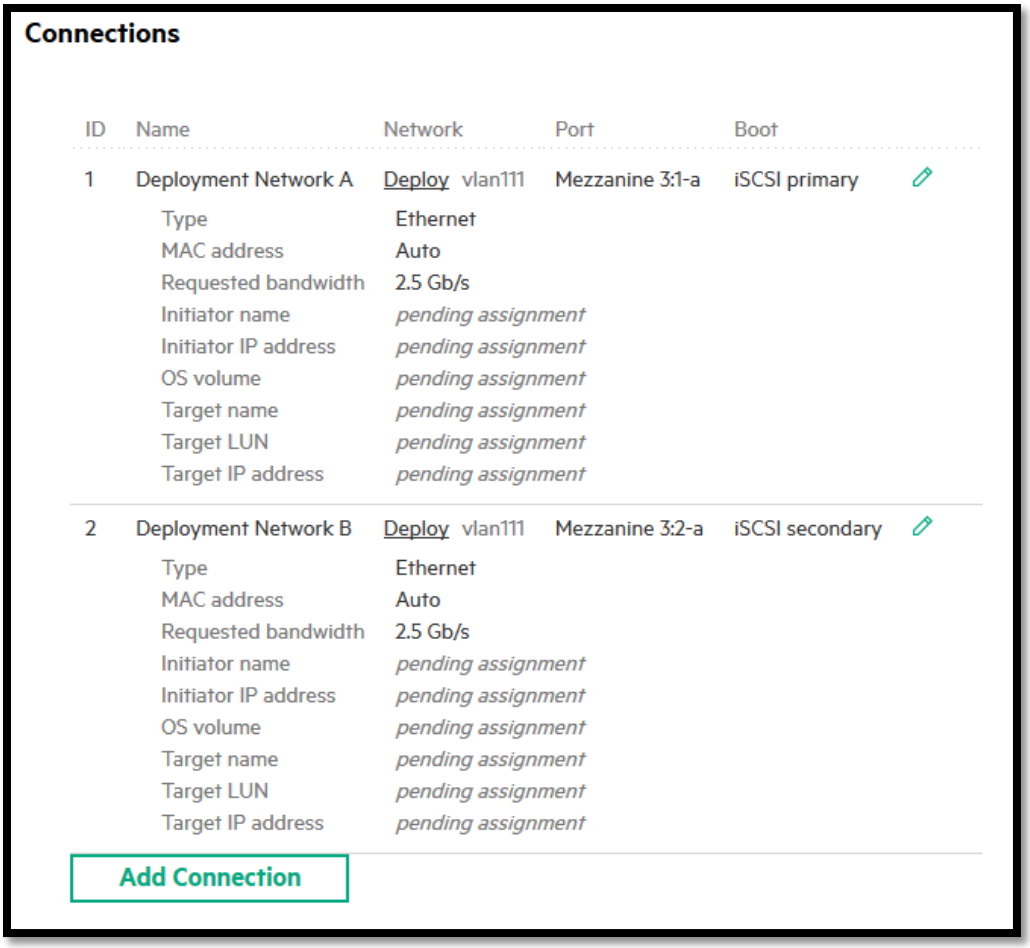

Figure 16: Redundant server profile connections for Image Streamer OS volumes – prior to creation.

Create additional connections and set other profile options if desired then create the profile.

Once the server profile is created the iSCSI initiator and target information can be viewed by selecting Connections from the server profile Overview screen and expanding one of the connections.

