Installing OpenVMS Integrity servers Version 8.4 as a Guest OS on HP Integrity Virtual Machines

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Executive Summary

This document includes the steps required to install, configure, and run OpenVMS as a guest operating system on HP Integrity Virtual Machines (Integrity VM).

Intended Audience

This document is intended for OpenVMS system administrators who are planning to install and run OpenVMS as a guest Operating System on Integrity VM.

Introduction

Integrity VM is a soft partitioning and virtualization technology that provides operating system isolation, with sub-CPU allocation granularity and shared I/O. Integrity VM can be installed on Integrity servers or hardware partition (nPartition) running HP-UX. You can install OpenVMS as a "guest" operating system, which is an Integrity VM environment running on Integrity servers. A VM Host administrator or OpenVMS system administrator can manage an OpenVMS guest operating system like a discreet Integrity server or nPartition.

Prerequisites

The prerequisites to install OpenVMS guest operating system are as follows:

- Systems must have VT-i (Intel Virtualization Technology for the Intel Itanium Architecture) enabled Intel Itanium processors.

Note: Intel Itanium processor 9000 and 9100 series and higher are VT-i supported.

- HP-UX 11i v3 Core #1 and HP-UX 11i v3 core #2 DVD.
- Integrity VM 4.1 Field Test evaluation kit.
- For HP-UX system requirements, see Chapter 2 of *HP-UX 11iv3 Installation and Update guide, September 2009 (Update 5 Release)* available at:

  http://docs.hp.com/en/5992-6552/index.html
- OpenVMS E8.4 kit in ISO format.
- Networking information, such as:
  - Hostname of the VM Host and each guest.
  - IP Address of the VM Host and each guest.
  - Subnet Mask of the VM Host and each guest.
  - IP address of one or more DNS servers and the gateway machine.
  - DECnet addresses of each guest (if DECnet is planned to be used).
- Timezone information.
- "root" account and password of the VM Host and "system" account password of each OpenVMS guest.

Note: To find out Itanium processor type:

1. From the EFI Shell:

   Execute the cpuconfig command on EFI shell:

```
Shell> cpuconfig
            # of
CPU         Logical                 L3 Cache   L4 Cache   Family/              Processor
Module      CPUs         Speed      Size       Size       Model(hex.)    Rev   State
-------     -------      ------     ------     ------     -------        ---   -------

0           2            1.6 GHz    9 MB       None       20/00          C2    Active
1           2            1.6 GHz    9 MB       None       20/00          C2    Active
CPU threads are turned off.
```

Look into the Family or Model shown in the output and map with the following table to find the processor type.

Table 1: Processor types

Family (hex.)	Model (hex.)	Processor
20	00	Itanium 9000 series
20	01	Itanium 9100 series

2. If system is running on HP-UX 11iV3; execute the following `machinfo` command as shown:

```
# /usr/contrib/bin/machinfo

CPU info:
 2 Intel(R) Itanium 2 9000 series processors (1.4 GHz, 12 MB)
                                    ← processor type
           399 MT/s bus, CPU version C2
           4 logical processors (2 per socket)
```

3. If system is running on OpenVMS, execute the clue `configuration` command in SDA as shown:

```
$anal/sys
SDA> clue config
      …
CPU ID         0                 CPU State rc,pa,pp,cv,pv,pmv,pl
CPU Type       Dual-Core Itanium (Intel Itanium 9000  Rev C2)
                                        ← processor type
```

Installing HP-UX

You can install HP-UX operating system by completing the procedure as follows:

