



Insight Control Server Provisioning

Capturing and Installing Red Hat Enterprise Linux 6 System Images

Table of contents

Summary	2
Preparing for image capture	2
Sanitizing server image	2
Copying scripts from this document	2
Creating the Capture Red Hat Linux Image OS Build Plan	2
Mount server image script	3
Capture server image script	3
Create the Capture Red Hat Linux Image OS Build Plan	3
Creating the Install Red Hat Linux Image OS Build Plan	4
Create new Filesystem script	4
Mount the Filesystem script	5
Deploy Linux image script	6
Fixup Linux deployment script	6
Reinstall HP SA Agent Script	7
Create the Install Red Hat Linux Image OS Build Plan	8
For more information	10

Summary

The Insight Control (IC) server provisioning appliance is prepackaged with OS Build Plans (OSBPs) that perform scripted installations of Red Hat Linux. Currently, it does not have OSBPs that allow the capture of Linux system images and the deployment of those images back to target servers. This technical document provides step-by-step instructions to create OSBPs that capture and deploy Linux images.

The instructions within this document can be used for Red Hat Enterprise Linux 6.5 through RHEL 6.6 and RHEL 6.7 on target servers that are configured in Legacy boot mode.

This document assumes that readers are:

- Familiar with the IC server provisioning appliance and have the appropriate administrative rights to the appliance.
- Proficient with Linux and can work with Linux scripts and have expert knowledge on Linux Administration.

Preparing for image capture

To facilitate image capture and deployments, there are a few steps that must be followed before initiating an image capture. None of these actions are mandatory, but if they are not handled before the image capture, they must be handled during deployment.

Sanitizing server image

There are several files on a server that contain hardware configuration references that must be removed to simplify the image deployment. For example, `/etc/fstab` and `/boot/grub/menu.lst` files. There might be may be references to UUID labels for disk partitions or the disk may be specified using a `/dev/disk/by-id/*` device. These values are specific to each disk, and must be replaced with a more generic value. For example, if a mount point is specified in `/etc/fstab` as `UUID=xxxxyy` where `xxxxyy` is a string value, it can be replaced with the actual disk partition, example `/dev/sda1`. Use `blkid` utility to view a list of the partitions with their labels and UUID values and determine which partition needs to replace the `UUID=xxxxyy`. If the device is specified by `/dev/disk/by-id/*`, you can search in the `/dev/disk/by-id` directory, enter the command `"ls -l"` and look at the physical device to which the link points.

Copying scripts from this document

WARNING: If the scripts are copied from this document using cut and paste some detrimental artifacts are noticed. Extra spaces and lines appear to be added to the text when it is pasted into the script content window. The script must be manually edited to remove these artifacts. The spaces after UNIX line continuation characters `'\'` and after copy block markers (EOF) cause the script to fail. Additional lines between the `'\'` character and the actual code also cause failures. It is recommended that the line continuations are removed and the code is placed on one line.

Creating the Capture Red Hat Linux Image OS Build Plan

The steps to perform an image capture are listed in the following section:

1. Boot into the LinuxPE service OS.
2. Mount the media source where the captured image is to be saved.
3. Mount the target server image for capture.
4. Capture the image using the tar utility.
5. Reboot the server into production mode.

Note: The following scripts are based on a typical installation of RHEL 6.5 using autopart. As autopart is used, it is possible that a third logical volume (lv_home) may be created. If it is not, then edit code to ensure that only available LVMs are mounted before capturing the OS image, and that all LVMs are correctly recreated during deployment.

Mount server image script

Use the *Sample - Mount the RHEL Filesystem* script or create a new script that creates a target directory (/mnt/target) and then mounts the target server image to /mnt/target. If the server /etc/fstab indicates more than just /boot and /root as mount points, then the script must be modified to reflect the mount points of the image to be captured.

IMPORTANT: Do not mount a swap partition. Review the /etc/fstab file in the target server to get information on swap partitions.