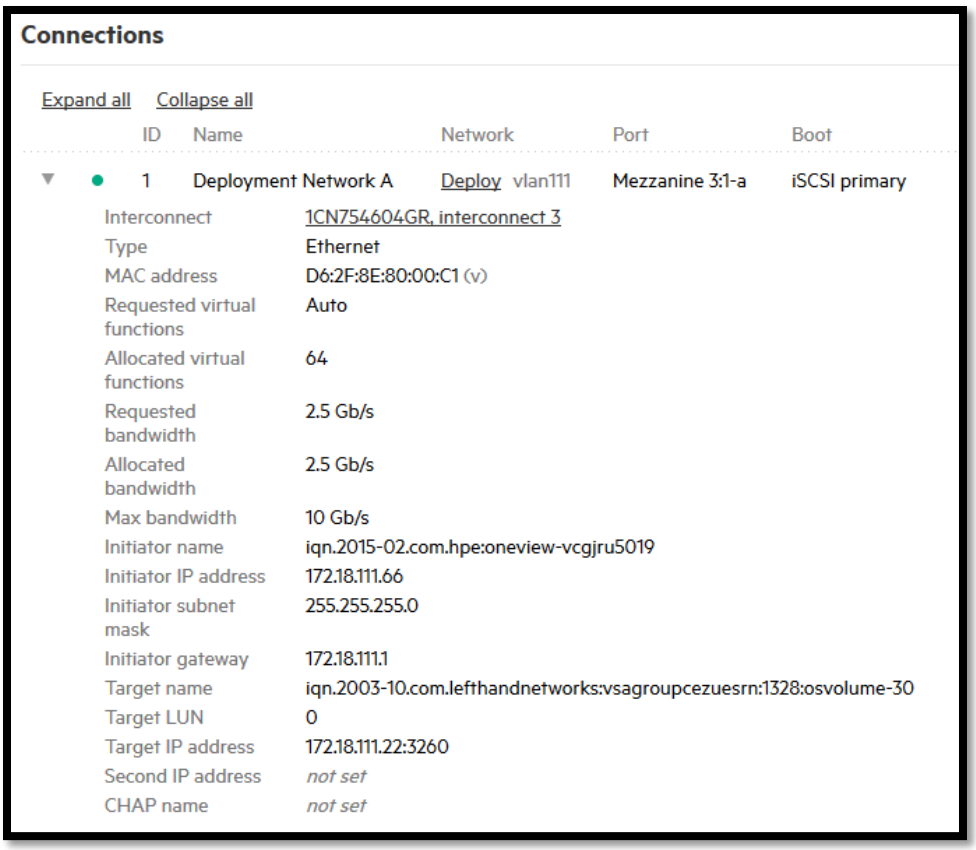

Figure 17: Primary iSCSI boot connection in a server profile

Back in the Image Streamer UI, the newly created OS volume can be seen by selecting *OS Volumes* from the main menu.