1. Insert DVD for core #1. Select "Internal Bootable DVD" from the Boot Menu and boot the system as shown:

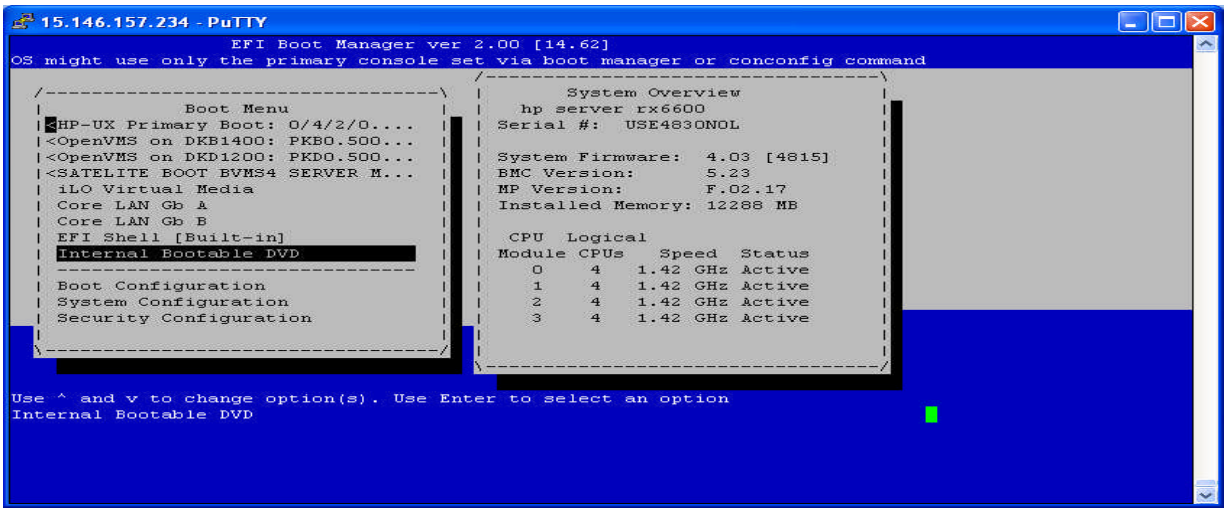

Figure 1

2. Select the "Install HP-UX" option as shown:

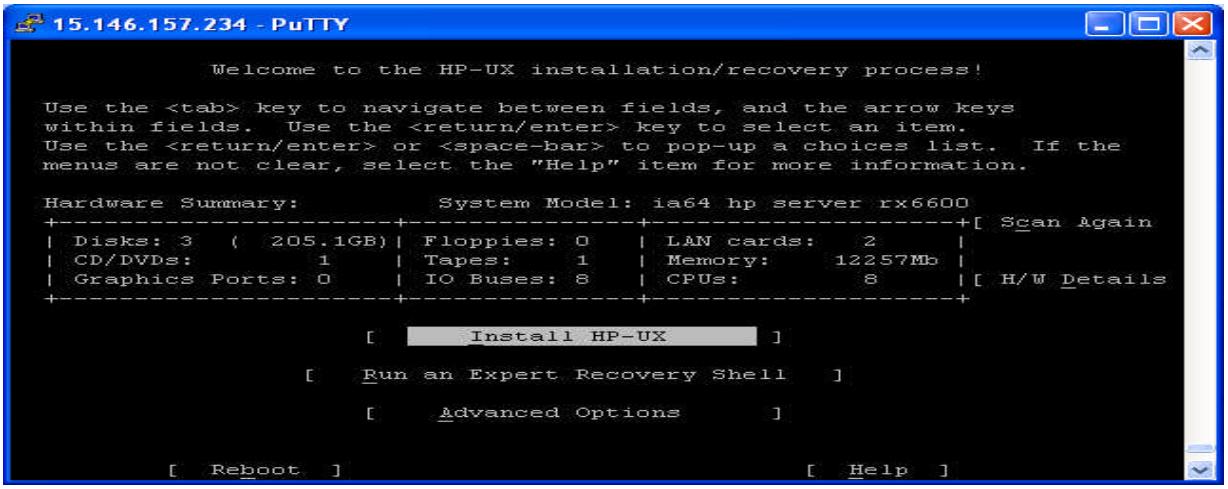

Figure 2

3. Select the "User Interface and Media" options and select "Media only installation" from Source Location Options and Advanced Installation (recommended for disk and filesystem management) from User Interface as shown:

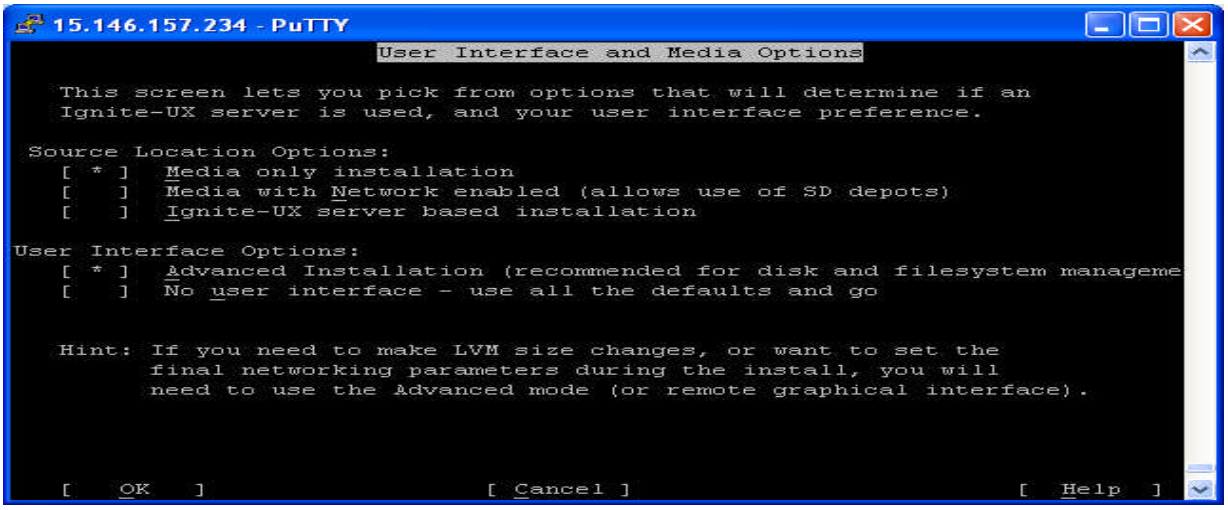

Figure 3

4. Select the Media Installation Selection and select "CD/DVD Installation" as shown:

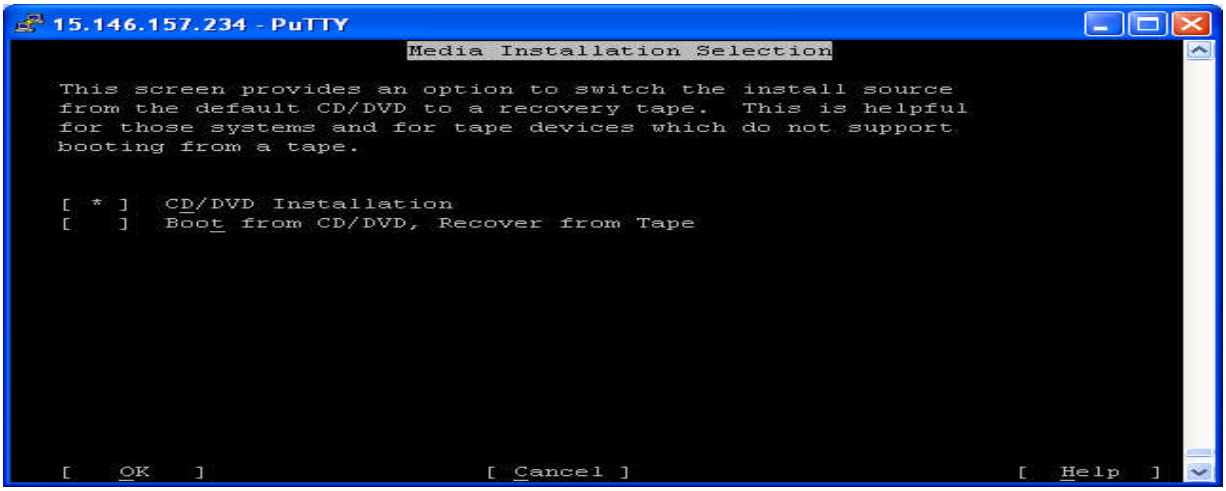

Figure 4

5. There are five tabs in the "Configuration information" screen, you can use them to specify system configuration parameters, they are:
   - Basic configuration
   - Software configuration
   - System configuration
   - File System configuration
   - Advanced configuration

Note: Press the tab key to move between different tabs. Use enter and arrow keys to make selections.

a) Basic Configuration

You need to provide the following information in the basic configuration screen:

- Root Disk (select a disk where you want to install HP-UX, if multiple disks are present)
- File System (select the Logical Volume Manager with VxFS)
- Root Swap (optimal value is 2048)
- Languages (select the preferred language)