To create a new script to mount the server image:

1. On the IC server provisioning appliance, create a new script of UNIX type and name it for the appropriate function.
2. Create the script content or copy and paste the script content from an external application. For example, for a standard Red Hat 6.5 installation, the script contains:

```
#!/bin/sh
mkdir -p /mnt/target
mount /dev/mapper/VolGroup-lv_root /mnt/target
#autopart third logical volume if exists
mkdir -p /mnt/target/home 2> /dev/null
mount /dev/mapper/VolGroup-lv_home /mnt/target/home
mkdir -p /mnt/target/boot
mount /dev/sda1 /mnt/target/boot
```

3. Click **OK** to save the script.

Capture server image script

Use the *Sample - Capture Linux Server Image* script or create a new script that captures the target server image and transfers it to a location on the Media Server.

To create a new script to mount the server image:

1. On the IC server provisioning appliance, create a new script of UNIX type and name it for the appropriate function.
2. Create the script content or copy and paste the script content from an external text application. For example, the script contains:

```
#!/bin/sh
cd /mnt/target
tar jcf /mnt/images/$1.tar.bz2 .
exit $?
```

where the image name is passed in as a first parameter to the script step and the Media Server is mounted on /mnt/images.

3. Click **OK** to save the script.

Create the Capture Red Hat Linux Image OS Build Plan

Once the *Mount Server Image Script* and *Capture Server Image Script* are created, you can create Linux capture OSBP.

To create a Capture Linux System Image OSBP:

1. Make a copy of the *ProLiant HW - Boot Linux Service OS* OSBP by selecting **Actions** and **Save As** from the OS Build Plan view.

2. Edit the new OS Build Plan with the following:
 - a. Retain the first step, *Check iLO Service*.
 - b. Modify the *Boot* step to ensure that the PXE Linux service OS RHEL6.6 is booted by adding `--serviceOS=linux64_6 --method=network --force` parameter to the Parameters field.
 - c. Retain the third step, *Wait for HP SA Agent*.
 - d. Add the *Set Media Source* script to mount the Media Server on `/mnt/images`. Include the following parameters in the script step:


```
@__OPSW-Media-WinUser@@__OPSW-Media-WinPassword@@__OPSW-Media-WinPath@#/mnt/images?noserverino
```
 - e. Add the *Sample - Mount the RHEL Filesystem* script or new *Mount Server Image* script as created in the *Mount Server Image Script* section. No parameters are required.
 - f. Add the *Sample - Capture Linux Server Image* or new *Capture Server Image* script as created in the *Capture Server Image Script* section. Set the Parameters field to a file and/or directory of `/mnt/images` where the image file will be stored. Any directories in the path must be already defined on the Media Server. For example, `LinuxImages/rh66normal` stores the image `rh66normal.tar.gz2` on the Media Server in the `LinuxImages` directory.
 - g. Add the *Reboot* script to boot the server into production mode.
 - h. Add the *Wait for HP SA Agent* script to wait for the server to boot into production mode. Include the following parameters in the script step:


```
--production --atLeast=3 --atMost=30
```

The OSBP is complete and ready to run on a target server. Copies of this OSBP can be created to capture different images by replacing the OSBP script in Step 2e for different mount instructions or script Step 2f for image name parameter.

Creating the Install Red Hat Linux Image OS Build Plan

The steps to perform an image deployment are listed in the following sections:

1. Boot into the LinuxPE service OS.
2. Remove old partitions and any logical volumes/groups using the Erase Server Disk script.
3. Mount the media source where the image is to be saved.
4. Create the new filesystems and partitions on the disk.
5. Mount the new filesystems for deployment.
6. Deploy the image.
7. Fix any issues that are required, such as remove old network settings and replace with new ones, and make hostname changes.
8. Reinstall the HP SA agent.
9. Reboot the server into the production mode.

Several of these steps can be combined into a single script, but they are listed here separately.

Note: The following scripts are based on a typical installation of RH6.5 using *autopart*. Because *autopart* is used, it is possible that a third logical volume (`lv_home`) may be created. If it is not, then edit code to ensure that only available LVMs are mounted before capturing the OS image, and that all LVMs are correctly recreated during deployment.