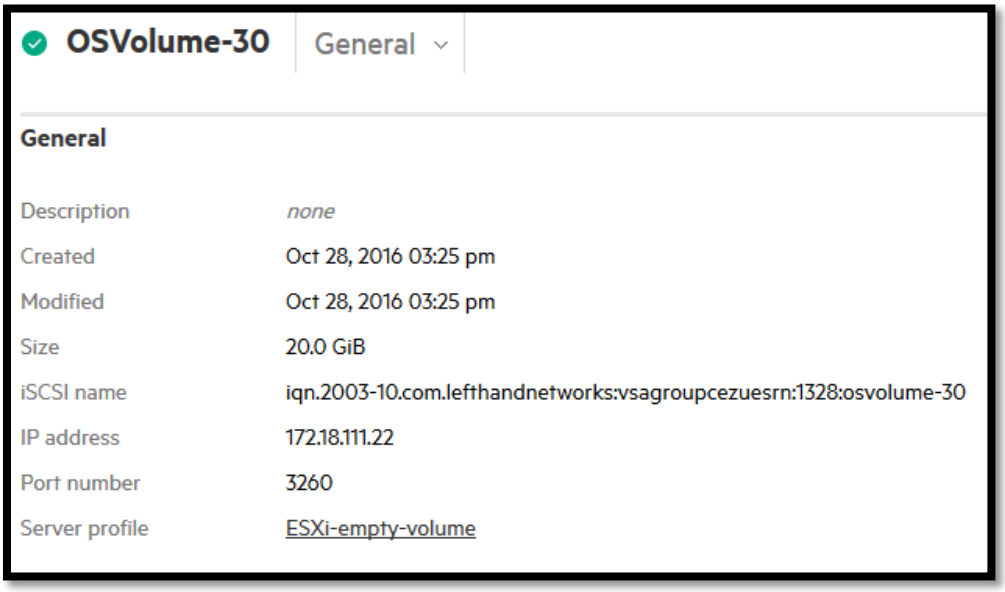

Figure 18: iSCSI target OS Volume in the Image Streamer interface

Step 3: Install the operating system

The operating system can now be installed using iLO virtual media to boot to an OS distribution ISO file. Some operating systems may not have the in-box drivers for iSCSI in the distribution. In this case the drivers need to be injected during

intallation. Current drivers can be obtained by downloading the Service Pack for Proliant from http://www.hpe.com/downloads/synergy

Step 4: Capture the Golden image
As with the deploy process, plan scripts and build plans for capture are created for use by the Golden image capture process. These artifacts will provide the logic and steps for generalizing the image for capture. Generalization, and therefore capture plan scripts, are not required in order to create a golden image. A capture build plan is required.

HPE provides plan scripts and build plans for the golden image process for supported operating systems. Explanation of the operations of the capture plan scripts is beyond the scope of this document.

Create a capture OS build plan with no plan script steps added. In this situation, no operations will be performed on the image prior to capture.

Select *Create Golden Image* from the Image Streamer main menu. Select the OS volume to be captured to a golden image, and select the capture build plan to use.