Fill the required information as shown:

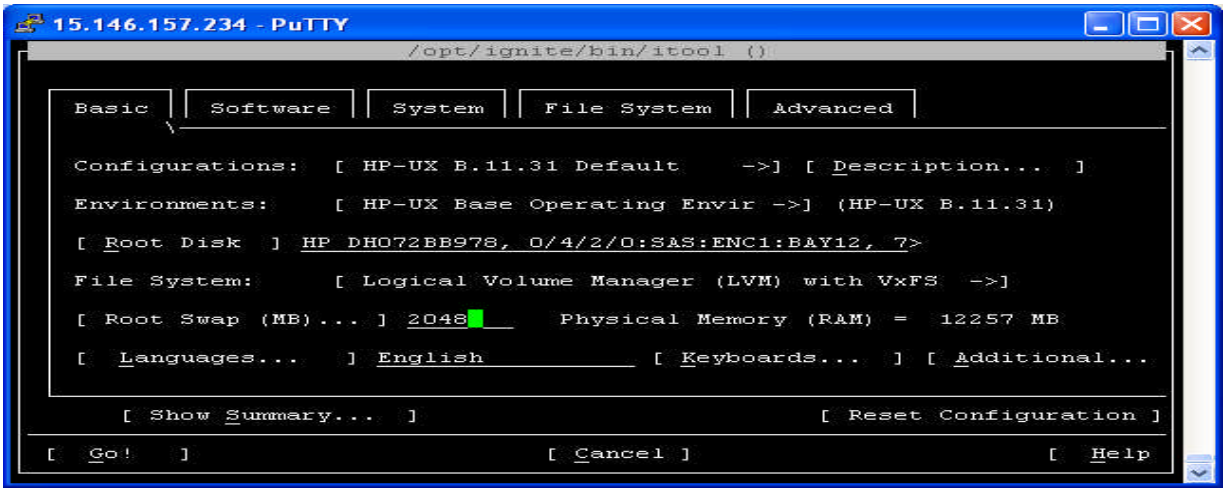

Figure 5

b) Software Configuration

There are no changes required. Default options are optimal.

c) System Configuration

There are two options for setting final system parameters:

- Set parameters now
- Ask at First boot

For the "Set Parameters now" option, provide the following information:

- Hostname
- IP Address
- Timezone (select the preferred timezone)
- Network services related information
- Set root password
- Additional interfaces
- Security Choices

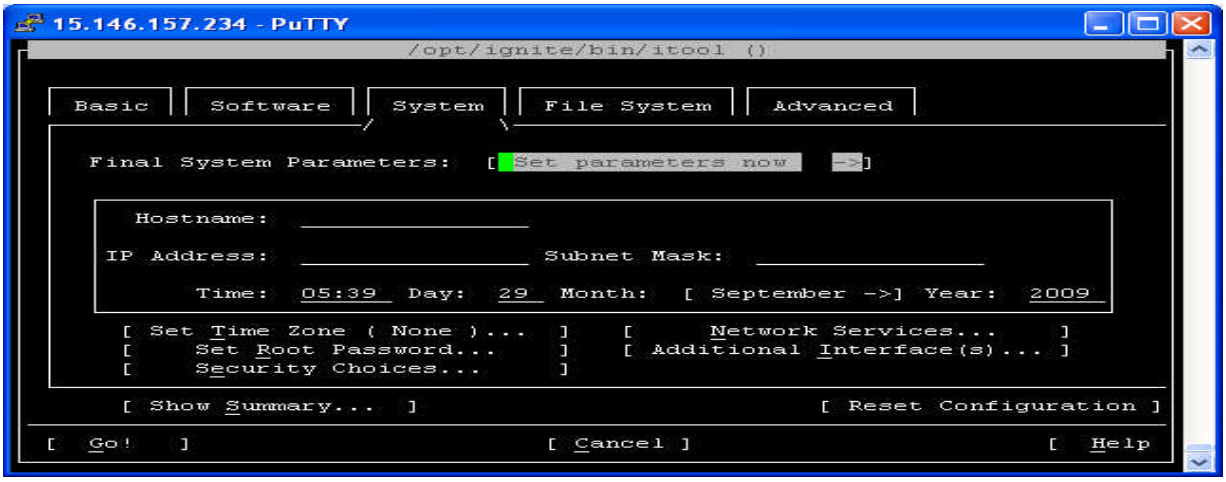

Figure 6

You can provide the network services information in the “Network Services” screen. You can set Gateway and DNS information. The Destination Hop Count must be 1. NIS and XNTP options are optional. Fill the required information as shown:

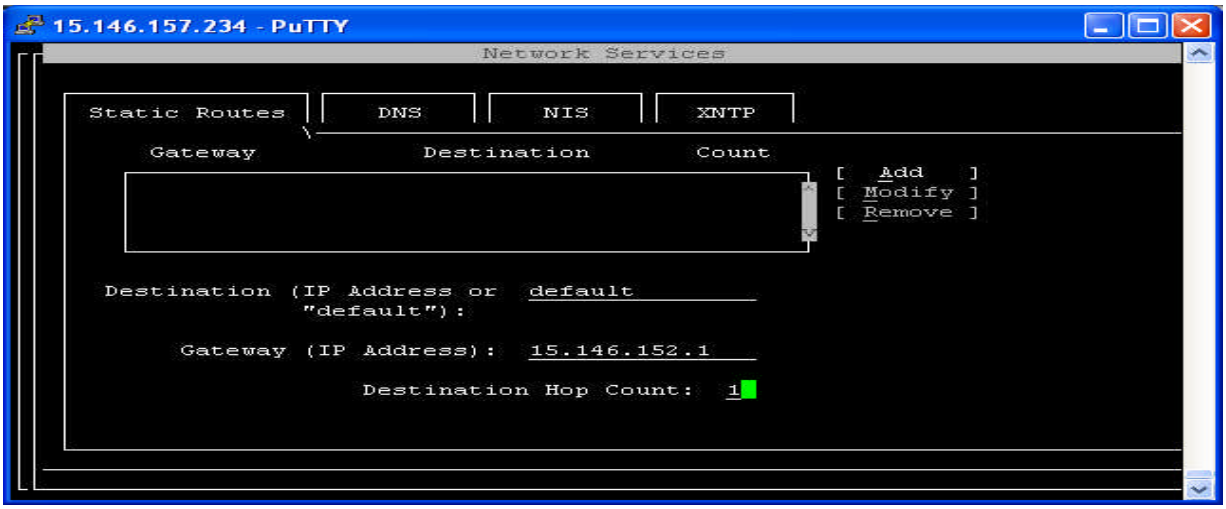

Figure 7

Select the appropriate timezone as shown:

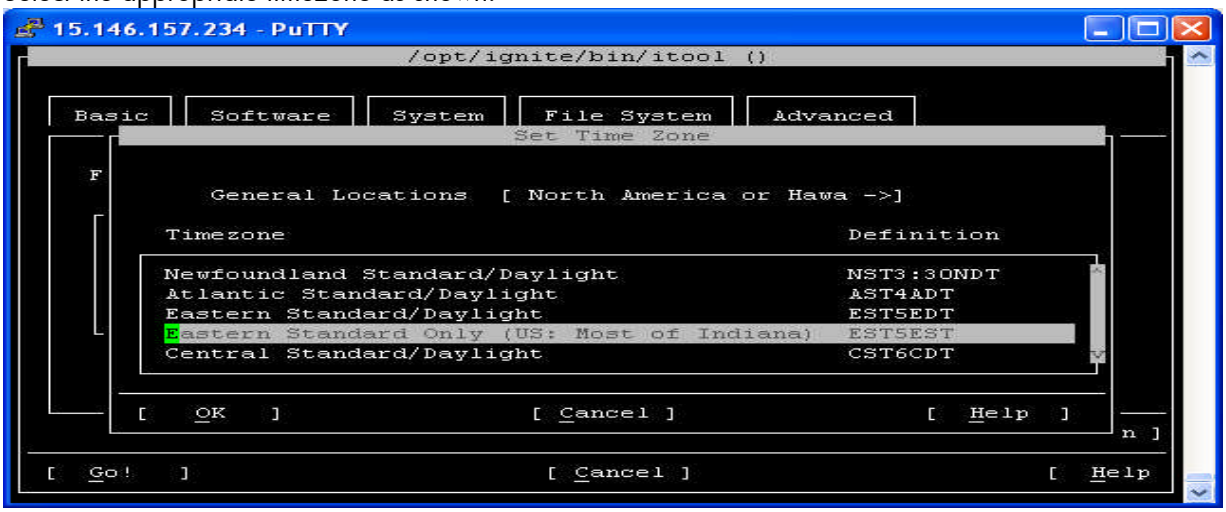

Figure 8

Set and confirm root password as shown:

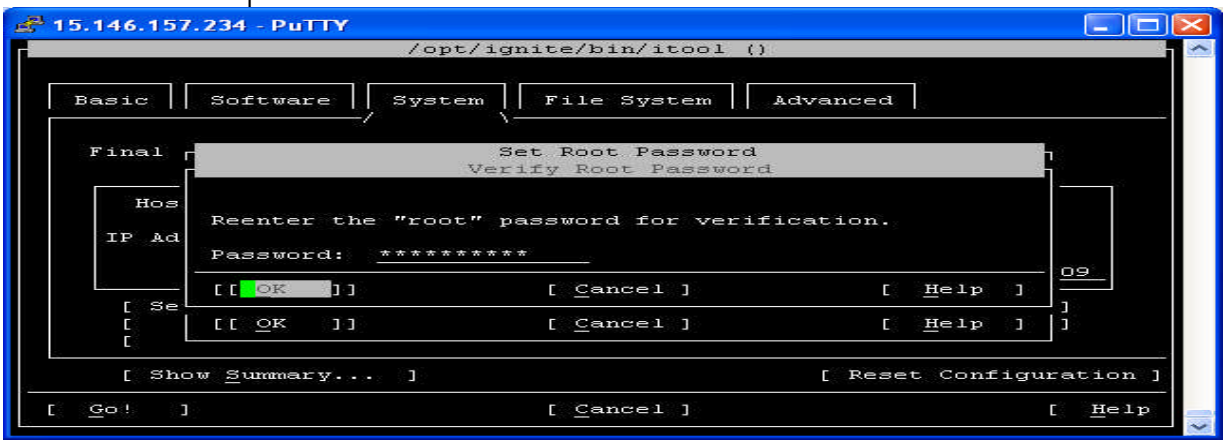

Figure 9

You can choose "Ask at first boot" option instead of "Set parameters now" in Figure 6. You must provide the following information at first system boot:

- Networking setup (standalone system or system in network)
- IP Address (Dynamic IP using DHCP or Static IP)
- Hostname
- Timezone (Choose preferred timezone)
- Network services related information (i.e. Gateway, DNS and NIS)
- Set root password
- Language (Choose preferred language)

Figures 10 and 11 are shown when you select the option "Ask at first boot".

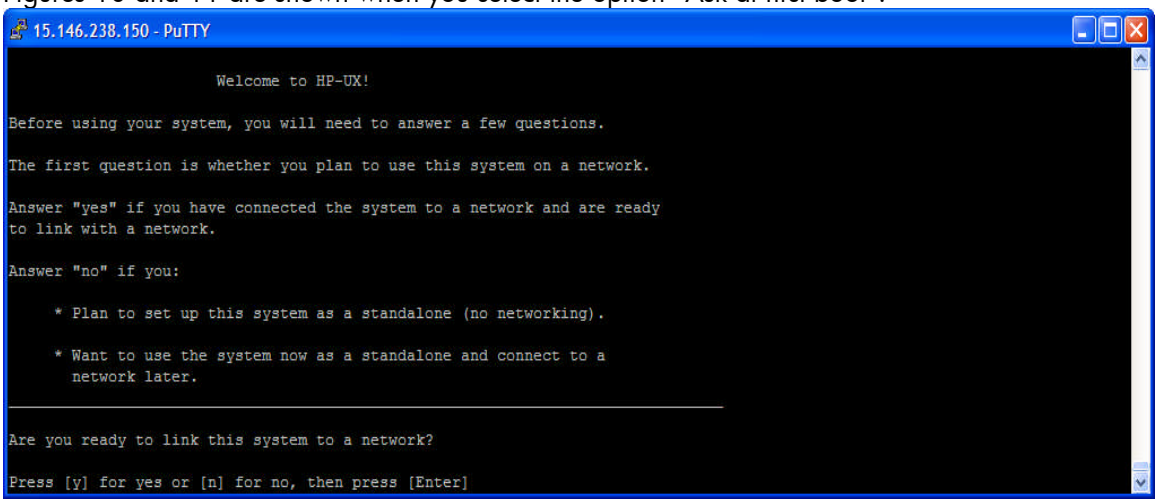

Figure 10

If you have answered "Y" to previous question, select either Static IP or Dynamic IP using DHCP as shown:

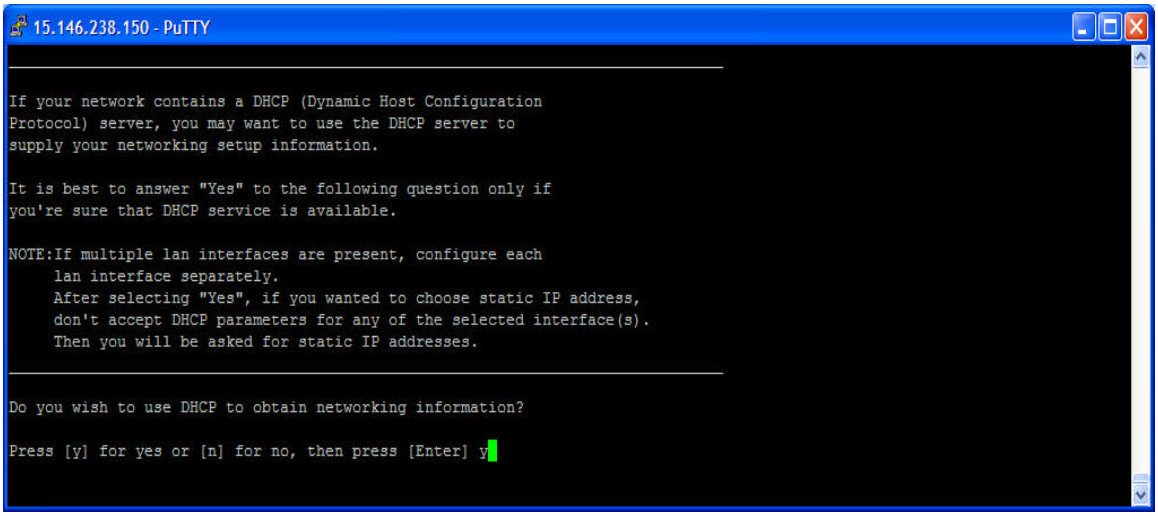

Figure 11

Complete the procedure by entering all the required information. The system will complete its boot process and allow you to login into the VM Host.

d) File System Configuration:

There are no changes required. Default options are optimal.

e) Advanced Configuration:

There are no changes required.

6. After filling all the required configuration information select “Go!” option and press Enter.

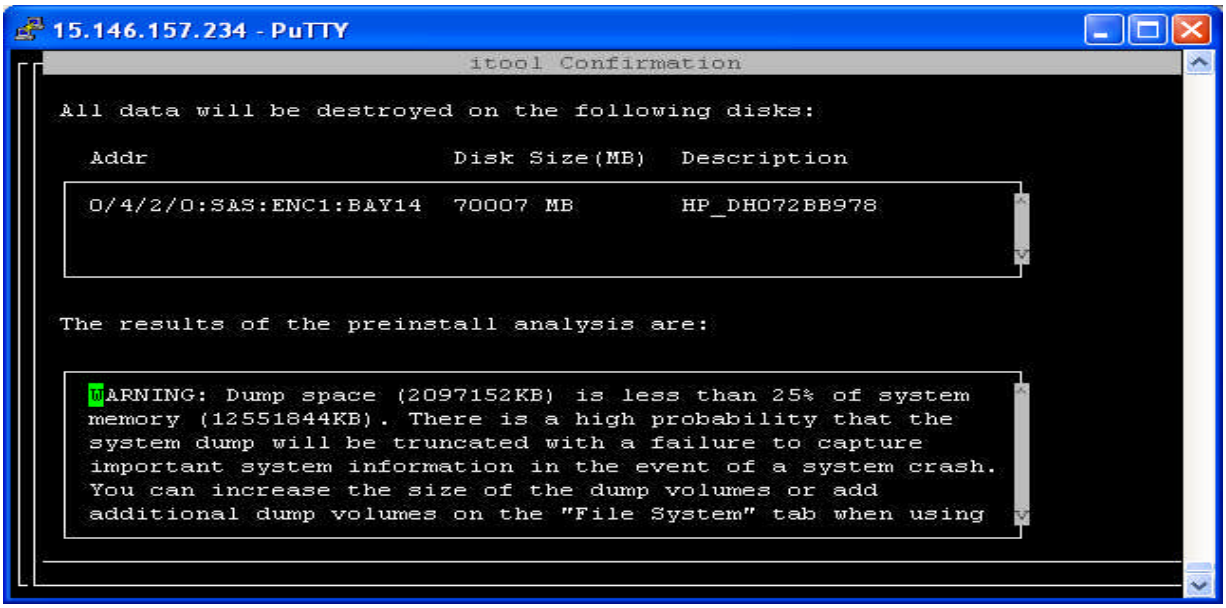

Figure 12

Note: Any errors encountered must be manually corrected by going back to the configuration UI and restarting the installation process. Warning such as the selected disk will be over written, can be ignored if the right disk is chosen, else select the Back option to go back to the configuration UI to change the disk. Warnings related to less dump space can also be ignored. Review any other warnings and take appropriate decision. Select "Go!" to continue with installation or Cancel If you do not want to start the installation.