Create new Filesystem script

Create a new script that repartitions the disk, creates logical volumes/groups and creates the filesystem to receive the new image. Sample script partitions the disk to replicate the old partition table, it is possible to alter the new partition if required. `/etc/fstab` file in the image must be updated accordingly before the image is deployed.

To create a new script to create the filesystem:

1. On the IC server provisioning appliance, create a new script of UNIX type and name it for the appropriate function.
2. Create the script content or copy and paste the script content from an external application. For example, the script contains:

```
#!/bin/bash

# Partition disk
echo "Partitioning disk..."
sfdisk /dev/sda -uM << EOF
0,500,L,*
,,L
EOF
while [ ! -e /dev/sda2 ]; do sleep 1; done

# Mark partition as Linux LVM
sfdisk --change-id /dev/sda 2 0x8e

# Create filesystems and logical volumes
echo "Create filesystem on boot partition..."
mkfs.ext4 -j -L boot /dev/sda1

echo "Create logical group and volumes..."
pvcreate -ff -y /dev/sda2
vgcreate VolGroup /dev/sda2

#autopart third logical volume if exists
lvcreate --size 10G VolGroup --name lv_root
while [ ! -e /dev/VolGroup/lv_root ]; do sleep 1; done

lvcreate --size 10G VolGroup --name lv_home
while [ ! -e /dev/VolGroup/lv_home ]; do sleep 1; done

lvcreate --size 4G VolGroup --name lv_swap
while [ ! -e /dev/VolGroup/lv_swap ]; do sleep 1; done

mkfs.ext4 -j -L root /dev/VolGroup/lv_root
mkfs.ext4 -j -L home /dev/VolGroup/lv_home
mkswap -f -L swap0 /dev/VolGroup/lv_swap 2> /dev/null
```

3. Click **OK** to save the script.

Mount the Filesystem script

Create a new script that mounts the filesystem, where the compressed image is uncompressed. If the image partition structure has not changed from the capture, the capture OS Build Plan's *Mount Server Image* script can be used.

To create a new script to mount the filesystem:

1. On the IC server provisioning appliance, create a new script of UNIX type and name it for the appropriate function.
2. Create the script content or copy and paste the script content from an external application. For example, the script contains:

```
#!/bin/bash

#Now mount new setup.
mkdir -p /mnt/target
mount /dev/mapper/VolGroup-lv_root /mnt/target
#autopart third logical volume if exists
mkdir -p /mnt/target/home 2> /dev/null
```

```
mount /dev/mapper/VolGroup-lv_home /mnt/target/home
mkdir -p /mnt/target/boot
mount /dev/sda1 /mnt/target/boot
```

3. Click **OK** to save the script.

Deploy Linux image script

This section helps to create a new script that deploys the previously captured Linux image.

To create a new script to deploy a Linux image:

1. On the IC server provisioning appliance, create a new script of UNIX type and name it for the appropriate function.
2. Create the script content or copy and paste the script content from an external application. For example, the script contains:

```
#!/bin/bash
tar jxf /mnt/images/$1.tar.bz2 -C /mnt/target
```

where the image name is passed as a parameter to the script step and the Media Server is mounted on /mnt/images.

3. Click **OK** to save the script.

Fixup Linux deployment script

Create a new script that adjusts with any new hardware or partition changes after the image is deployed to the target server. This sample script writes new MBR on the disk and fixes the network adapters.