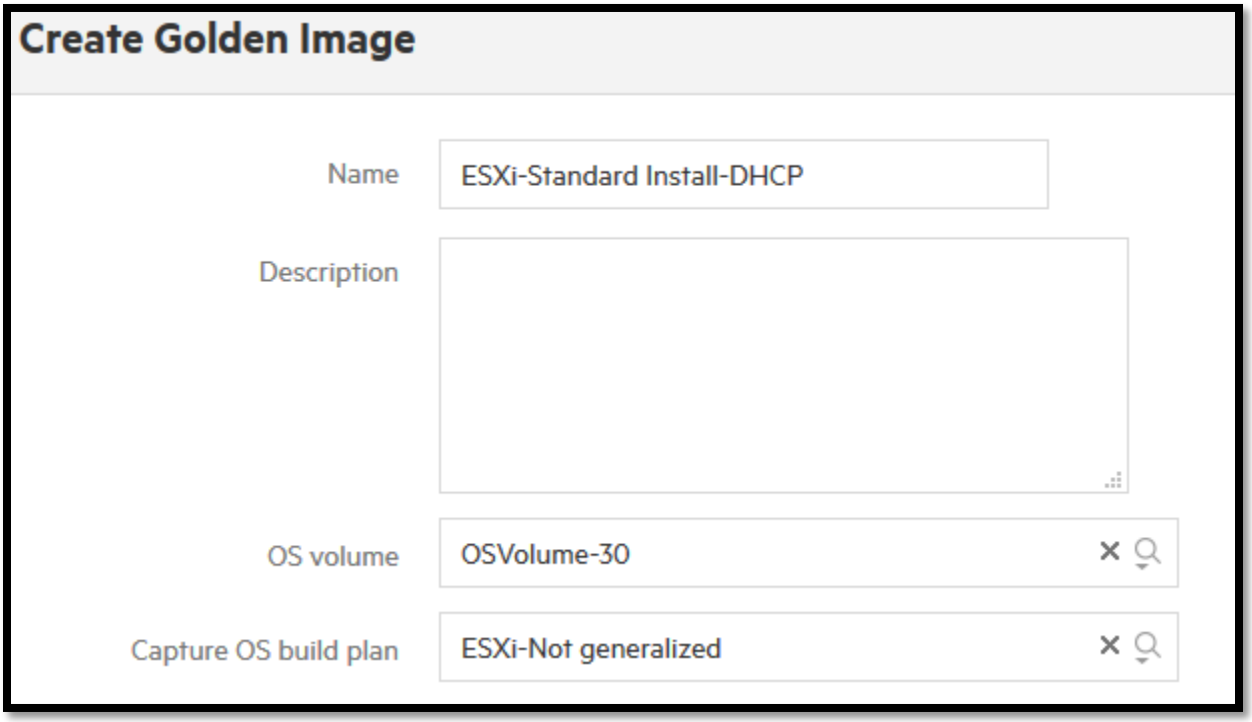

Figure 19: Create Golden Image

It takes less than 10 seconds to create the golden image. Its properties can be viewed from the *Golden Image* page in Image Streamer.

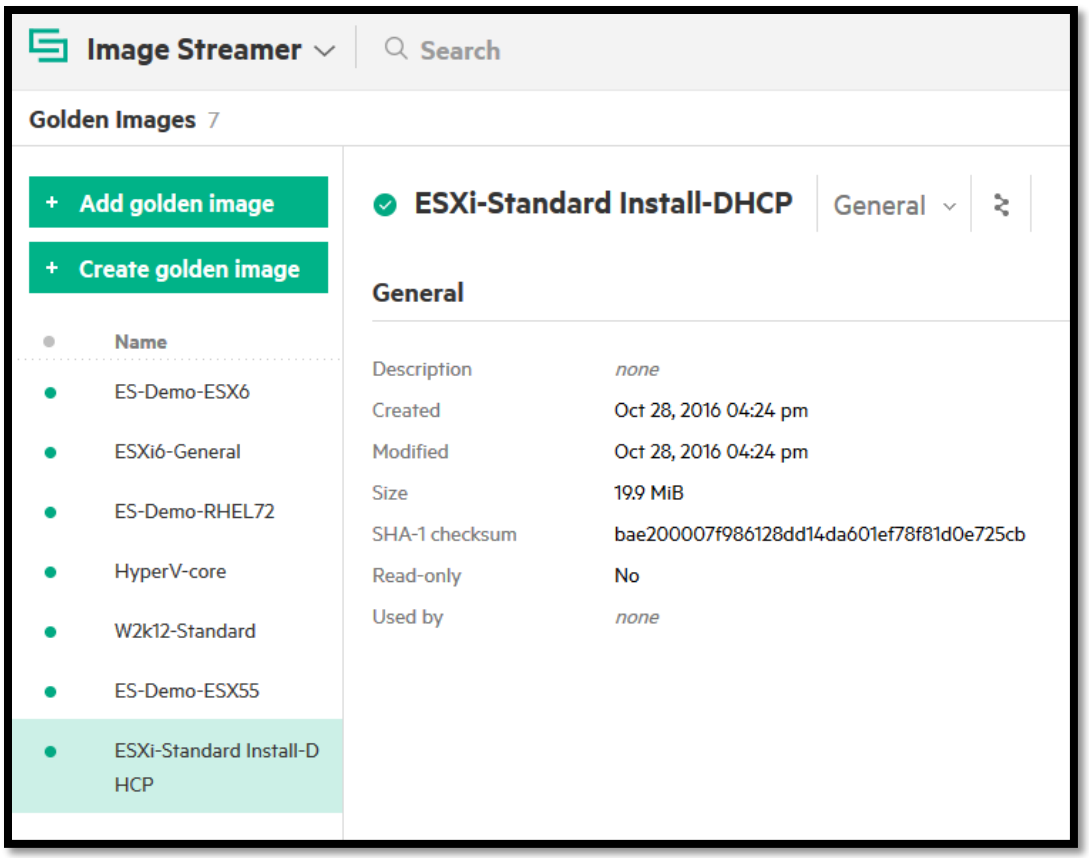

Figure 20: Captured golden image

My First Image Streamer Deployment

Once the golden image is created it must be attached to a deployment plan. HPE provides artifact bundles that contain build plans and plan scripts for personalizing golden images for operating systems that Image Streamer supports. These samples can be used along with the golden image to build a new deployment plan.