7. After successfully installing the required software from core #1, the following message is displayed:

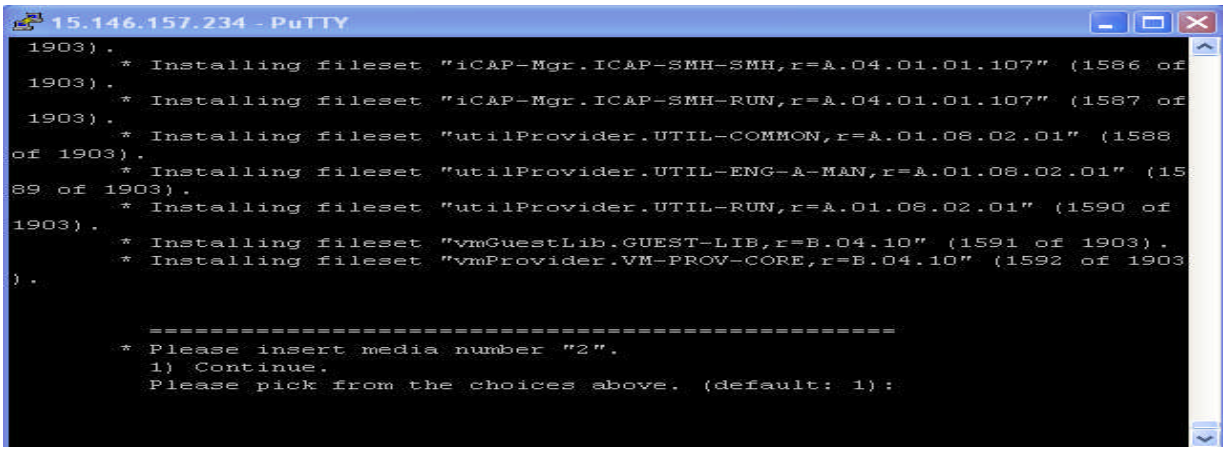

Figure 13

8. Eject the DVD for core #1 and insert the DVD for core #2 and continue with the installation as shown:

```
15.146.157.234 - PuTTY
          1) Continue.
          Please pick from the choices above. (default: 1):

        * Working...
        * Installing bundle "B3835DA,r=C.03.05" .
        * Installing bundle "B6848BA,r=1.4.gm.46.16" .
        * Installing bundle "DSAUtilities,r=C.01.00.18" .
        * Installing bundle "DynRootDisk,r=B.1131.A.3.4.39" .
        * Installing bundle "FIREFOX,r=A.2.0.0.19ar.02" .
        * Installing bundle "FIREFOXsrc,r=A.2.0.0.19ar.02" .
        * Installing bundle "GTK,r=2.6.8.00.01" .
        * Installing bundle "GTKsrc,r=2.6.8.00.01" .
        * Installing bundle "HP-ACC-Link,r=C.11.31.03" .
        * Installing bundle "HP-Caliper-PERF,r=C.11.31.04" .
        * Installing bundle "HPUX-DHCPv4,r=B.11.31" .
        * Installing bundle "HPUX-DHCPv6,r=B.11.31" .
        * Installing bundle "HPUX-FTPServer,r=C.2.6.1.4.0" .
        * Installing bundle "HPUX-NTP,r=B.11.31" .
        * Installing bundle "HPUX-NameServer,r=C.9.3.2.5.0" .
        * Installing bundle "HPUX-RAMD,r=B.11.31" .
        * Installing bundle "HPUX-TCPWRAP,r=B.11.31" .
        * Installing bundle "HPUXBastille,r=B.3.1.01" .
        * Installing bundle "HPUXExtns-Jpn,r=B.11.31" .
        * Installing bundle "HPUXExtns-Kor,r=B.11.31" .
```

Figure 14

9. After successful installation of the software from core #2, the system will automatically reboot as shown:

```
15.146.157.234 - PuTTY
        * Installing fileset "hpuxwsXML.BATIK,r=A.2.03" (1899 of 1903).
        * Installing fileset "hpuxwsXML.COCOON,r=A.2.03" (1900 of 1903).
        * Installing fileset "hpuxwsXML.FOP,r=A.2.03" (1901 of 1903).
        * Installing fileset "hpuxwsXML.XALANJ,r=A.2.03" (1902 of 1903).
        * Installing fileset "hpuxwsXML.XERCESJ,r=A.2.03" (1903 of 1903).
NOTE:     More information may be found in the Software Manager logfile using the command "sw
m job log -v 000001".

=======  09/29/09 23:33:00 EDT  Software Install - Saving State and Exiting (Pending Reboot)
 (user=root)  (jobid=000001)

        * Software installation of this source (HP-UX Core Software) is complete.
        * Loading_software:  Complete
=======  09/29/09 23:33:01 EDT  Building the new kernel.
        * Build_Kernel:  Begin
        * Building a new kernel using the command: "/usr/sbin/mk_kernel -f -o /stand/vmunix".
        * The currently running configuration has been imported from
          '/stand/system'.
        * Build_Kernel:  Complete
        * Boot_From_Client_Disk:  Begin
=======  09/29/09 23:33:29 EDT  Rebooting machine as expected.
NOTE:     Rebooting system.
Calling function e000000001de8240 for Shutdown State 1 type 0x1
```

Figure 15

10. After reboot select “HP-UX Primary Boot” from the “Boot” menu and boot the system as shown:

```
15.146.157.234 - PuTTY
|              Boot Menu                |  |   hp server rx6600                |
|<HP-UX Primary Boot: 0/4/2/0....       |  | Serial #:  USE4830N0L             |
|<OpenVMS on DKB1400: PKB0.500...       |  |                                   |
|<OpenVMS on DKD1200: PKD0.500...       |  | System Firmware:  4.03 [4815]     |
|<SATELITE BOOT BVMS4 SERVER M...       |  | BMC Version:      5.23            |
| iLO Virtual Media                     |  | MP Version:       F.02.17         |
| Core LAN Gb A                         |  | Installed Memory: 12288 MB        |
| Core LAN Gb B                         |  |                                   |
| EFI Shell [Built-in]                  |  |  CPU  Logical                     |
| Internal Bootable DVD                 |  | Module CPUs   Speed  Status       |
| ------------------------------        |  |    0    4   1.42 GHz Active       |
| Boot Configuration                    |  |    1    4   1.42 GHz Active       |
| System Configuration                  |  |    2    4   1.42 GHz Active       |
| Security Configuration                |  |    3    4   1.42 GHz Active       |
|                                       |  |                                   |
\---------------------------------------/  \-----------------------------------/

Use <^|v> to scroll     <ENTER> to Select    <ESC> or <X/x> for Previous Menu

Loading.: HP-UX Primary Boot: 0/4/2/0.0x5000c5000b0397f9.0x0
Starting: HP-UX Primary Boot: 0/4/2/0.0x5000c5000b0397f9.0x0

(C) Copyright 1999-2008 Hewlett-Packard Development Company, L.P.
```