To create a new script to adjust for new hardware and partitioning:

1. On the IC server provisioning appliance, create a new script of UNIX type and name it for the appropriate function.
2. Create the script content or copy and paste the script content from an external application. For example, the script contains:

```
#!/bin/bash
#Mount devfs
mount -t devtmpfs dev /mnt/target/dev

# write new MBR
chroot /mnt/target /sbin/grub \
--device-map=/boot/grub/device.map << EOF
root (hd0,0)
setup (hd0)
quit
EOF

# clean up installation.
# Message /etc/fstab mount points if needed

# Change network configuration/setup - Remove physical anchor
# settings.
sed -i -e '/^HWADDR/d' -e '/^UUID/d' \
/mnt/target/etc/sysconfig/network-scripts/ifcfg-eth0
rm -f /mnt/target/etc/udev/rules.d/70-persistent-net.rules
#

# Hostname
exit 0
```

3. Click **OK** to save the script.

Reinstall HP SA Agent Script

Use the *Sample - Re-Install RHEL HP SA Agent* script or create a new script that sets up the target server to reinstall the HP SA Agent after the server has rebooted for the first time into production. The script runs once on the server during the image deployment and then again when the server reboots.

Note: This step must be provided with ICsp deployment IP as a parameter.

To create a new script that reinstalls the HP SA Agent after deployment:

1. On the IC server provisioning appliance, create a new script of UNIX type and name it for the appropriate function.
2. Create the script content or copy and paste the script content from an external application. For example, the script contains:

```
#!/bin/bash

icspip="@@REPLACE_ME@"

if [ "$icspip" == "@@REPLACE_ME@" ]; then
    # script is running on server as part of deployment
    # need to set it up so that it runs after rebooting
    # deployed server.
    if [ -f "$0" ]; then
        sed -i -e "s/=\\\"@@REPLACE_ME@@/=\\\"$1/" $0
        # copy server into /rc{3,5}.d to run on startup.
        cp $0 /mnt/target/etc/rc3.d/S40hpsa_agent_installer
        cp $0 /mnt/target/etc/rc5.d/S40hpsa_agent_installer

        rm -rf /mnt/target/etc/opt/opsware/agent/mid
        rm -rf /mnt/target/var/opt/opsware/crypto/agent
        cp -R /var/opt/opsware/crypto/agent \
            /mnt/target/var/opt/opsware/crypto
        cp /etc/opt/opsware/agent/mid \
            /mnt/target/etc/opt/opsware/agent/mid
    else
        echo "Could not find script $0"
        exit 1
    fi
    rm -rf /mnt/target/etc/rc*.d/*opsware*
    echo "Done creating installation script for post reboot agent
installation.."
    exit 0
else
    cp /etc/rc3.d/S40hpsa_agent_installer /tmp
    rm -rf /etc/rc?.d/S40hpsa_agent_installer
fi

logfile=/tmp/Migrate.log
cd /tmp
filename=""
echo "*****" >> $logfile
echo "***** Start *****" >> $logfile
echo "*****" >> $logfile
echo `date` >> $logfile
uname -a | grep 86_64
if [ $? -eq 1 ] ; then
    echo "Cannot migrate x86 target" >> $logfile
    exit "11"
fi
if [ -e /etc/redhat-release ] ; then
```

```

cat /etc/redhat-release | grep "6.*"
if [ $? -eq 0 ] ; then
    echo "found RHEL6" >> $logfile
    filename="opsware-agent-LINUX-6SERVER-X86_64"
fi
cat /etc/redhat-release | grep "5.*"
if [ $? -eq 0 ] ; then
    echo "found RHEL5" >> $logfile
    filename="opsware-agent-LINUX-5SERVER-X86_64"
fi
fi
if [ -e /etc/SuSE-release ] ; then
    cat /etc/SuSE-release | grep -i "version = 11"
    if [ $? -eq 0 ] ; then
        echo "found sles11" >> $logfile
        filename="opsware-agent-LINUX-SLES-11-X86_64"
    fi
    cat /etc/SuSE-release | grep -i "version = 10"
    if [ $? -eq 0 ] ; then
        echo "found sles10" >> $logfile
        filename="opsware-agent-LINUX-SLES-10-X86_64"
    fi
fi
echo "File to Download -> $filename" >> $logfile

if [ -n "$filename" ] ; then
    wget http://$icspip:8081/$filename >> $logfile
    if [ -e "$filename" ] ; then
        chmod +x $filename
        echo "Execute ./ $filename -s --opsw_gw_list $icspip:3001" \
            >> $logfile
        ./ $filename -s --settime --force_full_hw_reg \
            --force_sw_reg --opsw_gw_list $icspip:3001 >> $logfile
    else
        echo "Download failed for http://$icspip:8081/$filename" \
            >> $logfile
        exit "1"
    fi
else
    echo "Download failed for http://$icspip:8081/$filename" \
        >> $logfile
    exit "1"
fi
exit 0