Step 1: Create a deployment plan

Select *Deployment Plans* from the Image Streamer UI main menu and select *Create deployment plan*. In the following dialog, choose an appropriate build plan for customization and choose the golden image.

In this example we are using an existing HPE provided build plan and the golden image created in the previous exercise.

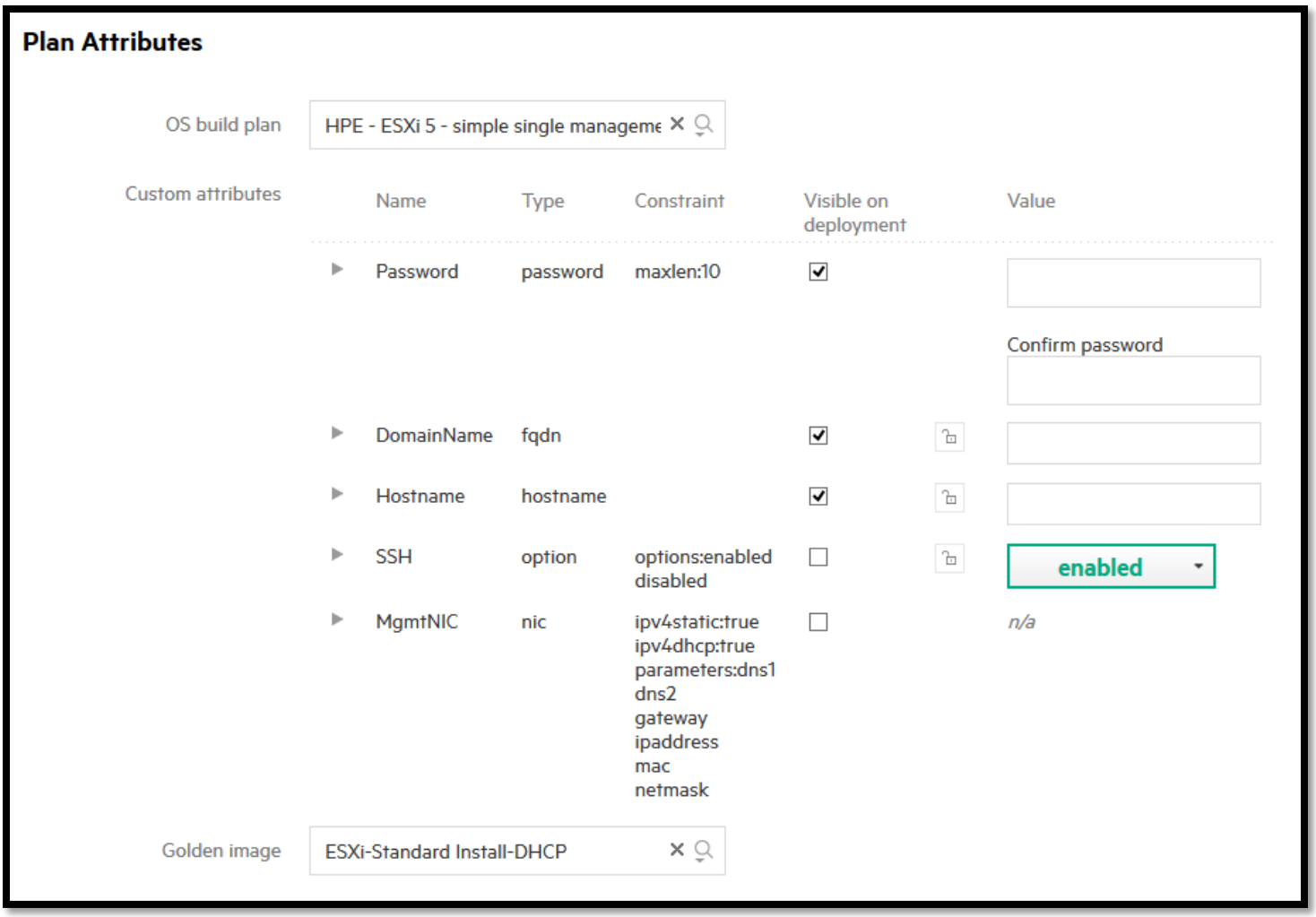

Figure 21: Deployment plan – OS build plan and golden image attributes

Once the deployment plan is created it is ready for use through profiles created on the Synergy Composer.