Figure 16

11. System boot now and completes the installation. The system will automatically reboot once again after completing installation as shown:

```
15.146.157.234 - PuTTY
=======  09/29/09 23:46:23 EDT  END Software Install succeeded. (user=root)  (jobid=000001)

       * Run_SD_Configure_Scripts:  Complete
       * Run_Postconfigure_Scripts:  Begin
       * Applying the networking information.
         /sbin/init.d/hpapa started.
         Please be patient. This may take about 20 seconds.
         HP_APA_MAX_LINKAGGS = 50
         HP_APA_DEFAULT_PORT_MODE = MANUAL
         /sbin/init.d/hpapa Completed successfully.
       * Applying the timezone: NST3:30NDT.
       * Applying the root password.
       * Creating the manifest.
       * Run all specified post-configure scripts.
       * Run_Postconfigure_Scripts:  Complete
=======  09/30/09 01:16:43 NDT  Installation complete: Successful


####### #     #
#     # #   #
#     # #  #
#     # ###
#     # #  #
#     # #   #
####### #     #


NOTE:    Rebooting system.
```

Figure 17

12. After reboot select “HP-UX Primary Boot” from the Boot Menu and boot the system (same as step 10).
13. Login to the system.

Installing Integrity VM

Integrity VM 4.1 Field Test evaluation kit is available on the web. Download the kit on a Windows machine and copy the kit to the VM Host. In the following example, the kit is copied to `/var/depots` directory.

If Integrity VM is already installed, first remove the existing Integrity VM. Execute the `swremove` command to remove Integrity VM 4.1.

```
# swremove -x autoreboot=true T2767CC
```

Note: If you have installed the online migration enable bundle, include `T8718AC` in the above command.

For other Integrity VM versions, see the *HP Integrity Virtual Machines Installation Configuration and Administration Guide*.

After Integrity VM is removed you can execute the `swinstall` command to install Integrity VM.

```
# swinstall -x autoreboot=true \
> -s /var/depots/hpvm_4.1_ovms_ft_2.depot \
> T2801AA VMGuestLib vmProvider VMGuestSW

======= 09/30/09 17:52:31 IST BEGIN swinstall SESSION
              (non-interactive) (jobid=ovmshpux-0003)

       * Session started for user "root@ovmshpux".

       * Beginning Selection
       * Target connection succeeded for "ovmshpux:/".
       * Source connection succeeded for
         "/var/depots/HPVM_4.1_OVMS_FT_2".
         ….
         ….
       * Analysis and Execution succeeded.

   NOTE:      More information may be found in the agent logfile using the
              command "swjob -a log ovmshpux-0003 @ ovmshpux:/".

       Shutdown at 18:05 (in 0 minutes)

       *** FINAL System shutdown message (ovmshpux) ***

       System going down IMMEDIATELY
```

After the system reboot, Integrity VM installation is complete.

Integrity VM Administration

Use the following command to start Integrity VM:

```
# /sbin/init.d/hpvm start
```

Use the following command to stop Integrity VM:

```
# /sbin/init.d/hpvm stop
```

The following table lists a few HP-UX commands related to Integrity VM.

Table 2: HP-UX commands

Command	Usage
hpvmcreate	Creates new Integrity VM (guest)
hpvmmodify	Modifies the configuration of a Integrity VM
hpvmstart	Starts the VM
hpvmconsole	Connect to the virtual console of a VM
hpvmstop	Stops the VM
hpvmstatus	Displays the status information about one or more VMs
hpvmnet	Creates and controls virtual network switch (vswitch)
hpvmdevmgmt	Manages the devices that are associated with the VM Host and the guests
hpvmclone	Duplicates VM Configuration
hpvmremove	Permanently removes VM

Installing and Configuring OpenVMS Guest

This section describes how to install and configure Integrity VM guest operating system.

1. Integrity VM does not support hyperthreads. The following command checks if hyperthreading is enabled:

   ```
   # getconf SC_HT_ENABLED
   1
   ```

   NOTE: In the output 1 indicates hyperthreading is enabled and 0 indicates hyperthreading is disabled.

   If hyperthreading is enabled you can turn it off by executing the following command and reboot the VM Host:

   ```
   # /usr/sbin/setboot -m off
   # reboot
   ```

2. On the VM Host add the following parameter in the Integrity VM configuration file:

   ```
   # ch_rc -a -p HPVMOPENVMSCAPABILITIES=1 /etc/rc.config.d/hpvmconf
   ```

3. OpenVMS E8.4 kit in ISO format is available in web downloaded form. Copy the OpenVMS E8.4 kit in ISO format to the VM Host. In the following example, the ISO file is copied to `/mypath` directory.

4. Add the ISO file entry as a virtual device in Integrity VM device-management database.

   ```
   # hpvmdevmgmt -a gdev:/mypath/OpenVMS.iso
   ```

   To allow shared access of the ISO file between multiple guests:

   ```
   # hpvmdevmgmt -m gdev:/mypath/OpenVMS.iso:attr:SHARE=YES
   ```

NOTE: You can burn the DVD using OpenVMS E8.4 ISO file. Insert the DVD in the VM Host. Identify the installation DVD drive location by executing the command on the VM Host:

```
# ioscan -NfunC disk
…
disk 7 64000/0xfa00/0x4 esdisk CLAIMED DEVICE Optiarc DVD RW AD-5590A
              /dev/disk/disk7 /dev/rdisk/disk7
```

5. Create and start the virtual switch (vswitch) using the hpvmnet command. Select a physical LAN device to be used by the virtual switch. Execute the `nwmgr` command as shown to observe all running LAN interfaces:

```
# nwmgr
Name/          Interface  Station        Sub-    Interface  Related
ClassInstance   State     Address        system  Type       Interface
============== ========= ========       ======= =========  ========
lan0            UP       0x0017A4771010 igelan  1000Base-SX
lan1            DOWN     0x0017A4771012 igelan  1000Base-SX
lan900          DOWN     0x000000000000 hp_apa  hp_apa
lan901          DOWN     0x000000000000 hp_apa  hp_apa
lan902          DOWN     0x000000000000 hp_apa  hp_apa
lan903          DOWN     0x000000000000 hp_apa  hp_apa
lan904          DOWN     0x000000000000 hp_apa  hp_apa
#
```

In this example lan0 interface "UP" status indicates the LAN interface is running.