```

3. Click **OK** to save the script.

Create the Install Red Hat Linux Image OS Build Plan

Once the scripts from *Creating the Install Red Hat Linux Image OS Build Plans* sections are created, you can create the Linux install OSBP.

Note: The image install works with the Service OS 6.6 only.

To create the Install Red Hat Linux System Image OSBP:

1. Make a copy of the *ProLiant HW - Boot Linux Service OS OSBP* by selecting **Actions** and **Save As** from the OS Build Plan view.
2. Edit the new OSBP with the following:
 - a. Retain the first step, *Check iLO Service*.
 - b. Remove the second step, *Verify Supported Boot Modes*.

- c. Modify the *Boot* step to ensure that the PXE LinuxPE service OS RHEL 6.6 is booted by adding `--serviceOS=linux64_6 --method=network -force` parameter to the Parameters field.
- d. Add the *Decommission Server* script.
- e. Retain the fourth step, *Wait for HP SA Agent*.
- f. Add the *Erase Server Disk* script.
- g. Add the *Reset Server Lifecycle to Unprovisioned* script.
- h. Add the *Boot* script and ensure that the PXE LinuxPE service OS RHEL6.6 is booted by adding `--serviceOS=linux64_6 --method=network --force` parameter to the Parameters field.
- i. Add the *Wait for HP SA Agent* step to wait for the server to boot into maintenance mode. Include the following parameters in the script step:
`--maintenance --atLeast=3 --atMost=20`
- j. Add the *Set Media Source* script to mount the Media Server on `/mnt/images`. Include the following parameters in the script step:
`@__OPSW-Media-WinUser@@__OPSW-Media-WinPassword@@__OPSW-Media-WinPath@#/mnt/images?noserverino`
- k. Add the new *Create New Filesystem* script as created in the *Create New Filesystem Script* section.
- l. Add the new *mount the Filesystem* script as created in the *Mount the Filesystem Script* section.
- m. Add the new *Deploy Linux Image* script as created in the *Deploy Linux Image Script* section. Set the Parameters field to a directory and filename of the image file to restore. For example, to restore the image specified in the previous capture step, the parameter used is `LinuxImages/rh66normal`. The script appends “.tar.bz2” to the name of image file.
- n. Add the new *Fixup Linux Deployment* script as created in the *Fixup Linux Deployment Script* section.
- o. Add the *Sample - Re-Install RHEL HP SA Agent* or new *Re-Install HP SA Agent* script as created in the *Re-Install HP SA Agent Script* section. Specify the ICsp's Deployment IP address as the parameter for this step.
- p. Add the *Reboot* script to boot the server into production mode.
- q. Add the *Wait for HP SA Agent* script to wait for the server to boot into production mode. Include the following parameters in the script step:
`--production --atLeast=3 --atMost=30`

The OSBP is complete and ready to run on similar target servers to deploy a previously captured Linux image. The sample scripts make several assumptions about the servers used. For example, the server model/storage configuration and NIC configurations are same between image capture and image install Targets. The disk partitioning code assumes that the root disk is `/dev/sda` and it fails if the root disk is actually `/dev/cciss/c0d0`. The scripts can be made better to handle different disks and different image formats. However, it is beyond the scope of this technical document.

For more information

To learn more about Insight Control server provisioning, go to www.hp.com/go/insightcontrol/docs.

- [HP Insight Management Support Matrix](#)
- [HP Insight Control Server Provisioning Installation Guide](#)
- [HP Insight Control Server Provisioning Administrator Guide](#)
- [HP Insight Control Server Provisioning Build Plans Reference Guide](#)
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