Step 2: Create the Synergy server profile
Synergy Image Streamer provides a stateless environment for OS deployment. The software state is maintained separately from the physical state of the compute node. The server profile is where the desired deployed state is defined by assigning a deployment plan to the physical compute node.

The profile creation process is identical to that performed when creating the first golden image. This time, however, choose the deployment plan containing an actual golden image. Provide values for the presented custom attributes and select *Create*.

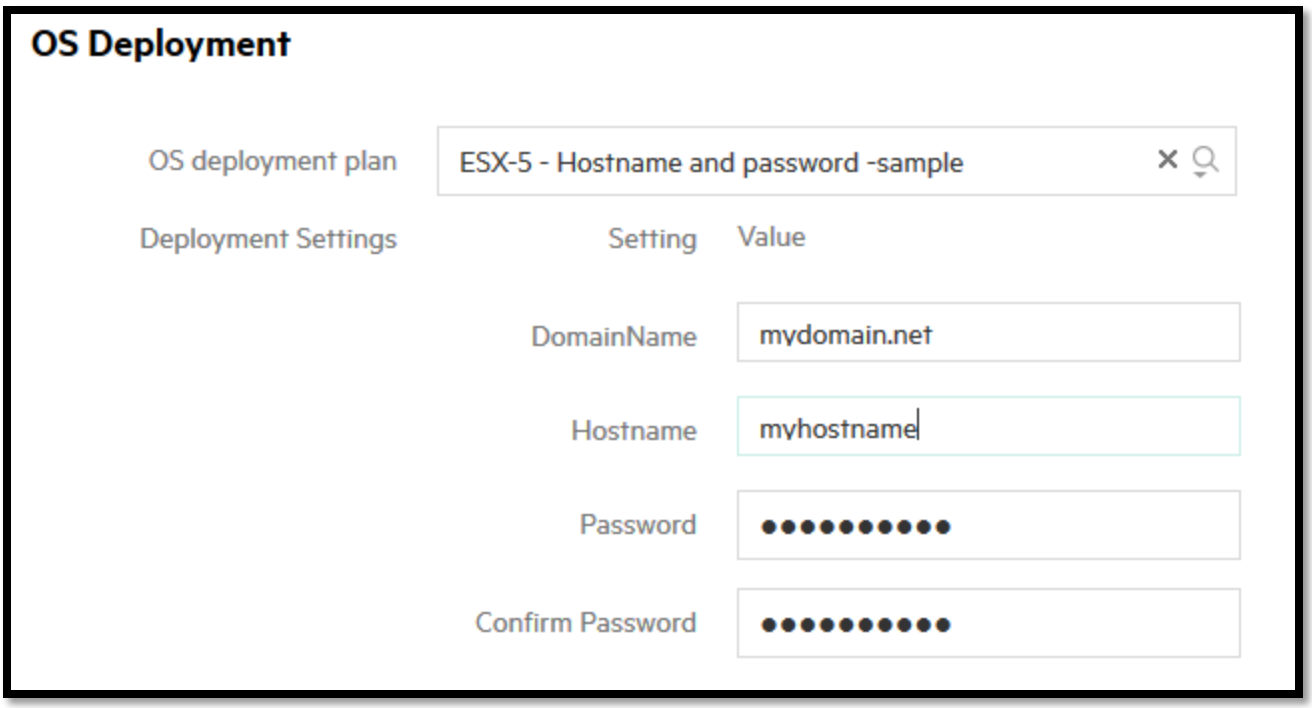

Figure 22: Deployment plan and attributes in the server profile

That's it. Once the server profile has applied the compute node can be powered on to verify the customized settings and placed into service.