To create the virtual switch, use the following command:

```
# hpvmnet -c -S myswitch -n 0
```

In this example the virtual switch name is myswitch and it is using lan0 interface.

To start the virtual switch, use the following command:

```
# hpvmnet -b -S myswitch
```

6. Create a file to act as OpenVMS system disk by executing the `hpvmdevmgmt` command. Mount the disk onto the VM Host file system using the following command:

```
# mount /dev/disk/disk237 /fdev/frackA/
# hpvmdevmgmt -S 4G /fdev/frackA/disk1
```

7. To create a virtual machine on the VM Host, use the following command:

```
# hpvmcreate -P vmsg1 -O OpenVMS -c 2 -r 2g -q ovms=1
# hpvmmodify -P vmsg1 -a network:avio_lan::vswitch:myswitch
# hpvmmodify -P vmsg1 -a disk:avio_stor::file:/fdev/frackA/disk1
```

For an ISO file, use this command:

```
# hpvmmodify -P vmsg1 –a  dvd:avio_stor::file:/mypath/OpenVMS.iso
```

For a DVD, use this command:

```
# hpvmmodify -P vmsg1 –a  dvd:avio_stor::disk:/dev/rdisk/disk7
```

In this example, the virtual machine name (guest name) is vmsg1 of OS type OpenVMS having the following:

- 2 CPUs
- 2 GB memory
- AVIO Disk with backing store as `/fdev/frackA/disk1`
- AVIO LAN virtual switch with the name `myswitch`
- AVIO Disk with backing store as `/dev/rdisk/disk7` (for DVD)

or

- AVIO Disk with backing store as /mypath/OpenVMS.iso (for ISO format)

NOTE: Specify the operating system type as OpenVMS.

If physical disk is used as a backing store, the disk can be defined to assume disk4 as the path to the physical disk. You can replace the following command,

```
# hpvmmodify -P gmsg1 –a disk:avio_stor::file:/fdev/frackA/disk1
```

with this command,

```
# hpvmmodify -P vmsg1 –a disk:avio_stor::disk:/dev/rdisk/disk4
```

If logical volume is used as a backing store, the logical volume can be defined to assume rlv012 as the path to the logical volume. You can replace the following command,

```
# hpvmmodify -P vmsg1 –a disk:avio_stor::file:/fdev/frackA/disk1
```

with the command,

```
# hpvmmodify -P vmsg1 –a disk:avio_stor::lv:/dev/vg01/rlv012
```

8. To display the status information about one or more Integrity VMs run the following command:

```
# hpvmstatus
[Virtual Machines]
Virtual Machine Name VM #  OS Type State  #VCPUs #Devs #Nets Memory  Rmt Host
==================== ===== ======= ====== ====== ===== ===== ======= ========
vmsg1                    1  OpenVMS Off         2     2     1    2 GB      -
```

9. To start the virtual machine on the VM Host, use the following command:

```
# hpvmstart -P vmsg1
(C) Copyright 2000 - 2008 Hewlett-Packard Development Company, L.P.
Opening minor device and creating guest machine container
Creation of VM, minor device 1
…
…
hpvmstart: Successful start initiation of guest 'vmsg1'
Use the hpvmconsole command to connect to the guest.
```

10. To connect to the virtual console of guest operating system, use the following command. For example:

```
# hpvmconsole -P vmsg1
[vmsg1] vMP> CO
Loading device drivers
EFI Boot Manager ver 1.10 [14.62] [Build:Mon Nov 3 14:18:56 2008]
Please select a boot option
EFI Shell [Built-in]
Boot option maintenance menu
Use ^ and v to change option
```

where `CO` is the command for console output, use `Ctrl/B` to return to the vMP main menu.

a) Typically, the EFI shell is selected automatically upon startup. If not, select EFI Shell [Built-in] from the menu.

```
Loading.: EFI Shell [Built-in]
EFI Shell version 1.10 [14.62]
Device mapping table
fs0 : Acpi(PNP0A03,0)/Pci(0|0)/Scsi(Pun1,Lun0)/CDROM(Entry0)
blk0 : Acpi(PNP0A03,0)/Pci(0|0)/Scsi(Pun0,Lun0)
blk1 : Acpi(PNP0A03,0)/Pci(0|0)/Scsi(Pun1,Lun0)
blk2 : Acpi(PNP0A03,0)/Pci(0|0)/Scsi(Pun1,Lun0)/CDROM(Entry0)
Shell>
```

The following example shows the file systems fs0, fs1, and fs2 present on the disk:

```
fs0 : Acpi(PNP0A03,0)/Pci(0|0)/Scsi(Pun0,Lun0)/HD(Part1,Sig5D1D1134
-C809-11DB-9AEB-000000000000)
fs1 : Acpi(PNP0A03,0)/Pci(0|0)/Scsi(Pun0,Lun0)/HD(Part2,Sig5DB58D88
-C809-11DB-9AEB-000000000000)
fs2 : Acpi(PNP0A03,0)/Pci(0|0)/Scsi(Pun1,Lun0)/CDROM(Entry0)
       …
       …
Shell>
```

EFI lists devices with file systems detected as fs(n). In this example, fs0 and fs1 are older file systems that are present on the disk. File system fs2 corresponds to the bootable OpenVMS Virtual DVD, as can be recognized by the CD against it

b) Boot the installation DVD, which is indicated in the device-mapping table as /CDROM, by entering the commands provided in the following example. Choose the virtual DVD drive by using the fs command. If the virtual DVD is shown as fs2 you can switch to that volume using fs2: For example:

```
fs2:\> cd efi\boot
fs2:\efi\boot>bootia64.efi
```

Boot the OpenVMS installation virtual DVD and perform a normal OpenVMS installation.

11. After executing the `bootia64` command the standard OpenVMS Installation menu is displayed where you can complete the OpenVMS guest operating system installation similar to the installation of OpenVMS on a physical system.

NOTE: To return the vMP press `Ctrl/B` (when logged in to the VM Host through its console press `Ctrl/X`.)

Feedback or Suggestion

If you have any suggestions to make this document better or more complete, submit them to OpenVMSFieldTestOps@hp.com.

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