Table 1: HPE Synergy Image Streamer terms and definitions.

Term	Definition
STATELESS COMPUTE NODE	Server deployment where the software state (boot volume) is maintained separately from the hardware state, including firmware and BIOS settings.
DEPLOYMENT ADMINISTRATOR	The Image Streamer resource producer. User that manages and maintains Image Streamer resources including golden images, deployment plans, OS build plans and plan scripts.
IMAGE STREAMER PRIMARY PAIR	Hosts the Image Streamer user interface, manages artifacts and maintenance of other Image Streamer appliances, and coordinates deployments directed by server profiles to the primary Image Streamer pair
IMAGE STREAMER SECONDARY PAIR	Hosts and serves OS volumes for the compute nodes in its logical enclosure. Serves as a backup to the primary pair
SERVER ADMINISTRATOR	The Image Streamer resource consumer. Typically the HPE OneView administrator responsible for creating server profiles that use Image Streamer deployment plans.
IMAGE STREAMER MANAGEMENT CLUSTER	The user interface and software stack for managing Image Streamer resources. An active/standby cluster architecture.
IMAGE STREAMER STORAGE CLUSTER	Software that manages stateless compute node boot volumes. An active/active cluster architecture.
IMAGE STREAMER DOMAIN	A single logical enclosure.
ARTIFACT	An Image Streamer resource used for image deployment and/or image capture. Artifacts include golden images, deployment plans, OS build plans, and plan scripts
ARTIFACT BUNDLE	A user defined, compressed archive of Image Streamer artifacts
GOLDEN IMAGE	A compressed block level copy of an OS volume which can be generalized using a capture OS build plan.
GOLDEN VOLUME	An golden image expanded to increase the speed of deployment
DEPLOYMENT PLAN	The Image Streamer resource exposed in the server profile that defines the golden image to use for deployment and the steps to perform to customize the image during deployment
OS BUILD PLAN	The Image Streamer resource that defines the steps to be performed during image capture or deployment and the order in which they are performed to generalize the golden image or customize the OS volume
PLAN SCRIPT	Scripts that execute operations on the filesystems in an OS volume for generalization during image capture and customization during deployment
CUSTOM ATTRIBUTE	Settable parameters that define the compute node's software state such as hostname, ip address, etc.
OS VOLUME	A customized compute node boot volume attached to a server profile
ARTIFACT REPOSITORY	Storage space reserved on the Image Streamer appliance for holding artifacts.
IMAGE REPOSITORY	Storage space on the Image Streamer appliance reserved for OS volumes and OS volume operations
ADVANCED MANAGEMENT VIRTUAL MACHINE	Built-in platform for validating and testing plan scripts, OS build plans and custom attributes.

Appendix A: AMVM example REST commands.

On Linux using CURL:

1. Establish a session with the HPE Synergy Composer appliance

AUTH=$(curl -k -X POST -d '{"userName":"administrator","password":"*{password}*"}' -H "Content-Type:application/json" -H "Accept:application/json" "https://*{composer IP}*/rest/login-sessions" | cut -d '"' -f4)

2. Retrieve the Image Streamer cluster ip address

curl -i -k -X GET -H "auth:${AUTH}" -H "X-Api-Version:300" "https://192.85.182.167/rest/deployment-servers/image-streamer-appliances/" | grep { | python -m json.tool | less

Sample Output:


```
{
    "category": "deployment-managers",
    "count": 2,
    "created": null,
    "eTag": null,
    "members": [
        {
            "alternateMgmtDNSServer": null,
            "alternateprodDNSServer": null,
            "amvmDataIPv4Address": "172.18.111.103",
            "amvmMgmtIPv4Address": "192.85.182.206",
            "applianceIpv6Address": "fe80::9eb6:54ff:fe97:3ff0",
            "applianceSerialNumber": "CN751704Z7",
            "applianceUUID": "79ecd1d0-19bb-4a78-8f59-a7ebe5474cd7",
            "applianceUri": "/rest/image-streamer-appliances/a79ded6f-5860-4506-9c55-cb554d11bbd0",
            "atlasVersion": "3.00.05-0284004",
            "certMd5": "83:92:23:15:14:02:8a:d7:ec:5d:83:cd:30:47:39:5a",
            "cimBay": 2,
            "cimEnclosureName": "Frame3-CN754602DW",
            "cimEnclosureUri": "/rest/enclosures/000000CN754602DW",
            "claimedByOV": true,
            "clusterIpv4Address": "192.85.182.204",
```

3. Retrieve the AMVM management ip address by using the following CURL command executed against the Image Streamer appliance. Use the clusterIpv4Address value retrieve in the previous step.

curl -i -k -X GET -H "auth:${AUTH}" -H "X-Api-Version:300" "https://{clusterIpv4Address}/rest/appliance/i3s/amvm" | grep { | python -m json.tool | less

Sample Output

{

"amvmstate": "running",

"dataipv4address": "172.18.111.103",

"dataipv4subnet": "255.255.255.0",

"managementipv4address": "192.85.182.206",

"managementipv4gateway": "255.255.255.128",

"managementipv4subnet": "255.255.255.128"

}

4. Start AMVM

curl -i -k -X PUT -H "auth:${AUTH}" -H "X-Api-Version:300" -H "action:start" "https://{clusterIpv4Address}/rest/appliance/i3s/amvm" | grep { | python -m json.tool | less

5. To stop AMVM, replace “action:start” with “action:stop” in the header information in the above curl command.

The Advanced Management Virtual Machine is now running and can be accessed via SSH at the managementipv4address retrieved in step 3 above. The default credentials are root/root123. You must change the password at first login.

On Windows using PowerShell:

1. Establish a session with the HPE Synergy Composer appliance

```
PS> $headers = @{}
PS> $headers[“X-API-Version”] = “300”
PS> $headers[“Content-Type”] = “application/json”
PS> $auth=Invoke-RestMethod -uri “https://{Composer-IP}/rest/login-sessions -Body
'{"userName":"Administrator","password":"{password}","authLoginDomain":"local"}' -Method POST -Headers
$headers
```

2. Retrive the Image Streamer appliance cluster IP address

```
PS> $headers[“auth”] = “$auth”
PS> $imageSteamer = (Invoke-RestMethod -uri “https://{Composer-IP}/rest/deployment-servers/image-streamer-
appliances/”  -Method GET -Headers $headers).clusterIpv4Address[0]
```

3. Retrieve the AMVM IP information

```
PS> $amvm = Invoke-RestMethod –uri “https://$imageStreamer/rest/appliance/i3s/amvm” -Headers $headers -
Method GET
```

Sample Output

```
managementipv4gateway : 192.168.0.1
dataipv4address       : 172.18.111.103
amvmstate             : running
managementipv4address : 192.168.0.206
dataipv4subnet        : 255.255.255.0
managementipv4subnet  : 255.255.255.0
```

4. Start AMVM

```
PS> $headers[“action”] = “start”
PS> Invoke-RestMethod –uri “https://$imageStreamer/rest/appliance/i3s/amvm” –Headers $headers –Method PUT
```

5. To stop AMVM, replace “action:start” with “action:stop” in the header information in the above curl command.

The Advanced Management Virtual Machine is now running and can be accessed via SSH at the managementipv4address retrieved in step 3 above. The default credentials are root/root123. You must change the password at first login

Note:
PowerShell by default will not allow appliance connections due to the certificate on the appliances being untrusted. This should be handled in code according to the organization requirements.

To bypass this restriction and allow all untrusted connections the following can be executed as the first step:

```
PS> [Net.ServicePointManager]::ServerCertificateValidationCallback = {$true}
```

Learn more at:

www.hpe.com/composable

www.hpe.com/info/synergy-docs

https://www.hpe.com/us/en/product-catalog/synergy/synergy-management/pip.hpe-synergy-image-streamer.1008615214.html

http://libguestfs.org/guestfish.1.html

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